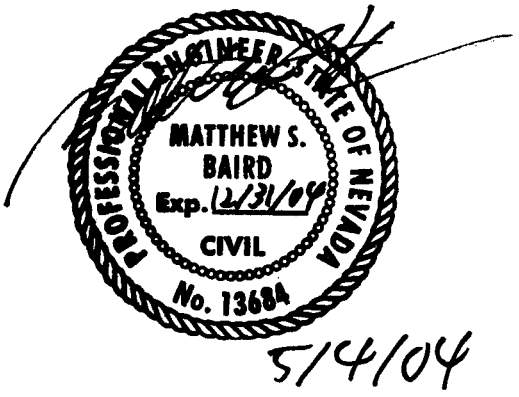
Request for Letter of Map Revision
Pittman Wash
Vicinity of Eastern Avenue and 215 Beltway
Clark County, Nevada

04-09-1194P

Prepared for:

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT
600 S. Grand Central Parkway
Las Vegas, NV 89155

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT



5/4/04

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May 4, 2004

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1.0 INTRODUCTION

The purpose of this Letter of Map Revision (LOMR) is to address a needed revision to numerous remnant Zone A flood zones of the Pittman Wash and tributaries in a portion of unincorporated Clark County and City of Henderson. The area in which the flood zones are located is predominantly urbanized and characterized by mixed density residential and commercial developments. The majority of the project area was developed between the mid 1980's and early 1990's. Development of the project area continues today and as a result much of the historic characteristics that made up the floodplain are no longer current. Note that technical drainage studies and/or civil improvement plans for many of the developments were not readily available from the local entity due to the age of the project area. Remnant flood zones, such as these, are generally created as a result of LOMR's not being pursued after developments or flood control facilities have been constructed. The historic flood source to the area of concern has been substantially reduced based on urbanization and the implementation of flood control facilities. This LOMR request will analyze a portion of the Pittman Wash Flood Zone and demonstrate that the current conditions no longer warrant some of the flood zone delineations as shown on the current effective FIRM Panel 2590 dated September 27, 2002, revised to reflect LOMR dated August 13, 2003. Please refer to **Figure 1 Area/Vicinity Map** for an overall view of the project area. The flood zones of interest have been labeled with a unique identifier for ease of identification when discussing the flood zones throughout the report. Also refer to **Figure 2 CCRFCD Flood Control Facilities Map** that shows existing and proposed facilities within and adjacent to the project area.

Please note that due to its large size the project area has been divided into two sections referred to herein as the north half and south half. Figures 5 & 6 correspond to the project area south of Pebble Road. Figures 7 & 8 correspond to the project area north of Pebble Road.

2.0 HYDROLOGIC MODELING

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 hydrology developed for use in this report utilized the existing condition model from the St. Rose Widening Project for all areas south of St. Rose Parkway. A subbasin map (Figure C3) for the area south of St. Rose Parkway is shown in Appendix C. Hydrology developed for the areas north of St. Rose Parkway was developed specifically for this study. A subbasin map (Figure C1) showing all basins north of St. Rose Parkway is in Appendix C. Hydrologic parameters were developed using GIS to calculate basin areas, curve numbers (based on existing land use and soil type) and precipitation depths. Lag times were calculated using the Clark County Regional Flood Control District's Hydrologic Criteria and Drainage Design Manual. Further discussion of the development of hydrologic parameters is in Appendix C.

3.0 HYDRAULIC MODELING

FlowMaster, version 6.1 was used for street capacity calculations and normal depth analysis of channel and/or natural wash cross-sections.

Hydraulic modeling of the Pittman Wash was performed in conformance with the local standards as specified in the Hydrologic Criteria and Drainage Design Manual using the HEC-RAS program, version 3.1. The U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) allows the user to perform steady and unsteady flow river hydraulic calculations. A single HEC-RAS model was prepared for this project for the portion of the Pittman Wash between Pebble Road and Pecos Road. A more detailed discussion of the HEC-RAS model can be found in the following section.

Note that PBS&J obtained survey data for many of the facilities discussed in this report in order to support the various hydraulic calculations. Please refer to the data CD provided in Appendix G and Appendix F for the survey data tables.

4.0 RESULTS

Presented below are the results of the analysis for the areas affected by the flood zones within the project boundary.

4.1 PITTMAN MAIN WASH

The portion of the Pittman Wash analyzed for this project is the reach from Pebble Road to Pecos Road. This reach of the channelized Pittman Wash is approximately 6,700 feet in length and has varying degrees of improvements including concrete, rip-rap and gabions. The area in and around the Pittman Wash between Pebble Road and Pecos Road has been substantially urbanized since the late 1980's and early 1990's primarily with single-family residential and some commercial developments. As a result, a significant amount of the historic flow reaching the Pittman Wash and its tributaries has been substantially reduced with the construction of various upstream flood control facilities. At the time the Pittman Wash was improved in the early 1990's the regulatory adopted flow was 10,500 cfs. Based on current conditions, the flow used for this analysis is approximately half (please refer to the HEC-RAS analysis).

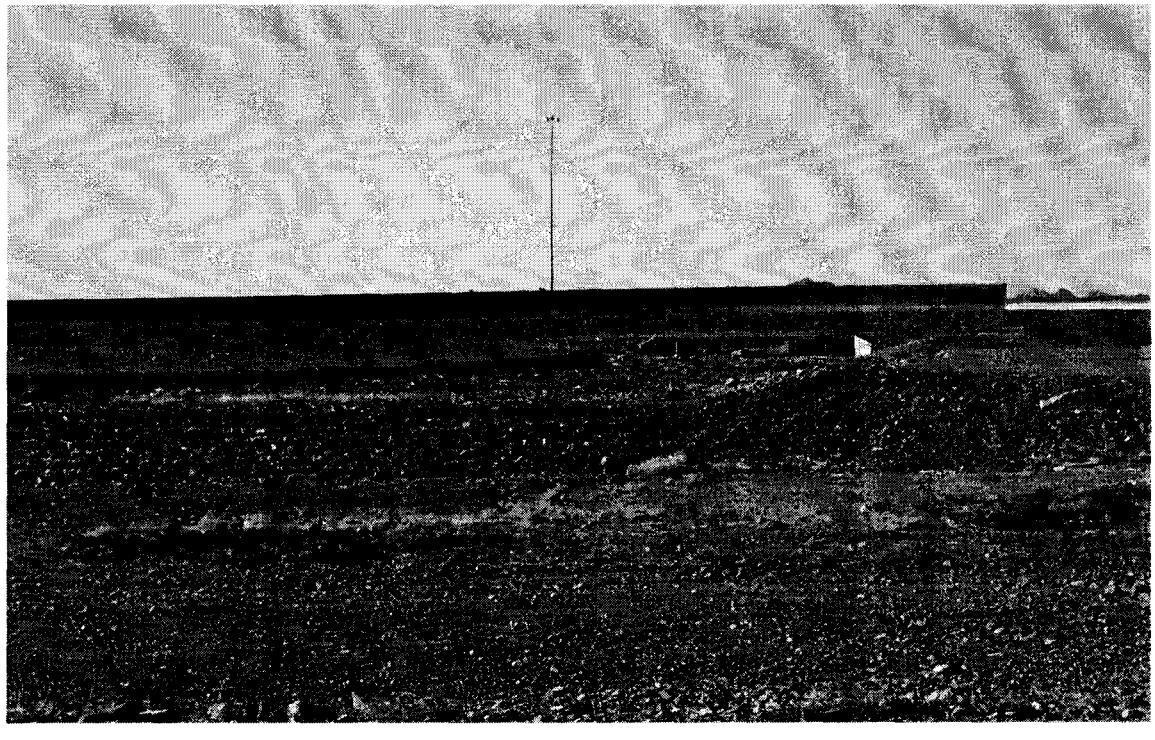
4.1.1 MAIN WASH BETWEEN EASTERN AVE AND PEBBLE ROAD

This portion of the Pittman Wash is the reach from Eastern Avenue to Pebble Road as shown in the site photographs below. The reach includes an approximate 1,300 foot long section of graded channel that has been partially lined with gabion banks. The base of the channel remains unimproved graded earth. This area has been analyzed with two cross-sections (T & U, see Figure 5) using Flowmaster to establish the normal flow depth and width in the channel. The results of the normal depth analysis can be found in Appendix D and show the flow of 5,032 cfs is contained within the channel.

View of Pittman Wash from Pebble Road Looking Southwest at D/S End of Culverts Beneath Eastern

View of Pittman Wash from Pebble Road Looking East.

Also included in this area is the confluence of the main wash and the east tributary as shown in the site photographs below and Figure 5. This reach includes an approximate 1,000 foot long section of graded channel that has been partially lined with gabion banks and a gabion drop structure. The base of the channel remains unimproved graded earth. This area has been analyzed with three cross-sections (V, W, and X, see Figure 5) using Flowmaster to establish the normal flow depth and width in the channel. The results of the normal depth analysis can be found in Appendix D and show the flow of 4,585 cfs is contained within the channel. Note that cross-sections V, W, and X show supercritical flow and the channel sections are not concrete lined. In order to more accurately map the floodplain the critical depth elevation for the supercritical Flowmaster calculation was used as the governing parameter to produce a critical depth top width. The top width at critical depth was then used to map the floodplain at sections V, W, and X.



View of Pittman Wash from Pebble Road Looking South at D/S End of Culverts Beneath I-215

View of Pittman Wash Looking Northeast at U/S End of (8) 12' x 9' Culverts Beneath Pebble Road

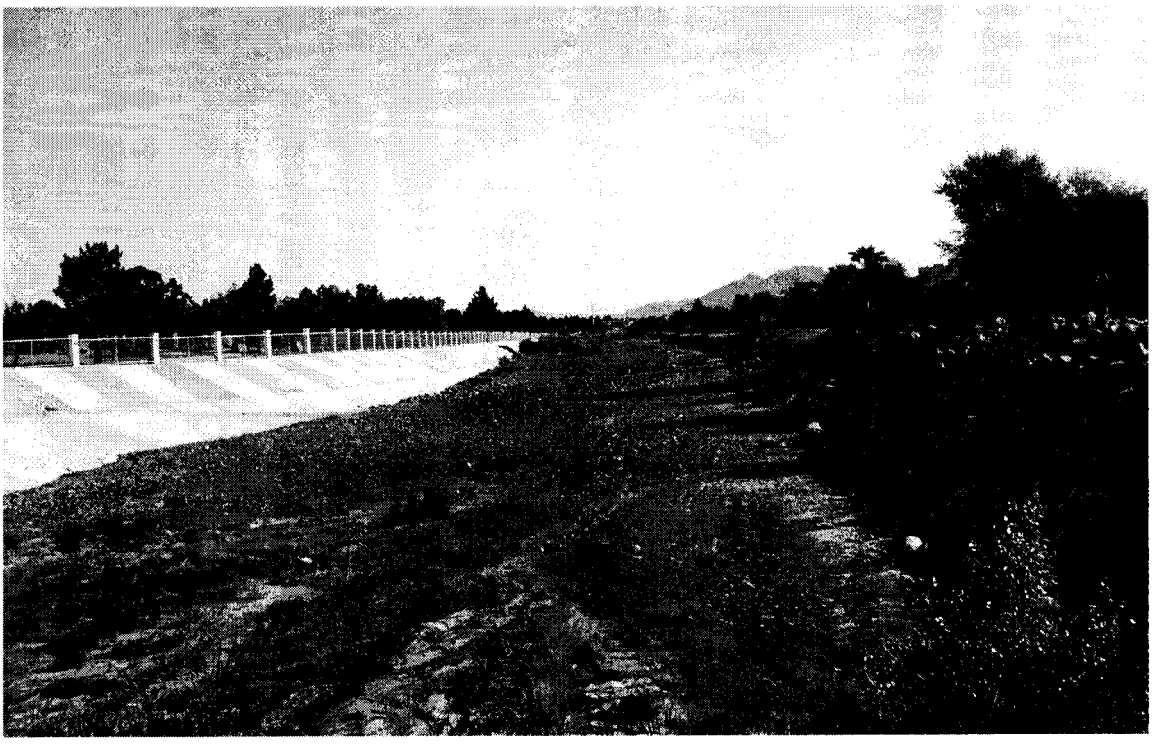
4.1.2 MAIN WASH BETWEEN PEBBLE ROAD AND PECOS ROAD

A HEC-RAS model has been prepared with the use of the design reports in conjunction with PBS&J survey data. Current survey data was required to fill in the cross-section gaps as not all the design reports for the various stages of the channel improvements were readily available. The previous models were prepared in HEC-2 and have been manually imported into HEC-RAS for this project. Please refer to Figure 7 for the HEC-RAS cross-section locations. Note that the elevations used in the HEC-2 models were prepared based on NGVD29 datum and the PBS&J survey data is based on NAVD88 datum. Therefore, the PBS&J survey data was adjusted to match the HEC-2 models with the use of a local datum conversion by subtracting 2.35 feet. The HEC-RAS model starts approximately 200 feet upstream of the culvert crossing beneath Pebble Road and extends northerly for approximately 2800 feet to the second culvert crossing at Wigwam Road. From there, the model extends northerly for an additional 1200 feet and turns easterly for approximately 2300 feet to the third culvert crossing at Pecos Road. The model terminates approximately 100' downstream of the third culvert crossing. The culvert crossings consist of eight 12'x9' RCB's at Pebble Road, five 10'x5' RCB's at Wigwam Road and a bridge at Pecos Road. Please refer to Appendix D for the detailed HEC-RAS output for the Pittman Wash. The results of the model show that the flow is contained within the Pittman Channel with the exception of overtopping at the culvert crossing at

Wigwam Parkway. It should be noted that the HEC-RAS model shows supercritical flow at many locations. The model also shows that the channel can contain the flow up to critical depth at these locations.

The existing culverts beneath Wigwam Parkway have insufficient capacity to convey the 100-year flow and thus flow overtops the road. Since the peak water surface is higher than the high point in Wigwam to the east, a flow split was developed in the HEC-1 model. The flow split was estimated by taking the depth of flow at the high point in Wigwam Parkway (0.78 feet) from the HEC-RAS model and inputting it into a Flowmaster cross section for a standard 80-foot Right-of-Way Street. The area of flow from the Flowmaster cross-section was divided by 80 feet to solve for an average depth. This average depth was input into the weir equation to solve for a flow rate which was used as the flow rate that would split at Wigwam. The Flowmaster calculation and weir calculation are shown in Appendix D. The flow diverted at Wigwam Parkway (38 cfs) is less than 1 foot deep and therefore does not warrant a new flood zone delineation. It should also be noted that a second profile was developed for the HEC-RAS model using a flow of 4,150 cfs. This profile was developed to establish the water surface elevation at Wigwam Parkway that matches the gutter flowline elevation in Wigwam Parkway at the high point east of the wash. This flow and corresponding water surface elevation was needed to determine when flow begins to overtop the highpoint in Wigwam Parkway. This information was then used to develop an accurate rating curve for the diversion in the HEC-1 model.

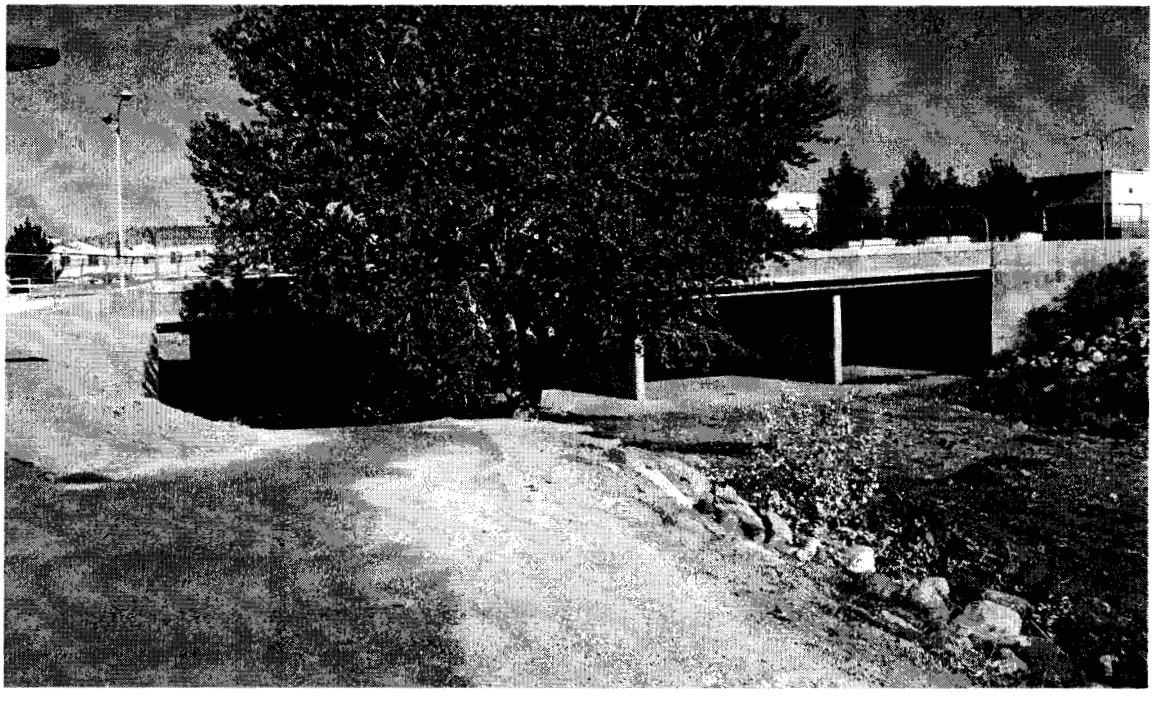
The resulting flood zone revisions for the Pittman Wash show containment within the channel from Pebble Road to Pecos Road except at Wigwam Parkway. Even though the HEC-RAS model shows containment of flow in the channel upstream and downstream of Wigwam Parkway it is believed that a flood hazard potential still exists for some of the existing homes downstream of Wigwam Parkway on the east and west banks of the channel. Therefore, a portion of the currently effective flood zone covering the east and west banks of the channel is proposed to remain until further improvements to the channel in this area eliminate overtopping of Wigwam Parkway. Please refer to the proposed floodzone delineation on Figure 8.



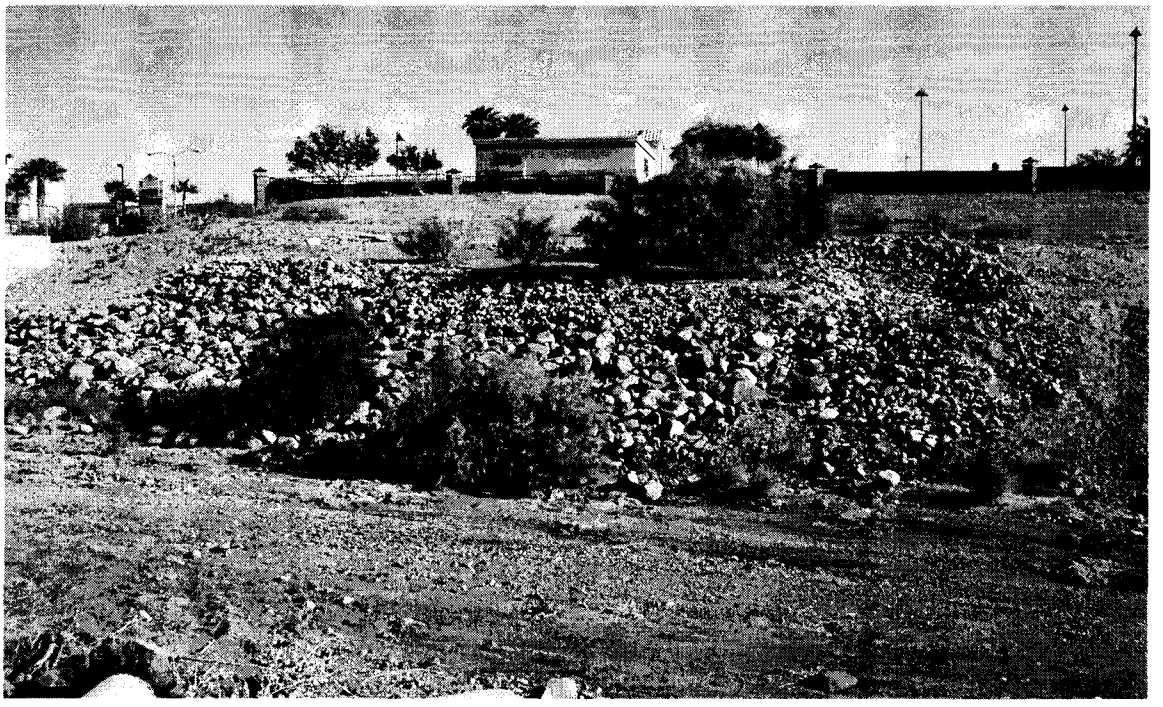
View of Pittman Wash from Pebble Road Looking Downstream (Northeast)

View of Pittman Wash from Wigwam Pkwy Looking Downstream

View of Pittman Wash Looking at D/S End of (6) 10' x 5' Culverts Beneath Wigwam Pkwy



View of Pittman Wash Looking Northwest at D/S End of (4) 15' x 10' Culverts Beneath Pecos Road



View of Pittman Wash Banks Looking North at D/S End of Culverts Beneath Pecos Road

View of Pittman Wash from Pecos Road Looking East (Downstream)

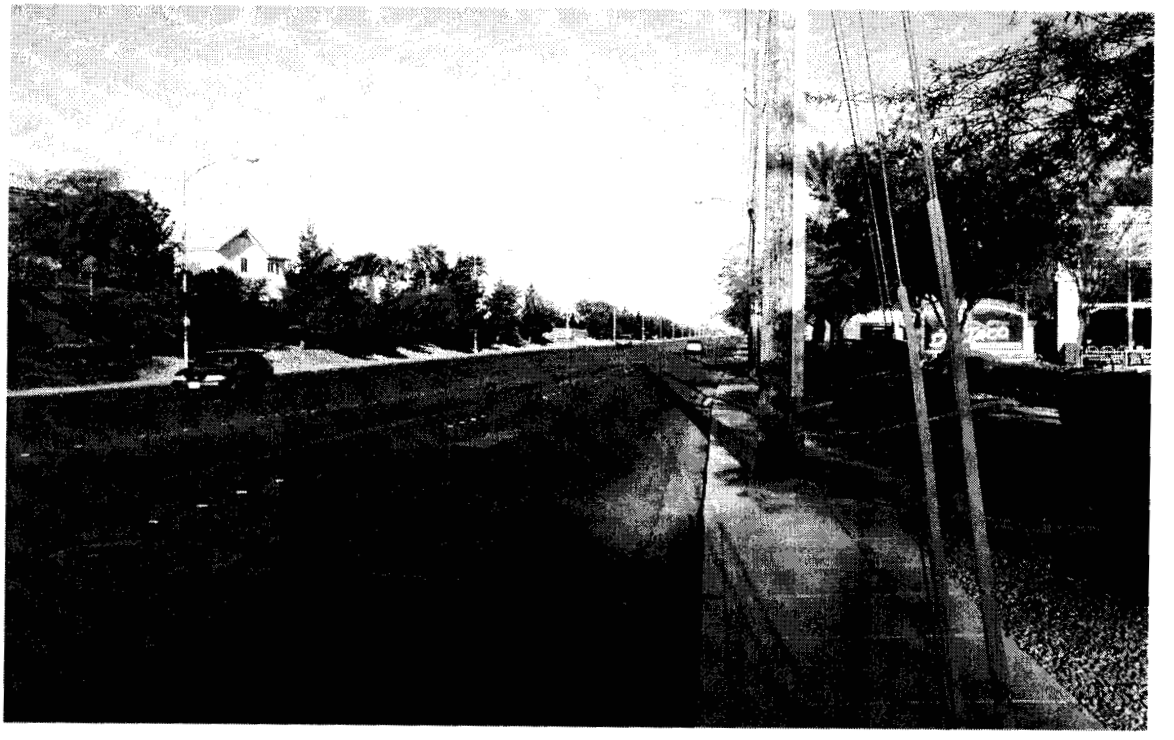
View of Pittman Wash Looking Easterly at U/S End of Culverts Beneath Pecos Road

View of Pittman Wash from Pecos Road Looking Upstream (Southwest)

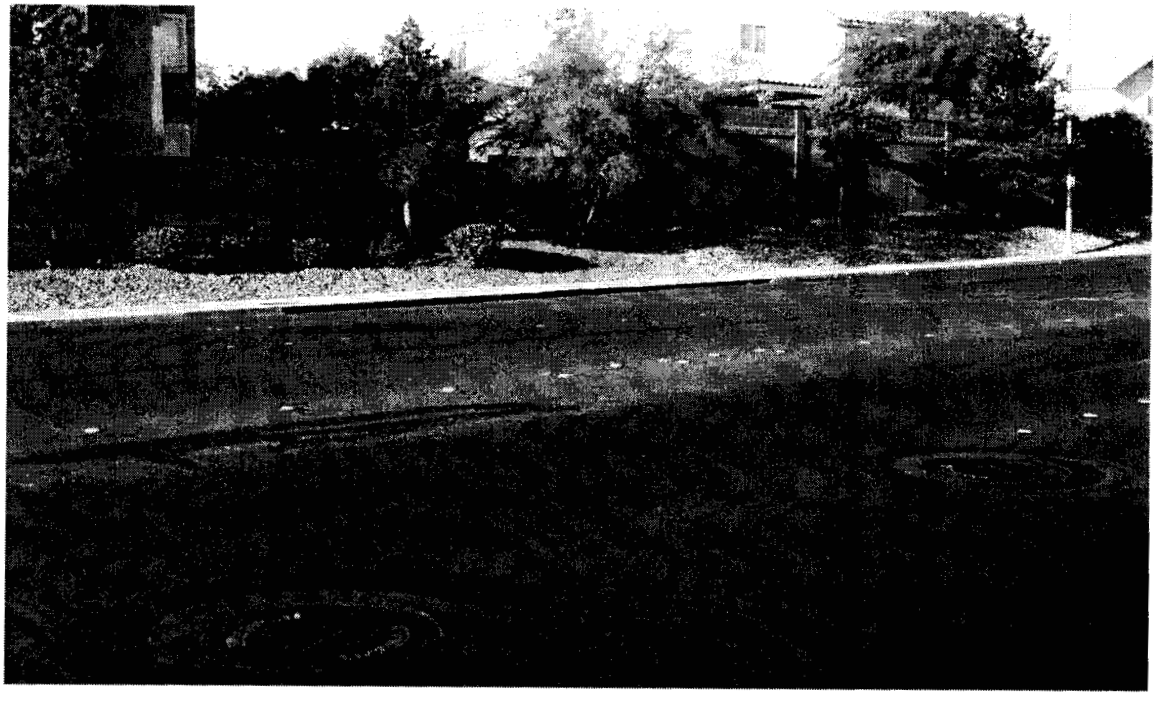
4.2 TRIBUTARY 1 OF MAIN WASH

Tributary 1 of the main wash is a remnant floodzone finger that historically contributed flow to the Pittman Wash. However, upstream developments and flood control facilities have reduced the amount of flow and is currently characterized by local residential drainage as shown on Figure C-1 in Appendix A. A Flowmaster cross-section (Section A) demonstrates the flow depth in Summer Cypress Street at 0.78 feet with the corresponding flow of 123 cfs. A Flowmaster cross-section (Section B) demonstrates the flow depth in Avola Street at 0.94 feet with the corresponding flow of 172 cfs. A Flowmaster cross-section (Section C) demonstrates the flow depth in Serene Avenue at 0.93 feet with the corresponding flow of 172 cfs. Please refer to Figure C1 in Appendix A for the basin delineations and flows for this area. Also refer to the site photographs below that show Serene Avenue in the location where the floodzone crosses Serene Avenue. Flow discharging to Serene Avenue is conveyed east and intercepted by the drop inlets as shown in the site photos below. The commercial development north of Serene Avenue have substantially elevated drive entrances as shown in the improvement plans for Serene Avenue, see Appendix E.

These cross-sections demonstrate that the depth of flow is less than 1-foot at all locations analyzed. Also the drainage area is less than one square mile thus the FIRM Panel should be revised as shown on Figure 6 – South Half Proposed Floodzone Map.



View of Serene Ave Looking West Where Floodzone Crosses Serene



View of Drop Inlet in Serene Ave (South Side) Downstream (East) of Floodzone That Crosses Serene.

View of Drop Inlet in Serene Ave (North Side) Downstream (East) of Floodzone That Crosses Serene

4.3 TRIBUTARY 2 OF MAIN WASH

Tributary 2 is a floodzone finger that starts at Richmar Avenue and extends north along Eastern Avenue, through the I-215 Beltway, and ties into the Pittman Wash floodzone. As shown on Figure 5 an existing storm drain system adjacent to the west side of Eastern Avenue collects the flow that would have historically contributed to the Tributary 2 floodzone. The storm drain system extends from Ione Road to the Beltway channel and consists of three facility types. The upstream portion consists of (4) 72" RCP's. The middle portion consists of dual arch culverts (11' span x 5.5' rise). The downstream portion consists of dual 13' x 6' RCB's. The slopes for the upstream and down stream segments were verified with the PBS&J survey data and show a slope of 1.5% for the (4) 72" RCP's and 1.3% for the dual 13'x6' RCB's. Please refer to Appendix D for the capacity calculations for the upstream and downstream portions of the storm drain (section S1 and S2, respectively). Also, refer to Appendix E for the hydraulic analysis of the dual arch culverts.

The cross-sections and reference material demonstrate adequate capacity of the storm drain system thus the FIRM Panel should be revised as shown on Figure 6 – South Half Proposed Floodzone Map.

4.4 TRIBUTARY 3 OF MAIN WASH

Tributary 3 is a floodzone finger that starts at Pebble Road and extends north through single-family residential and ties into the Pittman Wash floodzone as shown on Figure 7. A Flowmaster cross-section (Section N6) demonstrates the flow depth in Aragon Place is 0.56 feet with the corresponding flow of 46 cfs. A Flowmaster cross-section (Section N7) demonstrates the flow depth in Bosco Place is 0.55 feet with the corresponding flow of 43 cfs. A Flowmaster cross-section (Section N8) demonstrates the flow depth in Montclair Court is 0.90 feet with the corresponding flow of 207 cfs. Note that the flow at section N8 includes the flow split (38 cfs) from the culvert over-topping of the Pittman Wash at Wigwam Parkway. Please refer to Figure C1 in Appendix A for the basin delineations and flows for this area.

These cross-sections demonstrate that the depth of flow is less than 1-foot at all locations analyzed. Also the drainage area is less than one square mile thus the FIRM Panel should be revised as shown on Figure 8 – North Half Proposed Floodzone Map.

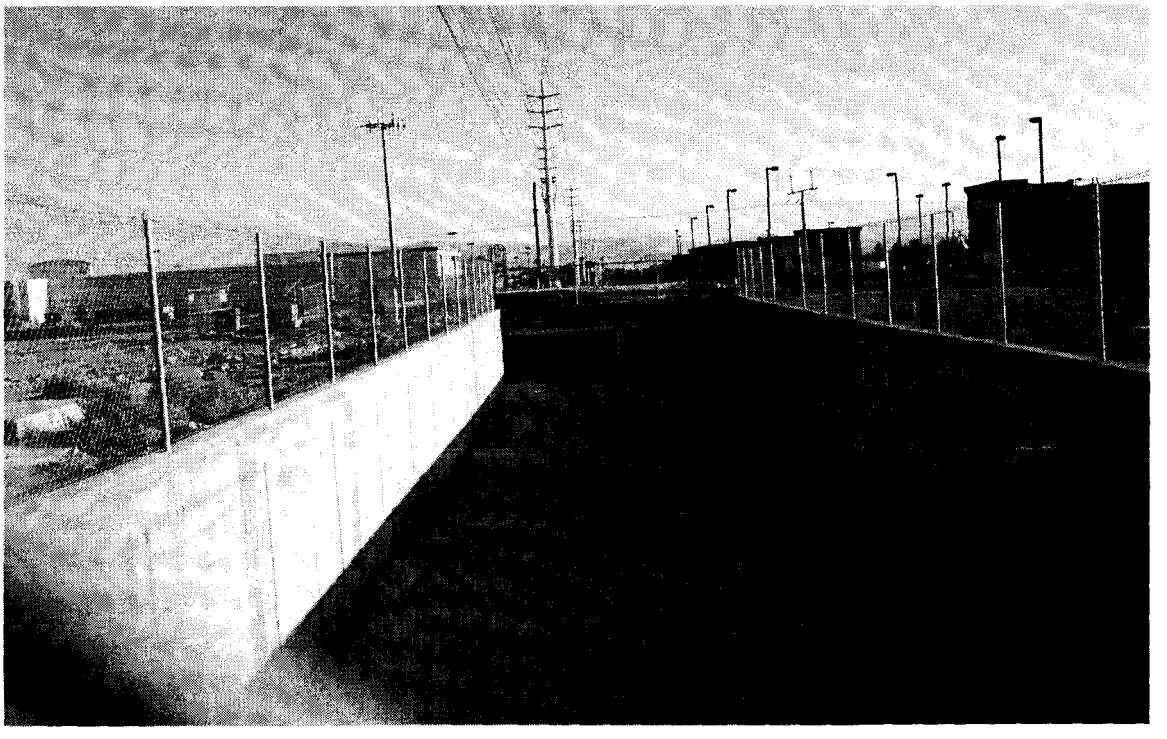
4.5 TRIBUTARY 4 OF MAIN WASH

Tributary 4 is a floodzone finger that starts in undeveloped land south of Pebble Road and extends north through single-family residential and terminates at Wigwam Parkway as shown on Figure 7. A Flowmaster cross-section (Section N1) demonstrates the flow depth in Hidden Falls is 0.38 feet with the corresponding flow of 6 cfs. A Flowmaster cross-section (Section N2) demonstrates the flow depth in Copper Creek is 0.31 feet with the corresponding flow of 3 cfs. A Flowmaster cross-section (Section N3) demonstrates the flow depth in Reyburn Drive is 0.36 feet with the corresponding flow of 9 cfs. A Flowmaster cross-section (Section N4) demonstrates the flow depth in Megan Drive is 0.56 feet with the corresponding flow of 46 cfs. A Flowmaster cross-section (Section N5) demonstrates the flow depth in Pleasant Dale is 0.53 feet with the corresponding flow of 39 cfs. Please refer to Figure C1 in Appendix A for the basin delineations and flows for this area.

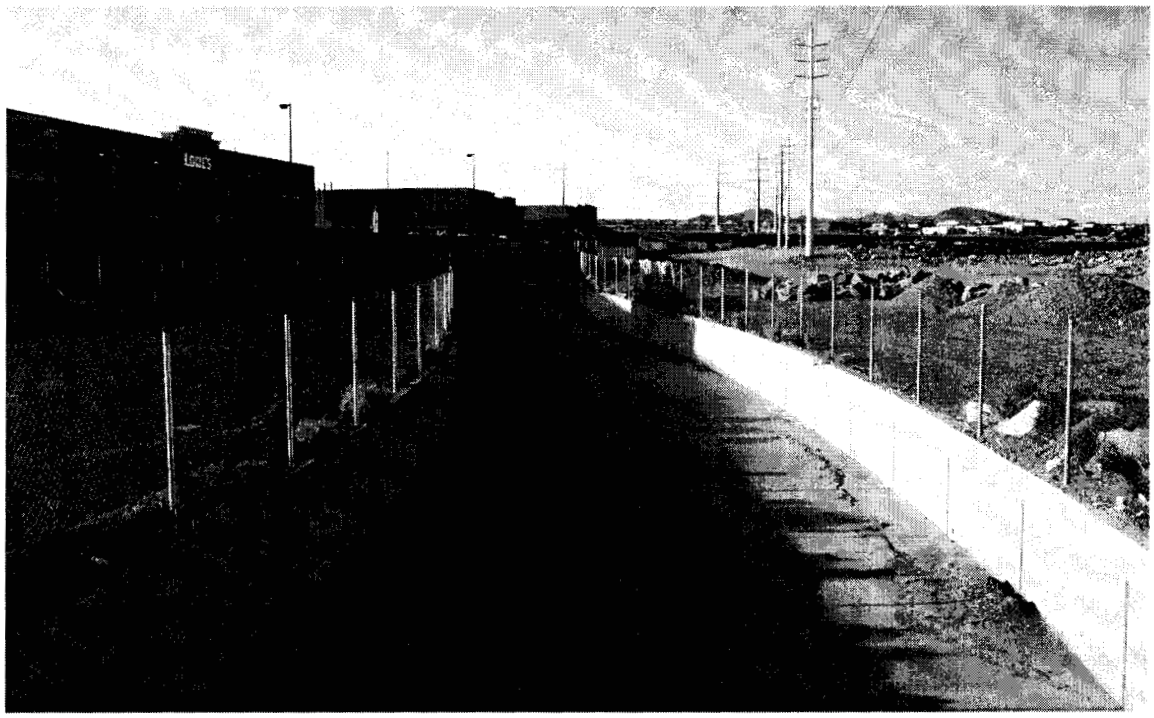
These cross-sections demonstrate that the depth of flow is less than 1-foot at all locations analyzed. Also the drainage area is less than one square mile thus the FIRM Panel should be revised as shown on Figure 8 – North Half Proposed Floodzone Map.

4.6 EAST TRIBUTARY OF MAIN WASH

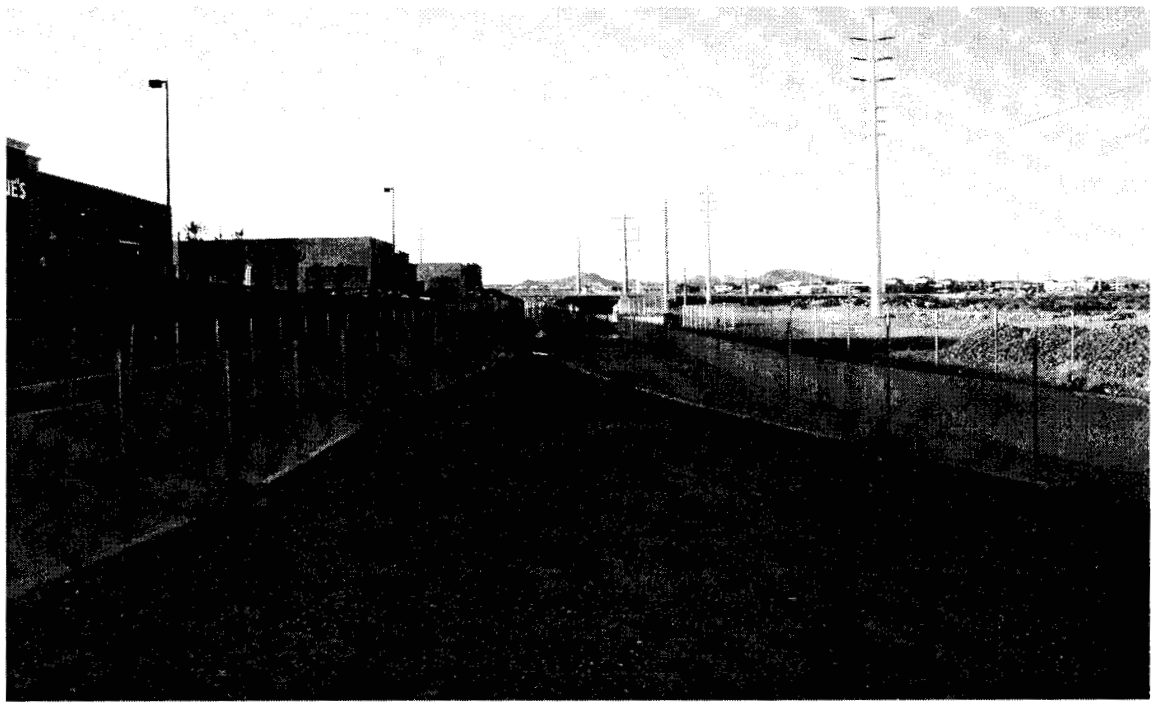
The East Tributary is comprised of the floodzone that extends from St. Rose Parkway north through the 215 Beltway and ties into the Pittman Wash floodzone as shown on Figure 5. This floodzone has been divided into three sections and analyzed separately. The first section is the very southern portion of the East Tributary (upstream of Eastern Avenue) and is cutoff by the South Pointe Channel shown in the site photographs below. The channel was analyzed with normal depth calculations to demonstrate adequate capacity. Please refer to Figure 5 for the location of the channel cross-sections (C5, C6, C7 and C8). Also, refer to Appendix D for the cross-section results that show the channel has adequate capacity. This LOMR proposes to cutoff this floodzone at the South Pointe channel and show that it is contained in the channel/box culverts. PBS&J recently prepared a LOMR for the Pittman East Detention Basin (FEMA Case #02-09-1171R) and the downstream portion of that proposed floodzone has been shown on Figure 6.



View of Concrete Channel Looking Downstream (North) Towards Culvert Crossing at Ione Road

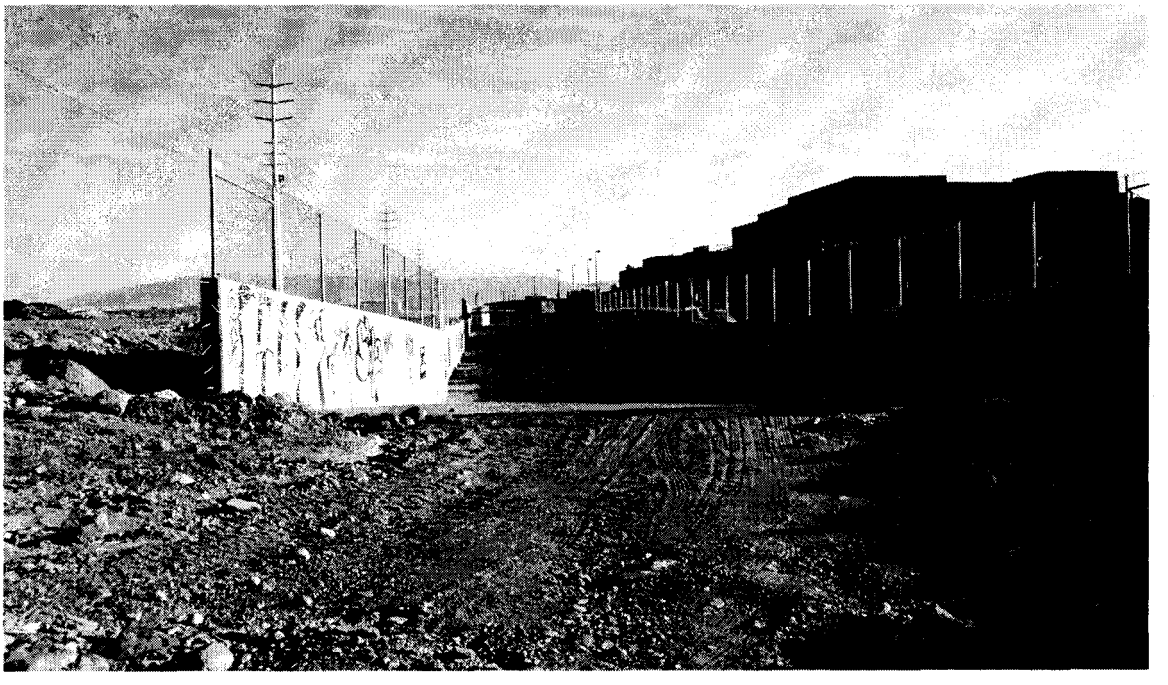


View of Concrete Channel Looking Upstream (South) From Ione Road



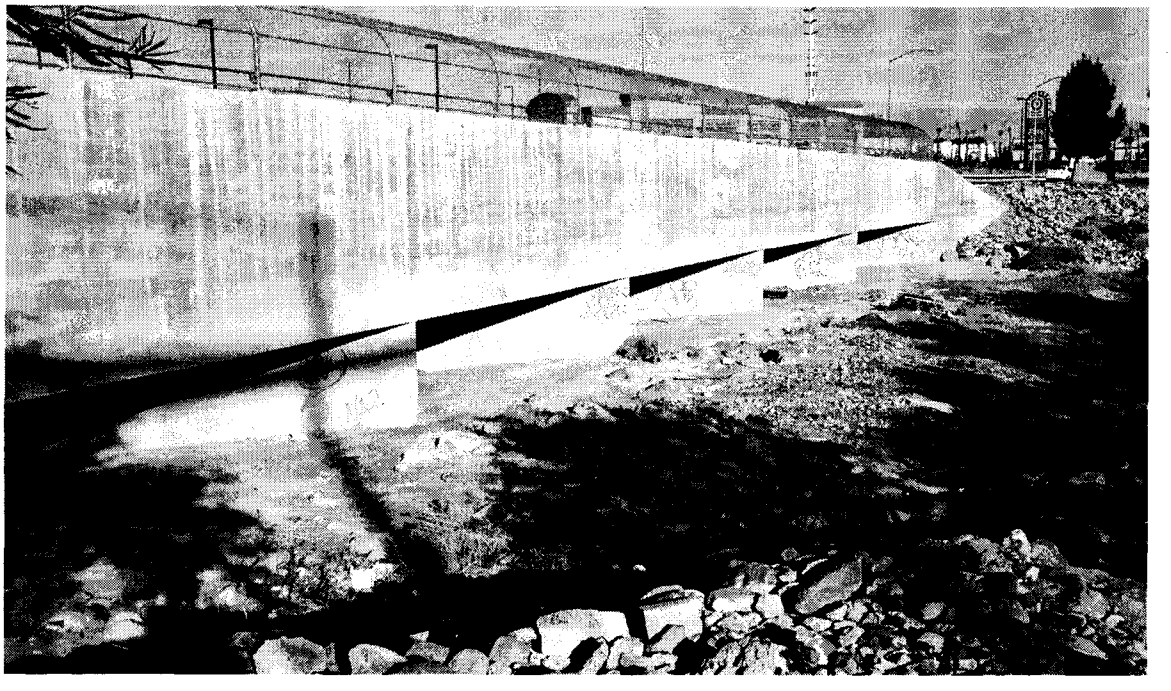
View of Concrete Channel Looking Downstream (South) at Channel Split

Additional View of Concrete Channel Looking Upstream From Ione Road

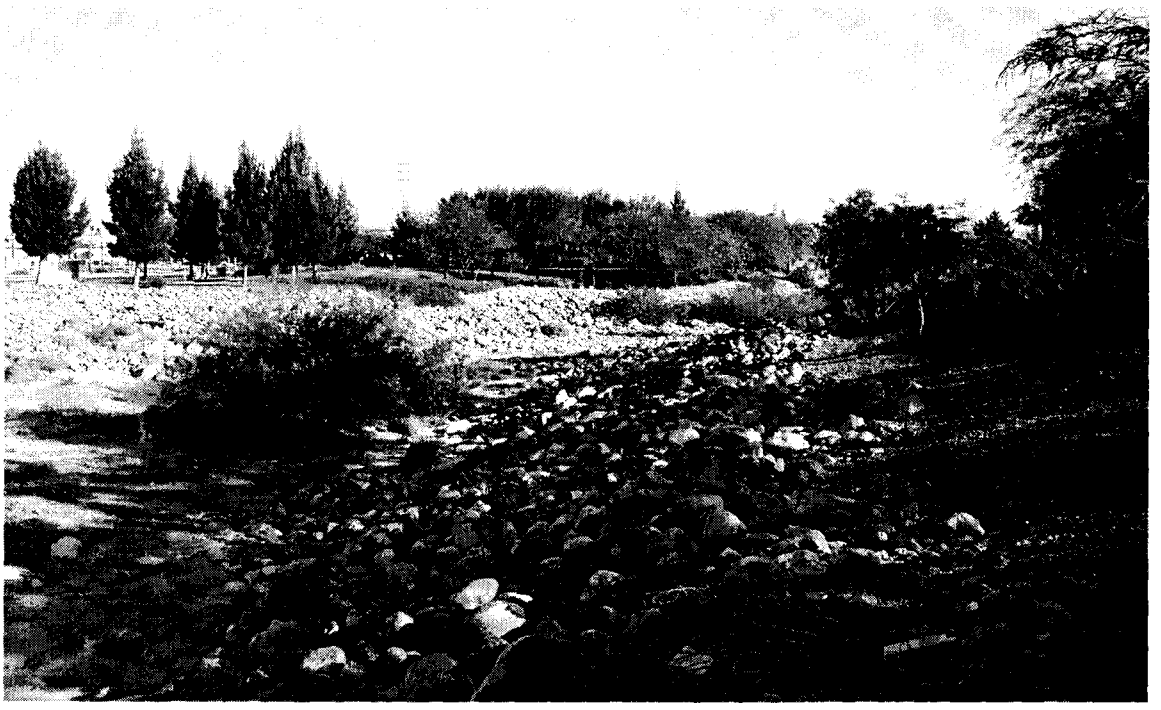


View of Upstream End of Concrete Channel Looking North From St. Rose Parkway

The second portion of the East Tributary analyzed is the channel between Eastern Avenue and Silverado Ranch Boulevard. This reach includes an approximate 1,100 foot long section of graded channel with rip-rap lined side slopes as shown in the site photographs below. This area has been analyzed with three cross-sections (C1, C2 and C3, see Figure 5) using Flowmaster to establish the normal flow depth and width in the channel. The results of the normal depth analysis can be found in Appendix D and show the flow of 2,189 cfs is contained within the channel. Note that cross-sections C1, C2 and C3 show supercritical flow and the channel is not concrete lined. In order to more accurately map the floodplain the critical depth elevation for the supercritical Flowmaster calculation was used as the governing parameter to produce a critical depth top width. The top width at critical depth was then used to map the floodplain at sections C1, C2 and C3.



View of East Tributary Wash Looking Northwest at D/S End of Culverts Beneath Eastern

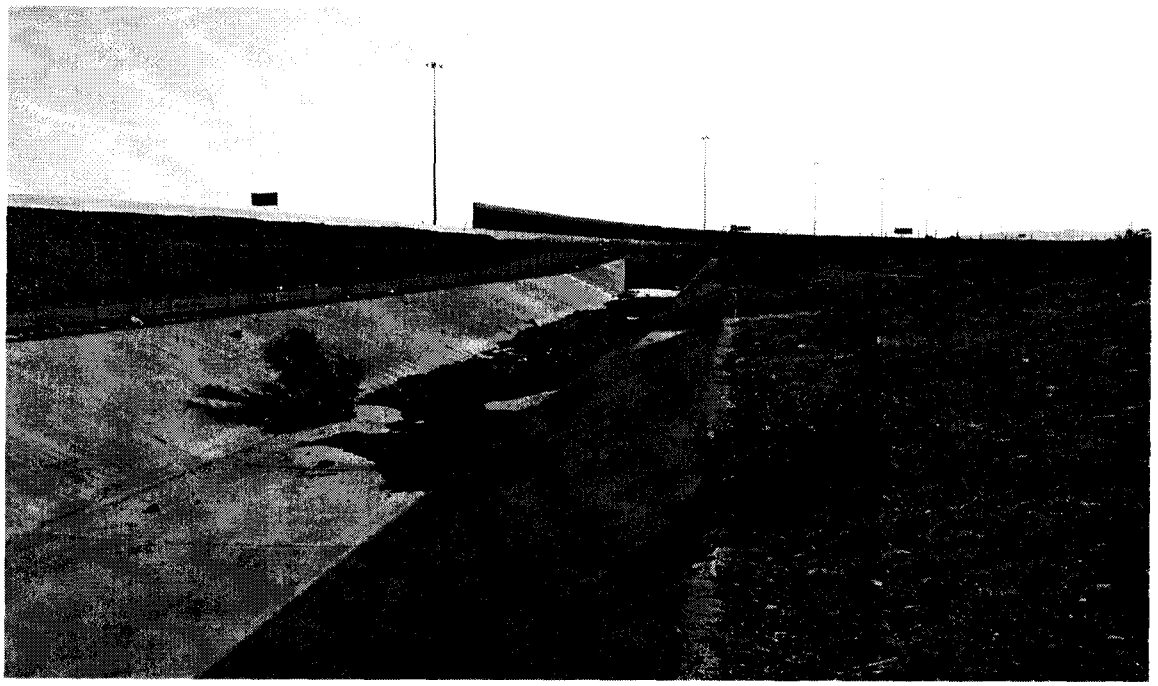


View of East Tributary Wash from Eastern Ave Looking Downstream (Northeast)

The third portion of the East Tributary analyzed is the natural wash area between Silverado Ranch Boulevard and the 215 Beltway. This area consists predominantly of undeveloped land with some commercial and residential developments as shown on Figure 5. Note that this area has been analyzed in conjunction with Tributary 2 of the East Tributary. This area has been analyzed with normal depth cross-sections (D through Q, see Figure 5) using Flowmaster to establish the normal flow depth and width in the channel. Also, two cross-sections (R and S) show the flow is contained in the Beltway Channel. Please refer to Figure 5 for the location of the Beltway Channel as shown by cross-sections R and S. Note that some of the cross-sections show supercritical flow for an area that consists of natural washes. In order to more accurately map the floodplain the critical depth elevation for the supercritical Flowmaster calculation was used as the governing parameter to produce a critical depth top width. The top width at critical depth was then used to map the floodplain at those sections. The results of the normal depth analysis can be found in Appendix D and show that the floodzone can be narrowed to that shown on Figure 6. The final analysis for the East Tributary is for the confluence of the natural wash and the two Beltway channels. This system consists of three separate culvert crossings beneath the I-215 Beltway immediately downstream of cross-section Q (see Figure 5). Also refer to the following site photos that show the beltway channels and the primary culvert crossing beneath the 215. The culvert crossings consist of (4) 12' x 8' RCB's for the primary wash, (2) 12' x 8' RCB's for the western

beltway channel and a single 8' x 8' RCB for the eastern beltway channel. Please refer to Appendix D for the inlet control nomograph calculations that show the culverts have adequate capacity.

View of Beltway Channel Looking Upstream (Westerly) at Outlet of Storm Drain Beneath Eastern Ave

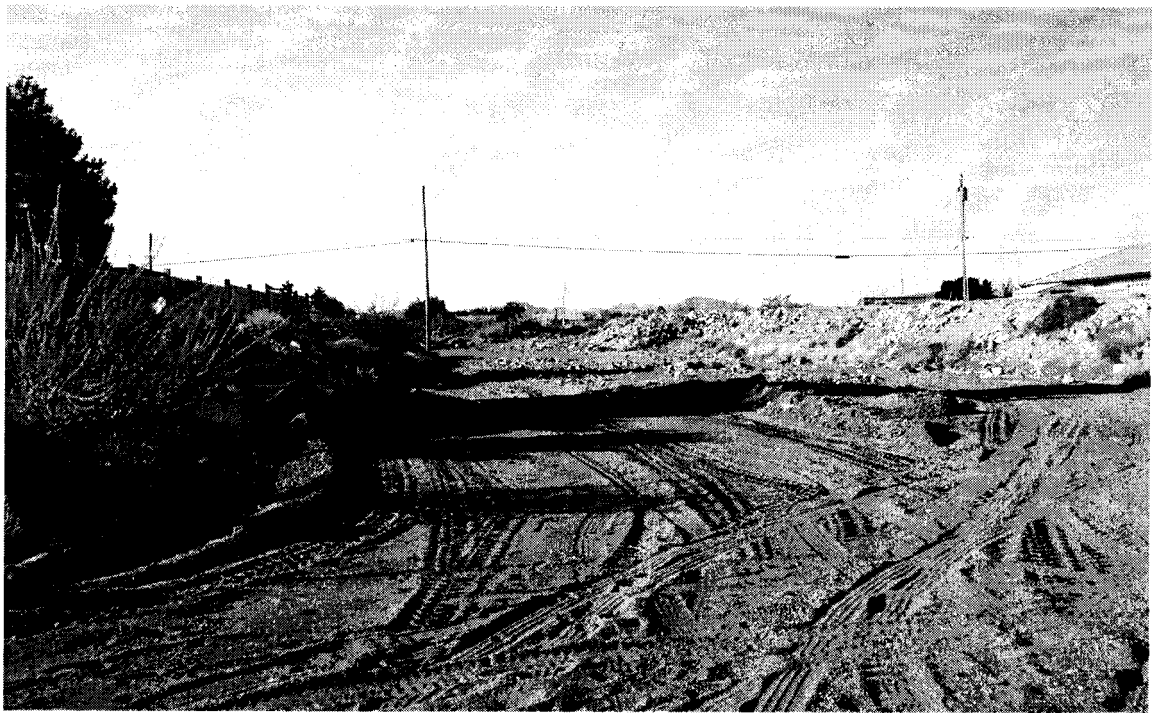


View of Beltway Channel Looking Downstream Towards East Tributary (Cross-Section R)

Upstream View of Culvert Crossing Beneath 215 Beltway for the East Tributary

View of the East Tributary Looking South (Upstream) from the 215 Beltway

View of East Tributary Wash at Confluence with Tributary 2, Looking Downstream from Serene Ave



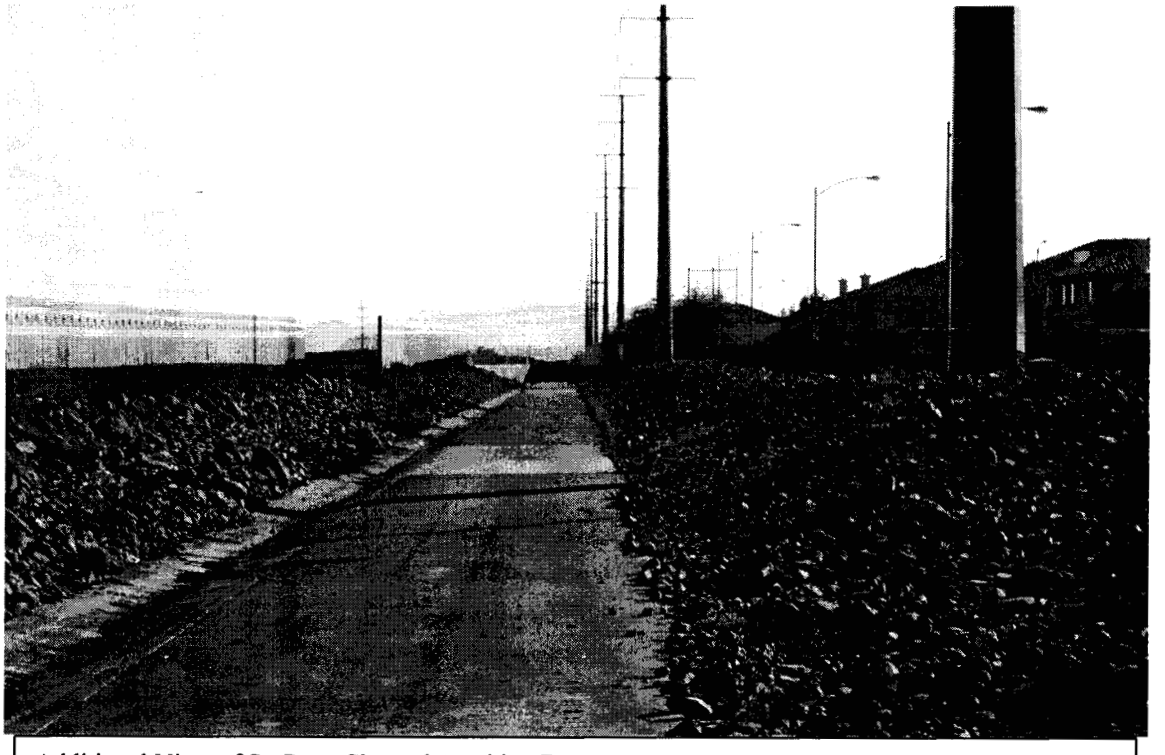
View of East Tributary Wash at the Confluence with Tributary 2, Looking Upstream from Serene Ave

4.7 TRIBUTARY 1 OF EAST TRIBUTARY

Tributary 1 is a floodzone finger that starts at St. Rose Parkway and extends northwest through single-family residential and ties into the East Tributary as shown on Figure 5. A Flowmaster cross-section (Section C4) demonstrates the flow depth in Norridgewock Street is 0.77 feet with the corresponding flow of 148 cfs. Please refer to Figure C1 in Appendix A for the basin delineations and flows for this area.

The cross-section demonstrates that the depth of flow is less than 1-foot. Also the drainage area is less than one square mile thus the FIRM Panel should be revised as shown on Figure 6 – South Half Proposed Floodzone Map.

View of Channel and Sound Wall (on Southeast Side of St. Rose, Northeast of Eastern Avenue) per St. Rose Widening Project, Looking Downstream (Northeast)



Additional View of St. Rose Channel, Looking Downstream

5.0 CONCLUSION

We believe that based on the data and supporting calculations contained within this Letter of Map Revision application, the flood zone revisions for the Pittman Wash and its tributaries are warranted. Please refer to **Figures 3 and 4, FEMA Flood Zone Map and Annotated FEMA Flood Zone Map**. Figure 4 shows the proposed revisions to the current effective flood zone delineations. Note that Figure 4 shows the proposed flood zone delineations for the Pittman Wash and East Tributary as an overlay to the current effective flood zone delineation. The remaining areas within the project boundary are shown as entirely removed from the current FIRM panel.

6.0 REFERENCES

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

FlowMaster — FlowMaster Version 6.1, Haestad Methods, Inc. 1999.

HEC-1 — HEC-1 Flood Hydrograph Package Version 4.0. U.S. Army Corps of Engineers, Hydrologic Engineering Center, September 1990.

HEC-RAS — U.S. Army Corps of Engineers' River Analysis System (HEC-RAS), Hydrologic Engineering Center, November 2002.

MPU 02 — *CCRFCD Master Plan Update of the Las Vegas Valley 2002.* Prepared for Clark County Regional Flood Control District. Prepared by PBS&J , 2002.

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

ESI — *Oak Forest Villas II Hydrology Study.* Prepared by Engineers and Surveyors, Inc dated May 20, 1991.

ESI — *2nd Addendum for Windmill Pointe Condominium Hydrology Study.* Prepared by Engineers and Surveyors, Inc dated October 2, 1992.

HDR — *St. Rose Parkway Improvements from I-15 to Pecos Road.* Prepared by HDR, Inc. dated November 20, 2002.

VTN — *Technical Drainage Study for Section 26 Phase I* and associated addendums and supplements. Prepared by VTN, Inc., 2000.

GCW — *Silverado Ranch Station Culvert Extension.* Prepared by G.C. Wallace dated March 1, 2001.

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 Unincorporated Areas	NV	32003C	2590E	08/13/03
320005	City of Henderson	NV	32003C	2590E	08/13/03

2. Flooding Source: Pittman Wash

3. Project Name/Identifier: Request for Letter of Map Revision Pittman Wash Vicinity of Eastern Avenue and 215 Beltway

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: Brian 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: May 3, 2004

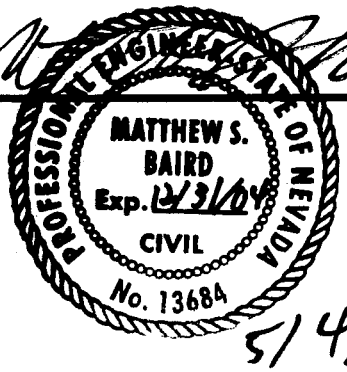
As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the 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: David Betley, P.E., Principal Engineer, Civil Engineering Division		Telephone No.: (702) 455-4808
Community Name: Clark County Unincorporated Areas	Community Official's Signature (required):	Date: May 3, 2004

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: Matthew S. Baird, P.E., CFM	License No.: NV 13684	Expiration Date: 12/31/04
Company Name: PBS&J	Telephone No.: (702) 263-7275	Fax No.: (702) 263-7200
Signature:		Date: May 3, 2004



5/4/04

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: Brian 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: May 3, 2004

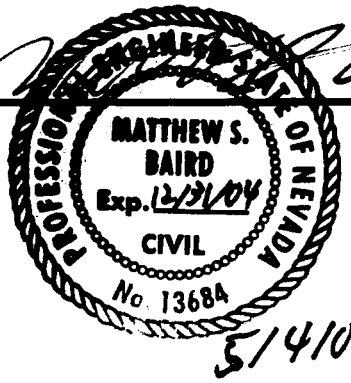
As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the 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: Curt Chandler, P.E., Project Engineer II		Telephone No.: (702) ~~455-4808~~ 267-3020
Community Name: City of Henderson Public Works	Community Official's Signature (required):	Date: May 3, 2004

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: Matthew S. Baird, P.E., CFM	License No.: NV 13684	Expiration Date: 12/31/04
Company Name: PBS&J	Telephone No.: (702) 263-7275	Fax No.: (702) 263-7200
Signature:		Date: May 3, 2004



5/4/04

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

Main Wash (Pittman)

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: Pittman Wash - Main 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)
Pittman Wash at Pebble	11.47	9258	5411

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	Pecos Road	-48	N/A	
Upstream Limit	Pebble	-0.5	N/A	

2. Hydraulic Method Used

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: N/A	Floodway File Name: N/A
Corrected Effective Model*	Natural File Name: N/A	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Revised or Post-Project Conditions Model	Natural File Name: See Attached	Floodway File Name: N/A
Other - (attach description)	Natural File Name: See Attached	Floodway File Name: N/A

*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.

Hydraulic Analysis HEC-RAS 3.1 and Flowmaster 6.1 [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 FORM 2

Tributary 1 of Main Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

PAPERWORK REDUCTION ACT

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Flooding Source: Pittman Wash - Tributary 1 to Main 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)

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	Serene	C		
Upstream Limit	Richmar	A		

2. Hydraulic Method Used

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: N/A	Floodway File Name: N/A
Corrected Effective Model*	Natural File Name: N/A	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Revised or Post-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Other - (attach description)	Natural File Name: See Attached	Floodway File Name: N/A

*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.

Hydraulic Analysis Flow Master 6.1 [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 FORM 2

Tributary 2 of Main Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

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Flooding Source: Pittman Wash - Tributary 2 to Main 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)

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	I-215	R	N/A	
Upstream Limit	Ione	S1	N/A	

2. Hydraulic Method Used

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: N/A	Floodway File Name: N/A
Corrected Effective Model*	Natural File Name: N/A	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Revised or Post-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Other - (attach description)	Natural File Name: See Attached	Floodway File Name: N/A

*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.

Hydraulic Analysis Flow Master 6.1 [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 FORM 2

Tributary 3 of Main Wash

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: Pittman Wash - Tributary 3 to Main 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)

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	Pittman Wash	N8		
Upstream Limit	Near Wigwam	N6		

2. Hydraulic Method Used

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: N/A	Floodway File Name: N/A
Corrected Effective Model*	Natural File Name: N/A	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Revised or Post-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Other - (attach description)	Natural File Name: See Attached	Floodway File Name: N/A

*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.

Hydraulic Analysis Flow Master 6.1 [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 FORM 2

Tributary 4 of Main Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

PAPERWORK REDUCTION ACT

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Flooding Source: Pittman Wash - Tributary 4 to Main 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)
			xx

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	Wigwam	N5		
Upstream Limit	Hidden Falls	N1		

2. Hydraulic Method Used

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: N/A	Floodway File Name: N/A
Corrected Effective Model*	Natural File Name: N/A	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Revised or Post-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Other - (attach description)	Natural File Name: See Attached	Floodway File Name: N/A

*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.

Hydraulic Analysis Flow Master 6.1 [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 FORM 2

East Tributary

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

PAPERWORK REDUCTION ACT

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Flooding Source: Pittman Wash - East Tributary
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)

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	Pebble Road	X	N/A	
Upstream Limit	lone	C5	N/A	

2. Hydraulic Method Used

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: N/A	Floodway File Name: N/A
Corrected Effective Model*	Natural File Name: N/A	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Revised or Post-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Other - (attach description)	Natural File Name: See Attached	Floodway File Name: N/A

*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.

Hydraulic Analysis Flow Master 6.1 [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 FORM 2

Tributary 1 of East Tributary

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
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Flooding Source: Pittman Wash - Tributary 1 to East Tributary
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)

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	Existing Zone A (East Trib)	C4		
Upstream Limit	St. Rose Parkway			

2. Hydraulic Method Used

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: N/A	Floodway File Name: N/A
Corrected Effective Model*	Natural File Name: N/A	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Revised or Post-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Other - (attach description)	Natural File Name: See Attached	Floodway File Name: N/A

*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.

Hydraulic Analysis Flow Master 6.1 [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 FORM 2

Tributary 2 of East Tributary

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: Pittman Wash - Tributary 2 to East Tributary
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)
		xx	xx

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	Existing Zone A	L		
Upstream Limit	Presque Isle	H		

2. Hydraulic Method Used

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: N/A	Floodway File Name: N/A
Corrected Effective Model*	Natural File Name: N/A	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Revised or Post-Project Conditions Model	Natural File Name: N/A	Floodway File Name: N/A
Other - (attach description)	Natural File Name: See Attached	Floodway File Name: N/A

*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.

Hydraulic Analysis Flow Master 6.1 [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 FORM 3

Riverine Structures Form

Tributary 2 to Main Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, 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: Pittman Wash - Tributary 2
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: Eastern Culvert along the west side of Eastern

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

Location of Structure: In or near Eastern from Ione to Beltway

Downstream Limit/Cross Section: S1 and S2

Upstream Limit/Cross Section:

2. Name of Structure:

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

Location of Structure:

Downstream Limit/Cross Section:

Upstream Limit/Cross Section:

3. Name of Structure:

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

Location of Structure:

Downstream Limit/Cross Section:

Upstream Limit/Cross Section:

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

B. CHANNELIZATION

Flooding Source:

Name of Structure:

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 (cfs) and/or the -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: Pittman Wash-Tributary 2

Name of Structure: Eastern Culvert along the west side of Eastern

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): Flowmaster
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

E. LEVEE/FLOODWALL (CONTINUED)

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.

East Tributary

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, 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: Pittman Wash - East Tributary
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: Beltway Culvert Crossing**

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

   Location of Structure: Pittman Wash East Tributary at Beltway

   Downstream Limit/Cross Section: See Appendix D

   Upstream Limit/Cross Section:

2. **Name of Structure: RCB under Eastern Avenue near Ione Road**

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

   Location of Structure: East Tributary Near Eastern Avenue

   Downstream Limit/Cross Section: C1

   Upstream Limit/Cross Section: C6

3. **Name of Structure: Beltway Collector Channels**

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

   Location of Structure: South of Beltway

   Downstream Limit/Cross Section: S and R

   Upstream Limit/Cross Section:

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

B. CHANNELIZATION

Flooding Source: East Tributary to Pittman Wash

Name of Structure: Beltway Collector Channels

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☒ Other (Describe): Concrete Lined Channel
- ☐ 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 (cfs) and/or the -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: East Tributary to Pittman Wash

Name of Structure: Beltway Culvert Crossing

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): Flowmaster
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

E. LEVEE/FLOODWALL (CONTINUED)

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.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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

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Flooding Source: Pittman Wash - East Tributary
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: Pittman East Channel and Flow Split upstream of Eastern at Ione Road**

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

   Location of Structure: Near Eastern and Ione

   Downstream Limit/Cross Section: C6 and C7

   Upstream Limit/Cross Section: C5

2. **Name of Structure:**

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

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure:**

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

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

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

B. CHANNELIZATION

Flooding Source: East Tributary and Tributary 2 to Pittman Wash

Name of Structure: Pittman East Channel and Flow Split upstream of Eastern at Ione Road.

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☒ Other (Describe): Concrete Lined Channel
- ☒ 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 (cfs) and/or the -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: East Tributary

Name of Structure: RCB under Eastern Avenue near Ione Road

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): Flowmaster
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

E. LEVEE/FLOODWALL (CONTINUED)

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.

E. LEVEE/FLOODWALL (CONTINUED)

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.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

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

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

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

Will the operation be automatic? ☐ Yes ☐ No

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

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

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

9. Other Design Criteria

a. The following items have been addressed as stated:

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

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

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

Form 1

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

Form 2

For All Washes

A.5. No sediment analysis was considered due to the fact that there are several detention/debris basins that are existing within the watershed area and the contributing area downstream of these basins is primarily urbanized.

Pittman Main Wash

B.4. HEC-RAS model for Pittman Wash between Pebble and Pecos – Pittman.prj Flowmaster Cross Sections T and U between Eastern and Pebble.

Pittman Wash – East Tributary

B.4. Flowmaster Cross Sections C5, C6, C8, C1, C2, C3, D, E, F, G, M, N, O, P, Q, V, W, X.

Pittman Wash – Tributary 1 to East Tributary

B.4. Flowmaster Cross Section C4.

Pittman Wash – Tributary 1 to Main Wash

B.4. Flowmaster Cross Sections A, B, and C.

Pittman Wash – Tributary 2 to East Tributary

B.4. Flowmaster Cross Sections L, K, J, I, and H.

Pittman Wash – Tributary 2 to Main Wash

B.4. Flowmaster Cross Sections C7, S1, S2 and R.

Pittman Wash – Tributary 3 to Main Wash

B.4. Flowmaster Cross Sections N6, N7, and N8.

Pittman Wash – Tributary 4 to Main Wash

B.4. Flowmaster Cross Sections N1, N2, N3, N4, and N5.

Form 3

For All Facilities

B.4 and C.4 No sediment analysis was considered due to the fact that there are several detention/debris basins that are existing within the watershed area and the contributing area downstream of these basins is primarily urbanized.

Pittman Wash – Tributary 2 to Main Wash

C.3 Design plans for some sections of the Eastern Culvert were not available. Supplemental PBS&J survey was completed to confirm the existence of the facility. PBS&J Survey included survey of the culvert invert elevations at manholes. Survey data is included on the CD in Appendix G. Also refer to Figure 2 and associated table (PTBL facility) from the CCRFCD 2002 MPU. Plans that were available for the facility are included in Appendix E.

APPENDIX B

Figures

PBS&J

ENGINEERING • PLANNING
CONSTRUCTION SERVICES
SURVEYING

May 4, 2004

Mr. Max H. Yuan, P.E.
Federal Emergency Management Agency
Mitigation Hazard Identification Branch
500 C Street, SW
Washington, DC 20472

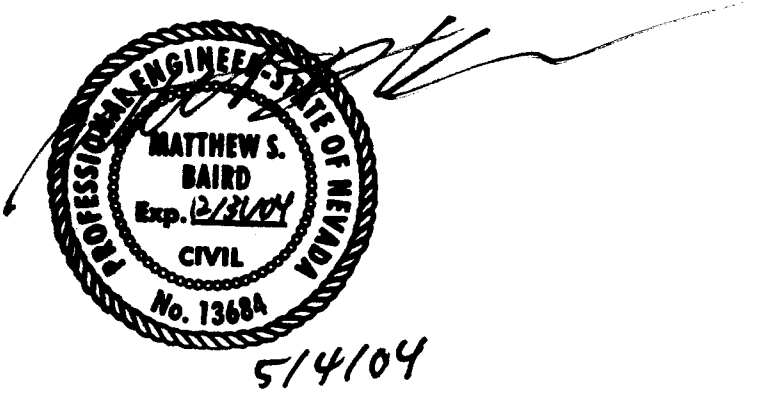
RE: WORKMAP CERTIFICATION FOR LETTER OF MAP REVISION APPLICATION FOR PITTMAN WASH
PBS&J REFERNCE NO.: 511542.00

Dear Mr. Yuan,

I, Matt Baird, hereby certify that flood zone delineations shown on the Work Maps (Figure 6 and Figure 8) included in this LOMR are consistent with the technical analysis performed by PBS&J as part of this LOMR.

Sincerely,

PBS&J



Matthew S. Baird, P.E., CFM
Lic. 13684, Nevada

2270 Corporate Circle • Suite 100 • Henderson, Nevada 89074-6382 • Telephone 702/263-7275 • Fax 702/263-7200

GRAPHIC SCALE

1500 0 750 1500 3000 6000

(IN FEET)

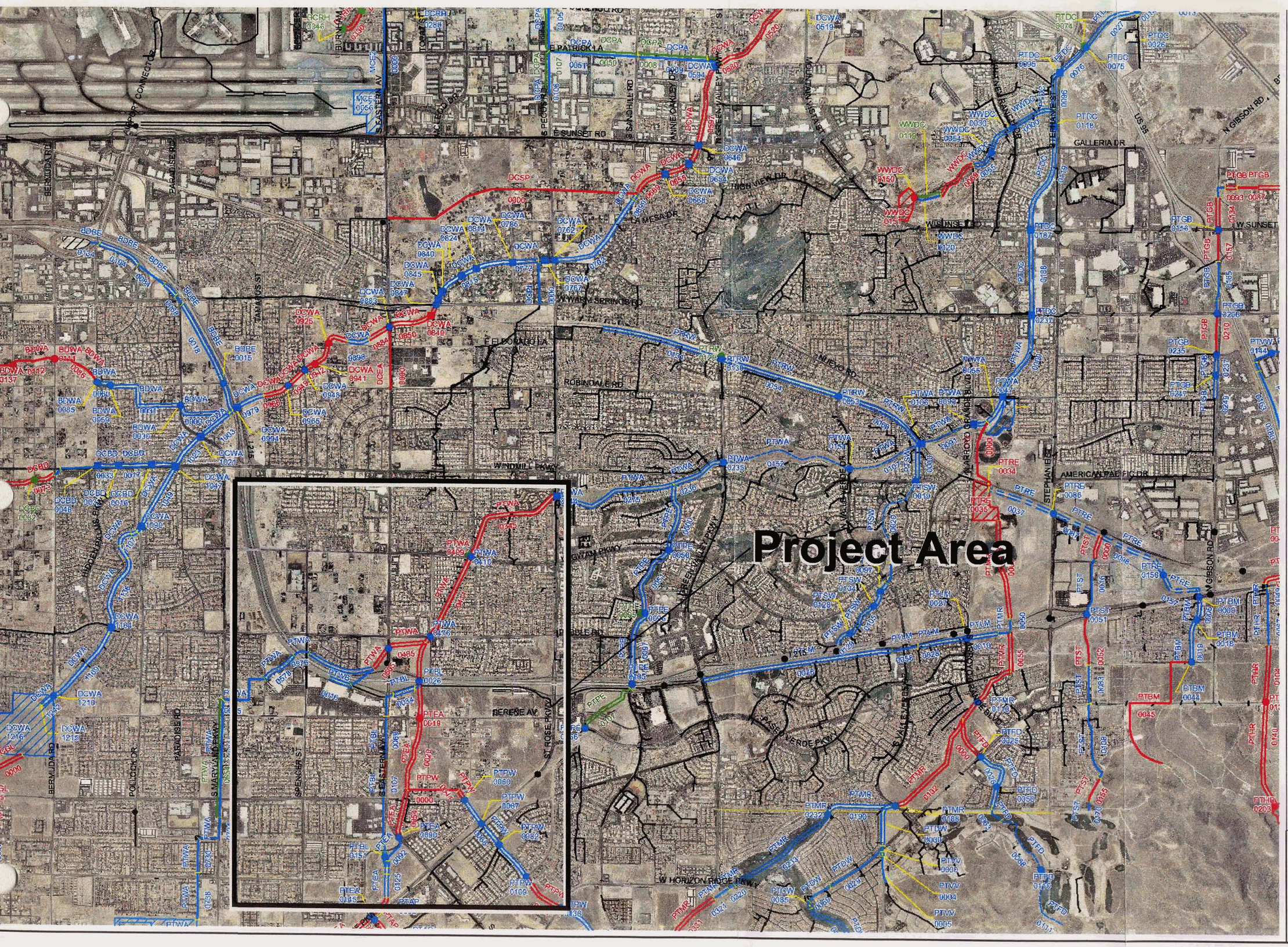
1 inch =1500 ft.

FIGURE 1: Area/Vicinity Map

Zone A Floodzone

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

FIGURE 1



REGIONAL FLOOD CONTROL DISTRICT

2002 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Culvert
- Bridge
- Pipeline
- Lined Channel
- Unlined Channel
- Dike
- Natural Wash
- ID-Mile Separator

N, W, E, S

0 1,000 2,000 3,000 4,000 5,000 Feet

SCALE: 1 inch = 3000 feet

FLOOD CONTROL FACILITIES
FIGURE F-21

PBS&J

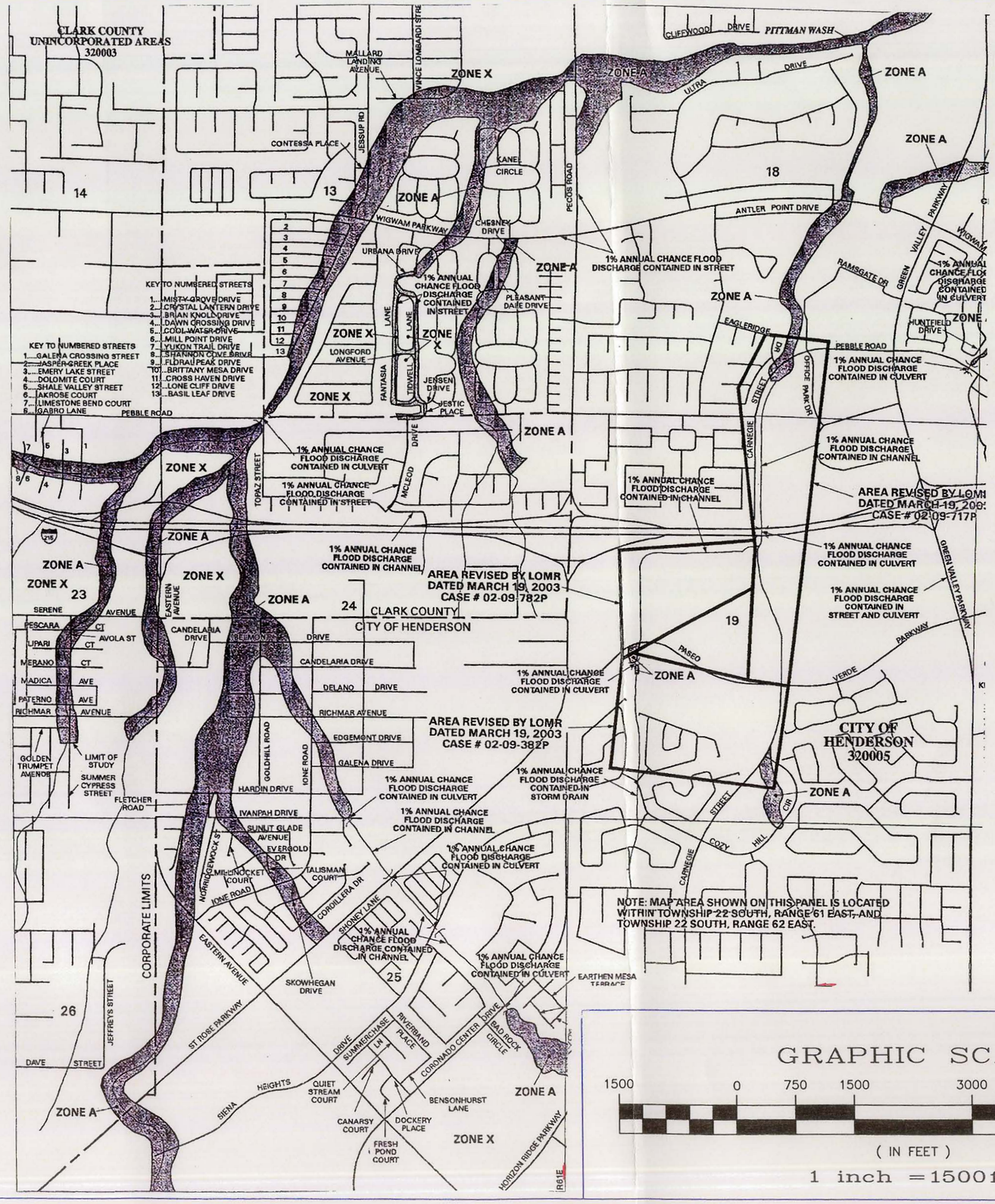
G.C. WALLACE, INC.

FIGURE 2

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BDBE		**BLUE DIAMOND AT BELTWAY**						
0000	E	Conc Chnl 20'W 6'D 2:1 SS	860	969	CDCC140	DUCK3	3.70	0.77
0015	E	2: 10' X 4' RCBC @ Robindale	140	969	CDCC140	DUCK3	3.70	0.60
0018	E	Conc Chnl 20'W 6'D 2:1 SS	2760	969	CDCC140	DUCK3	3.70	0.77
0068	E	2: 7' X 3' RCBC @ Paradise/Warm Springs	350	785	CDCC135	DUCK3	3.35	0.77
0074	E	Conc Chnl 15'W 3'D 2:1 SS	510	565	CDCC135N	DUCK3	2.96	0.77
0084	E	10' X 4' RCB	1050	565	CDCC135N	DUCK3	2.96	0.77
0104	E	Conc Chnl 10'W 3'D 2:1 SS	1430	518	CDCACDB	DUCK3	2.76	0.77
0134	E	2: 60" RCP @ Airport Connector	290	518	CDCACDB	DUCK3	2.76	1.48
BDWA		**BLUE DIAMOND WASH**						
0000	E	Conc Chnl 20'W 6'D 0:1 SS	1520	1331	CDCC070W	DUCK3	2.52	1.00
0030	E	3: 10' X 5.5' RCBC @ Pargadise	150	1331	CDCC070W	DUCK3	2.52	1.30
0031	E	Conc Chnl 10'W 8'D 0-1:1 SS	2725	1331	CDCC070W	DUCK3	2.52	0.63
0059	E	3: 8' X 4' RCBC @ Robindale	150	1331	CDCC070W	DUCK3	2.52	1.40
0060	E	Conc Chnl 20'W 8'D 0:1 SS	380	1331	CDCC070W	DUCK3	2.52	2.72
0085	E	2: 10' X 4' RCBC @ Amigo	50	1073	CBUB310	DUCK3	2.12	1.80
0086	E	Natural Wash	1570	1073	CBUB310	DUCK3	2.12	
0086	P1	10' X 5' RCB	1570	1073	CBUB310	DUCK3	2.12	3.00
0111	E	36" CMP @ Bermuda	50	1073	CBUB310	DUCK3	2.12	1.60
0111	P1	Replace with 10' X 6' RCB	50	1073	CBUB310	DUCK3	2.12	1.60
0112	E	Natural Wash	1310	1073	CBUB310	DUCK3	2.12	
0112	P1	10' X 5' RCB	1310	1073	CBUB310	DUCK3	2.12	3.00
0137	E	24", 36", and 54" CMP @ Placid	50	1073	CBUB310	DUCK3	2.12	1.40
0137	P1	Replace with 10' X 6' RCB	50	1073	CBUB310	DUCK3	2.12	1.40
0138	E	Natural Wash	1880	881	CBUB300	DUCK3	1.64	
0138	P1	10' X 5' RCB	1880	881	CBUB300	DUCK3	1.64	2.50
DCB10		**DUCK CREEK / BLUE DIAMOND**						
0000	E	Conc Chnl 10'W 5'D 1.6:1 SS	770	1976	CBUB360W	DUCK4	11.11	1.73
0016	E	Single Span Bridge 26'W 8.5'D @ Vision	60	1976	CBUB360W	DUCK4	11.11	2.10
0017	E	Conc Chnl 10'W 5'D 1.6:1 SS	1015	1976	CBUB360W	DUCK4	11.11	1.73
0032	E	Single Span Bridge 26'W 8.5'D @ Vista Twilight	40	1976	CBUB360W	DUCK4	11.11	1.80
0033	E	Conc Chnl 10'W 5'D 1.6:1 SS	615	1976	CBUB360W	DUCK4	11.11	1.73
0046	E	Single Span Bridge 26'W 8.5'D @ Amigo	50	1976	CBUB360W	DUCK4	11.11	2.20
0047	E	12' X 10' RCB	1160	1976	CBUB360W	DUCK4	11.11	2.50
0065	E	1: 12' X 10' RCBC @ Bermuda	310	1892	CBUB350	DUCK4	10.85	2.23
0073	E	Natural Wash	630	1892	CBUB350	DUCK4	10.85	
0078	P1	Conc Chnl 25'W 5'D 2:1 SS	630	1892	CBUB350	DUCK4	10.85	1.40
0082	E	4: 48" RCP @ Fairfield	80	1892	CBUB350	DUCK4	10.85	1.10
0082	P0	Replace with 2: 14' X 6' RCBC @ Fairfield	80	1892	CBUB350	DUCK4	10.85	
0083	E	Natural Wash	4750	1892	CBUB350	DUCK4	10.85	
0083	P1	Conc Chnl 20'W 5.5'D 2:1 SS	4750	1892	CBUB350	DUCK4	10.85	1.10
DCEA		**DUCK CREEK - EASTERN BRANCH**						
0000	P1	1: 8' X 5' RCB	2000	645	CDCC280S	DUCK3	1.01	1.50
DCGL		**DUCK CREEK GILESPIE CHANNEL**						
0000	E	Natural Wash	1900	1811	CDLD460	DUCK3	2.56	
0000	P2	Conc Chnl 32'W 6'D 0:1 SS	1900	1811	CDLD460	DUCK3	2.56	0.80
0035	P2	2: 16' X 4' RCBC @ Silverado Ranch	60	1811	CDLD460	DUCK3	2.56	0.90
0036	E	Natural Wash	1111	1811	CDLD460	DUCK3	2.56	
0036	P1	Conc Chnl 35'W 4'D 0:1 SS	1111	1811	CDLD460	DUCK3	2.56	0.80
0057	E	Conc Chnl 32'W 9.0'D 3:1 SS	1580	841	CDLD460S	DUCK3	1.10	0.20
0086	E	4: 8' X 5' RCBC @ E Pyle Ave	60	841	CDLD460S	DUCK3	1.10	1.20
0087	E	Natural Wash	1080	841	CDLD460S	DUCK3	1.10	
0087	P1	Conc Chnl 32'W 3.5'D 3:1 SS	1080	841	CDLD460S	DUCK3	1.10	0.90
0106	E	3: 8' X 4' RCBC @ La Cienega	80	841	CDLD460S	DUCK3	1.10	0.50
0107	E	Conc Chnl 12'W 7'D 2:1 SS	310	567	CDLD450	DUCK3	0.75	1.30
0112	E	2: 10' X 4' RCBC @ E Frias Ave	60	567	CDLD450	DUCK3	0.75	0.50
0113	E	Conc Chnl 12'W 7'D 2:1 SS	490	567	CDLD450	DUCK3	0.75	2.40
DCPA		**DUCK CREEK - PATRICK COLLECTOR**						
0000	E	Parallel 78" & 66" RCP	450	1333	CDCC340W	DUCK3	1.57	1.50
0001	P0	Add 1: 66" RCP	450	1333	CDCC340W	DUCK3	1.57	1.50
0008	P0	Add 1: 11' X 6' RCB	2210	1333	CDCC340W	DUCK3	1.57	1.00
0009	E	Parallel 54" & 66" RCP	2210	1333	CDCC340W	DUCK3	1.57	1.00
0050	P0	Add 1: 14' X 5' RCB	2860	1333	CDCC340W	DUCK3	1.57	0.80
0051	E	66" RCP	2860	1333	CDCC340W	DUCK3	1.57	0.80
0104	P0	Add 1: 6' X 5' RCB	2650	406	DCC370	DUCK3	0.53	0.40
0105	E	60" RCP	2650	406	DCC370	DUCK3	0.53	0.40
0106	E	48" RCP	1360	449	DCC330	DUCK3	0.51	0.50
0107	P0	Add 1: 9' X 4' RCB	1360	449	DCC330	DUCK3	0.51	0.50
DCPI		**DUCK CREEK PINE STREET**						
0000	E	1: 12' X 4' RCB	1360	785	CDCC310S	DUCK3	1.21	0.60
DCRH		**DUCK CREEK - RAWHIDE CHANNEL**						
0306	E	Earth Chnl 15'W 4.6'D 1:1 SS	1090	535	CDMC060	DUCK3SC	0.60	0.70
0306	P1	Conc Chnl 12'W 4.5'D 1.5:1 SS	1090	535	CDMC060	DUCK3SC	0.60	0.70
0329	E	2: 36" RCP @ Oquendo Rd	60	535	CDMC060	DUCK3SC	0.60	0.60
0329	P0	Replace with 3: 7' X 5' RCBC @ Oquendo Rd	60	535	CDMC060	DUCK3SC	0.60	0.60
0330	E	Earth Chnl 4.6'D 15'W 1:1 SS	860	535	CDMC060	DUCK3SC	0.60	0.70
0330	P1	Conc Chnl 12'W 4.5'D 1.5:1 SS	860	535	CDMC060	DUCK3SC	0.60	0.70
0346	E	3: 18" RCP @ Burnham Rd	60	535	CDMC060	DUCK3SC	0.60	0.60
0346	P0	Replace with 1: 10' X 7' RCBC @ Burnham Rd	60	535	CDMC060	DUCK3SC	0.60	0.60
DCSP		**DUCK CREEK - SUNSET PARK**						
0000	P1	1: 11' X 6' RCB	8200	784	CDCC230	DUCK3	1.47	0.70
DCWA		**DUCK CREEK WASH**						
0520	E	Natural Wash	3660	5826	CDCC360	DUCK5SC	21.47	
0520	P1	Gabion Chnl 75'W 6.5'D 2:1 SS	3660	5826	CDCC360	DUCK5SC	21.47	1.80
0580	P1	Conc Chnl 50'W 6.5'D 2:1 SS	230	5743	CDCC190*	DUCK5SC	19.15	0.76
0594	E	2 Span Bridge 130'W 15'D @ GVP/Patrick	70	5743	CDCC190*	DUCK5SC	19.15	1.40
0597	E	Natural Wash	2500	5743	CDCC190*	DUCK5SC	19.15	
0597	P1	Gabion Chnl 65'W 7'D 2:1 SS	2500	5743	CDCC190*	DUCK5SC	19.15	1.60
0646	E	3 Span Bridge 45'W 15'D @ Sunset	100	5743	CDCC190	DUCK5SC	19.15	1.70
0647	E	Earth Chnl 50'W 15'D 2:1 SS	600	5743	CDCC190	DUCK5SC	19.15	1.00
0647	P1	Conc Chnl 50'W 6.5'D 2:1 SS	600	5743	CDCC190	DUCK5SC	19.15	1.00
0654	E	Free Span Bridge 40'W 15'D 3:1 SS	50	5743	CDCC190	DUCK5SC	19.15	1.00
0655	E	Earth Chnl 50'W 15'D 2:1 SS	790	5743	CDCC190	DUCK5SC	19.15	0.60
0655	P1	Conc Chnl 50'W 7.5'D 2:1 SS	790	5743	CDCC190	DUCK5SC	19.15	0.60
0668	E	Free Span Bridge 40'W 15'D 3:1 SS @ Sunfire	40	5743	CDCC190	DUCK5SC	19.15	1.00
0669	E	Natural Wash	1120	5743	CDCC190	DUCK5SC	19.15	
0669	P1	Conc Chnl 28'W 8'D 2:1 SS	1120	5743	CDCC190	DUCK5SC	19.15	1.29
0695	E	Drop Structure		5416	CDCC240	DUCK5SC	17.96	
0696	E	Conc Chnl 28'W 8'D 2:1 SS	150	5416	CDCC240	DUCK5SC	17.96	1.29
0698	E	Drop Structure		5416	CDCC240	DUCK5SC	17.96	
0699	E	Conc Chnl 28'W 8'D 2:1 SS	150	5416	CDCC240	DUCK5SC	17.96	1.29
0701	E	Drop Structure		4982	CDCC240S	DUCK5SC	16.49	
0702	E	Conc Chnl 28'W 8'D 2:1 SS	3340	4982	CDCC240S	DUCK5SC	16.49	1.20
0762	E	Single Span Bridge 42'W 8'D @ Pecos	100	4923	CDCC310	DUCK5SC	16.09	1.10
0763	E	Earth/Conc Chnl 32'W 8'D 0:1 SS	220	4923	CDCC310	DUCK5SC	16.09	1.10
0763	P1	Conc Chnl 32'W 8'D 0:1 SS	220	4923	CDCC310	DUCK5SC	16.09	1.10
0767	E	2 Span Bridge 32'W 7.0'D	20	4923	CDCC310	DUCK5SC	16.09	1.98
0768	E	Conc Chnl 32'W 10'D 0:1 SS	200	4923	CDCC310	DUCK5SC	16.09	1.50
0772	E	Conc Chnl 30'W 6.5'D 0:1 SS	800	4831	CDCC285	DUCK5SC	14.88	2.00

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
DCWA		**DUCK CREEK WASH – continued**						
0785	E	2 Span Bridge 50'W 8'D @ Tomivasu	60	4831	CDCC285	DUCK5SC	14.88	1.30
0786	E	Conc Chnl 50'W 7.0'D 0:1 SS	1150	4831	CDCC285	DUCK5SC	14.88	0.80
0814	E	Single Span Bridge 50'W 7.5'D @ Miravista	50	4831	CDCC285	DUCK5SC	14.88	1.30
0815	E	Conc Chnl 50'W 7.0'D 0:1 SS	480	4831	CDCC285	DUCK5SC	14.88	1.15
0824	E	Single Span Bridge 50'W 7.5'D @ La Casita	50	4831	CDCC285	DUCK5SC	14.88	1.30
0825	E	Conc Chnl 50'W 7.0'D 0:1 SS	780	4831	CDCC285	DUCK5SC	14.88	0.60
0840	E	2 Span Bridge 50'W 8.0'D	50	4831	CDCC285	DUCK5SC	14.88	1.20
0841	E	Conc Chnl 50'W 7.0'D 0:1 SS	230	4831	CDCC285	DUCK5SC	14.88	1.90
0845	E	3 Span Bridge 90'W 7'D @ UPRR	20	4831	CDCC285	DUCK5SC	14.88	1.50
0846	E	Natural Wash	130	4831	CDCC285	DUCK5SC	14.88	
0846	P1	Gabion Chnl 70'W 8'D 2:1 SS	130	4831	CDCC285	DUCK5SC	14.88	0.80
0847	E	4: 14.5' X 9.5' RCBC @ Warm Springs	100	4831	CDCC285	DUCK5SC	14.88	0.60
0848	E	Natural Wash	300	4831	CDCC285	DUCK5SC	14.88	
0848	P1	Gabion Chnl 60'W 9'D 2:1 SS	300	4831	CDCC285	DUCK5SC	14.88	0.70
0849	E	Dip Section @ Topaz	60	4831	CDCC285	DUCK5SC	14.88	
0849	P1	2 Span Bridge 100'W 7.5'D @ Topaz	60	4831	CDCC285	DUCK5SC	14.88	0.60
0850	P1	Gabion Chnl 65'W 8.5'D 2:1 SS	1320	4831	CDCC285	DUCK5SC	14.88	0.70
0883	E	4: 14' X 10' RCBC @ Eastern	100	4800	CDCC280	DUCK5SC	14.69	0.68
0884	E	Earth Chnl 65'W 5'D 3:1 SS	720	4800	CDCC280	DUCK5SC	14.69	0.68
0884	P1	Gabion Chnl 60'W 9'D 2:1 SS	720	4800	CDCC280	DUCK5SC	14.69	0.68
0898	E	Conc Chnl 100'W 10'D 0:1 SS	710	4467	CDCC280W	DUCK5SC	13.68	0.60
0912	E	Earth Chnl 55'W 5'D 4:1 SS	700	4467	CDCC280W	DUCK5SC	13.68	0.70
0912	P1	Gabion Chnl 60'W 8.5'D 2:1 SS	700	4467	CDCC280W	DUCK5SC	13.68	0.65
0925	P1	4: 14' X 7' RCBC @ Eldorado Lane	70	4467	CDCC280W	DUCK5SC	13.68	0.65
0926	E	Earth Chnl 45'W 5'D 4:1 SS	815	4467	CDCC280W	DUCK5SC	13.68	0.68
0926	P1	Gabion Chnl 60'W 8.5'D 2:1 SS	815	4467	CDCC280W	DUCK5SC	13.68	0.65
0941	P1	4: 14' X 8' RCBC @ Sur Este Ave	70	4445	CDCC270	DUCK5SC	13.57	0.60
0942	E	Earth Chnl 45'W 5'D 4:1 SS	300	4445	CDCC270	DUCK5SC	13.57	0.68
0942	P1	Conc Chnl 45'W 6.5'D 2:1 SS	300	4445	CDCC270	DUCK5SC	13.57	0.60
0948	E	7: 10' X 6' RCBC @ Spencer	80	4445	CDCC270	DUCK5SC	13.57	0.60
0949	E	Earth/Conc Chnl 70'W 6'D 2:1 SS	650	4445	CDCC270	DUCK5SC	13.57	0.68
0949	P1	Conc Chnl 70'W 5.5'D 2:1 SS with Concrete Bottom	650	4445	CDCC270	DUCK5SC	13.57	0.68
0965	E	8: 14' X 6' RCBC @ Robindale	80	4445	CDCC270	DUCK5SC	13.57	1.00
0966	E	Earth/Conc Chnl 70'W 6'D 2:1 SS	820	4445	CDCC270	DUCK5SC	13.57	0.53
0966	P1	Conc Chnl 70'W 5.5'D 2:1 SS with Concrete Bottom	820	4445	CDCC270	DUCK5SC	13.57	0.53
0979	E	Conc Chnl 70'W 6'D 2:1 SS	880	4445	CDCC270	DUCK5SC	13.57	1.00
0994	E	Single Span Bridge @ Beltway	170	4375	CDCC070S*	DUCK3SC	7.03	1.30
0997	E	Conc Chnl 70'W 6'D 2:1 SS	80	4375	CDCC070S*	DUCK3SC	7.03	1.00
0999	E	Conc Chnl 70'W 6'D 2:1 SS	140	4375	CDCC070S*	DUCK3SC	7.03	1.00
1003	E	Conc Chnl 70'W 6'D 2:1 SS	1140	4375	CDCC070S*	DUCK3SC	7.03	1.00
1021	E	3 Span Bridge 80'W 8'D @ Paradise/Maryland Pkwy	100	4375	CDCC070S	DUCK3SC	7.03	1.40
1023	E	Conc Chnl 70'W 6'D 2:1 SS	1130	4375	CDCC070S	DUCK3SC	7.03	1.10
1045	E	Conc Chnl 70'W 6'D 2:1 SS	30	4375	CDCC070S	DUCK3SC	7.03	1.10
1047	E	Single Span Bridge 45'W 10'D @ Windmill	120	4196	CBUB360	DUCK3SC	6.51	1.20
1049	E	Conc Chnl 12'W 15'D 1:1 SS	2150	2015	CBUB360S	DUCK3SC	3.07	1.50
1090	E	2 Span Bridge 80'W 25'D @ Pollock	80	2015	CBUB360S	DUCK3SC	3.07	2.10
1091	E	Conc Chnl 12'W 15'D 3:1 SS; 3.5' d/s	200	2015	CBUB360S	DUCK3SC	3.07	1.51
1102	E	Drop Structure		2015	CBUB360S	DUCK3SC	3.07	
1103	E	Conc Chnl 12'W 15'D 3:1 SS	200	2015	CBUB360S	DUCK3SC	3.07	1.51
1106	E	Drop Structure		2015	CBUB360S	DUCK3SC	3.07	
1107	E	Conc Chnl 12'W 15'D 3:1 SS	590	2015	CBUB360S	DUCK3SC	3.07	1.51
1121	E	Drop Structure		1833	CDCC050	DUCK3SC	2.74	
1122	E	Conc Chnl 20'W 20'D 3:1 SS	480	1833	CDCC050	DUCK3SC	2.74	0.50
1136	E	Conc Chnl 20'W 20'D 3:1 SS	2400	1833	CDCC050	DUCK3SC	2.74	1.51
1164	E	2 Span Bridge 100'W 9'D @ Pebble	100	1247	CDCC030	DUCK3SC	1.83	0.70
1165	E	Conc Chnl 30'W 8'D 2:1 SS	180	1247	CDCC030	DUCK3SC	1.83	1.51
1169	E	Conc Chnl 46'W 10'D 1.5:1 SS	2680	1247	CDCC030	DUCK3SC	1.83	0.90
1210	E	5: 15' X 8.5' RCBC @ Bermuda	100	725	CDCC029	DUCK3SC	1.00	0.52
1212	E	Conc Chnl 80'W 8'D 0:1 SS	300	725	CDCC02B	DUCK3SC	1.00	0.86
1214	E	121.300 cfs PMF Spillway		121300	CDLDCDB	DUCK5SC	16.16	
1215	E	54" RCP Outlet	20	355	LDCDB	DUCK5SC	16.16	
1216	E	1:235 ac-ft Lower Duck Creek Detention Basin		5259	CDLDCDB	DUCK5SC	16.16	
1241	E	Natural Wash	540	4271	CDLD37B*	DUCK3SC	6.41	
1241	P2	2: 20' X 7' RCB	540	4271	CDLD37B*	DUCK3SC	6.41	1.94
MCE2		**MCCARRAN - EAST BRANCH 2**						
0000	E	48" RCP Outlet	3560	75	CDMCDB	DUCK3	1.78	0.70
0056	E	100-ac ft McCarran Detention Basin		1190	CDMC050	DUCK3	1.78	
PTAP		**PITTMAN ANTHEM PARKWAY**						
0000	P1	Conc Chnl 20'W 4.5'D 2:1 SS	100	1901	CPPE140	PIT3	2.18	5.00
0002	E	2: 8' X 8' RCBC @ St. Rose Pkwy	150	1901	CPPE140	PIT3	2.18	1.50
0005	E	Rip Rap Chnl 30'W 5'D 3:1 SS	525	1901	CPPE140	PIT3	2.18	1.30
0005	P1	Conc Chnl 20'W 5'D 2:1 SS	525	1901	CPPE140	PIT3	2.18	1.90
PTBL		**PITTMAN WASH - BELTWAY**						
0000	P1	Conc Chnl 50'W 6.5'D 2:1 SS	1000	5519	CPWA090	PIT3SC	7.93	0.70
0026	E	4: 12' X 8' RCBC @ I-215	360	5519	CPWA090	PIT3SC	7.93	1.00
0028	E	6: 12' X 8' and 1: 8' X 8' RCBC @ I-215	160	2224	CPWA085	PIT3SC	5.15	1.00
0034	E	Conc Chnl 12'W 6'D 2:1 SS	730	2224	CPWA085	PIT3SC	5.15	1.00
0053	E	12' X 6' RCB	860	2224	CPWA085	PIT3SC	5.15	1.70
0089	E	2: 13' X 6' RCB	1400	2224	CPWA085	PIT3SC	5.15	1.00
0095	P1	2: 13' X 6' RCB	590	1979	CPPE195	PIT3SC	5.39	1.00
0107	E	4: 72" RCP @ Silverado Ranch	600	1979	CPPE195	PIT3SC	5.39	2.00
0118	E	2: 11' X 6.2' Concrete Arch	1380	1979	CPPE195	PIT3SC	5.39	1.10
0144	E	Conc Chnl 25'W 6'D 0:1 SS	100	1979	CPPE195	PIT3SC	5.39	1.00
0146	E	2: 12' X 8' RCB	240	1768	NORTH	PIT3SC	5.15	1.00
0150	E	Conc Chnl 25'W 5.5'D 0:1 SS	40	1768	NORTH	PIT3SC	5.15	1.00
0151	E	2: 14' X 6' RCBC @ St. Rose Pkwy	40	1768	NORTH	PIT3SC	5.15	1.00
0157	E	Conc Chnl 25'W 5.5'D 0:1 SS	310	1768	NORTH	PIT3SC	5.15	1.00
PTBM		**PITTMAN WASH - BLACK MOUNTAIN**						
0000	E	2: 10' X 8' RCBC @ I-215	290	1589	CPRE060	PIT3	1.38	1.70
0005	E	Conc Chnl 20'W 4.5'D 2:1 SS	570	1589	CPRE060	PIT3	1.38	3.70
0018	E	2: 8' X 6' RCBC @ Las Palmas	50	1589	CPRE060	PIT3	1.38	3.70
0019	E	Conc. Chnl. 20'W 6'D 2:1 SS	1330	1589	CPRE060	PIT3	1.38	3.70
0044	E	2: 8' X 6' RCBC @ Paseo Verde	80	1166	CPRE050	PIT3	0.85	2.00
0045	P1	14' X 4' RCB	5700	1166	CPRE040	PIT3SC	0.85	4.00
PTDC		**PITTMAN WASH - DUCK CREEK**						
0027	E	Conc Chnl 60'W 7.9'D 0:1 SS	2000	6774	CPDC160	PIT5SC	23.80	0.85
0074	P0	Add 3: 10' X 8' RCBC @ I-515	160	6724	CPDC150	PIT5SC	23.54	0.80
0075	E	4: 10' X 8' RCBC @ I-515	160	6724	CPDC150	PIT5SC	23.54	0.80
0076	E	Conc Chnl 25'W 9'D 2:1 SS	960	6724	CPDC150	PIT5SC	23.54	1.20
0095	E	Single Span Bridge 75'W 8'D @ Stephanie	170	6299	CPDC120	PIT5SC	22.45	0.80
0096	E	Conc Chnl 30'W 8'D 2:1 SS	1150	6299	CPDC120	PIT5SC	22.45	0.80
0104	E	Conc Chnl 30'W 8'D 2:1 SS	520	5945	CPDC100	PIT5SC	19.63	0.80
0118	E	4 Span Bridge 60'W 8'D	70	5945	CPDC100	PIT5SC	19.63	1.30
0119	E	Conc. Chnl 30'W 8'D 2:1 SS	3430	5945	CPDC100	PIT5SC	19.63	0.80
0187	E	2 Span Bridge 42'W 8'D @ Sunset Road	100	5945	CPDC100	PIT5SC	19.63	1.40
0188	E	Conc Chnl 30'W 8'D 2:1 SS	2630	5777	CPDC030	PIT5SC	19.12	3.00
0237	E	2 Span Bridge 42'W 8'D @ Warm Springs	100	5777	CPDC030	PIT5SC	19.12	1.30

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
PTDW		**PITTMAN DESERT WILLOW**						
0000	E	Conc Chnl 29'W 5.5'D 2:1 SS	1550	1121	CPMR090	PIT3	2.19	2.20
0029	E	72" RCP	2140	568	DETB	PIT3	1.42	3.20
0069	E	78" RCP with 66" Orifice Plate Outlet	840	568	DETB	PIT3	1.42	1.40
0085	E	15 ac-ft Desert Willows Golf Course Detention Basin		1143	CPMR070	PIT3	1.42	
0088	E	Grass Chnl 100'W 5:1 SS	2090	1143	CPMR070	PIT3	1.42	2.20
PTEA		**PITTMAN WASH - EASTERN**						
0000	P2	Conc Chnl 24'W 8'D 0:1 SS	1000	3225	CPPE200	PIT3SC	6.71	1.60
0019	P2	2: 12' X 8' RCBC @ Serene	50	3225	CPPE200	PIT3SC	6.71	1.60
0020	P2	Conc Chnl 24'W 8'D 0:1 SS	2350	3225	CPPE200	PIT3SC	6.71	1.60
0054	P2	Conc Chnl 24'W 8'D 0:1 SS	1500	2284	CPPE205	PIT3SC	5.38	1.60
0090	E	3: 12' X 6' RCBC @ Eastern	200	2099	EAST	PIT3SC	5.15	1.70
0092	E	3: 10' X 6' RCB	820	2099	EAST	PIT3SC	5.15	2.40
0119	E	Conc Chnl 22'W 5'D 0:1 SS	200	2099	EAST	PIT3SC	5.15	2.00
0124	E	Splitter Structure		3892	CPPE155	PIT3SC	5.15	
0125	E	Conc Chnl 30'W 8'D 0:1 SS	740	3892	CPPE155	PIT3SC	5.15	1.20
0139	E	Earth Chnl 50'W 3:1 SS	800	3892	CPPE155	PIT3SC	5.15	1.20
0139	P3	Conc Chnl 30'W 8'D 0:1 SS	800	3892	CPPE155	PIT3SC	5.15	1.20
0145	E	3: 12' X 10' RCBC @ St. Rose Pkwy	80	2152	CPPE130	PIT3SC	2.97	0.90
0146	P3	Conc Chnl 20'W 6'D 2:1 SS	2100	2152	CPPE130	PIT3SC	2.97	1.00
PTFD		**PITTMAN FOOTHILLS DRIVE**						
0000	P1	Conc Chnl 15'W 4.5'D 2:1 SS	1330	1114	CPMR120	PIT3SC	1.32	3.00
0025	E	5: 12' X 4' RCBC @ Horizon Ridge Pkwy	70	1114	CPMR120	PIT3SC	1.32	10.00
0026	E	Conc Chnl 20'W 8'D 0:1 SS	1350	1114	CPMR120	PIT3SC	1.32	2.60
0050	E	20' X 10' RCAC @ Amador Ln	60	1114	CPMR120	PIT3SC	1.32	1.20
0051	E	Conc Chnl 13'W 6'D 1:1 SS	680	1114	CPMR120	PIT3SC	1.32	1.30
0063	E	16' X 6' RCAC @ Foothills Village Dr	550	1114	CPMR120	PIT3SC	1.32	2.60
0068	E	Natural Wash	2250	1114	CPMR120	PIT3SC	1.32	
0110	E	2: 14' X 10' RCBC @ MacDonald Ranch Dr	50	865	CPMR110	PIT3SC	1.00	3.10
0111	E	Natural Wash	2300	865	CPMR110	PIT3SC	1.00	
PTGB		**PITTMAN WASH - GIBSON**						
0058	P1	Conc Chnl 15'W 5.5'D 2:1 SS	1560	1532	CPBR080	PIT3SC	1.76	1.50
0087	P3	2: 10' X 6' RCB	660	1532	CPBR080	PIT3SC	1.76	0.50
0093	E	Earth/Conc Chnl 8'W 5'D 2:1 SS	550	1532	CPBR080	PIT3SC	1.76	1.50
0093	P1	Con



NFIP

PANEL 2590E

FIRM

FLOOD INSURANCE RATE MAP

CLARK COUNTY,
NEVADA
AND INCORPORATED AREAS

PANEL 2590 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY, UNINCORPORATED AREAS	320003	2590	E
HENDERSON, CITY OF	320005	2590	E

AUG 13 2003

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.

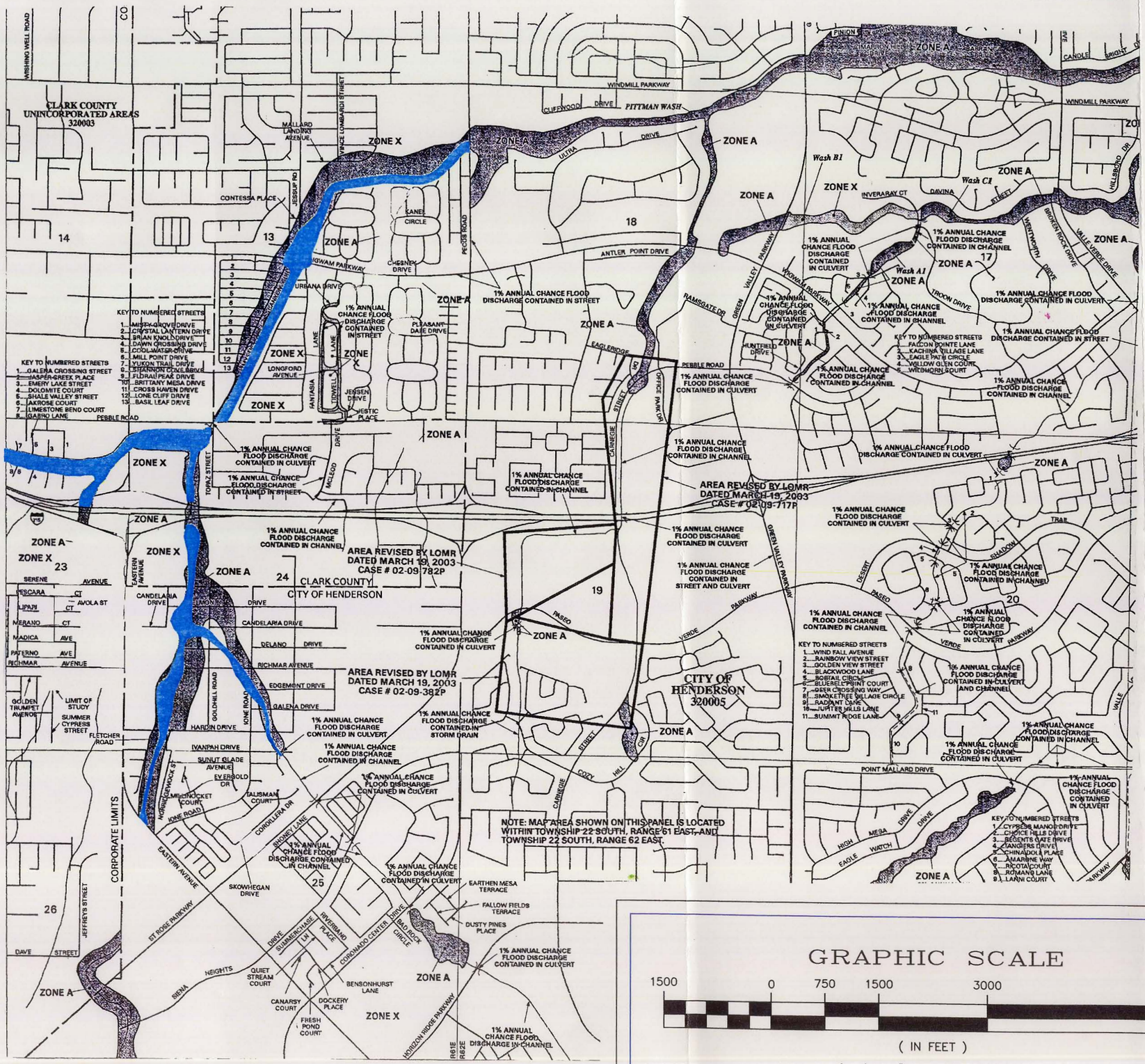
MAP NUMBER
32003C2590E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

FIGURE 3
FEMA FLOOD ZONE MAP

PBSJ
2270 Corporate Circle
Suite 1
Henderson, NV 89074
Phone: 702-263-7275
Fax: 702-263-7200
Engineering · Planning · Surveying · Construction Services



PANEL 2590E

FIRM

FLOOD INSURANCE RATE MAP

CLARK COUNTY,
NEVADA
AND INCORPORATED AREAS

PANEL 2590 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

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AUG 13 2003

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MAP NUMBER
32003C2590E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

Flood Zones Shown on This Figure are Revised per Figures 6 & 8 or Otherwise as Noted Below

Proposed Flood Zone Shown Overlain the Current Effective Flood Zone

GRAPHIC SCALE

1500 0 750 1500 3000 6000

(IN FEET)

1 inch = 1500 ft.

FIGURE 4
ANNOTATED FEMA FLOOD ZONE MAP

PBS&J
2270 Corporate Circle
Suite 1
Henderson, NV 89074
Phone: 702-263-7275
Fax: 702-263-7200
Engineering · Planning · Surveying · Construction Services

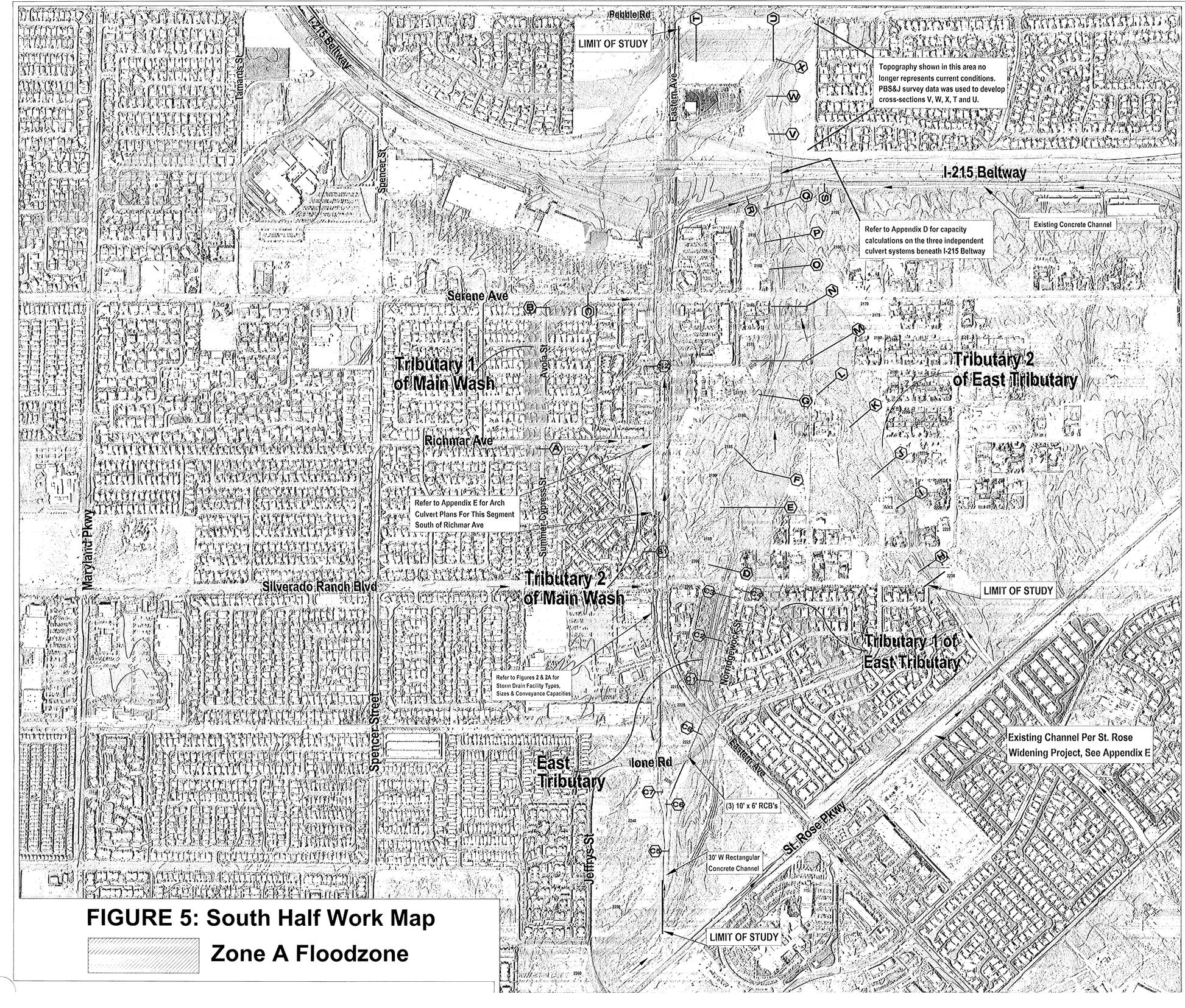

FIGURE 5: South Half Work Map

Zone A Floodzone

Legend

- Cross-Section Location
- Existing Storm Drain Facility
- Flow Direction Arrow

Note

Aerial photo as of April 2003.

Topographic data as of 1996.

The hydraulic analysis and associated flood zone delineations completed for this LOMR are based on topographic information shown on this map, grading plans provided in Appendix E and supplemental field survey completed by PBS&J.
I hereby certify that the information used in this LOMR substantially conforms with current conditions.

5/14/04

Matthew S. Baird, NV 13684

N

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400ft.

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

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FIGURE 5

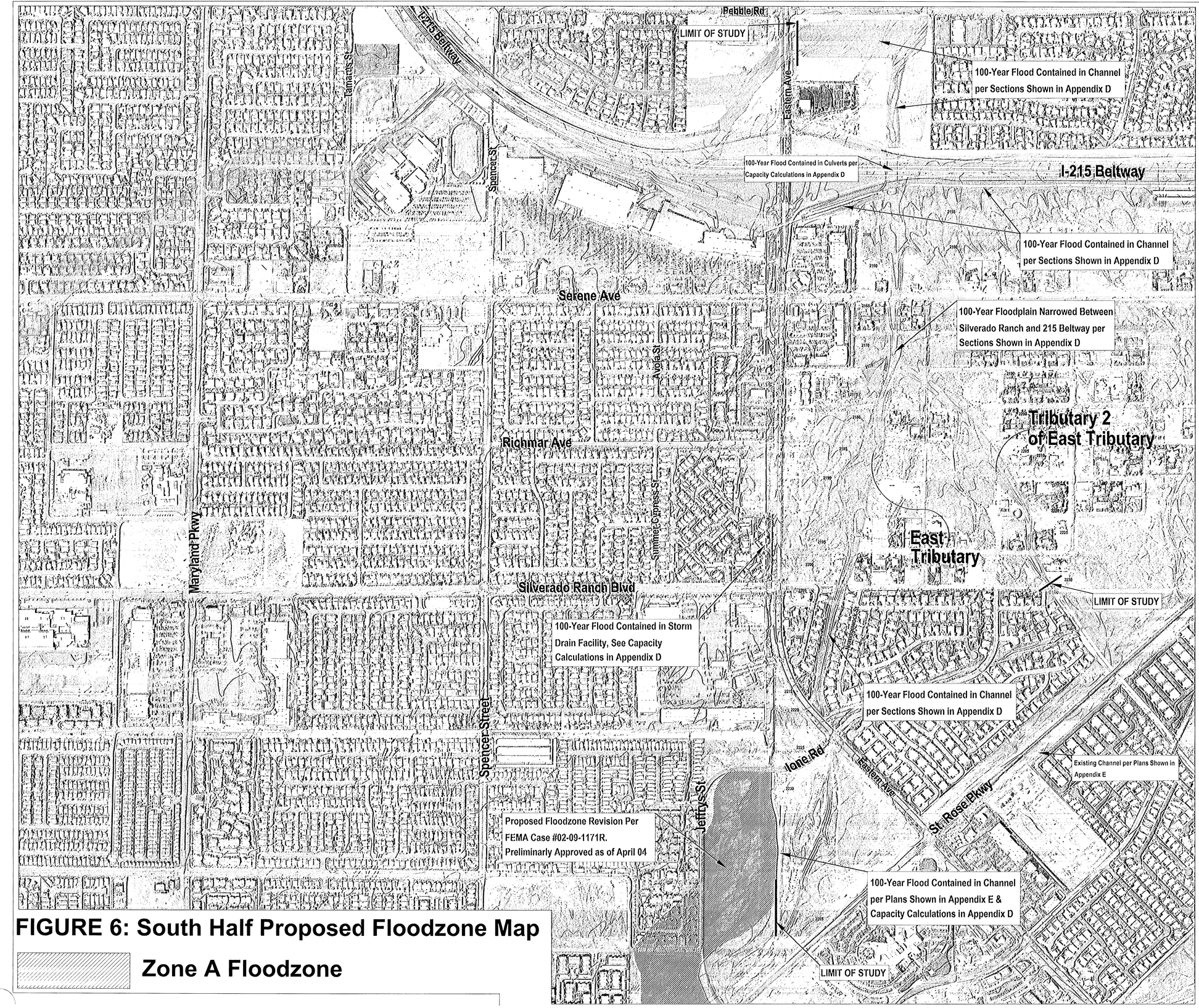

FIGURE 6: South Half Proposed Floodzone Map

Zone A Floodzone

Legend

A — Cross-Section Location

Existing Storm Drain Facility

Note

Aerial Photo as of April 2003.

Topographic data as of 1996.

The hydraulic analysis and associated flood zone delineations completed for this LOMR are based on topographic information shown on this map, grading plans provided in Appendix E and supplemental field survey completed by PBS&J.
I hereby certify that the information used in this LOMR substantially conforms with current conditions.

5/14/04

Matthew S. Baird, NV 13684

N

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)
1 inch = 400ft.

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

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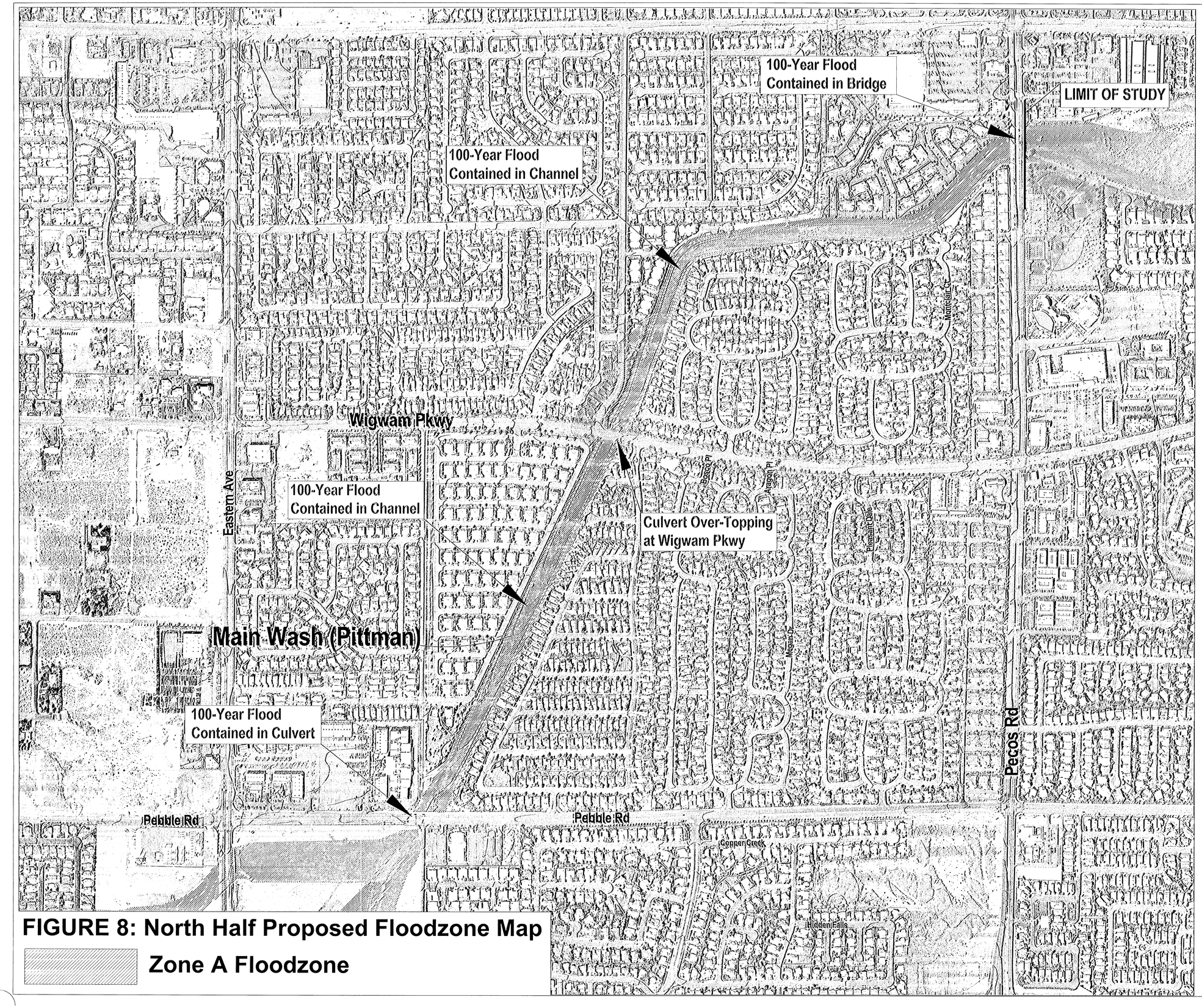
FIGURE 6



The hydraulic analysis and associated flood zone delineations completed for this LOMR are based on topographic information shown on this map, grading plans provided in Appendix E and supplemental field survey completed by PBS&J.
I hereby certify that the information used in this LOMR substantially conforms with current conditions.

5/14/04
Matthew S. Baird, NV 13684

N

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300ft.

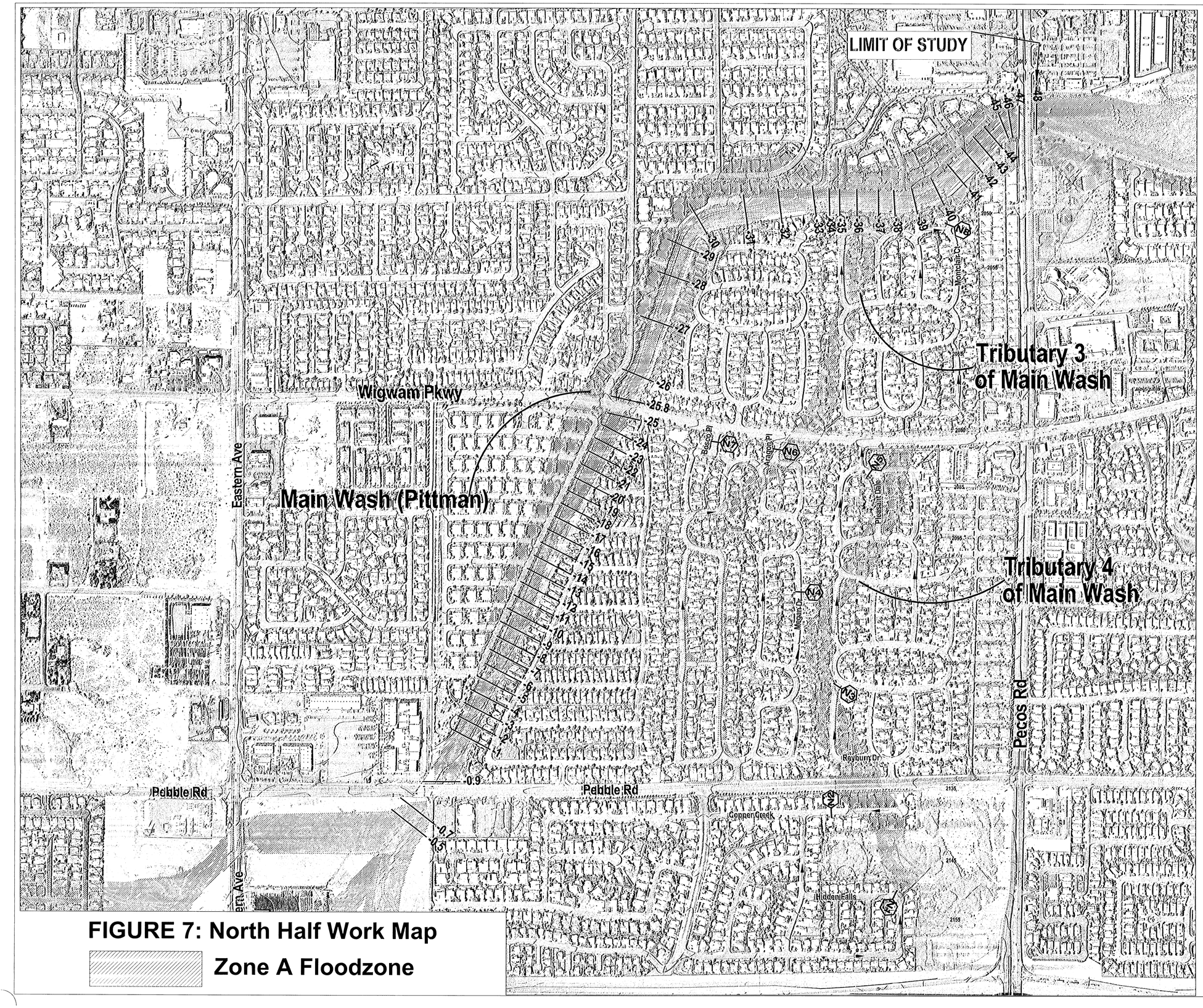
FIGURE 8: North Half Proposed Floodzone Map

Zone A Floodzone

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

ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

FIGURE 8



Legend

- Cross-Section Location
- -10 HEC-RAS Cross-Section Location
- Flow Direction

Note

Aerial Photo as of April 2003

Topographic Data as of 1996

The hydraulic analysis and associated flood zone delineations completed for this LOMR are based on topographic information shown on this map, grading plans provided in Appendix E and supplemental field survey completed by PBS&J.
I hereby certify that the information used in this LOMR substantially conforms with current conditions.

5/14/04

Matthew S. Baird, NV 13684

N

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300ft.

FIGURE 7: North Half Work Map

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FIGURE 7

APPENDIX C
Hydrology

Pittman Wash Hydrologic Data - North of St. Rose Parkway

Introduction

Hydrology for the Pittman Wash area is a combination of hydrology developed for the 30% Hydrology Submittal for St. Rose Parkway (Formerly, Lake Mead Drive) Widening (for areas south of St. Rose Parkway) and hydrology specifically developed for this study (for areas north of St. Rose Parkway). Limits for this study are the mountains to the south, Bermuda Road to the west, Windmill Road to the north, and Pecos to the east. For the area south of St. Rose Parkway, the hydrology used for this study utilizes the "30% Hydrology Submittal for St. Rose Parkway (Formerly, Lake Mead Drive) Widening from I-15 to Pecos Road" by PBS&J in 2001 (30% Study). The existing conditions hydrology from the 30% Study was used as input into this study. Flow splits near the intersection of Las Vegas Boulevard and St. Rose Parkway (Lake Mead Drive) were taken from Pittman Wash Flood Insurance Study Restudy (Nimbus 1995) because it is believed this is a more conservative analysis. The existing condition for 30% Study includes the ultimate condition for the Anthem and Seven Hills developments and the existing condition for the remaining areas. Upon reviewing the development in the area, it was decided that there would not be a modification to the hydrologic parameters, because the development that has occurred since this study was submitted was considered in the existing condition model. The 30% Study also included Pittman East Detention Basin. Hydrology upstream of Pittman East Detention Basin was not included because in this study, the worst case scenario model is a storm centered downstream of Pittman East Detention Basin. The text below gives a description of the hydrology developed for areas north of St. Rose Parkway, which will be referred to as the "study area". Geographic Information Systems (GIS) coverages developed for the 2002 Las Vegas Valley Flood Control Master Plan Update (2002 MPU) were utilized and/or modified to calculate the hydrologic parameters for this report. Figure C-1 shows a watershed map for the areas downstream of St. Rose Parkway. All hydrology used or developed for this study was completed in accordance with Clark County Regional Flood Control District's Hydrologic Criteria and Drainage Design Manual (CCRFCD Design Manual)

Design Storm

The design storm for this study is the 100-year, 6-hour frequency flood event. The rainfall used for hydrologic modeling in this study is intended to produce runoff discharges with an expected 100-year recurrence interval. A 100-year recurrence interval is defined as having a 1.0 percent chance of being equaled or exceeded in any given year.

Precipitation

Rainfall data published by the National Oceanic and Atmospheric Administration (NOAA) in NOAA Atlas 2, *Precipitation–Frequency Atlas of the Western United States, Volume VII–Nevada* (NOAA 1973) and their subsequent modification by the USACE Los Angeles District (1988) were used for this study. An adjustment factor of 1.43 (CCRFCD Design Manual) is multiplied by all rainfall depths obtained from the NOAA Atlas. The adjusted 100-year, 6-hour rainfall depths range from approximately 2.3 inches

to 4.3 inches in the Las Vegas Valley watershed. Most areas have a rainfall depth of 2.77 inches or higher except for the extreme northwest portion of the Valley between the Sheep and Spring Mountains.

Rainfall depth information used for this study was originally developed for the 1996 Las Vegas Valley Flood Control Master Plan Update (1996 MPU). For the 1996 MPU, a rainfall depth layer was created using GIS. The NOAA Atlas rainfall depths with the adjustment factor were scanned into a GIS format. GIS was then used to develop a grid of rainfall depths for the entire Las Vegas Valley. The rainfall grid and GIS polygon processing were used in this study to calculate a weighted average rainfall depth for each subbasin in the new hydrologic models. These rainfall depths were then used in the HEC-1 input files.

Storm Distribution

The rainfall depths discussed in the previous section are distributed over the 6-hour design storm period using three different storm distributions. Storm distribution numbers (SDN) 3, 4, and 5 are used for the Pittman Wash Flood Insurance Study. SDNs 3, 4, and 5 were applied to the HEC-1 models and associated concentration points depending on the tributary area to each concentration point of interest. For drainage areas less than 8 square miles in size, SDN 3 was used. For drainage areas greater than or equal to 8 and less than 12 square miles in size, SDN 4 was used. SDN 5 was used for drainage areas greater than or equal to 12 square miles in size (see CCRFCD Design Manual).

Two storm centerings were used in this study. The first was a full watershed model which included the entire watershed. The second storm centering did not include flows west of Seven Hills Drive/Spencer Street. This storm centering isolated the affect of the watershed downstream of the existing Pittman East Detention Basin.

Depth-Area-Reduction Factors

DARFs were applied to the HEC-1 models and associated rainfall depths for each concentration point based on the tributary area of each concentration point. The DARFs are a ratio less than or equal to 1.0 that is multiplied by the rainfall depth for each subbasin to account for the aerial extent of the storm being modeled for a given concentration point and tributary area; the result is a reduction in the rainfall depth used as the tributary area increases. Due to the number of concentration points created for the Pittman Wash Flood Insurance Study in the HEC-1 models, an average DARF value was used for a range of tributary areas. **Table C-1** summarizes the DARF values generally used for each storm distribution number in the HEC-1 models. Some exceptions were made to the use of the DARFs in **Table C-1** where the aerial extent of the HEC-1 model was large (greater than 20 square miles) and the number of concentration points of interest were relatively small (DARFs may have been added or modified to decrease the range of tributary area for each DARF).

Table C-1. Depth Area Reduction Factors

Area (Square Miles)	SDN 3	SDN 4	SDN 5
0≤Area<0.5	0.99	—	—
0.5≤Area<1	0.975	—	—
1≤Area<2	0.95	—	—
2≤Area<3	0.925	—	—
3≤Area<4	0.915	—	—
4≤Area<5	0.908	—	—
5≤Area<6	0.903	—	—
6≤Area<7	0.895	—	—
7≤Area<8	0.885	—	—
8≤Area<9	—	0.875	—
9≤Area<10	—	0.865	—
10≤Area<11	—	0.857	—
11≤Area<12	—	0.85	—
12≤Area<16	—	—	0.832
16≤Area<20	—	—	0.804
20≤Area<30	—	—	0.765
30≤Area<40	—	—	0.725
40≤Area<50	—	—	0.695
50≤Area<100	—	—	0.64
100≤Area<150	—	—	0.58
150≤Area<200	—	—	0.53

Land Use

Land use data for the study area is based on the 2002 MPU land use coverage, which was generated from general zoning information obtained from the local entities in the Las Vegas Valley. Areas that are currently undeveloped were revised to reflect this in the land use layer used in this study (Note: the 2002 MPU represents ultimate land use). **Figure C-2** shows a map of the land use for the study area

Table C-2 summarizes the 12 land uses used for this study (taken from the 2002 MPU). Each land use is defined by a specified percentage of impervious ground, landscaped area in good condition, and amount of desert shrub in poor hydrologic condition.

Table C-2. Land Use Categories

Land Use Index Number	Description - Typical Land Uses	Directly Connected Impervious (%)	Open Landscaped Good Condition (%)	Open Desert Shrub Poor Condition (%)
1	Undeveloped Land, Open Desert	0	0	100
2	Parks, Golf Courses	5	85	10
3	Rural, 0.5-1 units per acre	20	20	60
4	Low-Density Residential, 1-2 units per acre	25	40	35
5	Medium-Density Residential, 2-4 units per acre	38	62	0
6	High-Density Residential, 4-8 units per acre	69	31	0
7	Multi-Family, 8 units per acre or more	72	28	0
8	Commercial, Retail, Casino	90	10	0
9	Light Industrial	70	15	15
10	Heavy Industrial	85	8	7
11	Schools	50	50	0
12	Lakes	0	0	0

Soils

Soils data used for this study is identical to the 2002 MPU. The 2002 MPU soils data was developed from several sources as follows:

- U.S. Department of Agriculture, National Resource Conservation Service, Unpublished soils data for outlying areas of the Las Vegas Valley, obtained 2001
- U.S. Department of Agriculture, National Resource Conservation Service, State Soil Geographic (STATSGO) Data Base, dated September 1995.
- U.S. Department of Agriculture, National Resource Conservation Service, Supplemental Soil Survey of the Las Vegas Valley Area, dated December 1995
- U.S. Department of Agriculture, National Resource Conservation Service, Soil Survey of Las Vegas Valley Area, dated July 1985
- U.S. Department of Agriculture, National Resource Conservation Service, Soil Survey of Virgin River Area, dated July 1980

Note: The organization named above as the National Resource Conservation Service was formerly known as the Soil Conservation Service.

Soils data from the five sources listed above were used to develop a GIS soils layer for the entire Las Vegas Valley watershed. Much of the data included in the GIS soils layer are the same as the 1996 MPU, but many of the outlying areas of the Valley were supplemented with more recent soils information. The GIS soils layer is a compilation of all soil types in the Valley. The limits of each soil type are delineated in the GIS layer, and each is assigned a soil map unit number. These map unit numbers were taken from the original unit number assigned to it from the five sources listed above. The source of the soils information can be identified by the map unit number as follows:

Source 1: Map units 0 to 999
Source 2: Map units 1000 to 1999
Source 3: Map units 2000 to 2999
Source 4: Map units 3000 to 3999
Source 5: Map units 4000 to 4999

For Sources 1 and 2, the original map unit number was used with no modification. Generally, for Sources 3 and 4 a preceding number was added to the original map unit number. For example, for Source 3, if the original map unit number was 212, it became 3212. For Source 5, only one soil map unit number was used (RTF), and it was assigned number 4000 in the GIS layer.

Each soils map unit number is made up of a certain percentage of Hydrologic Soil Group A, B, C, and D. The four Hydrologic Soil Groups are defined as follows:

A	High infiltration rate, low runoff potential
B	Moderate infiltration rate, moderately low runoff potential
C	Slow infiltration rate, moderately high runoff potential
D	Very slow infiltration rate, high runoff potential

The Hydrologic Soil Group, along with the land use information, is used to obtain a curve number (CN) for a given area (see next section). Most map units are not made up of all four Hydrologic Soil Groups, and very few map units are made up completely of a single Hydrologic Soil Group.

Delineations for Hydrologic Soil Group are shown on **Figure C-2.**

Curve Numbers

Rainfall losses due to soil infiltration, depression storage, and other factors were calculated using the National Resource Conservation Service curve number method, which is a function of soil type, land cover, and antecedent moisture conditions. Based on the CCRFCD Design Manual, the average antecedent moisture condition (AMC II) is used for computing losses. To calculate a curve number for a given subbasin, the procedure described below was used.

1. Base curve numbers are taken from the CCRFCD Design Manual for the three assumed land cover conditions shown in **Table C-2** (directly connected impervious area, open landscaped area in good condition, open desert shrub in poor condition) for each of the four Hydrologic Soil Groups. In addition, a curve number of 90 is assumed for rock outcrop and directly connected impervious is assumed to have a curve number of 98 for all soil types.
2. For each land cover condition and soil map unit number (see above), a weighted curve number is calculated using the percentage each soil map unit includes for each of the four Hydrologic Soil Groups and rock outcrop and the curve numbers obtained from Step 1 above.
3. A curve number matrix is then generated that calculates a weighted curve number for a given soil map unit and a given land use type. **Table C-3** displays the curve number matrix used for the Pittman Wash Flood Insurance Study (included on the CD provided with this document).
4. GIS polygon processing is used to calculate a weighted curve number for each subbasin using the curve number matrix, subbasin delineations, soil map unit delineations, and the GIS land use layer. Each subbasin is divided into polygons that have a single land use and soil map unit number. The curve number matrix is then used to assign a curve number for each polygon. A weighted curve number is calculated for the whole subbasin based on the areas of the subdivided polygons and their associated curve numbers. The curve number and total area of each subbasin is then used in the HEC-1 input files.

Table C-3. Curve Number Matrix

MAP #	COMPONENTS			LAND USE CLASSIFICATION INDEX NUMBER											
	OPEN DESERT	OPEN GOOD	% IMP	1	2	3	4	5	6	7	8	9	10	11	12
	% --->			100	10	60	35	0	0	0	0	15	7	0	0
		% --->		0	85	20	40	71	38	28	10	15	8	50	0
			% --->	0	5	20	25	29	62	72	90	70	85	50	0
	CN	CN	CN												
105	71	51	98	71	55.35	72.4	69.75	64.63	80.14	84.84	93.3	86.9	92.35	74.5	30
107	65	42	98	65	47.1	67	64.05	58.24	76.72	82.32	92.4	84.65	91.21	70	30
112	66	43	98	66	48.05	67.8	64.8	58.95	77.1	82.6	92.5	84.95	91.36	70.5	30
113	66	43	98	66	48.05	67.8	64.8	58.95	77.1	82.6	92.5	84.95	91.36	70.5	30
117	65	42	98	65	47.1	67	64.05	58.24	76.72	82.32	92.4	84.65	91.21	70	30
120	64	40	98	64	45.3	66	62.9	56.82	75.96	81.76	92.2	84.2	90.98	69	30
127	64	41	98	64	46.15	66.2	63.3	57.53	76.34	82.04	92.3	84.35	91.06	69.5	30
128	64	41	98	64	46.15	66.2	63.3	57.53	76.34	82.04	92.3	84.35	91.06	69.5	30
129	66	44	98	66	48.9	68	65.2	59.66	77.48	82.88	92.6	85.1	91.44	71	30
130	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
132	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
133	79	66	98	79	68.9	80.2	78.55	75.28	85.84	89.04	94.8	90.35	94.11	82	30
134	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
140	84	72	98	84	74.5	84.4	82.7	79.54	88.12	90.72	95.4	92	94.94	85	30
150	86	77	98	86	78.95	86.6	85.4	83.09	90.02	92.12	95.9	93.05	95.48	87.5	30
151	87	78	98	87	79.9	87.4	86.15	83.8	90.4	92.4	96	93.35	95.63	88	30
152	86	76	98	86	78.1	86.4	85	82.38	89.64	91.84	95.8	92.9	95.4	87	30
155	86	77	98	86	78.95	86.6	85.4	83.09	90.02	92.12	95.9	93.05	95.48	87.5	30
160	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
181	79	64	98	79	67.2	79.8	77.75	73.86	85.08	88.48	94.6	90.05	93.95	81	30
182	77	60	98	77	63.6	77.8	75.45	71.02	83.56	87.36	94.2	89.15	93.49	79	30
183	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
184	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
187	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
190	76	60	98	76	63.5	77.2	75.1	71.02	83.56	87.36	94.2	89	93.42	79	30
191	77	62	98	77	65.3	78.2	76.25	72.44	84.32	87.92	94.4	89.45	93.65	80	30
192	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
200	77	62	98	77	65.3	78.2	76.25	72.44	84.32	87.92	94.4	89.45	93.65	80	30
206	77	62	98	77	65.3	78.2	76.25	72.44	84.32	87.92	94.4	89.45	93.65	80	30
222	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
236	78	62	98	78	65.4	78.8	76.6	72.44	84.32	87.92	94.4	89.6	93.72	80	30
237	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
240	87	78	98	87	79.9	87.4	86.15	83.8	90.4	92.4	96	93.35	95.63	88	30
252	78	62	98	78	65.4	78.8	76.6	72.44	84.32	87.92	94.4	89.6	93.72	80	30
255	78	62	98	78	65.4	78.8	76.6	72.44	84.32	87.92	94.4	89.6	93.72	80	30
260	64	41	98	64	46.15	66.2	63.3	57.53	76.34	82.04	92.3	84.35	91.06	69.5	30
262	69	49	98	69	53.45	70.8	68.25	63.21	79.38	84.28	93.1	86.3	92.05	73.5	30
263	64	41	98	64	46.15	66.2	63.3	57.53	76.34	82.04	92.3	84.35	91.06	69.5	30
264	63	39	98	63	44.35	65.2	62.15	56.11	75.58	81.48	92.1	83.9	90.83	68.5	30
270	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
278	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
282	84	73	98	84	75.35	84.6	83.1	80.25	88.5	91	95.5	92.15	95.02	85.5	30
300	87	78	98	87	79.9	87.4	86.15	83.8	90.4	92.4	96	93.35	95.63	88	30

Table C-3. Curve Number Matrix

MAP #	COMPONENTS			LAND USE CLASSIFICATION INDEX NUMBER											
	OPEN DESERT	OPEN GOOD	% IMP	1	2	3	4	5	6	7	8	9	10	11	12
	% --->			100	10	60	35	0	0	0	0	15	7	0	0
		% --->		0	85	20	40	71	38	28	10	15	8	50	0
			% --->	0	5	20	25	29	62	72	90	70	85	50	0
	CN	CN	CN												
301	87	79	98	87	80.75	87.6	86.55	84.51	90.78	92.68	96.1	93.5	95.71	88.5	30
302	81	68	98	81	70.8	81.8	80.05	76.7	86.6	89.6	95	90.95	94.41	83	30
305	83	72	98	83	74.4	83.8	82.35	79.54	88.12	90.72	95.4	91.85	94.87	85	30
307	86	76	98	86	78.1	86.4	85	82.38	89.64	91.84	95.8	92.9	95.4	87	30
325	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
326	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
341	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
360	87	82	98	87	83.3	88.2	87.75	86.64	91.92	93.52	96.4	93.95	95.95	90	30
380	84	73	98	84	75.35	84.6	83.1	80.25	88.5	91	95.5	92.15	95.02	85.5	30
390	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
400	87	78	98	87	79.9	87.4	86.15	83.8	90.4	92.4	96	93.35	95.63	88	30
415	78	62	98	78	65.4	78.8	76.6	72.44	84.32	87.92	94.4	89.6	93.72	80	30
417	82	72	98	82	74.3	83.2	82	79.54	88.12	90.72	95.4	91.7	94.8	85	30
418	78	62	98	78	65.4	78.8	76.6	72.44	84.32	87.92	94.4	89.6	93.72	80	30
419	77	62	98	77	65.3	78.2	76.25	72.44	84.32	87.92	94.4	89.45	93.65	80	30
430	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
440	76	60	98	76	63.5	77.2	75.1	71.02	83.56	87.36	94.2	89	93.42	79	30
450	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
481	86	77	98	86	78.95	86.6	85.4	83.09	90.02	92.12	95.9	93.05	95.48	87.5	30
484	87	79	98	87	80.75	87.6	86.55	84.51	90.78	92.68	96.1	93.5	95.71	88.5	30
500	82	69	98	82	71.75	82.6	80.8	77.41	86.98	89.88	95.1	91.25	94.56	83.5	30
501	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
502	81	68	98	81	70.8	81.8	80.05	76.7	86.6	89.6	95	90.95	94.41	83	30
505	82	70	98	82	72.6	82.8	81.2	78.12	87.36	90.16	95.2	91.4	94.64	84	30
510	88	82	98	88	83.4	88.8	88.1	86.64	91.92	93.52	96.4	94.1	96.02	90	30
540	77	62	98	77	65.3	78.2	76.25	72.44	84.32	87.92	94.4	89.45	93.65	80	30
542	77	62	98	77	65.3	78.2	76.25	72.44	84.32	87.92	94.4	89.45	93.65	80	30
545	81	68	98	81	70.8	81.8	80.05	76.7	86.6	89.6	95	90.95	94.41	83	30
600	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
605	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
610	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
615	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
630	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
635	90	90	98	90	90.4	91.6	92	92.32	94.96	95.76	97.2	95.6	96.8	94	30
640	90	90	98	90	90.4	91.6	92	92.32	94.96	95.76	97.2	95.6	96.8	94	30
645	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
999	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1141	86	79	98	86	80.65	87	86.2	84.51	90.78	92.68	96.1	93.35	95.64	88.5	30
1150	63	39	98	63	44.35	65.2	62.15	56.11	75.58	81.48	92.1	83.9	90.83	68.5	30
1191	67	45	98	67	49.85	68.8	65.95	60.37	77.86	83.16	92.7	85.4	91.59	71.5	30
1200	76	60	98	76	63.5	77.2	75.1	71.02	83.56	87.36	94.2	89	93.42	79	30
1221	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
1292	89	86	98	89	86.9	90.2	90.05	89.48	93.44	94.64	96.8	94.85	96.41	92	30

Table C-3. Curve Number Matrix

MAP #	COMPONENTS			LAND USE CLASSIFICATION INDEX NUMBER											
	OPEN DESERT	OPEN GOOD	% IMP	1	2	3	4	5	6	7	8	9	10	11	12
	% --->			100	10	60	35	0	0	0	0	15	7	0	0
		% --->		0	85	20	40	71	38	28	10	15	8	50	0
			% --->	0	5	20	25	29	62	72	90	70	85	50	0
	CN	CN	CN												
1294	90	89	98	90	89.55	91.4	91.6	91.61	94.58	95.48	97.1	95.45	96.72	93.5	30
1311	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
1314	79	64	98	79	67.2	79.8	77.75	73.86	85.08	88.48	94.6	90.05	93.95	81	30
1320	88	82	98	88	83.4	88.8	88.1	86.64	91.92	93.52	96.4	94.1	96.02	90	30
1321	88	82	98	88	83.4	88.8	88.1	86.64	91.92	93.52	96.4	94.1	96.02	90	30
1322	88	81	98	88	82.55	88.6	87.7	85.93	91.54	93.24	96.3	93.95	95.94	89.5	30
1341	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
1342	88	82	98	88	83.4	88.8	88.1	86.64	91.92	93.52	96.4	94.1	96.02	90	30
1351	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
1352	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
1380	65	43	98	65	47.95	67.2	64.45	58.95	77.1	82.6	92.5	84.8	91.29	70.5	30
1390	76	61	98	76	64.35	77.4	75.5	71.73	83.94	87.64	94.3	89.15	93.5	79.5	30
1400	71	53	98	71	57.05	72.8	70.55	66.05	80.9	85.4	93.5	87.2	92.51	75.5	30
1411	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
1421	88	81	98	88	82.55	88.6	87.7	85.93	91.54	93.24	96.3	93.95	95.94	89.5	30
1450	64	41	98	64	46.15	66.2	63.3	57.53	76.34	82.04	92.3	84.35	91.06	69.5	30
1452	67	45	98	67	49.85	68.8	65.95	60.37	77.86	83.16	92.7	85.4	91.59	71.5	30
1461	81	68	98	81	70.8	81.8	80.05	76.7	86.6	89.6	95	90.95	94.41	83	30
1480	83	72	98	83	74.4	83.8	82.35	79.54	88.12	90.72	95.4	91.85	94.87	85	30
1481	87	78	98	87	79.9	87.4	86.15	83.8	90.4	92.4	96	93.35	95.63	88	30
1490	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
1500	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
1505	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
1510	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
1511	87	78	98	87	79.9	87.4	86.15	83.8	90.4	92.4	96	93.35	95.63	88	30
1512	87	80	98	87	81.6	87.8	86.95	85.22	91.16	92.96	96.2	93.65	95.79	89	30
1520	88	83	98	88	84.25	89	88.5	87.35	92.3	93.8	96.5	94.25	96.1	90.5	30
1530	84	73	98	84	75.35	84.6	83.1	80.25	88.5	91	95.5	92.15	95.02	85.5	30
1581	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
1622	68	47	98	68	51.65	69.8	67.1	61.79	78.62	83.72	92.9	85.85	91.82	72.5	30
1674	81	69	98	81	71.65	82	80.45	77.41	86.98	89.88	95.1	91.1	94.49	83.5	30
1721	83	70	98	83	72.7	83.4	81.55	78.12	87.36	90.16	95.2	91.55	94.71	84	30
1731	88	79	98	88	80.85	88.2	86.9	84.51	90.78	92.68	96.1	93.65	95.78	88.5	30
1732	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
1753	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
1754	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
1760	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
1772	79	64	98	79	67.2	79.8	77.75	73.86	85.08	88.48	94.6	90.05	93.95	81	30
1840	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
1850	88	81	98	88	82.55	88.6	87.7	85.93	91.54	93.24	96.3	93.95	95.94	89.5	30
1853	88	82	98	88	83.4	88.8	88.1	86.64	91.92	93.52	96.4	94.1	96.02	90	30
1871	86	76	98	86	78.1	86.4	85	82.38	89.64	91.84	95.8	92.9	95.4	87	30
1874	86	76	98	86	78.1	86.4	85	82.38	89.64	91.84	95.8	92.9	95.4	87	30

Table C-3. Curve Number Matrix

MAP #	COMPONENTS			LAND USE CLASSIFICATION INDEX NUMBER											
	OPEN DESERT	OPEN GOOD	% IMP	1	2	3	4	5	6	7	8	9	10	11	12
	% --->			100	10	60	35	0	0	0	0	15	7	0	0
		% --->		0	85	20	40	71	38	28	10	15	8	50	0
			% --->	0	5	20	25	29	62	72	90	70	85	50	0
	CN	CN	CN												
2166	85	75	98	85	77.15	85.6	84.25	81.67	89.26	91.56	95.7	92.6	95.25	86.5	30
2167	86	76	98	86	78.1	86.4	85	82.38	89.64	91.84	95.8	92.9	95.4	87	30
2178	88	81	98	88	82.55	88.6	87.7	85.93	91.54	93.24	96.3	93.95	95.94	89.5	30
2200	76	60	98	76	63.5	77.2	75.1	71.02	83.56	87.36	94.2	89	93.42	79	30
2221	78	62	98	78	65.4	78.8	76.6	72.44	84.32	87.92	94.4	89.6	93.72	80	30
2227	83	71	98	83	73.55	83.6	81.95	78.83	87.74	90.44	95.3	91.7	94.79	84.5	30
2230	81	68	98	81	70.8	81.8	80.05	76.7	86.6	89.6	95	90.95	94.41	83	30
2233	83	72	98	83	74.4	83.8	82.35	79.54	88.12	90.72	95.4	91.85	94.87	85	30
2296	90	90	98	90	90.4	91.6	92	92.32	94.96	95.76	97.2	95.6	96.8	94	30
2297	87	82	98	87	83.3	88.2	87.75	86.64	91.92	93.52	96.4	93.95	95.95	90	30
2313	80	66	98	80	69	80.8	78.9	75.28	85.84	89.04	94.8	90.5	94.18	82	30
2314	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
2322	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
2450	65	42	98	65	47.1	67	64.05	58.24	76.72	82.32	92.4	84.65	91.21	70	30
2461	81	68	98	81	70.8	81.8	80.05	76.7	86.6	89.6	95	90.95	94.41	83	30
2478	86	76	98	86	78.1	86.4	85	82.38	89.64	91.84	95.8	92.9	95.4	87	30
2505	63	39	98	63	44.35	65.2	62.15	56.11	75.58	81.48	92.1	83.9	90.83	68.5	30
2506	85	74	98	85	76.3	85.4	83.85	80.96	88.88	91.28	95.6	92.45	95.17	86	30
2541	88	81	98	88	82.55	88.6	87.7	85.93	91.54	93.24	96.3	93.95	95.94	89.5	30
2581	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
2662	83	71	98	83	73.55	83.6	81.95	78.83	87.74	90.44	95.3	91.7	94.79	84.5	30
2721	83	70	98	83	72.7	83.4	81.55	78.12	87.36	90.16	95.2	91.55	94.71	84	30
2731	86	77	98	86	78.95	86.6	85.4	83.09	90.02	92.12	95.9	93.05	95.48	87.5	30
2732	77	61	98	77	64.45	78	75.85	71.73	83.94	87.64	94.3	89.3	93.57	79.5	30
2840	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
3200	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
3202	81	68	98	81	70.8	81.8	80.05	76.7	86.6	89.6	95	90.95	94.41	83	30
3204	86	77	98	86	78.95	86.6	85.4	83.09	90.02	92.12	95.9	93.05	95.48	87.5	30
3205	87	78	98	87	79.9	87.4	86.15	83.8	90.4	92.4	96	93.35	95.63	88	30
3209	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
3210	76	60	98	76	63.5	77.2	75.1	71.02	83.56	87.36	94.2	89	93.42	79	30
3211	79	65	98	79	68.05	80	78.15	74.57	85.46	88.76	94.7	90.2	94.03	81.5	30
3212	78	63	98	78	66.25	79	77	73.15	84.7	88.2	94.5	89.75	93.8	80.5	30
3216	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
3217	76	60	98	76	63.5	77.2	75.1	71.02	83.56	87.36	94.2	89	93.42	79	30
3218	76	60	98	76	63.5	77.2	75.1	71.02	83.56	87.36	94.2	89	93.42	79	30
3220	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
3222	86	77	98	86	78.95	86.6	85.4	83.09	90.02	92.12	95.9	93.05	95.48	87.5	30
3225	88	80	98	88	81.7	88.4	87.3	85.22	91.16	92.96	96.2	93.8	95.86	89	30
3226	82	69	98	82	71.75	82.6	80.8	77.41	86.98	89.88	95.1	91.25	94.56	83.5	30
3385	82	69	98	82	71.75	82.6	80.8	77.41	86.98	89.88	95.1	91.25	94.56	83.5	30
3539	74	57	98	74	60.75	75.4	73.2	68.89	82.42	86.52	93.9	88.25	93.04	77.5	30
4000	86	76	98	86	78.1	86.4	85	82.38	89.64	91.84	95.8	92.9	95.4	87	30

Lag Times

Lag times are calculated for subbasins over 1 square mile using the U.S. Bureau of Reclamation Method in the CCRFCD Design Manual. For subbasins less than 1 square mile, the time of concentration (velocity method) is used to compute lag time. Each method is further explained below.

U.S. Bureau of Reclamation Method

The lag time for basins over 1 square mile is calculated as follows:

$$T_{lag} = 20\ K_n\ (L\ L_c/S^{1/2})^{1/3}$$

Where:

T_{lag} = Lag time (hours)
L = Watershed length, length of longest watercourse (miles)
L_c = Length along longest watercourse measured upstream to a point opposite the centroid of the basin (miles)
S = Average slope of the longest watercourse (feet/mile)
K_n = Manning's roughness for the basin channels. For the 2002 MPU, a value of 0.050 is used.

Table C-4 shows the calculation for the basin that is over 1 square mile in the study area.

Table C-4. Lag Time Calculation (USBR Method)

Basin	Slope (ave.) ft/ft	Length (Total) ft.	Length (Centroid) ft.	n	$TLAG_{USBR}$
PW01	0.011	10,600	4,500	0.050	0.611

Time of Concentration Method

For drainage basins with less than 1 square mile, the time of concentration is calculated as follows:

$$T_c = T_i + T_t$$

Where:

T_c = Time of concentration (minutes)

T_i = Initial, inlet, or overland flow time (minutes)
T_t = Travel time in the ditch, gutter, etc. (minutes)

The lag time for basins less than 1 square mile is calculated as follows:

$$T_{lag} = 0.6T_c \text{ (hours)}$$

Initial flow time is calculated as follows:

$$T_i = 1.8(1.1 - K)L_o^{1/2}/S^{1/3}$$

Where:

T_i = Initial overland flow time (minutes)
K = 0.0132 * CN - 0.39
CN = Curve number
L_o = Length of overland flow (maximum 500 feet)
S = Average basin slope (percent)

Travel time is calculated as follows:

$$T_t = 500/(60\ V_1) + (L_t\text{-}500)/(60\ V_2)$$

Where:

T_t = Travel time in the ditch, gutter, etc. (minutes)
L_t = Travel length (feet)
V_1 = Average velocity of flow for the first 500 feet of travel distance(feet/second)
V_2 = Average velocity of flow for the remaining travel distance (feet/second)

V_1 and V_2 are calculated as follows:

$$V_1 = C_1 * (S/100)^{1/2}$$

$$V_2 = C_2 * (S/100)^{1/2}$$

Where:

C_1 = 20.2 for developed areas and 14.8 for undeveloped areas
C_2 = 30.6 for developed areas and 29.4 for undeveloped areas
S = Average slope for the flow path (percent)

In urbanized areas, the time of concentration calculated above should not exceed the time of concentration calculated by the following equation:

$$T_c = (L / 180) + 10$$

Where:

Tc = Time of concentration at the first design point in an urban watershed (minutes)
L = Watershed length (feet)

The smaller of the two calculations for Time of Concentration controls Minimum T_c for any watershed is limited to 5 minutes.

Table C-5 shows the time of concentration calculations for basins under 1 square mile in the study area, as well as curve numbers and precipitation values for each of the subbasins in the study area.

Table C-5. Time Lag Calculation (Time of Concentration Method)

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

PBS&J | Pittman Wash FIS | BY: SCA

File: FORM4Final1.XLS | WATERSHED | DATE: 5/4/04

Ultimate Conditions 100-Year Model

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag	REMARKS
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA MI^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS	V2 VELOCITY FPS	Tt Min	Min	Min	Tlag= 0.6Tc/60 Hours	RAINFALL Q100 Inches
(1)			(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)	(13)	(14)		
PW01	E	87.0	0.7584	710.40	1.11				Area Exceeds One Square Mile, Use USBR Method								2.79
PW02	E	82.0	0.6924	243.20	0.38	200	2.50	7.6	5200	1.63	1.9	3.8	25.3	32.9	N/A	0.329	2.78
PW03A	D	90.0	0.7980	531.20	0.83	100	1.00	5.4	9400	0.84	1.9	2.8	57.4	62.8	62.8	0.628	2.77
PW03B	D	87.0	0.7584	248.32	0.39	100	1.00	6.1	5200	0.83	1.8	2.8	32.6	38.8	39.4	0.388	2.77
PW04	E	79.0	0.6528	236.80	0.37	200	1.67	9.6	7800	1.53	1.8	3.6	38.0	47.6	N/A	0.476	2.77
PW05	D	88.0	0.7716	160.00	0.25	100	1.00	5.9	4800	0.94	2.0	3.0	28.4	34.3	37.2	0.343	2.77
PW06	D	86.0	0.7452	25.60	0.04	100	1.00	6.4	2700	1.52	2.5	3.8	13.1	19.5	25.6	0.195	2.77
PW07	D	96.0	0.8772	44.80	0.07	100	1.00	4.0	2000	1.55	2.5	3.8	9.9	13.9	21.7	0.139	2.77
PW08	D	83.0	0.7056	83.20	0.13	100	1.00	7.1	2900	1.31	2.3	3.5	15.0	22.1	26.7	0.221	2.77
PW09	E	79.0	0.6528	154.88	0.24	200	2.00	9.0	4000	1.00	1.5	2.9	25.5	34.5	N/A	0.345	2.77
PW09-1	E	78.0	0.6396	92.16	0.14	200	2.00	9.3	4000	0.63	1.2	2.3	32.2	41.5	N/A	0.415	2.77
PW10	E	71.0	0.5472	44.80	0.07	100	1.00	10.0	1600	2.50	2.3	4.6	7.5	17.5	N/A	0.175	2.77
PW11	D	88.0	0.7716	83.20	0.13	100	1.00	5.9	2200	1.05	2.1	3.1	13.1	19.0	22.8	0.190	2.77
PW12	D	79.0	0.6528	51.20	0.08	100	1.00	8.0	2800	1.18	2.2	3.3	15.3	23.4	26.1	0.234	2.77
PW14	D	79.0	0.6528	48.00	0.08	100	1.00	8.0	2500	1.40	2.4	3.6	12.7	20.7	24.4	0.207	2.77
PW14-1	D	79.0	0.6528	4.48	0.01	100	1.00	8.0	1100	1.00	2.0	3.1	7.4	15.4	16.7	0.154	2.77
PW14-2	D	65.0	0.4680	5.12	0.01	100	1.00	11.4	900	1.11	2.1	3.2	6.0	17.4	15.6	0.156	2.77
PW14-3	D	81.0	0.6792	2.56	0.00	100	1.00	7.6	2500	1.43	2.4	3.7	12.6	20.1	24.4	0.201	2.77
PW15	D	86.0	0.7452	38.40	0.06	100	1.00	6.4	2300	1.39	2.4	3.6	11.8	18.2	23.3	0.182	2.77
PW16	D	82.0	0.6924	57.60	0.09	100	1.00	7.3	3000	1.10	2.1	3.2	16.9	24.3	27.2	0.243	2.77
PW17-1	D	82.0	0.6924	28.80	0.05	100	1.00	7.3	2300	1.83	2.7	4.1	10.3	17.6	23.3	0.176	2.77
PW17-2	D	82.0	0.6924	30.08	0.05	100	1.00	7.3	2300	2.17	3.0	4.5	9.5	16.8	23.3	0.168	2.77
PW18	D	81.0	0.6792	101.76	0.16	100	1.00	7.6	6100	2.38	3.1	4.7	22.4	30.0	44.4	0.300	2.77
PW18-1	D	70.0	0.5340	14.08	0.02	100	1.00	10.2	1400	2.14	3.0	4.5	6.2	16.4	18.3	0.164	2.77
PW18-2	D	82.0	0.6924	5.12	0.01	100	1.00	7.3	600	1.67	2.6	4.0	3.6	11.0	13.9	0.110	2.77
PW19	D	82.0	0.6924	38.40	0.06	100	1.00	7.3	2400	1.21	2.2	3.4	13.2	20.5	23.9	0.205	2.77
PW20	D	84.0	0.7188	38.40	0.06	100	1.00	6.9	2700	1.48	2.5	3.7	13.2	20.1	25.6	0.201	2.77
PW21	D	86.0	0.7452	57.60	0.09	100	1.00	6.4	2300	1.52	2.5	3.8	11.3	17.7	23.3	0.177	2.77
PW22	D	88.0	0.7716	38.40	0.06	100	1.00	5.9	1800	1.39	2.4	3.6	9.5	15.4	20.6	0.154	2.77
PW23	D	82.0	0.6924	11.52	0.02	100	1.00	7.3	1500	2.00	2.9	4.3	6.8	14.1	18.9	0.141	2.77
PW23-1	D	82.0	0.6924	12.16	0.02	100	1.00	7.3	1500	2.33	3.1	4.7	6.3	13.6	18.9	0.136	2.77
PE01	E	71.0	0.5472	70.40	0.11	200	2.50	10.4	3000	1.67	1.9	3.8	15.3	25.7	N/A	0.257	2.77
PE02	E	69.0	0.5208	19.20	0.03	200	5.00	8.6	1600	1.25	1.7	3.3	10.6	19.2	N/A	0.192	2.77
PE03	D	82.0	0.6924	32.00	0.05	100	1.00	7.3	2200	1.45	2.4	3.7	11.1	18.5	22.8	0.185	2.77
PE03A	D	78.0	0.6396	70.40	0.11	100	1.00	8.3	4200	1.10	2.1	3.2	23.1	31.4	33.9	0.314	2.77
PE04	E	80.0	0.6660	32.00	0.05	200	5.00	6.5	2000	2.25	2.2	4.4	9.4	15.9	N/A	0.159	2.77
PE05	D	89.0	0.7848	64.00	0.10	100	1.00	5.7	3400	1.47	2.4	3.7	16.4	22.1	29.4	0.221	2.77
PE06	D	87.0	0.7584	25.60	0.04	100	1.00	6.1	1800	1.22	2.2	3.4	10.1	16.3	20.6	0.163	2.77
PE06A	D	85.0	0.7320	44.80	0.07	100	1.00	6.6	3200	1.10	2.1	3.2	18.0	24.6	28.3	0.246	2.77
PE06B	D	87.0	0.7584	32.00	0.05	100	1.00	6.1	2600	0.77	1.8	2.7	17.7	23.9	25.0	0.239	2.77
PE06C	D	88.0	0.7716	32.00	0.05	100	1.00	5.9	1900	1.11	2.1	3.2	11.2	17.1	21.1	0.171	2.77
PE06D	D	83.0	0.7056	51.20	0.08	100	1.00	7.1	2600	1.00	2.0	3.1	15.6	22.7	25.0	0.227	2.77
PE07	D	91.0	0.8112	32.00	0.05	100	1.00	5.2	1900	1.05	2.1	3.1	11.5	16.7	21.1	0.167	2.77
PE08	D	82.0	0.6924	38.40	0.06	100	1.00	7.3	2100	1.67	2.6	4.0	9.9	17.3	22.2	0.173	2.77
PE09	D	89.0	0.7848	88.96	0.14	100	1.00	5.7	4000	1.00	2.0	3.1	23.2	28.9	32.8	0.289	2.77
PE09-1	D	78.0	0.6396	8.96	0.01	100	1.00	8.3	1000	1.20	2.2	3.4	6.3	14.5	16.1	0.145	2.77
PE10	E	75.0	0.6000	64.00	0.10	200	2.50	9.4	2600	2.11	2.1	4.3	12.1	21.4	N/A	0.214	2.77
PE11	E	68.0	0.5076	43.52	0.07	200	2.50	11.1	3500	2.14	2.2	4.3	15.5	26.6	N/A	0.266	2.77
PE12	E	69.0	0.5208	294.40	0.46	300	5.00	10.6	6200	1.61	1.9	3.7	29.9	40.5	N/A	0.405	2.77

Tc = Ti + Tt Tlag = 0.6 Tc

Ti = 1.8 (1.1 - K) L^1/2 / S^1/3

K = 0.0132 (CN) - 0.39

Tc Check = L/180+10

For the travel time (Tt) calculations, V1 applies to the first 500 feet of travel distance; V2 applies to the remaining travel distance.

Existing V1 = 14.8*(S/100)^1/2 Developed V1 = 20.2*(S/100)^1/2

Existing V2 = 29.4*(S/100)^1/2 Developed V2 = 30.6*(S/100)^1/2

REFERENCE : 511542.00

STANDARD FORM 4

Routing

Channel routing in natural channels, alluvial fans, and sheet flow areas was performed using the Muskingum method, if stable. Routing in improved channels or storm drains was performed using the Muskingum-Cunge method.

Hydrograph routing was generally performed for all subbasins and combination points, where the routing length is 500 feet or longer, to the next downstream combination point. In general, two or more hydrographs were not routed down a channel reach independently (i.e., hydrographs were combined and routed using one routing card). Additional combination points were necessary in some areas to prevent routing overlap. The routing methodologies are further discussed below.

Muskingum Routing

Muskingum routing requires three input parameters: X, K, and NSTPS.

The X parameter accounts for channel or floodplain storage. A value of 0.15 was used in undeveloped areas for the MPU modeling.

The K parameter is equal to the travel time through the routing reach. To estimate the travel time, an average flow velocity is estimated using Manning's Equation as follows:

$$V = 1.49\, R^{2/3}\, S^{1/2} / n$$

Where:

V	=	Velocity in feet/second
R	=	Hydraulic radius in feet. For the 2002 MPU, a value of 1.5 is assumed.
S	=	Slope in feet/feet
n	=	Roughness coefficient

The K parameter is equal to the travel time in hours given by:

$$K = L / 3600\, V_{WAVE}$$

Where:

L	=	Length of the routing reach in feet

V_{WAVE} = Wave velocity, which is assumed to be equal to 8/5 of average channel velocity for a wide rectangular channel.

The NSTPS parameter is the number of time steps required. It is determined by using the closest integer given by the following equation:

$$NSTPS = 60\ K/\Delta t$$

Where:

Δt = The simulation time step from the IT (see HEC-1) record in minutes

Table C-6 shows the calculation for Muskingum Routings for the study area.

Table C-6. Pittman Watershed Muskingum Routing Calculations

$V=1.486/n*R^{2/3}*S^{1/2}$ $K=L/3600V_{WAVE}$ NSTPS=K/ DT
$V_{WAVE}=8/5*V$ (wide rectangular shape)

Reach	Length (L) ft.	Slope (S)	n	D (Ave)	VWAVE	DT	K	NSTPS	X
RDB13N	3900	0.0128	0.040	1.5	8.8	0.083	0.123	1	0.15
RDB14N	5200	0.0163	0.040	1.5	10.0	0.083	0.145	2	0.15
R2CDSDB	2400	0.0167	0.040	1.5	10.1	0.083	0.066	1	0.15
RDCH6MEN	3500	0.0214	0.040	1.5	11.4	0.083	0.085	1	0.15
RDB212N	1600	0.0313	0.040	1.5	13.8	0.083	0.032	0	0.15
RDCB23	1500	0.0267	0.040	1.5	12.8	0.083	0.033	0	0.15
RCDCB23	4800	0.0125	0.040	1.5	8.7	0.083	0.153	2	0.15
RCPE09	2000	0.015	0.040	1.5	9.6	0.083	0.058	1	0.15
RCCPE11	1800	0.0167	0.040	1.5	10.1	0.083	0.050	1	0.15

Muskingum-Cunge Routing

Muskingum-Cunge routing requires the following input parameters: roughness coefficient, base width, side slope, slope, and reach length. Muskingum-Cunge routings were used for routing flows in improved channels, streets, storm drains, and where the Muskingum-Cunge routing yielded unstable results.

HEC-1 Results

A summary of the results of the HEC-1 modeling for the area north of St. Rose Parkway is shown in **Tables C-7** and **C-8.**

Table C-7. Subbasin Flow Summary for Pittman Wash (North of St. Rose Parkway)

HEC-1 Node	Drainage Area (sq. mi.)	Discharge (cfs)
PE01	0.11	47
PE02	0.03	12
PE03	0.05	46
PE03A	0.11	67
PE04	0.05	49
PE05	0.1	119
PE06	0.04	51
PE06A	0.07	70
PE06B	0.05	53
PE06C	0.05	58
PE06D	0.08	76
PE07	0.05	79
PE08	0.06	62
PE09	0.14	148
PE09-1	0.01	12
PE10	0.1	59
PE11	0.07	22
PE12	0.46	130
PW01	1.11	695
PW02	0.38	278
PW03A	0.83	599
PW03B	0.39	332
PW04	0.37	188
PW05	0.25	241
PW06	0.04	39
PW07	0.07	122
PW08	0.13	116
PW09	0.24	147
PW09-1	0.14	75
PW10	0.07	32
PW11	0.13	157
PW12	0.08	33
PW14	0.08	57
PW14-1	0.01	6
PW14-2	0.01	2
PW14-3	0.004	3
PW15	0.06	73
PW16	0.09	79
PW17-1	0.05	43
PW17-2	0.05	46
PW18	0.16	136
PW18-1	0.02	11
PW18-2	0.01	9
PW19	0.06	53
PW20	0.06	61
PW21	0.09	108
PW22	0.06	78
PW23	0.02	20
PW23-1	0.02	19

Table C- 8. Combination Point Flow Summary for Pittman Wash (North of St. Rose Parkway)

Combination Point	Drainage Area (sq. mi.)	Discharge (cfs)	HEC-1 Model
CDB	54.48	4819	PITFIS5
CCPW02	54.86	5014	PITFIS5
CPW03A	55.69	5028	PITFIS5
CPW03B	56.08	5029	PITFIS5
CPW05	0.62	376	PITFIS3
CCPW05	0.69	424	PITFIS3
CPW07	0.8	495	PITFIS3
CCPW07	56.88	5032	PITFIS5
CPW08	57.01	5032	PITFIS5
CPW09	57.25	5032	PITFIS5
CPE01	3.02	2425	PITFIS3SC
CCPE01	5.17	4015	PITFIS3SC
CPE02	5.21	3995	PITFIS3SC
DPE03	5.21	1822	PITFIS3SC
EAST	5.21	2173	PITFIS3SC
CPE04	5.27	2189	PITFIS3SC
CPE09-1	5.28	2173	PITFIS3SC
CPE09	5.42	2292	PITFIS3SC
CPE10	5.52	2330	PITFIS3SC
CPE11	1.77	1174	PITFIS3SC
CCPE11	7.29	3256	PITFIS3SC
CPE03	5.26	1855	PITFIS3SC
CPE03A	5.37	1910	PITFIS3SC
CPE05	5.47	1966	PITFIS3SC
CPE06	5.51	1979	PITFIS3SC
CPE06B	0.18	172	PITFIS3
CPE06C	0.13	123	PITFIS3
CCPE06	5.69	2122	PITFIS3SC
CPE07	5.74	2162	PITFIS3SC
CPE08	5.81	2191	PITFIS3SC
CPE12	8.47	4585	PITFIS4SC
CPW10	65.78	5371	PITFIS5
CPW14	0.09	68	PITFIS3
CPW12	0.17	90	PITFIS3
CCPW12	11.47	5411	PITFIS4SC
CPW15	11.9	5540	PITFIS4SC
CPW21	11.99	5475	PITFIS4SC
CPW19	12.05	5475*	PITFIS4SC
CPW17	0.09	89	PITFIS3
CPW23	0.04	39	PITFIS3
CCPW23	0.13	117	PITFIS3N
CPW20	0.19	169	PITFIS3N
CPW22	12.3	5475*	PITFIS4SC
CPW18	0.03	20	PITFIS3
CCPW18	0.19	148	PITFIS3
CCCPW18	12.49	5475*	PITFIS4SC

*Flow from Upstream Combination Point

Pittman Wash Hydrologic Data – South of St. Rose Parkway

(30%) HYDROLOGY SUBMITTAL FOR ST. ROSE PARKWAY (FORMERLY, LAKE MEAD DRIVE) WIDENING FROM I-15 TO PECOS ROAD

NDOT Agreement No. P315-99-010

Prepared for:

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PBS&J Reference Number 511118.00
January 26, 2001

PBS&J

II. Method of Analysis

A. Design Events

1. Offsite/Cross Drainage Design Event

During preparation of the Risk Analysis, St. Rose Parkway was conceptually defined as an Expressway with a minimum 50-year design return frequency according to NDOT design guidelines. Since that time, NDOT has designated the roadway as an urban arterial (with a 25-year design return frequency). However, the roadway will eventually be protected from 100-year flows when the entire CCRFCD MPU system is in place. Additionally, NDOT required that the interim improvements by NDOT be generally compatible with the future 100-year MPU facilities and not create a backwater over one-foot above existing conditions. In consideration of all the above, the basic design criteria selected was:

a. Size proposed culverts similar to existing culvert sizes to generally perpetuate existing 50-year flow patterns with overtopping similar to existing conditions. And do not increase 100-year backwater conditions more than one-foot above existing conditions.

b. At future CCRFCD MPU crossings, size culverts and channels for future 100-year detained flows.

c. Generally size channels for 50-year existing flows.

d. For future conditions (without upstream detention basins) determine 100-year impacts to NDOT roadway. Note that this analysis was for future planning purposes only (not design) to help NDOT and COH manage the upstream watershed in the event that it develops rapidly prior to the construction of the detention basins.

Thus, the design return frequencies for offsite drainage analysis, as selected by NDOT, are the 50- and 100-year storm events.

Note that the criteria described above is basically Alternative 4A from the risk analysis with the addition of Design Criteria "B" above.

Note that the alternative selected from the risk analysis allows existing overtopping patterns (in some cases culverts overtop for less than the 25-year storm) to be perpetuated. This was selected because sizing interim culverts to convey all existing flows or expediting upstream CCRFCD MPU basins was not cost effective for NDOT.

As discussed above, the evaluation of offsite flow rates is based on the existing, interim and future conditions for the 50 and 100-year storm events (and in some cases 25-year peak flows have been determined however, all 25-year HEC-1 analysis is included in previous reports). The existing and interim conditions assume the 1996 MPU Pittman East and South Pittman Detention Basins are constructed. The future condition assumes the South Duck and Southwest Pittman Basins are also constructed.

B. Specific Criteria

The project has been designed and hydrology analysis completed in compliance with the CCRFCD Hydrologic Criteria and Drainage Design Manual (Criteria Manual), dated October 1990 and will be designed in accordance with CCRFCD standards except as noted.

C. Modeling

1. Offsite Hydrology/Cross Drainage

The hydrologic methodology used will be in general accordance with the CCRFCD Criteria Manual.

a. Geographic Information System

The hydrologic methodology incorporated the use of Geographic Information Systems (GIS) layers for the existing drainage facilities, land use, soil type, rainfall precipitation depths, basin boundaries, and land topography to determine the appropriate parameters.

Data from the GIS layers and attribute tables are linked to Excel spreadsheets to compute hydrologic parameters. Basin areas are calculated by GIS polygon processing. Basin boundaries (**Figures 5 and 5a:** Existing Conditions Drainage Subbasins), land use (**Figure 4:** Land Use Map – Existing Conditions), soil types (**Figure 9:** Soils Map), and rainfall depths (**Figure 10:** Rainfall Depths) are developed a GIS layer, and are used to determine the weighted curve numbers (CN) for each offsite subbasin.

b. Precipitation Depths

The precipitation depths used from the Criteria Manual applies a 1.39 and a 1.43 multiplication factor to the 50 and 100-year rainfall depths, respectively, of the 1973 NOAA Atlas Area 2 (1973 Atlas).

c. Rainfall Distributions

The rainfall time distributions in accordance with the Criteria Manual are distributions established by the USACE. For computation of flows for drainage areas less than 10 Square miles a Storm Distribution 3 (SDN 3) was used and for drainage areas greater than 10 Square miles a Storm Distribution 5 (SDN 5) was used.

Point precipitation values are adjusted based on aerial coverage by applying Depth Area Reduction Factors (DARFs). Hydrologic models were run with various DARF ratios and a summary table is included to interpolate the correct DARF and flow rate. The summary tables corresponding to each HEC-1 output file are included in **Appendix A-6** HEC-1 Output Summary Tables. The tables include the tributary area of each subbasin and concentration point in addition to the DARF used and the computed flow.

Appendix A-5 HEC-1 Output contains the ".out" HEC-1 output files for each model. For each HEC-1 output there are a series of DARFs (Depth Area Reduction Factors). These DARFs are used to adjust the peak flows depending on the size of the tributary area. Additionally, these values which appear in the HEC-1 "JR" cards can modify the peak hydrographs to simulate different events. Therefore, to determine the peak flow from a given area using a given DARF and for various storm events, the DARF and the event adjustment factor are multiplied. Table 502 in **Appendix A-3** Design Rainfall Information includes DARF values and their respective areas. Table 505 Depth-Duration-Frequency Values for McCarran Airport Rainfall Area includes precipitation depths corresponding to events and duration. The ratio to apply the DARF depending on the event is determined by the ratio of the event precipitation and the 100-year precipitation. For instance, the 50-year ratio is determined by dividing the 50-year, 6-hour precipitation by the 100-year, 6-hour precipitation (2.41/2.77=0.87).

Each of the SDN3 and SDN5 HEC-1models were set with a number of DARFs. The areas represented in the SDN 3 models include DARFs for 0, 2 and 10 square miles. The DARFs corresponding to these areas are 1.0, 0.93, and 0.86 respectively. Therefore, the 50-year, 2 square mile DARF value to be used in the "JR" card is approximately 0.81 (0.87 x 0.93).

The SDN 5 models use DARFs of 0.86, 0.79, 0.68 and 0.60. These correspond to 10, 20, 50 and 100 square miles respectively. Therefore, the 50-year, 20 square mile DARF value to be used in the "JR" card is approximately 0.69 (0.87 x 0.79).

d. Hydrograph Development/Lag Times

Design precipitation is converted to runoff hydrographs for each Subbasin using the Soil Conservation Service (SCS) unit hydrograph method.

The SCS unit hydrograph requires the input of a time parameter called Lag. In order to compute the required lag times, a Lag Time Calculation Worksheet has been implemented. The input for this worksheet requires the following parameters:

BASIN: Name given to each basin as shown on **Figure 5 and 5a:** Existing Conditions Drainage Subbasins

AREA: The area of each basin in square miles from GIS

CN: Curve Number from GIS files

CALC: Calculate Lag Time, Yes (Y) or No (N). If Y, the lag time is calculated using the equations listed below vs. N, which requires inputting a lag time found from another source.

$S_{ave.}$: The average slope (ft/ft) of the longest watercourse within each basin.

$S_{init.}$: The average slope (ft/ft) of the initial or overland length.

L_{tot}: The watershed length. Length of the longest watercourse through each basin (feet), see on **Figure 5 and 5a:** Existing Conditions Drainage Subbasins

L_c: The centroid length. The length along the longest watercourse measured upstream to a point opposite the centroid of the basin (feet).

URB: Urban, Yes (Y) for Urban basin or No (N) for Undeveloped basin.

Kn: Manning's roughness coefficient for basin channels. Note, When provided the roughness coefficient from the 1996 MPU was incorporated into **Table A4-1:** Lag Time Calculation Worksheet - Existing Conditions, 100-Year, 6-Hour Event included in **Appendix A-4** Lag Time Calculations, Basin Parameter, Routing Calculations and Diversion Information otherwise: Kn = 0.02 for developed basins, Kn = 0.04 for basins designated as rural residential and Kn = 0.05 for undeveloped basins. **Table A4-2:** Lag Time Calculation Worksheet – Future Conditions contains a listing of the roughness coefficient used for each of the offsite existing basins.

After this information is assembled through the GIS applications, the following parameters are used to determine the actual Lag Time to be used. **Table A4-1:** Lag Time Calculation Worksheet - Existing Conditions, 100-Year, 6-Hour Event contains the calculated Lag Times.

The method and equations used are further explained below:

Lag times will be calculated for subbasins over one square mile using the U.S. Bureau of Reclamation (USBR) method in the Criteria Manual. For subbasins less than one square mile the time of concentration (velocity method) will be used to compute lag time. Lag time for basins over one square mile will be

calculated using the following USBR method in the Criteria Manual.

$$LAG_{USBR} = 20K_n(L_{tot}L_c / S_{ave.}^{0.5})^{0.33}$$

Equation 613 of the Criteria Manual
Where:
LAG_{USBR} = Lag time (hours).
K_n = Manning's roughness factor for the basin channels
L_{tot} = length of longest watercourse (miles)
L_c = length along longest watercourse measured upstream to a point opposite the centroid of the basin (miles)
$S_{ave.}$ = Average slope of the longest watercourse (feet per mile)

Table 1: Roughness Coefficients

Kn	Water Course Description
0.015	In urbanized areas, streets, storm drains, improved channels
0.030	Well-defined, unimproved channels or washes, minimal vegetation
0.050	Not well-defined, small rills and braided wash areas
0.050	Mountainous channels with large boulders and flow restrictions
0.070	Shallow overland flow, numerous poorly defined flow paths

Time of Concentration Method:

For drainage basins smaller than one square mile, the time of concentration is calculated as follows:

$$Tc_{CALCD} = T_i + T_t$$

Equation 601 of the Criteria Manual

Where:
Tc_{CALCD}= calculated time of concentration (minutes)
T_i = initial or overland flow time (minutes)
T_t = travel time in the ditch, channel, gutter, storm sewer, etc. (minutes)

$$T_i = 1.8(1.1 - K)L_o^{1/2} / S_{init}^{1/3}$$

Equation 602 of the Criteria Manual

Where:
T_i = initial or overland flow time (minutes)
K = flow resistance coefficient
L_o = length of overland flow (feet, 500-feet maximum)
S_{init} = Average slope of initial overland

length (percent)

$$K = 0.0132\ CN - 0.39$$

Equation 603 of the Criteria Manual

Where:
K = flow resistance coefficient
CN = SCS Curve Number

$$T_t = L_T/(60V)$$

Where:

T_t = travel time in the ditch, channel, gutter, storm sewer, etc. (minutes)
L_T = travel length (feet, Ltot - Lo)
V = velocity in ft/s

$$Tc_{CHECK} = L_{tot} / 180 + 10$$

Equation 604 of the Criteria Manual

Where:
Tc_{CHECK}= time of concentration (minutes)
L_{tot} = watershed length (feet)

The Lag time for basins less than one square mile is calculated as follows:

$$LAG_{Tc} = 0.6\ T_c$$

Equation 612 of the Criteria Manual

Where:
LAG_{Tc}= lag time (hours)
T_c = time of concentration (hours)

In order to estimate the velocity of flow for travel time calculations a flow quantity is estimated. The amount of flow has a significant impact on the velocity. The following equations have been derived to estimate the flow from a small basin. These equations have been derived by regression analysis of output from hypothetical drainage basins with varying Curve Numbers. The results are consistent with the discharge per square mile curve developed by the USACE.

Urban and Undeveloped Basins (areas less than one square mile):

$$Q_{CALCD} = (34(CN) - 1950)A$$

Urban basins

$$Q_{CALCD} = (40(CN) - 2490)A$$

Undeveloped Basins

Where:
Q_{CALCD}= flow in cubic feet per second (cfs)
CN = SCS curve number

A = area in square miles

For Urban Areas:

After a flow from the total basin is estimated an average depth and velocity of the conveyed flow is estimated. These equations are based on Manning's equation, the continuity equation, Q = (Velocity * Area) and a triangular shaped gutter flow conveyance, typical of a street section with a cross slope of 2 %. One-fourth the total basin flow (for single channels, one-eighth for multiple channels) is estimated in a half street section. This assumes the average velocity is associated with half the total flow, and half of that is flowing in each side of the street.

Depth (y) and Velocity (V), Urban Areas, Multiple and Single Channels:

$y = \left[Q / \left(11{,}733 S_{ave.}^{1/2}\right)\right]^{3/8}$ Manning's equation, multiple channel

$y = \left[Q / \left(5867 S_{ave.}^{1/2}\right)\right]^{3/8}$ Manning's equation, single channel

$V = Q / (200y^2)$ Continuity equation (Q=VA), multiple channel

$V = Q / (100y^2)$ Continuity equation, single channel

Where:
y = depth of flow (feet)
V = velocity in feet per second (ft/s)
Q = estimated peak flow from the subbasin in cfs.
$S_{ave.}$ = average slope of main watercourse in feet per feet (ft/ft)

For Undeveloped Areas:

The flow for a small-undeveloped basin is assumed to collect gradually in natural watercourses. The equations developed by Dr. David Dawdy and adopted by FEMA for single channel flow regimes on alluvial fans are used to estimate depth and velocity. These equations assume that the natural flow will seek minimum energy adjusting its width, depth and sediment load.

Depth (y) and Velocity (V), Undeveloped Areas: Multiple and Single Channels:

$y = 0.0402\ Q^{0.4}$ Equation 2.18 of the FAN An Alluvial Fan Flooding Computer Program - User's Manual prepared by FEMA, 9/90. Multiple Channel.

$y = 0.0531\ Q^{0.4}$ Equation 2.18 of FEMA, 9/90. Single Channel

$V = 1.14\ Q^{0.2}$ Equation 2.19 of FEMA, 9/90. Multiple Channel

$V = 1.31\ Q^{0.2}$ Equation 2.19 of FEMA, 9/90. Single Channel

Where:
y = depth of flow (feet)
V = velocity in feet per second (ft/s)
Q = estimated peak flow from the subbasin in cfs.

e. Routing Methods

Flow routing within natural channels, alluvial fans and sheet flow areas, was performed by using the Muskingum method. For flows in the streets or man-made channels, the Kinematic method was used.

1. Muskingum Routing

Muskingum Routing requires three input parameters (X, K, and NSTPS)

The X parameter accounts for channel or floodplain storage. A value will be selected based on **Table 2**: Flood Plain Storage Characteristics, below with a value typically used in undeveloped watersheds. Values of this weighting factor in the Clark County area could range from 0.15 for channel reaches with some storage in overbank but few obstructions such as would be found on alluvial fans, to 0.10 for inadequate channels in developed basins where flows would encounter severe obstruction and consequently be significantly attenuated.

Table 2: Floodplain Storage Characteristics	
X	Description
0.10	Large floodplain storage – shallow sheet flow
0.15	Normal natural condition – poorly defined natural channels
0.30	Flows primarily confined within a major wash

The K parameter is equal to the travel time through the routing reach. To estimate the travel time, an average flow velocity will be estimated using Manning's Equation:

$$V = 1.49 R^{2/3} S^{1/2} / n$$

Where:

V =Velocity ft/sec
R = hydraulic radius in feet
S = slope in ft/ft
n = roughness coefficient

The Hydraulic Radius (R) was based on typical channel characteristics from the following **Table 3**, Hydraulic Radius/Typical Channel Characteristics.

Table 3: Hydraulic Radius/Typical Channel Characteristics	
R	Description
0.60	Shallow sheet flow
1.50	Normal natural condition – poorly defined natural channels
2.50	Flows primarily confined within a major wash

The K parameter is defined as the travel time in hours, given by:

$$K = L / (3600 V)$$

Where:

V = velocity in feet per second (ft/s)
L = length of the routing reach in feet

The NSTPS parameter is the number of time steps required. It will be determined by using the closest integer given by the following equation:

$$NSTPS = 60 K / \Delta t$$

Where:

K = travel time in hours
t = simulated time step in minutes

See **Table A4-5**: Data Table for HEC-1 Model Muskingum Routing Input, and **Table A4-6**: Calculation Worksheet for Muskingum Routing included in **Appendix A-4** Lag Time Calculations, Basin Parameter, Routing Calculations and Diversion Information of this report.

2. Kinematic Routing

Kinematic Routing is performed by inputting the characteristics of the channel reach, such as: roughness coefficient, base width, side slope and reach length. These parameters are shown in **Table A4-7**: Data Table for HEC-1 Model, Kinematic Routing Input included in **Appendix A-4** Lag Time Calculations, Basin Parameter, Routing Calculations and Diversion Information of this report.

f. HEC-1 Modeling

Hydrologic analysis will be performed by using the Flood Hydrograph Package HEC –1, September 1990, Version 4.0. Developed by the USACE, Hydrologic Engineering Center. The HEC-1 results can be found in **Appendix A-5**: HEC-1 Output, **Appendix A-6**: HEC-1 Output Summary Tables.

g. HY8 Modeling

Culvert Analysis will be performed by using HY8, September 1992, Version 4.1. Developed for the Federal Highway Administration and Pennsylvania State University. HY8 is a program to investigate the hydraulic performance of a culvert system. It consists of four individual modules. The Culvert Analysis and Design Module will be used for this study. The results of the individual culvert analysis can be found in **Appendix B-1**: HY8 Calculations.

h. EXCEL Linked Files

The information and calculations computed in the GIS system are imported into an Excel file. From here the information is copied into the LAG time computation spreadsheet (**Table A4-1**: Lag Time Calculation Worksheet - Existing Conditions, 100-Year, 6-Hour Event) and into the HEC-1 input files as required. The results of these programs are found in **Appendix A-4** Lag Time Calculations, Basin Parameter, Routing Calculations and Diversion Information.

D. Existing Development

The study area is partially developed. As mentioned previously, there are some large master planned communities and several smaller residential and commercial developments. The Anthem Master Planned Community is classified as Medium Density Residential and the Seven Hills Master Planned Community is classified as mainly High Density Residential. The smaller developments range from High Density

Residential to Rural Residential and the Henderson Executive Airport is classified as Industrial (high impervious). The remaining subbasins are considered Undeveloped Land for the existing and interim conditions hydrologic analysis (see **Figure 4**: Landuse Map - Existing Offsite Conditions).

The McCollough (DB2) and South Pittman Detention Basins (DB1) are shown in **Appendix D-1**. These detention basins are being constructed as part of the Del Webb Anthem Master Planned Community (see **Figure 5 and 5a**: Existing Conditions Drainage Subbasins Area 1, 2 and 3). Subbasins H1, H2 and H3A have been included in the drainage analysis for these detention basins that was performed by G.C. Wallace, April 1997 in the Master Drainage Study for the Del Webb 5000. The outfall from the South Pittman Detention Basin flows through the Southfork Channel "A" (see **Appendix D-3** Southfork). This channel crosses under St. Rose Pkwy in existing Culvert #20. For ease of modeling, the outflow hydrograph for the South Pittman Detention Basin was imported in the hydrologic models for this project. Both the 50-and 100-year hydrograph flows were obtained from the HEC-1 for the South Pittman Detention Basin (see **Appendix D-1** McCollough). Note that the hydrographs were not imported into the SDN 5 models, as the total tributary area to Culvert #20 does not exceed 10 square miles. The total tributary area to the South Pittman Detention Basin is approximately 7.5 square miles. This area has been manually added to the areas downstream of the detention basin outfall to represent the true tributary area necessary for determining flows.

The flood control facilities currently in the design/construction phase are the Pittman East and South Pittman Detention Basins. It is estimated that both detention basins will be constructed by the end of 2002.

E. Interim Development

It is assumed that the hydrologic area modeled in the interim conditions will have the same subbasin parameters as those used in the existing conditions. The only difference between the existing conditions and the interim conditions is the proposed St. Rose Pkwy facilities. As in the existing conditions it is assumed that the Pittman East and South Pittman Detention Basins are constructed.

Note that since the proposed St. Rose Pkwy facilities generally perpetuate existing conditions, separate interim condition HEC-1 models were not needed.

F. Future Development with MPU Facilities

The future development for the study area is based on the MPU land use (see **Figure 11**: Land Use Map – Future Offsite Conditions). The MPU indicates that the future development for the area is generally Medium Density Residential (M), this extends through the majority of the current undeveloped areas. The remaining areas considered Undeveloped Land in the future conditions are assumed to be undeveloped as they fall largely on mountainous areas with steep slopes.

A-1 Soils Information

SOILSYM	LUCODE_1	LUCODE_2	LUCODE_3	LUCODE_4	LUCODE_5	LUCODE_6	LUCODE_7	LUCODE_8	LUCODE_9	LUCODE_10	LUCODE_11	LUCODE_12
105	71	55	72	70	69	82	84	93	87	92	75	30
107	65	47	67	64	63	78	81	92	85	91	70	30
112	66	48	68	65	64	79	82	93	85	91	71	30
113	66	48	68	65	64	79	82	93	85	91	71	30
117	65	47	67	64	63	78	81	92	85	91	70	30
120	64	45	66	63	62	78	81	92	84	91	69	30
127	64	46	66	63	63	78	81	92	84	91	70	30
128	64	46	66	63	63	78	81	92	84	91	70	30
129	66	49	68	65	65	79	82	93	85	91	71	30
130	78	66	79	77	76	86	88	95	90	94	81	30
132	77	64	78	76	75	85	87	94	89	94	80	30
133	79	69	80	79	78	87	88	95	90	94	82	30
134	77	64	78	76	75	85	87	94	89	94	80	30
140	84	75	84	83	82	89	90	95	92	95	85	30
150	86	79	87	85	85	91	92	96	93	95	88	30
151	87	80	87	86	86	91	92	96	93	96	88	30
152	86	78	86	85	84	90	91	96	93	95	87	30
155	86	79	87	85	85	91	92	96	93	95	88	30
160	78	66	79	77	76	86	88	95	90	94	81	30
181	79	67	80	78	77	86	88	95	90	94	81	30
182	77	64	78	75	74	85	87	94	89	93	79	30
183	77	64	78	76	75	85	87	94	89	94	80	30
184	77	64	78	76	75	85	87	94	89	94	80	30
187	77	64	78	76	75	85	87	94	89	94	80	30
190	76	64	77	75	74	85	87	94	89	93	79	30
191	77	65	78	76	76	85	87	94	89	94	80	30
192	78	66	79	77	76	86	88	95	90	94	81	30
200	77	65	78	76	76	85	87	94	89	94	80	30
206	77	65	78	76	76	85	87	94	89	94	80	30
222	77	64	78	76	75	85	87	94	89	94	80	30
228	77	65	78	76	76	85	87	94	89	94	80	30
236	78	65	79	77	76	85	87	94	90	94	80	30
237	77	64	78	76	75	85	87	94	89	94	80	30
240	87	80	87	86	86	91	92	96	93	96	88	30
252	78	65	79	77	76	85	87	94	90	94	80	30
255	78	65	79	77	76	85	87	94	90	94	80	30
260	64	46	66	63	63	78	81	92	84	91	70	30
262	69	53	71	68	68	81	83	93	86	92	74	30
263	64	46	66	63	63	78	81	92	84	91	70	30
264	63	44	65	62	61	77	80	92	84	91	69	30
270	77	64	78	76	75	85	87	94	89	94	80	30
276	77	64	78	76	75	85	87	94	89	94	80	30

SOILSYM	LUCODE_1	LUCODE_2	LUCODE_3	LUCODE_4	LUCODE_5	LUCODE_6	LUCODE_7	LUCODE_8	LUCODE_9	LUCODE_10	LUCODE_11	LUCODE_12
278	77	64	78	76	75	85	87	94	89	94	80	30
282	84	75	85	83	83	89	91	96	92	95	86	30
300	87	80	87	86	86	91	92	96	93	96	88	30
301	87	81	88	87	86	91	92	96	94	96	89	30
302	81	71	82	80	79	88	89	95	91	94	83	30
305	83	74	84	82	82	89	90	95	92	95	85	30
307	86	78	86	85	84	90	91	96	93	95	87	30
320	86	78	86	85	84	90	91	96	93	95	87	30
325	77	64	78	76	75	85	87	94	89	94	80	30
326	77	64	78	76	75	85	87	94	89	94	80	30
341	85	76	85	84	83	90	91	96	92	95	86	30
360	87	83	88	88	88	92	93	96	94	96	90	30
380	84	75	85	83	83	89	91	96	92	95	86	30
390	85	76	85	84	83	90	91	96	92	95	86	30
400	87	80	87	86	86	91	92	96	93	96	88	30
415	78	65	79	77	76	85	87	94	90	94	80	30
417	82	74	83	82	82	89	90	95	92	95	85	30
418	78	65	79	77	76	85	87	94	90	94	80	30
419	77	65	78	76	76	85	87	94	89	94	80	30
430	77	64	78	76	75	85	87	94	89	94	80	30
440	76	64	77	75	74	85	87	94	89	94	80	30
450	88	82	88	87	87	92	93	96	94	93	79	30
481	86	79	87	85	85	91	92	96	93	96	89	30
484	87	81	88	87	86	91	92	96	94	95	88	30
500	82	72	83	81	80	88	89	95	91	96	89	30
501	77	64	78	76	75	85	87	94	89	95	84	30
502	81	71	82	80	79	88	89	95	91	94	80	30
505	82	73	83	81	81	88	90	95	91	94	83	30
510	88	83	89	88	88	92	93	96	94	95	84	30
540	77	65	78	76	76	85	87	94	89	96	90	30
542	77	65	78	76	76	85	87	94	89	94	80	30
545	81	71	82	80	79	88	89	95	91	94	80	30
600	85	76	85	84	83	90	91	96	92	94	83	30
605	85	76	85	84	83	90	91	96	92	95	86	30
610	85	76	85	84	83	90	91	96	92	95	86	30
615	85	76	85	84	83	90	91	96	92	95	86	30
630	88	82	88	87	87	92	93	96	92	95	86	30
635	90	90	92	92	93	95	96	97	94	96	89	30
640	90	90	92	92	93	95	96	97	96	97	94	30
645	85	76	85	84	83	90	91	96	92	97	94	30
999	30	33	44	47	56	74	78	91	92	95	86	30
1141	86	81	87	86	86	91	92	96	78	88	64	30
									93	96	89	30

SOILSYM	LUCODE_1	LUCODE_2	LUCODE_3	LUCODE_4	LUCODE_5	LUCODE_6	LUCODE_7	LUCODE_8	LUCODE_9	LUCODE_10	LUCODE_11	LUCODE_12
1191	67	50	69	66	65	79	82	93	85	92	72	30
1200	76	64	77	75	74	85	87	94	89	93	79	30
1221	78	66	79	77	76	86	88	95	90	94	81	30
1292	89	87	90	90	91	94	94	97	95	96	92	30
1294	90	90	91	92	92	95	95	97	95	97	94	30
1311	78	66	79	77	76	86	88	95	90	94	81	30
1314	79	67	80	78	77	86	88	95	90	94	81	30
1320	88	83	89	88	88	92	93	96	94	96	90	30
1321	88	83	89	88	88	92	93	96	94	96	90	30
1322	88	83	89	88	87	92	93	96	94	96	90	30
1341	88	82	88	87	87	92	93	96	94	96	89	30
1342	88	83	89	88	88	92	93	96	94	96	90	30
1351	88	82	88	87	87	92	93	96	94	96	89	30
1352	88	82	88	87	87	92	93	96	94	96	89	30
1380	65	48	67	64	64	79	82	93	85	91	71	30
1400	71	57	73	71	70	82	85	94	87	93	76	30
1411	85	76	85	84	83	90	91	96	92	95	86	30
1421	88	83	89	88	87	92	93	96	94	96	90	30
1452	67	50	69	66	65	79	82	93	85	92	72	30
1461	81	71	82	80	79	88	89	95	91	94	83	30
1480	83	74	84	82	82	89	90	95	92	95	85	30
1481	87	80	87	86	86	91	92	96	93	96	88	30
1490	78	66	79	77	76	86	88	95	90	94	81	30
1505	85	76	85	84	83	90	91	96	92	95	86	30
1510	85	76	85	84	83	90	91	96	92	95	86	30
1511	87	80	87	86	86	91	92	96	93	96	88	30
1512	87	82	88	87	87	92	93	96	94	96	89	30
1581	78	66	79	77	76	86	88	95	90	94	81	30
1674	81	72	82	80	80	88	89	95	91	94	84	30
1721	83	73	83	82	81	88	90	95	92	95	84	30
1731	88	81	88	87	86	91	92	96	94	96	89	30
1732	88	82	88	87	87	92	93	96	94	96	89	30
1753	88	82	88	87	87	92	93	96	94	96	89	30
1754	88	82	88	87	87	92	93	96	94	96	89	30
1772	79	67	80	78	77	86	88	95	90	94	81	30
1840	88	82	88	87	87	92	93	96	94	96	89	30
1850	88	83	89	88	87	92	93	96	94	96	90	30
1853	88	83	89	88	88	92	93	96	94	96	90	30
1871	86	78	86	85	84	90	91	96	93	95	87	30

A-2 Land Use Information

Table A2-1 Land Use Information

Land Use Code Number	ID Number Used on Figure 5 and 9	Description
LUCODE_1	1	Undeveloped Land
LUCODE_2	2	Parks, Golf Courses
LUCODE_3	3	Rural Residential
LUCODE_4	4	Low Density Residential
LUCODE_5	5	Medium Density Residential
LUCODE_6	6	High Density Residential
LUCODE_7	7	Public Facility
LUCODE_8	8	Commercial Retail, Casino (High Imp)
LUCODE_9	9	Industrial (Low Imp)
LUCODE_10	10	Industrial (High Imp)
LUCODE_11	11	Schools
LUCODE_12	12	Lakes

A-3 Design Rainfall Information

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SECTION 500
RAINFALL

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SECTION 500
RAINFALL

501 INTRODUCTION

Presented in this section is the design rainfall data for the minor and major storm events as designated in Section 304.2. This data is used to determine storm runoff in conjunction with the runoff models designated in Section 304.3. All hydrologic analysis within the jurisdiction of this MANUAL shall utilize the rainfall data presented herein for calculating storm runoff.

The rainfall data published by the National Oceanic and Atmospheric Administration (NOAA) in the NOAA Atlas 2, "Precipitation - Frequency Atlas of the Western United States, Volume VII - Nevada" (NOAA, 1973) and their subsequent modification by the Corps of Engineers, Los Angeles District (USACE, 1988) shall be used to develop point rainfall values for Clark County. The depth - area ratios developed by the Corps of Engineers, Los Angeles District (USACE, 1988) based on NOAA Technical Memorandum NWS HYDRO-40 (NOAA, 1984) and area data are used to reduce point rainfall to area rainfall. The distribution of design rainfall is based on studies conducted by the Los Angeles District Corps of Engineers (USACE, 1988).

Calculation methods and procedures are presented herein to compute rainfall depths and intensities for return frequencies of 2-, 5-, 10-, 25-, 50-, and 100-year and durations of 5-, 10-, 15-, and 30-minutes, and 1-, 2-, 3-, 6-, and 24-hours. Some of these values are not used to determine runoff for the analysis required by this MANUAL, but are included for informational purposes.

The information presented in this section is the state-of-the-art information available at the time of preparation of this manual. The information should be updated as better techniques and data become available in the future.

502 RAINFALL DEPTH-DURATION-FREQUENCY RELATIONS

502.1 RAINFALL DEPTH - DURATION - FREQUENCY MAPS

The NOAA Atlas 2 Rainfall Depth - Duration - Frequency Maps are reproduced for the Clark County area. Maps are presented for the 6- and 24-hour durations for the 2-, 5-, 10-, 25-, 50-, and 100-year recurrence frequencies as shown in Figures 501 through 512. The data obtained from these maps shall be refined as stated in Section 502.2 and subsequently modified according to procedure stated in Section 502.4 (except for SCS TR-55 as described in 502.4).

502.2 REFINEMENT OF VALUES OBTAINED FROM RAINFALL MAPS

The 6-hour and the 24-hour point rainfall values obtained from the NOAA Atlas 2 Maps (Figure 501 through 512) must be plotted on the return period diagram in Standard Form 3. A line of best fit shall be drawn through the plotted points. The values obtained from the maps are then either verified by or refined to the line of best fit. The new values as read from the return period diagram are used for further rainfall calculations.

502.3 RAINFALL DEPTHS FOR DURATIONS FROM ONE - TO - SIX HOURS

The refined rainfall values for the 6- and the 24-hour durations for 2- and 100-year recurrence intervals obtained following the procedure stated in Section 502.2 are utilized in calculation of rainfall values for one-hour duration and 2- and 100-year recurrence intervals. The following equations shall be used to derive the 2-year 1-hour and 100-year 1-hour rainfall:

$$Y_2 = -0.011 + 0.942\ [(X_1)\ (X_1/X_2)] \quad (501)$$

$$Y_{100} = 0.494 + 0.755\ [(X_3)\ (X_3/X_4)] \quad (502)$$

Where:

Y_2 = 2-yr 1-hr estimated value (inches)

Y_{100} = 100-yr 1-hr estimated value (inches)

X_1 = 2-yr 6-hr value from Standard Form 3 (inches)

X_2 = 2-yr 24-hr value from Standard Form 3 (inches)

X_3 = 100-yr 6-hr value from Standard Form 3 (inches)

X_4 = 100-yr 24-hr value from Standard Form 3 (inches)

The 2- and 100-year one-hour rainfall (Y_2 & Y_{100}) values are then plotted on Standard Form 3 and a straight line connecting these points is drawn. The 5-, 10-, 25-, and 50-year one-hour rainfall values are then read from the graph.

The 2- and 3-hour duration rainfall for the various recurrence intervals may then be calculated using the following equations:

$$(2\text{-hr}) = 0.341\ (6\text{-hr}) + 0.659\ (1\text{-hr}) \quad (503)$$

$$(3\text{-hr}) = 0.569\ (6\text{-hr}) + 0.431\ (1\text{-hr}) \quad (504)$$

Where:

2-hr = 2-hr 'x'-yr estimated value (inches)
3-hr = 3-hr 'x'-yr estimated value (inches)
1-hr = 1-hr 'x'-yr previously determined (inches)
6-hr = 6-hr 'x'-yr previously determined (inches)

These point rainfall values shall be modified as stated in the following Section 502.4.

502.4 ADJUSTMENTS TO NOAA ATLAS 2

Recent analysis of rainfall data in the Clark County area (WRC, 1989 and USACE, 1988) indicates that the NOAA Atlas 2 values do not necessarily reflect the trend of observed and recorded rainfall values which have occurred following publication of the Atlas in 1973. Therefore, the rainfall values in Sections 502.2 and 502.3 are to be adjusted to reflect the current trend of rainfall values based on the latest available information for the Clark County area. This adjustment consists of increasing the rainfall depths for durations of 6-hours or less by multiplying the values previously obtained by the appropriate factors presented in Table 501.

The said adjustment shall not be used when developing the design rainfall for use with SCS TR-55. The 24-hour design rainfall for TR-55 shall be used directly as developed in Section 502.2.

503 DEPTH - AREA REDUCTION FACTORS

The NOAA Atlas 2 precipitation depths are related to rainfall frequency at an isolated point. Storms, however, cause rainfall to occur over extensive areas simultaneously, with more intense rainfall typically occurring near the center of the storm. Standard precipitation analysis methods require adjusting point precipitation depths downward in order to estimate the average depth of rainfall over the entire storm area. This is normally performed using depth-area reduction curves relating to a point precipitation reduction factor to storm area and duration.

In previous hydrologic studies in Southern Nevada, three methods have been used for adjusting point-precipitation depths to areally averaged depths. All early studies used the depth-area reduction curves presented in the NOAA Atlas 2 (NOAA, 1973). These curves were developed through investigations of storms throughout the Western United States. In fact, the NOAA Atlas 2 for each state in the West contains the same family of depth area reduction curves. Most of the recent studies have adopted depth-area reduction factors from a relatively new publication known as "Hydro 40" (NOAA, 1984), which developed factors applicable specifically to Arizona and New Mexico.

The Corps of Engineers (USACE, 1988) used slightly different depth-area reduction factors than those presented in "Hydro 40" for areas greater than 30 square miles. These factors were based on analysis of thunderstorms in the greater Las Vegas area. For areas up to 30 square miles the depth-area reduction factors are almost the same as those in "Hydro 40".

The six-hour Corps of Engineers (USACE, 1988) depth-area reduction factors are to be used for all rainfall analysis in the Clark County area. The Corps of Engineers depth-area reduction curve is shown in Figure 514. The depth-area reduction factors for the six-hour storm are also tabulated in Table 502.

For areas greater than 200 square miles, the ability of the thunderstorm generating mechanisms (i.e. available moisture, strong convective currents, etc.) to sustain a thunderstorm much greater than 200 square miles in diameter is greatly reduced. Therefore, only a portion of an entire drainage basin could be subject to precipitation from the thunderstorm event. Analysis of this effect on runoff peaks and volumes is complicated by the necessity to determine the "storm centering" which produces the greatest peak flow and/or volume at the selected design point. In order to obtain a consistent method of analysis for these areas, the designer shall consult the local entity (and/or the CCRFCD if suggested by the local entity) to determine the appropriate method of analysis and design rainfall area reduction factors for the specific location and basin under consideration.

504 DESIGN STORMS

504.1 GENERAL

The design storm within the jurisdiction of the MANUAL shall be a 6-hour duration storm. The 6-hour duration storm is to be used for all HEC-1 runoff modeling in the Clark County area. The exception to the 6-hour design storm duration is when the SCS TR-55 method is used to compute runoff values. For SCS TR-55, a Type II rainfall distribution shall be used in conjunction with the 24-hour rainfall depth as described in TR-55.

504.2 SIX-HOUR DESIGN STORM DISTRIBUTION

Two different six-hour storm distributions are to be used as design storms in the Clark County area. The two design storm distributions, labeled SDN 3 and SDN 5, are graphically presented in Figure 515 and tabularized in Table 503. For drainage areas less than 10 square miles in size, use SDN 3. For drainage areas equal to or greater than 10 square miles in size, use SDN 5.

505 TIME-INTENSITY-FREQUENCY CURVES FOR RATIONAL METHOD

505.1 GENERAL

Procedures stated in Section 502 to obtain and modify the NOAA Atlas 2 rainfall depths must first be done before proceeding with development of time-intensity-frequency curves to be used with Rational Method.

505.2 TIME-INTENSITY-FREQUENCY CURVES

To develop time-intensity-frequency curves for the Rational Method of runoff analysis, take the 1-hour adjusted point depth(s) obtained from Section 502 and multiply by the factors in Table 504. These point values are then converted to intensities. An example showing the development of time-intensity-frequency curves is given in Section 507.

506 RAINFALL DATA FOR McCARRAN AIRPORT RAINFALL AREA

506.1 GENERAL

This section presents the point rainfall data to be used for the McCarran Airport Rainfall Area. The data presented is applicable to those studies that have their contributing drainage basin within the area presented in Figure 513.

506.2 RAINFALL DEPTH-DURATION-FREQUENCY

Presented in Table 505 and Figure 516 are the rainfall depth-duration-frequency values to be used in the McCarran Airport Rainfall Area as designated in Figure 513.

506.3 TIME-INTENSITY-FREQUENCY DATA

Presented in Table 506 and Figure 517 are the time-intensity-frequency values to be used in the McCarran Airport Rainfall Area as designated in Figure 513.

507 EXAMPLE APPLICATIONS

507.1 INTRODUCTION

The following examples are a first in a series of example applications pertaining to the use of this manual. The series is set up to lead the

reader through the MANUAL'S design/evaluation procedures by building on two different hypothetical design basins within the CCRFCD.

The two example basins are introduced in Figures 518 and 519 and list general basin parameters. The first design basin, shown in Figure 518, is located within Las Vegas Valley and was selected for non-urban, large basin applications. The second design basin, shown in Figure 519, is also located within Las Vegas Valley and was selected for urban, small basin applications utilizing the McCarran Airport Rainfall Area data. Basin modifications are presented as the examples progress in each section to emphasize the application modeled.

Even though the basins were selected to represent actual area's within the CCRFCD, minor changes have been made in basin parameters to enhance the use of this MANUAL. Therefore, results obtained from the hypothetical examples should not be construed as representative values for the actual basin locations.

507.2 Example: 6-Hour Design Storm Distribution

Problem: Utilizing the Basin in Figure 518, determine the 100-year, 6-hour design storm distribution.

Solution:

Step 1: Determine the NOAA 100-year, six-hour point rainfall value from Figure 506:

For sub-basin 1: P = 2.1 in (Area = 4.73 sq. mi.)

For sub-basin 2: P = 2.0 in (Area = 6.14 sq. mi.)

Step 2: Determine the weighted point rainfall:

$$= \frac{(2.1)(4.73) + (2.0)(6.14)}{10.87} = 2.04 \text{ in.}$$

(One point rainfall value is used for both basins to simplify the example calculation.)

Step 3: Determine the adjusted point rainfall value:

From Table 501: NOAA Adjustment Factor = 1.43
From Table 502: Depth/Area Adjustment Factor = 0.86
Adjusted Rainfall = 2.04 x 1.43 x 0.85 = 2.51 in.

Step 4: Compute the 100-Year, 6-Hour Design Storm Distribution:

For a basin area of 10.87 sq. mi. use SDN = 5.
Multiply the storm distribution percentages (Table 503 for SDN = 5) by the adjusted rainfall depth of 2.51 inches as follows:

Final 100-Year, 6-Hour Design Storm Distribution

Storm Time (Min)	Percent of Total Storm Depth (SDN 5 from TABLE 503)	Storm Depth (In)
0	0.00	0.00
5	2.00	0.05
10	5.90	0.15
15	8.00	0.20
20	11.00	0.28
25	14.40	0.36
30	15.00	0.38
35	16.00	0.40
40	16.80	0.42
45	17.10	0.43
50	18.00	0.45
55	18.20	0.46
60	18.70	0.47
.	.	.
.	.	.
.	.	.
330	99.00	2.48
335	99.20	2.49
340	99.30	2.49
345	99.60	2.50
350	99.70	2.50
355	99.90	2.51
360	100.00	2.51

Application: For HEC-1, the total adjusted rainfall depth of 2.51 inches is input on the PB Card (Adjusted Precipitation). The cumulative storm depths as computed above are input on the PC Card (Storm Distribution).

507.3 EXAMPLE: TIME-INTENSITY-FREQUENCY CURVES

Problem: Derive the 10-year and 100-year time-intensity-frequency curves for a 10 acre sub-basin within the basin presented in Figure 518. The 10 acre sub-basin is located in Section 7, T.23S., R.62E.:

Solution:

Step 1: Determine the 6-hour and 24-hour rainfall depths:

From Figure 513 the designated basin is not within the McCarran Airport rainfall area. Therefore the 2, 5, 10, 25, 50, and 100-year, 6 hour and 24 hour point precipitation values are read from Figures 501 through 512. For Section 7, T.23S., R.62E.:

Return Period (Yr)	6-Hour Depth (In)	24-Hour Depth (In)
2	1.0	1.2
5	1.2	1.6
10	1.45	2.0
25	1.75	2.4
50	1.2	1.6
10	1.45	2.0
25	1.75	2.4
50	1.9	2.8
100	2.1	3.0

The point depths found above are plotted on Standard Form 3 (Figure 520) for verification and refinement.

In this example the 100 year, 24 hour point precipitation was from 3.0 to 3.1 inches due to refinement.

Step 2: Determine the 1-hour rainfall depths:

Use equations 501 and 502 to find the 2-year and 100-year, 1 hour depths:

$$Y_2 = 0.011 + 0.942\ [(X_1)(X_1/x_2)] \quad (501)$$

$$Y_{100} = 0.494 + 0.755\ [(X_3)(X_3/X_4)] \quad (502)$$

Y_2 = -0.011 + 0.942 [(1.0) (1.0/1.2)] = 0.77 inches

Y_{100} = 0.494 + 0.755 [(2.1) (2.1/3.1)] = 1.57 inches

These two points are plotted on Figure 520 and connected with a straight line to develop one hour depths for the other return periods.

Step 3: Determine the adjusted 1-hour rainfall depths:

The adjusted 1-hour rainfall depths are obtained by multiplying the rainfall depths from Figure 520 by the adjustment factors in Table 501:

Return Period (Yr)	1-Hour Depth (In)	Adjustment Factor (Table 501)	Adjusted 1-Hour Depth (In)
2	0.77	1.00	0.77
5	1.00	1.16	1.16
10	1.15	1.24	1.43
25	1.30	1.33	1.73
50	1.40	1.39	1.95
100	1.57	1.43	2.25

Step 4: Determine the rainfall depths and intensities for durations less than 1-hour:

The values shown above are multiplied by the factors shown in Table 504 to obtain rainfall depths for durations less than 1-hour. These depths are then converted to intensities. The resulting rainfall depths and intensities for this example are presented in Table 507. The resulting time-intensity-frequency curves are shown on Figure 521 for the 10 and 100-year return period.

Application: The time-intensity-frequency curve is used to determine the rainfall intensities (I) used in the Rational Method (Q = CIA).

PRECIPITATION ADJUSTMENT RATIOS

Recurrence Interval	Ratio to NOAA Atlas 2
2-year	1.00
5-year	1.16
10-year	1.24
25-year	1.33
50-year	1.39
100-year	1.43

NOTE:
1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.
2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.
3. Tables 505 and 506 require no adjustments.

Revision	Date

SIX HOUR DEPTH-AREA REDUCTION FACTORS

Drainage Area (Square Miles)	Six-Hour Depth-Area Reduction Factor
0.0	1.00
0.5	0.98
1.0	0.97
2.0	0.93
4.0	0.91
6.0	0.90
8.0	0.88
10.0	0.86
20.0	0.79
30.0	0.74
50.0	0.68
100.0	0.60
150.0	0.55
200.0	0.51
300.0	0.46
400.0	0.42
500.0	0.39

NOTES: 1. A graphical representation of these factors is presented in Figure 514.

2. Consult with the local entity and/or the CCRFCD for guidance in using the Depth-Area Reduction Factors for drainage areas greater than 200 square miles.

Revision	Date

SIX-HOUR STORM DISTRIBUTIONS

Storm Time (In Minutes)	Percent of Total Storm Depth SDN 3	SDN 5	Storm Time (In Minutes)	Percent of Total Storm Depth SDN 3	SDN 5
0	0.00	0.00	185	32.20	43.00
5	2.00	2.00	190	35.20	47.70
10	5.70	5.90	195	40.90	51.40
15	7.00	8.00	200	49.90	56.10
20	8.70	11.00	205	59.00	63.00
25	10.80	14.40	210	71.00	71.00
30	12.40	15.00	215	74.40	72.00
35	13.00	16.00	220	78.10	73.10
40	13.00	16.80	225	81.20	75.20
45	13.00	17.10	230	81.90	77.90
50	13.00	18.00	235	83.50	79.00
55	13.00	18.20	240	85.10	79.50
60	13.00	18.70	245	85.60	80.40
65	13.30	19.00	250	86.00	81.00
70	14.00	19.70	255	86.80	82.00
75	14.20	20.20	260	87.60	82.60
80	14.80	21.00	265	88.80	84.00
85	15.80	22.00	270	91.00	85.90
90	17.20	23.00	275	92.60	88.90
95	18.10	24.10	280	93.70	91.00
100	19.00	25.00	285	95.00	93.80
105	19.70	25.90	290	97.00	96.60
110	19.90	26.50	295	97.60	97.00
115	20.00	28.00	300	98.20	97.40
120	20.10	29.00	305	98.50	97.90
125	20.40	30.00	310	98.70	98.10
130	21.40	30.50	315	98.90	98.30
135	22.90	30.90	320	99.00	98.50
140	24.10	31.00	325	99.30	98.90
145	24.90	31.70	330	99.30	99.00
150	25.10	32.10	335	99.40	99.20
155	25.60	32.70	340	99.50	99.30
160	27.00	33.30	345	99.80	99.60
165	27.80	34.60	350	99.80	99.70
170	28.10	36.10	355	99.90	99.90
175	28.30	38.10	360	100.00	100.00
180	29.50	40.80			

Notes:
1. For drainage areas less than 10 square miles in size, use SDN 3.
2. For drainage areas equal to or greater than 10 square miles in size, use SDN 5.
3. A graphical representation of these values is presented on Figure 515.

Revision	Date

FACTORS FOR DURATIONS OF LESS THAN ONE-HOUR

Duration (min)	5	10	15	30
Ratio to 1-hour	0.29	0.45	0.57	0.79

NOTE: 1. Multiply the 1-hour precipitation depths by the above ratios to obtain the precipitation depths for storm durations of less than 1-hour.

Revision	Date

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA

(IN INCHES)

	RECURRENCE INTERVAL					
TIME	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5 min.	0.15	0.27	0.35	0.46	0.54	0.63
10 min.	0.25	0.44	0.57	0.74	0.89	1.02
15 min.	0.33	0.57	0.74	0.97	1.15	1.32
30 min.	0.44	0.78	1.01	1.31	1.55	1.79
1 hour	0.52	0.89	1.15	1.50	1.78	2.06
2 hour	0.59	1.01	1.30	1.70	2.01	2.30
3 hour	0.64	1.08	1.39	1.82	2.15	2.48
6 hour	0.72	1.22	1.58	2.05	2.41	2.77
24 hour (TR-55)	1.20	1.60	1.80	2.40	2.70	2.96

NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.

2. The 24 hour values presented above are for use with TR-55 only.

3. Table 501 adjustments not required.

Revision	Date

TIME-INTENSITY-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA

(IN INCHES PER HOUR)

TIME (min)	RECURRENCE INTERVAL					
	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	1.80	3.24	4.20	5.52	6.48	7.56
10	1.50	2.64	3.42	4.44	5.34	6.12
15	1.32	2.28	2.96	3.88	4.60	5.28
30	0.88	1.56	2.02	2.62	3.10	3.58
60	0.52	0.89	1.15	1.50	1.78	2.06

NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.

2. Table 501 adjustments not required.

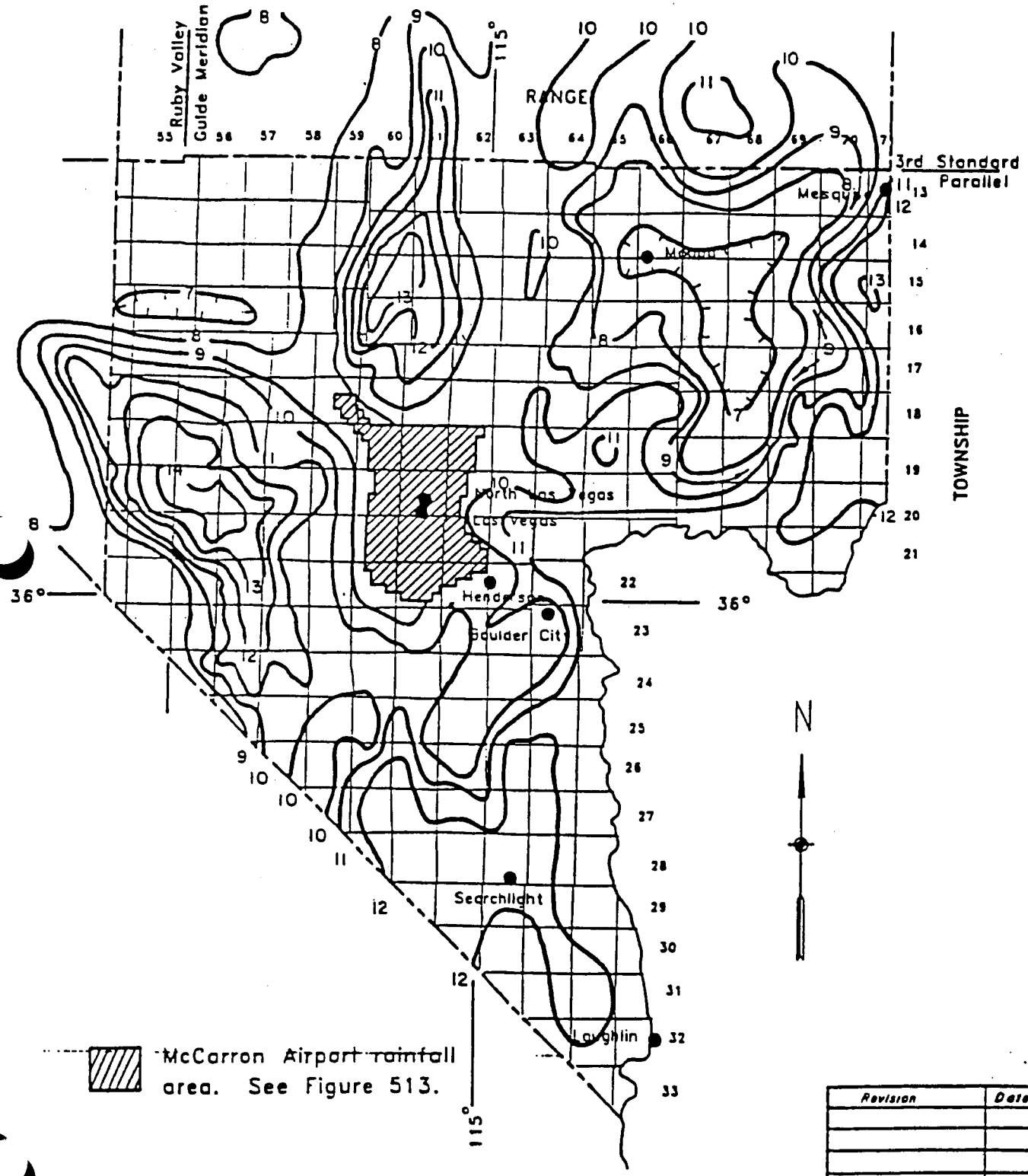
Revision	Date

TIME-INTENSITY-FREQUENCY VALUES FOR EXAMPLE IN SECTION 507.3

Return Period (Yr)	Adjusted 1-Hr Depth (In)	Duration							
		5 Min.		10 Min.		15 Min.		30 Min.	
		(In)	(In/Hr)	(In)	(In/Hr)	(In)	(In/Hr)	(In)	(In/Hr)
2	0.77	0.22	2.68	0.35	2.08	0.44	1.76	0.61	1.22
5	1.16	0.34	4.04	0.52	3.13	0.66	2.64	0.92	1.83
10	1.43	0.41	4.98	0.64	3.86	0.82	3.26	1.13	2.26
25	1.73	0.50	6.02	0.78	4.67	0.99	3.94	1.37	2.73
50	1.95	0.57	6.79	0.88	5.27	1.11	4.45	1.54	3.08
100	2.25	0.65	7.83	1.01	6.08	1.28	5.13	1.78	3.56

Revision	Date

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



Revision	Date

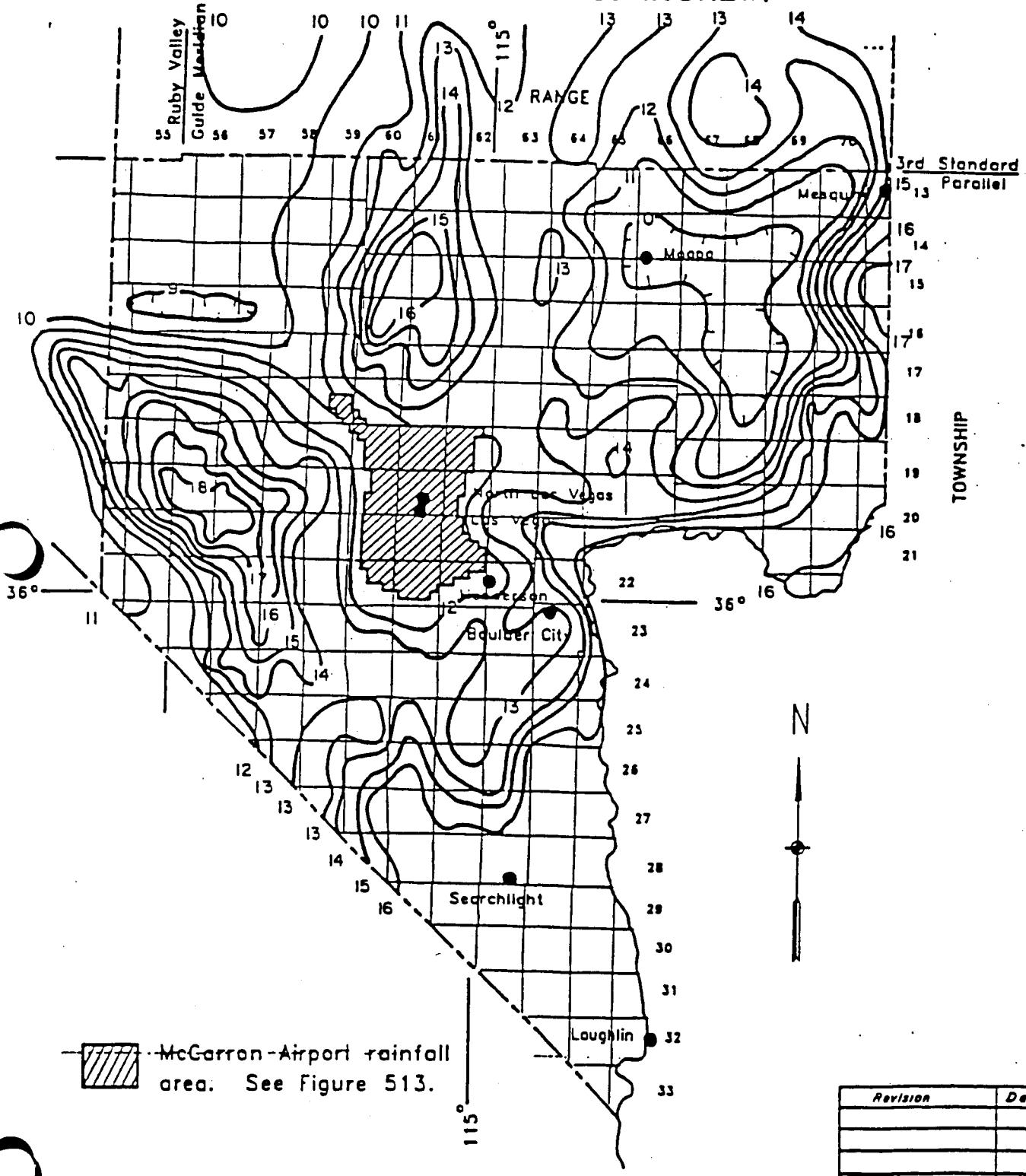
WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 501

RAINFALL DEPTH-DURATION-FREQUENCY
5-YEAR, 6-HOUR

(DEPTHS IN TENTHS OF INCHES)



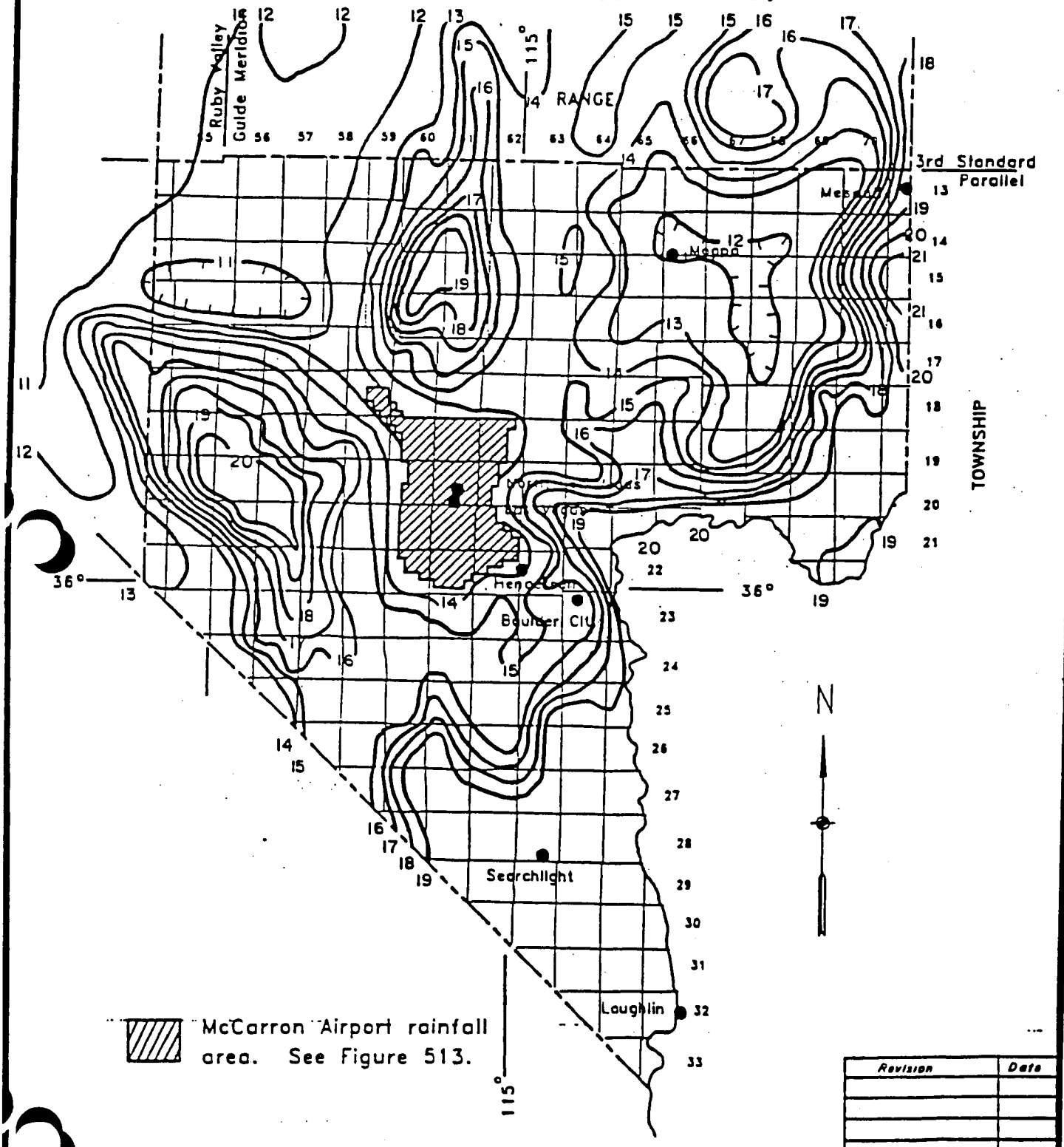
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 502

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



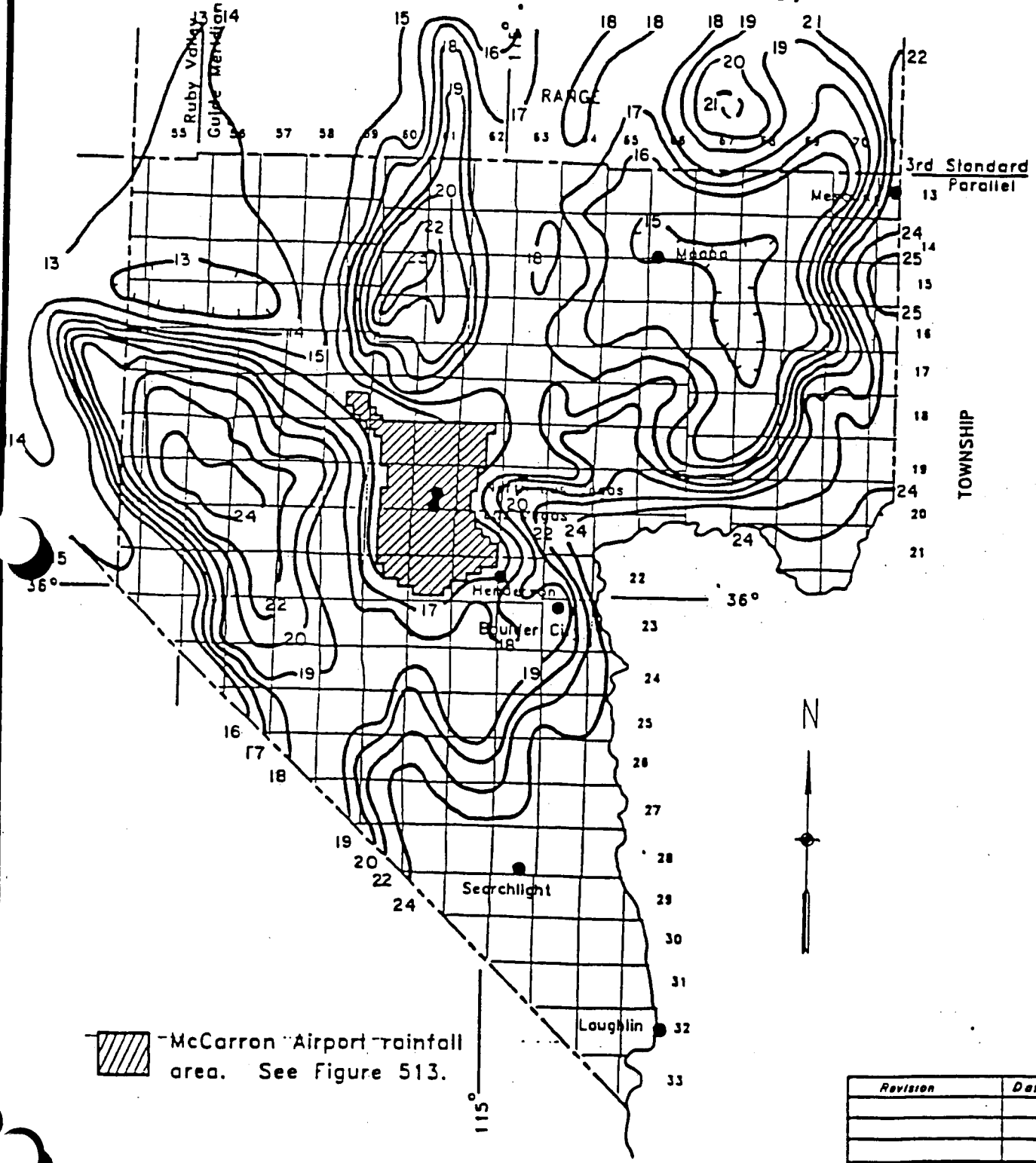
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 503

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



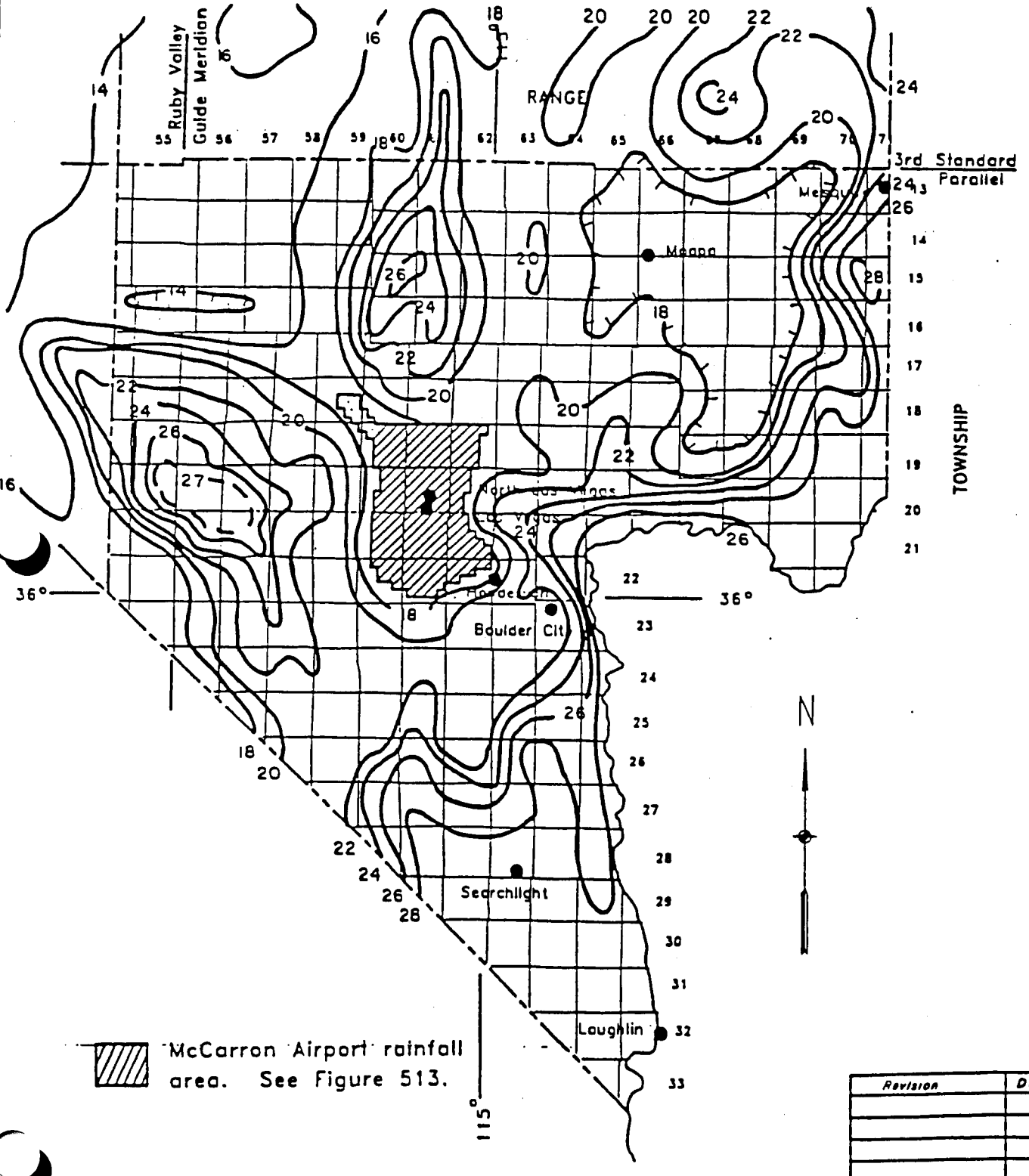
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 504

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



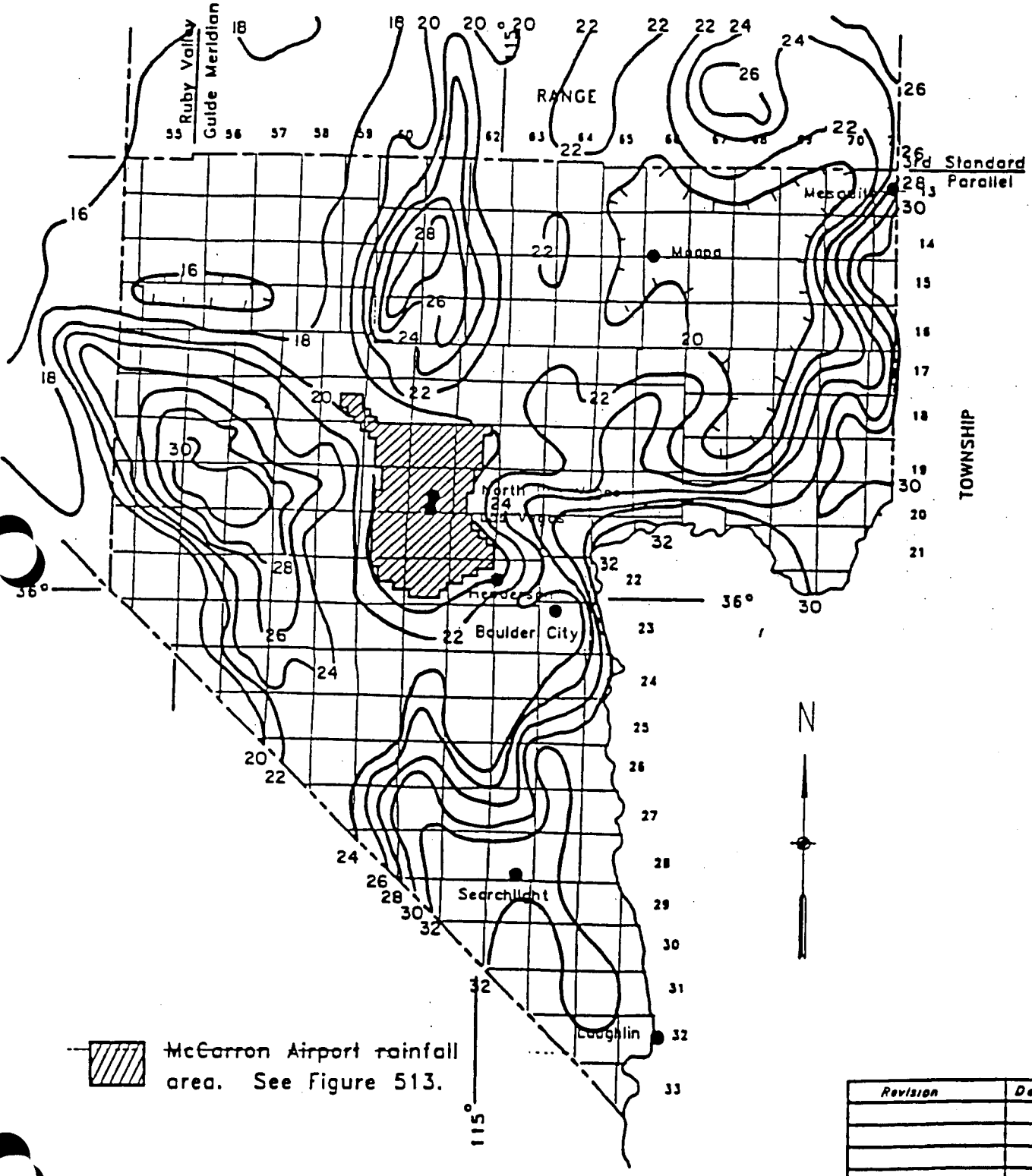
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 505

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



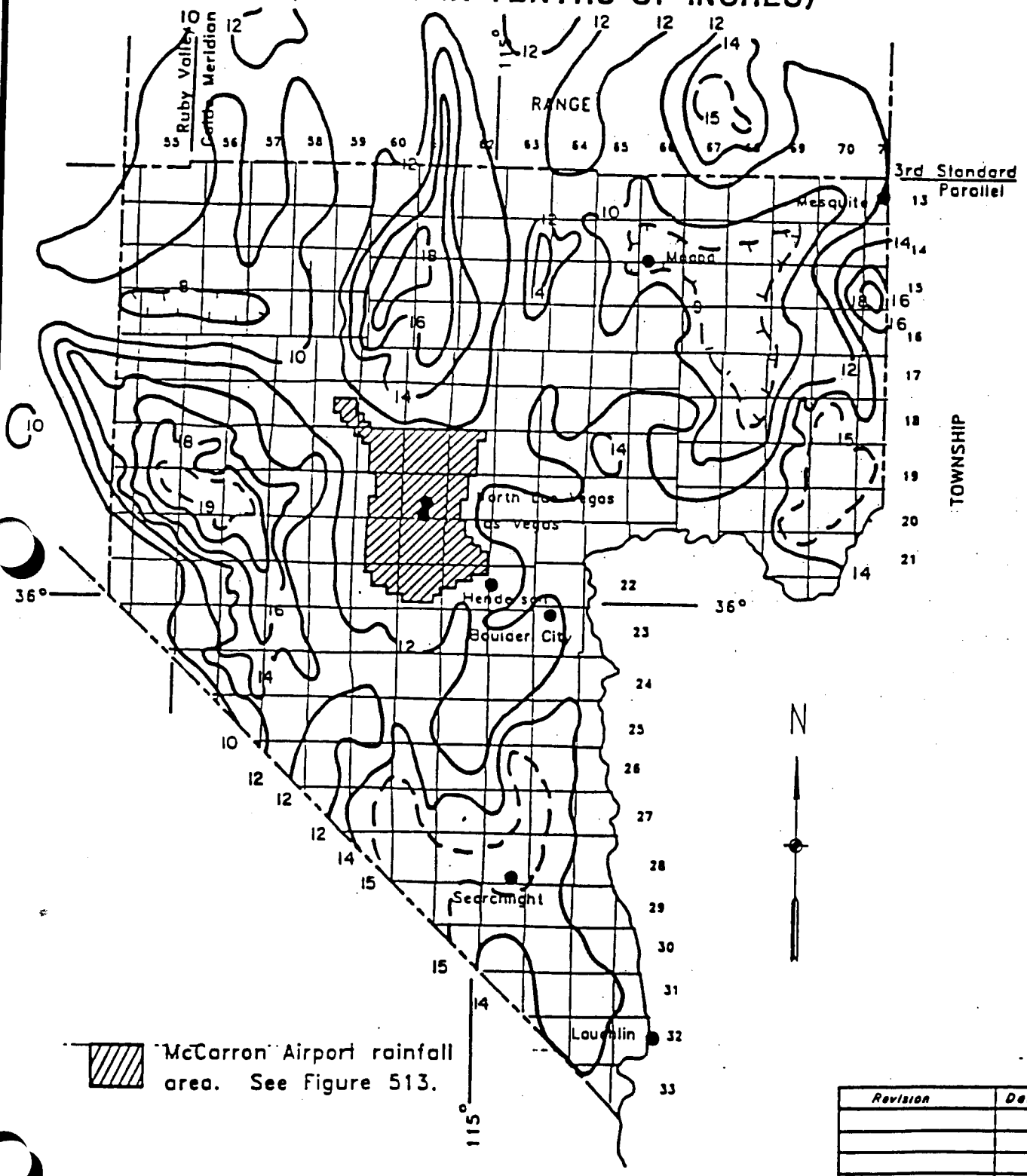
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

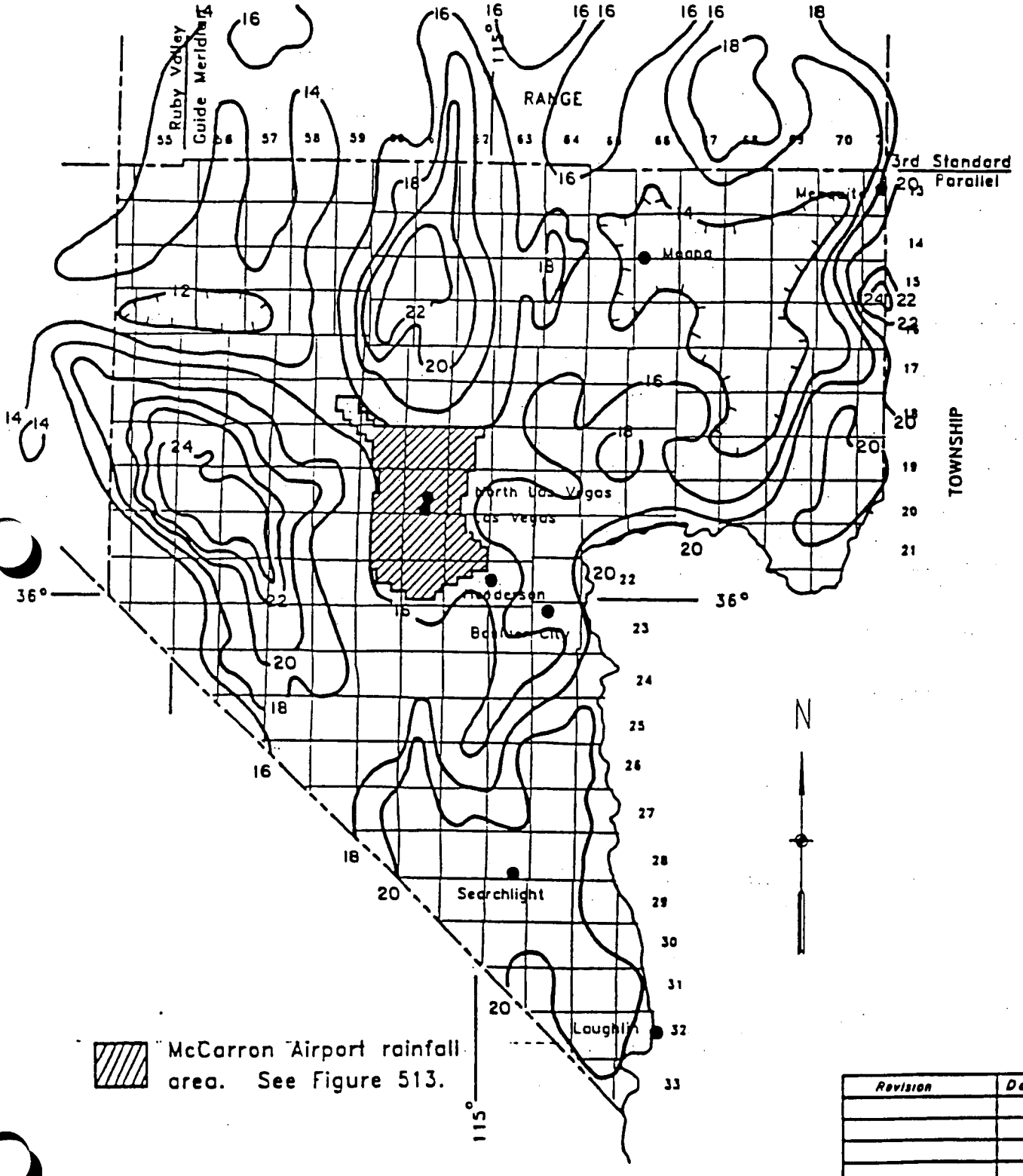
RAINFALL DEPTH-DURATION-FREQUENCY
2-YEAR, 24-HOUR
(DEPTHS IN TENTHS OF INCHES)



Revision	Date

WRC ENGINEERING	REFERENCE: NOAA ATLAS 2, VOLUME VII NEVADA, 1973	FIGURE 507

RAINFALL DEPTH-DURATION-FREQUENCY
5-YEAR, 24-HOUR
(DEPTHS IN TENTHS OF INCHES)



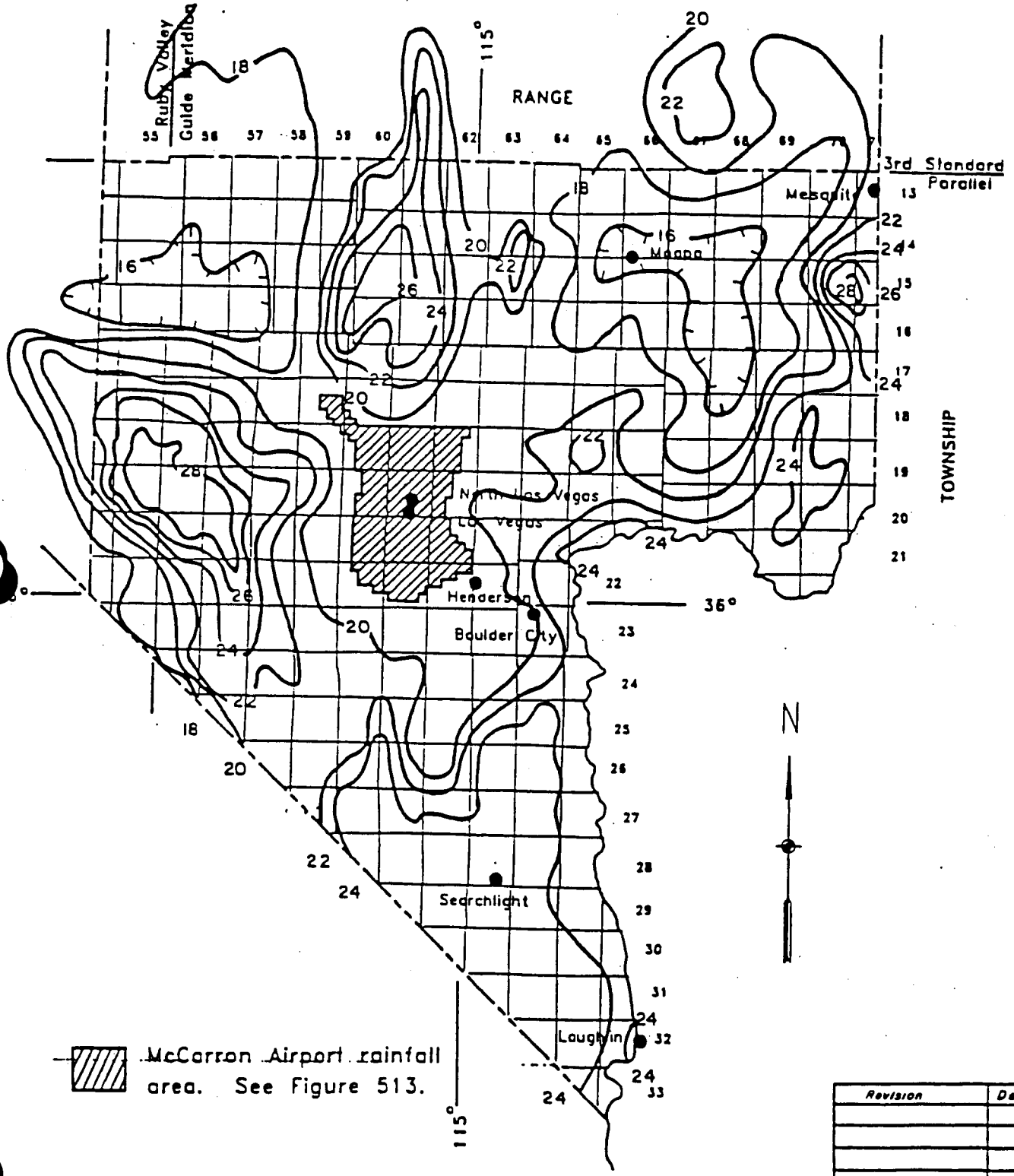
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 508

RAINFALL DEPTH-DURATION-FREQUENCY
10-YEAR, 24-HOUR
(DEPTHS IN TENTHS OF INCHES)



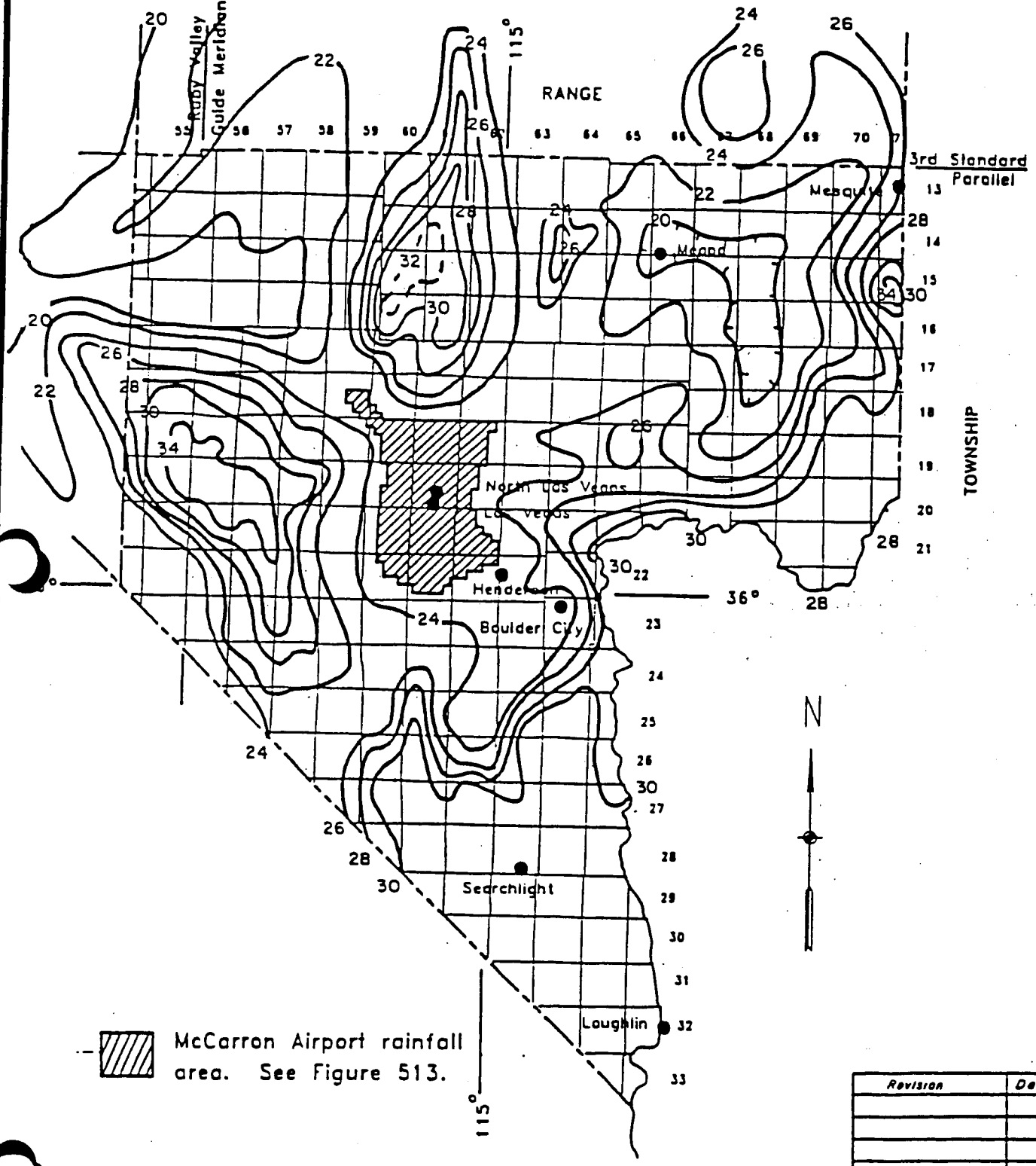
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 509

RAINFALL DEPTH-DURATION-FREQUENCY
25-YEAR, 24-HOUR
(DEPTHS IN TENTHS OF INCHES)



Revision	Date

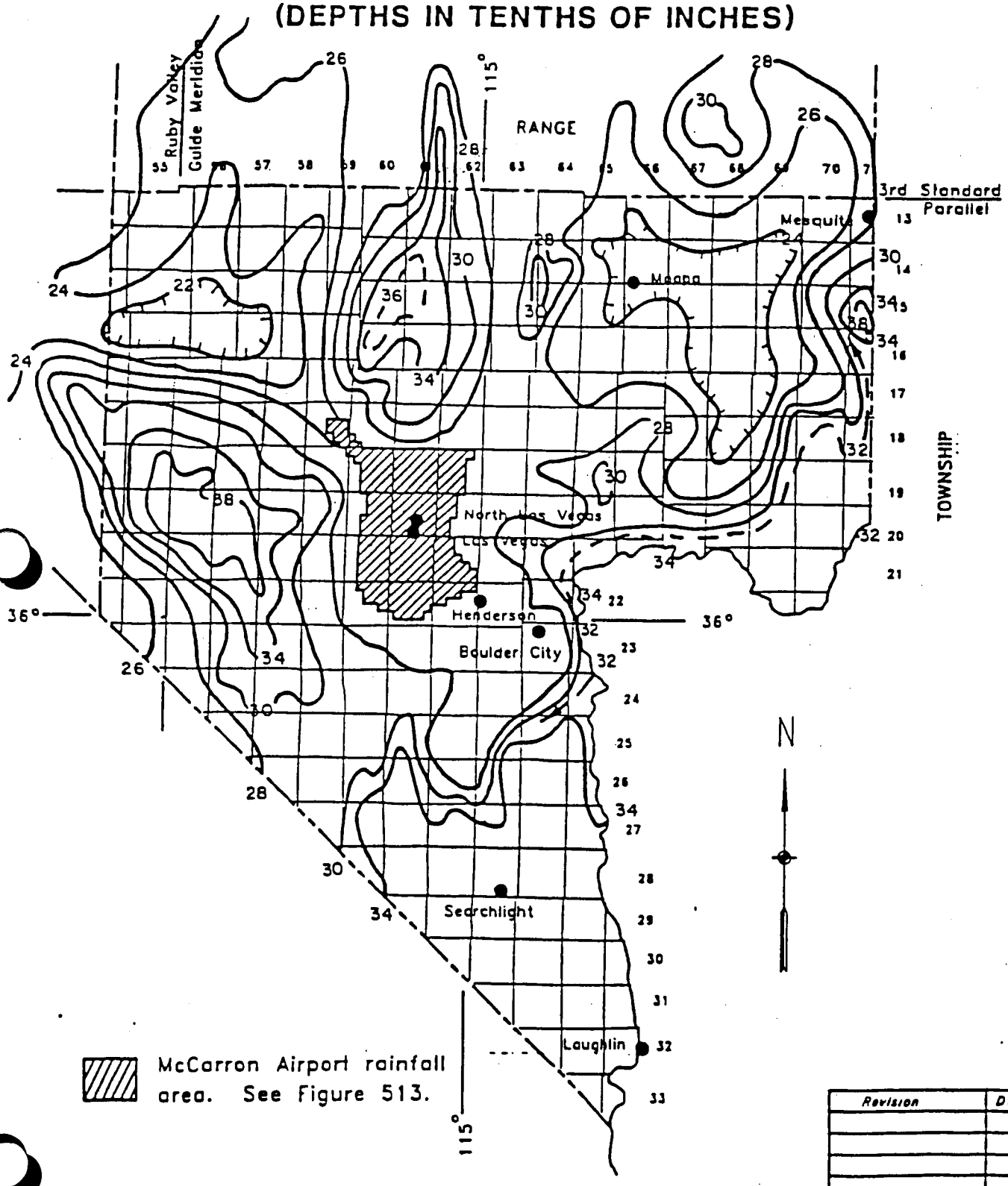
WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 510

RAINFALL DEPTH-DURATION-FREQUENCY 50-YEAR, 24-HOUR

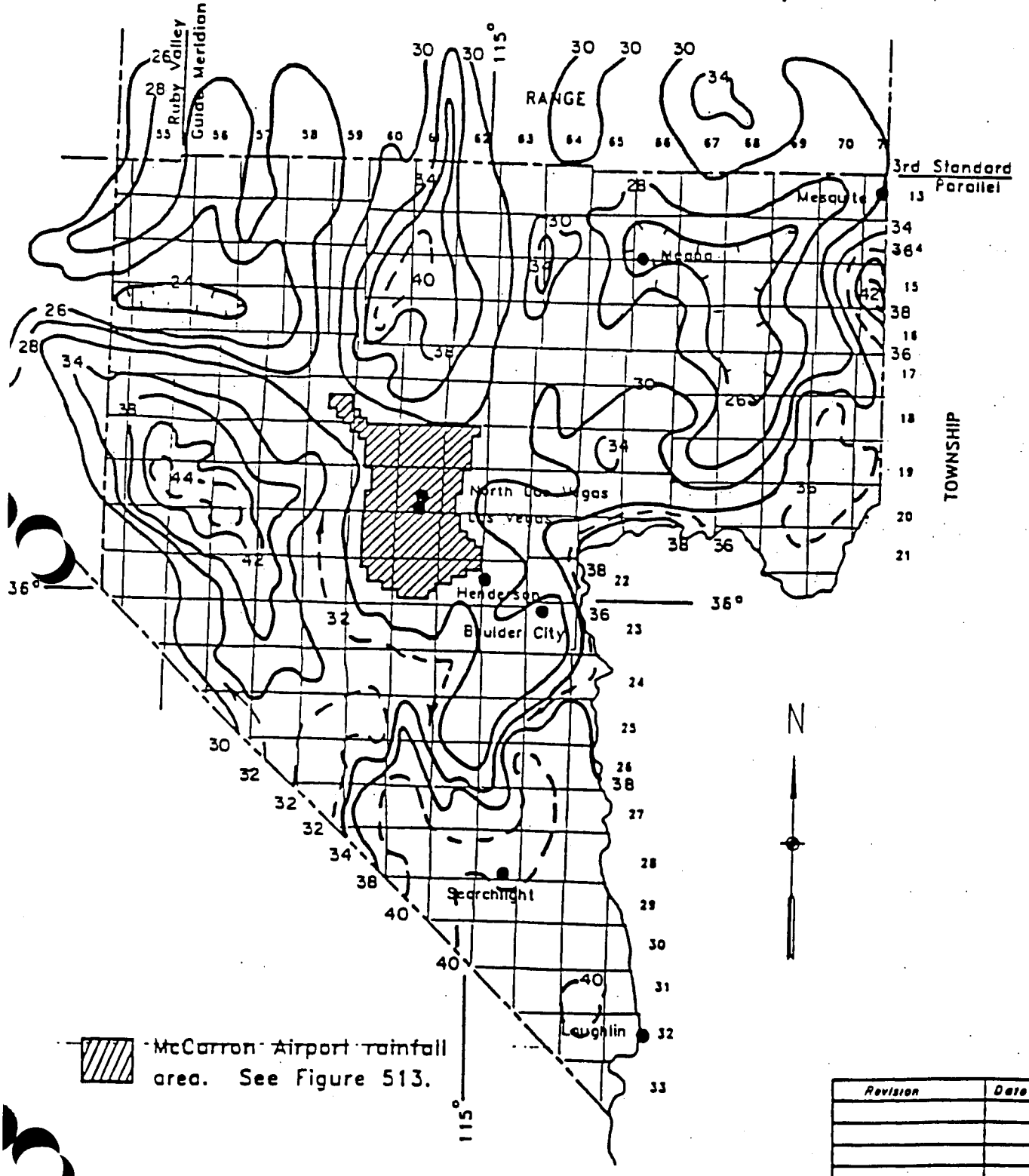
(DEPTHS IN TENTHS OF INCHES)



Revision	Date

WRC ENGINEERING	REFERENCE: NOAA ATLAS 2, VOLUME VII NEVADA, 1973	FIGURE 5.11

RAINFALL DEPTH-DURATION-FREQUENCY
100-YEAR, 24-HOUR
(DEPTHS IN TENTHS OF INCHES)



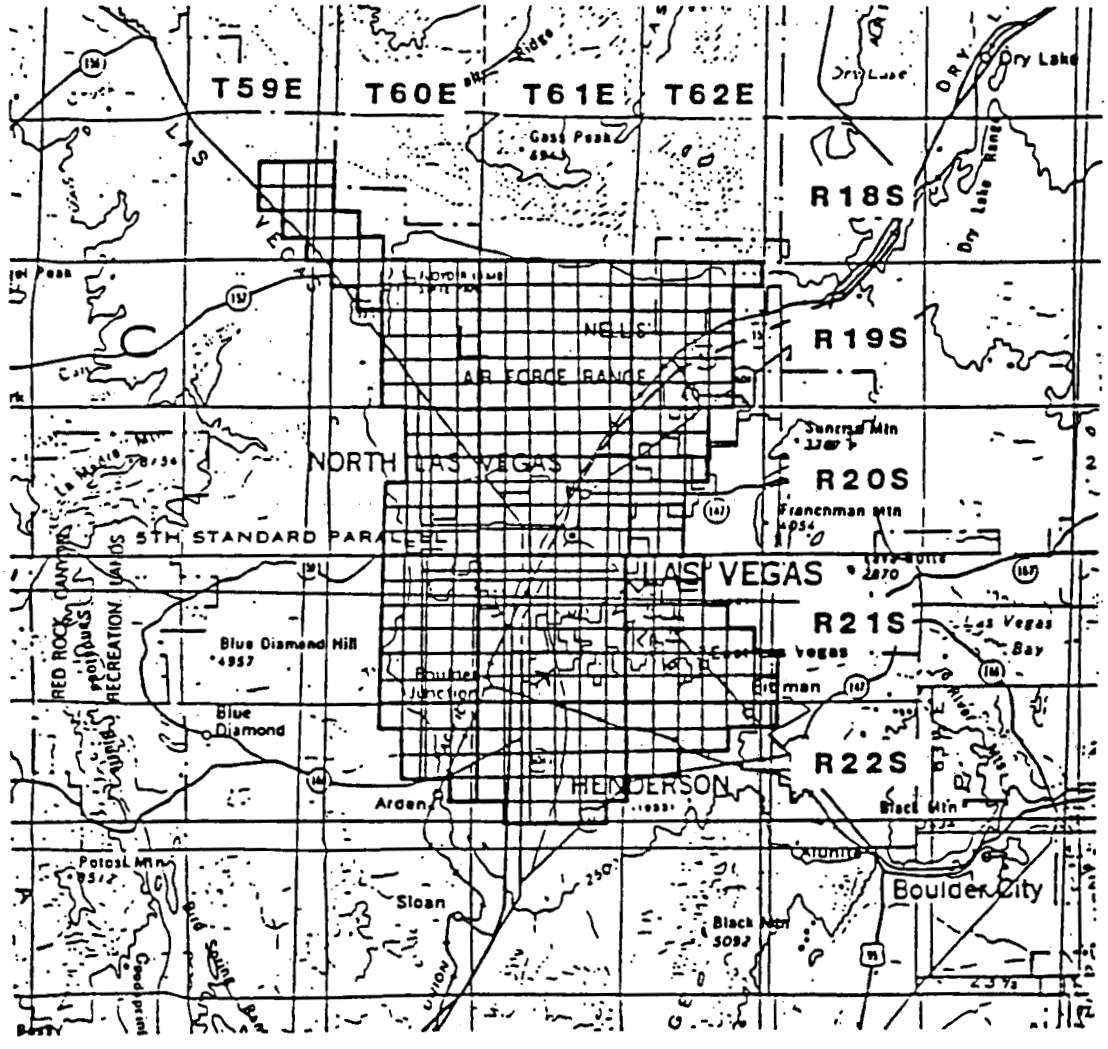
Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 512

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP	RANGE	SECTIONS	TOWNSHIP	RANGE	SECTIONS
18 South	59 East	13-15,22-26,36	20 South	62 East	4-9,16-20,29-32
18 South	60 East	30-32	21 South	60 East	1-4,9-16,21-28,33-36
19 South	60 East	1-6,8-16,21-28,33-36	21 South	61 East	ALL SECTIONS
19 South	61 East	ALL SECTIONS	21 South	62 East	4-9,15-23, 25-36
19 South	62 East	2-11,14-23,27-34	22 South	60 East	1-4,10-15,24
20 South	60 East	1-3,10-15,21-28,33-36	22 South	61 East	1-24,26-29
20 South	61 East	ALL SECTIONS	22 South	62 East	1-10,17-18

Notes:

1. Refer to Table 505 and Figure 516 Depth-Duration- Frequency values in the McCarran Airport Rainfall Area.
   Refer to Table 506 and Figure 517 for Time-Intensity-Frequency values on the McCarran Airport Rainfall Area.

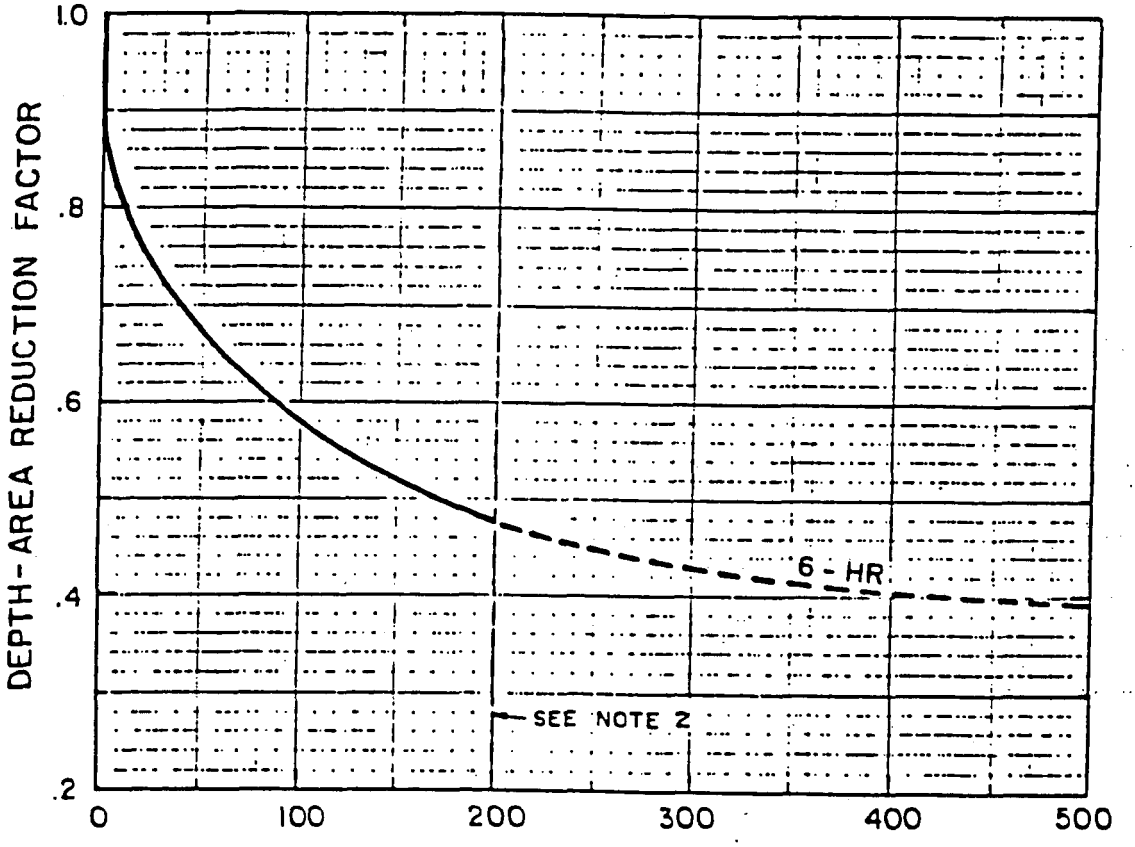
Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 513

DEPTH-AREA REDUCTION CURVES



Note:

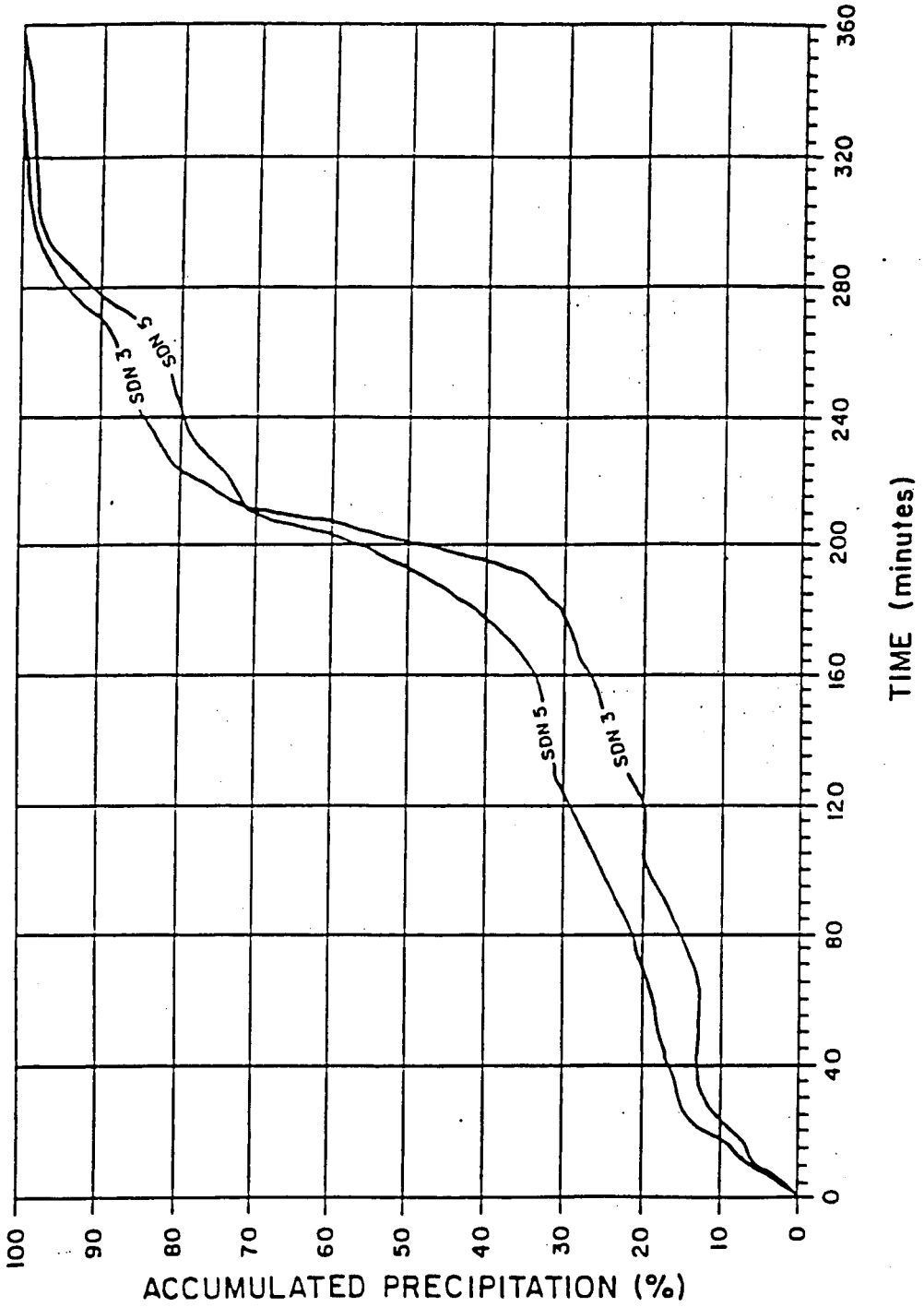
1. Refer to Table 502 for a tabulation of the 6-Hour Depth-Area reduction factors.

2. Consult with the local entity and/or the CCRFCD for guidance in using the Depth-Area Reduction factors for drainage areas greater than 200 miles.

Revision	Date

WRC ENGINEERING	REFERENCE: USACE, Los Angeles District, 1988	FIGURE 514

SIX-HOUR DESIGN STORM DISTRIBUTIONS



Notes:
1. For drainage areas less than 10 square miles in size, use SDN 3.
2. For drainage areas equal to or greater than 10 square miles in size, use SDN 5.
   Refer to Table 503 for a tabulation of storm distributions

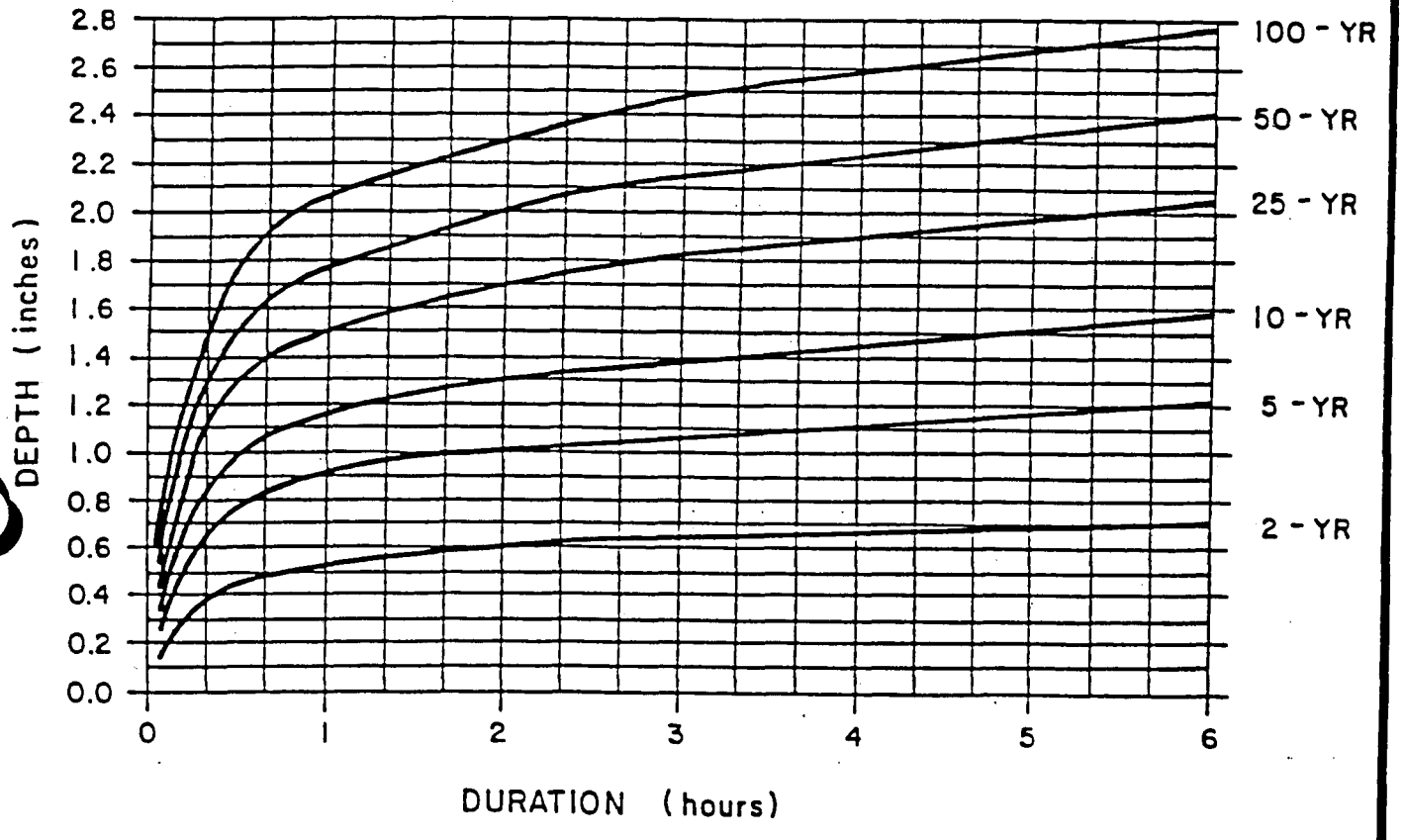
Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 515

DEPTH-DURATION-FREQUENCY CURVES FOR McCARRAN AIRPORT RAINFALL AREA



NOTES: 1. Refer to Table 505 for tabulation of depth-duration-frequency values.

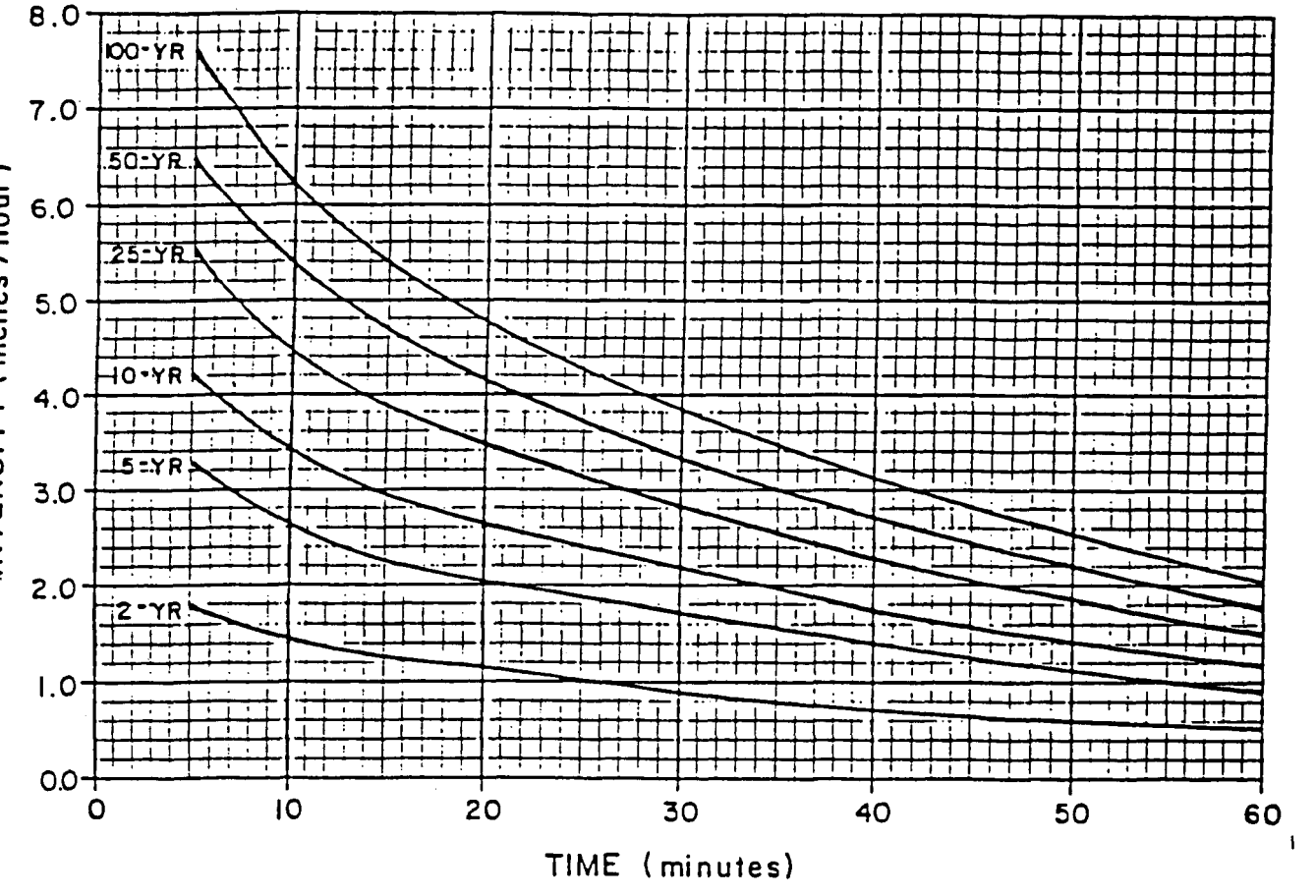
Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 516

TIME-INTENSITY-FREQUENCY CURVES FOR McCARRAN AIRPORT RAINFALL AREA

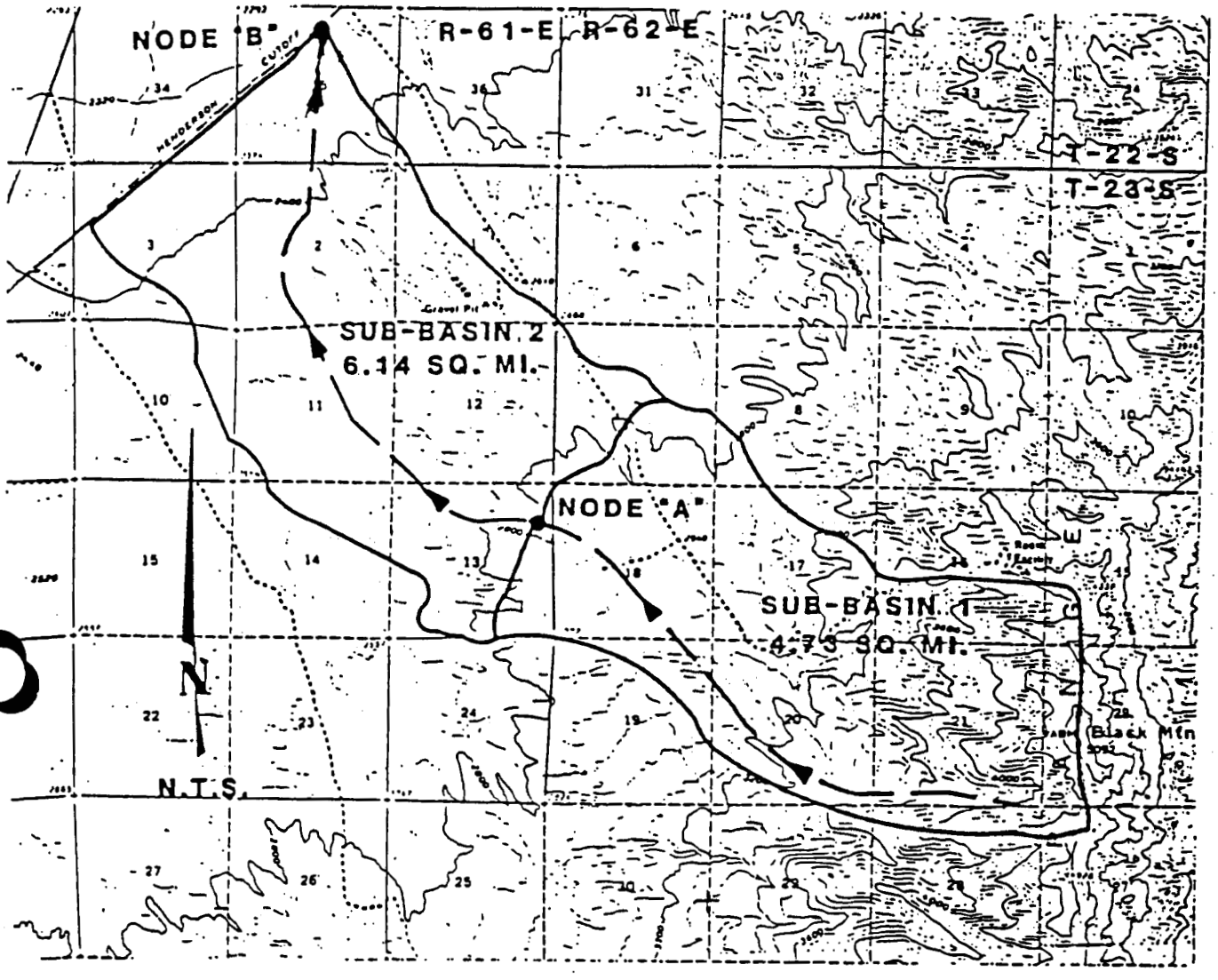


NOTE: 1. Refer to Table 506 for tabulation of Time-Intensity-Frequency Values.

Revision	Date

WRC ENGINEERING	REFERENCE: USACE, Los Angeles District, 1988	FIGURE 517

HYPOTHETICAL BASIN FOR NON-URBAN, LARGE BASIN EXAMPLES



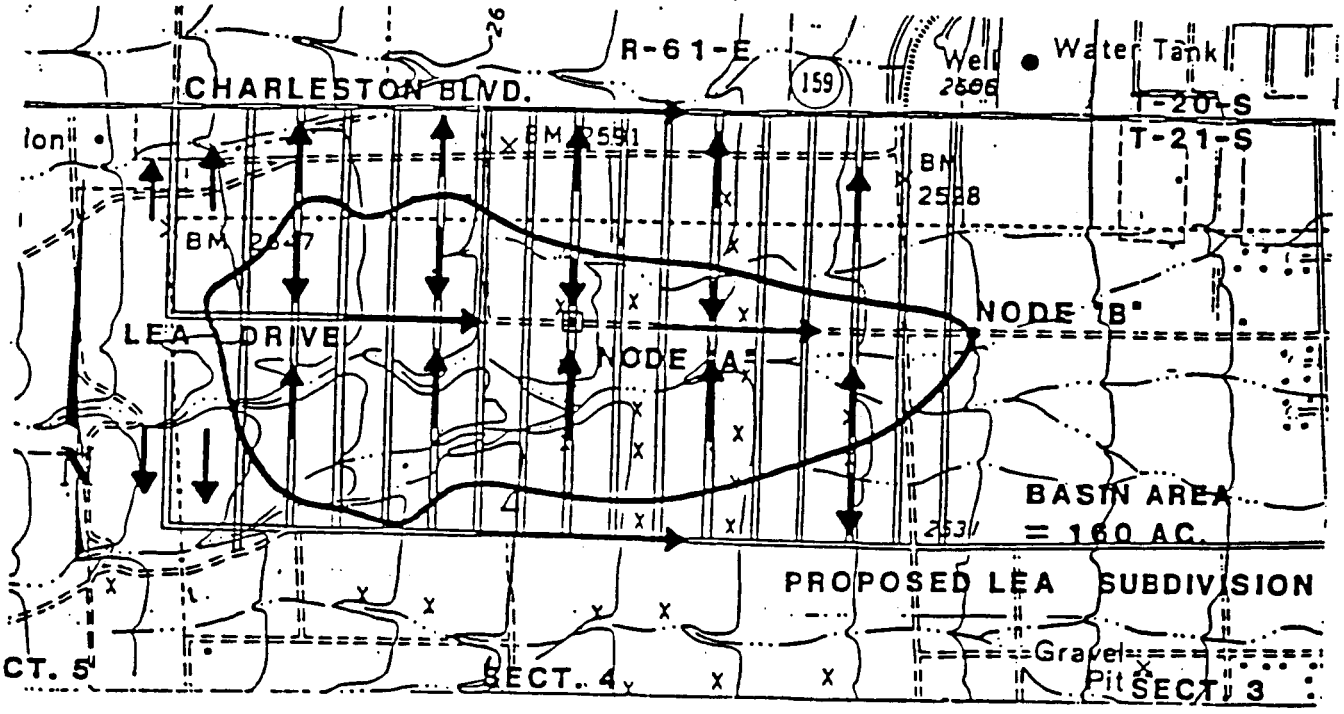
DESCRIPTION

The above basin is intally presented in Section 507.1 and will be used for non-urban, large basin examples in this Manual.

Revision	Date

WRC ENGINEERING	REFERENCE:	FIGURE 518

HYPOTHETICAL BASIN FOR URBAN, SMALL BASIN EXAMPLES



→ GENERAL DRAINAGE PATTERN

~ BASIN BOUNDARY

DESCRIPTION

The above basin is initially presented in Section 507.1 and will be used for urban, small basin examples in this MANUAL.
General drainage patterns for the proposed subdivision are shown above.
Off-site flows west of the proposed subdivision are diverted north and south around the subdivision.
Although not discussed in the examples, capacities of facilities to accomidate the offsite flow diversions must be addressed.

Revision	Date

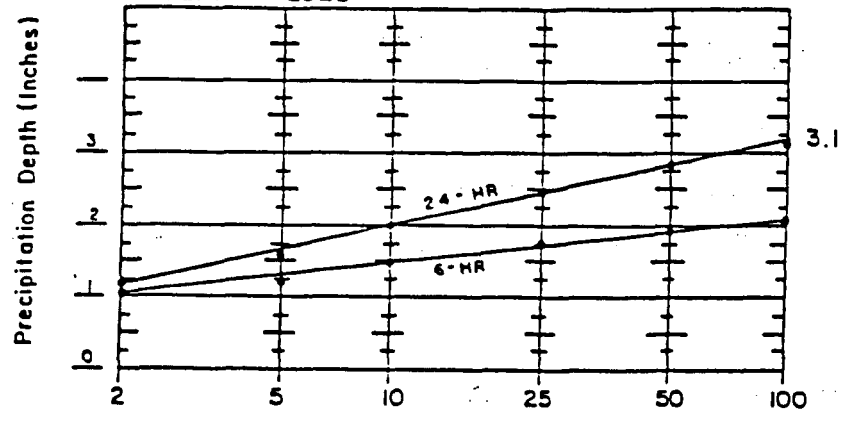
WRC ENGINEERING	REFERENCE:	FIGURE 519

PRECIPITATION DEPTH VERSUS RETURN PERIOD FOR EXAMPLE IN SECTION 507.2

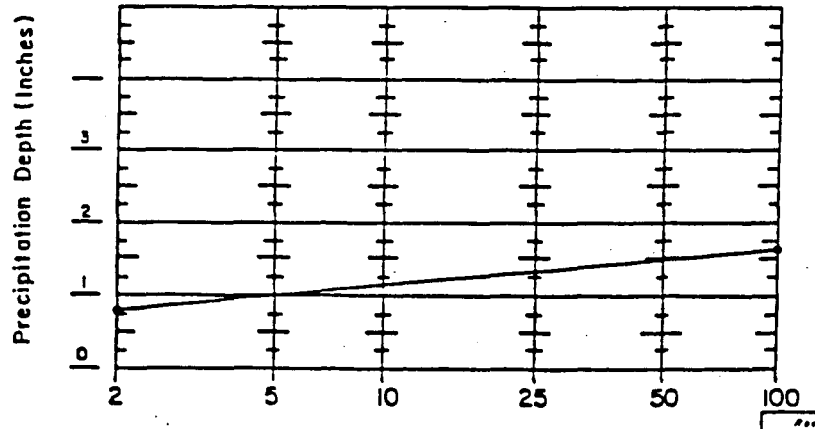
HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

PRECIPITATION DEPTH VERSUS RETURN PERIOD

A. PLOT OF 6-HOUR AND 24-HOUR PRECIPITATION DEPTH VALUES



B. PLOT OF 1-HOUR PRECIPITATION DEPTH VALUES



Revision	Date

REFERENCE: NOAA ATLAS 2, VOLUME VII NEVADA, 1973

STANDARD FORM 3

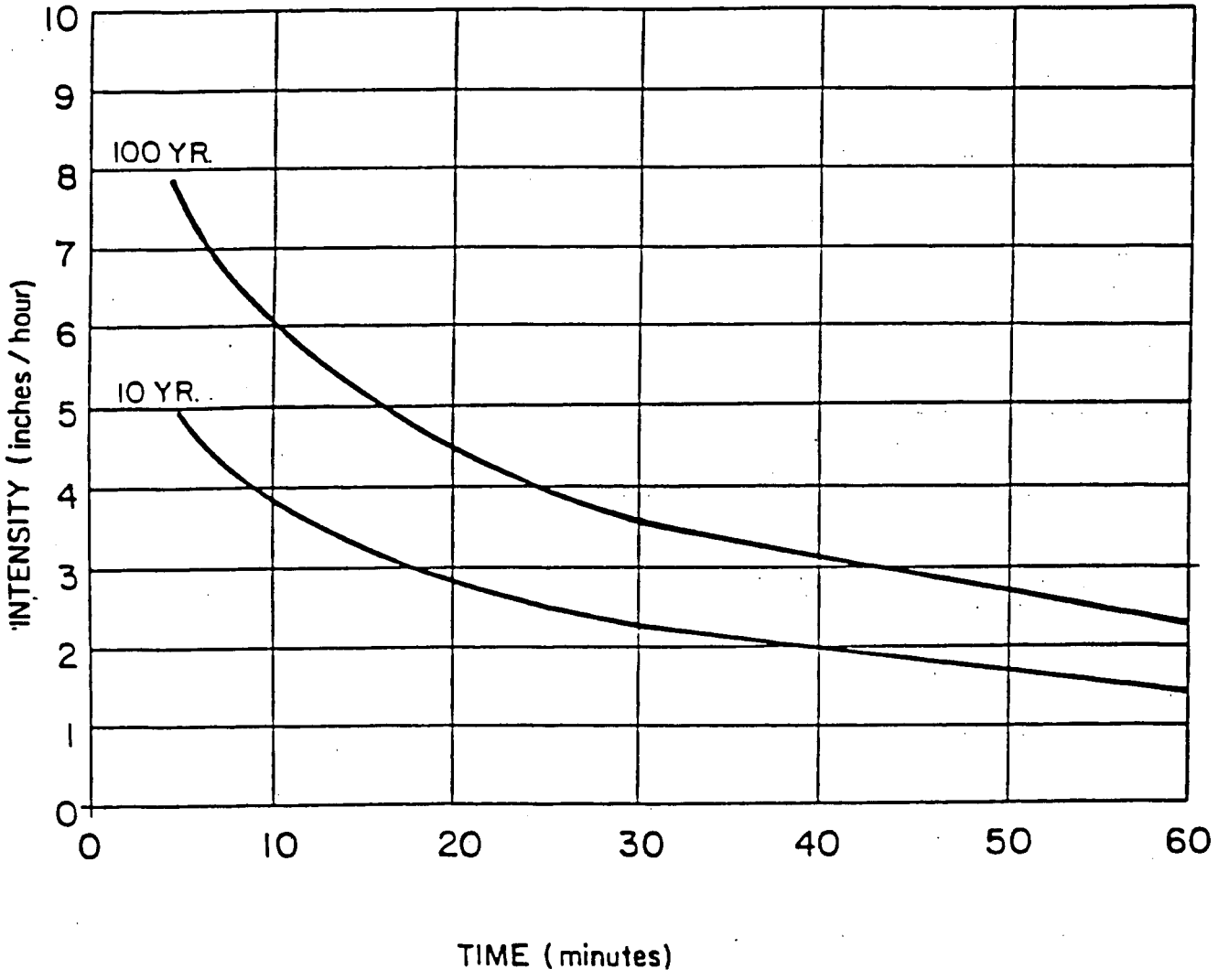
Revision	Date

WRC ENGINEERING

REFERENCE:

FIGURE 520

TIME-INTENSITY-FREQUENCY CURVE FOR EXAMPLE IN SECTION 507.3



Revision	Date

WRC ENGINEERING	REFERENCE:	FIGURE 521

A-4 Lag Time Calculations, Basin Parameter, Routing Calculations

TABLE A4 - 1

LAG TIME CALCULATION CONDITIONS (EXISTING)

designer _____ date _____

checker _____ date _____

	GIS LINKED											CALCULATED												
BASIN	AREA	CN	CALC	S ave.	S init.	L tot.	Lc	URB	Kn	CHAN	Q_{INPUT}	K	L init.	Ti	Q_{CALCD}	y	V	Tt	Tc CALCD	Tc CHECK	Tc	LAG Tc	LAG_{USBR}	LAG
	sq mi			ft/ft	ft/ft	feet	feet				cfs		feet	minutes	cfs	feet	ft/s	minutes	minutes	minutes	minutes	hours	hours	hours
A10A	0.342	82.9	Y	0.025	0.010	7,740	0.00	Y	0.020	M	297	0.704	300	12.35	297	0.50	5.87	21.13	33.48	53.00	33.48	0.335		0.335
A12	0.670	85.7	Y	0.021	0.010	10,800	0.00	Y	0.020	M	645	0.741	300	11.19	645	0.69	6.72	26.04	37.24	70.00	37.24	0.372		0.372
AP1	0.393	94.5	Y	0.016	0.010	7,920	0.00	Y	0.020	M	497	0.858	300	7.56	497	0.66	5.63	22.55	30.10	54.00	30.10	0.301		0.301
B10	0.033	86.0	Y	0.019	0.019	2,520	0.00	N	0.040	M	31	0.745	500	11.63	31	0.16	2.27	14.86	26.49	24.00	26.49	0.265		0.265
B11	0.184	86.1	Y	0.014	0.014	7,020	0.00	N	0.040	M	175	0.746	500	12.72	175	0.32	3.20	33.93	46.65	49.00	46.65	0.467		0.467
B12	0.121	86.0	Y	0.019	0.019	3,600	0.00	N	0.040	M	115	0.746	500	11.60	115	0.27	2.94	17.55	29.14	30.00	29.14	0.291		0.291
B1-2	0.516	81.2	Y	0.013	0.013	9,180	0.00	N	0.040	M	392	0.682	500	15.41	392	0.44	3.76	38.44	53.85	61.00	53.85	0.538		0.538
B13	0.050	86.0	Y	0.022	0.022	1,800	0.00	N	0.040	M	48	0.745	500	10.98	48	0.19	2.47	8.76	19.74	20.00	19.74	0.197		0.197
B14	0.040	85.8	Y	0.016	0.016	2,520	0.00	N	0.040	M	38	0.742	500	12.30	38	0.17	2.36	14.27	26.57	24.00	26.57	0.266		0.266
B15	0.070	83.4	Y	0.015	0.015	2,700	0.00	N	0.040	M	59	0.711	500	13.69	59	0.21	2.58	14.23	27.92	25.00	27.92	0.279		0.279
B16	0.024	85.9	Y	0.020	0.020	1,980	0.00	N	0.040	M	23	0.744	500	11.37	23	0.14	2.13	11.56	22.93	21.00	22.93	0.229		0.229
B17	0.534	84.3	Y	0.017	0.017	10,800	0.00	N	0.040	M	471	0.722	500	12.63	471	0.47	3.90	43.97	56.60	70.00	56.60	0.566		0.566
B18	0.180	86.0	Y	0.021	0.021	3,960	0.00	N	0.040	M	171	0.745	500	11.18	171	0.31	3.19	18.09	29.27	32.00	29.27	0.293		0.293
B19	0.011	88.3	Y	0.023	0.010	1,080	0.00	Y	0.040	M	12	0.775	300	10.12	12	0.15	2.55	5.10	15.22	16.00	15.22	0.152		0.152
B21-2	0.032	76.0	Y	0.019	0.019	1,260	0.00	N	0.040	M	18	0.613	500	15.82	18	0.13	2.03	6.23	22.05	17.00	22.05	0.221		0.221
B23	0.092	76.0	Y	0.028	0.028	3,600	0.00	N	0.040	M	51	0.613	500	13.90	51	0.19	2.50	20.64	34.55	30.00	34.55	0.345		0.345
B3	0.068	87.0	Y	0.015	0.015	3,780	0.00	N	0.040	M	67	0.758	500	12.13	67	0.22	2.64	20.68	32.81	31.00	32.81	0.328		0.328
B4	0.136	87.0	Y	0.016	0.016	4,500	0.00	N	0.040	M	134	0.758	500	11.77	134	0.29	3.04	21.96	33.73	35.00	33.73	0.337		0.337
B5	0.204	87.0	Y	0.017	0.017	8,100	0.00	N	0.040	M	202	0.758	500	11.52	202	0.34	3.30	38.43	49.95	55.00	49.95	0.500		0.500
B6	0.441	86.9	Y	0.016	0.016	9,000	0.00	N	0.040	M	434	0.757	500	11.81	434	0.46	3.84	36.89	48.70	60.00	48.70	0.487		0.487
B7	0.258	86.0	Y	0.015	0.015	9,900	0.00	N	0.040	M	245	0.745	500	12.48	245	0.36	3.43	45.73	58.21	65.00	58.21	0.582		0.582
B8	0.318	86.0	Y	0.022	0.022	5,400	0.00	N	0.040	M	302	0.745	500	10.97	302	0.39	3.57	22.86	33.84	40.00	33.84	0.338		0.338
B9	0.251	86.1	Y	0.019	0.019	6,480	0.00	N	0.040	M	239	0.746	500	11.61	239	0.36	3.41	29.24	40.85	46.00	40.85	0.409		0.409
D004	2.400	87.8																						0.765
D009	3.621	87.6																						0.690
D010	10.434	86.3																						1.219
D07	4.280	86.5																						1.196
D08	11.912	87.8																						1.805
DB1	1.926	87.8																						0.614
DB2	0.597	87.6																						0.331
F1	9.217	86.3																						0.970
F10	1.074	86.5																						0.730
F2	2.434	87.8																						0.790
F3	2.875	86.0																						0.650
F4	1.015	84.7																						0.450
F5	1.976	84.4																						0.630
F6	1.579	83.1																						0.590
F7	3.864	82.9																						0.880
F8	0.767	81.0	Y	0.070	0.070	8,280	0.00	N	0.040	M	575	0.679	500	8.85	575	0.51	4.06	31.91	40.77	56.00	40.77	0.408		0.408
F9A	0.114	83.0	Y	0.120	0.120	2,880	0.00	N	0.040	M	95	0.706	500	6.93	95	0.25	2.83	14.00	20.93	26.00	20.93	0.209		0.209

INFORMATION FOR THESE SUBBASINS TAKEN FROM THE PITTMAN EAST DETENTION BASIN PRE-DESIGN REPORT

INFORMATION FOR THESE SUBBASINS TAKEN FROM THE MPU

GIS LINKED												CALCULATED												
BASIN	AREA	CN	CALC	S ave.	S init.	L tot.	Lc	URB	Kn	CHAN	Q_{INPUT}	K	L init.	Ti	Q_{CALCD}	y	V	Tt	Tc CALCD	Tc CHECK	Tc	LAG Tc	LAG_{USBR}	LAG
F9B	0.488	82.2	Y	0.060	0.060	7,200	0.00	N	0.040	M	390	0.695	500	8.96	390	0.44	3.76	29.70	38.66	50.00	38.66	0.387		0.387
F9C	0.183	82.0	Y	0.080	0.080	3,960	0.00	N	0.040	M	145	0.693	500	8.19	145	0.29	3.08	18.70	26.89	32.00	26.89	0.269		0.269
F9D	0.092	83.0	Y	0.070	0.070	4,140	0.00	N	0.040	M	76	0.706	500	8.30	76	0.23	2.71	22.38	30.68	33.00	30.68	0.307		0.307
F9E	0.397	83.0	Y	0.070	0.070	3,960	0.00	N	0.040	M	330	0.706	500	8.30	330	0.41	3.64	15.86	24.16	32.00	24.16	0.242		0.242
F9F	0.516	84.8	Y	0.030	0.030	4,500	0.00	N	0.040	M	465	0.729	500	10.35	465	0.47	3.89	17.12	27.47	35.00	27.47	0.275		0.275
G1	3.350	82.2																						0.790
G2	1.658	82.0																						0.810
G3	1.889	83.0																						0.700
G4	2.016	83.0																						0.560
G5	2.391	84.8				INFORMATION FOR THESE SUBBASINS TAKEN FROM THE MPU																		1.040
G6	3.102	87.5																						1.160
G7	1.702	86.5																						0.980
G8	1.280	86.5																						1.340
H6MA	0.403	88.3	Y	0.021	0.010	9,360	0.00	Y	0.020	M	425	0.776	300	10.10	425	0.59	6.01	25.12	35.22	62.00	35.22	0.352		0.352
H6MB	0.994	82.5	Y	0.021	0.010	8,640	0.00	Y	0.020	M	851	0.699	300	12.49	851	0.77	7.15	19.44	31.93	58.00	31.93	0.319		0.319
H6MD	0.350	78.9	Y	0.028	0.010	7,200	0.00	Y	0.020	M	256	0.651	300	14.00	256	0.47	5.90	19.49	33.50	50.00	33.50	0.335		0.335
H6ME	0.305	74.7	Y	0.023	0.010	3,600	0.00	Y	0.020	M	180	0.596	300	15.71	180	0.42	5.02	10.96	26.67	30.00	26.67	0.267		0.267
H6MF	0.046	85.8	Y	0.020	0.010	1,260	0.00	Y	0.020	M	45	0.743	300	11.14	45	0.26	3.35	4.77	15.91	17.00	15.91	0.159		0.159

Note that not all the subbasin parameters are included in this table. Information that was excerpted from existing analyses was taken directly from hydrologic models and not recalculated for this project. Also note that the lag times for the "G" and most of the "F" subbasins were taken from the MPU and not recalculated based on revised curve numbers as they are each greater than 1 square mile and thus the lag times will not be affected by a change in curve number.

BASIN: Name given to each basin as shown on Figure 5: Existing Conditions Drainage Subbasins
AREA: The area of each basin in square miles from GIS
CN: Curve Number from GIS files
CALC: Calculate Lag Time, Yes (Y) or No (N). If Y, the lag time is calculated using the equations listed below vs. N, which requires inputting a lag time found from another source.
Save.: The average slope (ft/ft) of the longest watercourse within each basin.
Sinit.: The average slope (ft/ft) of the initial or overland length.
Ltot: The watershed length. Length of the longest watercourse through each basin (feet), see on Figure 5: Existing Conditions Drainage Subbasins
Lc: The centroid length. The length along the longest watercourse measured upstream to a point opposite the centroid of the basin (feet).
URB: Urban, Yes (Y) for Urban basin or No (N) for Undeveloped basin.
Kn: Manning's roughness coefficient for basin channels otherwise Kn=0.02 for developed basins, Kn = 0.04 for basins designated as rural residential and Kn= 0.05 for undevelooped basins.

TABLE A4 - 2

LAG TIME CALCULATION WORKSHEET - FUTURE CONDITIONS

checker ____ date ____

	GIS LINKED											CALCULATED												
BASIN	AREA	CN	CALC	S ave.	S init.	L tot.	Lc	URB	Kn	CHAN	Q_{INPUT}	K	L init.	Ti	Q_{CALCD}	y	V	Tt	Tc CALCD	Tc CHECK	Tc	LAG Tc	LAG_{USBR}	LAG
	sq mi			ft/ft	ft/ft	feet	feet				cfs		feet	minutes	cfs	feet	ft/s	minutes	minutes	minutes	minutes	hours	hours	hours
A10A	0.342	82.9	Y	0.025	0.010	7,740	0.00	Y	0.020	M	297	0.704	300	12.34	297	0.50	5.87	21.13	33.48	53.00	33.48	0.335		0.335
A12	0.670	85.7	Y	0.021	0.010	10,800	0.00	Y	0.020	M	645	0.741	300	11.19	645	0.69	6.72	26.04	37.23	70.00	37.23	0.372		0.372
AP1	0.393	94.5	Y	0.016	0.010	7,920	0.00	Y	0.020	M	497	0.858	300	7.55	497	0.66	5.63	22.55	30.10	54.00	30.10	0.301		0.301
B10	0.033	92.9	Y	0.019	0.010	2,520	0.00	Y	0.040	M	39	0.836	300	8.24	39	0.25	3.16	11.73	19.96	24.00	19.96	0.200		0.200
B11	0.184	93.6	Y	0.014	0.010	7,020	0.00	Y	0.040	M	226	0.845	300	7.94	226	0.51	4.41	25.40	33.34	49.00	33.34	0.333		0.333
B12	0.121	90.0	Y	0.019	0.010	3,600	0.00	Y	0.040	M	134	0.797	300	9.43	134	0.39	4.30	12.78	22.21	30.00	22.21	0.222		0.222
B1-2	0.516	80.4	Y	0.013	0.010	9,180	0.00	Y	0.040	M	405	0.672	300	13.36	405	0.64	4.96	29.83	43.19	61.00	43.19	0.432		0.432
B13	0.050	87.5	Y	0.022	0.010	1,800	0.00	Y	0.040	M	51	0.765	300	10.45	51	0.27	3.60	6.94	17.39	20.00	17.39	0.174		0.174
B14	0.040	91.6	Y	0.016	0.010	2,520	0.00	Y	0.040	M	47	0.819	300	8.77	47	0.27	3.13	11.82	20.59	24.00	20.59	0.206		0.206
B15	0.070	90.3	Y	0.015	0.010	2,700	0.00	Y	0.040	M	78	0.802	300	9.28	78	0.34	3.47	11.53	20.82	25.00	20.82	0.208		0.208
B16	0.024	88.8	Y	0.020	0.010	1,980	0.00	Y	0.040	M	26	0.783	300	9.90	26	0.21	2.94	9.54	19.43	21.00	19.43	0.194		0.194
B17	0.534	83.3	Y	0.017	0.010	10,800	0.00	Y	0.040	M	471	0.709	300	12.18	471	0.64	5.75	30.45	42.62	70.00	42.62	0.426		0.426
B18	0.180	86.0	Y	0.021	0.010	3,960	0.00	Y	0.040	M	176	0.745	300	11.05	176	0.43	4.81	12.69	23.75	32.00	23.75	0.237		0.237
B19	0.011	88.3	Y	0.023	0.010	1,080	0.00	Y	0.040	M	11	0.775	300	10.12	11	0.15	2.49	5.21	15.33	16.00	15.33	0.153		0.153
B21-2	0.032	76.0	Y	0.019	0.010	1,260	0.00	Y	0.040	M	21	0.613	300	15.18	21	0.20	2.73	5.86	21.04	17.00	17.00	0.170		0.170
B23	0.092	76.0	Y	0.028	0.010	3,600	0.00	Y	0.040	M	58	0.613	300	15.18	58	0.27	4.07	13.51	28.69	30.00	28.69	0.287		0.287
B3	0.068	86.0	Y	0.015	0.010	3,780	0.00	Y	0.040	M	66	0.745	300	11.06	66	0.32	3.29	17.61	28.68	31.00	28.68	0.287		0.287
B4	0.136	86.0	Y	0.016	0.010	4,500	0.00	Y	0.040	M	132	0.745	300	11.06	132	0.40	4.05	17.27	28.33	35.00	28.33	0.283		0.283
B5	0.204	86.0	Y	0.017	0.010	8,100	0.00	Y	0.040	M	198	0.745	300	11.06	198	0.46	4.59	28.33	39.40	55.00	39.40	0.394		0.394
B6	0.441	86.8	Y	0.016	0.010	9,000	0.00	Y	0.040	M	442	0.755	300	10.74	442	0.63	5.48	26.45	37.19	60.00	37.19	0.372		0.372
B7	0.258	89.1	Y	0.015	0.010	9,900	0.00	Y	0.040	M	279	0.786	300	9.79	279	0.54	4.77	33.55	43.33	65.00	43.33	0.433		0.433
B8	0.318	92.0	Y	0.022	0.010	5,400	0.00	Y	0.040	M	375	0.825	300	8.58	375	0.56	5.93	14.34	22.92	40.00	22.92	0.229		0.229
B9	0.251	93.0	Y	0.019	0.010	6,480	0.00	Y	0.040	M	304	0.838	300	8.18	304	0.54	5.27	19.54	27.71	46.00	27.71	0.277		0.277
D004	2.400	87.8																						0.765
D009	3.621	87.6																						0.690
D010	10.434	86.3																						1.219
D07	4.280	86.5																						1.196
D08	11.912	87.8																						1.805
DB1	1.926	87.8																						0.614
DB2	0.597	87.6																						0.331
F1	9.217	86.3																						0.970
F10	1.074	86.5																						0.730
F2	2.434	87.8																						0.790
F3	2.875	84.8																						0.650
F4	1.015	83.6																						0.450
F5	1.976	84.4																						0.630
F6	1.579	82.1																						0.590
F7	3.864	82.7																						0.880
F8	0.767	81.0	Y	0.070	0.020	8,280	0.00	Y	0.040	M	617	0.679	300	10.41	617	0.55	10.36	12.83	23.25	56.00	23.25	0.232		0.232
F9A	0.114	82.2	Y	0.120	0.020	2,880	0.00	Y	0.040	M	96	0.694	300	10.04	96	0.25	7.97	5.40	15.43	26.00	15.43	0.154		0.154
F9B	0.488	81.9	Y	0.060	0.020	7,200	0.00	Y	0.040	M	407	0.691	300	10.12	407	0.48	8.82	13.04	23.17	50.00	23.17	0.232		0.232

INFORMATION FOR THESE SUBBASINS TAKEN FROM THE PITTMAN EAST DETENTION BASIN PRE-DESIGN REPORT

INFORMATION FOR THESE SUBBASINS TAKEN FROM THE MPU

TABLE A4 - 2

LAG TIME CALCULATION WORKSHEET - FUTURE CONDITIONS

designer _____ date _____

checker _____ date _____

	GIS LINKED											CALCULATED											
BASIN	AREA	CN	CALC	S ave.	S init.	L tot.	Lc	URB	Kn	CHAN	Q_{INPUT}	K	L init.	Ti	Q_{CALCD}	y	V	Tt	Tc CALCD	Tc CHECK	Tc	LAG Tc	LAG_{USBR}	LAG
F9C	0.183	81.4	Y	0.080	0.020	3,960	0.00	Y	0.040	M	150	0.685	300	10.27	150	0.31	7.65	7.97	18.24	32.00	18.24	0.182		0.182
F9D	0.092	82.0	Y	0.070	0.020	4,140	0.00	Y	0.040	M	77	0.692	300	10.09	77	0.25	6.16	10.39	20.48	33.00	20.48	0.205		0.205
F9E	0.397	82.0	Y	0.070	0.020	3,960	0.00	Y	0.040	M	333	0.692	300	10.09	333	0.43	8.88	6.87	16.95	32.00	16.95	0.170		0.170
F9F	0.516	83.2	Y	0.030	0.020	4,500	0.00	Y	0.040	M	454	0.709	300	9.69	454	0.57	6.99	10.02	19.71	35.00	19.71	0.197		0.197
G1	3.350	81.9																						0.790
G2	1.658	81.4																						0.810
G3	1.889	82.0																						0.700
G4	2.016	82.0																						0.560
G5	2.391	83.2				INFORMATION FOR THESE SUBBASINS TAKEN FROM THE MPU																		1.040
G6	3.102	87.5																						1.160
G7	1.702	86.3																						0.980
G8	1.280	86.3																						1.340
H6MA	0.403	88.3	Y	0.021	0.010	9,360	0.00	Y	0.020	M	424	0.776	300	10.10	424	0.59	6.01	25.13	35.23	62.00	35.23	0.352		0.352
H6MB	0.994	82.5	Y	0.021	0.010	8,640	0.00	Y	0.020	M	851	0.699	300	12.50	851	0.77	7.15	19.44	31.93	58.00	31.93	0.319		0.319
H6MD	0.350	78.9	Y	0.028	0.010	7,200	0.00	Y	0.020	M	256	0.651	300	14.00	256	0.47	5.90	19.49	33.49	50.00	33.49	0.335		0.335
H6ME	0.305	74.7	Y	0.023	0.010	3,600	0.00	Y	0.020	M	180	0.596	300	15.71	180	0.42	5.02	10.96	26.67	30.00	26.67	0.267		0.267
H6MF	0.046	85.8	Y	0.020	0.010	1,260	0.00	Y	0.020	M	45	0.743	300	11.14	45	0.26	3.35	4.77	15.91	17.00	15.91	0.159		0.159

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Note that not all the subbasin parameters are included in this table. Information that was excerpted from existing analyses was taken directly from hydrologic models and not recalculated for this project.
Also note that the lag times for the "G" and most of the "F" subbasins were taken from the MPU and not recalculated based on revised curve numbers as they are each greater than 1 square mile and thus the lag times will not be affected by a change in curve number.

TABLE A4-3 BASIN PARAMETERS - EXISTING CONDITIONS

Subbasin Name	Area (sq mi)	Curve Number	Rainfall (in)
A10A	0.342	82.88	2.820
A12	0.670	85.68	2.810
AP1	0.393	94.52	2.860
B10	0.033	86.00	2.820
B11	0.184	86.09	2.830
B12	0.121	86.03	2.810
B1-2	0.516	81.23	2.970
B13	0.050	86.01	2.810
B14	0.040	85.79	2.800
B15	0.070	83.39	2.800
B16	0.024	85.92	2.790
B17	0.534	84.28	2.800
B18	0.180	86.02	2.780
B19	0.011	88.28	2.770
B21-2	0.032	76.00	2.770
B23	0.092	76.00	2.780
B3	0.068	86.98	2.920
B4	0.136	86.96	2.900
B5	0.204	87.00	2.890
B6	0.441	86.88	2.880
B7	0.258	86.00	2.860
B8	0.318	86.02	2.850
B9	0.251	86.05	2.840
D004	2.400	87.78	3.304
D009	3.621	87.55	3.312
D010	10.434	86.31	3.145
D07	4.280	86.53	3.202
D08	11.912	87.84	3.279
DB1	1.926	86.01	3.040
DB2	0.597	84.68	2.910
F1	9.217	84.42	3.380
F10	1.074	83.07	3.150
F2	2.434	82.94	3.300
F3	2.875	82.28	3.250
F4	1.015	84.20	3.220
F5	1.976	82.33	3.190
F6	1.579	86.17	3.230
F7	3.864	85.22	3.230
F8	0.767	81.00	3.170
F9A	0.114	83.00	3.120
F9B	0.488	82.23	3.150
F9C	0.183	82.03	3.150
F9D	0.092	83.00	3.110
F9E	0.397	83.00	3.110
F9F	0.516	84.79	3.110
G1	3.350	87.51	3.270
G2	1.658	86.54	3.150

TABLE A4-3 BASIN PARAMETERS -FUTURE CONDITIONS

Subbasin Name	Area (sq mi)	Curve Number	Rainfall (in)
A10A	0.342	82.88	2.820
A12	0.670	85.68	2.810
AP1	0.393	94.52	2.860
B10	0.033	86.00	2.820
B11	0.184	86.09	2.830
B12	0.121	86.03	2.810
B1-2	0.516	81.23	2.970
B13	0.050	86.01	2.810
B14	0.040	85.79	2.800
B15	0.070	83.39	2.800
B16	0.024	85.92	2.790
B17	0.534	84.28	2.800
B18	0.180	86.02	2.780
B19	0.011	88.28	2.770
B21-2	0.032	63.18	2.770
B23	0.092	63.57	2.780
B3	0.068	86.98	2.920
B4	0.136	86.96	2.900
B5	0.204	87.00	2.890
B6	0.441	86.88	2.880
B7	0.258	86.00	2.860
B8	0.318	86.02	2.850
B9	0.251	86.05	2.840
F1	9.217	84.42	3.380
F10	1.074	83.07	3.150
F2	2.434	82.94	3.300
F3	2.875	82.28	3.250
F4	1.015	84.20	3.220
F5	1.976	82.33	3.190
F6	1.579	86.17	3.230
F7	3.864	85.22	3.230
F8	0.767	81.00	3.170
F9A	0.114	83.00	3.120
F9B	0.488	82.23	3.150
F9C	0.183	82.03	3.150
F9D	0.092	83.00	3.110
F9E	0.397	83.00	3.110
F9F	0.516	84.79	3.110
G1	3.350	87.51	3.270
G2	1.658	86.54	3.150
G3	1.889	86.47	3.250
G4	2.016	86.63	3.190
G5	2.391	86.00	3.080
G6	3.102	86.10	3.080
G7	1.702	86.00	2.960
G8	1.280	86.75	2.960
H6MA	0.403	88.34	2.800
H6MB	0.994	82.52	2.860
H6MD	0.350	78.85	2.780
H6ME	0.305	74.71	2.780

TABLE A4-3 BASIN PARAMETERS -FUTURE CONDITIONS

Subbasin Name	Area (sq mi)	Curve Number	Rainfall (in)
H6MF	0.046	85.81	2.770

Note that not all the subbasin parameters are included in this table. Information that was excerpted from existing analyses was taken directly from hydrologic models and not recalculated for this project.

TABLE A4-5 MUSKINGUM ROUTING INPUT DATA

NAME	LENGTH	SLOPE	R	Kn	t	V	X	K	NSTPS
RCB1-2	360	0.028	2.5	0.040	5	11.4815	0.3	0.01	0
RCB3	3060	0.0147	2.5	0.040	5	8.31914	0.3	0.10	1
RCB4	1260	0.0198	2.5	0.040	5	9.655	0.3	0.04	0
RCB5	2340	0.0128	2.5	0.040	5	7.76291	0.30	0.08	1
RCB6	1260	0.008	2.5	0.040	5	6.13712	0.30	0.06	1
RNG3	2880	0.0139	1.5	0.040	5	5.75477	0.30	0.14	2
RCB7	900	0.011	2.5	0.040	5	7.19641	0.30	0.03	0
RCB8	1080	0.014	2.5	0.040	5	8.11865	0.30	0.04	0
RCB9	900	0.017	2.5	0.040	5	8.94631	0.3	0.03	0
RCB10	540	0.009	2.5	0.040	5	6.5094	0.3	0.02	0
RCB11	1440	0.004	1.5	0.040	5	3.0871	0.15	0.13	2
RCB12	1080	0.005	1.5	0.040	5	3.45148	0.15	0.09	1
RCB13	1260	0.004	1.5	0.040	5	3.0871	0.15	0.11	1
RAP1	2430	0.0164	1.5	0.040	5	6.2509	0.15	0.11	1
RCCB14	1080	0.046	1.5	0.040	5	10.4689	0.15	0.03	0
RCB15	540	0.019	1.5	0.040	5	6.72817	0.15	0.02	0
RCB16	2340	0.015	1.5	0.040	5	5.97814	0.30	0.11	1
RDDB1	8460	0.018	2.5	0.020	5	18.4114	0.3	0.13	2
RND07	7920	0.015	1.5	0.040	5	5.97814	0.15	0.37	4
RB21-2	900	0.0167	1.5	0.040	5	6.30781	0.15	0.04	0
RCB23	1800	0.0167	1.5	0.040	5	6.30781	0.15	0.08	1
RDCH6ME	1080	0.004	1.5	0.040	5	3.0871	0.15	0.10	1

Channel routing in natural channels, alluvial fans and sheet flow areas will be performed using the Muskingum method.

NAME Record identification for Muskingum routing used in the HEC-1 analysis

LENGTH Length of the routing reach in feet

SLOPE Channel slope, ft/ft.

R Hydraulic Radius in feet.

Kn Channel roughness.

t The simulation time step from the IT record in minutes in the HEC-1 model

V Velocity in ft/s calculated using the following equation:

$V = 1.49\ R^{2/3} S^{1/2} / Kn$

X The X parameter accounts for channel or floodplain storage. A value is selected from *Table A4-6b*.

K The K parameter is equal to the travel time through the routing reach

K = LENGTH /(3600 V)

TABLE A4 - 6
DATA TABLE FOR HEC-1 MODEL MUSKINGUM ROUTING

MUSKINGUM ROUTING

NAME	NSTPS	AMSK	X
RCB1-2	0	0.01	0.30
RCB3	1	0.10	0.30
RCB4	0	0.04	0.30
RCB5	1	0.08	0.30
RCB6	1	0.06	0.30
RNG3	2	0.14	0.30
RCB7	0	0.03	0.30
RCB8	0	0.04	0.30
RCB9	0	0.03	0.30
RCB10	0	0.02	0.30
RCB11	2	0.13	0.15
RCB12	1	0.09	0.15
RCB13	1	0.11	0.15
RAP1	1	0.11	0.15
RCCB14	0	0.03	0.15
RCB15	0	0.02	0.15
RCB16	1	0.11	0.30
RDDB1	2	0.13	0.30
RND07	4	0.37	0.15
RB21-2	0	0.04	0.15
RCB23	1	0.08	0.15
RDCH6ME	1	0.10	0.15

X	**Description**
0.10	Large floodplain storage – shallow sheet flow
0.15	Normal natural condition – poorly defined natural channels
0.30	Flows primarily confined within a major wash

TABLE A4 - 6B
DATA TABLE FOR HEC-1 MODEL MUSKINGUM ROUTING

NAME	Record identification for Muskingum routing used in the HEC-1 analysis
NSTPS	Integer steps (equal to number of subreaches) for the Muskingum routing Obtained from Table A4-5
AMSKK	Muskingum K coefficient in hours for entire reach. Obtained from Table A4-5
X	Muskingum X coefficient for Muskingum routing or working R&D routing Obtained from Table A4-5

TABLE A4 - 7
DATA TABLE FOR HEC-1 MODEL KINEMATIC ROUTING INPUT

KINEMATIC ROUTING							
NAME	LENGTH	SLOPE	Kn	HEC-1	SHAPE	B	Z
	feet	ft/ft				feet	
RCH6MB	3600	0.027	0.020	0	TRAP	30	0
RDBBG	4000	0.012	0.020	0	CIRC	5.5	0
RH6MA	2160	0.03	0.003	0	TRAP	15	5
RSDDB	6000	0.011	0.015	0	TRAP	10	2

NAME Record identification. Identification name for Kinematic routing used in the HEC-1 analysis

LENGTH Channel length in feet, see Figure 5: Basin Boundary Map - Existing Offsite Conditions.

SLOPE Channel slope, ft/ft.

Kn Channel roughness. Manning's roughness coefficient for urbanized areas:
water courses in the drainage area consist of street, storm sewer and improved channels.
This value obtained from Table 604 of the Criteria Manual

HEC-1 Not used. This field is only used with the UK/RK combination

SHAPE Trapezoidal channel (including triangular and rectangular)

B Channel bottom width (feet)

Z Side slopes, if required

designer_af__date_12/17.
checker_jb__date_____.

TABLE A4 - 7
DATA TABLE FOR HEC-1 MODEL KINEMATIC ROUTING INPUT

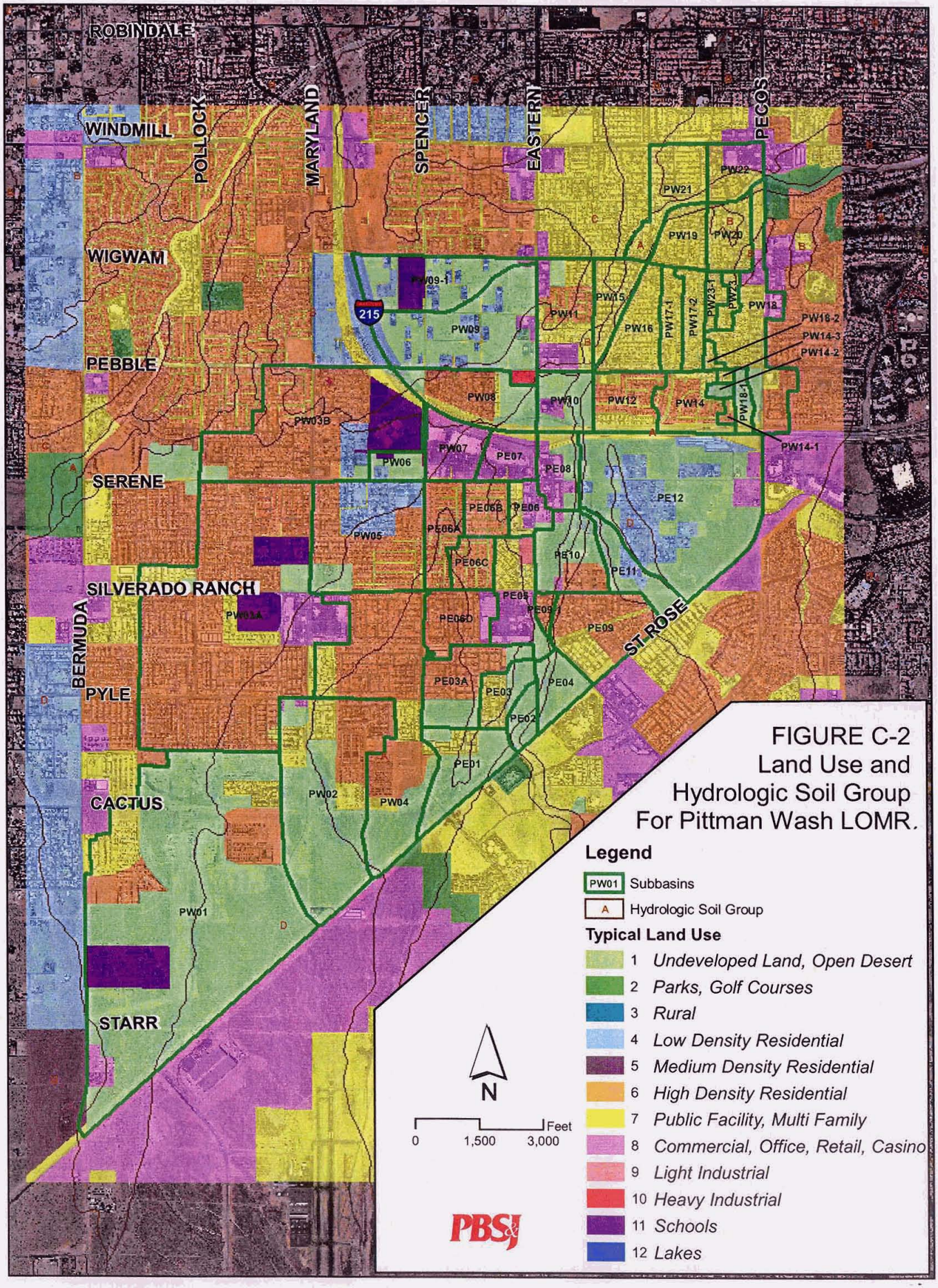
NAME	Record identification. Identification name for Kinematic routing used in the HEC-1 analysis
LENGTH	Channel length in feet, see Figure 5: Basin Boundary Map - Existing Offsite Conditions.
SLOPE	Channel slope, ft/ft.
Kn	Channel roughness. Manning's roughness coefficient for urbanized areas: water courses in the drainage area consist of street, storm sewer and improved channels. This value obtained from Table 604 of the Criteria Manual
HEC-1	Not used. This field is only used with the UK/RK combination
SHAPE	Trapezoidal channel (including triangular and rectangular)
B	Channel bottom width (feet)
Z	Side slopes, if required

Hydrologic Figures

C1 – Pittman Wash Subbasins

C2 – Pittman Wash Land Use Map

C3 – St. Rose Widening Watershed Reference Figure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WINDMILL
POLLOCK
MARYLAND
SPENCER
EASTERN
PECOS
WIGWAM
PEBBLE
SERENE
SILVERADO RANCH
BERMUDA
PYLE
CACTUS
STARR
ST ROSE
215
PW01
PW02
PW03A
PW03B
PW04
PW05
PW06
PW07
PW08
PW09
PW09-1
PW10
PW11
PW12
PW14
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PW18
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PW20
PW21
PW22
PW23-1
PW23-2
PE01
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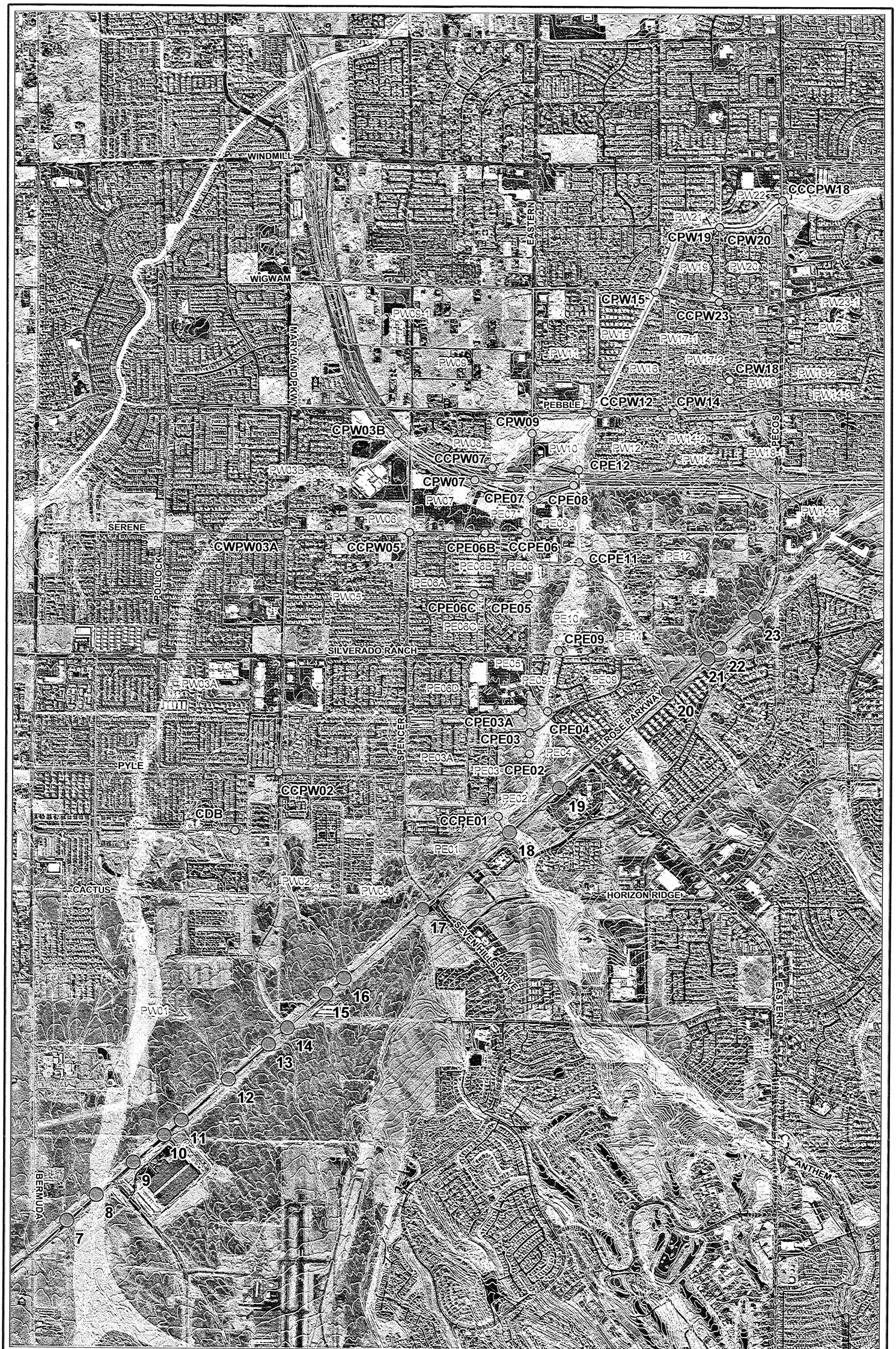
PE03
PE03A
PE04
PE05
PE06
PE06A
PE06B
PE06C
PE06D
PE07
PE08
PE09
PE09-1
PE10
PE11
PE12
FIGURE C-2
Land Use and
Hydrologic Soil Group
For Pittman Wash LOMR.
Legend
PW01 Subbasins
A Hydrologic Soil Group
Typical Land Use
1 Undeveloped Land, Open Desert
2 Parks, Golf Courses
3 Rural
4 Low Density Residential
5 Medium Density Residential
6 High Density Residential
7 Public Facility, Multi Family
8 Commercial, Office, Retail, Casino
9 Light Industrial
10 Heavy Industrial
11 Schools
12 Lakes
N
0
1,500
3,000
Feet
PBS&J



REGIONAL FLOOD CONTROL DISTRICT

CCRFCD

Flood Map Revisions

Figure C-1
Pittman Wash Subbasins

Legend

- Local Facilities
- FEMA Flood Zone A
- FEMA Flood Zone AE
- 5 foot contours
- 25 foot index contours
- PE01 Subbasin Boundary
- 7 Existing Numbered Culverts Under St. Rose Parkway (From (30%) Hydrology Submittal for St. Rose Parkway (Formerly, Lake Mead Drive) Widening From I-15 To Pecos Road)
- HEC-1 Concentration Point

N

1 inch equals 1,000 feet

* FOR SUBBASIN DELINEATIONS UPSTREAM (SOUTH) OF ST ROSE PARKWAY REFER TO APEX INDEX C-1, FOR SUBBASIN DELINEATIONS FROM (30%) HYDROLOGY SUBMITTAL FOR ST. ROSE PARKWAY (FORMERLY, LAKE MEAD DRIVE) WIDENING I-15 TO PECOS ROAD

* MORE THAN ONE HEC-1 CONCENTRATION POINT MAY EXIST AT A CERTAIN LOCATION. CONCENTRATION POINTS DISPLAYED HAVE THE LARGER DRAINAGE AREA

PBS&J

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N
W E
S

1 INCH = 1800 FEET

SUBBASIN BOUNDARIES

LIMITS OF STUDY (BY OTHERS)

EXISTING DETENTION BASINS (FOR THIS PROJECT)

FLOW DIRECTION

LONGEST SUBBASIN WATERCOURSE

HEC-1 COMBINATION POINT

p:\drdm\f3\jobs2.fmw\stfig5.gra

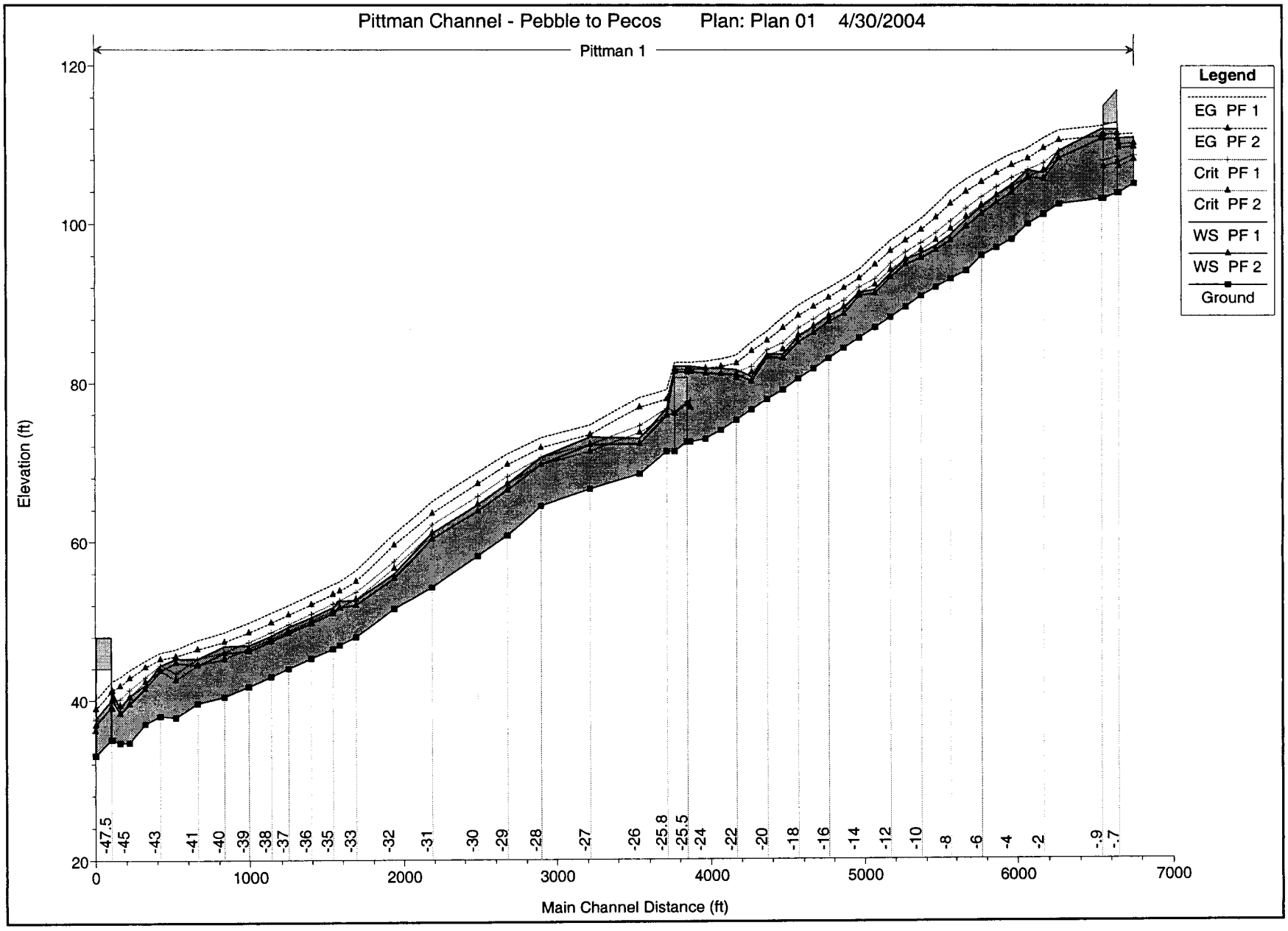
St. Rose Widening
Culvert Crossing Information

Crossing Number	Size (english)
1	4-14' x 5'RCB
2	24"CMP
3	24"CMP
4	36"CMP
5	8' x 4'RCB
6	30"CMP
7	8' x 4'RCB
8	10' x 5'RCB
9	2-36"CMP
10	30"CMP
11	36"CMP
12	36"CMP
13	30"CMP
14	8' x 4'RCB
15	36"CMP
16	36"CMP
17	10' x 6'RCB
18	2-8' x 8' RCB
19	30"CMP
20	2-10' x 6'RCB 1-12' x 6'RCB
21	36"CMP
22	30"CMP
23	24"CMP

SEE FIGURE 5A FOR CONTINUATION OF SUBBASINS

APPENDIX D
Hydraulics

Pittman Wash HEC-RAS Model
Pebble Road to Pecos Road


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
Pittman 1
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Elevation (ft)
120
100
80
60
40
20
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)
-47.5
-45
-43
-41
-40
-39
-38
-37
-36
-35
-33
-32
-31
-30
-29
-28
-27
-26
-25.8
-25.5
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
-.9
-.7

HEC-RAS Plan: Plan 01 River: Pittman Reach: 1

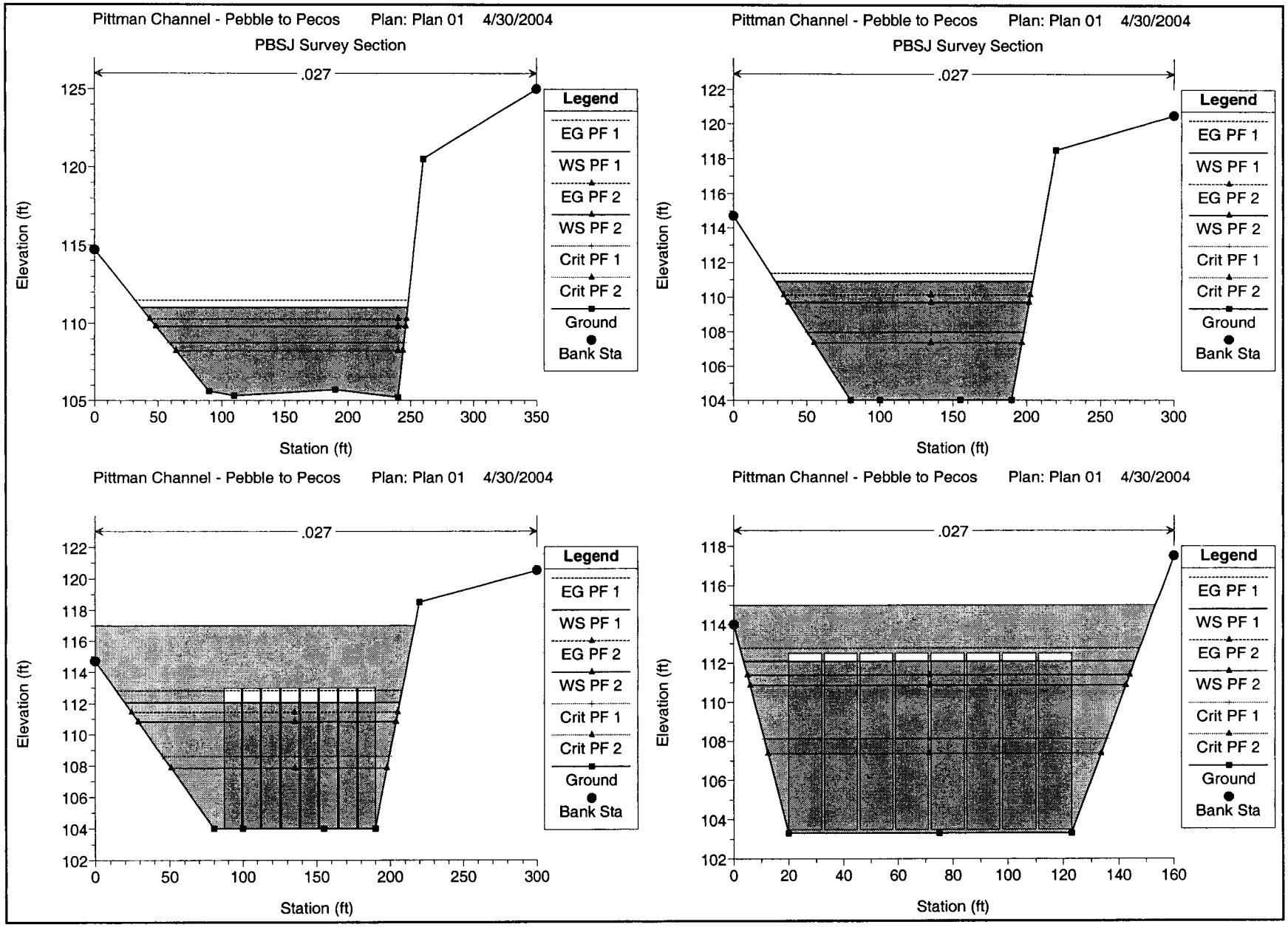
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	-.5	PF 1	5411.00	105.20	111.04	108.76	111.49	0.001226	5.40	1002.11	211.38	0.44
1	-.5	PF 2	4150.00	105.20	109.82	108.25	110.29	0.001707	5.51	752.97	197.74	0.50
1	-.7	PF 1	5411.00	104.00	110.91	107.96	111.38	0.001008	5.48	987.96	175.96	0.41
1	-.7	PF 2	4150.00	104.00	109.70	107.35	110.14	0.001177	5.31	782.23	164.42	0.43
1	-.8		Culvert									
1	-.9	PF 1	5411.00	103.30	112.09		112.48	0.000578	5.02	1078.59	142.34	0.32
1	-.9	PF 2	4150.00	103.30	110.85		111.18	0.000576	4.58	905.34	136.79	0.31
1	-1	PF 1	5411.00	102.61	109.30	109.30	111.90	0.005542	12.93	418.51	80.69	1.00
1	-1	PF 2	4150.00	102.61	108.37	108.37	110.62	0.005890	12.02	345.19	76.96	1.00
1	-2	PF 1	5411.00	101.31	106.51	107.76	110.91	0.013005	16.82	321.73	77.96	1.46
1	-2	PF 2	4150.00	101.31	105.77	106.85	109.59	0.014131	15.69	264.57	75.11	1.47
1	-3	PF 1	5411.00	100.10	106.84	106.92	109.64	0.005751	13.43	403.01	75.68	1.03
1	-3	PF 2	4150.00	100.10	105.92	105.95	108.31	0.005961	12.39	334.94	72.17	1.01
1	-4	PF 1	5411.00	98.17	105.02	105.86	108.86	0.008294	15.72	344.13	66.38	1.22
1	-4	PF 2	4150.00	98.17	103.99	104.75	107.46	0.009431	14.94	277.74	62.91	1.25
1	-5	PF 1	5411.00	97.14	103.68	104.71	107.92	0.009721	16.53	327.41	65.87	1.31
1	-5	PF 2	4150.00	97.14	102.79	103.69	106.46	0.010287	15.37	269.99	62.46	1.30
1	-6	PF 1	5411.00	96.11	102.19	103.46	106.84	0.011117	17.32	312.40	65.04	1.39
1	-6	PF 2	4150.00	96.11	101.35	102.42	105.33	0.011658	16.02	259.09	62.23	1.38
1	-7	PF 1	5411.00	94.18	100.64	102.02	105.66	0.011836	17.99	300.81	60.29	1.42
1	-7	PF 2	4150.00	94.18	99.75	100.94	104.08	0.012656	16.70	248.45	57.97	1.42
1	-8	PF 1	5411.00	93.15	98.69	100.41	104.22	0.016447	18.88	286.60	69.84	1.64
1	-8	PF 2	4150.00	93.15	98.02	99.43	102.62	0.016345	17.20	241.26	66.73	1.59
1	-9	PF 1	5411.00	92.12	97.40	98.97	102.44	0.016273	18.01	300.50	77.98	1.62
1	-9	PF 2	4150.00	92.12	96.84	98.05	100.87	0.015144	16.11	257.62	74.40	1.53
1	-10	PF 1	5411.00	91.00	96.38	97.68	100.72	0.013952	16.73	323.44	83.46	1.50
1	-10	PF 2	4150.00	91.00	95.79	96.79	99.31	0.013154	15.06	275.58	79.21	1.42
1	-11	PF 1	5411.00	89.61	95.61	96.53	99.30	0.010897	15.41	351.23	84.67	1.33
1	-11	PF 2	4150.00	89.61	95.00	95.65	97.97	0.010569	13.84	299.77	82.41	1.28
1	-12	PF 1	5411.00	88.31	93.90	95.11	97.97	0.015469	16.19	334.26	94.97	1.52
1	-12	PF 2	4150.00	88.31	93.35	94.30	96.69	0.014952	14.66	283.17	90.93	1.46
1	-13	PF 1	5411.00	87.01	91.83	93.16	96.23	0.018853	16.84	321.39	100.93	1.66
1	-13	PF 2	4150.00	87.01	91.31	92.41	94.97	0.019155	15.34	270.46	98.33	1.63
1	-14	PF 1	5411.00	85.70	91.38	92.10	94.37	0.011330	13.88	389.92	112.14	1.31
1	-14	PF 2	4150.00	85.70	90.99	91.37	93.22	0.009702	11.98	346.37	110.18	1.19
1	-15	PF 1	5411.00	84.40	89.44	90.40	93.13	0.012176	15.41	351.17	90.97	1.38
1	-15	PF 2	4150.00	84.40	88.72	89.59	91.98	0.013599	14.48	286.52	87.91	1.41
1	-16	PF 1	5411.00	83.10	88.47	89.28	91.98	0.009949	15.03	359.92	84.12	1.28
1	-16	PF 2	4150.00	83.10	87.74	88.42	90.72	0.010310	13.84	299.82	80.84	1.27
1	-17	PF 1	5411.00	81.81	87.11	88.02	90.92	0.010703	15.67	345.31	79.20	1.32
1	-17	PF 2	4150.00	81.81	86.35	87.13	89.61	0.011382	14.49	286.40	76.76	1.32
1	-18	PF 1	5411.00	80.50	85.84	86.90	89.79	0.011676	15.95	339.23	81.88	1.38
1	-18	PF 2	4150.00	80.50	85.16	86.01	88.45	0.011684	14.55	285.26	78.51	1.35
1	-19	PF 1	5411.00	79.10	83.64	85.04	88.28	0.018383	17.28	313.22	92.78	1.66
1	-19	PF 2	4150.00	79.10	83.11	84.25	86.94	0.018596	15.70	264.29	90.65	1.62
1	-20	PF 1	5411.00	77.90	83.68	84.18	86.53	0.008614	13.53	399.87	98.31	1.18
1	-20	PF 2	4150.00	77.90	83.28	83.40	85.34	0.006956	11.49	361.16	96.32	1.05
1	-21	PF 1	5411.00	76.60	80.77	82.08	85.14	0.018902	16.77	322.61	101.12	1.65
1	-21	PF 2	4150.00	76.60	80.19	81.32	84.03	0.021319	15.72	263.91	99.27	1.70
1	-22	PF 1	5411.00	75.30	81.68	81.35	83.53	0.004821	10.92	495.63	108.62	0.90
1	-22	PF 2	4150.00	75.30	81.01	80.60	82.50	0.004643	9.78	424.17	105.96	0.86

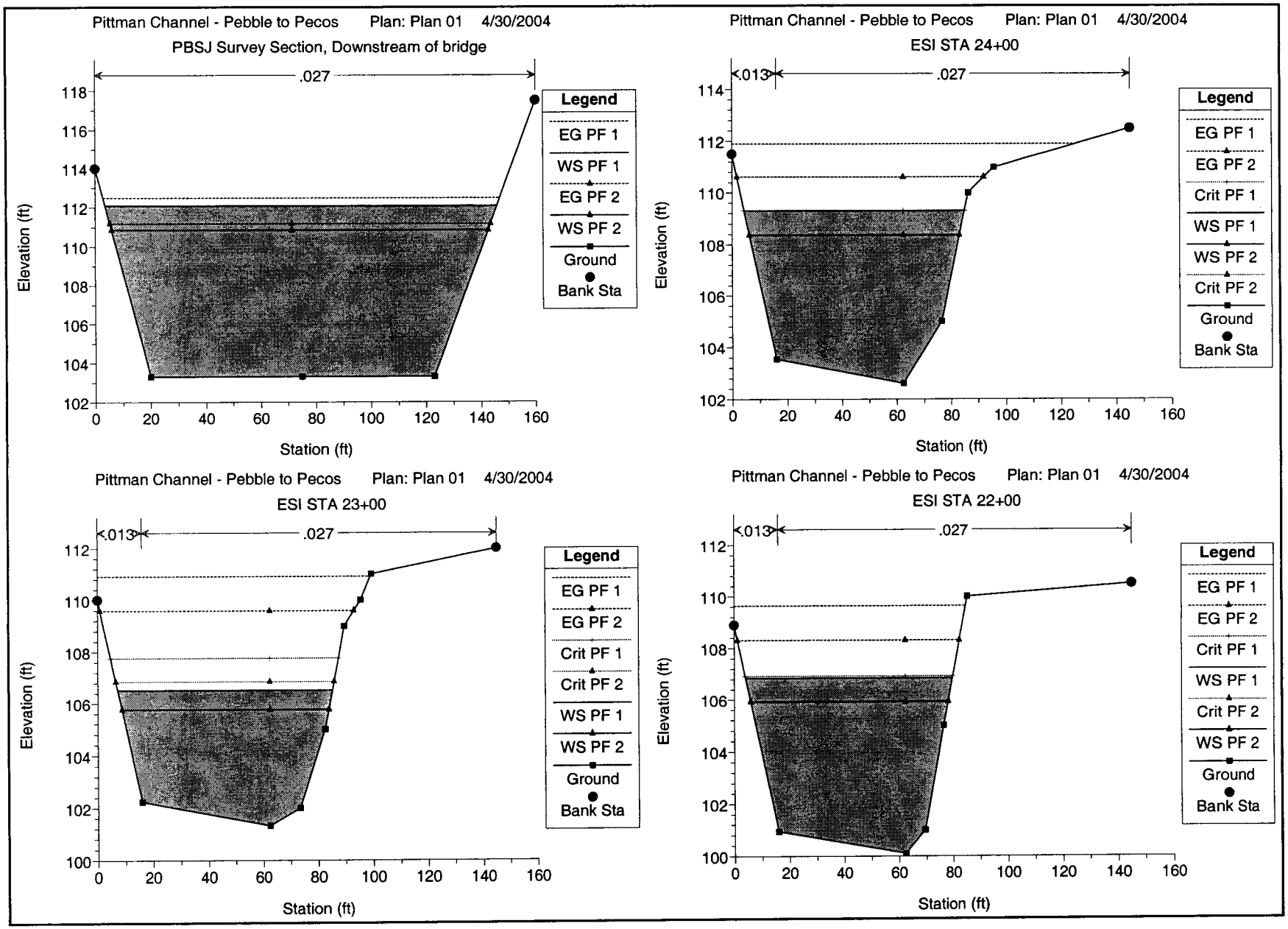
HEC-RAS Plan: Plan 01 River: Pittman Reach: 1 (Continued)

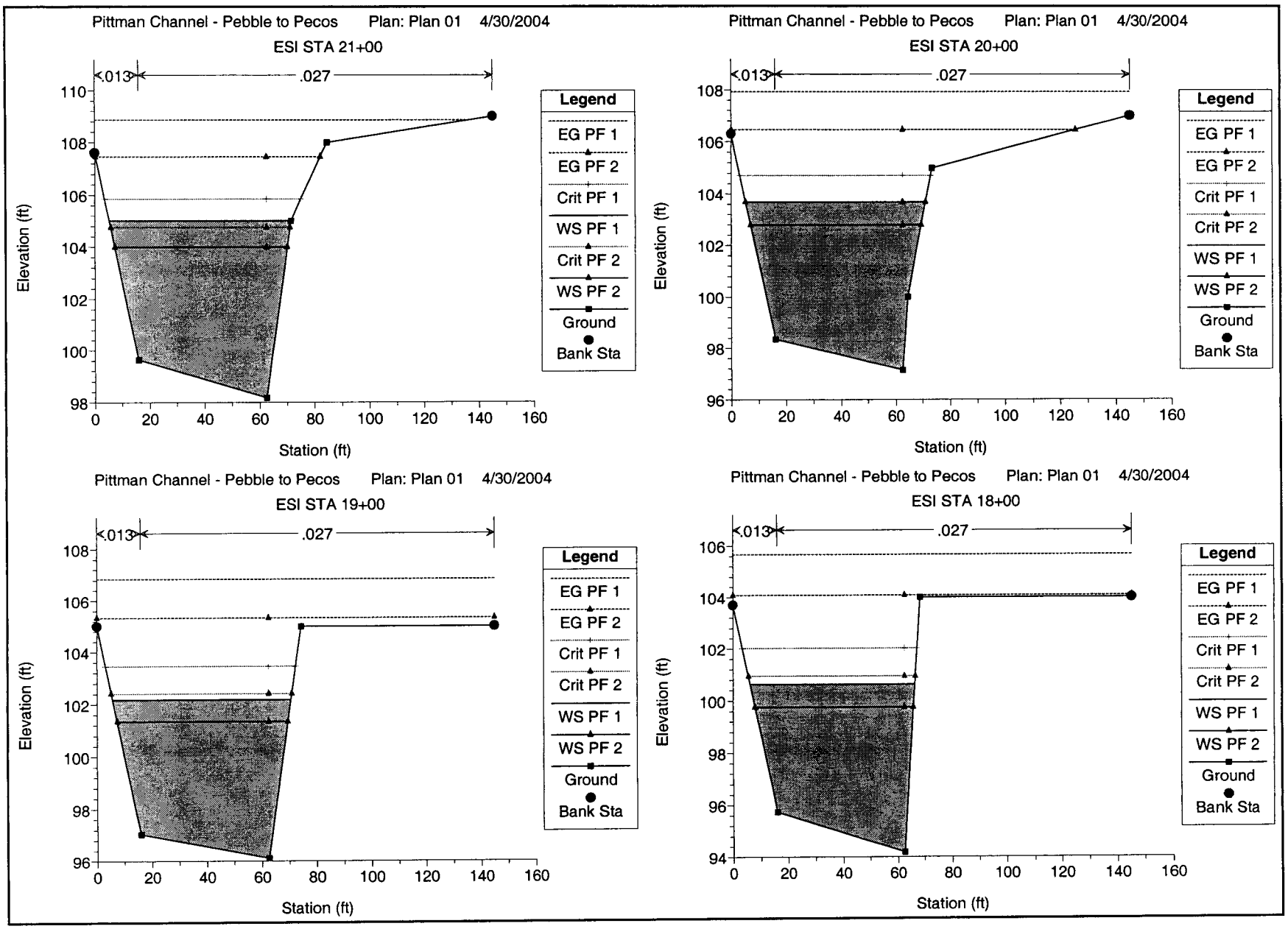
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	-23	PF 1	5411.00	74.00	81.81		83.03	0.002193	8.86	610.45	102.57	0.64
1	-23	PF 2	4150.00	74.00	81.14		82.05	0.001862	7.65	542.54	100.10	0.58
1	-24	PF 1	5411.00	72.90	81.90		82.75	0.001265	7.42	729.68	107.54	0.50
1	-24	PF 2	4150.00	72.90	81.20		81.82	0.001039	6.33	655.24	105.23	0.45
1	-25	PF 1	5540.00	72.49	82.12	77.75	82.61	0.000156	5.76	1099.78	750.69	0.35
1	-25	PF 2	4150.00	72.49	81.35	76.89	81.72	0.000128	4.90	915.79	615.76	0.31
1	-25.5		Culvert									
1	-25.8	PF 1	5502.00	71.31	76.76	76.76	79.11	0.001523	12.31	446.79	95.06	1.00
1	-25.8	PF 2	4150.00	71.31	75.87	75.87	77.88	0.001599	11.38	364.64	90.87	1.00
1	-26	PF 1	5502.00	68.46	72.99	74.57	78.14	0.021562	18.22	301.91	87.83	1.73
1	-26	PF 2	4150.00	68.46	72.28	73.69	76.89	0.024597	17.24	240.71	84.22	1.80
1	-27	PF 1	5502.00	66.60	73.16	72.18	74.68	0.003630	9.89	556.21	105.54	0.76
1	-27	PF 2	4150.00	66.60	72.16	71.35	73.46	0.003822	9.15	453.41	100.75	0.76
1	-28	PF 1	5502.00	64.50	70.61	70.61	73.06	0.006494	12.57	437.77	89.27	1.00
1	-28	PF 2	4150.00	64.50	69.70	69.70	71.79	0.006816	11.59	357.92	85.76	1.00
1	-29	PF 1	5502.00	60.77	67.30	68.22	71.05	0.011801	15.53	354.20	82.83	1.32
1	-29	PF 2	4150.00	60.77	66.50	67.29	69.70	0.012434	14.35	289.18	79.48	1.33
1	-30	PF 1	5502.00	58.19	64.69	65.73	68.73	0.012328	16.12	341.23	76.79	1.35
1	-30	PF 2	4150.00	58.19	63.88	64.74	67.29	0.012738	14.82	280.06	73.58	1.34
1	-31	PF 1	5502.00	54.26	61.09	62.12	65.08	0.011974	16.02	343.49	77.28	1.34
1	-31	PF 2	4150.00	54.26	60.34	61.12	63.59	0.011629	14.46	286.92	73.85	1.29
1	-32	PF 1	5502.00	51.56	55.98	57.50	60.98	0.022416	17.94	306.61	93.99	1.75
1	-32	PF 2	4150.00	51.56	55.42	56.67	59.54	0.022888	16.29	254.80	92.01	1.72
1	-33	PF 1	5502.00	48.00	52.68	53.65	56.38	0.013114	15.45	356.15	90.91	1.38
1	-33	PF 2	4150.00	48.00	52.05	52.78	55.02	0.012717	13.84	299.78	88.39	1.32
1	-34	PF 1	5502.00	47.00	52.56	52.64	55.03	0.006969	12.60	436.68	93.76	1.03
1	-34	PF 2	4150.00	47.00	51.74	51.77	53.80	0.007109	11.50	361.01	90.60	1.01
1	-35	PF 1	5475.00	46.50	51.76	52.20	54.63	0.008819	13.60	402.71	92.20	1.15
1	-35	PF 2	4150.00	46.50	50.99	51.32	53.40	0.009100	12.46	333.00	89.23	1.14
1	-36	PF 1	5475.00	45.30	50.48	50.92	53.38	0.008971	13.66	400.79	92.27	1.16
1	-36	PF 2	4150.00	45.30	49.78	50.07	52.13	0.008792	12.31	337.01	89.57	1.12
1	-37	PF 1	5475.00	44.00	49.30	49.62	52.04	0.008230	13.28	412.22	92.75	1.11
1	-37	PF 2	4150.00	44.00	48.51	48.77	50.82	0.008527	12.19	340.37	89.71	1.10
1	-38	PF 1	5475.00	43.00	48.17	48.63	51.08	0.009008	13.68	400.25	92.25	1.16
1	-38	PF 2	4150.00	43.00	47.45	47.77	49.84	0.008969	12.39	334.84	89.47	1.13
1	-39	PF 1	5475.00	41.70	46.97	47.38	49.83	0.008763	13.57	403.55	92.23	1.14
1	-39	PF 2	4150.00	41.70	46.23	46.54	48.59	0.008816	12.34	336.43	89.38	1.12
1	-40	PF 1	5475.00	40.40	46.87	46.08	48.61	0.004113	10.58	517.39	96.88	0.81
1	-40	PF 2	4150.00	40.40	45.98	45.24	47.41	0.004084	9.60	432.12	93.42	0.79
1	-41	PF 1	5475.00	39.60	45.28	45.28	47.66	0.006632	12.37	442.48	94.09	1.01
1	-41	PF 2	4150.00	39.60	44.44	44.44	46.45	0.006883	11.38	364.82	90.80	1.00
1	-42	PF 1	5475.00	37.80	45.27	43.42	46.47	0.002367	8.80	622.17	101.10	0.63
1	-42	PF 2	4150.00	37.80	44.76	42.58	45.58	0.001752	7.26	571.78	99.16	0.53
1	-43	PF 1	5475.00	38.00	44.43	44.43	46.06	0.006450	10.74	549.23	168.75	0.97
1	-43	PF 2	4150.00	38.00	43.74	43.74	45.21	0.006471	10.17	439.87	148.71	0.96
1	-44	PF 1	5475.00	37.00	41.93	42.93	45.04	0.012478	15.64	441.65	201.08	1.36
1	-44	PF 2	4150.00	37.00	41.47	42.38	44.21	0.012340	14.36	354.27	179.70	1.33
1	-45	PF 1	5475.00	34.64	40.54	41.29	43.85	0.010962	14.60	374.99	91.07	1.27
1	-45	PF 2	4150.00	34.64	39.52	40.42	42.82	0.014573	14.57	284.78	86.18	1.41
1	-46	PF 1	5475.00	34.60	38.97	40.14	42.96	0.017349	16.02	341.79	102.60	1.55

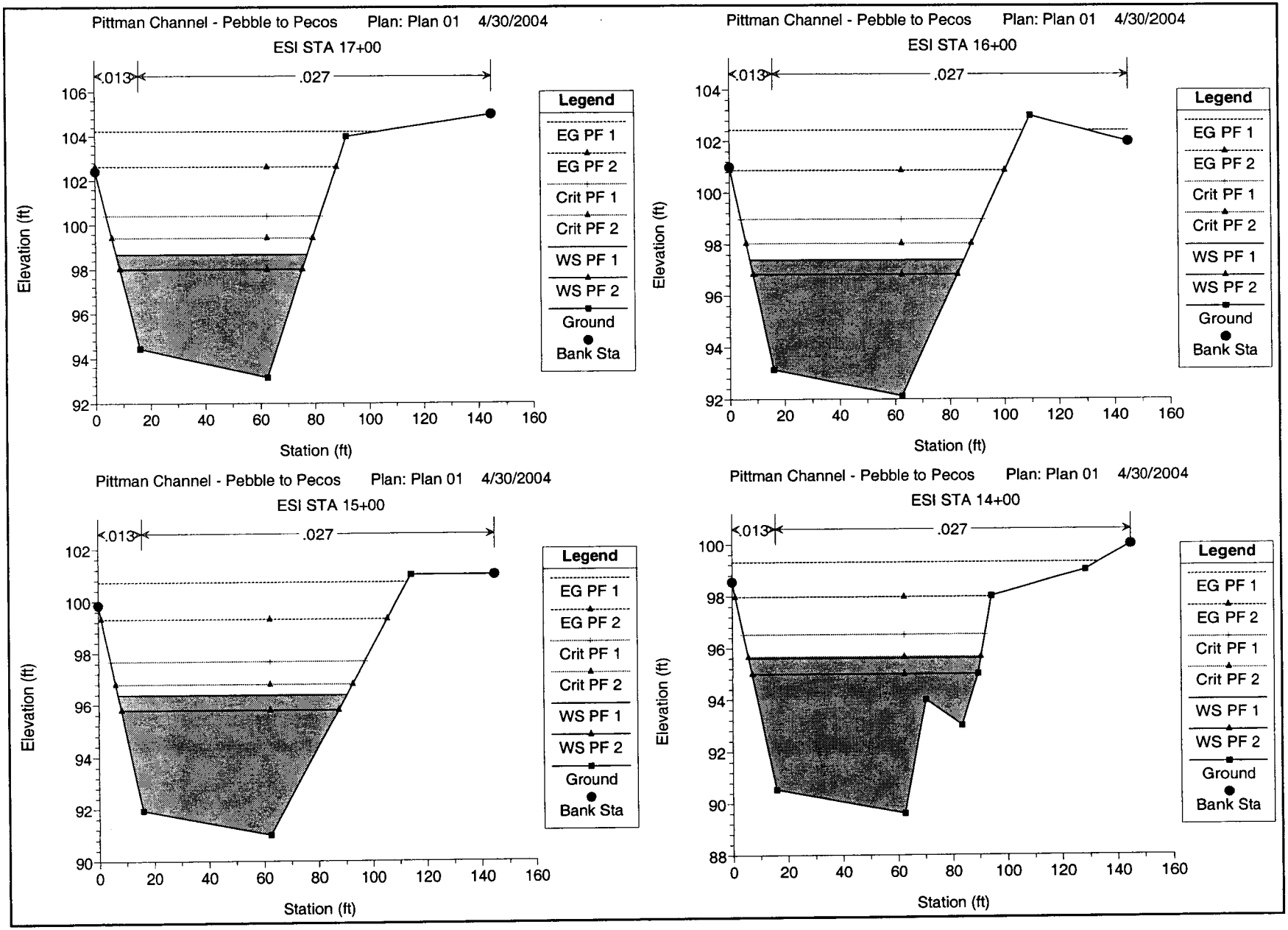
HEC-RAS Plan: Plan 01 River: Pittman Reach: 1 (Continued)

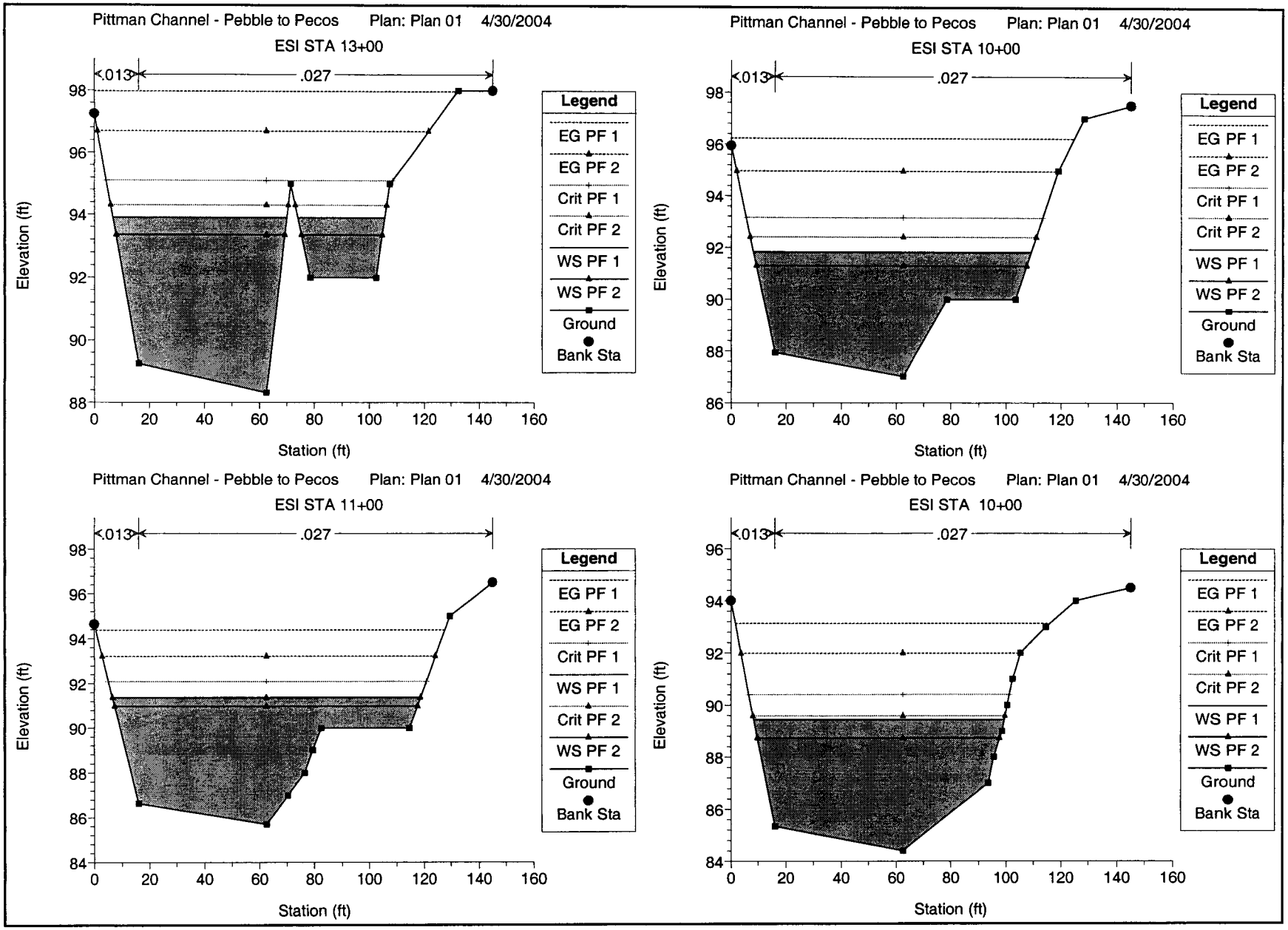
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	-46	PF 2	4150.00	34.60	38.34	39.35	41.81	0.019100	14.94	277.83	99.78	1.58
1	-47	PF 1	5475.00	35.01	41.15	39.75	42.44	0.002864	9.10	601.37	105.92	0.67
1	-47	PF 2	4150.00	35.01	40.16	38.98	41.24	0.002971	8.34	497.54	103.34	0.67
1	-47.5		Bridge									
1	-48	PF 1	5475.00	33.00	36.78	37.55	40.08	0.013069	14.59	375.24	100.72	1.33
1	-48	PF 2	4150.00	33.00	36.16	36.79	38.89	0.013528	13.26	312.88	100.27	1.32


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ Survey Section
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Crit PF 1
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ Survey Section
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Crit PF 1
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Crit PF 1
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Crit PF 1
Crit PF 2
Ground
Bank Sta


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ Survey Section, Downstream of bridge
.027
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 24+00
.013
.027
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 23+00
.013
.027
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 22+00
.013
.027
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 21+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 20+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 19+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 18+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 17+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 16+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 15+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 14+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta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ESI STA 13+00
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Station (ft)
Legend
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EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 10+00
.013
.027
Elevation (ft)
Station (ft)
Legend
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EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 11+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 10+00
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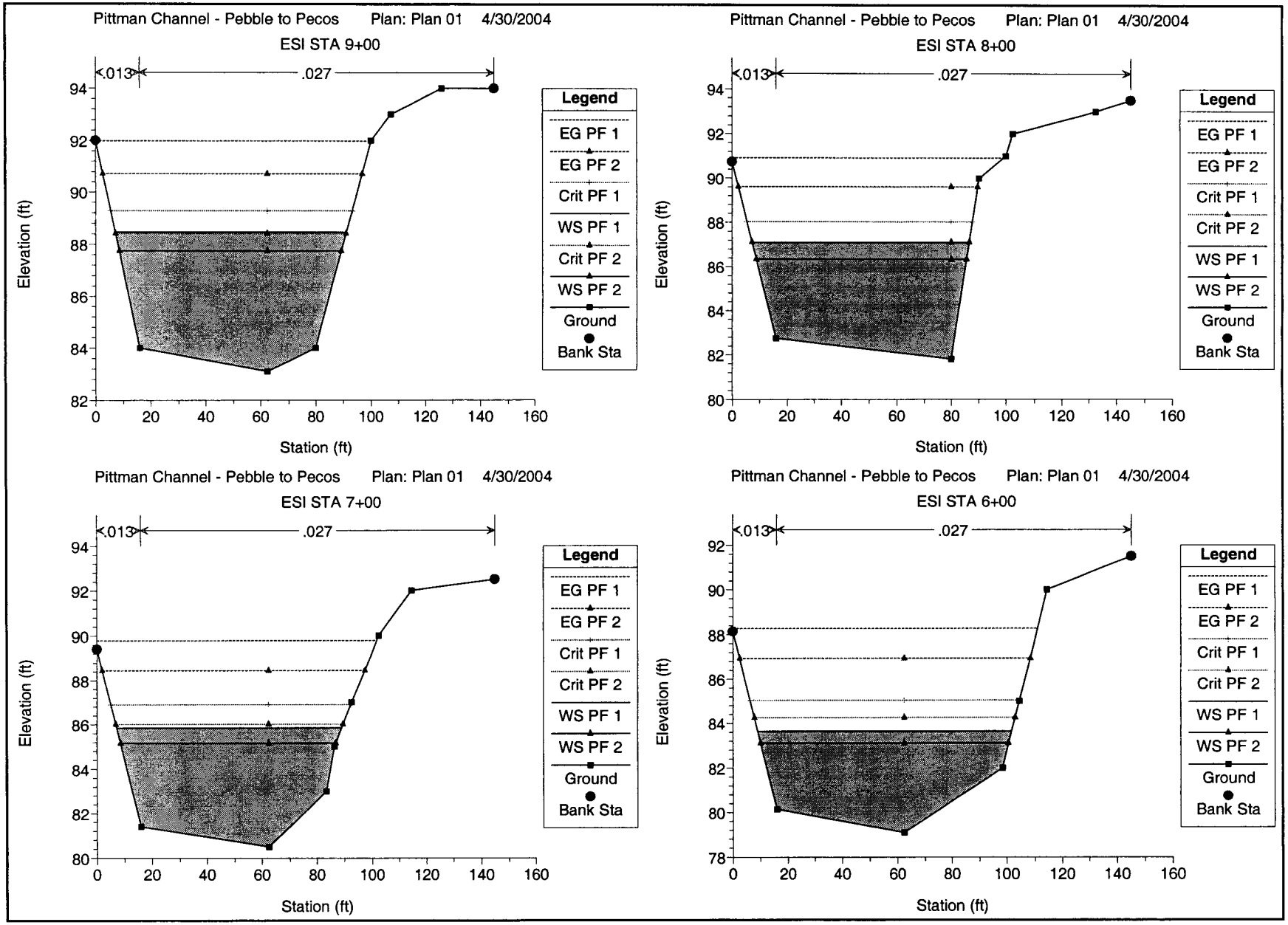
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta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Elevation (ft)
Station (ft)
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EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 8+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 7+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 6+00
.013
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Elevation (ft)
Station (ft)
Legend
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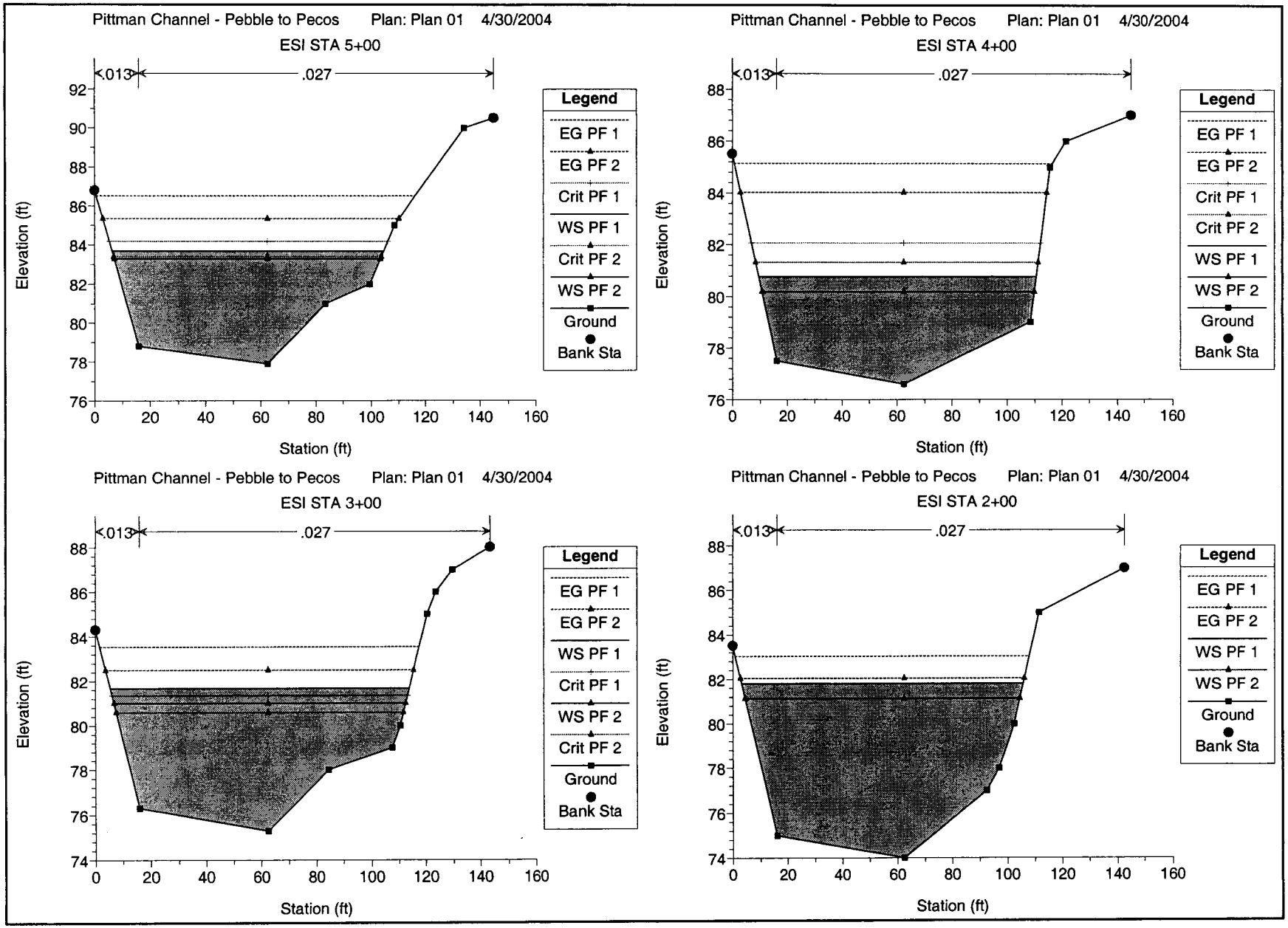
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta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ESI STA 5+00
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Elevation (ft)
Station (ft)
Legend
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EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 4+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 3+00
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
WS PF 1
Crit PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 2+00
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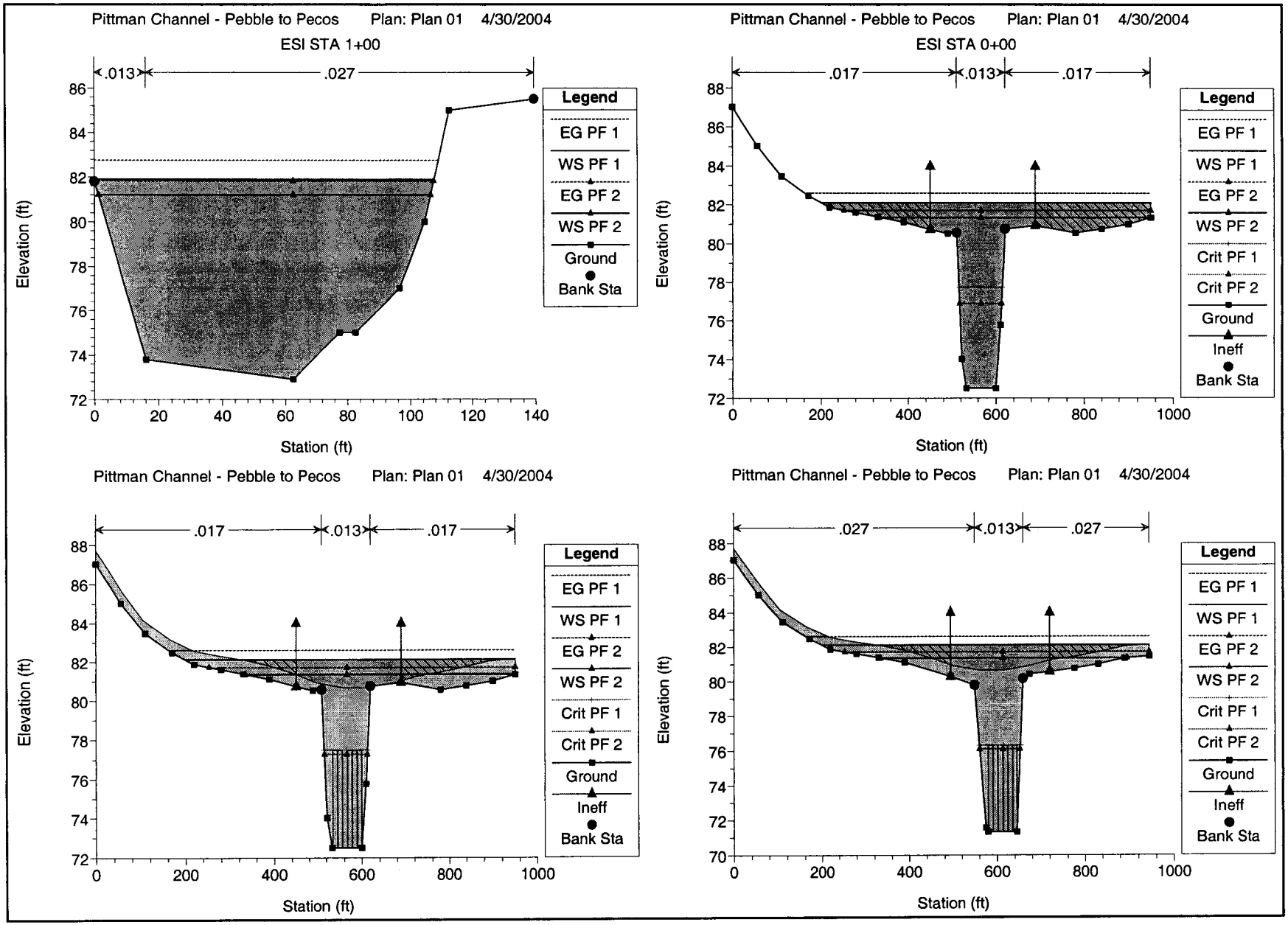
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
WS PF 1
WS PF 2
Ground
Bank Sta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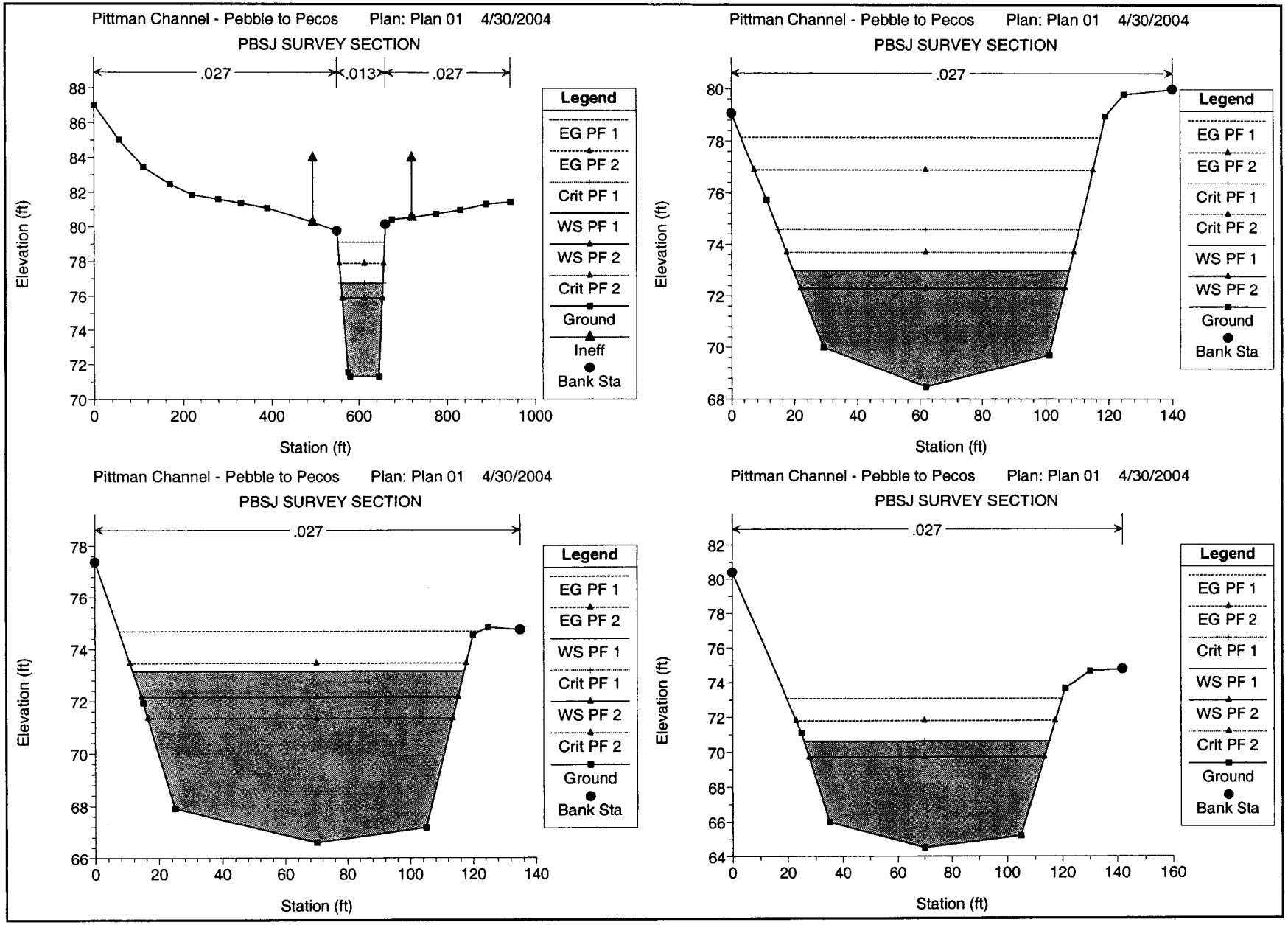
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 0+00
.017
.013
.017
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Crit PF 1
Crit PF 2
Ground
Ineff
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
.017
.013
.017
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Crit PF 1
Crit PF 2
Ground
Ineff
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
.027
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
EG PF 2
WS PF 2
Crit PF 1
Crit PF 2
Ground
Ineff
Bank Sta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PBSJ SURVEY SECTION
.027
.013
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
WS PF 1
Crit PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
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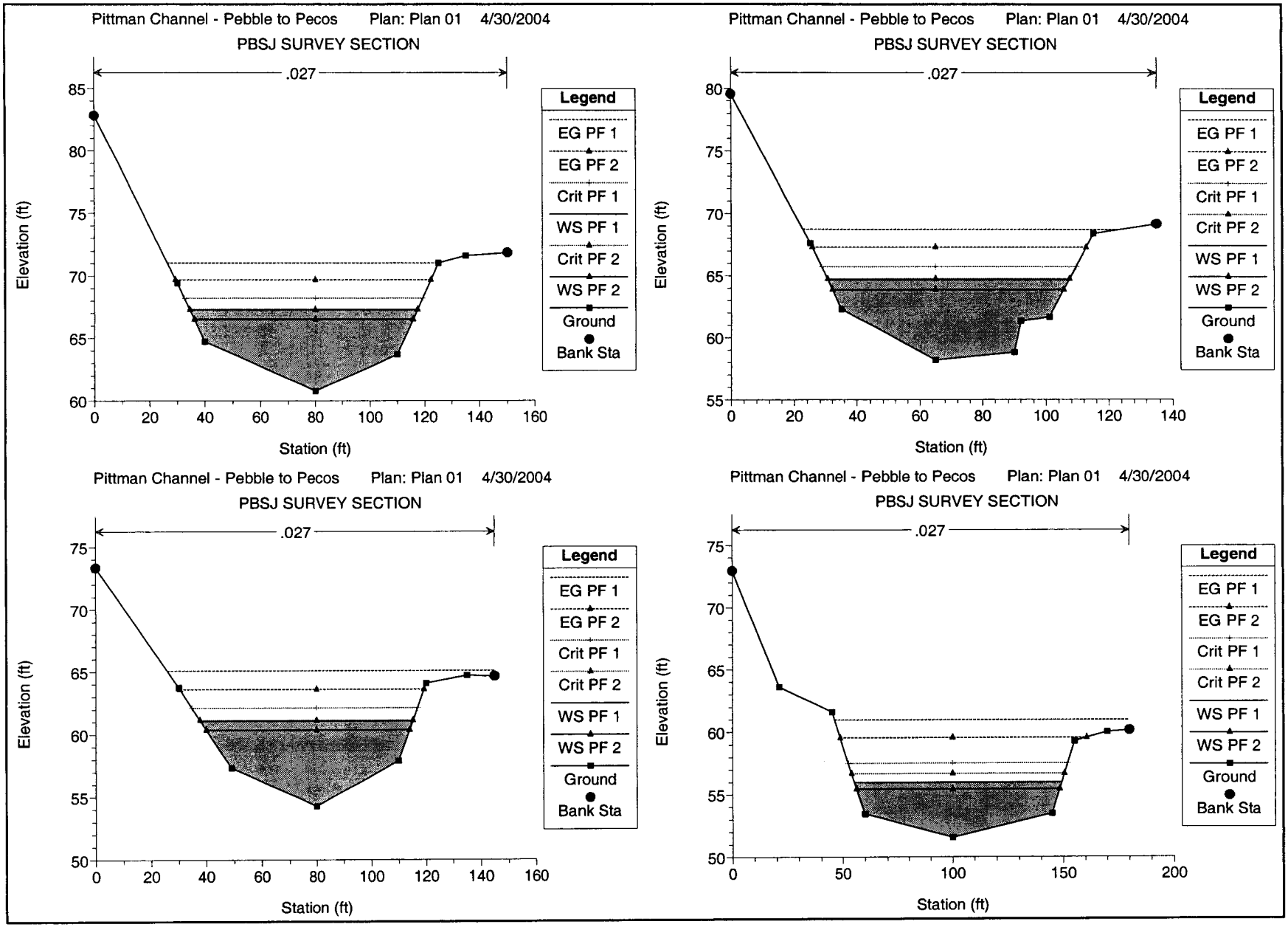
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
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Elevation (ft)
Station (ft)
Legend
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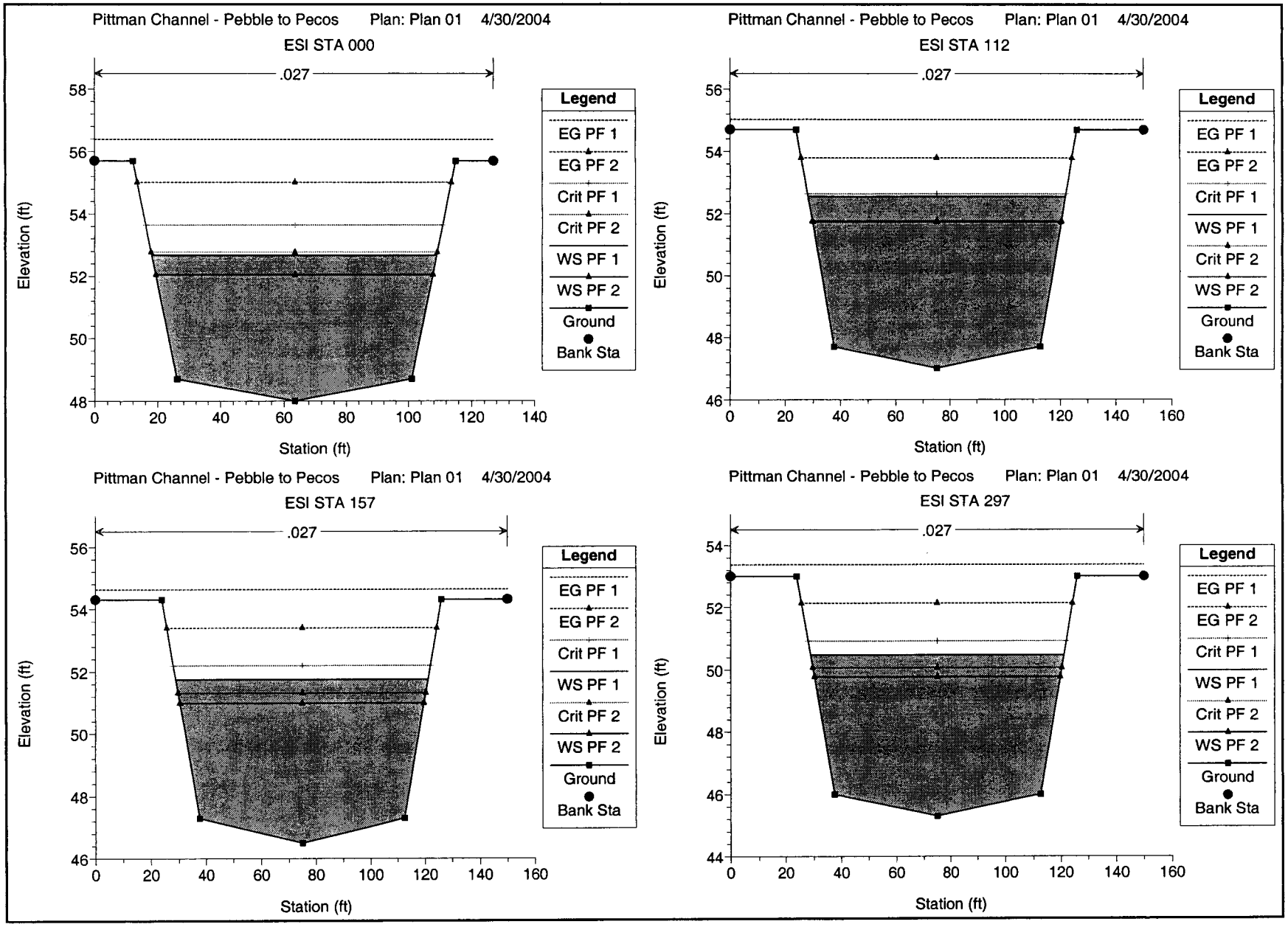
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 000
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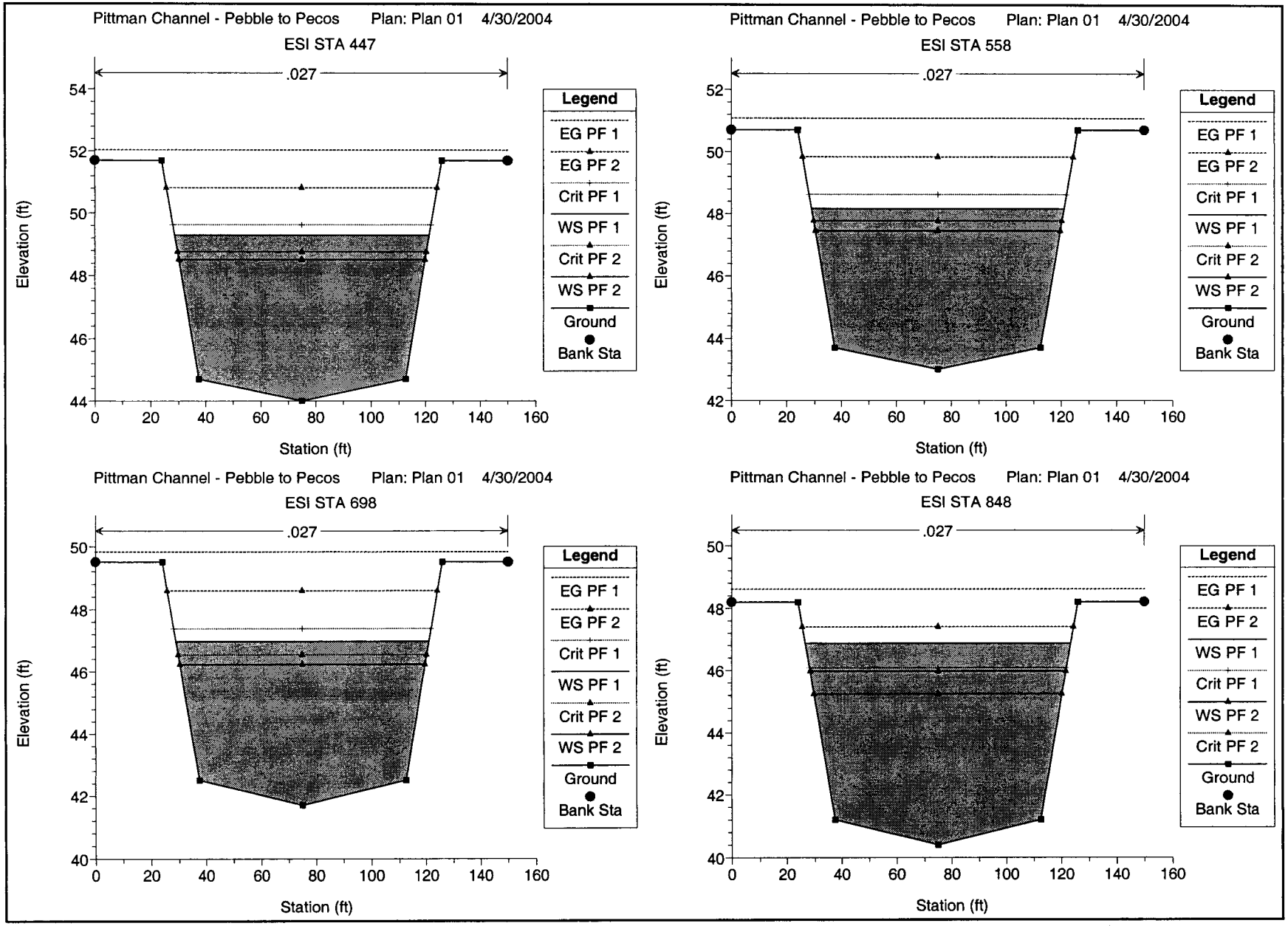
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 112
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 157
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 297
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta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Elevation (ft)
Station (ft)
Legend
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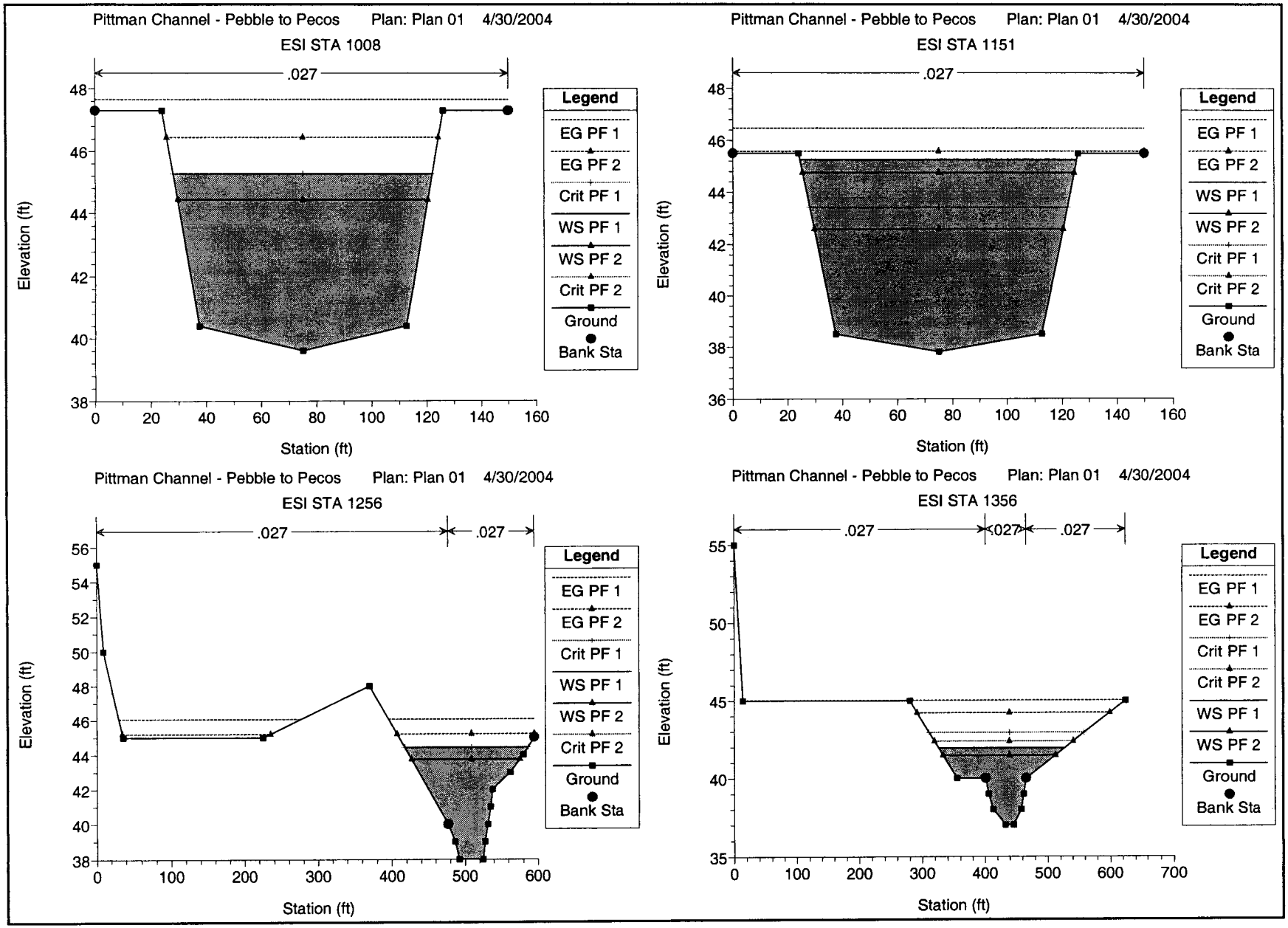
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 558
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 698
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 848
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
WS PF 1
Crit PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 1008
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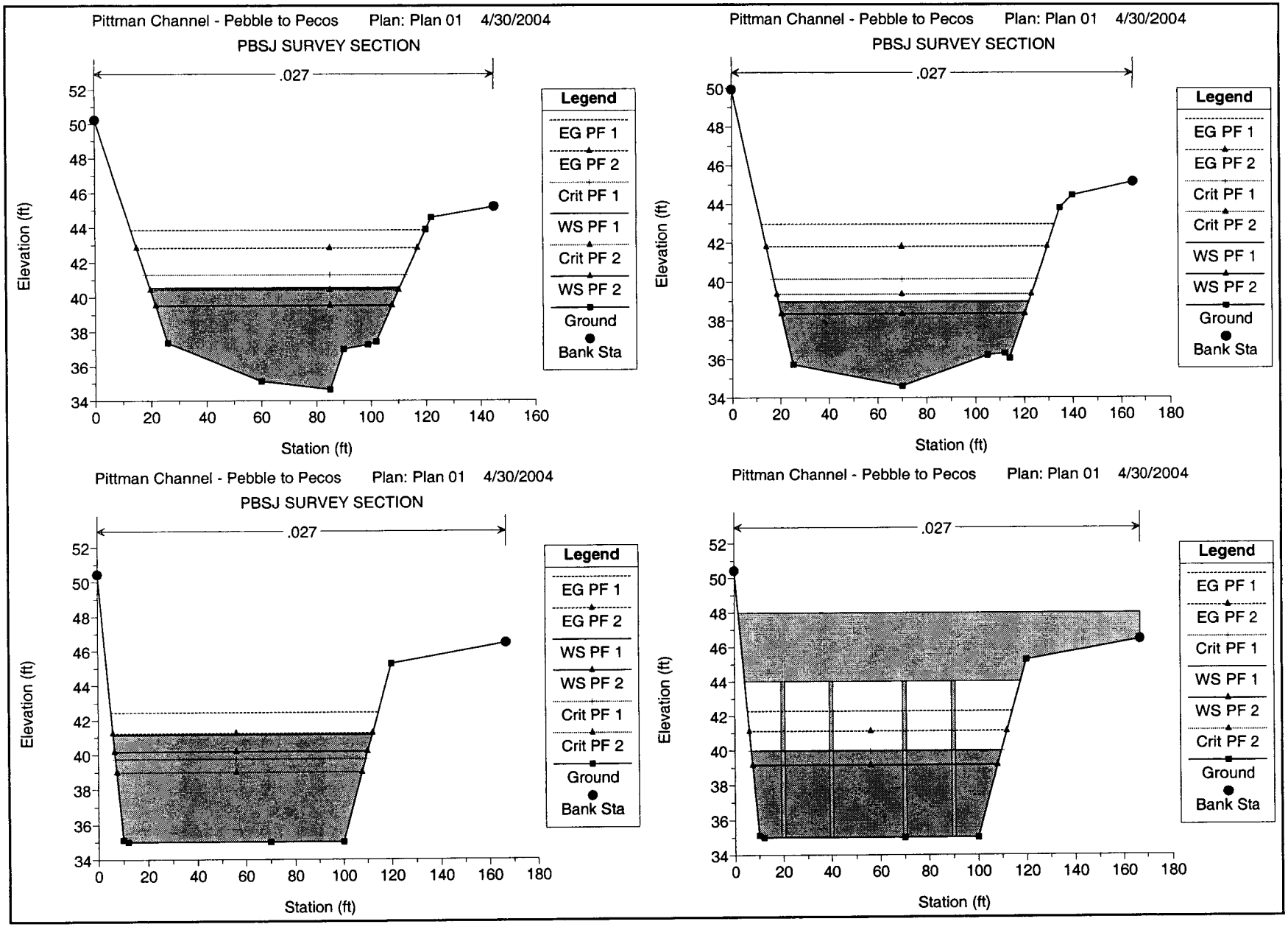
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 1151
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
WS PF 1
WS PF 2
Crit PF 1
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 1256
.027
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
ESI STA 1356
.027
.027
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
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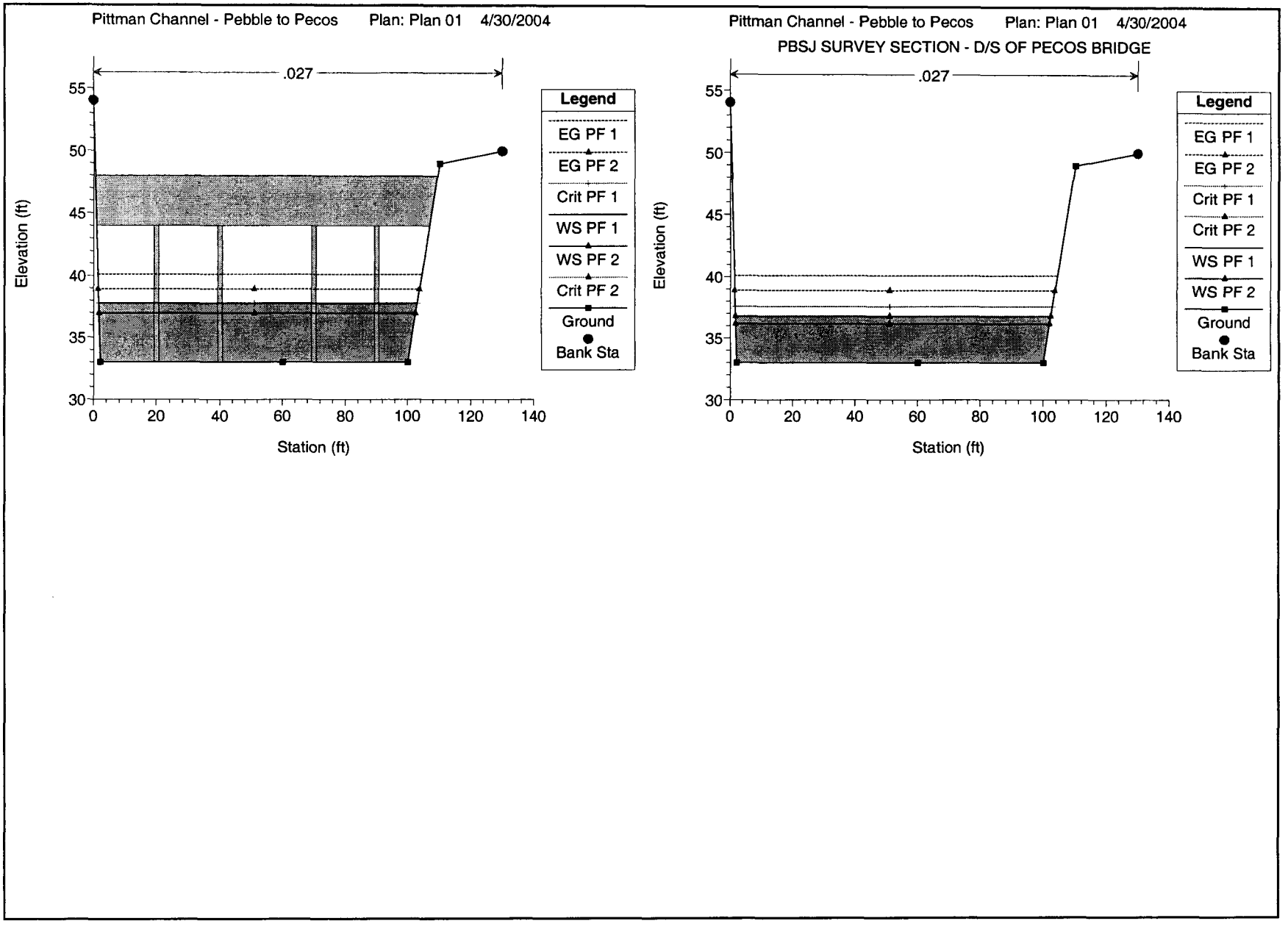
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
Crit PF 2
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
WS PF 1
WS PF 2
Crit PF 1
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
.027
Elevation (ft)
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta


Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
.027
Elevation (ft)
55
50
45
40
35
30
0
20
40
60
80
100
120
140
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
WS PF 1
WS PF 2
Crit PF 2
Ground
Bank Sta
Pittman Channel - Pebble to Pecos Plan: Plan 01 4/30/2004
PBSJ SURVEY SECTION - D/S OF PECOS BRIDGE
.027
Elevation (ft)
55
50
45
40
35
30
0
20
40
60
80
100
120
140
Station (ft)
Legend
EG PF 1
EG PF 2
Crit PF 1
Crit PF 2
WS PF 1
WS PF 2
Ground
Bank Sta

HEC-RAS Version 3.1 November 2002
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
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: Pittman Channel - Pebble to Pecos
Project File : Pittman.prj
Run Date and Time: 4/30/2004 10:34:46 AM

Project in English units

Project Description:
HEC-2 Import Data Into HEC-RAS for a Reach of the Pittman Channel from Pebble Road to Pecos Road.

PLAN DATA

Plan Title: Plan 01
Plan File : 1:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.p01

Geometry Title: Pitmman Channel
Geometry File : 1:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.g01

Flow Title : Pittman Channel
Flow File : 1:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.f01

Plan Summary Information:

Number of:	Cross Sections	= 52	Mulitple Openings	=	0
	Culverts	= 2	Inline Structures	=	0
	Bridges	= 1	Lateral Structures	=	0

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: Pittman Channel
Flow File : 1:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.f01

Flow Data (cfs)

River	Reach	RS	PF 1	PF 2
Pittman	1	-.5	5411	4150
Pittman	1	-25	5540	4150
Pittman	1	-25.8	5502	4150
Pittman	1	-35	5475	4150

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Pittman	1	PF 1	Normal S = 0.005	Critical

GEOMETRY DATA

Geometry Title: Pitmman Channel
Geometry File : 1:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.g01

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -.5

INPUT
Description: PBSJ Survey Section
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	114.7	90	105.6	110	105.3	190	105.7	240	105.2
260	120.5	350	125						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	350	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	350	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	111.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.		0.027	
W.S. Elev (ft)	111.04	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	108.76	Flow Area (sq ft)		1002.11	
E.G. Slope (ft/ft)	0.001226	Area (sq ft)		1002.11	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	211.38	Top Width (ft)		211.38	
Vel Total (ft/s)	5.40	Avg. Vel. (ft/s)		5.40	
Max Chl Dpth (ft)	5.84	Hydr. Depth (ft)		4.74	
Conv. Total (cfs)	154539.7	Conv. (cfs)		154539.7	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		213.64	
Min Ch El (ft)	105.20	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		1.94	
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	1.35	67.84	1.35
C & E Loss (ft)	0.00	Cum SA (acres)	1.20	14.44	1.09

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -.7

INPUT
Description: PBSJ Survey Section
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	114.7	80	104	100	104	155	104	190	104
220	118.5	300	120.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	300	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	300	110	110	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	111.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.		0.027	
W.S. Elev (ft)	110.91	Reach Len. (ft)	110.00	110.00	110.00
Crit W.S. (ft)	107.96	Flow Area (sq ft)		987.96	
E.G. Slope (ft/ft)	0.001008	Area (sq ft)		987.96	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	175.96	Top Width (ft)		175.96	
Vel Total (ft/s)	5.48	Avg. Vel. (ft/s)		5.48	
Max Chl Dpth (ft)	6.91	Hydr. Depth (ft)		5.61	
Conv. Total (cfs)	170445.5	Conv. (cfs)		170445.5	
Length Wtd. (ft)	110.00	Wetted Per. (ft)		178.00	
Min Ch El (ft)	104.00	Shear (lb/sq ft)		0.35	
Alpha	1.00	Stream Power (lb/ft s)		1.91	
Frctn Loss (ft)		Cum Volume (acre-ft)	1.35	65.55	1.35
C & E Loss (ft)		Cum SA (acres)	1.20	14.00	1.09

CULVERT

RIVER: Pittman
REACH: 1 RS: -.8

INPUT
Description:
Distance from Upstream XS = 10
Deck/Roadway Width = 90
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	117	105	220	117	102

Upstream Bridge Cross Section Data
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	114.7	80	104	100	104	155	104	190	104
220	118.5	300	120.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	300	.027

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	300	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	115	104	155	115	96

Downstream Bridge Cross Section Data
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	114	20	103.3	75	103.3	123	103.3	160	117.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	160	.027

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	160	.1	.3

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 =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	9	12

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Inlet control

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
10	90	.013	.013	0	.2	1

Number of Barrels = 8
Upstream Elevation = 103.98
Centerline Stations

Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.
93	106	119	132	145	158	171	184

Downstream Elevation = 103.5
Centerline Stations

Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.	Sta.
26	39	52	65	78	91	104	117

CULVERT OUTPUT Profile #PF 1 Culv Group: Culvert #1

Q Culv Group (cfs)	5411.00	Culv Full Len (ft)	
# Barrels	8	Culv Vel US (ft/s)	6.97
Q Barrel (cfs)	676.38	Culv Vel DS (ft/s)	6.56
E.G. US. (ft)	111.38	Culv Inv El Up (ft)	103.98
W.S. US. (ft)	110.91	Culv Inv El Dn (ft)	103.50
E.G. DS (ft)	112.48	Culv Frctn Ls (ft)	0.06
W.S. DS (ft)	112.09	Culv Exit Loss (ft)	0.28
Delta EG (ft)	1.11	Culv Entr Loss (ft)	
Delta WS (ft)	1.18	Q Weir (cfs)	
E.G. IC (ft)	111.38	Weir Sta Lft (ft)	
E.G. OC (ft)	112.97	Weir Sta Rgt (ft)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (ft)	112.07	Weir Max Depth (ft)	
Culv WS Outlet (ft)	112.09	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	3.83	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	4.62	Min El Weir Flow (ft)	117.01

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -.9

INPUT
Description: PBSJ Survey Section, Downstream of bridge
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	114	20	103.3	75	103.3	123	103.3	160	117.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	160	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	160	275	275	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	112.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.		0.027	
W.S. Elev (ft)	112.09	Reach Len. (ft)	275.00	275.00	275.00
Crit W.S. (ft)		Flow Area (sq ft)		1078.59	
E.G. Slope (ft/ft)	0.000578	Area (sq ft)		1078.59	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	142.34	Top Width (ft)		142.34	
Vel Total (ft/s)	5.02	Avg. Vel. (ft/s)		5.02	
Max Chl Dpth (ft)	8.79	Hydr. Depth (ft)		7.58	
Conv. Total (cfs)	224975.5	Conv. (cfs)		224975.5	
Length Wtd. (ft)	275.00	Wetted Per. (ft)		146.18	
Min Ch El (ft)	103.30	Shear (lb/sq ft)		0.27	
Alpha	1.00	Stream Power (lb/ft s)		1.34	
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	1.35	62.94	1.35
C & E Loss (ft)	0.22	Cum SA (acres)	1.20	13.60	1.09

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: Pittman
REACH: 1 RS: -1

INPUT
Description: ESI STA 24+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	111.5	16	103.54	62.5	102.61	76.5	105	86.5	110
95.5	111	145	112.5						

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	111.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.60	Wt. n-Val.		0.025	
W.S. Elev (ft)	109.30	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	109.30	Flow Area (sq ft)		418.51	
E.G. Slope (ft/ft)	0.005542	Area (sq ft)		418.51	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	80.69	Top Width (ft)		80.69	
Vel Total (ft/s)	12.93	Avg. Vel. (ft/s)		12.93	
Max Chl Dpth (ft)	6.69	Hydr. Depth (ft)		5.19	
Conv. Total (cfs)	72681.7	Conv. (cfs)		72681.7	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		83.27	
Min Ch El (ft)	102.61	Shear (lb/sq ft)		1.74	
Alpha	1.00	Stream Power (lb/ft s)		22.48	
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	1.35	58.22	1.35
C & E Loss (ft)	0.01	Cum SA (acres)	1.20	12.89	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -2

INPUT
Description: ESI STA 23+00
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	110	16	102.24	62.5	101.31	73.5	102	82.5	105
89.5	109	95.5	110	99.5	111	145	112		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	110.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.39	Wt. n-Val.		0.026	
W.S. Elev (ft)	106.51	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	107.76	Flow Area (sq ft)		321.73	
E.G. Slope (ft/ft)	0.013005	Area (sq ft)		321.73	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	77.96	Top Width (ft)		77.96	
Vel Total (ft/s)	16.82	Avg. Vel. (ft/s)		16.82	
Max Chl Dpth (ft)	5.20	Hydr. Depth (ft)		4.13	
Conv. Total (cfs)	47447.7	Conv. (cfs)		47447.7	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		79.86	
Min Ch El (ft)	101.31	Shear (lb/sq ft)		3.27	
Alpha	1.00	Stream Power (lb/ft s)		55.01	
Frctn Loss (ft)	0.81	Cum Volume (acre-ft)	1.35	57.37	1.35
C & E Loss (ft)	0.18	Cum SA (acres)	1.20	12.71	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -3

INPUT
Description: ESI STA 22+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	108.9	16	100.94	62.5	100.1	69.5	101	76.5	105
85.5	110	145	110.5						

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	109.64	Element	Left OB	Channel	Right OB

Vel Head (ft)	2.80	Wt. n-Val.		0.025	
W.S. Elev (ft)	106.84	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	106.92	Flow Area (sq ft)		403.01	
E.G. Slope (ft/ft)	0.005751	Area (sq ft)		403.01	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	75.68	Top Width (ft)		75.68	
Vel Total (ft/s)	13.43	Avg. Vel. (ft/s)		13.43	
Max Chl Dpth (ft)	6.74	Hydr. Depth (ft)		5.33	
Conv. Total (cfs)	71349.1	Conv. (cfs)		71349.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		78.67	
Min Ch El (ft)	100.10	Shear (lb/sq ft)		1.84	
Alpha	1.00	Stream Power (lb/ft s)		24.70	
Frctn Loss (ft)	0.81	Cum Volume (acre-ft)	1.35	56.54	1.35
C & E Loss (ft)	0.50	Cum SA (acres)	1.20	12.53	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -4

INPUT
Description: ESI STA 21+00
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	107.6	16	99.64	62.5	98.17	71.5	105	84.5	108
145	109								

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	108.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.84	Wt. n-Val.		0.025	
W.S. Elev (ft)	105.02	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	105.86	Flow Area (sq ft)		344.13	
E.G. Slope (ft/ft)	0.008294	Area (sq ft)		344.13	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	66.38	Top Width (ft)		66.38	
Vel Total (ft/s)	15.72	Avg. Vel. (ft/s)		15.72	
Max Chl Dpth (ft)	6.85	Hydr. Depth (ft)		5.18	
Conv. Total (cfs)	59415.7	Conv. (cfs)		59415.7	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		69.97	
Min Ch El (ft)	98.17	Shear (lb/sq ft)		2.55	
Alpha	1.00	Stream Power (lb/ft s)		40.04	
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)	1.35	55.68	1.35
C & E Loss (ft)	0.10	Cum SA (acres)	1.20	12.37	1.09

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -5

INPUT
Description: ESI STA 20+00
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	106.3	16	98.34	62.5	97.14	64.5	100	73.5	105
145	107								

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	107.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.24	Wt. n-Val.		0.025	
W.S. Elev (ft)	103.68	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	104.71	Flow Area (sq ft)		327.41	
E.G. Slope (ft/ft)	0.009721	Area (sq ft)		327.41	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	65.87	Top Width (ft)		65.87	
Vel Total (ft/s)	16.53	Avg. Vel. (ft/s)		16.53	
Max Chl Dpth (ft)	6.54	Hydr. Depth (ft)		4.97	
Conv. Total (cfs)	54881.4	Conv. (cfs)		54881.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		69.58	
Min Ch El (ft)	97.14	Shear (lb/sq ft)		2.86	
Alpha	1.00	Stream Power (lb/ft s)		47.19	
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	1.35	54.91	1.35

C & E Loss (ft)	0.04	Cum SA (acres)	1.20	12.22	1.09	

Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -6

INPUT
Description: ESI STA 19+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	105	16	97.04	62.5	96.11	74.5	105	145	105

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	106.84	Element			
Vel Head (ft)	4.66	Wt. n-Val.		0.025	
W.S. Elev (ft)	102.19	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	103.46	Flow Area (sq ft)		312.40	
E.G. Slope (ft/ft)	0.011117	Area (sq ft)		312.40	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	65.04	Top Width (ft)		65.04	
Vel Total (ft/s)	17.32	Avg. Vel. (ft/s)		17.32	
Max Chl Dpth (ft)	6.08	Hydr. Depth (ft)		4.80	
Conv. Total (cfs)	51319.2	Conv. (cfs)		51319.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		68.27	
Min Ch El (ft)	96.11	Shear (lb/sq ft)		3.18	
Alpha	1.00	Stream Power (lb/ft s)		55.01	
Frctn Loss (ft)	1.04	Cum Volume (acre-ft)	1.35	54.17	1.35
C & E Loss (ft)	0.04	Cum SA (acres)	1.20	12.07	1.09

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -7

INPUT
Description: ESI STA 18+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	103.7	16	95.74	62.5	94.18	68.5	104	145	104

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	105.66	Element			
Vel Head (ft)	5.02	Wt. n-Val.		0.025	
W.S. Elev (ft)	100.64	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	102.02	Flow Area (sq ft)		300.81	
E.G. Slope (ft/ft)	0.011836	Area (sq ft)		300.81	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	60.29	Top Width (ft)		60.29	
Vel Total (ft/s)	17.99	Avg. Vel. (ft/s)		17.99	
Max Chl Dpth (ft)	6.46	Hydr. Depth (ft)		4.99	
Conv. Total (cfs)	49736.2	Conv. (cfs)		49736.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		65.09	
Min Ch El (ft)	94.18	Shear (lb/sq ft)		3.42	
Alpha	1.00	Stream Power (lb/ft s)		61.43	
Frctn Loss (ft)	1.15	Cum Volume (acre-ft)	1.35	53.47	1.35
C & E Loss (ft)	0.04	Cum SA (acres)	1.20	11.92	1.09

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -8

INPUT
Description: ESI STA 17+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	102.4	16	94.44	62.5	93.15	91.5	104	145	105

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	145	100	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	104.22	Element	Left OB	Channel	Right OB	
Vel Head (ft)	5.54	Wt. n-Val.		0.025		
W.S. Elev (ft)	98.69	Reach Len. (ft)	100.00	100.00	100.00	
Crit W.S. (ft)	100.41	Flow Area (sq ft)		286.60		
E.G. Slope (ft/ft)	0.016447	Area (sq ft)		286.60		
Q Total (cfs)	5411.00	Flow (cfs)		5411.00		
Top Width (ft)	69.84	Top Width (ft)		69.84		
Vel Total (ft/s)	18.88	Avg. Vel. (ft/s)		18.88		
Max Chl Dpth (ft)	5.54	Hydr. Depth (ft)		4.10		
Conv. Total (cfs)	42191.9	Conv. (cfs)		42191.9		
Length Wtd. (ft)	100.00	Wetted Per. (ft)		71.86		
Min Ch El (ft)	93.15	Shear (lb/sq ft)		4.10		
Alpha	1.00	Stream Power (lb/ft s)		77.32		
Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	1.35	52.80	1.35	
C & E Loss (ft)	0.05	Cum SA (acres)	1.20	11.78	1.09	

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -9

INPUT
Description: ESI STA 16+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	101	16	93.14	62.5	92.12	109.5	103	145	102

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	102.44	Element	Left OB	Channel	Right OB	
Vel Head (ft)	5.03	Wt. n-Val.		0.026		
W.S. Elev (ft)	97.40	Reach Len. (ft)	100.00	100.00	100.00	
Crit W.S. (ft)	98.97	Flow Area (sq ft)		300.50		
E.G. Slope (ft/ft)	0.016273	Area (sq ft)		300.50		
Q Total (cfs)	5411.00	Flow (cfs)		5411.00		
Top Width (ft)	77.98	Top Width (ft)		77.98		
Vel Total (ft/s)	18.01	Avg. Vel. (ft/s)		18.01		
Max Chl Dpth (ft)	5.28	Hydr. Depth (ft)		3.85		
Conv. Total (cfs)	42418.0	Conv. (cfs)		42418.0		
Length Wtd. (ft)	100.00	Wetted Per. (ft)		79.59		
Min Ch El (ft)	92.12	Shear (lb/sq ft)		3.84		
Alpha	1.00	Stream Power (lb/ft s)		69.07		
Frctn Loss (ft)	1.64	Cum Volume (acre-ft)	1.35	52.12	1.35	
C & E Loss (ft)	0.15	Cum SA (acres)	1.20	11.61	1.09	

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -10

INPUT
Description: ESI STA 15+00
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	99.84	16	91.94	62.5	91	114.5	101	145	101

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	100.72	Element	Left OB	Channel	Right OB	
Vel Head (ft)	4.35	Wt. n-Val.		0.026		
W.S. Elev (ft)	96.38	Reach Len. (ft)	100.00	100.00	100.00	
Crit W.S. (ft)	97.68	Flow Area (sq ft)		323.44		
E.G. Slope (ft/ft)	0.013952	Area (sq ft)		323.44		
Q Total (cfs)	5411.00	Flow (cfs)		5411.00		
Top Width (ft)	83.46	Top Width (ft)		83.46		
Vel Total (ft/s)	16.73	Avg. Vel. (ft/s)		16.73		
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)		3.88		
Conv. Total (cfs)	45809.3	Conv. (cfs)		45809.3		
Length Wtd. (ft)	100.00	Wetted Per. (ft)		85.02		
Min Ch El (ft)	91.00	Shear (lb/sq ft)		3.31		
Alpha	1.00	Stream Power (lb/ft s)		55.44		
Frctn Loss (ft)	1.50	Cum Volume (acre-ft)	1.35	51.40	1.35	

C & E Loss (ft)	0.21	Cum SA (acres)	1.20	11.42	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -11

INPUT
Description: ESI STA 14+00

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	98.54	16	90.54	62.5	89.61	70.5	94	83.5	93
89.5	95	94.5	98	128.5	99	145	100		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	99.30	Element			
Vel Head (ft)	3.69	Wt. n-Val.		0.025	
W.S. Elev (ft)	95.61	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	96.53	Flow Area (sq ft)		351.23	
E.G. Slope (ft/ft)	0.010897	Area (sq ft)		351.23	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	84.67	Top Width (ft)		84.67	
Vel Total (ft/s)	15.41	Avg. Vel. (ft/s)		15.41	
Max Chl Dpth (ft)	6.00	Hydr. Depth (ft)		4.15	
Conv. Total (cfs)	51835.1	Conv. (cfs)		51835.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		87.54	
Min Ch El (ft)	89.61	Shear (lb/sq ft)		2.73	
Alpha	1.00	Stream Power (lb/ft s)		42.05	
Frctn Loss (ft)	1.23	Cum Volume (acre-ft)	1.35	50.63	1.35
C & E Loss (ft)	0.20	Cum SA (acres)	1.20	11.23	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -12

INPUT
Description: ESI STA 13+00

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	97.24	16	89.24	62.5	88.31	71.5	95	78.5	92
102.5	92	107.5	95	132.5	98	145	98		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	97.97	Element			
Vel Head (ft)	4.07	Wt. n-Val.		0.026	
W.S. Elev (ft)	93.90	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	95.11	Flow Area (sq ft)		334.26	
E.G. Slope (ft/ft)	0.015469	Area (sq ft)		334.26	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	94.97	Top Width (ft)		94.97	
Vel Total (ft/s)	16.19	Avg. Vel. (ft/s)		16.19	
Max Chl Dpth (ft)	5.59	Hydr. Depth (ft)		3.52	
Conv. Total (cfs)	43505.3	Conv. (cfs)		43505.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		98.85	
Min Ch El (ft)	88.31	Shear (lb/sq ft)		3.27	
Alpha	1.00	Stream Power (lb/ft s)		52.86	
Frctn Loss (ft)	1.29	Cum Volume (acre-ft)	1.35	49.84	1.35
C & E Loss (ft)	0.04	Cum SA (acres)	1.20	11.02	1.09

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -13

INPUT
Description: ESI STA 10+00

Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	95.94	16	87.94	62.5	87.01	78.5	90	103.5	90
119	95	128.5	97	145	97.5				

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	96.23	Element			
Vel Head (ft)	4.40	Wt. n-Val.		0.026	
W.S. Elev (ft)	91.83	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	93.16	Flow Area (sq ft)		321.39	
E.G. Slope (ft/ft)	0.018853	Area (sq ft)		321.39	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	100.93	Top Width (ft)		100.93	
Vel Total (ft/s)	16.84	Avg. Vel. (ft/s)		16.84	
Max Chl Dpth (ft)	4.82	Hydr. Depth (ft)		3.18	
Conv. Total (cfs)	39408.4	Conv. (cfs)		39408.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		102.42	
Min Ch El (ft)	87.01	Shear (lb/sq ft)		3.69	
Alpha	1.00	Stream Power (lb/ft s)		62.18	
Frctn Loss (ft)	1.70	Cum Volume (acre-ft)	1.35	49.09	1.35
C & E Loss (ft)	0.03	Cum SA (acres)	1.20	10.80	1.09

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -14

INPUT
Description: ESI STA 11+00
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	94.64	16	86.64	62.5	85.7	70.5	87	76.5	88
79.5	89	82.5	90	114.5	90	129.5	95	145	96.5

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	94.37	Element			
Vel Head (ft)	2.99	Wt. n-Val.		0.026	
W.S. Elev (ft)	91.38	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	92.10	Flow Area (sq ft)		389.92	
E.G. Slope (ft/ft)	0.011330	Area (sq ft)		389.92	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	112.14	Top Width (ft)		112.14	
Vel Total (ft/s)	13.88	Avg. Vel. (ft/s)		13.88	
Max Chl Dpth (ft)	5.68	Hydr. Depth (ft)		3.48	
Conv. Total (cfs)	50834.9	Conv. (cfs)		50834.9	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		114.00	
Min Ch El (ft)	85.70	Shear (lb/sq ft)		2.42	
Alpha	1.00	Stream Power (lb/ft s)		33.57	
Frctn Loss (ft)	1.44	Cum Volume (acre-ft)	1.35	48.27	1.35
C & E Loss (ft)	0.42	Cum SA (acres)	1.20	10.55	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -15

INPUT
Description: ESI STA 10+00
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	94	16	85.34	62.5	84.4	93.5	87	95.5	88		
98.5	89	100.5	90	102.5	91	105.5	92	114.5	93		
125.5	94	145	94.5								

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	93.13	Element			
Vel Head (ft)	3.69	Wt. n-Val.		0.026	
W.S. Elev (ft)	89.44	Reach Len. (ft)	100.00	100.00	100.00

Crit W.S. (ft)	90.40	Flow Area (sq ft)		351.17	
E.G. Slope (ft/ft)	0.012176	Area (sq ft)		351.17	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	90.97	Top Width (ft)		90.97	
Vel Total (ft/s)	15.41	Avg. Vel. (ft/s)		15.41	
Max Chl Dpth (ft)	5.04	Hydr. Depth (ft)		3.86	
Conv. Total (cfs)	49037.5	Conv. (cfs)		49037.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		92.63	
Min Ch El (ft)	84.40	Shear (lb/sq ft)		2.88	
Alpha	1.00	Stream Power (lb/ft s)		44.40	
Frctn Loss (ft)	1.17	Cum Volume (acre-ft)	1.35	47.42	1.35
C & E Loss (ft)	0.07	Cum SA (acres)	1.20	10.32	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -16

INPUT
Description: ESI STA 9+00
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	92	16	84	62.5	83.1	80	84	100	92
107.5	93	126	94	145	94				

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	91.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.51	Wt. n-Val.		0.026	
W.S. Elev (ft)	88.47	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	89.28	Flow Area (sq ft)		359.92	
E.G. Slope (ft/ft)	0.009949	Area (sq ft)		359.92	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	84.12	Top Width (ft)		84.12	
Vel Total (ft/s)	15.03	Avg. Vel. (ft/s)		15.03	
Max Chl Dpth (ft)	5.37	Hydr. Depth (ft)		4.28	
Conv. Total (cfs)	54248.9	Conv. (cfs)		54248.9	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		86.07	
Min Ch El (ft)	83.10	Shear (lb/sq ft)		2.60	
Alpha	1.00	Stream Power (lb/ft s)		39.05	
Frctn Loss (ft)	1.10	Cum Volume (acre-ft)	1.35	46.61	1.35
C & E Loss (ft)	0.05	Cum SA (acres)	1.20	10.12	1.09

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -17

INPUT
Description: ESI STA 8+00
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	90.74	16	82.74	80	81.81	90	90	100	91
102.5	92	132.5	93	145	93.5				

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	90.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.81	Wt. n-Val.		0.026	
W.S. Elev (ft)	87.11	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	88.02	Flow Area (sq ft)		345.31	
E.G. Slope (ft/ft)	0.010703	Area (sq ft)		345.31	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	79.20	Top Width (ft)		79.20	
Vel Total (ft/s)	15.67	Avg. Vel. (ft/s)		15.67	
Max Chl Dpth (ft)	5.30	Hydr. Depth (ft)		4.36	
Conv. Total (cfs)	52303.9	Conv. (cfs)		52303.9	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		82.12	
Min Ch El (ft)	81.81	Shear (lb/sq ft)		2.81	
Alpha	1.00	Stream Power (lb/ft s)		44.02	
Frctn Loss (ft)	1.03	Cum Volume (acre-ft)	1.35	45.80	1.35
C & E Loss (ft)	0.03	Cum SA (acres)	1.20	9.93	1.09

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -18

INPUT
Description: ESI STA 7+00
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	89.4	16	81.4	62.5	80.5	83.5	83	86.5	85
92.5	87	102.5	90	114.5	92	145	92.5		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	89.79	Element			
Vel Head (ft)	3.95	Wt. n-Val.		0.026	
W.S. Elev (ft)	85.84	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	86.90	Flow Area (sq ft)		339.23	
E.G. Slope (ft/ft)	0.011676	Area (sq ft)		339.23	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	81.88	Top Width (ft)		81.88	
Vel Total (ft/s)	15.95	Avg. Vel. (ft/s)		15.95	
Max Chl Dpth (ft)	5.34	Hydr. Depth (ft)		4.14	
Conv. Total (cfs)	50076.2	Conv. (cfs)		50076.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		83.82	
Min Ch El (ft)	80.50	Shear (lb/sq ft)		2.95	
Alpha	1.00	Stream Power (lb/ft s)		47.05	
Frctn Loss (ft)	1.12	Cum Volume (acre-ft)	1.35	45.01	1.35
C & E Loss (ft)	0.01	Cum SA (acres)	1.20	9.75	1.09

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -19

INPUT
Description: ESI STA 6+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	88.14	16	80.14	62.5	79.1	98.5	82	104.5	85
114.5	90	145	91.5						

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	88.28	Element			
Vel Head (ft)	4.63	Wt. n-Val.		0.026	
W.S. Elev (ft)	83.64	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	85.04	Flow Area (sq ft)		313.22	
E.G. Slope (ft/ft)	0.018383	Area (sq ft)		313.22	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	92.78	Top Width (ft)		92.78	
Vel Total (ft/s)	17.28	Avg. Vel. (ft/s)		17.28	
Max Chl Dpth (ft)	4.54	Hydr. Depth (ft)		3.38	
Conv. Total (cfs)	39908.3	Conv. (cfs)		39908.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		94.13	
Min Ch El (ft)	79.10	Shear (lb/sq ft)		3.82	
Alpha	1.00	Stream Power (lb/ft s)		65.98	
Frctn Loss (ft)	1.45	Cum Volume (acre-ft)	1.35	44.26	1.35
C & E Loss (ft)	0.07	Cum SA (acres)	1.20	9.54	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -20

INPUT
Description: ESI STA 5+00
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	86.8	16	78.8	62.5	77.9	83.5	81	99.5	82
108.5	85	134	90	145	90.5				

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	145	100	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	86.53	Element	Left OB	Channel	Right OB	
Vel Head (ft)	2.84	Wt. n-Val.		0.026		
W.S. Elev (ft)	83.68	Reach Len. (ft)	100.00	100.00	100.00	
Crit W.S. (ft)	84.18	Flow Area (sq ft)		399.87		
E.G. Slope (ft/ft)	0.008614	Area (sq ft)		399.87		
Q Total (cfs)	5411.00	Flow (cfs)		5411.00		
Top Width (ft)	98.31	Top Width (ft)		98.31		
Vel Total (ft/s)	13.53	Avg. Vel. (ft/s)		13.53		
Max Chl Dpth (ft)	5.78	Hydr. Depth (ft)		4.07		
Conv. Total (cfs)	58299.9	Conv. (cfs)		58299.9		
Length Wtd. (ft)	100.00	Wetted Per. (ft)		100.01		
Min Ch El (ft)	77.90	Shear (lb/sq ft)		2.15		
Alpha	1.00	Stream Power (lb/ft s)		29.10		
Frctn Loss (ft)	1.21	Cum Volume (acre-ft)	1.35	43.45	1.35	
C & E Loss (ft)	0.54	Cum SA (acres)	1.20	9.33	1.09	

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -21

INPUT
Description: ESI STA 4+00
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	85.5	16	77.5	62.5	76.6	108.5	79	115.5	85
121.5	86	145	87						

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	85.14	Element	Left OB	Channel	Right OB	
Vel Head (ft)	4.37	Wt. n-Val.		0.026		
W.S. Elev (ft)	80.77	Reach Len. (ft)	100.00	100.00	100.00	
Crit W.S. (ft)	82.08	Flow Area (sq ft)		322.61		
E.G. Slope (ft/ft)	0.018902	Area (sq ft)		322.61		
Q Total (cfs)	5411.00	Flow (cfs)		5411.00		
Top Width (ft)	101.12	Top Width (ft)		101.12		
Vel Total (ft/s)	16.77	Avg. Vel. (ft/s)		16.77		
Max Chl Dpth (ft)	4.17	Hydr. Depth (ft)		3.19		
Conv. Total (cfs)	39357.0	Conv. (cfs)		39357.0		
Length Wtd. (ft)	100.00	Wetted Per. (ft)		102.62		
Min Ch El (ft)	76.60	Shear (lb/sq ft)		3.71		
Alpha	1.00	Stream Power (lb/ft s)		62.22		
Frctn Loss (ft)	1.23	Cum Volume (acre-ft)	1.35	42.62	1.35	
C & E Loss (ft)	0.15	Cum SA (acres)	1.20	9.10	1.09	

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -22

INPUT
Description: ESI STA 3+00
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	84.3	16	76.3	62.5	75.3	84.5	78	107.5	79
110.5	80	120.5	85	123.5	86	129.5	87	143.5	88

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	143.5	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	83.53	Element	Left OB	Channel	Right OB	
Vel Head (ft)	1.85	Wt. n-Val.		0.026		
W.S. Elev (ft)	81.68	Reach Len. (ft)	100.00	100.00	100.00	
Crit W.S. (ft)	81.35	Flow Area (sq ft)		495.63		
E.G. Slope (ft/ft)	0.004821	Area (sq ft)		495.63		
Q Total (cfs)	5411.00	Flow (cfs)		5411.00		
Top Width (ft)	108.62	Top Width (ft)		108.62		
Vel Total (ft/s)	10.92	Avg. Vel. (ft/s)		10.92		

Max Chl Dpth (ft)	6.38	Hydr. Depth (ft)		4.56	
Conv. Total (cfs)	77927.0	Conv. (cfs)		77927.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		110.65	
Min Ch El (ft)	75.30	Shear (lb/sq ft)		1.35	
Alpha	1.00	Stream Power (lb/ft s)		14.72	
Frctn Loss (ft)	0.31	Cum Volume (acre-ft)	1.35	41.68	1.35
C & E Loss (ft)	0.19	Cum SA (acres)	1.20	8.86	1.09

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -23

INPUT
Description: ESI STA 2+00
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	83.5	16	75	62.5	74	92.5	77	97	78
102.5	80	111.5	85	142.5	87				

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	142.5	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	83.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.22	Wt. n-Val.		0.025	
W.S. Elev (ft)	81.81	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		610.45	
E.G. Slope (ft/ft)	0.002193	Area (sq ft)		610.45	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	102.57	Top Width (ft)		102.57	
Vel Total (ft/s)	8.86	Avg. Vel. (ft/s)		8.86	
Max Chl Dpth (ft)	7.81	Hydr. Depth (ft)		5.95	
Conv. Total (cfs)	115556.1	Conv. (cfs)		115556.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		105.36	
Min Ch El (ft)	74.00	Shear (lb/sq ft)		0.79	
Alpha	1.00	Stream Power (lb/ft s)		7.03	
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	1.35	40.41	1.35
C & E Loss (ft)	0.11	Cum SA (acres)	1.20	8.61	1.09

Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -24

INPUT
Description: ESI STA 1+00
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	81.8	16	73.8	62.5	72.9	77.5	75	82.5	75
96.5	77	104.5	80	112.5	85	139.5	85.5		

Manning's n Values num= 2

Sta	n Val	Sta	n Val
0	.013	16	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	139.5	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	82.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.85	Wt. n-Val.		0.025	
W.S. Elev (ft)	81.90	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		729.68	
E.G. Slope (ft/ft)	0.001265	Area (sq ft)		729.68	
Q Total (cfs)	5411.00	Flow (cfs)		5411.00	
Top Width (ft)	107.54	Top Width (ft)		107.54	
Vel Total (ft/s)	7.42	Avg. Vel. (ft/s)		7.42	
Max Chl Dpth (ft)	9.00	Hydr. Depth (ft)		6.79	
Conv. Total (cfs)	152151.4	Conv. (cfs)		152151.4	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		110.92	
Min Ch El (ft)	72.90	Shear (lb/sq ft)		0.52	
Alpha	1.00	Stream Power (lb/ft s)		3.85	
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	1.35	38.87	1.35
C & E Loss (ft)	0.11	Cum SA (acres)	1.20	8.37	1.09

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -25

INPUT
Description: ESI STA 0+00
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	87.02	55	85.03	110	83.47	170	82.47	220	81.87
280	81.6	330	81.37	390	81.11	450	80.73	490	80.52
510	80.56	522	74.01	533	72.49	600	72.49	610	75.78
620	80.75	690	80.93	780	80.56	840	80.76	900	81
950	81.34								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.017	510	.013	620	.017

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
510	620	150	150	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	450	84	F
690	950	84	F

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	82.61	Wt. n-Val.	0.017	0.013	0.017
Vel Head (ft)	0.49	Reach Len. (ft)	150.00	150.00	150.00
W.S. Elev (ft)	82.12	Flow Area (sq ft)	91.30	919.01	89.48
Crit W.S. (ft)	77.75	Area (sq ft)	273.11	919.01	422.28
E.G. Slope (ft/ft)	0.000156	Flow (cfs)	131.90	5293.01	115.09
Q Total (cfs)	5540.00	Top Width (ft)	310.69	110.00	330.00
Top Width (ft)	750.69	Avg. Vel. (ft/s)	1.44	5.76	1.29
Vel Total (ft/s)	5.04	Hydr. Depth (ft)	1.52	8.35	1.28
Max Chl Dpth (ft)	9.63	Conv. (cfs)	10556.7	423640.4	9211.8
Conv. Total (cfs)	443408.9	Wetted Per. (ft)	60.00	113.47	70.00
Length Wtd. (ft)	150.00	Shear (lb/sq ft)	0.01	0.08	0.01
Min Ch El (ft)	72.49	Stream Power (lb/ft s)	0.02	0.45	0.02
Alpha	1.25	Cum Volume (acre-ft)	1.04	36.98	0.86
Frctn Loss (ft)		Cum SA (acres)	0.84	8.12	0.71
C & E Loss (ft)					

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

CULVERT

RIVER: Pittman
REACH: 1 RS: -25.5

INPUT
Description:
Distance from Upstream XS = 20
Deck/Roadway Width = 80
Weir Coefficient = 3
Upstream Deck/Roadway Coordinates
num= 18

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	87.72	71.31	55	85.73	71.31	105	84.17	71.31
165	83.17	71.31	220	82.57	71.31	280	82.3	71.31
340	82.07	71.31	390	81.81	71.31	440	81.43	71.31
500	80.92	71.31	560	80.66	71.31	615	80.65	71.31
670	80.89	71.31	725	81.26	71.31	780	81.46	71.31
830	81.7	71.31	890	82.04	71.31	950	82.16	71.31

Upstream Bridge Cross Section Data
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	87.02	55	85.03	110	83.47	170	82.47	220	81.87
280	81.6	330	81.37	390	81.11	450	80.73	490	80.52
510	80.56	522	74.01	533	72.49	600	72.49	610	75.78
620	80.75	690	80.93	780	80.56	840	80.76	900	81
950	81.34								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.017	510	.013	620	.017

Bank Sta: Left	Right	Coeff Contr.	Expan.
510	620	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	450	84	F
690	950	84	F

Downstream Deck/Roadway Coordinates
num= 19

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	87.72	71.31	55	85.73	71.31	105	84.17	71.31
165	83.17	71.31	220	82.57	71.31	280	82.3	71.31
340	82.07	71.31	390	81.81	71.31	440	81.43	71.31
500	80.92	71.31	560	80.66	71.31	615	80.65	71.31
670	80.89	71.31	725	81.26	71.31	780	81.46	71.31
830	81.7	71.31	890	82.04	71.31	950	82.16	71.31
1000	82.03	71.31						

Downstream Bridge Cross Section Data
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	87.02	55	85.03	110	83.47	170	82.47	220	81.87
280	81.6	330	81.37	390	81.11	494	80.27	550	79.77
575	71.56	580	71.31	645	71.31	660	80.15	675	80.43
720	80.56	775	80.76	830	81	890	81.34	945	81.46

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0    .027     550    .013     660    .027

Bank Sta: Left   Right    Coeff Contr.   Expan.
          550     660          .1          .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
      0     494      84       F
    720     945      84       F

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         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1         Box       5      10
FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Inlet control
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                20      80     .013      .013        0                  .2               1
Number of Barrels =  6
Upstream   Elevation =  72.49
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
     540     551     562     573     584     595
Downstream Elevation =  71.31
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
     585     596     607     618     629     640

CULVERT OUTPUT  Profile #PF 1  Culv Group:  Culvert #1

  Q Culv Group (cfs)       3848.67    Culv Full Len (ft)         80.00
  # Barrels                      6    Culv Vel US (ft/s)         12.83
  Q Barrel (cfs)            641.45    Culv Vel DS (ft/s)         12.83
  E.G. US. (ft)              82.61    Culv Inv El Up (ft)        72.49
  W.S. US. (ft)              82.12    Culv Inv El Dn (ft)        71.31
  E.G. DS (ft)               79.11    Culv Frctn Ls (ft)          2.79
  W.S. DS (ft)               76.76    Culv Exit Loss (ft)         0.20
  Delta EG (ft)               3.50    Culv Entr Loss (ft)         0.51
  Delta WS (ft)               5.36    Q Weir (cfs)             1691.33
  E.G. IC (ft)               82.61    Weir Sta Lft (ft)         450.00
  E.G. OC (ft)               81.98    Weir Sta Rgt (ft)         690.00
  Culvert Control            Inlet    Weir Submerg                0.00
  Culv WS Inlet (ft)         77.49    Weir Max Depth (ft)         1.96
  Culv WS Outlet (ft)        76.31    Weir Avg Depth (ft)         1.76
  Culv Nml Depth (ft)         3.03    Weir Flow Area (sq ft)    423.13
  Culv Crt Depth (ft)         5.00    Min El Weir Flow (ft)      80.66


Note:    Culvert critical depth exceeds the height of the culvert.

CROSS SECTION


RIVER: Pittman
REACH: 1                  RS: -25.8

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   87.02      55   85.03     110   83.47     170   82.47     220   81.87
     280    81.6     330   81.37     390   81.11     494   80.27     550   79.77
     575   71.56     580   71.31     645   71.31     660   80.15     675   80.43
     720   80.56     775   80.76     830      81     890   81.34     945   81.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .027     550    .013     660    .027

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          550     660               180     180     180          .1          .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
      0     494      84       F
    720     945      84       F

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)             79.11    Element                 Left OB    Channel   Right OB
  Vel Head (ft)               2.35    Wt. n-Val.                         0.013
  W.S. Elev (ft)             76.76    Reach Len. (ft)         180.00     180.00    180.00
  Crit W.S. (ft)             76.76    Flow Area (sq ft)                  446.79
  E.G. Slope (ft/ft)      0.001523    Area (sq ft)                       446.79
  Q Total (cfs)           5502.00     Flow (cfs)                        5502.00
  Top Width (ft)             95.06    Top Width (ft)                      95.06
  Vel Total (ft/s)           12.31    Avg. Vel. (ft/s)                    12.31
  Max Chl Dpth (ft)           5.45    Hydr. Depth (ft)                     4.70
  Conv. Total (cfs)      141005.5     Conv. (cfs)                      141005.5
  Length Wtd. (ft)          180.00    Wetted Per. (ft)                    97.38
  Min Ch El (ft)             71.31    Shear (lb/sq ft)                     0.44
  Alpha                       1.00    Stream Power (lb/ft s)               5.37
  Frctn Loss (ft)             0.50    Cum Volume (acre-ft)        0.57    34.62     0.14
  C & E Loss (ft)             0.00    Cum SA (acres)              0.31     7.77     0.14


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 conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
```

0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -26

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	79.05	11	75.73	29	69.99	62	68.46	101	69.67
119	78.96	125	79.79	140	79.99				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	140	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	140	320	320	320 .1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	78.14	Element			
Vel Head (ft)	5.16	Wt. n-Val.		0.027	
W.S. Elev (ft)	72.99	Reach Len. (ft)	320.00	320.00	320.00
Crit W.S. (ft)	74.57	Flow Area (sq ft)		301.91	
E.G. Slope (ft/ft)	0.021562	Area (sq ft)		301.91	
Q Total (cfs)	5502.00	Flow (cfs)		5502.00	
Top Width (ft)	87.83	Top Width (ft)		87.83	
Vel Total (ft/s)	18.22	Avg. Vel. (ft/s)		18.22	
Max Chl Dpth (ft)	4.53	Hydr. Depth (ft)		3.44	
Conv. Total (cfs)	37469.1	Conv. (cfs)		37469.1	
Length Wtd. (ft)	320.00	Wetted Per. (ft)		89.16	
Min Ch El (ft)	68.46	Shear (lb/sq ft)		4.56	
Alpha	1.00	Stream Power (lb/ft s)		83.07	
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)	0.57	33.08	0.14
C & E Loss (ft)	0.28	Cum SA (acres)	0.31	7.39	0.14

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.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -27

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	77.37	15	71.95	25	67.9	70	66.6	105	67.18
120	74.54	125	74.83	135	74.73				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	135	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	135	320	320	320 .1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	74.68	Element			
Vel Head (ft)	1.52	Wt. n-Val.		0.027	
W.S. Elev (ft)	73.16	Reach Len. (ft)	320.00	320.00	320.00
Crit W.S. (ft)	72.18	Flow Area (sq ft)		556.21	
E.G. Slope (ft/ft)	0.003630	Area (sq ft)		556.21	
Q Total (cfs)	5502.00	Flow (cfs)		5502.00	
Top Width (ft)	105.54	Top Width (ft)		105.54	
Vel Total (ft/s)	9.89	Avg. Vel. (ft/s)		9.89	
Max Chl Dpth (ft)	6.56	Hydr. Depth (ft)		5.27	
Conv. Total (cfs)	91317.8	Conv. (cfs)		91317.8	
Length Wtd. (ft)	320.00	Wetted Per. (ft)		107.95	
Min Ch El (ft)	66.60	Shear (lb/sq ft)		1.17	
Alpha	1.00	Stream Power (lb/ft s)		11.55	
Frctn Loss (ft)	1.52	Cum Volume (acre-ft)	0.57	29.93	0.14
C & E Loss (ft)	0.09	Cum SA (acres)	0.31	6.68	0.14

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -28

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	80.39	25	71.1	35	66	70	64.5	105	65.2
121	73.66	130	74.67	142	74.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	142	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	142	220	220	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	73.06	Element			
Vel Head (ft)	2.45	Wt. n-Val.		0.027	
W.S. Elev (ft)	70.61	Reach Len. (ft)	220.00	220.00	220.00
Crit W.S. (ft)	70.61	Flow Area (sq ft)		437.77	
E.G. Slope (ft/ft)	0.006494	Area (sq ft)		437.77	
Q Total (cfs)	5502.00	Flow (cfs)		5502.00	
Top Width (ft)	89.27	Top Width (ft)		89.27	
Vel Total (ft/s)	12.57	Avg. Vel. (ft/s)		12.57	
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)		4.90	
Conv. Total (cfs)	68275.2	Conv. (cfs)		68275.2	
Length Wtd. (ft)	220.00	Wetted Per. (ft)		91.76	
Min Ch El (ft)	64.50	Shear (lb/sq ft)		1.93	
Alpha	1.00	Stream Power (lb/ft s)		24.31	
Frctn Loss (ft)	1.43	Cum Volume (acre-ft)	0.57	26.27	0.14
C & E Loss (ft)	0.01	Cum SA (acres)	0.31	5.97	0.14

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -29

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	82.82	30	69.43	40	64.74	80	60.77	110	63.7
125	71.04	135	71.63	150	71.87				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	250	190	160	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	71.05	Element			
Vel Head (ft)	3.75	Wt. n-Val.		0.027	
W.S. Elev (ft)	67.30	Reach Len. (ft)	250.00	190.00	160.00
Crit W.S. (ft)	68.22	Flow Area (sq ft)		354.20	
E.G. Slope (ft/ft)	0.011801	Area (sq ft)		354.20	
Q Total (cfs)	5502.00	Flow (cfs)		5502.00	
Top Width (ft)	82.83	Top Width (ft)		82.83	
Vel Total (ft/s)	15.53	Avg. Vel. (ft/s)		15.53	
Max Chl Dpth (ft)	6.53	Hydr. Depth (ft)		4.28	
Conv. Total (cfs)	50648.0	Conv. (cfs)		50648.0	
Length Wtd. (ft)	190.00	Wetted Per. (ft)		84.57	
Min Ch El (ft)	60.77	Shear (lb/sq ft)		3.09	
Alpha	1.00	Stream Power (lb/ft s)		47.93	
Frctn Loss (ft)	1.88	Cum Volume (acre-ft)	0.57	24.27	0.14
C & E Loss (ft)	0.13	Cum SA (acres)	0.31	5.53	0.14

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -30

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	79.54	25	67.62	35	62.29	65	58.19	90	58.81
92	61.34	101	61.66	115	68.41	135	69.18		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	135	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	135	320	300	280	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	68.73	Element	Left OB	Channel	Right OB	
Vel Head (ft)	4.04	Wt. n-Val.		0.027		
W.S. Elev (ft)	64.69	Reach Len. (ft)	320.00	300.00	280.00	
Crit W.S. (ft)	65.73	Flow Area (sq ft)		341.23		
E.G. Slope (ft/ft)	0.012328	Area (sq ft)		341.23		
Q Total (cfs)	5502.00	Flow (cfs)		5502.00		
Top Width (ft)	76.79	Top Width (ft)		76.79		
Vel Total (ft/s)	16.12	Avg. Vel. (ft/s)		16.12		
Max Chl Dpth (ft)	6.50	Hydr. Depth (ft)		4.44		
Conv. Total (cfs)	49554.2	Conv. (cfs)		49554.2		
Length Wtd. (ft)	300.00	Wetted Per. (ft)		79.60		
Min Ch El (ft)	58.19	Shear (lb/sq ft)		3.30		
Alpha	1.00	Stream Power (lb/ft s)		53.19		
Frctn Loss (ft)	2.29	Cum Volume (acre-ft)	0.57	22.76	0.14	
C & E Loss (ft)	0.03	Cum SA (acres)	0.31	5.18	0.14	

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: Pittman
REACH: 1 RS: -31

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	73.33	30	63.75	49	57.34	80	54.26	110	57.9
120	64.08	135	64.71	145	64.63				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	145	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	250	250	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	65.08	Element	Left OB	Channel	Right OB	
Vel Head (ft)	3.98	Wt. n-Val.		0.027		
W.S. Elev (ft)	61.09	Reach Len. (ft)	250.00	250.00	250.00	
Crit W.S. (ft)	62.12	Flow Area (sq ft)		343.49		
E.G. Slope (ft/ft)	0.011974	Area (sq ft)		343.49		
Q Total (cfs)	5502.00	Flow (cfs)		5502.00		
Top Width (ft)	77.28	Top Width (ft)		77.28		
Vel Total (ft/s)	16.02	Avg. Vel. (ft/s)		16.02		
Max Chl Dpth (ft)	6.83	Hydr. Depth (ft)		4.44		
Conv. Total (cfs)	50281.5	Conv. (cfs)		50281.5		
Length Wtd. (ft)	250.00	Wetted Per. (ft)		79.18		
Min Ch El (ft)	54.26	Shear (lb/sq ft)		3.24		
Alpha	1.00	Stream Power (lb/ft s)		51.94		
Frctn Loss (ft)	3.64	Cum Volume (acre-ft)	0.57	20.40	0.14	
C & E Loss (ft)	0.02	Cum SA (acres)	0.31	4.65	0.14	

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: Pittman
REACH: 1 RS: -32

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	72.95	21	63.62	45	61.62	60	53.44	100	51.56
145	53.46	155	59.27	170	60.01	180	60.14		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	180	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	180	250	250	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	60.98	Element	Left OB	Channel	Right OB	
Vel Head (ft)	5.00	Wt. n-Val.		0.027		
W.S. Elev (ft)	55.98	Reach Len. (ft)	250.00	250.00	250.00	
Crit W.S. (ft)	57.50	Flow Area (sq ft)		306.61		
E.G. Slope (ft/ft)	0.022416	Area (sq ft)		306.61		
Q Total (cfs)	5502.00	Flow (cfs)		5502.00		
Top Width (ft)	93.99	Top Width (ft)		93.99		
Vel Total (ft/s)	17.94	Avg. Vel. (ft/s)		17.94		
Max Chl Dpth (ft)	4.42	Hydr. Depth (ft)		3.26		
Conv. Total (cfs)	36748.5	Conv. (cfs)		36748.5		
Length Wtd. (ft)	250.00	Wetted Per. (ft)		95.40		
Min Ch El (ft)	51.56	Shear (lb/sq ft)		4.50		
Alpha	1.00	Stream Power (lb/ft s)		80.71		
Frctn Loss (ft)	4.00	Cum Volume (acre-ft)	0.57	18.53	0.14	
C & E Loss (ft)	0.10	Cum SA (acres)	0.31	4.16	0.14	

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: Pittman
REACH: 1 RS: -33

INPUT
Description: ESI STA 000

Station Elevation Data	num=	7					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	55.7	12	55.7	26	48.7	63.5	48
101	48.7	115	55.7	127	55.7		

Manning's n Values	num=	3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	127	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	127	118	106	112	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	56.38	Element			
Vel Head (ft)	3.71	Wt. n-Val.		0.027	
W.S. Elev (ft)	52.68	Reach Len. (ft)	118.00	106.00	112.00
Crit W.S. (ft)	53.65	Flow Area (sq ft)		356.15	
E.G. Slope (ft/ft)	0.013114	Area (sq ft)		356.15	
Q Total (cfs)	5502.00	Flow (cfs)		5502.00	
Top Width (ft)	90.91	Top Width (ft)		90.91	
Vel Total (ft/s)	15.45	Avg. Vel. (ft/s)		15.45	
Max Chl Dpth (ft)	4.68	Hydr. Depth (ft)		3.92	
Conv. Total (cfs)	48046.1	Conv. (cfs)		48046.1	
Length Wtd. (ft)	106.00	Wetted Per. (ft)		92.80	
Min Ch El (ft)	48.00	Shear (lb/sq ft)		3.14	
Alpha	1.00	Stream Power (lb/ft s)		48.54	
Frctn Loss (ft)	4.21	Cum Volume (acre-ft)	0.57	16.63	0.14
C & E Loss (ft)	0.39	Cum SA (acres)	0.31	3.63	0.14

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: Pittman
REACH: 1 RS: -34

INPUT
Description: ESI STA 112

Station Elevation Data	num=	7					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	54.7	24	54.7	37.5	47.7	75	47
112.5	47.7	126	54.7	150	54.7		

Manning's n Values	num=	3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	45	45	45	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	55.03	Element			
Vel Head (ft)	2.47	Wt. n-Val.		0.027	
W.S. Elev (ft)	52.56	Reach Len. (ft)	45.00	45.00	45.00
Crit W.S. (ft)	52.64	Flow Area (sq ft)		436.68	
E.G. Slope (ft/ft)	0.006969	Area (sq ft)		436.68	
Q Total (cfs)	5502.00	Flow (cfs)		5502.00	
Top Width (ft)	93.76	Top Width (ft)		93.76	
Vel Total (ft/s)	12.60	Avg. Vel. (ft/s)		12.60	
Max Chl Dpth (ft)	5.56	Hydr. Depth (ft)		4.66	
Conv. Total (cfs)	65909.9	Conv. (cfs)		65909.9	
Length Wtd. (ft)	45.00	Wetted Per. (ft)		96.15	
Min Ch El (ft)	47.00	Shear (lb/sq ft)		1.98	
Alpha	1.00	Stream Power (lb/ft s)		24.90	
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	0.57	15.67	0.14
C & E Loss (ft)	0.37	Cum SA (acres)	0.31	3.41	0.14

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: Pittman
REACH: 1 RS: -35

INPUT
Description: ESI STA 157

Station Elevation Data	num=	7					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	54.3	24	54.3	37.5	47.3	75	46.5
112.5	47.3	126	54.3	150	54.3		

Manning's n Values	num=	3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	140	140	140	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	54.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.87	Wt. n-Val.		0.027	
W.S. Elev (ft)	51.76	Reach Len. (ft)	140.00	140.00	140.00
Crit W.S. (ft)	52.20	Flow Area (sq ft)		402.71	
E.G. Slope (ft/ft)	0.008819	Area (sq ft)		402.71	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	92.20	Top Width (ft)		92.20	
Vel Total (ft/s)	13.60	Avg. Vel. (ft/s)		13.60	
Max Chl Dpth (ft)	5.26	Hydr. Depth (ft)		4.37	
Conv. Total (cfs)	58300.7	Conv. (cfs)		58300.7	
Length Wtd. (ft)	140.00	Wetted Per. (ft)		94.39	
Min Ch El (ft)	46.50	Shear (lb/sq ft)		2.35	
Alpha	1.00	Stream Power (lb/ft s)		31.94	
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.57	15.23	0.14
C & E Loss (ft)	0.04	Cum SA (acres)	0.31	3.31	0.14

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -36

INPUT
Description: ESI STA 297
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	53	24	53	37.5	46	75	45.3	112.5	46
126	53	150	53						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	150	150	150	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	53.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.90	Wt. n-Val.		0.027	
W.S. Elev (ft)	50.48	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	50.92	Flow Area (sq ft)		400.79	
E.G. Slope (ft/ft)	0.008971	Area (sq ft)		400.79	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	92.27	Top Width (ft)		92.27	
Vel Total (ft/s)	13.66	Avg. Vel. (ft/s)		13.66	
Max Chl Dpth (ft)	5.18	Hydr. Depth (ft)		4.34	
Conv. Total (cfs)	57805.4	Conv. (cfs)		57805.4	
Length Wtd. (ft)	150.00	Wetted Per. (ft)		94.47	
Min Ch El (ft)	45.30	Shear (lb/sq ft)		2.38	
Alpha	1.00	Stream Power (lb/ft s)		32.46	
Frctn Loss (ft)	1.25	Cum Volume (acre-ft)	0.57	13.94	0.14
C & E Loss (ft)	0.00	Cum SA (acres)	0.31	3.01	0.14

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: Pittman
REACH: 1 RS: -37

INPUT
Description: ESI STA 447
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	51.7	24	51.7	37.5	44.7	75	44	112.5	44.7
126	51.7	150	51.7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	111	111	111	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	52.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.74	Wt. n-Val.		0.027	
W.S. Elev (ft)	49.30	Reach Len. (ft)	111.00	111.00	111.00
Crit W.S. (ft)	49.62	Flow Area (sq ft)		412.22	
E.G. Slope (ft/ft)	0.008230	Area (sq ft)		412.22	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	92.75	Top Width (ft)		92.75	
Vel Total (ft/s)	13.28	Avg. Vel. (ft/s)		13.28	
Max Chl Dpth (ft)	5.30	Hydr. Depth (ft)		4.44	
Conv. Total (cfs)	60350.3	Conv. (cfs)		60350.3	
Length Wtd. (ft)	111.00	Wetted Per. (ft)		95.01	
Min Ch El (ft)	44.00	Shear (lb/sq ft)		2.23	
Alpha	1.00	Stream Power (lb/ft s)		29.61	
Frctn Loss (ft)	1.29	Cum Volume (acre-ft)	0.57	12.54	0.14
C & E Loss (ft)	0.05	Cum SA (acres)	0.31	2.69	0.14

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: Pittman
REACH: 1 RS: -38

INPUT
Description: ESI STA 558
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	50.7	24	50.7	37.5	43.7	75	43	112.5	43.7
126	50.7	150	50.7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	140	140	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	51.08	Element			
Vel Head (ft)	2.91	Wt. n-Val.		0.027	
W.S. Elev (ft)	48.17	Reach Len. (ft)	140.00	140.00	140.00
Crit W.S. (ft)	48.63	Flow Area (sq ft)		400.25	
E.G. Slope (ft/ft)	0.009008	Area (sq ft)		400.25	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	92.25	Top Width (ft)		92.25	
Vel Total (ft/s)	13.68	Avg. Vel. (ft/s)		13.68	
Max Chl Dpth (ft)	5.17	Hydr. Depth (ft)		4.34	
Conv. Total (cfs)	57684.7	Conv. (cfs)		57684.7	
Length Wtd. (ft)	140.00	Wetted Per. (ft)		94.44	
Min Ch El (ft)	43.00	Shear (lb/sq ft)		2.38	
Alpha	1.00	Stream Power (lb/ft s)		32.60	
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	0.57	11.51	0.14
C & E Loss (ft)	0.02	Cum SA (acres)	0.31	2.46	0.14

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -39

INPUT
Description: ESI STA 698
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	49.5	24	49.5	37.5	42.5	75	41.7	112.5	42.5
126	49.5	150	49.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	133	159	145	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	49.83	Element			
Vel Head (ft)	2.86	Wt. n-Val.		0.027	
W.S. Elev (ft)	46.97	Reach Len. (ft)	133.00	159.00	145.00
Crit W.S. (ft)	47.38	Flow Area (sq ft)		403.55	
E.G. Slope (ft/ft)	0.008763	Area (sq ft)		403.55	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	92.23	Top Width (ft)		92.23	
Vel Total (ft/s)	13.57	Avg. Vel. (ft/s)		13.57	
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)		4.38	
Conv. Total (cfs)	58487.1	Conv. (cfs)		58487.1	
Length Wtd. (ft)	159.00	Wetted Per. (ft)		94.43	
Min Ch El (ft)	41.70	Shear (lb/sq ft)		2.34	
Alpha	1.00	Stream Power (lb/ft s)		31.72	
Frctn Loss (ft)	1.24	Cum Volume (acre-ft)	0.57	10.22	0.14
C & E Loss (ft)	0.01	Cum SA (acres)	0.31	2.16	0.14

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: Pittman
REACH: 1 RS: -40

INPUT
Description: ESI STA 848
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	48.2	24	48.2	37.5	41.2	75	40.4	112.5	41.2
126	48.2	150	48.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	142	173	160	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	48.61	Element			
Vel Head (ft)	1.74	Wt. n-Val.		0.027	

W.S. Elev (ft)	46.87	Reach Len. (ft)	142.00	173.00	160.00
Crit W.S. (ft)	46.08	Flow Area (sq ft)		517.39	
E.G. Slope (ft/ft)	0.004113	Area (sq ft)		517.39	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	96.88	Top Width (ft)		96.88	
Vel Total (ft/s)	10.58	Avg. Vel. (ft/s)		10.58	
Max Chl Dpth (ft)	6.47	Hydr. Depth (ft)		5.34	
Conv. Total (cfs)	85372.5	Conv. (cfs)		85372.5	
Length Wtd. (ft)	173.00	Wetted Per. (ft)		99.66	
Min Ch El (ft)	40.40	Shear (lb/sq ft)		1.33	
Alpha	1.00	Stream Power (lb/ft s)		14.11	
Frctn Loss (ft)	0.89	Cum Volume (acre-ft)	0.57	8.54	0.14
C & E Loss (ft)	0.06	Cum SA (acres)	0.31	1.82	0.14

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -41

INPUT
Description: ESI STA 1008
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	47.3	24	47.3	37.5	40.4	75	39.6	112.5	40.4
126	47.3	150	47.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	143	143	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	47.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.38	Wt. n-Val.		0.027	
W.S. Elev (ft)	45.28	Reach Len. (ft)	143.00	143.00	143.00
Crit W.S. (ft)	45.28	Flow Area (sq ft)		442.48	
E.G. Slope (ft/ft)	0.006632	Area (sq ft)		442.48	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	94.09	Top Width (ft)		94.09	
Vel Total (ft/s)	12.37	Avg. Vel. (ft/s)		12.37	
Max Chl Dpth (ft)	5.68	Hydr. Depth (ft)		4.70	
Conv. Total (cfs)	67230.1	Conv. (cfs)		67230.1	
Length Wtd. (ft)	143.00	Wetted Per. (ft)		96.46	
Min Ch El (ft)	39.60	Shear (lb/sq ft)		1.90	
Alpha	1.00	Stream Power (lb/ft s)		23.50	
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.57	6.63	0.14
C & E Loss (ft)	0.35	Cum SA (acres)	0.31	1.44	0.14

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.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -42

INPUT
Description: ESI STA 1151
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	45.5	24	45.5	37.5	38.5	75	37.8	112.5	38.5
126	45.5	150	45.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	150	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	150	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	46.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.20	Wt. n-Val.		0.027	
W.S. Elev (ft)	45.27	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	43.42	Flow Area (sq ft)		622.17	
E.G. Slope (ft/ft)	0.002367	Area (sq ft)		622.17	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	101.10	Top Width (ft)		101.10	
Vel Total (ft/s)	8.80	Avg. Vel. (ft/s)		8.80	
Max Chl Dpth (ft)	7.47	Hydr. Depth (ft)		6.15	
Conv. Total (cfs)	112536.0	Conv. (cfs)		112536.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		104.42	
Min Ch El (ft)	37.80	Shear (lb/sq ft)		0.88	
Alpha	1.00	Stream Power (lb/ft s)		7.75	

Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.57	4.88	0.14
C & E Loss (ft)	0.04	Cum SA (acres)	0.31	1.12	0.14

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: Pittman
REACH: 1 RS: -43

INPUT
Description: ESI STA 1256
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	55	9	50	36	45	225	45	370	48
477	40	486	39	492	38	525	38	528	39
532	40	536	41	539	42	563	43	580	44
595	45								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	477	.027	595	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
477	595	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	46.06	Element			
Vel Head (ft)	1.63	Wt. n-Val.	0.027	0.027	
W.S. Elev (ft)	44.43	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	44.43	Flow Area (sq ft)	131.35	417.88	
E.G. Slope (ft/ft)	0.006450	Area (sq ft)	131.35	417.88	
Q Total (cfs)	5475.00	Flow (cfs)	984.96	4490.04	
Top Width (ft)	168.75	Top Width (ft)	59.28	109.48	
Vel Total (ft/s)	9.97	Avg. Vel. (ft/s)	7.50	10.74	
Max Chl Dpth (ft)	6.43	Hydr. Depth (ft)	2.22	3.82	
Conv. Total (cfs)	68169.9	Conv. (cfs)	12263.8	55906.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)	59.44	110.25	
Min Ch El (ft)	38.00	Shear (lb/sq ft)	0.89	1.53	
Alpha	1.05	Stream Power (lb/ft s)	6.67	16.40	
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.42	3.69	0.14
C & E Loss (ft)	0.08	Cum SA (acres)	0.24	0.88	0.14

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

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -44

INPUT
Description: ESI STA 1356
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	55	14	45	280	45	355	40	401	40
406	39	413	38	433	37	446	37	458	38
462	39	466	40	624	45				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	401	.027	466	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
401	466	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	45.04	Element			
Vel Head (ft)	3.10	Wt. n-Val.	0.027	0.027	0.027
W.S. Elev (ft)	41.93	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	42.93	Flow Area (sq ft)	116.95	265.65	59.04
E.G. Slope (ft/ft)	0.012478	Area (sq ft)	116.95	265.65	59.04
Q Total (cfs)	5475.00	Flow (cfs)	966.25	4154.04	354.71
Top Width (ft)	201.08	Top Width (ft)	75.00	65.00	61.09
Vel Total (ft/s)	12.40	Avg. Vel. (ft/s)	8.26	15.64	6.01
Max Chl Dpth (ft)	4.93	Hydr. Depth (ft)	1.56	4.09	0.97
Conv. Total (cfs)	49013.5	Conv. (cfs)	8650.1	37187.9	3175.5
Length Wtd. (ft)	100.00	Wetted Per. (ft)	75.06	65.48	61.12
Min Ch El (ft)	37.00	Shear (lb/sq ft)	1.21	3.16	0.75
Alpha	1.30	Stream Power (lb/ft s)	10.03	49.42	4.52
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)	0.13	2.90	0.07
C & E Loss (ft)	0.15	Cum SA (acres)	0.09	0.68	0.07

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

CROSS SECTION

RIVER: Pittman

REACH: 1 RS: -45

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	50.23	26	37.36	60	35.13	85	34.64	90	37
99	37.26	102	37.44	120	43.9	122	44.59	145	45.21

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	145	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	145	100	60	35	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	43.85	Element			
Vel Head (ft)	3.31	Wt. n-Val.		0.027	
W.S. Elev (ft)	40.54	Reach Len. (ft)	100.00	60.00	35.00
Crit W.S. (ft)	41.29	Flow Area (sq ft)		374.99	
E.G. Slope (ft/ft)	0.010962	Area (sq ft)		374.99	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	91.07	Top Width (ft)		91.07	
Vel Total (ft/s)	14.60	Avg. Vel. (ft/s)		14.60	
Max Chl Dpth (ft)	5.90	Hydr. Depth (ft)		4.12	
Conv. Total (cfs)	52292.8	Conv. (cfs)		52292.8	
Length Wtd. (ft)	60.00	Wetted Per. (ft)		92.97	
Min Ch El (ft)	34.64	Shear (lb/sq ft)		2.76	
Alpha	1.00	Stream Power (lb/ft s)		40.30	
Frctn Loss (ft)	1.17	Cum Volume (acre-ft)		2.17	
C & E Loss (ft)	0.02	Cum SA (acres)		0.50	

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: Pittman
REACH: 1 RS: -46

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	49.93	25	35.73	70	34.6	105	36.21	112	36.31
114	36.05	135	43.84	140	44.49	165	45.18		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	165	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	165	60	50	40	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	42.96	Element			
Vel Head (ft)	3.98	Wt. n-Val.		0.027	
W.S. Elev (ft)	38.97	Reach Len. (ft)	60.00	50.00	40.00
Crit W.S. (ft)	40.14	Flow Area (sq ft)		341.79	
E.G. Slope (ft/ft)	0.017349	Area (sq ft)		341.79	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	102.60	Top Width (ft)		102.60	
Vel Total (ft/s)	16.02	Avg. Vel. (ft/s)		16.02	
Max Chl Dpth (ft)	4.37	Hydr. Depth (ft)		3.33	
Conv. Total (cfs)	41566.6	Conv. (cfs)		41566.6	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		104.05	
Min Ch El (ft)	34.60	Shear (lb/sq ft)		3.56	
Alpha	1.00	Stream Power (lb/ft s)		56.99	
Frctn Loss (ft)	0.82	Cum Volume (acre-ft)		1.68	
C & E Loss (ft)	0.07	Cum SA (acres)		0.36	

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: Pittman
REACH: 1 RS: -47

INPUT
Description: PBSJ SURVEY SECTION
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	50.42	10	35.13	12	35.01	70	35.01	100	35.01
120	45.26	167	46.45						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	167	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	167	110	110	110	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	42.44	Element			
Vel Head (ft)	1.29	Wt. n-Val.		0.027	
W.S. Elev (ft)	41.15	Reach Len. (ft)	5.00	5.00	5.00
Crit W.S. (ft)	39.75	Flow Area (sq ft)		601.37	

E.G. Slope (ft/ft)	0.002864	Area (sq ft)	601.37
Q Total (cfs)	5475.00	Flow (cfs)	5475.00
Top Width (ft)	105.92	Top Width (ft)	105.92
Vel Total (ft/s)	9.10	Avg. Vel. (ft/s)	9.10
Max Chl Dpth (ft)	6.14	Hydr. Depth (ft)	5.68
Conv. Total (cfs)	102296.4	Conv. (cfs)	102296.4
Length Wtd. (ft)	5.00	Wetted Per. (ft)	110.67
Min Ch El (ft)	35.01	Shear (lb/sq ft)	0.97
Alpha	1.00	Stream Power (lb/ft s)	8.85
Frctn Loss (ft)		Cum Volume (acre-ft)	1.13
C & E Loss (ft)		Cum SA (acres)	0.24

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

BRIDGE

RIVER: Pittman
REACH: 1 RS: -47.5

INPUT
Description:
Distance from Upstream XS = 5
Deck/Roadway Width = 100
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	48	44	200	48	44

Upstream Bridge Cross Section Data
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	50.42	10	35.13	12	35.01	70	35.01	100	35.01
120	45.26	167	46.45						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	167	.027

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	167	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	48	44	110	48	44

Downstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	54	2	33	60	33	100	33	110	49
130	50								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	130	.027

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	130	.1	.3

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 =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 4

Pier Data
Pier Station Upstream= 20 Downstream= 20
Upstream num= 2

Width	Elev	Width	Elev
1.5	43	1.5	46

Downstream num= 2

Width	Elev	Width	Elev
1.5	43	1.5	46

Pier Data
Pier Station Upstream= 40 Downstream= 40
Upstream num= 2

Width	Elev	Width	Elev
1.5	43	1.5	70

Downstream num= 2

Width	Elev	Width	Elev
1.5	43	1.5	70

Pier Data
Pier Station Upstream= 70 Downstream= 70
Upstream num= 2

Width	Elev	Width	Elev
1.5	43	1.5	46

Downstream num= 2

Width	Elev	Width	Elev
1.5	43	1.5	46

Pier Data
Pier Station Upstream= 90 Downstream= 90
Upstream num= 2

Width	Elev	Width	Elev
1.5	43	1.5	46

Downstream num= 2

Width	Elev	Width	Elev
1.5	43	1.5	46

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Highest Energy Answer

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

			Inside BR US	Inside BR DS
E.G. US. (ft)	42.44	E.G. Elev (ft)	42.29	40.10
W.S. US. (ft)	41.15	W.S. Elev (ft)	39.97	37.76
Q Total (cfs)	5475.00	Crit W.S. (ft)	39.97	37.76
Q Bridge (cfs)	5475.00	Max Chl Dpth (ft)	4.96	4.76
Q Weir (cfs)		Vel Total (ft/s)	12.22	12.27
Weir Sta Lft (ft)		Flow Area (sq ft)	448.15	446.17
Weir Sta Rgt (ft)		Froude # Chl	1.00	1.00
Weir Submerg		Specif Force (cu ft)	3161.82	3142.09
Weir Max Depth (ft)		Hydr Depth (ft)	4.63	4.68
Min El Weir Flow (ft)	48.01	W.P. Total (ft)	140.34	140.48
Min El Prs (ft)	44.00	Conv. Total (cfs)	53483.5	53053.7
Delta EG (ft)	2.36	Top Width (ft)	96.84	95.43
Delta WS (ft)	4.38	Frctn Loss (ft)		
BR Open Area (sq ft)	859.62	C & E Loss (ft)		
BR Open Vel (ft/s)	12.27	Shear Total (lb/sq ft)	2.09	2.11
Coef of Q		Power Total (lb/ft s)	25.52	25.91
Br Sel Method	Momentum			

Warning: Pier drag coefficient of 2.0 assumed for Class B flow.
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 conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: The energy method has computed a class B profile.

CROSS SECTION

RIVER: Pittman
REACH: 1 RS: -48

INPUT
Description: PBSJ SURVEY SECTION - D/S OF PECOS BRIDGE
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	54	2	33	60	33	100	33	110	49
130	50								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.027	0	.027	130	.027

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	130	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	40.08	Element			
Vel Head (ft)	3.31	Wt. n-Val.		0.027	
W.S. Elev (ft)	36.78	Reach Len. (ft)			
Crit W.S. (ft)	37.55	Flow Area (sq ft)		375.24	
E.G. Slope (ft/ft)	0.013069	Area (sq ft)		375.24	
Q Total (cfs)	5475.00	Flow (cfs)		5475.00	
Top Width (ft)	100.72	Top Width (ft)		100.72	
Vel Total (ft/s)	14.59	Avg. Vel. (ft/s)		14.59	
Max Chl Dpth (ft)	3.78	Hydr. Depth (ft)		3.73	
Conv. Total (cfs)	47892.9	Conv. (cfs)		47892.9	
Length Wtd. (ft)		Wetted Per. (ft)		106.25	
Min Ch El (ft)	33.00	Shear (lb/sq ft)		2.88	
Alpha	1.00	Stream Power (lb/ft s)		42.04	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Note: The energy method has computed a class B profile.

SUMMARY OF MANNING'S N VALUES

River:Pittman

Reach	River Sta.	n1	n2	n3

1	-.5	.027	.027	.027
1	-.7	.027	.027	.027
1	-.8	Culvert		
1	-.9	.027	.027	.027
1	-1	.013	.027	
1	-2	.013	.027	
1	-3	.013	.027	
1	-4	.013	.027	
1	-5	.013	.027	
1	-6	.013	.027	
1	-7	.013	.027	
1	-8	.013	.027	
1	-9	.013	.027	
1	-10	.013	.027	
1	-11	.013	.027	
1	-12	.013	.027	
1	-13	.013	.027	
1	-14	.013	.027	
1	-15	.013	.027	
1	-16	.013	.027	
1	-17	.013	.027	
1	-18	.013	.027	
1	-19	.013	.027	
1	-20	.013	.027	
1	-21	.013	.027	
1	-22	.013	.027	
1	-23	.013	.027	
1	-24	.013	.027	
1	-25	.017	.013	.017
1	-25.5	Culvert		
1	-25.8	.027	.013	.027
1	-26	.027	.027	.027
1	-27	.027	.027	.027
1	-28	.027	.027	.027
1	-29	.027	.027	.027
1	-30	.027	.027	.027
1	-31	.027	.027	.027
1	-32	.027	.027	.027
1	-33	.027	.027	.027
1	-34	.027	.027	.027
1	-35	.027	.027	.027
1	-36	.027	.027	.027
1	-37	.027	.027	.027
1	-38	.027	.027	.027
1	-39	.027	.027	.027
1	-40	.027	.027	.027
1	-41	.027	.027	.027
1	-42	.027	.027	.027
1	-43	.027	.027	.027
1	-44	.027	.027	.027
1	-45	.027	.027	.027
1	-46	.027	.027	.027
1	-47	.027	.027	.027
1	-47.5	Bridge		
1	-48	.027	.027	.027

SUMMARY OF REACH LENGTHS

River: Pittman

Reach	River Sta.	Left	Channel	Right
1	-.5	100	100	100
1	-.7	110	110	110
1	-.8	Culvert		
1	-.9	275	275	275
1	-1	100	100	100
1	-2	100	100	100
1	-3	100	100	100
1	-4	100	100	100
1	-5	100	100	100
1	-6	100	100	100
1	-7	100	100	100
1	-8	100	100	100
1	-9	100	100	100
1	-10	100	100	100
1	-11	100	100	100
1	-12	100	100	100
1	-13	100	100	100
1	-14	100	100	100
1	-15	100	100	100
1	-16	100	100	100
1	-17	100	100	100
1	-18	100	100	100
1	-19	100	100	100
1	-20	100	100	100
1	-21	100	100	100
1	-22	100	100	100
1	-23	100	100	100
1	-24	100	100	100
1	-25	150	150	150
1	-25.5	Culvert		
1	-25.8	180	180	180
1	-26	320	320	320
1	-27	320	320	320
1	-28	220	220	220
1	-29	250	190	160
1	-30	320	300	280
1	-31	250	250	250
1	-32	250	250	250
1	-33	118	106	112
1	-34	45	45	45

1	-35	140	140	140
1	-36	150	150	150
1	-37	111	111	111
1	-38	140	140	140
1	-39	133	159	145
1	-40	142	173	160
1	-41	143	143	143
1	-42	100	100	100
1	-43	100	100	100
1	-44	100	100	100
1	-45	100	60	35
1	-46	60	50	40
1	-47	110	110	110
1	-47.5	Bridge		
1	-48	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Pittman

Reach	River Sta.	Contr.	Expan.
1	-.5	.1	.3
1	-.7	.1	.3
1	-.8	Culvert	
1	-.9	.1	.3
1	-1	.1	.3
1	-2	.1	.3
1	-3	.1	.3
1	-4	.1	.3
1	-5	.1	.3
1	-6	.1	.3
1	-7	.1	.3
1	-8	.1	.3
1	-9	.1	.3
1	-10	.1	.3
1	-11	.1	.3
1	-12	.1	.3
1	-13	.1	.3
1	-14	.1	.3
1	-15	.1	.3
1	-16	.1	.3
1	-17	.1	.3
1	-18	.1	.3
1	-19	.1	.3
1	-20	.1	.3
1	-21	.1	.3
1	-22	.1	.3
1	-23	.1	.3
1	-24	.1	.3
1	-25	.1	.3
1	-25.5	Culvert	
1	-25.8	.1	.3
1	-26	.1	.3
1	-27	.1	.3
1	-28	.1	.3
1	-29	.1	.3
1	-30	.1	.3
1	-31	.1	.3
1	-32	.1	.3
1	-33	.1	.3
1	-34	.1	.3
1	-35	.1	.3
1	-36	.1	.3
1	-37	.1	.3
1	-38	.1	.3
1	-39	.1	.3
1	-40	.1	.3
1	-41	.1	.3
1	-42	.1	.3
1	-43	.1	.3
1	-44	.1	.3
1	-45	.1	.3
1	-46	.1	.3
1	-47	.1	.3
1	-47.5	Bridge	
1	-48	.1	.3

CHECK-RAS

CHECK-RAS Program: Structure Check

Project File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.prj
Plan File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.p01
Geometry File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.g01
Flow File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.f01
Report File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.br
Selected profiles: PF 1
Date: 5/4/2004
Time: 8:53:18 AM

RS	MaxLoChord	MnTpRd	EGEL	WSEL	MinChEl	Structure
Pittman,1						
-0.5			111.49	111.04	105.2	
-0.7			111.38	110.91	104	
-0.8	15	117	0	112.9	6	Culvert #1-Up
-0.8	9	115	0	0	0	Culvert #1-Dn
-0.9			112.48	112.09	103.3	
-1			111.9	109.3	102.61	
-2			110.91	106.51	101.31	
-3			109.64	106.84	100.1	
-4			108.86	105.02	98.17	
-5			107.92	103.68	97.14	
-6			106.84	102.19	96.11	
-7			105.66	100.64	94.18	
-8			104.22	98.69	93.15	
-9			102.44	97.4	92.12	
-10			100.72	96.38	91	
-11			99.3	95.61	89.61	
-12			97.97	93.9	88.31	
-13			96.23	91.83	87.01	
-14			94.37	91.38	85.7	
-15			93.13	89.44	84.4	
-16			91.98	88.47	83.1	
-17			90.92	87.11	81.81	
-18			89.79	85.84	80.5	
-19			88.28	83.64	79.1	
-20			86.53	83.68	77.9	
-21			85.14	80.77	76.6	
-22			83.53	81.68	75.3	
-23			83.03	81.81	74	
-24			82.75	81.9	72.9	
-25			82.61	82.12	72.49	
-25.5	17	80.65	0	81.9	12	Culvert #1-Up
-25.5	5	80.65	0	0	0	Culvert #1-Dn
-25.8			79.11	76.76	71.31	
-26			78.14	72.99	68.46	
-27			74.68	73.16	66.6	
-28			73.06	70.61	64.5	
-29			71.05	67.3	60.77	
-30			68.73	64.69	58.19	
-31			65.08	61.09	54.26	
-32			60.98	55.98	51.56	
-33			56.38	52.68	48	
-34			55.03	52.56	47	
-35			54.63	51.76	46.5	
-36			53.38	50.48	45.3	
-37			52.04	49.3	44	
-38			51.08	48.17	43	
-39			49.83	46.97	41.7	
-40			48.61	46.87	40.4	
-41			47.66	45.28	39.6	
-42			46.47	45.27	37.8	
-43			46.06	44.43	38	

-44	45.04	41.93	37
-45	43.85	40.54	34.64
-46	42.96	38.97	34.6
-47	42.44	41.15	35.01
-48	40.08	36.78	33

RIVER/REACH: Pittman, 1
RIVER STATION: -0.8
TYPE OF STRUCTURE: Culvert

Description:

Distance from Upstream XS:	10
Deck/Roadway Width:	90
Weir Coefficient:	2.6
Maximum allowable submergence for weir flow:	0.95
Elevation at which weir flow begins:	0
Weir crest shape:	Broad Crested

Sec	River Station	Length Channel	WSEL	Surch.	EGEL	TopWidth Actual	
4	-0.5	100.00	111.04		111.49	211.38	
3	-0.7	110.00	110.91		111.38	175.96	
	-0.8	90.00	112.9		0	0	Culvert #1-Up
	-0.8	10.00	0		0	0	Culvert #1-Dn
2	-0.9	275.00	112.09		112.48	142.34	
1	-1	100.00	109.3		111.9	80.69	

Ineffective Flow, Section 3			Ineffective Flow, Section 2		
Sta L	Sta R	Elev	Sta L	Sta R	Elev

Opening Type	StagStaL	StagStaR	EncStaL	EncStaR	LIfStaS	RIfStaS	
Culvert Group					0	0	U
					0	0	D

CULVERT:
Culvert Name: Culvert #1

Shape:	Box	Rise:	9	Span:	12	Barrels:	0

FHWA Chart #: # 8 - flared wingwalls
FHWA Scale #: # 1 - Wingwall flared 30 to 75 deg.
Solution Crit:Inlet control

UpstrmDist:	10	Length:	90	n-Value:	0.013		
EntLossCoef:	0.2	ExtLossCoef:	1	CulvInvElU	6	CulvInvElD	0
LCntStaU:	93	RCntStaU:	184	LCntStaD	26	RCntStaD	117

Culv Area:	0	CulvQ:	5411	MinTopRd:	0

LAbutSt	RAbutSt	LMnTpRd	RMnTpRd	MnTpRd	MxLoCd

Culvert #1	87	190	117	117	117	15	U
	20	123	115	115	115	9	D

Name	Q Total.	Q Struc	Q Weir	Selected Method	Flow Type
Culvert #1		5411	0	Inlet control	UNKNOWN

GEOMETRIC CHECK

TYPE OF FLOW CHECK

RS: -0.8 This is Culvert #1
CV TF 01 Type of flow is UNKNOWN.
CHECKRAS can not find MxLoCd or MnTpRd elevation
or the given conditions do not satisfy the type of flow
specified in the CHECK-RAS program.
Please review the ground and road data, and encroachment stations.
or please review the messages, CV LF 01,CV PF 01, , CV LW 01
CV PW 01 for culverts to determine the type of flow.

RIVER/REACH: Pittman, 1
RIVER STATION: -25.5
TYPE OF STRUCTURE: Culvert

Description:	
Distance from Upstream XS:	20
Deck/Roadway Width:	80
Weir Coefficient:	3
Maximum allowable submergence for weir flow:	0.95
Elevation at which weir flow begins:	0
Weir crest shape:	Broad Crested

Sec	River Station	Length Channel	WSEL	Surch.	EGEL	TopWidth Actual	
4	-24	100.00	81.9		82.75	107.54	
3	-25	150.00	82.12		82.61	240	
	-25.5	80.00	81.9		0	0	Culvert #1-Up
	-25.5	50.00	0		0	0	Culvert #1-Dn
2	-25.8	180.00	76.76		79.11	95.06	
1	-26	320.00	72.99		78.14	87.83	

	Ineffective Flow, Section 3			Ineffective Flow, Section 2		
	Sta L	Sta R	Elev	Sta L	Sta R	Elev
1	888	0	0	888	0	0
2	0	0	0	0	0	0

Opening Type	StagStaL	StagStaR	EncStaL	EncStaR	LIfStaS	RIfStaS	
Culvert Group					0	888	U

0 888 D

CULVERT:
Culvert Name: Culvert #1
Shape: Box Rise: 5 Span: 10 Barrels:
0
FHWA Chart #: # 10- 90 degree headwall; Cha
FHWA Scale #: # 1 - Inlet edges chamfered 3/4 inch
Solution Crit:Inlet control

UpstrmDist:	20	Length:	80	n-Value:	0.013	
EntLossCoef:	0.2	ExtLossCoef:	1	CulvInvElU	12	CulvInvElD
0						
LCntStaU:	540	RCntStaU:	595	LCntStaD	585	RCntStaD
640						

Culv Area: 0 CulvQ: 3848.6 MinTopRd: 0

	LAbutSt	RAbutSt	LMnTpRd	RMnTpRd	MnTpRd	MxLoCd	
Culvert #1	535	600	80.65	80.65	80.65	17	U
	580	645	80.65	80.65	80.65	5	D

Name	Q Total.	Q Struc	Q Weir	Selected Method	Flow Type
Culvert #1		3848.6	0	Inlet control	UNKNOWN

GEOMETRIC CHECK

RS: -25.5
ST GD 03 The end station of 1000 from downstream road/weir data
is greater than the end station of 945 from downstream internal
section.
The high chord elevation of 82.03 for the end road/weir station is
greater than the ground elevation of 81.46 for the end ground station.
The EGEL at section 3 of 82.61 is greater than the ground elevation.
The road/weir data should be included in the ground data

TYPE OF FLOW CHECK

RS: -25.5 This is Culvert #1
CV TF 01 Type of flow is UNKNOWN.
CHECKRAS can not find MxLoCd or MnTpRd elevation
or the given conditions do not satisfy the type of flow
specified in the CHECK-RAS program.
Please review the ground and road data, and encroachment stations.
or please review the messages, CV LF 01,CV PF 01, , CV LW 01
CV PW 01 for culverts to determine the type of flow.

RIVER/REACH: Pittman, 1
RIVER STATION: -47.5
TYPE OF STRUCTURE: Bridge

Description:
Distance from Upstream XS: 5

Deck/Roadway Width: 100
Weir Coefficient: 2.6
Maximum allowable submergence for weir flow: 0.95
Elevation at which weir flow begins: 0
Weir crest shape: Broad Crested

Sec	River Station	Length Channel	WSEL	Surch.	EGEL	TopWidth Actual	
4	-46	50.00	38.97		42.96	102.6	
3	-47	110.00	41.15		42.44	105.92	
	-47.5	100.00	0		0	Null	Single BR-Up
	-47.5	5.00	0		0	Null	Single BR-Dn
2	-48	0.00	36.78		40.08	100.72	

Ineffective Flow, Section 3			Ineffective Flow, Section 2		
Sta L	Sta R	Elev	Sta L	Sta R	Elev

BRIDGE:
Bridge Name: Single BR
LowFlowMethod: Highest Energy Answer
Momentum Cd: 0
HighFlowMethod: Energy Only
SluiceGate Cd: 0 Submerged Cd: 0

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

MaxLowChord: 44 MinTopRd: 0 MinElPrs: 44

Opening Type	StagStaL	StagStaR	EncStaL	EncStaR	LIfStaS	RIfStaS	
Bridge					0	0	U
					0	0	D

	LAbutSt	RAbutSt	LMnTpRd	RMnTpRd	MnTpRd	MxLoCd	
Single BR	4.20	117.54	48.00	48.00	48.00	44.00	U
	0.95	106.88	48.00	48.00	48.00	44.00	D

Name	Q Total.	Q Struc	Q Weir	Selected Method	Flow Type
Single BR	5475	5475	0	Momentum	UNKNOWN

GEOMETRIC CHECK

TYPE OF FLOW CHECK

```
RS:        -47.5 This is Single BR
BR TF 01   Type of flow is UNKNOWN.
           CHECKRAS can not find MxLoCd or MnTpRd elevation
           or the given conditions do not satisfy the type of flow
           specified in the CHECK-RAS program.
           Please review the ground and road data, and encroachment stations.
           or please review the messages, BR LF 01, BR PF 01, BR PF 02, BR LW 01
           BR PW 01 for bridges to determine the type of flow.

---END
```

CHECK-RAS Program: NT Check
Manning's n Value and Transition Loss Coefficient Review

Project File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.prj
Plan File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.p01
Geometry File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.g01
Flow File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.f01
Report File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.nt
Selected profiles: PF 1
Date: 5/4/2004
Time: 8:53:23 AM

SECNO	STRUCTURE	NLOB	NCHL	NROB	CNTR	EXP
Pittman,1						
-.5		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-.7		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-.8	Culvert-Up	-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-.8	Culvert-Dn	-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-.9		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-1		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-2		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-3		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-4		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-5		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-6		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-7		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-8		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-9		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-10		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-11		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-12		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-13		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-14		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-15		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-16		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-17		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-18		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-19		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-20		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		

-21		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-22		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-23		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-24		-----	0.013	-----	0.1	0.3
		-----	0.027	-----		
-25		0.017	0.013	0.017	0.1	0.3
-25.5	Culvert-Up	0.017	0.013	0.017	0.1	0.3
-25.5	Culvert-Dn	0.027	0.013	0.027	0.1	0.3
-25.8		0.027	0.013	0.027	0.1	0.3
-26		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-27		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-28		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-29		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-30		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-31		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-32		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-33		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-34		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-35		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-36		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-37		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-38		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-39		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-40		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-41		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-42		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-43		0.027	0.027	0.027	0.1	0.3
-44		0.027	0.027	0.027	0.1	0.3
-45		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-46		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-47		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-47.5	Bridge-Up	-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-47.5	Bridge-Dn	-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		
-48		-----	0.027	0.027	0.1	0.3
		-----	0.027	-----		

---Summary of Statistics---

	Minimum	Maximum
Left Overbank n Value:	0.017	0.027
Right Overbank n Value:	0.017	0.027

Channel n Value:	0.013	0.027
Contraction Coefficient:	0.1	0.1
Expansion Coefficient:	0.3	0.3

ROUGHNESS COEFFICIENT CHECK

RS: -0.5
NT RC 01 Right overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -0.7
NT RC 01 Right overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -0.8
NT RC 01 Right overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -0.8
NT RC 01 Right overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -0.9
NT RC 01 Right overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -25
NT RC 01 Left overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -25
NT RC 01 Right overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -25
NT RC 03 Channel n value is equal to or less than 0.025
The n value of the channel is usually larger than 0.025.
The n value should be reevaluated it if is not representing a
concrete lined channel.

RS: -25.5
NT RC 01 Left overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -25.5
NT RC 01 Right overbank n value is less than 0.035
The n value for overbank is usually larger then 0.035.
The n value should be reevaluated.

RS: -25.5
NT RC 03 Channel n value is equal to or less than 0.025
The n value of the channel is usually larger than 0.025.
The n value should be reevaluated it if is not representing a
concrete lined channel.

```
RS:      -25.5
NT RC 01 Left overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -25.5
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -25.5
NT RC 03 Channel n value is equal to or less than 0.025
         The n value of the channel is usually larger than 0.025.
         The n value should be reevaluated it if is not representing a
         concrete lined channel.

RS:      -25.8
NT RC 01 Left overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -25.8
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -25.8
NT RC 03 Channel n value is equal to or less than 0.025
         The n value of the channel is usually larger than 0.025.
         The n value should be reevaluated it if is not representing a
         concrete lined channel.

RS:      -26
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -27
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -28
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -29
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -30
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -31
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.

RS:      -32
NT RC 01 Right overbank n value is less than 0.035
         The n value for overbank is usually larger then 0.035.
         The n value should be reevaluated.
```

```
RS:      -33
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -34
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -35
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -36
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -37
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -38
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -39
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -40
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -41
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -42
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -43
NT RC 01 Left overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -43
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -44
NT RC 01 Left overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.
```

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RS:      -44
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -45
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -46
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -47
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -47.5
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

RS:      -47.5
NT RC 01 Right overbank n value is less than 0.035
          The n value for overbank is usually larger then 0.035.
          The n value should be reevaluated.

TRANSITION LOSS COEFFICIENT CHECK
---------------------------------

RS:      -0.5
NT TL 01 This is section 4
          Contraction and expansion loss coefficients are 0.1 and 0.3
          They should be equal to 0.3 and 0.5 respectively.

RS:      -0.7
NT TL 01 This is section 3
          Contraction and expansion loss coefficients are 0.1 and 0.3
          They should be equal to 0.3 and 0.5 respectively.

RS:      -0.9
NT TL 01 This is section 2
          Contraction and expansion loss coefficients are 0.1 and 0.3
          They should be equal to 0.3 and 0.5 respectively.

RS:      -24
NT TL 01 This is section 4
          Contraction and expansion loss coefficients are 0.1 and 0.3
          They should be equal to 0.3 and 0.5 respectively.

RS:      -25
NT TL 01 This is section 3
          Contraction and expansion loss coefficients are 0.1 and 0.3
          They should be equal to 0.3 and 0.5 respectively.

RS:      -25.8
NT TL 01 This is section 2
          Contraction and expansion loss coefficients are 0.1 and 0.3
          They should be equal to 0.3 and 0.5 respectively.

RS:      -46
NT TL 01 This is section 4
          Contraction and expansion loss coefficients are 0.1 and 0.3
```

They should be equal to 0.3 and 0.5 respectively.

RS: -47
NT TL 01 This is section 3
Contraction and expansion loss coefficients are 0.1 and 0.3
They should be equal to 0.3 and 0.5 respectively.

RS: -47.5
NT TL 01 This is section Bridge-Up
Contraction and expansion loss coefficients are 0.1 and 0.3
They should be equal to 0.3 and 0.5 respectively.

RS: -47.5
NT TL 01 This is section Bridge-Dn
Contraction and expansion loss coefficients are 0.1 and 0.3
They should be equal to 0.3 and 0.5 respectively.

RS: -48
NT TL 01 This is section 2
Contraction and expansion loss coefficients are 0.1 and 0.3
They should be equal to 0.3 and 0.5 respectively.

ROUGHNESS COEFFICIENT AT STRUCTURES

RS: -25.8
NT RS 01 This is Section 2.
Channel n value of 0.013 is less than the channel n value of 0.027
at Section 1.

RS: -47.5
NT RS 02 The channel n value of 0.027 for the upstream internal bridge opening
section is equal or larger than the channel n value of 0.027 at Section 3.
Usually, the channel n value of the bridge opening section is
less than the channel n value of Section 3.
The selection of the n value(s) should be reevaluated.

RS: -47.5
NT RS 02 The channel n value of 0.027 for the downstream internal bridge opening
section is equal or larger than the channel n value of 0.027 at Section 2
Usually, the channel n value of the bridge opening section is
less than the channel n value of Section 2.
The selection of the n value(s) should be reevaluated.

---END---

CHECK-RAS Program, XS Check
Cross Section Location and Alignment Review

Project File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.prj
Plan File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.p01
Geometry File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.g01
Flow File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.f01
Report File: L:\PROJECTS\511542_FIS\Pittman Wash\HEC-RAS\Pittman.xs
Selected profiles: PF 1
Date: 5/4/2004
Time: 8:53:15 AM

SECNO	Len Lob	Len Chl	Len Rob	TopWdthAct	Q Total	Flow Code
Pittman,1						
-0.5	100	100	100	211.38	5411	
-0.7	110	110	110	175.96	5411	
-0.8	Culvert #1-Up					
-0.8	Culvert #1-Dn					
-0.9	275	275	275	142.34	5411	
-1	100	100	100	80.69	5411	C
-2	100	100	100	77.96	5411	
-3	100	100	100	75.68	5411	
-4	100	100	100	66.38	5411	
-5	100	100	100	65.87	5411	
-6	100	100	100	65.04	5411	
-7	100	100	100	60.29	5411	
-8	100	100	100	69.84	5411	
-9	100	100	100	77.98	5411	
-10	100	100	100	83.46	5411	
-11	100	100	100	84.67	5411	
-12	100	100	100	94.97	5411	D
-13	100	100	100	100.93	5411	
-14	100	100	100	112.14	5411	
-15	100	100	100	90.97	5411	
-16	100	100	100	84.12	5411	
-17	100	100	100	79.2	5411	
-18	100	100	100	81.88	5411	
-19	100	100	100	92.78	5411	
-20	100	100	100	98.31	5411	
-21	100	100	100	101.12	5411	
-22	100	100	100	108.62	5411	
-23	100	100	100	102.57	5411	
-24	100	100	100	107.54	5411	E
-25	150	150	150	240	5540	E
-25.5	Culvert #1-Up					
-25.5	Culvert #1-Dn					
-25.8	180	180	180	95.06	5502	C
-26	320	320	320	87.83	5502	
-27	320	320	320	105.54	5502	
-28	220	220	220	89.27	5502	C
-29	250	190	160	82.83	5502	
-30	320	300	280	76.79	5502	
-31	250	250	250	77.28	5502	
-32	250	250	250	93.99	5502	
-33	118	106	112	90.91	5502	
-34	45	45	45	93.76	5502	
-35	140	140	140	92.2	5475	
-36	150	150	150	92.27	5475	
-37	111	111	111	92.75	5475	
-38	140	140	140	92.25	5475	
-39	133	159	145	92.23	5475	
-40	142	173	160	96.88	5475	
-41	143	143	143	94.09	5475	C

-42	100	100	100	101.1	5475	
-43	100	100	100	168.75	5475	C
-44	100	100	100	201.08	5475	
-45	100	60	35	91.07	5475	
-46	60	50	40	102.6	5475	
-47	110	110	110	105.92	5475	
-47.5	Single BR-Up					
-47.5	Single BR-Dn					
-48	0	0	0	100.72	5475	

B=blocked obstruction
C=critial depth
D=divided flow
E=cross section extended
K=known water-surface

XS SC 05
XS SC 03
XS SC 01
XS SC 02
XS SC 04

DISTANCE CHECK

RS: -33
XS DT 01 Both right and left overbank distances are
longer than the channel distance.

SPACING CHECK

INEFFECTIVE FLOW CHECK

DISCHARGE CHECK

RS: -25.8
XS DC 01 Discharge decreases in the downstream direction.

RS: -25.8
XS DC 03 Discharge is different between the upstream side and downstream
side of the structure

RS: -35
XS DC 01 Discharge decreases in the downstream direction.

LOCATION CHECK

RS: -0.9
XS LC 01 Lenchl Up/TopwdthAct Dn = 3.41
MaxChlDpth Up/MaxChlDpth Dn = 1.31
TopwdthAct Up/TopwdthAct Dn = 1.76
This cross section is located too far upstream from the
critical depth cross section.

BOUNDARY CONDITION CHECK

XS BC 02 The name of the stream is Pittman,1
Critical is specified as the downstream boundary
for profile PF 1

```
XS BC 02 The name of the stream is Pittman,1
         Normal S = .005 is specified as the upstream boundary
         for profile PF 1

XS FR 02 The profile is computed as mixed flow regime.

---END---
```

Wigwam Flow Spilt Calculation

WIGWAM FLOW SPLIT
Worksheet for Irregular Channel

Project Description	
Worksheet	80' ROW WIGWAM F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	.1000 %
Water Surface Elev.	0.78 ft

Gutter Elevation at High Point in Wigwam

WSEL FROM HEC-RAS

82.12 − 81.34 = 0.78 ft

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results	
Mannings Coeffic	0.015
Elevation Range	0.00 to 2.00
Discharge	107.77 cfs
Flow Area	23.3 ft²
Wetted Perimeter	76.48 ft
Top Width	75.01 ft
Actual Depth	0.78 ft
Critical Elevation	0.87 ft
Critical Slope	0.4822 %
Velocity	4.62 ft/s
Velocity Head	0.33 ft
Specific Energy	1.11 ft
Froude Number	1.46
Flow Type	Supercritical

AVERAGE DEPTH $= \frac{23.3\ ft^2}{80\ ft} = 0.29\ ft$

WEIR CALCULATION

$Q = C\ L\ H^{3/2}$

C = 3.0
L = 80 ft
H = 0.29 ft

$Q = 38\ cfs$

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+73.00	0.016
0+73.00	0+80.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	2.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83
0+73.00	0.17
0+73.00	0.13

WIGWAM FLOW SPLIT
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+74.50	0.00
0+74.50	0.50
0+80.00	0.60
0+80.00	2.00

Channel and Natural Wash Capacity Calculations

1. East Tributary
2. Tributary 2 of East Tributary
3. Main Wash Upstream of Pebble Road
4. Inlet Control Nomograph's for Culverts Beneath I-215

EAST TRIBUTARY SECTION C1
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION C1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.8000	%
Discharge	2,189.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,208.82	ft
Elevation Range	2,204.00 to 2,220.00	
Flow Area	171.6	ft²
Wetted Perimeter	51.23	ft
Top Width	49.56	ft
Actual Depth	4.82	ft
Critical Elevation	2,209.33	ft
Critical Slope	1.1988	%
Velocity	12.75	ft/s
Velocity Head	2.53	ft
Specific Energy	2,211.34	ft
Froude Number	1.21	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	1+05.00	0.035

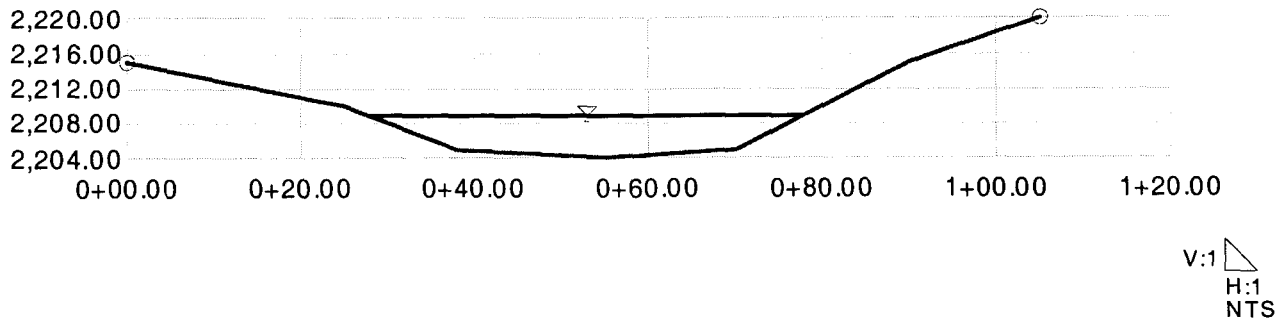
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,215.00
0+25.00	2,210.00
0+38.00	2,205.00
0+55.00	2,204.00
0+70.00	2,205.00
0+80.00	2,210.00
0+90.00	2,215.00
1+05.00	2,220.00

EAST TRIBUTARY SECTION C1
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION C1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.8000	%
Water Surface Elevation	2,208.82	ft
Elevation Range	2,204.00 to 2,220.00	
Discharge	2,189.00	cfs



EAST TRIBUTARY SECTION C2
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION C2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.8000	%
Discharge	2,189.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,208.48	ft
Elevation Range	2,204.00 to 2,220.00	
Flow Area	177.6	ft²
Wetted Perimeter	55.80	ft
Top Width	54.41	ft
Actual Depth	4.48	ft
Critical Elevation	2,208.95	ft
Critical Slope	1.2093	%
Velocity	12.32	ft/s
Velocity Head	2.36	ft
Specific Energy	2,210.84	ft
Froude Number	1.20	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	1+10.00	0.035

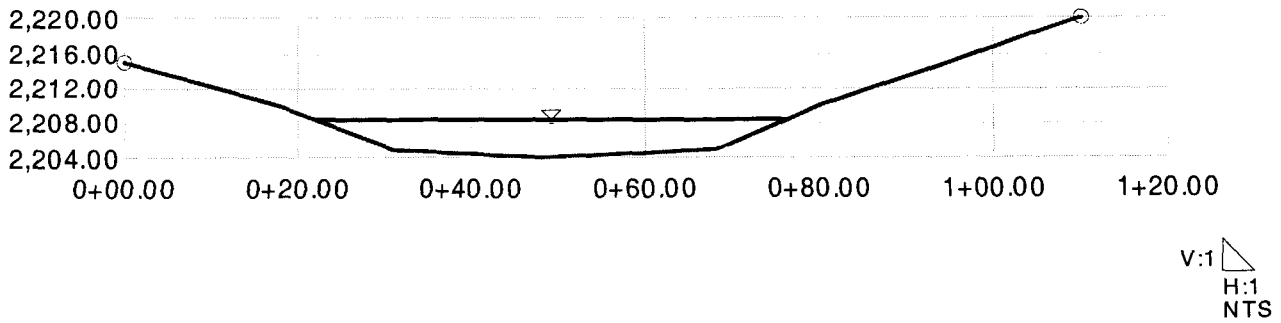
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,215.00
0+18.00	2,210.00
0+31.00	2,205.00
0+48.00	2,204.00
0+68.00	2,205.00
0+80.00	2,210.00
0+95.00	2,215.00
1+10.00	2,220.00

EAST TRIBUTARY SECTION C2
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION C2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.8000	%
Water Surface Elevation	2,208.48	ft
Elevation Range	2,204.00 to 2,220.00	
Discharge	2,189.00	cfs



EAST TRIBUTARY SECTION C3
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION C3
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.8000	%
Discharge	2,189.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,208.82	ft
Elevation Range	2,204.00 to 2,220.00	
Flow Area	179.3	ft²
Wetted Perimeter	57.17	ft
Top Width	55.99	ft
Actual Depth	4.82	ft
Critical Elevation	2,209.30	ft
Critical Slope	1.2120	%
Velocity	12.21	ft/s
Velocity Head	2.32	ft
Specific Energy	2,211.14	ft
Froude Number	1.20	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	1+20.00	0.035

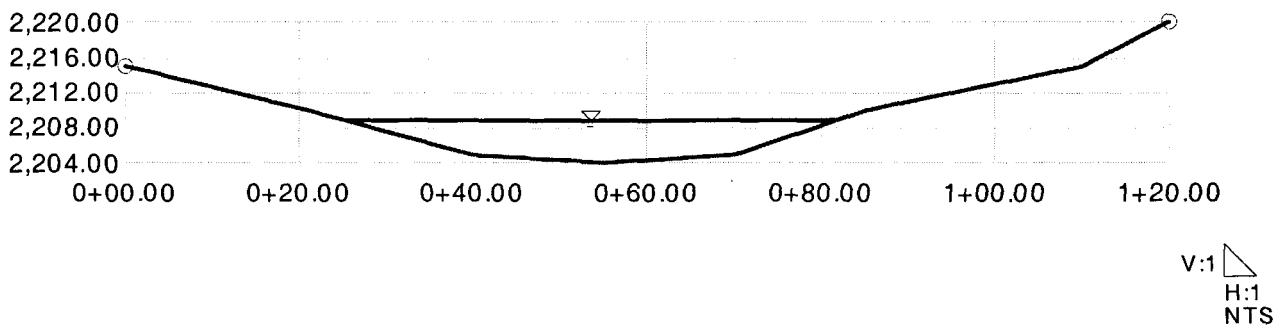
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,215.00
0+21.00	2,210.00
0+40.00	2,205.00
0+55.00	2,204.00
0+70.00	2,205.00
0+85.00	2,210.00
1+10.00	2,215.00
1+20.00	2,220.00

EAST TRIBUTARY SECTION C3
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION C3
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.8000	%
Water Surface Elevation	2,208.82	ft
Elevation Range	2,204.00 to 2,220.00	
Discharge	2,189.00	cfs



SECTION C5
Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION C5
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.8100	%
Discharge	3,995.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	5.24	ft
Elevation Range	0.00 to 8.00	
Flow Area	157.2	ft²
Wetted Perimeter	40.48	ft
Top Width	30.00	ft
Actual Depth	5.24	ft
Critical Elevation	8.20	ft
Critical Slope	0.2184	%
Velocity	25.41	ft/s
Velocity Head	10.04	ft
Specific Energy	15.28	ft
Froude Number	1.96	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+30.00	0.013

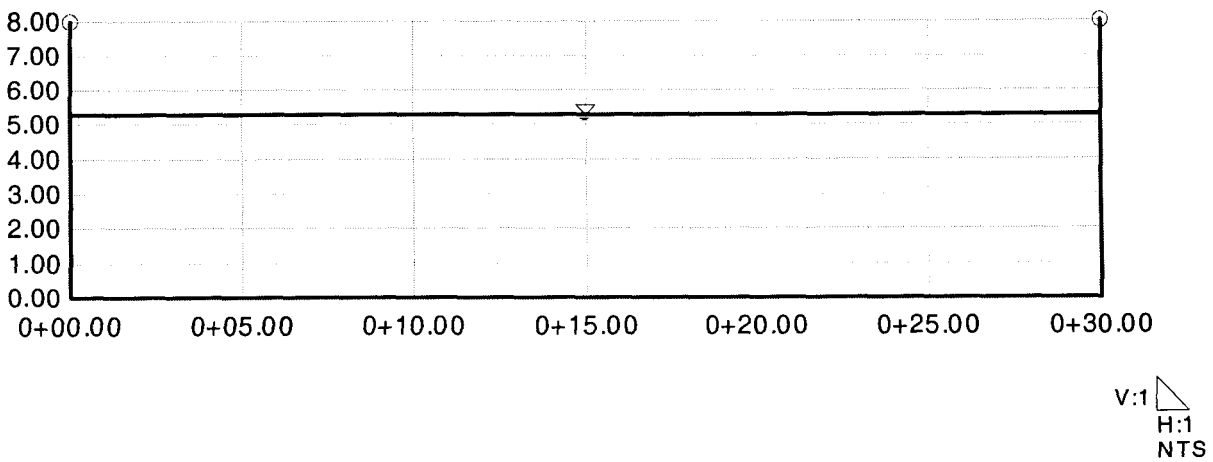
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	8.00
0+00.00	0.00
0+30.00	0.00
0+30.00	8.00

SECTION C5
Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION C5
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	0.8100	%
Water Surface Elevation	5.24	ft
Elevation Range	0.00 to 8.00	
Discharge	3,995.00	cfs



SECTION C6
Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION C6
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.8100	%
Discharge	2,173.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	3.51	ft
Elevation Range	0.00 to 8.00	
Flow Area	105.2	ft²
Wetted Perimeter	37.02	ft
Top Width	30.00	ft
Actual Depth	3.51	ft
Critical Elevation	5.46	ft
Critical Slope	0.2116	%
Velocity	20.65	ft/s
Velocity Head	6.62	ft
Specific Energy	10.13	ft
Froude Number	1.94	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+30.00	0.013

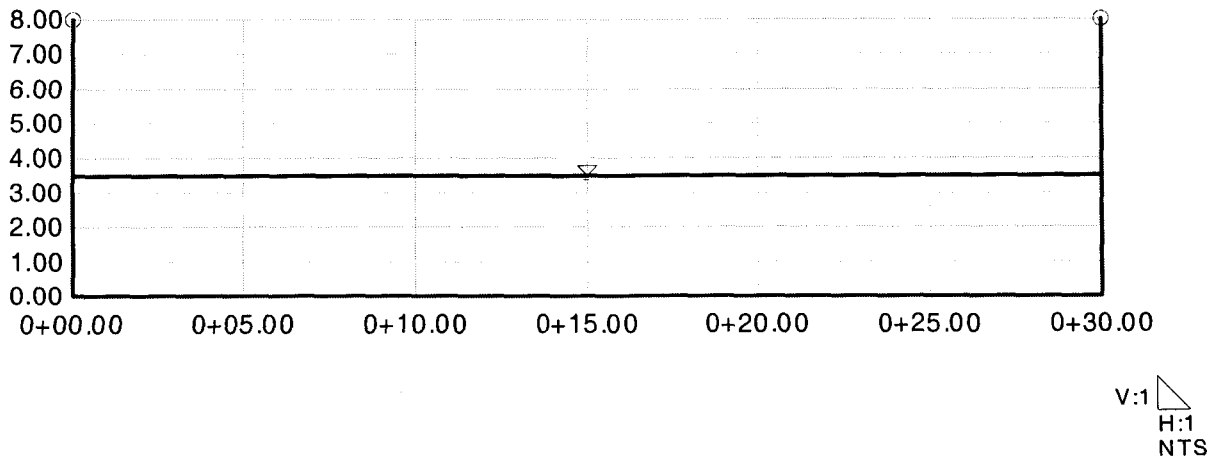
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	8.00
0+00.00	0.00
0+30.00	0.00
0+30.00	8.00

SECTION C6
Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION C6
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	0.8100	%
Water Surface Elevation	3.51	ft
Elevation Range	0.00 to 8.00	
Discharge	2,173.00	cfs



SECTION C7
Worksheet for Irregular Channel

Project Description	
Worksheet	SECTION C7
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.8100	%
Discharge	1,822.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	3.13	ft
Elevation Range	0.00 to 8.00	
Flow Area	93.9	ft²
Wetted Perimeter	36.26	ft
Top Width	30.00	ft
Actual Depth	3.13	ft
Critical Elevation	4.86	ft
Critical Slope	0.2114	%
Velocity	19.40	ft/s
Velocity Head	5.85	ft
Specific Energy	8.98	ft
Froude Number	1.93	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+30.00	0.013

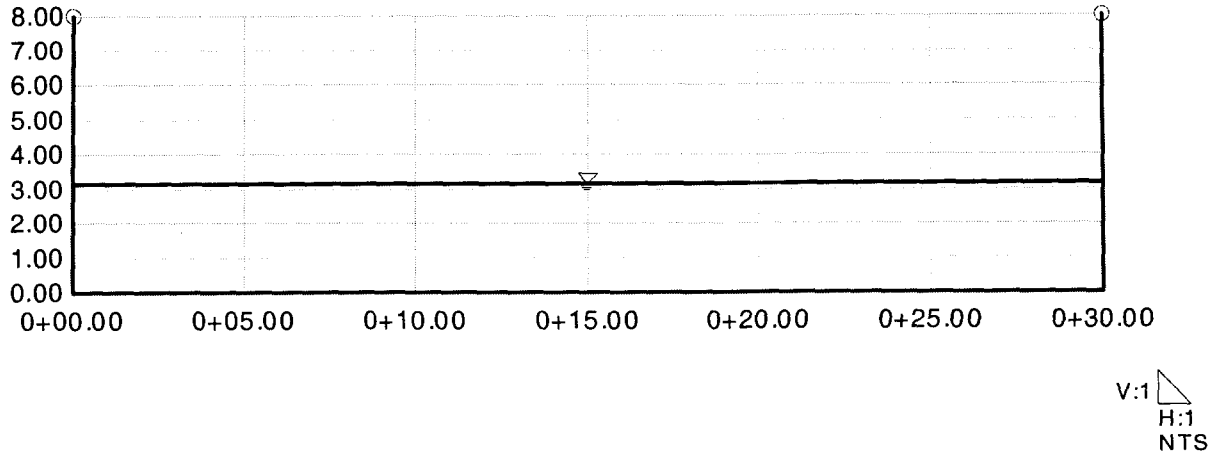
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	8.00
0+00.00	0.00
0+30.00	0.00
0+30.00	8.00

SECTION C7
Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION C7
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	0.8100	%
Water Surface Elevation	3.13	ft
Elevation Range	0.00 to 8.00	
Discharge	1,822.00	cfs



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SECTION C8
Worksheet for Irregular Channel

Section C8 consists of (3) 10'x6' RCB's. Analyzed 1 culvert using 1/3 Flow of 2173 cfs → 725 cfs

Project Description	
Worksheet	SECTION C8
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.8100	%
Discharge	725.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	4.10	ft
Elevation Range	0.00 to 6.00	
Flow Area	41.0	ft²
Wetted Perimeter	18.20	ft
Top Width	10.00	ft
Actual Depth	4.10	ft
Critical Elevation	5.47	ft
Critical Slope	0.3744	%
Velocity	17.68	ft/s
Velocity Head	4.86	ft
Specific Energy	8.96	ft
Froude Number	1.54	
Flow Type	Supercritical	

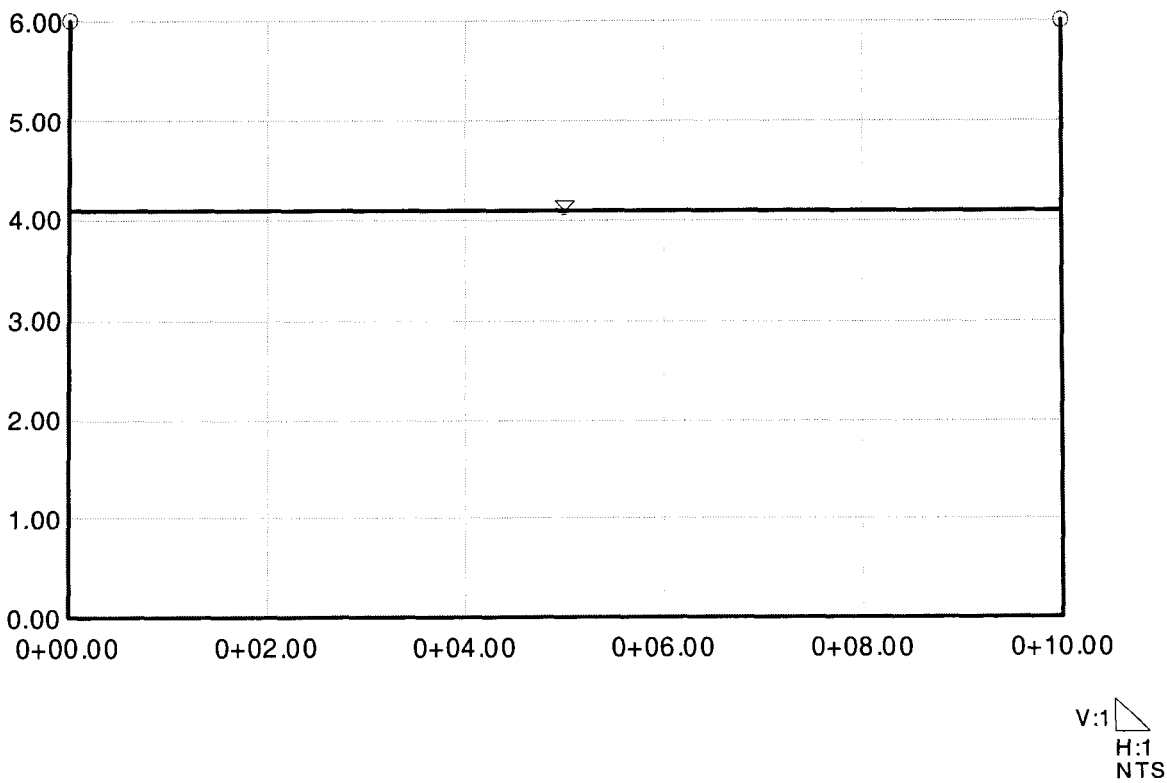
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+10.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	6.00
0+00.00	0.00
0+10.00	0.00
0+10.00	6.00

SECTION C8
Cross Section for Irregular Channel

Project Description	
Worksheet	SECTION C8
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	0.8100	%
Water Surface Elevation	4.10	ft
Elevation Range	0.00 to 6.00	
Discharge	725.00	cfs



EAST TRIBUTARY SECTION D
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.3000 %
Discharge	2,292.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,198.94	ft
Elevation Range	2,193.00 to 2,201.00	
Flow Area	254.0	ft²
Wetted Perimeter	99.77	ft
Top Width	98.79	ft
Actual Depth	5.94	ft
Critical Elevation	2,198.92	ft
Critical Slope	1.3217	%
Velocity	9.02	ft/s
Velocity Head	1.27	ft
Specific Energy	2,200.21	ft
Froude Number	0.99	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	2+80.00	0.035

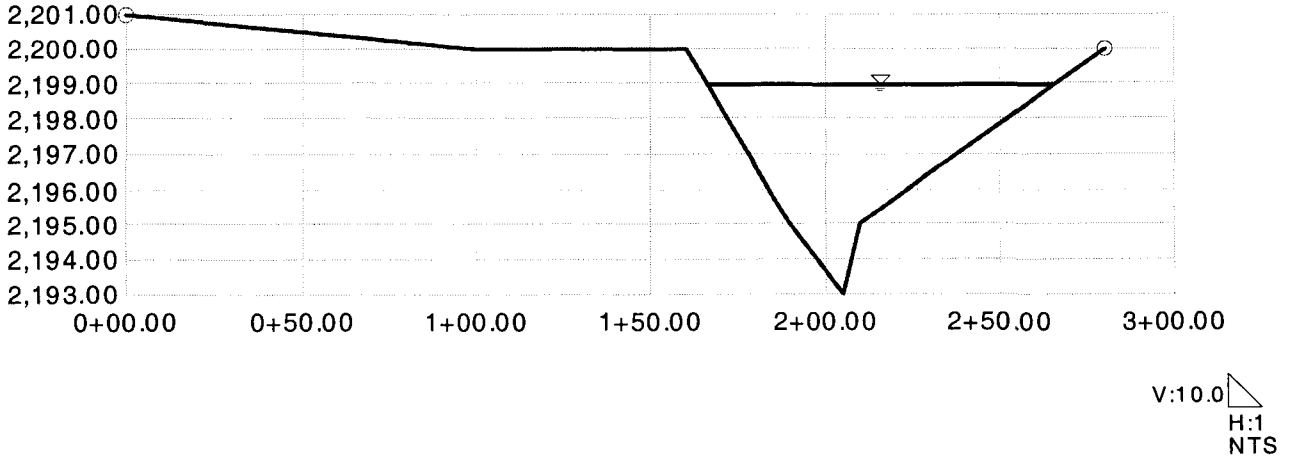
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,201.00
1+00.00	2,200.00
1+60.00	2,200.00
1+90.00	2,195.00
2+05.00	2,193.00
2+10.00	2,195.00
2+80.00	2,200.00

EAST TRIBUTARY SECTION D
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.3000	%
Water Surface Elevation	2,198.94	ft
Elevation Range	2,193.00 to 2,201.00	
Discharge	2,292.00	cfs



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EAST TRIBUTARY SECTION E
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.3000	%
Discharge	2,292.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,190.32	ft
Elevation Range	2,187.00 to 2,192.00	
Flow Area	371.2	ft²
Wetted Perimeter	257.66	ft
Top Width	257.45	ft
Actual Depth	3.32	ft
Critical Elevation	2,190.21	ft
Critical Slope	1.6035	%
Velocity	6.17	ft/s
Velocity Head	0.59	ft
Specific Energy	2,190.92	ft
Froude Number	0.91	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	4+30.00	0.035

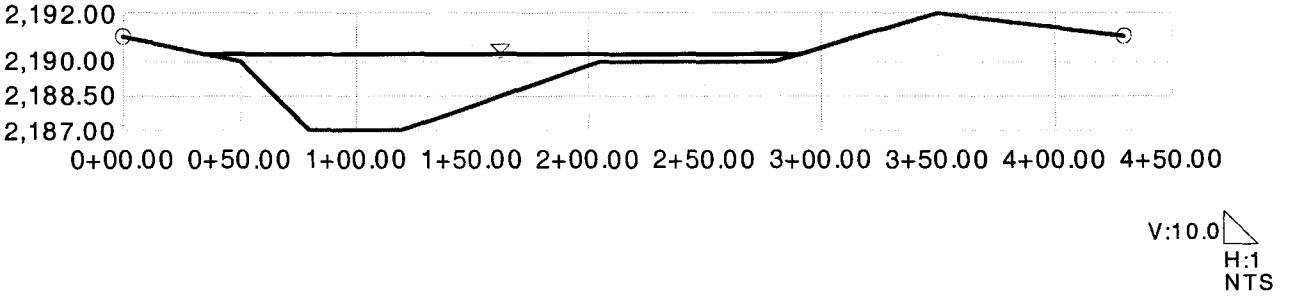
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,191.00
0+50.00	2,190.00
0+80.00	2,187.00
1+20.00	2,187.00
2+05.00	2,190.00
2+80.00	2,190.00
3+50.00	2,192.00
4+30.00	2,191.00

EAST TRIBUTARY SECTION E
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.3000	%
Water Surface Elevation	2,190.32	ft
Elevation Range	2,187.00 to 2,192.00	
Discharge	2,292.00	cfs



EAST TRIBUTARY SECTION F
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.3000	%
Discharge	2,292.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,181.90	ft
Elevation Range	2,179.00 to 2,190.00	
Flow Area	354.9	ft²
Wetted Perimeter	230.24	ft
Top Width	230.12	ft
Actual Depth	2.90	ft
Critical Elevation	2,181.80	ft
Critical Slope	1.5673	%
Velocity	6.46	ft/s
Velocity Head	0.65	ft
Specific Energy	2,182.55	ft
Froude Number	0.92	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	5+50.00	0.035

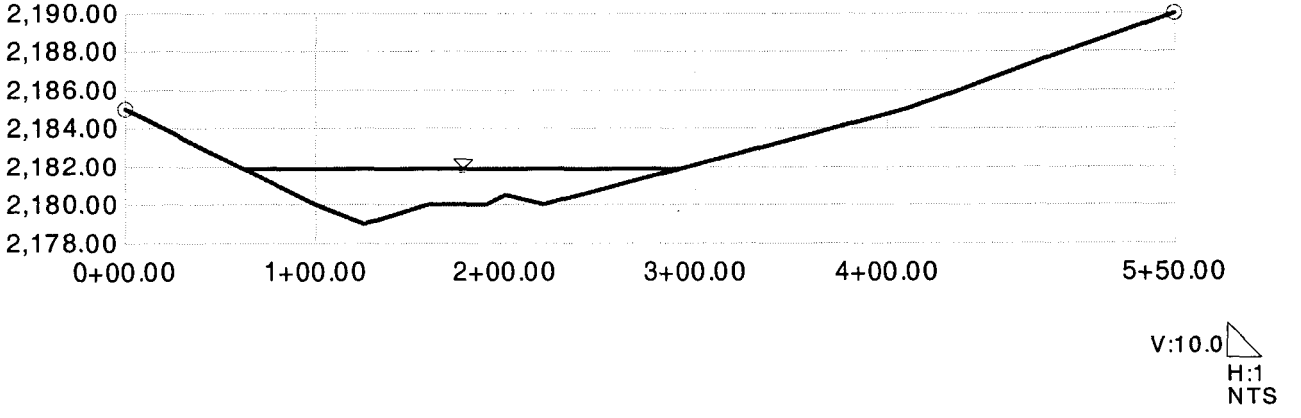
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,185.00
1+00.00	2,180.00
1+25.00	2,179.00
1+60.00	2,180.00
1+90.00	2,180.00
2+00.00	2,180.50
2+20.00	2,180.00
4+10.00	2,185.00
5+50.00	2,190.00

EAST TRIBUTARY SECTION F
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION F
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.3000	%
Water Surface Elevation	2,181.90	ft
Elevation Range	2,179.00 to 2,190.00	
Discharge	2,292.00	cfs



EAST TRIBUTARY SECTION G
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.3000	%
Discharge	2,292.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,174.05	ft
Elevation Range	2,169.00 to 2,176.00	
Flow Area	227.1	ft²
Wetted Perimeter	75.41	ft
Top Width	74.60	ft
Actual Depth	5.05	ft
Critical Elevation	2,174.10	ft
Critical Slope	1.2460	%
Velocity	10.09	ft/s
Velocity Head	1.58	ft
Specific Energy	2,175.64	ft
Froude Number	1.02	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	3+60.00	0.035

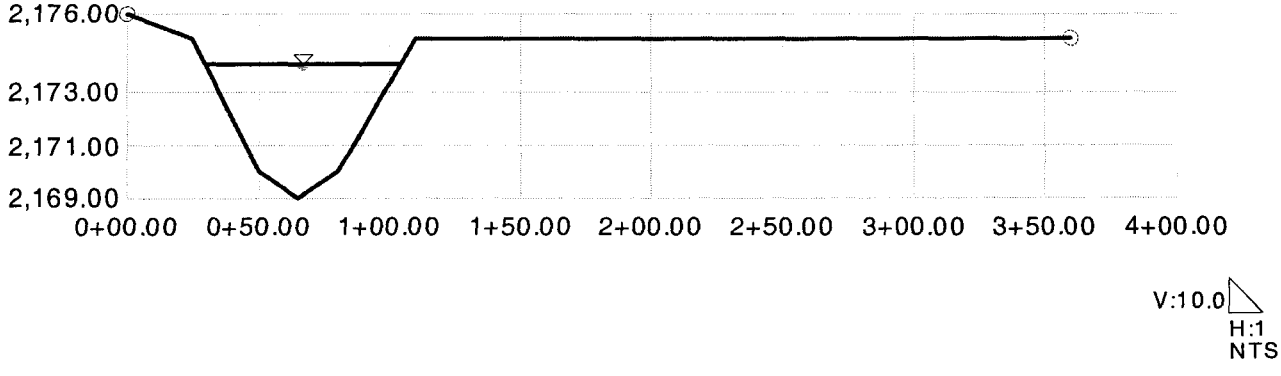
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,176.00
0+25.00	2,175.00
0+50.00	2,170.00
0+65.00	2,169.00
0+80.00	2,170.00
1+10.00	2,175.00
2+10.00	2,175.00
3+60.00	2,175.00

EAST TRIBUTARY SECTION G
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION G
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.3000	%
Water Surface Elevation	2,174.05	ft
Elevation Range	2,169.00 to 2,176.00	
Discharge	2,292.00	cfs



EAST TRIBUTARY SECTION H
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.9000	%
Discharge	1,174.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,224.27	ft
Elevation Range	2,219.00 to 2,229.00	
Flow Area	102.5	ft²
Wetted Perimeter	37.48	ft
Top Width	35.65	ft
Actual Depth	5.27	ft
Critical Elevation	2,224.69	ft
Critical Slope	1.3113	%
Velocity	11.45	ft/s
Velocity Head	2.04	ft
Specific Energy	2,226.31	ft
Froude Number	1.19	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	2+00.00	0.035

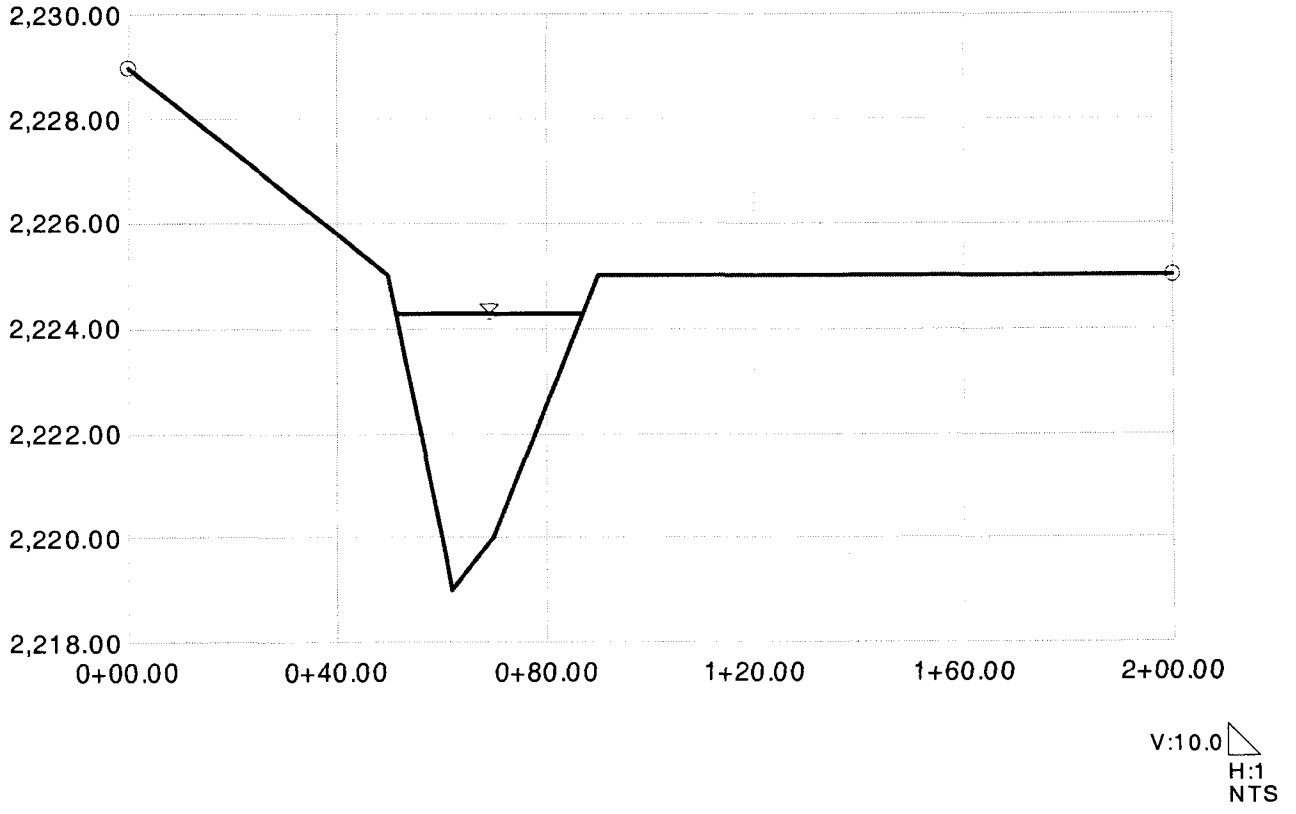
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,229.00
0+50.00	2,225.00
0+60.00	2,220.00
0+62.00	2,219.00
0+70.00	2,220.00
0+90.00	2,225.00
2+00.00	2,225.00

EAST TRIBUTARY SECTION H
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION H
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,224.27	ft
Elevation Range	2,219.00 to 2,229.00	
Discharge	1,174.00	cfs



EAST TRIBUTARY SECTION I
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION I
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.9000	%
Discharge	1,174.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,209.45	ft
Elevation Range	2,205.00 to 2,215.00	
Flow Area	111.3	ft²
Wetted Perimeter	46.03	ft
Top Width	45.05	ft
Actual Depth	4.45	ft
Critical Elevation	2,209.79	ft
Critical Slope	1.3290	%
Velocity	10.54	ft/s
Velocity Head	1.73	ft
Specific Energy	2,211.18	ft
Froude Number	1.18	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	2+00.00	0.035

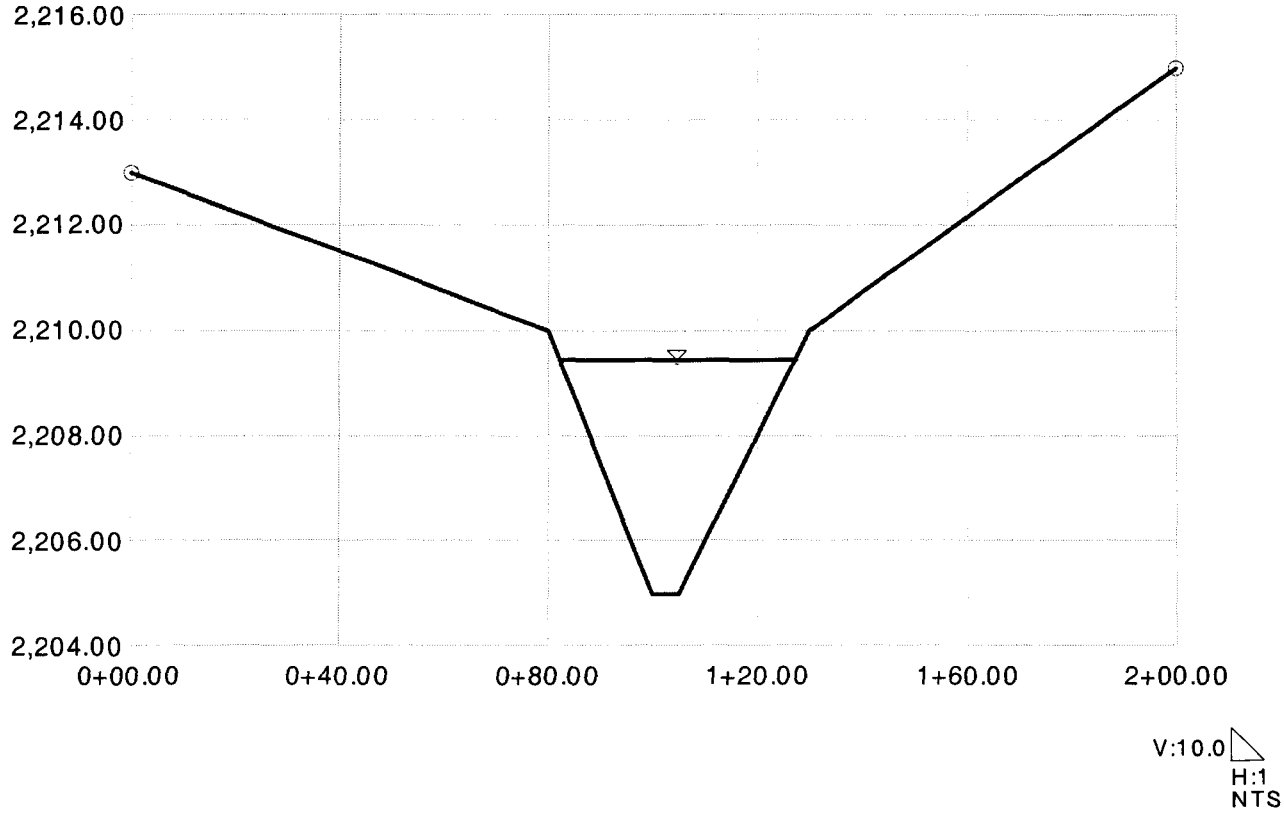
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,213.00
0+80.00	2,210.00
1+00.00	2,205.00
1+05.00	2,205.00
1+30.00	2,210.00
2+00.00	2,215.00

EAST TRIBUTARY SECTION I
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION I
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,209.45	ft
Elevation Range	2,205.00 to 2,215.00	
Discharge	1,174.00	cfs



EAST TRIBUTARY SECTION J
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION J
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.9000	%
Discharge	1,174.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,202.18	ft
Elevation Range	2,200.00 to 2,205.00	
Flow Area	181.6	ft²
Wetted Perimeter	156.39	ft
Top Width	156.31	ft
Actual Depth	2.18	ft
Critical Elevation	2,202.24	ft
Critical Slope	1.6865	%
Velocity	6.47	ft/s
Velocity Head	0.65	ft
Specific Energy	2,202.83	ft
Froude Number	1.06	
Flow Type	Supercritical	

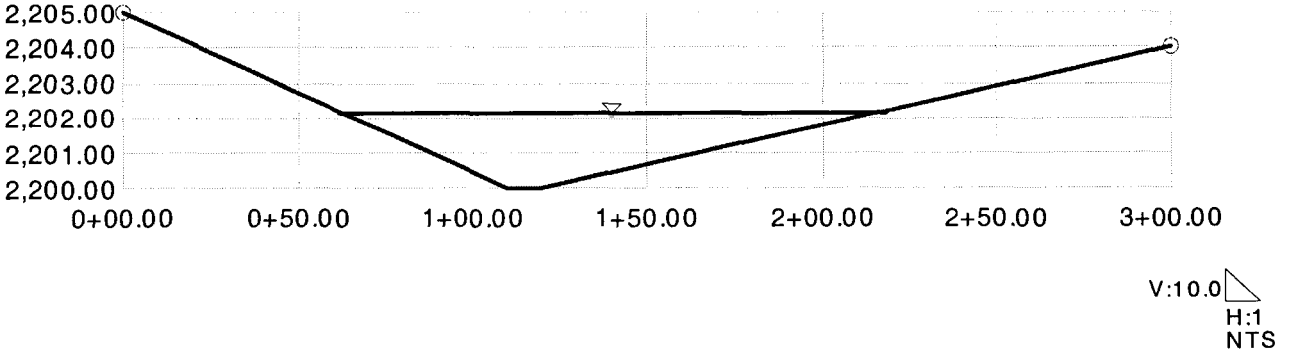
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	3+00.00	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	2,205.00
1+10.00	2,200.00
1+20.00	2,200.00
3+00.00	2,204.00

EAST TRIBUTARY SECTION J
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION J
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,202.18	ft
Elevation Range	2,200.00 to 2,205.00	
Discharge	1,174.00	cfs



EAST TRIBUTARY SECTION K
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION K
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.9000	%
Discharge	1,174.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,192.97	ft
Elevation Range	2,190.00 to 2,195.00	
Flow Area	130.1	ft²
Wetted Perimeter	67.92	ft
Top Width	67.55	ft
Actual Depth	2.97	ft
Critical Elevation	2,193.19	ft
Critical Slope	1.4176	%
Velocity	9.03	ft/s
Velocity Head	1.27	ft
Specific Energy	2,194.24	ft
Froude Number	1.15	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	2+50.00	0.035

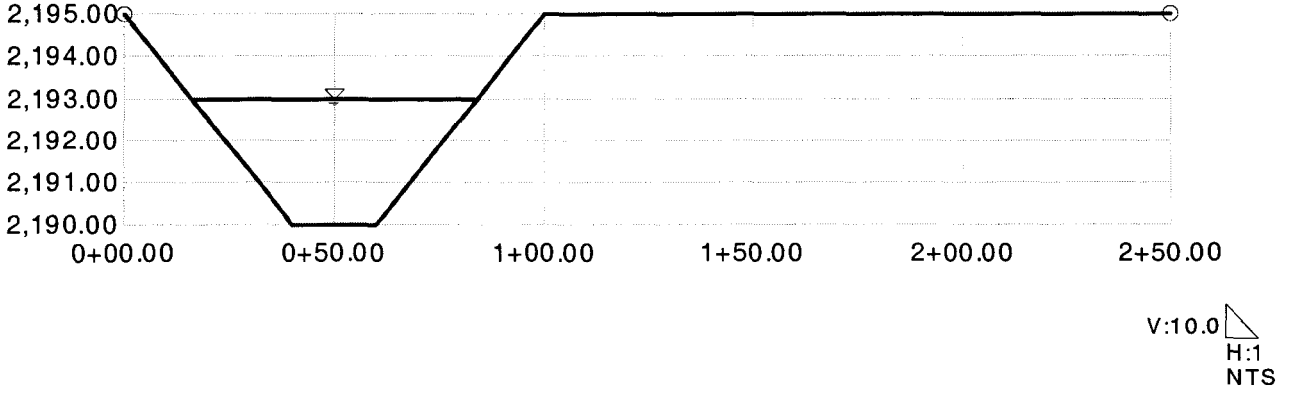
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,195.00
0+40.00	2,190.00
0+50.00	2,190.00
0+60.00	2,190.00
1+00.00	2,195.00
2+50.00	2,195.00

EAST TRIBUTARY SECTION K
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION K
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,192.97	ft
Elevation Range	2,190.00 to 2,195.00	
Discharge	1,174.00	cfs



EAST TRIBUTARY SECTION L
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION L
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	*Channel Depth*

Input Data		
Slope	1.9000	%
Discharge	1,174.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,182.00	ft
Elevation Range	2,179.00 to 2,185.00	
Flow Area	137.0	ft²
Wetted Perimeter	77.29	ft
Top Width	77.00	ft
Actual Depth	3.00	ft
Critical Elevation	2,182.18	ft
Critical Slope	1.4539	%
Velocity	8.57	ft/s
Velocity Head	1.14	ft
Specific Energy	2,183.14	ft
Froude Number	1.13	
Flow Type	*Supercritical*	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	1+20.00	0.035

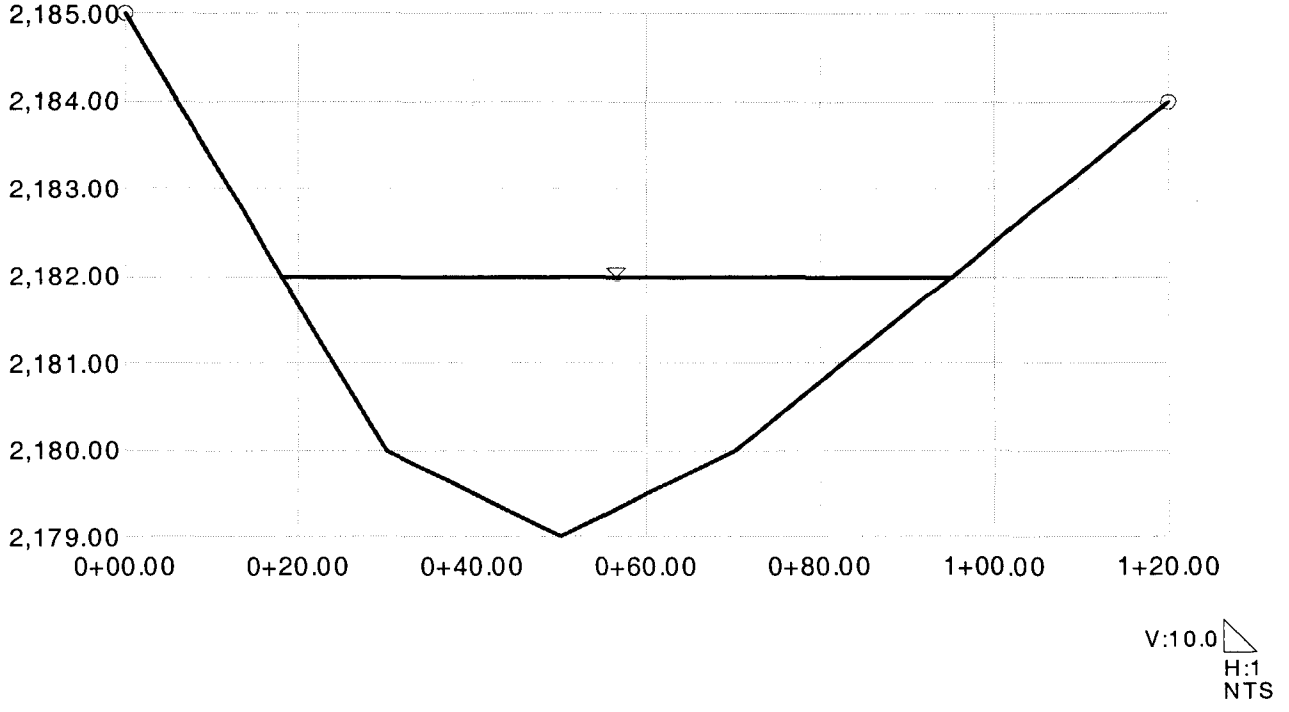
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,185.00
0+30.00	2,180.00
0+50.00	2,179.00
0+70.00	2,180.00
1+20.00	2,184.00

EAST TRIBUTARY SECTION L
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION L
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,182.00	ft
Elevation Range	2,179.00 to 2,185.00	
Discharge	1,174.00	cfs



EAST TRIBUTARY SECTION M
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION M
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.9500	%
Discharge	3,256.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,171.68	ft
Elevation Range	2,168.00 to 2,177.00	
Flow Area	433.0	ft²
Wetted Perimeter	303.06	ft
Top Width	302.49	ft
Actual Depth	3.68	ft
Critical Elevation	2,171.80	ft
Critical Slope	1.5662	%
Velocity	7.52	ft/s
Velocity Head	0.88	ft
Specific Energy	2,172.56	ft
Froude Number	1.11	
Flow Type	Supercritical	

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	10+00.00	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	2,172.00
1+20.00	2,170.00
1+75.00	2,170.00
1+93.00	2,175.00
2+09.00	2,175.00
2+30.00	2,170.00
2+70.00	2,168.00
3+02.00	2,170.00
4+85.00	2,175.00
5+17.00	2,175.00

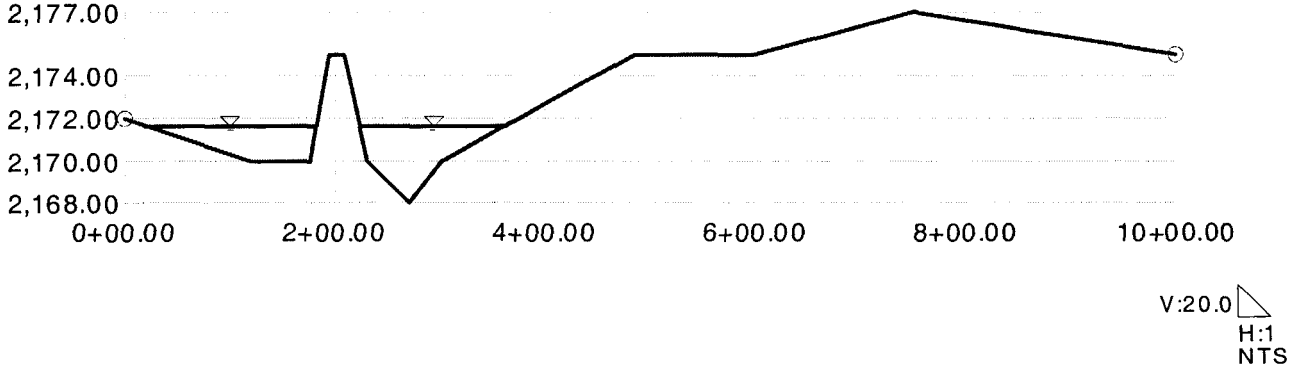
EAST TRIBUTARY SECTION M
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
6+00.00	2,175.00
7+50.00	2,177.00
10+00.00	2,175.00

EAST TRIBUTARY SECTION M
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION M
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9500	%
Water Surface Elevation	2,171.68	ft
Elevation Range	2,168.00 to 2,177.00	
Discharge	3,256.00	cfs



EAST TRIBUTARY SECTION N
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION N
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.9000	%
Discharge	3,256.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,163.11	ft
Elevation Range	2,158.00 to 2,166.00	
Flow Area	273.4	ft²
Wetted Perimeter	94.18	ft
Top Width	93.57	ft
Actual Depth	5.11	ft
Critical Elevation	2,163.60	ft
Critical Slope	1.2228	%
Velocity	11.91	ft/s
Velocity Head	2.20	ft
Specific Energy	2,165.32	ft
Froude Number	1.23	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	5+50.00	0.035

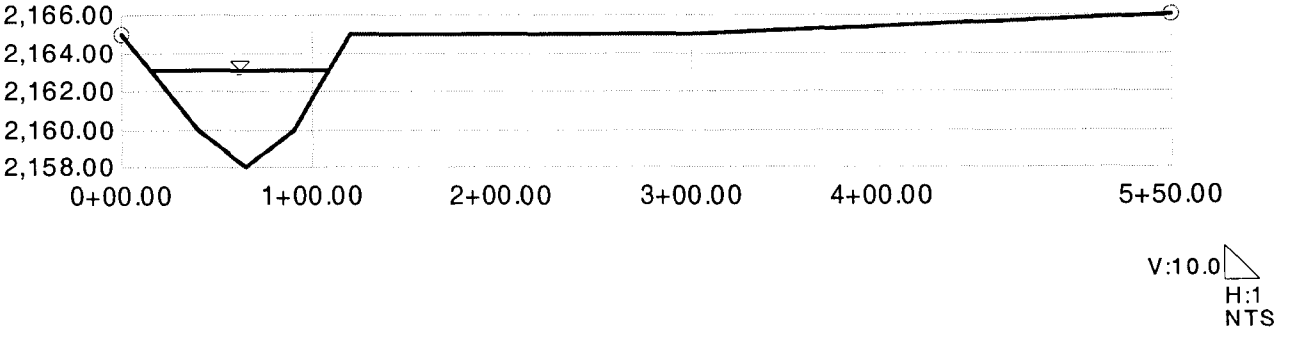
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,165.00
0+40.00	2,160.00
0+65.00	2,158.00
0+90.00	2,160.00
1+20.00	2,165.00
1+90.00	2,165.00
3+00.00	2,165.00
5+50.00	2,166.00

EAST TRIBUTARY SECTION N
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION N
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,163.11	ft
Elevation Range	2,158.00 to 2,166.00	
Discharge	3,256.00	cfs



EAST TRIBUTARY SECTION O
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION O
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.9000 %
Discharge	3,256.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,158.48	ft
Elevation Range	2,153.00 to 2,160.50	
Flow Area	276.0	ft²
Wetted Perimeter	96.44	ft
Top Width	95.67	ft
Actual Depth	5.48	ft
Critical Elevation	2,158.96	ft
Critical Slope	1.2331	%
Velocity	11.80	ft/s
Velocity Head	2.16	ft
Specific Energy	2,160.64	ft
Froude Number	1.22	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	3+00.00	0.035

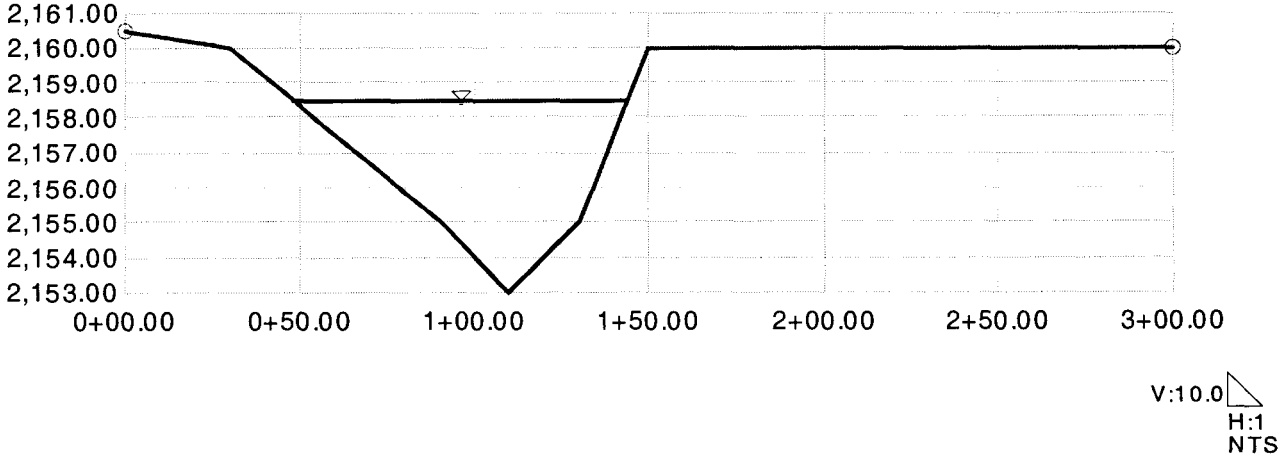
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,160.50
0+30.00	2,160.00
0+90.00	2,155.00
1+10.00	2,153.00
1+30.00	2,155.00
1+50.00	2,160.00
3+00.00	2,160.00

EAST TRIBUTARY SECTION O
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION O
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,158.48	ft
Elevation Range	2,153.00 to 2,160.50	
Discharge	3,256.00	cfs



EAST TRIBUTARY SECTION P
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION P
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.9000	%
Discharge	3,256.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,151.82	ft
Elevation Range	2,148.00 to 2,155.00	
Flow Area	350.2	ft²
Wetted Perimeter	174.88	ft
Top Width	174.69	ft
Actual Depth	3.82	ft
Critical Elevation	2,152.06	ft
Critical Slope	1.3892	%
Velocity	9.30	ft/s
Velocity Head	1.34	ft
Specific Energy	2,153.17	ft
Froude Number	1.16	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	4+00.00	0.035

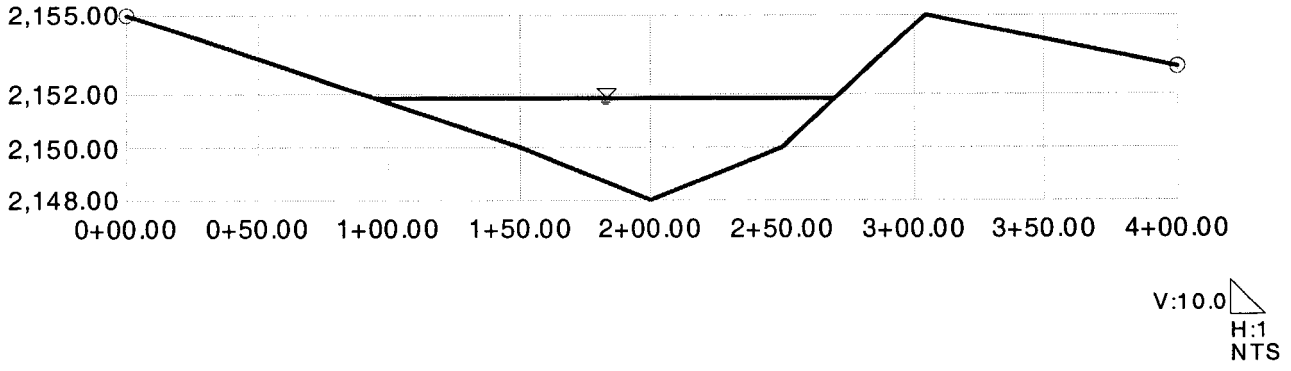
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,155.00
1+50.00	2,150.00
2+00.00	2,148.00
2+50.00	2,150.00
3+05.00	2,155.00
4+00.00	2,153.00

EAST TRIBUTARY SECTION P
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION P
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,151.82	ft
Elevation Range	2,148.00 to 2,155.00	
Discharge	3,256.00	cfs



EAST TRIBUTARY SECTION Q
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION Q
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.9000	%
Discharge	3,256.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,146.52	ft
Elevation Range	2,143.00 to 2,150.00	
Flow Area	408.1	ft²
Wetted Perimeter	256.32	ft
Top Width	256.18	ft
Actual Depth	3.52	ft
Critical Elevation	2,146.66	ft
Critical Slope	1.5054	%
Velocity	7.98	ft/s
Velocity Head	0.99	ft
Specific Energy	2,147.51	ft
Froude Number	1.11	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	4+00.00	0.035

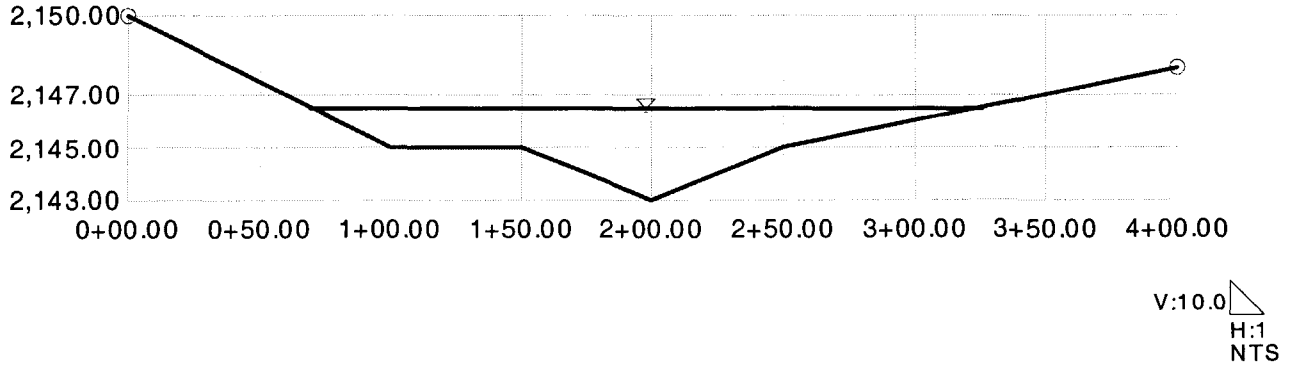
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,150.00
1+00.00	2,145.00
1+50.00	2,145.00
2+00.00	2,143.00
2+50.00	2,145.00
4+00.00	2,148.00

EAST TRIBUTARY SECTION Q
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION Q
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.9000	%
Water Surface Elevation	2,146.52	ft
Elevation Range	2,143.00 to 2,150.00	
Discharge	3,256.00	cfs



EAST TRIBUTARY SECTION R
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION R
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.0000	%
Discharge	2,162.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	2,142.71	ft
Elevation Range	2,138.22 to 2,144.17	
Flow Area	93.1	ft²
Wetted Perimeter	32.16	ft
Top Width	30.11	ft
Actual Depth	4.49	ft
Critical Elevation	2,145.06	ft
Critical Slope	0.1708	%
Velocity	23.22	ft/s
Velocity Head	8.38	ft
Specific Energy	2,151.09	ft
Froude Number	2.33	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+36.00	0.013

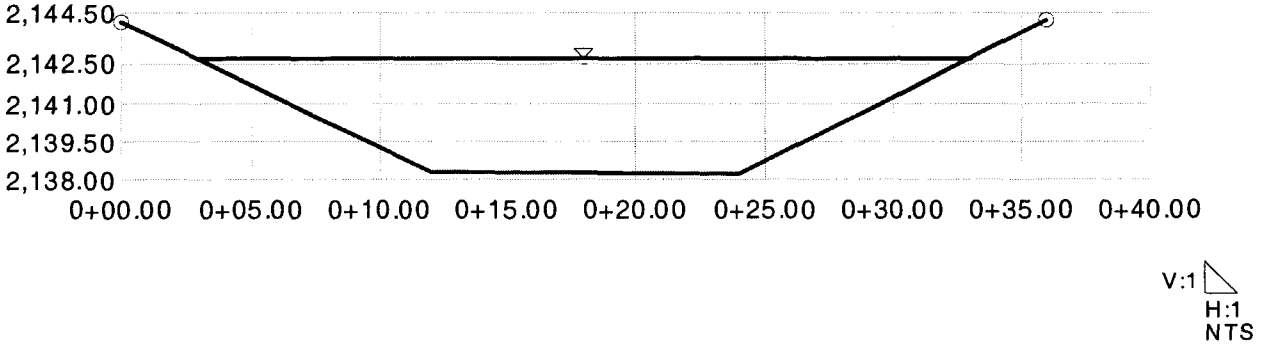
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,144.12
0+12.00	2,138.35
0+24.00	2,138.22
0+36.00	2,144.17

EAST TRIBUTARY SECTION R
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION R
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	1.0000	%
Water Surface Elevation	2,142.71	ft
Elevation Range	2,138.22 to 2,144.17	
Discharge	2,162.00	cfs



EAST TRIBUTARY SECTION S
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.0000	%
Discharge	130.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Water Surface Elevation	2,137.67	ft
Elevation Range	2,136.68 to 2,142.56	
Flow Area	12.9	ft²
Wetted Perimeter	15.52	ft
Top Width	14.95	ft
Actual Depth	0.99	ft
Critical Elevation	2,138.15	ft
Critical Slope	0.2447	%
Velocity	10.09	ft/s
Velocity Head	1.58	ft
Specific Energy	2,139.25	ft
Froude Number	1.92	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+30.00	0.013

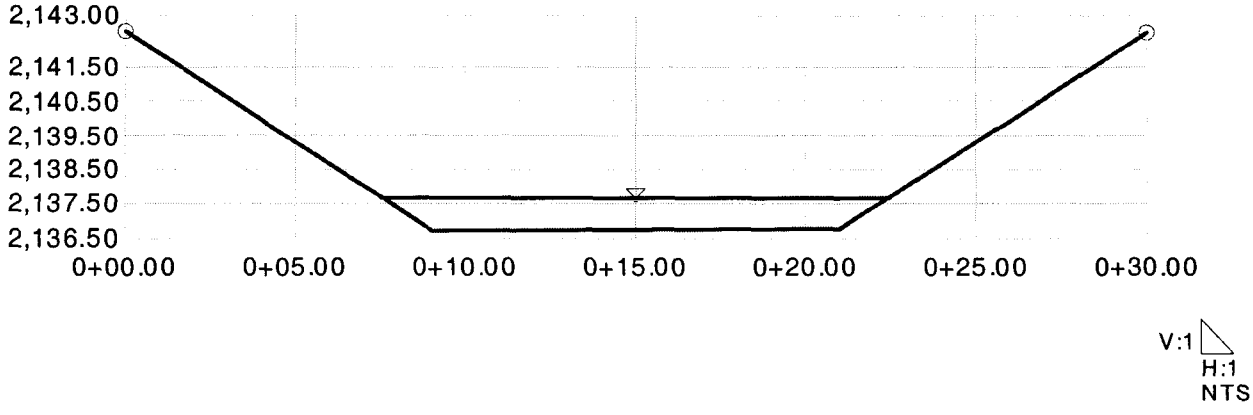
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,142.56
0+09.00	2,136.68
0+21.00	2,136.74
0+30.00	2,142.50

EAST TRIBUTARY SECTION S
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	1.0000	%
Water Surface Elevation	2,137.67	ft
Elevation Range	2,136.68 to 2,142.56	
Discharge	130.00	cfs



MAIN WASH SECTION T
Worksheet for Irregular Channel

Project Description	
Worksheet	MAIN WASH SECTION T
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.1000	%
Discharge	5,032.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,118.82	ft
Elevation Range	2,115.98 to 2,127.33	
Flow Area	654.0	ft²
Wetted Perimeter	287.97	ft
Top Width	286.86	ft
Actual Depth	2.84	ft
Critical Elevation	2,118.66	ft
Critical Slope	1.3950	%
Velocity	7.69	ft/s
Velocity Head	0.92	ft
Specific Energy	2,119.74	ft
Froude Number	0.90	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	3+15.00	0.035

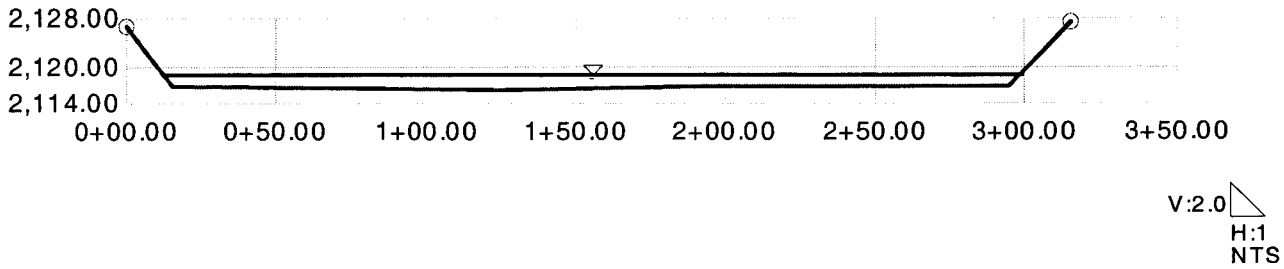
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,126.75
0+15.00	2,116.88
1+25.00	2,115.98
1+95.00	2,116.69
2+95.00	2,116.75
3+15.00	2,127.33

MAIN WASH SECTION T
Cross Section for Irregular Channel

Project Description	
Worksheet	MAIN WASH SECTION T
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.1000	%
Water Surface Elevation	2,118.82	ft
Elevation Range	2,115.98 to 2,127.33	
Discharge	5,032.00	cfs



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MAIN WASH SECTION U
Worksheet for Irregular Channel

Project Description	
Worksheet	MAIN WASH SECTION U
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.1000	%
Discharge	5,032.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	2,110.78	ft
Elevation Range	2,107.88 to 2,118.20	
Flow Area	658.4	ft²
Wetted Perimeter	292.76	ft
Top Width	291.89	ft
Actual Depth	2.90	ft
Critical Elevation	2,110.62	ft
Critical Slope	1.3987	%
Velocity	7.64	ft/s
Velocity Head	0.91	ft
Specific Energy	2,111.69	ft
Froude Number	0.90	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	3+20.00	0.035

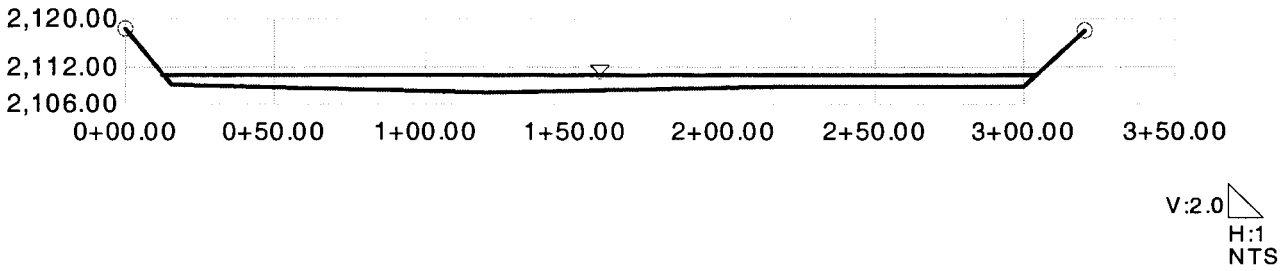
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,118.20
0+15.00	2,109.15
1+20.00	2,107.88
2+20.00	2,108.63
3+00.00	2,108.90
3+20.00	2,117.90

MAIN WASH SECTION U
Cross Section for Irregular Channel

Project Description	
Worksheet	MAIN WASH SECTION U
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	1.1000	%
Water Surface Elevation	2,110.78	ft
Elevation Range	2,107.88 to 2,118.20	
Discharge	5,032.00	cfs



EAST TRIBUTARY SECTION V
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION V
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.5300 %
Discharge	4,585.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.026	
Water Surface Elevation	2,132.63	ft
Elevation Range	2,129.18 to 2,133.77	
Flow Area	336.9	ft²
Wetted Perimeter	125.06	ft
Top Width	124.25	ft
Actual Depth	3.45	ft
Critical Elevation	2,133.43	ft
Critical Slope	0.6715	%
Velocity	13.61	ft/s
Velocity Head	2.88	ft
Specific Energy	2,135.51	ft
Froude Number	1.46	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+15.00	0.035
0+15.00	1+15.00	0.025
1+15.00	1+30.00	0.035

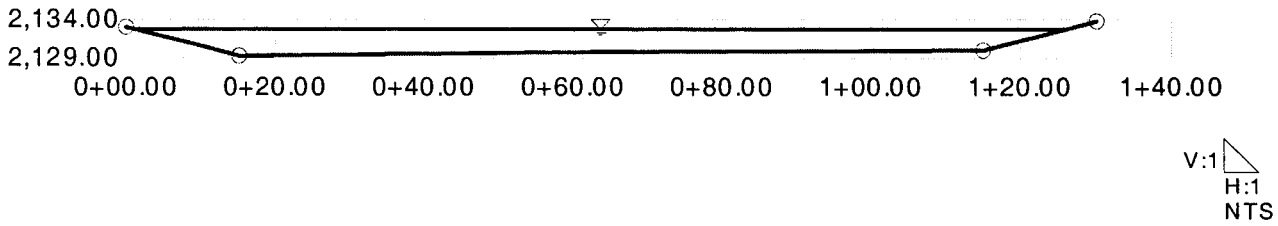
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,133.00
0+15.00	2,129.18
0+60.00	2,129.77
1+15.00	2,129.82
1+30.00	2,133.77

EAST TRIBUTARY SECTION V
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION V
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.026	
Slope	1.5300	%
Water Surface Elevation	2,132.63	ft
Elevation Range	2,129.18 to 2,133.77	
Discharge	4,585.00	cfs



EAST TRIBUTARY SECTION W
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION W
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.5300	%
Discharge	4,585.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.026	
Water Surface Elevation	2,123.73	ft
Elevation Range	2,120.32 to 2,124.55	
Flow Area	336.5	ft²
Wetted Perimeter	124.53	ft
Top Width	123.82	ft
Actual Depth	3.41	ft
Critical Elevation	2,124.54	ft
Critical Slope	0.6732	%
Velocity	13.62	ft/s
Velocity Head	2.88	ft
Specific Energy	2,126.61	ft
Froude Number	1.46	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+15.00	0.035
0+15.00	1+10.00	0.025
1+10.00	1+30.00	0.035

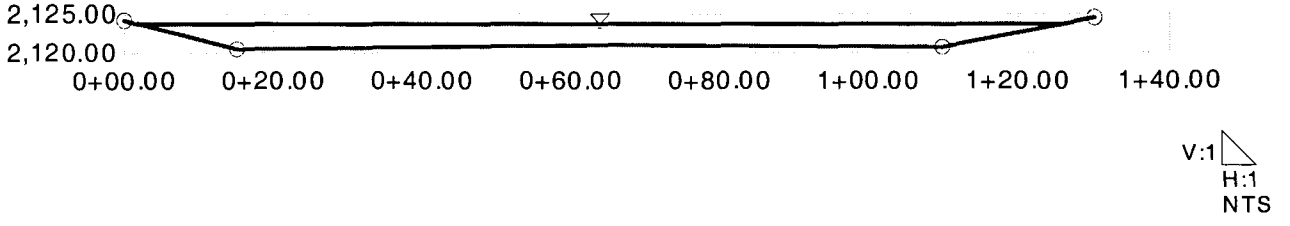
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,124.21
0+15.00	2,120.32
0+65.00	2,120.81
1+10.00	2,120.75
1+30.00	2,124.55

EAST TRIBUTARY SECTION W
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION W
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.026	
Slope	1.5300	%
Water Surface Elevation	2,123.73	ft
Elevation Range	2,120.32 to 2,124.55	
Discharge	4,585.00	cfs



EAST TRIBUTARY SECTION X
Worksheet for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION X
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.5300	%
Discharge	4,585.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.026	
Water Surface Elevation	2,121.25	ft
Elevation Range	2,118.00 to 2,123.05	
Flow Area	333.4	ft²
Wetted Perimeter	121.59	ft
Top Width	120.84	ft
Actual Depth	3.25	ft
Critical Elevation	2,122.12	ft
Critical Slope	0.6806	%
Velocity	13.75	ft/s
Velocity Head	2.94	ft
Specific Energy	2,124.19	ft
Froude Number	1.46	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+15.00	0.035
0+15.00	1+30.00	0.025
1+30.00	1+50.00	0.035

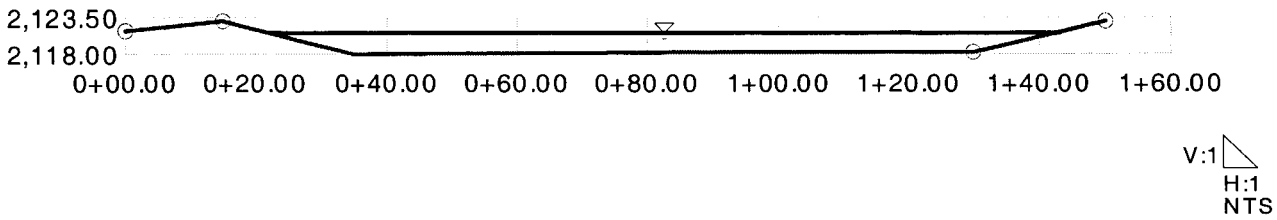
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2,121.53
0+15.00	2,123.05
0+35.00	2,118.00
0+90.00	2,118.23
1+30.00	2,118.24
1+50.00	2,122.88

EAST TRIBUTARY SECTION X
Cross Section for Irregular Channel

Project Description	
Worksheet	EAST TRIB SECTION X
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.026	
Slope	1.5300	%
Water Surface Elevation	2,121.25	ft
Elevation Range	2,118.00 to 2,123.05	
Discharge	4,585.00	cfs



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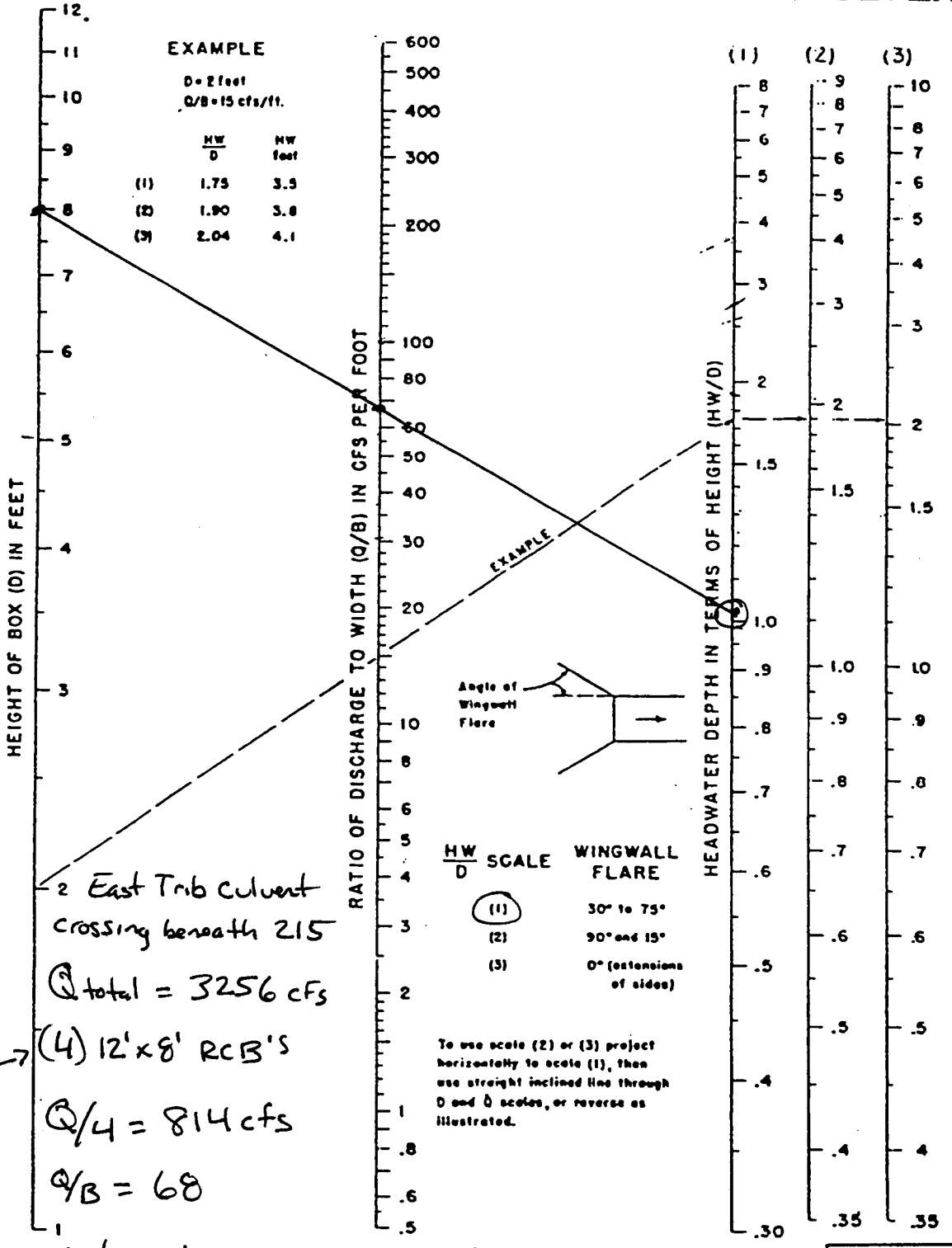
NOMOGRAPH – INLET CONTROL BOX CULVERT



2 East Trib culvert crossing beneath 215

$Q_{total} = 3256$ cfs

Total RCB's → (4) 12'x8' RCB's

$Q/4 = 814$ cfs

$Q/B = 68$

$HW/D = 1$

$\therefore HW = 8$ feet

refer to site photo in Section 4.6 that shows sufficient AHW.

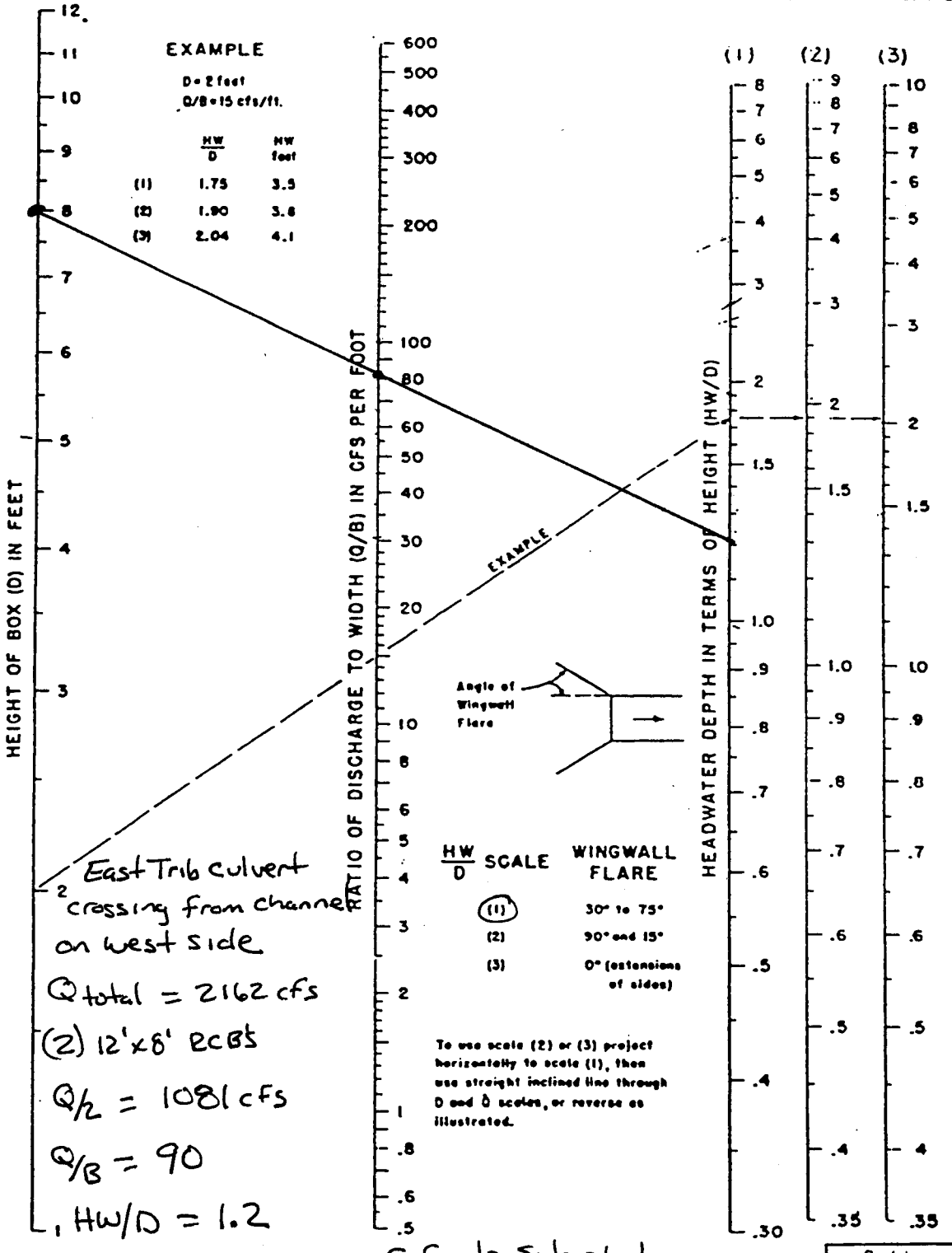
Revision	Date

WRC ENGINEERING

REFERENCE: USDOT, FHWA, HDS No.5, 1985

FIGURE 1004

NOMOGRAPH - INLET CONTROL BOX CULVERT



East Trib culvert crossing from channel on west side

$Q_{total} = 2162$ cfs

(2) 12'x8' RCBs

$Q/2 = 1081$ cfs

$Q/B = 90$

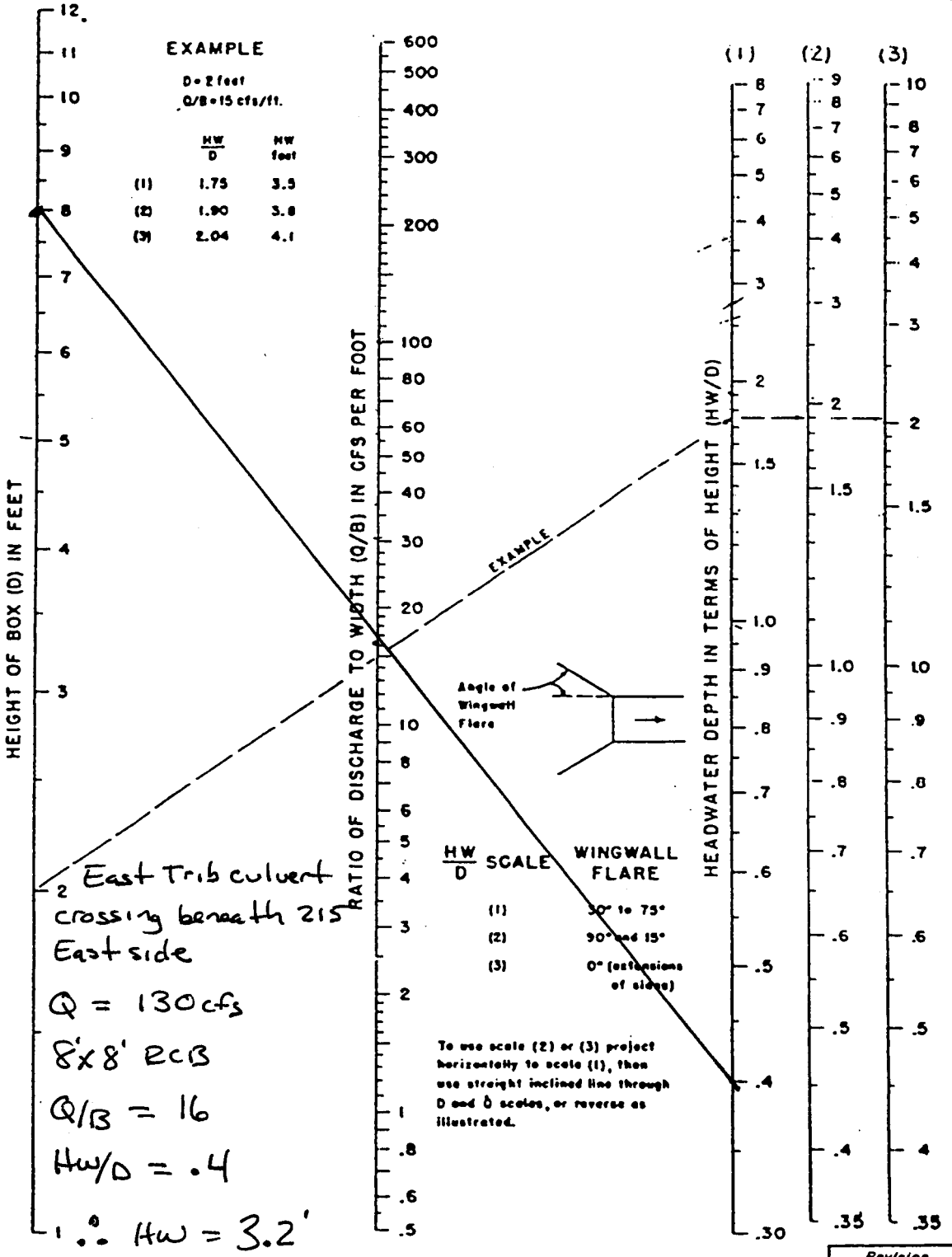
$\therefore HW/D = 1.2$

$\therefore HW = 9.6$ ft.

Refer to site photos in section 4.6 that show sufficient AHW capacity.

Revision	Date

NOMOGRAPH – INLET CONTROL BOX CULVERT



East Trib culvert crossing beneath 215 East side

$Q = 130$ cfs

8'x8' RCB

$Q/B = 16$

$Hw/D = .4$

$\therefore Hw = 3.2'$

Revision	Date

WRC ENGINEERING	REFERENCE: USDOT, FHWA, HDS No.5, 1985	FIGURE 1004

Flowmaster Street Capacity Calculations

Tributary 1 of Main Wash

1. Serene Ave
2. Avola St
3. Summer Cypress St

48' ROW SUMMER CYPRESS ST DEPTH CALCULATION
Worksheet for Irregular Channel

Cross-Section A

Project Description	
Worksheet	48' ROW SUMMER CYPRESS ST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.5000	%
Discharge	123.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.78	ft
Elevation Range	0.00 to 2.00	
Flow Area	19.6	ft²
Wetted Perimeter	49.46	ft
Top Width	48.00	ft
Actual Depth	0.78	ft
Critical Elevation	0.96	ft
Critical Slope	0.4507	%
Velocity	6.26	ft/s
Velocity Head	0.61	ft
Specific Energy	1.39	ft
Froude Number	1.73	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+05.50	0.015
0+05.50	0+42.50	0.016
0+42.50	0+48.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2.00
0+00.00	0.60
0+04.00	0.50
0+04.00	0.00
0+05.50	0.13
0+05.50	0.17
0+24.00	0.54
0+42.50	0.17
0+42.50	0.13
0+44.00	0.00
0+44.00	0.50

48' ROW SUMMER CYPRESS ST DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+48.00	0.60
0+48.00	2.00

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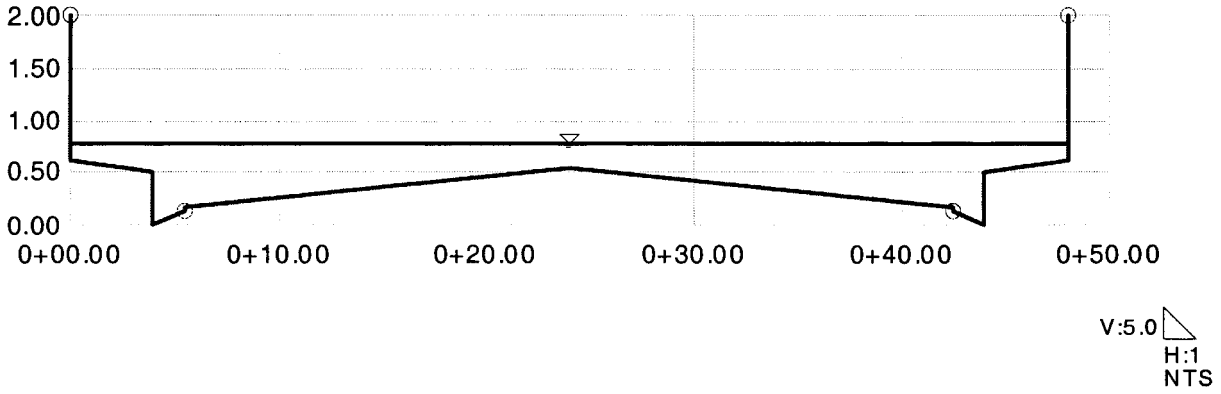
48' ROW SUMMER CYPRESS ST DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	48' ROW SUMMER CYPRESS ST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.5000	%
Water Surface Elevation	0.78	ft
Elevation Range	0.00 to 2.00	
Discharge	123.00	cfs



48' ROW AVOLA ST DEPTH CALCULATION
Worksheet for Irregular Channel

Cross Section B

Project Description	
Worksheet	48' ROW AVOLA ST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.0000 %
Discharge	172.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.94	ft
Elevation Range	0.00 to 2.00	
Flow Area	27.2	ft²
Wetted Perimeter	49.77	ft
Top Width	48.00	ft
Actual Depth	0.94	ft
Critical Elevation	1.11	ft
Critical Slope	0.4219	%
Velocity	6.32	ft/s
Velocity Head	0.62	ft
Specific Energy	1.56	ft
Froude Number	1.48	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+05.50	0.015
0+05.50	0+42.50	0.016
0+42.50	0+48.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2.00
0+00.00	0.60
0+04.00	0.50
0+04.00	0.00
0+05.50	0.13
0+05.50	0.17
0+24.00	0.54
0+42.50	0.17
0+42.50	0.13
0+44.00	0.00
0+44.00	0.50

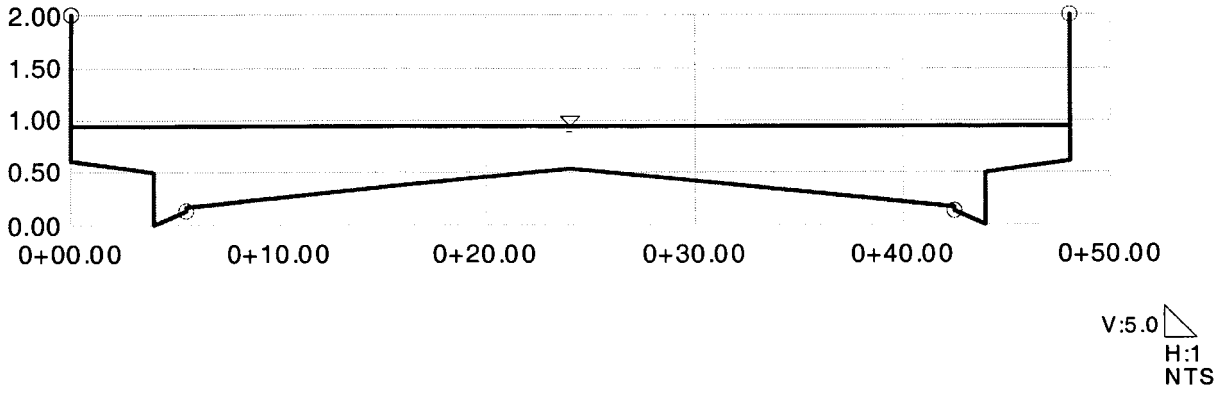
48' ROW AVOLA ST DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+48.00	0.60
0+48.00	2.00

48' ROW AVOLA ST DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	48' ROW AVOLA ST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.0000	%
Water Surface Elevation	0.94	ft
Elevation Range	0.00 to 2.00	
Discharge	172.00	cfs



80' ROW SERENE AVE DEPTH CALCULATION
Worksheet for Irregular Channel

Cross-Section C

Project Description	
Worksheet	80' ROW SERENE AVE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.7000 %
Discharge	172.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.015	
Water Surface Elevation	0.93	ft
Elevation Range	0.00 to 2.00	
Flow Area	35.3	ft²
Wetted Perimeter	81.77	ft
Top Width	80.00	ft
Actual Depth	0.93	ft
Critical Elevation	1.01	ft
Critical Slope	0.3961	%
Velocity	4.87	ft/s
Velocity Head	0.37	ft
Specific Energy	1.30	ft
Froude Number	1.29	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+73.00	0.015
0+73.00	0+80.00	0.013

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+40.00	0.83
0+73.00	0.17
0+73.00	0.13
0+74.50	0.00
0+74.50	0.50

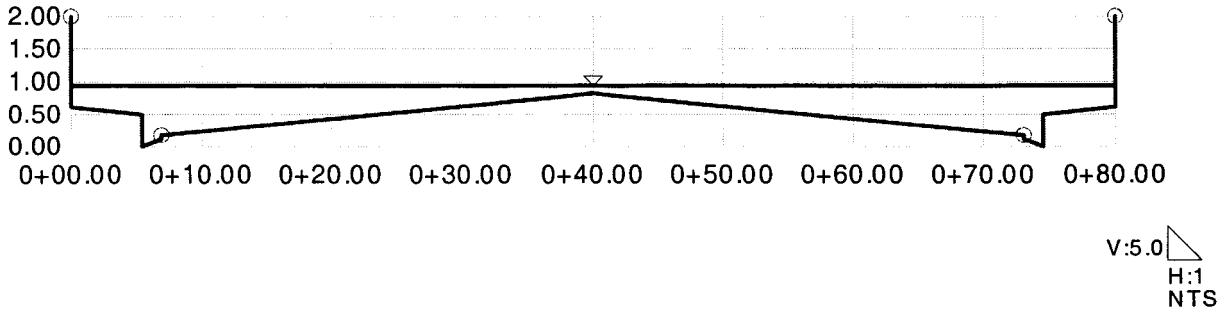
80' ROW SERENE AVE DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+80.00	0.60
0+80.00	2.00

80' ROW SERENE AVE DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	80' ROW SERENE AVE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.015	
Slope	0.7000	%
Water Surface Elevation	0.93	ft
Elevation Range	0.00 to 2.00	
Discharge	172.00	cfs



Tributary 2 of Main Wash

Capacity Calculations

1. (4) 72" RCP's
2. Dual 13'x6' RCB's

CROSS-SECTION S1 (72" RCP EASTERN AVE)
Worksheet for Circular Channel

Project Description	
Worksheet	SECTION S1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	1.5000	%
Diameter	72	in
Discharge	477.50	cfs

Results		
Depth	4.54	ft
Flow Area	22.9	ft²
Wetted Perimeter	12.65	ft
Top Width	5.15	ft
Critical Depth	5.62	ft
Percent Full	75.6	%
Critical Slope	1.0988	%
Velocity	20.81	ft/s
Velocity Head	6.73	ft
Specific Energy	11.27	ft
Froude Number	1.74	
Maximum Discharge	557.93	cfs
Discharge Full	518.66	cfs
Slope Full	1.2714	%
Flow Type	Supercritical	

Total flow = 1,910 cfs
storm drain system consists of (4) 72" RCP's.
modeled 1 RCP using 1/4 flow = 477.5 cfs

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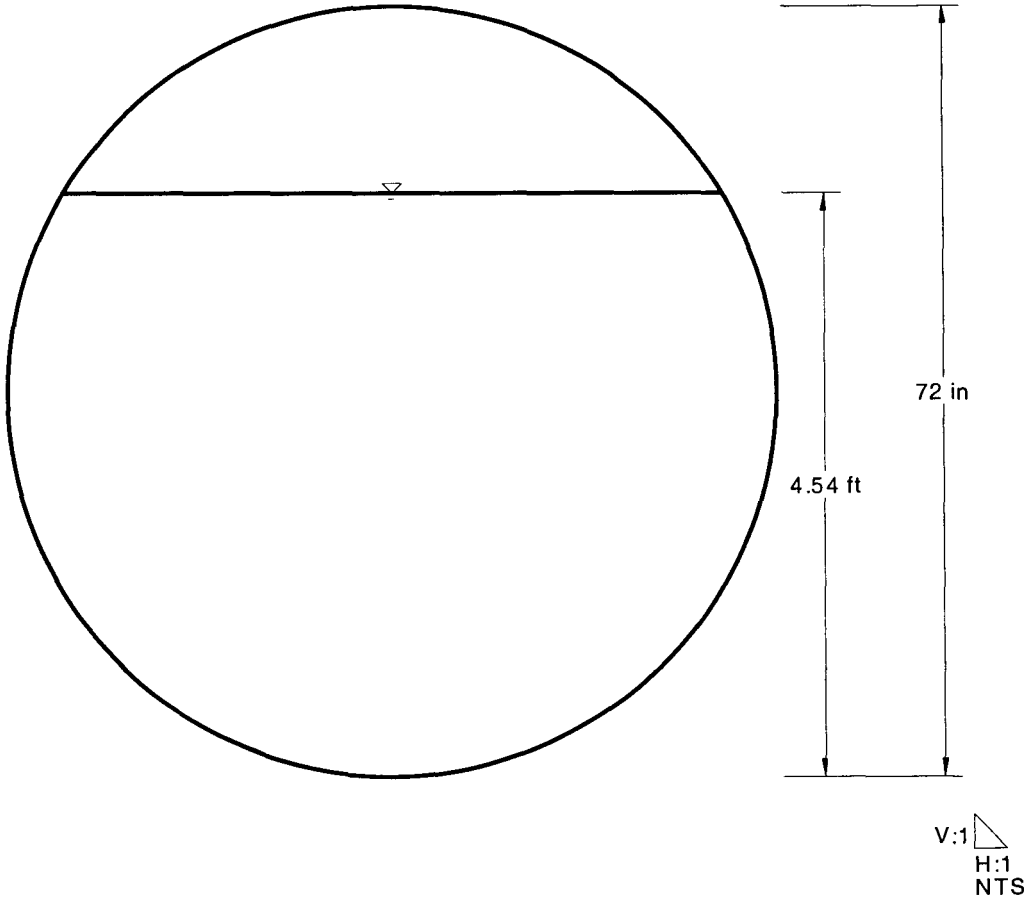
CROSS-SECTION S1 (72" RCP)
Cross Section for Circular Channel

Project Description	
Worksheet	SECTION S1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	1.5000	%
Depth	4.54	ft
Diameter	72	in
Discharge	477.50	cfs



CROSS-SECTION S2 (2 - 13' x 6' RCB)
Worksheet for Rectangular Channel

Project Description	
Worksheet	SECTION S2
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	1.3000	%
Bottom Width	13.00	ft
Discharge	983.00	cfs

Results		
Depth	3.40	ft
Flow Area	44.2	ft²
Wetted Perimeter	19.80	ft
Top Width	13.00	ft
Critical Depth	5.62	ft
Critical Slope	0.3179	%
Velocity	22.25	ft/s
Velocity Head	7.70	ft
Specific Energy	11.09	ft
Froude Number	2.13	
Flow Type	Supercritical	

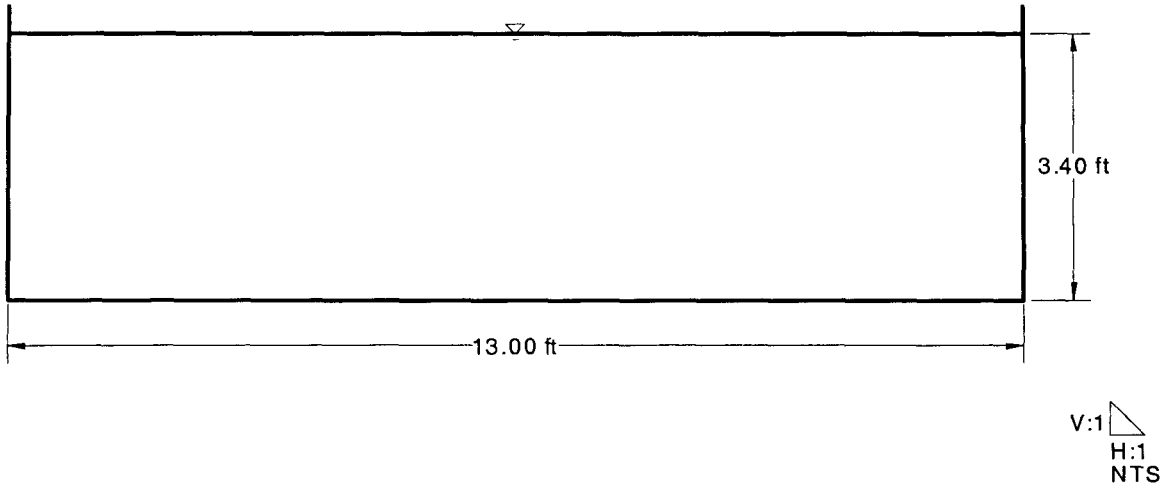
Storm drain consists of (2) 13'x6' RCB's

Modeled as 1 RCB using ½ flow = 983 cfs

CROSS-SECTION S2
Cross Section for Rectangular Channel

Project Description	
Worksheet	SECTION S2
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	1.3000	%
Depth	3.40	ft
Bottom Width	13.00	ft
Discharge	983.00	cfs



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Tributary 3 of Main Wash

1. Bosco Pl
2. Aragon Pl
3. Montclair Ct

51' ROW ARAGON PLACE DEPTH CALCULATION
Worksheet for Irregular Channel

Section N6

Project Description	
Worksheet	51' ROW ARAGON PLACE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.4000	%
Discharge	46.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.56	ft
Elevation Range	0.00 to 1.00	
Flow Area	10.9	ft²
Wetted Perimeter	47.59	ft
Top Width	46.50	ft
Actual Depth	0.56	ft
Critical Elevation	0.64	ft
Critical Slope	0.5528	%
Velocity	4.21	ft/s
Velocity Head	0.28	ft
Specific Energy	0.83	ft
Froude Number	1.53	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.015
0+07.00	0+44.00	0.016
0+44.00	0+51.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	1.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+25.50	0.45
0+44.00	0.17
0+44.00	0.13
0+45.50	0.00
0+45.50	0.50

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Project Engineer: Post, Buckley, Schuh & Jernigan, Inc.

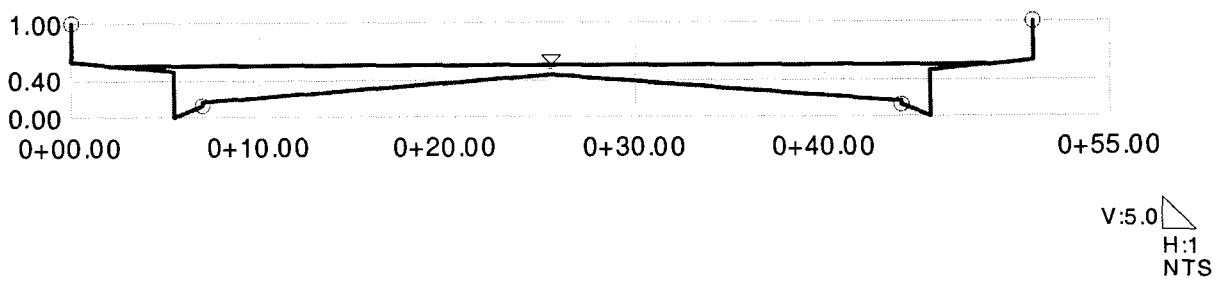
51' ROW ARAGON PLACE DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+51.00	0.60
0+51.00	1.00

51' ROW ARAGON PLACE DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	51' ROW ARAGON PLACE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.4000	%
Water Surface Elevation	0.56	ft
Elevation Range	0.00 to 1.00	
Discharge	46.00	cfs



51' ROW BOSCO PLACE DEPTH CALCULATION
Worksheet for Irregular Channel

Section N7

Project Description	
Worksheet	51' ROW BOSCO PLACE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.4000	%
Discharge	43.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.55	ft
Elevation Range	0.00 to 1.00	
Flow Area	10.4	ft²
Wetted Perimeter	46.39	ft
Top Width	45.30	ft
Actual Depth	0.55	ft
Critical Elevation	0.63	ft
Critical Slope	0.5676	%
Velocity	4.13	ft/s
Velocity Head	0.26	ft
Specific Energy	0.81	ft
Froude Number	1.52	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.015
0+07.00	0+44.00	0.016
0+44.00	0+51.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	1.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+25.50	0.45
0+44.00	0.17
0+44.00	0.13
0+45.50	0.00
0+45.50	0.50

51' ROW BOSCO PLACE DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+51.00	0.60
0+51.00	1.00

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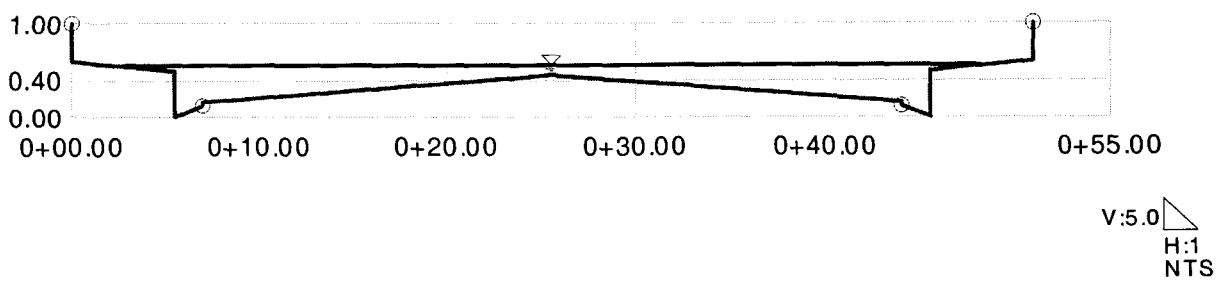
51' ROW BOSCO PLACE DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	51' ROW BOSCO PLACE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.4000	%
Water Surface Elevation	0.55	ft
Elevation Range	0.00 to 1.00	
Discharge	43.00	cfs



51' ROW MONTCLAIR COURT DEPTH CALCULATION
Worksheet for Irregular Channel

Section N8

Total Flow of 207 cfs includes 38 cfs from Wigwam Culvert over-topping.

Project Description	
Worksheet	51' ROW MONTCLAIR COURT
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.4000	%
Discharge	207.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.90	ft
Elevation Range	0.00 to 1.00	
Flow Area	28.0	ft²
Wetted Perimeter	52.69	ft
Top Width	51.00	ft
Actual Depth	0.90	ft
Critical Elevation	1.15	ft
Critical Slope	0.4035	%
Velocity	7.40	ft/s
Velocity Head	0.85	ft
Specific Energy	1.75	ft
Froude Number	1.76	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.015
0+07.00	0+44.00	0.016
0+44.00	0+51.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	1.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+25.50	0.45
0+44.00	0.17
0+44.00	0.13
0+45.50	0.00
0+45.50	0.50

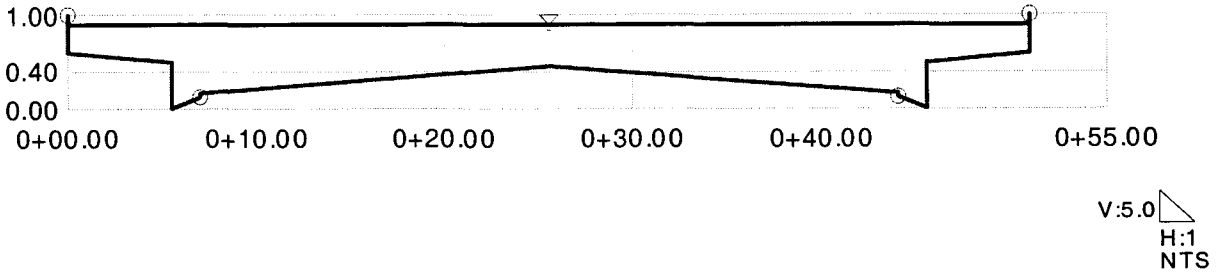
51' ROW MONTCLAIR COURT DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+51.00	0.60
0+51.00	1.00

51' ROW MONTCLAIR COURT DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	51' ROW MONTCLAIR COURT
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.4000	%
Water Surface Elevation	0.90	ft
Elevation Range	0.00 to 1.00	
Discharge	207.00	cfs



Tributary 4 of Main Wash

1. Copper Creek Dr
2. Hidden Falls Way
3. Reyburn Dr
4. Pleasant Dale Rd
5. Megan Dr

48' ROW HIDDEN FALLS WAY DEPTH CALCULATION
Worksheet for Irregular Channel

Section N1

Project Description	
Worksheet	48' ROW HIDDEN FALLS WAY
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.7000	%
Discharge	6.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.38	ft
Elevation Range	0.00 to 2.00	
Flow Area	3.1	ft²
Wetted Perimeter	24.47	ft
Top Width	23.62	ft
Actual Depth	0.38	ft
Critical Elevation	0.37	ft
Critical Slope	0.7622	%
Velocity	1.96	ft/s
Velocity Head	0.06	ft
Specific Energy	0.44	ft
Froude Number	0.96	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+05.50	0.015
0+05.50	0+42.50	0.016
0+42.50	0+48.00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	2.00
0+00.00	0.60
0+04.00	0.50
0+04.00	0.00
0+05.50	0.13
0+05.50	0.17
0+24.00	0.54
0+42.50	0.17

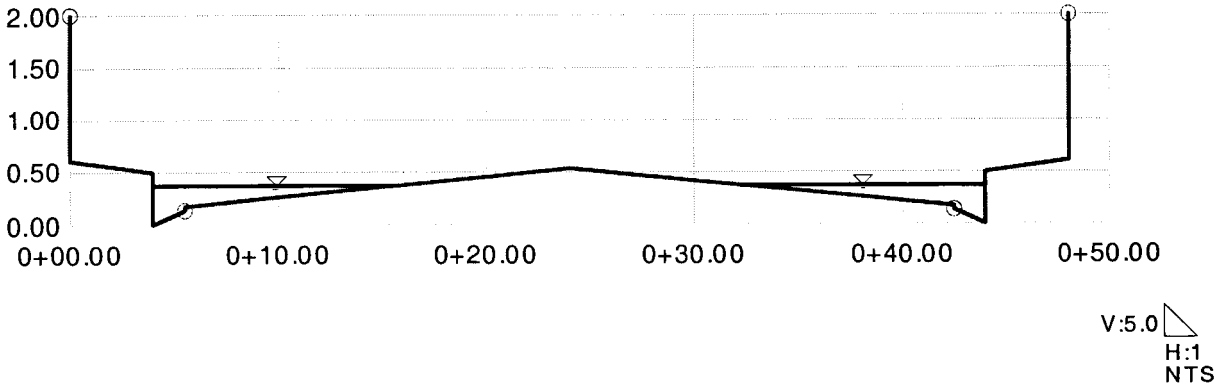
48' ROW HIDDEN FALLS WAY DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+42.50	0.13
0+44.00	0.00
0+44.00	0.50
0+48.00	0.60
0+48.00	2.00

48' ROW HIDDEN FALLS WAY DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	48' ROW HIDDEN FALLS WAY
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	0.7000	%
Water Surface Elevation	0.38	ft
Elevation Range	0.00 to 2.00	
Discharge	6.00	cfs



48' ROW COPPER CREEK DR DEPTH CALCULATION
Worksheet for Irregular Channel

Section N2

Project Description	
Worksheet	48' ROW COPPER CREEK DRIVE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.7000 %
Discharge	3.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	0.31 ft
Elevation Range	0.00 to 2.00
Flow Area	1.8 ft²
Wetted Perimeter	18.14 ft
Top Width	17.42 ft
Actual Depth	0.31 ft
Critical Elevation	0.31 ft
Critical Slope	0.8288 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.36 ft
Froude Number	0.92
Flow Type	Subcritical

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+05.50	0.015
0+05.50	0+42.50	0.016
0+42.50	0+48.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	2.00
0+00.00	0.60
0+04.00	0.50
0+04.00	0.00
0+05.50	0.13
0+05.50	0.17
0+24.00	0.54
0+42.50	0.17

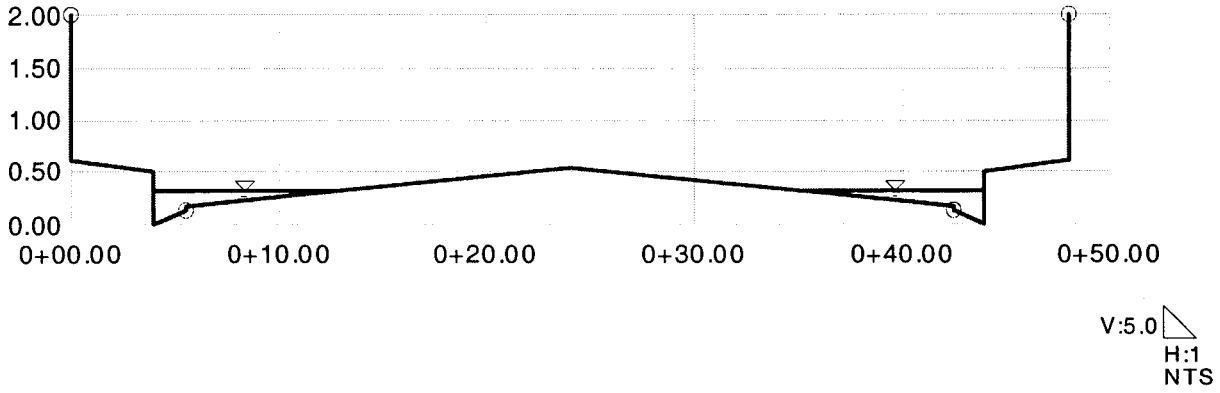
48' ROW COPPER CREEK DR DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+42.50	0.13
0+44.00	0.00
0+44.00	0.50
0+48.00	0.60
0+48.00	2.00

48' ROW COPPER CREEK DR DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	48' ROW COPPER CREEK DRIVE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	0.7000	%
Water Surface Elevation	0.31	ft
Elevation Range	0.00 to 2.00	
Discharge	3.00	cfs



51' ROW REYBURN DRIVE DEPTH CALCULATION
Worksheet for Irregular Channel

Section N3

Project Description	
Worksheet	51' ROW REYBURN DRIVE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.4000	%
Discharge	9.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.36	ft
Elevation Range	0.00 to 1.00	
Flow Area	3.4	ft²
Wetted Perimeter	29.58	ft
Top Width	28.76	ft
Actual Depth	0.36	ft
Critical Elevation	0.39	ft
Critical Slope	0.7455	%
Velocity	2.63	ft/s
Velocity Head	0.11	ft
Specific Energy	0.47	ft
Froude Number	1.34	
Flow Type	Supercritical	

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.015
0+07.00	0+44.00	0.016
0+44.00	0+51.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	1.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+25.50	0.45
0+44.00	0.17

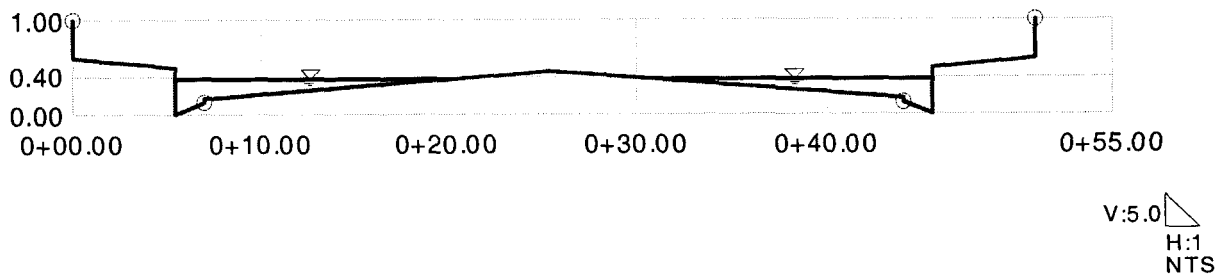
51' ROW REYBURN DRIVE DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+44.00	0.13
0+45.50	0.00
0+45.50	0.50
0+51.00	0.60
0+51.00	1.00

51' ROW REYBURN DRIVE DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	51' ROW REYBURN DRIVE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.4000	%
Water Surface Elevation	0.36	ft
Elevation Range	0.00 to 1.00	
Discharge	9.00	cfs



51' ROW MEGAN DRIVE DEPTH CALCULATION
Worksheet for Irregular Channel

Section N4

Project Description	
Worksheet	51' ROW MEGAN DRIVE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.4000 %
Discharge	46.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.56	ft
Elevation Range	0.00 to 1.00	
Flow Area	10.9	ft²
Wetted Perimeter	47.59	ft
Top Width	46.50	ft
Actual Depth	0.56	ft
Critical Elevation	0.64	ft
Critical Slope	0.5528	%
Velocity	4.21	ft/s
Velocity Head	0.28	ft
Specific Energy	0.83	ft
Froude Number	1.53	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.015
0+07.00	0+44.00	0.016
0+44.00	0+51.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	1.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+25.50	0.45
0+44.00	0.17
0+44.00	0.13
0+45.50	0.00
0+45.50	0.50

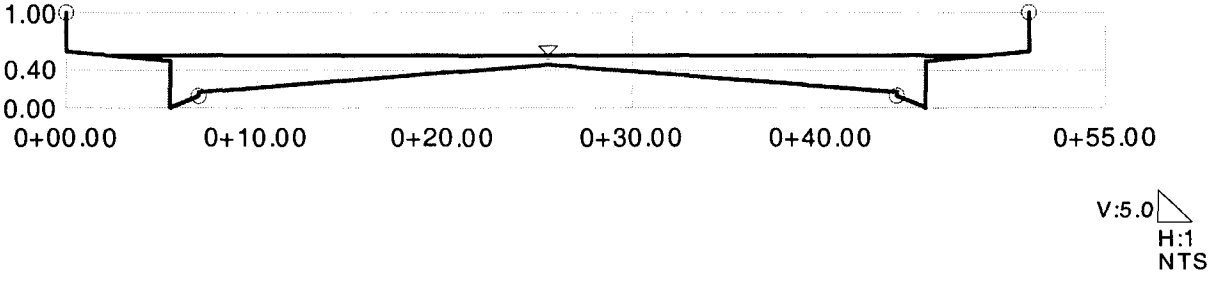
51' ROW MEGAN DRIVE DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+51.00	0.60
0+51.00	1.00

51' ROW MEGAN DRIVE DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	51' ROW MEGAN DRIVE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.4000	%
Water Surface Elevation	0.56	ft
Elevation Range	0.00 to 1.00	
Discharge	46.00	cfs



51' ROW PLEASANT DALE RD DEPTH CALCULATION
Worksheet for Irregular Channel

Section N5

Project Description	
Worksheet	51' ROW PLEASANT DALE ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	1.5000	%
Discharge	39.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.016	
Water Surface Elevation	0.53	ft
Elevation Range	0.00 to 1.00	
Flow Area	9.5	ft²
Wetted Perimeter	44.01	ft
Top Width	42.91	ft
Actual Depth	0.53	ft
Critical Elevation	0.61	ft
Critical Slope	0.5876	%
Velocity	4.12	ft/s
Velocity Head	0.26	ft
Specific Energy	0.79	ft
Froude Number	1.55	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.015
0+07.00	0+44.00	0.016
0+44.00	0+51.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	1.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+25.50	0.45
0+44.00	0.17
0+44.00	0.13
0+45.50	0.00
0+45.50	0.50

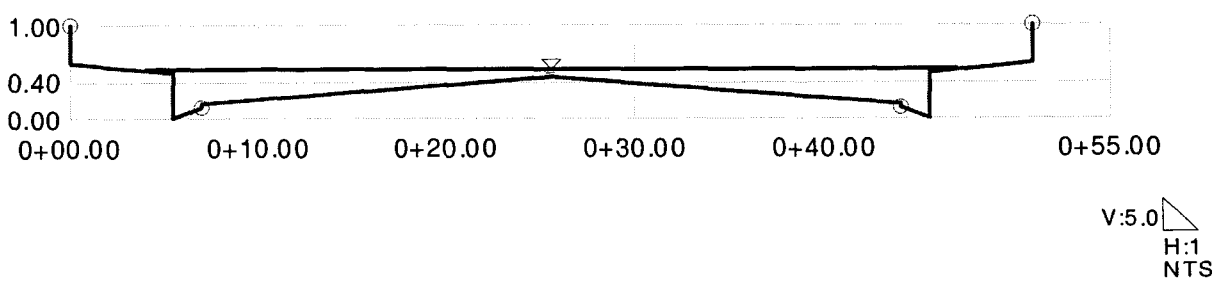
51' ROW PLEASANT DALE RD DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+51.00	0.60
0+51.00	1.00

51' ROW PLEASANT DALE RD DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	51' ROW PLEASANT DALE ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.5000	%
Water Surface Elevation	0.53	ft
Elevation Range	0.00 to 1.00	
Discharge	39.00	cfs



Tributary 1 of East Tributary

1. Norridgewock St

51' ROW NORRIDGEWOCK ST DEPTH CALCULATION

Worksheet for Irregular Channel

Section C4

Project Description	
Worksheet	51' ROW NORRIDGEWOCK ST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	1.6300 %
Discharge	148.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	0.77 ft
Elevation Range	0.00 to 1.00
Flow Area	21.8 ft²
Wetted Perimeter	52.44 ft
Top Width	51.00 ft
Actual Depth	0.77 ft
Critical Elevation	0.99 ft
Critical Slope	0.4283 %
Velocity	6.80 ft/s
Velocity Head	0.72 ft
Specific Energy	1.49 ft
Froude Number	1.83
Flow Type	Supercritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.015
0+07.00	0+44.00	0.016
0+44.00	0+51.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	1.00
0+00.00	0.60
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+25.50	0.45
0+44.00	0.17
0+44.00	0.13
0+45.50	0.00
0+45.50	0.50

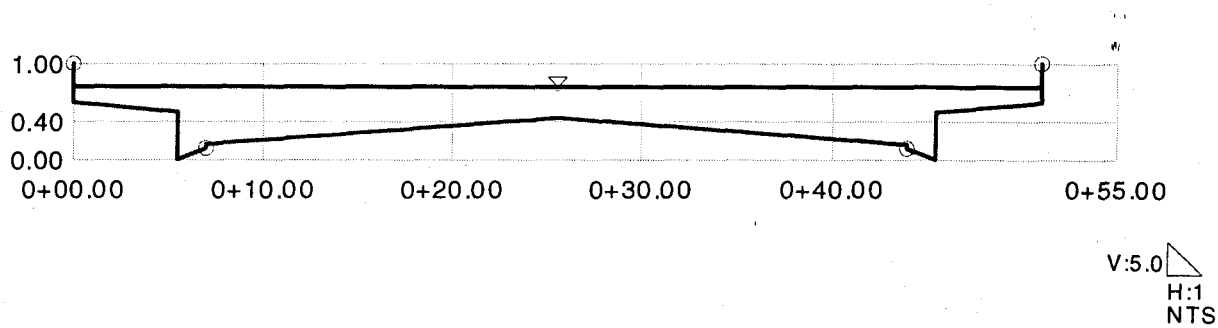
51' ROW NORRIDGEWOCK ST DEPTH CALCULATION
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+51.00	0.60
0+51.00	1.00

51' ROW NORRIDGEWOCK ST DEPTH CALCULATION
Cross Section for Irregular Channel

Project Description	
Worksheet	51' ROW NORRIDGEWOCK ST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.016	
Slope	1.6300	%
Water Surface Elevation	0.77	ft
Elevation Range	0.00 to 1.00	
Discharge	148.00	cfs



APPENDIX E

Reference Material

PBS&J

ENGINEERING · PLANNING
CONSTRUCTION SERVICES
SURVEYING

May 4, 2004

Mr. Max H. Yuan, P.E.
Federal Emergency Management Agency
Mitigation Hazard Identification Branch
500 C Street, SW
Washington, DC 20472

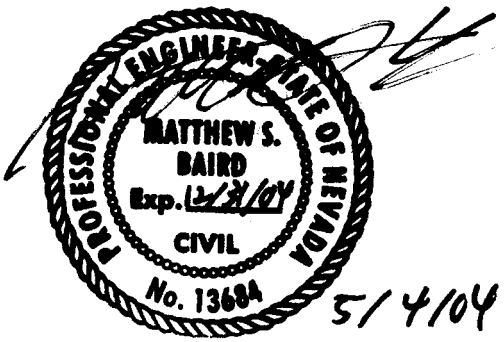
RE: AS-BUILT CERTIFICATION FOR LETTER OF MAP REVISION APPLICATION FOR PITTMAN WASH
PBS&J REFERNCE NO.: 511542.00

Dear Mr. Yuan,

I, Matt Baird, hereby certify that the facilities analyzed in this LOMR were constructed in substantial conformance with the plans provided in Appendix E and the supplemental field survey included on the CD in Appendix G.

Sincerely,

PBS&J



Matthew S. Baird, P.E., CFM
Lic. 13684, Nevada

2270 Corporate Circle · Suite 100 · Henderson, Nevada 89074-6382 · Telephone 702/263-7275 · Fax 702/263-7200

North Half

Pittman Wash Improvements
HEC-2 Data

HEC-2 Data for Cross-Sections -1 Through -25

ESI ENGINEERS & SURVEYORS INC.

July 31, 1991

City of Henderson
Department of Public Works
240 Water Street
Henderson, Nevada 89015

ATTN: Mr. Curt Chandler, Land Development Manager

RE: Pittman Channel adjacent to Oak Forest Villas II

Dear Curt:

Enclosed please find the HEC-2 analysis of the Pittman Channel adjacent to Oak Forest Villas II required by your office. The analysis was performed assuming improvements to the Western half of the channel only. The analysis demonstrates that without removal of a portion of the Easterly channel bank the water surface elevation will exceed the channel ROW. Excavation of the Easterly channel bank would lower the water surface elevation to an acceptable level as demonstrated within the original hydrology study.

Should you have any questions or require additional information, please contact me.

Sincerely,

Thomas E. Davy

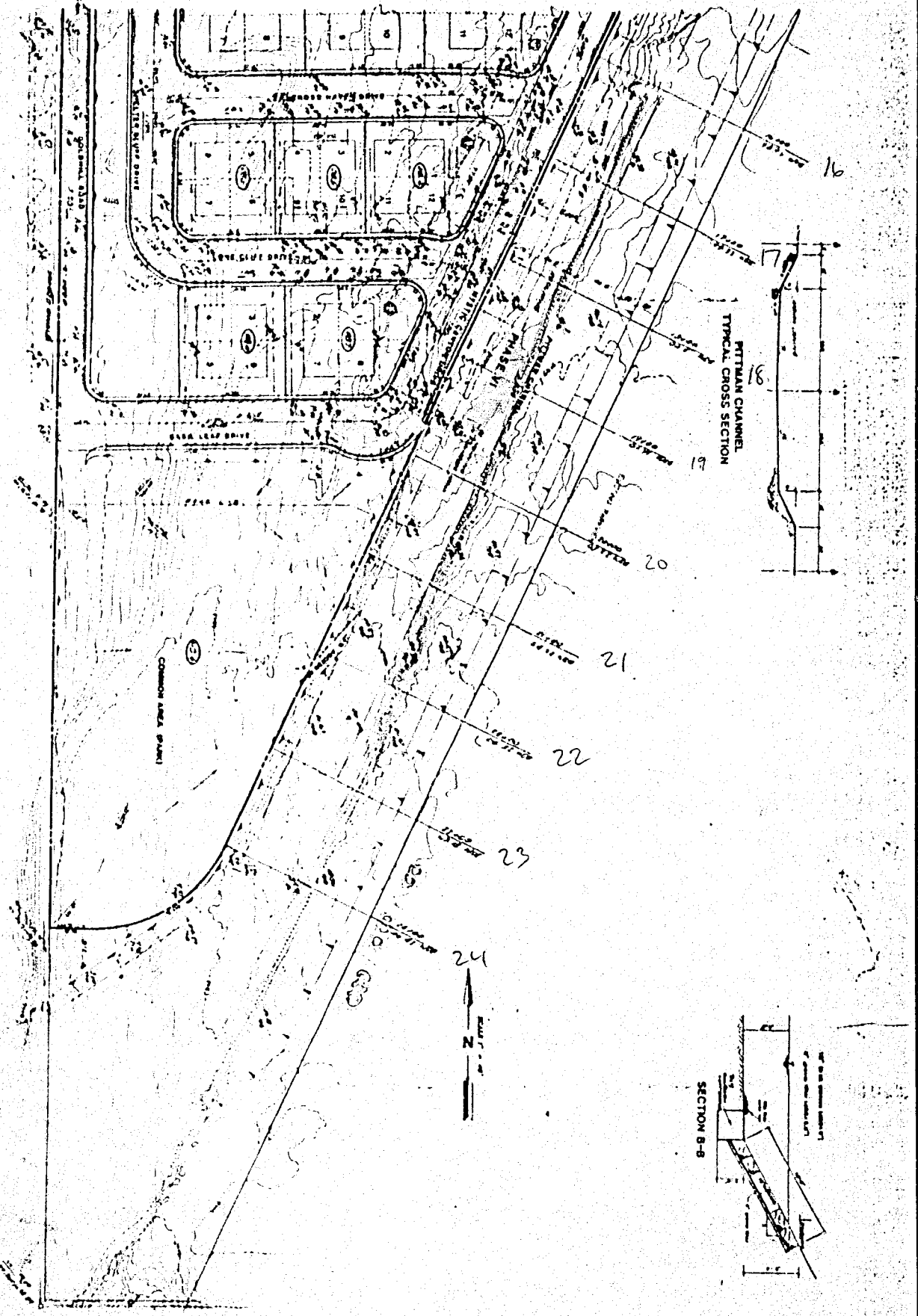
Thomas E. Davy, E.I.T.
Associate Engineer

REGISTERED PROFESSIONAL ENGINEER STATE OF NEVADA
DANIEL J. WONDERS
CIVIL
NO. 6950

7/31/91

Daniel J. Wonders, P.E.
Engineering Manager

7018 W. Charleston Blvd. • Las Vegas, NV 89117 • (702) 363-6415

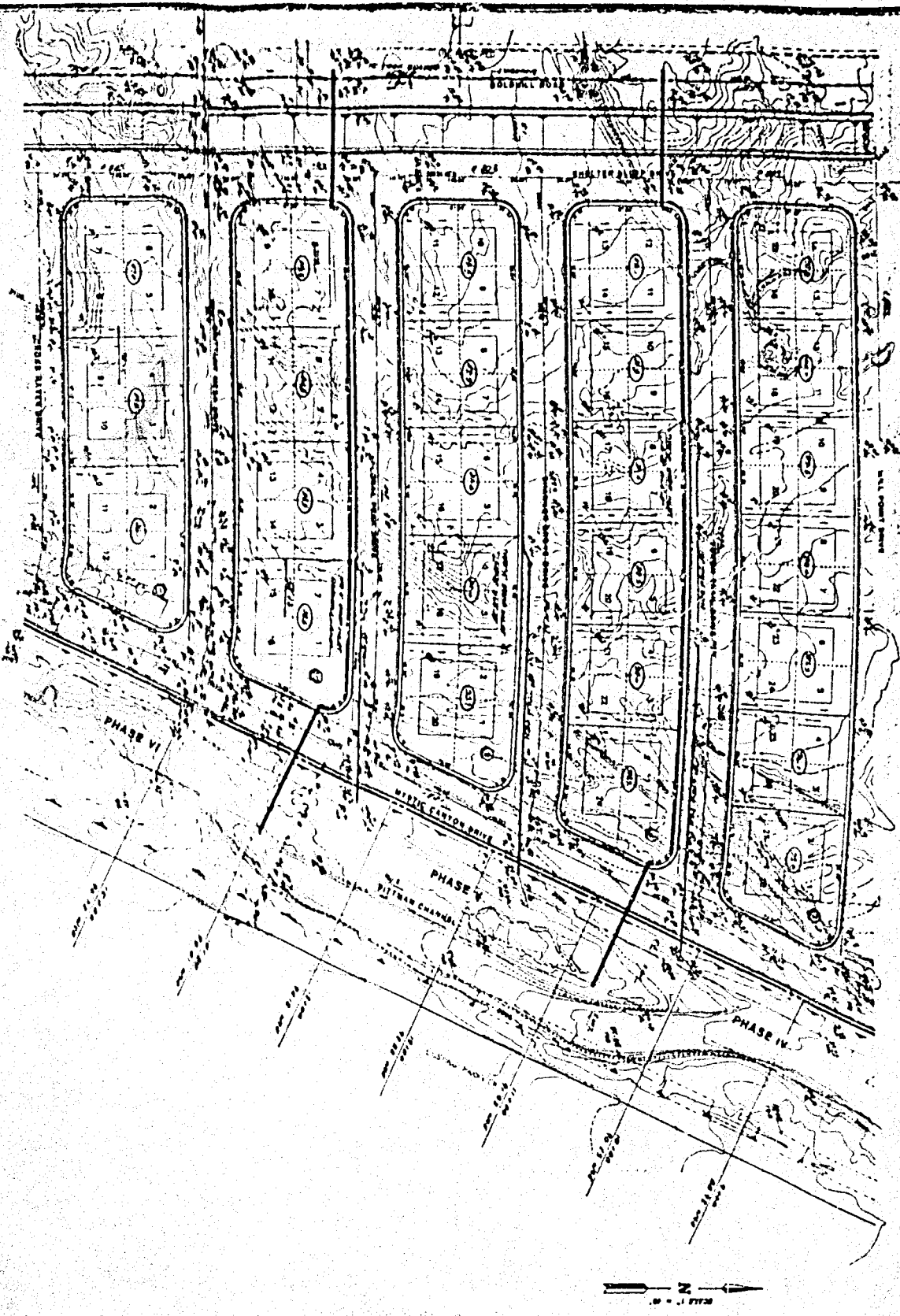


ROUGH GRADING PLAN

OAK FOREST VILLAS II

ESI ENGINEERS & SURVEYORS, INC.

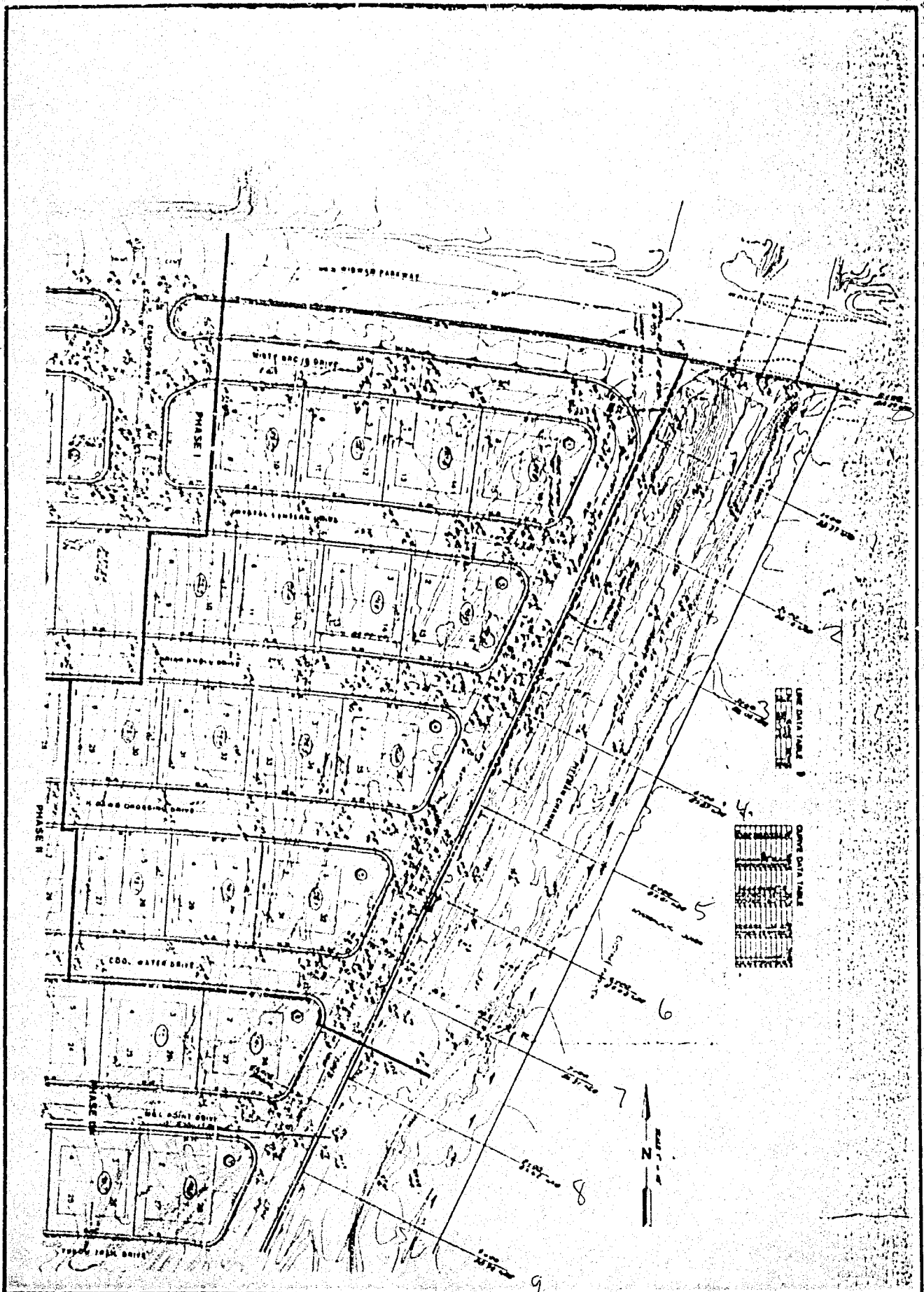
0000 1224



ROUGH GRADING PLAN

OAK FOREST VILLAS II

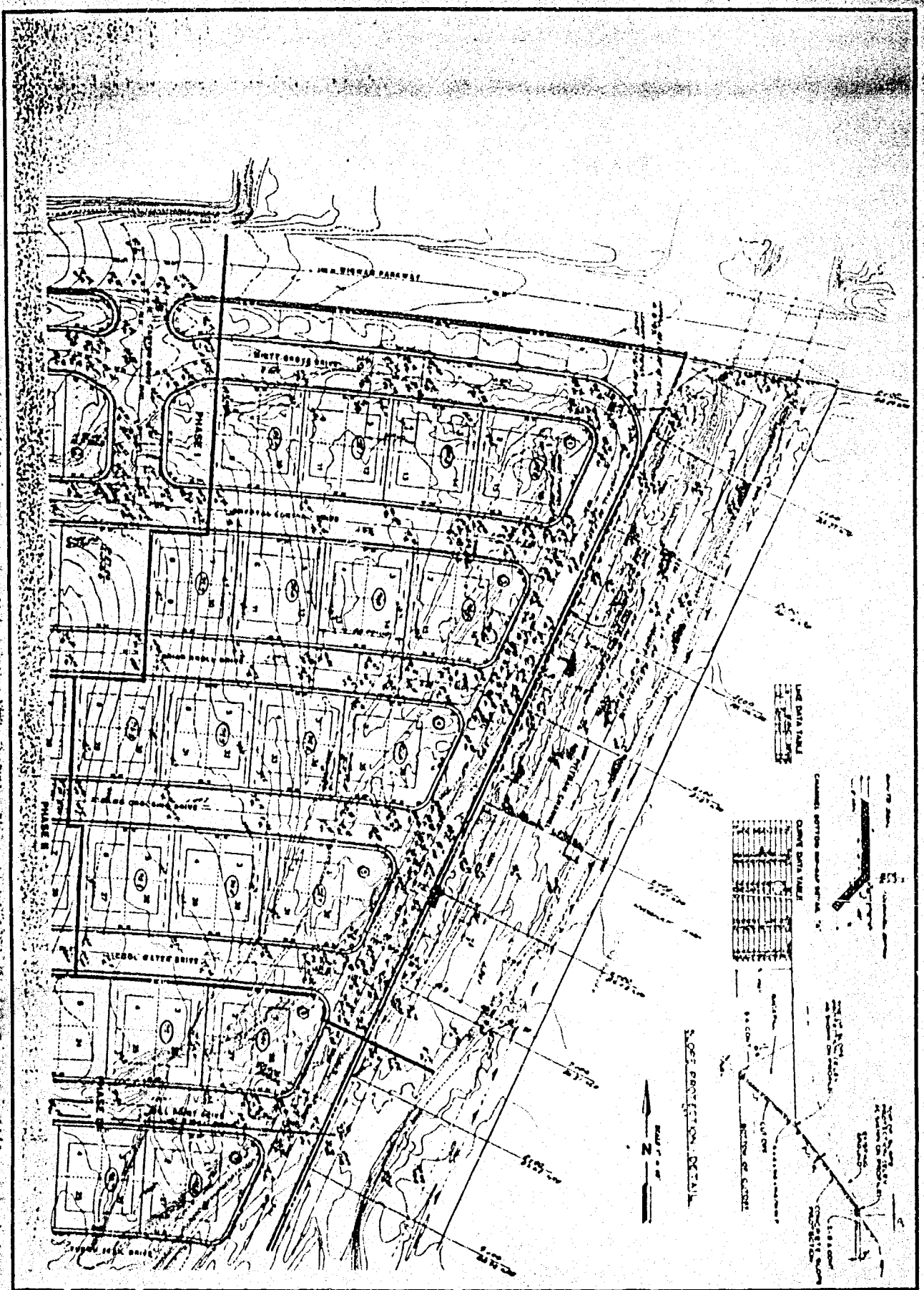
ESI ENGINEERS & SURVEYORS, INC.



ROUGH GRADING PLAN

OAK FOREST VILLAS II

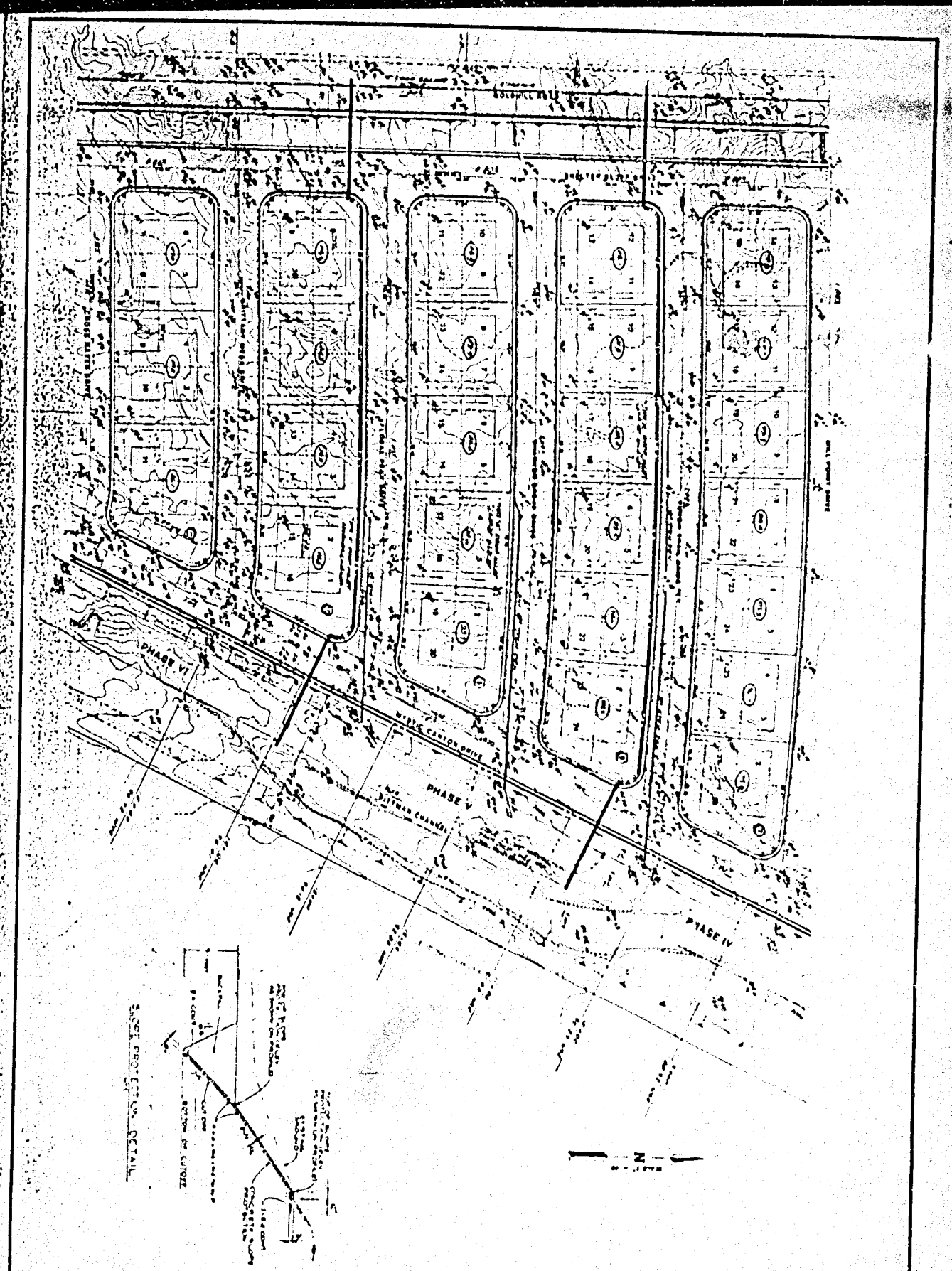
ESI ENGINEERS & SURVEYORS, INC.



ROUGH GRADING PLAN

OAK FOREST VILLAS II

ESI ENGINEERS & SURVEYORS, INC.



ROUGH GRADING PLAN

OAK FOREST VILLAS II

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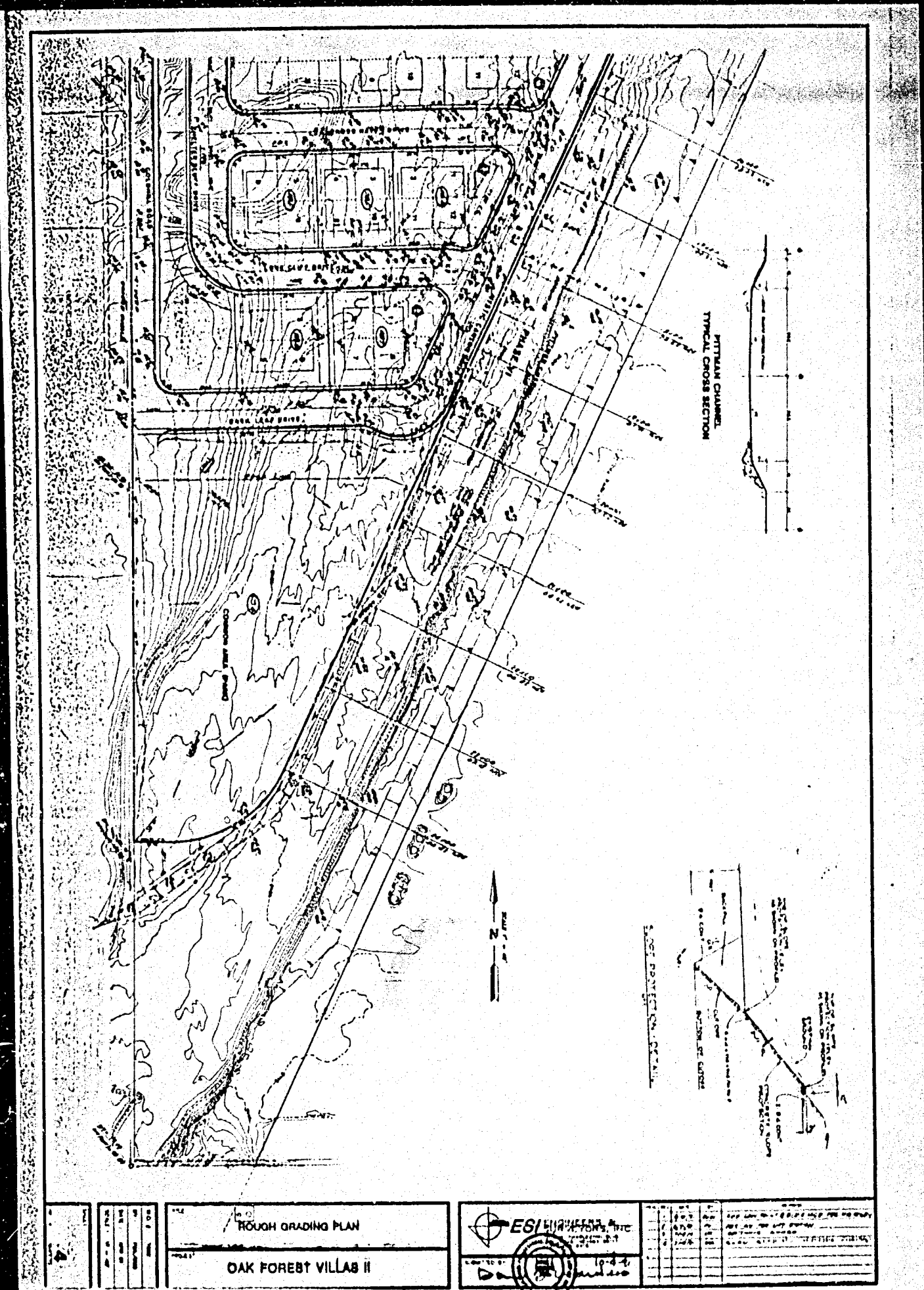
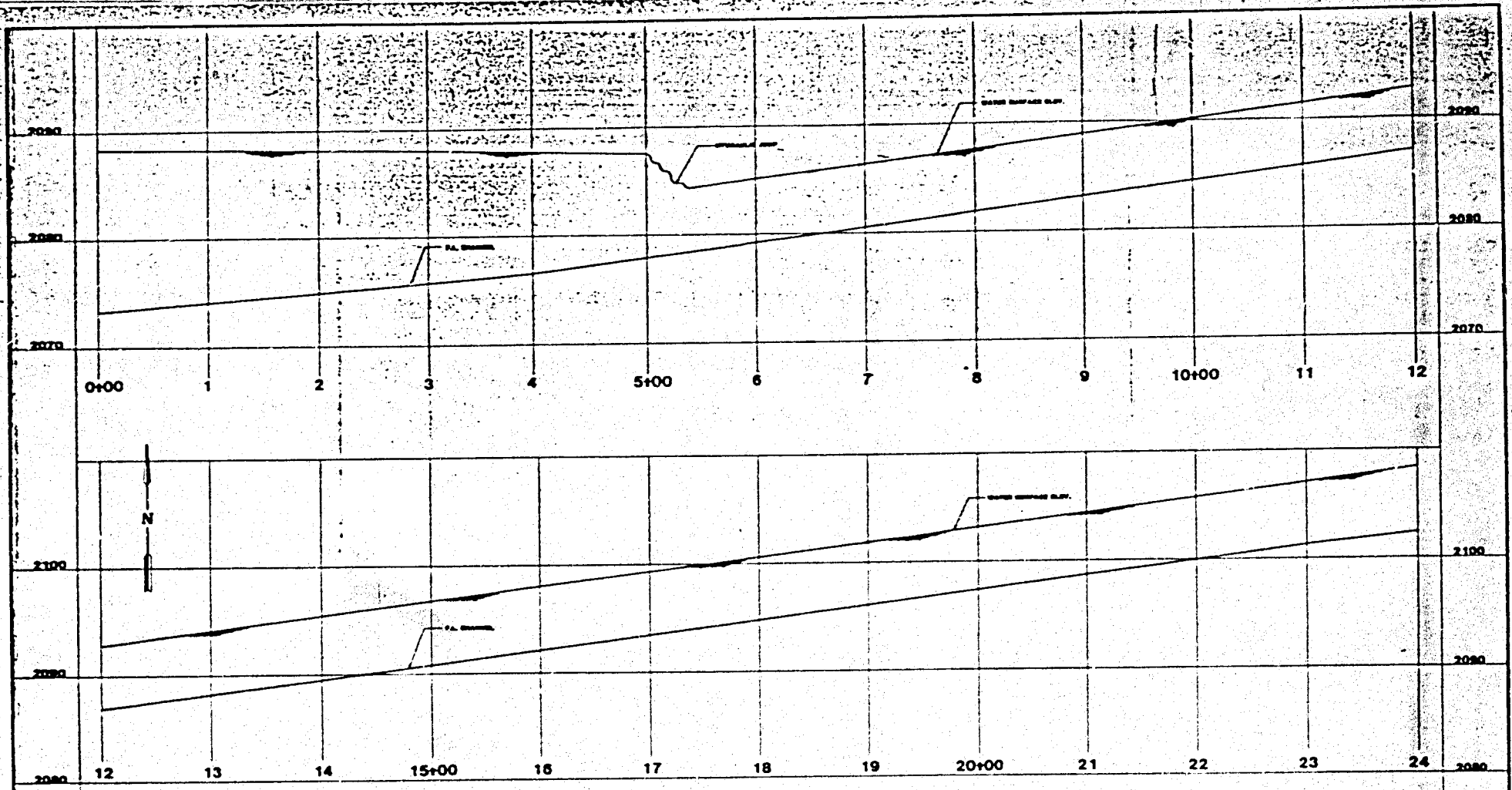


ROUGH GRADING PLAN

OAK FOREST VILLAS II

ESI

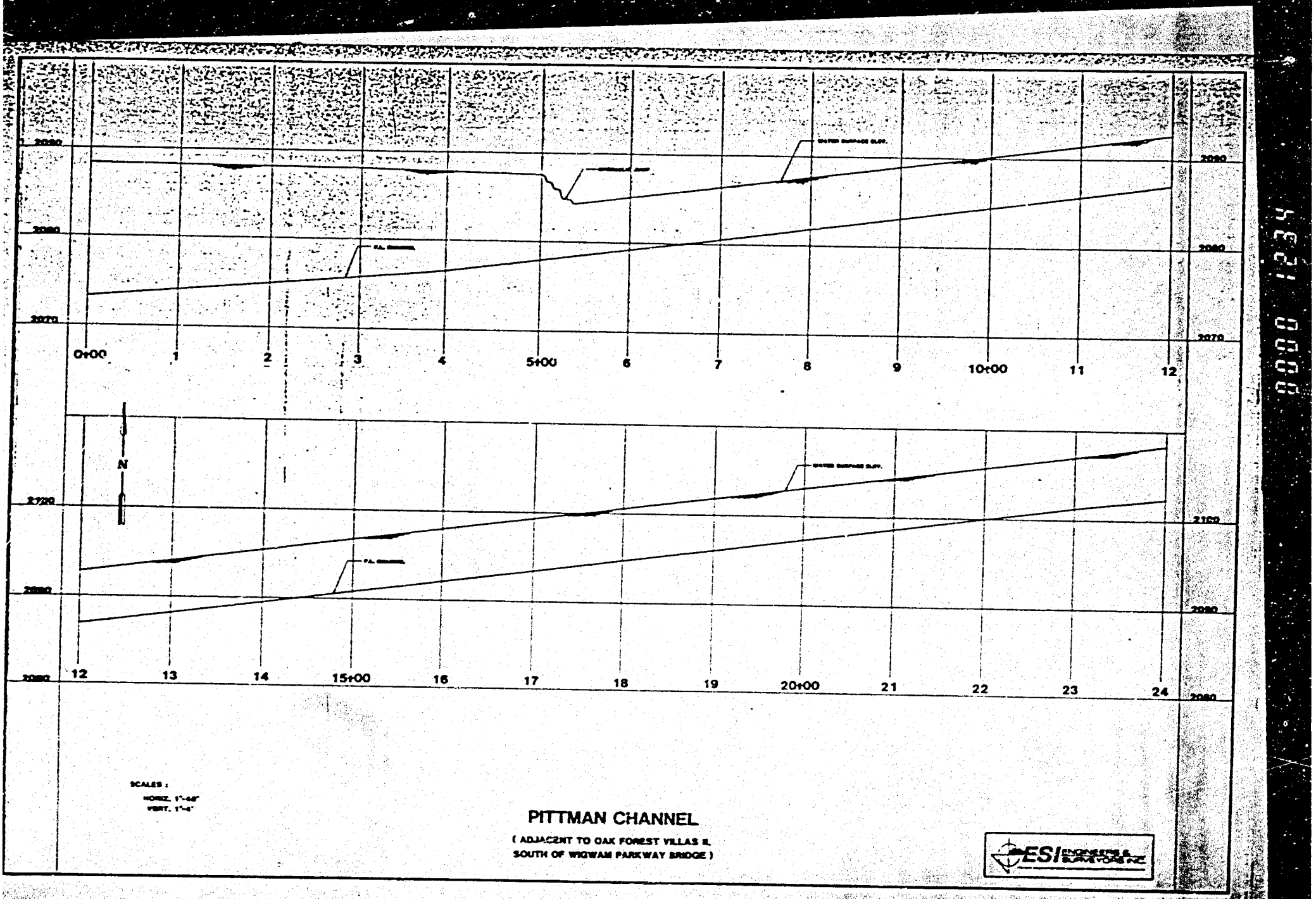


SCALES :
HORIZ. 1"=40'
VERT. 1"=4'

PITTMAN CHANNEL

(ADJACENT TO OAK FOREST VILLAS II,
SOUTH OF WIGWAM PARKWAY BRIDGE)

ESI ENGINEERING & ENVIRONMENTAL INC



SCALES :
HORIZ. 1"=40'
VERT. 1"=4'

PITTMAN CHANNEL

(ADJACENT TO OAK FOREST VILLAS II,
SOUTH OF WIGWAM PARKWAY BRIDGE)

ESI ENGINEERING & SURVEYING, INC.

4621 0000

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1**************************************************
*  WATER SURFACE PROFILES                        *
*  VERSION OF NOVEMBER 1976                      *
*  UPDATED MAY 1984                              *
*  IBM-PC-XT VERSION AUGUST 1985                 *
*  RUN DATE  07-29-91   TIME  11:55:23           *
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*  U.S. ARMY CORPS OF ENGINEERS
*  THE HYDROLOGIC ENGINEERING CENTE
*  609 SECOND STREET, SUITE D
*  DAVIS, CALIFORNIA 95616
*  (916) 440-2105 (FTS) 448-2105
**********************************
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THIS RUN EXECUTED 07-29-91

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 IBM-PC-XT VERSION AUGUST 1985
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T1          ENGINEERS & SURVEYORS, INC.
T2          JULY 22, 1991
T3          PROFILE 2 - SUPERCRITICAL- PITTMAN WASH

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Flow

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QT	1.000	10500.000	.000	.000	.000	.000	.000	.000	.000	.000
-1 X1	2400.000	7.000	.000	145.000	.000	.000	.000	.000	.000	.000
GR	111.500	.000	103.540	16.000	102.610	62.500	105.000	76.500	110.000	86.500
GR	111.000	95.500	112.500	145.000	.000	.000	.000	.000	.000	.000
	X-sect	# of additional cross sections	BSL	BSR	LOB	ROB	Chnl			
-2 X1	2300.000	0.000	.000	145.000	50.000	50.000	50.000	.000	.000	.000
GR	110.200	.000	102.240	16.000	101.310	62.500	102.000	73.500	105.000	82.500
GR	109.000	89.500	110.000	95.500	111.000	99.500	112.000	145.000	.000	.000
X1	2250.000	7.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	109.600	.000	101.590	16.000	100.010	62.500	101.000	70.500	105.000	80.500
GR	110.000	91.500	111.000	145.000	.000	.000	.000	.000	.000	.000
X1	2225.000	7.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	109.300	.000	101.260	16.000	100.340	62.500	101.000	70.500	105.000	78.500
GR	110.000	89.500	111.000	145.000	.000	.000	.000	.000	.000	.000
-3 X1	2200.000	7.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	108.900	.000	100.940	16.000	100.010	62.500	101.000	69.500	105.000	76.500
GR	110.000	85.500	110.500	145.000	.000	.000	.000	.000	.000	.000
X1	2175.000	7.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	108.600	.000	100.620	16.000	99.680	62.500	100.000	63.500	105.000	77.500
GR	110.000	89.500	110.000	145.000	.000	.000	.000	.000	.000	.000
X1	2150.000	7.000	.000	145.000	50.000	50.000	50.000	.000	.000	.000
GR	108.300	.000	100.290	16.000	99.360	62.500	100.000	65.500	105.000	77.500
GR	110.000	88.500	110.000	145.000	.000	.000	.000	.000	.000	.000

X1	2100.000	6.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	107.600	.000	99.640	16.000	98.710	62.500	105.000	71.500	108.000	84.500
GR	109.000	145.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	2000.000	6.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	106.300	.000	98.340	16.000	97.410	62.500	100.000	64.500	105.000	73.500
GR	107.000	145.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	1900.000	5.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	105.000	.000	97.040	16.000	96.110	62.500	105.000	74.500	105.000	145.000
X1	1800.000	5.000	.000	145.000	50.000	50.000	50.000	.000	.000	.000
GR	103.700	.000	95.740	16.000	94.810	62.500	104.000	68.000	104.000	145.000
X1	1750.000	6.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	103.100	.000	95.100	16.000	94.160	62.500	103.000	69.500	104.000	94.500
GR	104.000	145.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	1725.000	5.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	102.800	.000	94.760	16.000	93.840	62.500	104.000	67.500	104.500	145.000
X1	1700.000	5.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	102.400	.000	94.440	16.000	93.510	62.500	104.000	91.500	105.000	145.000
X1	1675.000	6.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	102.100	.000	94.120	16.000	93.180	62.500	104.000	99.500	104.000	104.500
GR	103.000	145.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	1650.000	7.000	.000	145.000	50.000	50.000	50.000	.000	.000	.000
GR	101.800	.000	93.790	16.000	92.860	62.500	104.000	95.500	104.000	107.500
GR	103.000	120.500	102.500	145.000	.000	.000	.000	.000	.000	.000
X1	1600.000	5.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	101.100	.000	93.140	16.000	92.210	62.500	103.000	109.500	102.000	145.000
X1	1500.000	5.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	99.840	.000	91.880	16.000	90.950	62.500	101.000	114.500	101.000	145.000
X1	[redacted]	9.000	.000	145.000	50.000	50.000	50.000	.000	.000	.000
GR	98.540	.000	90.580	16.000	89.610	62.500	94.000	70.500	93.000	83.500
GR	95.000	89.500	98.000	94.500	99.000	128.500	100.000	145.000	.000	.000
X1	1350.000	9.000	.000	145.000	50.000	50.000	50.000	.000	.000	.000
GR	97.890	.000	89.890	16.000	88.960	62.500	95.000	70.500	92.000	81.500
GR	92.000	97.500	95.000	104.500	98.000	122.500	99.000	145.000	.000	.000
X1	[redacted]	9.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	97.240	.000	89.240	16.000	88.310	62.500	95.000	71.500	92.000	78.500
GR	92.000	102.500	95.000	107.500	98.000	132.500	98.000	145.000	.000	.000

	-13									
X1	1200.000	8.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	95.940	.000	87.940	16.000	87.010	62.500	90.000	78.500	90.000	103.500
GR	95.000	119.500	97.000	128.500	97.500	145.000	.000	.000	.000	.000
	-14									
X1	1100.000	10.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	94.640	.000	86.640	16.000	85.710	62.500	87.000	70.500	88.000	76.500
GR	89.000	79.500	90.000	82.500	90.000	114.500	95.000	129.500	96.500	145.000
	-15									
X1	1000.000	12.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	93.340	.000	85.340	16.000	84.410	62.500	87.000	93.500	88.000	95.500
GR	89.000	98.500	90.000	100.500	91.000	102.500	92.000	105.500	93.000	114.500
GR	94.000	125.500	94.500	145.000	.000	.000	.000	.000	.000	.000
X1	975.000	8.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	93.020	.000	85.020	16.000	84.080	62.500	87.000	78.500	90.000	83.500
GR	93.000	101.500	94.000	130.500	94.500	145.000	.000	.000	.000	.000
X1	950.000	7.000	.000	145.000	25.000	25.000	25.000	.000	.000	.000
GR	92.690	.000	84.690	16.000	83.760	62.500	86.000	65.000	90.000	72.500
GR	93.000	82.500	94.500	145.000	.000	.000	.000	000	.000	.000
	-16									
X1	900.000	8.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	92.040	.000	84.040	16.000	83.110	62.500	91.000	64.500	92.000	68.500
GR	93.000	107.500	94.000	126.500	94.000	145.000	.000	.000	.000	.000
	-17									
X1	800.000	8.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	90.740	.000	82.740	16.000	81.810	62.500	90.000	73.500	91.000	88.500
GR	92.000	102.500	93.000	132.500	93.500	145.000	.000	.000	.000	.000
	-18									
X1	700.000	9.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	89.440	.000	81.440	16.000	80.510	62.500	83.000	83.500	85.000	86.500
GR	87.000	92.500	90.000	102.500	92.000	114.500	92.500	145.000	.000	.000
	-19									
X1	600.000	7.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	88.140	.000	80.140	16.000	79.210	62.500	82.000	98.500	85.000	104.500
GR	90.000	114.500	91.500	145.000	.000	.000	.000	.000	.000	.000
	-20									
X1	500.000	8.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	86.840	.000	78.840	16.000	77.910	62.500	81.000	83.500	82.000	99.500
GR	85.000	108.500	90.000	134.500	90.500	145.000	.000	.000	.000	.000
	-21									
X1	400.000	7.000	.000	145.000	100.000	100.000	100.000	.000	.000	.000
GR	85.540	.000	77.540	16.000	76.610	62.500	79.000	108.500	85.000	115.500
GR	86.000	121.500	87.000	145.000	.000	.000	.000	.000	.000	.000
	-22									
X1	300.000	10.000	.000	143.500	100.000	100.000	100.000	.000	.000	.000
GR	84.320	.000	76.320	16.000	75.390	62.500	78.000	84.500	79.000	107.500
GR	80.000	110.500	85.000	120.500	86.000	123.500	87.000	129.500	88.000	143.500

-23

X1	200.000	8.000	.000	142.500	100.000	100.000	100.000	.000	.000	.000
GR	83.100	.000	75.100	16.000	74.170	62.500	77.000	92.500	78.000	97.500
GR	80.000	102.500	85.000	111.500	87.000	142.500	.000	.000	.000	.000
X1	100.000	9.000	.000	139.500	100.000	100.000	100.000	.000	.000	.000
GR	81.880	.000	73.880	16.000	72.950	62.500	75.000	77.500	75.000	82.500
GR	77.000	96.500	80.000	104.500	85.000	112.500	85.500	139.500	.000	.000
X1	.000	7.000	.000	133.500	.000	.000	.000	.000	.000	.000
GR	80.660	.000	72.660	16.000	71.730	62.500	80.000	97.500	81.000	109.500
GR	82.000	120.500	83.000	133.500	.000	.000	.000	.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

-240

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

*SECNO 2400.000
3280 CROSS SECTION 2400.00 EXTENDED 1.22 FEET

3720 CRITICAL DEPTH ASSUMED

2400.00	10.11	112.72	112.72	110.00	115.56	2.83	.00	.00	111.50
10500.	0.	10500.	0.	0.	777.	0.	0.	0.	112.50
.00	.00	13.51	.00	.027	.027	.027	.000	102.61	.00
.006701	0.	0.	0.	0	10	0	.00	145.00	145.00

0
*SECNO 2300.000

3301 HV CHANGED MORE THAN HVINS

2300.00	7.37	108.68	111.24	.00	115.56	6.87	.00	.00	110.20
10500.	0.	10500.	0.	0.	499.	0.	0.	0.	112.00
.00	.00	21.04	.00	.027	.027	.027	.000	101.31	3.04
.014650	0.	0.	0.	9	5	0	.00	85.91	88.95

0
*SECNO 2250.000

2250.00	8.08	108.09	110.97	.00	114.84	6.75	.71	.00	109.60
10500.	0.	10500.	0.	0.	504.	0.	1.	0.	111.00
.00	.00	20.85	.00	.027	.027	.027	.000	100.01	3.01
.013888	50.	50.	50.	5	18	0	.00	84.30	87.31

0
*SECNO 2225.000

2225.00	8.22	108.56	111.07	.00	114.53	5.97	.31	.00	109.30
10500.	0.	10500.	0.	0.	536.	0.	1.	0.	111.00
.00	.00	19.61	.00	.027	.027	.027	.000	100.34	1.47
.011480	25.	25.	25.	3	15	0	.00	84.87	86.34

0
*SECNO 2200.000

2200.00	8.75	108.76	111.05	.00	114.26	5.50	.27	.00	108.90
10500.	0.	10500.	0.	0.	558.	0.	1.	0.	110.50
.00	.00	18.83	.00	.027	.027	.027	.000	100.01	.28
.009820	25.	25.	25.	4	13	0	.00	82.99	83.27

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDS

*SECNO 2175.000
2175.00 8.80 108.48 110.62 .00 114.01 5.54 .25 .00 108.60
10500. 0. 10500. 0. 0. 556. 0. 2. 0. 110.00
.00 .00 18.89 .00 .027 .027 .027 .000 99.68 .24
.010238 25. 25. 25. 2 18 0 .00 85.61 85.85
0
*SECNO 2150.000
2150.00 8.78 108.14 109.29 .00 113.76 5.62 .25 .00 108.30
10500. 0. 10500. 0. 0. 552. 0. 2. 0. 110.00
.00 .00 19.02 .00 .027 .027 .027 .000 99.36 .32
.010279 25. 25. 25. 2 12 0 .00 84.08 84.40
0
*SECNO 2100.000
3290 CROSS SECTION 2100.00 EXTENDED .86 FEET

2100.00 9.76 108.47 109.84 .00 113.22 4.75 .54 .00 107.60
10500. 0. 10500. 0. 0. 601. 0. 2. 0. 109.00
.00 .00 17.48 .00 .027 .027 .027 .000 98.71 .00
.011451 50. 50. 50. 4 11 0 .00 112.39 112.39
0
*SECNO 2000.000
3290 CROSS SECTION 2000.00 EXTENDED .27 FEET

2000.00 9.16 106.57 108.08 .00 111.86 5.28 1.36 .00 106.30
10500. 0. 10500. 0. 0. 569. 0. 4. 1. 107.00
.00 .00 18.44 .00 .027 .027 .027 .000 97.41 .00
.016403 100. 100. 100. 5 8 0 .00 129.79 129.79
0
*SECNO 1900.000
3280 CROSS SECTION 1900.00 EXTENDED .71 FEET

1900.00 9.60 105.71 106.86 .00 110.28 4.57 1.57 .00 105.00
10500. 0. 10500. 0. 0. 612. 0. 5. 1. 105.00
.01 .00 17.16 .00 .027 .027 .027 .000 96.11 .00
.015071 100. 100. 100. 5 11 0 .00 145.00 145.00
0
*SECNO 1800.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3280 CROSS SECTION 1800.00 EXTENDED 1.46 FEET

1800.00	10.35	105.16	105.91	.00	108.98	3.82	1.31	.00	103.70
10500.	0.	10500.	0.	0.	670.	0.	7.	1.	104.00
.01	.00	15.68	.00	.027	.027	.027	.000	94.81	.00
.011471	100.	100.	100.	5	11	0	.00	145.00	145.00

0
*SECNO 1750.000
3280 CROSS SECTION 1750.00 EXTENDED 1.81 FEET

1750.00	10.74	104.90	105.52	.00	108.44	3.54	.54	.00	103.10
10500.	0.	10500.	0.	0.	696.	0.	7.	1.	104.00
.01	.00	15.09	.00	.027	.027	.027	.000	94.16	.00
.010055	50.	50.	50.	4	8	0	.00	145.00	145.00

0
*SECNO 1725.000
3280 CROSS SECTION 1725.00 EXTENDED 2.89 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1725.00	11.95	105.69	105.69	.00	108.46	2.78	.21	.02	102.80
10500.	0.	10500.	0.	0.	785.	0.	8.	2.	104.50
.01	.00	13.37	.00	.027	.027	.027	.000	93.84	.00
.006920	25.	25.	25.	20	8	0	.00	145.00	145.00

0
*SECNO 1700.000

3301 HV CHANGED MORE THAN HVINS

1700.00	8.34	101.85	103.72	.00	108.23	6.38	.23	.00	102.40
10500.	0.	10500.	0.	0.	518.	0.	8.	2.	105.00
.01	.00	20.27	.00	.027	.027	.027	.000	93.51	1.10
.012707	25.	25.	25.	7	14	0	.00	84.47	85.57

0
*SECNO 1675.000

1675.00	7.91	101.09	103.87	.00	107.89	6.81	.34	.00	102.10
10500.	0.	10500.	0.	0.	502.	0.	9.	2.	103.00
.01	.00	20.93	.00	.027	.027	.027	.000	93.18	2.04
.014708	25.	25.	25.	4	11	0	.00	87.52	89.55

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
*SECNO 1650.000									
1650.00	8.24	101.10	103.47	.00	107.55	6.45	.35	.00	101.80
10500.	0.	10500.	0.	0.	515.	0.	9.	2.	102.50
.01	.00	20.38	.00	.027	.027	.027	.000	92.86	1.40
.013110	25.	25.	25.	4	15	0	.00	85.49	86.90
0									
*SECNO 1600.000									
1600.00	7.47	99.68	101.80	.00	106.81	7.13	.74	.00	101.10
10500.	0.	10500.	0.	0.	490.	0.	9.	2.	102.00
.01	.00	21.42	.00	.027	.027	.027	.000	92.21	2.86
.016890	50.	50.	50.	6	11	0	.00	92.18	95.03
0									
*SECNO 1500.000									
1500.00	7.34	98.25	100.25	.00	105.11	6.86	1.69	.00	99.84
10500.	0.	10500.	0.	0.	499.	0.	11.	2.	101.00
.01	.00	21.02	.00	.027	.027	.027	.000	90.91	3.18
.016943	100.	100.	100.	3	13	0	.00	97.14	100.32
0									
*SECNO 1400.000									
1400.00	8.10	97.71	99.80	.00	103.65	5.94	1.46	.00	98.54
10500.	0.	10500.	0.	0.	537.	0.	12.	2.	100.00
.01	.00	19.56	.00	.027	27	.027	.000	89.61	1.66
.012775	100.	100.	100.	5	11	0	.00	92.36	94.02
0									
*SECNO 1350.000									
1350.00	7.21	96.17	98.39	.00	102.87	6.70	.78	.00	97.89
10500.	0.	10500.	0.	0.	505.	0.	12.	2.	99.00
.01	.00	20.78	.00	.027	.027	.027	.000	88.96	3.44
.019277	50.	50.	50.	7	11	0	.00	108.07	111.51
0									
*SECNO 1300.000									
1300.00	7.47	95.78	97.79	.00	101.95	6.17	.92	.00	97.24
10500.	0.	10500.	0.	0.	527.	0.	13.	3.	98.00
.02	.00	19.94	.00	.027	.027	.027	.000	88.31	2.91
.017525	50.	50.	50.	4	11	0	.00	111.12	114.03
0									

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
*SECNO 1200.000									
1200.00	6.62	93.63	95.66	.00	100.16	6.53	1.80	.00	95.94
10500.	0.	10500.	0.	0.	512.	0.	14.	3.	97.50
.02	.00	20.51	.00	.027	.027	.027	.000	87.01	4.63
.018444	100.	100.	100.	7	8	0	.00	110.48	115.10
0									
*SECNO 1100.000									
1100.00	7.08	92.76	94.80	.00	98.43	5.68	1.72	.00	94.64
10500.	0.	10500.	0.	0.	549.	0.	15.	3.	96.50
.02	.00	19.12	.00	.027	.027	.027	.000	85.71	3.75
.016140	100.	100.	100.	4	11	0	.00	119.04	122.79
0									
*SECNO 1000.000									
1000.00	7.22	91.63	93.22	.00	97.05	5.42	1.39	.00	93.34
10500.	0.	10500.	0.	0.	562.	0.	17.	3.	94.50
.02	.00	18.68	.00	.027	.027	.027	.000	84.41	3.42
.012073	100.	100.	100.	3	11	0	.00	100.97	104.39
0									
*SECNO 975.000									

1685 INT SEC ADDED BY RAISING SEC 975.00, .220FT AND MULTIPLYING BY 1.140

3301 HV CHANGED MORE THAN HVINS

1.01	8.34	92.64	93.61	.00	96.71	4.07	.33	.00	93.24
10500.	0.	10500.	0.	0.	649.	0.	17.	3.	94.72
.02	.00	16.19	.00	.027	.027	.027	.000	84.30	1.35
.008441	33.	33.	33.	5	11	0	.00	110.48	111.84
0									

1685 INT SEC ADDED BY RAISING SEC 1.01, -.110FT AND MULTIPLYING BY .938

3280 CROSS SECTION 1.02 EXTENDED .85 FEET

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.02	9.79	93.98	93.98	.00	96.83	2.85	.24	.01	93.13
10500.	0.	10500.	0.	0.	776.	0.	18.	3.	94.61
.02	.00	13.54	.00	.027	.027	.027	.000	84.19	.00
.006144	33.	33.	33.	20	11	0	.00	135.62	135.62

0

1645 INT SEC ADDED BY RAISING SEC 1.02, -.110FT AND MULTIPLYING BY .934

3280 CROSS SECTION 975.00 EXTENDED 1.29 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

975.00	10.23	94.31	94.31	.00	97.10	2.79	.21	.06	93.02
10500.	0.	10500.	0.	0.	783.	0.	18.	4.	94.50
.02	.00	13.41	.00	.027	.027	.027	.000	84.08	.00
.006210	33.	33.	33.	20	8	0	.00	139.37	139.37

0
*SECNO 950.000
3280 CROSS SECTION 950.00 EXTENDED 2.21 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

950.00	11.14	94.90	94.90	.00	97.73	2.83	.16	.04	92.69
10500.	0.	10500.	0.	0.	778.	0.	19.	4.	94.50
.02	.00	13.49	.00	.027	.027	.027	.000	83.76	.00
.006797	25.	25.	25.	20	8	0	.00	145.00	145.00

0
*SECNO 900.000
3280 CROSS SECTION 900.00 EXTENDED 2.68 FEET

7185 MINIMUM SPECIFIC ENERGY

900.00	11.60	94.71	94.72	.00	97.55	2.84	.17	.00	92.04
10500.	0.	10500.	0.	0.	776.	0.	19.	4.	94.00
.02	.00	13.52	.00	.027	.027	.027	.000	83.11	.00
.007142	25.	25.	25.	6	8	0	.00	145.00	145.00

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

#SECNO 800.000

1645 INT SEC ADDED BY RAISING SEC 800.00, .867FT AND MULTIPLYING BY 1.017

3280 CROSS SECTION 1.01 EXTENDED .69 FEET

3301 HV CHANGED MORE THAN HVINS

1.01	9.61	92.29	94.00	.00	97.27	4.98	.28	.00	91.61
10500.	0.	10500.	0.	0.	586.	0.	20.	4.	94.37
.02	.00	17.91	.00	.027	.027	.027	.000	82.68	.00
.010197	33.	33.	33.	7	8	0	.00	96.09	96.09

0

1645 INT SEC ADDED BY RAISING SEC 1.01, -.433FT AND MULTIPLYING BY .992

3280 CROSS SECTION 1.02 EXTENDED .68 FEET

1.02	9.61	91.85	93.59	.00	96.93	5.07	.34	.00	91.17
10500.	0.	10500.	0.	0.	581.	0.	20.	4.	93.93
.02	.00	18.08	.00	.027	.027	.027	.000	82.24	.00
.010399	33.	33.	33.	0	8	0	.00	95.21	95.21

0

1645 INT SEC ADDED BY RAISING SEC 1.02, -.433FT AND MULTIPLYING BY .992

3280 CROSS SECTION 800.00 EXTENDED .68 FEET

800.00	9.61	91.41	93.22	.00	96.58	5.16	.35	.00	90.74
10500.	0.	10500.	0.	0.	576.	0.	21.	4.	93.50
.02	.00	18.24	.00	.027	.027	.027	.000	81.81	.00
.010598	33.	33.	33.	0	11	0	.00	94.37	94.37

0

#SECNO 700.000

1645 INT SEC ADDED BY RAISING SEC 700.00, .867FT AND MULTIPLYIN. 'Y .887

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	QLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

J301 HV CHANGED MORE THAN HVINS

1.01	7.83	89.21	91.29	.00	96.16	6.95	.41	.00	90.31
10500.	0.	10500.	0.	0.	496.	0.	21.	4.	93.37
.02	.00	21.16	.00	.027	.027	.027	.000	81.38	1.93
.014583	33.	33.	33.	6	8	0	.00	84.09	86.02

0

1645 INT SEC ADDED BY RAISING SEC 1.01, -.433FT AND MULTIPLYING BY 1.064

1.02	7.31	88.26	90.51	.00	95.64	7.39	.52	.00	89.87
10500.	0.	10500.	0.	0.	491.	0.	21.	4.	92.93
.02	.00	21.81	.00	.027	.027	.027	.000	80.94	3.05
.016702	33.	33.	33.	5	11	0	.00	86.81	89.86

0

1645 INT SEC ADDED BY RAISING SEC 1.02, -.433FT AND MULTIPLYING BY 1.060

700.00	6.91	87.42	89.77	.00	95.06	7.64	.58	.00	89.44
10500.	0.	10500.	0.	0.	473.	0.	22.	4.	92.50
.03	.00	22.18	.00	.027	.027	.027	.000	80.51	4.04
.018379	33.	33.	33.	4	11	0	.00	89.86	93.90

0

*SECNO 600.000

600.00	6.11	85.32	87.69	.00	93.08	7.76	1.98	.00	88.14
10500.	0.	10500.	0.	0.	470.	0.	23.	4.	91.50
.03	.00	22.35	.00	.027	.027	.027	.000	79.21	5.65
.021414	100.	100.	100.	6	11	0	.00	99.49	105.13

0

*SECNO 500.000

1645 INT SEC ADDED BY RAISING SEC 500.00, .650FT AND MULTIPLYING BY 1.044

1.01	6.53	85.09	87.31	.00	92.06	6.97	1.02	.00	87.49
10500.	0.	10500.	0.	0.	496.	0.	23.	5.	91.15
.03	.00	21.18	.00	.027	.027	.027	.000	78.56	4.99
.019526	50.	50.	50.	4	11	0	.00	106.54	111.54

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -.650FT AND MULTIPLYING BY .958

500.00	6.99	84.90	86.84	.00	91.18	6.27	.88	.00	86.84
10500.	0.	10500.	0.	0.	522.	0.	24.	5.	90.50
.03	.00	20.10	.00	.027	.027	.027	.000	77.91	3.86
.016007	50.	50.	50.	4	11	0	.00	104.36	108.23

0
*SECNO 400.000

400.00	5.85	82.46	84.57	.00	89.41	6.95	1.76	.00	85.54
10500.	0.	10500.	0.	0.	496.	0.	25.	5.	87.00
.03	.00	21.16	.00	.027	.027	.027	.000	76.61	6.15
.019559	100.	100.	100.	5	8	0	.00	106.39	112.54

0
*SECNO 300.000

1645 INT SEC ADDED BY RAISING SEC 300.00, .610FT AND MULTIPLYING BY 1.058

1.01	6.36	82.36	84.21	.00	88.49	6.13	.92	.00	84.93
10500.	0.	10500.	0.	0.	529.	0.	26.	5.	88.61
.03	.00	19.87	.00	.027	.027	.027	.000	76.00	5.44
.017473	50.	50.	50.	5	11	0	.00	115.21	120.65

0

1645 INT SEC ADDED BY RAISING SEC 1.01, -.610FT AND MULTIPLYING BY .945

300.00	6.94	82.33	83.83	.00	87.72	5.39	.77	.00	84.32
10500.	0.	10500.	0.	0.	564.	0.	26.	5.	88.00
.03	.00	18.63	.00	.027	.027	.027	.000	75.39	3.97
.013522	50.	50.	50.	5	11	0	.00	111.20	115.17

0
*SECNO 200.000

200.00	7.55	81.72	82.84	.00	86.55	4.83	1.17	.00	83.10
10500.	0.	10500.	0.	0.	595.	0.	28.	5.	87.00
.03	.00	17.64	.00	.027	.027	.027	.000	74.17	2.75
.010231	100.	100.	100.	4	11	0	.00	102.85	105.60

0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 100.000

100.00	7.69	80.64	81.82	.00	85.52	4.88	1.03	.00	81.88
10500.	0.	10500.	0.	0.	592.	0.	29.	6.	85.50
.03	.00	17.73	.00	.027	.027	.027	.000	72.95	2.48
.010418	100.	100.	100.	3	8	0	.00	103.05	105.52

0

*SECNO .000

1645 INT SEC ADDED BY RAISING SEC .00, .610FT AND MULTIPLYING BY 1.084

1.01	8.63	80.97	81.78	.00	85.05	4.09	.47	.00	81.27
10500.	0.	10500.	0.	0.	647.	0.	30.	6.	83.61
.03	.00	16.22	.00	.027	.027	.027	.000	72.34	.65
.008410	50.	50.	50.	5	11	0	.00	109.74	110.39

C

1645 INT SEC ADDED BY RAISING SEC 1.01, -.610FT AND MULTIPLYING BY .922

3280 CROSS SECTION .00 EXTENDED .96 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

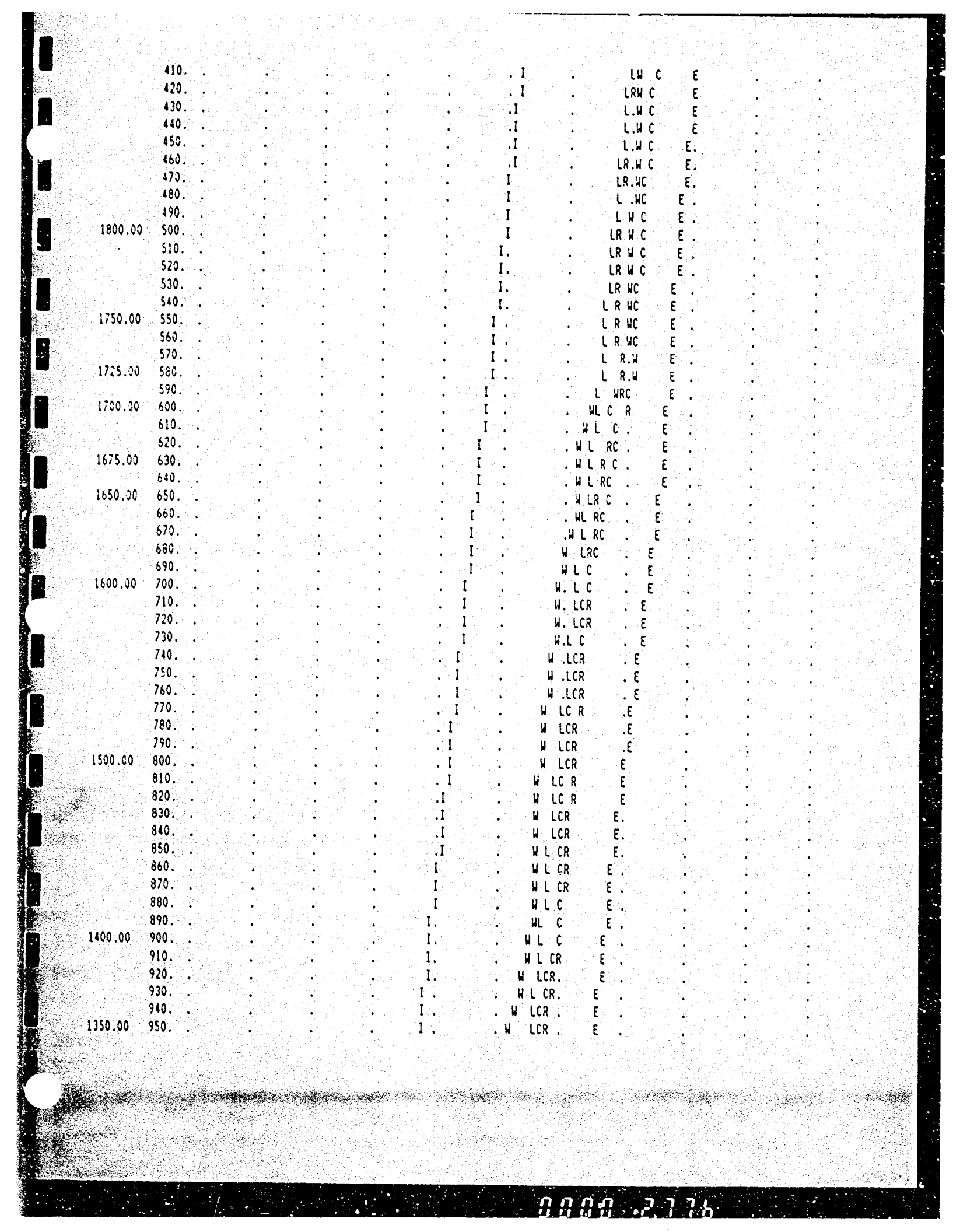
.00	9.39	81.62	81.62	.00	84.79	3.18	.35	.04	80.66
10500.	0.	10500.	0.	0.	734.	0.	30.	6.	83.00
.04	.00	14.30	.00	.027	.027	.027	.000	71.73	.00
.006048	50.	50.	50.	20	8	0	.00	116.27	116.27

0

PROFILE FOR STREAM PROFILE 2 - SUPERC

PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

ELEVATION	SECNO	CUMDIS	70.	75.	80.	85.	90.	95.	100.	105.	110.	115.
										I	L W	E
2400.00		0.								I	W L C R	E
2300.00		10.								I	W L C R	E
		20.								I	W L CR	E
		30.								I	W L CR	E
		40.								I	W L. C	E
2250.00		50.								I	W L. C	E
		60.								I	W L. C	E
		70.								I	W L. C	E
2225.00		80.								I	WL . C	E
		90.								I	W .RC	E
2200.00		100.								I	WL .RC	E
		110.								I	W RC	E
		120.								I	W RC	E
2175.00		130.								I	W C	E
		140.								I	WL CR	E
2150.00		150.								I	W CR	E
		160.								I	LW C.	E
		170.								I	LW C.	E
		180.								I	L WRC.	E
		190.								I	L WR C	E
2100.00		200.								I	L WRC.	E
		210.								I	LWR C.	E
		220.								I	L WR C.	E
		230.								I	LWR C	E
		240.								I	LWR C	E
		250.								I	LWR C	E
		260.								I	LWR C	E
		270.								I	LWR C	E
		280.								I	LW C	E
		290.								I	WR C	E
2000.00		300.								I	LWR C	E
		310.							I		LW C	E
		320.							I		LW C	E
		330.							I		W C	E
		340.							I		LW C	E
		350.							I		LW C	E
		360.							I		LW C	E
		370.							I		LW C	E
		380.							I		L W C	E
		390.							I		LW C	E
1900.00		400.							I			


410. . . . . I . LW C E . .
420. . . . . I . LRW C E . .
430. . . . . .I . L.W C E . .
440. . . . . .I . L.W C E . .
450. . . . . .I . L.W C E. . .
460. . . . . .I . LR.W C E. . .
470. . . . . I . LR.WC E. . .
480. . . . . I . L .WC E . .
490. . . . . I . L W C E . .
1800.00 500. . . . . I . LR W C E . .
510. . . . . I. . LR W C E . .
520. . . . . I. . LR W C E . .
530. . . . . I. . LR WC E . .
540. . . . . I. . L R WC E . .
1750.00 550. . . . . I . . L R WC E . .
560. . . . . I . . L R WC E . .
570. . . . . I . . L R.W E . .
1725.00 580. . . . . I . . L R.W E . .
590. . . . . I . . L WRC E . .
1700.00 600. . . . . I . . WL C R E . .
610. . . . . I . . W L C . E . .
620. . . . . I . . W L RC . E . .
1675.00 630. . . . . I . . W L R C . E . .
640. . . . . I . . W L RC . E . .
1650.00 650. . . . . I . . W LR C . E . .
660. . . . . I . . WL RC . E . .
670. . . . . I . .W L RC . E . .
680. . . . . I . W LRC . E . .
690. . . . . I . W L C . E . .
1600.00 700. . . . . I . W. L C . E . .
710. . . . . I . W. LCR . E . .
720. . . . . I . W. LCR . E . .
730. . . . . I . W.L C . E . .
740. . . . . I . W .LCR . E . .
750. . . . . I . W .LCR . E . .
760. . . . . I . W .LCR . E . .
770. . . . . I . W LC R .E . .
780. . . . . I . W LCR .E . .
790. . . . . I . W LCR .E . .
1500.00 800. . . . . I . W LCR E . .
810. . . . . I . W LC R E . .
820. . . . . I . W LC R E . .
830. . . . . I . W LCR E. . .
840. . . . . I . W LCR E. . .
850. . . . . I . W L CR E. . .
860. . . . . I . W L CR E . . .
870. . . . . I . W L CR E . . .
880. . . . . I . W L C E . . .
890. . . . . I. . WL C E . . .
1400.00 900. . . . . I. . W L C E . . .
910. . . . . I. . W L CR E . . .
920. . . . . I. . W LCR. E . . .
930. . . . . I . . W L CR. E . . .
940. . . . . I . . W LCR . E . . .
1350.00 950. . . . . I . . W LCR . E . . .

```
                960.  .  .  .  .  .  .  I  .  .  .  W  LCR  .  E  .  .  .  .  .
                970.  .  .  .  .  .  .  I  .  .  .  W  LCR  .  E  .  .  .  .  .
                980.  .  .  .  .  .  .  I  .  .  .  W  LCR  .  E  .  .  .  .  .
                990.  .  .  .  .  .  .  I  .  .  .  W  LC   .  E  .  .  .  .  .
1300.00        1000.  .  .  .  .  .  .  I  .  .  .  W L C  .  E  .  .  .  .  .
               1010.  .  .  .  .  .  I  .  .  .  .W  LCR  .  E  .  .  .  .  .
               1020.  .  .  .  .  .  I  .  .  .  .W  LCR  .  E  .  .  .  .  .
               1030.  .  .  .  .  .  I  .  .  .  W   C R  .  E  .  .  .  .  .
               1040.  .  .  .  .  .  I  .  .  .  W  LC R  . E  .  .  .  .  .
               1050.  .  .  .  .  .  I  .  .  .  W.  C  R  . E  .  .  .  .  .
               1060.  .  .  .  .  .  I  .  .  .  W.  C R  . E  .  .  .  .  .
               1070.  .  .  .  .  .  I  .  .  .  W.  C R  .E  .  .  .  .  .
               1080.  .  .  .  .  .  I  .  .  .  W . C  R  .E  .  .  .  .  .
               1090.  .  .  .  .  .  I  .  .  .  W . C  R  .E  .  .  .  .  .
1200.00        1100.  .  .  .  .  .  I  .  .  .  W  .CL  R  E  .  .  .  .  .
               1110.  .  .  .  .  .  I  .  .  .  W  .CL  R  E  .  .  .  .  .
               1120.  .  .  .  .  .  I  .  .  .  W  .C   R  E  .  .  .  .  .
               1130.  .  .  .  .  I  .  .  .  .  W  .C  R   E. .  .  .  .  .
               1140.  .  .  .  .  I  .  .  .  .  W  CL  R   E. .  .  .  .  .
               1150.  .  .  .  .  I  .  .  .  .  W   CL  R  E. .  .  .  .  .
               1160.  .  .  .  .I   .  .  .  .  W   C   R  E  . .  .  .  .  .
               1170.  .  .  .  .I   .  .  .  .  W   C   R  E  . .  .  .  .  .
               1180.  .  .  .  .I   .  .  .  .  W  CL  R   E  . .  .  .  .  .
               1190.  .  .  .  .I   .  .  .  .  W  CL  R   E  . .  .  .  .  .
1100.00        1200.  .  .  .  .I   .  .  .  .  W  C.  R   E  . .  .  .  .  .
               1210.  .  .  .  .I   .  .  .  .  W   C.  R  E  . .  .  .  .  .
               1220.  .  .  .  .I   .  .  .  .  W  CL. R  E  .  .  .  .  .  .
               1230.  .  .  .  .I   .  .  .  .  W  CL. R  E  .  .  .  .  .  .
               1240.  .  .  .  I    .  .  .  .  W  C .R   E  .  .  .  .  .  .
               1250.  .  .  .  I    .  .  .  W   C .R  E  .  .  .  .  .  .  .
               1260.  .  .  .  I    .  .  .  W  CL .R  E  .  .  .  .  .  .  .
               1270.  .  .  .  I    .  .  .  W  C  R   E  .  .  .  .  .  .  .
               1280.  .  .  .  I.   .  .  .  W  C  R   E  .  .  .  .  .  .  .
               1290.  .  .  .  I.   .  .  .  W   C R.  E  .  .  .  .  .  .  .
1000.00        1300.  .  .  .  I.   .  .  .  W  CL R.  E  .  .  .  .  .  .  .
               1310.  .  .  .  I.   .  .  .  W  C R.  E  .  .  .  .  .  .  .
               1320.  .  .  .  I.   .  .  .  W  C R.  E  .  .  .  .  .  .  .
               1330.  .  .  .  I.   .  .  .  WLC R.  E  .  .  .  .  .  .  .
    1.01       1340.  .  .  .  I.   .  .  .  WLC R.  E  .  .  .  .  .  .  .
               1350.  .  .  .  I.   .  .  .  WC R.  E  .  .  .  .  .  .  .
               1360.  .  .  .  I .  .  .  .  LWCR.  E  .  .  .  .  .  .  .
    1.02       1370.  .  .  .  I .  .  .  .  L WR.  E  .  .  .  .  .  .  .
               1380.  .  .  .  I .  .  .  .  L WR.  E  .  .  .  .  .  .  .
               1390.  .  .  .  I .  .  .  .  L WR.  E  .  .  .  .  .  .  .
 975.00        1400.  .  .  .  I .  .  .  .  L  W.  E  .  .  .  .  .  .  .
               1410.  .  .  .  I .  .  .  .  L  W.  E  .  .  .  .  .  .  .
               1420.  .  .  .  I .  .  .  .  L  RW  E  .  .  .  .  .  .  .
 950.00        1430.  .  .  .  I .  .  .  .  L  RW  E  .  .  .  .  .  .  .
               1440.  .  .  .  I .  .  .  .  L  RW  E  .  .  .  .  .  .  .
 900.00        1450.  .  .  .  I .  .  .  .  L  RW.  E  .  .  .  .  .  .  .
               1460.  .  .  .  I .  .  .  .  L  WC.  E  .  .  .  .  .  .  .
               1470.  .  .  .  I .  .  .  .  L  WRC.  E  .  .  .  .  .  .  .
               1480.  .  .  .  I .  .  .  .  L W  CR.  E  .  .  .  .  .  .  .
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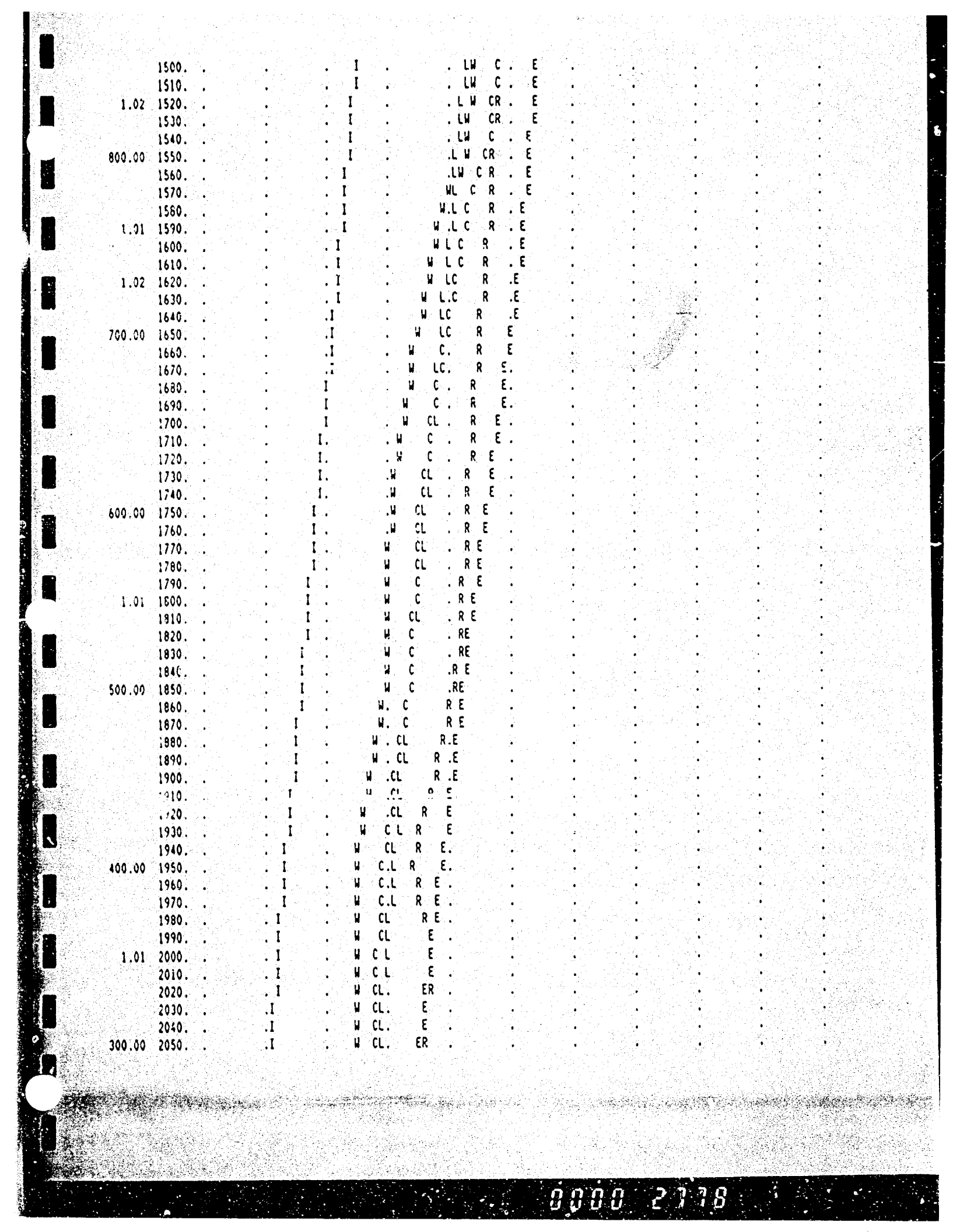
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1600. I W L C R E
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1.02 1620. I W LC R E
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1820. I . W C . RE .
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1900. I . W .CL R .E .
1910. I . W .CL R E .
1920. I . W .CL R E .
1930. I . W C L R E .
1940. I . W CL R E. .
400.00 1950. I . W C.L R E. .
1960. I . W C.L R E .
1970. I . W C.L R E .
1980. I . W CL R E .
1990. I . W CL E .
1.01 2000. I . W C L E .
2010. I . W C L E .
2020. I . W CL. ER .
2030. I . W CL. E .
2040. I . W CL. E .
300.00 2050. I . W CL. ER .

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        2060.  .        .I      .    W CL  .    ER  .  .  .  .  .  .  .  .
        2070.  .         I      .    W  CL .    ER  .  .  .  .  .  .  .  .
        2080.  .         I      .    W  CL .    E   .  .  .  .  .  .  .  .
        2090.  .         I      .    W  CL .    E   .  .  .  .  .  .  .  .
        2100.  .         I      .    W  C  .   ER   .  .  .  .  .  .  .  .
        2110.  .        I.      .    W CL  .   ER   .  .  .  .  .  .  .  .
        2120.  .        I.      .    W CL  .   ER   .  .  .  .  .  .  .  .
        2130.  .        I.      .    W CL  .   E    .  .  .  .  .  .  .  .
        2140.  .        I.      .    W C   .  ER    .  .  .  .  .  .  .  .
200.00  2150.  .       I .      .   W  C   .  ER    .  .  .  .  .  .  .  .
        2160.  .       I .      .   W CL   .  ER    .  .  .  .  .  .  .  .
        2170.  .       I .      .   W CL   .  E     .  .  .  .  .  .  .  .
        2180.  .       I .      .   W C    . ER     .  .  .  .  .  .  .  .
        2190.  .      I  .      .   W C    . ER     .  .  .  .  .  .  .  .
        2200.  .       I .      .  W  C    . ER     .  .  .  .  .  .  .  .
        2210.  .       I .      .  W CL    . E      .  .  .  .  .  .  .  .
        2220.  .       I .      .  W C     . E      .  .  .  .  .  .  .  .
        2230.  .     I   .      .  W C     .ER      .  .  .  .  .  .  .  .
        2240.  .     I   .      . W  C     .E       .  .  .  .  .  .  .  .
100.00  2250.  .     I   .      . W  C     .E       .  .  .  .  .  .  .  .
        2260.  .     I   .      . W  C     RE       .  .  .  .  .  .  .  .
        2270.  .    I    .      . WLC     R.E       .  .  .  .  .  .  .  .
        2280.  .    I    .      . WLC     RE        .  .  .  .  .  .  .  .
        2290.  .    I    .      . WLC   R E         .  .  .  .  .  .  .  .
   1.01 2300.  .    I    .      . WLC  R  E         .  .  .  .  .  .  .  .
        2310.  .   I     .      . WC   R  E         .  .  .  .  .  .  .  .
        2320.  .   I     .      . WC   R  E         .  .  .  .  .  .  .  .
        2330.  .   I     .      . LW   R  E         .  .  .  .  .  .  .  .
        2340.  .   I     .      . LW   R  E         .  .  .  .  .  .  .  .
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THIS RUN EXECUTED 07-29-91

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 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

PROFILE 2 - SUPERC

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	
*	2400.000	.00	.00	.00	102.61	10500.00	112.72	112.72	115.56	67.01	13.51	777.42	1382
	2300.000	.00	.00	.00	101.31	10500.00	108.68	111.24	115.56	146.50	21.04	499.06	867
	2250.000	50.00	.00	.00	100.01	10500.00	108.09	110.97	114.84	138.88	20.85	503.55	890
	2225.000	25.00	.00	.00	100.34	10500.00	108.56	111.07	114.53	114.80	19.61	535.56	979
	2200.000	25.00	.00	.00	100.01	10500.00	108.76	111.05	114.26	98.20	18.83	557.66	1059
	2175.000	25.00	.00	.00	99.68	10500.00	108.48	110.62	114.01	102.38	18.88	556.09	1037
	2150.000	25.00	.00	.00	99.36	10500.00	108.14	109.29	113.76	102.79	19.02	551.96	1035
	2100.000	50.00	.00	.00	98.71	10500.00	108.47	109.84	113.22	114.51	17.48	600.63	981
	2000.000	100.00	.00	.00	97.41	10500.00	106.57	108.08	111.86	164.03	18.44	569.33	819
	1900.000	100.00	.00	.00	96.11	10500.00	105.71	106.86	110.28	150.71	17.16	611.96	855
	1800.000	100.00	.00	.00	94.81	10500.00	105.16	105.91	108.98	114.71	15.68	669.84	980
	1750.000	50.00	.00	.00	94.16	10500.00	104.90	105.52	108.44	100.55	15.09	695.82	1047
*	1725.000	25.00	.00	.00	93.84	10500.00	105.69	105.69	108.46	69.20	13.37	785.20	1262

Critical

1700.000	25.00	.00	.00	93.51	10500.00	101.85	103.72	108.23	127.07	20.27	517.93	931
1675.000	25.00	.00	.00	93.18	10500.00	101.09	103.87	107.89	147.08	20.93	501.56	865
1650.000	25.00	.00	.00	92.86	10500.00	101.10	103.47	107.55	131.10	20.38	515.19	917
1600.000	50.00	.00	.00	92.21	10500.00	99.68	101.80	106.81	168.90	21.42	490.13	807

	SECNO	XLCH	ELTRO	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.0
	1500.000	100.00	.00	.00	90.91	10500.00	98.25	100.25	105.11	169.43	21.02	499.47	806
	1400.000	100.00	.00	.00	89.61	10500.00	97.71	99.80	103.65	127.75	19.56	536.84	928
	1350.000	50.00	.00	.00	88.96	10500.00	96.17	98.39	102.87	192.77	20.78	505.32	756
	1300.000	50.00	.00	.00	88.31	10500.00	95.78	97.79	101.95	175.26	19.94	526.70	793
	1200.000	100.00	.00	.00	87.01	10500.00	93.63	95.66	100.16	184.44	20.51	511.98	773
	1100.000	100.00	.00	.00	85.71	10500.00	92.76	94.43	98.43	161.40	19.12	549.16	825
	1000.000	100.00	.00	.00	84.41	10500.00	91.63	93.22	97.05	120.73	18.68	562.10	955
*	975.000	100.00	.00	.00	84.08	10500.00	94.31	94.31	97.10	62.10	13.41	782.75	1332
*	950.000	25.00	.00	.00	83.76	10500.00	94.90	94.90	97.73	67.97	13.49	778.21	1273
*	900.000	25.00	.00	.00	83.11	10500.00	94.71	94.72	97.55	71.42	13.52	776.39	1242
*	800.000	100.00	.00	.00	81.81	10500.00	91.41	93.22	96.58	105.98	18.24	575.75	1019
*	700.000	100.00	.00	.00	80.51	10500.00	87.42	89.77	95.06	183.79	22.18	473.50	774
	600.000	100.00	.00	.00	79.21	10500.00	85.32	87.69	93.08	214.14	22.35	469.76	717
*	500.000	100.00	.00	.00	77.91	10500.00	84.90	86.84	91.18	160.07	20.10	522.41	829
	400.000	100.00	.00	.00	76.61	10500.00	82.46	84.57	89.41	195.59	21.16	496.28	750
*	300.000	100.00	.00	.00	75.39	10500.00	82.33	83.83	87.72	135.22	18.63	563.66	902
	200.000	100.00	.00	.00	74.17	10500.00	81.72	82.84	86.55	102.31	17.64	595.13	1038
	100.000	100.00	.00	.00	72.95	10500.00	80.64	81.82	85.52	104.18	17.73	592.29	1028
*	.000	100.00	.00	.00	71.73	10500.00	81.62	81.62	84.79	60.48	14.30	734.05	1350

PROFILE 2 - SUPERC

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	2400.000	10500.00	112.72	.00	.00	2.72	145.00	.00
	2300.000	10500.00	108.68	.00	-4.04	.00	85.91	.00
	2250.000	10500.00	108.09	.00	-.59	.00	84.30	50.00
	2225.000	10500.00	108.56	.00	.47	.00	84.87	25.00
	2200.000	10500.00	108.76	.00	.20	.00	82.99	25.00
	2175.000	10500.00	108.48	.00	-.28	.00	85.61	25.00
	2150.000	10500.00	108.14	.00	-.34	.00	84.08	25.00
	2100.000	10500.00	108.47	.00	.33	.00	112.39	50.00
	2000.000	10500.00	106.57	.00	-1.90	.00	129.79	100.00
	1900.000	10500.00	105.71	.00	-.86	.00	145.00	100.00
	1800.000	10500.00	105.16	.00	-.55	.00	145.00	100.00
	1750.000	10500.00	104.90	.00	-.26	.00	145.00	50.00
*	1725.000	10500.00	105.69	.00	.78	.00	145.00	25.00
	1700.000	10500.00	101.85	.00	-3.83	.00	84.47	25.00
	1675.000	10500.00	101.09	.00	-.76	.00	87.52	25.00
	1650.000	10500.00	101.10	.00	.01	.00	85.49	25.00
	1600.000	10500.00	99.68	.00	-1.42	.00	92.18	50.00
	1500.000	10500.00	98.25	.00	-1.43	.00	97.14	100.00
	1400.000	10500.00	97.71	.00	-.54	.00	92.36	100.00
	1350.000	10500.00	96.17	.00	-1.54	.00	108.07	50.00
	1300.000	10500.00	95.78	.00	-.39	.00	111.12	50.00
	1200.000	10500.00	93.63	.00	-2.16	.00	110.48	100.00
	1100.000	10500.00	92.76	.00	-.87	.00	119.04	100.00
	1000.000	10500.00	91.63	.00	-1.13	.00	100.97	100.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
x	975.000	10500.00	94.31	.00	.33	.00	139.37	100.00
x	950.000	10500.00	94.90	.00	.59	.00	145.00	25.00
x	900.000	10500.00	94.71	.00	-.19	.00	145.00	25.00
x	800.000	10500.00	91.41	.00	-.44	.00	94.37	100.00
x	700.000	10500.00	87.42	.00	-.83	.00	89.86	100.00
	600.000	10500.00	85.32	.00	-2.10	.00	99.49	100.00
x	500.000	10500.00	84.90	.00	-.19	.00	104.36	100.00
	400.000	10500.00	82.46	.00	-2.44	.00	106.39	100.00
x	300.000	10500.00	82.33	.00	-.03	.00	111.20	100.00
	200.000	10500.00	81.72	.00	-.62	.00	102.85	100.00
	100.000	10500.00	80.64	.00	-1.08	.00	103.05	100.00
x	.000	10500.00	81.62	.00	.65	.00	116.27	100.00

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 2400.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 1725.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 1725.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 1725.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 975.000 PROFILE= 1 INTERPOLATED XSECTIONS USED

CAUTION SECNO= 950.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 950.000 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 950.000 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 900.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 800.000 PROFILE= 1 INTERPOLATED XSECTIONS USED

CAUTION SECNO= 700.000 PROFILE= 1 INTERPOLATED XSECTIONS USED

CAUTION SECNO= 500.000 PROFILE= 1 INTERPOLATED XSECTIONS USED

CAUTION SECNO= 300.000 PROFILE= 1 INTERPOLATED XSECTIONS USED

CAUTION SECNO= .000 PROFILE= 1 INTERPOLATED XSECTIONS USED

THIS RUN EXECUTED 07-29-91

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
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HEC-2 Data for Cross-Sections -33 Through -42

ESI

October 2, 1992

City of Henderson
Department of Public Works
240 Water Street
Henderson, Nevada 89015-7200

ATTN: Curt Chandler, P.E.

RE: 2nd Addendum for Windmill Pointe Condominium Hydrology Study

Dear Mr. Chandler

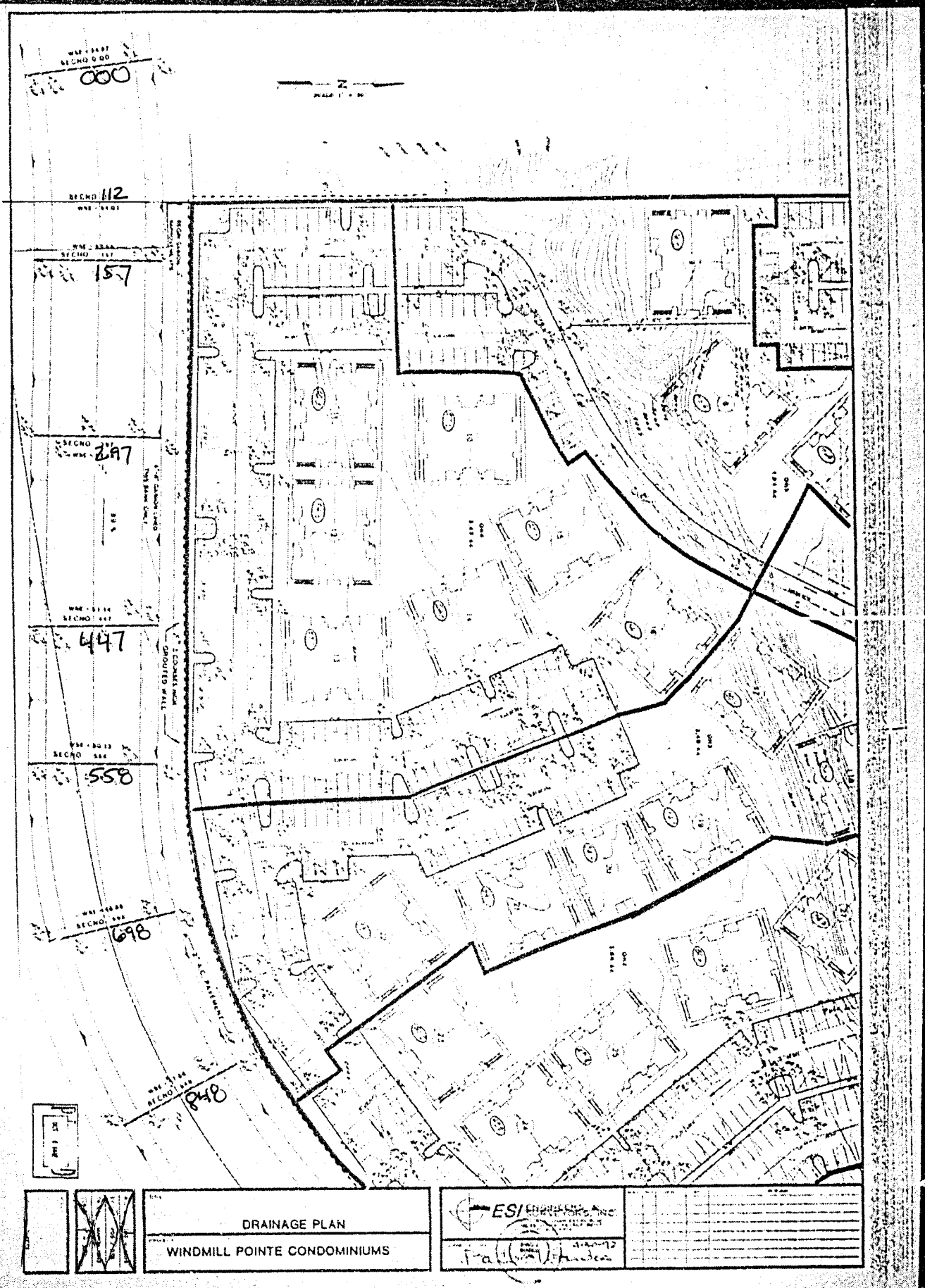
Herein you will find the 2nd Addendum for Windmill Pointe Condominium Hydrology Study, dated October 2, 1992 ready for your review.

Sincerely,

Jon Hayslip,
Associate Engineer

REGISTERED PROFESSIONAL ENGINEER-STATE OF NEVADA
10-6-92
DANIEL J. WONDERS
CIVIL
No. 6950

Daniel J. Wonders
Engineering Project Manager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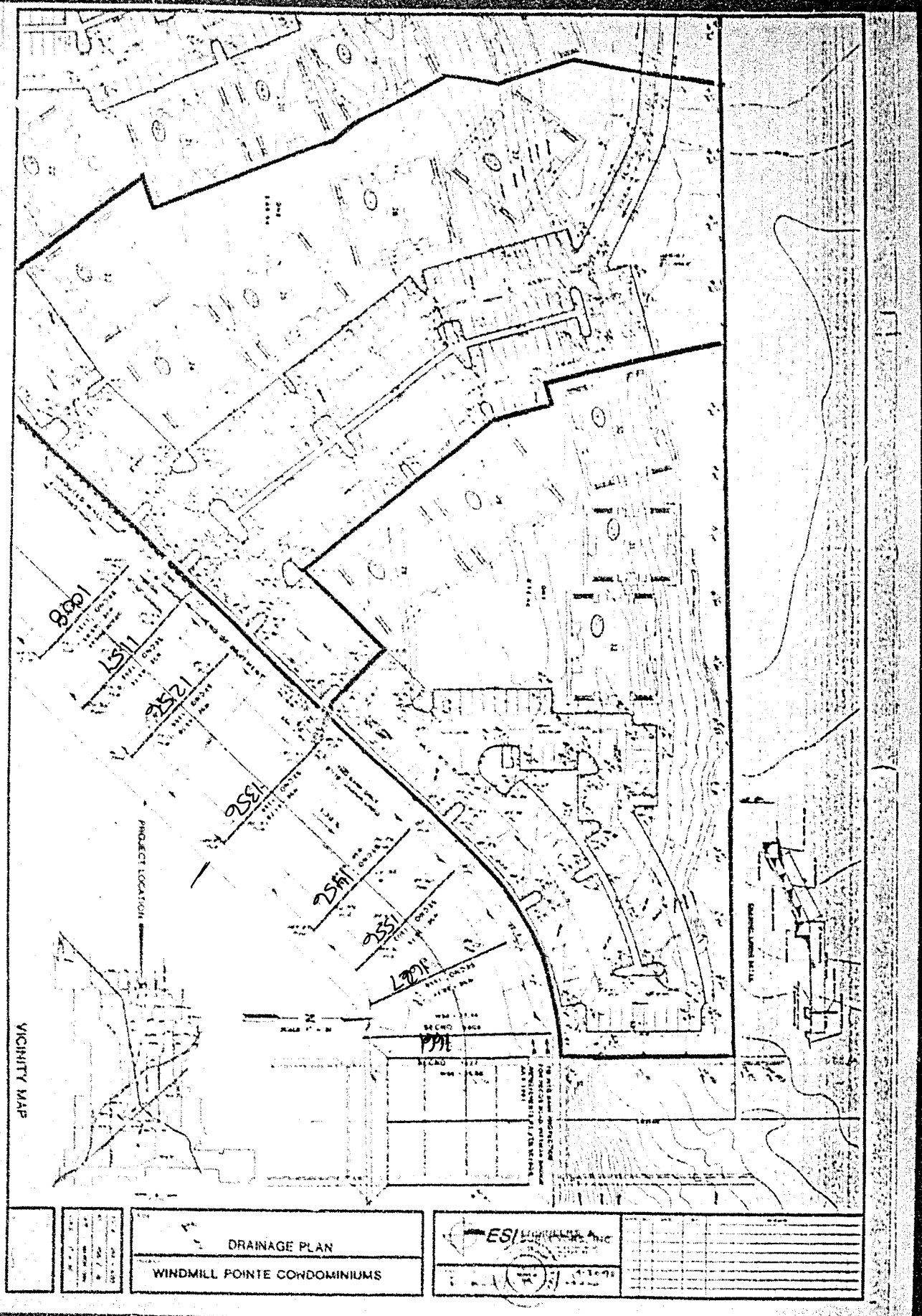
GROUTED WALL
DRAINAGE PLAN
WINDMILL POINTE CONDOMINIUMS
ESI



DRAINAGE PLAN

WINDMILL POINTE CONDOMINIUMS

ESI

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*****************************************
*  WATER SURFACE PROFILES               *
*  VERSION OF NOVEMBER 1976             *
*  UPDATED MAY 1984                     *
*  IBM-PC-XT VERSION AUGUST 1985        *
*  RUN DATE  10-05-92   TIME  08:08:07  *
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*****************************************
*  U.S. ARMY CORPS OF ENGINEERS         *
*  THE HYDROLOGIC ENGINEERING CENTER    *
*  609 SECOND STREET, SUITE D           *
*  DAVIS, CALIFORNIA 95616              *
*  (916) 440-2163 (FTS) 448-2163        *
*****************************************
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X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                  X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX              XXXXXXX
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10-05-92 08:08:07 PAGE 1

THIS RUN EXECUTED 10-05-92

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*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
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T1      ENGINEERS & SURVEYORS, INC.
T2      OCTOBER 5, 1992 - EXISTING CHANNEL
T3      PROFILE 1 - SUPER CRITICAL - WINDMILL POINTE CHANNEL

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

       0.        2.        0.        1. -1.000000      .00       1.0    16500.    55.000      .000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     -1.000      .000      .000      .000      .000      .000    -1.000      .000      .000      .000


NC       .025      .025      .025      .100      .300      .000      .000      .000      .000      .000
QT      1.000  16500.000      .000      .000      .000      .000      .000      .000      .000      .000
XI     10.000     7.000      .000   150.000   110.000   110.000   110.000      .000      .000      .000
GR     58.780      .000    58.780    54.780    51.780    54.580    51.580    75.880    51.780   110.000
GR     58.780   127.000    55.750   150.000      .000      .000      .000      .000      .000      .000
```

3888 228

X1	20.000	7.000	.000	150.000	40.000	40.000	40.000	.000	.000	.000
GR	56.560	.000	56.560	24.000	49.560	34.500	48.810	75.500	49.560	113.000
GR	56.560	127.000	56.560	150.000	.000	.000	.000	.000	.000	.000
X1	.000	7.000	.000	127.000	110.000	106.000	112.000	.000	.000	.000
GR	55.750	.000	55.750	12.000	48.750	26.000	48.000	62.500	48.750	101.000
GR	55.750	115.000	55.750	127.000	.000	.000	.000	.000	.000	.000
X1	112.000	7.000	.000	150.000	45.000	45.000	45.000	.000	.000	.000
GR	54.740	.000	54.740	24.000	47.740	37.500	46.990	75.000	47.740	112.500
GR	54.740	126.000	54.740	150.000	.000	.000	.000	.000	.000	.000
X1	157.000	7.000	.000	150.000	140.000	140.000	140.000	.000	.000	.000
GR	54.340	.000	54.340	24.000	47.340	37.500	46.590	75.000	47.340	112.500
GR	54.340	126.000	54.340	150.000	.000	.000	.000	.000	.000	.000
X1	277.000	7.000	.000	150.000	150.000	150.000	150.000	.000	.000	.000
GR	50.090	.000	50.090	24.000	46.090	37.500	45.340	75.000	46.090	112.500
GR	50.090	126.000	50.090	150.000	.000	.000	.000	.000	.000	.000
X1	447.000	7.000	.000	150.000	111.000	111.000	111.000	.000	.000	.000
GR	51.750	.000	51.750	24.000	44.750	37.500	44.000	75.000	44.750	112.500
GR	51.750	126.000	51.750	150.000	.000	.000	.000	.000	.000	.000

10-05-92 08:08:07 PAGE 1

X1	558.000	7.000	.000	150.000	122.000	145.000	140.000	.000	.000	.000
GR	50.750	.000	50.750	24.000	43.750	37.500	42.000	75.000	43.750	112.500
GR	50.750	126.000	50.750	150.000	.000	.000	.000	.000	.000	.000
X1	698.000	7.000	.000	150.000	137.000	139.000	142.000	.000	.000	.000
GR	49.810	.000	49.810	24.000	42.810	37.500	41.760	75.000	42.810	112.500
GR	49.810	126.000	49.810	150.000	.000	.000	.000	.000	.000	.000
X1	848.000	7.000	.000	150.000	142.000	137.000	140.000	.000	.000	.000
GR	48.180	.000	48.180	24.000	41.180	37.500	40.430	75.000	41.180	112.500
GR	48.180	126.000	48.180	150.000	.000	.000	.000	.000	.000	.000
X1	998.000	7.000	.000	150.000	140.000	147.000	142.000	.000	.000	.000
GR	47.370	.000	47.370	24.000	40.370	37.500	39.620	75.000	40.370	112.500
GR	47.370	126.000	47.370	150.000	.000	.000	.000	.000	.000	.000
X1	1151.000	7.000	.000	150.000	100.000	100.000	100.000	.000	.000	.000
GR	45.550	.000	45.550	24.000	38.550	37.500	37.800	75.000	38.550	112.500
GR	45.550	126.000	45.550	150.000	.000	.000	.000	.000	.000	.000
X1	1256.000	16.000	.000	595.000	100.000	100.000	100.000	.000	.000	.000
GR	55.000	.000	50.000	9.000	45.000	36.000	45.000	225.000	45.000	370.000
GR	40.000	477.000	39.000	486.000	38.000	492.000	38.000	525.000	39.000	528.000
GR	40.000	532.000	41.000	536.000	42.000	529.000	43.000	565.000	44.000	560.000
GR	45.000	595.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	1356.000	13.000	.000	624.000	100.000	100.000	100.000	.000	.000	.000

```
 GR    55.000     .000    45.000    14.000    45.000   280.000    40.000   355.000    40.000   401.000
 GR    39.000   406.000   38.000   413.000    37.000   437.000    37.000   446.000    38.000   458.000
 GR    39.000   462.000   40.000   466.000    45.000   624.000      .000      .000      .000      .000

 XI  1456.000    11.000     .000   595.000   120.000    80.000   100.000      .000      .000      .000
 GR    55.000     .000    50.000    16.000    45.000    20.000    40.000    58.000    40.000   324.000
 GR    39.000   352.000   38.000   357.000    37.000   363.000    37.000   405.000    38.000   410.000
 GR    40.000   422.000     .000      .000      .000      .000      .000      .000      .000      .000

 XI  1556.000     8.000     .000   265.000   120.000    35.000    80.000      .000      .000      .000
 GR    55.000     .000    50.000    10.000    45.000    25.000    40.000    55.000    37.000    85.000
 GR    35.000   194.000   30.000   242.000    38.000   265.000      .000      .000      .000      .000

 XI  1627.000    10.000     .000   159.000    75.000    35.000    80.000      .000      .000      .000
 GR    55.000     .000    40.000    38.000    39.000    38.000    38.000    48.000    37.000    83.000
 GR    35.000    80.000    37.000   102.000    34.000   159.000    38.000   149.000    38.000   154.000

 XI  1681.000     8.000     .000   141.000    22.000    15.000    20.000      .000      .000      .000
 GR    55.000     .000    40.000     7.000    38.000    28.000    37.000    75.000    37.000   105.000
 GR    32.000   105.000   36.000   129.000    37.000   141.000      .000      .000      .000      .000
 EJ      .000     .000     .000      .000      .000      .000      .000      .000      .000      .000
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10-05-82 08:08:07 PAGE 3

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   SECNO   DEPTH   CAREA   CPIWP   AREA    ES      HV      HL      CLOSS   PAVR ELEV
   Q       CLOB    CCH     CROB    ALOB    ACH     AROB    VOL     TAR   LEFT RIGHT
   TIME    VLOB    VCH     VROB    ANL     AXCH    ANR     WTN     ELMIN     BETA
   SLOPE   KLOBL   KLCH    KLOBR   ITRIAL  IEX     ICONT   ICONR   TOPWID    EMDEP
```

```
 4PRCP 1

 CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


 CCHV=    .100 CEHV=    .300
 4SECNO 10.000
 3280 CROSS SECTION     10.00 EXTENDED      7.65 FEET

 3720 CRITICAL DEPTH ASSUMED
    10.00     8.37    58.40    58.40    58.03    62.13     2.72      .00      .00    58.78
   10500.       0.   10500.       0.       0.      757.      0.       0.       0.    55.75
      .00      .00    13.24      .00      .025     .025     .025     .000    51.02      .00
  .005785       0.       0.       0.       0        7        0      .00   150.00   150.20

 4SECNO 20.000

 1645 INT SEC ADDED BY RAISING SEC     20.00.   1.480FT AND MULTIPLYING BY   1.031


 3301 HV CHANGED MORE THAN HVINS

     1.01     7.39    57.68    58.84      .00    61.76     4.08      .23      .14    58.04
   10500.       0.   10500.       0.       0.      648.      0.       1.       0.    58.04
```

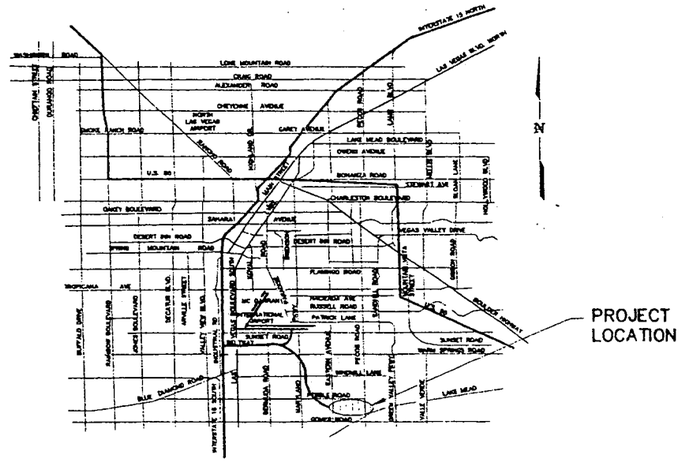
9808 2283

South Half

Beltway Channel Plans per the
Las Vegas Beltway Improvement Plans – Eastern Ave to Pecos Rd

BERGER OFFICE COPY

DEPARTMENT OF PUBLIC WORKS



Vicinity Map

NOT TO SCALE

CLARK COUNTY NEVADA

"Progress As Promised"

1996

IMPROVEMENT PLANS FOR

SOUTHERN SEGMENT LAS VEGAS BELTWAY

SECTION 3B

EASTERN AVE. TO PECOS ROAD

Funded By:
MASTER TRANSPORTATION IMPROVEMENT BONDS

LOUIS BERGER
& ASSOCIATES, INC.
LAS VEGAS, NEVADA

County Commissioners

Yvonne Atkinson Gates, Chair
Paul J. Christensen, Vice Chairman
Jay Bingham
Lorraine Hunt
Erin Kenny
Myrna Williams
Bruce L. Woodbury

County Manager

Donald L. (Pat) Shalmy

Director of Public Works

Approved:

M.J. Manning R.P.E. 7299

6/4/96

AGENCY	PLANS REVIEWED BY	DATE
SPRINT CENTRAL TELEPHONE - NEVADA		6-12-96
LAS VEGAS VALLEY WATER DISTRICT		06/12/96
SOUTHWEST GAS COMPANY		
NEVADA POWER COMPANY		6/11/96
REGIONAL TRANSPORTATION COMM.		
COMMUNITY CABLE T.V.		
HENDERSON DIRECTOR OF PUBLIC WORKS		6-5-96

DEPARTMENT OF PUBLIC WORKS	PLANS REVIEWED BY	DATE OF APPROVAL
DEPUTY DIRECTOR FOR PROFESSIONAL SERVICES		6-6-96
DEPUTY DIRECTOR FOR FIELD OPERATIONS		
COMMUNITY DEVELOPMENT DIVISION		6-4-96
CONSTRUCTION MANAGEMENT DIVISION		6/4/96
DESIGN ENGINEERING DIVISION		6-4-96
MAINTENANCE MANAGEMENT DIVISION		6-4-96
TRAFFIC MANAGEMENT DIVISION		6-4-96
COUNTY SURVEYOR'S OFFICE		May 31, 96

REVISIONS

REVISION No.	DESCRIPTION	BY	DATE	APPROVAL	DATE
	ISSUED FOR BID	RCH	06/13/96		

DESIGN ENGINEERING DIVISION

COVER SHEET

L-1497

S:\P\COVER RCH 6/04/96

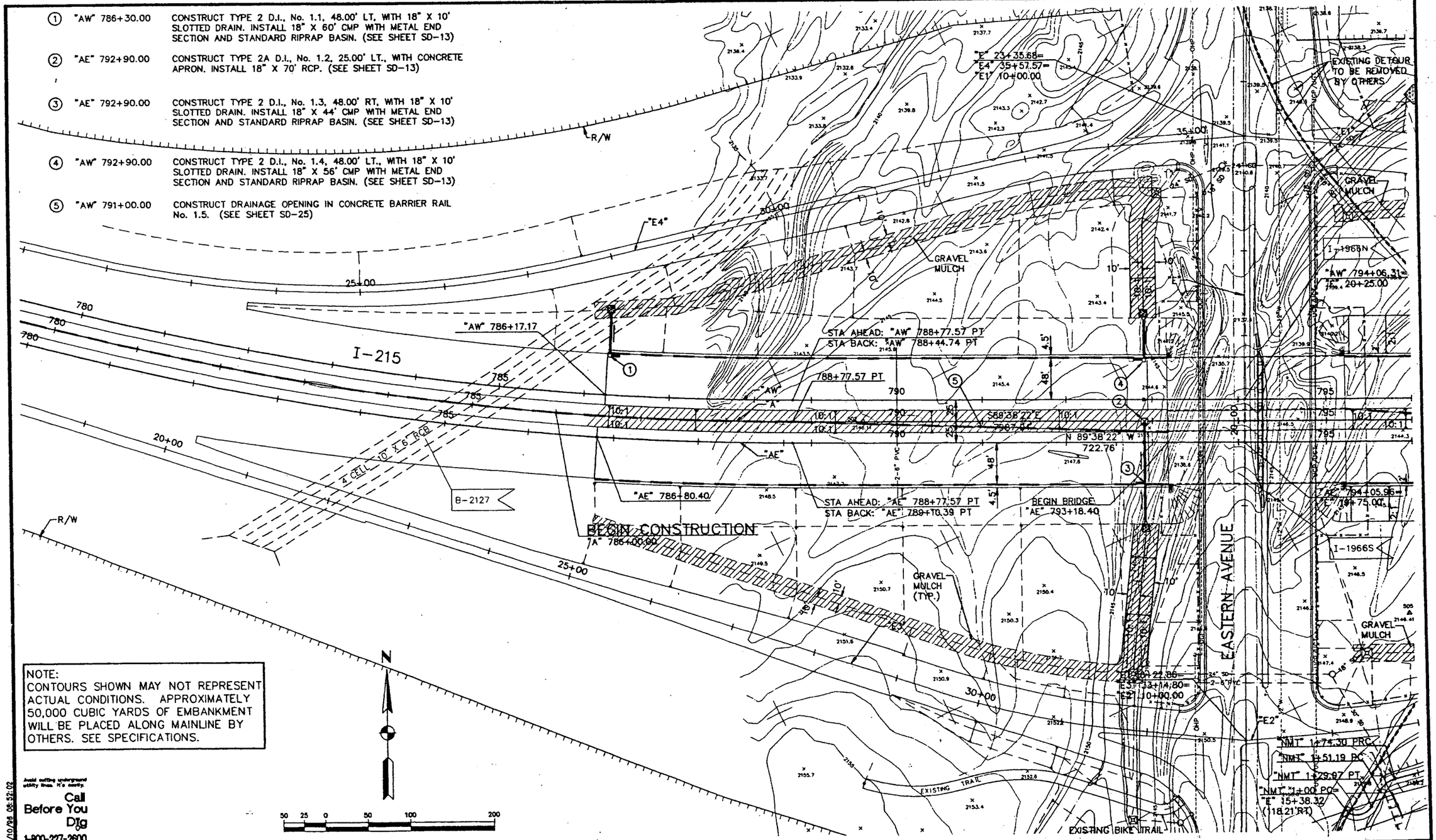
① "AW" 786+30.00 CONSTRUCT TYPE 2 D.I., No. 1.1, 48.00' LT, WITH 18" X 10' SLOTTED DRAIN. INSTALL 18" X 60' CMP WITH METAL END SECTION AND STANDARD RIPRAP BASIN. (SEE SHEET SD-13)

② "AE" 792+90.00 CONSTRUCT TYPE 2A D.I., No. 1.2, 25.00' LT., WITH CONCRETE APRON. INSTALL 18" X 70' RCP. (SEE SHEET SD-13)

③ "AE" 792+90.00 CONSTRUCT TYPE 2 D.I., No. 1.3, 48.00' RT, WITH 18" X 10' SLOTTED DRAIN. INSTALL 18" X 44' CMP WITH METAL END SECTION AND STANDARD RIPRAP BASIN. (SEE SHEET SD-13)

④ "AW" 792+90.00 CONSTRUCT TYPE 2 D.I., No. 1.4, 48.00' LT., WITH 18" X 10' SLOTTED DRAIN. INSTALL 18" X 56' CMP WITH METAL END SECTION AND STANDARD RIPRAP BASIN. (SEE SHEET SD-13)

⑤ "AW" 791+00.00 CONSTRUCT DRAINAGE OPENING IN CONCRETE BARRIER RAIL No. 1.5. (SEE SHEET SD-25)



NOTE:
CONTOURS SHOWN MAY NOT REPRESENT ACTUAL CONDITIONS. APPROXIMATELY 50,000 CUBIC YARDS OF EMBANKMENT WILL BE PLACED ALONG MAINLINE BY OTHERS. SEE SPECIFICATIONS.

N

50 25 0 50 100 200

Avoid cutting underground utility lines. It's costly.

Call Before You Dig
1-800-227-2600

REV. NO.	DATE	DESCRIPTION	APPROVED
	6/13/96	ISSUED FOR BID	RCH

C:\DEWO\SOPDRWG\ ARB 09/10/96 08:52:02

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3B

GRADING & DRAINAGE PLAN
"A" 780+00 TO "A" 796+00
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER REGISTERED HERB CIVIL No. 11288 STATE OF NEVADA 6/14/96

PROJECT No: 596 DRAWN BY: JDS
DESIGNED BY: PLC CHECKED BY: EWC
APPROVED BY RCH

LOUIS BERGER & ASSOCIATES, INC.
LAS VEGAS, NEVADA

SCALE
HORIZ: AS SHOWN
VERT: NONE
FIELD BOOK

DRAWING NO.
L-1497

SHT. SD-1 OF SD-35

7L

NOTE:
CONTOURS SHOWN MAY NOT REPRESENT ACTUAL CONDITIONS. APPROXIMATELY 50,000 CUBIC YARDS OF EMBANKMENT WILL BE PLACED ALONG MAINLINE BY OTHERS. SEE SPECIFICATIONS.

MATCH EXISTING PAVEMENT
"E1" 12+15.43 PC

"E1" 13+65.43 PT
S 84°14'23" E
215.43'

"E1" 13+00.00
92.00' RT.
ELEV. 2139.20

"E1" 16+00.00
60.00' RT.
ELEV. 2146.90

"E1" 17+00.00
50.00' LT.
ELEV. 2148.50

"E1" 17+30.28 PC

S 72°46'50" E

EXISTING DRAINAGE EASEMENT

"AW" 804+55.32
169.30' LT.
ELEV. 2135.00

"AW" 805+25.00
142.00' LT.
ELEV 2135.41

"AW" 807+36.47
132.85' LT.
ELEV. 2136.80

"AW" 805+00.00 (82.00 LT) FD
BEGIN SOUND WALL
"AW" 804+61.53 (61.19 LT)=
"E1" 20+86.25 (18.00' RT)

"E1" 23+85.94 PT

"E1" 27+22.03=
"AW" 811+00.00, (36.00' LT)

"AW" 803+54.00
67.00' RT.
ELEV. 2151.40

"AW" 804+63.51 (57.46 LT)

"AE" 803+54.00
62.00' RT.
ELEV. 2152.50

"AE" 804+88.01 (48.00' RT)

"AE" 804+88.01 (52.00' RT)
="E2" 21+27.10 (49.70' LT)

"E2" 23+17.01 PT

"E2" 17+28.52
52.39' LT.
ELEV. 2150.53

"E2" 14+31.82
78.23' LT.
ELEV. 2148.36

"E2" 18+67.01 PC

"E2" 12+87.43 PT
MATCH EXISTING PAVEMENT

EXISTING DRAINAGE EASEMENT

"AE" 805+82.25 (120.00' RT)
"DC2" 5+82.25 BEGIN AND END TRANSITIONS

"AE" 806+79.33 (120.00' RT)
"DC2" 6+79.33 END TRANSITION

"AE" 807+85.17 (125.00' RT)=
"DC2" 7+85.17 ANGLE POINT

"AE" 804+85.17 (120.00' RT)=
"DC2" 4+85.17 BEGIN TRANSITION

"NMT" 12+80.32 P.O.T. LOW PT.=
"DC2" 6+40.00 (18.25' RT)

"NMT" 16+30.37 POC LOW PT.=
"DC2" 9+90.00 (18.25' RT)

EXISTING WASH CHANNEL

EXISTING RIPRAP

24' DOUBLE SWING GATE

GRADE TO DRAIN

AREA OF GRAVEL MULCH

5' BERM

I-215

N 72°13'01" E

Avoid cutting underground utility lines. It's costly.
Call Before You Dig
1-800-227-2600

(12) "A" 801+35.00 — CONSTRUCT TYPE 2A D.I., No. 2.12, 6.40' RT., WITH MODIFIED CONCRETE APRON INSTALL 18" x 11' RCP (SEE SHT. SD-14)

(13) "A" 809+65.00 — CONSTRUCT TYPE 2A D.I., No. 2.13, 6.40' RT., WITH MODIFIED CONCRETE APRON INSTALL 24" x 94' RCP (SEE SHT. SD-15)

(14) "DC2" 6+40.00 — CONSTRUCT TYPE 2 D.I., No. 2.14, 30.26' RT., WITH CONCRETE APRON INSTALL 18" x 28' RCP (SEE SHT. NMT-6)

(15) "DC2" 9+90.00 — CONSTRUCT TYPE 2 D.I., No. 2.15, 29.25' RT., WITH CONCRETE APRON INSTALL 18" x 26' RCP (SEE SHT. NMT-6)

(1) "E1" 15+80.00 — CONSTRUCT TYPE 2 D.I., No. 2.1, 22.00' LT., WITH 18" X 10' SLOTTED DRAIN, 18" X 36' CMP WITH METAL END SECTION AND STANDARD RIPRAP BASIN. (SEE SHEET SD-13)

(2) "AE" 800+90.00 — CONSTRUCT TYPE 2 D.I., No. 2.2, 48.00' RT., WITH 18" X 20' SLOTTED DRAIN. INSTALL 18" X 30' CMP WITH METAL END SECTION AND STANDARD RIRAP BASIN. (SEE SHEET SD-14)

(3) "A" 801+35.00 — CONSTRUCT TYPE 2A D.I., No. 2.3, 6.40' LT., WITH MODIFIED CONCRETE APRON. INSTALL 18" X 65' RCP. (SEE SHEET SD-14)

(4) "AW" 801+35.00 — CONSTRUCT TYPE 2 D.I., No. 2.4, 48.00' LT., WITH 18" X 20' SLOTTED DRAIN. INSTALL 18" X 41' CMP WITH METAL END SECTION AND STANDARD RIPRAP BASIN. (SEE SHEET SD-14)

(5) "AE" 804+85.17 TO "AE" 811+50.00 — CONSTRUCT CONCRETE LINED CHANNEL (SEE SHEET SD-11 & 12)

(6) "AE" 807+85.00 — CONSTRUCT TYPE 2 D.I., No. 2.6, 64.58' RT., WITH 18" X 20' SLOTTED DRAIN. INSTALL 18" X 38' CMP AND 18" X 10' RCP. (SEE SHEET SD-14)

(7) "AW" 808+25.00 — CONSTRUCT TYPE 2 D.I., No. 2.7, 57.01' LT., WITH 18" X 10' SLOTTED DRAIN. INSTALL 18" X 140' RCP. (SEE SHEET SD-15)

(8) "AW" 809+65.00 — CONSTRUCT TYPE 2 D.I., No. 2.8, 51.41' LT., WITH 18" X 20' SLOTTED DRAIN. INSTALL 24" X 68' RCP. (SEE SHEET SD-15)

(9) "AW" 810+55.00 — CONSTRUCT TYPE 2 D.I., No. 2.9, 48.00' LT., WITH 18" X 10' SLOTTED DRAIN. INSTALL 18" X 90' RCP. (SEE SHEET SD-15)

(10) "A" 809+65.00 — CONSTRUCT TYPE 2A D.I., No. 2.10, 6.40' LT., WITH MODIFIED CONCRETE APRON. INSTALL 24" X 11' RCP. (SEE SHEET SD-15)

(11) "AE" 809+65.00 — CONSTRUCT TYPE 2A D.I., No. 2.11, 77.00' RT., WITH CONCRETE APRON. INSTALL 24" X 43' RCP. (SEE SHEET SD-15)

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3B
GRADING AND DRAINAGE PLAN
"A" 796+00 TO "A" 811+50
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

REV. NO.	DATE	DESCRIPTION	APPROVED

PROJECT No:	598	DRAWN BY:	JDS
DESIGNED BY:	PLC	CHECKED BY:	EWC
APPROVED BY	RCH		

LOUIS BERGER & ASSOCIATES, INC.
LAS VEGAS, NEVADA

SCALE
HORIZ: AS SHOWN
VERT: NONE
FIELD BOOK

DRAWING NO. L-1497

SHT. SD-2 OF SD-35

39PDRN02 RCH 06/11/98

73

① "AW" 816+80.00 — CONSTRUCT TYPE 2A D.I., No. 3.1, 60.00' LT., WITH CONCRETE APRON. INSTALL 24" X 77' RCP. (SEE SHEET SD-15)

② "A" 816+80.00 — CONSTRUCT TYPE 2A D.I., No. 3.2, 6.40' LT., WITH MODIFIED CONCRETE APRON. INSTALL 24" X 11' RCP. (SEE SHEET SD-15)

③ "AE" 816+80.00 — CONSTRUCT TYPE 2A D.I., No. 3.3, 66.00' RT., WITH CONCRETE APRON. INSTALL 24" X 50' RCP. (SEE SHEET SD-15)

④ "AW" 823+00.00 — CONSTRUCT TYPE 2A D.I., No. 3.4, 60.00' LT., WITH CONCRETE APRON. INSTALL 24" X 77' RCP. (SEE SHEET SD-16)

⑤ "A" 823+00.00 — CONSTRUCT TYPE 2A D.I., No. 3.5, 6.40' LT., WITH MODIFIED CONCRETE APRON. INSTALL 24" X 11' RCP. (SEE SHEET SD-16)

⑥ "AE" 823+00.00 — CONSTRUCT TYPE 2A D.I., No. 3.6, 66.00' RT., WITH CONCRETE APRON. INSTALL 24" X 41' RCP. (SEE SHEET SD-16)

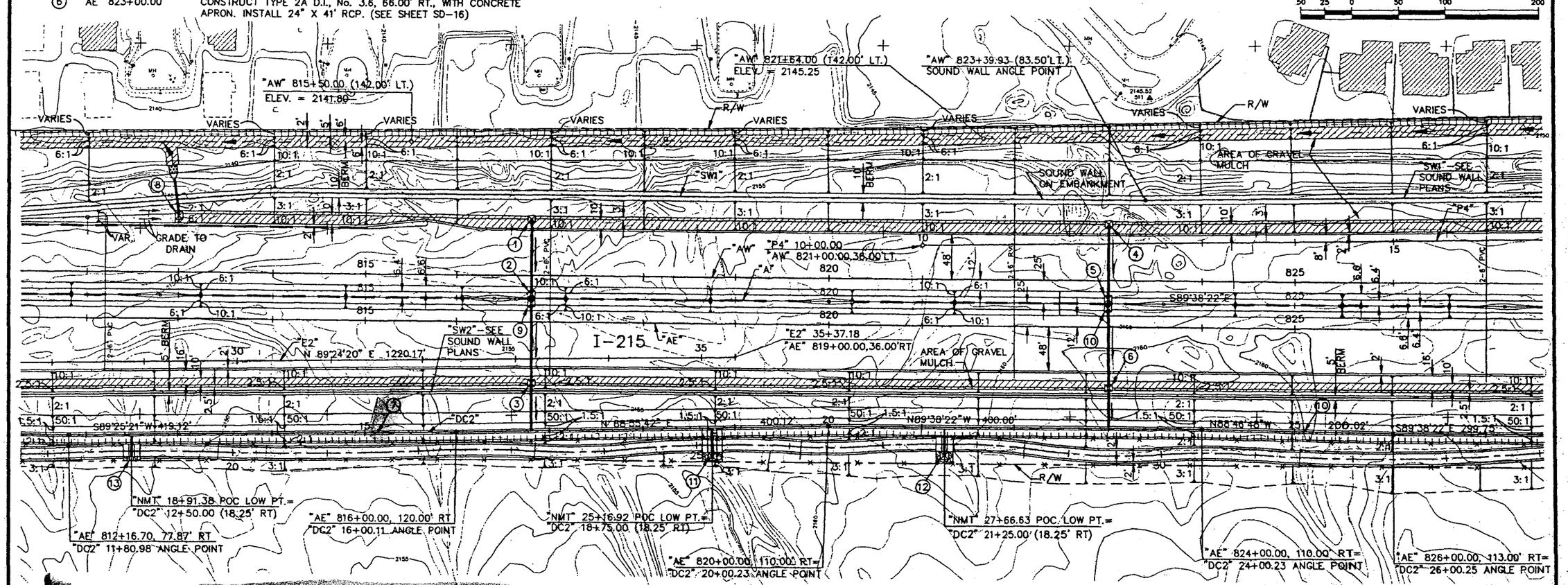
⑪ "DC2" 18+75.00 — CONSTRUCT TYPE 2 D.I., NO. 3.11, 29.25' RT., WITH CONCRETE APRON. INSTALL 18" X 26' RCP (SEE SHEET NMT-6)

⑫ "DC2" 21+25.00 — CONSTRUCT TYPE 2 D.I., NO. 3.12, 29.25' RT., WITH CONCRETE APRON. INSTALL 18" X 26' RCP (SEE SHEET NMT-6)

⑬ "DC2" 21+50.00 — CONSTRUCT TYPE 2 D.I., NO. 3.13, 27.25' RT. INSTALL 18" X 22' RCP (SEE SHEET NMT-6)

N

50 25 0 50 100 200



"A" 811+50.00 TO "A" 827+50.00 — CONSTRUCT CONCRETE LINED CHANNEL (SEE SHEET SD-11 & 12)

⑧ "AW" 813+00.00 — CONSTRUCT TYPE 2A D.I., No. 3.8, 58.00' LT., WITH CONCRETE APRON. INSTALL 18" X 50' RCP AND RCP END SECTION WITH STANDARD RIPRAP BASIN. (SEE SHEET SD-16)

⑨ "A" 816+80.00 — CONSTRUCT TYPE 2A D.I., No.3.9 6.40' RT., WITH MODIFIED CONCRETE APRON. INSTALL 24" X 83' RCP (SEE SHEET SD-15)

⑩ "A" 823+00.00 — CONSTRUCT TYPE 2A D.I., No.3.10 6.40' RT., WITH MODIFIED CONCRETE APRON. INSTALL 24" X 83' RCP (SEE SHEET SD-16)

Call Before You Dig 1-800-227-2600

REV. NO.	DATE	DESCRIPTION	APPROVED
	6/13/96	ISSUED FOR BID	RCH

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3B
GRADING AND DRAINAGE PLAN
"A" 811+50 TO "A" 827+50
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

ROBERT C. HERR 6111 CIVIL

PROJECT No: 596 DRAWN BY: JDS
DESIGNED BY: PLC CHECKED BY: EWC
APPROVED BY RCH

LOUIS BERGER & ASSOCIATES, INC.
LAS VEGAS, NEVADA

SCALE
HORIZ: AS SHOWN
VERT: NONE
FIELD BOOK

DRAWING NO. L-1497
SHT. SD-3 OF SD-35

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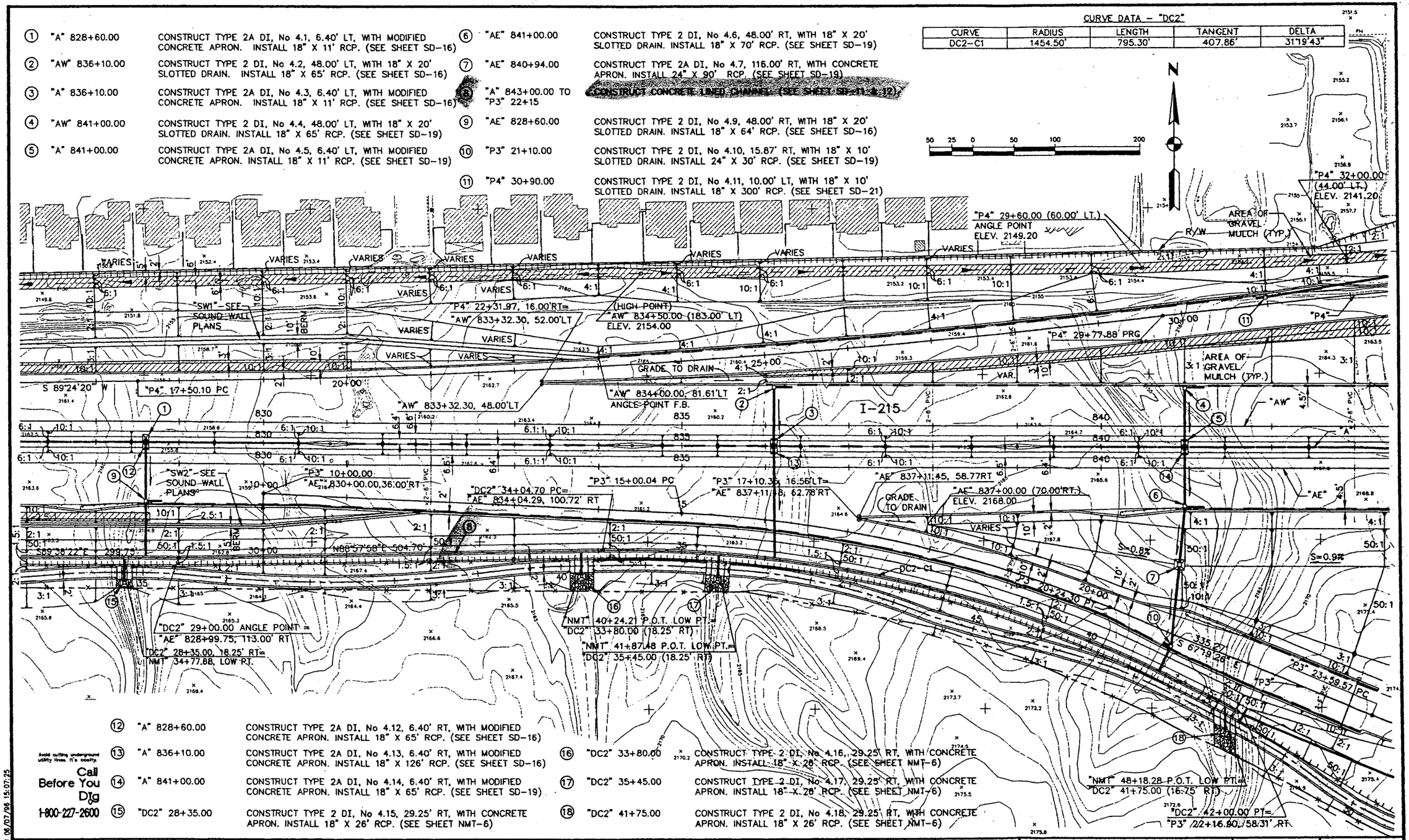
①	"A" 828+60.00	CONSTRUCT TYPE 2A DI, No 4.1, 6.40' LT, WITH MODIFIED CONCRETE APRON. INSTALL 18" X 11' RCP. (SEE SHEET SD-16)	⑥	"AE" 841+00.00	CONSTRUCT TYPE 2 DI, No 4.6, 48.00' RT, WITH 18" X 20' SLOTTED DRAIN. INSTALL 18" X 70' RCP. (SEE SHEET SD-19)
②	"AW" 836+10.00	CONSTRUCT TYPE 2 DI, No 4.2, 48.00' LT, WITH 18" X 20' SLOTTED DRAIN. INSTALL 18" X 65' RCP. (SEE SHEET SD-16)	⑦	"AE" 840+94.00	CONSTRUCT TYPE 2A DI, No 4.7, 116.00' RT, WITH CONCRETE APRON. INSTALL 24" X 90' RCP. (SEE SHEET SD-19)
③	"A" 836+10.00	CONSTRUCT TYPE 2A DI, No 4.3, 6.40' LT, WITH MODIFIED CONCRETE APRON. INSTALL 18" X 11' RCP. (SEE SHEET SD-16)	⑧	"A" 843+00.00 TO "P3" 22+15	CONSTRUCT CONCRETE LINED CHANNEL (SEE SHEET SD-17 & 18)
④	"AW" 841+00.00	CONSTRUCT TYPE 2 DI, No 4.4, 48.00' LT, WITH 18" X 20' SLOTTED DRAIN. INSTALL 18" X 65' RCP. (SEE SHEET SD-19)	⑨	"AE" 828+60.00	CONSTRUCT TYPE 2 DI, No 4.9, 48.00' RT, WITH 18" X 20' SLOTTED DRAIN. INSTALL 18" X 64' RCP. (SEE SHEET SD-16)
⑤	"A" 841+00.00	CONSTRUCT TYPE 2A DI, No 4.5, 6.40' LT, WITH MODIFIED CONCRETE APRON. INSTALL 18" X 11' RCP. (SEE SHEET SD-19)	⑩	"P3" 21+10.00	CONSTRUCT TYPE 2 DI, No 4.10, 15.87' RT, WITH 18" X 10' SLOTTED DRAIN. INSTALL 24" X 30' RCP. (SEE SHEET SD-19)
			⑪	"P4" 30+90.00	CONSTRUCT TYPE 2 DI, No 4.11, 10.00' LT, WITH 18" X 10' SLOTTED DRAIN. INSTALL 18" X 300' RCP. (SEE SHEET SD-21)

CURVE DATA – "DC2"

CURVE	RADIUS	LENGTH	TANGENT	DELTA
DC2–C1	1454.50'	795.30'	407.86'	31°19'43"



⑫	"A" 828+60.00	CONSTRUCT TYPE 2A DI, No 4.12, 6.40' RT, WITH MODIFIED CONCRETE APRON. INSTALL 18" X 65' RCP. (SEE SHEET SD-16)			
⑬	"A" 836+10.00	CONSTRUCT TYPE 2A DI, No 4.13, 6.40' RT, WITH MODIFIED CONCRETE APRON. INSTALL 18" X 126' RCP. (SEE SHEET SD-16)	⑯	"DC2" 33+80.00	CONSTRUCT TYPE 2 DI, No 4.16, 29.25' RT, WITH CONCRETE APRON. INSTALL 18" X 26' RCP. (SEE SHEET NMT-6)
⑭	"A" 841+00.00	CONSTRUCT TYPE 2A DI, No 4.14, 6.40' RT, WITH MODIFIED CONCRETE APRON. INSTALL 18" X 65' RCP. (SEE SHEET SD-19)	⑰	"DC2" 35+45.00	CONSTRUCT TYPE 2 DI, No 4.17, 29.25' RT, WITH CONCRETE APRON. INSTALL 18" X 26' RCP. (SEE SHEET NMT-6)
⑮	"DC2" 28+35.00	CONSTRUCT TYPE 2 DI, No 4.15, 29.25' RT, WITH CONCRETE APRON. INSTALL 18" X 26' RCP. (SEE SHEET NMT-6)	⑱	"DC2" 41+75.00	CONSTRUCT TYPE 2 DI, No 4.18, 29.25' RT, WITH CONCRETE APRON. INSTALL 18" X 26' RCP. (SEE SHEET NMT-6)

Avoid cutting underground utility lines. It's costly.
Call Before You Dig
1-800-227-2600

REV. NO.	DATE	DESCRIPTION	APPROVED
	6/13/96	ISSUED FOR BID	RCH

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3B
GRADING AND DRAINAGE PLAN
"A" 827+50 TO "A" 843+00
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROJECT No: 506 DRAWN BY: JDS
DESIGNED BY: PLC CHECKED BY: EWC
APPROVED BY RCH

LOUIS BERGER & ASSOCIATES, INC.
LAS VEGAS, NEVADA

SCALE
HORIZ: 1"= 50'
VERT: NONE
FIELD BOOK

DRAWING NO. L-1497
SHT. SD-4 OF SD-35

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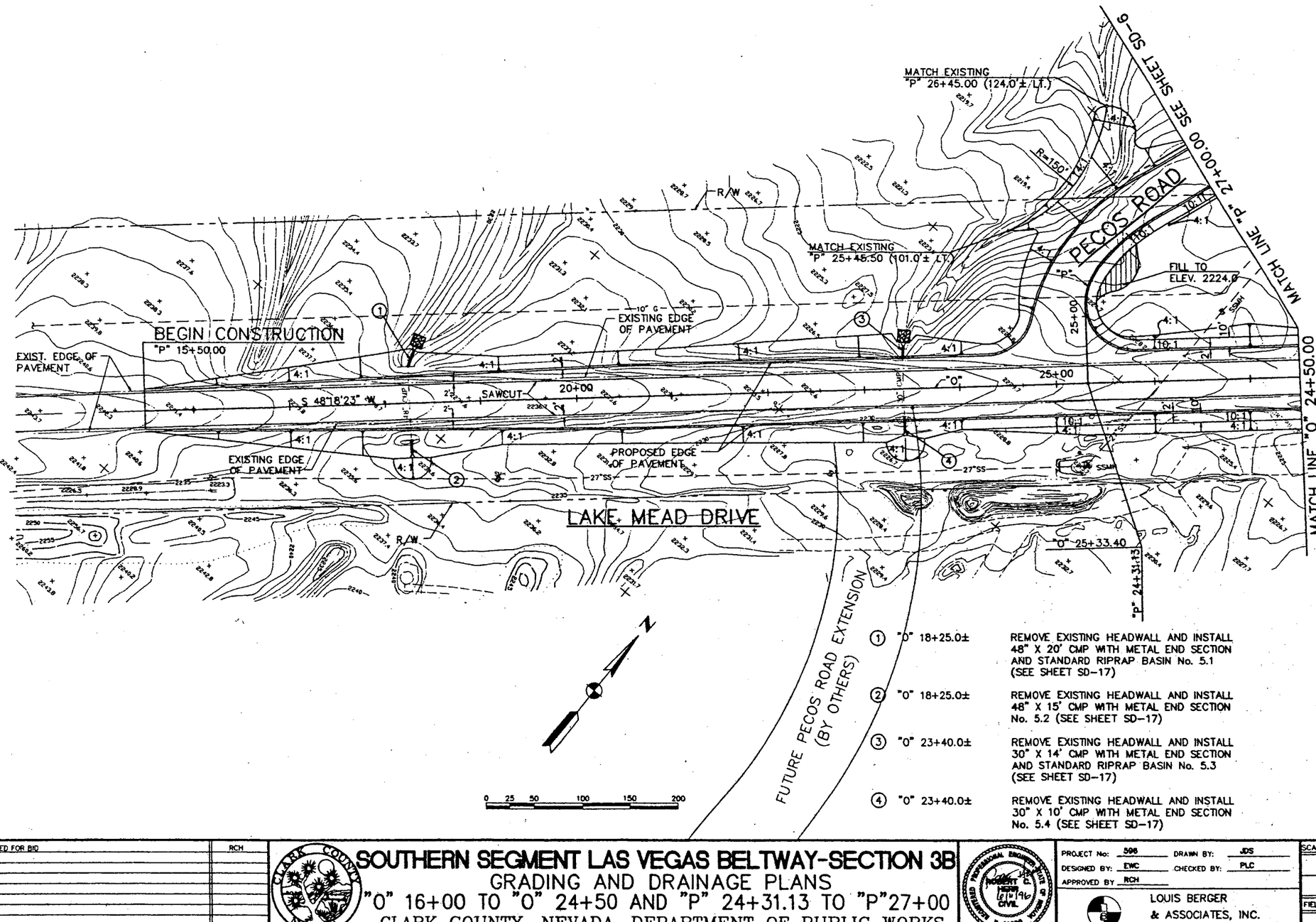
54



①	"O" 18+25.0±	REMOVE EXISTING HEADWALL AND INSTALL 48" X 20' CMP WITH METAL END SECTION AND STANDARD RIPRAP BASIN No. 5.1 (SEE SHEET SD-17)
②	"O" 18+25.0±	REMOVE EXISTING HEADWALL AND INSTALL 48" X 15' CMP WITH METAL END SECTION No. 5.2 (SEE SHEET SD-17)
③	"O" 23+40.0±	REMOVE EXISTING HEADWALL AND INSTALL 30" X 14' CMP WITH METAL END SECTION AND STANDARD RIPRAP BASIN No. 5.3 (SEE SHEET SD-17)
④	"O" 23+40.0±	REMOVE EXISTING HEADWALL AND INSTALL 30" X 10' CMP WITH METAL END SECTION No. 5.4 (SEE SHEET SD-17)

Avoid cutting underground utility lines. It's costly.
Call Before You Dig
1-800-227-2600

REV. NO.	DATE	DESCRIPTION	APPROVED
	6/13/96	ISSUED FOR BID	RCH

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3B
GRADING AND DRAINAGE PLANS
"O" 16+00 TO "O" 24+50 AND "P" 24+31.13 TO "P"27+00
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER STATE OF NEVADA ROBERT C. HOSKINS 6/14/96 CIVIL No. 11299

PROJECT No: 596 DRAWN BY: JDS
DESIGNED BY: EWC CHECKED BY: PLC
APPROVED BY RCH

LOUIS BERGER & ASSOCIATES, INC.
LAS VEGAS, NEVADA

SCALE
HORIZ: AS SHOWN
VERT: NONE
FIELD BOOK

DRAWING NO. L-1497
SHT. SD-5 OF SD-35

C:\DEW\59PDRN05 ARB 06/05/96 23:38:13

SOUTH HALF

St. Rose Parkway Improvement Plans
Roadway and Channel Plans per HDR, November 20, 2002

READVERTISE CONTRACT 3135

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	1

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.

INDEX OF SHEETS

1	TITLE SHEET
1A	LOCATION SKETCH
2 - 2MM	TYPICAL SECTIONS
3 - 3BB	GENERAL NOTES, SUMMARIES AND ESTIMATE OF QUANTITIES
CP1 - CP9	CONTROL POINTS
4 - 39	PLAN AND PROFILE
40 - 59b	SPECIAL DETAILS
60 - 66	DETOUR PLANS
S1 - S3	ROADWAY REMOVALS STRUCTURES LIST
S4 - S12	ROADWAY STRUCTURES LIST
D1 - D38	GRADING, DRAINAGE AND EROSION CONTROL PLANS
DP1 - DP30	DRAINAGE PROFILES
S13 - S56	DRAINAGE STRUCTURES LIST
U1 - U20	UTILITY PLANS
S57 - S58	UTILITY STRUCTURE LIST
R1 - R7	RIGHT OF WAY PLANS
TC1 - TC94	TRAFFIC CONTROL
ST1 - ST16	STRIPING PLANS
TS1 - TS53	SIGN DETAILS, LOCATIONS, REMOVALS AND SUMMARIES
T1 - T31	LIGHTING PLAN
T32 - T46	TRAFFIC SIGNAL PLANS
T47 - T48	LIGHTING, SIGNAL STRUCTURE LIST
RW1 - RW4	RETAINING WALLS
SW1 - SW12	SOUNDWALLS
S-59	RETAINING WALL/SOUNDWALLS STRUCTURE LIST

SEE STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION, METRIC, 2001 EDITION.

STATE OF NEVADA

DEPARTMENT OF TRANSPORTATION

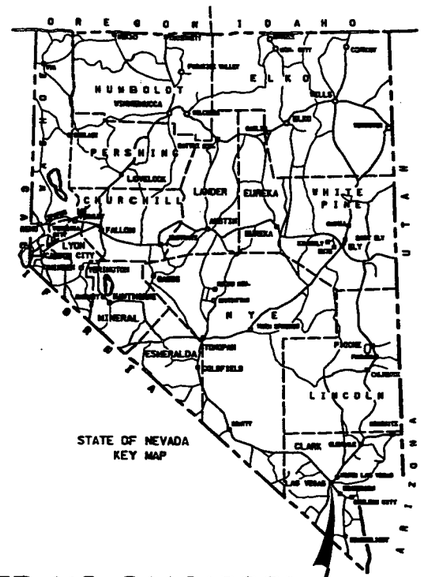
CONSTRUCTION PLANS

CLARK COUNTY

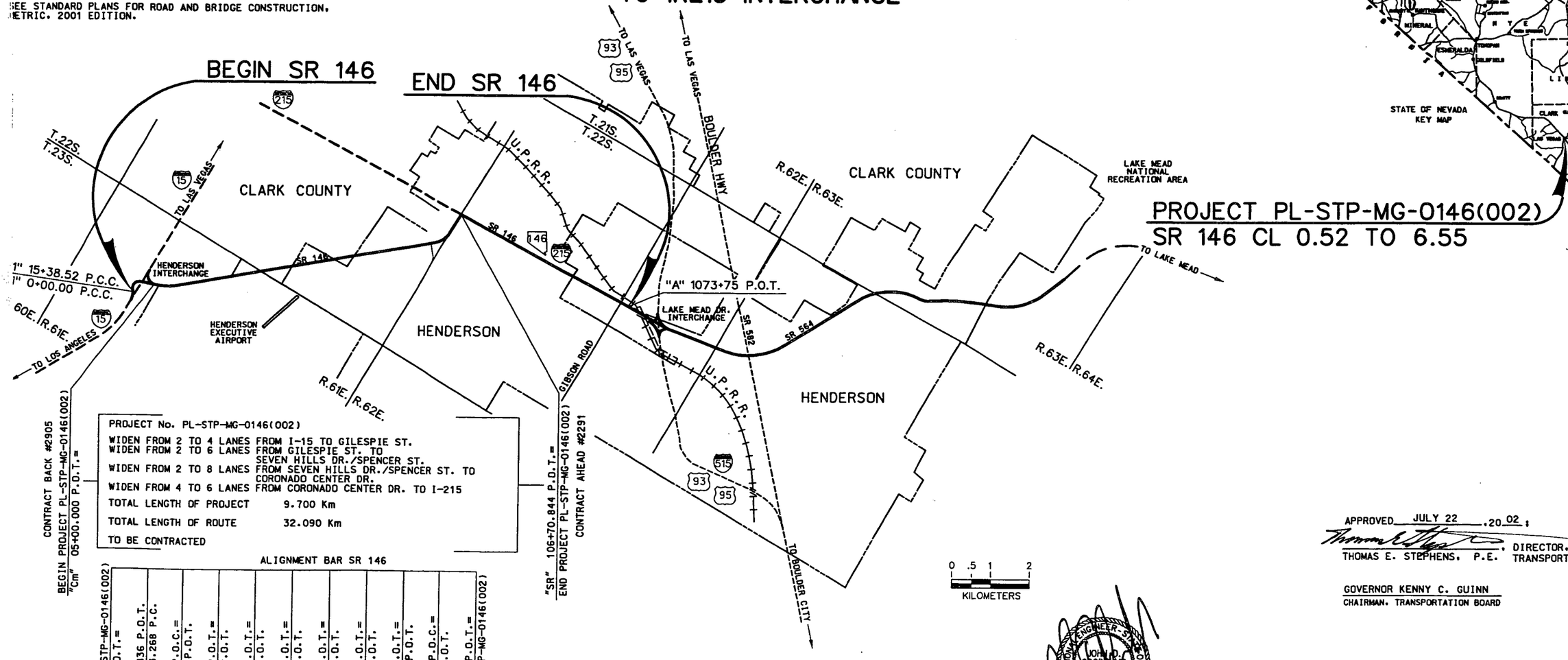
FROM IR015 INTERCHANGE ALONG ST. ROSE PARKWAY TO IR215 INTERCHANGE

SR 146
LVBS TO I-215

ADT 2004	36,700
ADT 2024	73,300
DHV	37,836
D	52%
T	9%
V	90 Kph



STATE OF NEVADA KEY MAP



PROJECT No. PL-STP-MG-0146(002)

WIDEN FROM 2 TO 4 LANES FROM I-15 TO GILESPIE ST.
WIDEN FROM 2 TO 6 LANES FROM GILESPIE ST. TO SEVEN HILLS DR./SPENCER ST.
WIDEN FROM 2 TO 8 LANES FROM SEVEN HILLS DR./SPENCER ST. TO CORONADO CENTER DR.
WIDEN FROM 4 TO 6 LANES FROM CORONADO CENTER DR. TO I-215

TOTAL LENGTH OF PROJECT	9.700 Km
TOTAL LENGTH OF ROUTE	32.090 Km

TO BE CONTRACTED

ALIGNMENT BAR SR 146

BEGIN PROJECT PL-STP-MG-0146(002)	
"Cm" 5+00.000 P.O.T.=	
EONBK "Cm" 7+80.836 P.O.T.	
EONAHD "SR" 12+73.268 P.C.	
"SR" 14+29.084 P.O.C.=	
"Am1" 118+78.162 P.O.T.	
"SR" 35+11.775 P.O.T.=	
"B" 10+00.000 P.O.T.	
"SR" 42+46.980 P.O.T.=	
"A" 30+60.891 P.O.T.	
"SR" 57+54.177 P.O.T.=	
"M" 10+00.000 P.O.T.	
"SR" 70+22.308 P.O.T.=	
"S" 10+00.000 P.O.T.	
"SR" 76+87.390 P.O.T.=	
"J" 10+00.000 P.O.T.	
"SR" 84+29.050 P.O.T.=	
"Em" 60+76.305 P.O.T.	
"SR" 101+92.152 P.O.C.=	
"PV" 10+00.000 P.O.T.	
"SR" 106+70.844 P.O.T.=	
END PROJECT PL-STP-MG-0146(002)	

0 .5 1 2
KILOMETERS

PROJECT PL-STP-MG-0146(002)
SR 146 CL 0.52 TO 6.55

APPROVED JULY 22, 20 02;

THOMAS E. STEPHENS, P.E., DIRECTOR, DEPT. OF TRANSPORTATION

GOVERNOR KENNY C. GUINN
CHAIRMAN, TRANSPORTATION BOARD

STATE OF NEVADA — JOHN D. GOODMAN — CIVIL — No. 12295 — PROFESSIONAL ENGINEER
11/20/02
EXP. 06/30/03

HDR
HDR Engineering, Inc.

FILE:
DATE:

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	17

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.

LEGEND

PLANTMIXING MISCELLANEOUS AREA

SAWCUT LINE (NO DIRECT PAYMENT)

DRIVEWAY NUMBER
P-PERMITTED, NP-NOT PERMITTED

TOP OF FORESLOPE (T.O.F.)

KEY MAP

NOTES

1. SEE RIGHT OF WAY PLANS FOR STATIONS AND OFFSETS, OF RIGHT OF WAY LIMITS.
2. SEE INTERSECTION GEOMETRICS FOR MEDIAN AND CURBING CONTROL, CURB RAMPS AND PLANTMIXING MISCELLANEOUS AREAS.
3. SEE DRIVEWAY DETAIL SHEETS FOR EDGE OF PAVEMENT CONTROL AND PLANTMIXING MISCELLANEOUS AREAS.
4. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT(EOP) UNLESS OTHERWISE NOTED.
5. MEDIAN NOSES SHALL MATCH THE SHAPE OF CURB OF THE ADJACENT CURBING.

"SR" 90+83.843 (24.150 m LT.) CONSTRUCT GUARDRAIL TERMINAL (FLARED) PER NDOT STD. PLANS R-8.2.1.

"SR" 90+95.273 (22.950 m LT.) TO "SR" 91+02.893 (22.950 m LT.) CONSTRUCT GALVANIZED GUARDRAIL(TRIPLE CORRUGATION) PER NDOT STD. PLANS R-8.1.1.

"SR" 91+02.893 (22.950 m LT.) CONSTRUCT GUARDRAIL-BRIDGERAIL CONNECTOR (TRIPLE CORRUGATION) PER NDOT STD. PLANS R-8.4.2.

"SR" 91+07.283 (22.950 m LT.) CONSTRUCT GUARDRAIL-BRIDGERAIL CONNECTOR (TRIPLE CORRUGATION) PER NDOT STD. PLANS R-8.4.2.

"SR" 91+11.673 (22.950 m LT.) TO "SR" 91+19.293 (22.950 m LT.) CONSTRUCT GALVANIZED GUARDRAIL(TRIPLE CORRUGATION) PER NDOT STD. PLANS R-8.1.1.

"SR" 91+19.293 (22.950 m LT.) CONSTRUCT GUARDRAIL TERMINAL (FLARED) PER NDOT STD. PLANS R-8.2.1.

"SR" 91+00.430 (45.720 m LT.) TO "SR" 91+20.000 (45.720 m LT.) CONSTRUCT 1800 mm CHAIN-LINK FENCE PER NDOT STD. PLAN R-6.3.1. SEE SHEET D-27.

"SR" 89+92.436 (28.310 m RT.) TO "SR" 94+25.197 (23.075 m RT.) CONSTRUCT SOUNDWALL. SEE SOUNDWALL DETAILS. SHEET SW-1 THRU SW-12.

"SR" 90+00.375 (22.950 m RT.) TO "SR" 91+02.711 (23.075 m RT.) PLANTMIXING MISCELLANEOUS AREAS.

"SR" 90+62.000 (32.262 m RT.) TO "SR" 90+88.000 (40.233 m RT.) CONSTRUCT 1800 mm CHAIN-LINK FENCE PER NDOT STD. PLAN R-6.3.1. SEE SHEET D-25.

"SR" 90+92.057 (22.134 m RT.) TO "SR" 91+26.101 (21.523 m RT.) REMOVE GUARDRAIL.

"SR" 90+92.264 (5.354 m RT.) TO "SR" 91+26.212 (4.998 m RT.) REMOVE GUARDRAIL.

"SR" 90+98.957 (45.024 m RT.) TO "SR" 91+08.741 (20L854 m RT.) TO "SR" 91+14.603 (20L829 m RT.) TO "SR" 91+18.613 (45.681 m RT.) REMOVE CHAIN-LINK FENCE.

"SR" 91+00.478 (45.781 m LT.) TO "SR" 91+03.932 (5.990 m RT.) TO "SR" 91+14.493 (5.970 m RT.) TO "SR" 91+18.836 (28.020 m LT.) REMOVE CHAIN-LINK FENCE.

"SR" 91+14.603 (23.398 m RT.) TO "SR" 91+26.000 (31.200 m RT.) CONSTRUCT 1800 mm CHAIN-LINK FENCE, 4.8 m SWING GATE (DOUBLE) PER NDOT STD. PLAN R-6.3.3. SEE SHEET D-26.

"SR" 91+18.538 (45.220 m RT.) TO "SR" 91+26.000 (35.508 m RT.) CONSTRUCT 1800 mm CHAIN-LINK FENCE PER NDOT STD. PLAN R-6.3.1. SEE SHEET D-27.

"SR" 94+25.198 (22.340 m RT.) TO "SR" 95+20.973 (22.340 m RT.) PLANTMIXING MISCELLANEOUS AREAS.

"AR2" 10+04.991 TO "AR2" 13+16.885 CONSTRUCT ACCESS ROAD. SEE ACCESS ROAD DETAILS, SHEET 59.

"SR" 94+25.197: 23.075 m RT. "AR2" 13+16.885: 2.765 m LT. END SOUNDWALL END MAINTENANCE ACCESS ROAD.

"SR" Δ = 02°33'30" R = 4000.000 m L = 178.598 m T = 89.314 m

"SR" 94+25.198 P.C.

"SR" 90+90.000 37.558 m LT. END BERM SEE SHEET 56.

"SR" 90+83.843 24.150 m LT. "SR" 95+83.843 24.150 m LT.

"SR" 91+02.893 22.950 m LT. "SR" 91+07.283 22.950 m LT. "SR" 91+11.673 22.950 m LT. "SR" 91+19.293 22.950 m LT. "SR" 91+30.723 24.150 m LT.

"SR" 91+98.497 23.390 RT.

"SR" 89+92.436 28.310 m RT. START SOUNDWALL

"SR" 90+21.600 28.310 m RT. START TAPER

"SR" 90+60.375: 22.950 m RT. "AR1" 13+00.995: 2.900 m LT. END BARRIERWALL/SOUNDWALL END ACCESS ROAD SEE SHEET 58.

"SR" 91+02.004 23.075 m RT. END TAPER

"SR" 91+13.993: 30.750 m RT. "AR2" 10+04.991: 2.853 m LT. START ACCESS ROAD SEE SHEET 59.

"SR" 94+25.198 28.290 m RT. BEGIN TAPER

"SR" 95+20.973 22.340 m RT. END TAPER

"SR" 94+25.198 22.340 m RT.

"SR" 94+25.197: 23.075 m RT. "AR2" 13+16.885: 2.765 m LT. END SOUNDWALL END MAINTENANCE ACCESS ROAD.

SR 146-CL 05.57 B-603

N.48° 18'14"E.~7414.425 m

ST. ROSE PARKWAY (SR 146)

"SR" "AR1" "AR2"

R/W T.O.F. E.O.P. R-97.55 m R-49.9 m

T.22S. R.61E. SEC. 24 SEC. 25

177-25-210 177-25-214 N-S SEC LINE SEC. 24

518-021

45.720 m

THOMAS M. CRAIG NEVADA No. 14516 PROFESSIONAL ENGINEER STATE OF NEVADA EXP. 12/31/02

11.15.01

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

CONSTRUCTION PLAN

HDR Engineering, Inc.

DESIGNED BY: CJW
DRAWN BY: CJW
CHECKED BY:
PROJECT No: PL-STP-MG-0146(002)

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DATE: 2 14:51

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	15

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.

KEY MAP

- LEGEND -

- PLANTMIXING MISCELLANEOUS AREA
- SAWCUT LINE (NO DIRECT PAYMENT)
- DRIVEWAY NUMBER P-PERMITTED, NP-NOT PERMITTED
- TOP OF FORESLOPE (T.O.F.)
- LIMITS OF COLD MILLING

DRIVEWAY TABLE	
DRIVEWAY NO.	DISTRICT PERMIT NO.
D10	748-98
D11	505+00
D12	63-01

- NOTES -

1. SEE RIGHT OF WAY PLANS FOR STATIONS AND OFFSETS OF RIGHT OF WAY LIMITS.
2. SEE INTERSECTION GEOMETRICS FOR MEDIAN AND CURBING CONTROL, CURB RAMPS AND PLANTMIXING MISCELLANEOUS AREAS.
3. SEE DRIVEWAY DETAIL SHEETS FOR EDGE OF PAVEMENT CONTROL AND PLANTMIXING MISCELLANEOUS AREAS.
4. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT(EOP) UNLESS OTHERWISE NOTED.
5. MEDIAN NOSES SHALL MATCH THE SHAPE OF CURB OF THE ADJACENT CURBING.

ST. ROSE PARKWAY (SR 146)
N.48°18'14"E.-7414.425 m

NOTE: CONTRACTOR SHALL TAKE EVERY PRECAUTION TO PROTECT FOUNTAINS AND OTHER AESTHETIC TREATMENTS ALONG FRONTAGE OF EASTERN MARKET PLACE.

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

CONSTRUCTION PLAN

THOMAS M. CRAIG — PROFESSIONAL ENGINEER — STATE OF NEVADA — NO. 14516
11-26-02 EXP. 12/31/02

HDR Engineering, Inc.

DESIGNED BY:	CJW
DRAWN BY:	CJW
CHECKED BY:	
PROJECT No:	PL-STP-MG-0146(002)

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DATE: 25 11:53

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-11

METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.

T.22S. R.61E.

[A] "SR" 81+56.109 (16.56 m RT.) — REMOVE EXISTING 750 mm x 35.3 m CMP WITH END SECTIONS LT. AND RT.

[B] "SR" 84+65.806 — REMOVE EXISTING 600mm x 56.572m CMP WITH END SECTIONS LT. AND RT.

① "SR" 81+62.000 — INSTALL 750 mm x 77.5 m CMP FROM 29.007 m RT. (UIE= 689.523) ALONG A 30° SKEW LT. AHEAD TO 29.007 m LT. (LIE= 689.136). INSTALL FLARED END SECTIONS LT. & RT. INSTALL CLASS 150 RIPRAP. SEE DETAIL ON SHEET D-17. SEE PROFILE SHEET DP-18.

② "Em" 59+93.018 (19.231 m LT.) — CONSTRUCT SPECIAL INLET "B" (LIE=688.240). SEE DETAIL SHEET D-21.

③ "Em" 59+98.370 — INSTALL 1700 mm x 1075 mm x 1.4 m OVAL RCP (UIE=688.240). INSTALL 1700 mm x 1075 mm RCP FROM 19.042 m LT. (UIE=688.240) TO 18.442 m LT. (LIE=688.237) SEE PROFILE SHEET DP-18.

④ "Em" 59+98.370 (17.028 m LT.) — CONSTRUCT 1800 mm PRECAST REINFORCED MANHOLE TYPE 4 (UIE=688.240). INSTALL 1700 mm x 1075 mm RCP RIM ELEV.=689.876

⑤ "Em" 59+99.323 / "Em" 60+28.479 — INSTALL 1700 mm x 1075 mm RCP FROM 17.045 m LT. (UIE=688.237) TO 17.481 m LT. (LIE=688.166) SEE PROFILE SHEET DP-18.

⑥ "Em" 60+29.482 (17.500 m LT.) — CONSTRUCT 1800 mm PRECAST REINFORCED MANHOLE TYPE 4 (UIE=688.166) (LIE=688.134).

⑦ "Em" 60+29.785 (3.333 m RT.) — ADJUST MANHOLE COVER TO GRADE (METHOD A) SEE SHEET D-15.

⑧ "Em" 60+15.623 (20.708 m RT.) — CONSTRUCT 6.15 m SPECIAL INLET "B". SEE DETAIL SHEET D-21. CONNECT TO EXISTING 900 mm RCP (LIE=688.552).

⑨ "Em" 60+22.840 (20.745 m RT.) — CONSTRUCT 6.15 m SPECIAL INLET "B". SEE DETAIL SHEET D-21. CONNECT TO EXISTING 900 mm RCP (LIE=688.552).

⑩ "SR" 87+72.000 — INSTALL 900 mm x 74.4 m RCP FROM 29.661 m RT. (UIE=684.680) TO 34.987 m LT (LIE=684.310). INSTALL FLARED END SECTION LT. SEE PROFILE SHEET DP-19.

⑪ "SR" 87+72.000 (34.99 m LT.) — CONSTRUCT TYPE 3 PIPE RISER INLET W/CONCRETE APRON PER DETAIL SHEET D-18A. GRATE ELEV.=685.768.

⑫ "SR" 87+72.000 (29.660 m RT.) — CONSTRUCT JUNCTION BOX. SEE DETAIL SHEET D-35.

⑬ "SR" 87+72.000 (21.294 m RT.) — INSTALL 1200 mm PRECAST REINFORCED CONCRETE MANHOLE TYPE 4. SEE PROFILE SHEET DP-19.

⑭ "SR" 87+72.000 (21.294 m RT.) / "SR" 88+06.150 (24.000 m RT.) — INSTALL 750 mm x 34.2 m RCP. (UIE=684.895) (LIE=684.792). SEE PROFILE SHEET DP-19.

⑮ "SR" 88+06.150 (24.000 m RT.) — CONSTRUCT TYPE 2 DROP INLET. ROTATED 90° GRATE EL.=686.314

⑯ "SR" 88+06.150 (24.000 m RT.) / "SR" 88+59.084 (21.550 m RT.) — INSTALL 750 mm x 52.9 m RCP. (UIE=685.054) (LIE=684.895). SEE PROFILE SHEET DP-19.

⑰ "SR" 88+59.084 (21.550 m RT.) — CONSTRUCT TYPE 2 DROP INLET. ROTATED 90° GRATE EL.=686.274

Elev 688.85 "SR" 81+00 L 31.45
Elev 689.75 "SR" 81+31 L 31.33
CULVERT CROSSING NO. 19
R/W
TEMPORARY CONSTRUCTION EASEMENT
TEMPORARY CONSTRUCTION EASEMENT
FOR BERM DETAILS SEE SHEET 56 & 57.
PUBLIC DRAINAGE ESMT
V-DITCH
"SR"
EXISTING V-DITCH
ST. ROSE PARKWAY
Elev 689.65 "SR" 84+01 R 46.23
Elev 690.17 "SR" 83+00 R 31.45
Elev 689.65 "SR" 81+00 R 31.45
Elev 691.41 "SR" 81+80 R 31.45
Elev 690.44 "SR" 82+00 R 31.45
Elev 689.58 "SR" 81+29 R 31.45
TEMPORARY CONSTRUCTION EASEMENT
TEMPORARY CONSTRUCTION EASEMENT
EXISTING DRAINAGE CHANNEL
EASTERN AVENUE

KEY MAP

LEGEND:
- □ INDICATES EXISTING DRAINAGE FACILITY
- ○ INDICATES PROPOSED DRAINAGE FACILITY
- ◇ INDICATES EROSION CONTROL DEVICE

JOHN D. DOOM, JR. — No. 12755 — CIVIL — STATE OF NEVADA — EXP. 06/30/03 — 11/14/02

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

GRADING DRAINAGE AND EROSION CONTROL PLAN

HDR Engineering, Inc.

DESIGNED BY:	JE, JD
DRAWN BY:	JD, BRH
CHECKED BY:	JDD
PROJECT No:	PL-STP-MG-0146(002)

FILE: p:\LC... d:\Addendum\d11.dgn
DATE: 14-Nov-... 18:54

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-12

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.

Ⓐ "SR" 91+03.802 (CL) — REMOVE EXISTING (2) 3.04 m x 1.83 m x 15.0 m AND (1) 3.66 m x 4.8 m x 15.0 m RCB'S WITH HEADWALLS LT. AND RT. REMOVE 51.80 m LT AND 24.68 m RT. EXISTING CONCRETE CHANNEL.

Ⓑ "SR" 93+91.836 (13.790 m RT.) — REMOVE EXISTING 900 mm x 22.9 m CMP WITH HEADWALLS LT. AND RT.

Ⓒ "SR" 95+00.424 (13.470 m RT.) — REMOVE EXISTING 750 mm x 26.7 m CMP WITH HEADWALLS AND END SECTIONS LT. AND RT.

Ⓓ "SR" 88+48.000 (23.360 m RT.) "SR" 89+98.800 (23.360 m RT.) — REMOVE EXISTING ACCESS RAMP AND CONCRETE CHANNEL.

① "SR" 88+59.084 (21.550 m RT.) "SR" 88+94.752 (21.550 m RT.) — INSTALL 750 mm x 35.7 m RCP. (UIE=685.161) LIE=685.054). SEE PROFILE SHEET DP-19

② "SR" 88+94.752 (21.550 m RT.) — CONSTRUCT TYPE 2 DROP INLET. ROTATED 90° GRATE EL=686.314

③ "SR" 90+42.000 (38.709 m RT.) "SR" 90+62.000 (38.709 m RT.) — INSTALL CLASS 150 RIPRAP TO MATCH EXISTING GRADE. SEE DETAIL ON SHEET D-17.

④ "SR" 90+62.000 (38.709 m RT.) — CONSTRUCT CONCRETE TRANSITION FROM OPEN CHANNEL TO RCB. SEE PROFILE SHEET DP-20 AND DETAIL SHEETS D-25 TO D-34.

⑤ "SR" 90+88.000 (38.709 m RT.) "SR" 91+08.810 (24.180 m RT.) — CONSTRUCT (1) 3.0 m x 1.8 m x 27.710 m RCB CURVED (R=13.970 m). SEE PROFILE SHEET DP-20 AND DETAIL SHEETS D-25 TO D-34.

⑥ "SR" 91+08.810 — CONSTRUCT (3) 3.0 m x 1.8 m x 48.500 m RCB'S (B-603). FROM 24.180 m RT. (UIE = 685.020) LT. AHEAD AT A 0° SKEW TO 24.180 m LT. (LIE=683.743). SEE PROFILE SHEET DP-20 AND DETAIL SHEETS D-25 TO D-34.

⑦ "SR" 91+08.810 (24.180 m RT.) "SR" 91+08.810 (45.720 m RT.) — CONSTRUCT CONCRETE TRANSITION WALLS FROM OPEN CHANNEL TO RCB. TIE INTO EXISTING TOP OF WALL. SEE PROFILE SHEET DP-20 AND DETAIL SHEETS D-25 TO D-34.

⑧ "SR" 91+08.810 (24.320 m LT.) "SR" 91+08.810 (45.720 m LT.) — CONSTRUCT CONCRETE TRANSITION WALLS RCB TO OPEN CHANNEL. TIE INTO EXISTING TOP OF WALL. SEE PROFILE SHEET DP-20 AND DETAIL SHEETS D-25 TO D-34.

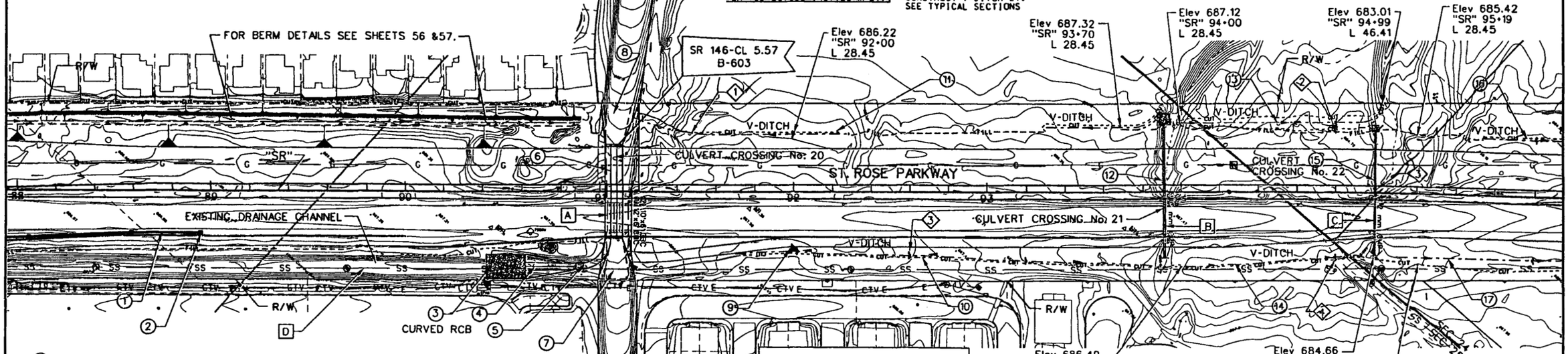
⑨ ± "SR" 92+000 (33.000 m RT.) ± "SR" 92+020 (33.000 m RT.) — CONSTRUCT CLASS A CONCRETE (TYPE 2) VALLEY GUTTER FROM V-DITCH TO CHANNEL ACCESS ROAD. SEE NDOT STD R-5.1.1

⑩ "SR" 92+00.000 (33.150 m RT.) "SR" 93+70.000 (28.450 m RT.) — CONSTRUCT V-DITCH RT. SEE TYPICAL SECTIONS

⑪ "SR" 91+42.000 (28.450 m LT.) "SR" 93+90.000 (28.450 m LT.) — CONSTRUCT V-DITCH LT. SEE TYPICAL SECTIONS

⑫ "SR" 93+91.000 — INSTALL 1050 mm x 69.0 m CMP FROM 37.000 m RT. (UIE=685.400) TO 32.000 m LT. (LIE=684.000). INSTALL FLARED END SECTIONS LT. & RT. SEE PROFILE SHEET DP-21. INSTALL CLASS 150 RIPRAP. SEE DETAIL ON SHEET D-17.

⑬ "SR" 94+00.000 (28.450 m LT.) "SR" 95+00.000 (45.720 m LT.) — CONSTRUCT V-DITCH LT. SEE TYPICAL SECTIONS

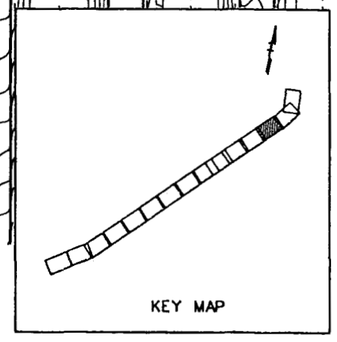


⑭ "SR" 94+00.000 (35.000 m RT.) "SR" 95+00.000 (35.000 m RT.) — CONSTRUCT V-DITCH RT. SEE TYPICAL SECTIONS

⑮ "SR" 95+00.000 — INSTALL 750 mm x 63.0 m CMP FROM 32.000 m RT. (UIE=684.822) TO 31.000 m LT. (LIE=683.654). INSTALL FLARED END SECTIONS LT. & RT. INSTALL CLASS 150 RIPRAP. SEE DETAIL ON SHEET D-17. SEE PROFILE SHEET DP-21.

⑯ "SR" 95+20.000 (28.450 m LT.) "SR" 95+80.000 (28.450 m LT.) — CONSTRUCT V-DITCH LT. SEE TYPICAL SECTIONS

⑰ "SR" 95+20.000 (35.000 m RT.) "SR" 95+80.000 (34.280 m RT.) — CONSTRUCT V-DITCH RT. SEE TYPICAL SECTIONS



EROSION CONTROL

◇① "SR" 91+12.000 (28.450 m LT.) "SR" 93+90.000 (28.450 m LT.) — INSTALL STRAW BALE CHECK DAM EVERY 60 m. CONSTRUCTION PHASE 4. SEE DETAIL SHEET D-20.

◇② "SR" 94+80.000 (28.450 m LT.) — INSTALL STRAW BALE CHECK DAM. CONSTRUCTION PHASE 4. SEE DETAIL SHEET D-20.

◇③ "SR" 91+40.000 (29.335 m RT.) "SR" 93+20.000 (28.450 m RT.) — INSTALL STRAW BALE CHECK DAM EVERY 60 m. CONSTRUCTION PHASE 3. SEE DETAIL SHEET D-20.

◇④ "SR" 94+80.000 (34.967 m RT.) — INSTALL STRAW BALE CHECK DAM. CONSTRUCTION PHASE 3. SEE DETAIL SHEET D-20.

LEGEND:

□ INDICATES EXISTING DRAINAGE FACILITY

○ INDICATES PROPOSED DRAINAGE FACILITY

◇ INDICATES EROSION CONTROL DEVICE

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

GRADING DRAINAGE AND EROSION CONTROL PLANS

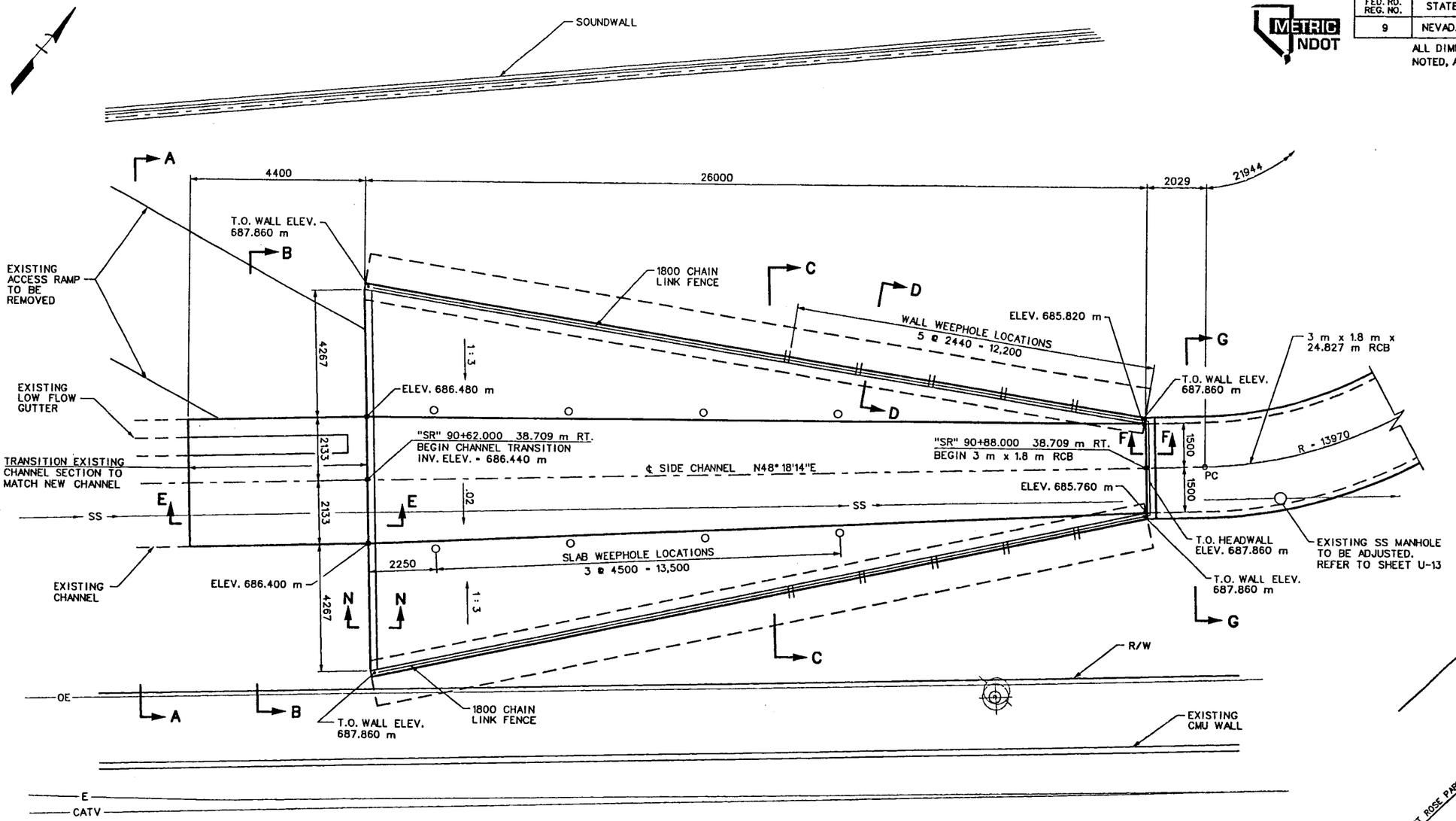
HDR Engineering, Inc.

DESIGNED BY: JE, JD
DRAWN BY: JD, GRH
CHECKED BY:
PROJECT No: PL-STP-MG-0146(002)

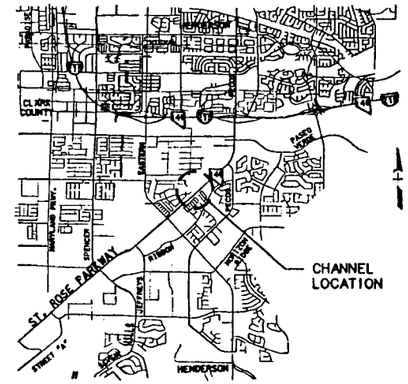
FILE: p:\d...\Addendum\d12.dgn
DATE: 19-No... 08:40

FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-25

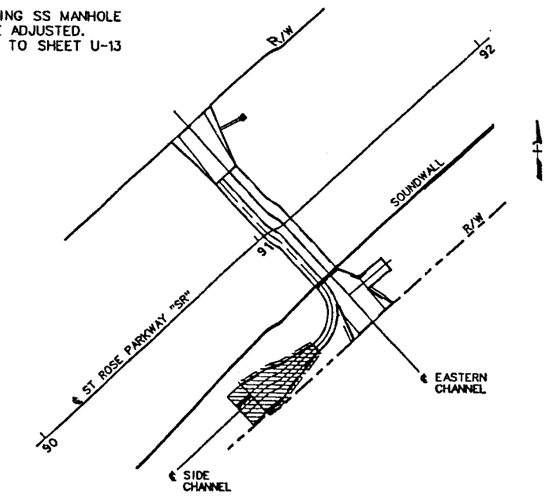
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.



SIDE CHANNEL PLAN



LOCATION MAP



KEY PLAN

GENERAL NOTES:

1. DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" 1996 WITH INTERIM SPECIFICATIONS THROUGH 2001.
2. CONSTRUCTION SPECIFICATIONS: STATE OF NEVADA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION 2001". EXCEPT AS NOTED BELOW AND IN THE SPECIAL PROVISIONS FOR THIS CONTRACT.
3. CONCRETE: CONCRETE SHALL BE CLASS D MODIFIED (MAJOR) WITH fc'=28 MPa AT 28 DAYS. ONLY TYPE V CEMENT SHALL BE USED FOR CONCRETE IN CONTACT WITH SOIL.
4. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615M GRADE 420 OR ASTM A706M. DIMENSIONS RELATING TO BAR SPACING ARE CENTER TO CENTER. BENDING DIMENSIONS ARE FROM OUT TO OUT OF BARS. THE FIRST TWO DIGITS OF THE BAR MARK INDICATE THE METRIC BAR SIZE. ANY ADJUSTMENTS TO REINFORCING STEEL LENGTHS OR SPACING MUST BE APPROVED BY THE ENGINEER.
5. INCIDENTAL ITEMS: ALL ITEMS SHOWN OR NOTED ON THE PLANS WHICH ARE NOT SPECIFICALLY BID ITEMS ARE CONSIDERED INCIDENTAL ITEMS. THE COST OF FURNISHING AND INSTALLING ALL SUCH ITEMS WILL NOT BE PAID FOR DIRECTLY, BUT SHALL BE INCLUDED IN THE UNIT PRICE BID FOR OTHER ITEMS, UNLESS NOTED OTHERWISE.
6. SEE NDOT STANDARD PLAN R-1.1.3 (206,207) "STRUCTURE EXCAVATION AND BACKFILL (METHOD OF MEASUREMENT)" FOR GENERAL NOTES AND OTHER INFORMATION NOT SHOWN.

PROFESSIONAL ENGINEER-STATE OF NEVADA
DAVID W. SEEKEY
CIVIL
No. 11751
EXP. 06/30/03
11/12/02

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

SIDE CHANNEL PLAN

R2H ENGINEERING, INC
CONSULTING STRUCTURAL ENGINEERS

DESIGN BY	DWS
DRAWN BY	VC
CHECKED BY	DWS
PROJECT NO	99098

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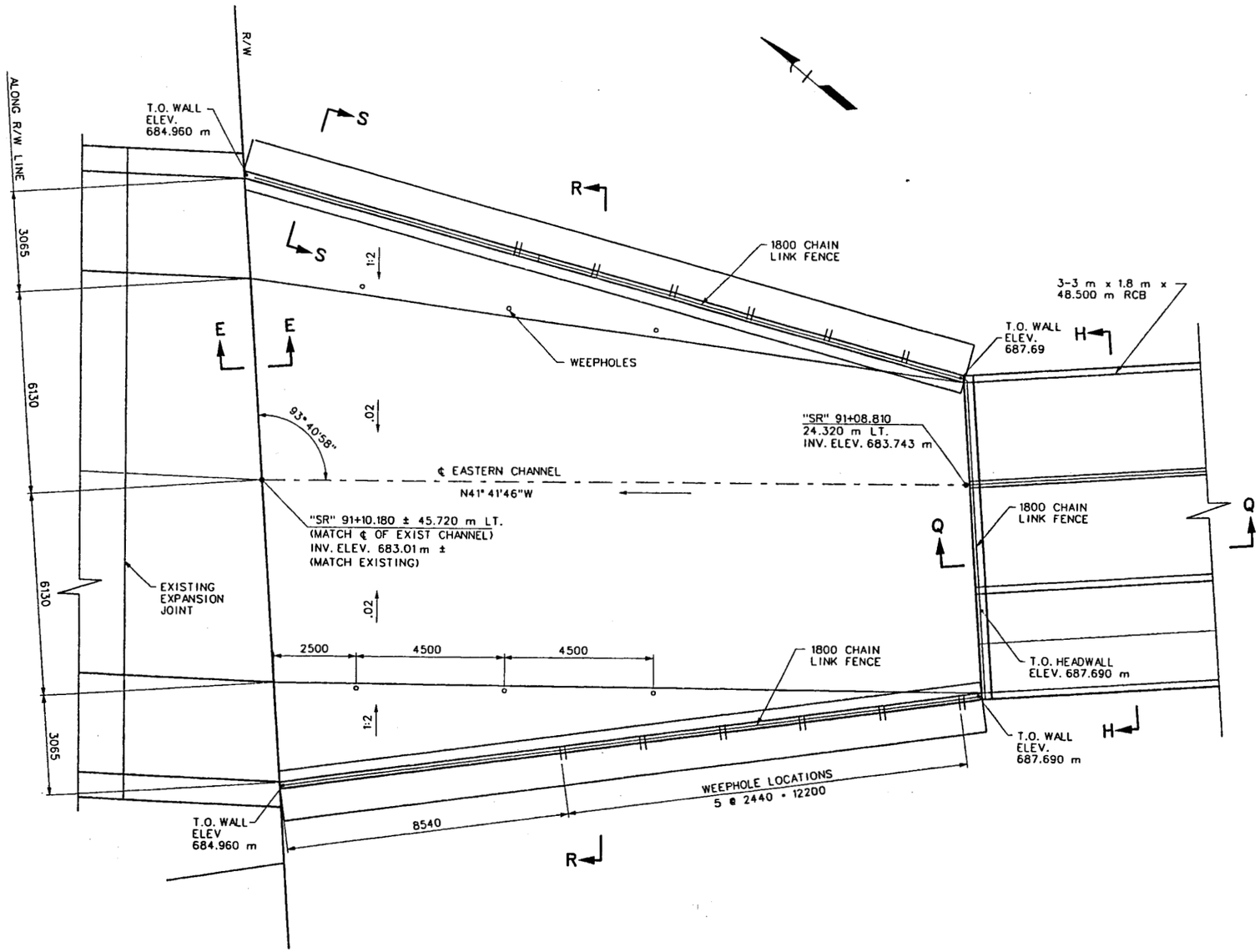
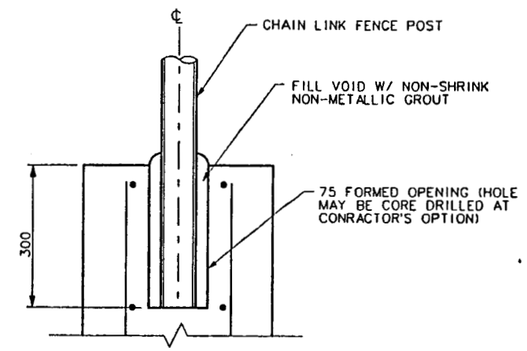
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-27

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.



EASTERN CHANNEL DOWNSTREAM TRANSITION PLAN



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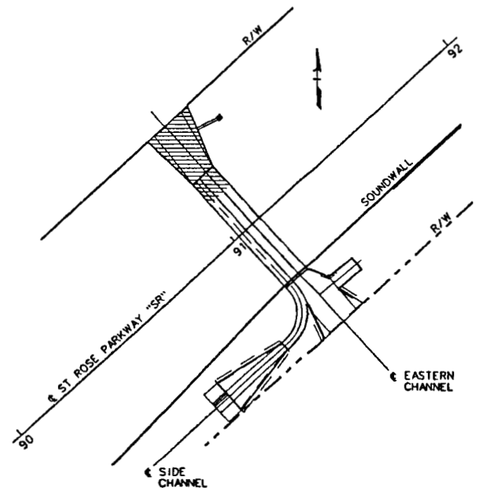

KEY PLAN

PROFESSIONAL ENGINEER-STATE OF NEVADA
DAVID W. SEELEY
No. 11751
EXP. 06/30/03
8/16/02

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

EASTERN CHANNEL
DOWNSTREAM TRANSITION PLAN

R2H ENGINEERING, INC
CONSULTING STRUCTURAL ENGINEERS

DESIGN BY	DWS
DRAWN BY	MC
CHECKED BY	
PROJECT NO	99098

16 AUG 2002 08:42:52
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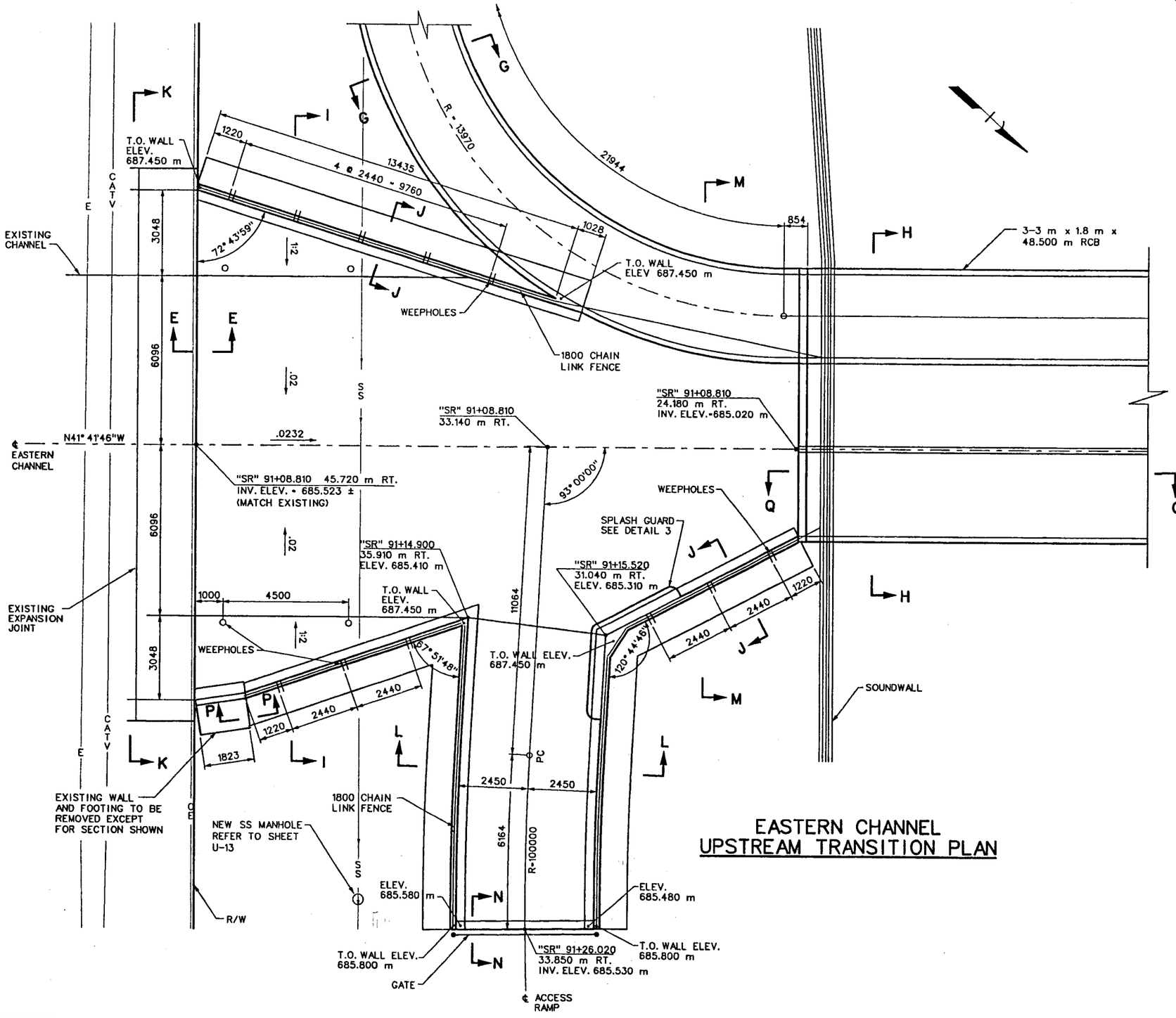
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-26

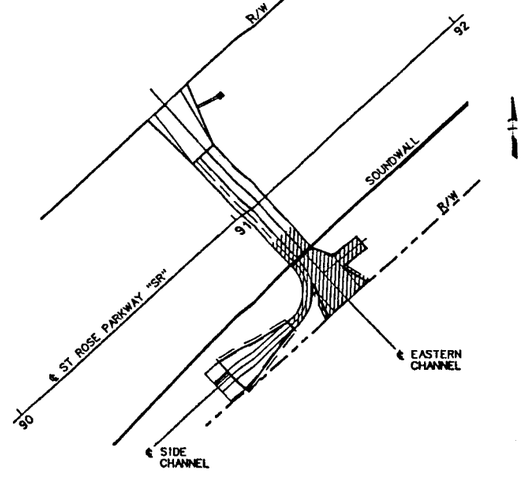
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.



EASTERN CHANNEL UPSTREAM TRANSITION PLAN

QUANTITIES

ITEM NO.	ITEM DESCRIPTION	UNIT	TOTAL
206.2000	STRUCTURE EXCAVATION	CUM	1473
207.2004	GRANULAR BACKFILL	CUM	2067
502.2352	CLASS D CONCRETE, MODIFIED (MAJOR)	CUM	700
505.2000	REINFORCING STEEL	KG	66447
505.2002	REINFORCING STEEL (DOWELED)	KG	113
616.2200	1800 mm CHAIN LINK FENCE	LIN. M	184
616.2316	4.8 METER SWING GATE (DOUBLE)	EA	1



KEY PLAN

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

EASTERN CHANNEL
UPSTREAM TRANSITION PLAN

PROFESSIONAL ENGINEER-STATE OF NEVADA DAVID W. SEELEY No. 11751
EXP. 06/30/03
11/12/02

R2H ENGINEERING, INC
CONSULTING STRUCTURAL ENGINEERS

DESIGN BY	DWS
DRAWN BY	VC
CHECKED BY	DWS
PROJECT NO	99098

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FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-28

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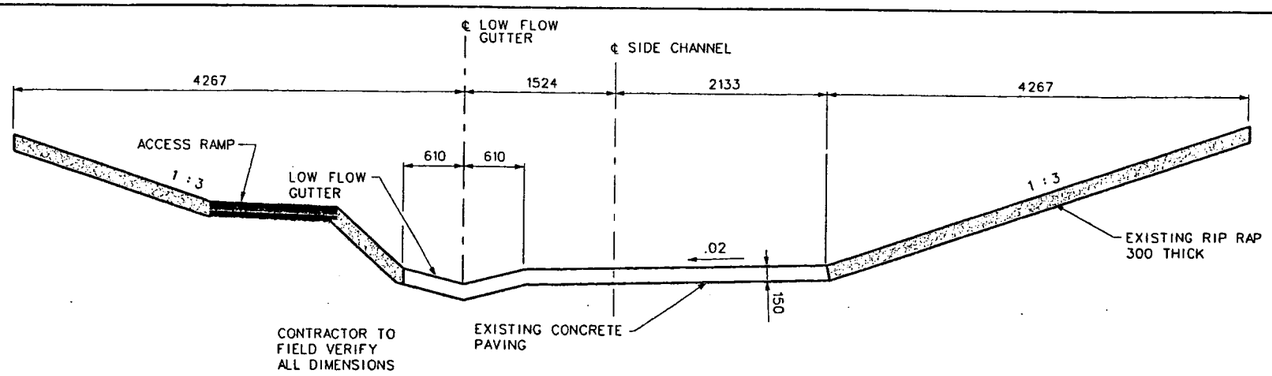
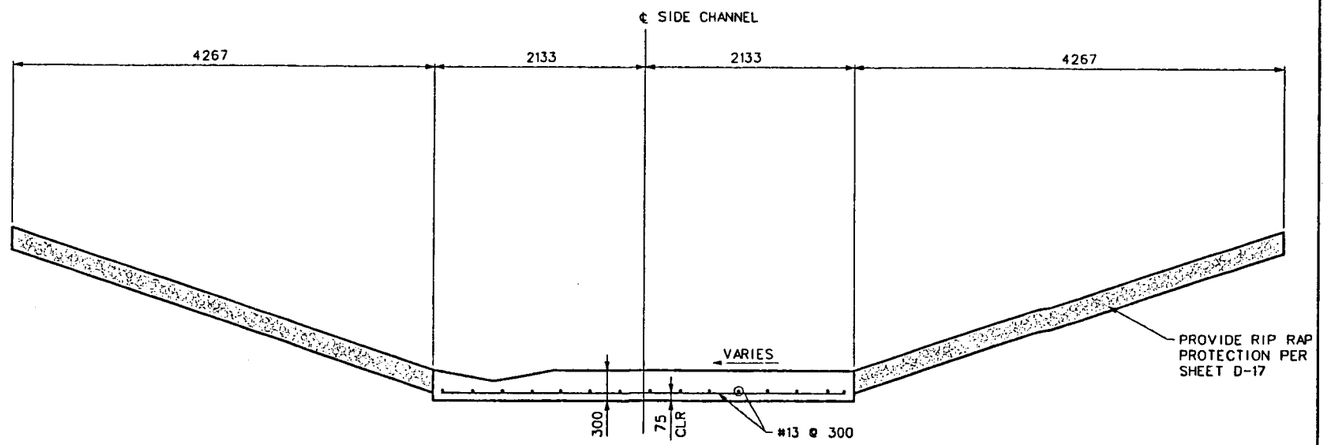
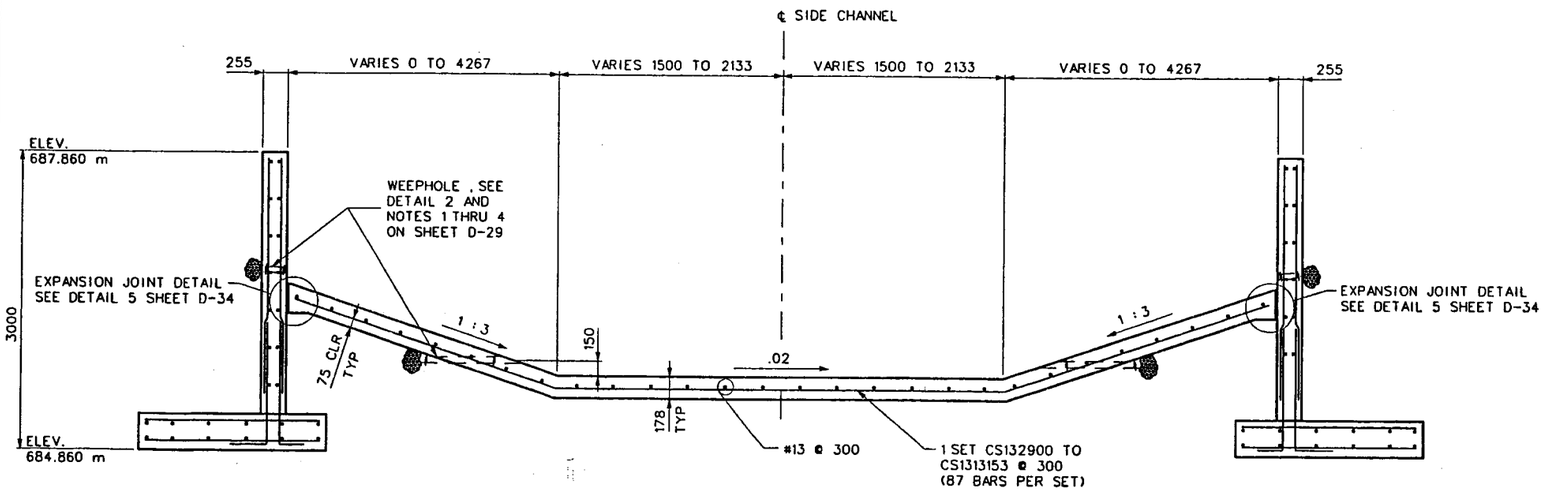


EXISTING CHANNEL SECTION A-A



CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS

SECTION B-B



SECTION C-C

MIN BAR LAPS

#13 TO #13 BARS = 510

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

CHANNEL SECTIONS

PROFESSIONAL ENGINEER-STATE OF NEVADA
DAVID W. SEELEY
No. 11751
EXP. 06/30/03
8/16/02

R2H ENGINEERING, INC
CONSULTING STRUCTURAL ENGINEERS

DESIGN BY	DWS
DRAWN BY	VC
CHECKED BY	DWS
PROJECT NO	99098

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16 AUG 2002
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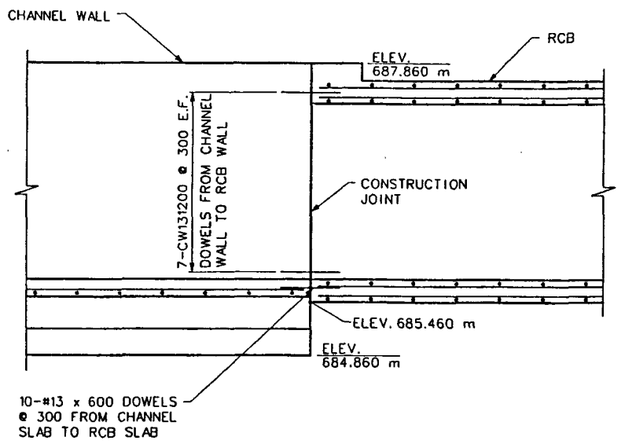
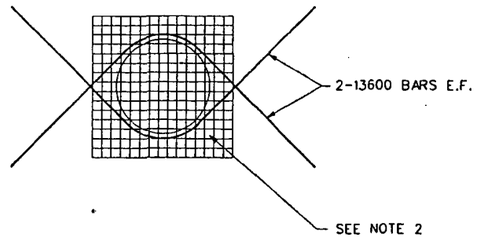
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-29

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.



SECTION F-F



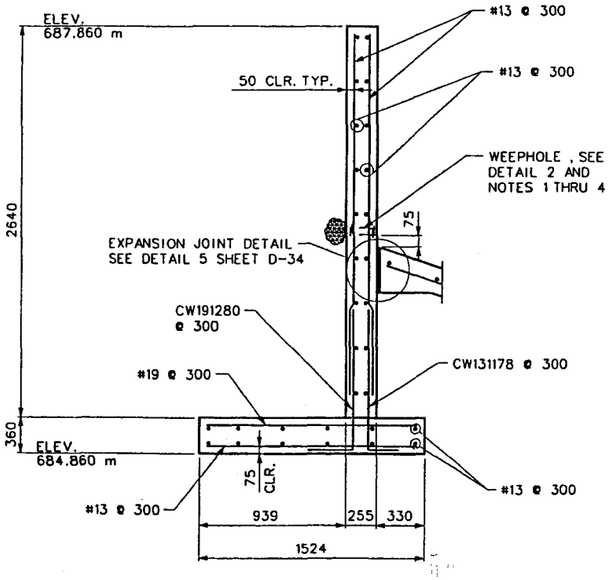
DETAIL 2

NOTES:

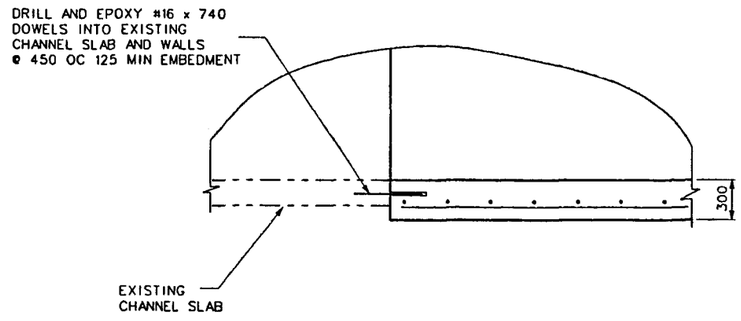
1. 75mm DIA DRAINS LOCATED AS SHOWN ON PLANS
2. 150mm SQUARE ALUMINUM OR GALVANIZED STEEL WIRE MESH HARDWARE CLOTH WITH A MINIMUM WIRE DIA .75mm
3. PLACE .06cum OF NDOT TYPE 1 OR 2 DRAIN BACKFILL, ENCAPSULATED IN A GEOTEXTILE FABRIC, SECURELY TIED. THE GEOTEXTILE FABRIC MUST:
   a) MEET OR EXCEED AASHTO TEST METHOD M288 CLASS 2 STRENGTH REQUIREMENTS.
   b) HAVE AN AOS NO GREATER THAN U.S. SIEVE NO. 40.
   c) HAVE A PERMITTIVITY OF AT LEAST 0.5 SEC^{-1}.
4. NO DIRECT PAYMENT WILL BE MADE FOR THE CONSTRUCTION OF WEEPHOLES.

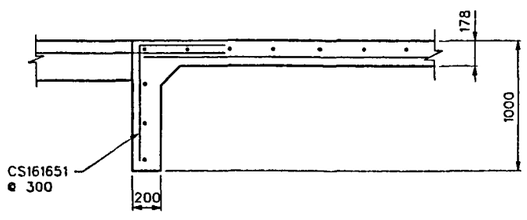
MIN BAR LAPS

#13 TO #13 BARS • 510
#13 TO #19 BARS • 510



WALL SECTION D-D





CUTOFF WALL SECTION E-E

PROFESSIONAL ENGINEER-STATE OF NEVADA
DAVID W. SEELEY
No. 11751
EXP. 06/30/03
8/16/02

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
ST. ROSE PARKWAY (SR 146) WIDENING

CHANNEL SECTIONS

R2H ENGINEERING, INC
CONSULTING STRUCTURAL ENGINEERS

DESIGN BY	DWS
DRAWN BY	VC
CHECKED BY	DWS
PROJECT NO	99098

16 AUG 2002 08:43:09
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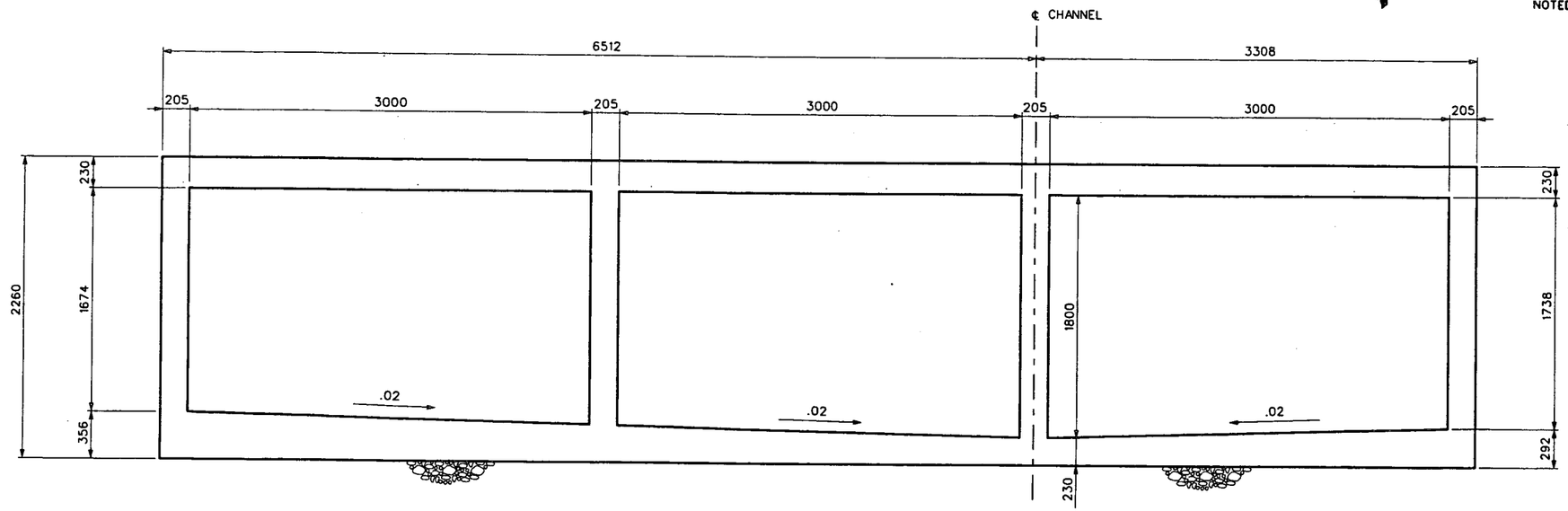
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-30

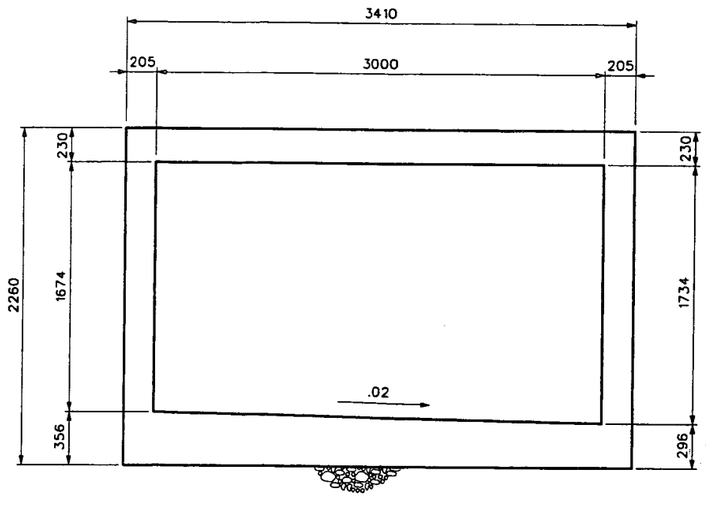
METRIC NDOT

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.



TRIPLE 3 m x 1.8 m RCB SECTION H-H

REINFORCEMENT PER NDOT STANDARD
DWG B-20.1.3 (502) AND B-20.1.3.1 (502)



TRIPLE 3 m x 1.8 m RCB SECTION G-G

REINFORCEMENT PER NDOT STANDARD DWG B-20.1.2 (502)

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PROFESSIONAL ENGINEER-STATE OF NEVADA
DAVID W. SEELEY
No. 11751
EXP. 06/30/03
8/16/02

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

ST. ROSE PARKWAY (SR 146) WIDENING

CHANNEL SECTIONS

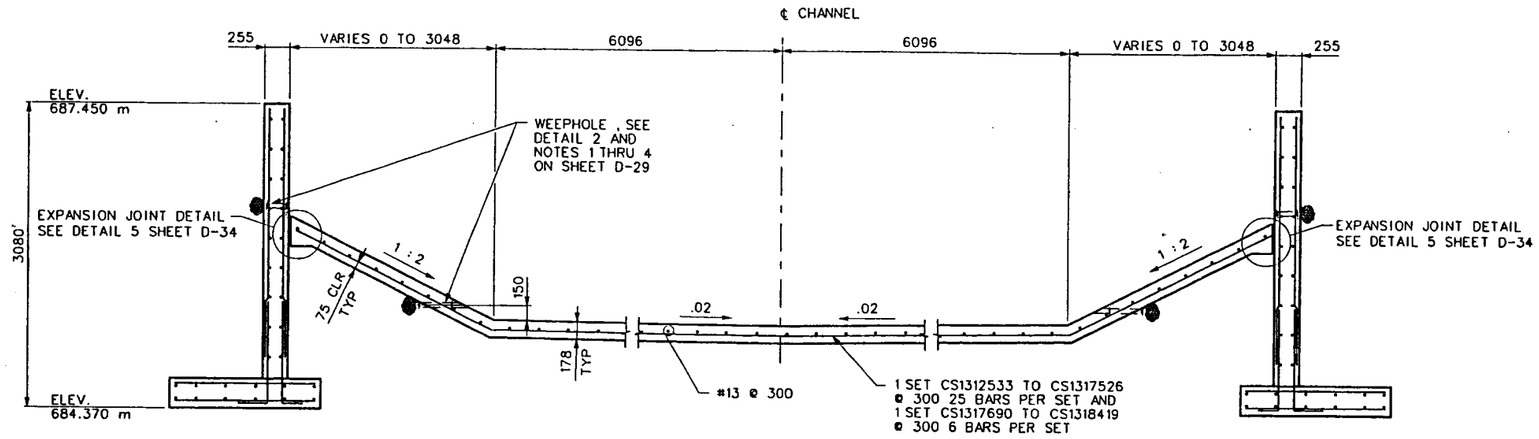
R2H ENGINEERING, INC
CONSULTING STRUCTURAL ENGINEERS

DESIGN BY	DWS
DRAWN BY	VC
CHECKED BY	CRD
PROJECT NO	99098

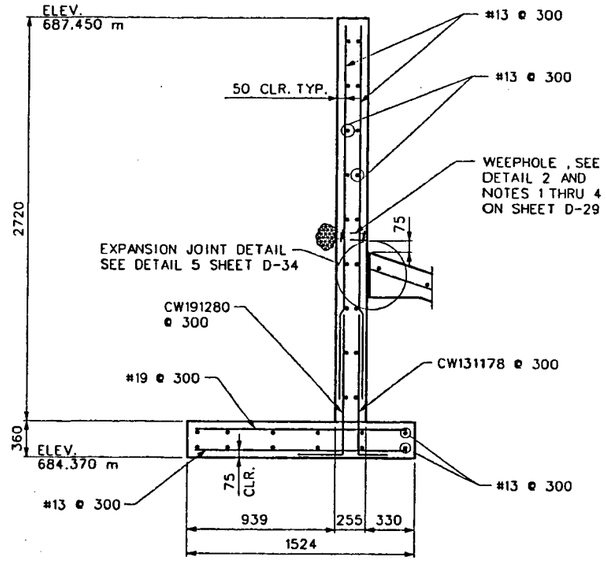
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA	PL-STP-MG-0146(002)	CLARK	D-31

METRIC NDOT

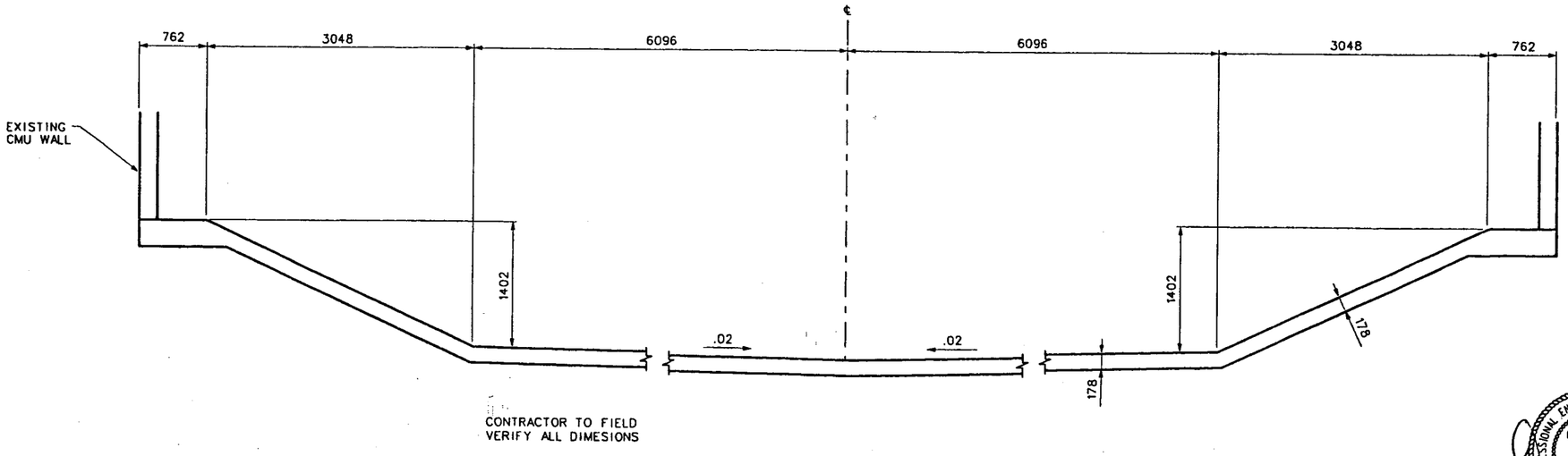
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED, ALL STATIONS ARE IN METERS.



CHANNEL SECTIONS 1-1
MAIN CHANNEL UPSTREAM



WALL SECTION J-J



EXISTING CHANNEL SECTION K-K

MIN BAR LAPS

#13 TO #13 BARS - 510
#13 TO #19 BARS - 510

PROFESSIONAL ENGINEER - STATE OF NEVADA
DAVID W. SEELEY
No. 11751
EXP. 06/30/03
8/16/02

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
ST. ROSE PARKWAY (SR 146) WIDENING

CHANNEL SECTIONS

R2H ENGINEERING, INC
CONSULTING STRUCTURAL ENGINEERS

DESIGN BY	DWS
DRAWN BY	VC
CHECKED BY	CRM
PROJECT NO	99098

16 AUG 2002 08:43:27
p:\99098\Dwg\99098-D31.dgn

SOUTH HALF

Southfork Pointe Channel Improvement Plans
Northwest Corner of Eastern Ave and St. Rose Parkway

ST. ROSE PKWY

JEFFREYS STREET

SWPPP 50' WIDE

SECTION LINE

50' SWPPP ESMT

EX. TRANSITION TO BE REMOVED

EX. 30' W. CONCRETE CHANNEL

PROPOSED DRAINAGE EASEMENT (WIDTH VARIES)

GRAPHIC SCALE

N

VICINITY MAP
NOT TO SCALE

VIENO CANYON
MARYLAND PARKWAY
SILVERADO RANCH
SPENCER
JAVE
JEFFREYS
EASTERN
HORIZON RIDGE
SERENE
SITE

REAL ESTATE MANAGER: JACK MANDEL
DATE DRAWING STARTED: JANUARY 2002

CHANNEL IMPROVEMENT PLAN

SOUTHFORK POINTE

CITY OF HENDERSON NEVADA

PROJECT No. 02-605 | DRAWN BY: MJK | CHECKED BY:

LOWE'S
ENGINEERING AND CONSTRUCTION
1530 FARADAY AVE. SUITE 140 CARLSBAD CA 92008
760.804.5300 (V) 760.602.1018 (F)

EN Engineers
Planners
Surveyors
245 East Warm Springs Road, Suite 100
Las Vegas, NV. 89119 (702) 866-6804

ORIGINAL ESTATE DATE: 09-25-02
PERMIT SET ESTATE DATE:
CONSTRUCTION SET ESTATE DATE:
DRAWING NUMBER:

1 of 4

Dwg. 12/31/2003

SEAL

REVISIONS
DATE | DESCRIPTION

LOWE'S HIW, INC.

BENCHMARK

CITY OF HENDERSON
BM # 205
BRASS CAP IN THE TOP OF CURB ON THE SOUTHEAST CORNER OF WHITNEY RANCH DRIVE AND RUSSELL ROAD.
(STAMPED C.O.H. BM)

ELEVATION=521.618 METERS (NAVD '88)
1711.34 FEET

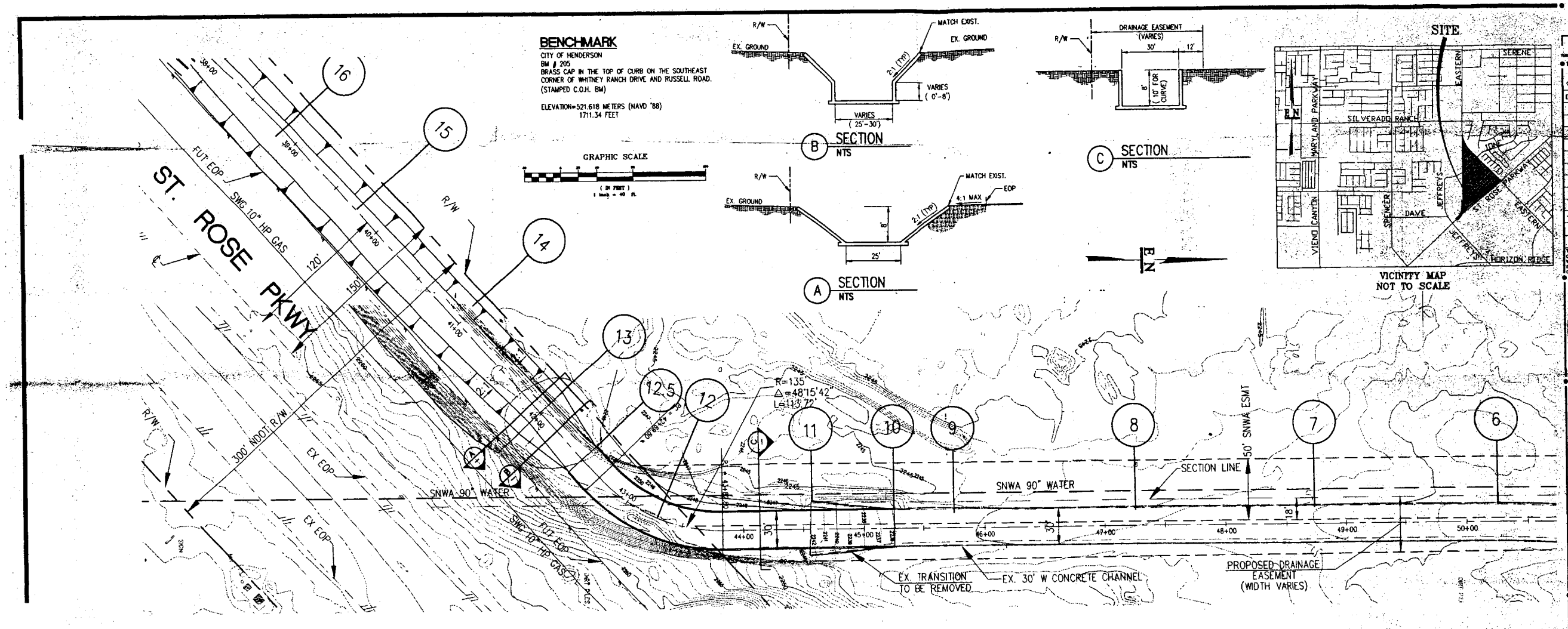
GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.

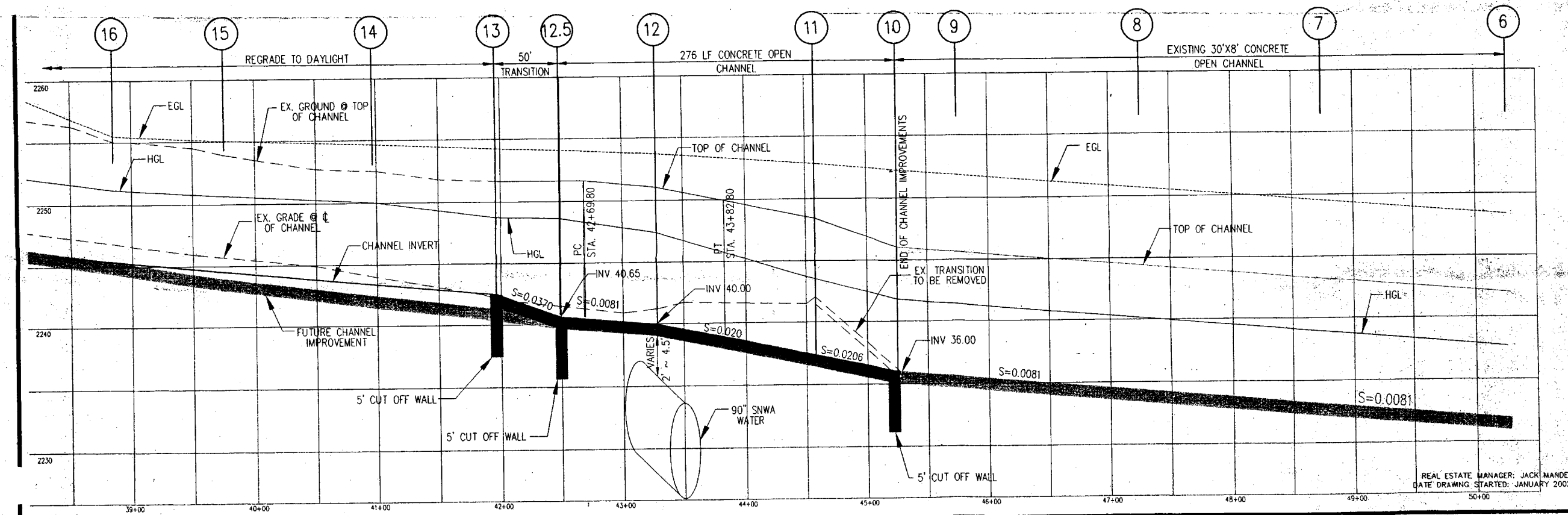
B SECTION
NTS

C SECTION
NTS

A SECTION
NTS

VICINITY MAP
NOT TO SCALE





LOWE'S HIW, INC.
1530 FARADAY AVE, SUITE 140 CARLSBAD CA 92008

REVISIONS
◇ PRE-BID SET ISSUE DATE △ POST BID SET ISSUE DATE

DATE	DESCRIPTION

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PROFESSIONAL ENGINEER STATE OF NEVADA
SHIMIN LUO
CIVIL
No. 14655
9/24/02
EXP: 12/31/2003

EN
Engineers
Planners
Surveyors
245 East Warm Springs Road, Suite 100
Las Vegas, NV. 89119 (702) 866-8604

LOWE'S
ENGINEERING AND CONSTRUCTION
1530 FARADAY AVE, SUITE 140 CARLSBAD CA 92008
760.804.5300 (V) 760.602.1018 (F)

CHANNEL IMPROVEMENT PLAN

SOUTHFORK POINTE
NEVADA

CITY OF HENDERSON
PROJECT NO: 01-005
DRAWN BY: MJK CHECKED BY: SL

ORIGINAL ISSUE DATE: 09-25-02
PERMIT SET ISSUE DATE:
CONSTRUCTION SET ISSUE DATE:
DRAWING NUMBER:

1 OF 1

GENERAL STRUCTURAL NOTES

A. GENERAL REQUIREMENTS

1. THESE DRAWINGS HAVE BEEN PREPARED USING STANDARDS OF PROFESSIONAL CARE AND COMPLETENESS NORMALLY EXERCISED UNDER SIMILAR CIRCUMSTANCES BY REPUTABLE STRUCTURAL ENGINEERS IN THIS OR SIMILAR LOCALITIES. THEY ASSUME THAT THE WORK DEPICTED WILL BE PERFORMED BY AN EXPERIENCED CONTRACTOR AND/OR WORKMEN WHO HAVE A WORKING KNOWLEDGE OF THE APPLICABLE CODE STANDARDS AND REQUIREMENTS AND OF INDUSTRY ACCEPTED STANDARD GOOD PRACTICE. AS NOT EVERY CONDITION OR ELEMENT IS (OR CAN BE) EXPLICITLY SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL USE INDUSTRY ACCEPTED STANDARD GOOD PRACTICE FOR MISCELLANEOUS WORK NOT EXPLICITLY SHOWN.
2. THESE DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, PROCEDURES, LAGGING, SHORING, BRACING, FORM-WORK, ETC. AS REQUIRED FOR THE PROTECTION OF LIFE AND PROPERTY DURING CONSTRUCTION. CONSTRUCTION MATERIALS SHALL BE UNIFORMLY SPREAD OUT SUCH THAT DESIGN LIVE LOAD PER SQUARE FOOT AS NOTED HEREIN IS NOT EXCEEDED.
3. VERIFY ALL DIMENSIONS, CONDITIONS AND ELEVATIONS. RESOLVE ANY DISCREPANCIES PRIOR TO START OF CONSTRUCTION.
4. NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS.
5. ALL INSPECTIONS REQUIRED BY THE BUILDING CODES, THESE GENERAL NOTES AND/OR BY THESE PLANS SHALL BE PROVIDED BY AN INDEPENDENT INSPECTION COMPANY OR THE BUILDING DEPARTMENT. SITE VISITS BY THE ENGINEER DO NOT CONSTITUTE AN INSPECTION.

B. BASIS FOR DESIGN

1. CODE: AASHTO 1996, ACI 318-99
2. DEAD LOAD: STRUCTURE SELF WEIGHT CONCRETE = 150 pcf
   SOIL BACKFILL = 110 pcf

C. FOUNDATION

1. SITE PREPARATION, GRADING, TESTS, INSPECTIONS, FIELD OBSERVATIONS, OR APPROVAL FROM THE GEOTECHNICAL ENGINEER RECOMMENDED BY THE GEOTECHNICAL REPORT AND ANY ADDENDA SHALL BE COMPLETED PRIOR TO CONSTRUCTION OF FOUNDATIONS.
2. ASSUMED ALLOWABLE SOIL BEARING PRESSURE: 2000 psf

E. CONCRETE

1. MIN 28 DAY COMPRESSIVE STRENGTH, f'c, SHALL BE 4500 psi FOR ALL CONCRETE. MAX WATER/CEMENT RATIO FOR CONCRETE IN CONTACT W/ SOIL SHALL BE 0.45
2. CEMENT SHALL BE TYPE V.
3. ALL CONCRETE SHALL BE NORMAL WEIGHT USING HARDROCK AGGREGATES.
4. MECHANICALLY VIBRATE CONCRETE IN ALL CUT-OFF WALLS AND FOOTINGS. REMOVE ALL DEBRIS FROM FORMS BEFORE PLACING CONCRETE. CONCRETE SHALL NOT BE DROPPED THROUGH REINFORCING STEEL SO AS TO CAUSE SEGREGATION OF AGGREGATES. UNCONFINED FALL OF CONCRETE SHALL NOT EXCEED 5 FEET.
5. ALL ITEMS TO BE CAST IN CONCRETE SUCH AS REINFORCING, DOWELS, BOLTS, ANCHORS, SLEEVES, ETC., SHALL BE SECURELY POSITIONED PRIOR TO CONCRETE PLACEMENT.

F. REINFORCING STEEL

1. REINFORCING STEEL SHALL CONFORM TO REQUIREMENTS OF ASTM A615, GRADE 60 (FY = 60 KSI) DEFORMED BARS.
2. ALL DIMENSIONS SHOWING THE LOCATION OF REINFORCING STEEL NOT NOTED AS "CLEAR" OR "CLR" ARE TO CENTER OF STEEL. MIN. COVER FOR REINFORCING SHALL BE AS FOLLOWS, U.N.O. ON PLAN OR DETAILS:

EXPOSURE CONDITION	MINIMUM COVER	TOLERANCE (+/-)
CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH:	3"	3/8"
EXPOSED TO EARTH OR WEATHER: NO. 5 AND SMALLER:	1 1/2"	3/8"
NO. 6 AND LARGER:	2"	3/8"

3. LAP SPLICES OF REINFORCING STEEL IN CONCRETE SHELLS, BEAMS, SLABS AND FOOTINGS SHALL BE ACCORDING TO THE LAP SCHEDULE BELOW. STAGGER SPLICES A MIN. OF ONE LAP LENGTH. CONTACT LAP SPLICES MAY BE USED PROVIDED ADEQUATE ENCASEMENT OF THE BARS AT THE SPLICE CAN BE ACHIEVED. NOT MORE THAN 1/3 OF THE REINFORCEMENT SHALL BE SPLICED AT ANY LOCATION. WHERE THIS CANNOT BE AVOIDED, INCREASE LAP SPLICE LENGTH BY 1.1 TIMES.

REBAR LAP SCHEDULE

BAR	LAP	1.1 LAP
#3	18"	21"
#4	24"	31"
#5	23"	39"
#6	28"	48"
#7	36"	62"
#8	47"	80"
#9	59"	101"
#10	75"	128"
#11	92"	157"

4. ALL REINFORCING SHALL BE BENT COLD. BARS SHALL NOT BE UNBENT AND RE-BENT EXCEPT AS NOTED ON PLAN. FIELD BENDING OF REBAR SHALL NOT BE ALLOWED EXCEPT AS NOTED ON PLAN. BENDS AND HOOKS SHALL CONFORM TO ACI STANDARD 315-80.
5. REINFORCING BAR SPACING SHOWN ON PLANS ARE MAX. ON CENTERS. DOWEL ALL VERT. REINFORCING TO FOUNDATION. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE. PROVIDE SUFFICIENT CLEARANCE BETWEEN BARS TO ALLOW ADEQUATE ENCASEMENT OF THE BARS.

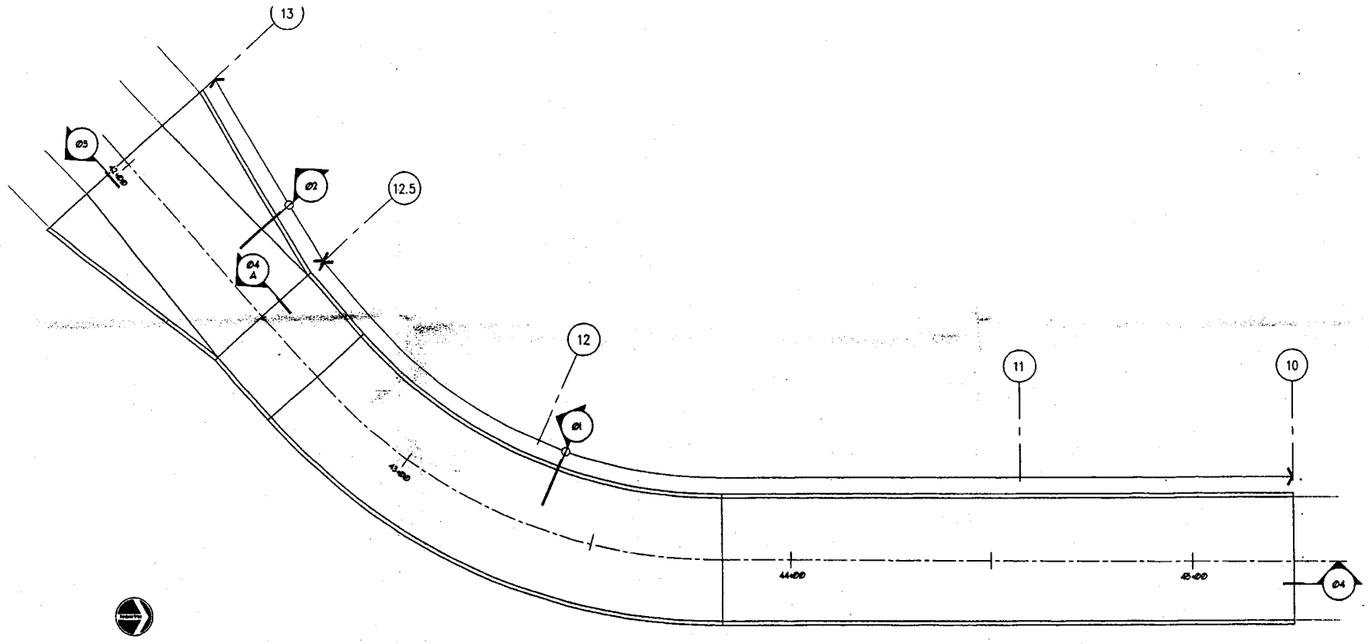
G. SPECIAL INSPECTIONS

1. THE OWNER SHALL EMPLOY ONE OR MORE SPECIAL INSPECTORS WHO SHALL PROVIDE INSPECTIONS DURING CONSTRUCTION FOR THE FOLLOWING TYPES OF WORK:

   1.1. DURING THE PLACING OF REINFORCING STEEL FOR ALL CONCRETE REQUIRED TO HAVE SPECIAL INSPECTION. THE INSPECTOR NEED NOT BE PRESENT DURING THE ENTIRE REINFORCING STEEL PLACING OPERATIONS

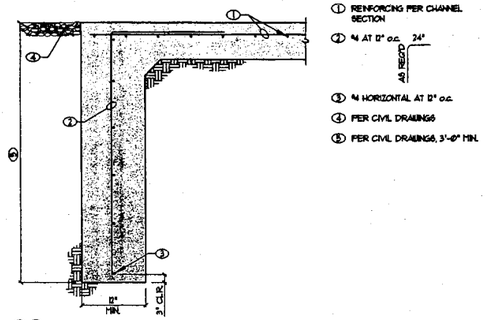
   1.2. DURING THE PLACING OF CONCRETE

2. THE SPECIAL INSPECTOR SHALL INSPECT THE WORK FOR CONFORMANCE TO THE MOST CURRENT APPROVED CONTRACT DOCUMENTS (NOT SHOP DRAWINGS) AND SHALL SUBMIT INSPECTION REPORTS INDICATING WHETHER THE WORK REQUIRING SPECIAL INSPECTION WAS, TO THE BEST OF THE INSPECTORS KNOWLEDGE, IN CONFORMANCE WITH THE APPROVED PLANS AND SPECS AND THE APPLICABLE CODE PROVISIONS.



PLAN VIEW

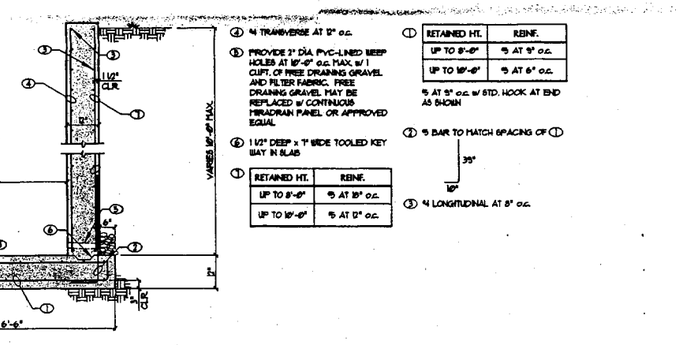
SCALE: 1/16" = 1'-0"



① REINFORCING PER CHANNEL SECTION
② #4 AT 12" o.c. 24" AS REQ'D
③ #4 HORIZONTAL AT 12" o.c.
④ PER CIVIL DRAWINGS
⑤ PER CIVIL DRAWINGS, 3'-0" MIN.

03 TYPICAL CUT-OFF WALL

03-22488 NO SCALE



④ #4 TRANSVERSE AT 12" o.c.
⑤ PROVIDE 3" DIA. PVC-LINED WEEP HOLES AT 10'-0" o.c. MAX. W/ 1 CU.FT. OF FREE DRAINING GRAVEL AND FILTER FABRIC. FREE DRAINING GRAVEL MAY BE REPLACED W/ CONTINUOUS MIRADRAIN PANEL OR APPROVED EQUAL
⑥ 1 1/2" DEEP x 7" WIDE TOOLED KEY WAY IN SLAB

① (RETAINED HT. / REINF.)

RETAINED HT.	REINF.
UP TO 8'-0"	#5 AT 18" o.c.
UP TO 10'-0"	#5 AT 12" o.c.

① (RETAINED HT. / REINF.)

RETAINED HT.	REINF.
UP TO 8'-0"	#5 AT 9" o.c.
UP TO 10'-0"	#5 AT 6" o.c.

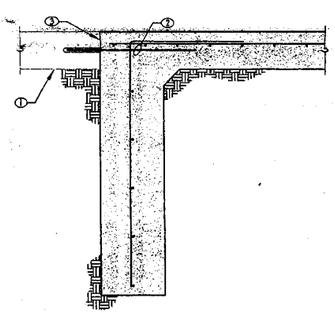
#5 AT 5" o.c. w/ STD. HOOK AT END AS SHOWN

② #5 BAR TO MATCH SPACING OF ①

③ #4 LONGITUDINAL AT 8" o.c.

01 RECTANGULAR SECTION - 10'-0" RETAINING HEIGHT MAX.

01-22488 NO SCALE

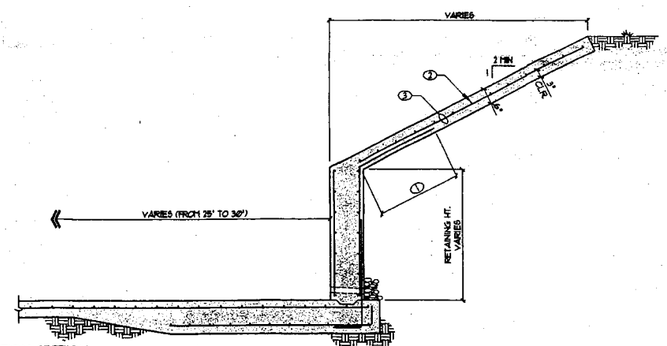


① EXISTING SLAB. CONTINUOUS AT SLAB AT A
② #4 x 24" DOWEL AT 12" o.c. w/ 8" EMBEDMENT INTO EXISTING SLAB. USE SIMPSON SET, HILTI HY-150 OR EQ. EPOXY. SPECIAL INSPECTION REQ. AT ALL EPOXY INSTALLATIONS. AT A, #4 x 30" AT 12" o.c. CENTERED ON CONSTRUCTION JOINT MAY BE USED IN LIEU OF EPOXY INSTALLATION
③ CONSTRUCTION JOINT AT A

A. REFER TO DETAIL Ø3 FOR INFORMATION SHOWN BUT NOT NOTED.

04 CUT-OFF WALL AT CONCRETE SLAB

04-22488 NO SCALE



① 30" MIN. LAP LENGTH. NOT REQUIRED WHERE REINFORCEMENT RUNS CONTINUOUS
② #4 AT 8" o.c.
③ #4 AT 12" o.c. NOT REQUIRED WHERE REINFORCEMENT RUNS CONTINUOUS FROM BELOW

A. REFER TO DETAIL Ø1 FOR INFORMATION SHOWN BUT NOT NOTED

02 TRANSITION SECTION

02-22488 NO SCALE

WRIGHT ENGINEERS

STATE OF NEVADA — PROFESSIONAL ENGINEER — JOSEPH L. WRIGHT — No. 10229 — OCT 23 2002

SOUTHFORK POINTE CHANNEL

City of Henderson, Nevada

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NUMBER	DATE	DESCRIPTION
△		

DATE: OCTOBER 23, 2002
DRAWN BY: CAS
CHECKED BY: LBW
PROJECT NO: SN22488

G.S.N., PLAN VIEW, AND SECTIONS

S1

WRIGHT STRUCTURAL ENGINEERS, INC 7310 SMOKE RANCH RD, SUITE F LAS VEGAS, NEVADA 89128 (702) 233-4455 FAX (702) 233-1164 WWW.WRIGHTENGINEERS.COM

Received 10/23/02 for D/S Add #1 02-41231

BENCHMARK

CITY OF HENDERSON
BM # 205
BRASS CAP IN THE TOP OF CURB ON THE SOUTHEAST CORNER OF WHITNEY RANCH DRIVE AND RUSSELL ROAD. (STAMPED C.O.H. BM)

ELEVATION=521.618 METERS (NAVD '88)
1711.34 FEET

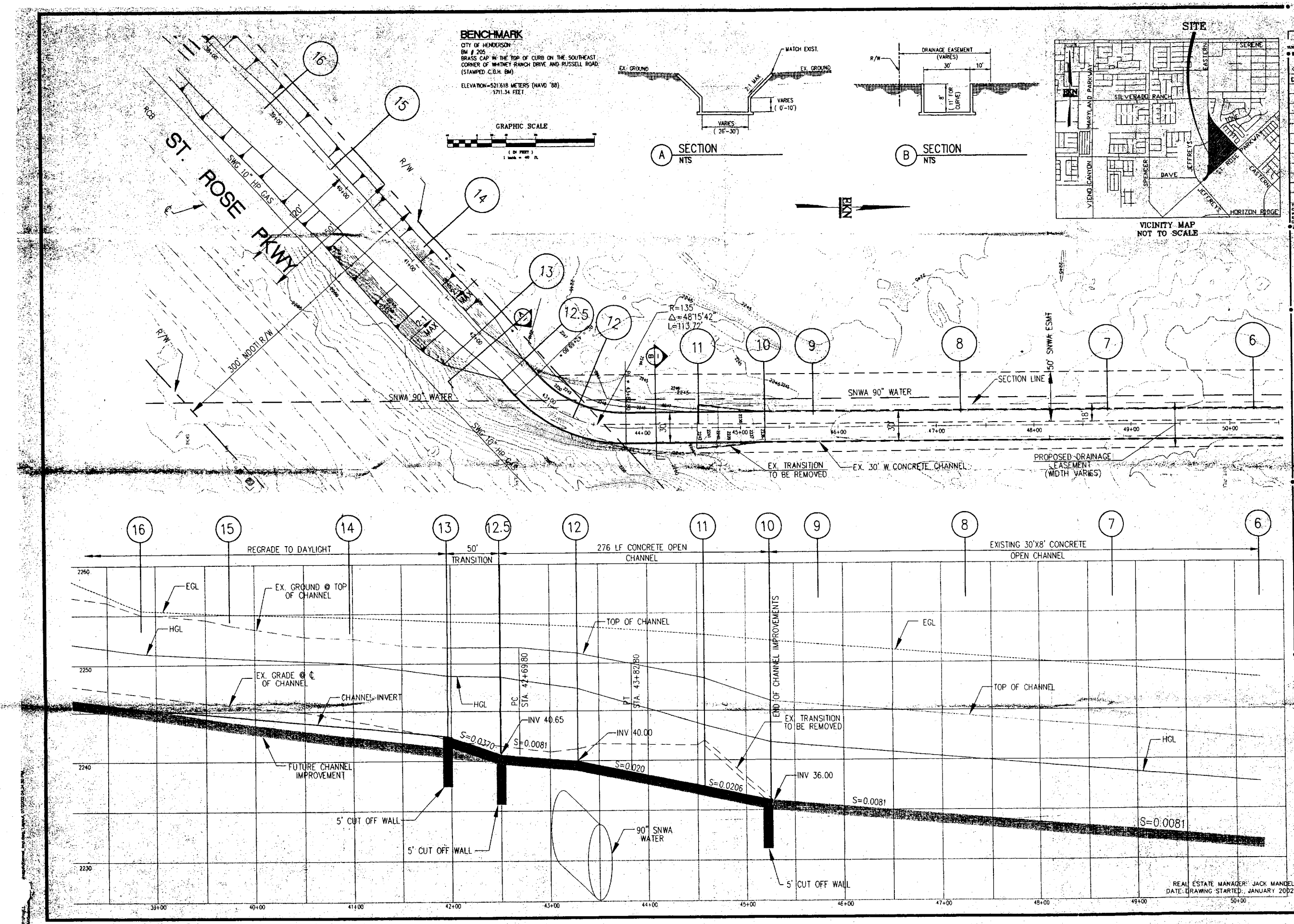
GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.

A SECTION
NTS

B SECTION
NTS

VICINITY MAP
NOT TO SCALE



REAL ESTATE MANAGER: JACK MANDEL
DATE: DRAWING STARTED: JANUARY 2002

LOWE'S HIW, INC.
10307 ARIZONA AVE., SUITE 140 CHINO, CA 91708

REVISIONS
◇ PRE-AND-POST ISSUE DATE △ ISSUE DATE

DATE	DESCRIPTION

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SEAL
PROFESSIONAL ENGINEER
SHIHSHIH LUO
CIVIL
No. 14695
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ENGINEERING, INC.
Engineers/Planners/Surveyors
TEL. (949) 660-1777 FAX (949) 660-0775
TEL. (702) 896-9494 FAX (702) 896-9497

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ENGINEERING AND CONSTRUCTION
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CHANNEL IMPROVEMENT PLAN

SOUTHFORK POINTE
CITY OF HENDERSON NEVADA
PROJECT No. 01-506 DRAWN BY: M.K. CHECKED BY: SL

ORIGINAL ISSUE DATE: 07-19-02
PERMIT SET ISSUE DATE:
CONSTRUCTION SET ISSUE DATE:
DRAWING NUMBER:

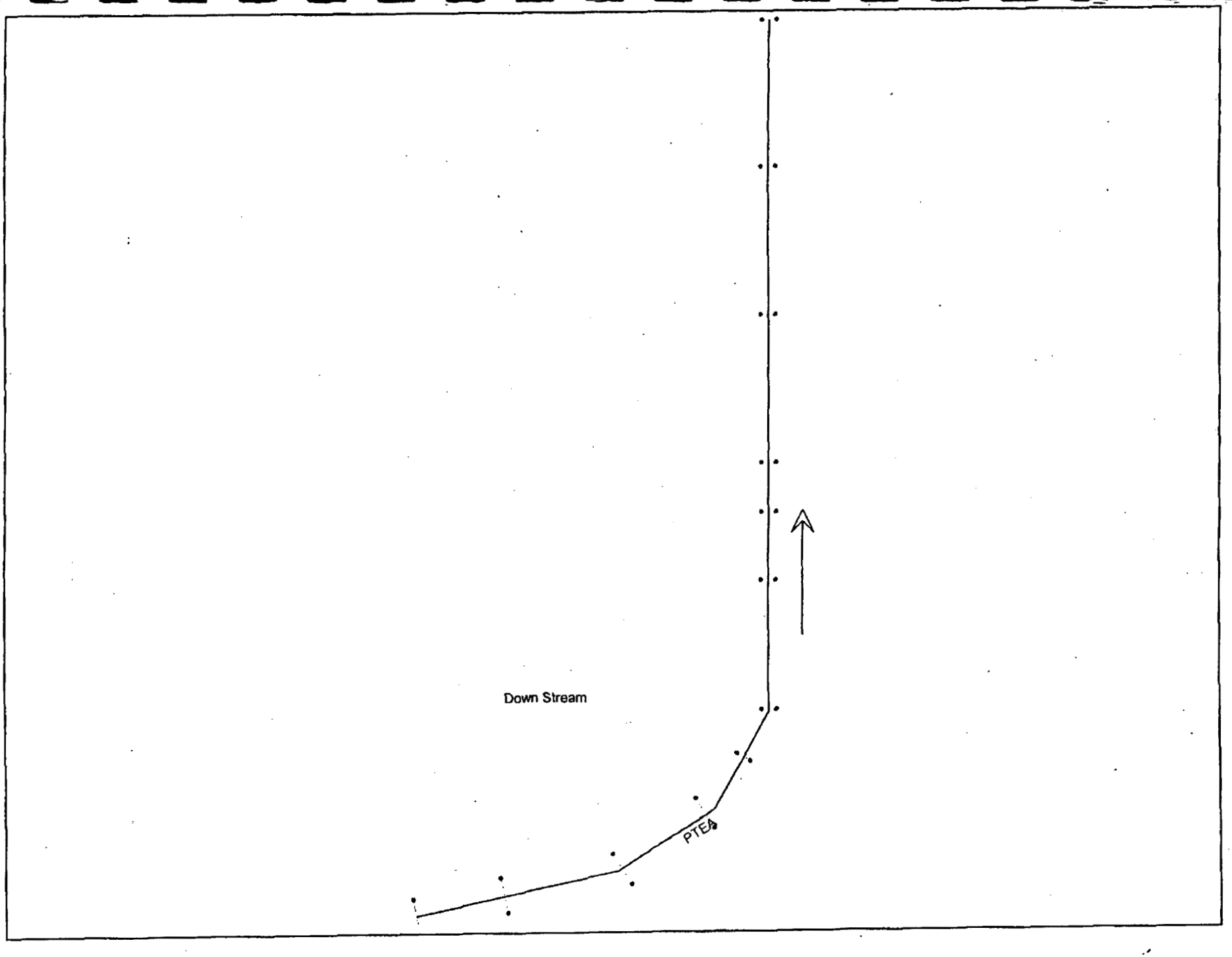
1 OF 1

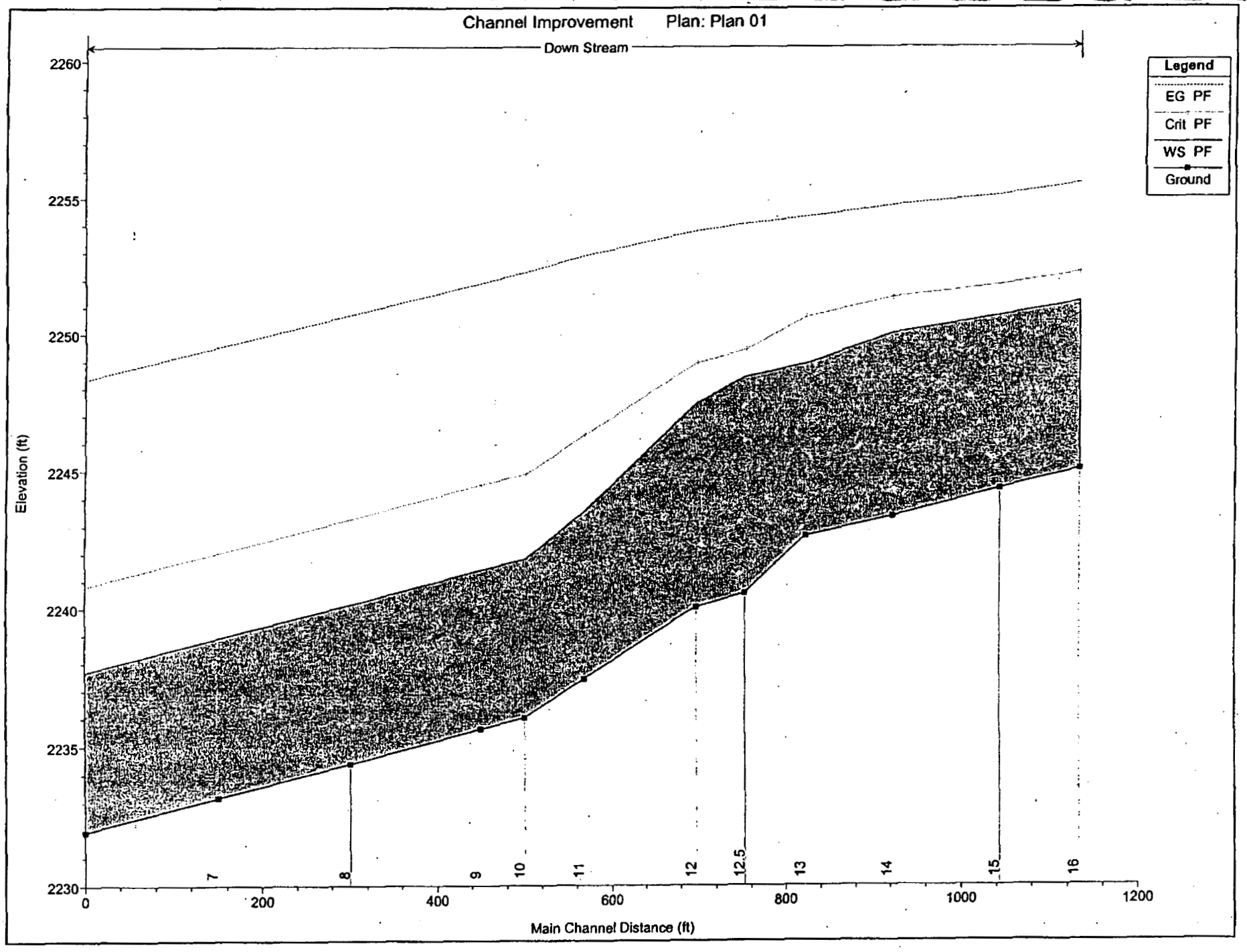
HEC-RAS Output Files for Channel Improvement

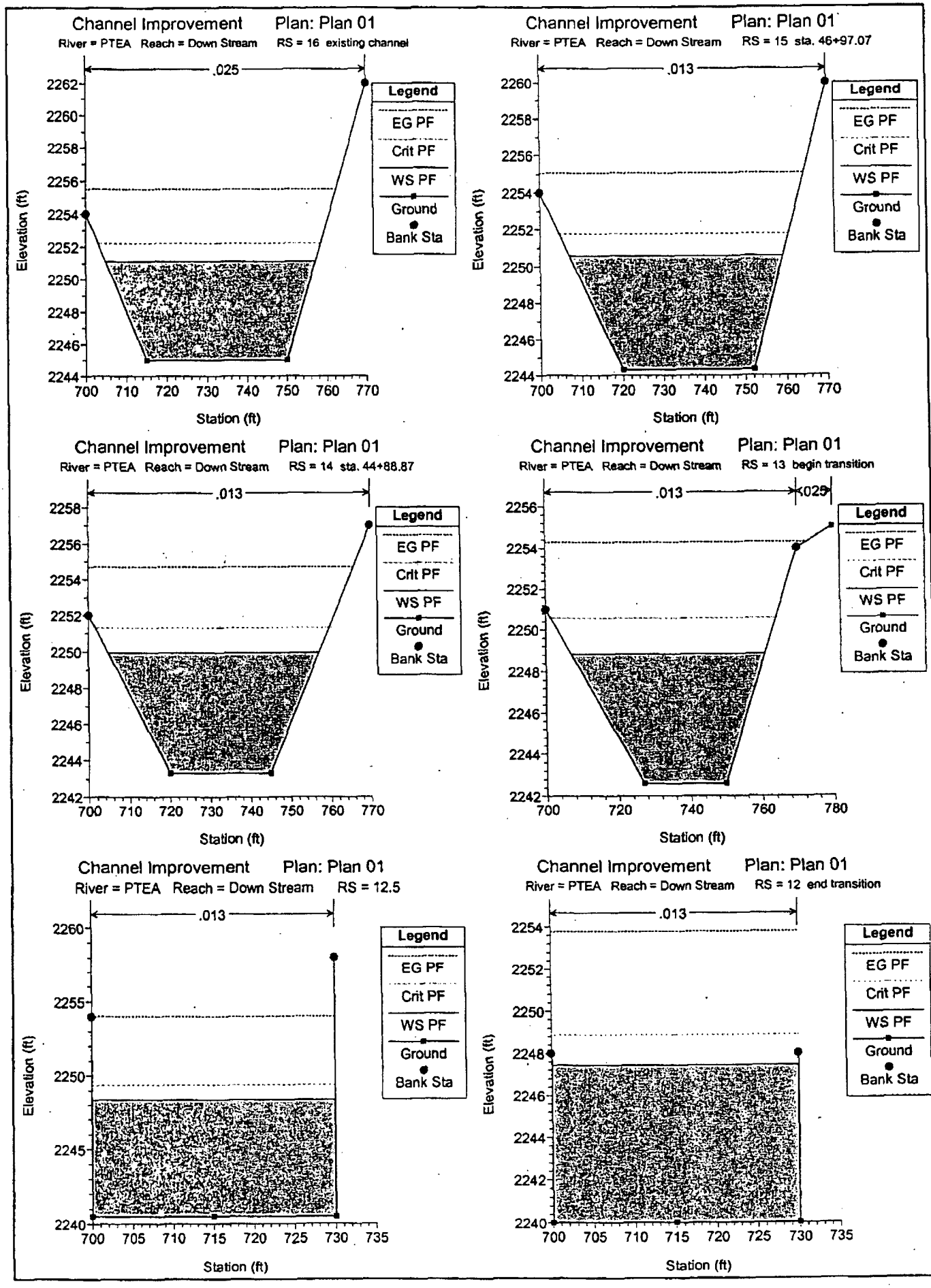
Channel Improvement Calculation Including Future St. Rose Crossing at Spencer Street

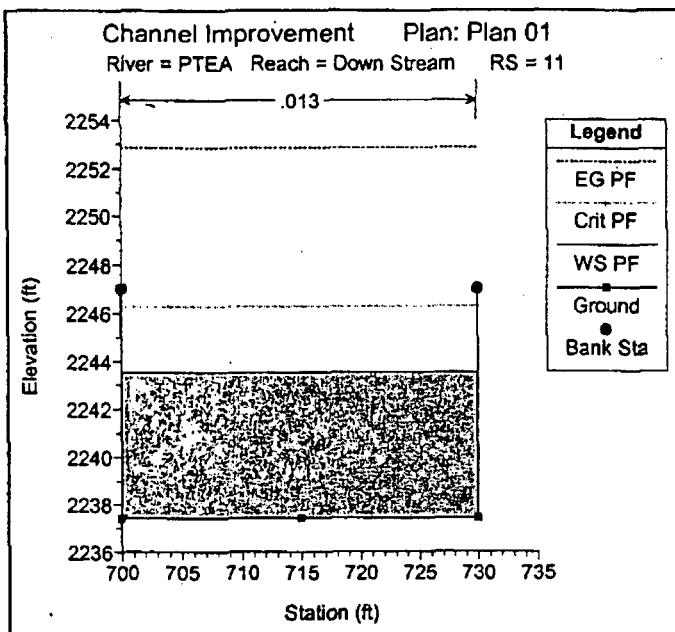
	HEC-RAS OUTPUT TABLE												CHANNEL CALCULATION					
	HEC-RAS Plan: Plan 01 River: PTEA Reach: Down Stream Profile: PF												flow	free	chnl	super	calc'd	use
	Reach	River	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top W (ft)	Froude #	depth	board	radii	elev.	depth	depth
Open Channel	Down Str	16	4500	2245.00	2251.13	2252.2	2255.51	0.010019	16.81	267.69	52.41	1.31	6.13	1.77			7.90	
	Down Str	15	4500	2244.30	2250.6	2251.75	2255.07	0.002769	16.96	265.3	52.21	1.33	6.3	1.78			8.08	
	Down Str	14	4500	2243.30	2249.96	2251.29	2254.69	0.003013	17.46	257.78	52.45	1.39	6.66	1.82			8.48	
Transition	Down Str	13	4500	2242.50	2248.72	2250.47	2254.26	0.003983	18.89	238.19	53.58	1.58	6.22	1.87			8.09	
	Down Str	12.5	4500	2240.65	2248.62	2249.5	2254.12	0.003004	18.83	239.04	30	1.18	7.97	1.94	135	1.22	11.13	11
	Down Str	12	4500	2240.00	2247.41	2248.87	2253.77	0.003703	20.23	222.39	30.01	1.31	7.41	1.99	135	1.41	10.81	11
	Down Str	11	4500	2237.40	2243.52	2246.27	2252.85	0.006481	24.5	183.64	30	1.75	6.12	2.12			8.24	9
Existing Concrete Channel	Down Str	10	4500	2236.00	2241.78	2244.85	2252.25	0.007681	25.97	173.28	30	1.9	5.78	2.17			7.95	8
	Down Str	9	4500	2235.60	2241.37	2244.48	2251.86	0.007706	25.99	173.17	30	1.91	5.77	2.17			7.94	8
	Down Str	8	4500	2234.37	2240.13	2243.24	2250.69	0.007784	26.08	172.54	30	1.92	5.76	2.17			7.93	8
	Down Str	7	4500	2233.16	2238.91	2242.01	2249.51	0.007839	26.14	172.16	30	1.92	5.75	2.17			7.92	8
	Down Str	6	4500	2231.94	2237.67	2240.8	2248.33	0.007878	26.2	171.76	30	1.93	5.73	2.17			7.90	8

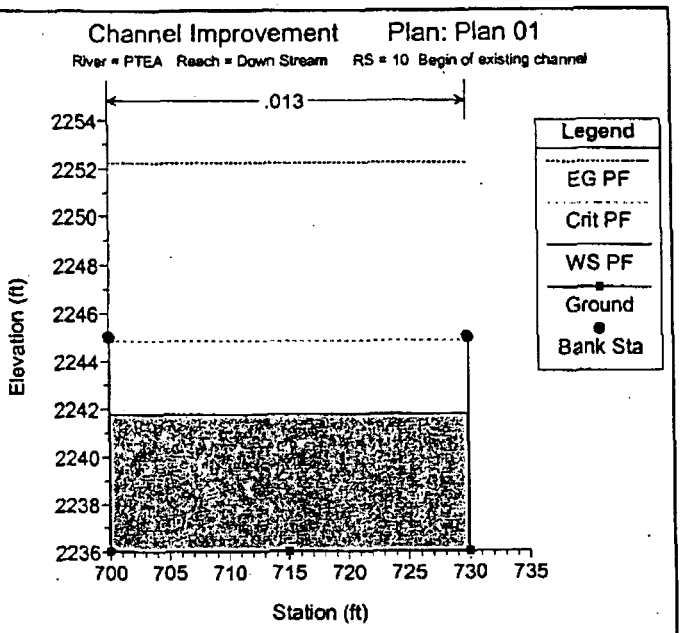
Date: 7/17

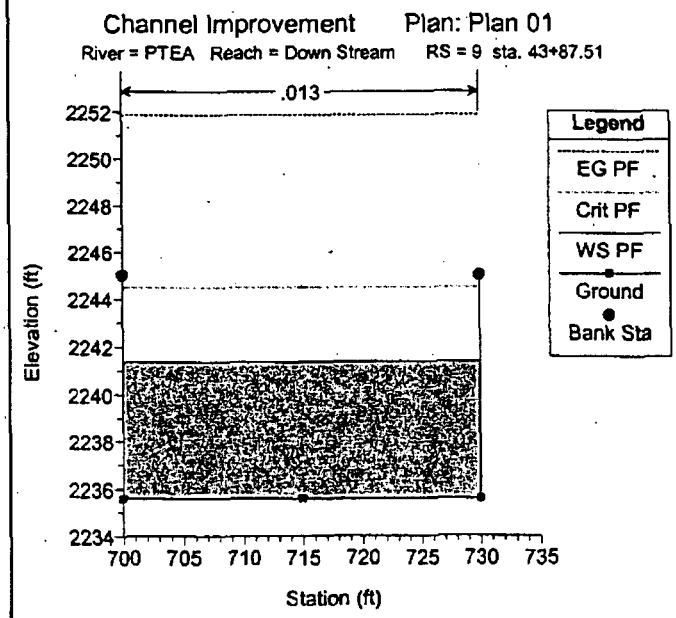

Down Stream
PTEA

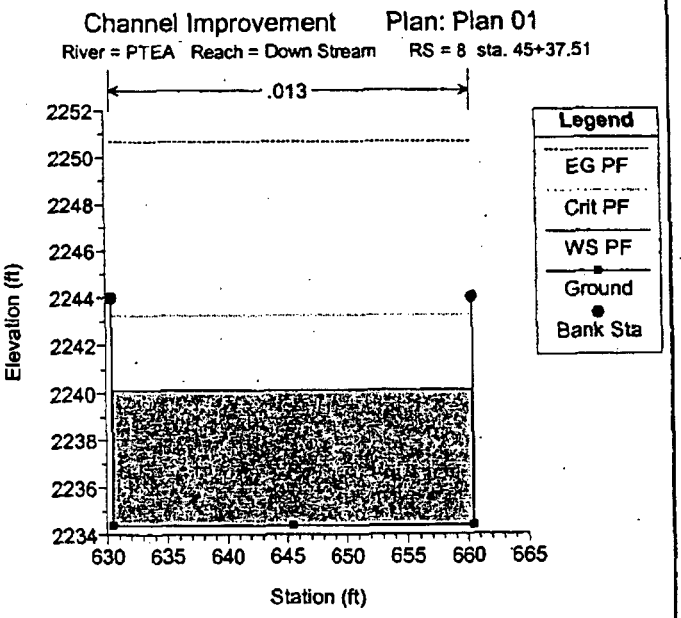

Channel Improvement Plan: Plan 01
Down Stream
Legend
EG PF
Crit PF
WS PF
Ground
Elevation (ft)
2260
2255
2250
2245
2240
2235
2230
0
200
400
600
800
1000
1200
Main Channel Distance (ft)
7
8
9
10
11
12
12.5
13
14
15
16

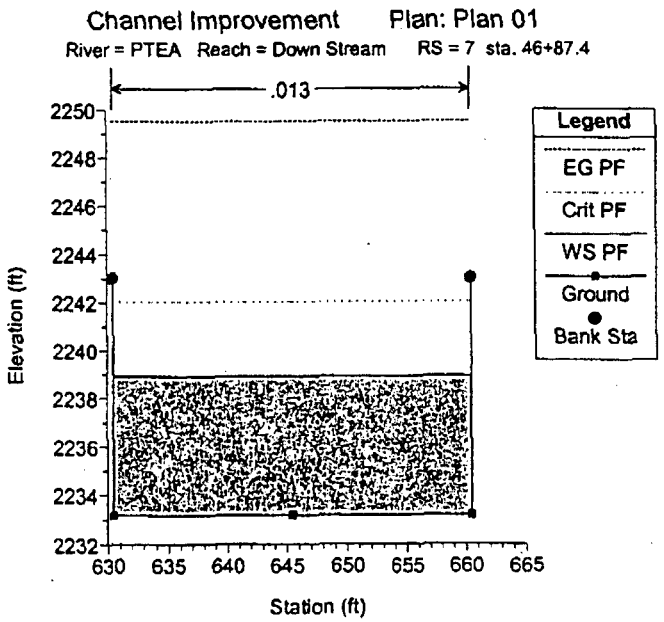

Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 16 existing channel
.025
Legend
EG PF
Crit PF
WS PF
Ground
Bank Sta
Elevation (ft)
Station (ft)
Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 15 sta. 46+97.07
.013
Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 14 sta. 44+88.87
.013
Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 13 begin transition
.013
.025
Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 12.5
.013
Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 12 end transition
.013

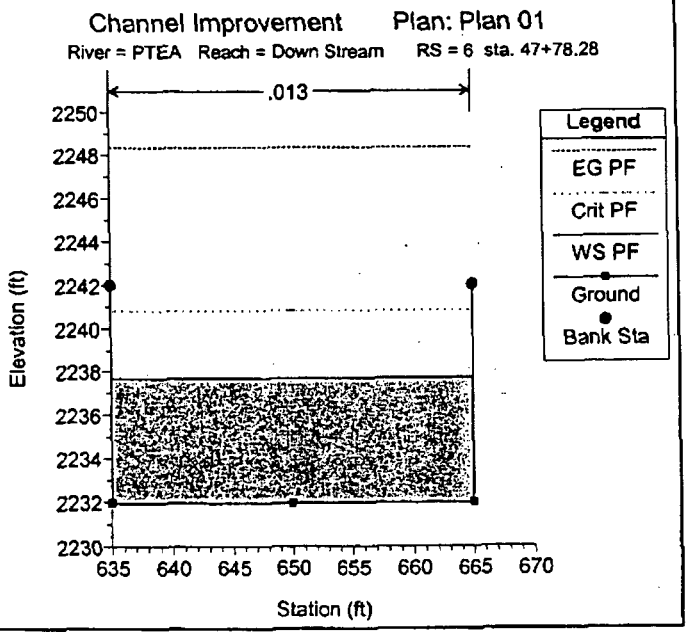

Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 11
.013
Legend
EG PF
Crit PF
WS PF
Ground
Bank Sta
Elevation (ft)
Station (ft)


Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 10 Begin of existing channel
.013
Legend
EG PF
Crit PF
WS PF
Ground
Bank Sta
Elevation (ft)
Station (ft)


Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 9 sta. 43+87.51
.013
Legend
EG PF
Crit PF
WS PF
Ground
Bank Sta
Elevation (ft)
Station (ft)


Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 8 sta. 45+37.51
.013
Legend
EG PF
Crit PF
WS PF
Ground
Bank Sta
Elevation (ft)
Station (ft)


Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 7 sta. 46+87.4
.013
Legend
EG PF
Crit PF
WS PF
Ground
Bank Sta
Elevation (ft)
Station (ft)


Channel Improvement Plan: Plan 01
River = PTEA Reach = Down Stream RS = 6 sta. 47+78.28
.013
Legend
EG PF
Crit PF
WS PF
Ground
Bank Sta
Elevation (ft)
Station (ft)

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November 15, 2000

Mr. Robert Thompson, P. E.
Clark County Public Works
500 S. Grand Central Parkway
Las Vegas, NV 89155

DISTRICT CONCURRENCE: SECTION 26 PHASE 1 (UPDATE #2) (HTE #00-32260) REVISED

Dear Mr. Thompson:

The District has reviewed the Technical Drainage Study dated July 26, 2000, Supplement No. 1 dated August 4, 2000, Supplement No. 2 dated August 18, 2000, Supplement No. 3 dated September 28, 2000, and Supplement No. 4 dated October 9, 2000, for the above-captioned project as submitted by VTN Nevada. In addition, the District is in receipt of the Conditional Letter of Acceptance from Clark County Public Works dated October 13, 2000.

The District concurs with the acceptance of this Technical Drainage Study by Clark County Public Works.

The District's review of this project was limited to issues of Regional Flood Control Significance as defined in the Uniform Regulations for the Control of Drainage. As noted in the study the site resides in a Special Flood Hazard Area (SFHA) designated as "Zone A" per the effective Flood Insurance Rate Map (FIRM). Therefore the consultant should be advised that this acceptance does not serve to amend the FIRM or remove the SFHA designation.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information submitted by VTN Nevada may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for the information, data or conclusions presented by the consulting engineer. We, therefore, make no warranties, either expressed or implied, in conducting this review.

GALE WM. FRASER II, P.E.
General Manager/Chief Engineer

BY: _____
Jon H. Hayslip, P.E.
Senior Engineer

cc: VTN Nevada
City of Henderson Public Works

JHH:jms

File: 22-61-26.vtn

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Website: *http://www.ccrfcd.org*

Department of Public Works

500 S Grand Central Pky • PO Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

M.J. Manning, Director • E-Mail: mjm@co.clark.nv.us

October 13, 2000

VTN Nevada
2727 S. Rainbow Boulevard
Las Vegas, NV 89146

Dear Sirs:

Re: WILLDAN/Clark County Public Works Plan Review Contract
Update #2 to the Technical Drainage Study for Section 26 Phase 1 **(3244)**
Study Dated: July 26, 2000
Supplemental Dated: August 4, 2000
Second Supplemental Dated: August 16, 2000
Third Supplemental Dated: September 28, 2000
Fourth Supplemental Dated: October 9, 2000
Location: Northwest of Lake Mead Drive and Eastern Avenue
(Sec. 26, T. 22 S., R. 61 E.)
H.T.E.#00-32260 (Cross Reference with HTE# 00-22970)

362-25 97

The referenced **Technical Drainage Study** has been reviewed and is accepted as complying with minimum improvement standards. As set forth in the subject drainage study, the following measures will be taken to mitigate flood hazards:

1. The original technical drainage study for Section 26 Phase 1 was approved on November 5, 1998. The Update to Section 26 Phase 1 was approved on March 12, 1999, and Supplemental to the Update Section 26 Phase 1 was approved on August 13, 1999. The purpose of Update #2 was for revisions to the horizontal alignment of the channel between stations 36+02.17 to 40+91.64, and for the construction of 2-12-foot X 6-foot RCBC's between stations 53+84 to 54+26. Update #3 for Section 26 Phase 1 (Lake Mead/Eastern) has recently been submitted to revise the channel adjacent to Lake Mead. As the horizontal alignment change proposed in Update #2 is being revised in Update #3, the engineer has requested that it not be included in the approval of Update #2. The hydraulic analysis in Supplement #4 includes the 2-12-foot X 6-foot RCBC's proposed with Update #2, the double 12-foot x 6-foot box culverts under Ione Road, designed in the approved drainage study for "Lake Mead/Eastern" by Crystal Cascades Civil

14

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DALE W. ASKEW, County Manager

Division, and the proposed improvements downstream of Ione Road designed in the approved drainage study for "Silverado Ranch Station Culvert Extension" by G.C. Wallace, Inc.;

2. The site shall be graded with respect to drainage as shown on "Channel Plan & Profile for Lake Mead/Eastern," sheet 4 of 8, last revised July 2000, signed and sealed by James L. Fitzpatrick, P.E., on July 26, 2000 and "Section Detail Sheet for Lake Mead/Eastern", sheet 8 of 8, last revised July 2000, signed and sealed by James L. Fitzpatrick, P.E., on July 26, 2000.

   The proposed channel/box culverts shall be structurally designed as shown on "Lake Mead/Eastern Phase 1 Drainage Channel", sheet S1, signed and sealed by Dana A. Ames, P.E., on July 13, 2000, and sheet S2, last revised August 16, 2000, signed and sealed by Dana A. Ames, P.E., on August 16, 2000; 2-12x6

3. The following revisions/additions are accepted:

   a. Approximately 40 lf of double 12-foot x 6-foot RCBs from station 53+84 to station 54+26 as shown on sheet 4 of 12

4. A bond estimate must be submitted to Clark County Public Works for the above-mentioned stormwater management facilities;

5. All other conditions and facilities, as stipulated in the original letters, still apply;

6. Mylars of the grading plan must be submitted to the Clark County Plan Check department for approval signatures prior to permit issuance;

7. Clark County Regional Flood Control District concurrence is required is since the project impacts a master planned facility;

8. At the request of Clark County Public Works, drainage/grading plans for the proposed development have been reviewed for compliance to the requirements set forth in the "Minimum Drainage Study Criteria Checklist," "Drainage Plan Information," dated July 15, 1997. **The drainage/grading plan submitted for this project appears to meet the minimum standards outlined in the above-referenced regulation;**

No liability is assumed by the County for information, data, and conclusions of the consulting engineer.

M.J. MANNING
DIRECTOR OF PUBLIC WORKS

BY: _____

Dave Betley, P.E.
Senior Engineer
Community Development Division

RBT/TO/bs

cc: Olympic Management / Developers of Nevada
Development File

C:\Applett\00-32260.wpd

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General Manager/Chief Engineer

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City of Henderson

Bruce L. Woodbury
Clark County

November 13, 2000

Mr. Curt Chandler, P.E.
City of Henderson Public Works
240 Water Street
Henderson, NV 89015

DISTRICT CONCURRENCE: SECTION 26 PHASE 1 (UPDATE #2)

Dear Mr. Chandler:

The District has reviewed the Technical Drainage Study dated July 26, 2000, Supplement No. 1 dated August 4, 2000, Supplement No. 2 dated August 18, 2000, Supplement No. 3 dated September 28, 2000, and Supplement No. 4 dated October 9, 2000, for the above-captioned project as submitted by VTN Nevada. In addition, the District is in receipt of the Conditional Letter of Acceptance from the City of Henderson Public Works dated August 3, 2000.

The District concurs with the acceptance of this Technical Drainage Study by the City of Henderson Public Works.

The District's review of this project was limited to issues of Regional Flood Control Significance as defined in the Uniform Regulations for the Control of Drainage. As noted in the study the site resides in a Special Flood Hazard Area (SFHA) designated as "Zone A" per the effective Flood Insurance Rate Map (FIRM). Therefore the consultant should be advised that this acceptance does not serve to amend the FIRM or remove the SFHA designation.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information submitted by VTN Nevada may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for the information, data or conclusions presented by the consulting engineer. We, therefore, make no warranties, either expressed or implied, in conducting this review.

GALE WM. FRASER II, P.E.
General Manager/Chief Engineer

BY: Jon H. Hayslip, P.E.
Senior Engineer

cc: VTN Nevada
Clark County Public Works

JHH:jms

File: 22-61-26.vtn

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Clark County

November 13, 2000

Mr. Robert Thompson, P. E.
Clark County Public Works
500 S. Grand Central Parkway
Las Vegas, NV 89155

DISTRICT CONCURRENCE: SECTION 26 PHASE 1 (UPDATE #2)
(HTE #00-~~22970~~ 32260)

Dear Mr. Thompson:

The District has reviewed the Technical Drainage Study dated July 26, 2000, Supplement No. 1 dated August 4, 2000, Supplement No. 2 dated August 18, 2000, Supplement No. 3 dated September 28, 2000, and Supplement No. 4 dated October 9, 2000, for the above-captioned project as submitted by VTN Nevada. In addition, the District is in receipt of the Conditional Letter of Acceptance from Clark County Public Works dated October 13, 2000.

The District concurs with the acceptance of this Technical Drainage Study by Clark County Public Works.

The District's review of this project was limited to issues of Regional Flood Control Significance as defined in the Uniform Regulations for the Control of Drainage. As noted in the study the site resides in a Special Flood Hazard Area (SFHA) designated as "Zone A" per the effective Flood Insurance Rate Map (FIRM). Therefore the consultant should be advised that this acceptance does not serve to amend the FIRM or remove the SFHA designation.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information submitted by VTN Nevada may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for the information, data or conclusions presented by the consulting engineer. We, therefore, make no warranties, either expressed or implied, in conducting this review.

GALE WM. FRASER II, P.E.
General Manager/Chief Engineer

BY: Jon H. Hayslip, P.E.
Senior Engineer

cc: VTN Nevada
City of Henderson Public Works

JHH:jms

File: 22-61-26.vtn

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00-2277C

RSW

10.11.00

00-32260-UP

*SUPPLEMENTAL INFORMATION

DATE RECEIVED 10-10-00

HTE # 00-22970

Direct From Willdan

VTN nevada

CONSULTING ENGINEERS • PLANNERS • SURVEYORS

SUPPLEMENT #4 TO UPDATE #2 TO THE TECHNICAL HYDROLOGY STUDY

FOR

SECTION 26 PHASE 1

CLARK COUNTY, NEVADA

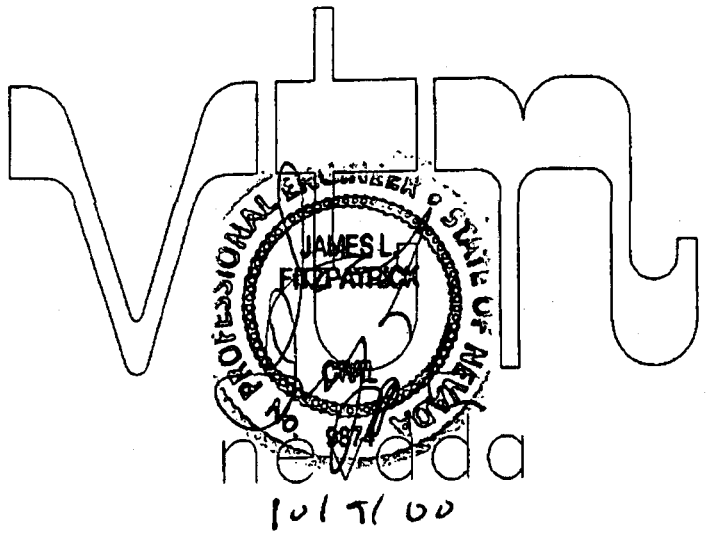
W.O. #5033-FC

Prepared for:

OLYMPIC MANAGEMENT /
DEVELOPERS OF NEVADA

Submitted to:

PUBLIC WORKS DEPT.
CLARK COUNTY, NEVADA



nevada

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SERVICES SINCE 1960

October 9, 2000
W.O. #5033-FC

WILLDAN 3244 TO
SERVING PUBLIC AGENCIES
OCT 10 2000
RECEIVED
LAS VEGAS

Willdan Associates
2725 E. Desert Inn Road, Ste. 100
Las Vegas, Nevada 89121

Attention: Mr. Chris O. Stone, P.E.

SUBJECT: **SUPPLEMENT #4 TO UPDATE #2 TO THE TECHNICAL HYDROLOGY STUDY FOR SECTION 26 PHASE I**

Mr. Stone:

This Supplement #4 is being submitted to Willdan Associates to address the review comments to the above mentioned study that were issued on October 6, 2000.

The subject review comments are listed and addressed as follows:

Comment #1.

> **Please find attached, the WSPG model information from the Silverado Ranch Culvert Extension drainage study by G.C. Wallace. Per our discussions of earlier today, investigate the location of the hydraulic jump shown in this WSPG and in the previously submitted HEC-RAS and revise your HEC-RAS as appropriate;**

The HEC-RAS analysis has been revised to reflect the location of the hydraulic jump as indicated by the WSPG model. The water surface elevations from the WSPG model has been inserted into the HEC-RAS model at the corresponding cross-sections using the known water surface option in the steady flow data. The analysis shows that the new location of the hydraulic jump does not change the water surface elevations through the Ione Culvert or the additional culvert added just upstream of the Ione Culvert. The input/output data for the revised analysis and a disk copy of the analysis has been included in the Appendix.

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
TEL. (702) 873-7550 FAX: 362-2597

Comment #2.

> **The vertical information shown on the HEC-RAS cross section maps submitted does not match that in the model submitted. The cross section maps or the model must be revised and resubmitted;**

Per discussions with Mr. Chris Stone of Willdan Associates and Mr. David Betley of Clark County Public Works, we have provided the Cross-Section Maps for the HEC-RAS analysis beginning at Station 41+17.51 and extending downstream to the end of the analysis. The cross-section upstream of Station 41+17.51 were not included because this portion of the analysis is currently being revised in the *Update #3 to the Technical Hydrology Study for Section 26 Phase 1* submittal. The revisions proposed with the *Update #3* submittal match into the plans submitted with this Update at Station 41+17.51 and supersede the revisions shown upstream of Station 41+17.51 in this submittal.

As discussed with Mr. Chris Stone of Willdan Associates and Mr. David Betley of Clark County Public Works, it is being requested that the approval of this study be limited to the construction of the proposed culvert between Stations 53+88.74 and 54+28.74 of the North Reach. All other revisions are being addressed in the *Update #3* submittal. The analysis included in the *Update #3* submittal contains the additional culvert in the North Reach as designed in this study. The *Update #3* model will be revised to include the revisions made in this analysis downstream of the Ione Culvert which will make one continuous model for the entire Section 26 Channel and Silverado Station Culvert up to the bubbler system. The next submittal for *Update #3* will also include the revised HEC-RAS Cross-Section Maps supplied in this study so that a complete HEC-RAS Cross-Section Map set will be provided with a complete model as is being requested.

I hope this addresses your concerns regarding this project. If there are any questions or additional information is required, please contact this office.

Respectfully Submitted,

VTN Nevada

Brian Ruiz, E.I.

/mjg

APPENDIX

WSPG ANALYSIS

FROM
IONE CULVERT TO
SILVERADO STATION BUBBLER

BY G.C. WALLACE, INC.

FILE DATED
JUNE 19, 2000

LICENSEE C.C. WALLACE, INCORPORATED FOSISP PAGE 1

WATER SURFACE PROFILE LISTING

SILVERADO RANCH STATION CULVERT EXTENSION
MODELED FROM U/S AT IONE RD TO DBL ARCH
FILE. CULVERT M DATE 6/19/00 BY. JROBINSON

STATION	INVERT ELEV	DEPTH OF FLOW	W S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ER		
1000.00	2210.89	16.460	2227 350	3400.0	17.75	4.895	2232.245	0.00	8.000		8.00	24.50	0.00	1	0.50
100.00	0.00940					.010031	1.00			6.808			0.00		
1100 00	2211.83	16.523	2228.353	3400.0	17.75	4.895	2233.248	0.00	8.000		8.00	24.50	0.00	1	0.50
127.30	0.04876					.010031	1.28			5.720			0.00		
1227.30	2218.04	11.589	2229.626	3400.0	17.75	4.895	2234.521	0.00	8.000		8 00	24.50	0 00	1	0.50
HYDRAULIC JUMP													0.00		
1227.30	2218.04	4.916	2222.953	3400.0	28.82	12.894	2235.847	0.00	8.000		8.00	24.50	0.00	1	0 50
18 31	0.04876					.021781	0.40			3.720			0.00		
1245.61	2218.93	5.033	2223.963	3400.0	28.15	12.301	2236.264	0.00	8.000		8.00	24.50	0 00	1	0.50
TRANS STR	0.04820					.020549	1.03						0.00		
1295.61	2221.34	6.447	2225.787	3400.0	27 31	11.578	2237.366	0.00	8.000		8.00	24.50	0.00	1	0.50
60.00	0.00933					.021083	1.27			5.856			- 0.00		
1355.61	2221 90	6.290	2228.190	3400.0	28 31	12.441	2238.631	0.00	8.000		6 00	28.50	0 00	1	0.50

WSPG MODEL OF DBL CULVERTS FROM IONE ROAD TO EXISTING DBL ARCH

DATE. 6/19/2000
TIME: 11:12

POS15P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	1	0.50	8.00	24.50	0.00	0.00	0.00										
CD	2	3	1	0.50	6.00	28.50	0.00	0.00	0.00										

P O S 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SILVERADO RANCH STATION CULVERT EXTENSION

HEADING LINE NO 2 IS -

MODELED FROM U/S AT IONE RD TO DBL ARCH

HEADING LINE NO 3 IS -

FILE: CULVERT.W DATE: 6/19/00 BY: JROBINSON

P O S 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT		W S ELEV
	1000.00	2210.69	1		2227.35

ELEMENT NO 2 IS A REACH

O/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN N
	1100.00	2211.83	1	0.015	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN N
	1245.61	2218.93	1	0.015	0.00	0.00	0.00	0

ELEMENT NO 4 IS A TRANSITION

U/S DATA	STATION	INVERT	SECT	N
	1295.61	2221.34	2	0.015

ELEMENT NO 5 IS A REACH

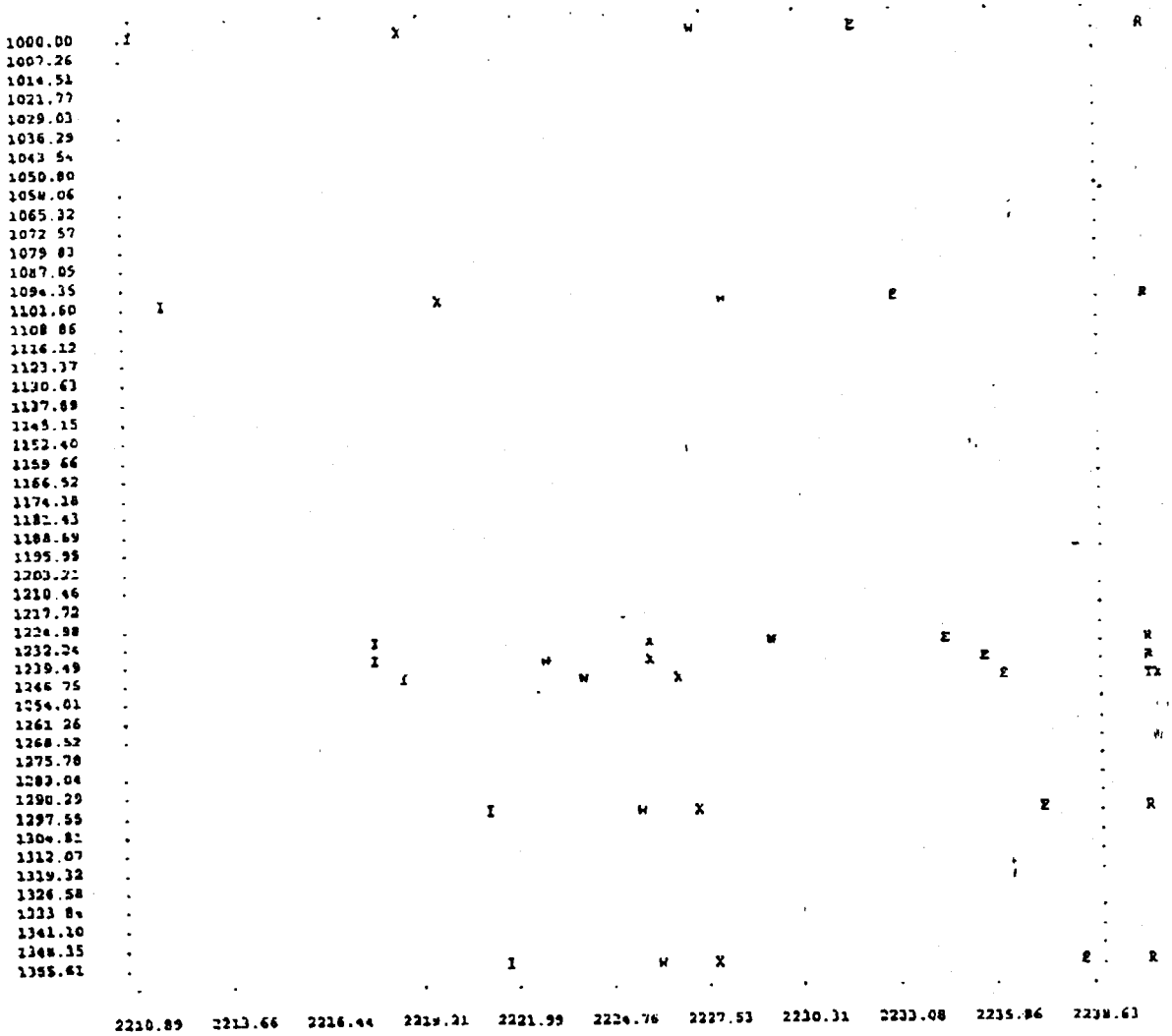
U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN N
	1355.61	2221.90	2	0.015	0.00	0.00	0.00	0

ELEMENT NO 6 IS A SYSTEM HEADWORKS

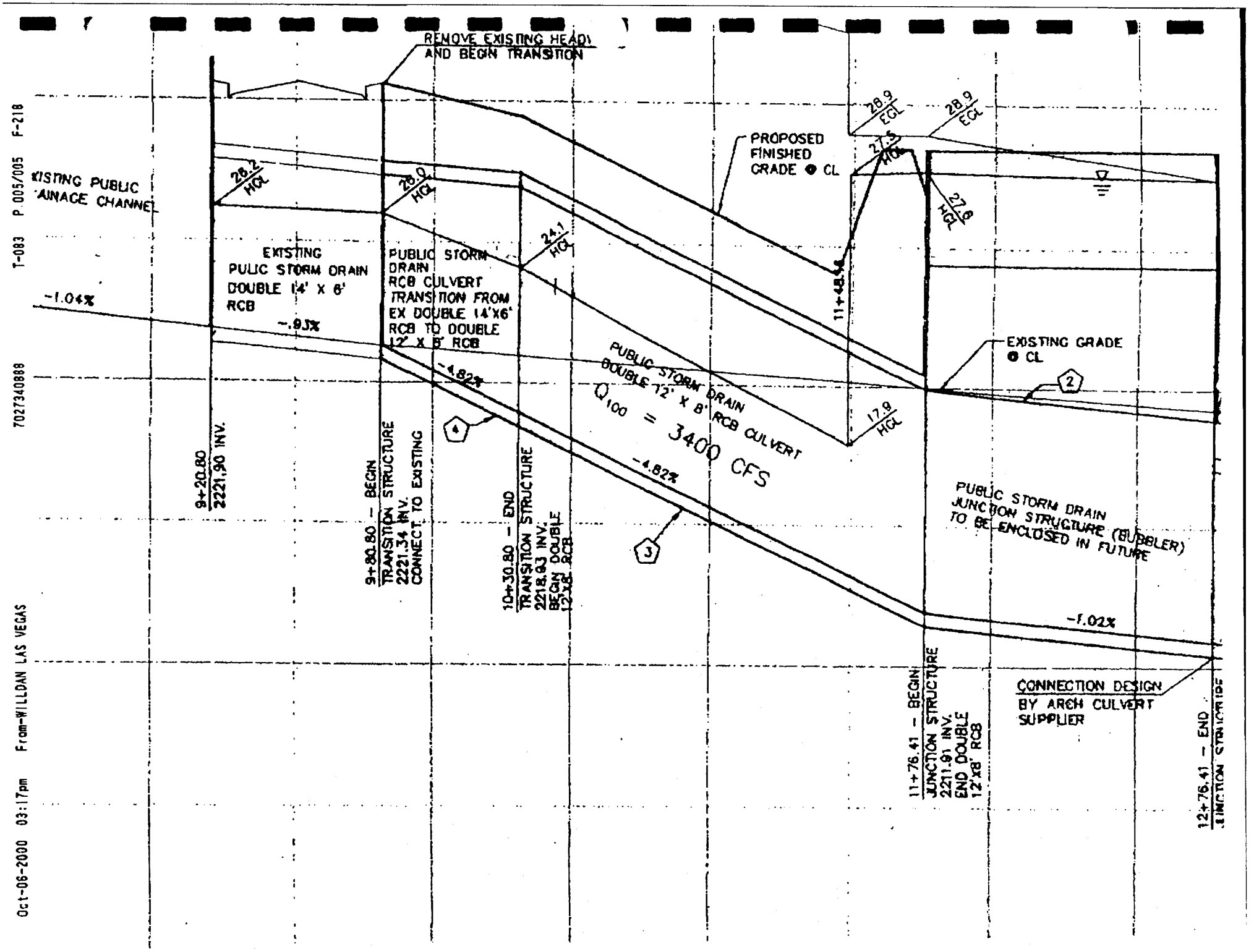
U/S DATA	STATION	INVERT	SECT	W S ELEV
	1355.61	2221.90	2	2226.19

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

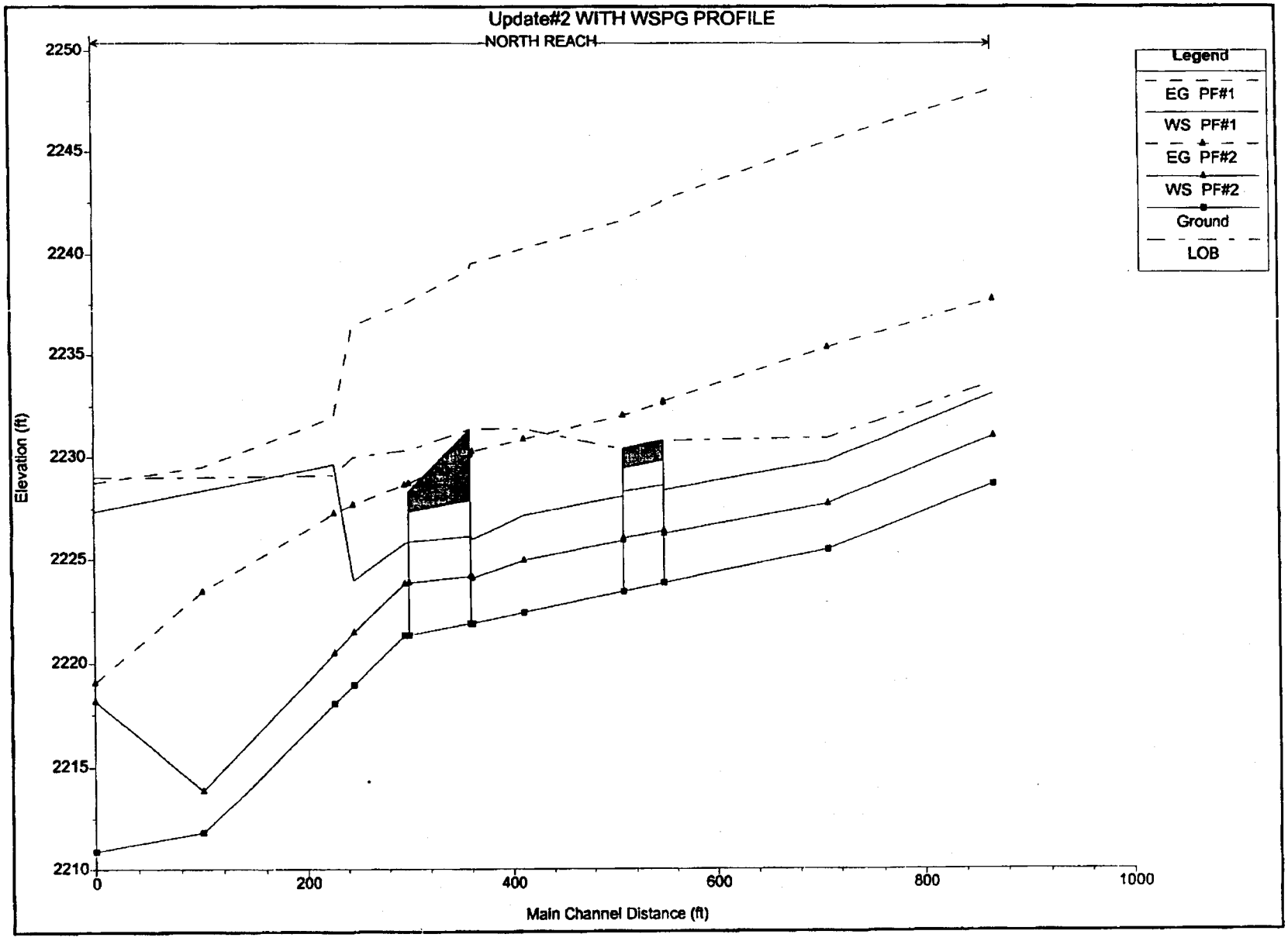
SILVERADO RANCH STATION CULVERT EXTENSION
MODELED FROM U/S AT IONE RD TO DBL ARCH
FILE: CULVERT.w DATE: 6/19/00 BY: JROBINSON



NOTES
1. GLOSSARY
I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT
2 STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

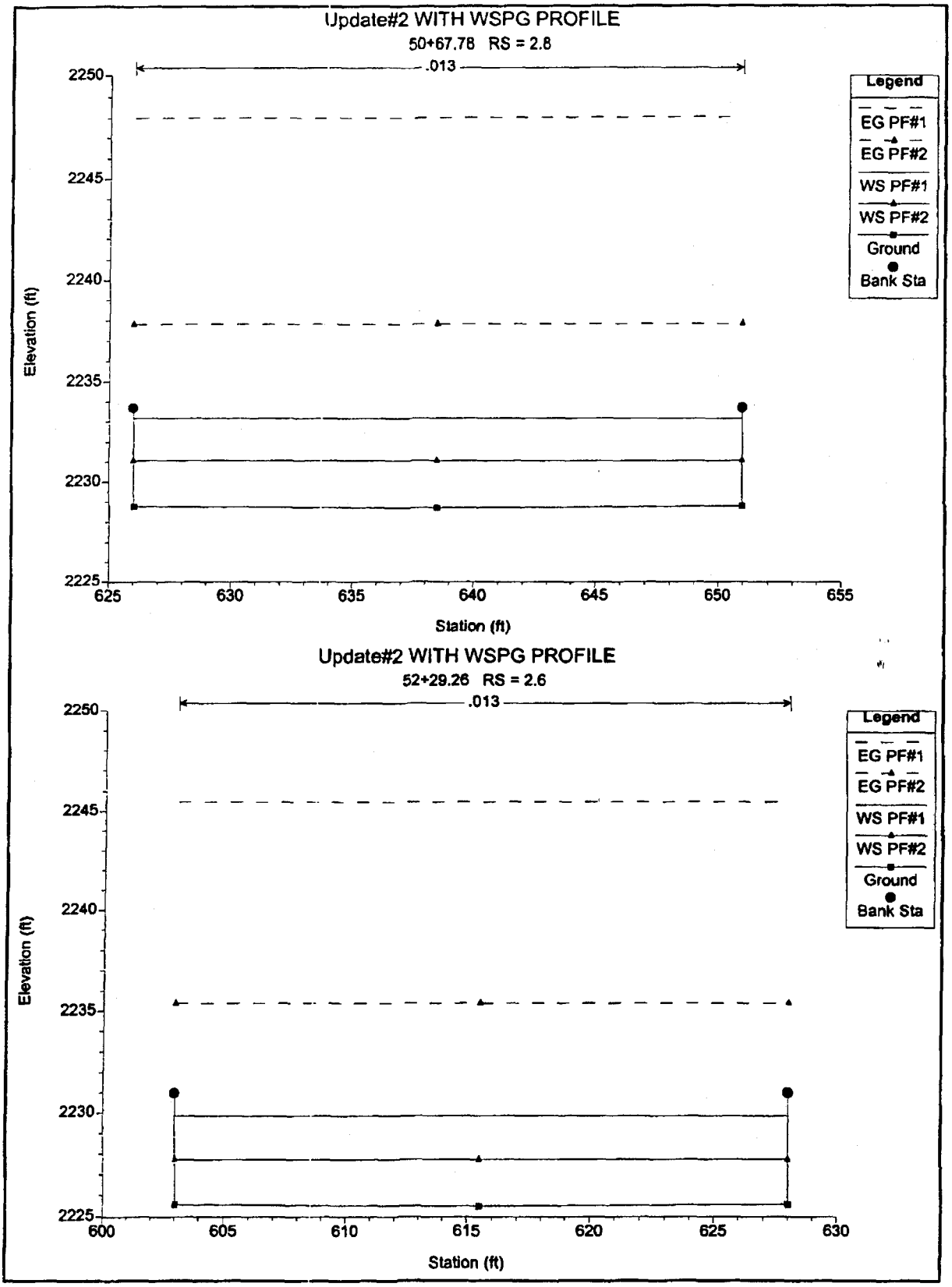

REMOVE EXISTING HEAD
AND BEGIN TRANSITION
EXISTING PUBLIC
DRAINAGE CHANNEL
28.2
HGL
28.9
HGL
28.9
EGL
28.9
EGL
27.5
HGL
PROPOSED
FINISHED
GRADE @ CL
27.6
HGL
24.1
HGL
17.9
HGL
11+48.56
EXISTING
PULIC STORM DRAIN
DOUBLE 14' X 6'
RCB
PUBLIC STORM
DRAIN
RCB CULVERT
TRANSITION FROM
EX DOUBLE 14'X6'
RCB TO DOUBLE
12' X 8' RCB
-1.04%
-.93%
-4.82%
-4.82%
PUBLIC STORM DRAIN
DOUBLE 12' X 8' RCB CULVERT
Q100 = 3400 CFS
EXISTING GRADE
@ CL
2
4
3
9+20.80
2221.90 INV.
9+80.80 - BEGIN
TRANSITION STRUCTURE
2221.34 INV.
CONNECT TO EXISTING
10+30.80 - END
TRANSITION STRUCTURE
2218.83 INV.
BEGIN DOUBLE
12'X8' RCB
PUBLIC STORM DRAIN
JUNCTION STRUCTURE (BUBBLER)
TO BE ENCLOSED IN FUTURE
-1.02%
11+76.41 - BEGIN
JUNCTION STRUCTURE
2211.91 INV.
END DOUBLE
12'X8' RCB
CONNECTION DESIGN
BY ARCH CULVERT
SUPPLIER
12+76.41 - END
JUNCTION STRUCTURE
T-083 P.005/005 F-218
7027340888
Oct-06-2000 03:17pm From-WILLDAN LAS VEGAS

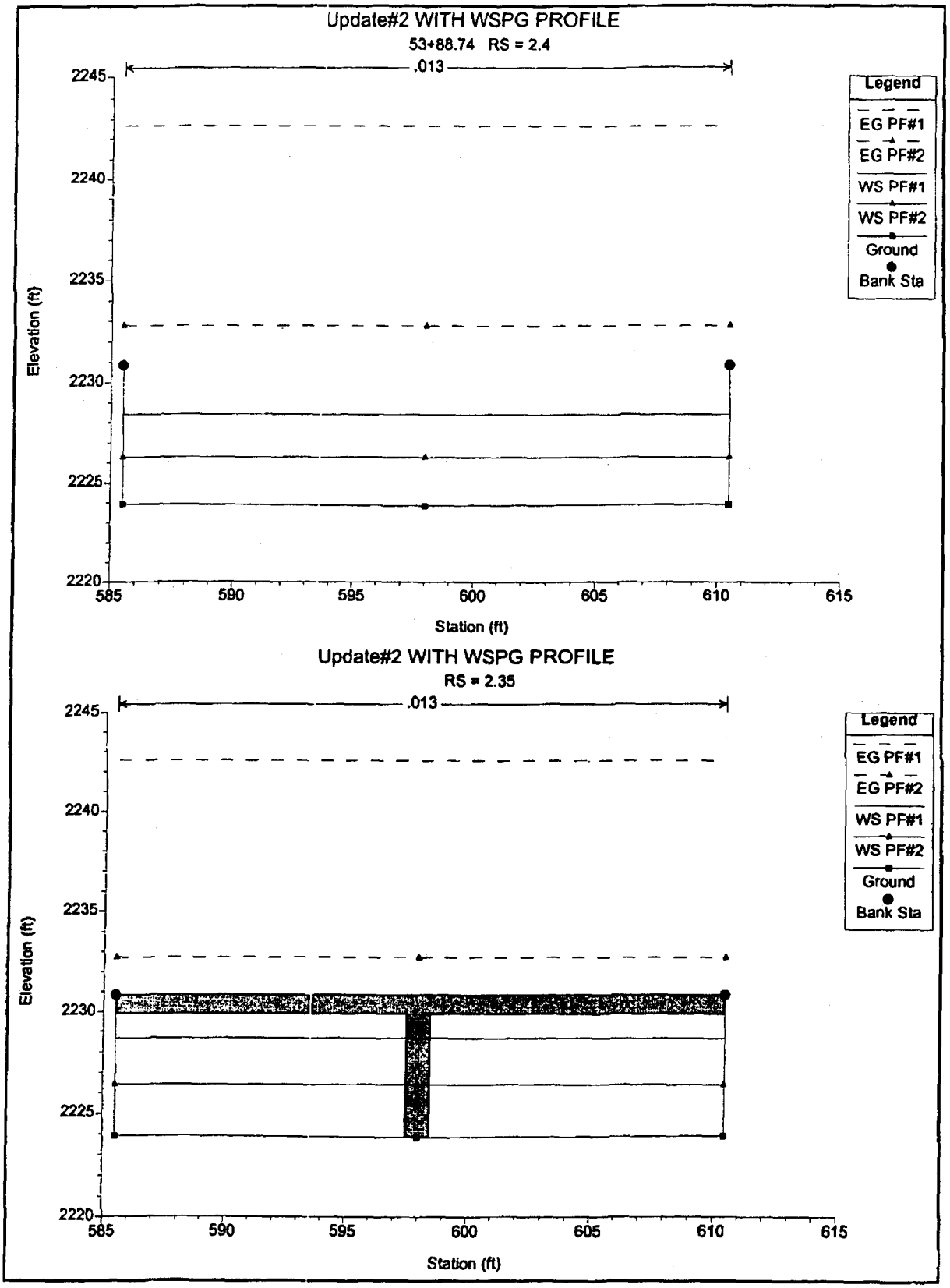
HEC-RAS ANALYSIS
NORTH REACH

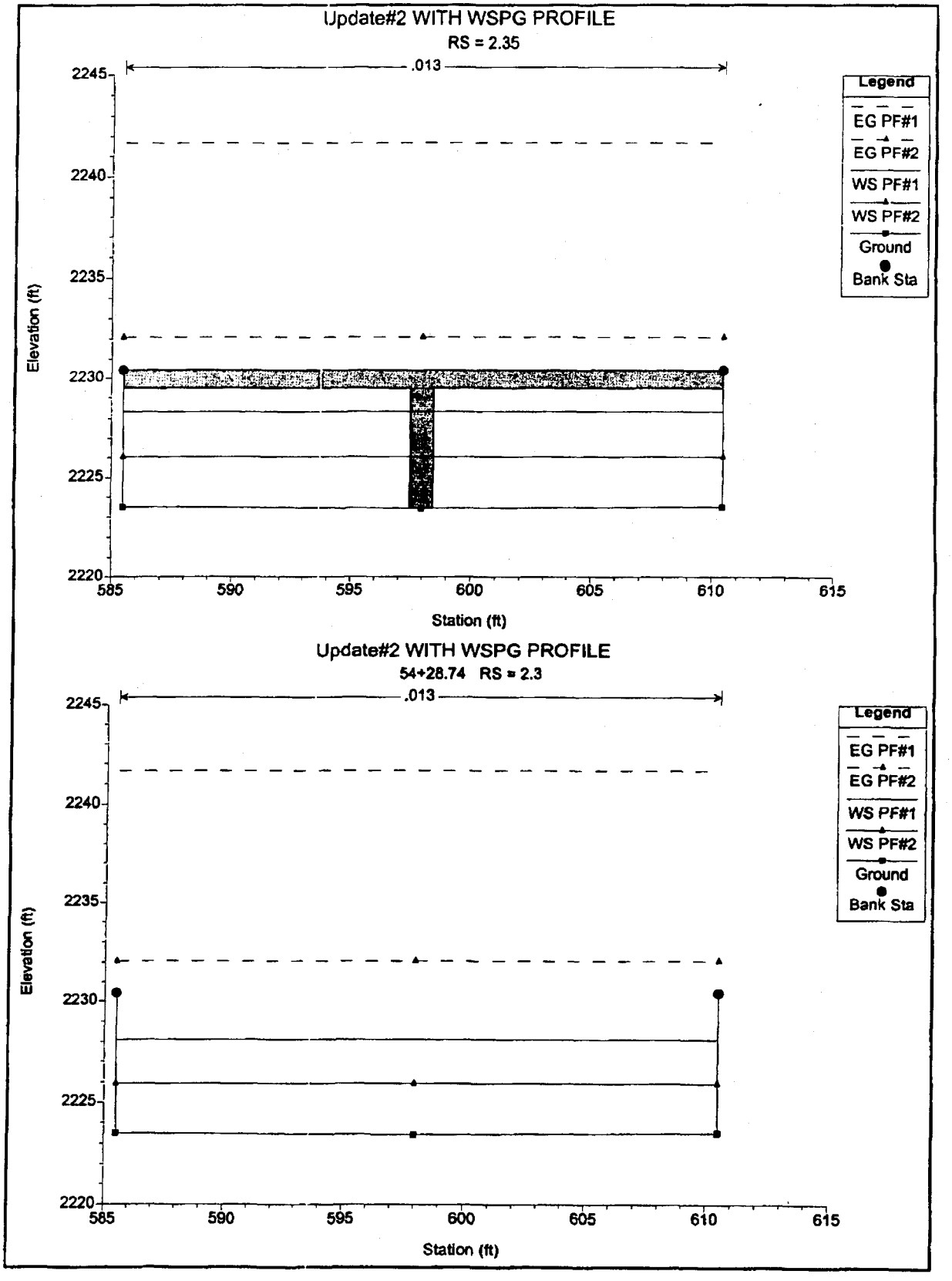

Update#2 WITH WSPG PROFILE
NORTH REACH
Legend
EG PF#1
WS PF#1
EG PF#2
WS PF#2
Ground
LOB
Elevation (ft)
2250
2245
2240
2235
2230
2225
2220
2215
2210
0
200
400
600
800
1000
Main Channel Distance (ft)

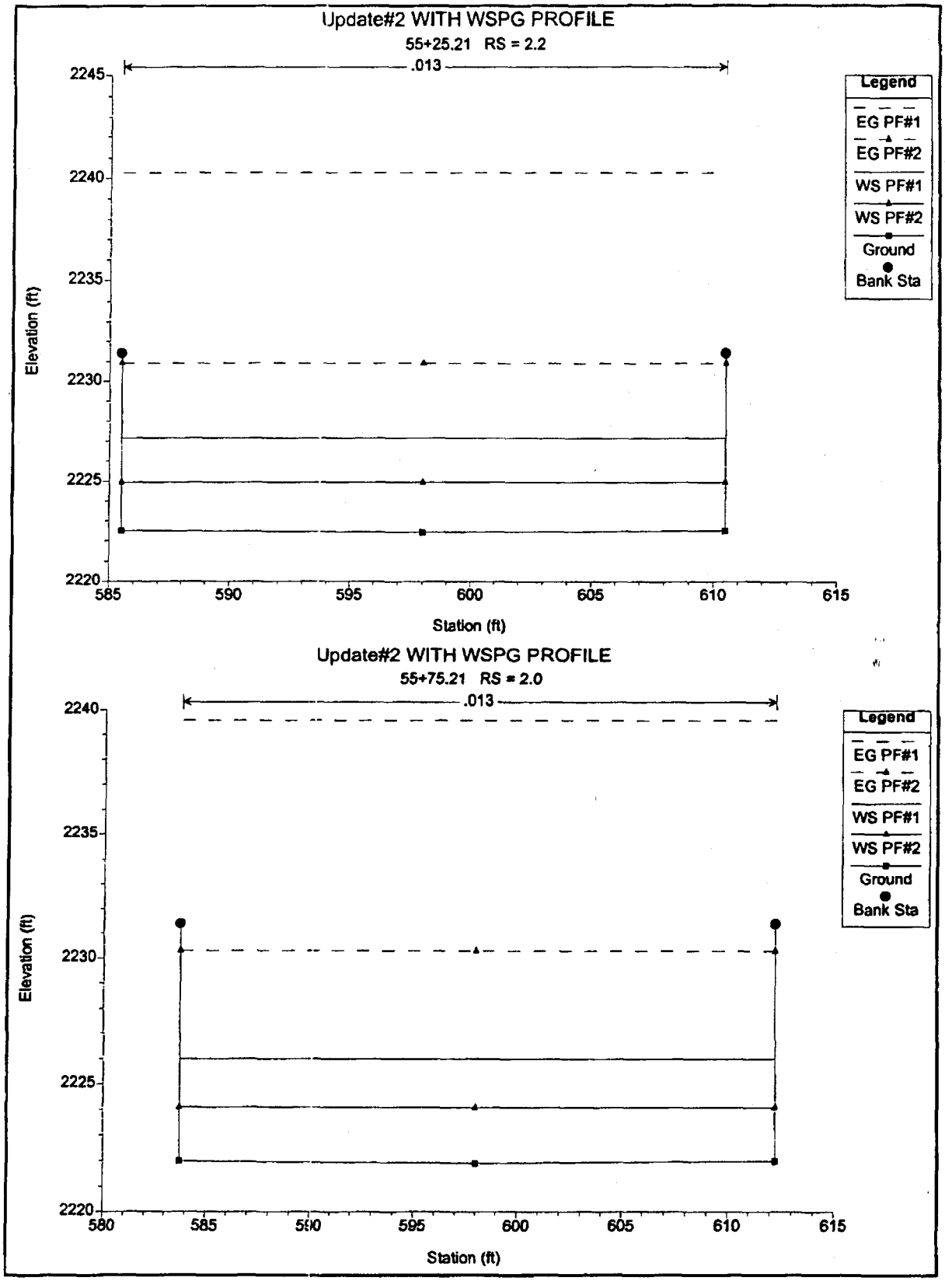
HEC-RAS Plan: Plan 01 River: NORTH REACH Reach: NORTH REACH

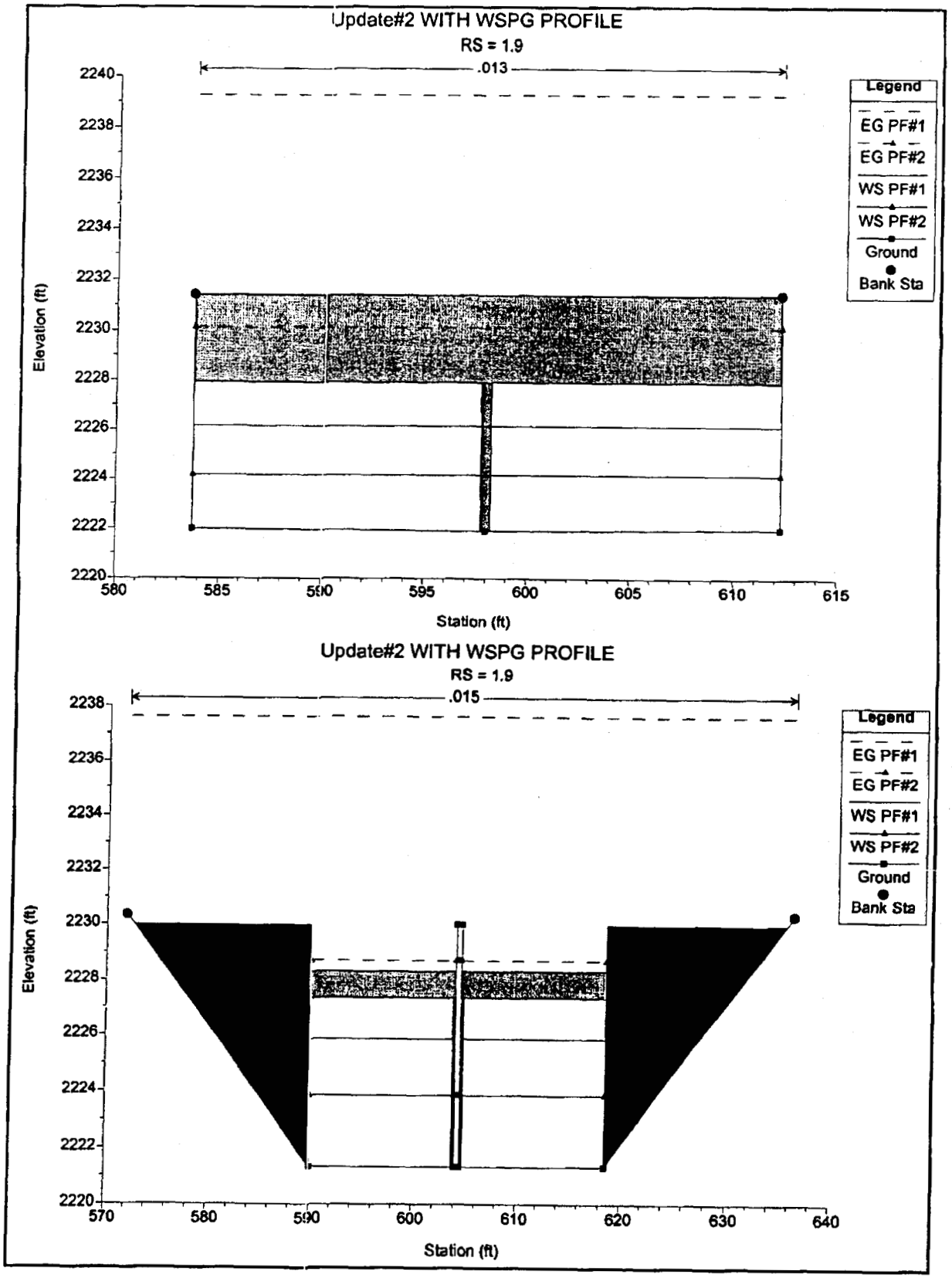
WSPG STATION	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
	NORTH REACH	2.8	3420.00	2228.71	2233.17	2237.12	2248.05	0.015076	30.95	110.49	25.01	2.60
	NORTH REACH	2.6	3420.00	2225.50	2229.85	2233.92	2245.49	0.016238	31.73	107.79	25.00	2.69
	NORTH REACH	2.4	3420.00	2223.84	2228.40	2232.26	2242.66	0.014151	30.31	112.85	25.00	2.51
	NORTH REACH	2.35	Bridge									
	NORTH REACH	2.3	3420.00	2223.42	2228.10	2231.81	2241.64	0.013111	29.53	115.80	25.00	2.42
	NORTH REACH	2.2	3420.00	2222.42	2227.17	2230.81	2240.28	0.012494	29.06	117.71	24.99	2.36
1355.61	NORTH REACH	2.0	3420.00	2221.90	2226.00	2229.57	2239.58	0.014411	29.58	115.63	28.51	2.59
	NORTH REACH	1.95	Bridge									
1295.61	NORTH REACH	1.9	3420.00	2221.34	2225.78	2230.69	2237.54	0.020357	27.52	124.29	28.00	2.30
1245.61	NORTH REACH	1.7	3420.00	2218.93	2223.96		2236.42	0.021371	28.33	120.72	24.00	2.23
1227.30	NORTH REACH	1.6	3420.00	2218.04	2229.63		2231.97	0.002432	12.28	278.42	24.50	0.64
1100	NORTH REACH	1.5	3420.00	2211.83	2228.35		2229.51	0.001051	8.63	396.48	24.00	0.37
1000	NORTH REACH	1.4	3420.00	2210.89	2227.35	2219.97	2228.74	0.001375	9.44	362.12	22.00	0.41

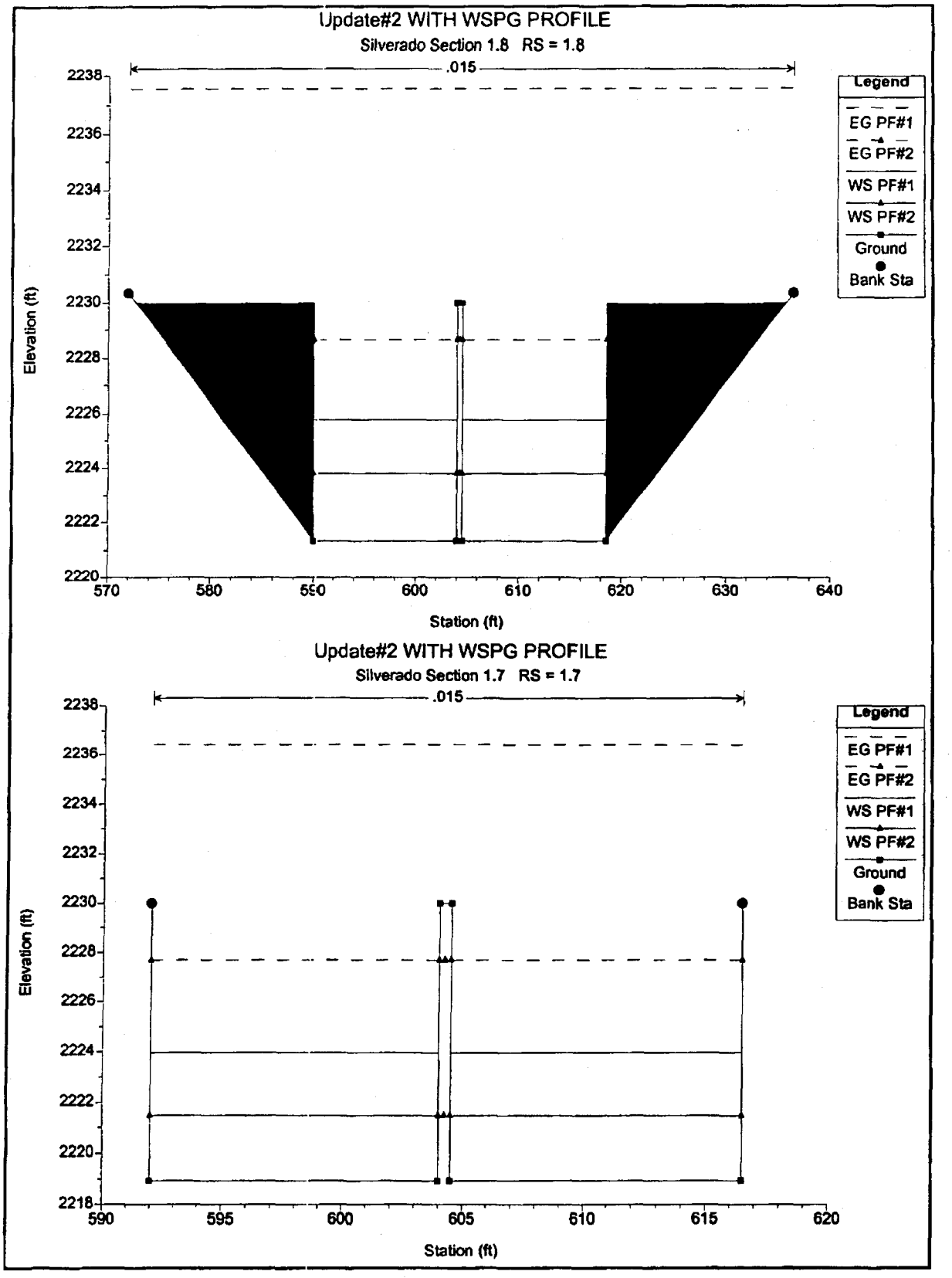

Update#2 WITH WSPG PROFILE
50+67.78 RS = 2.8
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2250
2245
2240
2235
2230
2225
625
630
635
640
645
650
655
Update#2 WITH WSPG PROFILE
52+29.26 RS = 2.6
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2250
2245
2240
2235
2230
2225
600
605
610
615
620
625
630

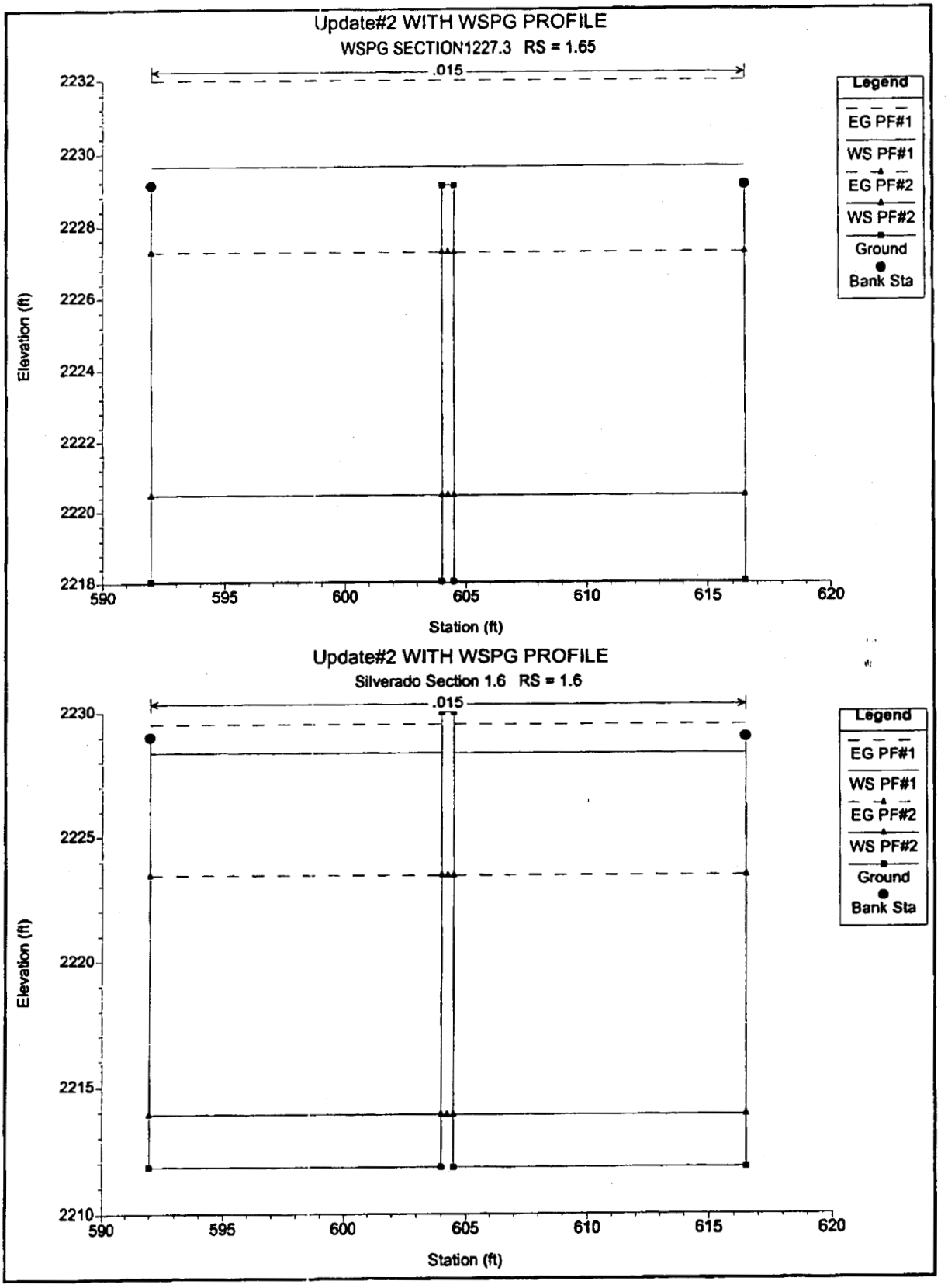

Update#2 WITH WSPG PROFILE
53+88.74 RS = 2.4
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2245
2240
2235
2230
2225
2220
585
590
595
600
605
610
615
Update#2 WITH WSPG PROFILE
RS = 2.35
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)

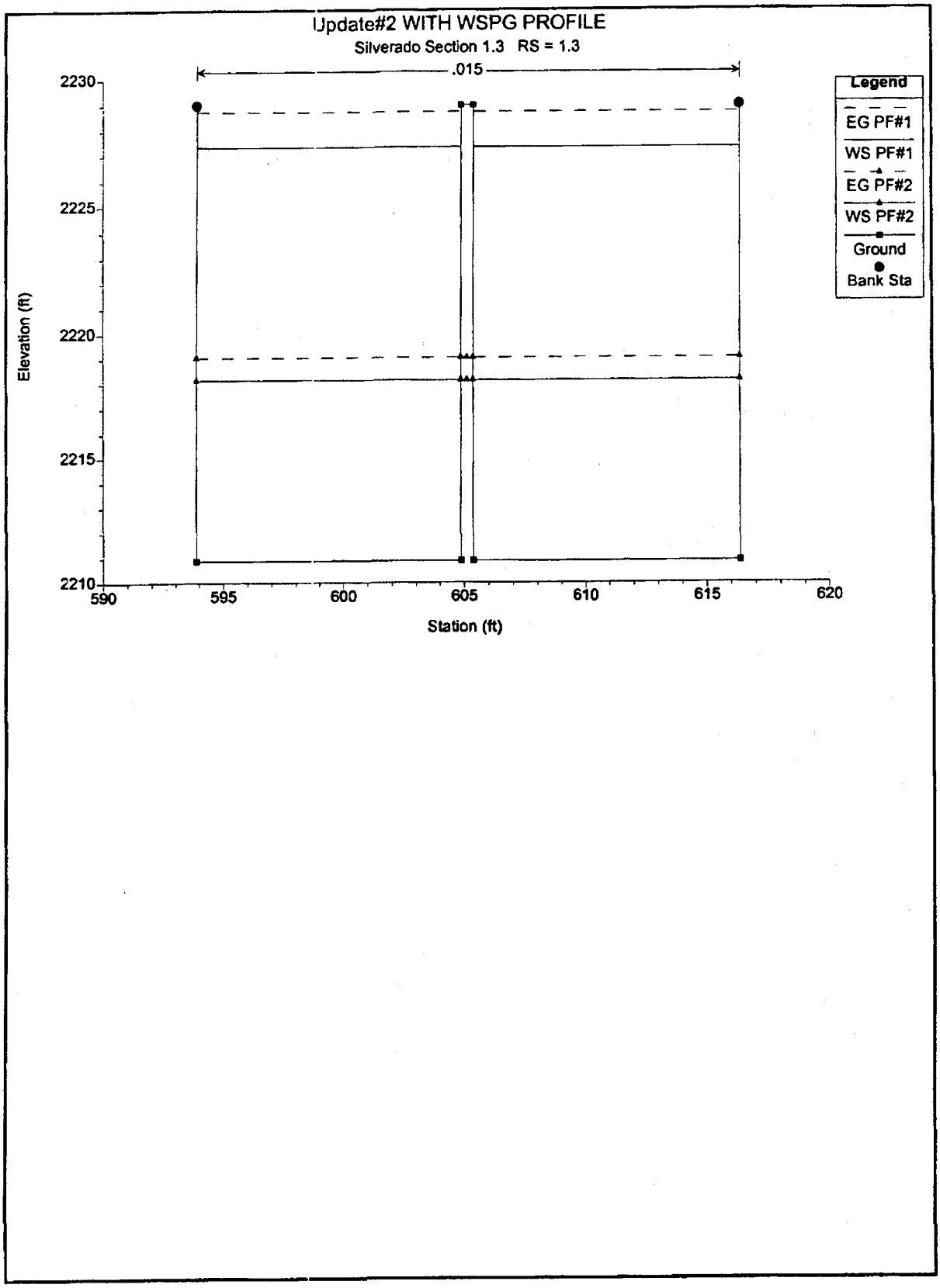

Update#2 WITH WSPG PROFILE
RS = 2.35
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2245
2240
2235
2230
2225
2220
585
590
595
600
605
610
615
Update#2 WITH WSPG PROFILE
54+28.74 RS = 2.3
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2245
2240
2235
2230
2225
2220
585
590
595
600
605
610
615


Update#2 WITH WSPG PROFILE
55+25.21 RS = 2.2
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2245
2240
2235
2230
2225
2220
585
590
595
600
605
610
615
Update#2 WITH WSPG PROFILE
55+75.21 RS = 2.0
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2240
2235
2230
2225
2220
580
585
590
595
600
605
610
615


Update#2 WITH WSPG PROFILE
RS = 1.9
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
Update#2 WITH WSPG PROFILE
RS = 1.9
.015
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Update#2 WITH WSPG PROFILE
Silverado Section 1.8 RS = 1.8
.015
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2238
2236
2234
2232
2230
2228
2226
2224
2222
2220
570
580
590
600
610
620
630
640
Update#2 WITH WSPG PROFILE
Silverado Section 1.7 RS = 1.7
.015
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2238
2236
2234
2232
2230
2228
2226
2224
2222
2220
2218
590
595
600
605
610
615
620


Update#2 WITH WSPG PROFILE
WSPG SECTION1227.3 RS = 1.65
.015
Legend
EG PF#1
WS PF#1
EG PF#2
WS PF#2
Ground
Bank Sta
Elevation (ft)
2232
2230
2228
2226
2224
2222
2220
2218
590
595
600
605
610
615
620
Station (ft)
Update#2 WITH WSPG PROFILE
Silverado Section 1.6 RS = 1.6
.015
Legend
EG PF#1
WS PF#1
EG PF#2
WS PF#2
Ground
Bank Sta
Elevation (ft)
2230
2225
2220
2215
2210
590
595
600
605
610
615
620
Station (ft)


Update#2 WITH WSPG PROFILE
Silverado Section 1.3 RS = 1.3
.015
Legend
EG PF#1
WS PF#1
EG PF#2
WS PF#2
Ground
Bank Sta
Elevation (ft)
2230
2225
2220
2215
2210
590
595
600
605
610
615
620
Station (ft)

HEC-RAS ANALYSIS
GEOMETRIC DATA
AND
FLOW DATA

HEC-RAS September 1998 Version 2.2
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
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: Update#2 WITH WSPG PROFILE
Project File : 5033U3c.prj
Run Date and Time: 10/6/00 4:09:58 PM

Project in English units

Project Description:
++++++

NORTH REACH	NORTH REACH	1.6	PF#1	Known WS	2228.35
NORTH REACH	NORTH REACH	1.3	PF#1	Known WS	2227.35

GEOMETRY DATA

Geometry Title: SECTION-26
Geometry File : j:\brianr\hec-ras\5033u3ras\5033U3c.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
LAKE MEAD N	LAKE MEAD N.		JUNCT 1
JEFFREYS	JEFFREYS		JUNCT 1
OLD EASTERN	OLD EASTERN	JUNCT 1	JUNCT 2
NORTH REACH	NORTH REACH	JUNCT 2	
EAST REACH	EAST REACH	JUNCT 2	

JUNCTION INFORMATION

Name: JUNCT 1
Description: LAKE MEAD
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
JEFFREYS	JEFFREYS	to OLD EASTERN	OLD EASTERN	127	
LAKE MEAD N	LAKE MEAD N.	to OLD EASTERN	OLD EASTERN	172	

Name: JUNCT 2
Description: SPLITTER STRUCTURE
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
OLD EASTERN	OLD EASTERN	to NORTH REACH	NORTH REACH	5	1
OLD EASTERN	OLD EASTERN	to EAST REACH	EAST REACH	5	5

CROSS SECTION RIVER: LAKE MEAD N
REACH: LAKE MEAD N. RS: 28

INPUT
Description: 22+80.28
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
345	2292.73	357	2286.66	395	2286	417	2286	440	2288
462	2290	492	2290	626	2290	637	2288	680	2288
692	2290	771	2290	797	2292	907	2292.2	924	2293.8
959	2294.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
345	.042	357	.025	924	.016

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
345	959	260	250	.1	.3

CROSS SECTION RIVER: LAKE MEAD N
REACH: LAKE MEAD N. RS: 27

INPUT
Description: 20+30.28
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
411	2289.87	418	2286.6	568	2286	578	2284	600	2284
643	2284	650	2284	657	2286	683	2288	766	2290
818	2288	840	2286	896	2285	916	2290.2	927	2290.7
961	2291.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
411	.042	418	.025	927	.016

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
411	961	285	245	.1	.3

CROSS SECTION RIVER: LAKE MEAD N
REACH: LAKE MEAD N. RS: 26

INPUT
Description: 17+85.28
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
475	2287.22	489	2280.22	510	2280	590	2282	635	2282
660	2282	670	2282	725	2282	738	2280	767	2280
793	2282	800	2284	873	2284	904	2284	930	2286
940	2287.8	961	2288.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
475	.042	489	.025	940	.016

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
475	961	250	250	.1	.3

CROSS SECTION RIVER: LAKE MEAD N
REACH: LAKE MEAD N. RS: 25

INPUT

```
Description: 15+35.28
Station Elevation Data    num=       8
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
     475 2284.47      484     2280      683     2280      736     2280      918     2282
     933     2284      940  2284.6       961     2285

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
     475    .042      484    .025      940    .016

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          475     961              245     245     245              .1      .3

CROSS SECTION          RIVER: LAKE MEAD N
REACH: LAKE MEAD N.       RS: 24

INPUT
Description: 12+90.28
Station Elevation Data    num=      14
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
     475 2281.78      485  2276.7       503     2276      540     2276      557     2276
     632     2276      647     2278      787     2280      825     2280      887     2278
     920     2278      932     2280      940  2281.3       961  2281.7

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
     475    .042      485    .025      940    .016

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          475     961              290     260     240              .1      .3

CROSS SECTION          RIVER: LAKE MEAD N
REACH: LAKE MEAD N.       RS: 23.5

INPUT
Description: 23.5
Station Elevation Data    num=       5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
     540 2274.37      550 2269.37       645 2269.37      748 2269.37      755     2273

Manning's n Values        num=       1
     Sta   n Val
     540    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          540     755              198     140     105              .1      .3

CROSS SECTION          RIVER: LAKE MEAD N
REACH: LAKE MEAD N.       RS: 23

INPUT
Description: 23
Station Elevation Data    num=       5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
     675 2269.82      686 2264.08       736 2264.08      777 2264.08      798 2270.02

Manning's n Values        num=       2
     Sta   n Val      Sta   n Val
     675    .042      686    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          675     798              125     133     140              .1      .3

CROSS SECTION          RIVER: LAKE MEAD N
REACH: LAKE MEAD N.       RS: 22

INPUT
Description: 22
Station Elevation Data    num=       5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
     760 2270.07   760.01 2259.07       812 2259.07   869.99 2259.07      870 2270.07

Manning's n Values        num=       1
     Sta   n Val
     760    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          760     870               65      80     110              .1      .3

CROSS SECTION          RIVER: LAKE MEAD N
REACH: LAKE MEAD N.       RS: 21

INPUT
Description: 21
Station Elevation Data    num=       5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
   793.5 2266.05   793.51 2256.27       815.5 2256.05   837.5 2256.27   837.51 2266.06

Manning's n Values        num=       2
     Sta   n Val      Sta   n Val
   793.5    .013   837.51    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        793.5  837.51              100     100     100              .1      .3

CROSS SECTION          RIVER: LAKE MEAD N
REACH: LAKE MEAD N.       RS: 20.8

INPUT
Description: 20.8
Station Elevation Data    num=       5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
   793.5  2261.5   793.51 2254.72       815.5  2254.5   837.5 2254.72   837.51  2261.5
```

```
Manning's n Values          num=       2
     Sta   n Val      Sta   n Val
   793.5    .013  837.51    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          793.5  837.51                 100      100      100             .1      .3

CROSS SECTION           RIVER: LAKE MEAD N
REACH: LAKE MEAD N.        RS: 20.6

INPUT
Description: 20.6
Station Elevation Data     num=       5
     Sta    Elev      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   793.5 2259.95  793.51 2253.17   815.5 2252.95   837.5 2253.17  837.51 2259.95

Manning's n Values          num=       2
     Sta   n Val      Sta   n Val
   793.5    .013  837.51    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          793.5  837.51                 155      155      155             .1      .3

CROSS SECTION           RIVER: LAKE MEAD N
REACH: LAKE MEAD N.        RS: 20

INPUT
Description: 30+30.53
Station Elevation Data     num=       7
     Sta    Elev      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   786.5 2260.05   793.5 2256.55  793.51 2250.77   815.5 2250.55  837.49 2250.77
   837.5 2256.55   849.5 2262.55

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   786.5     .03    793.5    .013   837.5     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          786.5  849.5                  100      100      100             .1      .3

CROSS SECTION           RIVER: LAKE MEAD N
REACH: LAKE MEAD N.        RS: 19

INPUT
Description: 31+31.80
Station Elevation Data     num=       7
     Sta    Elev      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   787.5    2258    793.5    2255  793.51 2249.22   815.5    2249  837.49 2249.22
   837.5    2255    849.5    2261

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   787.5     .03    793.5    .013   837.5     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          793.5  837.5                   90       90       90             .1      .3

CROSS SECTION           RIVER: LAKE MEAD N
REACH: LAKE MEAD N.        RS: 18

INPUT
Description: 32+21.30
Station Elevation Data     num=       5
     Sta    Elev      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     796 2257.59   796.01 2247.79   815.5 2247.59     835 2247.79  835.01 2257.59

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
     796    .013      796    .013   835.01    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          796  835.01                  70       70       70             .1      .3

BRIDGE                  RIVER: LAKE MEAD N
REACH: LAKE MEAD N.        RS: 17.5

INPUT
Description:
Distance from Upstream XS =       0
Deck/Roadway Width        =      70
Weir Coefficient          =     2.6
Bridge Deck/Roadway Skew  =
Upstream  Deck/Roadway Coordinates
    num=       4
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
     796  2260.5 2247.59   796.01  2260.5 2257.59      835  2260.5 2257.59
  835.01  2260.5 2247.59

Upstream Bridge Cross Section Data
Station Elevation Data     num=       5
     Sta    Elev      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     796 2257.59   796.01 2247.79   815.5 2247.59     835 2247.79  835.01 2257.59

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
     796    .013      796    .013   835.01    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          796  835.01             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       4
```

```
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     796 2259.99 2249.94  796.01 2259.99 2256.94     835 2259.99 2256.94
  835.01 2259.99 2249.94

Downstream Bridge Cross Section Data
Station Elevation Data    num=       5
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
     796 2256.94  796.01 2247.14   815.5 2246.94     835 2247.14  835.01 2256.94

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
     796    .013      796    .013   835.01    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          796  835.01             .1       .3

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            =
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=  808.83    Downstream=  808.83
Upstream     num=       2
    Width    Elev    Width    Elev
    1.67    2246    1.67 2257.59
Downstream     num=       2
    Width    Elev    Width    Elev
    1.67    2245    1.67 2256.99

Pier Data
Pier Station     Upstream=  821.67    Downstream=  821.67
Upstream     num=       2
    Width    Elev    Width    Elev
    1.67    2246    1.67 2257.59
Downstream     num=       2
    Width    Elev    Width    Elev
    1.67    2245    1.67 2256.99

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum                Cd   =     1.2
Selected Low Flow Methods = Highest Energy Answer

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: LAKE MEAD N
REACH: LAKE MEAD N.        RS: 17

INPUT
Description: 32+97.30
Station Elevation Data    num=       5
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
     796 2256.94  796.01 2247.14   815.5 2246.94     835 2247.14  835.01 2256.94

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
     796    .013      796    .013   835.01    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          796  835.01               100     100     100             .1       .3

CROSS SECTION           RIVER: LAKE MEAD N
REACH: LAKE MEAD N.        RS: 16

INPUT
Description: 33+97.3
Station Elevation Data    num=       5
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
   794.5   2252.1  794.51 2246.31   815.5   2246.1  836.49 2246.31   836.5   2252.1

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   794.5    .013    794.5    .013    836.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          794.5  836.5             .1       .3

CROSS SECTION           RIVER: JEFFREYS
REACH: JEFFREYS            RS: 3

INPUT
Description: UPSTREAM
Station Elevation Data    num=       6
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
     660     2262     688     2260     727     2257     761     2258     767     2260
     773     2262
```

```
Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
     660    .025      660    .025      773    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           660     773                75      30      32             .1      .3


CROSS SECTION           RIVER: JEFFREYS
REACH: JEFFREYS           RS: 2

INPUT
Description: UPSTREAM
Station Elevation Data     num=      12
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
    525.5     2268    730.5     2264    738.5     2260  738.51     2258    745.5 2254.73
    754.5 2254.73    763.5 2254.73    770.5     2258  770.51     2260    779.5     2264
    894.5     2266     1201     2268

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   525.5    .025    738.5    .025  770.51    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         738.5  770.51                193.57  193.57  193.57             .1      .3

BRIDGE                  RIVER: JEFFREYS
REACH: JEFFREYS           RS: 1.5

INPUT
Description: JEFFREYS #2 CROSSING
Distance from Upstream XS =        1
Deck/Roadway Width        =   150.85
Weir Coefficient          =      2.6
Bridge Deck/Roadway Skew  =
Upstream  Deck/Roadway Coordinates
    num=       9
      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
    525.5     2268  2254.5    644.5 2267.59  2254.5    730.5 2266.93  2254.5
    745.5 2266.83  2254.5   745.51 2266.83  2262.5    763.5 2266.83  2262.5
   763.51 2266.83  2254.5    779.5 2266.65  2254.5     1201 2266.74  2254.5

Upstream Bridge Cross Section Data
Station Elevation Data     num=      12
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
    525.5     2268    730.5     2264    738.5     2260  738.51     2258    745.5 2254.73
    754.5 2254.73    763.5 2254.73    770.5     2258  770.51     2260    779.5     2264
    894.5     2266     1201     2268

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
   525.5    .025    738.5    .025  770.51    .025

Bank Sta: Left   Right    Coeff Contr.   Expan.
         738.5  770.51             .1      .3

Downstream  Deck/Roadway Coordinates
    num=       6
      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
   777.49 2258.88    2246   778.49 2258.88    2246   778.5 2258.88 2254.38
    796.5 2258.88 2254.38   796.51 2258.88    2246  797.51 2258.88    2246

Downstream Bridge Cross Section Data
Station Elevation Data     num=       5
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
   777.49 2254.38    777.5 2246.48    787.5 2246.38    797.5 2246.48  797.51 2254.38

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
  777.49    .013  777.49    .013  797.51    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
         777.49  797.51             .1      .3

Upstream Embankment side slope             =         horiz. to 1.0 vertical
Downstream Embankment side slope           =         horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =      .95
Elevation at which weir flow begins        =
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=   754.5    Downstream=   787.5
Upstream      num=       2
    Width   Elev    Width   Elev
        2   2253        2 2262.73
Downstream    num=       2
    Width   Elev    Width   Elev
        2 2249.81       2 2257.81

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
      Energy        =
      Momentum              Cd   =     1.2
Selected Low Flow Methods = Momentum

High Flow Method
      Pressure and Weir flow
          Submerged Inlet Cd          =
          Submerged Inlet + Outlet Cd =      .8
```

```
          Max Low Cord                =

 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: JEFFREYS
 REACH: JEFFREYS           RS: 1

 INPUT
 Description: 33+74.94
 Station Elevation Data     num=       5
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   777.49 2254.38   777.5 2246.48   787.5 2246.38   797.5 2246.48  797.51 2254.38

 Manning's n Values         num=       3
      Sta   n Val      Sta   n Val      Sta   n Val
   777.49    .013   777.49    .013   797.51    .013

 Bank Sta: Left   Right    Coeff Contr.   Expan.
         777.49  797.51              .1       .3

 CROSS SECTION           RIVER: OLD EASTERN
 REACH: OLD EASTERN        RS: 13

 INPUT
 Description: 35+59.48
 Station Elevation Data     num=       5
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   793.49 2251.31   793.5 2244.86   815.5 2244.64   837.5 2244.86  837.51 2251.31

 Manning's n Values         num=       3
      Sta   n Val      Sta   n Val      Sta   n Val
   793.49    .013   793.49    .013   837.51    .013

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         793.49  837.51              42.69   42.69   42.69              .1       .3

 CROSS SECTION           RIVER: OLD EASTERN
 REACH: OLD EASTERN        RS: 12.5

 INPUT
 Description: 36+02.17
 Station Elevation Data     num=       5
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   793.49  2251.1   793.5 2244.65   815.5 2244.43   837.5 2244.65  837.51  2251.1

 Manning's n Values         num=       3
      Sta   n Val      Sta   n Val      Sta   n Val
   793.49    .013   793.49    .013   837.51    .013

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         793.49  837.51             127.65  127.65  127.65              .1       .3

 CROSS SECTION           RIVER: OLD EASTERN
 REACH: OLD EASTERN        RS: 12

 INPUT
 Description: 37+29.82
 Station Elevation Data     num=       5
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   805.49 2250.47   805.5 2244.02   827.5  2243.8   849.5 2244.02  849.51 2250.47

 Manning's n Values         num=       3
      Sta   n Val      Sta   n Val      Sta   n Val
   805.49    .013   805.49    .013   849.51    .013

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         805.49  849.51             193.18  193.18  193.18              .1       .3

 CROSS SECTION           RIVER: OLD EASTERN
 REACH: OLD EASTERN        RS: 11.5

 INPUT
 Description: 39+23
 Station Elevation Data     num=       5
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   789.49 2249.53   789.5 2243.08   811.5 2242.86   833.5 2243.08  833.51 2249.53

 Manning's n Values         num=       3
      Sta   n Val      Sta   n Val      Sta   n Val
   789.49    .013   789.49    .013   833.51    .013

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         789.49  833.51             168.64  168.64  168.64              .1       .3

 CROSS SECTION           RIVER: OLD EASTERN
 REACH: OLD EASTERN        RS: 11

 INPUT
 Description: 40+91.64
 40+91.64
 Station Elevation Data     num=       5
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   677.49  2248.7   677.5 2242.25   699.5 2242.03   721.5 2242.25  721.51  2248.7

 Manning's n Values         num=       3
      Sta   n Val      Sta   n Val      Sta   n Val
   677.49    .013   677.49    .013   721.51    .013
```

```
Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
        677.49  721.51              25.87   25.87   25.87              .1       .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 10

INPUT
Description: 41+17+.51
Station Elevation Data    num=      5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
  677.49  2249.9    677.5 2242.12   699.5  2241.9   721.5 2242.12  721.51  2249.9

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
  677.49    .013  677.49    .013  721.51    .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
        677.49  721.51              35.5      35    35.5              .1       .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 9.5*

INPUT
Description:
Station Elevation Data    num=      7
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
  653.99 2247.38      654  2240.5   654.01  2239.1   672.5 2238.88      691  2239.1
     691  2240.5   691.01 2247.38

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
  653.99    .013  653.99    .013  691.01    .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
        653.99  691.01              35.5      35    35.5              .1       .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 9

INPUT
Description: 41+87.51
Station Elevation Data    num=      5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   630.5 2244.86   630.51 2236.08   645.5 2235.86   660.5 2236.08  660.51 2244.86

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
   630.5    .013   630.5    .013  660.51    .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
        630.5  660.51              200     200     200              .1       .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 8

INPUT
Description: 43+87.51
Station Elevation Data    num=      5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   630.5 2242.24   630.51 2234.46   645.5 2234.24   660.5 2234.46  660.51 2242.24

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
   630.5    .013   630.5    .013  660.51    .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
        630.5  660.51              150     150     150              .1       .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 7

INPUT
Description: 45+37.51
Station Elevation Data    num=      5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   630.5 2241.03   630.51 2233.25   645.5 2233.03   660.5 2233.25  660.51 2241.03

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
   630.5    .013   630.5    .013  660.51    .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
        630.5  660.51           149.89  149.89  149.89              .1       .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 6

INPUT
Description: 46+87.4/10+00
47+05.38
46+80.77
Station Elevation Data    num=      5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   630.5 2239.81   630.51 2232.03   645.5 2231.81   660.5 2232.03  660.51 2239.81

Manning's n Values        num=      3
     Sta   n Val      Sta   n Val      Sta   n Val
   630.5    .013   630.5    .013  660.51    .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
        630.5  660.51            90.89   90.89   90.89              .1       .3

CROSS SECTION           RIVER: OLD EASTERN
```

```
REACH: OLD EASTERN        RS: 5.5

INPUT
Description: 10+90.89
47+05.38
46+80.77
Station Elevation Data    num=      5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     635 2239.07  635.01 2231.29     650 2231.07     665 2231.29  665.01 2239.07

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
     635    .013     635    .013  665.01    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          635  665.01             90.89   90.89   90.89             .1      .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 5

INPUT
Description: 11+81.78
11+81.78
Station Elevation Data    num=      5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   639.5 2237.84  639.51 2230.56    654.5 2230.34    669.5 2230.56  669.51 2237.84

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
   639.5    .013   639.5    .013  669.51    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          639.5  669.51              100     100     100             .1      .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 4

INPUT
Description: 12+81.78
Station Elevation Data    num=      5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   630.5 2237.53  630.51 2229.75    654.5 2229.53    678.5 2229.75  678.51 2237.53

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
   630.5    .013   630.5    .013  678.51    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          630.5  678.51              100     100     100             .1      .3

CROSS SECTION           RIVER: OLD EASTERN
REACH: OLD EASTERN        RS: 3

INPUT
Description: 13+82.69/50+67.55
Station Elevation Data    num=      5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   630.5 2234.71  630.51 2228.93    654.5 2228.71    678.5 2228.93  678.51 2234.71

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
   630.5    .013   630.5    .013  678.51    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          630.5  678.51             .1      .3

CROSS SECTION           RIVER: NORTH REACH
REACH: NORTH REACH        RS: 2.8

INPUT
Description: 50+67.78
Station Elevation Data    num=      5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     626 2233.71  626.02 2228.79    638.8 2228.71    650.99 2228.79  651.01 2233.71

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
     626    .013     626    .013  651.01    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          626  651.01             159.48  159.48  159.48             .1      .3

CROSS SECTION           RIVER: NORTH REACH
REACH: NORTH REACH        RS: 2.6

INPUT
Description: 52+29.26
52+15.93
Station Elevation Data    num=      5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     603    2231  603.02 2225.58    615.5  2225.5  627.99 2225.58  628.01    2231

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
     603    .013     603    .013  628.01    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          603  628.01             159.48  159.48  159.48             .1      .3

CROSS SECTION           RIVER: NORTH REACH
REACH: NORTH REACH        RS: 2.4

INPUT
```

```
Description: 53+88.74
53+88.74
53+63.3
Station Elevation Data     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   585.5 2230.84  585.52 2223.92     598 2223.84  610.49 2223.92  610.51 2230.84

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   585.5    .013   585.5    .013  610.51    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         585.5  610.51                 40      40      40             .1      .3

BRIDGE                  RIVER: NORTH REACH
REACH: NORTH REACH        RS: 2.35

INPUT
Description:
Distance from Upstream XS =       0
Deck/Roadway Width        =      40
Weir Coefficient          =     2.6
Bridge Deck/Roadway Skew  =
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   585.5 2230.87 2229.87  610.51 2230.87 2229.87

Upstream Bridge Cross Section Data
Station Elevation Data     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   585.5 2230.84  585.52 2223.92     598 2223.84  610.49 2223.92  610.51 2230.84

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   585.5    .013   585.5    .013  610.51    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
         585.5  610.51             .1      .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   585.5 2230.45 2229.45  610.51 2230.45 2229.45

Downstream Bridge Cross Section Data
Station Elevation Data     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   585.5 2230.42  585.52  2223.5     598 2223.42  610.49  2223.5  610.51 2230.42

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   585.5    .013   585.5    .013  610.51    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
         585.5  610.51             .1      .3

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        =
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=     598    Downstream=     598
Upstream      num=       2
    Width   Elev    Width   Elev
        1   2223        1 2229.87
Downstream    num=       2
    Width   Elev    Width   Elev
        1   2223        1 2229.45

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
      Energy
Selected Low Flow Methods = Highest Energy Answer

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: NORTH REACH
REACH: NORTH REACH        RS: 2.3

INPUT
Description: 54+28.74
53+63.3
Station Elevation Data     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   585.5 2230.42  585.52  2223.5     598 2223.42  610.49  2223.5  610.51 2230.42

Manning's n Values         num=       3
```

```
     Sta    n Val      Sta    n Val      Sta    n Val
   585.5     .013   585.5     .013  610.51     .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
          585.5  610.51              96.47   96.47   96.47              .1       .3

CROSS SECTION           RIVER: NORTH REACH
REACH: NORTH REACH        RS: 2.2

INPUT
Description: 55+25.21
Station Elevation Data     num=       5
      Sta     Elev       Sta     Elev       Sta     Elev      Sta     Elev      Sta     Elev
   585.5 2231.42   585.52  2222.5      598 2222.42  610.49  2222.5  610.51 2231.42

Manning's n Values         num=       3
      Sta    n Val      Sta    n Val      Sta    n Val
   585.5     .013   585.5     .013  610.51     .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
          585.5  610.51               50      50      50              .1       .3

CROSS SECTION           RIVER: NORTH REACH
REACH: NORTH REACH        RS: 2.0

INPUT
Description: 55+75.21
Station Elevation Data     num=       5
      Sta     Elev       Sta     Elev       Sta     Elev      Sta     Elev      Sta     Elev
  583.74  2231.4   583.75 2221.98      598  2221.9  612.25 2221.98  612.26  2231.4

Manning's n Values         num=       3
      Sta    n Val      Sta    n Val      Sta    n Val
  583.74     .013   583.74     .013  612.26     .013

Bank Sta: Left   Right     Lengths: Left Channel   Right      Coeff Contr.    Expan.
          583.74 612.26                66      66      66              .1       .3

BRIDGE                  RIVER: NORTH REACH
REACH: NORTH REACH        RS: 1.9

INPUT
Description:
Distance from Upstream XS =       2
Deck/Roadway Width        =      60
Weir Coefficient          =     2.6
Bridge Deck/Roadway Skew  =
Upstream  Deck/Roadway Coordinates
    num=       2
      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
  583.74  2231.4  2227.9   612.26  2231.4  2227.9

Upstream Bridge Cross Section Data
Station Elevation Data     num=       5
      Sta     Elev       Sta     Elev       Sta     Elev      Sta     Elev      Sta     Elev
  583.74  2231.4   583.75 2221.98      598  2221.9  612.25 2221.98  612.26  2231.4

Manning's n Values         num=       3
      Sta    n Val      Sta    n Val      Sta    n Val
  583.74     .013   583.74     .013  612.26     .013

Bank Sta: Left   Right     Coeff Contr.    Expan.
          583.74 612.26              .1       .3

Downstream  Deck/Roadway Coordinates
    num=       6
      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
      572 2228.34               590 2228.34           590.01 2228.34 2227.34
   618.5 2228.34 2227.34   618.51 2228.34            636.5 2228.34

Downstream Bridge Cross Section Data
Station Elevation Data     num=       8
      Sta     Elev       Sta     Elev       Sta     Elev      Sta     Elev      Sta     Elev
      572 2230.34       590 2221.34       604 2221.34       604     2230    604.5     2230
    604.5 2221.34   618.5 2221.34   636.5 2230.34

Manning's n Values         num=       1
      Sta    n Val
      572     .015

Bank Sta: Left   Right     Coeff Contr.    Expan.
          572    636.5              .1       .3
Blocked Obstructions       num=       2
   Sta L    Sta R     Elev    Sta L    Sta R     Elev
     572      590     2230    618.5    636.5     2230

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         =
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=     598    Downstream=  604.25
Upstream      num=       2
    Width    Elev     Width    Elev
       .5    2221        .5  2231.4
Downstream    num=       2
    Width    Elev     Width    Elev
```

```
       1    2221        1 2228.34

 Number of Bridge Coefficient Sets =  1

 Low Flow Methods and Data
        Energy
        Momentum                Cd   =     1.2
 Selected Low Flow Methods = Highest Energy Answer

 High Flow Method
        Pressure and Weir flow
            Submerged Inlet Cd          =
            Submerged Inlet + Outlet Cd =      .8
            Max Low Cord                =

 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: NORTH REACH
 REACH: NORTH REACH        RS: 1.8

 INPUT
 Description: Silverado Section 1.8
 Station Elevation Data    num=      8
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
      572 2230.34       590 2221.34       604 2221.34       604     2230    604.5     2230
    604.5 2221.34     618.5 2221.34     636.5 2230.34

 Manning's n Values        num=       1
      Sta    n Val
      572     .015

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           572   636.5                 50      50      50              .1      .3
 Blocked Obstructions      num=       2
    Sta L   Sta R    Elev    Sta L   Sta R    Elev
      572     590    2230    618.5   636.5    2230

 CROSS SECTION           RIVER: NORTH REACH
 REACH: NORTH REACH        RS: 1.7

 INPUT
 Description: Silverado Section 1.7
 Station Elevation Data    num=       8
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
      592     2230      592 2218.93       604 2218.93       604     2230    604.5     2230
    604.5 2218.93     616.5 2218.93     616.5     2230

 Manning's n Values        num=       1
      Sta    n Val
      592     .015

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           592   616.5                18.31   18.31   18.31              .1      .3

 CROSS SECTION           RIVER: NORTH REACH
 REACH: NORTH REACH        RS: 1.65

 INPUT
 Description: WSPG SECTION1227.3
 Station Elevation Data    num=       8
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
      592 2229.11       592 2218.04       604 2218.04       604 2229.11    604.5 2229.11
    604.5 2218.04     616.5 2218.04     616.5 2229.11

 Manning's n Values        num=       1
      Sta    n Val
      592     .015

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           592   616.5                127.3   127.3   127.3              .1      .3

 CROSS SECTION           RIVER: NORTH REACH
 REACH: NORTH REACH        RS: 1.6

 INPUT
 Description: Silverado Section 1.6
 Station Elevation Data    num=       8
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
      592     2229      592 2211.83       604 2211.83       604     2230    604.5     2230
    604.5 2211.83     616.5 2211.83     616.5     2229

 Manning's n Values        num=       1
      Sta    n Val
      592     .015

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           592   616.5                 100     100     100              .1      .3

 CROSS SECTION           RIVER: NORTH REACH
 REACH: NORTH REACH        RS: 1.3

 INPUT
 Description: Silverado Section 1.3
 G.C. WALLACE SECTION 1.3
 Station Elevation Data    num=       8
      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
  593.875     2229  593.875 2210.89  604.875 2210.89  604.875     2229  605.375     2229
  605.375 2210.89  616.375 2210.89  616.375     2229
```

```
Manning's n Values          num=        1
     Sta   n Val
 593.875    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       593.875 616.375                  0         0         0              .1       .3

CROSS SECTION           RIVER: EAST REACH
REACH: EAST REACH          RS: 2.8

INPUT
Description: 1+00.72
Station Elevation Data     num=        5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
   652.5 2233.71   652.51 2228.86   663.5 2228.71   674.49 2228.86   674.5 2233.71

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
   652.5    .013    652.5    .013    674.5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          652.5   674.5                110.98    110.98    110.98           .1       .3

CROSS SECTION           RIVER: EAST REACH
REACH: EAST REACH          RS: 2.35

INPUT
Description: 2+11.70
Station Elevation Data     num=        5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
   658.3 2231.48   658.31 2226.63   669.3 2226.48   680.29 2226.63   680.3 2231.48

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
   658.3    .013    658.3    .013    680.3    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          658.3   680.3                  90        90        90             .1       .3

CROSS SECTION           RIVER: EAST REACH
REACH: EAST REACH          RS: 2.2

INPUT
Description: 3+01.70
2+90.90
Station Elevation Data     num=        5
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
     659 2228.95   659.01 2224.15     674 2223.95     689 2224.15   689.01 2228.95

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
     659    .013     659    .013  689.01    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          659  689.01                   5         5         5              .1       .3
```

W.O.# 5033-FC

WILLDAN
Services For Public Agencies
[illegible] Desert Inn Road, Suite [illegible]
Las Vegas, Nevada 89121
702/734-3000 Fax 702/734-3090
www.willdan.com

FAX MEMORANDUM

TO: Brian Ruiz, James Fitzpatrick, P.E., VTN Nevada

FROM: Chris O. Stone, P.E. COS

DATE: October 6, 2000

OFFICE: Las Vegas

SUBJECT: **Technical Drainage Study** for Section 26 Phase 1 **(3244)**
H.T.E.#00-22970

This memo is being faxed in lieu of a typical mailed memorandum in order to expedite the review process. The following items are required in order to produce an approval memorandum for the above referenced **Technical Drainage Study**:

1. Please find attached, the WSPG model information from the Silverado Ranch Culvert Extension drainage study by G.C. Wallace. Per our discussions of earlier today, investigate the location of the hydraulic jump shown in this WSPG and in the previously submitted HEC-RAS and revise your HEC-RAS as appropriate;

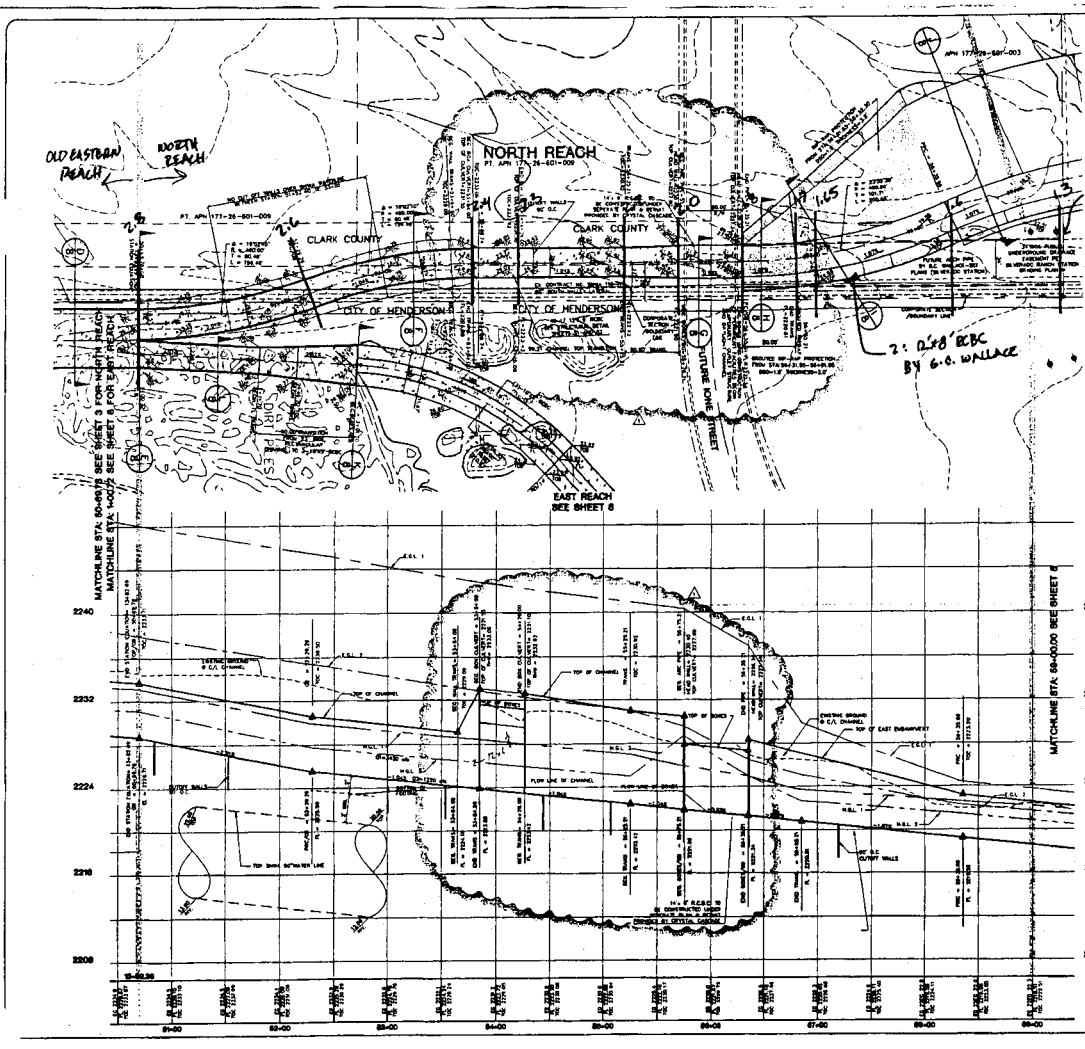
2. The vertical information shown on the HEC-RAS cross section maps submitted does not match that in the model submitted. The cross section maps or the model must be revised and resubmitted;

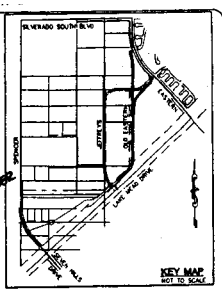
Two copies of the supplemental information must be submitted directly to WILLDAN.

The items listed herein must be thoroughly addressed and submitted for review within 5 days of the above date.

cc: Phu Simpson/Dave Betley, CCPW
Olympic Management / Developers of Nevada

P:\Projects\CCPW\CCPW-3249\Projects\3244-fx3.wpd





BENCHMARK
CITY OF HENDERSON BENCHMARK 153
CLARK COUNTY BENCHMARK BCM-2668

BEARING DIRECTION 998.680 DEGREES (2263.040 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS 998 NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NAD83), EAST ZONE, (2702), DETERMINED BY CONTROL POINTS, P.O.B. NO. 2" AND "B.BMK".

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION

Call before you Dig 1-800-227-2600
Call before you OVERHEAD 1-702-383-4111

GRAPHIC SCALE

NOTE:
Contractor shall field locate SNWA 110-H access manways, test stations, and location markers and protect.

CONTRACTOR WILL APPROPRIATELY ADJUST ALL SNWA ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES TO NEW GRADE AT CONTRACTORS EXPENSE. CONTRACTOR TO NOTIFY KRIS BRITTS AT (702) 568-1537 EXTENSION 209 AND DON JACOBSON WITH SNWS AT (702) 564-7887 PRIOR TO CONSTRUCTION ACTIVITY WITHIN LIMITS OF SNWA/SNWS FACILITIES (STATIONS 39+00-65+00) AND PRIOR TO ADJUSTING MANHOLE RINGS AND COVERS.

WILLDAN
RECEIVED
OCT 18 2000
LAS VEGAS

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____.

BEN T. BARNES P.E.
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

OLYMPIC NEVADA INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

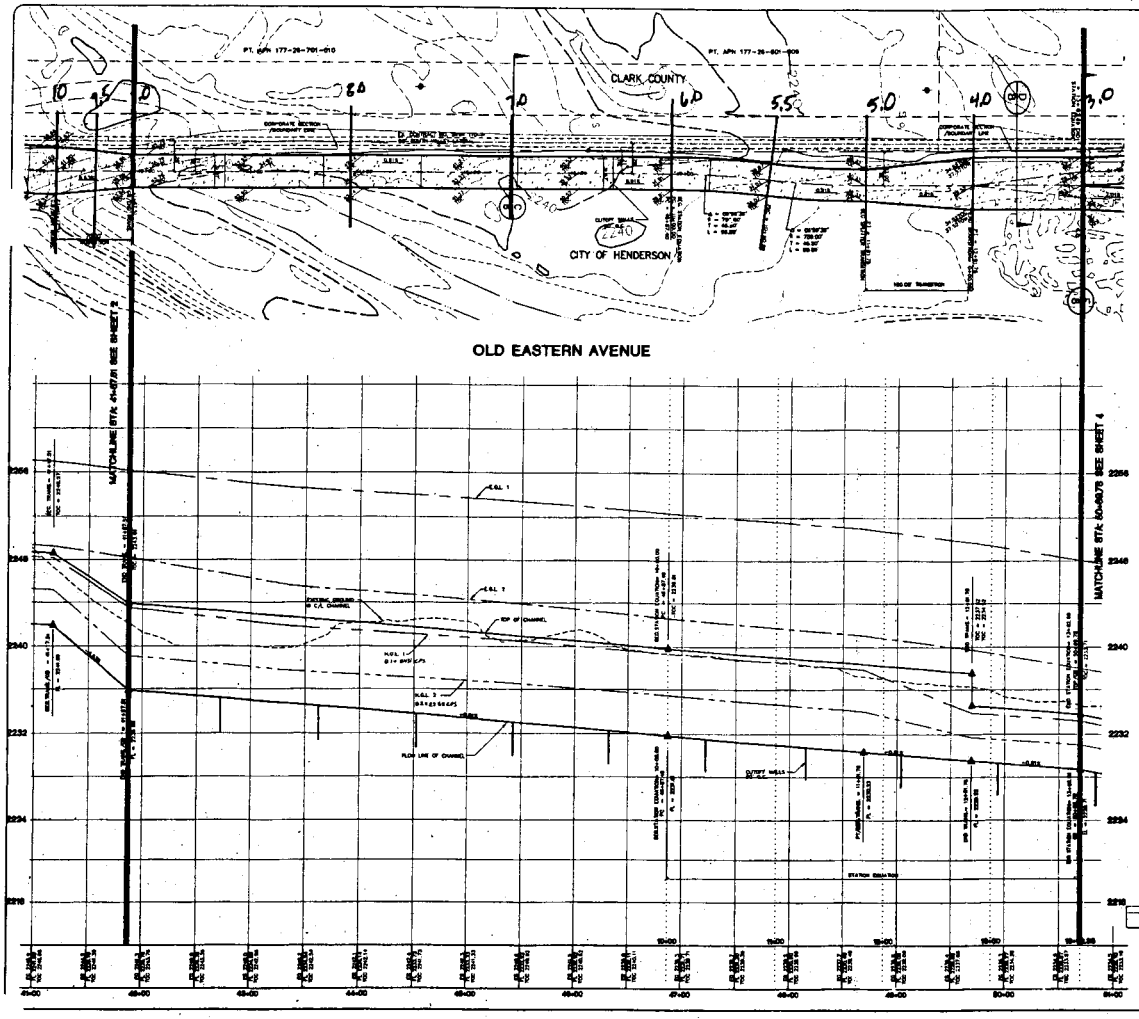
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
7727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89170-3148 PHONE (702) 873-7550 FAX (702) 361-2597

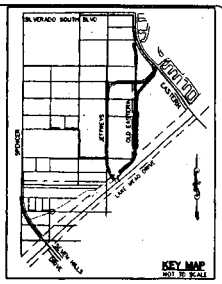
NO.	BY	REVISED CHANNEL TO ADD SIX GAUGES PER CLARK	DATE
1	RAS		10/17/00
2	RAS		10/18/00

CHANNEL PLAN & PROFILES
NORTH REACH

LAKE MEAD / EASTERN
PHASE 1 - DRAINAGE CHANNEL

JOB NO.	6033-FX
BY	BR/DLG
DATE	FEB.1998
SCALE	HORIZ. 1"=40' VERT. 1"=4'
SHEET	4 OF 12 SHEETS





BENCHMARK

CITY OF HENDERSON BENCHMARK NO.
CLARK COUNTY BENCHMARK 6229-2006

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD AT A/R STATION 217+53.76, 1000 ± WEST OF EASTERN AVENUE.

ELEVATION DATUM: 656.880 METERS (2063.946 FEET)

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS PROJECT IS SAID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NAD83), EAST ZONE, (FIPS), DETERMINED BY CONTROL POINTS, "TIA 187 3" AND "ELSIE".

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-656-8778

GRAPHIC SCALE

NOTE: (SNWA)

MINIMUM OF FIVE FEET OF COVER SHALL BE MAINTAINED OVER THE PIPELINE WHERE NECESSARY FOR EQUIPMENT TRAVEL DURING CONSTRUCTION OF THE CHANNEL.

THE VENT FOR THE AIR RAILWAY VAULT AND THE CATHODIC PROTECTION TEST STATION ARE RELOCATED PRIOR TO EXCAVATION OF THE CHANNEL AND THEIR DESIGN FOR THE RELOCATION BE APPROVED BY SNWA. IT IS FURTHER RECOMMENDED THE SNWA CATHODIC PROTECTION SPECIALIST BRUCE SMITH, 241-3971 BE NOTIFIED TO BE PRESENT DURING THESE RELOCATIONS.

Contractor shall field locate SNWA 110-H access manways, test stations, and location markers and protect.

CONTRACTOR WILL APPROPRIATELY ADJUST ALL SNWA ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES TO NEW GRADE AT CONTRACTORS EXPENSE CONTRACTOR TO NOTIFY KING GRITTS AT (702) 368-1637 EXTENSION 209 AND DON JACOBSON WITH SNWS AT (702) 864-7987 PRIOR TO CONSTRUCTION ACTIVITY WITHIN LIMITS OF SNWA/SNWS FACILITIES (STATIONS 39+00-65+00) AND PRIOR TO ADJUSTING MANHOLE RINGS AND COVERS.

WILLDAN ASSOCIATES
RECEIVED
OCT 10 2000
LAS VEGAS

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY, AND MUST BE RENEWED FOR REVISIONS TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY

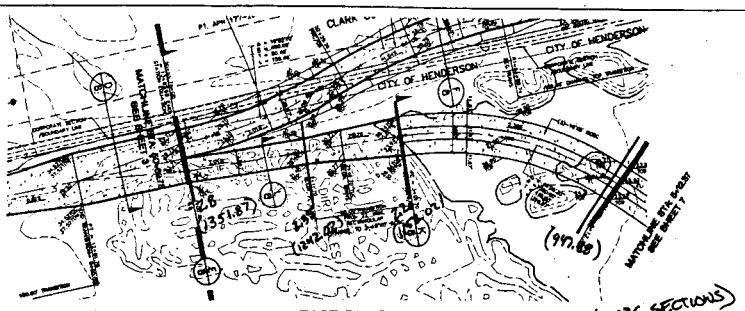
CITY OF HENDERSON, NEVADA
CLARK COUNTY, NEVADA
OLYMPIC NEVADA INC.

CONSULTING ENGINEERS & PLANNERS & LAND SURVEYORS
3770 HOWARD HUGHES PARKWAY, SUITE 300 LAS VEGAS, NEVADA 89109-5948 PHONE (702) 873-7500 FAX (702) 362-2987

CHANNEL PLAN & PROFILES OLD EASTERN AVENUE

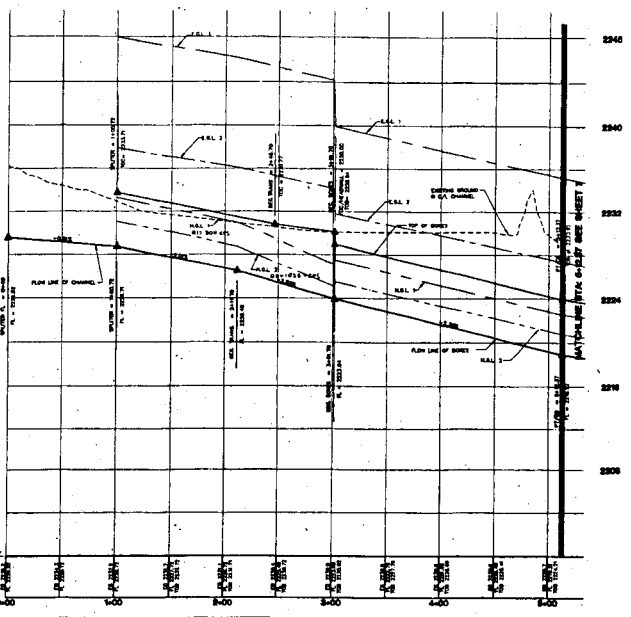
LAKE MEAD / EASTERN
PHASE I - DRAINAGE CHANNEL

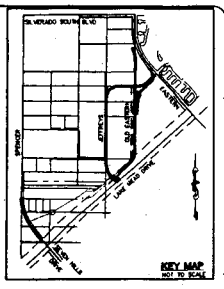
J.O. NO.	60631-FX
BY	BR/DLG
DATE	FEB.1998
SCALE	HORZ. 1"=40' VERT. 1"=4'
SHEET	3 OF 12 SHEETS



EAST REACH

(WSPG SECTIONS)





BENCHMARK

BASIS OF BEARINGS

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE ECSION ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-650-5555

GRAPHIC SCALE

WILLIAM SHOTO
REGIONAL PUBLIC WORKS MANAGER
OCT 11 2000
RECEIVED
LAS VEGAS

CITY APPROVAL OF THE ENGINEERING PLANS IS GIVEN FOR USE IN THAT ONLY. PLANS SHALL BE RESUBMITTED FOR APPROVAL IF THERE IS ANY DEPARTURE OF THE PLANS FROM CITY OF HENDERSON STANDARDS. IT SHALL BE THE RESPONSIBILITY OF THE ENGINEER OF RECORD TO SUBMIT REVISED PLANS FOR APPROVAL AND OBTAIN APPROVAL OF SUCH REVISIONS BEFORE CONSTRUCTION OF THE AFFECTED WORK. CITY OF HENDERSON ASSUMES NO RESPONSIBILITY FOR ERRORS OR OMISSIONS ON THE PLANS.

1-7-99
DEV. ENGINEERING PE
DEV. DEVELOPMENT ENGINEER, CITY OF HENDERSON DATE

OLYMPIC NEVADA/MC
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

CONSULTING ENGINEERS • PLANNERS & LAND SURVEYORS
3777 SOUTH FAMION BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7500 FAX (702) 362-7967

TITLE: CHANNEL PLAN & PROFILES
EAST REACH
LAKE MEAD CULVERT

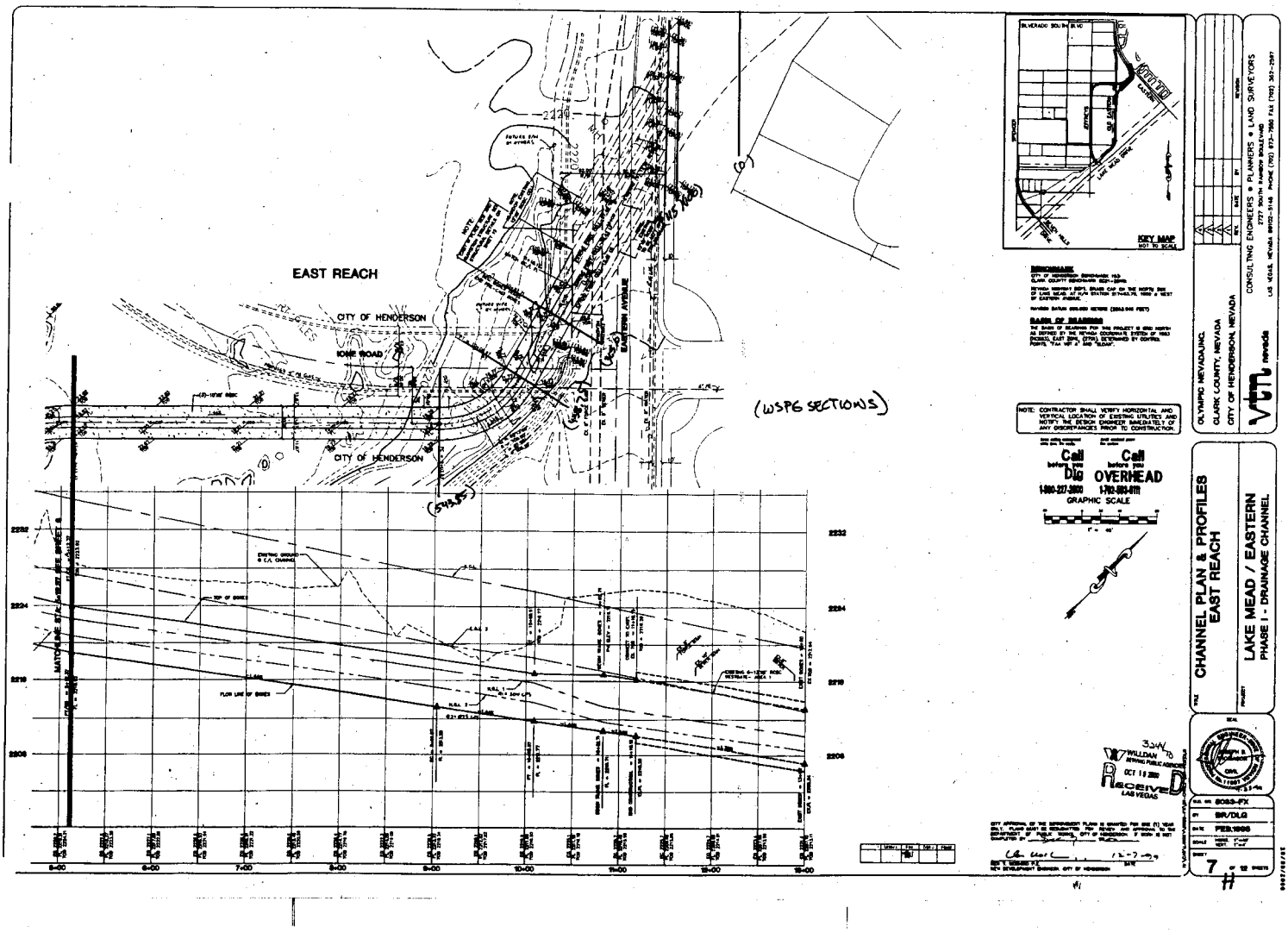
PROJECT: LAKE MEAD / EASTERN
PHASE I - DRAINAGE CHANNEL

SEAL

JOB NO.	6083-FX
BY	BR/DLG
DATE	FEB.1999
SCALE	HORZ. 1"=40' VERT. 1"=4'
SHEET	6 OF 10 SHEETS

#

#


EAST REACH
CITY OF HENDERSON
IONE ROAD
EASTERN AVENUE
(WSPG SECTIONS)
CITY OF HENDERSON
MATCHLINE STA 0+00.00 SEE SHEET 6
FOR LINE
EXISTING GROUND @ C.L. CHANNEL
TOP OF BANK
FLOW LINE OF BANKS
SEE TRANS. SHEET 8
SEE TRANS. SHEET 9
SEE TRANS. SHEET 10
2232
2224
2216
2208
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
13+00
KEY MAP
NOT TO SCALE
NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.
Call before you Dig 1-800-227-2600
Call before you OVERHEAD 1-702-893-8111
GRAPHIC SCALE
WILLDAN
RECEIVED
OCT 11 2000
LAS VEGAS
OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
LAS VEGAS, NEVADA 89102-2161 PHONE (702) 382-1300 FAX (702) 382-2397
vtn nevada
TITLE
CHANNEL PLAN & PROFILES
EAST REACH
PROJECT
LAKE MEAD / EASTERN
PHASE I - DRAINAGE CHANNEL
JOB NO. 2053-FX
BY SR/DLG
DATE FEB.1999
SCALE HORIZ. 1"=40' VERT. 1"=4'
SHEET 7 OF 12 SHEETS

SECTION 26 PHASE I FACILITIES
HEC-RAS WSPG
OUTPUT
REFERENCED FROM
ADDENDUM #3 TO THE
DESIGN REPORT FOR SECTION 26
DRAINAGE FACILTIES
BY VTN NEVADA
OCTOBER 9, 1998

EAST REACH
WSPG ANALYSIS

ULTIMATE CONDITION
ANALYSIS
Q= 1035 cfs

```
                                        ZX
 1 SECTION 26 CHANNEL (EAST REACH)
 2 FUTURE CONDITION Q= 1035CFS AUGUST 12, 1998
 3 FILE 5033FC.DAT
 O      0.002202.50  1
       100.002206.24  1       .022
 S     115.002206.8   6       .013
 X                    2
       365.002210.20  2       .013
 S     438.752211.77  3       .013
       543.852213.28  3       .013                                    60.22
       947.882219.09  3       .013
       1152.022223.95 3       .013                                    43.0
 E                    4
 S     1242.022226.08 5       .013
       1351.872228.71 5       .013
 H     1351.872228.71 5                                2230.73
 D   1  1             10.0     80.   2.   2.
 D   2  3   2     2.   6.0     40.
 D   3  3   2     2.   5.0     34.
 D   4  2             5.0     34.
 D   5  2             5.0     22.
 D   6  2             6.0     40.
```

TE: 9/17/1998
: 9:12

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

RD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
	1	1	0	0.00	10.00	80.00	2.00	2.00	0.00										
CD	2	3	2	2.00	6.00	40.00	0.00	0.00	0.00										
CD	3	3	2	2.00	5.00	34.00	0.00	0.00	0.00										
	4	2	0	0.00	5.00	34.00			0.00										
	5	2	0	0.00	5.00	22.00			0.00										
CD	6	2	0	0.00	6.00	40.00			0.00										

WATER SURFACE PROFILE - TITLE CARD LISTING

ING LINE NO 1 IS -

SECTION 26 CHANNEL (EAST REACH)

DING LINE NO 2 IS -

FUTURE CONDITION Q= 1035CFS AUGUST 12, 1998

DING LINE NO 3 IS -

FILE 5033FC.DAT

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	0.00	2202.50	1	0.00

MENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	100.00	2206.24	1	0.022	0.00	0.00	0.00	0

MENT NO 3 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	115.00	2206.80	6	0.013

LEMENT NO 4 IS A BRIDGE EXIT *

U/S DATA	STATION	INVERT	SECT
	115.00	2206.80	2

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	365.00	2210.20	2	0.013	0.00	0.00	0.00	0

EMENT NO 6 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	438.75	2211.77	3	0.013

EMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	543.85	2213.28	3	0.013	0.00	60.22	0.00	0

EMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	947.88	2219.09	3	0.013	0.00	0.00	0.00	0

LEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1152.02	2223.95	3	0.013	0.00	43.00	0.00	0

ELEMENT NO 10 IS A BRIDGE ENTRANCE *

U/S DATA	STATION	INVERT	SECT	FP
	1152.02	2223.95	4	1.000

ELEMENT NO 11 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	1242.02	2226.08	5	0.013

LEMENT NO 12 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1351.87	2228.71	5	0.013	0.00	0.00	0.00	0

LEMENT NO 13 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1351.87	2228.71	5	2230.73

0 EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

SECTION 26 CHANNEL (EAST REACH)

FUTURE CONDITION Q= 1035CFS AUGUST 12, 1998

FILE 5033FC.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
0.00	2202.50	0.969	2203.469	1035.0	13.04	2.639	2206.108	0.00	1.708		10.00	80.00	2.00	0	0.00
24.84	0.03740					.042217	1.05			0.991			2.00		
24.84	2203.43	0.944	2204.373	1035.0	13.39	2.784	2207.157	0.00	1.708		10.00	80.00	2.00	0	0.00
22.70	0.03740					.047770	1.08			0.991			2.00		
47.54	2204.28	0.901	2205.179	1035.0	14.04	3.062	2208.241	0.00	1.708		10.00	80.00	2.00	0	0.00
14.39	0.03740					.055828	0.80			0.991			2.00		
61.93	2204.82	0.860	2205.676	1035.0	14.73	3.368	2209.044	0.00	1.708		10.00	80.00	2.00	0	0.00
10.68	0.03740					.065253	0.70			0.991			2.00		
72.61	2205.22	0.821	2206.037	1035.0	15.45	3.705	2209.742	0.00	1.708		10.00	80.00	2.00	0	0.00
8.57	0.03740					.076280	0.65			0.991			2.00		
81.18	2205.54	0.783	2206.319	1035.0	16.20	4.076	2210.395	0.00	1.708		10.00	80.00	2.00	0	0.00
7.18	0.03740					.089178	0.64			0.991			2.00		
88.36	2205.80	0.747	2206.552	1035.0	16.99	4.484	2211.036	0.00	1.708		10.00	80.00	2.00	0	0.00
6.19	0.03740					.104270	0.65			0.991			2.00		
94.55	2206.04	0.713	2206.749	1035.0	17.82	4.932	2211.681	0.00	1.708		10.00	80.00	2.00	0	0.00
5.45	0.03740					.121930	0.66			0.991			2.00		
100.00	2206.24	0.681	2206.921	1035.0	18.69	5.425	2212.346	0.00	1.708		10.00	80.00	2.00	0	0.00
TRANS STR	0.03733					.030174	0.65						2.00		
115.00	2206.80	1.505	2208.305	1035.0	17.19	4.590	2212.895	0.00	2.751		6.00	40.00	0.00	0	0.00
BRIDGE EXIT													0.00		
115.00	2206.80	1.708	2208.508	1035.0	16.83	4.398	2212.906	0.00	2.951		6.00	40.00	0.00	2	2.00
37.43	0.01360					.014990	0.56			1.758			0.00		

WATER SURFACE PROFILE LISTING

SECTION 26 CHANNEL (EAST REACH)

FUTURE CONDITION Q= 1035CFS AUGUST 12, 1998

FILE 5033FC.DAT

STATION / ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH		HGT/ DIA / ZR	BASE/ ID NO.	ZL	NO PIER	AVBPR
152.43	2207.31	1.696	2209.005	1035.0	16.95	4.463	2213.468	0.00	2.951		6.00	40.00	0.00	2	2.00
134.09	0.01360					.016339	2.19			1.758			0.00		
286.52	2209.13	1.617	2210.750	1035.0	17.78	4.909	2215.659	0.00	2.951		6.00	40.00	0.00	2	2.00
78.48	0.01360					.018896	1.48			1.758			0.00		
365.00	2210.20	1.542	2211.742	1035.0	18.65	5.400	2217.142	0.00	2.951		6.00	40.00	0.00	2	2.00
TRANS STR	0.02129					.017522	1.29						0.00		
438.75	2211.77	1.971	2213.741	1035.0	17.50	4.757	2218.498	0.00	3.332		5.00	34.00	0.00	2	2.00
105.10	0.01437					.014956	1.57			1.990			0.00		
543.85	2213.28	1.955	2215.235	1035.0	17.65	4.835	2220.070	0.00	3.332		5.00	34.00	0.00	2	2.00
81.33	0.01438					.015381	1.25			1.989			0.00		
625.18	2214.45	1.934	2216.384	1035.0	17.84	4.940	2221.324	0.00	3.332		5.00	34.00	0.00	2	2.00
166.17	0.01438					.016811	2.79			1.989			0.00		
791.35	2216.84	1.844	2218.683	1035.0	18.71	5.434	2224.117	0.00	3.332		5.00	34.00	0.00	2	2.00
91.67	0.01438					.019371	1.78			1.989			0.00		
883.02	2218.16	1.758	2219.915	1035.0	19.62	5.977	2225.892	0.00	3.332		5.00	34.00	0.00	2	2.00
64.86	0.01438					.022334	1.45			1.989			0.00		
947.88	2219.09	1.677	2220.767	1035.0	20.58	6.575	2227.342	0.00	3.332		5.00	34.00	0.00	2	2.00
204.14	0.02381					.024132	4.93			1.679			0.00		
1152.02	2223.95	1.667	2225.617	1035.0	20.70	6.651	2232.268	0.00	3.332		5.00	34.00	0.00	2	2.00
BRIDGE ENTRANCE													0.00		
1152.02	2223.95	1.264	2225.214	1035.0	24.08	9.003	2234.217	0.00	3.065		5.00	34.00	0.00	0	0.00
TRANS STR	0.02367					.028726	2.59						0.00		

WATER SURFACE PROFILE LISTING

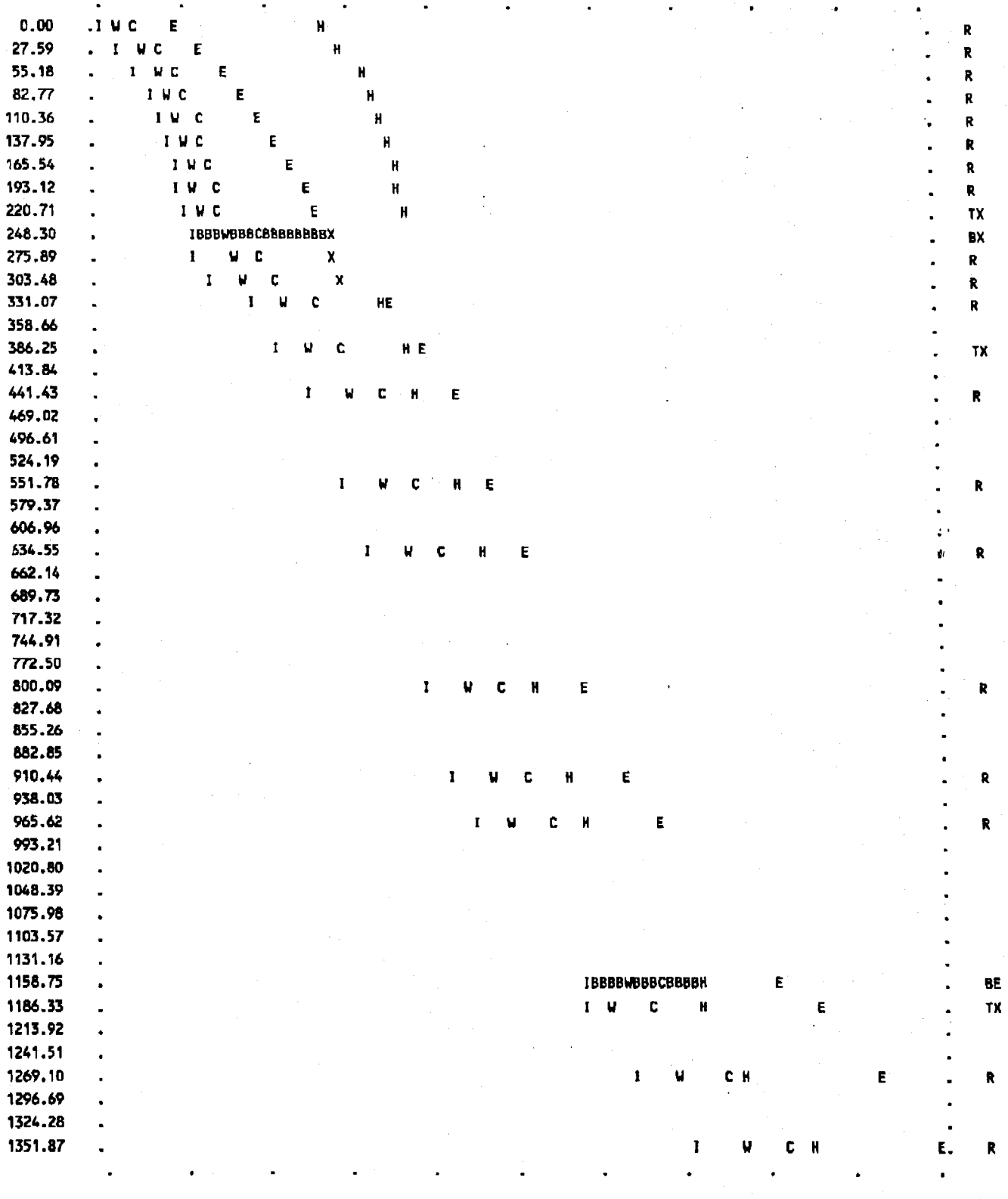
SECTION 26 CHANNEL (EAST REACH)

FUTURE CONDITION Q= 1035CFS AUGUST 12, 1998

FILE 5033FC.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
242.02	2226.08	1.978	2228.058	1035.0	23.78	8.782	2236.840	0.00	4.097		5.00	22.00	0.00	0	0.00
109.85	0.02394					.021043	2.31			1.918			0.00		
1351.87	2228.71	2.020	2230.730	1035.0	23.29	8.423	2239.153	0.00	4.097		5.00	22.00	0.00	0	0.00

SECTION 26 CHANNEL (EAST REACH)
FUTURE CONDITION Q= 1035CFS AUGUST 12, 1998
FILE 5033FC.DAT



T E S

SARY

INVERT ELEVATION

= CRITICAL DEPTH

W = WATER SURFACE ELEVATION

= HEIGHT OF CHANNEL

= ENERGY GRADE LINE

X = CURVES CROSSING OVER

B = BRIDGE ENTRANCE OR EXIT

= WALL ENTRANCE OR EXIT

STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

NORTH REACH

INTERIM CONDITIONS Q= 3,420 cfs
ULTIMATE CONDITIONS Q= 1,220 cfs

HYDRUALIC CULATIONS

Reach	River Station	Froude #	Channel Velocity (fps)	Flow Depth (ft)	Channel Depth (ft)	Freeboard Required (ft)	Channel Radius (ft)	Super Elevation (ft)	Fb + Se (ft)	Actual Freeboard (ft)
NORTH	2.6	2.69	22.5	2.21	5.00	1.73	480.00	0.82	2.55	2.79
NORTH	2.6	2.82	23.2	2.15	5.00	1.75	480.00	0.87	2.62	2.85
NORTH	2.4	2.45	21.13	2.35	5.00	1.70	480.00	0.72	2.42	2.65
NORTH	2.2	0.43	5.61	7.43	9.00	1.18			1.18	1.57
NORTH	2	0.34	5.42	8.09	9.50	0.96			0.96	1.41
NORTH	BRIDGE									
NORTH	1.8	1.01	9.95	3.64	6.00	1.38	480.00	0.26	1.64	2.36
NORTH	1.6	1.92	12.84	1.82	5.00	1.39	480.00	0.73	2.12	3.18
NORTH	1.56666*	0.76	6.78	2.91	4.00	1.21	480.00	0.23	1.44	1.09
NORTH	1.53333*	0.76	6.54	2.89	4.00	1.16	480.00	0.23	1.39	1.11
NORTH	1.5*	0.74	6.26	2.88	4.00	1.11	480.00	0.22	1.33	1.12
NORTH	1.46666*	0.76	5.95	2.87	4.00	1.05	480.00	0.25	1.30	1.13
NORTH	1.43333*	1	7.01	2.46	4.00	1.24	480.00	0.37	1.60	1.54
NORTH	1.4	1.11	7.23	2.28	4.00	1.24	480.00	0.43	1.67	1.72
NORTH	1.2	1.11	7.9	2.45	4.00	1.27	480.00	0.40	1.66	1.55
NORTH	1	1.1	7.91	2.48	4.00	1.27	480.00	0.48	1.75	1.52
NORTH	0.8	0.92	6.8	2.13	4.00	1.22	480.00	0.74	1.96	1.87

NOTE: STATIONS 1.8 - .8 MAKE UP THE TEMPORARY DAYLIGHT CHANNEL WHICH DOES NOT MAKE FREEBOARD REQUIREMENTS BUT CONTAINS A MINIMUM OF 1 FOOT OF FREEBOARD AT ALL LOCATIONS.

Super-Critical

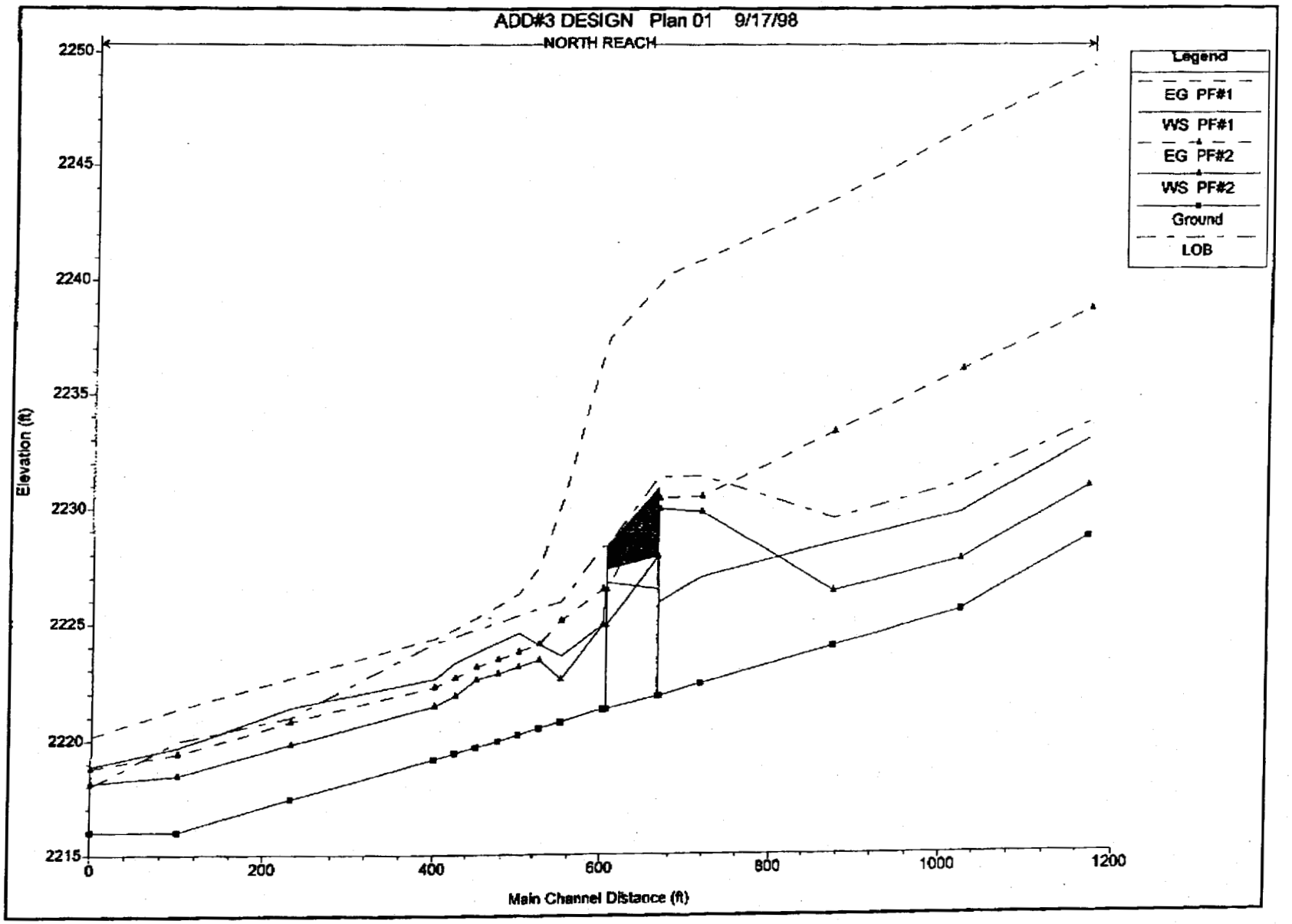
Fb= 1+.025*V*D^.333

Sub-Critical

Fb= .5+V^2/2g

Super Elevation

Se=V^2*Tw/(g*r)


ADD#3 DESIGN Plan 01 9/17/98
NORTH REACH
Legend
EG PF#1
WS PF#1
EG PF#2
WS PF#2
Ground
LOB
Elevation (ft)
2250
2245
2240
2235
2230
2225
2220
2215
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

HEC-RAS Plan: Plan 01 River: NORTH REACH Reach: NORTH REACH

	3420.00	2228.71	2232.96	2237.12	2249.40	0.017513	32.54	105.10	25.00	2.80
	1220.00	2228.71	2230.92	2232.94	2238.78	0.017003	22.50	54.22	24.99	2.69
	3420.00	2225.60	2229.79	2234.00	2246.66	0.018193	32.96	103.77	25.00	2.85
	1220.00	2225.60	2227.75	2229.82	2236.10	0.018725	23.20	52.58	24.99	2.82
	3420.00	2224.06	2228.48	2232.46	2243.67	0.015547	31.28	109.34	25.00	2.64
	1220.00	2224.06	2226.41	2228.28	2233.34	0.013960	21.13	57.73	24.99	2.45
	3420.00	2222.42	2227.02	2230.81	2241.00	0.013738	30.01	113.97	24.99	2.48
	1220.00	2222.42	2229.85	2226.65	2230.53	0.000430	6.61	184.57	25.00	0.43
	3420.00	2221.90	2225.97	2229.68	2240.25	0.015312	30.33	112.77	28.00	2.66
	1220.00	2221.90	2229.99	2225.82	2230.44	0.000254	5.42	225.29	28.01	0.34
	Bridge									
	3420.00	2221.34	2224.99	2228.07	2236.95	0.085889	27.76	123.21	40.38	2.80
	1220.00	2221.34	2224.98	2224.98	2226.51	0.011094	9.95	122.59	40.33	1.01
	3420.00	2220.81	2223.64	2225.66	2230.23	0.124594	20.60	168.06	71.78	2.39
	1220.00	2220.81	2222.63	2223.38	2225.19	0.094885	12.84	95.02	68.55	1.92
	3420.00	2220.54	2224.12	2225.22	2227.47	0.046308	14.69	232.88	79.52	1.51
	1220.00	2220.54	2223.45	2223.07	2224.16	0.013258	6.78	180.02	77.04	0.78
	3420.00	2220.27	2224.63	2224.76	2226.34	0.022700	10.50	325.81	108.48	1.07
	1220.00	2220.27	2223.16		2223.82	0.012767	6.54	186.68	82.27	0.78
	3420.00	2220.00	2224.25	2224.32	2225.82	0.021361	10.05	340.33	115.92	1.03
	1220.00	2220.00	2222.88		2223.49	0.012051	6.26	194.95	88.03	0.74
	3420.00	2219.74	2223.80	2223.85	2225.32	0.021790	9.89	345.70	122.62	1.04
	1220.00	2219.74	2222.61		2223.16	0.013369	5.95	205.18	108.51	0.76
	3420.00	2219.47	2223.35	2223.41	2224.82	0.022143	9.74	351.25	129.32	1.04
	1220.00	2219.47	2221.93	2221.93	2222.69	0.024950	7.01	174.04	115.05	1.00

HEC-RAS Plan: Plan 01 River: NORTH REACH Reach: NORTH REACH (Continued)

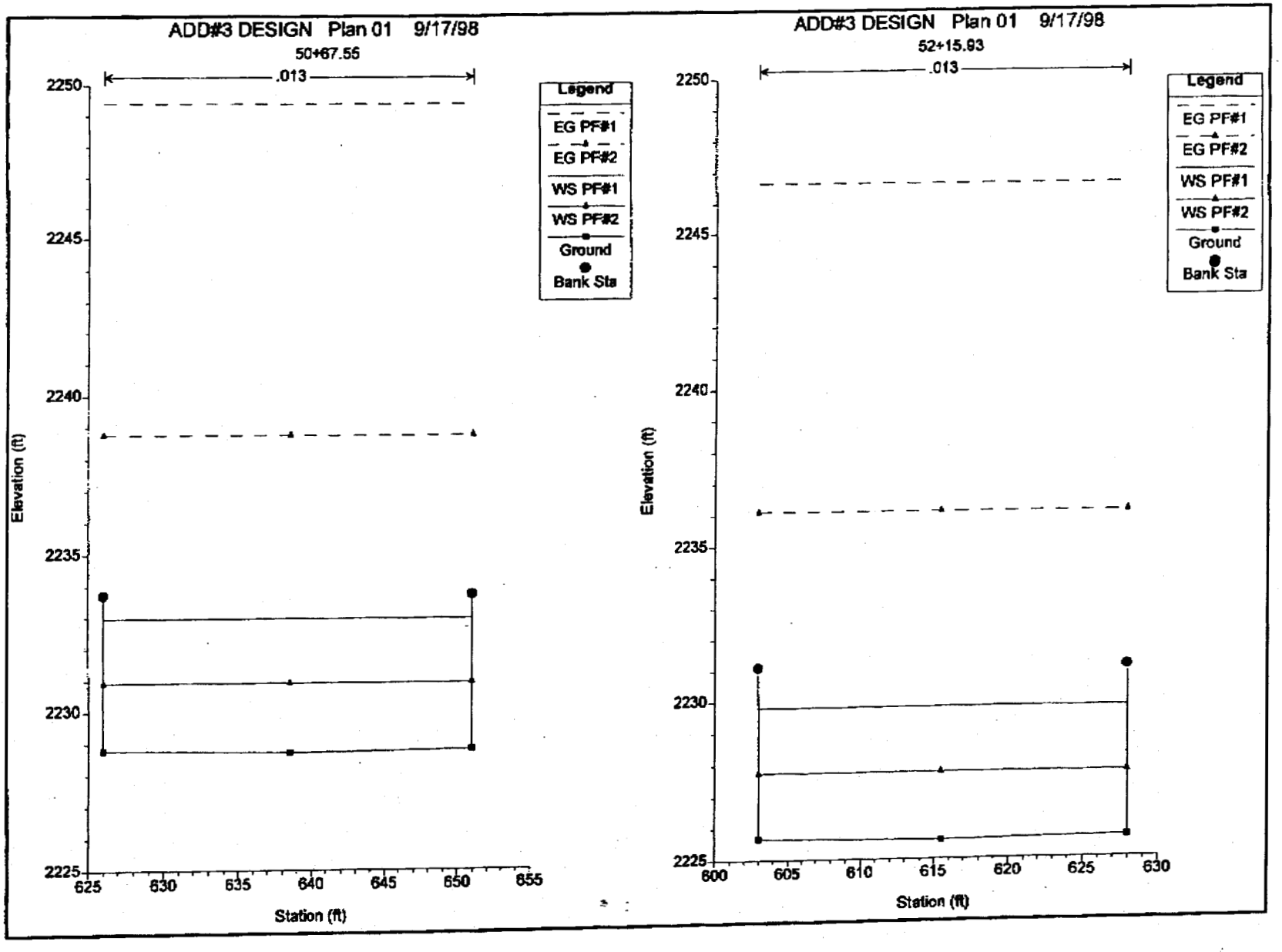
	3420.00	2219.20	2222.63	2222.98	2224.41	0.011372	10.66	320.14	134.41	1.22
	1220.00	2219.20	2221.48	2221.56	2222.29	0.011017	7.23	168.67	127.32	1.11
	3420.00	2217.41	2221.40	2221.62	2222.67	0.007979	9.31	394.86	205.01	1.02
	1220.00	2217.41	2219.86	2220.00	2220.83	0.010751	7.90	154.49	98.13	1.11
	3420.00	2216.00	2219.72	2220.17	2221.35	0.012072	10.59	339.90	171.12	1.24
	1220.00	2216.00	2218.48	2218.66	2219.43	0.010496	7.91	160.56	119.23	1.10
	3420.00	2216.00	2218.87	2219.25	2220.22	0.009398	10.40	413.37	301.56	1.18
	1220.00	2216.00	2218.13	2218.27	2218.80	0.006495	6.80	209.35	248.22	0.92

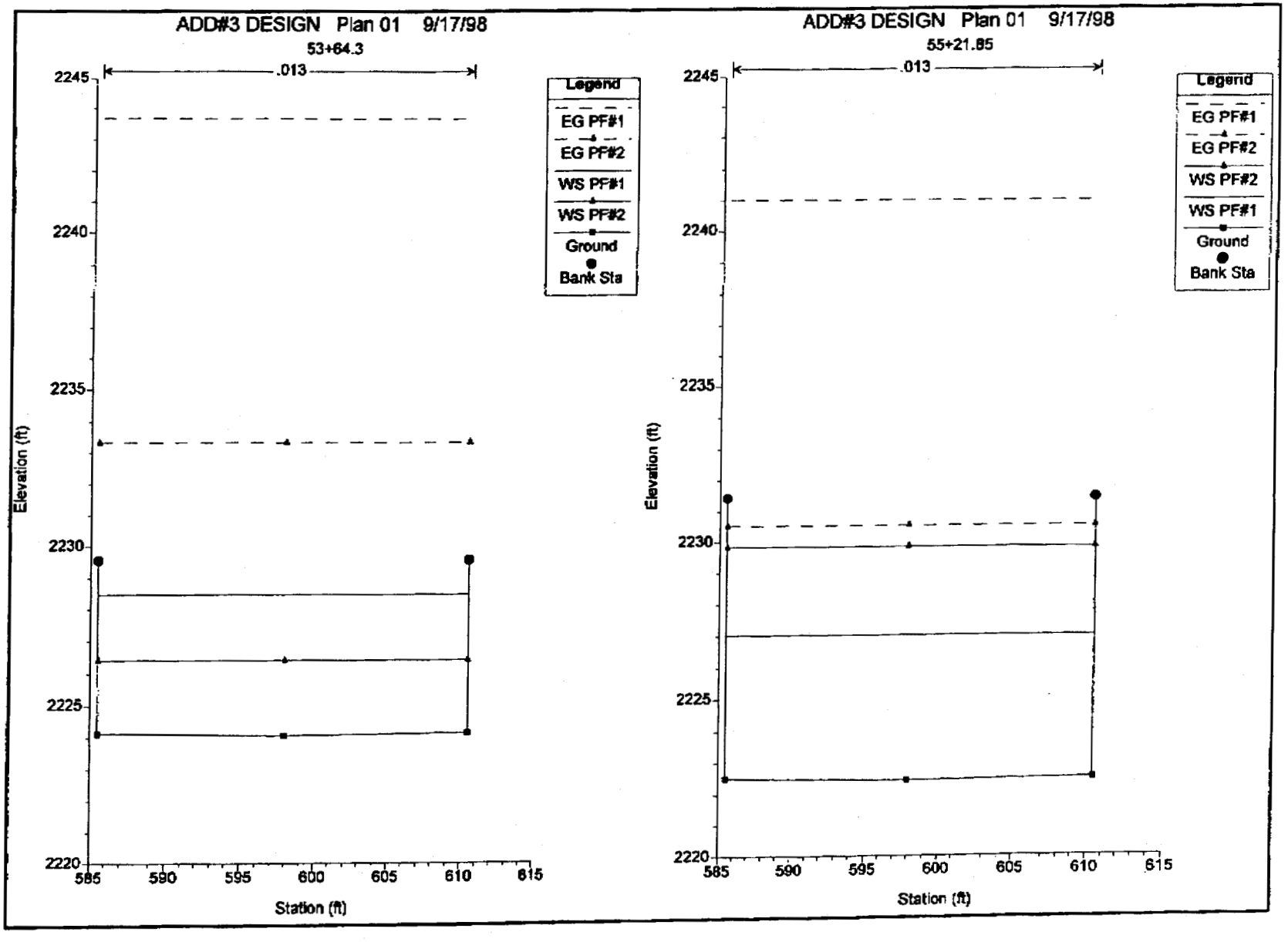
Plan: Plan 01 River: NORTH REACH Reach:NORTH REACH Riv Sta: 1.9 Profile: PF#1 Opening: Bridge #1

	2240.25			
	2225.97		2240.01	2237.49
	3420.00		2226.51	2226.79
	3420.00		2233.79	2227.16
			4.61	5.45
			29.49	26.24
			115.97	130.33
			2.43	1.99
			ft) 3409.43	3169.37
	2230.90		5.81	9.98
	2227.90		40.65	47.78
	3.30		26664.9	11814.4
	0.98		19.96	13.06
	135.01		0.03	2.15
	29.49		0.24	0.30
			q ft) 2.93	14.27
	Energy only		s) 86.41	374.47

Plan: Plan 01 River: NORTH REACH Reach:NORTH REACH Riv Sta: 1.9 Profile: PF#2 Opening: Bridge #1

[illegible]	2230.44	[illegible]			
[illegible]	2229.99	[illegible]		2230.44	2226.51
[illegible]	1220.00	[illegible]		2227.90	2224.98
[illegible]	1220.00	[illegible]		2225.80	2225.24
[illegible]		[illegible]		6.00	3.64
[illegible]		[illegible]		9.04	12.86
[illegible]		[illegible]		135.01	94.88
[illegible]		[illegible]		0.65	1.20
[illegible]		[illegible]	ft)	797.11	661.86
[illegible]	2230.90	[illegible]			4.04
[illegible]	2227.90	[illegible]		60.88	35.61
[illegible]	3.03	[illegible]		26241.6	8311.2
[illegible]	5.01	[illegible]			23.51
[illegible]	135.01	[illegible]			
[illegible]	9.04	[illegible]			
[illegible]		[illegible]	q ft)	0.30	3.49
	Press Only		s)	2.70	44.82


ADD#3 DESIGN Plan 01 9/17/98
50+67.55
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
ADD#3 DESIGN Plan 01 9/17/98
52+15.93
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)


ADD#3 DESIGN Plan 01 9/17/98
53+64.3
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2245
2240
2235
2230
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2220
585
590
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605
610
615
ADD#3 DESIGN Plan 01 9/17/98
55+21.85
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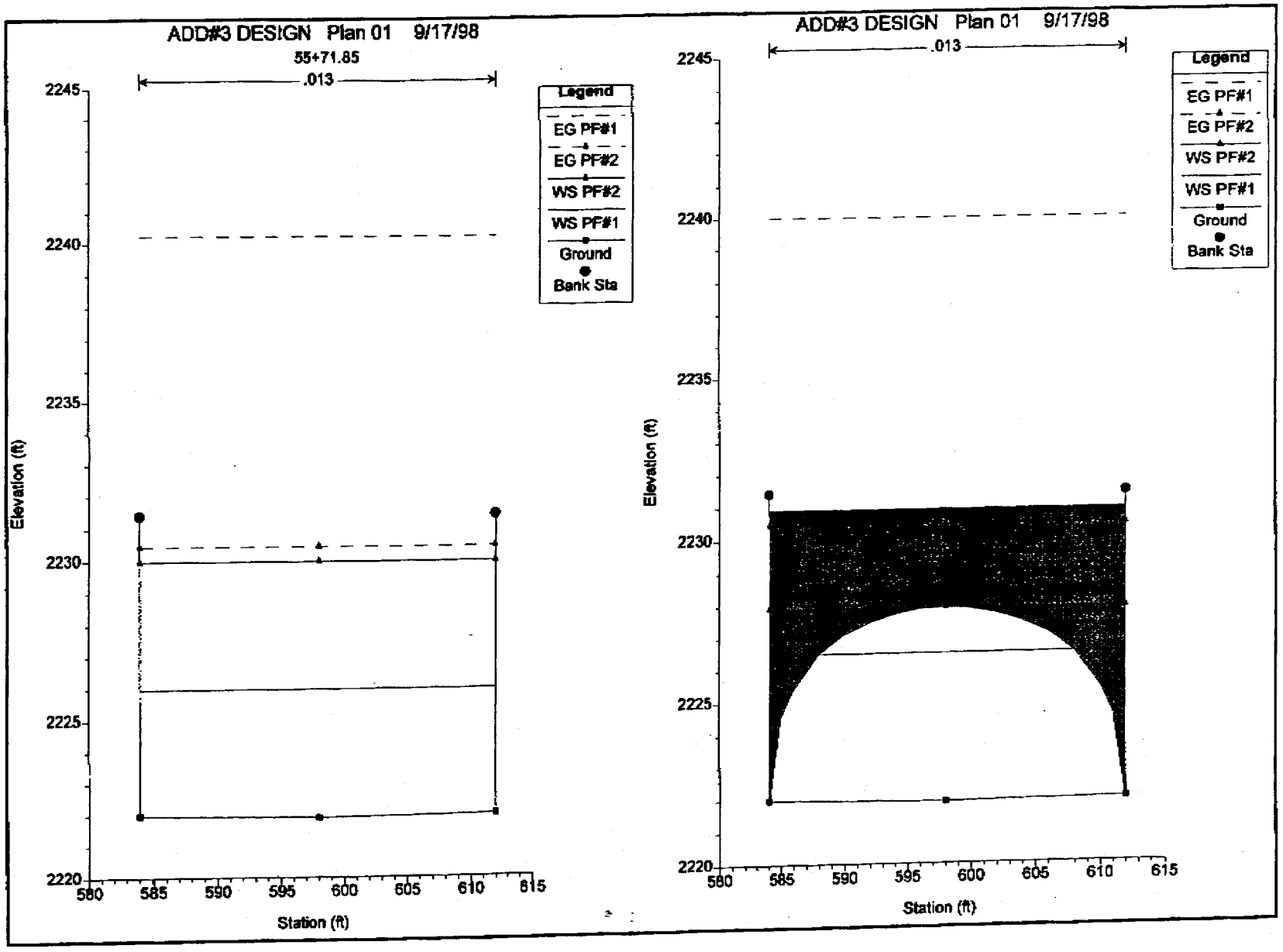
Bank Sta
Elevation (ft)
Station (ft)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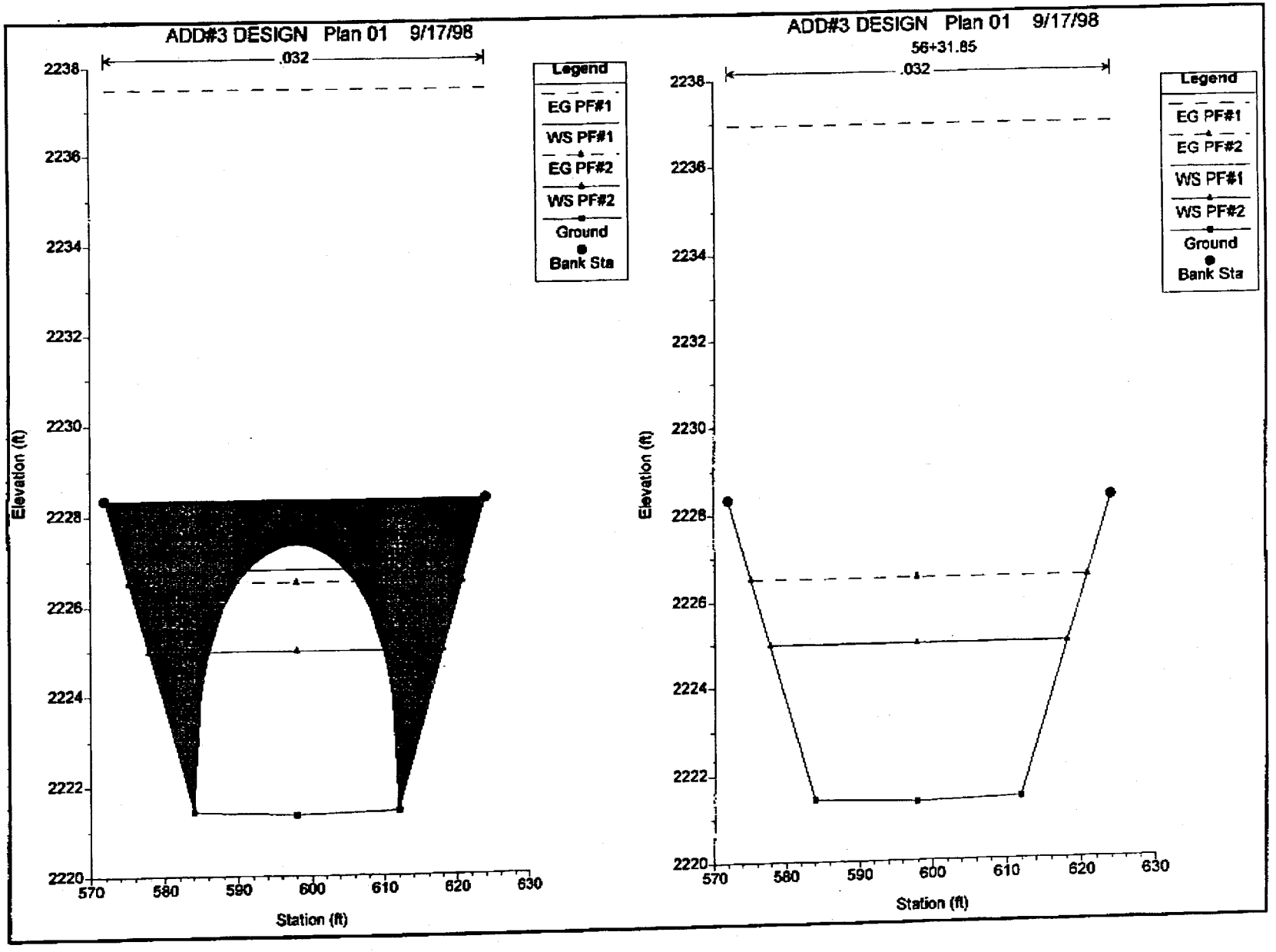
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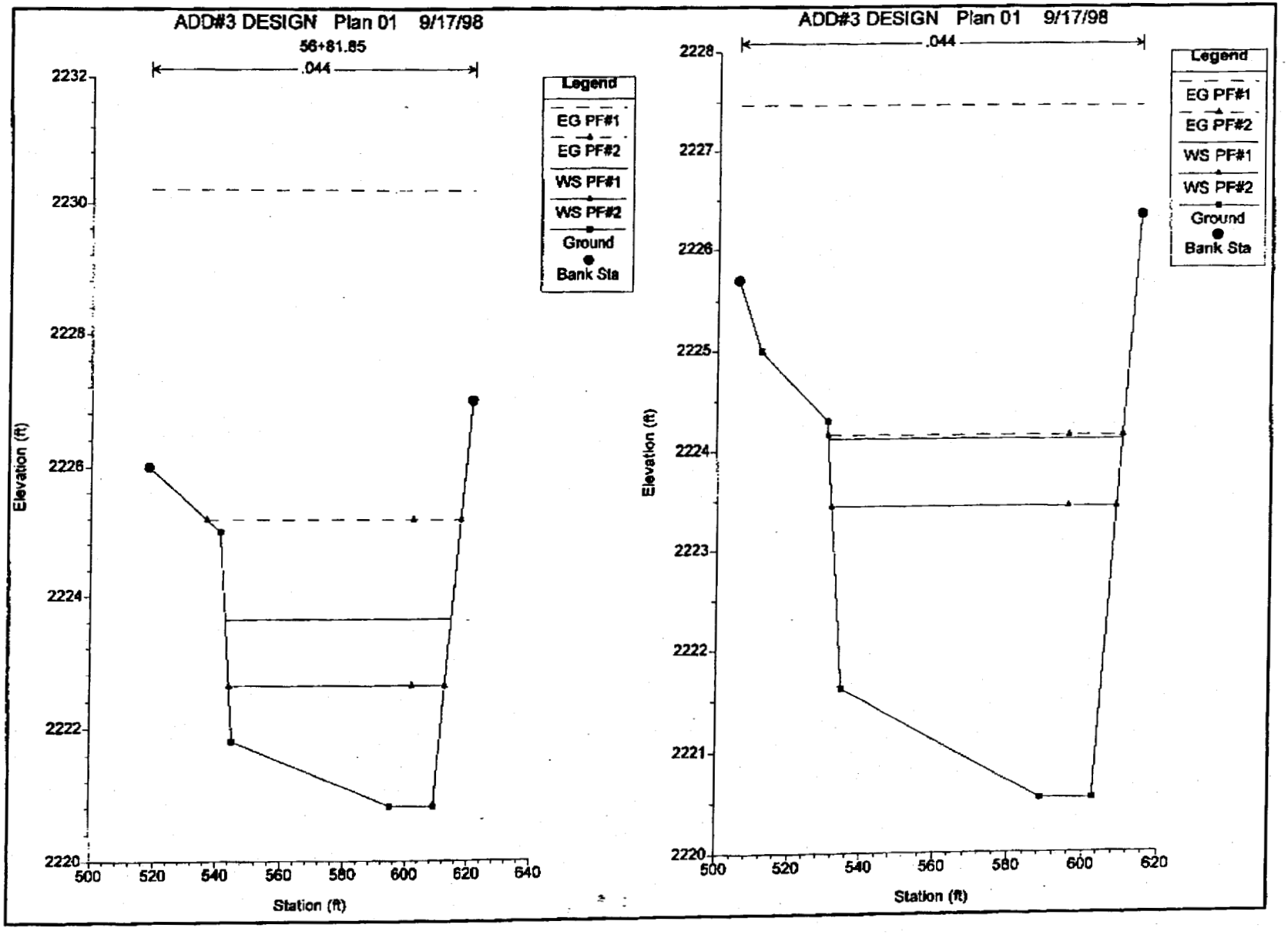
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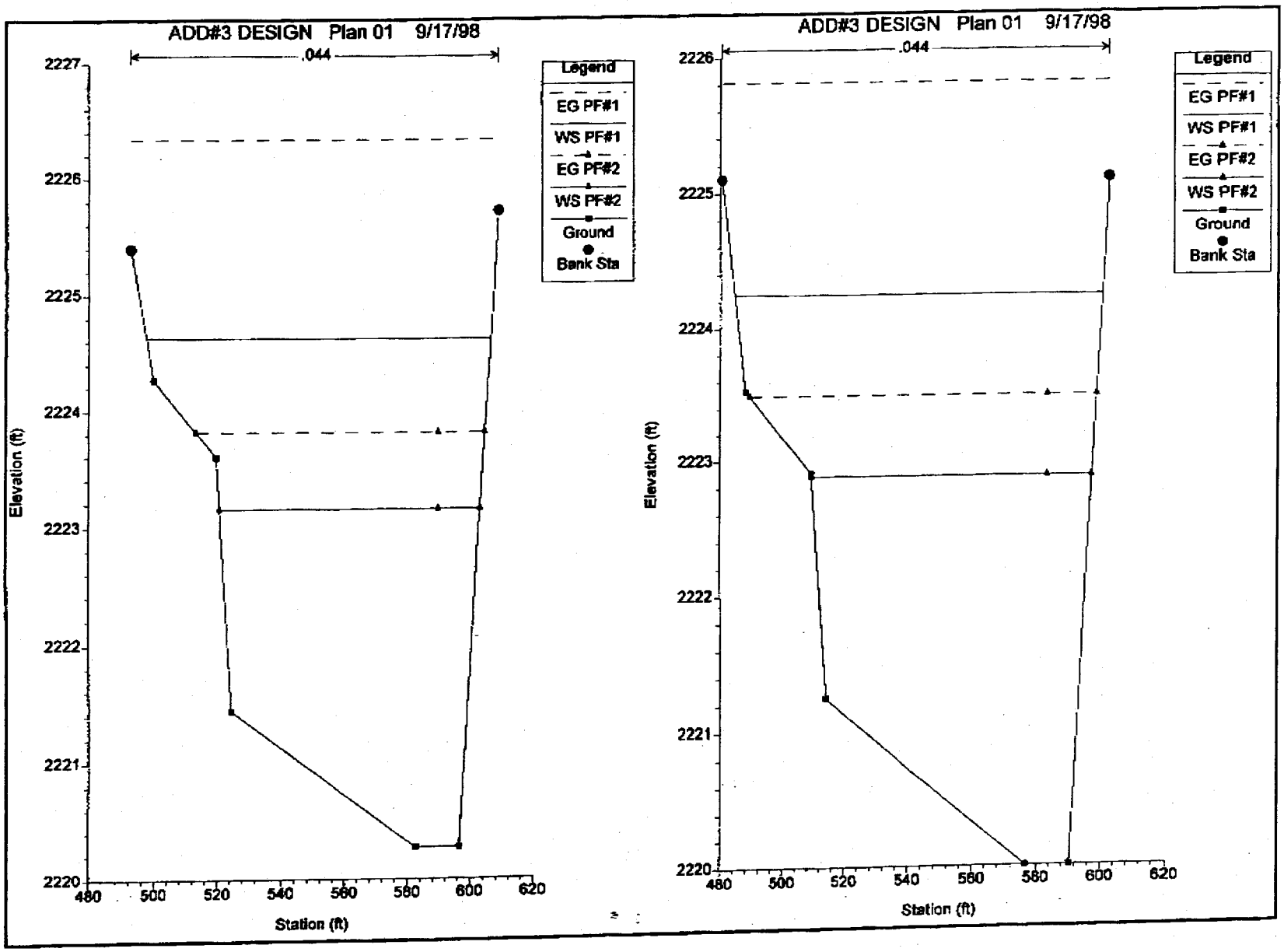
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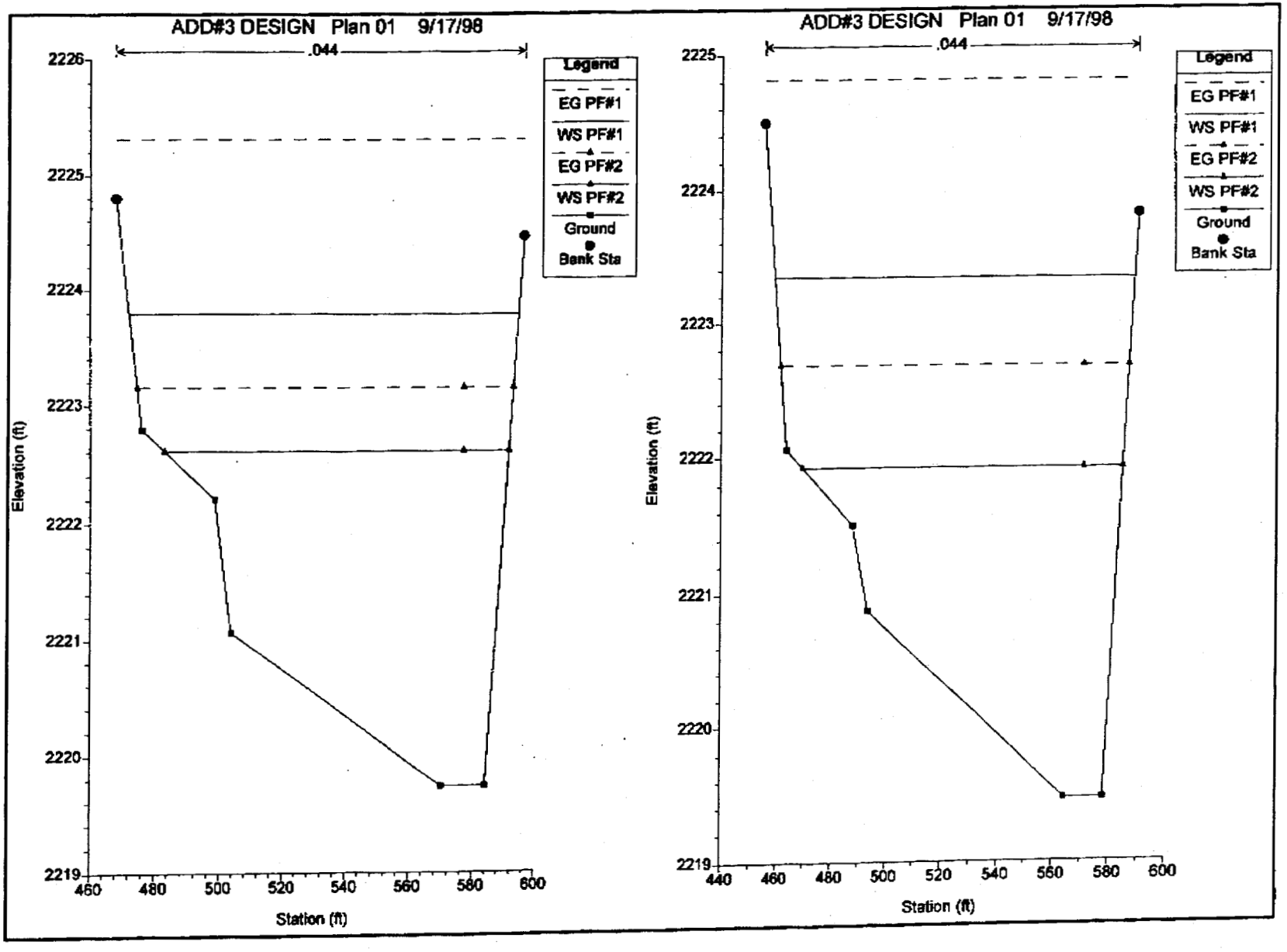
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Station (ft)
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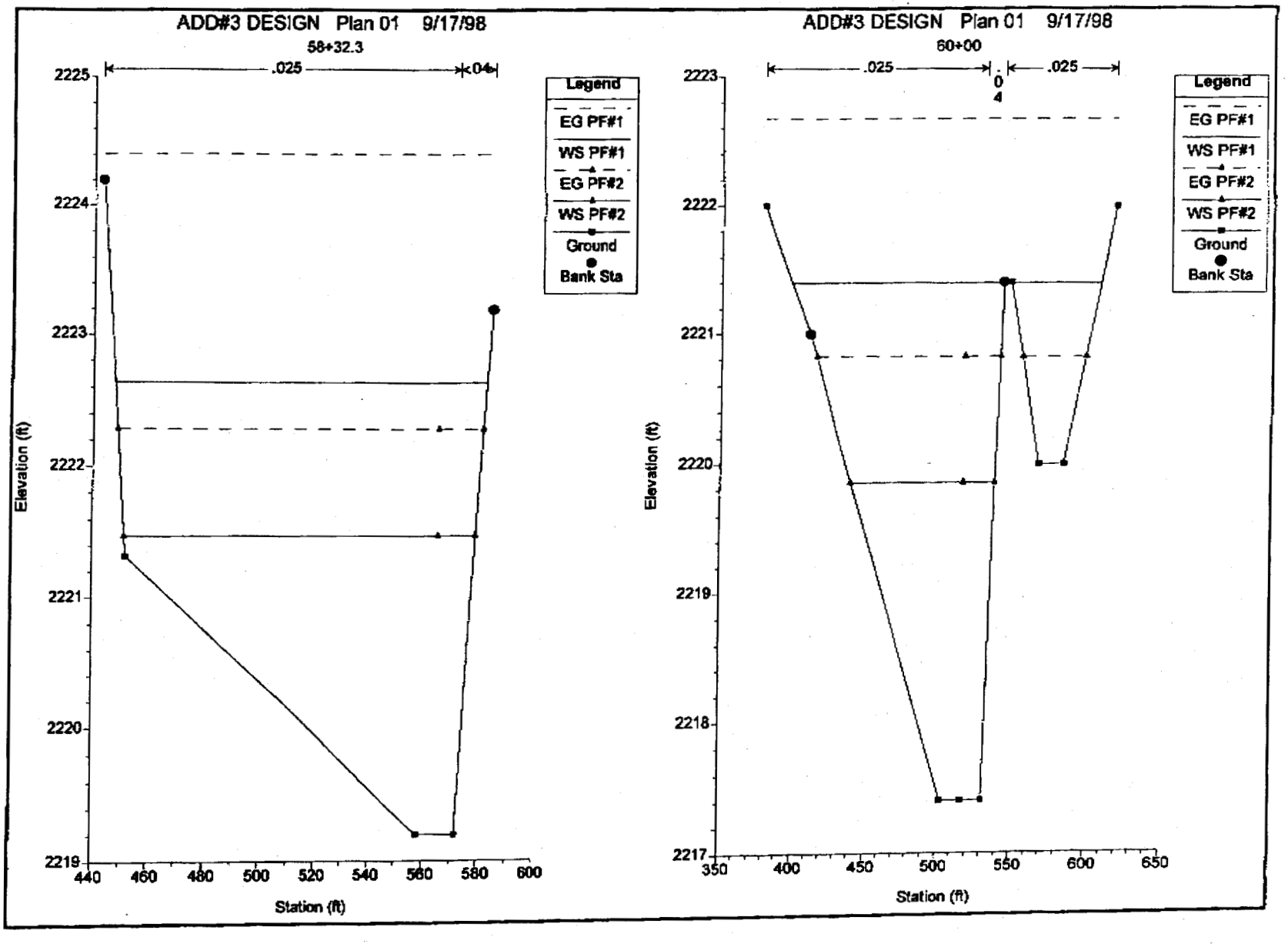
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WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
ADD#3 DESIGN Plan 01 9/17/98
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.025
.025
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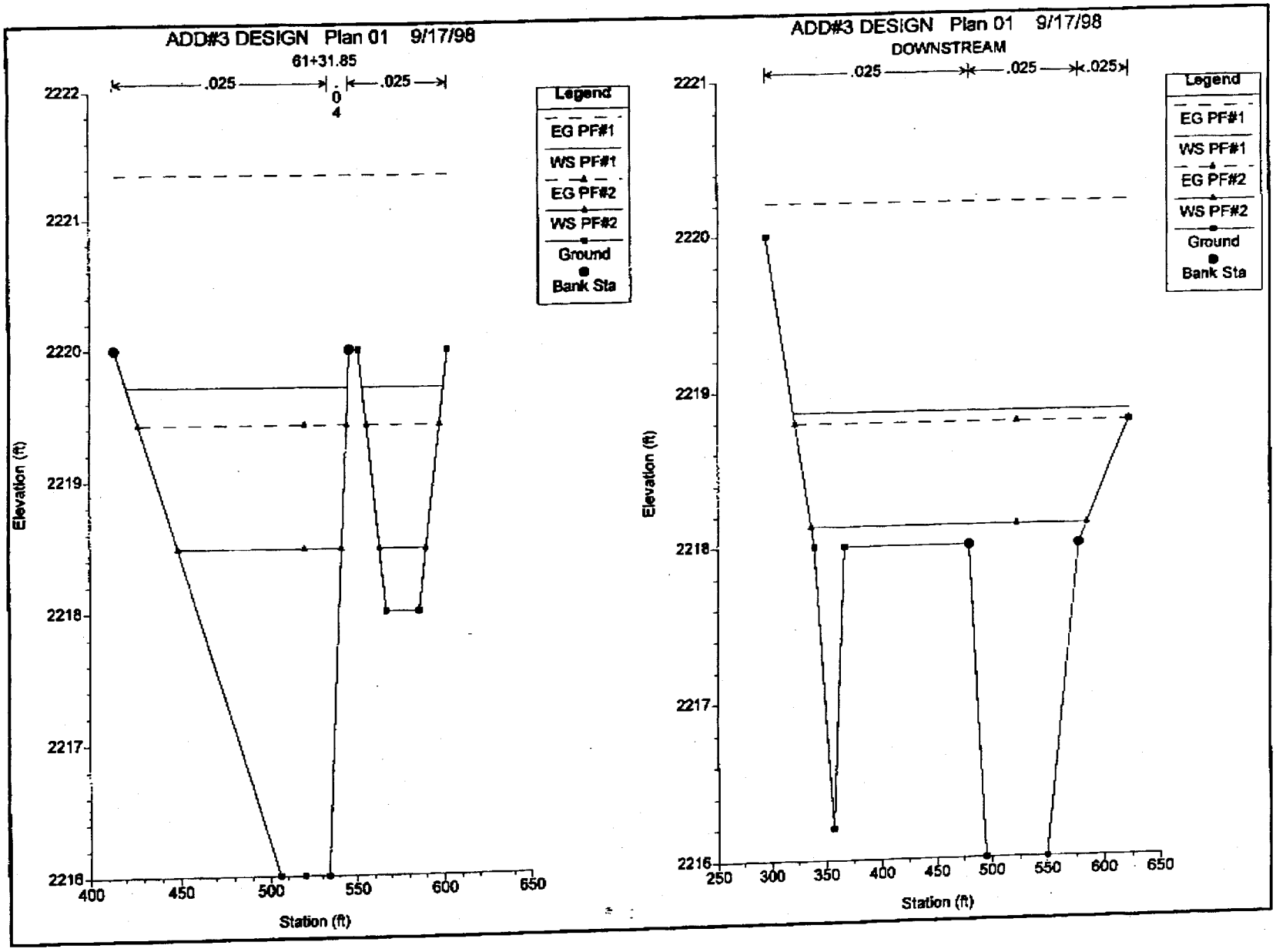
EG PF#2
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)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61+31.85
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.025
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WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
ADD#3 DESIGN Plan 01 9/17/98
DOWNSTREAM
.025
.025
.025
Legend
EG PF#1
WS PF#1
EG PF#2
WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)

EAST REACH

INTERIM CONDITIONS Q= 3,011 cfs
ULTIMATE CONDITIONS Q= 1,035 cfs

HYDRUALIC CULATIONS

Reach	River Station	Froude #	Channel Velocity (fps)	Flow Depth (ft)	Channel Depth (ft)	Freeboard Required (ft)	Channel Radius (ft)	Super Elevation (ft)	Fb + Se (ft)	Actual Freeboard (ft)
EAST REACH	2.8	2.79	22.76	2.14	5.00	1.73			1.73	2.86
EAST REACH	2.35	2.91	23.39	2.09	5.00	1.75			1.75	2.91
EAST REACH	2.2	3.51	23.92	1.54	5.00	1.69			1.69	3.46

Super-Critical

Fb= 1+.025*V*D^.333

Sub-Critical

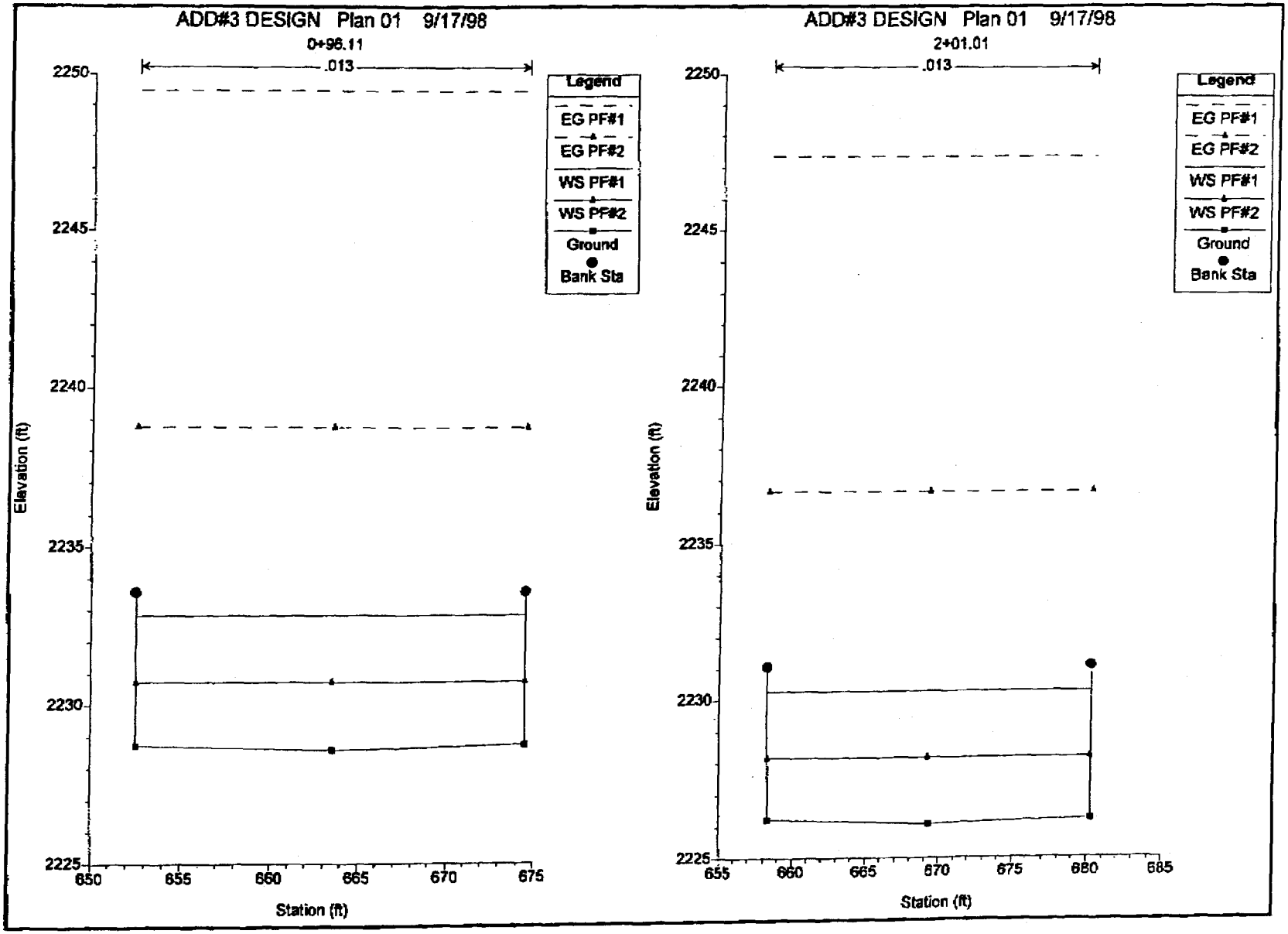
Fb= .5+V^2/2g

Super Elevation

Se=V^2*Tw/(g*r)

HEC-RAS Plan: Plan 01 River: EAST REACH Reach: EAST REACH

	3011.00	2228.59	2232.85	2236.98	2249.49	0.018577	32.73	91.98	22.00	2.82
	1035.00	2228.59	2230.73	2232.75	2238.78	0.018753	22.76	45.48	21.99	2.79
	3011.00	2226.08	2230.28	2234.47	2247.38	0.019341	33.18	90.74	22.00	2.88
	1035.00	2226.08	2228.17	2230.24	2236.66	0.020477	23.39	44.25	21.99	2.91
	3011.00	2223.95	2226.98	2230.87	2245.22	0.027022	34.27	87.85	30.00	3.53
	1035.00	2223.95	2225.49	2227.37	2234.38	0.030119	23.92	43.27	30.00	3.51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WS PF#2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2250
2245
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665
670
675
ADD#3 DESIGN Plan 01 9/17/98
2+01.01
.013
Legend
EG PF#1
EG PF#2
WS PF#1
WS PF#2
Ground
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Elevation (ft)
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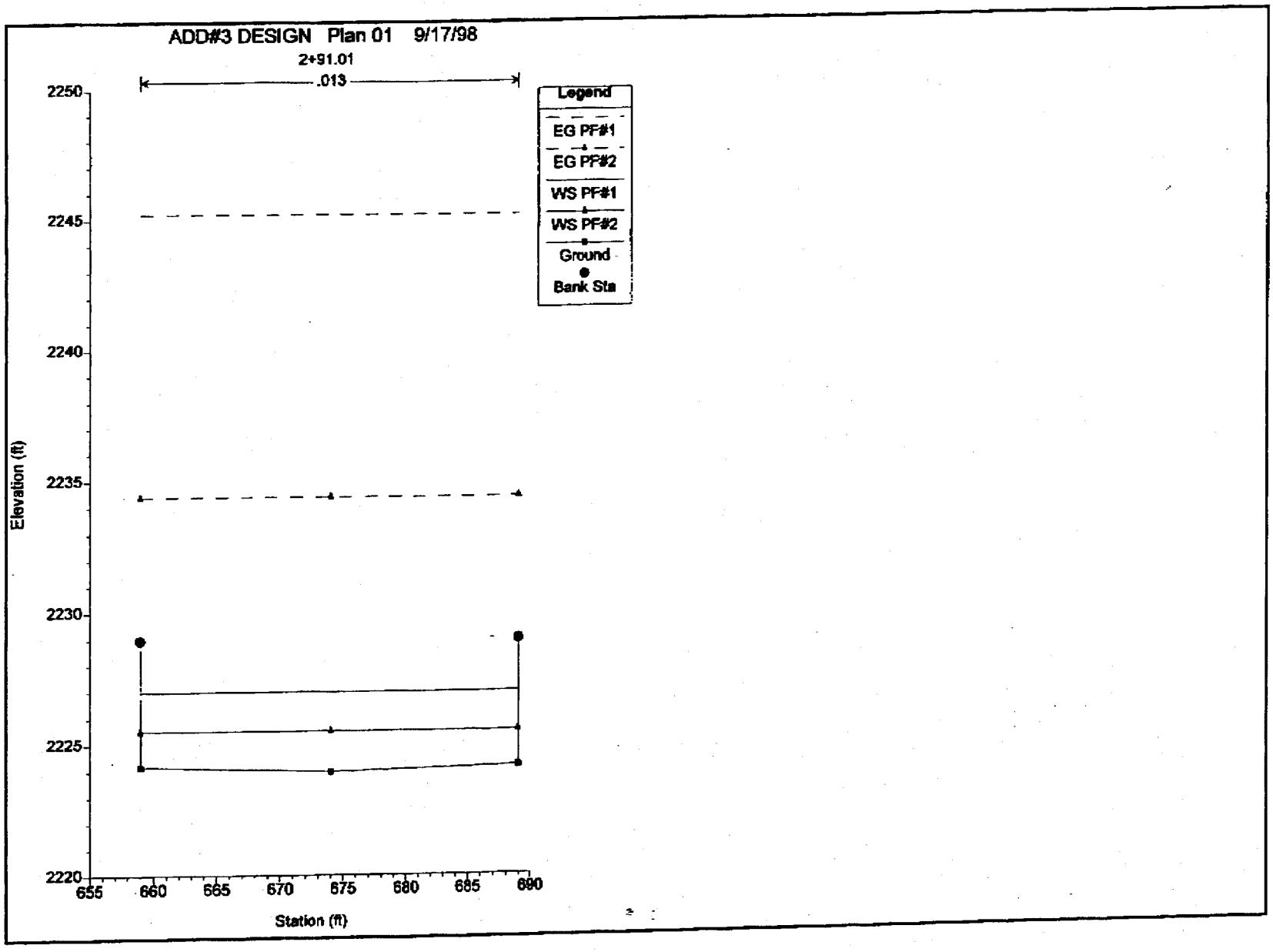
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Ground
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Elevation (ft)
2250
2245
2240
2235
2230
2225
2220
655
660
665
670
675
680
685
690
Station (ft)

WILLDAN ASSOCIATES ☐ ENGINEERS & PLANNERS

Professional Consulting Services Since 1964

5033-I

MEMORANDUM

TO: Bill Hunter, P.E.

FROM: Isabel Pennington

OFFICE: Las Vegas

DATE: January 18, 1999

SUBJECT: Willdan/Clark County Public Works Plan Review Contract
Technical Drainage Study for Ione Road **(2824)**
Study Dated: January 11, 1999
Location: Between Eastern Avenue and Jeffreys Street
(Sec. 25, T. 22 S., R. 61 E.)
HTE # 99-688
Prepared by VTN Nevada

We have completed our initial review of the above-referenced **Technical Drainage Study**, and have the following comments:

1. The analysis provided ~~is~~ is based on the assumption that the drainage facilities designed in the "Design Report for the Drainage Facility System for Section 26" will be constructed. The Ione Road cannot be constructed prior to these drainage facilities being in place;

2. Figure 2A appears to show flows (such as 139 cfs, 1030 cfs, 2950 cfs, 135 cfs) which were not used in the analysis. This must be addressed and the figure must be revised accordingly. Also, the "Proposed Drainage Facilities" (roadside swales) section of the text discusses roadside swales and flows which also do not appear to be applicable to this analysis. This must be addressed;

3. The study states basin OFFE-1, taken from the Southfork study, will impact Ione Road. It is not clear from the figure provided, if flows from some of the additional basins shown south of OFFE-1 are tributary to OFFE-1. This must be addressed and additional reference information which shows where the runoff from these basins south of OFFE-1 will be conveyed, must be provided;

2725 E. DESERT INN ROAD, SUITE 100 • LAS VEGAS, NEVADA 89121 • TEL: (702) 734-3001 • FAX: (702) 734-0888

4. An offsite drainage map from the St. Rose Dominican Hospital drainage study must be provided to verify impact to Lake Mead from basins south of Lake Mead Boulevard;

5. The hydrologic calculations provided include Basin E1. This basin must be shown on a figure with contours;

6. It is not clear which basins on Figure 3 were taken from the Silver Trace study and other reference studies. This must be addressed;

7. The text indicates Basins ON1 and ON2 are from the South Valley Apartments study, yet ON1 is not shown on Figure 3. This must be addressed;

8. Calculations have been provided on Standard ~~From~~ Form 4 for Basin R1, yet this basin is not shown on Figure 3. This must be addressed;

9. Curve number calculations have been provided for basin C3, but time of concentration calculations have not been provided for the basin nor was it included in the HEC-1 analysis. This must be addressed;

10. The structural calculations which must be provided for the Section 26 study for the arch culverts must include the drop inlets proposed with this study which tie into the arch culverts;

11. Clark County Regional Flood Control District (CCRFCD) concurrence is required since the roadway is crossed by regional facilities. It is the responsibility of the applicant to submit a copy of the drainage study and any addenda to the CCRFCD;

12. At the request of Clark County Public Works, drainage/grading plans for the proposed development have been reviewed for compliance to the requirements set forth in the "Minimum Drainage Study Criteria Checklist, "Drainage Plan Information," dated July 15, 1997. **The plans submitted do not meet the minimum requirements and must be revised prior to Drainage Study approval, to address the following:**

    a. Label existing contours

    b. Provide detail(s) which include a profile of the 42 inch RCP

c. Label drop inlets as proposed

d. Additional comments as shown on the plan

The grading plan has been red-lined and is being returned to the engineer. The red-lined grading plan must be resubmitted with the revised drawings. Failure to resubmit the re-lined grading plan will prevent further review of the project.

All addenda must be submitted directly to Clark County. Any drainage studies or addenda submitted directly to Willdan will be returned to Clark County for the necessary log-in procedures.

The items listed herein must be thoroughly addressed and submitted for review prior to acceptance of this study.

A study review workshop with Willdan Associates may be scheduled if there are questions concerning the above listed comments.

CONCURRENCE BY CLARK COUNTY PUBLIC WORKS:

Steve Ranieri — 02/08/99

Signature — Date

COMMENTS:

cc: Kurt Schaake, P.E.
Developers of Nevada

E:\Projects\CCPW\Drainage-3226\Projects6\2824-1.wpd

W.O# 5033-I

THE CITY OF HENDERSON

A Place To Call Home

February 24, 1999

Mr. James L. Fitzpatrick
VTN Nevada
2727 S. Rainbow Boulevard
Las Vegas, NV 89146

Re: Ione Road
PDG #98168-D, 530-1 (AH)

Dear Mr. Fitzpatrick:

This letter provides comments on the above referenced study dated January 11, 1999. This study was reviewed by Poggemeyer Design Group and the City of Henderson.

Based on the documents submitted, we have the following comments:

1) The grading plan appears to show existing facilities tying into the proposed facilities for Ione Road. Information from the reference study, Section 26, showing the analysis for the box culvert for the east reach and concrete channel for the north reach must be provided in the study.

2) The improvements necessary to protect Ione road need to be shown and the hydraulics need to be addressed in this drainage study assuming there is no other project providing these facilities since this road can not exist without the proposed facilities upstream. The improvement plans for the Section 26 improvements have not been submitted to the City at this time.

3) An analysis must be provided showing the conveyance of the flow in the proposed channel (north reach) through the proposed 28-feet by 6-feet arch culvert. Show upstream and downstream cross sections on the plans. Provide cross sectional details in the HEC output file.

4) Calculations for the rip-rap pad downstream of the arch culvert must be provided in the study for review.

5) It is unclear which type of drainage facility is being used to convey flow in the east reach. Figure 3 proposes a box culvert system conveying flow underneath Ione Road to the existing box culverts in Eastern. In the study, an

arch culvert is mentioned and on Sheet 1 of 2 of the grading plan, a drainage channel is shown. The facility used to drain the east reach must be clearly shown on all plans and analysis must be provided in the drainage study.

6) It appears that the 42-inch pipe is being used to remove the remaining proposed flow from the site. Contours must be provided showing positive conveyance into the pipe. The Construction Notes indicate a manhole, but none is shown. Provide a detail of the opening with headwall and screen to prevent entrance from unauthorized use.

7) Regional concurrence is required since the site is adjacent to a Regional Facility and is partially located in a Flood Zone.

8) Grading Plan Comments:

   a) Provide detail of drop inlet.

   b) Provide detail of arch pipe.

   c) Label rip-rap pad.

   d) Label valley gutters.

   e) Show all facilities necessary to protect this road; assuming there is no Section 26 improvements.

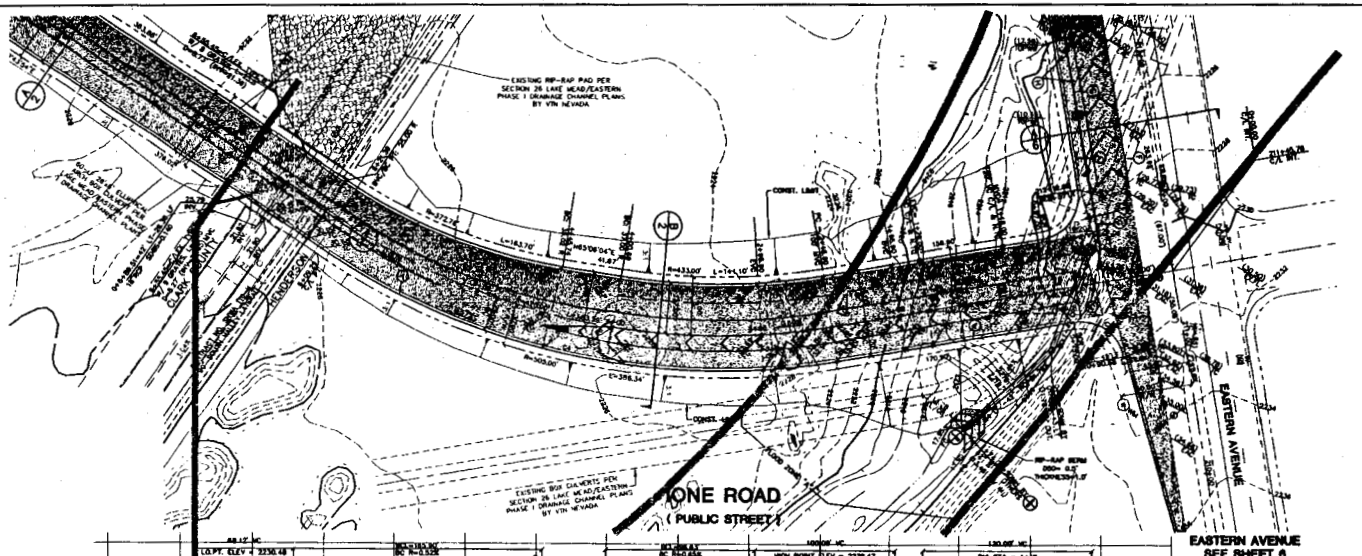
Please let me know if you have any questions concerning these comments.

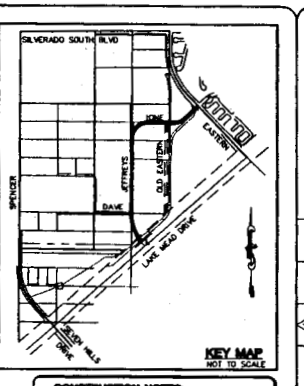
Sincerely,

Joseph V. Damiani

Joseph V. Damiani, P.E.
Project Manager

Cc: Curt Chandler, Janie Nihipali, New Development

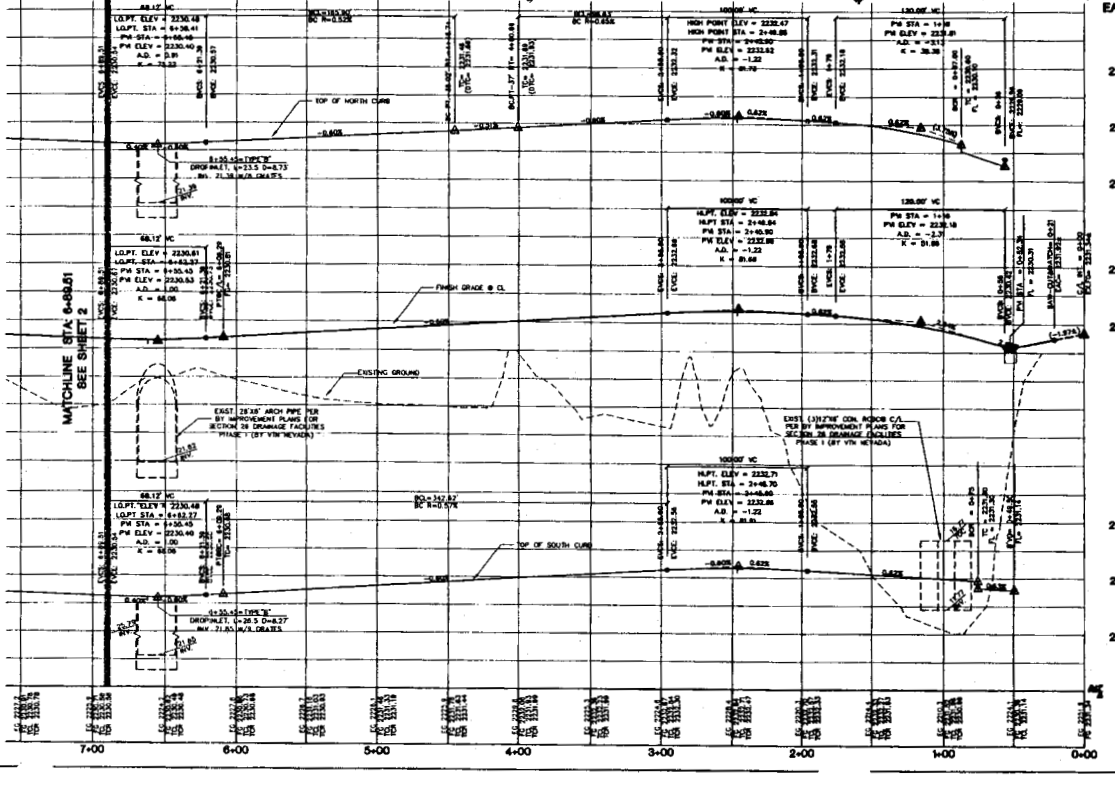




CONSTRUCTION NOTES:

(A) CONSTRUCT "L" CURB & GUTTER PER STD. # 210
(B) CONSTRUCT SIDEWALK PER STD. # 234
(C) CONSTRUCT CROSS GUTTER PER STD. # 238
(D) CONSTRUCT SIDEWALK RAMP PER STD. # 238
(E) CONSTRUCT TYPE "B" DROP INLET PER STD. # 412
(F) CUT & MATCH 3' BEYOND EXIST. A.C.
(G) REMOVE EXISTING CONCRETE HEADWALL & WINGWALL
(H) CAP, SEAL AND ABANDON 2 EACH NORT MONTERLY 12' X 6' RCB CULVERTS PER UNIF. STD. SPEC#.
(I) CONST. 42" RCB INTO EXIST. 12'X6' RCB BOX & CAP & SEAL BOX OPENING-PER UNIF. STD. SPEC#.

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.



GRAPHIC SCALE

1" = 40'

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-8111

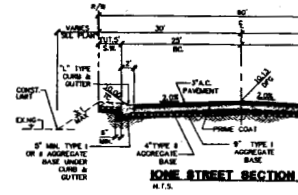
BENCHMARK

CLARK COUNTY BENCHMARK SCR-3MB: RIVET AND SQUARE ALUMINUM PLATE IN CENTER TOP OF A HEADWALL, NORTH SIDE OF LAKE MEAD NEAR MILE MARKER 2.16, 890 FEET EAST OF ENTRANCE TO SKY HARBOR AIRPORT.

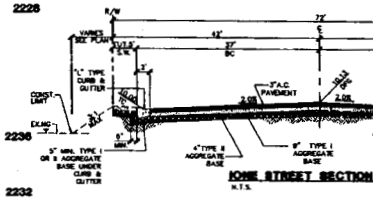
NAVD88 DATUM 717.488 METERS (2353.765 FEET)

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS, "TAA WEST A" AND "ISLAND".



IONE STREET SECTION
H.T.S.



IONE STREET SECTION
H.T.S.

LINE TABLE

NO.	BEARING	DISTANCE
L1	S00°00'00"E	41.00'

BACK OF CURB CURVE TABLE

NO.	RADIUS	LENGTH	TANGENT	DELTA
C1	10.00'	15.71'	10.00'	90°00'00"
C2	10.00'	15.71'	10.00'	90°00'00"
C3	30.00'	47.12'	30.00'	90°00'00"
C4	30.00'	47.12'	30.00'	90°00'00"

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____, 19__.

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS

Acceptance of plans for filing

By _____

Acceptance of these plans for filing shall not be construed to be an approval by the undersigned of any of the calculations or any of the details of existing facilities shown thereon. Such approval shall not relieve the engineer who prepared the plans for the construction of the improvements from any responsibility for the adequacy of the plans.

NOTE: Those items and/or other existing conditions not in general conformance with standard practice shown hereon will be noted or not approved by Clark County.

OLYMPIC NEVADA, INC.
CITY OF HENDERSON, NEVADA
CLARK COUNTY, NEVADA

vtn nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7500 FAX (702) 362-2267

NO.	DATE	BY	REVISION
1			
2			
3			
4			

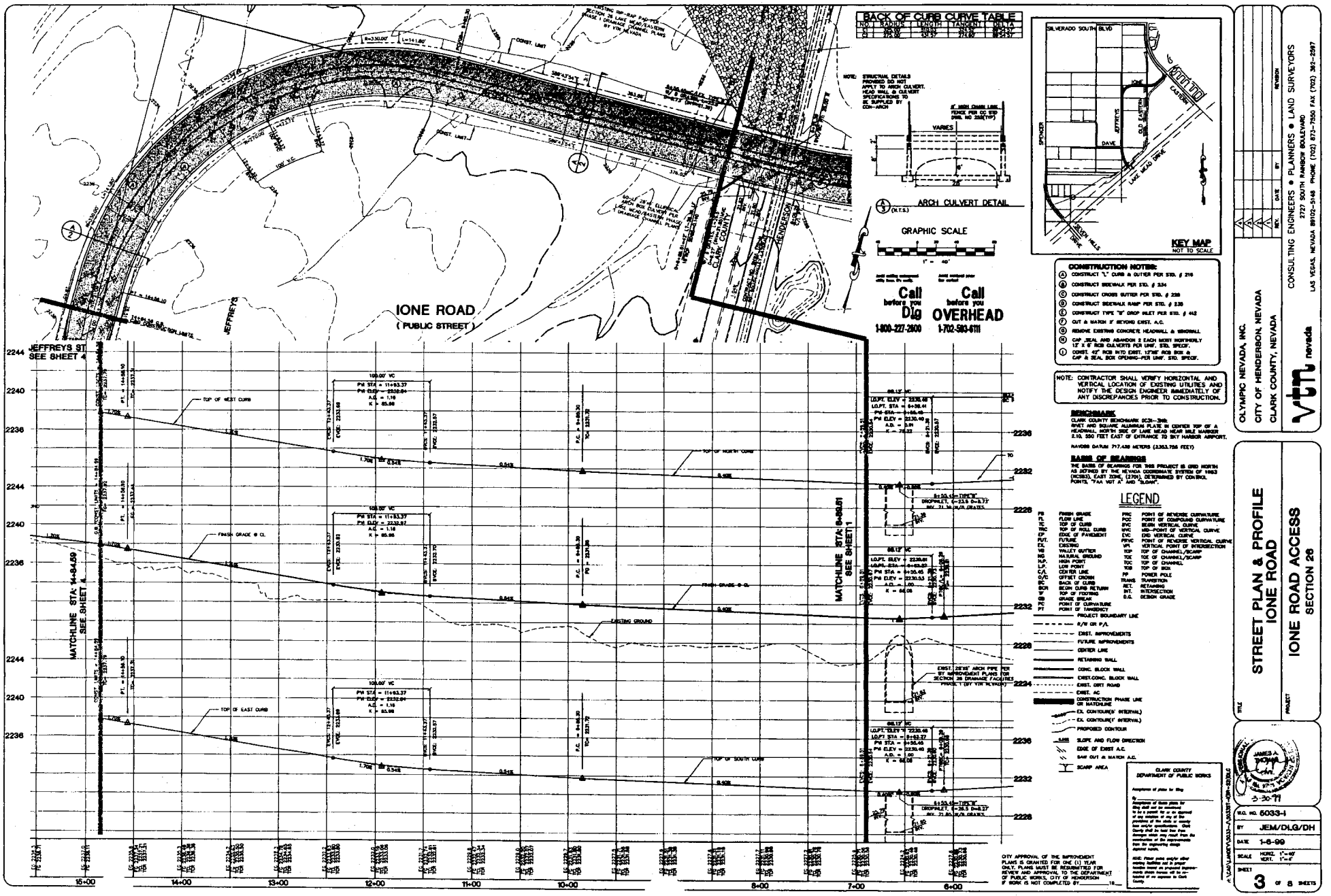
TITLE: STREET PLAN & PROFILE IONE ROAD

PROJECT: IONE ROAD ACCESS SECTION 26

JAMES E. JEM CIVIL 5-20-97

W.O. NO.	5033-1
BY	JEM/DLG/DH
DATE	7-9-96
SCALE	HORIZ. 1"=40' VERT. 1"=4'
SHEET	2 OF 8 SHEETS

A:\CAD\LANDEV\5033-1\5033T-DH-PHDLG



BACK OF CURB CURVE TABLE

NO.	RADIUS	LENGTH	TANGENT	DELTA
C1	330.00'	519.91'	330.53'	90°15'01"
C2	275.00'	431.59'	274.60'	89°54'57"

NOTE: STRUCTURAL DETAILS PROVIDED DO NOT APPLY TO ARCH CULVERT. HEAD WALL & CULVERT SPECIFICATIONS TO BE SUPPLIED BY CON-ARCH

ARCH CULVERT DETAIL (N.T.S.)

GRAPHIC SCALE

1" = 40'

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-8111

KEY MAP
NOT TO SCALE

CONSTRUCTION NOTES:

1. CONSTRUCT "L" CURB & GUTTER PER STD. # 210
2. CONSTRUCT SIDEWALK PER STD. # 234
3. CONSTRUCT CROSS GUTTER PER STD. # 228
4. CONSTRUCT SIDEWALK RAMP PER STD. # 238
5. CONSTRUCT TYPE "B" DROP INLET PER STD. # 412
6. CUT & MATCH 2' BEYOND EXIST. A.C.
7. REMOVE EXISTING CONCRETE HEADWALL & WINGWALL
8. CAP, SEAL, AND ABANDON 2 EACH 30X81 HORIZONTALLY 12' x 6' RCB CULVERTS PER UNIF. STD. SPECIF.
9. CONST. 42" RCB INTO EXIST. 12'X6' RCB BOX & CAP & SEAL BOX OPENING-PER UNIF. STD. SPECIF.

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

BENCHMARK

CLARK COUNTY BENCHMARK BC3I-398: RIVET AND SQUARE ALUMINUM PLATE IN CENTER TOP OF A HEADWALL, NORTH SIDE OF LAKE MEAD NEAR MILE MARKER 2.10, 350 FEET EAST OF ENTRANCE TO SKY HARBOR AIRPORT.

NAVD88 DATUM 717.430 METERS (2353.756 FEET)

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NAD83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS "FAA VGT A" AND "SLOAN".

LEGEND

FINISH GRADE	FLOW LINE	PRC	POINT OF REVERSE CURVATURE
TOP OF CURB	TOP OF SLOPE	PCC	POINT OF COMPOUND CURVATURE
TOP OF ROLL CURB	BEGIN VERTICAL CURVE	BVC	BEGIN VERTICAL CURVE
EDGE OF PAVEMENT	MID-POINT OF VERTICAL CURVE	MVC	MID-POINT OF VERTICAL CURVE
FUTURE	END VERTICAL CURVE	EVC	END VERTICAL CURVE
CROSSING	VERTICAL POINT OF INTERSECTION	PRVC	POINT OF REVERSE VERTICAL CURVE
VALLEY GUTTER	TOP OF CHANNEL/SCARP	VPI	VERTICAL POINT OF INTERSECTION
NATURAL GROUND	TOE OF CHANNEL/SCARP	TOP	TOP OF CHANNEL/SCARP
HIGH POINT	TOP OF CHANNEL	TOE	TOE OF CHANNEL/SCARP
LOW POINT	TOP OF BOX	TOC	TOP OF CHANNEL
CORNER LINE	POWER POLE	TOB	TOP OF BOX
OFFSET CROWN	TRANSITION	PP	POWER POLE
BEGIN CURB RETURN	RETAINING	TRANS	TRANSITION
TOP OF FOOTING	INTERSECTION	RET.	RETAINING
GRADE BREAK	DESIGN GRADE	INT.	INTERSECTION
POINT OF CURVATURE		D.G.	DESIGN GRADE
POINT OF TANGENCY			

- PROJECT BOUNDARY LINE
- R/W OR P/L
- EXIST. IMPROVEMENTS
- FUTURE IMPROVEMENTS
- CENTER LINE
- RETAINING WALL
- CONC. BLOCK WALL
- EXIST.CONC. BLOCK WALL
- EXIST. DIRT ROAD
- EXIST. AC
- CONSTRUCTION PHASE LINE OR MATCHLINE
- EX. CONTOUR(5' INTERVAL)
- EX. CONTOUR(1' INTERVAL)
- PROPOSED CONTOUR
- SLOPE AND FLOW DIRECTION
- EDGE OF EXIST A.C.
- SAW CUT & MATCH A.C.
- SCARP AREA

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY _____, 19__

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS

Acceptance of plans by Clerk

By _____

Acceptance of these plans for filing shall not be construed by the applicant as an approval of any violation of any of the provisions of this chapter or any other applicable ordinances. Such filing shall not bind the plan examiner to approve any work that the construction of the improvements from the engineering design approved herein.

NOTE: Power poles and/or other existing facilities not in proper relationship to proposed improvements shown hereon will be relocated at no expense to Clark County.

OLYMPIC NEVADA, INC.
CITY OF HENDERSON, NEVADA
CLARK COUNTY, NEVADA

vtn nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7250 FAX (702) 362-2287

NO.	DATE	BY	REVISION

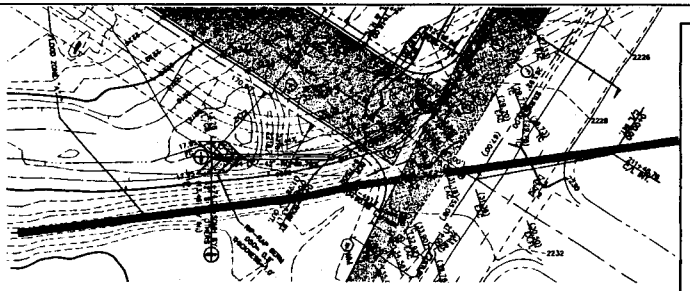
STREET PLAN & PROFILE
IONE ROAD

PROJECT
IONE ROAD ACCESS
SECTION 26

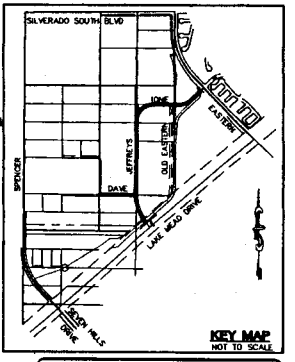
JAMES A. MOTT
No. 9787
REGISTERED ENGINEER
3-30-99

W.O. NO. 5033-1
BY JEM/DLG/DH
DATE 1-6-99
SCALE HORZ. 1"=40'
VERT. 1"=4'
SHEET 3 OF 8 SHEETS

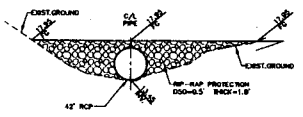
A:\DWG\W5033-1\W5033-1-SH3.DWG



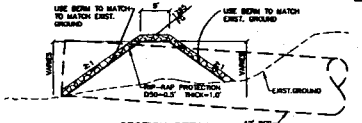
IONE ROAD
(PUBLIC STREET)



KEY MAP
NOT TO SCALE



SECTION DETAIL
(N.T.S.)



SECTION DETAIL
(N.T.S.)

CONSTRUCTION NOTES:

(A) CONSTRUCT "L" CURB & GUTTER PER STD. # 216
(B) CONSTRUCT SIDEWALK PER STD. # 234
(C) CONSTRUCT CROSS GUTTER PER STD. # 226
(D) CONSTRUCT SIDEWALK RAMP PER STD. # 235
(E) CONSTRUCT TYPE "B" DROP INLET PER STD. # 412
(F) CUT & MATCH 3' BEYOND EXIST. A.C.
(G) REMOVE EXISTING CONCRETE HEADWALL & WINGWALLS
(M) CAP, SEAL AND ABANDON 2 EACH MOST NORTHERLY 12' X 6' RCB CULVERTS PER UNIF. STD. SPECIF.
(I) CONST. 42" RCP INTO EXIST. 12'W RCB BOX & CAP & SEAL BOX OPENING PER UNIF. STD. SPECIF.

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

BENCHMARK
CLARK COUNTY BENCHMARK GCM-3MB
RIVET AND SQUARE ALUMINUM PLATE IN CENTER TOP OF A HEADWALL, NORTH SIDE OF LAKE MEAD NEAR MILE MARKER 3.10, 500 FEET EAST OF ENTRANCE TO BOY HARBOR AIRPORT.

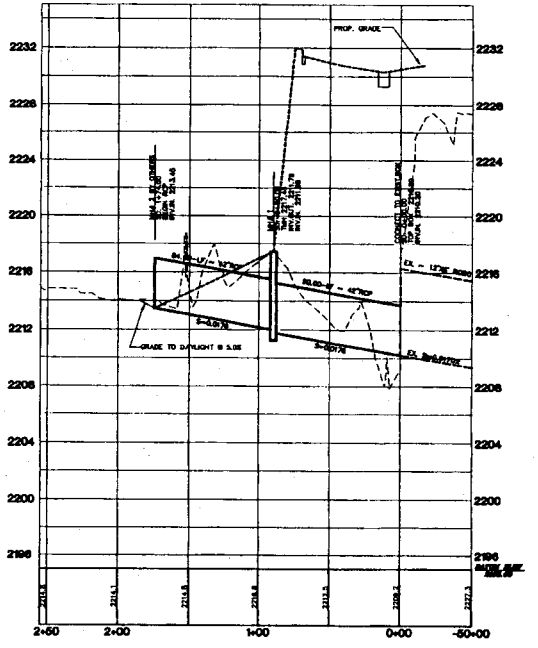
NAVD88 DATUM 717.428 METERS (2353.730 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NAD83), EAST ZONE (2701), DETERMINED BY CONTROL POINTS "FAI VIST A" AND "ELDAM".

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-6111

GRAPHIC SCALE
1" = 40'



SD: 0+00 TO 1+74.00
42" RCP
NORTH TO SOUTH • IONE/EASTERN

SCALE: HORIZ. 1"=40'
VERT. 1"=4'

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____, 19____.

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS

Acceptance of plans for filing

By _____

Acceptance of these plans for filing shall not be considered to be a waiver by or on behalf of any violation of any of the provisions of the whole or any part of any specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted hereon.

NOTE: Prior notice must be given to the Clark County Department of Public Works before any proposed improvements shown on approved improvement plans are to be constructed.

OLYMPIC NEVADA, INC.
CITY OF HENDERSON, NEVADA
CLARK COUNTY, NEVADA

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7500 FAX (702) 362-2567

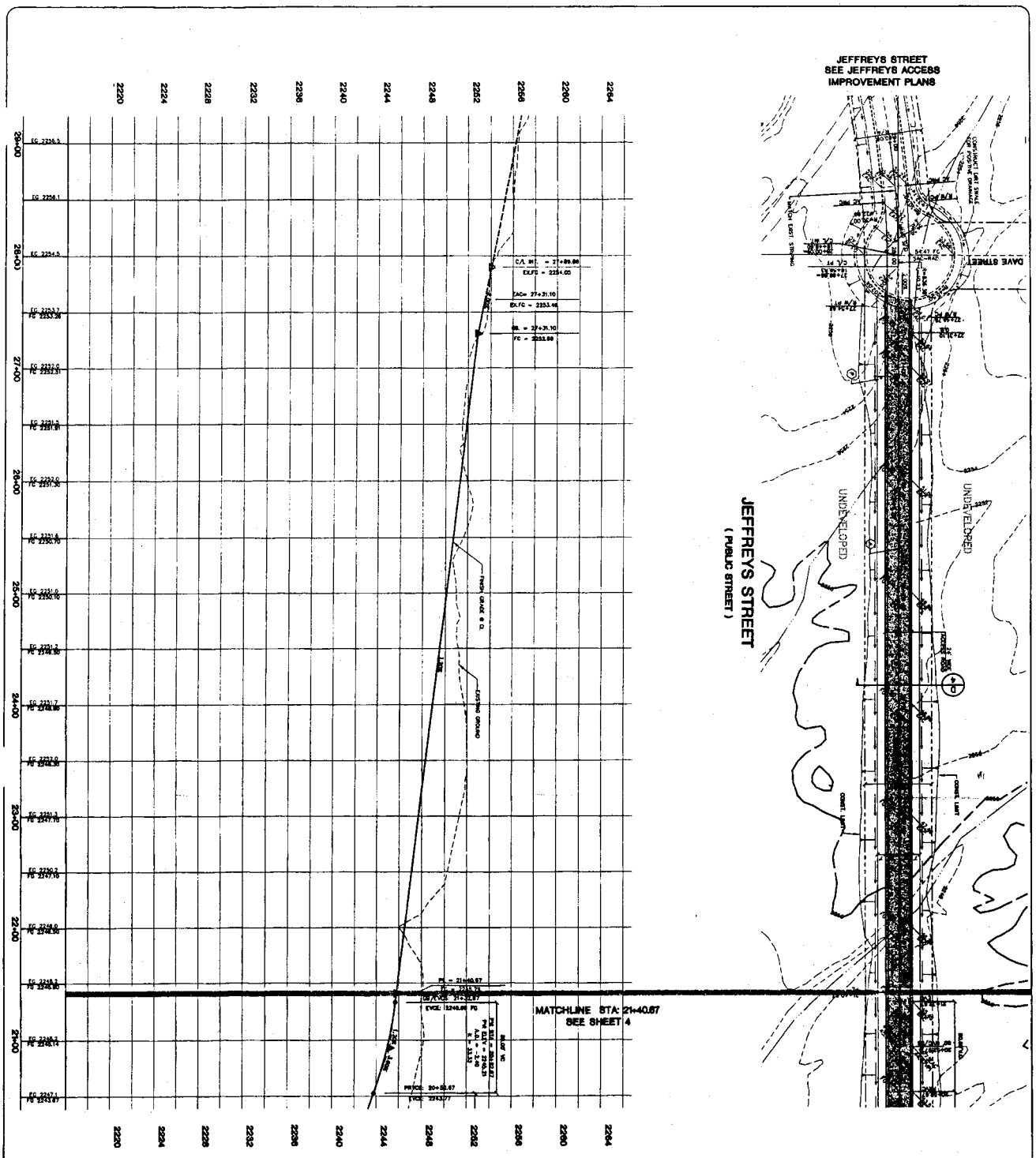
TITLE: 42" RCP PIPE PLAN & PROFILE IONE ROAD

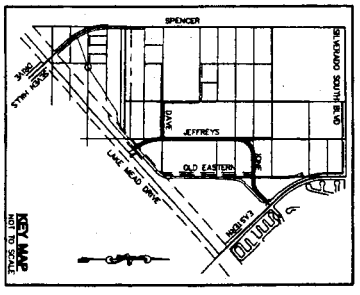
PROJECT: IONE ROAD ACCESS SECTION 26

JAMES A. JEFFREYS 7719 CIVIL
3-30-99

W.O. NO. 5033-I
BY JEM/DLG
DATE 1-6-99
SCALE HORIZ. 1"=40' VERT. 1"=4'
SHEET 8 OF 8 SHEETS

H:\cad\landev\50339-1\50339t-1.dwg Thu Mar 10 14:36:56 1999 PLOTTED BY: DLG





NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION

BENCHMARK
CLARK COUNTY BENCHMARK FOR THIS PROJECT IS LOCATED ON THE SOUTH SIDE OF A HEADWALL NORTH SIDE OF LAKE MEAD BLVD. 2.4± MILES EAST OF ENTRANCE TO SKY HARBOR AIRPORT.
NAD83 DATUM 733,438 METERS (2,403,729 FEET)

BASIS OF BEARINGS
THE BEARINGS SHOWN HEREON ARE BASED ON THE PROJECT'S GRID NORTH AS DEFINED AT THE NEVADA COORDINATE SYSTEM OF 1983, EAST ZONE (2702), DETERMINED BY CONTROL POINTS 1 AND 2 AS SHOWN HEREON.

Call before you Dig
1-800-227-2600

Call before you
OVERHEAD
1-702-383-6111

GRAPHIC SCALE
1" = 40'

CITY APPROVAL OF THIS IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR FROM DATE SIGNED. ANY WORK NOT COMPLETED WITHIN THIS PERIOD SHALL REQUIRE RESUBMITTAL OF PLANS TO THE CITY OF HENDERSON FOR REVIEW. CITY OF HENDERSON IF WORK IS NOT COMPLETED BY _____, 19__

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
Director of Public Works
Date

H:\CAD\LANDEV\50339-1\50339T-ICER-340DLG

F.A.P. NO.	50339-1
BY	JEM/DLG
DATE	1-6-99
SCALE	HORIZ. 1"=40' VERT. 1"=4'
SHEET	5 OF 8 SHEETS

3-31-11

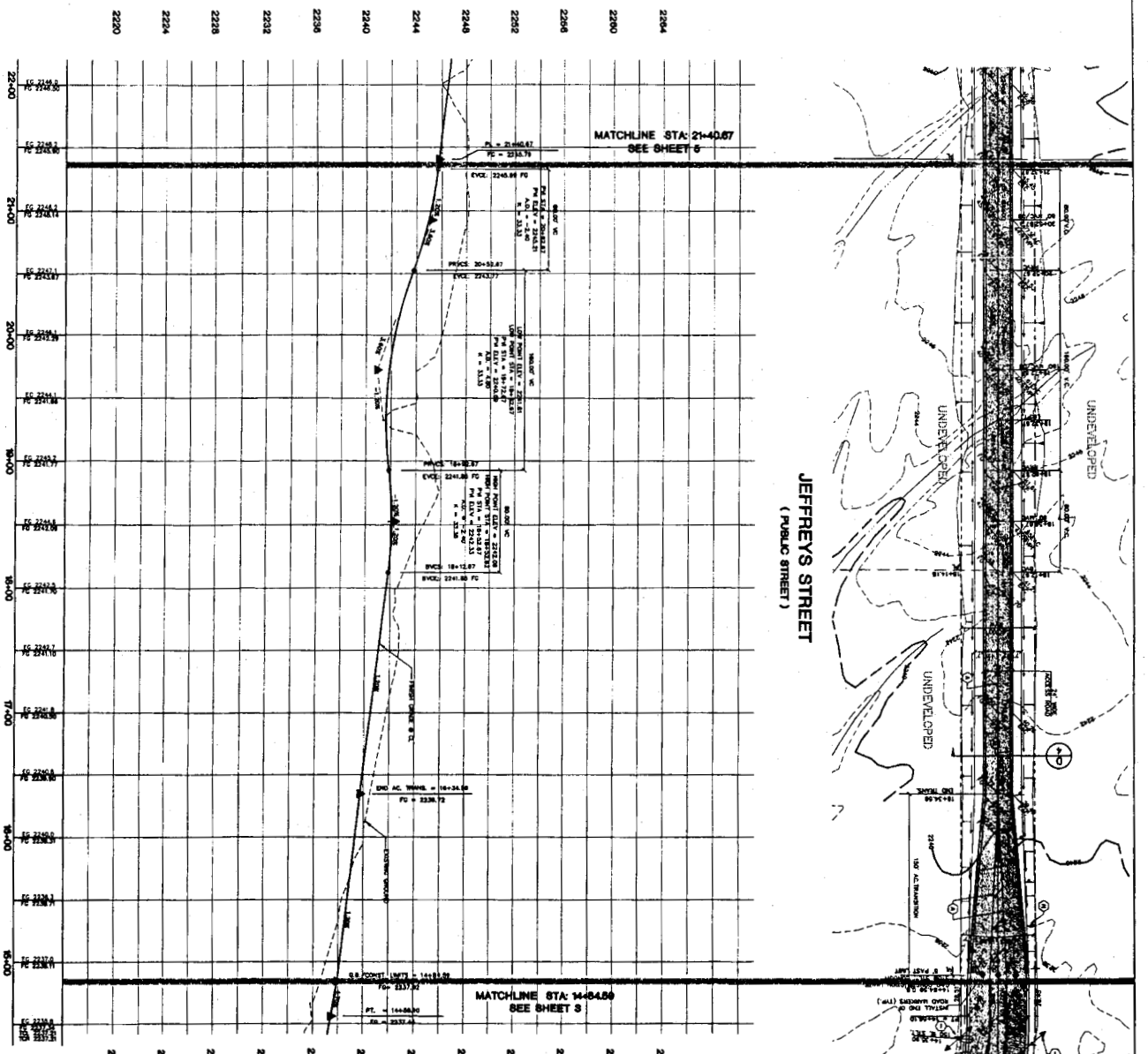
TITLE
STREET PLAN & PROFILE
JEFFREYS STREET

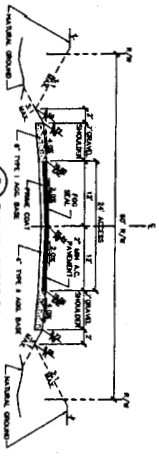
PROJECT
IONE ROAD ACCESS
SECTION 26

OLYMPIC NEVADA, INC.
CITY OF HENDERSON, NEVADA
CLARK COUNTY, NEVADA

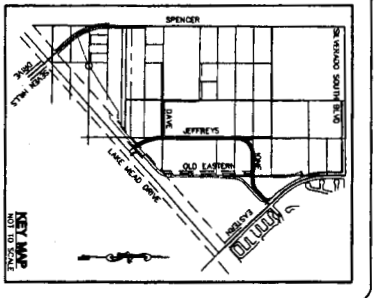
REV.	DATE	BY	REVISION
1			
2			
3			
4			

VTN nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597





GRAPHIC SCALE



NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL CONTROL AND IMMEDIATELY NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

BENCHMARK
CLARK COUNTY BENCHMARK 6031-396
BRASS CAP MONUMENT ON THE NORTH SIDE OF A HEADWALL NORTH END OF LAKE MEAD DRIVE BRIDGE
2,110, 580 FEET EAST OF ENTRANCE TO SKY HARBOR AIRPORT.

HAVING DATUM 717,438 METERS (2353,736 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DETERMINED BY GPS OBSERVATIONS OF CLARK COUNTY CONTROL POINTS, "FAA 167" & "LOW", AND "SLOAN".

Call before you DIG
Call OVERHEAD
1-800-227-2600 1-702-593-8111

CITY APPROVAL OF THE IMPROVEMENT PLANS DOES NOT RELIEVE THE DEVELOPER OF THE RESPONSIBILITY TO OBTAIN ALL OTHER APPROVALS REQUIRED BY CITY, COUNTY, STATE OR FEDERAL AGENCIES. IF WORK IS NOT COMPLETED BY _____, IT MAY BE NECESSARY TO RESUBMIT THE PLANS FOR REVIEW AND APPROVAL BY CITY OF HENDERSON.

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS

H:\CAD\LANDEV\6033-A\50335T-(SR-S3)DLG

TITLE
STREET PLAN & PROFILE
JEFFREYS STREET

PROJECT
IONE ROAD ACCESS
SECTION 26

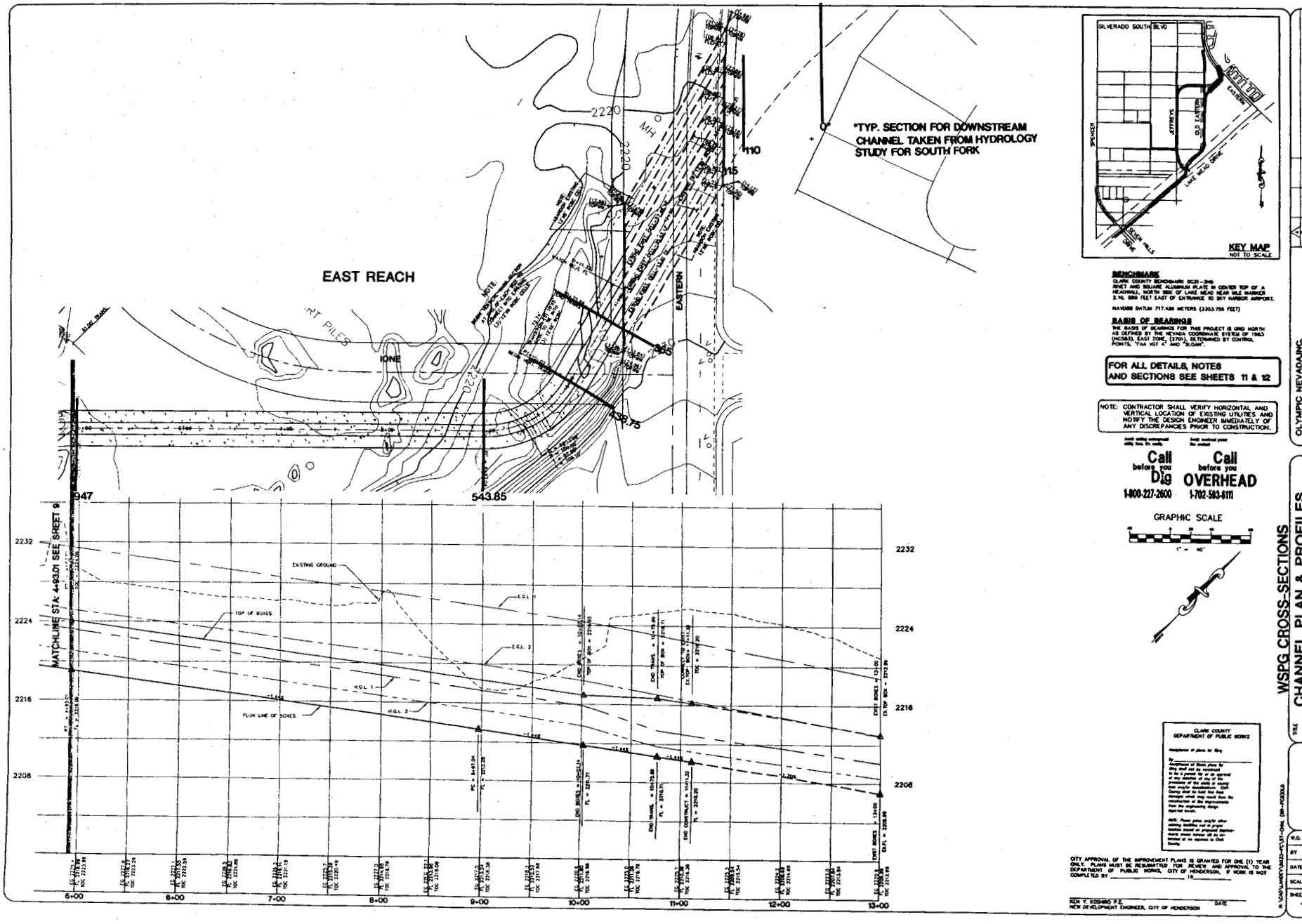
OLYMPIC NEVADA, INC.
CITY OF HENDERSON, NEVADA
CLARK COUNTY, NEVADA

REV.	DATE	BY	REVISION

vtn nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

JOB NO.	6033-I
DATE	1-8-99
BY	JEM/DLG
SCALE HORIZ.	1"=40'
SCALE VERT.	1"=4'
SHEET	4 OF 8 SHEETS

JAMES E. CHRISTENSEN
NEVADA
5-30-01



KEY MAP
NOT TO SCALE

BENCHMARK
CLARK COUNTY BENCHMARK DC31-3HB
RIVET AND SQUARE ALUMINUM PLATE IN CENTER TOP OF A HEADWALL NORTH SIDE OF LAKE MEAD NEAR MILE MARKER 3.10, 5860 FEET EAST OF ENTRANCE TO SKY HARBOR AIRPORT.

NAVD88 DATUM 717.426 METERS (2353.756 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (HCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS, "FAA VOT A" AND "SLOAN".

FOR ALL DETAILS, NOTES AND SECTIONS SEE SHEETS 11 & 12

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-6111

GRAPHIC SCALE

1" = 40'

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS

Acceptance of plans for filing

Approval of these plans for filing shall not be construed to be a permit for or an approval of any violation of any of the provisions of county ordinances or state laws. Approval of these plans shall not prevent the county from requiring the correction of errors in the plans discovered during construction. Approval of these plans shall not relieve the engineer of responsibility for the adequacy of the engineering design of said plans.

NOTE: Please advise any other affected facilities and/or property owners of the proposed improvements. Clear written notice will be sent to the appropriate Fire District.

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____, 19__.

KEN Y. KOSHIO P.E.
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

DATE

OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-3140 PHONE (702) 873-7550 FAX (702) 362-2597

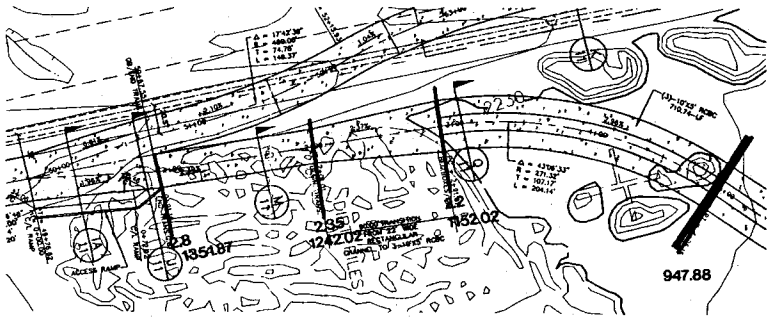
TITLE: WSPG CROSS-SECTIONS
CHANNEL PLAN & PROFILES
EAST REACH

PROJECT: LAKE MEAD / EASTERN
SECTION 26 DRAINAGE CHANNEL

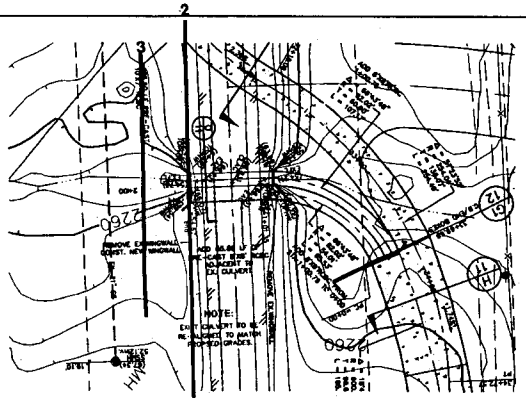
SEAL

W.O. NO. 5033-FC
BY BR/DLG
DATE FEB,1998
SCALE HORZ. 1"=40'
VERT. 1"=4'
SHEET 10 OF 12 SHEETS

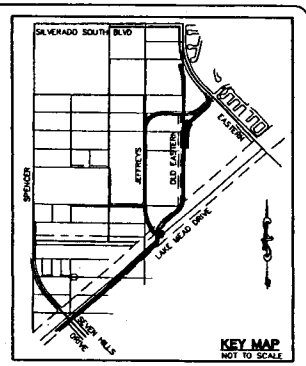
H:\CAD\LAKEVY\5033-FC\ST-CHN1.DWG



EAST REACH



JEFFREYS/LAKE MEAD CULVERT



KEY MAP
NOT TO SCALE

BENCHMARK
CLARK COUNTY BENCHMARK BC91-2HS:
RIVET AND BOLDER ALUMINUM PLATE IN CENTER TOP OF A HEADWALL, NORTH SIDE OF LAKE MEAD NEAR MILE MARKER 2.10, 580 FEET EAST OF ENTRANCE TO SKY HARBOR AIRPORT.

NAVD88 DATUM 717.438 METERS (2,353.755 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS, "FAA VOT A" AND "SLOAN".

FOR ALL DETAILS, NOTES AND SECTIONS SEE SHEETS 11 & 12

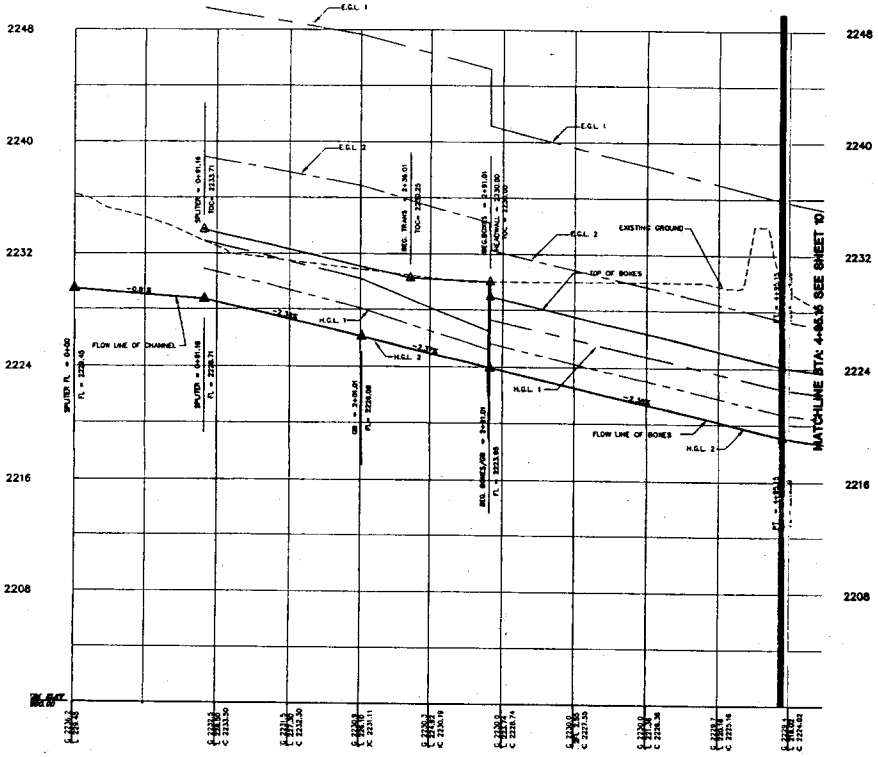
NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

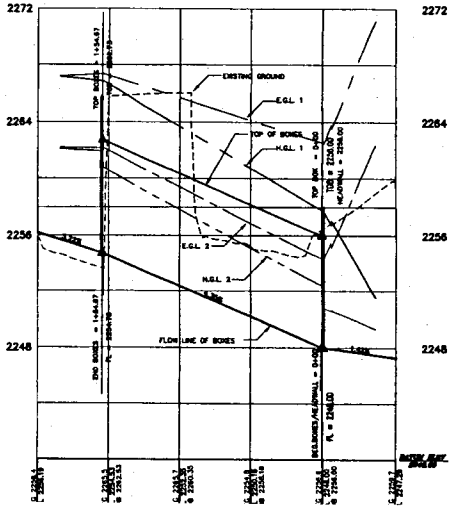
Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-8111

GRAPHIC SCALE

1" = 40'





CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS

Acceptance of plans for filing

By _____
Acceptance of these plans for filing shall not be construed to be a waiver of any requirement of any of the ordinances of Clark County which may apply to said plans. Clark County shall not be held liable for any damages which may arise from the construction of the improvements for the conforming design represented thereon.

NOTE: These plans may be subject to other zoning facilities and to proper building permit or grading approval. Such approval shall not be construed as an approval of its conformity to Code Compliance.

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL IF NOT COMPLETED BY _____

OLYMPIC NEVADA/JNC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

REVISION | BY | DATE

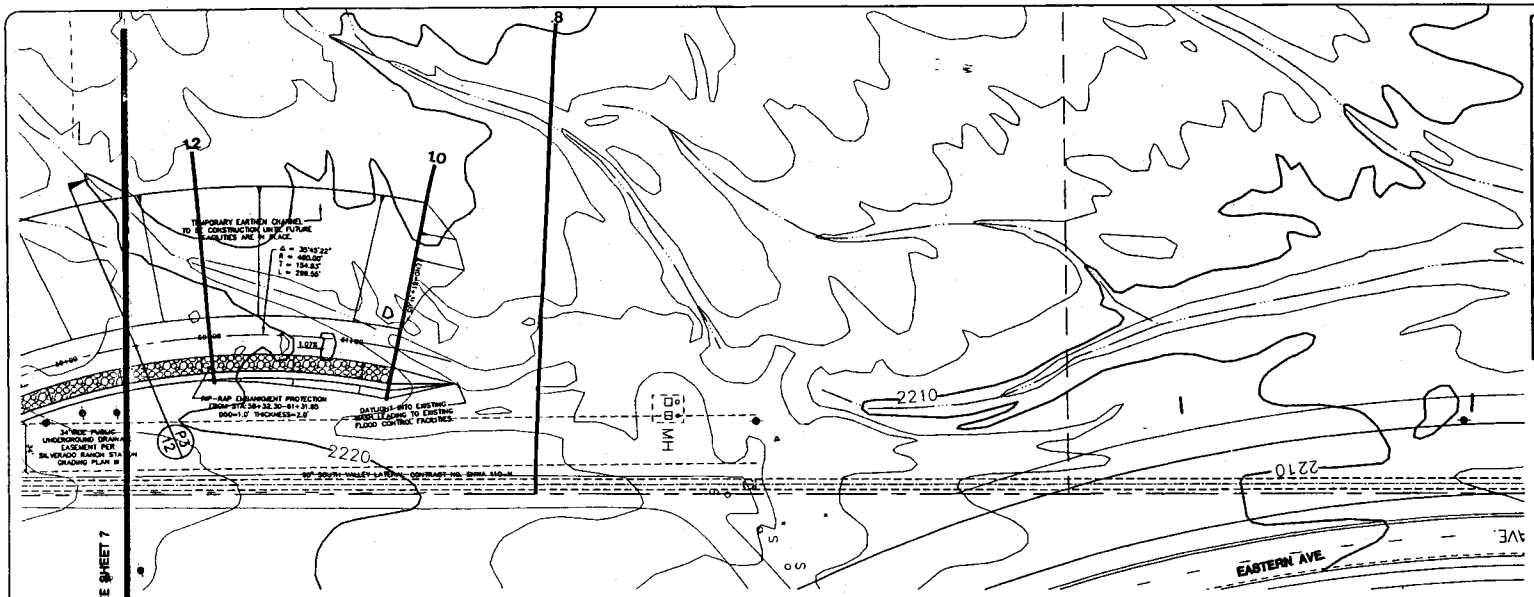
TITLE: WSPG HEC-RAS CROSS-SECTIONS
CHANNEL PLAN & PROFILES
EAST REACH & JEFFREYS/
LAKE MEAD CULVERT

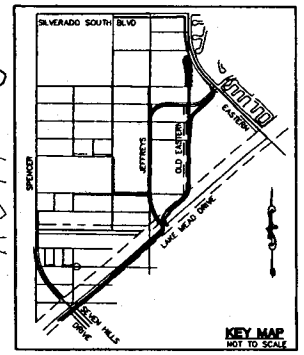
PROJECT: LAKE MEAD / EASTERN
SECTION 26 DRAINAGE CHANNEL

SEAL

E.G. NO. 5033-FC
BY BR/DLG
DATE FEB.1998
SCALE HORIZ. 1"=40'
VERT. 1"=4'

\\5033-FC\ST-DWG [5H-FC7]26.6





BENCHMARK
CLARK COUNTY BENCHMARK OCJR-2MB.
RIVET AND SQUARE ALUMINUM PLATE IN CENTER TOP OF A HEADWALL, NORTH SIDE OF LAKE MEAD NEAR MILE MARKER 2.18, 560 FEET EAST OF ENTRANCE TO SKY HARBOR AIRPORT.

NAVD88 DATUM 717.426 METERS (2353.755 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NAD83), EAST ZONE, (1701), DETERMINED BY CONTROL POINTS, "FAA YET A" AND "ELDAH".

FOR ALL DETAILS, NOTES AND SECTIONS SEE SHEETS 11 & 12

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

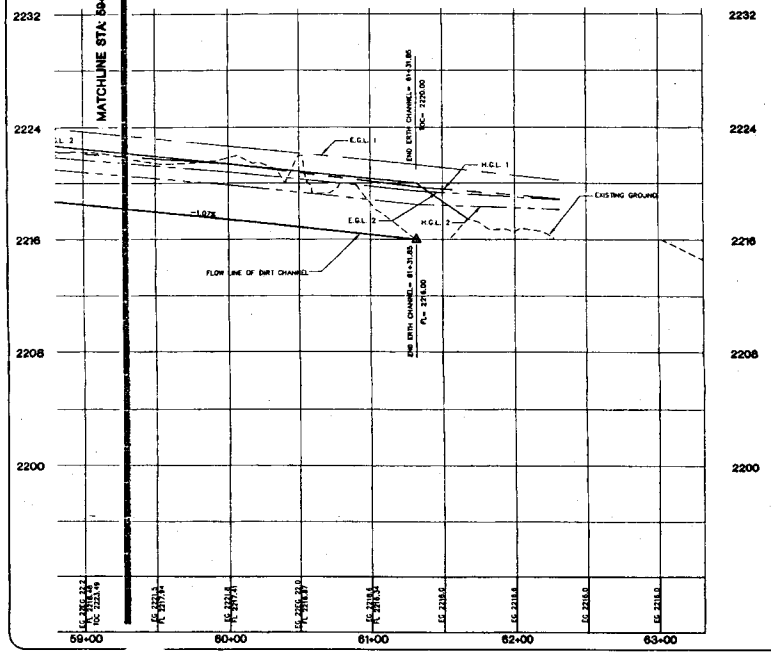
Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-6111

GRAPHIC SCALE

1" = 40'

NORTH REACH



NOTE

Contractor shall field locate SNWA 110-H access manways, test stations, and location markers and protect.

CONTRACTOR WILL APPROPRIATELY ADJUST ALL SNWA ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES TO NEW GRADE AT CONTRACTORS EXPENSE. **CONTRACTOR TO NOTIFY KIRK SMITTS AT (702) 648-1637 EXTENSION 209 AND DON JACKSON WITH SNWA AT (702) 564-7007 PRIOR TO CONSTRUCTION ACTIVITY WITHIN LIMITS OF SNWA/SNWS FACILITIES** (STATIONS 39+00-65+00)AND PRIOR TO ADJUSTING MANHOLE RINGS AND COVERS.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

Acceptance of plans for filing

By _____

Acceptance of these plans for filing shall not be construed to be a permit for or an approval of any violation of any of the provisions of the state or local ordinances. Acceptance of these plans for filing shall not prevent the correction of errors that may exist from the construction of the improvements from the engineering design depicted hereon.

NOTE: These plans expire when other existing facilities not in proper condition based on prevailing standards adopted by the County become a hazard to the public.

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____, 19__.

KEN Y. KORRING P.E. DATE
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

HEC-RAS CROSS-SECTIONS

OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7500 FAX (702) 362-2597

TITLE: CHANNEL PLAN & PROFILES NORTH REACH

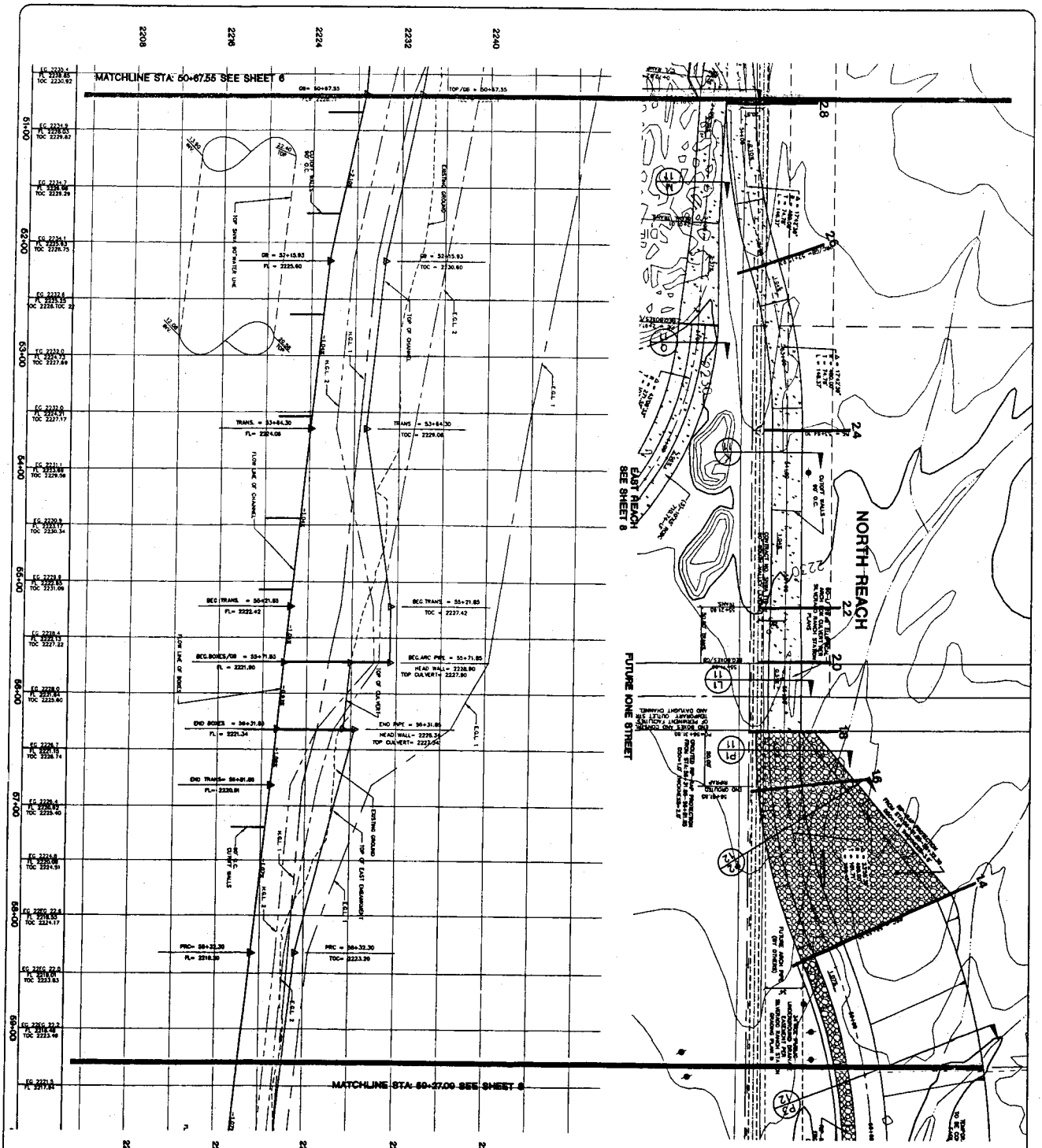
PROJECT: LAKE MEAD / EASTERN DRAINAGE CHANNEL

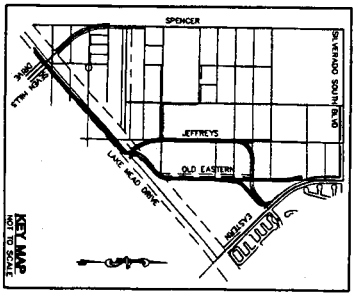
SEAL

W.O. NO. 5033-FC
BY BR/DLG
DATE FEB.1998
SCALE HORIZ. 1"=40' VERT. 1"=4'
SHEET 8 OF 12 SHEETS

H:\CAD\LAMEAD\5033-FC\ST-CHNL (BR-FEB98).0

H:\cad\LAMEAD\5033-FC\ST-CHNL2.dwg 1:1, 960 W 10:33:24 1998 Plotted by DLG





BENCHMARK

CLARK COUNTY BENCHMARK DCB-3BB, BRASS CAP SET IN CONCRETE, COVER TOP OF A MONUMENT, NORTH END OF LAKE MEAD NEAR TRUCK ENTRANCE TO DRY HARBOR AIRPORT. 2.1± MILES EAST OF ENTRANCE TO DRY HARBOR AIRPORT.

HORIZONTAL DATUM: 1927 NAD 83 (1986) (2.5313.706 FEET)

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DETERMINED BY GPS OBSERVATIONS ON MONUMENTS LAKE MEAD DRIVE, EAST ZONE, (1702), ESTABLISHED BY CONTROL POINTS, TYP. NO'X' AND 'SLOW'.

FOR ALL DETAILS, NOTES AND SECTIONS SEE SHEETS 11 & 12

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL DESIGN ELEMENTS (ALIGNMENTS) AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-384-4111

GRAPHIC SCALE

1" = 40'

NOTE:
Contractor shall field locate SWPPP, 10-ft access roadways, test stations, and location markers (and physical).

CONTRACTOR WILL APPROPRIATELY LOCATE ALL UTILITIES ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES TO NEW GRADE AT CONTRACTORS EXPENSE. CONTRACTOR TO ADJUST ALL MANHOLES, VALVES, AND OTHER APPURTENANCES TO NEW GRADE AT CONTRACTORS EXPENSE.

ACTIVITY WITHIN LIMITS OF DRAINAGE FACILITIES (STATIONS 39+00± - 63+00±) AND PRIOR TO ADJUSTING MANHOLE RINGS AND COVERS

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS SHALL BE RESUBMITTED FOR REVIEW AND APPROVAL IF WORK IS NOT COMPLETED BY ____, 19__.

CITY OF HENDERSON, NEVADA
DEPARTMENT OF PUBLIC WORKS

CITY ENGINEER

DATE

H:\CAD\LANDEV\6033-FC\ST-CH06. (SR-FCB)DLG

HEC-RAS CROSS-SECTIONS

TITLE: **CHANNEL PLAN & PROFILES NORTH REACH**

PROJECT: **LAKE MEAD / EASTERN DRAINAGE CHANNEL**

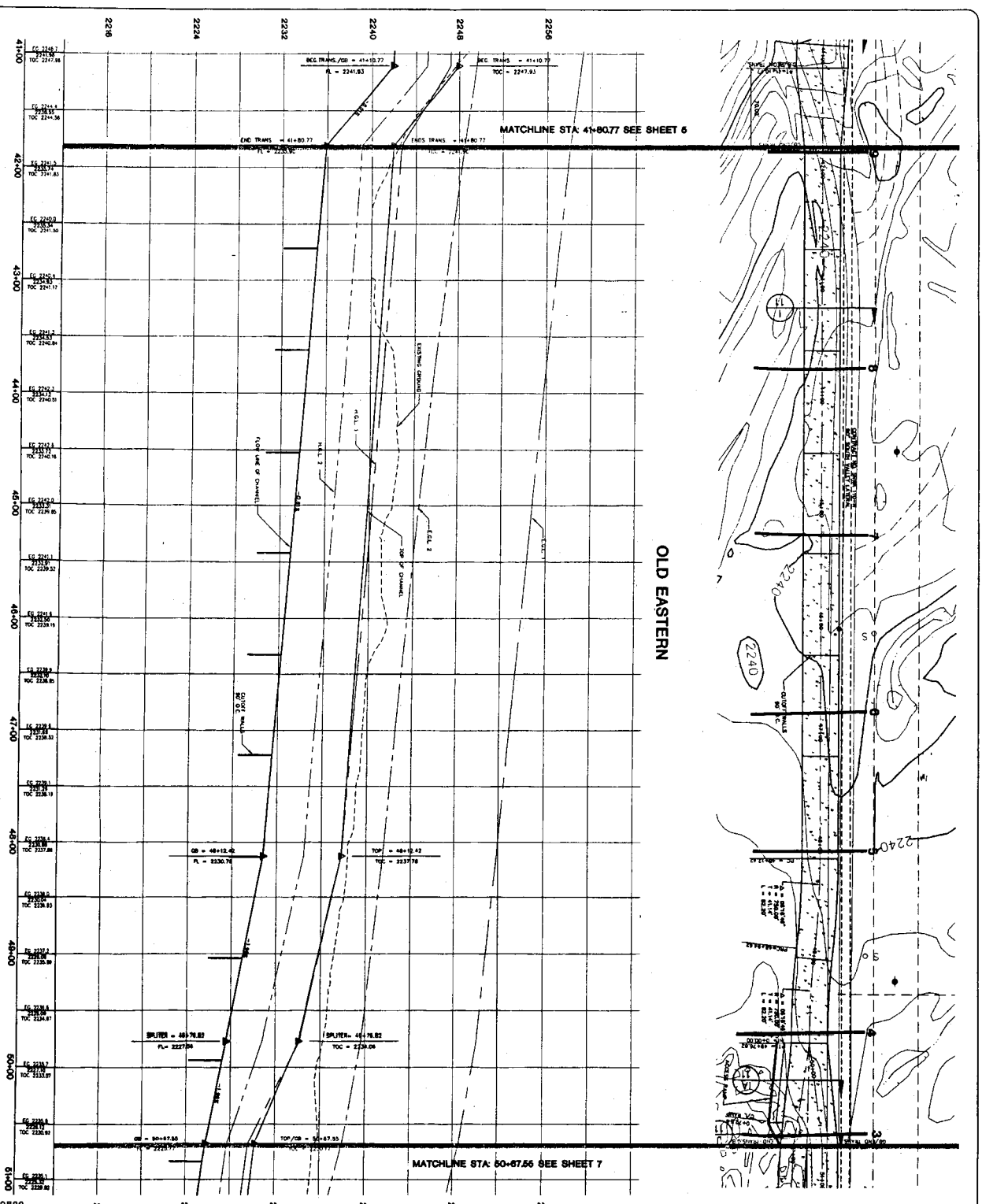
SEAL

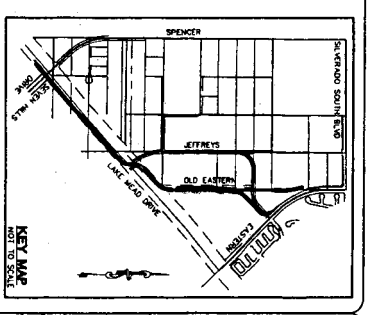
P.W. NO. 6033-FC
BY: BRI/DLG
DATE: FEB.1998
SCALE: HORIZ. 1"=40' VERT. 1"=4'
SHEET 7 OF 12 SHEETS

OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

REV.	DATE	BY	REVISION
3			
2			
1			

vtn nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2567





BENCHMARK
CLARK COUNTY BENCHMARK (BCP) - TYPE
BRASS CAP IN CONCRETE, 0.2 FEET BELOW GROUND, CENTER OF A MEADOWS, NORTH SIDE OF LAKE MEAD NEAR MILE MARKER 2.1 MI. 280 FEET EAST OF ENTRANCE TO SKY HARBOR AIRPORT.
HARDIN DATUM 717.426 METERS (2353.756 FEET)

BASIS OF BEARINGS
ALL BEARINGS FOR THIS PROJECT IS BASED NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM 1983 (NCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS 714, 101, & 102, KLOHN.

FOR ALL DETAILS, NOTES AND SECTIONS SEE SHEETS 11 & 12

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL CONTROL AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig OVERHEAD 1-800-227-2600 1-702-385-6111

GRAPHIC SCALE

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

CITY APPROVAL OF THIS PLAN MUST BE RESUBMITTED FOR RE-APPROVAL IF WORK IS NOT COMPLETED BY _____. PLANS MUST BE RESUBMITTED FOR RE-APPROVAL IF WORK IS NOT COMPLETED BY _____.
CITY OF HENDERSON, DEPARTMENT OF PUBLIC WORKS

CITY OF HENDERSON, P.E.
NEVADA REGISTERED
DEVELOPMENT ENGINEER, CITY OF HENDERSON
DATE

H:\CAD\LANDEV\3033-FC\ST-CHNL (BR-FEB)DLG

HEC-RAS CROSS-SECTIONS

TITLE: CHANNEL PLAN & PROFILES OLD EASTERN

PROJECT: LAKE MEAD / EASTERN DRAINAGE CHANNEL

SEAL

SHEET 6 OF 12 SHEETS
SCALE: HOR. 1"=40' VERT. 1"=4'
DATE: FEB.1998
BY: BR/DLG
JOB NO: 3033-FC

OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

REV.	DATE	BY	REVISION
1			
2			
3			
4			

VTN nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

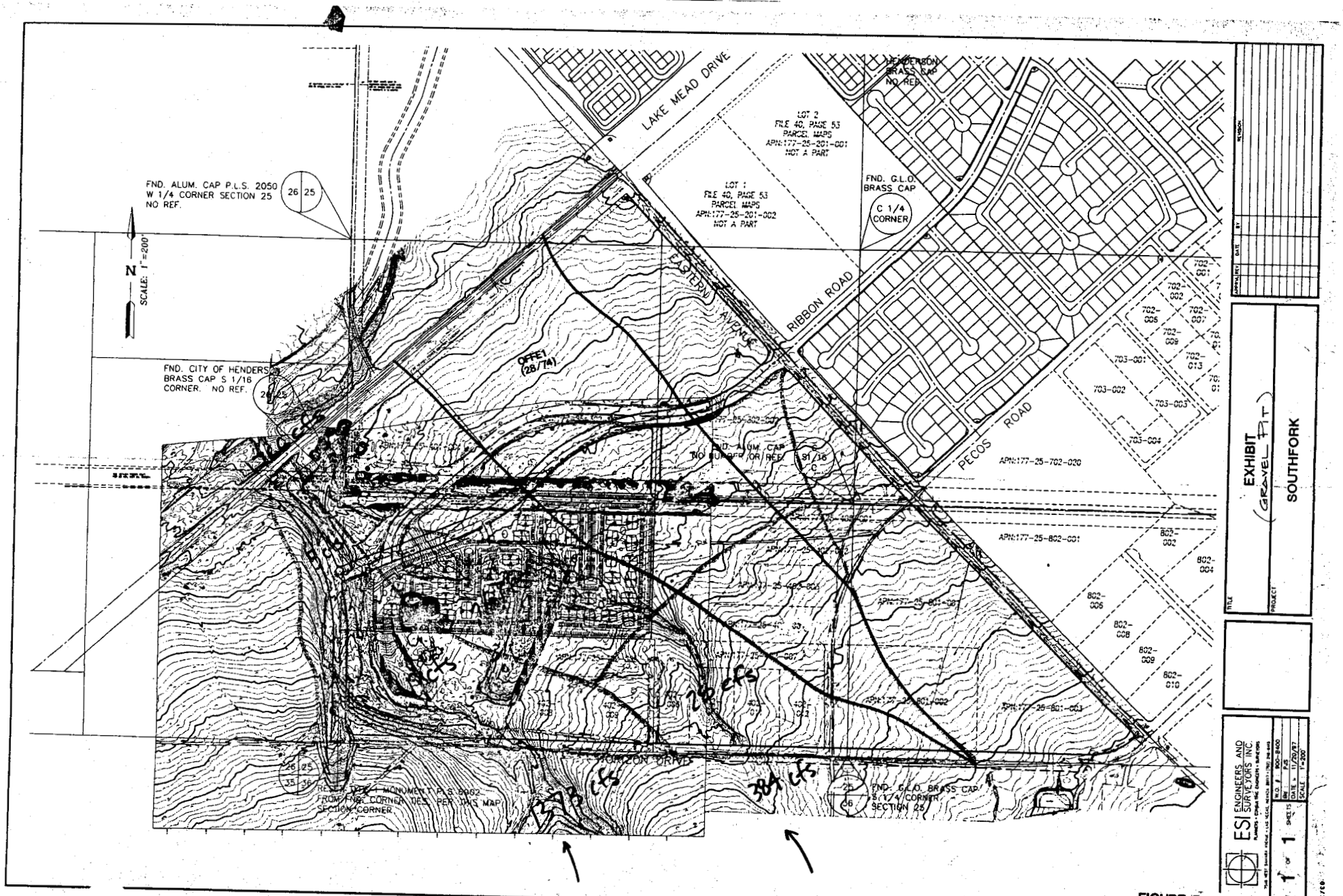


FIGURE F

RECORD

NOTE:
THIS DRAWING IS FOR EXHIBIT USE ONLY!

FIGURE ?

DEVELOPED DRAINAGE BASIN MAP

PROJECT: IONE ROAD

OLYMPIC NEVADA, INC.

CLARK COUNTY, NEVADA

REV	DATE	BY	REVISION
4	4/28/98	DLB	FIXED JEFFREYS ADDED IONA STREET PER CS
3	11/24/97	RWH	REV PER DJH
2	10/1/97	RWH	ADD EAST AREA
1			

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2567

vtn nevada

JOB NO. 6033
DATE 10/24/97
BY TJ
SCALE NOTE: 1"=200'
SHEET 1 OF 1 SHEETS

03/30/99

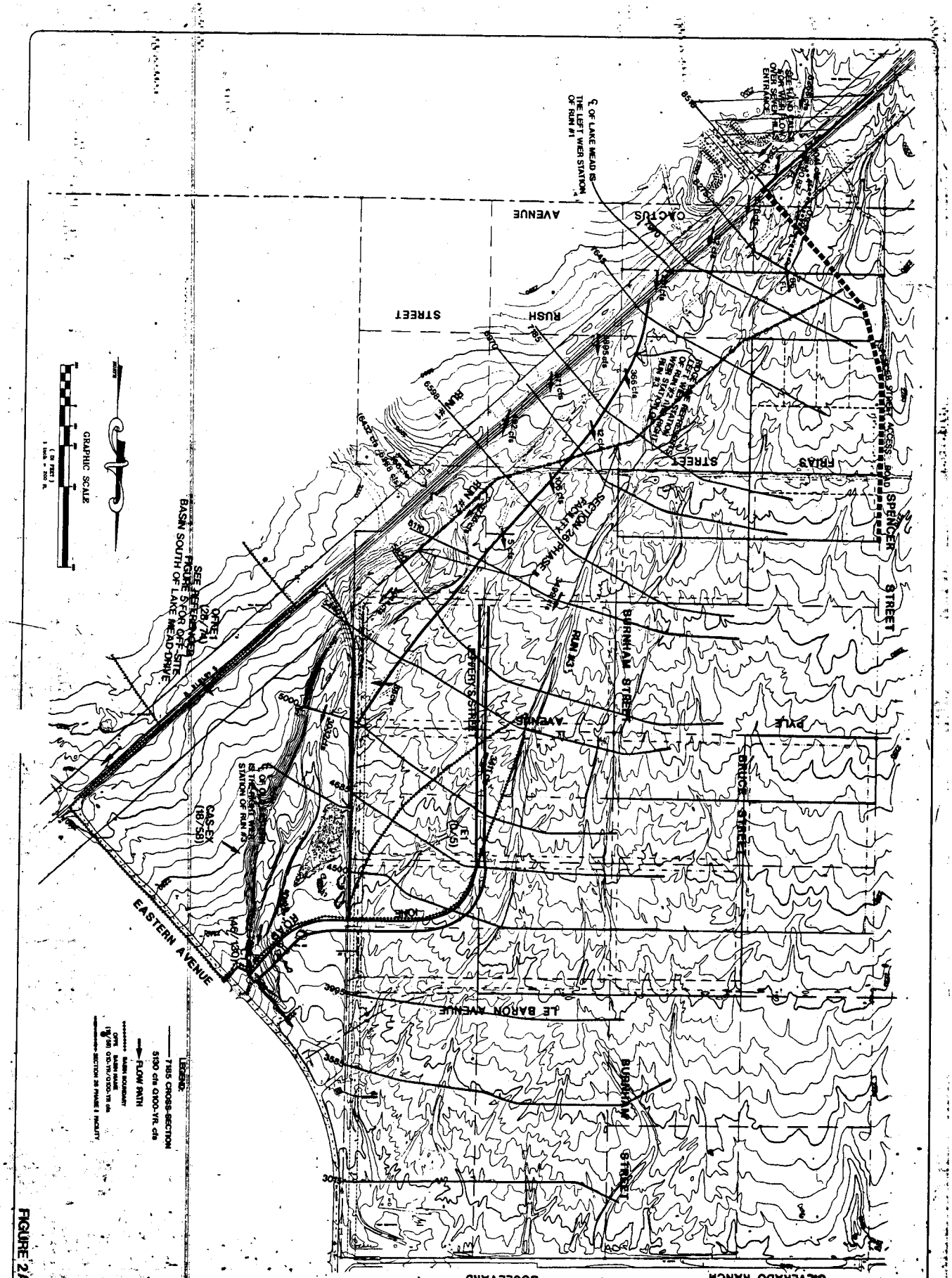


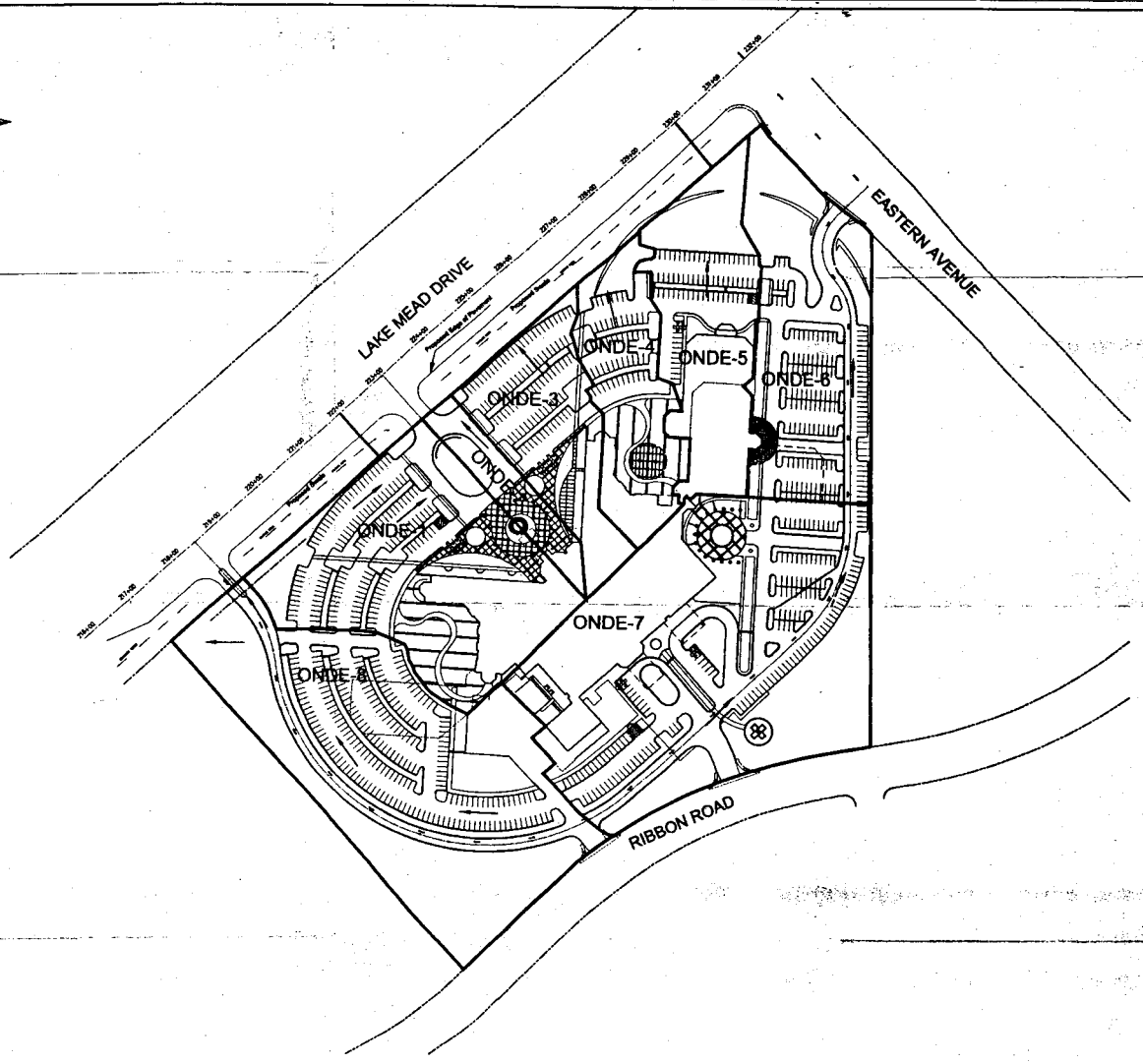
FIGURE 2A

EXISTING CONDITION
HEC-2 CROSS-SECTION EXHIBIT
AND DRAINAGE BASIN MAP

IONE ROAD

OLYMPIC NEVADA, INC.
CLARK COUNTY, NEVADA

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-8148 PHONE (702) 873-7880 FAX (702) 362-2997



FLOW SUMMARY TABLE

BASIN	AREA (acres)	Q_{10} (cfs)	Q_{100} (cfs)
ONDE-1	3.68	6	11
ONDE-2	0.62	1	2
ONDE-3	1.57	3	5
ONDE-4	1.53	2	5
ONDE-5	2.15	3	7
ONDE-6	2.90	5	10
ONDE-7	6.35	10	19
ONDE-8	5.26	9	16

GRAPHIC SCALE

(IN FEET)
1 inch = 100 ft.

PRINTED
DEC 16 1999

FIGURE 1: ONSITE DEVELOPED DRAINAGE BASINS

PBS&J
901 N. Green Valley Pkwy
Suite 100
Henderson, Nevada 89014
Telephone: 702/263-7275
Fax: 702/263-7200
ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

W.O.# 5033

Figure 1

LETTER OF TRANSMITTAL

530-2

To: Poggemeyer

Attn:

Project Name: Tone Road

Project No.

Date: 4/1/99

City of Henderson
Department of Public Works
Land Development Division

240 Water Street
Henderson, Nevada 89015

(702) 565-2140
Fax (702) 565-5687

WE TRANSMIT:

- ☐ Blueprint(s)
- ☐ Mylar(s)
- ☐ Other: _____

- ☐ For Correction/Revision
- ☒ For Your Info/File
- ☐ Other: _____

Remarks: _____

By: _____ Phone Number: _____

Date: 4/5/99

IF ENCLOSURES ARE NOT AS NOTED, PLEASE INFORM US IMMEDIATELY.

THE CITY OF HENDERSON

A Place To Call Home

May 11, 1999

James L. Fitzpatrick, P.E.
VTN of Nevada
2727 S. Rainbow Boulevard
Las Vegas, NV 89146-5148

Re: Hydrology Study for Ione Road
Addendum #1 to the Above
PDG #98168-D, 530-2F (AH)

Dear Mr. Fitzpatrick:

This letter provides comments on the above-referenced drainage study's addendum dated March 29, 1999. This study's addendum was reviewed by Poggemeyer Design Group and the City of Henderson.

Based on the documents submitted, **the subject study is approved.** The following comments and restrictions are noted:

1) All drainage study review fees, if any, above the original deposit, must be paid in full. You will be notified if any additional fees are required. If there are excess funds, you will be issued a refund check.

2) The grading plan for the above referenced drainage study titled, "Ione Road", sealed by James L. Fitzpatrick, P.E., on January 11, 1999, and the Addendum signed and sealed by the same as above on March 29, 1999, has been reviewed to determine conformance to the current City of Henderson laws and regulations. The plan appears to meet the requirements for approval. The site must be graded with the following changes on the above-noted grading plan and the following flood control facilities must be constructed:

3) **Flood Control Facilities:**

   a) A 42-inch RCP storm drain, approximately 174 feet long connecting into the existing culvert storm drain facility in Eastern Avenue with the following drainage facilities:

i) Two (2) SDMH
ii) A riprap berm pad
iii) D_{50} = 0.50 feet
iv) Thickness = 1.0 foot

4) A bond estimate must be submitted for the above-mentioned flood control facilities.

5) The site is located within Zone X and Zone A as shown on the Flood Insurance Rate Map Community Panel Number 32003C 2910 D, 2595 D, and 2930 D dated August 16, 1995. A Zone X is designated as being outside of the 500-year flood plain and Zone A is designated as an area inundated by the 100-year floodplain.

6) Regional Flood Control concurrence is required since the site is partially located in a flood zone and crossed by a regional facility.

Projects which disturb more than five acres of land must submit to the Nevada Department of Environmental Protection: (1) a "Notice of Intent" to discharge, (2) a request for inclusion in the Stormwater General Permit No. GNV0022241, and (3) a stormwater prevention plan. For more information, please call (702) 687-4670, ext. 3138.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information submitted by the above-named engineering firm may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. No liability is assumed by the City of Henderson, its officials, or employees for the information, data or conclusions presented by the consulting engineer. We therefore make no warranties, either expressed or implied, in conducting this review.

Please let me know if you have any questions concerning these comments.

Sincerely,

Joseph V. Damiani

Joseph V. Damiani, P.E.
Project Manager

Cc: Curt Chandler, Janie Nihipali

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

Gale Wm. Fraser, II, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

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Jan Laverty Jones
City of Las Vegas

Bryan A. Nix
City of Boulder City

John K. Rhodes
City of North Las Vegas

David Wood
City of Henderson

Bruce L. Woodbury
Clark County

June 14, 1999

Robert Thompson, P.E.
Clark County Department of Public Works
500 South Grand Central Parkway
Las Vegas, NV 89155

DISTRICT CONCURRENCE: IONE ROAD (99-688)

Dear Mr. Thompson:

The District has reviewed the Technical Drainage Study dated January 11, 1999; and Addendum No. 1 dated March 29, 1999, for the above captioned project as submitted by VTN Nevada. In addition, the District is in receipt of the Conditional Letter of Acceptance from Clark County Public Works dated April 22, 1999.

The District concurs with the acceptance of this Technical Drainage Study by Clark County Public Works.

The District's review of this project was limited to issues of Regional Flood Control Significance as defined in the Uniform Regulations for the Control of Drainage. As noted in the study the site resides in a Special Flood Hazard Area (SFHA) designated as "Zone A" per the effective Flood Insurance Rate Map (FIRM). Therefore the consultant should be advised that this acceptance does not serve to amend the FIRM or remove the SFHA designation.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information submitted by VTN Nevada may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. No liability is assumed by the District, its officials, or employees for the information, data or conclusions presented by the consulting engineer. We therefore make no warranties, either expressed or implied, in conducting this review.

GALE WM. FRASER II, P.E.
General Manager/Chief Engineer

BY: Jon Hayslip
Jon H. Hayslip, P.E.
Associate Engineer

cc: VTN Nevada
City of Henderson Public Works

JHH:mak

File: 22-61-26.vtn

301 E. Clark Avenue, Suite 301 • Las Vegas, Nevada 89101
(702) 455-3139 • FAX: (702) 455-3870

C L A R K C O U N T Y
REGIONAL FLOOD CONTROL DISTRICT

Gale Wm. Fraser, II, P.E.
General Manager/Chief Engineer

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City of Boulder City

John K. Rhodes
City of North Las Vegas

David Wood
City of Henderson

Bruce L. Woodbury
Clark County

June 14, 1999

Curt Chandler, P. E.
City of Henderson Public Works
240 Water Street
Henderson, NV 89015

DISTRICT CONCURRENCE: IONE ROAD
(PDG #98168-D, 530-2F (AH))

Dear Mr. Chandler:

The District has reviewed the Technical Drainage Study dated January 11, 1999; and Addendum No. 1 dated March 29, 1999, for the above captioned project as submitted by VTN Nevada. In addition, the District is in receipt of the Conditional Letter of Acceptance from City of Henderson Public Works dated May 11, 1999.

The District concurs with the acceptance of this Technical Drainage Study by City of Henderson Public Works.

The District's review of this project was limited to issues of Regional Flood Control Significance as defined in the Uniform Regulations for the Control of Drainage. As noted in the study the site resides in a Special Flood Hazard Area (SFHA) designated as "Zone A" per the effective Flood Insurance Rate Map (FIRM). Therefore the consultant should be advised that this acceptance does not serve to amend the FIRM or remove the SFHA designation.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information submitted by VTN Nevada may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. No liability is assumed by the District, its officials, or employees for the information, data or conclusions presented by the consulting engineer. We therefore make no warranties, either expressed or implied, in conducting this review.

GALE WM. FRASER II, P.E.
General Manager/Chief Engineer

BY: Jon Hayslip
Jon H. Hayslip, P.E.
Associate Engineer

cc: VTN Nevada
Clark County Public Works/Community Development

JHH:mak

File: 22-61-26.vtn

301 E. Clark Avenue, Suite 301 • Las Vegas, Nevada 89101
(702) 455-3139 • FAX: (702) 455-3870

South Half

Eastern Avenue Arch Culverts
Segment Between Ione Road and Richmar Avenue

C L A R K C O U N T Y
REGIONAL FLOOD CONTROL DISTRICT

RECEIVED
APR
Public Works
Community Development

Gale Wm. Fraser, II, P.E.
General Manager/Chief Engineer

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Chairman
City of Las Vegas

Cresent Hardy
Vice-Chairman
City of Mesquite

Mayor James Gibson
City of Henderson

Michael Mack
City of Las Vegas

Chip Maxfield
Clark County

Bryan A. Nix
City of Boulder City

John K. Rhodes
City of North Las Vegas

Bruce L. Woodbury
Clark County

April 2, 2001

Robert Thompson, P.E.
Clark County Public Works
500 S. Grand Central Parkway
Las Vegas, NV 89155

DISTRICT CONCURRENCE: **SILVERADO RANCH STATION CULVERT EXTENSION (UPDATE) (HTE #01-1517UP)**

Dear Mr. Thompson:

The District has reviewed the Technical Drainage Study dated January 17, 2001, Addendum No. 1 dated February 2, 2001, and Addendum No. 2 dated March 1, 2001, for the above-captioned project as submitted by G. C. Wallace, Inc. In addition, the District is in receipt of the Conditional Letter of Acceptance from Clark County Public Works dated March 16, 2001.

The District concurs with the acceptance of this Technical Drainage Study by Clark County Public Works.

The District's review of this project was limited to issues of Regional Flood Control Significance as defined in the Uniform Regulations for the Control of Drainage.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information submitted by G. C. Wallace, Inc. may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for the information, data, or conclusions presented by the consulting engineers. We, therefore, make no warranties, either expressed or implied, in conducting this review.

GALE WM. FRASER II, P.E.
General Manager/Chief Engineer

BY: _____
Jon H. Hayslip, P.E.
Senior Engineer

cc: G. C. Wallace, Inc.

JHH:jms

File: 22-61-26.gcw

600 S. Grand Central Parkway, Suite 300 • Las Vegas, Nevada 89106-4511
(702) 455-3139 • FAX: (702) 455-3870
Website: *http://www.ccrfcd.org*

Department of Public Works

500 S Grand Central Pky • PO Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

M.J. Manning, Director • E-Mail: mjm@co.clark.nv.us

March 16, 2001

G. C. Wallace, Inc.
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146

Dear Sirs:

Re: WILLDAN/Clark County Public Works Plan Review Contract
Update to the Technical Drainage Study for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65 **(3359)**
Study Dated: January 17, 2001
Addendum Dated: February 2, 2001
Addendum Dated: March 6, 2001
Location: Northwest corner of Ione Road and Eastern Avenue
(Sec. 26, T. 22 S., R. 61 E.)
HTE #01-1517UP

This approval letter is being issued to delete comments 3 and 9a of the previous approval letter. The referenced **Technical Drainage Study** has been reviewed and is accepted as complying with minimum improvement standards. As set forth in the subject drainage study, the following measures will be taken to mitigate flood hazards:

1. Comments 3 and 9a of the previous approval letter required a public drainage easement. This easement exists and is shown on sheet C-6, Therefore the comments have been removed.

2. This project is an update to a previously approved project, HTE# 00-9498. The revisions being proposed with the subject study and plans are limited to the lowering of the finished floor elevation of building F-3, revisions to the grading in the vicinity of the bubbler opening, and revisions to the opening of the top of the bubbler structure;

3. The site shall be graded with respect to drainage and facilities constructed as shown on "Silverado Ranch Station PH. III and Culvert Extension," sheets C-1 through C-7, signed and sealed by Roy D. Clark, P.E., on March 6, 2001, and, sheet S-1, signed and sealed by C. Russell Davis, P.E., on February 2, 2001, and sheet S-2, signed and sealed by C. Russell Davis, P.E., on September 5, 2000;

BOARD OF COUNTY COMMISSIONERS
DARIO HERRERA, Chairman • MYRNA WILLIAMS, Vice-Chair
YVONNE ATKINSON GATES • ERIN KENNY • MARY J. KINCAID • CHIP MAXFIELD • BRUCE L. WOODBURY
DALE W. ASKEW, County Manager

4. The previously approved study and plans required bond estimates be submitted for the proposed improvements at that time. The engineer must revise the bond estimate as necessary to reflect the changes in the plans with this update;

5. The minimum finished floor elevation for the proposed structure shall be in conformance with the project plans and study, with said elevation being:

   Building F-3, FF = 24.50

6. Mylars of the grading plan must be submitted to the Clark County Plan Check department for approval signatures prior to permit issuance. The mylars must also be revised to indicate the revisions shown on the submitted plans;

7. Clark County Regional Flood Control District (CCRFCD) concurrence is required because the project impacts a master planned facility. As a condition of final approval, the applicant must submit a copy of the drainage study and any addenda to CCRFCD. Permits will not be issued until concurrence is obtained from CCRFCD;

8. All other stipulations and conditions of the original approval letter of August 14, 2000 still apply;

9. At the request of Clark County Public Works, drainage/grading plans for the proposed development have been reviewed for compliance to the requirements set forth in the "Minimum Drainage Study Criteria Checklist, "Drainage Plan Information," dated July 15, 1997. **The drainage/grading plans submitted for this project appear to meet the minimum standards outlined in the above referenced regulations;**

No liability is assumed by the County for information, data, and conclusions of the consulting engineer.

M.J. MANNING
DIRECTOR OF PUBLIC WORKS

BY: _____

Dave Betley, P.E.
Senior Engineer
Community Development Division

DB/GH/bs/wlw

cc: AIG Baker Real Estate, LLC
Development File

C:\Drainage\Approval Letters\01-1517.wpd

Department of Public Works

500 S Grand Central Pky • PO Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

M.J. Manning, Director • E-Mail: mjm@co.clark.nv.us

March 14, 2001

G. C. Wallace, Inc.
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146

Dear Sirs:

Re: WILLDAN/Clark County Public Works Plan Review Contract
Update to the Technical Drainage Study for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65 **(3359)**
Study Dated: January 17, 2001
Addendum Dated: February 2, 2001
Addendum Dated: March 6, 2001
Location: Northwest corner of Ione Road and Eastern Avenue
(Sec. 26, T. 22 S., R. 61 E.)
HTE #01-1517UP

The referenced **Technical Drainage Study** has been reviewed and is accepted as complying with minimum improvement standards. As set forth in the subject drainage study, the following measures will be taken to mitigate flood hazards:

1. This project is an update to a previously approved project, HTE# 00-9498. The revisions being proposed with the subject study and plans are limited to the lowering of the finished floor elevation of building F-3, revisions to the grading in the vicinity of the bubbler opening, and revisions to the opening of the top of the bubbler structure;

2. The site shall be graded with respect to drainage and facilities constructed as shown on "Silverado Ranch Station PH. III and Culvert Extension," sheets C-1 through C-7, signed and sealed by Roy D. Clark, P.E., on March 6, 2001, and, sheet S-1, signed and sealed by C. Russell Davis, P.E., on February 2, 2001, and sheet S-2, signed and sealed by C. Russell Davis, P.E., on September 5, 2000;

3. A public drainage easement, width to be the top width of the water surface downstream of the bubbler opening, must be dedicated and shown on the plans;

BOARD OF COUNTY COMMISSIONERS
DARIO HERRERA, Chairman • MYRNA WILLIAMS, Vice-Chair
YVONNE ATKINSON GATES • ERIN KENNY • MARY J. KINCAID • CHIP MAXFIELD • BRUCE L. WOODBURY
DALE W. ASKEW, County Manager

4. The previously approved study and plans required bond estimates be submitted for the proposed improvements at that time. The engineer must revise the bond estimate as necessary to reflect the changes in the plans with this update;

5. The minimum finished floor elevation for the proposed structure shall be in conformance with the project plans and study, with said elevation being:

Building F-3, FF = 24.50

6. Mylars of the grading plan must be submitted to the Clark County Plan Check department for approval signatures prior to permit issuance. The mylars must also be revised to indicate the revisions shown on the submitted plans;

7. Clark County Regional Flood Control District (CCRFCD) concurrence is required because the project impacts a master planned facility. As a condition of final approval, the applicant must submit a copy of the drainage study and any addenda to CCRFCD. Permits will not be issued until concurrence is obtained from CCRFCD;

8. All other stipulations and conditions of the original approval letter of August 14, 2000 still apply;

9. At the request of Clark County Public Works, drainage/grading plans for the proposed development have been reviewed for compliance to the requirements set forth in the "Minimum Drainage Study Criteria Checklist, "Drainage Plan Information," dated July 15, 1997. **The plans submitted do not meet the minimum requirements and must be revised prior to Drainage Study approval, to address the following:**

a. The public drainage easement must be shown on the plans

No liability is assumed by the County for information, data, and conclusions of the consulting engineer.

M.J. MANNING
DIRECTOR OF PUBLIC WORKS

BY: _____

Dave Betley, P.E.
Senior Engineer
Community Development Division

DB/GH/bs/wlw

cc: AIG Baker Real Estate, LLC
Development File

C:\Drainage\Approval Letters\01-1517.wpd

WILLDAN
Serving Public Agencies

2725 East Desert Inn Road, Suite 100
Las Vegas, Nevada 89121
702/734-3001 fax 702/734-0888
www.willdan.com

MEMORANDUM

TO: Chris O. Stone, P.E. COS

FROM: Glenn S. Hale GH

OFFICE: Las Vegas

DATE: February 9, 2001

SUBJECT: WILLDAN/Clark County Public Works Plan Review Contract
Update to the Technical Drainage Study for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65 **(3359)**
Study Dated: January 17, 2001
Supplemental Dated: February 2, 2001
Location: Northwest corner of Ione Road and Eastern Avenue (Sec. 26, T. 22 S., R. 61 E.)
HTE #01-1517UP
Prepared by G.C. Wallace, Inc.

We have completed our second review of the above-referenced **Technical Drainage Study**, and have the following comments. The review of the subject study addressed the proposed revisions to the hydraulics analysis, the finished floor of building F-3 and to the extension of the bubbler weir opening:

1. It appears from the review of the HEC-RAS model output that there is very little freeboard at stations 1800 and 1700. The study and plans must address how flows will be contained within the overflow channel section;

2. It is noted that the finished floors of buildings F-1 and F-2 are not flood protected with 18 inches of freeboard. The study must address how these floors will have adequate flood protection;

3. At the request of Clark County Public Works, drainage/grading plans for the proposed development have been reviewed for compliance to the requirements set forth in the "Minimum Drainage Study Criteria Checklist, "Drainage Plan Information," dated July 15, 1997. **The plans submitted do not meet the minimum requirements and must be revised prior to Drainage Study approval, to address the following:**

   a. Revise the HGL/EGL hydraulic profile on sheet C-4

   b. Provide a detail cross section along the east side of building F-3

   c. Provide additional spot grading information adjacent to buildings F-1, F-2 and F-3

WILLDAN
Serving Public Agencies

d. Provide flood protection to buildings F-1 and F-2 or raise the finished floors to 18 inches above the water surface elevation

e. Provide a specific revision note for the lowering of the finished floor elevation of building F-3

f. Any additional comments on the plans

The grading plan has been red-lined and is being returned to the engineer. The red-lined grading plan must be resubmitted with the revised drawings. Failure to resubmit the red-lined grading plan will prevent further review of the project.

All addenda must be submitted directly to Clark County. Any drainage studies or addenda submitted directly to WILLDAN will be returned to Clark County for the necessary log-in procedures.

The items listed herein must be thoroughly addressed and submitted for review prior to acceptance of this study.

A study review workshop with WILLDAN may be scheduled if there are questions concerning the above listed comments.

CONCURRENCE BY CLARK COUNTY PUBLIC WORKS:

[signature] 2/5/01
Signature Date

COMMENTS: 1) If the water surface elevation at the inlet is 2712 feet, this will cause a backwater elevation out of the connecting 48" pipe just d/s of the bubbler structure. This backwater will come out of the drop inlet to the west of the bubbler structure and have the potential to flood the buildings, please address.

cc: Kevin Elliott, P.E.
AIG Baker Real Estate, LLC

Over →

2) Also, does the enlargement of the bubblen structure impact the WSPG model? Please discuss.

Why was the bubblen structure enlarged. If was an approved design, so why was it increased in size? Please discuss.

01-1517UP

WILLDAN
Serving Public Agencies

2725 East Desert Inn Road, Suite 100
Las Vegas, Nevada 89121
702/734-3001 fax 702/734-0888
www.willdan.com

FAX MEMORANDUM

FAXED 2/1/01

TO: Jerry Pruitt, P.E., G. C. Wallace, Inc.

FROM: Chris O. Stone, P.E. COS

DATE: February 1, 2001

OFFICE: Las Vegas

SUBJECT: **Technical Drainage Study** for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65 **(3359)**
H.T.E.# 01-1517UP

This memo is being faxed in lieu of a typical mailed memorandum in order to expedite the review process. The following items are required in order to produce an approval memorandum for the above referenced **Technical Drainage Study**:

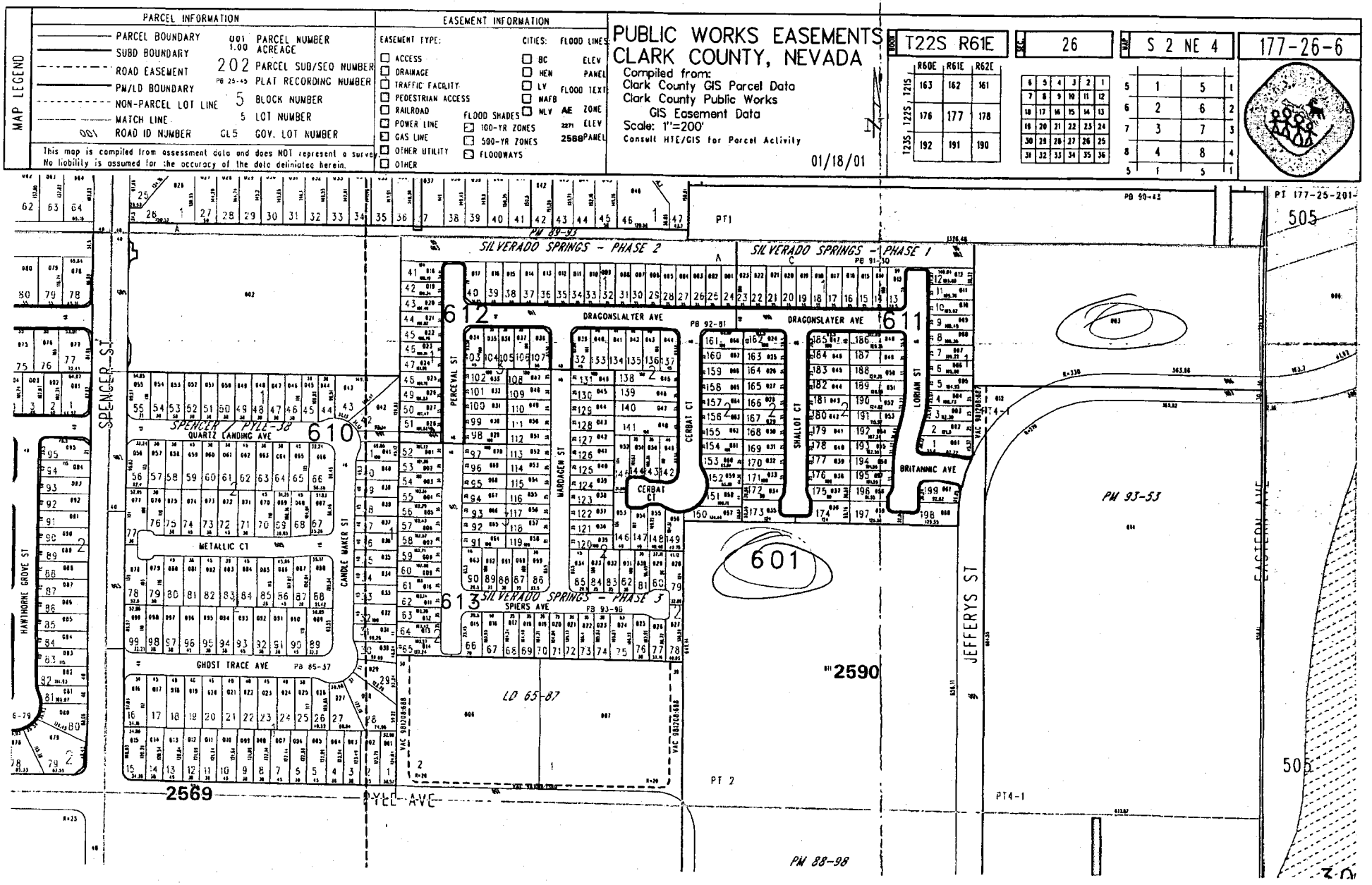
1. Per our earlier telephone conversation, there appear to be inconsistencies between the text of the study and the construction plans. As we discussed, please review the submittal package and revise accordingly;

Two copies of the supplemental information must be submitted directly to WILLDAN.

The items listed herein must be thoroughly addressed and submitted for review within 5 days of the above date.

cc: Phu Simpson/Dave Betley, CCPW
AIG Baker Real Estate, LLC

P:\Projects\CCPW\CCPW-3249\Forms\Fax-Memo.wpd


MAP LEGEND
PARCEL INFORMATION
PARCEL BOUNDARY
SUBD BOUNDARY
ROAD EASEMENT
PM/LD BOUNDARY
NON-PARCEL LOT LINE
MATCH LINE
001 ROAD ID NUMBER
001 1.00 PARCEL NUMBER ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 25-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER
This map is compiled from assessment data and does NOT represent a survey. No liability is assumed for the accuracy of the data delineated herein.
EASEMENT INFORMATION
EASEMENT TYPE:
ACCESS
DRAINAGE
TRAFFIC FACILITY
PEDESTRIAN ACCESS
RAILROAD
POWER LINE
GAS LINE
OTHER UTILITY
OTHER
FLOOD SHADES
100-YR ZONES
500-YR ZONES
FLOODWAYS
CITIES:
BC
HEN
LV
NAFB
NLV
FLOOD LINES
ELEV
PANEL
FLOOD TEXT
ZONE
2271 ELEV
2588 PANEL
PUBLIC WORKS EASEMENTS
CLARK COUNTY, NEVADA
Compiled from:
Clark County GIS Parcel Data
Clark County Public Works
GIS Easement Data
Scale: 1"=200'
Consult HTE/GIS for Parcel Activity
01/18/01
T22S R61E
26
S 2 NE 4
177-26-6
SILVERADO SPRINGS - PHASE 2
SILVERADO SPRINGS - PHASE 1
SILVERADO SPRINGS - PHASE 3
DRAGONSLAYER AVE
QUARTZ LANDING AVE
METALLIC CT
GHOST TRACE AVE
SPIERS AVE
PERCEVAL ST
MARDACEH ST
CERBAT CT
SHALOT CT
LORIAN ST
BRITANNIC AVE
CANDLE MAKER ST
SPENCER ST
HAWTHORNE GROVE ST
JEFFERYS ST
EASTERN AVE
PYLE AVE
SPENCER / PYLE-38
LD 65-87
PM 89-93
PB 91-30
PB 92-81
PB 85-57
PM 93-53
PM 88-98
610
611
612
613
601
2569
2590
505

CLARK COUNTY PUBLIC WORKS DEPARTMENT
COMMUNITY DEVELOPMENT DIVISION
OFF-SITE DEVELOPMENT SUBMITTAL SHEET

(Each set of plans and/or studies must have a separate submittal sheet and a separate check.) **398.177X68**

DATE January 17, 2001 TELEPHONE NUMBER (702) 804-2000

PROJECT NAME Silverado Ranch Station Culvert Extension - Station 9+80.80 to Station 13+61.65

RESPONSIBLE ENGINEER Jerry E. Pruitt, P.E. FIRM G. C. Wallace, Inc.

ADDRESS 1555 South Rainbow Boulevard, Las Vegas, NV 89146

PUBLIC WORKS AN/HTE# ~~00-5498~~ 01-1577 UP

TYPE OF SUBMITTAL (check only one)

- ☐ **NEW** (never submitted before)
  (new improvement plans require Drainage Study HTE# _____ and Traffic Study HTE # _____
- ☐ **CORRECTIONS/ADDENDUM** (requested changes have been made) ⇒ HTE number is required _____
- ☐ **AMENDMENT** (these are changes to a study previously approved)
- ■ **UPDATE** to a previously approved study

PROJECT TYPE (check only one)

- ■ ***DRAINAGE STUDY***
- ☐ **TRAFFIC STUDY**
- ☐ **COMMERCIAL IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **SUBDIVISION IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **PARCEL MAP IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **GRADING PLAN FOR PARCEL MAP**
- ☐ **GEOTECHNICAL REPORT**

(Please continue for NEW, AMENDMENT, and UPDATE submittals only.)

ASSESSOR'S PARCEL NUMBER (APN)

1. 177-26-601-003 2. _____ 3. _____

STREET LOCATION

1. **EAST/WEST** Silverado Ranch Boulevard 2. **NORTH/SOUTH** Eastern Avenue

ZONING ACTIONS

1. _____ 2. _____ 3. _____ 4. _____

OWNER/DEVELOPER AIG Baker Real Estate, L.L.C.

ADDRESS 1900 International Park Drive, Suite 303

CITY/STATE/ZIP Birmingham, AL 35243

COMMENTS _____

(Revised 6/11/97)

01-1517 UP

APP 10-23-00 00-9498
WILLDAN

UPDATE
TO THE
HYDRAULIC ANALYSIS
FOR
SILVERADO RANCH STATION
CULVERT EXTENSION
STATION 9+80.80 TO STATION 13+61.65

398.177X68

January 2001

Prepared for:

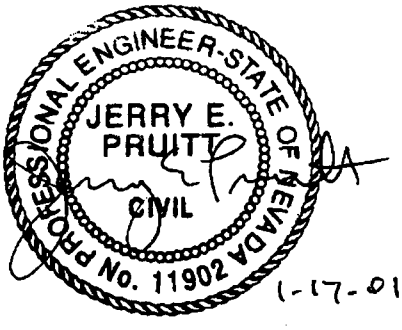
AIG Baker Real Estate, L. L. C.
1900 International Park Drive, Suite 303
Birmingham, AL 35243
Phone: (205) 969-1000
Fax: (205) 9969-1051

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

UPDATE
TO THE
HYDRAULIC ANALYSIS
FOR
SILVERADO RANCH STATION
CULVERT EXTENSION
STATION 9+80.80 TO STATION 13+61.65

398.177X68

January 2001



Prepared for:

AIG Baker Real Estate, L. L. C.
1900 International Park Drive, Suite 303
Birmingham, AL 35243
Phone: (205) 969-1000
Fax: (205) 9969-1051

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Silverado Ranch Station Culvert Extension — Station 9+80.80 to Station 13+61.65 — Date: January 2001 — **398.177X68**

Location of Development: a) Descriptive (Cross Streets) North/South: Eastern Avenue East/West: Silverado Ranch Blvd.

b) Sect. 26 Twn. 22 S Rng. 61 E

Name of Owner: AIG Baker Real Estate, L.L.C. Assessors Parcel No: 177-26-601-003

Telephone No: (205) 969-1000 Facsimile No: (205) 969-1051

Address: 1900 International Park Drive, Suite 303
Birmingham, AL 35243

Contact Person-Name: Jerry E. Pruitt, P.E. Telephone No: 804-2000

Firm: G. C. Wallace, Inc.

Address: 1555 South Rainbow Boulevard, Las Vegas, NV 89146

Type of Land Development/Land Disturbance Process:

	Rezoning		Subdivision Map		Clearing and Grading Only
	Parcel Map		Planned Unit Development	X	Other (Please specify below)
	Large Parcel Map		Building Permit	Commercial	

1. Total Owned Land Area: At Site: 42 ac. Being Developed/Disturbed: 1.2 ac.
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? Yes* **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? Yes* **No**
4. Proposed type of development (Residential, Commercial, etc.)? Commercial
5. Approximate upstream land area which drains to the subject site? 105 ac.
6. Has the site drainage been evaluated in the past? **YES** NO If yes, please identify documentation:
   Conceptual Drainage Study for Silverado Ranch Station and *Technical Drainage Study for Silverado Ranch Station Phase 1 and Phase 2*
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
   Eastern Avenue, Silverado Ranch Boulevard, 4-barrel 72-inch RCP north of Silverado Ranch Boulevard
8. Briefly describe your proposed schedule for the subject project: January 2001

PROFESSIONAL ENGINEER-STATE OF NEVADA JERRY E. PRUITT CIVIL No. 11902

1-17-01

Engineer's Seal

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

trol District is Required.

01-1517 UP

Local Entity File No.

Date

REFERENCE:

STANDARD FORM 1

CLARK COUNTY PUBLIC WORKS DEPARTMENT
COMMUNITY DEVELOPMENT DIVISION
OFF-SITE DEVELOPMENT SUBMITTAL SHEET

(Each set of plans and/or studies must have a separate submittal sheet and a separate check.) **398.177X68**

DATE January 17, 2001 TELEPHONE NUMBER (702) 804-2000

PROJECT NAME Silverado Ranch Station Culvert Extension - Station 9+80.80 to Station 13+61.65

RESPONSIBLE ENGINEER Jerry E. Pruitt, P.E. FIRM G. C. Wallace, Inc.

ADDRESS 1555 South Rainbow Boulevard, Las Vegas, NV 89146

PUBLIC WORKS AN/HTE# 00-9498

TYPE OF SUBMITTAL (check only one)

- ☐ **NEW** (never submitted before)
  (new improvement plans require Drainage Study HTE# _____ and Traffic Study HTE # _____
- ☐ **CORRECTIONS/ADDENDUM** (requested changes have been made) ⇒ HTE number is required _____
- ☐ **AMENDMENT** (these are changes to a study previously approved)
- ☐ **UPDATE** to a previously approved study

PROJECT TYPE (check only one)

- ☐ **DRAINAGE STUDY**
- ☐ **TRAFFIC STUDY**
- ☐ **COMMERCIAL IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- **SUBDIVISION IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
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(Please continue for NEW, AMENDMENT, and UPDATE submittals only.)

ASSESSOR'S PARCEL NUMBER (APN)

1. 177-26-601-003 2. _____ 3. _____

STREET LOCATION

1. **EAST/WEST** Silverado Ranch Boulevard 2. **NORTH/SOUTH** Eastern Avenue

ZONING ACTIONS

1. _____ 2. _____ 3. _____ 4. _____

OWNER/DEVELOPER AIG Baker Real Estate, L.L.C.

ADDRESS 1900 International Park Drive, Suite 303

CITY/STATE/ZIP Birmingham, AL 35243

COMMENTS _____

G. C. WALLACE, INC.
Engineers / Planners / Surveyors

G. C. WALLACE, PE/SE, PLS
JAMES A. DUDDLESTEN, PE
MICHAEL D. ROSS, PE
CHRISTOPHER W. ANDERSON, PE
CALVIN L. BLACK, PE, PLS
BENJAMIN C. SMITH, PE
SCOTT R. PLUMMER, PE
E. ROBERT PETERSON

PAUL BURN, PLS, WRS
MICHAEL J. CSIZMADIA, PE
C. RUSSELL DAVIS, PE/SE
DOUGLAS M. HANKEL
DONALD A. HASELHOFF, PE, CEM
RICKEY D. HUNSAKER, PE
NOEL C. LAUGHLIN, PE
MARVIN W. MAIZE
GREGORY J. PATCH, PE
JOHN R. TOBIN, PE
HOWARD K. VANDER MEER, PE
EUGENE W. WRIGHT, PE

JOSEPH A. BODROG, PLS
THOMAS P. DYSON, PE
KENNETH M. HANIFAN, PE
DONALD L. HOTCHKISS JR., PE
BERT A. HUGHES, PE
JERRY D. JOHNSTON
TIMOTHY A. McCOY, PE, PTOE
DANNY S. McFADDEN, PE
THOMAS R. NICHOLS, PE
JERRY E. PRUITT, PE
BRIAN L. SCHMIDT, PE
JEFF W. STAYTON, PE
RICHARD W. STEUBING, PLS, WRS
SAUNDRA L. VANCE, CCS, CCCA
JOHN M. WALKER, PE
G. IRA WALLACE, PE

JIM B. BAKKEDAHL, PE
THOMAS S. BARNES, PLS
DENNIS R. BROWN, PE
ROY D. CLARK, PE
RICHARD G. CLARKE
TODD G. CORMIER, PE
JOHN L. ELTSCHLAGER, PE
ALLAN P. FAJARDO, PE
ERIC G. GILES, PE
RANDALL K. GREMLICH, PE
PASCAL HAYES, PE
J. P. HIGGINS, PLS, WRS
DANNY E. HILL, PLS
GERALD L. HOLTON, PLS
KAYANN JONGSMA, PE
FARHAD KHANBOLOUKI, PE
WILLIAM METCALF
RANDY W. MROWICKI, PLS
RIMAH I. NAZZAL, PE
D. G. NEEL, PLS
JOHNNIE R. PATE JR., PE
BRIAN K. REED, PE
LUDWIG I. SMEETS, PE
DENNIS W. SOLANO, PLS
RICHARD A. E. STRUTZ
ROBERT J. WOODSON, PE
KENNETH T. YAMADA
CHRISTOPHER R. ZRINYI, PE

AFFILIATE OFFICE IN
SACRAMENTO, CA

398.177X68

January 17, 2001

Robert Thompson, P.E.
Plans Check Unit Supervisor
Clark County Department of Public Works
Community Development Division
500 South Grand Central Parkway
Las Vegas, Nevada 89155-4000

Subject: Update to the Hydraulic Analysis for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65 (HTE # 00-9498)

Dear Mr. Thompson:

The purpose of this letter to serve as an update to the previously approved hydraulic analysis to address revisions to the improvement plans along the southeast corner of the site. These revisions will not impact the previously identified drainage patterns for the project site. The *Hydraulic Analysis for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65* was approved by the Clark County Department of Public Works (CCPW) on August 14, 2000.

Since the approval, the layout along the southeast corner of the site has been revised. A private driveway has been added to provide access to the site via Ione Road. The finished floor for Building F-2 has been lowered 1-foot from elevation 25.5 feet to elevation 24.5 feet. The berm along west of the existing bubbler and the berm along the east of the private driveway have been modified slightly. The existing bubbler weir length has been increased approximately 20 feet. And finally, a Type B inlet has been added to intercept runoff at the low point in the parking area located at PTA and connected to the existing 48-inch High Density Polyethylene (HDPE) storm drain via a 18-inch HDPE storm drain lateral. Please refer to Exhibit 1.

As stated in the approved *Hydraulic Analysis for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65*, the 100-year flow of approximately 1300 cfs will weir flow out of the existing bubbler structure under interim conditions. This flow will continue traveling north across the Silverado Ranch Station Phase 2 parking lot and onto Eastern Avenue.

The HEC-RAS model is used in determining the surface flow in the parking lot. The starting water surface elevation at the outlet of the existing bubbler is determined to be 27.5 feet. A copy of the weir flow calculation is included in the Appendix. Spillover flow will occur along the eastern boundary of the site from Section 1300 which will travel north to Eastern Avenue as under historic conditions. However, under the worst case scenario, the total of 1300 cfs is assumed to be confined within the parking area. The water surface elevation within the parking lot is determined based on the above assumption that the total flow of 1300 cfs remains onsite. The HEC-RAS cross section locations are included in Exhibit 1. The result of the HEC-RAS model are summarized in Table 1. The surface flow pattern is consistent with the previous approved Silverado Ranch Station Phase 1 and Phase 2 drainage studies. A copy of the HEC-RAS model is attached.

TABLE 1

HEC-RAS HYDRAULIC MODEL SUMMARY

CROSS SECTION*	Q (CFS)	INV (FT)	WSE (FT)	D (FT)
2100	1300	24.4	26.6	2.2
2000	1300	24.0	26.3	2.3
1900	1300	23.6	25.6	2.0
1800	1300	22.6	24.2	1.6
1700	1300	21.8	23.4	1.6
1600	1300	20.8	22.7	1.9
1500	1300	20.7	22.5	1.8
1400	1300	20.6	22.3	1.7
1300	1300	20.2	21.9	1.7
1200	1300	19.8	21.9	2.1
1100	1300	19.4	21.6	2.2
1000	1300	18.4	20.4	2.0

*See Exhibit 1

The finished floor elevation is set at a minimum vertical distance of 18 inches above the 100-year depth of flow in the adjacent gutter for Building F-3.

The Modified Rational Method is used in determining the 10-year and 100-year runoff to PTA. The total 10-year and 100-year runoff are 0.8 cfs and 1.5 cfs, respectively. This runoff will be intercepted by a proposed Type B drop inlet in the sump condition at PTA. The ponding depth

for the 100-year runoff at PTA is determined to be 0.2 feet. This drop inlet was sized using the equations specified in the Manual. A 50 percent clogging factor has been provided in the calculations. This runoff will be conveyed to the existing 48-inch HDPE storm drain via the proposed 18-inch HDPE lateral. The proposed 18-inch HDPE lateral will be constructed at approximately 2 percent slope. The 100-year depth in the 18-inch HDPE is determined to be 0.4 feet with a velocity of 5.9 fps. Calculations for the Modified Rational Method, the inlet sizing, and the normal depth for the 18-inch HDPE storm drain lateral are included in the Appendix.

The proposed revisions will not alter the drainage scheme of the project. Once the Pittman - Eastern Detention Basin is constructed, there will be no surface flow from the bubbler.

A copy of the original grading plan Sheet C-12 is included in the Appendix for your reference. If you have any questions or need additional information, please do not hesitate to contact me at 804-2000.

Very truly yours,

G. C. WALLACE, INC.

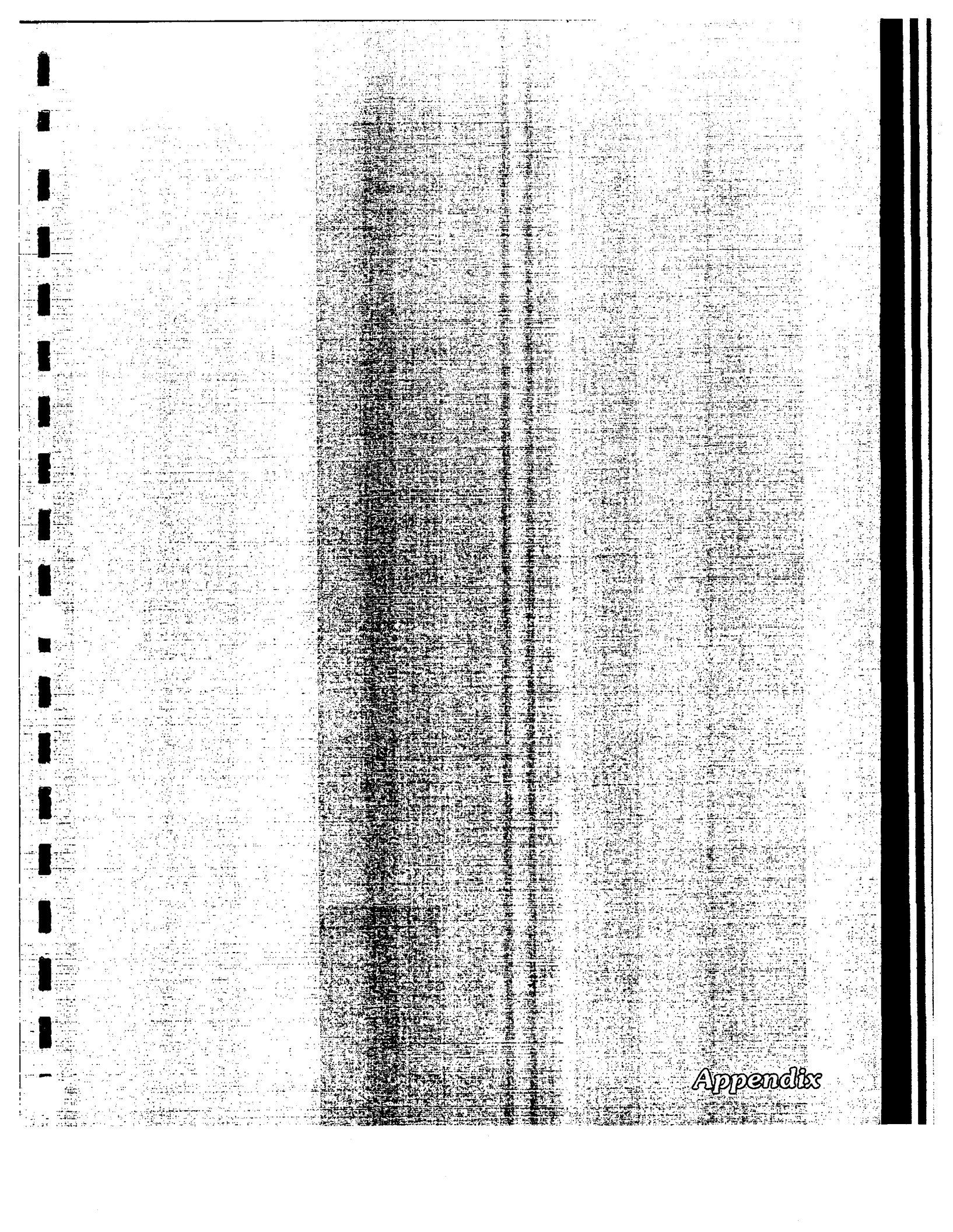
Ann Tanakul, E.I.
Designer

Jerry E. Pruitt, P.E.
Vice President

JEP:AT:jj

Encl.

pc: Calvin Black, GCW
Roy Clark, GCW


Appendix

HEC-RAS September 1998 Version 2.2
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
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: Silverado Ranch Station
Project File : sil.prj
Run Date and Time: 01/16/2001 8:42:00 AM

Project in English units

Project Description:
Run. Date 1/15/01

SUPERCRITICAL HEC-2 RUN (SUP.DAT)

SILVERADO RANCH STATION (398.177X)

DATA

Plan Title: Imported Plan 01
Plan File : C:\atanakul\silverado\sil.p01

Geometry Title: Imported Geom 01
Geometry File : C:\atanakul\silverado\sil.g01

Flow Title : Imported Flow 01
Flow File : C:\atanakul\silverado\sil.f01

Plan Summary Information:
Number of: Cross Sections = 12 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

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: Imported Flow 01
Flow File : C:\atanakul\silverado\sil.f01

Flow Data (cfs)

River Reach RS PF 1

ER-1 Reach-1 2100 1300

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
VER-1	Reach-1	PF 1	Known WS = 27.5	Critical

GEOMETRY DATA

Geometry Title: Imported Geom 01
Geometry File : C:\atanakul\silverado\sil.g01

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 2100

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	27	8	27	17	25	32	24.4	60	24.4
100	25	110	26.5	110	26	123	25.72	123	25.68
125	25.55	125	26.55	126	27	128	27		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	17	.016	125	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	17	125	16	16	17	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	27	125	128	26.55

SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	27.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.77	Wt. n-Val.	0.030	0.016	
W.S. Elev (ft)	26.56	Reach Len. (ft)	16.00	16.00	17.00
Crit W.S. (ft)	26.56	Flow Area (sq ft)	5.46	181.60	
E.G. Slope (ft/ft)	0.002976	Area (sq ft)	5.46	181.60	0.00
Q Total (cfs)	1300.00	Flow (cfs)	12.28	1287.72	
Top Width (ft)	115.03	Top Width (ft)	7.01	108.00	0.02
Vel Total (ft/s)	6.95	Avg. Vel. (ft/s)	2.25	7.09	
Max Chl Dpth (ft)	2.16	Hydr. Depth (ft)	0.78	1.68	
Conv. Total (cfs)	23829.7	Conv. (cfs)	225.2	23604.5	
Length Wtd. (ft)	16.00	Wetted Per. (ft)	7.18	109.68	
Min Ch El (ft)	24.40	Shear (lb/sq ft)	0.14	0.31	
Alpha	1.03	Stream Power (lb/ft s)	0.32	2.18	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.00	0.82	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.76	0.01

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.
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 parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 2000

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	27	10	27	20	25	112	25	120	25.5

20	25	143	24.72	143	24.68	145	24.55	145	25.55
148	27	150	27						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	20	.016	145	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
20	145	20	20	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	27	145	150	25.55

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	27.26	Element			
Vel Head (ft)	0.98	Wt. n-Val.	0.030	0.016	0.025
W.S. Elev (ft)	26.28	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	26.47	Flow Area (sq ft)	4.07	161.57	0.55
E.G. Slope (ft/ft)	0.005322	Area (sq ft)	4.07	161.57	0.55
Q Total (cfs)	1300.00	Flow (cfs)	10.77	1288.10	1.12
Top Width (ft)	132.89	Top Width (ft)	6.38	125.00	1.50
Vel Total (ft/s)	7.82	Avg. Vel. (ft/s)	2.64	7.97	2.06
Max Chl Dpth (ft)	1.73	Hydr. Depth (ft)	0.64	1.29	0.36
Conv. Total (cfs)	17820.5	Conv. (cfs)	147.7	17657.4	15.4
Length Wtd. (ft)	20.00	Wetted Per. (ft)	6.51	126.56	1.67
Min Ch El (ft)	24.55	Shear (lb/sq ft)	0.21	0.42	0.11
Alpha	1.03	Stream Power (lb/ft s)	0.55	3.38	0.22
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.00	0.75	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.72	0.01

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

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1900

Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	26.7	14	25	125	24.5	125	24	148	23.72
148	23.68	150	23.55	150	24.55	154	27	156	27

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	14	.016	150	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
14	150	25	22	20	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	26.7	150	156	24.55

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	27.06	Element			
Vel Head (ft)	1.51	Wt. n-Val.	0.025	0.016	0.025
W.S. Elev (ft)	25.55	Reach Len. (ft)	25.00	22.00	20.00
Crit W.S. (ft)	26.00	Flow Area (sq ft)	1.22	130.88	0.81
E.G. Slope (ft/ft)	0.012103	Area (sq ft)	1.22	130.88	0.81
Q Total (cfs)	1300.00	Flow (cfs)	3.35	1293.67	2.98
Top Width (ft)	142.11	Top Width (ft)	4.49	136.00	1.62
Vel Total (ft/s)	9.78	Avg. Vel. (ft/s)	2.74	9.88	3.69
Max Chl Dpth (ft)	2.00	Hydr. Depth (ft)	0.27	0.96	0.50
Conv. Total (cfs)	11816.5	Conv. (cfs)	30.4	11758.9	27.1
Length Wtd. (ft)	22.00	Wetted Per. (ft)	4.52	137.55	1.91
Min Ch El (ft)	23.55	Shear (lb/sq ft)	0.20	0.72	0.32
Alpha	1.02	Stream Power (lb/ft s)	0.56	7.11	1.18
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.00	0.69	0.00
C & E Loss (ft)	0.05	Cum SA (acres)	0.00	0.66	0.01

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

ng: 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, water surface was used.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1800

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	24.1	12	24	100	23.2	100	23.7	122	23.5
122	23	145	22.8	145	22.76	147	22.63	147	23.63
151	26	154	26						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	147	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	147	24	24	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	24.1	147	154	23.63

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	26.57	Element			
Vel Head (ft)	2.33	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	24.24	Reach Len. (ft)	24.00	24.00	24.00
Crit W.S. (ft)	24.86	Flow Area (sq ft)		105.90	0.31
E.G. Slope (ft/ft)	0.027543	Area (sq ft)		105.90	0.31
Q Total (cfs)	1300.00	Flow (cfs)		1298.76	1.24
Top Width (ft)	148.02	Top Width (ft)		147.00	1.02
Vel Total (ft/s)	12.24	Avg. Vel. (ft/s)		12.26	4.02
Max Chl Dpth (ft)	1.61	Hydr. Depth (ft)		0.72	0.30
Conv. Total (cfs)	7833.2	Conv. (cfs)		7825.7	7.5
Length Wtd. (ft)	24.00	Wetted Per. (ft)		149.19	1.19
Min Ch El (ft)	22.63	Shear (lb/sq ft)		1.22	0.45
Alpha	1.00	Stream Power (lb/ft s)		14.97	1.80
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)		0.63	0.00
C & E Loss (ft)	0.08	Cum SA (acres)		0.59	0.01

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1700

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23.5	45	23	153	22	153	21.96	155	21.83
155	22.83	159	25	162	25				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	155	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	155	50	50	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	23.5	155	162	22.83

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	25.86	Element			
Vel Head (ft)	2.50	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	23.37	Reach Len. (ft)	50.00	50.00	50.00

t W.S. (ft)	24.00	Flow Area (sq ft)	102.37	0.26
E.G. Slope (ft/ft)	0.029402	Area (sq ft)	102.37	0.26
Q Total (cfs)	1300.00	Flow (cfs)	1298.98	1.02
Top Width (ft)	143.84	Top Width (ft)	142.86	0.99
Vel Total (ft/s)	12.67	Avg. Vel. (ft/s)	12.69	3.88
Max Chl Dpth (ft)	1.54	Hydr. Depth (ft)	0.72	0.27
Conv. Total (cfs)	7581.5	Conv. (cfs)	7575.5	6.0
Length Wtd. (ft)	50.00	Wetted Per. (ft)	143.91	1.12
Min Ch El (ft)	21.83	Shear (lb/sq ft)	1.31	0.43
Alpha	1.00	Stream Power (lb/ft s)	16.57	1.68
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)	0.57	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.51	0.01

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.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1600

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	39	22	123	21	123	20.96	125	20.83
125	21.83	128	24	130	24				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	125	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	125		16	16	16	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	23	125	130	21.83

SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
W.S. Elev (ft)	24.70	Wt. n-Val.		0.016	0.025
Vel Head (ft)	2.00	Reach Len. (ft)	16.00	16.00	16.00
Crit W.S. (ft)	22.70	Flow Area (sq ft)		114.44	0.53
E.G. Slope (ft/ft)	23.30	Area (sq ft)		114.44	0.53
Q Total (cfs)	0.014934	Flow (cfs)		1298.08	1.92
Top Width (ft)	1300.00	Top Width (ft)		113.46	1.21
Vel Total (ft/s)	114.67	Avg. Vel. (ft/s)		11.34	3.64
Max Chl Dpth (ft)	11.31	Hydr. Depth (ft)		1.01	0.44
Conv. Total (cfs)	1.87	Conv. (cfs)		10622.3	15.7
Length Wtd. (ft)	10638.1	Wetted Per. (ft)		114.52	1.49
Min Ch El (ft)	16.00	Shear (lb/sq ft)		0.93	0.33
Alpha	20.83	Stream Power (lb/ft s)		10.57	1.20
Frctn Loss (ft)	1.00	Cum Volume (acre-ft)		0.45	0.00
C & E Loss (ft)	1.02	Cum SA (acres)		0.36	0.00
	0.15				

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: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1500

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	32	22	101	21	124	20.83	124	20.79
126	20.66	126	21.66	130	23	135	23		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	126	.025

Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	126	10	10	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	23	126	135	21.66

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	24.43	Element			
el Head (ft)	1.89	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	22.54	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	23.14	Flow Area (sq ft)		117.40	1.16
E.G. Slope (ft/ft)	0.013313	Area (sq ft)		117.40	1.16
Total (cfs)	1300.00	Flow (cfs)		1295.58	4.42
op Width (ft)	113.90	Top Width (ft)		111.27	2.63
Vel Total (ft/s)	10.97	Avg. Vel. (ft/s)		11.04	3.83
Max Chl Dpth (ft)	1.88	Hydr. Depth (ft)		1.06	0.44
onv. Total (cfs)	11266.8	Conv. (cfs)		11228.5	38.3
ength Wtd. (ft)	10.00	Wetted Per. (ft)		112.33	2.77
Min Ch El (ft)	20.66	Shear (lb/sq ft)		0.87	0.35
Alpha	1.01	Stream Power (lb/ft s)		9.59	1.33
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)		0.40	0.00
& E Loss (ft)	0.03	Cum SA (acres)		0.32	0.00

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.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1400

INPUT
Description:
Section Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	22.2	0	21.7	43	21	90	20.73	90	20.69
92	20.56	92	21.06	96	23	100	23		

ng's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	92	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	92	35	35	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	22.2	92	100	21.06

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	24.29	Element			
el Head (ft)	1.96	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	22.33	Reach Len. (ft)	35.00	35.00	35.00
Crit W.S. (ft)	22.92	Flow Area (sq ft)		114.81	1.67
E.G. Slope (ft/ft)	0.011131	Area (sq ft)		114.81	1.67
Total (cfs)	1300.00	Flow (cfs)		1292.75	7.25
op Width (ft)	94.63	Top Width (ft)		92.00	2.63
el Total (ft/s)	11.16	Avg. Vel. (ft/s)		11.26	4.33
Max Chl Dpth (ft)	1.77	Hydr. Depth (ft)		1.25	0.64
Conv. Total (cfs)	12321.9	Conv. (cfs)		12253.3	68.7
ength Wtd. (ft)	35.00	Wetted Per. (ft)		93.19	2.92
In Ch El (ft)	20.56	Shear (lb/sq ft)		0.86	0.40
Alpha	1.01	Stream Power (lb/ft s)		9.64	1.72
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)		0.38	0.00
& E Loss (ft)	0.01	Cum SA (acres)		0.30	0.00

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

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1300

INPUT
Description:
Section Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	21.5	0	21	88	20.35	88	20.31	90	20.18
90	20.68	94	23	97	23	97	25		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	90	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	90		36	36	36	.1	.3

Effective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	21.5	90	97	20.68

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	23.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.00	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	21.93	Reach Len. (ft)	36.00	36.00	36.00
Crit W.S. (ft)	22.52	Flow Area (sq ft)		113.84	1.35
E.G. Slope (ft/ft)	0.011197	Area (sq ft)		113.84	1.35
Q Total (cfs)	1300.00	Flow (cfs)		1294.37	5.63
Top Width (ft)	92.16	Top Width (ft)		90.00	2.16
Vel Total (ft/s)	11.29	Avg. Vel. (ft/s)		11.37	4.17
Max Chl Dpth (ft)	1.75	Hydr. Depth (ft)		1.26	0.63
Conv. Total (cfs)	12285.7	Conv. (cfs)		12232.6	53.2
Length Wtd. (ft)	36.00	Wetted Per. (ft)		91.48	2.49
Min Ch El (ft)	20.18	Shear (lb/sq ft)		0.87	0.38
Alpha	1.01	Stream Power (lb/ft s)		9.89	1.58
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)		0.28	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		0.22	0.00

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

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1200

T
ription:
ation Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21.45	0	20.95	87	20	87	19.96	89	19.83
89	20.33	89	23						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	89	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	89		19	19	19	.1	.3

Effective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	21.45	89	89	20.33

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	23.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.57	Wt. n-Val.		0.016	
W.S. Elev (ft)	21.91	Reach Len. (ft)	19.00	19.00	19.00
Crit W.S. (ft)	22.34	Flow Area (sq ft)		129.28	
E.G. Slope (ft/ft)	0.007459	Area (sq ft)		129.28	
Q Total (cfs)	1300.00	Flow (cfs)		1300.00	
Top Width (ft)	89.00	Top Width (ft)		89.00	
Vel Total (ft/s)	10.06	Avg. Vel. (ft/s)		10.06	
Max Chl Dpth (ft)	2.08	Hydr. Depth (ft)		1.45	
Conv. Total (cfs)	15052.1	Conv. (cfs)		15052.1	
Length Wtd. (ft)	19.00	Wetted Per. (ft)		92.10	
Min Ch El (ft)	19.83	Shear (lb/sq ft)		0.65	
Alpha	1.00	Stream Power (lb/ft s)		6.57	
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)		0.18	
C & E Loss (ft)	0.13	Cum SA (acres)		0.15	

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

S SECTION RIVER: RIVER-1

: Reach-1 RS: 1100

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21.5	0	21	70	20	92	19.57	92	19.53
94	19.4	94	19.9	94	22				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	94	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	94		48	48	48	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	21.5	94	94	19.9

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	23.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.68	Wt. n-Val.		0.016	
W.S. Elev (ft)	21.64	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)	22.12	Flow Area (sq ft)		124.94	
E.G. Slope (ft/ft)	0.008950	Area (sq ft)		124.94	
Q Total (cfs)	1300.00	Flow (cfs)		1300.00	
Top Width (ft)	94.00	Top Width (ft)		94.00	
Vel Total (ft/s)	10.41	Avg. Vel. (ft/s)		10.41	
Max Chl Dpth (ft)	2.24	Hydr. Depth (ft)		1.33	
Conv. Total (cfs)	13741.6	Conv. (cfs)		13741.6	
Length Wtd. (ft)	48.00	Wetted Per. (ft)		96.94	
Min Ch El (ft)	19.40	Shear (lb/sq ft)		0.72	
Alpha	1.00	Stream Power (lb/ft s)		7.49	
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)		0.13	
C & E Loss (ft)	0.01	Cum SA (acres)		0.11	

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

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1000

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21	50	20	100	19	131	18.54	131	18.5
133	18.37	133	18.87	133	21				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	133	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	133		0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	21	133	133	18.87

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	22.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.25	Wt. n-Val.		0.016	
W.S. Elev (ft)	20.44	Reach Len. (ft)			
Crit W.S. (ft)	21.13	Flow Area (sq ft)		108.10	
E.G. Slope (ft/ft)	0.016617	Area (sq ft)		108.10	
Q Total (cfs)	1300.00	Flow (cfs)		1300.00	
Top Width (ft)	105.23	Top Width (ft)		105.23	
Vel Total (ft/s)	12.03	Avg. Vel. (ft/s)		12.03	
Max Chl Dpth (ft)	2.07	Hydr. Depth (ft)		1.03	
Conv. Total (cfs)	10084.7	Conv. (cfs)		10084.7	
Length Wtd. (ft)		Wetted Per. (ft)		107.36	
Min Ch El (ft)	18.37	Shear (lb/sq ft)		1.04	

pha	1.00	Stream Power (lb/ft s)	12.56
rctn Loss (ft)	0.57	Cum Volume (acre-ft)	
& E Loss (ft)	0.06	Cum SA (acres)	

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

ning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

MARY OF MANNING'S N VALUES

er:RIVER-1

Reach	River Sta.	n1	n2	n3
ach-1	2100	.03	.016	.025
Reach-1	2000	.03	.016	.025
Reach-1	1900	.025	.016	.025
ach-1	1800	.016	.016	.025
ach-1	1700	.016	.016	.025
ach-1	1600	.016	.016	.025
Reach-1	1500	.016	.016	.025
Reach-1	1400	.016	.016	.025
ach-1	1300	.016	.016	.025
ach-1	1200	.016	.016	.025
ach-1	1100	.016	.016	.025
Reach-1	1000	.016	.016	.025

SUMMARY OF REACH LENGTHS

er: RIVER-1

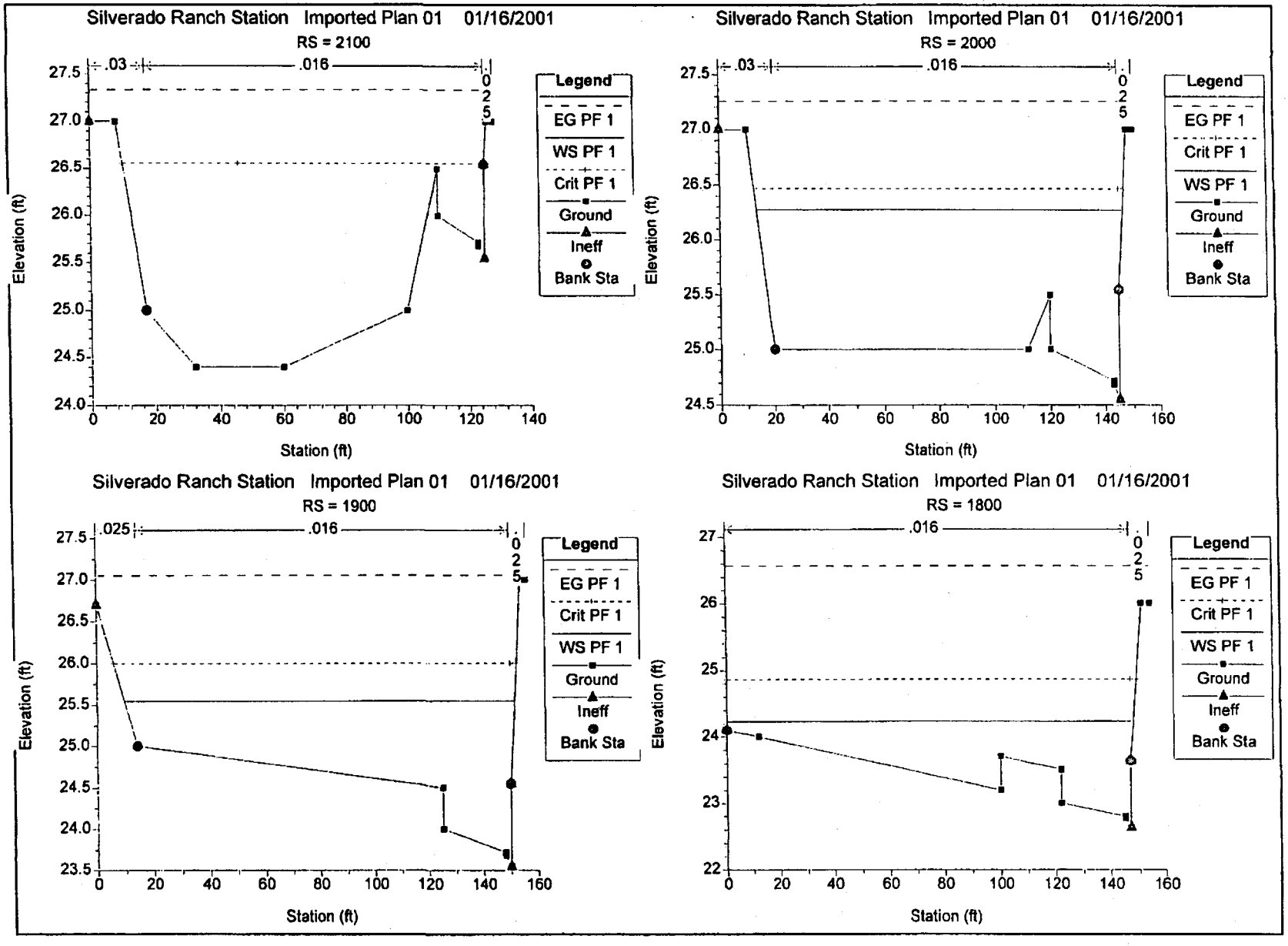
Reach	River Sta.	Left	Channel	Right
ach-1	2100	16	16	17
ach-1	2000	20	20	20
ach-1	1900	25	22	20
Reach-1	1800	24	24	24
Reach-1	1700	50	50	50
ach-1	1600	16	16	16
ach-1	1500	10	10	10
ach-1	1400	35	35	35
Reach-1	1300	36	36	36
Reach-1	1200	19	19	19
ach-1	1100	48	48	48
ach-1	1000	0	0	0

MARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	2100	.1	.3
Reach-1	2000	.1	.3
ach-1	1900	.1	.3
ach-1	1800	.1	.3
ach-1	1700	.1	.3
Reach-1	1600	.1	.3
Reach-1	1500	.1	.3
ach-1	1400	.1	.3
ach-1	1300	.1	.3
ach-1	1200	.1	.3
Reach-1	1100	.1	.3
Reach-1	1000	.1	.3

le Output Table - Standard Table 1

each	River Sta	Q Total	Min Ch El (cfs)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft)	Vel Chnl (ft/ft)	Flow Area (ft/s)	Top Width (sq ft)	Froude # Chl (ft)
each-1	2100	1300.00	24.40	26.56	26.56	27.33	0.002976	7.09	187.06	115.03	0.96
each-1	2000	1300.00	24.55	26.28	26.47	27.26	0.005322	7.97	166.19	132.89	1.24
Reach-1	1900	1300.00	23.55	25.55	26.00	27.06	0.012103	9.88	132.91	142.11	1.78
Reach-1	1800	1300.00	22.63	24.24	24.86	26.57	0.027543	12.26	106.20	148.02	2.55
each-1	1700	1300.00	21.83	23.37	24.00	25.86	0.029402	12.69	102.63	143.84	2.64
each-1	1600	1300.00	20.83	22.70	23.30	24.70	0.014934	11.34	114.96	114.67	1.99
each-1	1500	1300.00	20.66	22.54	23.14	24.43	0.013313	11.04	118.56	113.90	1.89
Reach-1	1400	1300.00	20.56	22.33	22.92	24.29	0.011131	11.26	116.48	94.63	1.78
Reach-1	1300	1300.00	20.18	21.93	22.52	23.93	0.011197	11.37	115.19	92.16	1.78
each-1	1200	1300.00	19.83	21.91	22.34	23.48	0.007459	10.06	129.28	89.00	1.47
each-1	1100	1300.00	19.40	21.64	22.12	23.32	0.008950	10.41	124.94	94.00	1.59
Reach-1	1000	1300.00	18.37	20.44	21.13	22.69	0.016617	12.03	108.10	105.23	2.09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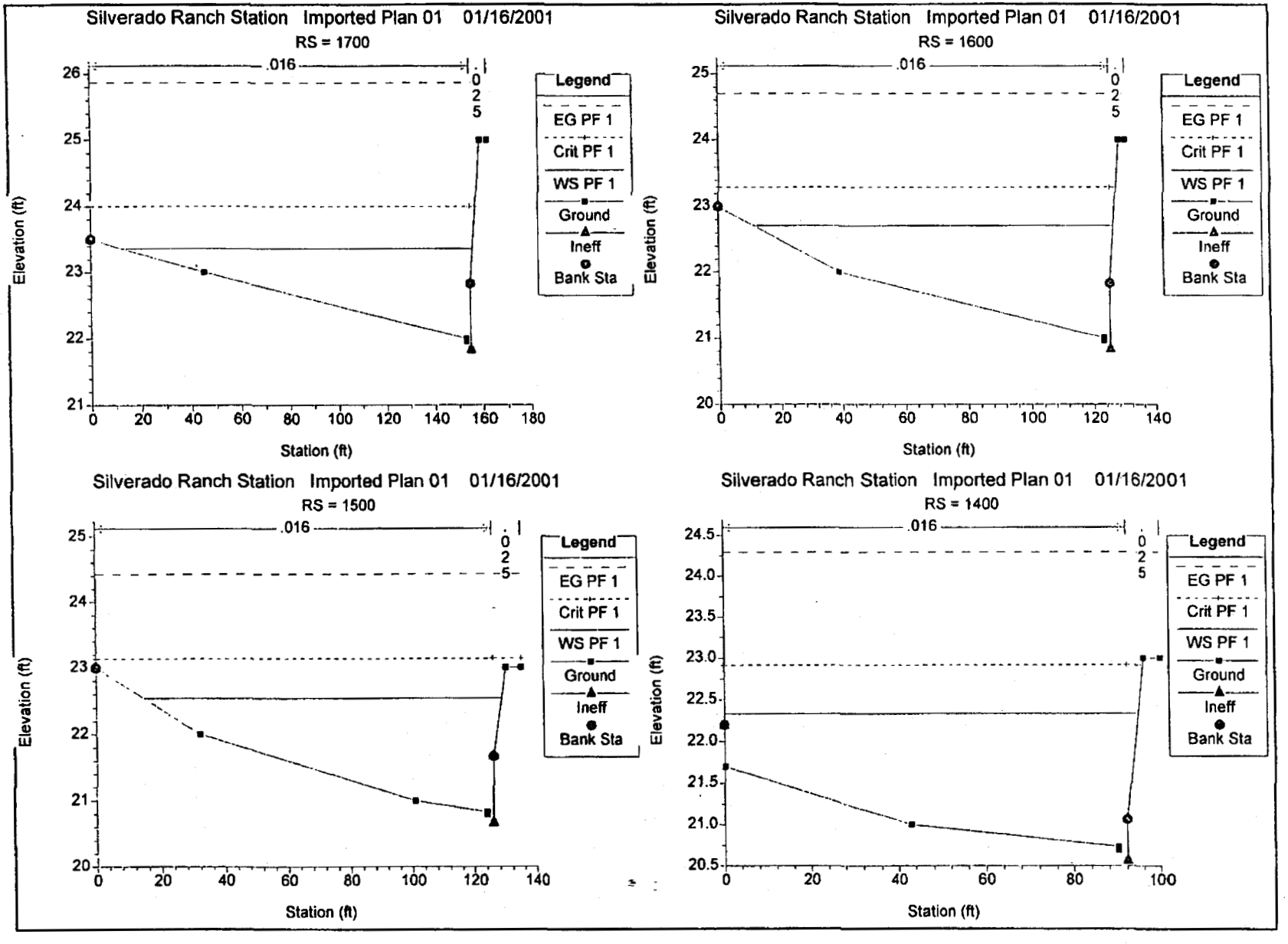
RS = 2100
.03
.016
0
2
5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 2000
.03
.016
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 1900
.025
.016
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 1800
.016
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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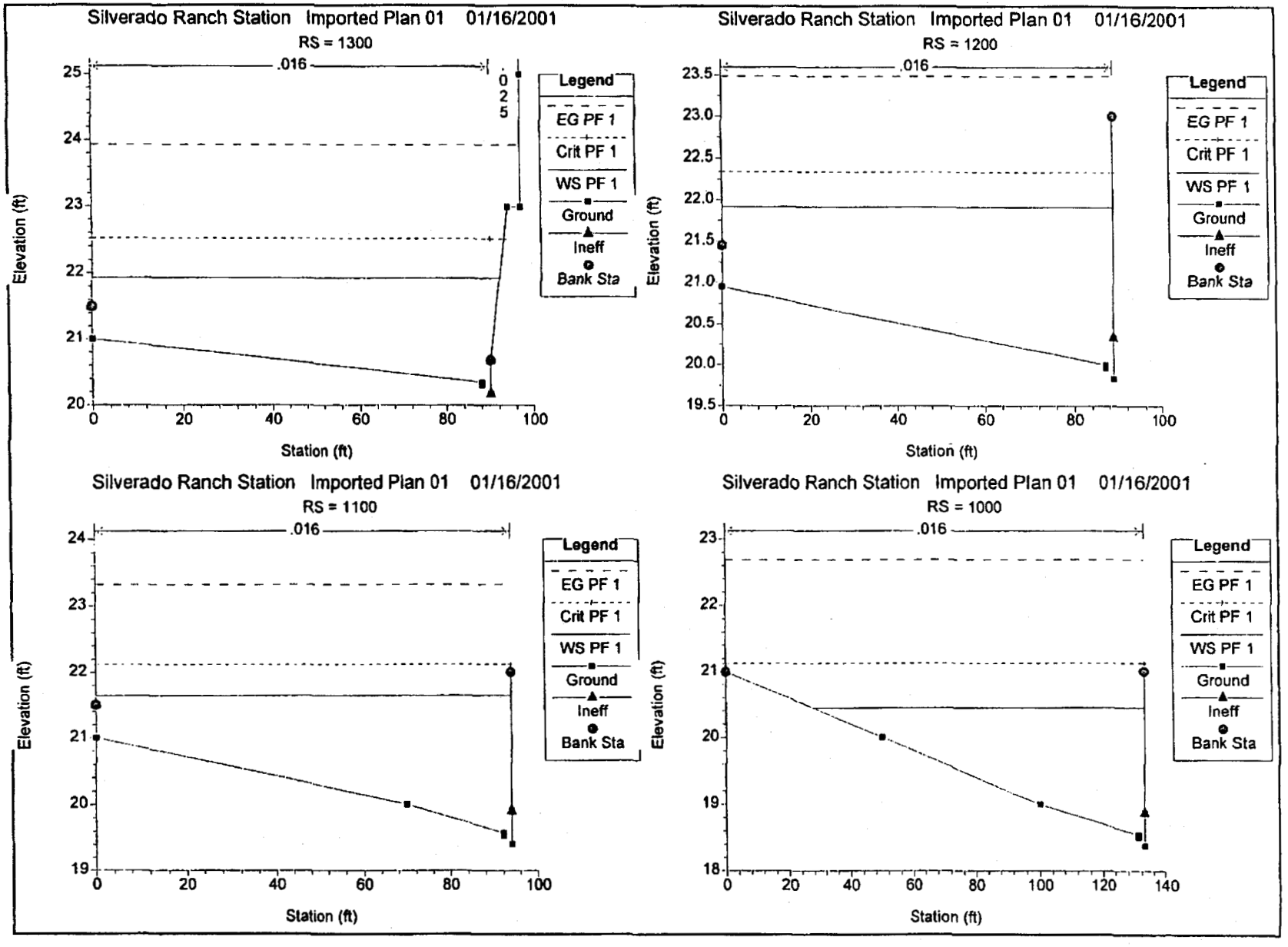
RS = 1700
.016
0
2
5
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 1600
.016
0
2
5
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 1500
.016
0
2
5
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 1400
.016
0
2
5
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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.016
.025
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 1200
.016
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 1100
.016
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 01/16/2001
RS = 1000
.016
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

DATE _____

CLIENT _____ JOB NO. _____ CALC. BY _____

DESCRIPTION WEIR EQ. CHECKED BY _____

$$Q = C L H^{3/2}$$

$$H = \left[\frac{1300}{3(80)}\right]^{2/3}$$

$$H = 3.1$$

STARTING WSE = 24.4 + 3.1 = 27.5 FT.

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

DATE

CLIENT JOB NO. CALC. BY

DESCRIPTION RATIONAL METHOD (MODIFIED) CHECKED BY

AREA = 0.45 Ac.

C_{10} = 0.88

C_{100} = 0.89

I_{10} = 4.2

I_{100} = 7.56

$Q = 0.5 C I A$

$Q_{10} = (0.5)(0.88)(4.2)(0.45) = 0.8$ CFS

$Q_{100} = (0.5)(0.89)(7.56)(0.45) = 1.5$ CFS

SHEET OF

3/66

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

Modified Type C Drop Inlet Sizing in a Sump

Type "B" Inlet at PTA

Known:		
D_p=	Ponding depth at inlet (ft)	0.2
W=	Gutter Width (ft)	1.50
L_g=	Length of grate (ft)	3.00
L_c=	Length of curb opening (ft)	2.50
H_c=	Curb opening height (ft)	0.547
C_{wc}=	Weir coefficient for curb opening	2.3
C_{wg}=	Weir coefficient for grate	3.0
C_o=	Orifice coefficient	0.67
R_o=	Grate opening factor	0.60
C_{fg}=	Clogging factor for grate (%)	50
C_{fc}=	Clogging factor for curb opening (%)	50
Grate Capacity Calculations		
P_g=	Active grate weir length (agwl) = 2*W*L_g (ft)	6.00
P_{agl}=	Adjusted agwl = 2*(1-C_{fg}/100)*W+L_g (ft)	4.50
A_g=	Grate area = W*L_g (ft^2)	4.50
A_{aga}=	Adjusted open grate area = A_g*R_o*(1-C_{fg}/100) (ft^2)	1.35
C=	check - If D_p<1.792*A_{ag}/P_{ag}; weir; else orifice	weir
Q_{ig}=	Flow intercepted by grate (cfs)	1.2
	If "weir" controls Q_{ig}=C_{wg}*P_{agl}*$D_p^{1.5}$	
	If "orifice" controls Q_{ig}=C_o*A_{aga}*$(64.4*D_p)^{0.5}$	
Curb Opening Capacity Calculations		
P_c=	Active curb opening weir length (acowl) = L_c+1.8*W (ft)	5.20
P_{acl}=	Adjusted acowl = L_c+1.8*(1-C_{fc}/100)*W (ft)	3.85
A_c=	curb opening area (coa) = L_c*H_c (ft^2)	1.37
A_{aca}=	Adjusted coa = A_c*(1-C_{fc}/100) (ft^2)	0.68
C=	check - If D_p<H_c; weir; else orifice	weir
Q_{ic}=	Flow int'd by curb opening (cfs)	0.8
	If "weir" controls Q_{ic}=C_{wc}*P_{acl}*$D_p^{1.5}$	
	If "orifice" controls Q_{ic}=C_o*A_{aca}*$(64.4*D_p-H_c/2)^{0.5}$	
Total Inlet Calculations		
Q_{ti}=	Total flow intercepted = Q_{ig}+Q_{ic} (cfs)	**2.0**
q=	Interception per unit length = Q_{ti}/L_g (cfs/ft)	0.7

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	18" HDPE
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Input Data		
Mannings Coefficien	0.013	
Slope	.020000	ft/ft
Diameter	18	in
Discharge	2.00	cfs

Results		
Depth	0.37	ft
Flow Area	0.3	ft²
Wetted Perimeter	1.56	ft
Top Width	1.30	ft
Critical Depth	0.53	ft
Percent Full	24.8	%
Critical Slope	0.004941	ft/ft
Velocity	5.86	ft/s
Velocity Head	0.53	ft
Specific Energy	0.91	ft
Froude Number	2.01	
Maximum Discha	15.98	cfs
Discharge Full	14.85	cfs
Slope Full	0.000363	ft/ft
Flow Type	Supercritical	

SUPPLEMENTAL INFORMATION
Date received 2/5/01
HTE# 01-1519 up.

ADD1/01-1517UP

ADDENDUM
TO THE
HYDRAULIC ANALYSIS UPDATE
FOR
SILVERADO RANCH STATION
CULVERT EXTENSION
STATION 9+80.80 TO STATION 13+61.65

398.177X68

February 2001

Prepared for:

AIG Baker Real Estate, L. L. C.
1900 International Park Drive, Suite 303
Birmingham, AL 35243
Phone: (205) 969-1000
Fax: (205) 9969-1051

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

ADDENDUM
TO THE
HYDRAULIC ANALYSIS UPDATE
FOR
SILVERADO RANCH STATION
CULVERT EXTENSION
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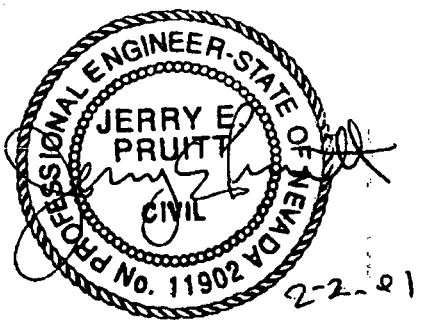
398.177X68

February 2001



Prepared for:

AIG Baker Real Estate, L. L. C.
1900 International Park Drive, Suite 303
Birmingham, AL 35243
Phone: (205) 969-1000
Fax: (205) 9969-1051

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Silverado Ranch Station Culvert Extension **398.177X68**

Name of Development: Station 9+80.80 to Station 13+61.65 Date: February 2001

Location of Development: a) Descriptive (Cross Streets) North/South: Eastern Avenue East/West: Silverado Ranch Blvd.

b) Sect. 26 Twn. 22 S Rng. 61 E

Name of Owner: AIG Baker Real Estate, L.L.C. Assessors Parcel No: 177-26-601-003

Telephone No: (205) 969-1000 Facsimile No: (205) 969-1051

Address: 1900 International Park Drive, Suite 303
Birmingham, AL 35243

Contact Person-Name: Jerry E. Pruitt, P.E. Telephone No: 804-2000

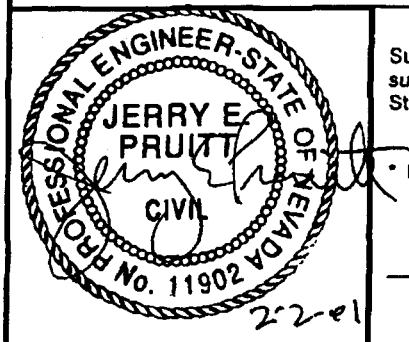
Firm: G. C. Wallace, Inc.

Address: 1555 South Rainbow Boulevard, Las Vegas, NV 89146

Type of Land Development/Land Disturbance Process:

	Rezoning		Subdivision Map		Clearing and Grading Only
	Parcel Map		Planned Unit Development	X	Other (Please specify below)
	Large Parcel Map		Building Permit	Commercial	

1. Total Owned Land Area: At Site: 42 ac. Being Developed/Disturbed: 1.2 ac.
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? Yes* No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? Yes* No
4. Proposed type of development (Residential, Commercial, etc.)? Commercial
5. Approximate upstream land area which drains to the subject site? 105 ac.
6. Has the site drainage been evaluated in the past? YES NO If yes, please identify documentation:
   Conceptual Drainage Study for Silverado Ranch Station and *Technical Drainage Study for Silverado Ranch Station Phase 1 and Phase 2*
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
   Eastern Avenue, Silverado Ranch Boulevard, 4-barrel 72-inch RCP north of Silverado Ranch Boulevard
8. Briefly describe your proposed schedule for the subject project: January 2001



Engineer's Seal

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

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

Local Entity File No.

Revision	*Date*

REFERENCE: **STANDARD FORM 1**

CLARK COUNTY PUBLIC WORKS DEPARTMENT
COMMUNITY DEVELOPMENT DIVISION
OFF-SITE DEVELOPMENT SUBMITTAL SHEET

(Each set of plans and/or studies must have a separate submittal sheet and a separate check.) **398.177X68**

DATE February 2, 2001 TELEPHONE NUMBER (702) 804-2000

PROJECT NAME Silverado Ranch Station Culvert Extension - Station 9+80.80 to Station 13+61.65

RESPONSIBLE ENGINEER Jerry E. Pruitt, P.E. FIRM G. C. Wallace, Inc.

ADDRESS 1555 South Rainbow Boulevard, Las Vegas, NV 89146

PUBLIC WORKS AN/HTE# _____

TYPE OF SUBMITTAL (check only one)

- ☐ **NEW** (never submitted before)
  (new improvement plans require Drainage Study HTE# _____ and Traffic Study HTE # _____
- ■ **CORRECTIONS/ADDENDUM** (requested changes have been made) ⇒ HTE number is required 01-1517UP
- ☐ **AMENDMENT** (these are changes to a study previously approved)
- ☐ **UPDATE** to a previously approved study

PROJECT TYPE (check only one)

- ■ **DRAINAGE STUDY**
- ☐ **TRAFFIC STUDY**
- ☐ **COMMERCIAL IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **SUBDIVISION IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **PARCEL MAP IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **GRADING PLAN FOR PARCEL MAP**
- ☐ **GEOTECHNICAL REPORT**

(Please continue for NEW, AMENDMENT, and UPDATE submittals only.)

ASSESSOR'S PARCEL NUMBER (APN)

1. 177-26-601-003 2. _____ 3. _____

STREET LOCATION

1. **EAST/WEST** Silverado Ranch Boulevard 2. **NORTH/SOUTH** Eastern Avenue

ZONING ACTIONS

1. _____ 2. _____ 3. _____ 4. _____

OWNER/DEVELOPER AIG Baker Real Estate, L.L.C.

ADDRESS 1900 International Park Drive, Suite 303

CITY/STATE/ZIP Birmingham, AL 35243

COMMENTS _____

G. C. WALLACE, INC.
Engineers / Planners / Surveyors

G. C. WALLACE, PE/SE, PLS
JAMES A. DUDDLESTEN, PE
MICHAEL D. ROSS, PE
CHRISTOPHER W. ANDERSON, PE
CALVIN L. BLACK, PE, PLS
BENJAMIN C. SMITH, PE
SCOTT R. PLUMMER, PE
E. ROBERT PETERSON
PAUL BURN, PLS, WRS
MICHAEL J. CSIZMADIA, PE
C. RUSSELL DAVIS, PE/SE
DOUGLAS M. HANKEL
DONALD A. HASELHOFF, PE, CEM
RICKEY D. HUNSAKER, PE
NOEL C. LAUGHLIN, PE
MARVIN W. MAIZE
GREGORY J. PATCH, PE
JOHN R. TOBIN, PE
HOWARD K. VANDER MEER, PE
EUGENE W. WRIGHT, PE

JOSEPH A. BODROG, PLS
THOMAS P. DYSON, PE
KENNETH M. HANIFAN, PE
DONALD L. HOTCHKISS JR., PE
BERT A. HUGHES, PE
JERRY D. JOHNSTON
TIMOTHY A. McCOY, PE, PTOE
DANNY S. McFADDEN, PE
THOMAS R. NICHOLS, PE
JERRY E. PRUITT, PE
BRIAN L. SCHMIDT, PE
JEFF W. STAYTON, PE
RICHARD W. STEUBING, PLS, WRS
SAUNDRA L. VANCE, CCS, CCCA
JOHN M. WALKER, PE
G. IRA WALLACE, PE

JIM B. BAKKEDAHL, PE
DENNIS R. BROWN, PE
ROY D. CLARK, PE
RICHARD G. CLARKE
TODD G. CORMIER, PE
JOHN L. ELTSCHLAGER, PE
ALLAN P. FAJARDO, PE
RANDALL K. GREMLICH, PE
PASCAL HAYES, PE
J. P. HIGGINS, PLS, WRS
DANNY E. HILL, PLS
GERALD L. HOLTON, PLS
KAYANN JONGSMA, PE
FARHAD KHANBOLOUKI, PE
MICHAEL G. KIDD, PLS
WILLIAM METCALF
RANDY W. MROWICKI, PLS
RIMAH I. NAZZAL, PE
D. G. NEEL, PLS
JOHNNIE R. PATE JR., PE
BRIAN K. REED, P.E.
DENNIS W. SOLANO, PLS
RICHARD A. E. STRUTZ
ROBERT J. WOODSON, PE
CHRISTOPHER R. ZRINYI, PE

AFFILIATE OFFICE IN
SACRAMENTO, CA

398.177X68

February 2, 2001

WILLDAN 3359 CS
SERVING PUBLIC AGENCIES
FEB 05 2001
RECEIVED
LAS VEGAS

Robert Thompson, P.E.
Plans Check Unit Supervisor
Clark County Department of Public Works
Community Development Division
Las Vegas, Nevada 89155-4000

Subject: Addendum to the Hydraulic Analysis Update for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65 (HTE # 01-1517UP)

Dear Mr. Thompson:

The purpose of this letter is to serve as a revised update to the previous letter submitted to the Clark County Department of Public Works (CCPW) on January 17, 2001.

The original letter dated January 17, 2001 stated that the finished floor for Building F-2 has been lowered 1-foot from elevation 25.5 feet to elevation 24.5 feet. However, this building name (Building F-2) was a typographical error. The finished floor elevation difference was intended to refer to Building F-3. Therefore, the above sentence should read "the finished floor for Building F-3 has been lowered 1-foot from elevation 25.5 feet to elevation 24.5 feet."

The original letter also stated that the existing bubbler weir length has been increased approximately 20 feet. In actuality, the existing bubbler weir length shown on the improvement plans set was increased approximately 35 feet. The weir flow calculation has been revised to reflect the correct weir length. Based on the revised weir flow calculation, the water surface elevation at the outlet of the existing bubbler is determined to be 27.2 feet. This water surface elevation is lower than the water surface elevation determined in the original submittal by approximately 0.3 feet. A copy of revised weir flow calculation is included in the Appendix.

The HEC-RAS model has also been revised to provide the correct starting water surface elevation at the outlet of the existing bubbler of 27.2 feet. The output of the revised HEC-RAS model however remains unchanged from the original

submittal. The results of the revised HEC-RAS model are summarized in Table 1. A copy of the revised HEC-RAS model is attached.

TABLE 1

HEC-RAS HYDRAULIC MODEL SUMMARY

CROSS SECTION*	Q (CFS)	INV (FT)	WSE (FT)	D (FT)
2100	1300	24.4	26.6	2.2
2000	1300	24.0	26.3	2.3
1900	1300	23.6	25.6	2.0
1800	1300	22.6	24.2	1.6
1700	1300	21.8	23.4	1.6
1600	1300	20.8	22.7	1.9
1500	1300	20.7	22.5	1.8
1400	1300	20.6	22.3	1.7
1300	1300	20.2	21.9	1.7
1200	1300	19.8	21.9	2.1
1100	1300	19.4	21.6	2.2
1000	1300	18.4	20.4	2.0

*See Exhibit 1.

Exhibit 1 has been revised to match the improvement plans. A copy of Revised Exhibit 1 is attached.

In addition, an onsite Type B inlet located at PTA mentioned in the original letter as a proposed additional drop inlet was actually just relocated due to the change in grading in this area. This drop inlet was added in the subsequent approved Silverado Ranch Phase 2 Grading Plans dated November 10, 2000. Calculations shown in the original letter are to confirm that this inlet has sufficient capacity to intercept runoff in the driveway.

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

398.177X68

If you have any questions or need additional information, please do not hesitate to contact me at 804-2000.

Very truly yours,

G. C. WALLACE, INC.

Ann Tanakul, E.I.
Designer

Jerry E. Pruitt, P.E.
Vice President

JEP:AT:jj

Encl.

pc: Calvin Black, GCW
Roy Clark, GCW

Appendix

DATE

CLIENT Silverado Ranch Station JOB NO. CALC BY

DESCRIPTION Weir Flow Calc. CHECKED BY

$Q = 1300$ cfs

$L = 95$ FT

$H = ?$

$$H = \left[\frac{Q}{CL}\right]^{2/3}$$

$$H = \left[\frac{1300 \text{ cfs}}{(3)(95 \text{ FT})}\right]^{2/3}$$

$H = 2.8$ FT

STARTING WSE = 24.4 + 2.8 = 27.2 FT.

SHEET ____ OF ____

-3-N
3/66

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-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	W.P. Channel	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)	
Reach-1	2100	1300.00	24.40	26.56	26.56	27.33	0.002976	7.09	187.06	115.03	109.68	0.96
Reach-1	2000	1300.00	24.55	26.28	26.47	27.26	0.005322	7.97	166.19	132.89	126.56	1.24
Reach-1	1900	1300.00	23.55	25.55	26.00	27.08	0.012103	9.88	132.91	142.11	137.55	1.76
Reach-1	1800	1300.00	22.63	24.24	24.86	26.57	0.027543	12.26	106.20	148.02	149.19	2.55
Reach-1	1700	1300.00	21.83	23.37	24.00	25.86	0.029402	12.69	102.63	143.84	143.91	2.64
Reach-1	1600	1300.00	20.83	22.70	23.30	24.70	0.014934	11.34	114.96	114.87	114.52	1.99
Reach-1	1500	1300.00	20.66	22.54	23.14	24.43	0.013313	11.04	118.56	113.90	112.33	1.89
Reach-1	1400	1300.00	20.56	22.33	22.92	24.29	0.011131	11.26	116.48	94.63	93.19	1.78
Reach-1	1300	1300.00	20.18	21.93	22.52	23.93	0.011197	11.37	115.19	92.16	91.48	1.78
Reach-1	1200	1300.00	19.83	21.91	22.34	23.48	0.007459	10.06	129.28	89.00	92.10	1.47
Reach-1	1100	1300.00	19.40	21.84	22.12	23.32	0.008950	10.41	124.94	94.00	96.94	1.59
Reach-1	1000	1300.00	18.37	20.44	21.13	22.89	0.016617	12.03	108.10	105.23	107.36	2.09

HEC-RAS September 1998 Version 2.2
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
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: Silverado Ranch Station
Project File : sil.prj
Run Date and Time: 02/02/2001 8:07:16 AM

Project in English units

Project Description:
Rev. Date 1/15/01

SUPERCRITICAL HEC-2 RUN (SUP.DAT)

SILVERADO RANCH STATION (398.177X)

PLAN DATA

Plan Title: Imported Plan 01
Plan File : f:\398-177\Drainage\update-ph2\sil.p01

Geometry Title: Imported Geom 01
Geometry File : f:\398-177\Drainage\update-ph2\sil.g01

Flow Title : Imported Flow 01
Flow File : f:\398-177\Drainage\update-ph2\sil.f01

Plan Summary Information:
Number of: Cross Sections = 12 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

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

W DATA

w Title: Imported Flow 01
ow File : f:\398-177\Drainage\update-ph2\sil.f01

ow Data (cfs)

River	Reach	RS	PF 1
RIVER-1	Reach-1	2100	1300

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	PF 1	Known WS = 27.2	Critical

GEOMETRY DATA

eometry Title: Imported Geom 01
eometry File : f:\398-177\Drainage\update-ph2\sil.g01

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 2100

NPUT
escription:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	27	8	27	17	25	32	24.4	60	24.4
100	25	110	26.5	110	26	123	25.72	123	25.68
125	25.55	125	26.55	126	27	128	27		

anning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	17	.016	125	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
17	125	16	16	17	.1	.3

effective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	27	125	128	26.55

ROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	27.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.77	Wt. n-Val.	0.030	0.016	
W.S. Elev (ft)	26.56	Reach Len. (ft)	16.00	16.00	17.00
Crit W.S. (ft)	26.56	Flow Area (sq ft)	5.46	181.60	
E.G. Slope (ft/ft)	0.002976	Area (sq ft)	5.46	181.60	0.00
Q Total (cfs)	1300.00	Flow (cfs)	12.28	1287.72	
Top Width (ft)	115.03	Top Width (ft)	7.01	108.00	0.02
Vel Total (ft/s)	6.95	Avg. Vel. (ft/s)	2.25	7.09	
Max Chl Dpth (ft)	2.16	Hydr. Depth (ft)	0.78	1.68	
Conv. Total (cfs)	23829.7	Conv. (cfs)	225.2	23604.5	
Length Wtd. (ft)	16.00	Wetted Per. (ft)	7.18	109.68	
Min Ch El (ft)	24.40	Shear (lb/sq ft)	0.14	0.31	
Alpha	1.03	Stream Power (lb/ft s)	0.32	2.18	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.00	0.82	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.76	0.01

arning: 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.

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.

arning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

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

OSS SECTION RIVER: RIVER-1
CH: Reach-1 RS: 2000

PUT
scription:
ation Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	27	10	27	20	25	112	25	120	25.5
120	25	143	24.72	143	24.68	145	24.55	145	25.55
148	27	150	27						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	20	.016	145	.025

nk Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
20 145 20 20 20 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	27	145	150	25.55

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	27.26	Element			
Vel Head (ft)	0.98	Wt. n-Val.	0.030	0.016	0.025
W.S. Elev (ft)	26.28	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	26.47	Flow Area (sq ft)	4.07	161.57	0.55
E.G. Slope (ft/ft)	0.005322	Area (sq ft)	4.07	161.57	0.55
Q Total (cfs)	1300.00	Flow (cfs)	10.77	1288.10	1.12
Top Width (ft)	132.89	Top Width (ft)	6.38	125.00	1.50
Vel Total (ft/s)	7.82	Avg. Vel. (ft/s)	2.64	7.97	2.06
Max Chl Dpth (ft)	1.73	Hydr. Depth (ft)	0.64	1.29	0.36
Conv. Total (cfs)	17820.5	Conv. (cfs)	147.7	17657.4	15.4
Length Wtd. (ft)	20.00	Wetted Per. (ft)	6.51	126.56	1.67
Min Ch El (ft)	24.55	Shear (lb/sq ft)	0.21	0.42	0.11
Alpha	1.03	Stream Power (lb/ft s)	0.55	3.38	0.22
Prctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.00	0.75	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.72	0.01

ote: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

OSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1900

PUT
scription:
ation Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	26.7	14	25	125	24.5	125	24	148	23.72
148	23.68	150	23.55	150	24.55	154	27	156	27

anning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	14	.016	150	.025

nk Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
14 150 25 22 20 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	26.7	150	156	24.55

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	27.06	Element			
Vel Head (ft)	1.51	Wt. n-Val.	0.025	0.016	0.025
W.S. Elev (ft)	25.55	Reach Len. (ft)	25.00	22.00	20.00
Crit W.S. (ft)	26.00	Flow Area (sq ft)	1.22	130.88	0.81
E.G. Slope (ft/ft)	0.012103	Area (sq ft)	1.22	130.88	0.81
Q Total (cfs)	1300.00	Flow (cfs)	3.35	1293.67	2.98
Top Width (ft)	142.11	Top Width (ft)	4.49	136.00	1.62
Vel Total (ft/s)	9.78	Avg. Vel. (ft/s)	2.74	9.88	3.69
Max Chl Dpth (ft)	2.00	Hydr. Depth (ft)	0.27	0.96	0.50
Conv. Total (cfs)	11816.5	Conv. (cfs)	30.4	11758.9	27.1
Length Wtd. (ft)	22.00	Wetted Per. (ft)	4.52	137.55	1.91

Min Ch El (ft)	23.55	Shear (lb/sq ft)	0.20	0.72	0.32
Alpha	1.02	Stream Power (lb/ft s)	0.56	7.11	1.18
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.00	0.69	0.00
C & E Loss (ft)	0.05	Cum SA (acres)	0.00	0.66	0.01

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, water surface was used.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1800

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	24.1	12	24	100	23.2	100	23.7	122	23.5
122	23	145	22.8	145	22.76	147	22.63	147	23.63
151	26	154	26						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	147	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	147		24	24	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	24.1	147	154	23.63

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	26.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.33	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	24.24	Reach Len. (ft)	24.00	24.00	24.00
Crit W.S. (ft)	24.86	Flow Area (sq ft)		105.90	0.31
E.G. Slope (ft/ft)	0.027543	Area (sq ft)		105.90	0.31
Q Total (cfs)	1300.00	Flow (cfs)		1298.76	1.24
Top Width (ft)	148.02	Top Width (ft)		147.00	1.02
Vel Total (ft/s)	12.24	Avg. Vel. (ft/s)		12.26	4.02
Max Chl Dpth (ft)	1.61	Hydr. Depth (ft)		0.72	0.30
Conv. Total (cfs)	7833.2	Conv. (cfs)		7825.7	7.5
Length Wtd. (ft)	24.00	Wetted Per. (ft)		149.19	1.19
Min Ch El (ft)	22.63	Shear (lb/sq ft)		1.22	0.45
Alpha	1.00	Stream Power (lb/ft s)		14.97	1.80
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)		0.63	0.00
C & E Loss (ft)	0.08	Cum SA (acres)		0.59	0.01

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

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

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1700

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23.5	45	23	153	22	153	21.96	155	21.83
155	22.83	159	25	162	25				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	155	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

0	155		50	50	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	23.5	155	162	22.83

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	25.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.50	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	23.37	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	24.00	Flow Area (sq ft)		102.37	0.26
E.G. Slope (ft/ft)	0.029402	Area (sq ft)		102.37	0.26
Q Total (cfs)	1300.00	Flow (cfs)		1298.98	1.02
Top Width (ft)	143.84	Top Width (ft)		142.86	0.99
Vel Total (ft/s)	12.67	Avg. Vel. (ft/s)		12.69	3.88
Max Chl Dpth (ft)	1.54	Hydr. Depth (ft)		0.72	0.27
Conv. Total (cfs)	7581.5	Conv. (cfs)		7575.5	6.0
Length Wtd. (ft)	50.00	Wetted Per. (ft)		143.91	1.12
Min Ch El (ft)	21.83	Shear (lb/sq ft)		1.31	0.43
Alpha	1.00	Stream Power (lb/ft s)		16.57	1.68
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)		0.57	0.00
C & E Loss (ft)	0.02	Cum SA (acres)		0.51	0.01

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.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1600

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	39	22	123	21	123	20.96	125	20.83
125	21.83	128	24	130	24				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	125	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	125	16	16	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	23	125	130	21.83

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	24.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.00	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	22.70	Reach Len. (ft)	16.00	16.00	16.00
Crit W.S. (ft)	23.30	Flow Area (sq ft)		114.44	0.53
E.G. Slope (ft/ft)	0.014934	Area (sq ft)		114.44	0.53
Q Total (cfs)	1300.00	Flow (cfs)		1298.08	1.92
Top Width (ft)	114.67	Top Width (ft)		113.46	1.21
Vel Total (ft/s)	11.31	Avg. Vel. (ft/s)		11.34	3.64
Max Chl Dpth (ft)	1.87	Hydr. Depth (ft)		1.01	0.44
Conv. Total (cfs)	10638.1	Conv. (cfs)		10622.3	15.7
Length Wtd. (ft)	16.00	Wetted Per. (ft)		114.52	1.49
Min Ch El (ft)	20.83	Shear (lb/sq ft)		0.93	0.33
Alpha	1.00	Stream Power (lb/ft s)		10.57	1.20
Frctn Loss (ft)	1.02	Cum Volume (acre-ft)		0.45	0.00
C & E Loss (ft)	0.15	Cum SA (acres)		0.36	0.00

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: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1500

INPUT
Description:

ation Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	32	22	101	21	124	20.83	124	20.79
126	20.66	126	21.66	130	23	135	23		

anning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	126	.025

ank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	0	126		10	10	10	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	23	126	135	21.66

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	24.43	Element			
Vel Head (ft)	1.89	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	22.54	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	23.14	Flow Area (sq ft)		117.40	1.16
E.G. Slope (ft/ft)	0.013313	Area (sq ft)		117.40	1.16
Q Total (cfs)	1300.00	Flow (cfs)		1295.58	4.42
Top Width (ft)	113.90	Top Width (ft)		111.27	2.63
Vel Total (ft/s)	10.97	Avg. Vel. (ft/s)		11.04	3.83
Max Chl Dpth (ft)	1.88	Hydr. Depth (ft)		1.06	0.44
Conv. Total (cfs)	11266.8	Conv. (cfs)		11228.5	38.3
Length Wtd. (ft)	10.00	Wetted Per. (ft)		112.33	2.77
Min Ch El (ft)	20.66	Shear (lb/sq ft)		0.87	0.35
Alpha	1.01	Stream Power (lb/ft s)		9.59	1.33
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)		0.40	0.00
C & E Loss (ft)	0.03	Cum SA (acres)		0.32	0.00

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.

ROSS SECTION RIVER: RIVER-1
ACH: Reach-1 RS: 1400

INPUT
escription:
tation Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	22.2	0	21.7	43	21	90	20.73	90	20.69
92	20.56	92	21.06	96	23	100	23		

anning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	92	.025

ank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	0	92		35	35	35	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	22.2	92	100	21.06

ROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	24.29	Element			
Vel Head (ft)	1.96	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	22.33	Reach Len. (ft)	35.00	35.00	35.00
Crit W.S. (ft)	22.92	Flow Area (sq ft)		114.81	1.67
E.G. Slope (ft/ft)	0.011131	Area (sq ft)		114.81	1.67
Q Total (cfs)	1300.00	Flow (cfs)		1292.75	7.25
Top Width (ft)	94.63	Top Width (ft)		92.00	2.63
Vel Total (ft/s)	11.16	Avg. Vel. (ft/s)		11.26	4.33
Max Chl Dpth (ft)	1.77	Hydr. Depth (ft)		1.25	0.64
Conv. Total (cfs)	12321.9	Conv. (cfs)		12253.3	68.7
Length Wtd. (ft)	35.00	Wetted Per. (ft)		93.19	2.92
Min Ch El (ft)	20.56	Shear (lb/sq ft)		0.86	0.40
Alpha	1.01	Stream Power (lb/ft s)		9.64	1.72
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)		0.38	0.00
C & E Loss (ft)	0.01	Cum SA (acres)		0.30	0.00

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

SS SECTION RIVER: RIVER-1
ACH: Reach-1 RS: 1300

PUT
Description:

Station Elevation Data	num=	9							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21.5	0	21	88	20.35	88	20.31	90	20.18
90	20.68	94	23	97	23	97	25		

Manning's n Values	num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	90	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	90	36	36	36	.1	.3

effective Flow	num=	2			
Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	21.5	90	97	20.68

OSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	23.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.00	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	21.93	Reach Len. (ft)	36.00	36.00	36.00
Crit W.S. (ft)	22.52	Flow Area (sq ft)		113.84	1.35
E.G. Slope (ft/ft)	0.011197	Area (sq ft)		113.84	1.35
Q Total (cfs)	1300.00	Flow (cfs)		1294.37	5.63
Top Width (ft)	92.16	Top Width (ft)		90.00	2.16
Vel Total (ft/s)	11.29	Avg. Vel. (ft/s)		11.37	4.17
Max Chl Dpth (ft)	1.75	Hydr. Depth (ft)		1.26	0.63
Conv. Total (cfs)	12285.7	Conv. (cfs)		12232.6	53.2
Length Wtd. (ft)	36.00	Wetted Per. (ft)		91.48	2.49
Min Ch El (ft)	20.18	Shear (lb/sq ft)		0.87	0.38
Alpha	1.01	Stream Power (lb/ft s)		9.89	1.58
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)		0.28	0.00
& E Loss (ft)	0.00	Cum SA (acres)		0.22	0.00

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

OSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1200

PUT
scription:

ation Elevation Data	num=	7							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21.45	0	20.95	87	20	87	19.96	89	19.83
89	20.33	89	23						

anning's n Values	num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	89	.025

nk Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	89	19	19	19	.1	.3

Ineffective Flow	num=	2			
Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	21.45	89	89	20.33

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	23.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.57	Wt. n-Val.		0.016	
W.S. Elev (ft)	21.91	Reach Len. (ft)	19.00	19.00	19.00
Crit W.S. (ft)	22.34	Flow Area (sq ft)		129.28	
E.G. Slope (ft/ft)	0.007459	Area (sq ft)		129.28	
Q Total (cfs)	1300.00	Flow (cfs)		1300.00	
Top Width (ft)	89.00	Top Width (ft)		89.00	
Vel Total (ft/s)	10.06	Avg. Vel. (ft/s)		10.06	
Max Chl Dpth (ft)	2.08	Hydr. Depth (ft)		1.45	
Conv. Total (cfs)	15052.1	Conv. (cfs)		15052.1	
Length Wtd. (ft)	19.00	Wetted Per. (ft)		92.10	

Min Ch El (ft)	19.83	Shear (lb/sq ft)	0.65
Alpha	1.00	Stream Power (lb/ft s)	6.57
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.18
C & E Loss (ft)	0.13	Cum SA (acres)	0.15

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

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1100

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21.5	0	21	70	20	92	19.57	92	19.53
94	19.4	94	19.9	94	22				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	94	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	94	48	48	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	21.5	94	94	19.9

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	23.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.68	Wt. n-Val.		0.016	
W.S. Elev (ft)	21.64	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)	22.12	Flow Area (sq ft)		124.94	
E.G. Slope (ft/ft)	0.008950	Area (sq ft)		124.94	
Q Total (cfs)	1300.00	Flow (cfs)		1300.00	
Top Width (ft)	94.00	Top Width (ft)		94.00	
Vel Total (ft/s)	10.41	Avg. Vel. (ft/s)		10.41	
Max Chl Dpth (ft)	2.24	Hydr. Depth (ft)		1.33	
Conv. Total (cfs)	13741.6	Conv. (cfs)		13741.6	
Length Wtd. (ft)	48.00	Wetted Per. (ft)		96.94	
Min Ch El (ft)	19.40	Shear (lb/sq ft)		0.72	
Alpha	1.00	Stream Power (lb/ft s)		7.49	
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)		0.13	
C & E Loss (ft)	0.01	Cum SA (acres)		0.11	

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

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1000

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21	50	20	100	19	131	18.54	131	18.5
133	18.37	133	18.87	133	21				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	133	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	133	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	0	21	133	133	18.87

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	22.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.25	Wt. n-Val.		0.016	
W.S. Elev (ft)	20.44	Reach Len. (ft)			

rit W.S. (ft)	21.13	Flow Area (sq ft)	108.10
G. Slope (ft/ft)	0.016617	Area (sq ft)	108.10
Total (cfs)	1300.00	Flow (cfs)	1300.00
op Width (ft)	105.23	Top Width (ft)	105.23
el Total (ft/s)	12.03	Avg. Vel. (ft/s)	12.03
ax Chl Dpth (ft)	2.07	Hydr. Depth (ft)	1.03
Conv. Total (cfs)	10084.7	Conv. (cfs)	10084.7
Length Wtd. (ft)		Wetted Per. (ft)	107.36
in Ch El (ft)	18.37	Shear (lb/sq ft)	1.04
lpha	1.00	Stream Power (lb/ft s)	12.56
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	
C & E Loss (ft)	0.06	Cum SA (acres)	

rning: 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 parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

SUMMARY OF MANNING'S N VALUES

ver:RIVER-1

Reach	River Sta.	n1	n2	n3
each-1	2100	.03	.016	.025
each-1	2000	.03	.016	.025
each-1	1900	.025	.016	.025
Reach-1	1800	.016	.016	.025
Reach-1	1700	.016	.016	.025
each-1	1600	.016	.016	.025
each-1	1500	.016	.016	.025
Reach-1	1400	.016	.016	.025
Reach-1	1300	.016	.016	.025
each-1	1200	.016	.016	.025
each-1	1100	.016	.016	.025
ach-1	1000	.016	.016	.025

MMARY OF REACH LENGTHS

River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	2100	16	16	17
Reach-1	2000	20	20	20
Reach-1	1900	25	22	20
Reach-1	1800	24	24	24
Reach-1	1700	50	50	50
Reach-1	1600	16	16	16
Reach-1	1500	10	10	10
Reach-1	1400	35	35	35
Reach-1	1300	36	36	36
Reach-1	1200	19	19	19
Reach-1	1100	48	48	48
Reach-1	1000	0	0	0

UMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

iver: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	2100	.1	.3
Reach-1	2000	.1	.3
Reach-1	1900	.1	.3
Reach-1	1800	.1	.3
each-1	1700	.1	.3

each-1	1600	.1	.3
ach-1	1500	.1	.3
ach-1	1400	.1	.3
each-1	1300	.1	.3
each-1	1200	.1	.3
each-1	1100	.1	.3
Reach-1	1000	.1	.3

ofile Output Table - Standard 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
Reach-1	2100	1300.00	24.40	26.56	26.56	27.33	0.002976	7.09	187.06	115.03	0.96
Reach-1	2000	1300.00	24.55	26.28	26.47	27.26	0.005322	7.97	166.19	132.89	1.24
Reach-1	1900	1300.00	23.55	25.55	26.00	27.06	0.012103	9.88	132.91	142.11	1.78
Reach-1	1800	1300.00	22.63	24.24	24.86	26.57	0.027543	12.26	106.20	148.02	2.55
Reach-1	1700	1300.00	21.83	23.37	24.00	25.86	0.029402	12.69	102.63	143.84	2.64
Reach-1	1600	1300.00	20.83	22.70	23.30	24.70	0.014934	11.34	114.96	114.67	1.99
Reach-1	1500	1300.00	20.66	22.54	23.14	24.43	0.013313	11.04	118.56	113.90	1.89
Reach-1	1400	1300.00	20.56	22.33	22.92	24.29	0.011131	11.26	116.48	94.63	1.78
Reach-1	1300	1300.00	20.18	21.93	22.52	23.93	0.011197	11.37	115.19	92.16	1.78
Reach-1	1200	1300.00	19.83	21.91	22.34	23.48	0.007459	10.06	129.28	89.00	1.47
Reach-1	1100	1300.00	19.40	21.64	22.12	23.32	0.008950	10.41	124.94	94.00	1.59
Reach-1	1000	1300.00	18.37	20.44	21.13	22.69	0.016617	12.03	108.10	105.23	2.09

ADD2/01-1817

ADDENDUM #2
TO THE
HYDRAULIC ANALYSIS UPDATE
FOR
SILVERADO RANCH STATION
CULVERT EXTENSION
STATION 9+80.80 TO STATION 13+61.65

398.177X68

March 2001

Prepared for:

AIG Baker Real Estate, L. L. C.
1900 International Park Drive, Suite 303
Birmingham, AL 35243
Phone: (205) 969-1000
Fax: (205) 9969-1051

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

ADDENDUM #2
TO THE
HYDRAULIC ANALYSIS UPDATE
FOR
SILVERADO RANCH STATION
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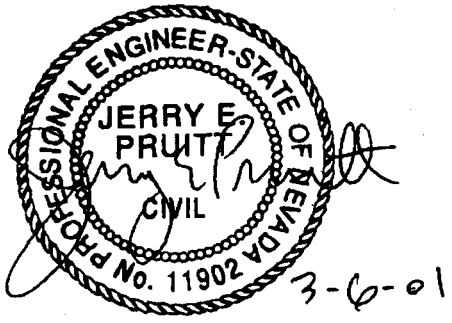

Prepared for:

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Phone: (205) 969-1000
Fax: (205) 9969-1051

CLARK COUNTY PUBLIC WORKS DEPARTMENT
COMMUNITY DEVELOPMENT DIVISION
OFF-SITE DEVELOPMENT SUBMITTAL SHEET

(Each set of plans and/or studies must have a separate submittal sheet and a separate check.) **398.177X68**

DATE March 1, 2001 TELEPHONE NUMBER (702) 804-2000

PROJECT NAME Silverado Ranch Station Culvert Extension - Station 9+80.80 to Station 13+61.65

RESPONSIBLE ENGINEER Jerry E. Pruitt, P.E. FIRM G. C. Wallace, Inc.

ADDRESS 1555 South Rainbow Boulevard, Las Vegas, NV 89146

PUBLIC WORKS AN/HTE# 01-1517

TYPE OF SUBMITTAL (check only one)

- ☐ **NEW** (never submitted before)
  (new improvement plans require Drainage Study HTE# _____ and Traffic Study HTE # _____
- ■ **CORRECTIONS/ADDENDUM** (requested changes have been made) ⇒ HTE number is required 01-1517UP
- ☐ **AMENDMENT** (these are changes to a study previously approved)
- ☐ **UPDATE** to a previously approved study

PROJECT TYPE (check only one)

- ■ **DRAINAGE STUDY**
- ☐ **TRAFFIC STUDY**
- ☐ **COMMERCIAL IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **SUBDIVISION IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **PARCEL MAP IMPROVEMENT PLANS** (☐ Gravel ☐ Paving ☐ Offsites)
- ☐ **GRADING PLAN FOR PARCEL MAP**
- ☐ **GEOTECHNICAL REPORT**

(Please continue for NEW, AMENDMENT, and UPDATE submittals only.)

ASSESSOR'S PARCEL NUMBER (APN)

1. 177-26-601-003 2. _____ 3. _____

STREET LOCATION

1. **EAST/WEST** Silverado Ranch Boulevard 2. **NORTH/SOUTH** Eastern Avenue

ZONING ACTIONS

1. _____ 2. _____ 3. _____ 4. _____

OWNER/DEVELOPER AIG Baker Real Estate, L.L.C.

ADDRESS 1900 International Park Drive, Suite 303

CITY/STATE/ZIP Birmingham, AL 35243

COMMENTS _____

(Revised 6/11/97)

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: *Silverado Ranch Station Culvert Extension* Station 9+80.80 to Station 13+61.65 — Date: March 2001 — **398.177X68**

Location of Development: a) Descriptive (Cross Streets) North/South: Eastern Avenue East/West: Silverado Ranch Blvd.

b) Sect. 26 Twn. 22 S Rng. 61 E

Name of Owner: AIG Baker Real Estate, L.L.C. Assessors Parcel No: 177-26-601-003

Telephone No: (205) 969-1000 Facsimile No: (205) 969-1051

Address: 1900 International Park Drive, Suite 303
Birmingham, AL 35243

Contact Person-Name: Jerry E. Pruitt, P.E. Telephone No: 804-2000

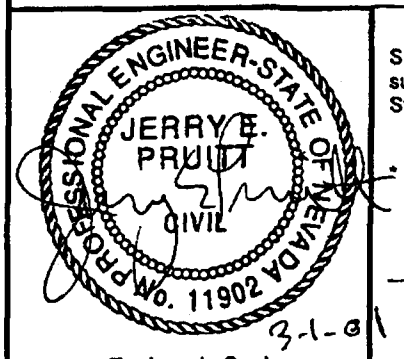
Firm: G. C. Wallace, Inc.

Address: 1555 South Rainbow Boulevard Las Vegas, NV 89146

Type of Land Development/Land Disturbance Process:

	Rezoning		Subdivision Map		Clearing and Grading Only
	Parcel Map		Planned Unit Development	X	Other (Please specify below)
	Large Parcel Map		Building Permit		Commercial

1. Total Owned Land Area: At Site: 42 ac. Being Developed/Disturbed: 1.2 ac.
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? Yes* [X] No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? Yes* [X] No
4. Proposed type of development (Residential, Commercial, etc.)? Commercial
5. Approximate upstream land area which drains to the subject site? 105 ac.
6. Has the site drainage been evaluated in the past? [X] YES NO If yes, please identify documentation:
Conceptual Drainage Study for Silverado Ranch Station and *Technical Drainage Study for Silverado Ranch Station Phase 1 and Phase 2*
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
Eastern Avenue, Silverado Ranch Boulevard, 4-barrel 72-inch RCP north of Silverado Ranch Boulevard
8. Briefly describe your proposed schedule for the subject project: *January 2001*



3-1-01

Engineer's Seal

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

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

Local Entity File No.

Revision	Date

REFERENCE: **STANDARD FORM 1**

G. C. WALLACE, INC.
Engineers / Planners / Surveyors

G. C. WALLACE, PE/SE, PLS
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MICHAEL D. ROSS, PE
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FARHAD KHANBOLOUKI, PE
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RIMAH I. NAZZAL, PE
D. G. NEEL, PLS
JOHNNIE R. PATE JR., PE
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LUDWIG I. SMEETS, PE
DENNIS W. SOLANO, PLS
RICHARD A. E. STRUTZ
ROBERT J. WOODSON, PE
KENNETH T. YAMADA
CHRISTOPHER R. ZRINYI, PE

AFFILIATE OFFICE IN
SACRAMENTO, CA

398.177X68

March 1, 2001

Robert Thompson, P.E.
Plans Check Unit Supervisor
Clark County Department of Public Works
Community Development Division
Las Vegas, Nevada 89155-4000

Subject: Addendum #2 to the Hydraulic Analysis Update for Silverado Ranch Station Culvert Extension Station 9+80.80 to Station 13+61.65 (HTE # 01-1517UP)

Dear Mr. Thompson:

The purpose of this letter is to respond to the subject comments received via memorandum from Willdan dated February 9, 2001, and signed by Clark County Public Works (CCPW) on February 25, 2001. The comments are addressed individually as follows:

Comment: "1. It appears from the review of the HEC-RAS model output that there is very little freeboard at stations 1800 and 1700. The study and plans must address how flows will be contained within the overflow channel section;"

Response: In order to better confine the 100-year storm flows and provide additional freeboard at Stations 1800 and 1700, the grading around the ridge line and bubbler area were revised slightly. The grades along the ridge line were raised approximately 0.5 feet at Stations 1800 and 1700. In addition, some grades downstream of the bubbler were lowered approximately 0.7 feet at Stations 2100, 2000, and 1900. A revised HEC-RAS model was run and the results indicated that a minimum freeboard of 0.4 feet would be maintained. Therefore, the storm flows would be completely confined to the east side of the ridge line and would travel north adjacent to building F-3 only.

Please note that this condition would be only temporary. The surface flow from the bubbler would be eliminated once the Pittman-Eastern Detention Basin was constructed. It is GCW's understanding that the funding for this detention basin is imminent

and the project will go out to bid soon after the funds are received. Therefore, GCW believes the risk of flooding to the buildings to the west of the ridge line is minimal during the 100-year storm event from the bubbler surface flows.

The results of the revised HEC-RAS model are summarized in Table 1. A copy of the revised HEC-RAS model is attached.

TABLE 1

HEC-RAS HYDRAULIC MODEL SUMMARY

CROSS SECTION*	Q (CFS)	INV (FT)	WSE (FT)	D (FT)
2100	1300	24.40	26.34	1.9
2000	1300	24.27	25.76	1.5
1900	1300	23.55	25.19	1.6
1800	1300	22.63	24.30	1.7
1700	1300	21.83	23.41	1.6
1600	1300	20.83	22.71	1.9
1500	1300	20.66	22.55	1.9
1400	1300	20.56	22.36	1.8
1300	1300	20.18	21.90	1.7
1200	1300	19.83	21.59	1.8
1100	1300	19.40	21.66	2.3
1000	1300	18.37	20.44	2.1

*See Exhibit 1.

Exhibit 1 has been revised to match the improvement plans. A copy of the revised Exhibit 1 is attached.

Comment: "2. It is noted that the finished floors of Buildings F-1 and F-2 are not flood protected with 18-inches of freeboard. The study must address how these floors will have adequate flood protection;"

Response: Refer to the Response to Comment 1.

Buildings F-1 and F-2 are not directly adjacent to the bubbler surface storm flows nor are they in a FEMA designated Special Flood Hazard Area. As you know, the CCRFCD Hydrologic Criteria and Drainage Design Manual and the Uniform Regulations for the Control of Drainage require that in non-Special Flood Hazard Areas for new construction (residential and non-residential) "the finished floor shall be set at a vertical distance above gutter flowline of at least twice the depth of flow in the flowline up to a maximum of 18 inches above the water surface elevation" which is meant for adjacent flows. The finished floor elevations for Buildings F-1 and F-2 meet this criteria by the back parking lot being graded to the south away from the buildings to a low point. The low point is set at elevation 22.18 with a drop inlet and storm drain to convey the small drainage area runoff (less than 2 cfs). The ponding depth at the drop inlet would be 0.2 feet to intercept 2 cfs.

Comment: "3. At the request of Clark County Public Works, drainage/grading plans for the proposed development have been reviewed for compliance to the requirements set forth in the "Minimum Drainage Study Criteria Checklist, "Drainage Plan Information," dated July 15, 1997. **The plans submitted do not meet the minimum requirements and must be revised prior to Drainage Study approval, to address the following:**

a. Revise the HGL/EGL hydraulic profile on sheet C-4;"

Response: a. The HGL/EGL hydraulic profile on sheet C-4 is correct. No revision is required.

Comment: "b. Provide a detail cross section along the east side of building F-3;"

Response: b. Detail is provided on sheet C-3.

Comment: "c. Provide additional spot grading information adjacent to Buildings F-1, F-2 and F-3;"

Response: c. Additional spot elevations provided.

Comment: "d. Provide flood protection to buildings F-1 and F-2 or raise the finished floors to 18 inches above the water surface elevation;"

Response: d. See Response to Comments 1 and 2.

Comment: "e. Provide a specific revision note for the lowering of the finished floor elevation of building F-3;"

Response: e. Specific revision note provided.

Comment: "f. Any additional comments on the plans."

Response: f. Noted and revised.

Additional Clark County Public Works Comments:

Comment: "1. If the water surface elevation at the weir is 27.2 feet, this will cause a backwater elevation out of the connecting 48-inch pipe just downstream of the bubbler structure. This backwater will come out of the drop inlet to the west of the bubbler structure and have the potential of flooding the buildings. Please address."

Response: The hydraulic grade line at the point where the 48-inch pipe connects to the double arch culvert is less than 19.3 (see Sheet C-4). Based on that, the hydraulic grade line within the 48-inch pipe never rises above the ground elevation and will not impact the buildings. It should be noted that immediately upstream from the inlet into the arch storm drain that the hydraulic grade line is shown at 27.4. However, under the design conditions, there is a significant head loss at the entrance arch into the storm drain system.

Comment: "2. Also, does the enlargement of the bubbler structure impact the WSPG model. Please discuss."

Response: The enlargement of the bubbler structure was based on the overhead power line and required clearances and was not related to hydraulic issues. The enlargement of the bubbler did not impact the overflow elevations and does not impact the WSPG model.

Comment: "3. Why was the bubbler structure enlarged? It was an approved design so why was it increased in size? Please discuss."

Response: The bubbler structure as noted above was altered to meet requirements for clearance from the overhead power lines and it was not required for hydraulic reasons.

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

398.177X68

If you have any questions or need additional information, please do not hesitate to contact us at 804-2000.

Very truly yours,

G. C. WALLACE, INC.

Jerry E. Pruitt, P.E.
Vice President

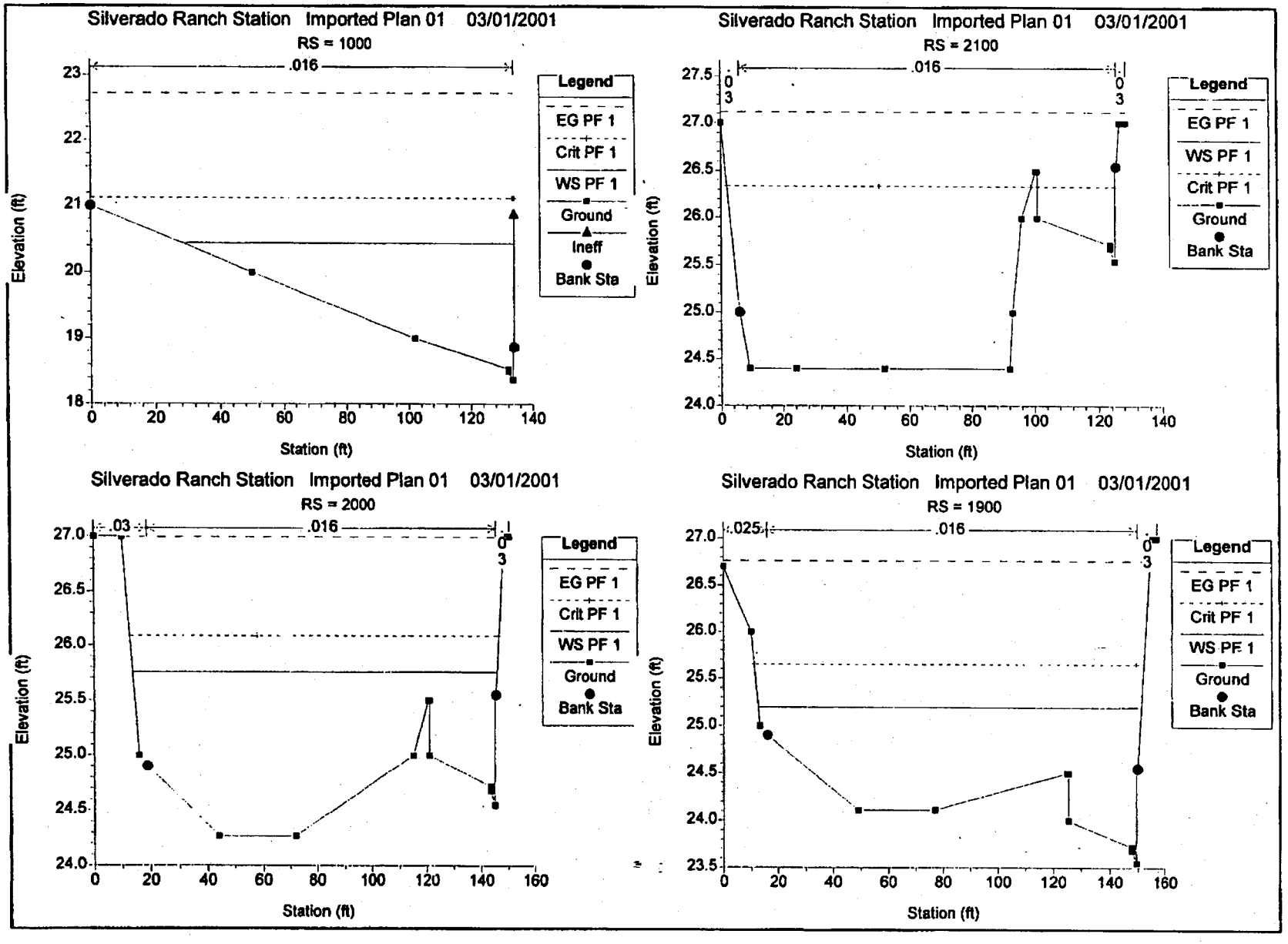
JEP:AT:jj

Encl.

pc: Calvin Black, GCW
Roy Clark, GCW

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-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
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2100	1300.00	24.40	26.34	26.34	27.12	0.003314	7.11	184.66	121.03	1.01
Reach-1	2000	1300.00	24.27	25.76	26.09	26.99	0.007949	8.95	147.35	132.20	1.48
Reach-1	1900	1300.00	23.55	25.19	25.65	26.76	0.012567	10.07	130.08	138.90	1.81
Reach-1	1800	1300.00	22.63	24.30	24.88	26.36	0.021040	11.53	113.10	141.59	2.27
Reach-1	1700	1300.00	21.83	23.41	24.07	25.80	0.023426	12.41	105.04	128.51	2.41
Reach-1	1600	1300.00	20.63	22.71	23.35	24.90	0.013126	11.88	109.79	92.22	1.91
Reach-1	1500	1300.00	20.66	22.55	23.21	24.70	0.012294	11.79	111.06	90.66	1.86
Reach-1	1400	1300.00	20.56	22.36	23.00	24.55	0.012731	11.90	110.37	91.17	1.89
Reach-1	1300	1300.00	20.18	21.90	22.54	24.09	0.012762	11.90	110.30	91.12	1.89
Reach-1	1200	1300.00	19.83	21.59	22.19	23.61	0.011159	11.39	114.16	88.50	1.77
Reach-1	1100	1300.00	19.40	21.66	22.13	23.32	0.008331	10.34	126.29	126.11	1.57
Reach-1	1000	1300.00	18.37	20.44	21.13	22.72	0.017186	12.12	107.25	105.83	2.12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WS PF 1
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Bank Sta
Elevation (ft)
Station (ft)
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Bank Sta
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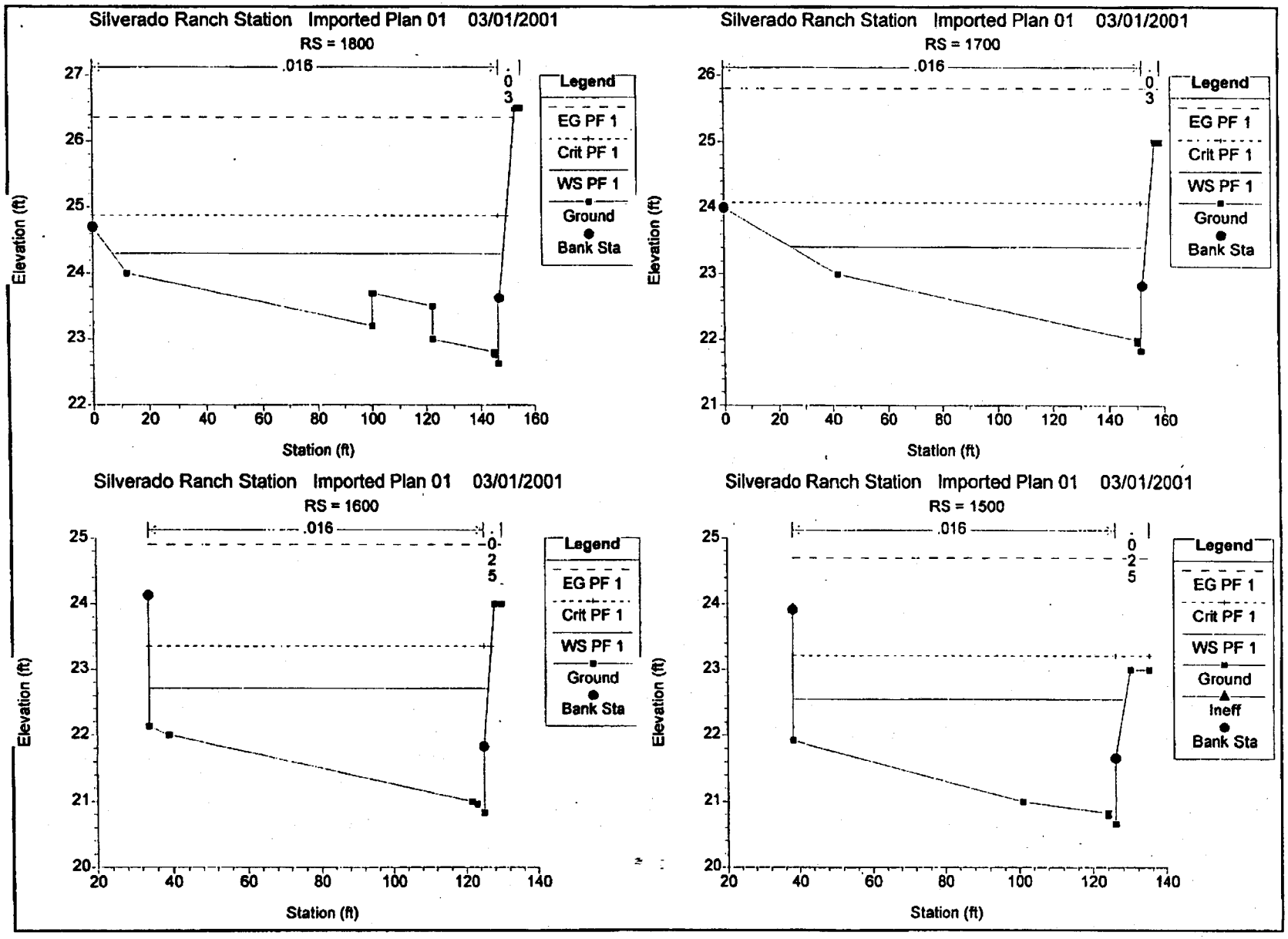
Station (ft)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Crit PF 1
WS PF 1
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Station (ft)
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2
5
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Crit PF 1
WS PF 1
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Station (ft)
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Crit PF 1
WS PF 1
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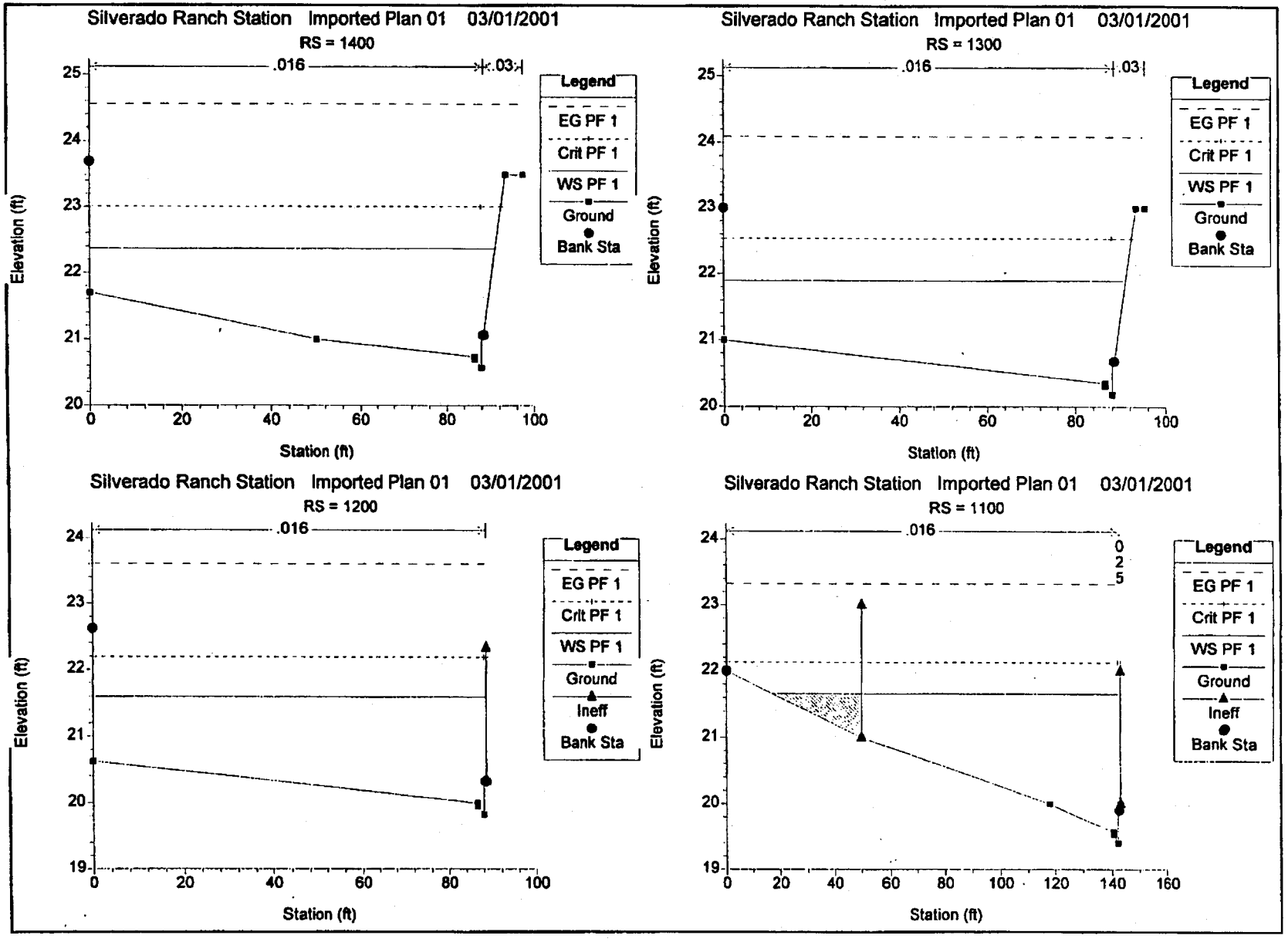
Ineff
Bank Sta
Elevation (ft)
Station (ft)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Crit PF 1
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Station (ft)
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.03
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Crit PF 1
WS PF 1
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Bank Sta
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Station (ft)
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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Silverado Ranch Station Imported Plan 01 03/01/2001
RS = 1100
.016
0
2
5
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

HEC-RAS September 1998 Version 2.2
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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PROJECT DATA
Project Title: Silverado Ranch Station
Project File : revised228.prj
Run Date and Time: 03/01/2001 9:27:12 AM

Project in English units

Project Description:
Rev. Date 2/28/01

SILVERADO RANCH STATION (398.177X)

PLAN DATA

Plan Title: Imported Plan 01
Plan File : f:\398-177\Drainage\update-ph2\hecras\revised228.p01

Geometry Title: revised2-27
Geometry File : f:\398-177\Drainage\update-ph2\hecras\revised228.g01

Flow Title : Imported Flow 01
Flow File : f:\398-177\Drainage\update-ph2\hecras\revised228.f01

Plan Summary Information:
Number of: Cross Sections = 12 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

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

OW DATA

ow Title: Imported Flow 01
low File : f:\398-177\Drainage\update-ph2\hecras\revised228.f01

Flow Data (cfs)

River	Reach	RS	PF 1
RIVER-1	Reach-1	2100	1300

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	PF 1	Known WS = 27.35	Critical

GEOMETRY DATA

Geometry Title: revised2-27
Geometry File : f:\398-177\Drainage\update-ph2\hecras\revised228.g01

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 *RS: 2100*

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	27	6	25	9	24.4	24	24.4	52	24.4
92	24.4	93	25	96	26	100.5	26.5	101	26.5
101	26	123.5	25.72	123.5	25.68	125	25.55	125	26.55
125.5	26.55	126.5	27	128.5	27				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	6	.016	125.5	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
6	125.5	16	16	17	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	27.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.	0.030	0.016	
W.S. Elev (ft)	26.34	Reach Len. (ft)	16.00	16.00	17.00
Crit W.S. (ft)	26.34	Flow Area (sq ft)	2.68	181.98	
E.G. Slope (ft/ft)	0.003314	Area (sq ft)	2.68	181.98	
Q Total (cfs)	1300.00	Flow (cfs)	5.63	1294.37	
Top Width (ft)	121.03	Top Width (ft)	4.01	117.02	
Vel Total (ft/s)	7.04	Avg. Vel. (ft/s)	2.10	7.11	
Max Chl Dpth (ft)	1.94	Hydr. Depth (ft)	0.67	1.56	
Conv. Total (cfs)	22581.8	Conv. (cfs)	97.7	22484.0	
Length Wtd. (ft)	16.00	Wetted Per. (ft)	4.22	118.59	
Min Ch El (ft)	24.40	Shear (lb/sq ft)	0.13	0.32	
Alpha	1.02	Stream Power (lb/ft s)	0.28	2.26	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.00	0.80	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.74	0.01

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.
Warning: Divided flow computed for this cross-section.
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.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 2000

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	27	10	27	16	25	19	24.9	44	24.27
72	24.27	115	25	120.5	25.5	121	25.5	121	25
143.5	24.72	143.5	24.68	145	24.55	145	25.55	145.5	25.55
148.5	27	150.5	27						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	19	.016	145.5	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
19	145.5	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	26.99	Element			
Vel Head (ft)	1.24	Wt. n-Val.	0.030	0.016	0.030
W.S. Elev (ft)	25.76	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	26.09	Flow Area (sq ft)	3.28	144.03	0.04
E.G. Slope (ft/ft)	0.007949	Area (sq ft)	3.28	144.03	0.04
Q Total (cfs)	1300.00	Flow (cfs)	10.38	1289.58	0.04
Top Width (ft)	132.20	Top Width (ft)	5.27	126.50	0.43
Vel Total (ft/s)	8.82	Avg. Vel. (ft/s)	3.17	8.95	0.91
Max Chl Dpth (ft)	1.49	Hydr. Depth (ft)	0.62	1.14	0.10
Conv. Total (cfs)	14580.9	Conv. (cfs)	116.5	14464.0	0.4
Length Wtd. (ft)	20.00	Wetted Per. (ft)	5.39	128.08	0.47
Min Ch El (ft)	24.27	Shear (lb/sq ft)	0.30	0.56	0.05
Alpha	1.02	Stream Power (lb/ft s)	0.96	5.00	0.04
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.00	0.74	0.00
C & E Loss (ft)	0.05	Cum SA (acres)	0.00	0.70	0.01

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: RIVER-1
REACH: Reach-1 RS: 1900

IPUT
escription:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	26.7	10	26	13	25	16	24.9	49	24.11
77	24.11	125	24.5	125.5	24.5	125.5	24	148	23.72
148	23.68	149.5	23.55	149.5	24.55	150	24.55	155	27
157	27								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	16	.016	150	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
16	150	25	22	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	26.76	Element			
Vel Head (ft)	1.57	Wt. n-Val.	0.025	0.016	0.030
W.S. Elev (ft)	25.19	Reach Len. (ft)	25.00	22.00	20.00
Crit W.S. (ft)	25.65	Flow Area (sq ft)	0.79	128.86	0.42
E.G. Slope (ft/ft)	0.012567	Area (sq ft)	0.79	128.86	0.42
Q Total (cfs)	1300.00	Flow (cfs)	1.91	1297.06	1.03
Top Width (ft)	138.90	Top Width (ft)	3.58	134.00	1.32
Vel Total (ft/s)	9.99	Avg. Vel. (ft/s)	2.42	10.07	2.43
Max Chl Dpth (ft)	1.64	Hydr. Depth (ft)	0.22	0.96	0.32
Conv. Total (cfs)	11596.4	Conv. (cfs)	17.0	11570.2	9.2
Length Wtd. (ft)	22.00	Wetted Per. (ft)	3.62	135.56	1.46
Min Ch El (ft)	23.55	Shear (lb/sq ft)	0.17	0.75	0.23
Alpha	1.01	Stream Power (lb/ft s)	0.41	7.51	0.55
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.00	0.68	0.00
C & E Loss (ft)	0.03	Cum SA (acres)	0.00	0.64	0.01

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1800

IPUT

:scription:
:tation Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	24.7	12	24	100	23.2	100	23.7	100.5	23.7
122.5	23.5	122.5	23	145	22.8	145	22.76	146.5	22.63
146.5	23.63	147	23.63	153	26.5	155	26.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	147	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	147	24	24	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	26.36	Element			
Vel Head (ft)	2.06	Wt. n-Val.		0.016	0.030
W.S. Elev (ft)	24.30	Reach Len. (ft)	24.00	24.00	24.00
Crit W.S. (ft)	24.88	Flow Area (sq ft)		112.62	0.47
E.G. Slope (ft/ft)	0.021040	Area (sq ft)		112.62	0.47
Q Total (cfs)	1300.00	Flow (cfs)		1298.47	1.53
Top Width (ft)	141.59	Top Width (ft)		140.18	1.41
Vel Total (ft/s)	11.49	Avg. Vel. (ft/s)		11.53	3.24
Max Chl Dpth (ft)	1.67	Hydr. Depth (ft)		0.80	0.34
Conv. Total (cfs)	8962.2	Conv. (cfs)		8951.7	10.6
Length Wtd. (ft)	24.00	Wetted Per. (ft)		142.24	1.56
Min Ch El (ft)	22.63	Shear (lb/sq ft)		1.04	0.40
Alpha	1.00	Stream Power (lb/ft s)		11.99	1.29
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)		0.62	0.00
C & E Loss (ft)	0.05	Cum SA (acres)		0.57	0.01

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1700

INPUT
escription:
tation Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	24	42	23	150	22	150	21.96	151.5	21.83
151.5	22.83	152	22.83	156.4	25	158.4	25		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	152	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	152	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	25.80	Element			
Vel Head (ft)	2.39	Wt. n-Val.		0.016	0.030
W.S. Elev (ft)	23.41	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	24.07	Flow Area (sq ft)		104.69	0.34
E.G. Slope (ft/ft)	0.023426	Area (sq ft)		104.69	0.34
Q Total (cfs)	1300.00	Flow (cfs)		1298.93	1.07
Top Width (ft)	128.51	Top Width (ft)		127.33	1.18
Vel Total (ft/s)	12.38	Avg. Vel. (ft/s)		12.41	3.10
Max Chl Dpth (ft)	1.58	Hydr. Depth (ft)		0.82	0.29
Conv. Total (cfs)	8493.6	Conv. (cfs)		8486.6	7.0
Length Wtd. (ft)	50.00	Wetted Per. (ft)		128.38	1.32
Min Ch El (ft)	21.83	Shear (lb/sq ft)		1.19	0.38
Alpha	1.00	Stream Power (lb/ft s)		14.80	1.18
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)		0.56	0.00
C & E Loss (ft)	0.03	Cum SA (acres)		0.50	0.01

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1600

INPUT
Description:
tation Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

34	24.13	34	22.13	39	22	121.5	21	123	20.96
125	20.83	125	21.83	128	24	130	24		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
34	.016	34	.016	125	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
34	125	16	16	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	24.90	Element		0.016	0.025
Vel Head (ft)	2.19	Wt. n-Val.		16.00	16.00
W.S. Elev (ft)	22.71	Reach Len. (ft)	16.00	109.26	0.54
Crit W.S. (ft)	23.35	Flow Area (sq ft)		109.26	0.54
E.G. Slope (ft/ft)	0.013126	Area (sq ft)		1298.17	1.83
Q Total (cfs)	1300.00	Flow (cfs)		91.00	1.22
Top Width (ft)	92.22	Top Width (ft)		11.88	3.42
Vel Total (ft/s)	11.84	Avg. Vel. (ft/s)		1.20	0.44
Max Chl Dpth (ft)	1.88	Hydr. Depth (ft)		11330.8	16.0
Conv. Total (cfs)	11346.8	Conv. (cfs)		92.59	1.50
Length Wtd. (ft)	16.00	Wetted Per. (ft)		0.97	0.29
Min Ch El (ft)	20.83	Shear (lb/sq ft)		11.49	1.00
Alpha	1.01	Stream Power (lb/ft s)		0.43	0.00
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)		0.37	0.00
C & E Loss (ft)	0.06	Cum SA (acres)			

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1500

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
38	23.92	38	21.92	101	21	124	20.83	124	20.79
126	20.66	126	21.66	130	23	135	23		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
38	.016	38	.016	126	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
38	126	10	10	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
38	38	23.92

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	24.70	Element		0.016	0.025
Vel Head (ft)	2.15	Wt. n-Val.		10.00	10.00
W.S. Elev (ft)	22.55	Reach Len. (ft)	10.00	109.88	1.18
Crit W.S. (ft)	23.21	Flow Area (sq ft)		109.88	1.18
E.G. Slope (ft/ft)	0.012294	Area (sq ft)		1295.62	4.38
Q Total (cfs)	1300.00	Flow (cfs)		88.00	2.66
Top Width (ft)	90.66	Top Width (ft)		11.79	3.71
Vel Total (ft/s)	11.70	Avg. Vel. (ft/s)		1.25	0.44
Max Chl Dpth (ft)	1.89	Hydr. Depth (ft)		11685.0	39.5
Conv. Total (cfs)	11724.4	Conv. (cfs)		89.68	2.80
Length Wtd. (ft)	10.00	Wetted Per. (ft)		0.94	0.32
Min Ch El (ft)	20.66	Shear (lb/sq ft)		11.09	1.20
Alpha	1.01	Stream Power (lb/ft s)		0.39	0.00
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)		0.34	0.00
C & E Loss (ft)	0.02	Cum SA (acres)			

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1400

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23.7	0	21.7	50	21	86.5	20.73	86.5	20.69

88	20.56	88	21.06	88.5	21.06	93.5	23.5	97.5	23.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	88.5	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	88.5	35	35	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	24.55	Element			
Vel Head (ft)	2.19	Wt. n-Val.		0.016	0.030
W.S. Elev (ft)	22.36	Reach Len. (ft)	35.00	35.00	35.00
Crit W.S. (ft)	23.00	Flow Area (sq ft)		108.63	1.74
E.G. Slope (ft/ft)	0.012731	Area (sq ft)		108.63	1.74
Q Total (cfs)	1300.00	Flow (cfs)		1293.19	6.81
Top Width (ft)	91.17	Top Width (ft)		88.50	2.67
Vel Total (ft/s)	11.78	Avg. Vel. (ft/s)		11.90	3.91
Max Chl Dpth (ft)	1.80	Hydr. Depth (ft)		1.23	0.65
Conv. Total (cfs)	11521.7	Conv. (cfs)		11461.4	60.4
Length Wtd. (ft)	35.00	Wetted Per. (ft)		89.72	2.97
Min Ch El (ft)	20.56	Shear (lb/sq ft)		0.96	0.47
Alpha	1.02	Stream Power (lb/ft s)		11.46	1.82
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)		0.37	0.00
C & E Loss (ft)	0.01	Cum SA (acres)		0.32	0.00

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1300

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	23	0	21	86.5	20.35	86.5	20.31	88	20.18
88	20.68	88.5	20.68	93.5	23	95.5	23		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	88.5	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	88.5	36	36	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	24.09	Element			
Vel Head (ft)	2.19	Wt. n-Val.		0.016	0.030
W.S. Elev (ft)	21.90	Reach Len. (ft)	36.00	36.00	36.00
Crit W.S. (ft)	22.54	Flow Area (sq ft)		108.70	1.59
E.G. Slope (ft/ft)	0.012762	Area (sq ft)		108.70	1.59
Q Total (cfs)	1300.00	Flow (cfs)		1294.00	6.00
Top Width (ft)	91.12	Top Width (ft)		88.50	2.62
Vel Total (ft/s)	11.79	Avg. Vel. (ft/s)		11.90	3.76
Max Chl Dpth (ft)	1.72	Hydr. Depth (ft)		1.23	0.61
Conv. Total (cfs)	11507.5	Conv. (cfs)		11454.4	53.1
Length Wtd. (ft)	36.00	Wetted Per. (ft)		89.94	2.89
Min Ch El (ft)	20.18	Shear (lb/sq ft)		0.96	0.44
Alpha	1.02	Stream Power (lb/ft s)		11.46	1.65
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)		0.28	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		0.25	0.00

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1200

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	22.62	0	20.62	86.5	20	86.5	19.96	88	19.83
88	20.33	88.5	20.33						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.016	0	.016	88.5	.03

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	88.5	19	19	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
88.5	88.5	22.33

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	23.61	Element			
Vel Head (ft)	2.01	Wt. n-Val.		0.016	
W.S. Elev (ft)	21.59	Reach Len. (ft)	19.00	19.00	19.00
Crit W.S. (ft)	22.19	Flow Area (sq ft)		114.16	
E.G. Slope (ft/ft)	0.011159	Area (sq ft)		114.16	
Q Total (cfs)	1300.00	Flow (cfs)		1300.00	
Top Width (ft)	88.50	Top Width (ft)		88.50	
Vel Total (ft/s)	11.39	Avg. Vel. (ft/s)		11.39	
Max Chl Dpth (ft)	1.76	Hydr. Depth (ft)		1.29	
Conv. Total (cfs)	12306.2	Conv. (cfs)		12306.2	
Length Wtd. (ft)	19.00	Wetted Per. (ft)		91.28	
Min Ch El (ft)	19.83	Shear (lb/sq ft)		0.87	
Alpha	1.00	Stream Power (lb/ft s)		9.92	
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)		0.19	0.00
C & E Loss (ft)	0.05	Cum SA (acres)		0.17	0.00

Warning: The cross-section end points had to be extended vertically for the computed water surface.
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.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1100

INPUT
scription:
ation Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	22	50	21	118	20	140.5	19.57	140.5	19.53
142	19.4	142	19.9	142.5	19.9	143	20		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	142.5	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	142.5	48	48	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	50	23	143	143	22

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	23.32	Element			
Vel Head (ft)	1.66	Wt. n-Val.		0.016	0.025
W.S. Elev (ft)	21.66	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)	22.13	Flow Area (sq ft)		125.44	0.86
E.G. Slope (ft/ft)	0.008331	Area (sq ft)		136.40	0.86
Q Total (cfs)	1300.00	Flow (cfs)		1297.50	2.50
Top Width (ft)	126.11	Top Width (ft)		125.61	0.50
Vel Total (ft/s)	10.29	Avg. Vel. (ft/s)		10.34	2.92
Max Chl Dpth (ft)	2.26	Hydr. Depth (ft)		1.36	1.71
Conv. Total (cfs)	14242.9	Conv. (cfs)		14215.5	27.4
Length Wtd. (ft)	48.00	Wetted Per. (ft)		93.06	2.17
Min Ch El (ft)	19.40	Shear (lb/sq ft)		0.70	0.20
Alpha	1.01	Stream Power (lb/ft s)		7.25	0.60
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)		0.13	0.00
C & E Loss (ft)	0.11	Cum SA (acres)		0.13	0.00

Warning: The cross-section end points had to be extended vertically for the computed water surface.
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.
te: Multiple critical depths were found at this location. The critical depth with the lowest, valid,

water surface was used.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 1000

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	21	50	20	102	19	132	18.54	132	18.5
133.5	18.37	133.5	18.87	134	18.87				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	0	.016	134	.025

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	134	0	0	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
134	134	20.87

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	22.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.28	Wt. n-Val.		0.016	
W.S. Elev (ft)	20.44	Reach Len. (ft)			
Crit W.S. (ft)	21.13	Flow Area (sq ft)		107.25	
E.G. Slope (ft/ft)	0.017186	Area (sq ft)		107.25	
Q Total (cfs)	1300.00	Flow (cfs)		1300.00	
Top Width (ft)	105.83	Top Width (ft)		105.83	
Vel Total (ft/s)	12.12	Avg. Vel. (ft/s)		12.12	
Max Chl Dpth (ft)	2.07	Hydr. Depth (ft)		1.01	
Conv. Total (cfs)	9916.4	Conv. (cfs)		9916.4	
Length Wtd. (ft)		Wetted Per. (ft)		107.96	
Min Ch El (ft)	18.37	Shear (lb/sq ft)		1.07	
Alpha	1.00	Stream Power (lb/ft s)		12.92	
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)			
C & E Loss (ft)	0.06	Cum SA (acres)			

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
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.

SUMMARY OF MANNING'S N VALUES

River:RIVER-1

Reach	River Sta.	n1	n2	n3
Reach-1	2100	.03	.016	.03
Reach-1	2000	.03	.016	.03
Reach-1	1900	.025	.016	.03
Reach-1	1800	.016	.016	.03
Reach-1	1700	.016	.016	.03
Reach-1	1600	.016	.016	.025
Reach-1	1500	.016	.016	.025
Reach-1	1400	.016	.016	.03
Reach-1	1300	.016	.016	.03
Reach-1	1200	.016	.016	.03
Reach-1	1100	.016	.016	.025
Reach-1	1000	.016	.016	.025

SUMMARY OF REACH LENGTHS

iver: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	2100	16	16	17
Reach-1	2000	20	20	20
Reach-1	1900	25	22	20
Reach-1	1800	24	24	24
Reach-1	1700	50	50	50
Reach-1	1600	16	16	16
Reach-1	1500	10	10	10
Reach-1	1400	35	35	35
Reach-1	1300	36	36	36
Reach-1	1200	19	19	19
Reach-1	1100	48	48	48
Reach-1	1000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEPPICIENTS
River: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	2100	.1	.3
Reach-1	2000	.1	.3
Reach-1	1900	.1	.3
Reach-1	1800	.1	.3
Reach-1	1700	.1	.3
Reach-1	1600	.1	.3
Reach-1	1500	.1	.3
Reach-1	1400	.1	.3
Reach-1	1300	.1	.3
Reach-1	1200	.1	.3
Reach-1	1100	.1	.3
Reach-1	1000	.1	.3

Profile Output Table - Standard 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)	Vel Chnl (ft/ft)	Flow Area (ft/s)	Top Width (sq ft)	Froude # Chl (ft)
Reach-1	2100	1300.00	24.40	26.34	26.34	27.12	0.003314	7.11	184.66	121.03	1.01
Reach-1	2000	1300.00	24.27	25.76	26.09	26.99	0.007949	8.95	147.35	132.20	1.48
Reach-1	1900	1300.00	23.55	25.19	25.65	26.76	0.012567	10.07	130.08	138.90	1.81
Reach-1	1800	1300.00	22.63	24.30	24.88	26.36	0.021040	11.53	113.10	141.59	2.27
Reach-1	1700	1300.00	21.83	23.41	24.07	25.80	0.023426	12.41	105.04	128.51	2.41
Reach-1	1600	1300.00	20.83	22.71	23.35	24.90	0.013126	11.88	109.79	92.22	1.91
Reach-1	1500	1300.00	20.66	22.55	23.21	24.70	0.012294	11.79	111.06	90.66	1.86
Reach-1	1400	1300.00	20.56	22.36	23.00	24.55	0.012731	11.90	110.37	91.17	1.89
Reach-1	1300	1300.00	20.18	21.90	22.54	24.09	0.012762	11.90	110.30	91.12	1.89
Reach-1	1200	1300.00	19.83	21.59	22.19	23.61	0.011159	11.39	114.16	88.50	1.77
Reach-1	1100	1300.00	19.40	21.66	22.13	23.32	0.008331	10.34	126.29	126.11	1.57
Reach-1	1000	1300.00	18.37	20.44	21.13	22.72	0.017186	12.12	107.25	105.83	2.12

DATE

CLIENT JOB NO. CALC. BY

DESCRIPTION RATIONAL METHOD (MODIFIED) CHECKED BY

AREA = 0.45 Ac.

C_{10} = 0.88

C_{100} = 0.89

I_{10} = 4.2

I_{100} = 7.56

$Q = 0.5 C I A$

$Q_{10} = (0.5)(0.88)(4.2)(0.45) = 0.8$ CFS

$Q_{100} = (0.5)(0.89)(7.56)(0.45) = 1.5$ CFS

EN-3-N
3/66

SHEET ____ OF ____

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

Modified Type C Drop Inlet Sizing in a Sump

Type "B" Inlet at PTA

Known:

D_p=	Ponding depth at inlet (ft)	0.2
W=	Gutter Width (ft)	1.50
L_g=	Length of grate (ft)	3.00
L_c=	Length of curb opening (ft)	2.50
H_c=	Curb opening height (ft)	0.547
C_{wc}=	Weir coefficient for curb opening	2.3
C_{wg}=	Weir coefficient for grate	3.0
C_o=	Orifice coefficient	0.67
R_o=	Grate opening factor	0.60
C_g=	Clogging factor for grate (%)	50
C_c=	Clogging factor for curb opening (%)	50

Grate Capacity Calculations

P_g=	Active grate weir length (agwl) = 2*W+L_g (ft)	6.00
P_{agl}=	Adjusted agwl = 2*(1-C_g/100)*W+L_g (ft)	4.50
A_g=	Grate area = W*L_g (ft^2)	4.50
A_{aga}=	Adjusted open grate area = A_g*R_o*(1-C_g/100) (ft^2)	1.35
C=	check - If D_p<1.792*A_{ag}/P_{ag}; weir; else orifice	weir
Q_g=	Flow intercepted by grate (cfs)	1.2

If "weir" controls $Q_g = C_{wg} * P_{agl} * D_p^{1.5}$

If "orifice" controls $Q_g = C_o * A_{aga} * (64.4 * D_p)^{0.5}$

Curb Opening Capacity Calculations

P_c=	Active curb opening weir length (acowl) = L_c+1.8*W (ft)	5.20
P_{acl}=	Adjusted acowl = L_c+1.8*(1-C_c/100)*W (ft)	3.85
A_c=	curb opening area (coa) = L_c*H_c (ft^2)	1.37
A_{aca}=	Adjusted coa = A_c*(1-C_c/100) (ft^2)	0.68
C=	check - If D_p<H_c; weir; else orifice	weir
Q_c=	Flow int'd by curb opening (cfs)	0.8

If "weir" controls $Q_c = C_{wc} * P_{acl} * D_p^{1.5}$

If "orifice" controls $Q_c = C_o * A_{aca} * (64.4 * D_p - H_c/2)^{0.5}$

Total Inlet Calculations

Q_t=	Total flow intercepted = Q_g+Q_c (cfs)	2.0
q=	Interception per unit length = Q_t/L_g (cfs/ft)	0.7

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	18" HDPE
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Input Data		
Mannings Coefficien	0.013	
Slope	.020000	ft/ft
Diameter	18	in
Discharge	2.00	cfs

Results		
Depth	0.37	ft
Flow Area	0.3	ft²
Wetted Perimeter	1.56	ft
Top Width	1.30	ft
Critical Depth	0.53	ft
Percent Full	24.8	%
Critical Slope	0.004941	ft/ft
Velocity	5.86	ft/s
Velocity Head	0.53	ft
Specific Energy	0.91	ft
Froude Number	2.01	
Maximum Discha	15.98	cfs
Discharge Full	14.85	cfs
Slope Full	0.000363	ft/ft
Flow Type	Supercritical	

© Haestad Methods, Inc.
G.C. Wallace, Inc.
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

DATE 3/1/01

CLIENT SILVERADO RANCH STATION JOB NO. 398-177 CALC. BY J.P.

DESCRIPTION BUBBLER WEIR FLOW CALC CHECKED BY

WATER SURFACE ELEVATION REQUIRED

27.35 (FROM SF6)

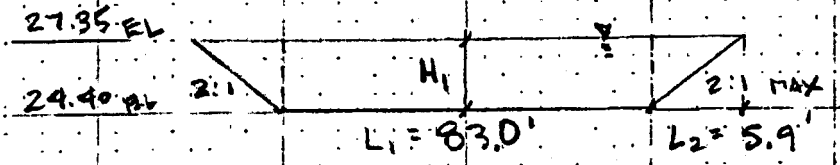
$Q = C L H^{3/2}$; $C = 3.0$

$L_1 = 83'$; $L_2 = 2(2.95') = 5.9'$

$H_1 = 27.35 - 24.40 = 2.95'$

$H_2 = H_1/2$

WEIR SECTION



$Q_1 = C L_1 H_1^{3/2} = (3.0)(83.0)(2.95)^{3/2} \approx 1262$ cfs

$Q_2 = C L_2 H_2^{3/2} = (3.0)(5.9)(2.95/2)^{3/2} \approx 32$ cfs

$Q_{TOT} \approx Q_1 + 2Q_2 \approx 1326$ cfs $\approx$ 1300 cfs

SHEET ____ OF ____

EN-3-N
3/66

G.C. WALLACE, INC.
Engineering/Architecture

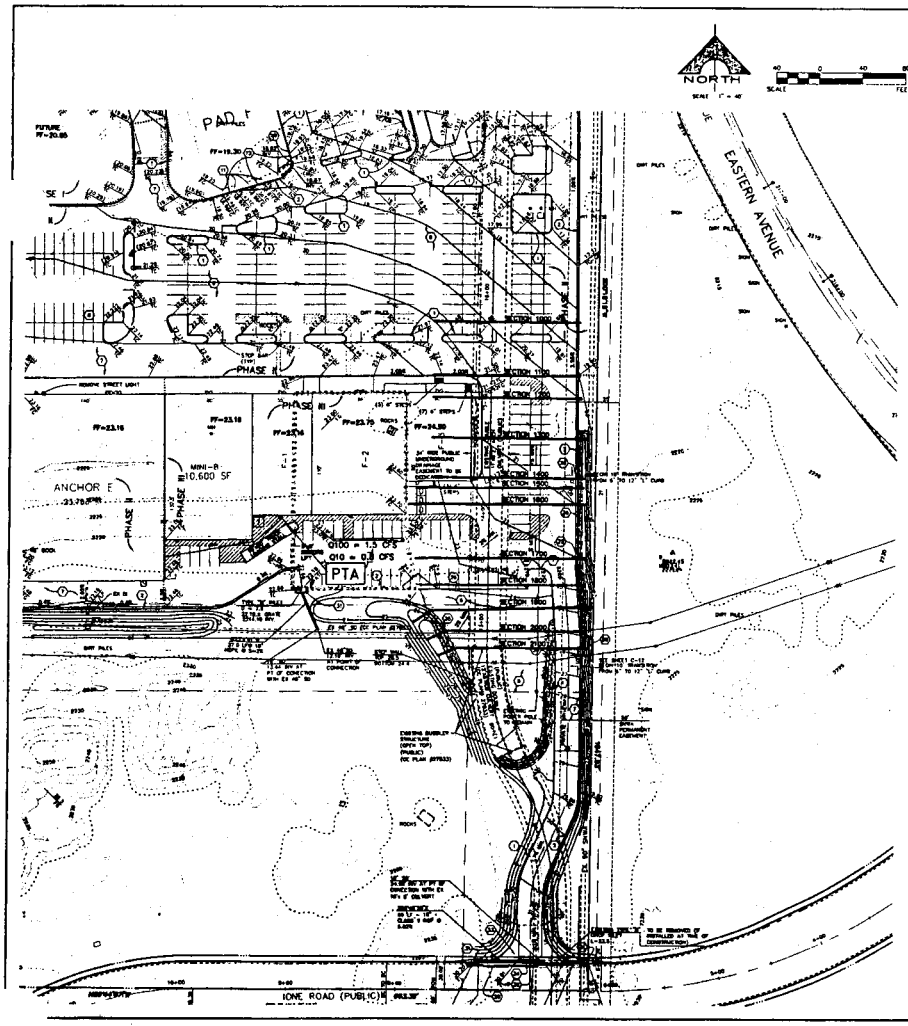
Storm Drain Hydraulic Calculations

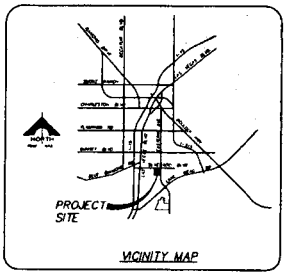
G.C. Wallace, Inc. — Silverado Ranch Station Hydraulic Analysis Interim Conditions — DATE: 03/01/01 — FILE: culvert.wb3

Storm Drain Manning's n (typ=0.013) = 0.013 | Inlet Structure Type or K_i = 4 | Wingwalls parallel (extension of sides); Square edged at crown

	CONDUIT DATA										FLOW DATA								ENERGY LOSS DATA																				EGL & HGL				COMMENTS	
																			PIPE	TRANSITION																								
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	$V^2/2g$	S_f	Ave.	Frict	Fric	Manhole			Junction			Contraction/Inlet			Expansion/Outlet			Bend				Misc		PIPE		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S												θ	K_{mh}	H_{mh}	θ	K_j	H_j	Inlet/	K_i	H_c	θ	K_o	H_e	R_{bend}	θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CTRL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	H_t (ft)	(deg)		(ft)	(deg)		(ft)	Cont			(deg)		(ft)	(deg)		(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		3263.92		72						194.96																			Outlet Ko=	2.0											196.31	199.96		
2	3263.92	2405.47	R	72					4	194.96	199.21	858.5	1.66%	113.09	0.0049	2100	18.57	5.35	0.0154	0.0154	13.20																	0.00	210.56	205.21			FULL	D/S
3	2405.47	2375.47	T		14	6			2	199.21	199.71	30.0	1.67%	168.00	0.0049	2100	12.50	2.43	0.0018	0.0086		0.26						cont	0.11	0.59								0.97	1.82			212.38	209.95	FULL	U/S
4	2375.47	2360.47	T		11	8.17	80.1	1.96	3	199.71	199.86	15.0	1.00%	120.20	0.0049	2100	17.47	4.74	0.0095	0.0057		0.08									12	0.18	0.07						0.15			212.53	207.79	FULL	U/S
5	2360.47	2159.50	R		11	8.17	80.1	1.96	3	199.86	201.90	201.0	1.02%	120.20	0.0049	2100	17.47	4.74	0.0095	0.0095	1.92																	0.00	214.45	209.71			FULL	U/S
6	2159.50	2154.50	T		11	8.17	80.1	1.96	3	201.90	202.06	5.0	1.20%	120.20	0.0049	2100	17.47	4.74	0.0095	0.0095		0.05	0	0.02	0.09														0.14			214.59	209.85	FULL	U/S
7	2154.50	1923.94	R		11	8.17	80.1	1.96	3	201.96	204.30	230.6	1.01%	120.20	0.0049	2100	17.47	4.74	0.0095	0.0095	2.20															20	15	0.10	0.48		0.48	216.79	212.05	217.28	212.54	FULL	U/S
8	1923.94	1760.23	R		11	8.17	80.1	1.96	2	204.30	205.96	163.7	1.01%	120.20	0.0049	2100	17.47	4.74	0.0095	0.0095	1.56																	0.00	218.84	214.10			FULL	U/S
9	1760.23	1755.23	T		11	8.17	80.1	1.96	2	205.96	206.02	5.0	1.10%	120.20	0.0049	2100	17.47	4.74	0.0095	0.0095		0.05	0	0.02	0.09												20	15	0.10	0.48	0.83			219.48	214.72	FULL	U/S
10	1755.23	1361.65	R		11	8.17	80.1	1.96	2	206.02	210.00	393.6	1.01%	120.20	0.0049	2100	17.47	4.74	0.0095	0.0095	3.75																	0.00	223.22	218.48			FULL	U/S
11	1361.65	1276.41	R		11	8.17	80.1	1.96	2	210.00	210.89	85.2	1.04%	120.20	0.0049	2100	17.47	4.74	0.0095	0.0095	0.81																	0.00	224.03	219.29			FULL	U/S
12	1276.41	1276.41			11	8.17	80.1	1.96	2	210.89	210.89	0.0		120.20	0.0049	2100	17.47	4.74	0.0095	0.0095									Ki=	0.70	3.32								3.32			227.35	227.35	FULL	U/S
13																																												
14																																												
15																																												

Date Printed: 01-Mar — File: culvert.wb3 — Version: 3.3





VICINITY MAP

GRADING NOTES

1. CONSTRUCT "A" TYPE CURB PER DETAIL 4 SHEET C-15
2. CONSTRUCT "L" TYPE CURB PER UBIDCA PUB. STD.
3. INSTALL BOLLARD AS PER DETAIL 8, SHEET C-15
4. CONSTRUCT CONCRETE CHANNEL PER DETAIL 9, SHEET C-15
5. CONSTRUCT THICKENED PAVEMENT EDGE
6. CONSTRUCT 3" AC PAVING OVER 4" TYPE II AGGREGATE BASE PER "A" DEMARCATION BOUNDARY PER DETAIL 1 SHEET C-29. SEE SOILS REPORT FOR MORE INFORMATION
7. CONSTRUCT 3" AC PAVING OVER 6" TYPE II AGGREGATE BASE PER "A" DEMARCATION BOUNDARY PER DETAIL 1 SHEET C-29. SEE SOILS REPORT FOR MORE INFORMATION
8. INSTALL HANDICAP SIGNAGE/PLAQUES AND PAINTING PER DETAIL 4 SHEET C-15
9. CONSTRUCT SIDEWALK ACCESS PER A.B.A.,A.I.B.C. REQ. SEE ARCH. PLANS FOR DETAILS
10. INSTALL SPEED BUMP
11. 6" TO 0" CURB TRANSITION
12. 6" CURB FLUSH WITH PAVEMENT
13. CONSTRUCT MODIFIED TYPE "C" DROP INLET. SEE DETAIL 10, SHEET C-15
14. INSTALL 24" RCP STORMDRAIN PIPE
15. CONSTRUCT CURB OPENING AND 60"-RAP CHANNEL PER DETAIL 1, SHEET C-16.
16. CONSTRUCT CHANNEL PER DETAIL 8, SHEET C-15.
17. CONSTRUCT 2' WIDE VALLEY GUTTER PER DETAILS 7 SHEET C-15
18. CONSTRUCT RETAINING WALL AS PER COUNTY STANDARD DETAIL AND ARCHITECTURAL PLANS.
19. CONSTRUCT L-CURB TRANSITION AS PER DETAIL 8, SHEET C-15
20. CONSTRUCT VALLEY GUTTER TRANSITION AS PER DETAIL 8, SHEET C-15
21. MATCH EXISTING
22. CONSTRUCT CONCRETE WALK AS PER DETAIL 8, SHEET C-15 AND THE ARCHITECTURAL PLANS
23. INSTALL 6" PVC DRAIN LINE - CAP 5' FROM BUILDING SUMP PUMP REQUIRED - SEE ARCH PLANS FOR DETAILS
24. CONSTRUCT CONCRETE HEADER AND UBIDCA CURB, SEE DETAIL
25. CONSTRUCT MODIFIED "L" (12") CURB PER DETAIL SHT. C-15
26. CONSTRUCT TYPE "B" CURB PER UBIDCA PUB. STD. WITH 8" END PACK EVERY 2'
27. CONSTRUCT CONCRETE WALK PER UBIDCA PUB. STD. FOR FUTURE RAMP
28. MATCH EXISTING AC PAVEMENT SECTION IN KIND
29. RAMP AND WALK
30. 4" TO 0" CURB TRANSITION
31. CONSTRUCT TYPE "B" DROP INLET PER UBIDCA PUB. STD.
32. CONSTRUCT MODIFIED TYPE "B" DROP INLET PER DETAIL 1 ON SHEET C-15
33. CONSTRUCT 8' CROSS GUTTER PER UBIDCA PUB. STD.
34. REMOVE EXISTING IMPROVEMENTS THAT INTERFERE WITH CONSTRUCTION OF DRIVEWAY ENTRANCES
35. INSTALL 60"-RAP SHEET MIN. 24" WIDE

ALL DIMENSIONS GIVEN ARE TO BACK OF CURB

DC = DESIGN GRADE
W = WATER
S = SEWER
G = GAS
SD = STORM DRAIN
SL = STREET LIGHT
SSMH = SEWER MANHOLE
SDMH = STORM DRAIN MANHOLE
CLV = CITY OF LAS VEGAS
LVVWD = LAS VEGAS VALLEY WATER DISTRICT
EX = EXISTING
FL = FLOW LINE
HP = HIGH POINT
R/W = RIGHT-OF-WAY
TC = TOP OF BACK OF CURB
FG = FINISHED GRADE
BCR = BEGIN CURB RETURN
DS = DOWN SPOUT
CCASD = CLARK COUNTY AREA STANDARD DRAWING
TG = TOP OF GRATE
BW = BACK OF WALK
FS = FINISH SURFACE
NG = NATURAL GRADE
FF = FINISH FLOOR
GB = GRADE BREAK
CCPWSD = CLARK COUNTY PUBLIC WORKS STANDARD DRAWING
FUT = FUTURE
EP = EDGE OF PAVEMENT
TMH = TOP OF MANHOLE

180.50 EXIST ELEVATION
180.5 PROPOSED ELEVATION
EXIST. SPOT ELEVATION
SUBDIVISION BOUNDARY
EASEMENT LINE
FUTURE LINE
STREET CENTERLINE
CONCRETE CURB & GUTTER
EXISTING IMPROVEMENTS
(2810) EXISTING GROUND CONTOUR LINES
2810 FINISH GROUND CONTOUR LINE
DRAINAGE FLOW LINE
BLOCK WALL
EXISTING BLOCK WALL
NO PARKING - RED CURB
EXISTING ROCK WALL
VISION RESTRICTION AREA

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTH LINE OF SAID SECTION 24, TOWNSHIP 21 SOUTH, RANGE 61 EAST, M.D.B.&M., SHOWN AS "SOUTH 89°36'11" WEST ON THE MAP RECORDED IN BOOK 45 OF SURVEY ON FILE IN FILE NO. 3405 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA

BENCHMARK

CLARK COUNTY BENCHMARK "NC21 2040" BRASS CAP STATE HIGHWAY MARKER, STAMPED "STH 60177+83.76 POT, 13.73' RT." LOCATED 250 FT EAST OF P.I. OF EASTERN AVE AND IONE ROAD, 1.5 MILES NORTH OF P.I. OF CLARK COUNTY VERTICAL CONTROL, NAD 83 1994 SE A, EPOCH 0002

RANGE ELEVATION = 699.680 METERS
RANGE ELEVATION = 2294.600 FEET

HEC2 HYDRAULIC MODEL SUMMARY

CROSS SECTION	Q (CFS)	INV (FT)	WSE (FT)	D (FT)
2100	1300	24.4	26.6	2.2
2000	1300	24.0	26.3	2.3
1900	1300	23.9	25.6	2.0
1800	1300	22.6	24.2	1.6
1700	1300	21.8	23.4	1.6
1600	1300	20.8	22.7	1.9
1500	1300	20.7	22.5	1.8
1400	1300	20.6	22.3	1.7
1300	1300	20.2	21.9	1.7
1200	1300	19.8	21.9	2.1
1100	1300	19.4	21.6	2.2
1000	1300	18.4	20.4	2.0

Call before you Dig 1-800-227-2600

1-702-393-6111

NOTE

THE SPECIFIC RETAINING WALL TYPE SHALL BE PER STANDARD CLARK COUNTY DETAILS. ALL RETAINING WALL SECTION STRUCTURAL CALCS. & SOILS REPORT SHALL BE SUBMITTED TO CLARK COUNTY BUILDING DEPARTMENT FOR REVIEW AND APPROVAL PRIOR TO WALL CONSTRUCTION PERMIT ISSUANCE

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Acceptance of plans for filing

By _____

Acceptance of these plans by the Director of Public Works or County Engineer shall not relieve the Engineer of Record of the responsibility for the design of the improvements. Prior to acceptance of these plans, the Engineer of Record shall submit a certification that the improvements have been designed in accordance with the approved drainage study.

NOTE: Permit plans valid for other building structures, but no structural footings beyond 24" below natural grade. Separate Grading Permit is required for any grading beyond the limits of the building footprint.

G.C. WALLACE, INC.
Engineering/Architecture
SUITE 200 (702) 364-2100
LAS VEGAS, NEVADA 89107 FAX (702) 364-2121

AID BAKER REAL ESTATE, L.L.C.
SILVERADO RANCH STATION - PHASE 2

EXHIBIT 1

SHEET
EX-1
OF 10 SHTS

ISSUE DATE

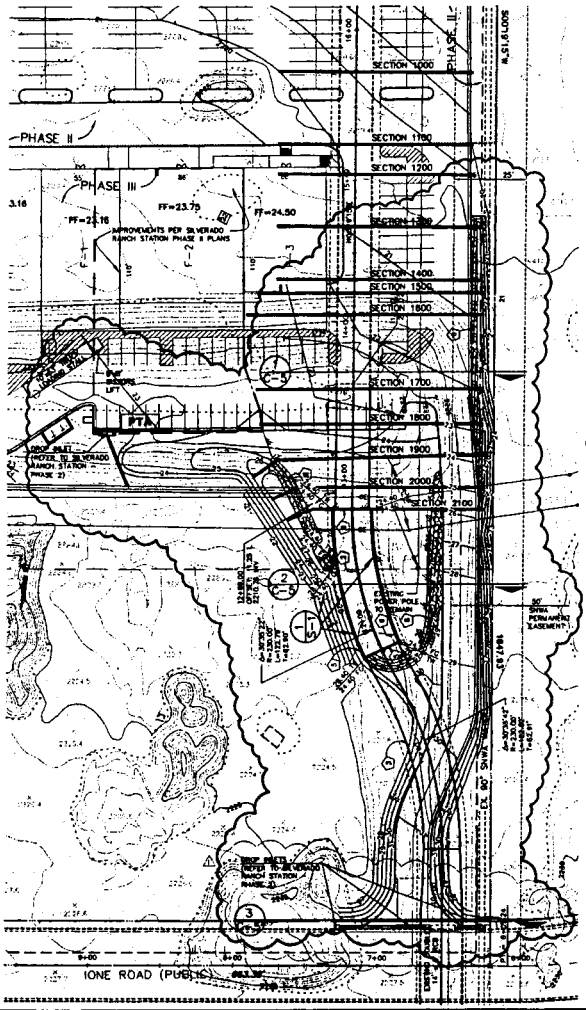
01-1517 UP

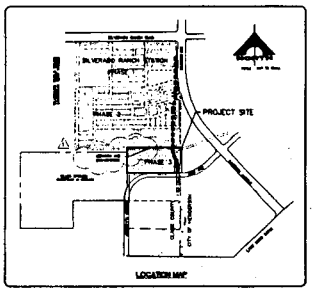
NORTH
SCALE 1"=30'
GRAPHIC SCALE
(IN FEET)
1 inch = 30 ft.
CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
Acceptance of plans for filing
By
Acceptance of these plans for filing shall not be construed as an approval of the design contained herein or any of the engineering calculations upon which it is based by Clark County, the Director of Public Works and/or subordinates. Clark County shall not be held liable for improper design or inaccuracies that may be contained within these plans.
NOTE: Prior plans and/or other building permits not in proper location based on property lines/setbacks shall require up to relocation of no expense to Clark County.
PHASE II
PHASE III
PHASE I
SECTION 1000
SECTION 1100
SECTION 1200
SECTION 1300
SECTION 1400
SECTION 1500
SECTION 1600
SECTION 1700
SECTION 1800
SECTION 1900
SECTION 2000
SECTION 2100
FF=23.16
FF=23.79
FF=24.50
IMPROVEMENTS FROM SILVERADO RANCH STATION PHASE II PLANS
DEEPEN FOOTING
5' SIDEWALK LIFT
INLET TO CONNECT TO SILVERADO RANCH STATION (PHASE 2)
EXISTING POWER POLE TO REMAIN
50' SNWA PERMANENT EASEMENT
APPROX. LOCATION OF SNWA CATHODIC PROTECTION TEST STATION (BOX) ON BRASS WIRE
APPROX. LOCATION OF SNWA AIR RELEASE VALVE OUTLET (CTRL STL CAN) OR/WITH GOOSE NECK ON GRADE
APPROX. LOCATION OF SNWA CONC. VAULT (MANWAY ACCESS) W/ MANHOLE FRAME/COVER ON GRADE
APPROX. LOCATION OF SNWA RADIO WAVE REFLECTOR BARRIER ON GRADE
IONE ROAD (PUBLIC)
PROJECT SITE
LOCATION MAP
SNWA CONSTRUCTION NOTE
1. CONTRACTOR SHALL LOCATE AND PROTECT ALL SNWA/SNWS APPURTENANCES INCLUDING BUT NOT LIMITED TO AIR/VAC, ACCESS MANWAYS & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY SNWS AT (702) 862-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE IMPROVED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, ROOF-AS AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.
SNWA
DATE
CONSTRUCTION NOTES
1. CONSTRUCT 69.2+ L.F. OF 11' 0 X 7' 0" DOUBLE ELLIPTICAL ARCH BOX CULVERTS FROM SAC BUBBLER STRUCTURE TO THE EXISTING DOUBLE 11'0 X 7'-0" ELLIPTICAL ARCH BOX CULVERTS. SEE CON-ARCH PLANS.
2. CONSTRUCT 100 L.F. OF BUBBLER STRUCTURE. SEE STRUCTURAL PLANS FOR DETAILS.
3. CONSTRUCT 145±0 L.F. OF STANDARD NEVADA DEPT. OF TRANSPORTATION (NDOT) DOUBLE 12' X 8' REINFORCED CONCRETE BOX CULVERT ACCORDING TO NDOT STD DWG #0-261.3 (DETAIL 1, SHT C-3)
4. CONSTRUCT AC PAVEMENT PER SECTION 3, SHEET C-5.
5. FLOOD WALL OF BUBBLER TO EXTEND TO FINISH GRADE AT 29+ TRANSITION WALL ON SOUTH FROM 30+ 29.1 ON EAST. INSTALL 5' CHAIN LINK FENCE ON TOP OF WALL ON WEST & SOUTH SIDES.
6. EAST SIDE OF BUBBLER TO BE FLAT AT ELEVATION 21+ WITH METAL PICKET FENCE, 6' HIGH AT TOP OF WALL, 6" OPENING BETWEEN FENCE SLATS AND GATE WITH LOCK AT LADDER/STEPS.
7. PROTECT POWER POLES IN PLACE. SEE DETAIL 4, SHEET C-5.
8. INSTALL RIP-RAP, 450mm-12", 24" THICK, ENDS 6' TYPE II BASE.
HEC2 HYDRAULIC MODEL SUMMARY

CROSS SECTION	Q (CFS)	INV (FT)	WSE (FT)	D (FT)
2100	1300	24.40	26.34	1.9
2000	1300	24.27	25.76	1.5
1900	1300	23.55	25.19	1.6
1800	1300	22.63	24.30	1.7
1700	1300	21.83	23.41	1.6
1600	1300	20.83	22.71	1.9
1500	1300	20.66	22.55	1.9
1400	1300	20.58	22.36	1.8
1300	1300	20.18	21.90	1.7
1200	1300	18.83	21.39	1.8
1100	1300	18.40	21.98	2.3
1000	1300	18.37	20.44	2.1
Call before you Dig.
1-800-227-2600
1-702-385-6181
POST EMBEDMENT DETAIL
FORCE POST SEE SNWA DRAWINGS FOR LOCATION
EDGE OF CONCRETE
FILL VOID W/ NON-SHRINK NON-METALLIC GROUT
24" PVC PIPE SLEEVE (HOLE MAY BE CORE DRILLED AT CONTRACTORS OPTION)
1/4" PVC X 36LNEAR WELD TO BASE PLATE
SECTION
S.C. WALLACE, INC.
Civil Engineering
AND BAKER REAL ESTATE, L.L.C.
SILVERADO RANCH STATION - PH. II + CULVERT EXTENSION
EXHIBIT 1
REVISED 01/10/03
SHEET
EX-1
OF

CONSTRUCTION NOTES

1. CONSTRUCT 35.5± LF OF 11' X 4'3" DOUBLE ELLIPTICAL ARCH BOX CULVERTS FROM THE BUBBLER STRUCTURE TO THE EXISTING DOUBLE 11'3 X 4'-3" ELLIPTICAL ARCH BOX CULVERTS. SEE CON-AGRA PLANS.
2. CONSTRUCT 105 L.F. OF BUBBLER STRUCTURE. SEE STRUCTURAL PLANS FOR DETAILS.
3. CONSTRUCT 148.81 L.F. OF STANDARD 42-INCH (DIA.) 0.064" CF (TRANSPORTATION (NDOT)) DOUBLE 12' X 4' REINFORCED CONCRETE BOX CULVERT ACCORDING TO NDOT STD DWG. JD-30.1.2 (DETAIL 9, SHT C-3)
4. CONSTRUCT AC PAVEMENT PER SECTION 3, SHEET C-5.
5. FLARE WALL OF BUBBLER TO EXTEND TO FINISH GRADE AT 25:1 TRANSITION WALL ON SOUTH FROM 2'6" TO 5'-1 ON EAST. INSTALL 6' BLACK LOW FENCE ON TOP OF WALL ON WEST & SOUTH SIDES.
6. EAST SIDE OF BUBBLER TO BE FLAT AT ELEVATION 24.0 WITH METAL POCKET FENCE, 6' HIGH AT TOP OF WALL, AT OPENING BETWEEN FENCE PLATE AND WALL WITH LOCK AT LADDER/STEPS.
7. PROTECT POINT POLES IN PLACE. SEE DETAIL 1, SHEET C-1
8. INSTALL RIP-RAP, d50=15", 24" THICK, OVER 6" TYPE I BASE.





SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL LOCATE AND PROTECT ALL SNWA/SNWA APPURTENANCES INCLUDING BUT NOT LIMITED TO AVIAN ANODES WARNINGS & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE BY CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY RICK BUSBY AT (702) 862-3644 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL IF USED FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE SURFACED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, EXCEPT AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS BEING HELD.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

SNWA DATE

NORTH
SCALE 1"=30'

GRAPHIC SCALE
1 IN. = 30 FT.

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

Acceptance of plans for filing

By _____

Acceptance of these plans by the Clark County Department of Public Works does not relieve the Developer of responsibility for the correction of errors, omissions, or inconsistencies that may be discovered in these plans during construction. Acceptance of these plans by the Clark County Department of Public Works does not relieve the Developer of responsibility for the correction of errors, omissions, or inconsistencies that may be discovered in these plans during construction.

NOTE: These plans and/or other submittals shall be valid for a period not to exceed one (1) year from the date of approval. If construction is not complete within the one (1) year period, these plans and/or other submittals must be resubmitted to Clark County for re-approval.

Call before you Dig. 1-800-227-2600

1-702-385-6111

WILLDAN
ENGINEERING PUBLIC WORKS SERVICES

RECEIVED
JUN 05 2001
CLARK COUNTY
PUBLIC WORKS

5959 CS

A001/04-1517

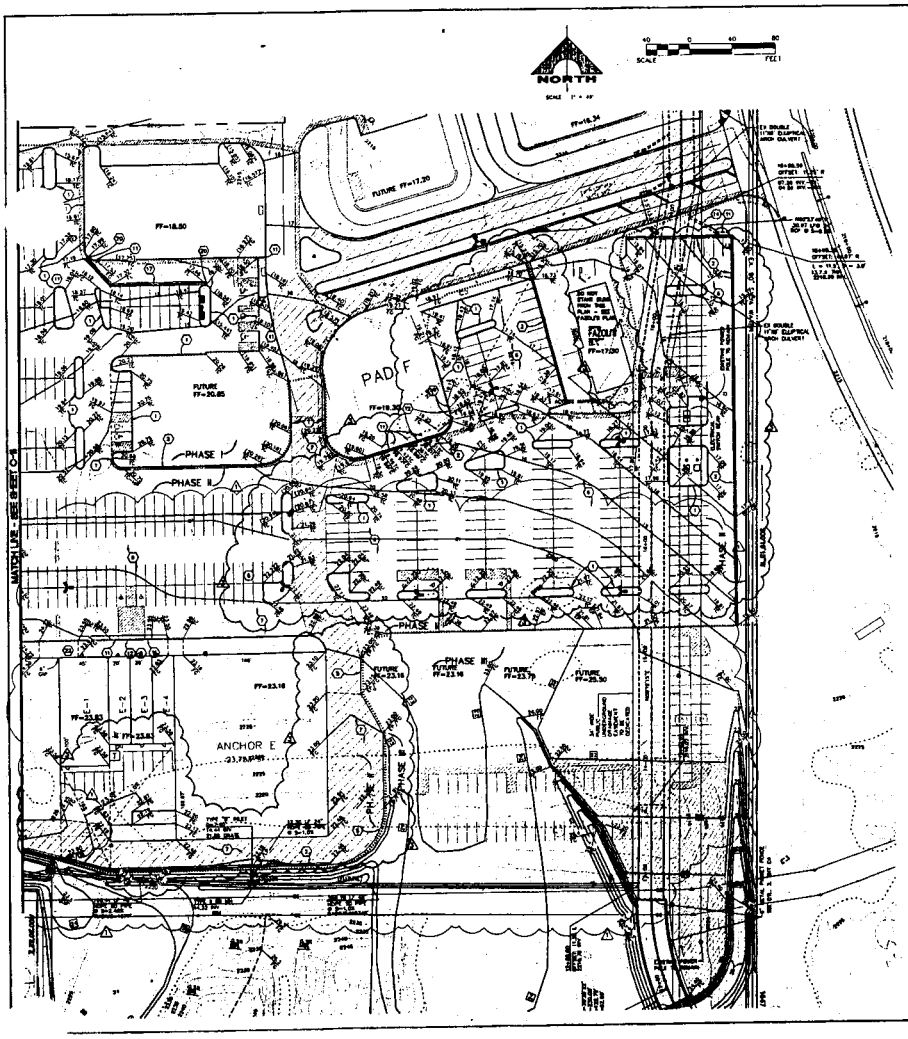
HEC2 HYDRAULIC MODEL SUMMARY

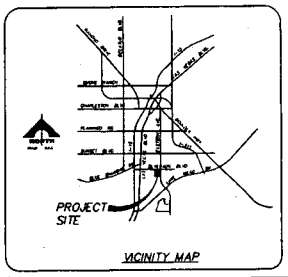
CROSS SECTION	Q (CFS)	INV (FT)	WSE (FT)	D (FT)
2100	1300	24.4	26.6	2.2
2000	1300	24.0	26.3	2.3
1900	1300	23.6	25.6	2.0
1800	1300	22.6	24.2	1.6
1700	1300	21.8	23.4	1.6
1600	1300	20.8	22.7	1.9
1500	1300	20.7	22.5	1.8
1400	1300	20.8	22.3	1.7
1300	1300	20.2	21.9	1.7
1200	1300	19.8	21.9	2.1
1100	1300	19.4	21.6	2.2
1000	1300	18.4	20.4	2.0

G.C. WALLACE, INC.
Engineers/Planners/Surveyors

AG BAKER REAL ESTATE, LLC.
SILVERADO RANCH STATION - PHASE II
REVISED EXHIBIT 1

SHEET
EX-1
3 OF 7 SHTS





VICINITY MAP

LEGEND

DG = DESIGN GRADE	(40.5) EXIST. ELEVATION
W = WATER	40.5 PROPOSED ELEVATION
S = SEWER	EXIST. SPOT ELEVATION
G = GAS	SUBDIVISION BOUNDARY
SD = STORM DRAIN	EASEMENT LINE
SL = STREET LIGHT	FUTURE LINE
SSMH = SEWER MANHOLE	STREET CENTERLINE
STMH = STORM DRAIN MANHOLE	CONCRETE CURB & GUTTER
CLV = CITY OF LAS VEGAS	EXISTING IMPROVEMENTS
LVVWD = LAS VEGAS VALLEY WATER DISTRICT	EXISTING GROUND CONTOUR LINES
EX = EXISTING	FINISH GROUND CONTOUR LINE
FL = FLOW LINE	DRAINAGE FLOW LINE
HP = HIGH POINT	BLOCK WALL
R/W = RIGHT-OF-WAY	3 WITNESS BLOCK WALL
TC = TOP OF BACK OF CURB	NO PARKING - RED CURB
FG = FINISHED GRADE	EXISTING ROCK WALL
BCR = BEGIN CURB RETURN	VISION RESTRICTION AREA
DS = DOWN SPOUT	
CCASD = CLARK COUNTY AREA STANDARD DRAWING	
TC = TOP OF CRATE	
BW = BACK OF WALL	
FS = FINISH SURFACE	
NG = NATURAL GRADE	
FF = FINISH FLOOR	
GB = GRADE BREAK	
CCPWSD = CLARK COUNTY PUBLIC WORKS STANDARD DRAWING	
FUT = FUTURE	
EP = EDGE OF PAVEMENT	
TMH = TOP OF MANHOLE	

GRADING NOTES

1. CONSTRUCT "A" TYPE CURB PER DETAIL 4 SHEET C-16
2. CONSTRUCT "L" TYPE CURB PER VEGGCA NO. 216
3. INSTALL BOLLARD AS PER DETAIL 6, SHEET C-10
4. CONSTRUCT CONCRETE CHANNEL PER DETAIL 3, SHEET C-15.
5. CONSTRUCT TROWELED PAVEMENT EDGE
6. CONSTRUCT 2" A.C. PAVING OVER 4" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-16. SEE SOILS REPORT FOR MORE INFORMATION
7. CONSTRUCT 2" A.C. PAVING OVER 6" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-16. SEE SOILS REPORT FOR MORE INFORMATION
8. INSTALL HANDICAP SIGNAGE/PLAQUES AND PARKING LOT STRIPING PER ARCHITECTURAL PLANS.
9. CONSTRUCT HANDICAP ACCESS PER A.D.A./A.B.A./N.B.C. REQ. SEE ARCH PLANS FOR DETAILS.
10. INSTALL SPEED BUMP
11. 6" TO 0" CURB TRANSITION
12. 6" CURB FLUSH WITH PAVEMENT
13. CONSTRUCT MODIFIED TYPE "C" DROP INLET, SEE DETAIL 14, SHEET C-16.
14. INSTALL 24" RCP STORMDRAIN PIPE
15. CONSTRUCT CURB OPENING AND RIP-RAP CHANNEL PER DETAIL 1, SHEET C-14
16. CONSTRUCT CHANNEL PER DETAIL 3, SHEET C-15
17. CONSTRUCT 2' SIDE VALLEY GUTTER PER DETAILS 7 SHEET C-15
18. CONSTRUCT RETAINING WALL AS PER COUNTY STANDARD DETAIL AND ARCHITECTURAL PLANS.
19. CONSTRUCT L-CURB TRANSITION AS PER DETAIL 8, SHEET C-16
20. CONSTRUCT VALLEY GUTTER TRANSITION AS PER DETAIL 6, SHEET C-15
21. MATCH EXISTING
22. CONSTRUCT CONCRETE SWALE AS PER DETAIL 3, SHEET C-15 AND THE ARCHITECTURAL PLANS.
23. INSTALL 6" PVC DRAIN LINE - CAP 5' FROM BUILDING SUMP PUMP REQUIRED - SEE ARCH PLANS FOR DETAILS

NOTE TO CONTRACTOR:
ALL DIMENSIONS GIVEN ARE TO BACK OF CURB

GRADING NOTES

(THESE NOTES APPLY ONLY TO ON-SITE PRIVATE FACILITIES)

1. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ALL DEBRIS AS ACCEPTABLE TO THE OWNER AND ENGINEER.
2. IF CONTRACTOR DOES NOT ACCEPT EXISTING TOPOGRAPHY AS SHOWN ON THE PLANS, WITHOUT EXCEPTION, HE SHALL HAVE BACK, AT HIS OWN EXPENSE, A TOPOGRAPHIC SURVEY AND SUBMIT IT TO THE OWNER FOR REVIEW.
3. CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDINGS
4. PRECAST STRUCTURES MAY BE USED AT THE CONTRACTOR'S OPTION
5. IN ALL AREAS WHERE NEW CURB AND GUTTER ARE INSTALLED, REMOVE ALL OLD CURB AND GUTTER AND SAW CUT A STRAIGHT EDGE ALONG ASPHALT
6. THE EARTHWORK FOR ALL BUILDING FOUNDATIONS AND SLABS SHALL BE IN ACCORDANCE WITH ARCHITECTURAL PLANS AND SPECIFICATIONS.
7. CONTRACTOR IS RESPONSIBLE FOR REPAIRS OF DAMAGE TO ANY EXISTING IMPROVEMENTS DURING CONSTRUCTION, SUCH AS BUT NOT LIMITED TO, CURB AND GUTTER, SIDEWALK, PAVEMENT, ETC. REPAIRS SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS.
8. SPOILS FROM FOOTINGS ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR IS TO USE THE SOIL FROM ON SITE OR REMOVE IT FROM SITE.
9. EARTHWORK SHALL BE ON AN UNBALANCED BASIS.
10. CONTRACTOR SHALL COMPLY WITH N.P.D.E.S. REGULATIONS AND FILE A NOTICE OF INTENT PRIOR TO COMMENCEMENT. CONTRACTOR MUST SUBMIT A NOTICE OF TERMINATION WHEN RIGHT UPON FINAL STABILIZATION.
11. ANY FILL USED TO ENGRADE THE ELEVATIONS OF THE PLANS SHALL BE APPROVED BY THE SOILS ENGINEER. IF THE SOILS ENGINEER DEEMS ANY FILL TO BE UNSUITABLE, ALL UNSUITABLE FILL SHALL BE REMOVED AND REPLACED WITH SUITABLE FILL. COMPACTION TESTS SHALL BE PERFORMED ON REPRESENTATIVE SAMPLES OF THE FILL MATERIAL TO DETERMINE WHETHER THE MATERIAL IS SUITABLE AS FILL. COMPACTED FILL SHOULD BE PLACED IN LAYERS OF NOT MORE THAN EIGHT INCHES IN UNCOMPACTED THICKNESS AT OPTIMUM MOISTURE CONTENT OR SLIGHTLY ABOVE. MOISTURE CONTENT SHALL BE MAINTAINED IN PAVING AREAS AND CONCRETE BUILDING AREAS OF THE SUBGRADE SOIL DENSITY AS DETERMINED BY THE MODIFIED PROCTOR METHOD, ASTM D-1557.
12. TOPOGRAPHIC BOUNDARY SURVEY, PROPERTY LINES, LEGAL DESCRIPTION, EXISTING UTILITIES, SITE TOPOGRAPHY WITH SPOT ELEVATIONS, DETERMINING OFFSITE FLOWS AND EXISTING STRUCTURE LOCATIONS WERE PROVIDED BY THE FOLLOWING:
13. G.C. WALLACE, INC. WILL NOT BE HELD RESPONSIBLE FOR THE ACCURACY OF THE SURVEY OR FOR DESIGN ERRORS OR OMISSIONS RESULTING FROM SURVEY INACCURACIES
14. ANY DEVIATION FROM THESE PLANS SHALL CAUSE THE WORK TO BE UNACCEPTABLE.
15. SITE CONTRACTOR SHALL SUPPLY AS-BUILT PLANS INDICATING ALL CHANGES AND DEVIATIONS.

NOTE

SEE SPECIFIC RETAINING WALLS AND A NON-STANDARD CLARK COUNTY RETAINING WALL DESIGN (SEE SOILS CLASS. B) SUBMITTED TO CLARK COUNTY BUILDING DEPT. FOR REVIEW AND APPROVAL PRIOR TO WALL CONSTRUCTION PERMIT ISSUANCE.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Acceptance of plans for filing

By _____ Date _____

Acceptance of these plans for filing shall not be construed to be an approval of the design contained herein or of any responsibility of the Clark County Department of Public Works, Clark County shall not be held liable for damages which may result from construction pursuant to these plans, nor from the engineering design contained herein.

NOTE: Prior plans and/or other review facilities may be given tentative approval or acceptance, but only the plans bearing the original signature of the engineer of record will be accepted at the counter in Clark County.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 26, TOWNSHIP 22 SOUTH, RANGE 61 EAST, M.D.M., SHOWN AS SOUTH 89°39'11" WEST ON THE NORTH LINE RECORD OF SURVEY ON FILE IN FILE 99, PAGE 73 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

CLARK COUNTY BENCHMARK "BCR1-2000"
BRASS CAP SURFACE MONUMENT, STAMPED "BCR1-2000", SET IN CONCRETE AT THE EAST 1/4 CORNER OF SECTION 26, T.22S., R.61E., M.D.B.&M., BEING 0.2' EAST OF P.I. OF EASTERN AND AND SOUTHERN BOUNDARY LINE OF SAID SECTION 26.
CLARK COUNTY VERTICAL CONTROL SHEET 22-61 SE A, DATED 1993.

BAYSIDE ELEVATION = 990.000 METERS
BAYSIDE ELEVATION = 3246.000 FEET

Call before you Dig. 1-800-227-2600

1-702-895-9111

G.C. WALLACE, INC.
Engineering/Architecture
7500 Dean Martin Drive, Suite 110
Las Vegas, Nevada 89139
(702) 260-3399

AID BAKER REAL ESTATE, L.L.C.
EL RANCHO RANCH STATION - PHASE 2
GRADING PLAN II

SHEET C-12
12 OF 17 SHEETS

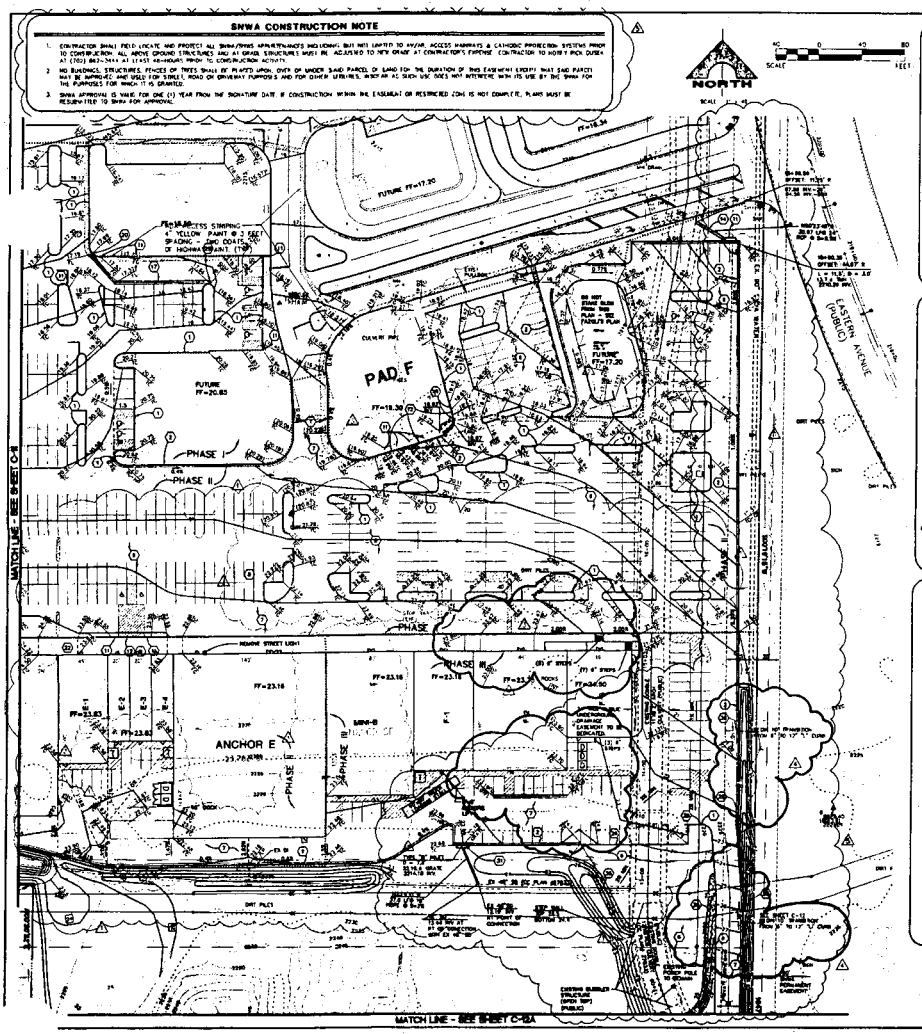
SNWA CONSTRUCTION NOTE

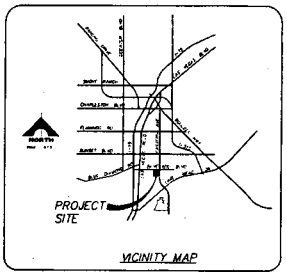
1. CONTRACTOR SHALL FIELD LOCATE AND PROTECT ALL SNWA/SNWA APPURTENANCES INCLUDING BUT NOT LIMITED TO WATER, ACCESS MANHOLES & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY RICK DUSEK AT (702) 862-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OF TREES SHALL BE PLANTED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF SNWA EASEMENT EXCEPT THAT SAID PARCEL MAY BE IMPROVED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, WHICH OR AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

NORTH

SCALE 1" = 40'

0 40 80 FEET





VICINITY MAP

LEGEND

DG = DESIGN GRADE	1852.31 EXIST. ELEVATION
W = WATER	1852.31 PROPOSED ELEVATION
S = SEWER	EXIST. SPOT ELEVATION
G = GAS	
SD = STORM DRAIN	SUBDIVISION BOUNDARY
SL = STREET LIGHT	EASEMENT LINE
SSMH = SEWER MANHOLE	FUTURE LINE
SDMH = STORM DRAIN MANHOLE	STREET CENTERLINE
C.L.V. = CITY OF LAS VEGAS	
LVVWD = LAS VEGAS VALLEY WATER DISTRICT	CONCRETE CURB & GUTTER
EX = EXISTING	EXISTING IMPROVEMENTS
FL = FLOW LINE	
HP = HIGH POINT	(2812) EXISTING GROUND CONTOUR LINES
R/W = RIGHT-OF-WAY	
TC = TOP OF BACK OF CURB	24 FINISH GROUND CONTOUR LINE
FG = FINISHED GRADE	
BCR = BEGIN CURB RETURN	DRAINAGE FLOW LINE
DS = DOWN SPOUT	
CCASD = CLARK COUNTY AREA STANDARD DRAWING	BLOCK WALL
TC = TOP OF GRATE	EXISTING BLOCK WALL
BW = BACK OF WALK	NO PARKING - RED CURB
FS = FINISH SURFACE	
NG = NATURAL GRADE	EXISTING ROCK WALL
FF = FINISH FLOOR	
GB = GRADE BREAK	VISION RESTRICTION AREA
CCPWSD = CLARK COUNTY PUBLIC WORKS STANDARD DRAWING	
FUT = FUTURE	
EP = EDGE OF PAVEMENT	
TMH = TOP OF MANHOLE	

GRADING NOTES

(THESE NOTES APPLY ONLY TO ON-SITE PRIVATE FACILITIES)

1. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ALL DEBRIS AS ACCEPTABLE TO THE OWNER AND ENGINEER.
2. IF CONTRACTOR DOES NOT ACCEPT EXISTING TOPOGRAPHY AS SHOWN ON THE PLANS, WITHOUT EXCEPTION, HE SHALL HAVE MADE, AT HIS OWN EXPENSE, A TOPOGRAPHIC SURVEY AND SUBMIT IT TO THE OWNER FOR REVIEW.
3. CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM ALL BUILDINGS.
4. PRECAST STRUCTURES MAY BE USED AT THE CONTRACTOR'S OPTION.
5. IN ALL AREAS WHERE NEW CURB AND GUTTER ARE INSTALLED, REMOVE ALL OLD CURB AND GUTTER AND SAW CUT A 1'-0" MIN. WIDE ALONG ASPHALT.
6. THE EARTHWORK FOR ALL BUILDING FOUNDATIONS AND SLABS SHALL BE IN ACCORDANCE WITH ARCHITECTURAL PLANS AND SPECIFICATIONS.
7. CONTRACTOR IS RESPONSIBLE FOR ANY MATCH UP WORK (EXISTING IMPROVEMENTS, UTILITIES, PAVEMENT, ETC.) THAT MAY BE REQUIRED TO COMPLETE THE PROJECT. ALL SUCH WORK AND REPAIRS SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS.
8. SPOILS FROM TRENCHING IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR IS TO USE THE SOIL FROM ON SITE OR REMOVE IT FROM SITE.
9. ELEVATIONS SHALL BE BASED ON LAND AS-BUILT DATA.
10. CONTRACTOR SHALL COMPLY WITH NPDES REGULATIONS AND FILE A NOTICE OF INTENT PRIOR PRIOR TO COMMENCEMENT. CONTRACTOR MUST SUBMIT A NOTICE OF TERMINATION (NOT) WITHIN FINAL STABILIZATION.
11. ANY FILL USED TO INCREASE THE ELEVATION OF THE FLOOR SLAB OR ANY FILL TO BE USED AS BACKFILL SHALL BE CLEAN, GRANULAR MATERIAL FREE OF THE USE OF ANY ORGANIC FILL. ON-SITE NON-ORGANIC SOILS SHOULD BE REVIEWED BY A GEOTECHNICAL ENGINEER OF THE FILL MATERIAL TO DETERMINE WHETHER THE MATERIAL IS SUITABLE AS FILL. COMPACTED FILL SHOULD BE PLACED IN LAYERS OF NOT MORE THAN EIGHT INCHES IN LOOSE THICKNESS AND COMPACTED TO NOT LESS THAN 90% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. ALL FILL SHALL BE TESTED AND APPROVED BY A GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF CONCRETE. ALL FILL SHALL BE PLACED AT A MOISTURE CONTENT NOT LESS THAN 2% BELOW OPTIMUM MOISTURE CONTENT AND NOT MORE THAN 4% ABOVE OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D-1557. ALL FILL SHALL BE TESTED AND APPROVED BY A GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF CONCRETE. ALL FILL SHALL BE PLACED AT A MOISTURE CONTENT NOT LESS THAN 2% BELOW OPTIMUM MOISTURE CONTENT AND NOT MORE THAN 4% ABOVE OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D-1557.
12. TOPOGRAPHIC INFORMATION SUPPLIED, PROPERTY LINES, LEGAL DESCRIPTION, EXISTING UTILITIES, SITE IMPROVEMENTS WERE TAKEN FROM (LIST SOURCES). QUESTIONABLE PHYSICAL FEATURES AND EXISTING STREET RIGHT-OF-WAY LINES WERE PROVIDED BY THE FOLLOWING COMPANY:
13. G.C. WALLACE, INC. MUST BE HELD RESPONSIBLE FOR THE ACCURACY OF THE SURVEY OR FOR DESIGN ERRORS OR OMISSIONS RESULTING FROM SURVEY INACCURACIES.
14. ANY DEVIATION FROM THESE PLANS MAY CAUSE THE WORK TO BE UNACCEPTABLE.
15. SITE CONTRACTOR SHALL SUPPLY AS-BUILT PLANS INDICATING ALL CHANGES AND REVISIONS.

GRADING NOTES

1. CONSTRUCT "A" TYPE CURB PER DETAIL 4 SHEET C-15.
2. CONSTRUCT "L" TYPE CURB PER VEGGIES NO. 390.
3. INSTALL BOLLARD AS PER DETAIL 6, SHEET C-15
4. CONSTRUCT CONCRETE CHANNEL PER DETAIL 5, SHEET C-15.
5. CONSTRUCT TRANSITION PAVEMENT EDGE
6. CONSTRUCT 2" AC PAVING OVER 4" TYPE 1 AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-20. SEE SOILS REPORT FOR MORE INFORMATION.
7. CONSTRUCT 2" AC PAVING OVER 4" TYPE 1 AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-20. SEE SOILS REPORT FOR MORE INFORMATION.
8. INSTALL HANDICAP SIGNAGE/PAINTS AND PARKING LOT STRIPING PER ARCHITECTURAL PLANS.
9. CONSTRUCT SIDEWALK ACCESS PER A.B.A.A.G. REQ. SEE SHEET PLANS FOR DETAILS.
10. INSTALL SPEED BUMP
11. 6" TO 8" CURB TRANSITION
12. 6" CURB FLUSH WITH PAVEMENT
13. CONSTRUCT MODIFIED TYPE "C" DROP INLET. SEE DETAIL 10, SHEET C-15
14. INSTALL 24" RCP STORMDRAIN PIPE.
15. CONSTRUCT CURB OPENING AND RIP-RAP CHANNEL PER DETAIL 1, SHEET C-14.
16. CONSTRUCT CHANNEL PER DETAIL 5, SHEET C-15.
17. CONSTRUCT 2' SIDE VALLEY GUTTER PER DETAIL 7 SHEET C-15
18. CONSTRUCT RETAINING WALL AS PER COUNTY STANDARD DETAIL AND ARCHITECTURAL PLANS
19. CONSTRUCT 1-CURB TRANSITION AS PER DETAIL 6, SHEET C-15
20. CONSTRUCT VALLEY GUTTER TRANSITION AS PER DETAIL 8, SHEET C-15
21. MATCH EXISTING
22. CONSTRUCT CONCRETE WALK AS PER DETAIL 2, SHEET C-15 AND THE ARCHITECTURAL PLANS
23. INSTALL 8" PVC DRAIN LINE - CAP 5' FROM BUILDING. RAMP PUMP REQUIRED - SEE MECH. PLANS FOR DETAILS
24. CONSTRUCT COMMERCIAL DRIVEWAY PER VEGGIES DWG. 220
25. CONSTRUCT MODIFIED "L" (18") CURB PER DETAIL SHT C-15
26. CONSTRUCT 6" CURB PER VEGGIES DWG. 210 WITH 6" BREAKS EVERY 2'
27. CONSTRUCT DEPRESSED CURB FOR FUTURE RAMP PER VEGGIES DWG. 230, TYPE 1
28. MATCH EXISTING AC PAVEMENT SECTION IN KIND
29. REMOVE AND REPLACE
30. 2'-6" CURB TRANSITION
31. CONSTRUCT 1-SIDE RAMP PER VEGGIES DWG. 231
32. CONSTRUCT MODIFIED TYPE "B" DROP INLET PER DETAIL 1 ON SHEET C-13
33. CONSTRUCT 6" CROSS GUTTER PER VEGGIES DWG. 251.0
34. REMOVE EXISTING IMPROVEMENTS THAT INTERFERE WITH CONSTRUCTION OF DRIVEWAY ENTRANCE
35. INSTALL RIP-RAP 6inFT MIN. 24" THICK

NOTE TO CONTRACTOR:
ALL ELEVATIONS SHOWN ARE TO BACK OF CURB

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF SAID SECTION 33, BEING N89°53'49"E, AS SHOWN ON RECORD OF SURVEY FOR BOULDER CITY, NEVADA, FILED IN BOOK 27 OF SURVEYS AT PAGE 67 IN THE OFFICE OF THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

CLARK COUNTY BENCHMARK "2K21 2546"
BRASS CAP SET ATOP HIGHWAY MARKER STAMPED "STA N297+82.79 POT; 15'/25/06", LOCATED 7'N, 17' EAST OF P.I. OF EASTERN AVE. AND LINE MEASURED ON ARC NORTH 1806.9' OF 1146.
CLARK COUNTY VERTICAL CONTROL DATUM ADJUSTMENT OF 1983 AS ADOPTED 1992.

ELEVATION = 2000.660 (FEET)
NAVD88 ELEVATION = 2296.006 (FEET)

Call before you Dig. 1-800-227-2600

1-702-598-8111

NOTE

THE SPECIFIC RETAINING WALLS ARE A NON-STANDARD CLARK COUNTY RETAINING WALL DESIGN. STRUCTURAL CALCULATIONS AND SOILS REPORT SHALL BE SUBMITTED TO CLARK COUNTY BUILDING DEPT. FOR REVIEW AND APPROVAL PRIOR TO WALL CONSTRUCTION PERMIT ISSUANCE.

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

Acceptance of plans for filing

By: [signature] Date: 11/16/06

Acceptance of these plans for filing shall not be construed as approval of the design of any particular item, nor as approval of the accuracy or adequacy of the design computations. Any omissions or errors on the plans remain the responsibility of the engineer of record. Any revisions to these plans must be submitted to the Department of Public Works for review and approval prior to construction of the revised facilities.

NOTE: Please print name and/or affix authority facsimile, but in no event facsimile signature or initials. Acceptance of these plans does not constitute approval of any variances to Code. Clark County.

G.C. WALLACE, INC.
CONSULTING ENGINEERS
2030 SOUTH GREEN VALLEY PARKWAY, SUITE 500
HENDERSON, NEVADA 89052
(702) 263-3399 FAX (702) 263-3398

AID BAKER REAL ESTATE LLC

BLVD MACH STATION - PHASE 2

GRADING PLAN II

SHEET
C-12
12 OF 16 SHTS

99-35109

SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL FIELD LOCATE AND PROTECT ALL SNWA/SNWA APPURTENANCES INCLUDING BUT NOT LIMITED TO AIR/VAC, ACCESS MANHOLES & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY BOX USER'S AT (702) 862-3464 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE LANDSCAPED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES SUCH AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

NORTH
SCALE 1" = 40'

SCALE 0 40 80 FEET

MATCH LINE - SEE SHEET C-12

IONE ROAD (PUBLIC)

SECTION
NO SCALE

MODIFIED "L" CURB
NO SCALE

PROJECT SITE

VICINITY MAP

LEGEND

DG = DESIGN GRADE
W = WATER
S = SEWER
G = GAS
SD = STORM DRAIN
SL = STREET LIGHT
SSMH = SEWER MANHOLE
SDMH = STORM DRAIN MANHOLE
CLV = CITY OF LAS VEGAS
LVVWD = LAS VEGAS VALLEY WATER DISTRICT
EX = EXISTING
FL = FLOW LINE
HP = HIGH POINT
R/W = RIGHT-OF-WAY
TC = TOP OF BACK OF CURB
FG = FINISHED GRADE
BCR = BEGIN CURB RETURN
DS = DOWN SPOUT
CCASD = CLARK COUNTY AREA STANDARD DRAWING
TG = TOP OF GRATE
Bw = BACK OF WALK
FS = FINISH SURFACE
NG = NATURAL GRADE
FF = FINISH FLOOR
GB = GRADE BREAK
CCPWSD = CLARK COUNTY PUBLIC WORKS STANDARD DRAWING
FUT = FUTURE
EP = EDGE OF PAVEMENT
TMH = TOP OF MANHOLE

(601.5) EXIST ELEVATION
601.5 / TC PROPOSED ELEVATION
FFST SPOT ELEVATION

SUBDIVISION BOUNDARY
EASEMENT LINE
FUTURE LINE
STREET CENTERLINE
CONCRETE CURB & GUTTER
EXISTING IMPROVEMENTS
(5613) EXISTING GROUND CONTOUR LINES
FINISH GROUND CONTOUR LINE
DRAINAGE FLOW LINE
BLOCK WALL
EXISTING BLOCK WALL
NO PARKING - RED CURB
EXISTING ROCK WALL
VISION RESTRICTION AREA

GRADING NOTES

1. CONSTRUCT "A" TYPE CURB PER DETAIL 4, SHEET C-15
2. CONSTRUCT "L" TYPE CURB PER UBIDCA NO. 216
3. INSTALL BOLLARD AS PER DETAIL 8, SHEET C-15
4. CONSTRUCT CONCRETE CHANNEL PER DETAIL 5, SHEET C-15
5. CONSTRUCT TRACKMED PAVEMENT EDGE
6. CONSTRUCT 2" AC PAVING OVER 4" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1, SHEET C-39. SEE SOILS REPORT FOR MORE INFORMATION.
7. CONSTRUCT 2" AC PAVING OVER 6" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1, SHEET C-39. SEE SOILS REPORT FOR MORE INFORMATION.
8. INSTALL HANDICAP SIGNAGE/RAMPS AND PARKING LOT STRIPING PER ARCHITECTURAL PLANS.
9. CONSTRUCT SIDEWALK ACCESS PER ADA/AUBC REQ. 302 ARCH PLANS FOR DETAILS.
10. INSTALL SPEED BUMP
11. 6" TO 4" CURB TRANSITION
12. 6" CURB FLUSH WITH PAVEMENT
13. CONSTRUCT MODIFIED TYPE "C" DROP INLET. SEE DETAIL 10, SHEET C-15
14. INSTALL 24" RCP STORMDRAIN PIPE
15. CONSTRUCT CURB OPENING AND RIP-RAP CHANNEL PER DETAIL 5, SHEET C-14
16. CONSTRUCT CHANNEL PER DETAIL 5, SHEET C-15
17. CONSTRUCT 2' SIDE VALLEY GUTTER PER DETAILS 2 SHEET C-15
18. CONSTRUCT RETAINING WALL AS PER COUNTY STANDARD DETAIL AND ARCHITECTURAL PLANS.
19. CONSTRUCT L-CURB TRANSITION AS PER DETAIL 6, SHEET C-15
20. CONSTRUCT VALLEY GUTTER TRANSITION AS PER DETAIL 9, SHEET C-15
21. MATCH EXISTING
22. CONSTRUCT CONCRETE WALL AS PER DETAIL 2, SHEET C-16 AND THE ARCHITECTURAL PLANS
23. INSTALL 6" PVC DRAIN LINE - CAP 5' FROM BUILDING. SUMP PUMP REQUIRED - SEE ARCH PLANS FOR DETAILS
24. CONSTRUCT DEPRESSED SIDEWALK PER UBIDCA SWALK 200
25. CONSTRUCT MODIFIED "L" (10") CURB PER DETAIL SWT C-124
26. CONSTRUCT TACH ON CURB PER UBIDCA DWAY 220 WITH 3" SPACING EVERY 5'
27. CONSTRUCT DEPRESSED CURB FOR FUTURE RAMP PER UBIDCA SWALK 210, TYP.
28. MATCH EXISTING AC PAVEMENT SECTION IN KIND
29. SAWCUT AND MATCH
30. 6" TO 12" CURB TRANSITION
31. CONSTRUCT TYPE "B" DROP INLET PER UBIDCA DWG. DW12
32. CONSTRUCT MODIFIED TYPE "B" DROP INLET PER DETAIL 1 ON SHEET C-12
33. CONSTRUCT 6' GRADE BUTTER PER UBIDCA SWAL 2220
34. REMOVE EXISTING IMPROVEMENTS THAT INTERFERE WITH CONSTRUCTION OF DRIVEWAY ENTRANCE
35. INSTALL RIP-RAP d=12" MIN., 24" THICK

NOTE TO CONTRACTOR:
ALL ELEVATIONS GIVEN ARE TO BACK OF CURB

GRADING NOTES

(THESE NOTES APPLY ONLY TO ON-SITE PRIVATE FACILITIES)

1. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ALL BERMS AS ACCEPTABLE TO THE OWNER AND ENGINEER.
2. IF CONTRACTOR DOES NOT ACCEPT EXISTING TOPOGRAPHY AS SHOWN ON THE PLANS, WITHOUT EXCEPTION, HE SHALL HAVE MADE, AT HIS OWN EXPENSE, A TOPOGRAPHIC SURVEY AND SUBMIT IT TO THE OWNER FOR REVIEW.
3. CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDINGS.
4. PRECAST STRUCTURES MAY BE USED AT THE CONTRACTOR'S OPTION.
5. IN ALL AREAS WHERE NEW CURB AND GUTTER ARE INSTALLED, REMOVE ALL OLD CURB AND GUTTER AND SAW CUT A STRAIGHT EDGE ALONG ASPHALT.
6. THE EARTHWORK FOR ALL BUILDING FOUNDATIONS AND SLABS SHALL BE IN ACCORDANCE WITH ARCHITECTURAL PLANS AND SPECIFICATIONS.
7. CONTRACTOR IS RESPONSIBLE FOR REPAIRS OF DAMAGE TO ANY EXISTING IMPROVEMENTS DURING CONSTRUCTION, SUCH AS BUT NOT LIMITED TO, DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURBS, ETC. REPAIRS SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS.
8. SPOILS FROM EXCAVATION IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR IS TO USE THE SOIL FROM THE SITE OR REMOVE IT FROM SITE.
9. EARTHWORK SHALL BE ON AN UNCLASSIFIED BASIS.
10. CONSTRUCTION SHALL COMPLY WITH NPDES REGULATIONS AND FILE A NOTICE OF INTENT (NOI) PRIOR TO COMMENCEMENT. CONTRACTOR MUST SUBMIT A NOTICE OF TERMINATION (NOT) UPON FINAL STABILIZATION.
11. NOT LESS THAN 10 WORKING DAYS PRIOR TO THE PLACEMENT OF ANY FILL, THE OWNER SHALL SUBMIT TO THE CLARK COUNTY BUILDING DEPARTMENT OR ITS DESIGNATED REPRESENTATIVE A REPORT SIGNED BY A PERSON OR REPRESENTATIVE OF A TESTING AGENCY WHO SHALL BE PRESENT DURING PREPARATION AND TESTING OF ALL MATERIALS TO BE PLACED IN LAYERS OF NOT MORE THAN EIGHT INCHES IN THICKNESS, AT A MOISTURE CONTENT WITHIN THREE PERCENT OPTIMUM, AND COMPACTED TO A MINIMUM DENSITY OF 90 PERCENT IN PAVING AREAS AND 95 PERCENT IN BUILDING AREAS (OR AS OTHERWISE SPECIFIED) AS DETERMINED BY THE MODIFIED PROCTOR METHOD, ASTM D-1557.
12. TOPOGRAPHIC, BOUNDARY SURVEY, PROPERTY LINES, LEGAL DESCRIPTION, EXISTING UTILITIES, ETC. PERFORMED BY THE SPOT ELEVATIONS, CONTOURS AND EXISTING STRUCTURE LOCATIONS WAS PROVIDED BY THE FOLLOWING COMPANY:
13. G.C. WALLACE, INC. WILL NOT BE HELD RESPONSIBLE FOR THE ACCURACY OF ANY SURVEY INFORMATION SHOWN (HEREIN) OR DIVERGES RESULTING FROM SURVEY INACCURACIES.
14. ANY DEVIATION FROM THESE PLANS MAY CAUSE THE WORK TO BE UNACCEPTABLE.
15. THE CONTRACTOR SHALL SUPPLY AS-BUILT PLANS INDICATING ALL CHANGES AND DEVIATIONS.

NOTE

THE SPECIFIC RETAINING WALL SHOWN ON THIS PLAN IS A STANDARD CLARK COUNTY RETAINING WALL DESIGN. STRUCTURAL CALCS. & SOILS REPORT SHALL BE SUBMITTED TO CLARK COUNTY BUILDING DEPT. FOR REVIEW AND APPROVAL PRIOR TO WALL CONSTRUCTION PERMIT ISSUANCE.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Acceptance of these plans for filing shall not be construed as an approval of any violation of any provisions of any of the County ordinances. Acceptance of these plans for filing shall not prevent the County from requiring the correction of errors in the plans when found to be in violation of any County ordinance.

NOTE: These plans and/or other submittals may not be proper location based on field conditions. Contractor is responsible for relocation of no problems to Clark County.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 29, TOWNSHIP 22 SOUTH, RANGE 61 EAST, MOUNT DIABLO BASE AND MERIDIAN, AS SHOWN ON THE RECORD OF SURVEY FILE 94, PAGE 72 ON FILE IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

A 3-INCH BRASS CAP STAMPED "RICE 29 1998" AND CAP STATE ORDINATE MARKER, STAMPED "STA #29-63.70 PRT. 12/21/98", LOCATED 250.11' EAST OF P.I. OF EASTERN AVE. AND LAKE MEAD DR. AND NORTH SIDE OF SR 146. CLARK COUNTY VERTICAL CONTROL SHEET 32-61 W. A. DATED 1990.

NAD83 ELEVATION = 999.000 METERS
NAVD88 ELEVATION = 2366.886 FEET

RECEIVED
FEB 05 2001
CITY OF LAS VEGAS

Call before you Dig.
1-800-227-2600

1-702-893-6111

G.C. WALLACE, INC.
Engineering/Architecture
6330 South Valley View Blvd., Suite 100
Las Vegas, Nevada 89118
(702) 895-6600 FAX (702) 895-7646

AND BAKER REAL ESTATE L.L.C.
ELDORADO RANCH ESTATES - PHASE 2
GRADING PLAN II

SHEET C-12A
12 OF 18 SHEETS

99-35103

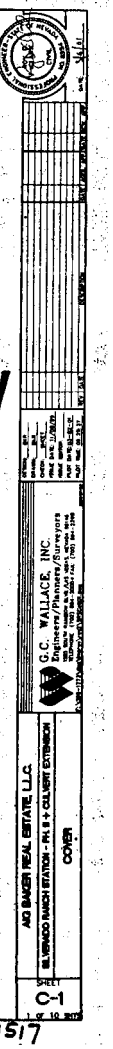
SILVERADO RANCH STATION PH. III AND CULVERT EXTENSION

AIG BAKER REAL ESTATE, L.L.C.

CLARK COUNTY, NV.

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 S. RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

Prepared for:
AIG BAKER REAL ESTATE, L.L.C.
1701 LEE BRANCH LANE
BIRMINGHAM, ALABAMA 35242



ADD2/01-1517

GENERAL NOTES

1. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITION BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND OF INGRESS AND EGRESS TO SAID CONSTRUCTION. EXTENT OF TRANSITIONS TO BE DETERMINED BY THE COUNTY ENGINEER.
2. EXISTING UTILITIES ARE LOCATED ON PLANS FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR THE PROTECTION OF UTILITIES AND THE ENGINEER BEARS NO RESPONSIBILITY FOR UTILITIES NOT SHOWN ON PLANS OR NOT IN THE LOCATION SHOWN ON THE PLANS. (CALL BEFORE YOU DIG 800-227-2600).
3. CONSTRUCTION SURVEY:
   GRADES ARE GIVEN FROM TOP OF STAKES OR MARKS. THE CONTRACTORS ARE CAUTIONED TO OBSERVE THE FOLLOWING RULE IN USING THE GRADE STAKES GIVEN BY THIS OFFICE. THREE CONSECUTIVE POINTS THAT ARE SHOWN TO BE ON THE SAME RATE OF SLOPE MUST BE USED IN COMMON IN ORDER THAT ANY VARIATION OUT OF A PERFECT STRAIGHT GRADE MAY BE DETECTED. IN CASE ANY SUCH DISCREPANCY IS FOUND, THE SAME MUST BE REPORTED OTHERWISE THIS OFFICE WILL NOT BE RESPONSIBLE FOR ANY ERROR IN THE GRADE OF THE FINISH WORK.
4. WHEELCHAIR RAMPS SHALL BE CONSTRUCTED AT ALL STREET INTERSECTIONS PER CLARK COUNTY STANDARD DRAWING 230. EXACT LOCATION OF RAMP TO BE DETERMINED IN FIELD BY A CLARK COUNTY INSPECTOR.
5. STANDARD STREET SECTIONS PER CLARK COUNTY STANDARD DRAWINGS UNLESS OTHERWISE NOTED.
6. CURB AND GUTTER WITH A GRADE OF LESS THAN FOUR TENTHS OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
7. EXACT LOCATION OF ALL SAWCUTS TO BE DETERMINED BY CLARK COUNTY INSPECTOR IN THE FIELD.
8. VALLEY GUTTER WITH A GRADE OF FOUR TENTHS OF ONE PERCENT OR LESS SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE PROPER DRAINAGE ACROSS ALL VALLEY GUTTERS.
9. ALL OFF-SITE IMPROVEMENT CONSTRUCTION SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS AND STANDARD DRAWINGS CLARK COUNTY AREA NEVADA AND CLARK COUNTY SUPPLEMENT TO UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS, LATEST REVISION.
10. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES OR STRUCTURES NOT SHOWN ON THE DRAWINGS. CONTRACTOR TO VERIFY THE EXACT LOCATION OF UTILITIES PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR'S RESPONSIBILITIES REGARDING UTILITIES SHALL BE AS REQUIRED UNDER SECTION 107.17 OF THE UNIFORM STANDARD SPECIFICATIONS FOR CLARK COUNTY AREA, NEVADA AND AS PROVIDED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL USE EXTREME CARE WORKING OVER OR NEAR ANY EXISTING GAS MAINS.
11. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS, WHICH ARE TO REMAIN IN PLACE FROM DAMAGE. ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR RECONSTRUCTED TO THE SATISFACTION OF THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.
12. FENCES, SIGNS, STRUCTURES, LIGHTS AND OTHER EXISTING IMPROVEMENTS WITHIN STREET R/W SHALL BE REMOVED WHERE SHOWN ON THE CONTRACT DRAWINGS, AND AS REQUIRED BY THE ENGINEER.
13. REPLACEMENT, RELOCATION OR RECONSTRUCTION OF ALL EXISTING IMPROVEMENTS, INCLUDING FENCES, WALL SIGNS, AND ALL OTHER ITEMS APPLICABLE TO THIS CONTRACT SHALL BE AS REQUIRED BY THE ENGINEER.
14. ALL BARRICADING AND TEMPORARY TRAFFIC CONTROL DEVICES OR METHODS USED DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE "NEVADA TRAFFIC CONTROL MANUAL, 1996 PUBLISHED BY THE STATE OF NEVADA, DEPARTMENT OF TRANSPORTATION, EXCEPT AS OTHERWISE PROVIDED IN THE CONTRACT DRAWINGS.
15. THE CONTRACTOR SHALL BACKFILL AND FINAL GRADE ALL CUT OR FILL SLOPES TO MATCH EXISTING CONDITIONS TO THE SATISFACTION OF THE ENGINEER.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERTICAL ADJUSTMENT OF ALL EXISTING SANITARY, WATER AND STORM SEWER MANHOLES TO THE FINAL FINISH GRADES IN ACCORDANCE WITH THE DETAILS SHOWN ON THE CONTRACT DRAWINGS AND IN ACCORDANCE WITH SECTION 604 OF THE "STANDARD SPECIFICATIONS".
17. ALL GRADING SHALL BE IN ACCORDANCE WITH THE SPECIFICATION MANUAL AND THE SOILS REPORT AS PREPARED BY TERRACON, INC. WHERE CONFLICTS OCCUR THE MOST RESTRICTIVE SHALL GOVERN.
18. 48 HOURS PRIOR TO START OF CONSTRUCTION THE CONTRACTOR SHALL CONTACT:

NEVADA POWER COMPANY	PHONE - 1-800-227-2600
CENTEL TELEPHONE COMPANY	PHONE - 1-800-227-2600
SOUTHWEST GAS CORPORATION	PHONE - (702)876-7200
LAS VEGAS VALLEY WATER DISTRICT	PHONE - (702)876-2011

19. PRIVATE STREETS AND/OR DRIVEWAYS REFLECTED ON THESE PLANS ARE TO BE INSPECTED BY A CLARK COUNTY INSPECTOR.
20. FINAL ASPHALTIC CONCRETE (AC) PAVEMENT SURFACES SHALL BE ONE-HALF (1/2") ABOVE THE LIP OF THE GUTTER (INCLUDING OPEN GRADE).

UTILITY COMPANIES

NEVADA POWER COMPANY
3215 E LONE MOUNTAIN
LAS VEGAS, NV 89030
(702) 657-4300

LAS VEGAS VALLEY WATER DISTRICT
1001 SOUTH VALLEY VIEW BLVD.
LAS VEGAS, NV 89153
(702) 870-2011

CLARK COUNTY SANITATION DISTRICT
5857 E. FLAMINGO ROAD
LAS VEGAS, NV 89122
(702) 434-8800

SPRINT TELEPHONE
330 S. VALLEY VIEW BLVD.
LAS VEGAS, NV 89152
(702)

SOUTHWEST GAS CORP.
4300 W. TROPICANA AVE.
LAS VEGAS, NV 89103
CONTACT: TOM CARDIN
(702) 365-2908

LEGEND + ABBREVIATIONS

1 DETAIL DRAWING NUMBER
DRAWING NUMBER FOR DETAIL DRAWN ON SAME SHEET
DRAWING NUMBER FOR DETAIL WITH REFERENCE TO THE SHEET IT IS DRAWN ON
INDICATES SEWER MANHOLE IN PROFILE
INDICATES STORM DRAIN MANHOLE IN PROFILE
1058.2 EXIST. ELEVATION
1062.5 PROPOSED ELEVATION
(2356.1) EXIST. SPOT ELEVATION
SUBDIVISION BOUNDARY
EASEMENT LINE
FUTURE LINE
STREET CENTERLINE
CONCRETE CURB & GUTTER
EXISTING IMPROVEMENTS
EXISTING GROUND CONTOUR LINES
FINISH GROUND CONTOUR LINE
DRAINAGE FLOW LINE
BLOCK WALL
EXISTING BLOCK WALL
D DUMPSTER
T TRANSFORMER

EMBANKMENT
TOP
BOTTOM
PROPOSED
EXISTING

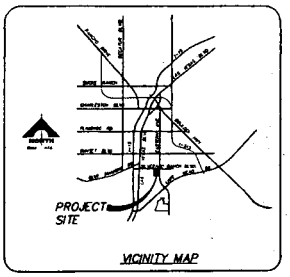
ABBREVIATION
I = IMPROVEMENTS
W = WATER
S = SEWER
G = GAS
SD = STORM DRAIN
SL = STREET LIGHT
Smh = SEWER MANHOLE
SDmh = STORM DRAIN MANHOLE
CLV = CITY OF LAS VEGAS
LVVWD = LAS VEGAS VALLEY WATER DISTRICT
EX = EXISTING
FL = FLOW LINE
HP = HIGH POINT
R/W = RIGHT-OF-WAY
TC = TOP OF BACK OF CURB
FG = FINISHED GRADE
BCR = BEGIN CURB RETURN
DS = DOWN SPOUT
CCASD = CLARK COUNTY AREA STANDARD DRAWING
CF = CURB FACE
BW = BACK OF WALK
FS = FINISH SURFACE
NG = NATURAL GRADE
FF = FINISH FLOOR
GB = GRADE BREAK
CCPWSD = CLARK COUNTY PUBLIC WORKS STANDARD DRAWING
FUT = FUTURE
EP = EDGE OF PAVEMENT

DEVIATIONS FROM STANDARD DRAWINGS

NONE

NOTICE TO CONTRACTOR

QUANTITIES SHOWN ARE ESTIMATES ONLY AND ARE INTENDED TO ILLUSTRATE SCOPE OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE EXACT QUANTITIES INVOLVED.



VICINITY MAP

INDEX OF DRAWINGS

NO.	TITLE + DESCRIPTION
C1	COVER SHEET
C2	GENERAL NOTES
C3	GRADING PLAN
C4	CULVERT PLAN AND PROFILE
C5	SECTIONS AND DETAILS I
C6	GRADING PLAN II
C7	GRADING PLAN III
C8	GRADING NOTES
C9	SECTIONS AND DETAILS II
C10	SECTIONS AND DETAILS III

LEGAL DESCRIPTION

THOSE PORTIONS OF SECTION 29, TOWNSHIP 22 SOUTH, RANGE 61 EAST, M.D.B.& M., DESCRIBED AS FOLLOWS:

THE NORTH HALF (N 1/2) NORTH HALF (N 1/2) NORTHEAST QUARTER (NE 1/4) NORTHEAST QUARTER (NE 1/4), SOUTH HALF (S 1/2) NORTHWEST QUARTER (NW 1/4) NORTHEAST QUARTER (NE 1/4) NORTHEAST QUARTER (NE 1/4), SOUTH HALF (S 1/2) NORTHEAST QUARTER (NE 1/4) NORTHEAST QUARTER (NE 1/4).

OWNERS

AG BAKER REAL ESTATE, L.L.C. CONTACT: MIKE HOPPER
1701 LEE BRANCH LANE
BIRMINGHAM, ALABAMA 35242
(205) 969-1000

CONSULTANT

G.C. WALLACE, INC. CONTACT: ROY CLARK
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89142
(702) 804-3000

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 29, TOWNSHIP 22 SOUTH, RANGE 61 EAST, M.D.M., SHOWN AS SOUTH 89°36'14" WEST ON THE AMENDED RECORD OF SURVEY ON FILE IN FILE 88, PAGE 73, OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

CLARK COUNTY BENCHMARK "GC21 2598"
BRASS CAP STATE HIGHWAY MARKER, STAMPED "STA NO17+83.78 POT, 12/21/58", LOCATED 230 FT EAST OF P.I. OF EASTERN AVE AND LAKE MEAD DR. AND NORTH SIDE OF SR 146.
CLARK COUNTY VERTICAL CONTROL, SHEET 22-61 SE A, DATED 1992.

NAVD88 ELEVATION = 690.680 METERS
NAVD88 ELEVATION = 2266.008 FEET

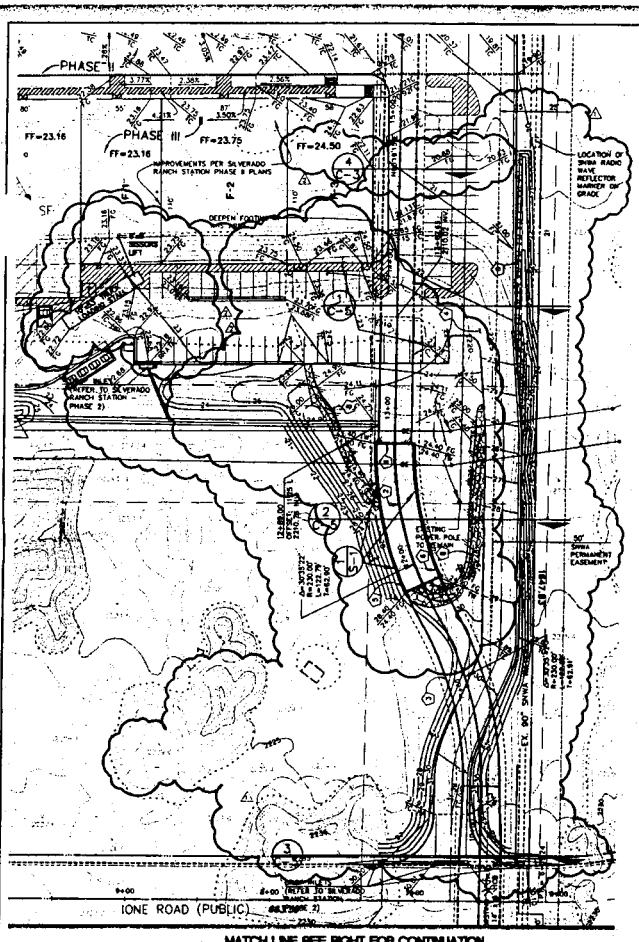
Call before you Dig. 1-800-227-2600

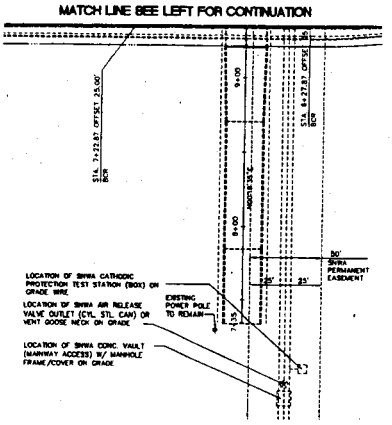
1-702-880-6116

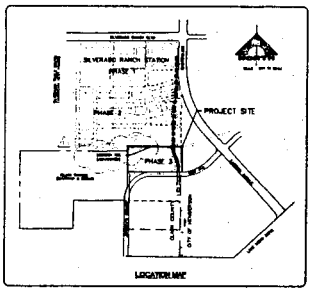
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 South Rainbow Blvd. Las Vegas, Nevada 89142
(702) 804-3000 FAX (702) 804-3001

AG BAKER REAL ESTATE, L.L.C.
SILVERADO RANCH STATION - PH II & COLLMER EXTENSION
GENERAL NOTES

SHEET C-2
2 OF 10 SHTS



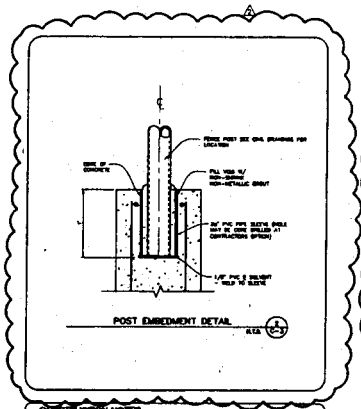


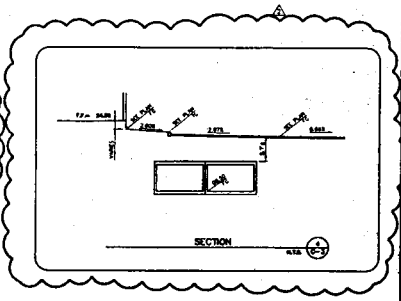


SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL LOCATE AND PROTECT ALL SNWA/SNWS APPURTENANCES INCLUDING, BUT NOT LIMITED TO CV/AIR ACCESS MANHOLE & CATHODIC PROTECTION TEST STATIONS PRIOR TO CONSTRUCTION. TO VERIFY EXISTING STRUCTURES AND/OR UTILITIES, CONTRACTOR SHALL CONTACT SNWA INSPECTION SERVICES. CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY INSPECTIONS AT (702) 862-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. ALL GRADING, STRUCTURES, FENCES OR WALLS SHALL BE PLACED UPON, OVER AND WITHIN SAID PARCEL(S) SUBJECT TO THE SNWA 50' PERMANENT EASEMENT EXCEPT THAT SAID PARCEL MAY BE LANDSCAPED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, PROVIDED AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE IF CONSTRUCTION WITHIN THE EASEMENT OF RESTRICTED ZONE IS NOT COMPLETE. PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

SNWA DATE





CONSTRUCTION NOTES

1. CONSTRUCT 28.84 LF. OF 11' X 6'-0" DOUBLE BARRICA. WITH 30in DIA.PIPES FROM THE DOUBLE STRUCTURE TO THE CHANNEL DOUBLE 11'-0 X 7'-0" ELLIPICAL BRICK BOX CULVERTS. SEE CON-BRICK PLANS.
2. CONSTRUCT 100 LF. OF DOUBLE STRUCTURE. SEE STRUCTURAL PLANS FOR DETAILS
3. CONSTRUCT VAULT (LF OF STANDARD NEVADA DEPT. OF TRANSPORTATION (NDOT) DOUBLE 12'-0 X 8'-0" REINFORCED CONCRETE BOX CULVERT ACCORDING TO NDOT STD. DWG. #M-SS.13 DETAIL C, SHT. C-2)
4. CONSTRUCT AC PAVEMENT PER SECTION 3, SHEET C-4
5. RAISED WALL OF SWIMLINE TO EXTEND TO POWER GRADE AT 26.4 TRANSITION WALL ON SOUTH FROM 26.4 TO 24.4 ON EAST. INSTALL 5' CHAIN LINK FENCE ON TOP OF WALL, OR VEST & SOUTH SIDES.
6. FLAT SIDE OF SWIMLINE TO BE FLAT AT ELEVATION 26.4 WITH METAL POCKET FENCE, 6' HIGH AT TOP OF WALL, 4' SPACING BETWEEN POCKET PLATE AND GATE WITH LOCK AT LOWER STEPS.
7. PROTECT POWER POLES IN PLACE. SEE DETAIL 4, SHEET C-5
8. INSTALL 30"-RCP, 4000-LB, 24" THICK, GRADE 6" TYPE 3 BASE

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

Acceptance of plans for filing

By _____

Acceptance of these plans for filing shall not be construed as approval of the design of any particular item shown hereon, but shall mean that in general it conforms to the design standards of the Department of Public Works, Clark County, Nevada, and that the Engineer of Record has been registered and his signature hereon authorized.

NOTE: Plans may and/or affect additional fees not shown hereon based on actual quantities. Fees shall be collected at the expense for Clark County.

Call before you Dig. 1-800-227-2600

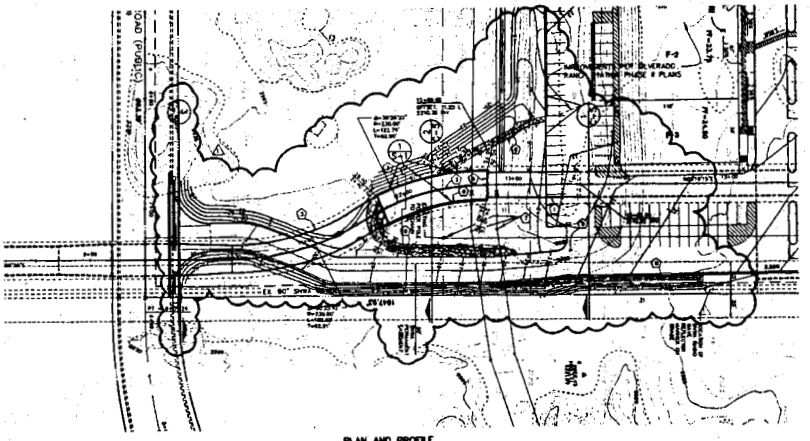
GRAPHIC SCALE

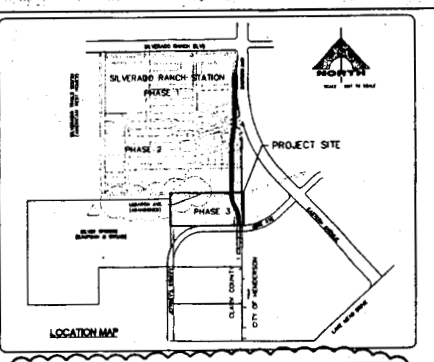
NORTH

G.C. WALLACE, INC.
Engineers/Planners/Surveyors

AID BAKER REAL ESTATE L.L.C.
SILVERADO RANCH STATION - PH 1B + CULVERT EXTENSION
GRADING PLAN

SHEET
C-3
3 OF 10 SHTS

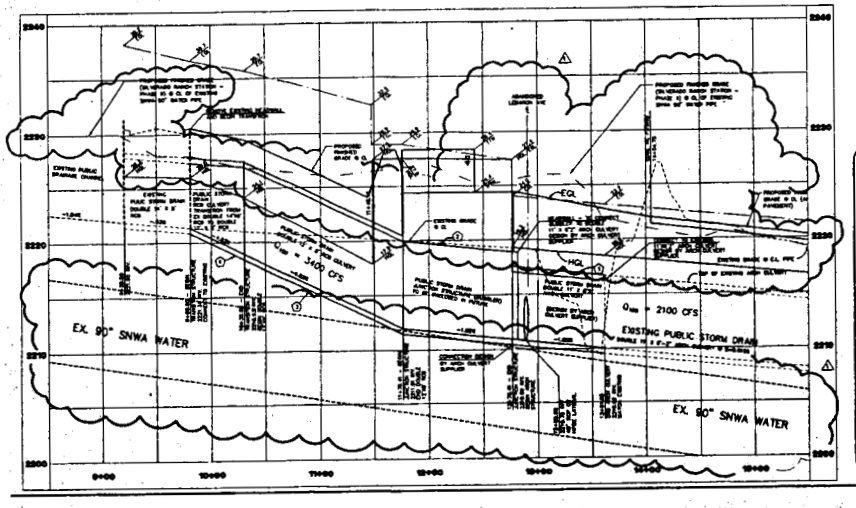




SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL LOCATE AND PROTECT ALL SNWA/OTHER APPURTENANCES, INCLUDING BUT NOT LIMITED TO MONITORING ACCESS MANHOLES, A CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE DURING/OR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE SURFACED AND USED FOR STREET, ROAD OR DRAINAGE PURPOSES AND FOR OTHER UTILITIES, MEETING AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM PIC SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

SNWA | DATE

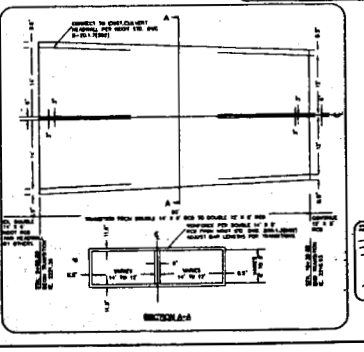


NORTH

GRAPHIC SCALE

CONSTRUCTION NOTES

1. CONSTRUCT 88.24 LF OF 11'-3" X 6'-0" DOUBLE BARRICAL AREA BOX CULVERTS FROM THE BUBBLER STRUCTURE TO THE EXISTING DOUBLE 11'-3" X 6'-0" ELLIPTICAL AREA BOX CULVERTS. SEE CON-AREA PLANS.
2. CONSTRUCT 100 L.F. OF BUBBLER STRUCTURE. SEE STRUCTURAL PLAN FOR DETAILS.
3. CONSTRUCT 100.01 L.F. OF STANDARD ASPHALT DEPT. OF TRANSPORTATION (NDOT) DOUBLE 12' X 6' REINFORCED CONCRETE BOX CULVERT ACCORDING TO NDOT STD. DWG. (R-261.3 DETAIL 4, SHT C-5)
4. SEE DETAIL A-A, SHT SHEET.
5. PLACE WALL OF BUBBLER TO EXTEND TO FINISH GRADE AT 25.4 TRANSITION WALL ON SOUTH END TO 24.4 ON EAST INSTALL 6' CHAIN LINK FENCE ON TOP OF WALL, ON WEST & SOUTH SIDES.
6. EAST SIDE OF BUBBLER TO BE FLAT AT ELEVATION 24.4 WITH METAL PICKET FENCE, 6' HIGH AT TOP OF WALL, 6" SPACING BETWEEN FENCE SLATS AND GATE WITH LOCK AT LARGER ACCESS.
7. PROJECT POWER POLES IN PLACE. SEE DETAIL 4, SHEET C-5.
8. INSTALL RIP-RAP, 400-LB., 24" THICK, UNDER 6" TYPE 1 BASE
9. CONSTRUCT HC PAVEMENT PER SECTION 2, SHEET C-5



CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

Acceptance of plans for filing

By _____

Acceptance of these plans for filing shall not be construed as approval of the design or any of the calculations or data contained therein. Acceptance of these plans for filing shall not relieve the engineer of record of any responsibility for errors or omissions contained in the plans, calculations or data. Acceptance of these plans for filing shall not relieve the engineer of record of the responsibility for the engineering design contained herein.

NOTE: Future owner and/or other successive property owners should not construct, alter, change or in any manner modify the grading, drainage or improvements without the approval of the engineer of record and the Clark County Department of Public Works.

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1-800-227-2600

1-702-880-6911

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 South Rainbow Blvd., Las Vegas, Nevada 89146
(702) 804-2100 FAX (702) 804-2909

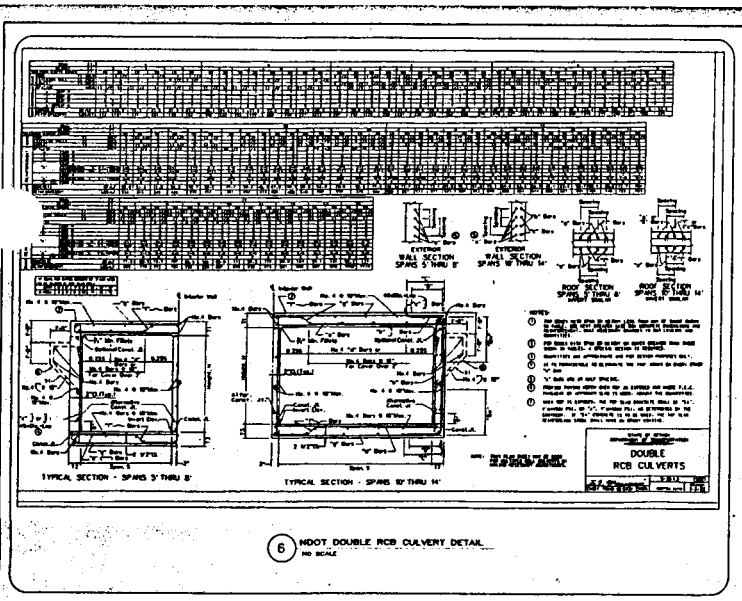
AD BAKER REAL ESTATE, L.L.C.

SILVERADO RANCH STATION – PH. II & CULVERT EXTENSION

CULVERT PLAN and PROFILE

STA. 9+40.00 to 15+40.00

SHEET
C-4
4 OF 10 SHTS

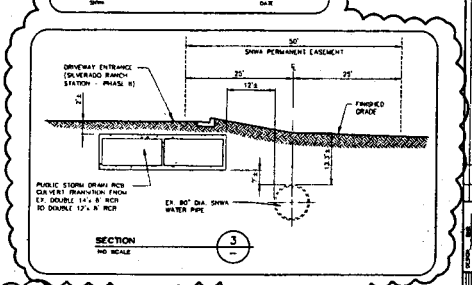


6 NDOT DOUBLE RCB CULVERT DETAIL
NO SCALE

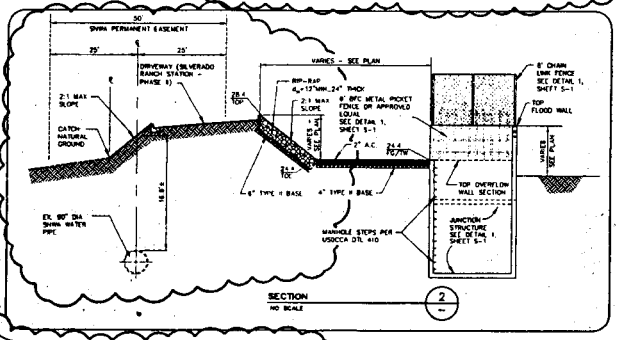
SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL LOCATE AND PROTECT ALL SNWA/OTHER UTILITY FACILITIES INCLUDING, BUT NOT LIMITED TO ANY AIR, ACCESS MANHOLES, & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND ALL DRAIN STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY INSPECTOR AT (702) 86[illegible]-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT SUCH AS ARE APPROVED AND USED FOR STREETS, ROAD OR PUBLIC UTILITIES, AND FOR OTHER UTILITIES, WHICH OF AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

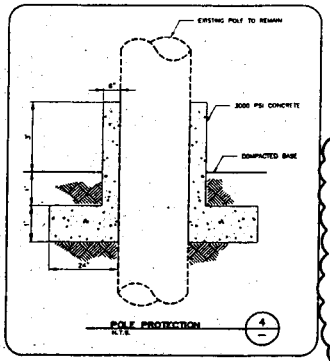
SNWA DATE



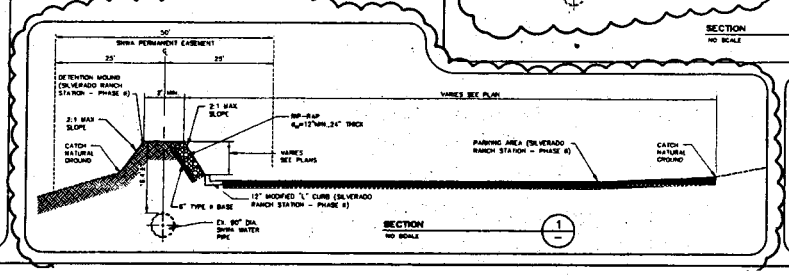
SECTION
NO SCALE
3



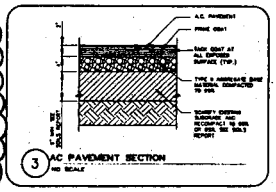
SECTION
NO SCALE
2



POLE PROTECTION
N.T.S.
4



SECTION
NO SCALE
1

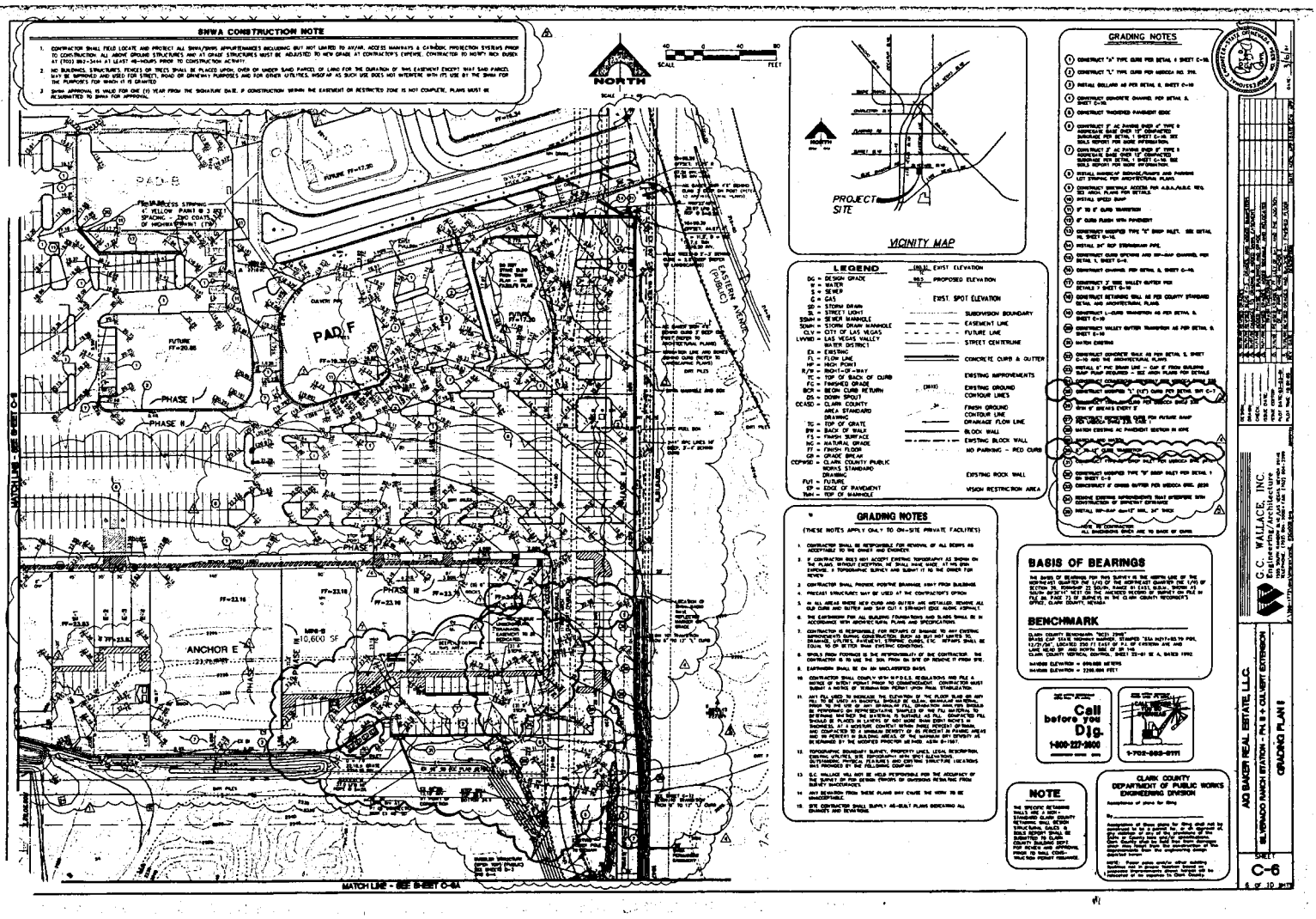


3 AC PAVEMENT SECTION
NO SCALE

G.C. WALLACE, INC.
Engineers/Planners/Surveyors

AG BAKER REAL ESTATE, L.L.C.
SILVERADO RANCH STATION - PH II & CULVERT EXTENSION
SECTIONS AND DETAILS I

SHEET
C-5
5 OF 10 SHTS


SNWA CONSTRUCTION NOTE
1. CONTRACTOR SHALL FIELD LOCATE AND PROTECT ALL SNWA/SVWPA APPURTENANCES INCLUDING BUT NOT LIMITED TO AIR/AIR, ACCESS MANHOLES & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY RICH BUSER AT (702) 862-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAND PARCEL OR LAND FOR THE DURATION OF THIS EASEMENT EXCEPT WHAT SAID PARCEL MAY BE IMPROVED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, WHICH OF AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL
NORTH
SCALE
FEET
PAD B
PAD E
PAD F
PHASE I
PHASE II
PHASE III
ANCHOR E
MATCH LINE - SEE SHEET C-5
MATCH LINE - SEE SHEET C-6A
PROJECT SITE
VICINITY MAP
LEGEND
GRADING NOTES
(THESE NOTES APPLY ONLY TO ON-SITE PRIVATE FACILITIES)
GRADING NOTES
BASIS OF BEARINGS
BENCHMARK
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1-702-385-6911
NOTE
CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
G.C. WALLACE, INC.
Engineering/Architecture
ADJ BAKER REAL ESTATE, L.L.C.
SILVERADO RANCH STATION - PA 8 + CULVERT EXTENSION
GRADING PLAN II
C-6
6 OF 10 SHTS

SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL FIELD LOCATE AND PROTECT ALL SNWA/SNWS APPURTENANCES INCLUDING BUT NOT LIMITED TO AIR/VAC, ACCESS MANHOLES & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE BY CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY SNWA DUBOIS AT (702) 862-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE IMPROVED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, PROVIDED AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

NORTH
SCALE 1" = 40'

SCALE 40 0 40 80 FEET

MATCH LINE - SEE SHEET C-6

LONE ROAD (PUBLIC)

SECTION A
NO SCALE

MODIFIED "L" CURB B
NO SCALE

CLASS B CONCRETE

VICINITY MAP

PROJECT SITE

LEGEND

DC = DESIGN GRADE
W = WATER
S = SEWER
G = GAS
SD = STORM DRAIN
SL = STREET LIGHT
SSMH = SEWER MANHOLE
SDMH = STORM DRAIN MANHOLE
C.V. = CITY OF LAS VEGAS
LVVWD = LAS VEGAS VALLEY WATER DISTRICT
EX = EXISTING
FL = FLOW LINE
HP = HIGH POINT
R/W = RIGHT-OF-WAY
TC = TOP OF BACK OF CURB
FG = FINISHED GRADE
BCR = BEGIN CURB RETURN
DS = DOWN SPOUT
CCASD = CLARK COUNTY AREA STANDARD DRAWING
TC = TOP OF GRATE
BW = BACK OF WALL
FS = FINISH SURFACE
NG = NATURAL GRADE
FF = FINISH FLOOR
GB = GRADE BREAK
CCPWSD = CLARK COUNTY PUBLIC WORKS STANDARD DRAWING
FUT = FUTURE
EP = EDGE OF PAVEMENT
TMH = TOP OF MANHOLE

(98.5) EXIST. ELEVATION
98.5 PROPOSED ELEVATION
EXIST. SPOT ELEVATION
SUBDIVISION BOUNDARY
EASEMENT LINE
FUTURE LINE
STREET CENTERLINE
CONCRETE CURB & GUTTER
EXISTING IMPROVEMENTS
(98.5) EXISTING GROUND CONTOUR LINES
98 FINISH GROUND CONTOUR LINE
DRAINAGE FLOW LINE
BLOCK WALL
EXISTING BLOCK WALL
NO PARKING - RED CURB
EXISTING ROCK WALL
VISION RESTRICTION AREA

GRADING NOTES

1. CONSTRUCT "A" TYPE CURB PER DETAIL 4 SHEET C-16
2. CONSTRUCT "L" TYPE CURB PER UBIDCA NO. 216
3. INSTALL BOLLARD AS PER DETAIL 8, SHEET C-19
4. CONSTRUCT CONCRETE CHANNEL PER DETAIL 8, SHEET C-10
5. CONSTRUCT RAISED/CD PAVEMENT EDGE
6. CONSTRUCT 2" AC PAVING OVER 4" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-16. SEE SOILS REPORT FOR MORE INFORMATION
7. CONSTRUCT 3" AC PAVING OVER 6" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-16. SEE SOILS REPORT FOR MORE INFORMATION
8. INSTALL HANDICAP SIGNAGE/REMOVE AND PAINTING LOT STRIPING PER ARCHITECTURAL PLANS.
9. CONSTRUCT DRIVEWAY ACCESS PER A.D.A./A.B.A.G. REQ. SEE ARCH. PLANS FOR DETAILS.
10. INSTALL SPEED BUMP
11. 8" TO 6" CURB TRANSITION
12. 6" CURB FLUSH WITH PAVEMENT
13. CONSTRUCT MODIFIED TYPE "C" GRATE INLET. SEE DETAIL #2, SHEET C-16
14. INSTALL 24" RCP STORMDRAIN PIPE
15. CONSTRUCT CURB OPENING AND RIP-RAP DRAINAGE PER DETAIL 1, SHEET C-6
16. CONSTRUCT CHANNEL PER DETAIL 8, SHEET C-10
17. CONSTRUCT 2' WIDE VALLEY GUTTER PER DETAILS 7 SHEET C-19
18. CONSTRUCT RETAINING WALL AS PER COUNTY STANDARD DETAIL AND ARCHITECTURAL PLANS.
19. CONSTRUCT 6-CURB TRANSITION AS PER DETAIL 8 SHEET C-16
20. CONSTRUCT VALLEY GUTTER TRANSITION AS PER DETAIL 8, SHEET C-16
21. MATCH EXISTING
22. CONSTRUCT CONCRETE WALK AS PER DETAIL 3, SHEET C-19 AND THE ARCHITECTURAL PLANS.
23. INSTALL 8" PVC SEWER LINE - SAY 3' FROM BUILDING SUMP PUMP REQUIRED - SEE ARCH. PLANS FOR DETAILS
24. CONSTRUCT CONNECTION TO EXISTING PER UBIDCA SWPP 220
25. CONSTRUCT MODIFIED "L" (12") CURB PER DETAIL SHT C-7
26. CONSTRUCT TACK ON CURB PER UBIDCA SWPP 220
27. INSTALL 4" BREAKAWAY SYSTEM 2
28. INSTALL CONCRETE SLAB FOR FUTURE RAMP
29. MATCH EXISTING AC PAVEMENT SECTION IN KIND
30. SAWCUT AND MATCH
31. 8" TO 12" CURB TRANSITION
32. CONSTRUCT TYPE "B" GRADE INLET PER UBIDCA SWPP 2012
33. CONSTRUCT MODIFIED TYPE "B" GRADE INLET PER DETAIL 1 ON SHEET C-19
34. CONSTRUCT 8' CROSS GUTTER AND MEDIAN SWPP 2020
35. REMOVE EXISTING IMPROVEMENTS THAT INTERFERE WITH CONSTRUCTION OF DRIVEWAY ENTRANCE
36. INSTALL RIP-RAP 6x4'x12" MIN., 24" THICK

NOTE TO CONTRACTOR:
ALL DIMENSIONS WHICH ARE TO BACK OF CURB.

GRADING NOTES

(THESE NOTES APPLY ONLY TO ON-SITE PRIVATE FACILITIES)

1. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ALL ITEMS AS ACCEPTABLE TO THE OWNER AND ENGINEER.
2. IF CONTRACTOR DOES NOT ACCEPT EXISTING TOPOGRAPHY AS SHOWN ON THE PLANS, WITHOUT EXCEPTION, HE SHALL HAVE SAME, AT HIS OWN EXPENSE, A TOPOGRAPHIC SURVEY AND SUBMIT IT TO THE OWNER FOR REVIEW.
3. CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDINGS.
4. PRECAST STRUCTURES SHALL BE USED AT THE CONTRACTOR'S OPTION.
5. IN ALL AREAS WHERE NEW CURB AND GUTTER ARE INSTALLED, REMOVE ALL OLD CURB AND GUTTER AND SAW CUT A STRAIGHT EDGE ALONG ASPHALT.
6. THE EARTHWORK FOR ALL BUILDING FOUNDATIONS AND SLABS SHALL BE IN ACCORDANCE WITH ARCHITECTURAL PLANS AND SPECIFICATIONS.
7. CONTRACTOR IS RESPONSIBLE FOR REPAIRS OR DAMAGES TO ANY EXISTING IMPROVEMENTS DURING CONSTRUCTION. SUCH AS BUT NOT LIMITED TO, SIDEWALKS, PAVEMENT, IRRIGATION, CURBS, ETC. REPAIRS SHALL BE DONE TO BE SIMILAR TO EXISTING CONDITIONS.
8. SPOILS FROM FOOTINGS IS THE RESPONSIBILITY OF THE CONTRACTOR. SEE CONTRACTOR TO HAUL OFF THE SITE, FROM ON SITE OR REMOVE IT FROM SITE.
9. EARTHWORK SHALL BE ON AN UNBALANCED BASIS.
10. CONTRACTOR SHALL COMPLY WITH N.R.S.625.1 REGULATIONS AND FILE A NOTICE OF INTENT PERMIT PRIOR TO GRADING. CONTRACTOR MUST SUBMIT A NOTICE OF TERMINATION PERMIT UPON FINAL STABILIZATION.
11. ANY FILL PLACED IN EXCESS OF THE DEPTH OF THE TESTS SHALL BE APPROVED BY THE SOILS ENGINEER. A SOILS REPORT SHALL BE SUBMITTED PRIOR TO THE USE OF ANY ON-SITE OR OFF-SITE SOILS FOR STRUCTURAL FILL. COMPACTION SHALL BE PERFORMED ON REPRESENTATIVE SAMPLES OF THE FILL MATERIAL TO DETERMINE WHETHER THE MATERIAL IS SUITABLE AS FILL. COMPACTED FILL SHOULD BE PLACED IN LAYERS OF NOT MORE THAN EIGHT INCHES IN THICKNESS, AT A MOISTURE CONTENT WITHIN THREE PERCENT OPTIMUM, AND COMPACTED TO A MINIMUM OF 90 PERCENT OF MAXIMUM DENSITIES AND AT PERCENT IN EXCESS OF THE OPTIMUM MOISTURE CONTENT AS DETERMINED BY THE MODIFIED PROCTOR METHOD ASTM D-1557.
12. TOPOGRAPHIC BOUNDARY SURVEY, PROPERTY LINES, LEGAL DESCRIPTION, AND EASEMENTS SHALL BE THE RESPONSIBILITY OF THE SITE PLANNER. CONTRACTOR SHALL VERIFY ALL EXISTING STRUCTURE LOCATIONS WITH PROVIDED BY THE FOLLOWING COMPANY.
13. G.C. WALLACE, INC. WILL NOT BE HELD RESPONSIBLE FOR THE ACCURACY OF THE BOUNDARY AND TOPOGRAPHIC SURVEY ON WHICH THESE PLANS ARE BASED.
14. ANY DEVIATION FROM THESE PLANS MAY CAUSE THE WORK TO BE UNACCEPTABLE.
15. THE CONTRACTOR SHALL SUPPLY AS-BUILT PLANS INDICATING ALL CHANGES AND REVISIONS.

NOTE

THE SPECIFIC RETAINING WALLS ARE A NON-STANDARD CLARK COUNTY RETAINING WALL DESIGN STRUCTURAL CALCS. & SOILS REPORT SHALL BE SUBMITTED TO CLARK COUNTY BUILDING DEPT. FOR REVIEW AND APPROVAL PRIOR TO WALL CONSTRUCTION PERMIT ISSUANCE.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Recommended for approval for filing

By _____

Acceptance of these plans for filing shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of the Clark County Code or any ordinance of the County. Any permits required must be obtained before work may begin. Acceptance of these plans for filing does not relieve the engineer(s) of record of responsibility for the engineering design.

NOTE: These plans shall be either wet-stamp signed or have a digital signature based on a certificate issued by a certificate authority as required by Clark County.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 22, T.21S., R.61E., M.D.B.&M. SHOWN AS EAST, N.A.D. 1983 (1994) ADJ. PER CORS STATION "P219" AS SHOWN ON RECORD OF SURVEY FILE 96, PAGE 73 OF SURVEYS, IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

CLARK COUNTY BENCHMARK "NCDI_BRASS"
BRASS CAP STATE HIGHWAY MARKER, STAMPED "STH #577+83.70 PRT, 1/2/1/04", LOCATED 258.11 EAST OF P.I. OF EASTERN AXE AND LIGHT HEAD OF AND NORTH SIDE OF SR 146.
CLARK COUNTY VERTICAL CONTROL SHEET 22-61 SE A, DATED 1992.

NAVD88 ELEVATION = 890.680 METERS
NAVD88 ELEVATION = 2765.855 FEET

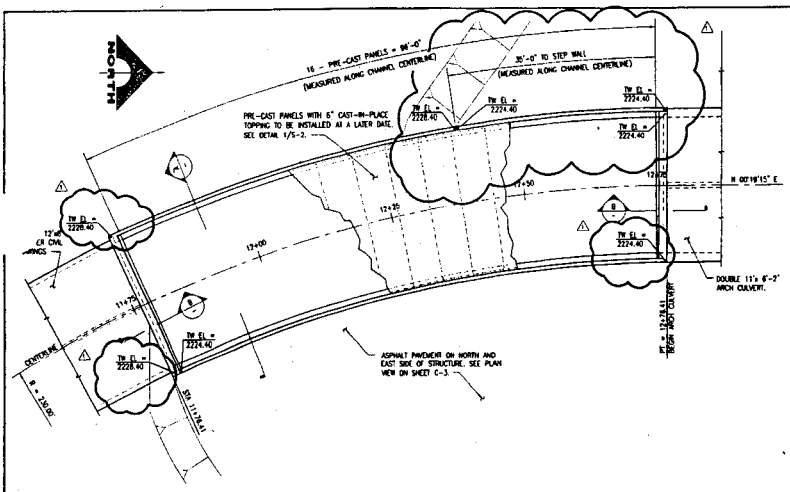
Call before you Dig. 1-800-227-2600

1-702-253-5111

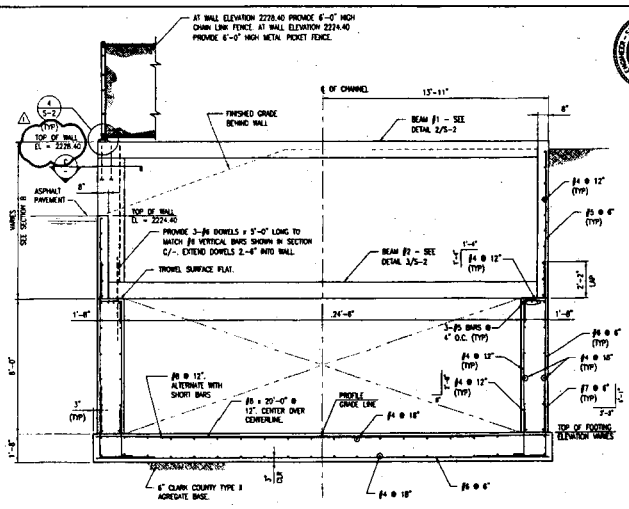
G.C. WALLACE, INC.
Engineering/Architecture
2030 E. FLAMINGO RD., SUITE 220
LAS VEGAS, NEVADA 89119
(702) 364-1866 FAX (702) 364-1975

AID BAKER REAL ESTATE L.L.C.
EL DORADO RANCH STATION - PH. II + CULVERT EXTENSION
GRADING PLAN II

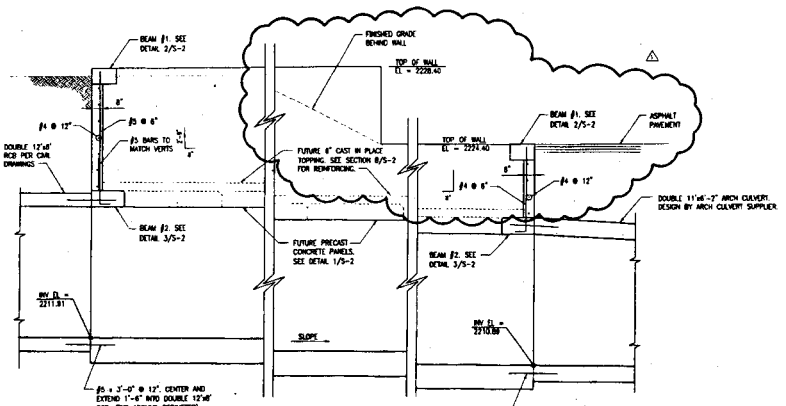
SHEET
C-7
7 OF 10 SHTS



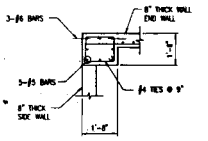
PLAN
1/8" = 1'-0"



SECTION
3/8" = 1'-0"



SECTION
3/8" = 1'-0"



SECTION
1/2" = 1'-0"

GENERAL NOTES:

DESIGN STANDARD: STANDARD SPECIFICATION FOR HIGHWAY BRIDGES, AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO), 1996 EDITION AND INTERIMS 1997-1998.

CONCRETE: ALL CONCRETE SHALL BE CLASS D WITH A MINIMUM ULTIMATE COMPRESSIVE STRENGTH f'c=4000psi AT 28 DAYS. ALL CONCRETE SHALL BE MADE USING TYPE V CEMENT. ALL EXPOSED CORNERS SHALL BE BEVELED 3/4" UNLESS OTHERWISE NOTED.

REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615, GRADE 60. DIMENSIONS RELATING TO BAR SPACING ARE CENTER TO CENTER. BENDING DIMENSIONS ARE FROM OUT TO OUT OF BARS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 2" UNLESS OTHERWISE NOTED. HOOKS MAY BE ROTATED OR TILTED, AS NECESSARY, TO PROVIDE PROPER CLEARANCES.

BEDDING MATERIAL: BEDDING MATERIAL SHALL BE 6" OF CLARK COUNTY TYPE II AGGREGATE. THE BEDDING LAYER SHALL BE COMPACTED TO AT LEAST 90 PERCENT OF THE MAXIMUM DRY DENSITY AS ESTABLISHED BY ASTM TEST METHOD D-1557.

EXISTING UTILITIES: THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES WITHIN THE WORK AREA, AND PROVIDING PROTECTION FOR THE VARIOUS UTILITIES AFFECTED, BEFORE PROCEEDING WITH THE WORK.

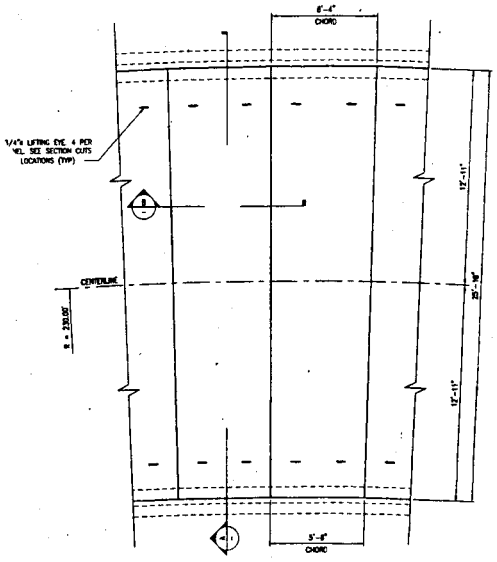
SOILS REPORT: SOILS REPORT PREPARED BY TERRACON CONSULTANTS WESTERN, INC., PROJECT NO. 64975102 DATED DECEMBER 18, 1997.

ALLOWABLE SOILS BEARING PRESSURE = 2,500psf
SOIL ACTIVE PRESSURE = 35 pcf/ft
SOIL WT = 135 pcf
COEF OF FRICTION = 0.44

G.C. WALLACE, INC.
Engineering/Architecture
6330 South Valley View Blvd., Suite 100
Las Vegas, Nevada 89118
(702) 263-1100 FAX (702) 263-1444

AID BAUER REAL ESTATE, L.L.C.
BUENAVIDO RANCH ESTATES - CULVERT EXTENSION
JUNCTION STRUCTURE
STA. 9+79.48 to 12+79.48

SHEET
S-1
6 OF 7 SHEETS

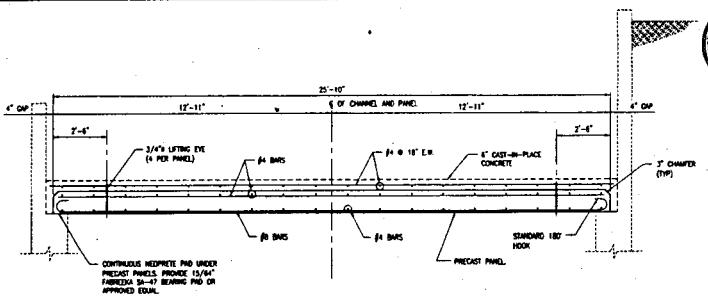


PRE-CAST SLAB DETAIL

3/8" = 1'-0"

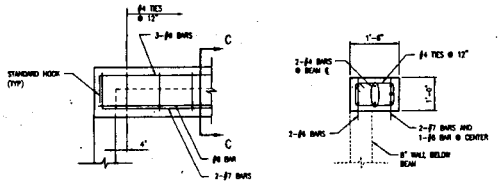
PRE-CAST PANEL NOTES:

1. CONSTRUCT 16 PRE-CAST PANELS TO COVER 96'-0" OF CHANNEL MEASURED FROM CENTERLINE OF CHANNEL.
2. TOP OF PRE-CAST SLABS SHALL BE INTENTIONALLY ROUGHENED WITH ROUGHNESS AMPLITUDE OF 1/4".



SECTION

1/2" = 1'-0"

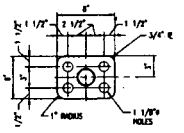


PLAN - BEAM #1

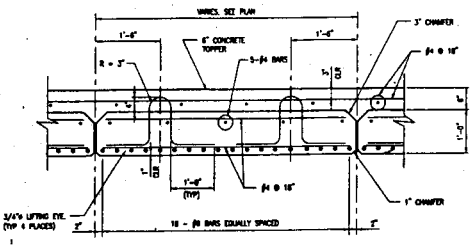
SECTION C-C

BEAM #1 DETAILS

3/4" = 1'-0"

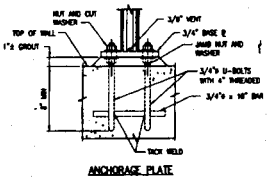


BASE PLATE



SECTION

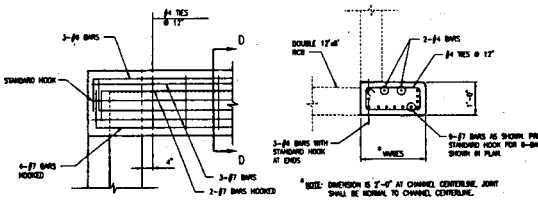
1" = 1'-0"



ANCHORAGE PLATE

FENCE CONNECTION DETAILS

SCALE - NONE



PLAN - BEAM #2

SECTION D-D

* NOTE: DIMENSION IS 2'-0" AT CHANNEL CENTERLINE. JOINT SHALL BE NORMAL TO CHANNEL CENTERLINE.

BEAM #2 DETAILS

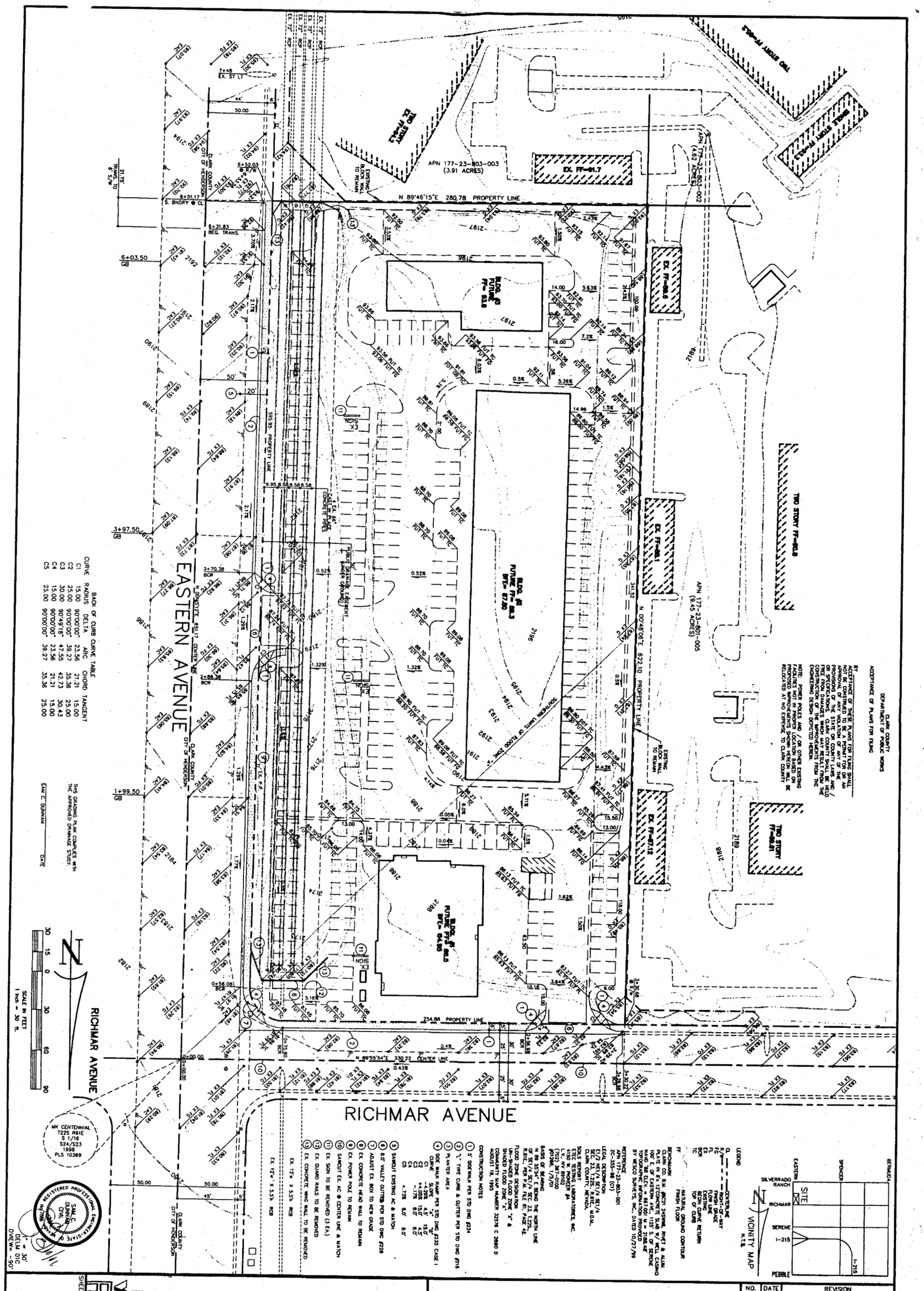
3/4" = 1'-0"

G.C. WALLACE, INC.
Engineering/Architecture

AID BAKER REAL ESTATE, L.L.C.
BUENAVOO RANCH STATION - CULVERT EXTENSION
JUNCTION STRUCTURE
BTA, SYRLA to SYRLA

SHEET
S-2
7 OF 7 SHTS

27793



RICHMAR PLAZA

GRADING PLAN

DUNNAM CIVIL ENGINEERS
(702) 798-1088
(702) 367-6945 FAX
3471 WEST OQUENDO ROAD
SUITE 101
LAS VEGAS, NV 89118

NO.	DATE	REVISION

RICHMAR PLAZA

UTILITY PLAN

DUNNAM CIVIL ENGINEERS
3411 WEST OQUENDO ROAD
SUITE 101
LAS VEGAS, NV 89118
(702) 795-1288
(702) 307-8945 FAX

NO.	DATE	REVISION
1	12/1/11	UPDATE LIFT STATION DATA
2	12/19	ADD EX GAS PER SW GAS ATLAS

SHEET 4 OF EIGHT

RECEIVED
AUG 10 2001
CLARK COUNTY
BUILDING DEPARTMENT
SERVING PUBLIC AGENCIES

3487 Ave.

SAM C. DUNNAM
CIVIL
No. 7856 REGISTERED PROFESSIONAL ENGINEER
STATE OF NEVADA
8/8/01

DELTA OUT
R = 30'
DYE/W= -90°

SCALE IN FEET
1 inch = 30 ft.
30 15 0 30 60 90

N

RICHMAR AVENUE

EASTERN AVENUE

RICHMAR AVENUE

SEE SHT #7

NOTE
APPROVAL OF THESE PLANS FOR THE WATER STUBOUT INSTALLATION WILL NOT BE CONSTRUED AS A COMMITMENT FOR WATER SERVICE TO THIS PROPERTY.

CONDITIONAL APPROVAL OF A VALVED OUTLET (10")
THESE WATER PLANS SHOW ONE OR MORE VALVED OUTLET EXTENDING OUT OF THE PAVED AREA. INSTALLATION OF THESE OUTLETS IS ACCEPTABLE. HOWEVER IF THE OUTLETS ARE INCORRECTLY LOCATED OR NOT USED FOR ANY REASON, WHEN THE PROPERTY IS ACTUALLY DEVELOPED, THE DEVELOPER SHALL ABANDON THE OUTLETS AT THE CONNECTION TO THE ACTIVE MAIN IN ACCORDANCE WITH THE DISTRICT'S STANDARDS AND AT THE DEVELOPERS EXPENSE.

LVVWD
This approval is for the placement and clearance of
Note: Existing utility locations shown hereon are approximate only. It shall be the contractor's responsibility to determine the exact vertical and horizontal location of all existing underground utilities prior to construction. No representation is made that all existing utilities are shown hereon. This engineer assumes no responsibility for utilities not shown in their proper location. Call before you dig. 1 (800) 227-2600.
DATE

NEVADA POWER CO.
DATE

CLARK CO. SANITATION DIST.
Signature on these plans shall not be construed to be a permit for or an approval of any violation of Clark County Sanitation District rules, regulations, or design & construction standards. The approval of these drawings does not guarantee capacity in the District's collection or treatment process.
DATE

SOUTHWEST GAS CORPORATION
DATE

CLARK CO. FIRE DEPT.
Approval of these plans shall not be construed to be a permit or an approval of any violation of any of the provisions of the state or county fire code or any of the provisions of residual pressure.
DATE

LEGEND & QUANTITY ESTIMATE

●	STANDARD 48" MANHOLE	2 EA.
	27 LF-27" PVC FORCE MAIN (SCH-80) @ 0.00 (PUBLIC)	
	1-1/4" STREET LIGHT CONDUIT	594 LF.
	12" PVC WATER	868 LF
	10" PVC WATER	15 LF
	6" PVC WATER	48 LF
	8" PVC SEWER	600 LF
	6" PVC SEWER	173 LF
	2" PVC FORCE MAIN (SCH-80)(PUBLIC)	869 LF
●	250 HPS LUMINAIRE	6 EA.
	EX. POWER POLE	
	EX. STREET LIGHT	
⑰	12" CAP & 2" B/O ASSY. PER UDACS PLATE #4	2 EA.
⑱	10" CAP & 2" B/O ASSY. PER UDACS PLATE #4	2 EA.
	12"x 12" TEE	1 EA.
⑮	NOT USED	
⑭	NOT USED	
⑬	ADJUST EX. BOX TO NEW GRADE.	
⑫	REMOVE EX. CAP & CONNECT TO EX 12" PVC WATER	
⑪	12" x 10" TEE	1 EA.
⑩	12" x 6" TEE	3 EA.
● ⑨	ENCO SOUTHWEST MODEL ESW4B1J2S PACKAGE LIFT STATION W/ GRINDER PUMP (PRIVATE)	1 EA.
⑧	AC PATCH PER STD. DWG. #503	
□ ⑦	FUTURE RPPA	
□ ⑥	FUTURE METER	
⑤	6 x 6 LVVWD EASEMENT	3 EA.
▲ ④	FIRE HYDRANT ASSY. UDACS PLATE #7	3 EA.
● ③	12" GATE VALVE	4 EA.
● ②	6" GATE VALVE	5 EA.
● ①	10" GATE VALVE	1 EA.

VICINITY MAP
N.T.S.

PEBBLE · SERENE · RICHMAR · SILVERADO RANCH · EASTERN · SPENCER · BERMUDA · I-215 · SITE

NOTES:
1. ALL WATER MAINS SHALL BE C-900 DR-18 PVC PIPE UNLESS OTHERWISE NOTED.
2. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM COVER OF 36" FROM FINISHED GRADE.
3. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWER MAINS.
4. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 18" FROM SEWER MAINS.
5. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM GAS MAINS.
6. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM GAS MAINS.
7. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM ELECTRIC, TELEPHONE, AND CABLE TV LINES.
8. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM ELECTRIC, TELEPHONE, AND CABLE TV LINES.
9. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM STORM DRAIN LINES.
10. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM STORM DRAIN LINES.
11. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM RECLAIMED WATER LINES.
12. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM RECLAIMED WATER LINES.
13. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEPTIC TANKS AND LEACH FIELDS.
14. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEPTIC TANKS AND LEACH FIELDS.
15. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE LAGOONS.
16. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE LAGOONS.
17. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE PUMPING STATIONS.
18. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE PUMPING STATIONS.
19. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE FORCE MAINS.
20. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE FORCE MAINS.
21. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM CHEMICAL WASTE LINES.
22. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM CHEMICAL WASTE LINES.
23. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM GARBAGE DISPOSAL LINES.
24. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM GARBAGE DISPOSAL LINES.
25. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEPTIC TANK DISPOSAL FIELDS.
26. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEPTIC TANK DISPOSAL FIELDS.
27. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE DISPOSAL FIELDS.
28. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE DISPOSAL FIELDS.
29. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE PONDS.
30. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE PONDS.
31. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE SPRAY IRRIGATION.
32. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE SPRAY IRRIGATION.
33. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE DRY WELLS.
34. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE DRY WELLS.
35. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE INJECTION WELLS.
36. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE INJECTION WELLS.
37. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE SEEPAGE PITS.
38. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE SEEPAGE PITS.
39. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE HOLDING TANKS.
40. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE HOLDING TANKS.
41. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE EVAPORATION PONDS.
42. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE EVAPORATION PONDS.
43. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE TREATMENT PLANTS.
44. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE TREATMENT PLANTS.
45. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE LIFT STATIONS.
46. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE LIFT STATIONS.
47. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE PUMPING STATIONS.
48. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE PUMPING STATIONS.
49. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE FORCE MAINS.
50. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE FORCE MAINS.
51. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM CHEMICAL WASTE LINES.
52. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM CHEMICAL WASTE LINES.
53. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM GARBAGE DISPOSAL LINES.
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55. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEPTIC TANK DISPOSAL FIELDS.
56. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEPTIC TANK DISPOSAL FIELDS.
57. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE DISPOSAL FIELDS.
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62. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE SPRAY IRRIGATION.
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99. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM HORIZONTAL SEPARATION OF 10' FROM SEWAGE HOLDING TANKS.
100. ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM VERTICAL SEPARATION OF 12" FROM SEWAGE HOLDING TANKS.

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS

ACCEPTANCE OF PLANS FOR FILING

BY _____

ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND / OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THE CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREON.

NOTE: POWER POLES AND / OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY

NO.	DATE	REVISION
1	7/12/01	change 66" RCP's to 66" arch pipes

DUNNAM CIVIL ENGINEERS
3471 WEST OQUENDO ROAD
SUITE 12
LAS VEGAS, NV 89118
(702) 736-1036
(702) 367-0446 FAX

RICHMAR PLAZA

3rd STREET PLAN & PROFILE – EASTERN

WILLDAN
SERVING PUBLIC AGENCIES
AUG 10 2001

SHEET LAS VEGAS
6
OF EIGHT

DELM 0153

EX 72" RCP (4 EA.)

6+50.58 MATCH EX. 93.27 TC (92.77) EX FL
6+31.83 BCR 92.58 TC 92.08 FL
6+03.50 GB 91.53 TC
-3.70%
-2.17%
89.28 TC
EX FG ℄ CL
3+97.50 GB 87.06 TC
3+70.38 BCR 86.71 TC 86.21 FL
2+88.38 BCR 85.65 TC 85.15 FL
1+99.50 GB 84.51 TC
2.17%
1.29%
1.29%
1.77%
82.75 TC
1+56.08 BCR/GB 81.97 TC 81.47 FL
(81.03) EX TC (80.53) EX FL
(81.26) EX FL
HYDRAULIC GRADE LINE (q100= 2100 CFS)
TOP OF CURB
FL EX CHANNEL
2 EA. 66" (RADIUS) CAST IN PLACE CONCRETE ARCH PIPES
EX 12' WIDE x 5.5' HIGH RCB (2 EA.)
(86.65) EX INV.
6+51.98 EX. HEADWALL END TRANS. STRUCTURE
86.50 INV.
6+45.98 BEG. TRANS. STRUCTURE
85.34 INV.
82.82 INV.
80.30 INV.
79.79 INV.
3+79.66 ℄
77.78 INV.
75.87 INV.
75.27 INV.
2+23.99 ℄
72.73 INV.
(71.80) EX INV.
71.99 INV.
0+82.22 HEADWALL BEG. TRANS. STRUCTURE
0+68.22 END TRANS. STRUCTURE

(WSPG Sta. 17+00) (WSPG Sta. 16+00) (WSPG Sta. 15+00) (WSPG Sta. 14+00) (WSPG Sta. 13+00) (WSPG Sta. 12+00) (WSPG Sta. 11+00) (WSPG Sta. 10+00)

7 6 5 4 3 2 1 0

2195 2190 2185 2180 2175 2170 2165

21.75 TRANSITION TO 8.0' S/W
EX. 72" RCP
EX. 72" RCP
EX. 72" RCP
REMOVE EX. WING WALL
4 EA. 66" CAST IN PLACE CONCRETE ARCH PIPES
50' PUBLIC DRAINAGE EASEMENT (UNDER GROUND)
N 00°26'34" E 266.33 CL PIPE
S 00°45'02" E 155.66 CL PIPE
N 01°38'04" E 165.85 CL PIPE
595.95 PROPERTY LINE
8' VG
REMOVE EX. WING WALL
REMOVE EX. WING WALL
ADJUST EX. BOX TO NEW GRADE
EX 8' VG
CLARK COUNTY
CITY OF HENDERSON
N 00°45'12"E 651.17 CENTER LINE
CLARK COUNTY
CITY OF HENDERSON
CLARK COUNTY
CITY OF HENDERSON
EDGE OF EX AC
EDGE OF EX AC
EASTERN AVENUE
RICHMAR AVENUE
SEE SHEET #7
0+00.00
0+00.00
6+03.50 GB
3+97.50 GB
1+99.50 GB

BACK OF CURB CURVE TABLE

CURVE	RADIUS	DELTA	ARC	CHORD	TANGENT
C1	15.00	90°00'00"	23.56	21.21	15.00
C2	25.00	90°00'00"	39.27	35.36	25.00
C3	30.00	90°49'18"	47.55	42.73	30.43

SCALE IN FEET
1 inch = 30 ft

SAWCUT & MATCH
℄ 50'
32'± 30' 13' 2' 5'
3/4" OPEN GRADE
1.53%
1.99%
2%
5 " MIN. AC
PRIME COAT
13" MIN. TYPE II AGGREGATE BASE
6" MIN. TYPE I OR II
5" MIN. TYPE II
EASTERN AVENUE
STD. DWG. #202.1

CL
13.33 13.33
74" CURB
66" 12"
12"

SAM C. DUNNAM CIVIL
REGISTERED PROFESSIONAL ENGINEER STATE OF NEVADA No. 7886
7/9/01

1" = 30'

Structural Cover Sheet
RICHMAR
PLAZA
Las Vegas, Nevada

LOCHSA ENGINEERING
5828 Spring Mtn Rd Ste 308
Las Vegas, Nevada 89146
Phone (702) 365-9312
Fax (702) 365-9317
LE Job Number – 2229
Email – Lochsa1@aol.com

NO.	DATE	REVISION

Abbreviations

A.B. or A. BOLT	Anchor Bolt	EXT.	Exterior	PERM.	Permanent
ANC.	Anchor	X-HVY	Extra Heavy	PERP.	Perpendicular
ADD.	Addition	X-STR	Extra Strong	PC.	Piece
AGGR.	Aggregate			PCF	Pounds Per Cubic Foot
		FAB.	Fabrication	Pen.	Penetration
ALT.	Alternate	FF	Far Face	PL	Plate
AL.	Aluminum	FS	Far Side	PLYWD.	Plywood
ACI	American Concrete Institute	FT. or '	Feet or Foot	PNT.	Paint
AIA	American Institute of Architects	FIG.	Figure	P-T	Post Tension, Post Tensioned
AISC	American Institute of Steel Construction	FIN.	Finish	P.T.	Pressure Treated
AISI	American Iron and Steel Institute	FLR.	Floor	P.P.	Partial Pen.
APA	American Plywood Association	F.D.	Floor Drain	PSF	Pounds Per Square Foot
ASTM	American Society for Testing and Materials	FTG.	Footing	PSI	Pounds Per Square Inch
ANSI	American National Standards Institute	FDN., FND. or FOUND.	Foundation	PROJ.	Project
AWS	American Welding Society	FRMG.	Framing		
&	And	GA.	Gage or Gauge	QTR.	Quarter
L	Angle	GALV.	Galvanize		
APPROX.	Approximate	GEN.	General (Notes)	RAD. or R.	Radius
ARCH.	Architect or Architectural	GLB	Glu Lam Beam	REF.	Reference
ASPH.	Asphalt	GR. or GRD.	Grade	REINF.	Reinforce, Reinforced, Reinforcement, or Reinforcing
ASS'Y.	Assembly	GRND.	Ground	REQD.	Required
AVG.	Average			REV.	Revise or Revision
		H.D.	Hold down (Simpson)	RF.	Roof
BPL.	Base Plate	HGT.	Height	RM.	Room
BM.	Beam	HORIZ.	Horizontal		
BRG.	Bearing			SCHED.	Schedule
BT	Bent	S	I Beam	SECT.	Section
M.	Bending Moment	IN. or "	Inches	SHT.	Sheet
BD.	Board	INCL.	Include or Included	SHTG.	Sheathing
B., BOTT. or BOT.	Bottom	ID	Inside Diameter	SHT. MET.	Sheet Metal
BLDG.	Building	IF	Inside Face	SIM. or SIML.	Similar
BLKG.	Blocking			SK.	Sketch
BOD	Bottom of Deck	JNT.	Joint	S	South
		K	Kip (1,000 lbs.)	SPECS.	Specifications
C.G.	Center of Gravity	K.O.	Knockout	SQ.	Square
CLG.	Ceiling			STD.	Standard
CEN.	Center	LAM.	Laminated	STL.	Steel
CL	Center Line	Ib.	Pound	STRL	Stirrup
CHAN.	Channel	LGTH.	Length	STR.	Stock
CLR.	Clear	LG.	Long	STRUCT.	Straight
COL.	Column	LONGIT.	Longitudinal	SYM. or SYMM.	Structural
CONC.	Concrete	L.H.E.	Low Hydrogen Electrode	S.FR.	Symmetrical
CONN.	Connection	LLBB	Long Leg Back To Back	S.F.	Strut Force
CONST.	Construction	LLH	Long Leg Horizontal		Square Foot
CONT.	Continuous	LLV	Long Leg Vertical		
CONTR.	Contractor			TAN.	Tangent
CMU	Concrete Masonry Units	M.B.	Machine Bolt	THK.	Thick
C.F.	Cubic Foot	MK.	Mark	THRU	Throughout
CT	Column Tie	MET.	Metal	THRU-OUT	Truss Joist MacMillan I Joist
C.Y.	Cubic Yard	MATL.	Material	TJI	Tolerance
		MAX.	Maximum	TOL.	Tongue & Groove
DET.	Detail	MECH.	Mechanical	T & G	Top and Bottom
DIAG.	Diagonal	MED.	Medium	T & B	Top Of
DIA.	Diameter	MEZZ.	Mezzanine	TO	Top of Concrete
DIMS.	Dimensions	MIN.	Minimum	TOC or TO CONC.	Top of Masonry
DO	Ditto	MIN.	Minute	TOM	
2L	Double Angle	MISC.	Miscellaneous		Top of Steel
D.F.	Douglas Fir	MIX.	Mixture	TOS or TO STL.	Total
DWG.	Drawing	MULT.	Multiple	TOT.	Transverse
				TRANSV.	Typical
EA.	Each	NF	Near Face	TYP.	
EA. END	Each End	NS	Near Side		Unless Noted
ELECT.	Electric or Electrical	NOM.	Nominal	UN	Unless Noted Otherwise
E.	East	N	North	UNO	
EL. or ELEV.	Elevation or Elevator	NTS	Not to Scale		Verify In the Field
ENGR.	Engineer	NO. or #	Number	V.I.F.	Vertical
E.N.	Edge Nail (Nailing)			VERT.	Volume
EQ.	Equal	OC	On Center	VOL.	
EQUIP.	Equipment	OPNG.	Opening		Weight
EST.	Estimate	OPP.	Opposite	WT.	West
EXCAV.	Excavate	ORIG.	Original	W	Wide Flange
EXIST. or EXG.	Existing	OD	Outside Diameter	W	Wood
EXP. JT. or E.J.	Expansion Joint	O.S.B.	Oriented Strand Board	WD.	Work Point
		OWJ	Open Web Joist	W.P.	
		PNL	Panel	YD.	Yard

Symbol Legend

- Slope Direction (down)
- Span Direction
- 00'-0" Miscellaneous Elevation
- 00'-0" Floor or Steel Elevation
- [00] Number of Headed Shear Studs Required
- Rigid Connection
- c=0" Camber Up

- Welding per AWS
- Structural Steel per AISC
- Symbols for Concrete per ACI
  - # Indicates Size of Deformed Bar.
  - AT Spacing Center to Center
  - Direction in Which Bars Extend
  - Limits of Area Covered By Bars or Post Tension

- Masonry (CMU) Wall
- Concrete Wall
- Earth
- Caliche
- S S Step in Foundation (Footing)
- Change (Step) in Elevation
- S2-3 Slip Critical Connection
  - Number of Bolts per Row
  - Number of Rows

- Section Cut
- Elevation Reference
- N North
- Revision

General Notes

GENERAL

1. The Contractor shall verify all dimensions prior to starting construction. The Architect shall be notified of any discrepancies or inconsistencies.
2. Do not scale the drawings.
3. Notes and details on the drawings shall take precedence over these general notes and the typical details.
4. All work shall conform to the minimum standards of following codes:

   The 1997 edition of the Uniform Building Code, and other regulating agencies which have authority over any portion of the work, and those codes and standard listed in these notes and in the project specifications.
5. See the architectural drawings for the following:
   Size and location of door and window openings, size and location of interior and exterior non-bearing partitions, size and location of concrete curbs, floor drains, slopes, depressed areas, changes in level, chamfers, grooves, inserts, etc., size and location of floor and roof openings, floor and roof finishes, stair framing and details, dimensions not shown on the structural drawings, ceiling assemblies, exterior wall assemblies.
6. See mechanical, plumbing, and electrical drawings for the following:
   Pipes, sleeves, hangers, trenches, wall floor and roof openings, duct penetration etc., except as shown or noted, electrical conduit runs, bosses, outlets in walls and slabs, concrete inserts for electrical, mechanical or plumbing fixtures, size and location of machine or equipment bases, anchor bolts for mounts.
7. The contract Structural drawings and specifications represent the finished structure. They do not indicate the method of construction.
8. The Contractor shall provide all measures necessary to protect the structure during construction. Such measures shall include, but not be limited to: bracing and shoring for loads due to hydrostatic, earth, wind or seismic forces, construction equipment, etc. Observation visits to the site by the Structural Engineer shall not include inspection of the above items.
9. Notify the Structural Engineer when drawings by others show openings, pockets, etc., not shown on the structural drawings, but which are located in the structural members.
10. All specifications and codes noted shall be the latest approved editions and revisions by the governmental agency having jurisdiction over this project.
11. Contractor shall investigate the site during clearing and earth work operations for filled excavations or buried structures such as cesspools, cisterns, foundations, utilities, etc. If any such structures are found, the Structural Engineer shall be notified immediately.
12. Construction materials shall be spread out when placed on framed floors or roofs. The construction material load shall not exceed the design live load per square foot. Provide adequate shoring and/or bracing where structure has not attained design strength.
13. Shop drawings submitted to the Structural Engineer for review shall consist of (1) blueline set and (1) sepia set.
14. Design Live Loads:

    Traffic Area HS20-44 Truck
    Other Areas 250psf surcharge
15. UBC Lateral Loads

    Basic Wind Speed = 75 mph, Exposure B
    Zone 88 Z = 0.2
16. UBC Table 19-A-4 Sulfate Exposure (See General Notes – Concrete Item #3 for concrete water cement ratio limits):

    Negligible

SPECIAL INSPECTION SHALL BE REQUIRED FOR THE FOLLOWING STRUCTURAL WORK:

1. Concrete.
2. Bolts, embedded plates and post-installed mechanical anchors installed in concrete.
3. Reinforcing and mechanical reinforcing bar splices:
   (a) During placement
4. Special cases:
   (a) Epoxy and grout set bolts and reinforcing bars
5. Excavation and back-filling.

Sheet List

S1.1 STRUCTURAL COVER SHEET AND GENERAL NOTES

S2.1 PLANS & SECTIONS
S2.2 PLANS & SECTIONS
S2.3 SECTIONS
S2.4 SECTIONS

S4.1 CONCRETE DETAILS & NOTES

EPOXY INSTRUCTIONS FOR ANCHORING REBAR AND BOLTS

1. Epoxy may not be used unless specifically detailed on the drawings or without prior approval of the Structural Engineer.
2. Bars must be deformed or threaded for the full embedment depth in epoxy.
3. Over-drill bar diameter by 1/4 in., unless indicated otherwise by the Epoxy Manufacturer, and to the depth indicated on the structural drawings.
4. Remove all dirt, dust, water, and ice by vacuum from the drilled holes.
5. Any dirt, rust, and oil on the bars shall be removed.
6. During the epoxy mixing and application process, follow the Epoxy Manufacturer's specifications exactly.
7. Fill the holes drilled for the bars partially with epoxy and then insert the bars. Work the bars in and out to compact the epoxy, then fill the remainder of the holes.
8. Vertical holes to be filled from the bottom are to use an epoxy gel.
9. The following epoxy systems are acceptable:

   RAWL POWER-FAST ICBO # 4514
   EPCON SYSTEM IV ITW RAMSET ICBO # 4285
   HILTI HIT HY-150 ICBO # 5193
   SIMPSON ET ICBO# 4945

   The use of any other epoxy system must be submitted for approval to the Structural Engineer.

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STRUCTURAL
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8/3/01

Add/01-19399

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RICHMAR PLAZA

STRUCTURAL COVER SHEET AND GENERAL NOTES

DATE: 05-11-01
SHEET
S1.1

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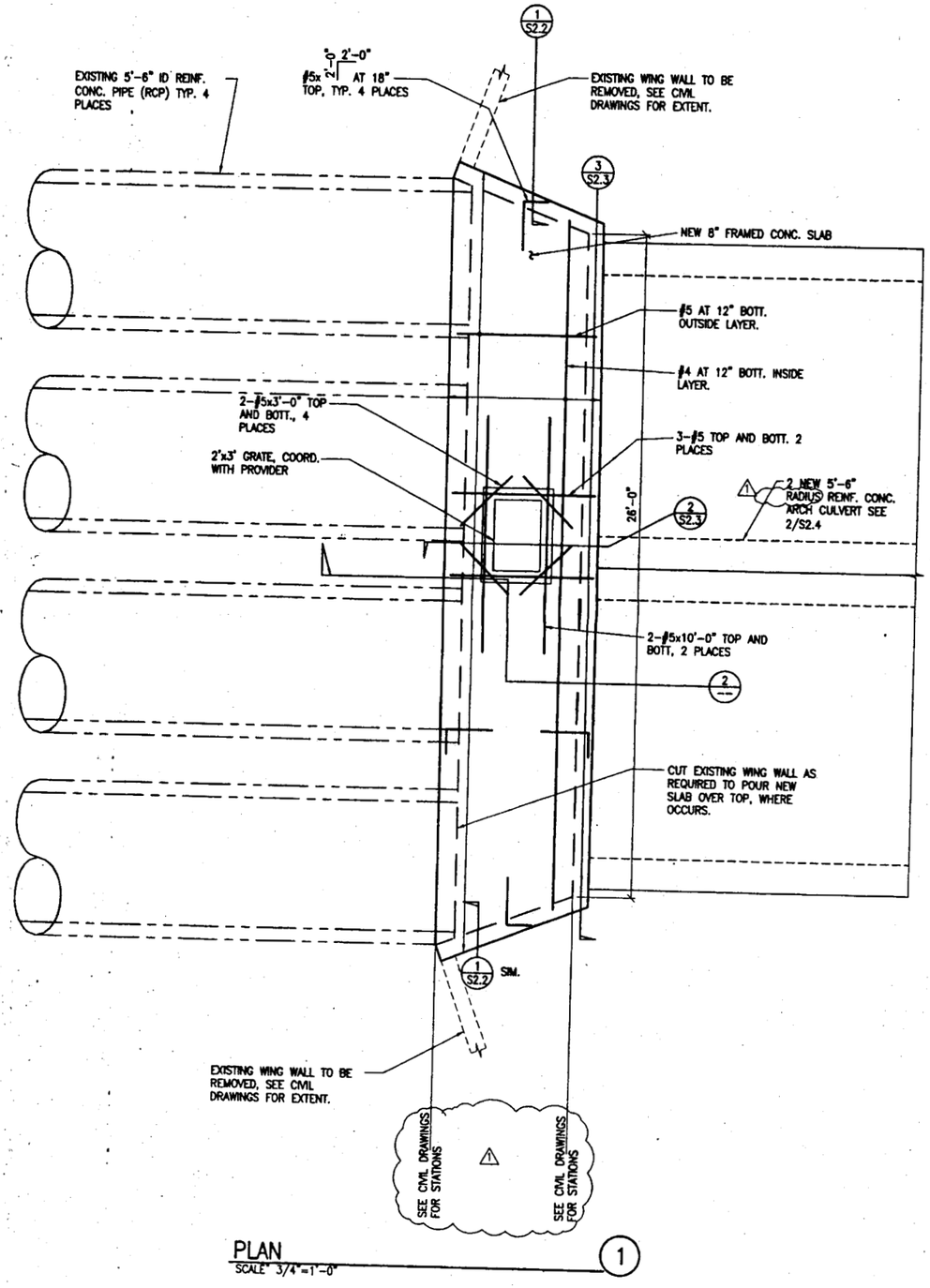
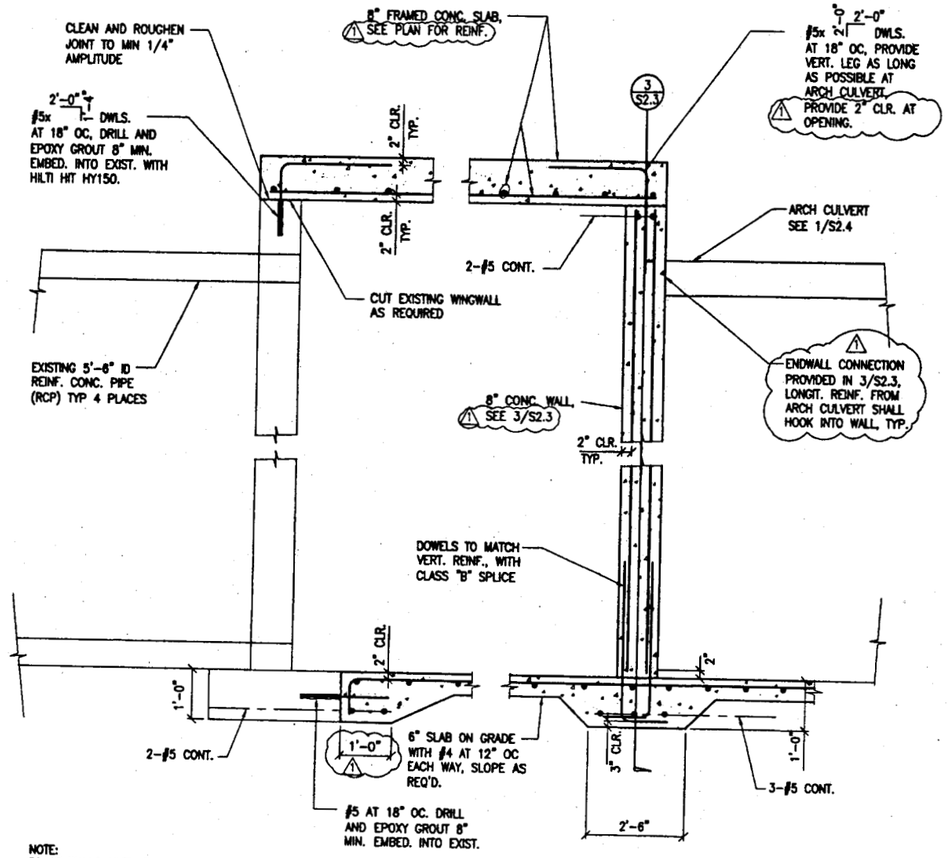


PLAN
SCALE: 3/4"=1'-0"



NOTE:
BRACE WALLS UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH.

SECTION
SCALE: 3/4"=1'-0"

NO.	DATE	REVISION
1	01 AUG. 2001	DELTA 1

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RICHMAR PLAZA

PLANS AND SECTIONS

DATE: 05-11-01
SHEET
S2.1

PROFESSIONAL ENGINEER-STATE OF NEVADA
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No. 8776
8/3/01

Delta 1 01 Aug. 2001

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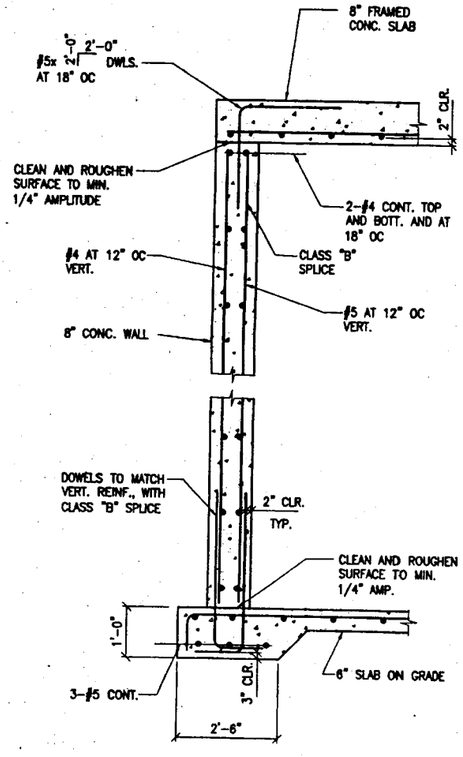
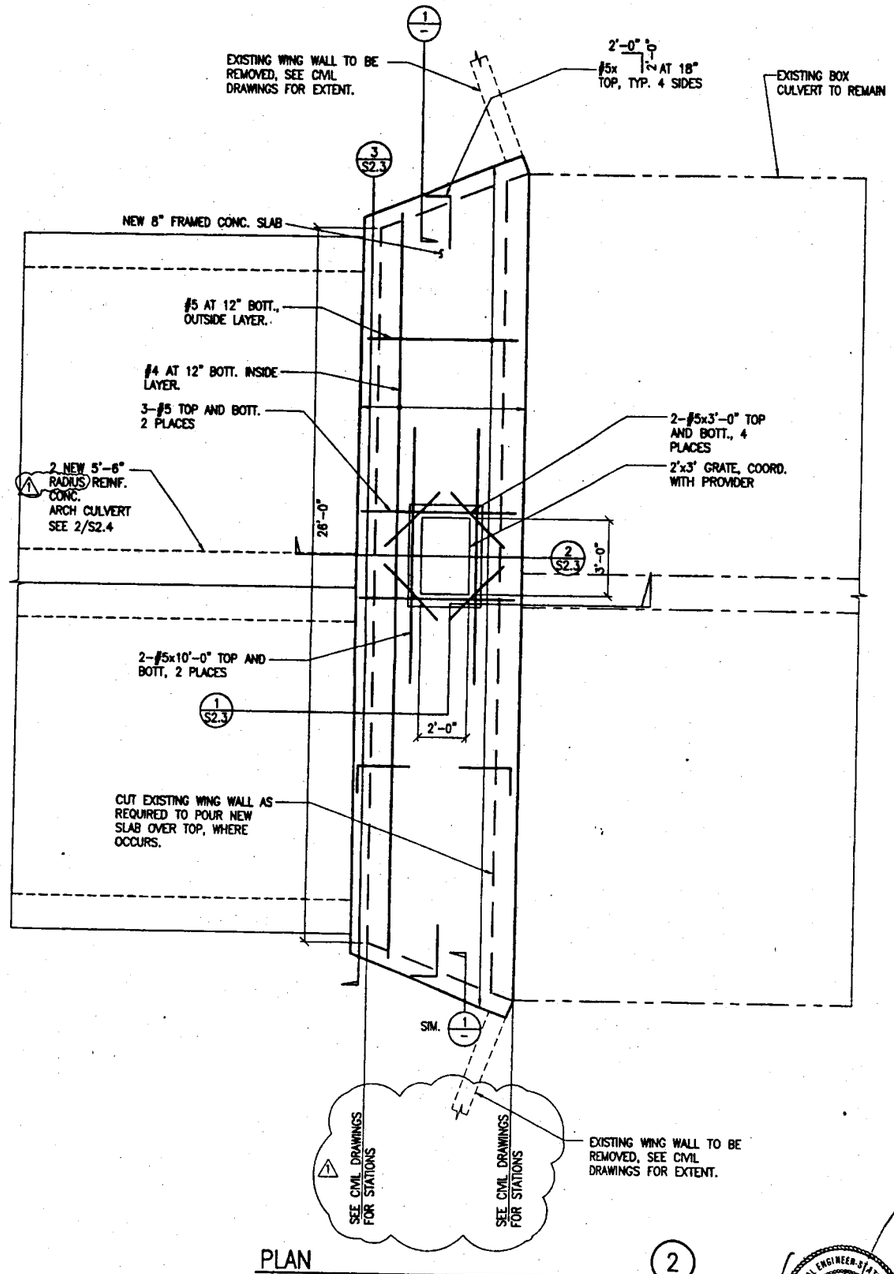


NOTE:
BRACE WALL UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH.

SECTION 1
SCALE: 3/4"=1'-0



PLAN 2
SCALE 3/4"=1'-0"

NOTES:
1. See Soils Report for all understab and footing requirements.
2. See sheet S4.1 for notes and typical details not referenced.

PROFESSIONAL ENGINEER STATE OF NEVADA
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RICHMAR PLAZA

PLANS AND SECTIONS

DATE: 05-11-01
SHEET

S2.2

Delta 1 01 Aug. 2001

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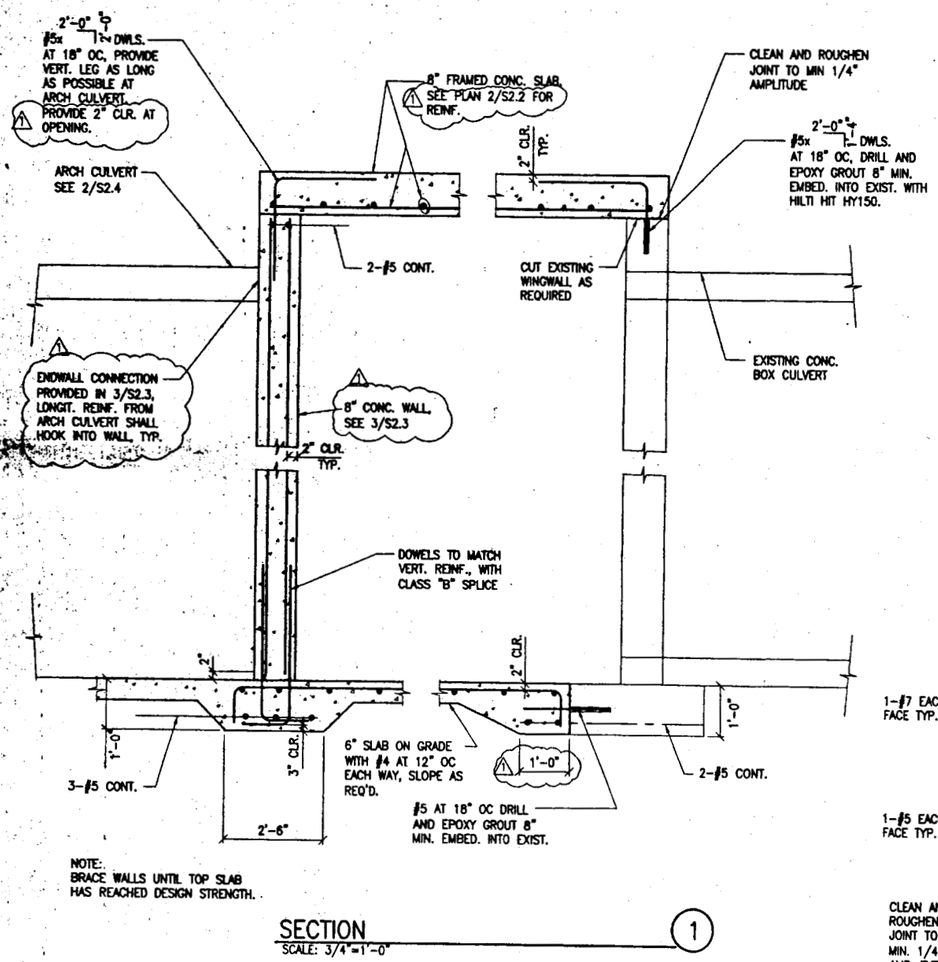
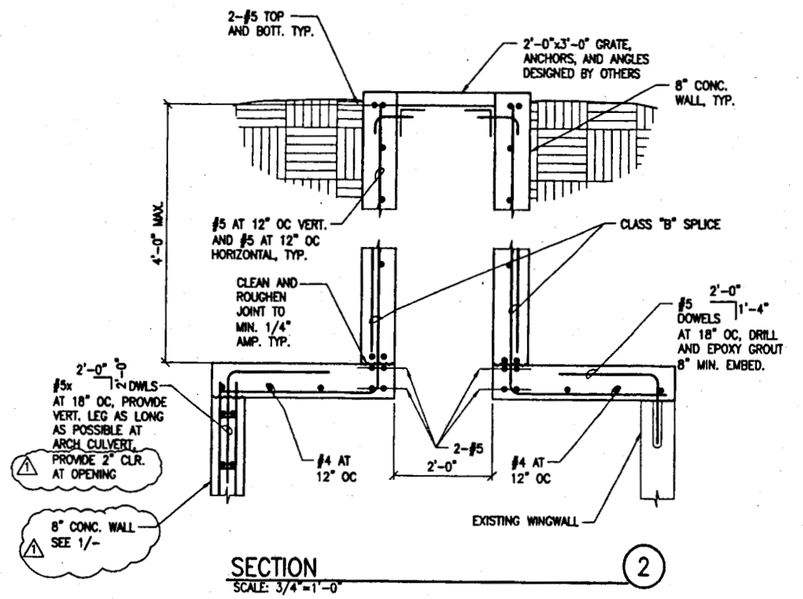


NOTE:
BRACE WALLS UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH.

SECTION (1)
SCALE: 3/4"=1'-0"



SECTION (2)
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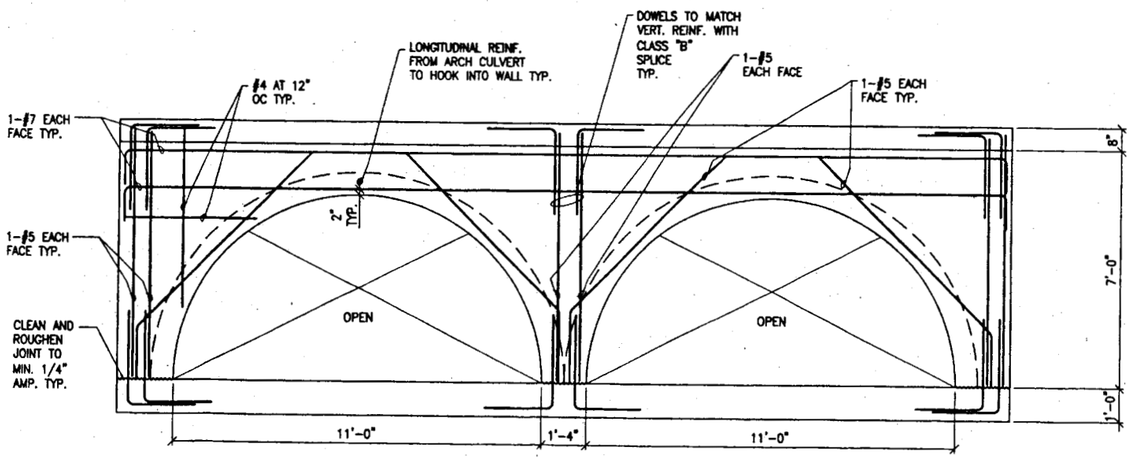

SECTION (3)
SCALE: 1/2"=1'-0"

PROFESSIONAL ENGINEER STATE OF NEVADA
KENNETH W. KARREN JR.
STRUCTURAL
No. 8776
8/3/01

NO.	DATE	REVISION
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RICHMAR PLAZA

SECTIONS

DATE: 05-11-01
SHEET

S2.3

Delta 1 01 Aug. 2001

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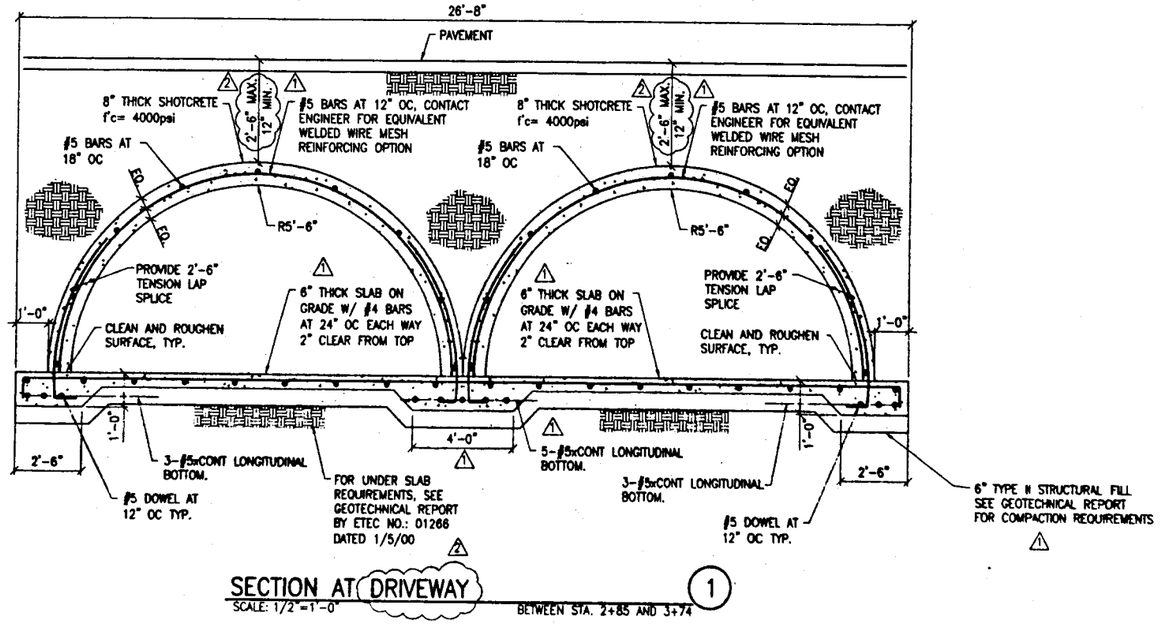
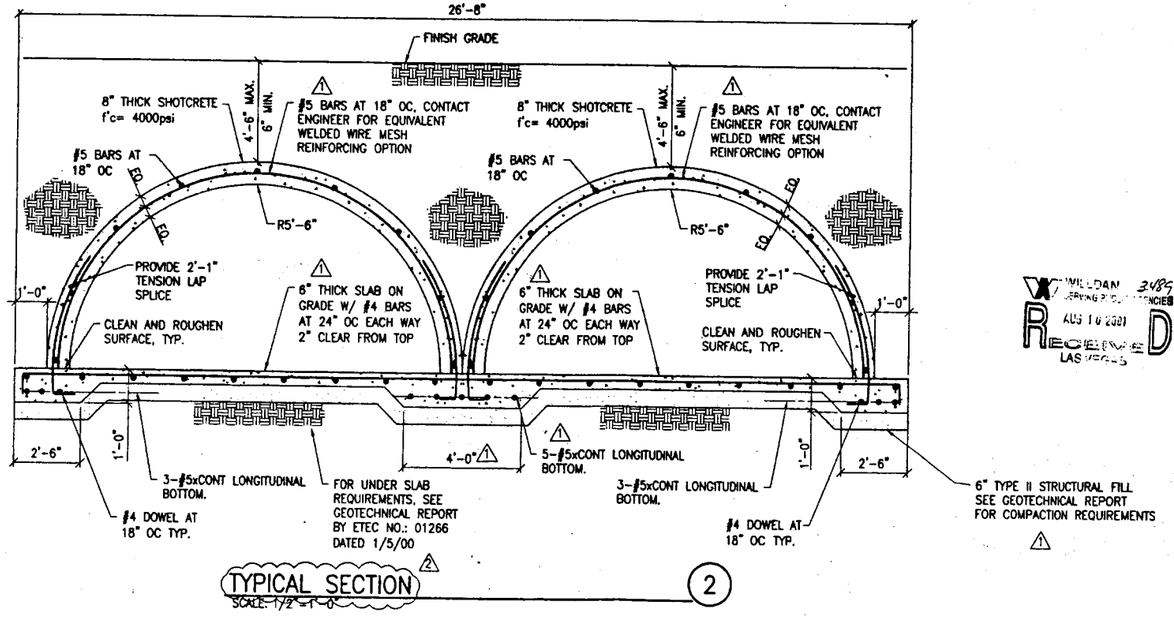


SECTION AT DRIVEWAY (1)

SCALE: 1/2"=1'-0"

BETWEEN STA. 2+85 AND 3+74



TYPICAL SECTION (2)

SCALE: 1/2"=1'-0"

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KENNETH W. WARREN, JR. STRUCTURAL No. 8776 8/10/01

Delta 2 10 Aug. 2001

NO.	DATE	REVISION
1	01 AUG. 2001	DELTA 1
2	10 AUG. 2001	DELTA 2

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RICHMAR PLAZA

ARCH CULVERT

DATE: 05-11-01

SHEET

S2.4

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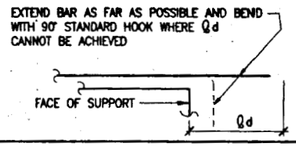
BAR SIZE	LAP CLASS	f'c = 4500 psi			
		TOP BARS		OTHER BARS	
		CASE 1	CASE 2	CASE 1	CASE 2
#3	A	18	27	14	21
	B	23	34	18	27
#4	A	24	35	18	27
	B	31	46	24	35
#5	A	29	44	23	34
	B	38	57	29	44
#6	A	35	53	27	41
	B	46	68	35	53
#7	A	51	77	40	59
	B	67	100	51	77
#8	A	59	88	45	68
	B	76	114	58	88
#9	A	68	99	51	78
	B	85	128	66	99
#10	A	73	109	56	84
	B	95	142	73	109
#11	A	80	120	62	93
	B	104	156	80	120

NOTES:
1. Table for use with normal weight hardrock concrete and grade 60 uncoated reinforcing bars. For lightweight aggregate use 1.3ℓ
2. Class A – Half or less of the bars are spliced within a required lap length. Class B – More than half of the bars are spliced within a required lap length.
3. Top bars are horizontal bars with 12" or more of concrete cast in the member below the bar.
4. For bars enclosed in standard column spirals, use 0.75ℓ or 12" min.
5. Lap splices of individual bars with a bundle shall be 1.2ℓ for that bar in a 3–bar bundle and 1.33ℓ for a 4–bar bundle. Entire bundles shall not be lap spliced at the same location. Splices for individual bars within a bundle shall be staggered such that they do not overlap.
6. ℓ – Basic lap length, shown at left.
7. Case Selection
   –For foundation reinforcement use Case 1 uno.
   –For column reinforcement and dowels use case 1 uno.
   –For beam reinforcement use Case 1 uno.
   –For structural slab reinforcement use Case 2 uno.
   –For slab on grade reinforcement use Case 1 uno.
   –For wall reinforcement and dowels use Case 1 (Except as noted below) uno.
   –For walls with a single mat of steel centered in the wall, use Case 1 for wall reinforcement and dowels uno.
   –For chord steel reinforcement use Case 2 uno.

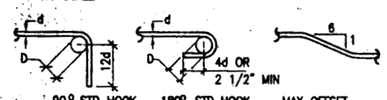
TENSION LAP SPLICE (1)
TENSION LAP SPLICE LENGTHS, ℓ (IN INCHES) FOR GRADE 60 UNCOATED BARS
NO SCALE

BAR SIZE	f'c = 4500 psi			
	TOP BARS		OTHER BARS	
	CASE 1	CASE 2	CASE 1	CASE 2
#3	18	27	14	21
#4	24	35	18	27
#5	29	44	23	34
#6	35	53	27	41
#7	51	77	40	59
#8	59	88	45	68
#9	66	99	51	78
#10	73	109	56	84
#11	80	120	62	93
#14	99	148	76	114
#18	132	197	101	152

NOTES:
1. Table for use with normal weight hardrock concrete and grade 60 uncoated reinforcing bars. For lightweight aggregate use 1.3ℓ
2. Top bars are horizontal bars with 12" or more of concrete cast in the member below the bar.
3. For bars enclosed in standard column spirals, use 0.75ℓ or 12" min.
4. Development length of individual bars within a bundle shall be 1.2ℓd for that bar in a 3–bar bundle and 1.33ℓd for a 4–bar bundle.
5. Compression development length (only where indicated on drawings) For grade 60 bars use 22 bar diameters.
6. Case Selection
   –For foundation reinforcement use Case 1 uno.
   –For column reinforcement and dowels use case 1 uno.
   –For beam reinforcement use Case 1 uno.
   –For structural slab reinforcement use Case 2 uno.
   –For slab on grade reinforcement use Case 1 uno.
   –For wall reinforcement and dowels use Case 1 (Except as noted below) uno.
   –For walls with a single mat of steel centered in the wall, use Case 1 for wall reinforcement and dowels uno.
   –For chord steel reinforcement use Case 2 uno.

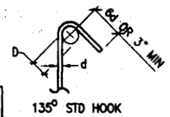


TENSION DEVELOPMENT LENGTH (2)
NO SCALE



D=6d FOR #3 TO #8
D=8d FOR #9 TO #11
D=10d FOR #14 AND #18

PRINCIPAL REINFORCING

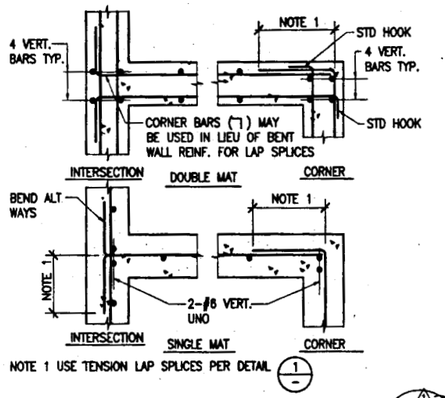


MIN D=1 1/2" FOR #3
MIN D=2" FOR #4
MIN D=2 1/2" FOR #5

STIRRUPS AND TIES

NOTES:
1. All bends shall be made cold.
2. #14 and #18 bars shall be bend tested and lab approved prior to bending

BAR BENDS (3)
NO SCALE



NOTE 1 USE TENSION LAP SPLICES PER DETAIL 1/–

REINFORCING AT WALL INTERSECTIONS (4)
SCALE: 3/4"=1'-0"

CONCRETE

1. All aspects of work pertaining to the concrete construction shall be in accordance with ACI 318–95, 'Building Code Requirements for Reinforced Concrete' and the latest edition of 'Specifications for Structural Concrete for Buildings', ACI 301, with modifications as noted on the project drawings and\or specifications.
2. Concrete mix designs shall be submitted to the Structural Engineer for review. All mix designs shall be designed by a qualified testing laboratory and shall be wet stamped by a Civil Engineer licensed in the State of Nevada.
3. Portland cement shall conform to ASTM C150 Type V where the concrete is in contact with soil. For UBC Table 19–A–4 Severe and Very Severe sulfate exposures as identified in the project geotechnical report, the water cement ratio shall not exceed 0.45 and shall not exceed 0.50 for Moderate sulfate exposure. Type II cement shall be used at all other locations in the structure.
4. Fly ash may be used in concrete mixes. The fly ash shall conform to ASTM C618 Class F. The loss of ignition shall be limited to 2%. The addition rate for fly ash shall be limited to 15% of the cement weight. The contractor shall submit all certificates showing the fly ash is in accordance with the above criteria.
5. Hard rock concrete aggregate shall conform to all requirements and tests of ASTM C33 and project specifications. Exceptions may be used only with approval of the Structural Engineer.
6. Structural concrete 28–day strengths & types are as follows:

LOCATION OF CONCRETE	STRENGTH, PSI	TYPE
FOOTINGS	4000	HARD ROCK
SLAB ON GRADE	4000	HARD ROCK
WALLS	4000	HARD ROCK
FRAMED SLABS	4000	HARD ROCK
SHOTCRETE ARCHES	4000	HARD ROCK

7. The modulus of elasticity of concrete, when tested in accordance with ASTM C469, shall be at least the value given by the equations in section 8.5.1 of ACI 318 for the specified concrete 28–day strength.
8. Concrete mixing operations, etc., shall be in accordance with ASTM C94.
9. Dry pack or grout under baseplates, sill plates, etc., see specifications. Strength requirements are as required for concrete.
10. Concrete forms shall be laid out and constructed to provide the specified cambers indicated on the structural drawings.
11. Concrete placement shall be in accordance with ACI standard 304 and project specifications. All concrete surfaces against which concrete is to be placed shall be sandblasted.
12. If columns and walls are placed with a floor, two hours must elapse between end of column or wall placement and beginning of the floor placement.
13. Clear coverage of concrete over reinforcing bars shall be as follows:

	MINIMUM COVER INCHES
A) Concrete cast against and permanently exposed to earth	3
B) Concrete exposed to earth or weather:	
No. 6 through No. 18 bar	2
No. 5 bar and smaller	1 1/2
C) Concrete not exposed to weather Or in contact with ground, U.N.O.: Slabs, walls, joists:	
No. 14 and No. 18 bar	1 1/2
No. 11 bar and smaller	3/4
Beams, columns: Primary reinforcement, ties	
Stirrups, spirals	1 1/2

D) Slab on grade, 2 inches clear from top

14. Prior to concrete placement, all reinforcing bars, anchor bolts and other concrete inserts shall be well secured in position.
15. Mechanical pipes or electrical conduit shall not pass through concrete columns or beams unless specifically detailed.
16. Unless otherwise indicated in the mechanical or electrical drawings or project specifications, mechanical pipes and electrical conduits which pass through slab on grade, concrete on steel deck, framed concrete floors and walls do not require sleeves. If sleeves are required, the sleeves shall be installed prior to placing concrete. Do not cut any reinforcing which may interfere with sleeve placement. Coring openings in concrete is not permitted. Notify the Structural Engineer in advance of conditions not shown on the structural drawings.
17. With the exception of slabs on grade and concrete on steel deck, the outside diameter of mechanical pipes and\or embedded electrical conduits (other than those passing through) shall not exceed 1/3 of the slab thickness and shall be centered between the top and bottom reinforcing, unless specifically detailed otherwise. Concentrations of mechanical pipes and\or electrical conduits shall be avoided except where detailed openings are provided.
18. For slabs on grade no pipes or conduits shall be placed within the indicated concrete slab thickness and shall be located below the slab unless specifically detailed otherwise.
19. The projecting corners of columns, beams, and walls, etc., shall be formed with a 3/4 in. chamfer, unless otherwise noted on architectural drawings or specifications.

REINFORCING STEEL (FOR CONCRETE)

1. All reinforcing steel shall be detailed and placed in accordance with the 'Building Code Requirements for Reinforced Concrete' (ACI 318–95) and the 'Manual of Standard Practice for Reinforced Concrete Construction' by CRSI and WCRSI as modified by the project drawings and specifications.
2. Deformed reinforcing bars shall conform to the requirements of ASTM A615 grade 60.
3. Welding of reinforcing is not permitted.
4. All reinforcing bar bends shall be made cold.
5. Lap splices shall be made only where shown on the structural drawings.
6. Reinforcing dowels between footings and walls or columns shall be the same number, size, spacing and grade as the specified vertical reinforcing, u.n.o.
7. All reinforcing bars shall be marked so their identification can be made when the final in–place inspection occurs.

PROFESSIONAL ENGINEER–STATE OF NEVADA
KENNETH W. KARREN, JR.
STRUCTURAL
No. 8776
8/3/01

NO.	DATE	REVISION
1	01 AUG. 2001	DELTA 1

LOCHSA ENGINEERING
8329 W. Spring Mtn Rd. Suite #205
Las Vegas, NV 89146
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RICHMAR PLAZA
CONCRETE NOTES AND TYP. DETAILS

DATE: 05-11-01
SHEET
S4.1

I:\CAD\DWG\2229\2229S41.dwg Fri Aug 03 08:26:05 2001 Lochsa Engineering - S#8

APPENDIX F

PBS&J Survey Data

Survey Data Table

PBS&J Survey Data
Pittman Wash LOMR

Point	Northing	Easting	Elevation	Point Description	Additional Desc.		
1	26708020.41	794834.44	2194.184	SET	60D	NAIL	
2	26706882.88	798823.982	2252.75	CCGIS-858			
3	26717114.73	783015.337	2178.62	CCGIS-953			
4	26713288.47	793673.682	2135.54	CCBM-4C2113SWW6			
5	26712020.75	788338.673	2179.714	CCBM-8C2122NES			
6	26706807.01	788077.798	2217.678	CCBM-8C2122SES			
7	26706839.81	792371.929	2206.68	CCBM-8C2123SSE6			
8	26707884.02	793668.294	2188.496	CCBM-8C2124SWW6			
100	26711943.55	794805.725	2111.992	D-RIPRAP-TOP			
101	26711928.66	794791.485	2112.436	D-RIPRAP-TOP			
102	26711922.19	794777.535	2113.111	D-RIPRAP-TOP			
103	26711913.24	794745.108	2113.014	D-RIPRAP-TOP			
104	26711914.74	794647.597	2114.643	D-TOP-BANK			
105	26711913.73	794547.835	2115.658	D-TOP-BANK			
106	26711912.96	794447.064	2117.177	D-TOP-BANK			
107	26711912.15	794347.152	2118.924	D-TOP-BANK			
108	26711913.1	794246.591	2119.979	D-TOP-BANK			
109	26711912.25	794145.323	2120.905	D-TOP-BANK			
110	26711911.79	794046.163	2122.069	D-TOP-BANK			
111	26711911.08	793950.183	2124.107	D-RIPRAP-TOP			
112	26711897.39	793852.522	2124.867	D-RIPRAP-TOP			
113	26711860.09	793763.476	2125.824	D-RIPRAP-TOP			
114	26711815.81	793702.541	2127.034	D-RIPRAP-TOP			
115	26711801.9	793711.892	2118.581	D-RIPRAP-TOE			
116	26711843.14	793768.91	2117.218	D-RIPRAP-TOE			
117	26711880.27	793853.761	2116.884	D-RIPRAP-TOE			
118	26711896.06	793949.576	2116.93	D-RIPRAP-TOE			
119	26711894.03	794044.911	2115.278	D-TOE-BANK			
120	26711896.68	794143.773	2114.226	D-TOE-BANK			
121	26711894.44	794243.84	2113.148	D-TOE-BANK			
122	26711897.45	794320.099	2111.632	FL	OUTLET	48"	RCP
123	26711897.43	794346.774	2111.586	D-TOE-BANK			
124	26711898.55	794445.245	2110.805	D-TOE-BANK			
125	26711898.32	794547.095	2109.145	D-TOE-BANK			
126	26711895.94	794645.534	2107.306	D-TOE-BANK			
127	26711896.41	794749.535	2105.596	D-RIPRAP-TOE			
128	26711907.92	794784.82	2104.729	D-RIPRAP-TOE			
129	26711916.02	794783.604	2105.973	FL	OUTLET	24"	RCP
130	26711918.63	794798.417	2105.057	D-RIPRAP-TOE			
131	26711935.87	794815.901	2104.895	D-RIPRAP-TOE			
132	26711920.65	794841.282	2104.539	D-NG			
133	26711896.65	794817.344	2104.748	D-NG			
134	26711868.62	794788.546	2105.075	D-NG			
135	26711855.46	794759.124	2105.318	D-NG			
136	26711815.45	794657.342	2106.898	D-NG			
137	26711792.06	794555.095	2107.88	D-NG			
138	26711802.68	794443.62	2109.463	D-NG			
139	26711803.35	794343.182	2110.303	D-NG			
140	26711793.85	794240.693	2112.055	D-NG			
141	26711799.23	794133.209	2113.139	D-NG			
142	26711797.05	794036.373	2114.019	D-NG			
143	26711777.85	793944.704	2115.475	D-NG			
144	26711769.48	793863.556	2115.987	D-NG			
145	26711755.52	793785.872	2116.653	D-NG			
146	26711735.21	793719.858	2117.966	D-NG			
147	26711691.03	793724.532	2118.693	D-NG			
148	26711695.45	793796.016	2117.681	D-NG			
149	26711700.19	793869.377	2116.699	D-NG			
150	26711701.63	793950.878	2115.868	D-NG			
151	26711706.52	794030.661	2115.462	D-NG			
152	26711703.74	794122.733	2113.702	D-NG			
153	26711694.26	794234.294	2112.294	D-NG			
154	26711694.09	794335.488	2111.229	D-NG			
155	26711696.21	794438.478	2110.401	D-NG			
156	26711686.44	794560.31	2108.634	D-NG			
157	26711712.15	794650.962	2106.973	D-NG			
158	26711732.55	794742.089	2106.285	D-NG			

159	26711785.59	794795.031	2105.737	D-NG			
160	26711849.61	794846	2104.973	D-NG			
161	26711887.97	794876.933	2104.715	D-NG			
162	26711870.38	794898.301	2104.358	D-RIPRAP-TOE			
163	26711829.08	794870.428	2104.563	D-RIPRAP-TOE			
164	26711750.91	794818.6	2105.28	D-RIPRAP-TOE			
165	26711681.89	794771.041	2106.544	D-RIPRAP-TOE			
166	26711611.69	794672.861	2107.965	D-RIPRAP-TOE			
167	26711605.88	794580.672	2108.908	D-RIPRAP-TOE			
168	26711604.24	794463.735	2111.137	D-TOE-BANK			
169	26711603.14	794330.958	2112.66	D-TOE-BANK			
170	26711599.43	794229.435	2113.854	D-TOE-BANK			
171	26711597.43	794115.137	2115.262	D-TOE-BANK			
172	26711593.43	794019.634	2117.295	D-TOE-BANK			
173	26711593.89	793949.389	2117.578	D-TOE-BANK			
174	26711595.84	793880.288	2118.146	D-TOE-BANK			
175	26711599.32	793821.676	2117.368	D-RIPRAP-TOE			
176	26711628.83	793778.152	2117.347	D-RIPRAP-TOE			
177	26711663.12	793723.059	2119.207	D-RIPRAP-TOE			
178	26711634.85	793717.306	2132.265	D-TOP-BANK			
179	26711587.66	793777.153	2131.682	D-TOP-BANK			
180	26711578.34	793821.009	2128.752	D-TOP-BANK			
181	26711578.47	793876.086	2127.334	D-TOP-BANK			
182	26711577.82	793949.559	2125.465	D-TOP-BANK			
183	26711580.22	794021.692	2124.027	D-TOP-BANK			
184	26711581.13	794109.33	2123.01	D-TOP-BANK			
185	26711582.14	794226.459	2122.241	D-TOP-BANK			
186	26711582.51	794326.046	2121.408	D-TOP-BANK			
187	26711584.31	794430.996	2121.167	D-TOP-BANK			
188	26711579.03	794573.852	2121.531	D-RIPRAP-TOP			
189	26711567.39	794584.041	2123.048	D-RIPRAP-TOP			
190	26711583.8	794603.468	2117.996	D-RIPRAP-TOP			
191	26711584.36	794645.923	2118.044	D-RIPRAP-TOP			
192	26711589.94	794676.818	2118.25	D-RIPRAP-TOP			
193	26711601.45	794715.848	2117.647	D-RIPRAP-TOP			
194	26711577.59	794705.601	2118.239	D-TOE-BANK			
195	26711575.4	794719.418	2122.883	D-TOP-BANK			
196	26711614.13	794751.716	2122.352	D-TOP-BANK			
197	26711662.36	794791.864	2121.89	D-TOP-BANK			
198	26711734.33	794839.816	2120.159	D-TOP-BANK			
199	26711794.21	794880.229	2118.472	D-TOP-BANK			
200	26711856.82	794916.162	2116.962	D-TOP-BANK			
201	26711571.73	794657.079	2118.229	D-NG			
202	26711467.4	794586.944	2123.013	D-TOP-BANK			
203	26711466.05	794595.805	2119.513	D-TOE-BANK			
204	26711464.96	794636.499	2119.08	D-NG			
205	26711462.32	794690.948	2119.328	D-TOE-BANK			
206	26711460.72	794699.58	2123.341	D-TOP-BANK			
207	26711366.85	794680.095	2124.548	D-TOP-BANK			
208	26711368.02	794670.649	2120.751	D-TOE-BANK			
209	26711372.09	794631.164	2120.818	D-NG			
210	26711378.16	794580.333	2120.328	D-TOE-BANK			
211	26711380.1	794569.867	2124.21	D-TOP-BANK			
212	26711284.13	794552.152	2125.906	D-TOP-BANK			
213	26711281.93	794563.442	2121.573	D-TOE-BANK			
214	26711277.21	794605.736	2122.672	D-NG			
215	26711273.93	794651.673	2122.287	D-TOE-BANK			
216	26711271.9	794662.201	2126.703	D-TOP-BANK			
217	26711176.28	794643.035	2129.153	D-TOP-BANK			
218	26711176.21	794629.522	2123.724	D-TOE-BANK			
219	26711178.48	794592.334	2123.98	D-NG			
220	26711183.71	794550.084	2122.582	D-TOE-BANK			
221	26711185.5	794533.648	2127.029	D-TOP-BANK			
222	26711085.28	794528.601	2129.107	D-TOP-BANK			
223	26711083.12	794546.996	2123.657	D-TOE-BANK			
224	26711083.59	794584.711	2126.392	D-NG			
225	26711085.1	794628.886	2124.406	D-TOE-BANK			
226	26711084.91	794649.08	2131.171	D-TOP-BANK			
227	26710987.37	794654.578	2132.971	D-TOP-BANK			
228	26710986.34	794639.025	2127.529	D-TOE-BANK			
229	26710980.72	794591.933	2128.078	D-NG			
230	26710983.4	794541.698	2126.186	D-TOE-BANK			

231	26710984.77	794527.981	2131.254	D-TOP-BANK			
232	26710884.91	794528.497	2132.302	D-TOP-BANK			
233	26710884.82	794543.551	2129.184	D-TOE-BANK			
234	26710887.94	794590.222	2129.77	D-NG			
235	26710884.82	794646.238	2129.819	D-TOE-BANK			
236	26710884.62	794660.436	2133.774	D-TOP-BANK			
237	26710820.89	794664.007	2135.876	D-RIPRAP-TOP			
238	26710823.3	794641.474	2130.984	D-RIPRAP-TOE			
239	26710823.76	794597.235	2130.501	D-RIPRAP-EDGE			
240	26710828.42	794546.157	2131.094	D-RIPRAP-TOE			
241	26710827.8	794519.911	2137.94	D-RIPRAP-TOP			
242	26710777.27	794520.225	2139.81	D-RIPRAP-TOP			
243	26710774.93	794543.641	2132.491	D-TOE-WW			
244	26710774.78	794543.568	2137.302	D-TOP-WW			
245	26710767.74	794550.147	2140.932	D-TOP-HW			
246	26710774.01	794640.666	2133.457	D-TOE-WW			
247	26710773.94	794640.694	2137.171	D-TOP-WW			
248	26710767.19	794634.069	2140.947	D-TOP-HW			
249	26710771.57	794657.849	2137.88	D-RIPRAP-TOP			
250	26712056.01	794901.92	2103.364	D-CLVRT-FL			
251	26712056.05	794916.413	2103.279	D-CLVRT-FL			
252	26712056.05	794931.783	2103.147	D-CLVRT-FL			
253	26712056.1	794947.378	2103.186	D-CLVRT-FL			
254	26712056.12	794962.735	2103.208	D-CLVRT-FL			
255	26712056.19	794978.233	2103.119	D-CLVRT-FL			
256	26712056.18	794993.973	2103.108	D-CLVRT-FL			
257	26712056.32	795024.242	2103.053	D-CLVRT-FL			
258	26712056.33	795044.637	2117.958	D-TOP-HW			
259	26712050.22	795066.568	2115.172	C-TBC			
260	26712049.96	795020.704	2114.889	C-TBC			
261	26712054.84	795044.373	2115.15	SW-BACK	SIDEWALK		
262	26712054.77	795023.976	2114.976	SW-BACK	SIDEWALK		
263	26712054.65	794967.415	2114.877	SW-BACK	SIDEWALK		
264	26712049.83	794967.263	2114.738	C-TBC			
265	26712049.62	794896.434	2114.455	C-TBC			
266	26712054.53	794899.943	2114.487	SW-BACK	SIDEWALK		
267	26712054.4	794880.214	2114.492	SW-BACK	SIDEWALK		
268	26712049.51	794877.811	2114.426	C-TBC			
269	26712055.93	794880.503	2117.129	D-TOP-HW			
270	26712049.61	794865.999	2114.315	C-TBC			
271	26711882.06	794921.573	2116.798	C-TBCE			
272	26711869.75	794914.679	2120.186	D-TOP-HW			
273	26711899.25	794914.929	2119.707	D-TOP-HW			
274	26711899.4	794914.944	2104.109	D-CLVRT-FL			
275	26711921.47	794915.321	2103.988	D-CLVRT-FL			
276	26711943.31	794915.245	2103.881	D-CLVRT-FL			
277	26711955.9	794908.886	2103.862	D-CLVRT-FL			
278	26711962.11	794897.967	2103.903	D-CLVRT-FL			
279	26711962.78	794883.004	2103.836	D-CLVRT-FL			
280	26711962.76	794867.888	2103.959	D-CLVRT-FL			
281	26711962.73	794852.338	2104	D-CLVRT-FL			
282	26711962.59	794837.022	2103.935	D-CLVRT-FL			
283	26711962.45	794816.419	2117.308	D-TOP-HW			
284	26711952.97	794811.351	2112.958	D-TOP-CONC-CHNL			
285	26711961.25	794830.985	2112.349	D-TOP-CONC-CHNL			
286	26711962.34	794836.811	2111.797	D-TOP-WW			
287	26711945.5	794825.206	2104.312	D-TOP-WW			
288	26711915.76	794864.952	2104.222	D-FL-CONC-CHNL			
289	26711885.8	794905.971	2104.272	D-TOP-WW			
290	26711898.82	794914.579	2111.334	D-TOP-WW			
291	26711874.77	794916.717	2117.129	SW-BACK	SIDEWALK		
292	26711870.07	794917.036	2117.103	A-EDGE-ASPHALT			
293	26711854.56	794924.334	2117.292	A-EDGE-ASPHALT			
294	26711936.33	794922.391	2115.471	C-BCR			
295	26711936.23	794917.542	2115.58	SW-BACK	SIDEWALK		
296	26711964.71	794891.274	2114.91	SW-BACK	SIDEWALK		
297	26711969.56	794891.259	2114.753	C-BCR			
298	26711969.34	794840.828	2114.352	C-TBC			
299	26711964.58	794837.574	2114.517	SW-BACK	SIDEWALK		
300	26711969.33	794822.364	2114.256	C-TBC			
301	26711964.49	794818.78	2114.415	SW-BACK	SIDEWALK		
302	26712013.85	794818.528	2114.711	A-CL-ASPHALT			

303	26712014.71	794854.103	2114.83	A-CL-ASPHALT			
304	26712014.45	794910.175	2115.024	A-CL-ASPHALT			
305	26712014.79	794965.628	2115.215	A-CL-ASPHALT			
306	26712015.21	795014.73	2115.42	A-CL-ASPHALT			
307	26712015.29	795052.133	2115.278	A-CL-ASPHALT			
308	26712056.74	795045.092	2115.293	D-TOP-CONC-CHNL			
309	26712070.2	795063.482	2115.788	D-TOP-CONC-CHNL			
310	26712080.43	795079.35	2117.602	D-RIPRAP-TOP			
311	26712153.81	795116.182	2117.057	D-RIPRAP-TOP			
312	26712318.47	795198.891	2114.245	D-RIPRAP-EDGE			
313	26712328.8	795178.95	2103.819	D-RIPRAP-EDGE			
314	26712344.38	795136.532	2102.171	D-NG			
315	26712375.84	795112.975	2102.506	D-TOE-CONC-CHNL			
316	26712397.27	795092.924	2114.218	D-TOP-CONC-CHNL			
317	26712276.85	795030.433	2109.772	D-TOP-CONC-CHNL			
318	26712224.92	795000.783	2112.303	D-TOP-CONC-CHNL			
319	26712214.77	795017.448	2103.681	D-TOE-CONC-CHNL			
320	26712195.24	795052.022	2102.929	D-NG			
321	26712170.04	795096.499	2103.5	D-RIPRAP-TOE			
322	26712083.15	795042.428	2103.639	D-TOE-WW			
323	26712067.66	795032.069	2111.013	D-TOP-WW			
324	26712057	795024.711	2111.034	D-TOP-WW			
325	26712100.36	794992.284	2102.933	D-FL-CONC-CHNL			
326	26712138.62	794964.78	2103.299	D-TOE-CONC-CHNL			
327	26712150.56	794949.205	2113.726	D-TOP-CONC-CHNL			
328	26712105.47	794918.184	2114.934	D-TOP-CONC-CHNL			
329	26712088.62	794906.835	2115.495	D-TOP-CONC-CHNL			
330	26712060.32	794885.985	2115.035	D-TOP-CONC-CHNL			
331	26712056.97	794902.444	2111.446	D-TOP-WW			
332	26712080.17	794918.648	2111.545	D-TOP-WW			
333	26712098.15	794930.97	2103.349	D-TOE-WW			
334	26711968.98	794718.31	2114.579	C-TBC			
335	26711963.98	794718.167	2114.701	SW-BACK	SIDEWALK		
336	26711963.39	794525.495	2116.779	SW-BACK	SIDEWALK		
337	26711968.32	794525.485	2116.706	C-TBC			
338	26711967.68	794331.316	2119.076	C-TBC			
339	26711962.68	794330.912	2119.196	SW-BACK	SIDEWALK		
340	26711962.12	794139.036	2121.594	SW-BACK	SIDEWALK		
341	26711967.03	794139.042	2121.504	C-TBC			
342	26711966.36	793939.724	2125.358	C-TBC			
343	26711961.41	793939.683	2125.513	SW-BACK	SIDEWALK		
344	26711847.47	793668.731	2133.674	SW-BACK	SIDEWALK		
345	26711847.44	793663.753	2133.533	C-TBC			
346	26711813.74	793664.449	2133.495	C-TBC			
347	26711814.02	793669.448	2133.604	SW-BACK	SIDEWALK		
348	26711814.09	793670.706	2137.018	D-TOP-HW			
349	26711766.34	793665.383	2133.6	C-TBC			
350	26711766.42	793670.495	2133.677	SW-BACK	SIDEWALK		
351	26711720.91	793671.391	2133.692	SW-BACK	SIDEWALK		
352	26711720.66	793666.294	2133.6	C-TBC			
353	26711672.29	793667.103	2133.73	C-TBC			
354	26711672.09	793665.495	2133.213	D-GRATE			
355	26711672.25	793672.283	2133.911	SW-BACK	SIDEWALK		
356	26711640.02	793667.945	2134.068	C-TBC			
357	26711640.33	793672.757	2134.169	SW-BACK	SIDEWALK		
358	26711594.63	793673.834	2134.49	SW-BACK	SIDEWALK		
359	26711594.99	793668.882	2134.373	C-TBC			
360	26711780.04	793671.331	2136.982	D-TOP-HW			
361	26711745.24	793671.967	2136.933	D-TOP-HW			
362	26711710.64	793672.575	2137.043	D-TOP-HW			
363	26711640.2	793673.79	2137.14	D-TOP-HW			
364	26711642.03	793673.953	2137.214	D-TOP-WW			
365	26711643.15	793705.566	2137.314	D-TOP-WW			
366	26711649.98	793684.88	2124.606	D-TOE-BANK			
367	26711658.2	793706.693	2123.691	D-TOE-BANK			
368	26711689.95	793708.495	2123.104	D-GRADEBREAK			
369	26711734.63	793705.083	2122.904	D-GRADEBREAK			
370	26711785.41	793701.339	2123.791	D-GRADEBREAK			
371	26711800.71	793695.927	2124.105	D-TOE-BANK			
372	26711785.7	793675.615	2123.988	D-TOE-BANK			
373	26711806.6	793671.692	2131.989	D-TOP-BANK			
374	26711786.55	793704.995	2118.449	D-GRADEBREAK			

375	26711734.2	793708.342	2117.962	D-GRADEBREAK			
376	26711690.89	793710.921	2117.499	D-GRADEBREAK			
377	26711502.47	791042.81	2166.326	INIT	PT		
378	26711419.81	791166.591	2163.71	D-TOP-CONC-CHNL			
379	26711439.92	791122.097	2164.039	D-TOP-CONC-CHNL			
380	26711462.3	791089.624	2164.355	D-TOP-HW			
381	26711440.24	791071.175	2164.447	D-TOP-HW			
382	26711419.39	791053.774	2164.646	D-TOP-HW			
383	26711393.4	791091.35	2164.258	D-TOP-CONC-CHNL			
384	26711374.5	791128.93	2163.935	D-TOP-CONC-CHNL			
385	26711395.3	790606.245	2167.098	INIT	PT		
386	26711420.12	790509.282	2167.535	A-EDGE-ASPHALT			
387	26711432.21	790512.412	2167.076	A-EDGE-ASPHALT			
388	26711424.47	790557.959	2166.894	A-EDGE-ASPHALT			
389	26711412.05	790555.586	2166.879	A-EDGE-ASPHALT			
390	26711398.65	790599.837	2167.296	A-EDGE-ASPHALT			
391	26711409.75	790605.577	2167.292	A-EDGE-ASPHALT			
392	26711374.42	790636.404	2166.561	A-EDGE-ASPHALT			
393	26711368.52	790625.309	2166.778	A-EDGE-ASPHALT			
394	26711324.16	790644.815	2166.14	A-EDGE-ASPHALT			
395	26711330.94	790655.565	2165.839	A-EDGE-ASPHALT			
396	26711347.52	790654.895	2165.742	D-NG			
397	26711364.45	790671.23	2166.388	D-NG			
398	26711404.03	790626.584	2167.077	D-NG			
399	26711452.13	790572.073	2167.731	D-NG			
400	26711429.28	790550.048	2166.555	D-NG			
401	26711348	790611.097	2163.939	D-TOP-CONC-CHNL			
402	26711357.23	790621.262	2167.129	D-TOP-HW			
403	26711374.11	790605.02	2167.152	D-TOP-HW			
404	26711396.57	790583.465	2167.217	D-TOP-HW			
405	26711386.79	790574.235	2164.251	D-TOP-CONC-CHNL			
406	26711346.46	790532.266	2165.287	D-TOP-CONC-CHNL			
407	26711335.42	790541.473	2156.741	D-TOE-CONC-CHNL			
408	26711385.61	790575.883	2156.152	D-TOE-CONC-CHNL			
409	26711349.72	790609.99	2156.086	D-TOE-CONC-CHNL			
410	26711315.75	790559.169	2156.424	D-TOE-CONC-CHNL			
411	26711306.19	790567.929	2164.858	D-TOP-CONC-CHNL			
412	26710469.07	792342.547	2154.455	A-EDGE-ASPHALT			
413	26710481.63	792344.833	2154.844	A-EDGE-ASPHALT			
414	26710479.08	792384.703	2155.516	A-EDGE-ASPHALT			
415	26710466.34	792385.155	2154.36	A-EDGE-ASPHALT			
416	26710467.12	792410.68	2155.307	A-EDGE-ASPHALT			
417	26710479.06	792415.159	2156.162	A-EDGE-ASPHALT			
418	26710459.66	792444.461	2155.505	A-EDGE-ASPHALT			
419	26710449.91	792436.459	2154.424	A-EDGE-ASPHALT			
420	26710424.28	792476.374	2154.287	A-EDGE-ASPHALT			
421	26710435.45	792482.277	2155.087	A-EDGE-ASPHALT			
422	26710415.55	792526.479	2155.627	A-EDGE-ASPHALT			
423	26710403.66	792522.209	2155.115	A-EDGE-ASPHALT			
424	26710434.77	792534.296	2156.075	D-NG			
425	26710449.52	792495.2	2155.861	D-NG			
426	26710465.25	792458.329	2156.091	D-NG			
427	26710482.74	792421.101	2156.495	D-NG			
428	26710436.85	792445.42	2153.999	D-TOP-HW			
429	26710451.42	792427.56	2153.99	D-TOP-HW			
430	26710465.24	792410.319	2154.138	D-TOP-HW			
431	26710457.12	792391.587	2154.104	D-TOP-HW			
432	26710453.64	792372.085	2154.112	D-TOP-HW			
433	26710455.36	792352.445	2154.165	D-TOP-HW			
434	26710416.81	792448.646	2152.106	D-TOP-WW			
435	26710417.92	792458.811	2151.506	D-RIPRAP-TOP			
436	26710398.13	792510.428	2153.494	D-RIPRAP-TOP			
437	26710383.36	792506.35	2149.505	D-RIPRAP-TOE			
438	26710370.12	792501.714	2149.66	D-RIPRAP-TOE			
439	26710350.68	792496.363	2156.601	D-RIPRAP-TOP			
440	26710364.62	792447.924	2157.868	D-RIPRAP-TOP			
441	26710385.72	792460.652	2147.408	D-RIPRAP-TOE			
442	26710399.99	792462.458	2147.352	D-RIPRAP-TOE			
443	26710441.17	792432.119	2144.327	D-FL-CHNNL			
444	26710454.41	792412.852	2144.273	D-FL-CHNNL			
445	26710447.26	792394.245	2144.286	D-FL-CHNNL			
446	26710443.53	792372.219	2144.437	D-FL-CHNNL			

447	26710443.9	792349.283	2144.521	D-FL-CHNNL			
448	26710427.38	792346.994	2144.696	D-RIPRAP-TOE			
449	26710417.36	792379.006	2144.71	D-RIPRAP-TOE			
450	26710408.96	792399.502	2145.151	D-RIPRAP-TOE			
451	26710401.01	792417.703	2145.139	D-RIPRAP-TOE			
452	26710380.97	792410.718	2157.023	D-RIPRAP-TOP			
453	26710387.92	792389.96	2156.914	D-RIPRAP-TOP			
454	26710397.44	792370.784	2155.186	D-RIPRAP-TOP			
455	26710409.58	792337.904	2154.862	D-RIPRAP-TOP			
456	26710074.93	793811.216	2156.756	INIT	PT		
457	26710120.26	793772.674	2148.486	D-TOP-HW			
458	26710144.12	793764.835	2148.549	D-TOP-HW			
459	26710130.87	793821.677	2147.121	D-TOP-CONC-CHNL			
460	26710141.28	793818.328	2140.73	D-TOE-CONC-CHNL			
461	26710146	793869.271	2146.732	D-TOP-CONC-CHNL			
462	26710157.55	793865.556	2140.602	D-TOE-CONC-CHNL			
463	26710169.72	793861.443	2141.057	D-TOE-CONC-CHNL			
464	26710180.36	793857.822	2146.492	D-TOP-CONC-CHNL			
465	26710164.61	793810.505	2146.81	D-TOP-CONC-CHNL			
466	26710153.17	793814.276	2140.916	D-TOE-CONC-CHNL			
467	26710303.27	794350.31	2144.148	D-TOP-CONC-CHNL			
468	26710314.21	794346.784	2138.348	D-TOE-CONC-CHNL			
469	26710326.24	794343.147	2138.22	D-TOE-CONC-CHNL			
470	26710337.87	794339.858	2144.168	D-TOP-CONC-CHNL			
471	26710352.4	794385.513	2143.949	D-TOP-CONC-CHNL			
472	26710341.23	794388.666	2138.305	D-TOE-CONC-CHNL			
473	26710329.95	794392.227	2138.259	D-TOE-CONC-CHNL			
474	26710318.35	794395.792	2144.041	D-TOP-CONC-CHNL			
475	26710345.73	794461.315	2147.136	D-TOP-HW			
476	26710369.19	794453.791	2147.169	D-TOP-HW			
477	26710375.55	794452.762	2146.463	D-NG			
478	26710388.23	794491.905	2147.413	D-NG			
479	26710337.25	794470.098	2146.543	D-NG			
480	26710357.46	794496.042	2146.243	D-NG			
481	26710396.55	794541.587	2145.929	D-NG			
482	26710358.11	794385.462	2144.765	A-EDGE-ASPHALT			
483	26710372.89	794380.058	2145.097	A-EDGE-ASPHALT			
484	26710389.95	794427.199	2146.29	A-EDGE-ASPHALT			
485	26710375.13	794432.727	2146.381	A-EDGE-ASPHALT			
486	26710391.8	794480.888	2147.831	A-EDGE-ASPHALT			
487	26710406.84	794475.864	2148.125	A-EDGE-ASPHALT			
488	26710421.81	794522.515	2148.734	A-EDGE-ASPHALT			
489	26710406.54	794526.73	2148.301	A-EDGE-ASPHALT			
490	26710414.26	794574.668	2147.082	A-EDGE-ASPHALT			
491	26710430.07	794574.786	2147.565	A-EDGE-ASPHALT			
492	26710428.42	794623.745	2147.155	A-EDGE-ASPHALT			
493	26710412.85	794621.529	2147.191	A-EDGE-ASPHALT			
494	26710405.88	794670.632	2146.326	A-EDGE-ASPHALT			
495	26710421.45	794673.064	2146.656	A-EDGE-ASPHALT			
496	26710415.5	794721.152	2145.562	A-EDGE-ASPHALT			
497	26710400.73	794721.534	2145.762	A-EDGE-ASPHALT			
498	26710403.86	794771.601	2144.574	A-EDGE-ASPHALT			
499	26710418.2	794770.367	2144.29	A-EDGE-ASPHALT			
500	26710422.37	794833.491	2142.341	A-EDGE-ASPHALT			
501	26710408.77	794833.144	2142.86	A-EDGE-ASPHALT			
502	26710351.03	794658.946	2142.034	D-RIPRAP-TOP			
503	26710345.98	794644.866	2139.24	D-RIPRAP-TOE			
504	26710347.43	794608.371	2137.622	D-NG			
505	26710348.97	794556.476	2138.716	D-RIPRAP-TOE			
506	26710348.8	794543.175	2142.819	D-RIPRAP-TOP			
507	26710390.06	794546.911	2145.389	D-TOP-BANK			
508	26710387.56	794565.195	2138.051	D-RIPRAP-TOE			
509	26710386.96	794591.588	2136.775	D-NG			
510	26710388.38	794630.205	2137.231	D-RIPRAP-TOE			
511	26710393.56	794642.384	2141.648	D-RIPRAP-TOP			
512	26710395.54	794629.85	2142.266	D-TOP-WW			
513	26710402.65	794623.041	2145.931	D-TOP-HW			
514	26710402.92	794573.166	2145.909	D-TOP-HW			
515	26710396.01	794566.371	2142.193	D-TOP-WW			
516	26710395.37	794629.725	2137.802	D-TOE-WW			
517	26710395.92	794566.558	2138.295	D-TOE-WW			
518	26710439.23	794677.912	2145.87	D-TOP-HW			

519	26710431.24	794677.873	2145.795	D-TOP-HW			
520	26710423.02	794745.178	2142.489	D-TOP-CONC-CHNL			
521	26710424.11	794790.244	2142.727	D-TOP-CONC-CHNL			
522	26710432.38	794790.239	2137.424	D-TOE-CONC-CHNL			
523	26710432.52	794745.164	2136.738	D-TOE-CONC-CHNL			
524	26710438.08	794745.26	2136.676	D-TOE-CONC-CHNL			
525	26710437.3	794790.312	2137.351	D-TOE-CONC-CHNL			
526	26710445.76	794790.341	2142.686	D-TOP-CONC-CHNL			
527	26710447.1	794745.242	2142.56	D-TOP-CONC-CHNL			
528	26710478.7	794791.277	2151.033	D-NG			
529	26710476.26	794744.038	2151.552	D-NG			
530	26710471.53	794699.124	2151.195	D-NG			
531	26710464.82	794654.197	2151.794	D-NG			
532	26710456.63	794610.888	2152.242	D-NG			
533	26710446.94	794562.838	2152.348	D-NG			
534	26710435.65	794515.758	2152.772	D-NG			
535	26710423.91	794471.993	2152.964	D-NG			
536	26710421.39	794462.575	2155.008	D-NG			
537	26710407.62	794417.56	2155.551	D-NG			
538	26710393.76	794373.539	2155.96	D-NG			
539	26710909.48	793100.001	2144.32	D-TOP-HW			
540	26710916.73	793078.648	2144.28	D-TOP-HW			
541	26710923.94	793057.509	2144.294	D-TOP-HW			
542	26710937.7	793051.147	2142.26	D-TOP-WW			
543	26710930.03	793140.196	2142.248	D-TOP-WW			
544	26710926.17	793152.926	2141.856	D-RIPRAP-TOP			
545	26710964.06	793184.986	2141.533	D-RIPRAP-TOP			
546	26710987.44	793214.312	2142.439	D-RIPRAP-TOP			
547	26711019.37	793238.136	2140.901	D-RIPRAP-TOP			
548	26711022.74	793235.728	2140.409	D-TOP-WW			
549	26711036.13	793215.875	2140.548	D-TOP-HW			
550	26711027.57	793184.751	2140.583	D-TOP-HW			
551	26711015.17	793139.743	2140.56	D-TOP-HW			
552	26711006.4	793126.167	2139.843	D-RIPRAP-TOP			
553	26710994.97	793079.379	2140.667	D-RIPRAP-TOP			
554	26710983.38	793029.938	2140.883	D-RIPRAP-TOP			
555	26710974.24	792985.619	2141.286	D-RIPRAP-TOP			
556	26710952.74	792989.972	2134.395	D-RIPRAP-TOE			
557	26710940.98	792992.024	2134.443	D-RIPRAP-TOE			
558	26710946.77	792990.823	2134.161	FL	12FT	GUT	
559	26710913.6	792999.198	2143.62	D-RIPRAP-TOP			
560	26710923.5	793051.694	2144.575	D-RIPRAP-TOP			
561	26710940.92	792991.921	2134.399	EDGE	12FT	GUT	
562	26710952.67	792989.617	2134.425	EDGE	12FT	GUT	
563	26710961.94	793036.146	2134.022	EDGE	12FT	GUT	
564	26710950.31	793038.274	2133.929	EDGE	12FT	GUT	
565	26710959.18	793084.157	2133.543	EDGE	12FT	GUT	
566	26710970.84	793081.752	2133.51	EDGE	12FT	GUT	
567	26710978.52	793120.419	2132.829	EDGE	12FT	GUT	
568	26710965.02	793113.13	2133.161	EDGE	12FT	GUT	
569	26710969.21	793132.978	2132.856	EDGE	12FT	GUT	
570	26710937.01	793104.482	2134.107	EDGE	12FT	GUT	
571	26710944.85	793095.506	2134.076	EDGE	12FT	GUT	
572	26710923	793076.162	2134.915	EDGE	12FT	GUT	
573	26710918.56	793088.145	2134.95	EDGE	12FT	GUT	
574	26710995.93	793142.952	2132.373	EDGE	VAR	GUT	
575	26711007.52	793155.453	2131.583	EDGE	VAR	GUT	
576	26711019.02	793161.668	2131.022	EDGE	VAR	GUT	
577	26711031.99	793216.596	2130.225	EDGE	VAR	GUT	
578	26710995.75	793184.969	2131.612	EDGE	VAR	GUT	
579	26710977.89	793153.09	2132.459	EDGE	VAR	GUT	
580	26711024.64	793183.662	2130.632	FL	GUT		
581	26711002.42	793168.274	2131.388	FL	GUT		
582	26710982.51	793150.505	2132.253	FL	GUT		
583	26710972.03	793129.243	2132.737	FL	GUT		
584	26710961.2	793117.327	2132.991	FL	GUT		
585	26710940.74	793100.063	2133.859	FL	GUT		
586	26710920.74	793082.388	2134.844	FL	GUT		
587	26710970.15	793112.119	2132.907	FL	GUT		
588	26710965.03	793082.897	2133.277	FL	GUT		
589	26710955.25	793037.342	2133.696	FL	GUT		
590	26710937.96	793051.122	2135.586	D-TOE-WW			

591	26710930.22	793140.218	2136.923	D-TOE-WW			
592	26711033.77	793207.114	2130.177	FL	84"	RCP	
593	26711030.29	793194.453	2130.311	FL	84"	RCP	
594	26711026.47	793180.525	2130.605	FL	84"	RCP	
595	26711022.99	793167.804	2130.796	FL	84"	RCP	
596	26711045.09	793311.391	2131.48	D-NG			
597	26711011.61	793288.749	2131.264	D-NG			
598	26710968.54	793263.565	2132.639	D-NG			
599	26710931.51	793229.856	2133.251	D-NG			
600	26711164.58	793301.714	2132.917	C-TBC			
601	26711113.94	793300.939	2132.129	C-TBC			
602	26711073.38	793300.345	2131.472	C-TBC			
603	26711068.27	793296.543	2131.328	C-TBC			
604	26711068.41	793283.577	2131.167	C-BCR			
605	26711065.85	793279.815	2131.144	C-BCR			
606	26711049.89	793279.566	2130.807	C-TBC<P			
607	26711048.36	793233.113	2129.978	C-TBC<P			
608	26711034.58	793183.075	2130.234	C-TBC			
609	26711019.7	793129.349	2130.445	C-TBC			
610	26711005.53	793078.2	2130.702	C-TBC			
611	26710992.15	793029.174	2131.158	C-TBC			
612	26710979.55	792983.618	2131.499	C-TBC			
613	26711004.89	792978.7	2131.877	AC			
614	26711018.82	793027.825	2131.59	AC			
615	26711032.73	793075.496	2131.278	AC			
616	26711046.09	793123.79	2130.945	AC			
617	26711060.16	793171.726	2130.813	AC			
618	26711076.75	793223.649	2130.613	AC			
619	26711091.93	793258.886	2131.019	AC			
620	26711141.76	793266.925	2131.851	AC			
621	26704827.61	793577.869	2232.737	D-TOP-CONC-CHNL			
622	26704826.25	793610.651	2232.716	D-TOP-CONC-CHNL			
623	26704766.15	793603.957	2230.978	D-TOP-CONC-CHNL			
624	26704735.87	793600.61	2231.765	D-TOP-CONC-CHNL			
625	26704744.16	793613.35	2230.687	D-NG			
626	26704798.46	793618.103	2230.107	D-NG			
627	26704840.91	793617.958	2230.698	D-NG			
628	26704861.5	793581.864	2231.194	D-NG			
630	26704767.08	793577.363	2230.954	D-TOP-CONC-CHNL			
631	26704736.63	793576.999	2231.879	D-TOP-CONC-CHNL			
632	26704737.93	793565.072	2231.803	D-NG			
633	26704791.29	793557.346	2231.837	D-NG			
634	26704843.79	793548.03	2231.188	D-NG			
635	26704888.84	793559.034	2230.768	D-NG			
636	26704870.4	793524.188	2229.914	D-TOP-CONC-CHNL			
637	26704914.64	793520.391	2229.602	D-TOP-CONC-CHNL			
638	26704934.46	793519.854	2233.219	D-TOP-CONC-CHNL			
639	26704934.87	793492.854	2233.084	D-TOP-CONC-CHNL			
640	26704913.25	793493.868	2229.379	D-TOP-CONC-CHNL			
641	26704865.73	793498.193	2229.936	D-TOP-CONC-CHNL			
642	26704861.02	793480.962	2231.512	D-NG			
643	26704913.84	793471.667	2231.561	D-NG			
644	26704948.21	793469.128	2231.36	D-NG			
645	26704956.07	793504.923	2231.769	D-NG			
646	26704956.72	793537.66	2231.379	D-NG			
647	26704916.5	793548.217	2231.407	D-NG			
648	26704975.44	793493.121	2232.717	D-TOP-CONC-CHNL			
649	26705052.6	793493.636	2232.066	D-TOP-CONC-CHNL			
650	26705126.05	793492.038	2231.417	D-TOP-CONC-CHNL			
651	26705125.97	793522.513	2231.513	D-TOP-CONC-CHNL			
652	26705042.95	793520.495	2232.013	D-TOP-CONC-CHNL			
653	26704975.08	793520.507	2232.598	D-TOP-CONC-CHNL			
654	26704998.76	793541.269	2230.289	D-NG			
655	26705068.97	793548.875	2229.29	D-NG			
656	26705131.67	793493.425	2229.955	D-GRATE			
657	26705131.54	793521.5	2230.042	D-GRATE			
658	26705129.97	793548.543	2230.734	C-BCR			
659	26705130.27	793508.428	2230.541	C-BCR			
660	26705130.51	793461.577	2230.697	C-BCR			
661	26705112.74	793450.455	2230.048	D-NG			
662	26705084.34	793447.215	2229.723	D-NG			
663	26705156.03	793428.739	2230.828	A-CL-ASPHALT			

664	26705154.91	793480.446	2230.552	A-CL-ASPHALT			
665	26705154.75	793531.258	2230.695	A-CL-ASPHALT			
666	26705156.03	793580.251	2231.012	A-CL-ASPHALT			
667	26705184.46	793499.455	2229.838	D-GRATE			
668	26705184.43	793475.948	2229.873	D-GRATE			
669	26705469.67	793459.053	2224.284	D-TOP-CONC-CHNL			
670	26705428.15	793462.716	2224.22	D-TOP-CONC-CHNL			
671	26705380.51	793477.755	2224.171	D-TOP-CONC-CHNL			
672	26705378.5	793478.511	2228.849	D-TOP-CONC-CHNL			
673	26705367.45	793453.17	2228.773	D-TOP-CONC-CHNL			
674	26705434.65	793433.899	2228.756	D-TOP-CONC-CHNL			
675	26705434.85	793433.714	2224.206	D-TOP-CONC-CHNL			
676	26705469.49	793431.385	2224.356	D-TOP-CONC-CHNL			
677	26705462.32	793419.806	2224.511	AC			
678	26705497.8	793403.985	2224.137	AC			
679	26705506.4	793438.806	2223.682	AC			
680	26705509.85	793473.239	2223.638	AC			
681	26705470.43	793476.56	2224.303	AC			
682	26705443.04	793486.211	2224.68	AC			
683	26705643.38	793972.224	2214.294	D-TOP-WW			
684	26705629.85	793963.185	2227.455	D-TOP-HW			
685	26705745.54	793857.908	2221.381	D-TOP-HW			
686	26705763.03	793849.62	2214.133	D-TOP-WW			
687	26705749.36	793847.956	2218.098	C-TBC			
688	26705788.75	793817.667	2216.777	C-TBC			
689	26705794.31	793819.815	2216.797	SW-BACK	SIDEWALK		
690	26705762.74	793843.686	2217.814	SW-BACK	SIDEWALK		
691	26705776.62	793841.221	2217.05	D-RIPRAP-TOP			
692	26705803.11	793851.055	2215.987	D-RIPRAP-TOP			
693	26705825.41	793862.116	2215.27	D-RIPRAP-TOP			
694	26705825.61	793881.611	2205.859	D-RIPRAP-TOE			
695	26705802.84	793876.714	2205.869	D-RIPRAP-TOE			
696	26705769.14	793865.786	2206.193	D-RIPRAP-TOE			
697	26705751.86	793863.794	2206.025	D-RIPRAP-TOE			
698	26705653	793962.256	2207.817	D-RIPRAP-TOE			
699	26705685.81	793951.687	2206.752	D-RIPRAP-TOE			
700	26705711.81	793936.728	2205.997	D-RIPRAP-TOE			
701	26705735.55	793960.374	2213.899	D-RIPRAP-TOP			
702	26705694.07	793972.063	2213.88	D-RIPRAP-TOP			
703	26705664.66	793979.44	2215.785	D-RIPRAP-TOP			
704	26705624.63	793967.884	2224.361	SW-BACK	SIDEWALK		
705	26705622.42	793963.077	2224.16	C-TBC			
706	26705580.68	794002.759	2226.521	C-TBC			
707	26705584.21	794006.228	2226.691	SW-BACK	SIDEWALK		
708	26706347.17	793464.001	2211.305	SDMH-708			
709	26706347.57	793484.445	2211.436	SDMH-9.60			
710	26707458.01	793486.208	2192.616	TG-7.80			
711	26707456.08	793486.211	2192.602	TG-7.80			
712	26707456.01	793489.104	2192.549	TG-7.80			
713	26707457.96	793489.142	2192.596	TG-7.80			
714	26708039.96	793492.453	2182.42	TG-10.60			
715	26708704.99	793506.544	2171.936	SDMH-8.50			
8999	26705097.1	793460.254	2231.064	INIT	PT		

PBS&J Survey Data - Set No.2
Pittman Wash LOMR

Point	Northing	Easting	Elevation	Description	Additional Description
9	798892.075	26716475.6	2044.693	CP	
10	798670.577	26716262.99	2047.06	CP	
11	799016.706	26717316.46	2068.305	COHBM-362	
1000	795641.987	26714685.59	2090.073	115	
1001	795697.006	26714681.65	2088.078	115	
1002	795752.463	26714677.22	2086.523	115	
1003	795809.007	26714671.87	2085.52	115	
1004	795864.915	26714666	2084.915	115	
1005	795921.25	26714659.42	2084.654	115	
1006	795975.166	26714652.47	2084.42	115	
1007	796029.741	26714644.83	2084.158	115	
1008	796085.237	26714636.37	2083.776	115	
1009	796142.334	26714626.19	2083.268	115	
1010	796197.13	26714616.73	2083.011	115	
1011	796252.656	26714606	2082.996	115	
1012	796307.753	26714595.14	2083.239	115	
1013	796362.779	26714583.34	2083.609	115	
1014	796416.376	26714571.53	2083.808	115	
1015	796469.489	26714559.23	2084.054	115	
1016	796524.056	26714547.12	2084.385	115	
1017	796578.377	26714535.37	2084.512	115	
1018	796578.248	26714535.5	2084.505	115	
1019	796631.91	26714524.27	2084.381	115	
1020	796689.534	26714512.59	2083.773	115	
1021	796744.937	26714502.58	2082.724	115	
1022	796800.343	26714492.67	2081.657	115	
1023	796854.505	26714481.99	2081.226	115	
1024	796120.761	26714259.11	2090.625	100	
1025	796105.662	26714267.04	2080.489	100	
1026	796026.324	26714305.7	2080.811	71	
1027	796011.239	26714312.27	2091.774	70	
1028	796052.175	26714399.15	2090.731	70	
1029	796068.344	26714391.32	2079.039	71	
1030	796148.632	26714357.31	2078.373	101	
1031	796166.472	26714347.7	2089.366	101	
1032	796215.254	26714448.01	2088.626	101	
1033	796200.13	26714454.94	2077.619	101	
1034	796168.209	26714473.71	2076.165	CL	WASH
1035	796117.488	26714369.07	2078.36	CL	WASH
1036	796074.139	26714281.6	2079.821	CL	WASH
1037	796126.25	26714502.49	2076.803	71	
1038	796105.633	26714512.22	2089.545	70	
1039	796132.442	26714561.56	2086.531	70	
1040	796144.43	26714569.66	2083.337	68	
1041	796155.337	26714561.53	2076.364	71	
1042	796173.69	26714560.18	2074.814	72	
1043	796199.717	26714555.41	2074.845	72	
1044	796230.527	26714549.89	2074.843	72	
1045	796246.938	26714533.97	2086.906	100	
1046	796245.259	26714553.31	2083.962	68	
1047	796241.829	26714549.45	2078.129	69	
1048	796242.63	26714554.54	2075.456	69	
1049	796163.349	26714572.38	2084.015	68	
1050	796184.521	26714577.86	2083.822	68	
1051	796184.302	26714578.41	2085.827	66	
1052	796210.474	26714573.3	2085.79	66	
1053	796247.289	26714566.05	2085.765	66	
1054	796246.814	26714565.91	2083.812	68	
1055	796247.717	26714567.53	2082.65	144	
1056	796248.586	26714571.64	2082.686	106	
1057	796217.152	26714573.44	2082.657	144	
1058	796222.898	26714576.85	2082.497	62	
1059	796212.342	26714578.93	2082.511	62	

1060	796185.486	26714583.5	2082.635	106	
1061	796184.875	26714579.75	2082.683	144	
1062	796117.804	26714591.62	2083.632	144	
1063	796118.384	26714594.94	2083.373	106	
1064	796317.152	26714557.36	2083.11	106	
1065	796316.449	26714553.94	2083.28	144	
1066	796364.014	26714620.34	2083.743	144	
1067	796363.354	26714616.9	2083.368	106	
1068	796273.59	26714635.36	2082.565	106	
1069	796274.579	26714640.08	2085.005	66	
1070	796247.205	26714646.18	2085.883	66	
1071	796242.408	26714645.61	2081.033	144	
1072	796246.702	26714640.29	2081.245	62	
1073	796236.527	26714642.21	2081.494	62	
1074	796211.272	26714651.4	2081.414	144	
1075	796210.411	26714647.27	2081.663	106	
1076	796170.884	26714684.9	2083.425	66	
1077	796171.158	26714684.87	2083.424	110	
1078	796193.553	26714650.94	2082.623	110	
1079	796295.389	26714654.24	2083.683	68	
1080	796281.714	26714658.4	2074.272	69	
1081	796278.398	26714660.11	2073.709	72	
1082	796253.707	26714664.66	2073.531	72	
1083	796220.042	26714671.49	2073.655	72	
1084	796219.326	26714670.74	2073.91	69	
1085	796208.725	26714702.16	2085.227	100	
1086	796220.25	26714697	2079.866	74	
1087	796235.089	26714693.86	2072.376	75	
1088	796261.556	26714689.74	2072.256	CL	WASH
1089	796287.913	26714686.43	2073.365	101	
1090	796301.032	26714680.13	2081.45	100	
1091	796331.008	26714670.1	2082.315	116	
1092	796342.882	26714665.83	2082.572	116	
1093	796427.918	26714804.47	2082.344	116	
1094	796417.757	26714810.73	2082.137	116	
1095	796412.932	26714813.47	2081.311	100	
1096	796397.497	26714821.83	2072.019	101	
1097	796363.888	26714840.13	2070.812	CL	WASH
1098	796329.856	26714857.51	2072.345	75	
1099	796317.338	26714863.88	2078.079	74	
1100	796307.209	26714869.03	2081.401	100	
1101	796432.6	26715208.08	2079.718	100	
1102	796448.067	26715202.84	2074.295	74	
1103	796457.364	26715199.23	2070.247	75	
1104	796500.073	26715184.79	2068.953	CL	WASH
1105	796530.688	26715170.62	2069.535	101	
1106	796544.955	26715164.69	2076.882	100	
1107	796549.138	26715163.44	2077.175	116	
1108	796560.448	26715159.97	2077.084	116	
1109	796664.796	26715458.79	2077.149	116	
1110	796653.416	26715462.2	2077.017	116	
1111	796646	26715464.6	2076.009	100	
1112	796629.736	26715470.76	2067.955	101	
1113	796594.942	26715483.59	2067.365	CL	WASH
1114	796564.847	26715494.52	2068.621	75	
1115	796554.181	26715497.82	2073.451	74	
1116	796530.652	26715506.76	2082.739	100	
1117	796604.404	26715727.45	2085.167	100	
1118	796629.654	26715712.94	2071.776	74	
1119	796637.975	26715708.95	2067.091	75	
1120	796675.742	26715693.21	2063.124	CL	WASH
1121	796705.513	26715680.29	2066.054	101	
1122	796719.958	26715676.97	2073.386	100	
1123	796727.101	26715674.37	2073.982	116	
1124	796738.572	26715670.84	2074.215	116	
1125	796827.938	26715790.69	2071.638	116	
1126	796821.903	26715800.74	2071.527	116	
1127	796816.091	26715810.09	2070.762	100	

1128	796808.455	26715821.66	2064.014	101	
1129	796803.318	26715830.72	2063.688	74	
1130	796800.684	26715835.21	2061.16	75	
1131	796787.616	26715856.09	2060.542	CL	WASH
1132	796771.261	26715883.56	2064.642	75	
1133	796766.066	26715892.02	2069.274	74	
1134	796753.97	26715913.77	2081.887	100	
1135	797063.112	26715994.81	2075.678	100	
1136	797064.234	26715964.67	2066.101	74	
1137	797067.124	26715948.41	2059.686	75	
1138	797069.965	26715915.18	2056.608	CL	WASH
1139	797076.776	26715881.59	2060.252	101	
1140	797078.589	26715872.21	2066.434	100	
1141	797080.366	26715859.13	2067.057	116	
1142	797082.609	26715847.89	2066.98	116	
1143	797328.186	26715889.36	2062.49	116	
1144	797326.281	26715901.08	2062.365	116	
1145	797323.922	26715914.74	2061.619	100	
1146	797322.459	26715925.12	2055.813	101	
1147	797313.24	26715970.48	2053.905	CL	WASH
1148	797304.886	26716000.93	2055.79	101	
1149	797301.733	26716012.26	2063.972	100	
1150	797296.097	26716046.41	2065.973	101	
1151	797291.305	26716065.91	2075.331	100	
1152	797517.597	26716101.69	2074.026	100	
1153	797520.976	26716073.85	2060.302	101	
1154	797525.396	26716046.13	2058.542	100	
1155	797527.365	26716035.5	2052.02	101	
1156	797532.926	26715988.94	2050.556	CL	WASH
1157	797535.146	26715969.53	2051.112	101	
1158	797541.65	26715939.57	2058.114	100	
1159	797542.187	26715936.87	2058.832	116	
1160	797544.009	26715925.03	2059.252	116	
1161	797650.774	26715932.2	2058.106	116	
1162	797650.606	26715944.02	2057.95	116	
1163	797650.533	26715952	2056.955	100	
1164	797649.678	26715965.72	2050.763	101	
1165	797647.265	26716003.11	2049.969	CL	WASH
1166	797640.717	26716042.71	2050.36	101	
1167	797640.208	26716051.07	2055.191	100	
1168	797654.064	26716045.31	2050.789	75	
1169	797653.71	26716058.06	2056.048	74	
1170	797654.074	26716057.89	2055.955	74	
1171	797654.314	26716061.55	2056.568	116	
1172	797654.232	26716072.74	2057.342	116	
1173	797761.254	26716070	2056.554	116	
1174	797760.873	26716059.22	2055.99	116	
1175	797760.645	26716055.93	2055.793	74	
1176	797760.474	26716044.34	2050.149	75	
1177	797760.042	26716000.71	2049.236	CL	WASH
1178	797760.64	26715965.05	2048.441	101	
1179	797760.753	26715946.08	2056.236	100	
1180	797760.671	26715942.92	2056.877	116	
1181	797760.87	26715930.97	2057.576	116	
1182	798811.972	26716423.44	2044.568	116	
1183	798802.132	26716433.07	2039.303	75	
1184	796212.21	26714652.76	2085.339	66	
1185	799047.134	26716491.48	2046.51	68	
1186	799032.166	26716506.25	2049.476	66	
1187	799032.214	26716506.5	2034.059	64	
1188	799031.73	26716519.72	2033.207	64	
1189	799031.209	26716561.78	2033.239	64	
1190	799030.353	26716617.18	2033.315	64	
1191	799030.886	26716618.5	2053.911	66	
1192	799050.789	26716639.41	2053.911	68	
1193	799030.623	26716639.47	2051.229	144	
1194	799030.002	26716619.34	2050.409	144	
1195	799030.55	26716561.74	2048.145	144	

1196	799031.606	26716505.48	2045.957	144	
1197	799032.458	26716485.34	2045.119	144	
1198	798932.841	26716484.24	2045.263	144	
1199	798933.18	26716504.24	2045.921	144	
1200	798932.863	26716553.16	2047.842	144	
1201	798931.505	26716618.41	2050.417	144	
1202	798930.559	26716642.33	2051.314	144	
1203	798912.573	26716635.18	2054.008	68	
1204	798912.121	26716635.75	2050.421	74	
1205	798861.318	26716617.02	2049.93	74	
1206	798790.659	26716569.68	2050.232	74	
1207	798931.053	26716617.19	2053.973	66	
1208	798932.533	26716504.94	2049.486	66	
1209	798915.119	26716487.12	2046.479	68	
1210	798914.572	26716485.96	2044.2	74	
1211	798924.406	26716497.69	2035.439	75	
1212	798932.405	26716505.41	2035.311	64	
1213	798935.881	26716515.04	2035.188	64	
1214	798935.909	26716518.29	2034.652	64	
1215	798935.918	26716530.12	2034.591	64	
1216	798935.5	26716561.06	2034.799	64	
1217	798934.932	26716592.21	2034.575	64	
1218	798930.967	26716616.85	2034.675	64	
1219	798922.065	26716621.02	2035.134	75	
1220	798872.31	26716592.9	2035.726	75	
1221	798802.281	26716545.93	2037.363	75	
1222	798817.469	26716518.18	2035.132	CL	WASH
1223	798875.837	26716548.56	2034.601	CL	WASH
1224	798923.01	26716617.41	2034.744	72	
1225	798923.805	26716560.92	2034.747	72	
1226	798924.391	26716506.16	2035.395	72	
1227	798877.779	26716510.94	2036.21	113	
1228	798879.185	26716502.97	2036.308	113	
1229	798879.558	26716499.66	2036.053	75	
1230	798845.023	26716481.96	2037.441	75	
1231	798842.123	26716486.9	2037.264	113	
1232	798837.545	26716493.12	2036.996	113	
1233	798833.812	26716496.31	2034.641	78	
1234	798852.728	26716466.77	2043.904	74	
1235	798879.565	26716480.73	2043.835	74	
1236	798880.463	26716475.42	2044.492	116	
1237	798855.289	26716464.19	2044.585	116	
1238	798867.474	26716443.94	2045.209	116	
1239	798885.193	26716450.63	2045.183	116	
1240	798912.353	26716446.78	2044.509	116	
1241	798933.056	26716447.16	2043.714	144	
1242	798938.199	26716447.26	2043.466	106	
1243	798932.867	26716469.44	2044.526	144	
1244	798937.921	26716470.13	2044.386	62	
1245	798937.757	26716479.32	2044.711	62	
1246	798914.214	26716471.6	2044.802	116	

APPENDIX G

Electronic Data CD

- HEC-1 Models
- Figures

PBS&J

An employee-owned company

October 5, 2004

Mr. Al Souid, Ph.D., CFM
Engineering - Study Production
Michael Baker Jr., Inc.
3601 Eisenhower Avenue
Alexandria, Virginia 22304-6425

RE: REQUEST FOR INFORMATION – PITTMAN WASH LOMR
COMMUNITY: CLARK COUNTY & CITY OF HENDERSON, NV
COMMUNITY NO.: 320005

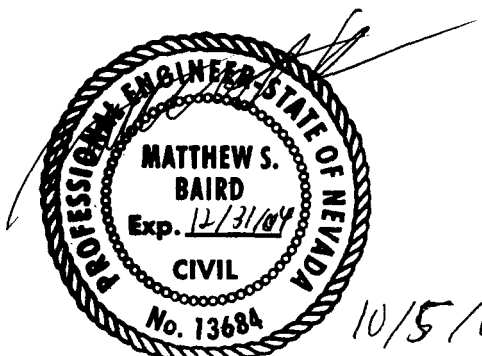
Dear Mr. Souid:

Per out telephone conversation today, PBS&J is submitting the following information to clarify the floodzone tie-in to the existing Southfork Channel at its intersection with Ione Road. Cross-Sections 27, 28 and 29 from the approved Pittman East Detention Basin LOMR (Case No. 04-09-0454P) demonstrate the flow is contained to the vacant land south of Ione Road and would not result in overtopping. Under current conditions the top of channel is at or close to existing grade to allow flow to weir into the channel. PBS&J is confident the channel design in relation to the existing topography will result in a 100-year cutoff as shown in our LOMR submittal for the Pittman Wash. Attached are the Flowmaster worksheets for cross-sections 27, 28 and 29 and a portion of Figure 3 showing the section locations for reference.

If you have any questions regarding this report, please contact our office at (702) 263-7275.

Sincerely,

PBS&J



10/5/04

Matt Baird, P.E., CFM
Senior Program Manager

RECD
10 13 3:07

2270 Corporate Circle, Suite 100, Henderson, Nevada 89074-6382 • Telephone 702.263.7275 • Fax 702.263.7200 • www.pbsj.com

Worksheet 27
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 27
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	2.0500	%
Discharge	578.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.031	
Water Surface Elevation	50.47	ft
Elevation Range	49.47 to 51.00	
Flow Area	171.8	ft²
Wetted Perimeter	499.08	ft
Top Width	498.51	ft
Actual Depth	1.00	ft
Critical Elevation	50.47	ft
Critical Slope	2.0054	%
Velocity	3.36	ft/s
Velocity Head	0.18	ft
Specific Energy	50.65	ft
Froude Number	1.01	
Flow Type	Supercritical	

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	1+28.79	0.017
1+28.79	5+83.00	0.035

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	50.50
1+07.54	49.97
1+07.54	49.47
1+28.79	50.28
2+75.44	50.00
2+92.00	49.50
3+27.00	50.50
3+58.00	49.50
3+72.00	50.00

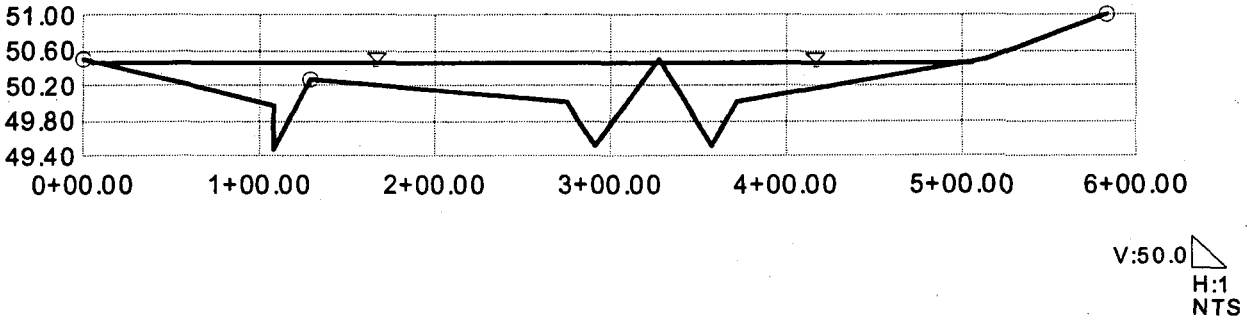
Worksheet 27
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
5+14.00	50.50
5+83.00	51.00

Cross Section 27
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 27
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.031	
Slope	2.0500	%
Water Surface Elevation	50.47	ft
Elevation Range	49.47 to 51.00	
Discharge	578.00	cfs



Worksheet 28
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 28
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	2.6450	%
Discharge	578.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Water Surface Elevation	39.22	ft
Elevation Range	37.00 to 42.00	
Flow Area	107.8	ft²
Wetted Perimeter	157.63	ft
Top Width	157.48	ft
Actual Depth	2.22	ft
Critical Elevation	39.30	ft
Critical Slope	2.0019	%
Velocity	5.36	ft/s
Velocity Head	0.45	ft
Specific Energy	39.67	ft
Froude Number	1.14	
Flow Type	Supercritical	

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	8+46.00	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	40.00
1+61.00	40.00
2+31.00	41.00
2+85.00	40.00
3+28.00	37.00
3+77.00	40.00
5+00.00	40.00
5+80.00	42.00
6+60.00	40.00
7+34.00	38.50

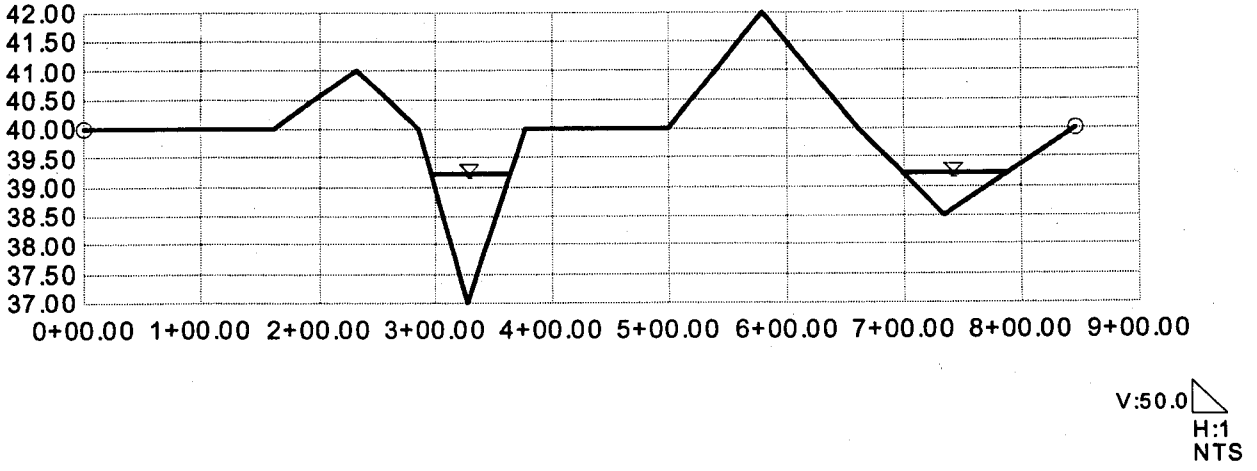
Worksheet 28
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
8+46.00	40.00

Cross Section 28
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 28
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Slope	2.6450	%
Water Surface Elevation	39.22	ft
Elevation Range	37.00 to 42.00	
Discharge	578.00	cfs



Worksheet 29
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 29
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.9688	%
Discharge	578.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.032	
Water Surface Elevation	29.62	ft
Elevation Range	27.00 to 30.50	
Flow Area	135.4	ft²
Wetted Perimeter	151.84	ft
Top Width	151.68	ft
Actual Depth	2.62	ft
Critical Elevation	29.44	ft
Critical Slope	1.5429	%
Velocity	4.27	ft/s
Velocity Head	0.28	ft
Specific Energy	29.90	ft
Froude Number	0.80	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

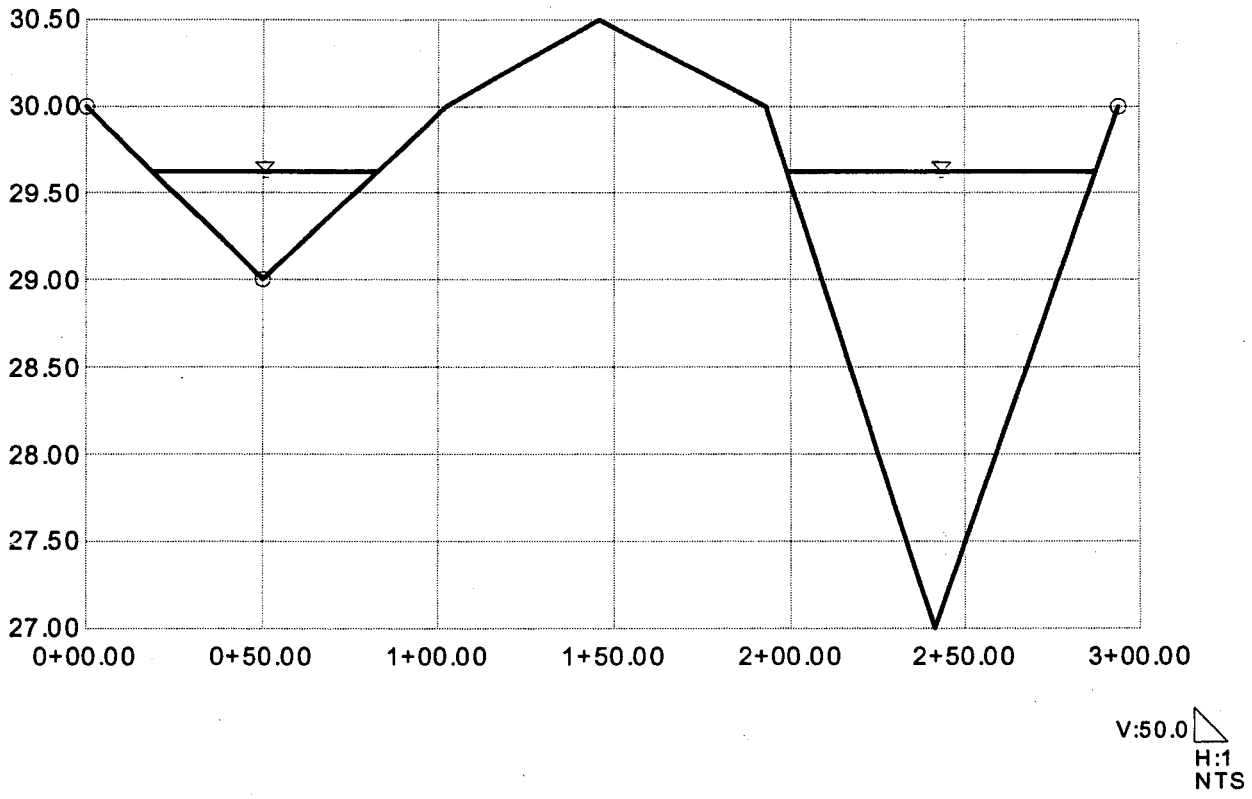
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+50.00	0.017
0+50.00	2+94.00	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	30.00
0+50.00	29.00
1+02.00	30.00
1+46.00	30.50
1+93.00	30.00
2+41.00	27.00
2+94.00	30.00

Cross Section 29
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 29
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.032	
Slope	0.9688	%
Water Surface Elevation	29.62	ft
Elevation Range	27.00 to 30.50	
Discharge	578.00	cfs



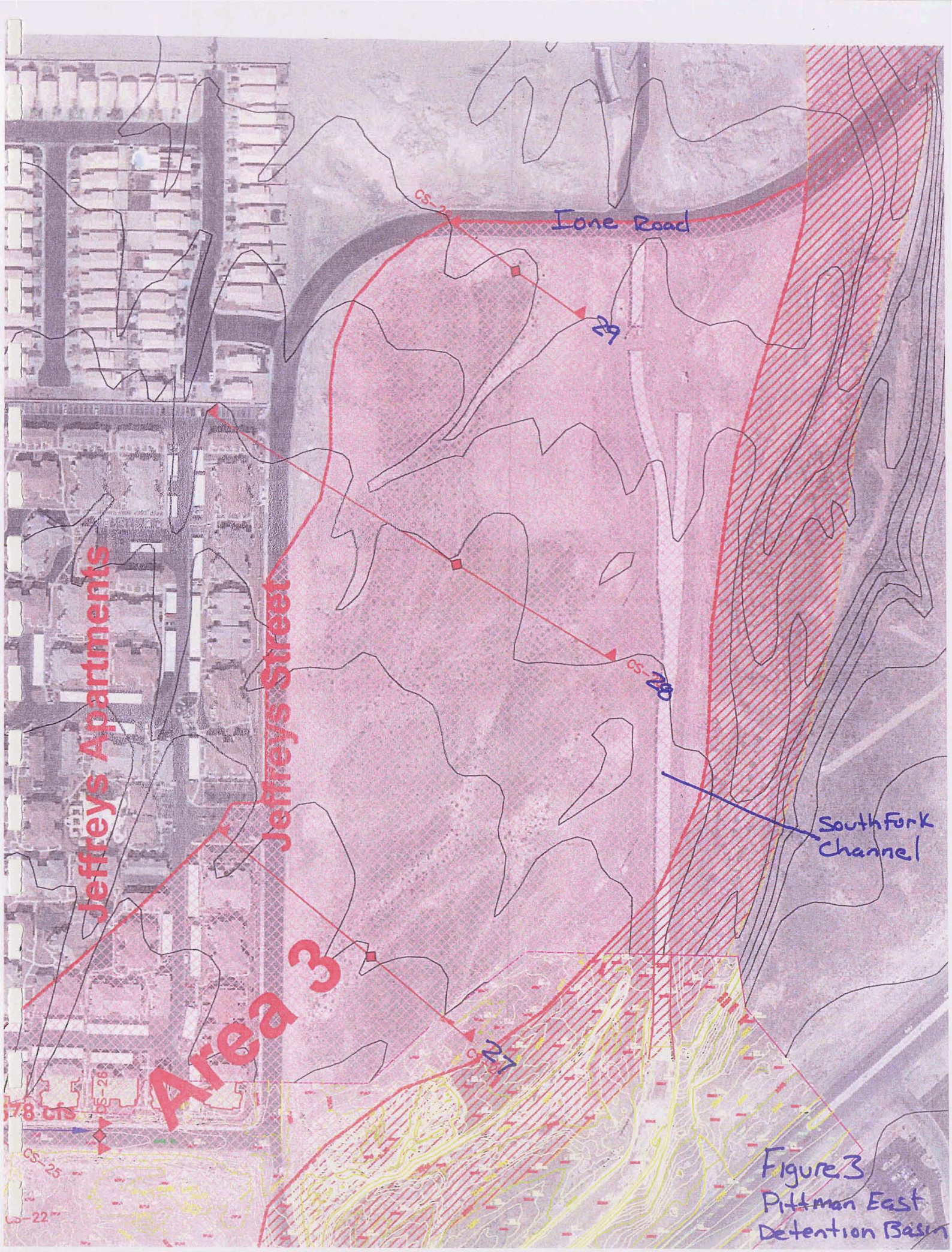


Figure 3
Pittman East
Detention Basin

PBS&J

RFCD
PM OCT -6 PM 3:06

LETTER OF TRANSMITTAL

Date October 6, 2004

Job No: 511542.00
Project Name: Pittman Wash LOMR

TO: Kevin Eubanks, P.E.
Clark County Regional Flood Control District
600 South Grand Central Parkway, Suite 300
Las Vegas, Nevada 89106

FROM: Brian K. Loffman
2270 Corporate Circle
Suite 100
Henderson, NV 89074

Transmitted:	For:	
☐ Herewith	☐ Approval	☐ Information
☒ Via Carrier	☐ Checking	☐ Return after Use
☐ Signature	☒ Your Use	☐ As Requested

The Following:

Request for Information - Pittman Wash LOMR

Comments:

Kevin, the copy of the report transmitted herewith is for your records. I have submitted a copy of this report to Michael Baker Jr., Inc. Please call me if you have any questions.

Received by: _____ Date _____

Signed by: _____
Brian K. Loffman

2270 Corporate Circle, Suite 100 Henderson, Nevada 89074 Telephone :(702) 263-7275 Fax : (702) 263-7200

RESPONSE TO COMMENTS TO THE PITTMAN WASH REQUEST FOR LETTER OF MAP REVISION

Case No.: 04-09-1194P
Communities: City of Henderson & Clark County, Nevada
Community Nos.: 320005 & 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: 511542.00
April 2005

The response to comments in a letter dated October 20, 2004 from Michael Baker Jr., Inc. (MBJ) are included below, see Appendix A for a copy of the comment letter. Also see Appendix A for the e-mail correspondence to Mr. Sacha Tohme requesting an extension for the completion of this project.

Comment 1: **Please provide as-built plans, certified by a registered professional engineer, for all proposed project elements along East Tributary of Main Wash, including plans for the three 10-foot by 6-foot reinforced concrete box culverts and the storm drain facility along Eastern Avenue.**

Response 1: PBS&J has made every effort possible to locate as-built plans for the various segments of the storm drain system along Eastern Avenue (between Ione Road and the 215 Beltway). It should be noted that the storm drain system was built in phases over a period of many years that has resulted in numerous section types making up the overall storm drain facility. PBS&J has collected what it believes to be the most complete set of design plans for the existing storm drain. Based on the field investigation and field survey it has been confirmed that the facilities analyzed in this LOMR are in substantial conformance with the plans included in this submittal. The only exception to this is at the downstream end of the 4, 72 inch RCPs. Based on the information collected the 72 inch RCPs were constructed steeper than indicated on the plans and this has been incorporated into the hydraulic model. PBS&J has prepared a letter certifying that the storm drain has been built in substantial conformance to what is shown on the design plans and supplemented with the field survey see Appendix E.

Comment 2: **The storm drain facility along Eastern Avenue is included in the Flowmaster hydraulic analysis for the proposed new delineation of East Tributary of Main Wash. Because of the long length of, and bends in, the storm drain facility, the use of the Flowmaster hydraulic model may not be suitable. Please provide a detailed explanation, along with backup calculations that compute the losses in the storm drain facility caused by the length and bends, why the Flowmaster model was chosen to model the storm drain facility. Alternatively, please provide a hydraulic analysis using a methodology that accounts for losses in the storm drain facility. Please note the possible need to use more cross sections along the storm drain facility to model the conditions accurately.**

Response 2: In the original LOMR submittal dated May 4, 2004 PBS&J provided a normal depth analysis on the major components of the storm drain system along Eastern Avenue. At the time the original LOMR was prepared the plans that had been made available to PBS&J were

incomplete and did not consist of any as-built plans. Thus, a backwater model of the storm drain system was not prepared. In addition, this is an approximate A zone and detailed hydraulic analysis is not typically required.

However, in response to this comment, PBS&J has prepared a WSPG model based on the design plans discussed in the response to Comment 1. The design plans and the WSPG model were verified and/or supplemented with PBS&J survey data and field visits where possible. Because the WSPG program does not allow multiple system components to be modeled simultaneously, the multi-barreled portions of the storm drain were converted to an equivalent size single barrel as follows:

1. Dual 12' x 6' RCB's modeled as a single 24' x 6' RCB and a 1-foot pier.
2. Dual 11' x 5.5' arch culverts modeled as a single 23' x 4.15' RCB and a 1-foot pier.
3. (4) 72" RCP's modeled as a single 24' x 5.3' RCB with (3) 1-foot piers.
4. Dual 11' x 6.2' arch culverts modeled as a single 23' x 4.8' RCB and a 1-foot pier.
5. Dual 12' x 8' RCB's modeled as a single 24' x 8' RCB and a 1-foot pier.

Please refer to Figure 5 in Appendix B for a complete schematic layout of the existing storm drain. Figure 5 also shows the approximate location of the WSPG stations used in the hydraulic model. Using the starting flow of 1,855 cfs (from the HEC-1) the WSPG model shows containment with the exception of the area near Richmar Avenue, specifically between WSPG Stations 2466.45 & 2487.45. The WSPG model (using the total flow of 1,910 cfs at this location) shows the HGL approximately 2.5' above finished ground. Therefore, flow was removed from the model at this location until the HGL was calculated to be below ground surface. This required removing 306 cfs from the storm drain. This included the 56 cfs that enters the system at Richmar Avenue. In addition it is anticipated that an additional 250 cfs will exit the system immediately south of Richmar Avenue through a grate opening in the top of the transition structure at this location (WSPG Station 2487.45). The flow leaving the system will travel north in Eastern Avenue. Cross-section A-A represents the 100-foot street section for Eastern Avenue (see Figure 5 for the location of the cross-section). The slope used in Section A-A of 1.7% and was obtained from the plans in Appendix E. The cross-section was cut along the flow path to determine if a new flood zone delineation was warranted in Eastern Avenue due to the 306 cfs that will be conveyed in the street

during a 100-year flood event. The hydraulic depth of Section A-A is 0.44-feet and thus no new flood zone is proposed. Please refer to Appendix D for the Flowmaster calculation worksheet.

It should be noted that the 100 foot long bubbler channel (between WSPG stations 4872.59 and 4972.59) was originally designed to release 1,300 cfs during a 100-year event. However, that was prior to current upstream flood control facilities that have since reduced the flow reaching the channel/storm drain system. Therefore, the flows shown on the plans in Appendix E no longer reflect current conditions and the hydraulic model no longer shows any flow leaving the system at the 13.5 foot deep bubbler channel.

Appendix A: Comment Letter & E-Mail Correspondence

511542

NATIONAL FLOOD INSURANCE PROGRAM
FEMA MAP COORDINATION CONTRACTOR

October 20, 2004

Mr. Kevin Eubanks, P.E., CFM
Assistant General Manager
Clark County Regional Flood Control District
600 South Grand Central Parkway, Suite 300
Las Vegas, NV 89106-4511

IN REPLY REFER TO:
Case No.: 04-09-1194P
Communities: City of Henderson and Clark County, NV
Community Nos.: 320005 and 320003

316-AD

Dear Mr. Eubanks:

This is in regard to your June 3, 2004, request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a Letter of Map Revision for the above-referenced communities. In a previous letter, you were informed that additional data might be required to complete our review of the request. The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed below.

1. Please provide as-built plans, certified by a registered professional engineer, for all proposed project elements along East Tributary of Main Wash, including plans for the three 10-foot by 6-foot reinforced-concrete box culverts and the storm drain facility along Eastern Avenue.

2. The storm drain facility along Eastern Avenue is included in the FlowMaster hydraulic analysis for the proposed new delineation of East Tributary of Main Wash. Because of the long length of, and bends in, the storm drain facility, the use of the FlowMaster hydraulic model may not be suitable. Please provide a detailed explanation, along with backup calculations that compute the losses in the storm drain facility caused by the length and bends, why the FlowMaster model was chosen to model the storm drain facility. Alternatively, please provide a hydraulic analysis using a methodology that accounts for the losses in the storm drain facility. Please note the possible need to use more cross sections along the storm drain facility to model the conditions accurately.

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 timeframe, 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 have specific questions concerning your request, please call the Revisions Coordinator for your State, Mr. Sacha Tohme, who may be reached at (703) 960-8800, ext. 3028.

Sincerely,

Sheila M. Norlin
National LOMC Manager
Michael Baker Jr., Inc.

Enclosure

cc: Mr. Dave Betley, P.E.
Principal Engineer
Civil Engineering Division
Department of Public Works
Clark County

Mr. Curt Chandler, P.E.
Land Development Manager
City of Henderson

Mr. Matthew S. Baird, P.E., CFM
PBS&J

Loffman, Brian

From: Kevin Eubanks [KEubanks@ccrfcd.org]
Sent: Thursday, January 13, 2005 1:32 PM
To: Tohme, Sacha
Cc: Baird, Matt; Loffman, Brian; Betley, Dave; curt.chandler@cityofhenderson.com
Subject: Case No. 04-09-1194P Pittman Wash Vicinity of Eastern

Sacha,

We are getting close to finishing up our response to comments offered on October 20, 2004. I don't think we will be able to submit before the 90 day clock runs out. Therefore, I would like to ask for an extension. Do you need anything more formal than this e-mail?

Kevin Eubanks, P.E., CFM
Assistant General Manager
Clark County Regional Flood Control District
600 Grand Central Parkway
Las Vegas, Nevada 89106-4511
702.455.3139
KEubanks@ccrfcd.org
Website: www.ccrfcd.org

Appendix B: Figure

Trapezoidal Channel
12' BW 2H:1V SS

Channel Transition

STA = 0.00
STA = 140.00
STA = 240.00
STA = 340.69
STA = 638.69
STA = 758.30
STA = 1071.51
STA = 1113.62
STA = 1167.49
STA = 1220.82
STA = 1831.12
STA = 2426.45
STA = 2466.45
STA = 2487.45
STA = 2493.45
STA = 3074.21
STA = 3080.21
STA = 3954.74
STA = 3956.14
STA = 4160.21
STA = 4393.27
STA = 4559.48
STA = 4789.35
STA = 4872.59
STA = 4972.59
STA = 5118.20
STA = 5168.20
STA = 5228.20
STA = 5278.20
STA = 5328.20

(2) 12' x 6' RCB's
Open Area = 144 sq ft.

(2) 12' x 5.5' RCB's
Open Area = 132 sq ft.

14' x 6' RCS
Open Area = 84 sq ft.

(2) 11' x 5.5' Arch Pipes
Open Area = 95 sq ft.

(4) 72" RCP's
Open Area = 112 sq ft.

(2) 11' x 6.2' Arch Pipes
Open Area = 110 sq ft.

24' W x 13.5' H
Rectangular Channel

(2) 12' x 8' RCB's
Open Area = 192 sq ft.

(2) 12' x 8' RCB's
Open Area = 192 sq ft.

24' W x 10' H
Rectangular Channel

(2) 14' x 6' RCB's
Open Area = 168 sq ft.

Serene Ave

Richmar Ave

Eastern Ave

Silverado Ranch Blvd

Eastern Avenue

Ione Rd

Aerial Photo as of April 2004

I hereby certify that the information used in the preparation of this LOMR and the associated analysis is in substantially conformance with the plans provided in this document and the field survey performed by PBS&J.

Matthew S. Baird, NV 13684 Date

LEGEND

Facility Alignment

Transition Structure

STA = 2956 WSPG Station

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)

1 inch = 200 ft.

Pittman Wash Letter of Map Revision

Storm Drain Analysis

Project No. 511542

April 2005

PBS&J
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Phone: 702-263-7275
Fax: 702-263-7200
Engineering • Planning • Surveying • Construction Services

FIGURE 5

Appendix C: WSPG Model

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Apr 14, 2005 18: 0:29

Input file : pwashjx.dat
Output file: pwashjx.out

INPUT FILE LISTING

```
T1 PITTMAN WASH LOMR (CASE NO. 04-09-1194P)
T2 STORM DRAIN ANALYSIS FOR SYSTEM ALONG EASTERN AVENUE
T3
SO      0.002139.98  5      .013                2143.00
R     140.002140.60  5      .013
TS    240.002141.04  10     .013
R     340.682142.01  1      .013
R     638.692145.08  1      .013                              300.0
R     758.302148.38  1      .013                                     7.0
R    1071.512153.74  1      .013
JX   1071.512153.74  1      .013   156.0
R    1113.622154.49  12     .013                                    15.0
R    1114.622154.51  12     .013                                    15.0
R    1115.622154.53  12     .013                                    11.0
TS   1167.492155.24  2      .013                                     7.0
R    1204.162155.76  2      .013
R    1220.822156.00  2      .013                               63.3
R    1831.172163.44  2      .013                                          1
R    2426.452170.98  2      .013
JX   2426.452170.99  2      .013     0.1
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R    4160.212201.83  7      .013                                          2
R    4393.272204.30  7      .013                                    10.0
R    4559.482205.99  7      .013                                    10.0  2
R    4789.352210.01  7      .013
JX   4789.352210.02  7      .013    55.0
TS   4862.592210.79  6      .013
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R    4972.592211.91  9      .013                              230.0
JX   4972.592211.92  6      .013
R    5118.202218.93  6      .013                              230.0         1
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R    5228.202221.90  11     .013
TS   5278.202222.42  4      .013
R    5328.202222.94  4      .013
SH         2222.94   4      .013
1                                                          SP
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WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

0 CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	1	1.00	6.00	25.00	.00	.00	.00										
CD	2	3	0	.00	6.00	14.00	.00	.00	.00										
CD	3	3	1	1.00	4.15	23.00	.00	.00	.00										
CD	4	2	0	.00	8.00	30.00			.00										
CD	5	1	0	.00	6.00	12.00	2.00	2.00	.00										
CD	6	3	1	1.00	8.00	25.00	.00	.00	.00										
CD	7	3	1	1.00	4.80	23.00	.00	.00	.00										
CD	8	3	3	1.00	5.30	24.00	.00	.00	.00										
CD	9	2	0	.00	13.50	24.00			.00										
CD	10	2	0	.00	6.00	25.00			.00										
CD	11	3	1	1.00	6.00	29.00	.00	.00	.00										
CD	12	3	1	1.00	5.50	25.00	.00	.00	.00										

ERROR MESSAGE NUMBER 7 IN SEQUENCE CHECKING THRU CHANNEL DEFINITION DATA
INVALID CARD CODE ENCOUNTERED WHILE PROCESSING CD AND PTS CARDS - CODE =

1 PAGE NO 1

0 WATER SURFACE PROFILE - TITLE CARD LISTING

0HEADING LINE NO 1 IS -

0 PITTMAN WASH LOMR (CASE NO. 04-09-1194P)

0HEADING LINE NO 2 IS -

0 STORM DRAIN ANALYSIS FOR SYSTEM ALONG EASTERN AVENUE

0HEADING LINE NO 3 IS -

0

1 PAGE NO 2

0 WATER SURFACE PROFILE - ELEMENT CARD LISTING

0 ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	.00	2139.98	5	2143.00

0 ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	140.00	2140.60	5	.013	.00	.00	.00	0

0 ELEMENT NO 3 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	240.00	2141.04	1	.013

0 ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	340.68	2142.01	1	.013	.00	.00	.00	0

0 ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	638.69	2145.08	1	.013	.00	300.00	.00	0

0 ELEMENT NO 6 IS A REACH * * *

```
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                                758.30 2148.38    1               .013                                      .00    .00    7.00      0
0 ELEMENT NO   7 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               1071.51 2153.74    1               .013                                      .00    .00    .00       0
0 ELEMENT NO   8 IS A JUNCTION       *        *     *     *                    *                   *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N       Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                               1071.51 2153.74    1     0     0    .013    156.0       .0       .00      .00     .00     .00
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
0 ELEMENT NO   9 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               1113.62 2154.49    1               .013                                      .00    .00   15.00      0
0 ELEMENT NO  10 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               1114.62 2154.51    1               .013                                      .00    .00   15.00      0
0 ELEMENT NO  11 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               1115.62 2154.53    1               .013                                      .00    .00   11.00      0
0 ELEMENT NO  12 IS A TRANSITION     *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
                               1167.49 2155.24    2               .013
1                                                                                                                          PAGE NO   3
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO  13 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               1204.16 2155.76    2               .013                                      .00    .00    .00       0
0 ELEMENT NO  14 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               1220.82 2156.00    2               .013                                      .00  63.30    .00       0
0 ELEMENT NO  15 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               1831.17 2163.44    2               .013                                      .00    .00    .00       1
0 ELEMENT NO  16 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               2426.45 2170.98    2               .013                                      .00    .00    .00       0
0 ELEMENT NO  17 IS A JUNCTION       *        *     *     *                    *                   *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N       Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                               2426.45 2170.99    2     0     0    .013      .1       .0       .00      .00     .00     .00
0 ELEMENT NO  18 IS A TRANSITION     *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
                               2466.45 2171.48    1               .013
0 ELEMENT NO  19 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               2487.45 2171.80    1               .013                                      .00    .00    .00       0
0 ELEMENT NO  20 IS A JUNCTION       *        *     *     *                    *                   *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N       Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                               2487.45 2171.81    3     0     0    .013   -250.0       .0       .00      .00     .00     .00
0 ELEMENT NO  21 IS A TRANSITION     *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
                               2493.45 2171.95    3               .013
0 ELEMENT NO  22 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               3074.21 2184.73    3               .013                                      .00    .00    .00       1
0 ELEMENT NO  23 IS A TRANSITION     *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
                               3080.21 2184.86    8               .013
1                                                                                                                          PAGE NO   4
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO  24 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               3951.74 2199.71    8               .013                                      .00    .00    .00       1
0 ELEMENT NO  25 IS A TRANSITION     *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
                               3956.74 2199.86    7               .013
0 ELEMENT NO  26 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               4160.21 2201.83    7               .013                                      .00    .00    .00       2
0 ELEMENT NO  27 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               4393.27 2204.30    7               .013                                      .00    .00   10.00      0
0 ELEMENT NO  28 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               4559.48 2205.99    7               .013                                      .00    .00   10.00      2
0 ELEMENT NO  29 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               4789.35 2210.01    7               .013                                      .00    .00    .00       0
0 ELEMENT NO  30 IS A JUNCTION       *        *     *     *                    *                   *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N       Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                               4789.35 2210.02    7     0     0    .013     55.0       .0       .00      .00     .00     .00
0 ELEMENT NO  31 IS A TRANSITION     *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
                               4862.59 2210.79    6               .013
0 ELEMENT NO  32 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               4872.59 2210.89    6               .013                                      .00    .00    .00       0
 WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS
0 ELEMENT NO  33 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               4972.59 2211.91    9               .013                                      .00 230.00    .00       0
0 ELEMENT NO  34 IS A JUNCTION       *        *     *     *                    *                   *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N       Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                               4972.59 2211.92    6     0     0    .013      .0       .0       .00      .00     .00     .00
1                                                                                                                          PAGE NO   5
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO  35 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               5118.20 2218.93    6               .013                                      .00 230.00    .00       1
0 ELEMENT NO  36 IS A TRANSITION     *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
                               5168.20 2221.34    1               .013
0 ELEMENT NO  37 IS A REACH          *        *     *
                    U/S DATA   STATION    INVERT  SECT              N                                    RADIUS  ANGLE  ANG PT  MAN H
                               5228.20 2221.90    1               .013                                      .00    .00    .00       0
0 ELEMENT NO  38 IS A TRANSITION     *        *     *
                    U/S DATA   STATION    INVERT  SECT              N
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                                  5278.20 2222.42    4              .013
0 ELEMENT NO  39 IS A REACH                  *      *      *
                        U/S DATA   STATION    INVERT  SECT             N                                RADIUS  ANGLE  ANG PT  MAN H
                                  5328.20 2222.94    4              .013                                  .00    .00     .00      0
0 ELEMENT NO  40 IS A SYSTEM HEADWORKS                      *                      *
                        U/S DATA   STATION    INVERT  SECT                                    W S ELEV
                                  5328.20 2222.94    4                                          .00
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
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WATER SURFACE PROFILE LISTING

PITTMAN WASH LOMR (CASE NO. 04-09-1194P)
STORM DRAIN ANALYSIS FOR SYSTEM ALONG EASTERN AVENUE

0 STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0 .00	2139.98	4.70	2144.68	1816.1	18.06	5.07	2149.75	.00	6.34	6.00	12.00	2.00	0	.00
0 140.00	.00443					.00588	.82		5.00			2.00		
0 140.00	2140.60	4.61	2145.21	1816.1	18.58	5.36	2150.57	.00	6.34	6.00	12.00	2.00	0	.00
0TRANS STR	.00440					.00948	.95					2.00		
0 240.00	2141.04	3.46	2144.50	1816.1	21.87	7.44	2151.94	.00	5.62	6.00	25.00	.00	1	1.00
0 100.68	.00963					.01346	1.36		3.83			.00		
0 340.68	2142.01	3.35	2145.36	1816.1	22.59	7.93	2153.29	.00	5.62	6.00	25.00	.00	1	1.00
0 97.96	.01030					.01479	1.45		3.74			.00		
0 438.64	2143.02	3.24	2146.26	1816.1	23.36	8.48	2154.74	.00	5.62	6.00	25.00	.00	1	1.00
0 110.15	.01030					.01663	1.83		3.74			.00		
0 548.79	2144.15	3.09	2147.24	1816.1	24.50	9.33	2156.57	.00	5.62	6.00	25.00	.00	1	1.00
0 89.90	.01030					.01908	1.72		3.74			.00		
0 638.69	2145.08	2.94	2148.02	1816.1	25.70	10.26	2158.29	.00	5.62	6.00	25.00	.00	1	1.00
0 39.94	.02759					.01988	.79		2.65			.00		
0 678.63	2146.18	3.00	2149.18	1816.1	25.24	9.90	2159.08	.00	5.62	6.00	25.00	.00	1	1.00
0 79.67	.02759					.01812	1.44		2.65			.00		
0 758.30	2148.38	3.14	2151.52	1816.1	24.07	9.00	2160.53	.00	5.62	6.00	25.00	.00	1	1.00
0 .00	.02759					.01688	.00		2.65			.00		
0 758.30	2148.38	3.14	2151.52	1816.1	24.07	9.00	2160.53	.00	5.62	6.00	25.00	.00	1	1.00
0 313.21	.01711					.01664	5.21		3.13			.00		
0 1071.51	2153.74	3.18	2156.92	1816.1	23.83	8.82	2165.74	.00	5.62	6.00	25.00	.00	1	1.00
0JUNCT STR	.00000					.02080	.00					.00		

WATER SURFACE PROFILE LISTING

PITTMAN WASH LOMR (CASE NO. 04-09-1194P)
STORM DRAIN ANALYSIS FOR SYSTEM ALONG EASTERN AVENUE

0 STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0 1071.51	2153.74	2.57	2156.31	1660.1	26.87	11.22	2167.53	.00	5.30	6.00	25.00	.00	1	1.00
0 42.11	.01781					.02583	1.09		2.90			.00		
0 1113.62	2154.49	2.53	2157.02	1660.1	27.32	11.60	2168.62	.00	5.30	6.00	25.00	.00	1	1.00
0 1.00	.02002					.02648	.03		2.79			.00		
0 1114.62	2154.51	2.53	2157.04	1660.1	27.33	11.61	2168.65	.00	5.30	6.00	25.00	.00	1	1.00
0 1.00	.02002					.02652	.03		2.79			.00		
0 1115.62	2154.53	2.53	2157.06	1660.1	27.34	11.62	2168.68	.00	5.30	6.00	25.00	.00	1	1.00
0TRANS STR	.01369					.01943	1.01					.00		
0 1167.49	2155.24	4.69	2159.93	1660.1	25.27	9.92	2169.86	.00	6.00	6.00	14.00	.00	0	.00
0 36.67	.01418					.01225	.45		4.46			.00		
0 1204.16	2155.76	4.71	2160.47	1660.1	25.15	9.83	2170.31	.00	6.00	6.00	14.00	.00	0	.00
0 .00	.01418					.01217	.00		4.46			.00		
0 1204.16	2155.76	4.71	2160.47	1660.1	25.15	9.83	2170.31	.00	6.00	6.00	14.00	.00	0	.00
0 16.66	.01441					.01213	.20		4.44			.00		
0 1220.82	2156.00	4.73	2160.73	1660.1	25.09	9.78	2170.51	.00	6.00	6.00	14.00	.00	0	.00
0 .00	.01441					.01208	.00		4.44			.00		
0 1220.82	2156.00	4.73	2160.73	1660.1	25.09	9.78	2170.51	.00	6.00	6.00	14.00	.00	0	.00
0 610.35	.01219					.01186	7.24		4.71			.00		
0 1831.17	2163.44	4.79	2168.23	1660.1	24.75	9.52	2177.75	.00	6.00	6.00	14.00	.00	0	.00
0 .00	.01219					.01163	.00		4.71			.00		
0 1831.17	2163.44	4.79	2168.23	1660.1	24.75	9.52	2177.75	.00	6.00	6.00	14.00	.00	0	.00
0 197.06	.01267					.01133	2.23		4.65			.00		

WATER SURFACE PROFILE LISTING

PITTMAN WASH LOMR (CASE NO. 04-09-1194P)
STORM DRAIN ANALYSIS FOR SYSTEM ALONG EASTERN AVENUE

0 STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0 2028.23	2165.94	4.88	2170.82	1660.1	24.29	9.17	2179.98	.00	6.00	6.00	14.00	.00	0	.00
0 257.03	.01267					.01035	2.66		4.65			.00		
0 2285.26	2169.19	5.12	2174.31	1660.1	23.16	8.33	2182.65	.00	6.00	6.00	14.00	.00	0	.00
0 141.19	.01267					.00907	1.28		4.65			.00		
0 2426.45	2170.98	5.37	2176.35	1660.1	22.08	7.58	2183.93	.00	6.00	6.00	14.00	.00	0	.00
0JUNCT STR	.00000					.00846	.00					.00		
0 2426.45	2170.99	5.38	2176.37	1660.0	22.06	7.56	2183.93	.00	6.00	6.00	14.00	.00	0	.00
0 2426.45	2170.99	6.00	2176.99	1660.0	19.82	6.11	2183.10	.00	6.00	6.00	14.00	.00	0	.00
0TRANS STR	.01225					.00765	.31					.00		
0 2466.45	2171.48	10.24	2181.72	1660.0	11.57	2.08	2183.80	.00	5.30	6.00	25.00	.00	1	1.00
0 21.00	.01524					.00408	.09		3.06			.00		
0 2487.45	2171.80	10.01	2181.81	1660.0	11.57	2.08	2183.89	.00	5.30	6.00	25.00	.00	1	1.00
0JUNCT STR	.00000											.00		
0 2487.45	2171.81	3.29	2175.10	1910.0	26.36	10.80	2185.90	.00	4.15	4.15	23.00	.00	1	1.00
0TRANS STR	.02331					.02027	.12					.00		
0 2493.45	2171.95	3.30	2175.25	1910.0	26.34	10.78	2186.03	.00	4.15	4.15	23.00	.00	1	1.00
0 180.54	.02201					.01956	3.53		3.20			.00		
0 2673.99	2175.92	3.38	2179.30	1910.0	25.69	10.26	2189.56	.00	4.15	4.15	23.00	.00	1	1.00
0 177.34	.02201					.01768	3.14		3.20			.00		
0 2851.33	2179.83	3.54	2183.37	1910.0	24.49	9.32	2192.69	.00	4.15	4.15	23.00	.00	1	1.00
0 103.09	.02201					.01546	1.59		3.20			.00		
0 2954.42	2182.09	3.72	2185.81	1910.0	23.35	8.48	2194.29	.00	4.15	4.15	23.00	.00	1	1.00

WATER SURFACE PROFILE LISTING

PITTMAN WASH LOMR (CASE NO. 04-09-1194P)

0 STATION / 0 L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0 69.53	.02201					.01353	.94		3.20			.00		
0 3023.95	2183.62	3.90	2187.52	1910.0	22.27	7.71	2195.23	.00	4.15	4.15	23.00	.00	1	1.00
0 50.26	.02201					.01185	.60		3.20			.00		
0 3074.21	2184.73	4.09	2188.82	1910.0	21.23	7.01	2195.82	.00	4.15	4.15	23.00	.00	1	1.00
0 3074.21	2184.73	4.22	2188.95	1910.0	21.04	6.88	2195.82	.00	4.15	4.15	23.00	.00	1	1.00
0TRANS STR	.02169					.01791	.11					.00		
0 3080.21	2184.86	6.63	2191.49	1910.0	17.32	4.66	2196.15	.00	5.30	5.30	24.00	.00	3	1.00
0 468.33	.01704					.01606	7.52		4.38			.00		
0 3548.54	2192.84	6.30	2199.14	1910.0	17.32	4.66	2203.80	.00	5.30	5.30	24.00	.00	3	1.00
0HYDRAULIC JUMP												.00		
0 3548.54	2192.84	4.38	2197.22	1910.0	20.77	6.70	2203.92	.00	5.30	5.30	24.00	.00	3	1.00
0 77.33	.01704					.01705	1.32		4.38			.00		
0 3625.87	2194.16	4.38	2198.54	1910.0	20.77	6.70	2205.24	.00	5.30	5.30	24.00	.00	3	1.00
0 325.87	.01704					.01707	5.56		4.38			.00		
0 3951.74	2199.71	4.38	2204.09	1910.0	20.79	6.71	2210.80	.00	5.30	5.30	24.00	.00	3	1.00
0TRANS STR	.03003					.01402	.07					.00		
0 3956.74	2199.86	4.10	2203.96	1910.0	21.16	6.95	2210.92	.00	4.80	4.80	23.00	.00	1	1.00
0 203.47	.00968					.01154	2.35		4.29			.00		
0 4160.21	2201.83	3.96	2205.79	1910.0	21.94	7.48	2213.27	.00	4.80	4.80	23.00	.00	1	1.00
0 4160.21	2201.83	6.71	2208.54	1910.0	18.17	5.13	2213.67	.00	4.80	4.80	23.00	.00	1	1.00
0 233.06	.01060					.01283	2.99		4.15			.00		
0 4393.27	2204.30	7.40	2211.70	1910.0	18.17	5.13	2216.83	.00	4.80	4.80	23.00	.00	1	1.00

0 STATION / 0 L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0 166.21	.01017					.01283	2.13		4.22			.00		
0 4559.48	2205.99	8.53	2214.52	1910.0	18.17	5.13	2219.65	.00	4.80	4.80	23.00	.00	1	1.00
0 229.87	.01749					.01283	2.95		3.47			.00		
0 4789.35	2210.01	7.45	2217.46	1910.0	18.17	5.13	2222.60	.00	4.80	4.80	23.00	.00	1	1.00
0JUNCT STR	.00000					.01246	.00					.00		
0 4789.35	2210.02	8.03	2218.05	1855.0	17.65	4.84	2222.89	.00	4.80	4.80	23.00	.00	1	1.00
0TRANS STR	.01051					.00717	.53					.00		
0 4862.59	2210.79	11.50	2222.29	1855.0	9.69	1.46	2223.75	.00	5.70	8.00	25.00	.00	1	1.00
0 10.00	.00998					.00224	.02		3.84			.00		
0 4872.59	2210.89	11.43	2222.32	1855.0	6.76	.71	2223.03	.00	5.70	13.50	24.00	.00	0	.00
0 46.79	.01020					.00035	.02		3.46			.00		
0 4919.38	2211.37	10.89	2222.26	1855.0	7.09	.78	2223.04	.00	5.70	13.50	24.00	.00	0	.00
0 43.77	.01020					.00040	.02		3.46			.00		
0 4963.14	2211.81	10.39	2222.20	1855.0	7.44	.86	2223.06	.00	5.70	13.50	24.00	.00	0	.00
0 9.45	.01020					.00044	.00		3.46			.00		
0 4972.59	2211.91	10.28	2222.19	1855.0	7.52	.88	2223.07	.00	5.70	13.50	24.00	.00	0	.00
0JUNCT STR	.00000											.00		
0 4972.59	2211.92	2.78	2214.70	1855.0	27.85	12.05	2226.75	.00	5.70	8.00	25.00	.00	1	1.00
0JUNCT STR	.00000					.02526	.00					.00		
0 4972.59	2211.92	2.78	2214.70	1855.0	27.85	12.05	2226.75	.00	5.70	8.00	25.00	.00	1	1.00
0 35.84	.04814					.02378	.85		2.23			.00		
0 5008.43	2213.65	2.90	2216.54	1855.0	26.68	11.06	2227.60	.00	5.70	8.00	25.00	.00	1	1.00

0 STATION / 0 L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0 31.69	.04814					.02087	.66		2.23			.00		
0 5040.12	2215.17	3.04	2218.21	1855.0	25.44	10.06	2228.27	.00	5.70	8.00	25.00	.00	1	1.00
0 25.57	.04814					.01819	.47		2.23			.00		
0 5065.69	2216.40	3.19	2219.59	1855.0	24.25	9.14	2228.73	.00	5.70	8.00	25.00	.00	1	1.00
0 20.93	.04814					.01586	.33		2.23			.00		
0 5086.62	2217.41	3.34	2220.75	1855.0	23.13	8.31	2229.06	.00	5.70	8.00	25.00	.00	1	1.00
0 17.27	.04814					.01384	.24		2.23			.00		
0 5103.89	2218.24	3.51	2221.75	1855.0	22.05	7.56	2229.30	.00	5.70	8.00	25.00	.00	1	1.00
0 14.31	.04814					.01209	.17		2.23			.00		
0 5118.20	2218.93	3.68	2222.61	1855.0	21.02	6.87	2229.48	.00	5.70	8.00	25.00	.00	1	1.00
0TRANS STR	.04820					.00834	.42					.00		
0 5168.20	2221.34	4.79	2226.13	1855.0	16.14	4.05	2230.18	.00	5.70	6.00	25.00	.00	1	1.00
0 22.64	.00933					.00517	.12		3.93			.00		
0 5190.84	2221.55	4.94	2226.49	1855.0	15.64	3.80	2230.29	.00	5.70	6.00	25.00	.00	1	1.00
0 22.25	.00933					.00465	.10		3.93			.00		
0 5213.09	2221.76	5.18	2226.94	1855.0	14.91	3.45	2230.40	.00	5.70	6.00	25.00	.00	1	1.00
0 11.62	.00933					.00409	.05		3.93			.00		
0 5224.71	2221.87	5.44	2227.30	1855.0	14.21	3.14	2230.44	.00	5.70	6.00	25.00	.00	1	1.00
0 3.49	.00933					.00359	.01		3.93			.00		
0 5228.20	2221.90	5.70	2227.60	1855.0	13.55	2.85	2230.46	.00	5.70	6.00	25.00	.00	1	1.00
0TRANS STR	.01040					.00203	.10					.00		
0 5278.20	2222.42	7.14	2229.56	1855.0	8.66	1.16	2230.73	.00	4.92	8.00	30.00	.00	0	.00

0 STATION / 0 L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0 22.39	.01040					.00075	.02		2.92			.00		
0 5300.59	2222.65	6.81	2229.46	1855.0	9.08	1.28	2230.74	.00	4.92	8.00	30.00	.00	0	.00
0 19.81	.01040					.00086	.02		2.92			.00		
0 5320.41	2222.86	6.49	2229.35	1855.0	9.52	1.41	2230.76	.00	4.92	8.00	30.00	.00	0	.00
0 7.79	.01040					.00095	.01		2.92			.00		
0 5328.20	2222.94	6.36	2229.30	1855.0	9.72	1.47	2230.77	.00	4.92	8.00	30.00	.00	0	.00
0 .00	.01040					.00049	.00		2.92			.00		

0 5328.20 2222.94 6.36 2229.30 1855.0 9.72 1.47 2230.77 .00 4.92 8.00 30.00 .00 0 .00
1

Appendix D: Flowmaster Worksheet

Worksheet for 100' ROW of Eastern Avenue (Section A-A)

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.77000	%
Discharge:	306.00	ft³/s

Options	
Current Roughness Weighted Meth	ImprovedLotters
Open Channel Weighted Roughnes	ImprovedLotters
Closed Channel Weighted Roughne	Hortons

Results		
Roughness Coefficient:	0.016	
Water Surface Elevation:	1.01	ft
Elevation Range:	0.00 to 2.00 ft	
Flow Area:	42.80	ft²
Wetted Perimeter:	99.54	ft
Top Width:	97.61	ft
Normal Depth:	1.01	ft
Critical Depth:	1.24	ft
Critical Slope:	0.00428	ft/ft
Velocity:	7.15	ft/s
Velocity Head:	0.79	ft
Specific Energy:	1.80	ft
Froude Number:	1.90	
Flow Type:	Supercritical	

Hydraulic Depth

$\frac{\text{Area}}{\text{Top width}} = \frac{42.80}{97.61}$

$= 0.44'$

Segment Roughness		
Start Station	End Station	Roughness Coefficient
(0+00, 2.00)	(0+07, 0.13)	0.015
(0+07, 0.13)	(0+93, 0.13)	0.016
(0+93, 0.13)	(1+00, 2.00)	0.015

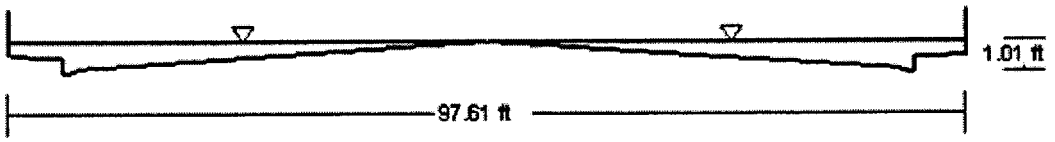
Section Geometry	
Station	Elevation

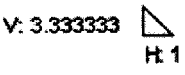
Worksheet for 100' ROW of Eastern Avenue (Section A-A)

Station	Elevation
0+00	2.00
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+50	1.03
0+93	0.17
0+93	0.13
0+95	0.00
0+95	0.50
1+00	0.60
1+00	2.00

Cross Section for 100' ROW of Eastern Avenue (Section A-A)

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.016	
Channel Slope:	1.77000	%
Normal Depth:	1.01	ft
Elevation Range:	0.00 to 2.00 ft	
Discharge:	306.00	ft^3/s





Appendix E: Storm Drain Design Plans

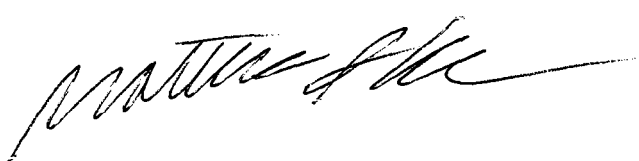
April 15, 2005

AS-BUILT CERTIFICATION FOR EASTERN AVENUE STORM DRAIN LETTER OF MAP REVISION APPLICATION FOR PITTMAN WASH CASE No. 04-09-1194P

I, Matt Baird, hereby certify that the facilities analyzed in this LOMR are in substantial conformance with the plans provided in Appendix E and the supplemental field survey included in the original request for LOMR submittal dated May 4, 2004.

Sincerely,

PBS&J



Matthew S. Baird, P.E., CFM
Lic. 13684, Nevada

CURVE	RADIUS	LENGTH	TANGENT	DELTA
DC1	750.00'	149.55'	75.02'	11°25'30"
DC2	750.00'	310.20'	157.35'	23°41'50"
DC3	750.00'	160.65'	80.63'	12°16'21"

SCALE 1"=50'

SERENE AVE.

EASTERN AVENUE

"EA" 08+19.17 ANGLE POINT

N 00°45'15"E

"ED2" 11+39.89 CUT & MATCH EXIST. A.C. PAVEMENT

BOX CULVERT CONSTRUCTION

"ED2" 18+75.69 CUT & MATCH EXIST. A.C. PAVEMENT

N 00°45'40"E 1302.14'

S 12°11'10" W 214.17'

N 11°30'41" W 178.15'

"ED2" 10+00.00 P.C.
"E" 10+00.00 P.O.T.

"ED2" 11+49.55 PT

"ED2" 13+63.72 PC

"ED2" 16+73.92 PT

"ED2" 18+52.07 PC

"ED2" 20+12.71 PT = "E" 20+00.00 P.O.T.

DC1 DC2 DC3

"A" "AE" "AW" "E1" "E2" "E3" "E4"

R/W

OHP OHP/OHT

2-36" DIP

Existing Eastern Ave.

790+00 795+00

S89°38'22"E

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3A

CONSTRUCTION AND GRADING PLAN

"ED2" 10+00.00 TO "ED2" 20+12.71

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

REV. NO.	DATE	DESCRIPTION	APPROVED

PROJECT No: 598 DRAWN BY: RCH/SKK
DESIGNED BY: RCH/SKK CHECKED BY: TDL
APPROVED BY RJP

LOUIS BERGER & ASSOCIATES, INC.
LAS VEGAS, NEVADA 390

SCALE
HORIZ: 1" = 50'
VERT: NONE
FIELD BOOK

DRAWING NO.
L-1485
SHT. 78

598CSH18.L4 03/04/03 12:49:09

CURVE	RADIUS	LENGTH	TANGENT	DELTA
D1	240.00'	298.01'	171.65	70°08'42"

SCALE 1"=50'

TEMPORARY CONSTRUCTION EASEMENT
DRAINAGE EASEMENT

"DC1" STA: 13+50.00
"E" 11+68.32, 83.00' LT
BEGIN BOX CULVERT

"DC1" 14+69.61 P.C. = "E" 12+87.93, 83.00' LT

FILL THIS AREA

HEAVY GROUTED RIPRAP TYPE I

NON-MOTORIZED TRAIL

R/W

"E3" 29+00.00
FOR CONTINUATION
SEE SD-8

GRADE TO DRAIN

FILL AND GRADE TO DRAIN

"AW" 792+93.23
FOR CONTINUATION
SEE SD-8

"AE" 794+05.96 POT=
"E" 19+75.00 POT

"AW" 794+06.31 POT=
"E" 19+25.00 POT

"F" 16+22.85 POT=
"E3" 33+14.79 POT=
"E2" 10+00.00 POT=
15+00

"DC1" 16+75.47
"E" 14+69.46

B-2125

OHP/OHT

"DC1" 17+67.62 P.T.
"E" 15+15.06, 79.43' RT

"DC1" STA: 18+68.30
END BOX CULVERT
BEGIN CHANNEL TRANSITION

"DC1" STA: 19+68.33
END CHANNEL TRANSITION

"E2" 12+87.44 PT
END CONSTRUCTION

EASTERN AVENUE

MATCH EXISTING PAVEMENT

S 89°30'02" W

S 89°38'22" E

①	"E" 11+68.32	CONSTRUCT 2-12' X 6' X 518.30' RCB'S WITH TYPE II HEADWALLS. (SEE SHT. SD2-7) B-2125
②	"DC1" 18+68.30 25+92.86	CONSTRUCT 12' CONCRETE LINED CHANNEL (SEE SHT. SD2-7) B-2125
③	"E" 15+30.00	CONSTRUCT TYPE 2A D.I. NO. 33 WITH CONCRETE APRON, 132.00' LT INSTALL 24" X 54' RCP. (SEE SHT. SD2-6)
④	"E" 15+27.00	CONSTRUCT TYPE 1 MANHOLE, NO. 34 75.00' LT WITH 24" X 80' RCP. CONNECT TO 12' X 6' RCB. (SEE SHT. SD2-6)
⑤	"E" 15+36.00	CONSTRUCT TYPE 11 D.I. NO. 35 62.36' LT, L=15' WITH 18" X 13' RCP. (SEE SHT. SD2-6)
⑥	"E" 14+90.00	CONSTRUCT TYPE 11 D.I. NO. 36 96.98' RT, L=15' WITH 18" X 14' RCP. (SEE SHT. SD2-6)
⑦	"E" 11+43.32 TO 11+68.32	CONSTRUCT GROUTED RIPRAP BASIN (SEE SHT. SD2-7)

REV. NO.	DATE	DESCRIPTION	APPROVED

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3A

GRADING & DRAINAGE PLAN
"E" 6+00 TO "E" 21+50
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

ROGER PATTEN No. 7796 REGISTERED PROFESSIONAL ENGINEER STATE OF NEVADA

PROJECT No: 506 DRAWN BY: LJH
DESIGNED BY: LJH CHECKED BY: EWC
APPROVED BY: RJP

LOUIS BERGER & ASSOCIATES, INC. 4/2
LAS VEGAS, NEVADA

SCALE
HORIZ: 1" = 50'
VERT: NONE
FIELD BOOK

DRAWING NO.
L-1485

SHT. SD2-3 OF SD2-13

S:\SBORN11\ LJH 05/05/05 14:41:10

①	"E" 10+40.95 ,45.00 'RT	TO "E" 15+51.40 ,19.51 'RT	CONSTRUCT CLASS B CONC. CURB AND GUTTER ("L" TYPE) (CCPW STD. DWG. NO. 120)
	"E" 12+35.00 ,45.00 'LT	TO "E3" 32+42.92 ,72.13 'RT	
	"E3" 32+36.63 ,28.00 'LT	TO "E4" 34+29.57 ,28.00 'RT	
	"E2" 11+10.30 ,28.00 'LT	TO "E1" 11+40.30 ,28.00 'RT	
②	"E" 10+40.95 ,45.00 'RT	TO "E" 15+51.40 ,19.51 'RT	CONSTRUCT CLASS B CONC. SIDEWALK (4-INCH) (CCPW STD. DWG. NO. 119)
	"E" 12+35.00 ,45.00 'LT	TO "E3" 32+42.92 ,72.13 'RT	
	"E3" 32+36.63 ,28.00 'LT	TO "E4" 34+29.57 ,28.00 'RT	
	"E2" 11+10.30 ,28.00 'LT	TO "E1" 11+40.30 ,28.00 'RT	
③	"E" 18+47.66 ,19.50 'RT	TO "E" 21+62.39 , 7.50 'RT	CONSTRUCT CLASS B CONC. CURB AND GUTTER (TYPE 8) (NDOT STD. R-5.1.1)
	"E" 18+47.66 ,24.50 'RT	TO "E" 21+62.39 ,12.50 'RT	
④	"E" 19+05.62 ,18.80' 'RT	TO "E" 19+28.62 ,18.60 'RT	INSTALL 4-BAY IMPACT ATTENUATOR (SEE DETAIL D, SHEET 10A)
	"E" 20+71.62 ,17.54 'RT	TO "E" 20+94.62 ,16.33 'RT	
⑤	"E" 11+50.00 ,7.00 'RT	TO "E" 16+15.57 ,25.00 'RT	CONSTRUCT CLASS B CONC. ISLAND CURB ("A" TYPE) (CCPW STD. DWG. NO. 108)
	"E" 11+50.00 ,5.00 'RT	TO "E" 16+13.82 , 5.00 'LT	
	"E" 16+86.92 ,19.00 'RT	TO "E" 18+44.66 ,19.00 'RT	
	"E" 16+86.92 ,25.00 'RT	TO "E" 18+44.66 ,25.00 'RT	
	"E" 15+55.67 ,46.00 'LT	TO "E3" 32+68.37 ,8.49 'RT	
	"E3" 31+47.38 ,6.26 'RT	TO "E3" 32+63.31 ,4.00 'RT	
	"E" 21+65.39 ,7.00 'RT	TO "E" 22+73.08 , 7.00 'RT	
	"E" 15+51.01 ,80.00 'RT	TO "E2" 10+77.20 ,12.56 'RT	
	"E" 15+48.81 ,89.49 'RT	TO "E2" 11+53.49 ,9.86 'RT	
	"E2" 10+82.18 ,8.00 'RT	TO "E2" 11+52.99 ,8.00 'RT	
	"E" 15+55.14 ,47.85 'LT	TO "E3" 31+46.89 ,12.19 'RT	
	"E" 21+65.39 ,13.00 'RT	TO "E" 22+73.08 ,13.00 'RT	
⑥	"E" 8+82.06 ,5.00 'RT	TO "E" 11+50.00 ,5.00 'RT	CONSTRUCT CLASS B CONC. MEDIAN (4-INCH) (CCPW STD.DWG.NO. 107)
	"E" 16+86.92 ,19.00 'RT	TO "E" 18+44.66 ,19.00 'RT	
	"E" 21+65.39 , 7.00 'RT	TO "E" 22+73.08 , 7.00 'RT	

CURVE TABLE

CURVE	RADIUS	LENGTH	TANGENT	DELTA
C3	967.00'	205.12'	102.95'	12°09'13"
C4	650.00'	153.67'	77.19'	13°32'43"

"E" 8+19.17= "S" 0+00.00

"E" 8+55.73 MATCH EXISTING PAVEMENT BEGIN TRANSITION

"E" 12+35.00, 45.00' LT BEGIN SIDEWALK, CURB AND GUTTER

"E" 10+40.94, 45.00' RT BEGIN SIDEWALK, CURB AND GUTTER

SAWCUT AND MATCH EXISTING PAVEMENT

"E3" 29+00.00 MATCH PAVEMENT (SEE DRAWING NO. R-18)

"E3" 29+64.55 PC

"E3" 31+69.67 PT

"E" 16+22.86 POT= "E3" 33+14.80 POT= "E2" 10+00.00 POT

"AE" 794+05.96 POT= "E" 19+75.00 POT

"AW" 794+06.31 POT= "E" 20+25.00 POT

"E2" 11+33.77 PC

"E2" 12+87.43 PT END CONSTRUCTION

EASTERN AVENUE

⑧	"E3" 29+00.00 ,128.55 'RT	TO "E3" 32+43.68 ,79.90 'RT	CONSTRUCT NON-MOTORIZED TRAIL (SEE DRAWING NO. NMT-9)
⑩	"E" 15+52.87 ,74.00 'LT		CONSTRUCT CLASS B CONC. RAMP, (4-INCH) (SEE DETAIL B, SHEET 10A)
	"E" 16+57.59 ,70.00 'LT		
	"E" 15+41.56 ,114.00 'RT		
	"E" 16+60.37 , 102.00'RT		
⑫	"E" 15+72.36 ,59.00 'LT		CONSTRUCT CLASS B CONC. RAMP (4-INCH), (USDCCA DWG. NO. 235)
	"E" 16+24.74 ,71.00 'LT		
	"E" 16+00.00 ,46.00 'LT		
	"E" 16+00.00 , 5.00 'LT		
	"E" 16+00.00 ,25.00 'RT		
	"E" 15+59.32 ,87.00 'RT		
	"E" 16+01.29 ,78.00 'RT		
	"E" 16+24.13 ,106.00 'RT		
⑬	"E2" 12+00.00		INSTALL TWO 4" PVC SCH 40 SLEEVES (NDOT STD. R-5.1.2.)
	"E3" 31+00.00		
⑭	"E3" 29+00.00 ,125.77 'RT		CONSTRUCT REMOVABLE BOLLARDS (SEE DRAWING NO. NMT-9)
⑮	"E3" 29+00.00 ,160.00 'RT		INSTALL 12' SINGLE SWING GATE (NDOT STD. R-6.3.2.)
⑯	"E3" 29+00.00 ,137.16 'RT	TO "E" 11+80.00 ,100.00 'LT	INSTALL 72" CHAIN LINK FENCE (NDOT STD. R-6.1.1.)
	"E" 9+75.91 ,110.00 'RT	TO "AE" 806+21.40 ,163.31 'RT	
	"E3" 29+00.00 ,116.55 'RT	TO "E3" 32+15.63 ,76.33 'RT	
	(SEE SHEET SD2-2 FOR CONTINUATION OF FENCE)		

⑦	"E" 11+50.00 , 5.00 'RT	TO "E" 16+13.82 , 5.00 'LT	CONSTRUCT AC MEDIAN (1.5-INCH) (CCPW STD.DWG.NO. 107)
	"E" 15+55.67 ,46.00 'LT	TO "E3" 32+68.37 ,8.49 'RT	
	"E" 15+51.01 ,80.00 'RT	TO "E2" 10+77.20 ,12.56 'RT	
	"E" 18+44.66 ,19.00 'RT	TO "E" 21+65.39 , 7.00 'RT	
⑨	"E" 19+28.12 ,16.60 'RT	TO "E" 20+71.62 ,13.60 'RT	CONSTRUCT CONC. BARRIER RAIL (TYPE B) (NDOT STD. R-8.3.1)
	"E" 19+28.12 ,21.60 'RT	TO "E" 20+71.62 ,16.60 'RT	
⑪	"E" 18+44.66 ,19.00 'RT	TO "E" 18+47.66 ,19.50 'RT	CONSTRUCT CONC. CURB AND GUTTER TRANSITION (TYPE 8 TO "A" TYPE) (SEE DETAIL A, SHEET 10A ,PAID FOR AS TYPE 8 CURB AND GUTTER)
	"E" 21+62.39 , 7.50 'RT	TO "E" 21+65.39 , 7.00 'RT	
	"E" 18+44.66 ,25.00 'RT	TO "E" 18+47.66 ,24.50 'RT	
	"E" 21+62.39 ,12.50 'RT	TO "E" 21+65.39 ,13.00 'RT	

⑰	"S" 00+71.45 ,40.00 'LT	TO "S" 3+09.95	CONSTRUCT PAVEMENT SECTION (3" PLANTMIX BITUMINOUS SURFACE) (8" TYPE II CLASS B AGGREGATE BASE)
	"E" 6+38.13 ,9.81 'LT	TO "E" 8+19.80 ,54.67 'LT	
	"E" 6+90.00 ,23.74 'RT	TO "E" 7+92.62 ,11.00 'RT	
⑱	"E" 8+82.06 , 7.00 'RT	TO "E" 11+50.00 ,10.00'RT	
	"E" 8+82.06 ,5.00 'LT	TO "E" 11+50.00 ,5.00 'RT	

"S" 3+09.95 MATCH EXISTING PAVEMENT

CONSTRUCT CLASS A CONC. GLUE DOWN CURB (TYPE A) (NDOT STD. R-5.1.1)

SEE SHEET SD2-2 FOR CONTINUATION OF DRAINAGE AND GRADING

"E2"

"A" "AW" "AE"

OHP/OHT

BOX CULVERT

S 89°30'02" W

S 89°36'22" E

N 00°45'40" E 1302.14'

N 72°15'01" E

S 72°05'07" E 163.14'

S 84°14'20" W 145.13'

SCALE 1"=50'

REV. NO.	DATE	DESCRIPTION	APPROVED

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3A
CONSTRUCTION PLAN
"E" 6+00 TO "E" 21+55
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROJECT No: 566 DRAWN BY: DPH
DESIGNED BY: K.J. CHECKED BY: AP
APPROVED BY: R.P

LOUIS BERGER & ASSOCIATES, INC.
LAS VEGAS, NEVADA

SCALE: HORIZ: 1" = 50' VERT: NONE
FIELD BOOK

DRAWING NO. L-1485
SHT. 68

CURVE	RADIUS	LENGTH	TANGENT	DELTA
D2	150.00'	187.31'	108.07'	71°32'43"
D3	50.00'	78.54'	50.00'	90°00'00"
D4	25.46'	15.30'	8.44'	36°41'41"
D5	67.31'	65.16'	35.39'	55°28'21"

① "DC1" 18+68.30 TO 25+92.86 — CONSTRUCT 12' X 725' CONCRETE LINED CHANNEL (SEE SHT. SD2-7) B-2125

② "DC1" 25+92.86 TO 30+48.59 — CONSTRUCT 2-12' X 8' X 456.27' RCB'S (SEE SHT. SD2-7) B-1965

③ "A" 804+06.00 — CONSTRUCT 4-12' X 8' X 365.54' RCB'S, 177.00' LT TO 168.00' RT (SEE SHT. SD2-7) B-1965

④ "A" 804+05.48 — CONSTRUCT GROUTED RIPRAP BASIN. (SEE SHT. SD2-7)

⑤ "DC2" 06+40.00 TO 10+00.00 — CONSTRUCT 8' X 8' X 360.54' RCB (SEE SHT. SD2-6) B-1965

⑥ "E1" 11+95.00 TO 18+10.00 — CONSTRUCT V-TYPE DITCH (SEE SHT. SD2-7 AND SD2-11)

⑦ "AE" 803+15, "AW" 803+03 — 24' DOUBLE SWING CHAIN LINK FENCE

"DC1" STA: 18+68.30 END BOX CULVERT BEGIN CHANNEL TRANSITION

"DC1" 19+68.30 END CHANNEL TRANSITION

"E2" 12+87.44 PT END CONSTRUCTION

"DC1" PC=25+92.86 END CHANNEL TRANSITION BEGIN BOX CULVERT

"DC1" 24+92.86 BEGIN CHANNEL TRANSITION

"DC" 26+84.13 BEGIN BOX CULVERT

"DC1" PT=27+80.16

"DC" 30+49.13 END BOX CULVERT

"DC1" 30+49.13 END BOX CULVERT

"DC2" 30+49.13 END BOX CULVERT

"DC" 28+62.13= "A" 804+05.50

"DC1" 28+87.13= "AW" 803+67.50

"DC2" 28+87.13= "AW" 804+35.17

"DC1" 28+37.13= "AE" 803+67.50

"DC2" 28+37.13= "AE" 804+35.17

"DC2" PT=27+67.13

"DC2" 26+88.59 BEGIN BOX CULVERT

"E1" "E2"

"AE" 802+70.02 226.58 RT

"AE" 802+95 217.00 RT

"AE" 802+95.00 245.00 RT

"AE" 802+95 387.00 RT

"AE" 803+67.35 50.05 RT

"AE" 803+81.55 183.18 RT

"AE" 804+95 165.00 RT

"AE" 804+46.84 149.55 RT

"AE" 804+60.40 165.61 RT

"AE" 804+95 245.00 RT

"AE" 804+95 387.00 RT

"AE" 806+21.40 163.31 RT

"AE" 800+09.32 351.15 RT

"AE" 799+42.19 379.38 RT

"AE" 798+72.18 401.20 RT

"AW" 802+85 382.00' LT

"AW" 802+85.00 258.00' LT

"AW" 802+85 204.00' LT

"AW" 802+75.27 206.41' LT

"AW" 803+43.52 157.39' LT

"AW" 804+95 382.00' LT

"AW" 804+95.00 258.00 LT

"AW" 804+95 159.00' LT

"AW" 805+19.77 150.00' LT

"AW" 799+00.85 350.98 LT

"AW" 799+43.92 337.71 LT

"AW" 799+86.14 321.95 LT

"AW" 802+07.61 231.88' LT EL. 2130.85

"S1" 15+52.88 PC

"S1" 16+17.84 PT END OF V-TYPE DITCH

"S1" 10+00.00 PT BEGIN V-TYPE DITCH

"S1" 10+18.30 PT

"E1" 12+18.41 73.98' LT, EL. 2132.00

AREA OF GRAVEL MULCH (TYP)

V-DITCH

MATCH EXISTING

TEMPORARY CONSTRUCTION EASEMENT

PERMANENT DRAINAGE EASEMENT

TEMPORARY FENCE

R/W

I-215

B-1965

B-2125

S 84°14'23" E

S 71°18'22" E

S 89°38'52" W 1328.25'

S 89°38'52" W 1328.91'

S 87°20'56" E

S89°38'22"E

N 89°24'20" E

N 72°13'01" E

579.56'

SCALE 1"=50'

N

REV. NO.	DATE	DESCRIPTION	APPROVED

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3A

GRADING & DRAINAGE PLAN

"A" 796+00 TO "A" 811+50

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

ROGER PATTON No. 7798 PROFESSIONAL ENGINEER STATE OF NEVADA

PROJECT No: 588 DRAWN BY: LJH
DESIGNED BY: EWC CHECKED BY: PLC
APPROVED BY: RJP

LOUIS BERGER & ASSOCIATES, INC. LAS VEGAS, NEVADA

SCALE
HORIZ: 1"= 50'
VERT: NONE
FIELD BOOK

DRAWING NO. L-1485

SHT SD2-2 OF SD2-13

5360DN2A LJH 05/05/95 14:33:36

Note: survey points 466 and 472 were used to re-establish the slope of the channel based on the as-built survey. The new slope is 0.0044 ft/ft (see profile this sheet). Survey point 462 was used to establish the invert elevation of the box culvert.

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3A

DRAINAGE PROFILE

"DC1" 13+50.00 TO "DC1" 30+49.13

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

REV. NO.	DATE	DESCRIPTION	APPROVED

PROJECT No.	586
DESIGNED BY:	PLC
APPROVED BY:	RJP
DRAWN BY:	LJH
CHECKED BY:	EMC

LOUIS BERGER & ASSOCIATES, INC. LAS VEGAS, NEVADA

SCALE	
HORIZ: NONE	
VERT: NONE	
FIELD BOOK	

DRAWING NO. L-1485

SHT. SD2-7 OF SD2-13

5990PROA.DW 05/02/03 15:05:18

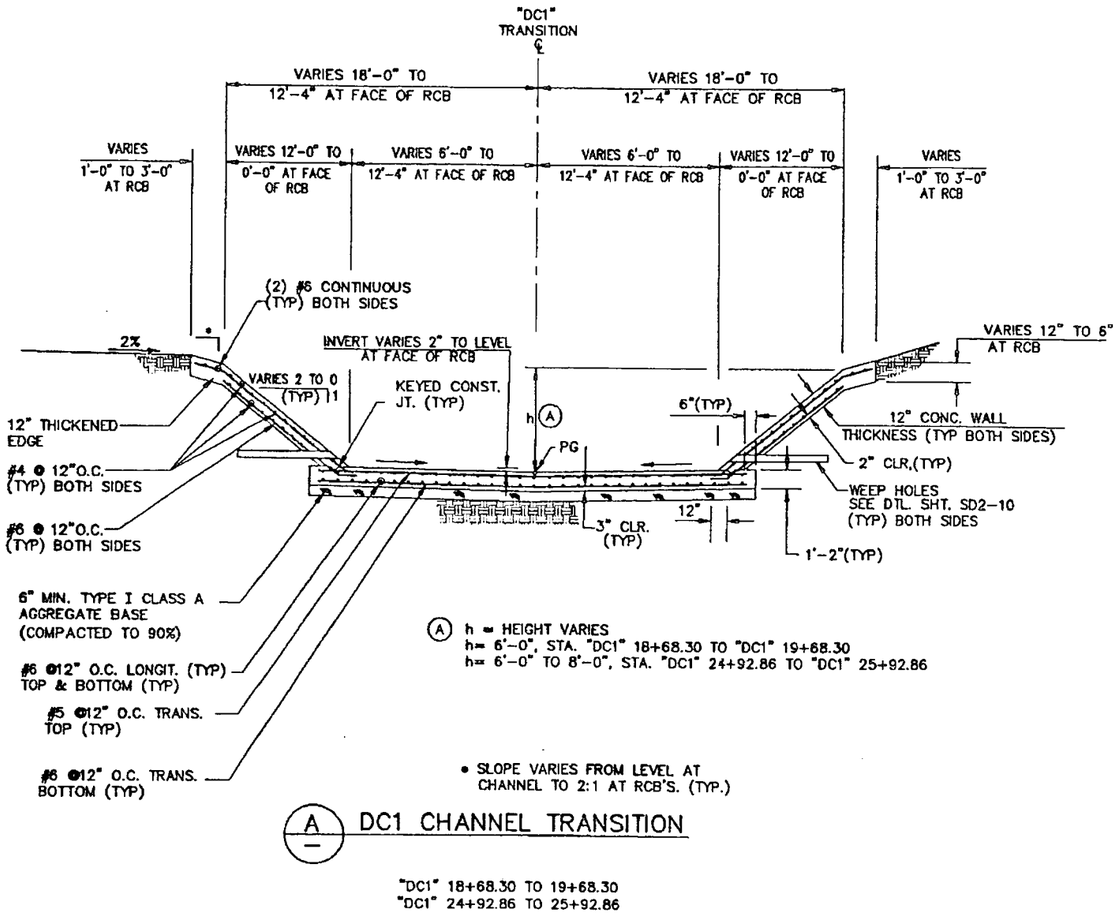
Note: All other plan sheets in this submittal are on NAVD 88.

V-TYPE DITCH
"E1" 12+00 TO 18+00

Note: Elevation are based on NGVD 29, add 2.38' to the elevations shown on this sheet to convert to NAVD 88.

"DC1" 25+92.86 TO "DC1" 30+49.13

Revised S=0.0044 ft/ft

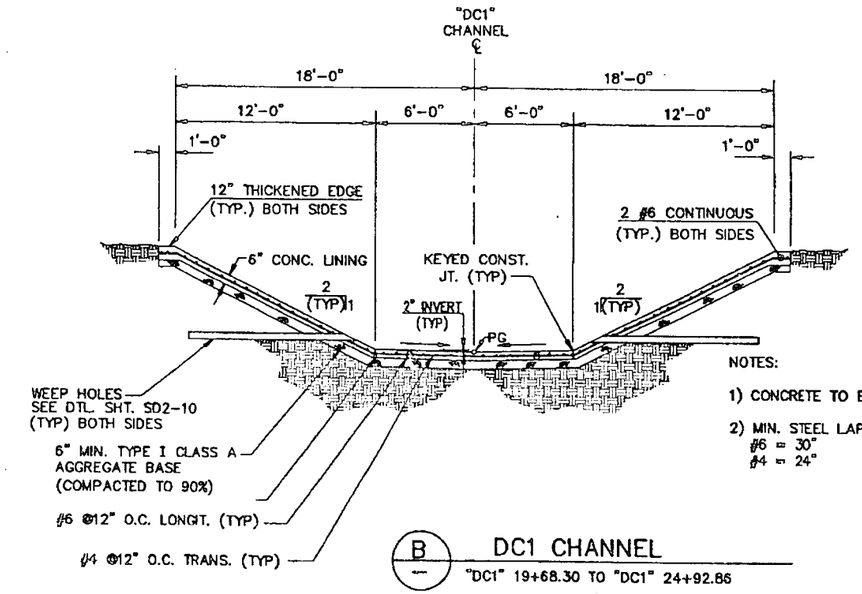


(A) h = HEIGHT VARIES
h= 6'-0", STA. "DC1" 18+68.30 TO "DC1" 19+68.30
h= 6'-0" TO 8'-0", STA. "DC1" 24+92.86 TO "DC1" 25+92.86

• SLOPE VARIES FROM LEVEL AT CHANNEL TO 2:1 AT RCB'S. (TYP.)

A — DC1 CHANNEL TRANSITION

"DC1" 18+68.30 TO 19+68.30
"DC1" 24+92.86 TO 25+92.86



NOTES:

1) CONCRETE TO BE CLASS 'A'

2) MIN. STEEL LAP DISTANCE:
#6 = 30"
#4 = 24"

B — DC1 CHANNEL

"DC1" 19+68.30 TO "DC1" 24+92.86

REV. NO.	DATE	DESCRIPTION	APPROVED

SOUTHERN SEGMENT LAS VEGAS BELTWAY-SECTION 3A

GRADING & DRAINAGE DETAILS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER STATE OF NEVADA ROGER PATTON 7796

PROJECT No: 568 DRAWN BY: DPH
DESIGNED BY: GAS CHECKED BY: EWC
APPROVED BY: RJP

LOUIS BERGER & ASSOCIATES, INC.
LAS VEGAS, NEVADA

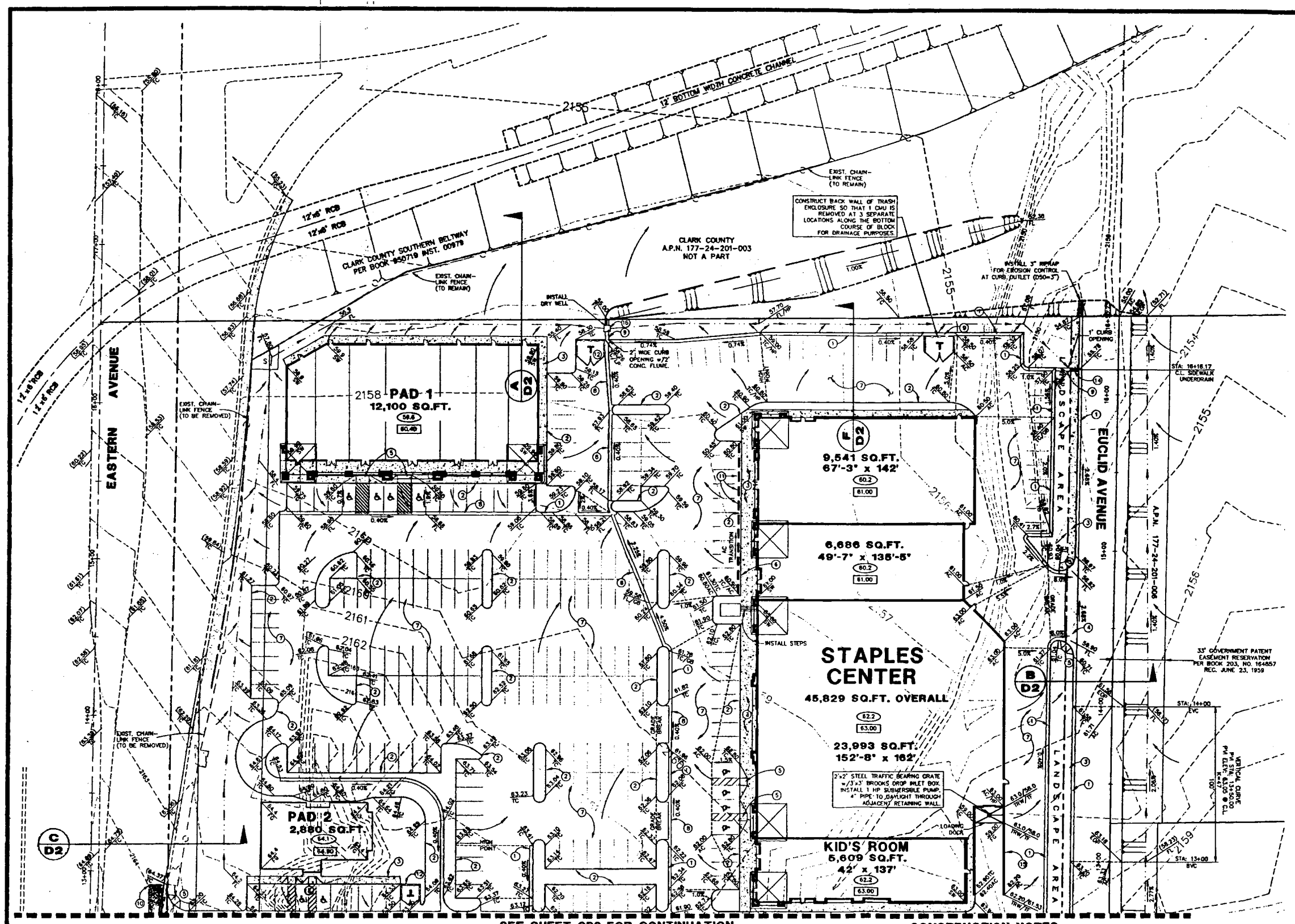
SCALE
HORIZ: 1"=4'
VERT: NONE
FIELD BOOK

DRAWING NO.
L-1485

SHT. SD2-0 OF SD2-13

418

5568DRDTL LM 05/05/05 12:43:28



LEGEND

- PROPERTY LINE
- STREET CENTER LINE
- EXISTING BUILDING
- SIMILE LINE
- PROPOSED BUILDING
- EXISTING CURB & GUTTER
- PROPOSED CURB & GUTTER
- EXISTING EDGE OF A.C. PAVEMENT
- SECTION / DETAIL SYMBOL
- 59 EXISTING CONTOUR LINE
- 64 PROPOSED 1' CONTOUR
- 65 PROPOSED 5' CONTOUR
- SPADE LINE
- HINGE LINE
- (1) CONSTRUCTION NOTE
- 1.00% SLOPE & DIRECTION OF SLOPE
- 67.43 PROPOSED ELEVATION
- (67.93) EXISTING ELEVATION
- [67.43] FUTURE ELEVATION
- AREA TO BE PAVED

SEE SHEET GP2 FOR CONTINUATION

BASIS OF BEARINGS

NORTH 00° 45' 40" EAST BEING THE WEST LINE OF THE THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 24, TOWNSHIP 22 SOUTH, RANGE 61 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN IN FILE 99, PAGE 43 OF SURVEYS, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

CLARK COUNTY BENCHMARK NO. BC21-24NWBG
INVERTED ALUMINUM MONUMENT EAST SIDE OF EASTERN AVE., 1150 FEET NORTH OF SERENE AVE., 6 FEET NORTH OF POWER POLE #BC24INP.
ELEVATION = 654.949 METERS
(2148.778 U.S. SURVEY FEET) NAVD88 DATUM
METERS X (3937 / 1200) = U.S. SURVEY FEET

1. THE ELEVATIONS SHOWN HEREON ARE BASED ON FEET.

NOTE:

QUANTITIES SHOWN ARE FOR PERMIT PURPOSES ONLY. CONTRACTORS SHALL BE RESPONSIBLE FOR HIS OWN ESTIMATE FOR BIDDING AND SHALL BID A COMPLETE JOB. CONTRACTOR SHALL ADVISE OWNER AND ENGINEER OF ANY DISCREPANCIES IN ESTIMATE.

EARTHWORK QUANTITIES

NOTE: THESE QUANTITIES ARE APPROXIMATE AND AREA RAW VOLUMES ONLY. OVER EXCAVATION, SUBSIDENCE, SHRINKAGE, SHRINKAGE AND BULKING FACTORS, ARE NOT INCLUDED AS PART OF THESE EARTHWORK QUANTITIES.

CUT	5060	CUBIC YARD
FILL	83790	CUBIC YARD
NET	-18210	CUBIC YARD (IMPORT)

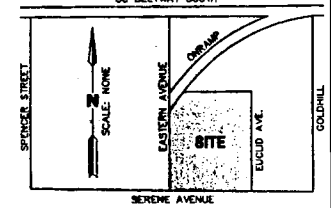
DISCLAIMER NOTE

EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON, THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. ALL DISCREPANCIES MUST BE IMMEDIATELY REPORTED TO THE ENGINEER. CALL BEFORE YOU DIG: 1-800-227-2600.

CONSTRUCTION NOTES

1. CONSTRUCT 24" "L" TYPE CURB & GUTTER PER UNIFORM STANDARD DRAWING NO. 216 - SEE DETAIL ON SHEET D1.
2. CONSTRUCT "A" TYPE CURB PER UNIFORM STANDARD DRAWING NO. 219 - SEE DETAIL ON SHEET D1.
3. CONSTRUCT CONCRETE SIDEWALK PER UNIFORM STANDARD DRAWING NO. 234 - SEE DETAIL ON SHEET D1.
4. CONSTRUCT 8' WIDE CONCRETE VALLEY GUTTER PER UNIFORM STANDARD DRAWING NO. 228 - SEE DETAIL ON SHEET D1.
5. CONSTRUCT SIDEWALK RAMP (CASE 1) PER UNIFORM STANDARD DRAWING NO. 235 SEE DETAIL ON SHEET D1.
6. CONSTRUCT "D" CURB FACE AS INDICATED
7. CONSTRUCT 2 1/2" A.C. PAVEMENT OVER 8 1/2" TYPE II GRAVE BASE - SEE SECTION ON SHEET D1.
8. CONSTRUCT 2' WIDE CONCRETE VALLEY GUTTER - SEE DETAIL ON SHEET D1.
9. CONSTRUCT CONCRETE FLUME (2' OPENING) - SEE DETAIL ON SHEET D1.
10. SAWCUT & MATCH EXISTING A.C. PAVEMENT AS INDICATED.
11. INSTALL CONCRETE WHEEL STOPS.
12. CONSTRUCT TRASH ENCLOSURE - SEE DETAIL SHEET D1.
13. REMOVE EXISTING 24" "L" TYPE CURB & GUTTER AS INDICATED.
14. CONSTRUCT UNDERSIDEWALK DRAIN PER UNIFORM STANDARD DRAWING NO. 236.
15. CONSTRUCT RETAINING WALL. INCLUDE A 2' HIGH SCREEN WALL AT LOADING DOCK. SEE DETAIL ON SHEET D1.
16. CONSTRUCT 4' x 4' x 2' DEEP DRY WELL BED. SEE DETAIL ON SHEET D1.

VICINITY MAP



Call before you Dig. 1-800-227-2600

Call before you OVERHEAD 1-702-593-6111

* SEE "CLARK COUNTY TRAFFIC NOTES" SHEET G2, ITEM 10 "CLARK COUNTY IS NOT A MEMBER OF CALL BEFORE YOU DIG."

GRAPHIC SCALE

(IN FEET)
1 inch = 30 ft.

NO.	DATE	BY	REVISION

GREAT AMERICAN CAPITAL
8687 WEST SAHARA AVE, SUITE 201
LAS VEGAS, NEVADA 89117
(702) 253-5751 FAX (702) 255-4088

ALPHA ENGINEERING COMPANY
50 So. Jones Blvd., Suite 101, Las Vegas, NV, 89107
Telephone: (702) 877-1300

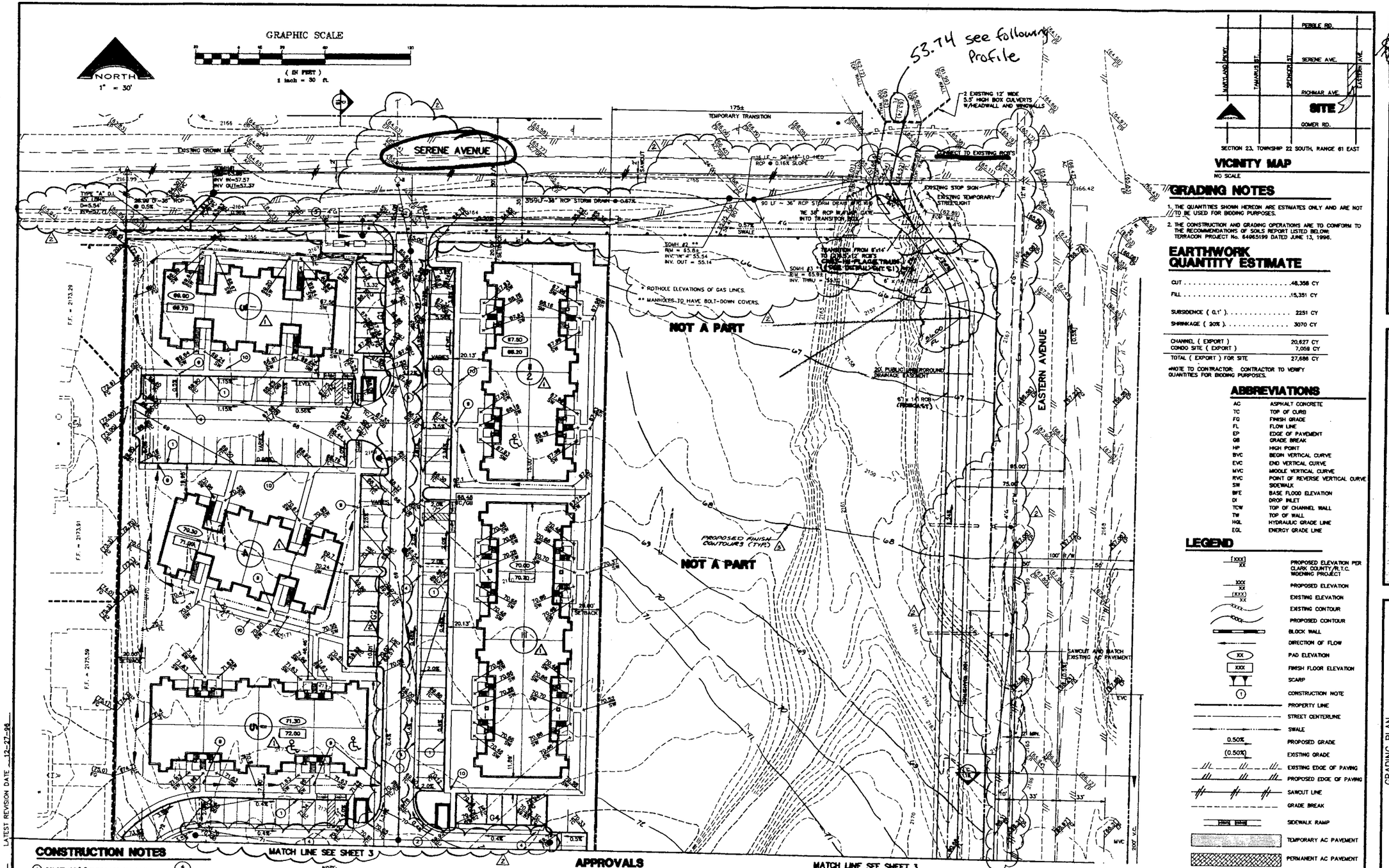
TITLE: BELTWAY MARKET PLACE

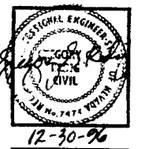
SHEET: GRADING PLAN (NORTH HALF)

DRAWN BY: TLD	01-08-01
DESIGNED BY: JEP	01-08-01
CHECKED BY: SEC	01-08-01
PROJECT NO: 010516	SCALE: 1"=30'

STEPHEN E. CRYDER — No. 11361 — PROFESSIONAL ENGINEER — STATE OF NEVADA — 01/19/01

SHEET: GP1
6 OF 16 SHEETS
DRAWING NO.





SECTION 23, TOWNSHIP 22 SOUTH, RANGE 61 EAST

VICINITY MAP

NO SCALE

GRADING NOTES

1. THE QUANTITIES SHOWN HEREON ARE ESTIMATES ONLY AND ARE NOT TO BE USED FOR BIDDING PURPOSES.
2. THE CONSTRUCTION AND GRADING OPERATIONS ARE TO CONFORM TO THE RECOMMENDATIONS OF SOILS REPORT LISTED BELOW: TERRACON PROJECT No. 64965199 DATED JUNE 13, 1996.

EARTHWORK QUANTITY ESTIMATE

CUT	48,358 CY
FILL	15,351 CY
SUBSIDENCE (0.1')	2251 CY
SHRINKAGE (20%)	3070 CY
CHANNEL (EXPORT)	20,827 CY
CONDO SITE (EXPORT)	7,059 CY
TOTAL (EXPORT) FOR SITE	27,886 CY

*NOTE TO CONTRACTOR: CONTRACTOR TO VERIFY QUANTITIES FOR BIDDING PURPOSES.

ABBREVIATIONS

AC	ASPHALT CONCRETE
TC	TOP OF CURB
FG	FINISH GRADE
FL	FLOW LINE
EP	EDGE OF PAVEMENT
GB	GRADE BREAK
HP	HIGH POINT
BVC	BEGIN VERTICAL CURVE
EVC	END VERTICAL CURVE
MVC	MIDDLE VERTICAL CURVE
RVC	POINT OF REVERSE VERTICAL CURVE
SW	SIDEWALK
BFE	BASE FLOOD ELEVATION
DI	DROP INLET
TCW	TOP OF CHANNEL WALL
TW	TOP OF WALL
HGL	HYDRAULIC GRADE LINE
EGL	ENERGY GRADE LINE

LEGEND

- PROPOSED ELEVATION PER CLARK COUNTY/R.T.C. WIDENING PROJECT
- PROPOSED ELEVATION
- EXISTING ELEVATION
- EXISTING CONTOUR
- PROPOSED CONTOUR
- BLOCK WALL
- DIRECTION OF FLOW
- PAD ELEVATION
- FINISH FLOOR ELEVATION
- SCARP
- CONSTRUCTION NOTE
- PROPERTY LINE
- STREET CENTERLINE
- SWALE
- PROPOSED GRADE
- EXISTING GRADE
- EXISTING EDGE OF PAVING
- PROPOSED EDGE OF PAVING
- SAWCUT LINE
- GRADE BREAK
- SIDEWALK RAMP
- TEMPORARY AC PAVEMENT
- PERMANENT AC PAVEMENT
- BUILDING TYPE AND NUMBER

CONSTRUCTION NOTES

1. CONSTRUCT "A" TYPE CURB PER DETAIL — (1/15)
2. CONSTRUCT "L" TYPE CURB & GUTTER PER U.S.D. #120
3. CONSTRUCT 8' WIDE VALLEY GUTTER PER U.S.D. #122
4. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL — (1/15)
5. CONSTRUCT 5' WIDE CONCRETE SIDEWALK PER U.S.D. #119
6. CONSTRUCT SIDEWALK RAMP PER U.S.D. #235, CASE 1
7. CONSTRUCT 2" A.C. PAVEMENT OVER 6" TYPE II GRAVEL BASE
8. CONSTRUCT DRAINAGE CHANNEL PER DETAIL — (2/15)
9. CONSTRUCT 4" PVC SIDEWALK DRAIN PER DETAIL — (3/15)
10. CONSTRUCT 4' SIDEWALK PER U.S.D. #119

NOTE:
"ALL WORK PERFORMED WITHIN THE PUBLIC RIGHT-OF-WAY AND OUTSIDE THE PROJECT BOUNDARY SHALL BE PERFORMED UNDER A SEPARATE ENCROACHMENT PERMIT ISSUED BY THE CONTROLLING AUTHORITY."

"ALL WORK PERFORMED OUTSIDE THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENT HAS BEEN OBTAINED FROM THE PROPERTY OWNER."

NOTE:
SIDEWALKS AND SIDEWALK GRADES AS SHOWN MEET A.D.A. STANDARDS. IF THEY ARE NOT INSTALLED AS SHOWN, THE NEW LOCATIONS AND GRADES SHOULD BE GIVEN TO THE ENGINEER SO THAT THEY CAN BE CHECKED TO ENSURE THEY MEET A.D.A. STANDARDS.

APPROVALS

CLARK COUNTY, DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
ACCEPTANCE OF PLANS FOR FILING

JNO 1-3-97
JKB 1/14/97

BY: [signature] 1/30/97
ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THIS CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN.

NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

BENCH MARK

STATION BC21-245WW6
ELEVATION = 667.051 METERS (NAVD88) 2188.48 FEET

RIVET AND ALUMINUM PLATE, IN A 8 FOOT BY 12 FOOT CONCRETE SLAB WITH WELL CASING, 100 FEET EAST OF EASTERN AVENUE AND 1125 FEET SOUTH OF SERENE AVENUE.

DISCLAIMER NOTE

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

Dial within Nevada before you Dig — Call before you Dig 1-800-227-2600

Dial outside Nevada before you OVERHEAD — Call before you OVERHEAD 1-702-593-6111

DESIGNED BY: PR | DRAWN BY: PRO | CHKD BY:
JOB NUMBER: 121-022-963 | DATE: 7-24-96

NO.	REVISION	DATE	APP.
1	PER CLARK COUNTY COMMENTS DATED 8-27-96	9-27-96	
2	PER CLARK COUNTY COMMENTS DATED 10-24-96	10-30-96	
3	PER CLARK COUNTY COMMENTS DATED 12-27-96	12-30-96	

LATEST REVISION DATE 12-27-96

DRAWING NAME ES-GP

L. R. NELSON CONSULTING ENGINEERS, INC.
• STRUCTURAL • CIVIL • SURVEY
3035 East Patrick Lane Suite 9
Las Vegas, Nevada 89120
(702) 798-7978
(702) 451-2296 FAX

GRADING PLAN
RANCHO SERENE
JULIET PROPERTY COMPANY
NEVADA
CLARK COUNTY

SHEET NUMBER
2
OF 15 SHEETS

121-022-963
97012703

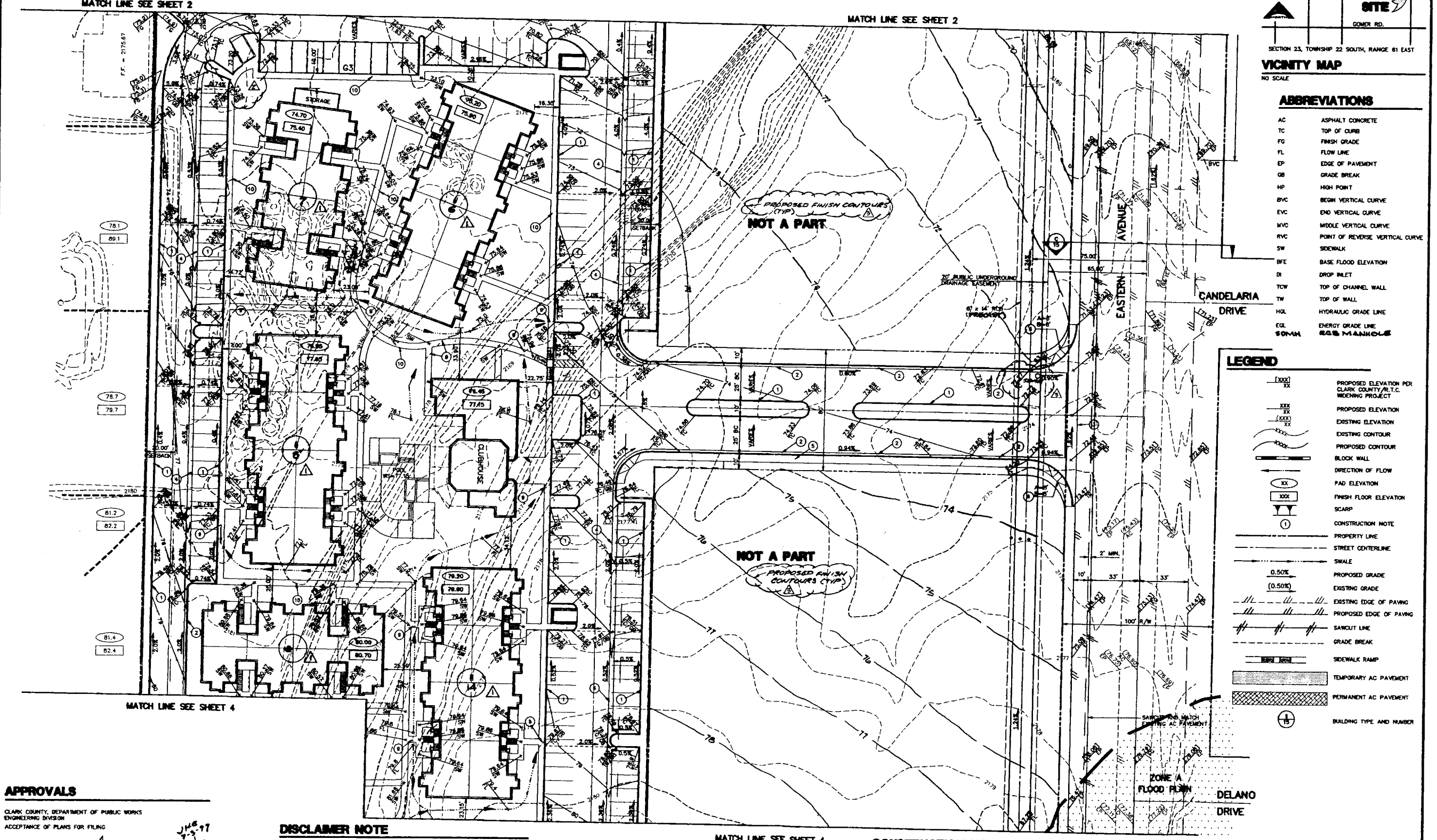
NORTH
1" = 30'

GRAPHIC SCALE
(IN FEET)
1 inch = 30 ft.

NOTE:
"ALL WORK PERFORMED WITHIN THE PUBLIC RIGHT-OF-WAY AND OUTSIDE THE PROJECT BOUNDARY SHALL BE PERFORMED UNDER A SEPARATE ENCROACHMENT PERMIT ISSUED BY THE CONTROLLING AUTHORITY."

"ALL WORK PERFORMED OUTSIDE THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENT HAS BEEN OBTAINED FROM THE PROPERTY OWNER."

NOTE:
SIDEWALKS AND SIDEWALK GRADES AS SHOWN MEET A.D.A. STANDARDS. IF THEY ARE NOT INSTALLED AS SHOWN, THE NEW LOCATIONS AND GRADES SHOULD BE GIVEN TO THE ENGINEER SO THAT THEY CAN BE CHECKED TO ENSURE THEY MEET A.D.A. STANDARDS.



PERBLE RD.
SERENE AVE.
RICHMAR AVE.
GOMER RD.
MARYLAND PKWY.
TAMARUS ST.
SPENCER ST.
EASTERN AVE.
SITE

SECTION 23, TOWNSHIP 22 SOUTH, RANGE 61 EAST

VICINITY MAP
NO SCALE

ABBREVIATIONS

AC	ASPHALT CONCRETE
TC	TOP OF CURB
FG	FINISH GRADE
FL	FLOW LINE
EP	EDGE OF PAVEMENT
GB	GRADE BREAK
HP	HIGH POINT
BVC	BEGIN VERTICAL CURVE
EVC	END VERTICAL CURVE
MVC	MIDDLE VERTICAL CURVE
RVC	POINT OF REVERSE VERTICAL CURVE
SW	SIDEWALK
BFE	BASE FLOOD ELEVATION
DI	DROP INLET
TCW	TOP OF CHANNEL WALL
TW	TOP OF WALL
HGL	HYDRAULIC GRADE LINE
EGL	ENERGY GRADE LINE
SDMH	SEWER MANHOLE

LEGEND

- [XXX] XX — PROPOSED ELEVATION PER CLARK COUNTY/R.T.C. WIDENING PROJECT
- XXX XX — PROPOSED ELEVATION
- (XXX) XX — EXISTING ELEVATION
- EXISTING CONTOUR
- PROPOSED CONTOUR
- BLOCK WALL
- DIRECTION OF FLOW
- (XX) — PAD ELEVATION
- XXX — FINISH FLOOR ELEVATION
- SCARP
- (1) — CONSTRUCTION NOTE
- PROPERTY LINE
- STREET CENTERLINE
- SWALE
- 0.50% — PROPOSED GRADE
- (0.50%) — EXISTING GRADE
- EXISTING EDGE OF PAVING
- PROPOSED EDGE OF PAVING
- SAWCUT LINE
- GRADE BREAK
- SIDEWALK RAMP
- TEMPORARY AC PAVEMENT
- PERMANENT AC PAVEMENT
- 1/15 — BUILDING TYPE AND NUMBER

APPROVALS

CLARK COUNTY, DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
ACCEPTANCE OF PLANS FOR FILING

BY: [signature] 1/30/97 — DATE: 1-31-97

ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THIS CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN.

NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

DISCLAIMER NOTE

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

Avoid cutting underground utility lines. It's costly. Call before you Dig 1-800-227-2600

Avoid overhead power lines contact Call before you OVERHEAD 1-702-593-8111

BENCH MARK

STATION BC21-24SWM6
ELEVATION = 667.051 METERS (NAVD88) 2188.48 FEET

RIVET AND ALUMINUM PLATE, IN A 8 FOOT BY 12 FOOT CONCRETE SLAB WITH WELL CASING, 100 FEET EAST OF EASTERN AVENUE AND 1125 FEET SOUTH OF SERENE AVENUE.

CONSTRUCTION NOTES

1. CONSTRUCT "A" TYPE CURB PER DETAIL — 4/15
2. CONSTRUCT "L" TYPE CURB & GUTTER PER U.S.D. #120
3. CONSTRUCT 8' WIDE VALLEY GUTTER PER U.S.D. #122
4. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL — 1/15
5. CONSTRUCT 5' WIDE CONCRETE SIDEWALK PER U.S.D. #119
6. CONSTRUCT SIDEWALK RAMP PER U.S.D. #235, CASE 1
7. CONSTRUCT 2" A.C. PAVEMENT OVER 6" TYPE II GRAVEL BASE
8. CONSTRUCT DRAINAGE CHANNEL PER DETAIL — 2/15
9. CONSTRUCT 4" PVC SIDEWALK DRAIN PER DETAIL — 3/15
10. CONSTRUCT 4" SIDEWALK PER U.S.D. #119

LATEST REVISION DATE 12-27-96
DRAWING NAME ES-GP

STATE OF NEVADA — No. 7474 — CIVIL — 12-30-96

NO.	REVISION	DATE	APPD.
1	REVISED PER CLARK COUNTY COMMENTS	12-27-96	
2	REVISED PER CLARK COUNTY COMMENTS	1-24-97	
3	REVISED PER CLARK COUNTY COMMENTS	1-30-97	

DESIGNED BY: PK | DRAWN BY: PRD | CHKD BY:
JOB NUMBER: 121-022-963 | DATE: 7-24-96

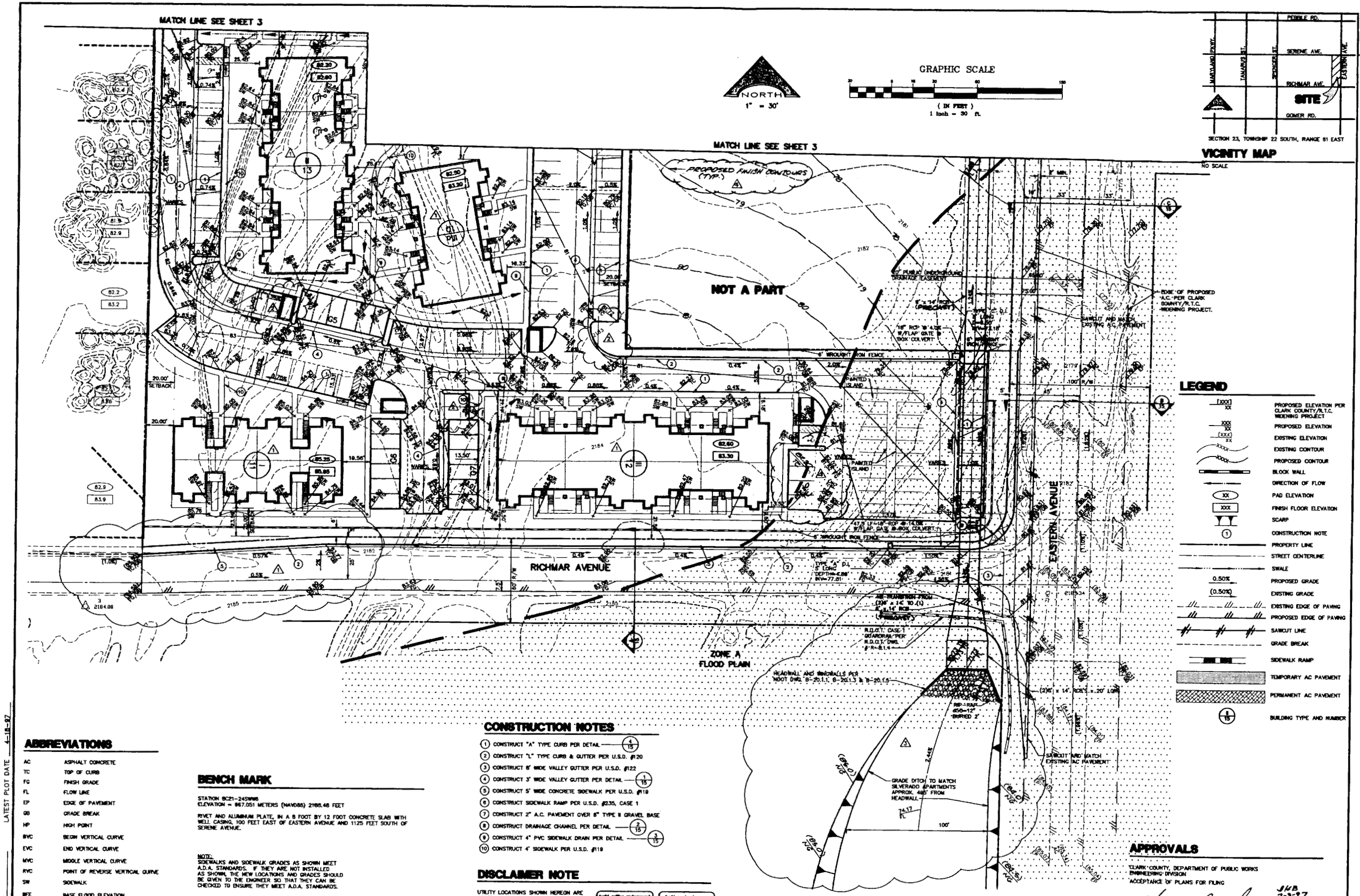
L. R. NELSON CONSULTING ENGINEERS, INC.
*STRUCTURAL *CIVIL *SURVEY
3035 East Patrick Lane Suite 9
Las Vegas, Nevada 89120
(702) 798-7978
(702) 451-2296 FAX

GRADING PLAN
RANCHO SERENE
JULIET PROPERTY COMPANY
CLARK COUNTY NEVADA

SHEET NUMBER
3
OF 15 SHEETS

121-022-963

97012703



VICINITY MAP

NO SCALE

LEGEND

- PROPOSED ELEVATION PER CLARK COUNTY/R.T.C. WIDENING PROJECT
- PROPOSED ELEVATION
- EXISTING ELEVATION
- EXISTING CONTOUR
- PROPOSED CONTOUR
- BLOCK WALL
- DIRECTION OF FLOW
- PAD ELEVATION
- FINISH FLOOR ELEVATION
- SCARP
- CONSTRUCTION NOTE
- PROPERTY LINE
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- 0.50% PROPOSED GRADE
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ABBREVIATIONS

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DI	DROP INLET
TCW	TOP OF CHANNEL WALL
TW	TOP OF WALL
HGL	HYDRAULIC GRADE LINE
EGL	ENERGY GRADE LINE

BENCH MARK

STATION BC21-24SWNS
ELEVATION = 667.051 METERS (NAVD88) 2188.46 FEET

RIVET AND ALUMINUM PLATE, IN A 8 FOOT BY 12 FOOT CONCRETE SLAB WITH WELL CASING, 100 FEET EAST OF EASTERN AVENUE AND 1125 FEET SOUTH OF SERENE AVENUE.

NOTE:
SIDEWALKS AND SIDEWALK GRADES AS SHOWN MEET A.D.A. STANDARDS. IF THEY ARE NOT INSTALLED AS SHOWN, THE NEW LOCATIONS AND GRADES SHOULD BE GIVEN TO THE ENGINEER SO THAT THEY CAN BE CHECKED TO ENSURE THEY MEET A.D.A. STANDARDS.

NOTE:
"ALL WORK PERFORMED WITHIN THE PUBLIC RIGHT-OF-WAY AND OUTSIDE THE PROJECT BOUNDARY SHALL BE PERFORMED UNDER A SEPARATE ENCROACHMENT PERMIT ISSUED BY THE CONTROLLING AUTHORITY."

"ALL WORK PERFORMED OUTSIDE THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENT HAS BEEN OBTAINED FROM THE PROPERTY OWNER."

CONSTRUCTION NOTES

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2. CONSTRUCT "L" TYPE CURB & GUTTER PER U.S.D. #120
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Avoid overlooked power line overload Call before you OVERHEAD 1-702-563-8111

APPROVALS

CLARK COUNTY, DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
ACCEPTANCE OF PLANS FOR FILING

JHB 7-3-97

BY: Harry Bowler 4/18/97

ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THIS CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN.

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LATEST PLOT DATE 4-18-97

DRAWING NAME ES-02

4-18-97

NO.	REVISION	DATE	APPR.
1	REVISED R.R. & A.D.A. PER A CROSS LINE AT REST. INF. OF RICHMAR	3/14/97	
2	TO TRAVEL PATH, SELF PARK ST. TO 26' PARK ST. REVISED DRAIN. PATH.	3/14/97	
3	ADDED HANDICAP DESIGNATIONS TO HANDICAP RAMPS	3/14/97	
4	REVISED PAVEMENT & DRAIN INCLUDING 18 DRIVE	3/14/97	
5	REVISED GRADING, PAVEMENT & DRAIN	3/14/97	
6	ADDED PROPOSED CONTOURS AT TIE TO EXISTING AND ADJUSTED GRADES AS REQUIRED	4/18/97	

DESIGNED BY: PK | DRAWN BY: PCO | CHKD BY:
JOB NUMBER: 121-022-963 | DATE: 7-24-96

L. R. NELSON CONSULTING ENGINEERS, INC.
• STRUCTURAL • CIVIL • SURVEY
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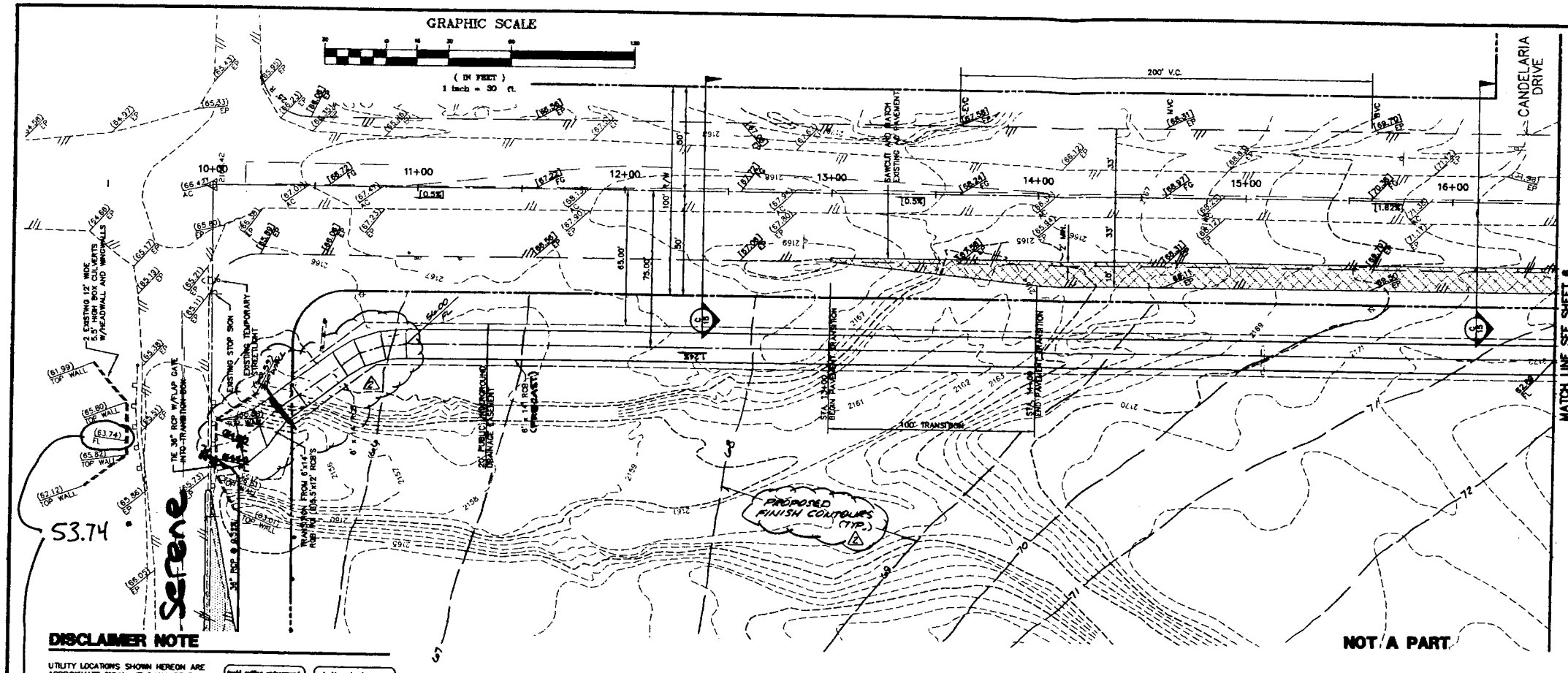
GRADING PLAN
RANCHO SERENE
JULIET PROPERTY COMPANY
CLARK COUNTY NEVADA

SHEET NUMBER 4
OF 15 SHEETS
121-022-963

97112712


GRAPHIC SCALE
(IN FEET)
1 inch = 30 ft.
CANDELARIA DRIVE
MATCH LINE SEE SHEET 6
NOT A PART
PROPOSED FINISH CONTOURS (TYP.)
EXISTING STOP SIGN
EXISTING TEMPORARY STREET LIGHT
TIE 36" RCP INTO HEADWALL
2 EXISTING 12' WIDE CONCRETE BOX CULVERTS WITH WINGWALLS AND CUTOFF WALLS
EXISTING 12" WIDE CONCRETE BOX CULVERTS WITH WINGWALLS
5.5' HIGH BOX CULVERTS WITH WINGWALLS
EXISTING 12" WIDE CONCRETE BOX CULVERTS WITH WINGWALLS
TIE 36" RCP INTO HEADWALL
EXISTING 36" RCP
EXISTING 24" RCP
EXISTING 18" RCP
EXISTING 15" RCP
EXISTING 12" RCP
EXISTING 8" RCP
EXISTING 6" RCP
EXISTING 4" RCP
EXISTING 2" RCP
EXISTING 1" RCP
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EXISTING 0.00000000000000000000000000000001121038771459853" RCP
EXISTING 0.000000000000000000000000000000005605193857299" RCP
EXISTING 0.0000000000000000000000000000000280259692864" RCP
EXISTING 0.00000000000000000000000000000001401298464" RCP
EXISTING 0.000000000000000000000000000000007006492" RCP
EXISTING 0.0000000000000000000000000000000350324" RCP
EXISTING 0.00000000000000000000000000000001751" RCP
EXISTING 0.000000000000000000000000000000008" RCP
EXISTING 0.0000000000000000000000000000000" RCP
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EXISTING" RCP
EXISTING RCP
EXISTING
EXISTING
EXISTING

BACK OF CURB CURVE DATA				
CURVE	RADIUS	DELTA	TANGENT	LENGTH
C1	30.00'	90°00'00"	30.00'	47.12'
C2	30.00'	88°10'45"	29.57'	46.66'

CANDELARIA DRIVE

DELANO DRIVE

MATCH LINE SEE SHEET 5

GRAPHIC SCALE
(IN FEET)
1 inch = 50 ft.

NORTH
1" = 50'

EDGE OF PROPOSED A.C. PER CLARK COUNTY/R.T.C. WIDENING PROJECT

SAWCUT AND MATCH EXISTING A/C PAVEMENT

6' WROUGHT IRON FENCE

PROPOSED FINISH GRADE CONTOURS (TYP.)

NOTE:
"ALL WORK PERFORMED WITHIN THE PUBLIC RIGHT-OF-WAY AND OUTSIDE THE PROJECT BOUNDARY SHALL BE PERFORMED UNDER A SEPARATE ENCROACHMENT PERMIT ISSUED BY THE CONTROLLING AUTHORITY."

"ALL WORK PERFORMED OUTSIDE THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENT HAS BEEN OBTAINED FROM PRE-PROPERTY OWNER."

NOT A PART

PEBBLE RD.
SERENE AVE.
RICHMAR AVE.
SITE
GOBER RD.
MARYLAND PKWY.
TAMARUS ST.
SPENCER ST.
EASTERN AVE.

SECTION 23, TOWNSHIP 22 SOUTH, RANGE 61 EAST

VICINITY MAP
NO SCALE

NOT A PART

20' PUBLIC UNDERGROUND DRAINAGE EASEMENT

6' x 14' RCB @ 14.0% W/FLAP GATE @ BOX CULVERT

15" RCP @ 14.0% W/FLAP GATE @ BOX CULVERT

4' LONG "A" TYPE DI INTO TOP OF BOX INVERT=4.50' INV.=77.31

HEADWALL AND WINGWALLS PER NDOT DWGS. B-201.1, B-201.3 & B-201.5

TYPE 1 CURB INLET

M.H.D.O.S. DWG. # R-8.1.4

STA. 24+56.07 END PAVEMENT TRANSITION

STA. 24+56.07 GRADE BREAK (2182.69 FG)

STA. 24+00 [1.96%]

STA. 23+00 [1.10%]

STA. 22+00 [1.82%]

STA. 21+00 [1.82%]

STA. 20+00 [1.82%]

STA. 19+00 [1.82%]

STA. 18+00 [1.82%]

STA. 17+00 [1.82%]

SAWCUT AND MATCH EXISTING AC PAVEMENT

(36') 1' x 14' RIP-RAP 6"DIA.-12" BURIED 2'

GRADE DITCH TO MATCH SIDEWALK APPROX. 48" FROM HEADWALL

100'

2.4%

(55.0) HG

(84.5) HG

(66.0) HG

(68.0) HG

(82.34) HG

(82.69) HG

(83.04) HG

(83.39) HG

(83.74) HG

(84.09) HG

(84.44) HG

(84.79) HG

(85.14) HG

(85.49) HG

(85.84) HG

(86.19) HG

(86.54) HG

(86.89) HG

(87.24) HG

(87.59) HG

(87.94) HG

(88.29) HG

(88.64) HG

(88.99) HG

Elevations confirmed with As-built survey

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
ACCEPTANCE OF PLANS FOR FILING
BY _____
ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND / OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THE CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN.

NOTE: POWER POLES AND / OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY

NO.	DATE	REVISION
1	4/12/01	change 66" RCP's to 65" arch pipes

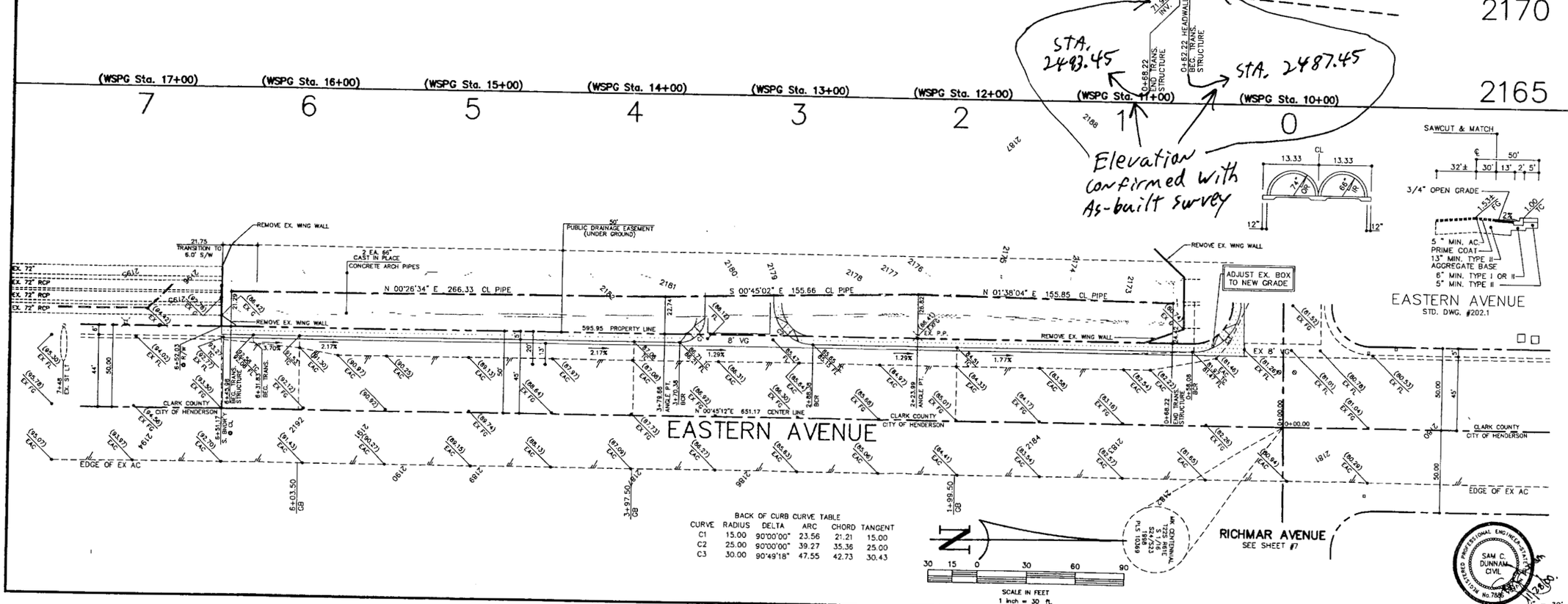
DUNNAM CIVIL ENGINEERS
3471 WEST OQUENDO ROAD
SUITE 101
LAS VEGAS, NV 89118
(702) 798-1088
(702) 367-6945 FAX

RICHMAR PLAZA

STREET PLAN & PROFILE – EASTERN

SHEET 6 OF EIGHT

EX 72" RCP (4 EA.)
84.86
84.73
6+50.58 MATCH EX. 93.27 TC (92.77) EX FL
6+31.83 BCR 92.58 TC 92.08 FL
6+03.50 GB 91.53 TC
3.70%
2.17%
89.28 TC
EX FG @ CL
3+97.50 GB 87.06 TC
3+70.38 BCR 85.71 TC 85.21 FL
2+88.38 BCR 85.65 TC 85.15 FL
1+99.50 GB 84.51 TC
1.29%
1.77%
82.75 TC
0+56.08 BCR/GB 81.97 TC 81.47 FL
(81.03) EX TC (80.53) EX FL
(81.26) EX FL
250 cfs exits the system Through grate.
250 cfs
HYDRAULIC GRADE LINE (q100= 2100 CFS)
TOP OF CURB
FL EX CHANNEL
As-built slope = 2.20%
2 EA. 66" (RADIUS) CAST IN PLACE CONCRETE ARCH PIPES
EX 12' WIDE x 5.5' HIGH RCB (2 EA.)
(71.80) EX INV.
6+51.98 EX. HEADWALL END TRANS. STRUCTURE
6+45.98 BCR END TRANS. STRUCTURE
STA. 3080.21
STA. 3074.21
0+52.22 HEADWALL END TRANS. STRUCTURE
0+68.22 END TRANS. STRUCTURE
STA. 2483.45
STA. 2487.45
Elevation confirmed with As-built survey
2195
2190
2185
2180
2175
2170
2165
(WSPG Sta. 17+00) 7
(WSPG Sta. 16+00) 6
(WSPG Sta. 15+00) 5
(WSPG Sta. 14+00) 4
(WSPG Sta. 13+00) 3
(WSPG Sta. 12+00) 2
(WSPG Sta. 11+00) 1
(WSPG Sta. 10+00) 0



BACK OF CURB CURVE TABLE

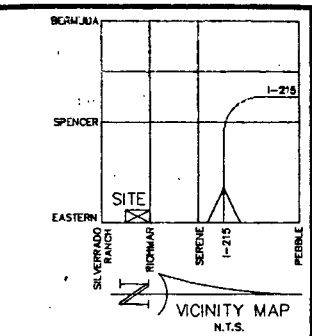
CURVE	RADIUS	DELTA	ARC	CHORD	TANGENT
C1	15.00	90°00'00"	23.56	21.21	15.00
C2	25.00	90°00'00"	39.27	35.36	25.00
C3	30.00	90°49'18"	47.55	42.73	30.43

SCALE IN FEET
1 inch = 30 ft.

00-36039

BACK OF CURB CURVE TABLE

CURVE	RADIUS	DELTA	ARC	CHORD	TANGENT
C1	3.19	90°00'04"	5.00	4.50	3.19
C2	5.50	180°00'00"	17.28	11.00	INFINITE
C3	5.50	180°00'00"	17.28	11.00	INFINITE
C4	6.00	180°00'00"	18.85	12.00	INFINITE
C5	20.00	83°14'37"	29.06	26.57	17.77
C6	3.00	96°45'23"	5.07	4.49	3.38
C7	6.00	180°00'00"	18.85	12.00	INFINITE
C8	20.00	83°14'37"	29.06	26.57	17.77
C9	3.00	96°45'23"	5.07	4.49	3.38
C10	3.00	91°03'40"	4.77	4.28	3.06
C11	30.00	82°01'32"	42.95	39.37	26.09
C12	3.00	96°54'48"	5.07	4.49	3.39
C13	5.00	90°00'00"	7.85	7.07	5.00
C14	5.00	90°00'00"	7.85	7.07	5.00
C15	30.00	87°20'47"	45.73	41.43	28.64
C16	3.00	93°36'13"	4.85	4.34	3.14
C17	28.00	90°00'00"	43.98	39.60	28.00
C18	28.00	80°47'35"	39.48	36.29	23.83
C19	3.00	99°12'25"	5.19	4.57	3.53
C20	10.00	92°53'59"	16.21	14.50	10.52



VICINITY MAP
N.T.S.

NO.	DATE	REVISION
1	6/12/01	

LEGEND

CL	CENTERLINE
R/W	RIGHT-OF-WAY
FG	FINISH GRADE
FL	FLOW LINE
EX	EXISTING
BCR	BEGIN CURVE RETURN
TC	TOP OF CURB
TRW	TOP OF RETAINING WALL
FTG	TOP OF FOOTING
~~	NATURAL GROUND CONTOUR
FF	FINISH FLOOR

BENCHMARK
CLARK CO. B.M. #8C21 2455WHG, RIVET & ALUM. PLATE IN 8'x 12'CONCRETE SLAB W/ WELL CASING 100' E. OF EASTERN AVE., 1125' S. OF SERENE
NAVD '88 ELEV. = 867.051 M = 2166.48'
TOPOGRAPHIC INFORMATION PROVIDED BY WESCO SURVEYS, INC., DATED 10/27/99

REFERENCE
APN 177-23-803-001
ZC-355-98, ZC-UC-1724-2000
UC-1798-2000

LEGAL DESCRIPTION
E1/2 NE1/4 SE1/4 SE1/4
SEC. 23, T.22S., R.61E., M.D.M.,
CLARK COUNTY, NEVADA.

SOILS REPORT
ETEC TESING LABS, INC.
(702) 367-0100
#01286, DATED 1/5/01

BASIS OF BEARING
N 89 55'54" E BEING THE NORTH LINE OF SE1/4 SE1/4 SEC. 23, T.22S., R.61E., PER P.M. FILE 81, PAGE 42.

FLOOD ZONE DESIGNATION
UN-SHADED FLOOD ZONE "X" & SHADED FLOOD ZONE "A"
COMMUNITY MAP NUMBER 32575 C 2590 D
Oct., 17, 1995

CONSTRUCTION NOTES

1. "L" TYPE CURB & GUTTER PER STD DWG #216
2. PLANTER AREA
3. "A" TYPE CURB & GUTTER PER STD DWG # 219
4. CONCRETE WALK PER SOILS REPORT
5. AC PAVING PER SOILS REPORT
   LIGHT 2.5" AC/4" II BASE
   MEDIUM 3.0" AC/4" II BASE
6. 24" VALLEY GUTTER PER DETAIL SHT #8
7. PLANTER PER DETAIL SHT #5
8. RETAINING WALL PER SECTION SHT #6
   (REQUIRES SEPARATE STRUCTURAL CALCS & DETAILS)
9. 6" RISE/RAMP w/ DETECTABLE WARNINGS
10. TRASH ENCLOSURE PER DETAIL SHT #6
11.
12.
13.

56 cfs

250 cfs

Total 306 cfs

slope used in street hydraulic calculation

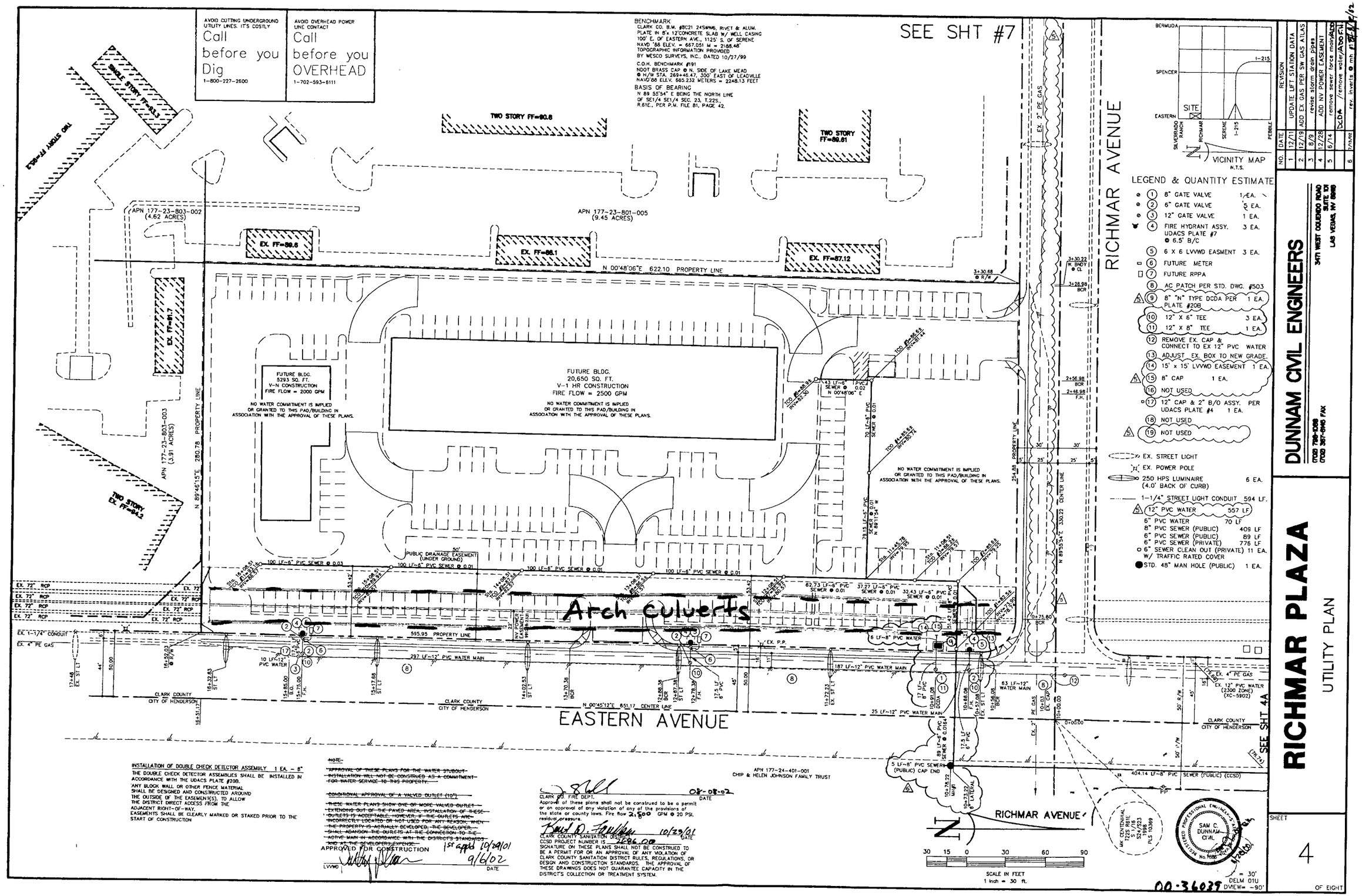
DUNNAM CIVIL ENGINEERS
3471 WEST OQUENDO ROAD
SUITE 32
LAS VEGAS, NV 89118
(702) 750-0389
(702) 367-0440 FAX

RICHMAR PLAZA II

GRADING PLAN

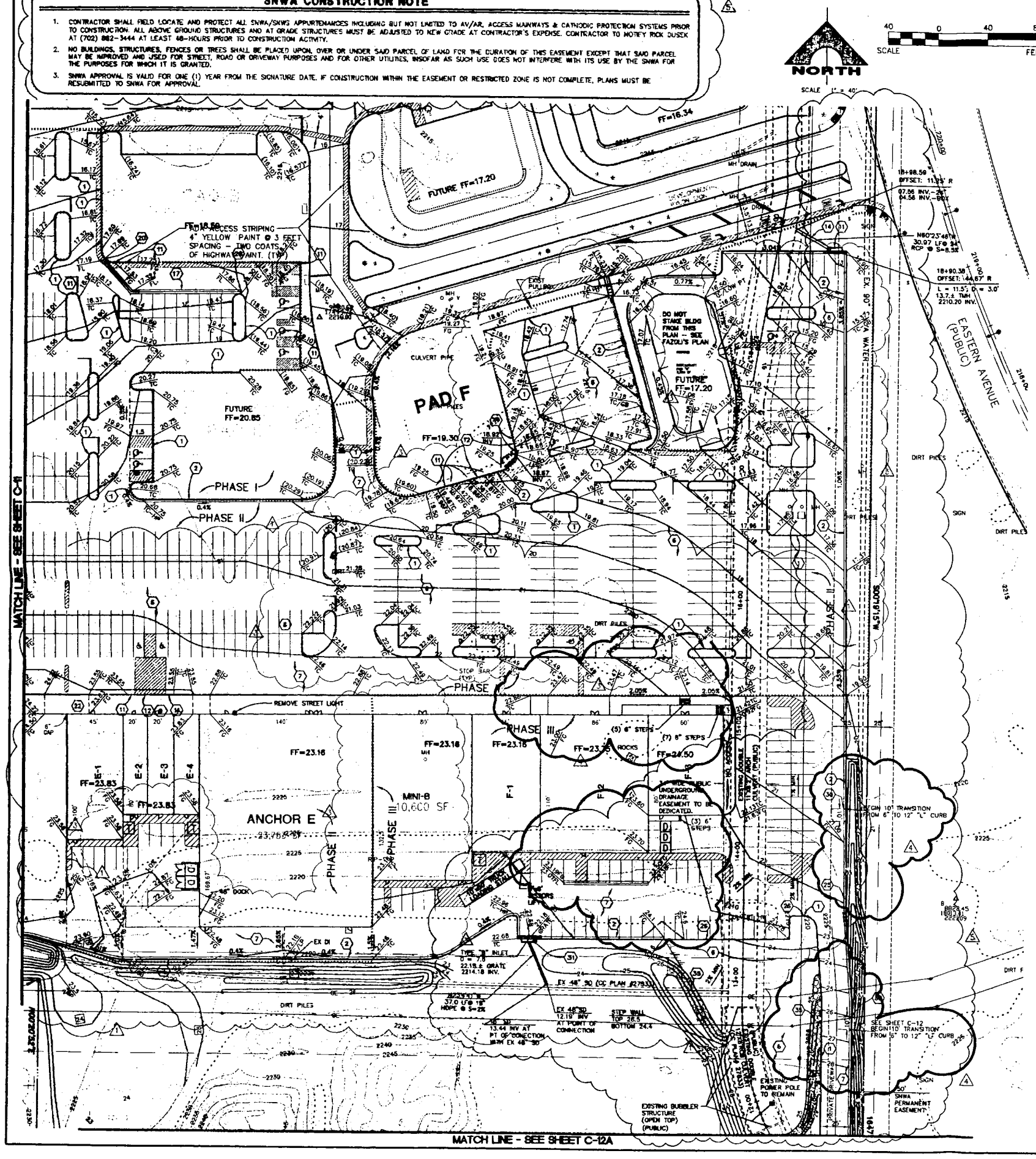
SHEET 3 OF SIX

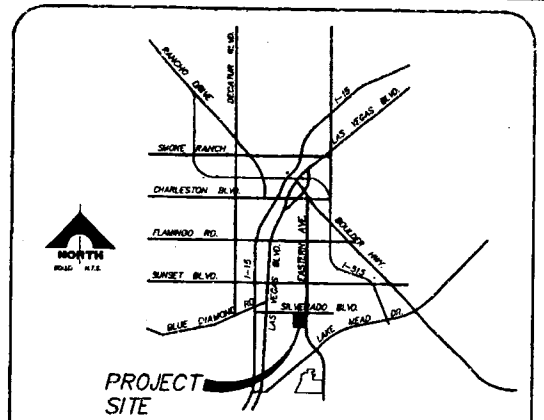
02-3512 UP


AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY
Call before you Dig
1-800-227-2600
AVOID OVERHEAD POWER LINE CONTACT
Call before you OVERHEAD
1-702-593-8111
BENCHMARK
CLARK CO. B.M. #8021 2456W6, RIVET & ALUM. PLATE IN 8'± 12"CONCRETE SLAB W/ WELL CASING 100' E. OF EASTERN AVE., 1125' S. OF SERENE
NAVD '88 ELEV. = 667.051 M = 2188.48'
TOPOGRAPHIC INFORMATION PROVIDED BY WESCO SURVEYS, INC., DATED 10/27/99
C.O.H. BENCHMARK #191
NDOT BRASS CAP ⊙ N. SIDE OF LAKE MEAD ⊙ H/W STA. 269+46.47, 200' EAST OF LEADVILLE
NAVD'88 ELEV. 585.232 METERS = 2248.13 FEET
BASIS OF BEARING
N. 89 55'54" E BEING THE NORTH LINE OF SE1/4 SE1/4 SEC. 23, T.22S., R.61E., PER P.M. FILE 81, PAGE 42.
SEE SHT #7
TWO STORY FF=80.8
TWO STORY FF=80.81
SINGLE STORY FF=83.3
TWO STORY FF=84.7
APN 177-23-803-002 (4.62 ACRES)
APN 177-23-801-005 (9.45 ACRES)
APN 177-23-803-003 (3.91 ACRES)
EX. FF=86.6
EX. FF=86.1
EX. FF=87.12
EX. FF=84.7
TWO STORY EX. FF=85.3
N 00°48'06"E 622.10 PROPERTY LINE
N 89°45'15"E 280.78 PROPERTY LINE
FUTURE BLDG. 5793 SQ. FT. V-N CONSTRUCTION FIRE FLOW = 2000 GPM
NO WATER COMMITMENT IS IMPLIED OR GRANTED TO THIS PAD/BUILDING IN ASSOCIATION WITH THE APPROVAL OF THESE PLANS.
FUTURE BLDG. 20,650 SQ. FT. V-1 HR CONSTRUCTION FIRE FLOW = 2500 GPM
NO WATER COMMITMENT IS IMPLIED OR GRANTED TO THIS PAD/BUILDING IN ASSOCIATION WITH THE APPROVAL OF THESE PLANS.
NO WATER COMMITMENT IS IMPLIED OR GRANTED TO THIS PAD/BUILDING IN ASSOCIATION WITH THE APPROVAL OF THESE PLANS.
50' PUBLIC DRAINAGE EASEMENT (UNDER GROUND)
Arch Culverts
595.95 PROPERTY LINE
EX. 72" RCP
EX. 1-1/4" CONDUIT
EX. 4" PE GAS
297 LF-12" PVC WATER MAIN
187 LF-12" PVC WATER MAIN
25 LF-12" PVC WATER MAIN
63 LF-12" WATER MAIN
8 LF-8" PVC WATER
10 LF-12" PVC WATER
EX. P.P.
EX. 12" PVC WATER (2300 ZONE) (XC-5902)
CLARK COUNTY CITY OF HENDERSON
N 00°45'12"E 651.17 CENTER LINE
EASTERN AVENUE
SEE SHT 4A
APN 177-24-401-001 CHIP & HELEN JOHNSON FAMILY TRUST
404.14 LF-8" PVC SEWER (PUBLIC) (CCSD)
5 LF-8" PVC SEWER (PUBLIC) CAP END
RICHMAR AVENUE
EX. 2" PE GAS
RICHMAR AVENUE
254.88 PROPERTY LINE
30' 25' 25' 30'
CENTER LINE
N 89°53'54"E 330.22
2+56.98 BCR
2+46.98 F.H.
3+30.22 H. BODY ⊙ ℄
3+28.98 BCR
3+30.68 ⊙ R/W
7+75.80 BCR
INSTALLATION OF DOUBLE CHECK DETECTOR ASSEMBLY 1 EA. - 8"
THE DOUBLE CHECK DETECTOR ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH THE UDACS PLATE #208.
ANY BLOCK WALL OR OTHER FENCE MATERIAL SHALL BE DESIGNED AND CONSTRUCTED AROUND THE OUTSIDE OF THE EASEMENT(S), TO ALLOW THE DISTRICT DIRECT ACCESS FROM THE ADJACENT RIGHT-OF-WAY. EASEMENTS SHALL BE CLEARLY MARKED OR STAKED PRIOR TO THE START OF CONSTRUCTION
NOTE:
APPROVAL OF THESE PLANS FOR THE WATER STUBOUT INSTALLATION WILL NOT BE CONSTRUED AS A COMMITMENT FOR WATER SERVICE TO THIS PROPERTY.
CONDITIONAL APPROVAL OF A VALVED OUTLET (10")
THESE WATER PLANS SHOW ONE OR MORE VALVED OUTLET EXTENDING OUT OF THE PAVED AREA. INSTALLATION OF THESE OUTLETS IS ACCEPTABLE, HOWEVER IF THE OUTLETS ARE INCORRECTLY LOCATED OR NOT USED FOR ANY REASON, WHEN THE PROPERTY IS ACTUALLY DEVELOPED, THE DEVELOPER SHALL ABANDON THE OUTLETS AT THE CONNECTION TO THE ACTIVE MAIN IN ACCORDANCE WITH THE DISTRICT'S STANDARDS AND AT THE DEVELOPER'S EXPENSE.
APPROVED FOR CONSTRUCTION
1st appls 10/29/01
9/6/02
LVVWD DATE
CLARK CO. FIRE DEPT. 08-08-02 DATE
Approval of these plans shall not be construed to be a permit or an approval of any violation of any of the provisions of the state or county laws. Fire flow 2500 GPM @ 20 PSI. residual pressure.
CLARK COUNTY SANITATION DISTRICT 10/22/01 DATE
CCSD PROJECT NUMBER IS 2496.00
SIGNATURE ON THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF CLARK COUNTY SANITATION DISTRICT RULES, REGULATIONS, OR DESIGN AND CONSTRUCTION STANDARDS. THE APPROVAL OF THESE DRAWINGS DOES NOT GUARANTEE CAPACITY IN THE DISTRICT'S COLLECTION OR TREATMENT SYSTEM.
SCALE IN FEET
1 inch = 30 ft.
BERMUDA
SPENCER
EASTERN
SITE
I-215
SILVERADO RANCH
RICHMAR
SERENE
PEBBLE
VICINITY MAP
N.T.S.
LEGEND & QUANTITY ESTIMATE
1 8" GATE VALVE 1 EA.
2 6" GATE VALVE 0 EA.
3 12" GATE VALVE 1 EA.
4 FIRE HYDRANT ASSY. UDACS PLATE #7 ⊙ 6.5' B/C 3 EA.
5 6 X 6 LVVWD EASMENT 3 EA.
6 FUTURE METER
7 FUTURE RPPA
8 AC PATCH PER STD. DWG. #503
9 8" "N" TYPE DCDA PER PLATE #208 1 EA.
10 12" X 6" TEE 3 EA.
11 12" X 8" TEE 1 EA.
12 REMOVE EX. CAP & CONNECT TO EX 12" PVC WATER
13 ADJUST EX. BOX TO NEW GRADE.
14 15' x 15' LVVWD EASEMENT 1 EA.
15 8" CAP 1 EA.
16 NOT USED
17 12" CAP & 2" B/O ASSY. PER UDACS PLATE #4 1 EA.
18 NOT USED
19 NOT USED
EX. STREET LIGHT
EX. POWER POLE
250 HPS LUMINAIRE (4.0' BACK OF CURB) 6 EA.
1-1/4" STREET LIGHT CONDUIT 594 LF.
12" PVC WATER 557 LF
6" PVC WATER 70 LF
8" PVC SEWER (PUBLIC) 409 LF
6" PVC SEWER (PUBLIC) 89 LF
6" PVC SEWER (PRIVATE) 776 LF
6" SEWER CLEAN OUT (PRIVATE) 11 EA. W/ TRAFFIC RATED COVER
STD. 48" MAN HOLE (PUBLIC) 1 EA.
NO. DATE REVISION
1 12/11 UPDATE LIFT STATION DATA
2 12/19 ADD EX GAS PER SW GAS ATLAS
3 8/9 revise storm drain pipes
4 12/28 ADD NV POWER EASEMENT
5 6/14 remove sewer force main/ADD DA /remove water/ADD FH
6 7/15/02 rev. inverts ⊙ mh #1
DUNNAM CIVIL ENGINEERS
3471 WEST CULEBRO ROAD SUITE 101 LAS VEGAS, NV 89102
(702) 798-1088
(702) 387-6945 FAX
RICHMAR PLAZA
UTILITY PLAN
SAM C. DUNNAM CIVIL
No. 7680
SHEET 4 OF EIGHT
00-36039
DELM 01U
DVIEW= -90°

SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL FIELD LOCATE AND PROTECT ALL SNWA/SNWG APPURTENANCES INCLUDING BUT NOT LIMITED TO AV/AR, ACCESS MANWAYS & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY RICK DUSEK AT (702) 862-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE IMPROVED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, INSOFAR AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.





VICINITY MAP

LEGEND

DG = DESIGN GRADE	(60.5) TC EXIST. ELEVATION
W = WATER	60.5 TC PROPOSED ELEVATION
S = SEWER	EXIST. SPOT ELEVATION
G = GAS	SUBDIVISION BOUNDARY
SD = STORM DRAIN	EASEMENT LINE
SL = STREET LIGHT	FUTURE LINE
SSMH = SEWER MANHOLE	STREET CENTERLINE
SDMH = STORM DRAIN MANHOLE	
CLV = CITY OF LAS VEGAS	
LVVWD = LAS VEGAS VALLEY WATER DISTRICT	CONCRETE CURB & GUTTER
EX = EXISTING	
FL = FLOW LINE	EXISTING IMPROVEMENTS
HP = HIGH POINT	
R/W = RIGHT-OF-WAY	
TC = TOP OF BACK OF CURB	
FG = FINISHED GRADE	EXISTING GROUND
BCR = BEGIN CURB RETURN	(2612) CONTOUR LINES
DS = DOWN SPOUT	
CCASD = CLARK COUNTY AREA STANDARD DRAWING	34 FINISH GROUND CONTOUR LINE
TG = TOP OF GRATE	DRAINAGE FLOW LINE
BW = BACK OF WALK	BLOCK WALL
FS = FINISH SURFACE	EXISTING BLOCK WALL
NG = NATURAL GRADE	NO PARKING - RED CURB
FF = FINISH FLOOR	
GB = GRADE BREAK	
CCPWSD = CLARK COUNTY PUBLIC WORKS STANDARD DRAWING	EXISTING ROCK WALL
FUT = FUTURE	
EP = EDGE OF PAVEMENT	VISION RESTRICTION AREA
TMH = TOP OF MANHOLE	

GRADING NOTES

(THESE NOTES APPLY ONLY TO ON-SITE PRIVATE FACILITIES)

1. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ALL DEBRIS AS ACCEPTABLE TO THE OWNER AND ENGINEER.
2. IF CONTRACTOR DOES NOT ACCEPT EXISTING TOPOGRAPHY AS SHOWN ON THE PLANS, WITHOUT EXCEPTION, HE SHALL HAVE MADE, AT HIS OWN EXPENSE, A TOPOGRAPHIC SURVEY AND SUBMIT IT TO THE OWNER FOR REVIEW.
3. CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDINGS.
4. PRECAST STRUCTURES MAY BE USED AT THE CONTRACTOR'S OPTION.
5. IN ALL AREAS WHERE NEW CURB AND GUTTER ARE INSTALLED, REMOVE ALL OLD CURB AND GUTTER AND SAW CUT A STRAIGHT EDGE ALONG ASPHALT.
6. THE EARTHWORK FOR ALL BUILDING FOUNDATIONS AND SLABS SHALL BE IN ACCORDANCE WITH ARCHITECTURAL PLANS AND SPECIFICATIONS.
7. CONTRACTOR IS RESPONSIBLE FOR REPAIRS OF DAMAGE TO ANY EXISTING IMPROVEMENTS DURING CONSTRUCTION, SUCH AS BUT NOT LIMITED TO, DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURBS, ETC. REPAIRS SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS.
8. SPOILS FROM FOOTINGS IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR IS TO USE THE SOIL FROM ON SITE OR REMOVE IT FROM SITE.
9. EARTHWORK SHALL BE ON AN UNCLASSIFIED BASIS.
10. CONTRACTOR SHALL COMPLY WITH N.P.D.E.S. REGULATIONS AND FILE A NOTICE OF INTENT PERMIT PRIOR TO COMMENCEMENT. CONTRACTOR MUST SUBMIT A NOTICE OF TERMINATION PERMIT UPON FINAL STABILIZATION.
11. ANY FILL USED TO INCREASE THE ELEVATION OF THE FLOOR SLAB OR ANY FILL TO BE USED AS BACKFILL SHOULD BE CLEAN, GRANULAR MATERIAL PRIOR TO THE USE OF ANY GRANULAR FILL, GRADATION ANALYSIS SHOULD BE PERFORMED ON REPRESENTATIVE SAMPLES OF THE FILL MATERIAL TO DETERMINE WHETHER THE MATERIAL IS SUITABLE AS FILL. COMPACTED FILL SHOULD BE PLACED IN LAYERS OF NOT MORE THAN EIGHT INCHES IN THICKNESS, AT A MOISTURE CONTENT WITHIN THREE PERCENT OPTIMUM, AND COMPACTED TO A MINIMUM DENSITY OF 95 PERCENT IN PAVING AREAS AND 90 PERCENT IN BUILDING AREAS, OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR METHOD, ASTM D-1557.
12. TOPOGRAPHIC BOUNDARY SURVEY, PROPERTY LINES, LEGAL DESCRIPTION, EXISTING UTILITIES, SITE TOPOGRAPHY WITH SPOT ELEVATIONS, OUTSTANDING PHYSICAL FEATURES AND EXISTING STRUCTURE LOCATIONS WAS PROVIDED BY THE FOLLOWING COMPANY:
13. G.C. WALLACE WILL NOT BE HELD RESPONSIBLE FOR THE ACCURACY OF THE SURVEY OR FOR DESIGN ERRORS OR OMISSIONS RESULTING FROM SURVEY INACCURACIES.
14. ANY DEVIATION FROM THESE PLANS MAY CAUSE THE WORK TO BE UNACCEPTABLE.
15. SITE CONTRACTOR SHALL SUPPLY AS-BUILT PLANS INDICATING ALL CHANGES AND DEVIATIONS.

GRADING NOTES

1. CONSTRUCT "A" TYPE CURB PER DETAIL 4 SHEET C-15.
2. CONSTRUCT "L" TYPE CURB PER USDCCA NO. 218.
3. INSTALL BOLLARD AS PER DETAIL 6, SHEET C-15
4. CONSTRUCT CONCRETE CHANNEL PER DETAIL 8, SHEET C-15.
5. CONSTRUCT THICKENED PAVEMENT EDGE
6. CONSTRUCT 3" AC PAVING OVER 4" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-28. SEE SOILS REPORT FOR MORE INFORMATION.
7. CONSTRUCT 3" AC PAVING OVER 6" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-30. SEE SOILS REPORT FOR MORE INFORMATION.
8. INSTALL HANDICAP SIGNAGE/RAMPS AND PARKING LOT STRIPING PER ARCHITECTURAL PLANS.
9. CONSTRUCT SIDEWALK ACCESS PER A.D.A./U.B.C. REQ. SEE ARCH. PLANS FOR DETAILS.
10. INSTALL SPEED BUMP
11. 0" TO 6" CURB TRANSITION
12. 6" CURB FLUSH WITH PAVEMENT
13. CONSTRUCT MODIFIED TYPE "C" DROP INLET. SEE DETAIL 10, SHEET C-15.
14. INSTALL 24" RCP STORMDRAIN PIPE.
15. CONSTRUCT CURB OPENING AND RIP-RAP CHANNEL PER DETAIL 1, SHEET C-14.
16. CONSTRUCT CHANNEL PER DETAIL 8, SHEET C-15.
17. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAILS 7 SHEET C-15
18. CONSTRUCT RETAINING WALL AS PER COUNTY STANDARD DETAIL AND ARCHITECTURAL PLANS.
19. CONSTRUCT L-C/URB TRANSITION AS PER DETAIL 8, SHEET C-15
20. CONSTRUCT VALLEY GUTTER TRANSITION AS PER DETAIL 9, SHEET C-15
21. MATCH EXISTING
22. CONSTRUCT CONCRETE WALK AS PER DETAIL 2, SHEET C-15 AND THE ARCHITECTURAL PLANS.
23. INSTALL 6" PVC DRAIN LINE - CAP 5' FROM BUILDING SUMP PUMP REQUIRED - SEE ARCH PLANS FOR DETAILS
24. CONSTRUCT COMMERCIAL DRIVEWAY PER USDCCA DWG# 222
25. CONSTRUCT MODIFIED "L" (12") CURB PER DETAIL SHT C-12A
26. CONSTRUCT TRANSITION CURB PER USDCCA DWG# 220 WITH 6" BREAKS EVERY 5'
27. CONSTRUCT DEPRESSED CURB FOR FUTURE RAMP PER USDCCA DWG# 235, CASE 1
28. MATCH EXISTING AC PAVEMENT SECTION IN KIND
29. SAWCUT AND MATCH
30. 6"-30-12" CURB TRANSITION
31. CONSTRUCT TYPE "B" DROP INLET PER USDCCA DWG #416
32. CONSTRUCT MODIFIED TYPE "B" DROP INLET PER DETAIL 1 ON SHEET C-13
33. CONSTRUCT 8' CROSS GUTTER PER USDCCA DWG. #228
34. REMOVE EXISTING IMPROVEMENTS THAT INTERFERE WITH CONSTRUCTION OF DRIVEWAY ENTRANCE
35. INSTALL RIP-RAP 6min 12" MIN., 24" THICK

NOTE TO CONTRACTOR:
ALL DIMENSIONS GIVEN ARE TO BACK OF CURB.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 26, TOWNSHIP 22 SOUTH, RANGE 61 EAST, M.D.M., SHOWN AS SOUTH 89°35'14" WEST ON THE AMENDED RECORD OF SURVEY ON FILE IN FILE 86, PAGE 73 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

CLARK COUNTY BENCHMARK "0C21 25W5"
BRASS CAP STATE HIGHWAY MARKER, STAMPED "STA N217+83.79 POT, 12/21/56", LOCATED 250 FT EAST OF P.I. OF EASTERN AVE AND LAKE MEAD DR. AND NORTH SIDE OF SR 146.
CLARK COUNTY VERTICAL CONTROL, SHEET 22-61 SE A, DATED 1962.

NAVD88 ELEVATION = 690.680 METERS
NAVD88 ELEVATION = 2266.006 FEET

Call before you Dig. 1-800-227-2600

YOU DON'T SEE OVERHEAD LINES. CALL BEFORE YOU DIG. 1-702-593-6111

WILLDAN SERVING PUBLIC AGENCIES

RECEIVED FEB 05 2001 LAS VEGAS

NOTE

THE SPECIFIC RETAINING WALLS ARE A NON-STANDARD CLARK COUNTY RETAINING WALL DESIGN. STRUCTURAL CALCS. & SOILS REPORT SHALL BE SUBMITTED TO CLARK COUNTY BUILDING DEPT. FOR REVIEW AND APPROVAL PRIOR TO WALL CONSTRUCTION PERMIT ISSUANCE.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Acceptance of plans for filing

By _____ Date 1/10/01

Acceptance of these plans for filing shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of the State or County laws and/or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted herein.

NOTE: Power poles and/or other existing facilities not in proper location based on proposed improvements shown hereon will be relocated at no expense to Clark County.

NO.	DATE	DESCRIPTION	APP
1	2/5/01	CHANGES TO GRADING & ADDED SNWA EASEMENT	
2	2/7/01	ADDED PHASE 3 BUILDING AND GRADE	
3	3/2/01	ADDED PLACES, ADDED SIDEWALK, AND RELOCATED WATER SERVICE	
4	3/7/01	REVISED GRADES AT ELEV OF A-1 AND THE ADDITION OF 16" RCP STORM DRAIN PHASE 1	
5	3/21/01	CHANGES TO BUILDING FINISH FLOOR	

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITION:
PLOT DATE: 03-09-01
PLOT TIME: 13:38:38

ISSUE DATE

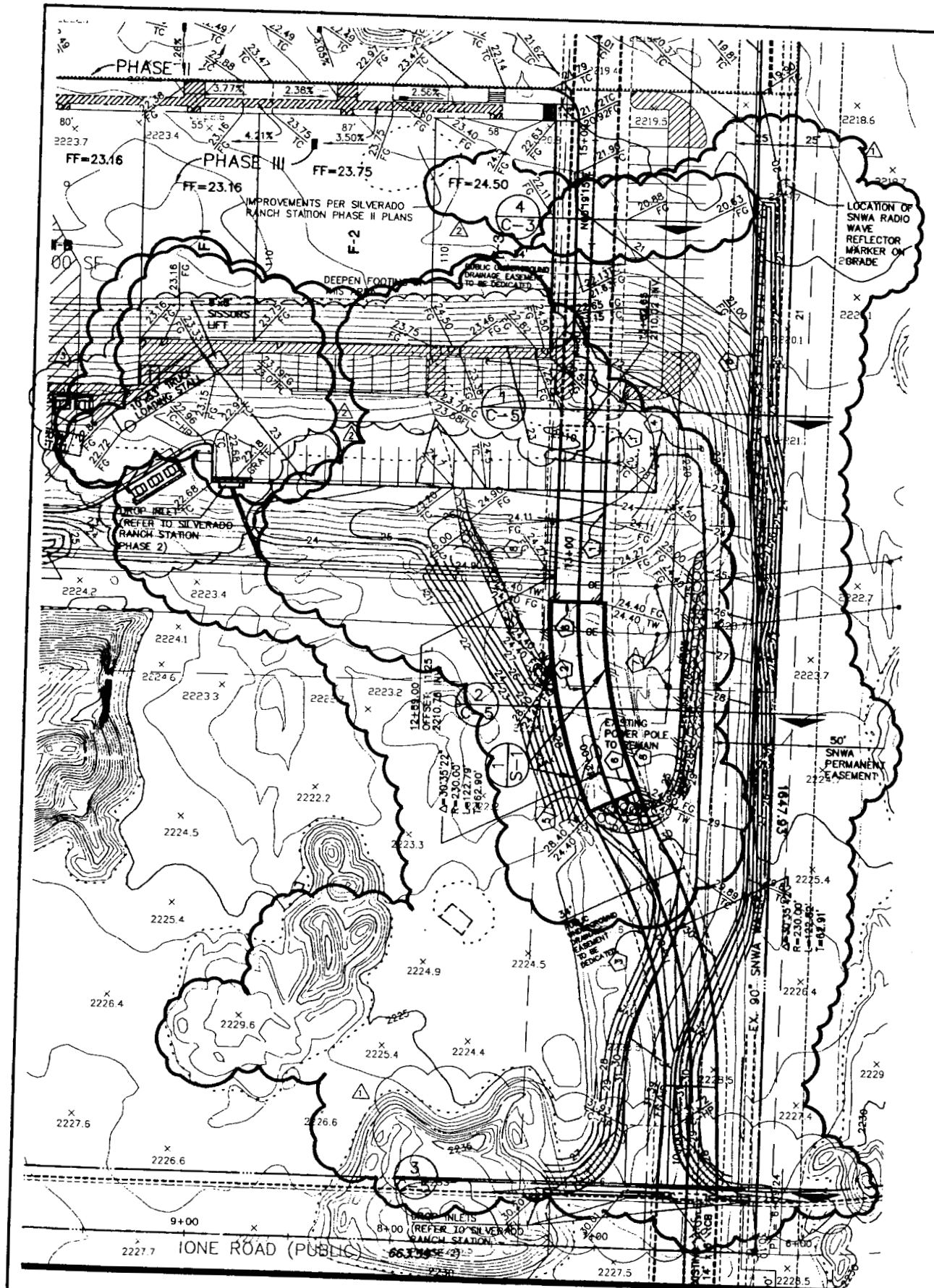
DATE: 1/10/01

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

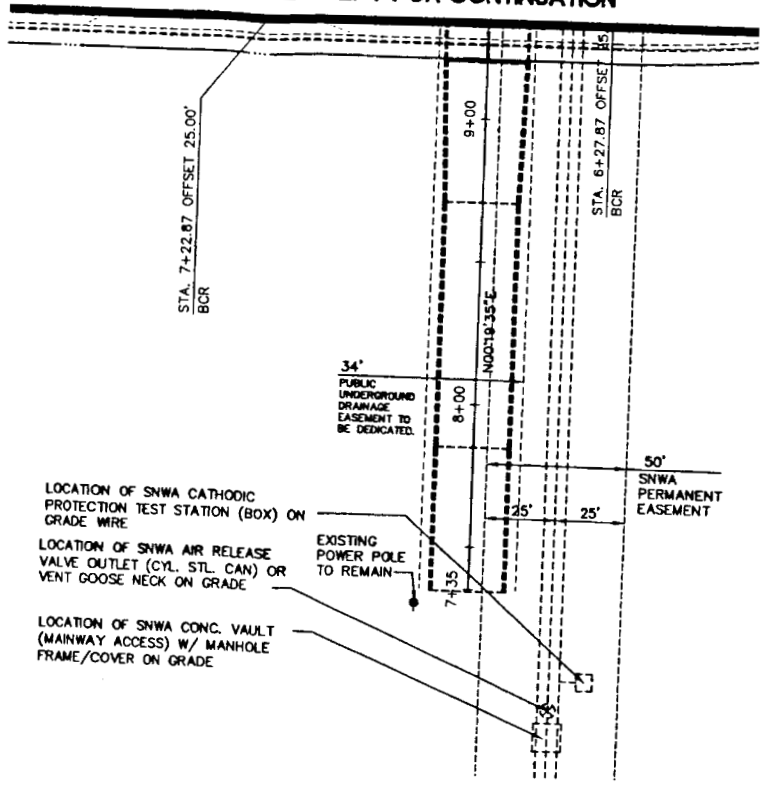
A/G BAKER REAL ESTATE, LLC.
SILVERADO RANCH STATION - PHASE 2
GRADING PLAN II

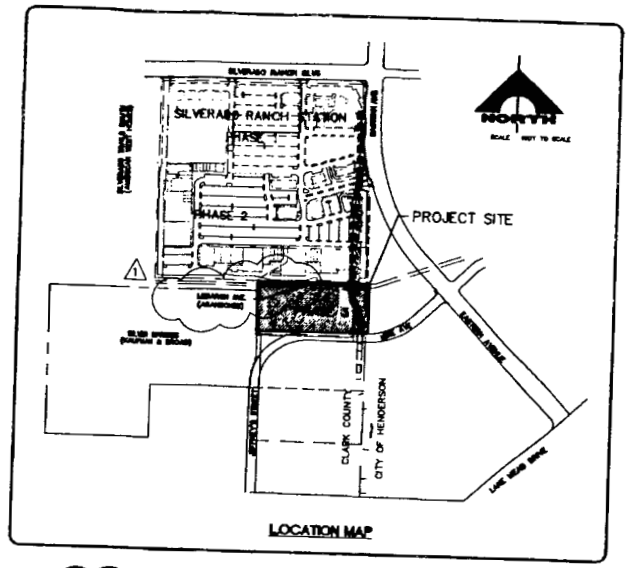
SHEET
C-12
12 OF 18 SHTS

99-35103



CALL BEFORE YOU DIG OVERHEAD
AVOID HITTING OVERHEAD POWER LINES IT'S COST.
1-702-593-6111
Call before you Dig.
1-800-227-2600

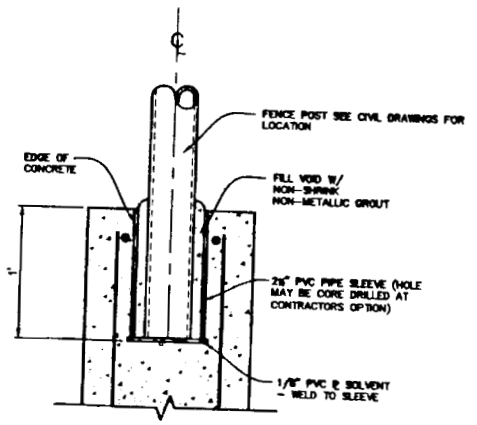




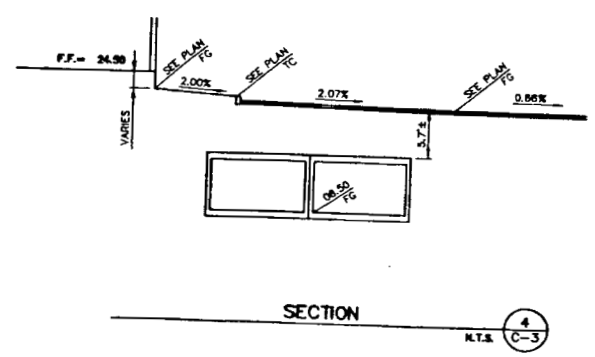
SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL LOCATE AND PROTECT ALL SNWA/SNWS APPURTENANCES INCLUDING BUT NOT LIMITED TO AV/AR, ACCESS MAINWAYS & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY RICK DUSEK AT (702) 862-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE IMPROVED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, INSOFAR AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

SNWA DATE



POST EMBEDMENT DETAIL (2 / C-3) N.T.S.



CONSTRUCTION NOTES:

1. CONSTRUCT 85.24 L.F. OF 11' X 6'2" DOUBLE ELLIPTICAL ARCH BOX CULVERTS FROM THE BUBBLER STRUCTURE TO THE EXISTING DOUBLE 11'X 6'-2" ELLIPTICAL ARCH BOX CULVERTS. SEE CON-ARCH PLANS.
2. CONSTRUCT 100 L.F. OF BUBBLER STRUCTURE. SEE STRUCTURAL PLANS FOR DETAILS.
3. CONSTRUCT 145.61 L.F. OF STANDARD NEVADA DEPT. OF TRANSPORTATION (NDOT) DOUBLE 12' X 8' REINFORCED CONCRETE BOX CULVERT ACCORDING TO NDOT STD DWG #M-20.1.3 (DETAIL 6, SHT C-3)
4. CONSTRUCT AC PAVEMENT PER SECTION 3, SHEET C-5.
5. FLOOD WALL OF BUBBLER TO EXTEND TO FINISH GRADE AT 26.4. TRANSITION WALL ON SOUTH FROM 26.4 TO 24.4 ON EAST. INSTALL 8' CHAIN LINK FENCE ON TOP OF WALL, ON WEST & SOUTH SIDES.
6. EAST SIDE OF BUBBLER TO BE FLAT AT ELEVATION 24.4 WITH METAL PICKET FENCE, 8' HIGH AT TOP OF WALL. 6" OPENING BETWEEN FENCE SLATS AND GATE WITH LOCK AT LADDER/STEPS.
7. PROTECT POWER POLES IN PLACE. SEE DETAIL 4, SHEET C-5.
8. INSTALL RIP-RAP, d50=12", 24" THICK, OVER 6" TYPE B BASE.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Acceptance of plans for filing

By: [signature] 4/16/01

Acceptance of these plans for filing shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of the State or County laws and/or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted herein.

NOTE: Power poles and/or other existing facilities not in proper location based on proposed improvements shown hereon will be relocated at no expense to Clark County.

REGISTERED PROFESSIONAL ENGINEER - STATE OF NEVADA - No. 6054 - 4/13/01

BY	DESCRIPTION	DATE
BKR	ADDED SNWA EASEMENT, GRADING, & SECTION	3-26-01
BKR	ADDED SNWA EASEMENT, CONSTRUCTION NOTES, & LOCATION MAP	4-12-01

DESIGN: BKR
DRAWN: BKR
CHECK:
ISSUE DATE:
PLOT DATE: 04-12-01
PLOT TIME: 11:28:27

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
2030 W. SUNSET ROAD, SUITE 1, HENDERSON, NEVADA 89014
TELEPHONE: (702) 895-0028 • FAX: (702) 564-2288

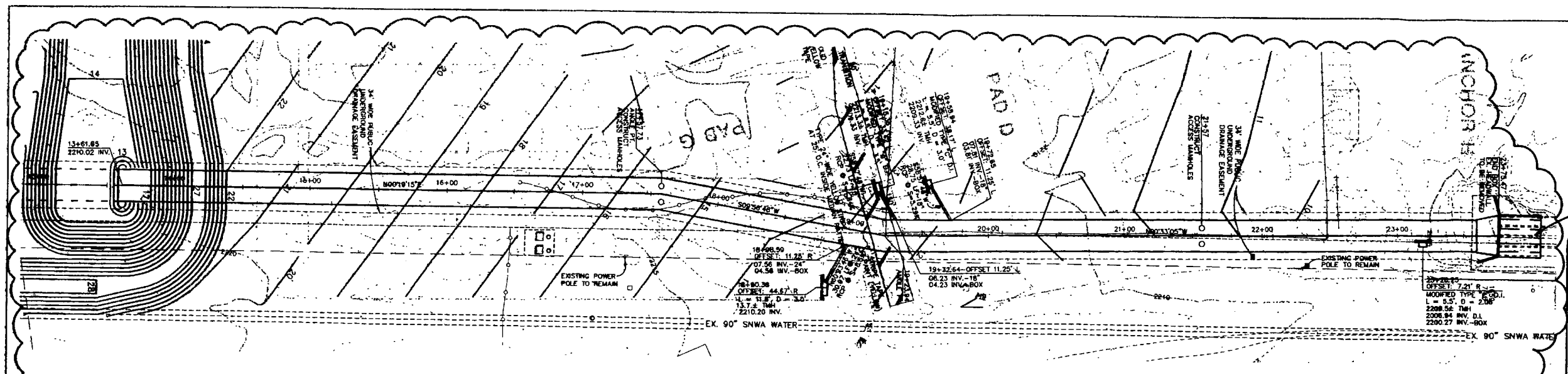
AIG BAKER REAL ESTATE, L.L.C.

SILVERADO RANCH STATION - PH. II + CULVERT EXTENSION

GRADING PLAN

SHEET C-3
3 OF 12 SHTS

01-1517

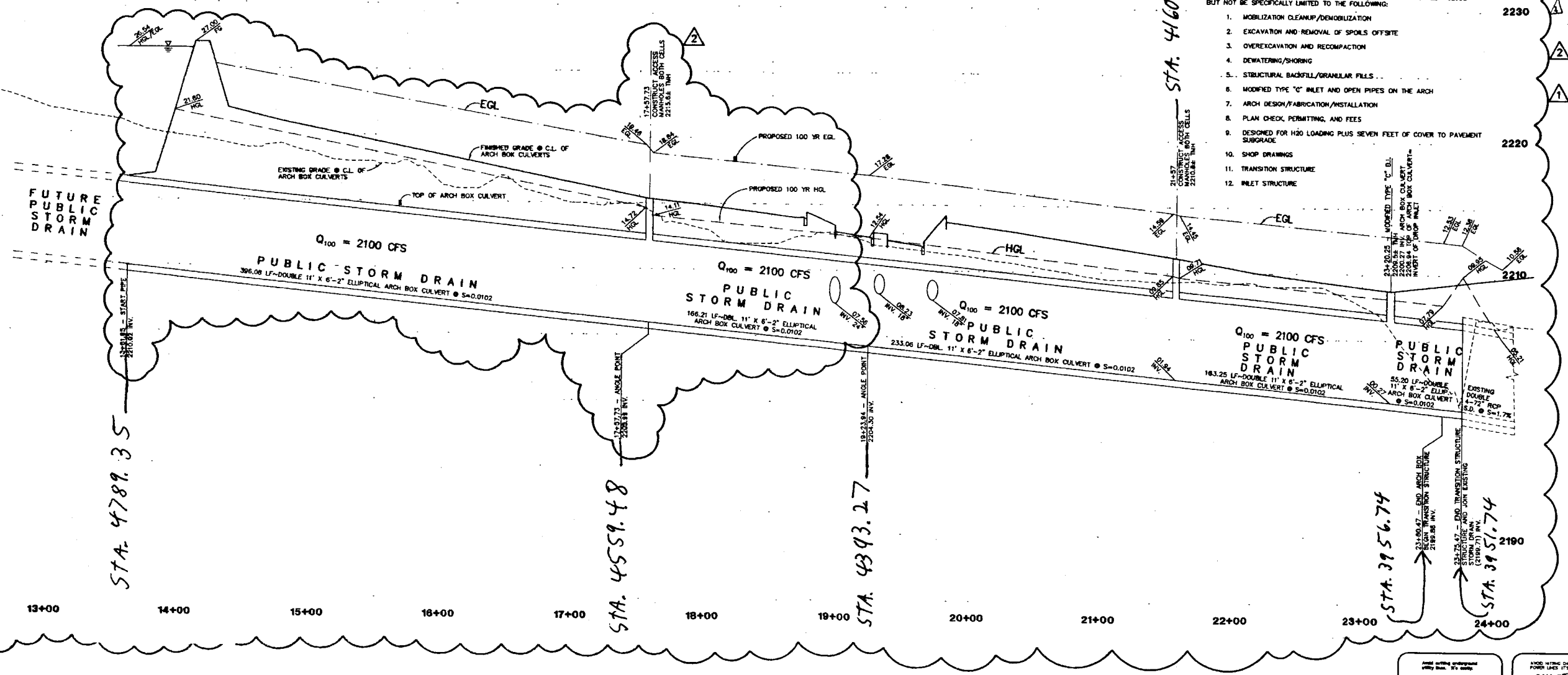


invert 2201.83
(from as-built survey)

STA. 4160.21

PLAN & PROFILE

HOR. : 1" = 40'
VERT. : 1" = 4'



DOUBLE 11' X 6'-2" ELLIPTICAL ARCH TOP BOX CULVERT

NOTICE TO BIDDERS

THE BIDDER SHALL INCLUDE A COMPLETE BID FOR THE TURNKEY - DESIGN AND CONSTRUCTION OF DOUBLE 11'38"-2" ARCH TOP BOX CULVERT TO THE ALIGNMENT, GRADES, AND LINES AS NOTED ON THESE PLANS, INCLUDING TRANSITION STRUCTURE AND INLETS. ALL WORK SHALL BE IN ACCORDANCE WITH "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION, OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (LATEST EDITION). THE WORK SHALL INCLUDE BUT NOT BE SPECIFICALLY LIMITED TO THE FOLLOWING:

1. MOBILIZATION CLEANUP/DEMOBILIZATION
2. EXCAVATION AND REMOVAL OF SPOILS OFFSITE
3. OVEREXCAVATION AND RECOMPACTION
4. DEWATERING/SHORING
5. STRUCTURAL BACKFILL/GRANULAR FILLS
6. MODIFIED TYPE "C" INLET AND OPEN PIPES ON THE ARCH
7. ARCH DESIGN/FABRICATION/INSTALLATION
8. PLAN CHECK, PERMITTING, AND FEES
9. DESIGNED FOR H20 LOADING PLUS SEVEN FEET OF COVER TO PAVEMENT SUBGRADE
10. SHOP DRAWINGS
11. TRANSITION STRUCTURE
12. INLET STRUCTURE

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Acceptance of plans for filing

By Dewey V. Blue 5-28-99

Acceptance of these plans for filing shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of the State or County laws and/or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted herein

NOTE: Power poles and/or other existing facilities not in proper location based on proposed improvements shown hereon will be relocated at no expense to Clark County.

Call before you Dig. 1-800-227-2600

CALL BEFORE YOU DO OVERHEAD 1-702-593-6111

ROY D. CLARK — NEVADA — PROFESSIONAL ENGINEER — NO. 6554 — DATE: 5/28/99

DESIGN: GDN
DRAWN: RDC
CHECK:
ISSUE DATE:
ISSUE EDITOR
PLOT DATE: 05-26-99
PLOT TIME: 09:44:40

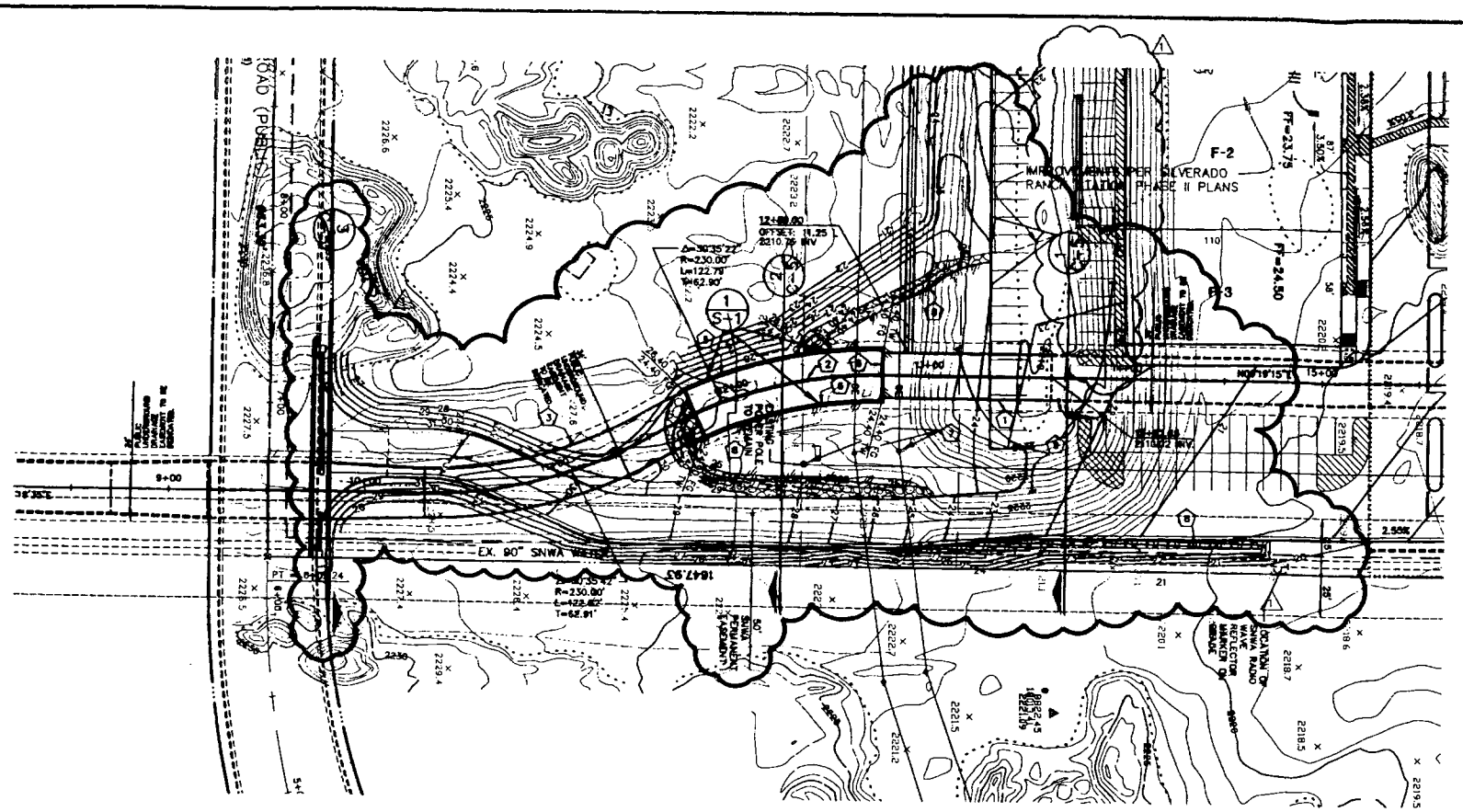
NO.	DATE	DESCRIPTION
1	12/01/98	ADDED 72" RCP'S, CHANGED SD SIZE FROM SINGLE 30"x8" ARCH BOX TO TWO 11'x6'-2" ARCH BOX
2	12/01/98	MOVED BOX CULVERT, EXTENDED SD, AND CHANGED SD SIZE FROM SINGLE 30"x8" ARCH BOX TO TWO 11'x6'-2" ARCH BOX

ISSUE DATE: 04/02/98

G.C. WALLACE, INC.
Engineering/Architecture
2030 HOWARD AVENUE, LAS VEGAS, NEVADA 89102
TELEPHONE (702) 364-1044 FAX (702) 365-8979
F:\365-1771\DWGS\engrg\Ass-AY\ARCH-0927.dwg

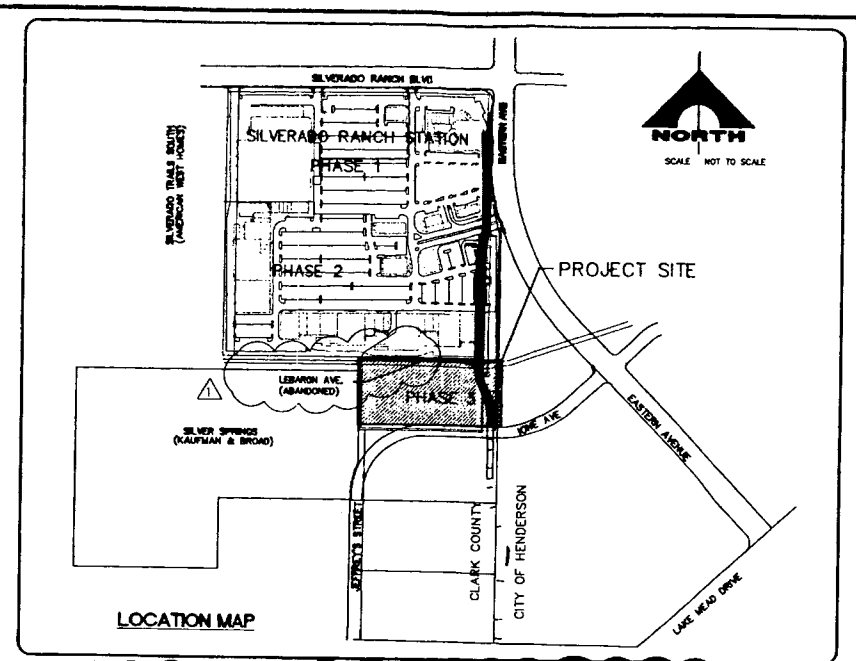
AIG BAKER REAL ESTATE, L.L.C.
SILVERADO RANCH STATION - PHASE I
STORM DRAIN PLAN I
DOUBLE 11' X 6'-2" ELLIPTICAL ARCH BOX CULVERT

SHEET
C-27
27 OF 35 SHTS



PLAN AND PROFILE
SCALE
HORIZ. 1" = 40'
VERT. 1" = 4'

see Transition section following sheets



LOCATION MAP

SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL LOCATE AND PROTECT ALL SNWA/SNWS APPURTENANCES INCLUDING BUT NOT LIMITED TO AV/AR, ACCESS MANWAYS & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE AT CONTRACTOR'S EXPENSE. CONTRACTOR TO NOTIFY RICK DUSEK AT (702) 862-3444 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR TREES SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE IMPROVED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER UTILITIES, INSOFAR AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

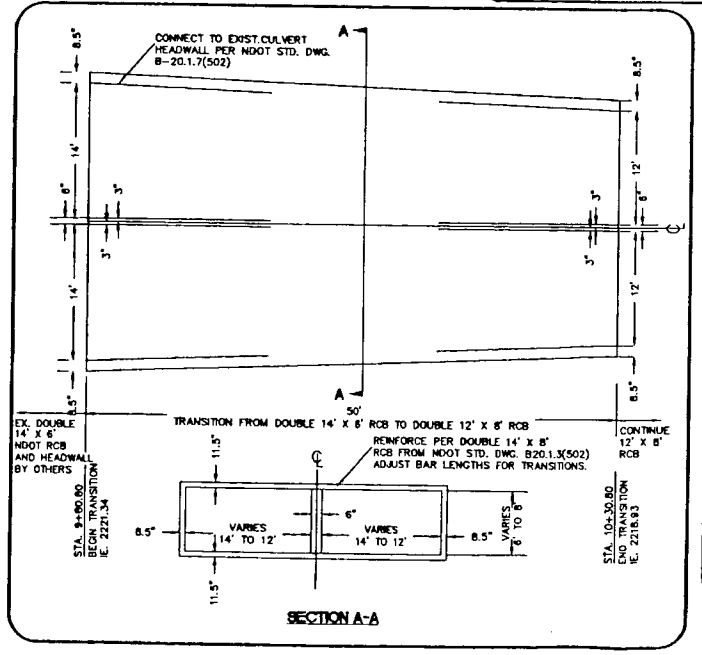
SNWA _____ DATE _____

NORTH
SCALE 1"=40'

GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.

CONSTRUCTION NOTES:

1. CONSTRUCT 85.24 L.F. OF 11' X 6'2" DOUBLE ELLIPTICAL ARCH BOX CULVERTS FROM THE BUBBLER STRUCTURE TO THE EXISTING DOUBLE 11'X 6'-2" ELLIPTICAL ARCH BOX CULVERTS. SEE CON-ARCH PLANS.
2. CONSTRUCT 100 L.F. OF BUBBLER STRUCTURE. SEE STRUCTURAL PLAN FOR DETAILS.
3. CONSTRUCT 145.61 L.F. OF STANDARD NEVADA DEPT. OF TRANSPORTATION (NDOT) DOUBLE 12' X 8' REINFORCED CONCRETE BOX CULVERT ACCORDING TO NDOT STD DWG #8-20.1.3 (DETAIL 8, SHT C-5)
4. SEE DETAIL A-A, THIS SHEET.
5. FLOOD WALL OF BUBBLER TO EXTEND TO FINISH GRADE AT 28.4.TRANSITION WALL ON SOUTH FROM 28.4 TO 24.4 ON EAST. INSTALL 6' CHAIN LINK FENCE ON TOP OF WALL ON WEST & SOUTH SIDES..
6. EAST SIDE OF BUBBLER TO BE FLAT AT ELEVATION 24.4 WITH METAL PICKET FENCE, 6' HIGH AT TOP OF WALL. 6' OPENING BETWEEN FENCE SLATS AND GATE WITH LOCK AT LADDER/STEPS.
7. PROTECT POWER POLES IN PLACE. SEE DETAIL 4, SHEET C-5.
8. INSTALL RIP-RAP, d50=12", 24" THICK, OVER 8" TYPE II BASE.
9. CONSTRUCT AC PAVEMENT PER SECTION 3, SHEET C-5.



SECTION A-A

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Acceptance of plans for filing
By _____ 4/16/01

Acceptance of these plans for filing shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of the State or County laws and/or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted herein.

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AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

Avoid hitting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE (702) 804-2100 FAX: (702) 804-2299

AIG BAKER REAL ESTATE, L.L.C.

SILVERADO RANCH STATION - PH. II + CULVERT EXTENSION

CULVERT PLAN and PROFILE
STA. 9+80.80 to 13+61.65

SHEET
C-4
4 OF 12 SHTS

DESIGN: BKR
DRAWN: BKR
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 04-12-01
PLOT TIME: 11:27:58

NO.	REVISION	DATE	AGEN. APP.	DATE	AGEN. APP.
1	REVISED BUBBLER, ADDED LEABON DETAIL AND DEMOLITION IN ROW	04-06-01			

DATE: 4/12/01

01-1517

SNWA CONSTRUCTION NOTE

1. CONTRACTOR SHALL FIELD LOCATE AND PROTECT ALL SNWA/SNWA APPURTENANCES INCLUDING BUT NOT LIMITED TO AM/AR, ACCESS MANHOLES & CATHODIC PROTECTION SYSTEMS PRIOR TO CONSTRUCTION. ALL ABOVE GRADE STRUCTURES AND AT GRADE STRUCTURES MUST BE ADJUSTED TO NEW GRADE BY CONTRACTOR EITHER PRE-CONSTRUCTION TO NOTIFY DON DUSEK AT (702) 867-3444 AT LEAST 10 WORKING DAYS TO CONSTRUCTION ACTIVITY.
2. NO BUILDINGS, STRUCTURES, FENCES OR WALLS SHALL BE PLACED UPON, OVER OR UNDER SAID PARCEL OF LAND FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID PARCEL MAY BE IMPROVED AND USED FOR STREET, ROAD OR DRIVEWAY PURPOSES AND FOR OTHER PURPOSES, HOWEVER, AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE SNWA FOR THE PURPOSES FOR WHICH IT IS GRANTED.
3. SNWA APPROVAL IS VALID FOR ONE (1) YEAR FROM THE SIGNATURE DATE. IF CONSTRUCTION WITHIN THE EASEMENT OR RESTRICTED ZONE IS NOT COMPLETE, PLANS MUST BE RESUBMITTED TO SNWA FOR APPROVAL.

NORTH
SCALE 1" = 40'

SCALE 40 0 40 80 FEET

MATCH LINE - SEE SHEET C-12

PROJECT SITE

VICINITY MAP

LEGEND	
DG = DESIGN GRADE	(60.5) TC EXIST. ELEVATION
W = WATER	60.5 TC PROPOSED ELEVATION
S = SEWER	EXIST. SPOT ELEVATION
G = GAS	SUBDIVISION BOUNDARY
SD = STORM DRAIN	EASEMENT LINE
SL = STREET LIGHT	FUTURE LINE
SSMH = SEWER MANHOLE	STREET CENTERLINE
SDMH = STORM DRAIN MANHOLE	
CLV = CITY OF LAS VEGAS	CONCRETE CURB & GUTTER
LVVWD = LAS VEGAS VALLEY WATER DISTRICT	
EX = EXISTING	EXISTING IMPROVEMENTS
FL = FLOW LINE	(2812) EXISTING GROUND CONTOUR LINES
HP = HIGH POINT	
R/W = RIGHT-OF-WAY	34 FINISH GROUND CONTOUR LINE
TC = TOP OF BACK OF CURB	DRAINAGE FLOW LINE
FG = FINISHED GRADE	
BCR = BEGIN CURB RETURN	BLOCK WALL
DS = DOWN SPOUT	EXISTING BLOCK WALL
CCASD = CLARK COUNTY AREA STANDARD DRAWING	NO PARKING - RED CURB
TG = TOP OF GRATE	
BW = BACK OF WALK	
FS = FINISH SURFACE	
NG = NATURAL GRADE	EXISTING ROCK WALL
FF = FINISH FLOOR	
GB = GRADE BREAK	
CCPWSD = CLARK COUNTY PUBLIC WORKS STANDARD DRAWING	VISION RESTRICTION AREA
FUT = FUTURE	
EP = EDGE OF PAVEMENT	
TMH = TOP OF MANHOLE	

GRADING NOTES

1. CONSTRUCT 4" TYP. TYPE II CURB PER DETAIL 4 SHEET C-10.
2. CONSTRUCT 6" TYP. TYPE II CURB PER DETAIL 5 SHEET C-10.
3. INSTALL CURB PER DETAIL 10 SHEET C-10.
4. CONSTRUCT CONCRETE GUTTER PER DETAIL 6 SHEET C-10.
5. CONSTRUCT ROLLED PAVEMENT EDGE
6. CONSTRUCT 3" AC PAVING OVER 6" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-10. SEE SOILS REPORT FOR MORE INFORMATION.
7. CONSTRUCT 3" AC PAVING OVER 8" TYPE II AGGREGATE BASE OVER 12" COMPACTED SUBGRADE PER DETAIL 1 SHEET C-10. SEE SOILS REPORT FOR MORE INFORMATION.
8. INSTALL HANDICAP SIGNAGE/RAMPS AND PAINTED LOT STRIPING PER ARCHITECTURAL PLANS.
9. CONSTRUCT SIDEWALK ACCESS PER A.D.A./A.C.C. PER SEE ARCH. PLANS FOR DETAILS.
10. INSTALL SPEED BUMP
11. 6" TO 0" CURB TRANSITION
12. 0" CURB FLUSH WITH PAVEMENT
13. CONSTRUCT MODIFIED TYPE "C" DROP INLET. SEE DETAIL 10, SHEET C-10.
14. INSTALL 24" RCP STORMDRAIN PIPE
15. CONSTRUCT CURB OPENING AND HANDICAP GRADING PER DETAIL 1, SHEET C-9.
16. CONSTRUCT CATWELL PER DETAIL 8, SHEET C-10.
17. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAILS 7 SHEET C-10
18. CONSTRUCT RETAINING WALL AS PER COUNTY STANDARD DETAIL AND ARCHITECTURAL PLANS.
19. CONSTRUCT L-CURB TRANSITION AS PER DETAIL 9, SHEET C-10
20. CONSTRUCT VALLEY GUTTER TRANSITION AS PER DETAIL 9, SHEET C-10
21. MATCH EXISTING
22. CONSTRUCT CONCRETE WALK AS PER DETAIL 2, SHEET C-10 AND THE ARCHITECTURAL PLANS.
23. INSTALL 8" PVC DRAIN LINE - CAP 8" FROM CULVERT STUB FOR FUTURE - SEE ARCH PLANS FOR DETAILS
24. CONSTRUCT CONVENTIONAL ROADWAY PER USDOCA DWG 225
25. CONSTRUCT RECESSED "L" (12") CURB PER DETAIL EXIT C-7
26. CONSTRUCT TACK OFF CURB PER USDOCA DWG 220 WITH 6" BREAKS EVERY 5'
27. CONSTRUCT DEPRESSED CURB PER FUTURE RAMP PER USDOCA DWG 236, CASE 1
28. MATCH EXISTING AC PAVEMENT GRADES IN CUL
29. SAWCUT AND MATCH
30. 0" TO 12" CURB TRANSITION
31. CONSTRUCT TYPE "B" DROP INLET PER USDOCA DWG 242
32. CONSTRUCT MODIFIED TYPE "D" DROP INLET PER DETAIL 1 ON SHEET C-9
33. CONSTRUCT 6" CROSS GUTTER PER USDOCA DWG 250
34. REMOVE EXISTING IMPROVEMENTS THAT INTERFERE WITH CONSTRUCTION OF DRIVEWAY ENTRANCE
35. INSTALL RIP-RAP d=12" MIN, 24" THICK

NOTE TO CONTRACTOR: ALL DIMENSIONS GIVEN ARE TO BACK OF CURB.

LINE TABLE			
No.	Bearing	Distance
L1	N 00°00'00" E	33.00'
L2	N 00°00'00" E	33.00'

CURVE TABLE				
No.	Radius	Delta	Tangent	Length
C1	15.00'	90°00'00"	15.00'	23.56'
C2	15.00'	90°00'00"	15.00'	23.56'
C3	50.00'	27°43'49"	12.35'	24.20'
C4	50.00'	27°43'49"	12.35'	24.20'
C5	50.00'	27°43'49"	12.35'	24.20'
C6	50.00'	27°43'49"	12.35'	24.20'
C7	50.00'	90°00'00"	50.00'	78.54'

NOTE: ALL CURB DATA TAKEN FROM BACK OF CURB

IONE ROAD (PUBLIC)
(CC PLANS 05903)

TYPE "B" INLET D= 3' 30.20± GRATE 28.44 INV

MODIFIED TYPE "D" INLET L=23.5 SEE DETAIL 1 ON SHEET C-13 (PUBLIC)

18" SD 23.44 INV AT PT OF CONNECTION WITH EX 10'x 8' CULVERT

N88°40'23"W 20 LF - 18" CLASS V RCP @ 14.45%

TYPE "B" INLET D= 2' 30.10± GRATE 28.33 INV

EXISTING DOUBLE 10'X8' RCB CULVERT (CC PLANS) Be LAKEMEAD / EASTERN PHASE 1 - CHANNEL PLANS BY VTN) (PUBLIC)

EXISTING TYPE "B" DROP INLET TO BE REMOVED (IF INSTALLED AT TIME OF CONSTRUCTION)

SECTION
NO SCALE

MODIFIED "L" CURB
NO SCALE

GRADING NOTES

(THESE NOTES APPLY ONLY TO ON-SITE PRIVATE FACILITIES)

1. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF ALL DEBRIS AS ACCEPTABLE TO THE OWNER AND ENGINEER.
2. IF CONTRACTOR DOES NOT ACCEPT EXISTING TOPOGRAPHY AS SHOWN ON THE PLANS, WITHOUT EXCEPTION, HE SHALL HAVE MADE, AT HIS OWN EXPENSE, A TOPOGRAPHIC SURVEY AND SUBMIT IT TO THE OWNER FOR REVIEW.
3. CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDINGS.
4. PRECAST STRUCTURES MAY BE USED AT THE CONTRACTOR'S OPTION.
5. IN ALL AREAS WHERE NEW CURB AND GUTTER ARE INSTALLED, REMOVE ALL OLD CURB AND GUTTER AND SAW CUT A STRAIGHT EDGE ALONG ASPHALT.
6. THE EARTHWORK FOR ALL BUILDING FOUNDATIONS AND SLABS SHALL BE IN ACCORDANCE WITH ARCHITECTURAL PLANS AND SPECIFICATIONS.
7. CONTRACTOR IS RESPONSIBLE FOR REPAIRS OF DAMAGE TO ANY EXISTING IMPROVEMENTS DURING CONSTRUCTION, SUCH AS BUT NOT LIMITED TO, DRAINAGE, UTILITIES, PAVEMENT, STRIPING, CURBS, ETC. REPAIRS SHALL BE EQUAL TO OR BETTER THAN EXISTING CONDITIONS.
8. SPOILS FROM FOOTINGS IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR IS TO USE THE SOIL FROM ON SITE OR REMOVE IT FROM SITE.
9. EARTHWORK SHALL BE ON AN UNCLASSIFIED BASIS.
10. CONTRACTOR SHALL COMPLY WITH N.P.D.E.S. REGULATIONS AND FILE A NOTICE OF INTENT PERMIT PRIOR TO COMMENCEMENT. CONTRACTOR MUST SUBMIT A NOTICE OF TERMINATION PERMIT UPON FINAL STABILIZATION.
11. ANY FILL USED TO INCREASE THE ELEVATION OF THE FLOOR SLAB OR ANY FILL TO BE USED AS BACKFILL SHOULD BE CLEAN, GRANULAR MATERIAL PRIOR TO THE USE OF ANY GRANULAR FILL, GRADATION ANALYSIS SHOULD BE PERFORMED ON REPRESENTATIVE SAMPLES OF THE FILL MATERIAL TO DETERMINE WHETHER THE MATERIAL IS SUITABLE AS FILL. COMPACTED FILL SHOULD BE PLACED IN LAYERS OF NOT MORE THAN EIGHT INCHES IN THICKNESS, AT A MOISTURE CONTENT WITHIN THREE PERCENT OF RUSIL, AND COMPACTED TO A MINIMUM DENSITY OF 95 PERCENT IN PAVING AREAS AND 88 PERCENT IN BUILDING AREAS, OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR METHOD, ASTM D-1557.
12. TOPOGRAPHIC BOUNDARY SURVEY, PROPERTY LINES, LEGAL DESCRIPTION, EXISTING UTILITIES, SITE TOPOGRAPHY WITH SPOT ELEVATIONS, OUTSTANDING PHYSICAL FEATURES AND EXISTING STRUCTURE LOCATIONS WAS PROVIDED BY THE FOLLOWING COMPANY:
13. G.C. WALLACE WILL NOT BE HELD RESPONSIBLE FOR THE ACCURACY OF THE SURVEY OR FOR DESIGN ERRORS OR OMISSIONS RESULTING FROM SURVEY INACCURACIES.
14. ANY DEVIATION FROM THESE PLANS MAY CAUSE THE WORK TO BE UNACCEPTABLE.
15. SITE CONTRACTOR SHALL SUPPLY AS-BUILT PLANS INDICATING ALL CHANGES AND DEVIATIONS.

NOTE

THE SPECIFIC RETAINING WALLS ARE A NON-STANDARD CLARK COUNTY RETAINING WALL DESIGN STRUCTURAL CALCS. & SOILS REPORT SHALL BE SUBMITTED TO CLARK COUNTY BUILDING DEPT. FOR REVIEW AND APPROVAL PRIOR TO WALL CONSTRUCTION PERMIT ISSUANCE.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION

Acceptance of plans for filing

By _____

Acceptance of these plans for filing shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of the State or County laws and/or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted herein.

NOTE: Power poles and/or other existing facilities not in proper location based on proposed improvements shown hereon will be relocated at no expense to Clark County.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 26, TOWNSHIP 22 SOUTH, RANGE 61 EAST, M.D.M., SHOWN AS SOUTH 89°36'14" WEST ON THE AMENDED RECORD OF SURVEY ON FILE IN FILE 86, PAGE 73, OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

BENCHMARK

CLARK COUNTY BENCHMARK "0C21 2345" BRASS CAP STATE HIGHWAY MARKER, STAMPED "STA H217+83.79 PDT, 12/21/56", LOCATED 250 FT EAST OF P.I. OF EASTERN AVE AND LAKE MEAD DR. AND NORTH SIDE OF SR 146. CLARK COUNTY VERTICAL CONTROL, SHEET 22-01 EE A, DATED 1982.

NAVD83 ELEVATION = 693.020 METERS
NAVD88 ELEVATION = 2265.005 FEET

Call before you Dig. 1-800-227-2600

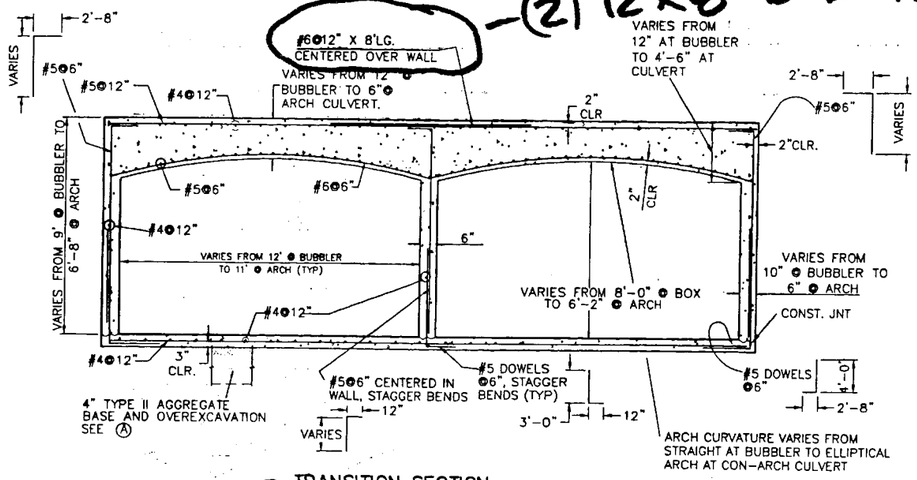
CALL BEFORE YOU DIG OVERHEAD 1-702-895-9111

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RANCHO DRIVE, SUITE 4
LAS VEGAS, NEVADA 89102
TELEPHONE: (702) 384-2000 • FAX: (702) 384-2999

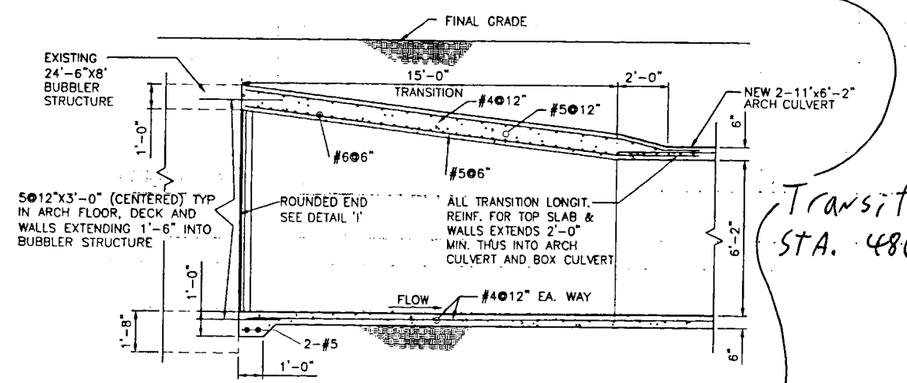
AG BAKER REAL ESTATE, L.L.C.
SILVERADO RANCH STATION - PH II + CULVERT EXTENSION
GRADING PLAN III

SHEET C-7
7 OF 10 SHTS

(2) 12'x8' BCB to Arch transition

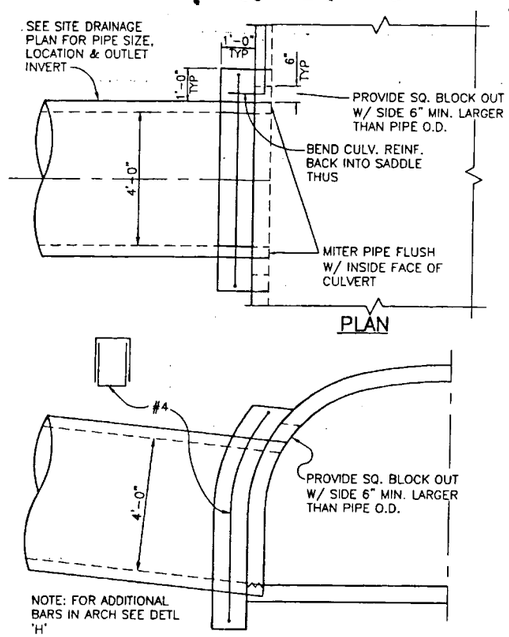


B TRANSITION SECTION
3/8"=1'-0"

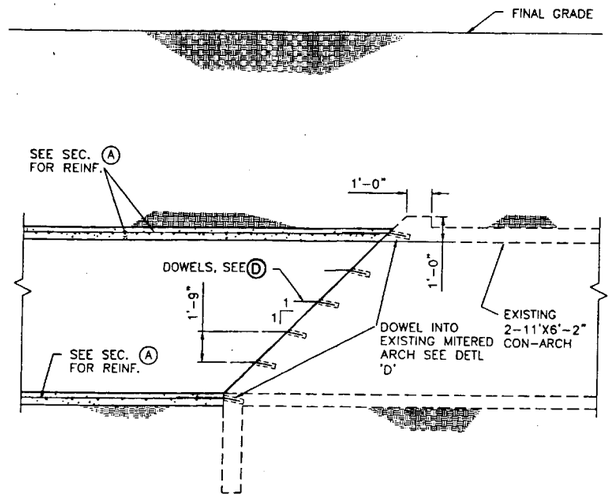


C TRANSITION SECTION @ CULVERT CROWN
3/8" = 1'-0"

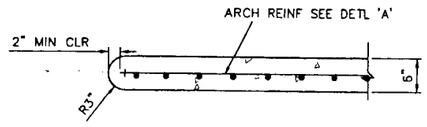
Transition section
STA. 4862.59 to STA. 4789.35



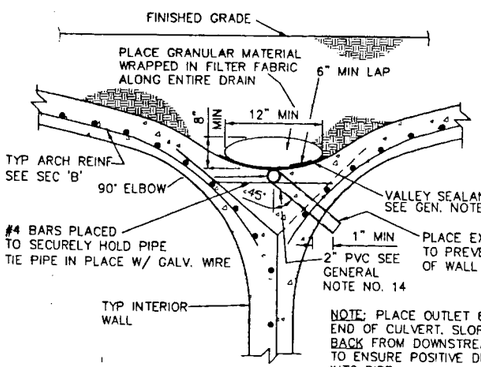
D PIPE PENETRATION DETAIL
1/2" = 1'-0"



E NEW BOX CULVERT TO EXIST CULV. CONNECTION DETAIL
3/8"=1'-0"

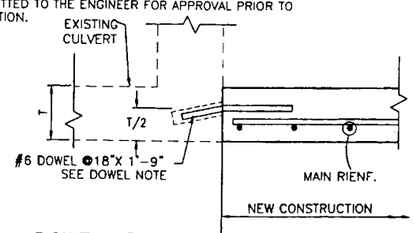


I SPLITTER PLAN DETAIL
1" = 1'-0"

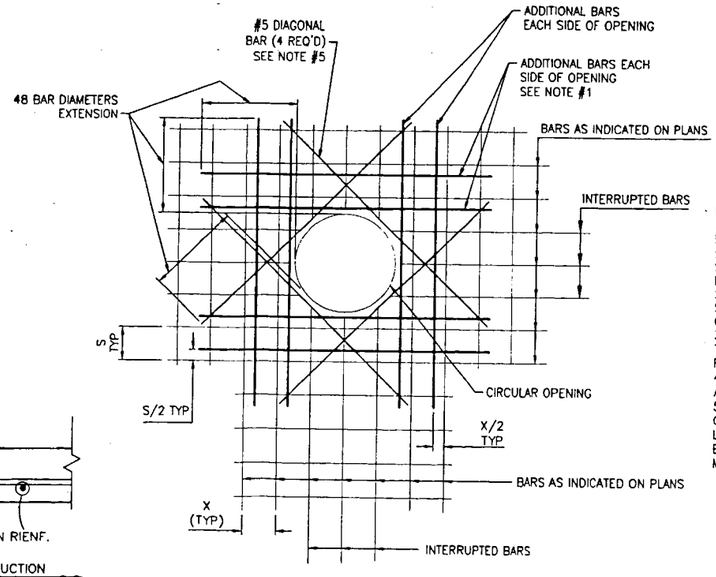


F WEEPHOLE DETAIL
1"=1'-0"

DOWEL NOTE:
DRILL 1" ø HOLE, 8" DEEP, FOR #6 DOWEL. EPOXY DOWEL IN HOLE WITH AN APPROVED EPOXY ADHESIVE. EPOXY ANCHORAGE SHALL DEVELOP A TENSILE PULLOUT STRENGTH OF 13 KIPS. DETAILS OF THE ANCHORAGE SYSTEM SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO INSTALLATION.



G DOWEL DETAIL
1" = 1'-0"



NOTES:
1. AREA OF ADDITIONAL BARS AT EACH EDGE OF OPENING IN EACH DIRECTION SHALL MATCH ½ THE CROSS SECTIONAL AREA OF THE INTERUPTED BARS.
2. PROVIDE STANDARD ACI HOOK IF STRAIGHT EXTENSION PAST OPENING CANNOT BE OBTAINED.
3. PLACE ADDITIONAL REINFORCING IN THE SAME PLANE AS THE REINFORCING IT IS REPLACING.
4. PROVIDE MINIMUM 2" CLEAR COVER AROUND OPENING.
5. PROVIDE FOUR DIAGONAL BARS @ OPENING FOR EACH MAT OF STEEL. LOCATE DIAGONALS AS TO NOT EFFECT POSITIONING OF MAT OR MINIMUM CLEARANCES REQUIRED.

H ADDTL REINF AT OPENING IN WALL
1/2"=1'-0"

WATSON ENGINEERING, LLC
CONSULTING ENGINEERS
2450 WEST POPPY AVENUE
TUCSON, ARIZONA 85705
PH: (520) 888-6468
FAX: (520) 292-6974

CON-ARCH

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SILVERADO RANCH STATION
ARCH-CULVERT DETAILS
CLARK COUNTY, NEVADA

REV	BY	DATE	COMMENT

SEAL PERTAINS ONLY TO WORK RELATED TO CON-ARCH CULVERT STRUCTURE. SURVEY DATA, INVERT ELEVATIONS & HYDRAULIC ANALYSIS PROVIDED BY OTHERS.

PROFESSIONAL ENGINEER STATE OF NEBRASKA
THOMAS A. SACRA III
31/10
CIVIL
No. 10039

Dsgn:	TAS
Drwn:	JR
Rvsd:	–
Chk:	ATS
Date:	8-30-00
SCALE:	AS NOTED
SHEET NO.	Proj. No.
10F 2	00067

08-32833

(2) 18" RCPCP BY OTHERS
BLOCK OUT 2' SQUARE HOLE OR BREAK HOLE TO TAKE PIPE. SEE DETAIL G FOR DETAILS

(1) 19" ø RCPCP BY OTHERS
BLOCK OUT 2' SQUARE HOLE OR BREAK HOLE TO TAKE PIPE. SEE DETAIL G FOR DETAILS

MATCHLINE STA 17+94.94

129 LF

19+81.49
INV.=07.48

STA 19+09.73
INV=07.54

STA 19+23.94
ANGLE POINT
INV.=2204.30

FLOW

451.53 LF

STA 21+57.00
RIM ELEV =2210.60

MANHOLES SEE DETAIL (H)

DIRECTION OF REINF. TYP. FLOOR & BARREL

6"
11'-0"
11'-0"
6"

STA.23+32.17

23+75.00
EX. HEADWALL TO BE REMOVED

NEW DOWELS SEE (F)
REMOVE CROSS HATCHED PORTION OF WINGWALL

9 1/2" TYP
14'-0"
8"

SILVERADO BLVD.

15'-0" TRANSITION STRUCTURE

EXIST. TRANSITION STRUCTURE
(2)-14'x6' RCBC

MODIFIED TYPE "C" DROP INLET (BY OTHERS)
C. L. RIDGEWAY TO PROVIDE BLOCKOUT.
SEE GRADING AND DRAINAGE PLANS FOR DETAILS AND EXACT LOCATIONS

STA 23+60.47
END CON-ARCH &
BEGIN TRANSITION STRUCTURE

INV.=2199.71

PLAN
SCALE: 1"=20'

FOR LOCATIONS & BEARINGS OF CULVERT SEE SHEET C-27 OF CIVIL DWGS. SILVERADO RANCH STATION PHASE 1

STA 13+61.65
INV.=2210.02

396.08 LF

FLOW

STA 17+57.00
RIM ELEV=2215.7

STA 17+57.73
ANGLE POINT
INV.=2205.99

MANHOLES SEE DETAIL (H)

37.21 LF

MATCHLINE STA 17+94.94

SYMMETRICAL ℄

16'-6"

VARIES 1± MIN TO 4± MAX

FINISHED GRADE

WWF 3X4 D6XW6

WEEP DRAIN SEE GEN. NOTES

6"

2" CLR

R12'-0"

R3'-10"

STAGGERED FIELD BENDS

2'-0"

#4@6" TYP

3'-6"

OPTIONAL ROUGHENED CONST. JT. TYP.

2'-0"

2'-0"

ROUGHENED CONST. JT. TYP.

6'-2"

2'-2"

WWF 3X4 D6XW6

LIMITS OF OVEREXCAVATION AND RECOMPACTION (OVEREXCAVATION AND RECOMPACTION BY OTHERS)

1'-6"

1'-6"

3" CLR

11'-0"

6"

6"

6"

WWF 3X4 D6XW6 WITH #4@12" LONGITUDINAL

4" TYPE II AGGREGATE BASE (BY OTHERS)

3'-0"

12"

WWF 3X4 D6XW6

(A) TYPICAL SECTION
1/2" = 1'-0"

#6@12" X 8'LG. CENTERED OVER WALL

#5@12"

#4@12"

VARIES FROM 9 1/2" @ BOX CULVERT TO 6" @ ARCH CULVERT.

#5@6"

#6@6"

VARIES FROM 9 1/2"@ BOX TO 4'-6"@ CON-ARCH CULV.

2" CLR

2'-8"

#5@12"

6'-0"

2"CLR.

2" CLR

#4@12"

VARIES FROM 14' @ BOX TO 11' @ ARCH (TYP)

VARIES FROM 8" @ BOX TO 6" @ ARCH

VARIES FROM 6'-0" @ BOX TO 6'-2" @ ARCH

VARIES FROM 6'-9 1/2" @ BOX TO 6'-8" @ ARCH

VARIES FROM 9 1/2"@ BOX TO 6" @ ARCH (TYP)

#4@12"

3" CLR.

#4@12"

#5 DOWELS @6", STAGGER BENDS (TYP)

3'-0"

12"

#5 DOWELS @6"

4'-0"

2'-8"

CONST. JOINT.

#5@6" CENTERED IN WALL, STAGGER BENDS

12"

6'-3"

4" TYPE II AGGREGATE BASE AND OVEREXCAVATION SEE (A)

ARCH CURVATURE VARIES FROM STRAIGHT AT BOX TO ELLIPTICAL ARCH AT CON-ARCH CULVERT

(B) TRANSITION SECTION
1/2" = 1'-0"

98-24371

SEAL PERTAINS ONLY TO WORK RELATED TO CON-ARCH CULVERT STRUCTURE. SURVEY DATA, INVERT ELEVATIONS & HYDRAULIC ANALYSIS PROVIDED BY OTHERS.

98/0150

WATSON ENGINEERING, LLC
CONSULTING ENGINEERS
2450 WEST [illegible]
TUCSON, [illegible]
PH: [illegible]
FAX: [illegible]

CON-ARCH

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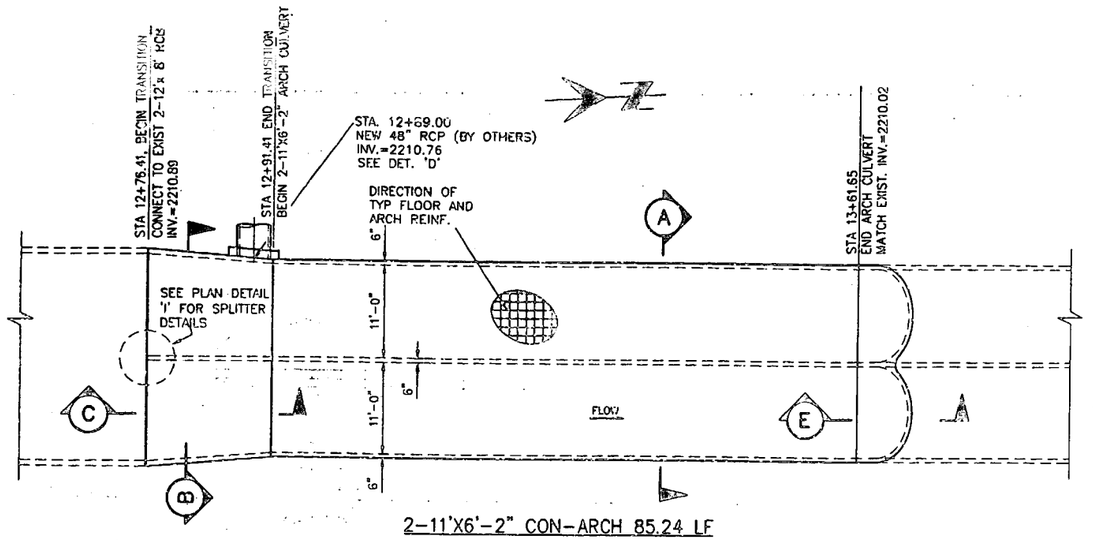
SILVERADO RANCH
ARCH-CULVERT DETAILS

CLARK COUNTY, NEVADA

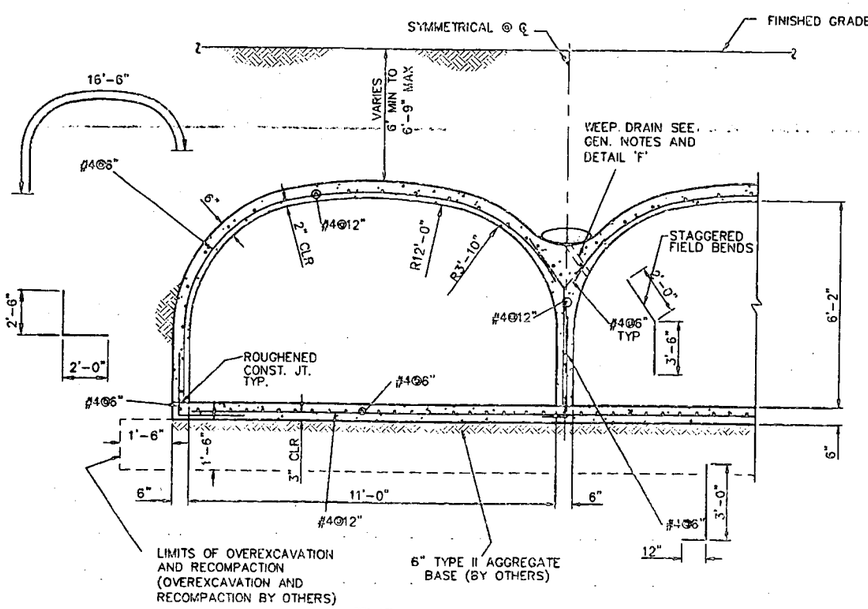
REV	BY	DATE	COMMENT

THOMAS A. SACRA III
NEVADA ENGINEER 12214
2/15/99
CIVIL
EXPIRES JUNE 30, 1999

Dsgn:	TAS
Drwn:	MJC
Rvsd:	–
Chk:	TAS
Date:	11/30/98
SCALE:	AS NOTED
Proj. No	9510
SHEET	33/34

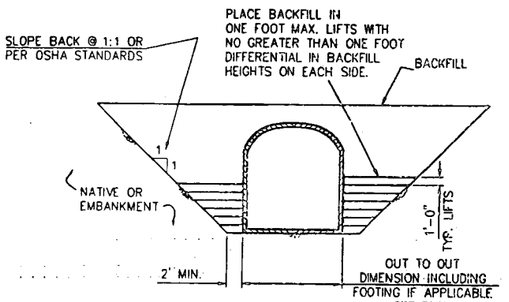


2-11'X6'-2" CON-ARCH 85.24 LF

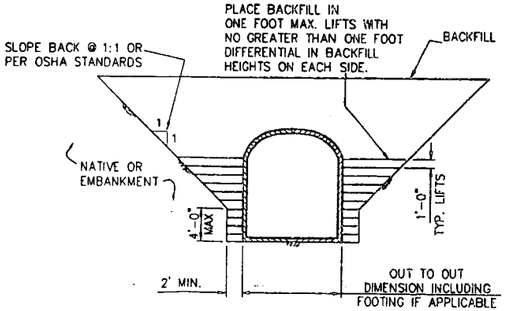


A TYPICAL SECTION

1/2" = 1'-0"



FOR SLOPED BANKS



FOR BENCHED BANKS

EXCAVATION & BACKFILL DIAGRAMS

NOT TO SCALE

NOTE: WHEN USING REINF. WITH METRIC BAR NUMBERS:
#3 = #10 (METRIC)
#4 = #13 (METRIC)
#5 = #16 (METRIC)
#6 = #19 (METRIC)

SEAL PERTAINS ONLY TO WORK RELATED TO CON-ARCH CULVERT STRUCTURE. SURVEY DATA, INVERT ELEVATIONS & HYDRAULIC ANALYSIS PROVIDED BY OTHERS.

REV	BY	DATE	COMMENT

GENERAL NOTES

1.) DESIGN SPECIFICATIONS: AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 16TH EDITION (1996) WITH INTERIM REVISIONS THROUGH 1997 AND CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT DESIGN MANUAL.

2.) CONSTRUCTION SPECIFICATIONS: CLARK COUNTY STANDARDS FOR CAPTIONS, STREET LIGHT AND TRAFFIC CONTROL SYSTEMS.

3.) LOADING CLASS: HS20-44

4.) DEAD LOADS: FOR SELF WEIGHT OF STRUCTURE, REINF. CONCRETE = 150 POUNDS PER CUBIC FOOT (PCF), BACKFILL AROUND STRUCTURE = 120 PCF.

5.) DESIGN METHODOLOGY:

A.) CONCRETE ARCH: DESIGN BASED ON FINITE ELEMENT SOIL-STRUCTURE INTERACTION COMPUTER PROGRAM STUDIES UTILIZING SERVICE LOAD STRESSES. PROGRAM CALCULATES DESIGN MOMENTS FOR ARCH, WALLS, AND SLAB ACTING AS A UNIT WITH SURROUNDING SOIL.

B.) CONCRETE REINFORCING REQUIREMENTS COMPUTED BY THE ULTIMATE STRENGTH DESIGN METHOD.

6.) REINFORCING STEEL:
AT C.L. RIDGEWAY'S OPTION CONVENTIONAL REINFORCING OR WELDED WIRE FABRIC MAY BE USED IN ANY COMBINATION AS LONG AS END AREAS ARE EQUAL. ALL STRUCTURAL CALCULATIONS ARE BASED ON GRADE 60 STEEL.

A.) CONVENTIONAL REINFORCEMENT: ASTM A615 GRADE 60. MINIMUM COVER 3 INCHES WHERE CONCRETE CAST AGAINST EARTH, 2 INCHES FOR #6 THROUGH #11 OR 1 1/2 INCHES FOR #5 AND SMALLER BARS WHERE CONCRETE SURFACE IS EXPOSED TO EARTH BACKFILL OR WEATHER U. N. O. (UNLESS NOTED OTHERWISE).

B.) WELDED WIRE FABRIC REINFORCEMENT: WELDED DEFORMED WIRE FABRIC, FY =75,000 PSI MIN., CONFORMING TO AASHTO M 55 OR M 221.

7.) REINFORCING BENDS AND LAPS: BENDS AND HOOKS SHALL CONFORM TO A. C. I. STD. 315-80 U. N. O. BEND DIMENSIONS ARE FROM OUT TO OUT AND LAPS SHALL BE 40 BAR DIAMETERS MINIMUM U. N. O. WELDED WIRE FABRIC LAPS 1'-0" MIN. U. N. O.

8.) CONCRETE AND SHOTCRETE:

A.) SHOTCRETE: FC' = 3,000 PSI @ 28 DAYS MIXED FOR AND PLACED BY THE WET MIX PLACEMENT PROCESS. SEE NO 15 BELOW.

B.) FLOOR CONCRETE: FC' = 4,000 PSI @ 28 DAYS & SHALL BE MODIFIED AA CLASS PURSUANT TO CLARK COUNTY BLUE BOOK STANDARDS.

C.) ALL OTHER CONCRETE: FC' = 3,000 PSI @28 DAYS & SHALL BE MODIFIED AA CLASS PURSUANT TO CLARK COUNTY BLUE BOOK STANDARDS.

D.)ALL CONCRETE AND SHOTCRETE SHALL BE MIXED WITH TYPE V CEMENT.

9.) WORKMANSHIP: CHAMFER EXPOSED CORNERS 3/4 INCHES U. N. O. FINISH EXPOSED CONCRETE SURFACES PER STANDARD SPECIFICATIONS.

10.) SCALE: DO NOT SCALE DIMENSIONS FROM THE DRAWINGS.

11.) CURING: AFTER SPRAY ON CURING COMPOUND HAS BEEN APPLIED AND SHOTCRETE HAS TAKEN SET TO ALLOW FOOT TRAFFIC, ARCH BARRELS SHALL BE COVERED WITH 6 MIL CLEAR OR BLACK POLYETHYLENE SHEETING SECURED AGAINST WIND UPLIFT. SHEETING SHALL BE LEFT IN PLACE DURING BACKFILLING.

12.) STRIPPING: FORMS MAY BE STRIPPED AFTER A TWELVE HOUR INITIAL SET OR WHEN, IN THE OPINION OF THE ENGINEER, THE SHOTCRETE HAS TAKEN ADEQUATE SET TO ALLOW STRIPPING TO TAKE PLACE. BACKFILLING MAY PROCEED WHEN ARCH SHOTCRETE CYLINDER STRENGTH HAS REACHED F'c=1,500 PSI OR WHEN, IN THE OPINION OF THE ENGINEER, THE ARCH SHOTCRETE HAS TAKEN ADEQUATE SET TO ALLOW BACKFILLING TO PROCEED.

13.) BACKFILLING:

A.) BACKFILL SHALL BE PLACED IN NO GREATER THAN ONE FOOT LIFTS WITH NO GREATER THAN A ONE FOOT DIFFERENTIAL IN BACKFILL HEIGHT TO EACH SIDE OF ANY INDIVIDUAL ARCH. NO EQUIPMENT HEAVIER THAN A RUBBER TIRED THREE YARD CAPACITY FRONT END LOADER IS PERMITTED TO PASS OVER THE STRUCTURE UNTIL THE BACKFILL, AS SPECIFIED, IS COMPLETE IN PLACE. SCRAPERS AND OTHER SUCH HEAVY EQUIPMENT SHALL NOT BE ALLOWED TO PASS OVER THE STRUCTURE UNLESS SPECIFIC PERMISSION IN WRITING IS ISSUED BY THE ENGINEER.

B.) DENSITY: 95% OF STD. PROCTOR MAXIMUM DENSITY AS DETERMINED BY ASTM D-698.

C.) BACKFILL ZONE: THE BACKFILL ZONE SHALL EXTEND OUT TO THE LESSOR OF 1.5 TIMES THE ARCH SPAN FROM THE OUTSIDE EDGE OF THE ARCH OR THE DISTANCE TO THE ADJACENT SLOPED NATIVE MATERIAL. THIS ZONE SHALL EXTEND UPWARD TO THE HEIGHT OF THE PAVEMENT SUBGRADE.

D.) MATERIALS: NATIVE AND IMPORTED GRANULAR SOILS WITH MAXIMUM EXPANSIVE POTENTIALS OF 1.8% AND A MAXIMUM PARTICLE SIZE OF 3".

E.) PROVIDE POSITIVE DRAINAGE (DAYLIGHT) AWAY FROM SITE. REMOVE WATER SOFTENED MATERIAL FROM BENEATH SLABS OR FOOTINGS.

14.) WEEP DRAINS: PROVIDE CONTINUOUS 2" DIAMETER SCHEDULE 40 PVC PIPE PLACED IN SAG POINT OF INVERT BETWEEN ARCH BARRELS AS SHOWN. SEAL OVER PIPE WITH ASPHALT EMULSION CONFORMING TO ASTM D-1227-87 TYPE III AND D-1187-82 TYPE I REINFORCED WITH FIBERGLASS MESH CONFORMING TO ASTM D-1668 TYPE III. AFTER THE INVERT HAS BEEN THUS SEALED, NOTCH THE TOP OF THE PIPE WITH SAW CUTS 6" LONG ON 12" CENTERS. SEE WEEPHOLE SECTION 'F' ON SHEET 2.

15.) SHOTCRETE REQUIREMENTS
SHOTCRETE SHALL COMPLY WITH THE RECOMMENDATIONS OF ACI "GUIDE TO SHOTCRETE." AND THE REQUIREMENTS OF ACI 506.2 "SPECIFICATION FOR MATERIALS, PROPORTIONING, AND APPLICATION OF SHOTCRETE."

PARTICULAR ATTENTION SHALL BE PAID TO THE FOLLOWING PARTS OF THE SHOTCRETE REQUIREMENTS.

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WATSON ENGINEERING
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CON-ARCH

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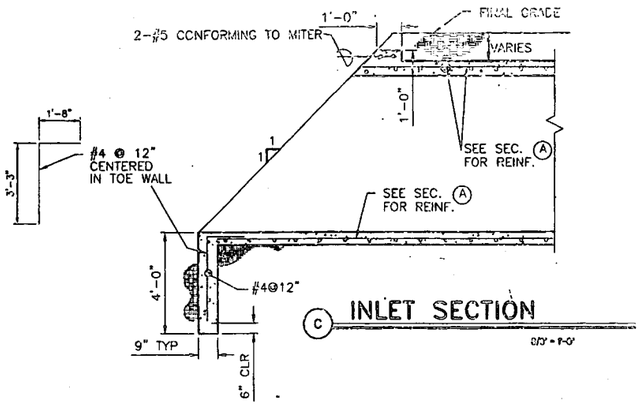
SILVERADO RANCH STATION ARCH-CULVERT DETAILS

CLARK COUNTY, NEVADA

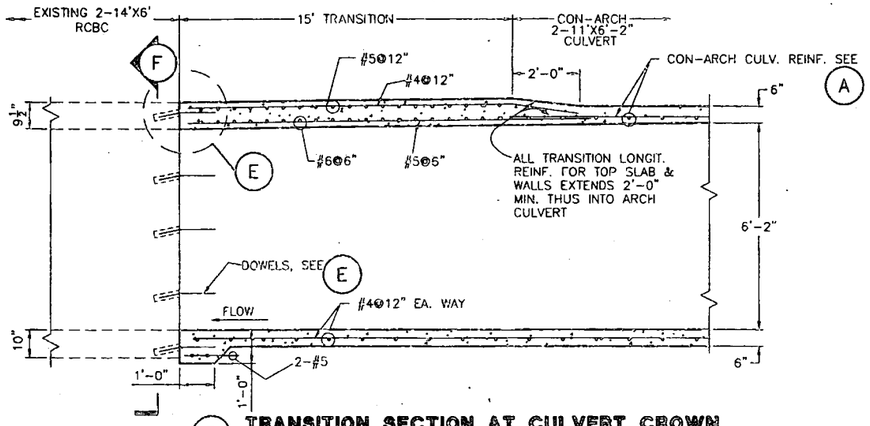
THOMAS A. SACRA III
No. 10039
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF NEVADA

Dsgn:	TAS
Drwn:	JR
Rvsd:	-
Chk:	ATS
Date:	8-30-00
SCALE:	AS NOTED
SHEET NO.	Proj. No.
1 OF 2	00037



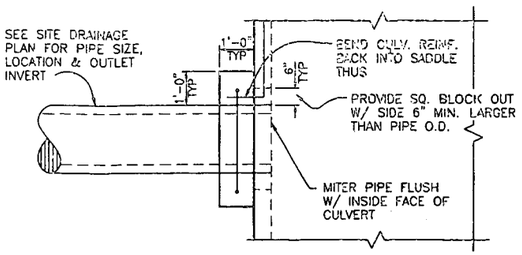
C **INLET SECTION**

1" = 1'-0"

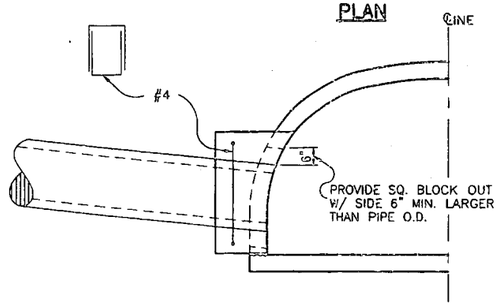


D **TRANSITION SECTION AT CULVERT CROWN**

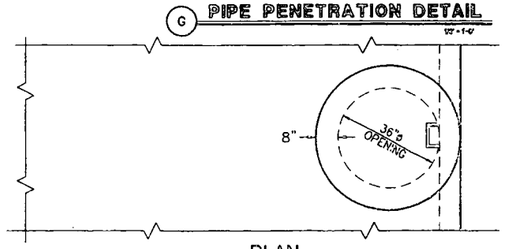
1/2" = 1'-0"



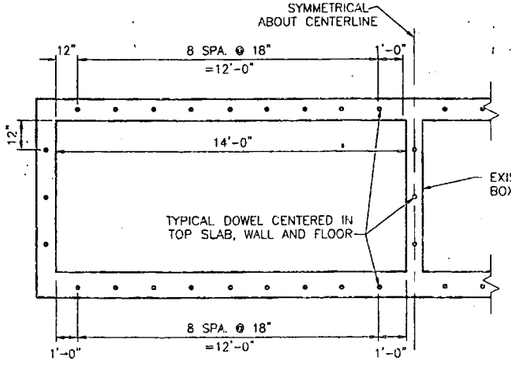
PLAN



G **PIPE PENETRATION DETAIL**



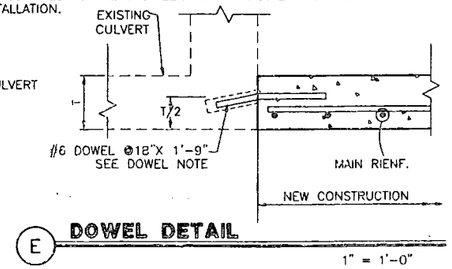
PLAN



F **DOWEL PLACEMENT**

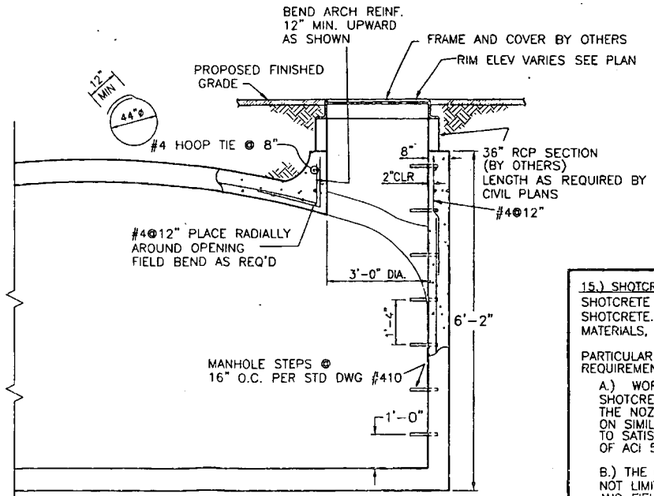
3/8" = 1'-0"

DOWEL NOTE:
DRILL 1"ø HOLE, 8" DEEP, FOR #6 DOWEL. EPOXY DOWEL IN HOLE WITH AN APPROVED EPOXY ADHESIVE. EPOXY ANCHORAGE SHALL DEVELOP A TENSILE PULLOUT STRENGTH OF 13 KIPS. DETAILS OF THE ANCHORAGE SYSTEM SHALL BE SUBMITTED TO THE EINGINEER FOR APPROVAL PRIOR TO INSTALLATION.



E **DOWEL DETAIL**

1" = 1'-0"



H **MANHOLE DETAIL**

1/2" = 1'-0"

NOTE: WHEN USING REINF. WITH METRIC BAR NUMBERS:
#3 = #10 (METRIC)
#4 = #13 (METRIC)
#5 = #16 (METRIC)
#6 = #19 (METRIC)

SEAL PERTAINS ONLY TO WORK RELATED TO CON-ARCH CULVERT STRUCTURE. SURVEY DATA, INVERT ELEVATIONS & HYDRAULIC ANALYSIS PROVIDED BY OTHERS.

REV	BY	DATE	COMMENT

GENERAL NOTES

1.) DESIGN SPECIFICATIONS: AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES", 1992 EDITION AND INTERIM SPECIFICATIONS THERETO, EXCEPT AS OTHERWISE NOTED.

2.) CONSTRUCTION SPECIFICATIONS: MOOT STANDARD SPECIFICATIONS, CURRENT EDITION, EXCEPT WHERE NOTED OTHERWISE.

3.) LOADING CLASS: HS20-44

4.) DEAD LOADS: FOR SELF WEIGHT OF STRUCTURE, REINF. CONCRETE = 150 POUNDS PER CUBIC FOOT (PCF), BACKFILL AROUND STRUCTURE = 120 PCF.

5.) DESIGN METHODOLOGY:

A.) CONCRETE ARCH: DESIGN BASED ON FINITE ELEMENT SOIL-STRUCTURE INTERACTION COMPUTER PROGRAM STUDIES UTILIZING SERVICE LOAD STRESSES. PROGRAM CALCULATES DESIGN MOMENTS FOR ARCH, WALLS, AND SLAB ACTING AS A UNIT WITH SURROUNDING SOIL.

B.) CONCRETE REINFORCING REQUIREMENTS COMPUTED BY THE ULTIMATE STRENGTH DESIGN METHOD.

6.) REINFORCING STEEL:

A.) CONVENTIONAL REINFORCEMENT: ASTM A615 GRADE 60 EXCEPT #3 BARS WHICH MAY BE GRADE 40 OR GRADE 60. MINIMUM COVER 3 INCHES WHERE CONCRETE CAST AGAINST EARTH, 2 INCHES FOR #6 THROUGH #11 OR 1 1/2 INCHES FOR #5 AND SMALLER BARS WHERE CONCRETE SURFACE IS EXPOSED TO EARTH BACKFILL OR WEATHER U. N O. (UNLESS NOTED OTHERWISE).

B.) ALTERNATE WELDED WIRE FABRIC REINFORCEMENT: WELDED DEFORMED WIRE FABRIC, FY = 70,000 PSI MIN., CONFORMING TO AASHTO M 55 OR M 221.

7.) REINFORCING BENDS AND LAPS: BENDS AND HOOKS SHALL CONFORM TO A. C. I. STD. 315-80 U. N. O. BEND DIMENSIONS ARE FROM OUT TO OUT AND LAPS SHALL BE 40 BAR DIAMETERS MINIMUM U. N. O. WELDED WIRE FABRIC LAPS 1'-0" MIN. U. N. O.

8.) CONCRETE AND SHOTCRETE:

A.) SHOTCRETE: FC' = 3,000 PSI @ 28 DAYS MIXED FOR AND PLACED BY THE WET MIX PLACEMENT PROCESS. SEE NO 15 BELOW.

B.) FLOOR CONCRETE: FC' = 4,000 PSI @ 28 DAYS & SHALL BE MODIFIED AA CLASS PURSUANT TO CLARK COUNTY BLUE BOOK STANDARDS.

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E.) PROVIDE POSITIVE DRAINAGE (DAYLIGHT) AWAY FROM SITE. REMOVE WATER SOFTENED MATERIAL FROM BENEATH SLABS OR FOOTINGS.

14.) WEEP DRAINS: ONE AND ONE HALF INCH DIAMETER HOLES SHALL BE PLACED IN THE INVERT BETWEEN ARCH BARRELS AT 4 FOOT CENTERS TO DRAIN THE FILL BETWEEN THE ARCH BARRELS. THE HOLES MAY BE EITHER DRILLED INTO THE SHOTCRETE OR PLACED AS 1½" DIA. SCHED. 40 PVC PIPE. AREA AROUND THE INLET TO THE HOLES SHALL BE COVERED WITH FILTER FABRIC EXTENDING AT LEAST ONE FOOT TO EACH SIDE OF EACH HOLE.

15.) SHOTCRETE REQUIREMENTS

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98-0150 / 98-2571

WATSON ENGINEERING LLC
CONSULTING ENGINEERS
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TUCSON, ARIZONA 85745
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FAX: (520) 797-3327

CON-ARCH

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SILVERADO RANCH
ARCH-CULVERT DETAILS
CLARK COUNTY, NEVADA

THOMAS A. SACRA III 2/15/99 CIVIL No. 9932

Dsgn:	TAS
Drwn:	MJC
Rvsd:	–
Chk:	TAS
Date:	11/30/93
SCALE:	AS NOTED
Proj. No	23104

SHEET 5 OF 24

BENCHMARK

CITY OF HENDERSON
BM # 205
BRASS CAP IN THE TOP OF CURB ON THE SOUTHEAST CORNER OF WHITNEY RANCH DRIVE AND RUSSELL ROAD.
(STAMPED C.O.H. BM)

ELEVATION=521.618 METERS (NAVD '88)
1711.34 FEET

GRAPHIC SCALE

B SECTION NTS

C SECTION NTS

A SECTION NTS

VICINITY MAP
NOT TO SCALE

ST. ROSE PKWY

FUT EOP

SWC 10" HP GAS

300' MOOT R/W

EX EOP

SNWA 90" WATER

SWC 10" HP GAS

R=135
Δ=48°15'42"
L=113.72'

50' SNWA ESMT

SECTION LINE

EX. TRANSITION TO BE REMOVED

EX. 30' W CONCRETE CHANNEL

PROPOSED DRAINAGE EASEMENT (WIDTH VARIES)

REGRADE TO DAYLIGHT

50' TRANSITION

276 LF CONCRETE OPEN CHANNEL

EXISTING 30'X8' CONCRETE OPEN CHANNEL

EGL

HGL

EX. GROUND @ TOP OF CHANNEL

EX. GRADE @ ℄ OF CHANNEL

CHANNEL INVERT

FUTURE CHANNEL IMPROVEMENT

PC STA. 42+69.80

PT STA. 43+82.80

INV 40.65

INV 40.00

INV 36.00

S=0.0370

S=0.0081

S=0.020

S=0.0206

S=0.0081

S=0.0081

TOP OF CHANNEL

END OF CHANNEL IMPROVEMENTS

EX TRANSITION TO BE REMOVED

5' CUT OFF WALL

5' CUT OFF WALL

5' CUT OFF WALL

VARIES 2' ~ 4.5'

90" SNWA WATER

REAL ESTATE MANAGER: JACK MANDEL
DATE DRAWING STARTED: JANUARY 2002

LOWE'S HIW, INC.

REVISIONS

DATE	DESCRIPTION

SHIMIN LUO
CIVIL
No. 14655
STATE OF NEVADA
PROFESSIONAL ENGINEER
EXP: 12/31/2003
11/24/02

Engineers Planners Surveyors
245 East Warm Springs Road, Suite 100
Las Vegas, NV. 89119. (702) 866-8604

LOWE'S
ENGINEERING AND CONSTRUCTION
1530 FARADAY AVE. SUITE 140 CARLSBAD CA 92008
760.804.5300 (V) 760.802.1018 (F)

CHANNEL IMPROVEMENT PLAN

SOUTHFORK POINTE
CITY OF HENDERSON NEVADA
PROJECT No: 01-806 DRAWN BY: MJR CHECKED BY: SL

ORIGINAL ISSUE DATE: 09-25-02
PERMIT SET ISSUE DATE:
CONSTRUCTION SET ISSUE DATE:
DRAWING NUMBER:

1 OF 1

Appendix F: Data CD

04-09-1194P

RESPONSE TO COMMENTS
PITTMAN WASH
REQUEST FOR LETTER OF MAP REVISION

Case No.: 04-09-1194P
Communities: City of Henderson & Clark County, Nevada
Community Nos.: 320005 & 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: 511542.00
July 2005

July 18, 2005

Ms. Sheila M. Norlin
National LOMC Manager
Michael Baker Jr., Inc.
3601 Eisenhower Avenue
Alexandria, Virginia 22304-6425

RE: RESPONSE TO COMMENTS – PITTMAN WASH LOMR
COMMUNITIES: CLARK COUNTY & CITY OF HENDERSON, NV
COMMUNITY NOS.: 320005 & 320003

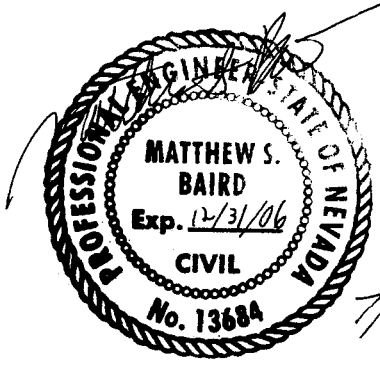
Dear Ms. Norlin:

Submitted for your review is the Response to Comments for the Pittman Wash Request for Letter of Map Revision.

If you have any questions regarding this report, please contact our office at (702) 263-7275.

Sincerely,

PBS&J



7/18/05

Brian K. Loffman, CFM
Hydrologist

Matt Baird, P.E., CFM
Senior Program Manager

The response to comments in a letter dated June 29, 2005 from Michael Baker Jr., Inc. (MBJ) are included below, see Appendix A for a copy of the comment letter. Note that some of the responses below are a result of a July 13, 2005 telephone conversation between Kevin Eubanks (CCRFCD) and Sacha Tohme of MBJ.

Comment 1: **From the submitted information, it is not clear what type and size of culvert extends from just downstream of Eastern Avenue to just downstream of Southfork channel along East Tributary to Pittman Wash (East Tributary). Please provide a hydraulic analysis that accounts for head losses and as-built plans, certified by a registered professional engineer or land surveyor, for the above mentioned culvert.**

Response 1: In the original LOMR submittal dated May 4, 2004 PBS&J provided a normal depth analysis on the culverts beneath Eastern Avenue. At the time the original LOMR was prepared the plans that had been made available to PBS&J were incomplete and did not consist of any as-built plans. Thus, a backwater model of the culvert system was not prepared.

However, in response to this comment, PBS&J has prepared a WSPG model based on the design plans entitled: *Improvement Plans for Lake Mead/Eastern Phase I – Drainage Channel.* The design plans and the WSPG model were verified and/or supplemented with PBS&J survey data and field visits where possible. (6) 12'x6' RCB's were constructed beneath Eastern Avenue at its crossing with the East Tributary. However, when the culverts were extended upstream with more recent improvements three of the 12'x6' cells were plugged. PBS&J verified the plugged culverts with a field visit on July 11, 2005. Also, the plugged culverts have been noted on the above mentioned improvements plans in Appendix B. The WSPG model was completed using the design plans and supplemented with PBS&J survey data where possible. The WSPG model includes the rectangular concrete channel located upstream of the culverts. A Flowmaster normal depth section of the rectangular channel was used as the starting WSEL in the WSPG model. Also see response to comment 2 for a discussion of the extension of the WSPG model for the downstream channel.

Using the flow of 2,189 cfs (from the HEC-1 model submitted in the original LOMR) the WSPG model shows containment within the culvert. Please refer to Appendix B for the detailed input/output files for the WSPG model.

A survey exhibit is provided in Appendix B showing the survey points. This information is also included electronically on the CD in Appendix E. A letter certifying that the culverts were built in substantial

conformance with the design plans and verified with field survey/field investigation is included in Appendix B.

Comment 2: **The submitted hydraulic analysis for the trapezoidal channel between Eastern Avenue and Silverado Ranch Boulevard along East Tributary included three identical cross-sections (C1, C2 and C3), and cross-sections C2 and C3 do not reflect the submitted topographic work map. In addition, no as-built plans were provided for the trapezoidal channel. Please provide as-built plans, certified by a registered professional engineer or land surveyor, for the trapezoidal channel between Eastern Avenue and Silverado Ranch Boulevard and update the hydraulic analysis so that all cross sections reflect the as-built plans.**

Response 2: The WSPG model discussed in the response to Comment 1 includes three cross sections downstream of Eastern Avenue within the channel. The cross sections are based on the survey data points shown on Figure 1A. The survey exhibit (Figure 1A) also serves to demonstrate as-built conditions of the channel. A normal depth section based on the field survey data was used as the downstream WSEL in the WSPG model. The Flowmaster worksheet and the WSPG model can be found in Appendix B. An electronic version of the survey data shown on Figure 1A is included in Appendix E. A letter certifying that the hydraulic analysis included in this document is an accurate representation of current field conditions for the channel and was prepared in substantial conformance with field survey data is included in Appendix B.

Comment 3: **The submitted plans entitled "Improvement Plans for Southern Segment Las Vegas Beltway, Section 3B, Eastern Avenue to Pecos Road," prepared by Louis Berger & Associates, Inc., dated June 13, 1996, were reduced to an unknown scale and did not contain the inlet and outlet elevations for all the culverts under the Interstate Highway 215 (I-215) Beltway. Please provide as-built plans, drawn at an accurate scale, that include the inlet elevations for all culverts under I-215 and that are certified by a registered professional engineer or land surveyor.**

Response 3: Please refer to Appendix C for an exhibit that shows the invert elevations for the culverts beneath I-215 Beltway using the survey data points prepared by PBS&J. Note that the survey point data is dense and overlapping due to the high number of points collected. Therefore, an electronic set of survey data points has been included with the data CD located in Appendix E. Also, a table containing all survey data point information has been included in Appendix C. A letter certifying that the culverts were built in substantial conformance with the design plans

and verified with field survey/field investigation is included in Appendix B.

Comment 4: **From the submitted information, it is not clear how the floodplain for Tributary 1 of East Tributary would be removed. The submitted hydraulic analysis, which included only one cross-section on Norridgewock Street, is not extensive enough to warrant the removal of the floodplain along Tributary 1 of East Tributary. Please provide a hydraulic analysis that demonstrates how the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for Tributary 1 of East Tributary would be conveyed to Norridgewock Street.**

Response 4: The watershed encompassing the Southfork residential development has been further subdivided based on a review of the grading plans and the 1996 Clark County GIS 5-foot topography. Note that the Clark County topography represents current conditions. Also, the grading plans for a portion of the development can be found in Appendix D. A hydrologic analysis using HEC-1 has been included in Appendix D. Please refer to Figure 2 in Appendix D that shows the hydrologic basins. The residential development has been subdivided into three basins (SFP1, SFP2 and SFP2). The basins show a 100-year flow of 68 cfs, 79 cfs and 46 cfs, respectively. Each basin drains to a single discharge point and a cross-section has been used to demonstrate the flow is less than one foot for each basin. Cross-section A within basin SFP1 shows a normal depth of 0.65'. Cross-section B within basin SFP2 shows a normal depth of 0.68'. Cross-section C within basin SFP3 shows a normal depth of 0.63'.

Comment 5: **The submitted hydraulic analysis for East Tributary shows water surface elevations (WSEL's) higher than the endpoints of Cross Sections V & W. The use of vertically extended cross sections might both overestimate the WSEL and underestimate the width of the floodplain. Please revise the submitted hydraulic analysis for East Tributary to include additional ground elevation data at the cross sections to eliminate all "cross section extended" warnings, or provide a hydraulic analysis to show how much flow will leave these cross sections and provide a topographic work map to show the extent of flooding at these locations.**

Response 5: As discussed in a July 13, 2005 telephone conversation between Kevin Eubanks and Sacha Tohme it was decided that the portion of the flood zone immediately north of I-215 would not be revised. Note that this only includes the area from immediately downstream of the I-215 culverts to cross-section X. As shown on Figure 5 Work Map in the original LOMR submittal there is a confluence of three flood zones

north of I-215 and east of Eastern Avenue (East Tributary, Tributary 1 of Main Wash and Tributary 2 of Main Wash). Therefore, the Zone A flood zone (East Tributary) from immediately downstream of the I-215 culverts extending approximately 850' north to cross-section X will remain as currently delineated. The other two flood zones will be revised per the original LOMR submittal.

APPENDIX A

FEMA Letter

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

June 29, 2005

Mr. Kevin Eubanks, P.E., CFM
Assistant General Manager
Clark County Regional Flood Control District
600 South Grand Central Parkway, Suite 300
Las Vegas, NV 89106-4511

IN REPLY REFER TO:
Case No.: 04-09-1194P
Communities: City of Henderson and Clark County, NV
Community Nos.: 320005 and 320003

316-AD

Dear Mr. Eubanks:

This responds to your submittal dated April 15, 2005, concerning a June 3, 2004, request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Clark County, Nevada and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Pittman Wash, Vicinity of Eastern Avenue and 215 Beltway
Flooding Sources:	Pittman Wash and Tributaries
FIRM Panel(s) Affected:	32003C2590 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.

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 timeframe, 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

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. Dave Betley, P.E.
Principal Engineer
Civil Engineering Division
Department of Public Works
Clark County

Mr. Curt Chandler, P.E., CFM
Land Development Manager
City of Henderson

Mr. Matthew S. Baird, P.E., CFM
PBS&J

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

Summary of Additional Data Required to Support a
Letter of Map Revision

Case No.: 04-09-1194P

Requester: Mr. Kevin Eubanks, P.E., CFM

Communities: City of Henderson and Clark County, NV

Community Nos.: 320005 and 320003

The issues listed below must be addressed before we can continue the review of your request.

1. From the submitted information, it is not clear what type and size of culvert extends from just downstream of Eastern Avenue to just downstream of Southfork channel along East Tributary to Pittman Wash (East Tributary). Please provide a hydraulic analysis that accounts for head losses and as-built plans, certified by a registered professional engineer or land surveyor, for the above-mentioned culvert.

2. The submitted hydraulic analysis for the trapezoidal channel between Eastern Avenue and Silverado Ranch Boulevard along East Tributary included three identical cross sections (C1, C2, and C3), and Cross Sections C2 and C3 do not reflect the submitted topographic work map. In addition, no as-built plans were provided for the trapezoidal channel. Please provide as-built plans, certified by a registered professional engineer or land surveyor, for the trapezoidal channel between Eastern Avenue and Silverado Ranch Boulevard, and update the hydraulic analysis so that all the cross sections reflect the as-built plans.

3. The submitted plans entitled "Improvement Plans for Southern Segment Las Vegas Beltway, Section 3B, Eastern Avenue to Pecos Road," prepared by Louis Berger & Associates, Inc., dated June 13, 1996, were reduced to an unknown scale and did not contain the inlet and outlet elevations for all the culverts under the Interstate Highway 215 (I-215) Beltway. Please provide as-built plans, drawn at an accurate scale, that include the inlet and outlet elevations for all the culverts under I-215 and that are certified by a registered professional engineer or land surveyor.

4. From the submitted information, it is not clear how the floodplain for Tributary 1 of East Tributary would be removed. The submitted hydraulic analysis, which included only one cross section on Norridgewock Street, is not extensive enough to warrant the removal of the floodplain along Tributary 1 of East Tributary. Please provide a hydraulic analysis that demonstrates how the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for Tributary 1 of East Tributary would be conveyed to Norridgewock Street.

5. The submitted hydraulic analysis for East Tributary shows water-surface elevations (WSELs) higher than the end points of Cross Sections V and W. The use of vertically extended cross sections might both overestimate the WSELs and underestimate the width of the base floodplain. Please revise the submitted hydraulic analysis for East Tributary to include additional ground elevation data at the cross sections to eliminate all "cross section extended" warnings, or provide a hydraulic analysis to show how much flow will leave these cross sections and provide a topographic work map to show the extent of flooding at these locations.

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.

APPENDIX B

Certification Letter
Culvert Design Plans
Survey Exhibit
Flowmaster Calculations
WSPG Model

July 18, 2005

Mr. Mike Godesky, P.E.
Project Engineer – Region IX
Federal Emergency Management Agency
Mitigation Division
500 C Street, SW
Washington, DC 20472

RE: AS-BUILT CERTIFICATION FOR LETTER OF MAP REVISION APPLICATION FOR PITTMAN WASH
PBS&J REFERNCE NO.: 511542.00

Dear Mr. Godesky,

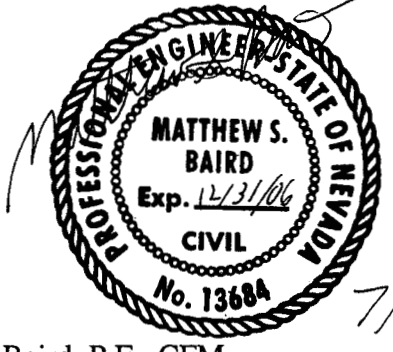
I herby certify that the culverts under Eastern Avenue along the East Tributary of the Pittman Wash were built in substantial conformance with the design plans titled "Improvement Plans for Lake Mead/Eastern, Phase I – Drainage Channel" dated 7/23/99 as verified through field inspection and field survey, which is included with this document.

I herby certify that the hydraulic analysis submitted in this document for the channel downstream of the Eastern Avenue culverts along the East Tributary of the Pittman Wash is an accurate representation of current field conditions for the channel and was prepared in substantial conformance with the field survey data included in this document.

I herby certify that the culverts under the I-215 Beltway east of Eastern Avenue along the East Tributary of the Pittman Wash were built in substantial conformance with the plans titled "Improvement Plans for Southern Segment Las Vegas Beltway, Section 3B, Eastern Avenue to Pecos Road" dated June 13, 1996 as verified through field inspection and field survey, which is included with this document.

Sincerely,

PBS&J



7/18/05

Matthew S. Baird, P.E., CFM
Lic. 13684, Nevada

IMPROVEMENT PLANS

FOR

LAKE MEAD / EASTERN
PHASE I - DRAINAGE CHANNEL

CITY OF HENDERSON
AND
CLARK COUNTY
STATE OF NEVADA

CLARK COUNTY FIRE DEPARTMENT GENERAL NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CLARK COUNTY ORDINANCE #1167, NFPA 624, 1987 EDITION OF THE UNIFORM FIRE CODE, 1988 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 PLACE A HYDRANT OUT OF SERVICE, THE CLARK COUNTY FIRE DEPARTMENT MUST BE CONTACTED.
4. PAINTING OF CURBS AND/OR STRIPPING OF ASPHALT AREAS AND PROTECTION OF HYDRANTS FROM PHYSICAL INJURY, PER FIRE INSTALLATION SPECIFICATIONS OF THE CLARK COUNTY CODE.
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 PLANTER 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 LAND 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 SECTION 13.64.130C(3) OF CLARK COUNTY ORDINANCE #1167, MUST BE PROVIDED BEFORE FINAL HYDRANT ACCEPTANCE CAN BE ATTAINED.

CLARK COUNTY SANITATION DISTRICT GENERAL NOTES

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

GENERAL NOTES FOR CLARK COUNTY

1. ALL ELEVATIONS SHOWN HEREON WITHIN LANDSCAPED AREAS ARE 0.50 FEET BELOW FINAL FINISH GRADES TO ALLOW FOR THE ADDITION OF LANDSCAPING MATERIALS ATOP THESE ROUGH GRADES.
2. ALL LOTS ARE TO BE FAA TYPE "A" DRAINAGE UNLESS OTHERWISE NOTED.
3. SEE IMPROVEMENT PLANS FOR STREET SECTIONS AND DETAILS. SEE FINAL MAP FOR EXACT BEARINGS AND DISTANCES.
4. CONTRACTORS SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND SHALL REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.
5. ALL GRADING AND SITE PREPARATION SHALL CONFORM TO THE REQUIREMENTS OF THE GEOTECHNICAL INVESTIGATION PREPARED BY: TERRACON, 9-6495096, DATED APRIL 29, 1998.
6. ALL WORK PERFORMED OUTSIDE OF THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENT HAVE BEEN OBTAINED FROM THE OFFSITE OWNER.
7. ALL WORK PERFORMED WITHIN PUBLIC RIGHT-OF-WAY AND OUTSIDE OF THE PROJECT BOUNDARY SHALL BE PERFORMED UNDER A SEPARATE ENCROACHMENT PERMIT ISSUED BY THE CONTROLLING AUTHORITY.
8. FINISH FLOOR ELEVATION = PAD ELEVATION +1'.
9. ALL STATIONING ON GRADING PLAN IS CENTERLINE STATIONING UNLESS OTHERWISE NOTED.
10. THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY ENGINEER AND INTENDED SOLELY AS A GENERAL GUIDELINE FOR CONSTRUCTION. ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS AND ORDINANCES, INCLUDING BUT NOT LIMITED TO THE FEDERAL FAIR HOUSING AMENDMENTS ACT, AMERICANS WITH DISABILITIES ACT, THE ARCHITECTURAL BARRIERS ACT AND ANY APPLICABLE UNIFORM STANDARDS, SPECIFICATIONS OR BRAVINGS. THE PERSON OR ENTITY PERFORMING THE CONSTRUCTION SHALL BE SOLELY RESPONSIBLE TO MAKE SURE CONSTRUCTION IS IN CONFORMANCE WITH ALL LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS, STANDARDS, GUIDELINES AND ORDINANCES AND FURTHER, IS IN CONFORMANCE WITH ANY APPLICABLE DESIGN CRITERIA, INCLUDING BUT NOT LIMITED TO SOILS REPORTS, ARCHITECTURAL PLANS AND SPECIFICATIONS, DRAINAGE PLANS OR STUDIES AND ANY OTHER CRITERIA, STANDARDS OR REQUIREMENTS LISTED IN THE PLANS OR THE GENERAL NOTES RELATED TO THESE PLANS OR PROVIDED BY ANYONE IN REFERENCE TO THIS PROJECT.

"Approval of these plans by the City of Henderson is limited to those improvements constructed in the dedicated right-of-way and/or dedicated easement. This approval does not authorize the construction of any improvements that deviate from adopted standards and/or specifications except those specifically identified as "Deviations from Standard". The Engineer shall receive any deviation other than those listed in "Deviations from Standard" in favor of the Uniform Standard Drawings and Specifications Clark County Area Nevada."

"OWNER RESPONSIBLE TO PROVIDE SURVEY MONUMENTATION AS SHOWN AND TO REPLACE ALL SURVEY MONUMENTATION DAMAGED, DISTURBED, DESTROYED OR OBSCURED DURING CONSTRUCTION."

BENCHMARK
CITY OF HENDERSON BENCHMARK 193:
CLARK COUNTY BENCHMARK 0021-2849:

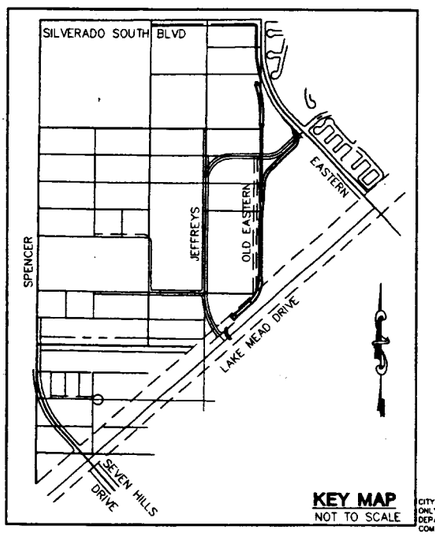
NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD, AT N/W STATION 217+63.78, 1600 ± WEST OF EASTERN AVENUE.

NAVD88 DATUM 880.880 METERS (2263.946 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS, "FAA VOT A" AND "SLOAN".

QUANTITY ESTIMATES (PUBLIC)

EXCAVATION	29,625 C.Y.
CHANNEL	1,626 C.Y.
RCBC's	810 C.Y.
RIP-RAP	9 C.Y.



KEY MAP
NOT TO SCALE

CITY OF HENDERSON GENERAL NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE "UNIFORM STANDARD SPECIFICATIONS AND STANDARD BRAVINGS CLARK COUNTY AREA NEVADA" AND "CLARK COUNTY SUPPLEMENT TO UNIFORM STANDARDS BRAVINGS AND SPECIFICATIONS", LATEST REVISION.
2. APPLICATION FOR INSPECTION BY THE CITY OF HENDERSON PUBLIC WORKS SHALL BE MADE BY THE CONTRACTOR AT LEAST 24 HOURS BEFORE THE INSPECTION SERVICES WILL BE REQUIRED, 565-2136 OR 565-2140.
3. WORK IN THE PUBLIC STREETS, ONCE BEGUN, SHALL BE PROSECUTED TO COMPLETION WITHOUT DELAY SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.
4. THE CONTRACTOR SHALL TAKE ALL NECESSARY AND PROPER PRECAUTIONS TO PROTECT ADJACENT PROPERTIES FROM ANY AND ALL DAMAGE THAT MAY OCCUR FROM STORM WATER RUN-OFF AND/OR DEPOSITION OF DEBRIS RESULTING FROM ANY AND ALL WORK IN CONNECTION WITH SUBDIVISION CONSTRUCTION.
5. PRIOR TO FINAL ACCEPTANCE, BONS RELEASES, AND A CERTIFICATE OF OCCUPANCY, A CERTIFIED LEGIBLE AS-BUILT BRAWING MUST BE SUBMITTED TO THE CITY OF HENDERSON. AS-BUILT MUST SHOW ALL CHANGES AND ACTUAL FIELD LOCATIONS. IN THE ABSENCE OF CHANGES, A COPY OF APPROVED BRAWINGS WILL BE REQUIRED STATING "INSTALLED AS PER BRAWINGS" AND CERTIFIED AS SUCH BY THE DEVELOPER'S ENGINEER.
6. APPROVAL OF THESE PLANS IS FOR THE CONSTRUCTION OF OFFSITE IMPROVEMENTS ONLY. ALL ONSITE IMPROVEMENTS, AS DEFINED BY THE CITY OF HENDERSON, INCLUDING BLOCK WALLS, MUST BE APPROVED BY THE BUILDING AND PLANNING DIVISIONS OF THE CITY OF HENDERSON.
7. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND INGRESS AND EGRESS TO SAID CONSTRUCTION. EXTENT OF THE TRANSITIONS TO BE DETERMINED BY THE CITY ENGINEER.
8. EXISTING UTILITIES ARE LOCATED ON PLANS FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR THE PROTECTION OF UTILITIES AND THE ENGINEER BEARS NO RESPONSIBILITY FOR UTILITIES NOT SHOWN ON THE PLANS OR NOT IN THE LOCATION SHOWN ON THE PLANS. THIS INCLUDES ALL SERVICE LATERALS OF ANY KIND.
9. POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO THE CITY OF HENDERSON.
10. WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD BRAVING NO. 220. EXACT LOCATION OF RAMPS SHALL BE DETERMINED IN THE FIELD BY A CITY INSPECTOR, OR AS SHOWN ON PLAN.
11. CURB AND GUTTER WITH GRADE OF LESS THAN FIVE-TENTHS OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
12. ALL GRADING SHALL CONFORM TO THE SOILS REPORT:

    ENGINEER: TERRACON

    DATE: APRIL 29, 1998

    JOB NUMBER 6-9605096
13. EARTHWORK SHALL BE PERFORMED IN ACCORDANCE WITH THE PRELIMINARY GEOTECHNICAL REPORT.
14. ALL STREET STRUCTURAL SECTIONS SHALL BE PER THE RECOMMENDATIONS OF THE SOILS ENGINEER, BASED ON R-VALUE OR R-VALUES. NO PAVING OR BASE WORK SHALL COMMENCE UNTIL A STREET STRUCTURAL SECTION IS APPROVED BY THE CITY ENGINEER, CITY OF HENDERSON.
15. 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 PUBLIC STREETS IMMEDIATELY AFTER THE FIRST GRADING WORK IS ACCOMPLISHED AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "NEVADA TRAFFIC CONTROL MANUAL" - CURRENT EDITION AND TO THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES" - CURRENT EDITION AND BE APPROVED BY THE CITY OF HENDERSON BEFORE CONSTRUCTION BEGINS.
16. WHERE EXISTING PAVEMENT IS CUT TO INSTALL UTILITY SERVICE LINES, BACKFILL AND PAVEMENT REPLACEMENT SHALL BE DONE PER STANDARD BRAVING 380 AND SECTION 286, 287, AND 288 OF THE STANDARD SPECIFICATION ISSUE, 1986.
17. ALL STATIONING IS REFERENCED TO CENTERLINE, EXCEPT AS NOTED.
18. EXACT LOCATION OF ALL SAWCUT LINES SHALL BE DETERMINED IN THE FIELD BY A CITY OF HENDERSON INSPECTOR.
19. PROTECTION AND REPLACEMENT OF SURVEY MONUMENTS OR PROPERTY STAKES NOT DELINEATED ON THE CONTRACT BRAVINGS SHALL BE THE CONTRACTOR'S RESPONSIBILITY. REPLACEMENT OF SURVEY MONUMENTS OR PROPERTY STAKES SHALL BE DONE TO THE CITY OF HENDERSON SURVEY SECTION'S SATISFACTION.
20. AFFECTED UTILITY COMPANIES SHALL BE NOTIFIED AT LEAST TWO (2) WORKING DAYS PRIOR TO COMMENCEMENT OF CONSTRUCTION.
21. CALL BEFORE YOU DIG, 1-800-227-2600
22. MODIFICATIONS TO EXISTING UTILITIES SHALL CONFORM TO THE OWNERS UTILITY STANDARDS AND SPECIFICATIONS.
23. THE CONTRACTOR SHALL TAKE REASONABLE MEASURES TO PROTECT EXISTING IMPROVEMENTS FROM DAMAGE AND ALL SUCH IMPROVEMENTS DAMAGED BY THE CONTRACTOR'S OPERATION SHALL BE REPAIRED OR RECONSTRUCTED TO THE CITY ENGINEER'S SATISFACTION AT THE EXPENSE OF THE CONTRACTOR.
24. ALL OFFSITE AND ONSITE WATER AND SEWER FACILITIES UP TO WITHIN 5 FEET OF BUILDINGS SHALL BE CONSTRUCTED TO PUBLIC WORKS STANDARDS OFOR APARTMENT BUILDINGS AND COMMERCIAL PROJECTS ONLY).
25. IF SEWER OR WATER LINES WITHIN THE PUBLIC UTILITY EASEMENTS REQUIRE REPAIRS, ALL SUCH REPAIRS WILL BE DONE IN ACCORDANCE WITH PUBLIC WORKS DEPARTMENT STANDARDS. CURBS AND GUTTERS AND SPECIAL PAVING REPAIRS SHALL BE THE RESPONSIBILITY OF THE HOMEOWNER'S ASSOCIATION.

SOUTHERN NEVADA WATER AUTHORITY — 11/23/99 DATE

CCPW GENERAL NOTES

1. EXACT LOCATION OF ALL SAW-CUT LINES SHALL BE DETERMINED IN THE FIELD BY A CLARK COUNTY INSPECTOR.
2. CURB AND GUTTER WITH A GRADE OF LESS THAN 4/10 OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
3. FINAL ASPHALTIC CONCRETE (AC) PAVEMENT SURFACES SHALL BE ONE-HALF(1/2") INCH ABOVE THE LIP OF THE GUTTER (INCLUDING OPEN GRADE).
4. ALL OFF-SITE IMPROVEMENT CONSTRUCTION SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS AND STANDARD DRAWINGS CLARK COUNTY AREA NEVADA CLARK COUNTY SUPPLEMENT TO UNIFORM STANDARD DRAWINDS AND SPECIFICATIONS , LATEST REVISION.
5. PRIVATE STREETS , CURB & GUTTER AND VALLEY GUTTERS REFLECTED ON THESE PLANS ARE TO BE INSPECTED BY A CLARK COUNTY INSPECTOR.

SHEET INDEX

1. COVER SHEET
2. CHANNEL PROFILE–NORTH LAKE MEAD
3. CHANNEL PROFILE–OLD EASTERN
4. CHANNEL PROFILE–NORTH REACH
5. CHANNEL PROFILE–NORTH REACH
6. CHANNEL PROFILE–EAST REACH
7. CHANNEL PROFILE–EAST REACH
8. SECTION DETAIL SHEET
9. TYPICAL DETAILS
10. CHANNEL DETAILS
11. HEADWALL DETAILS
12. RCB TRANSITION DETAILS

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____ 20__

KEN Y. KOSHIRO P.E. — DATE
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

LEGEND

FG	FINISH GRADE
FL	FLOW LINE
TC	TOP OF CURB
TRC	TOP OF ROLL CURB
EP	EDGE OF PAVEMENT
FUT.	FUTURE
EX	EXISTING
VG	VALLEY GUTTER
NG	NATURAL GROUND
H.P.	HIGH POINT
L.P.	LOW POINT
C/L	CENTER LINE
O/C	OFFSET CROWN
BC	BACK OF CURB
BCR	BEGIN CURB RETURN
TF	TOP OF FOOTING
GB	GRADE BREAK
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
PRC	POINT OF REVERSE CURVATURE
PCC	POINT OF COMPOUND CURVATURE
BVC	BEGIN VERTICAL CURVE
MVC	MID-POINT OF VERTICAL CURVE
EVC	END VERTICAL CURVE
PRVC	POINT OF REVERSE VERTICAL CURVE
VPI	VERTICAL POINT OF INTERSECTION
TOF	TOP OF CHANNEL/SCARP
TOE	TOE OF CHANNEL/SCARP
TOC	TOP OF CHANNEL
TOB	TOP OF BOX
PP	POWER POLE
TRANS	TRANSITION
RET.	RETAINING
INT.	INTERSECTION
D.C.	DESIGN GRADE

EX. CONTOUR(10' INTERVAL)
EX. CONTOUR(2' INTERVAL)
PROPOSED CONTOUR
SLOPE AND FLOW DIRECTION
EDGE OF EXIST A.C.
SAW CUT & MATCH A.C.
SCARP AREA
PROJECT BOUNDARY LINE
R/W OR P/L
EXIST. IMPROVEMENTS
FUTURE IMPROVEMENTS
CENTER LINE
RETAINING WALL
CONC. BLOCK WALL
EXIST.CONC. BLOCK WALL
EXIST. DIRT ROAD
EXIST. AC
CONSTRUCTION PHASE LINE OR MATCHLINE

OWNER
COMPANY: OLYMPIC NEVADA,INC.
ADDRESS: 3230 SOUTH RAINBOW BLVD SUITE 206
LAS VEGAS, NEVADA 89102
PHONE: (702) 259-6565
CONTACT: ROLLIE STURM

DEVELOPER
COMPANY: DEVELOPERS OF NEVADA
ADDRESS: 7440 W. SAHARA AVE.
LAS VEGAS, NEVADA 89117
PHONE: (702) 822-1460
CONTACT: JOSEPH P. CARBEL

APPROVAL

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____ 20__

Mark T. Calhoun — 12-2-99
MARK T. CALHOUN, P.E. — DATE
DIRECTOR OF PUBLIC WORKS-CITY OF HENDERSON

Curt Chandler — 9-22-99
CURT CHANDLER, P.E. — DATE
FLOOD CONTROL COORDINATOR-CITY OF HENDERSON

Thomas L Dolan FOR J.F.M — 12-1-99
JAMES MADDEN — DATE
FIRE MARSHAL-CITY OF HENDERSON

MICHAEL W. BOUSE — DATE
DIRECTOR, BUILDING AND SAFTEY-CITY OF HENDERSON

Michael A. Segler for KBS — 9.23.99
KURT SEGLER, P.E. — DATE
UTILITIES MANAGER-CITY OF HENDERSON

Jack — 8/20/99
SOUTHWEST GAS CORP. — DATE

9/23/99
NEVADA POWER COMPANY — DATE
This approval is only for the placement and clearance of streetlight and traffic signal installations.

Dan Whitehead — 9-23-99
SPRINT/CENTRAL TELEPHONE — DATE

John — 9-23-99
JOHN E. BARTELS, P.E. — DATE
TRAFFIC ENGINEER-CITY OF HENDERSON

OLYMPIC NEVADA , INC.
CLARK COUNTY,NEVADA
CITY OF HENDERSON, NEVADA

CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

NO.	DATE	BY	REVISION
1			
2			
3			
4			
5			

TITLE: COVER SHEET
PROJECT: LAKE MEAD \ EASTERN PHASE I - DRAINAGE CHANNEL

SEAL: JOSEPH D THOMPSON, CIVIL, No. 7907, STATE OF NEVADA, PROFESSIONAL ENGINEER — 9-23-99

W.O. NO. 5033-FX
BY DLG/DEH
DATE 02/27/98
SCALE HORIZ. NA VERT. NA
SHEET 1 OF 12 SHEETS

H:\CIVIL\JOBS\5033-FX\5033COV.DWG

99-6425

05486

JEFFREYS STREET

PHASE II PHASE I

PT. APN 177-28-701-010

SEE IMPROVEMENT PLANS FOR LAKEMEAD/EASTERN PHASE II-DRAINAGE FACILITIES BY VTN NEVADA

GRADE AT 10.0% MAX. TO MATCH EXIST. GRADE

ACCESS RAMP

CAUTION:
HIGH PRESSURE STEEL GAS CONTACT SOUTHWEST GAS 48 HOURS PRIOR TO START OF CONSTRUCTION CONTRACTOR TO VERIFY LOCATION.

NOTE: TEMPORARY DAYLIGHT CHANNEL TO BE CONSTRUCTED IF PHASE I IMPROVEMENTS ARE CONSTRUCTED PRIOR TO PHASE II IMPROVEMENTS.

TEMPORARY RIP-RAP PROTECTION FROM STA:35+98.29-35+36.29 D50=1' THICKNESS=2' IF PHASE I IMPROVEMENTS ARE CONSTRUCTED PRIOR TO PHASE I IMPROVEMENTS

CUTOFF WALLS 90' O.C.

CAUTION:
HIGH PRESSURE STEEL GAS CONTACT SOUTHWEST GAS 48 HOURS PRIOR TO START OF CONSTRUCTION CONTRACTOR TO VERIFY LOCATION.

CLARK COUNTY

CITY OF HENDERSON

LAKE MEAD DRIVE

CITY OF HENDERSON

8x8 BOX CULVERT IMPROVEMENTS PER IMPROVEMENT PLAN FOR SOUTH FORK AREA 3 INFRASTRUCTURE PHASE I BY V-POINT ENGINEERS

END CULVERT BOX
CL/08 = 2252.21

BEG. CHANNEL = 34+69.29
TOC = 2251.91

EXISTING GROUND
● C/L CHANNEL

E.G.L. 1

E.G.L. 2

TOP OF CHANNEL

H.G.L. 1
@ I = 6491 CFS

H.G.L. 2
@ I = 2256 CFS

-3.12%

-0.50%

-0.50%

BEG.CHANNEL = 35+98.29
FL = 2244.84

CUTOFF WALLS 90' O.C.

FLOW LINE OF CHANNEL

END CULVERT BOX= 39+91.39
FL = 2244.21

TOP SNWA 90"WATER LINE

10'MIN CLEARANCE

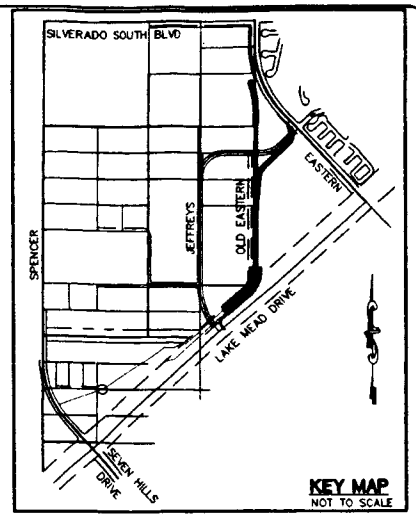
BEG.TRANS./CB = 41+17.51
FL = 2241.80

END TRANS./CB = 41+87.51
FL = 2243.88

MATCHLINE STA: 41+87.51 SEE SHEET 3

2268
2260
2252
2244
2236
2228

33+00 34+00 35+00 36+00 37+00 38+00 39+00 40+00 41+00 42+00



KEY MAP
NOT TO SCALE

BENCHMARK
CITY OF HENDERSON BENCHMARK 183
CLARK COUNTY BENCHMARK DC21-25MB:

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD, AT H/W STATION 217+83.79, 1800 ± WEST OF EASTERN AVENUE.

NAVD88 DATUM 680.680 METERS (2283.946 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS, "FAA VOT A" AND "SLOAN".

FOR ALL DETAILS, NOTES AND SECTIONS SEE SHEETS 8-12

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-8111

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

NOTE: (SNWA)

MINIMUM OF FIVE FEET OF COVER SHALL BE MAINTAINED OVER THE PIPELINE WHERE NECESSARY FOR EQUIPMENT TRAVEL DURING CONSTRUCTION OF THE CHANNEL.

THE VENT FOR THE AIR RELIEF VAULT AND THE CATHODIC PROTECTION TEST STATION BE RELOCATED PRIOR TO EXCAVATION OF THE CHANNEL AND THE DESIGN FOR THE RELOCATION BE APPROVED BY SNWA. IT IS FURTHER RECOMMENDED THE SNWS CATHODIC PROTECTION SPECIALIST BRUCE SMITH, 567-2077 BE NOTIFIED TO BE PRESENT DURING THE RELOCATIONS.

Contractor shall field locate SNWA 110-H access manways, test stations, and location markers and protect.

CONTRACTOR WILL APPROPRIATELY ADJUST ALL SNWA ABOVE GROUND STRUCTURES AND AT GRADE STRUCTURES TO NEW GRADE AT CONTRACTORS EXPENSE. CONTRACTOR TO NOTIFY KRIS GRITTS AT (702) 568-1637 EXTENSION 209 AND DON JACOBSON WITH SNWS AT (702) 564-7697 PRIOR TO CONSTRUCTION ACTIVITY WITHIN LIMITS OF SNWA/SNWS FACILITIES (STATIONS 39+00-65+00)AND PRIOR TO ADJUSTING MANHOLE RINGS AND COVERS.

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
Approved
By [signature] 8/1/99
Authorization of these plans for filing shall not be construed to be a permit for or an approval of any violation of any of the provisions of the state or county laws and/or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted hereon.
NOTE: Prior notice and/or other building facilities not in proper location based on proposed improvements shown hereon will be considered at no expense to Clark County.

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____ 20__

[signature] 10-7-99
REN Y. KOSHIRO P.E. DATE
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597
vtn nevada

REV.	DATE	BY	REVISION
A			
B			
C			
D			

OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

TITLE: CHANNEL PLAN & PROFILES NORTH LAKE MEAD DRIVE

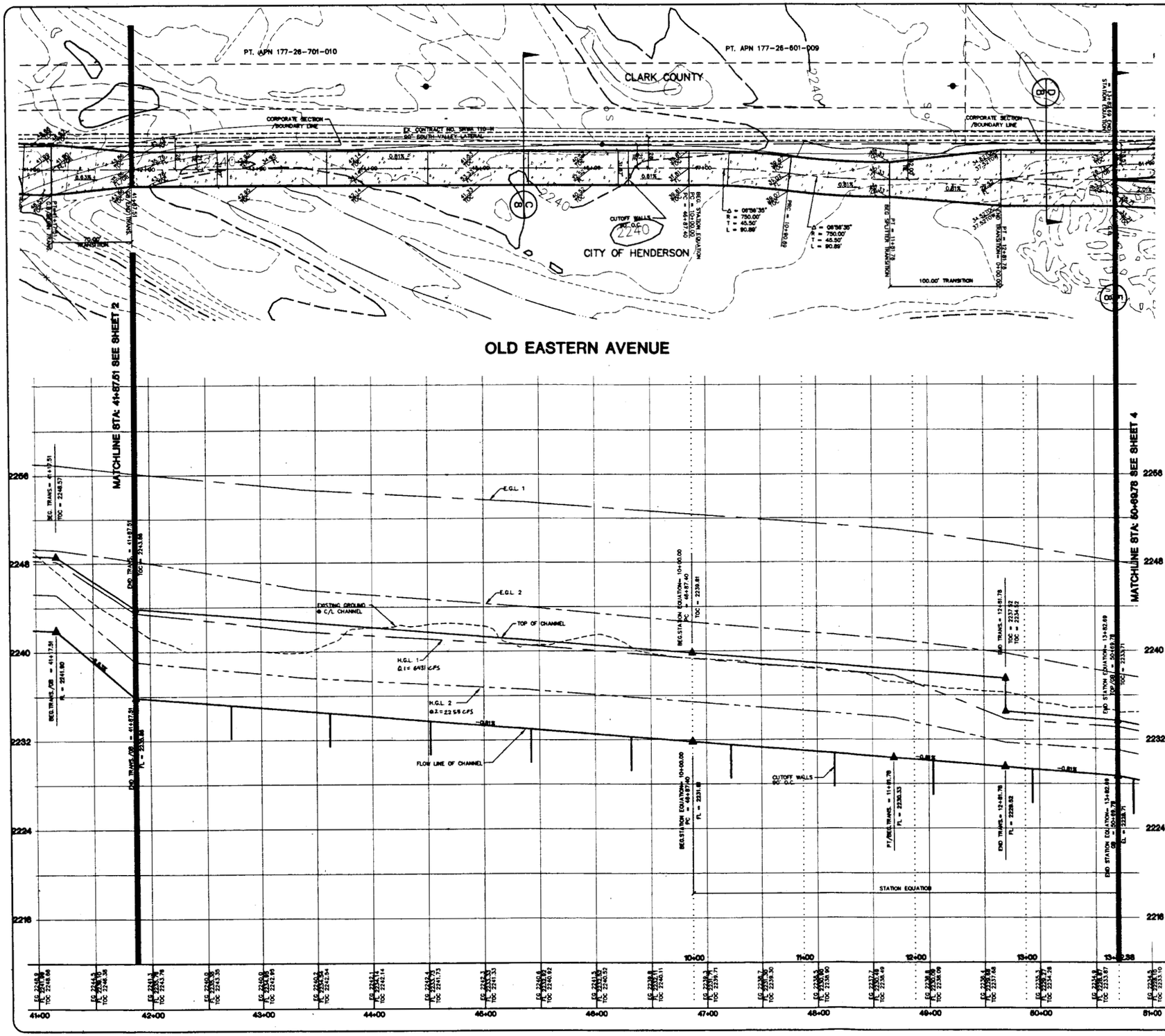
PROJECT: LAKE MEAD / EASTERN PHASE I - DRAINAGE CHANNEL

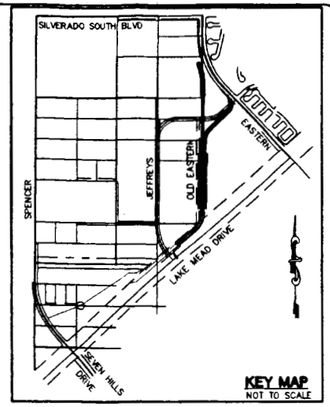
SEAL
REGISTERED PROFESSIONAL ENGINEER STATE OF NEVADA
DONALD D. JACOBSON
CIVIL
No. 7907
7-23-99

W.O. NO. 5033-FX
BY BR/DLG
DATE FEB,1998
SCALE HORIZ. 1"=40'
VERT. 1"=4'
SHEET 2 OF 12 SHEETS

H:\CAD\JAMES\5033-FX\ST-DWG3 (BR-FEB)DLG

05486





BENCHMARK
CITY OF HENDERSON BENCHMARK 183:
CLARK COUNTY BENCHMARK: DC21-2398:

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD, AT H/W STATION 217+83.78, 1800 ± WEST OF EASTERN AVENUE.

NAVD88 DATUM 690.680 METERS (2263.846 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS, "FAA VCT A" AND "SLOAN".

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-6111

GRAPHIC SCALE
1" = 40'

NOTE: (SNWA)

MINIMUM OF FIVE FEET OF COVER SHALL BE MAINTAINED OVER THE PIPELINE WHERE NECESSARY FOR EQUIPMENT TRAVEL DURING CONSTRUCTION OF THE CHANNEL.

THE VENT FOR THE AIR RELIEF VAULT AND THE CATHODIC PROTECTION TEST STATION BE RELOCATED PRIOR TO EXCAVATION OF THE CHANNEL AND THE DESIGN FOR THE RELOCATION BE APPROVED BY SNWA. IT IS FURTHER RECOMMENDED THE SNWS CATHODIC PROTECTION SPECIALIST BRUCE SMITH, 567-2077 BE NOTIFIED TO BE PRESENT DURING THE RELOCATIONS.

Contractor shall field locate SNWA 110-H access manways, test stations, and location markers and protect.

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CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____ 20__.

KEN Y. KOSHIRO P.E. — DATE 12-7-98
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

NO.	DATE	BY	REVISION

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597
vtn nevada

OLYMPIC NEVADA/JNC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

TITLE: CHANNEL PLAN & PROFILES OLD EASTERN AVENUE

PROJECT: LAKE MEAD / EASTERN PHASE I - DRAINAGE CHANNEL

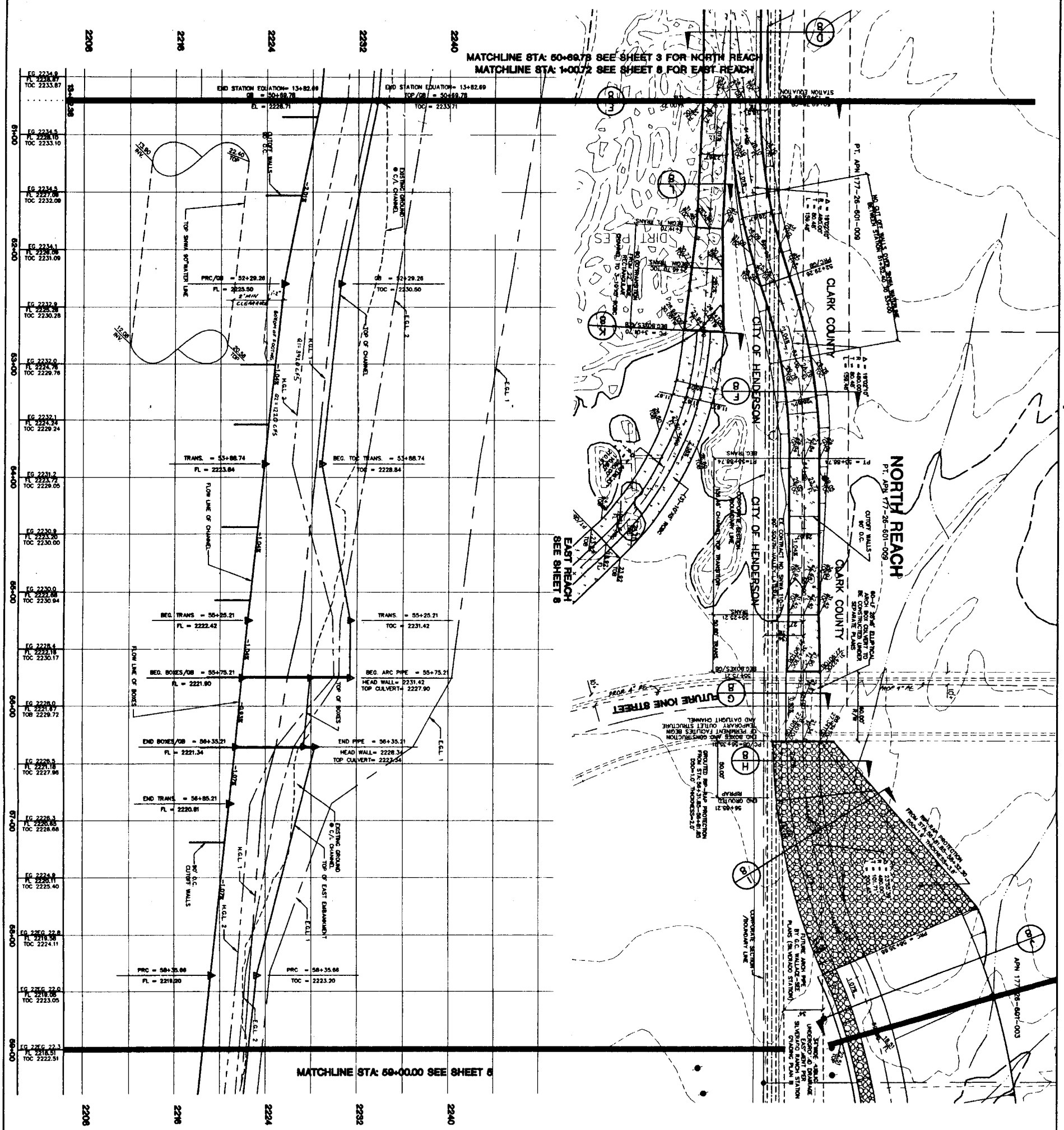
SEAL: REGISTERED ENGINEER STATE OF NEVADA KENNETH D. THOMPSON CIVIL NO. 11907 — 7-23-99

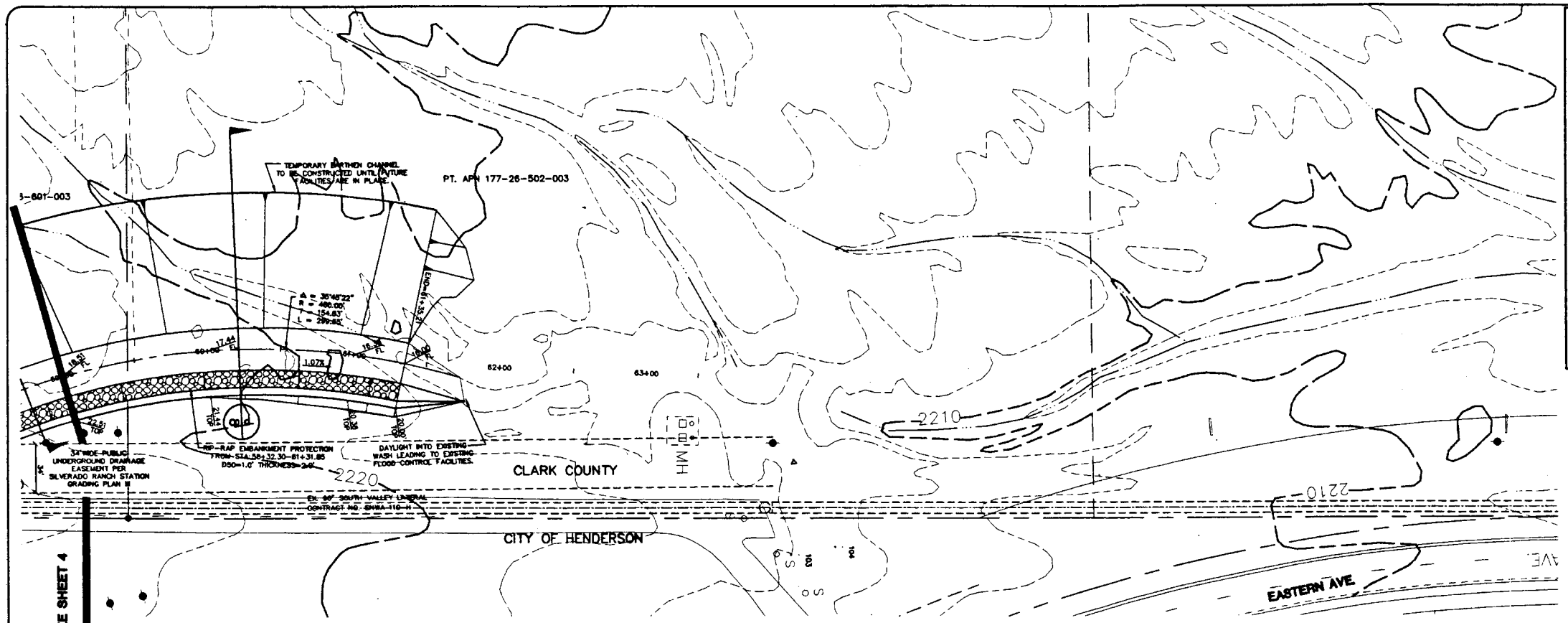
H:\CAD\JANDFX\5033-FX\ST-DWG\S (BR-TOTDLG

W.O. NO.	5033-FX
BY	BR/DLG
DATE	FEB,1998
SCALE	HORIZ. 1"=40' VERT. 1"=4'
SHEET	3 OF 12 SHEETS

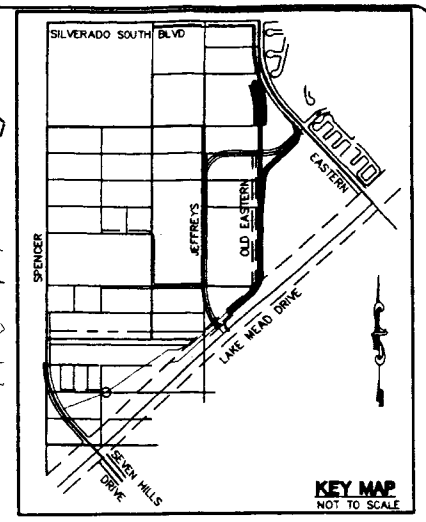
05486

H:\CAD\LANDEV\5033-FX\ST-CHNL2.DWG FRI JUL 23 08:37:14 1999 Plotted By : DLG


MATCHLINE STA: 50+69.78 SEE SHEET 3 FOR NORTH REACH
MATCHLINE STA: 1+00.72 SEE SHEET 8 FOR EAST REACH
MATCHLINE STA: 59+00.00 SEE SHEET 6
EAST REACH SEE SHEET 8
NORTH REACH
CITY OF HENDERSON
CLARK COUNTY
FUTURE IONE STREET
END STATION EQUATION= 13+82.69 BK = 50+69.78 EL = 2228.71
END STATION EQUATION= 13+82.69 TOP/BK = 50+69.78 TOC = 2233.71
PRC/BK = 52+29.26 FL = 2225.50
BK = 52+29.26 TOC = 2230.50
TRANS. = 53+88.74 FL = 2223.84
BEG. TOC TRANS. = 53+88.74 TOC = 2228.84
BEG. TRANS = 55+25.21 FL = 2222.42
TRANS. = 55+25.21 TOC = 2231.42
BEG. BOXES/BK = 55+75.21 FL = 2221.90
BEG. ARC PIPE = 55+75.21 HEAD WALL= 2231.42 TOP CULVERT= 2227.90
END BOXES/BK = 56+35.21 FL = 2221.34
END PIPE = 56+35.21 HEAD WALL= 2228.34 TOP CULVERT= 2223.34
END TRANS. = 56+85.21 FL = 2220.81
PRC = 58+35.68 FL = 2218.20
PRC = 58+35.68 TOC = 2223.20
EXISTING GROUND C/L CHANNEL
TOP OF CHANNEL
TOP OF BOXES
TOP OF EAST EMBANKMENT
FLOW LINE OF CHANNEL
FLOW LINE OF BOXES
H.G.L. 1
H.G.L. 2
E.G.L. 1
E.G.L. 2
CUTOFF WALLS 90' O.C.
TOP SNWA WATER LINE
2' MIN CLEARANCE
BOTTOM OF FOOTING
Q=1239 CFS
Q=1212 CFS
Q=1212 CFS
Q=1212 CFS
-1.00%
-1.04%
-1.05%
-1.07%
-1.07%
-1.08%
-1.08%
-1.08



NORTH REACH



BENCHMARK
CITY OF HENDERSON BENCHMARK 183:
CLARK COUNTY BENCHMARK 0C21-2588:

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD, AT H/W STATION 217+83.78, 1600 ± WEST OF EASTERN AVENUE.

NAVD88 DATUM 690.680 METERS (2283.946 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS, "FAA VGT A" AND "SLOAN".

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig 1-800-227-2600

Call before you OVERHEAD 1-702-593-8111

GRAPHIC SCALE

40 0 20 40 80

1" = 40'

NOTE: (SNWA)

MINIMUM OF FIVE FEET OF COVER SHALL BE MAINTAINED OVER THE PIPELINE WHERE NECESSARY FOR EQUIPMENT TRAVEL DURING CONSTRUCTION OF THE CHANNEL.

THE VENT FOR THE AIR RELIEF VAULT AND THE CATHODIC PROTECTION TEST STATION BE RELOCATED PRIOR TO EXCAVATION OF THE CHANNEL AND THE DESIGN FOR THE RELOCATION BE APPROVED BY SNWA. IT IS FURTHER RECOMMENDED THE SNWS CATHODIC PROTECTION SPECIALIST BRUCE SMITH, 567-2077 BE NOTIFIED TO BE PRESENT DURING THE RELOCATIONS.

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CLARK COUNTY DEPARTMENT OF PUBLIC WORKS

Approved by _____ Date 7/23/98

Approval of these plans by Clark County shall not be construed to be a permit for or an approval of any violation of any of the provisions of the state or county law and/or specifications. Clark County shall be held free from damages which may result from the construction of the improvements from the engineering design depicted herein.

NOTE: Power poles and/or other existing facilities must in proper location based on proposed improvements unless human will be removed at the expense to Clark County.

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____ 20__.

KEN Y. KOSHIRO P.E. — DATE 12-7-99
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

REV.	DATE	BY	REVISION
A			
B			
C			

CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

TITLE: CHANNEL PLAN & PROFILES NORTH REACH

PROJECT: LAKE MEAD / EASTERN PHASE I - DRAINAGE CHANNEL

SEAL

JOSEPH D. JACOBSON — NEVADA No. 11907 — PROFESSIONAL ENGINEER — CIVIL — STATE OF NEVADA — 7-23-98

W.O. NO.	5033-FX
BY	BR/DLG
DATE	FEB.1998
SCALE	HORIZ. 1"=40' VERT. 1"=4'
SHEET	5 OF 12 SHEETS

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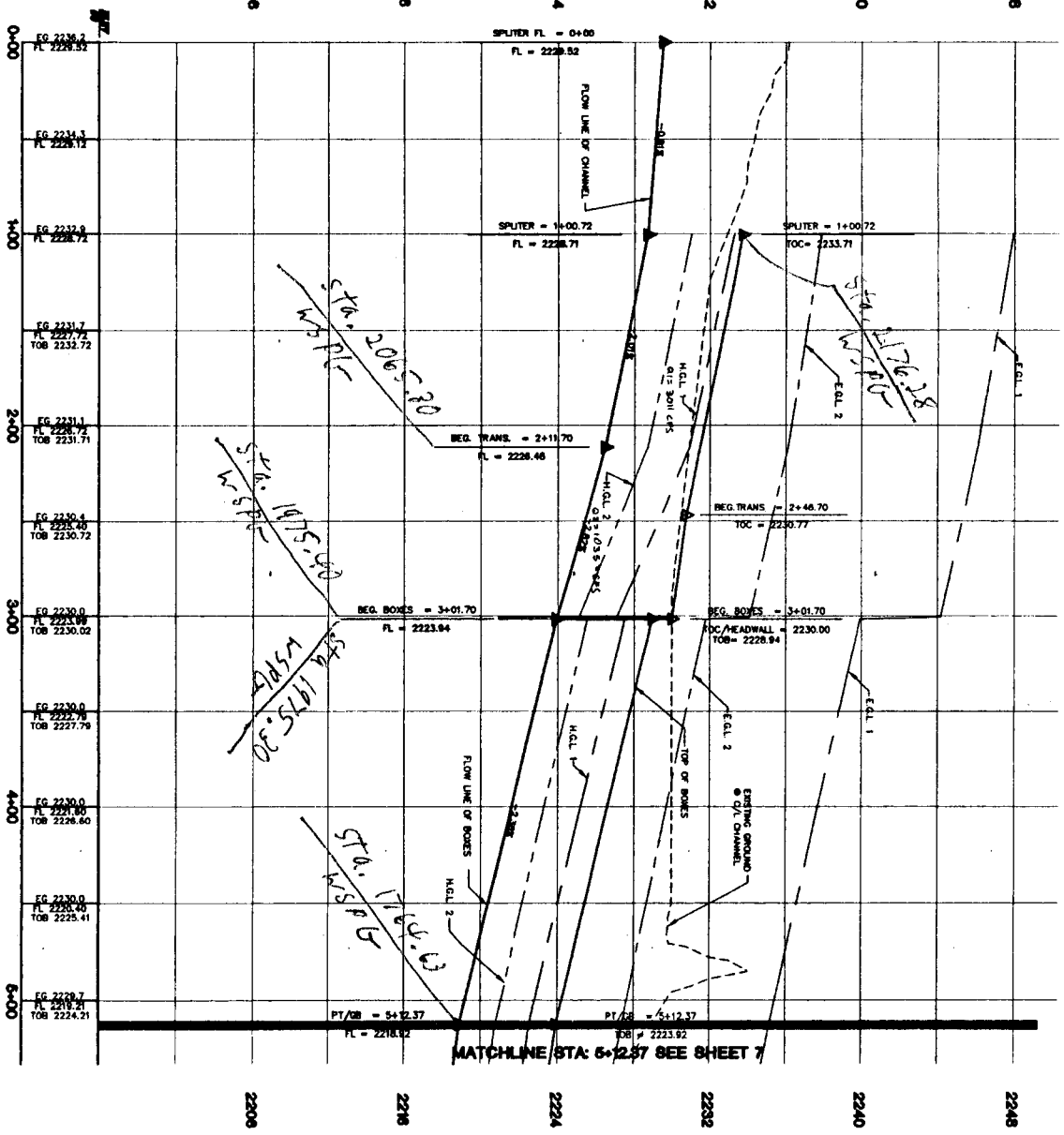
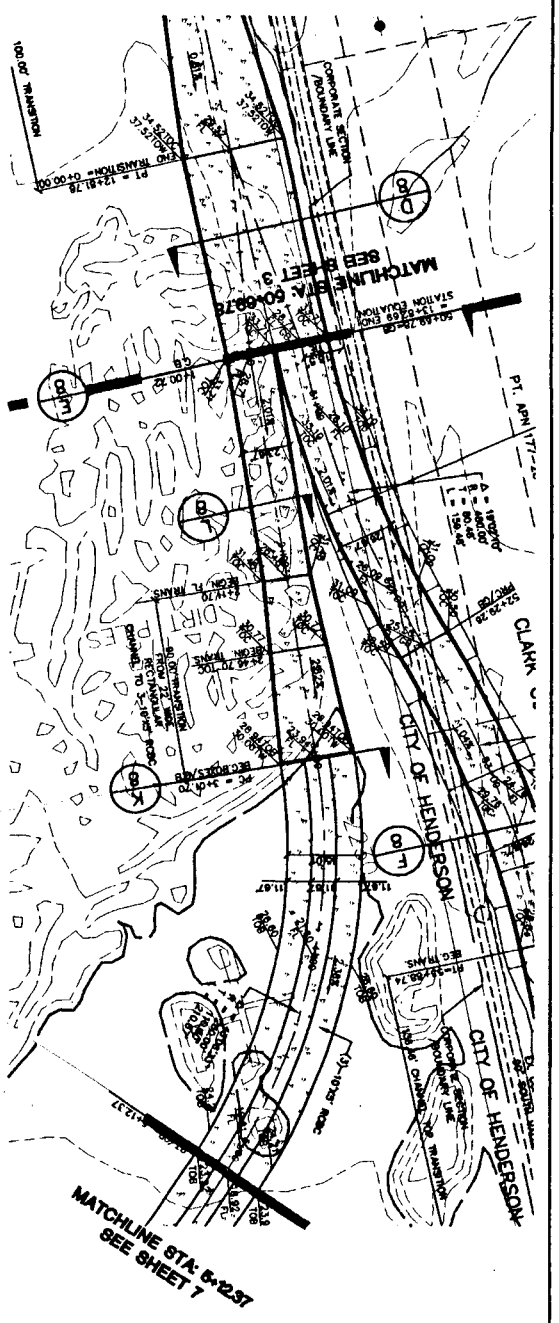
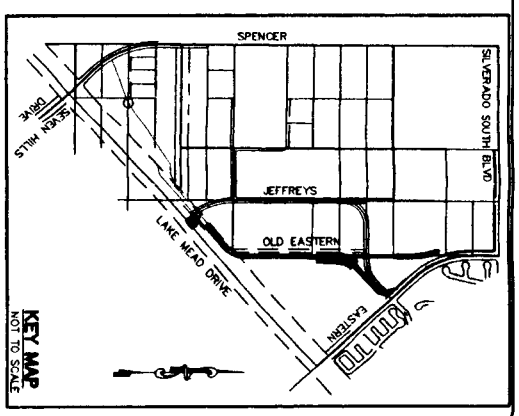




EAST REACH



BENCHMARK
CITY OF HENDERSON BENCHMARK 113.
CLARK COUNTY BENCHMARK DC31-2388.
NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD BLVD. STATION 21+45.79, 1660 ± WEST OF EASTERN AVENUE.
NAVD88 DATUM 660.080 METERS (2283.848 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NAD83) EAST ZONE (1702) AS DETERMINED BY CONTROL POINTS, "TAA VOT A" AND "SLOAN".

NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig OVERHEAD
1-800-227-2600 1-702-593-0111

GRAPHIC SCALE
1" = 40'

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY 2-7-99
TED Y. KOSSORA P.E.
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON
DATE

H:\CAD\LANDEV\5033-FX\ST-CHNL2 (BR-FC7)DLG

SEAL

W.O. NO. 5033-FX
BY BR/DLG
DATE FEB.1998
SCALE HORZ. 1"=40' VERT. 1"=4'
SHEET 6 OF 12 SHEETS

TITLE
CHANNEL PLAN & PROFILES
EAST REACH
LAKE MEAD CULVERT

PROJECT
LAKE MEAD / EASTERN
PHASE I - DRAINAGE CHANNEL

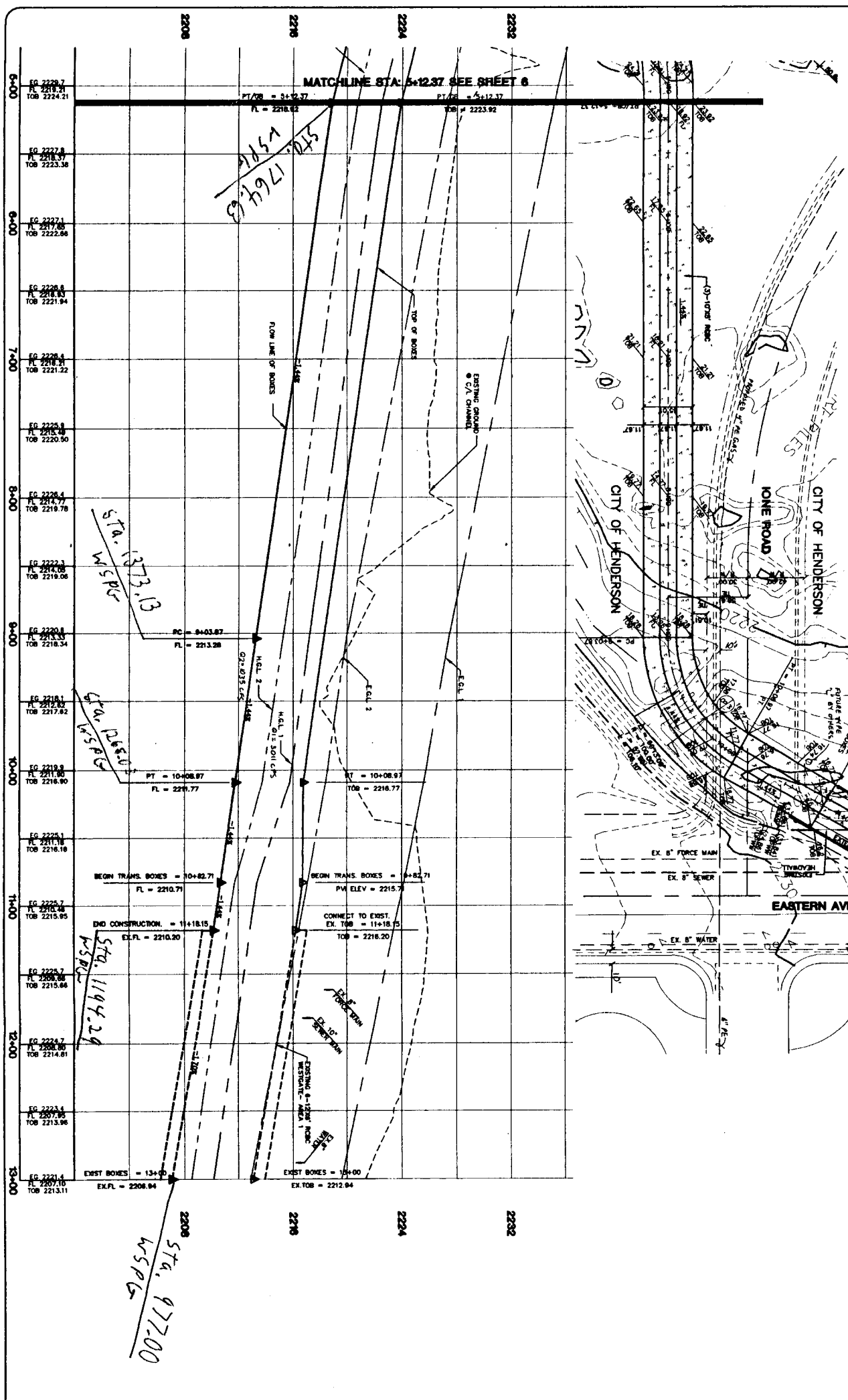
OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

REV.	DATE	BY	REVISION
4			
3			
2			
1			

vtn nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

05486

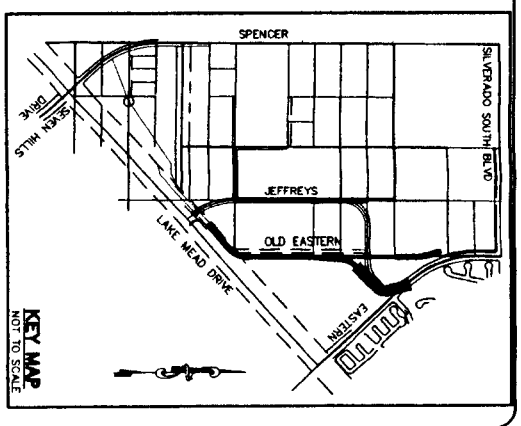
EAST REACH



BENCHMARK
CITY OF HENDERSON BENCHMARK 183:
CLARK COUNTY BENCHMARK QC21-22MR:
NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD, AT H/W STATION 217+83.78, 1800 ± WEST OF EASTERN AVENUE.

NAVD88 DATUM 680.680 METERS (2283.948 FEET)

BASIS OF BEARINGS
THE BASIS OF BEARING FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE, (2701), DETERMINED BY CONTROL POINTS "TAA VCT A" AND "SLOAN".



NOTE: CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

Call before you Dig OVERHEAD 1-800-227-2600 1-702-593-0111

GRAPHIC SCALE
0 20 40 80
1" = 40'

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR APPROVAL IF WORK IS NOT COMPLETED BY _____, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____, 20__.

KEN Y. KOSHIRO P.E.
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

12-7-98
DATE

H:\CAD\LANDEV\5033-FX\ST-CHNL2 (BR-FCB)DLG

W.O. NO.	5033-FX
BY	BR/DLG
DATE	FEB.1998
SCALE HORIZ.	1"=40'
SCALE VERT.	1"=4'
SHEET	7 OF 12 SHEETS

SEAL
PROFESSIONAL ENGINEER STATE OF NEVADA JOSEPH D. THOMASON CIVIL No. 11801 12-31-98

TITLE **CHANNEL PLAN & PROFILES EAST REACH**

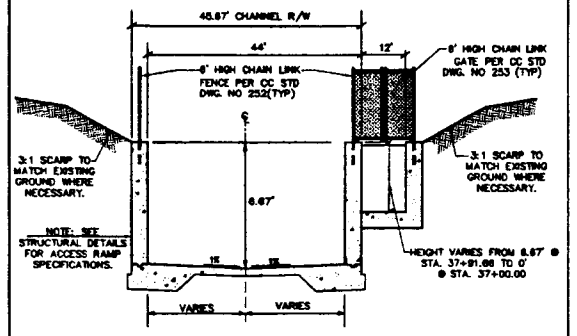
PROJECT **LAKE MEAD / EASTERN PHASE I - DRAINAGE CHANNEL**

OLYMPIC NEVADA,INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

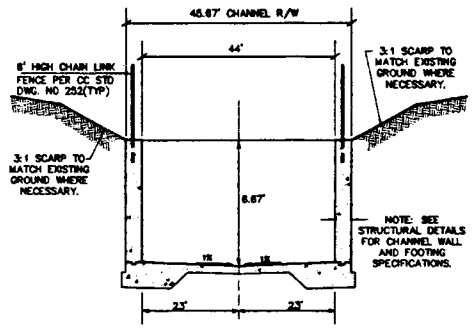
REV.	DATE	BY	REVISION
4			
3			
2			
1			

vtn nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

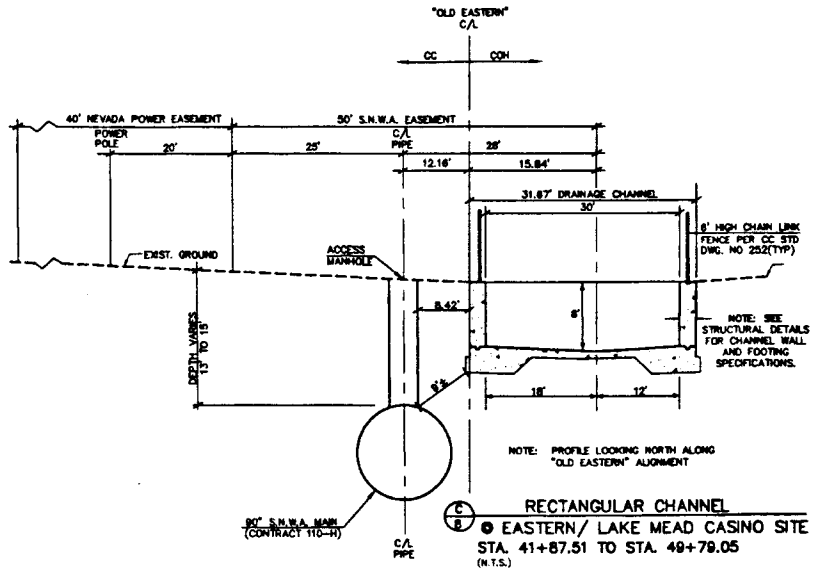
05486



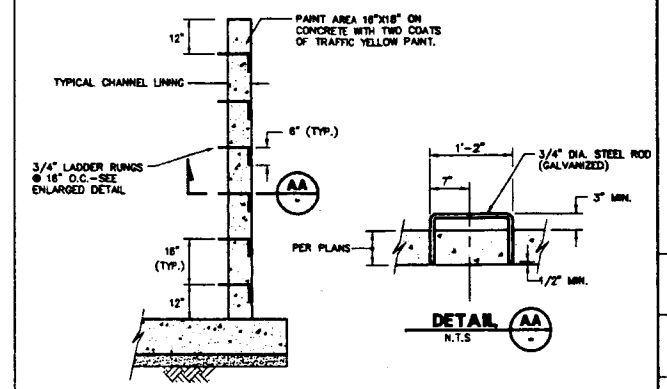
A/B ACCESS RAMP
STA.37+00.00 TO STA. 37+91.66
(N.T.S.)



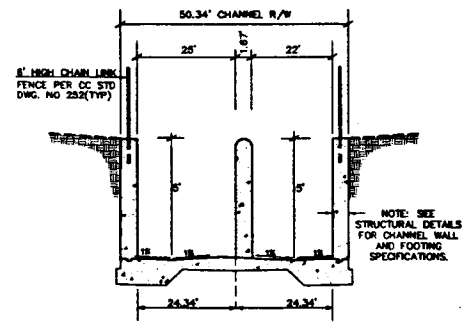
B/B RECTANGULAR CHANNEL
STA. 36+69.29 TO STA. 37+00.00 &
STA. 3791.66 TO STA. 41+17.51
(N.T.S.)



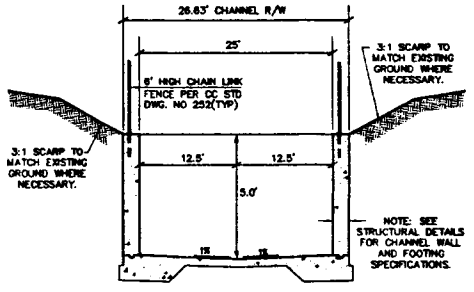
C/B RECTANGULAR CHANNEL
@ EASTERN/ LAKE MEAD CASINO SITE
STA. 41+87.51 TO STA. 49+79.05
(N.T.S.)



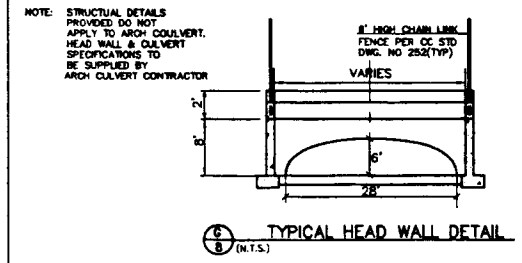
TYPICAL CHANNEL LADDER DETAIL
N.T.S



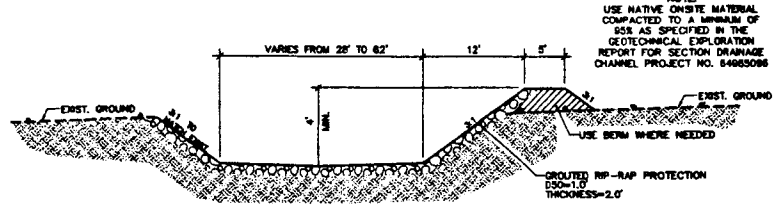
D/B SPLITTER STRUCTURE DETAIL
STA. 50+69.78
(N.T.S.)



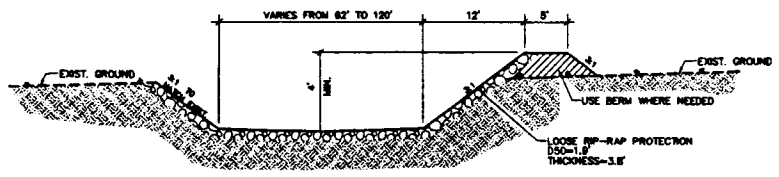
E/B RECTANGULAR CHANNEL
STA. 50+69.68 TO STA. 53+88.74
(N.T.S.)



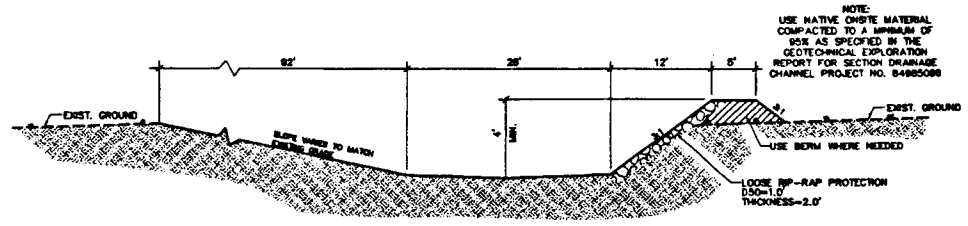
C/B TYPICAL HEAD WALL DETAIL
(N.T.S.)



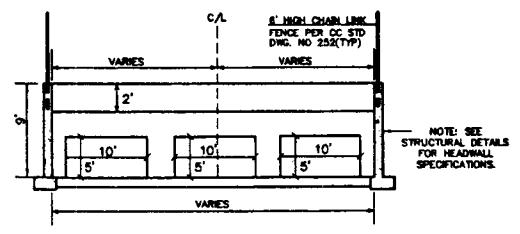
H/B TEMPORARY EARTHEN CHANNEL SECTION
STA. 56+35.21 TO STA. 56+85.21
(N.T.S.)



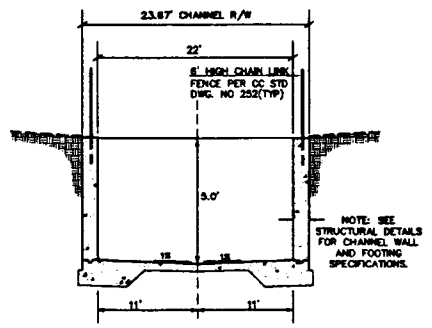
I/B TEMPORARY EARTHEN CHANNEL SECTION
STA. 56+85.21 TO STA. 58+35.66
(N.T.S.)



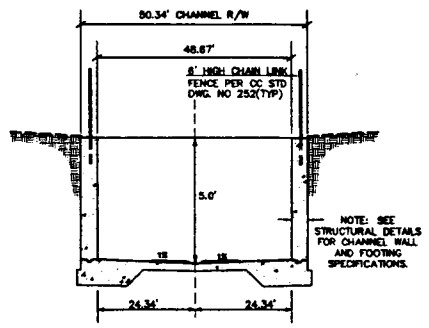
J/B TEMPORARY EARTHEN CHANNEL SECTION
STA. 58+35.66 TO STA. 61+35.21
(N.T.S.)



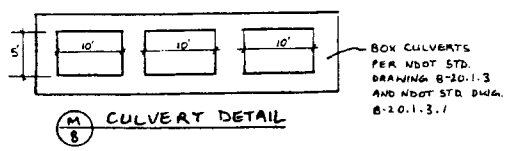
K/B TYPICAL HEAD WALL DETAIL
STA. 2+90.90
(N.T.S.)



L/B RECTANGLUR CHANNEL
STA. 0+91.00 TO STA. 2+02.06
(N.T.S.)



D/B RECTANGLUR CHANNEL
STA. 0+91.00 TO STA. 2+02.06
(N.T.S.)



M/B CULVERT DETAIL

NOTE: SEE SHEET 9 FOR CUTOFF WALL DETAIL

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____, 20__.

12-7-99
KEN Y. KOSHIRO P.E. — DATE
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

H:\CAD\LAKEVS\5033-FX\5033DET08-DET)

OLYMPIC NEVADA, INC.
CITY OF HENDERSON/CLARK COUNTY

NO.	DATE	REVISION
1	8/97	
2		
3		
4		

CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89102-5148 PHONE (702) 873-7550 FAX (702) 362-2597

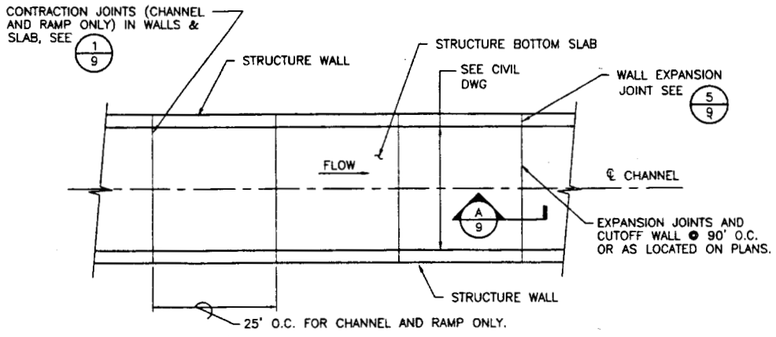
TITLE: SECTION DETAIL SHEET

PROJECT: LAKEMEAD / EASTERN
PHASE I - CHANNEL PLANS

SEAL
CIVIL ENGINEER — STATE OF NEVADA — JOSEPH E. CHAMBERS — No. 7190 — 8-24-99

W.O. NO.	5033-FX
BY	DEH
DATE	02/26/98
SCALE	HORIZ. NO SCALE VERT.
SHEET	8 OF 12 SHEETS

05486

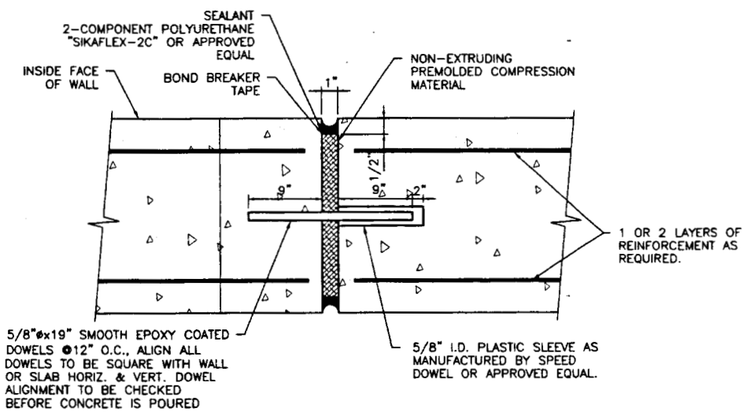


NOTES:

TRANSVERSE JOINTS AROUND CURVES SHALL BE ON RADIAL LINES AT 15' O.C. SPACED ALONG STRUCTURE CENTERLINE.

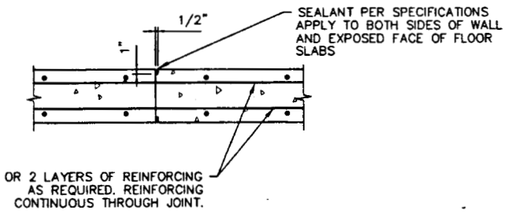
TYPICAL PLAN VIEW FOR JOINTS IN CHANNEL 6/9

SCALE: N.T.S.



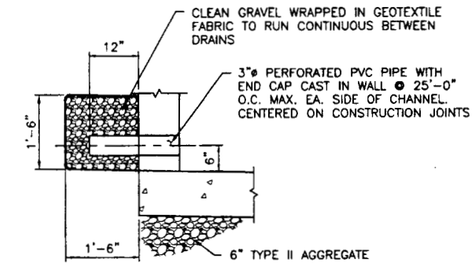
EXPANSION JOINT DETAIL AT WALL & TOP SLAB 5/9

SCALE: N.T.S.



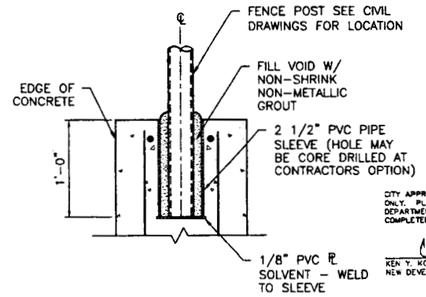
WALL AND SLAB CONSTRUCTION JOINT DETAIL 4/9

SCALE: N.T.S.



WALL DRAIN TYPICAL DETAIL 3/9

SCALE: 3/4" = 1'-0"

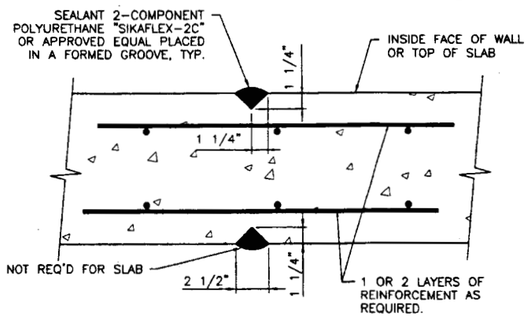


CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____, 20__.

_____ 12-7-98
KEN Y. MOSHIRG P.E. — DATE
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

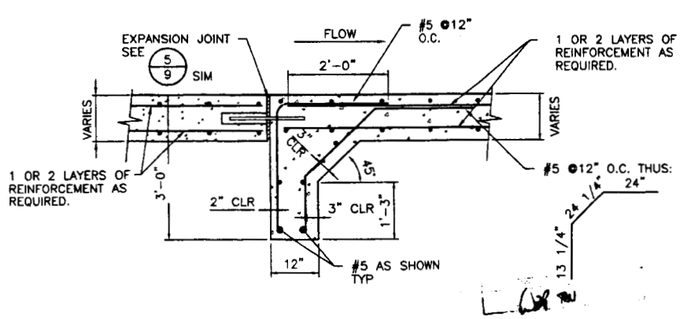
POST EMBEDMENT DETAIL 2/9

SCALE: N.T.S.



CONTRACTION JOINT DETAIL 1/9

SCALE: N.T.S.



EXPANSION JOINT SECTION AT BOTTOM SLAB A/9

SCALE: 3/4" = 1'-0"

GENERAL NOTES:

1. DESIGN CRITERIA: ACI 318-95, AASHTO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 16TH EDITION" DESIGN LIVE LOAD IS AASHTO HS20-44 TRUCK LOADING
2. PORTLAND CEMENT SHALL CONFORM TO A.S.T.M. C-150, TYPE V
3. AGGREGATE SHALL CONFORM TO A.S.T.M. C-33.
4. ALL STRUCTURAL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
5. ALL REINFORCEMENT STEEL SHALL BE ASTM DESIGNATION A615 GRADE 60.
6. COVERAGE FOR REINFORCING BARS, EXCEPT WHERE OTHERWISE SHOWN, SHALL BE: 3" FOR CONCRETE PLACED AGAINST EARTH; 2" FOR OTHERS.
7. DOWELS, PIPES, WATERSTOPS AND OTHER INSTALLED MATERIALS OR ACCESSORIES SHALL BE HELD SECURELY IN POSITION WHILE CONCRETE IS BEING PLACED.
8. ALL KEYWAYS AND CONSTRUCTION JOINTS IN CONCRETE SHALL BE CLEAN FOR BOND. CONSTRUCTION JOINTS BETWEEN FOOTINGS AND WALLS SHALL BE COVERED WITH POLYETHYLENE-COATED BURLAP MATS WHICH SHALL BE KEPT WET WITH WATER UNTIL CONCRETE IN WALLS IS PLACED. NO CURING COMPOUND SHALL BE APPLIED IN CONSTRUCTION JOINTS BETWEEN FOOTINGS AND WALLS.
9. USE 3/4" CHAMFER ON ALL EXPOSED CORNERS.
10. REINFORCING BARS AND ACCRESSORIES SHALL NOT BE IN CONTACT WITH ANY PIPE, PIPE FLANGE OR METAL PART EMBEDDED IN CONCRETE.
11. ALL REINFORCING BAR LAP SPLICES SHALL CONFORM TO AASHTO-15TH EDITION, AND THE ATTACHED TABLE.
12. SPLICE LENGTHS OF DIFFERENT BARS SHALL BE THE SPLICE LENGTH OF THE SMALLER BAR
13. ALL SPLICES SHALL BE TYPE B AND SHALL BE STAGGERED SUCH THAT NO MORE THAN 50 % OF THE BARS IN A LAYER ARE SPLICED WITHIN THE REQUIRED LAP LENGTH IF MORE THAN 50% ARE SPLICED USE TYPE C SPLICE.
14. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12 INCHES OF CONCRETE BELOW THE BAR.

MINIMUM BAR LAPS:

BAR SIZE	LAP CLASS	TOP BARS	OTHER BARS
#3	B	16	12
	C	20	15
#4	B	22	16
	C	29	20
#5	B	27	20
	C	36	26
#6	B	33	23
	C	43	31
#7	B	42	29
	C	55	39
#8	B	55	39
	C	71	51
#9	B	69	49
	C	90	65
#10	B	87	62
	C	114	82

REVISION | BY | DATE | REV

R2H • CB&L ENGINEERING
Planning • Civil • Structural
[illegible]

vtn nevada
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
[illegible]

OLYMPIC NEVADA, INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

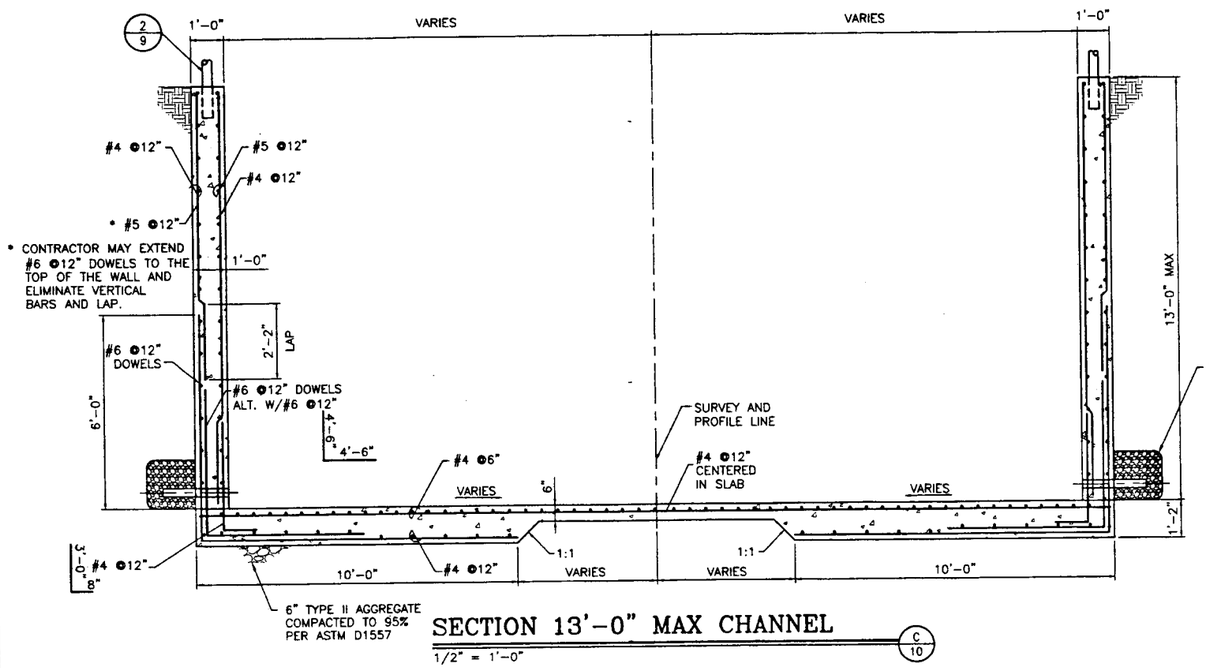
TITLE: TYPICAL DETAILS

PROJECT: LAKE MEAD \ EASTERN
SECTION 26 DRAINAGE CHANNEL

SEAL
PROFESSIONAL ENGINEER — STATE OF NEVADA — DANA A. AMES — No. 10717 — 7-26-99

WO NO. 5033-FC
BY DAA
DATE 11/06/98
SCALE HORIZ. NA VERT. NA
SHEET 9 OF 12 SHEETS

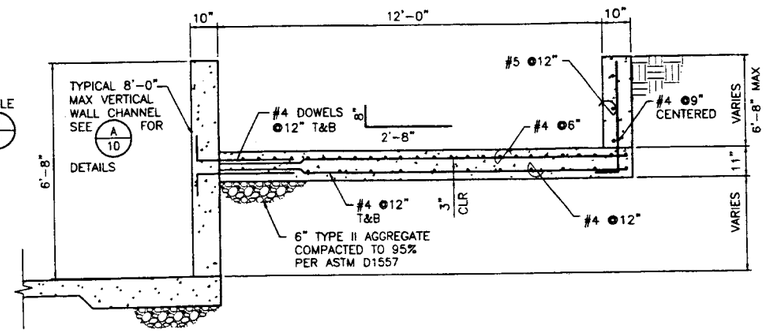
05-4186



SECTION 13'-0" MAX CHANNEL

1/2" = 1'-0"

C/10



SECTION

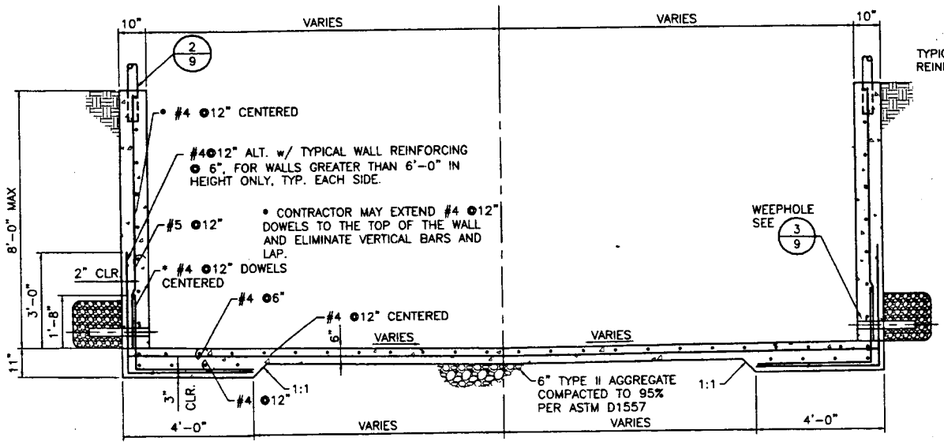
1/2" = 1'-0"

B/10

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____ 20__

KEN Y. KOSHIRO P.E. — DATE 12-7-98

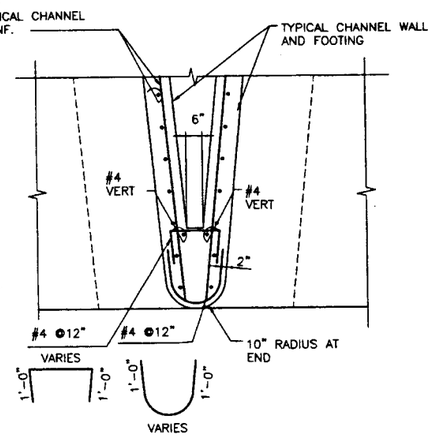
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON



SECTION 8'-0" MAX CHANNEL

1/2" = 1'-0"

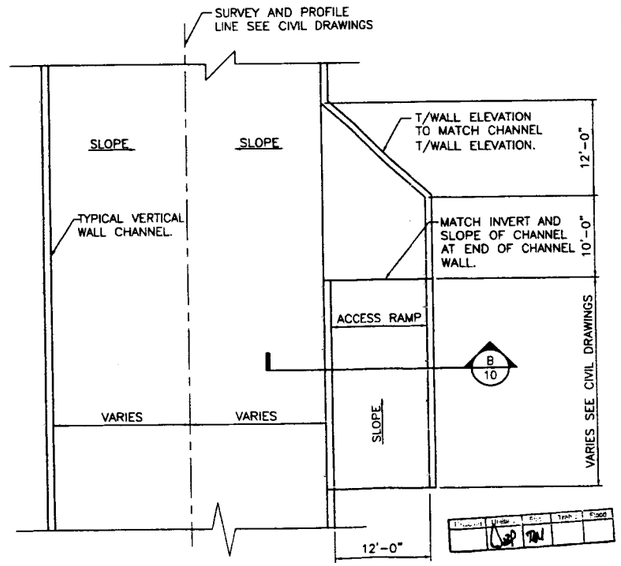
A/10



SPLITTER WALL DETAIL

1/2" = 1'-0"

2/10



ACCESS RAMP AT VERTICAL WALL CHANNELS

1/8" = 1'-0"

1/10

10.DWG

OLYMPIC NEVADA, INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

REV | DATE | BY | REVISION

R2H+GR&L ENGINEERING

vtn nevada

TITLE: CHANNEL DETAILS

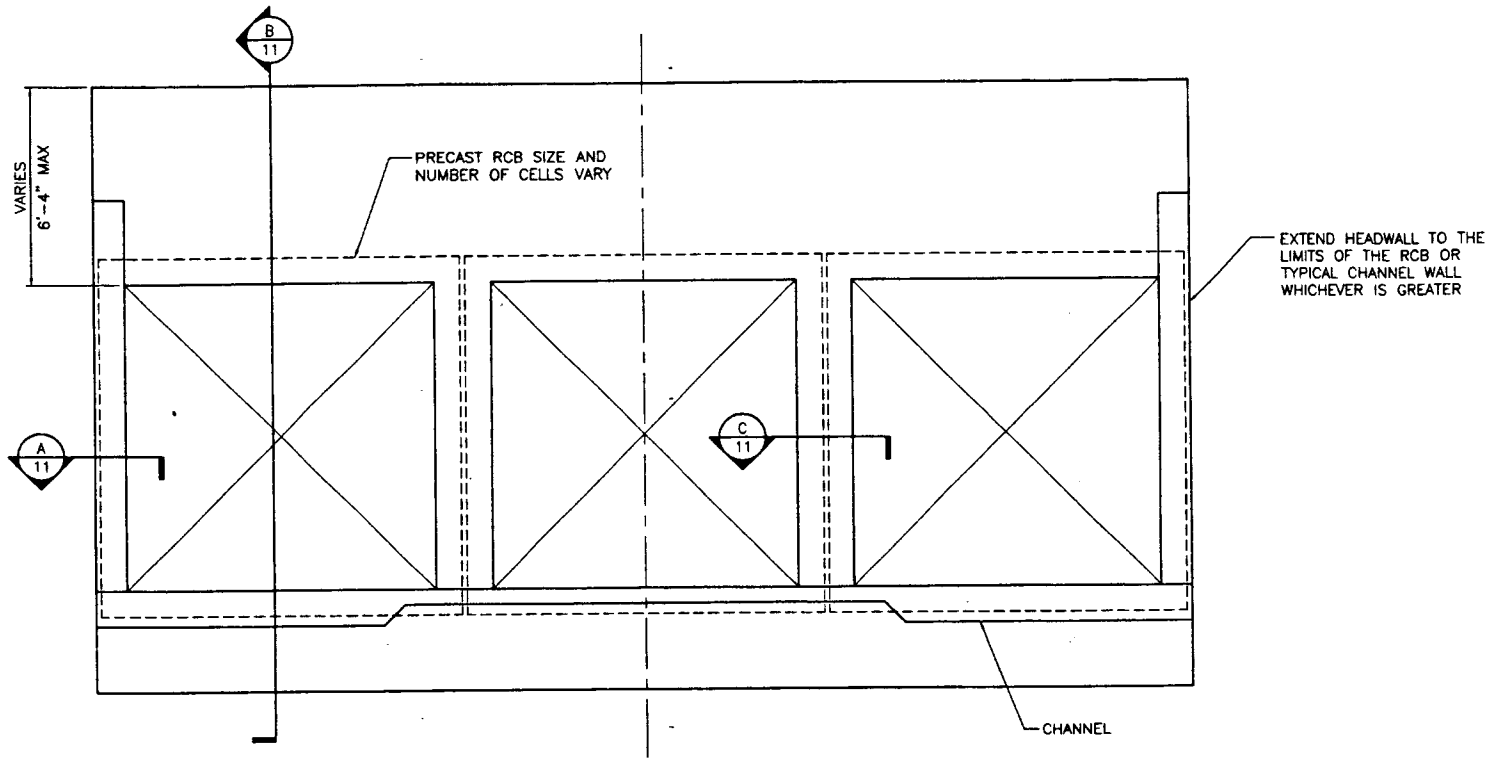
PROJECT: LAKE MEAD \ EASTERN
SECTION 26 DRAINAGE CHANNEL

SEAL

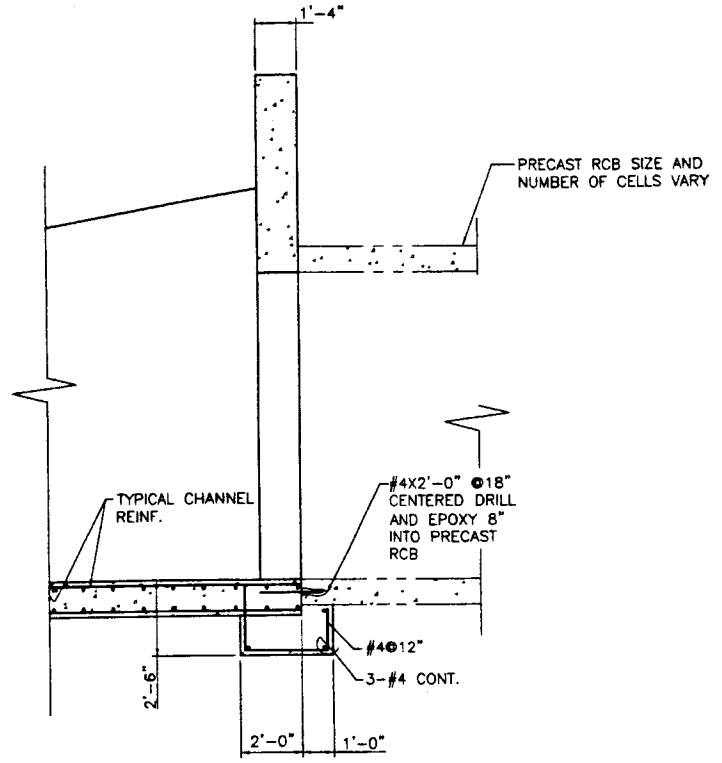
PROFESSIONAL ENGINEER STATE OF NEVADA
DANA A. AMES
CIVIL & STRUCTURAL
No. 10717
12-7-98

WO NO. 5033-FC
BY DAA
DATE 11/06/98
SCALE HORIZ. NA
VERT. NA
SHEET 10 OF 12 SHEETS

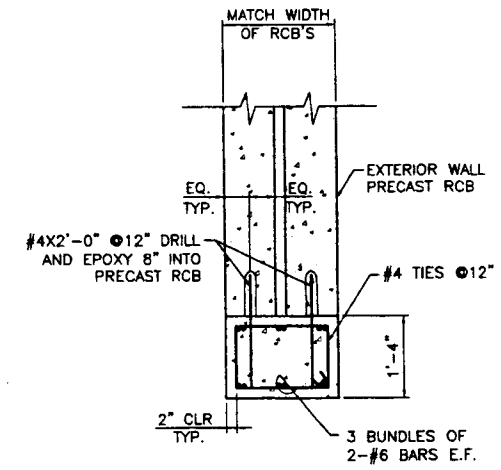
05486



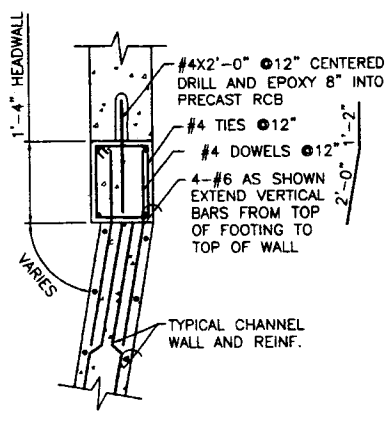
TYPICAL HEADWALL ELEVATION (1/11)
3/8" = 1'-0"



SECTION (B/11)
3/8" = 1'-0"



SECTION (C/11)
1/2" = 1'-0"



SECTION (A/11)
3/4" = 1'-0"

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12-7-98
KEN Y. KOSHIRO P.E. — DATE
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

OLYMPIC NEVADA, INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

vtn nevada

R&H•CB&I ENGINEERING

REVISION | BY | DATE | REV

TITLE: HEADWALL DETAILS

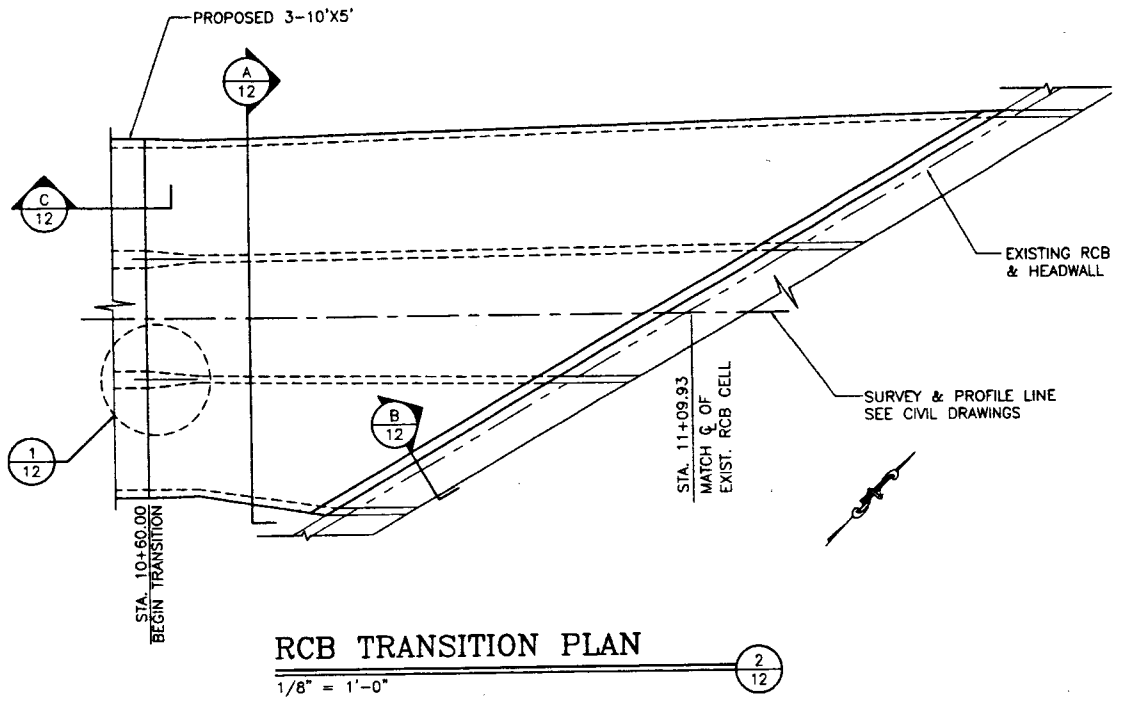
PROJECT: LAKE MEAD \ EASTERN
SECTION 26 DRAINAGE CHANNEL

SEAL
REGISTERED PROFESSIONAL ENGINEER
DANA A. AMES
CIVIL & STRUCTURAL
No. 10712
STATE OF NEVADA

WO NO. 5033-FC
BY DAA
DATE 11/06/98
SCALE HORIZ. NA
VERT. NA
SHEET 11 OF 12 SHEETS

05486

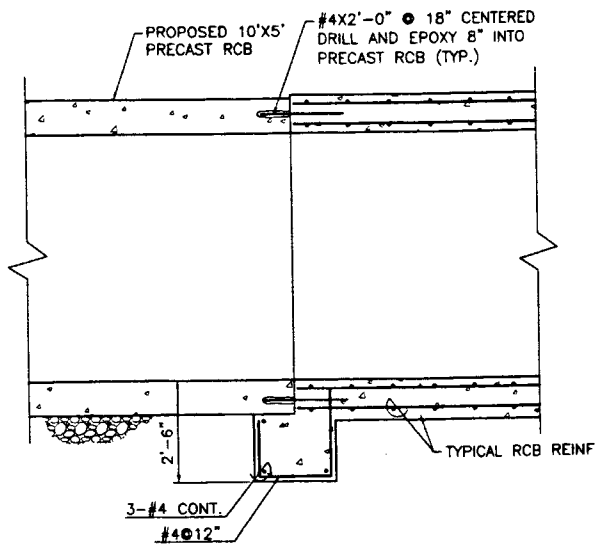
11.DWG



RCB TRANSITION PLAN

1/8" = 1'-0"

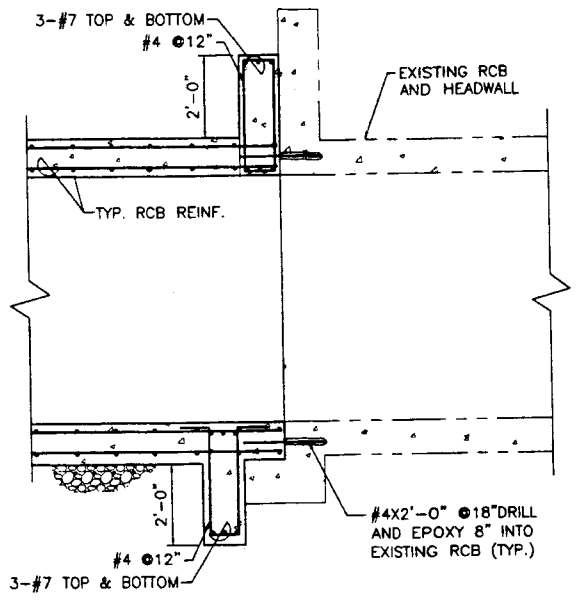
2/12



SECTION

1/2" = 1'-0"

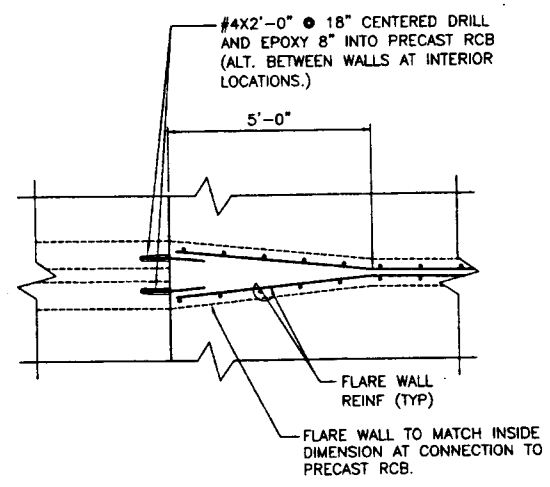
C 12



SECTION

1/2" = 1'-0"

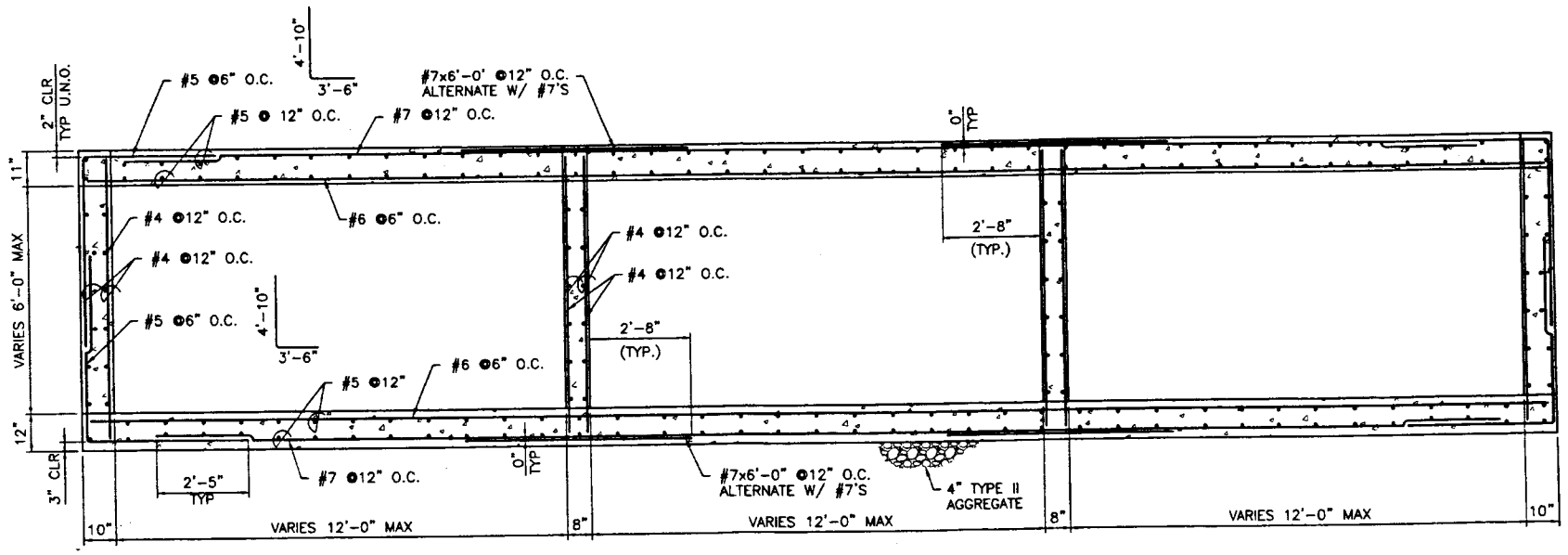
B 12



DETAIL

1/2" = 1'-0"

1 12



SECTION

1/2" = 1'-0"

A 12

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON, IF WORK IS NOT COMPLETED BY _____ 20__

KEN Y. KOSHIRO P.E. — DATE
NEW DEVELOPMENT ENGINEER, CITY OF HENDERSON

R2H • CB&L ENGINEERING
Consulting Engineers • Planners • Land Surveyors
Las Vegas, Nevada
Phone (702) 233-9999

REVISION | BY | DATE | REV

OLYMPIC NEVADA, INC.
CLARK COUNTY, NEVADA
CITY OF HENDERSON, NEVADA

TITLE: RCB TRANSITION DETAILS

PROJECT: LAKE MEAD \ EASTERN
SECTION 26 DRAINAGE CHANNEL

SEAL
PROFESSIONAL ENGINEER
DANA A. AMES
STATE OF NEVADA
No. 10712
12-16-99

WO NO. 5033-FC
BY DAA
DATE 11/06/98
SCALE HORIZ. NA
VERT. NA
SHEET 12 OF 12 SHEETS

05486

12.DWG

FIGURE 1A: SURVEY EXHIBIT

East Reach of Southpoint Channel

Project No. 511606.00 July 2005

Legend

+2129.11 D–TOP–BANK — Point ID; Elevation; Description

Survey Data Point

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)

1 inch = 100 ft.

I hereby certify that the information used to prepare this LOMR and the associated analysis substantially conforms with the field survey performed by PBS&J.

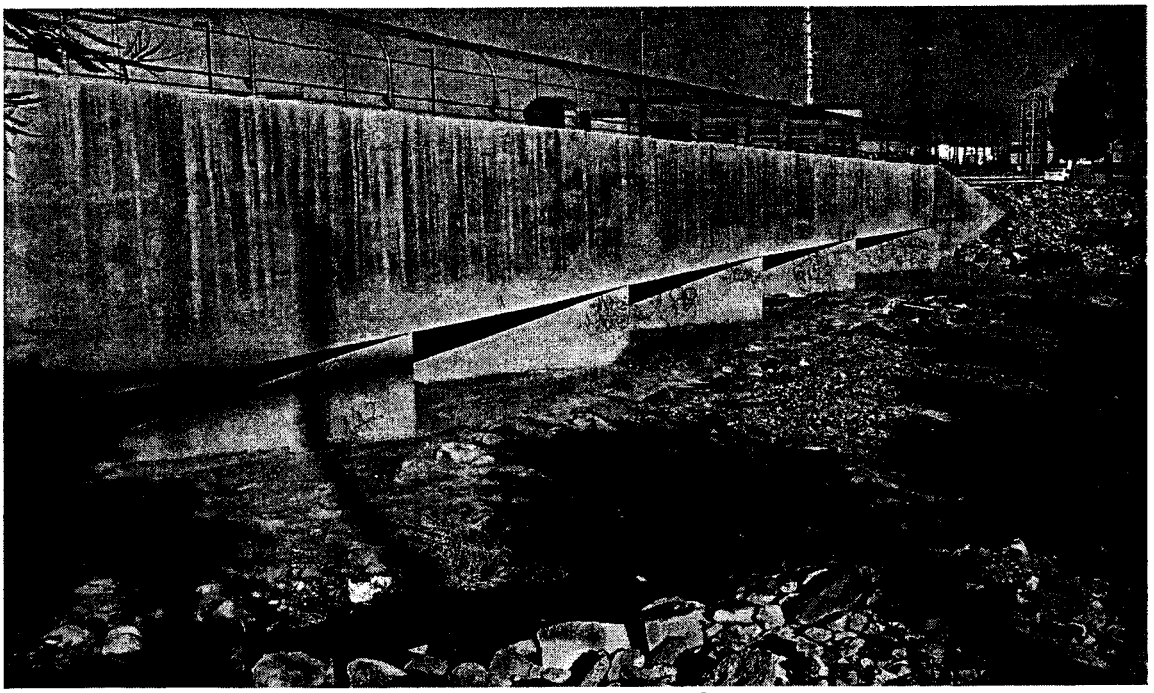
Matthew S. Baird

Matthew S. Baird, NV 13684 — Date 7/18/05

Aerial photo as of April 2005.

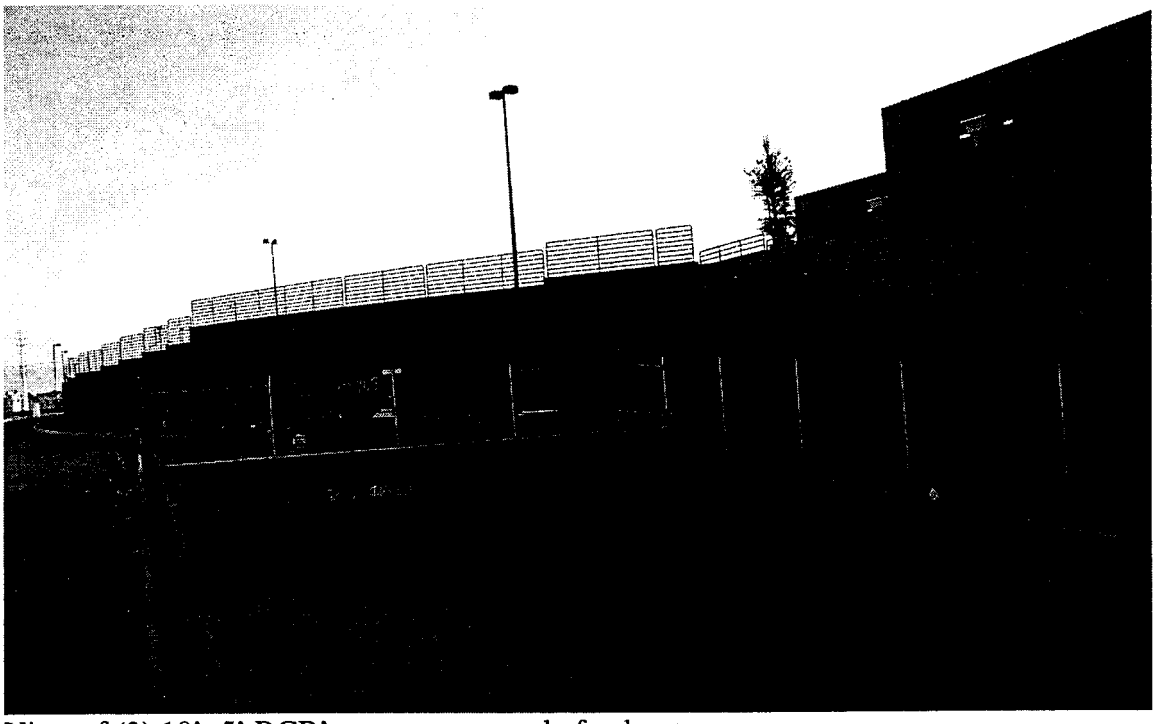
PBS&J
2270 Corporate Circle
Suite 100 Henderson,
Nevada 89014
Telephone: 702/263-7275
Fax: 702/263-7200
ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

FIGURE 1A



View of (6) 12'x6' RCB's immediately downstream of Eastern Avenue

View of channel immediately downstream of RCB's at Eastern Avenue



View of (3) 10'x5' RCB's at upstream end of culvert

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version
Serial Number

Jul 17, 2005 10:36:45

Input file : easttrib.dat
Output file: easttrib.out

INPUT FILE LISTING

```
T1 PITTMAN WASH LOMR (CASE NO. 04-09-1194P)
T2 STORM DRAIN/OPEN CHANNEL ANALYSIS (EASTERN AVENUE & IONE)
T3
SO      0.002195.70  1       .035                2200.29
TS    334.002198.55  2       .035
TS    670.002201.61  3       .035
TS    972.002206.00  4       .035
TS    977.002207.82  5       .013
WX                   6
R    1194.292210.71  6       .013
TS   1268.032211.77  7       .013
R    1373.132213.28  7       .013                            100.0
R    1764.632218.92  7       .013
R    1975.302223.94  7       .013                            280.0
BE                   9
R    1975.402223.95  9       .013
TS   2065.302226.46  8       .013
R    2176.282228.71  8       .013
SH          2228.71  8       .013                2232.01
1                                                   SP
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING — PAGE 1

0 CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	5	0	.00															
CD	2	5	0	.00															
CD	3	5	0	.00															
CD	4	5	0	.00															
CD	5	5	0	.00															
CD	6	3	2	2.00	6.00	40.00	.00	.00	.00										
CD	7	3	2	2.00	5.00	34.00	.00	.00	.00										
CD	8	2	0	.00	5.00	22.00			.00										
CD	9	2	0	.00	5.00	34.00			.00										

1 SP

WATER SURFACE PROFILE - CROSS SECTION POINT LISTING — PAGE 2

0 CARD CODE	SECT NO	NO OF POINTS	X(1) , Y(1) X(8) , Y(8)	X(2) , Y(2) X(9) , Y(9)	X(3) , Y(3) X(10) ,Y(10)	X(4) , Y(4) X(11) ,Y(11)	X(5) , Y(5) X(N) , Y(N)	X(6) , Y(6) X(N+1),Y(N+1)	X(7) , Y(7) X(99) ,Y(99)
0 PTS	1	9	.02 206.49	11.72 206.49	28.92 196.16	53.42 195.70	74.22 196.68	84.52 200.27	99.42 203.53
PTS			117.32 203.80	121.62 204.34					
0 PTS	2	7	.02 209.40	9.92 209.40	29.12 200.93	49.92 198.55	74.02 199.89	91.12 211.34	110.12 212.42
0 PTS	3	6	.02 216.62	30.22 215.24	52.12 203.54	69.12 201.61	87.12 203.32	113.62 217.32	
0 PTS	4	5	.02 215.99	37.22 206.19	128.42 206.00	158.52 206.75	193.62 215.78		
0 PTS	5	4	.02 215.99	37.22 207.82	158.52 207.82	193.62 215.78			

1 PAGE NO 1

0 WATER SURFACE PROFILE - TITLE CARD LISTING

0HEADING LINE NO 1 IS -
0 PITTMAN WASH LOMR (CASE NO. 04-09-1194P)
0HEADING LINE NO 2 IS -
0 STORM DRAIN/OPEN CHANNEL ANALYSIS (EASTERN AVENUE & IONE)
0HEADING LINE NO 3 IS -
0

1 PAGE NO 2

0 WATER SURFACE PROFILE - ELEMENT CARD LISTING

0 ELEMENT NO 1 IS A SYSTEM OUTLET * * *							W S ELEV		
U/S DATA	STATION	INVERT	SECT				2200.29		
	.00	2195.70	1						
0 ELEMENT NO 2 IS A TRANSITION * * *									
U/S DATA	STATION	INVERT	SECT	N					
	334.00	2198.55	2	.035					
0 ELEMENT NO 3 IS A TRANSITION * * *									
U/S DATA	STATION	INVERT	SECT	N					
	670.00	2201.61	3	.035					
0 ELEMENT NO 4 IS A TRANSITION * * *									
U/S DATA	STATION	INVERT	SECT	N					
	972.00	2206.00	4	.035					
0 ELEMENT NO 5 IS A TRANSITION * * *									
U/S DATA	STATION	INVERT	SECT	N					
	977.00	2207.82	5	.013					
0 ELEMENT NO 6 IS A WALL EXIT *									
U/S DATA	STATION	INVERT	SECT						
	977.00	2207.82	6						
0 ELEMENT NO 7 IS A REACH * * *									
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT MAN H
	1194.29	2210.71	6	.013			.00	.00	.00 0
0 ELEMENT NO 8 IS A TRANSITION * * *									
U/S DATA	STATION	INVERT	SECT	N					
	1268.03	2211.77	7	.013					
0 ELEMENT NO 9 IS A REACH * * *									
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT MAN H
	1373.13	2213.28	7	.013			.00	100.00	.00 0
0 ELEMENT NO 10 IS A REACH * * *									
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT MAN H
	1764.63	2218.92	7	.013			.00	.00	.00 0
0 ELEMENT NO 11 IS A REACH * * *									
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT MAN H
	1975.30	2223.94	7	.013			.00	280.00	.00 0
0 ELEMENT NO 12 IS A BRIDGE ENTRANCE *									

```
                    U/S DATA   STATION    INVERT  SECT          FP
                                1975.30 2223.94    9          1.000
0 ELEMENT NO  13 IS A REACH          *       *     *
                    U/S DATA   STATION    INVERT  SECT           N                              RADIUS  ANGLE  ANG PT  MAN H
                                1975.40 2223.95    9          .013                               .00    .00     .00      0
0 ELEMENT NO  14 IS A TRANSITION     *       *     *
                    U/S DATA   STATION    INVERT  SECT           N
                                2065.30 2226.46    8          .013
1                                                                                                              PAGE NO   3
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO  15 IS A REACH          *       *     *
                    U/S DATA   STATION    INVERT  SECT           N                              RADIUS  ANGLE  ANG PT  MAN H
                                2176.28 2228.71    8          .013                               .00    .00     .00      0
0 ELEMENT NO  16 IS A SYSTEM HEADWORKS                *                    *
                    U/S DATA   STATION    INVERT  SECT                                 W S ELEV
                                2176.28 2228.71    8                                   2232.01
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

1                                                                                                              PAGE    1
                                        WATER SURFACE PROFILE LISTING
                        PITTMAN WASH LOMR (CASE NO. 04-09-1194P)
                        STORM DRAIN/OPEN CHANNEL ANALYSIS (EASTERN AVENUE & IONE)

0 STATION     INVERT   DEPTH     W.S.          Q       VEL      VEL      ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL    NO  AVBPR
                ELEV  OF FLOW    ELEV                        HEAD    GRD.EL.   ELEV   DEPTH                DIA    ID NO.         PIER
0 L/ELEM        SO                                        SF AVE      HF                    NORM DEPTH                      ZR
**********************************************************************************************************************************
0       .00  2195.70     4.59  2200.29    2189.0     9.73     1.47  2201.76            4.33                      1            0    .00
0TRANS STR   .00853                                        .01070     3.57
0    334.00  2198.55     5.10  2203.65    2189.0    10.57     1.74  2205.39            5.03                      2            0    .00
0TRANS STR   .00911                                        .01140     3.83
0    670.00  2201.61     5.75  2207.36    2189.0    11.03     1.89  2209.25            5.67                      3            0    .00
0TRANS STR   .01454                                        .00606     1.83
0    972.00  2206.00     5.09  2211.09    2189.0     3.22      .16  2211.25            2.30                      4            0    .00
0TRANS STR   .36401
0    977.00  2207.82      .75  2208.57    2189.0    23.28     8.42  2217.00            2.11                      5            0    .00
0  WALL EXIT
0    977.00  2207.82     2.78  2210.60    2189.0    21.84     7.41  2218.02     .00    4.86          6.00   40.00    .00    2   2.00
0     56.51   .01330                                        .01576      .89                  2.93                      .00
0   1033.51  2208.57     2.75  2211.32    2189.0    22.09     7.59  2218.91     .00    4.86          6.00   40.00    .00    2   2.00
0    160.78   .01330                                        .01722     2.77                  2.93                      .00
0   1194.29  2210.71     2.62  2213.33    2189.0    23.17     8.34  2221.68     .00    4.86          6.00   40.00    .00    2   2.00
0TRANS STR   .01438                                        .01726     1.27                                            .00
0   1268.03  2211.77     3.22  2214.99    2189.0    22.69     8.00  2222.99     .00    5.00          5.00   34.00    .00    2   2.00
0    105.10   .01437                                        .01649     1.73                  3.35                      .00
0   1373.13  2213.28     3.16  2216.44    2189.0    23.08     8.28  2224.72     .00    5.00          5.00   34.00    .00    2   2.00
0    170.22   .01441                                        .01798     3.06                  3.35                      .00
0   1543.35  2215.73     3.03  2218.76    2189.0    24.09     9.02  2227.78     .00    5.00          5.00   34.00    .00    2   2.00
0    126.04   .01441                                        .02045     2.58                  3.35                      .00
1                                                                                                              PAGE    2
                                        WATER SURFACE PROFILE LISTING
                        PITTMAN WASH LOMR (CASE NO. 04-09-1194P)
                        STORM DRAIN/OPEN CHANNEL ANALYSIS (EASTERN AVENUE & IONE)

0 STATION     INVERT   DEPTH     W.S.          Q       VEL      VEL      ENERGY   SUPER  CRITICAL          HGT/   BASE/    ZL    NO  AVBPR
                ELEV  OF FLOW    ELEV                        HEAD    GRD.EL.   ELEV   DEPTH                DIA    ID NO.         PIER
0 L/ELEM        SO                                        SF AVE      HF                    NORM DEPTH                      ZR
**********************************************************************************************************************************
0   1669.39  2217.55     2.89  2220.44    2189.0    25.27     9.92  2230.36     .00    5.00          5.00   34.00    .00    2   2.00
0     95.24   .01441                                        .02341     2.23                  3.35                      .00
0   1764.63  2218.92     2.75  2221.67    2189.0    26.50    10.92  2232.59     .00    5.00          5.00   34.00    .00    2   2.00
0    210.67   .02383                                        .02578     5.43                  2.80                      .00
0   1975.30  2223.94     2.70  2226.64    2189.0    27.06    11.38  2238.02     .00    5.00          5.00   34.00    .00    2   2.00
0BRIDGE ENTRANCE                                                                                                       .00
0   1975.30  2223.94     2.05  2225.99    2189.0    31.44    15.36  2241.35     .00    5.05          5.00   34.00    .00    0    .00
0      .10   .10012                                        .03385      .00                  1.46                      .00
0   1975.40  2223.95     2.05  2226.00    2189.0    31.44    15.36  2241.36     .00    5.05          5.00   34.00    .00    0    .00
0TRANS STR   .02792                                        .02699     2.43                                            .00
0   2065.30  2226.46     3.30  2229.76    2189.0    30.17    14.15  2243.91     .00    6.75          5.00   22.00    .00    0    .00
0    110.98   .02027                                        .02011     2.23                  3.29                      .00
0   2176.28  2228.71     3.30  2232.01    2189.0    30.15    14.13  2246.14     .00    6.75          5.00   22.00    .00    0    .00
1
```

Normal depth section for downstream WSEL in WSPG model

Worksheet for EAST TRIB DEPTH SECTION

Project Description	
Flow Element:	Irregular Section
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data		
Channel Slope:	1.00000	%
Discharge:	2189.00	ft^3/s

Options	
Current Roughness Weighted Meth	ImprovedLotters
Open Channel Weighted Roughnes	ImprovedLotters
Closed Channel Weighted Roughne	Hortons

Results		
Roughness Coefficient:	0.035	
Water Surface Elevation:	2200.29	ft
Elevation Range:	2195.70 to 2206.49 ft	
Flow Area:	222.91	ft^2
Wetted Perimeter:	63.37	ft
Top Width:	61.53	ft
Normal Depth:	4.59	ft
Critical Depth:	4.34	ft
Critical Slope:	0.01228	ft/ft
Velocity:	9.82	ft/s
Velocity Head:	1.50	ft
Specific Energy:	6.09	ft
Froude Number:	0.91	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2205.63)	(1+22, 2204.34)	0.035

Section Geometry

Station	Elevation
0+00	2205.63
0+12	2206.49

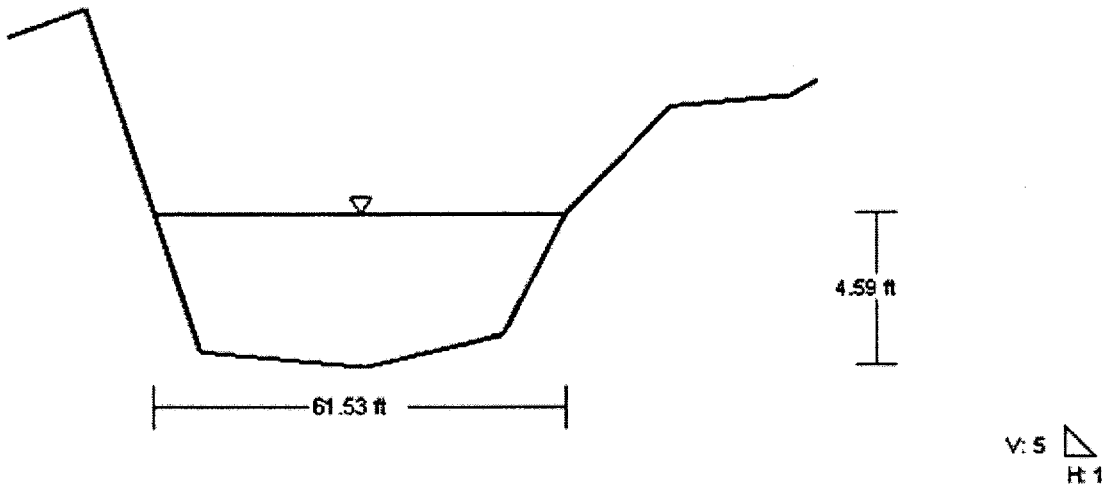
Worksheet for EAST TRIB DEPTH SECTION

Station	Elevation
0+29	2196.16
0+53	2195.70
0+74	2196.68
0+83	2200.27
0+99	2203.53
1+17	2203.85
1+22	2204.34

East Trib depth Section
Cross Section for EAST TRIB DEPTH SECTION

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.00000	%
Normal Depth:	4.59	ft
Elevation Range:	2195.70 to 2206.49 ft	
Discharge:	2189.00	ft^3/s



Normal depth section for upstream USGS in WSPG model

Worksheet for EastTribUS

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	2.01000	%
Discharge:	2189.00	ft³/s

Options		
Current Roughness Weighted Meth	ImprovedLotters	
Open Channel Weighted Roughnes	ImprovedLotters	
Closed Channel Weighted Roughne	Hortons	

Results		
Roughness Coefficient:	0.013	
Water Surface Elevation:	2232.01	ft
Elevation Range:	2228.71 to 2233.71 ft	
Flow Area:	72.59	ft²
Wetted Perimeter:	28.60	ft
Top Width:	22.00	ft
Normal Depth:	3.30	ft
Critical Depth:	6.75	ft
Critical Slope:	0.00247	ft/ft
Velocity:	30.15	ft/s
Velocity Head:	14.13	ft
Specific Energy:	17.43	ft
Froude Number:	2.93	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2233.71)	(0+22, 2233.71)	0.013

Section Geometry

Station	Elevation
0+00	2233.71
0+00	2228.71

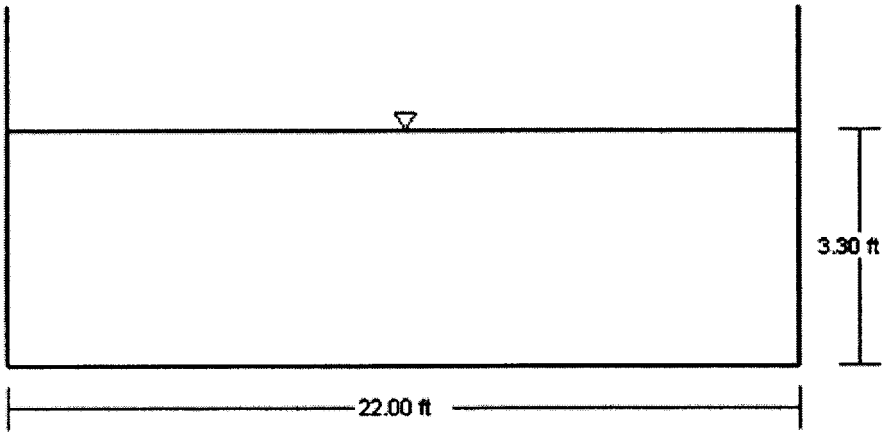
Worksheet for EastTribUS

Station	Elevation
0+22	2228.71
0+22	2233.71

East Trib US
Cross Section for EastTribUS

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.013	
Channel Slope:	2.01000	%
Normal Depth:	3.30	ft
Elevation Range:	2228.71 to 2233.71 ft	
Discharge:	2189.00	ft^3/s



V: 2
H: 1

APPENDIX C

Survey Exhibit

Survey Point Data Table

PBS&J Survey Data
Pittman Wash LOMR

Point	Northing	Easting	Elevation	Point Description	Additional Desc.		
1	26708020.41	794834.44	2194.184	SET	60D	NAIL	
2	26706882.88	798823.982	2252.75	CCGIS-858			
3	26717114.73	783015.337	2178.62	CCGIS-953			
4	26713288.47	793673.682	2135.54	CCBM-4C2113SWW6			
5	26712020.75	788338.673	2179.714	CCBM-8C2122NES			
6	26706807.01	788077.798	2217.678	CCBM-8C2122SES			
7	26706839.81	792371.929	2206.68	CCBM-8C2123SSE6			
8	26707884.02	793668.294	2188.496	CCBM-8C2124SWW6			
100	26711943.55	794805.725	2111.992	D-RIPRAP-TOP			
101	26711928.66	794791.485	2112.436	D-RIPRAP-TOP			
102	26711922.19	794777.535	2113.111	D-RIPRAP-TOP			
103	26711913.24	794745.108	2113.014	D-RIPRAP-TOP			
104	26711914.74	794647.597	2114.643	D-TOP-BANK			
105	26711913.73	794547.835	2115.658	D-TOP-BANK			
106	26711912.96	794447.064	2117.177	D-TOP-BANK			
107	26711912.15	794347.152	2118.924	D-TOP-BANK			
108	26711913.1	794246.591	2119.979	D-TOP-BANK			
109	26711912.25	794145.323	2120.905	D-TOP-BANK			
110	26711911.79	794046.163	2122.069	D-TOP-BANK			
111	26711911.08	793950.183	2124.107	D-RIPRAP-TOP			
112	26711897.39	793852.522	2124.867	D-RIPRAP-TOP			
113	26711860.09	793763.476	2125.824	D-RIPRAP-TOP			
114	26711815.81	793702.541	2127.034	D-RIPRAP-TOP			
115	26711801.9	793711.892	2118.581	D-RIPRAP-TOE			
116	26711843.14	793768.91	2117.218	D-RIPRAP-TOE			
117	26711880.27	793853.761	2116.884	D-RIPRAP-TOE			
118	26711896.06	793949.576	2116.93	D-RIPRAP-TOE			
119	26711894.03	794044.911	2115.278	D-TOE-BANK			
120	26711896.68	794143.773	2114.226	D-TOE-BANK			
121	26711894.44	794243.84	2113.148	D-TOE-BANK			
122	26711897.45	794320.099	2111.632	FL	OUTLET	48"	RCP
123	26711897.43	794346.774	2111.586	D-TOE-BANK			
124	26711898.55	794445.245	2110.805	D-TOE-BANK			
125	26711898.32	794547.095	2109.145	D-TOE-BANK			
126	26711895.94	794645.534	2107.306	D-TOE-BANK			
127	26711896.41	794749.535	2105.596	D-RIPRAP-TOE			
128	26711907.92	794784.82	2104.729	D-RIPRAP-TOE			
129	26711916.02	794783.604	2105.973	FL	OUTLET	24"	RCP
130	26711918.63	794798.417	2105.057	D-RIPRAP-TOE			
131	26711935.87	794815.901	2104.895	D-RIPRAP-TOE			
132	26711920.65	794841.282	2104.539	D-NG			
133	26711896.65	794817.344	2104.748	D-NG			
134	26711868.62	794788.546	2105.075	D-NG			
135	26711855.46	794759.124	2105.318	D-NG			
136	26711815.45	794657.342	2106.898	D-NG			
137	26711792.06	794555.095	2107.88	D-NG			
138	26711802.68	794443.62	2109.463	D-NG			
139	26711803.35	794343.182	2110.303	D-NG			
140	26711793.85	794240.693	2112.055	D-NG			
141	26711799.23	794133.209	2113.139	D-NG			
142	26711797.05	794036.373	2114.019	D-NG			
143	26711777.85	793944.704	2115.475	D-NG			
144	26711769.48	793863.556	2115.987	D-NG			
145	26711755.52	793785.872	2116.653	D-NG			
146	26711735.21	793719.858	2117.966	D-NG			
147	26711691.03	793724.532	2118.693	D-NG			
148	26711695.45	793796.016	2117.681	D-NG			
149	26711700.19	793869.377	2116.699	D-NG			
150	26711701.63	793950.878	2115.868	D-NG			
151	26711706.52	794030.661	2115.462	D-NG			
152	26711703.74	794122.733	2113.702	D-NG			
153	26711694.26	794234.294	2112.294	D-NG			
154	26711694.09	794335.488	2111.229	D-NG			
155	26711696.21	794438.478	2110.401	D-NG			
156	26711686.44	794560.31	2108.634	D-NG			
157	26711712.15	794650.962	2106.973	D-NG			
158	26711732.55	794742.089	2106.285	D-NG			

159	26711785.59	794795.031	2105.737	D-NG			
160	26711849.61	794846	2104.973	D-NG			
161	26711887.97	794876.933	2104.715	D-NG			
162	26711870.38	794898.301	2104.358	D-RIPRAP-TOE			
163	26711829.08	794870.428	2104.563	D-RIPRAP-TOE			
164	26711750.91	794818.6	2105.28	D-RIPRAP-TOE			
165	26711681.89	794771.041	2106.544	D-RIPRAP-TOE			
166	26711611.69	794672.861	2107.965	D-RIPRAP-TOE			
167	26711605.88	794580.672	2108.908	D-RIPRAP-TOE			
168	26711604.24	794463.735	2111.137	D-TOE-BANK			
169	26711603.14	794330.958	2112.66	D-TOE-BANK			
170	26711599.43	794229.435	2113.854	D-TOE-BANK			
171	26711597.43	794115.137	2115.262	D-TOE-BANK			
172	26711593.43	794019.634	2117.295	D-TOE-BANK			
173	26711593.89	793949.389	2117.578	D-TOE-BANK			
174	26711595.84	793880.288	2118.146	D-TOE-BANK			
175	26711599.32	793821.676	2117.368	D-RIPRAP-TOE			
176	26711628.83	793778.152	2117.347	D-RIPRAP-TOE			
177	26711663.12	793723.059	2119.207	D-RIPRAP-TOE			
178	26711634.85	793717.306	2132.265	D-TOP-BANK			
179	26711587.66	793777.153	2131.682	D-TOP-BANK			
180	26711578.34	793821.009	2128.752	D-TOP-BANK			
181	26711578.47	793876.086	2127.334	D-TOP-BANK			
182	26711577.82	793949.559	2125.465	D-TOP-BANK			
183	26711580.22	794021.692	2124.027	D-TOP-BANK			
184	26711581.13	794109.33	2123.01	D-TOP-BANK			
185	26711582.14	794226.459	2122.241	D-TOP-BANK			
186	26711582.51	794326.046	2121.408	D-TOP-BANK			
187	26711584.31	794430.996	2121.167	D-TOP-BANK			
188	26711579.03	794573.852	2121.531	D-RIPRAP-TOP			
189	26711567.39	794584.041	2123.048	D-RIPRAP-TOP			
190	26711583.8	794603.468	2117.996	D-RIPRAP-TOP			
191	26711584.36	794645.923	2118.044	D-RIPRAP-TOP			
192	26711589.94	794676.818	2118.25	D-RIPRAP-TOP			
193	26711601.45	794715.848	2117.647	D-RIPRAP-TOP			
194	26711577.59	794705.601	2118.239	D-TOE-BANK			
195	26711575.4	794719.418	2122.883	D-TOP-BANK			
196	26711614.13	794751.716	2122.352	D-TOP-BANK			
197	26711662.36	794791.864	2121.89	D-TOP-BANK			
198	26711734.33	794839.816	2120.159	D-TOP-BANK			
199	26711794.21	794880.229	2118.472	D-TOP-BANK			
200	26711856.82	794916.162	2116.962	D-TOP-BANK			
201	26711571.73	794657.079	2118.229	D-NG			
202	26711467.4	794586.944	2123.013	D-TOP-BANK			
203	26711466.05	794595.805	2119.513	D-TOE-BANK			
204	26711464.96	794636.499	2119.08	D-NG			
205	26711462.32	794690.948	2119.328	D-TOE-BANK			
206	26711460.72	794699.58	2123.341	D-TOP-BANK			
207	26711366.85	794680.095	2124.548	D-TOP-BANK			
208	26711368.02	794670.649	2120.751	D-TOE-BANK			
209	26711372.09	794631.164	2120.818	D-NG			
210	26711378.16	794580.333	2120.328	D-TOE-BANK			
211	26711380.1	794569.867	2124.21	D-TOP-BANK			
212	26711284.13	794552.152	2125.906	D-TOP-BANK			
213	26711281.93	794563.442	2121.573	D-TOE-BANK			
214	26711277.21	794605.736	2122.672	D-NG			
215	26711273.93	794651.673	2122.287	D-TOE-BANK			
216	26711271.9	794662.201	2126.703	D-TOP-BANK			
217	26711176.28	794643.035	2129.153	D-TOP-BANK			
218	26711176.21	794629.522	2123.724	D-TOE-BANK			
219	26711178.48	794592.334	2123.98	D-NG			
220	26711183.71	794550.084	2122.582	D-TOE-BANK			
221	26711185.5	794533.648	2127.029	D-TOP-BANK			
222	26711085.28	794528.601	2129.107	D-TOP-BANK			
223	26711083.12	794546.996	2123.657	D-TOE-BANK			
224	26711083.59	794584.711	2126.392	D-NG			
225	26711085.1	794628.886	2124.406	D-TOE-BANK			
226	26711084.91	794649.08	2131.171	D-TOP-BANK			
227	26710987.37	794654.578	2132.971	D-TOP-BANK			
228	26710986.34	794639.025	2127.529	D-TOE-BANK			
229	26710980.72	794591.933	2128.078	D-NG			
230	26710983.4	794541.698	2126.186	D-TOE-BANK			

231	26710984.77	794527.981	2131.254	D-TOP-BANK			
232	26710884.91	794528.497	2132.302	D-TOP-BANK			
233	26710884.82	794543.551	2129.184	D-TOE-BANK			
234	26710887.94	794590.222	2129.77	D-NG			
235	26710884.82	794646.238	2129.819	D-TOE-BANK			
236	26710884.62	794660.436	2133.774	D-TOP-BANK			
237	26710820.89	794664.007	2135.876	D-RIPRAP-TOP			
238	26710823.3	794641.474	2130.984	D-RIPRAP-TOE			
239	26710823.76	794597.235	2130.501	D-RIPRAP-EDGE			
240	26710828.42	794546.157	2131.094	D-RIPRAP-TOE			
241	26710827.8	794519.911	2137.94	D-RIPRAP-TOP			
242	26710777.27	794520.225	2139.81	D-RIPRAP-TOP			
243	26710774.93	794543.641	2132.491	D-TOE-WW			
244	26710774.78	794543.568	2137.302	D-TOP-WW			
245	26710767.74	794550.147	2140.932	D-TOP-HW			
246	26710774.01	794640.666	2133.457	D-TOE-WW			
247	26710773.94	794640.694	2137.171	D-TOP-WW			
248	26710767.19	794634.069	2140.947	D-TOP-HW			
249	26710771.57	794657.849	2137.88	D-RIPRAP-TOP			
250	26712056.01	794901.92	2103.364	D-CLVRT-FL			
251	26712056.05	794916.413	2103.279	D-CLVRT-FL			
252	26712056.05	794931.783	2103.147	D-CLVRT-FL			
253	26712056.1	794947.378	2103.186	D-CLVRT-FL			
254	26712056.12	794962.735	2103.208	D-CLVRT-FL			
255	26712056.19	794978.233	2103.119	D-CLVRT-FL			
256	26712056.18	794993.973	2103.108	D-CLVRT-FL			
257	26712056.32	795024.242	2103.053	D-CLVRT-FL			
258	26712056.33	795044.637	2117.958	D-TOP-HW			
259	26712050.22	795066.568	2115.172	C-TBC			
260	26712049.96	795020.704	2114.889	C-TBC			
261	26712054.84	795044.373	2115.15	SW-BACK	SIDEWALK		
262	26712054.77	795023.976	2114.976	SW-BACK	SIDEWALK		
263	26712054.65	794967.415	2114.877	SW-BACK	SIDEWALK		
264	26712049.83	794967.263	2114.738	C-TBC			
265	26712049.62	794896.434	2114.455	C-TBC			
266	26712054.53	794899.943	2114.487	SW-BACK	SIDEWALK		
267	26712054.4	794880.214	2114.492	SW-BACK	SIDEWALK		
268	26712049.51	794877.811	2114.426	C-TBC			
269	26712055.93	794880.503	2117.129	D-TOP-HW			
270	26712049.61	794865.999	2114.315	C-TBC			
271	26711882.06	794921.573	2116.798	C-TBCE			
272	26711869.75	794914.679	2120.186	D-TOP-HW			
273	26711899.25	794914.929	2119.707	D-TOP-HW			
274	26711899.4	794914.944	2104.109	D-CLVRT-FL			
275	26711921.47	794915.321	2103.988	D-CLVRT-FL			
276	26711943.31	794915.245	2103.881	D-CLVRT-FL			
277	26711955.9	794908.886	2103.862	D-CLVRT-FL			
278	26711962.11	794897.967	2103.903	D-CLVRT-FL			
279	26711962.78	794883.004	2103.836	D-CLVRT-FL			
280	26711962.76	794867.888	2103.959	D-CLVRT-FL			
281	26711962.73	794852.338	2104	D-CLVRT-FL			
282	26711962.59	794837.022	2103.935	D-CLVRT-FL			
283	26711962.45	794816.419	2117.308	D-TOP-HW			
284	26711952.97	794811.351	2112.958	D-TOP-CONC-CHNL			
285	26711961.25	794830.985	2112.349	D-TOP-CONC-CHNL			
286	26711962.34	794836.811	2111.797	D-TOP-WW			
287	26711945.5	794825.206	2104.312	D-TOP-WW			
288	26711915.76	794864.952	2104.222	D-FL-CONC-CHNL			
289	26711885.8	794905.971	2104.272	D-TOP-WW			
290	26711898.82	794914.579	2111.334	D-TOP-WW			
291	26711874.77	794916.717	2117.129	SW-BACK	SIDEWALK		
292	26711870.07	794917.036	2117.103	A-EDGE-ASPHALT			
293	26711854.56	794924.334	2117.292	A-EDGE-ASPHALT			
294	26711936.33	794922.391	2115.471	C-BCR			
295	26711936.23	794917.542	2115.58	SW-BACK	SIDEWALK		
296	26711964.71	794891.274	2114.91	SW-BACK	SIDEWALK		
297	26711969.56	794891.259	2114.753	C-BCR			
298	26711969.34	794840.828	2114.352	C-TBC			
299	26711964.58	794837.574	2114.517	SW-BACK	SIDEWALK		
300	26711969.33	794822.364	2114.256	C-TBC			
301	26711964.49	794818.78	2114.415	SW-BACK	SIDEWALK		
302	26712013.85	794818.528	2114.711	A-CL-ASPHALT			

303	26712014.71	794854.103	2114.83	A-CL-ASPHALT			
304	26712014.45	794910.175	2115.024	A-CL-ASPHALT			
305	26712014.79	794965.628	2115.215	A-CL-ASPHALT			
306	26712015.21	795014.73	2115.42	A-CL-ASPHALT			
307	26712015.29	795052.133	2115.278	A-CL-ASPHALT			
308	26712056.74	795045.092	2115.293	D-TOP-CONC-CHNL			
309	26712070.2	795063.482	2115.788	D-TOP-CONC-CHNL			
310	26712080.43	795079.35	2117.602	D-RIPRAP-TOP			
311	26712153.81	795116.182	2117.057	D-RIPRAP-TOP			
312	26712318.47	795198.891	2114.245	D-RIPRAP-EDGE			
313	26712328.8	795178.95	2103.819	D-RIPRAP-EDGE			
314	26712344.38	795136.532	2102.171	D-NG			
315	26712375.84	795112.975	2102.506	D-TOE-CONC-CHNL			
316	26712397.27	795092.924	2114.218	D-TOP-CONC-CHNL			
317	26712276.85	795030.433	2109.772	D-TOP-CONC-CHNL			
318	26712224.92	795000.783	2112.303	D-TOP-CONC-CHNL			
319	26712214.77	795017.448	2103.681	D-TOE-CONC-CHNL			
320	26712195.24	795052.022	2102.929	D-NG			
321	26712170.04	795096.499	2103.5	D-RIPRAP-TOE			
322	26712083.15	795042.428	2103.639	D-TOE-WW			
323	26712067.66	795032.069	2111.013	D-TOP-WW			
324	26712057	795024.711	2111.034	D-TOP-WW			
325	26712100.36	794992.284	2102.933	D-FL-CONC-CHNL			
326	26712138.62	794964.78	2103.299	D-TOE-CONC-CHNL			
327	26712150.56	794949.205	2113.726	D-TOP-CONC-CHNL			
328	26712105.47	794918.184	2114.934	D-TOP-CONC-CHNL			
329	26712088.62	794906.835	2115.495	D-TOP-CONC-CHNL			
330	26712060.32	794885.985	2115.035	D-TOP-CONC-CHNL			
331	26712056.97	794902.444	2111.446	D-TOP-WW			
332	26712080.17	794918.648	2111.545	D-TOP-WW			
333	26712098.15	794930.97	2103.349	D-TOE-WW			
334	26711968.98	794718.31	2114.579	C-TBC			
335	26711963.98	794718.167	2114.701	SW-BACK	SIDEWALK		
336	26711963.39	794525.495	2116.779	SW-BACK	SIDEWALK		
337	26711968.32	794525.485	2116.706	C-TBC			
338	26711967.68	794331.316	2119.076	C-TBC			
339	26711962.68	794330.912	2119.196	SW-BACK	SIDEWALK		
340	26711962.12	794139.036	2121.594	SW-BACK	SIDEWALK		
341	26711967.03	794139.042	2121.504	C-TBC			
342	26711966.36	793939.724	2125.358	C-TBC			
343	26711961.41	793939.683	2125.513	SW-BACK	SIDEWALK		
344	26711847.47	793668.731	2133.674	SW-BACK	SIDEWALK		
345	26711847.44	793663.753	2133.533	C-TBC			
346	26711813.74	793664.449	2133.495	C-TBC			
347	26711814.02	793669.448	2133.604	SW-BACK	SIDEWALK		
348	26711814.09	793670.706	2137.018	D-TOP-HW			
349	26711766.34	793665.383	2133.6	C-TBC			
350	26711766.42	793670.495	2133.677	SW-BACK	SIDEWALK		
351	26711720.91	793671.391	2133.692	SW-BACK	SIDEWALK		
352	26711720.66	793666.294	2133.6	C-TBC			
353	26711672.29	793667.103	2133.73	C-TBC			
354	26711672.09	793665.495	2133.213	D-GRATE			
355	26711672.25	793672.283	2133.911	SW-BACK	SIDEWALK		
356	26711640.02	793667.945	2134.068	C-TBC			
357	26711640.33	793672.757	2134.169	SW-BACK	SIDEWALK		
358	26711594.63	793673.834	2134.49	SW-BACK	SIDEWALK		
359	26711594.99	793668.882	2134.373	C-TBC			
360	26711780.04	793671.331	2136.982	D-TOP-HW			
361	26711745.24	793671.967	2136.933	D-TOP-HW			
362	26711710.64	793672.575	2137.043	D-TOP-HW			
363	26711640.2	793673.79	2137.14	D-TOP-HW			
364	26711642.03	793673.953	2137.214	D-TOP-WW			
365	26711643.15	793705.566	2137.314	D-TOP-WW			
366	26711649.98	793684.88	2124.606	D-TOE-BANK			
367	26711658.2	793706.693	2123.691	D-TOE-BANK			
368	26711689.95	793708.495	2123.104	D-GRADEBREAK			
369	26711734.63	793705.083	2122.904	D-GRADEBREAK			
370	26711785.41	793701.339	2123.791	D-GRADEBREAK			
371	26711800.71	793695.927	2124.105	D-TOE-BANK			
372	26711785.7	793675.615	2123.988	D-TOE-BANK			
373	26711806.6	793671.692	2131.989	D-TOP-BANK			
374	26711786.55	793704.995	2118.449	D-GRADEBREAK			

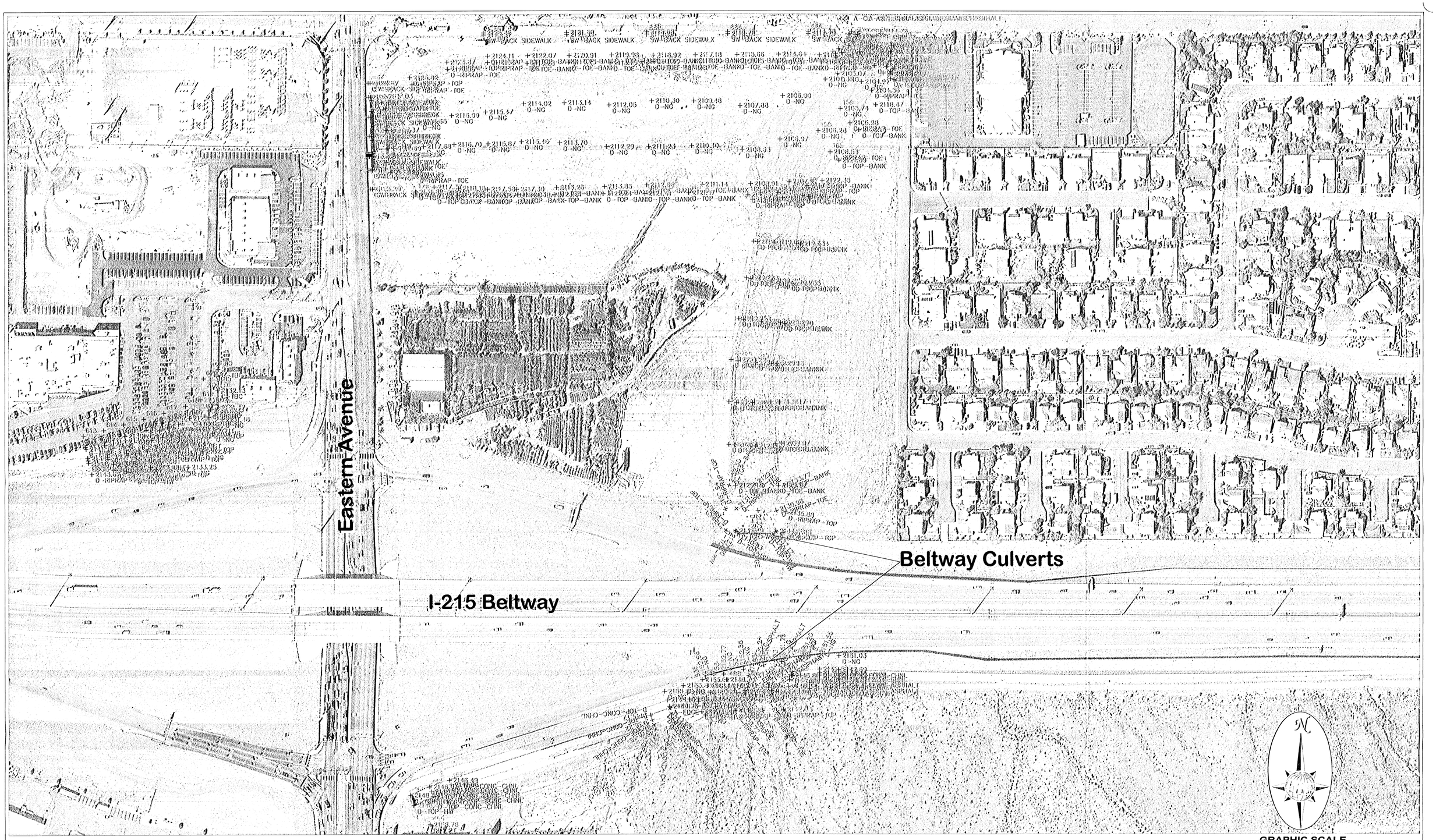
375	26711734.2	793708.342	2117.962	D-GRADEBREAK			
376	26711690.89	793710.921	2117.499	D-GRADEBREAK			
377	26711502.47	791042.81	2166.326	INIT	PT		
378	26711419.81	791166.591	2163.71	D-TOP-CONC-CHNL			
379	26711439.92	791122.097	2164.039	D-TOP-CONC-CHNL			
380	26711462.3	791089.624	2164.355	D-TOP-HW			
381	26711440.24	791071.175	2164.447	D-TOP-HW			
382	26711419.39	791053.774	2164.646	D-TOP-HW			
383	26711393.4	791091.35	2164.258	D-TOP-CONC-CHNL			
384	26711374.5	791128.93	2163.935	D-TOP-CONC-CHNL			
385	26711395.3	790606.245	2167.098	INIT	PT		
386	26711420.12	790509.282	2167.535	A-EDGE-ASPHALT			
387	26711432.21	790512.412	2167.076	A-EDGE-ASPHALT			
388	26711424.47	790557.959	2166.894	A-EDGE-ASPHALT			
389	26711412.05	790555.586	2166.879	A-EDGE-ASPHALT			
390	26711398.65	790599.837	2167.296	A-EDGE-ASPHALT			
391	26711409.75	790605.577	2167.292	A-EDGE-ASPHALT			
392	26711374.42	790636.404	2166.561	A-EDGE-ASPHALT			
393	26711368.52	790625.309	2166.778	A-EDGE-ASPHALT			
394	26711324.16	790644.815	2166.14	A-EDGE-ASPHALT			
395	26711330.94	790655.565	2165.839	A-EDGE-ASPHALT			
396	26711347.52	790654.895	2165.742	D-NG			
397	26711364.45	790671.23	2166.388	D-NG			
398	26711404.03	790626.584	2167.077	D-NG			
399	26711452.13	790572.073	2167.731	D-NG			
400	26711429.28	790550.048	2166.555	D-NG			
401	26711348	790611.097	2163.939	D-TOP-CONC-CHNL			
402	26711357.23	790621.262	2167.129	D-TOP-HW			
403	26711374.11	790605.02	2167.152	D-TOP-HW			
404	26711396.57	790583.465	2167.217	D-TOP-HW			
405	26711386.79	790574.235	2164.251	D-TOP-CONC-CHNL			
406	26711346.46	790532.266	2165.287	D-TOP-CONC-CHNL			
407	26711335.42	790541.473	2156.741	D-TOE-CONC-CHNL			
408	26711385.61	790575.883	2156.152	D-TOE-CONC-CHNL			
409	26711349.72	790609.99	2156.086	D-TOE-CONC-CHNL			
410	26711315.75	790559.169	2156.424	D-TOE-CONC-CHNL			
411	26711306.19	790567.929	2164.858	D-TOP-CONC-CHNL			
412	26710469.07	792342.547	2154.455	A-EDGE-ASPHALT			
413	26710481.63	792344.833	2154.844	A-EDGE-ASPHALT			
414	26710479.08	792384.703	2155.516	A-EDGE-ASPHALT			
415	26710466.34	792385.155	2154.36	A-EDGE-ASPHALT			
416	26710467.12	792410.68	2155.307	A-EDGE-ASPHALT			
417	26710479.06	792415.159	2156.162	A-EDGE-ASPHALT			
418	26710459.66	792444.461	2155.505	A-EDGE-ASPHALT			
419	26710449.91	792436.459	2154.424	A-EDGE-ASPHALT			
420	26710424.28	792476.374	2154.287	A-EDGE-ASPHALT			
421	26710435.45	792482.277	2155.087	A-EDGE-ASPHALT			
422	26710415.55	792526.479	2155.627	A-EDGE-ASPHALT			
423	26710403.66	792522.209	2155.115	A-EDGE-ASPHALT			
424	26710434.77	792534.296	2156.075	D-NG			
425	26710449.52	792495.2	2155.861	D-NG			
426	26710465.25	792458.329	2156.091	D-NG			
427	26710482.74	792421.101	2156.495	D-NG			
428	26710436.85	792445.42	2153.999	D-TOP-HW			
429	26710451.42	792427.56	2153.99	D-TOP-HW			
430	26710465.24	792410.319	2154.138	D-TOP-HW			
431	26710457.12	792391.587	2154.104	D-TOP-HW			
432	26710453.64	792372.085	2154.112	D-TOP-HW			
433	26710455.36	792352.445	2154.165	D-TOP-HW			
434	26710416.81	792448.646	2152.106	D-TOP-WW			
435	26710417.92	792458.811	2151.506	D-RIPRAP-TOP			
436	26710398.13	792510.428	2153.494	D-RIPRAP-TOP			
437	26710383.36	792506.35	2149.505	D-RIPRAP-TOE			
438	26710370.12	792501.714	2149.66	D-RIPRAP-TOE			
439	26710350.68	792496.363	2156.601	D-RIPRAP-TOP			
440	26710364.62	792447.924	2157.868	D-RIPRAP-TOP			
441	26710385.72	792460.652	2147.408	D-RIPRAP-TOE			
442	26710399.99	792462.458	2147.352	D-RIPRAP-TOE			
443	26710441.17	792432.119	2144.327	D-FL-CHNNL			
444	26710454.41	792412.852	2144.273	D-FL-CHNNL			
445	26710447.26	792394.245	2144.286	D-FL-CHNNL			
446	26710443.53	792372.219	2144.437	D-FL-CHNNL			

447	26710443.9	792349.283	2144.521	D-FL-CHNNL			
448	26710427.38	792346.994	2144.696	D-RIPRAP-TOE			
449	26710417.36	792379.006	2144.71	D-RIPRAP-TOE			
450	26710408.96	792399.502	2145.151	D-RIPRAP-TOE			
451	26710401.01	792417.703	2145.139	D-RIPRAP-TOE			
452	26710380.97	792410.718	2157.023	D-RIPRAP-TOP			
453	26710387.92	792389.96	2156.914	D-RIPRAP-TOP			
454	26710397.44	792370.784	2155.186	D-RIPRAP-TOP			
455	26710409.58	792337.904	2154.862	D-RIPRAP-TOP			
456	26710074.93	793811.216	2156.756	INIT	PT		
457	26710120.26	793772.674	2148.486	D-TOP-HW			
458	26710144.12	793764.835	2148.549	D-TOP-HW			
459	26710130.87	793821.677	2147.121	D-TOP-CONC-CHNL			
460	26710141.28	793818.328	2140.73	D-TOE-CONC-CHNL			
461	26710146	793869.271	2146.732	D-TOP-CONC-CHNL			
462	26710157.55	793865.556	2140.602	D-TOE-CONC-CHNL			
463	26710169.72	793861.443	2141.057	D-TOE-CONC-CHNL			
464	26710180.36	793857.822	2146.492	D-TOP-CONC-CHNL			
465	26710164.61	793810.505	2146.81	D-TOP-CONC-CHNL			
466	26710153.17	793814.276	2140.916	D-TOE-CONC-CHNL			
467	26710303.27	794350.31	2144.148	D-TOP-CONC-CHNL			
468	26710314.21	794346.784	2138.348	D-TOE-CONC-CHNL			
469	26710326.24	794343.147	2138.22	D-TOE-CONC-CHNL			
470	26710337.87	794339.858	2144.168	D-TOP-CONC-CHNL			
471	26710352.4	794385.513	2143.949	D-TOP-CONC-CHNL			
472	26710341.23	794388.666	2138.305	D-TOE-CONC-CHNL			
473	26710329.95	794392.227	2138.259	D-TOE-CONC-CHNL			
474	26710318.35	794395.792	2144.041	D-TOP-CONC-CHNL			
475	26710345.73	794461.315	2147.136	D-TOP-HW			
476	26710369.19	794453.791	2147.169	D-TOP-HW			
477	26710375.55	794452.762	2146.463	D-NG			
478	26710388.23	794491.905	2147.413	D-NG			
479	26710337.25	794470.098	2146.543	D-NG			
480	26710357.46	794496.042	2146.243	D-NG			
481	26710396.55	794541.587	2145.929	D-NG			
482	26710358.11	794385.462	2144.765	A-EDGE-ASPHALT			
483	26710372.89	794380.058	2145.097	A-EDGE-ASPHALT			
484	26710389.95	794427.199	2146.29	A-EDGE-ASPHALT			
485	26710375.13	794432.727	2146.381	A-EDGE-ASPHALT			
486	26710391.8	794480.888	2147.831	A-EDGE-ASPHALT			
487	26710406.84	794475.864	2148.125	A-EDGE-ASPHALT			
488	26710421.81	794522.515	2148.734	A-EDGE-ASPHALT			
489	26710406.54	794526.73	2148.301	A-EDGE-ASPHALT			
490	26710414.26	794574.668	2147.082	A-EDGE-ASPHALT			
491	26710430.07	794574.786	2147.565	A-EDGE-ASPHALT			
492	26710428.42	794623.745	2147.155	A-EDGE-ASPHALT			
493	26710412.85	794621.529	2147.191	A-EDGE-ASPHALT			
494	26710405.88	794670.632	2146.326	A-EDGE-ASPHALT			
495	26710421.45	794673.064	2146.656	A-EDGE-ASPHALT			
496	26710415.5	794721.152	2145.562	A-EDGE-ASPHALT			
497	26710400.73	794721.534	2145.762	A-EDGE-ASPHALT			
498	26710403.86	794771.601	2144.574	A-EDGE-ASPHALT			
499	26710418.2	794770.367	2144.29	A-EDGE-ASPHALT			
500	26710422.37	794833.491	2142.341	A-EDGE-ASPHALT			
501	26710408.77	794833.144	2142.86	A-EDGE-ASPHALT			
502	26710351.03	794658.946	2142.034	D-RIPRAP-TOP			
503	26710345.98	794644.866	2139.24	D-RIPRAP-TOE			
504	26710347.43	794608.371	2137.622	D-NG			
505	26710348.97	794556.476	2138.716	D-RIPRAP-TOE			
506	26710348.8	794543.175	2142.819	D-RIPRAP-TOP			
507	26710390.06	794546.911	2145.389	D-TOP-BANK			
508	26710387.56	794565.195	2138.051	D-RIPRAP-TOE			
509	26710386.96	794591.588	2136.775	D-NG			
510	26710388.38	794630.205	2137.231	D-RIPRAP-TOE			
511	26710393.56	794642.384	2141.648	D-RIPRAP-TOP			
512	26710395.54	794629.85	2142.266	D-TOP-WW			
513	26710402.65	794623.041	2145.931	D-TOP-HW			
514	26710402.92	794573.166	2145.909	D-TOP-HW			
515	26710396.01	794566.371	2142.193	D-TOP-WW			
516	26710395.37	794629.725	2137.802	D-TOE-WW			
517	26710395.92	794566.558	2138.295	D-TOE-WW			
518	26710439.23	794677.912	2145.87	D-TOP-HW			

519	26710431.24	794677.873	2145.795	D-TOP-HW			
520	26710423.02	794745.178	2142.489	D-TOP-CONC-CHNL			
521	26710424.11	794790.244	2142.727	D-TOP-CONC-CHNL			
522	26710432.38	794790.239	2137.424	D-TOE-CONC-CHNL			
523	26710432.52	794745.164	2136.738	D-TOE-CONC-CHNL			
524	26710438.08	794745.26	2136.676	D-TOE-CONC-CHNL			
525	26710437.3	794790.312	2137.351	D-TOE-CONC-CHNL			
526	26710445.76	794790.341	2142.686	D-TOP-CONC-CHNL			
527	26710447.1	794745.242	2142.56	D-TOP-CONC-CHNL			
528	26710478.7	794791.277	2151.033	D-NG			
529	26710476.26	794744.038	2151.552	D-NG			
530	26710471.53	794699.124	2151.195	D-NG			
531	26710464.82	794654.197	2151.794	D-NG			
532	26710456.63	794610.888	2152.242	D-NG			
533	26710446.94	794562.838	2152.348	D-NG			
534	26710435.65	794515.758	2152.772	D-NG			
535	26710423.91	794471.993	2152.964	D-NG			
536	26710421.39	794462.575	2155.008	D-NG			
537	26710407.62	794417.56	2155.551	D-NG			
538	26710393.76	794373.539	2155.96	D-NG			
539	26710909.48	793100.001	2144.32	D-TOP-HW			
540	26710916.73	793078.648	2144.28	D-TOP-HW			
541	26710923.94	793057.509	2144.294	D-TOP-HW			
542	26710937.7	793051.147	2142.26	D-TOP-WW			
543	26710930.03	793140.196	2142.248	D-TOP-WW			
544	26710926.17	793152.926	2141.856	D-RIPRAP-TOP			
545	26710964.06	793184.986	2141.533	D-RIPRAP-TOP			
546	26710987.44	793214.312	2142.439	D-RIPRAP-TOP			
547	26711019.37	793238.136	2140.901	D-RIPRAP-TOP			
548	26711022.74	793235.728	2140.409	D-TOP-WW			
549	26711036.13	793215.875	2140.548	D-TOP-HW			
550	26711027.57	793184.751	2140.583	D-TOP-HW			
551	26711015.17	793139.743	2140.56	D-TOP-HW			
552	26711006.4	793126.167	2139.843	D-RIPRAP-TOP			
553	26710994.97	793079.379	2140.667	D-RIPRAP-TOP			
554	26710983.38	793029.938	2140.883	D-RIPRAP-TOP			
555	26710974.24	792985.619	2141.286	D-RIPRAP-TOP			
556	26710952.74	792989.972	2134.395	D-RIPRAP-TOE			
557	26710940.98	792992.024	2134.443	D-RIPRAP-TOE			
558	26710946.77	792990.823	2134.161	FL	12FT	GUT	
559	26710913.6	792999.198	2143.62	D-RIPRAP-TOP			
560	26710923.5	793051.694	2144.575	D-RIPRAP-TOP			
561	26710940.92	792991.921	2134.399	EDGE	12FT	GUT	
562	26710952.67	792989.617	2134.425	EDGE	12FT	GUT	
563	26710961.94	793036.146	2134.022	EDGE	12FT	GUT	
564	26710950.31	793038.274	2133.929	EDGE	12FT	GUT	
565	26710959.18	793084.157	2133.543	EDGE	12FT	GUT	
566	26710970.84	793081.752	2133.51	EDGE	12FT	GUT	
567	26710978.52	793120.419	2132.829	EDGE	12FT	GUT	
568	26710965.02	793113.13	2133.161	EDGE	12FT	GUT	
569	26710969.21	793132.978	2132.856	EDGE	12FT	GUT	
570	26710937.01	793104.482	2134.107	EDGE	12FT	GUT	
571	26710944.85	793095.506	2134.076	EDGE	12FT	GUT	
572	26710923	793076.162	2134.915	EDGE	12FT	GUT	
573	26710918.56	793088.145	2134.95	EDGE	12FT	GUT	
574	26710995.93	793142.952	2132.373	EDGE	VAR	GUT	
575	26711007.52	793155.453	2131.583	EDGE	VAR	GUT	
576	26711019.02	793161.668	2131.022	EDGE	VAR	GUT	
577	26711031.99	793216.596	2130.225	EDGE	VAR	GUT	
578	26710995.75	793184.969	2131.612	EDGE	VAR	GUT	
579	26710977.89	793153.09	2132.459	EDGE	VAR	GUT	
580	26711024.64	793183.662	2130.632	FL	GUT		
581	26711002.42	793168.274	2131.388	FL	GUT		
582	26710982.51	793150.505	2132.253	FL	GUT		
583	26710972.03	793129.243	2132.737	FL	GUT		
584	26710961.2	793117.327	2132.991	FL	GUT		
585	26710940.74	793100.063	2133.859	FL	GUT		
586	26710920.74	793082.388	2134.844	FL	GUT		
587	26710970.15	793112.119	2132.907	FL	GUT		
588	26710965.03	793082.897	2133.277	FL	GUT		
589	26710955.25	793037.342	2133.696	FL	GUT		
590	26710937.96	793051.122	2135.586	D-TOE-WW			

591	26710930.22	793140.218	2136.923	D-TOE-WW			
592	26711033.77	793207.114	2130.177	FL	84"	RCP	
593	26711030.29	793194.453	2130.311	FL	84"	RCP	
594	26711026.47	793180.525	2130.605	FL	84"	RCP	
595	26711022.99	793167.804	2130.796	FL	84"	RCP	
596	26711045.09	793311.391	2131.48	D-NG			
597	26711011.61	793288.749	2131.264	D-NG			
598	26710968.54	793263.565	2132.639	D-NG			
599	26710931.51	793229.856	2133.251	D-NG			
600	26711164.58	793301.714	2132.917	C-TBC			
601	26711113.94	793300.939	2132.129	C-TBC			
602	26711073.38	793300.345	2131.472	C-TBC			
603	26711068.27	793296.543	2131.328	C-TBC			
604	26711068.41	793283.577	2131.167	C-BCR			
605	26711065.85	793279.815	2131.144	C-BCR			
606	26711049.89	793279.566	2130.807	C-TBC<P			
607	26711048.36	793233.113	2129.978	C-TBC<P			
608	26711034.58	793183.075	2130.234	C-TBC			
609	26711019.7	793129.349	2130.445	C-TBC			
610	26711005.53	793078.2	2130.702	C-TBC			
611	26710992.15	793029.174	2131.158	C-TBC			
612	26710979.55	792983.618	2131.499	C-TBC			
613	26711004.89	792978.7	2131.877	AC			
614	26711018.82	793027.825	2131.59	AC			
615	26711032.73	793075.496	2131.278	AC			
616	26711046.09	793123.79	2130.945	AC			
617	26711060.16	793171.726	2130.813	AC			
618	26711076.75	793223.649	2130.613	AC			
619	26711091.93	793258.886	2131.019	AC			
620	26711141.76	793266.925	2131.851	AC			
621	26704827.61	793577.869	2232.737	D-TOP-CONC-CHNL			
622	26704826.25	793610.651	2232.716	D-TOP-CONC-CHNL			
623	26704766.15	793603.957	2230.978	D-TOP-CONC-CHNL			
624	26704735.87	793600.61	2231.765	D-TOP-CONC-CHNL			
625	26704744.16	793613.35	2230.687	D-NG			
626	26704798.46	793618.103	2230.107	D-NG			
627	26704840.91	793617.958	2230.698	D-NG			
628	26704861.5	793581.864	2231.194	D-NG			
630	26704767.08	793577.363	2230.954	D-TOP-CONC-CHNL			
631	26704736.63	793576.999	2231.879	D-TOP-CONC-CHNL			
632	26704737.93	793565.072	2231.803	D-NG			
633	26704791.29	793557.346	2231.837	D-NG			
634	26704843.79	793548.03	2231.188	D-NG			
635	26704888.84	793559.034	2230.768	D-NG			
636	26704870.4	793524.188	2229.914	D-TOP-CONC-CHNL			
637	26704914.64	793520.391	2229.602	D-TOP-CONC-CHNL			
638	26704934.46	793519.854	2233.219	D-TOP-CONC-CHNL			
639	26704934.87	793492.854	2233.084	D-TOP-CONC-CHNL			
640	26704913.25	793493.868	2229.379	D-TOP-CONC-CHNL			
641	26704865.73	793498.193	2229.936	D-TOP-CONC-CHNL			
642	26704861.02	793480.962	2231.512	D-NG			
643	26704913.84	793471.667	2231.561	D-NG			
644	26704948.21	793469.128	2231.36	D-NG			
645	26704956.07	793504.923	2231.769	D-NG			
646	26704956.72	793537.66	2231.379	D-NG			
647	26704916.5	793548.217	2231.407	D-NG			
648	26704975.44	793493.121	2232.717	D-TOP-CONC-CHNL			
649	26705052.6	793493.636	2232.066	D-TOP-CONC-CHNL			
650	26705126.05	793492.038	2231.417	D-TOP-CONC-CHNL			
651	26705125.97	793522.513	2231.513	D-TOP-CONC-CHNL			
652	26705042.95	793520.495	2232.013	D-TOP-CONC-CHNL			
653	26704975.08	793520.507	2232.598	D-TOP-CONC-CHNL			
654	26704998.76	793541.269	2230.289	D-NG			
655	26705068.97	793548.875	2229.29	D-NG			
656	26705131.67	793493.425	2229.955	D-GRATE			
657	26705131.54	793521.5	2230.042	D-GRATE			
658	26705129.97	793548.543	2230.734	C-BCR			
659	26705130.27	793508.428	2230.541	C-BCR			
660	26705130.51	793461.577	2230.697	C-BCR			
661	26705112.74	793450.455	2230.048	D-NG			
662	26705084.34	793447.215	2229.723	D-NG			
663	26705156.03	793428.739	2230.828	A-CL-ASPHALT			

664	26705154.91	793480.446	2230.552	A-CL-ASPHALT			
665	26705154.75	793531.258	2230.695	A-CL-ASPHALT			
666	26705156.03	793580.251	2231.012	A-CL-ASPHALT			
667	26705184.46	793499.455	2229.838	D-GRATE			
668	26705184.43	793475.948	2229.873	D-GRATE			
669	26705469.67	793459.053	2224.284	D-TOP-CONC-CHNL			
670	26705428.15	793462.716	2224.22	D-TOP-CONC-CHNL			
671	26705380.51	793477.755	2224.171	D-TOP-CONC-CHNL			
672	26705378.5	793478.511	2228.849	D-TOP-CONC-CHNL			
673	26705367.45	793453.17	2228.773	D-TOP-CONC-CHNL			
674	26705434.65	793433.899	2228.756	D-TOP-CONC-CHNL			
675	26705434.85	793433.714	2224.206	D-TOP-CONC-CHNL			
676	26705469.49	793431.385	2224.356	D-TOP-CONC-CHNL			
677	26705462.32	793419.806	2224.511	AC			
678	26705497.8	793403.985	2224.137	AC			
679	26705506.4	793438.806	2223.682	AC			
680	26705509.85	793473.239	2223.638	AC			
681	26705470.43	793476.56	2224.303	AC			
682	26705443.04	793486.211	2224.68	AC			
683	26705643.38	793972.224	2214.294	D-TOP-WW			
684	26705629.85	793963.185	2227.455	D-TOP-HW			
685	26705745.54	793857.908	2221.381	D-TOP-HW			
686	26705763.03	793849.62	2214.133	D-TOP-WW			
687	26705749.36	793847.956	2218.098	C-TBC			
688	26705788.75	793817.667	2216.777	C-TBC			
689	26705794.31	793819.815	2216.797	SW-BACK	SIDEWALK		
690	26705762.74	793843.686	2217.814	SW-BACK	SIDEWALK		
691	26705776.62	793841.221	2217.05	D-RIPRAP-TOP			
692	26705803.11	793851.055	2215.987	D-RIPRAP-TOP			
693	26705825.41	793862.116	2215.27	D-RIPRAP-TOP			
694	26705825.61	793881.611	2205.859	D-RIPRAP-TOE			
695	26705802.84	793876.714	2205.869	D-RIPRAP-TOE			
696	26705769.14	793865.786	2206.193	D-RIPRAP-TOE			
697	26705751.86	793863.794	2206.025	D-RIPRAP-TOE			
698	26705653	793962.256	2207.817	D-RIPRAP-TOE			
699	26705685.81	793951.687	2206.752	D-RIPRAP-TOE			
700	26705711.81	793936.728	2205.997	D-RIPRAP-TOE			
701	26705735.55	793960.374	2213.899	D-RIPRAP-TOP			
702	26705694.07	793972.063	2213.88	D-RIPRAP-TOP			
703	26705664.66	793979.44	2215.785	D-RIPRAP-TOP			
704	26705624.63	793967.884	2224.361	SW-BACK	SIDEWALK		
705	26705622.42	793963.077	2224.16	C-TBC			
706	26705580.68	794002.759	2226.521	C-TBC			
707	26705584.21	794006.228	2226.691	SW-BACK	SIDEWALK		
708	26706347.17	793464.001	2211.305	SDMH-708			
709	26706347.57	793484.445	2211.436	SDMH-9.60			
710	26707458.01	793486.208	2192.616	TG-7.80			
711	26707456.08	793486.211	2192.602	TG-7.80			
712	26707456.01	793489.104	2192.549	TG-7.80			
713	26707457.96	793489.142	2192.596	TG-7.80			
714	26708039.96	793492.453	2182.42	TG-10.60			
715	26708704.99	793506.544	2171.936	SDMH-8.50			
8999	26705097.1	793460.254	2231.064	INIT	PT		



Legend

Point ID
+2129.11 — Elevation
D-TOP-BANK — Description

Survey Data Point

Note

Aerial photo as of April 2005.

I hereby certify that the information used to prepare this LOMR and the associated analysis substantially conforms with the field survey performed by PBS&J.

Matthew S. Baird, NV 13684 — Date 7/18/05

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

FIGURE 1: SURVEY EXHIBIT

I-215 Beltway

Project No. 511606.00 — July 2005

PBS&J
2270 Corporate Circle
Suite 100 Henderson,
Nevada 89014
Telephone: 702/263-7275
Fax: 702/263-7200
ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

FIGURE 1

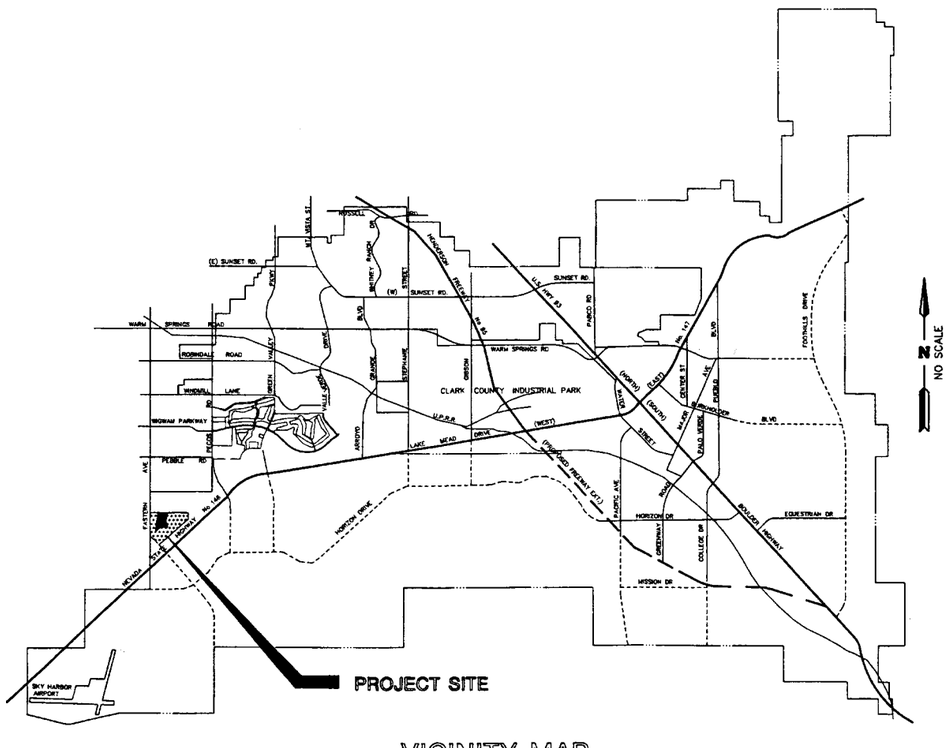
APPENDIX D

Southfork Parcel 12 Grading Plans
Drainage Basin Exhibit
Cross Sections
Hydrology

IMPROVEMENT PLANS
OF
SOUTHFORK
PARCEL 12 UNIT-2
CITY OF HENDERSON

GENERAL NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, 1986, AND THE UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA 1988.
2. APPLICATION FOR INSPECTION BY THE CITY OF HENDERSON PUBLIC WORKS SHALL BE MADE BY THE CONTRACTOR AT LEAST 24 HOURS BEFORE THE INSPECTION SERVICES WILL BE REQUIRED, 565-2136 OR 565-2140.
3. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE PROSECUTED TO COMPLETION WITHOUT DELAY SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.
4. THE CONTRACTOR SHALL TAKE ALL NECESSARY AND PROPER PRECAUTIONS TO PROTECT ADJACENT PROPERTIES FROM ANY AND ALL DAMAGE THAT MAY OCCUR FROM STORM WATER RUNOFF AND/OR DEPOSITION OF DEBRIS RESULTING FROM ANY AND ALL WORK IN CONNECTION WITH SUBDIVISION CONSTRUCTION.
5. PRIOR TO FINAL ACCEPTANCE, BOND RELEASES, AND A CERTIFICATE OF OCCUPANCY, A CERTIFIED LEGIBLE AS-BUILT DRAWING MUST BE SUBMITTED TO THE CITY OF HENDERSON. AS-BUILT MUST SHOW ALL CHANGES AND ACTUAL FIELD LOCATIONS. IN THE ABSENCE OF CHANGES, A COPY OF APPROVED DRAWINGS WILL BE REQUIRED STATING "INSTALLED AS PER DRAWINGS" AND CERTIFIED AS SUCH BY THE DEVELOPER'S ENGINEER.
6. APPROVAL OF THESE PLANS IS FOR THE CONSTRUCTION OF OFFSITE IMPROVEMENTS ONLY. ALL ONSITE IMPROVEMENTS, AS DEFINED BY CITY OF HENDERSON, INCLUDING BLOCK WALLS, MUST BE APPROVED BY THE BUILDING AND PLANNING DIVISIONS OF THE CITY OF HENDERSON.
7. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITION BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND OF INGRESS AND EGRESS TO SAID CONSTRUCTION. EXTENT OF TRANSITIONS TO BE DETERMINED BY THE CITY ENGINEER.
8. EXISTING UTILITIES ARE LOCATED ON PLANS FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE CONTRACTOR SHALL BEAR FULL RESPONSIBILITY FOR THE PROTECTION OF UTILITIES AND THE ENGINEER BEARS NO RESPONSIBILITY FOR UTILITIES NOT SHOWN ON THE PLANS OR NOT IN THE LOCATION SHOWN ON THE PLANS. THIS INCLUDES ALL SERVICE LATERALS OF ANY KIND.
9. POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO THE CITY OF HENDERSON.
10. WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING NO. 235. EXACT LOCATION OF RAMPS SHALL BE DETERMINED IN THE FIELD BY A CITY INSPECTOR, OR AS SHOWN ON PLAN.
11. CURB AND GUTTER WITH A GRADE OF LESS THAN FOUR-TENTHS OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
12. ALL GRADING SHALL CONFORM TO THE SOILS REPORT:
    ENGINEER GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.
    DATE 7-13-94
    JOB NUMBER CONS-6143
13. EARTHWORK SHALL BE PERFORMED IN ACCORDANCE WITH THE PRELIMINARY GEOTECHNICAL REPORT.
14. ALL STREET STRUCTURAL SECTIONS SHALL BE PER THE RECOMMENDATIONS OF THE SOILS ENGINEER. BASED ON CBR OR R-VALUES. NO PAVING OR BASE WORK SHALL COMMENCE UNTIL A STREET STRUCTURAL SECTION IS APPROVED BY THE CITY ENGINEER, CITY OF HENDERSON.
15. 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 PUBLIC STREETS IMMEDIATELY AFTER THE FIRST GRADING WORK IS ACCOMPLISHED AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "NEVADA TRAFFIC CONTROL MANUAL" - CURRENT EDITION AND TO THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES" - CURRENT EDITION AND BE APPROVED BY THE CITY OF HENDERSON BEFORE CONSTRUCTION BEGINS.
16. WHERE EXISTING PAVEMENT IS CUT TO INSTALL UTILITY SERVICE LINES, BACKFILL AND PAVEMENT REPLACEMENT SHALL BE DONE PER STANDARD DRAWING 5502 AND SECTIONS 206, 207, AND 208 OF THE STANDARD SPECIFICATION ISSUE, 1986.
17. ALL STATIONING IS REFERENCED TO CENTERLINE.
18. EXACT LOCATION OF ALL SAWCUT LINES SHALL BE DETERMINED IN THE FIELD BY A CITY OF HENDERSON INSPECTOR.
19. PROTECTION AND REPLACEMENT OF SURVEY MONUMENTS OR PROPERTY STAKES NOT DELINEATED ON THE CONTRACT DRAWINGS SHALL BE THE CONTRACTOR'S RESPONSIBILITY. REPLACEMENT OF SURVEY MONUMENTS OR PROPERTY STAKES SHALL BE DONE TO THE COH SURVEY SECTION'S SATISFACTION.
20. AFFECTED UTILITY COMPANIES SHALL BE NOTIFIED AT LEAST TWO (2) WORKING DAYS PRIOR TO COMMENCEMENT OF CONSTRUCTION.
21. CALL BEFORE YOU DIG, 1-800-227-2600.
22. MODIFICATIONS TO EXISTING UTILITIES SHALL CONFORM TO THE OWNER'S UTILITY STANDARDS AND SPECIFICATIONS.
23. THE CONTRACTOR SHALL TAKE REASONABLE MEASURES TO PROTECT EXISTING IMPROVEMENTS FROM DAMAGE AND ALL SUCH IMPROVEMENTS DAMAGED BY THE CONTRACTOR'S OPERATION SHALL BE REPAIRED OR RECONSTRUCTED TO THE ENGINEER'S SATISFACTION AT THE EXPENSE OF THE CONTRACTOR.
24. ALL OFFSITE AND ONSITE WATER AND SEWER FACILITIES UP TO WITHIN 5 FEET OF BUILDINGS SHALL BE CONSTRUCTED TO PUBLIC WORKS STANDARDS.



VICINITY MAP

OWNER & DEVELOPER

WESTGATE LIMITED PARTNERSHIP,
A NEVADA LIMITED PARTNERSHIP
7448 WEST SAHARA AVENUE SUITE 101
LAS VEGAS, NEVADA 89117
(702) 222-1410

BENCHMARK

C.O.H. BM #193

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD DRIVE, AT H/W STATION 217+83.79, 250 FEET± EAST OF EASTERN AVENUE.

ELEVATION = 2263.946
METRIC = 690.051 M

SHEET INDEX

1. COVER SHEET
2. DETAIL SHEET
3. ROUGH GRADING PLAN
4. ROUGH GRADING PLAN
5. STREET & SEWER PLAN & PROFILE - (NORRIDGE STREET)
6. STREET & SEWER PLAN & PROFILE - (WINDOM PEAK AVE./MILLINOCKET CT.)
7. STREET & SEWER PLAN & PROFILE - (MANDERLY DRIVE)
8. STREET & SEWER PLAN & PROFILE - (ARTEMIS CT./BRACERO))
9. MASTER SEWER PLAN
10. MASTER WATER PLAN
11. MASTER STREET LIGHT PLAN

QUANTITY ESTIMATE

2" ASPHALTIC CONCRETE PAVING	11,980 S.Y.
24" "L"TYPE CURB & GUTTER	5,528 L.F.
CONCRETE VALLEY GUTTER	2,413 S.F.
CONCRETE SIDEWALK	29,133 S.F.

APPROVALS

FLOOD CONTROL COORDINATOR — 5/18/95 DATE

UTILITIES MANAGER — 4.27.95 DATE

SOUTHWEST GAS CORPORATION — 11-15-94 DATE

SPRINT CENTRAL TELEPHONE - NEVADA — 11-15-94 DATE

FIRE SAFETY DIVISION — 2-14-95 DATE

BUILDING SUPERINTENDANT — 12/13/94 DATE

NEVADA POWER COMPANY — 11/10/94 DATE
THIS APPROVAL IS ONLY FOR THE PLACEMENT AND CLEARANCE OF STREET LIGHT AND SIGNAL LIGHT INSTALLATIONS.

Mark T. Calhoun — 5/22/95 DATE
DIRECTOR OF PUBLIC WORKS - MARK T. CALHOUN P.E. NO. 6585
CITY APPROVAL OF THE IMPROVEMENT PLAN IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY 5/22/19 96

22-61-25

APPROV.	REV.	DATE	BY	REVISION
	1	3/16/95	L.T.	REVISED UNIT NUMBERS

TITLE: COVER SHEET
PROJECT: SOUTHFORK PARCEL 12 UNIT - 2

CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF NEVADA — 7-8-94

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS
2704 W. CHARLESTON BLVD. LAS VEGAS, NEVADA 89102 • (702) 383-0463

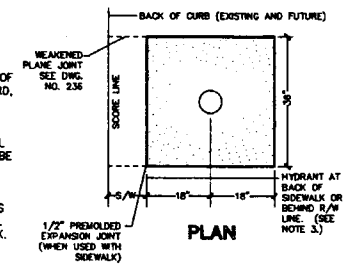
W.O. # : 900-B400
BY : DL/RK
DATE : JULY 1994
SCALE : NO SCALE

SHEET 1 OF 11 SHEETS

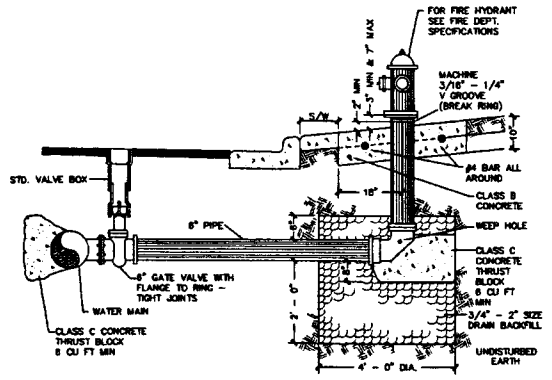
04249

NOTES:

1. NO HYDRANT SHALL BE LOCATED WITHIN 15' OF ANY DRIVEWAY, 5' OF ANY POWER POLE, LIGHT STANDARD, OR ANY OTHER OBSTRUCTION.
2. IF HYDRANT IS TO BE INSTALLED IN AN EXISTING SIDEWALK, A FULL PANEL OF THE SIDEWALK SHALL BE REMOVED AND REPLACED AFTER INSTALLATION OF THE HYDRANT.
3. WHEN R/W AND FIELD CONDITIONS PERMIT THE FIRE HYDRANT SHALL BE PLACED BEHIND THE SIDEWALK.



PLAN

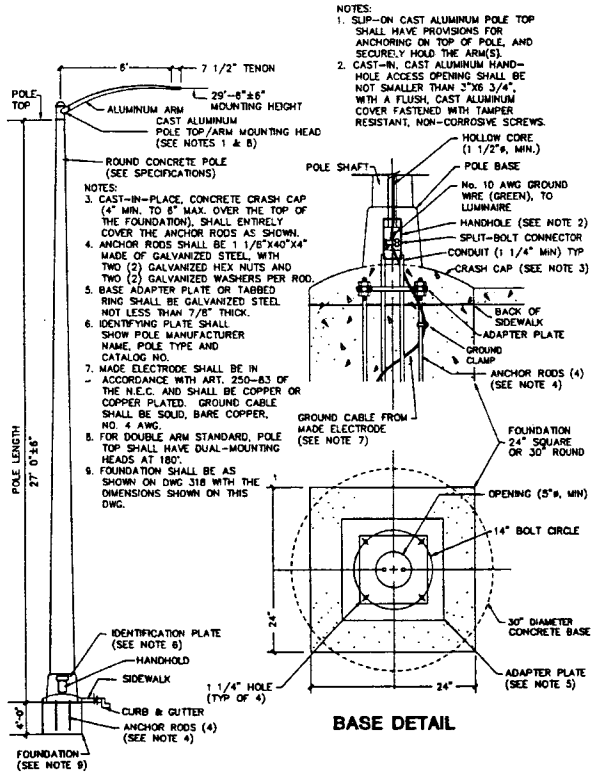


ELEVATION

FIRE HYDRANT

STANDARD DRAWING NO. 516

NOTES:
1. SLIP-ON CAST ALUMINUM POLE TOP SHALL HAVE PROVISIONS FOR ANCHORING ON TOP OF POLE, AND SECURELY HOLD THE ARM(S).
2. CAST-IN, CAST ALUMINUM HAND-HOLE ACCESS OPENING SHALL BE NOT SMALLER THAN 3"X6 3/4", WITH A FLUSH, CAST ALUMINUM COVER FASTENED WITH TAMPER RESISTANT, NON-CORROSIVE SCREWS.

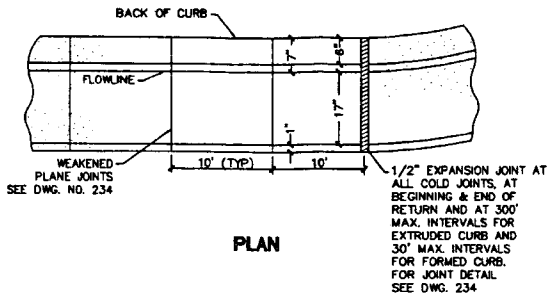


NOTES:
3. CAST-IN-PLACE CONCRETE CRASH CAP (4" MIN. TO 6" MAX. OVER THE TOP OF THE FOUNDATION), SHALL ENTIRELY COVER THE ANCHOR RODS AS SHOWN.
4. ANCHOR RODS SHALL BE 1 1/8"X40"X4" MADE OF GALVANIZED STEEL, WITH TWO (2) GALVANIZED HEX NUTS AND TWO (2) GALVANIZED WASHERS PER ROD.
5. BASE ADAPTER PLATE OR TABBED RING SHALL BE GALVANIZED STEEL NOT LESS THAN 7/8" THICK.
6. IDENTIFYING PLATE SHALL SHOW POLE MANUFACTURER NAME, POLE TYPE AND CATALOG NO.
7. MADE ELECTRODE SHALL BE IN ACCORDANCE WITH ART. 250-83 OF THE N.E.C. AND SHALL BE COPPER OR COPPER PLATED. GROUND CABLE SHALL BE SOLID, BARE COPPER, NO. 4 AWG.
8. FOR DOUBLE ARM STANDARD, POLE TOP SHALL HAVE DUAL-MOUNTING HEADS AT 180°.
9. FOUNDATION SHALL BE AS SHOWN ON DWG 318 WITH THE DIMENSIONS SHOWN ON THIS DWG.

BASE DETAIL

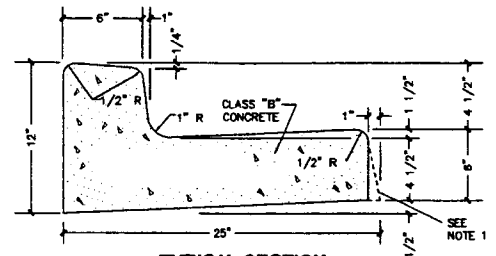
STREET LIGHTING STANDARD

CITY OF HENDERSON GREEN VALLEY AREA ONLY
STANDARD DRAWING NO. 313A



PLAN

NOTES:
1. 1" BATTER ON GUTTER FACE OPTIONAL.
2. WHERE LONGITUDINAL SLOPE IS LESS THAN 0.4% THE FLOWLINE SHALL BE WATER TESTED.



TYPICAL SECTION

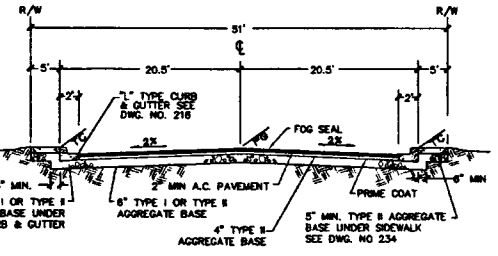
"L" TYPE CURB & GUTTER

STANDARD DRAWING NO. 216

REVISION	BY	DATE	APPR.	REV
DELETED UNIT NUMBER	EJH	5/16/95		1

TITLE: DETAIL SHEET

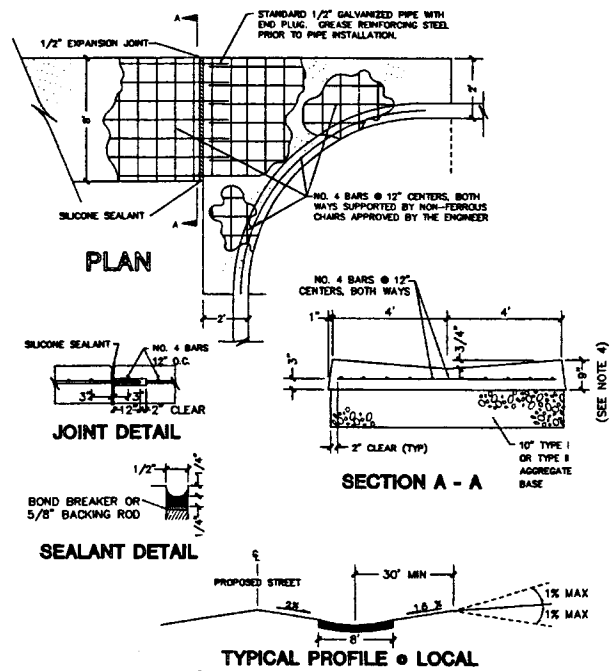
PROJECT: SOUTHFORK PARCEL 12/UNIT 2



TYPICAL 51' STREET SECTION

STANDARD DRAWING NO. 208
INTERIOR STREETS

NOTES:
1. FINAL A.C. PAVEMENT SURFACE (INCLUDING OPEN GRADE) SHALL BE 1/2" MAXIMUM ABOVE LIP OF GUTTER.
2. STRUCTURAL SECTION SHOWN IS BASED ON A SUBGRADE "R" VALUE OF 20. OTHER STRUCTURAL SECTIONS MAY BE APPROVED IF BASED ON ENGINEERING ANALYSIS BASED ON "R" OR "CBR" VALUES DETERMINED BY SOIL TESTING. IN NO CASE SHALL THE A.C. THICKNESS BE LESS THAN THAT SHOWN, NOR SHALL THE BASE BE LESS THAN 3" (ALTERNATE PAVEMENT SURFACE MAY BE ALLOWED).
3. RESIDENTIAL ONE-WAY STREET SHALL NOT EXCEED ONE THOUSAND FEET OR TWENTY RESIDENTIAL LOTS IN LENGTH, WHICHEVER IS LESS.
4. NO BASE PREPARATION OR PAVING TO BE DONE UNTIL STRUCTURAL SECTIONS FOR STREET ARE APPROVED BY THE CITY OF HENDERSON.
5. A 3/4" OPEN GRADE MAY BE REQUIRED AS DETERMINED BY THE ENGINEER.

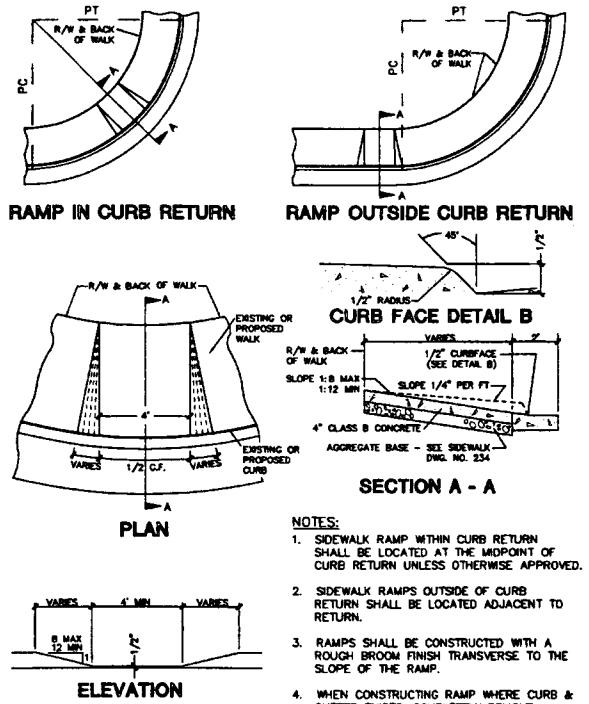


TYPICAL PROFILE @ LOCAL RESIDENTIAL STREET INTERSECTIONS

NOTES:
1. ALL CONCRETE SHALL BE CLASS B.
2. FINISHED ASPHALT CONCRETE SURFACE TO BE FLUSH WITH CROSS GUTTER LIP.
3. CONSTRUCTION OF CROSS GUTTER IS NOT ALLOWED ACROSS MAJOR COLLECTOR OR ARTERIAL STREETS.
4. ADJACENT SPANDREL SHALL BE 9" THICK P.C.C.

CROSS GUTTER

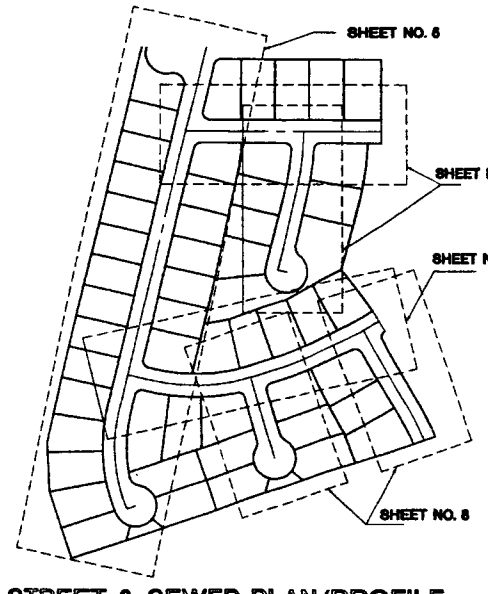
STANDARD DRAWING NO. 228



NOTES:
1. SIDEWALK RAMP WITHIN CURB RETURN SHALL BE LOCATED AT THE MIDPOINT OF CURB RETURN UNLESS OTHERWISE APPROVED.
2. SIDEWALK RAMPS OUTSIDE OF CURB RETURN SHALL BE LOCATED ADJACENT TO RETURN.
3. RAMPS SHALL BE CONSTRUCTED WITH A ROUGH BROOM FINISH TRANSVERSE TO THE SLOPE OF THE RAMP.
4. WHEN CONSTRUCTING RAMP WHERE CURB & GUTTER EXISTS, COMPLETELY REMOVE INTERFERING PORTIONS OF EXISTING CURB & GUTTER. RAMP, CURB & GUTTER TO BE MONOLITHIC.

SIDEWALK RAMP

STANDARD DRAWING NO. 236



STREET & SEWER PLAN/PROFILE

SHEET INDEX

APPROVAL

LAND DEVELOPMENT – KEN KOSHIRO, P.E. DATE

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW & APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY _____, 19__.

22-61-25

NEVADA PROFESSIONAL ENGINEER – STATE OF NEVADA – REGISTERED PROFESSIONAL ENGINEER – No. 6985 – KATHY R. SMITH – EXPIRES 12-31-96

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS
708 W. CHARLESTON BLVD. • LAS VEGAS, NEVADA 89102 • (702) 385-0052

W.O. # : 900-B400
BY : DL/MK
DATE : JULY 1994
SCALE : NO SCALE

SHEET 2 OF 11 SHEETS

$4249

N

SCALE: 1"= 40'

PROPOSED "SOUTHFORK PARCEL 11"

DRAINAGE CHANNEL

CHANNEL IMPROVEMENTS PER PARCEL 11 HYDROGOGY

NORRIDGE STREET

MILLINOCKET COURT

WINDOM PEAK AVE.

IVANPAH DRIVE

FOR CONTINUATION SEE SHEET 4

FOR CONTINUATION SEE SHEET 4

PROPOSED "SOUTHFORK PARCEL 12 – UNIT 3"

PROPOSED "SOUTHFORK PARCEL 12 – UNIT 3"

22-61-25

04449

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS
7548 WEST SAHARA AVENUE • LAS VEGAS, NEVADA 89117 • (702) 248-4415

SHEET 3 OF 11 SHEETS

W.O. # :	900-B400
BY :	MF\CHAO
DATE :	JULY 1994
SCALE :	1"= 40'

REGISTERED PROFESSIONAL ENGINEER STATE OF NEVADA 9-844 KATHY R. SMITH CIVIL No. 6987

TITLE

ROUGH GRADING PLAN

PROJECT

SOUTHFORK PARCEL 12 - UNIT 2

APPRVL	REV	DATE	BY	REVISION
	1	9/22/95	SLH	MISC. REVISIONS, CHANGE UNIT NO., ETC.
	2	6/1/95	TB	REV'D ST. GRADES LOWERED PADS, ADD RET. WALL
		5-15-95	DR	REVISED STORM DRAIN PER NEW GRADING ON MARLEFAN

N

SCALE: 1"= 40'

PROPOSED "SOUTHFORK PARCEL 11"

CHANNEL IMPROVEMENTS PER PARCEL 11 HYDROLOGY

DRAINAGE CHANNEL

EASTERN AVE.

NORRIDGE STREET

ARMAGOSSA POWERLINE EASEMENT

ARTEMUS COURT

IONE ROAD

MANDERLY DRIVE

BRACERO COURT

FOR CONTINUATION SEE SHEET 3

PROPOSED "SOUTHFORK PARCEL 16"

PROPOSED "SOUTHFORK PARCEL 12 - UNIT 3"

22-61-25

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS
7548 WEST SAHARA AVENUE • LAS VEGAS, NEVADA 89117 • (702) 248-6415

PROFESSIONAL ENGINEER STATE OF NEVADA No. 6987
1-8-96
KATHY R. SHULL
CIVIL

SHEET 4 OF 11 SHEETS

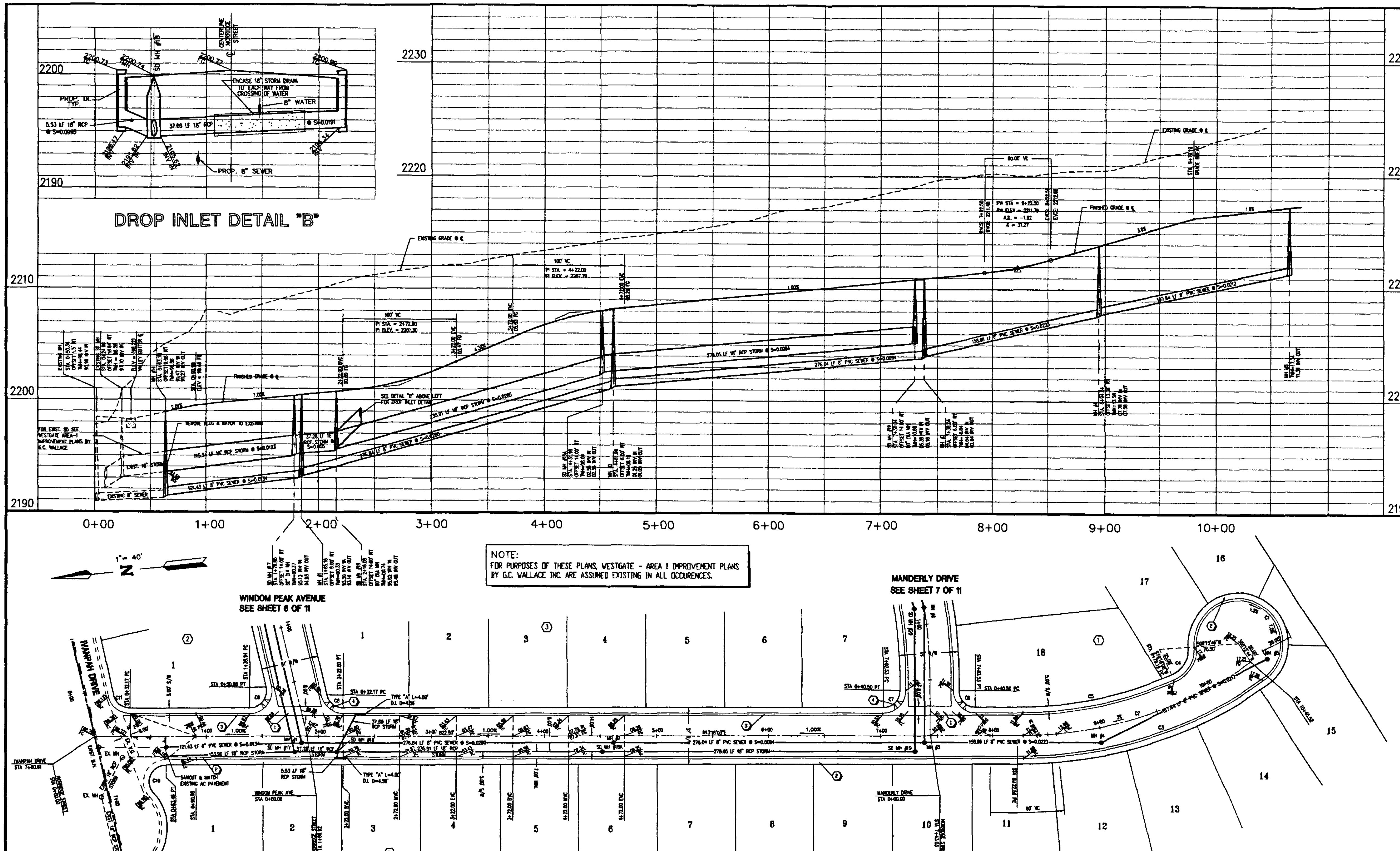
W.O. # :	900-8400
BY :	MF\CHAO
DATE :	JULY 1994
SCALE :	1"= 40'

TITLE
ROUGH GRADING PLAN

PROJECT
SOUTHFORK PARCEL 12 - UNIT 2

APPRVL	REV	DATE	BY	REVISION
	1	9-22-95	SLN	REVISED STORM DRAIN
	2	5-15-96	DF	REVISED SIDAR DRAIN PIPE NEW GRADES ON NORRIDGE
DF	3	11/8/96	RK/MJ	REVISED GRADES ON BRACERO CT.

44449



NORRIDGE STREET

BACK-OF-CURB CURVE DATA

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	40.50'	168.90'	71.88'	70.52'	238°56'58"
C2 C/L	364.50'	223.01'	115.12'	219.55'	35°03'19"
C3	385.00'	235.55'	121.59'	231.90'	35°03'19"
C4	30.00'	36.67'	21.02'	34.43'	70°02'22"
C5	344.00'	143.89'	73.01'	142.84'	23°57'55"
C6	20.00'	31.42'	20.00'	28.28'	90°00'00"
C7	20.00'	31.42'	20.00'	28.28'	90°00'00"
C8	20.00'	26.85'	15.89'	24.88'	76°55'34"
C9	20.00'	35.98'	25.18'	31.32'	103°04'26"
C10	20.00'	46.28'	45.54'	36.62'	132°35'03"
C11	20.00'	26.85'	15.89'	24.88'	76°55'34"

BENCHMARK

C.O.H. BM #193

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD DRIVE, AT H/W STATION 217+83.79, 250 FEET± EAST OF EASTERN AVENUE.

ELEVATION = 2263.946 FEET

QUANTITY ESTIMATE

2" ASPHALTIC CONCRETE — 4441 SY
24" 'L' TYPE CURB & GUTTER — 2102 LF
CONCRETE VALLEY GUTTER — 0 SF
CONCRETE SIDEWALK — 10761 SF

THESE QUANTITIES ARE ONLY ESTIMATES, CONTRACTOR TO VERIFY.

Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

CONSTRUCTION NOTES

1. CONSTRUCT VALLEY GUTTER PER CLARK COUNTY AREA STD. DWG. #226
2. CONSTRUCT 5' SIDEWALK PER CLARK COUNTY AREA STD. DWG. #234
3. CONSTRUCT 24" "L" TYPE CURB & GUTTER PER CLARK COUNTY AREA STD. DWG. #216
4. CONSTRUCT WHEELCHAIR RAMP PER CLARK COUNTY AREA STD. DWG. #235

APPROVAL

LAND DEVELOPMENT – KEN KOSHIRO, P.E. 5-22-95
DATE

CITY APPROVAL OF THE IMPROVEMENT PLAN IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY May 22 1996

APPR'L	REV	DATE	BY	REVISION
	1	5\3\95	DF	REV. SEWER, SD AND ST. GRADES PER NEW IVANPAH DESIGN ALSO ADDED STORM DRAIN MANHOLE

TITLE: STREET & SEWER PLAN & PROFILE (NORRIDGE STREET)

PROJECT: SOUTHFORK - PARCEL 12/UNIT 2

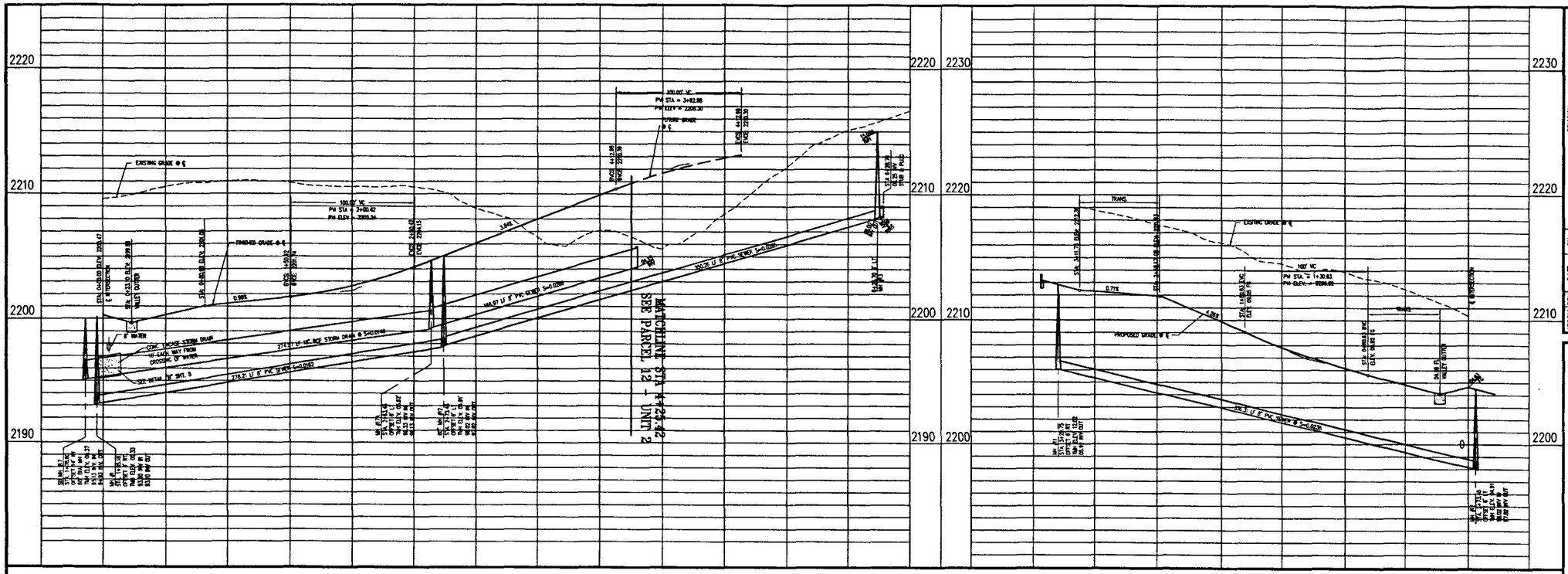
ESI ENGINEERS AND SURVEYORS INC
PLANNERS • CONSULTING ENGINEERS • SURVEYORS
7150 W. CHARLESTON BLVD. • LAS VEGAS, NEVADA 89117 • (702) 363-4451

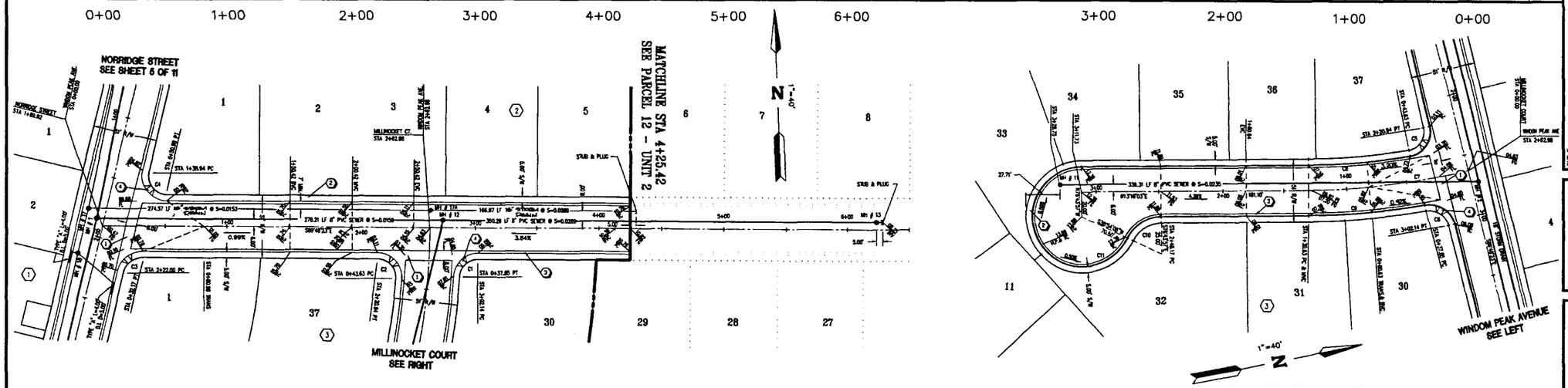
W.O. #: 900-B400
BY: DL/KK
DATE: JULY 1994
SCALE: HORIZ 1" = 40' VERT 1" = 4'

SHEET 5 OF 11 SHEETS

22-61-25

φ4249





BACK-OF-CURB CURVE DATA

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	20.00'	30.06'	18.73'	27.33'	86°07'42"
C2	20.00'	32.94'	21.58'	29.34'	94°21'58"
C3	20.00'	26.85'	15.88'	24.88'	76°50'34"
C4	20.00'	35.86'	25.10'	31.37'	102°44'26"
C5	20.00'	32.94'	21.58'	29.34'	94°21'58"
C6	20.00'	30.06'	18.73'	27.33'	86°12'42"
C7 C/L	572.48'	130.43'	65.60'	130.15'	13°03'26"
C8	504.98'	83.88'	42.00'	83.81'	09°31'27"
C9	562.98'	98.10'	49.18'	98.00'	09°58'58"
C10	30.00'	33.70'	18.88'	31.93'	64°21'57"
C11	40.50'	172.73'	54.38'	68.50'	244°21'57"

WINDOM PEAK AVE/MILLINOCKET CT.

BENCHMARK

C.O.H. BM #193

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD DRIVE, AT H/W STATION 217+83.79, 250 FEET± EAST OF EASTERN AVENUE.

ELEVATION = 2263.946 FEET

QUANTITY ESTIMATE

2" ASPHALTIC CONCRETE	3215 SY
24" "L" TYPE CURB & GUTTER	1453 LF
CONCRETE VALLEY GUTTER	986 SF
CONCRETE SIDEWALK	7816 SF

THESE QUANTITIES ARE ONLY ESTIMATES, CONTRACTOR TO VERIFY.

Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

CONSTRUCTION NOTES

1. CONSTRUCT VALLEY GUTTER PER CLARK COUNTY AREA STD. DWG. #238
2. CONSTRUCT 5' SIDEWALK PER CLARK COUNTY AREA STD. DWG. #234
3. CONSTRUCT 24" "L" TYPE CURB & GUTTER PER CLARK COUNTY AREA STD. DWG. #246
4. CONSTRUCT WHEELCHAIR RAMP PER CLARK COUNTY AREA STD. DWG. #235

APPROVAL

LAND DEVELOPMENT - KEN KOSHIRO, P.E. — DATE

CITY APPROVAL OF THE IMPROVEMENT PLAN IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY January 19 96

22-61-25

APPRVL	REV	DATE	BY	REVISION
	1	5/31/95	D.F.	REVI. GRADES, ST. AND ST. GRADES PER NEW VARIANCE APPROV.
				ALSO ADDED WINDOM PEAK MANHOLE.

TITLE: STREET & SEWER PLAN & PROFILE
WINDOM PEAK AVE/MILLINOCKET CT.

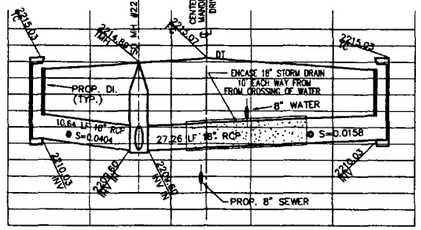
PROJECT: SOUTHFORK - PARCEL 12/UNIT 2

ESI ENGINEERS AND SURVEYORS INC
PLANNERS - CONSULTING ENGINEERS - SURVEYORS
709 W. CHARLESTON BLVD. • LAS VEGAS, NEVADA 89102 • (702) 383-0545

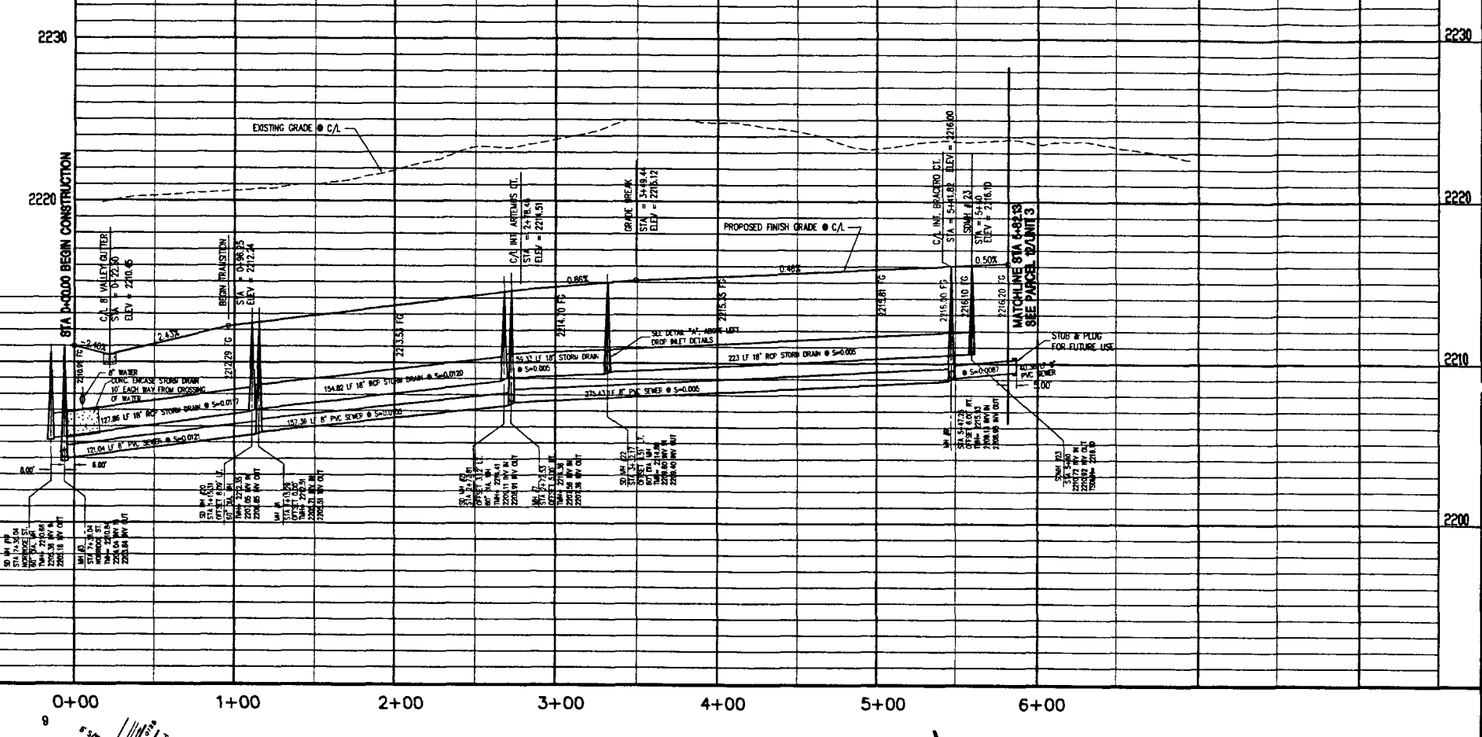
W.O. # : 900-8400
BY : DL/KK
DATE : JULY 1994
SCALE : HORIZ. 1" = 40'
VERT. 1" = 4'

SHEET 6 OF 11 SHEETS

#4249

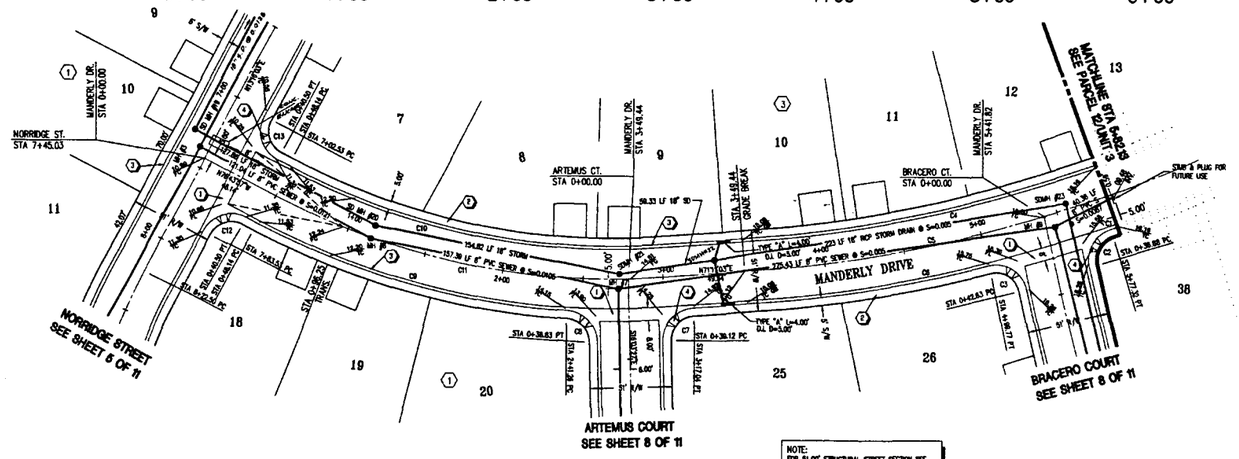


DROP INLET DETAIL "A"



CONSTRUCTION NOTES

1. CONSTRUCT VALLEY GUTTER PER CLARK COUNTY AREA STD. DWG. #228
2. CONSTRUCT 5' SIDEWALK PER CLARK COUNTY AREA STD. DWG. #234
3. CONSTRUCT 24" "L" TYPE CURB & GUTTER PER CLARK COUNTY AREA STD. DWG. #216
4. CONSTRUCT WHEELCHAIR RAMP PER CLARK COUNTY AREA STD. DWG. #235



BACK-OF-CURB CURVE DATA

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	870.00'	4.18'	2.45'	4.87'	00°19'33"
C2	20.00'	28.01'	17.73'	25.53'	80°16'20"
C3	20.00'	31.94'	20.53'	28.65'	91°30'27"
C4	828.00'	227.65'	114.24'	226.94'	15°45'16"
C5 C/A	848.00'	232.66'	117.08'	231.93'	15°43'15"
C6	870.00'	153.84'	77.17'	153.74'	10°08'04"
C7	20.00'	30.45'	19.06'	27.60'	87°14'30"
C8	20.00'	28.78'	18.41'	27.09'	82°26'50"
C9	470.00'	201.82'	102.54	200.31'	24°36'09"
C10	429.00'	240.50'	123.50'	237.37'	32°06'58"
C11 C/A	450.00'	251.88'	129.39'	248.70'	32°05'00"
C12	20.00'	31.42'	20.00'	28.28'	90°00'00"
C13	20.00'	31.42'	20.00'	28.28'	90°00'00"

BENCHMARK

C.O.H. BM #193

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD DRIVE, AT H/W STATION 217+83.79, 250 FEET± EAST OF EASTERN AVENUE.

ELEVATION = 2263.946 FEET

QUANTITY ESTIMATE

2" ASPHALTIC CONCRETE	2257 SY
24" 'L' TYPE CURB & GUTTER	1071 LF
CONCRETE VALLEY GUTTER	493 SF
CONCRETE SIDEWALK	5591 SF

THESE QUANTITIES ARE ONLY ESTIMATES, CONTRACTOR TO VERIFY.

Call before you Dig. 1-800-227-2600 UNDERGROUND SERVICE (NSA)

APPROVAL

LAND DEVELOPMENT – KEN KOSHIRO, P.E. — DATE 4-22-25

CITY APPROVAL OF THE IMPROVEMENT PLAN IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY May 23 19 26

22-61-25

APPRV.	REV	DATE	BY	REVISION
	2	9-22-95	PLH	UNIT CHANGE, MISC. REVISIONS
	1	12-11-94	LFC	ADD STORM DRAIN

TITLE: STREET & SEWER PLAN & PROFILE
MANDERLY DRIVE

PROJECT: SOUTHFORK - PARCEL 12/UNIT 2

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS
708 W. CHARLESTON BLVD. • LAS VEGAS, NEVADA 89107 • (702) 383-0463

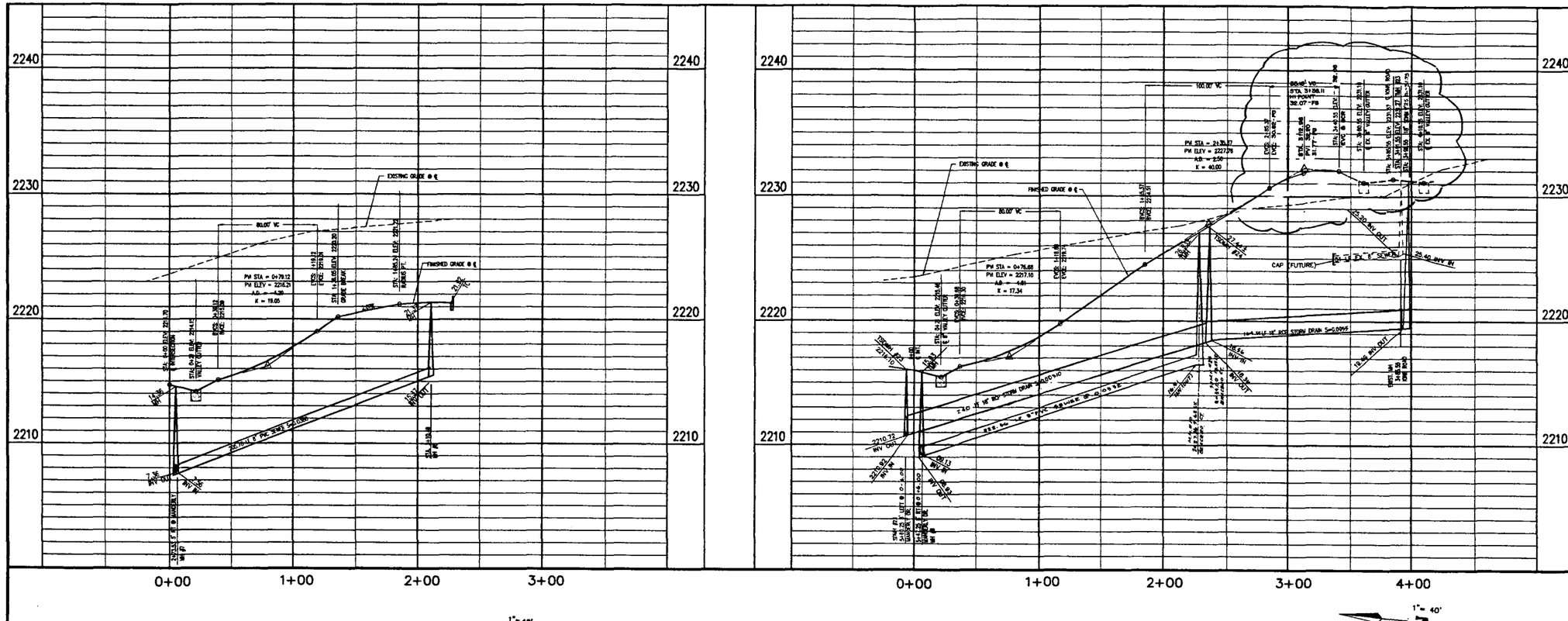
W.O. # : 900-8400
BY : DL/KK
DATE : JULY 1994
SCALE : HORZ. 1" = 40'
VERT. 1" = 4'

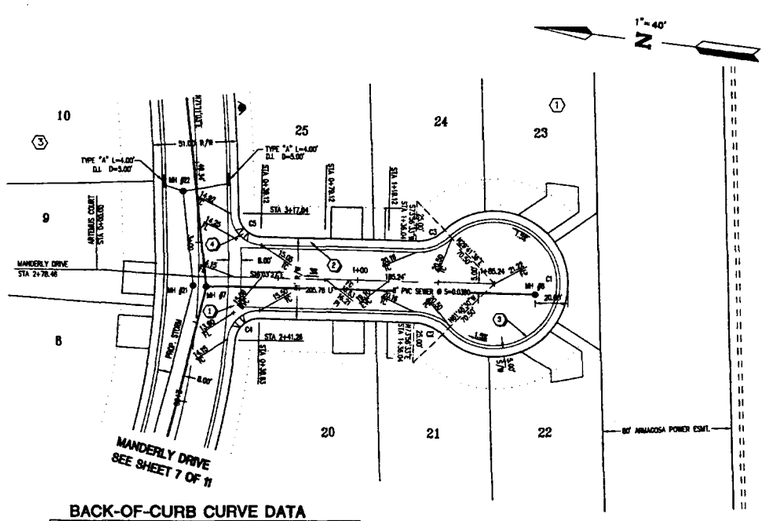
SHEET 7 OF 11 SHEETS

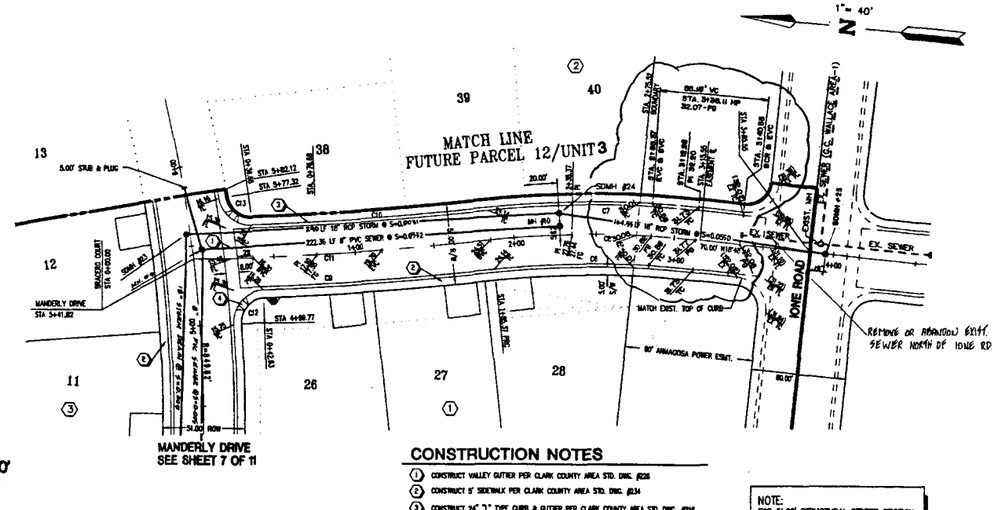
NOTE: FOR 31.00' STRUCTURAL STREET SECTION SEE DETAIL ON SHEET 2

MANDERLY DRIVE

#4249







BACK-OF-CURB CURVE DATA

CURVE	RADIUS	LENGTH	TANGENT	CHORD	DELTA
C1	40.50'	188.79'	41.58'	58.02'	266°29'54"
C2	30.00'	23.17'	12.20'	22.60'	44°14'59"
C3	30.00'	23.17'	12.20'	22.60'	44°14'59"
C4	20.00'	29.76'	18.41'	27.08'	85°15'50"
C5	20.00'	30.45'	19.08'	27.80'	87°14'38"
C6	579.50'	195.72'	63.11'	125.48'	19°20'51"
C7	620.50'	134.42'	67.56'	134.16'	12°24'31"
C8	600.00'	130.18'	65.54'	129.92'	12°25'59"
C9	2170.50'	144.90'	72.58'	144.07'	03°49'31"
C10	2129.50'	147.27'	73.68'	147.24'	03°57'45"
C11	2150.00'	185.37'	92.74'	185.32'	04°56'24"
C12	20.00'	31.24'	20.02'	28.15'	89°30'00"
C13	20.00'	29.01'	17.73'	26.53'	83°05'29"

BENCHMARK

C.O.H. BM #193

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD DRIVE, AT H/W STATION 217+83.79, 250 FEET± EAST OF EASTERN AVENUE.

ELEVATION = 2263.946 (FEET)
ELEVATION = 690.051 (METERS)

SCALE: HORIZ. 1"=40'
VERT. 1"=4'

ARTEMUS CT. / BRACERO CT.

QUANTITY ESTIMATE

2" ASPHALTIC CONCRETE	2049 SY
24" "L" TYPE CURB & GUTTER	902 LF
CONCRETE VALLEY GUTTER	934 SF
CONCRETE SIDEWALK	4965 SF

THESE QUANTITIES ARE ONLY ESTIMATES, CONTRACTOR TO VERIFY.

CONSTRUCTION NOTES

1. CONSTRUCT VALLEY GUTTER PER CLARK COUNTY AREA STD. DWG. #226
2. CONSTRUCT 5' SIDEWALK PER CLARK COUNTY AREA STD. DWG. #234
3. CONSTRUCT 24" "L" TYPE CURB & GUTTER PER CLARK COUNTY AREA STD. DWG. #216
4. CONSTRUCT WHEELCHAIR RAMP PER CLARK COUNTY AREA STD. DWG. #235

NOTE:
FOR 51.00' STRUCTURAL STREET SECTION SEE DETAIL SHEET 11

Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

APPROVAL

LAND DEVELOPMENT – KEN KOSHIRO, P.E. DATE

CITY APPROVAL OF THE IMPROVEMENT PLAN IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY

APPROVAL REV'D	DATE	BY	REVISION
	12-18-96	CDL	ADD STORM DRAIN
	1-10-95	CDL	ADD SPLIT @ 2.5%
	3-22-95	SLH	ADJUST SEWER LINE, MH #2, REVISIONS
	5-15-95	DC	ADD SEWER FOR NEW HOUSING DEV. / MANDERLY
	11-8-96	ROCKY	REVISED GRADES ON BRACERO CT.

TITLE: STREET & SEWER PLAN & PROFILE
ARTEMUS COURT / BRACERO

PROJECT: SOUTHFORK - PARCEL 12/UNIT 2

NEVADA REGISTERED PROFESSIONAL ENGINEER — No. 6997 — CHRISTOPHER D. LEE — 12-18-96 — CIVIL

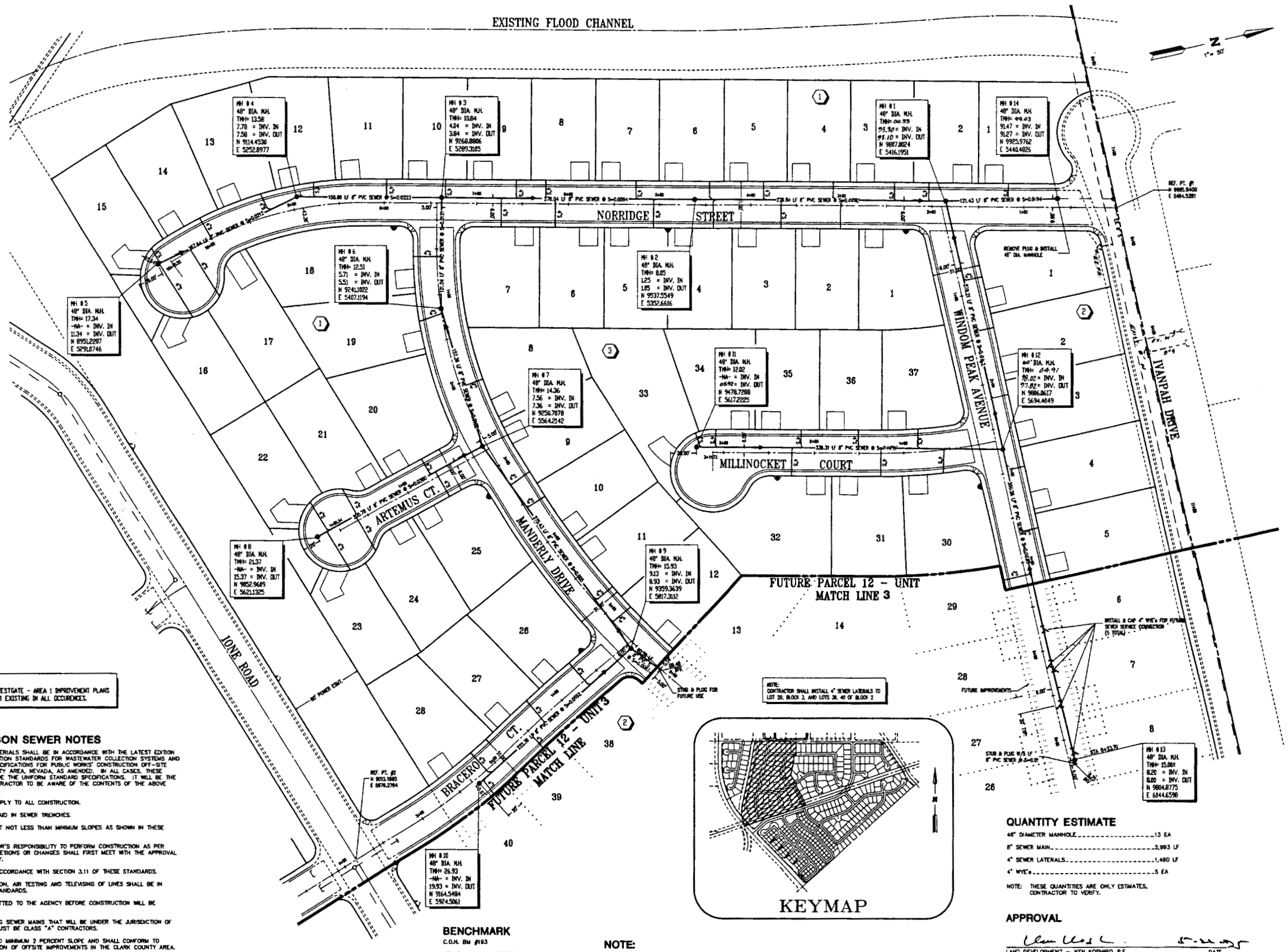
ESI ENGINEERS AND SURVEYORS INC.
PLANNERS - CONSULTING ENGINEERS - SURVEYORS
2709 W. CHARLESTON BLVD. • LAS VEGAS, NEVADA 89102 • (702) 384-0415

W.O. # : 900-B400
BY: DL/KK
DATE: JULY 1994
SCALE: HOR. 1"=40' VERT. 1"=4'

SHEET 8 OF 11 SHEETS

22-61-25

64249



Call before you Dig.
1-800-227-2600
(NEVADA ONE CALL)

NOTE:
FOR PURPOSES OF THESE PLANS, WESTGATE - AREA 1 IMPROVEMENT PLANS BY G.C. WALLACE INC. ARE ASSUMED EXISTING IN ALL OCCURRENCES.

CITY OF HENDERSON SEWER NOTES

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

BENCHMARK

C.O.H. BM #193

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD DRIVE, AT H/W STATION 217+83.79, 250 FEET± EAST OF EASTERN AVENUE.

ELEVATION = 2263.946 (FEET)
ELEVATION = 690.051 (METERS)

NOTE:

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

QUANTITY ESTIMATE

48" DIAMETER MANHOLE	13 EA
8" SEWER MAIN	2,993 LF
4" SEWER LATERALS	1,490 LF
4" WYE's	5 EA

NOTE: THESE QUANTITIES ARE ONLY ESTIMATES. CONTRACTOR TO VERIFY.

APPROVAL

LAND DEVELOPMENT – KEN KOSHIRO, P.E. DATE

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW & APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY 2349.

22-61-25

APPRVL	REV	DATE	BY	REVISION
	1	9/22/94	KAK	CHANGED SEWER FLOW
	2	5/1/95	TB	REVD SEWER INVERTS & ELEVS PER REVISED GRADING PLAN
	3	5-15-95	DP	ADD. INVERTS ON MANHOLES ON MAINLINE
	4	5-16-95	TB	REV DW LOCATIONS & SEWER LATS

TITLE: MASTER SEWER PLAN

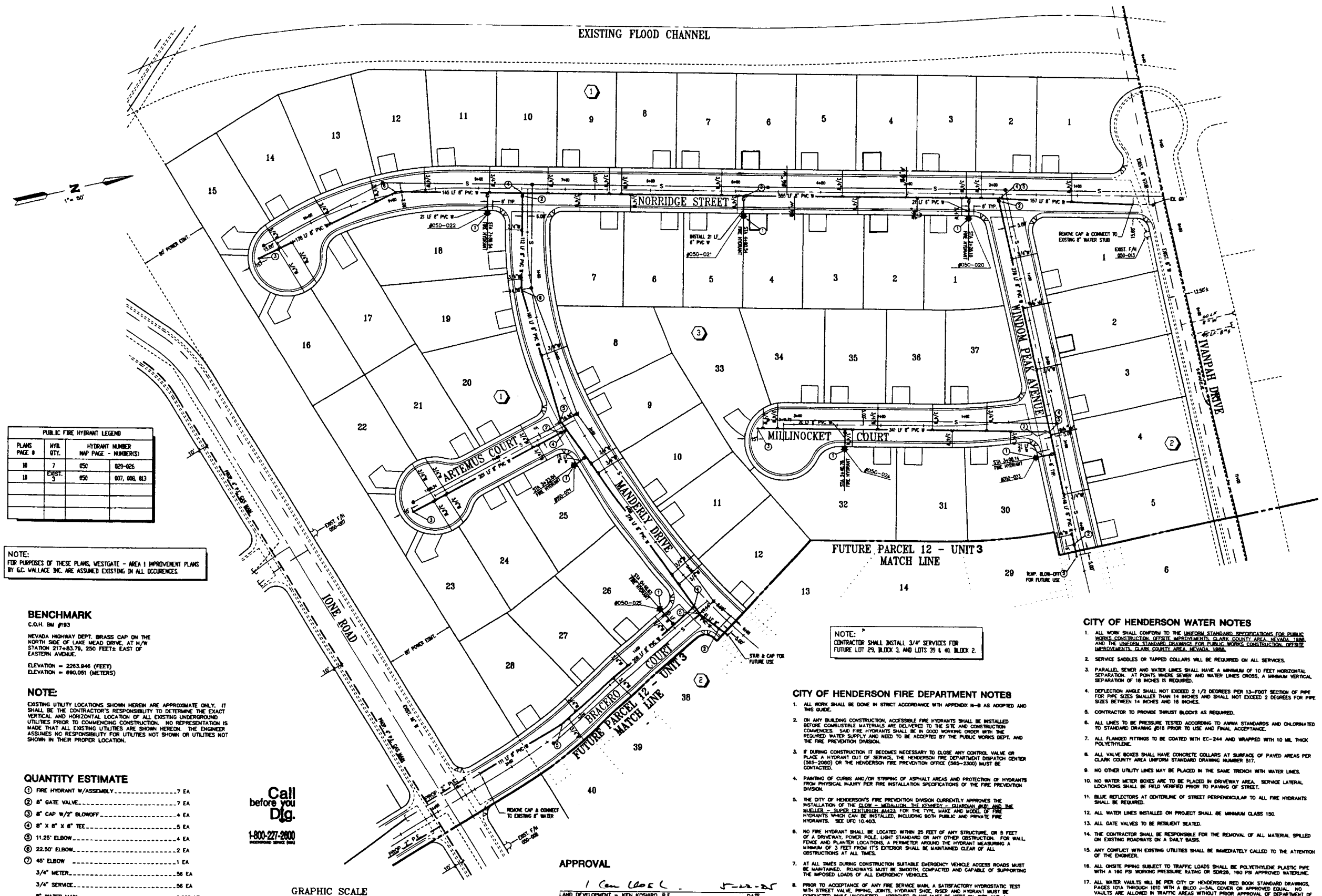
PROJECT: SOUTHFORK - PARCEL 12/UNIT 2

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS • CONSULTING ENGINEERS • SURVEYORS
7108 W. CHARLESTON BLVD. • LAS VEGAS, NEVADA 89117 • (702) 363-5403

W.O. # : 800-0400
BY: KK
DATE: AUGUST 1994
SCALE: 1" = 50'

SHEET 9 OF 11 SHEETS

$4249



PUBLIC FIRE HYDRANT LEGEND			
PLANS PAGE #	HYD. QTY.	HYDRANT NUMBER MAP PAGE - NUMBER(S)	
10	7	050	020-026
10	EXIST. 3	050	007, 008, 013

NOTE:
FOR PURPOSES OF THESE PLANS, WESTGATE - AREA I IMPROVEMENT PLANS BY G.C. WALLACE INC. ARE ASSUMED EXISTING IN ALL OCCURENCES.

BENCHMARK

C.O.H. BM #193

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD DRIVE, AT W/W STATION 217+83.79, 250 FEET± EAST OF EASTERN AVENUE.

ELEVATION = 2263.846 (FEET)
ELEVATION = 690.051 (METERS)

NOTE:

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

QUANTITY ESTIMATE

① FIRE HYDRANT W/ASSEMBLY	7 EA
② 8" GATE VALVE	7 EA
③ 8" CAP W/2" BLOWOFF	4 EA
④ 8" X 8" X 8" TEE	5 EA
⑤ 11.25° ELBOW	4 EA
⑥ 22.50° ELBOW	2 EA
⑦ 45° ELBOW	1 EA
3/4" METER	56 EA
3/4" SERVICE	56 EA
8" WATER MAIN	2,925 LF

NOTE: THESE QUANTITIES ARE ONLY ESTIMATES, CONTRACTOR TO VERIFY.

Call before you Dig.
1-800-227-2600
(NEVADA ONE CALL)

NOTE:
CONTRACTOR SHALL INSTALL 3/4" SERVICES FOR FUTURE LOT 29, BLOCK 3, AND LOTS 39 & 40, BLOCK 2.

APPROVAL

LAND DEVELOPMENT - KEN KOSHIRO, P.E. — DATE

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW & APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY 19 96

CITY OF HENDERSON FIRE DEPARTMENT NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH APPENDIX III-B AS ADOPTED AND THIS GUIDE.
2. ON ANY BUILDING CONSTRUCTION, 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 THE REQUIRED WATER SUPPLY AND NEED TO BE ACCEPTED BY THE PUBLIC WORKS DEPT. AND THE FIRE PREVENTION DIVISION.
3. IF DURING CONSTRUCTION IT BECOMES NECESSARY TO CLOSE ANY CONTROL VALVE OR PLACE A HYDRANT OUT OF SERVICE, THE HENDERSON FIRE DEPARTMENT DISPATCH CENTER (565-2000) OR THE HENDERSON FIRE PREVENTION OFFICE (565-2300) MUST BE CONTACTED.
4. PAINTING OF CURBS AND/OR STRIPING OF ASPHALT AREAS AND PROTECTION OF HYDRANTS FROM PHYSICAL INJURY PER FIRE INSTALLATION SPECIFICATIONS OF THE FIRE PREVENTION DIVISION.
5. THE CITY OF HENDERSON'S FIRE PREVENTION DIVISION CURRENTLY APPROVES THE INSTALLATION OF THE CLOW - MEDALLION, THE KENNEDY - GUARDIAN (K-81) AND THE MUELLER - SUPER CENTURION (A423) FOR THE TYPE, MAKE AND MODEL OF FIRE HYDRANTS WHICH CAN BE INSTALLED, INCLUDING BOTH PUBLIC AND PRIVATE FIRE HYDRANTS. SEE UFC 10.403.
6. NO FIRE HYDRANT SHALL BE LOCATED WITHIN 25 FEET OF ANY STRUCTURE, OR 5 FEET OF A DRIVEWAY, POWER POLE, LIGHT STANDARD OR ANY OTHER OBSTRUCTION. FOR WALL, FENCE AND PLANTER LOCATIONS, A PERIMETER AROUND THE HYDRANT MEASURING A MINIMUM OF 3 FEET FROM IT'S EXTERIOR SHALL BE MAINTAINED CLEAR OF ALL OBSTRUCTIONS AT ALL TIMES.
7. 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.
8. PRIOR TO ACCEPTANCE OF ANY FIRE SERVICE MAIN, A SATISFACTORY HYDROSTATIC TEST WITH STREET VALVE, PIPING, JOINTS, HYDRANT SHOE, RISER AND HYDRANT MUST BE CONDUCTED WHILE UNCOVERED. APPROVED PLANS MUST BE KEPT ON-SITE AND A CONTRACTOR'S MATERIALS AND TEST CERTIFICATE FOR UNDERGROUND PIPING MUST BE PROVIDED AT TIME OF FINAL INSPECTION FOR FIRE SERVICE MAINS WHICH SUPPLY AUTOMATIC SPRINKLER SYSTEMS.
9. BLUE REFLECTIVE MARKERS MUST BE INSTALLED BEFORE FINAL HYDRANT ACCEPTANCE CAN BE ATTAINED [91 UFC SEC. 10.105(c)].

CITY OF HENDERSON WATER NOTES

1. ALL WORK SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, 1986, AND THE UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, 1986.
2. SERVICE SADDLES OR TAPPED COLLARS WILL BE REQUIRED ON ALL SERVICES.
3. PARALLEL SEWER AND WATER LINES SHALL HAVE A MINIMUM OF 10 FEET HORIZONTAL SEPARATION. AT POINTS WHERE SEWER AND WATER LINES CROSS, A MINIMUM VERTICAL SEPARATION OF 18 INCHES IS REQUIRED.
4. DEFLECTION ANGLE SHALL NOT EXCEED 2 1/2 DEGREES PER 13-FOOT SECTION OF PIPE FOR PIPE SIZES SMALLER THAN 14 INCHES AND SHALL NOT EXCEED 2 DEGREES FOR PIPE SIZES BETWEEN 14 INCHES AND 18 INCHES.
5. CONTRACTOR TO PROVIDE THRUST BLOCKS AS REQUIRED.
6. ALL LINES TO BE PRESSURE TESTED ACCORDING TO AWWA STANDARDS AND CHLORINATED TO STANDARD DRAWING #618 PRIOR TO USE AND FINAL ACCEPTANCE.
7. ALL FLANGED FITTINGS TO BE COATED WITH EC-244 AND WRAPPED WITH 10 MIL THICK POLYETHYLENE.
8. ALL VALVE BOXES SHALL HAVE CONCRETE COLLARS AT SURFACE OF PAVED AREAS PER CLARK COUNTY AREA UNIFORM STANDARD DRAWING NUMBER 517.
9. NO OTHER UTILITY LINES MAY BE PLACED IN THE SAME TRENCH WITH WATER LINES.
10. NO WATER METER BOXES ARE TO BE PLACED IN DRIVEWAY AREA. SERVICE LATERAL LOCATIONS SHALL BE FIELD VERIFIED PRIOR TO PAVING OF STREET.
11. BLUE REFLECTORS AT CENTERLINE OF STREET PERPENDICULAR TO ALL FIRE HYDRANTS SHALL BE REQUIRED.
12. ALL WATER LINES INSTALLED ON PROJECT SHALL BE MINIMUM CLASS 150.
13. ALL GATE VALVES TO BE RESILIENT SEATED.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL MATERIAL SPILLED ON EXISTING ROADWAYS ON A DAILY BASIS.
15. ANY CONFLICT WITH EXISTING UTILITIES SHALL BE IMMEDIATELY CALLED TO THE ATTENTION OF THE ENGINEER.
16. ALL ONSITE PIPING SUBJECT TO TRAFFIC LOADS SHALL BE POLYETHYLENE PLASTIC PIPE WITH A 160 PSI WORKING PRESSURE RATING OR SDR26, 160 PSI APPROVED WATERLINE.
17. ALL WATER VAULTS WILL BE PER CITY OF HENDERSON RED BOOK STANDARD DRAWINGS, PAGES 101A THROUGH 101D WITH A BILCO J-SAL COVER OR APPROVED EQUAL. NO VAULTS ARE ALLOWED IN TRAFFIC AREAS WITHOUT PRIOR APPROVAL OF DEPARTMENT OF PUBLIC WORKS UTILITIES DIVISION.
18. LANDSCAPING AND IRRIGATION ADJACENT TO VAULTS SHALL BE DRAINED AWAY FROM VAULTS.
19. CONTRACTOR SHALL PROVIDE APPURTANCES TO PERFORM PRESSURE TESTS AND DISINFECTION AS REQUIRED BY THE CITY ENGINEER.

7/22/92

22-61-25

REVISION			
APPRVL	REV	DATE	BY
	2	8-18-95	PC

ADDED DW mh Lats A&B #1, B, A&B #3, 5, A&B #3

TITLE: MASTER WATER PLAN

PROJECT: SOUTHFORK PARCEL 12/UNIT 2

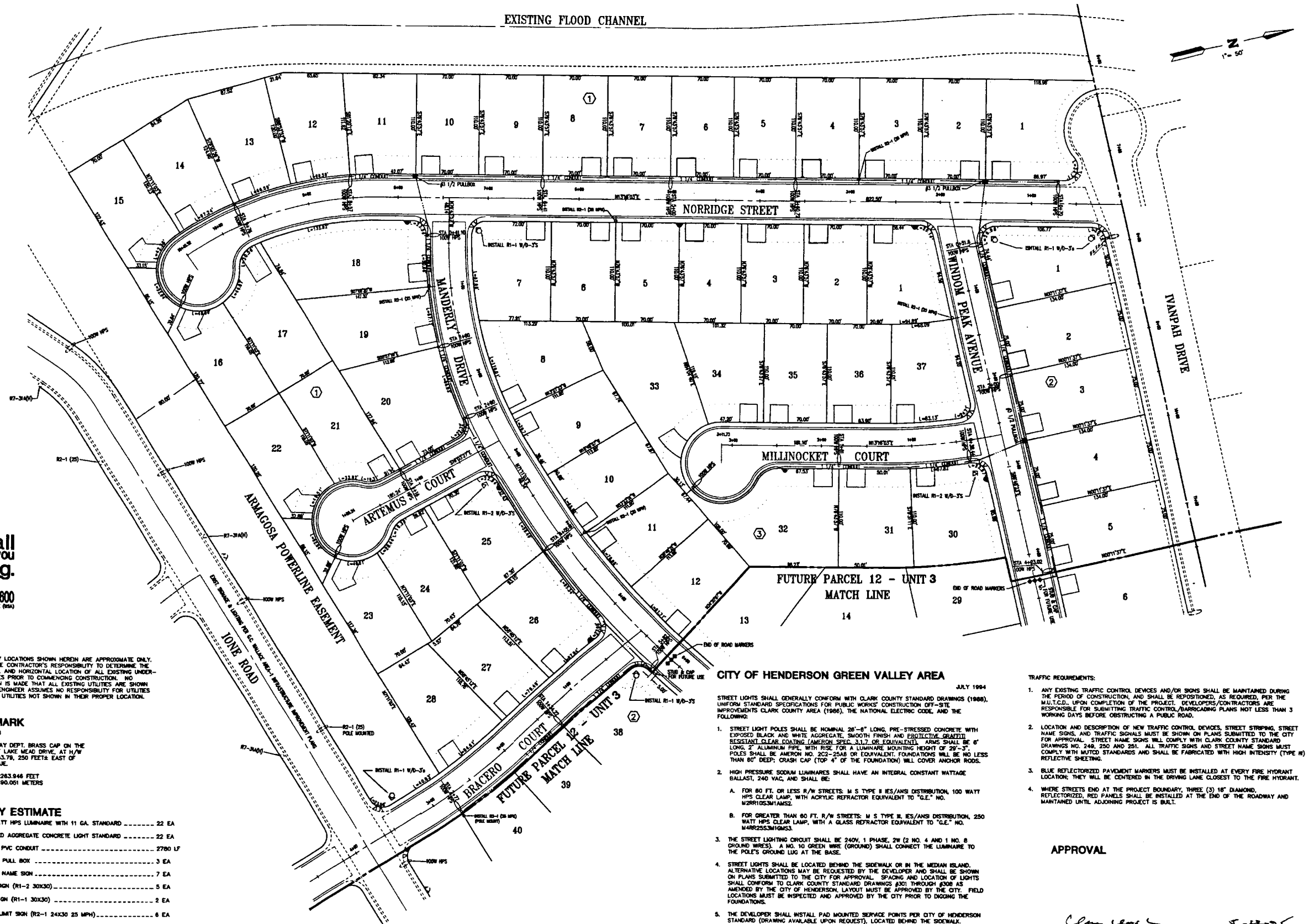
BYRON L. KNAPP — CIVIL — No. 11011 — STATE OF NEVADA — REGISTERED PROFESSIONAL ENGINEER

ESI ENGINEERS AND SURVEYORS INC
PLANNERS • CONSULTING ENGINEERS • SURVEYORS
708 W. CHARLESTON BLVD • LAS VEGAS, NEVADA 89107 • (702) 383-0463

W.O. # : 900-8400
BY : KK
DATE : AUGUST 1994
SCALE : 1" = 50'

SHEET 10 OF 11 SHEETS

#4249



Call before you Dig.

1-800-227-2600
UNDERGROUND SERVICE (NSA)

NOTE:

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

BENCHMARK

C.O.H. BM #183

NEVADA HIGHWAY DEPT. BRASS CAP ON THE NORTH SIDE OF LAKE MEAD DRIVE, AT H/W STATION 217+83.79, 250 FEET± EAST OF EASTERN AVENUE.

ELEVATION = 2263.946 FEET
ELEVATION = 690.051 METERS

QUANTITY ESTIMATE

100 WATT HPS LUMINAIRE WITH 11 GA. STANDARD	22 EA
EXPOSED AGGREGATE CONCRETE LIGHT STANDARD	22 EA
1 1/4" PVC CONDUIT	2780 LF
#3 1/2 PULL BOX	3 EA
STREET NAME SIGN	7 EA
YIELD SIGN (R1-2 30X30)	5 EA
STOP SIGN (R1-1 30X30)	2 EA
SPEED LIMIT SIGN (R2-1 24X30 25 MPH)	6 EA
END OF ROAD REFLECTORS	6 EA

NOTE: THESE QUANTITIES ARE ESTIMATES ONLY, CONTRACTOR TO VERIFY.

CITY OF HENDERSON GREEN VALLEY AREA

JULY 1994

STREET LIGHTS SHALL GENERALLY CONFORM WITH CLARK COUNTY STANDARD DRAWINGS (1988), UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS CLARK COUNTY AREA (1986), THE NATIONAL ELECTRIC CODE, AND THE FOLLOWING:

1. STREET LIGHT POLES SHALL BE NOMINAL 26'-0" LONG, PRE-STRESSED CONCRETE WITH EXPOSED BLACK AND WHITE AGGREGATE, SMOOTH FINISH AND PROTECTIVE GRAFFITI RESISTANT CLEAR COATING (AMERON SPEC. 11.7 OR EQUIVALENT). ARMS SHALL BE 6' LONG, 2" ALUMINUM PIPE, WITH RISE FOR A LUMINARE MOUNTING HEIGHT OF 29'-3". POLES SHALL BE AMERON NO. 2G2-25A8 OR EQUIVALENT. FOUNDATIONS WILL BE NO LESS THAN 60" DEEP. CRUSH CAP (TOP 4" OF THE FOUNDATION) WILL COVER ANCHOR RODS.
2. HIGH PRESSURE SODIUM LUMINARES SHALL HAVE AN INTEGRAL CONSTANT WATTAGE BALLAST, 240 VAC, AND SHALL BE:
   A. FOR 80 FT. OR LESS R/W STREETS: M S TYPE II IES/ANSI DISTRIBUTION, 100 WATT HPS CLEAR LAMP, WITH ACRYLIC REFRACTOR EQUIVALENT TO "G.E." NO. M2RR10SSM1AMS2.
   B. FOR GREATER THAN 80 FT. R/W STREETS: M S TYPE III, IES/ANSI DISTRIBUTION, 250 WATT HPS CLEAR LAMP, WITH A GLASS REFRACTOR EQUIVALENT TO "G.E." NO. M4RR25SSM1GMS3.
3. THE STREET LIGHTING CIRCUIT SHALL BE 240V, 1 PHASE, 2W (2 NO. 4 AND 1 NO. 8 GROUND WIRES). A NO. 10 GREEN WIRE (GROUND) SHALL CONNECT THE LUMINAIRE TO THE POLE'S GROUND LUG AT THE BASE.
4. STREET LIGHTS SHALL BE LOCATED BEHIND THE SIDEWALK OR IN THE MEDIAN ISLAND. ALTERNATIVE LOCATIONS MAY BE REQUESTED BY THE DEVELOPER AND SHALL BE SHOWN ON PLANS SUBMITTED TO THE CITY FOR APPROVAL. SPACING AND LOCATION OF LIGHTS SHALL CONFORM TO CLARK COUNTY STANDARD DRAWINGS #301 THROUGH #308 AS AMENDED BY THE CITY OF HENDERSON. LAYOUT MUST BE APPROVED BY THE CITY. FIELD LOCATIONS MUST BE INSPECTED AND APPROVED BY THE CITY PRIOR TO DIGGING THE FOUNDATIONS.
5. THE DEVELOPER SHALL INSTALL PAD MOUNTED SERVICE POINTS PER CITY OF HENDERSON STANDARD (DRAWING AVAILABLE UPON REQUEST), LOCATED BEHIND THE SIDEWALK. PROPOSED LOCATION OF SERVICE POINTS MUST BE SHOWN ON DRAWINGS. SUBJECT TO BE REVISED BY NEVADA POWER COMPANY. DESIGN OF SERVICE POINTS SHALL INCLUDE CONNECTION TO NEVADA POWER COMPANY. THE SERVICE RUN SHALL BE 120/240V, 1 PHASE, 3W, (2 NO. 2 AND 1 NO. 4 WIRES).
6. ALL WIRES SHALL BE THHN/THWN OR XHHW STRANDED COPPER.
7. STREET LIGHTS MUST BE OPERATING BEFORE A CERTIFICATE OF OCCUPANCY IS ISSUED. NEW STREET LIGHTS CANNOT BE CONNECTED TO EXISTING STREET LIGHTING CIRCUITS UNTIL AFTER NEW STREET LIGHTS AND THEIR RELATED WIRING ARE ACCEPTED BY THE CITY.

TRAFFIC REQUIREMENTS:

1. ANY EXISTING TRAFFIC CONTROL DEVICES AND/OR SIGNS SHALL BE MAINTAINED DURING THE PERIOD OF CONSTRUCTION, AND SHALL BE REPOSITIONED, AS REQUIRED, PER THE M.U.T.C.D., UPON COMPLETION OF THE PROJECT. DEVELOPERS/CONTRACTORS ARE RESPONSIBLE FOR SUBMITTING TRAFFIC CONTROL/BARRICADING PLANS NOT LESS THAN 3 WORKING DAYS BEFORE OBSTRUCTING A PUBLIC ROAD.
2. LOCATION AND DESCRIPTION OF NEW TRAFFIC CONTROL DEVICES, STREET STRIPING, STREET NAME SIGNS, AND TRAFFIC SIGNALS MUST BE SHOWN ON PLANS SUBMITTED TO THE CITY FOR APPROVAL. STREET NAME SIGNS WILL COMPLY WITH CLARK COUNTY STANDARD DRAWINGS NO. 249, 250 AND 251. ALL TRAFFIC SIGNS AND STREET NAME SIGNS MUST COMPLY WITH MUTCD STANDARDS AND SHALL BE FABRICATED WITH HIGH INTENSITY (TYPE III) REFLECTIVE SHEETING.
3. BLUE REFLECTORIZED PAVEMENT MARKERS MUST BE INSTALLED AT EVERY FIRE HYDRANT LOCATION; THEY WILL BE CENTERED IN THE DRIVING LANE CLOSEST TO THE FIRE HYDRANT.
4. WHERE STREETS END AT THE PROJECT BOUNDARY, THREE (3) 18" DIAMOND, REFLECTORIZED, RED PANELS SHALL BE INSTALLED AT THE END OF THE ROADWAY AND MAINTAINED UNTIL ADJOINING PROJECT IS BUILT.

APPROVAL

NEW DEVELOPMENT – KEN KOSHIRO, P.E. — DATE

CITY APPROVAL OF THE IMPROVEMENT PLANS IS GRANTED FOR ONE (1) YEAR ONLY. PLANS MUST BE RESUBMITTED FOR REVIEW & APPROVAL TO THE DEPARTMENT OF PUBLIC WORKS, CITY OF HENDERSON IF WORK IS NOT COMPLETED BY

22-61-25

APPVL/REV	DATE	BY	REVISION
	1-14-95	MC	ADDED BIKE PATH & CURB RAMPS
	6-16-95	MC	REVISED SOUTH LIGHTS AS PER CITY COMMENTS

TITLE: MASTER STREET LIGHT PLAN

PROJECT: SOUTHFORK PARCEL 12/UNIT 2

PROFESSIONAL ENGINEER — STATE OF NEVADA — No. 9869 — KATHY M. SMITH — CIVIL

ESI ENGINEERS AND SURVEYORS INC.
PLANNERS · CONSULTING ENGINEERS · SURVEYORS
7708 W. CHARLESTON BLVD · LAS VEGAS, NEVADA 89117 · (702) 363-8457

W.O. # : 900-8400
BY : DL/KK
DATE : JULY 1994
SCALE : 1"= 50'

SHEET 11 OF 11 SHEETS

Φ4249

HYDROLOGIC CRITERIÁ AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

PBS&J, Inc. **DEVELOPMENT:** **SOUTHFORK PARCEL 12**
Project No. : **511542.00**
File: STDRFRM4.XLS **CALCULATED BY :** **BKL** **DATE:** **JULY, 2005**

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc CHECK URBANIZED BASINS		FINAL Tc	Tlag	REMARKS
DESIG:	CN	K	AREA (acres)	AREA (mi^2)	LENGTH (ft)	SLOPE (%)	Ti (min)	LENGTH (ft)	SLOPE (%) *	LAND COVER k	VELOCITY* (fps)	Tt (min)	Tc = Ti + Tt (min)	TOTAL LENGTH (ft)	Tc = (L/180)+10 (min)	Tc = (min)	Tlag= 0.6Tc/60 (hrs)	Q_{100}/Q_{10} (cfs)
(1)		(2)	(3)		(4)	(5)	(6)	(7)	(8)		(9)	(10)	(11)	(12)	(13)	(14)		
SFP1	90	0.798	26.5	0.0413	100	1.0	5.4	1600	1.50	NA	4.9	5.4	10.9	1700	19.4	10.9	**0.109**	
SFP2	90	0.798	32.3	0.0505	100	1.0	5.4	2150	1.00	NA	4.6	7.8	13.2	2250	22.5	13.2	**0.132**	
SFP3	92	0.824	16.9	0.0263	75	1.0	4.3	1550	1.00	NA	3.8	6.9	11.2	1625	19.0	11.2	**0.112**	

Tc = Ti + Tt Ti = 1.8 (1.1 - K) L^1/2 / S^1/3

Tlag = 0.6Tc K = 0.0132 (CN) - 0.39

*** The velocity in column 9 is based on approximate channel properties.**

REFERENCE :

STANDARD FORM 4

* Average slope of basin calculated Using the Clark county 5' GIS Topo Shown on Fig 2

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   17JUL05  TIME  11:53:50   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    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

             1          ID  ************************************
             2          ID      File: SFP12.DAT                *
             3          ID      JULY 2005                      *
             4          ID                                     *
             5          ID      PITTMAN WASH FIS               *
             6          ID      EXISTING DRAINAGE CONDITIONS   *
             7          ID      SOUTHFORK PARCEL 12            *
             8          ID  ************************************
             9          ID
                        *DIAGRAM
*** FREE ***
            10          IT       3       0       0     300
            11          IO       5       0       0
            12          IN       5       0       0
            13          JR    PREC    1.00
                        *

            14          KK    SFP1
            15          KM   EXISTING RESIDENTIAL BASIN
            16          BA  0.0413
            17          PB    2.77
            18          PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
            19          PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
            20          PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
            21          PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
            22          PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
            23          PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
            24          PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
            25          PC    .998    .999   1.00
            26          LS       0      90
            27          UD   0.109
                        *

            28          KK    SFP2
            29          KM   EXISTING RESIDENTIAL BASIN
            30          BA  0.0505
            31          LS       0      90
            32          UD   0.132
                        *

            33          KK    SFP3
            34          KM   EXISTING RESIDENTIAL BASIN
            35          BA  0.0263
            36          LS       0      92
            37          UD   0.112
                        *
            38          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    14        SFP1
                .
                .
    28          .        SFP2
                .          .
                .          .
    33          .          .        SFP3
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION


```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*            VERSION 4.1                *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*****************************************
```

```
*                                    *
*  RUN DATE   17JUL05  TIME  11:53:50 *
*                                    *
**************************************
```


```
*                                    *
*       DAVIS, CALIFORNIA 95616      *
*           (916) 756-1104           *
*                                    *
**************************************
```


```
    ************************************
    File: SFP12.DAT                    *
    JULY 2005                          *
                                       *
    PITTMAN WASH FIS                   *
    EXISTING DRAINAGE CONDITIONS       *
    SOUTHFORK PARCEL 12                *
    ************************************

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

     IT          HYDROGRAPH TIME DATA
                      NMIN          3  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        1457  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL      .05 HOURS
                        TOTAL TIME BASE   14.95 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
                    1.00
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
                                                             1.00

 HYDROGRAPH AT
+                  SFP1        .04     1   FLOW             68.
                                           TIME            3.55

 HYDROGRAPH AT
+                  SFP2        .05     1   FLOW             79.
                                           TIME            3.55

 HYDROGRAPH AT
+                  SFP3        .03     1   FLOW             46.
                                           TIME            3.55


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

Worksheet for VELOCITY ESTIMATE FOR SFP1

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.50000	%
Discharge:	68.00	ft^3/s

Options		
Current Roughness Weighted Meth	ImprovedLotters	
Open Channel Weighted Roughnes	ImprovedLotters	
Closed Channel Weighted Roughne	Hortons	

Results		
Roughness Coefficient:	0.015	
Water Surface Elevation:	0.62	ft
Elevation Range:	0.00 to 1.00 ft	
Flow Area:	13.84	ft^2
Wetted Perimeter:	52.13	ft
Top Width:	51.00	ft
Normal Depth:	0.62	ft
Critical Depth:	0.73	ft
Critical Slope:	0.00488	ft/ft
Velocity:	4.91	ft/s
Velocity Head:	0.38	ft
Specific Energy:	0.99	ft
Froude Number:	1.66	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 1.00)	(0+07, 0.13)	0.015
(0+07, 0.13)	(0+44, 0.13)	0.016
(0+44, 0.13)	(0+51, 1.00)	0.015

Section Geometry

Station	Elevation

Worksheet for VELOCITY ESTIMATE FOR SFP1

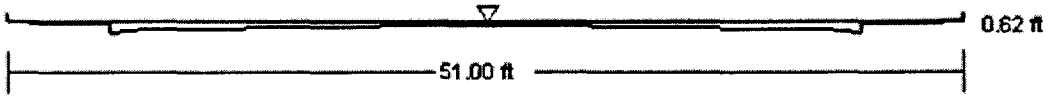
Station	Elevation
0+00	1.00
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+26	0.45
0+44	0.17
0+44	0.13
0+46	0.00
0+46	0.50
0+51	0.60
0+51	1.00

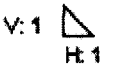
SFP1

Cross Section for VELOCITY ESTIMATE FOR SFP1

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.015	
Channel Slope:	1.50000	%
Normal Depth:	0.62	ft
Elevation Range:	0.00 to 1.00 ft	
Discharge:	68.00	ft^3/s





Worksheet for VELOCITY ESTIMATE FOR SFP2

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.00000	%
Discharge:	79.00	ft^3/s

Options	
Current Roughness Weighted Meth	ImprovedLotters
Open Channel Weighted Roughnes	ImprovedLotters
Closed Channel Weighted Roughne	Hortons

Results		
Roughness Coefficient:	0.015	
Water Surface Elevation:	0.68	ft
Elevation Range:	0.00 to 1.00 ft	
Flow Area:	17.22	ft^2
Wetted Perimeter:	52.26	ft
Top Width:	51.00	ft
Normal Depth:	0.68	ft
Critical Depth:	0.77	ft
Critical Slope:	0.00482	ft/ft
Velocity:	4.59	ft/s
Velocity Head:	0.33	ft
Specific Energy:	1.01	ft
Froude Number:	1.39	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 1.00)	(0+07, 0.13)	0.015
(0+07, 0.13)	(0+44, 0.13)	0.016
(0+44, 0.13)	(0+51, 1.00)	0.015

Section Geometry

Station	Elevation

Worksheet for VELOCITY ESTIMATE FOR SFP2

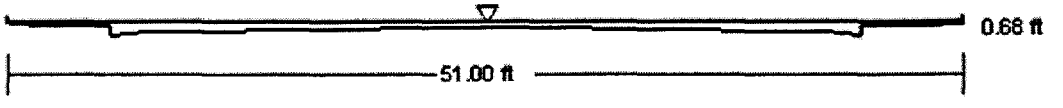
Station	Elevation
0+00	1.00
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+26	0.45
0+44	0.17
0+44	0.13
0+46	0.00
0+46	0.50
0+51	0.60
0+51	1.00

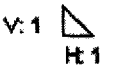
SFP2

Cross Section for VELOCITY ESTIMATE FOR SFP2

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.015	
Channel Slope:	1.00000	%
Normal Depth:	0.68	ft
Elevation Range:	0.00 to 1.00 ft	
Discharge:	79.00	ft^3/s





Worksheet for VELOCITY ESTIMATE FOR SFP3

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.00000	%
Discharge:	46.00	ft^3/s

Options	
Current Roughness Weighted Meth	ImprovedLotters
Open Channel Weighted Roughnes	ImprovedLotters
Closed Channel Weighted Roughne	Hortons

Results		
Roughness Coefficient:	0.015	
Water Surface Elevation:	0.59	ft
Elevation Range:	0.00 to 1.00 ft	
Flow Area:	12.26	ft^2
Wetted Perimeter:	50.66	ft
Top Width:	49.56	ft
Normal Depth:	0.59	ft
Critical Depth:	0.64	ft
Critical Slope:	0.00534	ft/ft
Velocity:	3.75	ft/s
Velocity Head:	0.22	ft
Specific Energy:	0.81	ft
Froude Number:	1.33	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 1.00)	(0+07, 0.13)	0.015
(0+07, 0.13)	(0+44, 0.13)	0.016
(0+44, 0.13)	(0+51, 1.00)	0.015

Section Geometry

Station	Elevation

Worksheet for VELOCITY ESTIMATE FOR SFP3

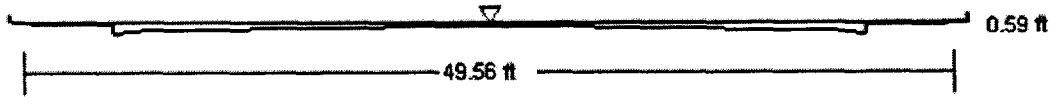
Station	Elevation
0+00	1.00
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+26	0.45
0+44	0.17
0+44	0.13
0+46	0.00
0+46	0.50
0+51	0.60
0+51	1.00

SFP3

Cross Section for VELOCITY ESTIMATE FOR SFP3

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.015	
Channel Slope:	1.00000	%
Normal Depth:	0.59	ft
Elevation Range:	0.00 to 1.00 ft	
Discharge:	46.00	ft^3/s



V: 1
H: 1

Rainfall Methodology

A. Point Rainfall

According to Figure 513 of the Criteria Manual the site located inside the McCarran Airport Rainfall area. The 100-year, 6-hour rainfall depth duration frequency values for areas located inside the McCarran Airport Rainfall area were obtained from Table 505 of the Criteria Manual. According to Table 505, the rainfall depth for the 100-year 6-hour event is 2.77 inches. Table 501 adjustments are not required for areas located inside the McCarran Airport Rainfall area. The HEC-1 multi-ratio option (HEC 1990) was used to model the 100-year design storm in the HEC-1 input file.

B. Storm Distribution

Table 503 in the Criteria Manual specifies that the 6-hour storm distribution, SDN 3 should be used for drainage areas less than eight square miles.

Runoff Methodology

A. Lag Time

The Criteria Manual's Standard Form 4 was completed to determine the time of concentration for each drainage basin. For all basins which comprise less than 1 square mile, the time of concentration was calculated as follows:

$T_c = T_i + T_t$

Where: Tc = Time of Concentration
Ti = Initial, inlet or overland flow time
Tt = Travel time in the ditch, gutter, etc.

The time of concentration is the sum of the initial flow time, T_i and the travel time, T_t. The minimum T_c recommended for non-urban watersheds is 10 minutes and 5 minute minimum for urbane watersheds.

Initial flow time was calculated as follows:

$Ti = 1.8(1.1 - K)Lo1/2/S1/3$

Where: Ti = Initial overland flow time (in minutes)
K = 0.0132CN – 0.39
CN = Curve Number
Lo = Length of overland flow (maximum 500 feet)
S = Average basin slope (in percent)

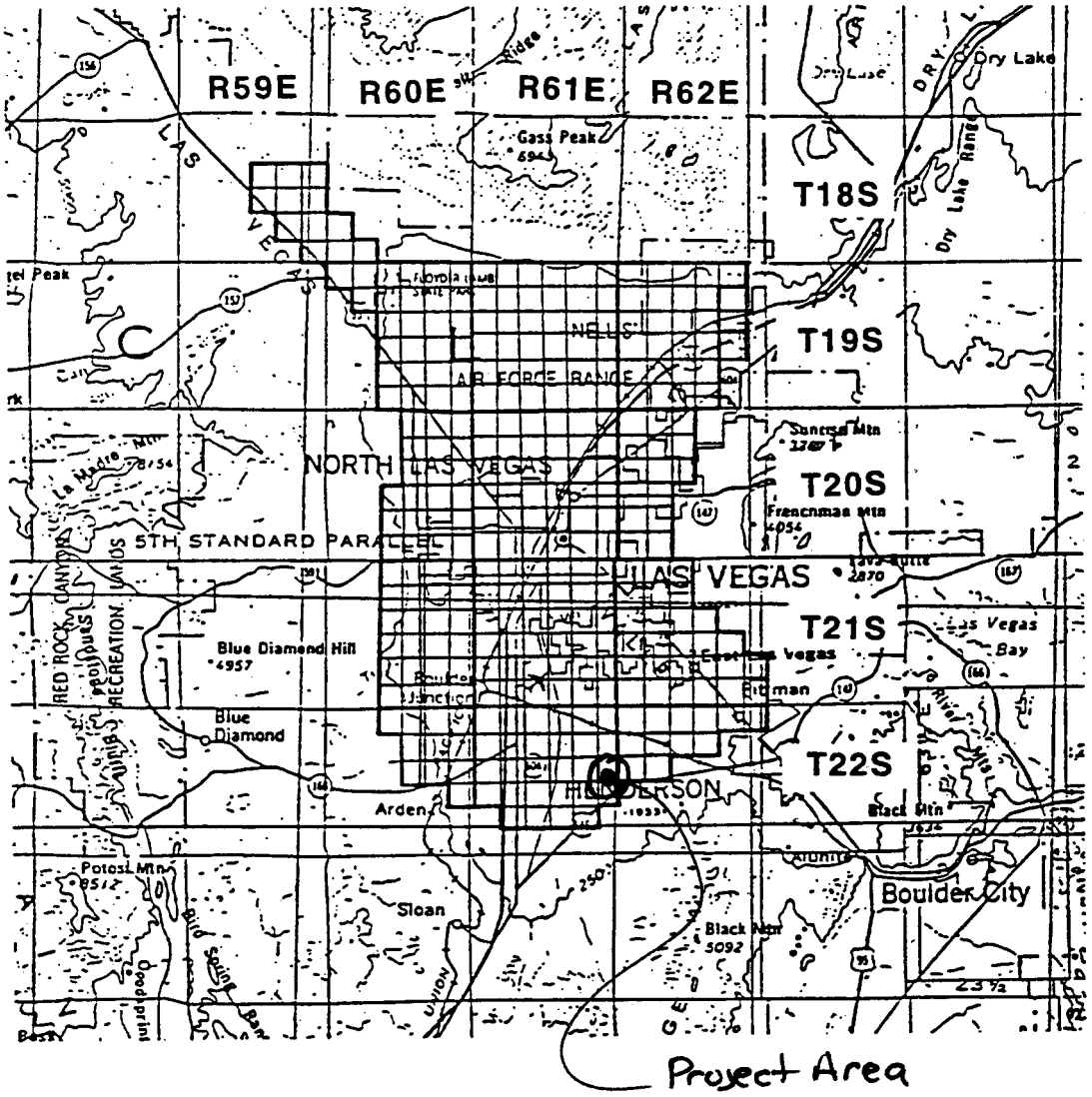
The lag time was calculated as follows:

$T_{lag} = 0.6T_c$ (in hours)

B. Soils – Curve Number Determination

Soils information, for the drainage basins, was obtained from the CCRFCD Hydrologic Subareas, Land Use and Soils Figure H-25 (see Appendix D). The soil types were matched to the corresponding SCS Curve Number (CN) for use in the Standard Form 4 and the HEC-1 analysis. The corresponding CN's for these soils are found on Table 602A of the Criteria Manual for residential areas.

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP	RANGE	SECTIONS	TOWNSHIP	RANGE	SECTIONS
18 South	59 East	13-15,22-26,36	20 South	62 East	4-9,16-20,29-32
18 South	60 East	30-32	21 South	60 East	1-4,9-16,21-28,33-36
19 South	60 East	1-6,8-16,21-28,33-36	21 South	61 East	ALL SECTIONS
19 South	61 East	ALL SECTIONS	21 South	62 East	4-9,15-23, 25-36
19 South	62 East	2-11,14-23,27-34	22 South	60 East	1-4,10-15,24
20 South	60 East	1-3,10-15,21-28,33-36	22 South	61 East	1-24,26-29
20 South	61 East	ALL SECTIONS	22 South	62 East	1-10,17-18

Notes:
1. Refer to Table 505 and Figure 516 Depth-Duration- Frequency values in the McCarran Airport Rainfall Area.
2. Refer to Table 506 and Figure 517 for Time-Intensity-Frequency values on the McCarran Airport Rainfall Area.

Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 513

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA

(IN INCHES)

	RECURRENCE INTERVAL					
TIME	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5 min.	0.15	0.27	0.35	0.46	0.54	0.63
10 min.	0.25	0.44	0.57	0.74	0.89	1.02
15 min.	0.33	0.57	0.74	0.97	1.15	1.32
30 min.	0.44	0.78	1.01	1.31	1.55	1.79
1 hour	0.52	0.89	1.15	1.50	1.78	2.06
2 hour	0.59	1.01	1.30	1.70	2.01	2.30
3 hour	0.64	1.08	1.39	1.82	2.15	2.48
6 hour	0.72	1.22	1.58	2.05	2.41	2.77
24 hour (TR-55)	1.20	1.60	1.80	2.40	2.70	2.96

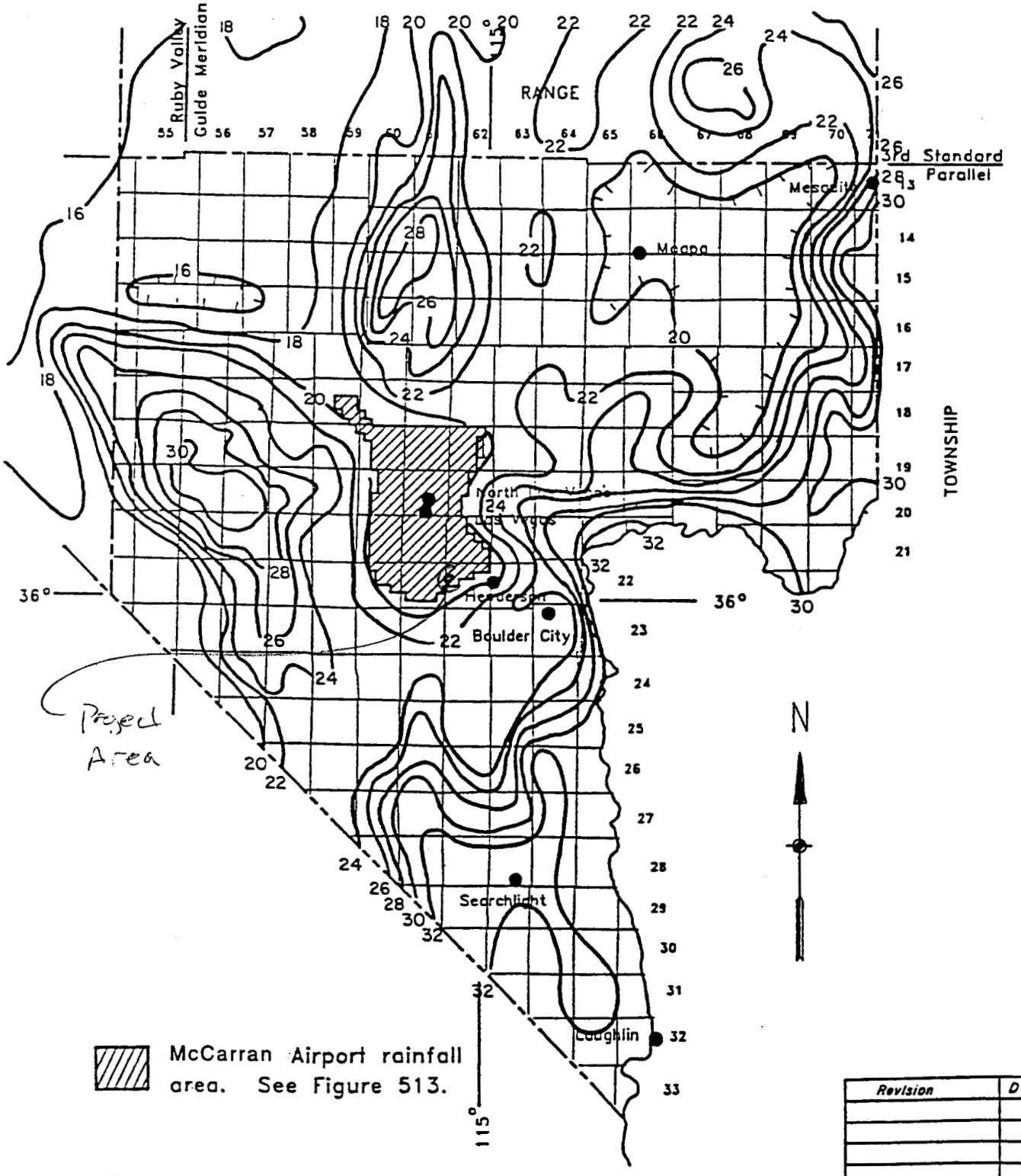
NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.

2. The 24 hour values presented above are for use with TR-55 only.

3. Table 501 adjustments not required.

Revision	Date

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



Revision	Date

WRC ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

SIX-HOUR STORM DISTRIBUTIONS

Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5	Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

Notes:
1. For drainage areas less than 8 square miles in size, use SDN 3.
2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
4. A graphical representation of these values is presented on **Figure 515.**

Revision	Date

REFERENCE:

TABLE 503

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

SFP3

Average Lot Size or Usage[1]	Percent Impervious[2]	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less[3]	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.

2 Actual percent impervious value should be compared to selected land use type.

3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

SFP1 & SFP2

Revision	Date

REFERENCE:

TABLE 602A

CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT

2002 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

LEGEND

- Ultimate Development Boundary
- Watershed Boundary
- 1D Subarea Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Proposed Facilities

- Type Hydrologic Soil Groups
- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential

Typical Land Use

- 1 Undeveloped Land, Open Desert
- 2 Parks, Golf Courses
- 3 Rural
- 4 Low Density Residential
- 5 Medium Density Residential
- 6 High Density Residential
- 7 Public Facility, Multi Family
- 8 Commercial, Office, Retail, Casino
- 9 Light Industrial
- 10 Heavy Industrial
- 11 Schools
- 12 Lakes

N W E S

0 1,000 2,000 3,000 4,000 5,000
Feet

SCALE: 1 inch = 3000 feet

US95 I-15 I-215

HYDROLOGIC SUBAREAS, LAND USE & SOILS

FIGURE H-25

PBS&J

G.C. WALLACE, INC.

Aerial photo as of April 2005.
Contour Data 1996 Clark County GIS

Legend

SFP1	Basin Name
→	Flow Arrow
—	Basin Delineation
—B	Cross Section

GRAPHIC SCALE

150 0 75 150 300 600

(IN FEET)

1 inch = 150 ft.

The hydrologic/hydraulic analysis completed for this LOMR is based on topographic information shown on this map and grading plans provided in Appendix D.

I hereby certify that the information used to prepare this LOMR and the associated analysis substantially conforms with current conditions.

Matthew S. Baird, NV 13684 — Date 7/18/05

FIGURE 2: BASIN/CROSS SECTION EXHIBIT
Southfork Parcel 12

Project No. 511606.00 July 2005

PBS&J
2270 Corporate Circle
Suite 100 Henderson,
Nevada 89014
Telephone: 702/263-7275
Fax: 702/263-7200
ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

FIGURE 2

Worksheet for Cross Section A 51' ROW

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.00000	%
Discharge:	68.00	ft^3/s

Options		
Current Roughness Weighted Meth	ImprovedLotters	
Open Channel Weighted Roughnes	ImprovedLotters	
Closed Channel Weighted Roughne	Hortons	

Results		
Roughness Coefficient:	0.015	
Water Surface Elevation:	0.65	ft
Elevation Range:	0.00 to 1.00 ft	
Flow Area:	15.69	ft^2
Wetted Perimeter:	52.20	ft
Top Width:	51.00	ft
Normal Depth:	0.65	ft
Critical Depth:	0.73	ft
Critical Slope:	0.00494	ft/ft
Velocity:	4.33	ft/s
Velocity Head:	0.29	ft
Specific Energy:	0.95	ft
Froude Number:	1.38	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 1.00)	(0+07, 0.13)	0.015
(0+07, 0.13)	(0+44, 0.13)	0.016
(0+44, 0.13)	(0+51, 1.00)	0.015

Section Geometry

Station	Elevation

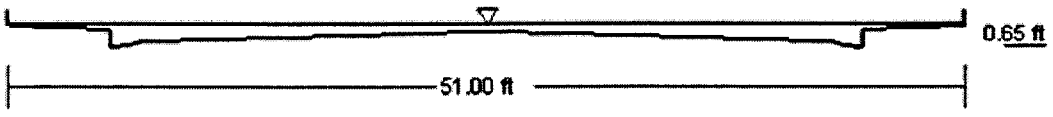
Worksheet for Cross Section A 51' ROW

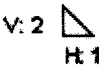
Station	Elevation
0+00	1.00
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+26	0.45
0+44	0.17
0+44	0.13
0+46	0.00
0+46	0.50
0+51	0.60
0+51	1.00

Cross Section A
Cross Section for Cross Section A 51' ROW

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.015	
Channel Slope:	1.00000	%
Normal Depth:	0.65	ft
Elevation Range:	0.00 to 1.00 ft	
Discharge:	68.00	ft^3/s





Worksheet for Cross Section B 51' ROW

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.00000	%
Discharge:	79.00	ft^3/s

Options		
Current Roughness Weighted Meth	ImprovedLotters	
Open Channel Weighted Roughnes	ImprovedLotters	
Closed Channel Weighted Roughne	Hortons	

Results		
Roughness Coefficient:	0.015	
Water Surface Elevation:	0.68	ft
Elevation Range:	0.00 to 1.00 ft	
Flow Area:	17.22	ft^2
Wetted Perimeter:	52.26	ft
Top Width:	51.00	ft
Normal Depth:	0.68	ft
Critical Depth:	0.77	ft
Critical Slope:	0.00482	ft/ft
Velocity:	4.59	ft/s
Velocity Head:	0.33	ft
Specific Energy:	1.01	ft
Froude Number:	1.39	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 1.00)	(0+07, 0.13)	0.015
(0+07, 0.13)	(0+44, 0.13)	0.016
(0+44, 0.13)	(0+51, 1.00)	0.015

Section Geometry

Station	Elevation

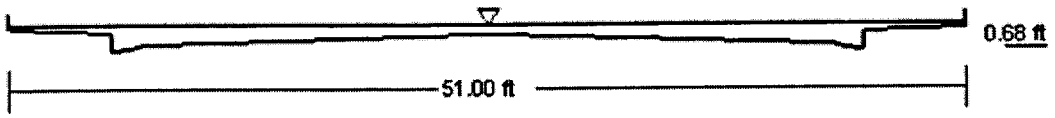
Worksheet for Cross Section B 51' ROW

Station	Elevation
0+00	1.00
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+26	0.45
0+44	0.17
0+44	0.13
0+46	0.00
0+46	0.50
0+51	0.60
0+51	1.00

Cross Section B
Cross Section for Cross Section B 51' ROW

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.015	
Channel Slope:	1.00000	%
Normal Depth:	0.68	ft
Elevation Range:	0.00 to 1.00 ft	
Discharge:	79.00	ft^3/s



V: 2
H: 1

Worksheet for Cross Section C 60' ROW IONE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.00000	%
Discharge:	46.00	ft^3/s

Options		
Current Roughness Weighted Meth	ImprovedLotters	
Open Channel Weighted Roughnes	ImprovedLotters	
Closed Channel Weighted Roughne	Hortons	

Results		
Roughness Coefficient:	0.016	
Water Surface Elevation:	0.63	ft
Elevation Range:	0.00 to 2.00 ft	
Flow Area:	13.38	ft^2
Wetted Perimeter:	61.16	ft
Top Width:	60.00	ft
Normal Depth:	0.63	ft
Critical Depth:	0.67	ft
Critical Slope:	0.00576	ft/ft
Velocity:	3.44	ft/s
Velocity Head:	0.18	ft
Specific Energy:	0.82	ft
Froude Number:	1.28	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2.00)	(0+07, 0.13)	0.015
(0+07, 0.13)	(0+53, 0.13)	0.016
(0+53, 0.13)	(0+60, 2.00)	0.015

Section Geometry

Station	Elevation

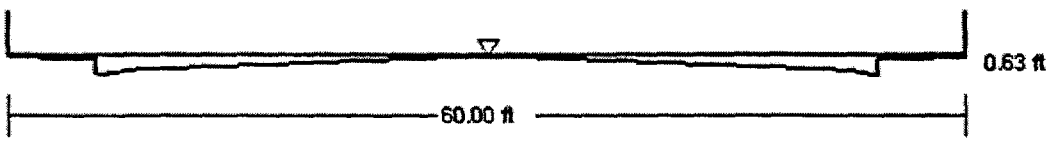
Worksheet for Cross Section C 60' ROW IONE

Station	Elevation
0+00	2.00
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+30	0.63
0+53	0.17
0+53	0.13
0+55	0.00
0+55	0.50
0+60	0.60
0+60	2.00

Cross Section C
Cross Section for Cross Section C 60' ROW IONE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.016	
Channel Slope:	1.00000	%
Normal Depth:	0.63	ft
Elevation Range:	0.00 to 2.00 ft	
Discharge:	46.00	ft^3/s



V: 2
H: 1

APPENDIX E

Data CD