Request for Conditional Letter of Map Revision

Upper Blue Diamond Diversion Channel

&

Rainbow Boulevard Collector System

Located

Between Wigwam Avenue and I-215 Beltway

Clark County, Nevada

04-09-1759R

Prepared for:

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

600 South Grand Central Parkway, Suite 300

Las Vegas, NV 89155

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PBS&J

September, 2004

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USACE Upper Blue Diamond Diversion Channel Design Documentation Report
USACE Upper Blue Diamond Diversion Channel Design Plans
Rainbow Boulevard Drainage Study and Technical Data Support Notebook
Rainbow Boulevard Roadway/Drainage Improvements Plans

1.0 INTRODUCTION

PBS&J has prepared a Conditional Letter of Map Revision (CLOMR) for the proposed Upper Blue Diamond Diversion Channel and the Rainbow Boulevard Collector System on behalf of the Clark County Regional Flood Control District (CCRFCD). The purpose of the study is to evaluate the removal of existing Zone A flood zones based on the construction of two proposed flood control facilities (see Figure 1-Vicinity Map & Figure 3A).

The proposed facilities are aligned within the right-of-way of Durango Drive and Rainbow Boulevard and will convey flow north to the existing beltway channel. The Beltway Channel runs east-west along the southern side of the I-215 Beltway, see Figure 3A. The Upper Blue Diamond Diversion Channel was designed by the United States Army Corps of Engineers (USACE) to convey the 100-year discharge from the Upper Blue Diamond Detention Basin and developments west of Durango Drive to the existing Beltway Channel. The system will include three major confluence structures and 11 side drains to collect flows west of Durango Drive. The proposed Upper Blue Diamond system consists of three primary components:

1. 5.1 acre-foot debris basin (inlet structure)
2. 7,480-feet of RCB
3. 6,315-feet of concrete lined rectangular channel

As described in the USACE Design Report, the system allows for the adequate collection and conveyance of existing and future condition 100-year flows (west of Durango Drive) with the aforementioned confluence structures and side drains.

The Rainbow Boulevard Collector System was designed by G.C. Wallace and will convey storm water runoff for the area between Durango Drive and Rainbow Boulevard. The system consists of varying size RCP (between 24" and 60") and a 10'x6' RCB to convey flow north where it discharges to the existing Beltway Channel.

The Rainbow system will also collect and convey existing and future condition 100-year flows. As described in the reference studies, the facility was designed for both interim and future conditions. Under interim conditions, flow west of Rainbow Boulevard will be channelized and collected with Nevada Department of Transportation Type II Field Inlets. Under future conditions (Rainbow Boulevard fully improved) the field inlets will be replaced with Type C drop inlets.

Additional details on the proposed Upper Blue Diamond Diversion Channel and Rainbow Collector System can be found in the approved design plans located in Appendix F. Also, refer to Appendix F for the USACE Pre-Certification Letter for the completion and base flood (100-year) conveyance capacity of the Upper Blue Diamond Diversion Channel.

2.0 PURPOSE AND SITE DESCRIPTION

2.1 PURPOSE

Prior to the completion of the Upper Blue Diamond Detention Basin in 2001 (see Figure 3A for location) a 100-year event would cause severe flooding to the alluvial area between Durango Drive and Rainbow Boulevard. This area and the associated flooding has been extensively studied in the past; however, due to the rapidly changing conditions (development and flood control facilities) previous studies may no longer accurately represent current conditions. Therefore, this CLOMR has been prepared to address the proposed facilities in Durango Drive and Rainbow Boulevard, in conjunction with current land conditions, for the purpose of floodzone removal.

2.2 LOCATION

The project area is located in the southwestern part of the Las Vegas Valley within Sections 2-5, 8-11, and 14-17, Township 22 South, Range 60 East, Mount Diablo Base & Meridian, Clark County, Nevada. Specifically, the area between Durango Drive and Rainbow Boulevard, and south of the I-215 Beltway and north of Blue Diamond Road. Also, the area east of Rainbow Boulevard to the I-215 Beltway. Please refer to Figure 1 – Vicinity Map.

2.3 TOPOGRAPHY

Historic topography in and around the subject facilities is alluvial characterized by a network of braided washes. The area is commonly referred to as the Blue Diamond Fan as shown on Figure 3. The overall slope across the project area is approximately 1.5% from Durango Drive to the I-215 Beltway (east of Rainbow Boulevard). The southwestern part of the Las Vegas Valley is experiencing rapid development; however, the area between Durango Drive and Rainbow Boulevard (South of I-215) remains largely undeveloped at the time of this report preparation.

2.4 EXISTING FLOOD CONTROL FACILITIES

The 2002 Master Plan Update (MPU) serves as a planning tool for the implementation of existing and proposed flood control facilities for the Las Vegas Valley. The MPU shows the alignment of the proposed Upper Blue Diamond Diversion Channel and the Rainbow Boulevard Collector System (see Figure 2). Figure 2 also shows the existing channel immediately south of the 215 Beltway for which the aforementioned facilities are tributary. Ultimately, the flows collected by the subject facilities drain to the Tropicana Detention Basin. Refer to Figure 2A that provides detailed information on each existing or proposed facility

discussed in this section.

2.5 FEMA FLOODZONE INFORMATION

Figure 3 is a reproduction of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Clark County, Nevada, Community Panel No. 320036C2553E, dated September 27, 2002, revised to reflect a LOMR dated January 15, 2004, Panel No. 320036C2535E, dated September 27, 2002, revised to reflect a LOMR dated September 3, 2004, Panel No. 320036C2561E, dated September 27, 2002, and Panel No. 320036C2545E, dated September 27, 2002. Figure 3 shows the Zone A floodzone traversing the project area from southwest to northeast. Also refer to Figure 3A that shows the DFIRM floodzone delineations for the subject area.

3.0 HYDROLOGY

3.1 COMPUTER MODELING

The hydrologic model utilized to calculate the 100-year runoff is the HEC-1 Flood Hydrograph Package, Version 4.1, developed by the U.S. Army Corps of Engineers Hydrologic Engineering Center.

3.2 REFERENCE HYDROLOGY

The hydrology associated with the design of the proposed Upper Blue Diamond Diversion Channel was prepared by the USACE and is included in the Design Documentation Report, see Appendix F. The hydrology associated with the design of the proposed Rainbow Collector System was prepared by G.C. Wallace and is included in the Drainage Study Report, see Appendix F.

3.3 HYDROLOGIC PARAMETERS

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 CCRFCD's Hydrologic Criteria and Drainage Design Manual (HCDDM) and are described below.

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 (HCDDM) is multiplied by all rainfall depths obtained from the NOAA Atlas, see Table 501 in Appendix C. 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. The central part of the Las Vegas Valley is known as they

McCarran Airport Rainfall Area with a 100-year, 6-hour precipitation of 2.77 inches as shown on Figure 506 and Table 505 in Appendix C. A portion of the watershed for the subject area is within the McCarran Airport Rainfall Area as shown on Figure 513 in Appendix C. Therefore a composite precipitation value was calculated for those basins that were both inside and outside the McCarran Airport Rainfall Area, see Table C-1 in Appendix C. 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 distribution numbers (SDN). SDNs 3, 4, and 5 are applied to a HEC-1 model 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 is used. For drainage areas greater than or equal to 8 and less than 12 square miles in size, SDN 4 is used. SDN 5 is used for drainage areas greater than or equal to 12 square miles in size (see CCRFCD Design Manual). All subbasins delineated for this CLOMR are less than 8 square miles, thus an SDN 3 was used. See Table 503 in Appendix C for six-hour storm distributions.

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 the rainfall over the entire storm area (per the HCDDM).

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, see Table 502 in Appendix C. A DARF was applied to the HEC-1 model for basin UBD6 that has a total area greater than ½ square mile.

Soils & 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. Soils information for the drainage basins was obtained from the Soil Conservation Service (SCS) Soil

Survey of Las Vegas Valley Area, Nevada, 1985. An SCS survey map is included in Appendix C, see Figure C1, Soils Map. The hydrologic group classification for each soil in the soil composite was read from Table 15 of the SCS survey, included in Appendix C. 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 602 of the HCDDM, see Appendix C.

Table C-2, Curve Number Calculations, in Appendix C, summarizes the computation of the Curve Numbers for the subbasins.

Lag Times

For subbasins less than 1 square mile, lag times are calculated using the time of concentration (velocity method) per the CCRFCD Design Manual as described below.

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:

$$T_t = L_t/(V*60)$$

Where:

T_t = Travel time in the ditch, gutter, etc. (minutes)
L_t = Travel length (feet)
V = Average velocity of flow computed using the total flow from the basin and an approximated channel geometry (feet/second)

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.

Please refer to Standard Form 4 in Appendix C that shows the time of concentration calculations for basins under 1 square mile in the study area. Velocity estimates used in column 9 of Standard Form 4 are also included in Appendix C.

3.4 HYDROLOGIC RESULTS

The HEC-1 model submitted in this CLOMR was prepared with the following assumptions:

1. The proposed Upper Blue Diamond Diversion Channel in Durango Drive represents a 100-year cutoff.

2. The proposed storm drain system in Rainbow Boulevard represents a 100-year cutoff.

Therefore, subbasins UBD1 through UBD9 have been delineated to show what is currently tributary to each floodzone using the above assumptions and current land uses (see Figure C2). Also, the reference hydrology from G.C. Wallace was

used to assist in the delineation of basin UBD7. A summary of the results of the HEC-1 modeling is shown in Table C3.

Table C3.
Subbasin Flow Summary

HEC-1 Node	Drainage Area (acres.)	100-Yr Discharge (cfs)
UBD1	39	63
UBD2	117	188
UBD3	127	198
UBD4	172	240
UBD5	317	401
UBD6	334	404
UBD7	272	110
UBD8	137	56
UBD9	181	58
C1	NA	385
C2	NA	448
C3	NA	805

4.0 HYDRAULICS

4.1 COMPUTER MODELING

FlowMaster, version 8 was used for normal depth analysis of channel and/or natural wash cross-sections.

4.2 NORMAL DEPTH CALCULATIONS

The effective floodzones within the project area were analyzed with normal depth cross-sections based on the hydrology established in Section 3 of this report. The project area consists predominantly of undeveloped land with some commercial and residential developments as shown on Figure 3A. In general, the current effective floodzones represent natural washes that traverse the area from southwest to northeast. Each floodzone finger was analyzed with a series of three to five cross-sections as shown on Figure C2 in Appendix C. Each cross-section has a unique identifier based on the subbasins in which it is located. For example, cross-sections UBD1A through UBD1C are located within basin UBD1. The flow used in the cross-sectional analysis is based on area percentage of the basin. The percentage breakdown and flow used in each cross-section is shown in Table D1, see Appendix D. Also, please refer to Appendix D for the Flowmaster calculation worksheets. Note that the Flowmaster worksheets present results in normal depth. However, the hydraulic analysis for this report is based on hydraulic depth (area/top width). Table D1, see Appendix D, shows the results of the hydraulic depth analysis based on the information obtained from the Flowmaster worksheets. It should be noted that all of the cross-sections show subcritical flow.

5.0 RESULTS

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

5.1 UPPER BLUE DIAMOND DIVERSION CHANNEL

The results for the Upper Blue Diamond Diversion Channel area (between Durango Drive and Rainbow Boulevard) are based on the hydrology/hydraulics for subbasins UBD1 through UBD8. All of the cross-sections for these subbasins show less than one foot of depth (hydraulic depth). Therefore, the effective Zone A floodzones between Durango Drive and Rainbow Boulevard can be removed as shown on Figures 4 & 5.

5.2 RAINBOW BOULEVARD COLLECTOR SYSTEM

The results for the Rainbow Boulevard Collector System (east of Rainbow Boulevard and south of I-215) are based on the hydrology/hydraulics for subbasin UBD9. All of the cross-sections for this subbasin show less than one foot of depth (hydraulic depth). Therefore, the effective Zone A floodzone can be removed as shown on Figures 4 & 5.

6.0 CONCLUSION

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

7.0 REFERENCES

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

FlowMaster — FlowMaster Version 8.0, Haestad Methods, Inc. 2004.

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

HEC-RAS — U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) Version 3.1.1, Hydrologic Engineering Center, May 2003.

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.

USACE — *Design Documentation Report Las Vegas Wash and Tributaries, (Tropicana & Flamingo Washes) Upper Blue Diamond Diversion Channel.* Prepared by United States Army Corps of Engineers, dated January 2004.

GCW — *Drainage Study for Rainbow Boulevard Improvements – Southern Beltway to Blue Diamond Road, 30% Design Submittal.* Prepared by G.C. Wallace dated September 2001.

GCW — *Pre-Final Submittal Technical Data Support Notebook for Rainbow Boulevard Improvements – Southern Beltway to Blue Diamond Road.* Prepared by G.C. Wallace dated January 2003.

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 480287	City of Katy Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
320003	Clark County	NV	32003C	2553E	01/15/04
32003	Clark County	NV	32003C	2535E	9/3/04
32003	Clark County	NV	32003C	2561E	9/27/02
32003	Clark County	NV	32003C	2545E	9/27/02

2. Flooding Source: Upper Blue Diamond Fan

3. Project Name/Identifier: Request for Conditional Letter of Map Revision for Upper Blue Diamond Diversion Channel/Rainbow Collector

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

5. Basis for Request and Type of Revision:

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

   ☒ Physical Change ☐ Improved Methodology/Data

   ☐ Regulatory Floodway Revision ☐ Other (Attach Description)

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

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

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

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $4,200

☒ No, Attach Explanation

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

D. SIGNATURE

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

Name: Brian K. Loffman, CFM	Company: PBS&J	
Mailing Address: 2270 Corporate Circle Suite 100 Henderson, NV 89074	Daytime Telephone No.: (702) 263-7275	Fax No.: (702) 263-7200
	E-Mail Address: bloffman@pbsj.com	
Signature of Requester (required):		Date: 9/21/04

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Dave Betley, P.E., Principal Engineer		Telephone No.: (702) 455-4808
Community Name: Clark County Department of Development Services	Community Official's Signature (required):	Date: 9/22/04

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Mathew S. Baird, P.E., CFM	License No.: NV 13684	Expiration Date: 12/31/04
Company Name: PBS&J	Telephone No.: (702) 263-7275	Fax No.: (702) 263-7200
Signature:		Date: 9/21/04

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 da
☐ 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

PROFESSIONAL ENGINEER-STATE OF NEVADA
MATTHEW S. BAIRD
Exp. 12/31/04
CIVIL
No. 13684
Seal (Optional)
9/21/04

Statement of Explanations

Form 1

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

MT-2 FORM 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

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

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Upper Blue Diamond Fan
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)
Southwest Las Vegas	2.65	N/A	variable

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 Beltway	n/a	n/a	n/a
Upstream Limit	Durango Drive	n/a	n/a	n/a

2. Hydraulic Method Used

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

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

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

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

4. Models Submitted

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

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

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

C. MAPPING REQUIREMENTS

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

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

D. COMMON REGULATORY REQUIREMENTS

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

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

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

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

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

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

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

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

MT-2 FORM 3

Riverine Structures Form

Upper Blue Diamond Diversion Channel

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: Blue Diamond Fan
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: Upper Blue Diamond Diversion Channel

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

Location of Structure: Within the right-of-way of Durango Drive

Downstream Limit/Cross Section: 1-215 Beltway

Upstream Limit/Cross Section: Shelbourne Ave

2. Name of Structure: Upper Blue Diamond Diversion Channel

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

Location of Structure: Within right-of-way of Durango Drive

Downstream Limit/Cross Section: Shelbourne Ave

Upstream Limit/Cross Section: Wigwam Road

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: Blue Diamond Fan

Name of Structure: Upper Blue Diamond Diversion Channel

1. Accessory Structures

The channelization includes (check one):

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

2. Drawing Checklist

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

3. Hydraulic Considerations

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

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

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

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

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

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

C. BRIDGE/CULVERT

Flooding Source: Blue Diamond Fan

Name of Structure: Upper Blue Diamond Deversion Channel

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): USACE EM 1110-2-1601
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

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

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

4. Sediment Transport Considerations

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

D. DAM

Flooding Source:

Name of Structure:

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

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

   ☐ Private organization Name of the agency or organization:

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

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

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

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

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

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

Stillwater Elevation Behind the Dam

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

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

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one):

☐ upgrading of an existing levee/floodwall system
☐ a newly constructed levee/floodwall system
☐ reanalysis of an existing levee/floodwall system

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

☐ earthen embankment, dike, berm, etc.	Station	to
☐ structural floodwall	Station	to
☐ Other (describe):	Station	to

c. Structural Type (check one):

☐ monolithic cast-in place reinforced concrete
☐ reinforced concrete masonry block
☐ sheet piling
☐ Other (describe):

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

☐ Yes ☐ No

If Yes, by which agency?

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

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

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

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

Coastal

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

2. Freeboard (continued)

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

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

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

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

3. Closures

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

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

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

Note: Geotechnical and geologic data

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

4. Embankment Protection

a. The maximum levee slope landside is:

b. The maximum levee slope floodside is:

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

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

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

Reach		Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
						D_{100}	D_{50}	Thickness	
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								

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

4. Embankment Protection (continued)

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

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

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:

☐ Overall height: Sta. ; height ft.

☐ Limiting foundation soil strength:

Sta. , depth to

strength ϕ = degrees, c = psf

slope: SS = (h) to (v)

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

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

c. Summary of stability analysis results:

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

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

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

If Yes, describe methodology used:

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

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

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

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

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability

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

☐ UBC (1988) or ☐ Other (specify):

b. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding If not, explain:

c. Loading included in the analyses were:

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ , ☐ surface psf

☐ Wind @ P_w = psf

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

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

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

d. Summary of Stability Analysis Results: Factors of Safety.

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

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

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)

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

e. Foundation bearing strength for each soil type:

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

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

Attach engineering analysis to support construction plans.

7. Settlement

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

b. The computed range of settlement is ft. to ft.

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

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

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

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

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

b. Relationships Established

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

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

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

e. Which flooding conditions were analyzed?

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

If No for any of the above, attach explanation.

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

If No, attach explanation.

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

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

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: Blue Diamond Fan

Name of Structure: Debris Basin (Upper Blue Diamond Diversion Channel)

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 11.5 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: see Section 1.27 & 1.8 of USACE Design Report

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: na

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.

na

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.

Rainbow Boulevard Collector System

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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

PAPERWORK REDUCTION ACT

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Flooding Source: Blue Diamond Fan
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: Rainbow Boulevard Collector Storm Drain

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

Location of Structure: Within the right-of-way of Rainbow Boulevard

Downstream Limit/Cross Section: 1-215 Beltway

Upstream Limit/Cross Section: Santoli Ave

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: Blue Diamond Fan

Name of Structure: Rainbow Boulevard Collector Storm Drain

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): Manual Calculation
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

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

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

4. Sediment Transport Considerations

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

D. DAM

Flooding Source:

Name of Structure:

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

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

   ☐ Private organization Name of the agency or organization:

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

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

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

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

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

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

Stillwater Elevation Behind the Dam

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

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

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one):

☐ upgrading of an existing levee/floodwall system
☐ a newly constructed levee/floodwall system
☐ reanalysis of an existing levee/floodwall system

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

☐ earthen embankment, dike, berm, etc.	Station	to
☐ structural floodwall	Station	to
☐ Other (describe):	Station	to

c. Structural Type (check one):

☐ monolithic cast-in place reinforced concrete
☐ reinforced concrete masonry block
☐ sheet piling
☐ Other (describe):

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

☐ Yes ☐ No

If Yes, by which agency?

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

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

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

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

Coastal

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

2. Freeboard (continued)

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

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

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

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

3. Closures

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

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

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

Note: Geotechnical and geologic data

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

4. Embankment Protection

a. The maximum levee slope landside is:

b. The maximum levee slope floodside is:

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

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

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

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D_{100}	D_{50}	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

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

4. Embankment Protection (continued)

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

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

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:

☐ Overall height: Sta. ; height ft.

☐ Limiting foundation soil strength:

Sta. , depth to

strength ϕ = degrees, c = psf

slope: SS = (h) to (v)

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

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

c. Summary of stability analysis results:

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

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

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

If Yes, describe methodology used:

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

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

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

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

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability

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

☐ UBC (1988) or ☐ Other (specify):

b. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding If not, explain:

c. Loading included in the analyses were:

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ , ☐ surface psf

☐ Wind @ P_w = psf

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

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

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

d. Summary of Stability Analysis Results: Factors of Safety.

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

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

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)

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

e. Foundation bearing strength for each soil type:

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

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

Attach engineering analysis to support construction plans.

7. Settlement

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

b. The computed range of settlement is ft. to ft.

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

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

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

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

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

b. Relationships Established

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

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

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

e. Which flooding conditions were analyzed?

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

If No for any of the above, attach explanation.

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

If No, attach explanation.

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

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

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.

Statement of Explanation:

Explanation: Sediment transport was not considered due to the steepness of the storm drain system and the associated high flow velocities. Any sediment entering the system would be transported through the system.

MT-2 FORM 6

Alluvial Fan Flooding Form

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLUVIAL FAN FLOODING FORM

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

PAPERWORK REDUCTION ACT

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.**

Flooding Source: Upper Blue Diamond Fan
Note: Fill out one form for each flooding source studied

A. THREE-STAGE ANALYSIS (Based on FEMA Guidelines dated February 23, 2000)

1. Stage 1 Analysis

   a. The landform is composed of (check one) ☐ alluvial ☐ debris flow deposits.

   b. Source of data used to determine composition, morphology, and location of the landform:

   c. Is there an NRCS soils survey and soil survey map available? ☐ Yes ☐ No
   If Yes, please include a copy of the map and any pertinent sections of the soil survey

2. Stage 2 Analysis

   a. The alluvial fan exhibits ☐ active ☐ inactive ☐ a combination of active and inactive alluvial fan flooding.

   b. Approximate age of inactive fan surfaces (thousands of years): yrs.

   c. Is there an opportunity for avulsions that could lead channels or sheetfloods across the older fan surfaces?
   ☐ Yes ☐ No

   d. Is there evidence of headcutting that could lead to stream piracy? ☐ Yes ☐ No

   e. Is there geomorphic evidence of past avulsions during the Holocene epoch? ☐ Yes ☐ No

   f. The fan exhibits the following types of flooding (check one):

   ☐ Flooding along stable channels
   ☐ Sheetflow
   ☐ Debris flow
   ☐ Unstable flow path flooding

3. Stage 3 Analysis

   The boundaries of the 1%-annual-chance floodplain have been determined using (check one):

   ☐ Risk-Based Analysis
   ☐ FEMA FAN program (if discharge at the apex is different than that given in the effective FIS, then attach MT-2, Form 2 along with a plot of the flood frequency curve on log-normal probability paper and include the drainage area above the hydrographic apex, and the mean, standard deviation, and skew coefficient of the curve)
   ☐ Sheetflow Methods
   ☐ Hydraulic Analytical Methods
   ☐ Geomorphic Data, Post-Flood Hazard Verification, and Historical Information
   ☐ Composite Methods

B. STRUCTURAL FLOOD CONTROL MEASURES

1. The following structural flood control measures are proposed or built (check one):

   ☒ Channelization ☐ Levee/Floodwall ☐ Dam ☒ Sedimentation Basin

2. Do the constructed or proposed structural measures affect flood hazards (including velocity, scour, and sediment deposition) on other areas of the fan? ☒ Yes ☐ No

3. Attach completed Form 3 (Riverine Structures Form).

4. Sediment Transport Considerations:
   Was sediment transport considered? ☒ Yes ☐ No If Yes, then fill out Form 3, Section F (Sediment Transport).
   If No, then attach your explanation for why sediment transport was not considered.

5. Please attach a copy of the formal Operations and Maintenance Plan.

C. MAPPING REQUIREMENTS

Attach a certified topographic work map showing the following:

- The boundaries of the alluvial fan including: toe, topographic and hydrologic apexes, and lateral boundaries
- The delineation of the active and inactive portions of the fan as determined by the Stage 2 analysis
- The revised 1%-annual-chance floodplain boundaries, as determined by the Stage 3 Analysis, that tie into the effective floodplain boundaries
- The correct alignment of all structural features
- The map scale

Statement of Explanation for following sections:

1. MT-2 Form 6 Page 1 of 2 Section A

Section A of this form is not applicable due to the construction of the Upper Blue Diamond Detention Basin and the proposed Upper Blue Diamond Diversion Channel as discussed in the report.

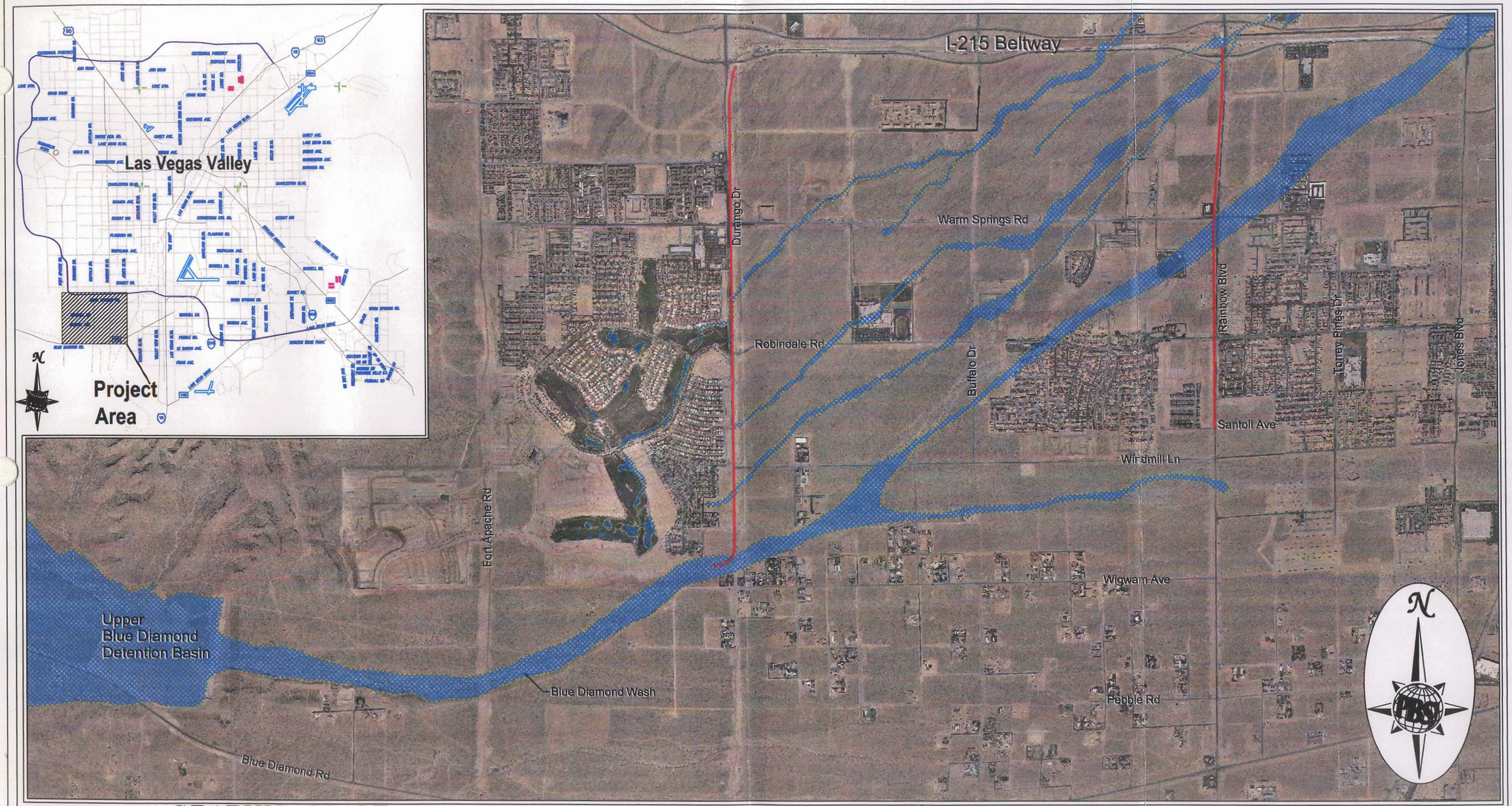
2. MT-2 Form 6 Page 2 of 2 Section B

Sediment transport was considered in the design of the Upper Blue Diamond Detention Basin. The design for this structure and associated hydrology has been previously approved by FEMA.

3. MT-2 Form 6 Page 2 of 2 Section C

Same response as Section A.

APPENDIX B
Figures



GRAPHIC SCALE

2000 0 1000 2000 4000 8000

(IN FEET)

1 inch = 2000 ft.

FIGURE 1: VICINITY MAP

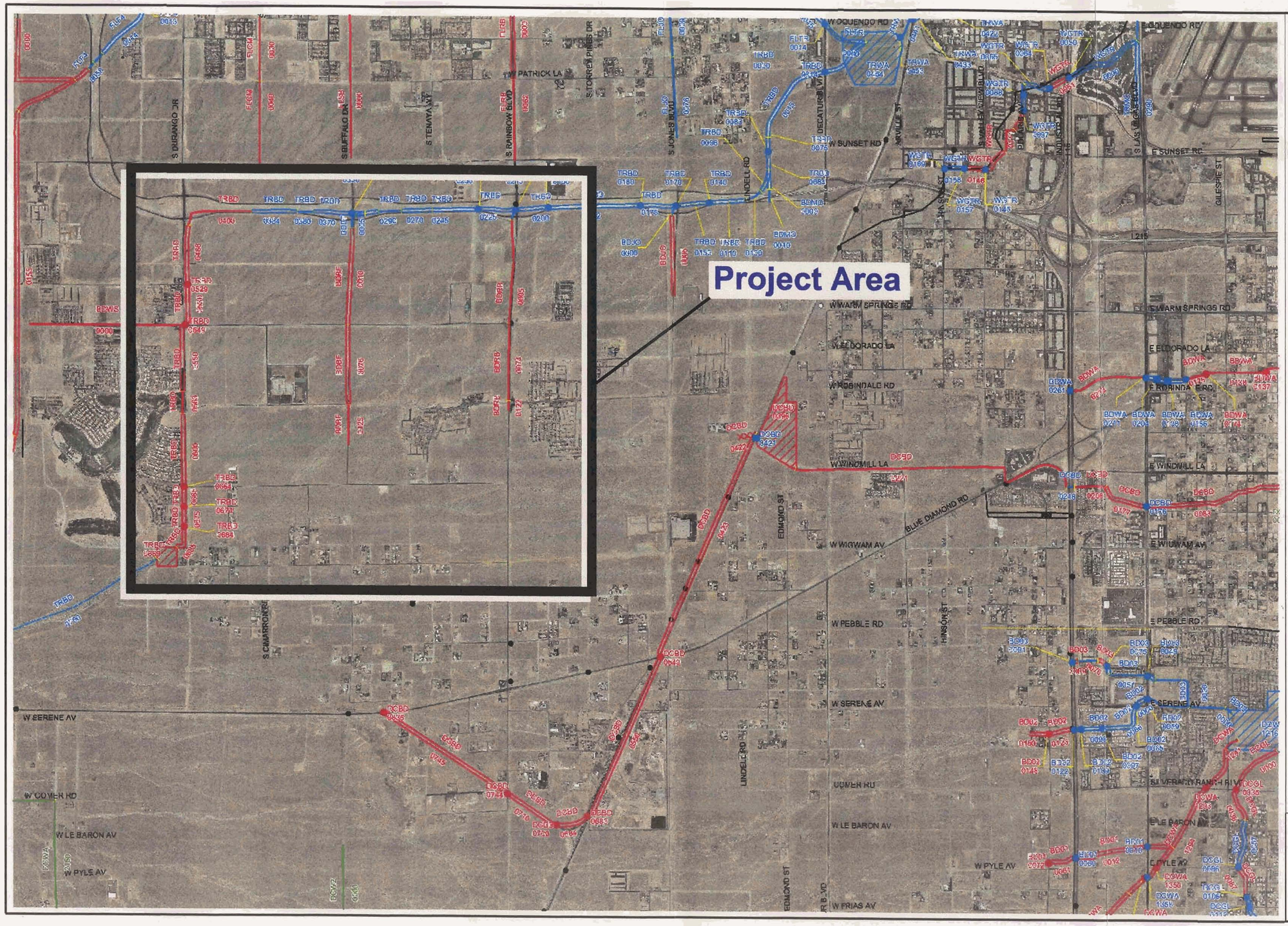
Upper Blue Diamond Diversion Channel/Rainbow System CLOMR

Zone A Floodzone

UBD/Rainbow Facility Alignment

PBSJ
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Tele: 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 6,000

Feet

SCALE: 1 inch = 3000 feet



FLOOD CONTROL FACILITIES
FIGURE F-20

PBS&J

C.C. Williams, 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 (%)
BD01		**BLUE DIAMOND CHANNEL 01**						
0000	E	Natural Wash	805	632	CDLD415	DUCK3	2.04	
0000	P1	Gabion Chnl 15'W 5.5'D 2:1 SS	805	632	CDLD415	DUCK3	2.04	0.50
0010	E	3: 10' X 5' RCBC @ Las Vegas Blvd	50	632	CDLD415	DUCK3	2.04	1.60
0012	E	Natural Wash	2400	632	CDLD415	DUCK3	2.04	
0012	P1	Conc Chnl 15'W 4.0'D 2:1 SS	2400	632	CDLD415	DUCK3	2.04	1.30
0060	E	3: 12' X 4' RCBC @ I-15	180	631	CDLD070	DUCK3	1.88	1.30
0061	E	Natural Wash	890	631	CDLD070	DUCK3	1.88	
0061	P1	Conc Chnl 15'W 4.0'D 2:1 SS	890	631	CDLD070	DUCK3	1.88	1.20
0072	P1	2: 6' X 6' RCBC @ Industrial	60	631	CDLD070	DUCK3	1.88	1.80
BD02		**BLUE DIAMOND CHANNEL 02**						
0000	E	3: 8' X 8' RCB	290	1767	CDLD185	DUCK3	4.36	1.10
0008	E	3: 96" CIPCP	1160	1767	CDLD185	DUCK3	4.36	1.10
0026	E	2: 78" CIPCP	1440	784	CDLD180	DUCK3	2.61	1.10
0059	E	2: 10' X 6' RCBC @ Las Vegas Blvd	80	784	CDLD180	DUCK3	2.61	1.10
0060	E	Conc Chnl 20'W 5'D 2:1 SS	375	784	CDLD180	DUCK3	2.61	1.10
0065	E	2: 10' X 6' RCBC @ Serene Ave	50	784	CDLD180	DUCK3	2.61	0.40
0066	E	Conc Chnl 20'W 5'D 2:1 SS	1630	784	CDLD180	DUCK3	2.61	0.45
0097	E	2: 10' X 6' RCBC	70	784	CDLD180	DUCK3	2.61	0.61
0098	E	Conc Chnl 20'W 5'D 2:1 SS	600	784	CDLD180	DUCK3	2.61	0.87
0109	E	2: 10' X 6' RCBC	150	784	CDLD180	DUCK3	2.61	8.09
0111	E	Gabion Chnl 25'W 5'D 2:1 SS	40	688	CDLD130	DUCK3	2.37	4.34
0122	E	2: 12' X 4' RCBC @ I-15	190	688	CDLD130	DUCK3	2.37	0.86
0123	E	Natural Wash	700	688	CDLD130	DUCK3	2.37	
0123	P1	Conc Chnl 20'W 3.5'D 2:1 SS	700	688	CDLD130	DUCK3	2.37	1.30
0148	P1	2: 10' X 5' RCBC @ Industrial	60	688	CDLD130	DUCK3	2.37	1.00
0150	E	Natural Wash	630	688	CDLD130	DUCK3	2.37	
0150	P1	Conc Chnl 20'W 3.5'D 2:1 SS	630	688	CDLD130	DUCK3	2.37	1.30
BD03		**BLUE DIAMOND CHANNEL 03**						
0000	E	2: 84" CIPCP	1070	1158	CDLD185N	DUCK3	1.75	1.20
0020	E	2: 96" CIPCP	880	1158	CDLD185N	DUCK3	1.75	0.60
0037	E	Gabion Chnl 20'W 8'D 2:1 SS	250	1158	CDLD185N	DUCK3	1.75	0.47
0049	E	3: 12' X 7' RCBC @ Las Vegas Blvd	100	1158	CDLD185N	DUCK3	1.75	0.90
0051	E	3: 10' X 5' RCB	1200	1158	CDLD185N	DUCK3	1.75	1.20
0068	E	Conc Chnl 60'W 6'D 2:1 SS	265	1158	CDLD185N	DUCK3	1.75	0.70
0075	E	3: 10' X 5' RCBC @ W Agate Ave	50	1158	CDLD185N	DUCK3	1.75	0.60
0076	E	Natural Wash	420	1158	CDLD185N	DUCK3	1.75	
0076	P1	Gabion Chnl 25'W 6'D 2:1 SS	420	1158	CDLD185N	DUCK3	1.75	0.60
0081	E	2: 109" CMP	700	1158	CDLD185N	DUCK3	1.75	0.60
0089	P1	Gabion Chnl 25'W 6'D 2:1 SS	200	1158	CDLD185N	DUCK3	1.75	0.60
0091	E	3: 12' X 5' RCBC @ I-15	190	1158	CDLD185N	DUCK3	1.75	1.20
BDBF		**BLUE DIAMOND-BUFFALO BRANCH**						
0000	E	Conc Chnl 10'W 10'D 0:1 SS	310	1613	CTBD11S	FLAM3SC	2.06	2.00
0005	E	10' X 10' RCB	480	1613	CTBD11S	FLAM3SC	2.06	2.00
0010	P1	Conc Chnl 10'W 9'D 0:1 SS	3190	1343	CTBD10	FLAM3SC	1.68	0.96
0076	P1	Conc Chnl 10'W 7.5'D 0:1 SS	2660	1002	CTBD9	FLAM3SC	1.29	0.96
0125	P1	90" RCP	1330	556	CTBD8	FLAM3SC	0.78	0.80
BDJO		**BLUE DIAMOND-JONES BRANCH**						
0000	E	12' X 7' RCB	320	768	CTBD19S	FLAM3SC	1.72	0.94
0005	P1	Conc Chnl 12'W 5.5'D 0:1 SS	2690	768	CTBD19S	FLAM3SC	1.72	0.94
BDMO		**BLUE DIAMOND CHANNEL MOHAWK**						
0000	E	Conc Chnl 10'W 6'D 0:1 SS	570	343	CTBD20BS	FLAM3SC	0.73	0.70
0010	E	2: 6' X 6' RCB	410	343	CTBD20BS	FLAM3SC	0.73	0.70
BDRB		**BLUE DIAMOND-RAINBOW BRANCH**						
0000	E	10' X 9' RCB	350	875	CTBD15S	FLAM3SC	1.77	1.09
0005	P2	10' X 6' RCB	3430	875	CTBD15S	FLAM3SC	1.77	1.09
0074	P2	60' RCP	2560	191	CTBD13	FLAM3SC	1.01	0.75
0122	P2	54" RCP	300	36	TBD12	FLAM3SC	0.51	0.60

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BDWA		**BLUE DIAMOND WASH**						
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
0174	E	48" CMP @ Rancho Destino	50	881	CBUB300	DUCK3	1.64	1.20
0174	P1	Replace with 10' X 6' RCB	50	881	CBUB300	DUCK3	1.64	1.20
0175	E	Natural Wash	630	881	CBUB300	DUCK3	1.64	
0175	P1	9' X 5' RCB	630	881	CBUB300	DUCK3	1.64	3.00
0186	E	3: 15' X 5' RCBC @ Haven St	50	881	CBUB300	DUCK3	1.64	1.00
0187	E	Conc Chnl 15'W 8'D 1:1 SS	585	881	CBUB300	DUCK3	1.64	0.86
0198	E	Single Span Bridge 45'W 10'D @ Giles	45	881	CBUB300	DUCK3	1.64	1.50
0199	E	Conc Chnl 15'W 8'D 1:1 SS	320	881	CBUB300	DUCK3	1.64	1.56
0204	E	Single Span Bridge 15.5'W 7'D	45	881	CBUB300	DUCK3	1.64	1.60
0205	E	Conc Chnl 15'W 8'D 1:1 SS	350	881	CBUB300	DUCK3	1.64	1.56
0211	E	48" CMP @ Las Vegas Blvd	140	578	CBUB290	DUCK3	1.16	1.70
0212	E	5' X 5' RCBC @ Las Vegas Blvd	140	578	CBUB290	DUCK3	1.16	1.70
0213	E	Natural Wash	2510	578	CBUB290	DUCK3	1.16	
0213	P1	7' X 5' RCB	2510	578	CBUB290	DUCK3	1.16	2.00
0261	E	12' X 5' RCBC @ I-15	200	314	CBUB280	DUCK3	0.83	1.30
BDWS		**BLUE DIAMOND-WARM SPRINGS BRANCH**						
0000	P1	84" RCP	2410	428	TBD5	FLAM3SC	0.49	0.80
DCBD		**DUCK CREEK / BLUE DIAMOND**						
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
0176	E	3: 10' X 8' RCBC @ Las Vegas Blvd	80	1747	CBUB340	DUCK4	10.35	0.70
0177	E	Natural Wash	1550	1747	CBUB340	DUCK4	10.35	
0177	P1	Conc Chnl 25'W 5'D 2:1 SS	1550	1747	CBUB340	DUCK4	10.35	1.07
0206	E	2: 60" CMP	1160	1747	CBUB340	DUCK4	10.35	1.20
0206	P1	Replace with 2: 10' X 6' RCB	1160	1747	CBUB340	DUCK4	10.35	1.16
0218	E	4: 12' X 5' RCBC @ I-15	240	1747	CBUB340	DUCK4	10.35	1.16
0221	P1	72" RCP	9930	271	LBDDB	DUCK3	7.67	0.94
0394	P2	48" RCP Outlet	200	271	LBDDB	DUCK3	7.67	
0398	P2	517 acre-ft Lower Blue Diamond Detention Basin		3957	CBLBDDB	DUCK3	7.67	
0421	E	3 Span Bridge 45'W 10'D	25	3921	CBUB205	DUCK3	7.55	1.10
0422	P1	Unlined Levee 3'	600	50	BUB205	DUCK3	0.13	1.20
0423	P1	Conc Chnl 20'W 8'D 2:1 SS	8082	3921	CBUB205	DUCK3	7.55	0.80
0549	P1	2: 12' X 8' RCB @ Blue Diamond	200	2449	CBUB150	DUCK3	3.64	1.00
0550	P1	Gabion Chnl 40'W 7.5'D 2:1 SS	5800	2394	CBUB150	DUCK3	3.64	0.50
0683	P1	2: 12' X 7' RCBC @ UPRR	50	2280	CBUB140	DUCK3	3.35	1.58
0684	P1	Gabion Chnl 30'W 6.5'D 2:1 SS	1050	2280	CBUB140	DUCK3	3.35	1.58
0709	P1	2: 14' X 6' RCBC @ UPRR	50	2280	CBUB140	DUCK3	3.35	1.58
0710	P1	Gabion Chnl 30'W 6.5'D 2:1 SS	1850	2280	CBUB140	DUCK3	3.35	1.58
0744	P1	2: 12' X 6' RCBC @ Rainbow	50	2062	CBUB130	DUCK3	3.01	1.50
0745	P1	Conc Chnl 12'W 6.5'D 2:1 SS	4800	2062	CBUB130	DUCK3	3.01	1.58
0835	P1	2: 12' X 6' RCBC @ Blue Diamond	75	2010	CBUB070	DUCK3	2.77	1.60
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
DCW2		**DUCK CREEK - TRIBUTARY 2**						
0000	P0	1: 8' X 5' RCB	3000	547	CDCD150N	DUCK3	1.68	1.10

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**						
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
1258	E	Natural Wash	1475	4271	CDLD37B*	DUCK3SC	6.41	
1258	P1	Conc Chnl 42'W 7'D 0:1 SS	1475	4271	CDLD37B*	DUCK3SC	6.41	0.70
1293	P2	2: 20' X 7' RCBC @ Silverado	150	4271	CDLD37B*	DUCK3SC	6.41	0.80
1294	E	Natural Wash	2175	4271	CDLD37B*	DUCK3SC	6.41	
1294	P2	Conc Chnl 42'W 7'D 0:1 SS	2175	4271	CDLD37B*	DUCK3SC	6.41	0.80
1338	E	Natural Wash	825	4271	CDLD37B*	DUCK3SC	6.41	
1338	P1	Conc Chnl 40'W 6.5'D 2:1 SS	825	4271	CDLD37B*	DUCK3SC	6.41	0.70
1350	P1	5: 14' X 6' RCBC @ W Pyle Ave	70	4271	CDLD37B	DUCK3SC	6.41	0.70
1351	E	Natural Wash	365	4271	CDLD37B	DUCK3SC	6.41	
1351	P1	Conc Chnl 40'W 6.5'D 2:1 SS	365	4271	CDLD37B	DUCK3SC	6.41	0.70
1358	E	1: 12' X 6' RCBC @ Las Vegas Blvd	120	4271	CDLD37B	DUCK3SC	6.41	0.60
1359	P1	Add 4: 14' X 6' RCBC @ Las Vegas Blvd	120	4271	CDLD37B	DUCK3SC	6.41	0.60
1362	E	Natural Wash	750	3018	CDLD06B	DUCK3SC	5.14	
1362	P1	Conc Chnl 40'W 5.5'D 2:1 SS	750	3018	CDLD06B	DUCK3SC	5.14	0.70
1378	E	Natural Wash	2500	3018	CDLD06B	DUCK3SC	5.14	
1378	P1	Conc Chnl 40'W 5.5'D 2:1 SS	2500	3018	CDLD06B	DUCK3SC	5.14	1.00
2150	P0	72" RCP	3880	299	CDCD010	DUCK3SC	0.45	1.20
2223	P0	66" RCP	5190	299	CDCD010	DUCK3SC	0.45	2.10
FLCM		**FLAMINGO-CIMMARON BRANCH**						
0000	P1	78" RCP	2110	391	UFS27	FLAM3SC	0.38	1.50
0040	P1	72" RCP	2690	391	UFS27	FLAM3SC	0.38	1.50
FLF4		**F4 CHANNEL**						
0014	E	Conc Chnl 10'W 10'D 2:1 SS	2340	5636	CUFS19S	FLAM3SC	6.82	0.90
0050	E	28' X 12' RCB	420	5330	CUFS18	FLAM3SC	6.47	0.94
0058	E	20' X 12' RCB	250	5330	CUFS18	FLAM3SC	6.47	0.94
0091	P1	Conc Chnl 20'W 8.5'D 2:1 SS	640	5330	CUFS18	FLAM3SC	6.47	1.28
0101	P1	Conc Chnl 20'W 8.5'D 2:1 SS	2280	4095	CUFS13	FLAM3SC	4.45	1.28
0155	P1	Conc Chnl 20'W 7.0'D 2:1 SS	10550	3846	CUFS12	FLAM3SC	4.07	1.90
FLJO		**FLAMINGO DIVERSION-JONES BRANCH**						
0000	E	12' X 6' RCB	3310	1179	CTD11S	FLAM3SC	1.46	1.00
0076	E	96" RCP	2640	699	CTD9	FLAM3SC	0.79	1.00
FLOQ		**FLAMINGO OQUENDO**						
0000	P1	Conc Chnl 12'W 7.5'D 0:1 SS	3160	926	CUFS15W	FLAM3SC	0.99	0.50
FLRB		**FLAMINGO DIVERSION-RAINBOW BRANCH**						
0000	P1	Conc Chnl 12'W 5.0'D 2:1 SS	3300	1086	CTD6	FLAM3SC	1.29	1.00
0062	P1	96" RCP	2660	671	CTD5	FLAM3SC	0.78	1.00
FLSB		**FLAMINGO DIVERSION-SOUTH BUFFALO BRANCH**						
0000	P1	9' X 6' RCB	7800	865	CTD3S	FLAM3SC	1.01	1.20
FLTR		**FLAMINGO-TROPICANA DIVERSION CHANNEL**						
0000	E	Conc Chnl 26'W 19.5'D 0:1 SS	1480	3478	CTD13	FLAM3SC	4.86	0.11
0014	E	26' X 18' RCBC	250	3478	CTD13	FLAM3SC	4.86	0.11
0015	E	Conc Chnl 26'W 18'D 0:1 SS	460	3214	CTD13N	FLAM3SC	4.44	0.11
FLWA		**FLAMINGO WASH**						
1439	E	66,000 cfs PMF Spillway		66000	CUFS28	FLAM5SC	30.38	
1440	E	2: 60" RCP Outlet	200	260	UPFLDB	FLAM5SC	30.38	
1443	E	1,100 ac-ft Flamingo Detention Basin		11180	CUFS28	FLAM5SC	30.38	
1444	P3	Upgrade to 1,340 ac-ft Flamingo Detention Basin		11180	CUFS28	FLAM5SC	30.38	
TRBD		**BLUE DIAMOND CHANNEL**						
0000	E	Conc Chnl 10'W 10'D 2:1 SS	1700	4353	CTD15	FLAM4SC	9.49	0.70
0014	E	23' X 10' RCB	130	4353	CTD15	FLAM4SC	9.49	0.70
0015	E	Conc Chnl 10'W 10'D 2:1 SS	3070	4353	CTD15	FLAM4SC	9.49	0.90
0075	E	Conc Chnl 19.5'W 12'D 0:1 SS	400	4233	CTD14	FLAM4SC	9.24	0.48
0083	E	2: 14' X 11' RCBC	120	4233	CTD14	FLAM4SC	9.24	0.48
0084	E	Conc Chnl 19.5'W 12'D 0:1 SS	550	4233	CTD14	FLAM4SC	9.24	0.48
0096	E	Conc Chnl 28'W 9'D 0:1 SS	760	4176	CTBD15*	FLAM3SC	6.47	1.00
0100	E	28' X 10' RCB	560	4176	CTBD15*	FLAM3SC	6.47	1.03
0110	E	Conc Chnl 28'W 9'D 0:1 SS	1040	4176	CTBD15	FLAM3SC	6.47	1.28
0140	E	28' X 10' RCB	380	4176	CTBD15	FLAM3SC	6.47	1.28

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
TRBD		**BLUE DIAMOND CHANNEL -- continued**						
0150	E	Conc Chnl 28'W 9'D 0:1 SS	780	4176	CTBD15	FLAM3SC	6.47	1.28
0170	E	26' X 10' RCB	260	4176	CTBD15	FLAM3SC	6.47	1.11
0175	E	Conc Chnl 26'W 9'D 0:1 SS	1000	4176	CTBD15	FLAM3SC	6.47	1.05
0180	E	26' X 10' RCB	370	4176	CTBD15	FLAM3SC	6.47	1.13
0182	E	Conc Chnl 16'W 9'D 2:1 SS	2600	4176	CTBD15	FLAM3SC	6.47	0.64
0190	E	24' X 10' RCB	430	4176	CTBD15	FLAM3SC	6.47	0.92
0200	E	Conc Chnl 24'W 9'D 0:1 SS	750	4176	CTBD15	FLAM3SC	6.47	1.82
0215	E	20' X 10' RCB	260	3508	CTBD11	FLAM3SC	4.70	1.29
0225	E	Conc Chnl 20'W 10'D 0:1 SS	950	3508	CTBD11	FLAM3SC	4.70	1.29
0230	E	20' X 10' RCB	320	3508	CTBD11	FLAM3SC	4.70	2.14
0245	E	Conc Chnl 20'W 8'D 2:1 SS	1300	3508	CTBD11	FLAM3SC	4.70	2.14
0270	E	Conc Chnl 23'W 10'D 0:1 SS	1030	3508	CTBD11	FLAM3SC	4.70	0.84
0290	E	23' X 10' RCB	750	3508	CTBD11	FLAM3SC	4.70	0.84
0300	E	Conc Chnl 23'W 10'D 0:1 SS	450	3508	CTBD11	FLAM3SC	4.70	1.60
0310	E	Conc Chnl 18'W 10.5'D 0:1 SS	310	2023	CTBD6	FLAM3SC	2.64	1.60
0350	E	18' X 10.5' RCB @ Buffalo	260	2023	CTBD6	FLAM3SC	2.64	0.65
0370	E	Conc Chnl 18'W 10'D 0:1 SS	1150	2023	CTBD6	FLAM3SC	2.64	0.65
0380	E	18' X 10' RCB	520	2023	CTBD6	FLAM3SC	2.64	0.98
0384	E	Conc Chnl 18'W 10'D 0:1 SS	1520	2023	CTBD6	FLAM3SC	2.64	0.87
0400	P1	18' X 7' RCB	2370	2023	CTBD6	FLAM3SC	2.64	0.90
0488	P1	Conc Chnl 12'W 6.5'D 2:1 SS	1920	2023	CTBD6	FLAM3SC	2.64	1.67
0529	P1	14' X 8' RCBC	80	2023	CTBD6	FLAM3SC	2.64	1.67
0530	P1	Conc Chnl 12'W 6.5'D 2:1 SS	1270	2023	CTBD6	FLAM3SC	2.64	1.67
0549	P1	14' X 8' RCBC @ Warm Springs	200	1671	CTBD5	FLAM3SC	2.27	1.20
0550	P1	Conc Chnl 12'W 5.5'D 2:1 SS	2130	1350	CTBD4	FLAM3SC	1.78	1.20
0563	P1	14' X 7' RCBC	750	1350	CTBD4	FLAM3SC	1.78	1.50
0600	P1	Conc Chnl 12'W 5.5'D 2:1 SS	2380	1350	CTBD4	FLAM3SC	1.78	1.10
0664	P1	14' X 6' RCBC	80	875	CTBD3	FLAM3SC	1.22	1.00
0665	P1	Conc Chnl 12'W 5'D 2:1 SS	600	875	CTBD3	FLAM3SC	1.22	1.00
0674	P1	14' X 6' RCBC	80	875	CTBD3	FLAM3SC	1.22	1.40
0675	P1	Conc Chnl 12'W 4.5'D 2:1 SS	580	875	CTBD3	FLAM3SC	1.22	1.40
0684	P1	14' X 7' RCBC	80	875	CTBD3	FLAM3SC	1.22	0.62
0685	P1	Conc Chnl 12'W 5'D 2:1 SS Outlet	850	875	CTBD3	FLAM3SC	1.22	0.62
0689	P1	3 ac-ft Blue Diamond Debris Basin		571	CTBD2	FLAM3SC	0.83	
0700	E	Natural Wash	10900	571	CTBD2	FLAM3SC	0.83	1.90
TRMC		**TROPICANA WASH - MCCARRAN AIRPORT**						
0263	E	2: 10' X 6' RCB	1500	1620	CMC8	FLAM3SC	2.42	1.28
0290	E	Rip Rap Chnl 30'W 2'D 4:1 SS	2440	249	MC8	FLAM3SC	0.51	0.79
TRWA		**TROPICANA WASH**						
0441	E	10' X 7' RCB	650	486	TRDB	FLAM5SC	14.79	0.26
0452	E	13,000 cfs PMF Spillway		13000	CTD16	FLAM5SC	14.79	
0453	E	10' X 8.5' RCB Outlet	200	486	TRDB	FLAM5SC	14.79	0.26
0454	E	825 ac-ft Tropicana Detention Basin		5765	CTD16	FLAM5SC	14.79	
WGTR		**WAGON TRAIL CHANNEL**						
0000	E	Grass Chnl 20'W 10'D 4:1 SS	2500	1620	CMC8	FLAM3SC	2.42	0.40
0050	E	2: 12' X 5' RCBC	340	1457	CMC7B	FLAM3SC	1.91	1.30
0051	P3	Conc Chnl 9'W 4.3'D 2:1 SS	500	1457	CMC7B	FLAM3SC	1.91	6.42
0064	E	3: 96" CMP Culvert	50	1457	CMC7B	FLAM3SC	1.91	1.00
0065	E	Rip Rap Chnl 35'W 4'D 2:1 SS	850	1457	CMC7B	FLAM3SC	1.91	1.05
0080	E	Rip Rap Chnl 20'W 6'D 2:1 SS	350	856	CMC7AS	FLAM3SC	1.30	0.36
0088	E	20' X 5' RCAC	50	856	CMC7AS	FLAM3SC	1.30	1.00
0089	E	Rip Rap Chnl 10'W 6.5'D 2:1 SS	470	856	CMC7AS	FLAM3SC	1.30	1.00
0097	E	20' X 7' RCAC	30	856	CMC7AS	FLAM3SC	1.30	1.00
0098	P1	Conc Chnl 30'W 5'D 2:1 SS	700	856	CMC7AS	FLAM3SC	1.30	0.20
0111	P2	10' X 6' RCB	980	856	CMC7AS	FLAM3SC	1.30	1.16
0128	P1	Conc Chnl 30'W 4'D 2:1 SS	860	856	CMC7AS	FLAM3SC	1.30	1.30
0145	E	2: 12' X 4' RCBC	140	694	CMC6B	FLAM3SC	1.12	0.70
0146	E	Rip Rap Chnl 12'W 4.25'D 2:1 SS	550	694	CMC6B	FLAM3SC	1.12	0.57
0146	P1	Conc Chnl 25'W 4'D 0:1 SS	550	694	CMC6B	FLAM3SC	1.12	0.57
0157	E	2: 12' X 4' RCBC	100	694	CMC6B	FLAM3SC	1.12	0.57
0158	E	Conc Chnl 12'W 4'D 2:1 SS	560	694	CMC6B	FLAM3SC	1.12	2.58
0169	E	2: 12' X 4' RCBC	90	694	CMC6B	FLAM3SC	1.12	0.20

*The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.
**As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.

REGIONAL FLOOD CONTROL DISTRICT

2002 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE FACILITY INVENTORY FIGURE F-20

LEGEND

Street Name Designator AA BB
Parent Stream Name
Stream Name
ID / River Mile 00 00
Distance above confluence
With parent stream
Miles in tenths

Existing Facility ..... E
Proposed or Modified Facility ..... P
Contingency Level
Category B P0
Master Plan P1
Preliminary Design P2
Design P3

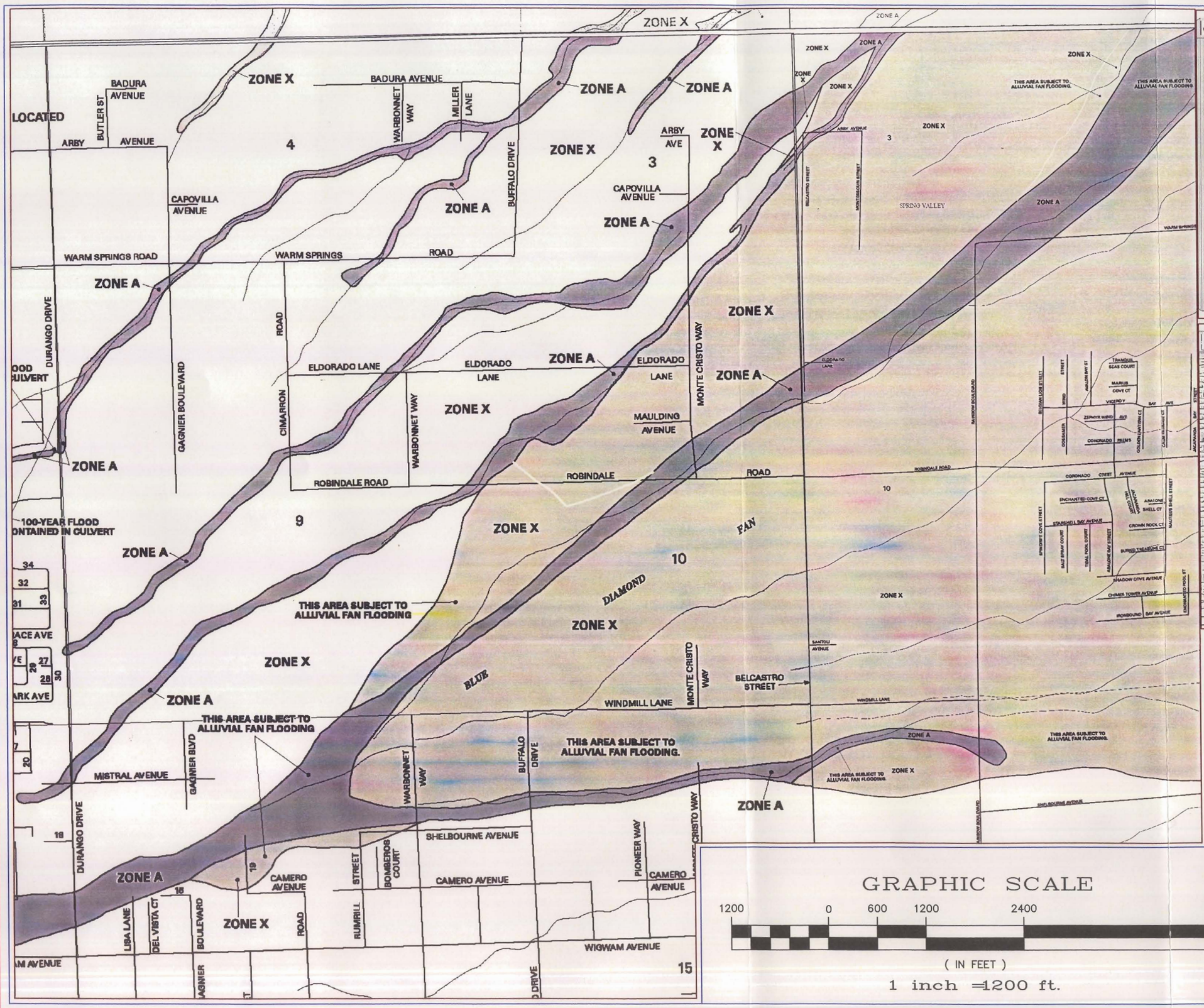
Bottom Width ..... W
Depth ..... D
Side Slope, H:V ..... SS

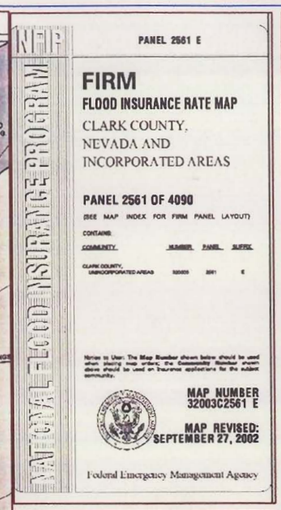
Construction Features

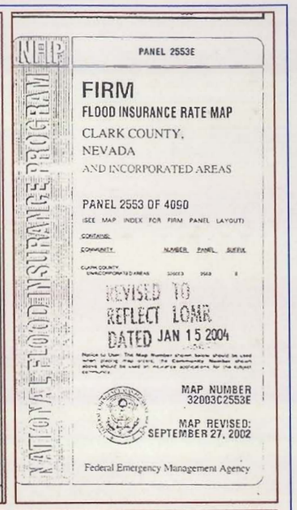
Cast in Place Concrete Pipe ..... CIPCP
Corrugated Metal Arch Pipe Culvert ..... CMAP
Corrugated Metal Pipe Culvert ..... CMP
High Density Polyethylene ..... HDPE
Helical Elliptical Reinforced Concrete Pipe ..... HERCP
Reinforced Concrete Arch Pipe ..... RCAC
Reinforced Concrete Box ..... RCB
Reinforced Concrete Box Culvert ..... RCBC
Reinforced Concrete Pipe ..... RCP
Reinforced Concrete Pipe Culvert ..... RCPC
Storm Sewer Pipe ..... SSP

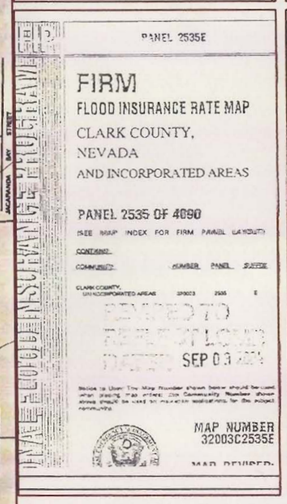
PBS&J
G.C. WALLACE, INC.

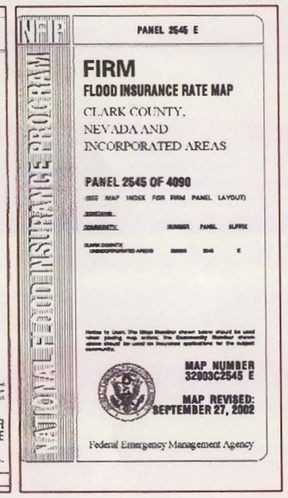
Figure 2A













GRAPHIC SCALE

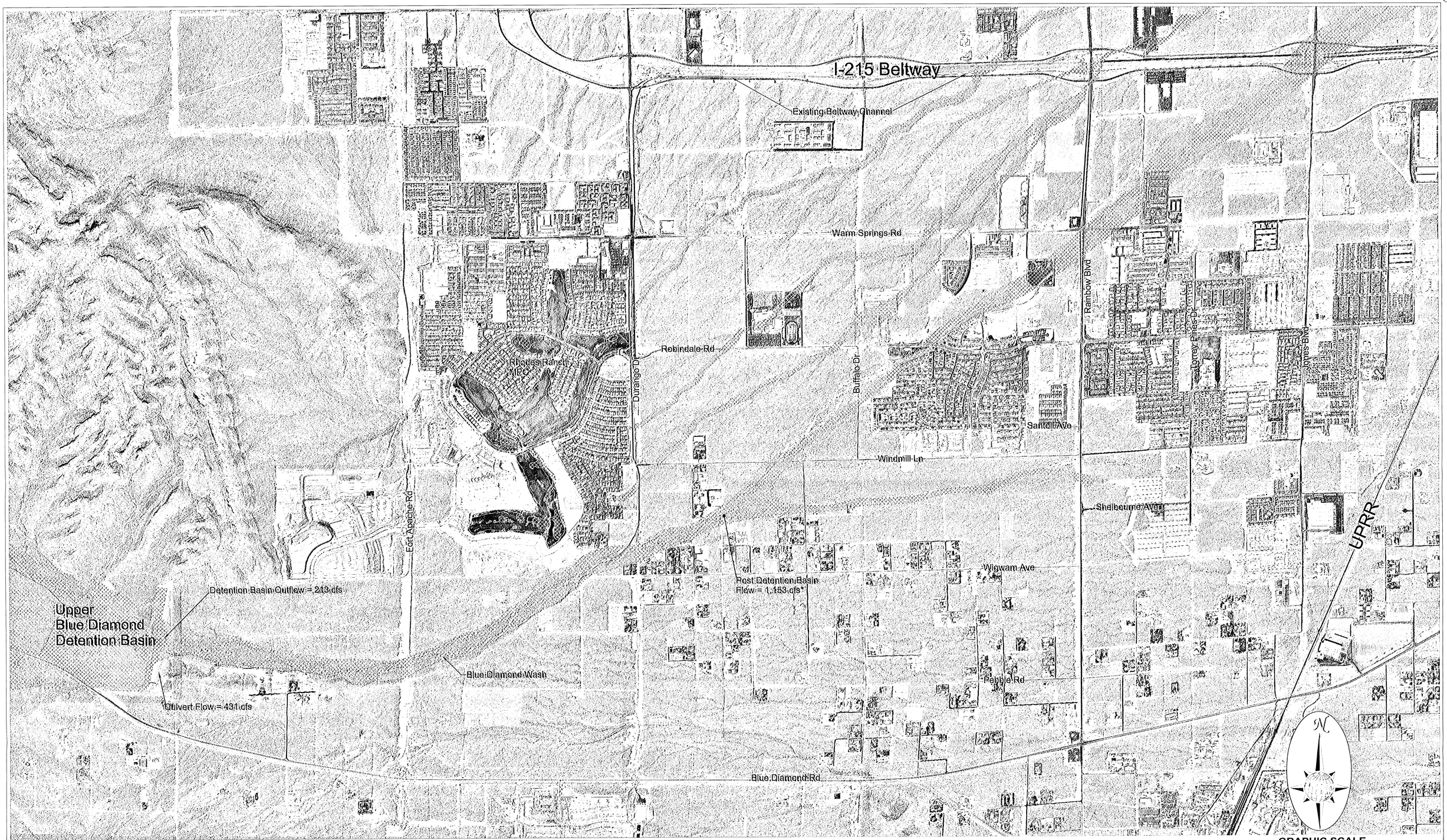
1200 0 600 1200 2400 4800

(IN FEET)

1 inch =1200 ft.

FIGURE 3
FEMA MAP

PBSJ
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Suite 100
Henderson, Nevada 89074
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ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES



Legend

Proposed Channel/Storm Drain Facility

Zone A Floodzone

Note

Aerial photo as of April 2004.

* per CLOMR for Area Downstream of Upper Blue Diamond Detention Basin based on Post Detention Basin Flows prepared by PBS&J, February 2000. (without Upper Blue Diamond Diversion Channel in-place)

GRAPHIC SCALE

1000 0 500 1000 2000 4000

(IN FEET)
1 inch = 1000 ft.

FIGURE 3A: DFIRM Flood Zone Map

Upper Blue Diamond Diverson Channel & Rainbow Blvd Collector System

Project No. 511606.00 August 2004

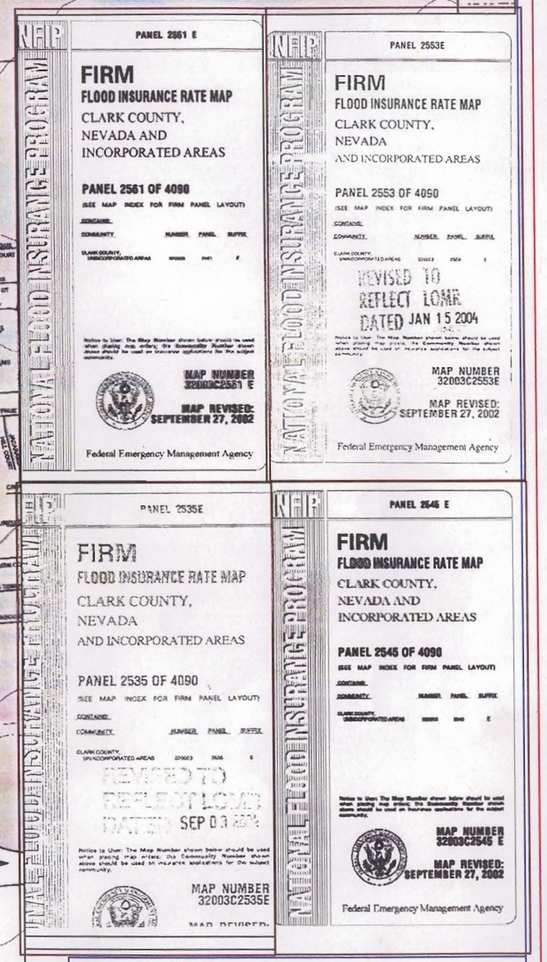
PBS&J
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FIGURE 3A

A SHOWN ON THIS PANEL IS LOCATED
HIP 22 AND RANGE 60 EAST.

DUNTY
ATED AREAS
3

ZONE A
ZONE X
BADURA AVENUE
BUTLER ST
ARBY AVENUE
WARBONNET WAY
MILLER LANE
BUFFALO DRIVE
CAPOVILLA AVENUE
WARM SPRINGS ROAD
DURANGO DRIVE
GAGNIER BOULEVARD
CIMARRON ROAD
ELDORADO LANE
MONTE CRISTO WAY
MAULDING AVENUE
ROBINDALE ROAD
CASCADE LAKE STREET
RANCHO MARIA STREET
ARBOUR GARDEN AVE
CHATEAU WHISTLER CT
100-YEAR FLOOD CONTAINED IN CULVERT
PALM TRACE AVE
SEA RIM AVE
TAYMAN PARK AVE
RUSTINGTON DR
FINN VALLEY ST
THIS AREA SUBJECT TO ALLUVIAL FAN FLOODING
DIAMOND FAN
BLUE DIAMOND
WINDMILL LANE
BELCASTRO STREET
SANTOU AVENUE
SPRING VALLEY
MISTRAL AVENUE
SHELBOURNE AVENUE
CAMERO AVENUE
PIONEER WAY
BOMBEROS COURT
RUMRILL STREET
LIBA LANE
DEL VISTA CT
WISWAM AVENUE
COUGAR AVENUE
WASH
JOHN S. PARK
ARBY AVE
BECASTRO STREET
MONTESSORI STREET
TRAVERS SEAS COURT
MARKS COVE CT
VICEROY
CORONADO COURT
AVENUE
ENDEAVOR COVE CT
ENDEAVOR COVE STREET
KEARNEY BAY AVENUE
KEARNEY COVE COURT
KEARNEY BAY DRIVE
KEARNEY COVE STREET
SANDRINGHAM COURT
SANDRINGHAM DRIVE
SHELBOURNE COURT
SHELBOURNE DRIVE
NORTH RIVA CLARA



GRAPHIC SCALE

1200 0 600 1200 2400 4800

(IN FEET)

1 inch = 1200 ft.

FIGURE 4
ANNOTATED FEMA MAP

Proposed Floodzone Removal

PBS&J
2270 Corporate Circle
Suite 100
Henderson, Nevada 89074
Telephone: 702/263-7275
Fax: 702/263-7200
ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

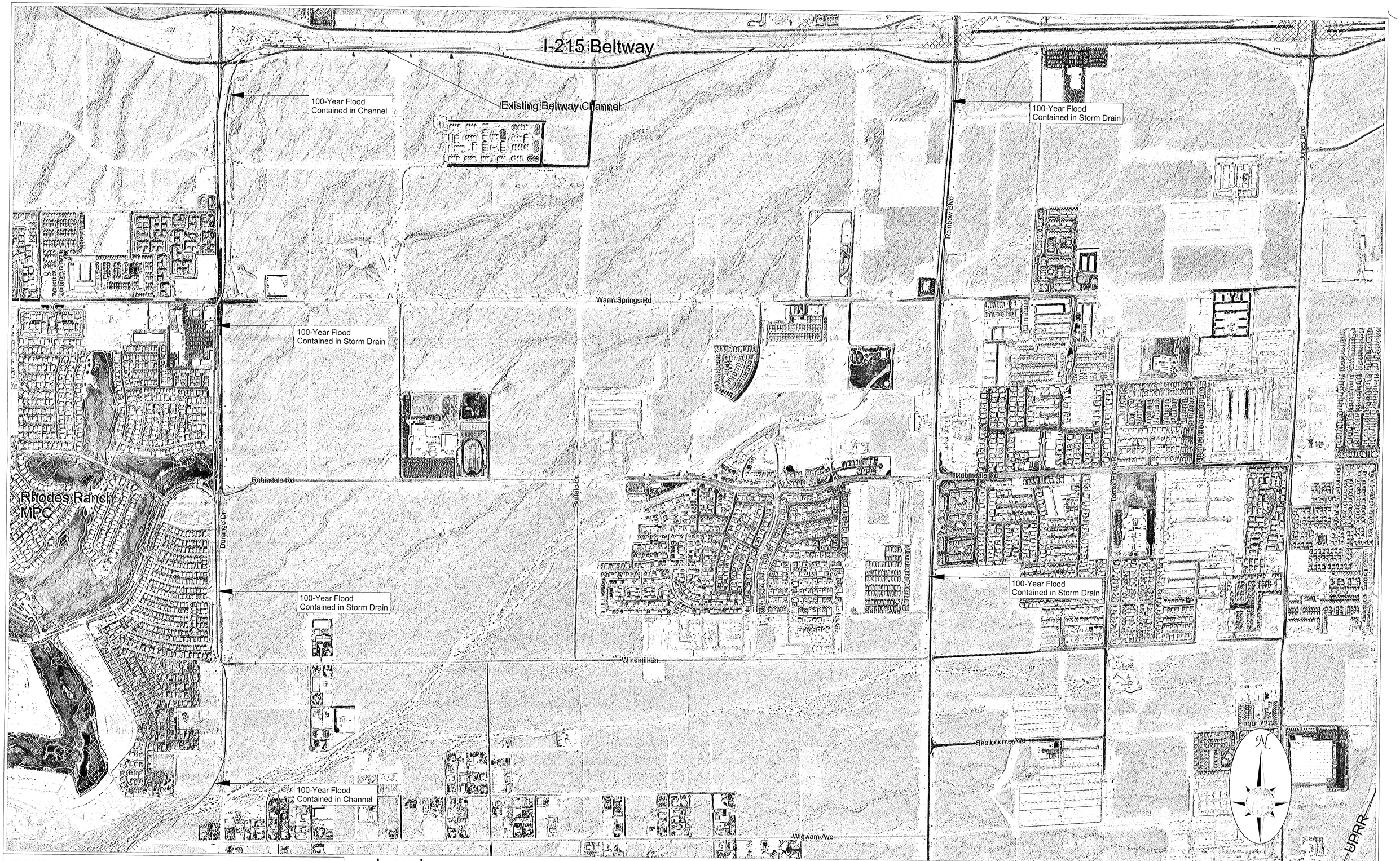


FIGURE 5: Proposed Floodzone Delineation Map

Upper Blue Diamond Diverson Channel & Rainbow Blvd Collector System

Project No. 511606.00

August 2004

Legend

Zone A Floodzone

Proposed Facility

Note

Aerial photo as of April 2004.

GRAPHIC SCALE

600 0 300 600 1200 2400

(IN FEET)

1 Inch = 600 ft.

PBS&J

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

ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

FIGURE 5

Request for Conditional Letter of Map Revision

Upper Blue Diamond Diversion Channel

&

Rainbow Boulevard Collector System

Located

Between Wigwam Avenue and I-215 Beltway

Clark County, Nevada

RFCD
2004 SEP 22 PM 3:31

Prepared for:

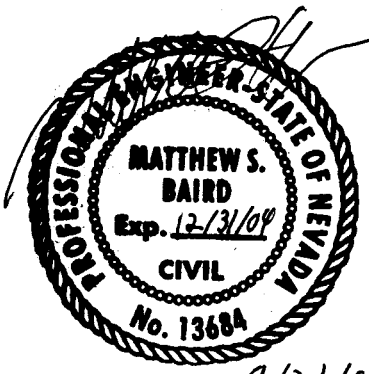
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
600 South Grand Central Parkway, Suite 300
Las Vegas, NV 89155

Prepared by:

PBS&J
2270 Corporate Circle, Suite 100
Henderson, Nevada 89074
(702) 263-7275

PBS&J

September, 2004

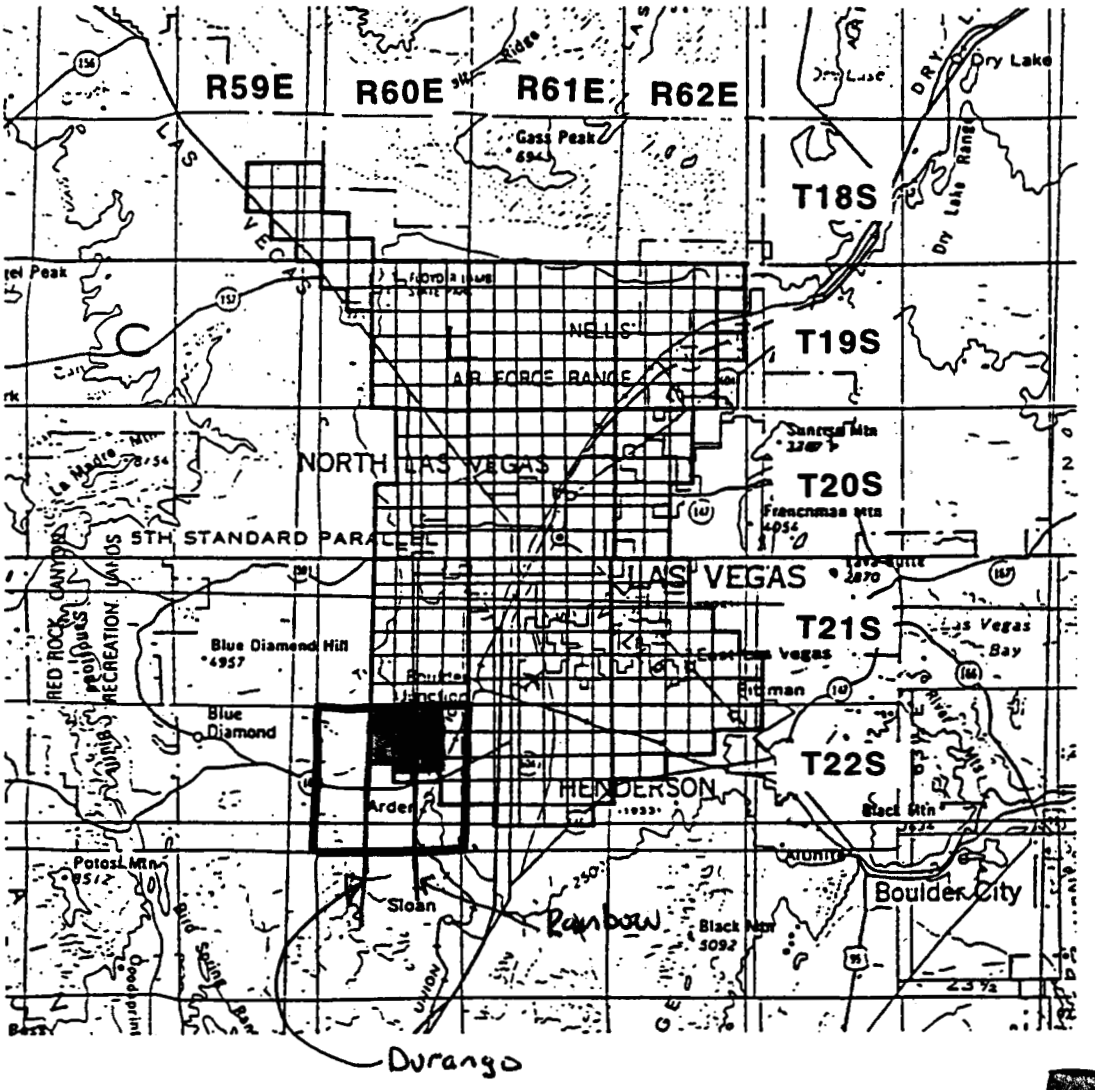


9/21/04

APPENDIX C
Hydrology

HYDROLOGIC DATA

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

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

All basins Fall in and outside the McCarran Airport rainfall area.

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

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA

(IN INCHES)

TIME	RECURRENCE INTERVAL 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

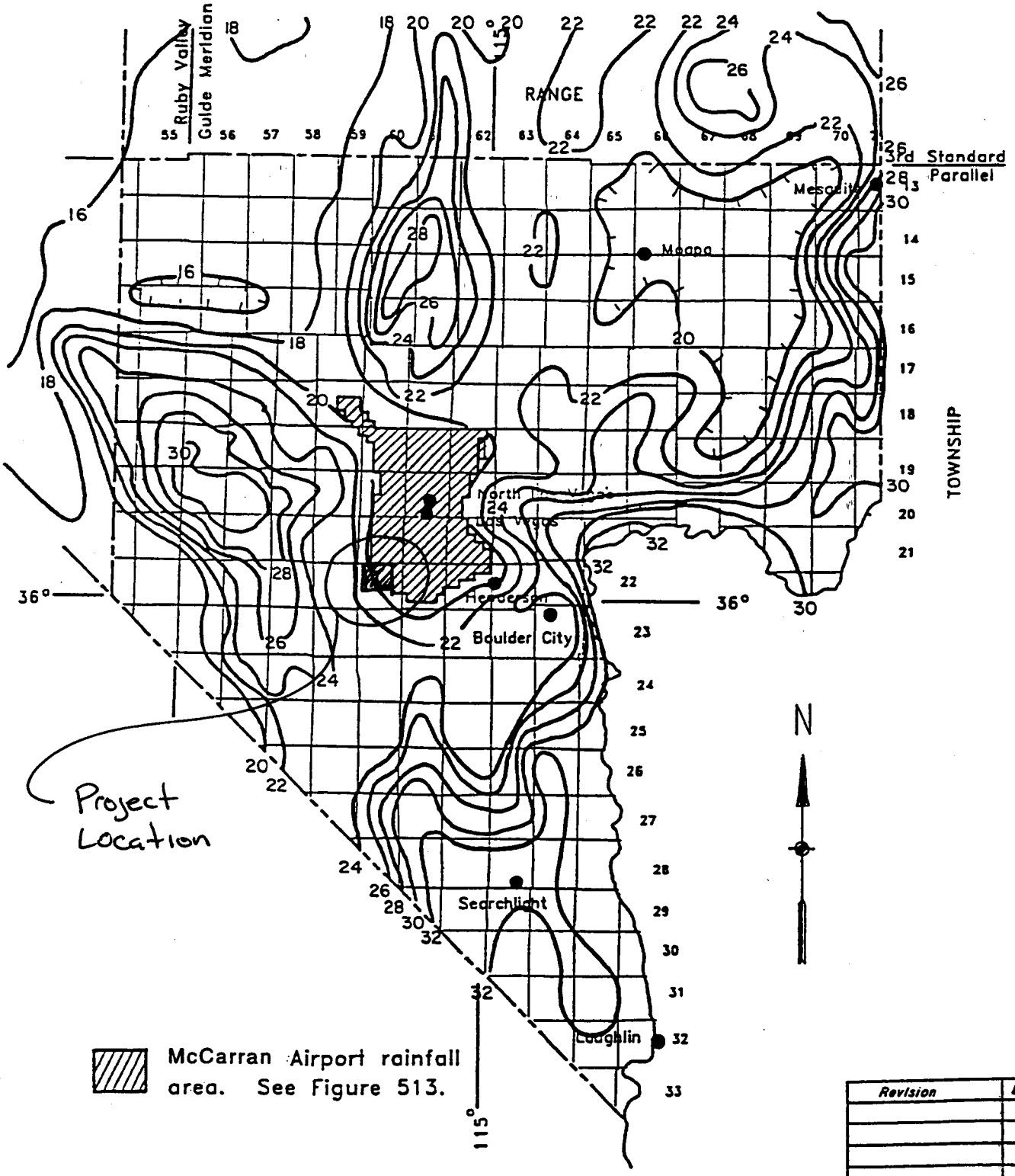
NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.

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

Table C-1
Precipitation Adjustments

6-hour Design Storm Precipitation Inside the McCarran Airport Area = 2.77"
6-hour Design Storm Precipitation Outside the McCarran Airport Area = 2.86"

Basin ID	% Outside	% Inside	Calculation	Composite Precipitation (inches)
UBD1	0	100	1 * 2.77	2.77
UBD2	50	50	(.5*2.86) + (.5*2.77)	2.82
UBD3	70	30	(.7*2.86) + (.3*2.77)	2.83
UBD4	85	15	(.85*2.86) + (.15*2.77)	2.85
UBD5	50	50	(.5*2.86) + (.5*2.77)	2.82
UBD6	60	40	(.6*2.86) + (.4*2.77)	2.83
UBD7	60	40	(.6*2.86) + (.4*2.77)	2.83
UBD8	50	50	(.5*2.86) + (.5*2.77)	2.82
UBD9	0	100	1*2.77	2.77

Precipitation Adjustment Calculation for Areas Outside McCarran Airport Area:
2.86" - 2.0" (Figure 506) * 1.43 (Table 501) = 2.86"

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

SIX HOUR DEPTH-AREA REDUCTION FACTORS

.5 x 640 = 320

Basin UBD6 = 334 acres

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

TABLE C-2
CURVE NUMBER CALCULATIONS

BASIN NAME	COVER TYPE	SOIL COMPOSITION	SOIL TYPE	HYDROLOGIC GROUP	CURVE NUMBER CALCULATIONS	COMPOSITE CURVE NUMBER
EXISTING CONDITIONS						
UBD1	Undeveloped (Native Desert) - 100%	100% Cave	#152	D	1 * 88	88
UBD2	Undeveloped (Native Desert) - 100%	100% Cave	#152	D	1 * 88	88
UBD3	Undeveloped (Native Desert) - 100%	100% Cave	#152	D	1 * 88	88
UBD4	Undeveloped (Native Desert) - 100%	100% Cave	#152	D	1 * 88	88
UBD5	12% Developed & 88% Undeveloped	34% Goodsprings & 66% Cave	#240/#152	D	0.88 * 88 + (0.03 * 89 + 0.09 * 98)	89.1
UBD6	Undeveloped (Native Desert) - 100%	35% Cave & 65% Goodsprings	#152/#240	D	1 * 88	88
UBD7	20% Developed & 80% Undeveloped	30% Cave & 70% Jean	#152/#263	D & A	0.3(.05*98+.95*88) + 0.7(.15 * 76 + .85*63)	71.93
UBD8	20% Developed & 80% Undeveloped	40% Goodsprings & 60% Jean	#240/#263	D & A	0.4(0.4*84 + 0.6*88) + 0.6*63	72.4
UBD9	20% Developed & 80% Undeveloped	5% Goodsprings & 95% Jean	#240/#263	D & A	(0.75 * 63) + (0.2 * 76) + (0.05*88)	66.85

TABLE 15.--SOIL AND WATER FEATURES

"Flooding" and "water table" and terms such as "rare" and "occasional" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding		High water table		Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Months	Depth	Months	Depth	Thickness	Depth	Hardness	Uncoated steel	Concrete
				Ft		In		In			
105*:											
McCullough	B	Rare	---	>6.0	---	>60	---	---	---	High	High.
Jean	A	Rare	---	>6.0	---	>60	---	---	---	High	Low.
Bluepoint	A	None	---	>6.0	---	>60	---	---	---	High	Low.
107 Arizo	A	Rare	---	>6.0	---	>60	---	---	---	High	Low.
112 Arizo	A	Occasional	Mar-Sep	>6.0	---	>60	---	---	---	High	Low.
113 Arizo	A	Rare	---	>6.0	---	>60	---	---	---	High	High.
117 Arizo	A	None	---	>6.0	---	>60	---	---	---	High	Low.
120 Bluepoint	A	Rare	---	4.0-6.0	Jun-Sep	>60	---	---	---	High	Moderate.
127, 128, 129 Bluepoint	A	None	---	>6.0	---	>60	---	---	---	High	Low.
130*:											
Bracken	B	None	---	>6.0	---	40-60	Soft	---	---	High	High.
Destazo	B	None	---	>6.0	---	>60	---	---	---	High	High.
132 Bracken	B	None	---	>6.0	---	40-60	Soft	---	---	High	High.
133*:											
Bracken	B	None	---	>6.0	---	40-60	Soft	---	---	High	High.
Rock outcrop.											
134 Bracken	B	None	---	>6.0	---	40-60	Soft	---	---	High	High.
140 Casaga	C	None	---	>6.0	---	>60	---	---	---	High	High.
150 Cave	D	None	---	>6.0	---	>60	---	4-20	Thick	High	Low.
151 Cave	D	None	---	>6.0	---	>60	---	10-20	Thick	High	Low.
152, 155 Cave	D	None	---	>6.0	---	>60	---	4-20	Thick	High	Low.
160 Destazo	B	None	---	>6.0	---	>60	---	---	---	High	High.
181*:											
Caliza	B	None	---	>6.0	---	>60	---	---	---	High	Low.
Pittman	C	None	---	>6.0	---	>60	---	20-30	Thick	High	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding		High water table		Bedrock		Cemented pan		Risk of corrosic	
		Frequency	Months	Depth	Months	Depth	Thickness	Depth	Hardness	Uncoated steel	Concre
				Ft		In		In			
182*:											
Caliza	B	None	---	>6.0	---	>60	---	---	---	High	Low.
Pittman	C	None	---	>6.0	---	>60	---	20-30	Thick	High	Low.
Arizo	A	Occasional	Mar-Sep	>6.0	---	>60	---	---	---	High	Low.
183-- Caliza	B	None	---	>6.0	---	>60	---	---	---	High	Low.
184-- Caliza	B	Rare	---	>6.0	---	>60	---	---	---	High	Low.
187-- Caliza	B	None	---	>6.0	---	>60	---	---	---	High	Low.
190-- Dalian	B	None	---	>6.0	---	>60	---	---	---	High	Low.
191-- Dalian	B	Rare	---	>6.0	---	>60	---	---	---	High	Low.
192*:											
Dalian	B	Rare	---	>6.0	---	>60	---	---	---	High	Low.
McCullough	B	Rare	---	>6.0	---	>60	---	---	---	High	Low.
200-- Glencarb	B	Rare	---	>6.0	---	>60	---	---	---	High	Low.
206-- Glencarb	C	Occasional	Jul-Sep	3.0-5.0	Jul-Jun	>60	---	---	---	High	Moderate.
222-- Glencarb	C	Rare	---	3.0-5.0	Jul-Jun	>60	---	---	---	High	High.
236-- Glencarb	B	Rare	---	>6.0	---	>60	---	---	---	High	High.
237-- Glencarb	B	Rare	---	>6.0	---	>60	---	---	---	High	High.
240-- Goodsprings	D	None	---	>6.0	---	>60	---	40-60	Thick	High	Low.
252, 255-- Grapevine	B	Rare	---	>6.0	---	>60	---	9-20	Thick	High	Low.
260-- Jean	A	Rare	---	>6.0	---	>60	---	---	---	High	High.
262*:											
Jean	A	Rare	---	>6.0	---	>60	---	---	---	High	Low.
Jean	A	Occasional	Jun-Sep	>6.0	---	>60	---	---	---	High	Low.
Goodsprings	D	Rare	---	>6.0	---	>60	---	---	---	High	Low.
263*:											
Jean	A	Rare	---	>6.0	---	>60	---	9-20	Thick	High	Low.
Jean	A	Occasional	Jun-Sep	>6.0	---	>60	---	---	---	High	Low.
264-- Jean	A	Rare	---	>6.0	---	>60	---	---	---	High	Low.

See footnote at end of table.

This unit is limited for roads because of the depth to the indurated hardpan. Roads should be designed to minimize cuts.

This map unit is in capability subclass VIIs, nonirrigated, and in horticultural group 6.

152—Cave gravelly fine sandy loam, 0 to 4 percent slopes. This shallow, well drained soil is on erosional fan remnants. It formed in alluvium derived from various kinds of rock.

Typically, about 80 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is pale brown gravelly fine sandy loam about 12 inches thick. The next layer to a depth of 36 inches is an indurated, lime-cemented hardpan. The underlying material to a depth of 60 inches or more is light brown very gravelly sandy loam. Depth to the hardpan ranges from 4 to 20 inches.

Included in this unit are about 5 percent Arizo soils, flooded, in channels, 5 percent Canutio soils on inset fans, and 5 percent Grapevine soils on side slopes of erosional fan remnants. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Cave soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed.

This unit is used mainly for urban development. It is also used as habitat for desert wildlife and for recreation.

This unit is poorly suited to urban development. The main limitation is the shallow depth to the hardpan. Excavation for building sites is limited by the hardpan, and heavy equipment is needed. Special design of septic tank absorption fields is needed.

Roads should be designed to minimize cuts because of the limited depth to the hardpan.

It is difficult to establish plants in areas where the pan is exposed. Mulching and fertilizing cut areas help to establish plants. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

Intermittent streams form the drainageways in this unit. These drainageways are subject to rare or occasional periods of high-velocity flooding. Care should be taken during urbanization to accommodate the runoff from the drainageways. If drains become plugged during a major flood, accelerated erosion and damage to roads, buildings, and other structures can occur.

This map unit is in capability subclass VIIs, nonirrigated, and in horticultural group 6.

155—Cave gravelly fine sandy loam, 4 to 15 percent slopes. This shallow, well drained soil is on erosional fan remnants. It formed in alluvium derived from various kinds of rock.

Typically, about 70 percent of the surface is covered with a desert pavement of rock fragments and pan fragments. The surface layer is light brown gravelly fine sandy loam about 5 inches thick. The underlying material to a depth of 15 inches is light brown gravelly fine sandy loam. The next layer to a depth of 60 inches or more is an indurated, lime-cemented hardpan. Depth to the hardpan ranges from 4 to 20 inches.

Included in this unit are about 5 percent Arizo soils, flooded, in channels and 5 percent Caliza soils on side slopes of erosional fan remnants. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Cave soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is moderate, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed.

This unit is used as habitat for desert wildlife and for recreation.

This unit is limited for roads because of the depth to the indurated hardpan. Roads should be designed to minimize cuts. Cutting and filling can be reduced by building roads in the less sloping areas.

This map unit is in capability subclass VIIs, nonirrigated and in horticultural group 6.

160—Destazo cobbly fine sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on relict alluvial flats. It formed in alluvium derived dominantly from limestone and dolomite.

Typically, about 60 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is pink cobbly fine sandy loam about 11 inches thick. The upper 29 inches of the underlying material is light brown very gravelly sandy clay loam, and the lower part to a depth of 60 inches or more is pinkish white gravelly sandy loam containing some crystalline gypsum.

Included in this unit are about 5 percent Bracken very cobbly fine sandy loam, 2 to 8 percent slopes, on side slopes of slightly higher remnants of relict alluvial flats and 10 percent Las Vegas soils on summits of slightly higher remnants of alluvial flats. Included areas make up about 15 percent of the total acreage.

Permeability of this Destazo soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development

This unit is well suited to the construction of dwellings.

The main limitation for septic tank absorption fields is restricted permeability. The operation of septic tank

backfilling the trench with sandy material help to compensate for the restricted permeability.

Channeling and deposition can be minimized and maintenance costs reduced by protecting roads from flooding. Trafficability of roads can be improved by providing a stable base and an adequate wearing surface.

The main limitation for lawns and landscaping is the excess salts in the soil. Because of the content of gypsum and other salts in the soil, salt-tolerant plants should be selected. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

If this unit is used for irrigated crops, the main limitations are excess salts and low fertility of the soil. The content of toxic salts can be reduced by leaching and returning crop residue to the soil. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Crops respond to nitrogen and phosphorus. The average yield is 6 tons per acre for alfalfa hay grown under a high level of management.

This map unit is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated. It is in horticultural group 4.

237—Glencarb very fine sandy loam, hardpan substratum. This deep, well drained soil is on recent alluvial flats. It formed in alluvium derived from various kinds of rock. Slope is 0 to 2 percent.

Typically, the surface layer is pale brown very fine sandy loam about 6 inches thick. The upper 36 inches of the underlying material is very pale brown, stratified silty clay loam to silt loam, and the lower part to a depth of 60 inches or more is a strongly lime-cemented hardpan. Depth to the hardpan ranges from 40 to 60 inches or more.

Permeability of the Glencarb soil is moderately slow above the hardpan. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is moderately affected by salts below a depth of 6 inches. It is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

Most areas of this unit are used as habitat for desert wildlife and for recreation and cropland. A few areas are used for urban development.

If this unit is used for irrigated crops, the main limitations are the hazard of soil blowing, excess salts, and low fertility of the soil. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Content of toxic salts can be reduced by leaching and returning crop residue to the soil. Crops respond to nitrogen and phosphorus. The average yield is 6 tons per acre for alfalfa hay grown under a high level of management.

The main limitation for construction of dwellings is the hazard of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings from flooding.

The main limitation for septic tank absorption fields is the restricted permeability of the soil. Poor permeability increases the possibility of failure of septic tank absorption fields. Using long absorption lines and backfilling the trench with sandy material help to compensate for the restricted permeability.

Channeling and deposition can be minimized and maintenance costs reduced by protecting roads from flooding. Trafficability of roads can be improved by providing a stable base and an adequate wearing surface.

Most climatically adapted plants can be used for lawns and landscaping.

This map unit is in capability subclasses IIIs, irrigated, and VIIs, nonirrigated. It is in horticultural group 1.

240—Goodsprings gravelly fine sandy loam, 2 to 4 percent slopes. This shallow, well drained soil is on erosional fan remnants. It formed in mixed alluvium derived mainly from limestone and sandstone.

Typically, about 90 percent of the surface is covered with a well developed desert pavement of pebbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is light brown gravelly fine sandy loam about 5 inches thick. The upper 10 inches of the underlying material is pink gravelly fine sandy loam, the next 37 inches is a reddish brown and pinkish white, strongly lime-cemented hardpan, and the lower part to a depth of 60 inches or more is pink extremely gravelly loamy fine sand. Depth to the hardpan ranges from 9 to 20 inches.

Included in this unit is about 5 percent Jean soils, flooded, in channels.

Permeability of the Goodsprings soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 9 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is high if the desert pavement is disturbed.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

The main limitation for construction of dwellings is the limited depth to the hardpan. Heavy equipment is needed for excavation.

The main limitation for septic tank absorption fields is the limited depth to the hardpan. Excavation is limited by the hardpan. Special design of septic tank absorption fields is needed.

This unit is limited for roads because of the limited depth to the hardpan. Roads should be designed to

minimize cuts. Heavy equipment is needed for excavation.

The main limitation for lawns and landscaping is the limited depth to the hardpan. It is difficult to establish plants in areas where the pan is exposed. Mulching and fertilizing cut areas help to establish plants. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

Intermittent streams form the drainageways in this unit. These drainageways are subject to rare or occasional periods of high-velocity flooding. Care should be exercised during urbanization to accommodate runoff from the drainageways. If drains become plugged during a major flood, accelerated erosion and damage to roads, buildings, and other structures can occur.

This map unit is in capability subclass VIIs, nonirrigated. It is in horticultural group 6.

252—Grapevine very fine sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on relict alluvial flats. It formed in alluvium derived from various kinds of rock.

Typically, about 10 percent of the surface is covered with a desert pavement of pebbles. The surface layer is pink very fine sandy loam about 1 inch thick. The upper 29 inches of the underlying material is pink and pinkish white fine sandy loam, the next 20 inches or more is pink very fine sandy loam, and the lower part to a depth of 54 inches is stratified, pink very fine sandy loam and reddish yellow fine sandy loam and has a few gypsum masses. The next layer to a depth of 69 inches or more is pink loam that has common gypsum masses. About 90 acres of this unit, 1 mile west of McCarran Airport, is strongly dissected and has a slope of 4 to 8 percent.

Included in this unit is about 5 percent Las Vegas soils on slightly higher relict alluvial flats.

Permeability of this Grapevine soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks. The soil is slightly affected by salts below a depth of 5 inches.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

The main limitation for construction of dwellings is the hazard of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings from flooding. Gypsum in the soil can induce electrochemical action that corrodes concrete. This limitation can be overcome by using cement that is resistant to sulfate corrosion.

Dikes and channels that have outlets for floodwater can be used to protect onsite sewage disposal systems from flooding. If the Grapevine soil is used for septic tank absorption fields, the limitation of restricted permeability can be overcome by increasing the size of the absorption field.

Channeling and deposition can be minimized and maintenance costs reduced by protecting roads from flooding.

The main limitation for lawns and landscaping is the excess salts in the soil. Salts can be flushed out by using heavy periodic applications of water. Because of the content of gypsum and other salts in the soil, salt-tolerant plants should be selected. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

This map unit is in capability subclasses IIs, irrigated, and VIIc, nonirrigated. It is in horticultural group 2.

255—Grapevine loamy fine sand, 2 to 4 percent slopes. This very deep, well drained soil is on relict alluvial flats and basin floor remnants. It formed in alluvium derived from various kinds of rock.

Typically, about 50 percent of the surface is covered with a desert pavement of small pebbles and hardpan fragments. The surface layer is reddish yellow loamy fine sand about 10 inches thick. The underlying material to a depth of 60 inches or more is pink, stratified fine sandy loam to clay loam.

Included in this unit are about 5 percent Las Vegas soils on the slightly higher basin floor remnants and 5 percent McCarran soils on the relict alluvial flats. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Grapevine soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks. The soil is slightly affected by salts below a depth of 10 inches.

This unit is used mainly for urban development. It is also used as habitat for desert wildlife and for recreation.

The main limitation for construction of dwellings is the hazard of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings from flooding. Gypsum in the soil can induce electrochemical action that corrodes concrete. This limitation can be overcome by using cement that is resistant to sulfate corrosion.

Dikes and channels that have outlets for floodwater can be used to protect onsite sewage disposal systems from flooding. If the Grapevine soil is used for septic tank absorption fields, the limitation of restricted

permeability can be overcome by increasing the size of the absorption field.

Channeling and deposition can be minimized and maintenance costs reduced by protecting roads from flooding.

The main limitation for lawns and landscaping is the excess salts in the soil. Salts can be flushed out by using heavy periodic applications of water. Because of the content of gypsum and other salts in the soil, salt-tolerant plants should be selected. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

This map unit is in capability subclasses IIs, irrigated, and VIIs, nonirrigated. It is in horticultural group 2.

260—Jean gravelly loamy fine sand, 2 to 4 percent slopes. This very deep, excessively drained soil is on inset fans. It formed in alluvium derived from various kinds of rock.

Typically, about 40 percent of the surface is covered with a desert pavement of pebbles and a few cobbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is pink gravelly loamy fine sand about 1 inch thick. The upper part of the underlying material is light reddish brown loamy fine sand about 7 inches thick, the next 10 inches or more is pink loamy fine sand, and the lower part to a depth of 60 inches or more is pink, stratified very gravelly loamy fine sand to extremely gravelly sand.

Included in this unit is about 5 percent Goodsprings soils on erosional fan remnants. The percentage varies from one area to another.

Permeability of this Jean soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

The main limitation for construction of dwellings is the hazard of flooding. Dikes and channels that have outlets for floodwater can be used to protect buildings from flooding. Excavating in areas of the Jean soil can expose material that is highly susceptible to soil blowing.

The main limitation for septic tank absorption fields is inadequate filtration of effluent. Because the substratum is highly permeable, special design may be needed to avoid polluting ground water and nearby water supplies. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems.

Channeling and deposition can be minimized and maintenance costs reduced by protecting roads from flooding. Unless an adequate wearing surface is maintained, stones and cobbles in the soil create road hazards and increase maintenance costs.

The main limitation for lawns and landscaping is the very low available water capacity of the soil. Frequent irrigation of lawns, gardens, and most other plantings is needed because of the limited available water capacity of the soil.

This map unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in horticultural group 3.

262—Jean-Goodsprings complex, 2 to 4 percent slopes. This map unit is on fan piedmonts.

This unit is 50 percent Jean gravelly loamy fine sand, 2 to 4 percent slopes, 25 percent Jean very gravelly loamy fine sand, flooded, 2 to 4 percent slopes, and 25 percent Goodsprings gravelly fine sandy loam, 2 to 4 percent slopes. The Jean gravelly loamy fine sand is on inset fans; the Jean, flooded, soil is in channels; and the Goodsprings soil is on erosional fan remnants. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Jean gravelly loamy fine sand is very deep and excessively drained. It formed in alluvium derived from various kinds of rock. Typically, about 75 percent of the surface is covered with a desert pavement of pebbles and cobbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is pink gravelly loamy fine sand about 2 inches thick. The upper 10 inches of the underlying material is light reddish brown loamy fine sand, and the lower part to a depth of 60 inches or more is pink, stratified extremely gravelly sand to very gravelly loamy fine sand.

Permeability of this Jean soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

The Jean very gravelly loamy fine sand, flooded, is very deep and excessively drained. It formed in alluvium derived from various kinds of rock. Typically, about 60 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is pink very gravelly loamy fine sand about 1 inch thick. The upper 10 inches of the underlying material is light reddish brown loamy fine sand, and the lower part to a depth of 60 inches or more is pink, stratified gravelly fine sand to very gravelly loamy fine sand.

Permeability of this Jean soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion

is slight. The hazard of soil blowing is high if the surface is disturbed. This soil is subject to occasional periods of very brief, high-velocity floods from June through September.

The Goodsprings soil is shallow and well drained. It formed in mixed alluvium derived dominantly from limestone and sandstone. Typically, about 80 percent of the surface is covered with a desert pavement of pebbles and cobbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is pink gravelly fine sandy loam about 5 inches thick. The upper 10 inches of the underlying material is pink gravelly fine sandy loam, the next 37 inches is a pinkish white, strongly lime-cemented hardpan, and the lower part to a depth of 60 inches or more is pink extremely gravelly loamy fine sand. Depth to the hardpan ranges from 9 to 20 inches.

Permeability of the Goodsprings soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 9 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

The main limitations for construction of dwellings are the hazard of flooding and the depth to the hardpan in areas of the Goodsprings soil. Flooding can be controlled only by use of major flood control structures. Excavation for building sites is limited by the hardpan. Heavy equipment is needed. Excavating in areas of the Jean soils can expose material that is highly susceptible to soil blowing.

The main limitations for septic tank absorption fields are inadequate filtration of effluent, the hazard of flooding in areas of the Jean very gravelly loamy fine sand, and the limited depth to the hardpan in areas of the Goodsprings soil. Because the substratum is highly permeable, special design may be needed to avoid polluting ground water and nearby water supplies. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. Dikes and channels that have outlets for floodwater can be used to protect onsite sewage disposal systems from flooding. Excavation is limited by the hardpan. Heavy equipment is needed.

This unit is limited for roads because of the hazard of flooding in areas of the Jean very gravelly loamy fine sand and the limited depth to the hardpan in areas of the Goodsprings soil. Flooding can be controlled only by use of major flood control structures. Roads should be designed to minimize cuts.

The main limitations for lawns and landscaping are the very low available water capacity of the Jean soils, the desert pavement on the Jean very gravelly loamy fine sand, and the limited depth to the hardpan in areas of the Goodsprings soil. Frequent irrigation of lawns, gardens, and most other plantings is needed because of the limited available water capacity. Removing the desert pavement is necessary for best results when landscaping, particularly in areas used for lawns. It is difficult to establish plants in areas where the pan is exposed. Mulching and fertilizing cut areas help to establish plants. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

This map unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. The Jean soils are in horticultural group 3, and the Goodsprings soil is in horticultural group 6.

263—Jean complex, 2 to 4 percent slopes. This map unit is on inset fans.

This unit is 55 percent Jean gravelly loamy fine sand, 2 to 4 percent slopes, and 40 percent Jean very gravelly loamy fine sand, flooded, 2 to 4 percent slopes. The Jean gravelly loamy fine sand is on inset fans, and the Jean, flooded, soil is in channels. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent Goodsprings soils on erosional fan remnants.

The Jean gravelly loamy fine sand is very deep and excessively drained. It formed in mixed alluvium derived dominantly from limestone, quartzite, and sandstone. Typically, about 50 percent of the surface is covered with a desert pavement of pebbles and cobbles. There is a dark desert varnish on the exposed surfaces of the rock fragments. The surface layer is pink gravelly loamy fine sand about 1 inch thick. The upper 10 inches of the underlying material is light reddish brown loamy fine sand, and the lower part to a depth of 60 inches or more is pink, stratified extremely gravelly sand to very gravelly loamy fine sand.

Permeability of this Jean soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

The Jean very gravelly loamy fine sand, flooded, is very deep and excessively drained. It formed in mixed alluvium derived dominantly from limestone, quartzite, and sandstone. Typically, about 60 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is pink very gravelly loamy fine sand about 1 inch thick. The upper 10 inches of the underlying material is light reddish brown loamy

fine sand, and the lower part to a depth of 60 inches or more is pink, stratified extremely gravelly fine sand to very gravelly loamy fine sand.

Permeability of this Jean soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed. This soil is subject to occasional periods of very brief, high-velocity flooding from June through September.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

The main limitation for construction of dwellings is the hazard of flooding. Flooding can be controlled only by use of major flood control structures. Excavating in areas of the Jean soils can expose material that is highly susceptible to soil blowing.

The main limitations for septic tank absorption fields are inadequate filtration of effluent and the hazard of flooding in areas of the Jean, flooded, soil. Because the substratum is highly permeable, special design may be needed to avoid polluting ground water and nearby water supplies. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. Dikes and channels that have outlets for floodwater can be used to protect onsite sewage disposal systems from flooding.

The Jean, flooded, soil is limited for roads because of the hazard of flooding. Flooding can be controlled only by use of major flood control structures.

The main limitations for lawns and landscaping are the very low available water capacity and the desert pavement on the Jean, flooded, soil. Frequent irrigation of lawns, gardens, and most other plantings is needed because of the limited available water capacity of the soil. Removing the desert pavement is necessary for best results when landscaping, particularly in areas used for lawns.

This map unit is in capability subclasses IVw, irrigated, and VIIw, nonirrigated. It is in horticultural group 3.

264—Jean very gravelly loamy fine sand, 2 to 4 percent slopes. This very deep, excessively drained soil is on inset fans. It formed in alluvium derived from various kinds of rock.

Typically, about 60 percent of the surface is covered with a desert pavement of pebbles. The surface layer is pink very gravelly loamy fine sand about 1 inch thick. The upper 17 inches of the underlying material is light reddish brown loamy fine sand, and the lower part to a depth of 60 inches or more is pink, stratified extremely gravelly sand to very gravelly loamy fine sand.

Permeability of this Jean soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are common along streambanks.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban developme

The main limitation for construction of dwellings is tl hazard of flooding. Dikes and channels that have outle for floodwater can be used to protect buildings from flooding. Excavating in areas of the Jean soil can expc material that is highly susceptible to soil blowing.

The main limitation for septic tank absorption fields i inadequate filtration of effluent. Because the substratu is highly permeable, special design may be needed to avoid polluting ground water and nearby water supplies If the density of housing is moderate to high, communi sewage systems are needed to prevent contamination water supplies as a result of seepage from onsite sewage disposal systems.

Channeling and deposition can be minimized and maintenance costs reduced by protecting roads from flooding. Unless an adequate wearing surface is maintained, stones and cobbles in the soil create road hazards and increase maintenance costs.

The main limitations for lawns and landscaping are th desert pavement and the very low available water capacity. Removing the desert pavement is necessary for best results when landscaping, particularly in areas used for lawns. Frequent irrigation of lawns, gardens, and most other plantings is needed because of the limited available water capacity of the soil.

This map unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated. It is in horticultural group 3.

270—Land silt loam, drained. This very deep, somewhat poorly drained soil is on recent alluvial flats. The drainage has been artificially altered. The soil formed in alluvium derived from various kinds of rock. Slope is 0 to 2 percent.

Typically, the surface layer is pink silt loam that is high in soluble salts and is about 6 inches thick. The underlying material to a depth of 60 inches or more is pink, stratified silty clay to silt loam and is high in soluble salts.

Included in this unit are about 5 percent Glencarb soils on recent alluvial flats and 5 percent McCarran soils on relict alluvial flats. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Land soil is moderately slow. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 3.5 to 6.0 feet from March through September. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to rare periods of flooding during prolonged, high-intensity storms. Channeling and deposition are

RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					

See Table 602A

Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

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
4,000 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.

Revision	Date

REFERENCE:

TABLE 602A

RUNOFF CURVE NUMBERS
(SEMIARID RANGELANDS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition[2]	A[3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, burasage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and $I_a = 0.2S$.

[2]*Poor:* <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: >70% ground cover.

[3]Curve numbers for group A have been developed only for desert shrub.

Revision	Date

HEC-1 MODEL

- Standard Form 4
- Velocity Estimates

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

PBS&J, Inc. **PROJECT: UPPER BLUE DIAMOND/RAINBOW AREA CLOMR**
Project No. : 511606.00
File: STDRFRM4.XLS **CALCULATED BY : BKL** **DATE: SEPTEMBER 2004**

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)		
UBD1	88.00	0.772	39.0	0.0609	150	1.0	7.2	4000	1.6	NA	2.75	24.2	31.5	4150	na	31.5	0.315	
UBD2	88.00	0.772	117.0	0.1828	200	1.0	8.4	6100	1.7	NA	4.09	24.9	33.2	6300	na	33.2	0.332	
UBD3	88.00	0.772	127.0	0.1984	220	1.0	8.8	6800	1.8	NA	4.24	26.7	35.5	7020	na	35.5	0.355	
UBD4	88.00	0.772	172.0	0.2688	450	1.0	12.5	8700	1.8	NA	4.51	32.2	44.7	9150	na	44.7	0.447	
UBD5	89.10	0.786	317.0	0.4953	400	1.0	11.3	13300	1.8	NA	5.31	41.7	53.0	13700	na	53.0	0.530	
UBD6	88.00	0.772	334.0	0.5219	350	1.0	11.1	13700	1.9	NA	5.42	42.1	53.2	14050	na	53.2	0.532	
UBD7	71.93	0.559	272.0	0.4250	250	1.0	15.4	12800	1.7	NA	3.41	62.6	77.9	13050	na	77.9	0.779	
UBD8	72.40	0.566	137.0	0.2141	150	1.0	11.8	11050	1.7	NA	2.69	68.5	80.2	11200	na	80.2	0.802	
UBD9	66.85	0.492	181.0	0.2828	200	1.0	15.5	6400	1.7	NA	2.73	39.1	54.5	6600	na	54.5	0.545	

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

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*                JUN  1998              *
*              VERSION 4.1              *
*                                       *
*  RUN DATE   19SEP04  TIME  13:56:51   *
*                                       *
*****************************************
```


```
*****************************************
*                                       *
*    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: UBD.DAT                *
        3           ID      AUGUST 2004                  *
        4           ID                                   *
        5           ID      UPPER BLUE DIAMOND CLOMR     *
        6           ID      EXISTING DRAINAGE CONDITIONS *
        7           ID                                   *
        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    0.98    1.00
                    *

       14           KK    UBD2
       15           BA  0.1828
       16           PB    2.82
       17           PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
       18           PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
       19           PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
       20           PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
       21           PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
       22           PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
       23           PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
       24           PC    .998    .999    1.00
       25           LS       0      88
       26           UD   0.332
                    *

       27           KK    UBD3
       28           BA  0.1984
       29           PB    2.83
       30           LS       0      88
       31           UD   0.355
                    *

       32           KK      C1
       33           KM    COMBINE BASINS UBD2 AND UBD3
       34           HC       2
                    *

       35           KK    UBD1
       36           BA  0.0609
       37           PB    2.77
       38           LS       0      88
       39           UD   0.315
                    *
```

1 HEC-1 INPUT PAGE 2

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

       40           KK      C2
       41           KM    COMBINE C1 AND UBD1
       42           HC       2
                    *

       43           KK    UBD4
```

```
44          BA  0.2688
45          PB    2.85
46          LS       0      88
47          UD   0.447
            *

48          KK    UBD5
49          BA  0.4953
50          PB    2.82
51          LS       0    89.1
52          UD   0.530
            *

53          KK    UBD6
54          BA  0.5219
55          PB    2.83
56          LS       0      88
57          UD   0.532
            *

58          KK      C3
59          KM   COMBINE BASINS UBD5 AND UBD6
60          HC       2
            *

61          KK    UBD7
62          BA  0.4250
63          PB    2.83
64          LS       0   71.93
65          UD   0.779
            *

66          KK    UBD8
67          BA  0.2141
68          PB    2.82
69          LS       0    72.4
70          UD   0.802
            *

71          KK    UBD9
72          BA  0.2828
73          PB    2.77
74          LS       0   66.85
75          UD   0.545
            *
76          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

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

    14        UBD2
              .
              .
    27        .        UBD3
              .          .
              .          .
    32        C1.........
              .
              .
    35        .        UBD1
              .          .
              .          .
    40        C2.........
              .
              .
    43        .        UBD4
              .          .
              .          .
    48        .          .       UBD5
              .          .         .
              .          .         .
    53        .          .         .       UBD6
              .          .         .         .
              .          .         .         .
    58        .          .         C3.........
              .          .         .
              .          .         .
    61        .          .         .       UBD7
              .          .         .         .
              .          .         .         .
    66        .          .         .         .       UBD8
              .          .         .         .         .
              .          .         .         .         .
    71        .          .         .         .         .       UBD9
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   19SEP04  TIME  13:56:51   *
*                                       *
*****************************************
```

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

```
                    ************************************
                        File: UBD.DAT                  *
                        AUGUST 2004                    *
                                                       *
                        UPPER BLUE DIAMOND CLOMR       *
                        EXISTING DRAINAGE CONDITIONS   *
                                                       *
                    ************************************

   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
                    .98      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  RATIO 2
                                                              .98      1.00

 HYDROGRAPH AT
+                  UBD2       .18     1   FLOW              183.     188.
                                           TIME             3.75     3.75

 HYDROGRAPH AT
+                  UBD3       .20     1   FLOW              193.     198.
                                           TIME             3.80     3.80

   2 COMBINED AT
+                   C1        .38     1   FLOW              374.     385.
                                           TIME             3.75     3.75

 HYDROGRAPH AT
+                  UBD1       .06     1   FLOW               61.      63.
                                           TIME             3.75     3.75

   2 COMBINED AT
+                   C2        .44     1   FLOW              435.     448.
                                           TIME             3.75     3.75

 HYDROGRAPH AT
+                  UBD4       .27     1   FLOW              233.     240.
                                           TIME             3.90     3.90

 HYDROGRAPH AT
+                  UBD5       .50     1   FLOW              401.     412.
                                           TIME             3.95     3.95

 HYDROGRAPH AT
+                  UBD6       .52     1   FLOW              404.     416.
                                           TIME             3.95     3.95

   2 COMBINED AT
+                   C3       1.02     1   FLOW              805.     828.
                                           TIME             3.95     3.95

 HYDROGRAPH AT
+                  UBD7       .43     1   FLOW              105.     110.
                                           TIME             4.35     4.30

 HYDROGRAPH AT
+                  UBD8       .21     1   FLOW               53.      56.
```

				TIME	4.35	4.35
HYDROGRAPH AT						
+	UBD9	.28	1	FLOW	55.	58.
				TIME	4.10	4.10

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

Worksheet for VELOCITY ESTIMATE UBD1

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01600	ft/ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	63.00	ft^3/s

Results		
Normal Depth:	0.41	ft
Flow Area:	22.88	ft^2
Wetted Perimeter:	62.26	ft
Top Width:	62.23	ft
Critical Depth:	0.35	ft
Critical Slope:	0.02604	ft/ft
Velocity:	2.75	ft/s
Velocity Head:	0.12	ft
Specific Energy:	0.53	ft
Froude Number:	0.80	
Flow Type:	Subcritical	

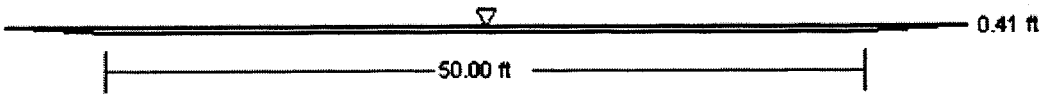
GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

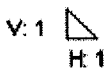
GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:	N/A	
Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	0.41	ft
Critical Depth:	0.35	ft
Channel Slope:	0.01600	ft/ft

UBD1
Cross Section for VELOCITY ESTIMATE UBD1

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01600	ft/ft
Normal Depth:	0.41	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	63.00	ft^3/s





Worksheet for VELOCITY ESTIMATE UBD2

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01700	ft/ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	188.00	ft^3/s

Results		
Normal Depth:	0.75	ft
Flow Area:	46.02	ft^2
Wetted Perimeter:	72.58	ft
Top Width:	72.53	ft
Critical Depth:	0.71	ft
Critical Slope:	0.02117	ft/ft
Velocity:	4.09	ft/s
Velocity Head:	0.26	ft
Specific Energy:	1.01	ft
Froude Number:	0.90	
Flow Type:	Subcritical	

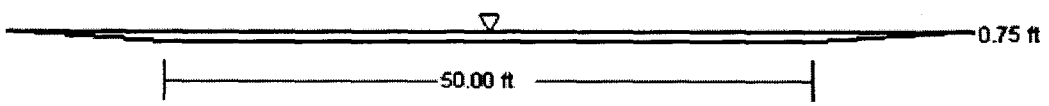
GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

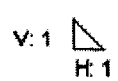
GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:	N/A	
Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	0.75	ft
Critical Depth:	0.71	ft
Channel Slope:	0.01700	ft/ft

UBD2
Cross Section for VELOCITY ESTIMATE UBD2

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01700	ft/ft
Normal Depth:	0.75	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	188.00	ft^3/s





Worksheet for VELOCITY ESTIMATE UBD3

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01800	ft/ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	198.00	ft^3/s

Results		
Normal Depth:	0.76	ft
Flow Area:	46.73	ft^2
Wetted Perimeter:	72.88	ft
Top Width:	72.83	ft
Critical Depth:	0.73	ft
Critical Slope:	0.02098	ft/ft
Velocity:	4.24	ft/s
Velocity Head:	0.28	ft
Specific Energy:	1.04	ft
Froude Number:	0.93	
Flow Type:	Subcritical	

GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

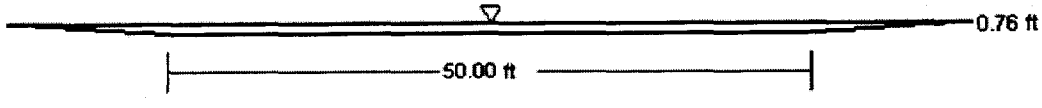
GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:	N/A	
Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	0.76	ft
Critical Depth:	0.73	ft
Channel Slope:	0.01800	ft/ft

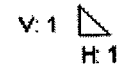
UBD3

Cross Section for VELOCITY ESTIMATE UBD3

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01800	ft/ft
Normal Depth:	0.76	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	198.00	ft^3/s





Worksheet for VELOCITY ESTIMATE UBD4

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01800	ft/ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	240.00	ft^3/s

Results		
Normal Depth:	0.85	ft
Flow Area:	53.21	ft^2
Wetted Perimeter:	75.50	ft
Top Width:	75.45	ft
Critical Depth:	0.82	ft
Critical Slope:	0.02027	ft/ft
Velocity:	4.51	ft/s
Velocity Head:	0.32	ft
Specific Energy:	1.16	ft
Froude Number:	0.95	
Flow Type:	Subcritical	

GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

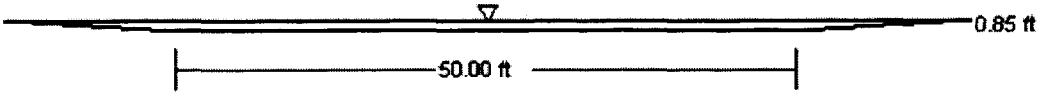
GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:	N/A	
Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	0.85	ft
Critical Depth:	0.82	ft
Channel Slope:	0.01800	ft/ft

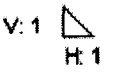
UBD4

Cross Section for VELOCITY ESTIMATE UBD4

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01800	ft/ft
Normal Depth:	0.85	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	240.00	ft^3/s





Worksheet for VELOCITY ESTIMATE UBD5

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	401.00	ft^3/s

Results		
Normal Depth:	1.13	ft
Flow Area:	75.53	ft^2
Wetted Perimeter:	83.93	ft
Top Width:	83.86	ft
Critical Depth:	1.12	ft
Critical Slope:	0.01855	ft/ft
Velocity:	5.31	ft/s
Velocity Head:	0.44	ft
Specific Energy:	1.57	ft
Froude Number:	0.99	
Flow Type:	Subcritical	

GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:	N/A	
Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	1.13	ft
Critical Depth:	1.12	ft
Channel Slope:	0.01800	ft/ft

Worksheet for VELOCITY ESTIMATE UBD5

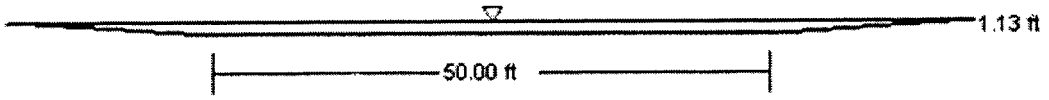
Critical Slope:	0.01855	ft/ft

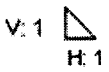
UBD5

Cross Section for VELOCITY ESTIMATE UBD5

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	1.13	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	401.00	ft^3/s





Worksheet for VELOCITY ESTIMATE UBD6

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01900	ft/ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	404.00	ft^3/s

Results		
Normal Depth:	1.12	ft
Flow Area:	74.52	ft^2
Wetted Perimeter:	83.57	ft
Top Width:	83.49	ft
Critical Depth:	1.12	ft
Critical Slope:	0.01853	ft/ft
Velocity:	5.42	ft/s
Velocity Head:	0.46	ft
Specific Energy:	1.57	ft
Froude Number:	1.01	
Flow Type:	Supercritical	

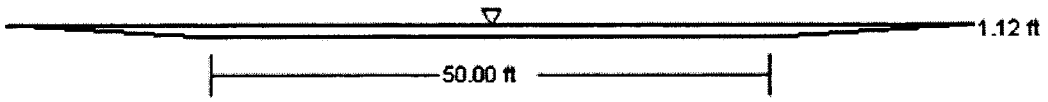
GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

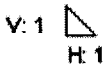
GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:	N/A	
Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	1.12	ft
Critical Depth:	1.12	ft
Channel Slope:	0.01900	ft/ft

UBD6
Cross Section for VELOCITY ESTIMATE UBD6

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01900	ft/ft
Normal Depth:	1.12	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	404.00	ft^3/s





Worksheet for VELOCITY ESTIMATE UBD7

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	110.00	ft^3/s

Results		
Normal Depth:	0.55	ft
Flow Area:	32.23	ft^2
Wetted Perimeter:	66.63	ft
Top Width:	66.59	ft
Critical Depth:	0.50	ft
Critical Slope:	0.02338	ft/ft
Velocity:	3.41	ft/s
Velocity Head:	0.18	ft
Specific Energy:	0.73	ft
Froude Number:	0.86	
Flow Type:	Subcritical	

GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:	N/A	
Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	0.55	ft
Critical Depth:	0.50	ft
Channel Slope:	0.01700	ft/ft

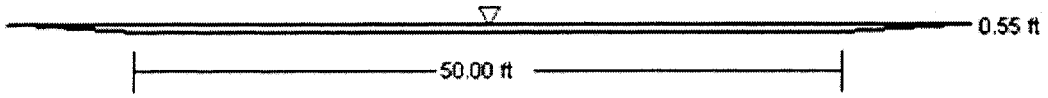
Worksheet for VELOCITY ESTIMATE UBD7

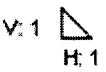
Critical Slope:	0.02338	ft/ft

UBD7
Cross Section for VELOCITY ESTIMATE UBD7

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.55	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	110.00	ft^3/s





Worksheet for VELOCITY ESTIMATE UBD8

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	56.00	ft^3/s

Results		
Normal Depth:	0.37	ft
Flow Area:	20.79	ft^2
Wetted Perimeter:	61.24	ft
Top Width:	61.22	ft
Critical Depth:	0.33	ft
Critical Slope:	0.02665	ft/ft
Velocity:	2.69	ft/s
Velocity Head:	0.11	ft
Specific Energy:	0.49	ft
Froude Number:	0.81	
Flow Type:	Subcritical	

GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

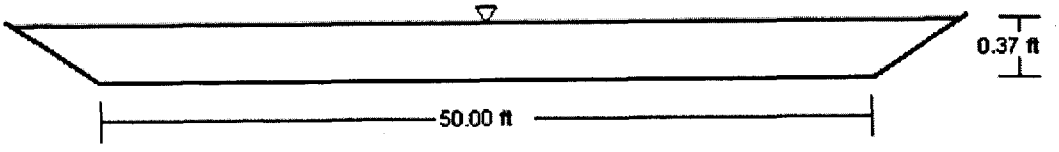
GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:		
Headloss:	0.00	ft
Downstream Velocity:	Infinity	ft/s
Upstream Velocity:	Infinity	ft/s
Normal Depth:	0.37	ft
Critical Depth:	0.33	ft
Channel Slope:	0.01700	ft/ft

Worksheet for VELOCITY ESTIMATE UBD8

Critical Slope:	0.02665	ft/ft

UBD8
Cross Section for VELOCITY ESTIMATE UBD8

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.37	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	56.00	ft^3/s



V: 10
H: 1

Worksheet for VELOCITY ESTIMATE UBD9

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01700	ft/ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	58.00	ft^3/s

Results		
Normal Depth:	0.38	ft
Flow Area:	21.26	ft^2
Wetted Perimeter:	61.47	ft
Top Width:	61.45	ft
Critical Depth:	0.34	ft
Critical Slope:	0.02647	ft/ft
Velocity:	2.73	ft/s
Velocity Head:	0.12	ft
Specific Energy:	0.50	ft
Froude Number:	0.82	
Flow Type:	Subcritical	

GVF Input Data		
Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

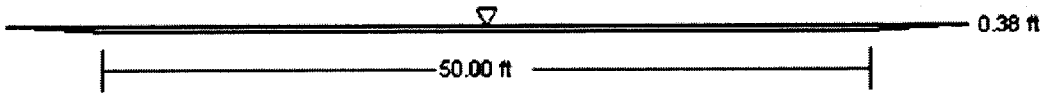
GVF Output Data		
Upstream Depth:	0.00	ft
Profile Description:	N/A	
Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	0.38	ft
Critical Depth:	0.34	ft
Channel Slope:	0.01700	ft/ft

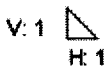
UBD9

Cross Section for VELOCITY ESTIMATE UBD9

Project Description		
Flow Element:	Trapezoidal Channel	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	0.01700	ft/ft
Normal Depth:	0.38	ft
Left Side Slope:	15.00	ft/ft (H:V)
Right Side Slope:	15.00	ft/ft (H:V)
Bottom Width:	50.00	ft
Discharge:	58.00	ft^3/s

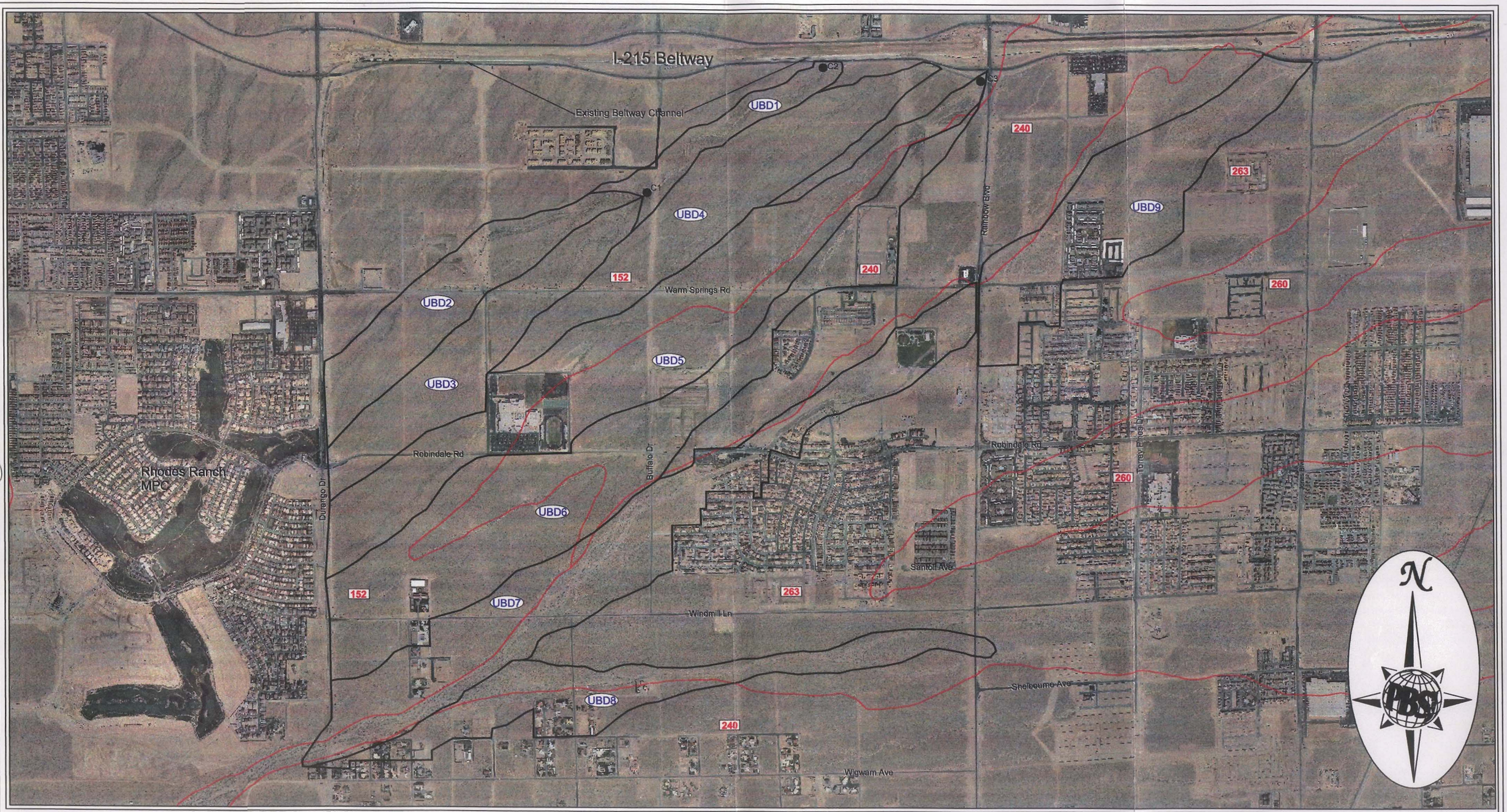




Hydrologic Figures

C1 – Soils Map

C2 – Subbasin Exhibit



GRAPHIC SCALE

1500 0 750 1500 3000 6000

(IN FEET)

1 inch =1500 ft.

FIGURE C1: SOILS MAP

UBD2 Basin Name

152 Soil Unit Number

Soils Boundary

Basin Boundary

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

FIGURE C1

Basin Name	Basin Area	Slope (%)	Velocity (fps)	Q_{100} (cfs)
UBD1	39	1.6	2.75	63
UBD2	117	1.7	4.09	188
UBD3	127	1.8	4.24	198
UBD4	172	1.8	4.51	240
UBD5	317	1.8	5.33	401
UBD6	334	1.9	5.42	404
UBD7	272	1.7	3.37	110
UBD8	137	1.7	2.94	56
UBD9	181	1.7	2.73	58
Combination Points				
C1	NA	NA	NA	385
C2	NA	NA	NA	448
C3	NA	NA	NA	805

I-215 Beltway

Existing Beltway Channel

Warm Springs Rd

Robindale Rd

Durango Dr

Buffalo Dr

Rainbow Blvd

Santora Ave

Windmill Ln

Shelbourne Ave

Wigwam Ave

Rhodes Ranch MPC

UBD1

UBD2

UBD3

UBD4

UBD5

UBD6

UBD7

UBD8

UBD9

C1

C2

C3

Legend

- Cross-Section Location
- Basin Delineation
- Basin Identifier
- Flow Direction
- Zone A Floodzone
- 5' Contour

Note

Aerial photo as of April 2004.

GRAPHIC SCALE

600 0 300 600 1200 2400

(IN FEET)

1 inch = 600 ft.

FIGURE C2: Upper Blue Diamond Drainage Map

Upper Blue Diamond Diverson Channel & Rainbow Blvd Collector System

Project No. 511606.00

August 2004

PBS&J
2270 Corporate Circle
Suite 100 Henderson,
Nevada 89014
Telephone: 702/263-7275
Fax: 702/263-7200
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FIGURE C2

APPENDIX D

Hydraulics

Natural Wash Capacity Calculations

TABLE D1

Upper Blue Diamond/Rainbow CLOMR
Summary of Average Depth Calculations

Cross-Section ID	Total Flow per Basin (cfs)	Percent of Basin (%)	Flow at Cross-Section	Flow Area (Sq Ft)	Top Width (ft)	Normal Depth[1] (ft)	Hydraulic Depth[2] (ft)
UBD1A	385*	100% of C1	385	81.43	98.50	1.39	0.83
UBD1B	448**	50	417	76.72	75.20	1.69	1.02
UBD1C	448	100% of C2	448	99.71	130.23	1.43	0.77
UBD2A	188	20	38	20.25	102.61	0.39	0.20
UBD2B	188	40	75	25.47	65.67	0.53	0.39
UBD2C	188	60	113	27.84	44.23	0.92	0.63
UBD2D	188	100	188	39.85	50.55	1.16	0.79
UBD3A	198	75	149	44.55	99.00	0.90	0.45
UBD3B	198	85	168	53.91	133.26	0.89	0.40
UBD3C	198	100	198	35.35	36.05	1.74	0.98
UBD4A	240	50	120	33.37	66.50	1.09	0.50
UBD4B	240	65	156	43.88	88.87	0.99	0.49
UBD4C	240	100	240	45.12	49.86	1.65	0.90
UBD5A	401	25	100	34.51	95.10	0.78	0.36
UBD5B	401	50	200	71.43	207.08	0.67	0.34
UBD5C	401	75	301	80.74	152.48	1.06	0.53
UBD5D	805***	100% of C3	805	185.08	277.52	1.28	0.67
UBD6A	404	10	40	15.89	56.38	0.56	0.28
UBD6B	404	25	101	31.02	74.73	0.83	0.42
UBD6C	404	60	242	67.12	138.72	1.06	0.48
UBD6D	404	85	343	80.73	130.34	1.39	0.62
UBD6E	404	100	404	88.34	127.71	1.49	0.69
UBD7A	110	30	33	20.45	129.82	0.16	0.16
UBD7B	110	55	61	27.24	105.75	1.33	0.26
UBD7C	110	75	82	26.85	65.54	0.82	0.41
UBD7D	110	100	110	52.37	224.21	0.47	0.23
UBD8A	56	35	20	14.01	107.08	0.18	0.13
UBD8B	56	80	45	11.19	17.73	0.68	0.63
UBD8C	56	100	56	27.17	119.68	0.56	0.23
UBD9A	58	25	15	14.50	178.61	0.16	0.08
UBD9B	58	50	29	18.59	124.24	0.43	0.15
UBD9C	58	100	58	26.82	109.86	0.49	0.24

1 - Normal Depth per FlowMaster
2 - Area/Top Width
* Equals flow from combination point C1
** Flow from combination point C2 + 50% of basin UBD1
*** Percent of flow from combination point C3

Worksheet for UBD1A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.60000	%
Discharge:	385.00	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:	2555.39	ft
Elevation Range:	2,554.00 to 2,561.50	
Flow Area:	81.43	ft^2
Wetted Perimeter:	98.56	ft
Top Width:	98.50	ft
Normal Depth:	1.39	ft
Critical Depth:	1.34	ft
Critical Slope:	0.01936	ft/ft
Velocity:	4.73	ft/s
Velocity Head:	0.35	ft
Specific Energy:	1.73	ft
Froude Number:	0.92	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2560.00)	(2+50, 2561.50)	0.035

Section Geometry

Station	Elevation
0+00	2560.00
0+50	2555.00

Worksheet for UBD1A

Station	Elevation
1+00	2554.00
1+40	2555.00
2+00	2560.00
2+50	2561.50

UBD1A

Cross Section for UBD1A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.60000	%
Normal Depth:	1.39	ft
Elevation Range:	2,554.00 to 2,561.50	
Discharge:	385.00	ft^3/s



V: 5
H: 1

Worksheet for UBD1B

Project Description

Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data

Channel Slope:	1.60000	%
Discharge:	417.00	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:	2535.69	ft
Elevation Range:	2534.00 to 2542.00 ft	
Flow Area:	76.72	ft^2
Wetted Perimeter:	75.31	ft
Top Width:	75.20	ft
Normal Depth:	1.69	ft
Critical Depth:	1.65	ft
Critical Slope:	0.01793	ft/ft
Velocity:	5.44	ft/s
Velocity Head:	0.46	ft
Specific Energy:	2.15	ft
Froude Number:	0.95	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2540.50)	(3+00, 2542.00)	0.035

Section Geometry

Station	Elevation
0+00	2540.50
0+60	2540.00

Worksheet for UBD1B

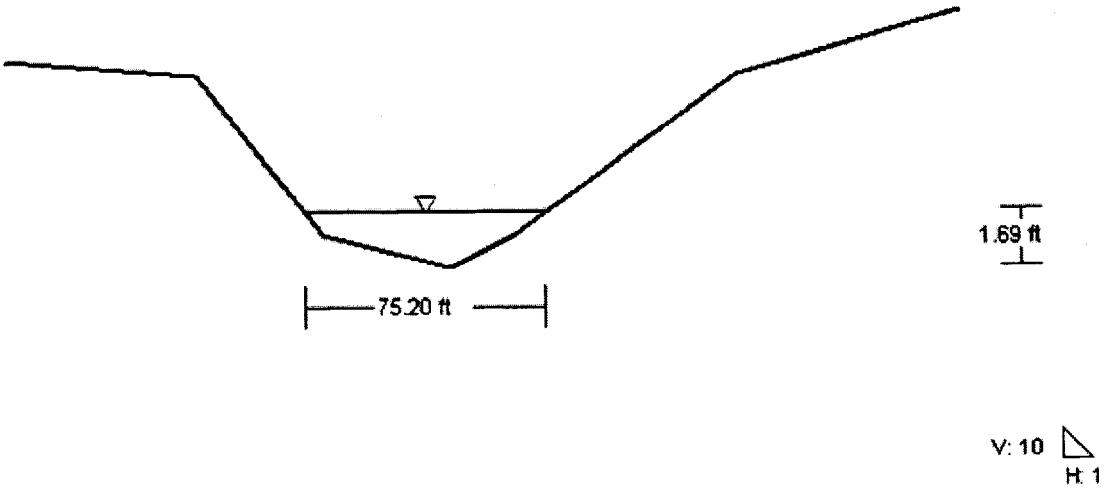
Station	Elevation
1+00	2535.00
1+40	2534.00
1+60	2535.00
2+30	2540.00
3+00	2542.00

UBD1B

Cross Section for UBD1B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.60000	%
Normal Depth:	1.69	ft
Elevation Range:	2534.00 to 2542.00 ft	
Discharge:	417.00	ft³/s



Worksheet for UBD1C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.60000	%
Discharge:	448.00	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:	2505.43	ft
Elevation Range:	2,504.00 to 2,510.00	
Flow Area:	99.71	ft^2
Wetted Perimeter:	130.26	ft
Top Width:	130.23	ft
Normal Depth:	1.43	ft
Critical Depth:	1.37	ft
Critical Slope:	0.01982	ft/ft
Velocity:	4.49	ft/s
Velocity Head:	0.31	ft
Specific Energy:	1.75	ft
Froude Number:	0.91	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2510.00)	(2+50, 2506.00)	0.035

Section Geometry

Station	Elevation
0+00	2510.00
1+00	2505.00

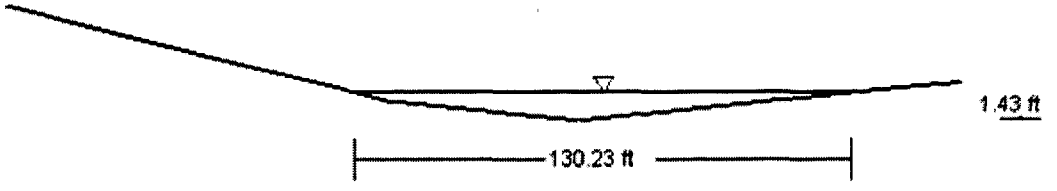
Worksheet for UBD1C

Station	Elevation
1+50	2504.00
2+00	2505.00
2+50	2506.00

UBD1C
Cross Section for UBD1C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.60000	%
Normal Depth:	1.43	ft
Elevation Range:	2,504.00 to 2,510.00	
Discharge:	448.00	ft^3/s



V: 5
H: 1

Worksheet for UBD2A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	38.00	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:	2654.89	ft
Elevation Range:	2,654.50 to 2,656.00	
Flow Area:	20.25	ft^2
Wetted Perimeter:	102.62	ft
Top Width:	102.61	ft
Normal Depth:	0.39	ft
Critical Depth:	0.35	ft
Critical Slope:	0.03190	ft/ft
Velocity:	1.88	ft/s
Velocity Head:	0.05	ft
Specific Energy:	0.45	ft
Froude Number:	0.74	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2656.00)	(2+00, 2655.50)	0.035

Section Geometry

Station	Elevation
0+00	2656.00
0+50	2655.00

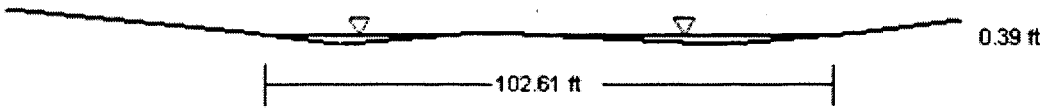
Worksheet for UBD2A

Station	Elevation
0+70	2654.50
1+00	2655.00
1+50	2654.50
1+80	2655.00
2+00	2655.50

UBD2A
Cross Section for UBD2A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.39	ft
Elevation Range:	2,654.50 to 2,656.00	
Discharge:	38.00	ft^3/s



V: 5
H: 1

Worksheet for UBD2B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	*Manning Formula*	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	75.00	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:	2625.53	ft
Elevation Range:	2,625.00 to 2,630.00	
Flow Area:	25.47	ft^2
Wetted Perimeter:	65.70	ft
Top Width:	65.67	ft
Normal Depth:	0.53	ft
Critical Depth:	0.48	ft
Critical Slope:	0.02520	ft/ft
Velocity:	2.94	ft/s
Velocity Head:	0.13	ft
Specific Energy:	0.67	ft
Froude Number:	0.83	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2630.00)	(2+00, 2627.00)	0.035

Section Geometry

Station	Elevation
0+00	2630.00
0+60	2625.00

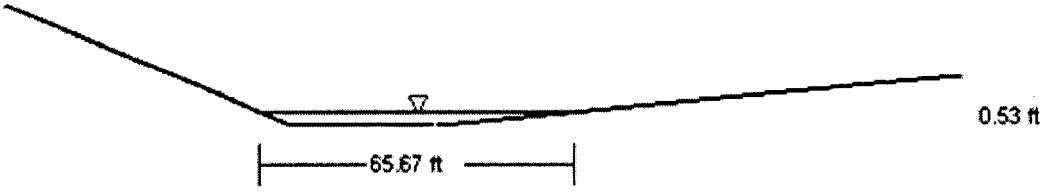
Worksheet for UBD2B

Station	Elevation
0+90	2625.00
2+00	2627.00

UBD2B
Cross Section for UBD2B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.53	ft
Elevation Range:	2,625.00 to 2,630.00	
Discharge:	75.00	ft^3/s



V: 5
H: 1

Worksheet for UBD2C

Project Description

Flow Element:	Irregular Section
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Channel Slope:	1.70000	%
Discharge:	113.00	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:	2595.42	ft
Elevation Range:	2594.50 to 2600.00 ft	
Flow Area:	27.84	ft^2
Wetted Perimeter:	44.33	ft
Top Width:	44.23	ft
Normal Depth:	0.92	ft
Critical Depth:	0.88	ft
Critical Slope:	0.02132	ft/ft
Velocity:	4.06	ft/s
Velocity Head:	0.26	ft
Specific Energy:	1.18	ft
Froude Number:	0.90	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2600.00)	(0+90, 2600.00)	0.035

Section Geometry

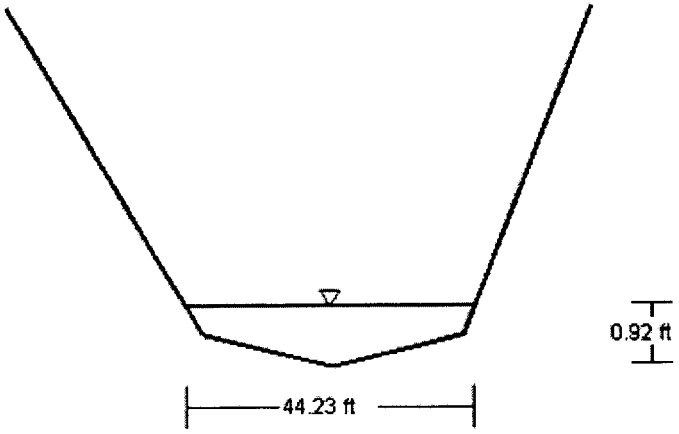
Station	Elevation
0+00	2600.00
0+30	2595.00

Worksheet for UBD2C

Station	Elevation
0+50	2594.50
0+70	2595.00
0+90	2600.00

UBD2C
Cross Section for UBD2C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.92	ft
Elevation Range:	2594.50 to 2600.00 ft	
Discharge:	113.00	ft^3/s



V: 10
H: 1

Worksheet for UBD2D

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	188.00	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:	2565.66	ft
Elevation Range:	2,564.50 to 2,575.00	
Flow Area:	39.85	ft^2
Wetted Perimeter:	50.67	ft
Top Width:	50.55	ft
Normal Depth:	1.16	ft
Critical Depth:	1.12	ft
Critical Slope:	0.01961	ft/ft
Velocity:	4.72	ft/s
Velocity Head:	0.35	ft
Specific Energy:	1.51	ft
Froude Number:	0.94	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2570.00)	(1+90, 2575.00)	0.035

Section Geometry

Station	Elevation
0+00	2570.00
0+20	2565.00

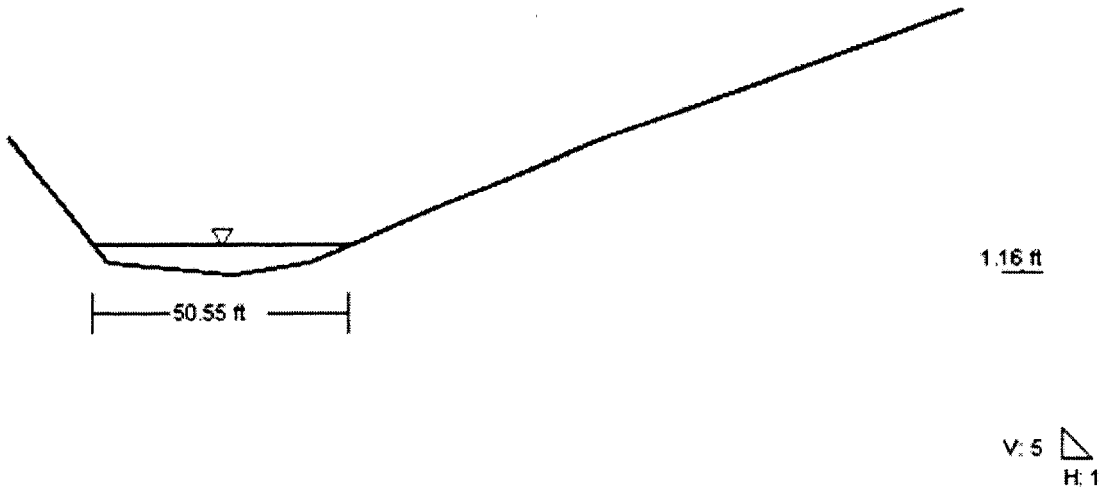
Worksheet for UBD2D

Station	Elevation
0+45	2564.50
0+60	2565.00
1+20	2570.00
1+90	2575.00

UBD2D
Cross Section for UBD2D

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	1.16	ft
Elevation Range:	2,564.50 to 2,575.00	
Discharge:	188.00	ft^3/s



Worksheet for UBD3A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.80000	%
Discharge:	149.00	ft³/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:	2609.90	ft
Elevation Range:	2,609.00 to 2,612.00	
Flow Area:	44.55	ft²
Wetted Perimeter:	99.02	ft
Top Width:	99.00	ft
Normal Depth:	0.90	ft
Critical Depth:	0.85	ft
Critical Slope:	0.02371	ft/ft
Velocity:	3.34	ft/s
Velocity Head:	0.17	ft
Specific Energy:	1.07	ft
Froude Number:	0.88	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2612.00)	(2+10, 2610.50)	0.035

Section Geometry

Station	Elevation
0+00	2612.00
0+90	2610.00

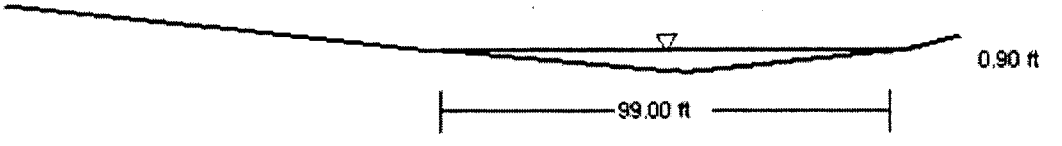
Worksheet for UBD3A

Station	Elevation
1+50	2609.00
2+00	2610.00
2+10	2610.50

UBD3A
Cross Section for UBD3A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	0.90	ft
Elevation Range:	2,609.00 to 2,612.00	
Discharge:	149.00	ft^3/s



V: 5
H: 1

Worksheet for UBD3B

Project Description	
Flow Element:	Irregular Section
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data		
Channel Slope:	1.80000	%
Discharge:	168.00	ft³/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:	2590.39	ft
Elevation Range:	2,589.50 to 2,591.00	
Flow Area:	53.91	ft²
Wetted Perimeter:	133.29	ft
Top Width:	133.26	ft
Normal Depth:	0.89	ft
Critical Depth:	0.85	ft
Critical Slope:	0.02474	ft/ft
Velocity:	3.12	ft/s
Velocity Head:	0.15	ft
Specific Energy:	1.04	ft
Froude Number:	0.86	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2591.00)	(1+75, 2590.50)	0.035

Section Geometry

Station	Elevation
0+00	2591.00
0+60	2590.00

Worksheet for UBD3B

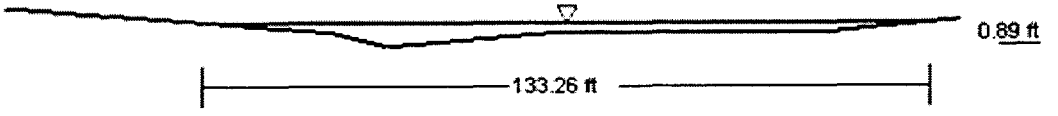
Station	Elevation
0+70	2589.50
1+00	2590.00
1+50	2590.00
1+75	2590.50

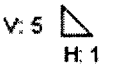
UBD3B

Cross Section for UBD3B

Project Description	
Flow Element:	Irregular Section
Friction Method:	Manning Formula
Solve For:	Normal Depth

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	0.89	ft
Elevation Range:	2,589.50 to 2,591.00	
Discharge:	168.00	ft^3/s





Worksheet for UBD3C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.80000	%
Discharge:	198.00	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:	2566.24	ft
Elevation Range:	2564.50 to 2570.50 ft	
Flow Area:	35.35	ft^2
Wetted Perimeter:	36.26	ft
Top Width:	36.05	ft
Normal Depth:	1.74	ft
Critical Depth:	1.74	ft
Critical Slope:	0.01812	ft/ft
Velocity:	5.60	ft/s
Velocity Head:	0.49	ft
Specific Energy:	2.23	ft
Froude Number:	1.00	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2570.50)	(1+40, 2570.50)	0.035

Section Geometry

Station	Elevation
0+00	2570.50
0+25	2570.00

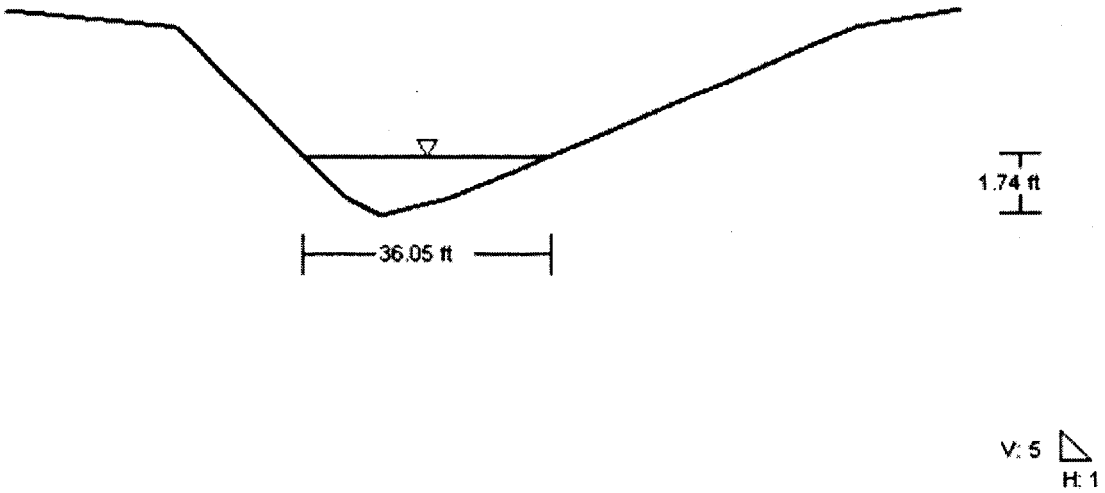
Worksheet for UBD3C

Station	Elevation
0+50	2565.00
0+55	2564.50
0+65	2565.00
1+25	2570.00
1+40	2570.50

UND3C
Cross Section for UBD3C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	1.74	ft
Elevation Range:	2564.50 to 2570.50 ft	
Discharge:	198.00	ft^3/s



Worksheet for UBD4A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.80000	%
Discharge:	120.00	ft³/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:	2545.59	ft
Elevation Range:	2,544.50 to 2,547.00	
Flow Area:	33.37	ft²
Wetted Perimeter:	66.54	ft
Top Width:	66.50	ft
Normal Depth:	1.09	ft
Critical Depth:	1.05	ft
Critical Slope:	0.02280	ft/ft
Velocity:	3.60	ft/s
Velocity Head:	0.20	ft
Specific Energy:	1.29	ft
Froude Number:	0.89	
Flow Type:	Subcritical	

Segment Roughness		
Start Station	End Station	Roughness Coefficient
(0+00, 2547.00)	(1+20, 2546.00)	0.035

Section Geometry	
Station	Elevation
0+00	2547.00
0+50	2545.00

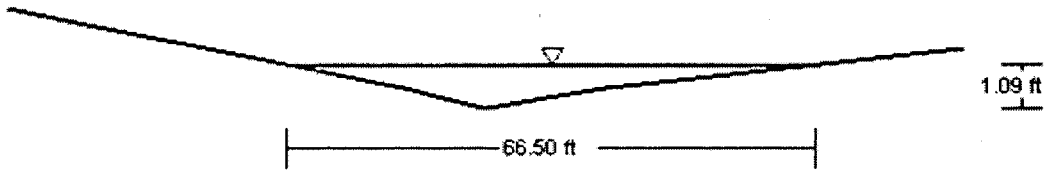
Worksheet for UBD4A

Station	Elevation
0+60	2544.50
0+75	2545.00
1+20	2546.00

UBD4A
Cross Section for UBD4A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	1.09	ft
Elevation Range:	2,544.50 to 2,547.00	
Discharge:	120.00	ft^3/s



V: 5
H: 1

Worksheet for UBD4B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.80000	%
Discharge:	156.00	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:	2519.99	ft
Elevation Range:	2,519.00 to 2,521.00	
Flow Area:	43.88	ft^2
Wetted Perimeter:	88.89	ft
Top Width:	88.87	ft
Normal Depth:	0.99	ft
Critical Depth:	0.94	ft
Critical Slope:	0.02294	ft/ft
Velocity:	3.56	ft/s
Velocity Head:	0.20	ft
Specific Energy:	1.18	ft
Froude Number:	0.89	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2521.00)	(2+00, 2521.00)	0.035

Section Geometry

Station	Elevation
0+00	2521.00
0+60	2520.00

Worksheet for UBD4B

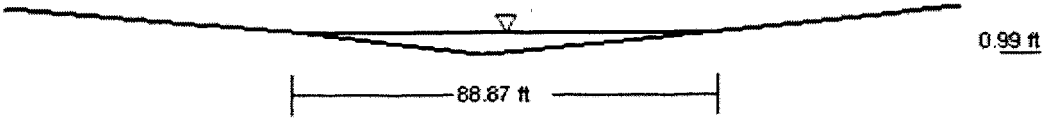
Station	Elevation
1+00	2519.00
1+50	2520.00
2+00	2521.00

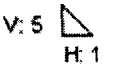
UBD4B

Cross Section for UBD4B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	0.99	ft
Elevation Range:	2,519.00 to 2,521.00	
Discharge:	156.00	ft^3/s





Worksheet for UBD4C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.80000	%
Discharge:	240.00	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:	2476.15	ft
Elevation Range:	2474.50 to 2480.00 ft	
Flow Area:	45.12	ft^2
Wetted Perimeter:	50.00	ft
Top Width:	49.86	ft
Normal Depth:	1.65	ft
Critical Depth:	1.64	ft
Critical Slope:	0.01856	ft/ft
Velocity:	5.32	ft/s
Velocity Head:	0.44	ft
Specific Energy:	2.09	ft
Froude Number:	0.99	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2480.00)	(1+50, 2480.00)	0.035

Section Geometry

Station	Elevation
0+00	2480.00
0+35	2475.00

Worksheet for UBD4C

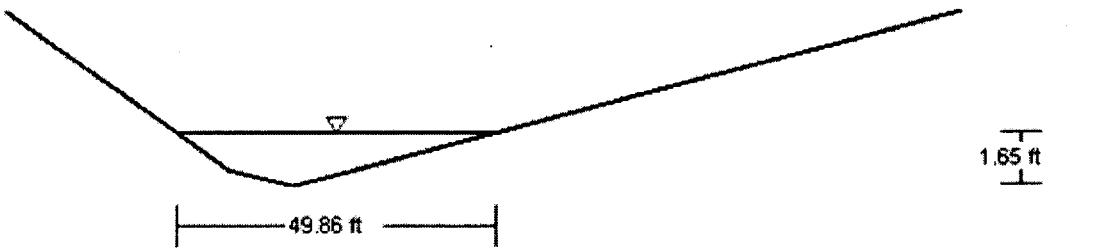
Station	Elevation
0+45	2474.50
0+55	2475.00
1+50	2480.00

UBD4C

Cross Section for UBD4C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	1.65	ft
Elevation Range:	2474.50 to 2480.00 ft	
Discharge:	240.00	ft^3/s



V: 5
H: 1

Worksheet for UBD5A

Project Description

Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data

Channel Slope:	1.80000	%
Discharge:	100.00	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:	2650.28	ft
Elevation Range:	2,649.50 to 2,651.00	
Flow Area:	34.51	ft^2
Wetted Perimeter:	95.12	ft
Top Width:	95.10	ft
Normal Depth:	0.78	ft
Critical Depth:	0.73	ft
Critical Slope:	0.02554	ft/ft
Velocity:	2.90	ft/s
Velocity Head:	0.13	ft
Specific Energy:	0.91	ft
Froude Number:	0.85	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2651.00)	(2+00, 2651.00)	0.035

Section Geometry

Station	Elevation
0+00	2651.00
0+50	2650.00

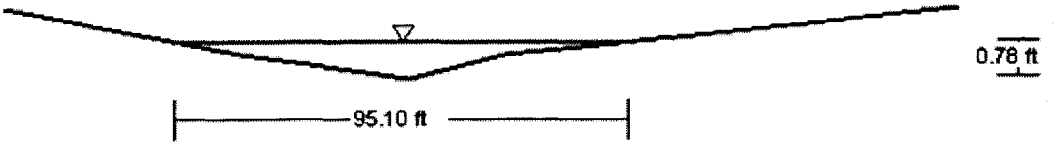
Worksheet for UBD5A

Station	Elevation
0+85	2649.50
1+05	2650.00
2+00	2651.00

UBD5A

Cross Section for UBD5A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	0.78	ft
Elevation Range:	2,649.50 to 2,651.00	
Discharge:	100.00	ft³/s



V: 10
H: 1

Worksheet for UBD5B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.80000	%
Discharge:	200.00	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:	2590.17	ft
Elevation Range:	2589.50 to 2590.50 ft	
Flow Area:	71.43	ft^2
Wetted Perimeter:	207.28	ft
Top Width:	207.08	ft
Normal Depth:	0.67	ft
Critical Depth:	0.63	ft
Critical Slope:	0.02612	ft/ft
Velocity:	2.80	ft/s
Velocity Head:	0.12	ft
Specific Energy:	0.79	ft
Froude Number:	0.84	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(-0+15, 2590.20)	(2+60, 2590.00)	0.035

Section Geometry

Station	Elevation
-0+15	2590.20
0+00	2590.00

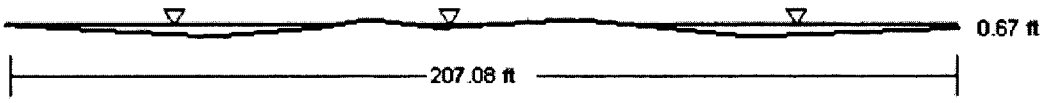
Worksheet for UBD5B

Station	Elevation
0+45	2589.50
0+75	2590.00
0+90	2590.50
1+10	2590.00
1+50	2590.50
2+00	2589.50
2+60	2590.00

UBD5B
Cross Section for UBD5B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	0.67	ft
Elevation Range:	2589.50 to 2590.50 ft	
Discharge:	200.00	ft^3/s



V: 5
H: 1

Worksheet for UBD5C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.80000	%
Discharge:	301.00	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:	2550.06	ft
Elevation Range:	2549.00 to 2551.00 ft	
Flow Area:	80.74	ft^2
Wetted Perimeter:	152.50	ft
Top Width:	152.48	ft
Normal Depth:	1.06	ft
Critical Depth:	1.01	ft
Critical Slope:	0.02238	ft/ft
Velocity:	3.73	ft/s
Velocity Head:	0.22	ft
Specific Energy:	1.27	ft
Froude Number:	0.90	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2551.00)	(3+80, 2551.00)	0.035

Section Geometry

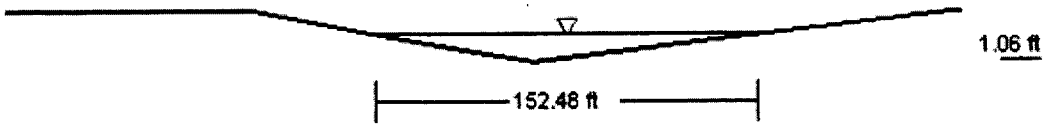
Station	Elevation
0+00	2551.00
1+00	2551.00

Worksheet for UBD5C

Station	Elevation
1+50	2550.00
2+10	2549.00
2+95	2550.00
3+80	2551.00

UBD5C
Cross Section for UBD5C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	1.06	ft
Elevation Range:	2549.00 to 2551.00 ft	
Discharge:	301.00	ft^3/s



V: 10
H: 1

Worksheet for UBD5D

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.80000	%
Discharge:	805.00	ft³/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:	2475.78	ft
Elevation Range:	2474.50 to 2477.00 ft	
Flow Area:	185.08	ft²
Wetted Perimeter:	277.57	ft
Top Width:	277.52	ft
Normal Depth:	1.28	ft
Critical Depth:	1.25	ft
Critical Slope:	0.02067	ft/ft
Velocity:	4.35	ft/s
Velocity Head:	0.29	ft
Specific Energy:	1.57	ft
Froude Number:	0.94	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2477.00)	(3+50, 2476.00)	0.035

Section Geometry

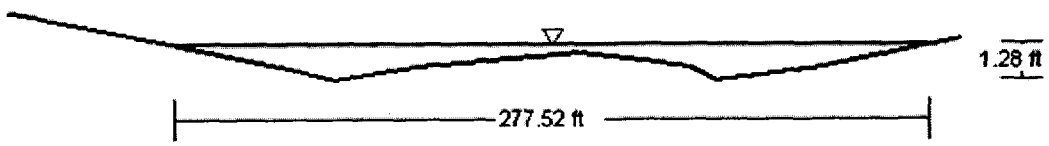
Station	Elevation
0+00	2477.00
1+00	2475.00

Worksheet for UBD5D

Station	Elevation
1+20	2474.50
1+50	2475.00
2+10	2475.50
2+50	2475.00
2+60	2474.50
3+00	2475.00
3+50	2476.00

UBD5D
Cross Section for UBD5D

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.80000	%
Normal Depth:	1.28	ft
Elevation Range:	2474.50 to 2477.00 ft	
Discharge:	805.00	ft^3/s



V: 10
H: 1

Worksheet for UBD6A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Channel Slope:	1.90000	%
Discharge:	40.00	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:	2699.56	ft
Elevation Range:	2,699.00 to 2,700.00	
Flow Area:	15.89	ft^2
Wetted Perimeter:	56.39	ft
Top Width:	56.38	ft
Normal Depth:	0.56	ft
Critical Depth:	0.52	ft
Critical Slope:	0.02789	ft/ft
Velocity:	2.52	ft/s
Velocity Head:	0.10	ft
Specific Energy:	0.66	ft
Froude Number:	0.84	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2700.00)	(1+00, 2700.00)	0.035

Section Geometry

Station	Elevation
0+00	2700.00
0+50	2699.00

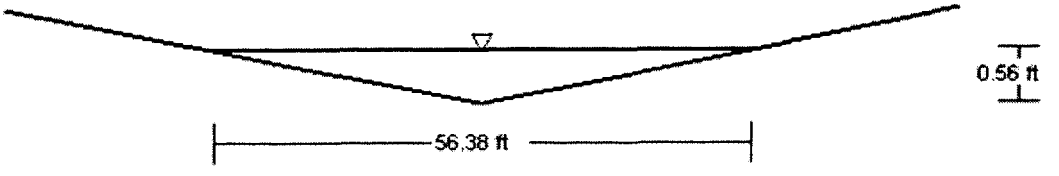
Worksheet for UBD6A

Station	Elevation
1+00	*2700.00*

UBD6A
Cross Section for UBD6A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.90000	%
Normal Depth:	0.56	ft
Elevation Range:	2,699.00 to 2,700.00	
Discharge:	40.00	ft^3/s



V: 10
H: 1

Worksheet for UBD6B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.90000	%
Discharge:	101.00	ft³/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:	2659.83	ft
Elevation Range:	2,659.00 to 2,661.00	
Flow Area:	31.02	ft²
Wetted Perimeter:	74.75	ft
Top Width:	74.73	ft
Normal Depth:	0.83	ft
Critical Depth:	0.79	ft
Critical Slope:	0.02431	ft/ft
Velocity:	3.26	ft/s
Velocity Head:	0.16	ft
Specific Energy:	1.00	ft
Froude Number:	0.89	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2661.00)	(3+00, 2660.00)	0.035

Section Geometry

Station	Elevation
0+00	2661.00
1+00	2660.00

Worksheet for UBD6B

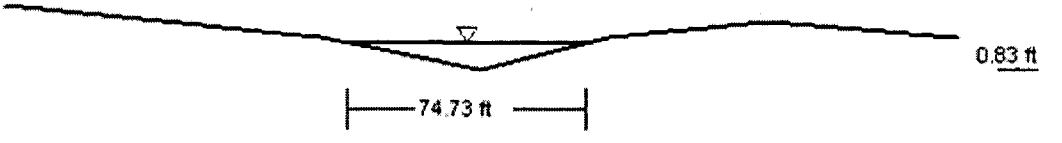
Station	Elevation
1+50	2659.00
1+90	2660.00
2+40	2660.50
3+00	2660.00

UBD6B

Cross Section for UBD6B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.90000	%
Normal Depth:	0.83	ft
Elevation Range:	2,659.00 to 2,661.00	
Discharge:	101.00	ft^3/s



V: 10
H: 1

Worksheet for UBD6C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Channel Slope:	1.90000	%
Discharge:	242.00	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:	2595.06	ft
Elevation Range:	2,594.00 to 2,596.00	
Flow Area:	67.12	ft^2
Wetted Perimeter:	138.81	ft
Top Width:	138.72	ft
Normal Depth:	1.06	ft
Critical Depth:	1.00	ft
Critical Slope:	0.02253	ft/ft
Velocity:	3.61	ft/s
Velocity Head:	0.20	ft
Specific Energy:	1.26	ft
Froude Number:	0.91	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2595.50)	(3+50, 2595.50)	0.035

Section Geometry

Station	Elevation
0+00	2595.50
0+20	2595.00

Worksheet for UBD6C

Station	Elevation
0+35	2594.00
0+50	2595.00
1+10	2596.00
1+70	2595.00
2+20	2594.00
2+60	2595.00
3+50	2595.50

UBD6C
Cross Section for UBD6C

Project Description		
Flow Element:	*Irregular Section*	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.90000	%
Normal Depth:	1.06	ft
Elevation Range:	2,594.00 to 2,596.00	
Discharge:	242.00	ft^3/s



V: 10
H: 1

Worksheet for UBD6D

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.90000	%
Discharge:	343.00	ft³/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:	2545.39	ft
Elevation Range:	2,544.00 to 2,547.00	
Flow Area:	80.73	ft²
Wetted Perimeter:	130.48	ft
Top Width:	130.34	ft
Normal Depth:	1.39	ft
Critical Depth:	1.36	ft
Critical Slope:	0.02108	ft/ft
Velocity:	4.25	ft/s
Velocity Head:	0.28	ft
Specific Energy:	1.67	ft
Froude Number:	0.95	
Flow Type:	Subcritical	

Segment Roughness		
Start Station	End Station	Roughness Coefficient
(0+00, 2547.00)	(2+20, 2545.50)	0.035

Section Geometry	
Station	Elevation
0+00	2547.00
0+60	2545.00

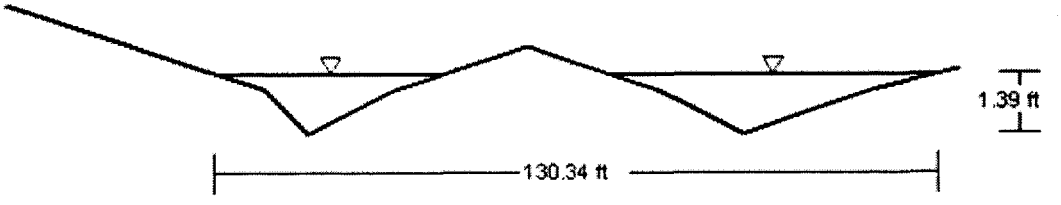
Worksheet for UBD6D

Station	Elevation
0+70	2544.00
0+90	2545.00
1+20	2546.00
1+50	2545.00
1+70	2544.00
2+00	2545.00
2+20	2545.50

UBD6D
Cross Section for UBD6D

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.90000	%
Normal Depth:	1.39	ft
Elevation Range:	2,544.00 to 2,547.00	
Discharge:	343.00	ft^3/s



V: 10
H: 1

Worksheet for UBD6E

Project Description

Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data

Channel Slope:	1.90000	%
Discharge:	404.00	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:	2500.49	ft
Elevation Range:	2499.00 to 2501.00 ft	
Flow Area:	88.34	ft^2
Wetted Perimeter:	127.88	ft
Top Width:	127.71	ft
Normal Depth:	1.49	ft
Critical Depth:	1.47	ft
Critical Slope:	0.02030	ft/ft
Velocity:	4.57	ft/s
Velocity Head:	0.33	ft
Specific Energy:	1.82	ft
Froude Number:	0.97	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2500.50)	(1+75, 2501.00)	0.035

Section Geometry

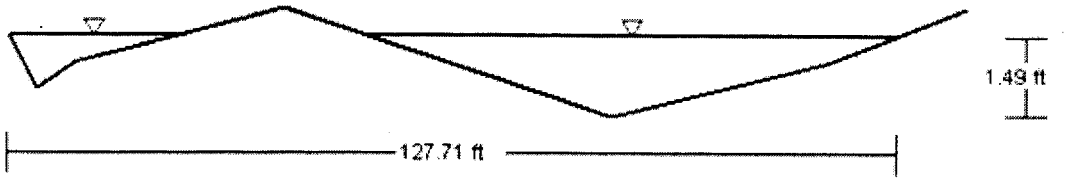
Station	Elevation
0+00	2500.50
0+05	2499.50

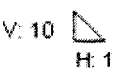
Worksheet for UBD6E

Station	Elevation
0+12	2500.00
0+50	2501.00
0+80	2500.00
1+10	2499.00
1+50	2500.00
1+75	2501.00

UBD6E
Cross Section for UBD6E

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.90000	%
Normal Depth:	1.49	ft
Elevation Range:	2499.00 to 2501.00 ft	
Discharge:	404.00	ft^3/s





Worksheet for UBD7A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	33.00	ft³/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:	2679.16	ft
Elevation Range:	2679.00 to 2683.00 ft	
Flow Area:	20.45	ft²
Wetted Perimeter:	129.83	ft
Top Width:	129.82	ft
Normal Depth:	0.16	ft
Critical Depth:	0.13	ft
Critical Slope:	0.03547	ft/ft
Velocity:	1.61	ft/s
Velocity Head:	0.04	ft
Specific Energy:	0.20	ft
Froude Number:	0.72	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2680.00)	(4+50, 2680.00)	0.035

Section Geometry

Station	Elevation
0+00	2680.00
0+70	2683.00

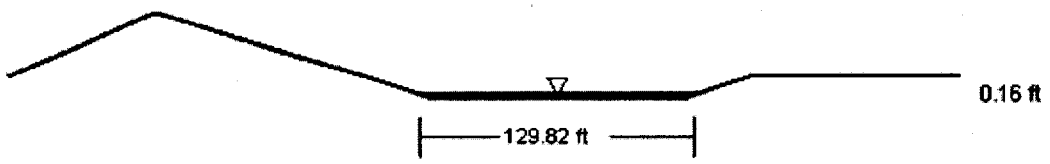
Worksheet for UBD7A

Station	Elevation
1+70	2680.00
2+00	2679.00
2+50	2679.00
2+75	2679.00
3+00	2679.00
3+20	2679.00
3+50	2680.00
4+50	2680.00

UBD7A
Cross Section for UBD7A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.16	ft
Elevation Range:	2679.00 to 2683.00 ft	
Discharge:	33.00	ft³/s



V: 10
H: 1

Worksheet for UBD7B

Project Description

Flow Element:	Irregular Section
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Channel Slope:	1.70000	%
Discharge:	61.00	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:	2640.33	ft
Elevation Range:	2639.00 to 2640.50 ft	
Flow Area:	27.24	ft^2
Wetted Perimeter:	105.92	ft
Top Width:	105.75	ft
Normal Depth:	1.33	ft
Critical Depth:	1.28	ft
Critical Slope:	0.02883	ft/ft
Velocity:	2.24	ft/s
Velocity Head:	0.08	ft
Specific Energy:	1.41	ft
Froude Number:	0.78	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2640.50)	(1+50, 2640.50)	0.035

Section Geometry

Station	Elevation
0+00	2640.50
0+90	2640.00

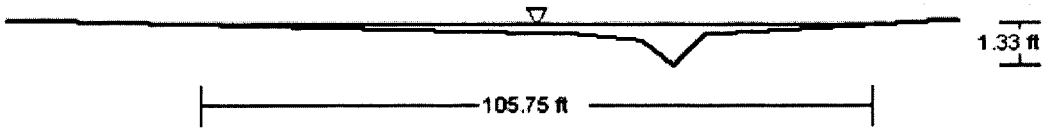
Worksheet for UBD7B

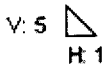
Station	Elevation
1+00	2639.80
1+05	2639.00
1+10	2640.00
1+50	2640.50

UBD7B
Cross Section for UBD7B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	1.33	ft
Elevation Range:	2639.00 to 2640.50 ft	
Discharge:	61.00	ft^3/s





Worksheet for UBD7C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	82.00	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:	2574.82	ft
Elevation Range:	2,574.00 to 2,577.00	
Flow Area:	26.85	ft^2
Wetted Perimeter:	65.56	ft
Top Width:	65.54	ft
Normal Depth:	0.82	ft
Critical Depth:	0.76	ft
Critical Slope:	0.02461	ft/ft
Velocity:	3.05	ft/s
Velocity Head:	0.14	ft
Specific Energy:	0.96	ft
Froude Number:	0.84	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2575.00)	(2+90, 2577.00)	0.035

Section Geometry

Station	Elevation
0+00	2575.00
1+20	2575.00

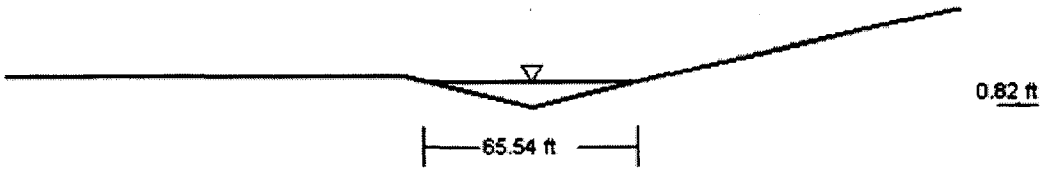
Worksheet for UBD7C

Station	Elevation
1+60	2574.00
2+00	2575.00
2+90	2577.00

UBD7C
Cross Section for UBD7C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.82	ft
Elevation Range:	2,574.00 to 2,577.00	
Discharge:	82.00	ft^3/s



V: 10
H: 1

Worksheet for UBD7D

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	110.00	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:	2519.97	ft
Elevation Range:	2,519.50 to 2,520.00	
Flow Area:	52.37	ft^2
Wetted Perimeter:	224.23	ft
Top Width:	224.21	ft
Normal Depth:	0.47	ft
Critical Depth:	0.42	ft
Critical Slope:	0.03003	ft/ft
Velocity:	2.10	ft/s
Velocity Head:	0.07	ft
Specific Energy:	0.54	ft
Froude Number:	0.77	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2520.00)	(4+50, 2520.00)	0.035

Section Geometry

Station	Elevation
0+00	2520.00
0+50	2520.00

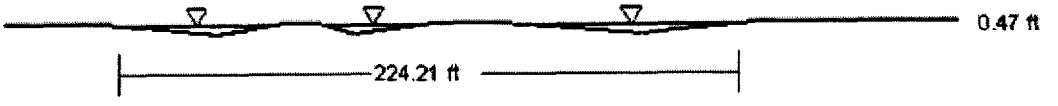
Worksheet for UBD7D

Station	Elevation
1+00	2519.50
1+30	2520.00
1+50	2520.00
1+65	2519.50
2+00	2520.00
2+40	2520.00
3+00	2519.50
3+50	2520.00
4+50	2520.00

UBD7D
Cross Section for UBD7D

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.47	ft
Elevation Range:	2,519.50 to 2,520.00	
Discharge:	110.00	ft^3/s



V: 10
H: 1

Worksheet for UBD8A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	20.00	ft³/s

Options	
Current Roughness Weighted Methc	ImprovedLotters
Open Channel Weighted Roughnes:	ImprovedLotters
Closed Channel Weighted Roughne	Hortons

Results		
Roughness Coefficient:	0.035	
Water Surface Elevation:	2679.18	ft
Elevation Range:	2679.00 to 2680.50 ft	
Flow Area:	14.01	ft²
Wetted Perimeter:	107.08	ft
Top Width:	107.08	ft
Normal Depth:	0.18	ft
Critical Depth:	0.15	ft
Critical Slope:	0.03723	ft/ft
Velocity:	1.43	ft/s
Velocity Head:	0.03	ft
Specific Energy:	0.21	ft
Froude Number:	0.70	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2680.00)	(4+00, 2680.50)	0.035

Section Geometry

Station	Elevation
0+00	2680.00
1+50	2679.00

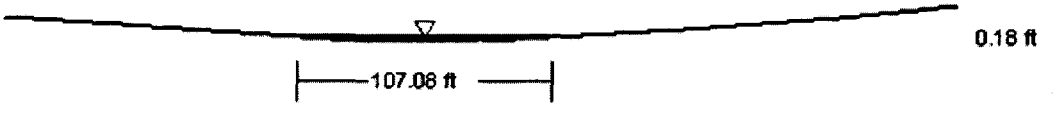
Worksheet for UBD8A

Station	Elevation
2+00	2679.00
2+85	2679.50
3+50	2680.00
4+00	2680.50

UBD8A
Cross Section for UBD8A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.18	ft
Elevation Range:	2679.00 to 2680.50 ft	
Discharge:	20.00	ft^3/s



V: 10
H: 1

Worksheet for UBD8B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	45.00	ft³/s

Options	
Current Roughness Weighted Methc	ImprovedLotters
Open Channel Weighted Roughnes:	ImprovedLotters
Closed Channel Weighted Roughne	Hortons

Results		
Roughness Coefficient:	0.035	
Water Surface Elevation:	2610.68	ft
Elevation Range:	2610.00 to 2620.00 ft	
Flow Area:	11.19	ft²
Wetted Perimeter:	18.06	ft
Top Width:	17.73	ft
Normal Depth:	0.68	ft
Critical Depth:	0.64	ft
Critical Slope:	0.02178	ft/ft
Velocity:	4.02	ft/s
Velocity Head:	0.25	ft
Specific Energy:	0.93	ft
Froude Number:	0.89	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2620.00)	(1+05, 2620.00)	0.035

Section Geometry

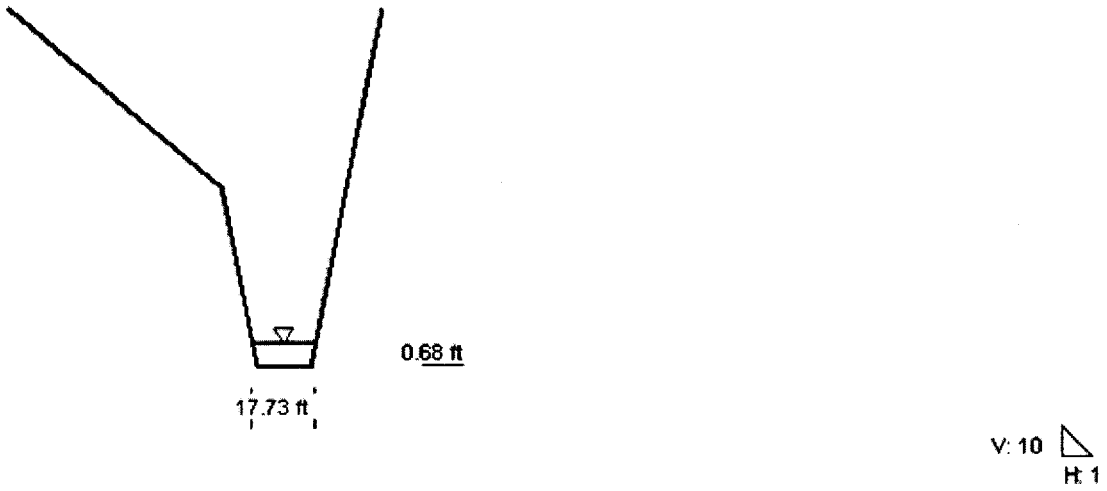
Station	Elevation
0+00	2620.00
0+60	2615.00

Worksheet for UBD8B

Station	Elevation
0+70	2610.00
0+85	2610.00
0+95	2615.00
1+05	2620.00

UBD8B
Cross Section for UBD8B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.68	ft
Elevation Range:	2610.00 to 2620.00 ft	
Discharge:	45.00	ft^3/s



Worksheet for UBD8C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	56.00	ft³/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:	2550.06	ft
Elevation Range:	2549.50 to 2550.50 ft	
Flow Area:	27.17	ft²
Wetted Perimeter:	119.69	ft
Top Width:	119.68	ft
Normal Depth:	0.56	ft
Critical Depth:	0.49	ft
Critical Slope:	0.02862	ft/ft
Velocity:	2.06	ft/s
Velocity Head:	0.07	ft
Specific Energy:	0.62	ft
Froude Number:	0.76	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2550.30)	(3+00, 2550.20)	0.035

Section Geometry

Station	Elevation
0+00	2550.30
0+65	2550.50

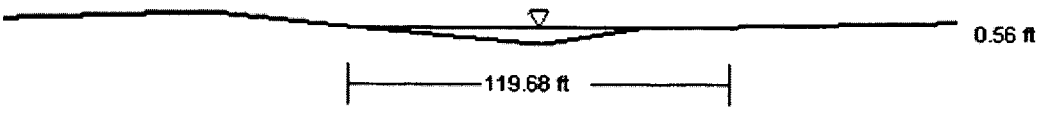
Worksheet for UBD8C

Station	Elevation
1+15	2550.00
1+70	2549.50
2+00	2550.00
3+00	2550.20

UBD8C
Cross Section for UBD8C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.56	ft
Elevation Range:	2549.50 to 2550.50 ft	
Discharge:	56.00	ft^3/s



V: 10
H: 1

Worksheet for UBD9A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	15.00	ft³/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:	2494.66	ft
Elevation Range:	2,494.50 to 2,495.50	
Flow Area:	14.50	ft²
Wetted Perimeter:	178.62	ft
Top Width:	178.61	ft
Normal Depth:	0.16	ft
Critical Depth:	0.14	ft
Critical Slope:	0.04377	ft/ft
Velocity:	1.03	ft/s
Velocity Head:	0.02	ft
Specific Energy:	0.18	ft
Froude Number:	0.64	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2495.00)	(7+00, 2495.00)	0.035

Section Geometry

Station	Elevation
0+00	2495.00
1+00	2494.50

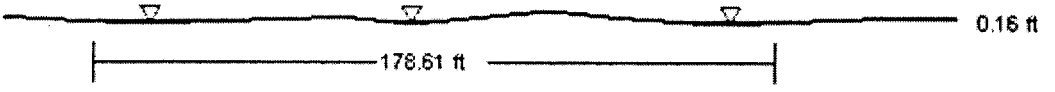
Worksheet for UBD9A

Station	Elevation
2+50	2495.00
3+00	2494.50
3+50	2495.00
4+00	2495.50
4+50	2495.00
5+25	2494.50
6+50	2495.00
7+00	2495.00

UBD9A
Cross Section for UBD9A

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.16	ft
Elevation Range:	2,494.50 to 2,495.50	
Discharge:	15.00	ft^3/s



V: 10
H: 1

Worksheet for UBD9B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Input Data		
Channel Slope:	1.70000	%
Discharge:	29.00	ft³/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:	2454.93	ft
Elevation Range:	2,454.50 to 2,456.00	
Flow Area:	18.59	ft²
Wetted Perimeter:	124.25	ft
Top Width:	124.24	ft
Normal Depth:	0.43	ft
Critical Depth:	0.39	ft
Critical Slope:	0.03450	ft/ft
Velocity:	1.56	ft/s
Velocity Head:	0.04	ft
Specific Energy:	0.47	ft
Froude Number:	0.71	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2455.00)	(8+50, 2455.00)	0.035

Section Geometry

Station	Elevation
0+00	2455.00
1+00	2455.00

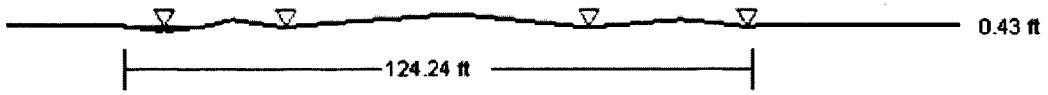
Worksheet for UBD9B

Station	Elevation
1+40	2454.50
1+80	2455.00
2+00	2455.50
2+50	2454.80
2+60	2455.00
4+00	2456.00
5+00	2455.00
5+15	2454.80
5+40	2455.00
6+00	2455.50
6+50	2455.00
6+59	2454.80
6+69	2455.00
6+50	2455.00

UBD9B

Cross Section for UBD9B

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.43	ft
Elevation Range:	2,454.50 to 2,456.00	
Discharge:	29.00	ft^3/s



V: 10
H: 1

Worksheet for UBD9C

Project Description

Flow Element:	Irregular Section
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Channel Slope:	1.70000	%
Discharge:	58.00	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:	2409.49	ft
Elevation Range:	2,409.00 to 2,410.50	
Flow Area:	26.82	ft^2
Wetted Perimeter:	109.87	ft
Top Width:	109.86	ft
Normal Depth:	0.49	ft
Critical Depth:	0.44	ft
Critical Slope:	0.02957	ft/ft
Velocity:	2.16	ft/s
Velocity Head:	0.07	ft
Specific Energy:	0.56	ft
Froude Number:	0.77	
Flow Type:	Subcritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 2410.00)	(7+00, 2410.00)	0.035

Section Geometry

Station	Elevation
0+00	2410.00
1+00	2409.00

Worksheet for UBD9C

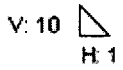
Station	Elevation
2+25	2410.00
4+00	2410.00
4+20	2409.50
4+50	2410.00
5+50	2410.50
7+00	2410.00

UBD9C
Cross Section for UBD9C

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	

Section Data		
Roughness Coefficient:	0.035	
Channel Slope:	1.70000	%
Normal Depth:	0.49	ft
Elevation Range:	2,409.00 to 2,410.50	
Discharge:	58.00	ft^3/s





APPENDIX E

Electronic Data CD

1. HEC-1 Model
2. Figures

APPENDIX F

Reference Material

U.S. Army Corps of Engineers Pre-Certification Letter

Upper Blue Diamond Diversion Channel

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT CORPS OF ENGINEERS

REPLY TO
ATTENTION OF

October 3, 2003

RECD
2003 OCT -3 PM 3:34

Office of the Chief
Hydrology & Hydraulics Branch

Mr. Gale Wm. Fraser, II, P.E.
General Manager
Clark County Regional Flood Control District
600 Grand Central Parkway, Suite 300
Las Vegas, Nevada 89106-4511

Dear Mr. Fraser:

This letter is to pre-certify the completion of the construction currently on-going on the Upper Blue Diamond Diversion Channel element of the Tropicana and Flamingo Washes Flood Control Project. It will also serve to assist you in acquiring a "Letter of Map Revision" from the Federal Emergency Management Agency.

Federal law allows a Federal agency with responsibility for flood control, such as the U.S. Army Corps of Engineers (USACE), to certify to the Federal Emergency Management Agency (FEMA), that a particular project has been adequately designed and constructed to provide protection from the base flood (100 year-flood or a flood-event with a one percent chance of being equaled or exceeded in any given year). This law is contained in the Code of Federal Regulations, Title 44-Federal Emergency Management Agency; Subchapter B – Insurance and Hazard Mitigation, National Flood Insurance Program; Part 65 – Identification and Mapping, Section 65.10(e) – Certification Requirements.

Under this authority, I hereby certify that the Upper Blue Diamond Diversion Channel from the Beltway Channel upstream to Blue Diamond Wash along Durango Drive roadway was designed to convey the base flood. Upon completion of construction, the USACE would be able to certify to FEMA the appropriate re-mapping of the floodplain.

Supporting technical information upon which design certification is based was developed in our various engineering technical areas, including Hydrology & Hydraulics, Geotechnical, and

Structural. Questions may be directed to Mr. Rene Vermeeren of our Hydrology & Hydraulics Section at 213-452-3547.

Sincerely,

Robert E. Koplin, P.E.
Chief, Engineering Division

Upper Blue Diamond Diversion Channel

U.S. Army Corps of Engineers Design Documentation Report

Prepared By: LOS ANGELES, DISTRICT
DESIGN BRANCH

DESIGN DOCUMENTATION REPORT

MAIN REPORT

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND CHANNEL
DIVERSION CHANNEL

JANUARY, 2004

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL

DESIGN DOCUMENTATION REPORT

LOS ANGELES DISTRICT
JANUARY, 2003

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND CHANNEL DIVERSION CHANNEL

PRODUCT DEVELOPMENT TEAM

The following individuals were primarily responsible for developing this document:

DISCIPLINE	TEAM MEMBER
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Project Engineer	Huma M. Nisar
Hydrologic Engineering	Jody Fischer
Hydraulic Engineer	John Oldenburger III
Soil Engineer	Julia Yang
Materials and Investigations	Elmer Datuin
Geologist	Bob Walker
Ecologist	Alex Watt
Structural Engineer	Tony Wong
Cost Engineer	Irene Leyva-Tracy
Real Estate Specialist	Ed Peterson
Construction Engineer	Robert Caskie

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND CHANNEL DIVERSION CHANNEL

INDEPENDENT TECHNICAL REVIEW TEAM

The following individuals were primarily responsible for developing this document:

DISCIPLINE	TEAM MEMBER
Civil Design	Paul Underwood
Structural Design	Dave Van Dorpe
Hydraulics	Bob Castle
Soils Design	Chris Sands
Geology	John Ferguson
Materials and Investigations	Bill Halczak
Environmental Support	Lois Goodman
Cost Engineering	Don Nguyen
Real Estate	Steve Gale
Plan Formulation Specialist	Kevin Inada
Review Team Leader	Paul Underwood

SYLLABUS

The Corps of Engineers completed a Feasibility Report for the Las Vegas Wash (Tropicana and Flamingo Washes), Las Vegas, Nevada in October 1991 (revised January 1992). In the Report, a plan was developed to reduce the flooding threat posed to the Las Vegas community by the Tropicana and Flamingo Washes. The plan includes a comprehensive system of detention basins, debris basins, collector channels and primary channels designed to provide 100-year future condition protection to the affected areas.

The Tropicana Channel as described in the Feasibility Report is a reinforced concrete channel of primarily trapezoidal cross section. It is approximately 9 km in length and represents on e of eight main channels in the recommended plan. Confusion in the naming convention used in the Feasibility Report required that the Tropicana Channel be renamed to the Blue Diamond Channel. Consequently, this report refers to this channel by it's new name. The purpose of the Blue Diamond Channel is to safely convey Blue Diamond detention Basin outflows as well as local flow south of the Las Vegas Beltway to the Tropicana Detention basin. This channel consists of the following reaches: Upper Blue Diamond, Section 7A and Section 7B of the Las Vegas Beltway, and Lower Blue Diamond.

This Design Document Report covers only the furthest upstream (upper portion) segment of the Blue Diamond Channel, the segment between the Las Vegas Beltway and the Blue Diamond Detention Basin, hereafter referred to as the Upper Blue Diamond Channel Durango Reach. The remainder (lower portion) of the Blue Diamond Channel is addressed in Lower Blue Diamond Diversion Channel, Design Memorandums.

Technical and environmental studies for the planed contained in this Design Document Report addresses a reinforced concrete rectangular channel, and inlet structure, Grouted Riprap Berm, and the natural wash area. See Civil Design Appendix for design details.

The channel will transition from the natural wash to an Open Concrete Lined Channel via inlet structure. The Open Concrete Lined Channel will transition to a box, location shown on from Sheet C1 to Sheet C 17. The recommended plan also includes the followings:

3 confluence structure
a) Rhoads Ranch
b) Warmspring Road
c) Beltway
Maintenance roads, location shown on Plan and Profile sheets
11 side drains, see Sheet S14 for detail and location
Upper Blue Diamond Wash Slope Protection Berm, see Sheet C30 for detail and location
Access ramps, see Sheet S10 to S12
Inlet Structure, Outlet Tower, and Spillway see Sheet C1 for Plan and Profile, detail shown on sheets S17, and S18.
The total first cost for the Upper Blue Diamond Channel is estimated at $11,789,212.

PERTINENT DATA

Item	Unit
Drainage areas	**4.8 kms**
Channel Information	
Length of entire channel	4206.00 m
Rectangular length	1925.19 m
Box culvert length	2280.19 m
Rectangular width (range)	4.27 to 7.98 m
Wall height (range)	2.74 to 3.1m
Design discharge (range)	62.3 to 74 cms
Design discharge velocity (range)	9.36 ms
Inlet Structure	
Embankment	
Crest elevation	840.00 m
Crest Length	177.00 m
Crest Width	6.00 m
Maximum height above streambed	3.86 m
Freeboard above maximum water surface (PMF)	1.50 m
Spillway	
Crest Elevation	836.20 m
Crest Length	24.44 m
Design Discharge (PMF)	42.5 cms
Outlet Tower	
Size of Conduit	0.914 x 0.914 m
Length of conduit	155.59 m
Intake Elevation	834.02 m
Reservoir	
Area at spillway crest	6350.32 ms
Storage allocation below spillway crest	
Sediment Storage	14570 cms

GENERAL

PRIOR STUDIES AND REPORTS

1. The following prior reports have been issued by the U. S. Army Corps of Engineers.

2. "Report on Flood of 13 June 1955, Las Vegas and Vicinity, Nevada", Corps of Engineers, Los Angeles District, 6 July 1955.

3. "Report of Flood of 21 August 1957, Las Vegas and Vicinity, Nevada", Corps of Engineers, Los Angeles District, 16 September 1957.

4. "Report on Survey for Flood Control, Las Vegas Wash and Tributaries, Las Vegas and Vicinity, Nevada', Corps of Engineers, Los Angeles District, 30 September1959.

5. "Flood Plain Information, Lower Las Vegas Wash, Clark County, Nevada", Corps of Engineers, Los Angeles District, December 1967.

6. "Flood Plain Information, Lower Las Vegas Wash, Clark County, Nevada", Corps of Engineers, Los Angeles District, December 1967.

7. "Hydrologic Documentation for Feasibility Study, Las Vegas Wash and Tributaries, Clark County, Nevada", U.S. Army Corps of Engineers, Los Angeles, Draft, April 1988.

8. "Technical Documentation Report, Las Vegas Wash and Tributaries (Tropicana Flamingo Washes), Nevada", U. S. Army Corps of Engineers, Los Angeles District, South Pacific Division, October 1991.

9. "Feasibility Report and Environmental Impact Statement, Las Vegas Wash and Tributaries, Tropicana and Flamingo Washes, Las Vegas, Nevada", U. S. Army Corps of Engineers, Los Angeles District, South Pacific Division, October 1991; Revised 10 January 1992.

10. "Hydrologic Basis for Design, Las Vegas Wash and Tributaries, (Tropicana and Flamingo Washes), Nevada", U. S. Army Corps of Engineers, Los Angeles District, June1993

11. Las Vegas Wash and Tributaries, (Tropicana and Flamingo Washes), Nevada, Design Memorandum, Red Rock Detention Basin, "U.S. Army Corps of Engineers, Los Angeles District, November 1993.

12. "Las Vegas Wash and Tributaries, "Tropicana and Flamingo Washes), Nevada, Design Memorandum, Tropicana Detention Basin and Outlet Channel, "U. S. Army Corps of Engineers, Los Angeles District, July 1996.

13. "Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes), Nevada, Design Memorandum, Lower Blue Diamond Diversion Channel", U. S. Army Corps of Engineers, Los Angeles District, August 1997.

14. "Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes), Nevada, Final Design Memorandum, Lower Red Rock Complex"' U. S. Army Corps of Engineers, Los Angeles District, March 1998.

15. "Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes), Nevada, Design Memorandum, Blue Diamond Detention Basin', U. S. Army Corps of Engineers, Los Angeles District, April 1998.

16. "Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes), Nevada, Design Memorandum, Flamingo Diversion Channel."

17. "Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes), Nevada, Design Document Report, F-1 and F-2 Channels and F-1 and F-2 Debris Basins".

18. "Design Memorandum, Red Rock Outlet Channel, R-4 Channel, and R-4 Debris Basin, Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes) Nevada," U. S. Army Corps of Engineers, Los Angeles District, February 2000.

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A. Introduction

1. General. The U.S. Army Corps of Engineers (USACE) completed the Feasibility Report for Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes), Las Vegas, Nevada in October 1991 and revised it in January 1992. The report was prepared in conjunction with the Clark County Regional Flood report Control District (CCRFCD) and the Clark County Department of Public Works (CCDPW), the local sponsors for the report. The report study area is located in Clark County in Southern Nevada and is located in the southwestern and central portions of the Las Vegas community. Vicinity and project location maps are shown in Sheet T1. The feasibility report addressed the flood threat to the Las Vegas community posed by the Tropicana and Flamingo Washes and studied a number of alternatives to alleviate the threat. Based on these studies, a flood protection plan meeting all planning objectives and Corps requirements was selected for implementation.

2. The Plan selected for implementation provides for a 100-year future condition, computed probability level of protection to the partially developed and developed areas affected by the Tropicana and Flamingo Washes. The selected plan includes a comprehensive system of detention basins, debris basins, lateral collector channels, and primary channels. The system is designed to intercept and divert flood flows in the project area into downstream. The major features of the plan include two new detention basins (Blue Diamond and Tropicana); construction of four debris basins; channelization from each of the four debris basins and Red Rock Detention Basin to the Flamingo Detention Basin; channelization from the Flamingo Detention Basin and the Blue Diamond Detention Basin to the Tropicana Detention Basin; channelization from the Tropicana Detention Basin to the existing Tropicana Wash conduit at the Interstate 15 (I-15) highway; stream stabilizations downstream of I-15; and construction of a lateral collector channel system on the alluvial fan area of the project.

3. This Design Document Report covers only the Upper Blue Diamond Diversion Channel feature of the Tropicana and Flamingo Washes flood protection plan. Design criteria for Red Rock Dam and the Tropicana Detention Basin and Outlet Channel were addressed in their respective design memorandum. The remaining features of the plan will be covered in future reports.

4. Project Authorization. The Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes) feasibility study was authorized by a Senate Resolution (Committee on Environment and Public Works) in October 1982. Further authority was provided with the Water Resources Development Act of 1986, Title IV, Section 401©. The Project was authorized for construction by the Water Resources Development Act of 1992.

5. Scope and Purpose. The purpose of this Design Document Report (DDR) is to present the results of associated design studies and to present the technical criteria and basis for design of the Upper Blue Diamond Diversion Channel of the Tropicana and Flamingo Washes Project. It has been prepared in compliance with ER 1110-2-1150.

6. The scope of the Design Documentation Report (DDR) is to prepare a design analysis of the recommended plan in the feasibility report. The level of detail for the DDR design is sufficient to support the Micro-Computer Aided Cost Estimating System (M-CACES) cost estimate presented. In general, the level of detail for most features of the project is sufficient to proceed to Plans and Specifications.

7. The supporting technical analyses for hydrology and hydraulics, environmental engineering, Geotechnical, structural, and civil design along with a detailed cost estimate are presented in six appendices: A. Hydrology and Hydraulics; B. Geologic; C. Civil Design; D. Structural; E. Costs Engineering; F. Real estate.

8. Local Cooperation. The studies described in this report have been coordinated with representatives of CCRFCD, CCDPW, and others.

9. Prior Studies and Reports. Included in the front of this document are tow lists of Corps of Engineers reports – ones that have been issued pertaining to the project area and reports presently scheduled to be issued as part of the implementation of the Las Vegas Wash and Tributaries (Tropicana and Flamingo Washes) project. The subject 1991 Feasibility Report, Section I. (J), contains a list of prior studies and reports conducted and prepared by the Corps of Engineers and other agencies that were incorporated into that study. Section D (Alternative Design Studies) of this report contains descriptions and discussions of several more recent reports prepared by the local sponsor, CCRFCD, that pertain to this DDR.

B. Problem Identification

10. Location and Description of Area. The proposed Upper Blue Diamond Diversion Channel is located between the proposed Las Vegas Beltway and the Blue Diamond Detention Basin. See Sheet T1 for the vicinity and location maps of the overall study area.

11. The Flamingo-Tropicana Washes and Blue Diamond Wash watersheds are located west of the city of Las Vegas on the western side of Las Vegas Valley in Clark County, Nevada. All the streams in these watersheds are ephemeral. The watersheds generally trend from west to east, with streams beginning in the mountains, then transitioning to the flat alluvial valley. Vegetation in the mountains consists of moderately dense brush and trees while the valley area maintains sparse vegetative cover. Flamingo-Tropicana Washes are bounded on the north by the La Madre Mountain range, on the west by the Spring Mountains, and on the south by a natural divide formed by alluvial material eroded from the Spring Mountains. The mountains on the northern and western boundary of the watershed are rugged and steep with maximum elevations of approximately 2486 m NAVD in the La Madre Mountains.

12. Red Rock Wash and Flamingo Wash are the main watercourses in the project area. The streams generally flow from west to east; Red Rock Wash joins Flamingo

Wash; Flamingo Wash drains to Las Vegas Wash. The drainage area at the confluence with Las Vegas wash is about 390 square kilometers. Tropicana Wash and Red Rock Wash are the principal tributaries to Flamingo Wash. Stream gradients in the watershed range from 11.4 percent in the mountains to 0.95 percent in the valley.

13. Blue Diamond Wash divides, with a large portion of its flow splitting off to the Tropicana Wash. The majority of the Blue Diamond Wash is tributary to Duck Creek. Duck Creek comprises the southwestern portion of the Las Vegas Wash drainage basin. Originating in the Spring Mountains near Sandstone Bluffs, the Blue Diamond Wash flows southerly between Sandstone Bluffs and the foothills forming its boundary with Flamingo-Tropicana Washes. Stream gradients in this area are about 9.5 percent. The wash then turns and flows eastward through Cottonwood Valley to the fan apex where a major flow split to Tropicana Wash occurs. Further splitting of flows also occurs when discharges passing through the Union Pacific Railroad culvert exceed capacity and are conveyed along the railroad embankment to Tropicana Wash. The drainage area at this point is about 180 square kilometers. Stream gradients in this area are about 1.6 percent. Flows in Blue Diamond Wash, which remain in the channel, continue eastward to its confluence with Duck Creek.

14. Present Conditions. More than 1.1 million people now live in the Las Vegas Valley. Figures released in October 1995 by the Census Bureau Show that the Las Vegas population jumped 26 percent between 1990 and 1994, making it the fastest growing metropolitan area in the nation. As described in the 1991 Feasibility Report (Revised 1992), the study area contains more than 30 percent of the overall population. In 1991, more than 5, 000 buildings were counted within the 500-year future condition overflow area. Significant social disruption is prevalent as a result of flooding or simply the threat of flooding. In the downtown community and casino resort corridor, flooding brings a halt to the routine activities associated with "The Strip." Vehicular and pedestrian traffic, government operations, retail shopping, and tourism area are all impacted and disrupted, resulting in significant loss of time and money to the local and national economy.

15. Nearly all of the major flood events in the Las Vegas area have been the result of heavy localized summer thunderstorms. Flood flows have most commonly been generated by short duration, high-intensity summer thunderstorms occurring in the mountainous and/or alluvial fan regions of the watershed. Flood damages are generally attributable to high velocity flows causing scour in the washes and unlined channels, and sediment-ladened overflows and breakouts along the limited capacity channels in the developed valley floor region of the watershed. Existing development has significantly encroached into flow boundaries along the washes. Damage from flows results from a combination of erosion, sedimentation, inundation, debris, and associated structural damages.

16. Since the 1991 Feasibility Study was completed, several project features have been, or are being, constructed in the project area. Since 1991, 13 projects have been completed, including: 1) Southern Beltway Reach 7b, 2) Lower Blue Diamond Channel, 3) Red Rock Detention Basin Expansion, 4) Tropicana Detention Basin, 5) Tropicana Outlet Channel, 6) Beltway Reach 8, 7) Beltway Reach 9, 8) Blue Diamond Detention

Basin, 9) Red Rock Reach Segment 10a, and Lower Red Rock Outlet Channel. The Red Rock Detention Basin was originally constructed by Clark County in 1987, and modified as part of the Federal project plan of improvements in 1997. The Flamingo Detention Basin was constructed by Clark County in 1992 and is scheduled for modifications by the Corps by 2004. Projects currently under construction are 1) Upper Flamingo Diversion Channel 2) F-1 Channel – Beltway to Hualapai Way 3) F-2 Channel.

17. CCDPW is constructing a significant expressway called the Las Vegas Beltway. The project channels covered by this DDR runs from the Blue Diamond Detention Basin to the Beltway Channel.

18. Problems and Opportunities. There are two problems as described in the 1991 Feasibility Report that contribute to flooding in the Tropicana-Flamingo Washes project area. These are: 1) inadequate existing channel capacities and flow restrictions such as undersized bridges that cause breakouts in urbanized areas, and 2) flood characteristics on the alluvial fan. Another consideration is the expected extension and the rate of expansion of future development.

19. This last issue is most prominent on the alluvial fan in the area upstream of Flamingo Detention Basin, a portion of which is the subject of this DDR. The Federal project will provide an opportunity to implement a comprehensive flood control plan on the alluvial fan that would meet FEMA requirements and eliminate the requirement for flood insurance. This in turn will reduce ongoing and future development costs required to comply with FEMA and CCRFCD flood control regulations, reduce private land development requirements for flood control, reduce future flood damages on the fan, and be able to account for future urban development drainage requirements.

20. The plan of improvements presented in this DDR has shaped in response to dynamic development and changing needs of the area. Channel alignments are dependent on addressing the cost issues associated with right-of-way requirements and infrastructure developments that are being designed and built concurrently. The following paragraphs describe the Feasibility Report selected plan in the subject area and the results of recent design studies in developing the current alignments for the plan of improvements.

C. Description of Plan of Improvements

21. General. The Feasibility Report studied several alternative solutions for the flooding caused by the Tropicana and Flamingo Washes. The most effective and economically justified method of flood control was determined to be combination of detention, diversion and channelization measures. The plan of improvements presented in this DDR show some revision from the Feasibility Report, selected plan channel alignments, and associated appurtenances. However, the flood control plan concepts have been fulfilled effectively and economically as described in this report.

22. Upper Blue Diamond Diversion Channel. This DDR presents design information for the reach between the Blue Diamond Detention Basin and Las Vegas Beltway Channel. As much as feasible, the channel will be entrenched, open channel to allow side inflows to enter over the channel walls. Channel invert slopes have been selected to avoid excessive channel excavation and maintain stable flow conditions. The channel will convey the peak discharge of the 100-year flood from their tributary watersheds, including inflows along the channel alignments.

23. The Upper Blue Diamond Diversion Channel will be constructed of reinforced concrete. The channel cross sections will be rectangular, or box culverts under roadways and commercial properties. Maintenance roads will be constructed along both sides of the channel where there is no right-of-way constraint.

24. Lateral Channels. The Upper Blue Diamond Diversion Channel will serve as collectors for local drainage systems. The design discharges include these local lateral contributions. The location and the 100-year design flow for side drains and laterals have been coordinated with the Clark County Department of Public Works. Three laterals will be provided: at the Beltway Channel, at Warmsprings Road, and at the Rhoads Ranch Golf Course.

25. In general, the design and construction of the lateral collector channels are a local responsibility. As described in the 1993 Hydrologic Basis for Design, lateral channels should be laid out at approximately one-mile spacings along the section line major street alignments so that damaging flood flows would be prevented in the protected areas bounded by the laterals and the main channel. The design and construction of confluences was determined to be a Federal responsibility in the 1991 Feasibility Report. During the preparation of this DDR, the design of the lateral collector system and confluences was coordinated with the local sponsors.

D. Alternative Design Studies

26. Feasibility Report Recommended Plan. For the Projects covered in this DDR, the 1991 Feasibility Report selected and presented channel alignments that can be characterized generally as following the downward slope to the Red Rock Channel. Refer to Sheet 1 of the subject 1991 Feasibility Report. The Corps 1991 Feasibility Report selected plan is described as follows:

a. The Tropicana Channel (now know as Upper Blue Diamond Diversion Channel) alignment was placed north of Blue Diamond Wash to minimize the length of channel between Blue Diamond Detention Basin and Tropicana Detention Basin.

27. Changes to the Feasibility Report Plan. The conception plan for the Upper Blue Diamond Diversion Channel, as outlined in the Feasibility Report, has been retained. However, based on the detailed analysis and studies performed during the Preconstruction Engineering and Design (PE&D) phase, some modifications have been required. The modifications have generally been confined to changes to the dimensions of channel side slopes and cross sections as required by soil conditions, and by right-of-

way and construction space constraints. The modifications are described below. The channel layout, design, and details are shown on Sheets C1 thru C19.

28. In compliance with Executive Order 12770, dated July 25, 1991, the topographic mapping for this project was converted from inch-pound units to metric units.

29. The trapezoidal channel has been changed to open rectangular channel. A comparative study performed to determine the least project cost substantiates that the use rectangular channel is cost effective. In addition, the rectangular channel will minimize land acquisition along the channel horizontal alignment.

30. The horizontal alignment of the channel has been refined to minimize total project cost. This was accomplished by maximizing the use of the public lands under the jurisdiction of the Bureau of Land Management (BLM). Information regarding this refinement of the alignment was provided by the project sponsors, Clark County Regional Flood control District and Clark County Department of Public Works.

31. Transition curves (spirals) were added between the channel tangents and curve sections to provide better flow conditions through curves.

32. The vertical alignment of the channel was modified to incorporate box channel where the real estate constraint and minimize utility relocations. The refinement of the channel profile was based on real estate and utility information provided by the project sponsors, Clark County Regional Flood Control District and Clark County Department of Public Works. The Street Crossings are provided below.

1. 2 Paved crossings for Rhodes Ranch Main entrance

2. Crossing Intersection of Warmsprings Road and Durango Dr.

3. Crossing at Badura Ave.

4. Crossing at Maule Ave.

5. Crossing Eastbound Frontage Road of Southern Beltway

6. Crossing Future On-Ramp East of Durango Drive

33. The invert access ramp locations are shown on Plan and Profile Sheets. The invert access ramps permit vehicular access during construction and maintenance.

34. Road detours will be added at the 100% submittal. Road detour plans show vehicular access and maintenance during construction of the box culverts at Durango Dr., Warmsprings, and the Beltway access ramp.

35. Changes have been made to the configuration of the collector channel system to conform to the Las Vegas Beltway alignment. These changes, and the resulting change in hydrologic design information, were first documented in the *Tropicana Detention Basin, Outlet Channel Design Memorandum,* dated May 1996. This report reiterates and details of the revised hydrology for this reach of the Blue Diamond Channel. Discharges in the Lower Blue Diamond Channel Reach have increased 50% as result of the new configuration. In addition, several laterals have been removed from the project plan. One confluence structure has been added to connect Culvert H to the main channel. Although the configurations of the channel and laterals have changed, the same protection is offered to the same area.

36. Recommended Plan. The feasibility report plan, including the PE&D design modification, was selected as the recommended plan. Reference is made to the report titled, *Feasibility Report and Environmental Impact Statement, Las Vegas, Nevada,* prepared by the U.S. Army corps of Engineers, Los Angeles District, October 1991; Revised 10 January 1992.

E. Project Features

37. General. The Blue Diamond Channel consists of two reaches: Lower Blue Diamond, Section7A and Section 7B of the Las Vegas Beltway, and Upper Blue Diamond. The Upper Blue Diamond Diversion Channel will be located between the Las Vegas Beltway and the Blue Diamond Detention Basin. The location of this reach of the Blue Diamond Channel is shown on Sheet T1.

38. The downstream end of the Upper Blue Diamond Diversion Channel will connect to the upstream end of Section 7B of the Beltway. The upstream end terminates at the Blue Diamond Detention Basin. From the Blue Diamond Detention Basin to Durango Dr., the channel will stay as a natural wash. From approximately the intersection of the Blue Diamond Wash and Durango Drive, the channel will consist mainly of rectangular reinforced concrete totaling 4206.00m to the upstream end of Section 7B of the Beltway. The rectangular base width varies from 4.27m to 7.98m. The height of the entire channel will vary from 2.74m to 3.1m. See plan and profile sheets for height and width dimensions.

39. Confluence Structures. Three confluence structures are required. One at Rhodes Ranch, one at Warmsprings, and one at Beltway. Each confluence structure will connect lateral culverts to the main channel.

40. Maintenance Roads. Form Sta. 52+06.89 to Sta. 48+40 the maintenance road runs on both sides of the open channel. Per Rhoads Ranch agreement, from Sta. 43+30.73 to 37+35.58, a man-way will be constructed on the west side of the channel. From Sta. 31+04.22 to Sta. 30+18.42 and from Sta. 22+84 to Sta. 21+03, the maintenance road will be constructed only on the west side. From Sta. 17+90 to Sta. 16+40 the maintenance road will be constructed only on the east side. From Sta. 15+62 to 14+10 the maintenance road will be constructed only on the south side and from Sta.

12+80 to 10+00 the maintenance road will be constructed only on the north side of the open channel.

41. Where the maintenance roads are located on both sides of the channel will be constructed of gravel. The gravel road will consist of 0.150m thick aggregate base courses over 0.150-m thick compacted sub-grade with a 2 percent cross slope towards the channel. Some places, where there are right-of-way constraints, man walkways will be provided.

42. Access Roads. Access roads from the street to the maintenance roads will be constructed along the open rectangular channel reaches. Durango Street, south of Windmill and north of Warmsprings is currently unimproved. An improvement of Durango, which includes new pavement and curbs and gutters, is not scheduled until after the Upper Blue Diamond Diversion Channel is constructed. Where the design of future street improvements is unavailable, all access roads will be terminated short of the street right-of-way. These roads will be 5.0-m wide and paved with 3.660 m wide by 0.050 m thick asphaltic concrete underlain by 0.100 m thick aggregate base course.

43. Invert Access Ramps. Three invert access ramps will be constructed along the Upper Blue Diamond Diversion Channel. The locations are shown on the plan and profile sheets.

44. Safety Provisions. Chain-link safety fencing will be placed 6" inside of the right-of-way limits on both sides of the channel. Access gates will be provided for maintenance and rescue purposes. The fencing will be comprised of 1.8929 m high chain-link fabric on 1.93 m high by 0.038 m diameter galvanized steel posts. Sturdy galvanized steel pipe access gates will be provided at the accesses to the maintenance roads along the open rectangular channel reach. Fence details are shown Sheet M1.

45. Per an agreement with Rhoads Ranch developer, an Ornamental Metal Fence will be placed on the channel walls from Sta. 30+18.42 to Sta. 33+65 and Sta. 37+35.58 to Sta. 43+30.73. For the Ornamental Metal Fence detail see Sheet M4, and for specifications, see Spec. Sect. 05502.

46. Safety railings will be placed along the top of the rectangular wall to protect maintenance worker from falling into the channel. Safety railing shall be designed to resist a concentrated load of 3 KN/m in any direction. Safety railing shall be made of 50 mm galvanized steel pipe. Steel pipe shall conform to ASTM A 53 or ASTM a 500, Grade A or B. Intermittent openings along the channel alignment will be provided for access into the channel.

47. Inlet Structure at the upstream end of Concrete Lined Channel. An inlet is required at the upstream end of the concrete channel. The inlet will consist of a 21.44m spillway and 6.0m wide berm. The base of the inlet will be graded to catch the sediment before entering the concrete lined channel. See Sheet S17, Sheet S18 and Appendix A for the detailed design of the inlet.

48. Side Drains. The local sponsor initiated a drainage study of the project area in 2001. The draft drainage study, prepared by VTN Nevada dated November 2001, provides design information for local drainage facilities required along the Upper Blue Diamond Diversion Channel. See Appendix A for location and sizes of the Side Drains. See Sheet S14 for detail.

49. Esthetic Treatment. EM 1110-2-38 provides guidance on the environmental quality aspects of Engineering design of civil works Projects. Esthetic treatment is addressed for the Upper Blue Diamond Diversion Channel, and conceptual esthetic treatment plans have been proposed for the project as described in the Flamingo Diversion Channel subsection, titled "Esthetic Treatment", of section 4., titled "Recommended Plan". Reference is made to Policy Guidance Letter No. 29, dated 15 August 1991, titled *Expenditure on Esthetic Treatment for Civil Works Project.*

50. Relocations. In accordance with the requirements of authorizing legislation, local interests will be responsible for the required relocations of all utilities, roads, and bridges.

51. Utility relocations will consist of: relocation, modification or protection of power, domestic water, sewer, telephone and gas lines. The relocations should be routine and will not present unusual problems influencing the channel vertical and horizontal locations. Ultimate utility locations are closely associated with the recommended construction. Preferable, relocation work will be done before construction of the recommended flood control construction. If it is not done, the relocation work will be carefully phased with the recommended flood control construction schedule to permit simultaneous construction.

52. Pertinent information regarding existing utilities, including proposed treatment, is given on the following Table.

Table 1. Pertinent Information On Utility Relocation

Street	Approximate Center Line Station	Description	Owner	Comments
Warmsprings		36" water	Las Vegas Water District	Protect in Place
Warmsprings		8" Steel Gas Main	Southwest Gas Corp	Relocation by CCDPW

53. Local interests will be responsible for the design and construction (or modification) of roads required for the project. Included will be structures, detours, and the removal and replacement of existing street paving, curbs, sidewalks, and gutters associated with maintenance of road accesses.

F. Post-Authorization Change

54. The recommended plan for the Upper Blue Diamond Diversion Channel is similar in concept and function and not substantially different in location from the feasibility report plan. Therefore, a post-authorization change is not required.

G. Coordination With Others

55. The studies described in this DDR were coordinated with representatives of Clark County Regional Flood Control District, Clark County Department of Public Works, State of Nevada Department of Transportation, Bureau of Land Management, U.S. Fish and Wildlife, and others.

H. Basis for Design

56. See Appendix A for Hydrology and Hydraulics, Appendix B for Geologic Investigations, Appendix C for Civil Design, and Appendix D for Structures.

APPENDIX – A
HYDRAULIC AND HYDROLOGY

HYDRAULIC

UPPER BLUE DIAMOND CHANNEL

Hydraulic Analyses and Design

GENERAL PROJECT DESCRIPTION

1.1 The Upper Blue Diamond Channel is the element of the Las Vegas Wash and Tributaries Project that will connect the Blue Diamond Detention Basin to the Tropicana Detention Basin. This channel consists of the following reaches: Lower Blue Diamond, Section 7A and Section 7B of the Beltway, and Upper Blue Diamond. Only the Upper Blue Diamond Channel will be discussed in this documentation.

There are several components to the Upper Blue Diamond Channel. The Blue Diamond Detention Basin (reference DM, Blue Diamond Detention Basin, April 1998) discharges into the natural wash of the Upper Blue Diamond Channel, which has an approximate length of 3.7 km upstream of the proposed concrete-lined Durango Reach. A grouted riprap berm should be constructed on the left bank of the natural wash approximately 2.0 km upstream of the Upper Blue Diamond Channel, Durango Reach. The natural wash should connect to the Upper Blue Diamond Channel, Durango Reach by means of an inlet structure. Downstream of the inlet structure, the recommended Upper Blue Diamond Channel, Durango Reach consists of a 4.2 km concrete lined channel intended to provide 100-yr flood protection, with a scheduled construction start date in 2003. The proposed channel varies with respect to the natural wash due to right of way, utility, and grading constraints. The Upper Blue Diamond Channel, Durango Reach connects to Section 7B of the Beltway Channel (reference DM, Lower Blue Diamond Diversion Channel, August 1997). Confluences are recommended at Rhodes Ranch (station 23+02.2), Warm Springs (station 16+45.5), and near the Beltway (station 4+10). All units are metric unless otherwise noted.

DIFFERENCE FROM FEASIBILITY DESIGN

1.2 The alignment of the channel has slightly changed from the design in the 1991 feasibility report due to right of way constraints and local sponsor preferences.

EXISTING CONDITIONS

1.3 The Upper Blue Diamond Channel follows an existing wash on an alluvial fan. Currently, there is minimal development in this area. However, development is rapidly increasing. Hydrologic and hydraulic analyses of existing conditions are presented in the 1991 subject feasibility report and the associated 1991 technical documentation report (LAD, USACE, 1991).

HYDRAULIC DESIGN CRITERIA

1.4 The hydraulic design of the Upper Blue Diamond Channel was based mainly on the Corps of Engineers design criteria and procedures set forth in EM 1110-2-1601, Hydraulic Design of Flood Control Channels, herein after referred to as EM 1110-2-1601. Additional

references are noted in paragraph 1.51. The channel was designed to satisfy the specific project requirements while adhering to applicable accepted hydraulic design criteria. The resulting project configuration and dimensions are within the range for which general hydraulic design criteria is applicable. Therefore, physical model testing is not necessary to verify the adopted project designs. Additionally, the local sponsor requested and received a waiver from the Corps to conduct the design based on previous traditional methods rather than on a risk-based analysis.

BASIS FOR HYDRAULIC DESIGN

Datum/Unit Conversion

1.5 Collection of topographic information by the photogrammetric method for the Upper Blue Diamond, Durango Reach site was completed in 2001. Horizontal control is based on North American Datum of 1983 (NAD 83), and vertical control is based on North American Vertical Datum of 1988 (NAVD 88). The topographic mapping is in metric units (1 m = 3.28 ft, 0.305 m = 1 ft) in compliance with Executive Order (EO) 12770 dated 25 July 1991, "Metric Usage in Federal Government Programs".

Hydrology

1.6 The basis of hydrologic design is documented in Appendix A-1.

Embankment Height Criteria

1.7 Deposition - The Corps of Engineers design guidance for debris basins requires that the structure be sized to store the entire design volume of debris below the spillway crest. The guidance recommends that the slope of the debris deposition extending upstream from the spillway crest be assumed as one-half of the natural channel slope. The amount of excavation and spillway crest elevation are then determined by trial to provide the necessary storage volume between the plane defined by the assumed debris slope and the excavated surface and/or existing ground.

1.8 Sediment Storage Capacity - The height of the spillway crest and embankment were established in conjunction with the upstream excavation to provide the design volume for sediment deposition below the spillway crest.

1.9 Freeboard - The Corps guidelines for debris basins set forth a freeboard requirement of 1.52 meters above the elevation of the Probable Maximum Flood (PMF) for the top of the embankment. Due to the cost minimization and inlet structure sizing objectives, and due to the size of the PMF event (4100 cms), this criteria was not adhered to.

1.10 Spillway Configuration - The spillway length and configuration are directly related to the embankment height. The shorter the spillway length, the higher the head required to pass the design discharge, and consequently, the higher the embankment height. Conversely, the longer the spillway length, the lower the embankment height may be. Since concrete costs are

substantially greater than earthwork costs, and a longer converging chute is required for wider spillways, it is more economically practical to make the spillway narrow.

Low-Level Outlet Works Capacity

1.11 Based on Handbook of Hydraulics, Equation 4-18 (Brater and King, 1976), the amount of time (t) required to lower the water stored behind the debris basin a specified distance (y) can be approximated using the following equation:

$$dt = \frac{A\,dy}{Ca\sqrt{2gy}}$$

where:

dt = increment of time
A = area of water surface for a depth y
dy = infinitesimal vertical distance
C = coefficient of discharge
a = area of orifice
g = gravitational constant
y = depth

Because the water surface area varies with depth, HEC-1 was used to estimate the drain time through the outlet tower based on a synthetic 100-yr hydrograph and storage, elevation, and outflow information.

Low-Level Outlet Conduit

1.12 The EM-1110-2-2902 "Engineering and Design-Conduits, Culverts, Pipes," recommends pipe through small dams should be concrete pressure pipe, steel cylinder type. The EM specifies reinforced concrete pipe with bell and spigot joint may be used in less critical areas.

Alignment

1.13 Local interests provided all rights-of-way for the proposed channel. All alignment revisions were coordinated with the local sponsor. Generally, horizontal curves were used for deflection angles greater than three degrees and omitted for smaller deflection angles, which is accepted Los Angels District practice.

Water Surface Profile Model

1.14 The design water surface profile was calculated using the computer program WS1D (LAD, USACE 1995), a modified version of WASURO. The water surface profile is the variation in flow depth with respect to length along the channel reach. The calculation of water surface profiles in WS1D (WASURO) is based on the energy principle. The WS1D program computes water surface profiles by both the direct and standard step methods using Manning's formula to estimated friction losses. WS1D utilizes the Standard Step Method to calculate the

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water surface profile within a transition. The channel was designed to flow in the stable supercritical range along the entire reach. Unstable flow in the supercritical regime occurs when the depth exceeds 90% of critical depth or when the Froude number is less that 1.1.

Air Entrainment

1.15 In the supercritical flow regime, turbulent flows can cause air to become entrained, decreasing flow density and increasing volume. WS1D accounts for air entrainment following guidance in EM 1110-2-1601 and produces water surface elevations that include entrained air.

Transition Losses

1.16 The convergence and divergence rates are presented in Table 2-2 of EM 1110-2-1601. These values were based on previous model studies and account for velocity changes, stationary waves, and other hydraulic disturbances that may increase the water surface. All transitions design for this project meet Corps of Engineers hydraulic design criteria.

Channel Geometry

1.17 The channel was designed with a minimum base width of 3.05 m, as requested by the local sponsor for ease of maintenance. The channel transitions were designed in the supercritical flow reaches with the recommended rapid flow transition rates as presented in EM 1110-2-1601. The transitions converge or diverge on a straight line at a minimum flare ratio of 1:15 or 1:20 (horizontal to longitudinal), depending on the channel velocity at the transition.

Channel Roughness Coefficients

1.18 The channel was designed using two design values of Manning's roughness coefficient. An n-value of 0.014 was used to compute the design water surface profile. This profile was used to set the wall heights, including the appropriate freeboard. An n-value of 0.012 was used for a high estimate of velocities, resulting in the controlling values for minimum transition rates, minimum spiral curve lengths, and minimum curve radii. These n-values have been historically accepted as appropriate for the design of concrete channels by the Corps of Engineers, Los Angeles District. This criteria was upheld in a memorandum dated 18 December 1962 by Robert W. Fritz, Colonel, Assistant Director of Civil Works for Civil Works, Subject: Design Roughness Value for Concrete Channels. The Corps of Engineers EM 1110-2-1601 was revised subsequent to the memorandum, and recommends using the equivalent boundary surface roughness (k) values of 0.002 and 0.007 to compute the roughness coefficient, which results in n-values of approximately 0.013 and 0.015. However, field studies of prototype flows in concrete-lined flood control channels conducted in the Los Angeles District and documented in Appendix B-I of Los Angeles River Design Memorandum No. 3 (LAD, USACE, 1997) have shown that n-values of 0.012 and 0.014 are more appropriate. Note that the impact of bed-material movement on the hydraulic roughness was considered insignificant due to the lack of bed-material load present in the flow as discussed in paragraph 1.50.

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Wall Heights

1.19 To account for the hydraulic uncertainties discussed in Section 2-6.a. of EM 1110-2-1601, the minimum top of wall elevations were set 0.60 m above the computed design water surface profile for rectangular sections. As stated in EM 1110-2-1601, if the total rise in water surface due to superelevation and surface disturbances is less than 0.15 m, then the normally determined channel freeboard should be adequate and no additional wall heights or invert banking is required.

Superelevation

1.20 Water surface superelevation (Δy) through the curves was determined by the methods outlined in EM 1110-2-1601, using the following equation:

$$(\Delta y) = C\frac{V^2W}{gr}$$

where:

C = superelevation coefficient,
V = mean channel velocity,
W = channel width at the elevation of center-line water surface,
g = acceleration of gravity, and
r = radius of channel center-line curvature.

Using Table 2-4 of EM 1110-2-1601, the value of C was determined to be 0.5 for the rapid flow, rectangular sections with spiral curves; the value of C was determined to be 1.0 for rapid flow, rectangular sections with simple curves.

Spiral Transitions

1.21 Spiral transitions are required on the upstream and downstream ends of curves when the calculated superelevation is greater than 0.15 m. The required length of the spiral is calculated based on the following equation found in EM 1110-2-1601:

$$L_S = 1.82\frac{VW}{\sqrt{gy}}$$

where:

V = mean channel velocity,
W = channel width at the elevation of center-line water surface,
g = acceleration of gravity, and
y = straight channel flow depth

Bridges and Culvert Crossings

1.22 The road crossings will be clear-span culverts without piers to eliminate the potential for undesirable flow conditions created by a bridge pier placed in supercritical flow. Since the

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design wall heights incorporate freeboard of 0.60 m above the computed water surface, pressure flow should not occur under the bridges during the design event.

Side Drain Connections

1.23 All future side drains connections (i.e., pipes, culverts, etc) must be designed with an angle of entry that minimizes flow disturbances within a channel caused by a sudden increase in side inflow (LAD, USACE, 1998). Ideally, for supercritical flow conditions (high velocity), the suitable angles of entry are listed below:

Pipe Size	Angle of Entry
Up to 0.61 m	90°
0.61 m to 0.91 m	60°
0.91 m to 1.52 m	45°
1.52 m and over	30°

In addition, a minimum of 1.22 m submergence from the top of the pipe to the design water surface should be used in the design to help minimize flow disturbances caused by a sudden increase in channel discharge. The invert elevation of the side drain should be a minimum of 0.15 m above the channel invert elevation to minimize debris blockage conveyance restrictions.

Confluences

1.24 The confluences for Upper Blue Diamond Channel were designed with a zero angle of entry. Although EM 1110-2-1601 permits angles of entry up to 12 degrees, the zero degree angle of entry is the optimum hydraulic condition. The length of the confluence was designed to be twice the width of the channels at the end of the divider wall. This method was based on previous model studies of the Los Angeles River.

HYDRAULIC DESIGN DETAILS

Upper Blue Diamond Channel, Natural Wash

Erosion Protection

1.25 The recommended erosion protection was a result of a study initially requested by the local sponsor. The purpose of the berm would be to prevent erosion along a section of the wash channel that could cause flood damage outside of the project right-of-way. The grouted riprap berm should be constructed on the left band approximately 2.03 km (1.26 miles) upstream of the Durango Reach along the Upper Blue Diamond Channel. The toe of the berm should be set to elevation 866.95 m to provide sufficient toe protection from the 100-yr discharge as well as more frequent events. A top of berm elevation of 870.0 m would readily terminate to the existing grade and would potentially minimize flooding outside of the project footprint. Plates XXX-XXX show the location of the proposed berm and the general design details. The criteria used for design as well as the dimensions of the proposed berm are shown in Table 1.

Table 1: Upper Blue Diamond Channel, Natural Wash Berm Features

Design Feature	Information, Source, Assumption, etc.
Discharge = 39.6 cms (1400 cfs)	Approximate 100-year discharge from BDDB design.
Area = 150.75 square meters	Channel Section (Trapezoidal Estimate)
Slope = 0.016 m/m	Topo Maps
Manning's "n" = 0.035	Channel Topography
Normal Depth = 1.2 m	Manning's Equation (Trapezoidal Section)
Min. Channel Elev.	868.2 m From Topo Maps
Toe Protection	1.25 m (4.1 ft)
Berm Top Elevation	870 m
Berm Bottom Elevation	866.95 m
Berm Length	53.85 m (176.7 ft)
Berm Height	3.05 m (10 ft)
Berm Top Width	1.37 m (4.5 ft)
Berm Front Slope (2:1)	Layer Thickness 0.61 m (24 in) Grouted Riprap
	Minimum = 1.5*d(50)=0.46 m (18 in) +Factor of Safety
	d(100) = 0.61 m (24 in) riprap (ChanPro Software)
Berm Back Slope (3:1)	Earth Fill

Upper Blue Diamond Channel, Inlet Structure

Site

1.26 The recommended Upper Blue Diamond Channel Inlet Structure will control sediment from a drainage area of 4.8 square kilometers (not including a drainage area of 174.2 square kilometers from Blue Diamond Detention Basin). The location and configuration of the inlet structure are key factors in satisfying the objectives of the project. The location of the inlet structure was set immediately upstream of the Upper Blue Diamond Channel, Durango Reach to protect the concrete lined channel from sediment entering the channel. The site is located on BLM property upstream of private property.

Sediment Volume

1.27 The Upper Blue Diamond Channel Inlet Structure is designed to store the 100-year sediment volume of 14,190 cubic meters based on Upper Blue Diamond Comparison of Alternatives (Montgomery Watson, December 1998). The maximum pond volume of the designed inlet structure is 14,570 cubic meters.

Balanced Earthwork

1.28 The inlet structure site is located on BLM property. Since BLM maintains the mineral rights, excess materials cannot be removed from the site without authorization from BLM. Therefore, the amount of excavation for debris storage and embankment construction, and the amount of fill in the embankment, are designed to be close to a balance.

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Embankment Height

1.29 The minimum top of embankment elevation is 840.0 m, which is 1.7 m above the peak 100-yr pool elevation of 838.3 m. The maximum height of the embankment is approximately 3.3 meters above existing grade (reference profile of Upper Blue Diamond Channel Inlet Structure) and approximately 5.0 m above the toe of downstream compacted fill.

Grading

1.30 The recommended grading for the Upper Blue Diamond Channel Inlet Structure is a straight alignment across the natural wash. It consists of an earthen embankment with a 6.0 m wide crest, with 2 percent cross slope downward toward the basin. The upstream embankment slope is 5:1 (horizontal : vertical). The downstream embankment, is 6:1 for the dam embankment compacted fill, with miscellaneous fill placed on the face at a milder slope. The milder slope will help balance the earthwork, improve aesthetics, and allow for re-vegetation of the downstream face of the embankment. The slope on the basin floor is 3 percent downward toward the bottom of the basin and 6 percent upward toward the channel spillway. Cut slopes where inflow is not expected to occur are 6:1.

Slope Protection

1.31 Slope protection will be provided on the upstream embankment face. The protection will be soil cement. The soil cement on the upstream embankment will be sized based on minimum thickness recommendations. The downstream embankment face will be mildly sloped (6:1 horizontal to vertical) and re-vegetated in accordance with BLM guidelines.

Low-Level Outlet Works

1.32 The low-level outlet works for the Upper Blue Diamond Channel Inlet Structure will consist of an outlet tower and conduit to drain the basin. The principal outlet from the basin is the spillway. The outlet tower is a 1.219 m by 1.219 m box riser. The riser has 76 mm diameter PVC pipe openings spaced at 305 mm increments horizontally, and 610 mm increments vertically, with the elevations staggered on adjacent sides of the box, to provide openings at elevation increments of 305 mm. The top of the tower is at elevation 837.5 m, 1 m above the spillway crest. There is a grate on top of the tower.

Low-Level Outlet Works Capacity

1.33 The peak discharge through the outlet tower and over the spillway is approximately 40 cms. A 100-yr synthetic hydrograph was routed through the intake structure and over the spillway (reference Hydrology Section). The estimated drain time through the outlet tower and over the spillway is approximately 13 hours. Therefore, even after a major event, the basin will drain relatively quickly. The stage-discharge relationship for the outlet tower was based on applying the orifice equation to each opening in the tower with consideration of the differential head between the outside of the tower and the inside of the tower, and the capacity of the outlet conduit.

Low-Level Outlet Conduit

1.34 Since the debris basin is normally dry, and only detains water during infrequent events, and since the principal outlet for the debris basin is the service spillway, a steel cylinder type pipe was not used. Pre-cast pipe was not used because it requires special fabrication to provide extra cover over reinforcement. The proposed outlet is a 0.914 m by 0.914 m cast-in-place box. The invert elevation of the box at the outlet tower is 834.1 m. The box is on a slope of 0.008. The total head to the centerline of the box during a 100-year event is approximately 3.7 m (assuming 838.3 m upstream water surface elevation). The length of the box from the outlet tower to the Upper Blue Diamond Channel, Durango Reach is approximately 135 m.

Spillway

1.35 An embankment height that met the constraints of the topography and limits of property lines was selected and resulted in a spillway crest width of 6.1 meters. The spillway crest will be set to elevation 836.2 m and will function as a broad crested weir. The same spillway was designed to pass the 100-year flood discharge of 42.5 cms. The converging chute transitions from 6.1 meters wide to 3.05 meters wide in 100 meters (33:1).

Upper Blue Diamond Channel, Durango Reach

Horizontal Alignment

1.36 The horizontal alignment of the Upper Blue Diamond Channel, Durango Reach was based on the local sponsor's preference to optimize the available lands. The minimum curve radii and minimum spiral length requirements were calculated based on water surface profiles computed with an n-value of 0.012. The locations of the curves and their associated spiral transition curves are summarized in Table 2. Spiral transition curves were included upstream and downstream of most circular curves to minimize the effects of cross-waves, as recommended in the Corps criteria. Sufficient additional freeboard was added where the maximum superelevation along the curve was greater than 0.15 m. All curves meet the minimum radius criteria as presented in EM 1110-2-1601.

Table 2 Upper Blue Diamond Channel , Durango Reach Channel Horizontal Curve Data

Curve Stationing	C	Maximum S.E. (m)	Radius (m)	Unbanked Spiral Length (m)	Banked Spiral Length (m)
39+75.42 to 37+59.53	0.5	0.07	175	20	-
27+08.27 to 26+54.58	0.5	0.07	200	15	-
26+47.91 to 25+88.6	0.5	0.08	200	20	-
24+49.06 to 23+99.41	0.5	0.08	200	15	-
23+87.62 to 23+37.73	0.5	0.07	200	15	-
18+73.17 to 18+09.34	0.5	0.09	250	25	-
15+76.94 to 15+19.66	0.5	0.10	200	25	-
7+27.23 to 4+13.55	0.5	0.14	200	30	-

Table 2A: Rhodes Ranch Lateral Horizontal Curve Data

Curve Stationing	C	Maximum S.E. (m)	Radius (m)	Unbanked Spiral Length (m)	Banked Spiral Length (m)
1+58.47 to 1+38.81	1.0	0.14	100	-	-
1+06.05 to +09.08	0.5	0.17	55	15	-

Table 2B: Warm Springs Lateral Horizontal Curve Data

Curve Stationing	C	Maximum S.E. (m)	Radius (m)	Unbanked Spiral Length (m)	Banked Spiral Length (m)
1+02.62 to +09.98	0.5	0.12	[illegible]	[illegible]	-

Table 2C: Beltway Lateral Horizontal Curve Data

Curve Stationing	C	Maximum S.E. (m)	Radius (m)	Unbanked Spiral Length (m)	Banked Spiral Length (m)
1+93.81 to +06.7	1.0	0.01	650		-

Vertical Alignment

1.37 The vertical alignment was coordinated with Civil Design, Section B, USACE to ensure not only hydraulic acceptability, but also that local sponsor concerns and civil design issues were accommodated. Grade breaks were designed to produce stable flows in the supercritical flow range resulting in invert slopes varying from 0.00854 to 0.03178 m/m along the channel reach as presented in Table 3. The channel was designed to be incised within the existing ground resulting in both boxed and open channel reaches, depending on the topography. The channel alignment considered future overbank grading to allow overland flow to enter open channel reaches. The vertical alignment was designed to minimize utility relocations, balance cut and fill quantities, allow sufficient maintenance access, and incorporate future bridge crossings.

Channel Cross-Sections

1.38 Table 3 summarizes the channel cross sections in terms of base width and channel type. Base widths range from 3.05 m to 7.62 m. The channel cross sections are rectangular, box, or transitional. The locations of the transitions along the channel are summarized in Table 3. The transitions are of the wedge type as described on page 2-8 and pictured in plate 19 of EM 1110-2-1601. The channel sections at the bridge crossings are rectangular box.

Bridge Crossings

1.39 Table 4 summarizes the bridge crossing stationing.

Table 4: Bridge Crossing Stationing

Bridge Crossing	Beginning Station	Ending Station

Water Surface Profile Computations

1.40 The design water surface profile from station 41+90.28 (upstream) to station 0+00.00 (downstream) was calculated using the computer program WSTD, as mentioned in paragraph 1.13. Critical depth was assumed to be a conservative starting depth at the upstream end of the inlet structure chute. The invert elevation at the upstream end of the inlet structure chute (station 41+90.28) is 836.20 m. The invert elevation at the downstream end of the chute (station 40+90.28) is 833.02 m. The downstream end of Upper Blue Diamond Channel, Durango Reach (station 0+00.00) connects to the upstream end of the Beltway Channel (station 242+50.00), at invert elevation 779.16 m. The upstream end of the Beltway Channel is a 5.48 m wide by 3.05 m high rectangular box channel. The flow regime is supercritical for the entire length of the channel (with the model starting at critical depth); the computed Froude numbers ranged from 1.0 to 2.94.

Design Depths and Velocities

1.41 The maximum computed depth is 2.94 m and occurs at station 30+74.09. The minimum computed depth is 1.20 m and occurs at station 3+95.4. The maximum velocity is 9.36 m/s and occurs at station 25+01.06. Values in this paragraph are all based on a design n-value of 0.014. A discussion of roughness coefficient selection is located in paragraph 1.18.

Wall Heights

1.42 The wall heights were designed to contain the computed water depths/water surface profile and meet the minimum freeboard requirements described in EM 1110-2-1601 (reference paragraph 1.19). The wall heights were higher than required in some locations to allow for ease of construction. The minimum wall height for covered (box) sections is 3.05 m, as requested by the local sponsor, to allow vertical access for maintenance vehicles. The Upper Blue Diamond Channel, Durango Reach wall heights vary from 2.6 m to 3.6 m, as summarized in Table 3.

Peak Discharges

1.43 The design water surface profile was calculated using the computer program WS1D (LAD, USACE 1995), a modified version of WASURO. The specified discharge value indicated at each concentration point (CP) was used as the design discharge for the channel reach upstream of that concentration point (to appropriate station in WS1D model) to account for local future side drain inflows along the channel without compromising the design channel capacity. The discharges and the stations of the discharge changes are shown in Table 5.

Table 5: Upper Flamingo Diversion Channel Peak Discharges

Station	Q (cms)	Remarks
41+90.28 to 23+02.2	62.3	Station 41+90.28 is the u/s end of model. Station 23+02.2 is CP point at confluence with Rhodes Ranch Lateral.
23+02.2 to 16+45.5	65.1	Station 16+45.5 is CP point at confluence with Warm Springs Lateral.
16+45.5 to 4+10.0	74	Station 4+10.0 is CP point at confluence with the Beltway Lateral.
4+10.0 to 0+00.0	74	Station 0+00.0 is d/s end of model where UBDC, Durango Reach connects to Section 7B of the Beltway Channel.

Based on the peak model results, a table of pertinent data and hydraulic elements was assembled. The Rhodes Ranch, Warm Springs, and Beltway confluences were modeled separately for the different hydrologic scenarios described below.

Lateral Confluence Design

1.44 Three lateral confluences were designed for the Upper Blue Diamond Channel. The horizontal and vertical alignments for the laterals were coordinated with Civil Design, Section B, USACE to ensure not only hydraulic acceptability, but also that local sponsor concerns and civil design issues were accommodated. The laterals will be constructed to the project ROW limits. The local sponsor will be responsible for connecting to the laterals during future development, which is not part of this project.

The Rhodes Ranch lateral is designed to connect to the Upper Blue Diamond Channel at station 23+02.2. The maximum lateral design discharge is 36.8 cms. The base width is 3.05 m. Table 3A contains the pertinent data and hydraulic elements for the Rhodes Ranch lateral. The Warm Springs lateral is designed to connect to the Upper Blue Diamond Channel at station 16+45.5. The maximum lateral design discharge is 25.5 cms. The base width is 3.05 m. Table 3B contains the pertinent data and hydraulic elements for the Rainbow lateral. The Beltway lateral is designed to connect to the Upper Blue Diamond Channel at station 4+10.0. The maximum lateral design discharge is 17.1 cms. The base width is 1.83 m. Table 3C contains the pertinent data and hydraulic elements for the Beltway lateral.

WSID was used to compute the water surface elevations downstream of the confluences based on one-dimensional momentum principles. The confluences were modeled with their corresponding discharge combinations for each storm centering (see Hydrology Appendix). The three scenarios are as follows:

Scenario 1. Peak discharge in the lateral channel; coincident discharges in the main channel above and below the confluence.

Scenario 2. Peak discharge in the main channel above the confluence; coincident discharges in the lateral channel and in the main channel below the confluence.

Scenario 3. Peak discharge in the main channel below the confluence; coincident discharges in the lateral channel and the main channel above the confluence.

The wall heights downstream of the confluence were designed to contain the highest water surface produced by modeling the various combinations at the confluences.

Rhodes Ranch Confluence

1.45 Three different confluence scenarios were modeled for the Rhodes Ranch Confluence. The three scenarios were modeled using WS1D. For each scenario, the hydraulics were found to be acceptable (Froude numbers were >= 1.13 and transitioned without significant disturbances or discontinuities). Scenario 2 produced the most conservative results in terms of the highest water surface profile through the confluence. For Scenario 2, the flow depths/water surface profiles from the confluence model results were higher than the flow depths/water surface profiles from the peak model results downstream of the confluence from station 23+02.2 to 20+45.78.

Table 6: Rhodes Ranch Confluence Discharges

Scenario	Q (u/s) cms	Q (lateral) cms	Q (d/s) cms
1	22.6	34	56.6
2	32.6	29.7	62.3
3	25.5	36.8	62.3
Peak	62.3	-	65.1

Warm Springs Confluence

1.46 Three different confluence scenarios were modeled for the Warm Springs Confluence. The three scenarios were modeled using WS1D. For each scenario, the hydraulics were found to be acceptable (Froude numbers were >= 1.13 and transitioned without significant disturbances or discontinuities). Scenario 1 produced the most conservative results in terms of the highest water surface profile through the confluence. For Scenario 1, the flow depths/water surface profiles from the confluence model results were higher than the flow depths/water surface profiles from the peak model results downstream of the confluence from station 16+45.5 to 16+30.2.

Table 7: Warm Springs Confluence Discharges

Scenario	Q (u/s) cms	Q (lateral) cms	Q (d/s) cms
1	39.6	25.5	65.1
2	48.1	17.0	65.1
3	48.1	17.0	65.1
Peak	65.1	-	74

Beltway Confluence

1.47 Three different confluence scenarios were modeled for the Beltway Confluence. The three scenarios were modeled using WS1D. For each scenario, the hydraulics were found to be acceptable (Froude numbers were >= 1.13 and transitioned without significant disturbances or discontinuities). Scenario 1 produced the most conservative results in terms of the highest water surface profile through the confluence. For Scenario 1, the flow depths/water surface profiles from the confluence model results were higher than the flow depths/water surface profiles from the peak model results downstream of the confluence from station 4+10.0 to 0+00.0.

Table 8: Beltway Confluence Discharges

Scenario	Q (u/s) cms	Q (lateral) cms	Q (d/s) cms
1	56.6	17.1	73.6
2	65.1	8.5	73.6
3	65.1	8.5	73.6
Peak	73.6	-	73.6

Side Drains

1.48 Reinforced concrete pipes (RCPs) and concrete overflow side channels were designed to connect local drainage to the Upper Blue Diamond Channel, Durango Reach, as shown in Table 9. The angles of entry for the RCPs and the inverts of the RCPs relative to the channel inverts were designed to sufficiently meet LA District COE design criteria. The total depths at each RCP station within open sections (and within closed sections four channel widths or less from a downstream open section) sufficiently met minimum LA District COE design criteria (0.15 m channel invert to side drain invert + pipe diameter/box height + 1.22 m side drain soffit to channel water surface <= water surface depth) as described in paragraph 1.23. The concrete overflow side channels were designed to sufficiently meet LA District COE design criteria.

Table 9: Upper Blue Diamond Channel Side Drain Information

Inflow Station	Road Crossing	Pipe Size, m	Angle of Entry	Discharge, m³/sec (cfs) Design/Existing	Height, Above Invert, m	Channel Section
37+36.6	Shelbourne Ave	1.372 (54") RCP	45	5.72 (202)	0.15 (6")	Open
33+20.7	Windmill Lane	0.762 (30") RCP	60	0.93 (33)	0.15 (6")	Open
32+90.3	Windmill Lane	0.762 (30") RCP	60	0.93 (33)	0.15 (6")	Open
?	Rhodes Ranch Phase III (south)	Concrete Overflow	-	2.75 (97)	-	Open
?	Rhodes Ranch – Phase III (north)	Concrete Overflow	-	1.90 (67)	-	Open
25+70.2	Rhodes Ranch Parkway	0.762 (30") RCP	60	1.39 (49)	0.15 (6")	Box
24+94.2	Rhodes Ranch – Parkway	0.762 (30") RCP	60	1.39 (49)	0.15 (6")	Box
23+02.2	Rhodes Ranch Lateral – Golf Course	3.05 x 3.05 (10'x10') RCB	0	36.8 (1300)	0	Box
?	Rhodes Ranch Phase II (south)	Concrete Overflow	-	2.15 (76)	-	Box
?	Rhodes Ranch – Phase II (north)	Concrete Overflow	-	0.82 (29)	-	Box
16+45.5	Warm Springs Lateral	2.74 x 3.05 (9'x10') RCB	0	25.5(900)	0	Box

Inflow Station	Road Crossing	Pipe Size, m	Angle of Entry	Discharge, m^3/sec (cfs) Design/Existing	Height Above Invert, m	Channel Section
12+68.3	Arby Ave.	0.610 (24") RCP	60	0.85 (30)	0.15 (6")	Box
8+68.4	Maule Ave.	0.914 (36") RCP	45	0.88 (31)	0.15 (6")	Box
8+68.4	Maule Ave.	0.914 (36") RCP	45	1.27 (45)	0.15 (6")	Box
8+68.4	Maule Ave.	0.914 (36") RCP	45	0.40 (14)	0.15 (6")	Box
4+10.0	Beltway Lateral	1.83 x 2.60 (6'x8.5') RC Channel	0	17.1 (600)	[illegible]	Open

The above inlet locations, pipe sizes, and discharges should be considered preliminary.

Interior Drainage

1.49 With few exceptions the entire channel is fully entrenched and should not induce any local ponding problems. Areas where the overbanks are situated below the tops of the walls will be filled and brought up to the required grade to allow unconcentrated side flows to enter the channel.

Sediment Transport

1.50 Sediment inflow is an important consideration since deposition of sediment could affect the roughness of the concrete channel as well as reduce the effective channel depth. It is reasonable to expect a negligible bed material load because of the existing upstream detention basin, the proposed upstream inlet structure, and the high degree of urbanization of the intervening watershed. Therefore, as mentioned in paragraph 1.17, no increase in the design n-value of 0.014 to account for the effects of bed material loads was necessary.

Interim Conditions

1.51 A check was made to ensure that the water would not overtop the channel walls during the interim condition. The interim condition occurs when the channels have been completed, but the lateral collector channels located outside the main channel right-of-way limits have not been constructed. The project channels, debris basins, and detention basins will control flood flows and the corresponding sediment loads along all of the significant watercourses upstream of the area to be protected. Inspection of the project map, which was prepared from reduced USGS quadrangle topographic maps, clearly indicates that no significant, well-defined channels will exist on the intervening drainage area for the interim conditions. However, the watercourses will consist of swales and small channels typical of undeveloped desert alluvial fans. These watercourses by themselves are generally not capable of transporting large bed material loads, or at least not as large as could be transported by the high-velocity concrete channels. Any bed

material that is transported to the improved channels during interim conditions is therefore not expected to significantly impact the hydraulic capacity. Even if the inflowing sediment load were to slightly increase the hydraulic roughness, the channels will still convey the project design flood in the freeboard zone up to the top of the walls. This conclusion was verified with WS1D water surface profile computations using a Manning's n-value of 0.017. This value is sufficient to reflect the slight increase in roughness that could be expected from the relatively minor amounts of gravel, cobbles, or boulders that would be transported along the bottom of the channels.

REFERENCES

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draft

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draft

HYDROLOGY

Las Vegas Wash and Tributaries

Tropicana and Flamingo Washes

Las Vegas, Nevada

DESIGN MEMORANDUM

LOWER BLUE DIAMOND – DURANGO CHANNEL

HYDROLOGY APPENDIX

Department of the Army

Los Angeles District, Corps of Engineers

Los Angeles, California

January, 2004

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HYDROLOGY APPENDIX

1. GENERAL

1.1 Scope.

This appendix documents specific hydrology for the Blue Diamond Channel from downstream of lateral BD-4 (Jones Lateral at the Beltway), upstream to the Blue Diamond Detention Basin. This report updates the "Design Memorandum, Tropicana Detention Basin and Outlet Channel". Changes contained in this report do not affect the Tropicana Detention Basin design or the Lower Blue Diamond Channel.

1.2 Previous Studies.

The Corps of Engineers has published several reports documenting the Las Vegas Wash & Tributaries, Tropicana and Flamingo Washes, Nevada study area. Pertinent ones are listed below.

a. Technical Documentation Report, dated October 1991.

b. Hydrologic Basis for Design, dated June 1993.

c. Tropicana Detention Basin and Outlet Channel Design Memorandum, dated June, 1996.

d. Lower Blue Diamond Diversion Channel Design Memorandum, dated August 1997.

e. Blue Diamond Detention Basin Design Memorandum, dated April 1998.

1.3 Background Information.

Hydrologic information, such as general description of the drainage area, precipitation and runoff, reservoir design and spillway design flood determination, sediment yield estimation, and collector system main and lateral channels were given in reference 1.2a, herein called the 1991 Technical Documentation. Design information for the collector system, including Upper Blue Diamond Channel, was reviewed and refined as necessary and documented in reference 1.2b, herein called the 1993 Hydrologic Basis for Design.

1.4 Changes in Design.

The Blue Diamond Channel was realigned in the mid 1990's. This change is documented in

reference 1.2c and 1.2d. Drainage area maps are presented on Plates 1, 2, and 3.

1.5 Blue Diamond Channel Reaches.

Since 1993 Basis For Design, the Blue Diamond Channel has been separated into 4 sections: the Blue Diamond Wash from Blue Diamond Detention Basin to the Beltway, the Blue Diamond Channel Durango Reach along Durango Rd. and between the Wash and the Southern Beltway, the Blue Diamond Beltway Channel along the Beltway, and the Lower Blue Diamond Channel from the Beltway to Flamingo Detention Basin (Plate 2). This report includes the Wash and Durango Reaches. The Beltway Reach is included in tables and plates because no formal document was published for this reach since the County constructed it. This report does not include the Lower Blue Diamond Channel that was published in a DM dated August 1997.

1.6 Other Changes in Design.

Since the 1993 Basis for Design, changes that do not affect the Blue Diamond Diversion Channel are as follows. The Red Rock Channel and laterals were revised and modeled in detail in FY 1997. The R-4 Debris Basin has been redesigned as a detention basin.

1.7 Recent Changes to Design.

Three changes to design were made since the last documentation of the Blue Diamond Channel. The first is that the Blue Diamond Detention Basin design location was moved upstream (ref. 1e). The second was that a culvert under the same dam was included to allow a 1.01 sq.mi. interior drainage area to pass under the dam. The third was the inclusion of the Rhodes Ranch Development currently under construction.

1.7.1 ***Blue Diamond Detention Basin Relocation.*** The Blue Diamond Detention Basin was relocated ¼ mile upstream from the 1993 location for design reasons. This added approximately .41 sq.mi. of uncontrolled drainage area to the Blue Diamond Diversion Channel. This change was incorporated into the final hydrology for the reach of channel between the Blue Diamond Dam and the Rhodes Ranch Inlet (inclusive, CP 10). Downstream of CP 10 this change was insignificant and so not incorporated into the analysis presented in this report.

1.7.2 ***Culvert Under Blue Diamond Detention Basin.*** During the final design of the Blue Diamond Dam, a culvert was included in the design that allowed drainage from 0.6 sq.mi. to flow without retention through the dam. This change too was incorporated into the final hydrology for the reach of channel between the Blue Diamond Dam and the Rhodes Ranch Inlet (inclusive, CP 10). Downstream of CP 10 this change was insignificant and so not incorporated into the analysis presented in this report. Please reference document 1.2e for further details.

1.7.3 ***Rhodes Ranch Development.*** In 2000, the Windmill Lateral was removed and a Rhodes Ranch confluence was added to incorporate a development that is now under construction. The

design revisions were not carried downstream because they were determined to be insignificant in most cases. The Warm Springs Lateral design discharge was not decreased due to time constraints. Therefore, the Warm Springs Lateral area as presented in table 1 is larger than actually exists (post construction). The developed drainage area (with Rhodes Ranch Development) for this lateral, according to the proposed Rhodes Ranch Development, is .64 sq.mi. and not 0.76 sq.mi. Refer to plates 3 and 4 for a comparison.

2. CHANNELS

2.1 General

The channels design-flood-frequency is 100-year computed probability. This level of protection was determined by NED analysis and is documented in the 1991 Technical Documentation. The purpose of the Blue Diamond Channel is to safely convey Blue Diamond Detention Basin outflow as well as local flow below Blue Diamond Detention Basin to the Tropicana Detention Basin. Lateral collector channels capture and convey runoff from the alluvial fan and serve as outlet channels for local interior drainage. The Beltway Reach has four laterals and the Durango Reach has one lateral (Warm Springs) and one major inlet (Rhodes Ranch).

2.2 Precipitation

One-hundred year design peak discharges for the Blue Diamond Channel were determined by critically centering the 100-year storm over the unregulated watershed below Blue Diamond Detention Basin with contemporaneous rainfall above the detention basin. Rainfall excess was determined by applying a constant loss rate of 12.7 mm/hr (0.50 in/hr). The design storm and the 12.7 mm/hr (0.50 in/hr) loss rate were determined in the calibration phase of the feasibility study, documented in the 1991 Technical Documentation. Table 1 lists the subareas contributing to the detention basin. Table 2 lists the subarea contribution below the detention basin to each concentration point. The average 6-hour rainfall, intensity pattern number, and average transposition factor (TF) are given in Table 2. Example calculations for contemporaneous rainfall are shown on Plate 4. A more detailed explanation of precipitation determination and application and determination of the loss rate is included in the 1991 Technical Documentation. The transposition factor is explained in the 1993 Hydrologic Basis for Design.

2.3 Rainfall-Runoff Model

2.3.1 *Method.* Subareas for the entire area are shown on Plate 1. Plate 2 shows subareas below Blue Diamond Detention Basin. Subarea characteristics are given in Tables 3 and 4. The channel design discharges were determined using the stream system analysis approach. A subarea map displayed on Plate 3 shows the revised collector system alignment. The runoff model used was taken from the 1991 Technical Documentation. The model consists of a combination of the Soil Conservation Service (SCS) dimensionless unit hydrograph and

kinematic wave runoff models. Runoff for un-urbanized areas was determined using the SCS dimensionless unit hydrograph, and runoff for urbanized areas was determined using the kinematic wave method. Only one input parameter is required to develop the SCS unit hydrograph, the lag time of the subbasin. SCS subarea lag times are listed in Table 3. Kinematic wave subarea characteristics are given in Table 4.

2.3.2 ***Model.*** LAPRE-1 preprocessor and computer program HEC-1 were used to determine subarea hydrographs, and HEC-1 was used to route and combine subarea hydrographs. The stream system on the fan is very complicated, as can be seen on Plate 3. Laterals and main channels divide subareas in a complex manner. Rather than redefine without project subareas and kinematic wave characteristics, a percentage of flow from a subarea contributing to a particular location was used in the routing and combining. A unit computation time of 5 minutes was required to adequately define the runoff hydrograph. Computations were performed in English units and the design discharges converted to metric for hydraulic analysis. This was because the complete hydrologic model was developed prior to the mandate to use metric units. As a result, hydrologic tables in this appendix are presented in both English and metric units.

2.4 Base Flow and Snowmelt

Base flow is considered negligible for this study area as runoff occurs only as a direct response to moderate to high intensity rainfall. Allowance for snowmelt is inappropriate in this region for storms occurring in the summer season.

2.5 Flood Routing

2.5.1 ***Channel.*** Channel routing was performed using the Muskingum method. Routing parameters for the reaches upstream from Blue Diamond Detention Basin, which is not being improved, were taken without change from the 1993 Basis for Design. The value of X used for these undeveloped areas including Blue Diamond Wash was 0.15. The remaining reaches below Blue Diamond Wash at Durango will be improved. Here, flood wave travel time, hence, Muskingum coefficient K, was determined from velocity computations made during pre-final hydraulic design, depending on availability. Muskingum X values in the improved reaches were estimated according to the type of channel improvement. Values of X range from 0.30 for streets and improved but unlined laterals to 0.40 for reaches with concrete channels. Muskingum X values for routing reaches comprised of both unlined and concrete sections were estimated by length-weighted averaging. The With-Project Muskingum routing parameters for the various reaches in the study area are given in Table 5. A schematic routing diagram for the drainage area is shown on Plate 5.

2.5.2 ***Reservoir.*** Reservoir routing through the detention basin was accomplished by use of the Modified Puls routing procedure. Reservoir elevation-storage-outflow relationships for the Blue

Diamond Basin are listed in Table 6. Construction of this dam was completed in 2000. These updated relationships, as refined in final design, do not significantly impact the design discharges presented herein. It should be noted that the elevations for the elevation-storage-outflow relationships are in National American Vertical Datum (NAVD). These relationships are based on a new grading plan developed in May 1997.

2.6 Results

Design peak discharges are presented in Table 7 and shown on Plate 6. The computed discharges were compared with the discharges generated from the 100-year computed probability discharge versus drainage area curve (Plate 7) described in the 1993 Hydrologic Basis for Design. If the computed discharge was greater than the curve discharge, the computed discharge was adopted. Otherwise the average of the two was adopted.

TABLE 1: CONTRIBUTING AREAS TO DIVERSION CHANNELS

Concentration Point	SUBAREA	D.A. (Mi^2)	% OF AREA	PART OF D.A. (Mi^2)	T.F.	ADOPTED D.A. (Mi^2)	EQUIV. T.F.
Blue Diamond D.B.							
	71	6.90	100	6.900	1.28	67.24	1.26
	72	6.58	100	6.580	1.28		
	73	4.02	100	4.020	1.23		
	501	11.28	100	11.280	1.28		
	502	27.40	100	27.400	1.28		
	503	5.54	100	5.540	1.20		
	504	6.53	84.5	5.518	1.16		
				67.238			
Downstream of Blue Diamond Detention Basin							
	504	6.53	15.5	1.012	1.16	1.01	1.16
				1.012			
CP 1 Blue Diamond Wash at Debris/Inlet Structure (Durango Rd.)							
	T7	0.58	84	0.487	1.03	1.85	1.10
	T4	3.22	11	0.354	1.03		
	504	6.53	15.5	1.012	1.16		
				1.853			
CP 10A: Rhodes Ranch Rd. Inlet							
	T4	3.22	23	0.741	1.03	0.92	1.05
	F6	0.99	9	0.089	1.15		
	F5S	2.25	4	0.090	1.15		
				0.920			
CP 10 D/S of Rhodes Ranch Rd. Inlet							
	T7	0.58	84	0.487	1.03	2.77	1.09
	T4	3.22	34	1.095	1.03		
	F6	0.99	9	0.089	1.15		
	F5S	2.25	4	0.090	1.15		
	504	6.53	15.5	1.012	1.16		
				2.773			
Beginning with this next reach, 15.5% of area 504 that flows under the B.D.D.B is not included because final design was complete prior to this change. There would be no noticeable change in design discharge.							
CP 11A: Warm Springs Lateral Inlet [1]							
	F4	1.50	10	0.15	1.15	0.76	1.15
	F6	0.99	18	0.178	1.15		
	F5S	2.25	19	0.428	1.15		
				0.756			
CP 11: D/S of Warm Springs Lateral Inlet							
	T7	0.58	84	0.487	1.03	2.40	1.07
	T4	3.22	34	1.095	1.03		
	F4	1.50	14	0.210	1.15		
	F6	0.99	18	0.178	1.15		
	F5S	2.25	19	0.428	1.15		

TABLE 1(CONT.): CONTRIBUTING AREAS TO DIVERSION CHANNELS

Concentration Point	SUBAREA	D.A. (Mi^2)	% OF AREA	PART OF D.A. (Mi^2)	T.F.	ADOPTED D.A. (Mi^2)	EQUIV. T.F.
				2.398			
CP 12A: Inlet along the Beltway							
	F5S	2.25	17	0.383	1.15	0.38	1.15
				0.383			
CP 12: Beltway Channel D/S of Durango & 12A Inlet							
	T7	0.58	84	0.487	1.03	2.78	1.08
	T4	3.22	34	1.095	1.03		
	F4	1.50	14	0.210	1.15		
	F6	0.99	18	0.178	1.15		
	F5S	2.25	19	0.428	1.15		
	F5S	2.25	17	0.383	1.15		
				2.781			
CP 13A: Buffalo Lateral							
	T7	0.58	16	0.093	1.03	1.86	1.07
	T8	1.22	10	0.122	1.03		
	T4	3.22	34	1.095	1.03		
	F6	0.99	56	0.554	1.15		
				1.864			
CP 13: D/S of Buffalo Lateral							
	T7	0.58	100	0.580	1.03	4.64	1.08
	T4	3.22	68	2.190	1.03		
	F4	1.50	14	0.210	1.15		
	F6	0.99	74	0.733	1.15		
	F5S	2.25	36	0.810	1.15		
	T8	1.22	10	0.122	1.03		
				4.64			
CP 14A: Rainbow Lateral							
	T8	1.22	30	0.366	1.03	1.39	1.03
	T4	3.22	30	0.966	1.03		
	T1	1.56	4	0.062	1.03		
				1.394			
CP 14: D/S of Rainbow Lateral							
	T7	0.58	100	0.580	1.03	6.04	1.06
	T4	3.22	98	3.156	1.03		
	F4	1.50	14	0.210	1.15		
	F6	0.99	74	0.733	1.15		
	F5S	2.25	36	0.810	1.15		
	T8	1.22	40	0.488	1.03		
	T1	1.56	4	0.062	1.03		
				6.039			

TABLE 1(CONT.): CONTRIBUTING AREAS TO DIVERSION CHANNELS

Concentration Point	SUBAREA	D.A. (Mi^2)	% OF AREA	PART OF D.A. (Mi^2)	T.F.	ADOPTED D.A. (Mi^2)	EQUIV. T.F.
CP LD-BD4: Jones Lateral							
	T8	1.22	49	0.598	1.03	0.91	1.03
	T5	1.00	31	0.310	1.03		
				0.908			
CP BD4: D/S of Jones Lateral							
	T7	0.58	100	0.580	1.03	6.95	1.06
	T4	3.22	98	3.156	1.03		
	F4	1.50	14	0.210	1.15		
	F6	0.99	74	0.733	1.15		
	F5S	2.25	36	0.810	1.15		
	T8	1.22	89	1.086	1.03		
	T1	1.56	4	0.062	1.03		
	T5	1.00	31	0.310	1.03		
				6.947			

Subarea locations are shown on Plates 1 and 2.
*Note: The percentages for this subarea do not add up to 100% because a portion of the subarea is out of the collector system.

TABLE1 1M: ADOPTED DRAINAGE AREAS AND TRANSPOSITION FACTORS

Concentration Point	SUBAREA	D.A. (Km^2)	% OF AREA	PART OF D.A. (Km^2)	T.F.	ADOPTED D.A. (Km^2)	EQUIV. T.F.
Blue Diamond D.B.							
	71	17.87	100	17.87	1.28	174.2	1.26
	72	17.04	100	17.04	1.28		
	73	10.41	100	10.41	1.23		
	501	29.22	100	29.22	1.28		
	502	70.97	100	70.97	1.28		
	503	14.35	100	14.35	1.20		
	504	16.91	84.5	14.29	1.16		
				174.15			
Downstream of Blue Diamond Detention Basin							
	504	16.91	15.5	2.62	1.16	2.6	1.16
				2.62			
CP 1 Blue Diamond Wash at Debris/Inlet Structure (Durango Rd.)							
	T7	0.58	84	1.26	1.03	1.85	1.10
	T4	3.22	11	0.92	1.03		
	504	6.53	15.5	2.62	1.16		
				4.80			
CP 10A: Rhodes Ranch Rd. Inlet							
	T4	8.34	23	1.92	1.03	2.38	1.05
	F6	2.56	9	0.23	1.15		
	F5S	5.83	4	0.23	1.15		
				2.38			
CP 10 D/S of Rhodes Ranch Rd. Inlet							
	T7	1.50	84	1.26	1.03	7.2	1.09
	T4	8.34	34	2.84	1.03		
	F6	2.56	9	0.23	1.15		
	F5S	5.83	4	0.23	1.15		
	504	16.91	15.5	2.62	1.16		
				7.18			
Beginning with this next reach the area 504 that flows under the B.D.D.B is not included because final design was complete prior to this change. There would be no noticeable change in design discharge.							
CP 11A: Warm Springs Lateral Inlet							
	F4	3.89	10	0.39	1.15	1.96	1.15
	F6	2.56	18	0.46	1.15		
	F5S	5.83	19	1.11	1.15		
				1.96			
CP 11: D/S of Warm Springs Lateral Inlet							

TABLE 1M (CONT.): ADOPTED DRAINAGE AREAS AND TRANSPOSITION FACTORS

Concentration Point	SUBAREA	D.A. (Km^2)	% OF AREA	PART OF D.A. (Km^2)	T.F.	ADOPTED D.A. (Km^2)	EQUIV. T.F.
	T7	1.50	84	1.26	1.03	6.21	1.07
	T4	8.34	34	2.84	1.03		
	F4	3.89	14	0.54	1.15		
	F6	2.56	18	0.46	1.15		
	F5S	5.83	19	1.11	1.15		
				6.21			
CP 12A: Inlet along the Beltway							
	F5S	5.83	17	0.99	1.15	0.99	1.15
				0.99			
CP 12: Beltway Channel D/S of Durango & 12A Inlet							
	T7	0.58	84	1.26	1.03	7.2	1.08
	T4	3.22	34	2.84	1.03		
	F4	1.50	14	0.54	1.15		
	F6	0.99	18	0.46	1.15		
	F5S	2.25	19	1.11	1.15		
	F5S	2.25	17	0.99	1.15		
				7.20			
CP 13A: Buffalo Lateral							
	T7	1.50	16	0.24	1.03	4.8	1.07
	T8	3.16	10	0.32	1.03		
	T4	8.34	34	2.84	1.03		
	F6	2.56	56	1.44	1.15		
				4.82			
CP 13: D/S of Buffalo Lateral							
	T7	1.50	100	1.50	1.03	12.0	1.08
	T4	8.34	68	5.67	1.03		
	F4	3.89	14	0.54	1.15		
	F6	2.56	74	1.90	1.15		
	F5S	5.83	36	2.10	1.15		
	T8	3.16	10	0.32	1.03		
				12.03			
CP 14A: Rainbow Lateral							
	T8	3.16	30	0.95	1.03	3.6	1.03
	T4	8.34	30	2.50	1.03		
	T1	4.04	4	0.16	1.03		
				3.61			
CP 14: D/S of Rainbow Lateral							

TABLE 1M (CONT.): ADOPTED DRAINAGE AREAS AND TRANSPOSITION FACTORS

Concentration Point	SUBAREA	D.A. (Km^2)	% OF AREA	PART OF D.A. (Km^2)	T.F.	ADOPTED D.A. (Km^2)	EQUIV. T.F.
	T7	1.50	100	1.50	1.03	15.6	1.06
	T4	8.34	98	8.17	1.03		
	F4	3.89	14	0.54	1.15		
	F6	2.56	74	1.90	1.15		
	F5S	5.83	36	2.10	1.15		
	T8	3.16	40	1.26	1.03		
	T1	4.04	4	0.16	1.03		
				15.63			
CP LD-BD4: Jones Lateral							
	T8	3.16	49	1.55	1.03	2.4	1.03
	T5	2.59	31	0.80	1.03		
				2.35			
CP BD4: D/S of Jones Lateral							
	T7	1.50	100	1.50	1.03	18.0	1.06
	T4	8.34	98	8.17	1.03		
	F4	3.89	14	0.54	1.15		
	F6	2.56	74	1.90	1.15		
	F5S	5.83	36	2.10	1.15		
	T8	3.16	89	2.81	1.03		
	T1	4.04	4	0.16	1.03		
	T5	2.59	31	0.80	1.03		
				17.98			

Subarea locations are shown on Plates 1 and 2.
*Note: The percentages for this subarea do not add up to 100% because a portion of the subarea is out of the collector system.

TABLE 2: RAINFALL DE[illegible]AND CURVE NUMBERS

Centered and coincident rainfall depths and patterns for all laterals on Blue Diamond Channel - Wash, Durango, and Beltway Reaches.

CENTERED OVER CP	CENTERED RAIN AND PATTERN — ADOPTED D.A. (Mi^2)	RAIN (In)	T.F.	DEPTH (1) (In)	PATTERN (2)	COINCIDENT RAIN & PATTERN — D.A. (Mi^2)	COINC. DEPTH (3) (In)	TF OF COINC.	COINC. RAIN (4) (In)	EFF. D.A. (5) (mi^2)	PATTERN (2)
BLUE DIAMOND WASH DOWNSTREAM OF BLUE DIAMOND DAM AND CULVERT											
UBDUR – Upper Blue Diamond Wash d/s of Blue Diamond Dam	1.50	2.65	1.12	[illegible]		**BDDB Blue Diamond Detention Basin** 67.24	[illegible]	1.26	1.71	78	[illegible]
BDDB Blue Diamond Detention Basin	67.24	1.76	1.26	[illegible]							
BLUE DIAMOND WASH AT DEBRIS STRUCTURE (Durango Rd.)	1.85	2.64	1.1	[illegible]							
RHODES RANCH INLET (Not a lateral because it was built by the developer) [6]											
10A	**Rhodes Ranch Inlet** 0.92	2.68	1.05	[illegible]		**Main Channel U/S of Rhodes Ranch Inlet** 1.85	[illegible]	1.1	2.56	2.86	[illegible]
10B	**Main Channel U/S of Rhodes Ranch Inlet** 1.85	2.64	1.10	[illegible]		**Rhodes Ranch Inlet** 0.92	[illegible]	1.05	2.53	3.60	[illegible]
10	**Main Channel D/S of Rhodes Ranch Inlet** 2.77	2.59	1.09	[illegible]		**U/S of Blue Diamond Detention Basin (for all Warm Sp. Comps.)** 67.24	[illegible]	1.26	1.09	464	[illegible]
BDDB	**U/S of Blue Diamond Detention Basin** 67.24	1.76	1.25	2.20	4.96						
WARM SPRINGSLATERAL [2]											
11A	**Warm Springs Lateral** 0.76	2.68	1.12	[illegible]		**Main Channel U/S of Warm Springs Confl.** 1.64	[illegible]	1.04	2.56	2.86	[illegible]
11B	**Main Channel U/S of Warm Springs Confl.** 1.64	2.64	1.04	[illegible]		**Warm Springs Lateral** 0.76	[illegible]	1.12	2.51	4.2	[illegible]
11	**Main Channel D/S of Warm Springs Confl.** 2.40	2.59	1.07	[illegible]		**Blue Diamond Detention Basin (for all Warm Sp. Comps.)** ---	2.17				5.00

TABLE 2 (CONT.): RAINFALL [illegible]HS AND CURVE NUMBERS

CENTERED OVER CP	ADOPTED D.A. (Mi^2)	RAIN (In)	T.F.	DEPTH (1) (In)	PATTERN (2)	D.A. (Mi^2)	COINC. DEPTH (3) (In)	T.F. OF COINC.	COINC. RAIN (4) (In)	EFF. D.A. (5) (Mi^2)	PATTERN (2)
	------- CENTERED RAIN AND PATTERN -------					-------- COINCIDENT RAIN & PATTERN -------					
SOUTHERN BELTWAY LATERAL CONFLUENCE											
	Beltway Lateral					**Blue Diamond Durango Channel U/S of Confl.**					
12A	0.38	2.71	1.15	[illegible]	[illegible]	2.40	[illegible]	1.07	2.55	3.0	[illegible]
	Blue Diamond Durango Channel U/S of Confl.					**Beltway Lateral**					
12B	2.40	2.59	1.07	[illegible]	[illegible]	0.38	[illegible]	1.15	2.47	5.4	[illegible]
	Blue Diamond Beltway Channel D/S of Confl.					**Blue Diamond Detention Basin (for all Durango/Beltway Comps.)**					
12	2.78	2.57	1.08	[illegible]	[illegible]	---	2.17				5.00
BLUE DIAMOND BELTWAY REACH AT BUFFALO LATERAL CONFLUENCE											
	Buffalo Lateral					**Blue Diamond Beltway Channel U/S of Confl.**					
13A	1.87	2.62	1.07	[illegible]	[illegible]	2.78	[illegible]	1.08	2.44	6.3	[illegible]
	Blue Diamond Beltway Channel U/S of Confl.					**Bufalo Lateral**					
13B	2.78	2.57	1.08	[illegible]	[illegible]	1.87	[illegible]	1.07	2.41	7.2	[illegible]
	Blue Diamond Beltway Channel D/S of Confl.					**Blue Diamond Detention Basin (for all Buffalo Comps.)**					
13	4.65	2.50	1.08	[illegible]	[illegible]	---	2.17				5.00
BLUE DIAMOND BELTWAY REACH AT RAINBOW LATERAL CONFLUENCE											
	Rainbow Lateral					**Blue Diamond Beltway Channel U/S of Confl.**					
14A	1.39	2.65	1.03	[illegible]	[illegible]	4.65	[illegible]	1.08	2.40	7.5	[illegible]
14B	**Blue Diamond Beltway Channel U/S of Confl.**					**Rainbow Lateral**					
	4.65	2.50	1.08	[illegible]	[illegible]	1.39	[illegible]	1.03	2.28	12	[illegible]
	Blue Diamond Beltway Channel D/S of Confl.					**Blue Diamond Detention Basin (for all Rainbow Comps.)**					
14	6.04	2.45	1.07	[illegible]	[illegible]	---	2.17				5.00

TABLE 2 (CONT.): RAINFALL[illegible]THS AND CURVE NUMBERS

CENTERED OVER CP	CENTERED RAIN AND PATTERN — ADOPTED D.A. (MI^2)	RAIN (In)	T.F.	DEPTH (1) (In)	PATTERN (2)	COINCIDENT RAIN & PATTERN — D.A. (MI^2)	COINC. DEPTH (3) (In)	T.F. OF COINC.	COINC. RAIN (4) (In)	EFF. D.A. (5) (Mi^2)	PATTERN (2)
BLUE DIAMOND BELTWAY REACH AT JONES LATERAL CONFLUENCE											
	Jones Lateral					**Blue Diamond Beltway Channel U/S of Confl.**					
LD-BD4	0.91	2.68	1.03	[illegible]		6.04	[illegible]	1.07	2.37	8.4	[illegible]
14R	**Blue Diamond Beltway Channel U/S of Confl.**					**Jones Lateral**					
	6.04	2.45	1.07	[illegible]		0.91	[illegible]	1.03	2.17	18.4	[illegible]
	Blue Diamond Beltway Channel D/S of Confl.					**Blue Diamond Detention Basin (for all Jones Comps.)**					
BD4	6.95	2.42	1.06	[illegible]		---					

DA = Drainage Area in sq.mi.
TF = Transposition Factor
RAIN (R) = Aerially reduced rain at McCarran Airport
DEPTH (D) = Rain applied to the indicated area (adjusted for location by the TF)
COINC. = Coincident
CENT. = Centered over

(1) RAIN * TF = DEPTH

(2) PATTERN is determined by curve in Ref. 1.2.c.

(3) COINC. DEPTH ($D_{COINC.}$) = (D_{TOTAL}* $D.A._{TOTAL}$ - D_{CENT} * $D.A._{CENT}$) / ($D.A._{COINC.}$) Also see Plate 5.

(4) COINC. RAIN ($R_{COINS.}$)= ($D_{COINC.}$) / ($TF_{COINC.}$)

(5) EFFECTIVE D.A. = Area corresponding to the coincident rain.

(6) Includes 15.5 % of area 504 interior & d/s of dam

TABLE 3: SOIL CONSERVATION SERVICE (SCS) SUBAREA PARAMETERS FOR ENTIRE LAS VEGAS PROJECT ABOVE TROPICANA DETENTION BASIN

SUBAREA	DRAINAGE AREA (Mi^2)	LAG (Hrs)	PERCENT IMPERVIOUS (%)
16	4.20	0.62	0
17	4.00	0.37	0
18	6.50	0.46	0
19	4.60	0.58	0
101	13.10	0.56	0
102	11.20	1.48	0
103	7.70	0.71	0
104	3.90	0.88	0
R4	10.54	0.83	0
F1	4.63	0.78	0
F2	1.28	0.43	0
F3	2.60	0.34	12
F4	1.50	0.41	5
71	6.90	0.42	0
72	6.58	0.46	0
73	4.02	0.47	0
501	11.28	0.45	0
502	27.40	0.95	0
503	5.54	0.94	2
504	6.53	0.91	0

See Plate 1 for location of subareas.
Taken from Table 14, 1993 Basis for Design.

TABLE 3M: SOIL CONSERVATION SERVICE (SCS) SUBAREA PARAMETERS FOR ENTIRE LAS VEGAS PROJECT ABOVE TROPICANA DETENTION BASIN

Subarea	Drainage Area (Km^2)	Lag (Hrs)	Percent Imperviousness (%)
16	10.88	0.62	0
17	10.36	0.37	0
18	16.84	0.46	0
19	11.91	0.58	0
101	33.93	0.56	0
102	29.00	1.48	0
103	19.94	0.71	0
104	10.10	0.88	0
R4	27.30	0.83	0
F1	11.99	0.78	0
F2	3.32	0.43	0
F3	6.73	0.34	12
F4	3.88	0.41	5
71	17.87	0.42	0
72	17.04	0.46	0
73	10.41	0.47	0
501	29.22	0.45	0
502	70.97	0.95	0
503	14.35	0.94	2
504	16.91	0.91	0

See Plate 2 for location of subareas.
Taken from Table 14, 1993 Basis for Design.

TABLE 4: KINEMATIC WAVE PARAMETERS - FUTURE, WITH-PROJECT CONDITIONS FOR ENTIRE LAS VEGAS PROJECT ABOVE TROPICANA DETENTION BASIN

Subarea	Drainage Area (mi^2)	Collector Type	% Of Total	Length (ft)	Slope (ft/ft)	Roughness	Area Served By Typical Collector (mi^2)	Channel Shape	Channel Width	Channel Side Slope
R-1	4.96	Overland Plane - Pervious	65	600	0.020	0.15	--	--	--	--
		Overland Plane - Impervious	35	60	0.021	0.10	--	--	--	--
		Subcollector	--	2600	0.020	0.025	0.04	--	--	--
		Collector	--	5000	0.019	0.025	0.30	--	--	1
		Main Channel	--	34000	0.0212	0.032	--	Trap	40	2
R-3	2.03	Overland Plane - Pervious	73	500	0.025	0.15	--	--	--	--
		Overland Plane - Impervious	27	60	0.025	0.10	--	--	--	--
		Subcollector	--	1300	0.023	0.025	0.02	--	--	1
		Collector	--	5500	0.025	0.025	0.09	--	--	1
		Main Channel	--	15500	0.023	0.03	--	Trap	100	5
R-5	4.08	Overland Plane - Pervious	65	600	0.025	0.15	--	--	--	--
		Overland Plane - Impervious	35	60	0.025	0.10	--	--	--	--
		Subcollector	--	1300	0.020	0.02	0.02	--	--	1
		Collector	--	7920	0.023	0.02	0.20	--	--	1
		Main Channel	--	13000	0.019	0.03	--	Trap	40	2
R-6	1.51	Overland Plane - Pervious	72	500	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	28	60	0.016	0.10	--	--	--	--
		Subcollector	--	1300	0.005	0.02	0.02	--	--	1
		Collector	--	5200	0.016	0.025	0.13	--	--	1
		Main Channel	--	8000	0.0044	0.03	--	Trap	40	1
F-5N	3.75	Overland Plane - Pervious	70	300	0.025	0.15	--	--	--	--
		Overland Plane - Impervious	30	60	0.025	0.10	--	--	--	--
		Subcollector	--	2000	0.023	0.025	0.04	--	--	--
		Collector	--	3200	0.025	0.025	0.20	--	--	1
		Main Channel	--	18000	0.023	0.03	--	Trap	70	5
F-5S	2.25	Overland Plane - Pervious	70	400	0.020	0.35	--	--	--	--
		Overland Plane - Impervious	30	60	0.020	0.10	--	--	--	--
		Subcollector	--	2600	0.020	0.02	0.04	--	--	--
		Collector	--	3500	0.020	0.025	0.16	--	--	1
		Main Channel	--	14500	0.017	0.03	--	Trap	50	5
F-6	0.99	Overland Plane - Pervious	65	350	0.018	0.20	--	--	--	--
		Overland Plane - Impervious	35	60	0.018	0.10	--	--	--	--
		Subcollector	--	1200	0.008	0.02	0.02	--	--	--
		Collector	--	4000	0.014	0.025	0.15	--	--	1
		Main Channel	--	5500	0.008	0.03	--	Trap	40	1

TABLE 4 (CONT.): KINEMATIC WAVE PARAMETERS - FUTURE, WITH-PROJECT CONDITIONS FOR ENTIRE LAS VEGAS PROJECT ABOVE TROPICANA DETENTION BASIN

Subarea	Drainage Area (mi^2)	Collector Type	% Of Total	Length (ft)	Slope (ft/ft)	Roughness	Area Served By Typical Collector (mi^2)	Channel Shape	Channel Width	Channel Side Slope
F-7	1.50	Overland Plane - Pervious	63	700	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	37	60	0.015	0.10	--	--	--	--
		Subcollector	--	2000	0.010	0.02	0.04	--	--	--
		Collector	--	4000	0.0114	0.025	0.65	--	--	--
		Main Channel	--	7500	0.0116	0.03	--	Trap	50	1 5
F-12	0.88	Overland Plane - Pervious	65	700	0.012	0.15	--	--	--	--
		Overland Plane - Impervious	35	50	0.013	0.10	--	--	--	--
		Subcollector	--	1500	0.010	0.02	0.04	--	--	--
		Collector	--	3500	0.012	0.025	0.21	--	--	--
		Main Channel	--	8200	0.013	0.025	--	Trap	10	1 5
T-1	1.56	Overland Plane - Pervious	74	600	0.020	0.15	--	--	--	--
		Overland Plane - Impervious	26	40	0.020	0.10	--	--	--	--
		Subcollector	--	2600	0.015	0.02	0.06	--	--	--
		Collector	--	4000	0.020	0.025	0.28	--	--	--
		Main Channel	--	13200	0.017	0.03	--	Trap	50	1 5
T-3	0.99	Overland Plane - Pervious	59	500	0.010	0.15	--	--	--	--
		Overland Plane - Impervious	41	40	0.011	0.10	--	--	--	--
		Subcollector	--	2400	0.011	0.02	0.04	--	--	--
		Collector	--	3000	0.010	0.025	0.16	--	--	--
		Main Channel	--	10000	0.0106	0.030	--	Trap	30	1 5
T-4	3.22	Overland Plane - Pervious	65	500	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	35	40	0.018	0.10	--	--	--	--
		Subcollector	--	2600	0.018	0.02	0.04	--	--	--
		Collector	--	2700	0.019	0.03	0.25	--	--	--
		Main Channel	--	20000	0.0185	0.03	--	Trap	75	1 10
T-5	1.00	Overland Plane - Pervious	75	600	0.010	0.15	--	--	--	--
		Overland Plane - Impervious	25	40	0.012	0.10	--	--	--	--
		Subcollector	--	2600	0.013	0.02	0.04	--	--	--
		Collector	--	2500	0.012	0.025	0.21	--	--	--
		Main Channel	--	6500	0.013	0.03	--	Trap	30	1 5
T-6	1.30	Overland Plane - Pervious	68	600	0.010	0.15	--	--	--	--
		Overland Plane - Impervious	32	100	0.015	0.10	--	--	--	--
		Subcollector	--	2000	0.012	0.02	0.04	--	--	--
		Collector	--	6000	0.012	0.025	0.40	--	--	--
		Main Channel	--	10800	0.012	0.03	--	Trap	30	1 5

TABLE 4 (CONT.): KINEMATIC WAVE PARAMETERS - FUTURE, WITH-PROJECT CONDITIONS FOR ENTIRE LAS VEGAS PROJECT ABOVE TROPICANA DETENTION BASIN

Subarea	Drainage Area (mi^2)	Collector Type	% Of Total	Length (ft)	Slope (ft/ft)	Roughness	Area Served By Typical Collector (mi^2)	Channel Shape	Channel Width	Channel Side Slope
T-7	0.58	Overland Plane - Pervious	79	300	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	21	60	0.015	0.10	--	--	--	--
		Subcollector	--	--	--	--	--	--	--	--
		Collector	--	1500	0.015	0.03	0.032	--	--	--
		Main Channel	--	13100	0.0149	0.03	--	Trap	300	1
										1
T-8	1.22	Overland Plane - Pervious	65	600	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	35	50	0.018	0.10	--	--	--	--
		Subcollector	--	2000	0.016	0.02	0.03	--	--	--
		Collector	--	2000	0.018	0.025	0.14 [1]	--	--	--
		Main Channel	--	18000	0.0161	0.03	--	Trap	75	1
										5
T-9	0.99	Overland Plane - Pervious	76	600	0.010	0.15	--	--	--	--
		Overland Plane - Impervious	24	50	0.013	0.10	--	--	--	--
		Subcollector	--	2600	0.012	0.02	0.06	--	--	--
		Collector	--	4000	0.010	0.025	0.12	--	--	--
		Main Channel	--	10200	0.0134	0.03	--	Trap	30	1
										5
T-10	1.48	Overland Plane - Pervious	90	700	0.013	0.15	--	--	--	--
		Overland Plane - Impervious	10	400	0.011	0.10	--	--	--	--
		Subcollector	--	1100	0.012	0.020	0.12	--	--	--
		Collector	--	3000	0.008	0.020	0.50	--	--	1
		Main Channel	--	8000	0.010	0.030	--	Trap	30	1
										2

[1] Revised from 1993 Hydrologic Basis for Design.

See Plate 1 for location of subareas.
Taken from Table 15, 1993 Hydrologic Basis for Design.

TABLE 4M: KINEMATIC WAVE PARAMETERS - FUTURE, WITH-PROJECT CONDITIONS FOR ENTIRE LAS VEGAS PROJECT ABOVE TROPICANA DETENTION BASIN

Subarea	Drainage Area (km^2)	Collector Type	% Of Total	Length (m)	Slope (m/m)	Roughness	Area Served By Typical Collector (km^2)	Channel Shape	Channel Width (m)	Channel Side Slope
R-1	12.85	Overland Plane - Pervious	65	182.88	0.020	0.15	--	--	--	--
		Overland Plane - Impervious	35	18.29	0.021	0.10	--	--	--	--
		Subcollector	--	792.48	0.020	0.025	0.10	--	--	--
		Collector	--	1524.00	0.019	0.025	0.78	--	--	--
		Main Channel	--	10363.20	0.0212	0.032	--	Trap	12.19	1 2
R-3	5.26	Overland Plane - Pervious	73	152.40	0.025	0.15	--	--	--	--
		Overland Plane - Impervious	27	18.29	0.025	0.10	--	--	--	--
		Subcollector	--	396.24	0.023	0.025	0.05	--	--	--
		Collector	--	1676.40	0.025	0.025	0.23	--	--	1
		Main Channel	--	4724.40	0.023	0.03	--	Trap	30.48	1 5
R-5	10.57	Overland Plane - Pervious	65	182.88	0.025	0.15	--	--	--	--
		Overland Plane - Impervious	35	18.29	0.025	0.10	--	--	--	--
		Subcollector	--	396.24	0.020	0.02	0.05	--	--	--
		Collector	--	2414.02	0.023	0.02	0.52	--	--	1
		Main Channel	--	3962.40	0.019	0.03	--	Trap	12.19	1 2
R-6	3.91	Overland Plane - Pervious	72	152.40	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	28	18.29	0.016	0.10	--	--	--	--
		Subcollector	--	396.24	0.005	0.02	0.05	--	--	--
		Collector	--	1584.96	0.016	0.025	0.34	--	--	1
		Main Channel	--	2438.40	0.0044	0.03	--	Trap	12.19	1 1
F-5N	9.71	Overland Plane - Pervious	70	91.44	0.025	0.15	--	--	--	--
		Overland Plane - Impervious	30	18.29	0.025	0.10	--	--	--	--
		Subcollector	--	609.60	0.023	0.025	0.10	--	--	--
		Collector	--	975.36	0.025	0.025	0.52	--	--	1
		Main Channel	--	5486.40	0.023	0.03	--	Trap	21.34	5
F-5S	5.83	Overland Plane - Pervious	70	121.92	0.020	0.35	--	--	--	--
		Overland Plane - Impervious	30	18.29	0.020	0.10	--	--	--	--
		Subcollector	--	792.48	0.020	0.02	0.10	--	--	--
		Collector	--	1066.80	0.020	0.025	0.41	--	--	1
		Main Channel	--	4419.60	0.017	0.03	--	Trap	15.24	5
F-6	2.56	Overland Plane - Pervious	65	106.68	0.018	0.20	--	--	--	--
		Overland Plane - Impervious	35	18.29	0.018	0.10	--	--	--	--
		Subcollector	--	365.76	0.008	0.02	0.05	--	--	--
		Collector	--	1219.20	0.014	0.025	0.39	--	--	1
		Main Channel	--	1676.40	0.008	0.03	--	Trap	12.19	1

TABLE 4M (CONT.): KINEMATIC WAVE PARAMETERS - FUTURE, WITH-PROJECT CONDITIONS FOR ENTIRE LAS VEGAS PROJECT ABOVE TROPICANA DETENTION BASIN

Subarea	Drainage Area (km^2)	Collector Type	% Of Total	Length (m)	Slope (m/m)	Roughness	Area Served By Typical Collector (km^2)	Channel Shape	Channel Width (m)	Channel Side Slope
F-7	3.89	Overland Plane - Pervious	63	213.36	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	37	18.29	0.015	0.10	--	--	--	--
		Subcollector	--	609.60	0.010	0.02	0.10	--	--	--
		Collector	--	1219.20	0.0114	0.025	1.68	--	--	1
		Main Channel	--	2286.00	0.0116	0.03	--	Trap	15.24	5
F-12	2.28	Overland Plane - Pervious	65	213.36	0.012	0.15	--	--	--	--
		Overland Plane - Impervious	35	15.24	0.013	0.10	--	--	--	--
		Subcollector	--	457.20	0.010	0.02	0.10	--	--	--
		Collector	--	1066.80	0.012	0.025	0.54	--	--	1
		Main Channel	--	2499.36	0.013	0.025	--	Trap	3.05	5
T-1	4.04	Overland Plane - Pervious	74	182.88	0.020	0.15	--	--	--	--
		Overland Plane - Impervious	26	12.19	0.020	0.10	--	--	--	--
		Subcollector	--	792.48	0.015	0.02	0.16	--	--	--
		Collector	--	1219.20	0.020	0.025	0.72	--	--	1
		Main Channel	--	4023.36	0.017	0.03	--	Trap	15.24	5
T-3	2.56	Overland Plane - Pervious	59	152.40	0.010	0.15	--	--	--	--
		Overland Plane - Impervious	41	12.19	0.011	0.10	--	--	--	--
		Subcollector	--	731.52	0.011	0.02	0.10	--	--	--
		Collector	--	914.40	0.010	0.025	0.41	--	--	1
		Main Channel	--	3048.00	0.0106	0.030	--	Trap	9.14	5
T-4	8.34	Overland Plane - Pervious	65	152.40	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	35	12.19	0.018	0.10	--	--	--	--
		Subcollector	--	792.48	0.018	0.02	0.10	--	--	--
		Collector	--	822.96	0.019	0.03	0.65	--	--	1
		Main Channel	--	6096.00	0.0185	0.03	--	Trap	22.86	10
T-5	2.59	Overland Plane - Pervious	75	182.88	0.010	0.15	--	--	--	--
		Overland Plane - Impervious	25	12.19	0.012	0.10	--	--	--	--
		Subcollector	--	792.48	0.013	0.02	0.10	--	--	--
		Collector	--	762.00	0.012	0.025	0.54	--	--	1
		Main Channel	--	1981.20	0.013	0.03	--	Trap	9.14	5

TABLE 4M (CONT.): KINEMATIC WAVE PARAMETERS - FUTURE, WITH-PROJECT CONDITIONS FOR ENTIRE LAS VEGAS PROJECT ABOVE TROPICANA DETENTION BASIN

Subarea	Drainage Area (km^2)	Collector Type	% Of Total	Length (m)	Slope (m/m)	Roughness	Area Served By Typical Collector (km^2)	Channel Shape	Channel Width (m)	Channel Side Slope
T-6	3.37	Overland Plane - Pervious	68	182.88	0.010	0.15	--	--	--	--
		Overland Plane - Impervious	32	30.48	0.015	0.10	--	--	--	--
		Subcollector	--	609.60	0.012	0.02	0.10	--	--	--
		Collector	--	1828.80	0.012	0.025	1.04	--	--	--
		Main Channel	--	3291.84	0.012	0.03	--	Trap	9.14	1 5
T-7	1.50	Overland Plane - Pervious	79	91.44	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	21	18.29	0.015	0.10	--	--	--	--
		Subcollector	--	--	--	--	--	--	--	--
		Collector	--	457.20	0.015	0.03	0.083	--	--	--
		Main Channel	--	3992.88	0.0149	0.03	--	Trap	91.44	1 1
T-8	3.16	Overland Plane - Pervious	65	182.88	0.015	0.15	--	--	--	--
		Overland Plane - Impervious	35	15.24	0.018	0.10	--	--	--	--
		Subcollector	--	609.60	0.016	0.02	0.08	--	--	--
		Collector	--	609.60	0.018	0.025	0.36[1]	--	--	--
		Main Channel	--	5486.40	0.0161	0.03	--	Trap	22.86	1 5
T-9	2.56	Overland Plane - Pervious	76	182.88	0.010	0.15	--	--	--	--
		Overland Plane - Impervious	24	15.24	0.013	0.10	--	--	--	--
		Subcollector	--	792.48	0.012	0.02	0.16	--	--	--
		Collector	--	1219.20	0.010	0.025	0.31	--	--	--
		Main Channel	--	3108.96	0.0134	0.03	--	Trap	9.14	1 5
T-10	3.83	Overland Plane - Pervious	90	213.36	0.013	0.15	--	--	--	--
		Overland Plane - Impervious	10	121.92	0.011	0.10	--	--	--	--
		Subcollector	--	335.28	0.012	0.020	0.31	--	--	--
		Collector	--	914.40	0.008	0.020	1.30	--	--	1
		Main Channel	--	2438.40	0.010	0.030	--	Trap	9.14	1 2

[1] Revised from 1993 Hydrologic Basis for Design.

See Plate 1 for location of subareas.
Taken from Table 15, 1993 Hydrologic Basis for Design.

TABLE 5: MUSKINGUM ROUTING PARAMETERS WITH-PROJECT CONDITIONS[8]

CHANNEL REACH[2]	REACH LENGTH (Mi)	AVERAGE VELOCITY (Ft/S)	NSTPS[1] (NO. OF SUBREACHES)	MUSKINGUM "K" (Hrs)	MUSKINGUM "X"
ROUTING REACHES ABOVE BLUE DIAMOND DETENTION BASIN (No Revisions from 1993 Hydrologic Basis for Design)					
71-501[3]	2.65	10.0	5	0.39	0.15
501-502[3]	2.77	10.0	5	0.40	0.15
502-503[3]	2.95	12.0	4	0.36	0.15
73-503[3]	2.90	12.0	4	0.36	0.15
503-504[3]	2.95	12.0	4	0.36	0.15
ROUTING REACHES ABOVE TROPICANA DETENTION BASIN (Revisions from 1993 Hydrologic Basis for Design as Noted)					
BLUE DIAMOND DURANGO CHANNEL					
BD-CP1[4]	1.77	13.7	2	0.19	0.40
F4-CP10[4]	0.85	4.0	4	0.31	0.30
CP10-CP11[4]	1.00	19.0	1	0.08	0.40
F4-CP11[3][4]	0.70	6.0	2	0.17	0.15
CP11-CP12[4]	0.70	22.0	1	0.047	0.40
BLUE DIAMOND BELTWAY CHANNEL					
CP12-CP13[4]	1.00	20.0	1	0.073	0.40
T7-CP2[3][4]	0.49	4.5	2	0.16	0.15
CP2-CP13[4]	1.44	5.5	5	0.38	0.30
CP13-CP14[4]	1.00	26.0	2	0.056	0.40
CP3-CP14[4]	0.64	6.5	2	0.14	0.30
CP14-CP5A[4]	1.00	26.0	1	0.056	0.40

(1) Based on 5-minute computation interval.
(2) Improved channel except indicated otherwise.
(3) Unimproved channel.
(4) Routing reach added since 1993 Hydrologic Basis for Design.

TABLE 5M: MUSKINGUM ROUTING PARAMETERS WITH-PROJECT CONDITIONS[8]

CHANNEL REACH[2]	REACH LENGTH (Km)	AVERAGE VELOCITY (M/S)	NSTPS[1] (NO. OF SUBREACHES)	MUSKINGUM "K" (Hrs)	MUSKINGUM "X"
ROUTING REACHES ABOVE BLUE DIAMOND DETENTION BASIN (No Revisions from 1993 Hydrologic Basis for Design)					
71-501[3]	4.26	3.05	5	0.39	0.15
501-502[3]	4.46	3.05	5	0.40	0.15
502-503[3]	4.75	3.66	4	0.36	0.15
73-503[3]	4.67	3.66	4	0.36	0.15
503-504[3]	4.75	3.66	4	0.36	0.15
ROUTING REACHES ABOVE TROPICANA DETENTION BASIN (Revisions from 1993 Hydrologic Basis for Design as Noted)					
BLUE DIAMOND DURANGO CHANNEL					
BD-CP1[4]	2.85	4.18	2	0.19	0.40
F4-CP10[4]	1.37	1.22	4	0.31	0.30
CP10-CP11[4]	1.61	5.79	1	0.08	0.40
F4-CP11[3][4]	1.83	1.83	3	0.28	0.15
CP11-CP12[4]	1.13	6.71	1	0.047	0.40
BLUE DIAMOND BELTWAY CHANNEL					
CP12-CP13[4]	1.61	6.10	1	0.073	0.40
T7-CP2[3][4]	0.79	1.37	2	0.16	0.15
CP2-CP13[4]	2.32	1.68	5	0.38	0.30
CP13-CP14[4]	1.61	7.92	1	0.056	0.40
CP3-CP14[4]	1.03	1.98	2	0.14	0.30
CP14-CP5A[4]	1.61	7.92	1	0.056	0.40

(1) Based on 5-minute computation interval.
(2) Improved channel except indicated otherwise.
(3) Unimproved channel.
(4) Routing reach added since 1993 Hydrologic Basis for Design.

TABLE 6: ELEVATION-STORAGE-OUTFLOW RELATIONSHIPS
BLUE DIAMOND DETENTION BASIN - WITH-PROJECT CONDITIONS[1]

ELEVATION (Ft NGVD)	STORAGE (AF)	SPILLWAY (Ft^3/S)	OUTLET 48" RCP 30" ORIFICE. (Ft^3/S)	TOTAL OUTFLOW (Ft^3/S)
2917.8	0	0	0	0
2920	0.24	0	34	34
2922	2.98	0	64	64
2925	15.05	0	84	84
2930	67.58	0	109	109
2932	111.3	0	118	118
2935	176.8	0	130	130
2940	346.3	0	148	148
2942	428.9	0	154	154
2945	572.1	0	163	163
2950	865.1	0	178	178
2952	1001.3	0	183	183
2955	1226	0	191	191
2960	1655.6	0	204	204
2962	1850.5	0	208	208
2965	2171.3	0	215	215
2966.234	2312.6	0	218	218
2967	2407.2	4004	220	4224
2970	2777.6	47332	226	47,559
2972	3044.6	94,548	231	94,778
2973	3183.7	124,186	231	124,417
2974	3326.2	154,530	233	154,762

Spillway Crest = 2966.234 ft NAVD
Top of Dam = 2973 ft NAVD
[1] Final Design Rating Curve. This supersedes the BDDB DM

TABLE 6M: ELEVATION-STORAGE-OUTFLOW RELATIONSHIPS
BLUE DIAMOND DETENTION BASIN - WITH-PROJECT CONDITIONS[1]

ELEVATION M NAVD	STORAGE CAPACITY (M^3)	SPILLWAY DISCHARGE (M^3/S)	OUTLET DISCHARGE (M^3/S)	TOTAL OUTFLOW (M^3/S)
889.35	0	0.00	0.00	0.00
890.02	296	0.00	0.96	0.96
890.63	3,676	0.00	1.81	1.81
891.54	18,564	0.00	2.38	2.38
893.06	83,359	0.00	3.09	3.09
893.67	137,287	0.00	3.34	3.34
894.59	218,081	0.00	3.68	3.68
896.11	427,158	0.00	4.19	4.19
896.72	529,044	0.00	4.36	4.36
897.64	705,680	0.00	4.62	4.62
899.16	1,067,092	0.00	5.04	5.04
899.77	1,235,094	0.00	5.18	5.18
900.68	1,512,259	0.00	5.41	5.41
902.21	2,042,166	0.00	5.78	5.78
902.82	2,282,573	0.00	5.89	5.89
903.73	2,678,277	0.00	6.09	6.09
904.11	2,852,569	0.00	6.17	6.17
905.26	3,426,142	1340.29	6.41	1346.7
905.87	3,755,484	2677.3	6.54	2683.8
906.17	3,927,062	3516.6	6.54	3523.1
906.48	4,102,885	4375.8	6.60	4382.4

Spillway Crest = 904.11 m NAVD
Top of Dam = 906.93 m NAVD
[1] Final Design Rating Curve. This supersedes the BDDB DM

TABLE 7. DESIGN DISCHARGES FOR UPPER BLUE DIAMOND CHANNEL.

REACH OR LOCATION (CP)	DRAINAGE AREA (Mi^2)	DRAINAGE AREA (Km^2)	DESIGN DISCHARGE (Ft^3/S)	DESIGN DISCHARGE (M^3/S)
BLUE DIAMOND DAM OUTFLOW				
D/s of culvert	1.01	2.62	208	5.9
BLUE DIAMOND WASH				
Blue Diamond Dam to Durango Rd. (CP 1)	1.85	4.79	1500	42.5
BLUE DIAMOND CHANNEL – DURANGO REACH				
B.D.Wash to Rhodes Ranch (CP 10) [3]	2.77	7.17	2200	62.3[3]
Rhodes Ranch Inlet to Warm Sp. (CP 11)	2.40[5]	6.21 [5]	2300	65.1
Warm Springs to mid way to Beltway [2]	----	---	2450	69.4
Mid Way to Beltway to Beltway (CP 12) [1]	2.78 [5]	7.2 [5]	2600	73.6
BLUE DIAMOND CHANNEL- BELTWAY REACH				
Beltway to midway to Buffalo [2]	----	----	3000	86.4
Midway to Buffalo to Buffalo (CP 13) [1]	4.64 [5]	13.03 [5]	3500	99.1
Buffalo to midway to Rainbow [2]	----	----	3900	110.4
Midway to Rainbow to Rainbow (CP 14) [1]	6.04 [5]	15.64 [5]	4300	121.8
Rainbow to midway to Jones [2]	----	----	4400	124.6
Midway to Jones to Jones (CP BD4) [1]	6.95 [5]	17.99 [5]	4500	127.4
LATERALS				
10A: Rhodes Ranch	.92	2.38	1300	36.8
11A: Warm Springs [4]	.76	1.97	900	25.5
12A: Beltway	.38	0.98	600	17.0
13A: Buffalo	1.86	4.82	1900	53.8
14A Rainbow	1.39	3.60	1500	42.5
BD4: Jones	0.91	2.36	1100	31.4

(1) Design discharges for each CP were determined and applied half way upstream to the next CP (about ½ mile).

(2) Design discharge determined as the u/s discharge plus half of the increase to the d/s discharge, or the average of the u/s and d/s CPs.

(3) Carried full 2200 ft^3/s all the way upstream to CP 1 (no midway change) due to uncertainty of development and ultimate build out.

(4) With Rhodes Ranch proposed development complete, this drainage area is 0.64 mi^2. No midway change in discharge because it is a short reach.

(5) Not including 1.01 mi^2 runoff from dam area 504 due to changes made after final design. See para. 1.7.1 and 1.7.2.

TABLE 8. CONFLUENCE DESIGN DISCHARGES.

LATERAL AND LOCATION	D.A. Mi^2	SCENARIO 1 LATERAL Ft^3/S	SCENARIO 2 U/S OF CONFL. Ft^3/S	SCENARIO 3 D/S OF CONFL. Ft^3/S
RHODES RANCH				
CP 10A Lateral	0.92	**1200**	1050	1300
CP 10B u/s of Confl.	1.85	800	**1150**	900
CP 10 d/s of Confl.	2.77	2000	2200	**2200**
WARM SPRINGS				
CP 11A Lateral	0.76	**900**	600	600
CP 11B u/s of Confl.	1.64	1400	**1700**	1700
CP 11 d/s of Confl.	2.4	2300	2300	**2300**
BELTWAY/DURANGO				
CP 12A Lateral	0.38	**600**	300	300
CP 12B u/s of Confl.	2.4	2000	**2300**	2300
CP 12 d/s of Confl.	2.78	2600	2600	**2600**
BUFFALO				
CP 13A Lateral	1.86	**1900**	1100	1400
CP 13B u/s of Confl.	2.78	1500	**2400**	2100
CP 13 d/s of Confl.	4.64	3400	3500	**3500**
RAINBOW		(1)		
CP 14A Lateral	1.39	**1400** 1300	750	1000
CP 14B u/s of Confl.	4.64	2800 3000	**3450**	3100
CP 14 d/s of Confl.	6.04	4200 **4300**	4200	**4100**
JONES				
CP BD4A Lateral	0.91	**1000**	400	600
CP BD4B u/s of Confl.	6.04	3500	**4100**	3900
CP BD4 d/s of Confl.	6.95	4500	4500	**4500**

Scenario 1: Storm centered over the lateral, contemporaneous over the main channel u/s of the confluence. Taken at peak time of the lateral.

Scenario 2: Storm centered over the channel u/s of the confluence, and contmporaniout over the lateral. Taken at peak time of the channel u/s of the confluence.

Scenario 3: Storm centered over the entire area equally and the peak taken downstream of the confluence.

In all scenarios, the rainfall u/s of Blue Diamond Dam was contmporanious to the total rain d/s of the dam.

Flows in bold are the peak flows for that location.

(1) Peak flows are in bold for the same scenario at different time periods.

TABLE 8M. CONFLUENCE DESIGN DISCHARGES.

LATERAL AND LOCATION	D.A. Km^2	SCENARIO 1 LATERAL M^3/S	SCENARIO 2 U/S OF CONFL. M^3/S	SCENARIO 3 D/S OF CONFL. M^3/S
RHODES RANCH				
CP 10A Lateral	2.4	**34.0**	29.7	36.8
CP 10B u/s of Confl.	4.8	22.6	**32.6**	25.5
CP 10 d/s of Confl.	7.2	56.6	62.3	**62.3**
WARM SPRINGS				
CP 11A Lateral	1.96	**25.5**	17.0	17.0
CP 11B u/s of Confl.	4.25	39.6	**48.1**	48.1
CP 11 d/s of Confl.	6.21	65.1	65.1	**65.1**
BELTWAY/DURANGO				
CP 12A Lateral	0.99	**17**	8	8
CP 12B u/s of Confl.	6.21	57	**65**	65
CP 12 d/s of Confl.	7.20	74	74	**74**
BUFFALO				
CP 13A Lateral	4.82	**54**	31	40
CP 13B u/s of Confl.	7.20	42	**68**	59
CP 13 d/s of Confl.	12.02	96	99	**99**
RAINBOW				
CP 14A Lateral	3.61	**40(p)** 38	21	28
CP 14B u/s of Confl.	12.02	79 84	**98**	88
CP 14 d/s of Confl.	15.63	119 **(p)122**	119	**116**
JONES				
CP BD4A Lateral	2.4	**28**	11	17
CP BD4B u/s of Confl.	15.63	99	**116**	110
CP BD4 d/s of Confl.	18.0	127	127	**127**

Scenario 1: Storm centered over the lateral, contemporaneous over the main channel u/s of the confluence. Taken at peak time of the lateral.
Scenario 2: Storm centered over the channel u/s of the confluence, and contemporaneous over the lateral. Taken at peak time of the channel u/s of the confluence.
Scenario 3: Storm centered over the entire area equally and the peak taken downstream of the confluence.
In all scenarios, the rainfall u/s of Blue Diamond Dam was contemporaneous to the total rain d/s of the dam.

Flows in bold are the peak flows for that location.

(1) Peak flows are in bold for the same scenario at different time periods.

Upper Blue Diamond Diversion Channel

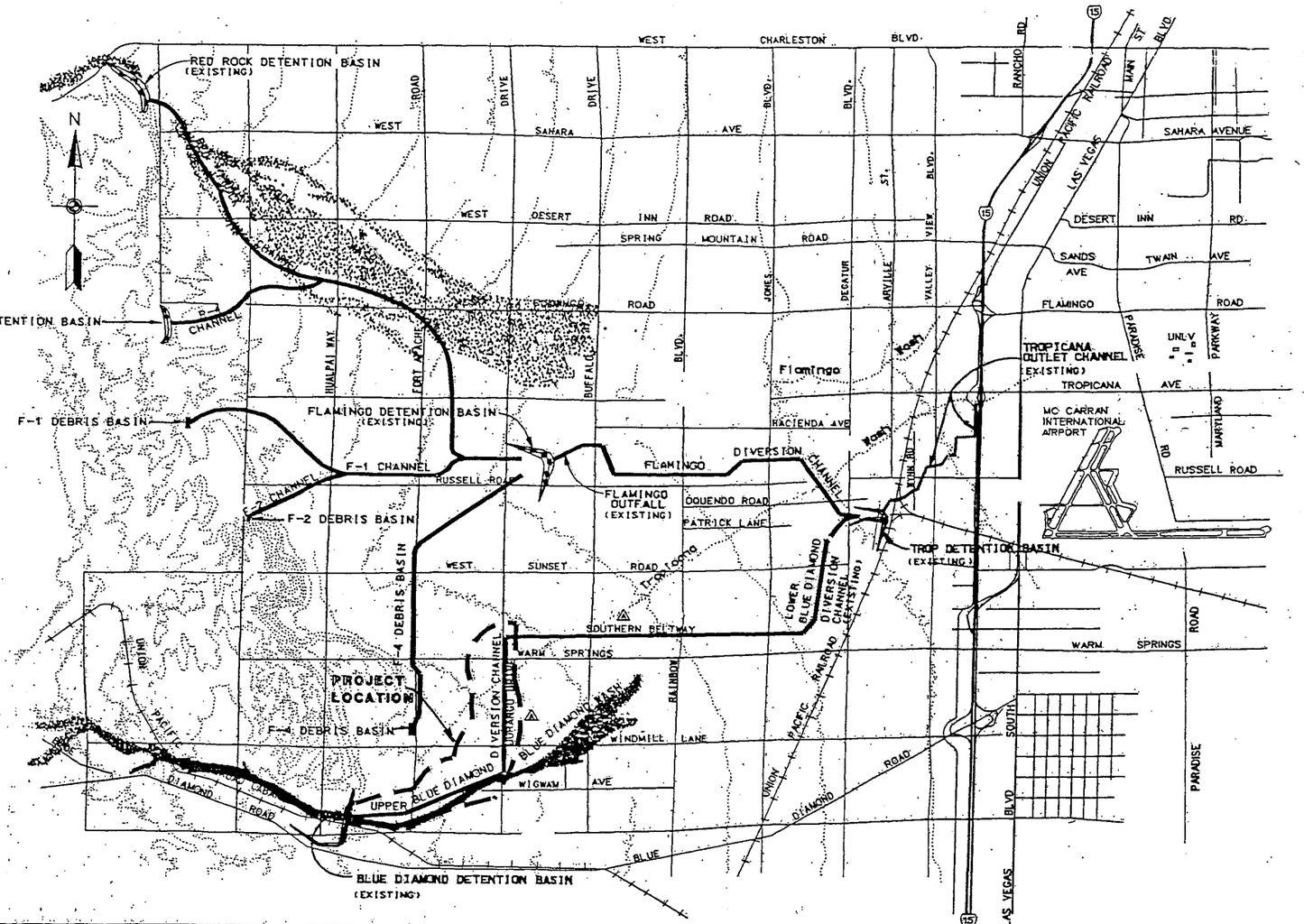
U.S. Army Corps of Engineers Design Plans

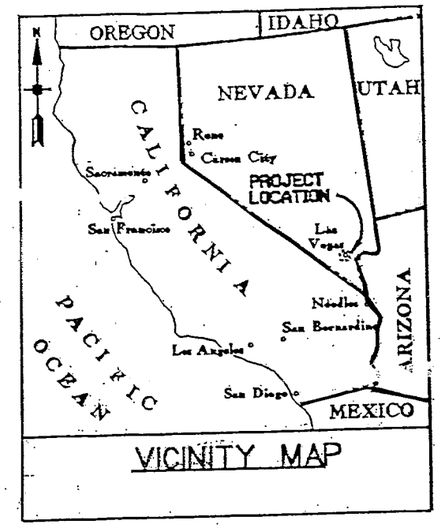
VALUE ENGINEERING PAYS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

(BLUE DIAMOND DETENTION BASIN TO BELTWAY CHANNEL)





VICINITY MAP

AGENCY	PLANS REVIEWED BY	DATE
LAS VEGAS VALLEY WATER DISTRICT		
SOUTHERN NEVADA WATER AUTHORITY		
SPRINT/CENTRAL TELEPHONE COMPANY		
SOUTHWEST GAS CORPORATION		
NEVADA POWER COMPANY		
CLARK COUNTY SANITATION DISTRICT		
WILLIAMS GAS PIPE LINE-WEST		
AT&T		
COX COMMUNICATIONS LAS VEGAS, INC.		

PROJECT LOCATION MAP

Clark County Department of Public Works
Approved by:
M.J. Manning, P.E., Director

Clark County Regional Flood Control District
Approved by:
Gale Wm. Fraser, II, P.E., General Manager/Chief Engineer

County Manager
Thomas P. Reilly

County Commissioners
Mary J. Kincaid-Chauncey, Chair
Chip Maxfield, Vice-Chair
Yvonne Atkinson Gates
Mark A. James
Rory Reid
Myrna Williams
Bruce L. Woodbury

NOTE:
1. ALL ROADS SHOWN ON THIS DRAWING MAY NOT HAVE BEEN CONSTRUCTED YET. THE ROUTE FOR SITE ACCESS AND DISPOSAL OF MATERIALS SHALL BE VERIFIED BY THE CONTRACTOR.
2. DRAINAGE FACILITIES SHOWN ON THIS DRAWING ARE PROPOSED FUTURE CONSTRUCTION UNLESS NOTED OTHERWISE.

THIS PROJECT WAS DESIGNED BY THE LOS ANGELES DISTRICT OF THE U.S. ARMY CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES AND REGISTRATION DESIGNATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT, AS REQUIRED BY E.R. 1110-1-8152. SIGNATURES AFFIXED HEREON INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL THE DRAWINGS IN THIS SET.

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

PREPARED UNDER THE DIRECTION OF: COLONEL RICHARD G. THOMPSON, DISTRICT ENGINEER
SUBMITTED BY: DATE
CHIEF, DESIGN BRANCH
DESIGNED BY: HMN
DRAWN BY: AGM
CHECKED BY: CED
DATE APPROVED:
CHIEF, ENGINEERING DIVISION
DISTRICT FILE NO. 21H057 REV. A
SPEC. NO. DACW09-03-B-0005
FILE NAME: T01D0N

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
VICINITY MAP, PROJECT LOCATION M.

SYMBOL	DESCRIPTIONS	DATE APPROVAL
	ADDED NOTES. REVISIONS	

SHEET T1

This border was produced in METRIC

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214/200		

ABBREVIATIONS AND SYMBOLS

ABT.	ABOUT	GALV.	GALVANIZED	RDS	RECORD OF SURVEY
A.B.C.	AGGREGATE BASE COURSE	G.B.	GRADE BREAK	RT.	RIGHT
A.C.	ASPHALTIC CONCRETE	HORIZ./H.	HORIZONTAL	R/W	RIGHT-OF-WAY
APPROX.	APPROXIMATELY	HT./H	HEIGHT	S-	SLOPE EQUALS
AVE.	AVENUE	INV.	INVERT	S.	SOUTH
B.C.	BEGINNING-OF-CURVE	L	LENGTH-OF-CURVE	S.C.	SPIRAL TO CURVE
BLVD.	BOULEVARD	LH	LEFT HEIGHT	SE	SOUTHEAST
BOT.	BOTTOM	L.	SPIRAL LENGTH	SEC.	SECTION
B.V.C.	BEGINNING OF VERTICAL CURVE	LT.	LEFT	SHT.	SHEET
C.C.	CENTER TO CENTER	MAT'L.	MATERIAL	ST.	STREET
CEMT.	CEMENT	MAX.	MAXIMUM	S.T.	SPIRAL TO TANGENT
℄	CENTERLINE/ CONTROL LINE	MIN.	MINIMUM	STA.	STATION
C.L.	CHAIN LINK	MISC.	MISCELLANEOUS	STD.	STANDARD
CL./CLR.	CLEARANCE	MSL	MEAN SEA LEVEL	STL.	STEEL
COE	CORPS OF ENGINEERS, US ARMY	N.	NORTH	SW	SOUTHWEST
COMP.	COMPACTED	NDOT	NEVADA DEPARTMENT OF TRANSPORTATION	SYMM.	SYMMETRICAL
CONC.	CONCRETE	NE	NORTHEAST	T	TANGENT
CONSTR. JT./C.J.	CONSTRUCTION JOINT	N.I.C.	NOT IN CONTRACT	T.C.E.	TEMPORARY CONSTRUCTION EASEMENT
COR.	CORNER	NO.	NUMBER	T.H.	TEST HOLE
CMU	CONCRETE MASONRY UNIT	N.T.S.	NOT TO SCALE	T.O.P.	TOP OF PIPE
C.S.	CURVE TO SPIRAL	NW	NORTHWEST	T.O.W.	TOP OF WALL
△	DEFLECTION ANGLE	Ø	DIAMETER	T.S.	TANGENT TO SPIRAL
△	SPIRAL DEFLECTION ANGLE	O.D.	OUTSIDE DIAMETER	TYP.	TYPICAL
DIA.	DIAMETER	O.C.	ON CENTER	V	VERTICAL
DR.	DRIVE	P.I.	POINT-OF-INTERSECTION	VAR	VARIABLE SLOPE
E.	EAST	P.L.	PROTECT-IN-PLACE	U.N.O.	UNLESS NOTED OTHERWISE
E.C.	END-OF-CURVE	P.L.P.	PROPERTY LINE	W.	WEST
EA.	EACH FACE	PLS	PROFESSIONAL LAND SURVEYOR		
EL./ELEV.	ELEVATION	R	RADIUS		
E.W.	EACH WAY	RD.	ROAD		
E.V.C.	END OF VERTICAL CURVE	RH	RIGHT HEIGHT		
EXIST.	EXISTING				
F.G.	FINISHED GRADE				

LEGEND

SYMBOL	DESCRIPTION
* 635.300	EXISTING ELEVATION
* 633.500	FINISHED GRADE ELEVATION
	CENTERLINE/CONTROL LINE
R/W	RIGHT-OF-WAY
TCE	TEMPORARY CONSTRUCTION EASEMENT
	LIMITS OF FILL
-X-X-	FENCE
GAS	GAS LINE
W	WATER LINE
OHP	OVERHEAD ELECTRICAL LINE
OHT	OVERHEAD TELEPHONE LINE
OHC	OVERHEAD CABLE TELEVISION LINE
UG ELEC	UNDERGROUND ELECTRICAL LINE
UG TEL	UNDERGROUND TELEPHONE LINE
UG CATV	UNDERGROUND CABLE TELEVISION LINE
SS	SEWER LINE
	TRANSMISSION TOWER
	HAUL ROUTE

SYMBOL	DESCRIPTION
	TOP OF SLOPE
	TOE OF SLOPE
	EXISTING ASPHALT CONCRETE (A/C)
	NEW ASPHALT CONCRETE (A/C)
	CONTRACTORS STAGING AREA
	NEW A.B.C. SURFACE
	DISPOSAL SITE

This drawing has been prepared in METRIC

SYMBOL	DESCRIPTIONS	DATE APPROVAL
	REVISIONS	
△	REVISED AS NOTED	8/03/03
△	REVISED AS NOTED	8/26/03
△	REVISED AS NOTED	8/26/03

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND; DIVERSION CHANNEL
INDEX TO CONTRACT DRAWINGS ABBREVIATIONS, AND SYMBOLS.

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE CHIEF, DESIGN BRANCH

DESIGNED BY: MM
DRAWN BY: AQM
CHECKED BY: GED

FILE NAME: T02.dgn

SPEC. NO: DACW09-03-B-0005

DISTRICT FILE NO. 214/058 REV. A

SHEET T2

VALUE ENGINEERING PAYS

INLET DAM
ALIGNMENT CONTROL POINT

PI NO.	NORTHING	EASTING
01	8142454.82	227114.63
02	8142516.30	227115.90
03	8142524.73	227114.00
04	8142560.67	227096.02
05	8142567.86	227089.49
06	8142598.08	227041.30

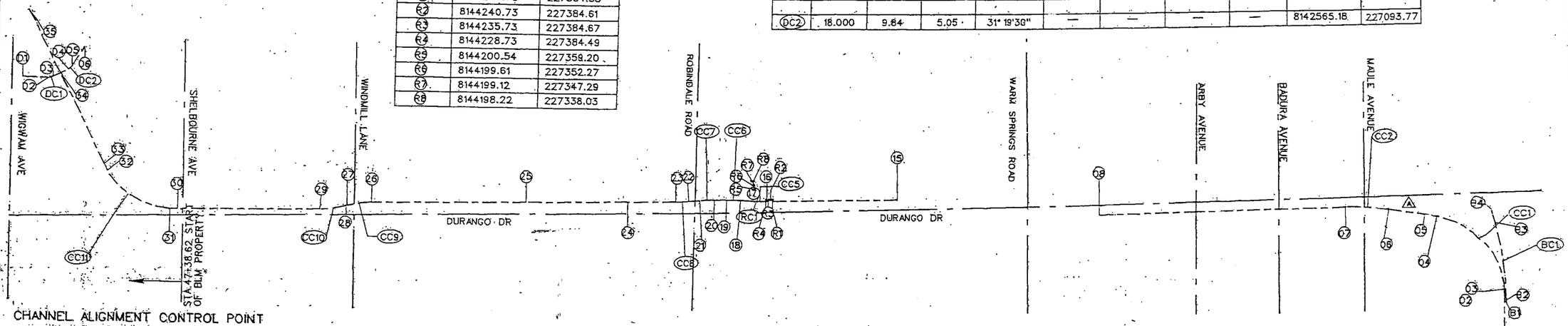
LATERAL CHANNEL
ALIGNMENT CONTROL POINT

PI NO.	NORTHING	EASTING
B1	8146029.40	227652.36
B2	8146029.44	227646.41
B3	8146002.39	227456.90
B4	8145992.41	227423.38
W1	8144925.44	227406.51
W2	8144895.30	227402.19
W3	8144860.98	227363.25
W4	8144858.76	227228.55
R1	8144245.73	227384.55
R2	8144240.73	227384.61
R3	8144235.73	227384.67
R4	8144228.73	227384.49
R5	8144200.54	227359.20
R6	8144199.61	227352.27
R7	8144199.12	227347.29
R8	8144198.22	227338.03

NOT IN CONTRACT

LATERAL CHANNEL AND INLET DAM CURVE DATA

CURVE DATA					SPIRAL DATA					
PI NO.	R	L	T	Δ	L_s	Δ_s	I	T_s	NORTHING	EASTING
BC1	650.000	192.12	96.77	16° 56'07"	—	—	—	—	8146030.02	227549.64
~~WC1~~	~~40.000~~	~~56.47~~	~~34.09~~	~~80° 53'11"~~					~~8144861.55~~	~~227397.34~~ NOT IN CONTRACT
RC1	32.000	40.53	23.49	72° 34'13"	7.000	6° 16'00"	85° 06'13"	32.93	8144205.35	227382.19
DC1	18.000	8.72	4.45	27° 45'51"	—	—	—	—	8142520.75	227116.00
DC2	18.000	9.84	5.05	31° 19'30"	—	—	—	—	8142565.18	227093.77



CHANNEL ALIGNMENT CONTROL POINT

PI NO.	NORTHING	EASTING
01	8146024.16	228062.35
02	8146025.35	227649.52
03	8146024.76	227619.54
04	8145871.16	227439.29
05	8145841.66	227433.87
06	8145756.50	227420.41
07	8145650.85	227413.03
08	8145050.34	227424.09
~~09~~	~~8145025.34~~	~~227424.03~~
~~10~~	~~8145018.18~~	~~227425.58~~
~~11~~	~~8144993.37~~	~~227420.55~~
~~12~~	~~8144763.12~~	~~227387.51~~
~~13~~	~~8144738.37~~	~~227384.38~~
~~14~~	~~8144724.90~~	~~227383.49~~
15	8144699.90	227383.36
16	8144231.12	227388.74
17	8144197.93	227388.02
18	8144168.42	227386.39
19	8144135.23	227385.67
20	8144105.49	227386.01
21	8144070.47	227387.64
22	8144042.02	227389.97
23	8144008.66	227391.58
24	8143893.29	227393.28
25	8143649.94	227397.15
26	8143283.30	227402.65
27	8143223.59	227411.66
28	8143222.28	227412.04
29	8143162.07	227421.05
30	8142822.66	227425.32
31	8142804.65	227425.24
32	8142659.18	227336.60
33	8142650.85	227320.65
34	8142467.31	226953.76

NOT IN CONTRACT

CHANNEL CURVE DATA

	CURVE DATA					SPIRAL DATA					
PI NO.	R	L	T	Δ	L_s	Δ_s	I	T_s	NORTHING	EASTING
CC1	200.000	253.380	146.890	72° 35'20"	30.000	4° 17'50"	81° 10'59"	186.530	8146025.90	227462.99
CC2	609.600	106.840	53.560	10° 02'34"	—	—	—	—	8145703.59	227412.04
CC3	200.000	7.180	3.590	2° 03'25"	25.000	3° 34'52"	9° 13'08"	28.630	8145021.71	227424.62
~~CC4~~	~~250.000~~	~~13.500~~	~~6.750~~	~~3° 05'38"~~	~~25.000~~	~~2° 51'53"~~	~~8° 40'25"~~	~~31.800~~	~~8144734.69~~	~~227383.00~~
CC5	500.000	33.210	16.610	3° 48'20"	—	—	—	—	8144214.51	227388.93
CC6	500.000	33.200	16.610	3° 48'17"	—	—	—	—	8144151.83	227385.48
CC7	500.000	35.070	17.540	4° 01'06"	—	—	—	—	8144087.95	227386.21
CC8	500.000	33.400	16.710	3° 49'39"	—	—	—	—	8144025.37	227391.33
CC9	225.00	60.570	30.470	15° 25'28"	—	—	—	—	8143252.83	227403.11
CC10	225.00	61.120	30.750	15° 33'49"	—	—	—	—	8143192.77	227420.66
CC11	175.00	177.920	97.510	58° 15'03"	18.000	2° 56'48"	64° 08'39"	118.71	8142703.96	227426.81

NOT IN CONTRACT

STATION	PROPERTIES OWNER
17+90.000 TO 18+73.000	TIBERTI
20+78.000 TO 22+84.000	GRAGSON
22+84.000 TO 25+19.089	TIBERTI
33+65.000 TO 37+35.580	RHODES RANCH

N

100 50 0 100 200
SCALE: 1: 5000

Call before you Dig
1-800-227-2600
METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	REVISED AS NOTED.		
	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL

SURVEY CONTROL MAP

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: FNN
DRAWN BY: MKH
CHECKED BY: GED

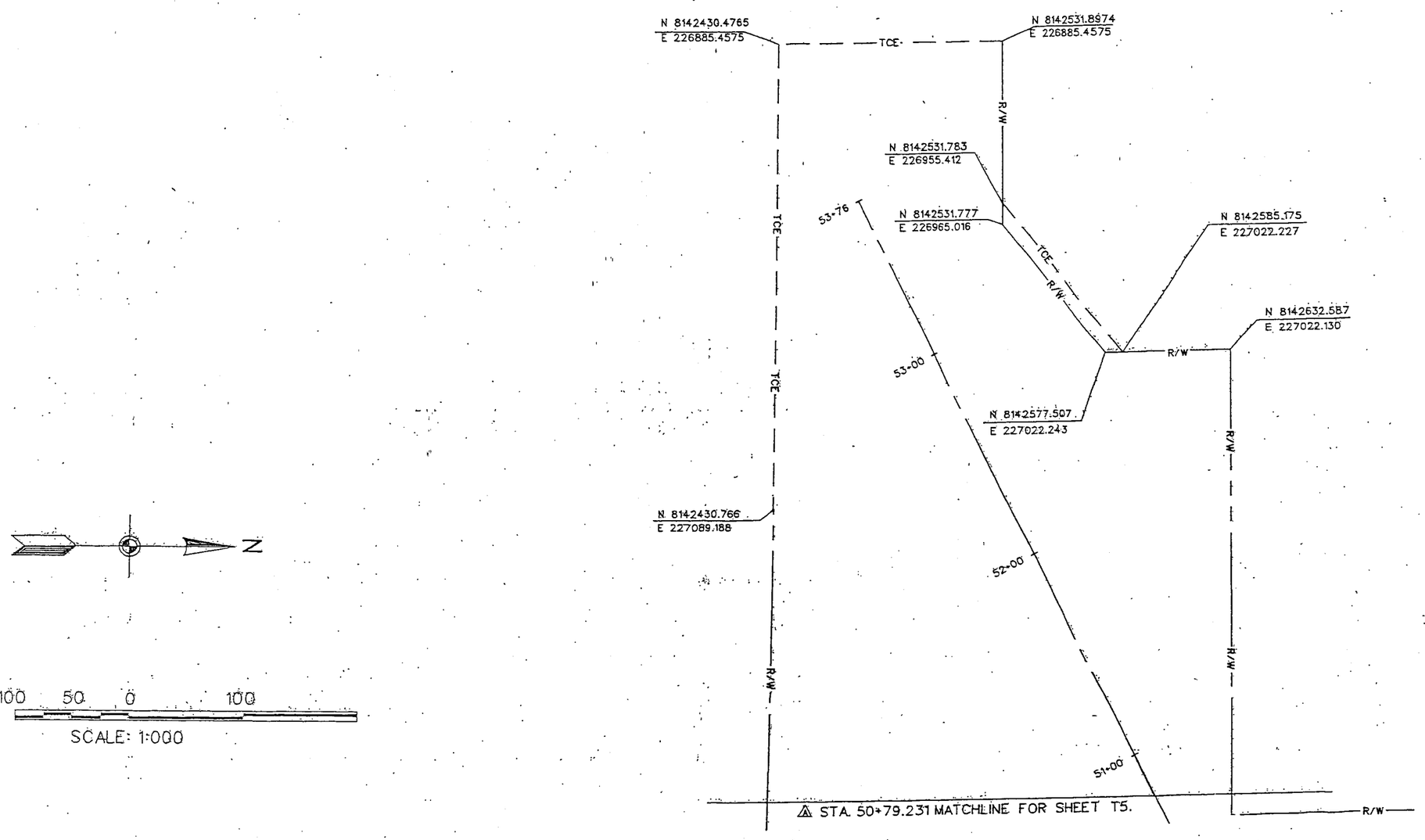
FILE NAME: T03.dgn

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214059 REV. A

SHEET
T3

VALUE ENGINEERING PAYS



N

100 50 0 100

SCALE: 1:000

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISED AS NOTED.		
	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA.
UPPER BLUE DIAMOND DIVERSION CHANNEL
WORK LIMITS
BLUE DIAMOND WASH

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMN
DRAWN BY: AQM
CHECKED BY: GED

FILE NAME: T04.dgn

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/060 REV. 'A'

SHEET
T4

Call
before you
Dig
1-800-227-2600

METRIC

VALUE ENGINEERING PAYS

N 8142430.766
E 227089.188

WIGWAM AVENUE

R/W

SHELBOURNE AVENUE

BM 200121
N 8,142,674.439
E 227,122.8317
EL 835.13

STA. 50+79.231 MATCHLINE FOR SHEET T4.

51+00

N 8142835.038
E 227226.108

N 8142632.694
E 227227.553

N 8142442.312
E 227332.229

N 8142430.119
E 227332.347

N 8142632.828
E 227330.386

N 8142632.873
E 227417.875

50+00

49+00

48+00

47+00

46+00

N 8142843.446
E 227406.157

N 8142835.842
E 227407.642

N 8142835.731
E 227415.399

DURANGO DR

N 8142835.985
E 227445.840

N 8142851.167
E 227415.204

STA. 47+01.5462 MATCHLINE FOR SHEET T6

ESTABLISHED CONTROL POINTS

POINT NO.	DESCRIPTION	OWNER
200121	SET A MAG NAIL AND 2 INCH ALUMINUM WASHER STAMPED "USCE LA-DIST, LVW 2001-21"; APPROXIMATELY 3 FEET NORTHERLY OF THE EDGE OF PAVEMENT AND 100 FEET EASTERLY OF AN INTERSECTION OF NEW STREETS, USE GPS NAVIGATION TO REACH THE STATION.	COE

N

100 50 0 100

SCALE: 1:2000

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	REVISED AS NOTED.		

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES,
(TROPICANA AND FLAMINGO WASHES), NEVADA.

UPPER BLUE DIAMOND: DIVERSION CHANNEL

WORK LIMITS
BLUE DIAMOND WASH

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HMA
DRAWN BY: AQN
CHECKED BY: GED

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: T05.dgn

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/081 REV-A

SHEET
T5

VALUE ENGINEERING PAYS

BM 200121
N 8,142,874.439
E 227,122.832
EL 835.13

ESTABLISHED CONTROL POINTS

POINT NO.	DESCRIPTION	OWNER
10455	FOUND A PUNCHED 1½ INCH ALUMINUM DISK, PARTIALLY ILLEGIBLE, STAMPED IN PART "B K JEFFERSON PLS", DOWN 0.75 FEET IN A WELL.	"BLM" MONUMENTATION
200121	SET A MAG NAIL AND 2 INCH ALUMINUM WASHER STAMPED "USCE LA DIST. LVW 2001-21", APPROXIMATELY 3 FEET NORTHERLY OF THE EDGE OF PAVEMENT AND 100 FEET EASTERLY OF AN INTERSECTION OF NEW STREETS, USE GPS NAVIGATION TO REACH THE STATION.	COE
200122	SET A ½ INCH BRASS CAP ON A COPPER WELD ROD STAMPED "USCE LA DIST. LVW 2001-22", APPROXIMATELY 25 FEET NORTHERLY OF AN OLD RAILROAD BED, USE GPS NAVIGATION TO REACH THE STATION.	COE

STA. 47+01.5462 MATCHLINE FOR SHEET T5

STA. 41+67.2024 MATCHLINE FOR SHEET T7

WINDMILL LANE

DURANGO DR

N 8143241.739
E 227385.339

N 8143241.895
E 227399.445

N 8143241.935
E 227403.084

N 8143038.876
E 227403.698

N 8143038.943
E 227412.842

N 8143175.673
E 227401.976

N 8143196.579
E 227410.858

N 8143283.252
E 227398.693

N 8143226.943
E 227425.717

N 8143227.107
E 227435.774

N 8143227.545
E 227462.642

N 8143242.014
E 227410.286

N 8143257.772
E 227446.884

N 8143256.021
E 227462.146

N 8143039.215
E 227438.138

N 8143039.302
E 227443.319

N 8142874.045
E 227445.399

BM 10455
N 8,143,241.929
E 227,425.558
EL 827.688

BM 200122
N 8,142,888.706
E 227,622.008
EL 827.77

TCE — R/W

47+00 46+00 45+00 44+00 43+00 42+00

30'

N

100 50 0 100 200

SCALE: 1:2000

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	REVISED AS NOTED.	9/28/03	
2	REVISED AS NOTED.	9/29/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

WORK LIMITS

STA. 47+01.5462 TO STA. 41+67.2024

DESIGNED BY: HMN
DRAWN BY: AOM
CHECKED BY: DED

FILE NAME: T06.dgn

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

SPEC. NO. DACW09-03-B-0005

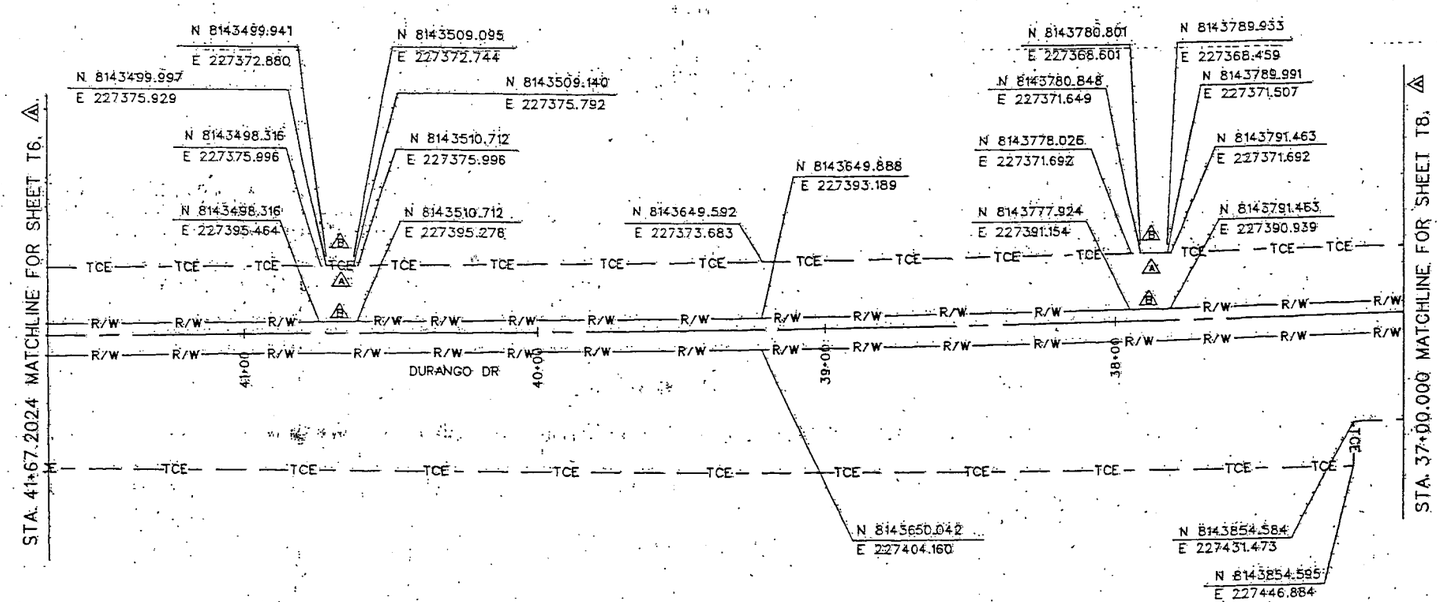
DISTRICT FILE NO. 214052 REV. A

SUBMITTED BY:

SHEET
T6

8 7 6 5 4 3 2 1

VALUE ENGINEERING PAYS



SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
2	REVISED AS NOTED.	8/26/05	
1	REVISED AS NOTED.	8/20/03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

WORK LIMITS
STA. 41+67.2024 TO STA. 37+00.00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HAN
DRAWN BY: AQM
CHECKED BY: GED

DISTRICT FILE NO. 214085 REV. A

SPEC. NO. DACW09-03-B-0005

FILE NAME: T07.dgn

SHEET
T7

Call before you Dig
1-800-227-2600

METRIC

8 7 6 5 VALUE ENGINEERING PAYS 4 3 2 1

ESTABLISHED CONTROL POINTS

POINT NO.	DESCRIPTION	OWNER
200127	SET A GEAR SPIKE AND ALUMINUM WASHER STAMPED "USCE LA DIST. LVW 2001-27", 3 FEET SOUTHERLY OF THE NORTHERLY CURB FACE ON PINE SHORES AND APPROXIMATELY 200 FEET NORTHWEST OF THE INTERSECTION OF RHODES RANCH AND PINE SHORES.	COE
200128	SET A GEAR SPIKE AND ALUMINUM WASHER STAMPED "USCE LA DIST. LVW 2001-28", FLUSH IN AN UNNAMED ASPHALT ROAD, USE GPS NAVIGATION TO REACH THE STATION.	COE

BM 200127
N 8,144,018.440
E 227,107.466
EL 822.67

ROBINDALE ROAD

DURANGO DR

STA. 37+00.000 MATCHLINE FOR SHEET T7

STA. 30+19.84 MATCHLINE FOR SHEET T9

N 8144058.538 E 227367.344
N 8144058.554 E 227352.266
N 8144030.218 E 227367.783
N 8143874.892 E 227370.191
N 8144013.225 E 227350.287
N 8143394.641 E 227368.335
N 8144079.650 E 227352.290
N 8144179.950 E 227322.274
N 8144079.819 E 227367.104
N 8144180.461 E 227365.950
N 8144180.658 E 227383.099
N 8144207.857 E 227321.954
N 8144208.740 E 227365.627
N 8144208.780 E 227369.080
N 8144229.100 E 227380.852
N 8144245.748 E 227381.304
N 8144443.979 E 227356.441
N 8144445.287 E 227362.237
N 8144444.012 E 227362.932
N 8144331.686 E 227383.319
N 8144445.287 E 227369.243
N 8144421.428 E 227369.243
N 8144421.428 E 227382.290
N 8144460.187 E 227356.441
N 8144459.172 E 227362.237
N 8144460.187 E 227362.746
N 8144459.172 E 227369.243
N 8144465.877 E 227362.681
N 8144466.382 E 227406.198
N 8144466.225 E 227393.159
N 8144058.312 E 227397.832
N 8144058.619 E 227423.128
N 8144058.687 E 227428.310
N 8144168.644 E 227382.438
N 8144135.193 E 227381.710
N 8144105.457 E 227382.051
N 8144121.105 E 227410.182
N 8144121.253 E 227422.411
N 8143893.237 E 227389.322
N 8144008.617 E 227387.616
N 8143873.362 E 227431.182
N 8144041.710 E 227386.020
N 8144070.159 E 227383.694

TCE R/W 37+00 36+00 35+00 34+00 33+00 32+00 31+00

BM 200128
N 8,144,060.672
E 227,629.769
EL 815.45

N

100 50 0 100 200
SCALE: 1:2000

Call before you Dig 1-800-227-2600

METRIC

SAFETY PAYS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
2	REVISED AS NOTED.	6/28/05	
1	REVISED AS NOTED.	6/20/05	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA.
UPPER BLUE DIAMOND CHANNEL
WORK LIMITS
STA. 37+00.00 TO STA. 30+19.84

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE, CHIEF, DESIGN BRANCH

DESIGNED BY: HMN
DRAWN BY: AQM
CHECKED BY: QED

FILE NAME: T08.dgn
SPEC. NO: DACW09-03-B-0005
DISTRICT FILE NO. 214764 REV. A

SHEET T8

VALUE ENGINEERING PAYS

WARM SPRINGS ROAD

DURANGO DR

DURANGO DRIVE

STA. 30+19.84 MATCHLINE FOR SHEET T8.

STA. 25+00 MATCHLINE FOR SHEET T10.

N 8144562.605
E 227361.561

N 8144562.694
E 227369.234

N 8144571.800
E 227369.243

N 8144572.327
E 227391.930

N 8144572.477
E 227404.975

N 8144933.904
E 227419.348

N 8144977.201
E 227417.030

N 8145011.385
E 227410.306

N 8144977.208
E 227416.554

N 8145006.459
E 227430.212

N 8144907.472
E 227419.833

N 8144891.314
E 227436.367

N 8144891.374
E 227449.089

N 8145011.384
E 227445.889

N 8145068.059
E 227445.849

R=16.45

TCE

R/W

29+00

28+00

27+80

26+00

25+00

100 50 0 100 200

SCALE: 1:2000

N

Call before you Dig
1-800-227-2600

METRIC

SYMBOL	REVISIONS DESCRIPTIONS	DATE	APPROVAL
1	REVISED AS NOTED.		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
WORK LIMITS
STA. 30+19.84 TO STA. 25+00.00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HNN
DRAWN BY: AQM
CHECKED BY: GED

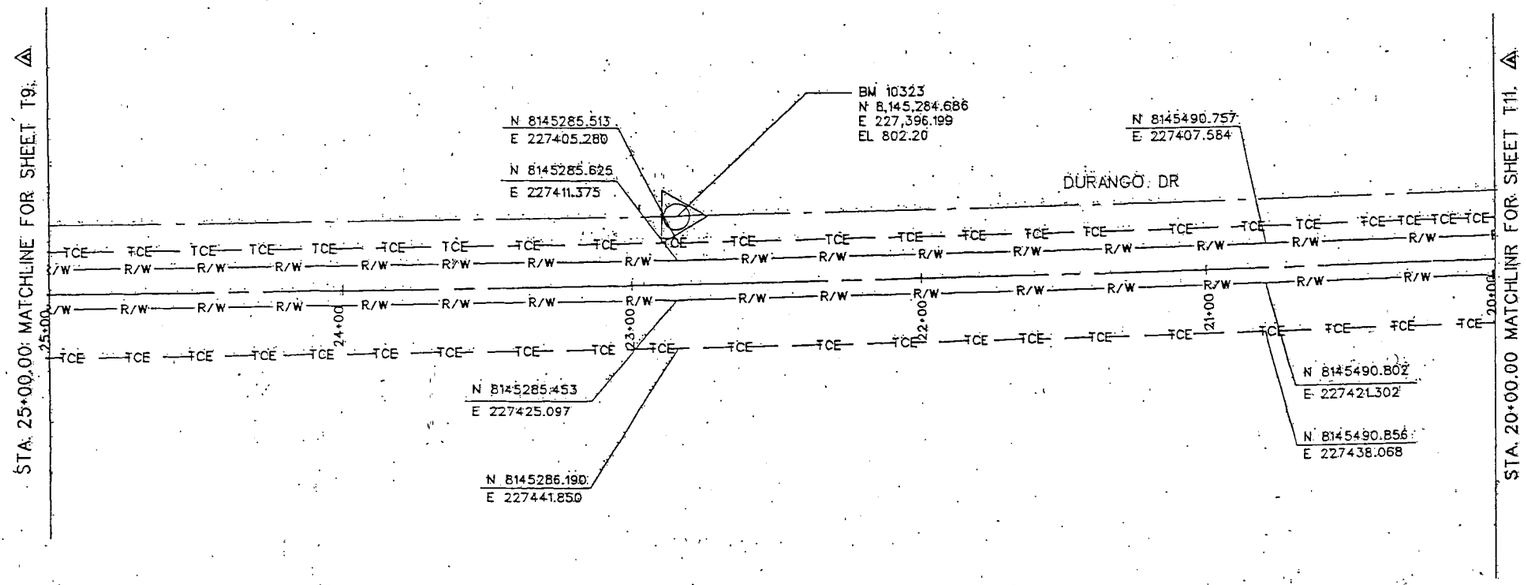
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SPEC. NO. DACW09-03-B-0005

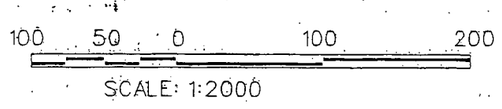
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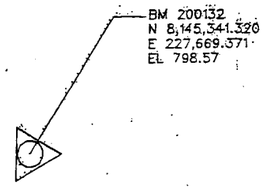
SHEET
T9

VALUE ENGINEERING PAYS









ESTABLISHED CONTROL POINTS

POINT NO.	DESCRIPTION	OWNER
10323	FOUND A 2 INCH BRASS DISK STAMPED "51-16-5-2, PLS 11535", FLUSH IN THE ASPHALT PAVEMENT.	"BLM" MONUMENTATION
200132	SET A 1½ INCH BRASS CAP ON A COPPER WELD ROD STAMPED "USCE LA DIST. LVW 2001-32"; USE GPS NAVIGATION TO REACH THE STATION.	COE

Call before you Dig
1-800-227-2600
This drawing was produced in METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	REVISED AS NOTED.		

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
WORK LIMITS

STA. 25+00.00 TO STA. 20+00.00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HMN
DRAWN BY: AQM
CHECKED BY: GED

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: T10.dgn

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/068, REV. A

SHEET
T10

ESTABLISHED CONTROL POINTS

POINT NO.	DESCRIPTION	OWNER
10098	FOUND A PUNCHED 2½ INCH DIAMETER BRASS DISK STAMPED "N ¼ S5 S4 PLS 5088 2000", FLUSH IN 6 INCH DIAMETER CONCRETE.	"BLM" MONUMENTATION
10104	FOUND A PUNCHED 1½ INCH ALUMINUM DISK, PARTIALLY ILLEGIBLE STAMPED "VTN PLS", DOWN 0.5 FEET.	"BLM" MONUMENTATION

VALUE ENGINEERING PAYS

BM 10104
N 8,145,695.338
E 227,388.592
EL 795.19

BM 10098
N 8,146,111.897
E 227,380.994
EL 795.58

MAULE AVENUE

DURANGO DR

STA. 20+00 MATCHLINE FOR SHEET T10. ⚠

STA. 14+00.000 MATCHLINE FOR SHEET T12. ⚠

N 8145696.112
E 227403.789

N 8145726.781
E 227403.236

N 8145769.204
E 227396.341

N 8145901.499
E 227416.470

N 8145864.110
E 227409.319

N 8145880.425
E 227450.861

N 8145895.673
E 227424.571

N 8145902.412
E 227441.493

N 8146043.327
E 227412.936

N 8145987.254
E 227416.726

N 8145996.018
E 227414.115

N 8146000.299
E 227418.447

N 8145997.552
E 227419.265

N 8146112.264
E 227440.369

N 8146023.555
E 227497.762

N 8146043.247
E 227440.372

N 8146019.490
E 227548.100

N 8146015.576
E 227549.834

N 8146037.097
E 227580.656

N 8145985.782
E 227574.104

N 8146035.493
E 227654.811

N 8146041.046
E 227654.811

N 8145650.155
E 227418.357

N 8145696.155
E 227419.258

N 8145696.162
E 227421.533

N 8145696.198
E 227434.273

N 8145724.660
E 227433.760

N 8145764.343
E 227429.334

N 8145785.163
E 227440.006

N 8145863.077
E 227455.645

N 8145868.315
E 227452.583

N 8145875.153
E 227455.427

N 8145893.253
E 227455.665

N 8145888.563
E 227489.100

N 8145899.090
E 227479.867

N 8145935.190
E 227476.383

N 8145904.098
E 227518.854

N 8145935.867
E 227494.521

N 8145999.482
E 227457.770

N 8145903.948
E 227592.914

N 8145962.487
E 227592.125

N 8145981.886
E 227640.733

N 8145967.750
E 227504.719

N 8146017.690
E 227632.513

N 8146017.771
E 227652.413

R=20.19

12+33
12+00
11+00
15+00
10+00
14+00

TCE R/W 20+00 19+00 17+00 15+00

N

100 50 0 100 200

SCALE: 1:2000

Call before you Dig
1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
⚠	REVISED AS NOTED.	11/25/03	
⚠	REVISED AS NOTED.	11/25/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

WORK LIMITS

STA. 20+00.00 TO STA. 14+00.00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: MMN
DRAWN BY: AQM
CHECKED BY: GED

SUBMITTED BY:

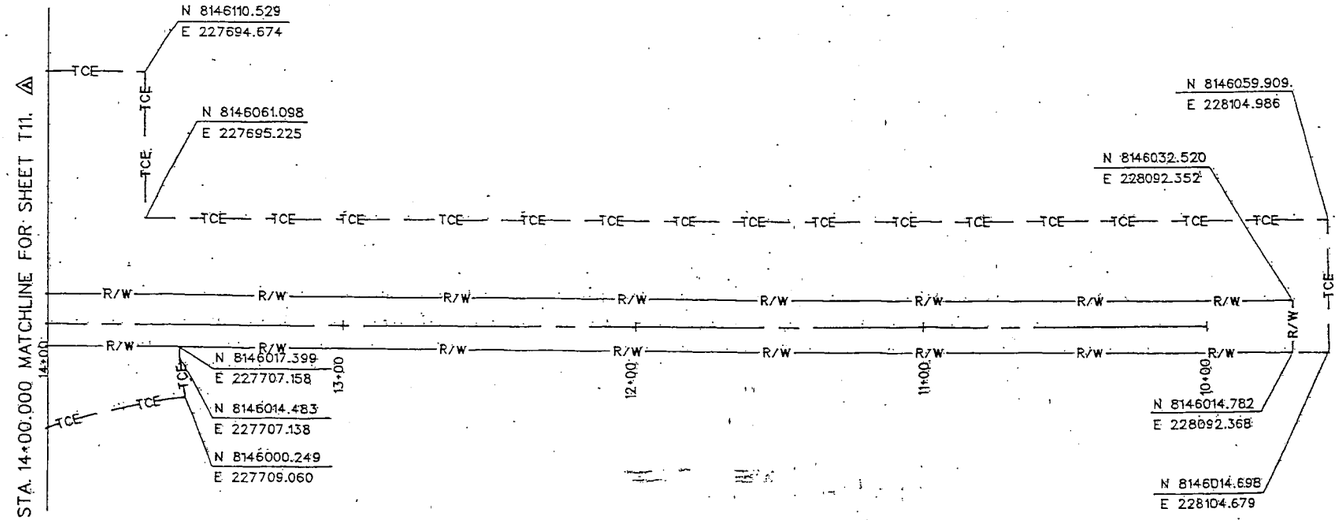
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

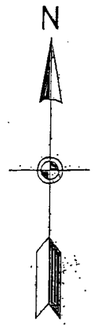
FILE NAME: T11.dgn

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214087 REV A

SHEET
T 11





100 50 0 100 200

SCALE: 1:2000

BM. 200133
N 8,145,683.713
E 227,667.157
EL 793.02

BM. 10096
N 8,145,696.473
E 227,802.814
EL 792.26

MAULE AVENUE

ESTABLISHED CONTROL POINTS

POINT NO.	DESCRIPTION	OWNER
10096	FOUND A 2 INCH PIPE WITH A 3 INCH BRASS CAP "U.S. CADASTRAL SURVEY BUREAU OF LAND MANAGEMENT PENALTY $250 FOR REMOVAL" STAMPED "T22S R60E 1/16 S4 CC 1957", UP 2.0 FEET IN A ROCK MOUND.	"BLM" MONUMENTATION
200133	SET A 1½ INCH BRASS CAP ON A COPPER WELD ROD STAMPED "USCE LA DIST. LVW 2001-33", USE GPS NAVIGATION TO REACH THE STATION.	COE

Call before you Dig 1-800-227-2600

This drawing is prepared in METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
1	REVISED AS NOTED.		

LAS VEGAS WASH AND TRIBUTARIES
TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
WORK LIMITS
STA 14+00.00 TO STA. 10+00.00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

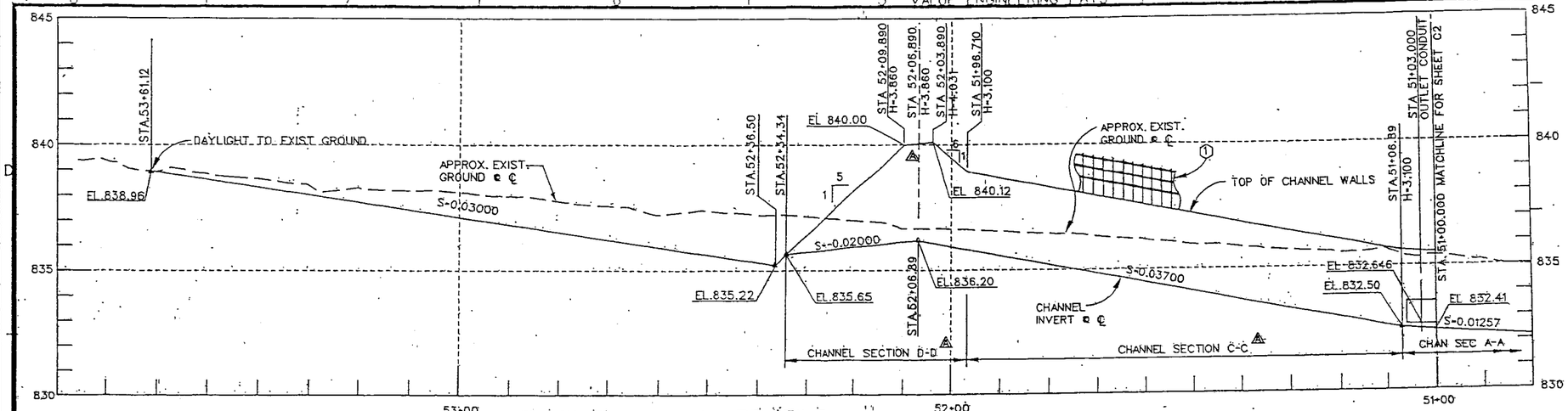
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMH
DRAWN BY: AOM
CHECKED BY: GED

DISTRICT FILE NO. 211/ORM REV. 'A' | SPEC. NO. DACW09-03-B-0005 | FILE NAME: T12.dgn

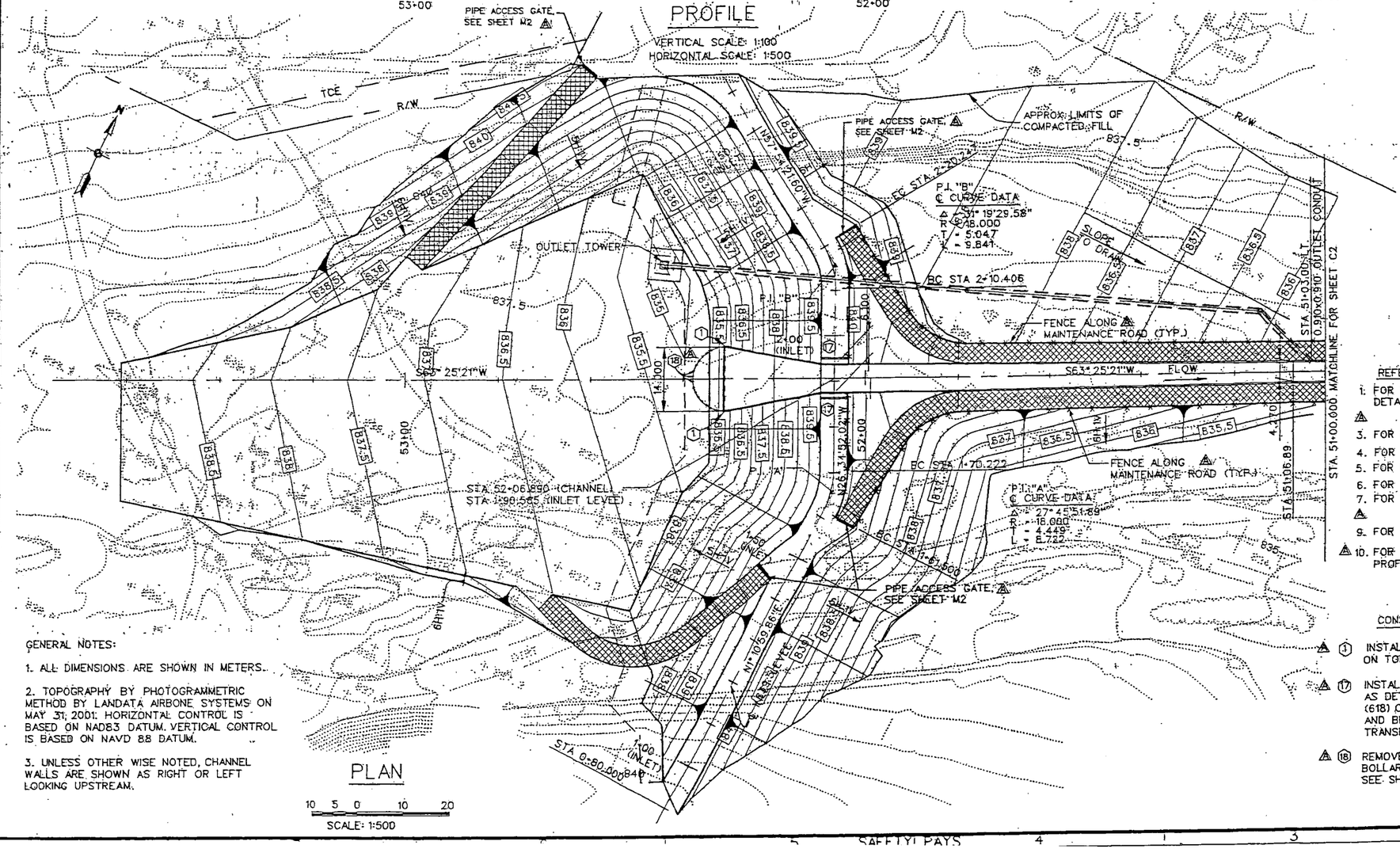
SHEET T12

VALUE ENGINEERING PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

10 5 0 10 20
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBONE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHER WISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

REFERENCE NOTES:

1. FOR TYP. CHANNEL SECTIONS AND DETAILS, SEE SHEET S2.
3. FOR POST AND CABLE RAILING, SEE SHEET M3.
4. FOR MAINT. ROAD DETAIL, SEE SHEET M1.
5. FOR INLET TOWER, SEE SHEET S17 AND S18.
6. FOR INLET STRUCTURE GRADING PLAN, SEE SHEET C32.
7. FOR OUTLET CONDUIT PLAN & PROFILE, SEE SHEET C36.
9. FOR CHANNEL GRADING SEE SHEETS C20 TO C28.
10. FOR SPILLWAY (INLET STRUCTURE) PLAN AND PROFILE, SEE SHEET S18.

CONSTRUCTION NOTES:

(1) INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL.

(17) INSTALL 6 M METAL BEAM GUARDRAIL AS DETAILED ON DRAWING NO. R-8.2.2 (618) OF THE "STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION", DEPT OF TRANSPORTATION, STATE OF NEVADA

(18) REMOVEABLE LOCKABLE BOLLARDS, 1.000 OC, SEE SHEET M2 FOR DETAILS

Call before you Dig 1-800-227-2600

This drawing was prepared in METRIC

SYMBOL	REVISED SHEET DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
PLAN AND PROFILE
INLET STRUCTURE TO STA 51+00.000

DESIGNED BY: HMN
DRAWN BY: AGM
CHECKED BY: GED

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

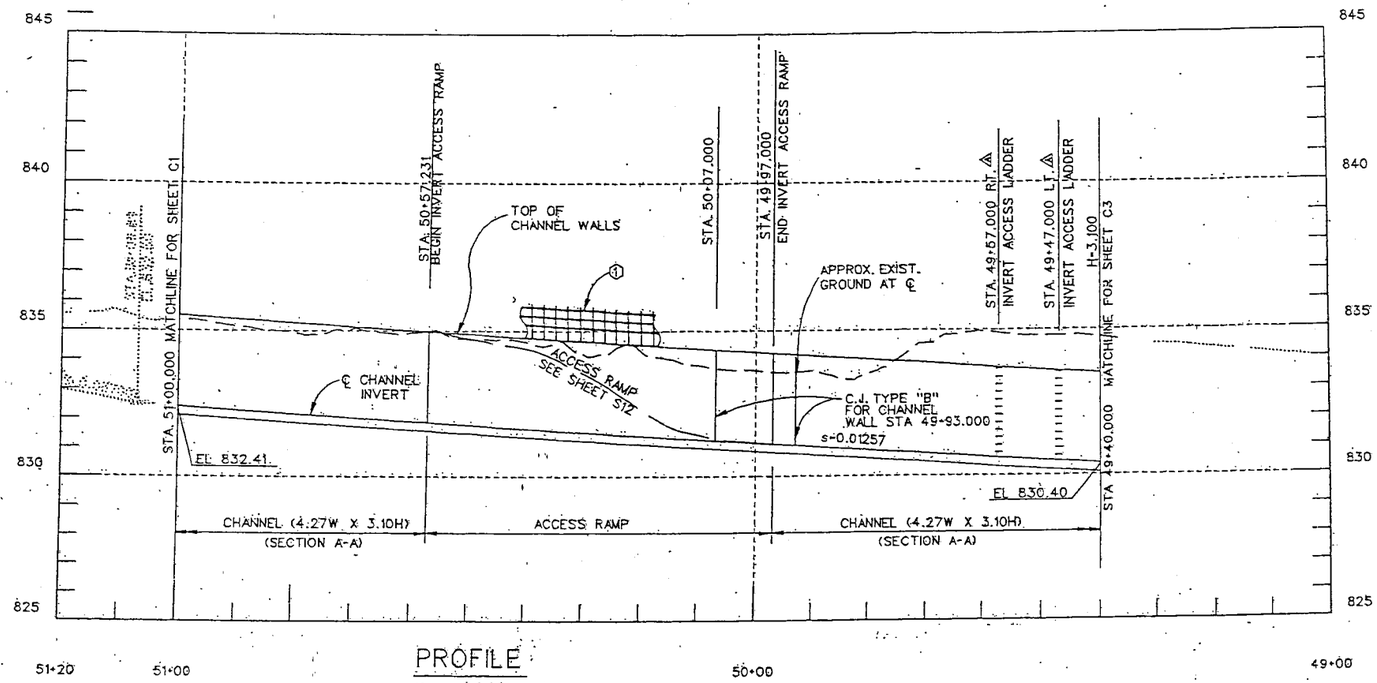
COLOGN

FILE NAME:

DISTRICT FILE NO. 214/071 REV. A | SPEC. NO. DACW09-03-B-0005

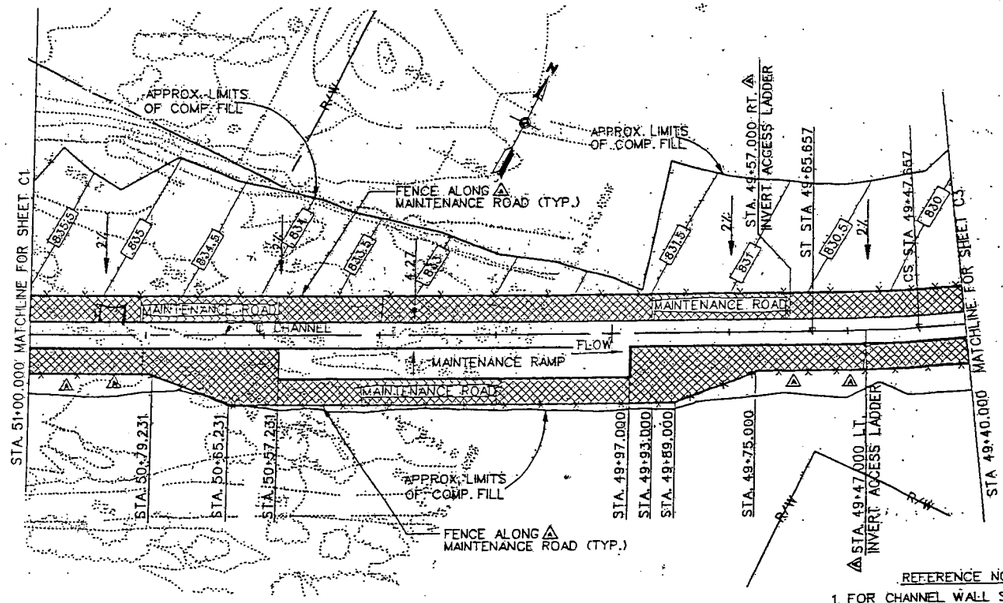
SHEET C1

SAFETY! PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

10 5 0 10 20
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHER WISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

⚠ ① INSTALL POST AND CABLE RAILINGS ON TOP OF CHANNEL WALL.

REFERENCE NOTES:

1. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
2. FOR INVERT ACCESS LADDER, SEE SHEET S2.
3. FOR POST AND CABLE RAILING, SEE SHEET M3.
4. FOR MAINT. ROAD DETAIL, SEE SHEET M1
5. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
6. ⚠ FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
7. FOR INVERT ACCESS RAMP, SEE SHEET S12.
8. FOR TOE AND R/W LIMIT, SEE SHEETS T4 TO T12.

-after underground

Call before you Dig 1-800-227-2600

The drawings were prepared in METRIC

SYMBOL	REVISED SHEET DESCRIPTIONS REVISIONS	DATE APPROVAL
⚠		

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
PLAN AND PROFILE
STA. 51+00.00 TO STA. 49+40.00

DESIGNED BY: HMM
DRAWN BY: AGM
CHECKED BY: GED

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

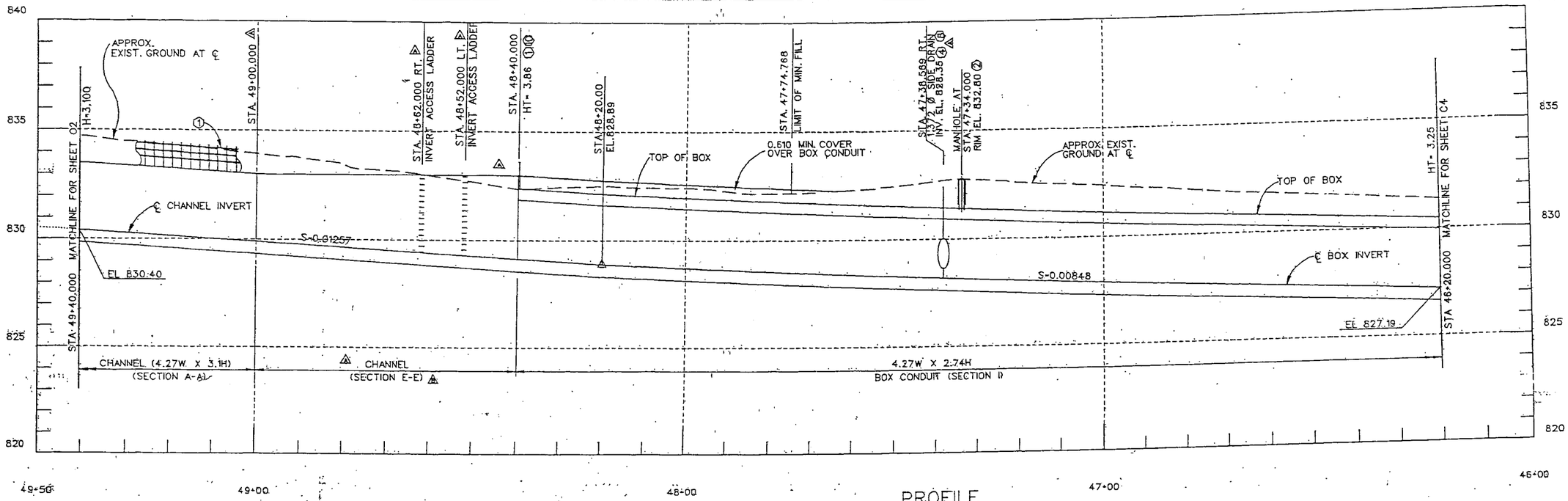
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DISTRICT FILE NO. 214/6172 REV. A | SPEC. NO. DACW09-03-B-0005

SHEET C2

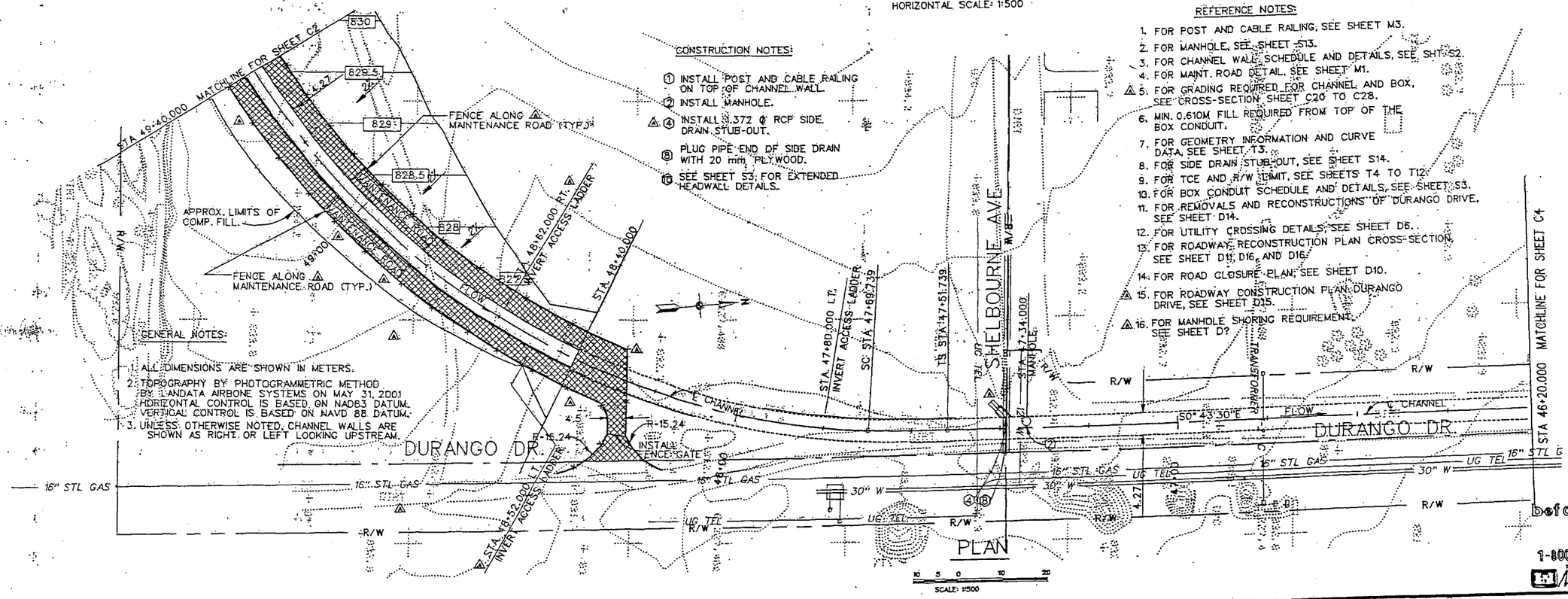
VALUE ENGINEERING PAYS

SAFETY PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

SCALE: 1:500

CONSTRUCTION NOTES:

1. INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL.
2. INSTALL MANHOLE.
4. INSTALL Ø372 Ø RCP SIDE DRAIN STUB-OUT.
8. PLUG PIPE END OF SIDE DRAIN WITH 20 mm PLYWOOD.
10. SEE SHEET S3 FOR EXTENDED HEADWALL DETAILS.

REFERENCE NOTES:

1. FOR POST AND CABLE RAILING, SEE SHEET M3.
2. FOR MANHOLE, SEE SHEET S13.
3. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHT. S2.
4. FOR MAINT. ROAD DETAIL, SEE SHEET M1.
5. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION, SHEET C20 TO C28.
6. MIN. 0.610M FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
7. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
8. FOR SIDE DRAIN STUB-OUT, SEE SHEET S14.
9. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
10. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
11. FOR REMOVALS AND RECONSTRUCTIONS OF DURANGO DRIVE, SEE SHEET D14.
12. FOR UTILITY CROSSING DETAILS, SEE SHEET D5.
13. FOR ROADWAY RECONSTRUCTION PLAN CROSS-SECTION, SEE SHEET D11, D16, AND D16.
14. FOR ROAD CLOSURE PLAN, SEE SHEET D10.
15. FOR ROADWAY CONSTRUCTION PLAN DURANGO DRIVE, SEE SHEET D15.
16. FOR MANHOLE SHORING REQUIREMENT, SEE SHEET D?

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBONE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
⚠	REVISED AS NOTED.	9/30/03	
⚠	REVISED AS NOTED.	8/25/03	

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NV/AZ/CA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 49+40.000 TO STA. 46+20.000

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HNN
DRAWN BY: AQM
CHECKED BY: GED

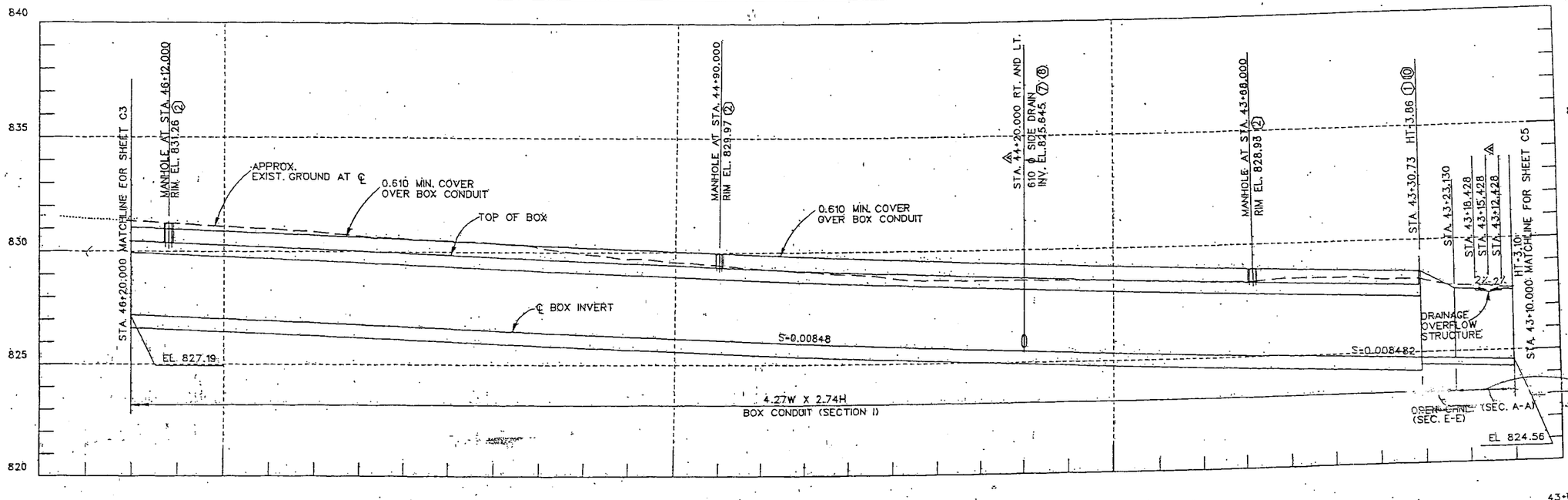
FILE NAME: C03.DGN

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214073 REV. A

SHEET C3

VALUE ENGINEERING PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500

CONSTRUCTION NOTES:

② INSTALL MANHOLE.

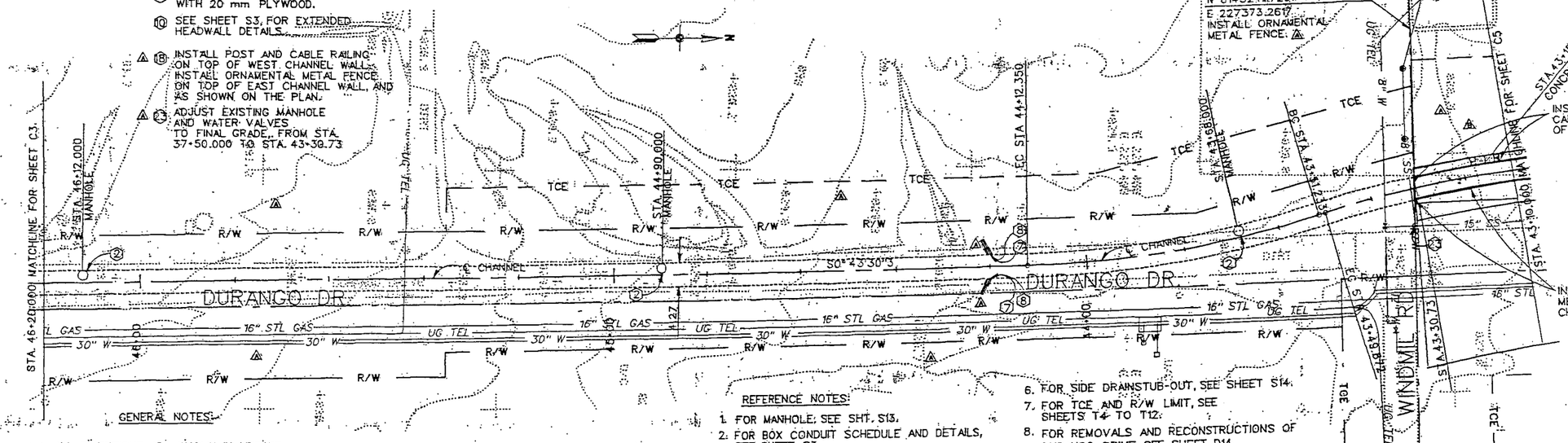
△⑦ INSTALL 0.610 ϕ RCP SIDE DRAIN STUB-OUT.

⑧ PLUG PIPE END OF SIDE DRAIN WITH 20 mm PLYWOOD.

⑩ SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.

△⑱ INSTALL POST AND CABLE RAILING ON TOP OF WEST CHANNEL WALL, INSTALL ORNAMENTAL METAL FENCE ON TOP OF EAST CHANNEL WALL, AND AS SHOWN ON THE PLAN.

△⑬ ADJUST EXISTING MANHOLE AND WATER VALVES TO FINAL GRADE, FROM STA. 37+50.000 TO STA. 43+30.73



PLAN

50 0 10 20

SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001 HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

REFERENCE NOTES:

1. FOR MANHOLE, SEE SHT. S13.
2. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
3. MIN. 0.610 FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
4. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
△5. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20- TO C28.
6. FOR SIDE DRAINSTUB-OUT, SEE SHEET S14.
7. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
8. FOR REMOVALS AND RECONSTRUCTIONS OF DURANGO DRIVE, SEE SHEET D14
9. FOR DRAINAGE OVERFLOW STRUCTURE SEE SHEET C30
△10. FOR ORNAMENTAL METAL FENCE DETAILS, SEE SHEET M4
11. FOR CONCRETE OVERFLOW, SEE SHEET C29 AND C30.
△12 FOR UTILITY CROSSING DETAILS, SEE SHEET D5.
13. FOR ROAD CLOSURE PLAN, SEE SHEET D10.

△△

Call before you Dig
1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS: REVISIONS	DATE	APPROVAL
△	REVISED AS NOTED.	9/24/03	
△	REVISED AS NOTED.	9/20/03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 46+20.000 TO STA. 43+10.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HMN
DRAWN BY: AOH
CHECKED BY: GED

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

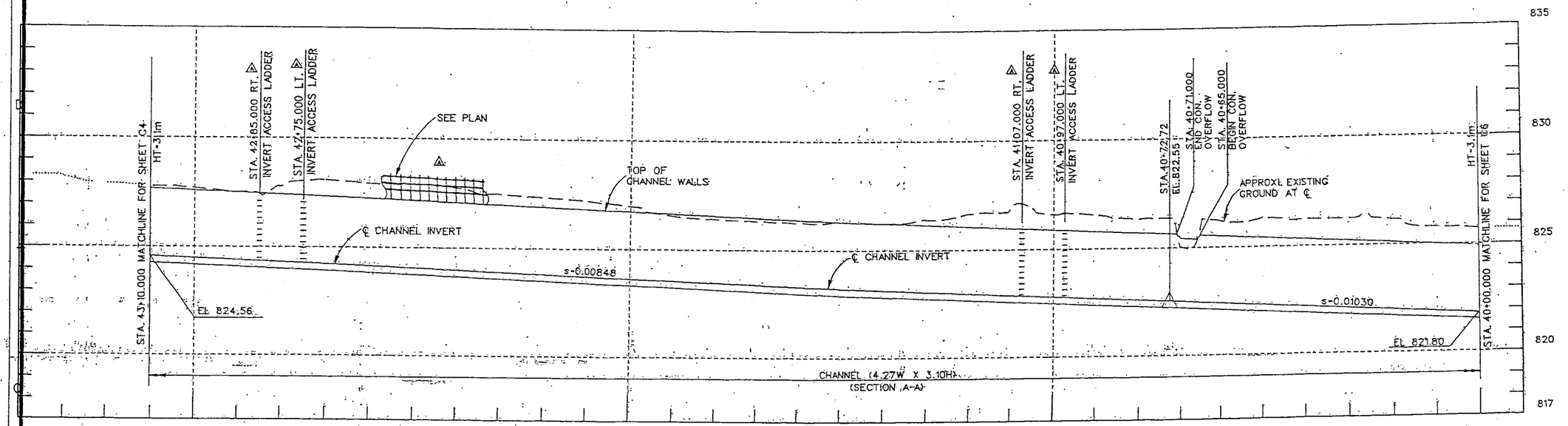
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SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 311.074 REV. A

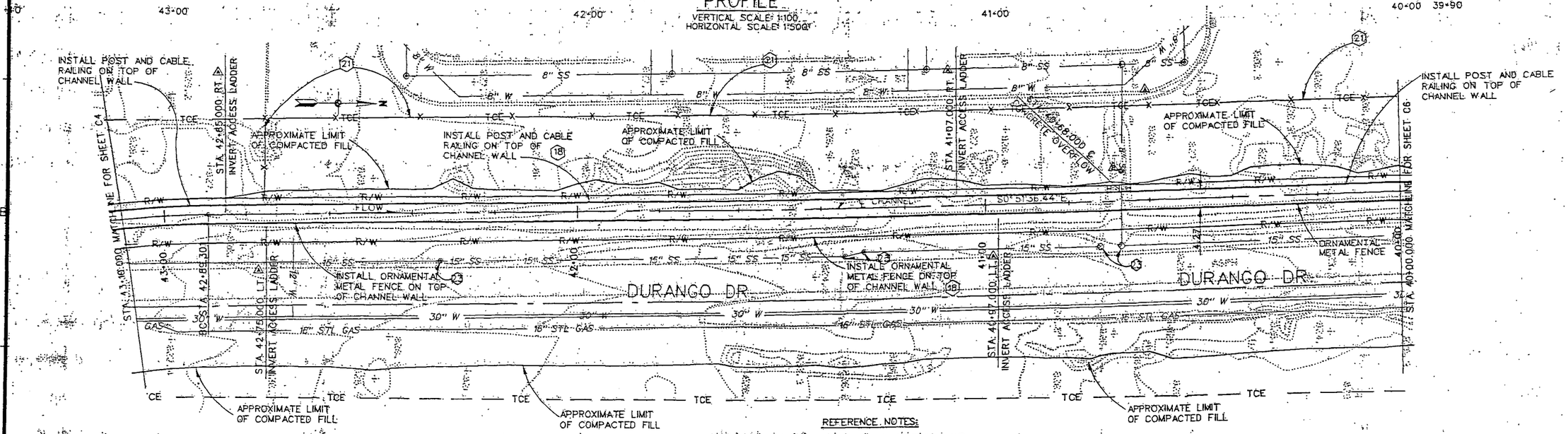
SHEET
C4

SAFETY! PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001 HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

- ⚠ (18) INSTALL POST AND CABLE RAILING ON TOP OF WEST CHANNEL WALL. INSTALL ORNAMENTAL METAL FENCE ON TOP OF EAST CHANNEL WALL, AND AS SHOWN ON THE PLAN.
- ⚠ (21) INSTALL 11 GAGE CHAIN LINK FENCE.
- ⚠ (23) ADJUST EXISTING MANHOLE AND WATER VALVES TO FINAL GRADE. FROM STA. 37+50.000 TO STA. 43+30.73

PLAN
10 5 0 10 20
SCALE: 1:500

REFERENCE NOTES:

1. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
2. FOR INVERT ACCESS LADDER, SEE SHEET S2.
3. FOR POST AND CABLE RAILING, SHEET SHEET M3.
4. FOR MAINT. ROAD DETAIL, SEE SHEET M1.
5. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
7. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T.12.
8. FOR CONCRETE OVERFLOW, SEE SHEET C29
9. ⚠ FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
10. ⚠ FOR ORNAMENTAL FENCE DETAILS, SEE SHEET M4
11. FOR TYPICAL PAVEMENT SECTION, SEE SHEET D11.
12. ROADWAY CONSTRUCTION PLAN, SEE SHEET D17 AND D18.
13. FOR UTILITY CROSSING, SEE SHEET D5.

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL
⚠	REVISED AS NOTED.	11/28/03	
⚠	REVISED AS NOTED.	11/26/03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
PLAN AND PROFILE
STA. 43+10.000 TO STA. 40+00.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HMH
DRAWN BY: AOM
CHECKED BY: GED

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: C05.DGN

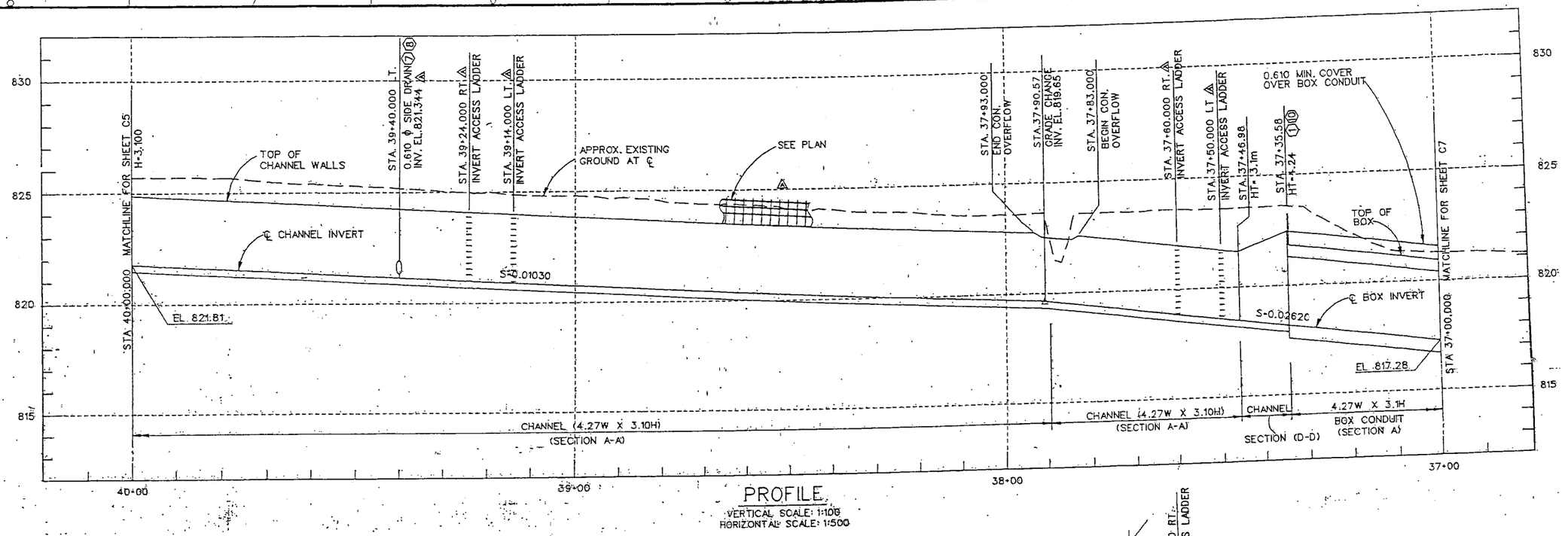
DISTRICT FILE NO. 21403S REV. A | SPEC. NO. DACW09-03-R-0005

SHEET C5

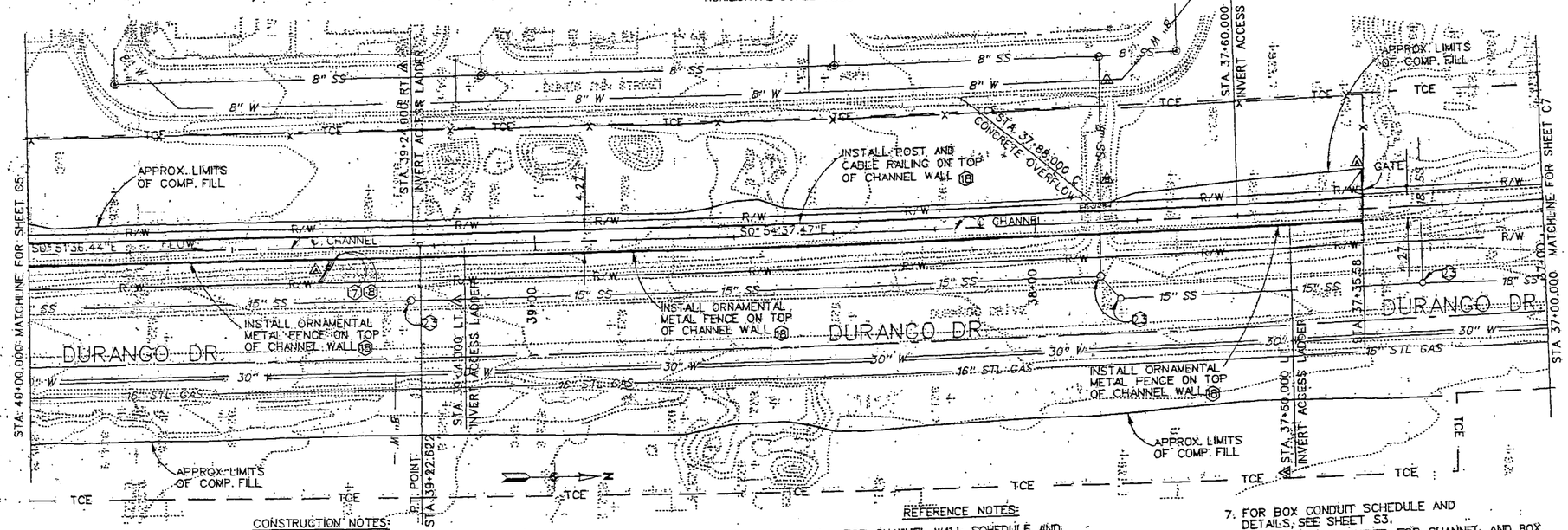
Call before you Dig 1-800-227-2600

METRIC

VALUE ENGINEERING PAYS



PROFILE
VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

- Δ7 INSTALL 0.610 ϕ RCP SIDE DRAIN STUB-OUT.
- Δ8 PLUG PIPE END OF SIDE DRAIN WITH 20 mm PLYWOOD.
- (10) SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.
- Δ18 INSTALL POST AND CABLE RAILING ON TOP OF WEST CHANNEL WALL. INSTALL ORNAMENTAL METAL FENCE ON TOP OF EAST CHANNEL WALL, AND AS SHOWN ON THE PLAN.
- Δ23 ADJUST EXISTING MANHOLE AND WATER VALVES TO FINAL GRADE, FROM STA. 37+50.000 TO STA. 43+30.73

REFERENCE NOTES:

1. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
2. FOR INVERT ACCESS LADDER; SEE SHEET S2.
3. FOR POST AND CABLE RAILING, SEE SHEET M3.
4. FOR MAINTENANCE ROAD DETAIL, SEE SHEET M1.
5. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
6. MIN. 0.610 FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
7. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
- Δ8. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
9. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
- Δ10. FOR ORNAMENTAL METAL FENCE DETAILS, SEE SHEET M4.
11. FOR UTILITY CROSSING DETAIL, SEE D4 AND D5.
12. FOR CONCRETE OVERFLOW, SEE SHEET C29 AND C30.
13. FOR TYPICAL PAVEMENT SECTION, SEE SHEET D11.
14. FOR ROADWAY CONSTRUCTION PLAN, SEE SHEET D17 AND D18.
15. FOR UTILITY CROSSING, SEE SHEET D4 AND D5.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL
Δ	REVISED AS NOTED.	01/29/03
Δ	REVISED AS NOTED.	01/29/03

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
PLAN AND PROFILE
STA. 40+00.000 TO STA. 37+00.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HNN
DRAWN BY: AOW
CHECKED BY: GED

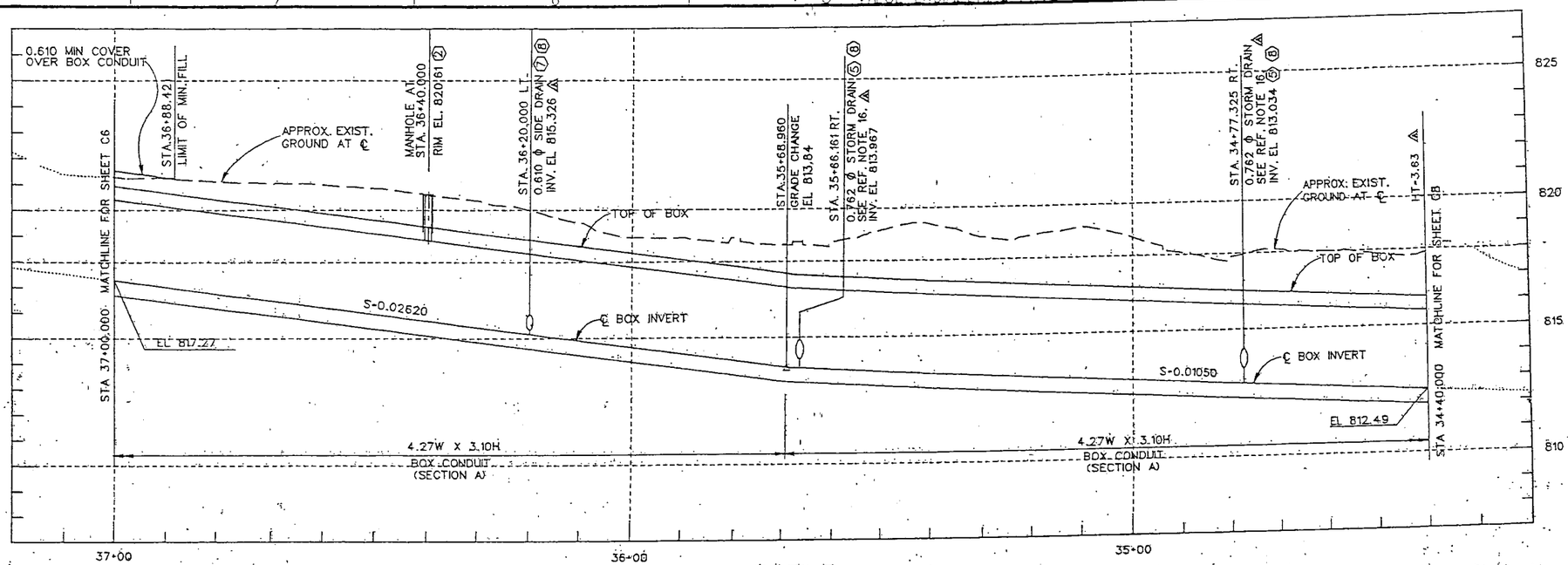
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: C06.DGN

DISTRICT FILE NO. 214078 REV. A | SPEC. NO. DACW09-03-B-0005

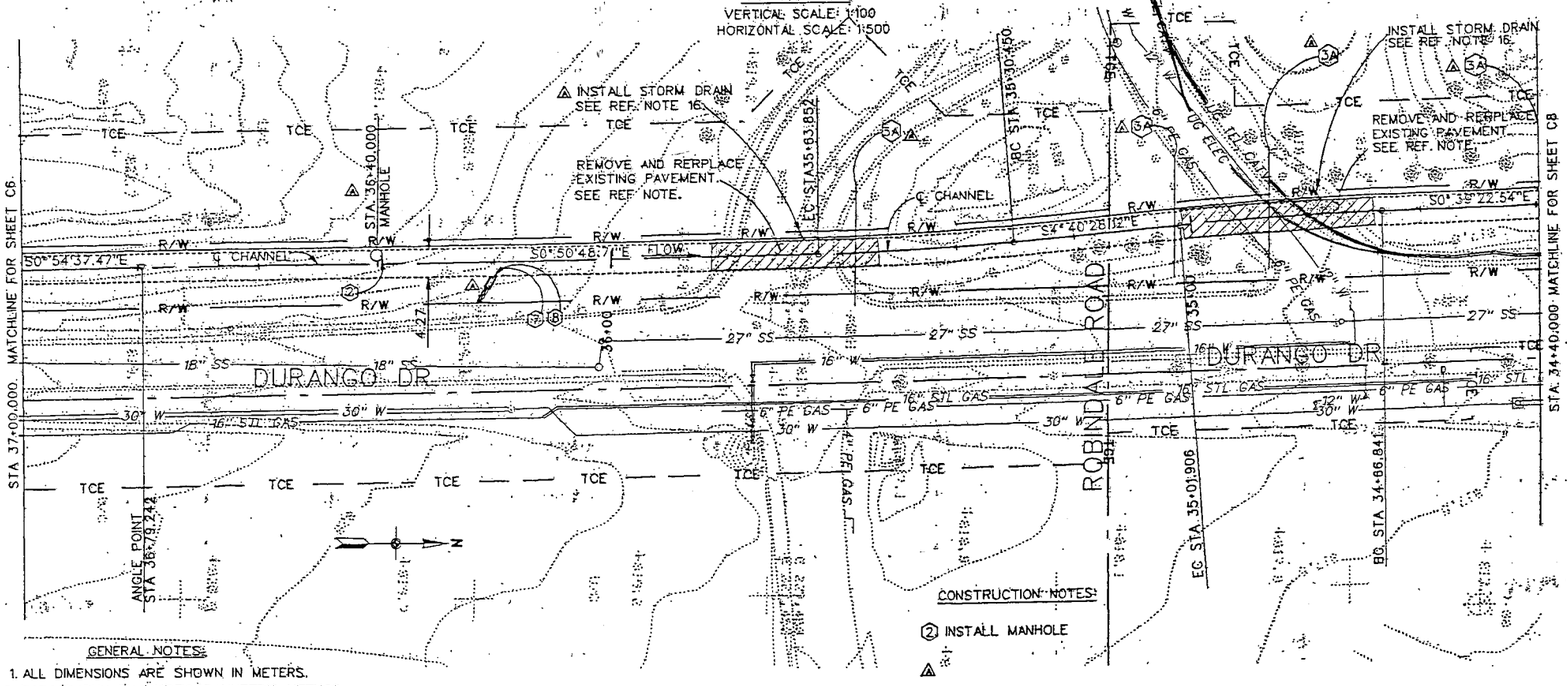
SHEET C6

SAFETY PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

10 5 0 10 20
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

(2) INSTALL MANHOLE

△ (7) INSTALL 0.610 ϕ RCP SIDE DRAIN STUB-OUT.

(8) PLUG PIPE END OF SIDE DRAIN WITH 20 mm PLYWOOD.

△ (5A) EXCAVATION SHORING REQUIRED FROM STA. 35+57.644 TO STA. 35+02.853 WEST SIDE OF EXCAVATION AND STA. 34+86.656 TO STA. 34+40.000 WEST SIDE OF EXCAVATION

REFERENCE NOTES:

1. FOR BOX CONDUIT OF SCHEDULE AND DETAILS, SEE SHEET S3
2. FOR MANHOLE DETAIL, SEE SHEET S13.
3. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3
△ 4. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
5. MIN. 0.610 FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
6. FOR SIDE DRAIN STUB-OUT SEE SHEET S14.
7. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12
8. FOR UTILITY CROSSING, SEE SHEET D4
9. FOR RHODES RANCH ENTRY DETOUR, SEE SHEET D9.
10. FOR REMOVE AND RECONSTRUCTION OF RHODES RANCH PARKWAY; SEE SHEET D13.
11. FOR ROAD CLOSURE PLAN, SEE SHEET D10.
12. FOR REMOVALS AND RELOCATIONS OF DURANGO DRIVE, SEE SHEET D14.
13. FOR ROAD WAY RECONSTRUCTION PLAN, SEE SHEET D18.
△ 15. FOR REMOVALS AND RECONSTRUCTIONS, SEE SHEET D13.
△ 16. FOR STORM DRAIN PLAN AND PROFILE, SEE SHEET D13 AND D19.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	REVISIONS DESCRIPTIONS	DATE	APPROVAL
△	REVISED AS NOTED		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
PLAN AND PROFILE
STA. 37+00.000 TO STA. 34+40.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGEL, PE
CHIEF, DESIGN BRANCH

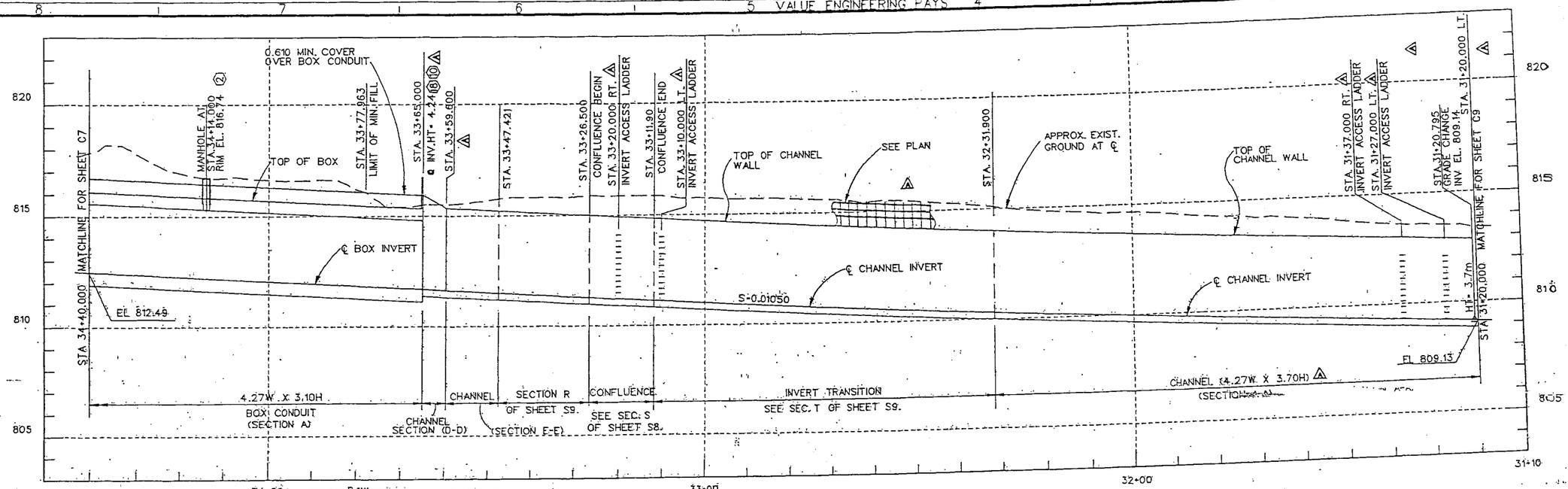
DESIGNED BY: HMN
DRAWN BY: AGM
CHECKED BY: GED

FILE NAME: C07.DGN

DISTRICT FILE NO. 214/077 REV. A | SPEC. NO. DACW09-03-B-0005

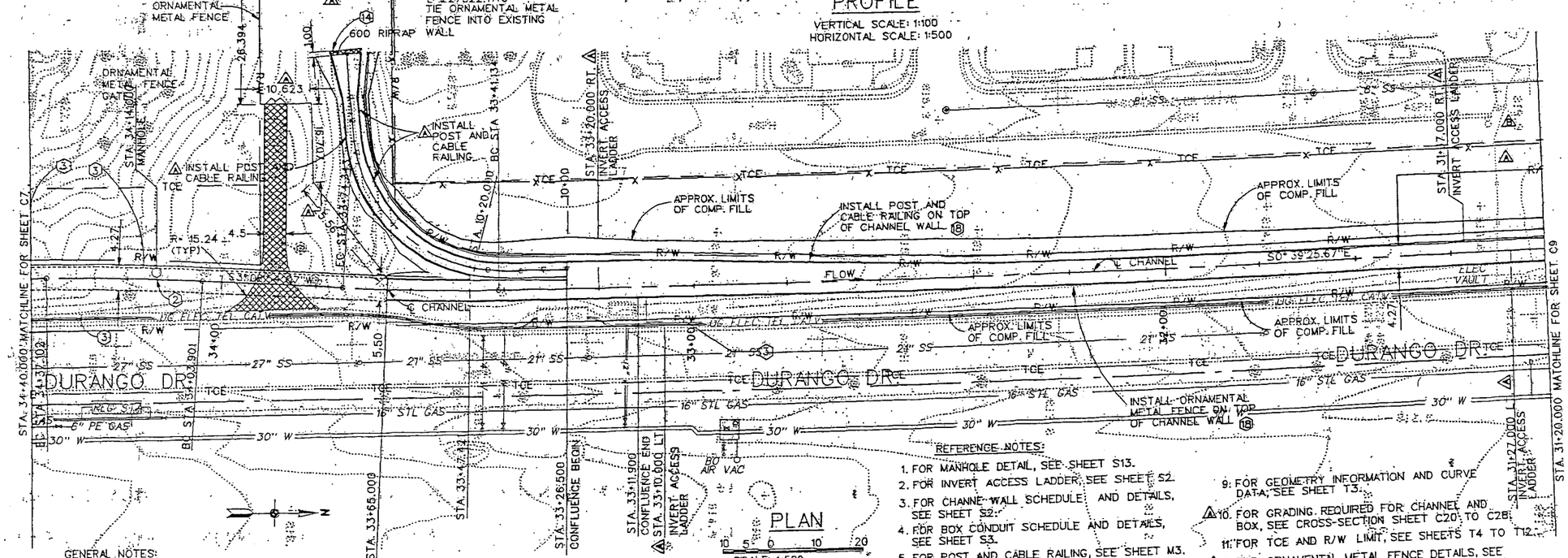
SHEET C7

5 VALUE ENGINEERING PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 NDATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

- ⚠ (2) INSTALL MANHOLE
- (3) EXCAVATION SHORING REQUIRED FROM STA.34+30.000 TO STA. 33+02.481 EAST SIDE OF EXCAVATION AND STA.34+40.000 TO STA. 34+16.498 WEST SIDE OF EXCAVATION
- (10) SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.
- (14) PLACE RIPRAP ALONG THE APRON AS SHOWN ON THE PLAN.
- ⚠(18) INSTALL POST AND CABLE RAILING ON TOP OF WEST CHANNEL WALL. INSTALL ORNAMENTAL METAL FENCE ON TOP OF EAST CHANNEL WALL; AND AS SHOWN ON THE PLAN.

REFERENCE NOTES:

1. FOR MANHOLE DETAIL, SEE SHEET S13.
2. FOR INVERT ACCESS LADDER, SEE SHEET S2.
3. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
4. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
5. FOR POST AND CABLE RAILING, SEE SHEET M3.
6. FOR RHODES RANCH LATERAL PLAN AND PROFILE, SEE SHEET C-17.
7. FOR RHODES RANCH CONFLUENCE STRUCTURAL DETAIL, SEE SHEET S8.
8. MIN. 0.610M FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
9. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
- ⚠10. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
11. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
- ⚠12. FOR ORNAMENTAL METAL FENCE DETAILS, SEE SHEET M4.
13. FOR UTILITY CROSSING DETAILS, SEE SHEET D4.
14. RHODES RANCH ENTRY DETOUR, SEE SHEET D9.

SYMBOL	DESCRIPTIONS	DATE
⚠	REVISED NOTE	9/26/03
⚠	REVISED NOTE	4/10/03
	REVISIONS	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 34+40.000 TO STA. 31+20.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS. OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMN
DRAWN BY: AGM
CHECKED BY: CED

FILE NAME: C08.DGN

DISTRICT FILE NO. 214078 REV. A | SPEC. NO. DACW09-03-B-0005

SHEET C8

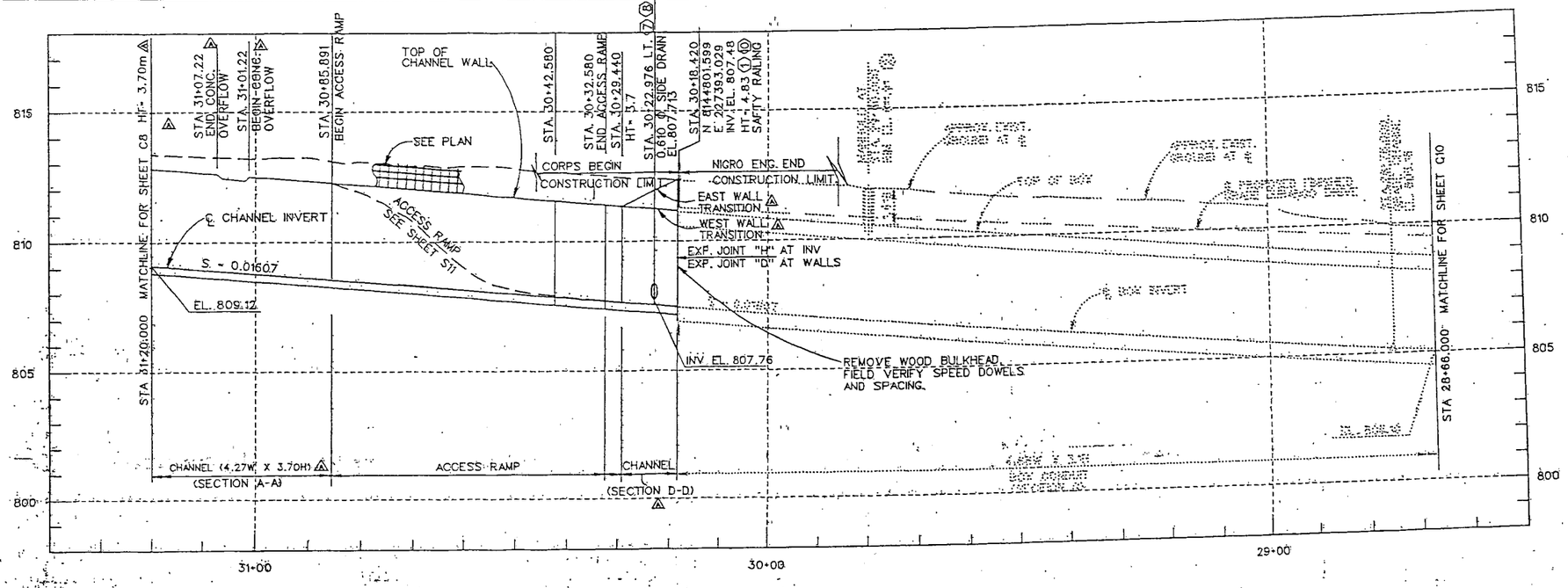
Call before you Dig 1-800-227-2600

METRIC

6 SAFETY PAYS 5 4 3 2 1

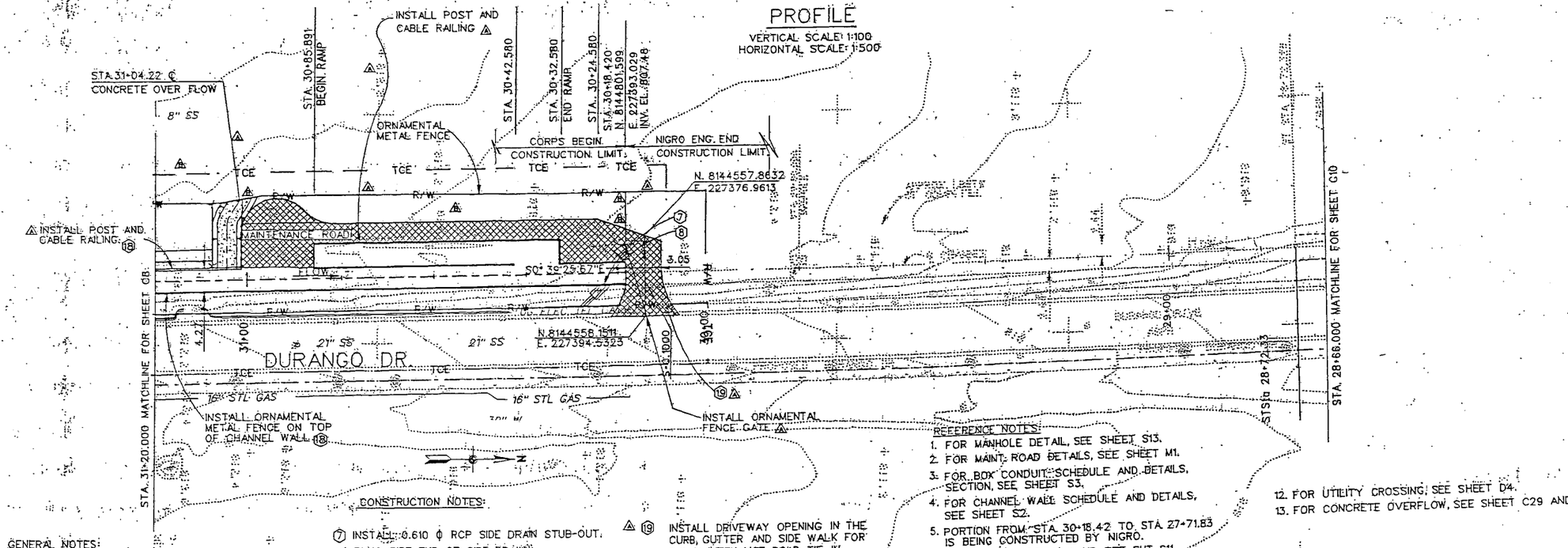
VALUE ENGINEERING PAYS

SAFETY PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

7. INSTALL 0.610 ϕ RCP SIDE DRAIN STUB-OUT.
8. PLUG PIPE END OF SIDE DRAIN WITH 20 mm PLYWOOD.
10. SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.
18. INSTALL POST AND CABLE RAILING ON TOP OF WEST CHANNEL WALL. INSTALL ORNAMENTAL METAL FENCE ON TOP OF EAST CHANNEL WALL, AND AS SHOWN ON THE PLAN.
19. INSTALL DRIVEWAY OPENING IN THE CURB, GUTTER AND SIDE WALK FOR THE MAINTENANCE ROAD TIE IN.

REFERENCE NOTES:

1. FOR MANHOLE DETAIL, SEE SHEET S13.
2. FOR MAINT. ROAD DETAILS, SEE SHEET M1.
3. FOR BOX CONDUIT SCHEDULE AND DETAILS, SECTION, SEE SHEET S3.
4. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
5. PORTION FROM STA 30+18.42 TO STA 27+71.83 IS BEING CONSTRUCTED BY NIGRO.
6. FOR INVERT ACCESS RAMP, SEE SHT. S11.
7. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
8. FOR EXP. JOINTS, SEE SHEET S1.
9. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
10. FOR SIDE DRAIN STUB OUT, SEE SHEET S14.
11. FOR ORNAMENTAL METAL FENCE DETAILS, SEE SHEET M4.
12. FOR UTILITY CROSSING, SEE SHEET D4.
13. FOR CONCRETE OVERFLOW, SEE SHEETS C29 AND C30.

SYMBOL	DESCRIPTIONS	DATE
	REVISIONS	APPROVAL
1	REVISED AS NOTED.	11/26/03
2	REVISED AS NOTED.	9/30/03

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 31+20.000 TO STA. 28+66.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED: BYMAN
DRAWN: BY: AON
CHECKED: BY:

SUBMITTED: BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: C09.DGN

DISTRICT FILE NO. 214079 REV. A | SPEC. NO. DACW09-03-B-0005

SHEET C9

Call before you Dig 1-800-227-2600

METRIC

VALUE ENGINEERING PAYS

SAFETY! PAYS

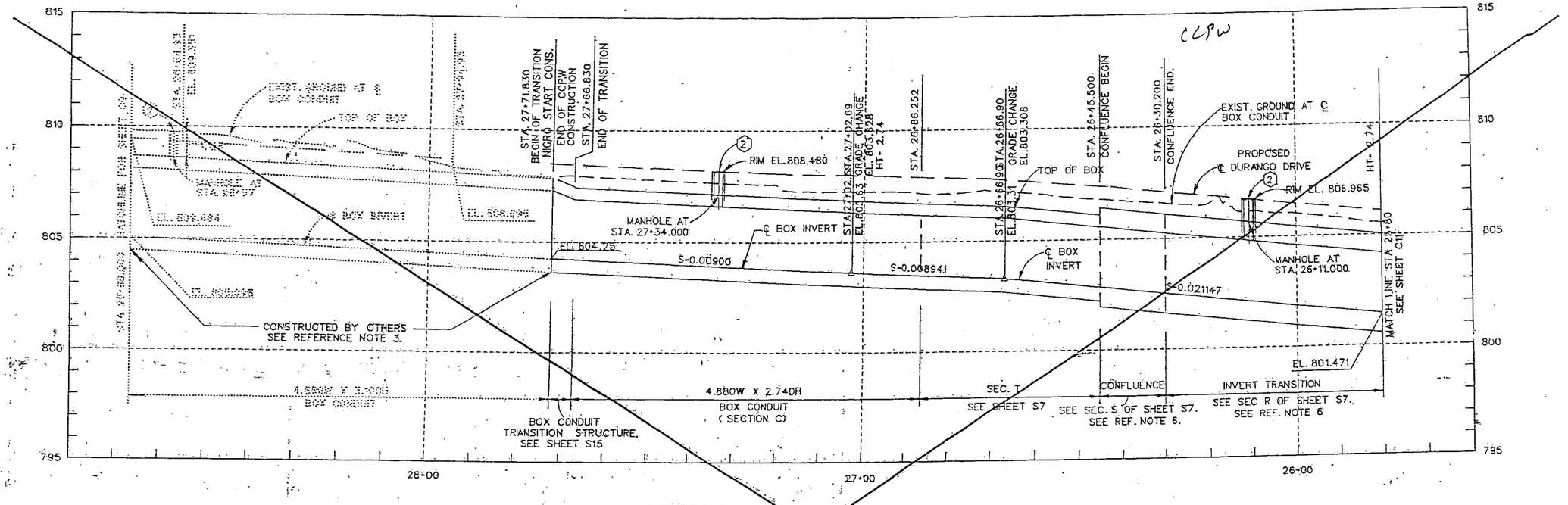
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Private

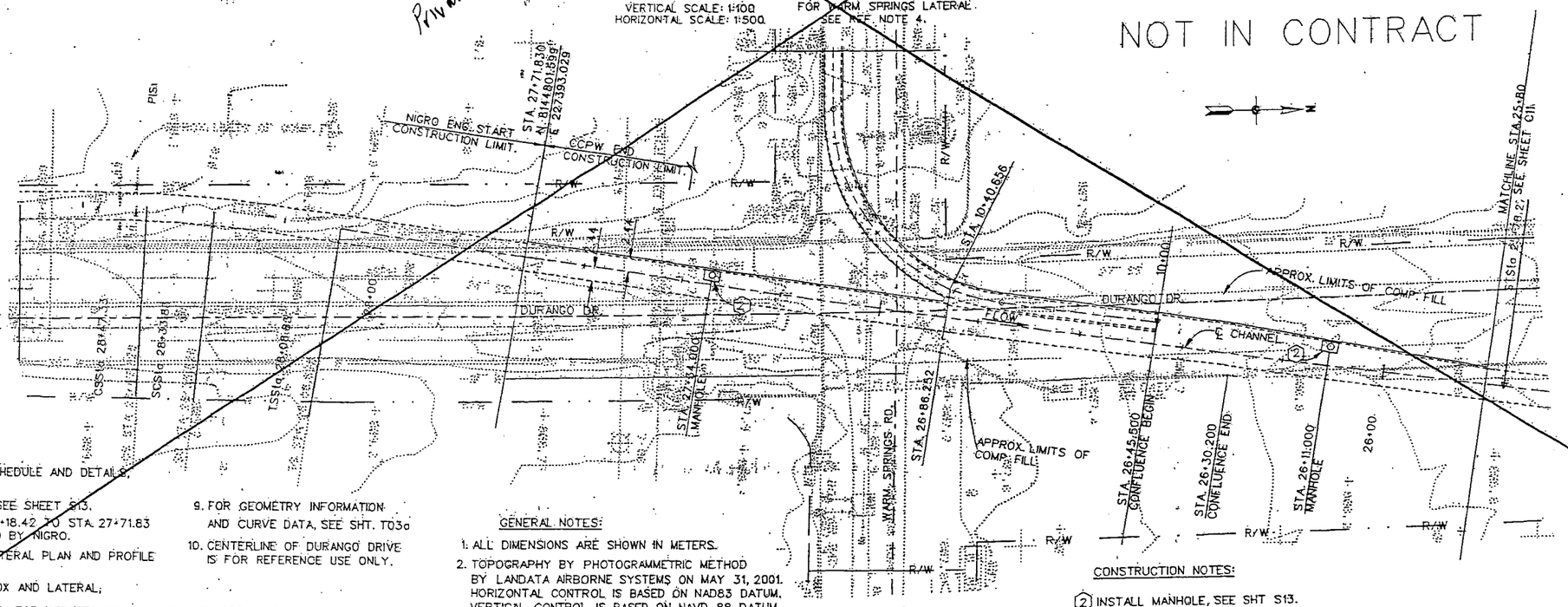
NOT IN CONTRACT

PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN



REFERENCE NOTES:

1. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
2. FOR MANHOLE DETAIL, SEE SHEET S13.
3. PORTION FROM STA. 30+18.42 TO STA. 27+71.83 IS BEING CONSTRUCTED BY NIGRO.
4. FOR WARM SPRINGS LATERAL PLAN AND PROFILE SEE SHEET C-18.
5. FOR CROSS-SECTION BOX AND LATERAL, SEE SHEET C-18a.
6. FOR WARM SPRINGS CONFLUENCE STRUCTURAL DETAIL, SEE SHEET S6 AND S7.
7. MIN. 0.914m FILL REQUIRED FROM TOP OF THE BOX. MATCH EXISTING GROUND WITH 1V: 3H. SLOPE.
9. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHT. T03a
10. CENTERLINE OF DURANGO DRIVE IS FOR REFERENCE USE ONLY.

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

(2) INSTALL MANHOLE, SEE SHT S13.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 28+66.000 TO STA. 25+80.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

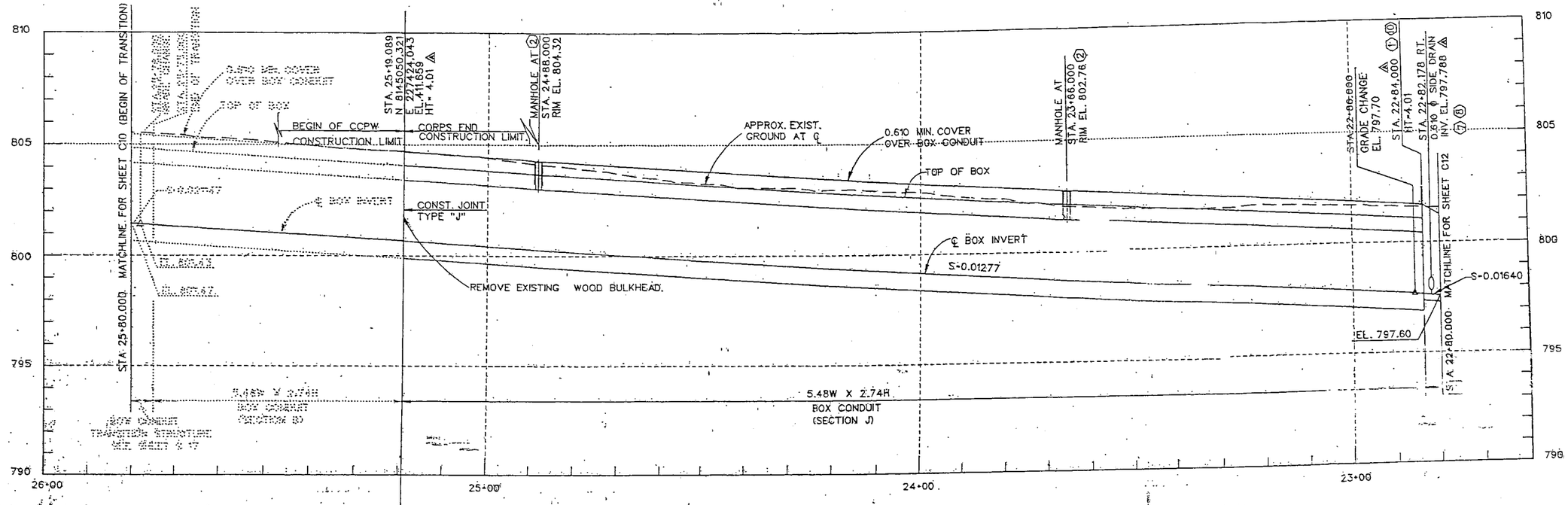
SUBMITTED BY: THOMAS H. SAGE, PE, CHIEF, DESIGN BRANCH

DESIGNED BY: HMN
DRAWN BY: AOM
CHECKED BY: GED

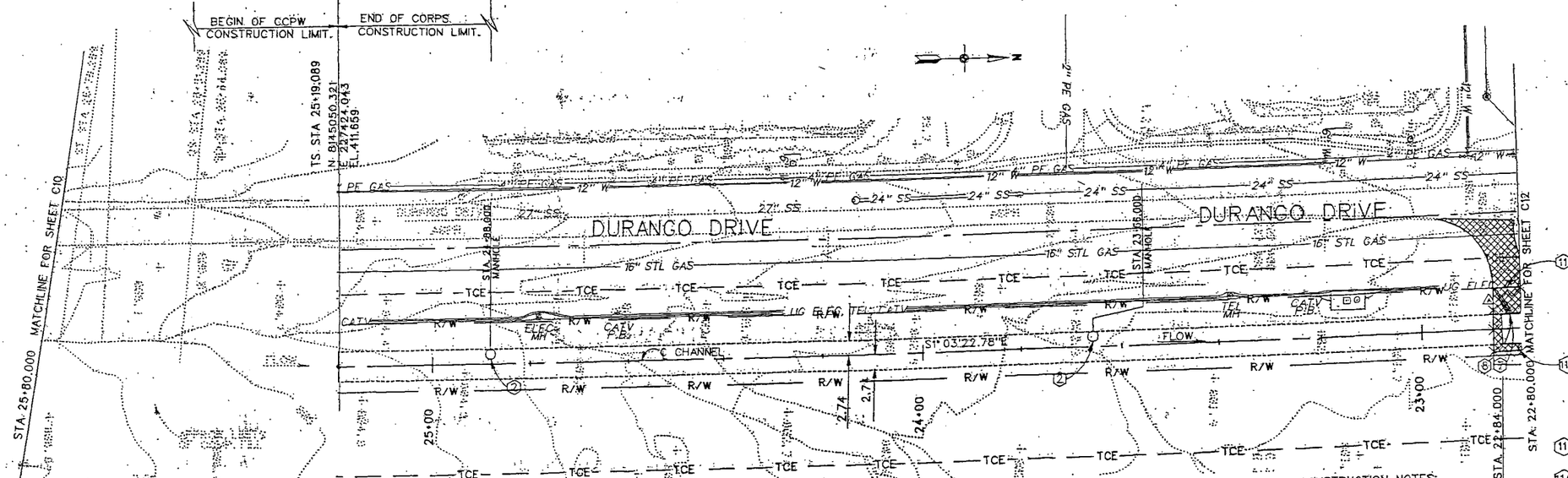
DISTRICT FILE NO. 214/080 | SPEC. NO. DACW09-03-B-0005 | FILE NAME: C10.DGN

SHEET C10

VALUE ENGINEERING PAYS



PROFILE
VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN
10 5 0 10 20
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

REFERENCE NOTES:

1. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
2. FOR MANHOLE DETAIL, SEE SHEET S13.
3. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
4. MIN. 0.610m FILL REQUIRED FROM TOP OF THE BOX.
5. FOR BOX CONDUIT TRANSITION STRUCTURE, SEE SHEET S-16.
6. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T03.
7. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12
8. FOR CONST. JOINT, SEE SHEET S1.
9. AT STA. 25+19.089 BEGIN OF CCPW CONSTRUCTION LIMIT AND CORPS END CONSTRUCTION LIMIT.
10. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
11. FOR CHAIN LINK FENCING AND GATE, SEE SHEET M1.

CONSTRUCTION NOTES:

1. INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL.
2. INSTALL MANHOLE
7. INSTALL 0.610 Ø RCP SIDE DRAIN STUB-OUT.
8. PLUG PIPE END OF SIDE DRAIN WITH 20mm PLYWOOD.
10. SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.
11. INSTALL 4.200Ø DOUBLE SWING GATE
11A. INSTALL SINGLE SWING GATE

Call before you Dig
1-800-227-2600

THE METRIC SYSTEM WILL BE USED EXCLUSIVELY ON THIS PROJECT

SYMBOL	REVISIONS	DESCRIPTIONS	DATE	APPROVAL
4	REVISED AS NOTED.			

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 25+80.000 TO STA. 22+80.000

U.S. ARMY ENGINEER DISTRICT, LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HJH
DRAWN BY: AOM
CHECKED BY: GED

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

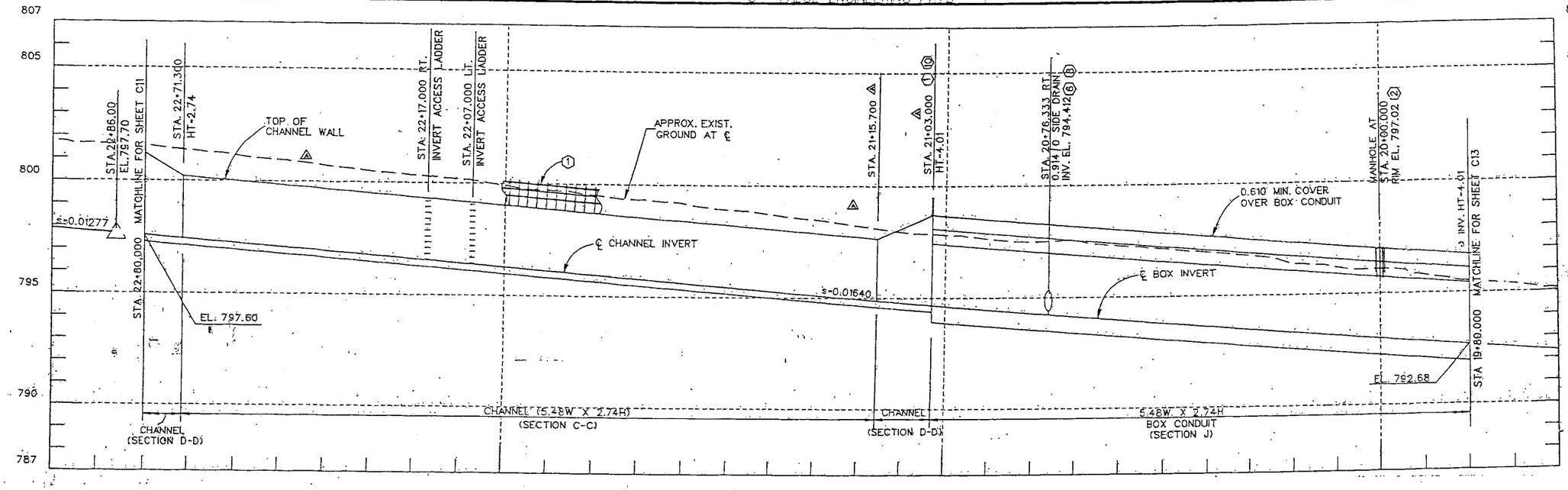
FILE NAME: C11.DGN
SPEC. NO. DACW09-03-B-0005

SUBMITTED BY:

DISTRICT FILE NO. 214/081 REV. A

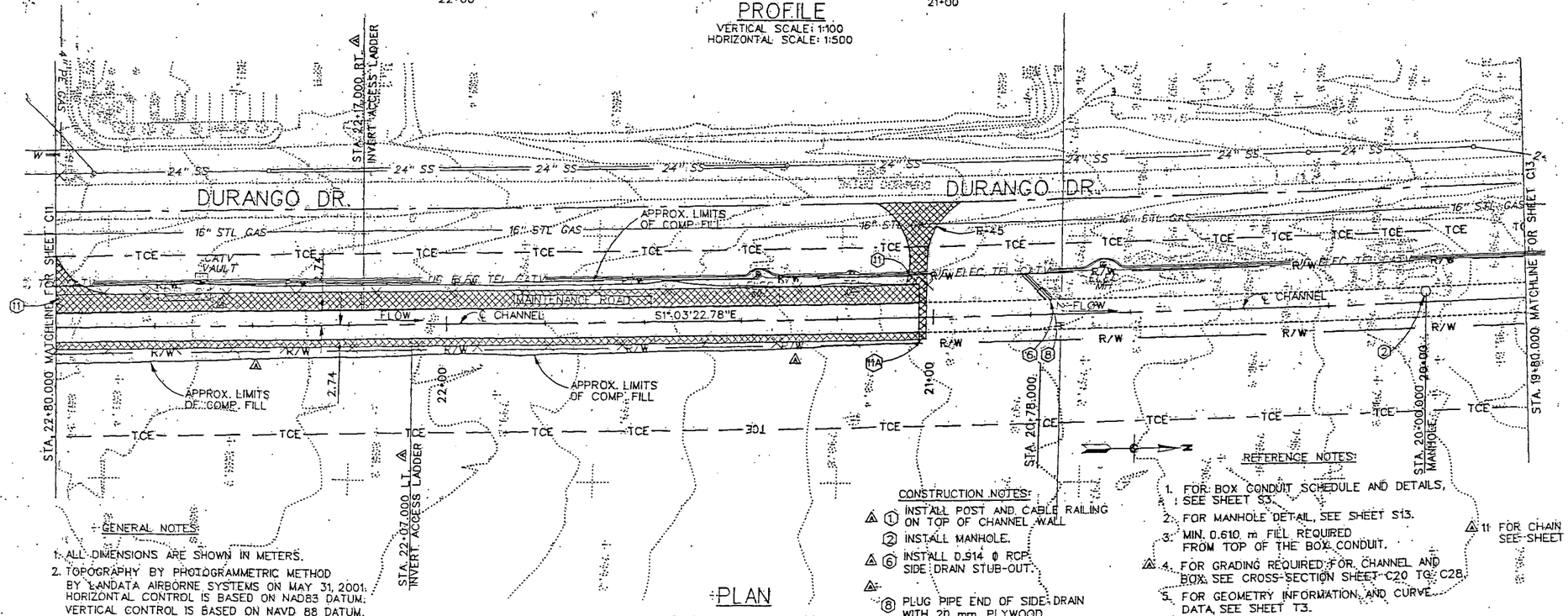
SHEET
C11

VALUE ENGINEERING PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

10 5 0 10 20
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

- ⚠ ① INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL
- ② INSTALL MANHOLE.
- ⚠ ⑥ INSTALL 0.914 Ø RCP SIDE DRAIN STUB-OUT.
- ⑧ PLUG PIPE END OF SIDE DRAIN WITH 20 mm PLYWOOD.
- ⚠ ⑩ SEE SHEET S3, FOR EXTENDED HEADWALL DETAIL.
- ⚠ ⑪ INSTALL 4.200 DOUBLE SWING GATE.
- ⚠ ⑪A INSTALL SINGLE SWING GATE.

REFERENCE NOTES:

1. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
2. FOR MANHOLE DETAIL, SEE SHEET S13.
3. MIN. 0.610 m FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
- ⚠ 4. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
5. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
6. FOR SIDE DRAIN STUB-OUT, SEE SHEET S14.
7. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
8. FOR UTILITY CROSSING, SEE SHEET D3.
- ⚠ 9. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
- ⚠ 10. FOR INVERT ACCESS LADDER, SEE SHEET S2.
- ⚠ 11. FOR CHAIN LINK FENCING AND GATE, SEE SHEET M1.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
⚠	REVISED AS NOTED.		

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 22+80.000 TO STA. 19+80.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

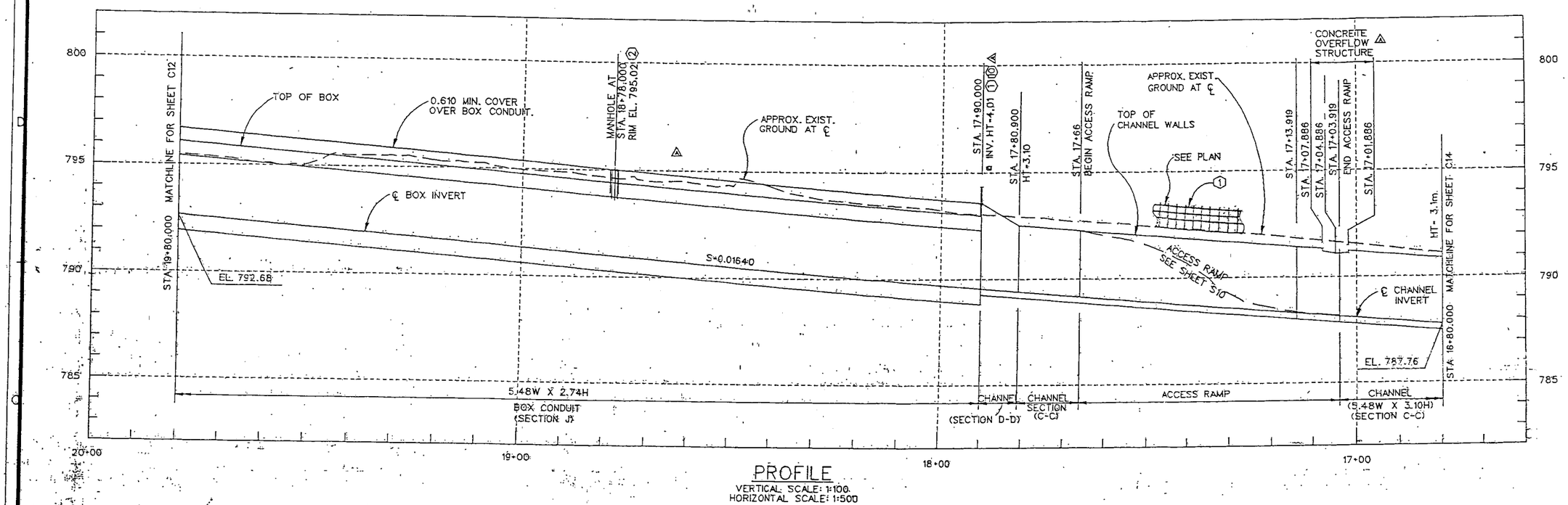
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMN
DRAWN BY: AOM
CHECKED BY: GED

DISTRICT FILE NO. 21H082 REV. A | SPEC. NO. DACW09-03-B-0005 | FILE NAME: C12.DGN

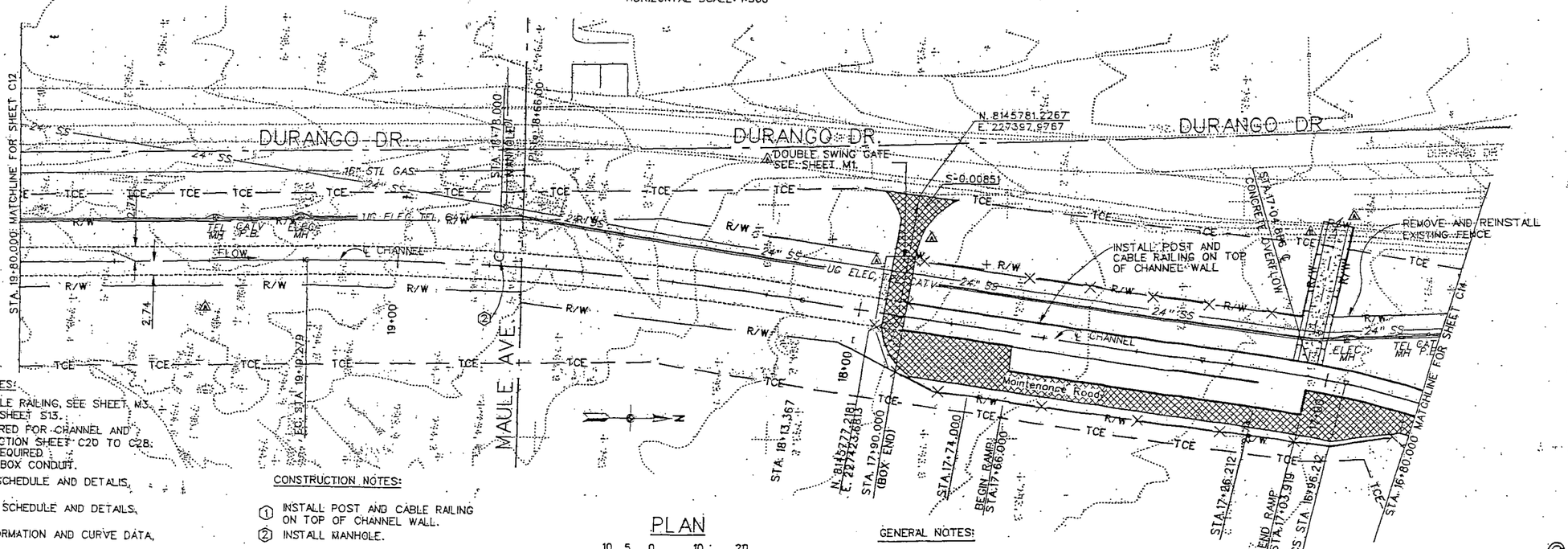
SHEET
C12

Submitted by Hadda on Thursday, September 04 2003 09:27:24 AM PDT



PROFILE

VERTICAL SCALE: 1:100.
HORIZONTAL SCALE: 1:500



PLAN

10 5 0 10 20
SCALE: 1:500

REFERENCE NOTES:

1. FOR POST AND CABLE RAILING, SEE SHEET M3.
2. FOR MANHOLE, SEE SHEET S13.
3. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
4. MIN. 0.610 m FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
5. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
6. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
7. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
8. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
9. FOR MAINT. ROAD DETAIL, SEE SHEET M1.
10. FOR INVERT ACCESS RAMP, SEE SHEET S10.
11. FOR CHAIN LINK FENCING AND GATE, SEE SHEET M1.
12. FOR UTILITY CROSSING, SEE SHEET D3.
13. FOR CONCRETE OVERFLOW DETAILS, SEE SHEET C29.

CONSTRUCTION NOTES:

1. INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL.
2. INSTALL MANHOLE.
8. PLUG PIPE END OF SIDE DRAIN WITH 20 mm PLYWOOD.
10. SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31,2001 HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

Call before you Dig 1-800-227-2600

THIS DRAWING IS METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
2	REVISED AS NOTED.	11/20/03	
1	REVISED AS NOTED.	11/25/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 19+80.000 TO STA. 16+80.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

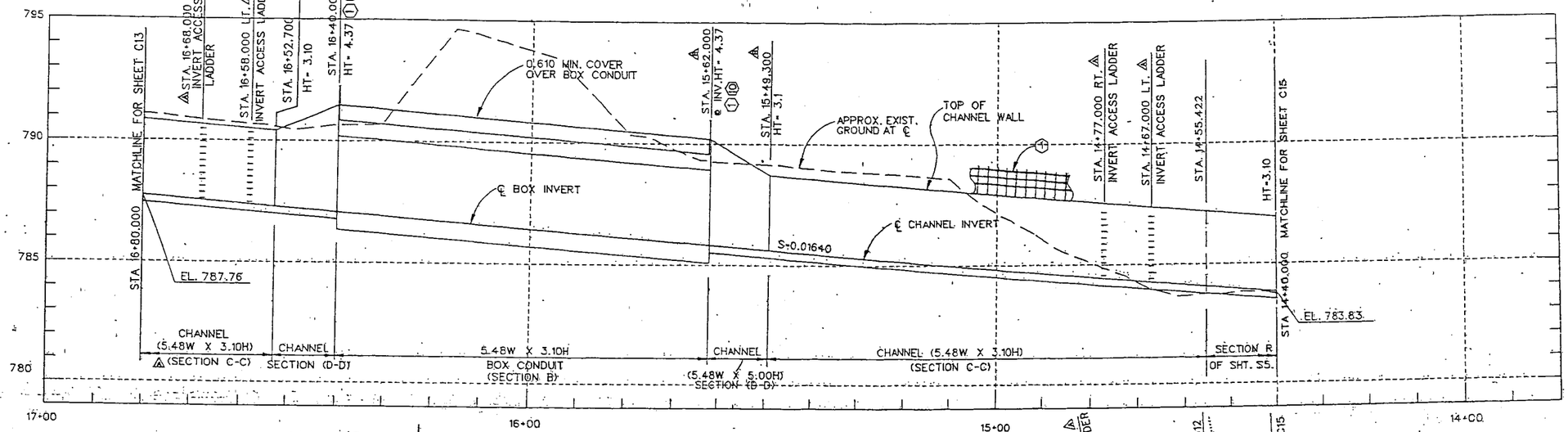
DESIGNED BY: HNN
DRAWN BY: AON
CHECKED BY: GED

FILE NAME: C13.DGN

DISTRICT FILE NO. 214083 REV. 4 SPEC. NO. DACW09-03-B-0005

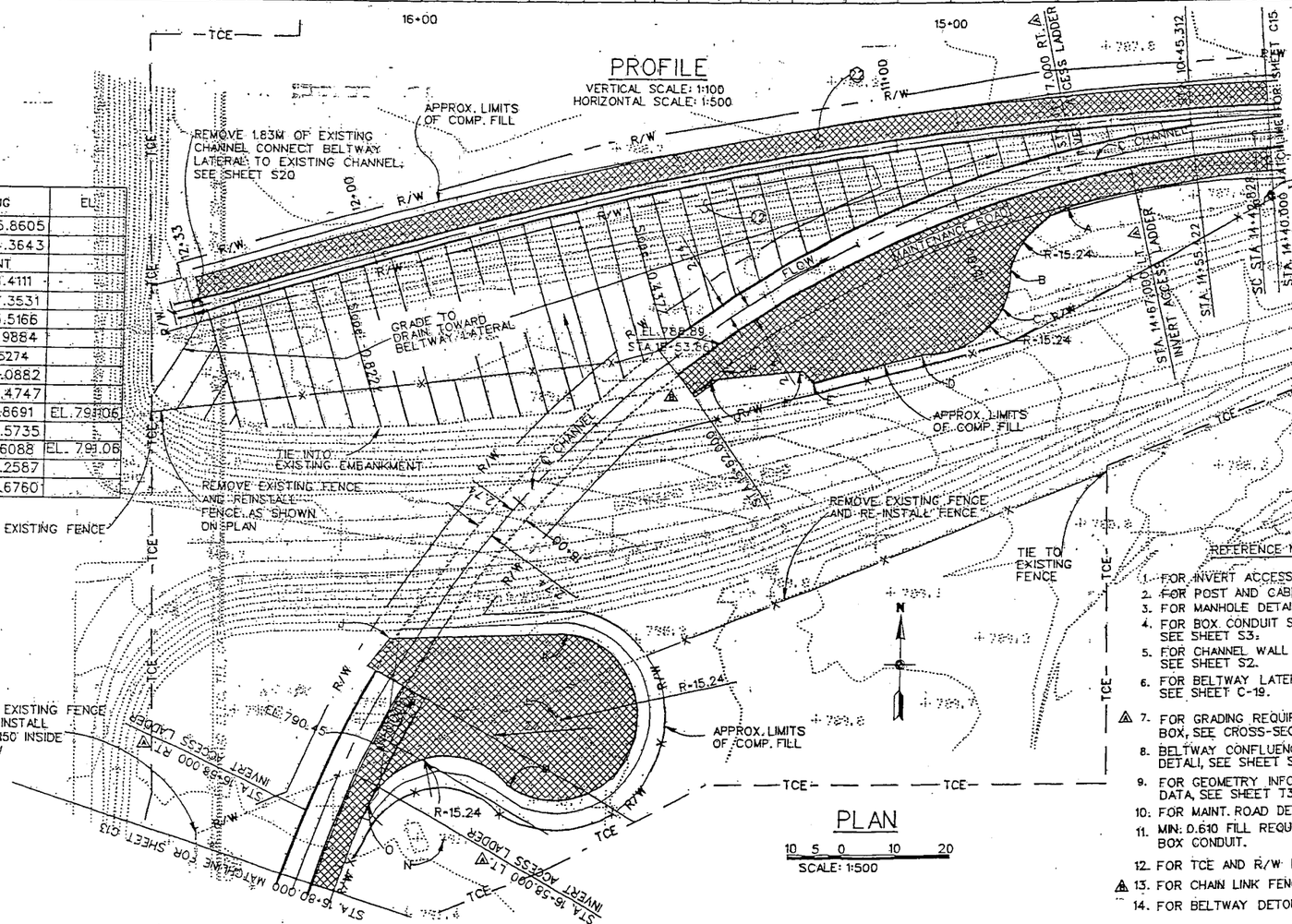
SHEET C13

VALUE ENGINEERING PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



POINT NO.	NORTHING	EASTING	EL.
A	N:8146011.6141	E:227585.8605	
B	N:8145999.6902	E:227574.3643	
C	TIE INTO EXISTING EMBANKMENT		
D	N:8145983.7566	E:227558.4111	
E	N:8145978.5394	E:227537.3531	
F	N:8145980.5440	E:227535.5166	
G	N:8145978.9497	E:227517.9884	
H	N:8145980.7640	E:227520.5274	
I	N:8145971.0908	E:227509.0882	
J	N:8145930.7424	E:227459.4747	
K	N:8145931.6324	E:227491.8691	EL. 791.06
L	N:8145916.4476	E:227490.5735	
M	N:8145904.1232	E:227481.6088	EL. 791.06
N	N:8145893.9530	E:227470.2587	
O	N:8145900.8645	E:227456.6760	

PLAN

10 5 0 10 20
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31,2001 HORIZONTAL CONTROL IS BASED ON NAD83 DATUM, VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

4. INSTALL POST AND CABLE RAILING ON TOP OF CHANNEL WALL.
10. SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.
12. REMOVE EXISTING RIPRAP AND GEOTEXTILE FEBRIC FROM STA. 10+00.000 TO STA. 14+55.422 MAIN CHANNEL, AND STA. 10+45.312 TO STA. 12+33.000 OF THE BELTWAY LATERAL.

REFERENCE NOTES:

1. FOR INVERT ACCESS LADDER, SEE SHEET S2.
2. FOR POST AND CABLE RAILING, SEE SHEET M3.
3. FOR MANHOLE DETAIL, SEE SHEET S13.
4. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
5. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
6. FOR BELTWAY LATERAL PLAN AND PROFILE, SEE SHEET C-19.
7. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
8. BELTWAY CONFLUENCE STRUCTURAL DETAIL, SEE SHEET S4 AND S5.
9. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
10. FOR MAINT. ROAD DETAIL, SEE SHEET M1.
11. MIN. 0.610 FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
12. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
13. FOR CHAIN LINK FENCE AND MAINT. ROAD, SEE SHEET M1 AND M5.
14. FOR BELTWAY DETOUR, SEE SHEETS D7 AND D8.
15. FOR DETOUR ROAD TYPICAL PAVEMENT SECTION, SEE SHEET D11.
16. FOR REMOVAL AND RECONSTRUCTION FRONTAGE ROAD, SEE SHEET D12.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE APPROVAL
	REVISIONS	
⚠	REVISED AS NOTED.	7/31/03
⚠	REVISED AS NOTED.	8/28/03

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 16+80.000 TO STA. 14+40.000

DESIGNED BY: HMN
DRAWN BY: AOM
CHECKED BY: GED

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: C14.DGN

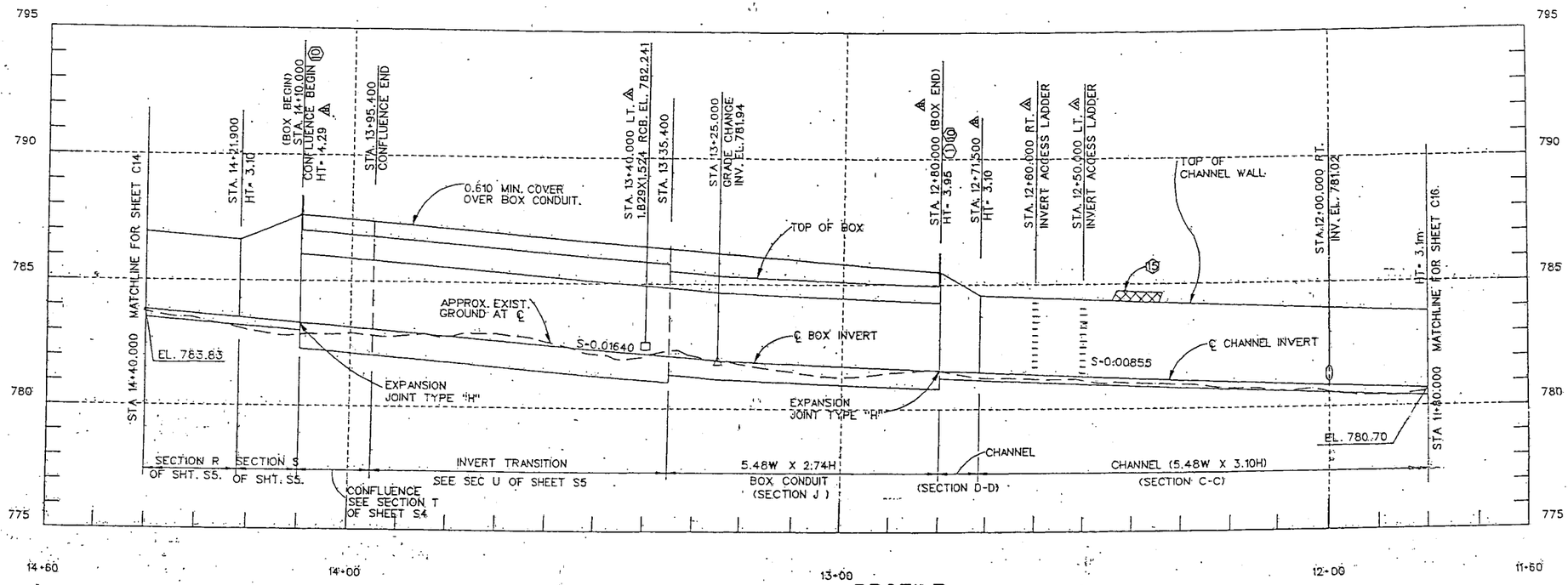
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214084 REV. A

SHEET
C14

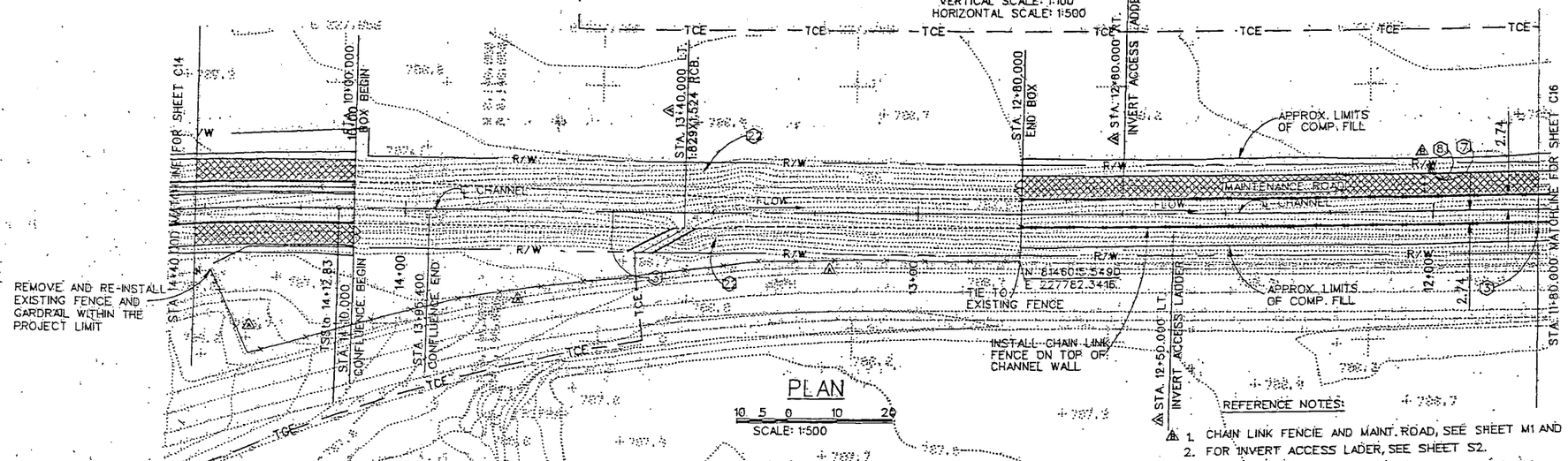
SAFETY! PAYS

VALUE ENGINEERING PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

10 5 0 10 20
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001 HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

⚠ ⑦ INSTALL 0.610 Ø RCP SIDE DRAIN STUB-OUT.
⚠ ⑧ PLUG PIPE END OF SIDE DRAIN WITH 20 mm PLYWOOD.
⑩ SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.
㉒ REMOVE EXISTING RIPRAP ALONG GEOTEXTILE FEBRIC FROM STA. 10+00.000 TO STA. 14+55.422 MAIN MCHANNEL, AND STA. 10+45.312 TO STA. 12+33.000 OF THE BELTWAY LATERAL.
⑮ INSTALL 1.22m HIGH CHAIN LINK FENCE ON TOP OF OPEN CHANNEL WALL FROM STA. 10+00.000 TO STA. 12+80.000 (BOTH SIDE)

REFERENCE NOTES:

⚠ 1. CHAIN LINK FENCIE AND MAINT. ROAD, SEE SHEET M1 AND M5.
2. FOR INVERT ACCESS LADER, SEE SHEET S2.
3. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
4. FOR BELTWAY CONFLUENCE STRUCTURAL DETAIL, SEE SHEET S4 AND S5.
5. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
⚠ 6. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
7. MIN. 0.610 m FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
8. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
9. FOR MAINTENANCE ROAD, SEE SHEET M1

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
⚠	REVISED AS NOTED.	9/28/05	
⚠	REVISED AS NOTED.	8/30/05	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE

STA. 14+40.000 TO STA. 11+80.00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HMN
DRAWN BY: AOM
CHECKED BY: QED

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: C15.DGN

SPEC. NO. DACW09-03-B-0005

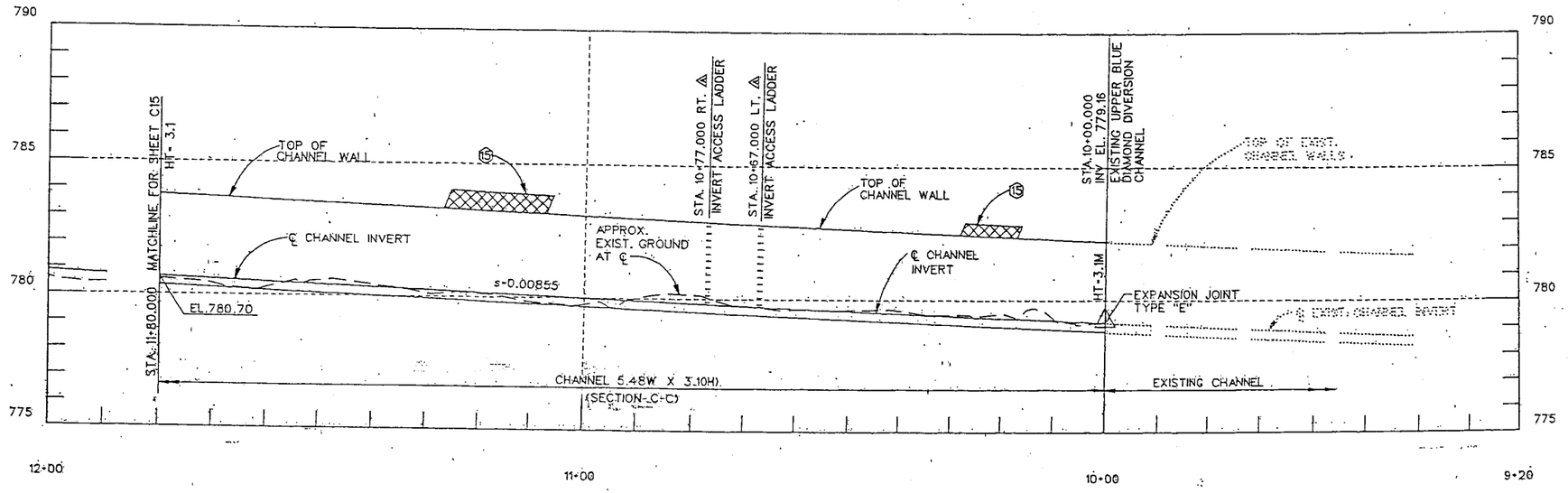
DISTRICT FILE NO. 214085 REV. A

SHEET C15

Call before you Dig 1-800-227-2600

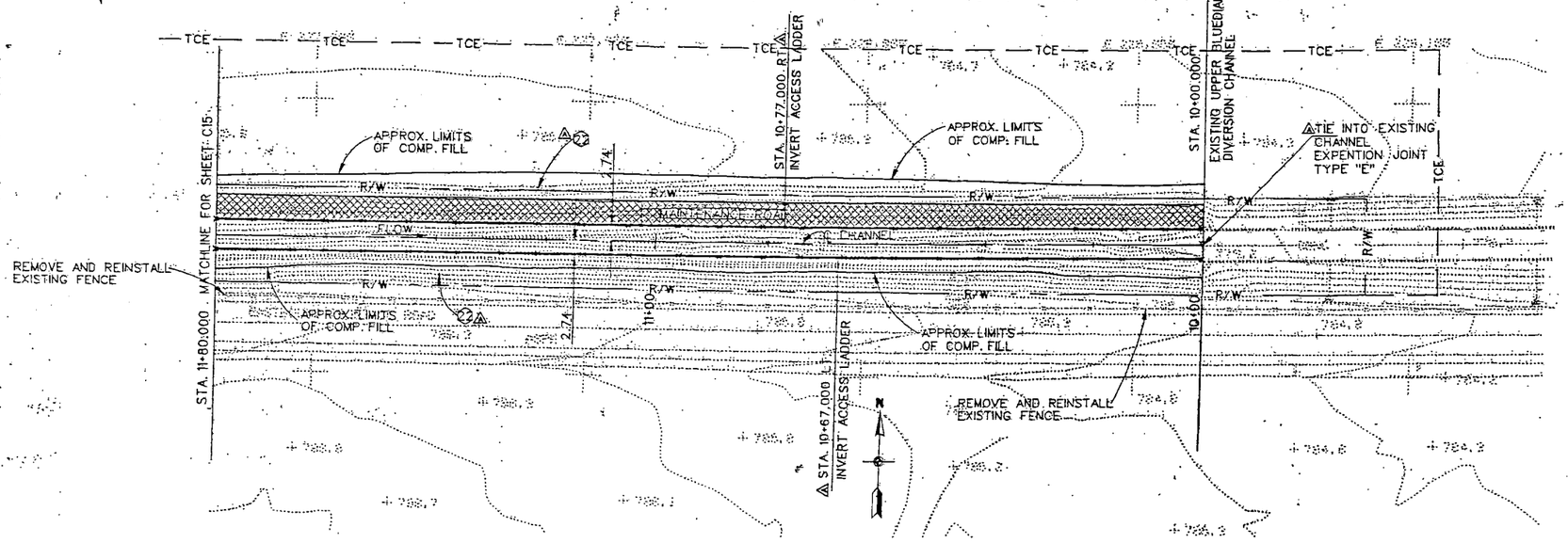
METRIC

SAFETY! PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

10 5 0 10 20
SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAMS.

REFERENCE NOTES:

1. FOR 1.22m FENCE ON TOP OF CHANNEL WALL, SEE SHEET M5.
2. FOR MAINTENANCE ROAD, SEE SHEET M1.
3. FOR INVERT ACCESS LADDER, SEE SHEET S2
4. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
5. ⚠ FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
6. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
7. FOR TCE AND R/W LIMIT, SEE SHEETS T4 TO T12.
8. FOR EXPANSION JOINT DETAIL, SEE SHEET S1.

CONSTRUCTION NOTES:

⚠ (2) REMOVE EXISTING RIPRAP ALONG GEOTEXTILE FEBRICFROM STA. 10+00 TO STA. 14+55.322 MAIN CHANNEL, AND STA. 10+45.312 TO STA. 12+33.000 OF THE BELTWAY LATERAL.

(15) INSTALL 1.22m HIGH CHAIN LINK FENCE ON TOP OF OPEN CHANNEL WALL FROM STA. 10+00.000 TO STA. 12+80.000

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL
⚠	ADDED NOTE.		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
STA. 11+80.000 TO STA. 10+00.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HAN
DRAWN BY: L. AQUINO
CHECKED BY: J. OED

DISTRICT FILE NO. 211088 REV. A | SPEC. NO. DACW09-03-B-0005 | FILE NAME: C16.DGN

SHEET C16

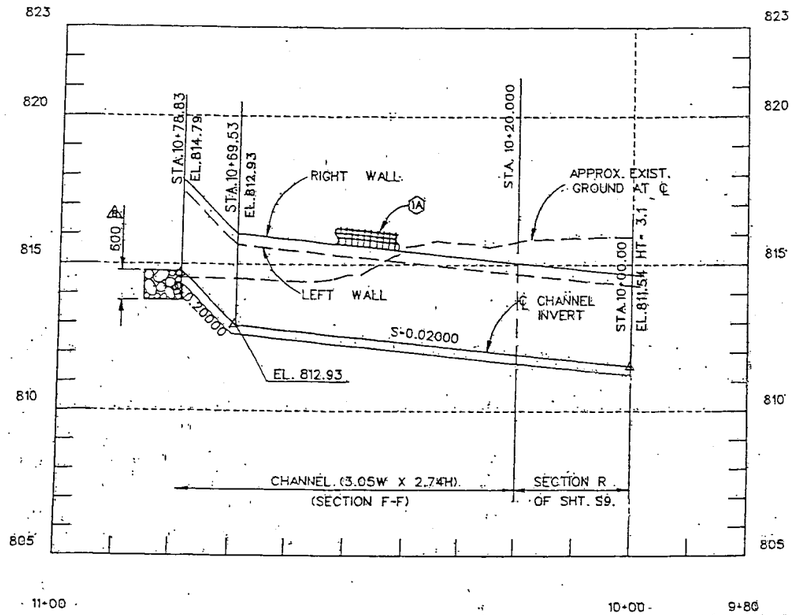
Call before you Dig 1-800-227-2600

METRIC

Submitted by 11 addam Thursday, September 04, 2003 09:27:13 AM PDT

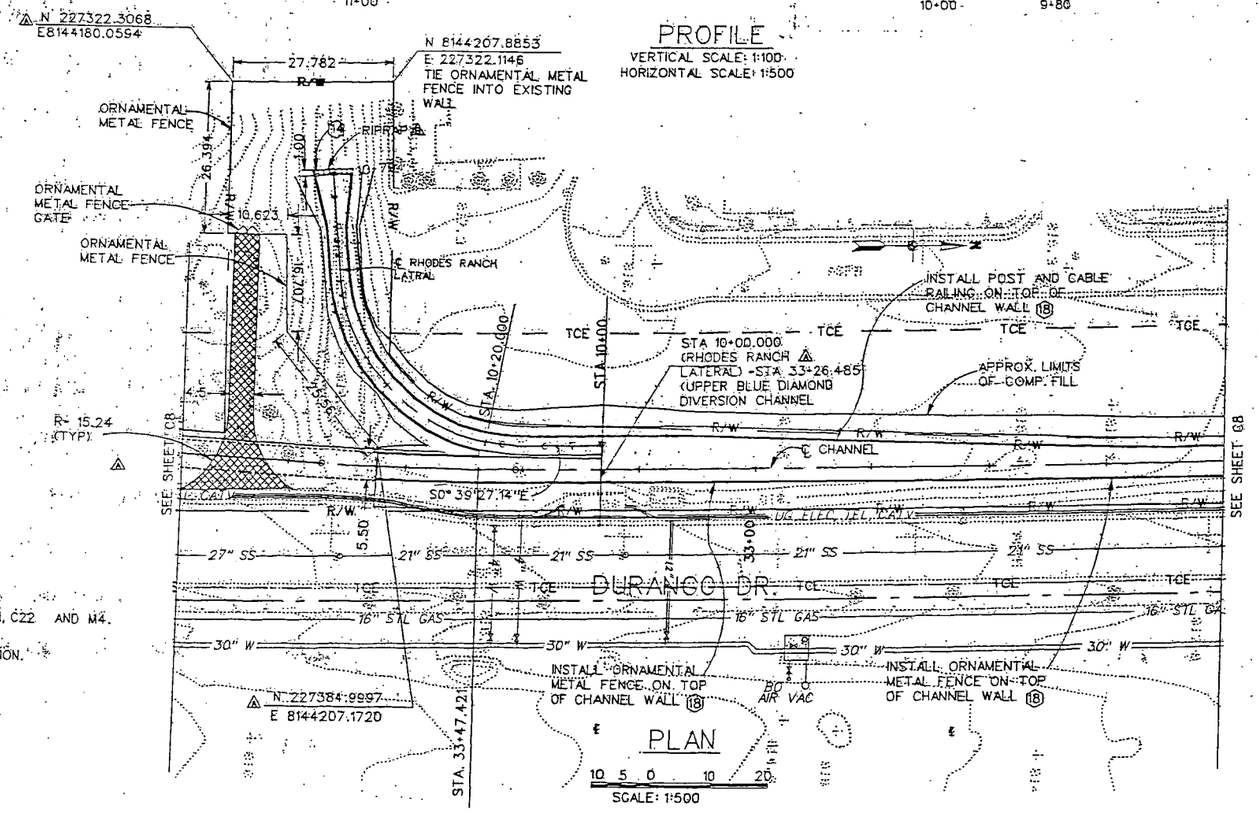
VALUE ENGINEERING PAYS

SAFETY PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEM ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM

REFERENCE NOTES:

1. FOR POST AND CABLE RAILING, SEE SHEET M3.
2. FOR UPPER BLUE DIAMOND CHANNEL PLAN AND PROFILE, SEE SHEET C8.
3. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
4. FOR RHODES RANCH CONFLUENCE STRUCTURAL DETAIL, SEE SHEET S8 AND S9.
5. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
6. FOR CHANNEL WALL SCHEDULE AND DETAILS, SEE SHEET S2.
7. FOR ORNAMENTAL METAL FENCE DETAIL, SEE SHEET C21, C22 AND M4.
8. REMOVE EXISTING WALL WITHIN THE R/W LIMIT FROM STA. 30+18.420 TO STA. 33+65.000 FIELD VARIFY LOCATION.
9. FOR TCE AND R/W LIMIT, SEEE SHEETS T4 TO T12.
10. FOR ORNAMENTAL FENCE PLACEMENT, SEE SHEET C8.
11. FOR RHODES RANCH LATERAL END DETAIL, SEE SHEET S19.

CONSTRUCTION NOTE:

(1A) INSTALL POST AND CABLE RAILING ON TOP OF LATERAL WALL.

(16) INSTALL 600 RIPRAP AT STA. 10+79.000

(14) PLACE RIPRAP ALONG THE APRON - AS SHOWN ON THE PLAN

(18) INSTALL POST AND CABLE RAILING ON TOP OF WEST CHANNEL WALL. INSTALL ORNAMENTAL METAL FENCE ON TOP OF EAST CHANNEL WALL, AND AS SHOWN ON THE PLAN.

Call before you Dig 1-800-227-2600

This drawing was produced in METRIC

SYMBOL	DESCRIPTIONS	DATE
	REVISIONS	APPROVAL
1	REVISED AS NOTED.	9/28/05
2	REVISED AS NOTED.	11/30/05

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE
RHODES RANCH LATERAL

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HNN
DRAWN BY: AOM
CHECKED BY: GED

FILE NAME: C17.DGN

DISTRICT FILE NO. 214/007 REV:1 SPEC. NO. DACW09-03-R-0005

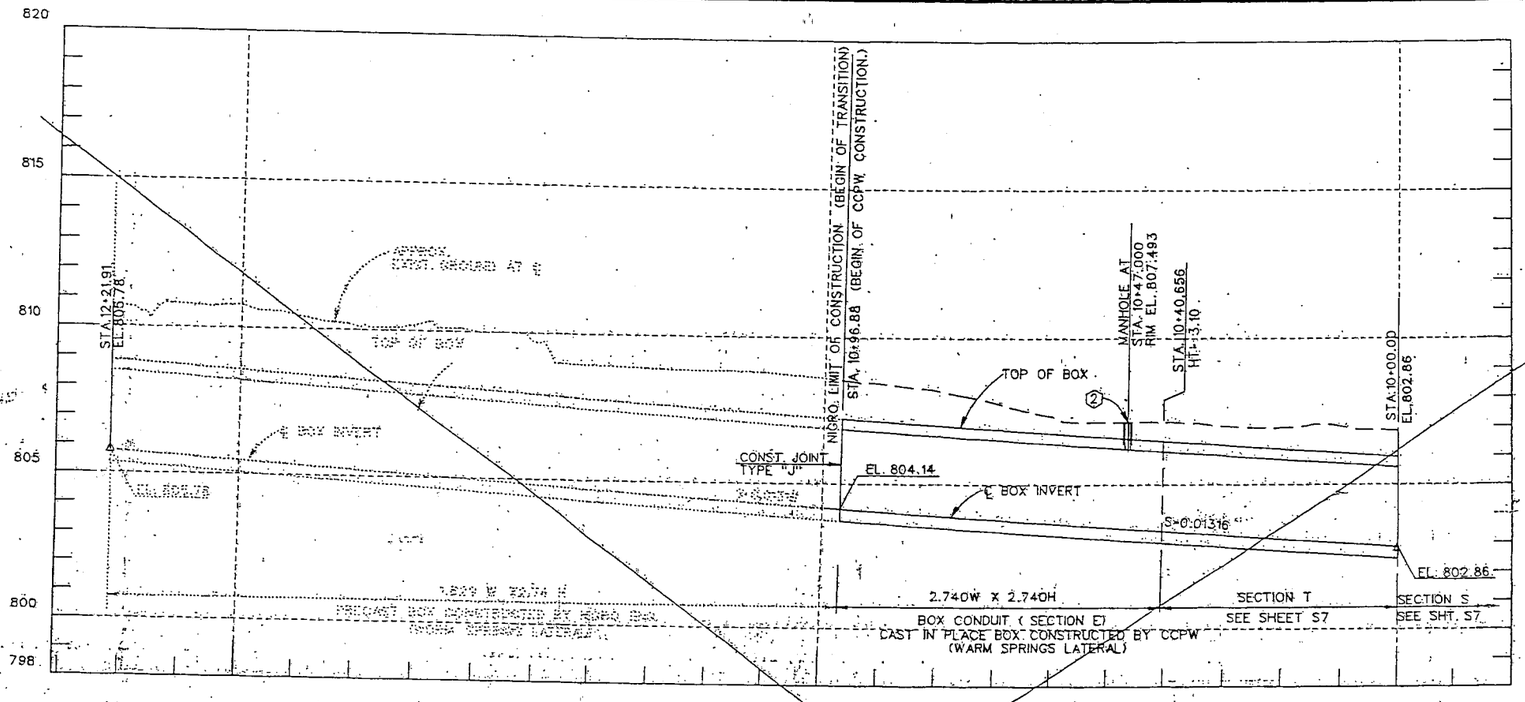
SHEET C17

5 VALUE ENGINEERING PAYS

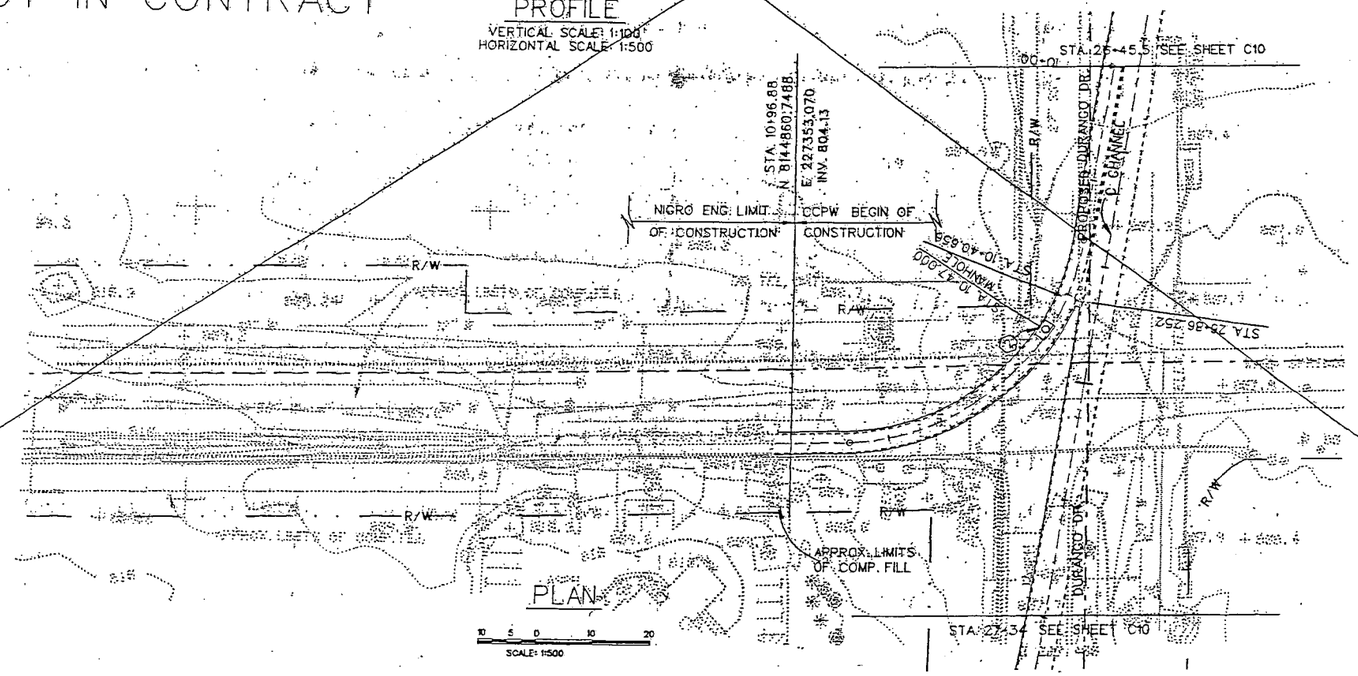
NOT IN CONTRACT

PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN



GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31,2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED; CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

REFERENCE NOTES:

1. FOR MANHOLE DETAIL, SEE SHEET S13.
2. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
3. FOR CROSS-SECTION, SEE SHEET C18a.
4. FOR UPPER BLUE DIAMOND CHANNEL PLAN AND PROFILE, SEE SHEET C10.
5. MIN. 0.610m FILL REQUIRED FROM TOP OF THE BOX CONDUIT. MATCH EXISTING GROUND 1V: 3H SLOPE.
6. FOR WARM SPRINGS CONFLUENCE STRUCTURAL DETAIL, SEE SHEET S6 AND S7.
8. FOR GEOMETRY INFORMATION AND CURVE DATA; SEE SHEET T03.

CONSTRUCTION NOTES:

(2) INSTALL MANHOLE, SEE SHT S13.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND CHANNEL

PLAN AND PROFILE

WARM SPRINGS LATERAL

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: MMR
DRAWN BY: AOM
CHECKED BY: GED

FILE NAME: C18.DGN

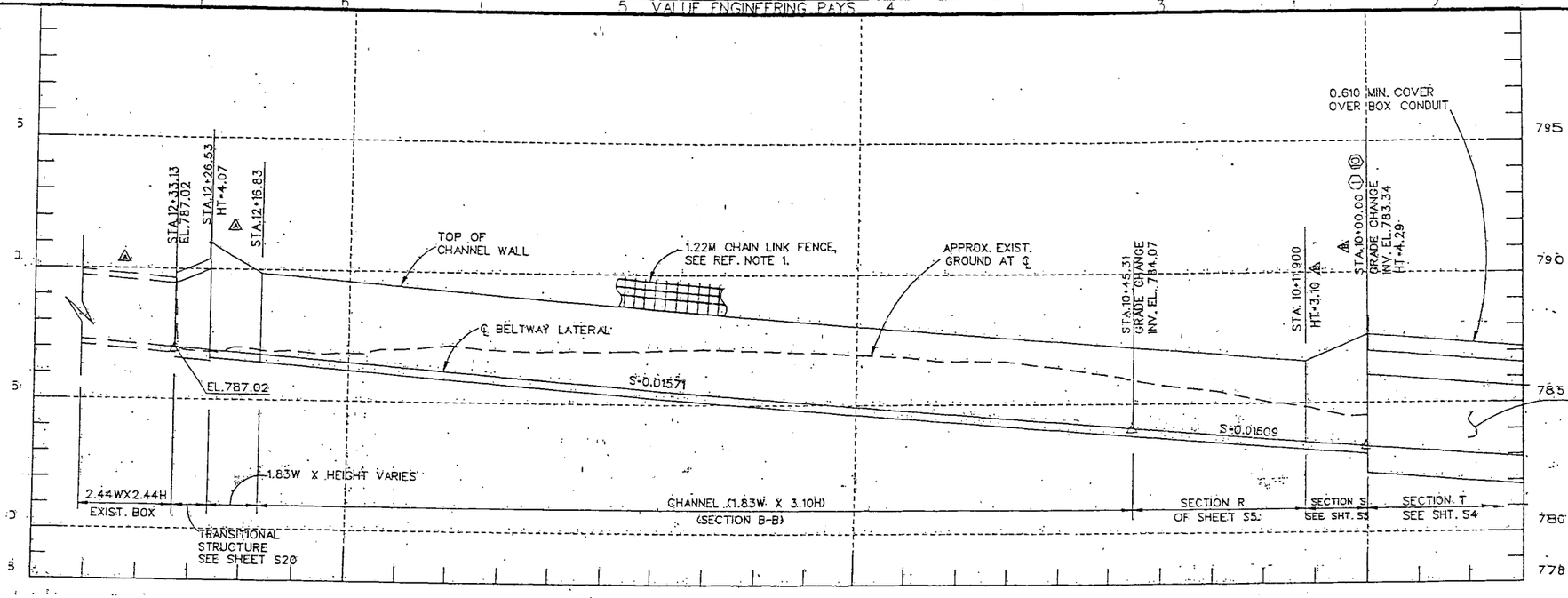
DISTRICT FILE NO. 214/088

SPEC. NO. DACW09-03-B-0005

SHEET C18

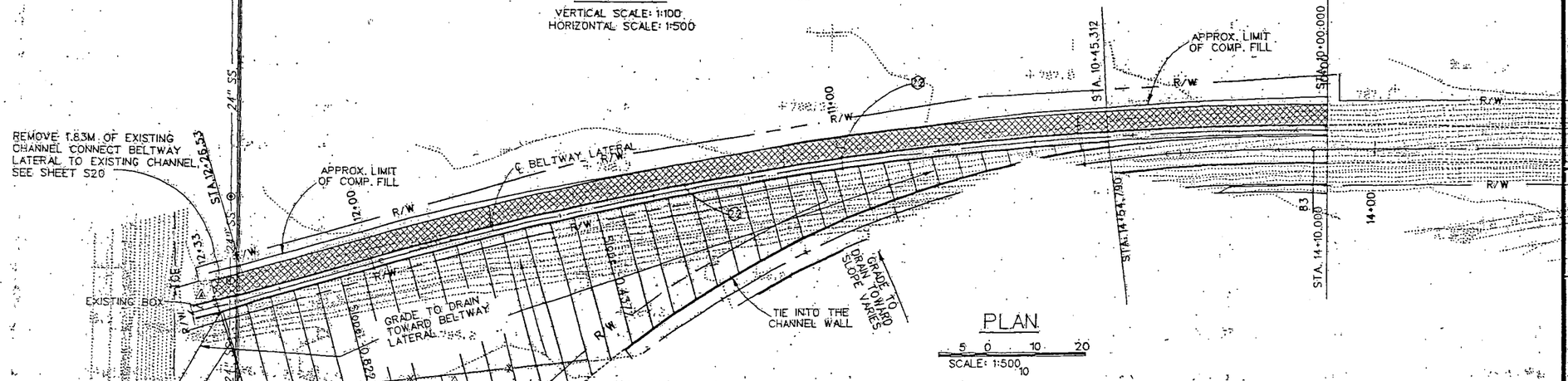
SAFETY PAYS

5 VALUE ENGINEERING PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

SCALE: 1:500

REFERENCE NOTES:

1. FOR 1.22M FENCE ON TOP OF CHANNEL WALL, SEE SHEET M5.
2. FOR BOX CONDUIT SCHEDULE AND DETAILS, SEE SHEET S3.
3. MIN. 0.610 m FILL REQUIRED FROM TOP OF THE BOX CONDUIT.
4. FOR UPPER BLUE DIAMOND CHANNEL PLAN AND PROFILE, SEE SHEET C14.
5. FOR GRADING REQUIRED FOR CHANNEL AND BOX, SEE CROSS-SECTION SHEET C20 TO C28.
6. FOR BELTWAY CONFLUENCE STRUCTURAL DETAIL, SEE SHEET S6 AND S7.
7. FOR GEOMETRY INFORMATION AND CURVE DATA, SEE SHEET T3.
8. FOR TCE AND R/W LIMIT, SEE SHEET T4 TO T12.
9. FOR POST AND CABLE RAILING, SEE SHEET M2.
10. FOR MAINTENANCE ROAD, SEE SHEET M1.
11. FOR BELTWAY DETOUR, SEE SHEET D7 AND D8.
12. FOR FENCE, SEE SHEET M1.

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBORNE SYSTEMS ON MAY 31, 2001 HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHERWISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING UPSTREAM.

CONSTRUCTION NOTES:

⑩ SEE SHEET S3, FOR EXTENDED HEADWALL DETAILS.

⑫ REMOVE EXISTING RIPRAP ALONG GEOTEXTILE FEBRIC FROM STA. 10+00.000 TO STA. 14+55.422 MAIN CHANNEL, AND STA. 10+45.312 TO STA.12+33.000 OF THE BELTWAY LATERAL.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
⚠	REVISED AS NOTED	11/20/03	
⚠	ADDED NOTE.	11/20/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES, TROPICANA AND FLAMINGO WASHES, NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN AND PROFILE

BELTWAY LATERAL

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HNK
DRAWN BY: HNK
CHECKED BY: GEB

FILE NAME: C19.DGN

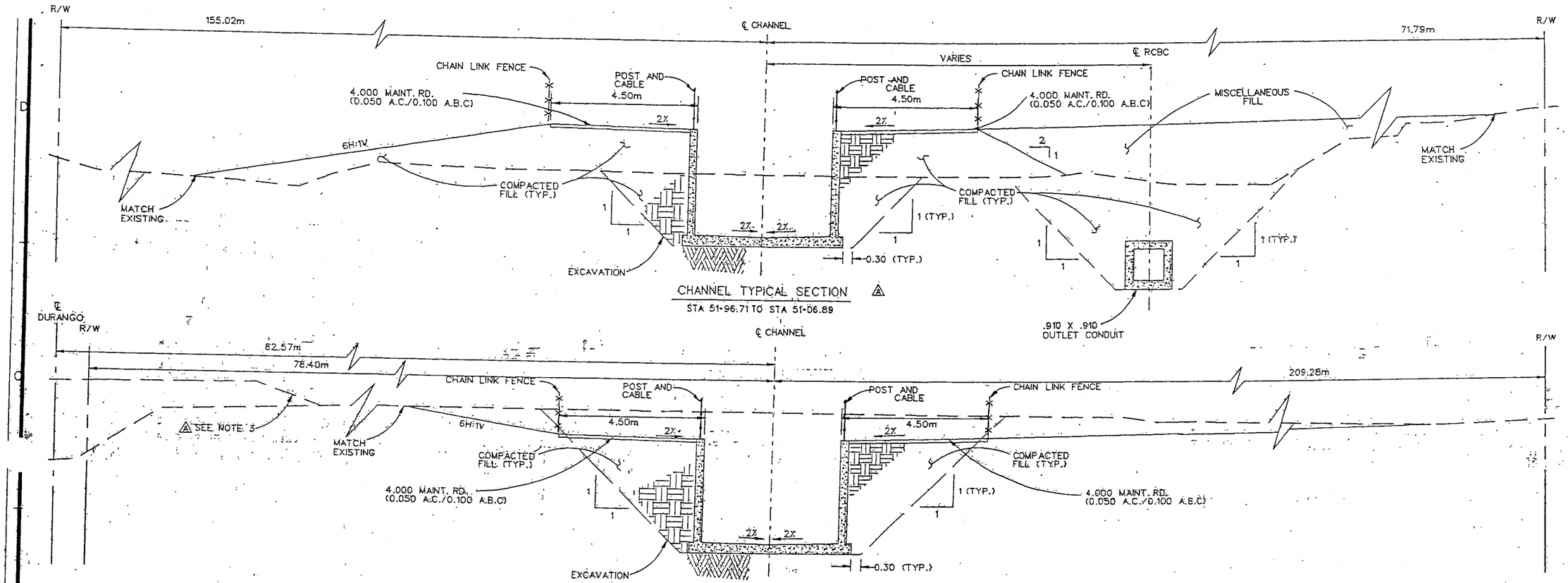
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 2141088 REV. A

SHEET
C19

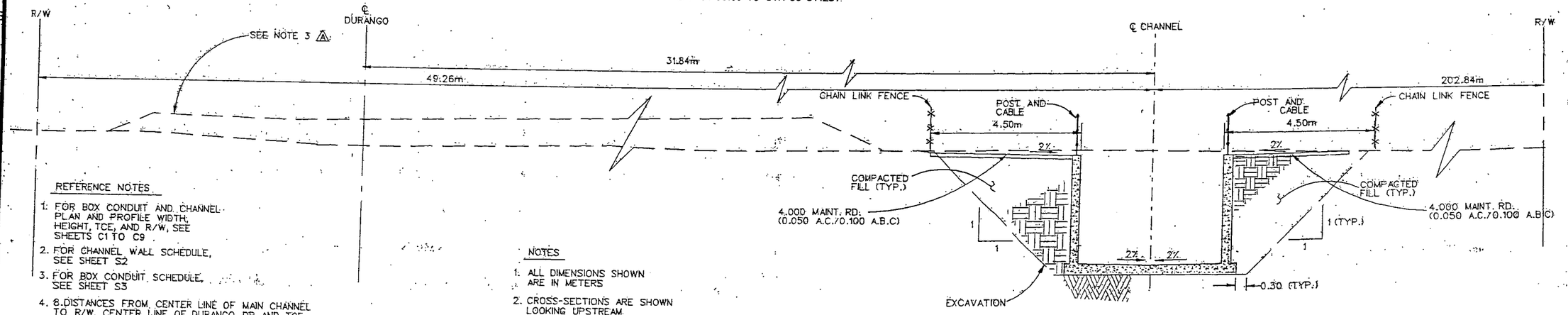
5 SAFETY PAYS

VALUE ENGINEERING PAYS



CHANNEL TYPICAL SECTION
STA 51+96.71 TO STA 51+06.89 ⚠

CHANNEL TYPICAL SECTION
STA 51+06.89 TO STA 50+57.231



CHANNEL TYPICAL SECTION
STA 49+97.00 TO STA 48+40.00

REFERENCE NOTES

1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEETS C1 TO C9
2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2
3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3
4. 8.DISTANCES FROM CENTER LINE OF MAIN CHANNEL TO R/W, CENTER LINE OF DURANGO DR. AND TCE ARE APPROXIMATE, SEE SHEETS T4 TO T12.
5. FOR MAINTENANCE ROAD SEE SHEET M1
6. FOR ACCESS RAMP CROSS SECTIONS FROM STA 49+97.000 TO 50+57.231 SEE SHEET C28.

NOTES

1. ALL DIMENSIONS SHOWN ARE IN METERS
2. CROSS-SECTIONS ARE SHOWN LOOKING UPSTREAM
3. ⚠ GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL
⚠	REVISED AS NOTED	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

TYPICAL CROSS SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMN
DRAWN BY: MKH
CHECKED BY: GEO

FILE NAME: C20.dgn
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214090 REV. A

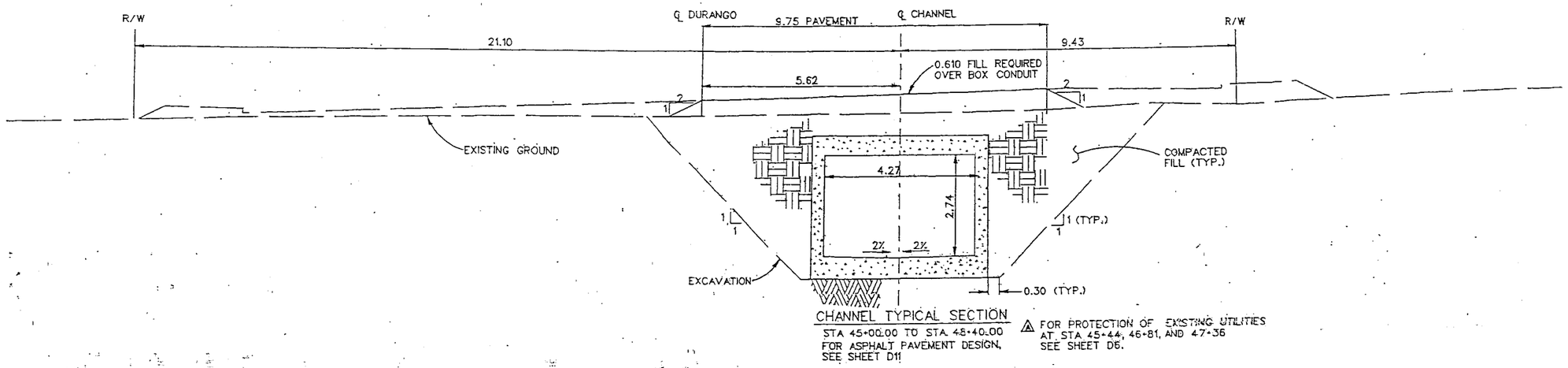
SHEET C20

Call before you Dig 1-800-227-2600

METRIC

In Submitted by: Thomas Sage @ [illegible]

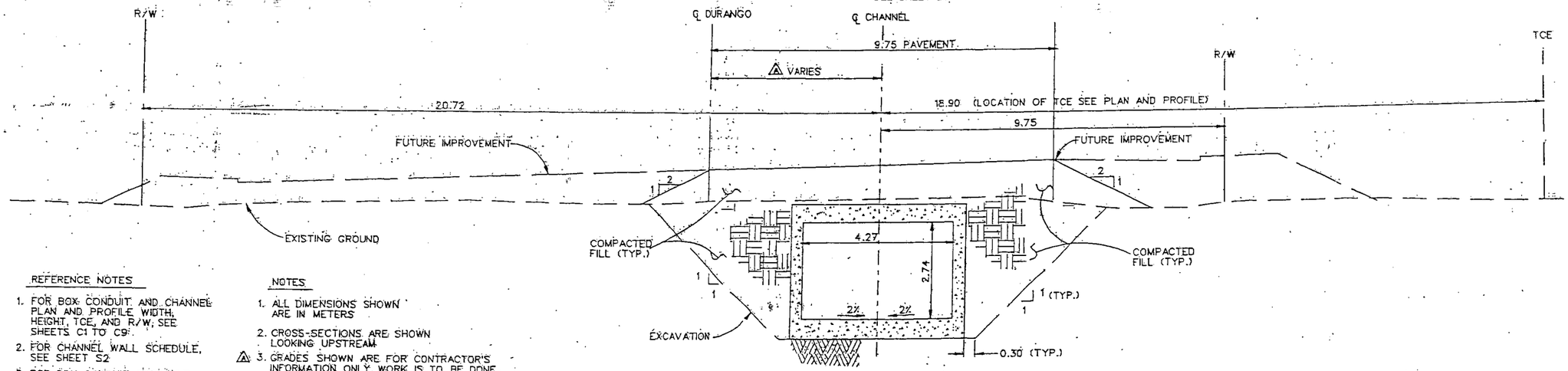
VALUE ENGINEERING PAYS



CHANNEL TYPICAL SECTION

STA 45+00.00 TO STA 48+40.00
FOR ASPHALT PAVEMENT DESIGN, SEE SHEET D11

⚠ FOR PROTECTION OF EXISTING UTILITIES AT STA 45+44, 46+81, AND 47+36 SEE SHEET D6.



CHANNEL TYPICAL SECTION

STA 43+30.73 TO STA 45+00.00
FOR ASPHALT PAVEMENT DESIGN, SEE SHEET D11

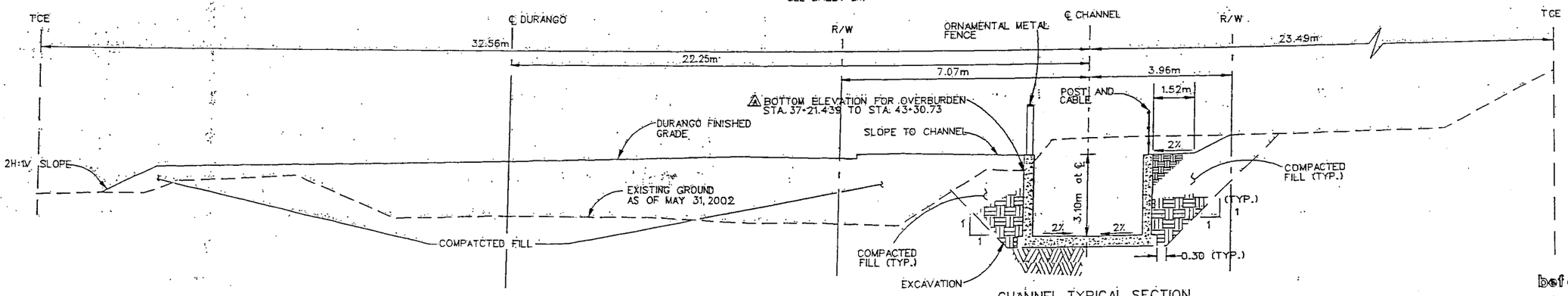
⚠ FOR PROTECTION OF EXISTING UTILITIES AT 43+34, SEE SHEET D6.

REFERENCE NOTES

1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEETS C1 TO C9.
2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2
3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3.

NOTES

1. ALL DIMENSIONS SHOWN ARE IN METERS
2. CROSS-SECTIONS ARE SHOWN LOOKING UPSTREAM.
⚠ 3. GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.



CHANNEL TYPICAL SECTION

STA 37+21.439 TO STA 43+30.73

SIDEWALK, CURB & GUTTER, AGGREGATE BASE, AND PLANTMIX BITUMINOUS SURFACE TO BE CONSTRUCTED BY OTHERS UPON COMPLETION OF THE CHANNEL PROJECT, SEE SHEET D11

Call before you Dig 1-800-227-2600

This sheet is prepared in METRIC

SYMBOL	REVISIONS DESCRIPTIONS	DATE	APPROVAL
⚠	REVISED AS NOTED		

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

TYPICAL CROSS SECTIONS

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE CHIEF, DESIGN BRANCH

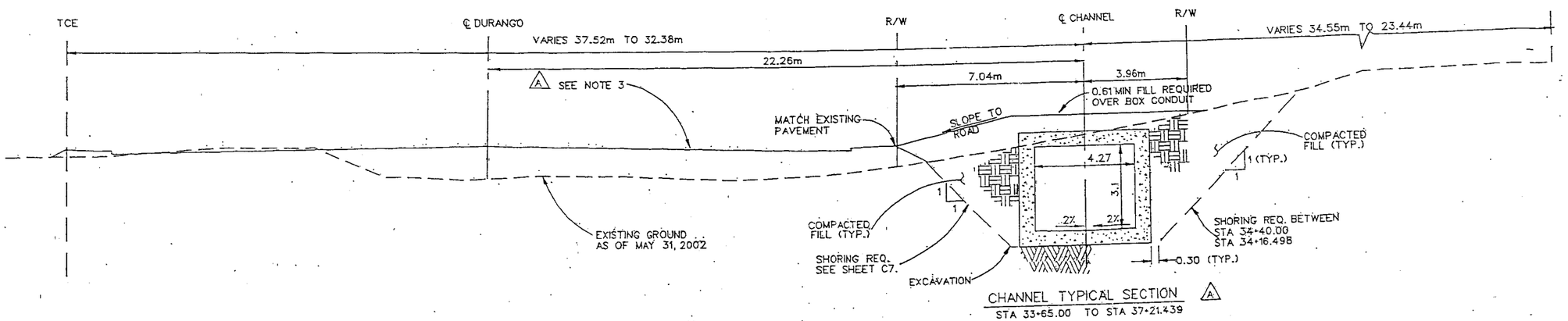
DESIGNED BY: HMN DRAWN BY: MKH CHECKED BY: PED

FILE NAME: C21.dgn

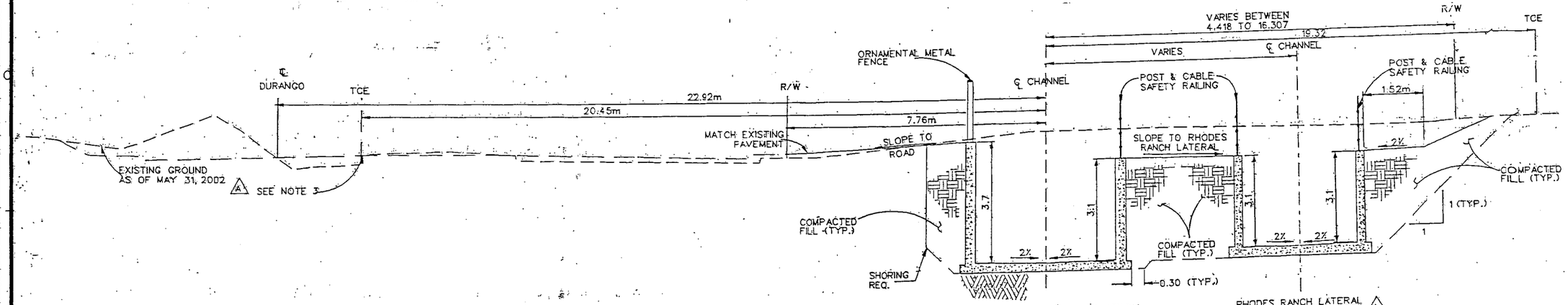
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/091

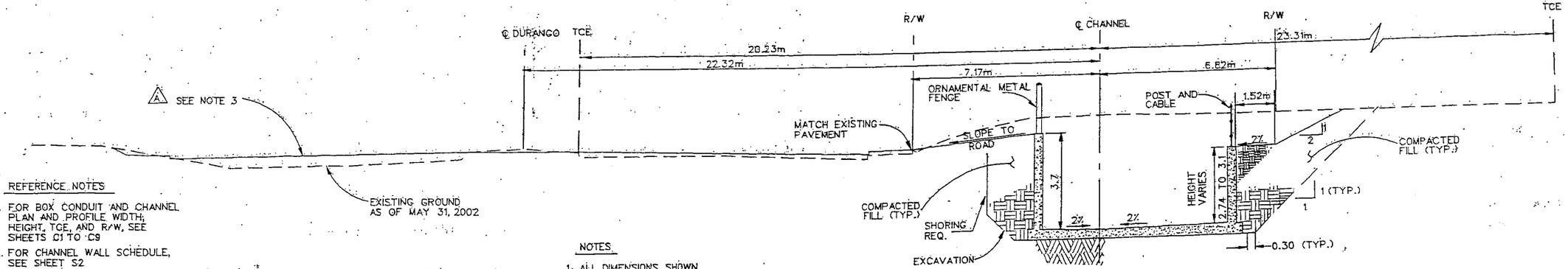
SHEET C21



CHANNEL TYPICAL SECTION A
STA 33+65.00 TO STA 37+21.439



CHANNEL TYPICAL SECTION
STA 33+47.421 to STA 33+65.00



RHODES RANCH CONFLUENCE CHANNEL TYPICAL SECTION A
STA 33+11.90 TO STA 33+26.50

REFERENCE NOTES

1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEETS C1 TO C9
2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2
3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3
4. SHORING REQUIREMENT AT STA 34+86.656 TO STA 35+02.853, SEE SHEET C7
5. SHORING REQUIREMENT AT STA 34+30.00 TO STA 33+02.481 AND STA 34+40.00 TO STA 34+16.498, SEE SHEET C8
6. FOR RHODES RANCH CONFLUENCE, SEE SHEETS S8 AND S9
7. DISTANCES FROM CENTER LINE OF MAIN CHANNEL TO R/W, CENTER LINE OF DURANGO DR. AND TCE ARE APPROXIMATE, SEE SHEETS T4 TO T12.
8. FOR CROSS SECTION FROM STA 33+26.50 TO STA 33+47.421, SEE SHEET C 28

NOTES

1. ALL DIMENSIONS SHOWN ARE IN METERS
2. CROSS-SECTIONS ARE SHOWN LOOKING UPSTREAM
3. A GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL
A	REVISED AS NOTED	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
TYPICAL CROSS SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

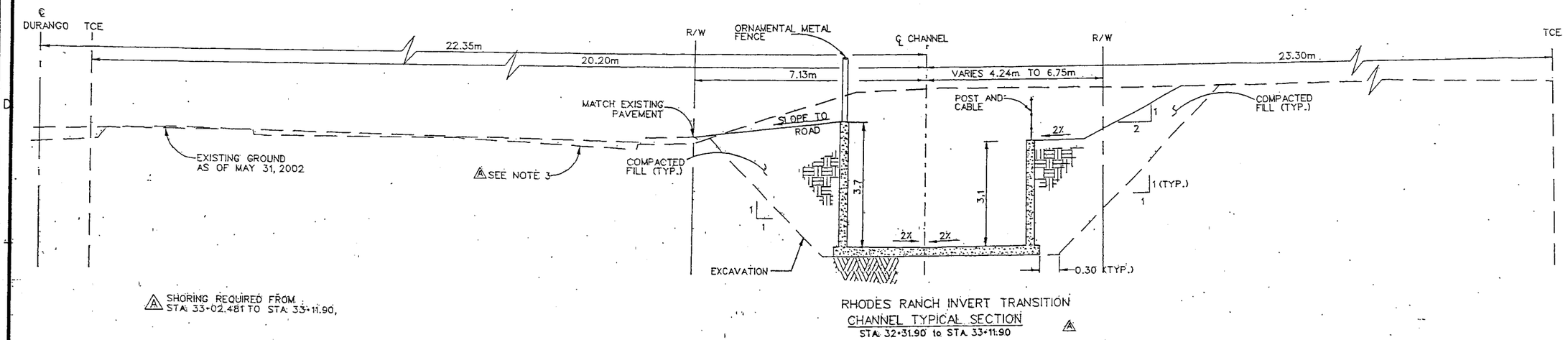
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMN MKH
DRAWN BY:
CHECKED BY: GEO

FILE NAME: C22.dgn

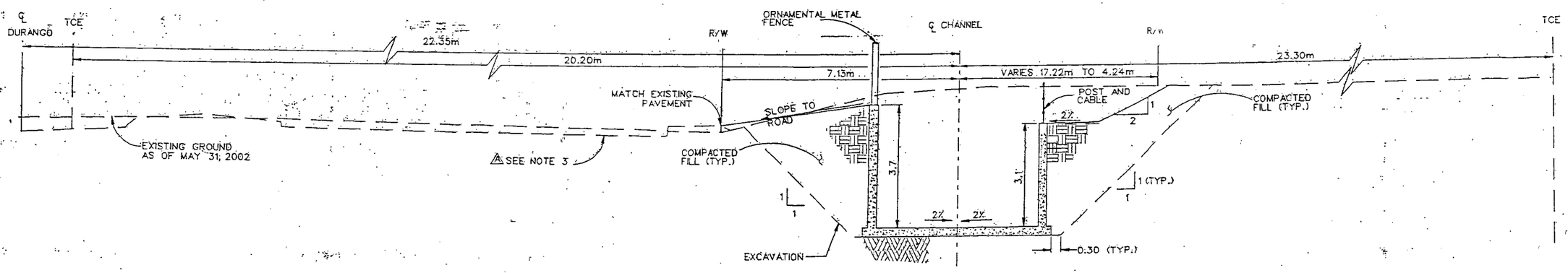
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SHEET C22

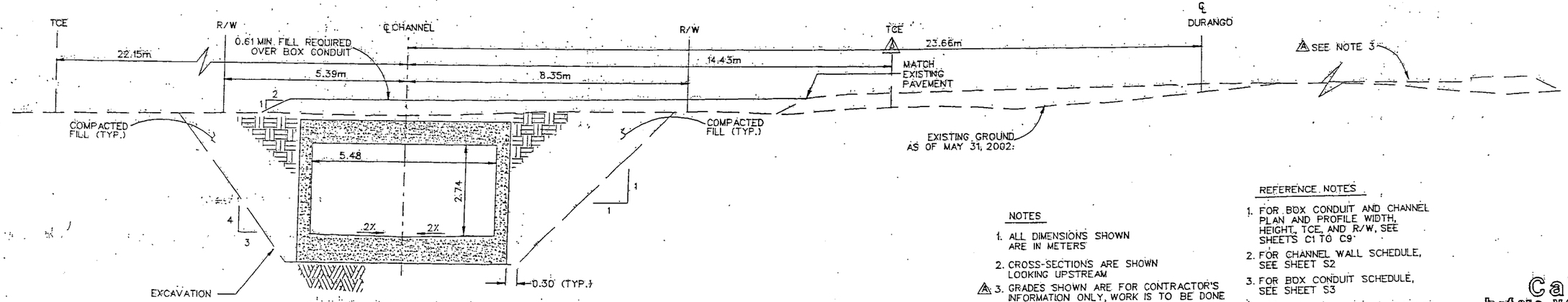


⚠ SHORING REQUIRED FROM STA. 33+02.481 TO STA. 33+11.90.

RHODES RANCH INVERT TRANSITION
CHANNEL TYPICAL SECTION
STA. 32+31.90 to STA. 33+11.90 ⚠



CHANNEL TYPICAL SECTION
STA. 31+45.95 to STA. 32+31.90 ⚠



CHANNEL TYPICAL SECTION
STA. 22+84.00 to STA. 25+19.089
SHORING REQUIREMENT AT STA. 22+15.00 AND STA. 23+14.00, SEE SHEET D3 ⚠

NOTES

1. ALL DIMENSIONS SHOWN ARE IN METERS
2. CROSS-SECTIONS ARE SHOWN LOOKING UPSTREAM
⚠ 3. GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.

REFERENCE NOTES

1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEETS C1 TO C9
2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2
3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3
4. FOR RHODES RANCH CONFLUENCE, SEE SHEETS S8 AND S9
⚠ 5. FOR CROSS SECTION FROM STA 30+32.580, TO STA 30+85.891 SEE SHEET C 28

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
⚠	REVISED AS NOTED		

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

TYPICAL CROSS SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

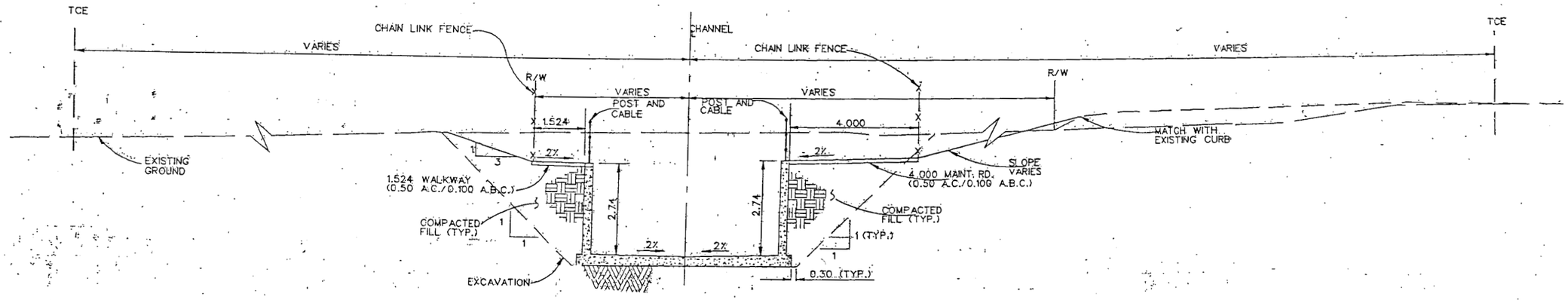
DESIGNED BY: HNN
DRAWN BY: MKH
CHECKED BY: GED

FILE NAME: C23.dgn

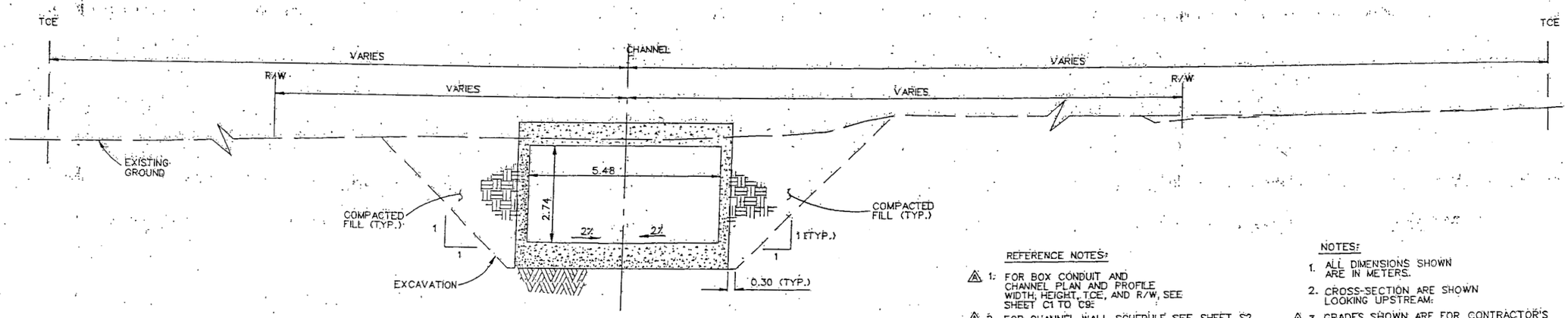
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214093 REV. A

SHEET
C23



⚠ CHANNEL TYPICAL SECTION
20+78.000 TO 22+84.000



CHANNEL TYPICAL SECTION
17+90.000 TO 20+78.000

REFERENCE NOTES:

⚠ 1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEET C1 TO C9.

⚠ 2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2.

⚠ 3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3.

NOTES:

1. ALL DIMENSIONS SHOWN ARE IN METERS.
2. CROSS-SECTION ARE SHOWN LOOKING UPSTREAM.

⚠ 3. GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.

Call before you Dig 1-800-227-2600

This drawing was produced in METRIC

SYMBOL	REVISED AS NOTED DESCRIPTIONS	DATE	APPROVAL
⚠	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL

TYPICAL CROSS SECTIONS

DESIGNED BY: FMW
DRAWN BY: MKH
CHECKED BY: GED

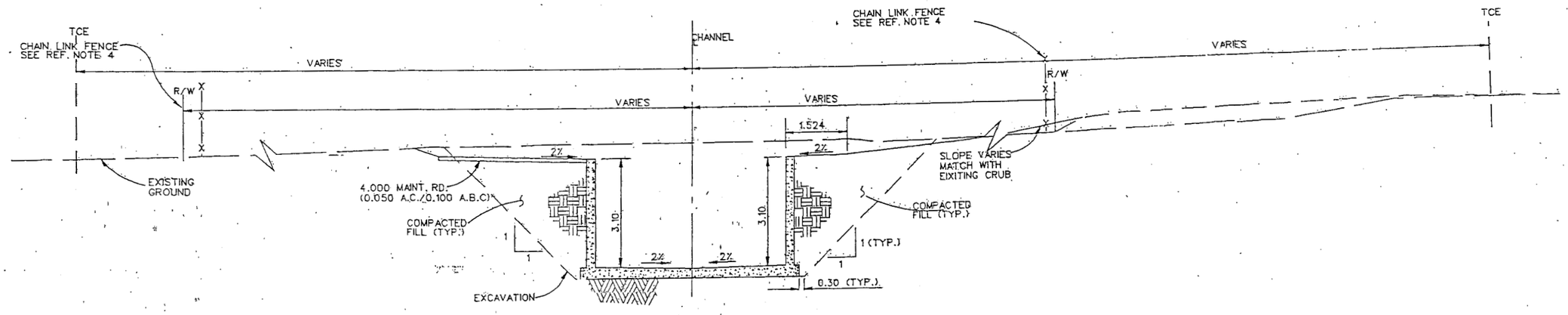
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

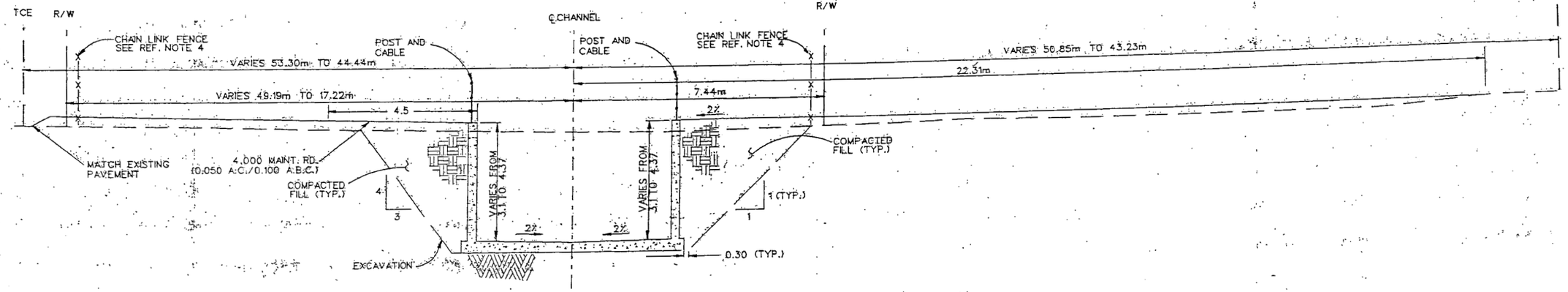
FILE NAME: C24.dgn
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214/954 REV. A

SHEET
C24

VALUE ENGINEERING PAYS



CHANNEL TYPICAL SECTION
STA. 17+66.000 to STA. 17+90.000



CHANNEL TYPICAL SECTION
STA. 16+40.000 to STA. 16+52.7000

REFERENCE NOTES:

A 1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEET C1 TO C9.
A 2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2.
A 3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3.
A 4. INSTALL CHAIN LINK FENCE .15 METER INSIDE THE R/W.

NOTES:

1. ALL DIMENSIONS SHOWN ARE IN METERS.
2. CROSS-SECTION ARE SHOWN LOOKING UPSTREAM.
A 3. GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.
A 4. FOR ACCESS RAMP CROSS SECTION FROM STA 16+52.700 TO 17+66.000, SEE SHEET C 28.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
A	REVISED AS NOTED	4/24/03	
A	REVISED AS NOTED	4/30/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA.

UPPER BLUE DIAMOND DIVERSION CHANNEL

TYPICAL CROSS SECTIONS

DESIGNED BY: HMN
DRAWN BY: ADM
CHECKED BY: JED

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

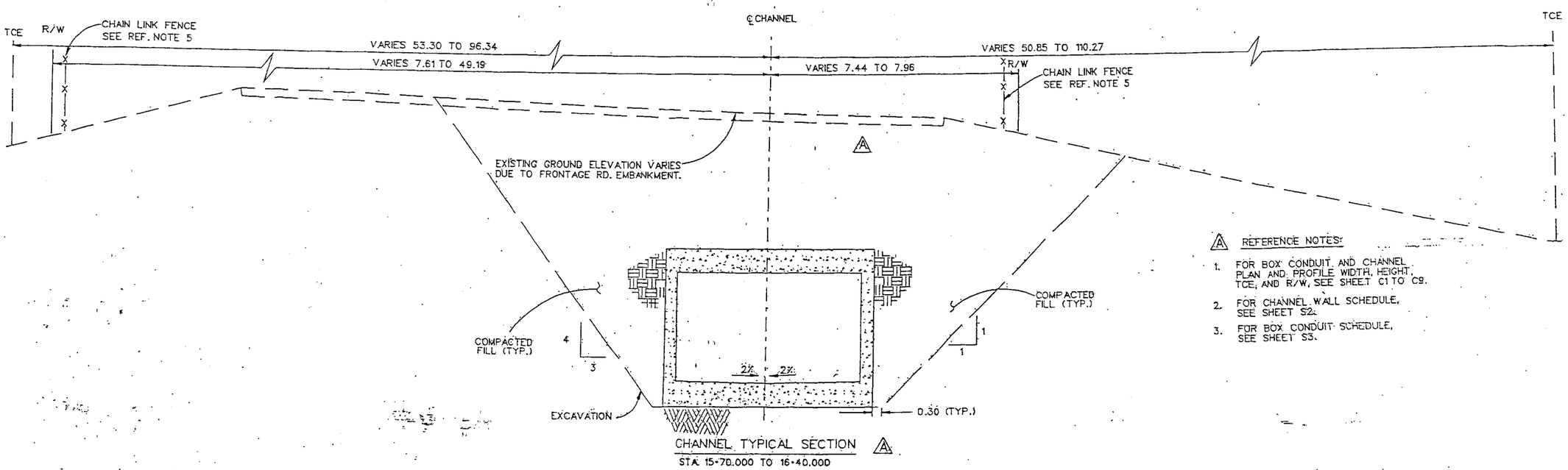
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: C24A.dgn

DISTRICT FILE NO. 211/055 REV. A | SPEC. NO. DACW09-03-B-0005

SHEET C24A

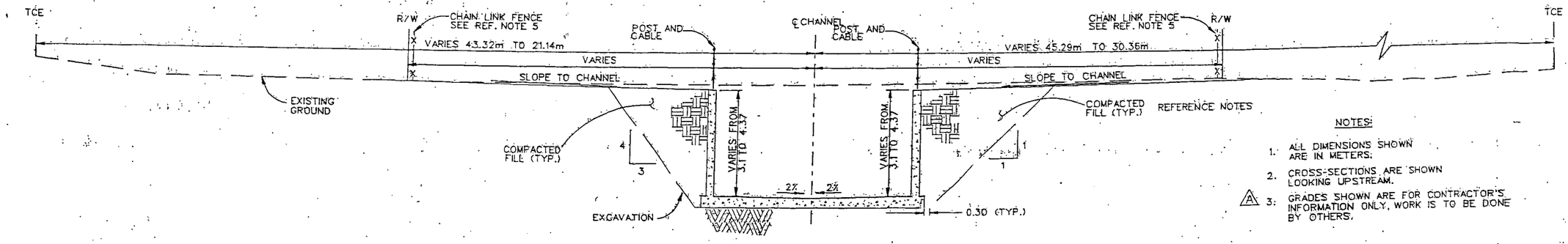
SAFETY PAYS



CHANNEL TYPICAL SECTION
STA. 15+70.000 TO 16+40.000

A REFERENCE NOTES:

1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEET C1 TO C9.
2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2.
3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3.

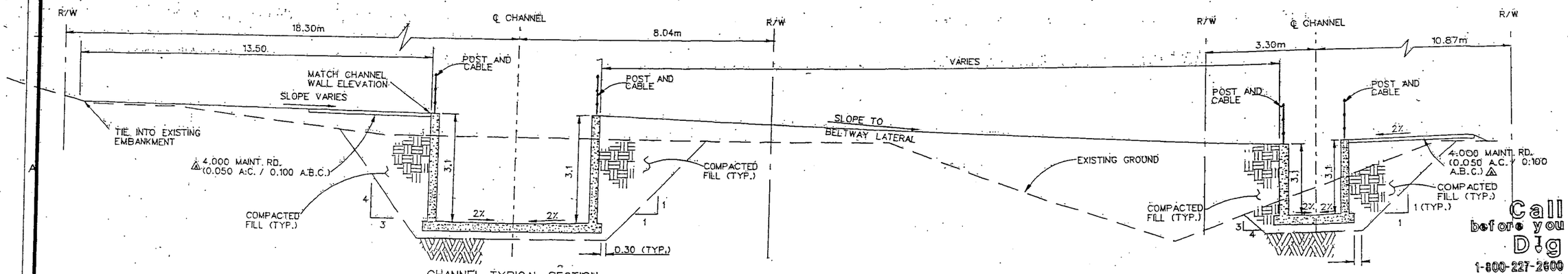


CHANNEL TYPICAL SECTION
STA. 15+70 TO 15+57.300

REFERENCE NOTES

NOTES:

1. ALL DIMENSIONS SHOWN ARE IN METERS.
2. CROSS-SECTIONS ARE SHOWN LOOKING UPSTREAM.
3. GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.



CHANNEL TYPICAL SECTION
STA. 14+25.50 TO 15+57.3000

BELTWAY LATERAL

Call before you Dig 1-800-227-2600

METRIC

REVISIONS			
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISED AS NOTED		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL

TYPICAL CROSS SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

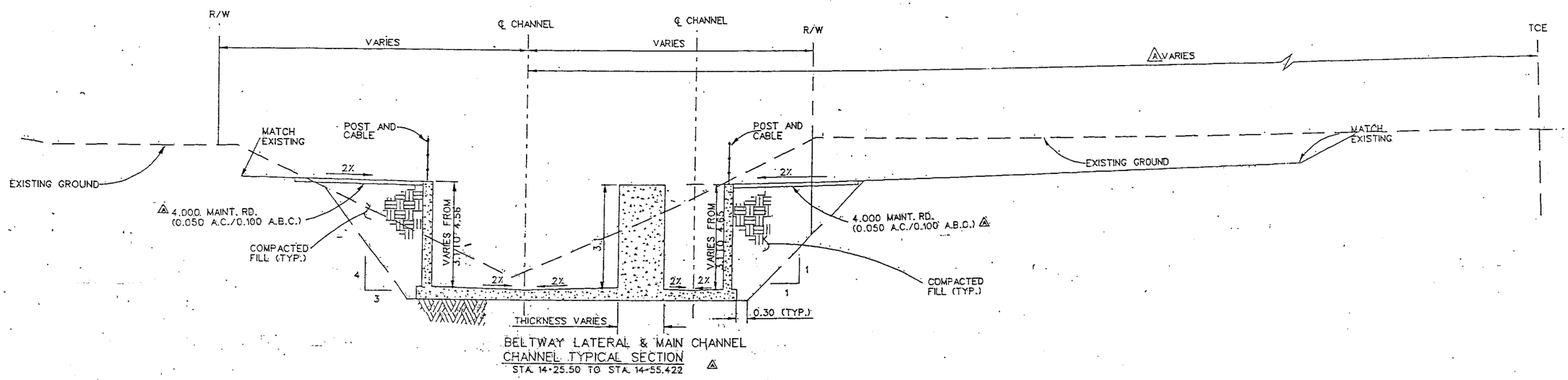
DESIGNED BY: HNN
DRAWN BY: MKH
CHECKED BY: CED

FILE NAME: C25.dgn

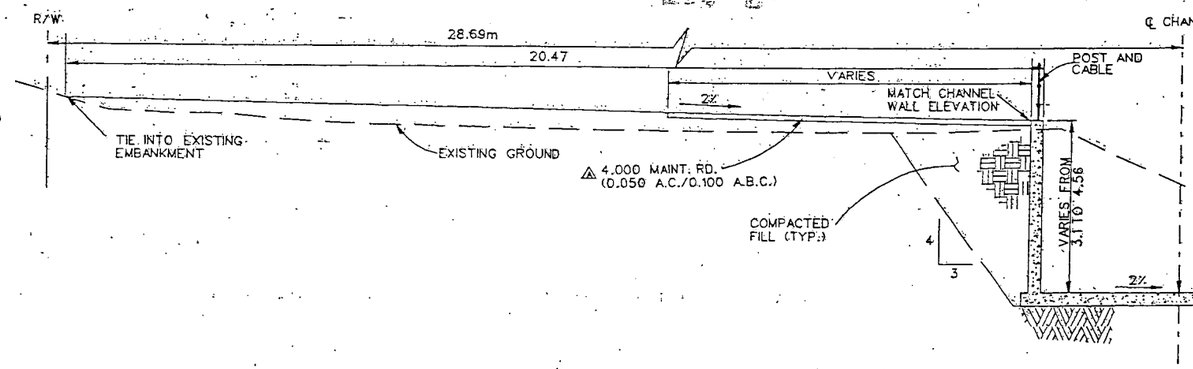
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214096 REV. A

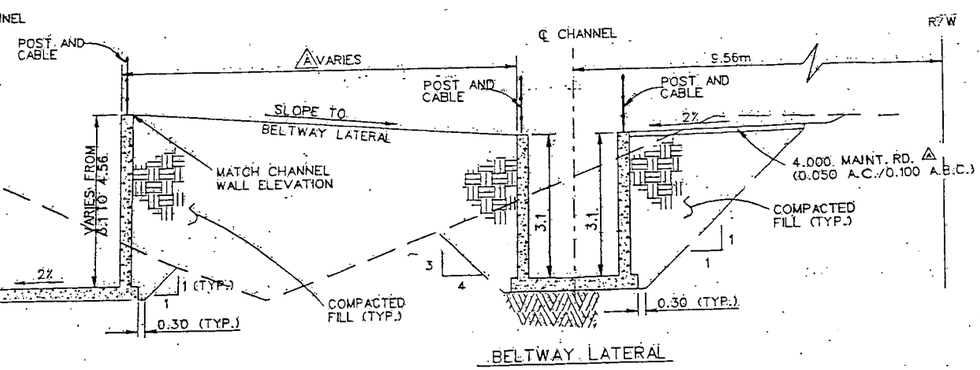
SHEET
C25



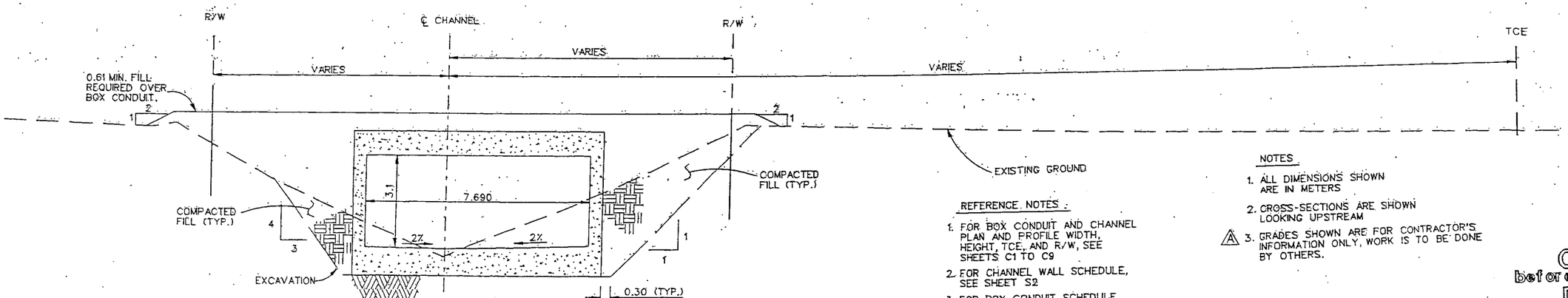
BELTWAY LATERAL & MAIN CHANNEL
CHANNEL TYPICAL SECTION
STA. 14+25.50 TO STA. 14+55.422 △



CHANNEL TYPICAL SECTION
STA. 14+10.000 TO STA. 14+25.50 △



BELTWAY LATERAL



CHANNEL TYPICAL SECTION
BELTWAY CONFLUENCE
STA. 13+95.400 TO STA. 14+10.000 △

REFERENCE NOTES:

1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEETS C1 TO C9
2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2
3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3
4. FOR BELTWAY CONFLUENCE, SEE SHEETS S4 AND S5

NOTES

1. ALL DIMENSIONS SHOWN ARE IN METERS
2. CROSS-SECTIONS ARE SHOWN LOOKING UPSTREAM
△ 3. GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
△	REVISED AS NOTED		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

TYPICAL CROSS SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: RMN
DRAWN BY: MKH
CHECKED BY: GED

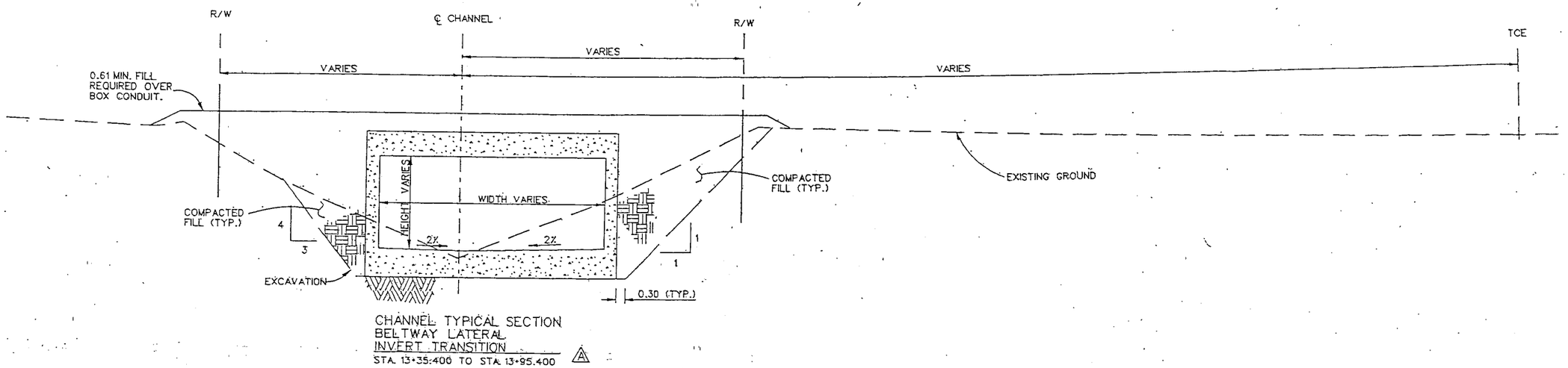
SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

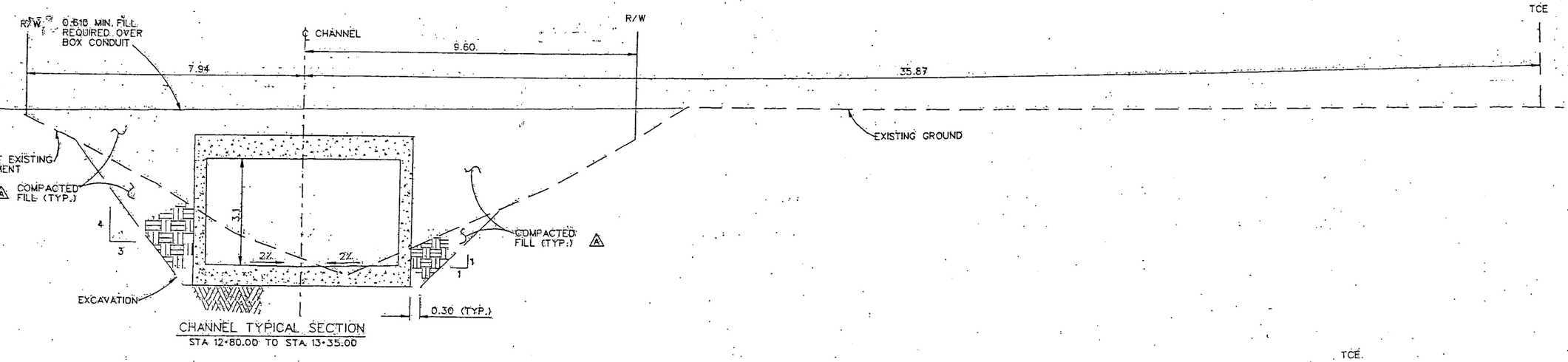
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DISTRICT FILE NO. 214/097 REV. A | SPEC. NO. DACW09-03-B-0005

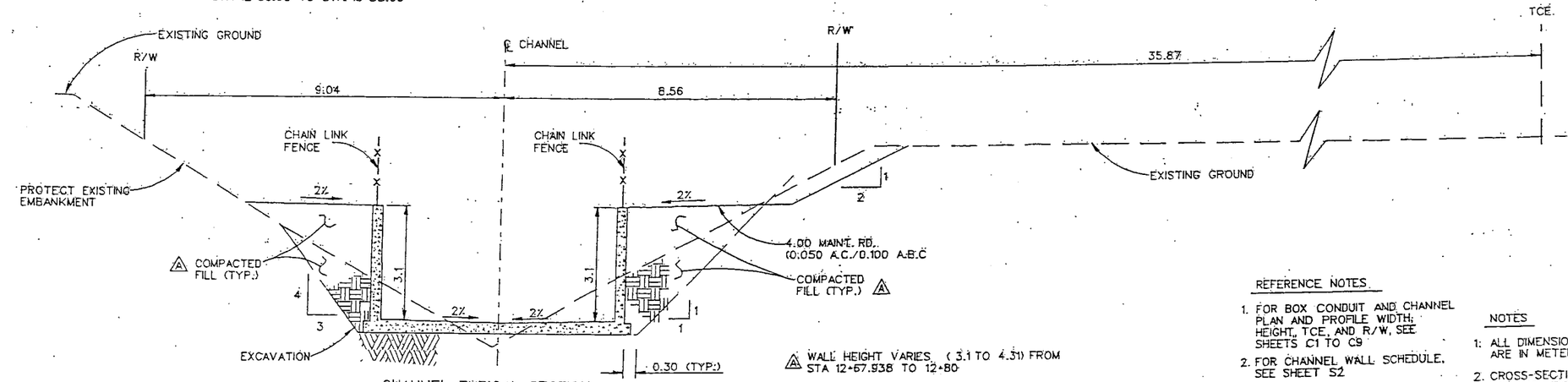
SHEET C26



CHANNEL TYPICAL SECTION
BELTWAY LATERAL
INVERT TRANSITION
STA 13+35.400 TO STA 13+95.400 ⚠



CHANNEL TYPICAL SECTION
STA 12+80.00 TO STA 13+35.00



CHANNEL TYPICAL SECTION
STA 10+00.00 TO STA 12+80.00

⚠ WALL HEIGHT VARIES, (3.1 TO 4.31) FROM STA 12+67.938 TO 12+80

REFERENCE NOTES

1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT, TCE, AND R/W, SEE SHEETS C1 TO C9
2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2
3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3

NOTES

1. ALL DIMENSIONS SHOWN ARE IN METERS
2. CROSS-SECTIONS ARE SHOWN LOOKING UPSTREAM

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
⚠	REVISIONS		

REVISED AS NOTED

LAS VEGAS WASH AND TRIBUTARIES,
CITRUS AND FLAMINGO WASHES, NEVADA.
UPPER BLUE DIAMOND DIVERSION CHANNEL
TYPICAL CROSS SECTIONS

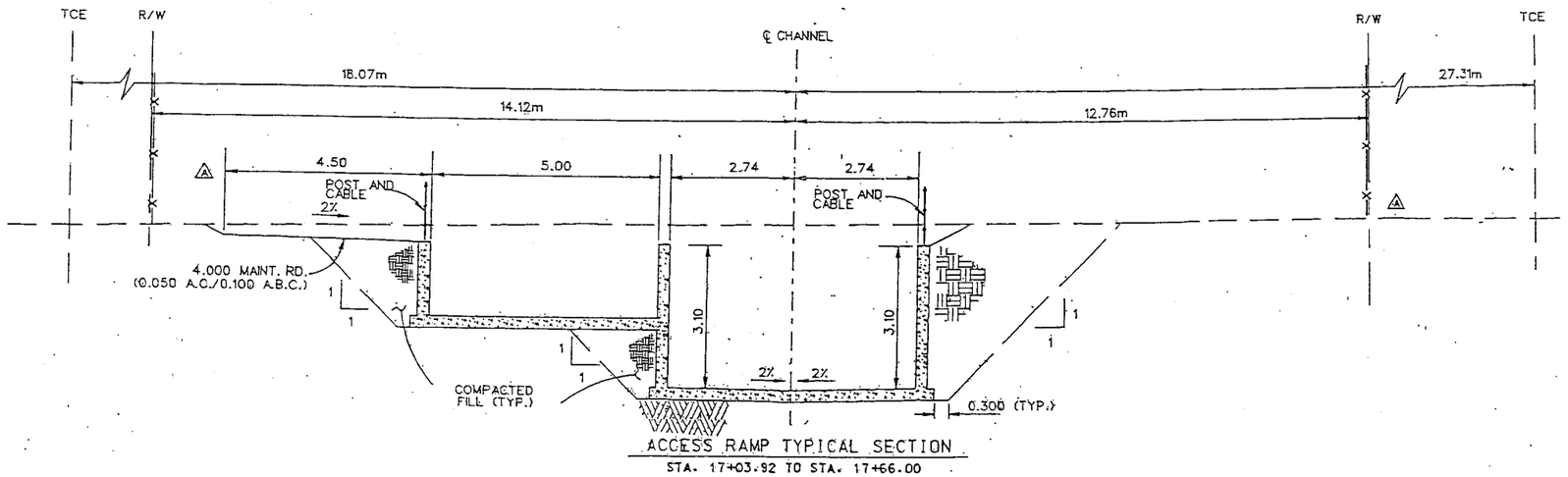
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HWH
DRAWN BY: MKH
CHECKED BY: GED

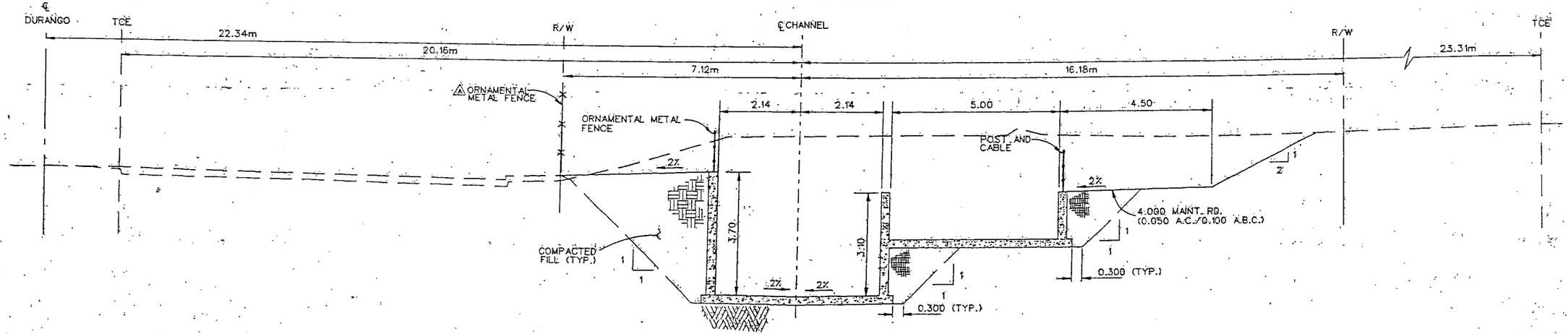
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SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214/098 REV. A

SHEET C27



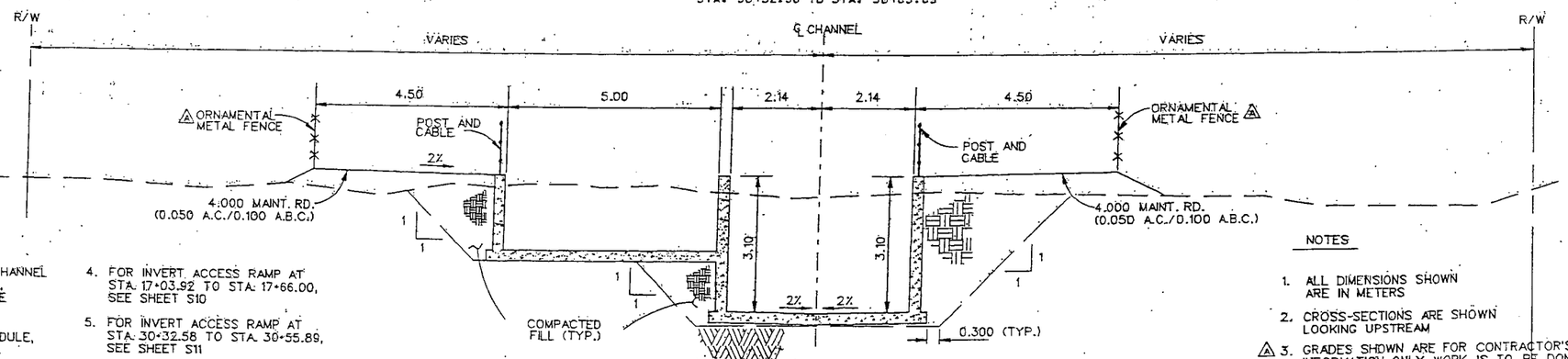
ACCESS RAMP TYPICAL SECTION

STA. 17+03.92 TO STA. 17+66.00



ACCESS RAMP TYPICAL SECTION

STA. 30+32.58 TO STA. 30+85.89



ACCESS RAMP TYPICAL SECTION

STA. 49+97.00 TO STA. 50+57.23

REFERENCE NOTES

1. FOR BOX CONDUIT AND CHANNEL PLAN AND PROFILE WIDTH, HEIGHT; TCE, AND R/W, SEE SHEETS C1 AND C9
2. FOR CHANNEL WALL SCHEDULE, SEE SHEET S2
3. FOR BOX CONDUIT SCHEDULE, SEE SHEET S3
4. FOR INVERT ACCESS RAMP AT STA. 17+03.92 TO STA. 17+66.00, SEE SHEET S10
5. FOR INVERT ACCESS RAMP AT STA. 30+32.58 TO STA. 30+55.89, SEE SHEET S11
6. FOR INVERT ACCESS RAMP AT STA. 49+97.00 TO STA. 50+57.23, SEE SHEET S12

NOTES

1. ALL DIMENSIONS SHOWN ARE IN METERS
2. CROSS-SECTIONS ARE SHOWN LOOKING UPSTREAM
3. GRADES SHOWN ARE FOR CONTRACTOR'S INFORMATION ONLY, WORK IS TO BE DONE BY OTHERS.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	REVISIONS DESCRIPTIONS	DATE APPROVAL
3	REVISED AS NOTED	

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

ACCESS RAMP TYPICAL CROSS SECTIONS

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, P.E. CHIEF, DESIGN BRANCH

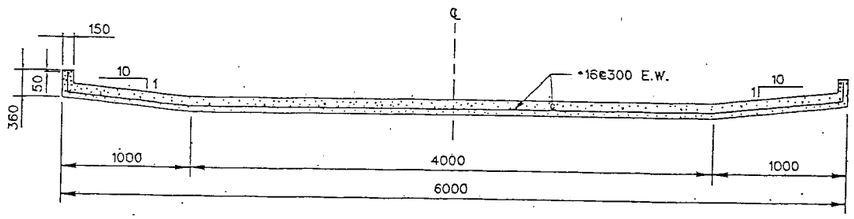
DESIGNED BY: HWN. DRAWN BY: MKH. CHECKED BY: GED

FILE NAME: C28.dgn

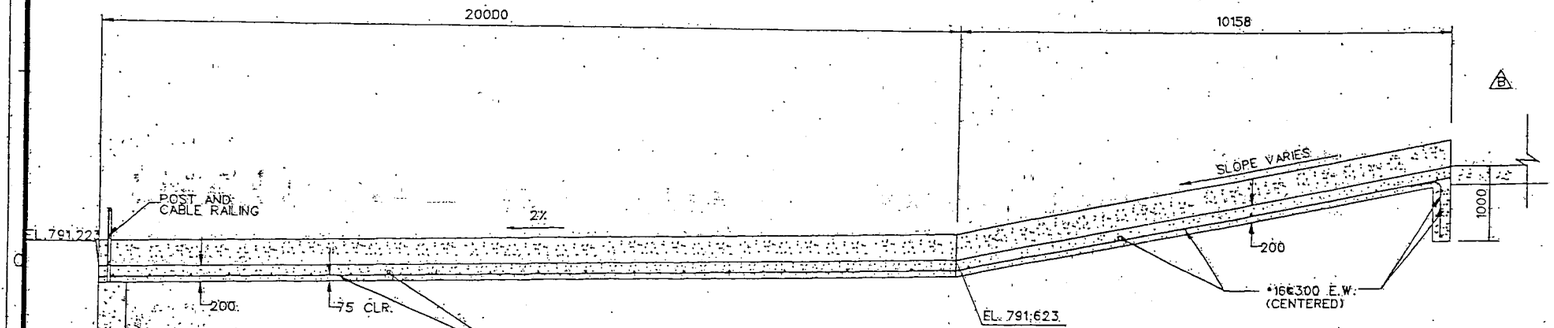
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/099 REV. A

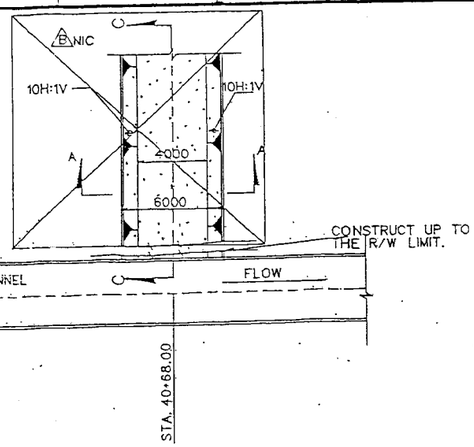
SHEET C28



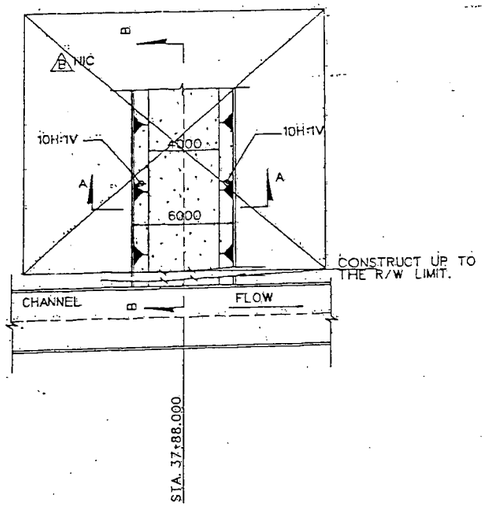
SECTION A-A
SCALE : NTS



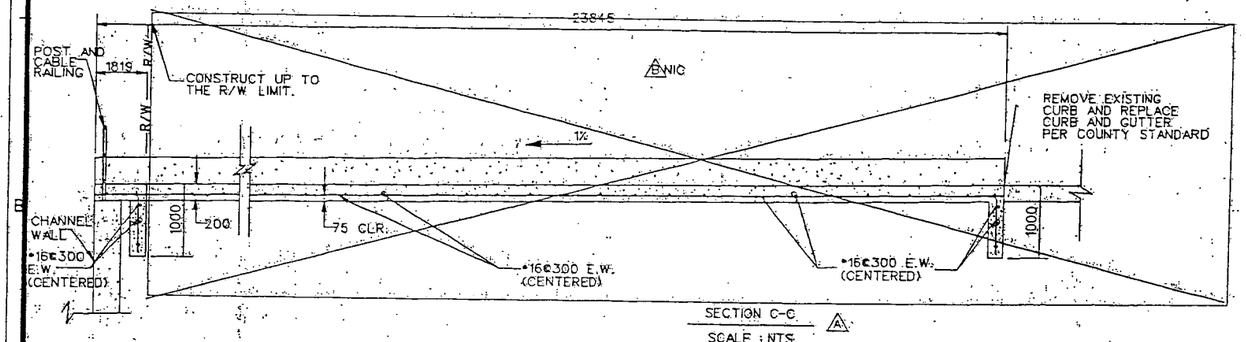
SECTION G-G
SCALE : NTS



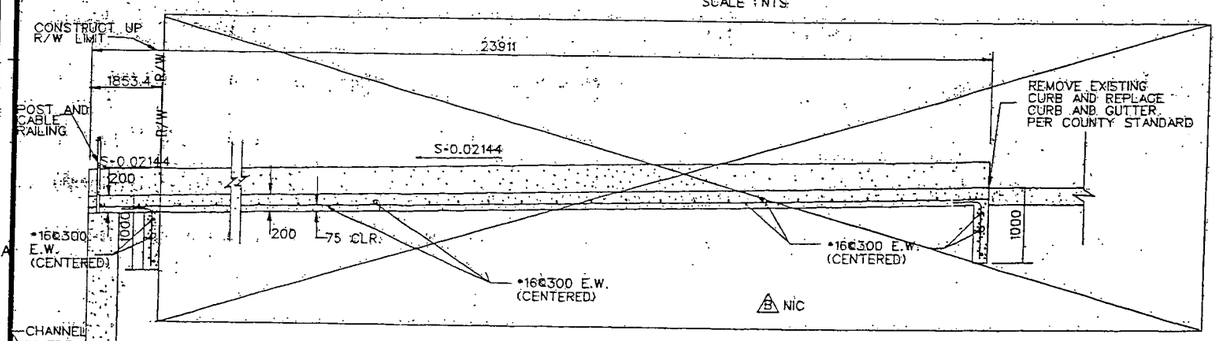
PLAN
CONCRETE OVERFLOW STRUCTURE @ STA. 40+68.00
SCALE : NTS



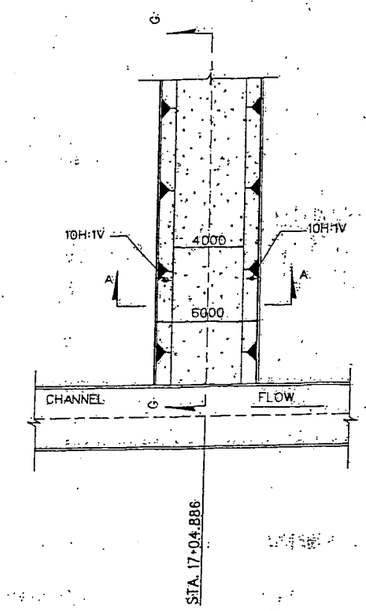
PLAN
CONCRETE OVERFLOW STRUCTURE @ STA. 37+88.00
SCALE : NTS



SECTION C-C
SCALE : NTS



SECTION B-B
SCALE : NTS



PLAN
CONCRETE OVERFLOW STRUCTURE @ STA. 17+04.886
SCALE : NTS

CONSTRUCTION NOTES:

A 26 JOINT SEALANT IS REQUIRED TO ALL DETAIL WHERE THE CONCRETE OVERFLOW CONNECT TO EXISTING CONCRETE OR CHANNEL.

NOTES:

1. FOR LOCATION OF OVERFLOW STRUCTURE SEE SHEET C5, C6, AND C13
2. FOR DRAINAGE OVERFLOW CROSS SECTION , SEE SECTION A-A ON THIS SHEET

Call before you Dig 1-800-227-2600

This drawing was produced in METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
B	REVISED AS NOTED	11/28/03	
A	REVISED AS NOTED	11/20/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

CONCRETE OVERFLOW STRUCTURES

STA. 17+04.886, STA. 37+88.000 AND STA. 40+68.000

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMN
DRAWN BY: JSR
CHECKED BY: GEO

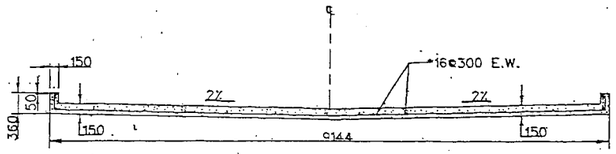
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SPEC. NO. DACW09-03-B-0005

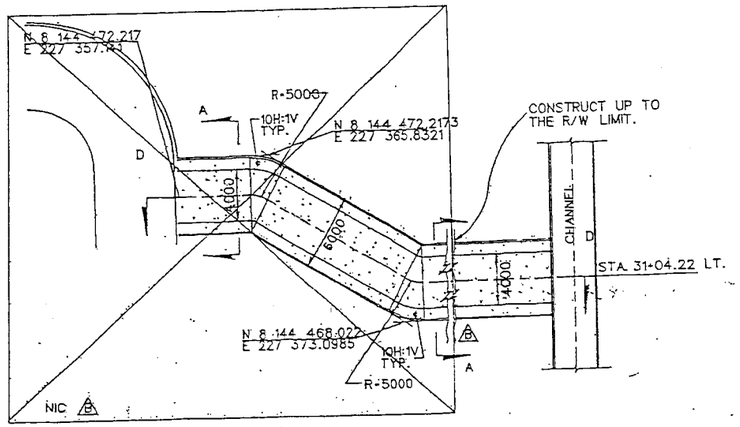
DISTRICT FILE NO. 21400 REV. A

SHEET
C29

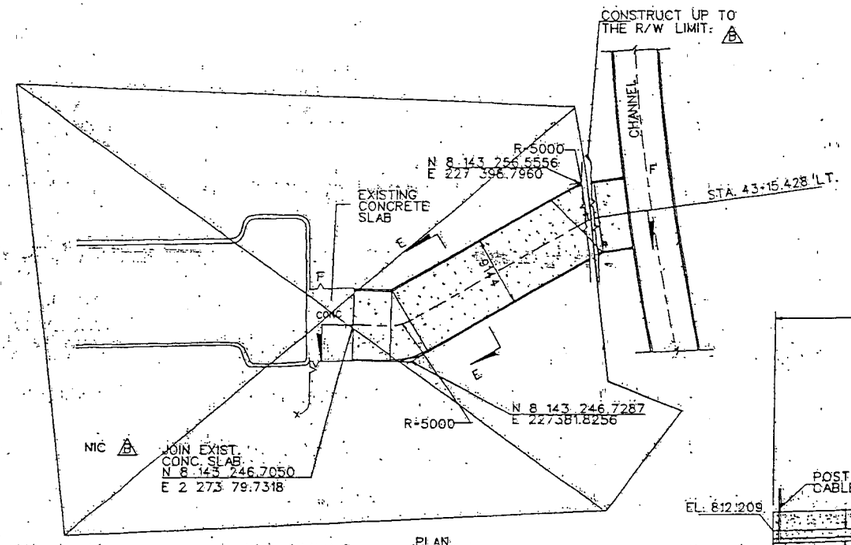
VALUE ENGINEERING PAYS



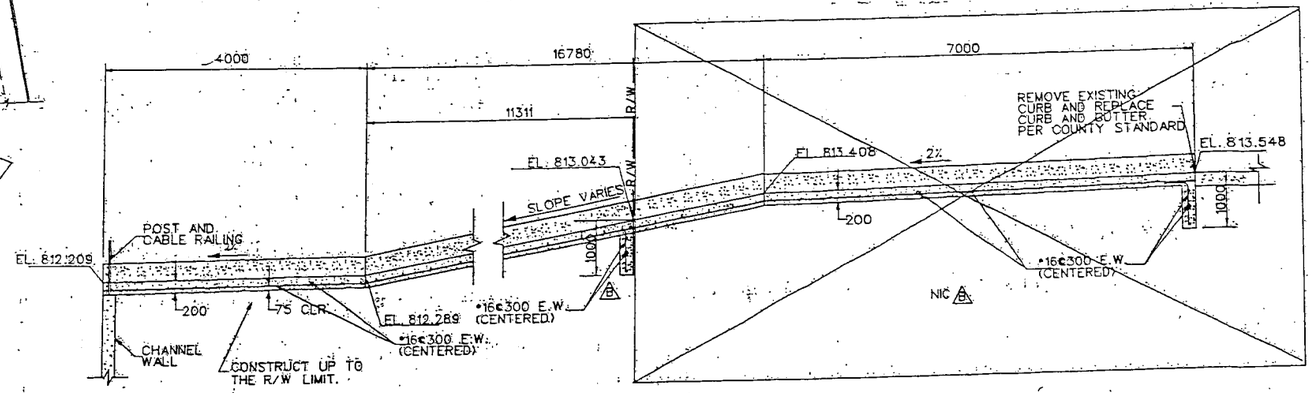
SECTION E-E (A)
SCALE : NTS



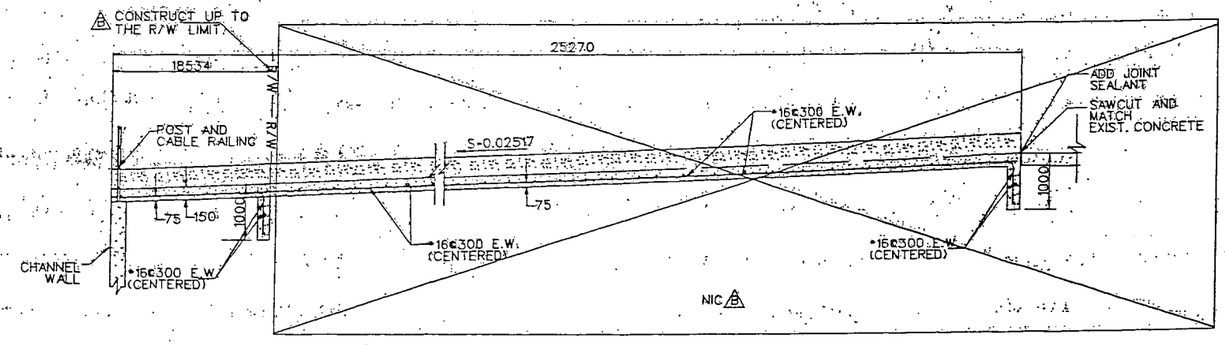
PLAN
CONCRETE OVERFLOW STRUCTURE @ STA. 31+04.22
SCALE : NTS



PLAN
CONCRETE OVERFLOW STRUCTURE @ STA. 43+15.428
SCALE : NTS



SECTION B-B
SCALE : NTS (A)



SECTION F-F (A)
SCALE : NTS

CONSTRUCTION NOTES:
(A) (20) JOINT SEALANT IS REQUIRED TO ALL DETAIL WHERE THE CONCRETE OVERFLOW CONNECT TO EXISTING CONCRETE OR CHANNEL

NOTES:
1. FOR LOCATION OF DRAINAGE STRUCTURES, SEE SHEETS C4 & C9.
2. FOR DRAINAGE STRUCTURE CROSS SECTIONS, SEE SECTION A-A ON SHEET C29 AND SECTION E-E ON THIS PAGE.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
(A)	REVISED AS NOTED	6/20/03	
(B)	REVISED AS NOTED	6/20/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
CONCRETE OVERFLOW STRUCTURES
STA. 31+04.220 AND STA. 43+15.428

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HAN
DRAWN BY: JOR
CHECKED BY: GED

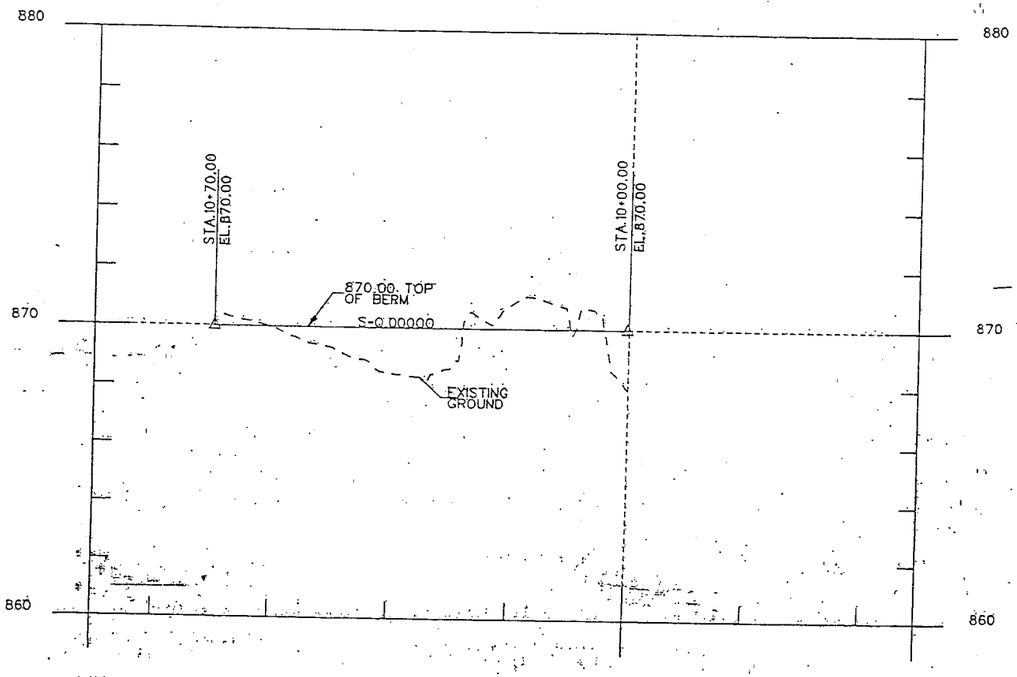
FILE NAME: C30.dgn

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 314/111 REV. A

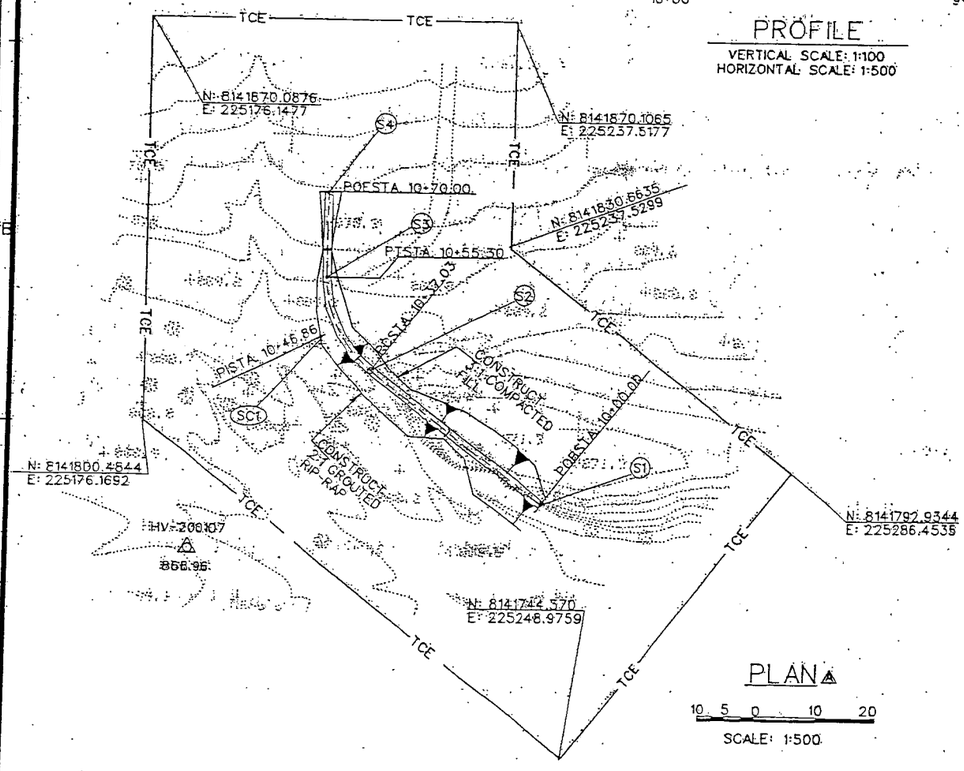
SHEET C30

SAFETY PAYS



PROFILE

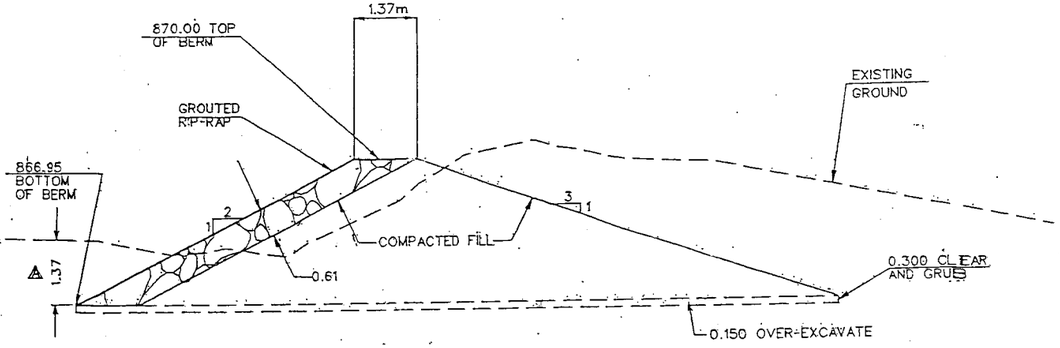
VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN ⚠

10 5 0 10 20

SCALE: 1:500



TYPICAL SECTION

N.T.S.

ESTABLISHED CONTROL POINTS

POINT NO.	DESCRIPTION	OWNER
200107	SET A ½ INCH BRASS CAP ON A COPPER WELD ROD STAMPED "USCE LA DIST. LVW 2001-07", SET IN THE BOTTOM OF A WASH, USE GPS NAVIGATION TO REACH THE STATION.	COE

BERM ALIGNMENT CONTROL POINTS AND CURVE DATA

	CURVE DATA					
PI NO.	R	L	T	△	NORTHING	EASTING
(S1)	—	—	—	—	8141786.96	225243.96
(S2)	—	—	—	—	8141809.57	225214.63
(S3)	—	—	—	—	8141825.40	225206.85
(S4)	—	—	—	—	8141840.10	225206.84
(SC1)	20.000	18.27	9.83	52° 20'36"	8141815.57	225206.85

⚠ REFERENCE NOTE:

1. SLOPE PROTECTION BERM LOCATED APPROXIMATELY 426 METERS UPSTREAM FROM CHANNEL STA. 52+60.890, ON THE NORTH EMBANKMENT OF EXISTING WASH.

Call before you Dig 1-800-227-2600

This drawing prepared in METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
⚠	REVISED AS NOTED		

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASH), NEVADA

UPPER BLUE DIAMOND WASH DIVERSION CHANNEL

UPPER BLUE DIAMOND WASH
SLOPE PROTECTION BERM

C31.DGN

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMN
DRAWN BY: HMN
CHECKED BY: GED

FILE NAME:

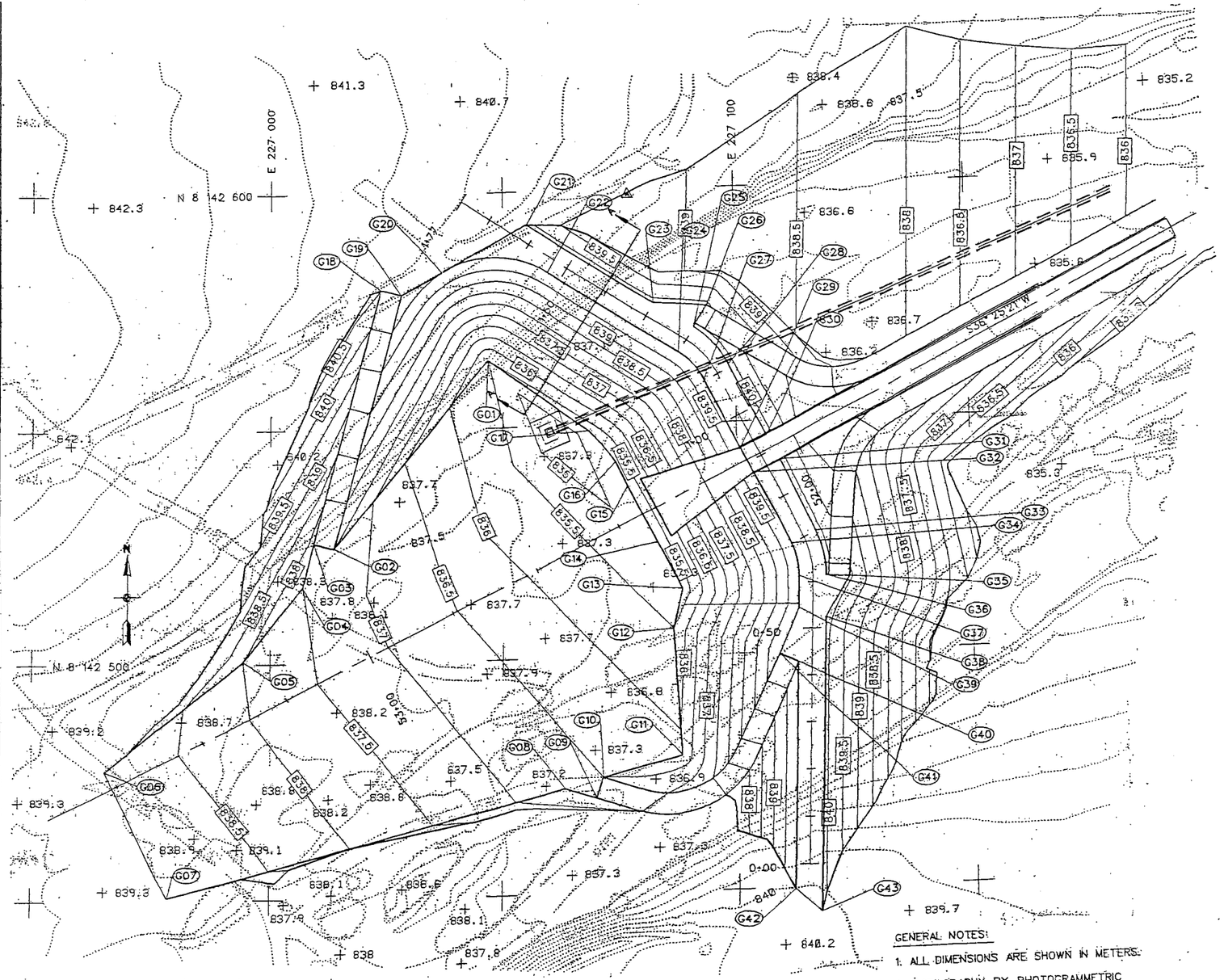
DISTRICT FILE NO. 214/102 REV. 1 SPEC. NO. DACW09-03-B-0005

SHEET C31

VALUE ENGINEERING PAYS

INLET STRUCTURE COORDINATE POINTS

POINT NUMBER	NORTHING	EASTING	ELEVATION
G1	8 142 564.495	227 046.867	835.500
G2	8 142 524.523	227 013.930	837.500
G3	8 142 525.662	227 009.576	837.500
G4	8 142 516.274	227 007.133	837.500
G5	8 142 500.472	226 994.111	838.000
G6	8 142 477.347	226 965.260	838.960
G7	8 142 450.630	226 978.620	838.960
G8	8 142 472.364	227 063.632	836.667
G9	8 142 470.163	227 070.354	836.500
G10	8 142 474.445	227 071.748	836.500
G11	8 142 478.677	227 088.325	836.150
G12	8 142 505.876	227 086.517	835.500
G13	8 142 514.298	227 088.614	835.450
G14	8 142 524.611	227 083.344	835.450
G15	8 142 536.834	227 077.129	835.200
G16	8 142 542.079	227 074.541	835.100
G17	8 142 548.692	227 068.846	835.100
G18	8 142 579.729	227 023.648	840.500
G19	8 142 576.583	227 028.049	840.500
G20	8 142 583.311	227 036.900	840.006
G21	8 142 593.117	227 055.260	840.120
G22	8 142 582.941	227 059.795	840.000
G23	8 142 575.891	227 082.729	840.120
G24	8 142 565.319	227 087.896	840.000
G25	8 142 570.575	227 091.198	840.120
G26	8 142 575.005	227 093.957	840.120
G27	8 142 559.324	227 093.341	840.000
G28	8 142 562.370	227 098.526	840.120
G29	8 142 544.305	227 100.857	840.000
G30	8 142 546.942	227 106.246	840.120
G31	8 142 541.538	227 108.950	840.120
G32	8 142 538.853	227 103.584	840.000
G33	8 142 525.972	227 116.738	840.120
G34	8 142 523.386	227 111.322	840.000
G35	8 142 515.983	227 123.680	840.120
G36	8 142 516.241	227 118.955	840.120
G37	8 142 516.366	227 112.904	840.000
G38	8 142 507.242	227 116.769	840.120
G39	8 142 509.462	227 112.762	840.120
G40	8 142 497.899	227 112.523	840.000
G41	8 142 499.715	227 108.406	840.000
G42	8 142 449.701	227 111.527	840.000
G43	8 142 444.756	227 117.478	840.120



LEGEND

- G27 — COORDINATE POINT NUMBER
- 838 — FINISHED GRADE CONTOUR
- 837.5 — EXISTING GRADE CONTOUR
- + 839.3 — EXISTING POINT ELEVATION

PLAN

10 5 0 10 20

SCALE: 1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE SHOWN IN METERS.
2. TOPOGRAPHY BY PHOTOGRAMMETRIC METHOD BY LANDATA AIRBONE SYSTEMS ON MAY 31, 2001. HORIZONTAL CONTROL IS BASED ON NAD83 DATUM. VERTICAL CONTROL IS BASED ON NAVD 88 DATUM.
3. UNLESS OTHER WISE NOTED, CHANNEL WALLS ARE SHOWN AS RIGHT OR LEFT LOOKING DOWNSTREAM.

Call before you Dig 1-800-227-2600

The device you powered by METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	REVISED AS NOTED		
	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO, WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

INLET STRUCTURE
GRADING PLAN

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HWN
DRAWN BY: ML
CHECKED BY: GEO

FILE NAME: C32.DGN

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

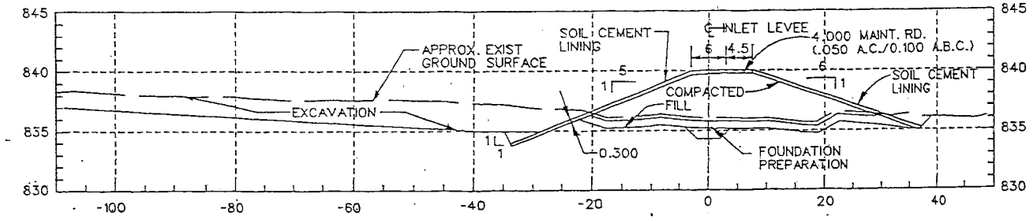
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/103 REV. A

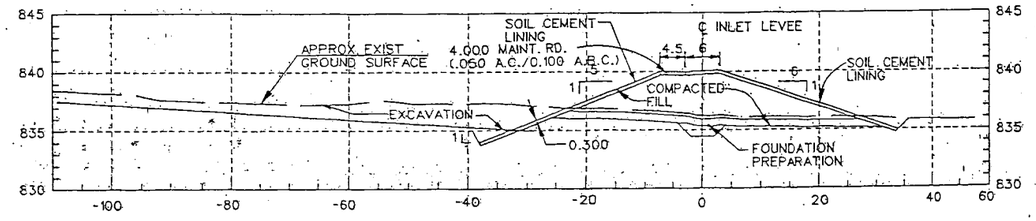
SHEET C32

SAFETY PAYS

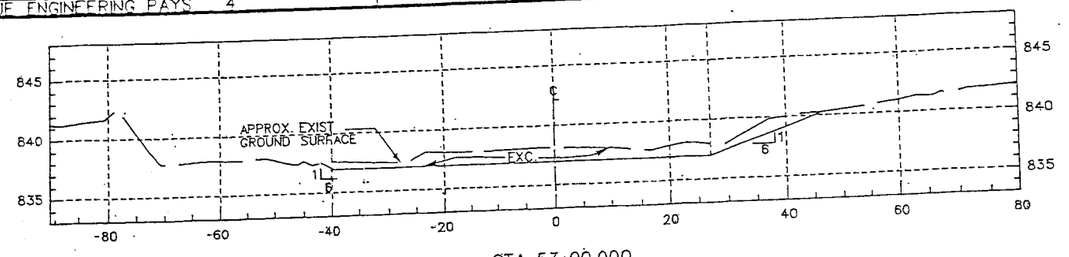
VALUE ENGINEERING PAYS



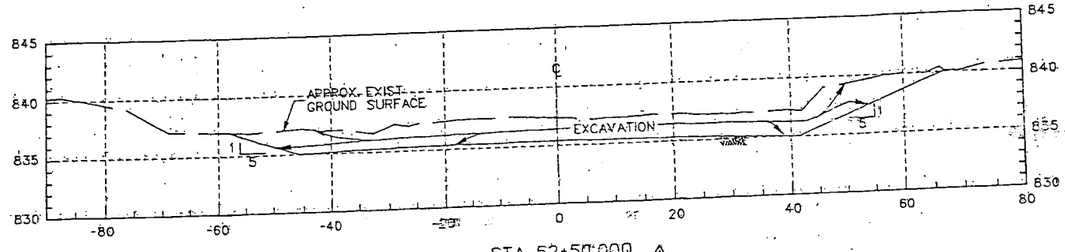
STA 1+20.000 ⚠
(℄ INLET LEVEE)



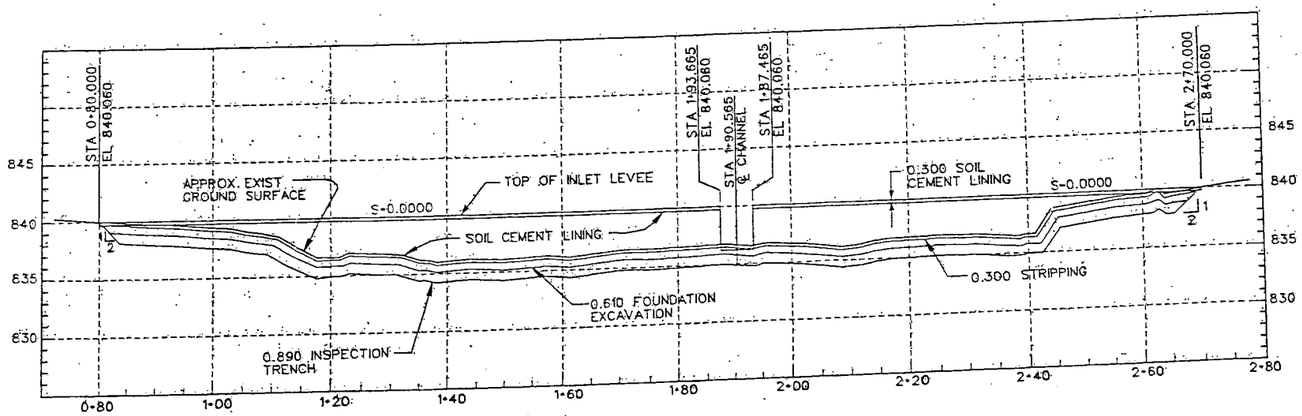
STA 0+60.000 ⚠
(℄ INLET LEVEE)



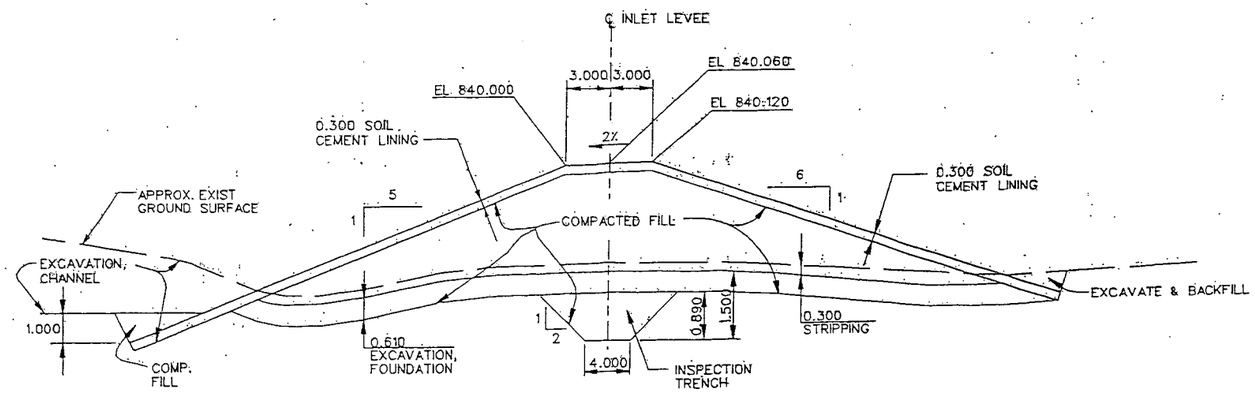
STA 53+00.000
(℄ CHANNEL)



STA 52+50.000 ⚠
(℄ CHANNEL)



℄ PROFILE
INLET STRUCTURE LEVEE



INLET LEVEE AT SECTION A-A ⚠
NOT TO SCALE

HORIZ. SCALE: 1:500
VERT. SCALE: 1:250

NOTES:
1. CROSS SECTIONS ARE TAKEN LOOKING UP STATIONS
2. FOR PLAN VIEW OF INLET STRUCTURE, SEE SHEET C1.
3. FOR OUTLET TOWER DETAILS, SEE SHEET S17.
⚠4. FOR GRADING PLAN OF INLET STRUCTURE, SEE SHEET C32.
5. FOR 0.910 x 0.910 RCB DETAILS, SEE SHEET S3.
6. ALL DIMENSIONS ARE SHOWN IN METERS.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	REVISED AS NOTED DESCRIPTIONS REVISIONS	DATE	APPROVAL
⚠			

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL

INLET STRUCTURE
SECTIONS AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HNN
DRAWN BY: HU
CHECKED BY: GED

FILE NAME: C33.DGN

DISTRICT FILE NO. 214/104 REV. A | SPEC. NO. DACW09-03-R-0009

SHEET
C33

VALUE ENGINEERING PAYS

STA 31+00
N 8 142 579.162
E 227025.827

STA 11+57.885
N 8 142 573.099
E 227 092.772

ACCESS RAMP (AR) NO. 1

℄ CURVE DATA
Δ - 58° 10'13"
R - 17.500
T - 9.734
L - 17.767

STA 11+67.644 EC
STA 11+67.877 BC
STA 11+76.540 (CHANNEL) (AR NO. 1)
N 8 142 568.247
E 227 144.661

N57° 54'21.60"W
N85° 29'39"W
N57° 54'21.60"W
S63° 55'26"W
S62° 54'26"W

2.50 (INLET)

STA 11+71.231
N 8 142 574.147
E 227 079.467

ACCESS RAMP (AR) NO. 3

S14° 35'39"W

N 8 142 556.110
E 227 119.860

7.00 (INLET)

N 8 142 559.564
E 227 149.011

STA 21+60 (AR NO. 2) (CHANNEL)

N 8 142 546.575
E 227 123.621

BC STA 21+18.857
EC STA 21+36.620

℄ CURVE DATA
Δ - 58° 48'40"
R - 17.500
T - 9.863
L - 17.963

N36° 23'52.02"W
S4° 05'49"W

ACCESS RAMP (AR) NO. 2

STA 41+00
N 8 142 510.742
E 227 115.789

S29° 19'55"W

STA 21+57.267
N 8 142 516.144
E 227 121.441

STA 21+69.008
N 8 142 505.907
E 227 115.689

1+50 (INLET)

ACCESS RAMP (AR) NO. 4

S24° 02'35"W

STA 41+76.168
N 8 142 472.302
E 227 071.054

BC STA 41+34.940
EC STA 41+60.621

N71° 52'35"W

℄ CURVE DATA
Δ - 84° 04'50"
R - 17.500
T - 15.779
L - 25.681

PI
N 8 142 464.425
E 227 095.125

1+00

SAFETY! PAYS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

ACCESS RAMP PLAN

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMH
DRAWN BY: HU
CHECKED BY: GED

FILE NAME: 034.DGN

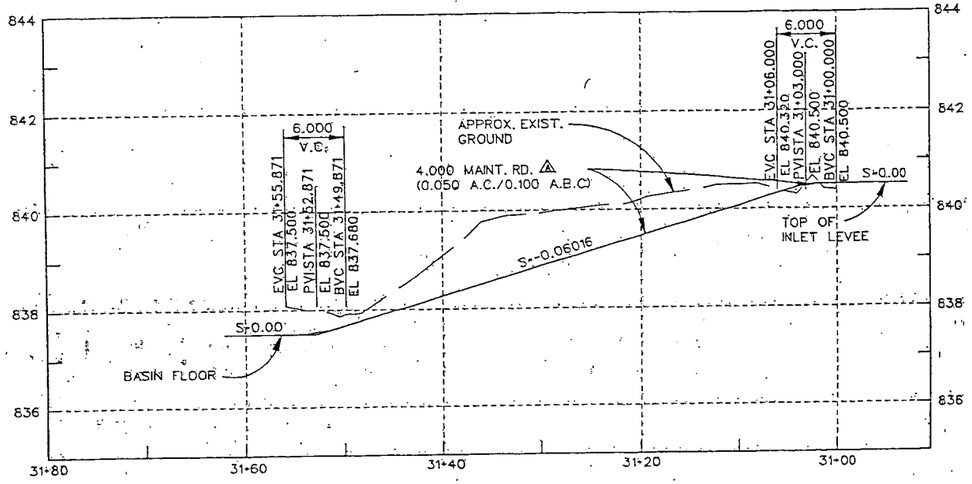
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 204104

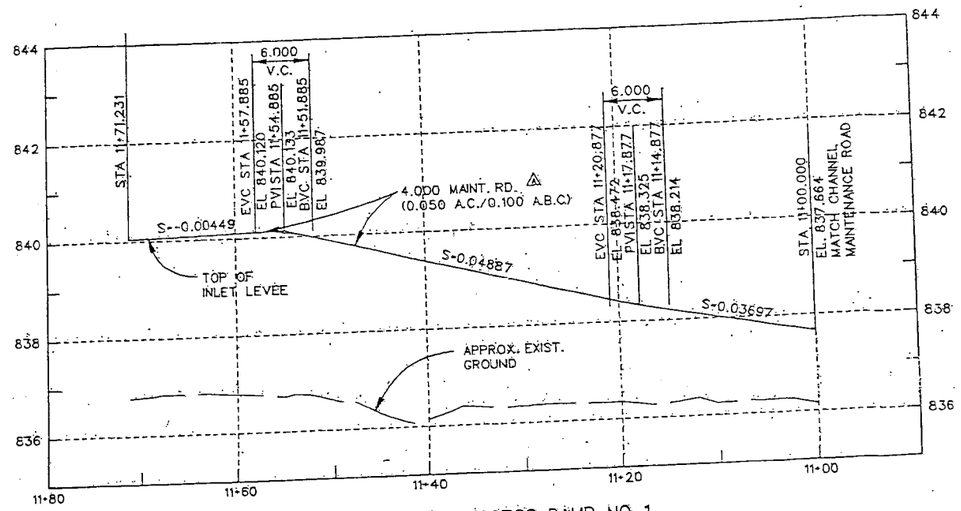
SHEET
C34

Call before you Dig
1-800-227-2600

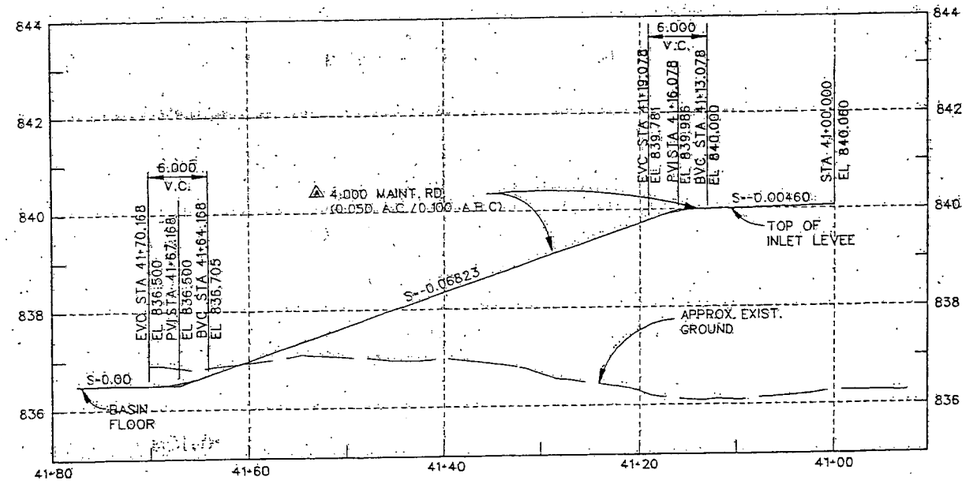
METRIC



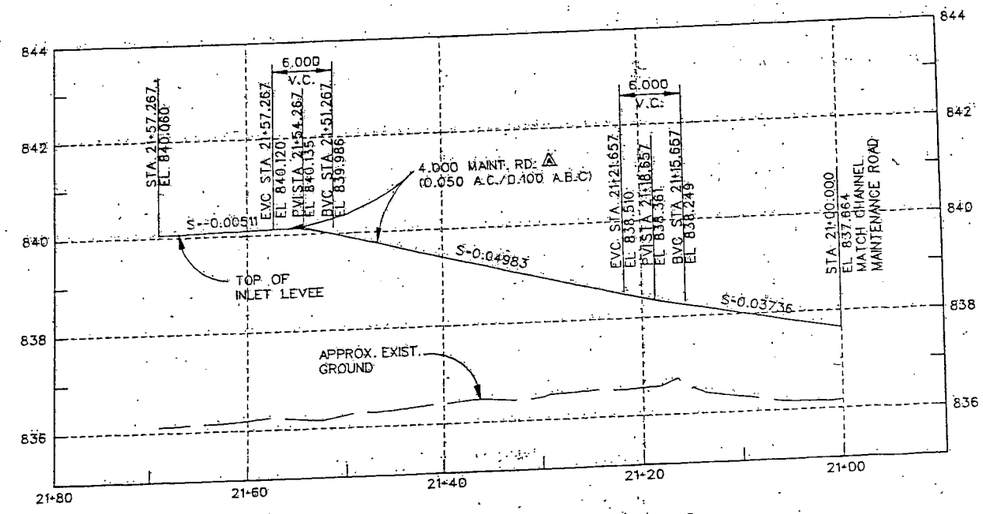
PROFILE - ACCESS RAMP NO. 3



PROFILE - ACCESS RAMP NO. 1



PROFILE - ACCESS RAMP NO. 4



PROFILE - ACCESS RAMP NO. 2

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	REVISED AS NOTED		

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO, WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

ACCESS RAMP PROFILES

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HMH
DRAWN BY: HU
CHECKED BY: DED

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

C35:DGN

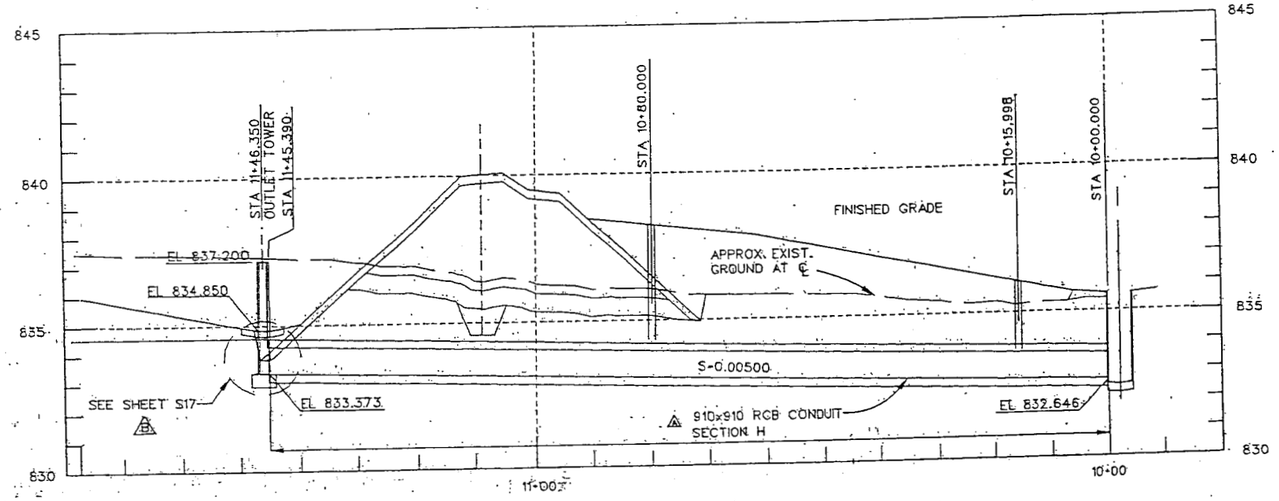
FILE NAME:

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/106, REV. A

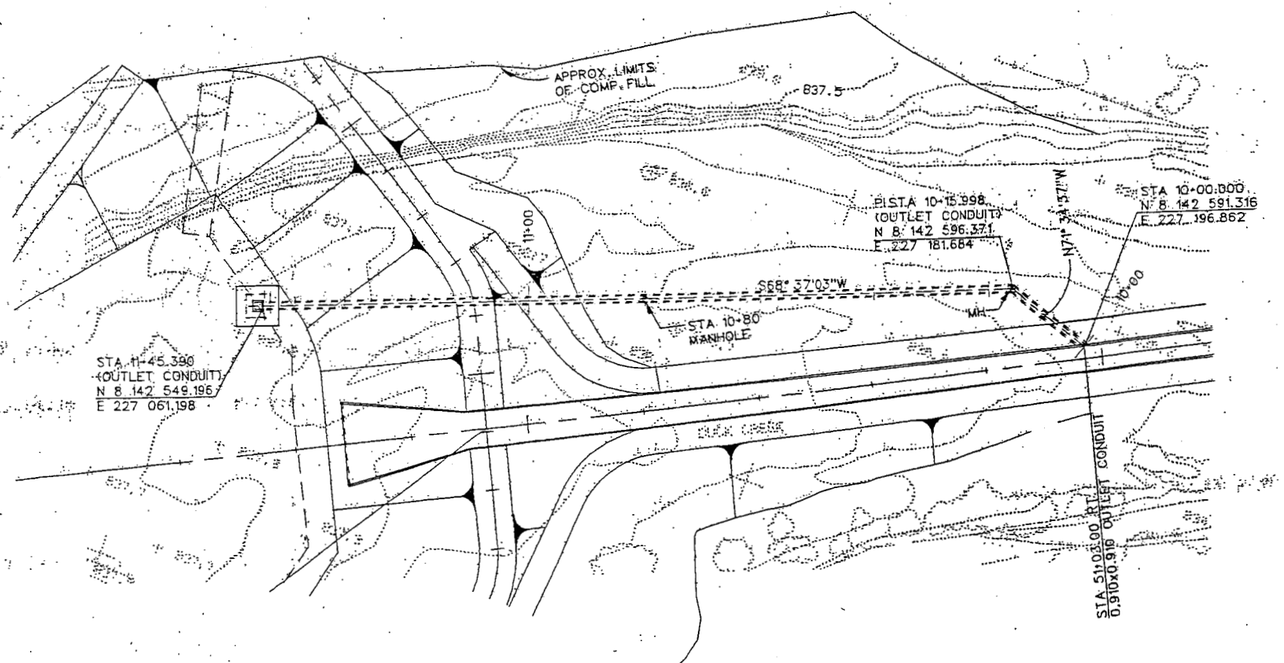
SHEET
C35

VALUE ENGINEERING PAYS



PROFILE

VERTICAL SCALE: 1:100
HORIZONTAL SCALE: 1:500



PLAN

5 0 10 20

SCALE: 1:500

REFERENCE NOTES

1. SEE SHEET S3 FOR STRUCTURAL DETAILS.
2. SEE SHEET S14 FOR RCP CONNECTION TO THE CHANNEL.

Call before you Dig
1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
⚠	REVISED ELEVATION	11/21/03	
⚠	REVISED AS-NOTED	12/21/03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

OUTLET CONDUIT
PLAN AND PROFILE

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HMM
DRAWN BY: HU
CHECKED BY: GED

FILE NAME: C36.DGN

DISTRICT FILE NO. 214/107 REV. A | SPEC. NO. DACW09-03-B-0005

SHEET
C36

SAFETY PAYS

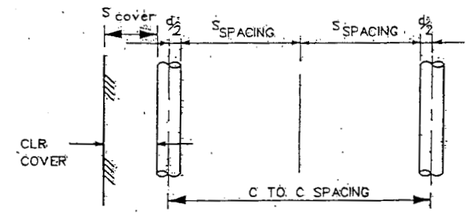
REINFORCEMENT TENSION LAPS, EMBEDMENT AND HOOK LENGTHS (1)(2)

fy = 420 MPa f'c = 25 MPa (3)

BAR SIZE (d)	CLEAR SPACING (S) (mm) (4)(5)			EMBEDMENT & CLASS A LAP SPLICES (mm) (6)						CLASS B LAP SPLICES (mm) (6)						HOOK (mm) (8)
				TOP BAR (7)			OTHER BARS			TOP BAR (7)			OTHER BARS			
	d	2d	3d	d≤S<2d	2d≤S<3d	3d ≤ S	d≤S<2d	2d≤S<3d	3d ≤ S	d≤S<2d	2d≤S<3d	3d ≤ S	d≤S<2d	2d≤S<3d	S≥3d	
10	10	19	29	500	300	300	390	300	300	650	390	390	500	300	300	190
13	13	25	38	670	400	400	520	310	310	870	520	520	670	400	400	260
16	16	32	48	840	510	510	650	390	390	1090	660	660	840	510	510	320
19	19	38	57	1010	610	610	780	470	470	1310	790	790	1010	610	610	390
22	22	44	67	1460	880	880	1120	680	680	1908	1140	1140	1460	880	880	450
25	25	51	76	1670	1000	1000	1290	770	770	2176	1300	1300	1670	1000	1000	510
29	29	57	86	1890	1130	1130	1450	870	870	2450	1470	1470	1890	1130	1130	580
32	32	65	97	2120	1270	1270	1630	980	980	2760	1660	1660	2120	1270	1270	650
36	36	72	107	2350	1410	1410	1810	1090	1090	3050	1830	1830	2350	1410	1410	720

NOTES:

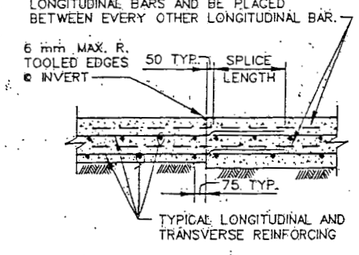
1. LAP SPLICES AND HOOKS SHALL BE IN ACCORDANCE WITH THE TABLE UNLESS DETAILED OTHERWISE.
2. LENGTHS SHOWN CONFORM TO THE NON-SEISMIC PROVISIONS OF ACI 318M-99 FOR UNCOATED BARS NOT ENCLOSED BY CLOSELY SPACED SPIRALS OR TIES. DEVELOPMENT OF REINFORCEMENT NOT COVERED BY THE TABLE SHALL CONFORM TO ACI 318M-99.
3. MULTIPLY LENGTHS SHOWN BY 0.91 FOR 30 MPa and 0.85 for 35 MPa CONCRETE. LENGTH OF LAP SHALL NOT BE LESS THAN 300 mm.
4. BAR CLEAR SPACING (S) IS THE LESSER OF THE CLEAR COVER, OR ONE-HALF THE CLEAR SPACING OF THE BARS BEING DEVELOPED.



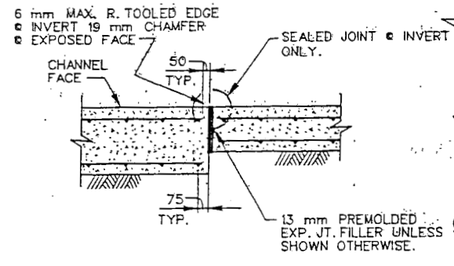
S = LESSER OF S_{COVER} OR $S_{SPACING}$

5. THE MINIMUM CLEAR SPACING BETWEEN PARALLEL BARS IN A LAYER SHALL BE 1½ BAR DIAMETERS BUT NOT LESS THAN 1½ TIMES THE MAXIMUM SIZE OF COARSE AGGREGATE. THE MINIMUM CLEAR COVER SHALL BE PER THE STRUCTURAL DETAILS BUT NOT LESS THAN TWO BAR DIAMETERS.
6. LAP SPLICES SHALL BE CLASS B SPLICES EXCEPT THAT CLASS A SPLICES ARE ALLOWED WHEN BOTH: (1) THE AREA OF REINFORCEMENT PROVIDED IS AT LEAST TWICE THAT REQUIRED BY ANALYSIS OVER THE ENTIRE LENGTH OF THE SPLICE, AND (2) ONE-HALF OR LESS OF THE TOTAL REINFORCEMENT IS SPLICED WITHIN THE REQUIRED LAP LENGTH.
7. TOP BARS ARE HORIZONTAL REINFORCEMENT PLACED SO THAT MORE THAN 300 mm OF CONCRETE IS CAST BELOW THE REINOFRCEMENT.
8. HOOK LENGTH GIVEN IS THE STRAIGHT LINE DISTANCE FROM THE LOCATION OF MAXIMUM STRESS IN THE BAR TO THE OUTSIDE END OF THE HOOK. MULTIPLY LENGTHS GIVEN BY 0.7 FOR HOOKS WITH SIDE COVER NORMAL TO THE HOOK NOT LESS THAN 65 mm AND FOR 90 DEGREE HOOKS, COVER ON BAR EXTENSION BEYOND HOOK NOT LESS THAN 50 mm.

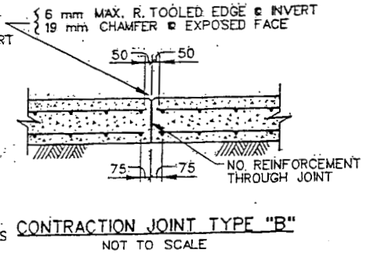
PROVIDE 2000 mm LONG BAR ACROSS TRANSVERSE JOINTS AT CHANNEL INVERT AND SIDE SLOPE. BAR SIZE TO MATCH LONGITUDINAL BARS AND BE PLACED BETWEEN EVERY OTHER LONGITUDINAL BAR.



CONSTRUCTION JOINT TYPE "J"
NOT TO SCALE



EXPANSION JOINT TYPE "D"
NOT TO SCALE

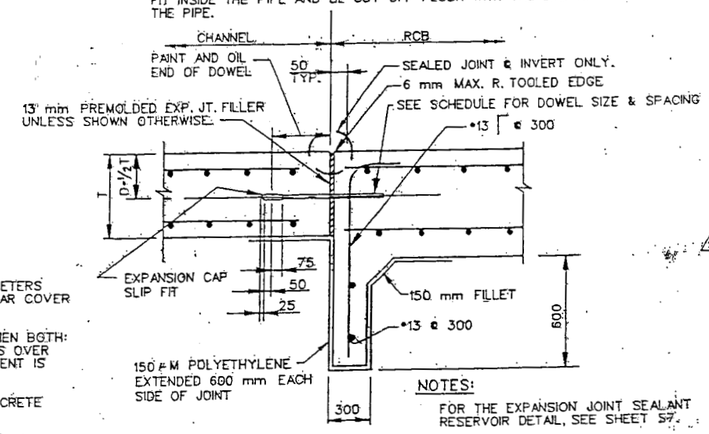


CONTRACTION JOINT TYPE "B"
NOT TO SCALE

DOWEL SIZE AND SPACING SCHEDULE			
SLAB OR WALL THICKNESS (mm)	MINIMUM DOWEL LENGTH (mm)	MAXIMUM DOWEL SPACING (mm)	DOWEL DIAMETER AND TYPE
T ≤ 150	450	300	19 mm BAR
150 < T ≤ 200	450	300	25 mm BAR
200 < T ≤ 275	500	300	31 mm BAR
275 < T ≤ 400	500	300	38 mm BAR OR 38 mm EXTRA-STRENGTH PIPE
400 < T ≤ 525	500	450	44 mm BAR OR 44 mm EXTRA-STRENGTH PIPE
525 < T ≤ 650	600	450	50 mm BAR OR 50 mm EXTRA-STRENGTH PIPE
T ≥ 650	750	450	75 mm BAR OR 75 mm EXTRA-STRENGTH PIPE

NOTES:

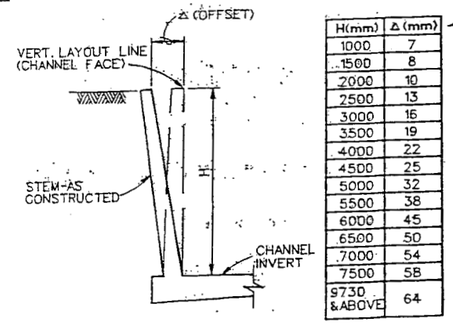
1. DOWELS SHALL CONFORM TO ASTM A 675/A 675M, GRADE 80.
2. PIPE SHALL CONFORM TO ASTM A 53, SCHEDULE 80.
3. DOWEL SIZE SHALL BE SELECTED BASED ON THE THINNER MEMBER CONNECTED.
4. IF MEMBER THICKNESS VARIES ALONG THE LENGTH OF THE JOINT, DOWEL SIZE SHALL BE BASED ON THE MINIMUM THICKNESS OF THE MEMBER.
5. WHEN PIPE IS USED IN LIEU OF DOWELS, THE PIPE SHOULD BE FILLED WITH A STIFF MIXTURE OF SAND-ASPHALT OR CEMENT MORTAR, OR THE ENDS OF THE PIPE SHOULD BE PLUGGED. PLUGS FIT INSIDE THE PIPE AND BE CUT OFF FLUSH WITH THE END OF THE PIPE.



NOTES:

FOR THE EXPANSION JOINT SEALANT RESERVOIR DETAIL, SEE SHEET S7.

EXPANSION JOINT TYPE "H"
NOT TO SCALE

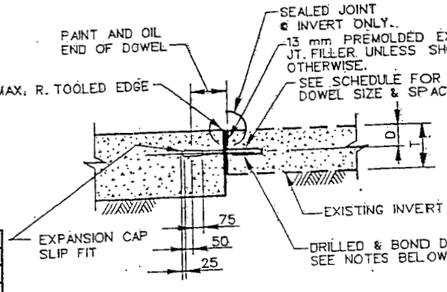


H(mm)	Δ (mm)
1000	7
1500	8
2000	10
2500	13
3000	16
3500	19
4000	22
4500	25
5000	32
5500	38
6000	45
6500	50
7000	54
7500	58
9730 & ABOVE	64

VERTICAL WALL OFFSET VALUES FOR TYPICAL CHANNEL WALL
NOT TO SCALE

GENERAL STRUCTURAL NOTES

1. ELEVATIONS SHOWN ARE IN METERS AND REFER TO NAVD88.
2. RIGHT WALL (RW) AND LEFT WALL (LW) ARE DETERMINED WHILE LOOKING IN A DOWNSTREAM DIRECTION. SECTIONS ARE CUT LOOKING DOWNSTREAM UNLESS NOTED OTHERWISE.
3. DIMENSIONS SHALL NOT BE SCALED FROM THE DRAWINGS.
4. ALL STATIONING SHOWN IS ALONG THE PROJECT CENTERLINE, OR NORMAL TO CENTERLINE OF CONSTRUCTION.
5. TRANSVERSE AND LONGITUDINAL JOINTS IN INVERT SLAB OF U-CHANNELS ARE REQUIRED AT THE END OF EACH CONTINUOUS POURING OPERATION AND SHALL BE CONSTRUCTION JOINT TYPE "J" WITHOUT SPACING REQUIREMENTS. VERTICAL JOINTS IN CHANNEL WALLS SHALL BE CONTRACTION JOINT TYPE "B" AND ARE REQUIRED AT INTERVALS OF 3 METERS MINIMUM AND 18 METERS MAXIMUM, UNLESS SHOWN OTHERWISE OR AS APPROVED BY THE CONTRACTING OFFICER. WHEREVER IT REQUIRES A TYPE "J" JOINT AT THE INVERT, IT SHOULD HAVE A TYPE "B" JOINT AT THE WALL AS WELL.
6. TRANSVERSE CONSTRUCTION JOINTS IN SLABS AND CONTRACTION JOINTS IN WALLS SHALL BE IN THE SAME PLANE WHEN THEY BOTH ARE PRESENT. NO STAGGERING OF JOINTS WILL BE PERMITTED. TRANSVERSE CONSTRUCTION JOINTS SHALL BE NORMAL OR RADIAL TO THE CENTERLINE OF CONSTRUCTION.
7. TRANSVERSE CONSTRUCTION JOINTS IN BOTH SLABS AND WALLS OF BOX CONDUITS SHALL BE PLACED AT THE END OF EACH POUR AND SHALL BE CONSTRUCTION JOINT TYPE "J". THE SPACING OF JOINTS SHALL NOT EXCEED 18 m OR LESS THAN 3 m UNLESS SHOWN OTHERWISE, OR AS APPROVED BY THE CONTRACTING OFFICER.
8. TRANSVERSE CONSTRUCTION JOINTS SHALL NOT BE PLACED WITHIN 1 m OF A MANHOLE OR WITHIN 3 m OF JUNCTION STRUCTURE OPENINGS UNLESS SHOWN OTHERWISE, OR AS APPROVED BY THE CONTRACTING OFFICER.
9. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 20 MILLIMETERS UNLESS OTHERWISE INDICATED.
10. IN CURVED SECTIONS OF OPEN RECTANGULAR CHANNEL, THE MAXIMUM SPACING OF BARS SHALL NOT EXCEED THAT SHOWN FOR TYPICAL SECTIONS. STEEL SHALL BE PLACED RADIALLY FROM THE MAXIMUM SPACING.
11. THE CONTRACTOR SHALL SUBMIT AN OVERALL CHANNEL CONSTRUCTION JOINT PLAN TO THE CONTRACTING OFFICER FOR APPROVAL PRIOR TO PLACING ANY CONCRETE INVERTS. PROPOSED JOINT LAYOUT PLAN SHALL INCLUDE DESIGNED JOINT TYPE, LOCATION, DISTANCES TO THE ACCESS STEPS, WEEP HOLES, ETC., AND SHALL INCLUDE DESIGNED JOINT LOCATIONS AS WELL.
12. ALL SINGLE LAYER REINFORCEMENT SHALL BE PLACED IN THE CENTER OF CONCRETE UNLESS NOTED OTHERWISE.
13. UNLESS OTHERWISE NOTED, ALL REINFORCEMENT SHALL HAVE A MINIMUM CLEARANCE OF 50 MILLIMETERS FROM A FORMED OR FINISHED FACE AND 75 MILLIMETERS FROM A SURFACE CAST AGAINST EARTH.
14. CONCRETE COMPRESSIVE STRENGTH SHALL BE AS FOLLOWS:
    CAST-IN-PLACE STRUCTURES OTHER THAN BOX CONDUITS ..... f'c = 25 MPa
    CAST-IN-PLACE STRUCTURES (COVERED BOX SECTIONS OF CHANNEL) ..... f'c = 30 MPa
    BOX CONDUITS ..... f'c = 30 MPa
    CONFLUENCE STRUCTURE ..... f'c = 30 MPa
15. EXPANSION JOINTS OF THE TYPE INDICATED SHALL BE PROVIDED AT LOCATIONS SHOWN ON THE DRAWINGS.
16. UNLESS DETAILED OTHERWISE, LAP SPLICES FOR REINFORCING BARS SHALL BE IN ACCORDANCE WITH THE TABLE HEREON.
17. ALL U-WALL CHANNELS, CONFLUENCES, BOX CONDUITS AND INVERT ACCESS RAMPS SUBGRADE SHALL BE GRADED ACCORDING TO THE DRAWINGS WITH A 2% SLOPE TO CENTERLINE RESULT IN A V-DITCH.



NOTES:

1. DIMENSION "D" IS TYPICALLY ONE-HALF OF SLAB THICKNESS "T" BUT MAY VARY ± ONE-HALF OF THE DOWEL DIAMETER.
2. REINFORCING NOT SHOW FOR CLARITY. SEE EXPANSION JOINT TYPE "D" FOR DETAILS.
3. DRILLED HOLE SHALL BE 2 TIMES THE DIAMETER OF THE DOWEL AND FILLED WITH EPOXY (ASTM C881 TYPE 3).
4. TO VERIFY THAT DRILLED DOWELS ARE IN PLANE AND PARALLEL TO JOINT MOVEMENT PRIOR TO CONCRETE PLACEMENT.

EXPANSION JOINT TYPE "E"
NOT TO SCALE

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	REVISED NOTE.	DESCRIPTIONS	9/23/03	DATE	APPROVAL
6		REVISIONS			

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
GENERAL STRUCTURAL NOTES AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

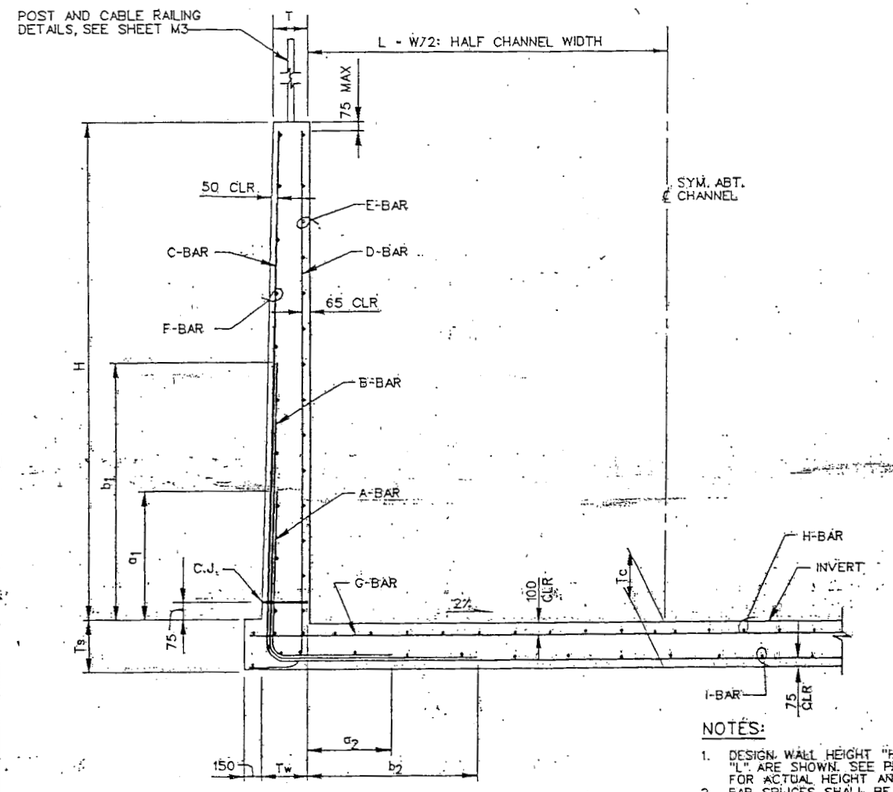
DESIGNED BY: TWF
DRAWN BY: NH
CHECKED BY: RC

FILE NAME: S01.dgn

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/121

SHEET S1



TYPICAL U-WALL CHANNEL SECTION
NOT TO SCALE

REFERENCE NOTES:
1. FOR OPEN CHANNEL PLAN AND PROFILE, SEE SHEETS C1 THRU C12.
2. FOR STRUCTURAL GENERAL DETAILS AND NOTES, SEE SHEET S1.

NOTES:
1. DESIGN WALL HEIGHT "H" AND FOOTING LENGTH "L" ARE SHOWN. SEE PLAN AND PROFILE SHEETS FOR ACTUAL HEIGHT AND CHANNEL WIDTH.
2. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE SHOWN ON SHEET S1 UNLESS OTHERWISE NOTED.
3. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.
4. STARTER WALLS ARE OPTIONAL IF THERE IS A TWO PERCENT CROSS SLOPE IN INVERT SLAB.
5. FOR CHANNEL WEEP HOLE DETAIL AND SPACING SEE DETAIL THIS SHEET.

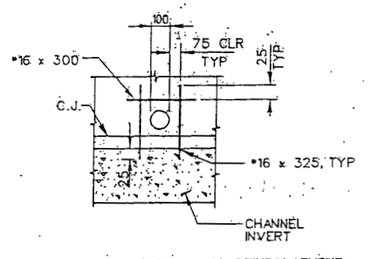
U-WALL CHANNEL CONCRETE AND REINFORCING SCHEDULE

SECTION	CONCRETE						REINFORCEMENT										
	H	L	T	Tw	Ts	Tc	A-BAR	a_1	a_2	B-BAR	b_1	b_2	C-BAR	D-BAR	E-BAR	F-BAR	G-BAR	H-BAR	I-BAR
A - A	3.100	2.135	250	250	280	280	-	-	-	#19@300	970	790	#16@300	#13@300	#13@150	#13@300	#13@300	#16@150	#16@300
B - B	3.100	0.915	250	250	280	280	-	-	-	#19@300	970	790	#16@300	#13@300	#13@150	#13@300	#13@300	#16@150	#16@300
C - C	3.100	2.740	250	250	280	280	-	-	-	#19@300	970	790	#16@300	#13@300	#13@150	#13@300	#13@300	#16@150	#16@300
D - D	5.000	2.740	250	430	460	460	-	-	-	#29@300	2470	1960	#16@300	#13@300	#13@150	#13@300	#13@300	#16@150	#16@300
E - E	3.700	2.135	250	300	330	330	-	-	-	#19@300	1020	840	#19@300	#13@300	#13@150	#13@300	#16@300	#16@150	#16@300
F - F	2.740	1.525	250	250	280	280	-	-	-	#16@300	845	690	#13@300	#13@300	#13@150	#13@300	#16@300	#16@150	#16@300

CHANNEL LADDER LOCATION SCHEDULE

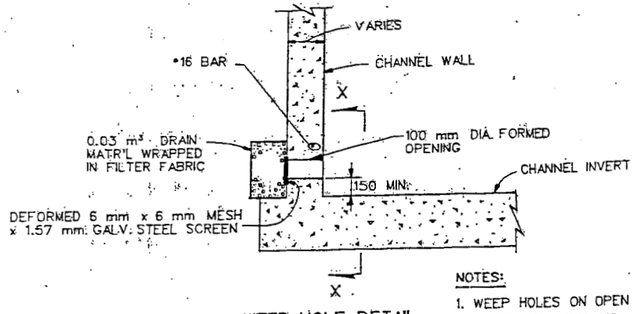
STATION	OFFSET
49+47	LT
49+57	RT
48+52	LT
48+62	RT
42+75	LT
42+85	RT
40+97	LT
41+07	RT
39+14	LT
39+24	RT
37+50	LT
37+60	RT
33+10	LT
33+20	RT
31+27	LT
31+37	RT
22+17	RT
22+07	LT
16+58	LT
16+68	RT
14+67	LT
14+77	RT
12+50	LT
12+60	RT
10+67	LT
10+77	RT

A



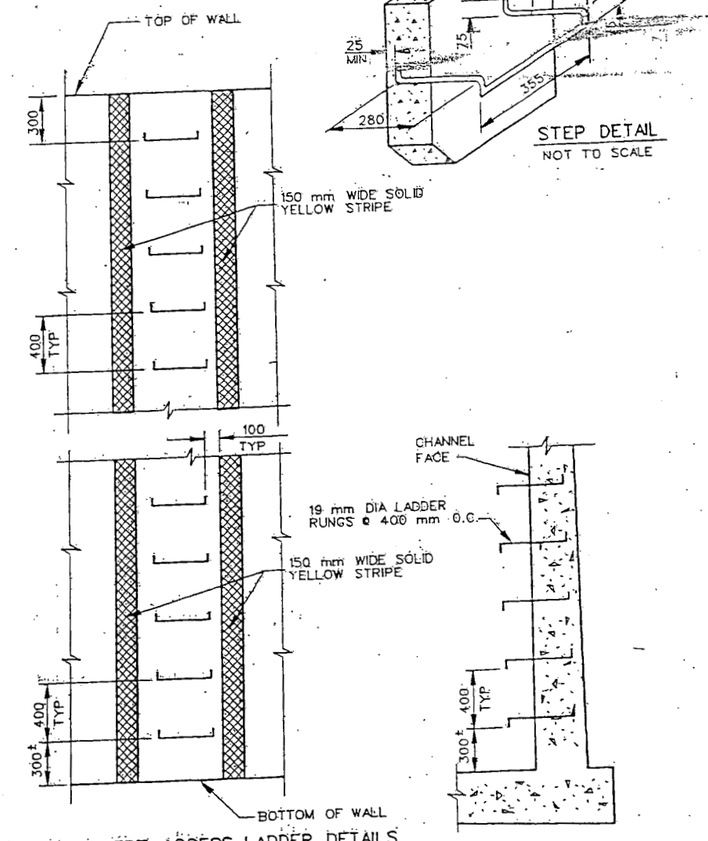
NOTE:
1. #16 BARS IN ADDITION TO TYP. WALL REINFORCEMENT

SECTION X-X
NOT TO SCALE

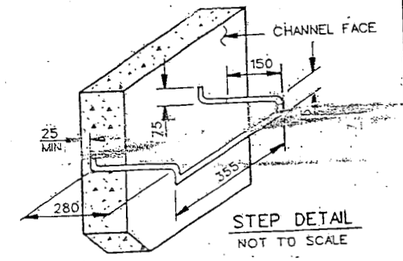


WEEP HOLE DETAIL
NOT TO SCALE

NOTES:
1. WEEP HOLES ON OPEN CHANNEL SECTIONS ONLY
2. WEEP HOLE SPACING - 9.000



TYPICAL INVERT ACCESS LADDER DETAILS
NOT TO SCALE



STEP DETAIL
NOT TO SCALE

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL
1	REVISED AS NOTED	1/28/03

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
CHANNEL WALL SCHEDULE, DETAILS AND INVERT ACCESS LADDER DETAILS

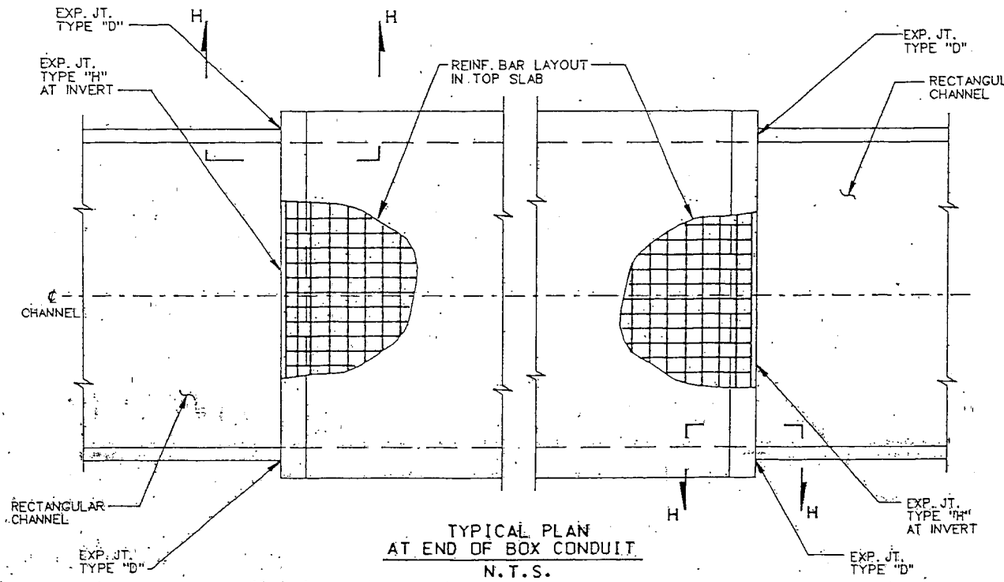
DESIGNED BY: TW
DRAWN BY: NH
CHECKED BY: RC
FILE NAME: S02.dgn

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

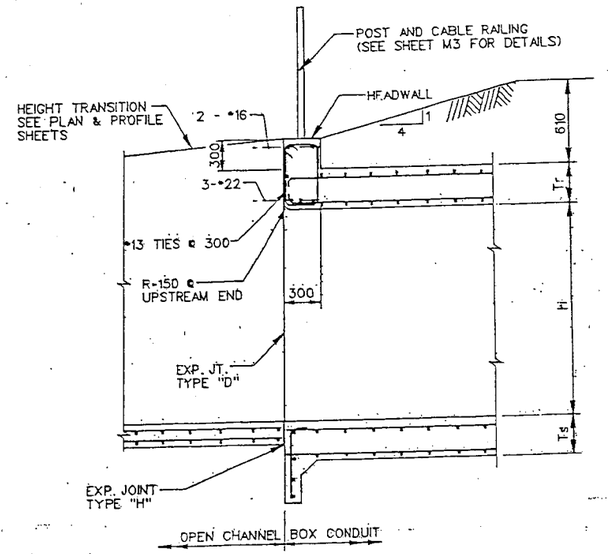
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 314/122 REV: A

SHEET
S2

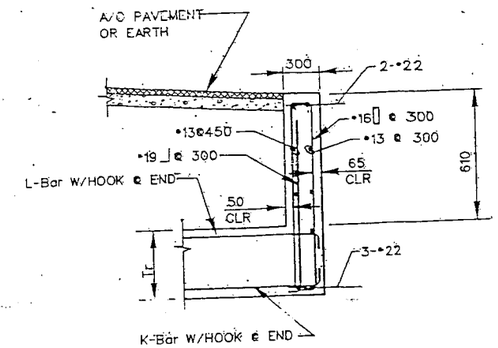


TYPICAL PLAN
AT END OF BOX CONDUIT
N.T.S.

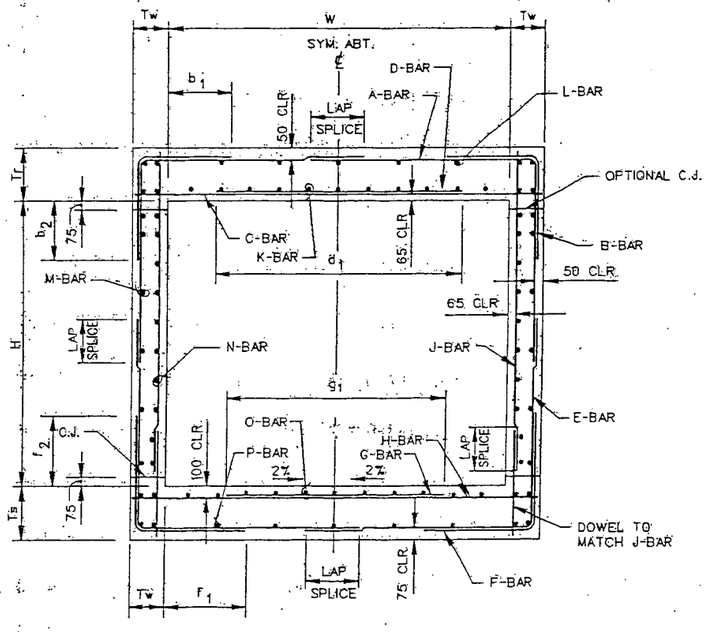


SECTION H-H
N.T.S

NOTES: FOR Tr, K-Bar AND L-Bar, SEE SINGLE BOX CONDUIT CONCRETE AND REINFORCING SCHEDULE



EXTENDED HEADWALL
N.T.S.



TYPICAL SINGLE BOX CHANNEL SECTION
N.T.S.

SINGLE BOX CONDUIT
CONCRETE AND REINFORCING SCHEDULE

	SECTION	A	B	C	D	E	F	G	H	I	J
CONCRETE	W	4270 mm	5480 mm	3880 mm	6050 mm	2740 mm	7690 mm	4880 mm	910 mm	4270 mm	5480 mm
	H	3100 mm	3100 mm	2340 mm	2740 mm	2740 mm	3100 mm	3100 mm	910 mm	2740 mm	2740 mm
	Tr	530 mm	660 mm	530 mm	840 mm	360 mm	940 mm	560 mm	250 mm	510 mm	660 mm
	Tw	360 mm	360 mm	360 mm	460 mm	330 mm	510 mm	360 mm	250 mm	330 mm	330 mm
	Ts	580 mm	740 mm	610 mm	910 mm	410 mm	1040 mm	510 mm	280 mm	580 mm	740 mm
REINFORCING	A-BAR	#29 @ 300	#29 @ 300	#22 @ 150	#22 @ 150	#22 @ 150	#29 @ 300	#22 @ 150	#22 @ 300	#29 @ 300	#29 @ 300
	B-BAR	-	#25 @ 300	-	-	-	#25 @ 300	-	-	-	#25 @ 300
	b_1	-	310 mm	-	-	-	1170 mm	-	-	-	530 mm
	b_2	-	310 mm	-	-	-	1170 mm	-	-	-	530 mm
	C-BAR	#29 @ 300	#29 @ 300	#22 @ 150	#22 @ 150	#22 @ 150	#29 @ 300	#22 @ 150	#22 @ 300	#29 @ 300	#29 @ 300
	D-BAR	#25 @ 300	#25 @ 300	-	#16 @ 150	-	#25 @ 300	-	-	#25 @ 300	#25 @ 300
	d_1	2850 mm	4620 mm	-	2450 mm	-	7160 mm	-	-	2900 mm	4620 mm
	E-BAR	#29 @ 300	#29 @ 300	#22 @ 150	#22 @ 150	#22 @ 150	#29 @ 300	#22 @ 150	#22 @ 300	#29 @ 300	#29 @ 300
	F-BAR	-	#25 @ 300	-	-	-	#25 @ 300	-	-	-	#25 @ 300
	f_1	-	310 mm	-	-	-	1170 mm	-	-	-	530 mm
	f_2	-	310 mm	-	-	-	1170 mm	-	-	-	530 mm
	G-BAR	#25 @ 300	#25 @ 300	-	#19 @ 150	-	#25 @ 300	-	-	#25 @ 300	#25 @ 300
	g_1	3120 mm	4830 mm	-	3710 mm	-	7340 mm	-	-	3175 mm	4780 mm
	H-BAR	#29 @ 300	#29 @ 300	#22 @ 150	#22 @ 150	#22 @ 150	#29 @ 300	#22 @ 150	#22 @ 300	#29 @ 300	#29 @ 300
	J-BAR	#29 @ 300	#29 @ 300	#22 @ 150	#22 @ 150	#22 @ 150	#29 @ 300	#22 @ 150	#22 @ 300	#29 @ 300	#29 @ 300
	K-BAR	#19 @ 300	#16 @ 150	#19 @ 150	#19 @ 150	#16 @ 150	#19 @ 150	#19 @ 150	#13 @ 150	#13 @ 150	#16 @ 150
	L-BAR	#16 @ 300	#16 @ 300	#19 @ 300	#16 @ 150	#16 @ 300	#19 @ 300	#19 @ 300	#13 @ 300	#13 @ 300	#16 @ 300
	M-BAR	#13 @ 300	#13 @ 300	#16 @ 300	#16 @ 300	#16 @ 300	#13 @ 300	#16 @ 300	#13 @ 300	#13 @ 300	#13 @ 300
	N-BAR	#13 @ 150	#13 @ 150	#19 @ 300	#16 @ 150	#19 @ 300	#13 @ 150	#16 @ 150	#13 @ 150	#13 @ 150	#13 @ 150
	O-BAR	#19 @ 150	#19 @ 150	#19 @ 150	#19 @ 150	#16 @ 150	#19 @ 150	#19 @ 150	#13 @ 150	#19 @ 150	#19 @ 150
	P-BAR	#19 @ 300	#19 @ 300	#19 @ 300	#16 @ 150	#16 @ 300	#19 @ 300	#19 @ 300	#13 @ 300	#19 @ 300	#19 @ 300

A N.I.C. A N.I.C. A
B

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL
1	REVISED BOX CONDUIT DIMENSION.	7/15/03
2	REVISED BOX CONDUIT REINFORCEMENT.	8/18/03

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
BOX CONDUIT SCHEDULE AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: R.N.
DRAWN BY: N.H.
CHECKED BY: T.W.

FILE NAME: S03.DGN

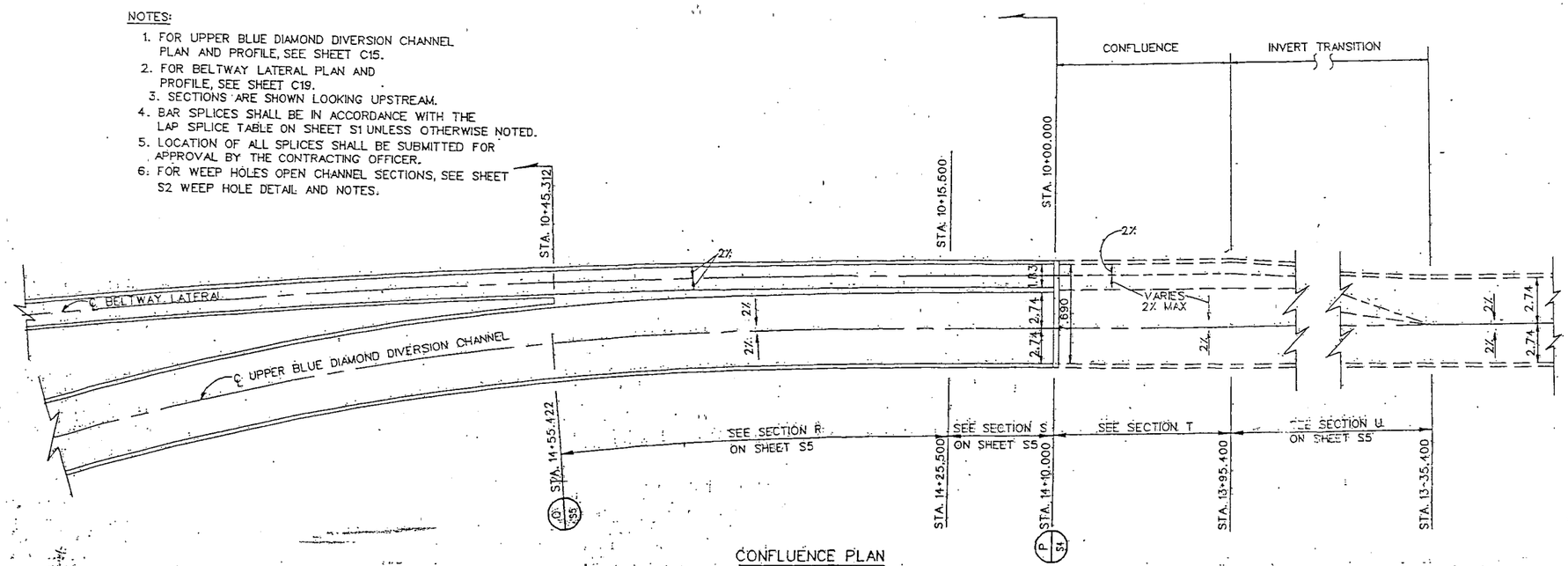
DISTRICT FILE NO. 214/123 REV: A
SPEC. NO. DACW09-03-B-0005

SHEET
S3

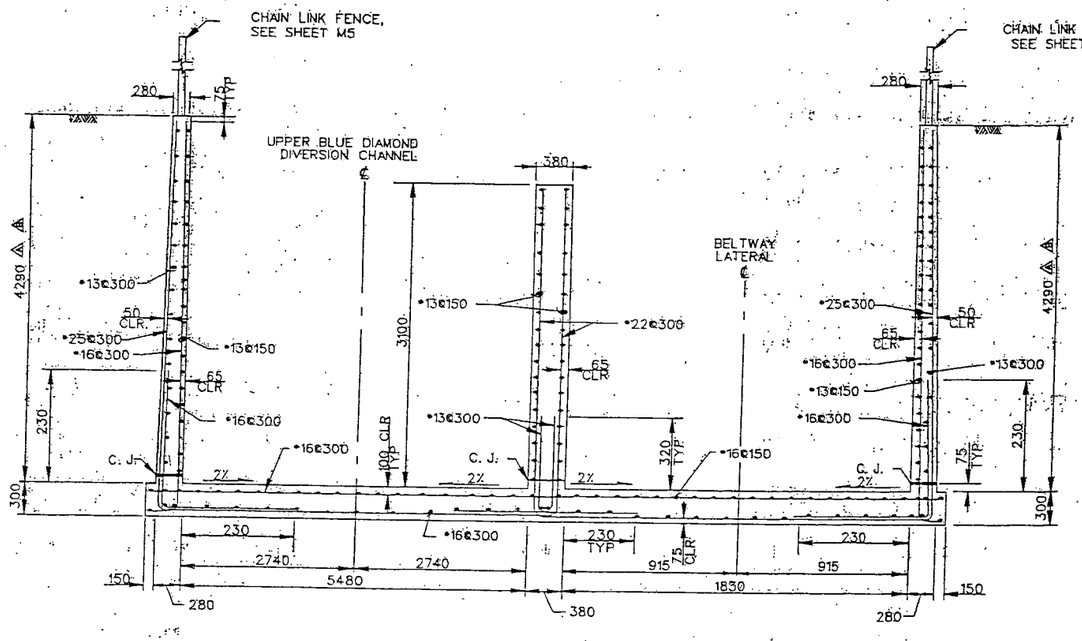
8 7 6 5 VALUE ENGINEERING PAYS 4 3 2 1

NOTES:

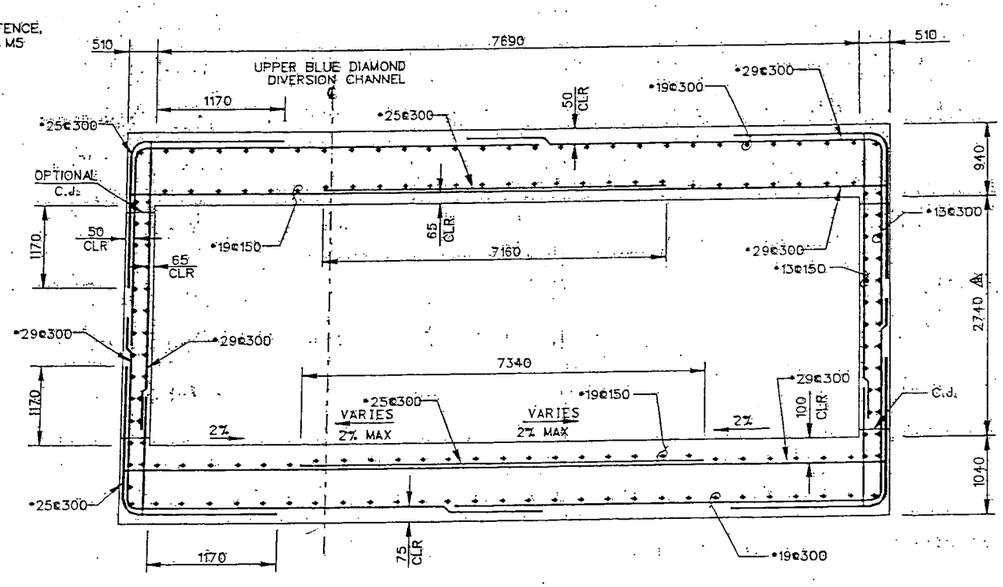
1. FOR UPPER BLUE DIAMOND DIVERSION CHANNEL PLAN AND PROFILE, SEE SHEET C15.
2. FOR BELTWAY LATERAL PLAN AND PROFILE, SEE SHEET C19.
3. SECTIONS ARE SHOWN LOOKING UPSTREAM.
4. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
5. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.
6. FOR WEEP HOLES OPEN CHANNEL SECTIONS, SEE SHEET S2 WEEP HOLE DETAIL AND NOTES.



CONFLUENCE PLAN
NOT TO SCALE



SECTION P
NOT TO SCALE



SECTION T
N.T.S.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
2	REVISED DIMENSION	11/26/03	
1	REVISED AS NOTED	5/20/03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASH) NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
BELTWAY CONFLUENCE
PLAN, SECTIONS AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: TW
DRAWN BY: NH
CHECKED BY: RC

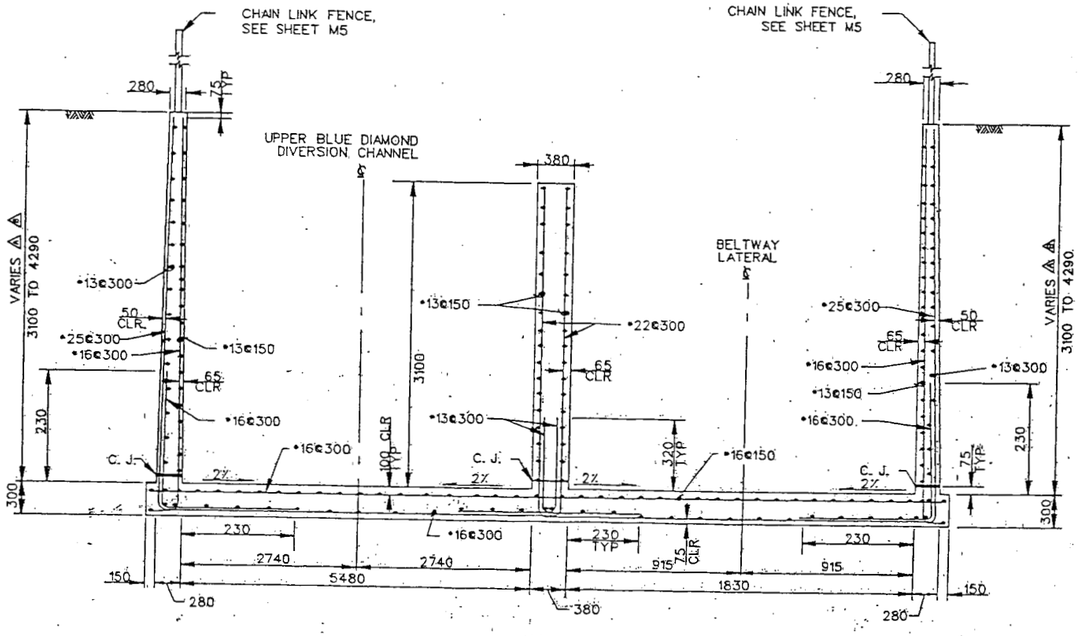
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: S04.dgn

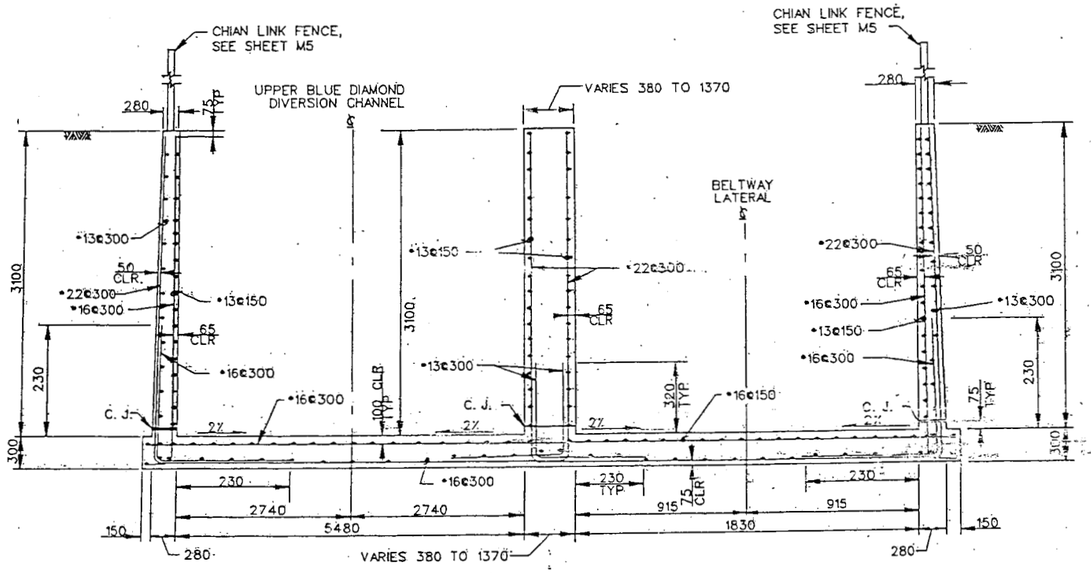
DISTRICT FILE NO. 21H124 REV. VI | SPEC. NO. DACW09-03-B-0005

SHEET
S4

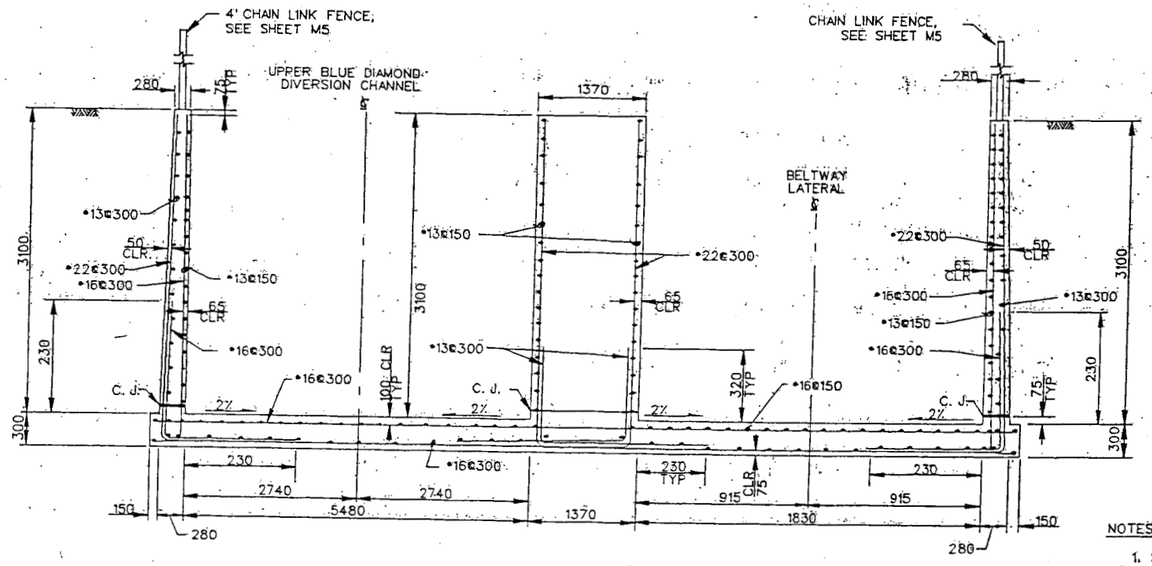
8 7 6 5 SAFETY PAYS 4 3 2 1



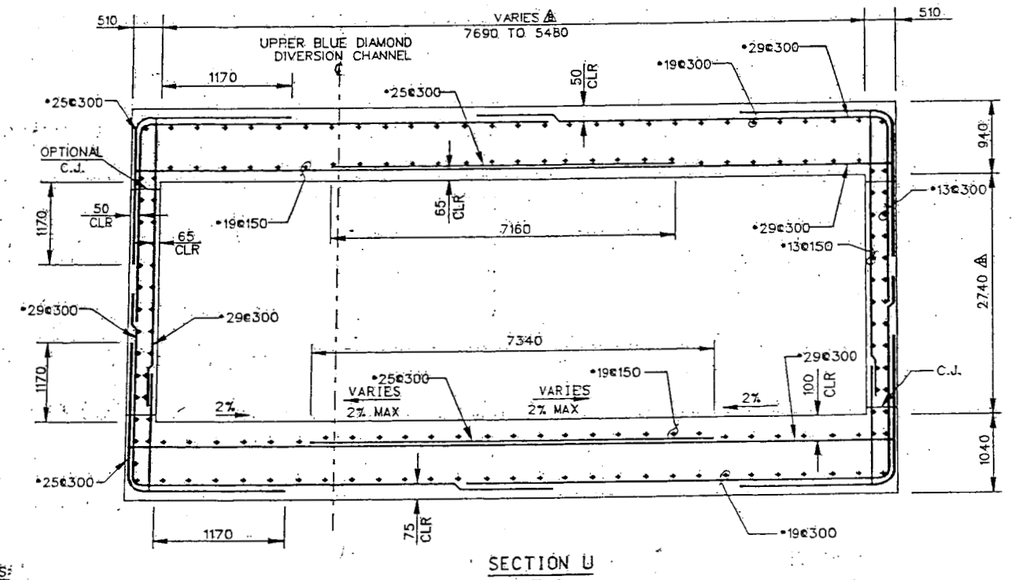
SECTION S
NOT TO SCALE



SECTION R
NOT TO SCALE



SECTION Q
NOT TO SCALE



SECTION U
N.T.S.

NOTES:

1. SECTIONS ARE SHOWN LOOKING UPSTREAM.
2. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
3. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.
4. FOR WEEP HOLES OF CHANNEL SECTIONS, SEE SHEET S2 WEEP HOLE DETAIL AND NOTES.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
2	REVISED DIMENSION	11/26/03	
1	REVISED AS NOTED.	11/20/03	

LAS VEGAS WASH AND TRIBUTARIES
TROPICANA AND FLAMINGO WASHES, NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
BELTWAY CONFLUENCE
SECTIONS AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: TW
DRAWN BY: NH
CHECKED BY: RC

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: S05.dgn

SPEC. NO. DACW09-03-B-0005

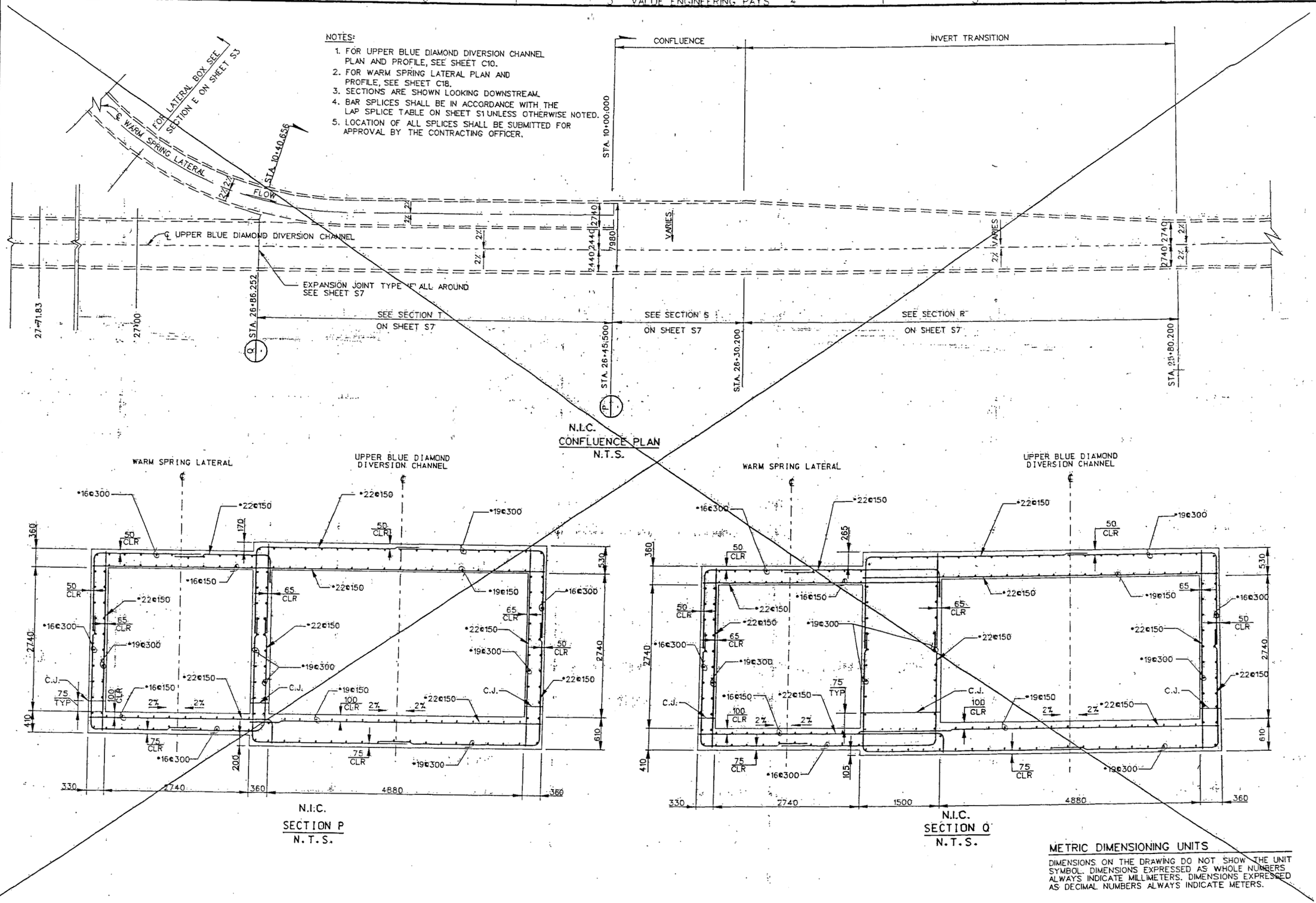
DISTRICT FILE NO. 214/125 REV. K

SHEET
S5

VALUE ENGINEERING PAYS

NOTES:

1. FOR UPPER BLUE DIAMOND DIVERSION CHANNEL PLAN AND PROFILE, SEE SHEET C10.
2. FOR WARM SPRING LATERAL PLAN AND PROFILE, SEE SHEET C18.
3. SECTIONS ARE SHOWN LOOKING DOWNSTREAM.
4. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
5. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.



N.I.C.
SECTION P
N.T.S.

N.I.C.
SECTION Q
N.T.S.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

WARM SPRINGS CONFLUENCE PLAN, SECTIONS AND DETAILS

DESIGNED BY: R.N.
DRAWN BY: N.H.
CHECKED BY: T.W.

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

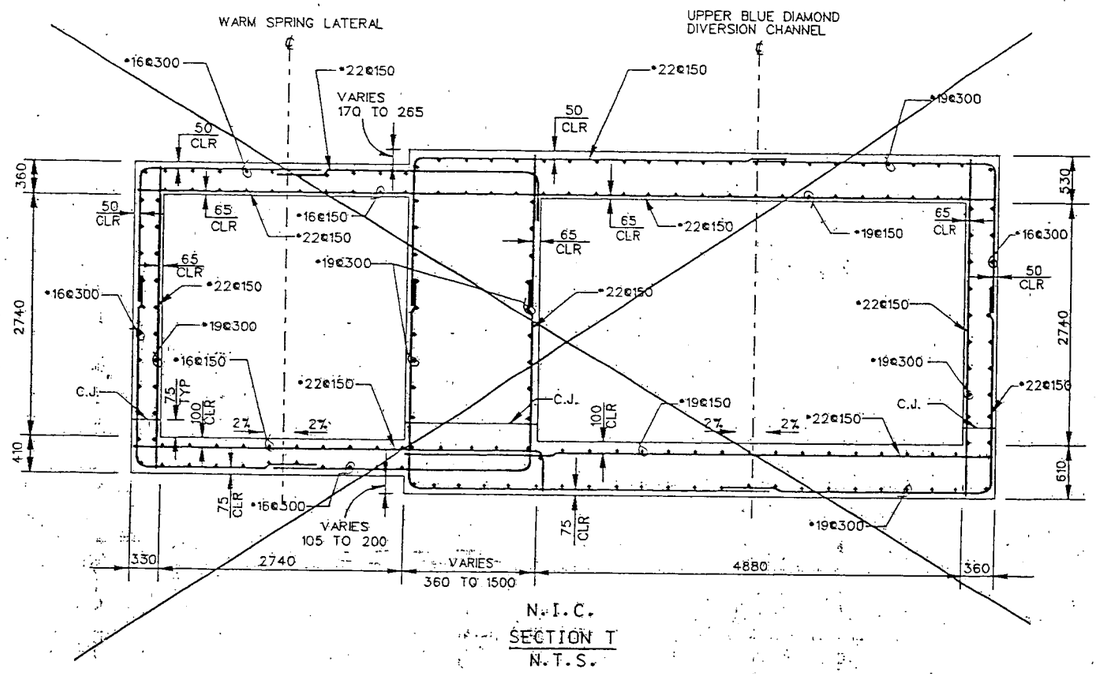
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SPEC. NO. DACW09-03-B-0005

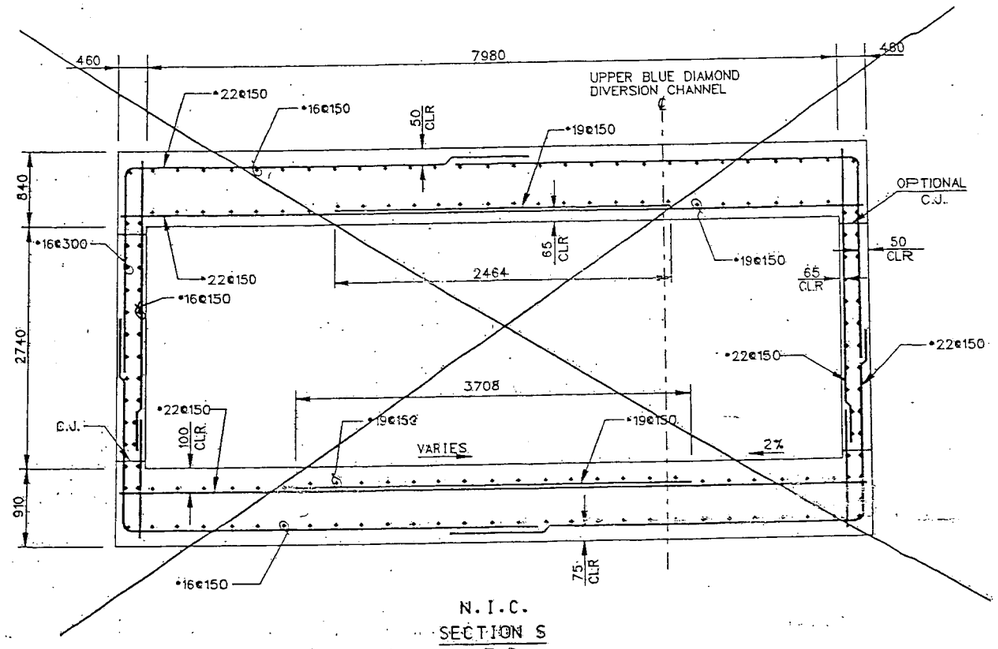
DISTRICT FILE NO. 214/128

SHEET
S6

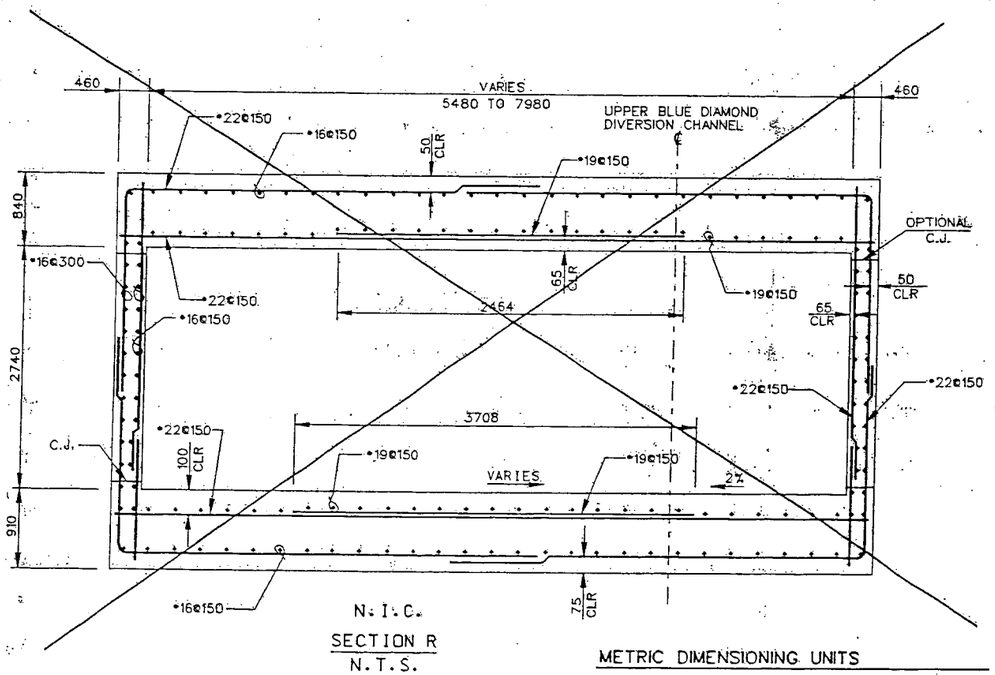
SAFETY PAYS



N.I.C.
SECTION T
N.T.S.



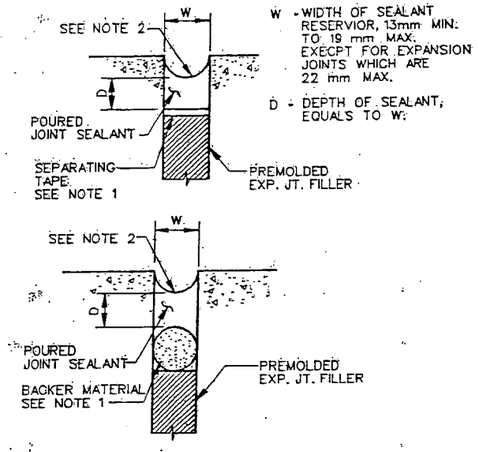
N.I.C.
SECTION S
N.T.S.



N.I.C.
SECTION R
N.T.S.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.



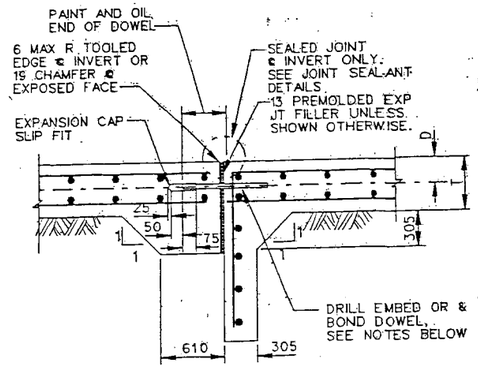
W - WIDTH OF SEALANT RESERVIOR, 13mm MIN. TO 19 mm MAX. EXCEPT FOR EXPANSION JOINTS WHICH ARE 22 mm MAX.

D - DEPTH OF SEALANT, EQUALS TO W.

NOTES:

1. SEPARATING TAPE OR BACKER MATERIAL REQUIRED TO PREVENT JOINT SEALANT FROM FLOWING INTO JOINT, TO SEPARATE NONCOMPATIBLE MATERIALS, AND TO PREVENT SEALANT FROM BONDING TO BOTTOM OF RESERVOIR.
2. TOP OF SEALANT WILL BE 5mm TO 10mm BELOW TOP OF PAVEMENT.

JOINT SEALING DETAILS
NOT TO SCALE



NOTES:

1. DIMENSION "D" IS TYPICALLY ONE-HALF OF SLAB THICKNESS "T" BUT MAY VARY : ONE-HALF OF THE DOWEL DIAMETER.
2. DRILLED HOLE SHALL BE 2 TIMES THE DIAMETER OF THE DOWEL AND FILLED WITH GROUT.

EXPANSION JOINT TYPE "F"
NOT TO SCALE

SYMBOL	DESCRIPTIONS / REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

WARM SPRINGS CONFLUENCE
SECTIONS AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

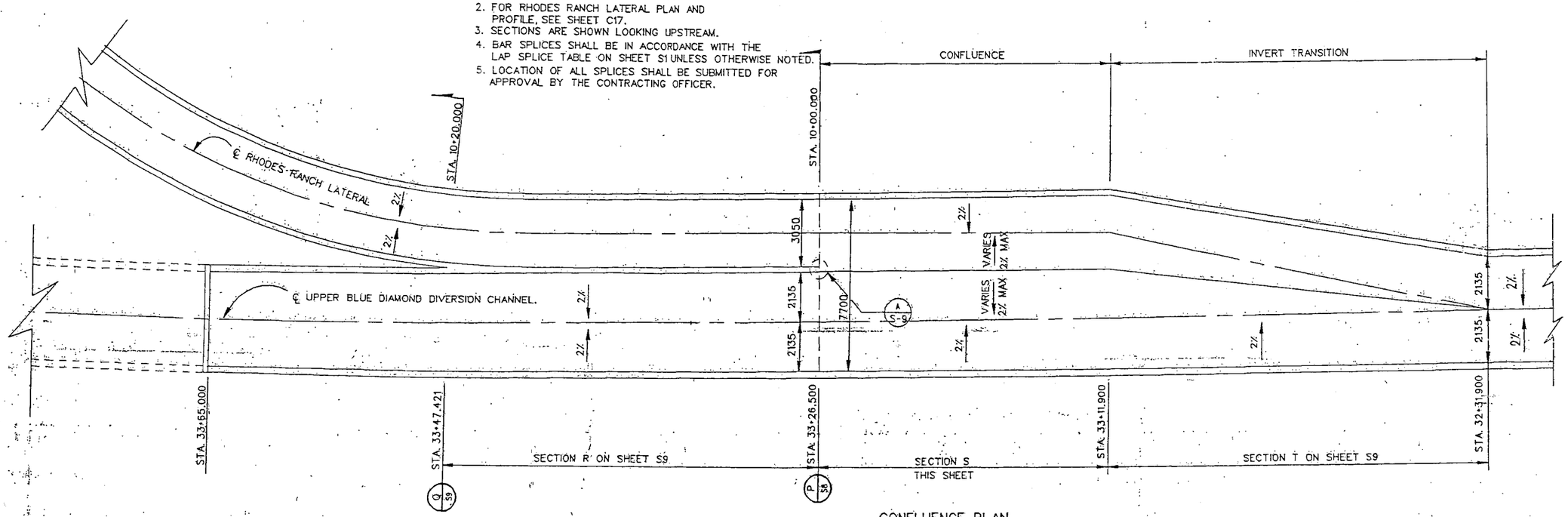
DESIGNED BY: R.R.
DRAWN BY: N.H.
CHECKED BY: T.W.

FILE NAME: S07.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214/127

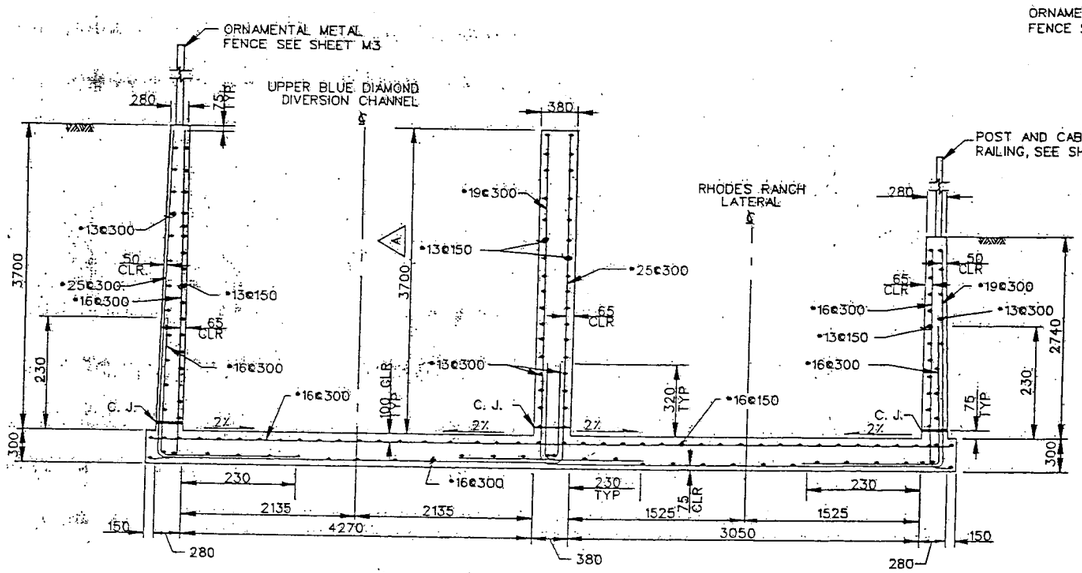
SHEET
S7

NOTES:

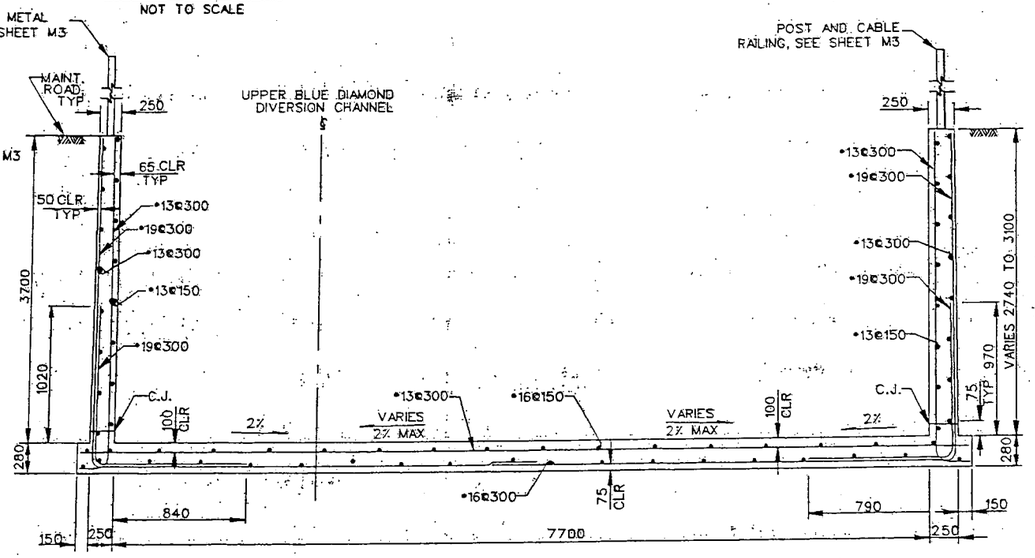
1. FOR UPPER BLUE DIAMOND DIVERSION CHANNEL PLAN AND PROFILE, SEE SHEET C8.
2. FOR RHODES RANCH LATERAL PLAN AND PROFILE, SEE SHEET C17.
3. SECTIONS ARE SHOWN LOOKING UPSTREAM.
4. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
5. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.



CONFLUENCE PLAN
NOT TO SCALE



SECTION P
NOT TO SCALE



SECTION S
NOT TO SCALE

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
2	CHANGE WALL HEIGHT OF SEC. P.	6/18/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
RHODES RANCH CONFLUENCE
PLAN, SECTIONS AND DETAILS

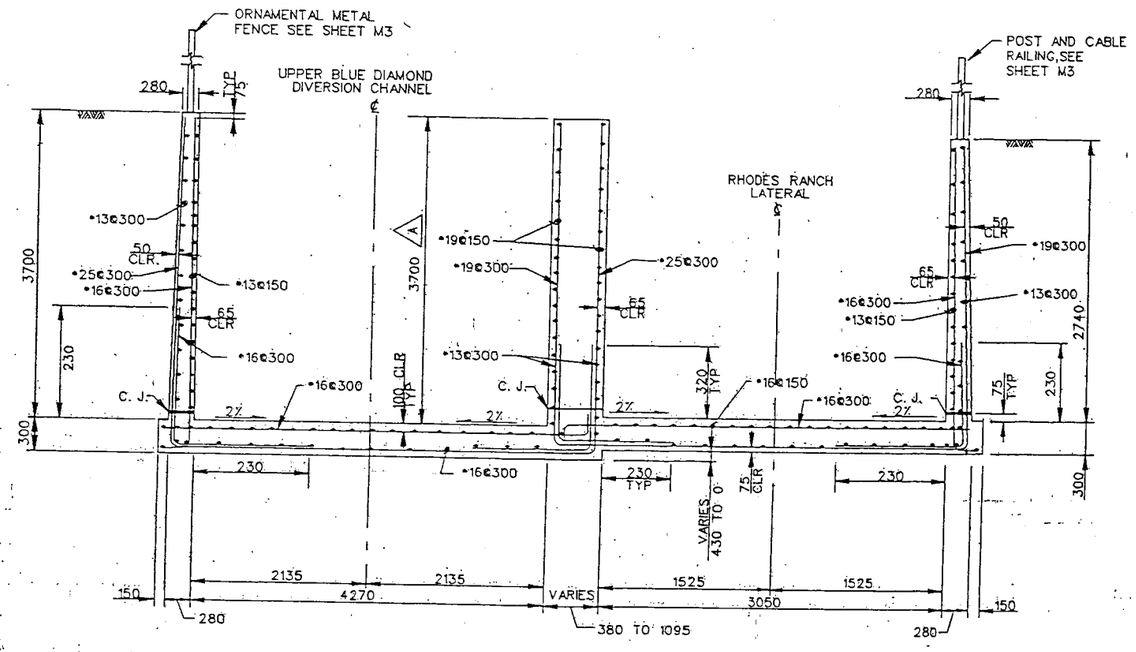
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: TW
DRAWN BY: AM
CHECKED BY: RC

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: S08.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214198 REV. A

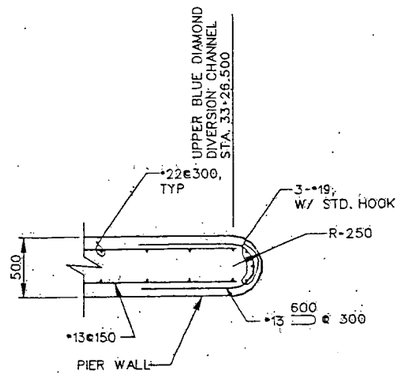
SHEET
S8



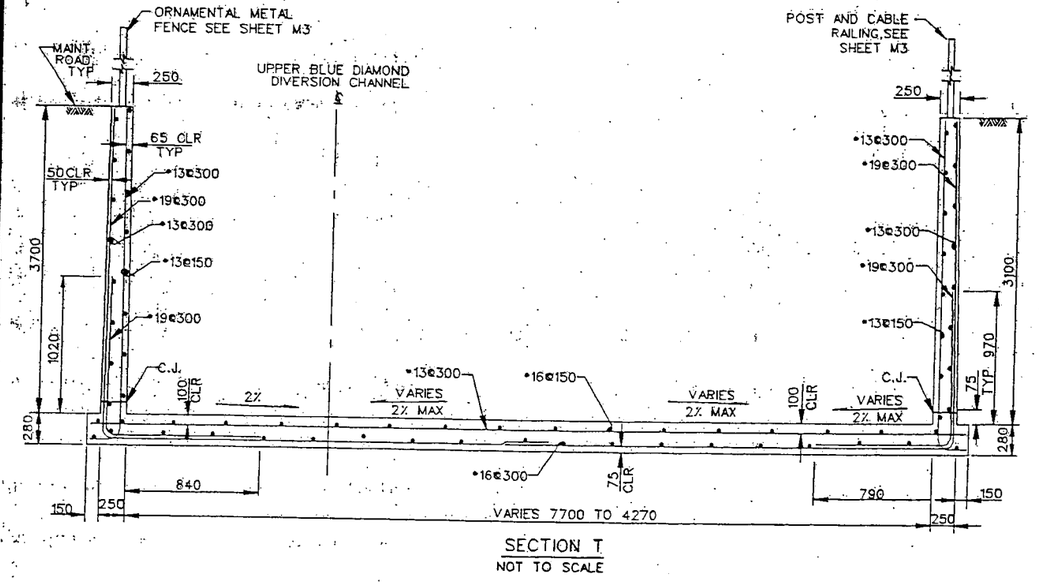
SECTION R
NOT TO SCALE

NOTES:

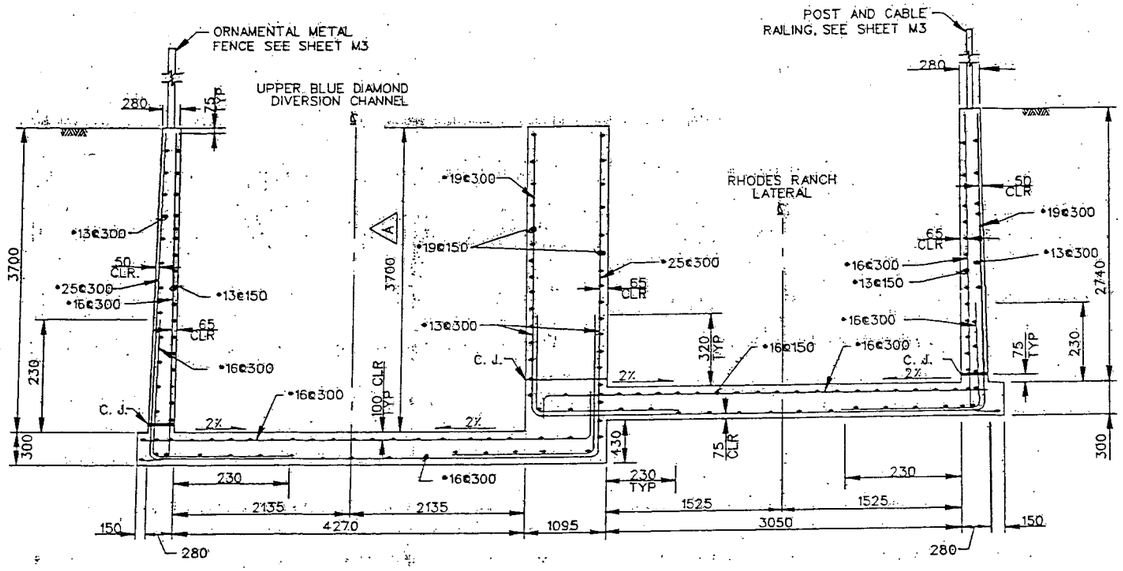
1. SECTIONS ARE SHOWN LOOKING UPSTREAM.
2. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
3. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.



DETAIL A
NOT TO SCALE



SECTION T
NOT TO SCALE



SECTION Q
NOT TO SCALE

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS REVISIONS	INITIALS	DATE	APPROVAL
A	CHANGE WALL HEIGHTS OF SEC Q,R.			

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
RHODES RANCH CONFLUENCE
SECTIONS AND DETAILS

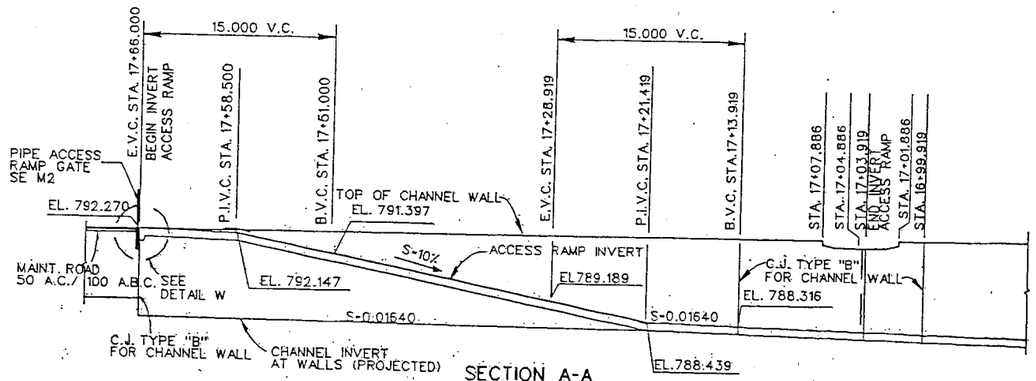
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: TW
DRAWN BY: AM
CHECKED BY: RC

FILE NAME: S09.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214/129 REV. A

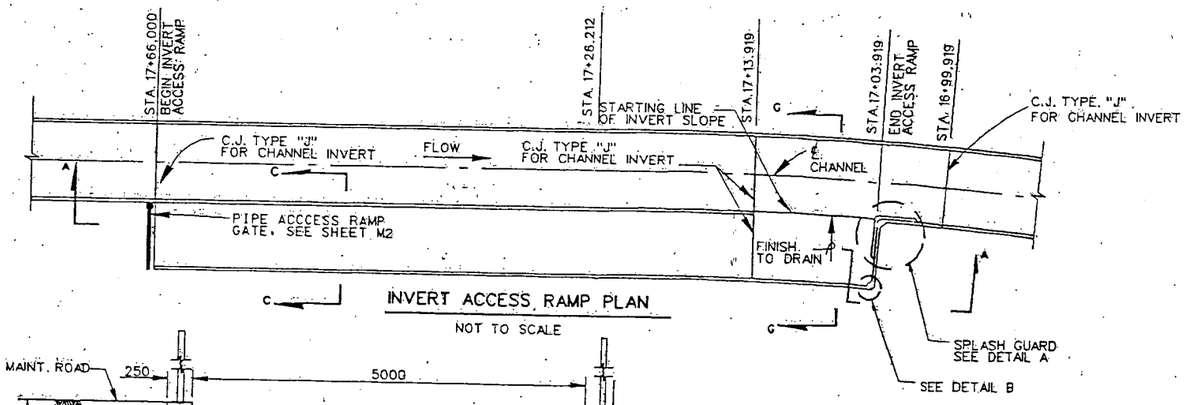
SHEET
S9



SECTION A-A

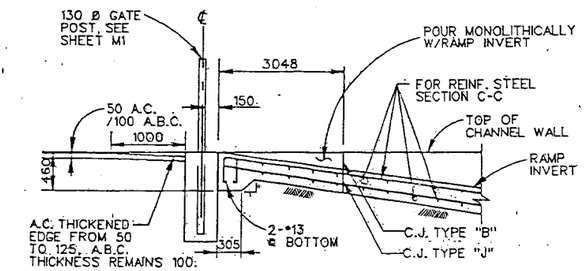
INVERT ACCESS RAMP-PROFILE (B)

NOT TO SCALE



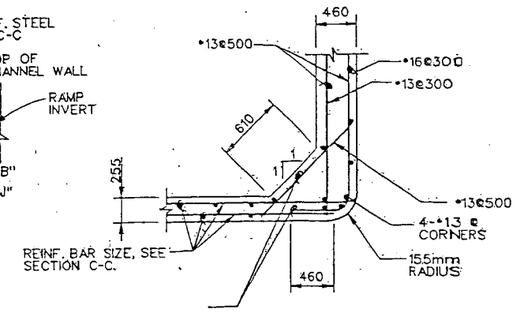
INVERT ACCESS RAMP PLAN

NOT TO SCALE



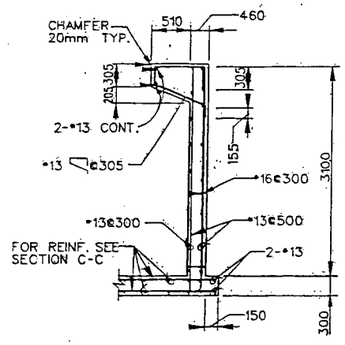
DETAIL W

NOT TO SCALE



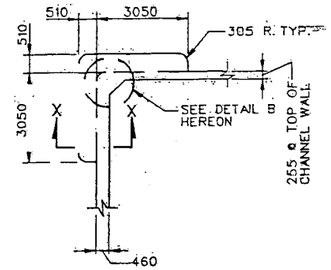
DETAIL B

NOT TO SCALE



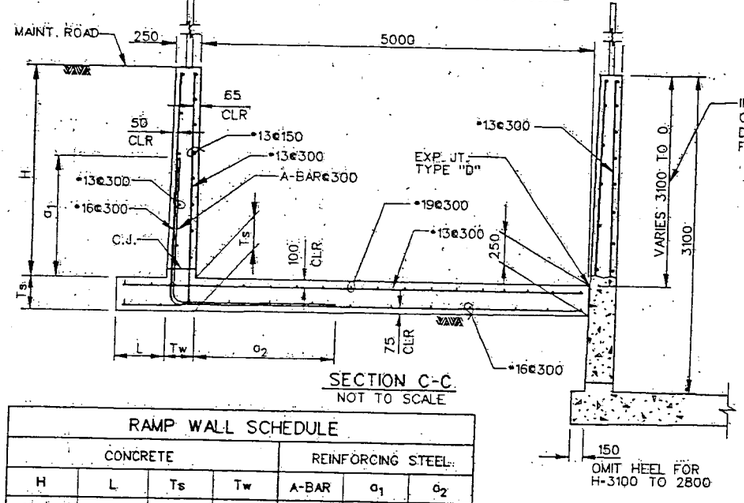
SECTION X-X

NOT TO SCALE



DETAIL A

NOT TO SCALE



SECTION C-C

NOT TO SCALE

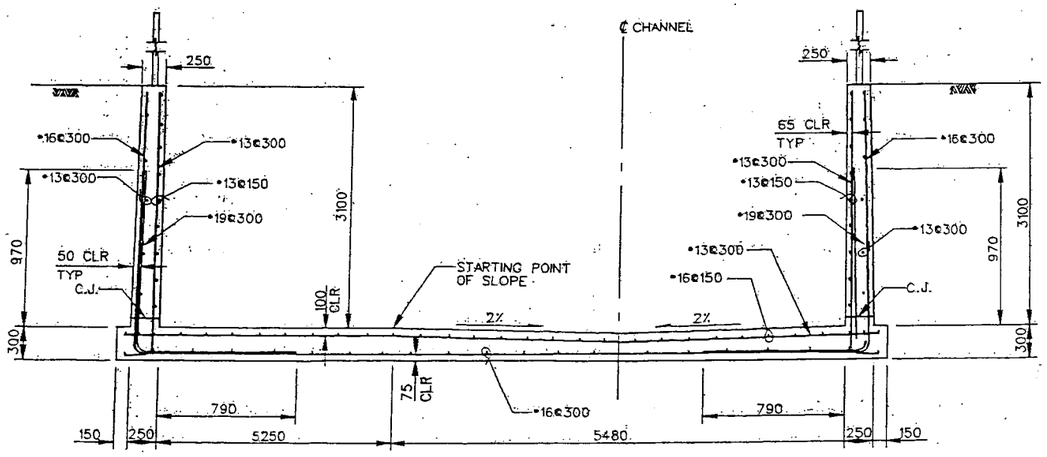
RAMP WALL SCHEDULE

CONCRETE				REINFORCING STEEL		
H	L	Ts	Tw	A-BAR	a_1	a_2
3100 TO 2600	300 TO 155	300	280	#19	970	790
2600 TO 1400	300 TO 150	300	280	#16	680	570
1400 TO 300	150	280	250	#13	700	750
300 TO 0	0	280	250	——	——	——

NOTE:

FOR REINF. BAR SIZE NOT SHOWN, SEE TYPICAL RECTANGULAR CHANNEL SECTION C-C ON SHEET S2.

(A)



SECTION G-G

STA. 17+13.919 TO STA. 17+03.919

NOT TO SCALE

NOTES:

1. DESIGN WALL HEIGHT "H" AND FOOTING LENGTH "L" ARE SHOWN. SEE PLAN AND PROFILE FOR ACTUAL HEIGHT AND CHANNEL WIDTH.
2. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
3. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

REFERENCE NOTES:

1. FOR UPPER BLUE DIAMOND DIVERSION CHANNEL PLAN AND PROFILE, SEE SHEET C13.
2. FOR PIPE ACCESS RAMP GATE DETAILS, SEE SHEET M2.
3. FOR MAINTENANCE ROAD DETAILS, SEE SHEET M1.
4. FOR GENERAL STRUCTURAL NOTES AND DETAILS, SEE SHEET S1.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
2	REVISED SEC A-A.	4/28/03	
1	REVISED SEC C-C NOTE.	4/28/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
INVERT ACCESS RAMP
PLAN, PROFILE, SECTIONS AND DETAILS
STA. 17+66.000 TO STA. 16+99.919

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

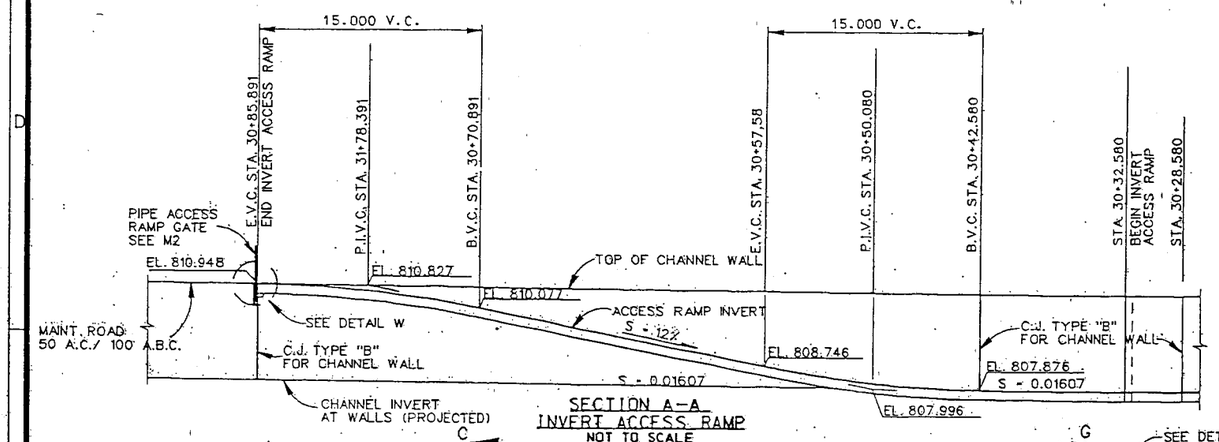
DESIGNED BY: TW
DRAWN BY: NH
CHECKED BY: RC

FILE NAME: S10.dgn

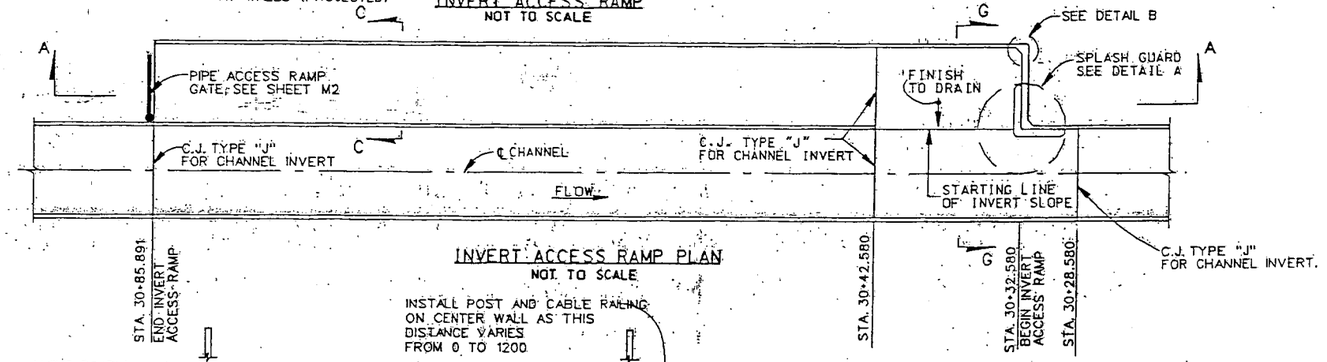
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/130 REV "A"

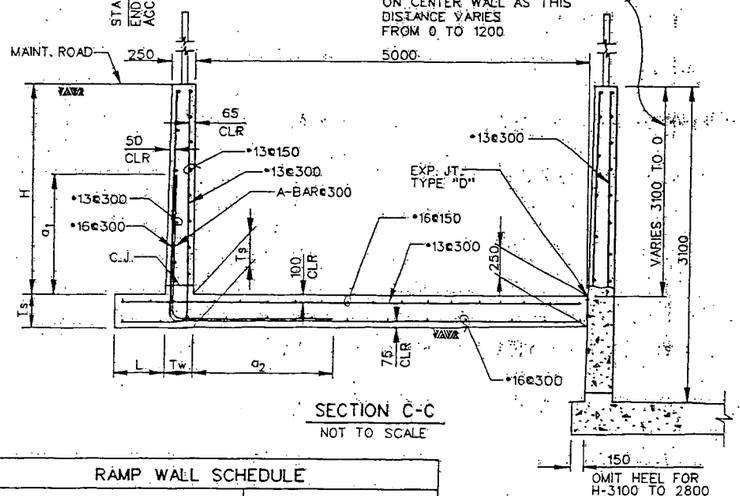
SHEET
S10



SECTION A-A
INVERT ACCESS RAMP
NOT TO SCALE



INVERT ACCESS RAMP PLAN
NOT TO SCALE



SECTION C-C
NOT TO SCALE

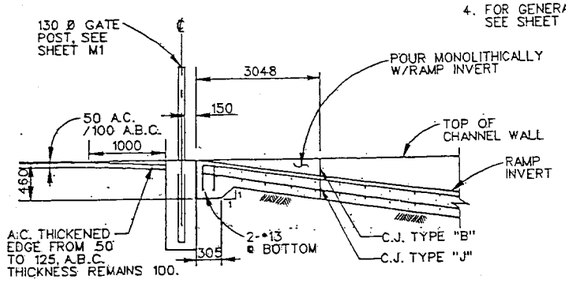
RAMP WALL SCHEDULE						
CONCRETE				REINFORCING STEEL		
H	L	Ts	Tw	A-BAR	a_1	a_2
3100 TO 2600	300 TO 155	300	280	•19	970	790
2600 TO 1400	300 TO 150	300	280	•16	680	570
1400 TO 300	150	280	250	•13	700	750
300 TO 0	0	280	250	—	—	—

NOTES:

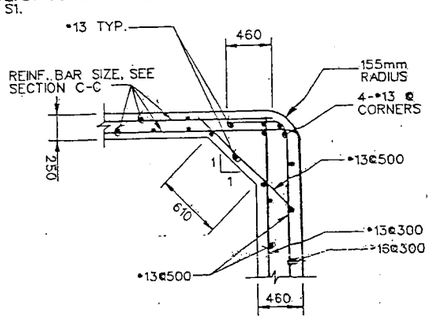
FOR REINF. BAR SIZE NOT SHOWN, SEE TYPICAL RECTANGULAR CHANNEL SECTION D-D ON SHEET S2

REFERENCE NOTES:

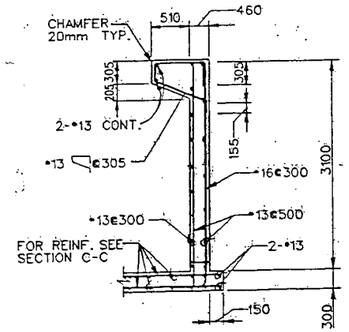
1. FOR UPPER BLUE DIAMOND DIVERSION CHANNEL PLAN AND PROFILE, SEE SHEET C9.
2. FOR PIPE ACCESS RAMP GATE DETAILS, SEE SHEET M2.
3. FOR MAINTENANCE ROAD DETAILS, SEE SHEET M1.
4. FOR GENERAL STRUCTURAL NOTES AND DETAILS, SEE SHEET S1.

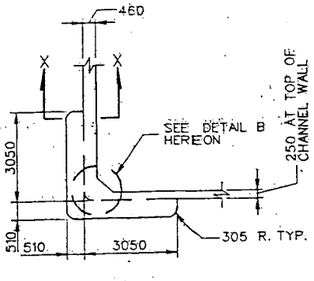


DETAIL W
NOT TO SCALE



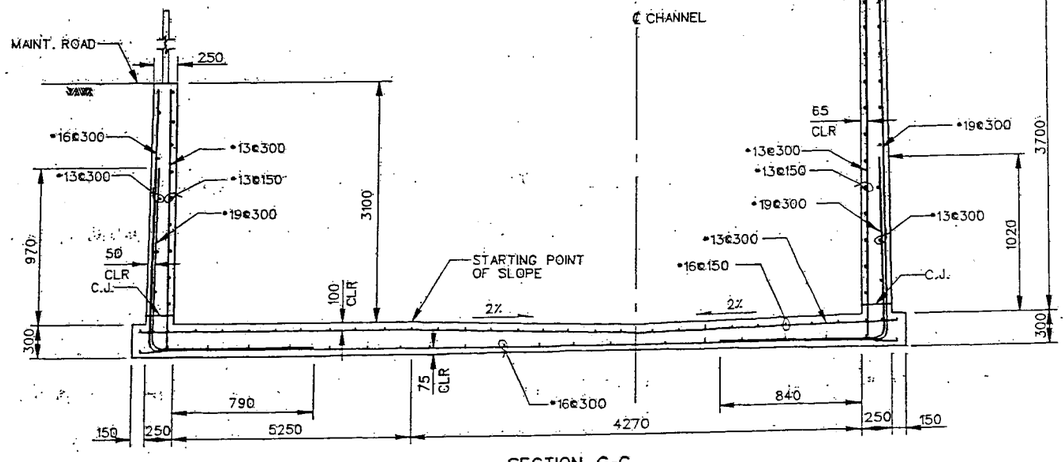
DETAIL B
NOT TO SCALE





DETAIL A
NOT TO SCALE

SECTION X-X
NOT TO SCALE



SECTION G-G
STA. 30+42.580 TO STA. 30+32.580
NOT TO SCALE

NOTES:

1. DESIGN WALL HEIGHT "H" AND FOOTING LENGTH "L" ARE SHOWN. SEE PLAN AND PROFILE FOR ACTUAL HEIGHT AND CHANNEL WIDTH.
2. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
3. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS	DATE APPROVAL
	REVISIONS	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
INVERT ACCESS RAMP PLAN, PROFILE AND SECTIONS
STA. 30+58.891 TO STA. 30+28.580

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

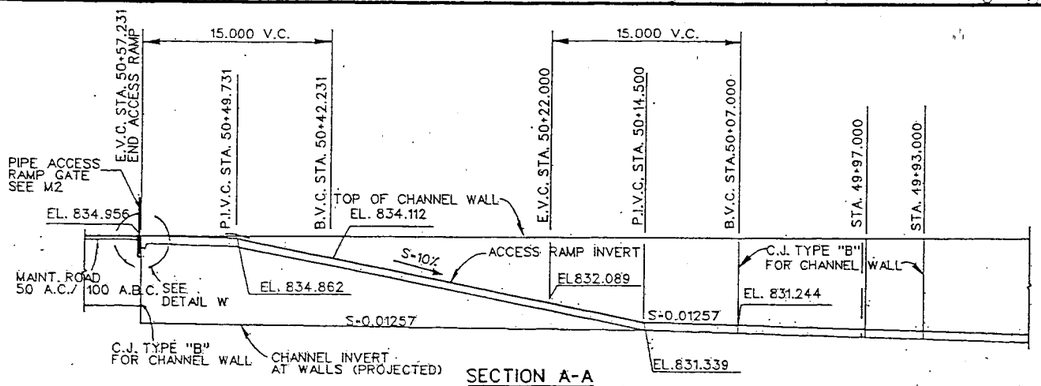
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

FILE NAME: S11.dgn

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/131

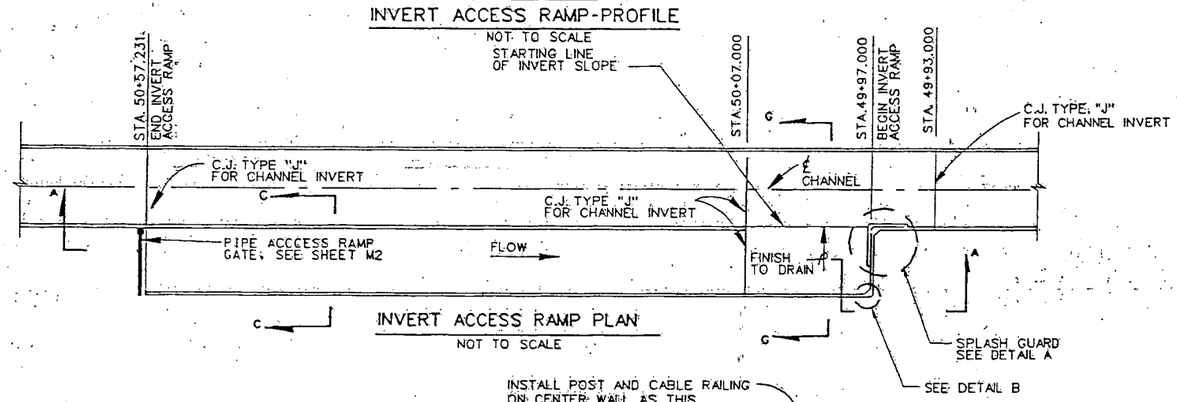
SHEET
S11



SECTION A-A

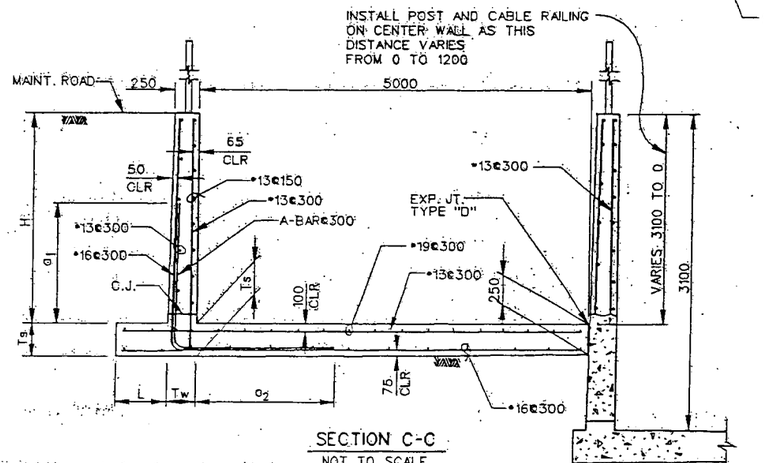
INVERT ACCESS RAMP-PROFILE

NOT TO SCALE



INVERT ACCESS RAMP PLAN

NOT TO SCALE



SECTION C-C

NOT TO SCALE

RAMP WALL SCHEDULE						
CONCRETE				REINFORCING STEEL		
H	L	Ts	Tw	A-BAR	a_1	a_2
3100 TO 2600	300 TO 155	300	280	•19	970	790
2600 TO 1400	300 TO 150	300	280	•16	680	570
1400 TO 300	150	280	250	•13	700	750
300 TO 0	0	280	250	—	—	—

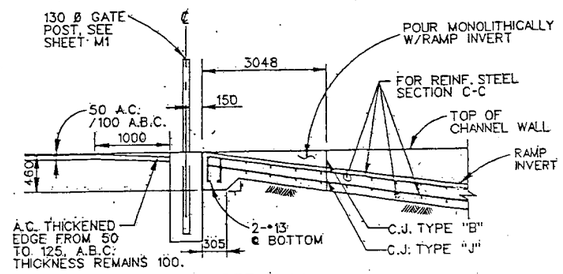
NOTE:

FOR REINF. BAR SIZE NOT SHOWN, SEE TYPICAL RECTANGULAR CHANNEL SECTION A-A ON SHEET S2.

(A)

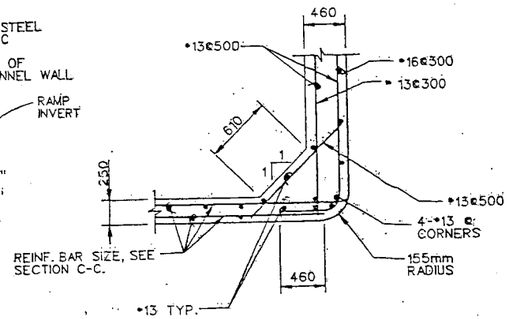
REFERENCE NOTES:

1. FOR UPPER BLUE DIAMOND DIVERSION CHANNEL PLAN AND PROFILE, SEE SHEET C2.
2. FOR PIPE ACCESS RAMP GATE DETAILS, SEE SHEET M2.
3. FOR MAINTENANCE ROAD DETAILS, SEE SHEET M1.
4. FOR GENERAL STRUCTURAL NOTES AND DETAILS, SEE SHEET S1.



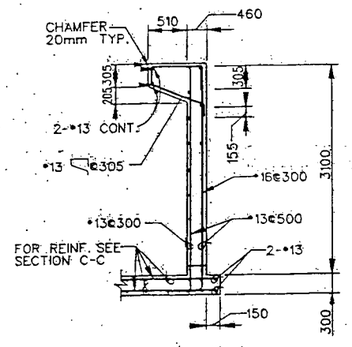
DETAIL W

NOT TO SCALE



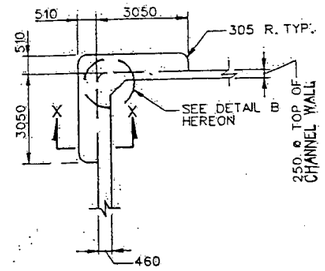
DETAIL B

NOT TO SCALE.



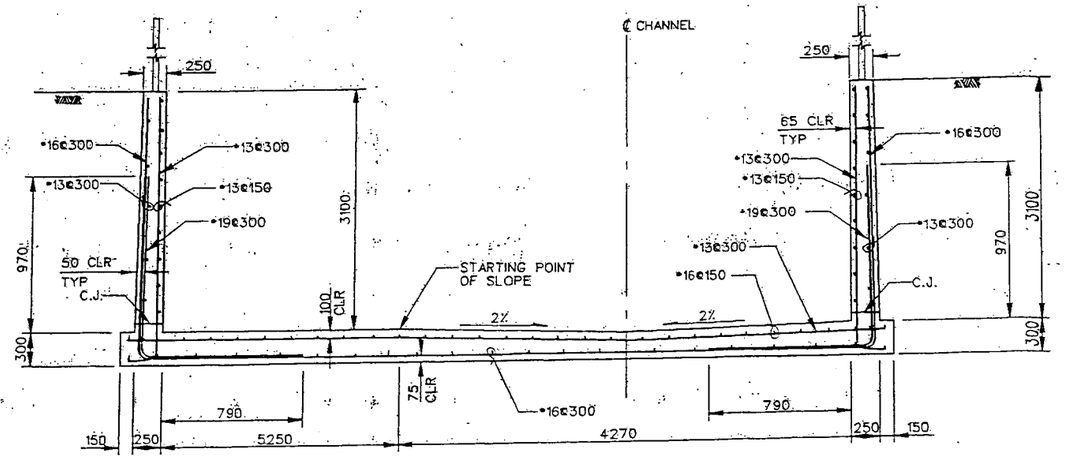
SECTION X-X

NOT TO SCALE



DETAIL A

NOT TO SCALE



SECTION G-G

STA. 50+07.000 TO STA. 49+97.000

NOT TO SCALE

NOTES:

1. DESIGN WALL HEIGHT "H" AND FOOTING LENGTH "L" ARE SHOWN. SEE PLAN AND PROFILE FOR ACTUAL HEIGHT AND CHANNEL WIDTH.
2. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
3. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	REVISED SEC C-C NOTE.	4/27/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

INVERT ACCESS RAMP PLAN, PROFILE, SECTION AND DETAILS STA. 50+57.231 TO STA. 49+93.000

DESIGNED BY:
DRAWN BY:
CHECKED BY:

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

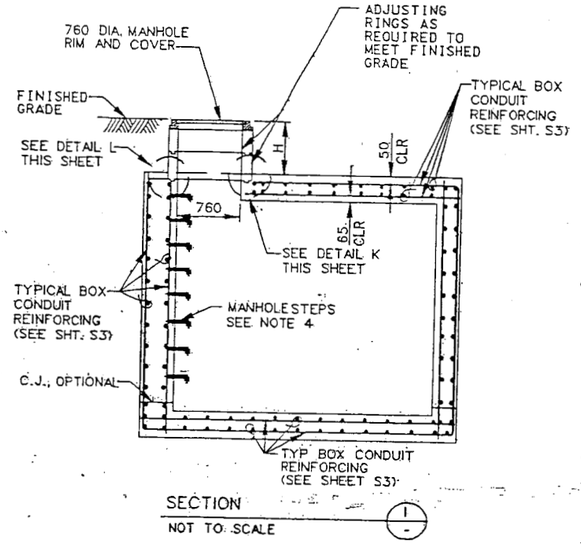
SUBMITTED BY: THOMAS H. SAGE, PE CHIEF, DESIGN BRANCH

FILE NAME: S12.dgn

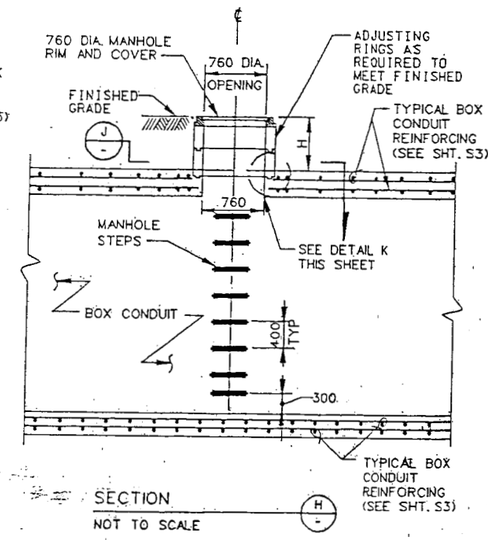
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 24/03 REV #1

SHEET S12

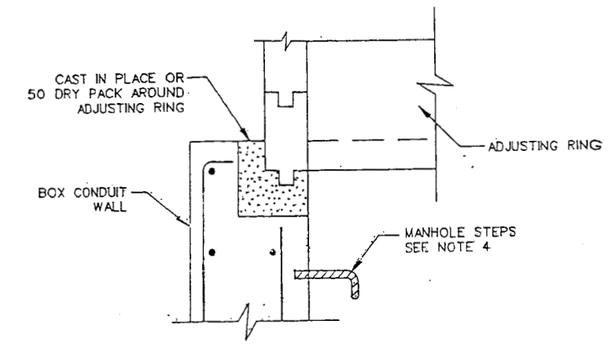


SECTION
NOT TO SCALE (I)



SECTION
NOT TO SCALE (H)

MANHOLE SCHEDULE UPPER BLUE DIAMOND CHANNEL	
STATION	HEIGHT ABOVE (H) BOX CONDUIT(mm)
47+34.000	1370
46+12.000	720
44+90.000	610
43+68.000	610
36+40.000	1250
34+14.000	910
24+88.000	610
23+66.000	610
20+00.000	610
18+78.000	610

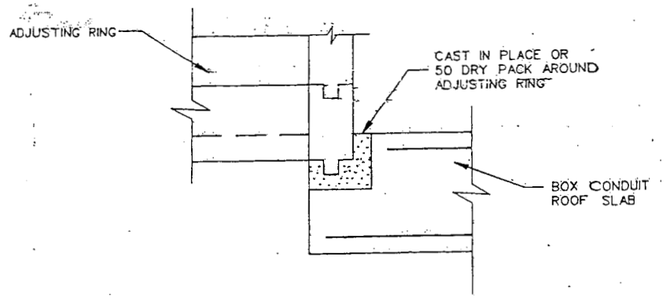


DETAIL
NOT TO SCALE (L)

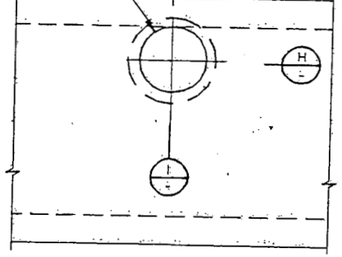
MANHOLE SCHEDULE WARM SPRING LATERAL	
STATION	HEIGHT ABOVE BOX CHANNEL
10+47.000	

NOTE:

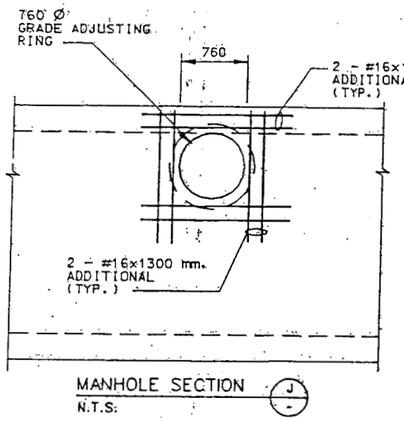
THE MANHOLE HEIGHT SHALL BE VERIFIED IN THE FIELD AND ADJUSTED WITH GRADE ADJUSTING RINGS.



DETAIL
NOT TO SCALE (K)



CONDUIT MANHOLE PLAN
NOT TO SCALE

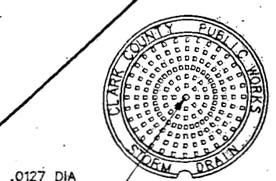


MANHOLE SECTION
N.T.S. (J)

BOX CONDUIT MANHOLE AND DETAILS

NOTES:

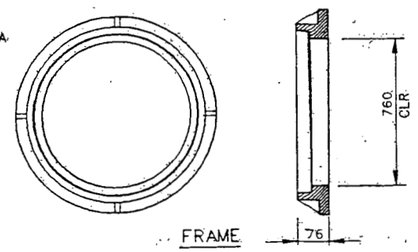
1. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
2. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.
3. FOR MANHOLE LOCATIONS, RIM AND INVERT ELEVATIONS, SEE SHEET C3,C4,C7,C8,C9,C10,C11,C12,C13,C15.
4. MANHOLE STEPS SHALL BE FABRICATED FROM ALUMINUM AND SHALL BE AS DETAILED ON DRAWING NO.410 OF THE "UNIFORM STANDARD DRAWINGS" CLARK COUNTY AREA, NEVADA, 1988.
5. SEE BOX CONDUIT SCHEDULE ON SHEET S3 FOR THE DIMENSION.
6. GRADE ADJUSTING RING SHALL CONFORM TO DRAWING NO. 403, TYPE I MANHOLE, OF THE "UNIFORM STANDARD DRAWINGS" CLARK COUNTY AREA, NEVADA, 1988.



COVER

NOTES:

1. FRAME AND COVER SHALL BE TYPE A-1497 BY ALHAMBRA FOUNDRY COMPANY LIMITED. OR EQUAL, AND AS MODIFIED.
2. CAST IRON SHALL HAVE A MINIMUM TENSILE STRENGTH OF 207 MPa
3. FRAME AND COVER MACHINED TO FIT.
4. WEIGHT OF FRAME AND COVER SHALL BE 281 Kg MIN
5. DO NOT INSTALL RUBBER GASKET
6. LIDS TO BE IMPRINTED WITH THE WORDS "CLARK COUNTY PUBLIC WORKS STORM DRAIN"



FRAME

MANHOLE COVER & FRAME DETAIL
NOT TO SCALE

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL
MANHOLE SCHEDULE AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: N.H.
DRAWN BY: N.H.
CHECKED BY: T.W.

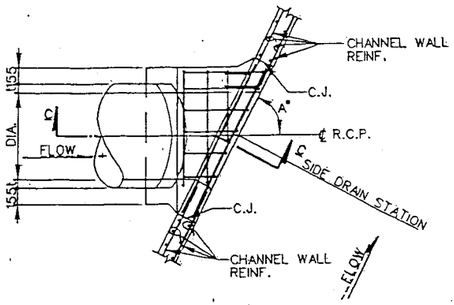
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: S13.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214/133

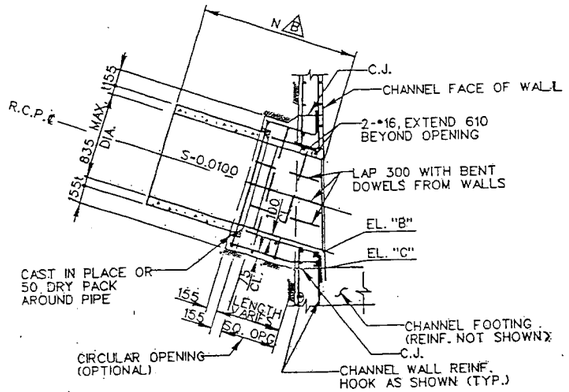
SHEET
S13

TABULATION OF SIDE DRAINS

CHANNEL STATION	SHT. NO.	WALL	PIPE/BOX TYPE	PIPE/BOX DIA./WxH (mm)	PIPE/BOX N (m)	TYPE	A°	EL. "B"	EL. "C"	REMARKS
51+03.00	C1	RIGHT	RCB	910X910				832.500	832.655	
47+38.569	C3	RIGHT	RCP	1372	4.877	C	45	828.350	828.195	PLUG END
44+20.000	C4	RT/LT	RCP	610	3.658	B	60	825.645	825.493	PLUG END
39+40.000	C6	LEFT	RCP	610	5.160	B	60	821.344	821.192	PLUG END
36+20.000	C7	LEFT	RCP	610	5.224	B	60	815.326	815.174	PLUG END
35+66.161	C7	RIGHT	RCP	762	1.761	B	60	813.967	813.814	
34+77.325	C7	RIGHT	RCP	762	1.893	B	60	813.034	812.882	
30+22.976	C9	LEFT	RCP	610	6.308	B	60	807.713	807.561	PLUG END
22+82.178	C11	RIGHT	RCP	610	6.154	B	60	797.788	797.636	PLUG END
20+76.333	C12	RIGHT	RCP	914	7.292	C	45	796.412	794.259	PLUG END
13+40.000	C15	LEFT	RCB	1800X1500	9.706	-	30	782.261	782.186	PLUG END
12+00.000	C15	RIGHT	RCP	610	2.08	B	60	781.02	780.87	PLUG END



PLAN A

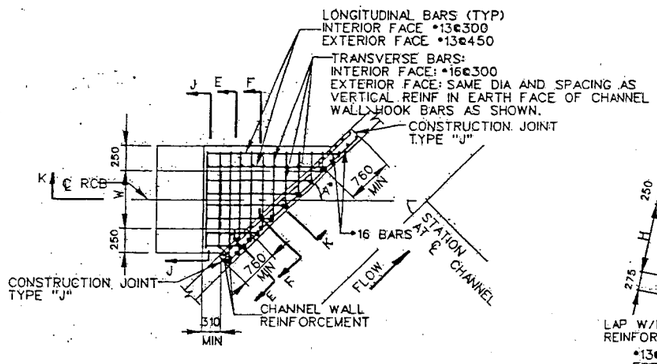


SECTION C-C
NOT TO SCALE

NOTE:
PROVIDE 4-#16 DIAGONALS EACH FACE OF PIPE OPENING. (LENGTH OF PIPE DIAGONALS EQUALS PIPE DIA. +610mm)

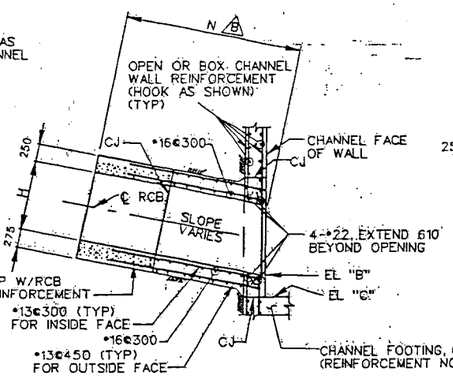
THIS DETAIL IS USE WHEN ELEV. "B" IS 150mm ABOVE ELEV. "C".

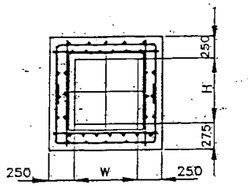
JUNCTION STRUCTURE TYPE "B"
NOT TO SCALE



NOTE: BOTTOM SLAB IS SIMILAR.

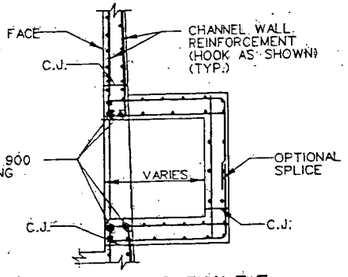
RCB SIDE DRAIN CONNECTION - TOP PLAN A C
NOT TO SCALE



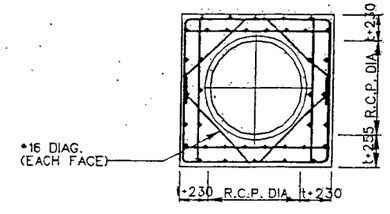


SECTION J-J A C
NOT TO SCALE

NOTE:
CONCRETE DIMENSIONS, REBAR SIZE, SPACING AND CLEARANCES ARE SAME WITH SECTION E-E.

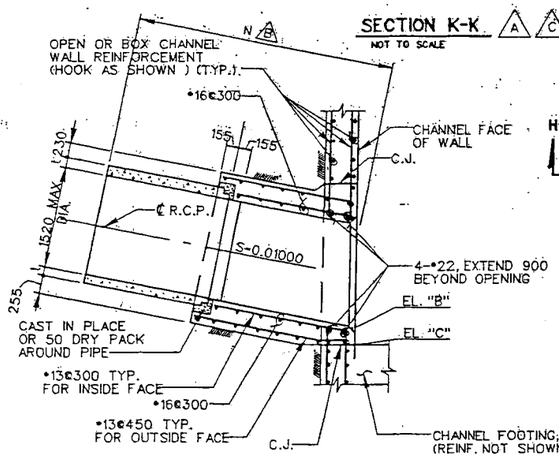


SECTION F-F
NOT TO SCALE



SECTION G-G
NOT TO SCALE

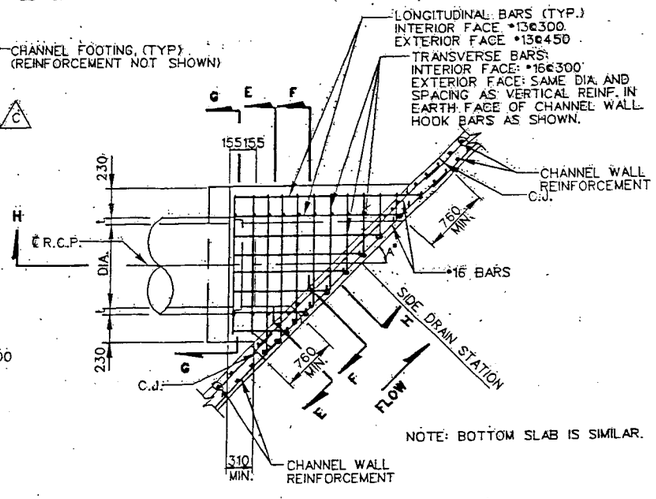
NOTES:
1. OPENINGS IN CHANNEL WALL SHALL BE CHAMFERED 20mm UNLESS OTHERWISE NOTED.
2. CUT REINFORCEMENT 50mm FROM OPENING IN CHANNEL WALL EXCEPT WHEN HOOK OR BEND IS REQUIRED.
3. "t" - WALL THICKNESS OF PIPE.
4. ALL REINFORCEMENT SHALL HAVE A MINIMUM OF 50mm CLEARANCE UNLESS OTHERWISE NOTED.
5. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
6. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.
7. ALL REBARS #16℄300 UNLESS OTHERWISE NOTED.



SECTION K-K A C
NOT TO SCALE

NOTE:
THIS DETAIL IS USED WHEN ELEV. "B" IS 150mm ABOVE ELEV. "C".

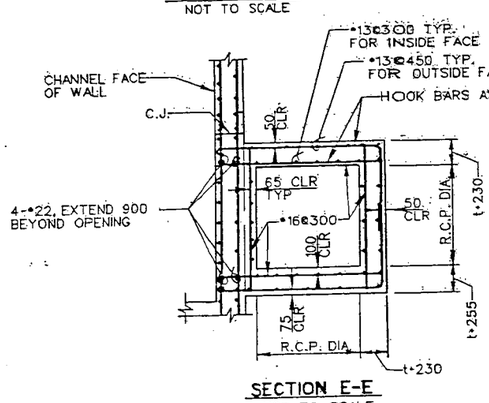
SECTION H-H
NOT TO SCALE



NOTE: BOTTOM SLAB IS SIMILAR.

PLAN - TOP SLAB
NOT TO SCALE

JUNCTION STRUCTURE TYPE "C"
NOT TO SCALE



SECTION E-E
NOT TO SCALE

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL
A	REVISED DIMENSIONS.	9/3/03
B	REVISED AS NOTED.	9/25/03
C	REVISED AS NOTED.	9/30/03

LAS VEGAS WASH AND TRIBUTARIES, NEVADA
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
SIDE DRAIN TABULATION AND DETAILS

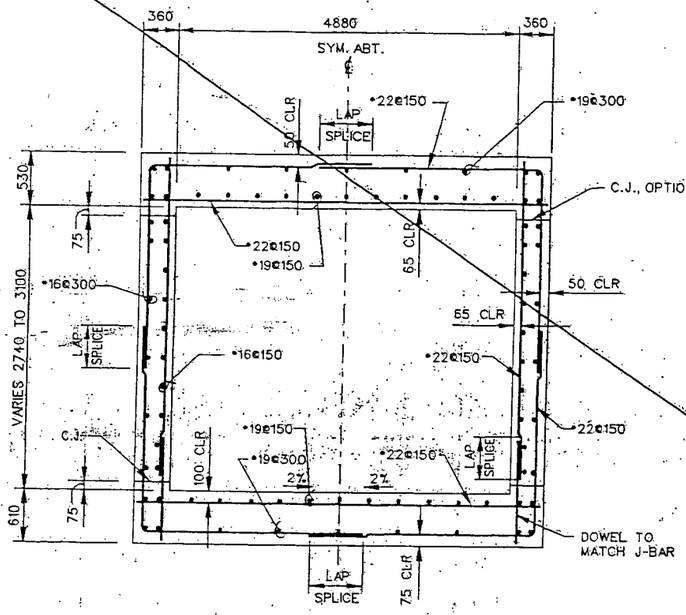
DESIGNED BY: TW
DRAWN BY: NH
CHECKED BY: RC

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

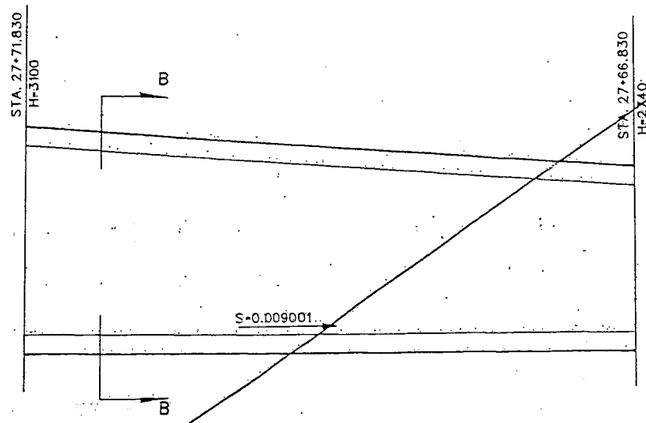
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: S14.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214154 REV. A

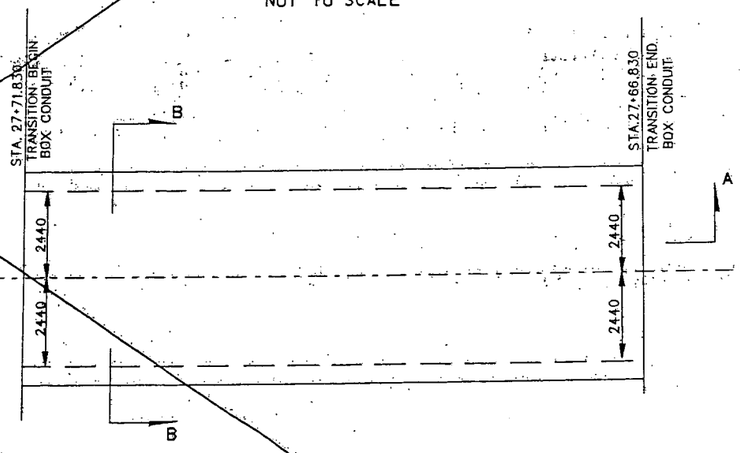
SHEET
S14



SECTION B-B
NOT TO SCALE



SECTION A-A
NOT TO SCALE



PLAN
NOT TO SCALE

NOT IN CONTRACT

BOX CONDUIT TRANSITION STRUCTURE
NOT TO SCALE

NOTES:

1. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE SHOWN ON SHEET S1 UNLESS OTHERWISE NOTED.
2. NO SPLICES IN TRANSVERSE REINFORCING STEEL WILL BE PERMITTED OTHER THAT SHOWN ON THE DRAWING WITHOUT THE APPROVAL OF THE CONTRACTING OFFICER. NO MORE THAN THREE SPLICES WILL BE PERMITTED IN ANY LONGITUDINAL BAR BETWEEN TRANSVERSE JOINTS.
3. FOR UPPER BLUE DIAMOND CHANNEL PLAN AND PROFILE, SEE SHEET C10.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS / REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
BOX CONDUIT TRANSITION STRUCTURE
STA. 27+66.830 TO STA. 27+71.830

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

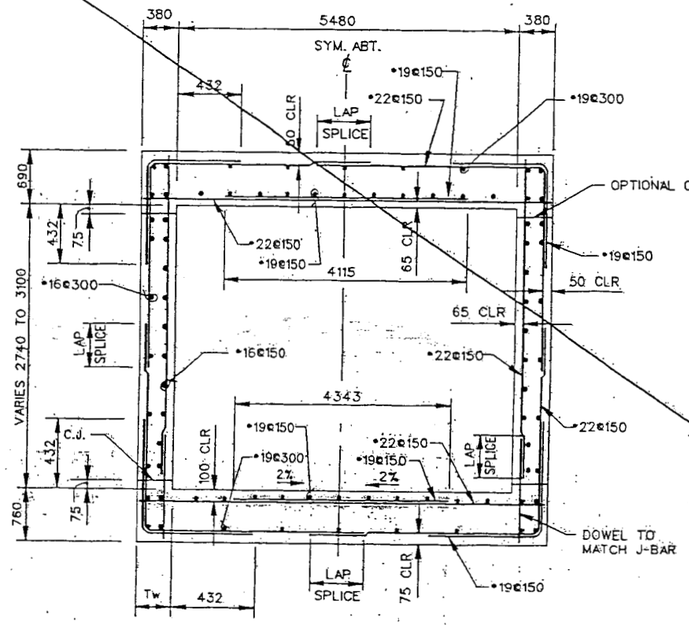
DESIGNED BY: R.N.
DRAWN BY: N.H.
CHECKED BY: T.W.

FILE NAME: S15.DGN

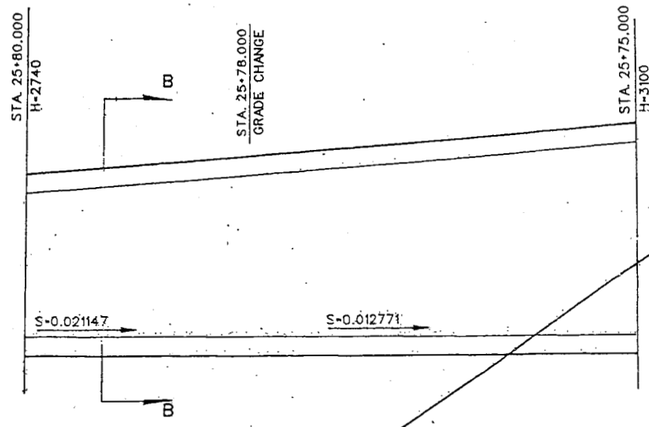
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/135

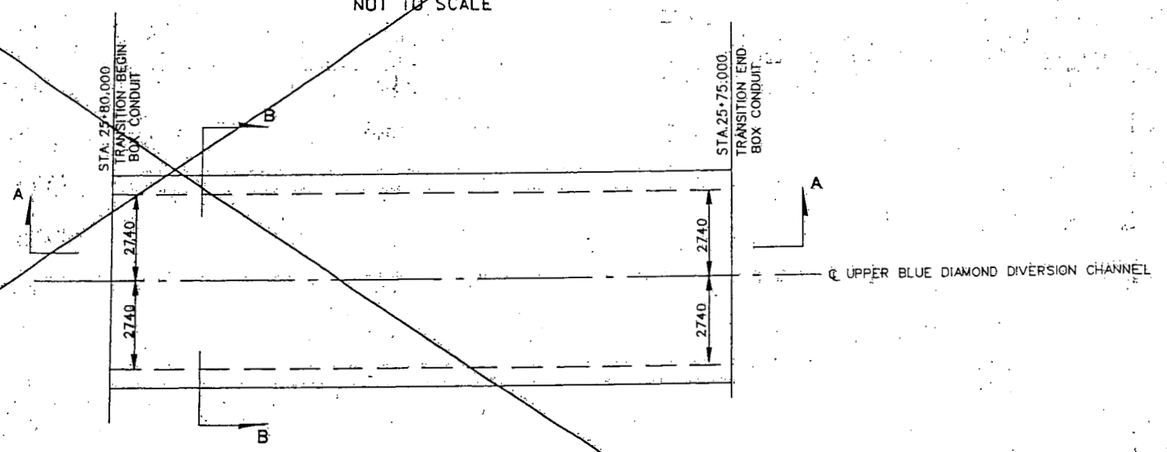
SHEET
S15



SECTION B-B
NOT TO SCALE



SECTION A-A
NOT TO SCALE



PLAN
NOT TO SCALE

NOT IN CONTRACT

NOTES:

1. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE SHOWN ON SHEET S1 UNLESS OTHERWISE NOTED.
2. NO SPLICES IN TRANSVERSE REINFORCING STEEL WILL BE PERMITTED OTHER THAT SHOWN ON THE DRAWING WITHOUT THE APPROVAL OF THE CONTRACTING OFFICER. NO MORE THAN THREE SPLICES WILL BE PERMITTED IN ANY LONGITUDINAL BAR BETWEEN TRANSVERSE JOINTS.
3. FOR UPPER BLUE DIAMOND CHANNEL PLAN AND PROFILE, SEE SHEET C11.

BOX CONDUIT TRANSITION STRUCTURE
NOT TO SCALE

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

BOX CONDUIT TRANSITION STRUCTURE
STA. 25+75.000 TO STA. 25+80.000

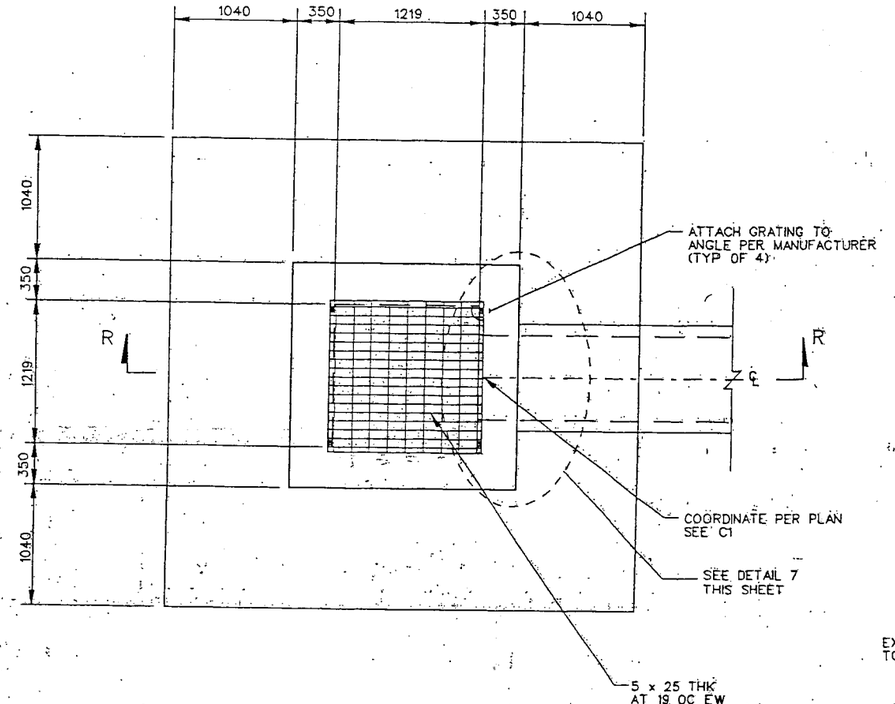
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: R.M.
DRAWN BY: N.H.
CHECKED BY: T.W.

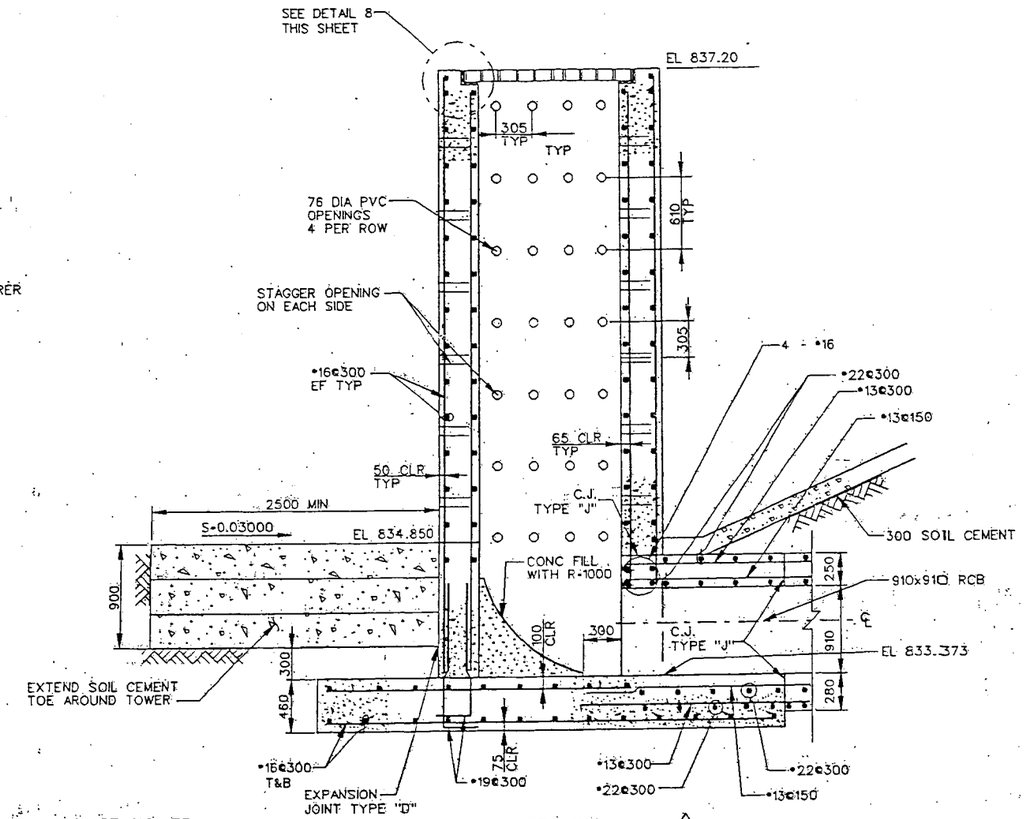
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: S16.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214/136

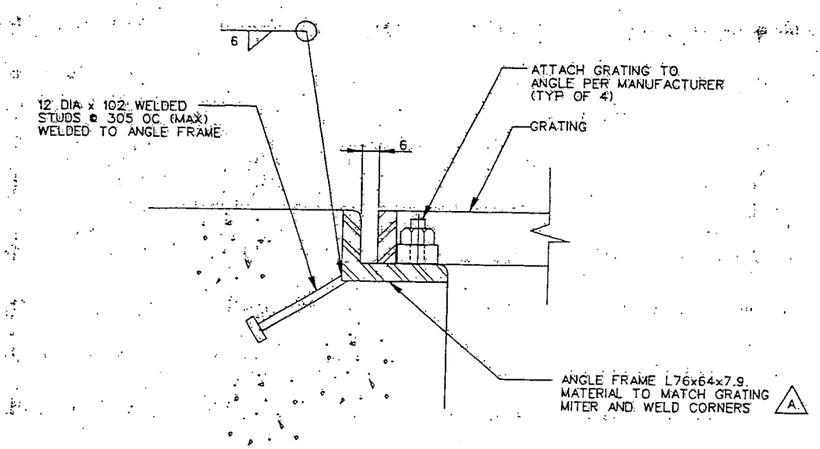
SHEET
S16



PLAN
SCALE: 1:25

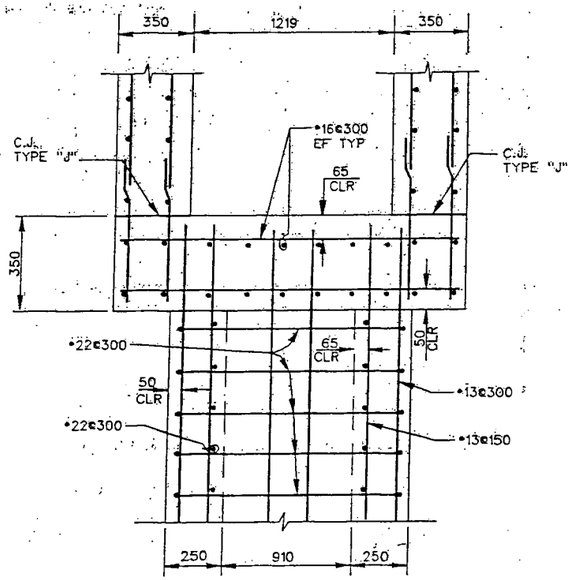


SECTION R-R (B)
SCALE: 1:25



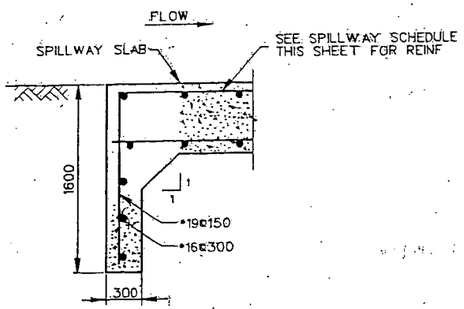
DETAIL 8
NOT TO SCALE

OUTLET TOWER



DETAIL 7 (A)
NOT TO SCALE

NOTES:
1. FOR INTAKE STRUCTURE PLAN AND PROFILE, SEE SHEETS C1.
2. FOR 910x910 BOX CONDUIT SEE SHEET S3.



DETAIL 6
N.T.S.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
B	REVISED ELEVATION	8/26/03	
A	REVISED AS NOTED.	8/20/03	
	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO, WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
INLET STRUCTURE - OUTLET TOWER

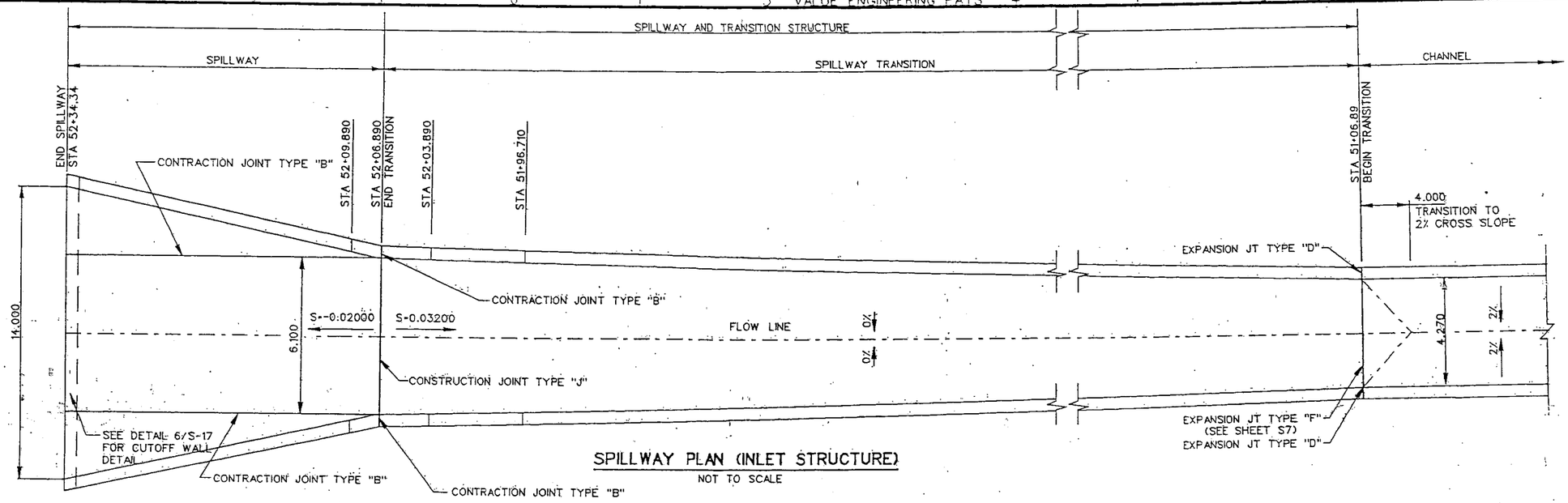
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: TW
DRAWN BY: NH
CHECKED BY: RC

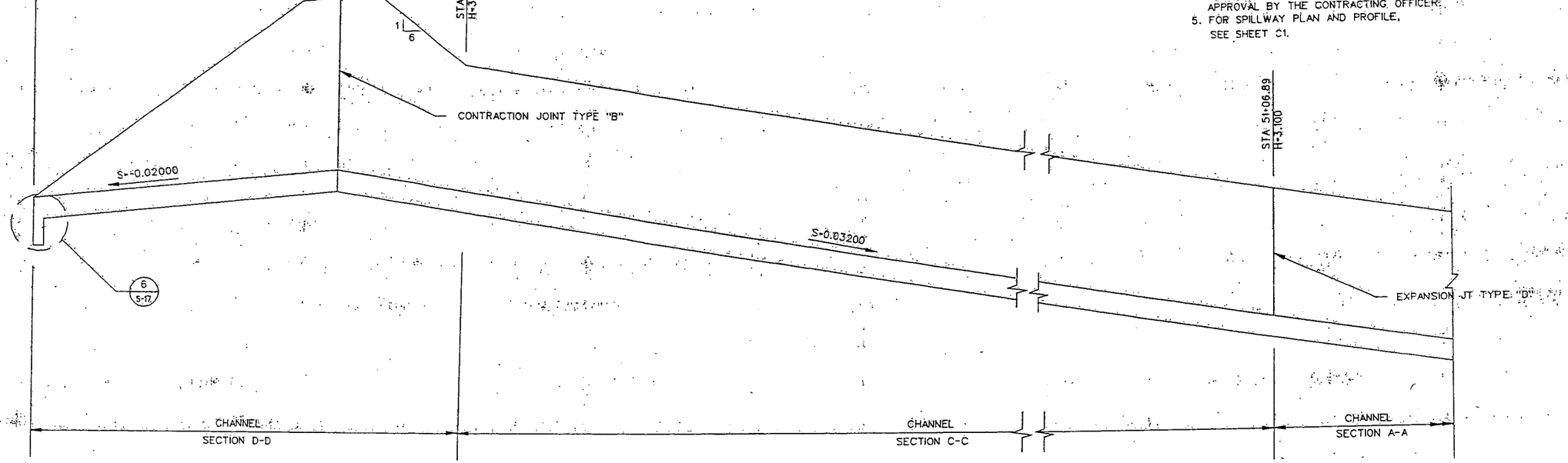
FILE NAME: S17.DGN
SPEC. NO. DACW09-03-B-0005
REV 'A' 8/4/03
DISTRICT FILE NO. 214137

SHEET
S17



SPILLWAY PLAN (INLET STRUCTURE)

NOT TO SCALE



SPILLWAY PROFILE (INLET STRUCTURE)

NOT TO SCALE

NOTES:

1. FOR TYPICAL CHANNEL SECTIONS AND DETAILS SEE SHEET S2.
2. THE CHANNEL WIDTH AND HEIGHT ARE VARIES, SEE PLAN AND PROFILE FOR DIMENSIONS.
3. BAR SPLICES SHALL BE IN ACCORDANCE WITH THE LAP SPLICE TABLE ON SHEET S1 UNLESS OTHERWISE NOTED.
4. LOCATION OF ALL SPLICES SHALL BE SUBMITTED FOR APPROVAL BY THE CONTRACTING OFFICER.
5. FOR SPILLWAY PLAN AND PROFILE, SEE SHEET C1.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS / REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

SPILLWAY

PLAN, SECTIONS AND SCHEDULE

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: TW
DRAWN BY: NH
CHECKED BY: RC

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

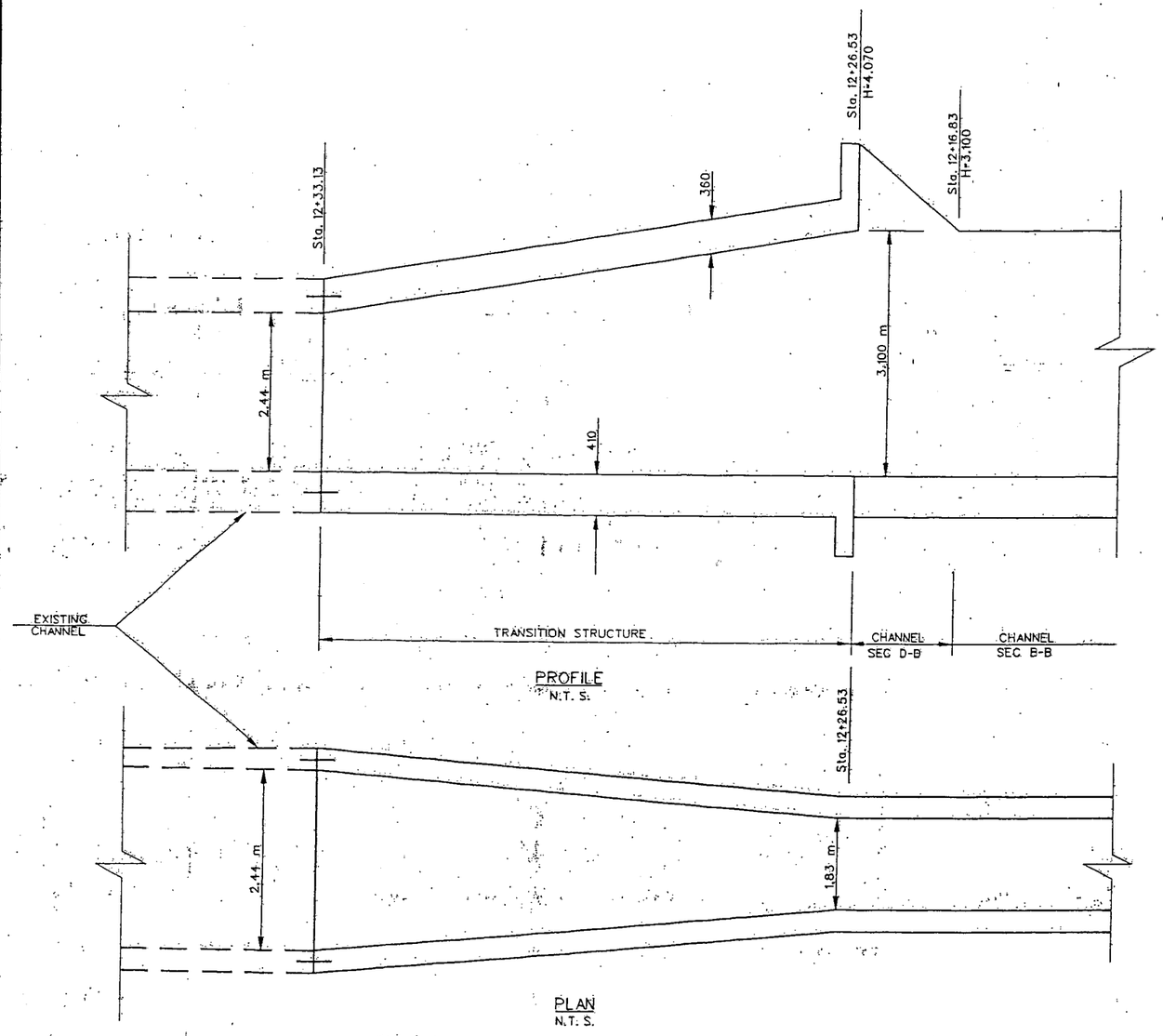
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SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214138

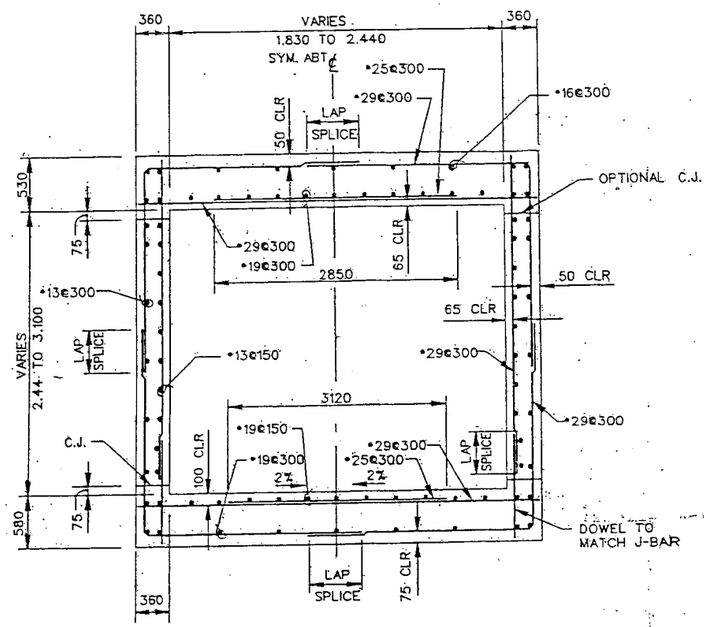
SHEET
S18

8 7 6 5 VALUE ENGINEERING PAYS 4 3 2 1



PROFILE
N.T.S.

PLAN
N.T.S.



TRANSITION STRUCTURE
N.T.S.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	NEW DETAIL SHEET.	6/2013	
	REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

BELTWAY LATERAL TRANSITION DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: N.H.
DRAWN BY: N.H.
CHECKED BY: T.W.

FILE NAME: S20.dgn

SPEC. NO. DACW09-03-B-0005

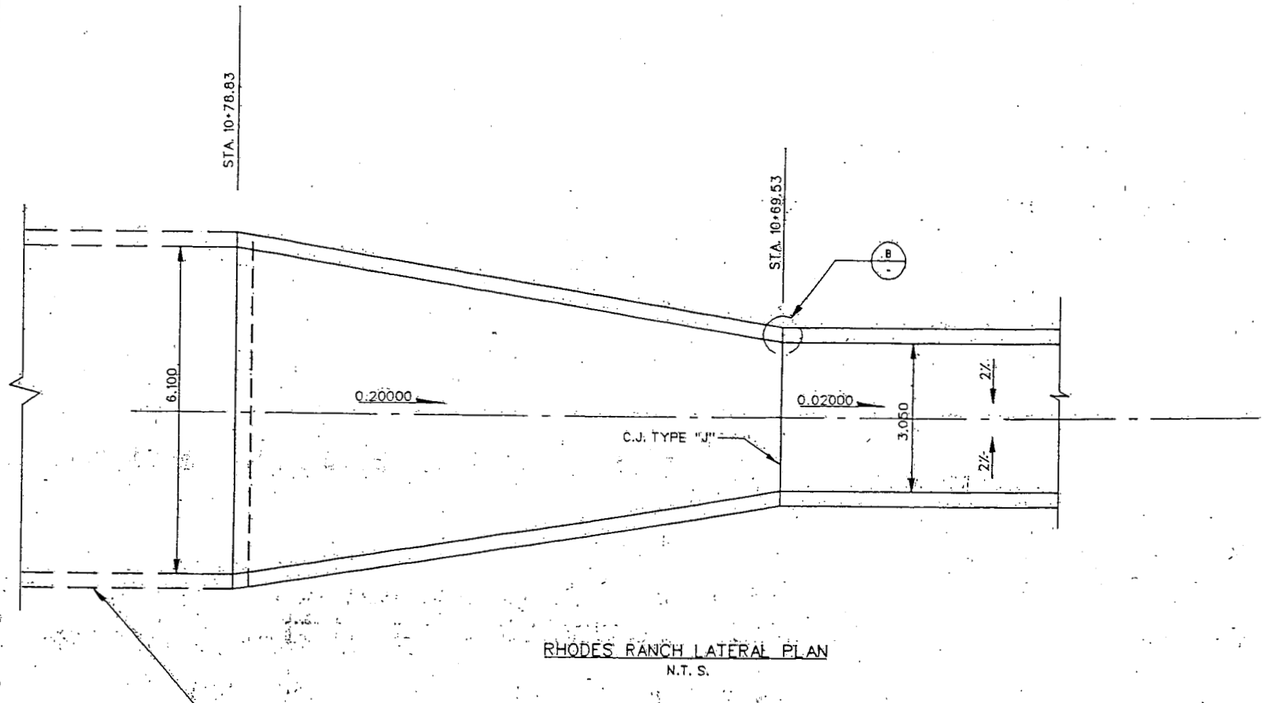
DISTRICT FILE NO. 211/140 REV. A

SHEET
S20

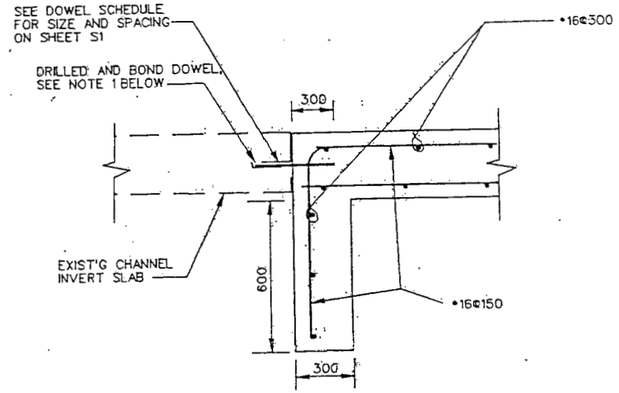
8 7 6 5 SAFETY PAYS 4 3 2 1

VALUE ENGINEERING PAYS

SAFETY PAYS



RHODES RANCH LATERAL PLAN
N.T.S.

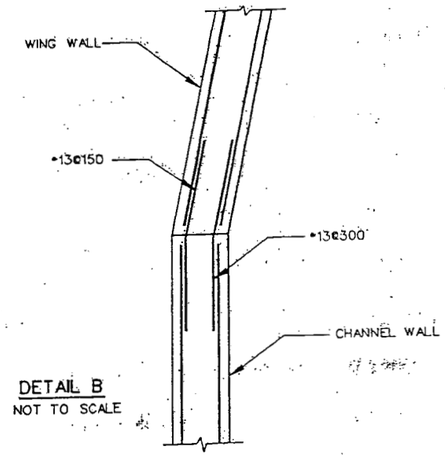


NOTES:

1. DRILLED HOLE SHALL BE 2 TIMES THE DIAMETER OF THE DOWEL AND FILLED WITH GROUT.

DETAIL A
NOT TO SCALE

RHODES RANCH LATERAL PROFILE
N.T.S.



DETAIL B
NOT TO SCALE

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	NEW DETAIL SHEET.	4/29/03	

REVISIONS

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

RHODES RANCH/ BELTWAY LATERAL DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: N.H.
DRAWN BY: N.H.
CHECKED BY: T.W.

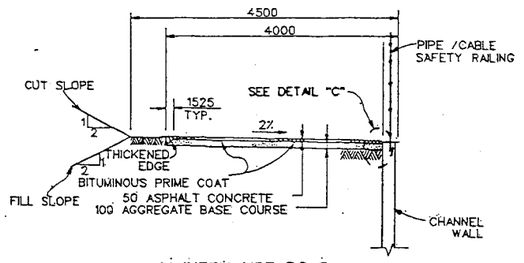
SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: S19.dgn

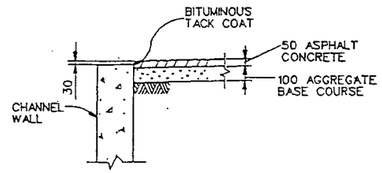
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SPEC. NO. DACW09-03-B-0005

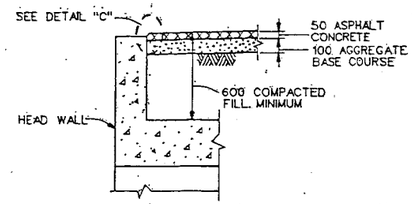
SHEET
S19



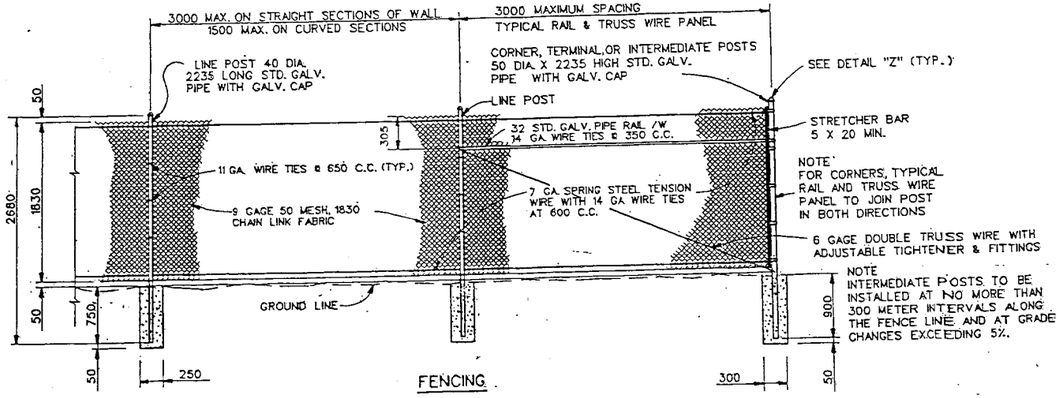
MAINTENANCE ROAD
NOT TO SCALE



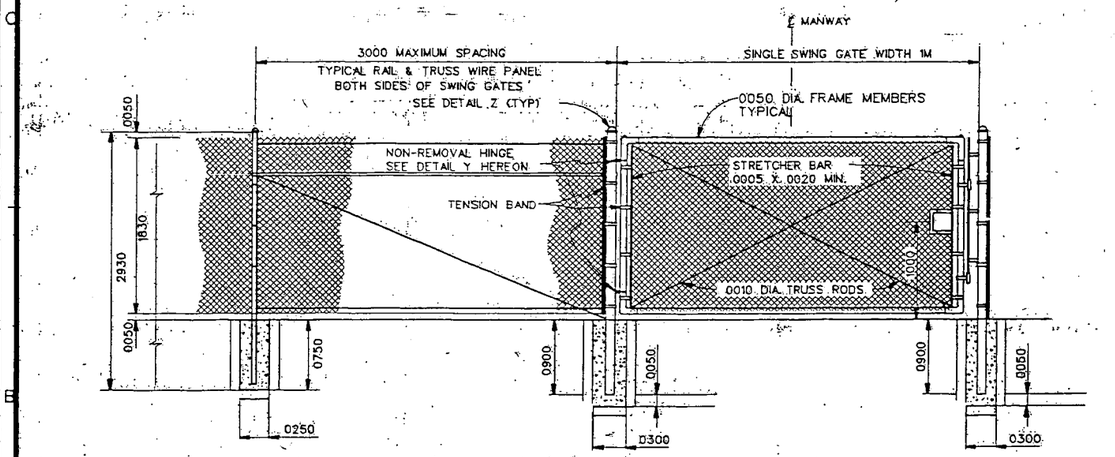
DETAIL C
NOT TO SCALE



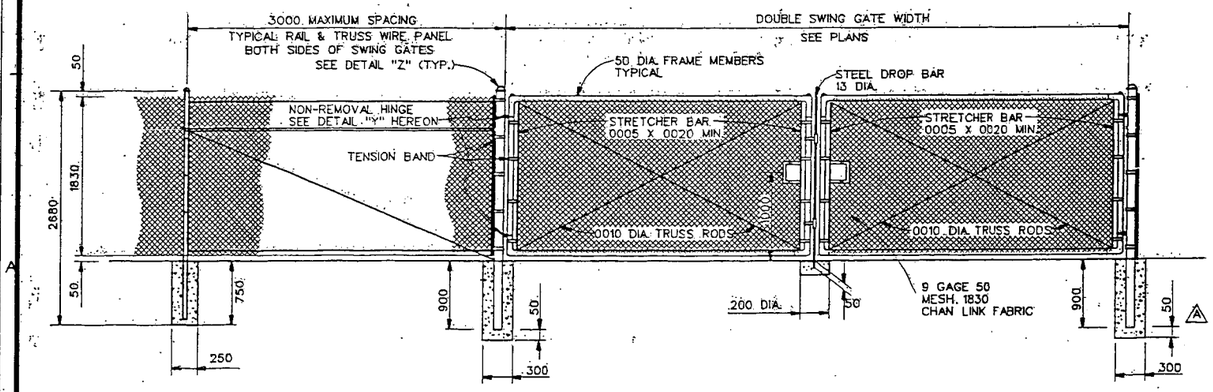
TYPICAL PAVED AREA RCB
NOT TO SCALE



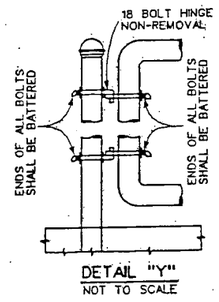
FENCING
NOT TO SCALE



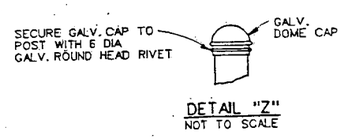
SINGLE SWING GATE ELEVATION Ⓐ
NOT TO SCALE



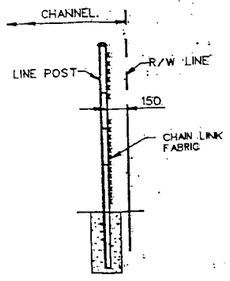
DOUBLE SWING GATE ELEVATION Ⓐ
NOT TO SCALE



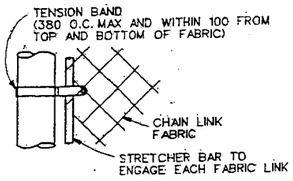
DETAIL "Y"
NOT TO SCALE



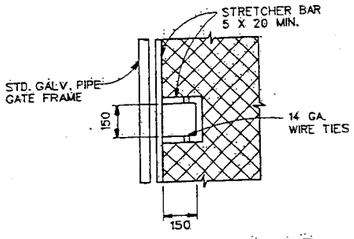
DETAIL "Z"
NOT TO SCALE



R/W FENCE LOCATION
NOT TO SCALE



END OR GATE POST DETAIL



DETAIL OF CUTOUT FOR CHAIN AND LOCK
NOT TO SCALE

NOTE:
1. ADJUSTABLE TIGHTENERS SHALL BE TURNBUCKLE OR EQUIVALENT, HAVING 150 MIN. TAKE UP.
2. CHAIN LINK FENCE POST SHALL BE INSTALLED VERTCALLY.
3. CHAIN LINK FABRIC SHALL BE INSTALLED ON OUTSIDE FACE OF POST (FACE OPPOSITE CHANNEL FACE).

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL
1	REVISED AS NOTED.		

LAS VEGAS WASH AND TRIBUTARIES; (TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

CHAIN LINK FENCING, MANWAY AND MAINTENANCE ROAD DETAILS

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

SUBMITTED BY: THOMAS H. SAGE, PE CHIEF, DESIGN BRANCH

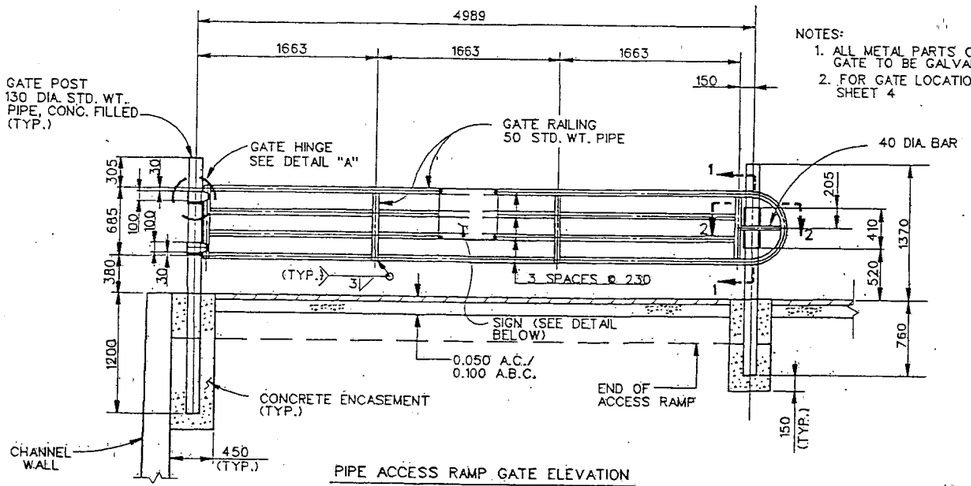
DESIGNED BY: HMN DRAWN BY: AON CHECKED BY: GED

FILE NAME: M01.dgn

SPEC. NO. DACW09-03-B-0005

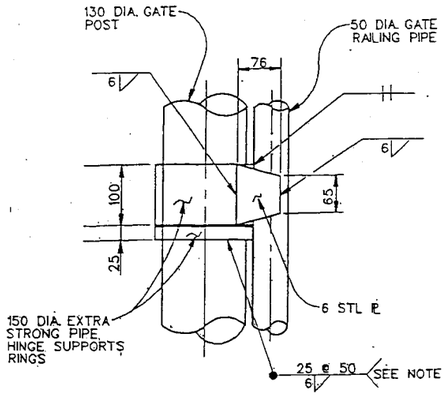
DISTRICT FILE NO. 214/151

SHEET M1



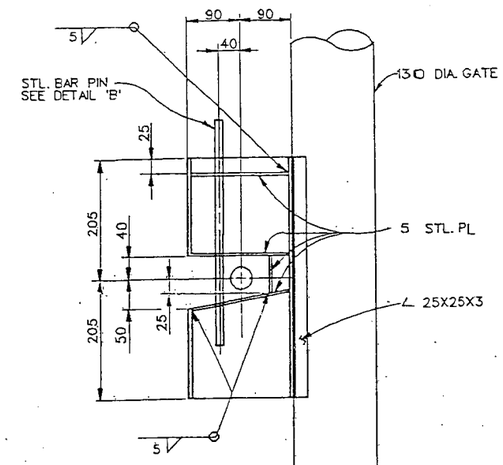
NOTES:
1. ALL METAL PARTS OF PIPE GATE TO BE GALVANIZED
2. FOR GATE LOCATION, SEE SHEET 4

PIPE ACCESS RAMP GATE ELEVATION
NOT TO SCALE

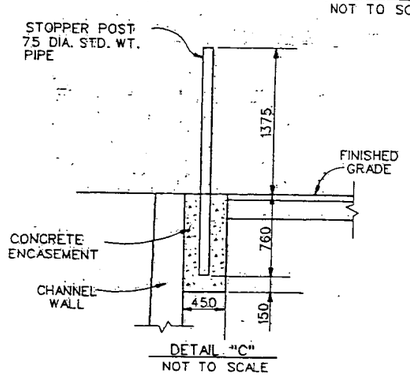


DETAIL "A"--GATE HINGE
NOT TO SCALE

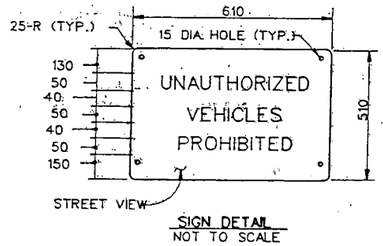
NOTE:
BOTTOM HINGE SUPPORT RING SHOP WELDED; TOP HINGE SUPPORT RING SHALL BE FIELD WELDED FOLLOWING GATE INSTALLATION.



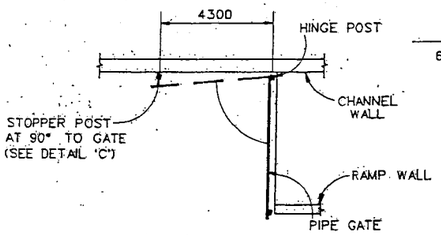
SECTION 1-1
NOT TO SCALE



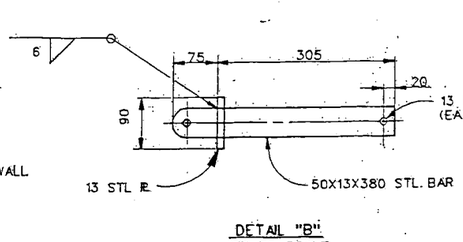
DETAIL "C"
NOT TO SCALE



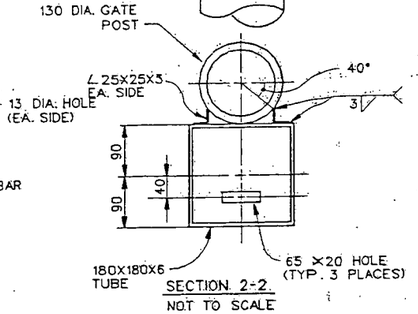
SIGN DETAIL
NOT TO SCALE



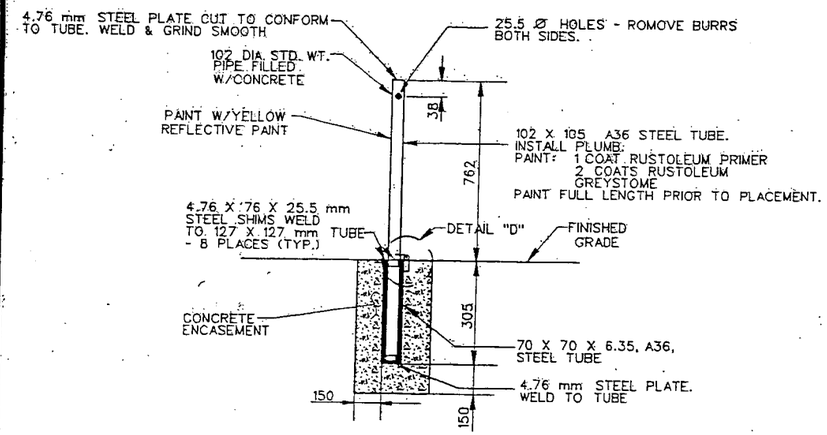
PIPE GATE PLAN
NOT TO SCALE



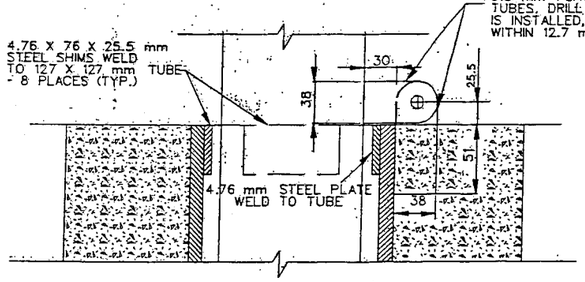
DETAIL "B"
NOT TO SCALE



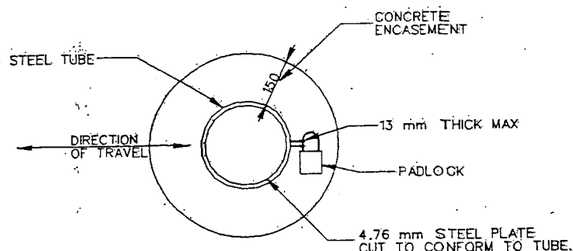
SECTION 2-2
NOT TO SCALE



REMOVABLE BOLLARD ⚠
NOT TO SCALE



DETAIL "D"
NOT TO SCALE



PLAN
NOT TO SCALE

NOTE:
LOCKS TO BE PROVIDED BY OTHERS

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
⚠	REVISED AS NOTED REVISIONS		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
PIPE SAFETY RAILING AND PIPE ACCESS RAMP GATE
DETAILS AND SECTIONS

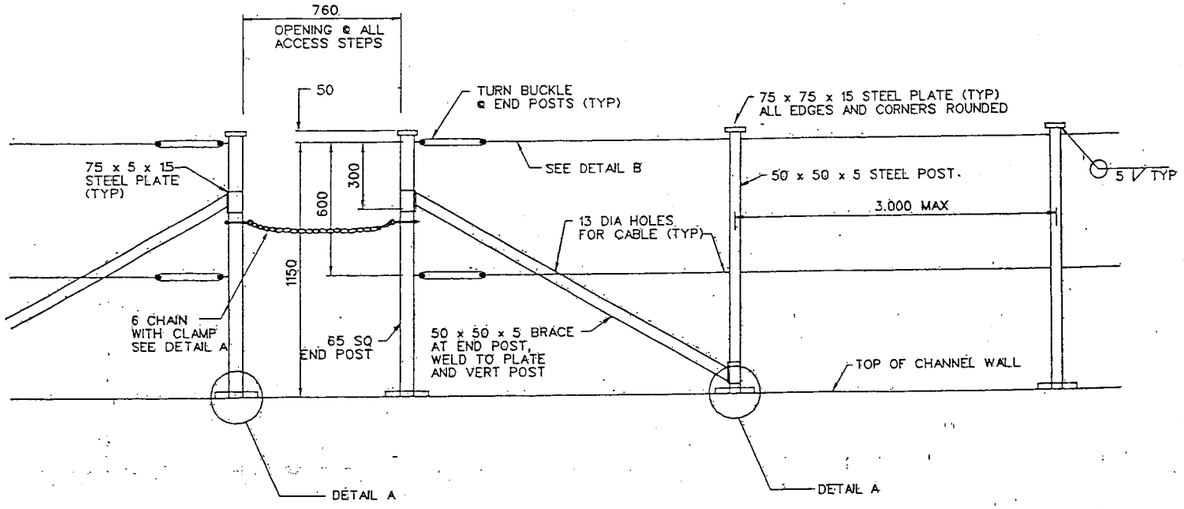
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

DESIGNED BY: HAM
DRAWN BY: ADM
CHECKED BY: GED

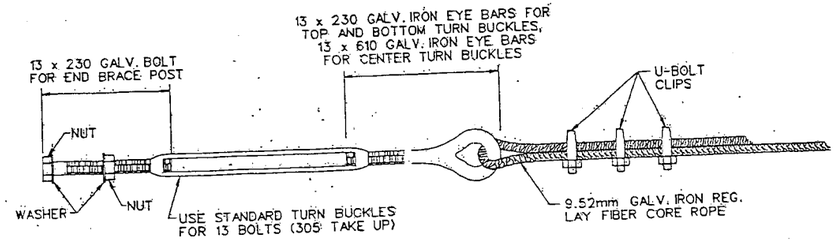
FILE NAME: M02.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214/152 REV. A

SHEET
M2

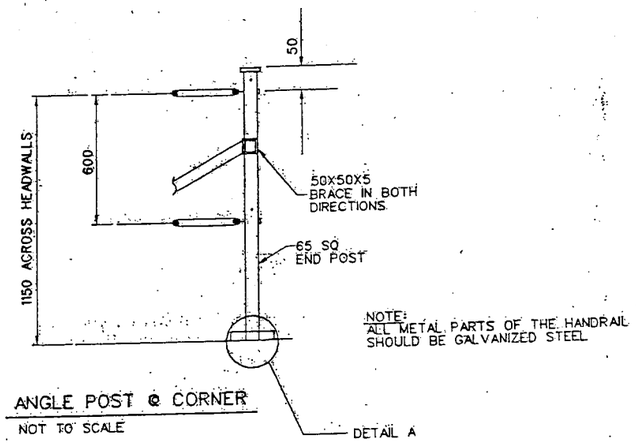


NOTES:
1. ALL POSTS SHALL BE SET PLUMB.
2. RAILING POSTS AND FITTINGS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
3. CHAIN SAFETY GATES SHALL BE PROVIDED AT LADDER LOCATIONS SEE DETAIL A
4. ANGLE POST SEE DETAIL THIS SHEET.
5. CABLE SHALL BE STRETCHED TAUT.

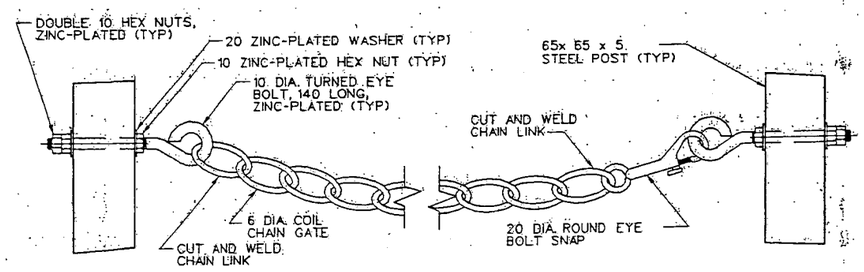
POST AND CABLE RAILING
NOT TO SCALE



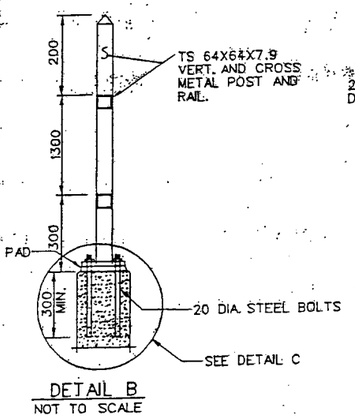
DETAIL B - TURN BUCKLE
NOT TO SCALE



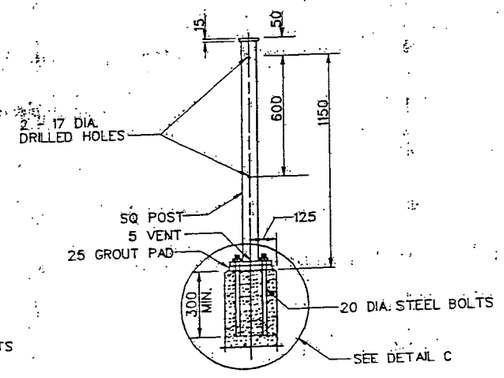
ANGLE POST @ CORNER
NOT TO SCALE



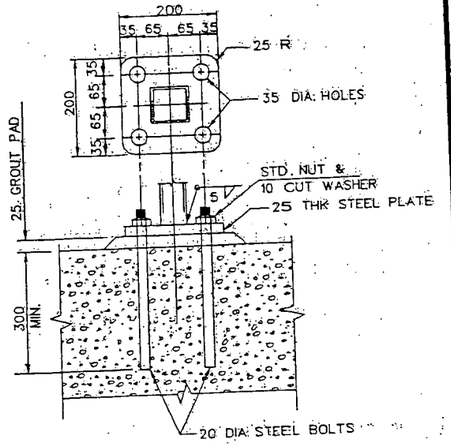
DETAIL A - CHAIN SAFETY GATE
NOT TO SCALE



DETAIL B
NOT TO SCALE



DETAIL A
NOT TO SCALE



DETAIL C
NOT TO SCALE

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	DESCRIPTIONS / REVISIONS	DATE	APPROVAL
1	REVISED AS NOTED		

UPPER BLUE DIAMOND DIVERSION CHANNEL
LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
POST AND CABLE SAFETY RAILING DETAILS

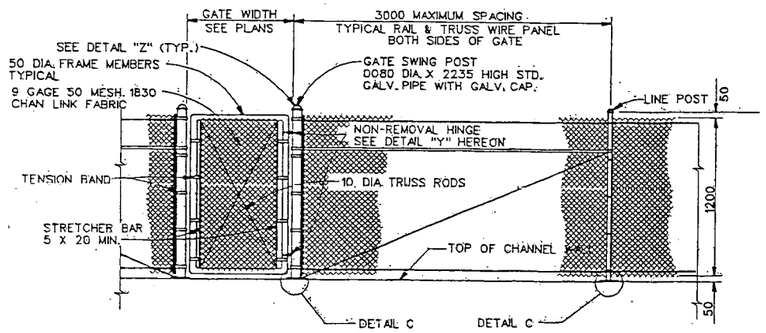
DESIGNED BY: HMN
DRAWN BY: AQM
CHECKED BY: GED

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

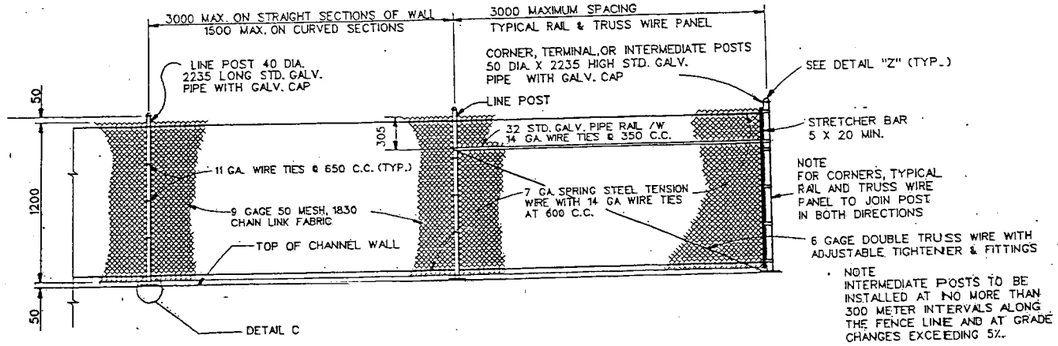
FILE NAME: M03.dgn
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214/151 REV. A

SHEET
M3



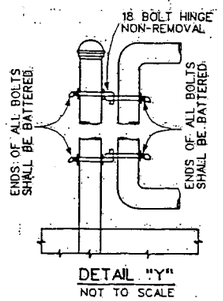
SINGLE GATE ELEVATION

NOT TO SCALE



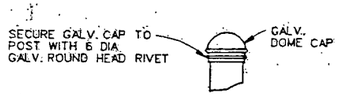
FENCING

NOT TO SCALE



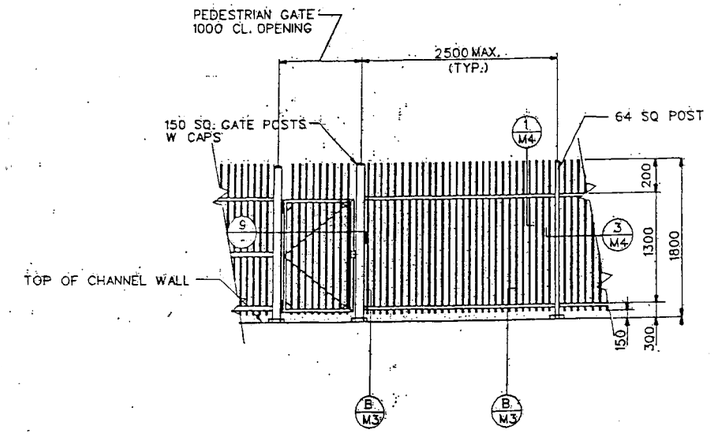
DETAIL "Y"

NOT TO SCALE



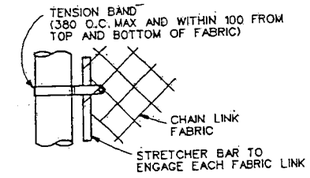
DETAIL "Z"

NOT TO SCALE

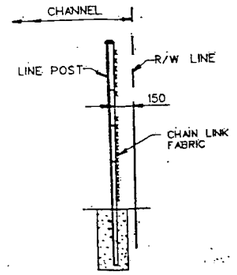


METAL FENCE & GATE ELEVATION

N.T.S.

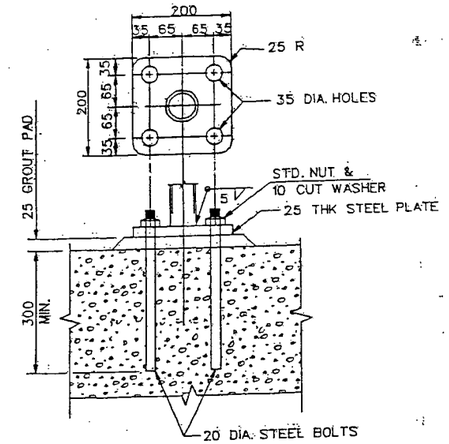


END OR GATE POST DETAIL



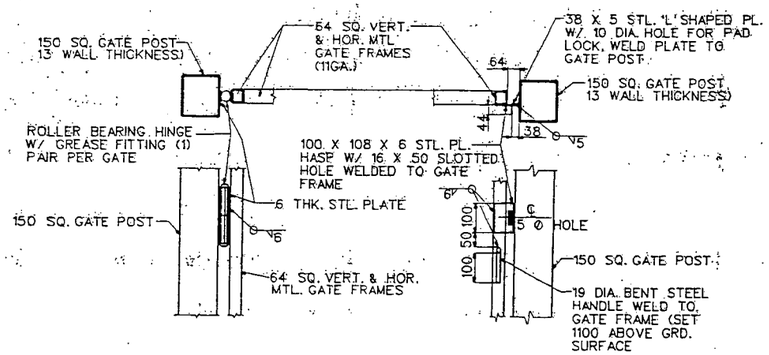
R/W FENCE LOCATION

NOT TO SCALE



DETAIL C

NOT TO SCALE



9 - PEDESTRIAN GATE HINGE, HASP AND HANDLE DET.

N.T.S.

NOTE:

1. ADJUSTABLE TIGHTENERS SHALL BE TURNBUCKLE OR EQUIVALENT, HAVING 150 MIN. TAKE UP.
2. CHAIN LINK FENCE POST SHALL BE INSTALLED VERTCALLY.
3. CHAIN LINK FABRIC SHALL BE INSTALLED ON OUTSIDE FACE OF POST (FACE OPPOSITE CHANNEL FACE).

METRIC DIMENSIONING UNITS

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SYMBOL	REVISED AS NOTED.	DATE APPROVAL
	DESCRIPTIONS	
	REVISIONS	

LAS VEGAS WASH AND TRIBUTARIES, NEVADA
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

CHAIN LINK FENCING, MANWAY AND MAINTENANCE ROAD DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: HMH
DRAWN BY: AGM
CHECKED BY: GED

SUBMITTED BY:

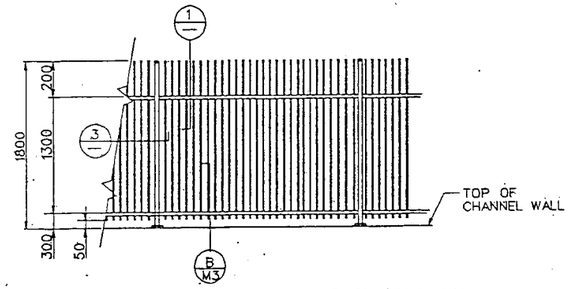
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: M05.dgn

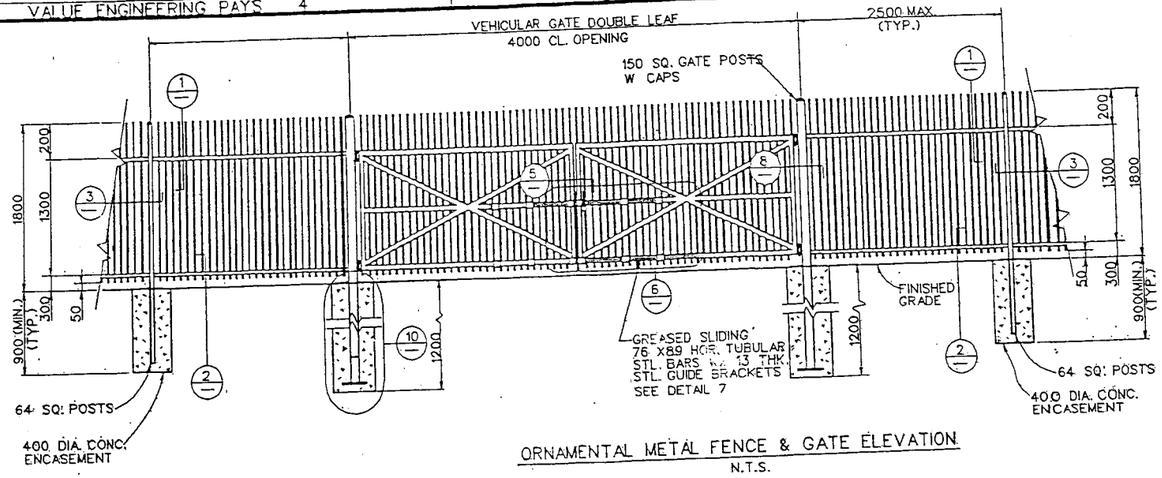
SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 141/65 REV 'K'

SHEET
M5

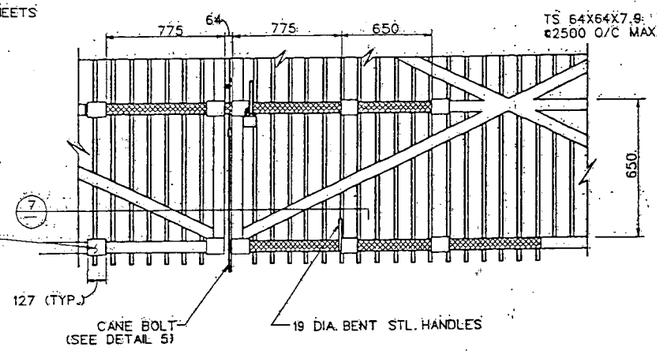


ORNAMENTAL METAL FENCE ABOVE CHANNEL WALL
N.T.S.

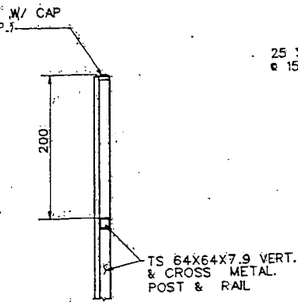


ORNAMENTAL METAL FENCE & GATE ELEVATION
N.T.S.

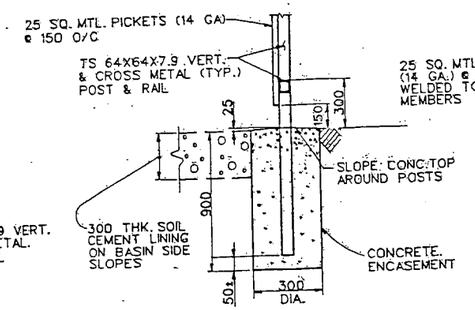
1. SEE SPECIFICATION 05502 FOR ORINAMENTAL METAL FENCE
2. FOR LOCATION OF ORINAMENTAL FENCE SEE PLAN AND PROFILE SHEETS C4, C5, C6, C8, AND C9



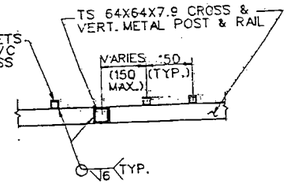
6 DOUBLE LEAF GATE
N.T.S.



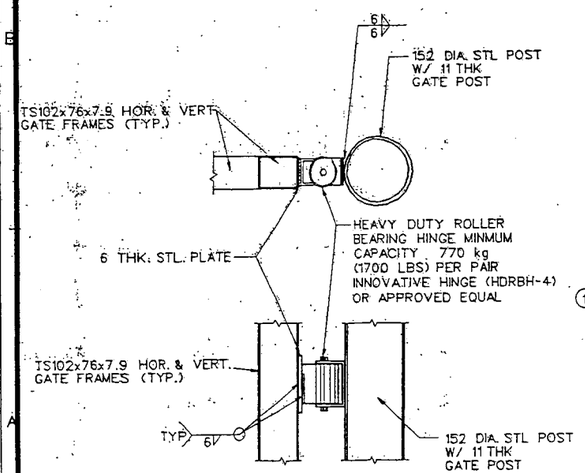
1 FENCE DET.
N.T.S.



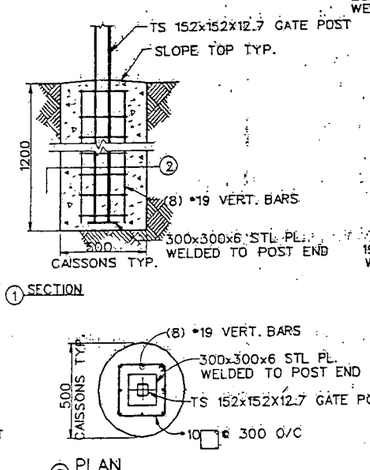
2 FENCE DET.
N.T.S.



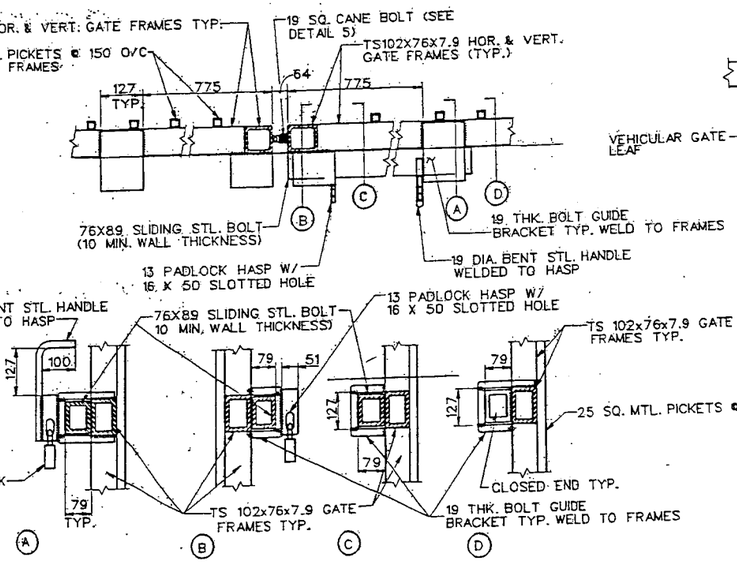
3 FENCE DET.
N.T.S.



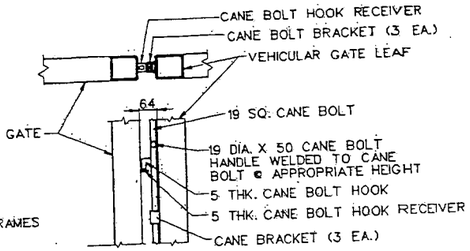
8 VEHICULAR GATE HINGE DET.
N.T.S.



10 POST DETAIL @ VEHICULAR GATES TYP.



7 VEHICULAR GATE SLIDING BOLT DET.
N.T.S.



5 CANE BOLT DETAIL
N.T.S.

NOTES:
1. FENCE CROSS MEMBERS SHALL BE CONSTRUCTED PARALLEL TO THE FINISHED GRADES ON THE BASIN SIDE SLOPES AND HORIZONTAL ALONG THE BASIN INVERT.
2. ALL METAL COMPONANTS OF THE STEEL FENCING AND GATES SHALL BE GALVANIZED.
3. ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

METRIC DIMENSIONING UNITS

DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL. DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

SYMBOL	NEW SHEET	DESCRIPTIONS REVISIONS	DATE	APPROVAL
1				

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
ORNAMENTAL METAL FENCE DETAILS

DESIGNED BY: HMH
DRAWN BY: AQM
CHECKED BY: GED

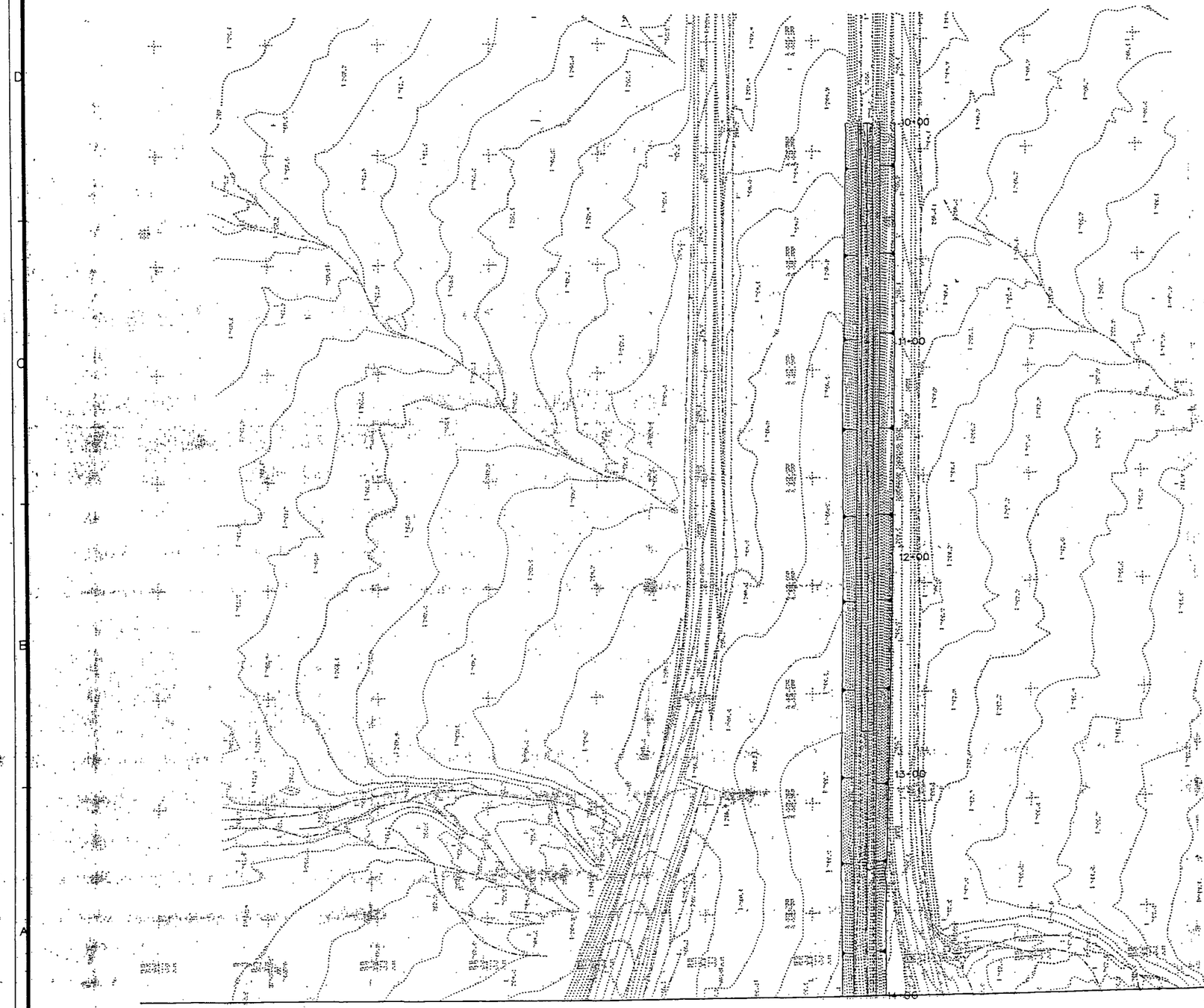
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS.

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: M04.dgn

DISTRICT FILE NO. 214/453 REV. A SPEC. NO. DACW09-03-B-0005

SHEET
M4



NOTES:

1. SEE SHEET G8 FOR GENERAL NOTES AND SOIL CLASSIFICATION.

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: G.N.

SUBMITTED BY: ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

FILE NAME: G:\DDX\PLN01.DGN

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/161

SHEET G1

Call before you Dig 1-800-227-2600

This sheet was prepared in METRIC

J:\PEBBLES\TROPICANAFLAMINGO\BDC\UPPER\DDR\GEOTECH

VALUE ENGINEERING PAYS

MATCHLINE TO SHEET G1

STA. 14+00

STA. 19+00

MATCHLINE TO SHEET G3

DR 02R-1

DR 02H-1

DR 02R-2

NOTES:

1. SEE SHEET G8 FOR GENERAL NOTES AND SOIL CLASSIFICATION.

LEGEND:

DR 02R-1 — ROTARY TEST HOLE, YEAR AND NUMBER.

DR 02H-1 — BUCKET AUGER TEST HOLE, YEAR AND NUMBER.

50 25 0 50 100m

METRIC

Call before you Dig 1-800-227-2600

SAFETY! PAYS

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/DDR/GEOTECH

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: G.N.

FILE NAME: GBDDXPLN02.DGN

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/162

SHEET G2

VALUE ENGINEERING PAYS

STA. 19+00

STA. 25+00

DR 02R-2

DR 02H-2

DR 02R-3

DR 02R-4

DR 02R-5

DR 01H-6

N

MATCHLINE TO SHEET G2

MATCHLINE TO SHEET G4

LEGEND:

DR 02R-3 — ROTARY TEST HOLE, YEAR AND NUMBER.

DR 02H-2 — BUCKET AUGER HOLE, YEAR AND NUMBER.

NOTES:

1. SEE SHEET G8 FOR GENERAL NOTES AND SOIL CLASSIFICATION.

50 25 0 50 100m

METRIC

Call before you Dig 1-800-227-2600

SAFETY! PAYS

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/DDR/GEOTECH

SYMBOL	DESCRIPTIONS / REVISIONS	DATE	APPROVAL

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY: J.Y.
DRAWN BY: ah
CHECKED BY: G.N.

FILE NAME: GBDDXPLN03.DGN

DISTRICT FILE NO. 214763

SPEC. NO. DACW09-03-B-0005

SHEET G3

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN OF EXPLORATION

8 7 6 5 VALUE ENGINEERING PAYS 4 3 2 1

D

STA. 25+00

MATCHLINE TO SHEET G3

DR 02R-5

DR 02R-6

WARM SPRINGS ROAD

DURANGO DRIVE

DR 02H-3

DR 02R-7

DR 01H-8

DR 02R-8

CASCADE RIVER DRIVE

APPLE RIVER COURT

RUBY LAKE DRIVE

CHASE OAKS DRIVE

STA. 32+00

MATCHLINE TO SHEET G5

N

C

B

A

LEGEND:

DR 02R-7

ROTARY HOLE NUMBER: YEAR AND NUMBER.

DR 02H-8

BUCKET AUGER TEST HOLE, YEAR AND NUMBER.

NOTES:

1. SEE SHEET G8 FOR GENERAL NOTES AND SOIL CLASSIFICATION.

50 25 0 50 100m

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: O.N.

SUBMITTED BY: ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

SPEC. NO. DACW09-03-B-0005

FILE NAME: GBDDXPLN04.DGN

DISTRICT FILE NO. 214/164

SHEET G4

SAFETY! PAYS

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/DDR/GEOTECH

VALUE ENGINEERING PAYS

STA. 32+00

STA. 39+00

DR 01H-9

DR 02R-9

DR 01H-10

DR 02R-10

DURANGO DRIVE

DUNES INN STREET

CASCADE RIVER DRIVE

HIGHLAND HILLS COURT

RUBY LAKE DRIVE

GERMAN SHEPHERD AVENUE

RHODES RANCH PKWY

BAY FOREST AVENUE

EMPIRE LAKES AVENUE

WOODLACK SPRINGS DR

MATCHLINE TO SHEET G4

MATCHLINE TO SHEET G6

LEGEND:

DR 02H-9 — BUCKET AUGER TEST HOLE, YEAR AND NUMBER.

DR 02R-9 — ROTARY TEST HOLE, YEAR AND NUMBER.

NOTES:

1. SEE SHEET G8 FOR GENERAL NOTES AND SOIL CLASSIFICATION.

50 25 0 50 100m

Call before you Dig 1-800-227-2600

This drawing was prepared in METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
TROPICANA AND FLAMINGO WASHES, NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN OF EXPLORATION

U.S. ARMY, ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: G.N.

FILE NAME: G8DDXPLN05.DGN

SUBMITTED BY: ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/165

SHEET G5

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/DDR/GEOTECH

SAFETY PAYS

VALUE ENGINEERING PAYS

STA. 39+00

MATCHLINE TO SHEET G5

STA. 46+00

MATCHLINE TO SHEET G7

DURANGO DRIVE

DUNES INN STREET

KARNALI STREET

WHITE BLUFFS STREET

WINDMILL LANE

MICHAEL JAMES AVENUE

RILEY ST

DR 02H-11

DR 02R-11

DR 01H-12

FAIRFIELD GLADE AVENUE

FOREST MEADOW AVENUE

HIGH HAMPTON AVENUE

OLD SILK CT

SUN KOSHI CT

HIGHLANDWOODS AVENUE

KAVALAGOONS AVENUE

MISTRAL AV

LEGEND:

DR 02H-9 — BUCKET AUGER TEST HOLE, YEAR AND NUMBER.

DR 02R-9 — ROTARY TEST HOLE, YEAR AND NUMBER.

NOTES:

1. SEE SHEET G8 FOR GENERAL NOTES AND SOIL CLASSIFICATION.

50 25 0 50 100m

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
TROPICANA AND FLAMINGO, WASHES, NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: N.G.

SUBMITTED BY: ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

FILE NAME: GBDDYPLN06.DGN

DISTRICT FILE NO. 214/166

SPEC. NO. DACW09-03-B-0005

SHEET G6

J:/PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/DDR/GEOTECH

SAFETY! PAYS

VALUE ENGINEERING PAYS

SAFETY PAYS

STA. 46+00

MATCHLINE TO SHEET G6

46+00 47+00 48+00 49+00 50+00 51+00

DR 01H-13
DR 02R-12
DR 01H-14
DR 01T-15
DR 02T-7
DR 02T-1
DR 02T-8A
DR 01T-16
DR 02R-DB3
DR 02T-2
DR 02T-3
DR 02T-4
DR 02R-DB1
DR 02T-5
DR 02T-6
DR 02T-10
DR 02R-DB2

N

LEGEND:

DR 02H-13 — BUCKET AUGER, YEAR AND NUMBER

DR 02T-3 — TEST TRENCH, YEAR AND NUMBER

DR 02R-12 — ROTARY TEST HOLE, YEAR AND NUMBER

DR 02R-DB1 — ROTARY TEST HOLE, YEAR AND NUMBER

NOTES:

1. SEE SHEET G8 FOR GENERAL NOTES AND SOIL CLASSIFICATION.

50 25 0 50 100m

Call before you Dig 1-800-227-2600

This drawing was prepared in METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

PLAN OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: H.G.

FILE NAME: GBDIVXPLN07.DGN

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO. 214/167

SHEET G7

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/DDR/GEOTECH

DR01H-6
ELEV. 804m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL. -4	MECH. ANAL. -200	DESCRIPTION
0.9	GP-GM		N/P	N/P	49	12	POORLY GRADED GRAVEL WITH SILT AND SAND: light brown, coarse to fine-grained sand, 15% cobbles up to 152mm, water was used to facilitate drilling and prevent caving, cemented material encountered @ 0.8m and coring bucket was used to advance drilling. ⚠
			N/P	N/P	50	8	same as above, cemented; coring bucket was used, 406mm thick core was retrieved @ 1.8m.
3.0			N/P	N/P	50	7	same as above, cemented.
4.0							
4.6			N/P	N/P	51	8	

DR01H-8
ELEV. 813m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL. -4	MECH. ANAL. -200	DESCRIPTION
2.1	GP-GM		N/P	N/P	43	9	POORLY GRADED GRAVEL WITH SILT AND SAND: brown, moist, loose, coarse-grained sand, gravel up to 76mm, 10% cobbles up to 229mm; 15% boulders on surface only. ⚠
3.7			N/P	N/P	44	5	same as above, 20% cobbles up to 229mm.
4.6	GW		N/P	N/P	39	4	WELL GRADED GRAVEL WITH SAND: 5% boulders @ 4m, cemented; hard drilling due to large boulders up to 356mm, coring bucket was used to advance drilling.
5.5	GP-GM		N/P	N/P	53	9	POORLY GRADED GRAVEL WITH SILT AND SAND: ⚠ same as above, 20% cobbles up to 229mm, 5% boulders up to 356mm.
6.1			N/P	N/P	39	7	same as sample #1, 5% boulders up to 280mm, cemented; coring bucket was used @ 5.8m to advance drilling. ⚠

GENERAL NOTE:
MATERIALS WITH VARIOUS DEGREES OF CEMENTATION WERE ENCOUNTERED AT VARIOUS DEPTHS IN MOST TEST HOLES AND TEST TRENCHES.

NOTES:

1. SEE SHEETS G1 THROUGH G7 FOR LOCATION OF EXPLORATION.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS. More than half of material is larger than no. 200 sieve size.	GRAVELS. More than half of coarse fraction is larger than no. 4 sieve size.	Clean Gravels	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS. More than half of coarse fraction is smaller than no. 4 sieve size.	Clean Sands	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands, gravelly sands, little or no fines.
		Sands with fines.	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS. More than half of materials smaller than no. 200 sieve size.	SILTS AND CLAYS	Low liquid limit.	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts, with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
		High liquid limit.	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
Highly organic soils			Pt	Peat and other highly organic soils.

NOTES:

1. BOUNDARY CLASSIFICATION: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS. FOR EXAMPLE, GW-GC, WELL GRADED GRAVEL-SAND MIXTURE WITH CLAY BINDER.
2. ALL SIEVE SIZES ON THE CHART ARE U.S. STANDARD.
3. THE TERMS "SILT" AND "CLAY" ARE USED RESPECTIVELY TO DISTINGUISH MATERIALS EXHIBITING LOWER PLASTICITY FROM THOSE WITH HIGHER PLASTICITY. THE MINUS NO. 200 SIEVE MATERIAL IS SILT IF THE LIQUID LIMIT AND PLASTICITY INDEX PLOT BELOW THE "A" LINE ON THE PLASTICITY CHART, AND IS CLAY IF THE LIQUID LIMIT AND PLASTICITY INDEX PLOT ABOVE THE "A" LINE ON THE CHART.
4. THE SOIL CLASSIFICATION SYSTEM IS BASED ON THE AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM).
   A. (ASTM) D2487 STANDARD TEST METHOD FOR CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES.
   B. (ASTM) D2488 STANDARD RECOMMENDED PRACTICE FOR DESCRIPTION OF SOILS (VISUAL MANUAL PROCEDURE).

LEGEND:

MC	MOISTURE CONTENT.
LL	LIQUID LIMITS.
PI	PLASTIC INDEX. (LIQUID LIMIT-PLASTIC LIMIT)
-4	PERCENT OF MATERIAL, BY WEIGHT, PASSING No. 4 SIEVE.
-200	PERCENT OF MATERIAL, BY WEIGHT, PASSING No. 200 SIEVE.
N/P	NONPLASTIC.

GENERAL NOTES:

1. LOGS OF EXPLORATION INDICATE GEOTECHNICAL CONDITIONS AT THAT TIME AND LOCATION. CONDITIONS CAN CHANGE. STRATIFICATION LINES SHOWN ON LOGS REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES.
2. GROUNDWATER NOT ENCOUNTED.
3. TEST HOLES WERE DRILLED IN OCTOBER 2002, USING A TRUCK-MOUNTED POWER AUGER EZ BORE 4290 WITH A 600mm DIAMETER BUCKET AND EQUIPPED WITH 600mm CORE BARREL.
4. TEST HOLES WERE DRILLED IN JULY AND AUGUST 2001, USING A TRUCK-MOUNTED POWER AUGER WITH A 600mm DIAMETER BUCKET AND EQUIPPED WITH 600mm AND 460mm CORING BUCKET.
5. TEST TRENCHES WERE EXCAVATED IN JULY 2001, USING A BACKHOE WITH 450mm WIDE BUCKET.
6. MECHANICAL ANALYSIS WAS PERFORMED ON -76mm FRACTION OF SOIL.
7. MOISTURE CONTENT DETERMINATIONS WERE MADE ON -25mm FRACTION OF SOIL.
8. MOISTURE VALUES MAY NOT BE ACCURATE WHEN WATER WAS USED TO FACILITATE DRILLING.
9. THE PERCENT BY WEIGHT COBBLES AND BOULDERS WERE VISUALLY ESTIMATED DURING EXPLORATION.
10. ⚠ NO SUBSURFACE INVESTIGATION HAS BEEN CONDUCTED BY THE CORPS OF ENGINEERS FROM STA. 10+00 TO STA. 16+00 (APPROX) OF THE UPPER BLUE DIAMOND DIVERSION CHANNEL, STA. 10+00 TO STA. 12+33 OF THE BELTWAY LATERAL AND THE BELTWAY BORROW PIT AREA, DUE TO PREVIOUS ACCESSIBILITY CONSTRAINTS. THESE AREAS ARE CONSIDERED TO BE COMPROMISED OF HIGHLY CEMENTED MATERIALS AND THE CONTRACTOR SHALL BE REQUIRED TO UTILIZE BLASTING OR OTHER ROCK EXCAVATION TECHNIQUES THROUGHOUT.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		
⚠	ADDED NOTE 10 TO GENERAL NOTES.	7-1-03	
⚠	FIELD DESCRIPTIONS WERE MODIFIED.	7-1-03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

LOGS OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.V.Y.
DRAWN BY: ef
CHECKED BY: N.G.

SUBMITTED BY: ABBAS T. ROODSARI, CHIEF, GEOTECHNICAL BRANCH

FILE NAME: GOBA.DGN

DISTRICT FILE NO. 314/168 REV. A | SPEC. NO. DACW09-03-B-0005

SHEET G8

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/AMMENDMENT1

DR01H-9
ELEV. 815m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	GW-GM		N/P	N/P	36	7	WELL GRADED GRAVEL WITH SILT AND SAND: light brown, moist, loose, 5% cobbles up to 152.4mm. ⚠
1.8	GP		N/P	N/P	43	3	POORLY GRADED GRAVEL WITH SAND: same as above.
2.7	GW-GM		N/P	N/P	42	6	WELL GRADED GRAVEL WITH SILT AND SAND: same as sample #1.
3.7	GP-GM		N/P	N/P	44	6	POORLY GRADED GRAVEL WITH SILT AND SAND: brown; hard but not cemented, moist, gravel up to 76mm, 5% cobbles up 152mm, some silt. ⚠
4.6			N/P	N/P	50	12	cemented: sand and gravel cemented, coarse, gravel deposits, water was used to prevent caving, coring bucket was used to advance drilling @ 3.7m.

DR01H-10
ELEV. 819m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	GM		N/P	N/P	45	14	SILTY GRAVEL WITH SAND: dry, loose; 15% cobbles up to 152.4mm. ⚠
2.4	SP-SM		N/P	N/P	59	9	POORLY GRADED SAND WITH SILT AND GRAVEL: same as above, cemented material encountered from 0.9 to 2.4m, coring bucket was used to advance drilling.
4.0	SW		N/P	N/P	53	3	WELL GRADED SAND WITH GRAVEL: same as first sample, coring bucket was used to advance drilling, a core was retrieved @ 2.7m.
4.3	GP-GM		N/P	N/P	40	9	POORLY GRADED GRAVEL WITH SILT AND SAND: same as first sample, used bucket auger to collect material, drilling terminated @ 4.3m due to highly cemented material encountered.
							REFUSAL due to cemented layer encountered.

DR01H-11
ELEV. 827m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
4.9							BACK FILL MATERIAL: light brown, coarse to fine sand, 10%cobbles up to 178mm, well compacted; used coring bucket @ 0.8m to advance drilling. ⚠
5.8	GP-GM		N/P	N/P	50	8	POORLY GRADED GRAVEL WITH SILT AND SAND: coarse to fine-grained sand; 10% cobbles up to 203mm, cemented; coarse-grained deposits, more dense, cemented sand and gravel @ 5.4m sections. ⚠
6.4	GM		N/P	N/P	45	13	SILTY GRAVEL WITH SAND: same as first sample; cemented; coring bucket was used to advance drilling, very hard drilling.
7.6	GP-GM		N/P	N/P	45	10	POORLY GRADED GRAVEL WITH SILT AND SAND: same as first sample.

DR01H-12
ELEV. 829m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.6	GM		N/P	N/P	62	24	SILTY GRAVEL WITH SAND: light brown; moist, loose material up to 0.6m. ⚠
1.1	SP-SM		N/P	N/P	53	5	POORLY GRADED SAND WITH SILT AND GRAVEL: same as above; cemented material, coring bucket was used @ 0.6m to advance drilling, pockets of red fine sand @ 0.8m to 1.1m.
							REFUSAL due to cemented layer encountered.

GENERAL NOTE:
MATERIALS WITH VARIOUS DEGREES OF CEMENTATION WERE ENCOUNTERED AT VARIOUS DEPTHS IN MOST TEST HOLES AND TEST TRENCHES.

NOTES:
1. SEE SHEETS G1 THROUGH G7 FOR LOCATION OF EXPLORATION.
2. SEE SHEET G8 FOR SOIL CLASSIFICATION AND GENERAL NOTES.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	REVISIONS / DESCRIPTIONS	DATE	APPROVAL
	FIELD DESCRIPTIONS WERE MODIFIED.	7-1-03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
LOGS OF EXPLORATION

DESIGNED BY: J.X.
DRAWN BY: eh
CHECKED BY: G.N.

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

FILE NAME: G09A.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214169 REV.A

SHEET G9

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/AMMENDMENT1

DR01H-13
ELEV. 831m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.6	SM		N/P	N/P	58	15	SILTY SAND WITH GRAVEL: light brown, dry, loose, gravel up to 76mm; used water to facilitate drilling and prevent caving.
1.8	GP-GM		N/P	N/P	47	11	POORLY GRADED GRAVEL WITH SILT AND SAND: light brown, dry, soft to moderatley hard, coring bucket was used @ 0.6m to advance drilling.
2.4			N/P	N/P	52	11	
3.7	GW		N/P	N/P	49	2	WELL GRADED GRAVEL WITH SAND: white to light brown, dry, hard to moderately hard, gravel up to 76mm.
4.0	SW-SM		N/P	N/P	54	7	WELL GRADED SAND WITH SILT AND GRAVEL: same as above, stopped at 4.0m, hard drilling.
							REFUSAL due to cemented layer encountered.

DR01H-14
ELEV. 834m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	SM		N/P	N/P	70	17	SILTY SAND WITH GRAVEL: light brown, dry, loose, gravel up to 76mm, 15% cobbles up to 229mm.
1.8	SP-SM		N/P	N/P	55	8	POORLY GRADED SAND WITH SILT AND GRAVEL: light brown, dry, gravel up to 76mm, 15% cobbles up to 152mm, coring bucket was used @ 0.9m to advance drilling.
2.7	GP-GM		N/P	N/P	55	10	POORLY GRADED GRAVEL WITH SILT AND SAND: same as above.
4.0	GM		N/P	N/P	54	13	SILTY GRAVEL WITH SAND: same as above, 15% cobble up to 152mm.
4.6	GP-GM		N/P	N/P	41	9	POORLY GRADED GRAVEL WITH SILT AND SAND: same as sample 2, 15% cobbles up to 127mm.

DR01T-15
ELEV. 834m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	GP		N/P	N/P	26	1	POORLY GRADED GRAVEL WITH SAND: light brown, dry, loose, 15% cobbles up to 254mm, 5% boulders up to 356mm.
1.8	GW		N/P	N/P	37	3	WELL GRADED GRAVEL WITH SAND: 15% cobbles up to 229mm.
2.7			N/P	N/P	42	3	same as above, 20% cobbles up to 152mm.
3.7			N/P	N/P	38	3	same as above, 10% boulders up to 432mm.
4.6	GP		N/P	N/P	32	4	POORLY GRADED GRAVEL WITH SAND: same as sample #1, 15% cobbles up to 229mm.

DR01T-16
ELEV. 837m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	GP		N/P	N/P	40	4	POORLY GRADED GRAVEL WITH SAND: light brown, loose, dry, gravel up to 76mm, 30% cobbles up to 229mm, 10% boulders on surface.
1.8			N/P	N/P	26	1	same as above, 20% cobbles up to 229mm; some boulders.
2.7	GW		N/P	N/P	44	2	WELL GRADED GRAVEL WITH SAND: brown, dry, loose, gravel up to 76mm, 25% cobbles up to 229mm, 5% boulders up to 381mm.
3.7			N/P	N/P	38	3	
4.6			N/P	N/P	37	3	

GENERAL NOTE:
MATERIALS WITH VARIOUS DEGREES OF CEMENTATION WERE ENCOUNTERED AT VARIOUS DEPTHS IN MOST TEST HOLES AND TEST TRENCHES.

NOTES:
1. SEE SHEETS G1 THROUGH G7 FOR LOCATION OF EXPLORATION.
2. SEE SHEET G8 FOR SOIL CLASSIFICATION AND GENERAL NOTES.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL
	FIELD DESCRIPTIONS WERE MODIFIED.	7-1-03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
LOGS OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: ABBAS T. ROODSARI, CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY: fy
DRAWN BY: eh
CHECKED BY: g.n.

SPEC. NO: DACW09-03-B-0005

FILE NAME: G10ADDN

DISTRICT FILE NO. 214170 REV. A

SHEET G10

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/AMMENDMENT1

DR 02T-1
ELEV. 836.5m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.6	GP	1		N/P	37	2	POORLY GRADED GRAVEL WITH SAND: brown, dry with little moist, subangular gravel up to 76.2mm; some dark gray gravel, no vegetation on surface but some roots.
1.2	GW	1		N/P	34	4	WELL GRADED GRAVEL WITH SAND: dark reddish brown, dry with little moisture, subangular gravel, 15% cobbles up to 228.6mm.
2.1	GP	1		N/P	26	1	POORLY GRADED GRAVEL WITH SAND: light brown, dry with little moisture, rounded gravel, 20% cobbles up to 152.4mm.
3.0		1		N/P	38	3	darker light brown, dry with little moisture, rounded to subrounded gravel, 15% cobbles up to 203.2mm, dark gravel.
4.6		2		N/P	37	2	darker light reddish brown, dry with little moisture, rounded gravel, 15% cobbles up to 203.2mm, fine to medium coarse grained sand; 1 boulder up to 457.2mm.

DR 02T-2
ELEV. 836.5m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.6	GP-GM	0		N/P	25	6	POORLY GRADED GRAVEL WITH SILT AND SAND: light brown, dry, rounded to subangular gravel up to 76.2mm, 5% boulders up to 304.6mm.
1.2	GP	1					POORLY GRADED GRAVEL WITH SAND: some as above, finer than the layer above, 30% fine grained sand, 30% rounded to subangular gravel up to 76.2mm, fewer boulders up to 381mm.
1.8		0		N/P	41	4	light brown, dry, gravel up to 76.2mm, boulders up to 381mm.
2.4	GW	0		N/P	39	2	WELL GRADED GRAVEL WITH SAND: light brown, dry, cobbles up to 152.4mm, boulders on side of the wall up to 457.2mm & 2.13m.
3.0		0		N/P	45	3	larger boulders up to 330.2mm, bigger material and harder to dig.
4.6	GP	1		N/P	42	3	POORLY GRADED GRAVEL WITH SAND: darker brown, dry, rounded to subangular gravel, cobbles.

DR 02T-3
ELEV. 837.5m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.6	GW	1		N/P	47	3	WELL GRADED GRAVEL WITH SAND: reddish-brown, little moisture, rounded to subrounded gravel up to 76.2mm, dark gray color gravel, 5% cobbles up to 152.4mm.
1.2	GP	1		N/P	36	3	POORLY GRADED GRAVEL WITH SAND: same as above, more large material, subangular gravel up to 76.2mm, 5% cobbles up to 228.6mm.
1.8	GP-GM	1		N/P	44	5	POORLY GRADED GRAVEL WITH SILT AND SAND: same as above, more larger material, less gravel, 10% subangular cobbles.
3.0	SP-SM	1		N/P	56	5	POORLY GRADED SAND WITH SILT AND GRAVEL: same as above, finer material, darker reddish-brown, moist; 15% cobbles: one rock breaks into angular piece: dark gray.
4.6	GP	1		N/P	37	2	POORLY GRADED GRAVEL WITH SAND: same as above, 5% cobbles up to 228.6mm.

DR 02T-4
ELEV. 837.0m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.6	GP	1		N/P	44	4	POORLY GRADED GRAVEL WITH SAND: reddish-brown, dry, subangular to rounded gravel, 304.8mm boulder.
1.2	GW	0		N/P	36	2	WELL GRADED GRAVEL WITH SAND: same as above, fine grained sand, subangular gravel up to 76.2mm, 30% cobbles up to 254.0mm.
2.1		1		N/P	43	3	dark reddish-brown, dry, alluvial sand, subangular to rounded gravel up to 76.2mm, 5% cobbles up to 254.0mm.
3.0		1		N/P	52	4	light brown, dry, subangular gravel up to 76.2mm, 5% cobbles up to 228.6mm.
3.7	GP	1		N/P	30	2	POORLY GRADED GRAVEL WITH SAND: light brown, dry, rounded to subangular gravel up to 76.2mm, 30% cobbles up to 203.2mm, hard to dig.
4.6		1		N/P	33	3	light brown, dry, subrounded gravel up to 76.2mm, 20% cobbles up to 228.6mm.

GENERAL NOTE:
MATERIALS WITH VARIOUS DEGREES OF CEMENTATION WERE ENCOUNTERED AT VARIOUS DEPTHS IN MOST TEST HOLES AND TEST TRENCHES.

NOTES:
1. SEE SHEETS G1 THROUGH G7 FOR LOCATION OF EXPLORATION.
2. SEE SHEET G8 FOR SOIL CLASSIFICATION AND GENERAL NOTES.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	REVISIONS	DESCRIPTIONS	DATE / APPROVAL
A	MC WAS ROUNDED TO THE NEAREST WHOLE NUMBER	FIELD DESCRIPTIONS WERE MODIFIED.	7-1-03

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
LOGS OF EXPLORATION

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: G.N.

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

FILE NAME: G11A.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214171 REV. A

SHEET G11

J://PEBBLES/TROPICANAFLAMINGO/BDC/UPPER/AMMENDMENT1

DR 02T-5
ELEV. 838.0m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
3.7	GW	1		N/P	42	3	WELL GRADED GRAVEL WITH SAND: light brown, very dry, very loose, gravel up to 76.2mm, 20% cobbles.
3.7		1		N/P	45	3	light brown, very dry, loose, gravel up to 76.2mm, 5% cobbles.
3.7		1		N/P	47	2	
3.7		1		N/P	43	3	light brown, very dry, gravel up to 76.2mm, 5% cobbles, some boulders, easy to dig with back-hoe.
4.6	GP	1		N/P	33	2	POORLY GRADED GRAVEL WITH SAND: same as above.

DR 02T-6
ELEV. 840.0m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.8	GM	0		N/P	59	18	SILTY GRAVEL WITH SAND: brown, very dry, loose the first 0.3m; then got very hard, well cemented, can not dig with backhoe.

DR 02T-7
ELEV. 836.0m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	GP	0.21		N/P	44	1	POORLY GRADED GRAVEL WITH SAND: brown, very dry, very loose, well graded subrounded gravel up to 76.2mm, 5% cobbles.
1.8	SP	0.75		N/P	67	3	POORLY GRADED SAND WITH GRAVEL: same as above, 15% cobbles.
2.7	GP	1.21		N/P	35	4	POORLY GRADED GRAVEL WITH SAND: brown, very dry, loose, subrounded gravel up to 76.2mm, 10% cobbles.
3.7		1.74		N/P	32	3	WELL GRADED GRAVEL WITH SAND: brown, very dry, loose, subrounded gravel, 20% cobbles.
4.6	GW	1.17		N/P	40	3	WELL GRADED GRAVEL WITH SAND: same as above, 5% cobbles, more boulders, harder to dig @ 3.9m.

DR 02T-8A
ELEV. 838.5m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	GW			N/P	39	3	WELL GRADED GRAVEL WITH SAND: brown, very dry, loose @ 0.3m and stiff @ 0.6m, very hard to dig @ 0.9m, cannot dig with backhoe, well cemented.

DR 02T-10
ELEV. 838.5m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	GP	0.15		N/P	42	2	POORLY GRADED GRAVEL WITH SAND: light brown, very dry, very loose, gravel up to 76.2mm, 5% cobbles, 5% boulders on surface.
1.8		0.51		N/P	44	3	some as above, no boulders.
2.7				N/P	45	3	light brown, dry, loose, gravel up to 76.2mm, 5% cobbles, some boulders.
3.7		0.86		N/P	30	2	
4.6	GW	0.73		N/P	37	3	WELL GRADED GRAVEL WITH SAND: light brown, dry, gravel up to 76.2mm, 15 % cobbles, 10% boulders, very hard digging with backhoe, cemented bottom.

GENERAL NOTE:
MATERIALS WITH VARIOUS DEGREES OF CEMENTATION WERE ENCOUNTERED AT VARIOUS DEPTHS IN MOST TEST HOLES AND TEST TRENCHES.

NOTES:
1. SEE SHEETS G1 THROUGH G7 FOR LOCATION OF EXPLORATION.
2. SEE SHEET G8 FOR SOIL CLASSIFICATION AND GENERAL NOTES.

Call before you Dig 1-800-227-2600

This drawing was produced in METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL
	MC WAS ROUNDED TO THE NEAREST WHOLE NUMBER	7-1-03	
	FIELD DESCRIPTIONS WERE MODIFIED.		

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
LOGS OF EXPLORATION

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: G.N.

SUBMITTED BY: ABBAS T. ROODSARI, CHIEF, GEOTECHNICAL BRANCH

FILE NAME: G12A.DGN
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 214172 REV. A

SHEET G12

VALUE ENGINEERING PAYS

DR-02-H1
ELEV. 793.5m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9	GM			N/P	48	15	SILTY GRAVEL WITH SAND: hightly cemented very dry, subangular gravel up to 76.2mm, very slow drilling, used water in hole.
1.8							cored through this layer, 508mm thick of very highly cemented material, very hard coring.
2.4							228mm thick core recovered.
3.0	GM			N/P	48	14	SILTY GRAVEL WITH SAND: light brown, very dry, very hard to core, very highly cemented.
4.0	GP-GM			N/P	43	7	POORLY GRADED GRAVEL WITH SILT AND SAND: highly cemented, used cutter bucket.
4.9	SP-SM			N/P	57	10	POORLY GRADED SAND WITH SILT AND GRAVEL: same as above.
5.5	GP-GM			N/P	52	10	POORLY GRADED GRAVEL WITH SILT AND SAND: light brown, very dry, subangular gravel up to 76.2mm, highly cemented, slow drilling.
6.4	GW-GM			N/P	44	7	WELL GRADED GRAVEL WITH SILT AND SAND: highly cemented, 10% subangular cobbles, same as above.

DR-02-H2
ELEV. 798.0m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.9							cored through this layer, cored from surface to 0.6m, very highly cemented, silty gravel, used cutter bucket at start and changed @ 0.9m.
1.8	GM			N/P	58	20	SILTY GRAVEL WITH SAND: light brown, very dry, subangular gravel up to 76.2mm, highly cemented, very hard drilling.
2.1							cored through this layer, highly cemented, used core bucket.
3.7	GM			N/P	53	13	SILTY GRAVEL WITH SAND: subangular gravel up to 76.2mm, very highly cemented, very hard drilling.
				N/P	56	16	
4.6	GP-GM			N/P	52	10	POORLY GRADED GRAVEL WITH SILT AND SAND: same as above.
5.5	SP-SM			N/P	57	9	POORLY GRADED SAND WITH SILT AND GRAVEL: light brown to white, very dry, subangular gravel up to 76.2mm.
6.4	SW-SM			N/P	55	9	WELL GRADED SAND WITH SILT AND GRAVEL: same as above.

DR-02-H3
ELEV. 804.3m

DEPTH (m)	SOIL CLASS	MC	LL	PI	MECH. ANAL -4	MECH. ANAL -200	DESCRIPTION
0.6	GW-GM			N/P	42	9	WELL GRADED GRAVEL WITH SILT AND SAND: very dry, subangular gravel up to 76.2mm; very highly cemented, some cobbles on surface, very hard drilling.
1.5							highly cemented caliche 508mm thick layer, no sample taken.
2.7	GP-GM			N/P	51	8	POORLY GRADED GRAVEL WITH SILT AND SAND: highly cemented, same as sample from ground level to 0.6m.
3.6	GW-GM			N/P	51	8	WELL GRADED GRAVEL WITH SILT AND SAND: dry, subangular gravel up to 76.2mm, very highly cemented.
4.6				N/P	43	6	highly cemented, same as above.
5.5	SP-SM			N/P	57	10	POORLY GRADED SAND WITH SILT AND GRAVEL: very dry, subangular gravel up to 76.2mm; very highly cemented, very hard to drill, slow drilling.

GENERAL NOTE:
MATERIALS WITH VARIOUS DEGREES OF CEMENTATION WERE ENCOUNTERED AT VARIOUS DEPTHS IN MOST TEST HOLES AND TEST TRENCHES.

NOTES:
1. SEE SHEETD G1 THROUGH G7 FOR LOCATION OF EXPLORATION.
2. SEE SHEET G8 FOR SOIL CLASSIFICATION AND GENERAL NOTES.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL
	FIELD DESCRIPTIONS WERE MODIFIED.	7-1-03	

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
LOGS OF EXPLORATION

DESIGNED BY: J.Y.
DRAWN BY: eh
CHECKED BY: G.N.
FILE NAME: G13A.DGN

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI
CHIEF, GEOTECHNICAL BRANCH

DISTRICT FILE NO. 214173 REV. A | SPEC. NO. DACW09-03-B-0005

SHEET G13

Form Submitted by Heddaam Thursday September 04 2003 11:01:26 AM PDT

YUCCA

WHITE BURSAGE & CREOSOTE

CACTUS

LANDSCAPING OF APPROX. CRWN OF COMPACTED FILL AREA, HYDROSEEDING

SLOPE TO DRAIN

MAINTENANCE ROAD

MAINTENANCE RAMP

MAINTENANCE ROAD

MAINTENANCE ROAD

FLOW

N57°54'21.60"W

S63°25'21"W

6H:1V

5H:1V

2+50 (INLET)

P.I. "B"

2+00 (INLET)

OUTLET TOWER

6.00

52.00

14.00

N26°34'52.02"W

P.I. "A"

1+50 (INLET)

N1°10'59.86"E

INLET LEVEE

1+00 (INLET)

STA 0+80.000

53.00

51.00

LANDSCAPING AREA, HYDROSEEDING

WIGWAM AVENUE

REFERENCE NOTE:

A 1. INSTALL TORTOISE FENCE ALONG THE TCE/RW SHOWN ON SHEET T4 AND T5 UP TO STA. 47+38.62

Call before you Dig 1-800-227-2600

SCALE: 1"= 500 500 250 0 500

This drawing is prepared in METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE APPROVAL
A	REVISED AS NOTED	

LAS VEGAS WASH AND TRIBUTARIES, (TROPICANA AND FLAMINGO WASHES), NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME:

SPEC. NO. DACW09-03-B-0005

DISTRICT FILE NO.

SHEET L1

ESTIMATED TOTAL PLANTS TO BE SALVAGED

SCIENTIFIC NAME	COMMON NAME	QTY.
Echinocereus trigochidiatus	Hedgehog cactus	0
Ferocactus cylindraceus	Barrel cactus	0
Optuntia echinocarpa	Silver cholla	1
Yucca schidigeri	Mohave yucca	6
Ambrosia dumosa	White bursage	20
Larrea tridentata	Creosote bush	20
TOTAL # OF PLANTS TO BE SALVAGED		47

PLANTING CRITERIA

TREATMENT DESCRIPTION	VOLUME	AREA	QUANTITY
Place Topsoil to Finish Grade	203 mm depth	1 hectare	6,570 cu meters
Hedgehog coctus	0/hectare	1 hectare	0
Barrel coctus	0/hectare	1 hectare	0
Silver cholla	1/hectare	1 hectare	1
Mohave yucca	6/hectare	1 hectare	6
White bursage	20/hectare	1 hectare	20
Creosote bush	20/hectare	1 hectare	20
Seeding and Fertilization	----	1 hectare	1 hectare
Soil Stabilizer	----	1 hectare	1 hectare
Provide and Place Boulder groups (3 Boulders per group)	0 groups/hectare	1 hectare	0 groups
Provide irrigation for 1 year	----	1 hectare	1 hectare
Provide browse protection (Nursury grown white bursage and creosote bush plants only)	----		1
TOTAL PLANTS			47

LANDSCAPE NOTES:

1. THE TEMPORARY PLANT STORAGE AREA AT THE PROJECT SITE SHALL BE PREPARED AND THE TEMPORARY SECURITY FENCING INSTALLED AROUND THE PERIMETER OF THE STORAGE AREA PRIOR TO COMMENCING WITH PLANT EXTRACTION AND SALVAGE.
2. PLANTING CONFIGURATIONS SHALL MIMIC THE SURROUNDING LANDSCAPE IN SPECIES COMPOSITION AND LAYOUT AT THE SITE.
3. THE CONTRACTING OFFICER SHALL APPROVE ALL LOCATIONS FOR CACTUS AND YUCCA TRANSPLANTS PRIOR TO THE CONTRACTOR DIGGING PLANT PITS. THE CONTRACTOR SHALL MARK THE PROPOSED PLANT LOCATIONS IN THE FIELD WITH 610mm (24-INCH) PIN FLAGS FOR REVIEW BY THE CONTRACTING OFFICER. DIFFERENT COLOR PIN FLAGS SHALL BE USED FOR EACH DIFFERENT SPECIES.
4. IN THE EVENT MORE AREA IS DISTURBED AND REQUIRES MORE REVEGETATION THAN SHOWN ON SHEET L-1, THE ADDITIONAL AREAS SHALL BE PLANTED TO BLEND WITH THE SURROUNDING LANDSCAPE.
5. ALL SLOPES AND RECLAIMED AREAS WHERE SOILS CONTRAST WITH ADJACENT NATURAL AREAS SHALL BE TREATED WITH SIMULATED DESERT VARNISH (PERMEON). AREAS SHALL BE TREATED AS DIRECTED BY THE CONTRACTING OFFICER. PIGMENT COLOR SHALL BE SPRAYED ON TEST PLOTS AND APPROVED BY THE CONTRACTING OFFICER, IN CONSULTATION WITH THE BLM.
6. CREOSOTE BUSH AND WHITE BURSAGE SHALL BE SALVAGED FROM EMBANKMENT AND BASIN AREAS FIRST. IF ADDITIONAL PLANTS ARE REQUIRED, SALVAGE FROM OTHER AREAS IN THE CONSTRUCTION AREA.
7. THE TEMPORARY NURSURY AREA SHALL BE RECLAIMED AT THE END OF THE PROJECT. THE CHAINLINK FENCE SHALL BE REMOVED, COMPACTED SOILS SHALL BE TILLED TO A DEPTH OF 203mm. THE AREA SHALL BE SEEDED AND PLANTED IN ACCORDANCE WITH THE PLANTING CRITERIA AND SPECIFICATIONS.

SYMBOL	DESCRIPTIONS : REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES
(TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
LANDSCAPE TREATMENT CRITERIA AND NOTES

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:

THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

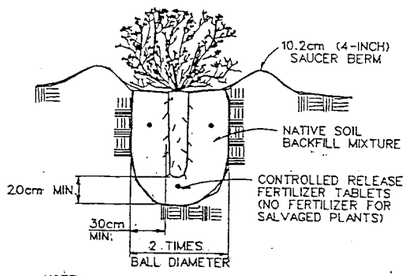
DESIGNED BY: MS
DRAWN BY: MS
CHECKED BY: GED

DISTRICT FILE NO. 214178 | SPEC. NO. DACW09-03-B-0005 | FILE NAME: L02.dgn

SHEET
L2

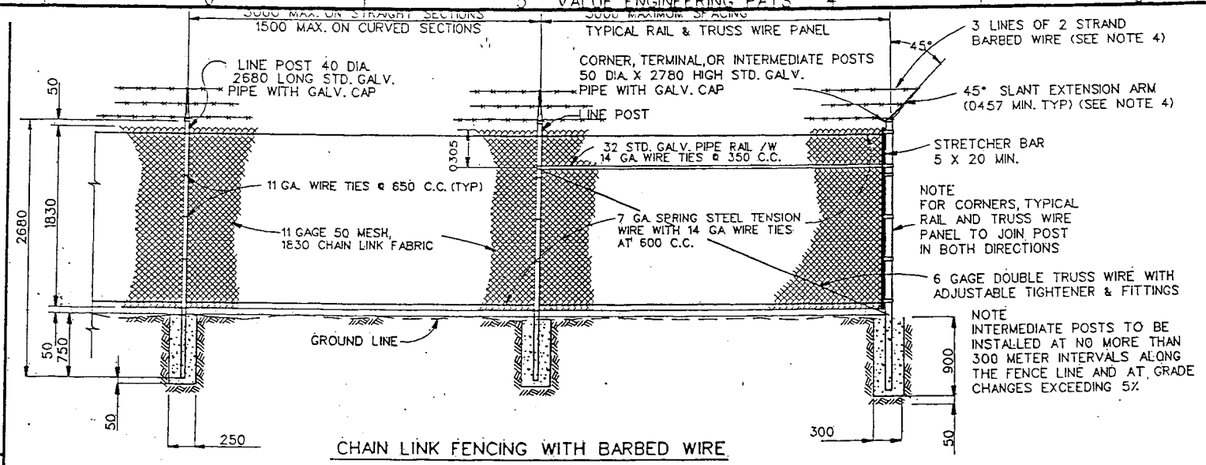
Call before you Dig
1-800-227-2600

METRIC



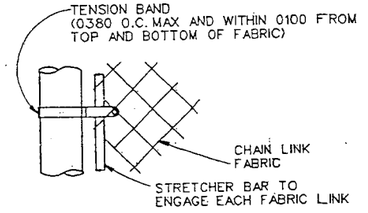
NOTE:
1. FOR SALVAGED PLANT MATERIALS, THE PLANT SHALL BEAR SAME RELATION TO FINISHED GRADE AS IT BORE PRIOR TO PLANTING.

PLANTING SHRUBS
NOT TO SCALE

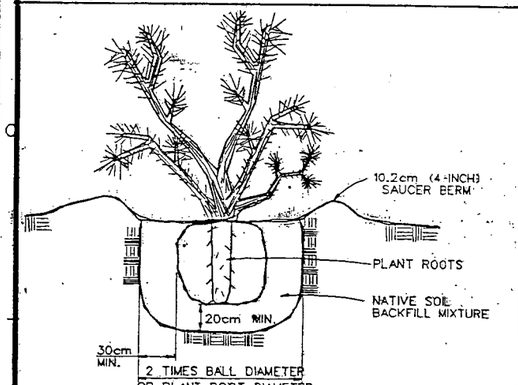


CHAIN LINK FENCING WITH BARBED WIRE
NOT TO SCALE

NOTES:
1. ADJUSTABLE TIGHTENERS SHALL BE TURNBUCKLE OR EQUIVALENT, HAVING 150 MIN. TAKE UP
2. CHAIN LINK FENCE POST SHALL BE INSTALLED VERTICALLY
3. CHAIN LINK FABRIC SHALL BE INSTALLED ON OUTSIDE FACE OF POST.
4. USE EXTENSION ARMS AND BARBED WIRE ON FENCING FOR TEMPORARY PLANT NURSERY ONLY.
5. FENCING IS TEMPORARY AND SHALL BE REMOVED FROM THE PROJECT SITE AFTER COMPLETION OF PLANTING OPERATIONS.

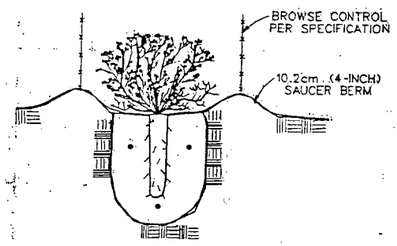


END OR GATE POST DETAIL
NOT TO SCALE



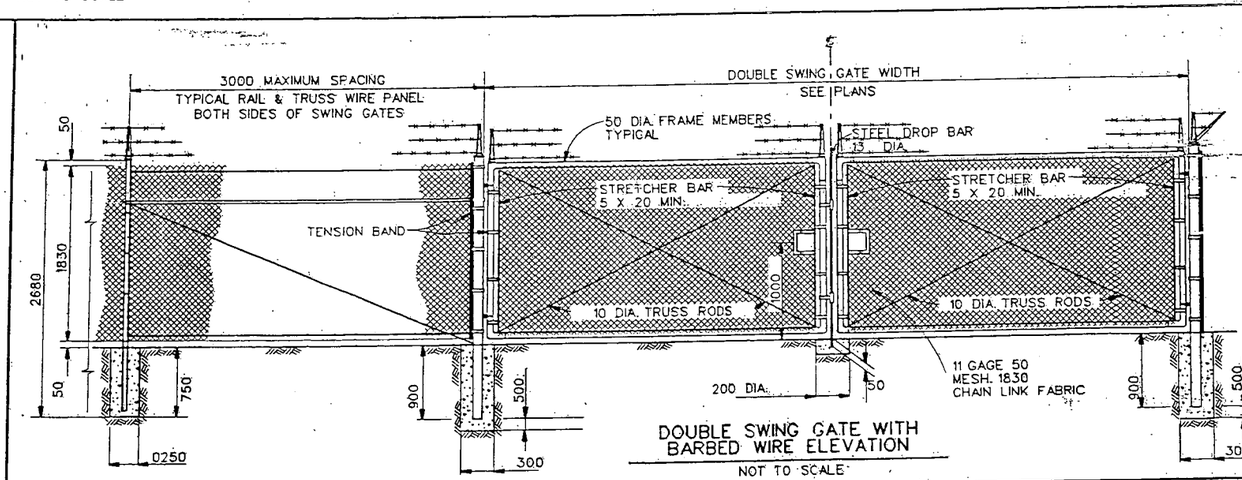
NOTE:
1. TREES AND SHRUBS SHALL BEAR SAME RELATION TO FINISHED GRADE AS THEY BORE PRIOR TO PLANTING.
2. ALL CACTUS AND YUCCA SHALL BE PLANTED WITH THE SAME NORTH ORIENTATION AS THEY HAD PRIOR TO EXTRACTION.

SALVAGED PLANTING
NOT TO SCALE

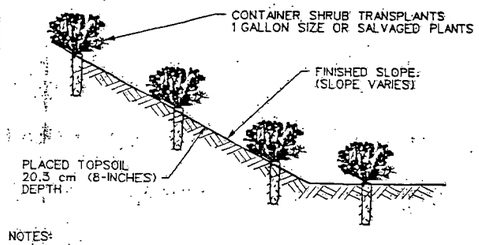


NOTE:
BROWSE CONTROL IS ONLY REQUIRED FOR NURSERY-GROWN PLANTS.

BROWSE CONTROL
NOT TO SCALE

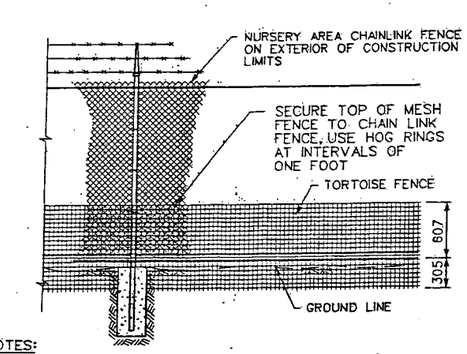


DOUBLE SWING GATE WITH BARBED WIRE ELEVATION
NOT TO SCALE



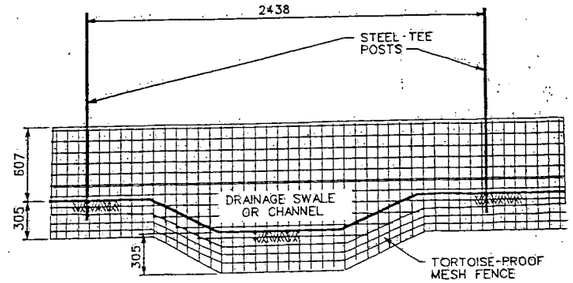
NOTES:
1. WOODY SHRUB TRANSPLANTS SHALL BE SALVAGED STOCK UNLESS OTHERWISE SPECIFIED AND APPROVED BY THE CONTRACTING OFFICER.
2. WOODY SHRUB TRANSPLANTS SHALL BE PLANTED ON PREPARED SLOPES. ALL GRADING AND SLOPE STABILIZATION MEASURES SHALL BE COMPLETE PRIOR TO PLANTING SHRUBS.
3. ALL NURSERY-GROWN SHRUB TRANSPLANTS SHALL BE PLANTED WITH A SLOW RELEASE FERTILIZER TABLET COMPRISED OF 20-10-5.
4. SHRUBS SHALL BE PLANTED SO THAT SOILS ARE WELL COMPACTED AROUND ROOT BALL OR BARE ROOTS SUCH THAT THERE ARE NO AIR POCKETS AND NO ROOTS ARE TORN OR TURNED UP (J-ROOTED).
5. PLANT SPECIES AND PLANTING DENSITIES CRITERIA ON SHEET L-3 AND SHEET L-6. SHRUBS SHALL BE PLANTED IN A NATURAL LOOKING RANDOM PATTERN.

WHITE BURSAGE AND CREOSOTE BUSH SHRUB TRANSPLANTS
NOT TO SCALE



NOTES:
1. FENCE SHALL BE MONITORED BY THE CONTRACTOR A MINIMUM OF ONCE EACH MONTH, AND FOLLOWING PRECIPITATION EVENTS. PROVIDE ROUTINE MAINTENANCE INCLUDING REMOVAL OF TRASH AND SEDIMENT ACCUMULATION, REPAIR OF ANY DAMAGE, AND RESTORATION OF ZERO CLEARANCE BETWEEN THE GROUND AND THE BOTTOM OF THE FENCE.

CHAINLINK FENCE WITH BARBED WIRE AND TORTOISE FENCE
NOT TO SCALE



TORTOISE FENCE DETAIL
NOT TO SCALE

WHEN DIMENSIONS ON THE DRAWING DO NOT SHOW THE UNIT SYMBOL, DIMENSIONS EXPRESSED AS WHOLE NUMBERS ALWAYS INDICATE MILLIMETERS. DIMENSIONS EXPRESSED AS DECIMAL NUMBERS ALWAYS INDICATE METERS.

Call before you Dig 1-800-227-2600

METRIC

SYMBOL	DESCRIPTIONS REVISIONS	DATE	APPROVAL

LAS VEGAS WASH AND TRIBUTARIES (TROPICANA AND FLAMINGO WASHES), NEVADA
UPPER BLUE DIAMOND DIVERSION CHANNEL
LANDSCAPE DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: MS
DRAWN BY: MS
CHECKED BY: GED

SUBMITTED BY:
THOMAS H. SAGE, PE
CHIEF, DESIGN BRANCH

FILE NAME: L03.dgn
SPEC. NO. DACW09-03-B-0005
DISTRICT FILE NO. 1a/1b/179

SHEET L3

GENERAL NOTES

1 ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" AND "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", AND APPENDICES, CURRENT EDITION.

2 TRAFFIC SIGNAL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA VOLUME II" CURRENT EDITION.

3 ALL UTILITIES SHOWN ARE BELIEVED TO BE ACCURATELY LOCATED. CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UTILITIES LIKELY TO BE AFFECTED. THE CONTRACTOR SHALL DETERMINE THE LOCATION AND DEPTH OF SUSPECTED UTILITY INTERFERENCES, AND SHALL FURNISH INFORMATION ON THE SAME TO THE ENGINEER. NOT LESS THAN TEN (10) DAYS PRIOR TO THE ANTICIPATED IMPACT OF THESE SUSPECTED INTERFERENCES ON HIS WORK. IF CONFLICTS EXIST, THE CONTRACTOR WILL IMMEDIATELY CONTACT THE ENGINEER AND PROVIDE THE ENGINEER WITH ALL THE NECESSARY DATA SUCH AS ELEVATIONS, HORIZONTAL LOCATIONS, ETC., AND PROVIDE THE ENGINEER WITH SKETCHES INDICATING THE PROPOSED IMPROVEMENT AND THE UTILITY CONFLICT. THE ENGINEER WILL EXAMINE AND REVIEW ALL THE DATA AND SKETCHES PROVIDED, AND WILL PROVIDE THE CONTRACTOR WITH AN ALTERNATIVE DESIGN WITHIN FIVE (5) DAYS AFTER RECEIPT OF DATA AND SKETCHES.

4 CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES AT LEAST SEVENTY-TWO (72) HOURS PRIOR TO BEGINNING CONSTRUCTION

5 SIGNATURES SHOWN ON THE COVER OF THESE PLANS, BY THE LOCAL UTILITY COMPANIES DOES NOT ASSUME OR GUARANTEE THEIR LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

6 THE CONTRACTOR SHALL COORDINATE WITH THE NEVADA POWER COMPANY, SPRINT TELEPHONE COMPANY, LOCAL CABLE COMPANY AND THE SOUTHWEST GAS CORPORATION FOR THE RELOCATION OF UNDERGROUND OR OVERHEAD UTILITIES THAT INTERFERE WITH THE REQUIRED IMPROVEMENTS AS SHOWN ON THE PLANS.

7 THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERTICAL ADJUSTMENT OF ALL LAS VEGAS VALLEY WATER DISTRICT FACILITIES AND CLARK COUNTY WATER RECLAMATION DISTRICT MANHOLES AS INDICATED ON THE PLANS OR IN THE SPECIAL PROVISIONS UNLESS OTHERWISE INDICATED.

8 THE CONTRACTOR SHALL NOT REMOVE TREES, SHRUBS, LAWNS, WALLS, FENCES, SIGNS, STRUCTURE, LIGHTS OR ANY OTHER IMPROVEMENTS OUTSIDE THE RIGHT-OF-WAY EXCEPT WHERE REQUIRED TO DO SO BY THE CONTRACT DRAWINGS OR AS DIRECTED BY THE ENGINEER.

9 EXACT LOCATIONS OF ALL SAWCUT LINES SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER. THOSE SAWCUTS THAT ARE LONGITUDINAL TO THE ROADWAY MAY BE WHEEL CUT WITH EQUIPMENT AS APPROVED BY THE ENGINEER. ALL OTHER SAWCUTS SHALL BE MADE BY A ROTARY SAW.

LAS VEGAS VALLEY WATER DISTRICT NOTES

PROJECT # 20330

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN RELEASED FOR CONSTRUCTION BY LVVWD. FOLLOWING WATER PLAN APPROVAL, 48 HOURS NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) PRIOR TO START OF CONSTRUCTION. NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO A LVVWD INSPECTION. WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE.
2. ALL WORK SHALL CONFORM TO LVVWD'S STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS AND TO THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS (UDACS), LATEST EDITION.
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2, SHALL BE DONE IN ACCORDANCE WITH THE MOST CURRENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR THE PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. THE FOLLOWING REQUIREMENTS MUST BE MET IN THE EVENT A WATER LINE AND SANITARY OR STORM SEWER LINE CROSS:

   A MINIMUM EIGHTEEN (18) INCH VERTICAL SEPARATION (OUTSIDE TO OUTSIDE) MUST BE MAINTAINED WHEN THE WATER LINE IS INSTALLED OVER THE SANITARY OR STORM SEWER LINE. IF THE VERTICAL SEPARATION CAN NOT BE MAINTAINED OR THE WATER LINE MUST BE PLACED UNDER THE SANITARY OR STORM SEWER LINE, THE SANITARY OR STORM SEWER LINE MUST BE CONSTRUCTED WITH ONE OF THE FOLLOWING OR, AS SHOWN ON THE PLANS:

   a. POTABLE WATER SUPPLY QUALITY MATERIAL
   b. ENCASEMENT, WITH FOUR (4) INCH CONCRETE (MINIMUM)
   c. SLEEVING WITH POTABLE WATER SUPPLY QUALITY PIPE

   EACH PROVISION MUST EXTEND ALONG THE SANITARY OR STORM SEWER, ON EITHER SIDE OF THE MAIN, A MINIMUM 10 FOOT DISTANCE PERPENDICULAR TO THE WATER MAIN EXTERIOR.
9. WARNING TAPE SHALL BE REQUIRED OVER ALL MAINS, ALL SIX (6) INCH DIAMETER AND LARGER SERVICE LATERALS, AND ANY SERVICE LATERAL NOT INSTALLED PERPENDICULAR TO THE MAIN IN ACCORDANCE WITH STANDARD PLATE No. 27.
10. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD'S DISTRIBUTION SYSTEM.
11. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 FORTY-EIGHT (48) HOURS PRIOR TO PICKUP.
12. CONSTRUCTION MAY INTERRUPT SERVICE, WITH LVVWD APPROVAL AND PROPER NOTIFICATION, BETWEEN THE HOURS OF 10 PM AND 6 AM, SUNDAY THROUGH THURSDAY CIRCUMSTANCES MAY REQUIRE TEMPORARY SERVICE FEEDS TO BE INSTALLED, WITHOUT LVVWD REIMBURSEMENT. ANY TEMPORARY SERVICE FEED MUST HAVE PRIOR LVVWD APPROVAL.
13. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE LISTED ON THE LVVWD'S PRE-APPROVED MATERIAL AND MANUFACTURERS LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.

TRAFFIC NOTES

1 ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HEREUNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.

2 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 GROUND MOUNTED STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING COUNTY STREETS IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.

3 ALL CONSTRUCTION SIGNING, BARRICADING AND PAVEMENT MARKINGS SHALL CONFORM TO THE NEVADA WORK ZONE TRAFFIC CONTROL HANDBOOK - 1986 AND TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, CURRENT EDITION.

4 IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL, OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE COUNTY TRAFFIC MANAGER.

5 THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CLARK COUNTY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH CLARK COUNTY STANDARDS. ALL SIGNS SHALL USE TYPE III SHEETING.

6 IF A PROPOSED STREETLIGHT STANDARD IS FIELD LOCATED TO WITHIN FIVE (5) FEET OF ANY SIGN SHOWN HEREON TO BE MOUNTED ON A SIGN POST, THEN CHANGE SIGN MOUNTING TO ONE ON THE STREETLIGHT STANDARD.

7 PRIOR TO CONSTRUCTION, THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE CURRENT PLANNING DIVISION OF THE DEPARTMENT OF COMPREHENSIVE PLANNING.

8 ALL TRAFFIC SIGNAL POLE ASSEMBLIES, STEEL PEDESTALS FOR CABINETS, AND STREET LIGHT POLES SHALL BE GALVANIZED PER ASTM A-123, AND SHALL NOT BE PAINTED.

9 ALL STREET LIGHTING INSTALLATIONS EXCEPT AS NOTED ON THE STREET LIGHTING PLANS SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, LATEST EDITION.

10 THE FOLLOWING CLARK COUNTY UNDERGROUND FACILITIES MAY BE LOCATED IN YOUR PROJECT AREA: STREET LIGHTING, TRAFFIC SIGNALS, LAS VEGAS AREA COMPUTER TRAFFIC SYSTEM (LVACTS) INTERCONNECT CABLE. YOU MUST CONTACT CLARK COUNTY TRAFFIC MANAGEMENT DIVISION, OPERATIONS UNIT AT 455-7511 FOR LOCATIONS AT LEAST 48 HOURS PRIOR TO WORKING IN THE AREA. CLARK COUNTY IS NOT A MEMBER OF CALL BEFORE YOU DIG (UNDERGROUND SERVICE ALERT), AND A CALL TO THAT ORGANIZATION DOES NOT RELIEVE YOU OF LIABILITY FOR CLARK COUNTY FACILITIES.

ABBREVIATIONS

ACP	ASBESTOS CEMENT PIPE
AGG	AGGREGATE
BC	BACK OF CURB
CC	CLARK COUNTY
C&G	CURB AND GUTTER
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
COMM DWY	COMMERCIAL DRIVEWAY
CONC	CONCRETE
CONST	CONSTRUCTION OR CONSTRUCT
DI	DROP INLET
DIA	DIAMETER
DIAG	DIAGONAL
DWG	DRAWING
DWY	DRIVEWAY
ELEV	ELEVATION
EP	EDGE OF PAVEMENT
EXIST	EXISTING
FG	FINISHED GRADE
FL	FLOW LINE
GB	GRADE BREAK
HPS	HIGH PRESSURE SODIUM
INV	INVERT
LF	LINEAR FEET
LT	LEFT
MATL	MATERIAL
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
No	NUMBER
NTS	NOT TO SCALE
OC	- ON CENTER
PVMT	PAVEMENT
PBS	PLANTMIX BITUMINOUS SURFACE
PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
PL	PROPERTY LINE
PT	POINT OF TANGENCY
PVI	POINT OF VERTICAL INTERSECTION
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RP	RADIUS POINT
RT	RIGHT
RW	RIGHT OF WAY
SD	STORM DRAIN
STD	STANDARD
SW	SIDEWALK
TC	TOP OF CURB
TRANS	TRANSITION
(TYP)	TYPICAL
UBDDR	UPPER BLUE DIAMOND DURANGO REACH CHANNEL
USD	UNIFORM STANDARD DRAWING
UTACS	ULTRA THIN ASPHALT CONCRETE SURFACE
VC	VERTICAL CURVE
VG	VALLEY GUTTER
VPI	VERTICAL POINT OF INTERSECTION
VPC	VERTICAL POINT OF CURVE
VPT	VERTICAL POINT OF TANGENCY

LEGEND

- REMOVAL ITEM, CONSTRUCTION ITEM, TRAFFIC ITEM
- EXISTING/PROPOSED CONDUIT RUN NUMBER
- CENTERLINE W/STATION
- RIGHT-OF-WAY LINE
- PROPERTY LINE
- GRADING DAYLIGHT LINE
- EXISTING/PROPOSED STREETLIGHT
- EXISTING/PROPOSED/FUTURE DROP INLET
- EXISTING/PROPOSED CURB & GUTTER
- FUTURE CURB & GUTTER
- EXISTING/PROPOSED UNDERGROUND UTILITY SHOWN AT WIDTH WHEN > 18"
- EXISTING/PROPOSED/ADJUST MANHOLE
- EXISTING/PROPOSED/ADJUST PULLBOX
- EXISTING/PROPOSED/ADJUST WATER OR GAS VALVE
- EXISTING/PROPOSED EDGE OF PAVEMENT
- EXISTING/PROPOSED DRIVEWAY
- EXISTING BLOCKWALL/FENCE
- (99.32)99.32 EXISTING/PROPOSED ELEVATION
- CURVE DATA NOTATION
- EXISTING TELEPHONE AND/OR POWER POLE
- EXISTING/PROPOSED FIRE HYDRANT
- EXISTING/PROPOSED SERVICE PEDESTAL
- PAVEMENT TRANSITION / TEMPORARY PAVEMENT TRANSITION
- EXISTING MAILBOX BENCHMARK
- POTHOLE NUMBER
- EXISTING/ADJUST WATER METER
- SAWCUT LINE
- EXISTING/PROPOSED 1-1/4" PVC STREETLIGHT CONDUIT
- EXISTING/PROPOSED CONTROLLER CABINET
- EXISTING/PROPOSED SIDEWALK RAMP

SUMMARY OF QUANTITIES

Sheet No.	Description	Unit	Quantity
UTILITY CROSSING ITEMS			
D3	EXCAVATION SHORING FOR ELECTRICAL VAULT - STA 22+55	LS	1
D3	EXCAVATION SHORING FOR ELECTRICAL VAULT - STA 23+14	LS	1
D4	EXCAVATION SHORING FOR ELECTRICAL VAULT - STA 33+25	LS	1
D4	SUPPORT AND CONCRETE ENCASE 12-INCH WATER - STA 34+88	LS	1
D4	SUPPORT AND CONCRETE ENCASE ELEC. CONDUITS - STA 34+88	LS	1
D4	SUPPORT AND CONCRETE ENCASE TEL. CONDUITS - STA 34+88	LS	1
D4	SUPPORT AND CONCRETE ENCASE 6-INCH GAS - STA 34+88	LS	1
D5	SUPPORT AND CONCRETE ENCASE TEL. CONDUITS - STA 43+94	LS	1
D6	SUPPORT AND CONCRETE ENCASE TEL. CONDUITS - STA 45+44	LS	1
D6	SUPPORT AND CONCRETE ENCASE TEL. CONDUITS - STA 45+81	LS	1
D6	RELOCATE AND STEEL ENCASE 8-INCH WATER LINE - STA 47+36	LS	1
DETOUR AT SOUTHERN BELTWAY			
D7	REMOVE CHAIN LINK FENCE	LF	200
D7	REMOVE AND SALVAGE RIPRAP IN FILL AREA	CY	270
D7	ROADWAY EMBANKMENT FILL	CY	13,800
D7	TYPE II AGGREGATE BASE	CY	450
D7	2 1/2-INCH PLANTMIX BITUMINOUS SURFACE	SF	17,500
D7	SAWCUT & MATCH AT BOTH ENDS	LS	1
D8	PORTABLE PRECAST CONCRETE BARRIER RAIL	LF	1,630
D8	GROUND MOUNTED CONSTRUCTION SIGNS	EA	7
D8	TYPE 4 LANE LINE (PAINT)	LF	800
D8	6-INCH WIDE WHITE PAINTED EDGE LINE	LF	1,700
D8	RIPRAP PROTECTION OF TOE OF EMBANKMENT	CY	12
DETOURS AT RHODES RANCH ENTRY			
D8	GROUND MOUNTED CONSTRUCTION SIGNS - PHASE 1	EA	7
D8	PORTABLE PRECAST CONCRETE BARRIER RAIL - PHASE 1	LF	340
D8	TYPE III BARRICADE - PHASE 1	LF	30
D8	GROUND MOUNTED CONSTRUCTION SIGNS - PHASE 2	EA	10
D8	PORTABLE PRECAST CONCRETE BARRIER RAIL - PHASE 2	LF	340
D8	REMOVAL OF LANDSCAPED MEDIAN - PHASE 2	SF	900
D8	TEMPORARY PAVEMENT PATCH - PHASE 2	SF	900
D8	TRAFFIC DRUMS - PHASE 1 & 2	EA	120
D8	4-INCH DOUBLE SOLID YELLOW CENTERLINE TAPE - PHASE 2	LF	360
D8	24-INCH STOP BAR PAINT - PHASE 1 & 2	LF	75
D8	TYPE III BARRICADE - PHASE 2	LF	30
D8	REPLACE PAVED MEDIAN CURB - PHASE 2	LF	120
ROAD CLOSURE - WIGWAM AVENUE TO ROBINDALE ROAD			
EASTBOUND FRONTAGE ROAD REMOVAL AND RECONSTRUCTION			
D12	REMOVE CHAIN LINK FENCE	LF	430
D12	REMOVE GALVANIZED GUARDRAIL	LF	380
D12	REMOVE 6-INCH ASPHALT SURFACE	SF	9,700
D12	TYPE II AGGREGATE BASE	CY	325
D12	6-INCH PLANTMIX BITUMINOUS SURFACE	SF	4,700
D12	CONSTRUCT GALVANIZED GUARDRAIL	LF	380
D12	RESTORE PAVEMENT MARKINGS	LS	1
RHODES RANCH ENTRY REMOVAL AND RECONSTRUCTION			
D13	REMOVE "L" TYPE CURB & GUTTER	LF	510
D13	REMOVE "A" TYPE CURB	LF	240
D13	REMOVE 4-INCH CONCRETE SIDEWALK	SF	1,750
D13	REMOVE 3-INCH ASPHALT SURFACE	SF	10,500
D13	CONSTRUCT 20-FT TYPE CM DROP INLET	EA	3
D13	CONSTRUCT 20-FT TYPE DM DROP INLET	EA	3
D13	INSTALL 18-INCH RCP	LF	42
D13	INSTALL 24-INCH RCP	LF	44
D13	INSTALL 30-INCH RCP	LF	46
D13	CONSTRUCT "L" TYPE CURB & GUTTER	LF	510
D13	CONSTRUCT "A" TYPE CURB	LF	240
D13	CONSTRUCT 4-INCH CONCRETE SIDEWALK	SF	1,450
D13	INSTALL TYPE II AGGREGATE BASE	CY	150
D13	CONSTRUCT 2-FT WIDE VALLEY GUTTER	SF	600
D13	CONSTRUCT 2-INCH PLANTMIX BITUMINOUS SURFACE	SF	10,500
DURANGO DRIVE REMOVAL AND RECONSTRUCTION			
D14	REMOVE 3-INCH ASPHALT SURFACE	SF	52,060
D14	ROADWAY EMBANKMENT FILL	CY	34,600
D15, D16, D17, D18	TYPE II AGGREGATE BASE	CY	1,590
D15, D16, D17, D18	2 1/2-INCH PLANTMIX BITUMINOUS SURFACE	SF	62,200
D15, D16, D17, D18	ADJUST WATER VALVE COVER	EA	13
D15, D16, D17, D18	ADJUST SANITARY SEWER MANHOLE COVER	EA	8

INDEX OF "D" SHEETS

D1A GENERAL NOTES, ABBREVIATIONS, QUANTITIES

D1B CONTROL PLAN FOR "D" SHEETS

D2 STORM DRAIN AND UTILITY DETAILS

UTILITY CROSSING DETAILS
D3 UBDDR STA. 17+90, 20+74, AND 22+55
D4 UBDDR STA. 33+25, 34+88, AND 37+24.4
D5 UBDDR STA. 37+87, 40+70, AND 43+34
D6 UBDDR STA. 45+44, 46+81, AND 47+36

DETOURS AND ROAD CLOSURES
D7 BELTWAY DETOUR CONSTRUCTION PLAN
D8 BELTWAY DETOUR SIGNING & STRIPING PLAN.
D9 RHODES RANCH ENTRY DETOUR PLAN
D10 ROAD CLOSURE PLAN - WIGWAM TO ROBINDALE

D11 ROADWAY SECTIONS

REMOVAL AND RECONSTRUCTION
D12 SOUTHERN BELTWAY EASTBOUND FRONTAGE ROAD
D13 RHODES RANCH ENTRY
D14 DURANGO DRIVE

ROADWAY CONSTRUCTION PLAN
D15 DURANGO DRIVE STA. -7+50 TO STA. 4+00
D16 DURANGO DRIVE STA. 4+00 TO STA. 15+00
D17 DURANGO DRIVE STA. 15+00 TO STA. 26+00
D18 DURANGO DRIVE STA. 26+00 TO STA. 36+00

D19 STORM DRAIN PROFILES

UPPER BLUE DIAMOND DIVERSION CHANNEL

AVOID NTTPIC ACCIDENT! POWER LINES IT'S DEADLY!
CALL BEFORE YOU DIG OVERHEAD
1-702-593-6111

Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)
CLARK COUNTY ROAD MAINTENANCE MANAGEMENT 702-455-7540
AND
CLARK COUNTY TRAFFIC MANAGEMENT 702-455-7511

AGENCY APPROVALS

AGENCY	PLANS REVIEWED BY	DATE
SPRINT		
LAS VEGAS VALLEY WATER DISTRICT		
SOUTHWEST GAS CORPORATION		
NEVADA POWER COMPANY (TRANSMISSION)		
NEVADA POWER COMPANY (DISTRIBUTION)		
CLARK COUNTY WATER RECLAMATION DISTRICT		
COX COMMUNICATIONS		

REV No	DATE	DESCRIPTION	APPROVED

UPPER BLUE DIAMOND DIVERSION CHANNEL

GENERAL AND CONSTRUCTION NOTES

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
PAUL H. JUDD
Exp. 09-30-04
CIVIL
No. 7942

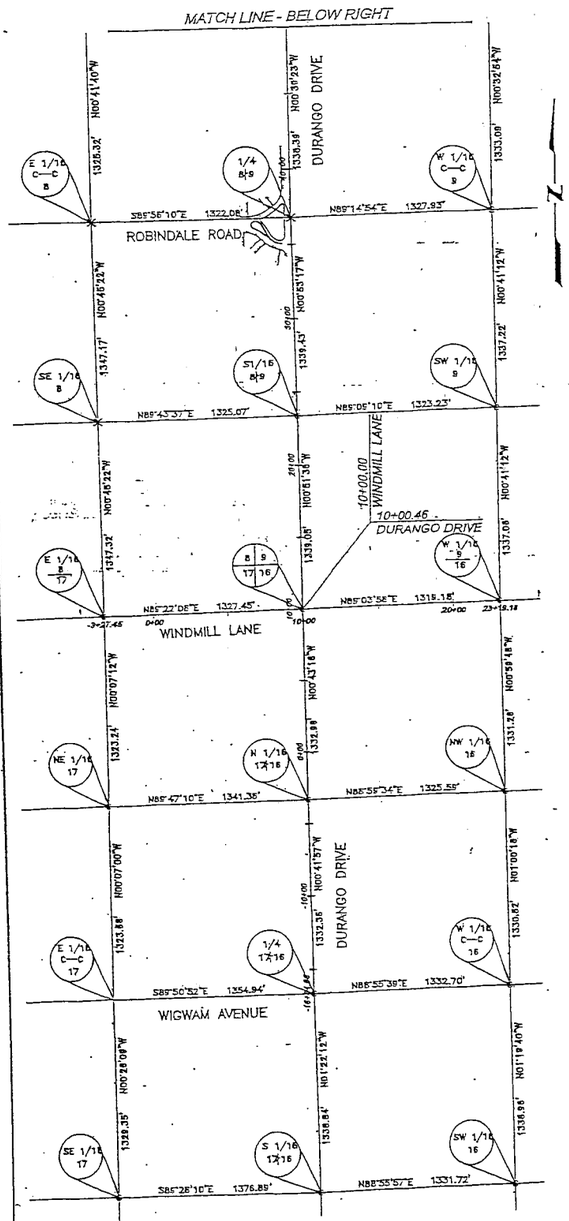
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CHECKED BY:	PHJ
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SPEC. NO.	DACW09-03-B-0015

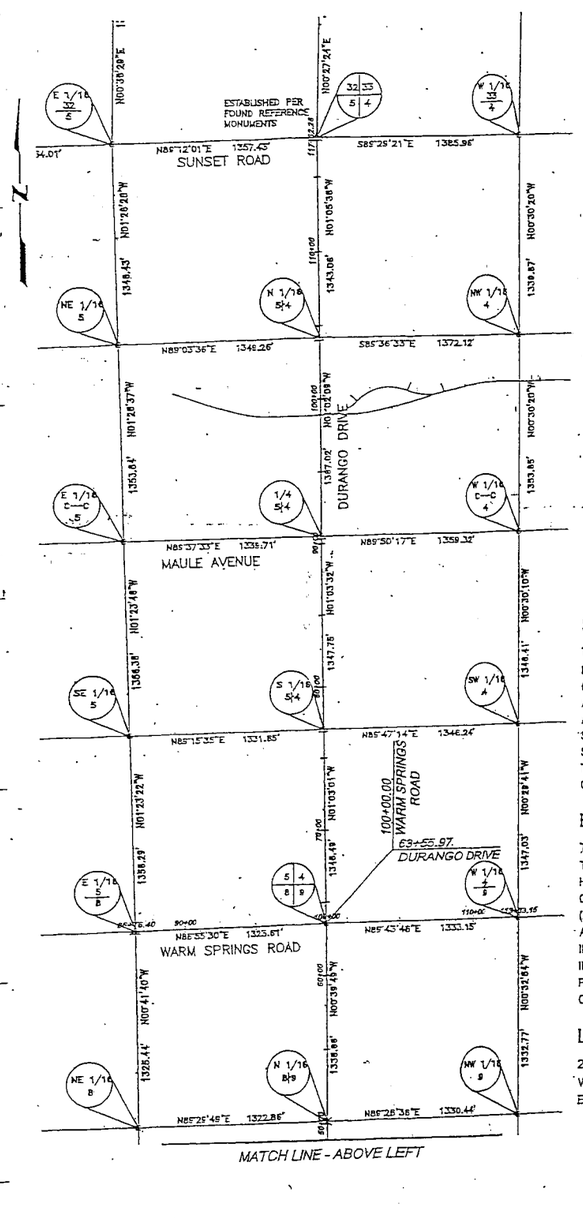
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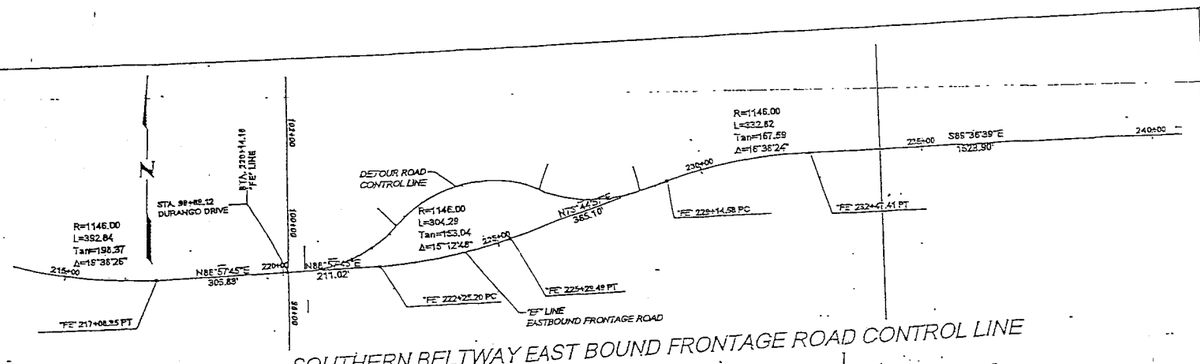
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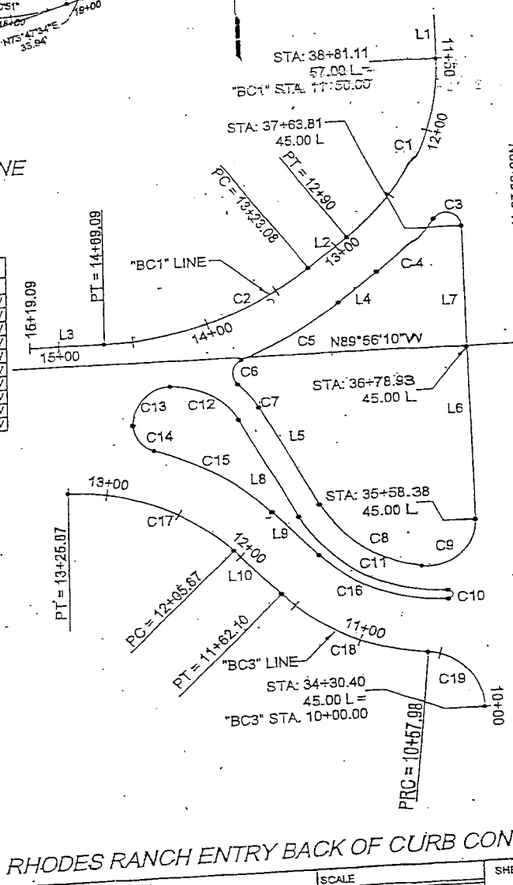
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SURVEY CONTROL NOTES

THE CONTRACTOR SHALL PROTECT ALL SURVEY MONUMENTS WITHIN THE WORK ZONE DURING CONSTRUCTION.
ANY MONUMENT THAT IS DAMAGED OR OBLITERATED AS A RESULT OF THE CONTRACTORS OPERATIONS. SHALL BE REPLACED BY A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE STATE OF NEVADA. THE DISTANCES SHOWN ON THIS DRAWING ARE GROUND FEET DISTANCES.

BASIS OF BEARINGS:

THE BASIS OF BEARINGS FOR THE LINES SHOWN ON THIS DRAWING, AND ON ALL OTHER "D" SHEETS HEREIN, IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE (2701), DETERMINED BY THE CONTROL POINTS 39, 40, AND 41 AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN FILE 64 OF SURVEYS, AT PAGE 97. THE REFERENCE RECORD OF SURVEY FOR THIS PROJECT IS IN FILE 101 OF SURVEYS, AT PAGE 11.

LOCAL BENCH MARK

2-INCH BRASS CAP IN CONCRETE/ WELL MONUMENT AT WIGWAM AND DURANGO.
ELEVATION 2739.173

LINE TABLE

LINE	LENGTH	BEARING
L1	271.00	N00°39'23"W
L2	33.08	S52°49'11"W
L3	50.00	N37°59'57"W
L4	33.08	S52°49'11"W
L5	75.89	N28°57'44"W
L6	120.55	N00°59'17"W
L7	84.67	N28°57'44"W
L8	75.89	N44°09'43"W
L9	43.77	N44°09'43"W
L10	43.77	N44°09'43"W

CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA
C1	140.00'	150.00'	53°28'34"
C2	146.01'	225.00'	37°10'52"
C3	24.84'	10.00'	142°20'30"
C4	50.24'	182.00'	15°49'04"
C5	74.96'	257.00'	16°42'44"
C6	20.60'	10.00'	118°01'05"
C7	22.49'	66.00'	19°31'26"
C8	80.00'	82.00'	49°49'21"
C9	53.46'	30.00'	102°06'12"
C10	9.59'	3.00'	183°05'50"
C11	113.73'	108.00'	60°20'03"
C12	52.81'	50.00'	60°31'12"
C13	40.46'	25.00'	82°43'31"
C14	24.33'	20.00'	69°41'22"
C15	90.04'	186.00'	27°44'06"
C16	88.97'	114.00'	45°13'06"
C17	120.00'	150.00'	45°50'12"
C18	104.13'	150.00'	39°46'24"
C19	57.98'	40.00'	83°02'50"

RHODES RANCH ENTRY BACK OF CURB CONTROL

REV No	DATE	DESCRIPTION	APPROVED

UPPER BLUE DIAMOND DIVERSION CHANNEL

CONTROL PLAN FOR "D" SHEETS

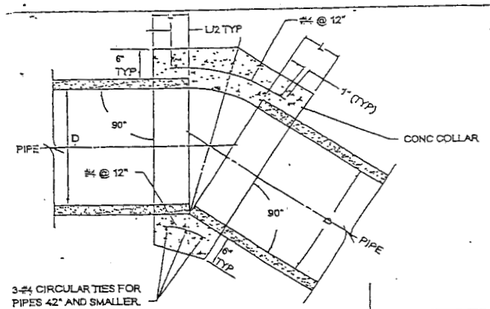
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA PAUL H. JUDD 06/30/04 CIVIL No. 7842

DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Jun 06, 2003 - 4:03pm
DISTRICT FILE NO.	214/182
SPEC. NO.	DACW09-03-B-0015

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SHEET No D1B
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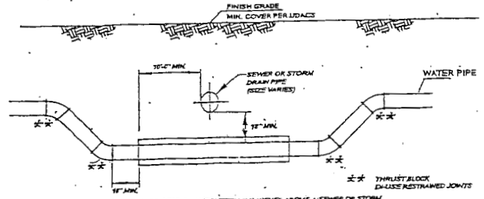
1. A CONCRETE COLLAR IS REQUIRED WHERE THE CHANGE IN ALIGNMENT OR GRADES EXCEED THAT ALLOWED FOR AN ORDINARY JOINT.
2. L=12" FOR PIPES 24" OR LESS, L=18" FOR PIPES 27" TO 39", AND L = 24" FOR PIPES 42" AND GREATER.
3. OMIT REINFORCING ON PIPES 24" OR LESS IN DIAMETER.
4. WHERE REINFORCING IS REQUIRED, THE DIAMETER OF CIRULAR TIES SHALL BE D+(2"WALL THICKNESS)+8". USE GRADE 60 REINFORCING STEEL.
5. NOT TO BE USED FOR A SIZE CHANGE IN THE MAINLINE.

CONCRETE PIPE COLLAR

NOTE (WATER): WHEN A WATERLINE IS LESS THAN EIGHTEEN (18) INCHES ABOVE A SEWER OR STORM DRAIN LINE OR ANYTIME A WATER LINE IS BELOW A SEWER OR STORM DRAIN LINE THE FOLLOWING PROVISIONS SHALL APPLY:

1. A REASONABLE EFFORT MUST BE MADE TO PLACE WATER AND SEWER PIPELINE JOINTS AN EQUAL DISTANCE FROM THE CROSSING POINT. THIS REQUIREMENT DOES NOT APPLY TO WELDED JOINTS.
2. A MINIMUM VERTICAL SEPARATION OF SIX (6) INCHES MUST BE MAINTAINED AND STRUCTURAL SUPPORT IN THE FORM OF A CEMENT SLURRY ENCASEMENT WHICH WILL EXTEND UPWARD FROM THE SEWER/STORM DRAIN LINE TO THE SPRINGLINE OF THE WATER LINE.
3. THE CROSSING SHALL BE CONSTRUCTED USING ONE OF THE FOLLOWING OPTIONS:
   a) THE SEWER LINE MUST BE CONSTRUCTED OF WATER SUPPLY QUALITY MATERIALS MEETING AWWA STANDARDS.
   b) THE SEWER OR WATER LINE SHALL BE TOTALLY ENCASED BY A MINIMUM FOUR (4) INCH THICK 300 PSI CEMENT SLURRY, A DISTANCE OF TEN FEET ON EACH SIDE OF THE CROSSING MIDPOINT. THIS OPTION IS NOT AVAILABLE FOR ACP.
   c) THE SEWER OR WATER LINE SHALL BE INSTALLED IN A SLEEVE OF WATER QUALITY PIPE OR STANDARD CASING, WITHOUT JOINTS, TEN FEET ON EACH SIDE.

SEWER/STORM DRAIN WATER CROSSING DETAIL



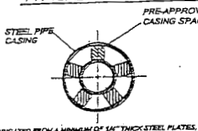
WHERE A WATERLINE IS LESS THAN EIGHTEEN (18) INCHES ABOVE A SEWER OR STORM DRAIN LINE, WHERE THE WATER LINE IS BELOW A SEWER OR STORM DRAIN LINE, AND WHERE THE HORIZONTAL SEPARATION, AS REQUIRED BY THE WATER SUPPLY REGULATIONS, CANNOT BE MAINTAINED BECAUSE OF PHYSICAL OBSTRUCTIONS, THE WATER LINE SHALL BE PROTECTED BY CONSTRUCTION OF THE SEWER OR STORM DRAIN OR WATER LINE IN THE FOLLOWING MANNER:

1. THE SEWER OR STORM DRAIN LINE MUST BE CONSTRUCTED OF WATER SUPPLY QUALITY MATERIALS MEETING AWWA STANDARDS.
2. THE WATER MAIN SHALL BE D.I.P. WITH MECHANICAL JOINTS. INSTALL IN A STEEL CASING WHICH EXTENDS 10-FT ON EACH SIDE OF THE CROSSING.
3. THE SEWER OR STORM DRAIN OR WATER LINE (DEPENDING ON FIELD CONDITIONS) SHALL BE TOTALLY ENCASED IN A MINIMUM OF FOUR (4) INCHES OF CEMENT SLURRY (300 PSI+) FOR A DISTANCE OF TEN (10) FEET ON EACH SIDE OF THE CROSSING ONLY WITH INDIRECT APPROVAL. ENCASEMENT WILL NOT BE PERMITTED FOR ASBESTOS CEMENT PIPE.

EACH OF THESE PROVISIONS SHALL ALSO BE EXTENDED FOR OTHER THAN 90 DEGREE CROSSINGS TO THE POINT AT WHICH THE TEN FOOT SEPARATION BETWEEN THE WATERLAND SEWER OR STORM DRAIN LINES IS ACHIEVED (REGIME OF CROSSING ANGLE).

TYPICAL CASING SECTION

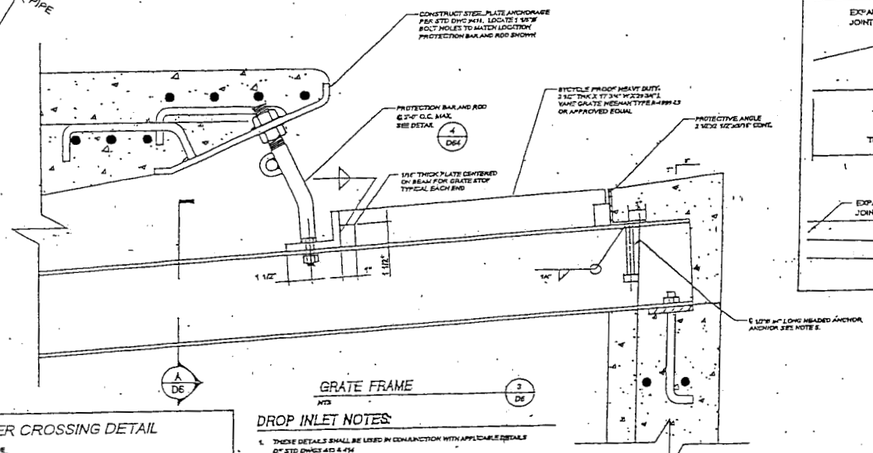
D.I. CARRIER PIPE	
PIPE DIA.	CASING DIA.
8	16
6	24
10	20
12	24
18	30
24	42



NOTES:

1. STEEL PIPE CASING SYMMETRICAL ABOUT WATER MAIN CENTERLINE.
2. PRE-APPROVED CASING SPACERS AND PRE-APPROVED END SEALS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATION. (REDWOOD SKIDS NOT ALLOWED. LEGACY SECTION 2.04 NOT APPLICABLE). USE A CENTERED CONFIGURATION AND PROVIDE THE MANUFACTURER WITH THE FOLLOWING:
   -PIPE OD.
   -CASING ID
   -CASING LENGTH

1. STEEL PIPE CASING SHALL BE FABRICATED FROM A MINIMUM OF 1/4" THICK STEEL PLATES, CONFORMING TO THE REQUIREMENTS OF ASTM A36, GRADE B, C, OR D. ALL JOINTS SHALL BE WELDED. INTERIOR JOINTS SHALL BE GROUNDED TO A SMOOTH FINISH. ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWWA C206, "AWWA STD FOR FIELD WELDING OF STEEL WATER PIPE. COATINGS FOR STEEL CASING ARE NOT REQUIRED.
2. PIPE CASING SHALL BE LAID TRUE TO LINE GRADE WITH NO BENDS OR CHANGES IN GRADE FOR THE FULL LENGTH OF THE CASING.
3. THE PIPE SHALL BE SUPPORTED AT EACH END OF EACH JOINT WITH SPACERS. AFTER INSTALLATION OF THE PIPE, THE CASING SHALL BE SEALED AT BOTH ENDS WITH CASING END SEALS. DUCTILE IRON PIPE JOINTS INSIDE CASING ARE TO BE RESTRAINED.

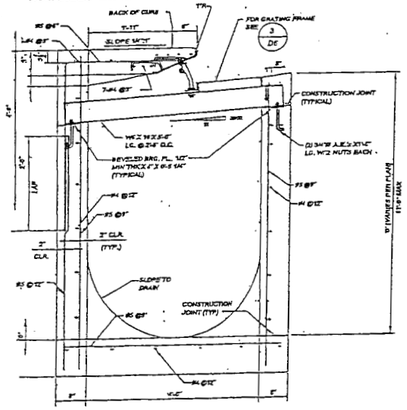


GRATE FRAME

3 D6

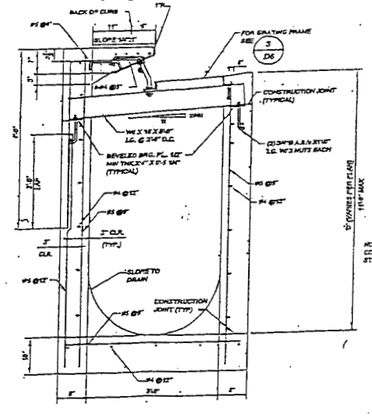
DROP INLET NOTES:

1. THESE DETAILS SHALL BE USED IN CONJUNCTION WITH APPLICABLE DETAILS OF STD DWGS 415 & 434
2. ALL EXPOSED METALS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
3. PROVIDE 1/2" (MIN) CLEARANCE ALL AROUND THE STEEL BEAM, DRY PACK AFTER INSTALLATION.
4. WHEN REQUIRED BY LENGTH OF OPENING, PLATE ANGLES MAY BE DELIVERED IN SECTIONS AND BUTT WELDED IN PLACE.
5. ALL GALVANIZING DAMAGED BY WELDING SHALL RECEIVE TWO COATS OF GALVALLOY OR EQUAL.
6. ANGLE ANCHORS SHALL BE EMBEDDED MIDPOINT IN BACK SIDEWALL AND EVENLY SPACED, MAXIMUM SPACING OF 2'.



TYPE "CM" DROP INLET SECTION

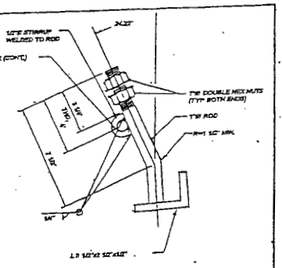
1 D6



TYPE "DM" DROP INLET SECTION

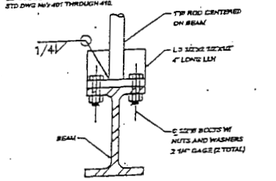
2 D6

NOTE: TO BE USED WHENEVER UTILITIES CONFLICT WITH TYPE "CM" DROP INLET



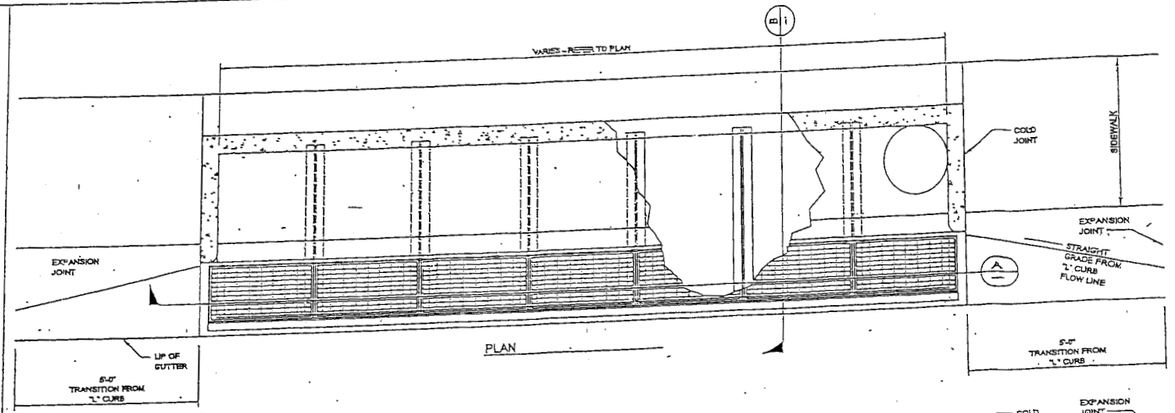
PROTECTION BAR & ROD

4 D6

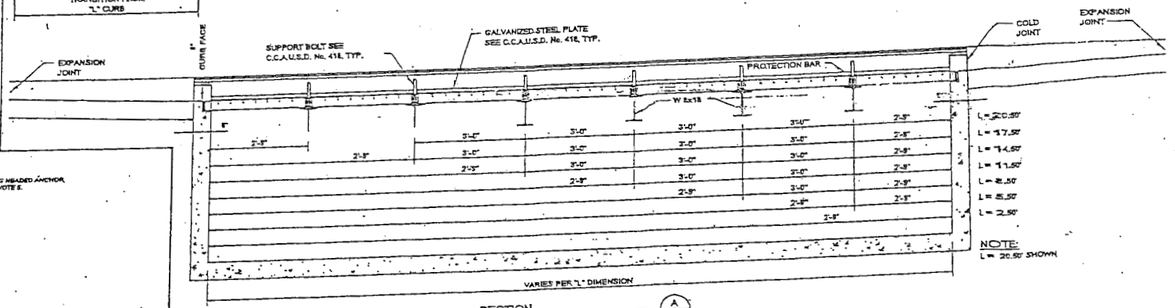


SECTION

A D6

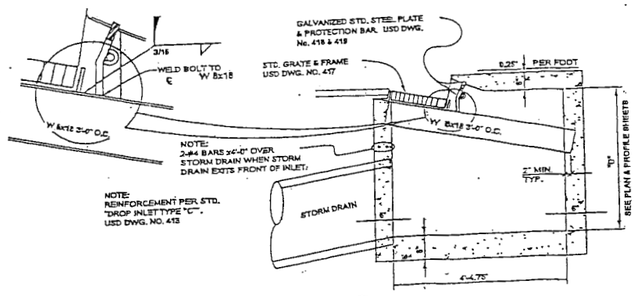


PLAN



SECTION

A



SECTION

B

DROP INLET SIZING CHART

DROP INLET No.	DEPTH (feet)	LENGTH (feet)	No. OF GRATES
1	5.5	14.50'	5

MODIFIED TYPE "C" DROP INLET

1 SD-03

NOT TO SCALE

REV No	DATE	DESCRIPTION	APPROVED

UPPER BLUE DIAMOND DIVERSION CHANNEL

REMOVALS, RELOCATIONS, DETOURS
STORM DRAIN AND UTILITY DETAILS
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp: 06/30/04
CIVIL
No. 7842

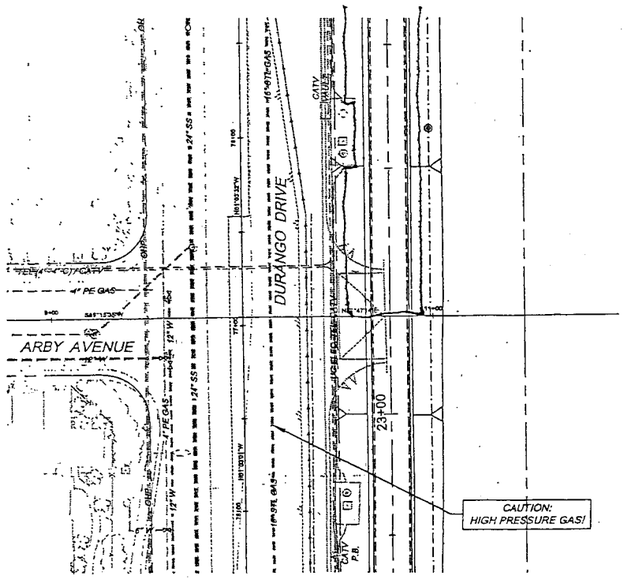
DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Jun 06, 2003 - 3:58pm
DISTRICT FILE NO.	214/183
SPEC. NO.	DACW09-03-B-0015

SCALE	
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VERT:	1" = 4'
FIELD BOOK	NONE

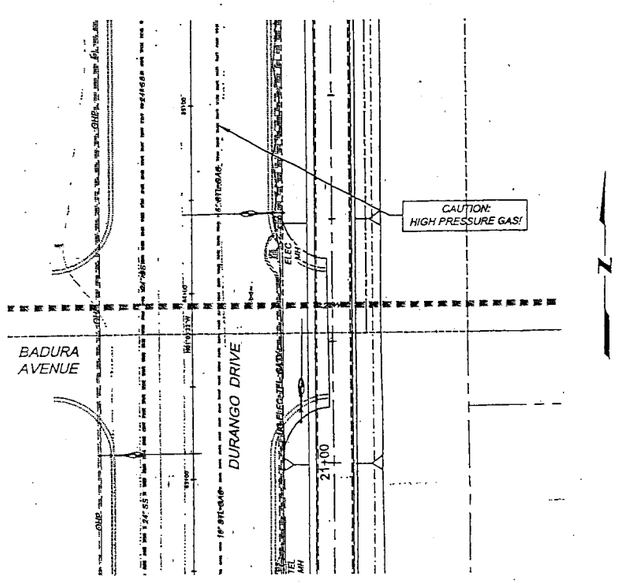
SHEET No **D2**

F950917

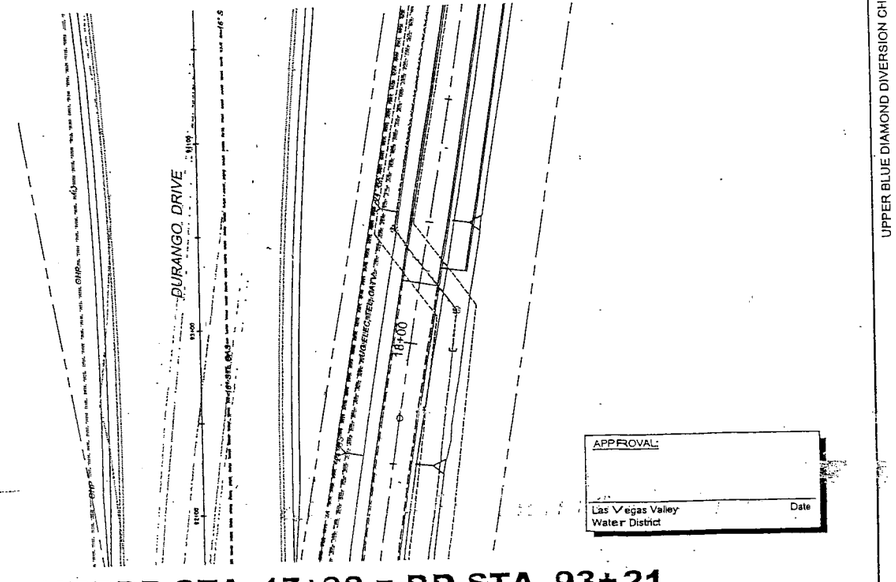
L-1715



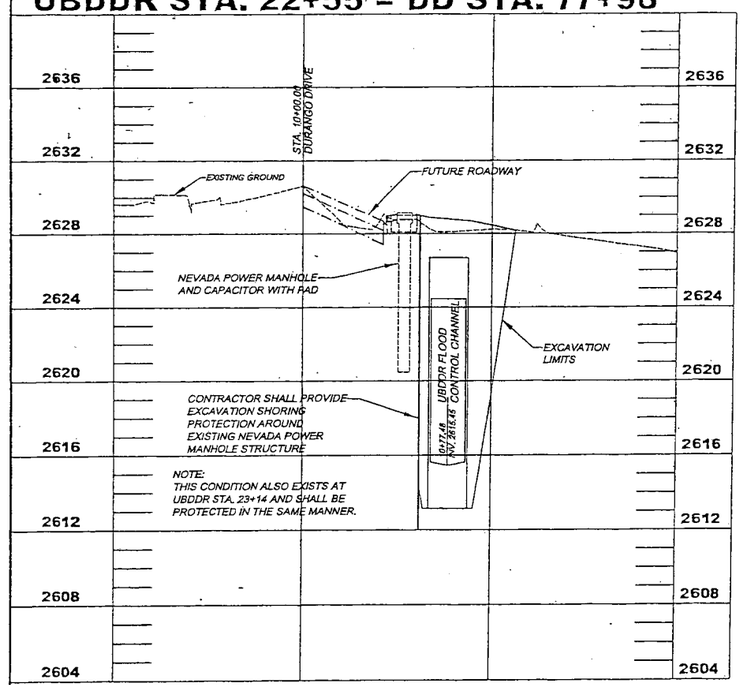
UBDDR STA. 22+55 = DD STA. 77+98

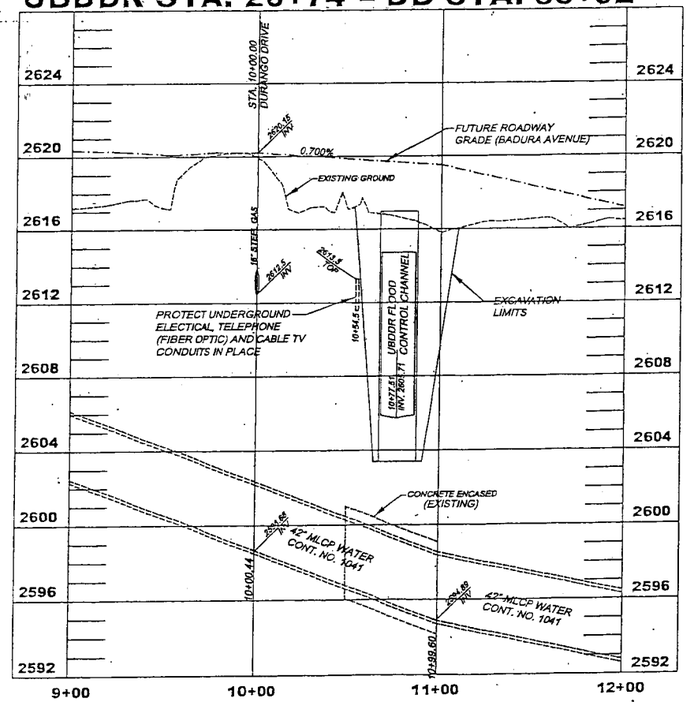


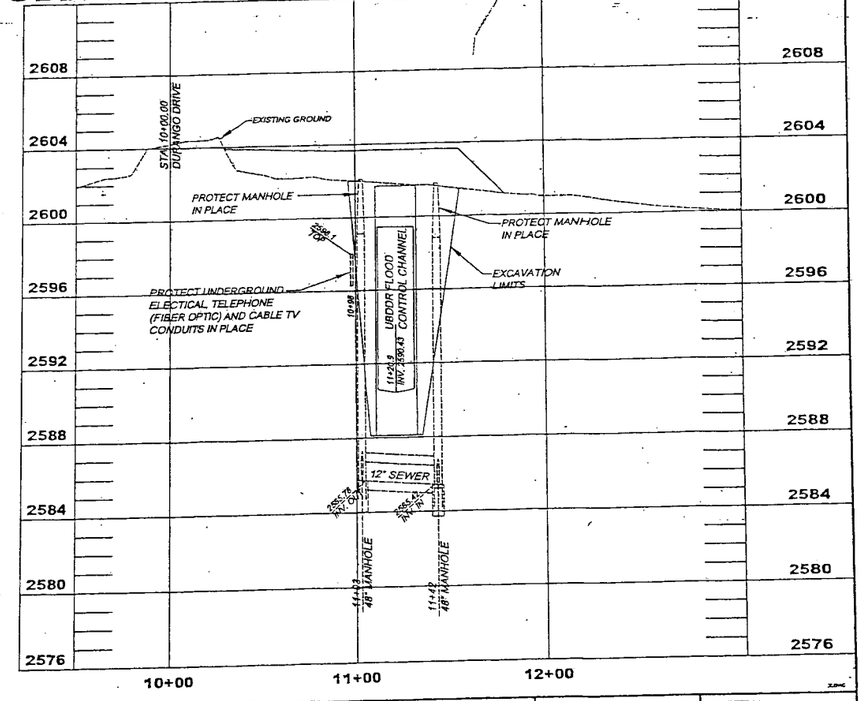
UBDDR STA. 20+74 = DD STA. 83+92



UBDDR STA. 17+90 = DD STA. 93+21







REV No	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

UTILITY CROSSING DETAILS

UBDDR STA. 17+90, 20+74, AND 22+55

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp: 06\30\04
CIVIL
No. 7942

DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 08, 2003 - 3:58pm
DISTRICT FILE NO.	214/184
SPEC. NO.	DACW09-03-B-0015

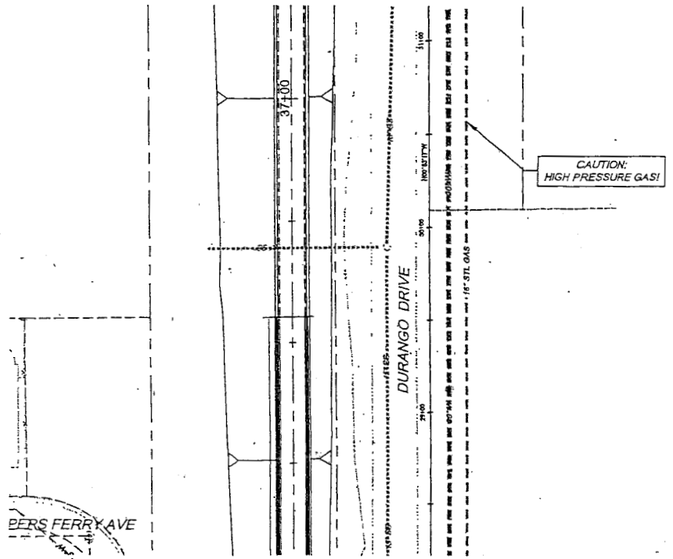
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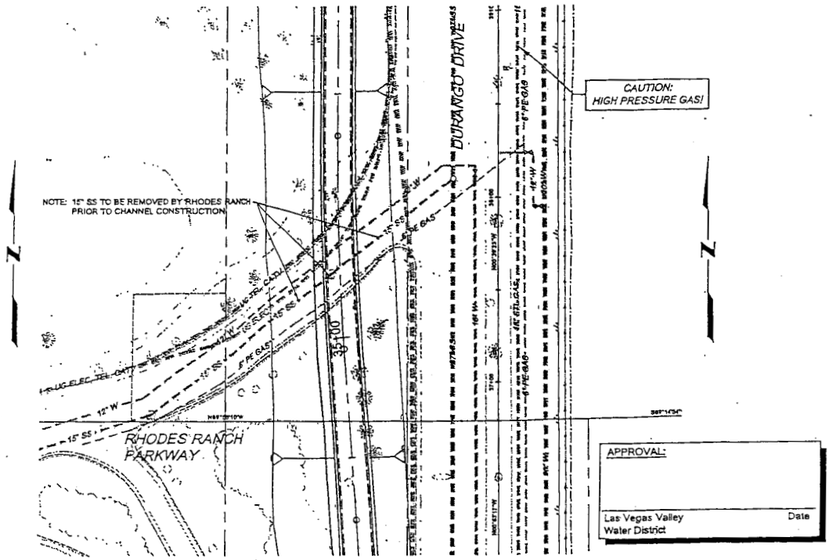
F950917

L-1715

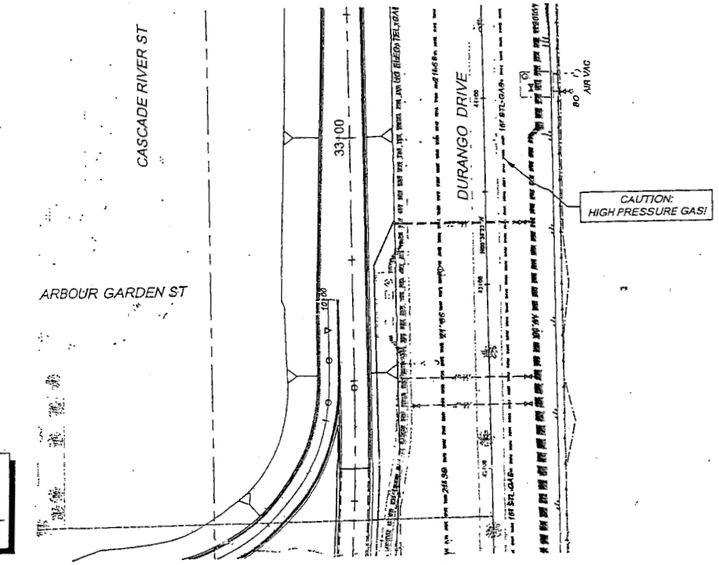
UPPER BLUE DIAMOND DIVERSION CHANNEL



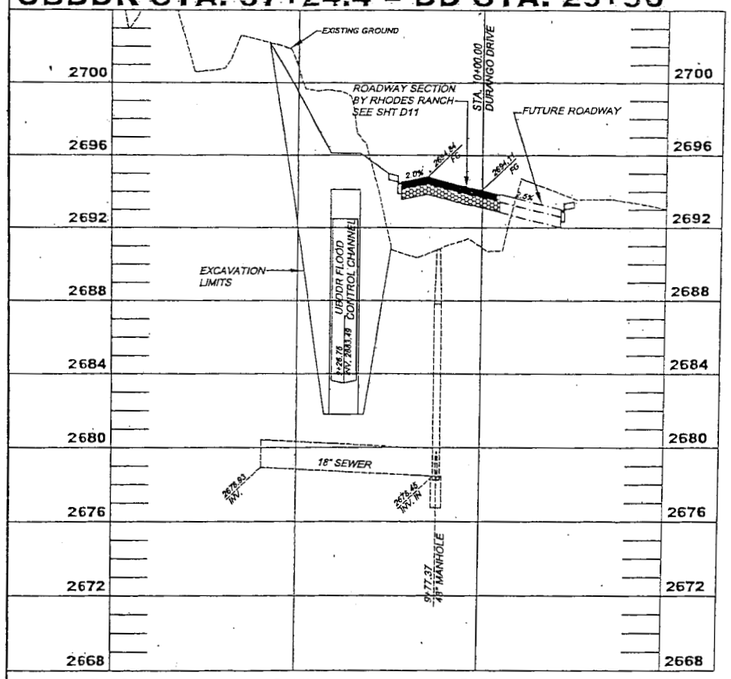
UBDDR STA. 37+24.4 = DD STA. 29+90

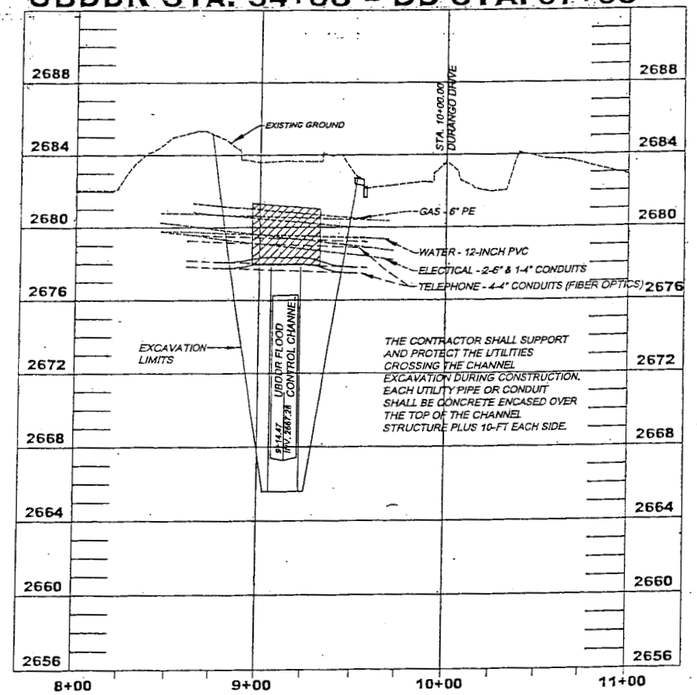


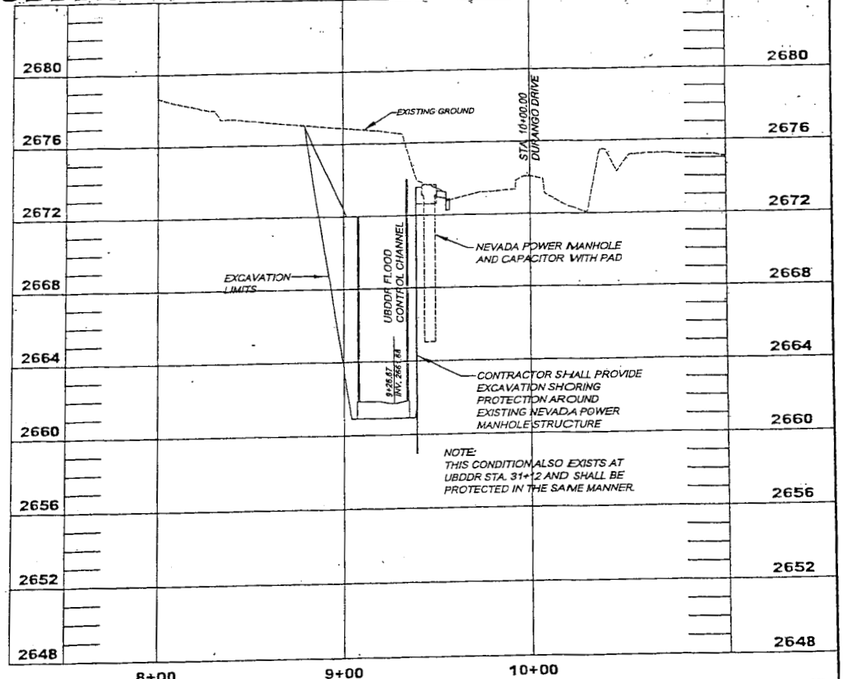
UBDDR STA. 34+88 = DD STA. 37+65



UBDDR STA. 33+25 = DD STA. 42+99







REV No	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

UTILITY CROSSING DETAILS

UBDDR STA. 33+25, 34+88, AND 37+24.4

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp: 06\30\04
CIVIL
No. 7942

DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 08, 2003 - 4:01pm
DISTRICT FILE NO.	214/185
SPEC. NO.	DACW09-03-B-0015

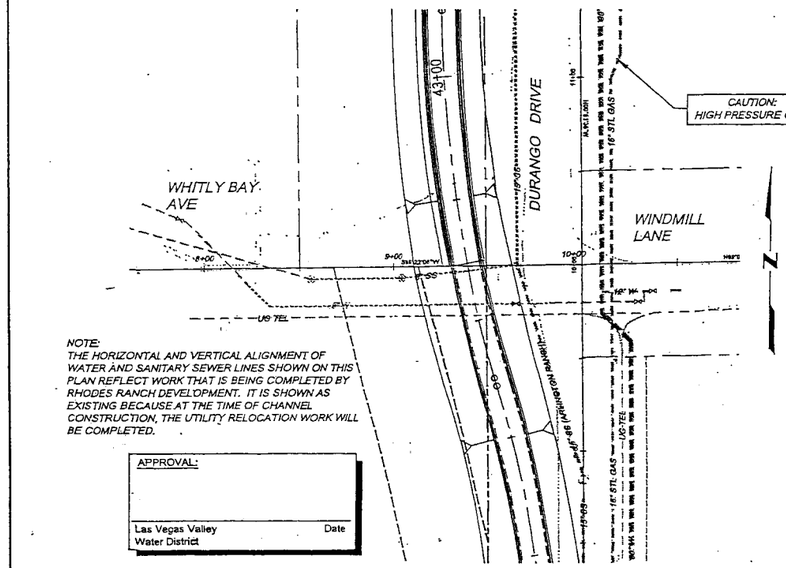
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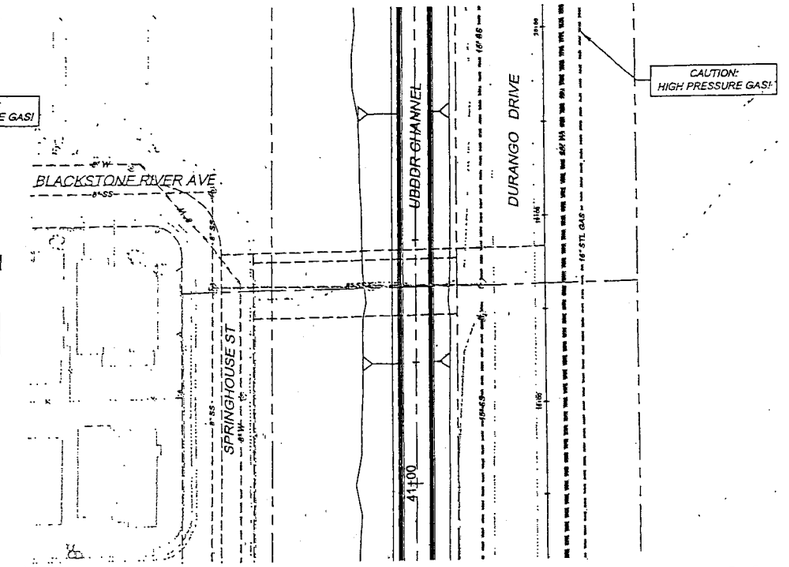
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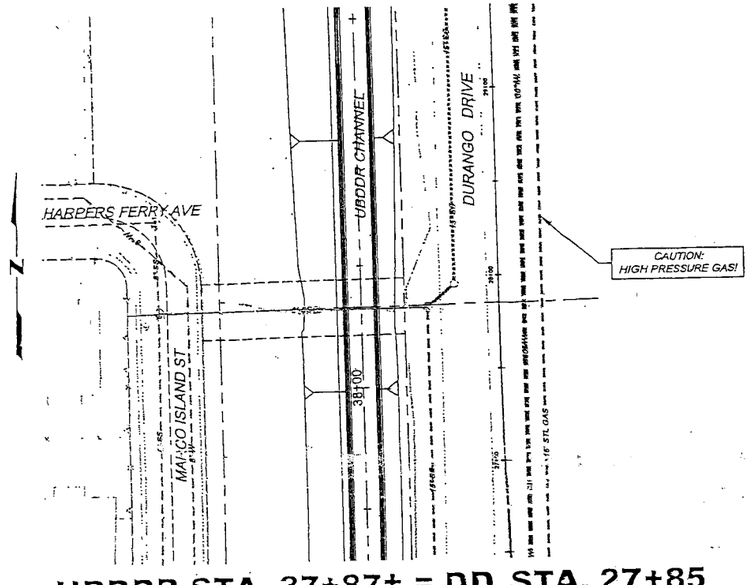
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L-1715

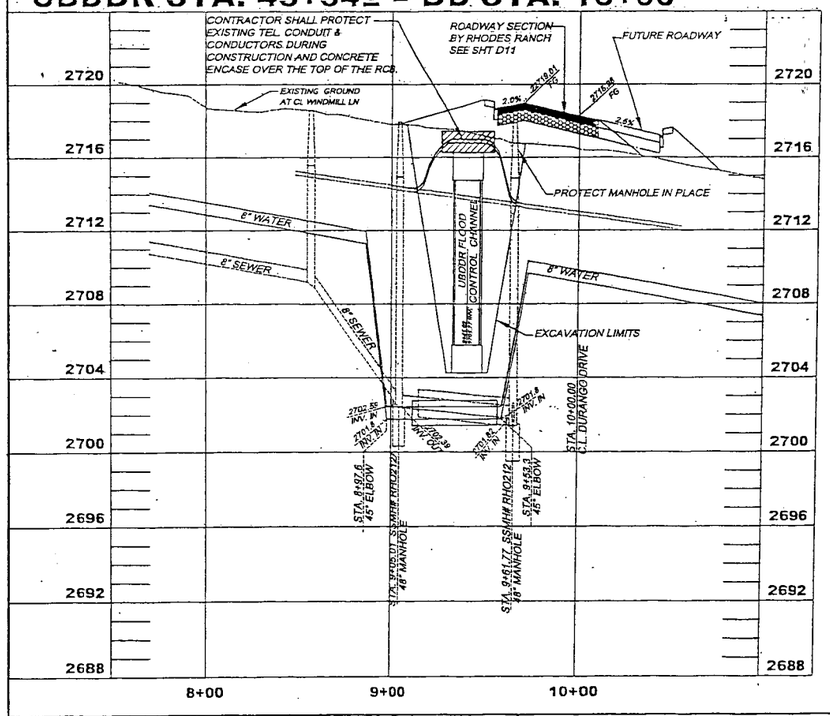
UPPER BLUE DIAMOND DIVERSION CHANNEL



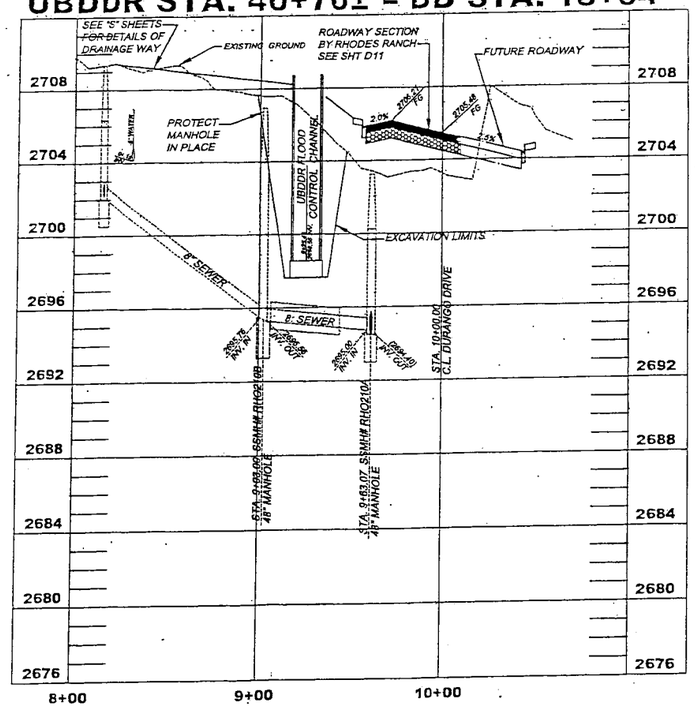




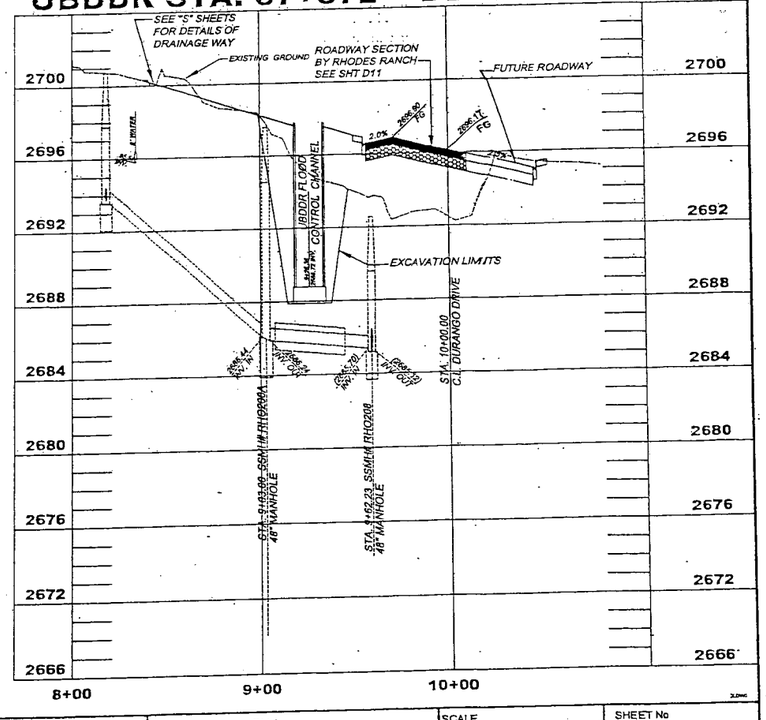
UBDDR STA. 43+34± = DD STA. 10+00



UBDDR STA. 40+70± = DD STA. 18+64



UBDDR STA. 37+87± = DD STA. 27+85



REV No	DATE	DESCRIPTION	APPROVED

UPPER BLUE DIAMOND DIVERSION CHANNEL

UTILITY CROSSING DETAILS

UBDDR STA. 37+87, 40+70, AND 43+34

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp: 06/30/04
CIVIL
No. 7942

DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 08, 2003 - 4:04pm
DISTRICT FILE NO.	214/186
SPEC. NO.	DACW09-03-B-0015

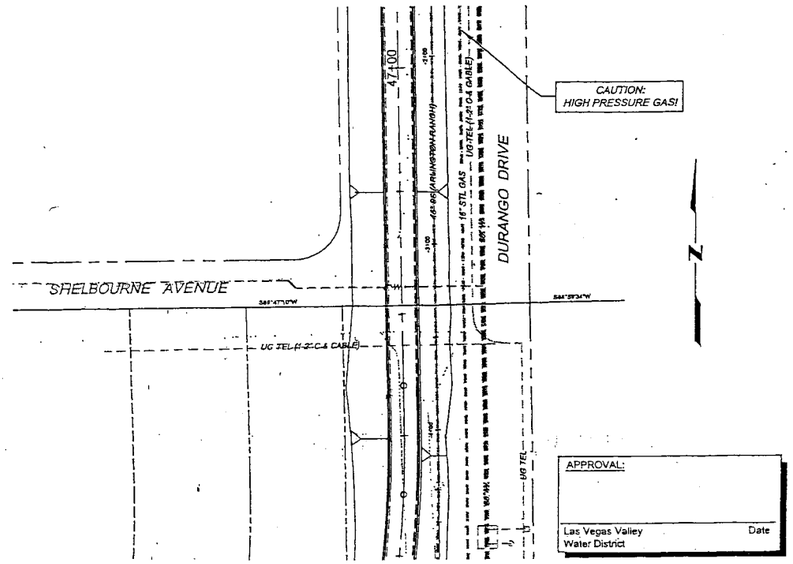
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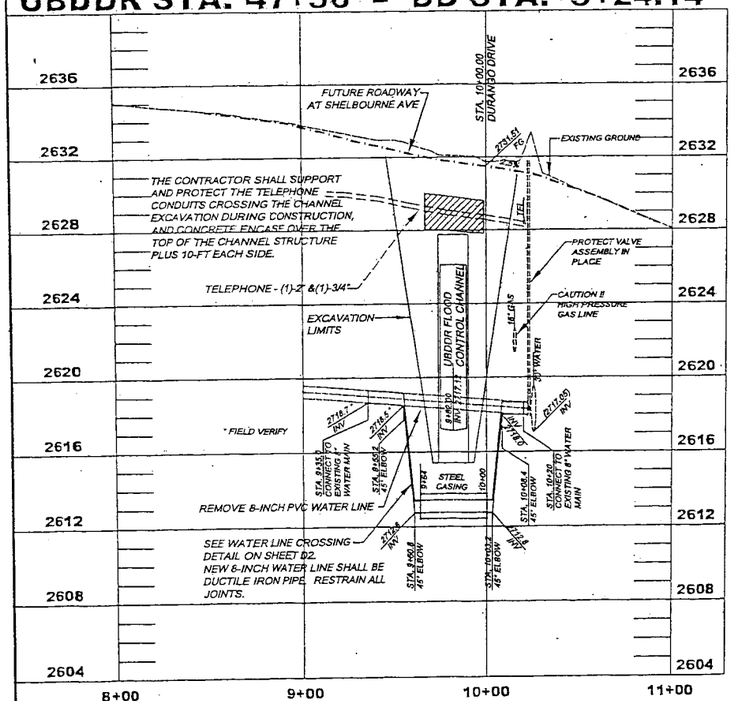
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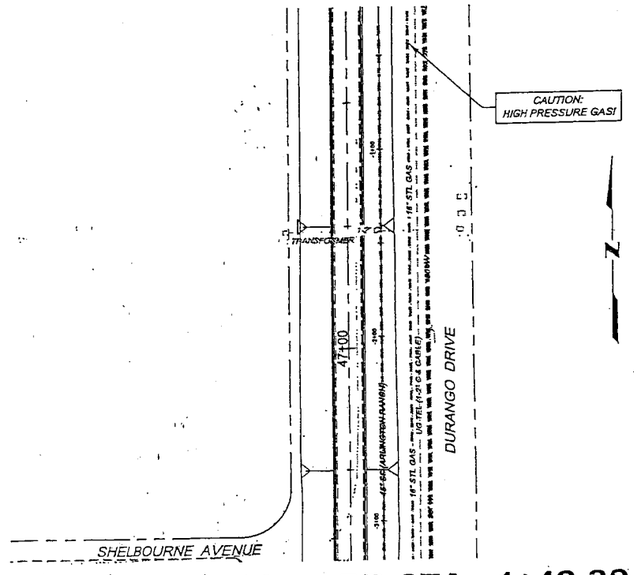
L-1715

UPPER BLUE DIAMOND DIVERSION CHANNEL

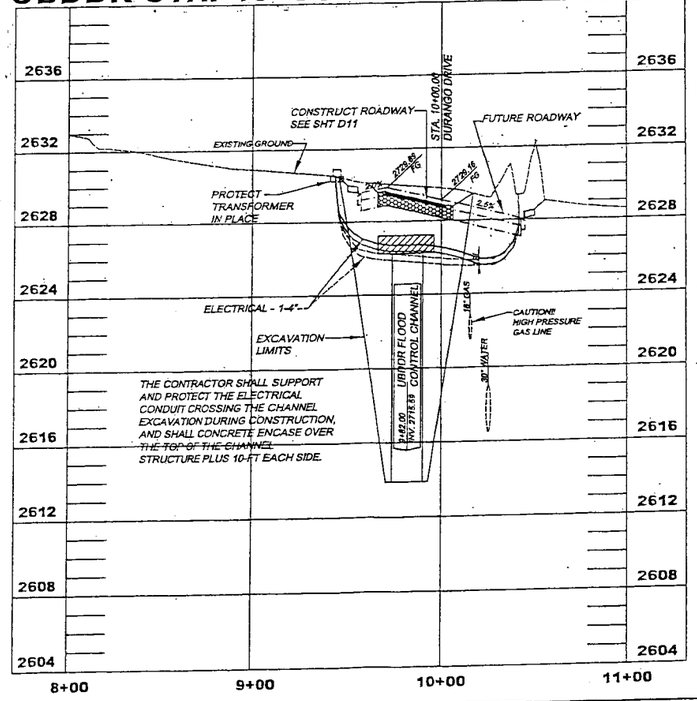


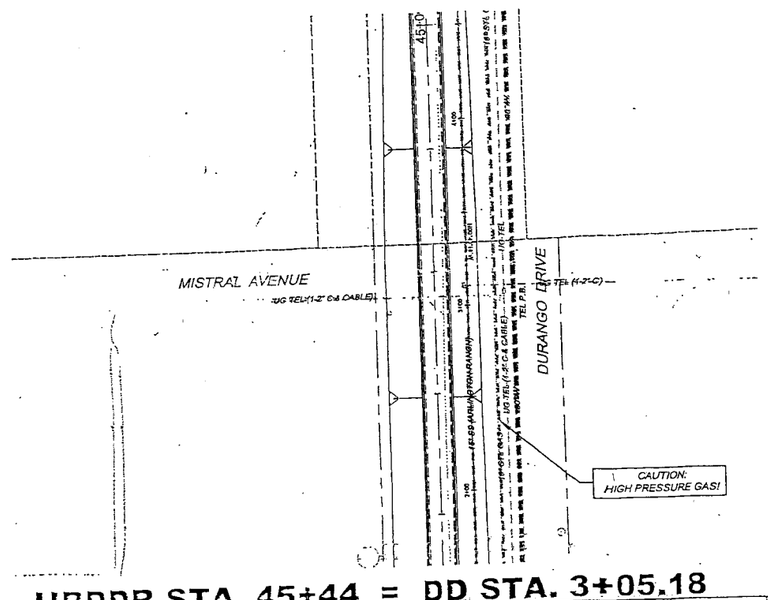
UBDDR STA. 47+36 = DD STA. -3+24.14



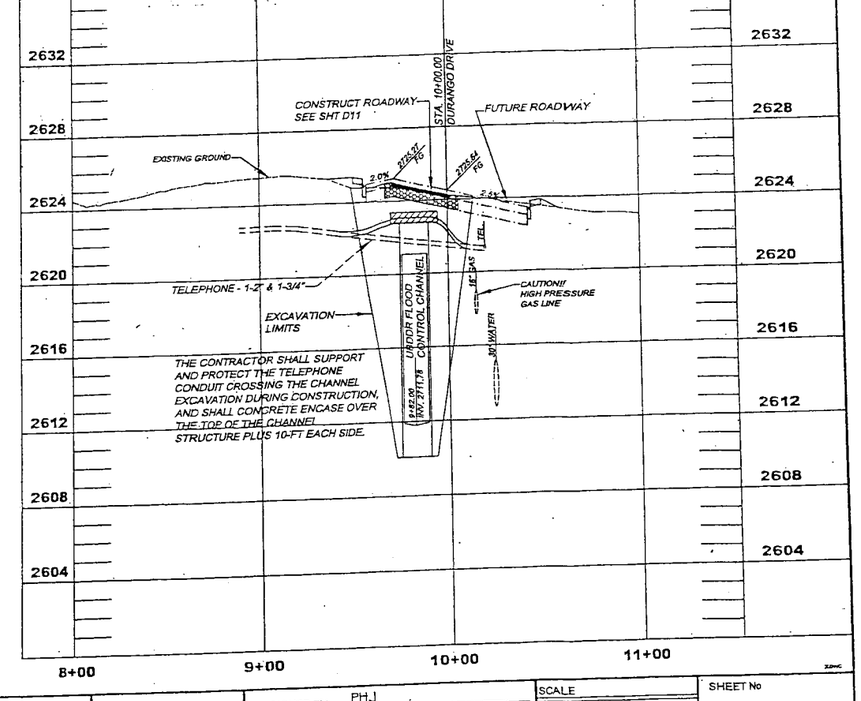


UBDDR STA. 46+81 = DD STA. -1+43.39





UBDDR STA. 45+44 = DD STA. 3+05.18



UPPER BLUE DIAMOND DIVERSION CHANNEL

REV No	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

UTILITY CROSSING DETAILS

UBDDR STA. 45+44, 46+81, AND 47+36

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp: 06/30/04
CIVIL
No. 7942

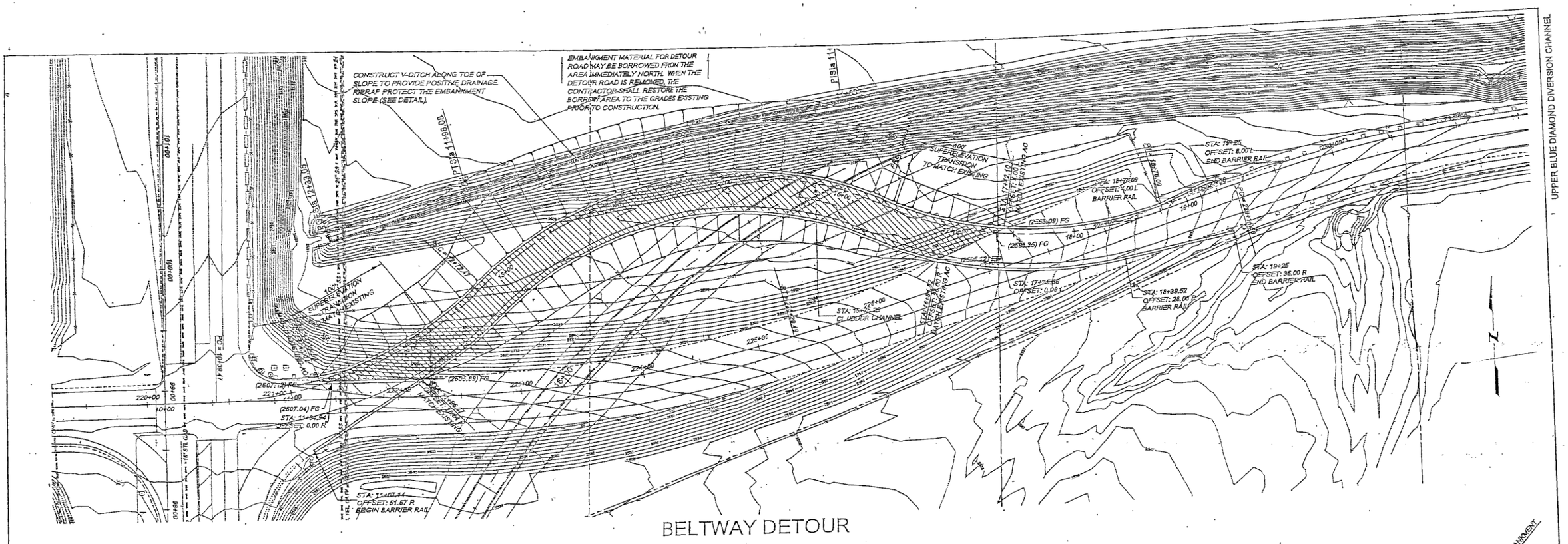
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DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 08, 2003 - 4:06pm
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SPEC. NO.	DACW09-03-B-0015

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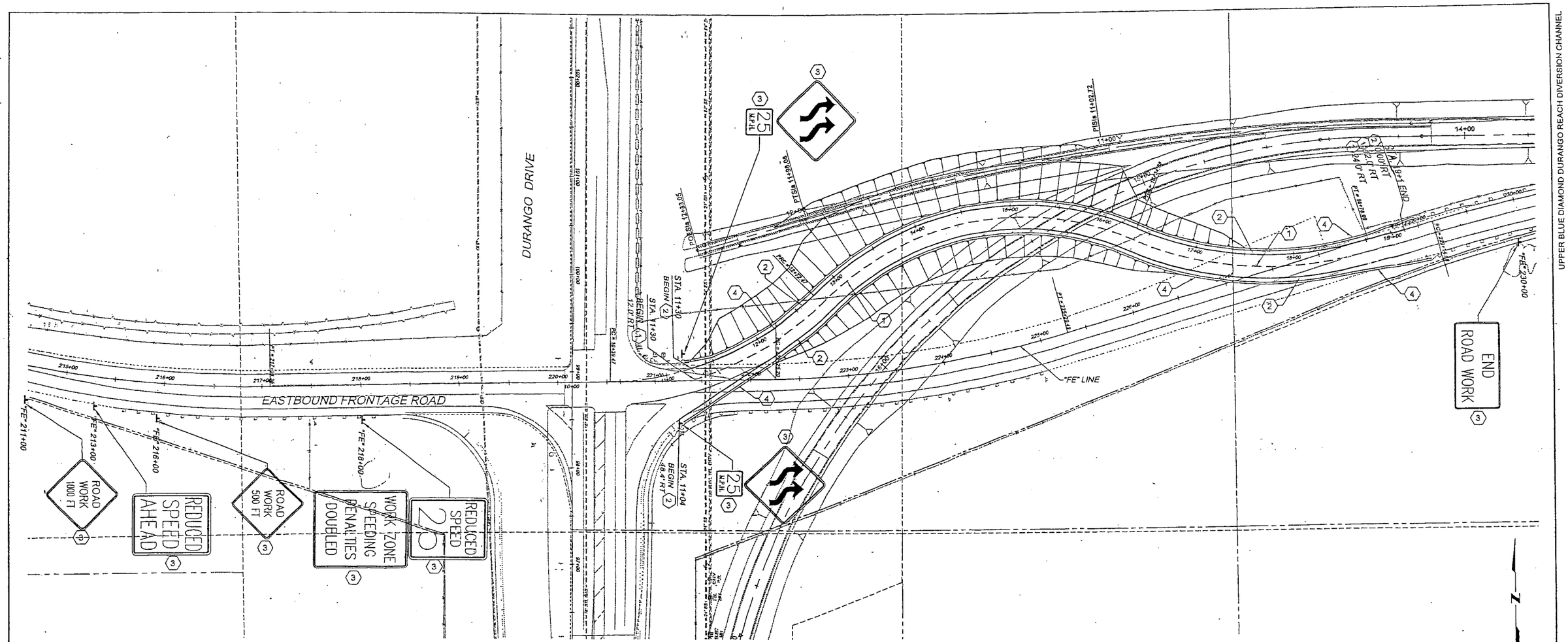
L-1715



UPPER BLUE DIAMOND DIVERSION CHANNEL
BELTWAY DETOUR CONSTRUCTION PLAN
STATION 10+00 TO 19+00

CLARK COUNTY NEVADA DEPARTMENT OF PUBLIC WORKS

DESIGNED BY:	PHJ/JAG
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Jun 06, 2003 - 3:05pm
DISTRICT FILE NO.	214/188
SCALE	
HORIZ:	1" = 40'
VERT:	1" = 4'
FIELD BOOK	NONE
SHEET No	D7
	F950917



CONSTRUCTION NOTES

1. INSTALL 6-INCH WIDE WHITE DASHED TYPE 1 LANE LINE (PAINT)
2. INSTALL 6-INCH SOLID WHITE EDGE LINE (PAINT)
3. INSTALL GROUND MOUNTED SIGN
4. INSTALL PORTABLE PRECAST CONCRETE BARRIER RAIL

REV No	DATE	DESCRIPTION	APPROVED

BLUE DIAMOND DURANGO REACH DIVERSION CHANNEL
FRONTAGE ROAD DETOUR PLAN
CONSTRUCTION SIGNING & STRIPING
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp: 06\30\04
CIVIL
No. 7942

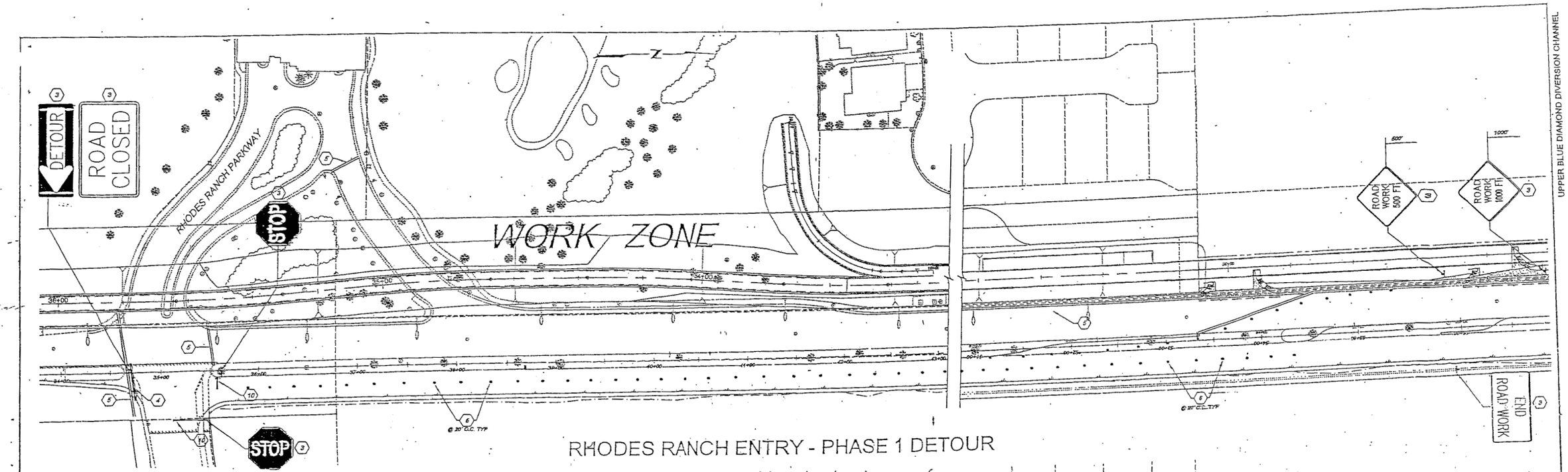
DESIGNED BY:	PHJ/JAG
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 08, 2003 - 3:41pm
DISTRICT FILE NO.	214/189
SPEC. NO.	DACW09-03-B-0015

SCALE	
HORIZ:	1" = 50'
VERT:	NONE
FIELD BOOK	NONE

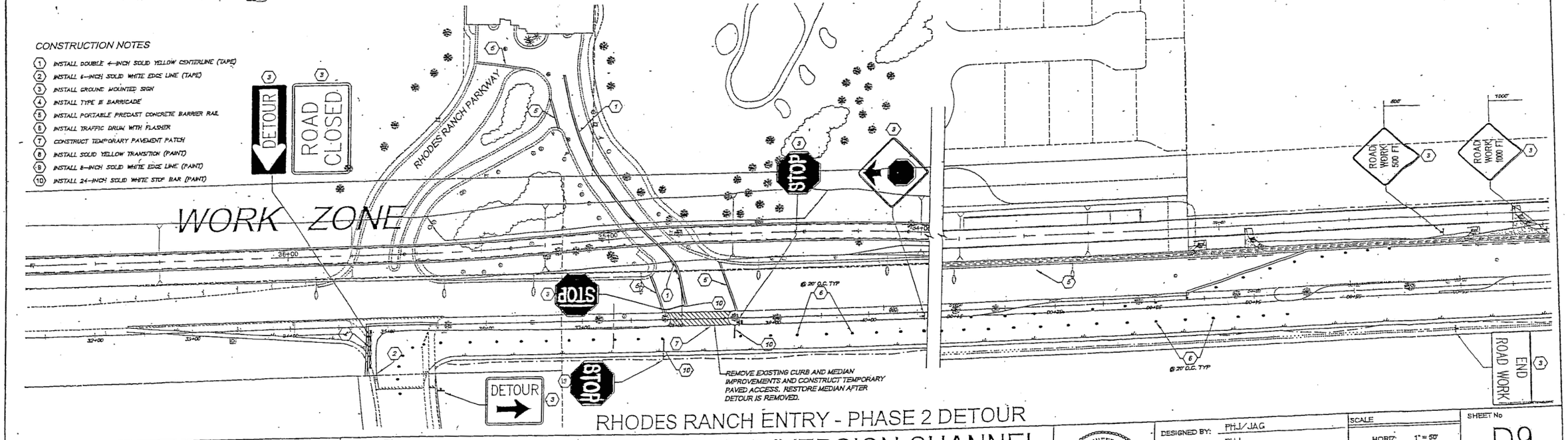
SHEET No **D8**

F950917

L-1715



RHODES RANCH ENTRY - PHASE 1 DETOUR



RHODES RANCH ENTRY - PHASE 2 DETOUR

REV No	DATE	DESCRIPTION	APPROVED

UPPER BLUE DIAMOND DIVERSION CHANNEL

RHODES RANCH ENTRY

PHASE 1 & 2 DETOUR CONSTRUCTION PLAN

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
PAUL H. JUDD
Exp. 06/30/04
CIVIL
No. 7842

DESIGNED BY:	PHJ/JAG
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Jan 06, 2003 - 2:55pm
DISTRICT FILE NO.	214/190
SPEC. NO.	DACW09-03-B-0015

SCALE	
HORIZ:	1" = 50'
VERT:	NONE
FIELD BOOK	NONE

SHEET No **D9**

F950917

L-1715

UPPER BLUE DIAMOND DIVERSION CHANNEL

UPPER BLUE DIAMOND DIVERSION CHANNEL

BONITA VISTA ST

DURANGO DR

GAGNIER BLVD

LISA LN

MILLER LN

WARBONNET WY

BUFFALO DR

COUGAR AVE

WIGWAM AVE

CAMBRIA AVE

SHELBOURNE AVE

BAY TALISM

BAY BURNHAM

MARYBRIDETH

MOBERLY AVE

ROBINDALE RD

BAY PINEDROW

SCHOOL

DETOUR
ROAD CLOSED TO THRU TRAFFIC
ROAD CLOSED
M4-10R
M4-10L
M4-9L
M4-9R
R11-4
R11-2
(3) TYPE IIIA

UPPER BLUE DIAMOND DURANGO REACH DIVERSION CHANNEL
ROAD CLOSURE PLAN
DURANGO DRIVE - ROBINDALE RD. TO WIGWAM AVE.
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

APPROVED

DESIGNED BY:	PHJ/JAG
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Jun DG. 2003 – 3:04pm
DISTRICT FILE NO.	214/191
SPEC. NO.	DACW09-03-B-0015

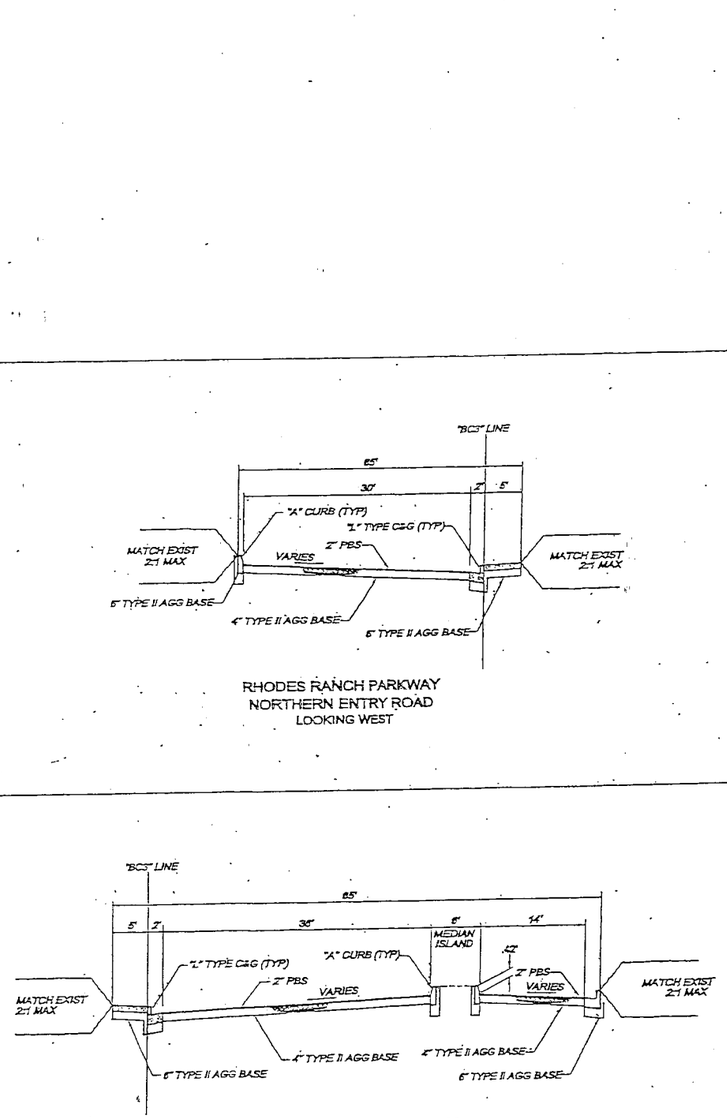
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VERT:	NONE
FIELD BOOK	NONE

SHEET No D10

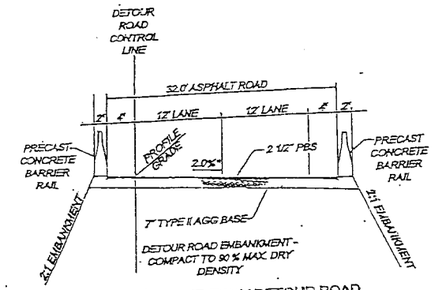
FS50917

L-1715

RHODES RANCH PARKWAY
NORTHERN ENTRY ROAD
LOOKING WEST

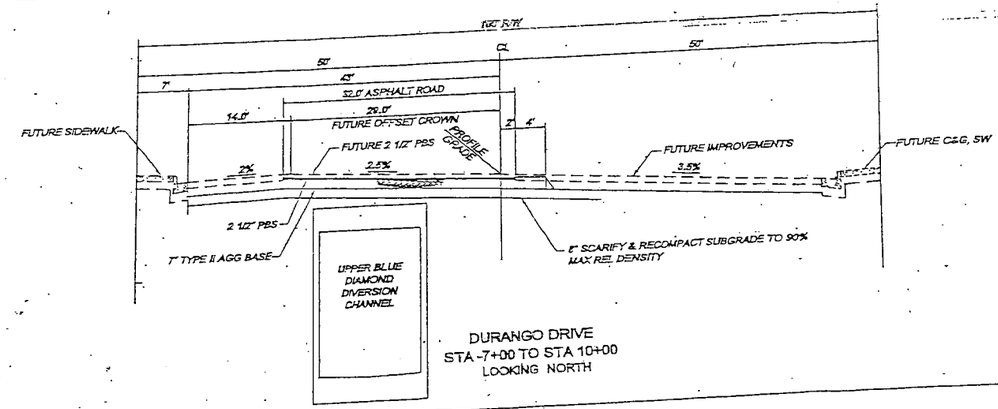


RHODES RANCH PARKWAY
SOUTHERN ENTRY ROAD
LOOKING WEST

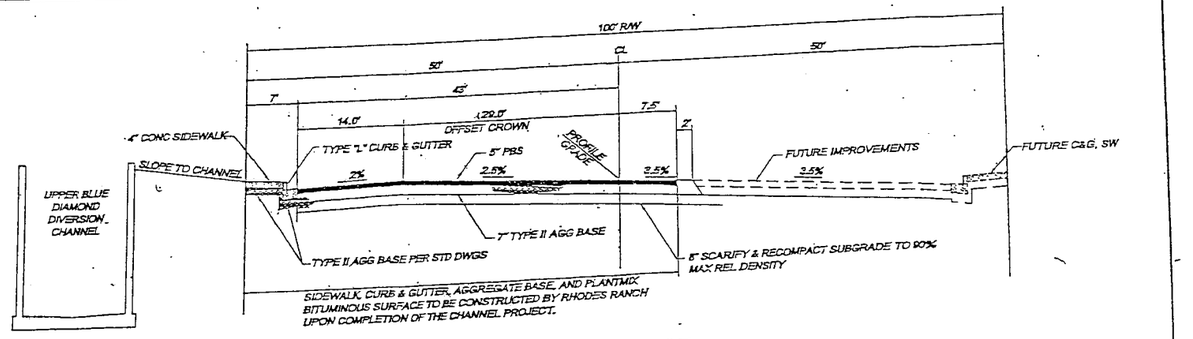


SOUTHERN BELTWAY DETOUR ROAD
STA. 11+50 TO STA 17+40
LOOKING EAST

* ADJUST CROSS SLOPE TO MATCH EXISTING AT CONNECTION POINTS



DURANGO DRIVE
STA -7+00 TO STA 10+00
LOOKING NORTH



DURANGO DRIVE
STA 10+00 TO STA 34+56.51
LOOKING NORTH

UPPER BLUE DIAMOND DIVERSION CHANNEL

UPPER BLUE DIAMOND DIVERSION CHANNEL

TYPICAL PAVEMENT SECTIONS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

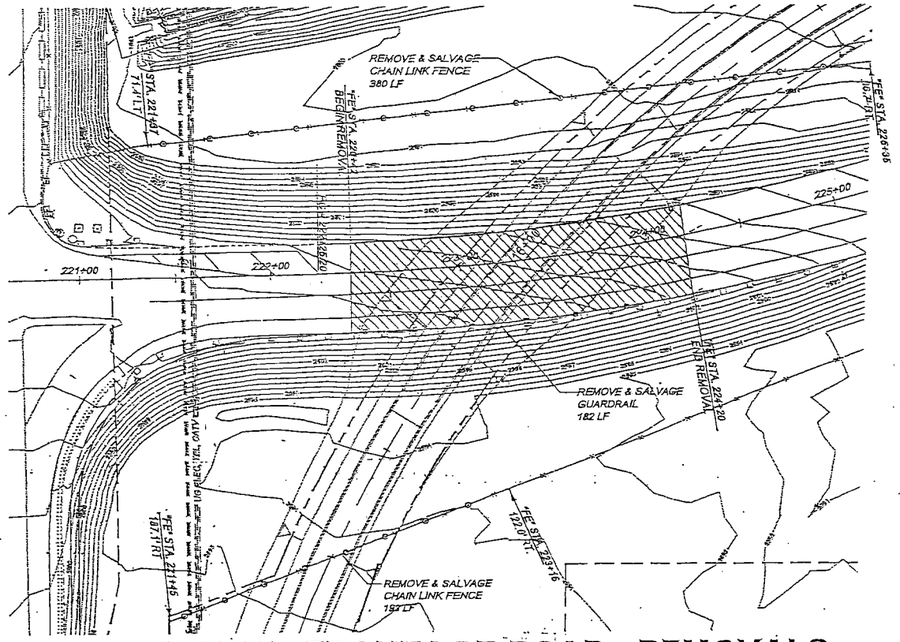
REV No	DATE	DESCRIPTION	APPROVED

PROFESSIONAL ENGINEER - STATE OF NEVADA
PAUL H. JUDD
Exp. 06/30/04
No. 7942
CIVIL

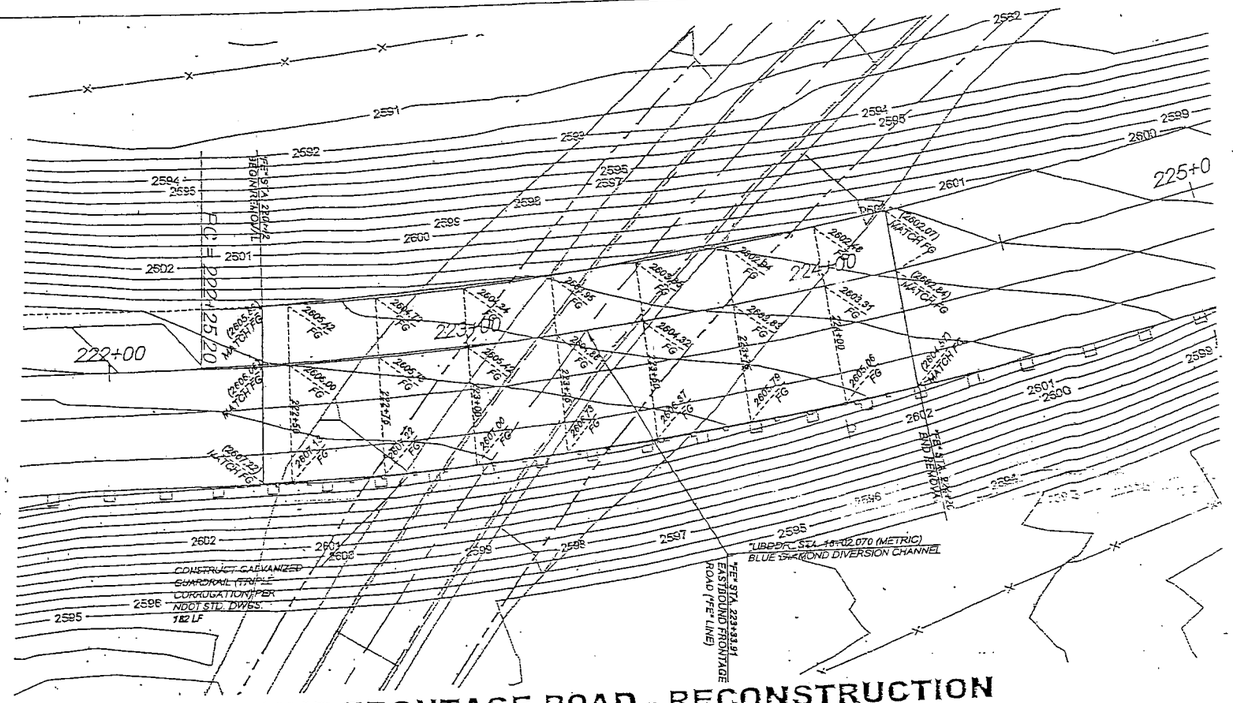
DESIGNED BY:	JAG/PHJ
DRAWN BY:	JAG/PHJ
CHECKED BY:	PHJ
DATE:	Jan 06, 2003 - 2:34pm
DISTRICT FILE NO.	214/192
SPEC. NO.	DACW09-03-0015

SCALE	
HORIZ:	NONE
VERT:	NONE
FIELD BOOK	NONE

SHEET No
D11
F950917
L-1715



EASTBOUND FRONTAGE ROAD - REMOVALS

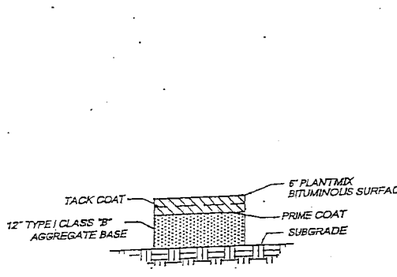


EASTBOUND FRONTAGE ROAD - RECONSTRUCTION

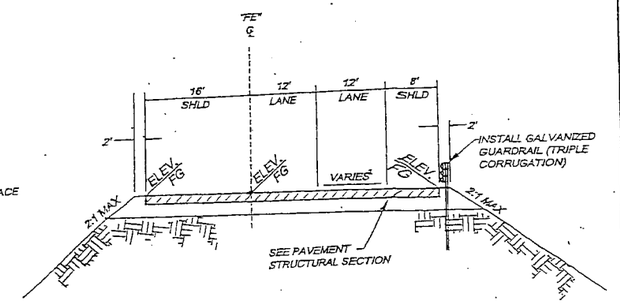
UPPER BLUE DIAMOND DIVERSION CHANNEL

RECONSTRCUTION NOTES:

THE SPOT ELEVATIONS SHOWN ON THIS DETAIL ARE BASED ON THE DIGITAL TERRAIN MODEL GENERATED FROM THE AERIAL TOPOGRAPHY FILES.
THE CONTRACTOR SHALL SURVEY THE SPOT ELEVATIONS SHOWN ON THE ABOVE GRID PRIOR TO REMOVAL OF THE SURFACE IMPROVEMENTS, AND ADJUST THE FG ELEVATIONS TO MATCH THE SURVEY DATA. THE ROADWAY SURFACE SHALL BE RESTORED TO THE GRADES EXISTING PRIOR TO REMOVAL.



PAVEMENT STRUCTURAL SECTION "FE" LINE



"FE" TYPICAL SECTION

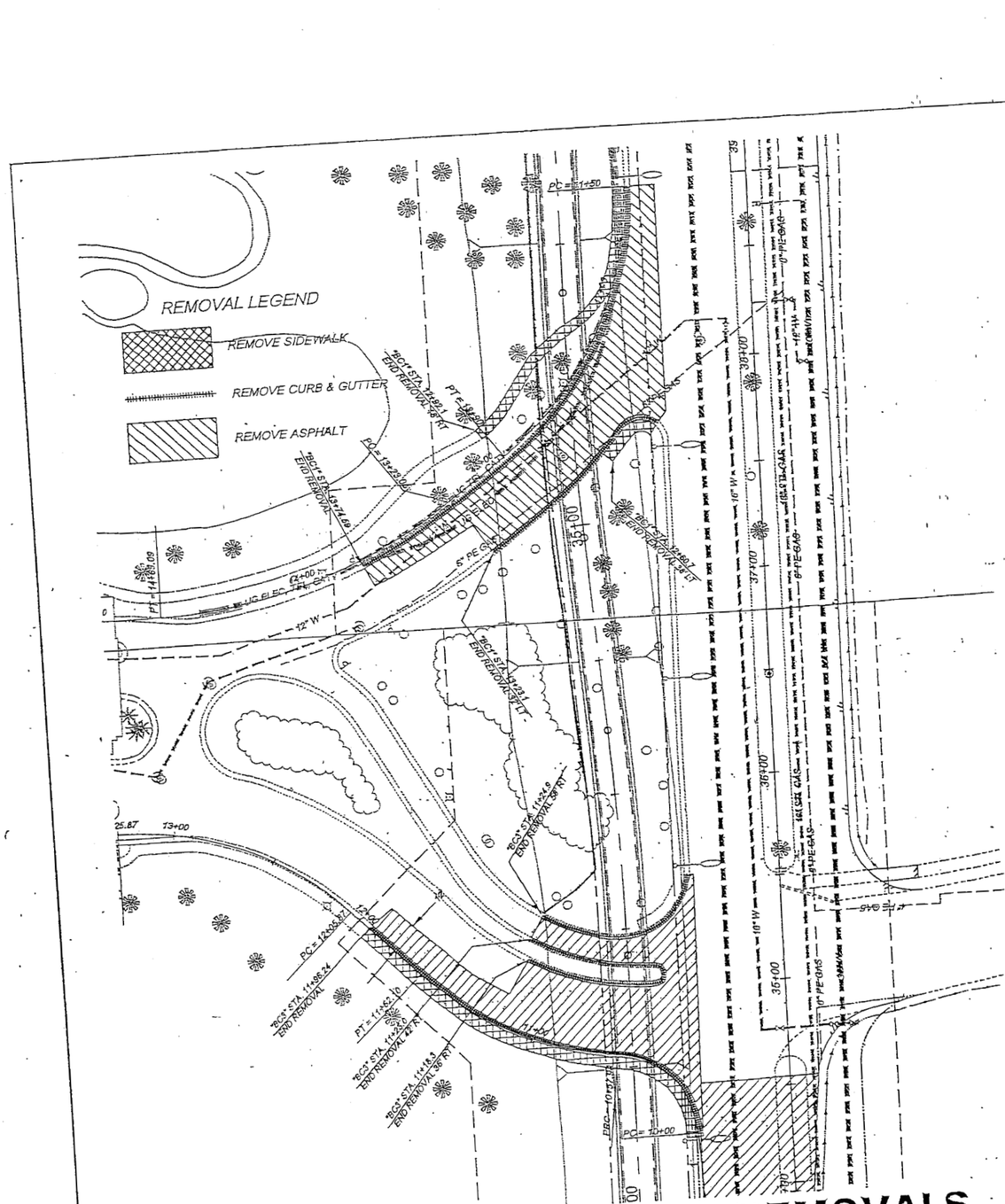
REV No	DATE	DESCRIPTION	APPROVED

UPPER BLUE DIAMOND DIVERSION CHANNEL

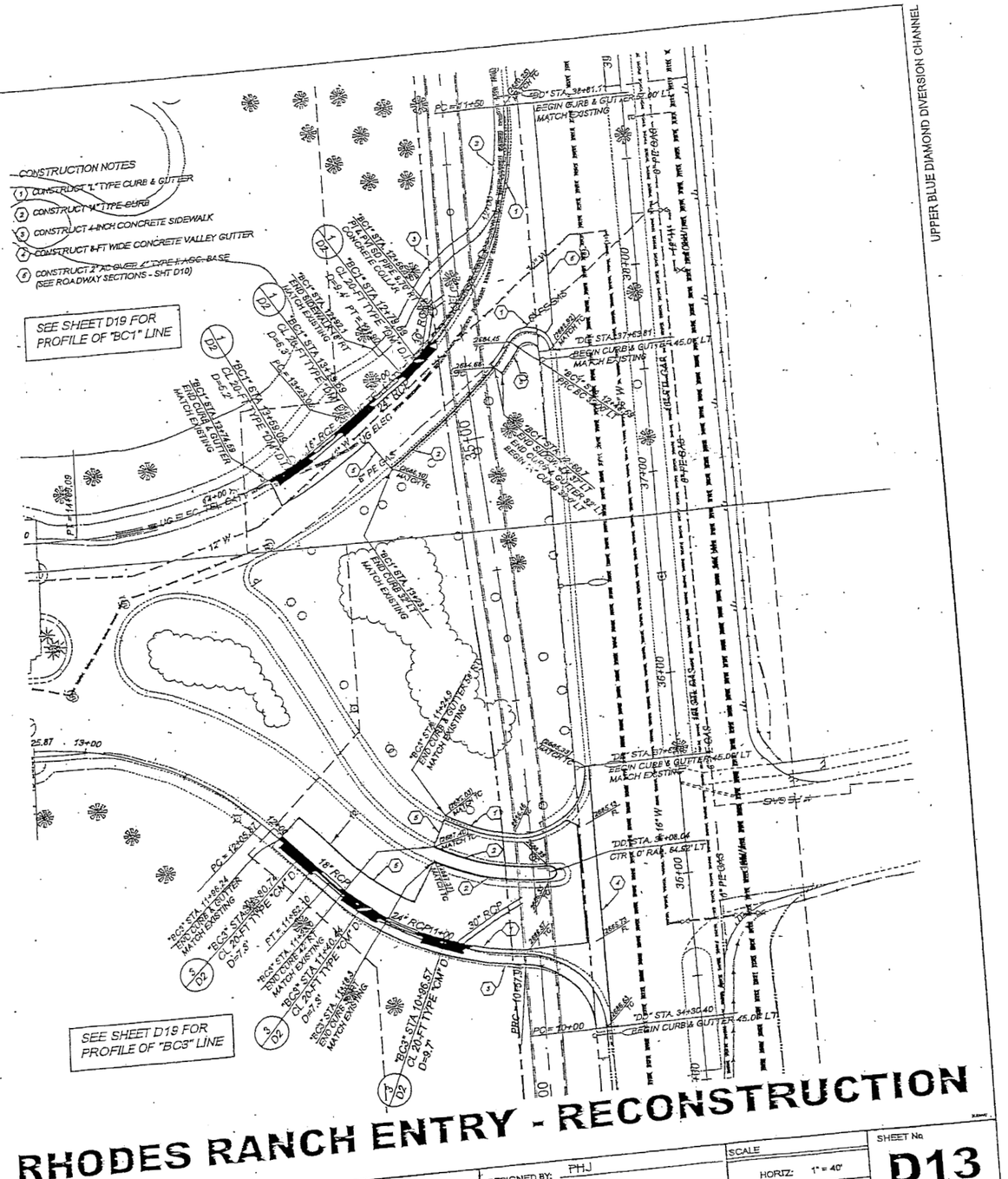
REMOVAL AND RECONSTRUCTION
SOUTHERN BELTWAY EASTBOUND FRONTAGE ROAD
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

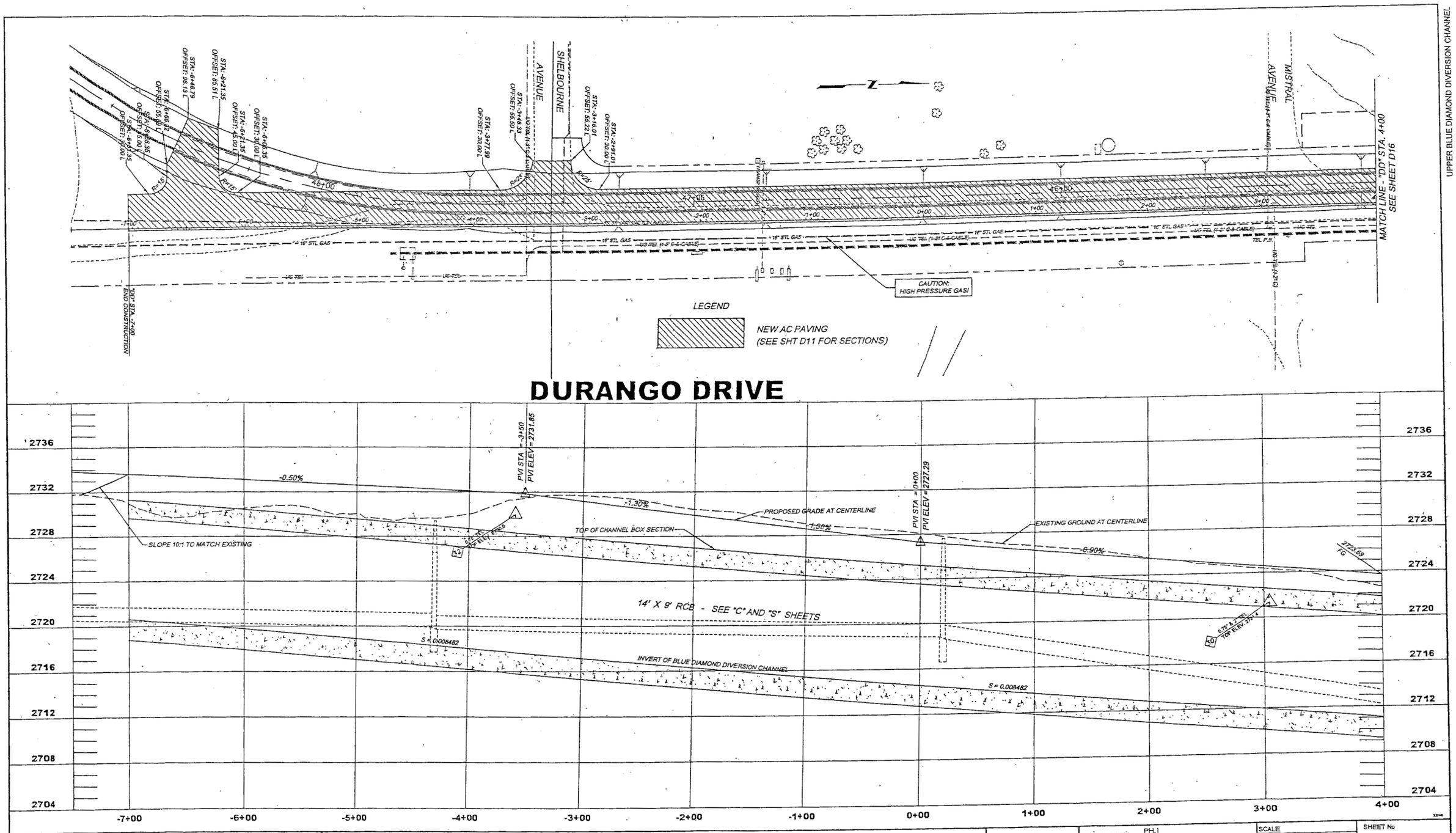
DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Jun 06, 2003 - 3:34pm
DISTRICT FILE NO.	214/193
SPEC. NO.	DACW09-03-B-0015

SCALE	
HORIZ:	1" = 40'
VERT:	1" = 4'
FIELD BOOK	NONE
SHEET No	D12
	F950917
	L-1715



RHODES RANCH ENTRY - REMOVALS


CONSTRUCTION NOTES
1 CONSTRUCT "L" TYPE CURB & GUTTER
2 CONSTRUCT "M" TYPE CURB
3 CONSTRUCT 4-INCH CONCRETE SIDEWALK
4 CONSTRUCT 8-FT WIDE CONCRETE VALLEY GUTTER
5 CONSTRUCT 2" AC OVER 6" TYPE II AGG. BASE (SEE ROADWAY SECTIONS - SHT D10)
SEE SHEET D19 FOR PROFILE OF "BC1" LINE
SEE SHEET D15 FOR PROFILE OF "BC3" LINE
"BC1" STA 13+74.89 END CURB & GUTTER MATCH EXISTING
"BC1" STA 13+23.89 END CURB & GUTTER MATCH EXISTING
"BC2" STA 11+66.24 END CURB & GUTTER MATCH EXISTING
"BC2" STA 11+52.10 END CURB & GUTTER MATCH EXISTING
"BC3" STA 11+24.9 END CURB & GUTTER MATCH EXISTING
"BC3" STA 11+18.3 END CURB & GUTTER MATCH EXISTING
"BC1" STA 13+74.89 BEGIN CURB & GUTTER MATCH EXISTING
"BC1" STA 13+23.89 BEGIN CURB & GUTTER MATCH EXISTING
"BC2" STA 11+66.24 BEGIN CURB & GUTTER MATCH EXISTING
"BC2" STA 11+52.10 BEGIN CURB & GUTTER MATCH EXISTING
"BC3" STA 11+24.9 BEGIN CURB & GUTTER MATCH EXISTING
"BC3" STA 11+18.3 BEGIN CURB & GUTTER MATCH EXISTING
"BC1" STA 13+74.89 CL 20 FT TYPE "DM" D
"BC1" STA 13+23.89 CL 20 FT TYPE "DM" D
"BC2" STA 11+66.24 CL 20 FT TYPE "CM" D
"BC2" STA 11+52.10 CL 20 FT TYPE "CM" D
"BC3" STA 11+24.9 CL 20 FT TYPE "CM" D
"BC3" STA 11+18.3 CL 20 FT TYPE "CM" D
"BC1" STA 13+74.89 D=5.2°
"BC1" STA 13+23.89 D=6.3°
"BC2" STA 11+66.24 D=7.5°
"BC2" STA 11+52.10 D=7.5°
"BC3" STA 11+24.9 D=9.7°
"BC3" STA 11+18.3 D=9.7°
"BC2" STA 10+86.57 CL 20 FT TYPE "CM" D
"BC2" STA 10+60.71 CL 20 FT TYPE "CM" D
"BC1" STA 13+74.89 CL 20 FT TYPE "DM" D
"BC1" STA 13+23.89 CL 20 FT TYPE "DM" D
"BC1" STA 12+98.10 CL 20 FT TYPE "DM" D
"BC1" STA 12+66.10 CL 20 FT TYPE "DM" D
"BC1" STA 12+39.4 PT = 11+66.10
"BC1" STA 12+66.10 PC = 12+06.87
"BC1" STA 12+98.10 PC = 12+39.4
"BC1" STA 13+23.89 PC = 12+65.67
"BC1" STA 13+74.89 PC = 13+23.89
"BC2" STA 11+52.10 PT = 11+66.10
"BC2" STA 11+66.24 PC = 11+52.10
"BC2" STA 10+60.71 PC = 10+86.57
"BC3" STA 11+18.3 PC = 11+24.9
"BC3" STA 10+86.57 PC = 10+97.30
PC= 1+50
PT= 14+88.09
PC= 10+00
PC= 13+00
25.87
12" W
16" W
6" PE GAS
10" PE GAS
24" RCP
30" RCP
16" RCP
35+00
36+00
37+00
SYS # 1
SYS # 2
SYS # 3
SYS # 4
SYS # 5
SYS # 6
SYS # 7
SYS # 8
SYS # 9
SYS # 10
SYS # 11
SYS # 12
SYS # 13
SYS #



REV No	DATE	DESCRIPTION	APPROVED

UPPER BLUE DIAMOND DIVERSION CHANNEL

ROADWAY CONSTRUCTION PLAN

DURANGO DRIVE STA. -7+50 TO STA. 4+00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp: 06/30/04
CIVIL
No. 7942

DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 08, 2003 - 3:49pm
DISTRICT FILE NO.	214/196
SPEC. NO.	DACW09-03-B-0015

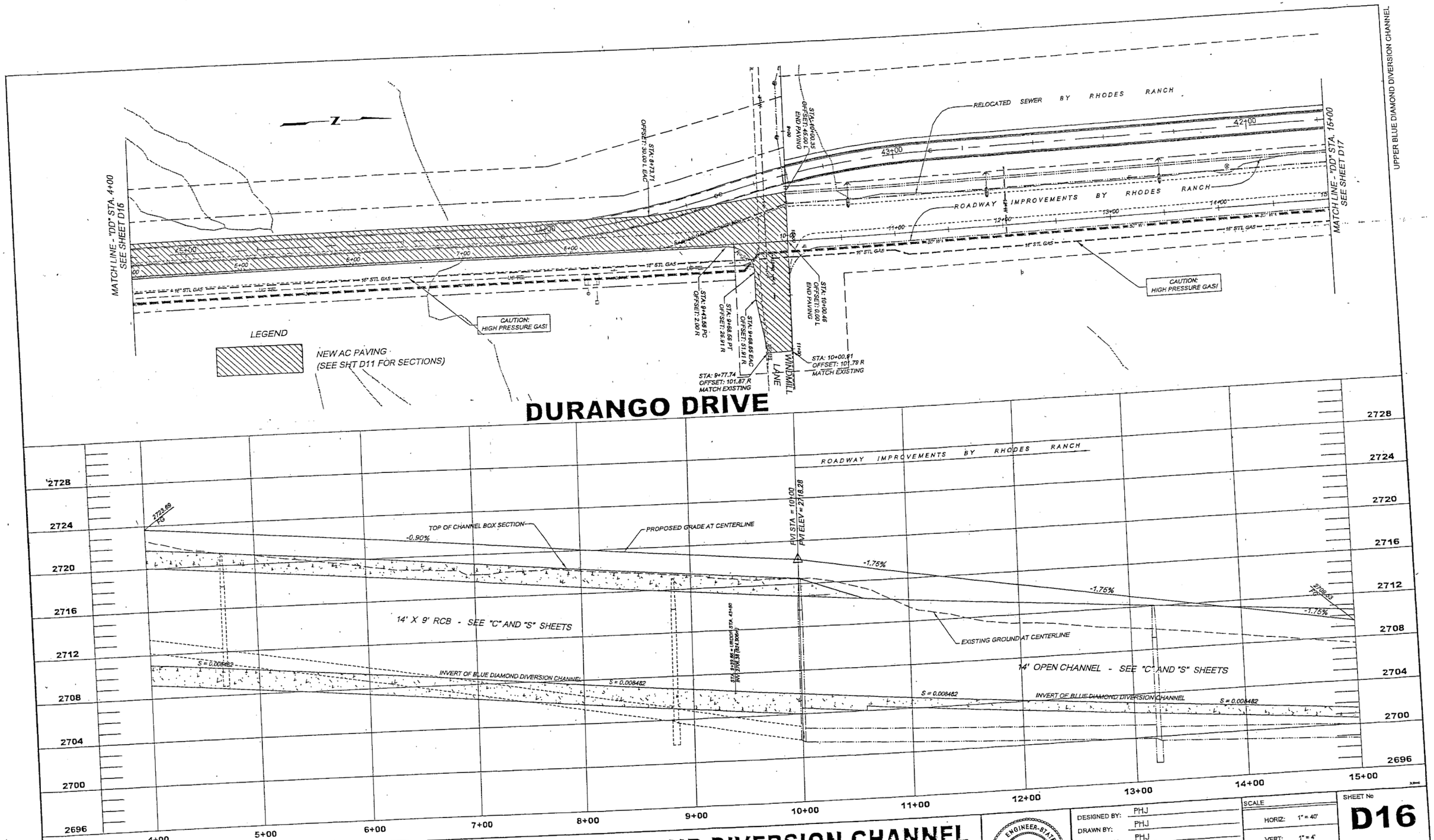
SCALE	
HORIZ:	1" = 40'
VERT:	1" = 4'
FIELD BOOK	NONE

SHEET No **D15**

F950917

L-1715

UPPER BLUE DIAMOND DIVERSION CHANNEL



UPPER BLUE DIAMOND DIVERSION CHANNEL

ROADWAY CONSTRUCTION PLAN

DURANGO DRIVE STA. 4+00 TO STA. 15+00

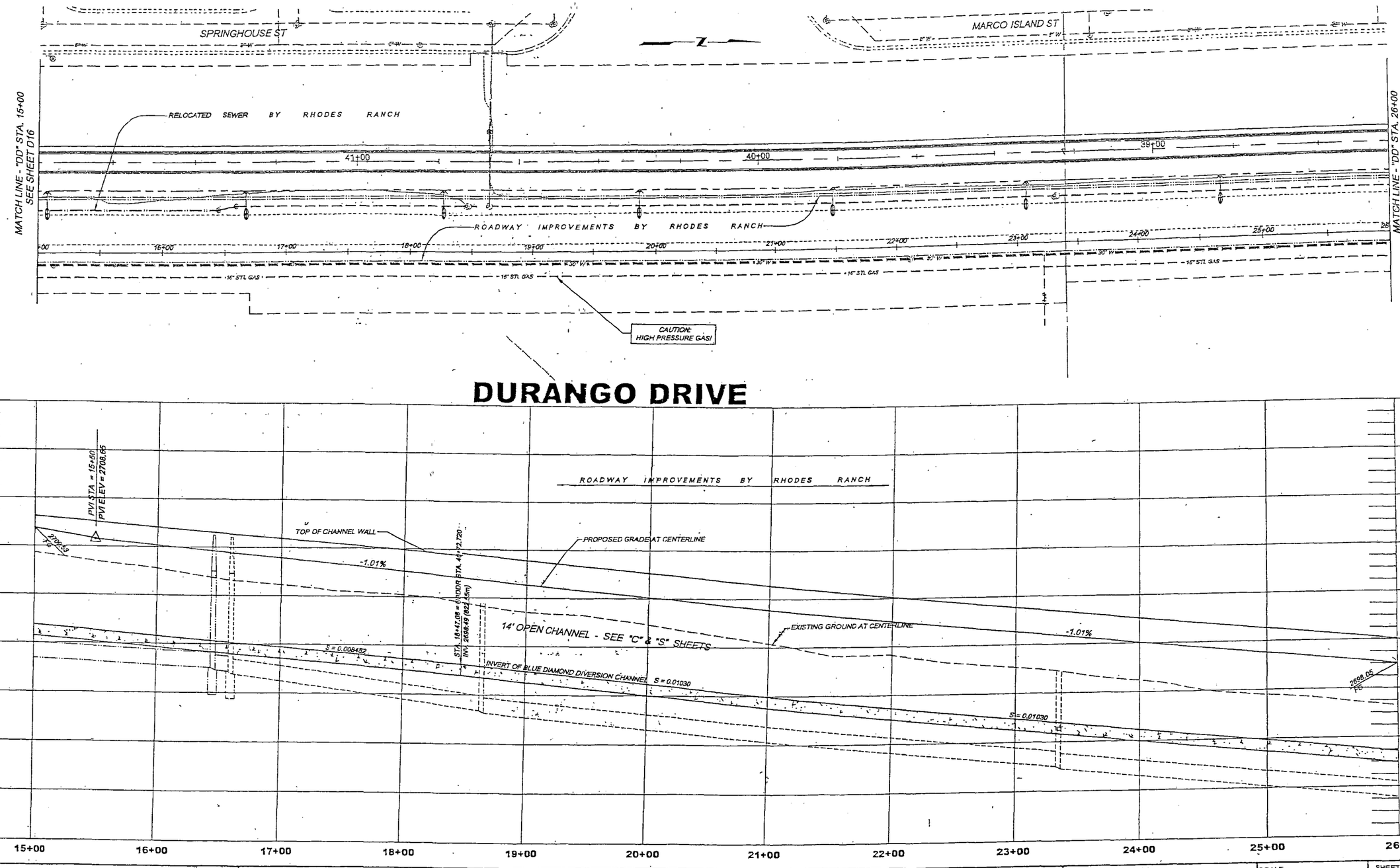
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

CLARK COUNTY NEVADA

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp: 06/30/04
CIVIL
No. 7942

REV No	DATE	DESCRIPTION	APPROVED

DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 08, 2003 - 3:51pm
DISTRICT FILE NO.	214/197
SPEC. NO.	DACW09-03-B-0015
SCALE	
HORIZ:	1" = 40'
VERT:	1" = 4'
FIELD BOOK	NONE
SHEET No	D16
	F950917
	L-1715



UPPER BLUE DIAMOND DIVERSION CHANNEL

REV No	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

ROADWAY CONSTRUCTION PLAN

DURANGO DRIVE STA. 15+00 TO STA. 26+00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER - STATE OF NEVADA
PAUL H. JUDD
Exp: 06\30\04
CIVIL
No. 7947

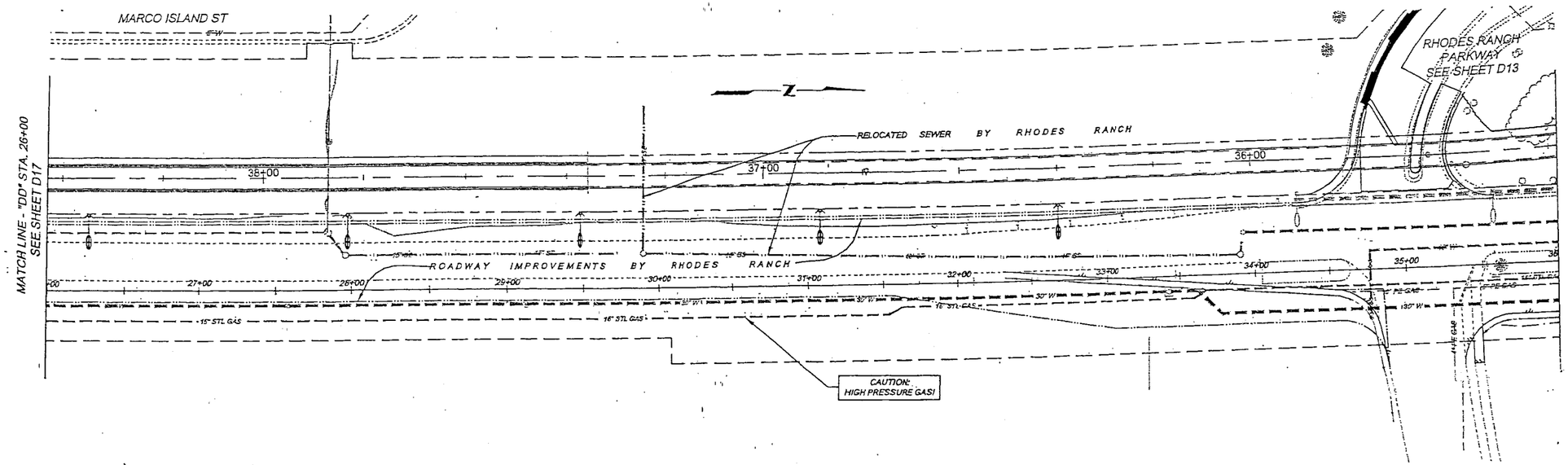
DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 06, 2003 - 3:53pm
DISTRICT FILE NO.	214/198
SPEC. NO.	DACW09-03-B-0015

SCALE	
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VERT:	1" = 4'
FIELD BOOK	NONE

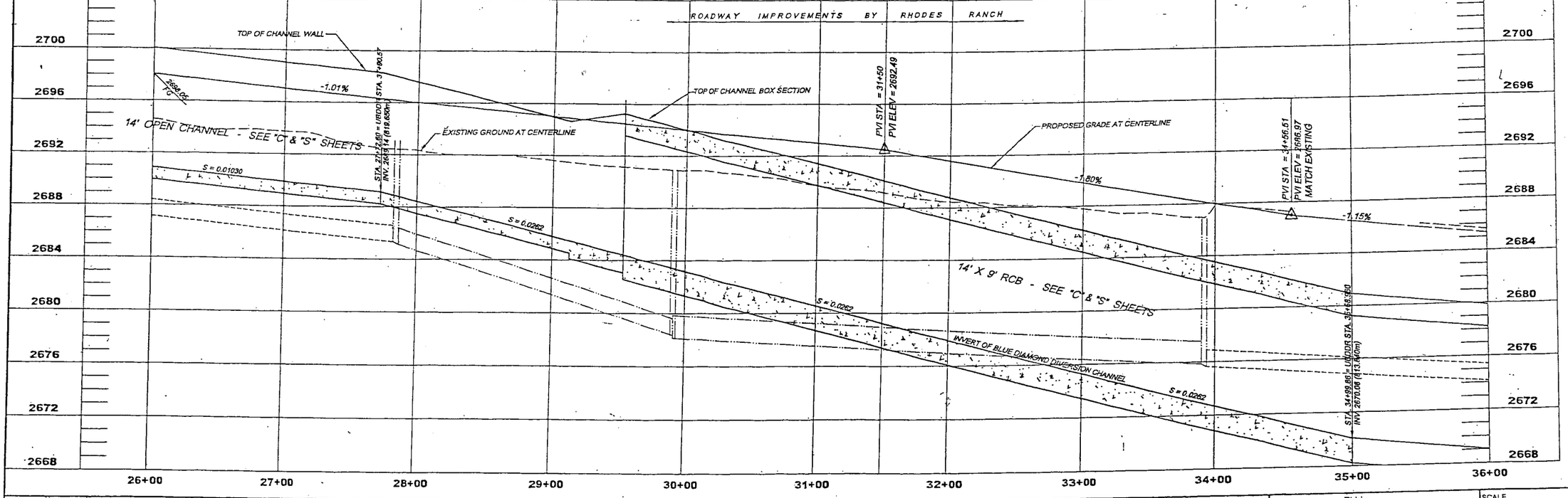
SHEET No **D17**

F950917

L-1715



DURANGO DRIVE



REV No	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

UPPER BLUE DIAMOND DIVERSION CHANNEL

ROADWAY CONSTRUCTION PLAN

DURANGO DRIVE STA. 26+00 TO STA. 36+00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp. 06/30/04
CIVIL
No. 7942

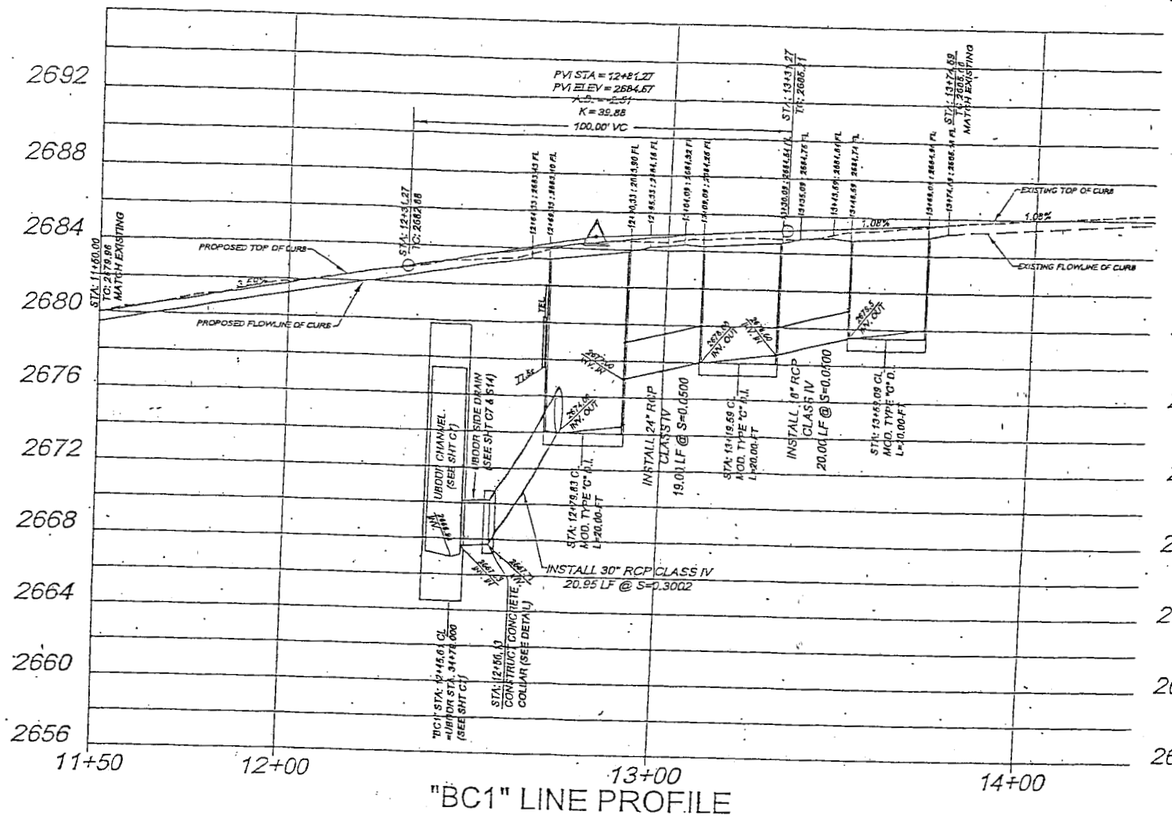
DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Aug 08, 2003 - 3:55pm
DISTRICT FILE NO.	214/199
SPEC. NO.	DACW09-03-B-0015

SCALE	
HORIZ:	1" = 40'
VERT:	1" = 4'
FIELD BOOK	NONE

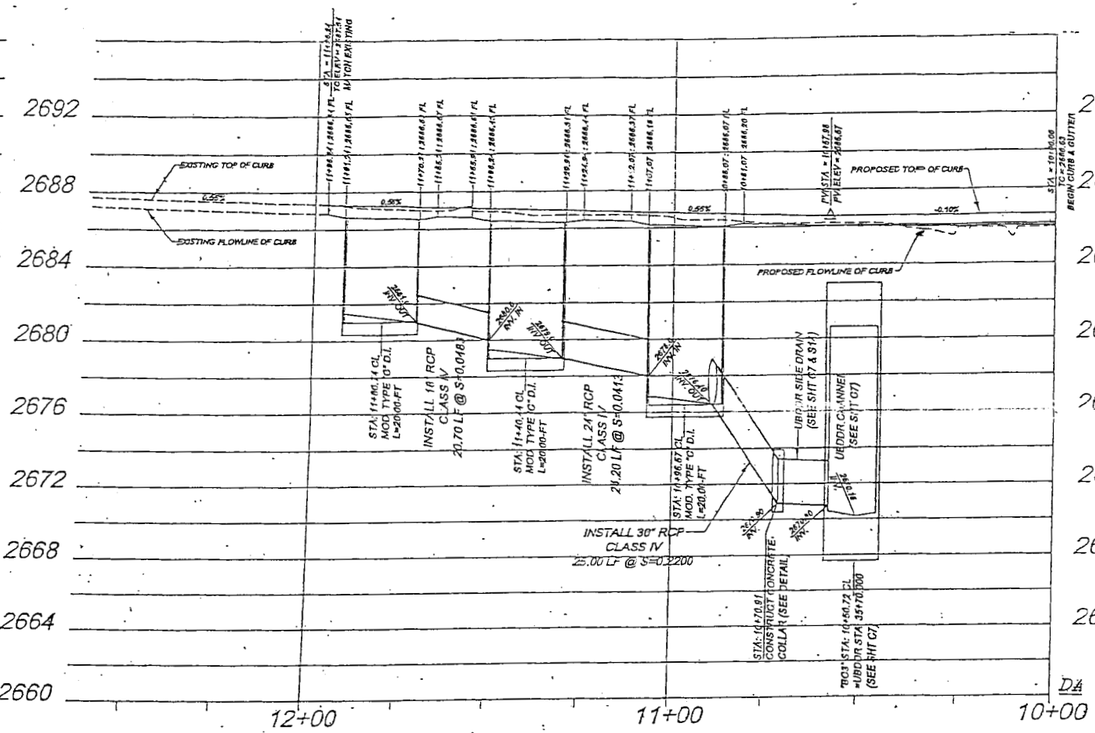
SHEET No **D18**

F950917

L-1715



"BC1" LINE PROFILE



"BC3" LINE PROFILE

UPPER BLUE DIAMOND DIVERSION CHANNEL

REV No | DATE | DESCRIPTION | APPROVED

UPPER BLUE DIAMOND DIVERSION CHANNEL

STORM DRAIN PROFILES

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL H. JUDD
Exp. 06/30/04
CIVIL
No. 7842

DESIGNED BY:	PHJ
DRAWN BY:	PHJ
CHECKED BY:	PHJ
DATE:	Jan 06, 2003 - 4:01pm
DISTRICT FILE NO.	214/200
SPEC. NO.	DACW09-03-B-0015

SCALE	
HORIZ:	1"=X'
VERT:	1"=X'
FIELD BOOK	NONE

SHEET No
D19
X
L-

RAINBOW BOULEVARD COLLECTOR SYSTEM

G.C. Wallace Inc Drainage Study & Technical Data Support Notebook

DRAINAGE STUDY
FOR
RAINBOW BOULEVARD IMPROVEMENTS
SOUTHERN BELTWAY TO
BLUE DIAMOND ROAD

30% PRELIMINARY DESIGN SUBMITTAL

500.854

September 2001

Prepared for:

Clark County Public Works
500 South Grand Central Parkway
Las Vegas, Nevada 89106



Prepared by:

G.C. Wallace, Inc.
1555 South Rainbow Boulevard
Las Vegas, Nevada, 89146
Phone: (702) 804-2000
Fax: (702) 804-2299

```
321          KK   3-28D
322          KM        RUNOFF FROM AREA 3-28D
323          KM            AREA     1.14   ACRES
324          KM              CN     80.6
325          KM              Tc     10.8     MIN
326          KM
327          BA  .00178
328          PB   2.77
329          LS            80.6
330          UD   0.108
             *

331          KK  R3-22A
332          KM        ROUTE 3-28D TO C3-10C
333          RD   1145    .011    .016       0    TRAP       0      60
             *
```



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

334          KK  C3-10C
335          KM        COMBINED RUNOFF FROM 3-28C AND 3-28D AT INTERSECTION OF
336          KM        WINDMILL AND TENAYA
337          HC       2
             *

338          KK  R3-22B
339          KM        ROUTE THROUGH 3-28 TO C3-14A
340          RD   2400    .009    .016       0    TRAP       0      50
             *

341          KK   3-28
342          KM        RUNOFF FROM AREA 3-28
343          KM            AREA     3.08   ACRES
344          KM              CN     98.0
345          KM              Tc     17.0     MIN
346          KM
347          BA  .00481
348          PB   2.77
349          LS            98.0
350          UD   0.170
             *

351          KK   3-28A
352          KM        RUNOFF FROM AREA 3-28A
353          KM            AREA     1.02   ACRES
354          KM              CN     98.0
355          KM              Tc      2.7     MIN
356          KM
357          BA  .00159
358          PB   2.77
359          LS            98.0
360          UD    .027
             *

361          KK  C3-14A
362          KM        COMBINED RUNOFF R3-22B AND AREAS 3-28 AND 3-28A
363          HC       3
             *

364          KK   C3-14
365          KM        COMBINED RUNOFF FROM C3-12 AND C3-14A
366          HC       2
             *

367          KK   C3-15
368          KM        COMBINED RUNOFF FROM C3-6A AND C3-14
369          HC       2
             *
```



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

370          KK   R3-22
371          KM        ROUTE C3-15 THRU AREA 3-29
372          RD   1035    .012    .016       0    TRAP      50
             *

373          KK    3-29
374          KM        RUNOFF FROM AREA 3-29
375          KM            AREA    14.33   ACRES
376          KM              CN     80.6
377          KM              Tc     15.1     MIN
378          KM
379          BA  .02239
380          PB   2.77
381          LS            80.6
382          UD   0.151
             *

383          KK   C3-16
384          KM        COMBINED RUNOFF FROM R3-22 AND AREA 3-29
```

```
385          HC       2
             *

386          KK   C3-17
387          KM        COMBINED RUNOFF R8&3-7 AND C3-16
388          HC       2
             *

389          KK   R3-23
390          KM        ROUTE C3-17 THRU AREA 3-30
391          RD     830   0.016     0.03        0    TRAP      50
             *

392          KK    3-30
393          KM        RUNOFF FROM AREA 3-30
394          KM            AREA     1.96   ACRES
395          KM              CN     64.3
396          KM              Tc      7.2     MIN
397          KM
398          BA   .00306
399          PB    2.77
400          LS              64.3
401          UD   0.072
             *

402          KK  R&3-30
403          KM        COMBINED RUNOFF FROM R3-23 AND AREA 3-30
404          HC       2
             *
```



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

405          KK   3-34B
406          KM        RUNOFF FROM AREA 3-34B
407          KM            AREA     1.57     AC
408          KM              CN       98
409          KM              Tc     13.2     MIN
410          KM
411          BA   .00245
412          PB    2.77
413          LS              98
414          UD   0.132
             *
             *       DO NOT ROUTE: LENGTH IS LESS THAN 500 FEET
             *

415          KK   3-34C
416          KM        RUNOFF FROM AREA 3-34C
417          KM            AREA      2.5   ACRES
418          KM              CN     76.8
419          KM              Tc     14.8     MIN
420          KM
421          BA   .00391
422          PB    2.77
423          LS             76.8
424          UD   0.148
             *

425          KK  C3-19C
426          KM        COMBINED RUNOFF AREAS 3-34B, 3-33C
427          HC       2
             *

428          KK  R3-25B
429          KM        ROUTE C3-19C THROUGH AREA 3-34A TO CONCENTRATION POINT C3-19A
430          KM      LEN   SLOPE       n       NA   SHAPE      BW
431          RD     1820    .012    .016            TRAP      40
             *

432          KK   3-34A
433          KM        RUNOFF FROM AREA 3-34A
434          KM            AREA    19.46   ACRES
435          KM              CN     73.9
436          KM              Tc     19.8     MIN
437          KM
438          BA   .03041
439          PB    2.77
440          LS             73.9
441          UD    .198
             *
```



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

442          KK  C3-19A
443          KM        COMBINED RUNOFF FROM R3-25B AND AREA 3-34A
444          HC       2
             *

445          KK    3-35
446          KM        RUNOFF FROM AREA 3-35
447          KM            AREA     2.04   ACRES
```

```
448          KM              CN    98.0
449          KM              Tc     5.5     MIN
450          KM
451          BA  .00319
452          PB   2.77
453          LS            98.0
454          UD  0.055
             *

455          KK  C3-21
456          KM       COMBINED RUNOFF FROM C3-19A AND AREA 3-35
457          HC       2
             *

458          KK  R3-26
459          KM       ROUTE C3-21 THRU AREA 3-37
460          RK    890    .015    .016        0    TRAP      20
             *

461          KK   3-37
462          KM       RUNOFF FROM AREA 3-37
463          KM           AREA   15.40   ACRES
464          KM             CN    80.6
465          KM             Tc    15.3     MIN
466          KM
467          BA  .02406
468          PB   2.77
469          LS            80.6
470          UD  0.153
             *

471          KK  C3-22
472          KM       COMBINED RUNOFF FROM R3-26 AND AREA 3-37
473          HC       2
             *

474          KK  C3-23
475          KM       COMBINED RUNOFF FROM R&3-30 AND C3-22
476          HC       2
             *
```



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

477          KK  R3-27
478          KM       ROUTE C3-23 THRU AREA 3-36B
479          RD    665   0.017    0.03        0    TRAP     100
             *

480          KK   3-36
481          KM       RUNOFF FROM AREA 3-36
482          KM           AREA   12.11   ACRES
483          KM             CN    80.6
484          KM             Tc    15.3     MIN
485          KM
486          BA  .01892
487          PB   2.77
488          LS            80.6
489          UD  0.153
             *

490          KK  3-36A
491          KM       RUNOFF FROM AREA 3-36A
492          KM           AREA   22.30   ACRES
493          KM             CN    85.7
494          KM             Tc    20.5     MIN
495          KM
496          BA  .03484
497          PB   2.77
498          LS            85.7
499          UD  0.205
             *

500          KK  3-36B
501          KM       RUNOFF FROM AREA 3-36B
502          KM           AREA    1.54   ACRES
503          KM             CN    64.3
504          KM             Tc    11.2     MIN
505          KM
506          BA  .00241
507          PB   2.77
508          LS            64.3
509          UD  0.112
             *

510          KK  C3-23A
511          KM       COMBINED RUNOFF FROM 3-36 AND 3-36A AND R3-27 AND 3-36B
512          HC       4
             *

513          KK  R-23A
514          KM       ROUTE C3-23A THROUGH 3-38C AND 3-38B TO RAINBOW BOULEVARD
515          RD   1380   0.017    0.03        0    TRAP     100
             *
```

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

  516     KK   3-38A
  517     KM        RUNOFF FROM AREA 3-38A
  518     KM            AREA   24.22   ACRES
  519     KM              CN    79.1
  520     KM              Tc    17.8     MIN
  521     KM
  522     BA  .03784
  523     PB   2.77
  524     LS            79.1
  525     UD   0.178
          *

  526     KK   R-23B
  527     KM        ROUTE 3-38A TO C3-24A
  528     RD     685    .007    .016       0    TRAP      50
          *

  529     KK   3-38E
  530     KM        RUNOFF FROM AREA 3-38E
  531     KM            AREA    6.10   ACRES
  532     KM              CN    94.1
  533     KM              Tc    12.5     MIN
  534     KM
  535     BA  .00953
  536     PB   2.77
  537     LS            94.1
  538     UD   0.125
          *

  539     KK  R3-38E
  540     KM        ROUTE 3-38E TO C3-24A
  541     RD    1615    .014    .016       0    TRAP      50
          *

  542     KK   3-38D
  543     KM        RUNOFF FROM AREA 3-38D
  544     KM            AREA   10.37   ACRES
  545     KM              CN    91.6
  546     KM              Tc    15.6     MIN
  547     KM
  548     BA  .01620
  549     PB   2.77
  550     LS            91.6
  551     UD   0.156
          *

  552     KK  R3-38D
  553     KM        ROUTE 3-38D TO C3-24A
  554     RD    1280    .014    .016       0    TRAP      50
          *
```



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

  555     KK   3-38C
  556     KM        RUNOFF FROM AREA 3-38C
  557     KM            AREA   10.33   ACRES
  558     KM              CN    70.3
  559     KM              Tc    22.5     MIN
  560     KM
  561     BA  .01614
  562     PB   2.77
  563     LS            70.3
  564     UD   0.225
          *

  565     KK  R3-38C
  566     KM        ROUTE 3-38C TO C3-24A
  567     RD     610    .014    .016       0    TRAP      50
          *

  568     KK   3-38B
  569     KM        RUNOFF FROM AREA 3-38B
  570     KM            AREA   10.24   ACRES
  571     KM              CN    90.1
  572     KM              Tc    13.0     MIN
  573     KM
  574     BA  .01600
  575     PB   2.77
  576     LS            90.1
  577     UD   0.130
          *

  578     KK  C3-24A
  579     KM        COMBINED RUNOFF 3-38A, 3-38B, 3-38C, 3-38D AND 3-38E
  580     HC        5
          *

  581     KK   R-24A
```

```
646          KK    8-5A
647          KM        RUNOFF FROM AREA 8-5A
648          KM            AREA    5.41   ACRES
649          KM              CN    98.0
650          KM              Tc    13.4     MIN
651          KM
652          BA  .00845
653          PB   2.77
654          LS            98.0
655          UD  0.134
             *

656          KK   R8-5A
657          KM        ROUTE 8-5A TO C8-3
658          RD     620    .010    .016       0    TRAP      50
             *

659          KK     8-3
660          KM        RUNOFF FROM AREA 8-3
661          KM            AREA   27.95   ACRES
662          KM              CN    91.6
663          KM              Tc    18.4     MIN
664          KM
665          BA  .04367
666          PB   2.77
667          LS            91.6
668          UD  0.184
             *
```



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

669          KK    R8-3
670          KM        ROUTE 8-3 THROUGH 8-5B
671          RD     675    .013    .016       0    TRAP      50
             *

672          KK    8-5B
673          KM        RUNOFF FROM AREA 8-5B
674          KM            AREA    8.93   ACRES
675          KM              CN    91.4
676          KM              Tc     9.5     MIN
677          KM
678          BA  .01395
679          PB   2.77
680          LS            91.4
681          UD  0.095
             *

682          KK  8-3&5B
683          KM        COMBINED RUNOFF FROM RC8-3 AND 8-5B
684          HC       2
             *

685          KK   R3&5B
686          KM        ROUTE 8-3&5B TO C8-3
687          RD     620     .01    .016       0    TRAP      50
             *

688          KK    8-5C
689          KM        RUNOFF FROM AREA 8-5C
690          KM            AREA   10.09   ACRES
691          KM              CN    95.2
692          KM              Tc    11.1     MIN
693          KM
694          BA  .01577
695          PB   2.77
696          LS            95.2
697          UD  0.111
             *

698          KK    8-5D
699          KM        RUNOFF FROM AREA 8-5D
700          KM            AREA    0.66   ACRES
701          KM              CN    98.0
702          KM              Tc     6.5     MIN
703          KM
704          BA  .00103
705          PB   2.77
706          LS            98.0
707          UD  0.065
             *
```



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

708          KK   C8-3
709          KM        COMBINED RUNOFF FROM RC8-2, 8-5A, 8-5B, 8-5C AND 8-5D
710          HC       5
             *

711          KK   RC8-3
```

```
712          KM        ROUTE C8-3 TO C8-4
713          RD    1290    .014    .016       0    TRAP      50
             *

714          KK    8-6A
715          KM        RUNOFF FROM AREA 8-6A
716          KM            AREA    2.63   ACRES
717          KM              CN    95.3
718          KM              Tc     7.9     MIN
719          KM
720          BA  .00411
721          PB   2.77
722          LS             95.3
723          UD  0.079
             *

724          KK   R8-6A
725          KM        ROUTE 8-6A TO C8-4
726          RD     890    .014    .016       0    TRAP      50
             *

727          KK    8-6B
728          KM        RUNOFF FROM AREA 8-6B
729          KM            AREA   21.54   ACRES
730          KM              CN    94.7
731          KM              Tc    15.3     MIN
732          KM
733          BA  .03366
734          PB   2.77
735          LS             94.7
736          UD  0.153
             *
             * DO NOT ROUTE: DISTANCE IS LESS THAN 500 FEET
             *

737          KK    8-6C
738          KM        RUNOFF FROM AREA 3-38B
739          KM            AREA    5.05   ACRES
740          KM              CN    94.9
741          KM              Tc     9.2     MIN
742          KM
743          BA  .00789
744          PB   2.77
745          LS             94.9
746          UD  0.092
             *
```



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

747          KK    C8-4
748          KM        COMBINED RUNOFF RC8-3, 8-6A, 8-6B AND 8-6C
749          HC       4
             *

750          KK   RC8-4
751          KM        ROUTE C8-4 TO C8-5
752          RD     655    .012    .016       0    TRAP      50
             *

753          KK     8-7
754          KM        RUNOFF FROM AREA 8-7
755          KM            AREA   10.07   ACRES
756          KM              CN    94.0
757          KM              Tc    11.2     MIN
758          KM
759          BA  .01573
760          PB   2.77
761          LS             94.0
762          UD  0.112
             *

763          KK    C8-5
764          KM        COMBINED RUNOFF FROM RC8-4 AND 8-7
765          KM        TOTAL RUNOFF TO WARM SPRINGS BETWEEN BUFFALO AND RAINBOW
766          HC       2
             *

767          KK   RC8-5
768          KM        ROUTE C8-5 TO WARM SPRINGS AND RAINBOW
769          RD     645    .014    .016       0    TRAP      50
             *

770          KK    6-1A
771          KM        RUNOFF FROM AREA 6-1A
772          KM            AREA    2.61   ACRES
773          KM              CN    76.8
774          KM              Tc    13.8     MIN
775          KM
776          BA  .00408
777          PB   2.77
778          LS             76.8
779          UD  0.138
             *
```

```
780          KK   R6-1A
781          KM        ROUTE 6-1A TO C6-1
782          RD    1700    .017    .016       0    TRAP      50
             *
```



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

783          KK    6-1B
784          KM        RUNOFF FROM AREA 6-1B
785          KM            AREA    1.69   ACRES
786          KM              CN    98.0
787          KM              Tc     8.7     MIN
788          KM
789          BA  .00264
790          PB   2.77
791          LS             98.0
792          UD  0.087
             *

793          KK   R6-1B
794          KM        ROUTE 6-1B TO C6-1
795          RD    1270    .017    .016       0    TRAP      50
             *

796          KK    6-1C
797          KM        RUNOFF FROM AREA 6-1C
798          KM            AREA    9.39   ACRES
799          KM              CN    81.6
800          KM              Tc    16.7     MIN
801          KM
802          BA  .01467
803          PB   2.77
804          LS             91.6
805          UD  0.167
             *

806          KK    C6-1
807          KM        COMBINED RUNOFF FROM R6-1A, R6-1B AND 6-1C
808          HC       3
             *

809          KK   RC6-1
810          KM        ROUTE C6-1 TO C9-1
811          RD    1600    .004    .016       0    TRAP      50
             *

812          KK    9-1A
813          KM        RUNOFF FROM AREA 9-1A
814          KM            AREA   10.58     AC
815          KM              CN    82.3
816          KM              Tc    15.2     MIN
817          KM
818          BA  .01653
819          PB   2.77
820          LS             82.3
821          UD  0.152
             *
```

1


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

822          KK    9-1B
823          KM        RUNOFF FROM AREA 9-1B
824          KM            AREA    7.52   ACRES
825          KM              CN    89.3
826          KM              Tc    12.7     MIN
827          KM
828          BA  .01175
829          PB   2.77
830          LS             89.3
831          UD  0.127
             *

832          KK  91A&1B
833          KM        COMBINED RUNOFF FROM 9-1A AND 9-1B AT RAINBOW
834          HC       2
             *

835          KK   R91AB
836          KM        ROUTE 91A&B TO C9-1
837          RD     960    .005    .016       0    TRAP      50
             *

838          KK    9-2
839          KM        RUNOFF FROM AREA 9-2
840          KM            AREA    6.06   ACRES
841          KM              CN    91.2
842          KM              Tc    14.4     MIN
843          KM
844          BA  .00947
845          PB   2.77
```

```
846          LS           91.2
847          UD   0.144
             *

848          KK    C9-1
849          KM       COMBINED RUNOFF FROM R91AB AND 9-2
850          HC       2
             *

851          KK    C9&6
852          KM       COMBINED RUNOFF FROM C9-1 AND C6-1
853          HC       2
             *

854          KK   RC9&6
855          KM       ROUTE C9&6 TO C5-1
856          RD     950    .008    .016       0    TRAP      50
             *
```



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

857          KK    5-1A
858          KM       RUNOFF FROM AREA 5-1A
859          KM           AREA   13.79     AC
860          KM             CN    76.8
861          KM             Tc    17.9     MIN
862          KM
863          BA  .02155
864          PB    2.77
865          LS           76.8
866          UD   0.179
             *

867          KK    5-1B
868          KM       RUNOFF FROM AREA 5-1B
869          KM           AREA    6.52   ACRES
870          KM             CN    78.2
871          KM             Tc    15.0     MIN
872          KM
873          BA  .01019
874          PB    2.77
875          LS           78.2
876          UD   0.150
             *

877          KK   R5-1B
878          KM       ROUTE 5-1B TO C5-2
879          RD    1530    .013    .016       0    TRAP      50
             *

880          KK    5-1C
881          KM       RUNOFF FROM AREA 5-1C
882          KM           AREA   17.64   ACRES
883          KM             CN    77.8
884          KM             Tc    18.7     MIN
885          KM
886          BA  .02756
887          PB    2.77
888          LS           77.8
889          UD   0.187
             *

890          KK   C5-2B
891          KM       COMBINED RUNOFF FROM 5-1A, R5-1B AND 5-1C
892          HC       3
             *

893          KK  RC5-2B
894          KM       ROUTE C5-2B TO C5-2C
895          RD    1995     .01    .016       0    TRAP      50
             *
```



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

896          KK     5-3
897          KM       RUNOFF FROM AREA 5-3
898          KM           AREA    2.95   ACRES
899          KM             CN    73.9
900          KM             Tc    15.8     MIN
901          KM
902          BA  .00461
903          PB    2.77
904          LS           73.9
905          UD    .158
             *

906          KK    R5-3
907          KM       ROUTE 5-3 TO C5-2C
908          RD     945    .011    .016       0    TRAP      50
             *
```

```
909          KK     5-1
910          KM        RUNOFF FROM AREA  5-1
911          KM            AREA   23.86   ACRES
912          KM              CN    76.8
913          KM              Tc    20.3     MIN
914          KM
915          BA  .03728
916          PB   2.77
917          LS             76.8
918          UD   0.203
             *

919          KK   C5-2C
920          KM        COMBINED RUNOFF RC5-2B, R5-3 AND AREA 5-1
921          HC       3
             *
             * DO NOT ROUTE: DISTANCE IS LESS THAN 500 FEET
             *

922          KK    5-4A
923          KM        RUNOFF FROM AREA 5-4A
924          KM            AREA    3.58   ACRES
925          KM              CN    86.2
926          KM              Tc     8.8     MIN
927          KM
928          BA  .00559
929          PB   2.77
930          LS             86.2
931          UD   0.088
             *
             * DO NOT ROUTE: DISTANCE IS LESS THAN 500 FEET
             *
```



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

932          KK    5-4B
933          KM        RUNOFF FROM AREA 5-4B
934          KM            AREA    2.68   ACRES
935          KM              CN    85.9
936          KM              Tc    10.3     MIN
937          KM
938          BA  .00419
939          PB   2.77
940          LS             85.9
941          UD   0.103
             *

942          KK     5-4
943          KM        RUNOFF FROM AREA 5-4
944          KM            AREA    1.65   ACRES
945          KM              CN      98
946          KM              Tc    10.0     MIN
947          KM
948          BA  .00258
949          PB   2.77
950          LS               98
951          UD   0.100
             *

952          KK     5-2
953          KM        RUNOFF FROM AREA 5-2
954          KM            AREA    7.13   ACRES
955          KM              CN    91.1
956          KM              Tc    13.0     MIN
957          KM
958          BA  .01114
959          PB   2.77
960          LS             91.1
961          UD   0.130
             *

962          KK    C5-1
963          KM        COMBINED RUNOFF FROM C5-2C, 5-4A, 5-4B, 5-4 AND 5-2
964          HC       5
             *

965          KK    C569
966          KM        COMBINED RUNOFF FROM C5-1 AND RC9&6
967          KM        TOTAL RUNOFF TO RAINBOW BETWEEN ROBINDALE AND WINDMILL
968          HC       2
             *

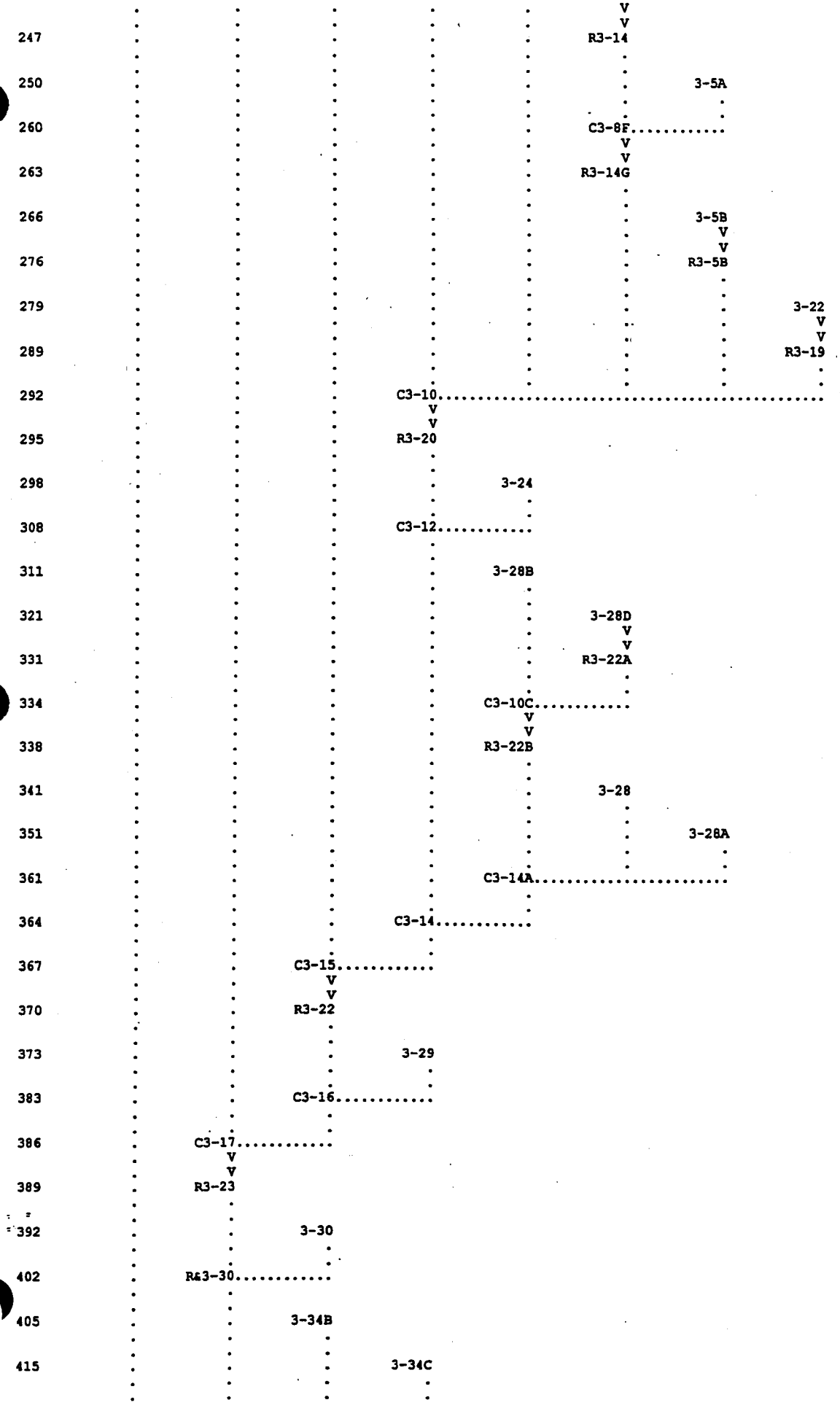
969          KK   RC569
970          KM        ROUTE FLOW TO RAINBOW AND WARM SPRINGS
971          RD    2630    .009    .016       0    TRAP     50
             *
```

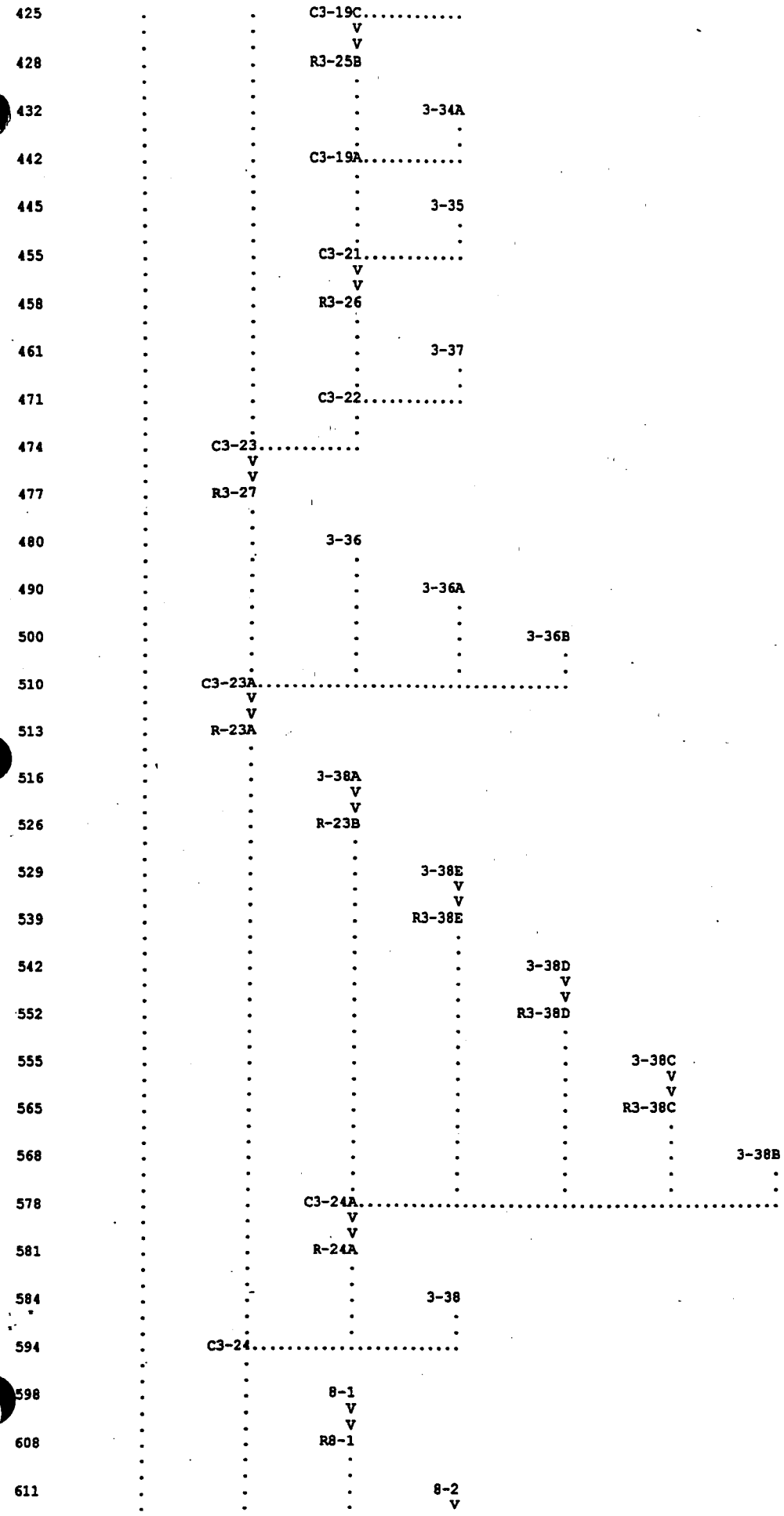


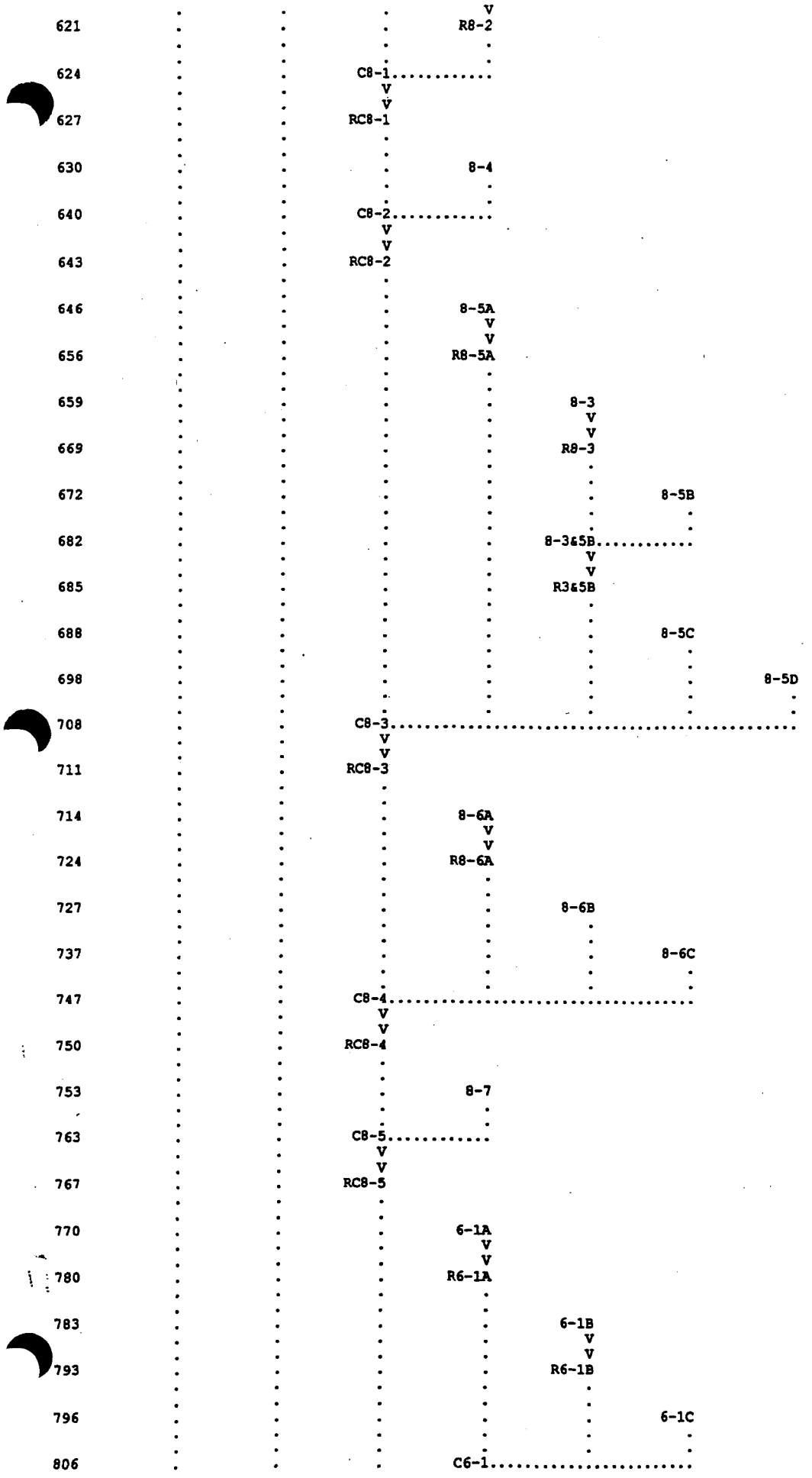
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LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

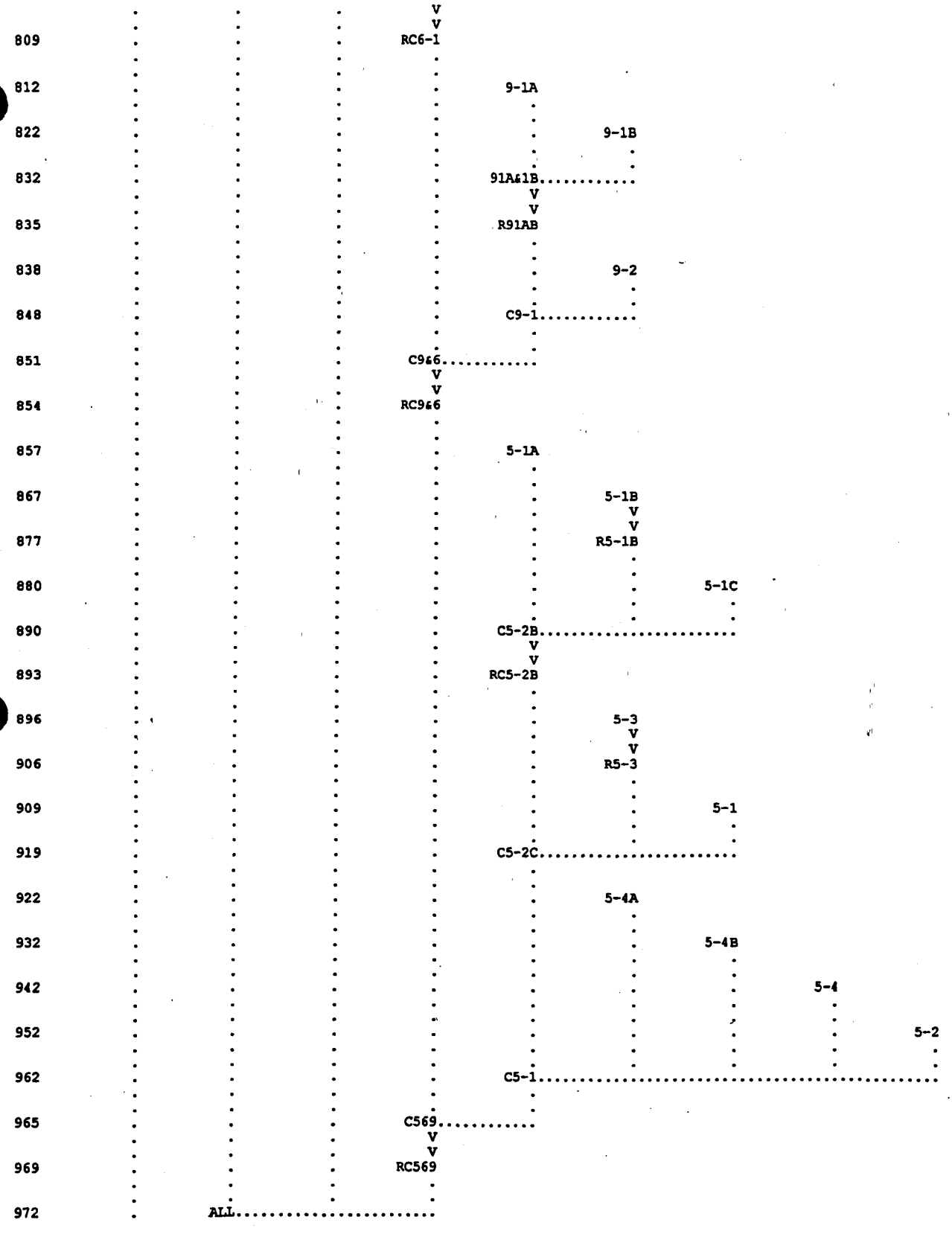
972          KK     ALL
973          KM        COMBINED RUNOFF FROM SECTION 10
```

```
      974          HC       3
                    *
      975          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW
 NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW
  40          3-1
                .
                .
  58            .        3-1C
                .          V
                .          V
  68            .       R3-1C
                .          .
                .          .
  71            .          .        3-1B
                .          .          .
                .          .          .
  81            .          .          .        3-5
                .          .          .         .
                .          .          .         .
  91            .          .       C3-8B.........
                .          .          V
                .          .          V
  94            .          .       R3-14E
                .          .          .
                .          .          .
  97            .          .          .        3-1A
                .          .          .         .
                .          .          .         .
 107            .          .       C3-8A.........
                .          .          .
                .          .          .
 110            .       C3-2.........
                .          V
                .          V
 113            .       R3-6
                .          .
                .          .
 116            .          .        3-4A
                .          .          V
                .          .          V
 126            .          .        R3-7
                .          .          .
                .          .          .
 129            .          .          .        3-4
                .          .          .         .
                .          .          .         .
 139            .          .          .         .        3-6
                .          .          .         .         .
                .          .          .         .         .
 149            .          .       C3-8C.....................
                .          .          .
                .          .          .
 152            .          .          .        3-2
                .          .          .         .
                .          .          .         .
 162            .          .          .         .        3-3
                .          .          .         .         .
                .          .          .         .         .
 172            .       C3-4.....................................
                .          V
                .          V
 175            .       R3-8
                .          .
                .          .
 178            .          .        3-7
                .          .          .
                .          .          .
 188            .       R8&3-7.......
                .          .
                .          .
 191            .          .        3-8
                .          .          V
                .          .          V
 201            .          .        R3-9
                .          .          .
                .          .          .
 204            .          .          .        3-9
                .          .          .         .
                .          .          .         .
 214            .          .       C3-6A.........
                .          .          .
                .          .          .
 217            .          .          .        3-15
                .          .          .         .
                .          .          .         .
 227            .          .          .         .        3-18
                .          .          .         .         .
                .          .          .         .         .
 237            .          .          .         .         .      3-14
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247
R3-14
250
3-5A
260
C3-8F
263
R3-14G
266
3-5B
276
R3-5B
279
3-22
289
R3-19
292
C3-10
295
R3-20
298
3-24
308
C3-12
311
3-28B
321
3-28D
331
R3-22A
334
C3-10C
338
R3-22B
341
3-28
351
3-28A
361
C3-14A
364
C3-14
367
C3-15
370
R3-22
373
3-29
383
C3-16
386
C3-17
389
R3-23
392
3-30
402
R&3-30
405
3-34B
415
3-34C


425
C3-19C
428
R3-25B
432
3-34A
442
C3-19A
445
3-35
455
C3-21
458
R3-26
461
3-37
471
C3-22
474
C3-23
477
R3-27
480
3-36
490
3-36A
500
3-36B
510
C3-23A
513
R-23A
516
3-38A
526
R-23B
529
3-38E
539
R3-38E
542
3-38D
552
R3-38D
555
3-38C
565
R3-38C
568
3-38B
578
C3-24A
581
R-24A
584
3-38
594
C3-24
598
8-1
608
R8-1
611
8-2


621
R8-2
624
C8-1
627
RC8-1
630
8-4
640
C8-2
643
RC8-2
646
8-5A
656
R8-5A
659
8-3
669
R8-3
672
8-5B
682
8-3&5B
685
R3&5B
688
8-5C
698
8-5D
708
C8-3
711
RC8-3
714
8-6A
724
R8-6A
727
8-6B
737
8-6C
747
C8-4
750
RC8-4
753
8-7
763
C8-5
767
RC8-5
770
6-1A
780
R6-1A
783
6-1B
793
R6-1B
796
6-1C
806
C6-1



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

FLOOD HYDROGRAPH PACKAGE (HEC-1)
SEPTEMBER 1990
VERSION 4.0

RUN DATE 10/07/2002 TIME 08:56:30

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

G.C.WALLACE, INC
CITY OF LAS VEGAS, CLARK COUNTY, NEVADA

SECTION 10
RAINBOW BOULEVARD
ULTIMATE CONDITIONS
ASSUMES THAT THE DURANGO AND BUFFALO FACILITIES
HAVE BEEN CONSTRUCTED

RETURN PERIOD	10- & 100-YEAR
DISTRIBUTION	6-HOUR, SDN3
PROJECT NUMBER	500.854
FILE NAME	SEC10_U.H1
DATE MODELED	10/4/02
MODELED BY	MM

DEPTH-AREA REDUCTION FACTOR (DARF)

AREA (Mi^2)	DARF (10-YR)	DARF (100-YR)
0.00-0.05	0.57	1.00
0.06-0.31	0.56	0.99
0.32-0.44	0.56	0.98
0.45-1.00	0.55	0.97
1.01-1.50	0.55	0.96

37 IO OUTPUT CONTROL VARIABLES

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

IT HYDROGRAPH TIME DATA

NMIN		5	MINUTES IN COMPUTATION INTERVAL
IDATE	1	0	STARTING DATE
ITIME		0000	STARTING TIME
NQ		300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2	0	ENDING DATE
NDTIME		0055	ENDING TIME
ICENT		19	CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 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 .99 .98 .97 .96 .57 .56 .55

1

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00	RATIO 2 .99	RATIO 3 .98	RATIO 4 .97	RATIO 5 .96	RATIO 6 .57	RATIO 7 .56	RATIO 8 .55
HYDROGRAPH AT												
+	3-1	.00	1	FLOW	1.	1.	1.	1.	1.	0.	0.	0.
				TIME	3.58	3.58	3.58	3.58	3.58	4.83	4.83	4.83
HYDROGRAPH AT												
+	3-1C	.00	1	FLOW	3.	3.	3.	3.	3.	2.	2.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
DUTED TO												
	R3-1C	.00	1	FLOW	3.	3.	3.	3.	3.	2.	1.	1.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.83
HYDROGRAPH AT												
+	3-1B	.00	1	FLOW	6.	6.	6.	6.	6.	3.	3.	3.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

HYDROGRAPH AT												
+	3-5	.01	1	FLOW	5.	5.	5.	5.	5.	1.	1.	1.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT												
	C3-8B	.01	1	FLOW	11.	11.	11.	11.	10.	4.	4.	4.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R3-14E	.01	1	FLOW	11.	11.	10.	10.	10.	4.	4.	4.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
HYDROGRAPH AT												
+	3-1A	.02	1	FLOW	19.	18.	18.	18.	17.	6.	5.	5.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT												
+	C3-8A	.03	1	FLOW	28.	28.	27.	27.	26.	9.	9.	9.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
2 COMBINED AT												
+	C3-2	.03	1	FLOW	30.	30.	29.	29.	28.	11.	10.	10.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
ROUTED TO												
+	R3-6	.03	1	FLOW	30.	29.	29.	29.	28.	10.	10.	9.
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83
HYDROGRAPH AT												
+	3-4A	.00	1	FLOW	4.	4.	4.	4.	4.	1.	1.	1.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R3-7	.00	1	FLOW	4.	4.	4.	4.	3.	1.	1.	1.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
HYDROGRAPH AT												
+	3-4	.01	1	FLOW	12.	12.	12.	12.	11.	5.	4.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	3-6	.00	1	FLOW	4.	3.	3.	3.	3.	1.	1.	1.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.67	3.67
3 COMBINED AT												
+	C3-8C	.02	1	FLOW	18.	18.	17.	17.	17.	6.	6.	5.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT												
	3-2	.02	1	FLOW	28.	27.	27.	26.	26.	11.	10.	10.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT												
+	3-3	.00	1	FLOW	1.	1.	1.	1.	1.	0.	0.	0.
				TIME	3.50	3.50	3.50	3.50	3.50	4.83	4.83	4.83
4 COMBINED AT												
+	C3-4	.07	1	FLOW	70.	69.	68.	67.	66.	23.	22.	21.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
ROUTED TO												
+	R3-8	.07	1	FLOW	72.	71.	70.	68.	67.	22.	22.	20.
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.92	3.92
HYDROGRAPH AT												
+	3-7	.00	1	FLOW	2.	2.	2.	2.	2.	0.	0.	0.
				TIME	3.50	3.50	3.50	3.50	3.50	3.75	3.75	3.75
2 COMBINED AT												
+	R8&3-7	.08	1	FLOW	73.	72.	71.	70.	69.	22.	22.	20.
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.92	3.92
HYDROGRAPH AT												
+	3-8	.01	1	FLOW	8.	8.	8.	7.	7.	2.	2.	2.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R3-9	.01	1	FLOW	8.	7.	7.	7.	7.	2.	2.	2.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	3-9	.00	1	FLOW	9.	8.	8.	8.	8.	5.	5.	5.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	C3-6A	.01	1	FLOW	14.	14.	13.	13.	13.	5.	5.	5.
				TIME	3.58	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
	3-15	.02	1	FLOW	19.	19.	18.	18.	18.	6.	5.	5.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
HYDROGRAPH AT												
+	3-18	.00	1	FLOW	3.	3.	3.	3.	3.	1.	1.	1.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

HYDROGRAPH AT													
+	3-14	.02	1	FLOW	32.	32.	32.	31.	31.	14.	14.	14.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	R3-14	.02	1	FLOW	31.	31.	31.	30.	30.	14.	14.	13.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	3-5A	.05	1	FLOW	40.	39.	38.	37.	37.	12.	11.	11.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	C3-8F	.07	1	FLOW	71.	70.	69.	68.	67.	26.	25.	24.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO													
+	R3-14G	.07	1	FLOW	70.	68.	66.	65.	64.	26.	25.	24.
				TIME	3.67	3.67	3.75	3.67	3.67	3.75	3.75	3.75
HYDROGRAPH AT													
+	3-5B	.01	1	FLOW	13.	12.	12.	12.	12.	4.	4.	3.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	R3-5B	.01	1	FLOW	12.	12.	11.	11.	11.	3.	3.	3.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.75	3.75
HYDROGRAPH AT													
+	3-22	.04	1	FLOW	33.	32.	32.	31.	30.	9.	9.	9.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.67	3.67
ROUTED TO													
+	R3-19	.04	1	FLOW	32.	31.	31.	30.	30.	10.	9.	9.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
5 COMBINED AT													
+	C3-10	.14	1	FLOW	134.	132.	129.	126.	125.	44.	43.	41.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
ROUTED TO													
+	R3-20	.14	1	FLOW	129.	127.	124.	121.	120.	44.	42.	40.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
HYDROGRAPH AT													
+	3-24	.01	1	FLOW	11.	10.	10.	10.	10.	2.	2.	2.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
2 COMBINED AT													
+	C3-12	.16	1	FLOW	138.	136.	133.	130.	128.	46.	44.	42.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
HYDROGRAPH AT													
+	3-28B	.00	1	FLOW	7.	7.	7.	7.	7.	4.	4.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	3-28D	.00	1	FLOW	2.	2.	2.	2.	2.	1.	1.	1.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	R3-22A	.00	1	FLOW	2.	2.	2.	2.	2.	1.	1.	0.
				TIME	3.67	3.67	3.67	3.67	3.75	3.75	3.75	3.75
2 COMBINED AT													
+	C3-10C	.01	1	FLOW	8.	7.	7.	7.	7.	4.	4.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO													
+	R3-22B	.01	1	FLOW	8.	7.	7.	7.	7.	4.	4.	3.
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83
HYDROGRAPH AT													
+	3-28	.00	1	FLOW	9.	8.	8.	8.	8.	5.	5.	5.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	3-28A	.00	1	FLOW	4.	4.	4.	4.	4.	2.	2.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT													
+	C3-14A	.01	1	FLOW	15.	15.	15.	15.	14.	8.	8.	7.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	C3-14	.17	1	FLOW	153.	151.	147.	144.	143.	53.	51.	49.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
2 COMBINED AT													
	C3-15	.18	1	FLOW	165.	162.	159.	155.	153.	57.	54.	52.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
ROUTED TO													
+	R3-22	.18	1	FLOW	161.	158.	155.	152.	150.	54.	52.	50.
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83

HYDROGRAPH AT													
+	3-29	.02	1	FLOW	22.	21.	21.	20.	20.	6.	6.	6.	
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	
2 COMBINED AT													
	C3-16	.20	1	FLOW	177.	174.	171.	167.	164.	59.	56.	54.	
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.83	
2 COMBINED AT													
+	C3-17	.28	1	FLOW	249.	245.	241.	236.	232.	81.	77.	74.	
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83	
ROUTED TO													
+	R3-23	.28	1	FLOW	247.	244.	239.	234.	231.	80.	76.	73.	
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83	
HYDROGRAPH AT													
+	3-30	.00	1	FLOW	1.	1.	1.	1.	1.	0.	0.	0.	
				TIME	3.50	3.50	3.50	3.50	3.50	4.83	4.83	4.83	
2 COMBINED AT													
+	R&3-30	.29	1	FLOW	248.	244.	240.	235.	231.	80.	76.	73.	
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83	
HYDROGRAPH AT													
+	3-34B	.00	1	FLOW	5.	4.	4.	4.	4.	3.	2.	2.	
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	
HYDROGRAPH AT													
+	3-34C	.00	1	FLOW	3.	3.	3.	3.	3.	1.	1.	1.	
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	
2 COMBINED AT													
+	C3-19C	.01	1	FLOW	8.	8.	7.	7.	7.	3.	3.	3.	
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	
ROUTED TO													
+	R3-25B	.01	1	FLOW	7.	7.	7.	7.	7.	3.	3.	3.	
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83	
HYDROGRAPH AT													
+	3-34A	.03	1	FLOW	18.	17.	17.	16.	16.	3.	3.	3.	
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	
2 COMBINED AT													
+	C3-19A	.04	1	FLOW	25.	24.	24.	23.	23.	6.	6.	6.	
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	
HYDROGRAPH AT													
+	3-35	.00	1	FLOW	7.	7.	7.	7.	7.	4.	4.	4.	
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
2 COMBINED AT													
+	C3-21	.04	1	FLOW	28.	27.	26.	26.	25.	8.	7.	7.	
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	
ROUTED TO													
+	R3-26	.04	1	FLOW	27.	27.	26.	25.	25.	7.	7.	7.	
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75	
HYDROGRAPH AT													
+	3-37	.02	1	FLOW	23.	23.	22.	22.	21.	7.	6.	6.	
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	
2 COMBINED AT													
+	C3-22	.06	1	FLOW	48.	47.	46.	45.	44.	13.	12.	12.	
				TIME	3.58	3.58	3.58	3.67	3.67	3.75	3.75	3.75	
2 COMBINED AT													
+	C3-23	.35	1	FLOW	290.	286.	281.	275.	271.	92.	87.	83.	
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83	
ROUTED TO													
+	R3-27	.35	1	FLOW	287.	282.	277.	271.	267.	89.	85.	81.	
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.92	3.92	
HYDROGRAPH AT													
+	3-36	.02	1	FLOW	18.	18.	18.	17.	17.	5.	5.	5.	
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	
HYDROGRAPH AT													
+	3-36A	.03	1	FLOW	37.	37.	36.	36.	35.	14.	14.	13.	
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	
HYDROGRAPH AT													
+	3-36B	.00	1	FLOW	1.	1.	1.	1.	1.	0.	0.	0.	
				TIME	3.58	3.58	3.58	3.58	3.58	4.83	4.92	4.92	
COMBINED AT													
	C3-23A	.41	1	FLOW	333.	327.	321.	315.	310.	103.	98.	93.	
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83	
ROUTED TO													
+	R-23A	.41	1	FLOW	327.	318.	313.	307.	301.	104.	99.	95.	
				TIME	3.75	3.75	3.75	3.75	3.83	3.92	3.92	3.92	

HYDROGRAPH AT												
+	3-38A	.04	1	FLOW	31.	31.	30.	29.	29.	9.	8.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
ROUTED TO												
+	R-23B	.04	1	FLOW	31.	30.	30.	29.	28.	8.	8.	8.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
HYDROGRAPH AT												
+	3-38E	.01	1	FLOW	16.	16.	16.	16.	16.	8.	8.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R3-38E	.01	1	FLOW	16.	16.	15.	15.	15.	8.	8.	8.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	3-38D	.02	1	FLOW	25.	25.	24.	24.	24.	11.	11.	11.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R3-38D	.02	1	FLOW	24.	23.	23.	23.	22.	11.	11.	11.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	3-38C	.02	1	FLOW	7.	7.	6.	6.	6.	1.	1.	1.
				TIME	3.67	3.67	3.67	3.67	3.67	3.83	3.83	3.83
ROUTED TO												
+	R3-38C	.02	1	FLOW	7.	7.	6.	6.	6.	1.	1.	1.
				TIME	3.75	3.75	3.75	3.75	3.75	3.92	3.92	4.00
HYDROGRAPH AT												
+	3-38B	.02	1	FLOW	24.	24.	23.	23.	23.	11.	10.	10.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
5 COMBINED AT												
+	C3-24A	.10	1	FLOW	95.	94.	92.	91.	89.	36.	35.	34.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO												
+	R-24A	.10	1	FLOW	94.	93.	91.	90.	88.	35.	33.	32.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
HYDROGRAPH AT												
+	3-38	.02	1	FLOW	25.	25.	24.	24.	24.	11.	11.	11.
				TIME	3.50	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT												
+	C3-24	.52	1	FLOW	427.	417.	410.	402.	392.	131.	126.	120.
				TIME	3.75	3.75	3.75	3.75	3.75	3.92	3.92	3.92
HYDROGRAPH AT												
+	8-1	.02	1	FLOW	28.	27.	27.	27.	26.	14.	13.	13.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R8-1	.02	1	FLOW	27.	27.	26.	26.	25.	13.	13.	12.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	8-2	.02	1	FLOW	37.	36.	36.	36.	35.	18.	17.	17.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R8-2	.02	1	FLOW	35.	35.	34.	34.	33.	17.	16.	16.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
2 COMBINED AT												
+	C8-1	.04	1	FLOW	61.	60.	60.	59.	58.	30.	29.	29.
				TIME	3.67	3.58	3.67	3.67	3.58	3.67	3.67	3.67
ROUTED TO												
+	RC8-1	.04	1	FLOW	60.	59.	59.	59.	57.	30.	29.	28.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
HYDROGRAPH AT												
+	8-4	.09	1	FLOW	132.	130.	129.	127.	126.	63.	61.	60.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
2 COMBINED AT												
+	C8-2	.13	1	FLOW	192.	189.	187.	185.	182.	91.	88.	87.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO												
+	RC8-2	.13	1	FLOW	190.	187.	185.	184.	179.	88.	85.	83.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
YDROGRAPH AT												
	8-5A	.01	1	FLOW	16.	15.	15.	15.	15.	9.	9.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R8-5A	.01	1	FLOW	15.	15.	15.	15.	15.	8.	8.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

HYDROGRAPH AT												
+	8-3	.04	1	FLOW	63.	62.	62.	61.	60.	29.	28.	27.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R8-3	.04	1	FLOW	60.	60.	59.	58.	57.	28.	28.	27.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	8-5B	.01	1	FLOW	24.	23.	23.	23.	22.	11.	10.	10.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
2 COMBINED AT												
+	8-3&5B	.06	1	FLOW	81.	80.	79.	78.	77.	37.	36.	35.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R3&5B	.06	1	FLOW	78.	77.	76.	75.	74.	36.	35.	34.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
HYDROGRAPH AT												
+	8-5C	.02	1	FLOW	28.	28.	28.	27.	27.	15.	14.	14.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	8-5D	.00	1	FLOW	2.	2.	2.	2.	2.	1.	1.	1.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
5 COMBINED AT												
+	C8-3	.22	1	FLOW	301.	296.	293.	290.	285.	143.	138.	135.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO												
+	RC8-3	.22	1	FLOW	299.	296.	291.	289.	284.	139.	135.	132.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
HYDROGRAPH AT												
+	8-6A	.00	1	FLOW	8.	8.	8.	8.	8.	4.	4.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO												
+	R8-6A	.00	1	FLOW	8.	8.	8.	8.	7.	4.	4.	4.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT												
+	8-6B	.03	1	FLOW	57.	56.	56.	55.	55.	29.	28.	28.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT												
+	8-6C	.01	1	FLOW	15.	15.	15.	15.	14.	8.	8.	7.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT												
+	C8-4	.26	1	FLOW	362.	358.	353.	350.	344.	172.	167.	163.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO												
+	RC8-4	.26	1	FLOW	361.	357.	352.	349.	343.	169.	164.	159.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	8-7	.02	1	FLOW	27.	27.	27.	26.	26.	13.	13.	13.
				TIME	3.50	3.50	3.50	3.50	3.50	3.58	3.58	3.58
2 COMBINED AT												
+	C8-5	.28	1	FLOW	380.	375.	370.	367.	361.	178.	173.	168.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO												
+	RC8-5	.28	1	FLOW	378.	374.	369.	365.	360.	175.	170.	165.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	6-1A	.00	1	FLOW	3.	3.	3.	3.	3.	1.	1.	1.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R6-1A	.00	1	FLOW	3.	3.	3.	3.	3.	1.	1.	1.
				TIME	3.75	3.75	3.75	3.75	3.75	4.17	4.00	4.00
HYDROGRAPH AT												
+	6-1B	.00	1	FLOW	5.	5.	5.	5.	5.	3.	3.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
ROUTED TO												
+	R6-1B	.00	1	FLOW	5.	5.	5.	5.	5.	3.	3.	3.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
DROGRAPH AT												
	6-1C	.01	1	FLOW	22.	22.	22.	21.	21.	10.	10.	10.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT												
+	C6-1	.02	1	FLOW	27.	27.	26.	26.	26.	13.	12.	12.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58

ROUTED TO												
+	RC6-1	.02	1	FLOW	27.	27.	27.	26.	26.	13.	12.	12.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT												
	9-1A	.02	1	FLOW	17.	17.	17.	16.	16.	6.	5.	5.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT												
+	9-1B	.01	1	FLOW	17.	17.	17.	17.	16.	7.	7.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT												
+	91A&1B	.03	1	FLOW	35.	34.	34.	33.	32.	13.	13.	12.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R91AB	.03	1	FLOW	32.	32.	32.	31.	31.	13.	12.	11.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	9-2	.01	1	FLOW	15.	14.	14.	14.	14.	7.	6.	6.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT												
+	C9-1	.04	1	FLOW	45.	45.	44.	44.	43.	18.	18.	17.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
2 COMBINED AT												
+	C9&6	.06	1	FLOW	70.	70.	69.	68.	67.	29.	28.	27.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.75	3.75
ROUTED TO												
+	RC9&6	.06	1	FLOW	67.	66.	66.	64.	64.	27.	26.	26.
				TIME	3.67	3.67	3.67	3.67	3.75	3.75	3.83	3.83
HYDROGRAPH AT												
+	5-1A	.02	1	FLOW	15.	15.	15.	14.	14.	4.	3.	3.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
HYDROGRAPH AT												
+	5-1B	.01	1	FLOW	9.	8.	8.	8.	8.	2.	2.	2.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	R5-1B	.01	1	FLOW	8.	8.	8.	8.	8.	2.	2.	2.
				TIME	3.75	3.75	3.75	3.75	3.75	3.92	3.92	3.83
HYDROGRAPH AT												
+	5-1C	.03	1	FLOW	20.	20.	20.	19.	19.	5.	5.	5.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
3 COMBINED AT												
+	C5-2B	.06	1	FLOW	43.	43.	42.	41.	40.	9.	8.	8.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.83
ROUTED TO												
+	RC5-2B	.06	1	FLOW	44.	43.	42.	41.	40.	10.	9.	8.
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	4.00
HYDROGRAPH AT												
+	5-3	.00	1	FLOW	3.	3.	3.	3.	3.	1.	1.	0.
				TIME	3.58	3.58	3.58	3.58	3.58	3.67	3.67	3.67
ROUTED TO												
+	R5-3	.00	1	FLOW	3.	3.	3.	3.	3.	1.	1.	1.
				TIME	3.75	3.75	3.75	3.75	3.75	4.00	4.08	3.92
HYDROGRAPH AT												
+	5-1	.04	1	FLOW	26.	25.	25.	24.	24.	6.	6.	5.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
3 COMBINED AT												
+	C5-2C	.10	1	FLOW	70.	68.	67.	66.	64.	15.	14.	12.
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.92
HYDROGRAPH AT												
+	5-4A	.01	1	FLOW	8.	8.	8.	8.	7.	3.	3.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
+	5-4B	.00	1	FLOW	6.	5.	5.	5.	5.	2.	2.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.58	3.58	3.58
HYDROGRAPH AT												
+	5-4	.00	1	FLOW	5.	5.	5.	5.	5.	3.	3.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT												
	5-2	.01	1	FLOW	17.	17.	17.	17.	16.	8.	8.	8.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
5 COMBINED AT												
+	C5-1	.12	1	FLOW	90.	89.	86.	85.	83.	22.	20.	19.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.83	3.58

2 COMBINED AT												
+	C569	.18	1	FLOW	157.	155.	152.	149.	146.	49.	46.	44.
				TIME	3.67	3.67	3.67	3.67	3.67	3.75	3.83	3.83
ROUTED TO												
	RC569	.18	1	FLOW	159.	157.	154.	151.	148.	49.	45.	43.
				TIME	3.75	3.75	3.75	3.75	3.75	3.92	4.00	4.00
3 COMBINED AT												
+	ALL	.98	1	FLOW	935.	918.	904.	890.	872.	326.	311.	299.
				TIME	3.75	3.75	3.75	3.75	3.75	3.83	3.83	3.83

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .00									
R3-1C	MANE	2.75	2.74	220.00	2.57	5.00	2.74	220.00	2.59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1773E+00 EXCESS= .0000E+00 OUTFLOW= .1794E+00 BASIN STORAGE= .3197E-02 PERCENT ERROR= -3.0

FOR PLAN = 1 RATIO= .00									
R3-1C	MANE	2.75	2.72	220.00	2.54	5.00	2.72	220.00	2.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1754E+00 EXCESS= .0000E+00 OUTFLOW= .1775E+00 BASIN STORAGE= .3183E-02 PERCENT ERROR= -3.0

FOR PLAN = 1 RATIO= .00									
R3-1C	MANE	2.75	2.69	220.00	2.51	5.00	2.69	220.00	2.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1734E+00 EXCESS= .0000E+00 OUTFLOW= .1756E+00 BASIN STORAGE= .3169E-02 PERCENT ERROR= -3.1

FOR PLAN = 1 RATIO= .00									
R3-1C	MANE	2.75	2.66	220.00	2.49	5.00	2.66	220.00	2.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1715E+00 EXCESS= .0000E+00 OUTFLOW= .1737E+00 BASIN STORAGE= .3154E-02 PERCENT ERROR= -3.1

FOR PLAN = 1 RATIO= .00									
R3-1C	MANE	2.75	2.63	220.00	2.46	5.00	2.63	220.00	2.48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1696E+00 EXCESS= .0000E+00 OUTFLOW= .1718E+00 BASIN STORAGE= .3139E-02 PERCENT ERROR= -3.1

FOR PLAN = 1 RATIO= .00									
R3-1C	MANE	2.75	1.51	220.00	1.38	5.00	1.51	220.00	1.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9481E-01 EXCESS= .0000E+00 OUTFLOW= .9627E-01 BASIN STORAGE= .3019E-02 PERCENT ERROR= -4.7

FOR PLAN = 1 RATIO= .00									
R3-1C	MANE	2.75	1.46	228.25	1.35	5.00	1.43	220.00	1.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9290E-01 EXCESS= .0000E+00 OUTFLOW= .9438E-01 BASIN STORAGE= .2936E-02 PERCENT ERROR= -4.8

FOR PLAN = 1 RATIO= .00									
R3-1C	MANE	3.00	1.58	222.00	1.33	5.00	1.32	230.00	1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9135E-01 EXCESS= .0000E+00 OUTFLOW= .9286E-01 BASIN STORAGE= .2761E-02 PERCENT ERROR= -4.7

FOR PLAN = 1 RATIO= .00									
R3-14E	MANE	3.00	10.90	219.00	1.46	5.00	10.73	220.00	1.46

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7330E+00 EXCESS= .0000E+00 OUTFLOW= .7353E+00 BASIN STORAGE= .2362E-02 PERCENT ERROR= -.6

FOR PLAN = 1 RATIO= .00									
R3-14E	MANE	3.00	10.74	219.00	1.43	5.00	10.57	220.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7222E+00 EXCESS= .0000E+00 OUTFLOW= .7245E+00 BASIN STORAGE= .2347E-02 PERCENT ERROR= -.6

FOR PLAN = 1 RATIO= .00									
R3-14E	MANE	3.00	10.57	219.00	1.41	5.00	10.41	220.00	1.41

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

G.C. Wallace, Inc.
File: NT11_sf4.wb3
Project No.: 5524.4091

Update to Nevada Trails
Ultimate Conditions
Section 10

BY: mm
DATE: 10/07/02

SUB-BASIN DATA								INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc		Tlag	REMARKS
DESIG: (1)	DEV./EX. (D or E)	LAND USE	SOIL TYPE	CN	K (2)	AREA Ac (3)	AREA MI^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	TI Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Tc Calc. (13)	Tc Check	Tlag= 0.6Tc/60 Hours Per Tc Calc	RAINFALL Inches 100-yr\10-yr
3-01	E	DS	263	64.3	0.4588	2.47	0.00386	60	3.0	6.2	950	2.0	n/a	5.22*	3.0	9.2	15.6	0.092	2.77\1.58
3-01A	D	R	263	80.6	0.6739	12.42	0.01941	100	1.0	7.7	1310	1.4	2.4	3.6	7.3	15.0	17.8	0.150	2.77\1.58
3-01B	D	S	263	98.0	0.9036	2.03	0.00317	50	2.0	2.0	1310	0.7	1.7	2.5	10.3	12.3	17.6	0.123	2.77\1.58
3-01C	D	S	263	98.0	0.9036	0.84	0.00131	50	2.0	2.0	540	1.3	2.3	3.4	3.9	5.9	13.3	0.059	2.77\1.58
3-02	D	R/S/P	240\263	86.5	0.7518	14.67	0.02292	50	2.0	13.5	2465	1.1	2.1	3.3	18.9	17.5	24.0	0.175	2.77\1.58
3-03	E	DS	263	64.3	0.4588	2.06	0.00322	60	3.0	6.2	330	1.6	n/a	5.03*	1.1	7.3	12.2	0.073	2.77\1.58
3-04	D	R	263	86.0	0.7452	5.71	0.00892	115	2.0	5.4	660	1.4	2.4	3.6	4.2	9.7	14.3	0.097	2.77\1.58
3-04A	D	R	263	80.6	0.6739	2.49	0.00389	100	1.0	7.7	840	1.5	2.4	3.7	4.9	12.6	15.2	0.126	2.77\1.58
3-05	D	R	263	76.8	0.6238	4.03	0.00630	100	1.0	8.6	705	1.2	2.2	3.3	4.6	13.4	14.5	0.134	2.77\1.58
3-05A	D	R	263	80.6	0.6739	29.75	0.04648	100	1.0	7.7	2160	1.2	2.2	3.3	12.1	19.8	22.6	0.198	2.77\1.58
3-05B	D	R	263	80.6	0.6739	8.37	0.01308	100	1.0	7.7	1360	1.3	2.3	3.5	9.7	15.4	18.1	0.154	2.77\1.58
3-06	D	R/O	263	75.9	0.6119	3.02	0.00472	100	1.0	8.8	760	0.6	1.6	2.4	7.2	16.0	14.8	0.148	2.77\1.58
3-07	E	DS	240\263	68.8	0.5182	3.09	0.00483	60	3.0	5.6	825	1.7	n/a	5.36*	2.6	8.2	14.9	0.082	2.77\1.58
3-08	D	R	263	76.8	0.6238	6.39	0.00998	100	1.0	8.6	990	1.4	2.4	3.6	5.8	14.4	16.1	0.144	2.77\1.58
3-09	D	S	263	98.0	0.9036	2.55	0.00398	35	2.0	1.7	1085	1.5	2.6	3.7	6.0	7.6	16.2	0.076	2.77\1.58

* Velocity based on majority percentage of flow (in wash) through typical channel section (includes detention basin discharge).

* Velocity was applied to entire travel length (column 7) for purposes of travel time computations.

Tc = Ti + Tt Ti = L/V Tlag = 0.6 Tc

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

K = 0.0132 (CN) - 0.39

For the travel time (Ti) 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 :

STANDARD FORM 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

G.C. Wallace, Inc. | **Nevada Trails** | **BY:** mm

File: NT11_sf4.wb3 | **Ultimate Conditions** | **DATE:** 10/07/02

Project No.: 5524.4158 | **Section 10**

SUB-BASIN DATA								INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc		Tlag	REMARKS
DESIG: (1)	DEV./EX. (D or E)	LAND USE	SOIL TYPE	CN	K (2)	AREA Ac (3)	AREA MI^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Tc Calc. (13)	Tc Check	Tlag= 0.6Tc/60 Hours Per Tc Calc	RAINFALL Inches 100-yr\10-yr
3-14	D	C	263	90.1	0.7993	13.72	0.02144	50	2.0	3.0	1490	1.3	2.3	3.5	8.2	11.3	18.6	0.113	2.77\1.58
3-15	D	R	263	80.6	0.6739	13.85	0.02164	100	1.0	7.7	1725	1.0	2.0	3.1	10.7	18.4	20.1	0.184	2.77\1.58
3-18	D	R	263	76.8	0.6238	2.23	0.00348	100	1.0	8.6	935	1.2	2.2	3.3	6.0	14.6	15.8	0.146	2.77\1.58
3-22	D	R	263	80.6	0.6739	22.72	0.03550	100	1.0	7.7	1850	1.5	2.5	3.8	9.2	16.9	20.8	0.169	2.77\1.58
3-24	D	R	263	76.2	0.6158	8.86	0.01384	100	1.0	8.7	1020	1.4	2.4	3.6	5.9	14.6	16.2	0.146	2.77\1.58
3-28	D	S	263	98.0	0.9036	3.08	0.004811	35	2.0	1.7	2400	0.9	1.9	2.9	15.3	17.0	23.5	0.170	2.77\1.58
3-28A	D	S	263	98.0	0.9036	1.02	0.00159	35	2.0	1.7	120	1.0	2.0	3.1	1.0	2.7	10.9	0.027	2.77\1.58
3-28B	D	S	263	98.0	0.9036	2.20	0.00344	50	2.0	2.0	1625	1.9	2.7	4.2	7.5	9.5	19.3	0.095	2.77\1.58
3-28D	D	R	263	80.6	0.6739	1.14	0.00176	100	1.0	7.7	480	1.6	2.5	3.8	3.2	10.8	13.2	0.108	2.77\1.58
3-29	D	R	263	80.6	0.6739	14.33	0.02239	100	1.0	7.7	1225	1.2	2.2	3.5	7.4	15.1	17.4	0.151	2.77\1.58
3-30	E	DS	263	64.3	0.4588	1.96	0.00306	60	3.0	6.2	330	1.6	n/a	5.59	1.0	7.2	12.2	0.072	2.77\1.58
3-34A	D	R	263	73.9	0.5855	19.46	0.03041	100	1.0	9.3	1860	1.2	2.2	3.4	10.5	19.8	20.9	0.198	2.77\1.58
3-34B	D	S	263	98.0	0.9036	1.57	0.002451	30	2.0	1.5	1370	0.6	1.5	2.3	11.6	13.2	17.8	0.132	2.77\1.58
3-34C	D	R	263	76.8	0.6238	2.50	0.00391	100	1.0	8.6	755	0.8	1.8	2.7	6.2	14.8	14.8	0.148	2.77\1.58
3-35	D	S	263	98.0	0.9036	2.04	0.00319	35	2.0	1.7	700	1.8	2.7	4.1	3.9	6.5	14.1	0.055	2.77\1.58
3-36	D	R	263	80.6	0.6739	12.11	0.01892	100	1.0	7.7	1560	1.7	2.6	4.0	7.6	15.3	19.2	0.153	2.77\1.58
3-36A	D	R	240\263	85.7	0.7412	22.30	0.03484	100	1.0	6.5	3045	1.6	2.6	3.9	14.0	20.5	27.5	0.205	2.77\1.58
3-36B	E	DS	263	64.3	0.4588	1.54	0.00241	50	3.0	5.7	1710	1.7	n/a	6.18	4.5	11.2	19.8	0.112	2.77\1.58
3-37	D	R	263	80.6	0.6739	15.40	0.02406	100	1.0	7.7	1450	1.5	2.5	3.7	7.6	15.3	18.6	0.153	2.77\1.58
3-38	D	C/S	240/263	91.0	0.8412	9.98	0.01559	100	1.0	6.2	1045	1.3	2.3	3.5	6.1	11.3	16.4	0.113	2.77\1.58

* Velocity based on majority percentage of flow (in wash) through typical channel section (includes detention basin discharge).

• Velocity was applied to entire travel length (column 7) for purposes of travel time computations.

Tc = Ti + Tt Tt = L/V Tlag = 0.6 Tc

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

K = 0.0132 (CN) - 0.39

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 :

STANDARD FORM 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

G.C. Wallace, Inc.
File: NT11_sf4.wb3
Project No.: 5524.4158

Nevada Trails
Ultimate Conditions
Section 10

BY: mm
DATE: 10/07/02

SUB-BASIN DATA								INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc		Tlag	REMARKS
DESIG: (1)	DEV./EX. (D or E)	LAND USE	SOIL TYPE	CN	K (2)	AREA Ac (3)	AREA MI^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Tc Calc. (13)	Tc Check	Tlag= 0.6Tc/60 Hours Per Tc Calc	RAINFALL Inches 100-yr\10-yr
3-38A	D	OS	263	79.1	0.6541	24.22	0.03784	100	1.0	8.0	1715	1.2	2.2	3.4	9.7	17.8	20.1	0.178	2.77\1.58
3-38B	D	C/S	263	90.1	0.7993	10.24	0.01600	100	1.0	5.4	1035	0.9	1.9	2.9	7.5	13.0	16.3	0.130	2.77\1.58
3-38C	D	OS	240\263	70.3	0.5380	10.33	0.01614	500	1.6	19.3	500	1.7	2.6	4.0	3.2	22.5	16.6	0.225	2.77\1.58
3-38D	D	R/S	240\263	91.6	0.8191	10.37	0.01620	100	1.0	5.1	2225	1.6	2.6	3.9	10.6	15.6	22.9	0.156	2.77\1.58
3-38E	D	R/S	240\263	94.1	0.8521	6.10	0.00953	50	2.0	2.5	1745	1.2	2.2	3.4	10.0	12.5	20.0	0.125	2.77\1.58
5-1	D	R	263	76.8	0.6238	23.86	0.03726	100	1.0	8.8	1995	1.1	2.1	3.2	11.5	20.3	21.6	0.203	2.77\1.58
5-1A	D	R	263	76.8	0.6238	13.79	0.02155	100	1.0	8.6	1704	1.3	2.3	3.5	9.3	17.9	20.0	0.179	2.77\1.58
5-1B	D	R	263	78.2	0.6422	6.52	0.01019	100	1.0	8.2	870	0.8	1.8	2.8	6.7	15.0	15.4	0.150	2.77\1.58
5-1C	D	R	260/263	77.8	0.6370	17.64	0.02756	100	1.0	8.3	1630	1.0	2.0	3.0	10.3	18.7	19.6	0.187	2.77\1.58
5-2	D	C	260/263	91.1	0.8125	7.13	0.01114	100	1.0	5.2	1150	1.0	2.0	3.0	7.8	13.0	16.9	0.130	2.77\1.58
5-3	D	R	263	73.9	0.5855	2.95	0.00461	100	1.0	9.3	950	0.8	1.8	2.7	7.4	16.6	15.8	0.158	2.77\1.58
5-4	D	S	263	98.0	0.9036	1.65	0.00258	50	2.0	2.0	1485	1.4	2.4	3.6	8.0	10.0	16.5	0.100	2.77\1.58
5-4A	D	R	263	86.2	0.7478	3.58	0.00559	50	2.0	3.6	875	1.4	2.4	3.6	5.2	8.8	15.1	0.088	2.77\1.58
5-4B	D	I/S	263	85.9	0.7439	2.68	0.00419	100	1.0	8.4	635	1.6	2.5	3.8	3.9	10.3	14.1	0.103	2.77\1.58
6-1A	D	R	263	76.8	0.6238	2.61	0.00408	100	1.0	8.6	865	1.4	2.4	3.6	5.2	13.8	15.4	0.138	2.77\1.58
6-1B	D	S	263	98.0	0.9036	1.69	0.00264	50	2.0	2.0	1310	1.6	2.6	3.9	6.7	8.7	17.6	0.087	2.77\1.58
6-1C	D	I	260/263	81.6	0.6871	9.39	0.01467	100	1.0	7.4	1620	1.2	2.2	3.4	9.2	16.7	19.6	0.167	2.77\1.58
8-1	D	I/S	240	93.5	0.8442	10.47	0.01636	100	1.0	4.6	1220	1.2	2.2	3.3	7.5	12.1	17.3	0.121	2.77\1.58
8-2	D	C/S	240	92.4	0.8297	14.65	0.02289	100	1.0	4.9	1660	1.3	2.3	3.4	9.3	14.1	19.6	0.141	2.77\1.58
8-3	D	R/S	240	91.6	0.8191	27.95	0.04367	100	1.0	5.1	2390	1.2	2.2	3.3	13.3	18.4	23.8	0.184	2.77\1.58
8-4	D	I/S	152/240	92.6	0.8323	60.49	0.09452	100	1.0	4.8	3000	1.2	2.2	3.4	16.2	21.0	27.2	0.210	2.77\1.58
8-5A	D	S	240	98.0	0.9036	5.41	0.00845	40	2.0	1.8	2370	1.5	2.5	3.8	11.6	13.4	23.4	0.134	2.77\1.58
8-5B	D	R	240	91.4	0.8165	8.93	0.01395	100	1.0	5.1	675	1.3	2.3	3.5	4.4	9.5	14.3	0.095	2.77\1.58
8-5C	D	C/S	240	95.2	0.8666	10.09	0.01577	100	1.0	4.2	1095	1.1	2.2	3.3	6.9	11.1	16.6	0.111	2.77\1.58
8-5D	D	S	240	98.0	0.9036	0.66	0.00103	40	2.0	1.8	805	1.0	2.0	3.0	4.7	6.5	13.6	0.065	2.77\1.58
8-6A	D	C/S	240	95.3	0.8680	2.63	0.00411	100	1.0	4.2	545	1.4	2.4	3.6	3.7	7.9	13.6	0.079	2.77\1.58
8-6B	D	R/S	240\263	94.7	0.8600	21.54	0.03366	100	1.0	4.3	1980	1.2	2.2	3.4	10.9	15.3	21.6	0.153	2.77\1.58
8-6C	D	C/S	240	94.9	0.8627	5.05	0.00789	100	1.0	4.3	770	1.3	2.3	3.5	4.9	9.2	14.8	0.092	2.77\1.58
8-7	D	C/S	240\263	94.0	0.8508	10.07	0.01573	100	1.0	4.5	1090	1.2	2.2	3.3	6.7	11.2	16.8	0.112	2.77\1.58
9-1A	D	I	260/263	82.3	0.6964	10.58	0.01653	100	1.0	7.8	1480	1.4	2.4	3.6	4.7	15.2	18.8	0.152	2.77\1.58
9-1B	D	R	260/263	89.3	0.7888	7.52	0.01175	100	1.0	5.6	1170	1.2	2.2	3.3	7.1	12.7	17.6	0.127	2.77\1.58
9-2	D	C	260/263	91.2	0.8138	6.06	0.00947	100	1.0	5.2	1155	0.7	1.7	2.6	9.3	14.4	17.0	0.144	2.77\1.58

* Velocity based on majority percentage of flow (in wash) through typical channel section.
* Velocity was applied to entire travel length (column 7) for purposes of travel time computations.

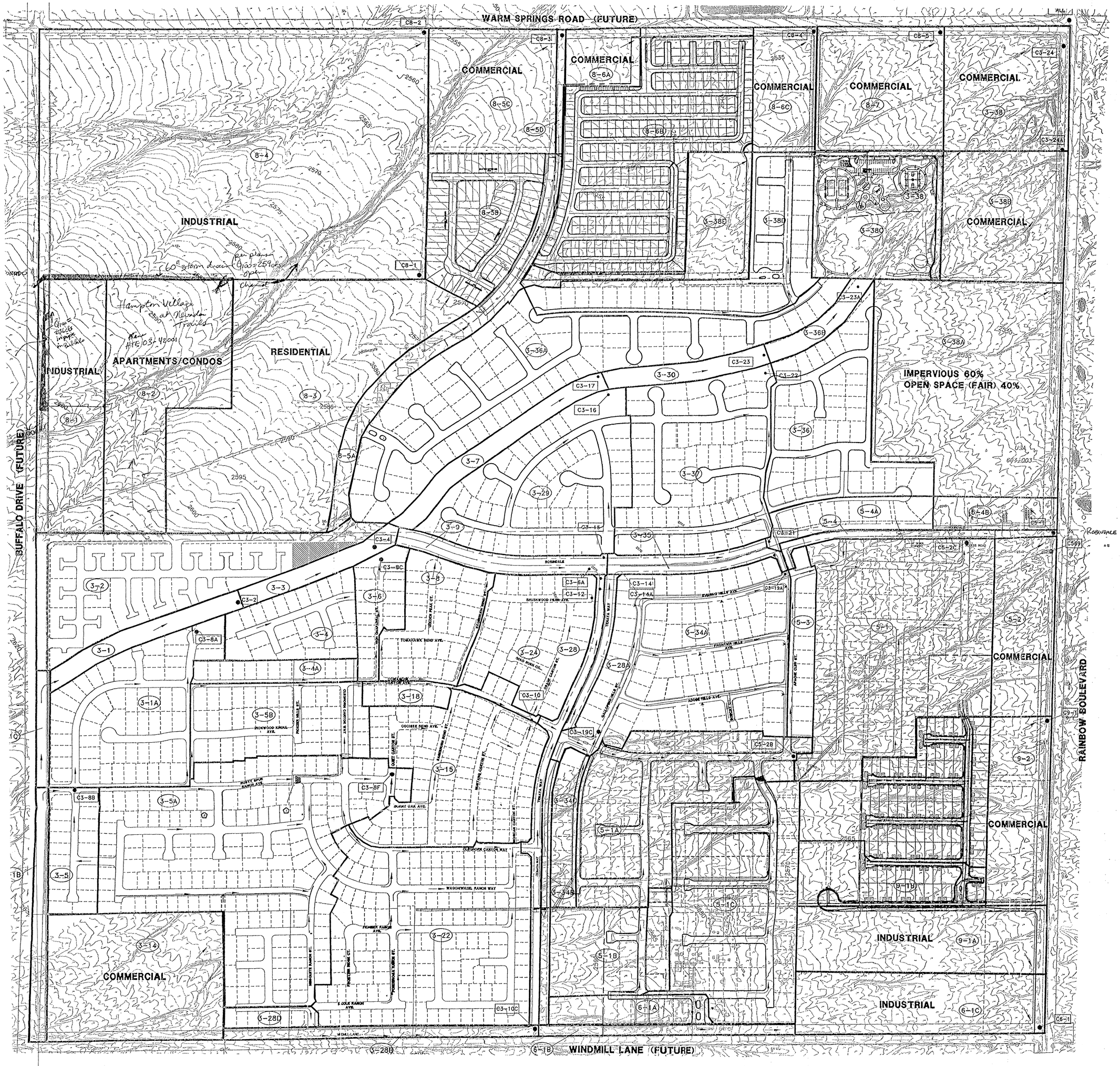
Tc = Ti + Tt Ti = L/V Tlag = 0.6 Tc
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3
K = 0.0132 (CN) - 0.39

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 :

STANDARD FORM 4


WARM SPRINGS ROAD (FUTURE)
BUFFALO DRIVE (FUTURE)
RAINBOW BOULEVARD
WINDMILL LANE (FUTURE)
ROBINDALE
INDUSTRIAL
COMMERCIAL
RESIDENTIAL
APARTMENTS/CONDOS
IMPERVIOUS 60%
OPEN SPACE (FAIR) 40%
60" storm drain (Q=325 cfs per plans) to 259 open channel
Hampton Village at Nevada Trails
Rev TE 03-42001
Q=xx cfs in pipe in ballade
ROSEDALE
TOMAHAWK BEND AVE.
BRUSHWOOD KNOLL AVE.
RUSTY SPUR RANCH AVE.
WAGONWHEEL RANCH WAY
PIONEER RANCH AVE.
E. GOLF RANCH AVE.
ROLLING HILLS AVE.
FRONTIER HILLS AVE.
LOOKOUT HILLS AVE.
TRAVIA WAY
GOLD RANCH CT.
BRUSHWOOD TERR. AVE.
COCHISE BEND AVE.
SUNNY OAK AVE.
OLDHORN CANYON WAY
MESA CANYON ST.
DUNCAN CANYON ST.
DUST CANYON ST.
SILVER CANYON ST.
GOLDSPRINGS ST.
ROCKY HILLS ST.
PIONEER HILLS ST.
SADDLEHORN RANCH ST.
FRONTIER RIDGE CT.
PIONEERTOWN ST.
MOUNTAIN RIDGE CT.
ROCKY PEAK CT.
ARROWHEAD ROAD ST.
SUNSET HILLS ST.
MAPLE CLIFF ST.
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RAINBOW BOULEVARD COLLECTOR SYSTEM

G.C. Wallace Inc Design Plans

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

500.854

Name of Development: Rainbow Boulevard Improvements Blue Diamond Road to Southern Segment of Las Vegas Beltway — Date: September 2001

Location of Development: a) Descriptive (Cross Streets): North/South: Southern Beltway / Blue Diamond Road — East/West: Rainbow Boulevard

b) Sect. 2, 3, 10, 11, 14, 15, 22, 23 — Twn. 22 S — Rng. 60 E

Name of Owner: Clark County Public Works — Assessors Parcel No: Clark County R.O.W.

Telephone: (702) 455-6000 — Facsimile No: (702) 455-6040

Address: 500 South Grand Central Parkway; Las Vegas, Nevada 89106

Contact Person - Name: Mark J. Failla, P.E. — Telephone No: (702) 804-2129

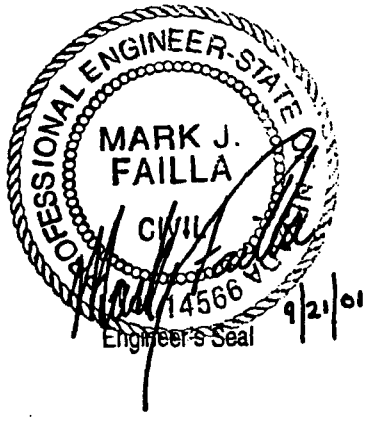
Firm: G. C. Wallace, Inc.

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		Roadway improvements

1. Total Owned Land Area: At Site: ± 43 Ac. — Being Developed / Disturbed: ± 43 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.)? Public Works
5. Approximate upstream land area which drains to the subject site? ± 75.5 sq. mi. (interim)
6. Has the site drainage been evaluated in the past? Yes / NO If yes, please identify documentation:
   Southwest Las Vegas Valley Development Guidelines, Area 1 CCPW, July 1996.
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
   North and west of the proposed site into the existing natural wash
   Regional Facilities BDRB 0000 and BDRB 0074 as well as various unnamed washes
8. Briefly describe your proposed schedule for the subject project: 30% Submittal 9/01. Final Submittal 3/02.



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.

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

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I. INTRODUCTION

The Clark County Department of Public Works (CCPW) has contracted with G.C. Wallace, Inc. (GCW) to provide engineering and design services with general regard to grading, drainage, right-of-way, lighting, utilities, traffic design and construction phasing for improvements to Rainbow Boulevard from Blue Diamond Road (SR-160) to the eastbound frontage road intersection of the Southern Segment of the Las Vegas Beltway (I-215). By means of contract, the design services have been divided into two separate phases: the ultimate project and the initial project. The ultimate project encompasses full improvements within the 120-foot right-of-way of Rainbow Boulevard between the project limits. The full improvements include development of six lanes of traffic with curb and gutter, as well as all general project aspects listed above. The proposed full improvements are recommendations for future construction of Rainbow Boulevard after the initial project when traffic and development warrant it. The initial project includes all improvements defined under the ultimate project with the general exception of one less lane of traffic, fewer and shorter drainage facilities, and no curb and gutter. The initial project constitutes design recommendations to be constructed under the present contract. Additionally, the initial project will be designed to accommodate features of the ultimate project not to be constructed with the initial improvements with minimal additional design effort and disruption to the initial improvements.

This report addresses the 30-percent design level for the necessary drainage improvements resulting from the development of the project segment of Rainbow Boulevard. The intention of this report is to provide detailed hydrologic and hydraulic analyses in support of the drainage recommendations for both the initial and ultimate phases of the project. The following tasks were performed in the preparation of this report:

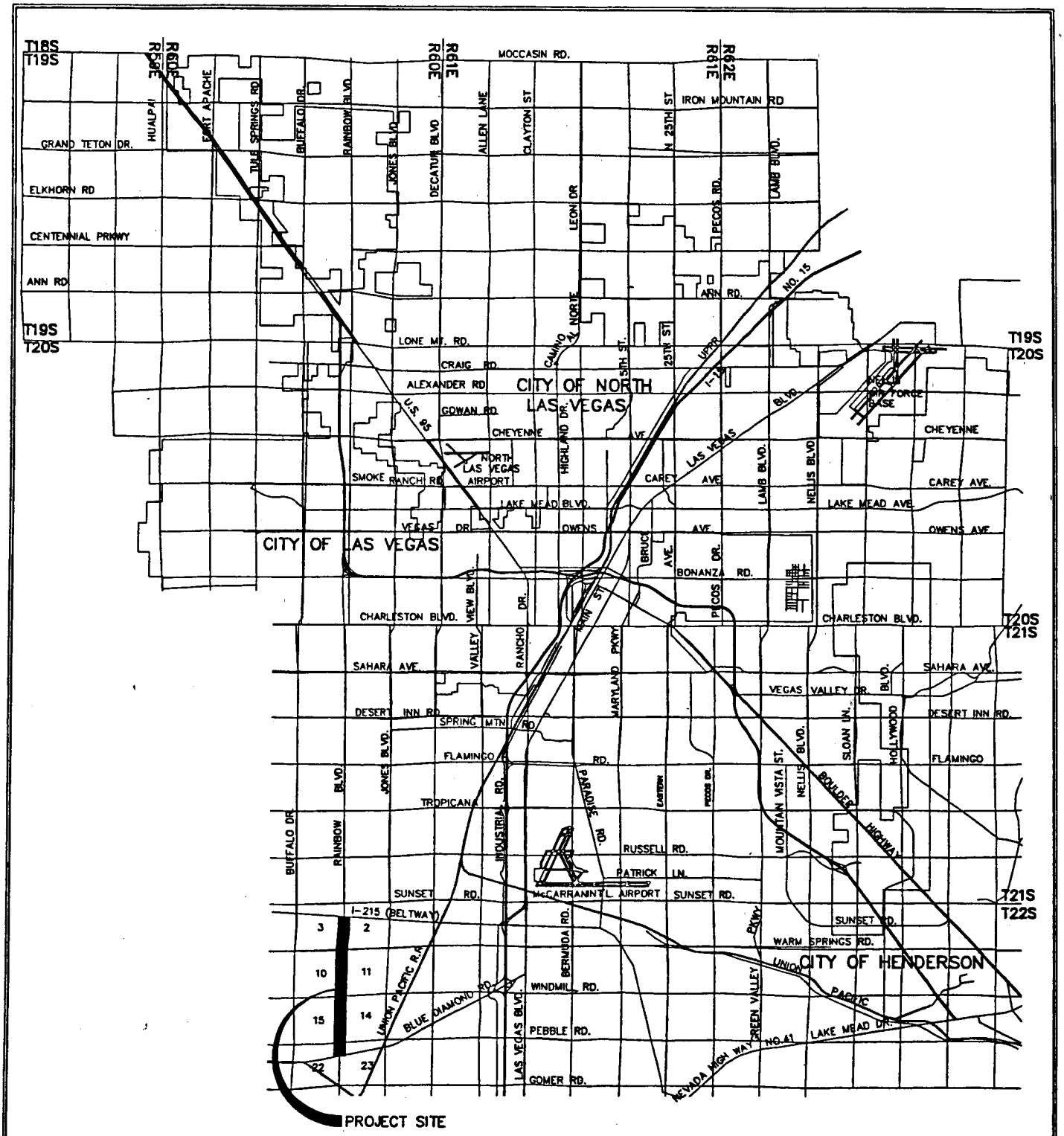
- Identified and reviewed previous drainage studies for the project.
- Identified record drawings for area projects and utilities, and extracted information pertinent to the recommended drainage facilities.
- Determined the FEMA floodplain designation within the project limits.
- Identified existing and proposed CCRFCD drainage facilities adjacent to the project site.
- Estimated runoff generated from offsite subbasins during the 100-year return period storm event under interim and ultimate conditions.

- Estimated runoff generated from onsite subbasins during the 10- and 100-year return period storm events under ultimate conditions.
- Determined design flows for recommended drainage facilities.
- Developed regional facility design alternative.
- Performed site field investigations.
- Recommended interim and ultimate conditions drainage facilities.
- Performed HGL profiles for the recommended storm drain facilities.
- Identified project constraints and anticipated resolutions.
- Prepared preliminary storm drain improvement plans incorporating recommended interim and ultimate conditions drainage facility recommendations.

II. LOCATION AND DESCRIPTION

The Rainbow Boulevard improvements project is located inside unincorporated Clark County, Nevada. More specifically, the project is bounded by Blue Diamond Road (SR 160) to the south, the eastbound frontage road intersection of the Southern Segment of the Las Vegas Beltway (I-215) to the north and predominantly undeveloped private lands to the east and west. The project limits will incorporate improvements to approximately 3 miles of Rainbow Boulevard. Figures 1 and 2 depict the vicinity and location of the project.

Currently, one northbound and one southbound travel lanes comprise the developed condition of Rainbow Boulevard. The portion of the roadway north of Windmill Lane to the eastbound frontage road intersection of the Southern Segment of the Las Vegas Beltway slopes to the north. Adjacent topography in this area generally slopes from the southwest to the northeast across Rainbow Boulevard. The portion of Rainbow Boulevard south of Windmill Lane to Blue Diamond Road slopes to the south. Adjacent topography in this area generally slopes from west to east across Rainbow Boulevard. Various sags in the roadway profile exist south of Windmill Lane to allow for the passage of stormwater runoff from several defined washes crossing Rainbow Boulevard.

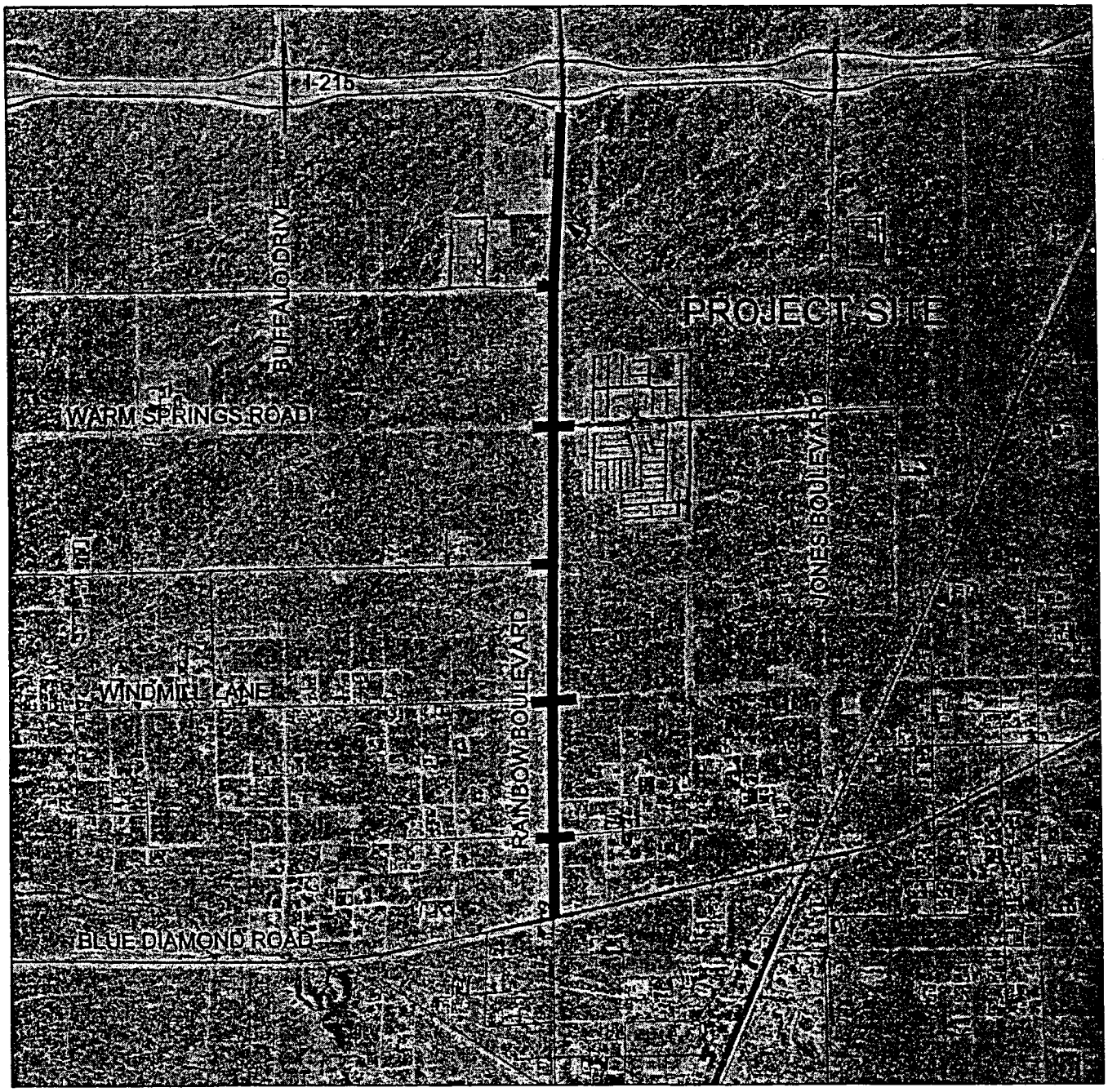


RAINBOW BOULEVARD IMPROVEMENTS
BLUE DIAMOND RD TO S. BELTWAY

FIGURE 1

VICINITY MAP

G.C. WALLACE, INC.
Engineering/Architecture 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146



NORTH

GRAPHIC SCALE

3000 0 1500 3000

(IN FEET)

1 inch = 3000 ft.

RAINBOW BOULEVARD IMRPOVEMENTS
BLUE DIAMOND RD TO S. BELTWAY

FIGURE 2

LOCATION MAP

G.C. WALLACE, INC.
Engineers/Planners/Surveyors 5555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89146

F:\854\drainage\figures\FIG2.dwg 09-11- 16:58:18 KGundersen

III. PREVIOUS STUDIES

Several previous studies and record plans were utilized in the preliminary planning of the recommended drainage facilities. Table 1 provides a summary of the previous studies and record drawings utilized in the preparation of this report.

TABLE 1
Previous Studies & Reference Drawings

Type	Description
Drainage Study	*Supplemental Hydrology Analysis and Hydraulics Analysis for the Southern Segment of the Las Vegas Beltway Section 7A, Rainbow Boulevard to Decatur Boulevard, 90% Design Submittal*, dated April 1997, prepared by VTN Nevada.
Drainage Study	CCRFCD 1996 MPU
Drainage Study	*Conceptual Master Drainage Study for Section 10 by Pardee Homes*, dated May 2000, revised June 16, 2000, prepared by G.C. Wallace, Inc.
Design Drawing	*Rainbow/Robindale 2635 Zone South Pipeline*, signed March 16, 1999, prepared by Pentacore

The drainage study prepared by VTN and listed above is designated as Reference 1 and is hereinafter referred to as the VTN Study. The drainage study listed above for Section 10 is designated as Reference 2 and is hereinafter referred to as the Section 10 Study.

IV. FEMA FLOOD PLAIN STATUS

Figure 3 depicts current Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas (SFHA) as obtained from the GIS database for Clark County. The limits of the project are located on Flood Insurance Rate Map (FIRM) Panels 32003C2561 D, 32003C2563 D and, 32003C2565 D for Clark County, Nevada, and incorporated areas and are dated August 16, 1995. Map Panels 32003C2561 D and 32003C2563 D have been revised to reflect the Letter of Map Revision (LOMR) dated June 28, 2000. Review of the FIRMs indicate that portions of the project are located within FEMA designated SFHA Zone A, Zone AE, and Zone A99. The Zone A99 is a temporary designation until the final LOMR approval associated with construction of the Blue Diamond Detention Basin is received from FEMA. As per discussion with CCRFCD, receipt of final LOMR approval is anticipated within the

next month. Upon final approval, the Zone A99 SFHA designation will be removed.

V. CCRFCD FLOOD CONTROL MASTER PLAN UPDATE

Figure 4 is reproduced from Figure F-18 and Figure F-22 as taken from the *Clark County Regional Flood Control District 1996 Master Plan Update* (Reference 3, hereinafter referred to as the MPU). This figure depicts the location of the subject project in relation to existing and proposed flood control facilities. As shown on the figure, two future CCRFCD regional facilities are proposed within the project limits along Rainbow Boulevard and are designated as BDRB0000 and BDRB0074. BDRB0000 is defined as a future concrete lined channel, 4.1 feet in depth with a 10-foot bottom width and 2:1 side slopes. BDRB0074 is defined as a future concrete lined channel, 2.9 feet in depth with a 10-foot bottom width and 2:1 side slopes. These regional facilities are proposed as part of this study, although modifications to the type of facility have been recommended. The MPU also depicts facilities BDRB0000 and BDRB0074 discharging to facility TRBD0182, known as the beltway channel. This portion of the beltway channel is constructed and will provide the outlet for the proposed regional facilities BDRB0000 and BDRB0074 recommended with this project.

VI. DESIGN PROCEDURES AND CRITERIA

The procedures and criteria used in the design and planning of recommended drainage facilities are based on standards published in the CCRFCD *Hydrologic Criteria and Drainage Design Manual* (Reference 4, hereinafter referred to as the Manual). Specific design criteria are described in further detail as follows.

Hydrologic Model Description

The interim and ultimate conditions offsite watershed hydrology was modeled using the SCS Unit Hydrograph method within the U.S. Army Corps of Engineers (USACOE) *HEC-1 Flood Hydrograph Package* (Reference 5).

The ultimate conditions local watershed hydrology along Rainbow Boulevard was modeled using the Modified Rational Method, as taken from Section 604.1 of the Manual.

Precipitation

The project limits along Rainbow Boulevard lie within the McCarran Rainfall Area. A majority of the offsite subbasins are located outside of the McCarran Rainfall Area as identified in the Manual. For the interim and ultimate conditions offsite hydrologic models, GIS data from the CCRFCD MPU was utilized to calculate rainfall depths for the offsite subbasins. The GIS rainfall depths were extracted from the NOAA Atlas II, Volume VII and have been adjusted according to the approach outlined in Section 500 of the Manual. Each offsite subbasin was given a composite point precipitation value for use in the HEC-1 model. The adjusted 100-year point precipitation values range from 2.78 to 3.03 inches.

The adjusted point precipitation depths were further adjusted to estimate the average rainfall depth over an entire drainage area by the application of the Depth Area Reduction Factor (DARF). The appropriate DARF's were taken from Table 502 of the Manual. The flows for each subbasin or concentration point were determined in the HEC-1 output by using the listed tributary area and referencing the flow value in the column of the HEC-1 output with the appropriate DARF. A summary of the used DARF's are included in Appendix A and at the beginning of each HEC-1 run also found in Appendix A.

The HEC-1 model of the watershed tributary upstream of, and including the Blue Diamond Detention Basin was prepared by the USACOE. The USACOE HEC-1 model was included in the hydrologic analysis of the project site watershed. The USACOE model used a design storm and precipitation values based on USACOE established criteria. Therefore, DARF factors were not applied to this portion of the HEC-1 model, or to the cumulative downstream area. Portions of the HEC-1 model prepared for the interim conditions offsite hydrology were taken from the USACOE model of the Blue Diamond Detention Basin and upstream watershed as included in the Section 10 Study.

Since the drainage area for the project is less than 8 square miles, an SDN 3 design storm was selected for use in the HEC-1 computer models.

For the modified rational methodology utilized in the determination of local hydrology along Rainbow Boulevard, 10- and 100-year rainfall intensity values were obtained from Table 506 of the Manual. As per Table 506, for a five-minute duration, the 10-

year storm event rainfall intensity is 4.20 in/hr and the 100-year storm event rainfall intensity is 7.56 in/hr. A five-minute duration is the minimum recommended duration and was conservatively selected for computing 10- and 100-year peak flow rates. A copy of Table 506 has been included in Appendix A.

Curve Numbers & Runoff Coefficients

The soils information utilized for the offsite hydrologic models was obtained from the *SCS Soil Survey of the Las Vegas Valley* as provided by the United States Department of Agriculture (USDA, Reference 6). The Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service) methodology for computing runoff divides soils into four hydrologic soil groups A, B, C, and D. The soil survey was used to determine the hydrologic soil group of each soil type for use in determination of composite curve numbers. The hydrologic soil groups are defined as follows:

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

Land use data used in the determination of interim conditions composite curve numbers was based on aerial photography and site evaluation of current land uses. Land use determination of the ultimate conditions composite curve numbers was based on 2001 MPU land use assumptions. Some 2001 MPU land use assumptions for particular subbasins were modified to indicate a higher development density. The 2001 MPU is currently being developed.

The ultimate conditions hydrologic models are discussed in further detail later in this report. Table 2 summarizes land use designations and associated curve numbers used in the interim and ultimate conditions offsite hydrology.

TABLE 2
Land Use Summary & Composite Curve Numbers

Land Use Designation	HSG and Curve Number			
	A	B	C	D
Desert Shrub (Poor Condition)	63	77	85	88
Medium Density Residential	61	75	83	87

TABLE 2
Land Use Summary & Composite Curve Numbers

Land Use Designation	HSG and Curve Number			
	A	B	C	D
High Density Residential	80	87	90	92
Light Industrial	81	88	91	93
Commercial	89	92	94	95

Runoff coefficients used in the computations of peak flow rates for the local hydrology along Rainbow Boulevard were taken from Table 601 in the Manual. A value of 0.90 was selected for paved roads and streets for the 10-year storm event and a value of 0.93 was selected for the 100-year storm event per Table 601.

Drainage Areas and Flow Patterns

The interim conditions offsite subbasins, flow patterns and slopes were determined utilizing existing topography and contours obtained from a GIS database for the area. Ultimate conditions offsite hydrology was based on subbasin assumptions from the 2001MPU. Some modifications to the 2001 MPU subbasin assumptions were made based on actual developed conditions. These modifications are described in further detail later in this report. Ultimate conditions local subbasins were determined utilizing design roadway profiles and typical sections for the Rainbow Boulevard improvements project.

Lag Time

The lag time is described as the time between the center of mass of rainfall excess and the time to peak discharge from a basin. Lag time (t_L) can be related to time of concentration (t_c) by the following relationship: $t_L = 0.6(t_c)$. The time of concentration is defined as the time required for runoff to flow from the hydrologically most distant point of the subbasin to the outlet of the subbasin or concentration point. The procedure for calculating t_c is outlined in Section 602 of the Manual. Lag time calculations for the subject property subbasins, as incorporated on Standard Form 4, are included in Appendix A.

Manning's "N" Design Values

The following table summarizes Manning's "n" values used for each material and

facility type recommended for the Rainbow Boulevard improvements. Values used are consistent with recommended values contained in Tables 702 and 801 of the Manual. Additionally, recommended maximum permissible velocities associated with each material type are also listed. Maximum permissible velocities are consistent with Table 703 and Section 802.2 of the Manual.

TABLE 3
Mannings "n" Design Values

Facility Type	Mannings "n" Value	Maximum Permissible Velocity (fps)
RCP/RCB Storm Drain	0.013	25
RCP/RCB Culvert	0.013	25
Natural Desert Lining	0.025	4
Un-lined Roadside Ditches	0.025	4

Culverts

Culverts were designed in accordance with Section 1000 of the Manual. More specifically, headwater depths were determined in accordance with Section 1002.4 of the Manual. Section 1002.4 allows for the maximum headwater for culverts greater than 36-inch diameter, or a culvert rise of 36-inch shall be 1.5 times the culvert height. Section 1002.4 allows maximum headwaters for culverts with a height of 36-inch or less to be 5 feet if adjacent properties are not affected. If the design flow exceeds 500 cfs in an urban area, the maximum headwater shall not exceed the height of the culvert for an ultimate condition.

Since culvert locations recommended as part of the Rainbow Boulevard project are not currently shown on the MPU, it is assumed that the above listed criteria is acceptable and that the bridge headwater criteria described in the Manual does not apply as dictated in the Manual. Additionally, for recommended culverts with design flows exceeding 500 cfs, headwater elevations were allowed to rise above the height of the culvert on an interim basis. It is anticipated that under ultimate conditions, as adjacent properties develop, these culverts will be extended through the upstream property and will function as storm drain.

The CCPW's desire to maintain a minimum culvert height of six feet for box culverts was unable to be met in many instances. Due to the relatively flat existing grade and low proposed roadway profile required to minimize earthwork, six-foot high culverts posed a hardship in that downstream daylight from the culvert invert was excessive. In order to minimize the acquisition length of downstream drainage easements a minimum box culvert height of four feet was utilized. It is anticipated that in many instances, as adjacent development is constructed, culverts will be extended upstream and will function as storm drain. Additionally, the CCPW desires to maintain a minimum 8-foot width per box culverts. This desire was achieved for all instances with the exception of one recommended 5-foot wide by 4-foot high RCB. This was done strictly to minimize cost and the 5-foot width can be increased to 8-foot upon further recommendations from the County.

Storm Drain

Storm drain facilities were sized to convey the entire 100-year storm flow without consideration to street flow capacity. This is considered appropriate since the only storm drain proposed is that which is designated as a regional facility which requires the conveyance of the 100-year storm event peak flow rate. Additionally, the hydraulic grade line of the storm drain pipe was designed to be a minimum of 1-foot below finished grade in accordance with Section 804 of the Manual.

Drop Inlets

Ultimate conditions drop inlet facilities located along Rainbow Boulevard have been designed in accordance with Section 805 of the Manual. Drop inlets located in sump conditions have been designed to capture the anticipated 100-year storm event runoff.

Under interim conditions, field inlets have been recommended at various locations along the west side of Rainbow Boulevard. These inlets were placed at locations where well-defined flowlines will be cutoff by the improvements to Rainbow Boulevard. These inlets were not based on a particular design flow since the downstream most inlet was designed to capture the entire 100-year flow. The field inlets were placed in order to aid the overall drainage of the project and minimize surface flow for smaller storm events.

Roadside Ditches

Interim conditions roadside ditches were designed based on the assumption that they are intended only to convey surface runoff generated from the west side of Rainbow Boulevard. Furthermore, the assumption is that the majority of upstream flow is directed to the major inlet points or culverts.

Additionally, the interim ditches were designed to minimize offsite disturbance. Due to the limited right-of-way, shallow depth and low flows, 2:1 side slopes were utilized in many instances. This allowed for minimal acquisition of offsite grading and drainage easements. In all cases, peak 100-year flow velocities within the ditches will be less than 4 cfs (the accepted maximum permissible velocity for coarse gravel unlined ditches) with the exception of interim v-ditch facilities 1, 3, 4, and 5. Peak velocities within these facilities, based on the maximum anticipated slope, range between 4.2 and 5.6 fps. It is recommended that these interim ditches remain unlined and repaired should erosion occur. This would eliminate the use of a costly and undesirable riprap lining alternative. Furthermore, freeboard within the ditches and above the anticipated flow depth of the ditches was not provided since overflow would be on undeveloped adjacent property to the west or the roadway shoulder area to the east. Additionally, absence of freeboard within the ditch will minimize the offsite disturbance and required grading and drainage easement. This scheme is considered acceptable because it is a temporary condition only. It is assumed that these roadside ditches will be filled under ultimate conditions as adjacent properties develop.

Street Flow Hydraulics

The Rainbow Boulevard typical roadway section consists of a 120-foot right-of-way width. The ultimate conditions back-of-curb to back-of-curb width will be 110 feet. The street will have "L" type curbing and a 5-foot sidewalk on each side. A typical section will have a 24-foot median.

The street flow hydraulics have been designed in accordance with Section 304.4 of the Manual. Section 304.4 requires the depth (D) and velocity (V) times depth (V*D) during the 100-year storm event to be less than or equal to 2 and 8, respectively. Additionally, the depth of flow during the 100-year storm event will be less than 1-foot at through traffic streets as required by the Manual. Section 304.4 requires the depth

(D) and velocity (V) times depth (V*D) during the 10-year storm event to be less than or equal to 1 and 6, respectively. Additionally, Section 304.4 requires a 12-foot wide dry lane be maintained in either direction during the 10-year storm event. Street flow hydraulics are discussed in further detail later on in this report.

VII. EXISTING CONDITIONS

Under existing conditions, Rainbow Boulevard within the project limits consists of a single northbound and a single southbound paved roadway with no curb and gutter. Adjacent topography slopes generally from southwest to northeast. Adjacent properties are primarily undeveloped desert land, however significant development of the adjacent areas appears to be underway or imminent based on site field investigation. The roadway profile of Rainbow Boulevard north of Windmill Lane slopes to the north. The roadway profile of Rainbow Boulevard south of Windmill Lane is fairly flat with numerous sags which allow for the drainage of transverse washes.

Stormwater runoff north of Windmill Lane and south of Warm Springs Road flows across Rainbow Boulevard. Primarily stormwater runoff is carried by the Blue Diamond Wash which enters Rainbow Boulevard just south of its intersection with Warm Springs Road. Stormwater runoff discharging to Rainbow Boulevard and north of Warm Springs Road generally is collected and discharged by inlets and storm drain located at the southwest corner of the Southern Beltway intersection. More specifically, a 10-foot wide by 8-foot high RCB storm drain inlet and a special 48-inch RCP storm drain inlet are constructed at this location. Both storm drain facilities discharge to separate storm drain segments prior to combining into a single 10-foot wide by 9-foot high RCB storm drain at the Southern Beltway/Rainbow Boulevard intersection. The 10-foot wide by 9-foot high RCB storm drain discharges to the Beltway channel a few hundred feet downstream. Stormwater runoff north of Warm Springs Road and generated from the east side of Rainbow Boulevard sheet flows off the roadway surface to the east. Please note that drainage patterns and hydrologic models for the existing and interim conditions are identical and are discussed in further detail in the following sections.

VIII. HYDROLOGIC MODELS

Five separate hydrologic models were developed for use in determination of the interim and ultimate overall drainage design of Rainbow Boulevard. The five separate separate models were developed in order to address various interim and ultimate conditions that occur or are anticipated to occur in the future. Since a major task of the Rainbow Boulevard project is to develop a constructible design for the initial phase of the project with minimal additional design effort and disruption to initial improvements for the ultimate design, peak flow rates utilized in the design of the recommended drainage facilities were based on the "worst case" peak flow rate determined from the five separate hydrologic models. The following paragraphs discuss each model in more detail as well as present a summary of peak flow rates established.

The first model, hereinafter referred to as the GCW Interim HEC-1, addresses the interim conditions flows to Rainbow Boulevard. This model analyses offsite subbasins draining to Rainbow Boulevard from the west. Land uses and drainage patterns determined for this model are based on aerial topography and development information obtained from aerial photos, previous drainage studies and site field investigation current to the date of submittal of this report. As discussed previously in this report, the interim conditions model incorporates the Blue Diamond Detention Basin as well as drainage patterns developed by the Section 10 Study. Additionally, peak flow rates utilized for the southern most subbasin draining to Rainbow Boulevard were taken from the Southwest Area Development Guidelines (Reference 7). Figure 5 shows the offsite subbasins and drainage patterns used in the hydrologic analysis under the interim conditions. A copy of the GCW Interim HEC-1 model has been included in Appendix A. Table 4 summarizes the 100-year peak flow rates established by the GCW Interim HEC-1 model.

TABLE 4
Summary of Interim Conditions Offsite HEC-1 Analysis

Subbasin or Concentration Point*	Q_{100} (cfs)
BD	209
OFF-S	418
OFF-1	508
OFF-2	179
OFF-3	111
0FF-4	427
OFF-5	35
OFF-6	83
0FF-7	25
0FF-8	31
OFF-9	23
OFF-10	457
OFF-10A	211
OFF-11	227
OFF-12	665
C10-1	999
C10-2	723
C10-3	747
C12-1	1349
C6-1	535
COMB	557
C8-1	51
C9-1	70
C6-1	546
C11-1	803
C12-1	1346

*See Figure 5.

The second model, hereinafter referred to as the Tropicana/Flamingo Modified 2001 MPU HEC-1, addresses the ultimate conditions flows to Rainbow Boulevard north of Windmill Lane. The base hydrologic model, including land use and lag time assumptions and drainage patterns, was taken from analysis prepared for the 2001 MPU currently being developed. The 2001 MPU was modified in order to incorporate more conservative land use densities known to be scheduled within the ultimate

conditions subbasins draining to Rainbow Boulevard. ~~This was done~~ The conservative land use densities were used in order to develop a more conservative peak flow rate for use in drainage facility design. Additionally, the 2001 MPU was modified to incorporate the recommended drainage facilities in the storm routings. The modifications to the land use and storm routing parameters of the 2001 MPU hydrologic model do not have a significant effect on the overall peak flow rates determined for the Tropicana/Flamingo Watershed, however it was determined to be an important consideration for the Rainbow Boulevard drainage facility design. Figure 6 shows the offsite subbasins and drainage patterns used in the hydrologic analysis for the ultimate conditions north of Windmill Lane. A copy of the Tropicana/Flamingo Modified 2001 MPU HEC-1 model has been included in Appendix A. Table 5 summarizes the 100-year peak flow rates determined by the Tropicana/Flamingo Modified 2001 MPU HEC-1 model.

TABLE 5
Summary of Ultimate Conditions Modified 2001 MPU HEC-1 Analysis for Tropicana/Flamingo Watershed

Subbasin or Concentration Point*	Q_{100} (cfs)
TBD12	219
TBD13	347
CTBD13	526
TBD14	373
CTBD14	857
TBD15	402
CTBD15S	1209

*See Figure 6.

The third model, hereinafter referred to as the GCW Ultimate HEC-1, addresses the ultimate conditions flows to Rainbow Boulevard between Windmill Lane and Robindale Road. This model was developed in order to determine peak flow rates in this area based on known future drainage patterns per the Section 10 Study. Since the Tropicana/Flamingo Wash Modified 2001 MPU HEC-1 model assumes that one-half of the Section 10 area will drain to the area between Windmill Lane and Robindale Road, it was necessary to develop a separate project specific model to determine future peak flow rates draining to this area. Additionally, since the Tropicana/Flamingo Wash Modified 2001 MPU HEC-1 model more conservatively computes peak flow rates downstream of Robindale Road with its current drainage basin assumption, it was decided to keep that model's subbasins in accordance with

the 2001 MPU and to develop the separate GCW Ultimate HEC-1 model for the Windmill Lane to Robindale Road area only. Figure 5 shows the subbasins (OFF7, OFF8 and OFF9) and drainage patterns used in the hydrologic analysis for the ultimate conditions between Windmill Lane and Robindale Road. Land use assumptions between the interim and ultimate conditions HEC-1 models for these subbasins were changed. The land use assumptions for the ultimate conditions of these subbasins were based on the designations approved by the Board of County Commissioners as discussed in the Section 10 study. A copy of the GCW Ultimate HEC-1 model has been included in Appendix A. Table 6 summarizes the 100-year peak flow rates determined by the GCW Ultimate HEC-1 model.

TABLE 6
Summary of Ultimate Conditions
HEC-1 Analysis Between Windmill Lane & Robindale Road

Subbasin or Concentration Point*	Q_{100} (cfs)
OFF-7	102
OFF-8	55
C8-1	151
OFF-9	73
C9-1	210

*See Figure 5 Subbasins OFF7, OFF8, and OFF9.

The fourth model, hereinafter referred to as the Duck Creek/Blue Diamond Modified 2001MPU HEC-1, addresses ultimate conditions flows to Rainbow Boulevard south of Windmill Lane. The base hydrologic model, including land use and lag time assumptions and drainage patterns, was taken from analysis prepared for the 2001MPU currently being developed. The only modification to the 2001 MPU hydrologic model for the Duck Creek/Blue Diamond watershed was the addition of combination points. This was done in order to obtain peak flow rate information at desired locations. Figure 6 shows the offsite subbasins and drainage patterns used in the hydrologic analysis for the ultimate conditions south of Windmill Lane. A copy of the Duck Creek/Blue Diamond Modified 2001 MPU HEC-1 model has been included in Appendix A. Table 7 summarizes the 100-year peak flow rates determined by the Duck Creek/Blue Diamond Modified 2001 MPU HEC-1 model.

TABLE 7 Summary of Ultimate Conditions Modified 2001 MPU HEC-1 Analysis for Duck Creek/Blue Diamond Watershed	
Subbasin or Concentration Point*	Q_{100} (cfs)
BUB060	234
BUB090	455
CBUB090	677
BUB100	408
CBUB100	1002
BUB110	322
CBUB100S	1277
BUB170	297
BUB180	41

*See Figure 6.

The fifth model, hereinafter referred to as GCW Local Drainage, addresses ultimate conditions local drainage along Rainbow Boulevard. More specifically, the local drainage includes only runoff generated from the ultimate conditions roadway of Rainbow Boulevard. As previously discussed, the Modified Rational Method was utilized for the peak flow rate determinations. These flow rates were computed in order to determine the need for and size of the ultimate conditions storm drain facilities. Figure 7 shows the onsite subbasins and drainage patterns used in the hydrologic analysis for the ultimate conditions along Rainbow Boulevard. A copy of the Modified Rational Method computation has been included in Appendix A. Table 8 summarizes the 10- and 100-year peak flow rates determined by the Local Drainage analysis.

TABLE 8 Summary of Ultimate Conditions Local Hydrology Modified Rational Method Analysis		
Subbasin or Concentration Point*	Q_{10} (cfs)	Q_{100} (cfs)
ON1	2	4
ON2	3	6
ON3	2	3
ON4	2	4
ON5	1	2
ON6	1	2
ON7	2	4

TABLE 8
Summary of Ultimate Conditions Local Hydrology
Modified Rational Method Analysis

Subbasin or Concentration Point*	Q_{10} (cfs)	Q_{100} (cfs)
ON8	3	6
ON9	1	2
ON10	2	4
ON11	2	4
ON12	2	4
ON13	2	3
ON14	2	4
ON15	2	4
ON16	3	6
ON17	1	3
ON18	2	4
ON19	5	10
ON20	9	17
ON21	5	10
ON22	9	17
ON23	5	10
ON24	9	17
ON25	2	4
ON26	3	6
ON27	1	1
ON28	1	2

*See Figure 7.

As discussed, the various interim and ultimate conditions hydrologic models were developed to determine "worst case" peak flows for use in the drainage facility designs. The selected design flows for each recommended drainage facility are presented later in this report.

IX. RECOMMENDED INTERIM DRAINAGE FACILITIES

The recommended drainage improvements along Rainbow Boulevard and within the project limits were designed to be consistent with drainage patterns established in the MPU. More specifically, drainage north of Windmill Lane will be directed to the north along Rainbow Boulevard and will discharge to the beltway channel in accordance with the MPU. Drainage south of Windmill Lane will be perpetuated from west to east across Rainbow Boulevard for discharge through existing and future development to future downstream regional facilities, also in accordance with the MPU.

The recommended drainage facilities include roadside drainage ditches, drop inlets, RCP and RCB storm drain, and RCP and RCB culverts. Each of these facilities is described in further detail as follows.

The roadside drainage ditches have been designed to convey interim condition stormwater runoff generated from the west side of Rainbow Boulevard to either culvert facilities or storm drain facilities. These facilities are provided only for surface runoff from Rainbow Boulevard. It is assumed that the major offsite flows reaching Rainbow Boulevard will discharge directly to the culvert facilities or storm drain inlet facilities. The drainage ditches consist of a v-ditch geometry with either a 2:1, 6:1 or a 2:1,2:1 side slope configuration. The specific design criteria for the ditches has been provided in Section VI of this report. V-ditch computations have been included in Appendix B.

Two types of drop inlets have been recommended for the interim conditions. A special drop inlet located at the existing 48-inch RCP inlet near the intersection of Rainbow Boulevard and the Southern Beltway, is proposed to replace the existing inlet. This inlet is designed to intercept the entire upstream flow discharging to it.

Additionally, this inlet type will meet the County's desire to not have a culvert inlet type facility at this location. The special drop inlet will be attached to the side of the proposed RCB storm drain. Additionally, NDOT Type 2A field inlets have been recommended along the v-ditch on the west side of Rainbow Boulevard and north of Warm Springs Road. These inlets were placed at locations where well-defined flowlines will be cut off by the improvements to Rainbow Boulevard. These inlets

were not based on a particular design flow since the downstream special drop inlet discussed above was designed to capture the entire 100-year flow. The field inlets were placed in order to aid the overall drainage of the project and minimize surface flow during smaller storm events. The specific design criteria for the drop inlets has been provided in Section VI of this report. Drop inlet computations have been included in Appendix B.

Storm drain facilities have been recommended only along Rainbow Boulevard north of Robindale Road. The recommended storm drain will serve as the CCRFCD regional flood control facility conveyance system to the Southern Beltway Channel per the MPU. It is recommended that this storm drain facility be constructed in the initial phase of the project in order to minimize additional design effort and disruption for the ultimate design in accordance with the contract philosophy. Additionally, construction of the regional storm drain facility in the initial phase will eliminate the need for other interim condition "throw away" facilities. The recommended storm drain facilities consist of a 10-foot wide by 6-foot high RCB from just south of Warm Springs Road to the Southern Beltway tie-in facility, a 60-inch RCP from just south of Warm Springs Road to just north of Robindale Road and a 54-inch RCP from just north of Robindale Road to just south of Robindale Road. Additionally, a 24-inch RCP lateral storm drain facility is located at Station 213+50. This facility is primarily being constructed as part of the initial design in order to eliminate the associated disruptions of constructing it for the ultimate design as would be necessary. The specific design criteria for the storm drain has been provided in Section VI of this report. Storm drain computations have been included in Appendix B.

Culvert facilities have been recommended south of Windmill Lane in order to perpetuate west to east flow across Rainbow Boulevard in accordance with existing conditions and the MPU. The recommended culvert facilities vary in size from a 36-inch RCP to dual 12-foot wide by 5-foot high RCB. It is recommended that the culverts be constructed as part of the initial project. It is anticipated that the culverts can be extended for the ultimate conditions. This will allow for minimal disruption, cost and design effort for the ultimate conditions. Drainage and grading easements of varying dimensions will be required to accommodate the recommended culverts in that the Rainbow Boulevard profile will require the culverts to be constructed below existing grade. In order to drain the culverts, the downstream invert must be graded

to daylight which will require additional right-of-way or easement outside the road right-of-way. Culvert heights of 4 feet (2 feet less than desired by CCPW) were utilized in order to minimize the extent of the grading and drainage easements required. Additionally, it is anticipated that as adjacent properties develop, the culverts will be extended upstream and will function as storm drain. The specific design criteria for the culverts has been provided in Section VI of this report. Culvert computations have been included in Appendix B.

Table 9 provides an inventory of recommended interim conditions drainage facilities as well as selected design flows as determined from the various hydrologic models. Figure 5 depicts the location of each drainage facility.

TABLE 9
Summary of Recommended Interim Conditions Drainage Facilities & Design Flows

Facility Identifier[1]	Facility Type	Facility Term Use	Interim Q_{100} (cfs)	Ultimate Q_{100} (cfs)	Design Q_{100} (cfs)	Design Flow Source
BDRB0000 From So. Beltway Channel to Exist. 10'x9' inlet (Sta. 211+40)	Existing 10'x9' RCB	Interim	1,346	1,630[2]	1,500	VTN 1997 Drainage Study Beltway –'Rainbow to Decatur
BDRB0000 From Sta. 211+40 to Sta. 197+25	10'x6' RCB	Interim	803	1,209[3]	1,200	Tropicana/Flamingo
BDRB0000 From Sta. 197+25 to Sta. 178+50	10'x6' RCB	Interim	747	857[3]	860	Tropicana/Flamingo
RDRB0074 From Sta. 178+50 to Sta. 157+50	60" RCP	Interim	70	210[4]	210	GCW Ultimate HEC-1
RDRB0074 From Stat. 157+50 to Sta. 154+50	54" RCP	Interim	51	151[4]	150	GCW Ultimate HEC-1
1	Roadside Ditch	Interim	45[7]	N/A	45	GCW Interim HEC-1
1A	Special DI	Interim	230	N/A	230	GCW Interim HEC-1
1B	DI & 24" RCP Storm Drain	Interim	<25	25	25	GCW Local Drainage
2	Special Inlet	Interim	747	526[3]	750	GCW Interim HEC-1
3	Roadside Ditch	Interim	23	N/A	23	GCW Interim HEC-1
4	Roadside Ditch	Interim	23	N/A	23	GCW Interim HEC-1
5	Roadside Ditch	Interim	51	N/A	51	GCW Interim HEC-1
5A	Special Inlet	Interim	51	N/A	51	GCW Interim HEC-1

TABLE 9
Summary of Recommended Interim Conditions Drainage Facilities & Design Flows

Facility Identifier[1]	Facility Type	Facility Term Use	Interim Q_{100} (cfs)	Ultimate Q_{100} (cfs)	Design Q_{100} (cfs)	Design Flow Source
6	Roadside Ditch	Interim	25	N/A	25	GCW Interim HEC-1
7	12'x5' RCB	Interim	546	41	550	GCW Interim HEC-1
8	Roadside Ditch	Interim	3	N/A	3	GCW Local Drainage
9	36" RCP	Interim	35	41	41	Duck Creek/ Blue Diamond
10	Roadside Ditch	Interim	4	N/A	4	GCW Local Drainage
11	12'x5' RCB	Interim	427	297	430	GCW Interim HEC-1
12	Roadside Ditch	Interim	3	N/A	3	GCW Local Drainage
13	12'x4' RCB	Interim	111	330[5]	330	Duck Creek/ Blue Diamond
14	Roadside Ditch	Interim	6	N/A	6	GCW Local Drainage
15	12'x4' RCB	Interim	179	330[5]	330	Duck Creek/ Blue Diamond
16	Roadside Ditch	Interim	4	N/A	4	GCW Local Drainage
17	12'x5' RCB	Interim	508	330	510	GCW Interim HEC-1
18	5'x4' RCB	Interim	N/A	161[6]	160	Duck Creek/ Blue Diamond
19	Roadside Ditch	Interim	5	N/A	5	GCW Local Drainage
20	Two (2) 12'x4' RCB	Interim	703	N/A	700	SW Area Guidelines
21	Roadside Ditch	Interim	4	N/A	4	GCW Local Drainage

(1) See Figure 5
(2) Per CCRFCD 1996 MPU
(3) Per modified 2001 MPU Tropicana/Flamingo hydrologic model included in Appendix
(4) Per GCW ultimate condition HEC-1 hydrologic model between Windmill Lane & Robindale Road included in Appendix.
(5) Computed as one-third of 100-yr ultimate total combined flow generated from Subbasins BUB60, BUB 90 and BUB100 per 2001 MPU hydrologic model for Duck Creek/Blue Diamond Watershed.
(6) Computed as one-half of 100-yr ultimate flow generated from Subbasin BUB110 per 2002 MPU hydrologic model for Duck Creek/Blue Diamond Watershed.
(7) Computed as total 100-yr interim flow generated from Subbasin OFF11 divided by five (5) drop inlets provided to intercept runoff and direct to storm drain.

The interim conditions recommended drainage improvements along Rainbow Boulevard will result in some utility conflicts and other project constraints. Utility issues conclusions were based on record drawings, field survey data and site field investigation. Additional verification of existing utilities will be required. The primary conflict with the recommended drainage facilities occurs at Warm Springs Road. Currently, an existing 66-inch and an existing 42-inch watermains are located along the Warm Springs Road alignment, and cross to Rainbow Boulevard. These utilities are located parallel to each other and at varying elevations. The elevation difference

between the two utilities does not allow for even a minimally sized storm drain facility to cross. Therefore, the recommended 10-foot wide by 6-foot high RCB storm drain has been designed to cross above the 66-inch watermain. However, it will be necessary to relocate the 42-inch watermain. This conflict is considered a major project issue in that the relocation of the 42-inch watermain will be expensive. No feasible options to avoid a relocation of at least one of the watermains and construct the CCRFCD facility exist. Table 10 summarizes utility issues and other project constraints associated with the recommended drainage facilities.

TABLE 10
Summary of Utility Issues & Project Constraints

Item	Location	Resolution
66-in Watermain Crossing	Station 183+25	No anticipated conflict. Protect during construction
42-in Watermain Crossing	Station 183+39	Relocate
12-in Sanitary Sewer Crossing	Station 156+40	Protective concrete cap
4-in Gas Main Crossing	Station 64+80	Relocate
4-in Gas Main Crossing	Station 74+60	Relocate
4-in Gas Main Crossing	Station 79+05	Relocate
4-in Gas Main Crossing	Station 89+15	Relocate
4-in Gas Main Crossing	Station 99+20	Relocate
4-in Gas Main Crossing	Station 111+10	Relocate
4-in Gas Main Crossing	Station 121+65	No anticipated conflict. Protect during construction
4-in Gas Main Crossing	Station 128+40	Relocate
4-in Gas Main Crossing	Station 156+78	Relocate
Telephone Crossing	Station 64+80	Relocate
Telephone Crossing	Station 74+60	Relocate
Telephone Crossing	Station 79+05	Relocate
Telephone Crossing	Station 89+15	Relocate
Telephone Crossing	Station 99+20	Relocate
Telephone Crossing	Station 111+10	Relocate
Telephone Crossing	Station 121+65	Relocate
Telephone Crossing	Station 128+40	Relocate
Cable TV & Electric Conduits	Station 157+00 to Station 183+50 Parallel West Side	No anticipated conflict. Proposed grading above utilities. Protect during construction.
Overhead Power & Poles	Station 62+00 to Station 218+00 Parallel East Side	No anticipated conflict.

TABLE 10
Summary of Utility Issues & Project Constraints

Item	Location	Resolution
Cable TV & Electric Conduits	Station 157+00 to Station 183+50 Parallel East Side	No anticipated conflict. Protect during construction.
Offsite Grading	Various locations within project limits as denoted on drainage drawings.	Grading & Drainage Easements.

X. RECOMMENDED ULTIMATE DRAINAGE FACILITIES

In accordance with the design philosophy of the project contract, the initial drainage recommendations were designed to minimize future design effort and disruption for the ultimate conditions of Rainbow Boulevard. All initial project recommended improvements, as discussed in the previous section, are intended to remain for the ultimate conditions. Ultimate conditions improvements will be limited to the extension of culverts and the addition of storm drain and drop inlets. It is anticipated that as adjacent properties develop, it will be the responsibility of those property owners to get drainage to the major facilities. As discussed, all facilities have been designed to accommodate anticipated future design flow. Table 11 provides an inventory of recommended ultimate conditions drainage facilities as well as selected design flows as determined from the various hydrologic models.

TABLE 11
Summary of Recommended Ultimate Conditions Drainage Facilities and Design Flows

Facility Identifier	Facility Type	Facility Term Use	Interim Q_{100} (cfs)	Ultimate Q_{100} (cfs)	Design Q_{100} (cfs)	Design Flow Source
BDRB0000 From So. Beltway Channel to Exist. 10'x9' inlet (Sta. 211+40)	Existing 10'x9' RCB	Ultimate	1,346	1,630[(1)]	1,500	VTN 1997 Drainage Study Beltway – Rainbow to Decatur
BDRB0000 From Sta. 211+40 to Sta. 197+25	10'x6' RCB	Ultimate	803	1,209[(2)]	1,200	Tropicana/Flamingo
BDRB0000 From Sta. 197+25 to Sta. 178+50	10'x6' RCB	Ultimate	747	857[(2)]	860	Tropicana/Flamingo
RDRB0074 From Sta. 178+50 to Sta. 157+50	60" RCP	Ultimate	70	210[(3)]	210	GCW Ultimate HEC-1
RDRB0074 From Stat. 157+50 to Sta. 154+50	54" RCP	Ultimate	51	151[(3)]	150	GCW Ultimate HEC-1

TABLE 11
Summary of Recommended Ultimate Conditions Drainage Facilities and Design Flows

Facility Identifier[1]	Facility Type	Facility Term Use	Interim Q_{100} (cfs)	Ultimate Q_{100} (cfs)	Design Q_{100} (cfs)	Design Flow Source
1B	DI & 24" RCP Storm Drain	Ultimate	<25	25	25	GCW Local Drainage
7	12'x5' RCB	Ultimate	546	41	550	GCW Interim HEC-1
9	36" RCP	Ultimate	35	41	41	Duck Creek/ Blue Diamond
11	12'x5' RCB	Ultimate	427	297	430	GCW Interim HEC-1
13	12'x4' RCB	Ultimate	111	330[4]	330	Duck Creek/ Blue Diamond
15	12'x4' RCB	Ultimate	179	330[4]	330	Duck Creek/ Blue Diamond
17	12'x5' RCB	Ultimate	508	330	510	GCW Interim HEC-1
18	5'x4' RCB	Ultimate	N/A	161[5]	160	Duck Creek/ Blue Diamond
20	Two (2) 12'x4' RCB	Ultimate	703	N/A	700	SW Area Guidelines

(1) Per CCRFCD 1996 MPU
(2) Per modified 2001 MPU Tropicana/Flamingo hydrologic model included in Appendix
(3) Per GCW ultimate condition HEC-1 hydrologic model between Windmill Lane & Robindale Road included in Appendix.
(4) Computed as one-third of 100-yr ultimate total combined flow generated from Subbasins BUB60, BUB 90 and BUB100 per 2001 MPU hydrologic model for Duck Creek/Blue Diamond Watershed.
(5) Computed as one-half of 100-yr ultimate flow generated from Subbasin BUB110 per 2002 MPU hydrologic model for Duck Creek/Blue Diamond Watershed.

Table 12 summarizes the location and type of anticipated future drop inlets.

TABLE 12
Summary of Ultimate Conditions Drop Inlet Facilities

Location	Type	Condition	Design Storm	Design Flow (cfs)	Flow Captured (%)
Station 64+80 West Side	Modified Type B	Sump	100	4	100
Station 64+80 East Side	Modified Type B	Sump	100	6	100
Station 79+05 West Side	Modified Type B	Sump	100	5	100
Station 79+05 East Side	Modified Type B	Sump	100	6	100
Station 89+15 West Side	Modified Type B	Sump	100	4	100
Station 89+15 East Side	Modified Type B	Sump	100	6	100
Station 99+20 West Side	Type B	Sump	100	6	100
Station 99+20 East Side	Type B	Sump	100	8	100
Station 111+10 West Side	Type B	Sump	100	3	100

TABLE 12
Summary of Ultimate Conditions Drop Inlet Facilities

Location	Type	Condition	Design Storm	Design Flow (cfs)	Flow Captured (%)
Station 111+10 East Side	Type B	Sump	100	4	100
Station 121+65 West Side	Modified Type B	Sump	100	4	100
Station 121+65 East Side	Modified Type B	Sump	100	6	100
Station 128+40 West Side	Modified Type B	Sump	100	3	100
Station 128+40 East Side	Modified Type B	Sump	100	4	100
Station 213+50 East Side	11.5-ft Modified Type C	Sump	100	25	100

In addition to ultimate conditions drop inlet facilities, the ultimate conditions street flow hydraulics of Rainbow Boulevard were analyzed. The primary purpose of performing ultimate conditions street flow hydraulics was to determine the necessity of additional storm drain and drop inlets in order to meet dry lane criteria as discussed in Section VI. Performance of the ultimate conditions street flow computations resulted in the determination that no additional storm drain or drop inlet facilities will be required to meet dry lane criteria. Only drop inlets located at sump locations along the Rainbow Boulevard profile are necessary. Table 12 summarizes the street flow hydraulic computations for the 100-year storm event. Street flow computations have been included in Appendix B.

TABLE 13
Summary of Street Flow Hydraulics
During a 100-Year Storm Event (Major Storm)

X-Section	Slope (%)	R.O.W. Width (feet)	100-Year Storm Event			
			Q (cfs)	Depth (feet)	Velocity (fps)	V·D
A-A	0.0076	120	34	0.69	3.49	2.41
B-B	0.0087	120	23	0.60	3.35	2.01
C-C	0.0076	120	17	0.56	2.99	1.67
D-D	0.0044	120	17	0.61	2.40	1.46
E-E	0.0044	120	10	0.52	2.16	1.12
F-F	0.0067	120	4	0.37	2.04	0.75
G-G	0.0067	120	3	0.34	1.90	0.65
H-H	0.0040	120	6	0.45	1.86	0.84

TABLE 13
Summary of Street Flow Hydraulics
During a 100-Year Storm Event (Major Storm)

X-Section*	Slope (%)	R.O.W. Width (feet)	100-Year Storm Event			
			Q (cfs)	Depth (feet)	Velocity (fps)	V*D
I-I	0.0040	120	4	0.40	1.68	0.67
J-J	0.0040	120	4	0.40	1.68	0.67
K-K	0.0040	120	3	0.37	1.57	0.58
L-L	0.0040	120	8	0.49	1.98	0.97
M-M	0.0040	120	6	0.45	1.86	0.84
N-N	0.0040	120	6	0.45	1.86	0.84
O-O	0.0040	120	4	0.40	1.68	0.67
P-P	0.0040	120	6	0.45	1.86	0.84
Q-Q	0.0040	120	5	0.43	1.77	0.76
R-R	0.0040	120	6	0.45	1.86	0.84
S-S	0.0040	120	4	0.40	1.68	0.67

*See Figure 7.

Table 13 summarizes the street flow hydraulic computations for the 10-year storm event.

TABLE 14
Summary of Street Flow Hydraulics
During a 10-Year Storm Event (Minor Storm)

X-Section*	Slope (%)	R.O.W. Width (feet)	10-Year Storm Event			
			Q (cfs)	Depth (feet)	Velocity (fps)	V*D
A-A	0.0076	120	17	0.56	2.99	1.67
B-B	0.0087	120	12	0.50	2.92	1.46
C-C	0.0076	120	9	0.46	2.61	1.2
D-D	0.0044	120	9	0.51	2.10	1.07
E-E	0.0044	120	5	0.42	1.84	0.77
F-F	0.0067	120	2	0.30	1.73	0.52
G-G	0.0067	120	1	0.25	1.47	0.37
H-H	0.0040	120	3	0.37	1.57	0.58
I-I	0.0040	120	2	0.33	1.42	0.47
J-J	0.0040	120	2	0.33	1.42	0.47
K-K	0.0040	120	2	0.33	1.42	0.47
L-L	0.0040	120	4	0.40	1.68	0.67
M-M	0.0040	120	3	0.37	1.57	0.58

TABLE 14
Summary of Street Flow Hydraulics
During a 10-Year Storm Event (Minor Storm)

X-Section*	Slope (%)	R.O.W. Width (feet)	10-Year Storm Event			
			Q (cfs)	Depth (feet)	Velocity (fps)	V*D
N-N	0.0040	120	3	0.37	1.57	0.58
O-O	0.0040	120	2	0.33	1.42	0.47
P-P	0.0040	120	3	0.37	1.57	0.58
Q-Q	0.0040	120	3	0.37	1.57	0.58
R-R	0.0040	120	3	0.37	1.57	0.58
S-S	0.0040	120	2	0.33	1.42	0.47

*See Figure 7.

XI. RECOMMENDED DRAINAGE FACILITIES COST ESTIMATE

Table 15 provides a preliminary opinion of probable construction costs for the recommended interim conditions drainage facilities along Rainbow Boulevard from Blue Diamond Road to the Southern Beltway.

TABLE 15
Preliminary Cost Estimate for Interim Recommended Drainage Improvements

Item No.	Description	Approx. Quantity	Unit	Unit Cost	CCRFCD Cost	CCPW Cost	Total Cost
203.01	Excavation	33,750	CY	$ 5	$ 150,000	$ 18,750	$ 187,500
302.01	Type II, 6-in Aggregate Base	1,410	CY	$ 22	$ 25,080	$ 5,940	$ 31,020
302.02	Granular Backfill	23,700	CY	$ 15	$ 355,500		$ 355,500
502.01	10-ft by 6-ft Culvert Hdwl.	0.5[(1)]	Each	$ 8,750	$ 4,375		$ 4,375
502.02	5-ft by 4-ft Culvert Hdwl.	1[(1)]	Each	$ 3,350		$ 3,350	$ 3,350
502.03	12-ft by 4-ft Culvert Hdwl.	2[(1)]	Each	$ 3,950		$ 7,900	$ 7,900
502.04	12-ft by 5-ft Culvert Hdwl.	3[(1)]	Each	$ 4,950		$ 14,850	$ 14,850
502.05	(2) 12-ft by 4-ft Culvert Hdwl.	1[(1)]	Each	$ 5,500		$ 5,500	$ 5,500
502.06	Confluence Structure	1	Each	$15,000	$ 15,000		$ 15,000
509.01	5-ft by 4-ft RCB Culvert	100	LF	$ 270		$ 27,000	$ 27,000
509.02	10-ft by 6-ft RCB Storm Drain	3225	LF	$ 700	$2,257,500		$2,257,500
509.03	12-ft by 5-ft RCB Culvert	330	LF	$ 950		$313,500	$ 313,500
509.04	12-ft by 4-ft RCB Culvert	430	LF	$ 860		$369,800	$ 369,800
603.01	24-in RCP	180	LF	$ 45		$ 8,100	$ 8,100
603.02	36-in RCP Culvert	105	LF	$ 85		$ 8,925	$ 8,925

TABLE 15
Preliminary Cost Estimate for Interim Recommended Drainage Improvements

Item No.	Description	Approx. Quantity	Unit	Unit Cost	CCRFCD Cost	CCPW Cost	Total Cost
603.03	54-in RCP	200	LF	$ 170	$ 34,000		$ 34,000
603.04	60-in RCP	2225	LF	$ 200	$ 133,500		$ 133,500
609.01	NDOT Type 2A Drop Inlet	5	Each	$ 2,000	$ 10,000		$ 10,000
609.02	Type II Manhole	6	Each	$ 5,000	$ 30,000		$ 30,000
609.02	Special Drop Inlet: Sta.	1	Each	$35,000	$ 35,000		$ 35,000
609.03	Mod. Type I 48-in Manhole	9	Each	$ 3,000	$ 27,000		$ 27,000
				Subtotal:	$3,076,955	$783,615	$3,860,570
				15% Contingency:	$ 461,543	$117,543	$ 579,086
				Total:	$3,538,498	$901,158	$4,439,656

(1) Headwall quantities are per pair, one at inlet and one at outlet.

Table 16 provides a preliminary opinion of probable additional construction costs for the recommended ultimate condition drainage facilities along Rainbow Boulevard from Blue Diamond Road to the Southern Beltway.

TABLE 16
Preliminary Estimate of Additional Cost for Ultimate Recommended Drainage Improvements

Item No.	Description	Approx. Quantity	Unit	Unit Cost	CCRFCD Cost	CCPW Cost	Total Cost
502.01	10-ft by 6-ft Culvert Hdwl.	0.5(1)	Each	$8,750	$4,375		$ 4,375
502.02	5-ft by 4-ft Culvert Hdwl.	1(1)	Each	$3,350		$ 3,350	$ 3,350
502.03	12-ft by 4-ft Culvert Hdwl.	2(1)	Each	$3,950		$ 7,900	$ 7,900
502.04	12-ft by 5-ft Culvert Hdwl.	3(1)	Each	$4,950		$ 14,850	$ 14,850
502.05	(2) 12-ft by 4-ft Culvert Hdwl.	1(1)	Each	$5,500		$ 5,500	$ 5,500
509.01	5-ft by 4-ft RCB Culvert Extension	40	LF	$ 270		$ 10,800	$ 10,800
509.03	12-ft by 5-ft RCB Culvert Extension	125	LF	$ 950		$118,750	$118,750
509.04	12-ft by 4-ft RCB Culvert Extension	160	LF	$ 860		$137,600	$137,600
603.02	36-in RCP Culvert Extension	50	LF	$ 85		$ 4,250	$ 4,250
609.04	Mod. Type C Drop Inlet, 12-ft	1	Each	$9,000		$ 9,000	$ 9,000
609.05	Mod. Type B Drop Inlet	14	Each	$2,000		$ 28,000	$ 28,000
				Subtotal:	$4,375	$340,000	$344,375
				15% Contingency:	$ 656	$ 51,000	$ 51,656
				Total:	$5,031	$391,000	$396,031

(1) Headwall quantities are per pair, one at inlet and one at outlet.

The CCRFCD Ten-Tear Construction Program (Reference 8) for the fiscal year 2001-2002 through the fiscal year 2010/2011 contains project cost estimates for the portion of the Rainbow Boulevard improvements project described as BDRB0000 and BDRB0074. Construction of this project is programmed in fiscal year 2007/2008. The 10-Year Construction Program includes approximately $2.54 million for this project. Please note that only the 10-foot wide by 6-foot high RCB storm drain, 60-inch RCP storm drain and the 54-inch RCP storm drain, and associated excavation, backfill and aggregate base comprise the CCRFCD BDRB regional facilities.

XII. ALTERNATIVE CCRFCD FACILITIES & COST COMPARISON

In addition to the recommended regional storm drain facilities north of Windmill Lane, an alternative drainage option was considered. The alternate option consists of perpetuating the offsite flows within Blue Diamond Wash across Rainbow Boulevard for the interim conditions. This would be accomplished by means of culverts. Therefore, on an interim basis the regional storm drain facility would not be necessary.

The alternative option discussed above offers the following advantage to the recommended design.

- Initial project costs to construct are well below recommended initial project costs.

The alternative option discussed above results in the following disadvantages to the recommended design.

- Interim facility will be "throw away" in order to accommodate ultimate facility in accordance with the MPU.
- The interim facility will still require expensive relocation of the 42-inch watermain due to unavoidable conflict. Ultimate condition relocation will also still be necessary.
- Various surface utilities such as power poles and electric power consoles are located in the vicinity of the interim facility discharge. Extreme caution would be necessary to protect these structures during the interim conditions.

- Due to the depth that the interim facilities would need to be constructed, additional extensive downstream grading and drainage easement would be required similar to the requirements to the initial improvements south of Windmill Lane.
- Extensive additional design effort and disruption to initial roadway improvements would be required during the ultimate improvement construction.

Table 17 provides a preliminary opinion of probable interim and ultimate condition construction costs for the alternative CCRFCD regional facilities north of Windmill Lane.

TABLE 17
CCRFCD Alternative Facilities Cost Estimate

Description	Approx. Quantity	Unit	Unit Cost	CCRFCD Total Cost
INTERIM CONDITIONS				
Double 12-ft by 4-ft RCB Culvert	260	LF	$ 860	$223,600
36-in RCP Culvert below Robindale	100	LF	$ 85	$ 8,500
24-in RCP	140	LF	$ 45	$ 6,300
Special Drop Inlet	1	Each	$35,000	$ 35,000
NDOT Type 2A Drop Inlet	1	Each	$ 2,000	$ 2,000
			Subtotal	$275,400
			15% Contingency	$ 41,310
			Total	$316,710
ULTIMATE CONDITIONS				
Excavation	30,000	CY	$ 5	$ 150,000
Type II, 6-in Aggregate Base	1,140	CY	$ 22	$ 25,080
Granular Backfill	23,700	CY	$ 15	$ 355,500
10-ft by 6-ft Culvert Hdwl.	0.5[1]	Each	$ 8,750	$ 4,375
Confluence Structure	1	Each	$15,000	$ 15,000
10-ft by 6-ft RCB Storm Drain	3225	LF	$ 700	$2,257,500
54-in RCP	200	LF	$ 170	$ 34,000
60-in RCP	2225	LF	$ 200	$ 133,500
NDOT Type 2A Drop Inlet	4	Each	$ 2,000	$ 8,000
Type II Manhole	6	Each	$ 5,000	$ 30,000
Mod. Type I 48-in Manhole	9	Each	$ 3,000	$ 27,000
Remove RCB Culvert	260	LF	$ 500	$ 130,000
			Subtotal	$3,169,955
			15% Contingency	$ 475,493
			Total	$3,645,448

Table 18 provides an interim and ultimate conditions cost comparison between the recommended regional drainage facilities and the alternative regional drainage facilities.

TABLE 18
CCRFCD Facility Alternatives Cost Comparison

Description	CCRFCD Interim Cost	CCRFCD Ultimate Cost	CCRFCD Total Cost
Proposed Regional Facilities	$3,538,498	$ 5,031	$3,543,529
Alternative Regional Facilities	$ 316,710	$3,645,448	$3,962,158

XIII. CONCLUSIONS AND RECOMMENDATIONS

1. The recommended drainage facilities are shown on the attached preliminary construction drawings plan and profile sheets.
2. The methods used to calculate storm runoff and various hydraulic characteristics for this project are in compliance with the Manual.
3. Construct a 10-foot wide by 6-foot high RCB storm drain from Station 179+40 to Station 211+50 as part of the initial project. This facility will function for the interim and ultimate conditions and will be a CCRFCD regional facility.
4. Construct a 60-inch RCP storm drain from Station 157+50 to Station 179+40 as part of the initial project. This facility will function for the interim and ultimate conditions and will be a CCRFCD regional facility.
5. Construct a 54-inch RCP storm drain from Station 154+50 to Station 157+50 as part of the initial project. This facility will function for the interim and ultimate conditions and will be a CCRFCD regional facility.
6. Construct a 12-foot wide by 5-foot high RCB culvert at Station 128+40 as part of the initial project. This facility will need to be extended for the ultimate conditions.
7. Construct a 36-inch RCP culvert at Station 121+65 as part of the initial project. This facility will need to be extended for the ultimate conditions.
8. Construct a 12-foot wide by 5-foot high RCB culvert at Station 111+10 as part of the initial project. This facility will need to be extended for the ultimate conditions.
9. Construct a 12-foot wide by 4-foot high RCB culvert at Station 99+20 as part of the initial project. This facility will need to be extended for the ultimate conditions.
10. Construct a 12-foot wide by 4-foot high RCB culvert at Station 89+15 as part of the initial project. This facility will need to be extended for the ultimate conditions.
11. Construct a 12-foot wide by 5-foot high RCB culvert at Station 79+05 as part of the initial project. This facility will need to be extended for the ultimate conditions.
12. Construct a 5-foot wide by 4-foot high RCB culvert at Station 74+60 as part of the initial project. This facility will need to be extended for the ultimate conditions.

XIII. CONCLUSIONS AND RECOMMENDATIONS (Cont'd.)

13. Construct two 12-foot wide by 4-foot high RCB culvert at Station 64+80 as part of the initial project. This facility will need to be extended for the ultimate conditions.
14. Construct a special drop inlet at Station 211+40. This facility will function for the interim conditions.
15. Construct a 24-inch lateral storm drain at Station 213+50. This storm drain will function for the interim and ultimate conditions. The interim condition NDOT Type 2A field inlet will need to be replaced by an ultimate condition 11.5-foot long modified Type "C" drop inlet.
16. Construct interim conditions NDOT Type 2A field inlets along interim v-ditch adjacent to the west side of Rainbow Boulevard.
17. Ultimate condition drop inlets are proposed at each sump location which are located at all culvert crossings.
18. Interim conditions v-ditches are proposed along the west side of Rainbow Boulevard to convey runoff from the Rainbow Boulevard roadway.
19. It will be necessary to relocate the 42-inch watermain located at the Warm Springs Road/Rainbow Boulevard intersection.

XIV. REFERENCES

1. VTN Nevada, *Supplemental Hydrology Analysis and Hydraulics Analysis for the Southern Segment of the Las Vegas Beltway Section 7A, Rainbow Boulevard to Decatur Boulevard, 90% Design Submittal*, April 1997.

2. G.C. Wallace, Inc., *Conceptual Master Drainage Study for Section 10 by Pardee Homes*, May 2000, revised June 16, 2000.

3. PBS&J, Inc. and VTN, Inc., *Clark County Regional Flood Control District, The 1996 Master Plan Update for the Las Vegas Valley*, February, 1997.

4. CCRFCD, *Hydrologic Criteria and Drainage Design Manual*, 1990.

5. U.S. Army Corps of Engineers, *HEC-1 Flood Hydrograph Package*, revised June 1998, Version 4.1.

6. U.S.D.A. Soil Conservation Service, *Soil Survey of Las Vegas Valley Area, Nevada, Part of Clark County*, July 1985.

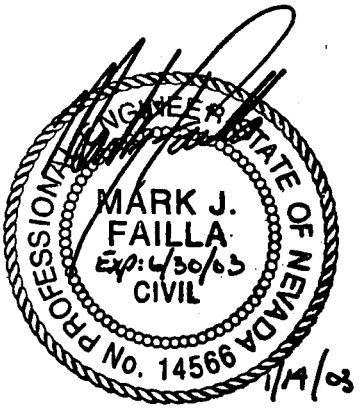
7. PBS&J, Inc. *Southwest Las Vegas Valley Area II Development Guidelines.* June 1996.

8. CCRFCD, *Ten-Year Construction Program, Fiscal Year 2001/2002 Through Fiscal Year 2010/2011*, June 14, 2001.

PRE-FINAL SUBMITTAL
TECHNICAL DATA SUPPORT NOTEBOOK
FOR
RAINBOW BOULEVARD IMPROVEMENTS
SOUTHERN BELTWAY TO
BLUE DIAMOND ROAD

500.854

January 2003



Prepared for:

Clark County Public Works
500 South Grand Central Parkway
Las Vegas, Nevada 89106

Prepared by:

G.C. Wallace, Inc.
1555 South Rainbow Boulevard
Las Vegas, Nevada, 89146
Phone: (702) 804-2000
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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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October 24, 2001

Mr. Robert Herr, P.E.
Clark County Department of Public Works
Design Engineering Division
500 South Grand Central Parkway, Suite 2001
P.O. Box 554000
Las Vegas, NV 89155-4000

Re: Rainbow Boulevard Improvements
Southern Beltway to Blue Diamond Road

Dear Mr. Herr:

Clark County Regional Flood Control District (District) has reviewed *Drainage Study for Rainbow Boulevard Improvements Southern Beltway to Blue Diamond Road 30% Preliminary Design Submittal* dated September 2001 prepared by GC Wallace for Clark County Public Works (CCPW). Improvements include construction of approximately 5700 linear feet of reinforced concrete pipe (RCP) and box culvert (RCBC) ranging in size from 54-inch diameter to 10' X 6' with associated facilities. These structures are labeled BDRB 0000 through 0074 on District Master Plan Update (MPU). District review was limited to only those structures shown on MPU. The following comments are offered for your consideration as the project proceeds:

General

1. Construction funding for proposed MPU facility is scheduled in Year 7 on District's 10 Year Plan. It is unclear why project design has been initiated at this time. Address CCPW intentions for funding.

2. Cost estimate provided in design report provides break down of District costs versus CCPW costs. If this project is to be funded by Regional Transportation Commission, typically costs associated with providing a 10-year system necessary for road to meet criteria are deducted from District costs. Please address how funding for project is to be accomplished and revise break down of costs as appropriate.

3. Address need for Section 14 and United States Army Corps of Engineers (COE) 404 Permit. Provide analyses for District and COE approval as required.

600 S. Grand Central Parkway, Suite 300 • Las Vegas, Nevada 89106-4511
(702) 455-3139 • FAX: (702) 455-3870
Website: http://www.ccrfcd.org

4. Design report states that subject site is located within a Flood Zone A and Flood Zone A99. It should be noted that a Letter of Map Revision (LOMR) has been issued by Federal Emergency Management Agency for this area. Flood Zone A99 has been revised to a Shaded Zone X. A copy of LOMR is attached to this letter.

5. Army Corp of Engineers approval of hydrology, hydraulics and improvement drawings is required since project outfall enters COE facility. Provide District documentation that CCPW has submitted information to and received approval from COE.

6. Coordinate relocation of 42-inch water line with Las Vegas Valley Water District. It would be desirable and less costly if water line could be shut down for relocation eliminating need for a wet tap. This may be possible if there is redundancy within system and water line is relocated during winter months when demand is low. If timing of road project does not agree with time line for water line relocation, consider a contract separate from roadway to relocate water line.

7. Facility is proposed outside of existing two lanes of paving. As such, RCBC can be constructed without affecting existing traffic flow. District suggests allowing an alternative bid for either precast RCBC or cast-in-place RCBC.

8. Project includes approximately 1 mile of 10' X 6' RCBC. Coordinate design with CCPW Maintenance Management Division. Address need to provide a vault with opening large enough to lower maintenance equipment into culvert.

9. Stubs are not provided at intersections with future streets along storm drain alignment. District suggests consultant complete a local storm drain plan or refer to a local plan (if existing) to determine need for stubs to accept flows for future conditions. At a minimum, stubs should be provided at major street crossings to accept flow from future drop inlets. Stubs should be extended past proposed paving to eliminate need to cut asphalt for future lateral.

Hydrology

10. A soils map with offsite basins delineated is required and must be submitted for review.

11. On Standard Form 4 for interim conditions, urbanized check is calculated for undeveloped basins. Urbanized check should only be used for developed conditions. Revise Standard Form 4 and HEC-1 model accordingly.

12. On Standard Form 4 for interim conditions, a slope of 4% is used in initial/overland time calculations for Basin OFF7. This slope seems excessive. Please review and revise calculations as necessary.

13. Standard Form 6 uses a pipe length for storm drain between Stations 157+50 and 161+00 as approximately 400-feet in length. Revise calculations to use a length of 350-feet.

Hydraulics

14. Drawings show a 36-inch RCP accepting 150 cfs at upstream end of storm drain system. Standard Form 6 analyzes a 54-inch RCP at this location. Pipe is shown to flow full. Address ability for 36-inch RCP to convey expected flow. Revise analysis or drawing accordingly.

Improvement Drawings

15. Consider providing culverts, for transverse flows south of Windmill Lane, with lengths capable of allowing future road widening without culvert extension if right-of-way exists. This will eliminate removal and replacement of headwalls in future. Interim costs may rise, but overall costs should be reduced. In addition, provide guard rails along roadway at culvert headwalls.

16. Drawing No. SD-9. Storm drain is shown on drawing stubbed and capped to the south. Is it anticipated that storm drain will be extended south with future project? If so, design must consider additional flows entering system. Revise pipe size at upstream end of system as necessary in accordance with Comment 14.

17. Drawing No. SD-10. Revise transition structure at Station 157+50 so change in pipe height is adjusted at top of pipe instead of at invert of pipe to improve hydraulics for low flows.

18. Drawing No. SD-12. Provide a manhole at Station 186+00 to allow maintenance access to horizontal angle point and lateral inflow location. Show existing cable/telephone line crossing RCB near Station 183+40 to be relocated.

19. Drawing No. SD-15. Provide a connection detail for transition from 10' X 6' RCB to 10' X 9' RCB.

20. Drawing No. SD-18. District suggests providing skewed headwalls for culverts at Stations 99+20 and 111+10 to protect road from flow in existing washes.

If you have any questions, please give me a call.

GALE WM. FRASER, II, P.E.
General Manager/Chief Engineer

BY: Steve Parrish
Steve Parrish, P.E.
Senior Civil Engineer

GWF:SP:jb

Attachment

c: Denis Cederburg, P.E., CCPW
Mark Failla, P.E., GC Wallace
Stephen Roberts, P.E., CCRFCD

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Pre-Final Submittal - Technical Data Notebook

The following is a summary of project changes and issues that have occurred subsequent to the 70% Submittal. The following also reiterates certain project drainage assumptions established at the pre-design level or at project review meetings.

- Due to the natural west/east topography and the existence of several distinct existing washes south of Windmill Lane, the proposed drainage design south of Windmill Lane utilizes culvert crossings to perpetuate existing drainage across Rainbow Boulevard. The perpetuation of existing flows across Rainbow Boulevard is consistent with drainage patterns presented in the CCRFCD Master Plan. An assumption of the proposed drainage design south of Windmill Lane is that future development to the west of Rainbow Boulevard will generally maintain drainage in the existing washes and that drainage will be directed to the proposed culvert crossings. This assumption will minimize anticipated future runoff in the "major" roadways south of Windmill Lane. The "major" roadways are considered to be Windmill Lane, Wigwam Avenue, and Pebble Road. This drainage assumption is crucial to the anticipated design flow capacities of proposed storm drain stub-outs and intersection cross flow. Proposed storm drain stub-out design flows are discussed later in this report.

- Since the Rainbow Boulevard Improvements project at this time is to address the initial roadway widening and associated drainage perpetuation, storm drain stub-outs were generally designed to extend beyond the initial paving at intersections. For the proposed stub-outs at "major" intersections to be included as part of the CCRFCD facilities, the stub-outs were designed with capacity for the anticipated future 100-year flow rates. The "major" intersections containing Clark County Regional Flood Control District (CCRFCD) facilities are considered to be Robindale Road, Windmill Avenue, and Badura Avenue. An assumption of the proposed stub-outs at these intersections is that future costs for adequate facilities to intercept the 100-year design flows will be cost shared between Regional Transportation Commission (RTC), CCRFCD, and possibly future developers. Additionally, it should be noted that since the future inlet facilities at these intersections are to capture the 100-year storm event anticipated flows, no runoff from the 10-year storm event will enter the intersections under ultimate conditions thus meeting RTC requirements restricting the 10-year storm flow to be conveyed at or below the curb height.

- Per the request of Clark County Development Services Department (CCDSD) - Major Projects, it was requested that an additional culvert be added along the north side of Wigwam Avenue in order to assist design planning of development east of Rainbow Boulevard in accordance with the existing Master Plan of the Pinnacle Peaks community. As a result of this request, a 60-inch RCP culvert was added at this location at Station "RB" 104+60. The culvert pipe size was based on a design capacity of 85 cfs. This 100-year storm event flow rate was taken from the report entitled, *Addendum No.1 to the Update to Pinnacle Peaks Overall Conceptual Master Plan* as prepared by PBS&J, dated April 4, 2001. A copy of Figure 4B from the report has been included in the Appendix of this report for reference.

- As a result of updated existing utility locations and updated hydraulic storm drain computations the following table summarizes changes that have occurred in the proposed storm drain facilities.

Summary of Proposed Facility Changes			
Location	**Original Facility**	**Revised Facility**	**Cause of Change**
"RB" 155+43 to "RB" 156+68	45"x29" HERCP	48" RCP	Existing sanitary sewer that was to be avoided is now proposed to be abandoned as part of new sanitary sewer design allowing taller pipe.
"RB" 156+68 to "RB" 160+00	54" RCP	60" RCP	Updated hydraulic computations.
"RB" 168+00 to "RB" 179+30	60" RCP	66" RCP	Updated hydraulic computations.
Warm Springs Rd. Lateral	60" RCP	8'x4' RCB	Updated information regarding existing 66" waterline showed facility higher reducing available cover at lateral location.
Culvert "RB" 64+80	(2)-12'x4' RCB	(3)-10'x3' RCB	Updated information regarding proposed sanitary sewer showed facility higher reducing available cover at culvert location.

- The following table summarizes changes in design flows that were incorrectly reported in the 70% Technical Data Notebook for certain facilities adjacent to Section 10. The table also summarizes changes in recommended facility sizes that have occurred as discussed previously. Note that only facilities that design flows were revised or that facility sizes have changed have been included in the table. Also note that the referenced Section 10-Ult HEC-1 model has not changed and a that copy of the analysis has been included in the appendix of this report for reference.

Summary of Recommended Drainage Facilities & Design Flows						
Facility Identifier[1]	**Facility Type**	**Facility Term Use**	**Interim Q_{100} (cfs)**	**Ultimate Q_{100} (cfs)**	**Design Q_{100} (cfs)**	**Design Flow Source**
BDRB0000 From Sta. 207+00 to Sta. 203+40	10'x6' RCB	Int/Ult	435	1,209	1,200	Tropicana/ Flamingo
BDRB0000 From Sta. 203+40 to Sta. 182+91	10'x6' RCB	Int/Ult	253	872	870	Sect10-ULT HEC-1
BDRB0000 From Sta. 183+30 to Sta. 182+91	10'x6' RCB	Int/Ult	253	557[1]	555	Sect10-ULT HEC-1
RDRB0074 From Sta. 179+30 to Sta. 170+20	66" RCP	Int/Ult	67	249[2]	250	Sect10-ULT HEC-1
RDRB0074 From Stat. 170+20 to Sta. 156+68	60" RCP	Int/Ult	48	186[3]	185	Sect10-ULT HEC-1
RDRB0074 From Stat. 156+68 to Sta. 155+43	48" RCP	Int/Ult	48	87[4]	87	Sect10-ULT HEC-1
"RB" 104+60	60" RCP	Int/Ult	N/A	85	85	PBS&J Study

[1] Sum of Combination Point C569 and C3-24 from Sect10-ULT HEC-1 model.
[2] Sum of Combination Point C569 and C3-24A from Sect10-ULT HEC-1 model.
[3] Sum of Combination Point C569 and 3-38A from Sect10-ULT HEC-1 model.
[4] Sum of Combination Point C9+6 and 5-2 from Sect10-ULT HEC-1 model.

- Design flows for stub-out facilities at the intersections of Pebble Road and Wigwam Avenue were reported to be 160 cfs and 126 cfs respectively per the 70% Technical Data Notebook. These design flows were based on 10-year peak flow rates minus the street flow capacity to meet 12-foot dry lane criteria. These design flows were also conservatively based on maximum possible contributing subbasins that may drain to the roadways as discussed in the 70% Technical Data Notebook. Based on storm drain hydraulic computations included in the Appendix of this report, the design flows provided by the stub-out facilities at Pebble Road and Wigwam Avenue are 140 cfs and 90 cfs respectively. Due to design constraints in available cover and tie-ins to proposed culvert facilities, the conservative design flows were unable to be achieved. However, as discussed previously, the drainage assumption at these locations is that the majority of flow from upstream subbasins will be directed to the proposed culverts via interior roadways, storm drain and/or washes and not via Pebble Road and Wigwam Avenue to the existing topography. Therefore, the reduced design capacity is still expected to provide adequate capacity for future flows. It should also be noted that the mainline of the stub-outs at these locations are expected to be extended up the roadways as determined by future designers as needed to meet required street flow criteria. The proposed lateral facilities at the stub-outs are not designed to intercept the entire flow. The design flows of the laterals are identified on the storm drain profile for each lateral system. It is expected that additional laterals will be provided along the future extension of the mainline to provide interception of the entire design flow. It will be the responsibility of future designers to provide analysis of these systems as they develop.

APPENDIX LAYOUT

Appendix A - Pre-Final Project Correspondence

1. Response to CCRFCD 70% Submittal Comments
2. E-Mail Correspondence with CCDSD Regarding Additional Culvert at Wigwam
3. E-Mail Correspondence with CCPW Regarding Revisions to Culvert North of Blue Diamond Road

Appendix B - Storm Drain Hydraulic Computations

1. Standard Form 6 Computations for Mainline Storm Drain
2. WSPG Computations for Lateral Storm Drain at Warm Springs Road
3. WSPG Computations for Lateral Storm Drain at Robindale Road
4. WSPG Computations for Lateral Storm Drain at Windmill Lane
5. WSPG Computations for Lateral Storm Drain at Wigwam Avenue
6. WSPG Computations for Lateral Storm Drain at Pebble Road
7. Culvert Computation at Station "RB" 104+60

Appendix C - Pre-Final Cost Estimates

1. Overall Project Cost Estimate
2. RTC/CCRFCD Estimate of Cost Share

Appendix D – Reference Hydrologic Analysis

1. Section 10 Ultimate Condition HEC-1 Analysis, Section 10 Curve Number Computations and Standard Form 4, and Section 10 Ultimate Condition Drainage Plan from the report entitled, *70% Submittal, Technical Data Notebook for Rainbow Boulevard Improvements, Southern Beltway to Blue Diamond Road* as prepared by G.C. Wallace, Inc., dated September 2002.
2. Figure 4B from the report entitled, *Addendum No.1 to the Update to Pinnacle Peaks Overall Conceptual Master Plan* as prepared by PBS&J, dated April 4, 2001.

Appendix A

Pre-Final Project Correspondence

CCRFCD Correspondence

G. C. WALLACE, INC.
Engineers / Planners / Surveyors

G. C. WALLACE, PE/SE, PLS
JAMES A. DUDDLESTEN, PE
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CALVIN L. BLACK, PE, PLS
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SCOTT R. PLUMMER, PE
E. ROBERT PETERSON

THOMAS P. DYSON, PE
KENNETH M. HANIFAN, PE
DOUGLAS M. HANKEL
DONALD A. HASELHOFF, PE, CEM
BERT A. HUGHES, PE
RICKEY D. HUNSAKER, PE, LC
NOEL C. LAUGHLIN, PE
MARVIN W. MAIZE
TIMOTHY A. McCOY, PE, PTOE
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THOMAS R. NICHOLS, PE
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JEFF W. STAYTON, PE
JOHN R. TOBIN, PE, PTOE
HOWARD K. VANDER MEER, PE, WRS
G. IRA WALLACE, PE
EUGENE W. WRIGHT, PE

JIM B. BAKKEDAHL, PE
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ERIC J. GALVAN
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J. P. HIGGINS, PLS, WRS
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DONALD L. HOTCHKISS JR., PE
JERRY D. JOHNSTON
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GGY M. POUND
AN L. SCHMIDT, PE
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JOHN M. WALKER, PE
CHRISTOPHER R. ZRINYI, PE

DENNIS R. BROWN, PE
MARY A. CARR, PE
ROY D. CLARK, PE
RICHARD G. CLARKE
HEIDI A. DEXHEIMER, PE
G. QUINCY EDWARDS, PE
MARK J. FAILLA, PE
JOHN FITCH, PE
ERIC G. GILES, PE
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PASCAL HAYES, PE/SE
GABRIEL A. HERRERA, PE
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RUSSELL D. JAMISON, PLS
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TODD N. KELLEY, PE
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MARK H. PETERSON, PE
RICK J. READ, PE
BRADFORD G. ROCKWELL, PE
CHRISTOPHER B. SMITH, PE
DENNIS W. SOLANO, PLS
TODD STEADHAM, PE
HUAGAO (HUGO) TAN, PE
CHURAIRAT (ANN) TANAKAL, PE
KEVIN L. TOMLINSON, PE
DUARDO VILLALOBOS, PE/SE
PHEN L. WEATHERMAN, PE
SON W. WONG, PE, PTOE

AFFILIATE OFFICE IN
SACRAMENTO, CA

500.854

January 7, 2003

Steve Parrish, P.E.
Senior Civil Engineer
Clark County Regional Flood Control District
600 S. Grand Central Parkway, Suite 300
Las Vegas, Nevada 89106-4511

Subject: Response to CCRFCD 70% Submittal Comments on the Rainbow Boulevard Improvements Southern Beltway to Blue Diamond Road

Dear Mr. Parrish:

This letter is submitted in response to your comments contained in the October 24, 2002 review memorandum for the above-referenced project. The comments are individually addressed as follows:

Hydraulics

Comment: "1. Hydrology was revised for Section 10 from previous submittal, which results in new design flow rates for storm drain. Provide revised hydraulic calculations using new flow rates."

Response: Acknowledged. Revised Standard Form 6 storm drain hydraulic computations have been performed based on design flow rates computed per the previously submitted ultimate condition hydrologic model for Section 10. The revised mainline storm drain computations have been included in the Appendix.

Comment: "2. Results of hydrologic analysis show a 100-year flow rate of 375 cfs in Warm Springs Road at intersection with Rainbow Boulevard. Provide calculations to verify that lateral stub at this location is capable of accepting flow in Warm Springs road."

Response: Acknowledged. A WSPG storm drain hydraulic model has been prepared to verify the adequacy of the proposed lateral facility at Warm Springs Road. The lateral storm drain computations have been included in the Appendix.

Comment: "3. Flow rate in mainline facility increases from 860 cfs to 1200 cfs at Station 199+00. Drawings do not show any lateral facilities stubbed from mainline capable of accepting additional flow to enter system. Revise facility to allow future connections."

Response: Acknowledged. The flow rate increase was based on the Tropicana/Flamingo Wash modified CCRFCD 2002 MPU hydrologic analysis presented in the 30% Pre-Design report for this project. This flow increase occurs at the future Badura Avenue (concentration point CTBD13 per the drainage analysis). Since no pavement is proposed to extend up this future intersection as part of the initial Rainbow Boulevard improvements project a stub was not proposed with previous project submittals. However, per the request of the CCRFCD a 60-inch RCP stub has been added to the Pre-Final submittal drawings. This stub has been sized to accommodate a flow of 340 cfs (the difference in flow increase 1200 cfs – 860 cfs). Also note that the location of the flow increase has been revised to be at approximate Station "RB" 203+40 so as correspond more closely with the hydrologic analysis and the alignment of Badura Avenue.

Improvement Drawings

Comment: "4. Drawing No. SD-11. Provide a matchline and profile for storm drain lateral extending west in Robindale Road. Plan view shows a telephone utility crossing mainline alignment near Station 156+15. Show utility on profile and indicate relocation if necessary. Provide structural details for junction structures with future submittal. Flow rates shown on profile for elliptical pipe and 54-inch diameter pipe do not match design report. Revise accordingly. Indicate class of RCP required on profile."

Response: The plan view on Sheet SD-11 has been shifted so as to accommodate the storm drain lateral extending up Robindale Road.

All existing utilities have been added to the storm drain profiles where appropriate. Relocations of utilities have been identified as necessary.

Structural details have been provided in the drawings for all junction structures as necessary.

Flow rates indicated on the drawings have been revised as necessary to match computations included in the design report.

A note stating that all RCP storm drain is Class III unless otherwise indicated has been added to the drawings and profile sheets.

Comment: "5. Drawing No. SD-13. Provide a profile for 10' X 6' RCBC lateral. Show existing utilities crossing alignment and indicate relocation if necessary. A structure is shown on plan view for transition from 60-inch RCP to 10' X 6' RCBC, with 10' X 6' RCBC lateral tying into structure from the west. At this point, the mainline is actually the 10' X 6' RCBC lateral. District recommends providing an angle point or curve in 10' X 6' RCBC at this

location with a pipe connection to RCBC wall for 60-inch RCP. Review drawing accordingly. Box culvert shown on profile is labeled at a 10' X 9' RCBC. Revise to match plan view."

Response: A profile for the 10-foot by 6-foot RCB lateral has been provided on Sheet SD-22. Additionally existing utilities crossing the lateral have been included on the profile and indicated to be relocated as necessary.

A structural detail for the junction between the 10-foot by 6-foot lateral and 60-in RCP has been added to the drawings.

The profile has been revised to correctly indicate a 10-foot by 6-foot RCB.

Comment: "6. Drawing No. SD-14. Add caution note to plan view for overhead power lines. On profile at Station 182+30.00, a description for a manhole is provided. Plan view shows only lateral connections at this location, with no manhole. Revise accordingly. Show cable and telephone utility crossings near Station 183+45. Indicate relocation if necessary. An 18-inch RCP pipe penetration is shown on profile at Station 184+00.00, but is not indicated on plan view. Revise accordingly."

Response: Caution notes for the gas line and overhead power have been added to all sheets.

Manhole at Station "RB" 182+30 has been removed from the profile.

All utility crossings have been added to the profile and have been indicated as a relocation as necessary.

The 18-in RCP penetration has been removed from the profile.

Comment: "7. Drawing No. SD-15. A grade break is noted on profile at Station 197+25.00, but slopes are constant for storm drain upstream and downstream of this station. Revise accordingly. A rim elevation is provided on profile at Station 199+10.00, but no manhole is shown on plan view. Revise accordingly. Also provide invert elevations for both lateral pipes connecting to mainline at this location."

Response: No grade break occurs at Station "RB" 197+25 and has been removed from the profile.

No manhole is located at Station "RB" 199+10 and the rim elevation call-out has been removed from the profile.

Both lateral pipe invert elevations at Station "RB" 199+10 have been added to the profile.

Comment: "8. Drawing No. SD-16. Provide connection details for proposed facility to existing RCBC."

Response: A connection detail from the proposed 10-foot by 6-foot RCB to the existing 10-foot by 9-foot RCB has been provided.

Comment: "9. Drawing No. SD-23. Lateral Profile – "RB" 155+00 shows lateral in conflict with existing 12-inch waterline. Adjust lateral profile accordingly. Typical for profiles for laterals at Stations 164+00, 172+00 and 182+30, show existing water, sewer and gas lines crossing lateral alignments and indicate relocations if necessary. Also lower all lateral invert elevations at connections to mainline facility to facilitate submergence below water surface elevation in mainline. On Lateral Profile – "RB" 182+30, revise description of mainline facility to 10' X 6' RCBC."

Response: The lateral profile at Station "RB" 148+60 and "RB" 155+37 indicates that the proposed storm drain is in conflict with the existing 12-in waterline. The waterline at these locations has been indicated to be relocated.

All existing utilities have been added to the profiles and relocations have been indicated as required.

Lateral invert elevations have been lowered to connect to the mainline at the center of the mainline facility to facilitate submergence where possible. Some lateral connections remained above the center line of the mainline to eliminate conflict with existing utilities.

The mainline facility call-outs have been revised to correctly indicate a 10-foot by 6-foot RCB on all profiles.

Comment: "10. Drawing No. SD-24. Show all existing utilities crossing lateral alignments and indicate relocations if necessary. Lower all lateral invert elevations at connections to mainline facility to facilitate submergence below water surface elevation in mainline. Revise descriptions of mainline facility to 10' X 6' RCBC on each profile."

Response: All existing utilities have been added to the profiles and relocations have been indicated as required.

Lateral invert elevations have been lowered to connect to the mainline at the center of the mainline facility to facilitate submergence where possible. Some lateral connections remained above the center line of the mainline to eliminate conflict with existing utilities.

The mainline facility call-outs have been revised to correctly indicate a 10-foot by 6-foot RCB on all profiles.

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

If you have any questions or require additional information, please do not hesitate to contact this office.

Very truly yours,

G. C. WALLACE, INC.

Mark J. Failla, P.E.
Senior Project Manager
Flood Control Division

MF:jj

Encl.

pc: Kathy Kingston, CCPW
Denis Cederburg, CCPW
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Calvin L. Black, GCW
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CLARK COUNTY
REGIONAL FLOOD CONTROL DISTRICT



Gale Wm. Fraser, II, P.E.
General Manager/Chief Engineer

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Bruce L. Woodbury
Clark County

October 24, 2002

Mr. Robert Herr, P.E.
Clark County Department of Public Works
Design Engineering Division
500 South Grand Central Parkway, Suite 2001
P.O. Box 554000
Las Vegas, NV 89155-4000

RE: RAINBOW BOULEVARD IMPROVEMENTS SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

Dear Mr. Herr:

Clark County Regional Flood Control District (District) has reviewed *70% Submittal Technical Data Support Notebook for Rainbow Boulevard Improvements Southern Beltway to Blue Diamond Road* dated September 2002 and *Improvement Plans For Rainbow Boulevard From Blue Diamond To Southern Beltway* prepared by GC Wallace for Clark County Public Works (CCPW). Improvements include construction of approximately 5200 linear feet of reinforced concrete pipe (RCP) and box culvert (RCBC) ranging in size from 54-inch diameter to 10' X 6' with associated facilities. These structures are labeled BDRB 0000 through 0074 on District Master Plan Update (MPU). District review was limited to only those structures shown on MPU. The following comments are offered for your consideration as the project proceeds:

Hydraulics

1. Hydrology was revised for Section 10 from previous submittal, which results in new design flow rates for storm drain. Provide revised hydraulic calculations using new flow rates.

2. Results of hydrologic analysis show a 100-year flow rate of 375 cfs in Warm Springs Road at intersection with Rainbow Boulevard. Provide calculations to verify that lateral stub at this location is capable of accepting flow in Warm Springs Road.

3. Flow rate in mainline facility increases from 860 cfs to 1200 cfs at Station 199+00. Drawings do not show any lateral facilities stubbed from mainline

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capable of accepting additional flow to enter system. Revise facility to allow future connections.

Improvement Drawings

4. Drawing No. SD-11. Provide a matchline and profile for storm drain lateral extending west in Robindale Road. Plan view shows a telephone utility crossing mainline alignment near Station 156+15. Show utility on profile and indicate relocation if necessary. Provide structural details for junction structures with future submittal. Flow rates shown on profile for elliptical pipe and 54-inch diameter pipe do not match design report. Revise accordingly. Indicate class of RCP required on profile.

5. Drawing No. SD-13. Provide a profile for 10' X 6' RCBC lateral. Show existing utilities crossing alignment and indicate relocation if necessary. A structure is shown on plan view for transition from 60-inch RCP to 10' X 6' RCBC, with 10' X 6' RCBC lateral tying into structure from the west. At this point, the mainline is actually the 10' X 6' RCBC lateral. District recommends providing an angle point or curve in 10' X 6' RCBC at this location with a pipe connection to RCBC wall for 60-inch RCP. Revise drawing accordingly. Box culvert shown on profile is labeled as a 10' X 9' RCBC. Revise to match plan view.

6. Drawing No. SD-14. Add caution note to plan view for overhead power lines. On profile at Station 182+30.00, a description for a manhole is provided. Plan view shows only lateral connections at this location, with no manhole. Revise accordingly. Show cable and telephone utility crossings near Station 183+45. Indicate relocation if necessary. An 18-inch RCP pipe penetration is shown on profile at Station 184+00.00, but is not indicated on plan view. Revise accordingly.

7. Drawing No. SD-15. A grade break is noted on profile at Station 197+25.00, but slopes are constant for storm drain upstream and downstream of this station. Revise accordingly. A rim elevation is provided on profile at Station 199+10.00, but no manhole is shown on plan view. Revise accordingly. Also provide invert elevations for both lateral pipes connecting to mainline at this location.

8. Drawing No. SD-16. Provide connection details for proposed facility to existing RCBC.

9. Drawing No. SD-23. Lateral Profile – "RB" 155+00 shows lateral in conflict with existing 12-inch waterline. Adjust lateral profile accordingly. Typical for profiles for laterals at Stations 164+00, 172+00 and 182+30, show existing water, sewer and gas lines crossing lateral alignments and indicate relocations if necessary. Also lower all lateral invert elevations at connections to mainline facility to facilitate submergence below water surface elevation in mainline. On Lateral Profile – "RB" 182+30, revise description of mainline facility to 10' X 6' RCBC.

10. Drawing No. SD-24. Show all existing utilities crossing lateral alignments and indicate relocations if necessary. Lower all lateral invert elevations at connections to mainline facility to facilitate submergence below water surface elevation in mainline. Revise descriptions of mainline facility to 10' X 6' RCBC on each profile.

If you have any questions, please give me a call.

GALE WM. FRASER, II, P.E.
General Manager/Chief Engineer

BY: 
Steve Parrish, P.E.
Senior Civil Engineer

c: Mark Failla, P.E., GC Wallace
Stephen Roberts, P.E., CCRFCD

P:\Letters and Memos\Capital Improvement Projects\CLA17\cla17b02Rainbow Branch - 70%.doc

Appendix B

Storm Drain Hydraulic Computations

Mainline

G.C. Wallac — 90% Storm D… — …gn – Windmill Lane to Southern Beltway — DATE: 01/07/03 — FIL… …rain2_90.wb3

Storm Drain Manning's n (typ=0.013) = 0.013 — Inlet Structure Type or K_I = 0.20 — Projecting Entrance: Grooved Edge (RCP)

| CONDUIT DATA | | | | | | | | | | FLOW DATA | | | | | | | | | ENERGY LOSS DATA | | | | | | | | | |

Warm Springs Road

DATE: 1/ 7[illegible]
TIME: 15: 5

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

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	0	0.00	4.00	8.00	0.00	0.00	0.00										
CD	2	4			3.50														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 6, 2003

HEADING LINE NO 2 IS -

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

HEADING LINE NO 3 IS -

STORM DRAIN AT INTERSECTION OF WARM SPRINGS AND RAINBOW-START Q100= 375 CF

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	0.00	2502.10	1	2506.10

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	20.00	2502.50	1	0.013	0.00	0.00	42.00	0

ELEMENT NO 3 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	39.00	2502.88	1	2	2	0.013	60.0	60.0	2503.15	2503.15	40.00	75.00

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	52.00	2503.14	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 5 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	52.00	2503.14	1	2507.14

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

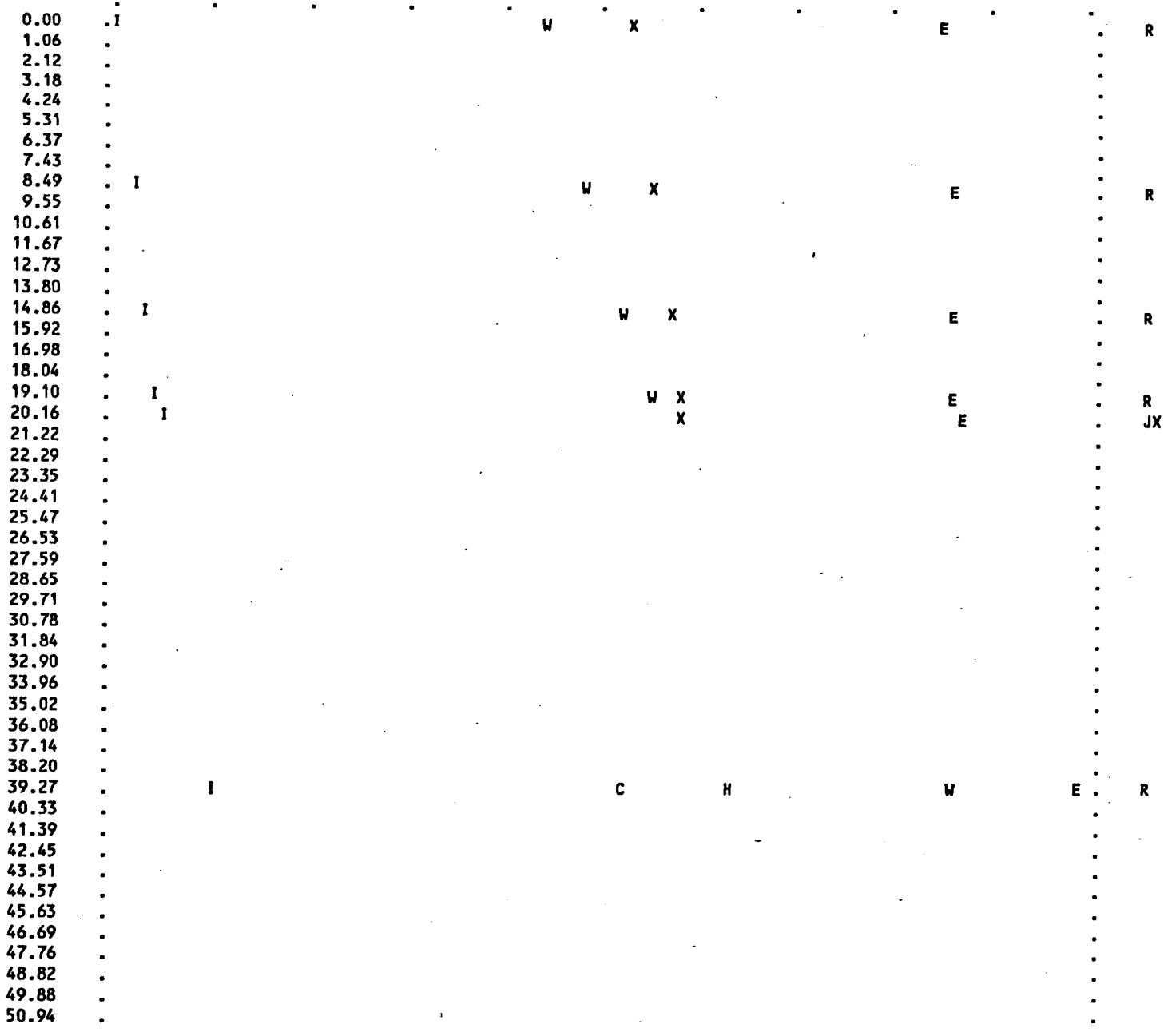
G.C. WALLACE, INC. - JOB#500.854 - JANUARY 6, 2003

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

STORM DRAIN AT INTERSECTION OF WARM SPRINGS AND RAINBOW-START Q100= 375 CF

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	2502.10	3.319	2505.419	375.0	14.12	3.097	2508.516	0.00	4.000		4.00	8.00	0.00	0	0.00
8.17	0.02000					.006516	0.05			2.267			0.00		
8.17	2502.26	3.466	2505.729	375.0	13.52	2.840	2508.569	0.00	4.000		4.00	8.00	0.00	0	0.00
6.24	0.02000					.005761	0.04			2.267			0.00		
14.41	2502.39	3.635	2506.023	375.0	12.89	2.581	2508.604	0.00	4.000		4.00	8.00	0.00	0	0.00
3.84	0.02000					.005066	0.02			2.267			0.00		
18.25	2502.47	3.813	2506.278	375.0	12.29	2.347	2508.625	0.00	4.000		4.00	8.00	0.00	0	0.00
1.75	0.02000					.006046	0.01			2.267			0.00		
20.00	2502.50	4.000	2506.500	375.0	11.81	2.166	2508.666	0.00	4.000		4.00	8.00	0.00	0	0.00
JUNCT STR	0.02000					.005376	0.10						0.00		
39.00	2502.88	5.676	2508.556	255.0	8.03	1.002	2509.558	0.00	3.161		4.00	8.00	0.00	0	0.00
13.00	0.02000					.003399	0.04			1.736			0.00		
52.00	2503.14	5.460	2508.600	255.0	8.03	1.002	2509.602	0.00	3.161		4.00	8.00	0.00	0	0.00

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 6, 2003
RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD
STORM DRAIN AT INTERSECTION OF WARM SPRINGS AND RAINBOW-START Q100= 375 CF



52.00 . . I . . C . H . W . E . R

2502.10	2502.85	2503.60	2504.35	2505.10	2505.85	2506.60	2507.35	2508.10	2508.85	2509.60

N O T E S

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

Robindale Road

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

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	4			3.50														
CD	2	4			2.00														
CD	3	4			1.50														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 6, 2003

HEADING LINE NO 2 IS -

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

HEADING LINE NO 3 IS -

STORM DRAIN AT INTERSECTION OF ROBINDALE AND RAINBOW - STARTING Q100= 90 C

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	0.00	2528.70	1	2532.20

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	33.50	2529.28	1	0.013	0.00	0.00	20.00	0

ELEMENT NO 3 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	38.50	2529.36	1	2	0	0.013	20.0	0.0	2530.80	0.00	45.00	0.00

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	168.50	2532.74	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 5 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	173.50	2532.86	1	3	0	0.013	10.0	0.0	2534.80	0.00	45.00	0.00

ELEMENT NO 6 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	186.00	2533.19	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	186.00	2533.19	1	2536.69

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 6, 2003

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

STORM DRAIN AT INTERSECTION OF ROBINDALE AND RAINBOW - STARTING Q100= 90 C

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	2528.70	2.206	2530.906	90.0	14.08	3.080	2533.986	0.00	2.944		3.50	0.00	0.00	0	0.00
33.50	0.01731					.014922	0.50			2.116			0.00		
33.50	2529.28	2.243	2531.523	90.0	13.82	2.964	2534.487	0.00	2.944		3.50	0.00	0.00	0	0.00
JUNCT STR	0.01600					.017851	0.09						0.00		
38.50	2529.36	1.705	2531.065	70.0	15.04	3.511	2534.576	0.00	2.622		3.50	0.00	0.00	0	0.00
29.01	0.02600					.020317	0.59			1.606			0.00		
67.51	2530.11	1.746	2531.860	70.0	14.59	3.304	2535.164	0.00	2.622		3.50	0.00	0.00	0	0.00
30.43	0.02600					.018329	0.56			1.606			0.00		
97.94	2530.91	1.813	2532.718	70.0	13.91	3.004	2535.722	0.00	2.622		3.50	0.00	0.00	0	0.00
20.62	0.02600					.016154	0.33			1.606			0.00		
118.56	2531.44	1.883	2533.325	70.0	13.26	2.731	2536.056	0.00	2.622		3.50	0.00	0.00	0	0.00
14.83	0.02600					.014249	0.21			1.606			0.00		
133.39	2531.83	1.957	2533.784	70.0	12.64	2.483	2536.267	0.00	2.622		3.50	0.00	0.00	0	0.00
11.01	0.02600					.012582	0.14			1.606			0.00		
144.40	2532.11	2.035	2534.148	70.0	12.06	2.257	2536.405	0.00	2.622		3.50	0.00	0.00	0	0.00
8.21	0.02600					.011125	0.09			1.606			0.00		
152.61	2532.33	2.118	2534.445	70.0	11.49	2.052	2536.497	0.00	2.622		3.50	0.00	0.00	0	0.00
6.16	0.02600					.009850	0.06			1.606			0.00		
158.77	2532.49	2.205	2534.692	70.0	10.96	1.865	2536.557	0.00	2.622		3.50	0.00	0.00	0	0.00
4.44	0.02600					.008734	0.04			1.606			0.00		
163.21	2532.60	2.298	2534.900	70.0	10.45	1.695	2536.595	0.00	2.622		3.50	0.00	0.00	0	0.00
3.02	0.02600					.007762	0.02			1.606			0.00		

WATER SURFACE PROFILE LISTING

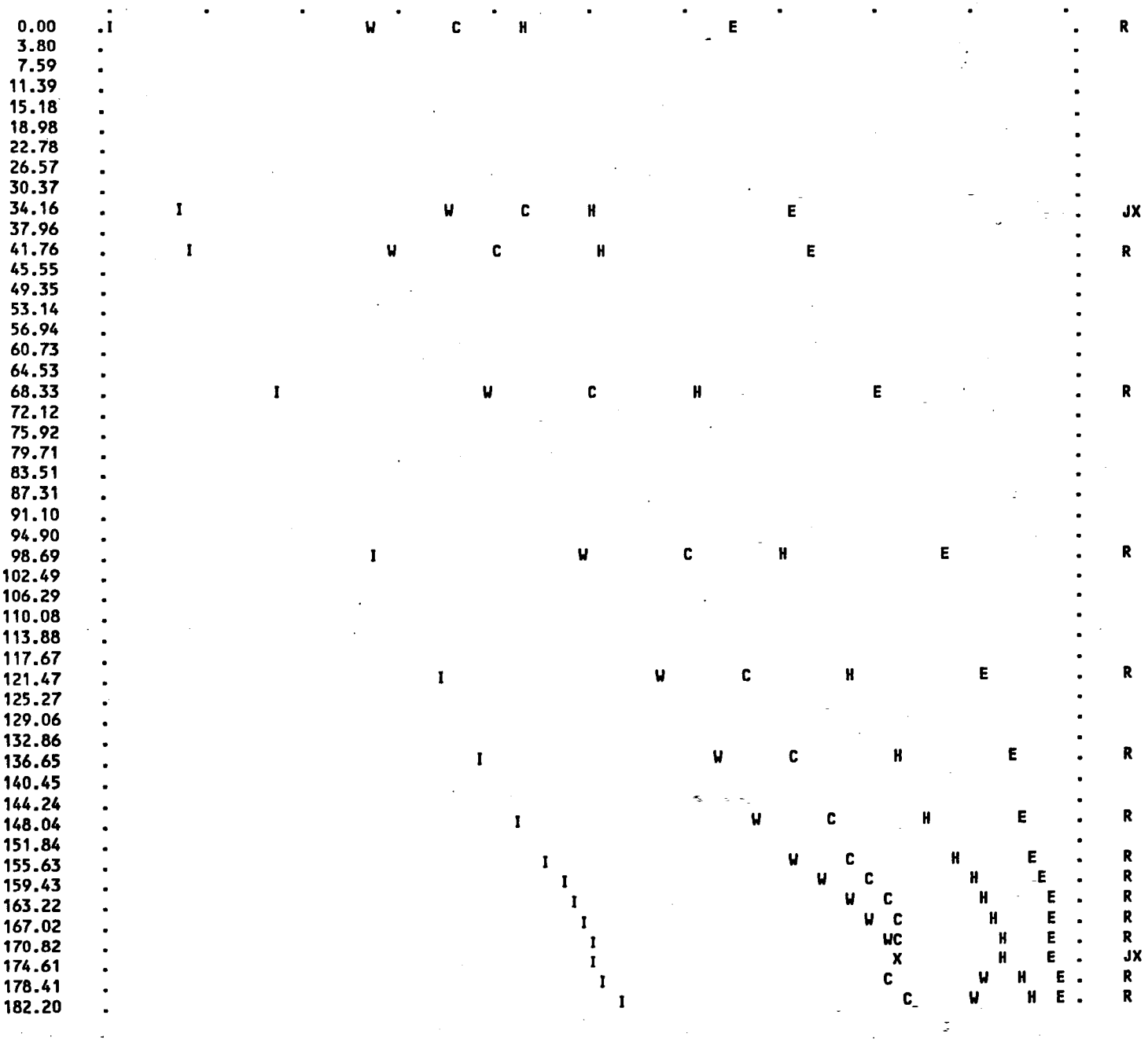
G.C. WALLACE, INC. - JOB#500.854 - JANUARY 6, 2003

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

STORM DRAIN AT INTERSECTION OF ROBINDALE AND RAINBOW - STARTING Q100= 90 C

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		
166.23	2532.68	2.397	2535.078	70.0	9.96	1.542	2536.620	0.00	2.622		3.50	0.00	0.00	0	0.00
1.74	0.02600					.006915	0.01			1.606			0.00		
167.97	2532.73	2.504	2535.230	70.0	9.50	1.402	2536.632	0.00	2.622		3.50	0.00	0.00	0	0.00
0.53	0.02600					.006179	0.00			1.606			0.00		
168.50	2532.74	2.622	2535.362	70.0	9.05	1.273	2536.635	0.00	2.622		3.50	0.00	0.00	0	0.00
JUNCT STR	0.02400					.004474	0.02						0.00		
173.50	2532.86	3.176	2536.036	60.0	6.54	0.664	2536.700	0.00	2.427		3.50	0.00	0.00	0	0.00
5.31	0.02640					.003219	0.02			1.467			0.00		
178.81	2533.00	2.987	2535.987	60.0	6.86	0.730	2536.717	0.00	2.427		3.50	0.00	0.00	0	0.00
3.57	0.02640					.003484	0.01			1.467			0.00		
182.38	2533.09	2.832	2535.926	60.0	7.19	0.803	2536.729	0.00	2.427		3.50	0.00	0.00	0	0.00
2.47	0.02640					.003834	0.01			1.467			0.00		
184.85	2533.16	2.696	2535.856	60.0	7.54	0.884	2536.740	0.00	2.427		3.50	0.00	0.00	0	0.00
1.15	0.02640					.004178	0.00			1.467			0.00		
186.00	2533.19	2.611	2535.801	60.0	7.79	0.943	2536.744	0.00	2.427		3.50	0.00	0.00	0	0.00

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 6, 2003
RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD
STORM DRAIN AT INTERSECTION OF ROBINDALE AND RAINBOW - STARTING Q100= 90 C



186.0 . . . . . I . . . . C W . HE . R

2528.70 2529.50 2530.31 2531.11 2531.92 2532.72 2533.53 2534.33 2535.14 2535.94 2536.74

N O T E S
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

Windmill Lane

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

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	4			2.00														
CD	2	4			1.50														

WATER SURFACE PROFILE LISTING

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

STORM DRAIN AT INTERSECTION OF WINDMILL AND RAINBOW-STARTING QDESIGN= 13 C

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	2546.59	2.160	2548.750	13.0	4.14	0.266	2549.016	0.00	1.297		2.00	0.00	0.00	0	0.00
13.46	0.01812					.003271	0.04			0.910			0.00		
13.46	2546.83	2.000	2548.834	13.0	4.14	0.266	2549.100	0.00	1.297		2.00	0.00	0.00	0	0.00
10.51	0.01812					.003064	0.03			0.910			0.00		
23.97	2547.02	1.814	2548.838	13.0	4.34	0.293	2549.131	0.00	1.297		2.00	0.00	0.00	0	0.00
5.20	0.01812					.002988	0.02			0.910			0.00		
29.17	2547.12	1.706	2548.825	13.0	4.55	0.322	2549.147	0.00	1.297		2.00	0.00	0.00	0	0.00
3.75	0.01812					.003236	0.01			0.910			0.00		
32.92	2547.19	1.618	2548.805	13.0	4.77	0.354	2549.159	0.00	1.297		2.00	0.00	0.00	0	0.00
1.46	0.01812					.003448	0.01			0.910			0.00		
34.38	2547.21	1.587	2548.800	13.0	4.86	0.367	2549.167	0.00	1.297		2.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
34.38	2547.21	1.063	2548.276	13.0	7.66	0.911	2549.187	0.00	1.297		2.00	0.00	0.00	0	0.00
1.31	0.01812					.010759	0.01			0.910			0.00		
35.69	2547.24	1.063	2548.300	13.0	7.66	0.911	2549.211	0.00	1.297		2.00	0.00	0.00	0	0.00
5.22	0.01812					.010118	0.05			0.910			0.00		
40.91	2547.33	1.104	2548.436	13.0	7.30	0.828	2549.264	0.00	1.297		2.00	0.00	0.00	0	0.00
3.41	0.01812					.008930	0.03			0.910			0.00		
44.32	2547.39	1.148	2548.541	13.0	6.96	0.753	2549.294	0.00	1.297		2.00	0.00	0.00	0	0.00
2.19	0.01812					.007892	0.02			0.910			0.00		
46.51	2547.43	1.194	2548.627	13.0	6.64	0.685	2549.312	0.00	1.297		2.00	0.00	0.00	0	0.00
1.18	0.01812					.006982	0.01			0.910			0.00		

WATER SURFACE PROFILE LISTING

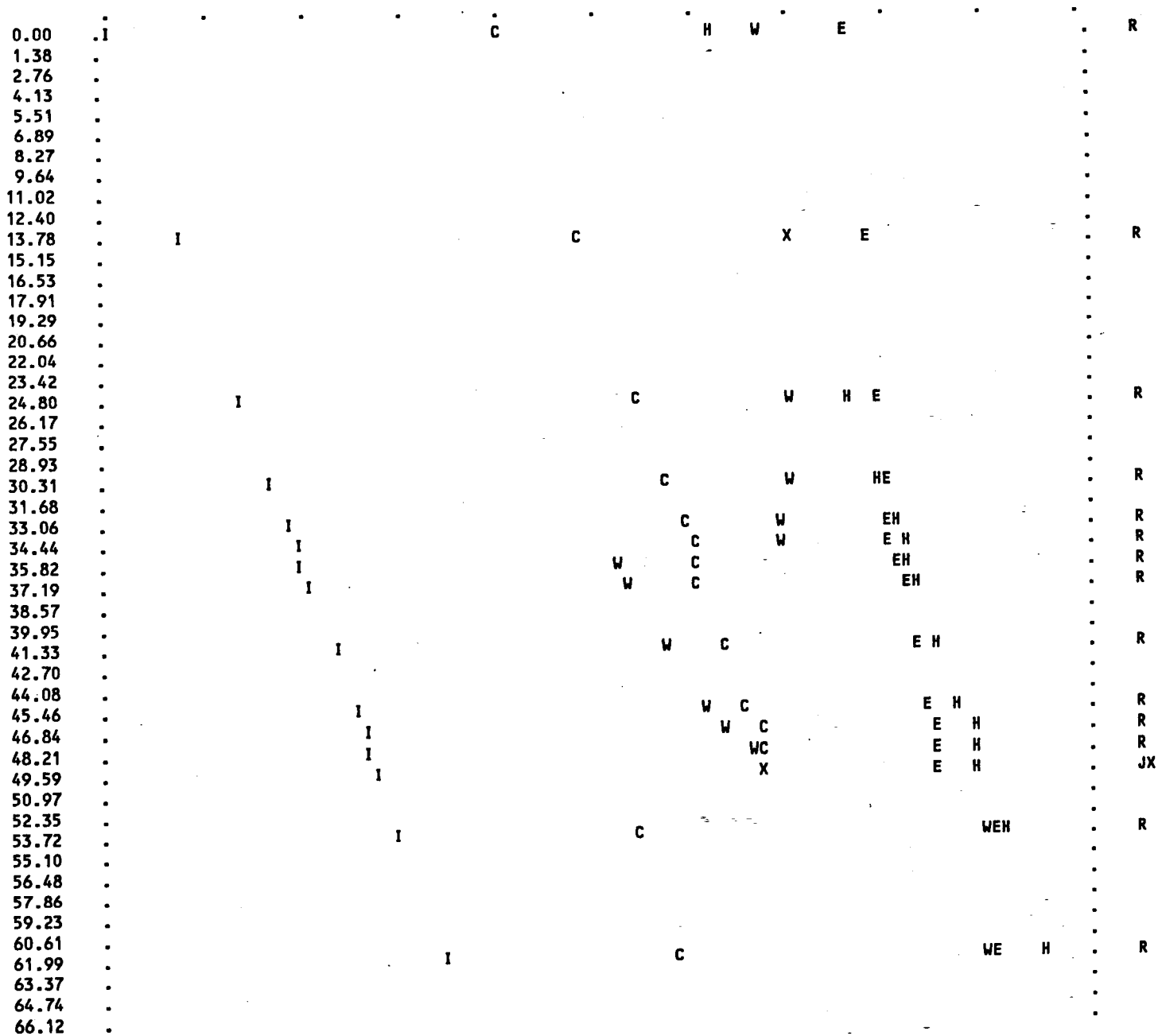
G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

STORM DRAIN AT INTERSECTION OF WINDMILL AND RAINBOW-STARTING QDESIGN= 13 C

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		
47.69	2547.45	1.243	2548.697	13.0	6.33	0.622	2549.319	0.00	1.297		2.00	0.00	0.00	0	0.00
0.31	0.01812					.006184	0.00			0.910			0.00		
48.00	2547.46	1.297	2548.757	13.0	6.03	0.565	2549.322	0.00	1.297		2.00	0.00	0.00	0	0.00
JUNCT STR	0.01600					.003119	0.02						0.00		
53.00	2547.54	1.928	2549.468	5.0	1.61	0.040	2549.508	0.00	0.788		2.00	0.00	0.00	0	0.00
8.58	0.01655					.000430	0.00			0.560			0.00		
61.58	2547.68	1.786	2549.468	5.0	1.69	0.044	2549.512	0.00	0.788		2.00	0.00	0.00	0	0.00
5.92	0.01655					.000449	0.00			0.560			0.00		
67.50	2547.78	1.687	2549.467	5.0	1.77	0.049	2549.516	0.00	0.788		2.00	0.00	0.00	0	0.00

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003
RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD
STORM DRAIN AT INTERSECTION OF WINDMILL AND RAINBOW-STARTING QDESIGN= 13 C



67.5 . I WE H . R

2546.59 2546.91 2547.23 2547.55 2547.87 2548.19 2548.50 2548.82 2549.14 2549.46 2549.78

N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
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   X = CURVES CROSSING OVER
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   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

Wigwam Avenue

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

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	4			3.50														
CD	2	4			2.50														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003

HEADING LINE NO 2 IS -

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

HEADING LINE NO 3 IS -

STORM DRAIN AT INTERSECTION OF WIGWAM AND RAINBOW-STARTING QDESIGN= 90 CFS

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003

HEADING LINE NO 2 IS -

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

HEADING LINE NO 3 IS -

STORM DRAIN AT INTERSECTION OF WINDMILL AND RAINBOW-STARTING QDESIGN= 13 C

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	0.00	2546.59	1	2548.75

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	48.00	2547.46	1	0.013	0.00	0.00	45.00	0

ELEMENT NO 3 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	53.00	2547.54	1	2	2	0.013	4.0	4.0	2548.00	2548.00	0.50	90.00

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	67.50	2547.78	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 5 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	67.50	2547.78	1	2549.78

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	0.00	2550.75	1	2554.25

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	7.50	2550.86	1	0.013	0.00	0.00	45.00	0

ELEMENT NO 3 IS A TRANSITION

U/S DATA	STATION	INVERT	SECT	N
	12.50	2550.92	1	0.013

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	407.50	2554.38	1	0.013	0.00	0.00	30.00	0

ELEMENT NO 5 IS A TRANSITION

U/S DATA	STATION	INVERT	SECT	N
	412.50	2554.42	1	0.013

ELEMENT NO 6 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	456.50	2554.78	1	0.013	0.00	0.00	60.00	0

ELEMENT NO 7 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	461.50	2554.81	1	2	2	0.013	20.0	20.0	2554.90	2554.90	90.00	15.00

ELEMENT NO 8 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	499.00	2555.00	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 9 IS A SYSTEM HEADWORKS

U/S DATA	STATION	INVERT	SECT	W S ELEV
	499.00	2555.00	1	2558.50

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

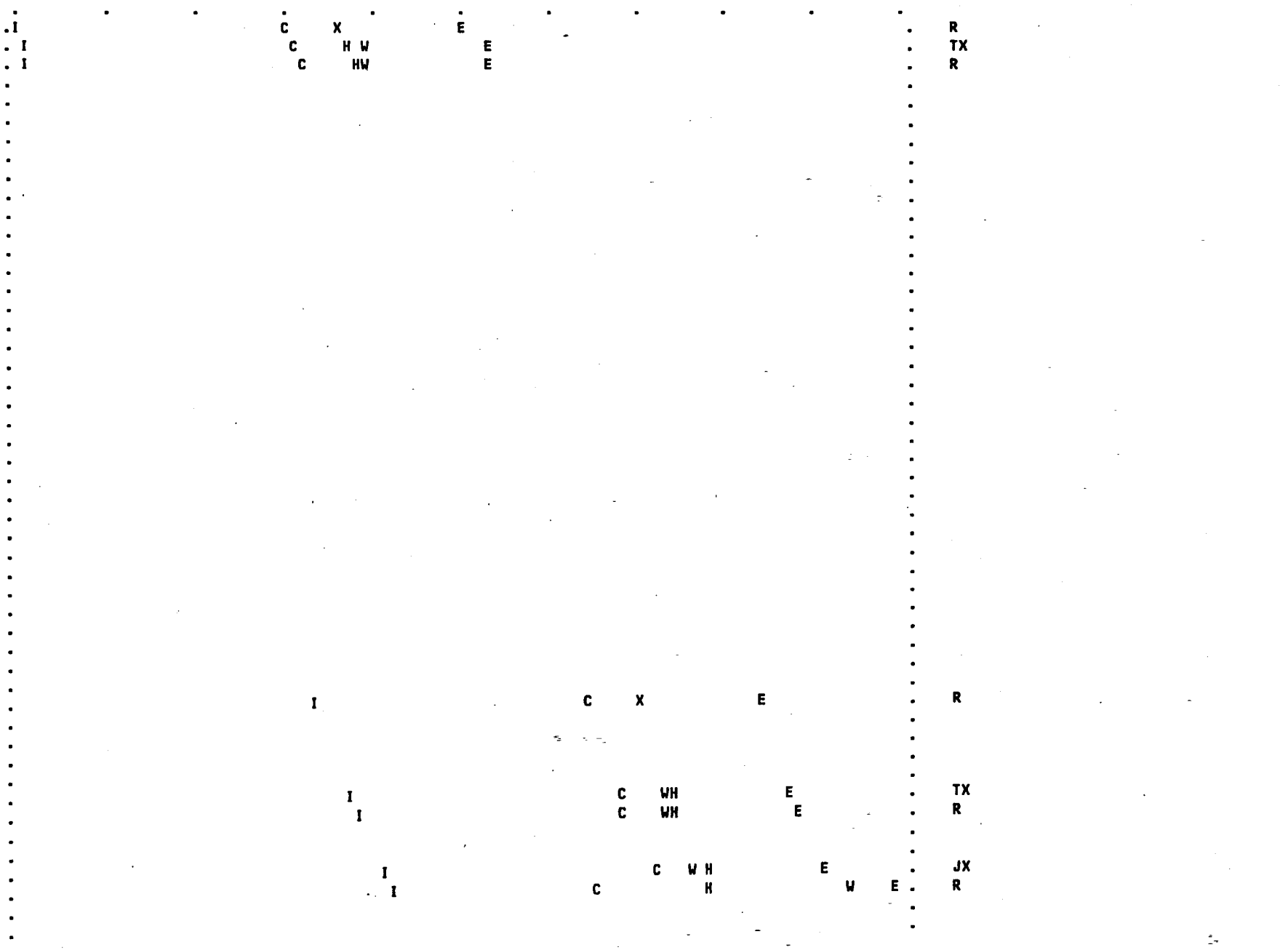
G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

STORM DRAIN AT INTERSECTION OF WIGWAM AND RAINBOW-STARTING QDESIGN= 126 CF

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	2550.75	3.500	2554.250	90.0	9.35	1.359	2555.609	0.00	2.944		3.50	0.00	0.00	0	0.00
7.50	0.01467					.008002	0.06			2.237			0.00		
7.50	2550.86	3.652	2554.512	90.0	9.35	1.359	2555.871	0.00	2.944		3.50	0.00	0.00	0	0.00
TRANS STR	0.01200					.008002	0.04						0.00		
12.50	2550.92	3.632	2554.552	90.0	9.35	1.359	2555.911	0.00	2.944		3.50	0.00	0.00	0	0.00
351.87	0.00876					.007945	2.80			2.740			0.00		
364.37	2554.00	3.500	2557.502	90.0	9.35	1.359	2558.861	0.00	2.944		3.50	0.00	0.00	0	0.00
43.13	0.00876					.007537	0.33			2.740			0.00		
407.50	2554.38	3.435	2557.815	90.0	9.39	1.370	2559.185	0.00	2.944		3.50	0.00	0.00	0	0.00
TRANS STR	0.00800					.007176	0.04						0.00		
412.50	2554.42	3.430	2557.850	90.0	9.40	1.372	2559.222	0.00	2.944		3.50	0.00	0.00	0	0.00
44.00	0.00818					.007064	0.31			2.833			0.00		
456.50	2554.78	3.355	2558.135	90.0	9.49	1.398	2559.533	0.00	2.944		3.50	0.00	0.00	0	0.00
JUNCT STR	0.00600					.004717	0.02						0.00		
461.50	2554.81	5.024	2559.834	50.0	5.20	0.419	2560.253	0.00	2.210		3.50	0.00	0.00	0	0.00
37.50	0.00507					.002470	0.09			2.153			0.00		
499.00	2555.00	4.927	2559.927	50.0	5.20	0.419	2560.346	0.00	2.210		3.50	0.00	0.00	0	0.00

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003
RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD
STORM DRAIN AT INTERSECTION OF WIGWAM AND RAINBOW-STARTING QDESIGN= 126 CF



499.0 . . . . . I . . . C . . H . . W E. R

2550.75 2551.71 2552.67 2553.63 2554.59 2555.55 2556.51 2557.47 2558.43 2559.39 2560.35

N O T E S
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

Pebble Road

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

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	4			4.00														
CD	2	4			2.50														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003

HEADING LINE NO 2 IS -

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

HEADING LINE NO 3 IS -

STORM DRAIN AT INTERSECTION OF PEBBLE AND RAINBOW-STARTING QDESIGN= 140 CF

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	0.00	2551.80	1	2555.80

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	46.50	2552.27	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 3 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	51.50	2552.32	1	0.013

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	178.50	2553.58	1	0.013	0.00	0.00	70.00	0

ELEMENT NO 5 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N
	183.50	2553.62	1	0.013

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	209.50	2553.88	1	0.013	0.00	0.00	13.00	0

ELEMENT NO 7 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	214.50	2554.93	1	2	2	0.013	20.0	20.0	2554.00	2554.00	45.00	74.00

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	224.00	2555.02	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 9 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	224.00	2555.02	1	2559.02

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

STORM DRAIN AT INTERSECTION OF PEBBLE AND RAINBOW-STARTING QDESIGN= 140 CF

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	2551.80	4.000	2555.800	140.0	11.14	1.927	2557.727	0.00	3.511		4.00	0.00	0.00	0	0.00
0.00	0.01011					.009435	0.00			3.173			0.00		
0.00	2551.80	4.000	2555.800	140.0	11.14	1.927	2557.727	0.00	3.511		4.00	0.00	0.00	0	0.00
46.50	0.01011					.008968	0.42			3.173			0.00		
46.50	2552.27	3.932	2556.202	140.0	11.18	1.942	2558.144	0.00	3.511		4.00	0.00	0.00	0	0.00
TRANS STR	0.01000					.008540	0.04						0.00		
51.50	2552.32	3.922	2556.242	140.0	11.19	1.945	2558.187	0.00	3.511		4.00	0.00	0.00	0	0.00
59.21	0.00992					.008362	0.50			3.203			0.00		
110.71	2552.91	3.748	2556.655	140.0	11.44	2.033	2558.688	0.00	3.511		4.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
110.71	2552.91	3.281	2556.188	140.0	12.69	2.500	2558.688	0.00	3.511		4.00	0.00	0.00	0	0.00
37.27	0.00992					.009393	0.35			3.203			0.00		
147.98	2553.28	3.317	2556.594	140.0	12.57	2.452	2559.046	0.00	3.511		4.00	0.00	0.00	0	0.00
30.52	0.00992					.008938	0.27			3.203			0.00		
178.50	2553.58	3.511	2557.091	140.0	11.98	2.227	2559.318	0.00	3.511		4.00	0.00	0.00	0	0.00
TRANS STR	0.00800												0.00		
183.50	2553.62	3.325	2556.945	140.0	12.54	2.441	2559.386	0.00	3.511		4.00	0.00	0.00	0	0.00
26.00	0.01000					.008921	0.23			3.190			0.00		
209.50	2553.88	3.511	2557.391	140.0	11.98	2.227	2559.618	0.00	3.511		4.00	0.00	0.00	0	0.00
JUNCT STR	0.21000					.006710	0.03						0.00		
214.50	2554.93	4.546	2559.476	100.0	7.96	0.983	2560.459	0.00	3.030		4.00	0.00	0.00	0	0.00
9.50	0.00947					.004847	0.05			2.501			0.00		

WATER SURFACE PROFILE LISTING

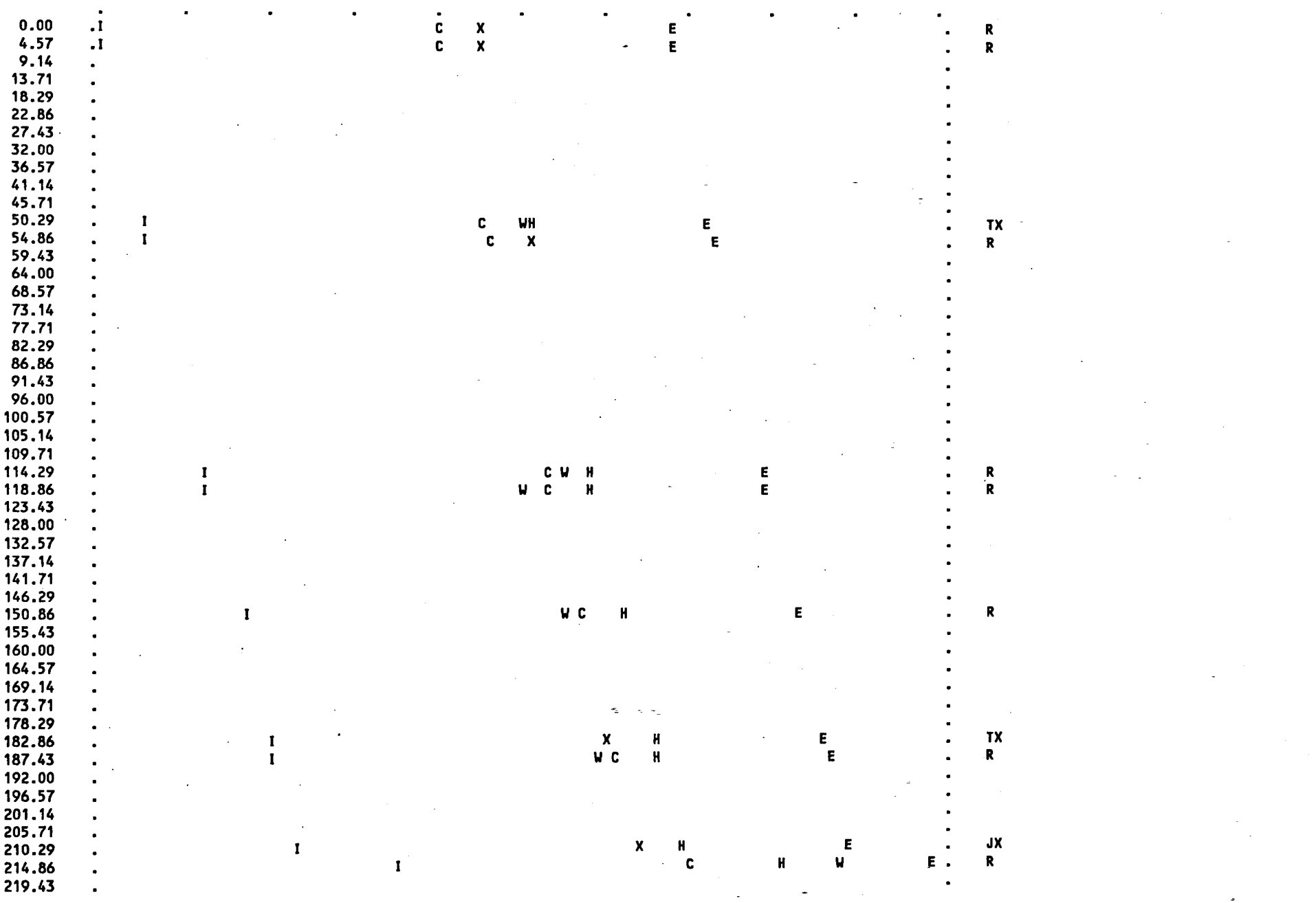
G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003

RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD

STORM DRAIN AT INTERSECTION OF PEBBLE AND RAINBOW-STARTING QDESIGN= 140 CF

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		
224.00	2555.02	4.502	2559.522	100.0	7.96	0.983	2560.505	0.00	3.030	4.00	0.00	0.00	0	0.00

G.C. WALLACE, INC. - JOB#500.854 - JANUARY 3, 2003
RAINBOW BOULEVARD IMPROVEMENTS, SOUTHERN BELTWAY TO BLUE DIAMOND ROAD
STORM DRAIN AT INTERSECTION OF PEBBLE AND RAINBOW-STARTING QDESIGN= 140 CF



224. I C H W E. R

2551.80 2552.67 2553.54 2554.41 2555.28 2556.15 2557.02 2557.89 2558.76 2559.64 2560.50

N O T E S
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

Culvert at Station 104+60

PIPE CULVERT

Inlet control and outlet control.

Culvert at Sta. "RB" 104+60

INPUT VARIABLES:		OUTPUT VARIABLES:	
Pipe diameter	60.00 in	INLET CONTROL HWo:	
Slope	0.40 %	Tapered throat	3.65 ft
Number of pipes	1	45 degree bevels	3.79 ft
Manning's 'n'	0.015	Sq. edge headwall	3.88 ft
Culvert length	144.00 ft	Thin edge projecting	4.14 ft
Discharge	85.00 cfs		
		OUTLET CONTROL HWo:	
Ent. Coef. (Ke)	0.35	HWo depth	3.81 ft
		Velocity	4.33 fps
		Critical depth	2.57 ft

Note: 1. Outlet control assumes full pipe flow.
2. Critical depth can not exceed the pipe diameter.

Appendix C

Pre-Final Cost Estimates

Rainbow Boulevard Improvements
Southern Beltway to Blue Diamond Road
Pre-Final Submittal - 1/7/03

Summary of Cost Share Between CCRFCD and RTC

Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I
Facility Location	Facility Length	Proposed CCRFCD Facility Size & Design Flow	CCRFCD Facility Unit Cost	CCRFCD Facility Total Cost	Required RTC Facility Size & Design Flow	RTC Facility Unit Cost	RTC Facility Total Cost	CCRFCD Cost to Upsize Facility
	(ft)		($/ft)	(BxD)		($/ft)	(BxG)	(E-H)
Sta. "RB" 155+36 to Sta. "RB" 156+65	129	48" RCP Q100 = 87 cfs	$140.00	$18,060.00	24" RCP nuisance	$80.00	$10,320.00	$7,740.00
Sta. "RB" 156+68 to Sta. "RB" 168+00	1132	60" RCP Q100 = 185 cfs	$200.00	$226,400.00	24" RCP nuisance	$80.00	$90,560.00	$135,840.00
Sta. "RB" 168+00 to Sta. "RB" 179+15	1115	66" RCP Q100 = 250 cfs	$220.00	$245,300.00	30" RCP Q10 = 31 cfs[1]	$110.00	$122,650.00	$122,650.00
Sta. "RB" 179+44 to Sta. "RB" 182+91	347	10'Wx6'H RCB Q100 = 555 cfs	$450.00	$156,150.00	48" RCP Q10 = 116 cfs[1]	$140.00	$48,580.00	$107,570.00
Sta. "RB" 182+91 to Sta. "RB" 203+40	2049	10'Wx6'H RCB Q100 = 870 cfs	$450.00	$922,050.00	60" RCP Q10 = 249 cfs[1]	$200.00	$409,800.00	$512,250.00
Sta. "RB" 203+40 to Sta. "RB" 207+00	360	10'Wx6'H RCB Q100 = 1200 cfs	$450.00	$162,000.00	72" RCP Q10 = 402 cfs[1]	$240.00	$86,400.00	$75,600.00
Blue Diamond Wash Stubout	33	10'Wx6'H RCB Q100 = 402 cfs[4]	$450.00	$14,850.00	48" RCP Q10 = 120 cfs[4]	$140.00	$4,620.00	$10,230.00
Warm Springs Road Stubout	45	8'Wx4'H RCB Q100 = 375 cfs	$255.00	$11,475.00	42" RCP Q10 = 93 cfs[2]	$130.00	$5,850.00	$5,625.00
Robindale Road Stubout	186	42" RCP Q100 = 90 cfs	$130.00	$24,180.00	30" RCP Q10 = 50 cfs[3]	$110.00	$20,460.00	$3,720.00
Badura Avenue Stubout	30	60" RCP Q100 = 330 cfs	$200.00	$6,000.00	42" RCP Q10 = 88 cfs[3]	$130.00	$3,900.00	$2,100.00
			Sum =	$1,786,485.00		Sum =	$803,140.00	$983,325.00

[1] Q10 design flow is based on the computed 10-year storm flow minus 50 cfs which is the ultimate condition west side street capacity of Rainbow Boulevard that will provide a 12-ft dry lane.

[2] Q10 design flow is based on the computed 10-year storm flow minus an estimated 80 cfs which is the ultimate condition full street capacity of Warm Springs Road that will provide a 12-ft dry lane.

[3] Q10 design flow is based on the computed 10-year storm flow minus an estimated 40 cfs which is the ultimate condition full street capacity of Robindale Road and Badura Avenue that will provide a 12-ft dry lane.

[4] Q10 & Q100 design flow is based on concentration point C3-24 from the Section-10 ultimate condition analysis.

G. C. Wallace, Inc.

RAINBOW BOULEVARD - Blue Diamond Road to Southern Beltway
Construction Cost Estimate - Pre-Final Submittal

Date: 1/8/2003
Project No. 580.854

Item No.	Description	Unit	Unit Price	RTC Quantity	RTC Amount	CCRFCD Quantity	CCRFCD Amount	TOTAL Quantity	TOTAL Amount
105.01	ON-SITE MATERIAL TESTING FOR QUALITY CONTROL	LS	$315,000.00	1	$315,000.00		$0.00	1	$315,000.00
107.01	TRAFFIC CONTROL	LS	$250,000.00	1	$250,000.00		$0.00	1	$250,000.00
108.01	HISTORICAL OWNER CAUSED DELAY ALLOWANCE	DAY	$500.00	15	$7,500.00		$0.00	15	$7,500.00
108.02	ADDITIONAL AMOUNT OVER $500/DAY	DAY	$750.00	15	$11,250.00		$0.00	15	$11,250.00
109.03	CONSTRUCTION CONFLICTS AND ADDITIONAL WORK	LS	$200,000.00	1	$200,000.00		$0.00	1	$200,000.00
200.01	MOBILIZATION	LS	$334,707.73	1	$334,707.73		$0.00	1	$334,707.73
201.01	CLEARING AND GRUBBING	ACRE	$1,000.00	35	$35,000.00		$0.00	35	$35,000.00
202.01	REMOVE BITUMINOUS PAVEMENT	SY	$4.00	58,000	$232,000.00		$0.00	58,000	$232,000.00
202.02	REMOVE CURB AND GUTTER	LF	$2.00	140	$280.00		$0.00	140	$280.00
202.03	REMOVE STORM DRAIN PIPE	LF	$30.00	240	$7,200.00		$0.00	240	$7,200.00
202.04	REMOVE STORM DRAIN PLUG	EA	$1,000.00	1	$1,000.00		$0.00	1	$1,000.00
202.05	REMOVE AND SALVAGE SIGN	EA	$20.00	18	$360.00		$0.00	18	$360.00
202.06	REMOVE STREET LIGHT	EA	$500.00	2	$1,000.00		$0.00	2	$1,000.00
202.07	REMOVE TRAFFIC STRIPING	LF	$0.50	500	$250.00		$0.00	500	$250.00
202.08	REMOVE CONCRETE SIDEWALK	SF	$1.00	700	$700.00		$0.00	700	$700.00
203.01	ROADWAY EXCAVATION	CY	$8.00	58,300	$466,400.00		$0.00	58,300	$466,400.00
208.01	TRENCH OVER-EXCAVATION & COMPACTED IMPORTED AGGREGATE BEDDING	CY	$10.00	500	$5,000.00		$0.00	500	$5,000.00
208.02	CHANGES IN EARTHWORK QUANTITIES BEFORE INITIAL TRENCHING	CY	$10.00	500	$5,000.00		$0.00	500	$5,000.00
208.03	INCREASE IN EARTHWORK QUANTITIES AFTER INITIAL TRENCHING	CY	$10.00	500	$5,000.00		$0.00	500	$5,000.00
212.01	MODIFY LANDSCAPING AND IRRIGATION (ROBINDALE)	LS	$2,000.00	1	$2,000.00		$0.00	1	$2,000.00
302.01	TYPE II AGGREGATE BASE	CY	$20.00	40,750	$815,000.00		$0.00	40,750	$815,000.00
402.01	PLANTMIX BITUMINOUS SURFACE	TON	$26.00	41,500	$1,079,000.00		$0.00	41,500	$1,079,000.00
402.02	PLANTMIX BITUMINOUS SURFACE (ISLAND PAVING)	TON	$30.00	2,000	$60,000.00		$0.00	2,000	$60,000.00
502.01	5-FT X 4-FT REINFORCED CONCRETE BOX CULVERT	LF	$200.00	145	$29,000.00		$0.00	145	$29,000.00
502.02	8-FT X 4-FT REINFORCED CONCRETE BOX CULVERT	LF	$255.00	22	$5,625.00	23	$5,850.00	45	$11,475.00
502.03	10-FT X 8-FT REINFORCED CONCRETE BOX CULVERT	LF	$460.00	1,221	$549,400.00	1,568	$705,650.00	2,789	$1,255,050.00
502.04	12-FT X 4-FT REINFORCED CONCRETE BOX CULVERT	LF	$475.00	486	$230,850.00		$0.00	486	$230,850.00
502.05	12-FT X 8-FT REINFORCED CONCRETE BOX CULVERT	LF	$500.00	299	$149,500.00		$0.00	299	$149,500.00
502.06	TRIPLE 10-FT X 3-FT REINFORCED CONCRETE BOX CULVERT	LF	$950.00	131	$124,450.00		$0.00	131	$124,450.00
502.07	5-FT X 4-FT RCB HEADWALL	EA	$1,700.00	2	$3,400.00		$0.00	2	$3,400.00
502.08	10-FT X 8-FT RCB HEADWALL	EA	$4,500.00	0.50	$2,250.00	0.50	$2,250.00	1	$4,500.00
502.09	12-FT X 4-FT RCB HEADWALL	EA	$2,000.00	4	$8,000.00		$0.00	4	$8,000.00
502.10	12-FT X 8-FT RCB HEADWALL	EA	$2,500.00	4	$10,000.00		$0.00	4	$10,000.00
502.11	TRIPLE 10-FT X 3-FT RCB HEADWALL	EA	$3,000.00	2	$6,000.00		$0.00	2	$6,000.00
502.12	60-INCH RCP HEADWALL	EA	$1,500.00	4	$6,000.00		$0.00	4	$6,000.00
502.13	36-INCH RCP HEADWALL	EA	$500.00	2	$1,000.00		$0.00	2	$1,000.00
502.14	JUNCTION STRUCTURE @ "RB" 182+91	LS	$9,600.00	0.50	$4,800.00	0.50	$4,800.00	1	$9,600.00
502.15	JUNCTION STRUCTURE @ "RB" 179+30	LS	$11,000.00	0.25	$2,750.00	0.75	$8,250.00	1	$11,000.00
502.16	CONCRETE ENCASEMENT	CY	$150.00	55	$8,250.00		$0.00	55	$8,250.00
603.01	18-INCH RCP STORM DRAIN (1350-D)	LF	$65.00	1,572	$102,180.00		$0.00	1,572	$102,180.00
603.02	24-INCH RCP STORM DRAIN (1350-D)	LF	$80.00	2,823	$225,840.00		$0.00	2,823	$225,840.00
603.03	30-INCH RCP STORM DRAIN (1350-D)	LF	$110.00	250	$27,500.00		$0.00	250	$27,500.00
603.04	36-INCH RCP STORM DRAIN (1350-D)	LF	$120.00	171	$20,520.00		$0.00	171	$20,520.00
603.05	42-INCH RCP STORM DRAIN (1350-D)	LF	$130.00	877	$114,010.00	157	$20,460.00	1,034	$134,470.00
603.06	48-INCH RCP STORM DRAIN (1350-D)	LF	$140.00	74	$10,320.00	55	$7,740.00	129	$18,060.00
603.07	60-INCH RCP STORM DRAIN (1350-D)	LF	$200.00	472	$94,460.00	977	$195,340.00	1,449	$289,800.00
603.08	66-INCH RCP STORM DRAIN (1350-D)	LF	$220.00	556	$122,650.00	559	$122,650.00	1,115	$245,300.00
603.09	18-INCH STORM DRAIN PLUG	EA	$200.00	16	$3,200.00		$0.00	16	$3,200.00
603.10	24-INCH STORM DRAIN PLUG	EA	$500.00	3	$1,500.00		$0.00	3	$1,500.00
603.11	30-INCH STORM DRAIN PLUG	EA	$600.00	1	$600.00		$0.00	1	$600.00
603.12	42-INCH STORM DRAIN PLUG	EA	$600.00	2	$1,200.00		$0.00	2	$1,200.00
603.13	48-INCH STORM DRAIN PLUG	EA	$700.00	1	$700.00		$0.00	1	$700.00
603.14	60-INCH STORM DRAIN PLUG	EA	$800.00	1	$800.00		$0.00	1	$800.00
603.15	8-FT X 4-FT RCB STORM DRAIN PLUG	EA	$800.00	1	$800.00		$0.00	1	$800.00
603.16	36-INCH RCP END SECTION	EA	$500.00	1	$500.00		$0.00	1	$500.00
609.01	TYPE A DROP INLET (L=4 FEET)	EA	$3,000.00	1	$3,000.00		$0.00	1	$3,000.00
609.02	NDOT TYPE 2A DROP INLET	EA	$4,000.00	21	$84,000.00		$0.00	21	$84,000.00
609.03	ADJUST MANHOLE COVER	EA	$650.00	4	$2,600.00		$0.00	4	$2,600.00
609.04	TYPE III STORM DRAIN MANHOLE	EA	$5,000.00	24	$120,000.00	3	$15,000.00	27	$135,000.00
609.05	ACCESS MANHOLE	EA	$4,000.00	4.50	$18,000.00	4.50	$18,000.00	9	$36,000.00
610.01	RIPRAP	CY	$60.00	800	$48,000.00		$0.00	800	$48,000.00
613.01	"L" TYPE CURB AND GUTTER	LF	$7.00	780	$5,320.00		$0.00	780	$5,320.00
613.02	CONCRETE SIDEWALK	SF	$2.50	4,600	$11,500.00		$0.00	4,600	$11,500.00
613.03	TACK-ON CONCRETE MEDIAN CURB	LF	$6.00	31,000	$186,000.00		$0.00	31,000	$186,000.00
613.04	CONCRETE MEDIAN SURFACE	SF	$3.00	50,000	$150,000.00		$0.00	50,000	$150,000.00
623L.01	250-WATT STREET LIGHT ASSEMBLY	EA	$2,200.00	5	$11,000.00		$0.00	5	$11,000.00
623L.02	2-INCH CONDUIT (STREET LIGHTING)	LF	$4.00	3,102	$12,408.00		$0.00	3,102	$12,408.00
623L.03	NO. 3-1/2 PULLBOX (STREET LIGHTING)	LF	$200.00	20	$4,000.00		$0.00	20	$4,000.00
623L.04	SERVICE PEDESTAL	EA	$5,000.00	10	$50,000.00		$0.00	10	$50,000.00
623L.05	ELECTRICAL SERVICE CONDUIT	LF	$50.00	2,000	$100,000.00		$0.00	2,000	$100,000.00
623T.01	TRAFFIC SIGNAL SYSTEM AT RAINBOW/WARM SPRINGS	LS	$175,000.00	1	$175,000.00		$0.00	1	$175,000.00
623T.02	TRAFFIC SIGNAL SYSTEM AT RAINBOW/ROBINDALE	LS	$175,000.00	1	$175,000.00		$0.00	1	$175,000.00
623T.03	TRAFFIC SIGNAL MODIFICATON AT RAINBOW/BLUE DIAMOND	LS	$25,000.00	1	$25,000.00		$0.00	1	$25,000.00
623T.04	No. 5 PULLBOX (FUTURE SIGNAL)	EA	$150.00	28	$4,200.00		$0.00	28	$4,200.00
623T.05	No. 7 PULLBOX (FUTURE SIGNAL)	EA	$250.00	4	$1,000.00		$0.00	4	$1,000.00
623T.06	P-30 PULLBOX (INTERCONNECT)	EA	$300.00	29	$8,700.00		$0.00	29	$8,700.00
623T.07	TYPE 200 PULLBOX (INTERCONNECT)	EA	$300.00	21	$6,300.00		$0.00	21	$6,300.00
623T.08	2-INCH CONDUIT (FUTURE SIGNAL)	LF	$5.00	3,047	$15,235.00		$0.00	3,047	$15,235.00
623T.09	3-INCH CONDUIT (FUTURE SIGNAL)	LF	$6.00	6,056	$36,336.00		$0.00	6,056	$36,336.00
623T.10	4-INCH CONDUIT (INTERCONNECT)	LF	$6.00	17,331	$103,986.00		$0.00	17,331	$103,986.00
623T.11	FIBER OPTIC CABLE	LF	$1.50	3,784	$5,676.00		$0.00	3,784	$5,676.00
623T.12	TRAFFIC COUNT STATION	EA	$2,500.00	3	$7,500.00		$0.00	3	$7,500.00
627.01	PERMANENT SIGNS (GROUND MOUNTED)(METAL SUPPORTS)	EA	$150.00	21	$3,150.00		$0.00	21	$3,150.00
627.02	RELOCATE SIGN	EA	$75.00	17	$1,275.00		$0.00	17	$1,275.00
628.01	PREFORMED MARKING FILM (24-INCH SOLID WHITE)	LF	$8.00	2,154	$17,232.00		$0.00	2,154	$17,232.00
628.02	PREFORMED MARKING FILM ARROWS	EA	$200.00	130	$26,000.00		$0.00	130	$26,000.00
628.03	PREFORMED MARKING FILM LEGENDS ("ONLY")	EA	$250.00	71	$17,750.00		$0.00	71	$17,750.00
628.04	LIQUID PAVEMENT MARKINGS (4-INCH SOLID WHITE)	LF	$0.75	33,294	$24,970.50		$0.00	33,294	$24,970.50
628.05	PERMANENT PAINT STRIPING (DOUBLE SOLID YELLOW CENTERLINE)	LF	$0.75	1,601	$1,200.75		$0.00	1,601	$1,200.75
628.06	MEDIAN PAINT	SF	$1.50	966	$1,449.00		$0.00	966	$1,449.00
629.01	ADJUST WATER VALVE BOX	EA	$250.00	13	$3,250.00		$0.00	13	$3,250.00
629.02	ADJUST WATER VAULT	EA	$750.00	2	$1,500.00		$0.00	2	$1,500.00
629.03	ADJUST AVAR	EA	$750.00	2	$1,500.00		$0.00	2	$1,500.00
629.04	ADJUST WATER MANHOLE	EA	$500.00	2	$1,000.00		$0.00	2	$1,000.00
629.05	ADJUST BLOW-OFF ASSEMBLY	EA	$350.00	3	$1,050.00		$0.00	3	$1,050.00
629.06	42-INCH WATER LINE RELOCATION @ WARM SPRINGS	LS	$225,000.00	1	$225,000.00		$0.00	1	$225,000.00
630.07	ADJUST SANITARY SEWER MANHOLE	EA	$250.00	2	$500.00		$0.00	2	$500.00
631.01	STREET NAME SIGNS	EA	$150.00	10	$1,500.00		$0.00	10	$1,500.00
633.01	NONREFLECTIVE PAVEMENT MARKERS	EA	$1.50	4,670	$7,005.00		$0.00	4,670	$7,005.00
633.02	REFLECTIVE PAVEMENT MARKERS	EA	$2.50	2,616	$6,540.00		$0.00	2,616	$6,540.00
634.01	TEMPORARY TAPE (24-INCH SOLID WHITE)	LF	$5.00	3,510	$17,550.00		$0.00	3,510	$17,550.00
634.02	TEMPORARY TAPE (VARIES)	SF	$5.00	3,105	$15,525.00		$0.00	3,105	$15,525.00
637.01	DUST CONTROL	LS	$150,000.00	1	$150,000.00		$0.00	1	$150,000.00
	SUBTOTAL				$7,596,410.98		$1,105,990.00		$8,702,400.98
	15% CONTINGENCY				$1,139,461.65		$165,898.50		$1,305,360.15
	GRAND TOTAL				$8,735,872.63		$1,271,888.50		$10,007,761.12

Appendix D

Reference Hydrologic Analysis

70% Technical Data Notebook Reference

70% SUBMITTAL
TECHNICAL DATA SUPPORT NOTEBOOK
FOR
RAINBOW BOULEVARD IMPROVEMENTS
SOUTHERN BELTWAY TO
BLUE DIAMOND ROAD

500.854

September 2002

Prepared for:

Clark County Public Works
500 South Grand Central Parkway
Las Vegas, Nevada 89106

Prepared by:

G.C. Wallace, Inc.
1555 South Rainbow Boulevard
Las Vegas, Nevada, 89146
Phone: (702) 804-2000
Fax: (702) 804-2299

Hydrologic Parameter Computations

GCW Interim HEC-1:
Revised Lag Time & 10-Year Precipitation Values

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

G.C. Wallace, Inc.
File: RB_tc_interim_R.wb2
Project No.: 500.854

Rainbow Boulevard Improvements
Southern Beltway to Blue Diamond Road
Interim Conditions

BY: MJF
DATE: 11/29/01

SUB-BASIN DATA								INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc		Tlag	REMARKS
DESIG: (1)	DEV./EX. (D or E)	LAND USE	SOIL TYPE	CN	K (2)	AREA Ac (3)	AREA MI^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Tc Calc. (13)	Tc Check	Tlag= 0.6Tc/60 Hours	RAINFALL Inches 100-yr
OFF1	E	DL	240	86.7	0.7544	577.28	0.90200	500	1.6	11.9	14944	1.7	1.9	3.8	67.1	79.0	N/A	0.790	2.87
OFF2	E	DL	240	86.8	0.7558	147.20	0.23000	500	1.8	11.4	7356	1.6	1.9	3.7	35.2	46.6	N/A	0.466	2.79
OFF3	E	DL	240	86.9	0.7571	79.36	0.12400	500	2.0	11.0	5037	1.6	1.9	3.7	24.8	35.7	N/A	0.357	2.77
OFF4	E	DL	240	86.6	0.7531	491.52	0.76800	500	2.0	11.1	14580	1.6	1.9	3.7	67.6	78.6	N/A	0.786	2.85
OFF5	E	DL	240\263	69.6	0.5287	74.24	0.11600	500	1.8	18.9	5214	1.3	1.7	3.4	28.4	47.3	N/A	0.473	2.77
OFF6	E	DL	240\263	71.4	0.5525	204.80	0.32000	500	2.2	16.9	11397	1.7	1.9	3.8	51.7	68.6	N/A	0.686	2.82
OFF7	E	DL	260\263	64.0	0.4548	83.84	0.13100	500	2.2	20.0	3954	1.7	1.9	3.8	19.3	39.3	N/A	0.393	2.77
OFF8	D	R	263	71.3	0.5512	44.80	0.07000	125	2.0	8.8	3908	1.9	2.8	4.2	16.5	25.2	32.4	0.252	2.77
OFF9	D	R	263	67.9	0.5063	42.24	0.06600	125	2.0	9.5	3291	1.9	2.8	4.2	14.0	23.5	29.0	0.235	2.77
OFF10A	E	DL	152\263	72.1	0.5617	472.96	0.73900	500	2.5	16.0	13025	1.9	2.0	4.1	55.6	71.6	N/A	0.716	2.80
OFF11	D	R	240\263	86.4	0.7505	180.48	0.28200	125	2.0	5.6	8299	1.7	2.6	4.0	35.7	41.3	56.8	0.413	2.77
OFF12	E	DL	152\240	86.8	0.7558	859.30	1.34266	500	2.2	10.7	14440	1.7	1.9	3.8	64.9	75.6	N/A	0.756	2.82

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

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 :

STANDARD FORM 4

DATE 11-29-01

CLIENT RAINBOW BLVD IMPROVEMENTS JOB NO 500.854 CALC BY RG

DESCRIPTION 10-YR ADJUSTED RAINFALL CHECKED BY

Where:

- A_T = Total Area
- A_{OUT} = Area Outside McCarran Rainfall
- A_{IN} = Area Inside McCarran Rainfall
- P_{IN} = Precipitation Within McCarran
- P_{OUT} = Precipitation Outside McCarran
- 10-YR Precipitation Adjustment Ratio = 1.24 Table 501 Manual

OFF-1

A_T = 577.28 ac

A_{OUT} = 376.96 ac

P_{IN} = 1.58" → Manual Table 505

P_{OUT} = 1.38" (1.24) = 1.71"

$$P = \frac{(200.32\ ac)(1.58") + (376.96\ ac)(1.71")}{577.28\ ac} = \boxed{1.66"}$$

OFF-2

A_T = 147.20 ac

A_{OUT} = 25.91 ac

A_{IN} = 121.29 ac

P_{IN} = 1.58"

P_{OUT} = 1.38" (1.24) = 1.71"

$$P = \frac{(121.29\ ac)(1.58") + (25.91\ ac)(1.71")}{147.20\ ac} = \boxed{1.60"}$$

OFF-3

P_{IN} = $\boxed{1.58"}$

G. C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146

DATE 11-29-01

CLIENT RAINBOW BLVD IMPROVEMENTS JOB NO 500.854 CALC BY RG

DESCRIPTION 10-YR ADJUSTED RAINFALL CHECKED BY

OFF-4

A_T = 491.52 ac

A_{OUT} = 301.04 ac

A_{in} = 190.48 ac

P_{in} = 1.58"

P_{out} = 1.38" (1.24) = 1.71"

$$P = \frac{(190.48\ ac)(1.58") + (301.04)(1.71")}{491.52\ ac} = \boxed{1.66"}$$

OFF-5

P_{in} = **1.58"**

OFF-6

A_T = 204.80 ac

A_{OUT} = 106.53 ac

A_{in} = 98.27 ac

P_{in} = 1.58"

P_{OUT} = 1.38" (1.24) = 1.71"

$$P = \frac{(98.27\ ac)(1.58") + (106.53)(1.71")}{204.80\ ac} = \boxed{1.65"}$$

OFF-7

P_{in} = **1.58"**

OFF-8

P_{in} = **1.58"**

OFF-9

P_{in} = **1.58"**

G. C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146

DATE 11-29-01

CLIENT RAINBOW BLVD IMPROVEMENTS JOB NO 500.854 CALC BY RG

DESCRIPTION 10-YR ADJUSTED RAINFALL CHECKED BY

OFF-10A

A_T = 472.96 ac

A_{in} = 279.35 ac

A_{out} = 193.61 ac

P_{in} = 1.58"

P_{out} = 1.38" (1.24) = 1.71"

$$P = \frac{(279.35\,ac)(1.58") + (193.61\,ac)(1.71")}{472.96\,ac} = \boxed{1.63"}$$

OFF-11

P_{in} = 1.58

OFF-12

A_T = 859.30 ac

A_{out} = 468.59 ac

A_{in} = 390.71 ac

P_{in} = 1.58"

P_{out} = 1.38" (1.24) = 1.71"

$$P = \frac{(390.71\,ac)(1.58") + (468.59\,ac)(1.71")}{859.30\,ac} = \boxed{1.65"}$$

G. C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146

GCW Ultimate HEC-1:
Revised Curve Number & Lag Time Computations

RAINBOW BOULEVARD IMPROVEMENTS

CURVE NUMBER CALCULATIONS FOR ULTIMATE CONDITIONS

Basin	Area (ac.)	Land Use	Land Use %	HSG	CN Value	Composite CN
OFF7A	28.1	COM	29.5	A	89	
		SR	49.1	A	80	
		RD	21.4	A	98	
OFF7A						**86.5**
OFF7	55.7	COM	18.0	A	89	
		SR	82.0	A	80	
OFF7						**81.6**
OFF8	44.8	SR	100.0	A	80	**80.0**
OFF9	42.2	COM	52.8	A	89	
		SR	32.6	A	80	
		MF	14.6	A	89	
OFF9						**86.1**

CN VALUES OBTAINED FROM TABLE 602 OF CCRFCD MANUAL
WHERE:
MF = MULTI-FAMILY RESIDENTIAL (LESS THAN 6,000 SQ. FT. LOTS)
SR = SUBURBAN RESIDENTIAL (6,000 SQ. FT. LOTS)
COM = COMMERCIAL AND BUSINESS
RD = ROADS AND OTHER IMPERVIOUS AREAS

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990               *
*           VERSION 4.0                 *
*                                       *
*  RUN DATE  10/07/2002  TIME  08:56:30 *
*                                       *
*****************************************
```

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

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

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

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


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

    1         ID        G.C.WALLACE, INC
    2         ID        CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
    3         ID
    4         ID
    5         ID   ************************************************************
    6         ID   * ..................................................... *
    7         ID   * :                                                   : *
    8         ID   * :                    SECTION 10                     : *
    9         ID   * :                 RAINBOW BOULEVARD                 : *
   10         ID   * :                 ULTIMATE CONDITIONS               : *
   11         ID   * :    ASSUMES THAT THE DURANGO AND BUFFALO FACILITIES : *
   12         ID   * :              HAVE BEEN CONSTRUCTED                : *
   13         ID   * :.................................................... *
   14         ID   * :                                                   : *
   15         ID   * :          RETURN PERIOD_ _ _ _ _ _10- & 100-YEAR   : *
   16         ID   * :          DISTRIBUTION_ _ _ _ _ _ 6-HOUR, SDN3     : *
   17         ID   * :          PROJECT NUMBER_ _ _ _ _ 500.854          : *
   18         ID   * :          FILE NAME_ _ _ _ _ _ _ _SEC10_U.H1       : *
   19         ID   * :          DATE MODELED_ _ _ _ _ _ 10/4/02          : *
   20         ID   * :          MODELED BY_ _ _ _ _ _ _ MM               : *
   21         ID   * :.................................................... *
   22         ID   * :                                                   : *
   23         ID   * :          DEPTH-AREA REDUCTION FACTOR (DARF)       : *
   24         ID   * :                                                   : *
   25         ID   * :          AREA (Mi^2)     DARF (10-YR)    DARF (100-YR)  : *
   26         ID   * :          0.00-0.05          0.57            1.00    : *
   27         ID   * :          0.06-0.31          0.56            0.99    : *
   28         ID   * :          0.32-0.44          0.56            0.98    : *
   29         ID   * :          0.45-1.00          0.55            0.97    : *
   30         ID   * :          1.01-1.50          0.55            0.96    : *
   31         ID   * :.................................................... *
   32         ID   ************************************************************
   33         ID
   34         ID
   35         ID
              *DIAGRAM
   36         IT       5       0       0     300
   37         IO       5       0       0
   38         IN       5       0       0
   39         JR    PREC    1.00    0.99    0.98    0.97    0.96    0.57    0.56    0.55

   40         KK     3-1
   41         KM        RUNOFF FROM AREA 3-1 (BLUE DIAMOND WASH)
   42         KM            AREA    2.47   ACRES
   43         KM              CN    64.3
   44         KM              Tc     9.2    MIN
   45         KM
   46         BA  .00386
   47         PB    2.77
   48         PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
   49         PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
   50         PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
   51         PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
   52         PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
   53         PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
```

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

  54      PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
  55      PC    .998    .999   1.00
  56      LS            64.3
  57      UD   0.092
          *

  58      KK    3-1C
  59      KM        RUNOFF FROM AREA 3-1C
  60      KM            AREA    0.84   ACRES
  61      KM              CN    98.0
  62      KM              Tc     5.9     MIN
  63      KM
  64      BA  .00131
  65      PB   2.77
  66      LS            98.0
  67      UD   0.059
          *

  68      KK   R3-1C
  69      KM        ROUTE 3-1C THROUGH 3-1
  70      RD    950    0.02    0.03       0    TRAP     100
          *

  71      KK    3-1B
  72      KM        RUNOFF FROM OFF-SITE DRAINAGE AREA 3-1B (EAST SIDE OF BUFFALO DRIVE)
  73      KM            AREA    2.03   ACRES
  74      KM              CN      98
  75      KM              Tc    12.3     MIN
  76      KM
  77      BA  .00317
  78      PB   2.77
  79      LS              98
  80      UD    .123
          *

  81      KK     3-5
  82      KM        RUNOFF FROM AREA 3-5
  83      KM            AREA    4.03   ACRES
  84      KM              CN    76.8
  85      KM              Tc    13.4     MIN
  86      KM
  87      BA  .00630
  88      PB   2.77
  89      LS            76.8
  90      UD    .134
          *

  91      KK   C3-8B
  92      KM        COMBINED RUNOFF FROM AREAS 3-1B AND 3-5 (AT ENTRYWAY TO 3-5)
  93      HC       2
          *
```



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

  94      KK  R3-14E
  95      KM        ROUTE C3-8B THROUGH 3-1A
  96      RD    1315    .014    .016       0    TRAP      50
          *

  97      KK    3-1A
  98      KM        RUNOFF FROM DRAINAGE BASIN 3-1A
  99      KM            AREA   12.42   ACRES
 100      KM              CN    80.6
 101      KM              Tc    15.0     MIN
 102      KM
 103      BA  .01941
 104      PB   2.77
 105      LS            80.6
 106      UD   0.150
          *

 107      KK   C3-8A
 108      KM        COMBINED RUNOFF FROM AREA 3-1A AND R3-14E (IN NORTHEAST CORNER OF 3-1A)
 109      HC       2
          *
          *  DO NOT ROUTE: DISTANCE TO COMBINATION POINT IS LESS THAN 500 FEET.
          *

 110      KK   C3-2
 111      KM        COMBINED RUNOFF FROM 3-1 AND  C3-8A (IN BLUE DIAMOND WASH)
 112      HC       2
          *

 113      KK    R3-6
 114      KM        ROUTE C3-2 THRU AREA 3-3
 115      RD     830   0.016    0.03       0    TRAP     100
          *

 116      KK    3-4A
 117      KM        RUNOFF FROM ONSITE BASIN 3-4A
 118      KM            AREA    2.49   ACRES
```

```
119          KM              CN    80.6
120          KM              Tc    12.6     MIN
121          KM
122          BA  .00389
123          PB   2.77
124          LS            80.6
125          UD  0.126
             *
126          KK    R3-7
127          KM        ROUTE 3-4A THRU AREA 3-6
128          RD     760   0.006   0.016       0    TRAP       0      50
             *
```



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

129          KK     3-4
130          KM        RUNOFF FROM AREA 3-4
131          KM            AREA    5.71   ACRES
132          KM              CN    86.0
133          KM              Tc     9.7     MIN
134          KM
135          BA  .00892
136          PB   2.77
137          LS            86.0
138          UD  0.097
             *
             *  DO NOT ROUTE: DISTANCE TO COMBINATION POINT IS LESS THAN 500 FEET.
             *
139          KK     3-6
140          KM        RUNOFF FROM AREA 3-6
141          KM            AREA    3.02   ACRES
142          KM              CN    75.9
143          KM              Tc    14.8     MIN
144          KM
145          BA  .00472
146          PB   2.77
147          LS            75.9
148          UD   .148
             *
149          KK   C3-8C
150          KM        COMBINED RUNOFF FROM R3-7 AND AREAS 3-6 AND 3-4
151          HC       3
             *
152          KK     3-2
153          KM        RUNOFF FROM DRAINAGE BASIN 3-2
154          KM            AREA   14.67   ACRES
155          KM              CN    86.5
156          KM              Tc    17.5     MIN
157          KM
158          BA  .02292
159          PB   2.77
160          LS            86.5
161          UD  0.175
             *
162          KK     3-3
163          KM        RUNOFF FROM AREA 3-3 (BLUE DIAMOND WASH)
164          KM            AREA    2.06   ACRES
165          KM              CN    64.3
166          KM              Tc     7.3     MIN
167          KM
168          BA  .00322
169          PB   2.77
170          LS            64.3
171          UD  0.073
             *
```



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

172          KK    C3-4
173          KM        COMBINED RUNOFF FROM AREAS 3-3 AND 3-2 AND FROM R3-6 AND C3-8C
174          HC       4
             *
175          KK    R3-8
176          KM        ROUTE C3-4 THRU AREA 3-7
177          RD    1325   0.017    0.03       0    TRAP     100
             *
178          KK     3-7
179          KM        RUNOFF FROM AREA 3-7 (BLUE DIAMOND WASH)
180          KM            AREA    3.09   ACRES
181          KM              CN    68.8
182          KM              Tc     8.2     MIN
183          KM
184          BA  .00483
185          PB   2.77
```

```
186          LS           68.8
187          UD   0.082
             *

188          KK  R8&3-7
189          KM        COMBINED RUNOFF FROM R3-8 AND AREA 3-7
190          HC        2
             *

191          KK     3-8
192          KM        RUNOFF FROM AREA 3-8
193          KM            AREA     6.39   ACRES
194          KM              CN     76.8
195          KM              Tc     14.4     MIN
196          KM
197          BA  .00998
198          PB    2.77
199          LS           76.8
200          UD   0.144
             *

201          KK    R3-9
202          KM        ROUTE 3-8 THRU AREA 3-9
203          RD     510   0.019   0.016       0    TRAP       0      50
             *

204          KK     3-9
205          KM        RUNOFF FROM AREA 3-9 (ROBINDALE ROAD)
206          KM            AREA     2.55   ACRES
207          KM              CN     98.0
208          KM              Tc      7.6     MIN
209          KM
210          BA  .00398
211          PB    2.77
212          LS           98.0
213          UD   0.076
             *
```



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

214          KK   C3-6A
215          KM        COMBINED RUNOFF R3-9 AND AREA 3-9
216          HC        2
             *

217          KK    3-15
218          KM        RUNOFF FROM AREA 3-15
219          KM            AREA    13.85   ACRES
220          KM              CN     80.6
221          KM              Tc     18.4     MIN
222          KM
223          BA  .02164
224          PB    2.77
225          LS           80.6
226          UD    .184
             *

227          KK    3-18
228          KM        RUNOFF FROM AREA 3-18
229          KM            AREA     2.23   ACRES
230          KM              CN     76.8
231          KM              Tc     14.6     MIN
232          KM
233          BA  .00348
234          PB    2.77
235          LS           76.8
236          UD   0.146
             *

237          KK    3-14
238          KM        RUNOFF FROM AREA 3-14
239          KM            AREA    13.72   ACRES
240          KM              CN     90.1
241          KM              Tc     11.3     MIN
242          KM
243          BA  .02144
244          PB    2.77
245          LS           90.1
246          UD   0.113
             *

247          KK   R3-14
248          KM        ROUTE 3-14 THROUGH AREA 3-5A
249          RD    1670    .012   0.016       0    TRAP       0      50
             *

250          KK    3-5A
251          KM        RUNOFF FROM AREA 3-5A
252          KM            AREA    29.75   ACRES
253          KM              CN     80.6
254          KM              Tc     19.8     MIN
255          KM
256          BA  .04648
```

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 257          PB    2.77
1                                        HEC-1 INPUT                                        PAGE  7

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

 258          LS             80.6
 259          UD   0.198
              *

 260          KK   C3-8F
 261          KM        COMBINE R3-14 AND AREA 3-5A
 262          HC        2
              *

 263          KK  R3-14G
 264          KM         ROUTE C3-8F THROUGH AREA 3-15 TO C3-10
 265          RD    1125     .010   0.016       0    TRAP        0       50
              *

 266          KK    3-5B
 267          KM         RUNOFF FROM AREA 3-5B
 268          KM             AREA    8.37   ACRES
 269          KM               CN    80.6
 270          KM               Tc    15.4     MIN
 271          KM
 272          BA  .01308
 273          PB    2.77
 274          LS             80.6
 275          UD   0.154
              *

 276          KK   R3-5B
 277          KM         ROUTE 3-5B THROUGH AREA 3-18 TO C3-10
 278          RD     935     .012   0.016       0    TRAP        0       50
              *

 279          KK    3-22
 280          KM         RUNOFF FROM AREA 3-22
 281          KM             AREA   22.72   ACRES
 282          KM               CN    80.6
 283          KM               Tc    16.9     MIN
 284          KM
 285          BA  .03550
 286          PB    2.77
 287          LS             80.6
 288          UD   0.169
              *

 289          KK   R3-19
 290          KM         ROUTE 3-22 THROUGH 3-15
 291          RD     675     .010   0.016       0    TRAP        0       50
              *

 292          KK   C3-10
 293          KM         COMBINED RUNOFF FROM R3-5B, R3-14G AND AREAS 3-15, 3-18 AND 3-22
 294          HC        5
              *
1                                        HEC-1 INPUT                                        PAGE  8

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

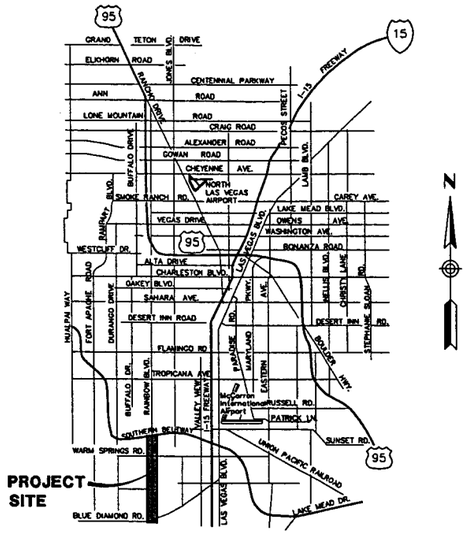
 295          KK   R3-20
 296          KM         ROUTE C3-10 THROUGH AREA 3-24
 297          RD     640     .014   0.016       0    TRAP        0       50
              *

 298          KK    3-24
 299          KM         RUNOFF FROM AREA 3-22
 300          KM             AREA    8.86   ACRES
 301          KM               CN    76.2
 302          KM               Tc    14.6     MIN
 303          KM
 304          BA  .01384
 305          PB    2.77
 306          LS             76.2
 307          UD   0.146
              *

 308          KK   C3-12
 309          KM         COMBINED RUNOFF FROM R3-20 AND C3-12
 310          HC        2
              *

 311          KK   3-28B
 312          KM         RUNOFF FROM AREA 3-28B
 313          KM             AREA    2.20   ACRES
 314          KM               CN    98.0
 315          KM               Tc     9.5     MIN
 316          KM
 317          BA  .00344
 318          PB    2.77
 319          LS             98.0
 320          UD   0.095
              *
```

DEPARTMENT OF PUBLIC WORKS



Vicinity Map

NOT TO SCALE

County Commissioners

Chip Maxfield, Chairman
Myrna Williams, Vice–Chair
Yvonne Atkinson–Gates
Mary J. Kincaid–Chauncey
Rory Reid
Bruce L. Woodbury

SIGNATURE ON THESE PLANS WILL 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.

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

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

CLARK COUNTY NEVADA

"Progress as Promised"

2004

IMPROVEMENT PLANS FOR RAINBOW BOULEVARD FROM BLUE DIAMOND ROAD TO SOUTHERN BELTWAY PHASE I

FUNDED BY

REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146

County Manager
Thomas F. Reilly

Director of Public Works
Approved:

M.J. Manning R.P.E.

Regional Transportation Commission of Southern Nevada
Approved:

Jacob Snow, General Manager

Clark County Regional Flood Control District
Approved:

Gale Wm. Fraser II, P.E.
General Manager/Chief Engineer

AGENCY	PLANS REVIEWED BY	DATE
CLARK COUNTY WATER RECLAMATION DISTRICT		
COX COMMUNICATIONS LAS VEGAS, INC.		
LAS VEGAS VALLEY WATER DISTRICT		
NEVADA POWER COMPANY		
SOUTHWEST GAS COMPANY		
SPRINT		

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

REVISIONS		
NUMBER	DESCRIPTION	DATE

PROFESSIONAL ENGINEER - STATE OF NEVADA
KEVIN L. TOMLINSON
Exp. 09/30/2004
CIVIL
No. 14987

DESIGN ENGINEERING DIVISION

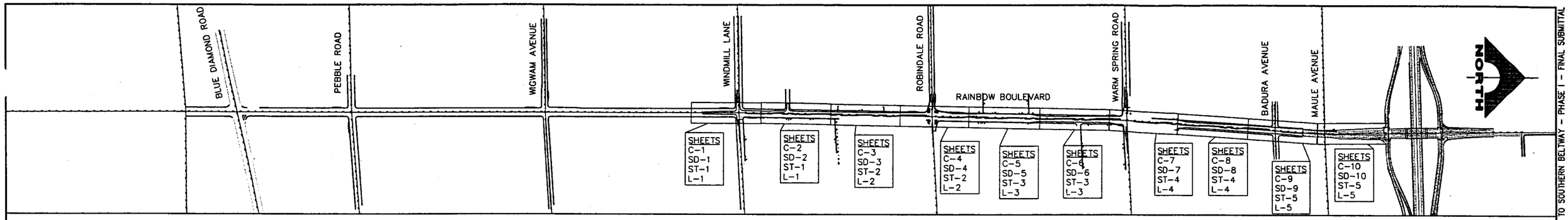
COVER SHEET

L–1728A

BID No.: 5552–04

RAINBOW BOULEVARD – BLUE DIAMOND ROAD TO SOUTHERN BELTWAY – PHASE I

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KEY MAP
NOT TO SCALE

INDEX OF DRAWINGS

GENERAL DRAWINGS

SHT NO.	SHEET DESCRIPTION
G-1	COVER SHEET
G-2	KEY MAP AND INDEX OF DRAWINGS
G-3	GENERAL NOTES
G-4	LEGEND AND ABBREVIATIONS
G-5	MONUMENTATION AND HORIZONTAL CONTROL
G-6	MONUMENTATION AND HORIZONTAL CONTROL

TYPICAL SECTIONS

SHT NO.	SHEET DESCRIPTION
TY-1	TYPICAL SECTIONS

CIVIL DRAWINGS

SHT NO.	SHEET DESCRIPTION
C-1	PLAN AND PROFILE "RB" 123+50.00 TO "RB" 133+00.00
C-2	PLAN AND PROFILE "RB" 133+00.00 TO "RB" 142+50.00
C-3	PLAN AND PROFILE "RB" 142+50.00 TO "RB" 152+00.00
C-4	PLAN AND PROFILE "RB" 152+00.00 TO "RB" 161+50.00
C-5	PLAN AND PROFILE "RB" 161+50.00 TO "RB" 171+00.00
C-6	PLAN AND PROFILE "RB" 171+00.00 TO "RB" 180+50.00
C-7	PLAN AND PROFILE "RB" 180+50.00 TO "RB" 190+00.00
C-8	PLAN AND PROFILE "RB" 190+00.00 TO "RB" 199+50.00
C-9	PLAN AND PROFILE "RB" 199+50.00 TO "RB" 209+00.00
C-10	PLAN AND PROFILE "RB" 209+00.00 TO "RB" 218+50.00
C-11	ROBINDALE ROAD CORNER ISLAND GEOMETRICS

DETAILED GRADING DRAWINGS

SHT NO.	SHEET DESCRIPTION
DG-1	DETAILED GRADING RAINBOW BOULEVARD AT WINDMILL LANE
DG-2	DETAILED GRADING RAINBOW BOULEVARD AT ROBINDALE ROAD
DG-3	DETAILED GRADING RAINBOW BOULEVARD AT WARM SPRINGS ROAD

STORM DRAIN DRAWINGS

SHT NO.	SHEET DESCRIPTION
SD-1	STORM DRAIN PLAN AND PROFILE "RB" 123+50.00 TO "RB" 133+00.00
SD-2	STORM DRAIN PLAN AND PROFILE "RB" 133+00.00 TO "RB" 142+50.00
SD-3	STORM DRAIN PLAN AND PROFILE "RB" 142+50.00 TO "RB" 152+00.00
SD-4	STORM DRAIN PLAN AND PROFILE "RB" 152+00.00 TO "RB" 161+50.00
SD-5	STORM DRAIN PLAN AND PROFILE "RB" 161+50.00 TO "RB" 171+00.00
SD-6	STORM DRAIN PLAN AND PROFILE "RB" 171+00.00 TO "RB" 180+50.00
SD-7	STORM DRAIN PLAN AND PROFILE "RB" 180+50.00 TO "RB" 190+00.00
SD-8	STORM DRAIN PLAN AND PROFILE "RB" 190+00.00 TO "RB" 199+50.00
SD-9	STORM DRAIN PLAN AND PROFILE "RB" 199+50.00 TO "RB" 209+00.00
SD-10	STORM DRAIN PLAN AND PROFILE "RB" 209+00.00 TO "RB" 218+50.00
SD-11	STORM DRAIN CULVERTS PLAN AND PROFILE
SD-12	STORM DRAIN LATERALS PROFILE
SD-13	STORM DRAIN LATERALS PROFILE
SD-14	STORM DRAIN LATERALS PROFILE
SD-15	STORM DRAIN GRADING TYPICAL SECTIONS
SD-16	STORM DRAIN GRADING TYPICAL SECTIONS
SD-17	STORM DRAIN GRADING TYPICAL SECTIONS
SD-18	STORM DRAIN DETAILS
SD-19	GENERAL NOTES AND STRUCTURAL DETAILS
SD-20	JUNCTION STRUCTURE DETAILS
SD-21	JUNCTION STRUCTURE DETAILS
SD-22	JUNCTION STRUCTURE DETAILS
SD-23	CONCRETE APRON DETAIL
SD-24	STORM DRAIN DETAILS

UTILITY DRAWINGS

SHT NO.	SHEET DESCRIPTION
U-1	UTILITY PLAN AND PROFILE 42-INCH WATERLINE RELOCATION AT WARM SPRINGS
U-2	UTILITY DETAILS
U-3	THRUST FLANGE DETAILS
U-4	UTILITY DETAILS
U-5	UTILITY DETAILS
U-6	UTILITY DETAILS
U-7	UTILITY DETAILS
U-8	SANITARY SEWER LATERALS PROFILE
U-9	SANITARY SEWER LATERALS PROFILE

TRAFFIC SIGNAL PLANS

SHT NO.	SHEET DESCRIPTION
TS-1	TRAFFIC SIGNAL PLAN RAINBOW BOULEVARD/ROBINDALE ROAD
TS-1A	TRAFFIC SIGNAL PLAN RAINBOW BOULEVARD/ROBINDALE ROAD
TS-2	TRAFFIC SIGNAL PLAN RAINBOW BOULEVARD/WARM SPRINGS ROAD
TS-3	CCTV DETAILS
TS-4	TEMPORARY TRAFFIC SIGNAL PLAN RAINBOW BOULEVARD/ROBINDALE ROAD
TS-5	TEMPORARY TRAFFIC SIGNAL PLAN RAINBOW BOULEVARD/ROBINDALE ROAD

TRAFFIC SIGNING AND STRIPING

SHT NO.	SHEET DESCRIPTION
ST-1	TRAFFIC STRIPING AND SIGNING "RB" 123+50.00 TO "RB" 142+50.00
ST-2	TRAFFIC STRIPING AND SIGNING "RB" 142+50.00 TO "RB" 161+50.00
ST-3	TRAFFIC STRIPING AND SIGNING "RB" 161+50.00 TO "RB" 180+50.00
ST-4	TRAFFIC STRIPING AND SIGNING "RB" 180+50.00 TO "RB" 199+50.00
ST-5	TRAFFIC STRIPING AND SIGNING "RB" 199+50.00 TO "RB" 218+50.00
ST-6	TRAFFIC STRIPING AND SIGNING WINDMILL LANE AND ROBINDALE ROAD
ST-7	TRAFFIC STRIPING AND SIGNING WARM SPRINGS ROAD
ST-8	TRAFFIC STRIPING AND SIGNING NOTES AND DETAILS

STREET LIGHTING PLANS

SHT NO.	SHEET DESCRIPTION
L-1	STREET LIGHTING "RB" 123+50.00 TO "RB" 142+50.00
L-2	STREET LIGHTING "RB" 142+50.00 TO "RB" 161+50.00
L-3	STREET LIGHTING "RB" 161+50.00 TO "RB" 180+50.00
L-4	STREET LIGHTING "RB" 180+50.00 TO "RB" 199+50.00
L-5	STREET LIGHTING "RB" 199+50.00 TO "RB" 218+50.00
L-6	STREET LIGHTING NOTES AND DETAILS
L-7	STREET LIGHTING CIRCUIT CAPACITY VERIFICATION

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

KEY MAP AND INDEX OF DRAWINGS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT CHECKED BY: KLT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: NONE
VERT: NONE
FIELD BOOK

L-1728A
DRAWING NO.
G-2
SHT. ___ OF ___

CLARK COUNTY WATER RECLAMATION DISTRICT

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

CLARK COUNTY WATER RECLAMATION DISTRICT **DATE**

SIGNATURE ON THESE PLANS WILL 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.

BENCHMARK

CLARK COUNTY BENCHMARK 2C20 11SWS

NAVD 88 ELEVATION 2550.43 FEET (PROJECT VALUE)
NAVD 88 ELEVATION 777.372 METERS

NAVD 88 (v.2003) ELEVATION 2550.47 FEET
NAVD 88 (v.2003) ELEVATION 777.386 METERS

RIVET AND SQUARE ALUMINUM PLATE IN A CONCRETE MONUMENT, NORTHEAST QUADRANT OF RAINBOW BLVD. AND WINDMILL LN.

BASIS OF BEARING

NORTH 87°02'16" EAST, BEING THE BEARING ON THE LINE BETWEEN CLARK COUNTY G.I.S. MONUMENT 855 AND CLARK COUNTY G.I.S. MONUMENT 854. SAID BEARING IS BASED UPON THE NORTH AMERICAN DATUM OF 1983, PUBLISHED VALUES AS SHOWN BY THE CLARK COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY TITLED "LAS VEGAS VALLEY GEODETIC CONTROL NETWORK", RECORDED IN FILE 88, PAGE 53 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

LAS VEGAS VALLEY WATER DISTRICT (LVVWD) STANDARD NOTES

LVVWD PROJECT #25553

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 PM THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. **WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT NUMBER IDENTIFIED ABOVE.**

2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE 2003 EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS).

3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA.

4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.

5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.

6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.

7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.

8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.19 OF THE 2003 EDITION OF THE UDACS.

9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED, AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.

10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3802, TWO (2) WORKING DAYS PRIOR TO METER PICKUP.

11. ANY INTERRUPTION OF SERVICE MUST BE APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.

12. ANY WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.

13. TELEPHONE "CALL BEFORE YOU DIG" AT 1-800-227-2600.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT DATE

EXTENDING SERVICE LATERALS 2" AND SMALLER

WATER METERS IN FINISHED ROADWAYS SHALL BE RELOCATED TO THE BACK OF CURB AND SHALL BE INSTALLED PER THE UDACS PLATE NO. 1B OR 1D. ALL SERVICE LATERALS 2" AND SMALLER MAY BE EXTENDED, PROVIDING THE FOLLOWING CRITERIA ARE MET:

1. LATERAL CAN ONLY BE EXTENDED IF CONNECTING TO COPPER.
2. LATERAL MUST BE INSTALLED AT 90 DEGREES TO THE MAIN.
3. AN EXISTING SERVICE LATERAL THAT IS NOT COPPER IS TO BE ABANDONED FROM THE EXISTING WATER MAIN, AND REPLACED WITH A COPPER SERVICE LATERAL PER UDACS PLATE NO. 1B OR 1D. IF THE CORPORATION STOP IS DAMAGED BEYOND REPAIR OR PULLED FROM THE EXISTING WATER MAIN, THE MAIN SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE, IN A MANNER APPROVED BY THE LVVWD. IF THE CORPORATION STOP IS NOT WATER TIGHT, THE CONTRACTOR SHALL NOTIFY LVVWD COMMUNICATION SUPPORT CENTER (702-258-7171) FOR FURTHER DIRECTION.

GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS FOR THIS PROJECT SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA, NEVADA" LATEST EDITION, THE "UNIFORM DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA, NEVADA" LATEST EDITION AND THE "CLARK COUNTY SUPPLEMENT TO UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS", UNLESS OTHERWISE NOTED ON THE PLANS AND/OR SPECIAL PROVISIONS. THE IMPROVEMENT STANDARDS WILL HEREAFTER BE REFERRED TO AS "CLARK COUNTY AREA STANDARD DRAWINGS".
2. THE CONTRACTOR SHALL NOTIFY ALL AFFECTED PUBLIC ENTITIES, THE PROJECT ENGINEER, CLARK COUNTY AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF WORK.
3. LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM INFORMATION RECEIVED FROM THE APPLICABLE UTILITY COMPANIES. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES OR STRUCTURES NOT SHOWN, OR FOR UTILITIES OR STRUCTURES NOT SHOWN AT ACTUAL LOCATIONS ON THE DRAWINGS. EXISTING SERVICE LATERALS ARE NOT SHOWN ON THESE DRAWINGS. CONTRACTOR TO VERIFY THE EXACT LOCATION OF UTILITIES PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR'S RESPONSIBILITY 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.
4. THE CONTRACTOR SHALL NOT REMOVE TREES, SHRUBS, LAWNS, WALLS, FENCES, SIGNS, STRUCTURES, LIGHTS, OR ANY EXISTING IMPROVEMENTS OUTSIDE OF STREET RIGHT-OF-WAY, EXCEPT WHERE REQUIRED TO DO SO BY THE CONTRACT DRAWINGS OR BY THE ENGINEER. REPLACEMENT, RELOCATION OR RECONSTRUCTION OF ALL EXISTING IMPROVEMENTS INCLUDING SPRINKLER SYSTEMS, LAWNS, FENCES, WALLS, SIGNS, STEPS, SIDEWALK, DRIVEWAYS, LAWN LIGHTS, AND ALL OTHER ITEMS APPLICABLE TO THIS CONTRACT SHALL BE AS REQUIRED BY THE ENGINEER.
5. THE CONTRACTOR SHALL BACKFILL AND FINE GRADE ALL CUT OR FILL SLOPES TO MATCH EXISTING CONDITIONS TO THE SATISFACTION OF THE ENGINEER. WHERE EXISTING LAWNS ARE DAMAGED BY THE CONTRACTOR'S OPERATIONS, THE CONTRACTOR SHALL SOD THE AFFECTED AREA TO A CONDITION EQUAL TO OR BETTER THAN THAT WHICH EXISTED PRIOR TO CONSTRUCTION.
6. ALL BARRICADING AND TEMPORARY TRAFFIC CONTROL DEVICES OR METHODS USED DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA, NEVADA" LATEST EDITION.
7. REMOVAL OR RELOCATIONS OF POWER POLES, TELEPHONE POLES, JOINTLY-OWNED POLES, AND APPURTENANCES WHICH INTERFERE WITH IMPROVEMENTS REQUIRED TO BE CONSTRUCTED UNDER THIS CONTRACT, SHALL BE THE RESPONSIBILITY OF THE RESPECTIVE UTILITY COMPANY. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE UTILITY COMPANIES FAR ENOUGH IN ADVANCE AS TO NOT IMPACT THE SCHEDULE.
8. UNLESS OTHERWISE SHOWN ON THE CONTRACT DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL WATER SERVICES AND METERS WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
9. 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 SECTION 600 OF THE "STANDARD SPECIFICATIONS".
10. SPRINT SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL TELEPHONE FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
11. NOT USED
12. ALL EXISTING TRAFFIC SIGNS, STREET LIGHTS & SIGNS TO BE REMOVED SHALL BE SALVAGED BY THE CONTRACTOR AND DELIVERED TO THE CLARK COUNTY TRAFFIC OPERATIONS DIVISION LOCATED AT 5821 E. FLAMINGO ROAD, LAS VEGAS, NEVADA WITHIN 48 HOURS OF THEIR REMOVAL.
13. EXACT LOCATIONS OF ALL SAWCUT LINES SHALL BE DETERMINED IN THE FIELD BY THE CLARK COUNTY INSPECTOR.
14. ALL SANITARY SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CLARK COUNTY SANITATION DISTRICT DESIGN AND CONSTRUCTION STANDARDS.
15. THE PLANS DO NOT SHOW ALL SEWER LATERALS, SEWER FORCE MAINS AND WATER SERVICE LATERALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REPAIRS OR RELOCATIONS OF LATERALS BROKEN OR IN CONFLICT WITH THE PROPOSED STORM DRAIN OR ROADWAY CONSTRUCTION.
16. CONTRACTOR SHALL MAINTAIN CONTINUOUS SEWER SERVICE TO ALL CCSD & CLV CUSTOMERS. SEWER LATERALS CUT DURING CONSTRUCTION SHALL BE REPAIRED BY CONTRACTOR PER CCSD DESIGN AND CONSTRUCTION STANDARDS. CONTRACTOR SHALL IMMEDIATELY REPORT ANY SANITARY SEWER OR SEWER LATERALS THAT CANNOT BE RECONNECTED TO SEWER MAIN DUE TO STORM DRAIN CONFLICT. CLARK COUNTY SHALL BE RESPONSIBLE FOR PROVIDING RESUBMITTED APPROVED MAIN LINE SEWER EXTENSION PLANS TO PROVIDE NEW MAIN TO REROUTE ANY SEWERS THAT CANNOT BE RECONNECTED.
17. THE NEVADA POWER COMPANY SHALL BE RESPONSIBLE FOR THE RELOCATION OF UNDERGROUND OR OVERHEAD POWER LINES THAT INTERFERE WITH THE REQUIRED IMPROVEMENTS AS SHOWN ON THE PLANS.
18. CURB AND GUTTER OF 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 TEST AS SOON AS POSSIBLE AFTER CONSTRUCTION.
19. POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENT SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO THE CLARK COUNTY.
20. THE CONTRACTOR SHALL VERIFY IN THE FIELD ALL DIMENSIONS, EXISTING CONDITIONS AND POINTS OF CONNECTION WITH ADJOINING PROPERTY (PUBLIC AND PRIVATE). ANY DISCREPANCIES SHALL BE CALLED TO THE ATTENTION OF THE PROJECT ENGINEER PRIOR TO PROCEEDING WITH THE WORK.
21. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE PROPER DRAINAGE, INGRESS AND EGRESS TO THE PROJECT.
22. FINAL PLANTMIX BITUMINOUS SURFACE (PBS) PAVEMENT SHALL BE ONE-HALF INCH ABOVE THE LIP OF GUTTER (INCLUDING OPEN GRADE). PAVEMENT SURFACES SHALL BE FLUSH WITH EDGES OF CROSS GUTTERS EXCEPT AT SIDEWALK RAMPS WHERE PBS PAVEMENT SHALL BE FLUSH WITH CONCRETE RAMP.
23. THE CONTRACTOR SHALL MAINTAIN AN ONGOING REMOVAL PROCESS OF ALL SPILLAGE OF EXCAVATION MATERIAL ON ALL PAVED STREETS.
24. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING TRAFFIC SIGNS, NOT SPECIFICALLY NOTED ON THE DRAWINGS, WHICH ARE TO BE RELOCATED OR REMOVED.
25. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED THEREUNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR.
26. OFFSET DIMENSIONS TO CURB AND GUTTER ARE MEASURED TO BACK OF CURB. OFFSET DIMENSIONS TO GLUE DOWN MEDIAN ARE MEASURED TO FACE OF CURB/MEDIAN.
27. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL, OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE COUNTY TRAFFIC MANAGER.
28. LVACTS INTERCONNECT CABLE POLICY IS IN EFFECT. INTERCONNECT CABLE MUST BE MAINTAINED AT ALL TIMES. CONTRACTOR SHALL PROVIDE TEMPORARY OVERHEAD INTERCONNECT CABLE WHILE PAVEMENT CABLE IS BEING RELOCATED. TEMPORARY AERIAL INSTALLATION MUST BE ACCEPTABLE TO THE COUNTY TRAFFIC MANAGER AND TO LVACTS. ANY DAMAGE TO THIS CABLE IS DEEMED AN EMERGENCY BY LVACTS, CITY OF LAS VEGAS, CLARK COUNTY AND NDOT AND MUST BE REPAIRED IMMEDIATELY TO LVACTS' ACCEPTANCE. $3,500 PER DAY DAMAGES WILL BE ASSESSED AFTER TWENTY-FOUR (24) HOURS HAS ELAPSED FROM THE TIME OF BREAK OR DAMAGE.
29. ALL NEW OR REPLACEMENT TRAFFIC SIGNAL LOOPS SHALL BE INSTALLED USING CABLE-IN-DUCT WIRING, SHALL HAVE INDEPENDENT LEAD-IN WIRES FOR EACH LOOP FROM THE CONTROLLER TO THE PULL-BOX, AND EACH LEAD-IN SHALL BE INDIVIDUALLY TAGGED.
30. THE CONTRACTOR SHALL DETERMINE THE LOCATION AND DEPTH OF SUSPECTED UTILITY INTERFERENCES, AND SHALL FURNISH INFORMATION ON THE SAME TO THE ENGINEER, NOT LESS THAN TEN (10) DAY PRIOR TO THE ANTICIPATED IMPACT OF THESE SUSPECTED INTERFERENCES ON HIS WORK. IF CONFLICTS EXIST, THE CONTRACTOR WILL IMMEDIATELY CONTACT THE ENGINEER AND PROVIDE THE ENGINEER WITH ALL THE NECESSARY DATA SUCH AS ELEVATIONS, HORIZONTAL LOCATIONS, ETC., AND PROVIDE THE ENGINEER WITH SKETCHES INDICATING THE PROPOSED IMPROVEMENT AND THE UTILITY CONFLICT. THE ENGINEER WILL EXAMINE AND REVIEW ALL THE DATA AND SKETCHES PROVIDED, AND WILL PROVIDE THE CONTRACTOR WITH AN ALTERNATIVE DESIGN WITHIN FIVE (5) DAYS AFTER RECEIPT OF DATA AND SKETCHES.
31. PRIOR TO BEGINNING OF CONSTRUCTION, OR RELOCATION OF ANY TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION INFORMING OF THE DATE WORK WILL BEGIN.
32. THREE (3) WORKING DAYS PRIOR TO TURN-ON OR COMPLETION OF MODIFICATION(S) TO A TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION THAT WORK IS BEING COMPLETED AND SHALL INCLUDE THE PROPOSED DATE OF COMPLETION.
33. 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 GROUND MOUNTED STOP SIGNS AT ALL STREET ENCROACHMENTS INTO EXISTING COUNTY STREETS IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED. STOP SIGNS SHALL BE INSTALLED IN GROUND. NO TEMPORARY MOUNTINGS WILL BE ALLOWED.
34. COX COMMUNICATIONS SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL CATV FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.







REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

GENERAL NOTES

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: LG
DESIGNED BY: KLT CHECKED BY: JRT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: NONE
VERT: NONE
FIELD BOOK

L-1728A
DRAWING NO.
G-3
SHT. ___ OF ___

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LEGEND

- CENTERLINE
- CONTROL OF ACCESS WITH FENCE
- CONTROL OF ACCESS WITHOUT FENCE
- EASEMENT LINE
- PROPOSED RIGHT-OF-WAY LINE
- EXISTING RIGHT-OF-WAY LINE
- EXISTING PROPERTY LINE
- HYDRAULIC GRADE LINE (PROFILE)
- GRADE BREAK (PROFILE)
- EXISTING TELEPHONE LINE
- EXISTING CABLE TV LINE
- EXISTING WATER LINE
- EXISTING STORM DRAIN LINE
- EXISTING UNDERGROUND POWER LINE
- EXISTING OVERHEAD POWER LINE
- EXISTING SANITARY SEWER LINE
- EXISTING GAS LINE
- PROPOSED SANITARY SEWER LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED STORM DRAIN MANHOLE
- EXISTING MANHOLE OR VAULT
- EXISTING INDEX CONTOUR (5' INTERVAL)
- EXISTING INTERMEDIATE CONTOUR (1' INTERVAL)
- EXISTING EDGE OF ASPHALT CONCRETE PAVING
- EXISTING FENCE (TYPE DELINEATED ON DRAWINGS)
- PROPOSED FENCE (TYPE DELINEATED ON DRAWINGS)
- EXISTING STREETLIGHT
- ULTIMATE STREETLIGHT
- EXISTING VALVE (GAS OR WATER)
- EXISTING FIRE HYDRANT-PUBLIC
- PROPOSED STORM DRAIN INLET
- EXISTING STORM DRAIN INLET
- ULTIMATE STORM DRAIN INLET
- EXISTING POWER OR TELEPHONE POLE
- PROPOSED ELEVATION
- EXISTING ELEVATION
- ULTIMATE ELEVATION
- EXISTING STREET SIGN
- CURVE NUMBER SYMBOL
- PROPOSED SAWCUT LINE
- ULTIMATE CURB, GUTTER, AND SIDEWALK
- PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE (CONSTRUCTION SHEETS)

ABBREVIATIONS

AC	ASPHALT CONCRETE	EXP	EXPANSION	PE	PROFESSIONAL ENGINEER or POLYETHYLENE	TEL	TELEPHONE
ALT	ALTERNATE	FDN	FOUNDATION	PED	PEDESTRIAN	TEMP	TEMPORARY
AP or ANG. PT.	ANGLE POINT	FC	FACE OF CURB	PG	PROPOSED GRADE	TG	TOP OF GRATE
APPR	APPROACH	FG	FINISH GRADE	PGL	PROFILE GRADE LINE	THRU	THROUGH
AVAR	AIR VACUUM/AIR RELEASE VALVE	FH	FIRE HYDRANT	PI	POINT OF INTERSECTION	TMH	TOP OF MANHOLE
AVE	AVENUE	FL	FLOW LINE	℄	PROPERTY LINE	TOP	TOP TOP OF BERM
BC	BACK OF CURB	FLR	FLARE	PMF	PAVEMENT MARKING FILM	TOP	TOP OF PIPE
BCR	BACK OF CURB RADIUS	FS	FILL SLOPE	POB	POINT OF BEGINNING	TP	TRANSMISSION POLE
BLDG	BUILDING	FT	FOOT/FEET	POC	POINT ON CURVE	TRANS	TRANSITION
BLVD	BOULEVARD	FWY	FREEWAY	POE	POINT OF ENDING	TRAP	TRAPEZOIDAL
BM	BENCHMARK	G	GAS	POT	POINT ON TANGENCY	TRW	TOP OF RETAINING WALL
BO	BLOW-OFF	GA	GAGE	PP	POWER POLE	TS	TRAFFIC SIGNAL
BOC	BEGINNING OF CURVE	GB	GRADE BREAK	PPCBR	PORTABLE PRECAST CONC. BARRIER RAIL	TSI	TRAFFIC SIGNAL INTERCONNECT
BOT	BOTTOM (OF PIPE)	GRD	ELECTRICAL GROUND	PROP	PROPOSED	TYP	TYPICAL
BR	BRIDGE	GRND	GROUND	PRC	POINT OF REVERSE CURVATURE	UDACS	UNIFORM DESIGN & CONST STANDARDS
BS	BACK SLOPE	H	HEIGHT	PRVC	POINT OF REVERSE VERTICAL CURVE	USDCCA	UNIFORM STD. DWG. CLARK CO. AREA
BSW	BACK OF SIDEWALK	HDPE	HIGH DENSITY POLYETHYLENE PIPE	PSI	POUNDS PER SQUARE INCH	UT	UNDERGROUND TELEPHONE
BVC	BEGIN VERTICAL CURVE	HERCP	HORIZONTAL ELLIPTICAL RCP	PT	POINT OF TANGENCY	UTACS	ULTRA-THIN ASPHALT CONCRETE SURFACE
C/A	CONTROLLED ACCESS FENCE	HDWL	HEADWALL	PU	PERFORATED UNDERDRAIN	V	DESIGN SPEED (VELOCITY)
CALC	CALCULATED	HGL	HYDRAULIC GRADE LINE	PVC	POLYVINYL CHLORIDE	VAR	VARIABLE/VARIES
CATV	UNDERGROUND CABLE TV	HORIZ	HORIZONTAL	PVI	POINT OF VERTICAL INTERSECTION	VC	VERTICAL CURVE
CCPW	CLARK COUNTY PUBLIC WORKS	HP	HIGH POINT	PVMT	PAVEMENT	VERT	VERTICAL
CCBM	CLARK COUNTY BENCH MARK	HWY	HIGHWAY	R	RADIUS	VG	VALLEY GUTTER FLOW LINE
CCWRD	CLARK COUNTY WATER RECLAMATION DISTRICT	INT	INTERSECTION	RCB	REINFORCED CONCRETE BOX	VGFL	
CG	CURB AND GUTTER	INV	INVERT	RCP	REINFORCED CONCRETE PIPE	W	WATER
CHAN	CHANNEL	JT	JOINT	RD	ROAD	W.	WEST
℄	CENTER LINE	L	LENGTH	RDWY	ROADWAY	WT	WEIGHT
CLR	CLEAR OR CLEARANCE	LBS	POUNDS	REC	RECTANGULAR	XING	CROSSING
CLSM	CONTROLLED LOW STRENGTH MATERIAL	LF	LINEAR FEET	REINF	REINFORCED	YD	YARD
CONC	CONCRETE	LN	LANE	RGRCP	RUBBER GASKETED RCP		
CONN	CONNECTOR	LOC	LIMITS OF CONSTRUCTION	RND	ROUND		
CONST	CONSTRUCT OR CONSTRUCTION	LP	LOW POINT	RP	RADIUS POINT		
COORD	COORDINATE	LT	LEFT	RT	RIGHT		
COR	CORNER	LVVWD	LAS VEGAS VALLEY WATER DISTRICT	R/W	RIGHT OF WAY		
CY or CU YD	CUBIC YARD(S)	MATL	MATERIAL	RW	REUSE/RECYCLED WATER		
Δ	DELTA, ANGLE POINT	MAX	MAXIMUM	S.	SOUTH		
DB	DIRECT BURY	MED	MEDIAN	SB	SOUTH BOUND		
DBL	DOUBLE	MH	MANHOLE	SCH	SCHEDULE		
DCSWCS	DESIGN & CONST STDS WASTEWATER COLLECTION SYS	MI	MILE(S)	SD	STORM DRAIN		
DI	DROP INLET	MIN	MINIMUM	SDMH	STORM DRAIN MANHOLE		**ALIGNMENT ABBREVIATIONS**
DIA	DIAMETER	MISC	MISCELLANEOUS	SECT	SECTION	"BA"	BADURA AVENUE
DIST	DISTANCE	MOD	MODIFIY/MODIFIED	SHLDR	SHOULDER	"MA"	MAULE AVENUE
DR	DRIVE	MON	MONUMENT	SF or SQ FT	SQUARE FOOT/FEET	"RB"	RAINBOW BOULEVARD
DWG	DRAWING	MUTCD	MANUAL OF UNIFORM TRAFF CNTRL DVCS	SHT	SHEET	"RR"	ROBINDALE ROAD
E.	EAST	MP	MILE POST	SL	STREET LIGHT	"WL"	WINDMILL LANE
EA	EACH	MPH	MILES PER HOUR	SQ	SQUARE	"WS"	WARM SPRINGS ROAD
ECR	END CURB RETURN	N.	NORTH	SS	SANITARY SEWER		
EG	EXISTING GRADE	NB	NORTH BOUND	SSMH	SANITARY SEWER MANHOLE		
ELEC	ELECTRICAL	NDOT	NEVADA DEPT. OF TRANSPORTATION	STA	STATION		
ELEV	ELEVATION	NDP	NO DIRECT PAYMENT	STD	STANDARD		
EMBK	EMBANKMENT	NPC	NEVADA POWER COMPANY	ST	STREET		
EOC	END OF CURVE	NTS	NOT TO SCALE	STL	STEEL		
EP or EOP	EDGE OF PAVEMENT	OC	ON CENTER	STRUCT	STRUCTURE		
EQ	EQUAL	OHP	OVERHEAD POWER LINE	SURF	SURFACE/SURFACING		
ESMT	EASEMENT	P	POWER	SW	SIDEWALK		
EST	ESTIMATED	PB	PULL BOX	T	TELEPHONE		
EVC	END VERTICAL CURVE	PBS	PLANTMIX BITUMINOUS SURFACE	TAN	TANGENT		
EXIST	EXISTING	PC	POINT OF CURVATURE	TC	TOP OF CURB		
EXC	EXCAVATION	PCC	POINT OF COMPOUND CURVATURE	TCE	TEMPORARY CONSTRUCTION EASEMENT		

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

LEGEND AND ABBREVIATIONS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

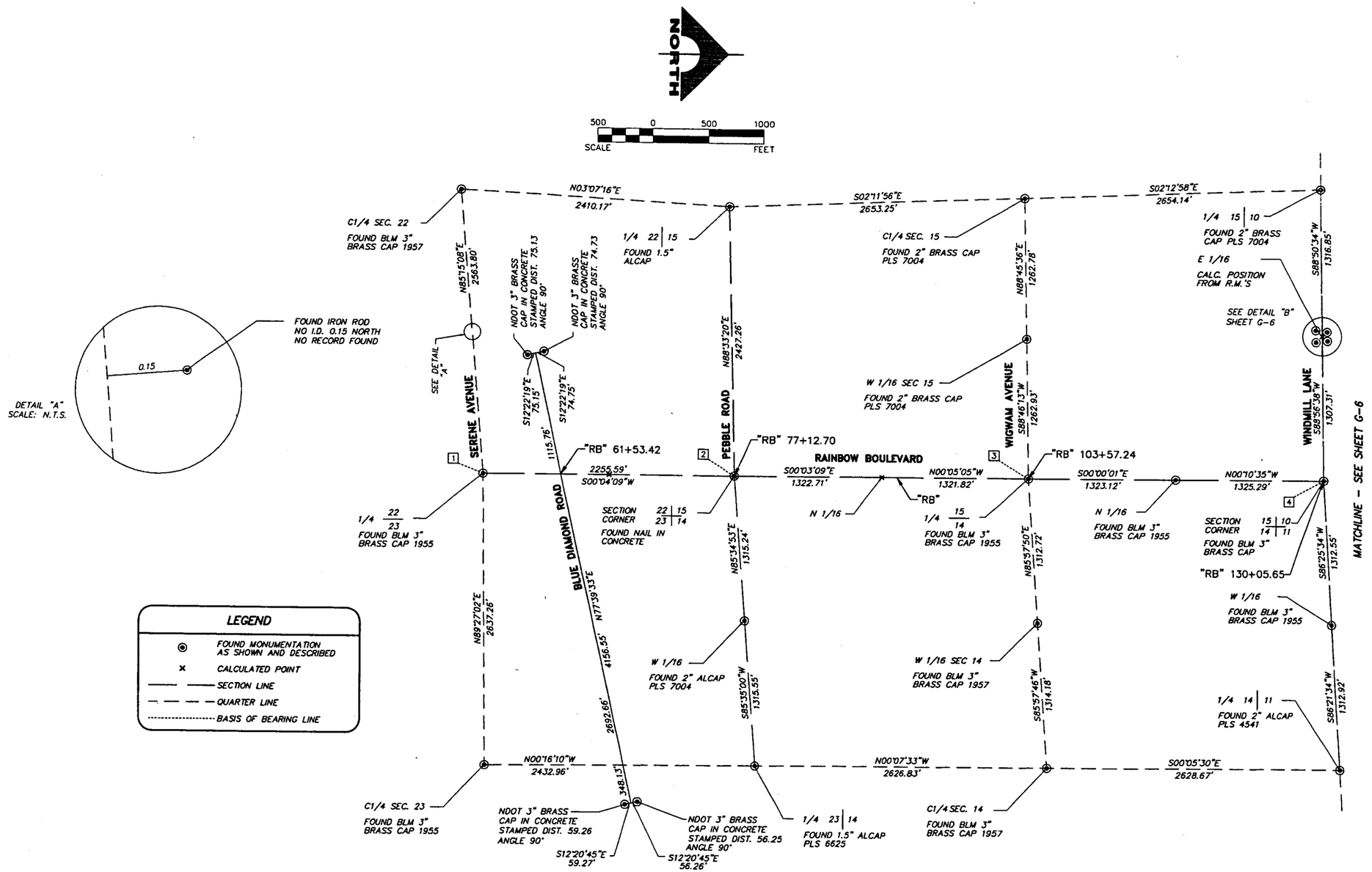
FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: LG
DESIGNED BY: KLT CHECKED BY: JRT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000• FAX: (702) 804-2299

SCALE
HORIZ: NONE
VERT: NONE
FIELD BOOK

L-1728A
DRAWING NO.
G-4
SHT. ___ OF ___



LEGEND

- FOUND MONUMENTATION AS SHOWN AND DESCRIBED
- CALCULATED POINT
- SECTION LINE
- QUARTER LINE
- BASIS OF BEARING LINE

CALCULATED CONTROL POINTS

POINT NO.	NORTHING	EASTING	DESCRIPTION
1	714216.72	756804.21	1/4 SEC COR 22, 23
2	716472.31	756806.93	SEC COR 15, 22, 23, 14
3	719116.84	756803.76	1/4 SEC COR 15, 14
4	721765.25	756799.67	SEC COR 10, 15, 14, 11

BASIS OF BEARINGS

NORTH 87°02'16" EAST, BEING THE BEARING ON THE LINE BETWEEN CLARK COUNTY G.I.S. MONUMENT 855 AND CLARK COUNTY G.I.S. MONUMENT 854. SAID BEARING IS BASED UPON THE NORTH AMERICAN DATUM OF 1983, PUBLISHED VALUES AS SHOWN BY THE CLARK COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY TITLED "LAS VEGAS VALLEY GEODETIC CONTROL NETWORK", RECORDED IN FILE 88, PAGE 53 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

AVOID HITTING OVERHEAD POWER LINES. IT'S EASY!
CALL BEFORE YOU DO OVERHEAD
1-702-593-8111

Call before you Dig.
1-800-227-2600

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

MONUMENTATION AND HORIZONTAL CONTROL

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: KLT
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SCALE
HORIZ: AS SHOWN
VERT: NONE
FIELD BOOK

L-1728A
DRAWING NO.
G-5
SHT. ____ OF ____

NORTH

SCALE 500 0 500 1000 FEET

CLARK COUNTY G.I.S. 855

1/4 15 | 10 FOUND 2" BRASS CAP PLS 7004

E 1/16 CALC. POSITION FROM R.M.'S

SEE DETAIL "B" SHEET G-6

S88°50'34"W 1316.85'

S87°02'17"W 15774.26'

N00°32'33"E 2653.05'

C1/4 SEC. 10 FOUND 1.5" ALCAP PLS 4046

N00°31'05"E 2637.77'

1/4 10 | 3 FOUND 1" PLASTIC CAP PLS 5876

S01°19'46"W 2690.61'

C1/4 SEC. 3 FOUND BLM 3" BRASS CAP 1957

HUB & TACK W/TAG PLS 13384 REFERENCE MONUMENTS (TYP.)

S45°57'05"W 200.07' 99.99' 100.08' 99.99' 99.99' 139.94' S44°04'06"E

DETAIL "C" SCALE: N.T.S.

MATCHLINE – SEE SHEET G-5

WINDMILL LANE

S88°56'38"W 1307.31'

S86°25'34"W 1312.55'

S86°21'34"W 1312.92'

W 1/16 FOUND BLM 3" BRASS CAP 1955

1/4 14 | 11 FOUND 2" ALCAP PLS 4541

BASIS OF BEARING PER FILE 88, PAGE 53 SURVEYS

ROBINDALE ROAD

N89°02'17"E 2645.07'

HUB & TACK W/TAG PLS 13384 REFERENCE MONUMENTS (TYP.)

"RB" 156+52.70

N44°02'26"W 200.00'

RAINBOW BOULEVARD

S01°00'36"W 1320.70'

N00°59'15"E 1326.35'

N45°57'27"E 200.00'

S 1/16 FOUND BLM 3" BRASS CAP 1955

1/4 10 | 11 FOUND PK NAIL WITH REFERENCE MONUMENTS

SECTION CORNER 15 | 10 / 14 | 11 FOUND BLM 3" BRASS CAP

"RB" 130+05.65

S86°50'23"W 1321.02'

W 1/16 SEC 11 FOUND 2" ALCAP PLS 4541

S86°50'23"W 1330.12'

C1/4 SEC. 11 FOUND 2" ALCAP IN WELL PLS 4541

S01°35'28"W 2628.63'

CLARK COUNTY G.I.S. 854

SEE DETAIL "C" THIS SHEET

S00°58'33"W 1323.41'

N 1/16 FOUND PK NAIL WITH REFERENCE MONUMENTS CALC. POSITION FROM RM'S

N01°00'07"E 1323.18'

SECTION CORNER 10 | 3 / 11 | 2 FOUND BLM 3" BRASS CAP

S88°52'10"W 1333.77'

W 1/16 SEC 3 FOUND 1.5" ALCAP PLS 8421

WARM SPRINGS ROAD

N88°51'21"E 1333.29'

S87°14'30"W 2678.02'

S01°36'05"W 2629.95'

1/4 11 | 2 FOUND BLM 3" BRASS CAP 1955

S03°45'12"W 1350.23'

"RB"

"RB" 182+99.29

S 1/16 FOUND BLM 3" BRASS CAP

BADURA AVENUE

N03°41'46"E 1350.63'

1/4 3 / 2 FOUND 3" ALCAP PLS 5571

S88°48'13"W 1369.79'

E 1/16 SEC 3 FOUND 2" ALCAP PLS 5571

W 1/16 SEC 2 FOUND BLM 3" ALCAP 1957

S87°25'19"W 1290.11'

C1/4 SEC. 2 FOUND BLM 3" BRASS CAP 1957

S01°40'57"W 2683.81'

MAULE AVENUE

N88°47'49"E 1390.39'

N00°51'03"W 1363.93'

"RB" 210+00.09

S87°24'34"W 1290.79'

N00°50'19"W 1317.30'

HUB & TACK W/TAG PLS 13384 REFERENCE MONUMENTS (TYP.)

N42°20'04"E 79.98' 57.47' 78.06' 61.79' S43°49'28"E

DETAIL "B" SCALE: N.T.S.

LEGEND

- FOUND MONUMENTATION AS SHOWN AND DESCRIBED
- × CALCULATED POINT
- SECTION LINE
- QUARTER LINE
- BASIS OF BEARING LINE

CALCULATED CONTROL POINTS

POINT NO.	NORTHING	EASTING	DESCRIPTION
4	721765.25	756799.67	SEC COR 10, 15, 14, 11
5	724411.90	756845.81	1/4 SEC COR 10, 11
6	727058.10	756891.50	SEC COR 3, 10, 11, 2
7	729753.25	757066.95	1/4 SEC COR 3, 2
8	731117.04	757046.69	1/16 SEC COR 3, 2

BASIS OF BEARINGS

NORTH 87°02'16" EAST, BEING THE BEARING ON THE LINE BETWEEN CLARK COUNTY G.I.S. MONUMENT 855 AND CLARK COUNTY G.I.S. MONUMENT 854. SAID BEARING IS BASED UPON THE NORTH AMERICAN DATUM OF 1983, PUBLISHED VALUES AS SHOWN BY THE CLARK COUNTY DEPARTMENT OF PUBLIC WORKS SURVEY TITLED "LAS VEGAS VALLEY GEODETIC CONTROL NETWORK", RECORDED IN FILE 88, PAGE 53 OF SURVEYS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD

1-702-593-6111

Avoid cutting underground utility lines. It's costly.

Call before you Dig. 1-800-227-2600 UNDERGROUND SERVICE (USA)

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

MONUMENTATION AND HORIZONTAL CONTROL

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: KLT

DESIGNED BY: KLT CHECKED BY: KLT

APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE

HORIZ: AS SHOWN

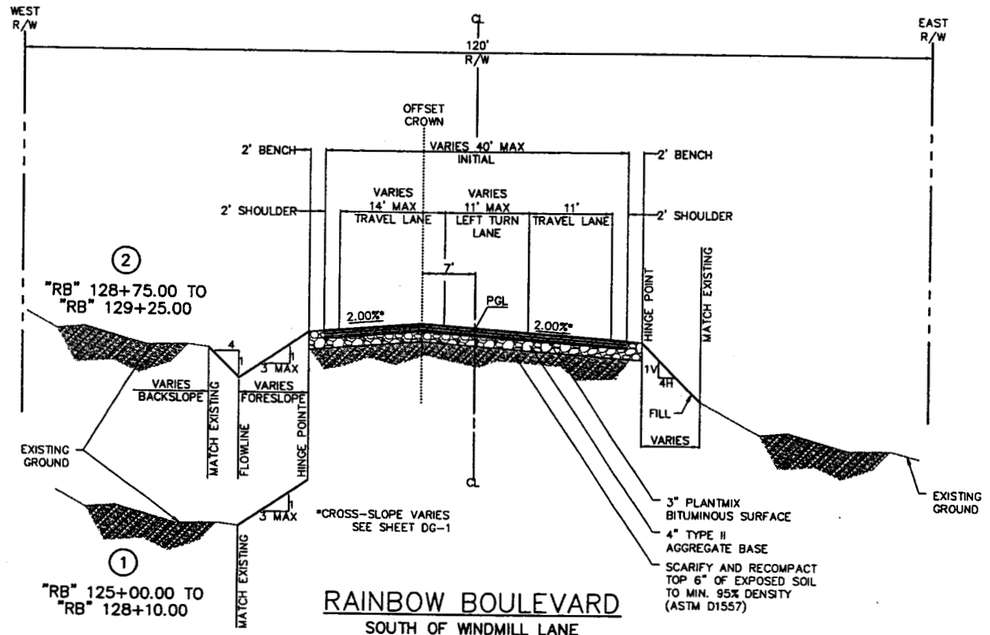
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FIELD BOOK

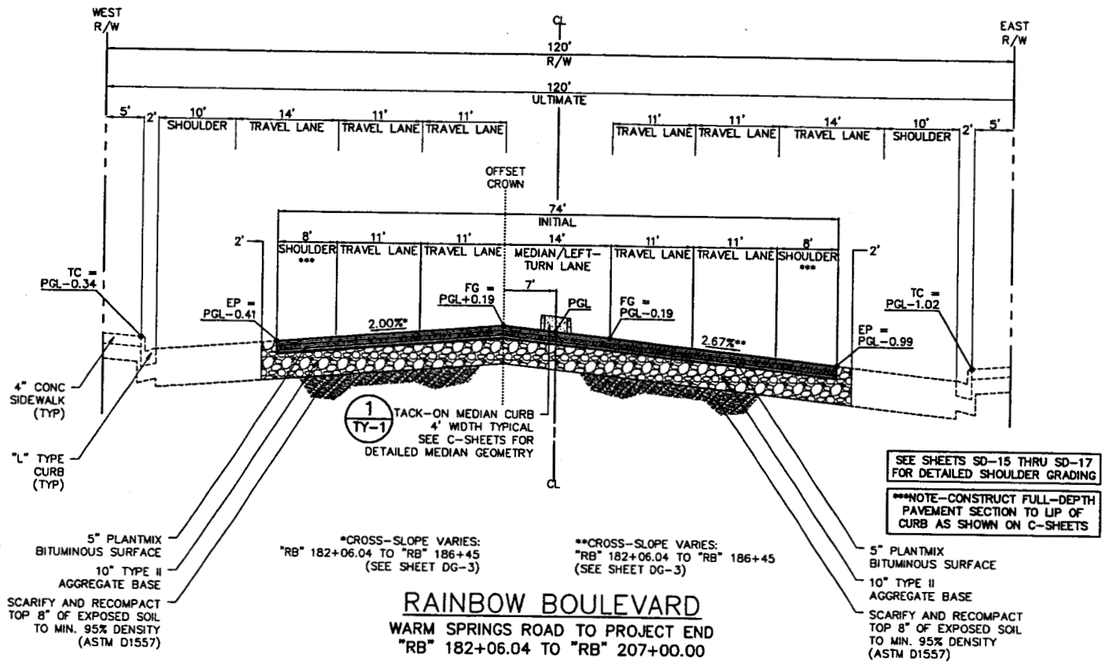
L-1728A

DRAWING NO. G-6

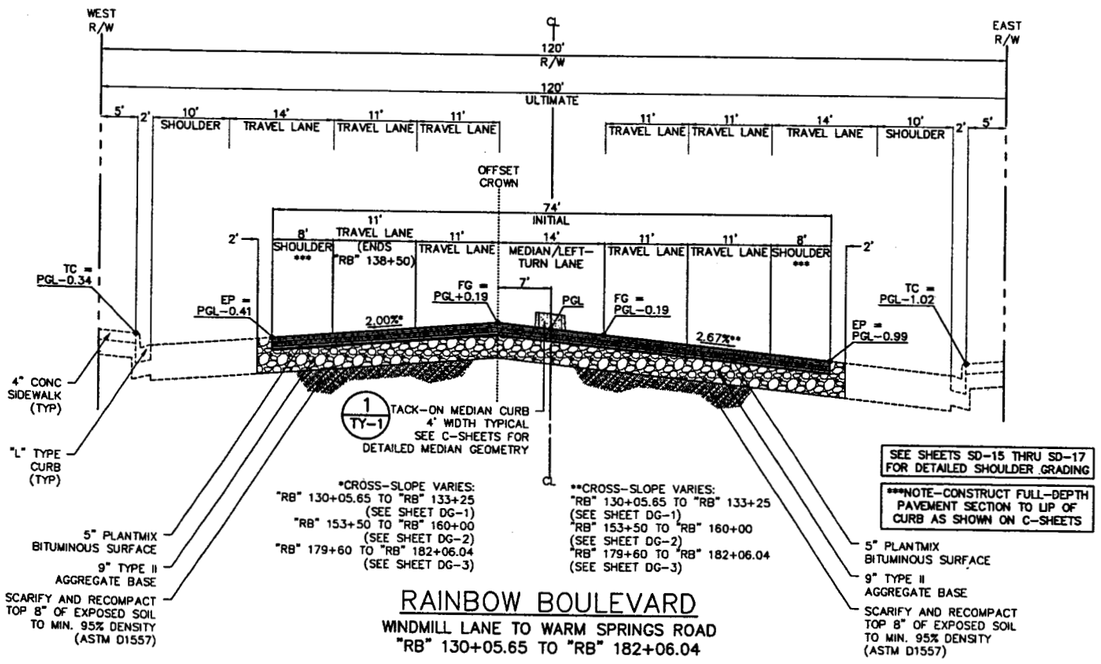
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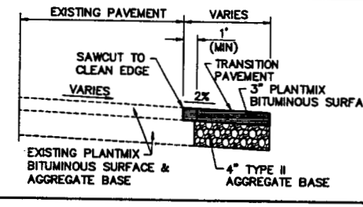
RAINBOW BOULEVARD
SOUTH OF WINDMILL LANE
"RB" 125+00.00 TO "RB" 130+05.65



RAINBOW BOULEVARD
WARM SPRINGS ROAD TO PROJECT END
"RB" 182+06.04 TO "RB" 207+00.00



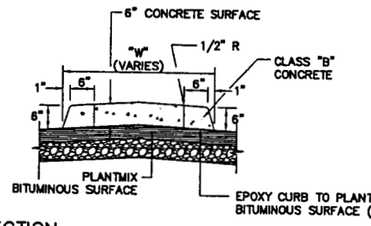
RAINBOW BOULEVARD
WINDMILL LANE TO WARM SPRINGS ROAD
"RB" 130+05.65 TO "RB" 182+06.04



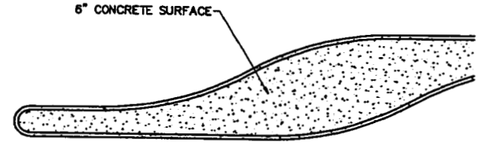
TRANSITION PAVEMENT LOCATIONS:
RAINBOW BLVD SOUTH OF WINDMILL LANE (SEE TYPICAL SECTION)
EAST AND WEST LEG AT WINDMILL LANE INTERSECTION
WEST LEG AT SANTOLI AVENUE
EAST AND WEST LEG AT WARM SPRINGS ROAD INTERSECTION

TRANSITION PAVEMENT DETAIL
NOT TO SCALE

NOTES:
1. 1/2" RADIUS ROUNDED EDGES ON ALL EXPOSED CORNERS.
2. MEDIAN SURFACE TREATMENT SHALL BE CLASS B CONCRETE SLAB.
3. FOR CONCRETE SLAB CONSTRUCT WEAKENED PLANE JOINT EVERY 10 FEET AND EXPANSION JOINT EVERY 30 FEET.
4. FOR FORMED CURB CONSTRUCT EXPANSION JOINT AT ALL COLD JOINTS, AT BEGINNING & END OF RETURN AND AT 30 FEET MAX. INTERVALS.
5. FOR EXPANSION JOINT AND WEAKENED PLANE DETAIL SEE USD NO. 234.
6. THE CONTRACTOR HAS THE OPTION TO POUR MEDIAN MONOLITHICALLY. IF POURED MONOLITHICALLY, MEDIAN WILL BE PAID FOR AS "CONCRETE MEDIAN SURFACE".



SECTION



PLAN

TACK-ON MEDIAN DETAIL
NOT TO SCALE

1 TY-1

AVOID HITTING OVERHEAD POWER LINES. IT'S COOL!
CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

Avoid hitting underground utility lines. It's easy.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

TYPICAL SECTIONS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: KLT
DESIGNED BY: KLT/JRT CHECKED BY: JRT
APPROVED BY

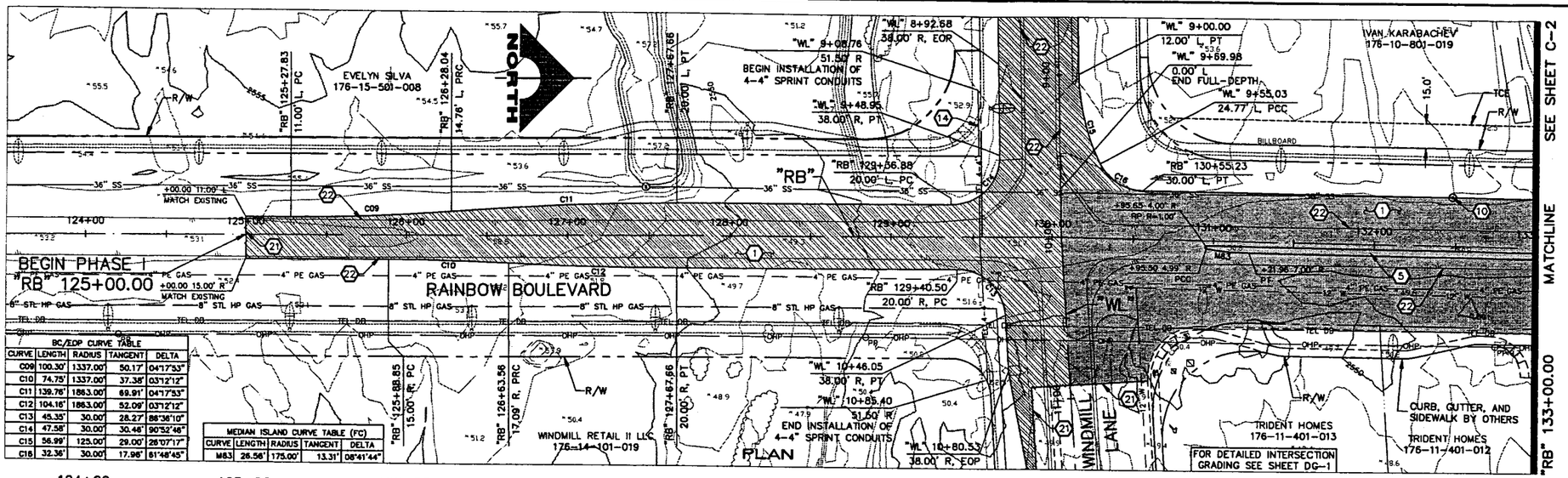
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: NONE
VERT: NONE
FIELD BOOK

L-1728A
DRAWING NO.
TY-1
SHT. ___ OF ___

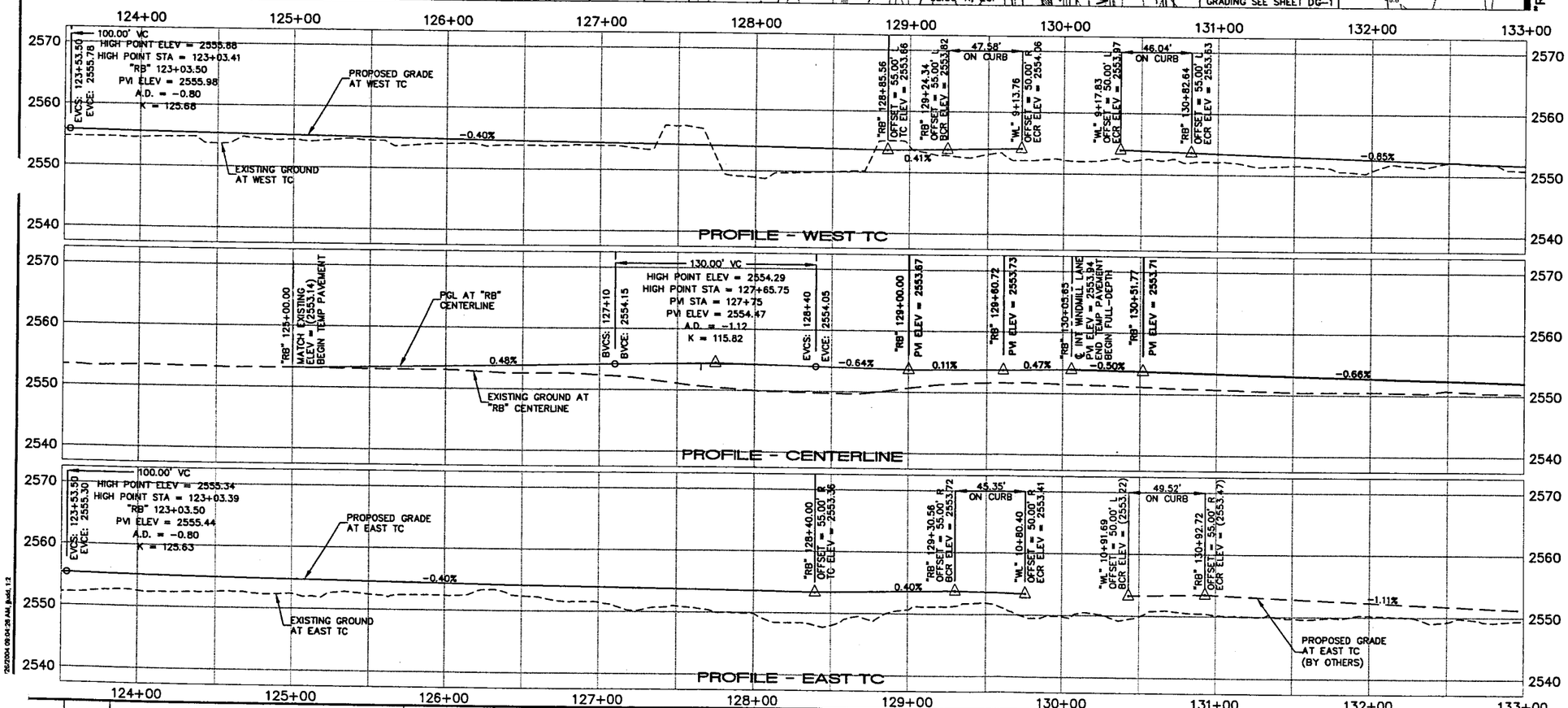
RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

F:\500-854\dwg\improv-plt\98 TY1
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BC/EOP CURVE TABLE				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C09	100.30'	1337.00'	50.17'	04°17'53"
C10	74.75'	1337.00'	37.38'	03°12'12"
C11	139.78'	1863.00'	69.91'	04°17'53"
C12	104.16'	1863.00'	52.09'	03°12'12"
C13	45.35'	30.00'	28.27'	86°36'10"
C14	47.58'	30.00'	30.46'	90°52'46"
C15	56.99'	125.00'	29.00'	26°07'17"
C16	32.36'	30.00'	17.98'	61°48'45"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M83	26.56'	175.00'	13.31'	08°41'44"



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
4. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE I)
5. CONSTRUCT TACK-ON MEDIAN
6. PROVIDE 1' MEDIAN OPENING
7. ADJUST WATER VALVE BOX COVER TO GRADE VALVE SHALL BE ACCESSIBLE AT ALL TIMES
8. ADJUST BLOW-OFF AND RISER ASSEMBLY
9. ADJUST VALVE VAULT ACCESS AND APPURTENANCES TO GRADE
10. ADJUST SANITARY SEWER MH TO GRADE
11. ADJUST ELECTRICAL MH COVER TO GRADE (BY NEVADA POWER)
12. ADJUST STORM DRAIN MH COVER TO GRADE
13. ADJUST WATER MH COVER TO GRADE
14. INSTALL 4-4" CONDUITS BY SPRINT
15. ADJUST AVAR TO GRADE
16. CONSTRUCT TACTILE WARNING PANEL (SEE DETAIL A SHEET C-11)
17. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE II)
18. REMOVE CONCRETE BARRIER RAIL
19. REMOVE CONCRETE SIDEWALK
20. REMOVE PULLBOX
21. SAWCUT AND MATCH EXISTING PAVEMENT
22. REMOVE EXISTING PAVEMENT
23. PROVIDE 5' MEDIAN OPENING

LVVWD SIGNATURE DATE

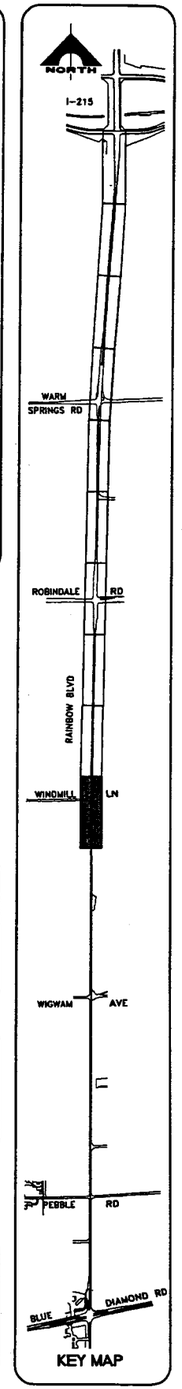
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE: 40 0 40 80 FEET



Call before you Dig. 1-800-227-2600



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 123+50.00 TO "RB" 133+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT/JRT CHECKED BY: KLT/JRT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
C-1
SHT. ___ OF ___

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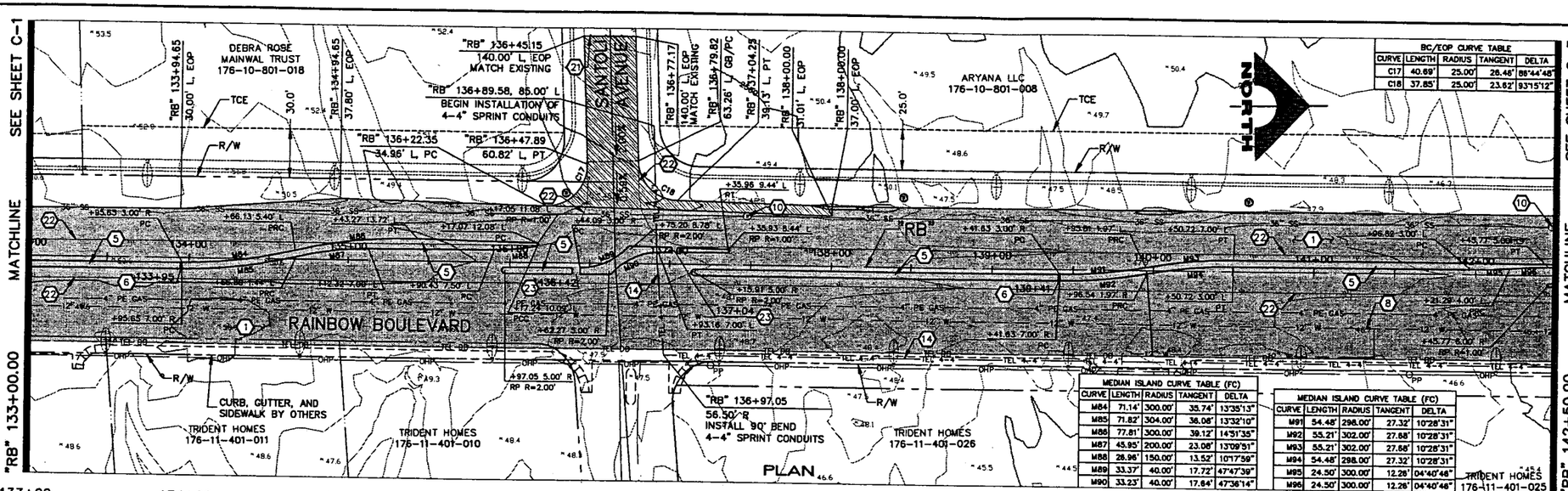
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SEE SHEET C-1

MATCHLINE "RB" 133+00.00

SEE SHEET C-3

MATCHLINE "RB" 142+50.00



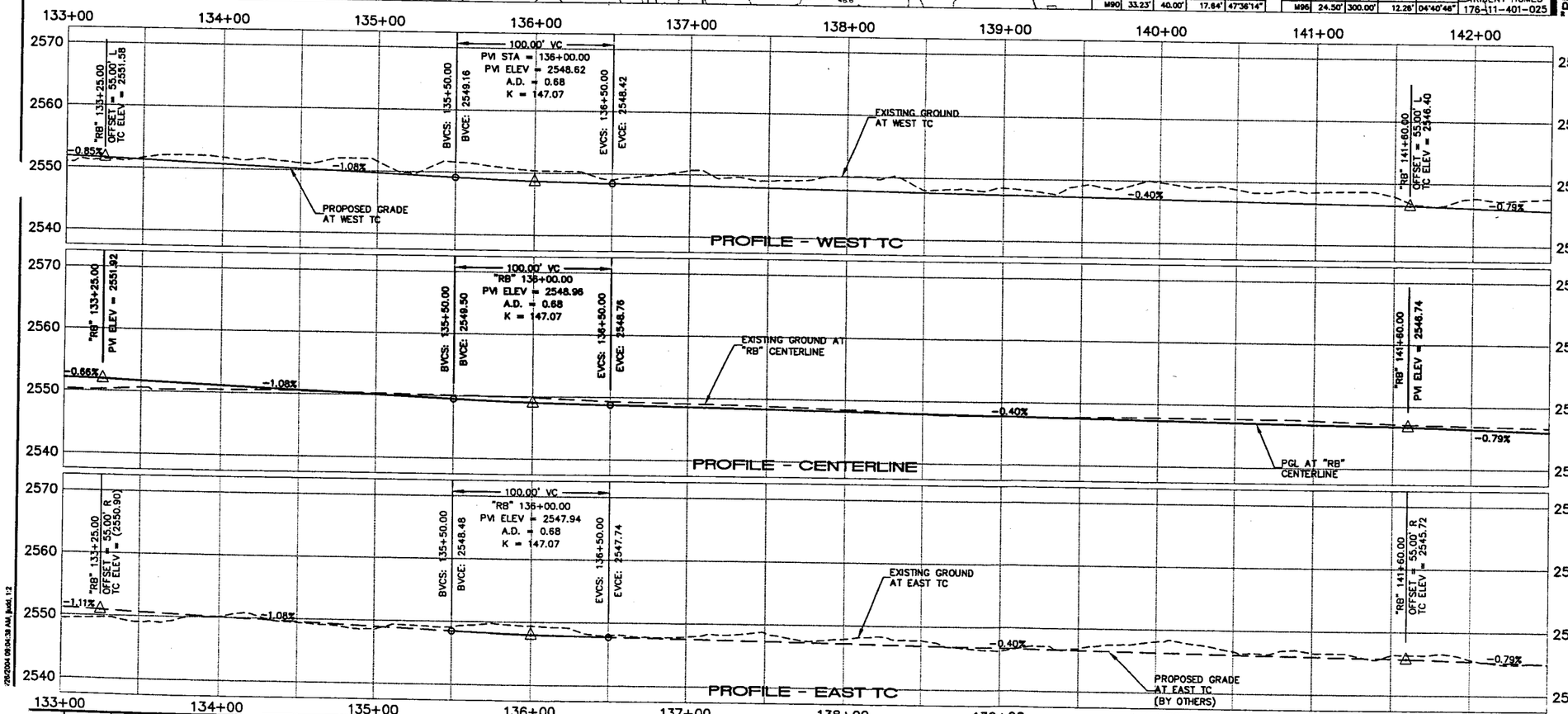
BC/EOP CURVE TABLE				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C17	40.69'	25.00'	26.46'	86°44'48"
C18	37.85'	25.00'	23.62'	93°15'12"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M84	71.14'	300.00'	35.74'	13°35'13"
M85	71.82'	304.00'	36.08'	13°32'10"
M86	77.81'	300.00'	39.12'	14°51'35"
M87	45.95'	200.00'	23.08'	13°09'51"
M88	28.96'	150.00'	13.52'	10°17'59"
M89	33.37'	40.00'	17.72'	47°47'39"
M90	33.23'	40.00'	17.64'	47°36'14"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M91	54.48'	298.00'	27.32'	10°28'31"
M92	55.21'	302.00'	27.68'	10°28'31"
M93	55.21'	302.00'	27.68'	10°28'31"
M94	54.48'	298.00'	27.32'	10°28'31"
M95	24.50'	300.00'	12.26'	04°40'46"
M96	24.50'	300.00'	12.26'	04°40'46"

CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
4. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE I)
5. CONSTRUCT TACK-ON MEDIAN
6. PROVIDE 1' MEDIAN OPENING
7. ADJUST WATER VALVE BOX COVER TO GRADE VALVE SHALL BE ACCESSIBLE AT ALL TIMES
8. ADJUST BLOW-OFF AND RISER ASSEMBLY
9. ADJUST VALVE VAULT ACCESS AND APPURTENANCES TO GRADE
10. ADJUST SANITARY SEWER MH TO GRADE
11. ADJUST ELECTRICAL MH COVER TO GRADE (BY NEVADA POWER)
12. ADJUST STORM DRAIN MH COVER TO GRADE
13. ADJUST WATER MH COVER TO GRADE
14. INSTALL 4-4" CONDUITS BY SPRINT
15. ADJUST AVAR TO GRADE
16. CONSTRUCT TACTILE WARNING PANEL (SEE DETAIL A SHEET C-11)
17. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE II)
18. REMOVE CONCRETE BARRIER RAIL
19. REMOVE CONCRETE SIDEWALK
20. REMOVE PULLBOX
21. SAWCUT AND MATCH EXISTING PAVEMENT
22. REMOVE EXISTING PAVEMENT
23. PROVIDE 5' MEDIAN OPENING

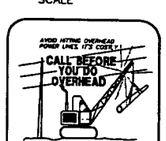


LVVWD SIGNATURE DATE

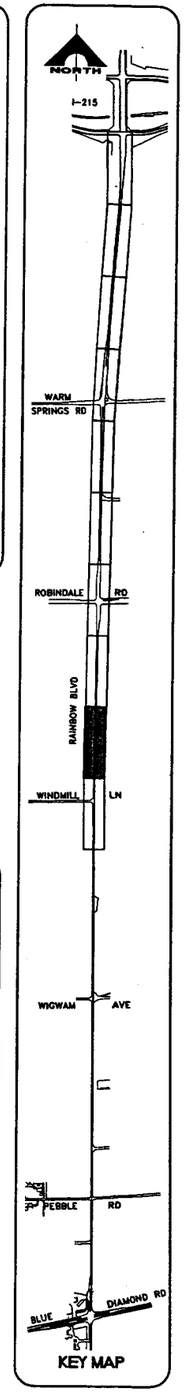
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE 40 0 40 80 FEET



Call before you Dig. 1-800-227-2600



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 133+00.00 TO "RB" 142+50.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: JPJ

DESIGNED BY: KLT/JRT CHECKED BY: KLT/JRT

APPROVED BY

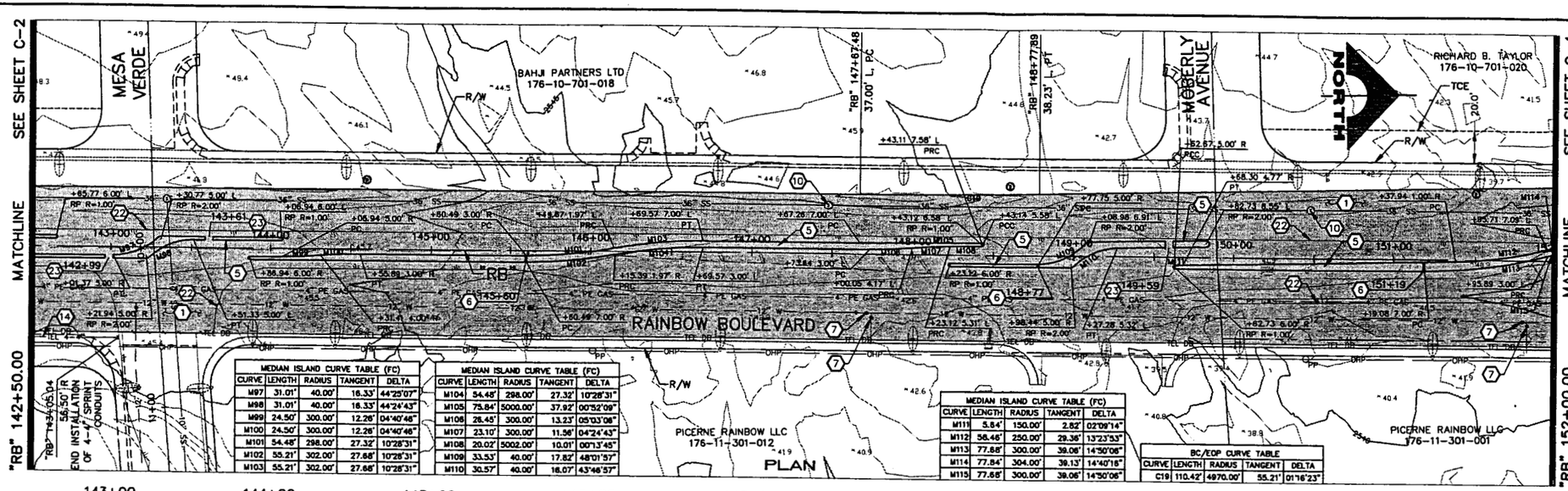
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
C-2
SHT. ____ OF ____

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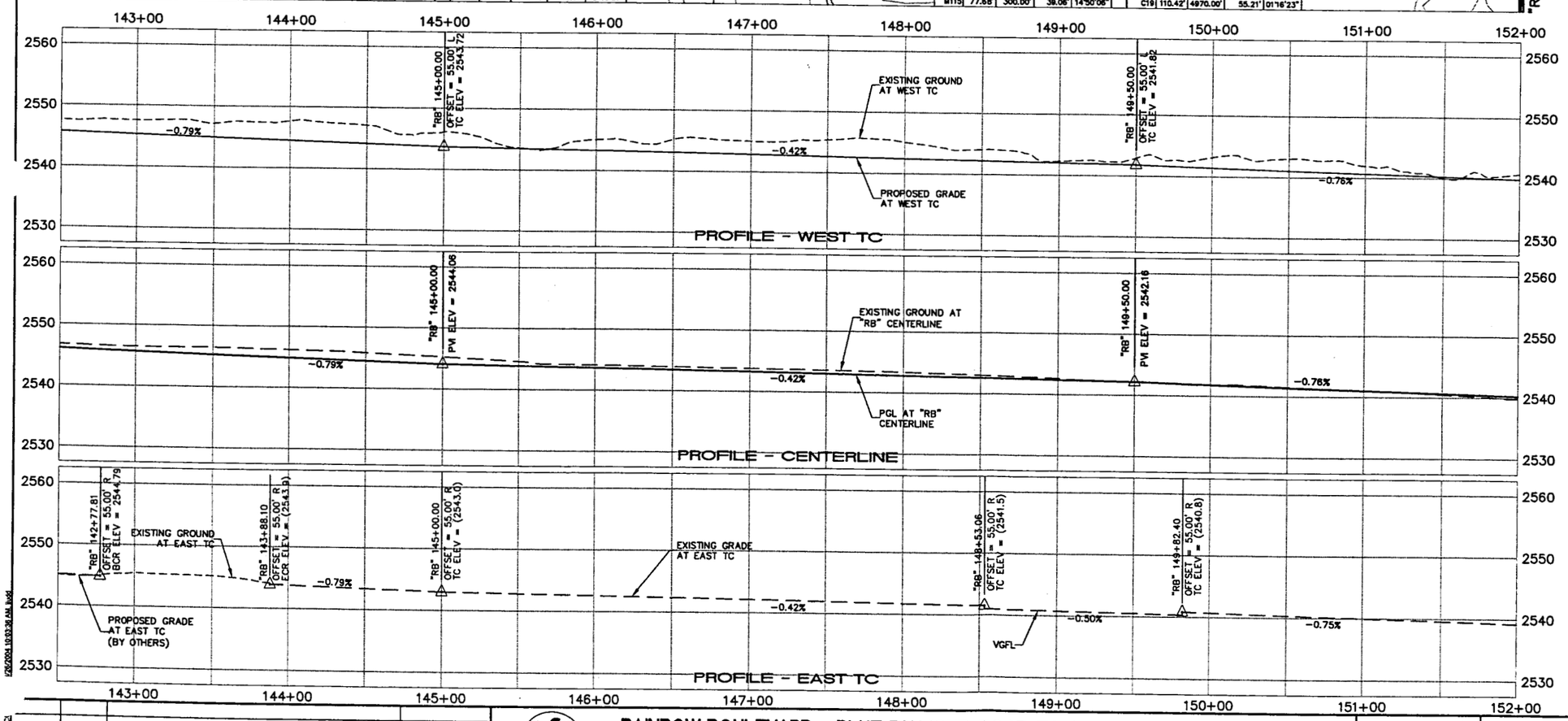


MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M97	31.01'	40.00'	16.33'	44°25'07"
M98	31.01'	40.00'	16.33'	44°24'43"
M99	24.50'	300.00'	12.26'	04°40'46"
M100	24.50'	300.00'	12.26'	04°40'46"
M101	54.48'	298.00'	27.32'	10°28'31"
M102	55.21'	302.00'	27.68'	10°28'31"
M103	55.21'	302.00'	27.68'	10°28'31"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M104	54.48'	298.00'	27.32'	10°28'31"
M105	75.84'	5000.00'	37.92'	00°52'09"
M106	26.45'	300.00'	13.23'	05°03'08"
M107	23.10'	300.00'	11.56'	04°24'43"
M108	20.02'	5002.00'	10.01'	00°13'45"
M109	33.53'	40.00'	17.82'	48°01'57"
M110	30.57'	40.00'	16.07'	43°46'57"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M111	5.84'	150.00'	2.82'	02°09'14"
M112	56.46'	250.00'	28.36'	13°23'53"
M113	77.68'	300.00'	39.06'	14°50'06"
M114	77.84'	304.00'	39.13'	14°40'15"
M115	77.68'	300.00'	39.06'	14°50'06"

BC/EOP CURVE TABLE				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C19	110.42'	4970.00'	55.21'	01°16'23"



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
4. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE I)
5. CONSTRUCT TACK-ON MEDIAN
6. PROVIDE 1' MEDIAN OPENING
7. ADJUST WATER VALVE BOX COVER TO GRADE VALVE SHALL BE ACCESSIBLE AT ALL TIMES
8. ADJUST BLOW-OFF AND RISER ASSEMBLY
9. ADJUST VALVE VAULT ACCESS AND APPURTENANCES TO GRADE
10. ADJUST SANITARY SEWER MH TO GRADE
11. ADJUST ELECTRICAL MH COVER TO GRADE (BY NEVADA POWER)
12. ADJUST STORM DRAIN MH COVER TO GRADE
13. ADJUST WATER MH COVER TO GRADE
14. INSTALL 4-4" CONDUITS BY SPRINT
15. ADJUST AVAR TO GRADE
16. CONSTRUCT TACTILE WARNING PANEL (SEE DETAIL A SHEET C-11)
17. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE II)
18. REMOVE CONCRETE BARRIER RAIL
19. REMOVE CONCRETE SIDEWALK
20. REMOVE PULLBOX
21. SAWCUT AND MATCH EXISTING PAVEMENT
22. REMOVE EXISTING PAVEMENT
23. PROVIDE 5' MEDIAN OPENING

LVVWD SIGNATURE DATE

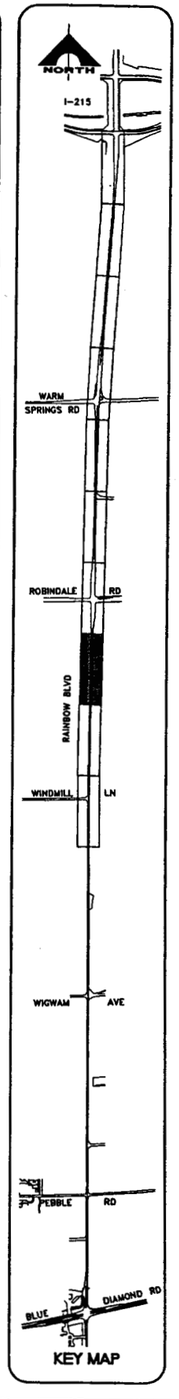
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE: 40 0 40 80 FEET



Call before you Dig. 1-800-227-2600



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 142+50.00 TO "RB" 152+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854	DRAWN BY: JPJ	SCALE	L-1728A
DESIGNED BY: KLT/JRT	CHECKED BY: KLT/JRT	HORIZ: AS SHOWN	DRAWING NO.
APPROVED BY		VERT: AS SHOWN	C-3
		FIELD BOOK	SHT. ___ OF ___

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

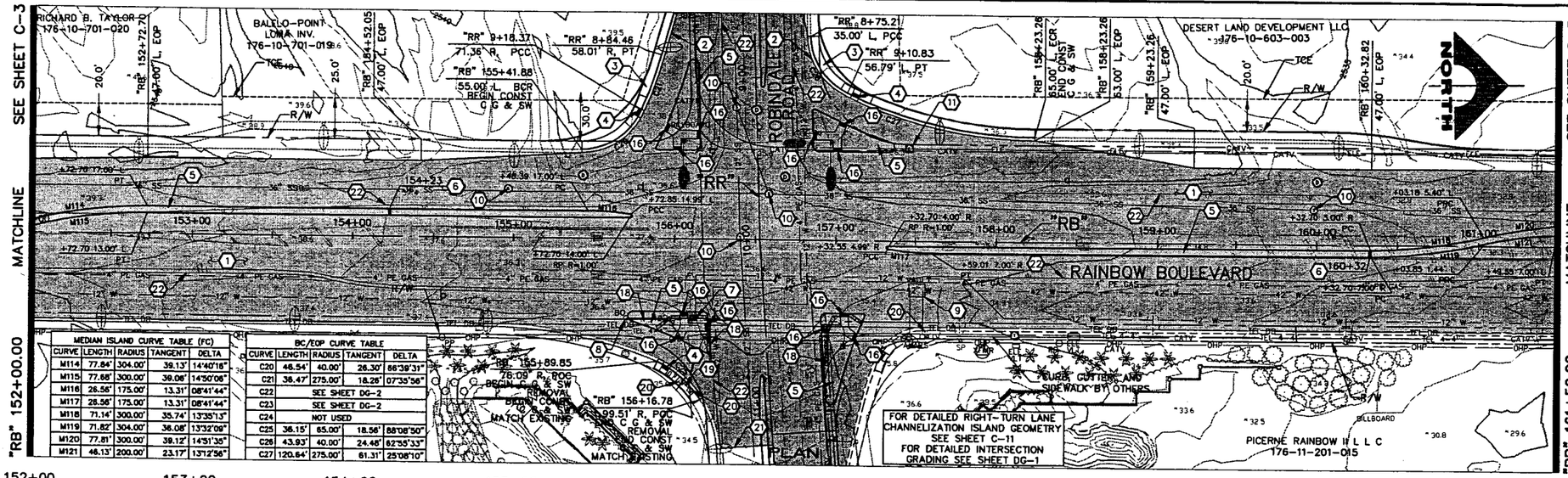
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2/6/2004 10:03:26 AM, kvd

SEE SHEET C-3

MATCHLINE "RB" 152+00.00

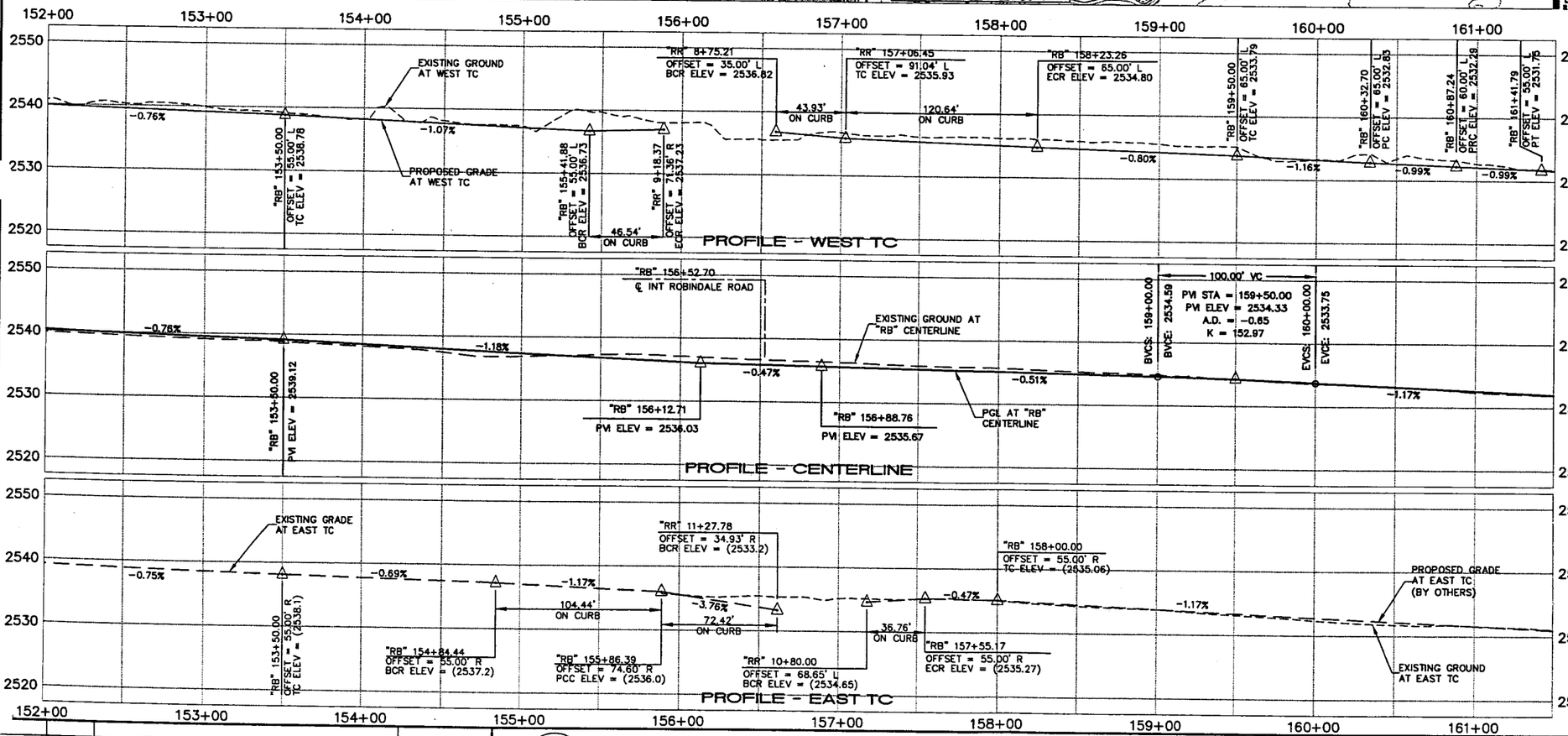
SEE SHEET C-5

MATCHLINE "RB" 161+50.00



MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M114	77.84'	304.00'	39.13'	14°40'18"
M115	77.68'	300.00'	39.08'	14°50'08"
M116	26.56'	175.00'	13.31'	08°41'44"
M117	26.56'	175.00'	13.31'	08°41'44"
M118	71.14'	300.00'	35.74'	13°35'13"
M119	71.82'	304.00'	36.08'	13°32'09"
M120	77.81'	300.00'	39.12'	14°51'35"
M121	46.13'	200.00'	23.17'	13°12'56"

BC/EOP CURVE TABLE				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C20	46.54'	40.00'	26.30'	86°39'31"
C21	38.47'	275.00'	18.26'	07°35'56"
C22	SEE SHEET DG-2			
C23	SEE SHEET DG-2			
C24	NOT USED			
C25	36.15'	65.00'	18.56'	88°08'50"
C26	43.93'	40.00'	24.46'	62°55'33"
C27	120.64'	275.00'	61.31'	25°08'10"



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
4. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE I)
5. CONSTRUCT TACK-ON MEDIAN
6. PROVIDE 1' MEDIAN OPENING
7. ADJUST WATER VALVE BOX COVER TO GRADE VALVE SHALL BE ACCESSIBLE AT ALL TIMES
8. ADJUST BLOW-OFF AND RISER ASSEMBLY
9. ADJUST VALVE VAULT ACCESS AND APPURTENANCES TO GRADE
10. ADJUST SANITARY SEWER MH TO GRADE
11. ADJUST ELECTRICAL MH COVER TO GRADE (BY NEVADA POWER)
12. ADJUST STORM DRAIN MH COVER TO GRADE
13. ADJUST WATER MH COVER TO GRADE
14. INSTALL 4-4" CONDUITS BY SPRINT
15. ADJUST AVAR TO GRADE
16. CONSTRUCT TACTILE WARNING PANEL (SEE DETAIL A SHEET C-11)
17. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE II)
18. REMOVE CONCRETE BARRIER RAIL
19. REMOVE CONCRETE SIDEWALK
20. REMOVE PULLBOX
21. SAWCUT AND MATCH EXISTING PAVEMENT
22. REMOVE EXISTING PAVEMENT
23. PROVIDE 5' MEDIAN OPENING

SIDEWALK RAMP CALCULATIONS

STATION	OFFSET	A	B
"RB" 155+78	L	4.50'	4.50'
"RB" 155+95	R	8.00'	4.00'
"RB" 157+11	L	4.50'	4.50'

LVVWD SIGNATURE DATE

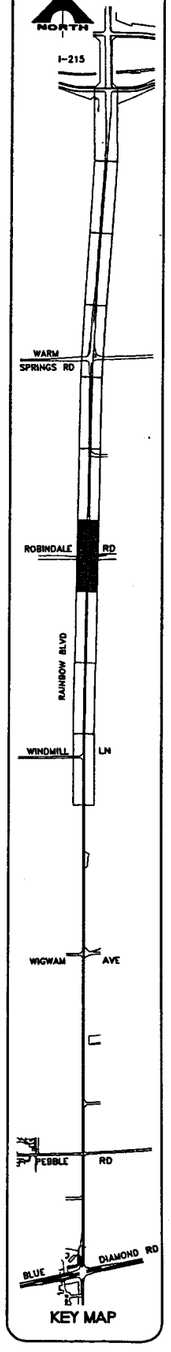
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE 40 0 40 80 FEET



Call before you Dig. 1-800-227-2600



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

2/6/2004 10:07:10 AM jpj

F:\500.854\Civil\rainbow plan.dgn

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 152+00.00 TO "RB" 161+50.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT/JRT CHECKED BY: KLT/JRT
APPROVED BY

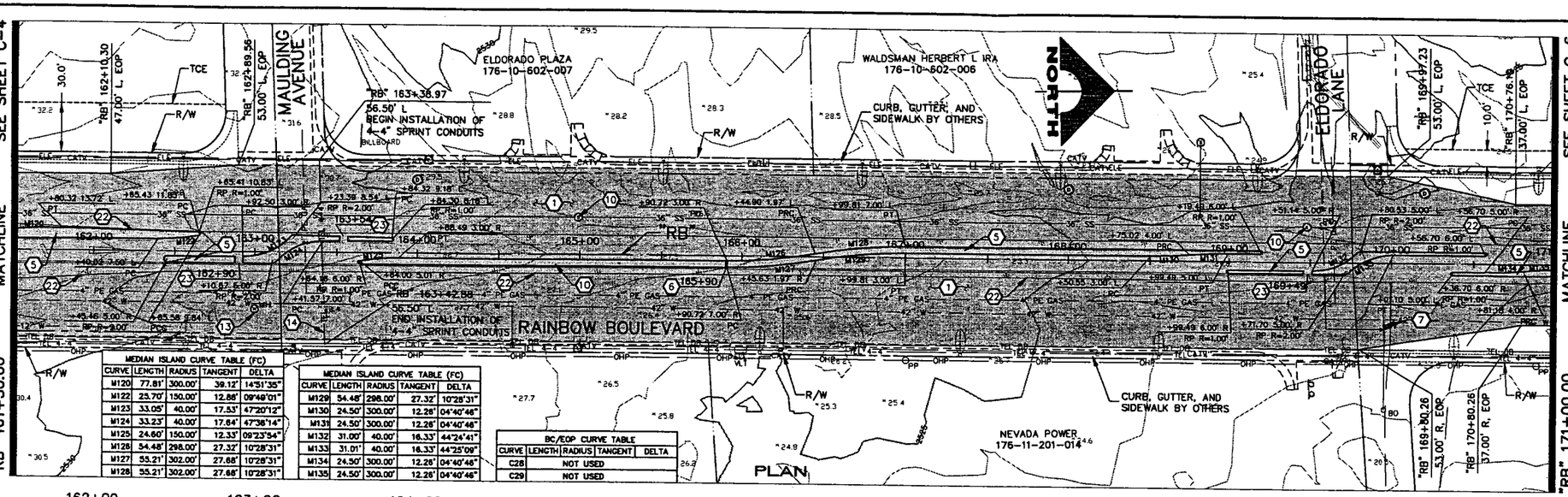
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

DRAWING NO. L-1728A

C-4

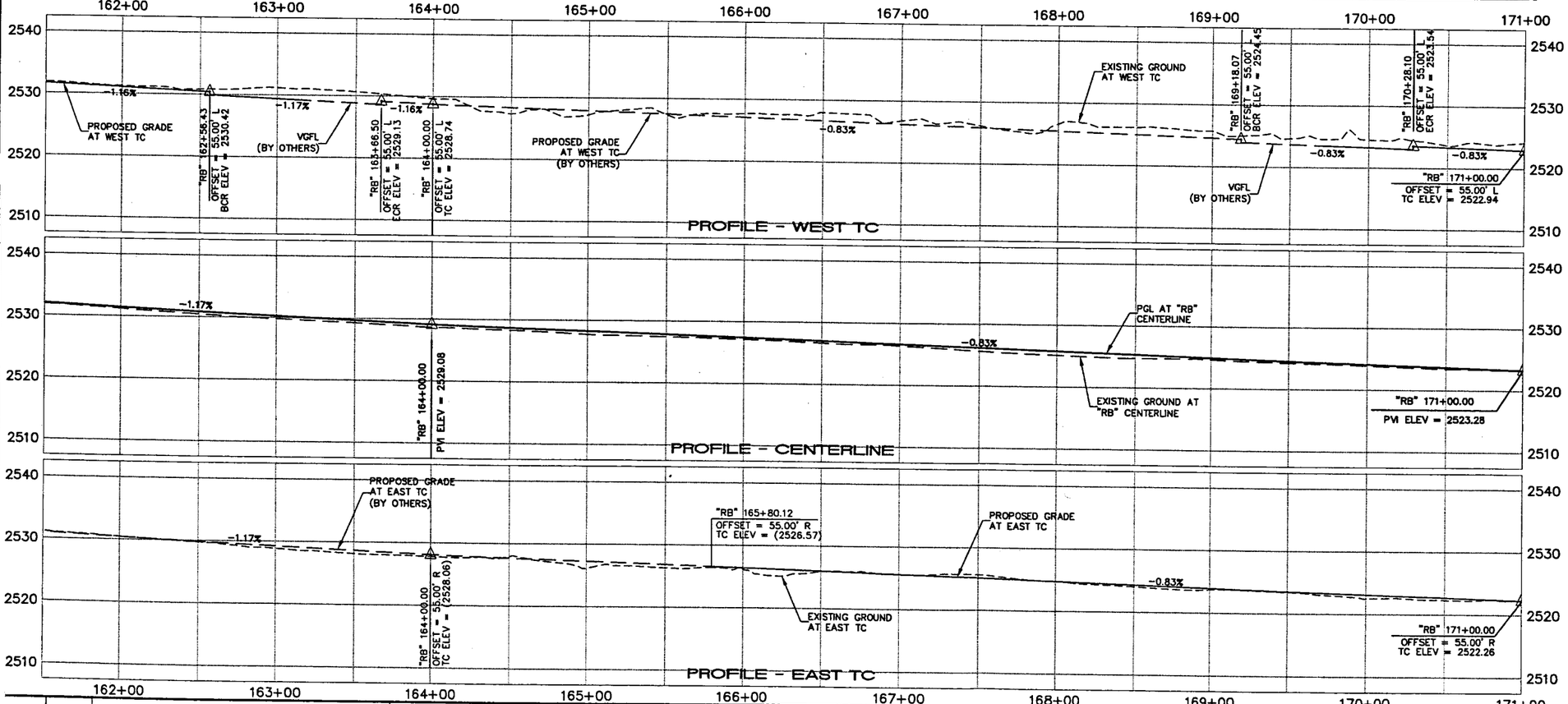
SHT. ___ OF ___



MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M120	77.81'	300.00'	39.12'	14°51'35"
M122	25.70'	150.00'	12.88'	09°49'01"
M123	33.05'	40.00'	17.53'	47°20'12"
M124	33.23'	40.00'	17.64'	47°36'14"
M125	24.60'	150.00'	12.33'	09°23'54"
M126	54.48'	298.00'	27.32'	10°28'31"
M127	55.21'	302.00'	27.68'	10°28'31"
M128	55.21'	302.00'	27.68'	10°28'31"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M129	54.48'	298.00'	27.32'	10°28'31"
M130	24.50'	300.00'	12.26'	04°40'46"
M131	24.50'	300.00'	12.26'	04°40'46"
M132	31.00'	40.00'	16.33'	44°24'41"
M133	31.01'	40.00'	16.33'	44°25'09"
M134	24.50'	300.00'	12.26'	04°40'46"
M135	24.50'	300.00'	12.26'	04°40'46"

BC/EOP CURVE TABLE				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C28	NOT USED			
C29	NOT USED			



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
4. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE I)
5. CONSTRUCT TACK-ON MEDIAN
6. PROVIDE 1' MEDIAN OPENING
7. ADJUST WATER VALVE BOX COVER TO GRADE VALVE SHALL BE ACCESSIBLE AT ALL TIMES
8. ADJUST BLOW-OFF AND RISER ASSEMBLY
9. ADJUST VALVE VAULT ACCESS AND APPURTENANCES TO GRADE
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19. REMOVE CONCRETE SIDEWALK
20. REMOVE PULLBOX
21. SAWCUT AND MATCH EXISTING PAVEMENT
22. REMOVE EXISTING PAVEMENT
23. PROVIDE 5' MEDIAN OPENING

LVVWD SIGNATURE DATE

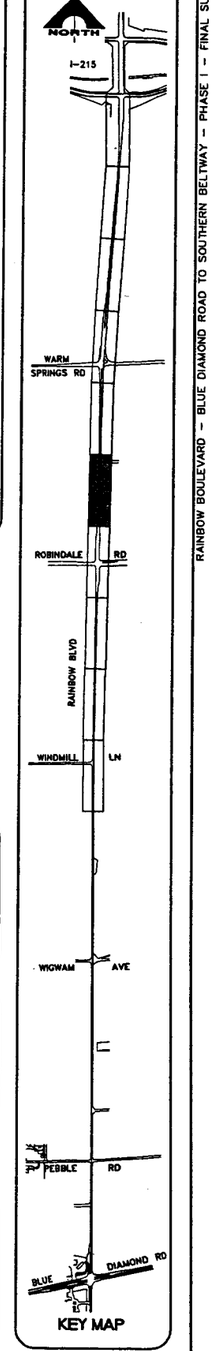
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE: 40 0 40 80 FEET



Call before you Dig. 1-800-227-2600



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 161+50.00 TO "RB" 171+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

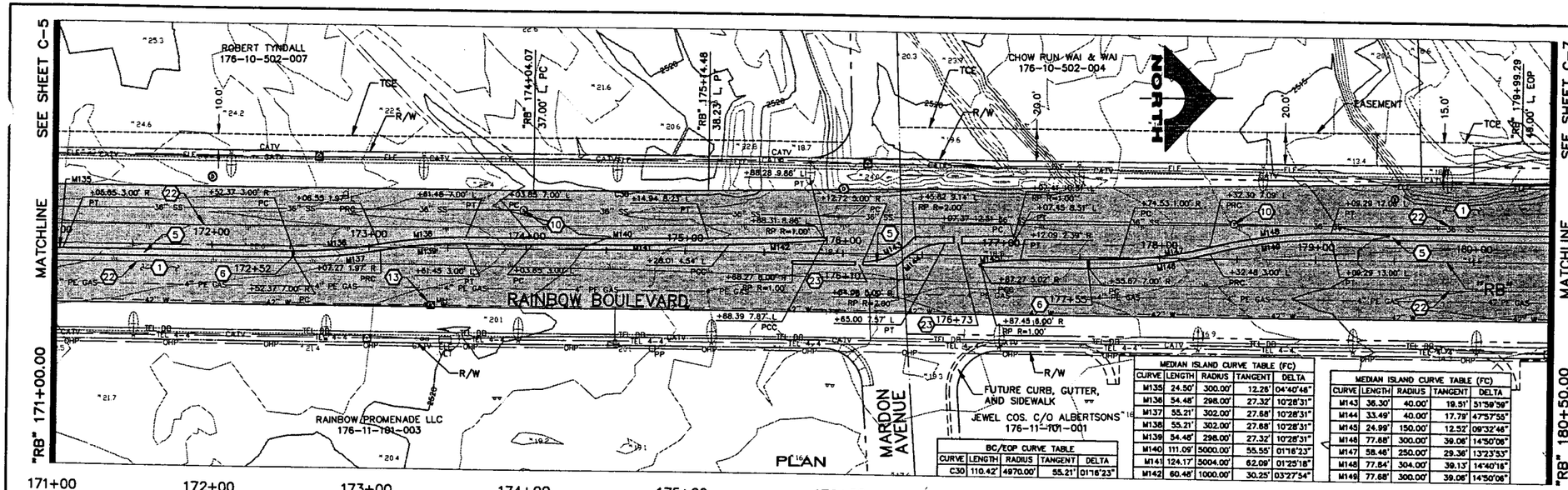
PROJECT No:	500.854
DESIGNED BY:	KLT/JRT
APPROVED BY	
DRAWN BY:	JPJ
CHECKED BY:	KLT/JRT
SCALE	
HORIZ: AS SHOWN	
VERT: AS SHOWN	
FIELD BOOK	

L-1728A

DRAWING NO. C-5

SHT. ___ OF ___

J:\500\854\maintenance\11PB_C5_1728A.dwg 12/2/2004 10:02:23 AM JPJ



BC/EOP CURVE TABLE

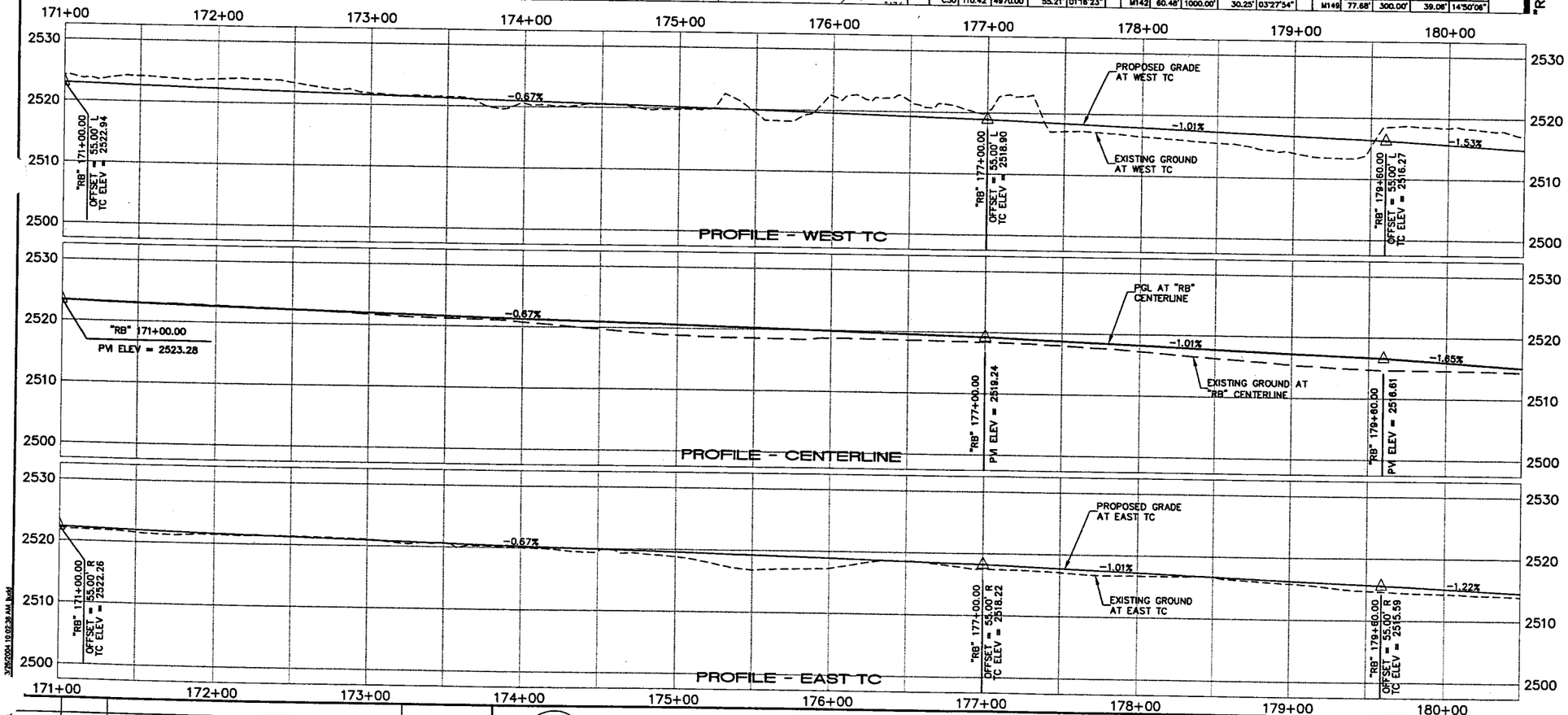
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C30	110.42'	4970.00'	55.21'	01°16'23"

MEDIAN ISLAND CURVE TABLE (FC)

CURVE	LENGTH	RADIUS	TANGENT	DELTA
M135	24.50'	300.00'	12.26'	04°40'48"
M136	54.48'	298.00'	27.32'	10°28'31"
M137	55.21'	302.00'	27.68'	10°28'31"
M138	55.21'	302.00'	27.68'	10°28'31"
M139	54.48'	298.00'	27.32'	10°28'31"
M140	111.09'	5000.00'	55.55'	01°16'23"
M141	124.17'	5004.00'	62.09'	01°25'18"
M142	60.48'	1000.00'	30.25'	03°27'54"

MEDIAN ISLAND CURVE TABLE (FC)

CURVE	LENGTH	RADIUS	TANGENT	DELTA
M143	38.30'	40.00'	19.51'	51°58'59"
M144	33.49'	40.00'	17.79'	47°57'55"
M145	24.99'	150.00'	12.52'	09°32'46"
M146	77.68'	300.00'	39.08'	14°50'06"
M147	58.46'	250.00'	29.36'	13°23'53"
M148	77.84'	304.00'	39.13'	14°40'16"
M149	77.68'	300.00'	39.08'	14°50'06"



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
4. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE I)
5. CONSTRUCT TACK-ON MEDIAN
6. PROVIDE 1' MEDIAN OPENING
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9. ADJUST VALVE VAULT ACCESS AND APPURTENANCES TO GRADE
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13. ADJUST WATER MH COVER TO GRADE
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18. REMOVE CONCRETE BARRIER RAIL
19. REMOVE CONCRETE SIDEWALK
20. REMOVE PULLBOX
21. SAWCUT AND MATCH EXISTING PAVEMENT
22. REMOVE EXISTING PAVEMENT
23. PROVIDE 5' MEDIAN OPENING

LVVWD SIGNATURE DATE

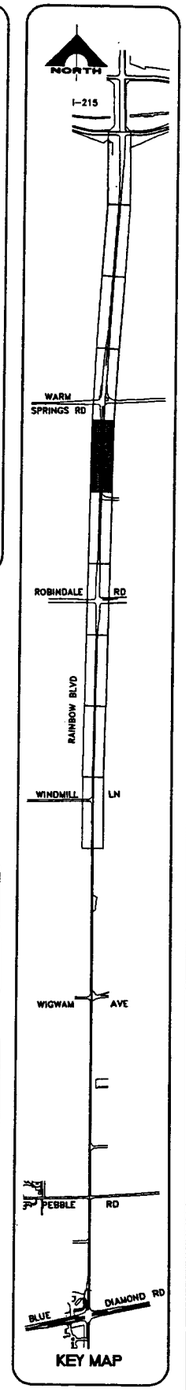
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE 40 0 40 80 FEET



Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 171+00.00 TO "RB" 180+50.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

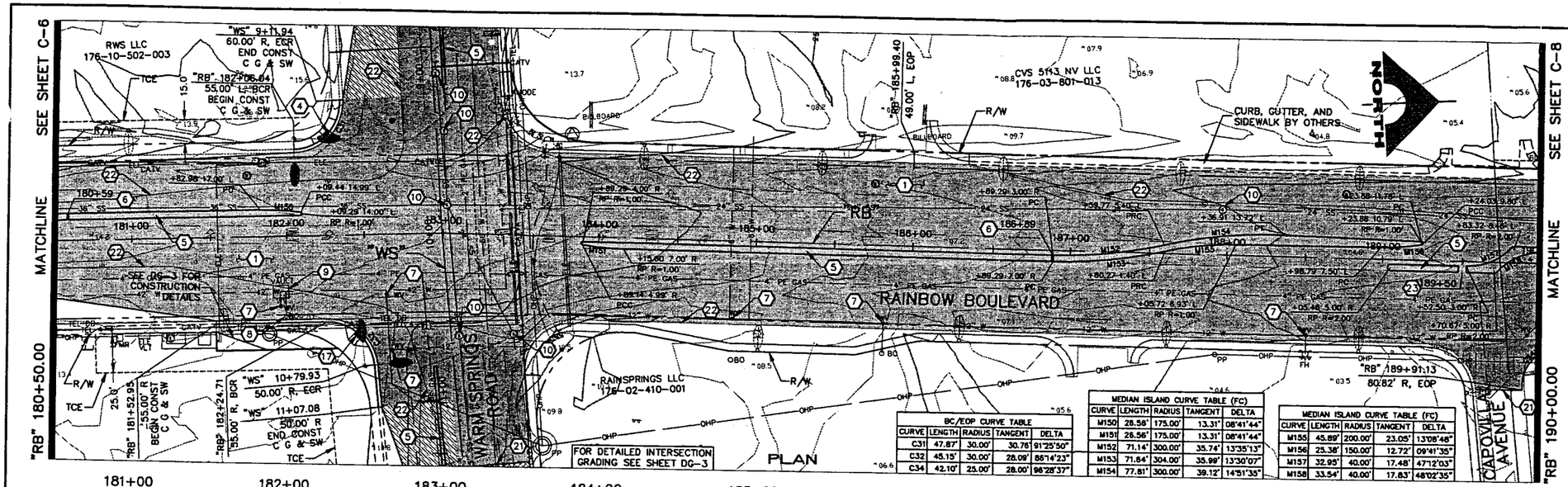
PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT/JRT CHECKED BY: KLT/JRT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
C-6
SHT. ___ OF ___

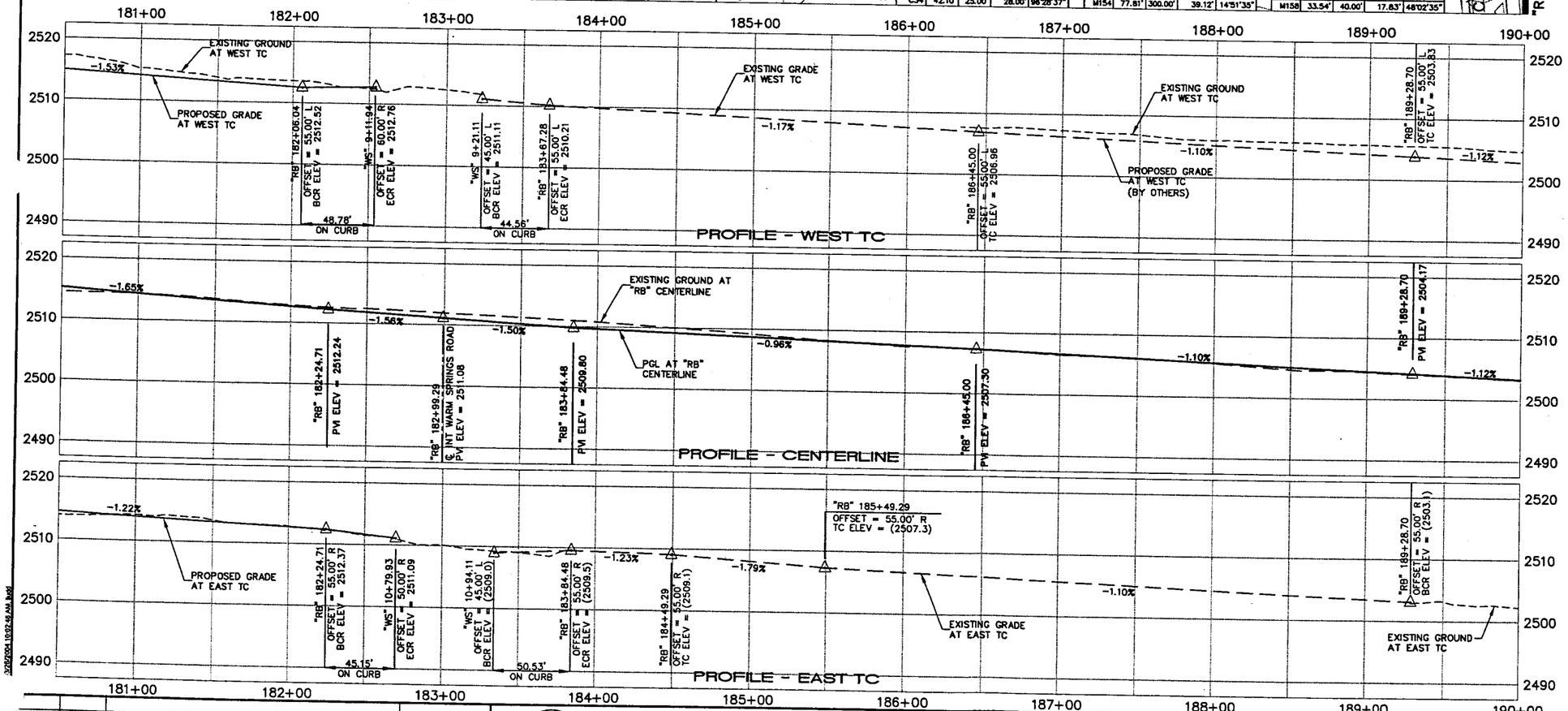
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3/9/2004 10:07:38 AM, Kelly



BC/EOP CURVE TABLE				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C31	47.87'	30.00'	30.76'	91°25'50"
C32	45.15'	30.00'	28.09'	86°14'23"
C34	42.10'	25.00'	28.00'	96°28'37"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M150	26.56'	175.00'	13.31'	08°41'44"
M151	26.56'	175.00'	13.31'	08°41'44"
M152	71.14'	300.00'	35.74'	13°35'13"
M153	71.64'	304.00'	35.99'	13°30'07"
M154	77.81'	300.00'	39.12'	14°51'35"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M155	45.89'	200.00'	23.05'	13°08'48"
M156	25.38'	150.00'	12.72'	09°41'35"
M157	32.95'	40.00'	17.48'	47°12'03"
M158	33.54'	40.00'	17.83'	48°02'35"



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
4. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE I)
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LVVWD SIGNATURE DATE

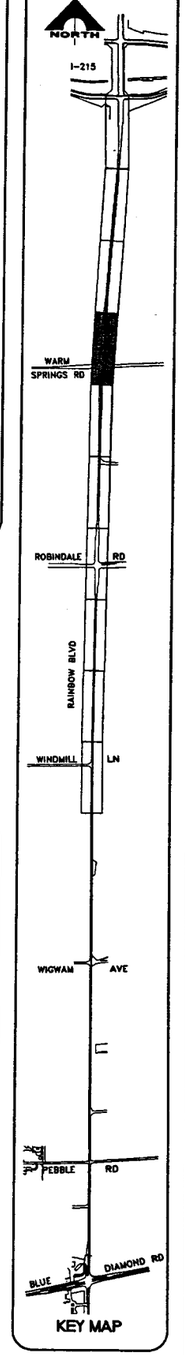
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE 40 0 40 80 FEET

AVOID HITTING OVERHEAD POWER LINES, IT'S DEADLY. CALL BEFORE YOU DO OVERHEAD 1-702-593-6111

Avoid cutting underground utility lines, it's deadly. Call before you Dig. 1-800-227-2600 UNDERGROUND SERVICE (USA)



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 180+50.00 TO "RB" 190+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT/JRT CHECKED BY: KLT/JRT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
C-7
SHT. ___ OF ___

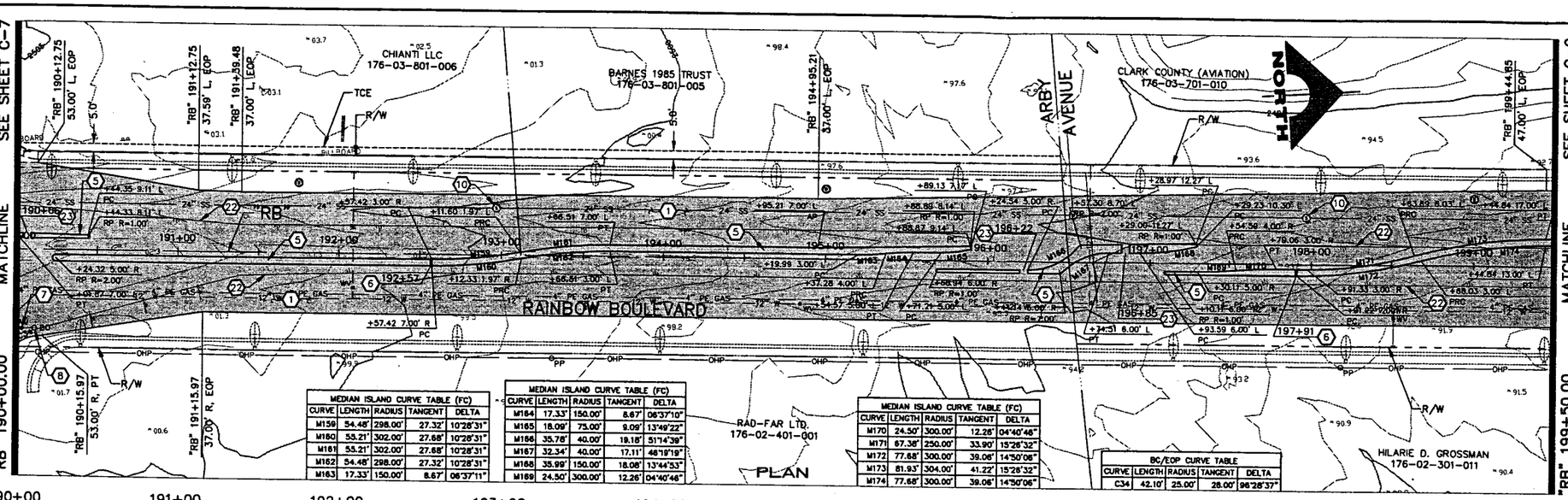
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SEE SHEET C-7

SEE SHEET C-9

MATCHLINE "RB" 190+00.00

MATCHLINE "RB" 199+50.00

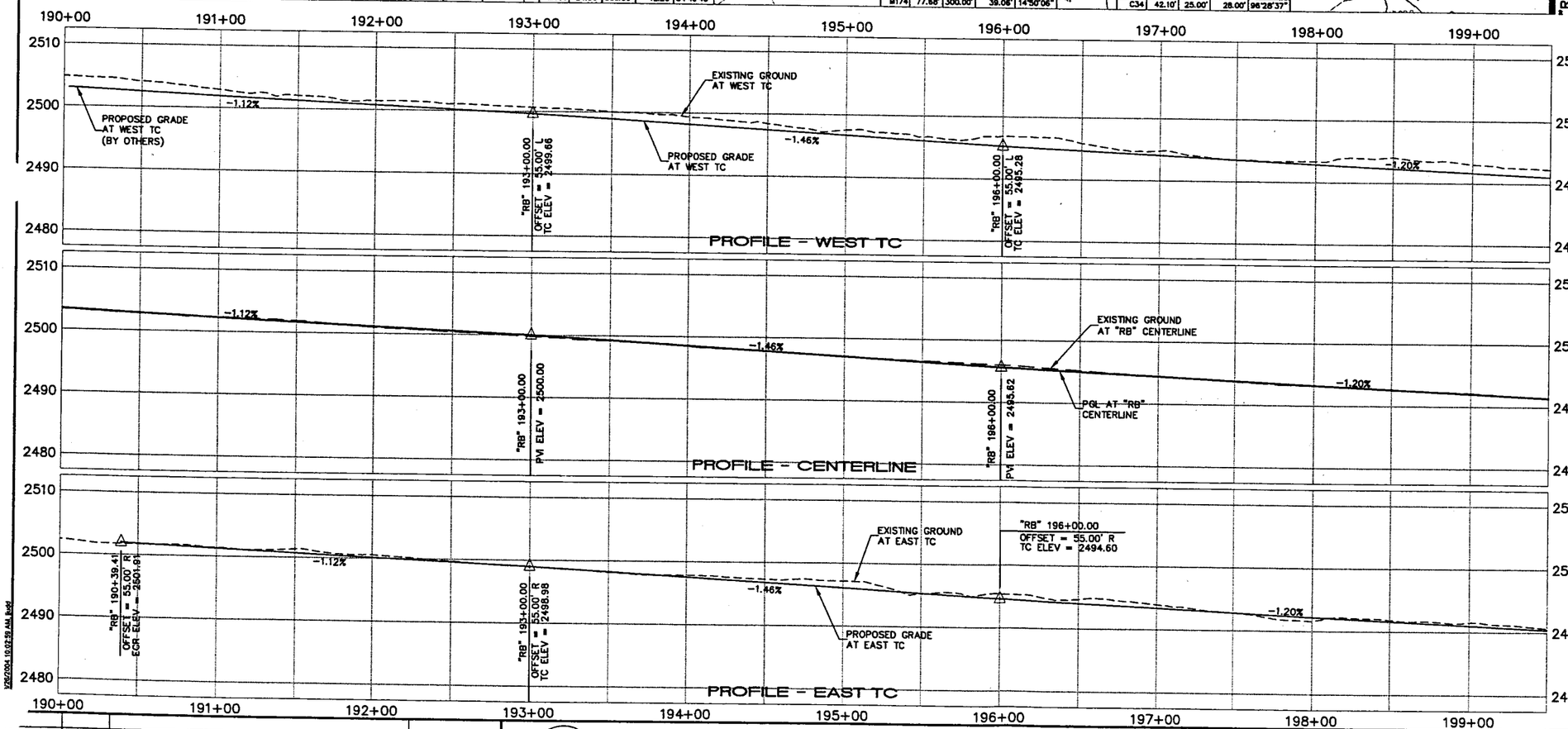


MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M159	54.48'	298.00'	27.32'	10°28'31"
M160	55.21'	302.00'	27.68'	10°28'31"
M161	55.21'	302.00'	27.68'	10°28'31"
M162	54.48'	298.00'	27.32'	10°28'31"
M163	17.33'	150.00'	8.67'	06°37'11"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M164	17.33'	150.00'	8.67'	06°37'10"
M165	18.09'	75.00'	9.09'	13°49'22"
M166	35.78'	40.00'	19.16'	51°14'39"
M167	32.34'	40.00'	17.11'	46°19'19"
M168	35.99'	150.00'	18.08'	13°44'53"
M169	24.50'	300.00'	12.26'	04°40'46"

MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M170	24.50'	300.00'	12.26'	04°40'46"
M171	67.36'	250.00'	33.90'	15°26'32"
M172	77.68'	300.00'	39.06'	14°50'06"
M173	81.93'	304.00'	41.22'	15°26'32"
M174	77.68'	300.00'	39.06'	14°50'06"

BC/EOP CURVE TABLE				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
C34	42.10'	25.00'	28.00'	96°28'37"



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
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LVVWD SIGNATURE DATE

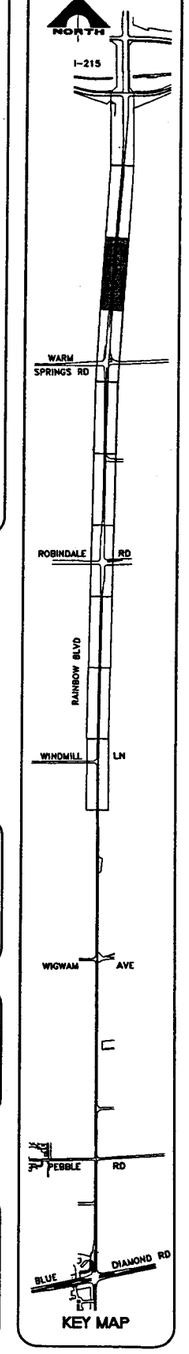
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE 40 0 40 80 FEET



Call before you Dig. 1-800-227-2600



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 190+00.00 TO "RB" 199+50.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

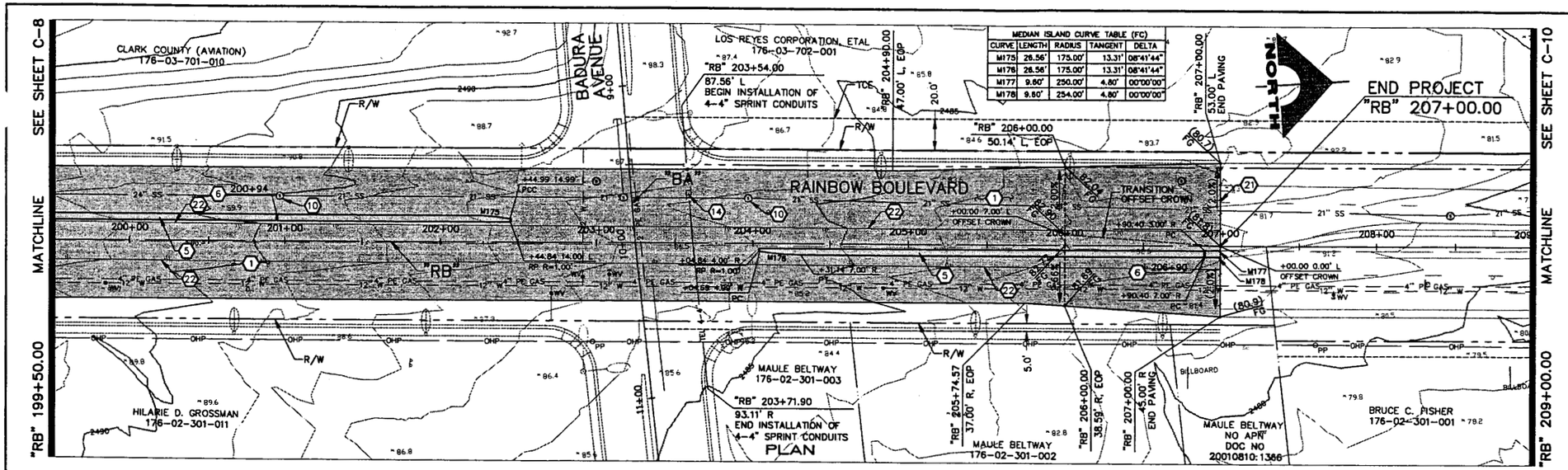
PROJECT No: 500.854 DRAWN BY: JPJ
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G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

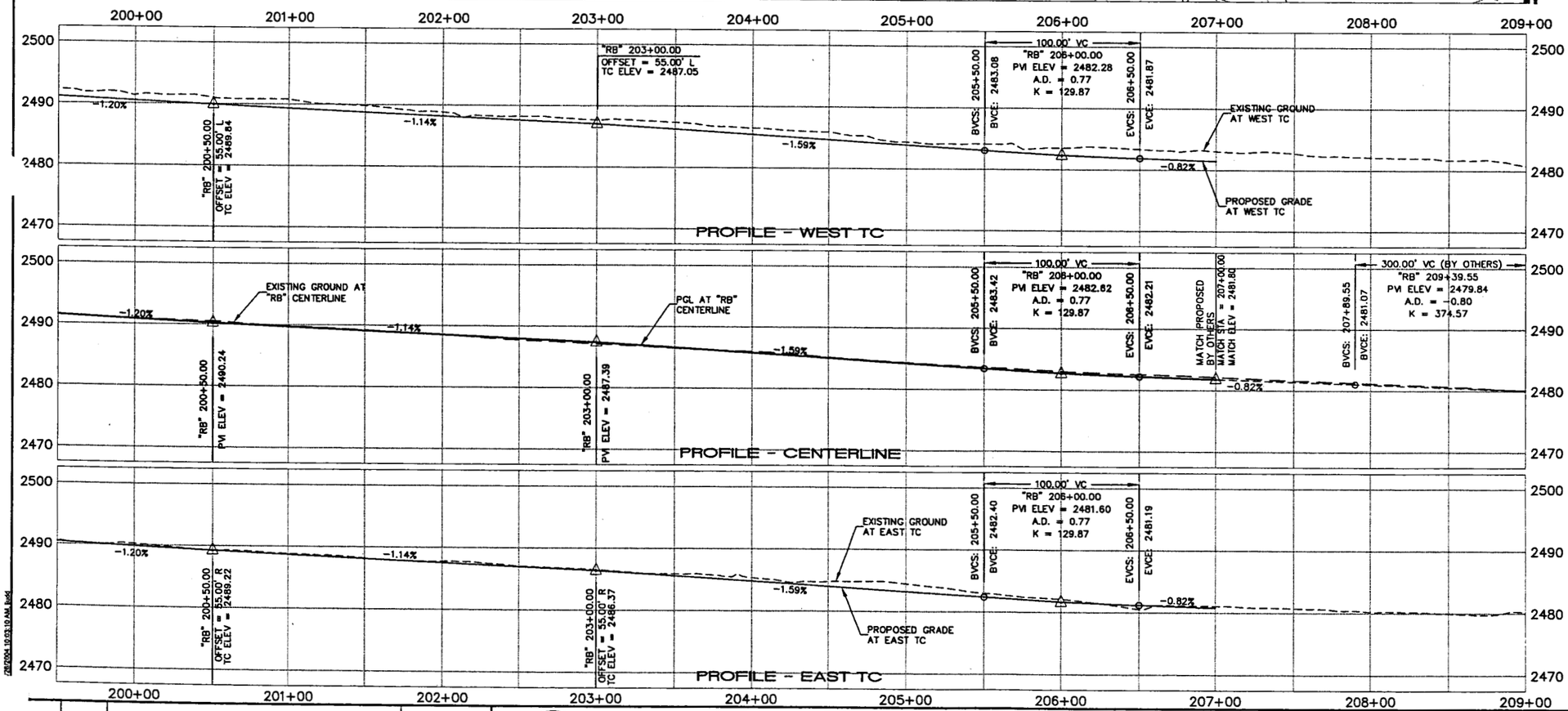
SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
C-8
SHT. ___ OF ___

F:\500-854\Drawings\Plan\1998_C
2/6/2004 10:07:59 AM JPJ



MEDIAN ISLAND CURVE TABLE (FC)				
CURVE	LENGTH	RADIUS	TANGENT	DELTA
M175	26.56'	175.00'	13.31'	08°41'44"
M176	26.56'	175.00'	13.31'	08°41'44"
M177	9.60'	250.00'	4.80'	00°00'00"
M178	9.60'	254.00'	4.80'	00°00'00"



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
4. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE I)
5. CONSTRUCT TACK-ON MEDIAN
6. PROVIDE 1' MEDIAN OPENING
7. ADJUST WATER VALVE BOX COVER TO GRADE VALVE SHALL BE ACCESSIBLE AT ALL TIMES
8. ADJUST BLOW-OFF AND RISER ASSEMBLY
9. ADJUST VALVE VAULT ACCESS AND APPURTENANCES TO GRADE
10. ADJUST SANITARY SEWER MH TO GRADE
11. ADJUST ELECTRICAL MH COVER TO GRADE (BY NEVADA POWER)
12. ADJUST STORM DRAIN MH COVER TO GRADE
13. ADJUST WATER MH COVER TO GRADE
14. INSTALL 4-4" CONDUITS BY SPRINT
15. ADJUST AVAR TO GRADE
16. CONSTRUCT TACTILE WARNING PANEL (SEE DETAIL A SHEET C-11)
17. CONSTRUCT SIDEWALK RAMP WITH TACTILE WARNING PANEL (CASE II)
18. REMOVE CONCRETE BARRIER RAIL
19. REMOVE CONCRETE SIDEWALK
20. REMOVE PULLBOX
21. SAWCUT AND MATCH EXISTING PAVEMENT
22. REMOVE EXISTING PAVEMENT
23. PROVIDE 5' MEDIAN OPENING

LVVWD SIGNATURE DATE

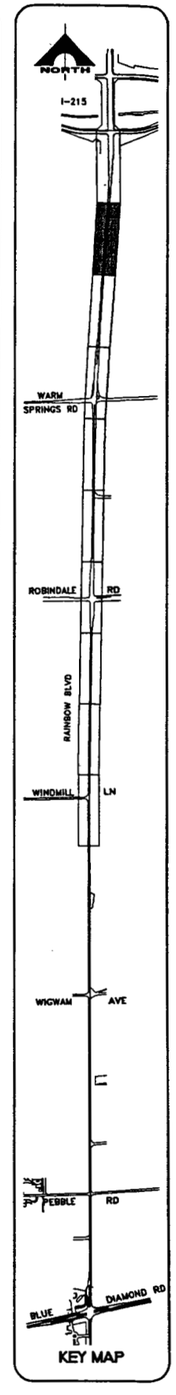
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

SCALE: 40 0 40 80 FEET

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)



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 199+50.00 TO "RB" 209+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

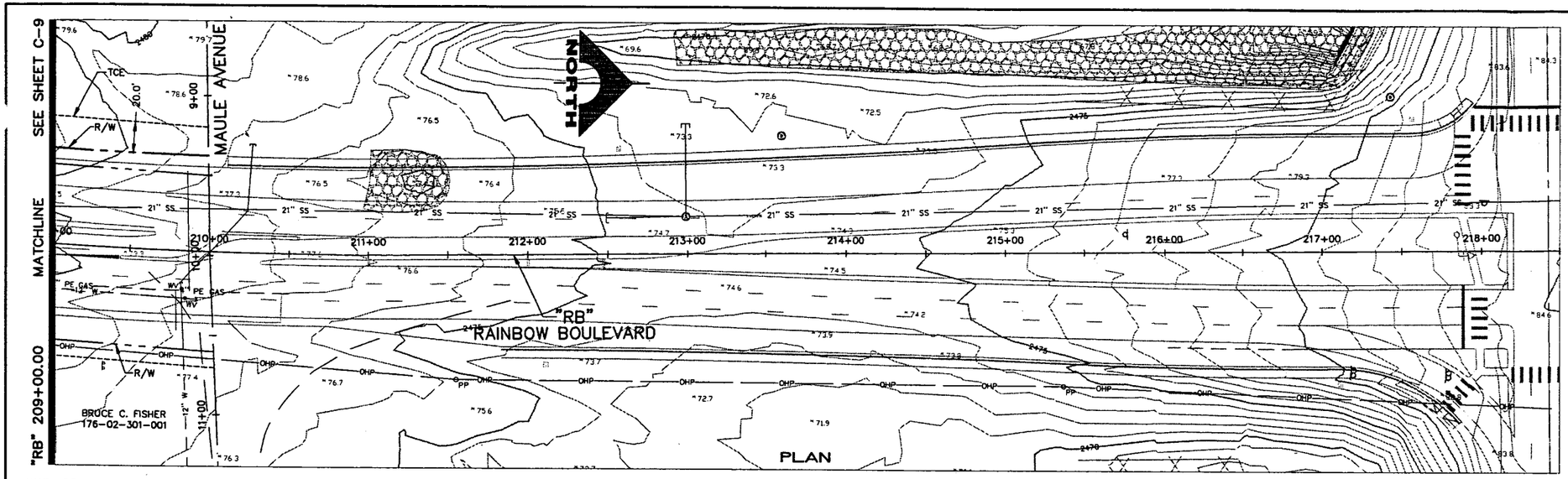
PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT/JRT CHECKED BY: KLT/JRT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

DRAWING NO. L-1728A
C-9
SHT. ___ OF ___

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2/6/2004 10:03:10 AM Brad



CONSTRUCTION NOTES

1. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
2. CONSTRUCT "L" TYPE CURB & GUTTER
3. CONSTRUCT CONCRETE SIDEWALK
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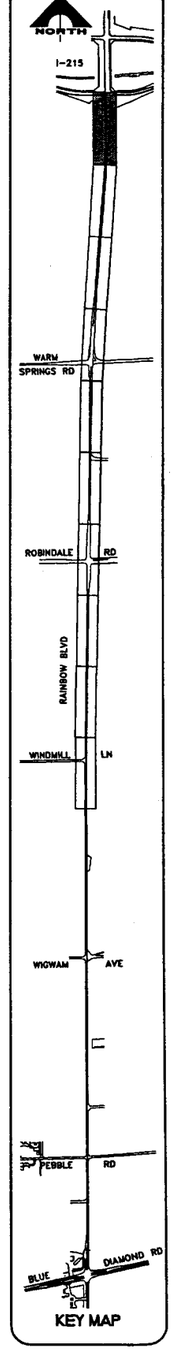
LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

40 0 40 80
SCALE FEET







RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

PLAN AND PROFILE

"RB" 209+00.00 TO "RB" 218+50.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

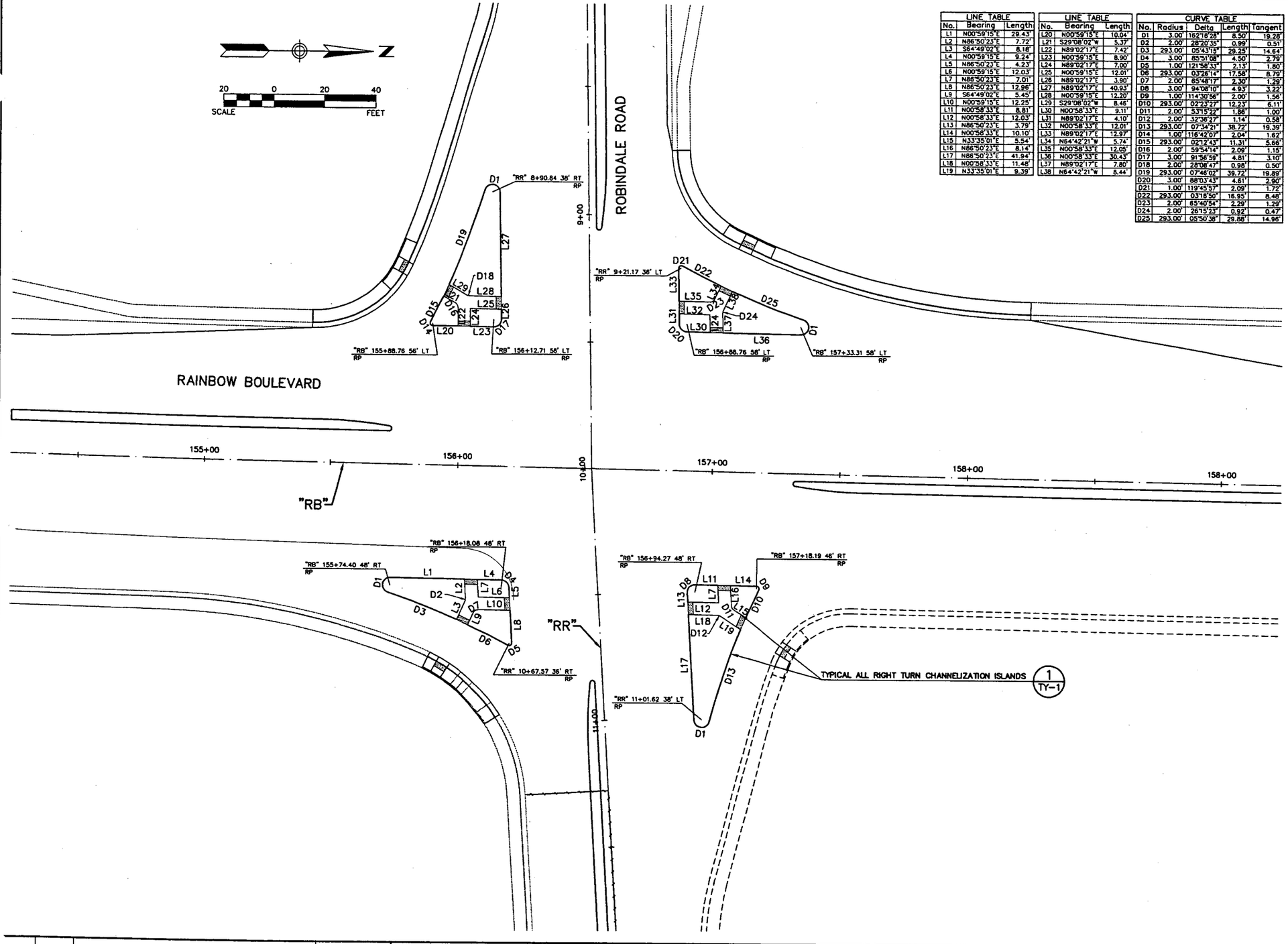
PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT/JRT CHECKED BY: KLT/JRT
APPROVED BY

G.C. WALLACE, INC.
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SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
C-10
SHT. ___ OF ___

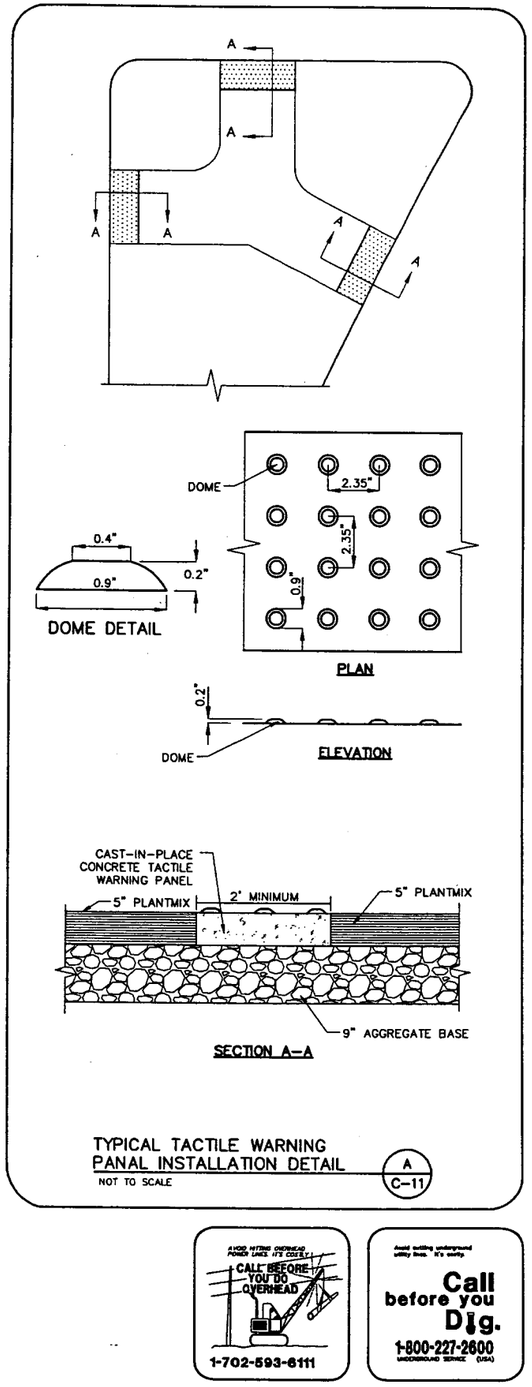
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LINE TABLE		
No.	Bearing	Length
L1	N00°59'15"E	29.43'
L2	N86°50'23"E	7.72'
L3	S64°49'02"E	8.18'
L4	N00°59'15"E	9.24'
L5	N86°50'23"E	4.23'
L6	N00°59'15"E	12.03'
L7	N86°50'23"E	7.01'
L8	N86°50'23"E	12.96'
L9	S64°49'02"E	5.45'
L10	N00°59'15"E	12.25'
L11	N00°58'33"E	8.81'
L12	N00°58'33"E	12.03'
L13	N86°50'23"E	3.79'
L14	N00°58'33"E	10.10'
L15	N33°35'01"E	5.54'
L16	N86°50'23"E	8.14'
L17	N86°50'23"E	41.94'
L18	N00°58'33"E	11.48'
L19	N33°35'01"E	9.39'

LINE TABLE		
No.	Bearing	Length
L20	N00°59'15"E	10.04'
L21	S29°08'02"W	5.37'
L22	N89°02'17"E	7.42'
L23	N00°59'15"E	8.90'
L24	N89°02'17"E	7.00'
L25	N00°59'15"E	12.01'
L26	N89°02'17"E	3.90'
L27	N89°02'17"E	40.93'
L28	N00°59'15"E	12.20'
L29	S29°08'02"W	8.46'
L30	N00°58'33"E	9.11'
L31	N89°02'17"E	4.10'
L32	N00°58'33"E	12.01'
L33	N89°02'17"E	12.97'
L34	N64°42'21"W	5.74'
L35	N00°58'33"E	12.05'
L36	N00°58'33"E	30.43'
L37	N89°02'17"E	7.80'
L38	N64°42'21"W	8.44'

CURVE TABLE				
No.	Radius	Delta	Length	Tangent
D1	3.00'	162°16'28"	8.50'	19.28'
D2	2.00'	28°20'35"	0.99'	0.51'
D3	293.00'	05°43'15"	29.25'	14.64'
D4	3.00'	85°51'08"	4.50'	2.79'
D5	1.00'	121°58'33"	2.13'	1.80'
D6	293.00'	03°26'14"	17.58'	8.79'
D7	2.00'	65°48'17"	2.30'	1.29'
D8	3.00'	94°08'10"	4.93'	3.22'
D9	1.00'	114°30'56"	2.00'	1.56'
D10	293.00'	02°23'27"	12.23'	6.11'
D11	2.00'	53°15'22"	1.86'	1.00'
D12	2.00'	32°36'27"	1.14'	0.58'
D13	293.00'	07°34'21"	38.72'	19.39'
D14	1.00'	116°42'07"	2.04'	1.62'
D15	293.00'	02°12'43"	11.31'	5.66'
D16	2.00'	59°54'14"	2.09'	1.15'
D17	3.00'	91°56'59"	4.81'	3.10'
D18	2.00'	28°08'47"	0.98'	0.50'
D19	293.00'	07°46'02"	39.72'	19.89'
D20	3.00'	88°03'43"	4.61'	2.90'
D21	1.00'	119°45'57"	2.09'	1.72'
D22	293.00'	03°18'50"	16.95'	8.48'
D23	2.00'	65°40'54"	2.29'	1.29'
D24	2.00'	26°15'23"	0.92'	0.47'
D25	293.00'	05°50'38"	29.88'	14.96'



TYPICAL TACTILE WARNING PANAL INSTALLATION DETAIL
NOT TO SCALE
A
C-11

Avoid hitting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
ROBINDALE ROAD
RIGHT TURN CHANNELIZATION ISLAND GEOMETRICS
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: FJG/KLT
DESIGNED BY: JRT CHECKED BY: KLT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
C-11
SHT. ___ OF ___

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

F:\500-854\dwg\improv-p1\TRB_C11.dwg, 03/26/2004 09:06:37 AM, jkidd, 1:2

MATCH LINE SEE BELOW

MATCH LINE SEE ABOVE

"RB" 125+00.00 BVC
MATCH EXISTING PAVEMENT
"RB" 127+10.00 BVC
"RB" 128+40.00 EVC
"RB" 133+25.00 EVC
"WL" 7+92.00
38.00' R, 12.00' AP
"WL" 8+50.00
2.00' R, 22.00' R
END STRIPING REMOVAL
MATCH EXISTING
"WL" 9+69.98
0.00' L
AP
SAWCUT
22.00' R
2.00' R
OFFSET CROWN
R/W
TCE
BILLBOARD
"RB"
RAINBOW BOULEVARD
WINDMILL LANE
"WL" 10+00.00
"WL" 10+91.69
24.00' R
MATCH EXISTING
SAWCUT
24.00' R
"WL" 11+72.84
26.00' R
MATCH EXISTING
EP
PAVEMENT BY OTHERS
"WL" 5+91.00
2.00' R
BEGIN STRIPING REMOVAL
MATCH EXISTING
"WL" 6+92.00
24.29' R
MATCH EXISTING
"WL"
RAINBOW BOULEVARD
RB 130+05.85

NORTH
SCALE 30 0 30 60 FEET

LEGEND
- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

Call before you Dig.
1-800-227-2600

KEY MAP
NORTH
I-215
WARM SPRINGS RD
ROBINDALE RD
RAINBOW BLVD
WINDMILL
WIGWAM AVE
PEBBLE RD
BLUE DIAMOND RD

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
DETAILED GRADING
RAINBOW BOULEVARD AT WINDMILL LANE
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT CHECKED BY: KLT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: NONE
FIELD BOOK

L-1728A
DRAWING NO.
DG-1
SHT. ___ OF ___

RAINBOW BOULEVARD – BLUE DIAMOND ROAD TO SOUTHERN BELTWAY – PHASE I – FINAL SUBMITTAL

NORTH

SCALE 30 0 30 60 FEET

"RR" 6+70.00
31.00' L
MATCH EXISTING ER

"RR" 6+96.78
20.00' R
MATCH EXISTING ER

"RR" 7+56.00
5.00' L, RP
R=2.00'

"RR" 7+54.00
12.00' L
3.00' L
AP

"RR" 7+59.87
19.00' L
AP

SAWCUT
18.00' R

"RR" 7+96.78
35.00' R, PC

"RR" 7+96.78
21.82' L
MATCH EXISTING EP

"RR" 8+78.69
7.00' L, PC

"RR" 8+65.21
31.00' L
AP

"RR" 8+27.17
39.73' R, PT

"RR" 8+84.46
58.01' R, POT

"RR" 9+05.00
4.00' L, RP
R=1.00'

"RR" 9+05.15
4.99' L, PCC

RAINBOW BOULEVARD
"RR" 156+52.70

ROBINDALE ROAD
"RR" 10+00.00

"RB" 153+50.00

"RB" 159+00.00

"RB" 160+00.00

OFFSET CROWN

RAINBOW BOULEVARD

MATCH LINE SEE RIGHT

MATCH LINE SEE LEFT

"RR" 12+34.00
5.00' R, RP
R=2.00'

"RR" 11+27.80
33.00' R
MATCH EXISTING

"RR" 11+85.29
39.73' L
BCR

"RR" 11+95.56
33.00' L
MATCH EXISTING EP

SAWCUT
0.00' R

ROBINDALE ROAD

FOR DETAILED RIGHT TURN CHANNELIZATION GEOMETRY SEE SHEET C-11

MEDIAN CURVE TABLE

CURVE	LENGTH	RADIUS	TANGENT	DELTA
M77	26.56'	175.00'	13.31'	8°41'44"
M78	2.87'	1.00'	7.24'	164°16'45"
M79	2.99'	1.00'	13.15'	171°18'16"
M80	26.56'	175.00'	13.31'	8°41'44"

BC/EOP CURVE TABLE

CURVE	LENGTH	RADIUS	TANGENT	DELTA
C22	30.88'	100.00'	15.56'	17°41'32"

LEGEND
- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
- REMOVE EXISTING PAVEMENT MARKINGS (LPM, RPM, PMF)

AVOID ACCIDENTS CONTACT POWER LINES 811 (USA)
CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

Avoid costly accidents and utility lines. It's simple.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

KEY MAP
I-215
NORTH
WARM SPRINGS RD
ROBINDALE RD
RAINBOW BLVD
WINDMILL LN
WIGWAM AVE
PEBBLE RD
BLUE DIAMOND RD

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
DETAILED GRADING
RAINBOW BOULEVARD AT ROBINDALE ROAD
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT CHECKED BY: KLT
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE HORIZ: AS SHOWN VERT: NONE
FIELD BOOK

L-1728A
DRAWING NO. DG-2
SHT. ___ OF ___

F:\500-854\dwg\improv-p1IRB.DC
3/26/2004 09:06:50 AM, jpjdd, 1:2

MATCH LINE SEE RIGHT

"WS" 7+31.94
28.00' R
AP, EP

"WS" 8+11.94
36.00' R
AP, EP

"WS" 8+25.00
43.00' L
END STRIPING REMOVAL
MATCH EXISTING EP

"WS" 9+05.00
7.00' L, RP
R=1.00'

"WS" 9+11.94
48.00' R
MATCH EXISTING EP

"WS" 9+21.11
43.00' L
AP, EP

"WS" 10+00.00

RAINBOW BOULEVARD
RB 182+99.29

WARM SPRINGS ROAD

"WS" 3+71.27
BEGIN STRIPING REMOVAL

"WS" 5+53.00
23.07' R
MATCH EXISTING EP

"WS" 6+33.00
7.00' L, RP
R=1.00'

MATCH LINE SEE LEFT

"RB" 186+45.00

RB 179+60.00

BSMT

TCE

R/W

BILLBOARD

OFFSET CROWN

RAINBOW BOULEVARD

"RB" 181+52.95
60.00' R
BSW

"RB" 181+85.79
72.00' R
BSW/AP

"RB" 182+31.49
72.00' R
BSW/POC

L=44.58'
R=54.00'
T=23.65'
D=47°17'50"

"WS" 11+07.08
48.00' R
AP, EP

"WS" 11+85.00
28.37' R
AP, EP

"WS" 11+50.00
43.00' L
BEGIN STRIPING REMOVAL
MATCH EXISTING EP

"WS" 10+85.00
12.00' R, RP
R=1.00'

"WS" 11+84.00
12.00' R, RP
R=1.00'

WARM SPRINGS ROAD

SAWCUT
3.00' R

MATCH LINE SEE RIGHT

"WS" 13+10.00
12.00' R
AP, EP

"WS" 13+39.46
43.00' L

"WS" 13+49.04
3.00' R
AP, EP

"WS" 14+49.68
10.00' R
END STRIPING
REMOVAL
MATCH EXISTING

MATCH LINE SEE LEFT

NORTH

SCALE 30 0 30 60 FEET

LEGEND

- PLANTMIX BITUMINOUS SURFACE PER TYPICAL SECTIONS
- 3" PLANTMIX BITUMINOUS SURFACE OVER 4" TYPE II AGGREGATE BASE
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KEY MAP
NORTH
I-215
WARM SPRINGS RD
ROBINDALE RD
RAINBOW BLVD
WINDMILL LN
WIGWAM AVE
PEBBLE RD
BLUE DIAMOND RD

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
DETAILED GRADING
RAINBOW BOULEVARD AT WARM SPRINGS ROAD
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

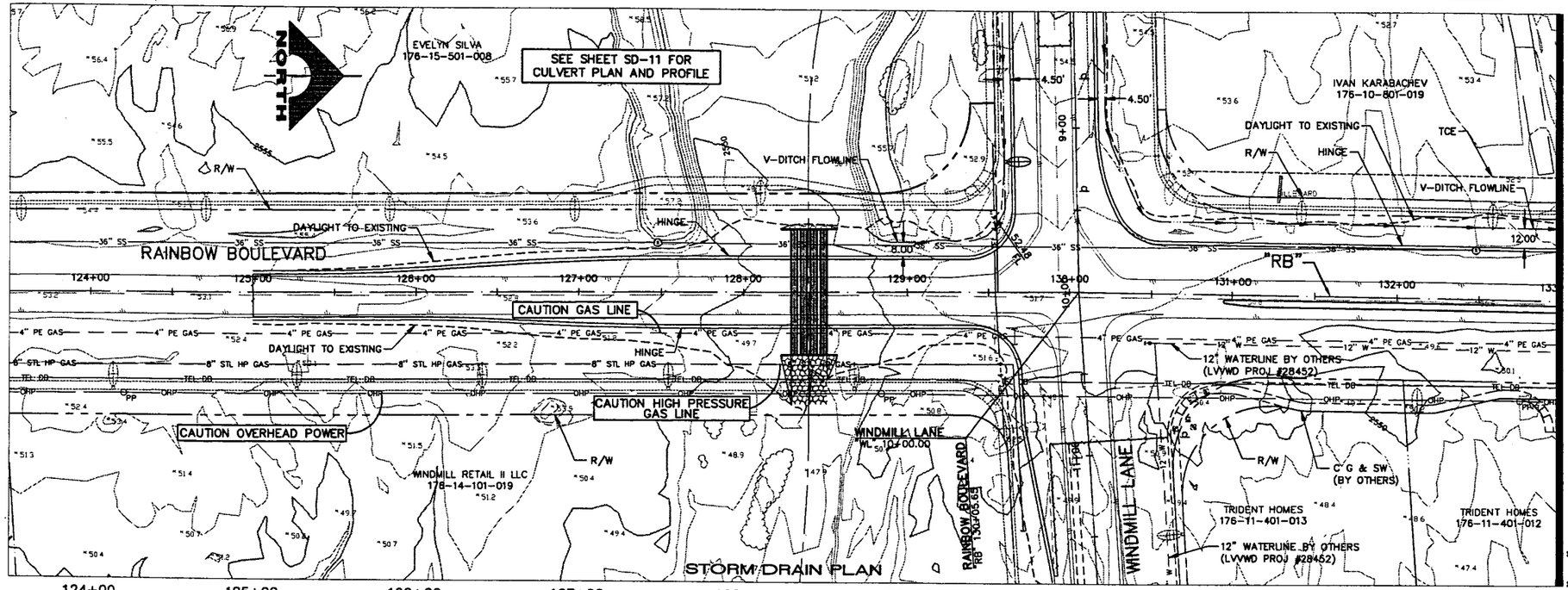
PROJECT No: 500.854 DRAWN BY: JPJ
DESIGNED BY: KLT CHECKED BY: KLT
APPROVED BY

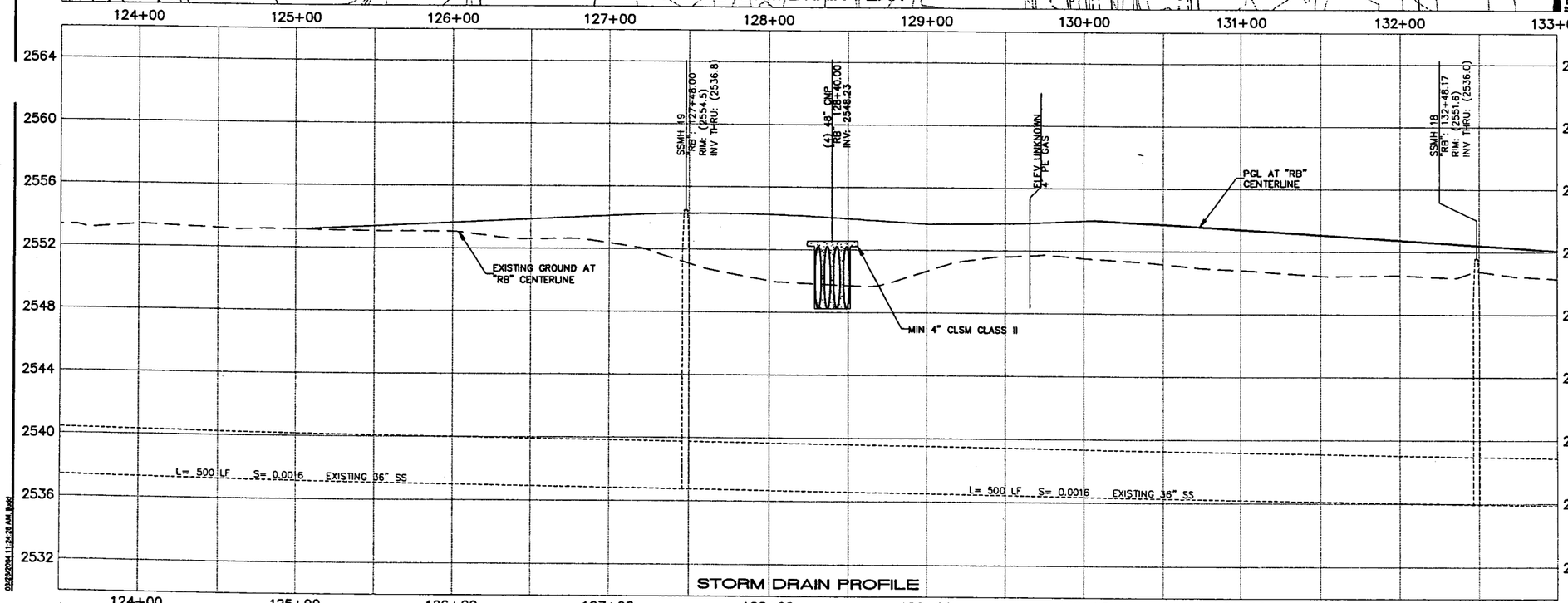
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: NONE
FIELD BOOK

L-1728A
DRAWING NO.
DG-3
SHT. ___ OF ___

F:\500.854\dwg\improvs\1RB_C
_02/26/2004 08:07:00 AM, jpjdd, 1:2





UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

PROTECT WATERLINES IN PLACE. WHERE A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CAN NOT BE MET, BACKFILL TRENCH WITH CEMENT SLURRY OR FLOWABLE BACKFILL TO THE SPRINGLINE OF THE WATERLINE.

LVVWD SIGNATURE DATE

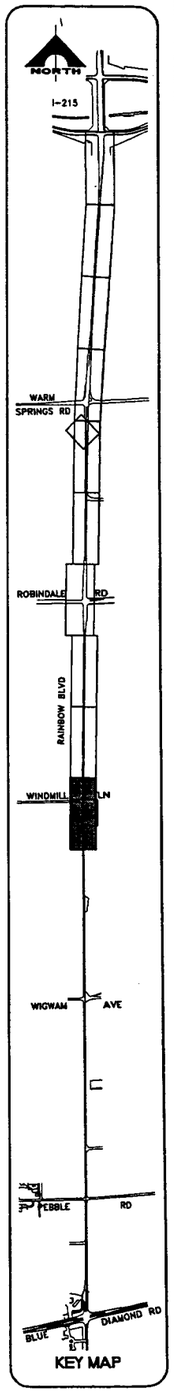
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

STORM DRAIN NOTES:
1. STORM DRAIN FACILITIES SHOWN ON PLANS TO BE BUILT DURING INITIAL CONSTRUCTION PHASE UNLESS SPECIFICALLY LABELED AS ULTIMATE.
2. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
3. STORM DRAIN MANHOLES AS SHOWN IN PROFILE SHALL BE CONSTRUCTED PER "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" LATEST EDITION, UNLESS OTHERWISE NOTED.
4. ALL STORM DRAIN PIPE IS CLASS III UNLESS OTHERWISE NOTED.

40 0 40 80
SCALE FEET



Avoid hitting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN PLAN AND PROFILE
"RB" 123+50.00 TO "RB" 133+00.00
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

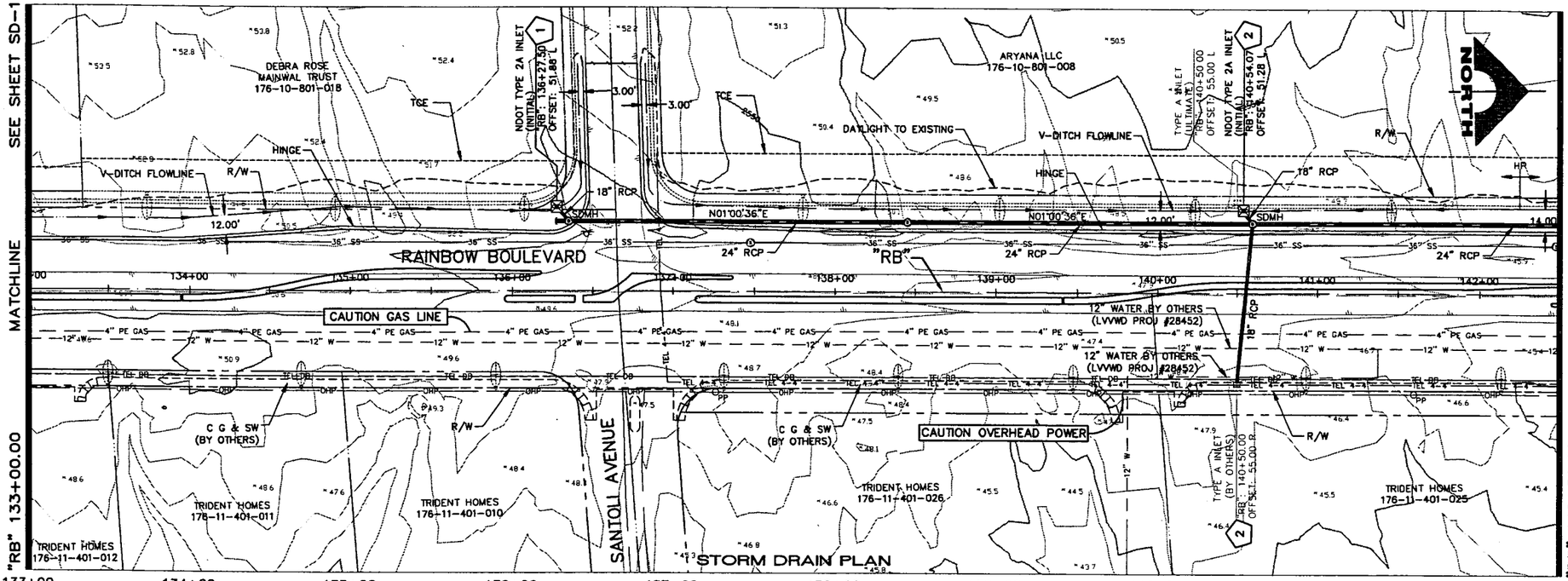
PROJECT No: 500.854 DRAWN BY: JPJ/KLT
DESIGNED BY: KLT/RRB CHECKED BY: RRB
APPROVED BY

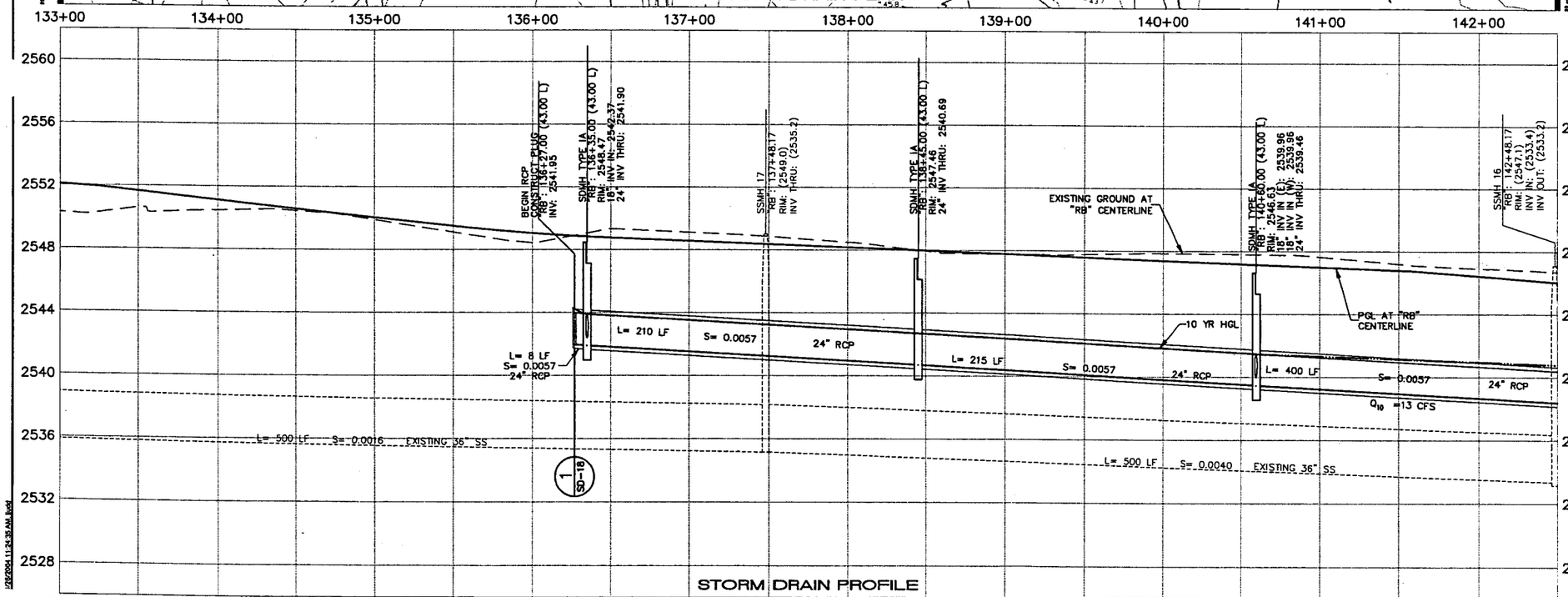
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-1
SHT. ___ OF ___

F:\500.854\dwg\mmcrop\USE_S
02/26/2004 11:24:28 AM jpjd





UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

PROTECT WATERLINES IN PLACE. WHERE A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CAN NOT BE MET, BACKFILL TRENCH WITH CEMENT SLURRY OR FLOWABLE BACKFILL TO THE SPRINGLINE OF THE WATERLINE.

LVVWD SIGNATURE DATE

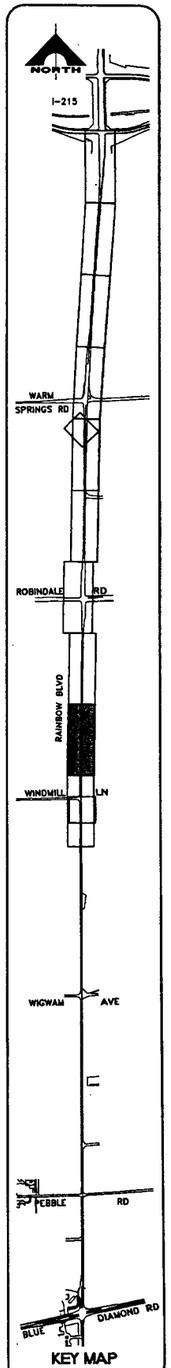
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

STORM DRAIN NOTES:
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40 0 40 80
SCALE FEET



Avoid cutting underground utility lines. It's costly.
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1-800-227-2600
UNDERGROUND SERVICE (USA)



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN PLAN AND PROFILE
"RB" 133+00.00 TO "RB" 142+50.00
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

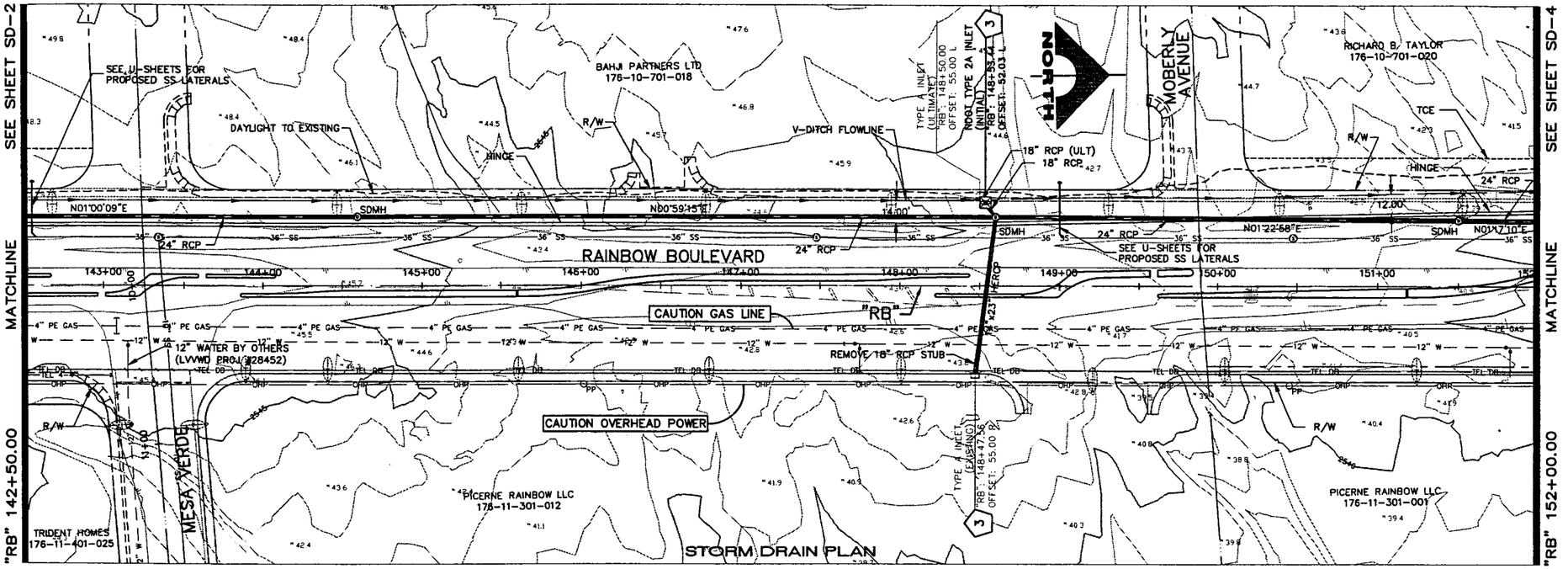
PROJECT No: 500.854 DRAWN BY: JPJ/KLT
DESIGNED BY: KLT/RRB CHECKED BY: RRB
APPROVED BY

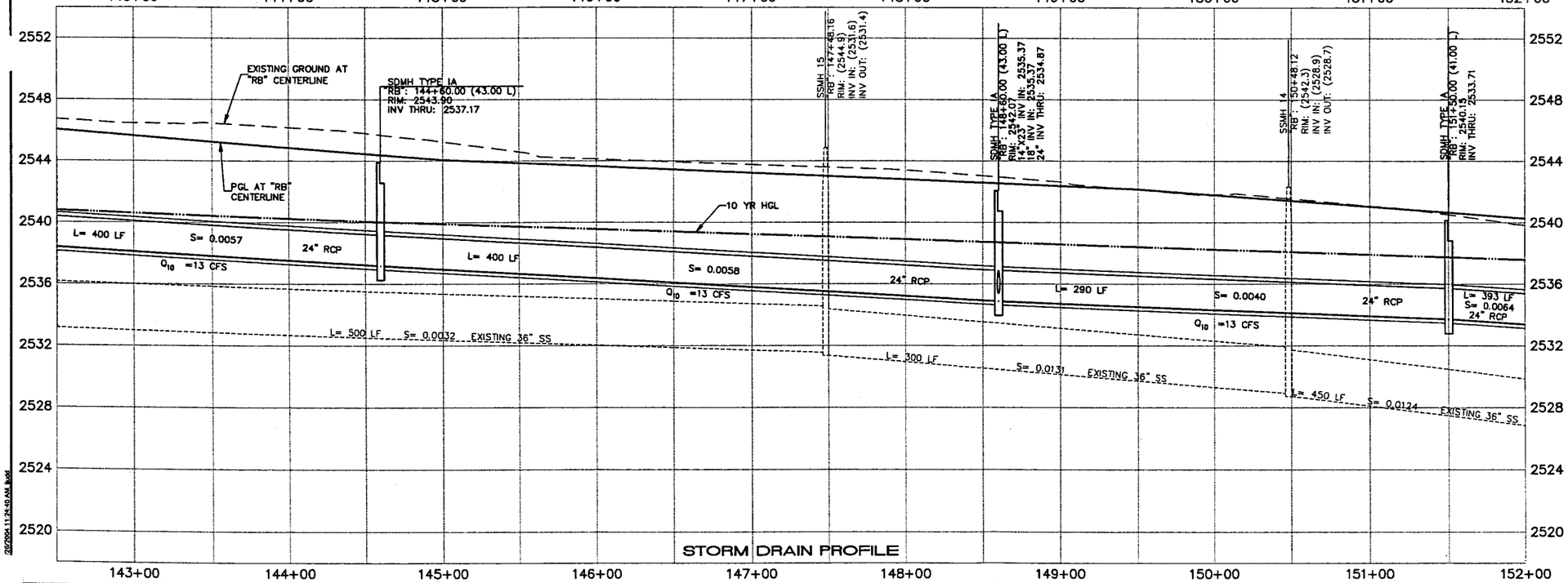
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-2
SHT. ___ OF ___

F:\500.854\dwg\lawrence\11RB_SD2.dwg
12/6/2004 11:24:35 AM, jlydd





UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

PROTECT WATERLINES IN PLACE. WHERE A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CAN NOT BE MET, BACKFILL TRENCH WITH CEMENT SLURRY OR FLOWABLE BACKFILL TO THE SPRINGLINE OF THE WATERLINE.

LVVWD SIGNATURE DATE

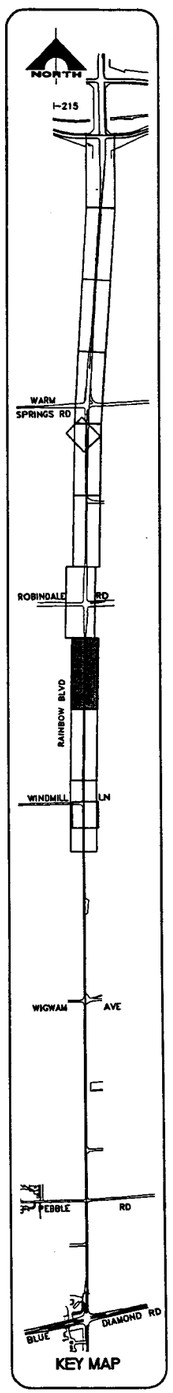
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

STORM DRAIN NOTES:
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4. ALL STORM DRAIN PIPE IS CLASS III UNLESS OTHERWISE NOTED.

40 0 40 80
SCALE FEET



Call before you Dig. 1-800-227-2600



REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN PLAN AND PROFILE
"RB" 142+50.00 TO "RB" 152+00.00
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

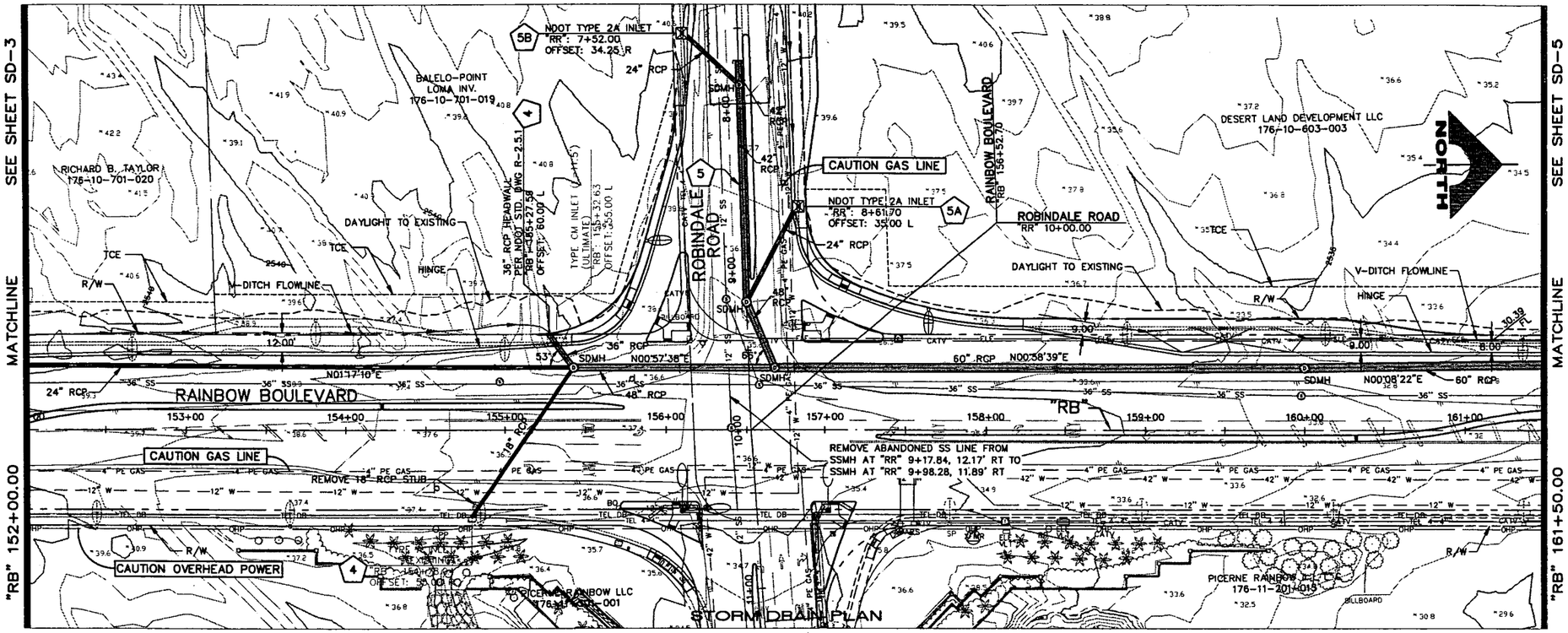
PROJECT No: 500.854 DRAWN BY: JPJ/KLT
DESIGNED BY: KLT/RRB CHECKED BY: RRB
APPROVED BY

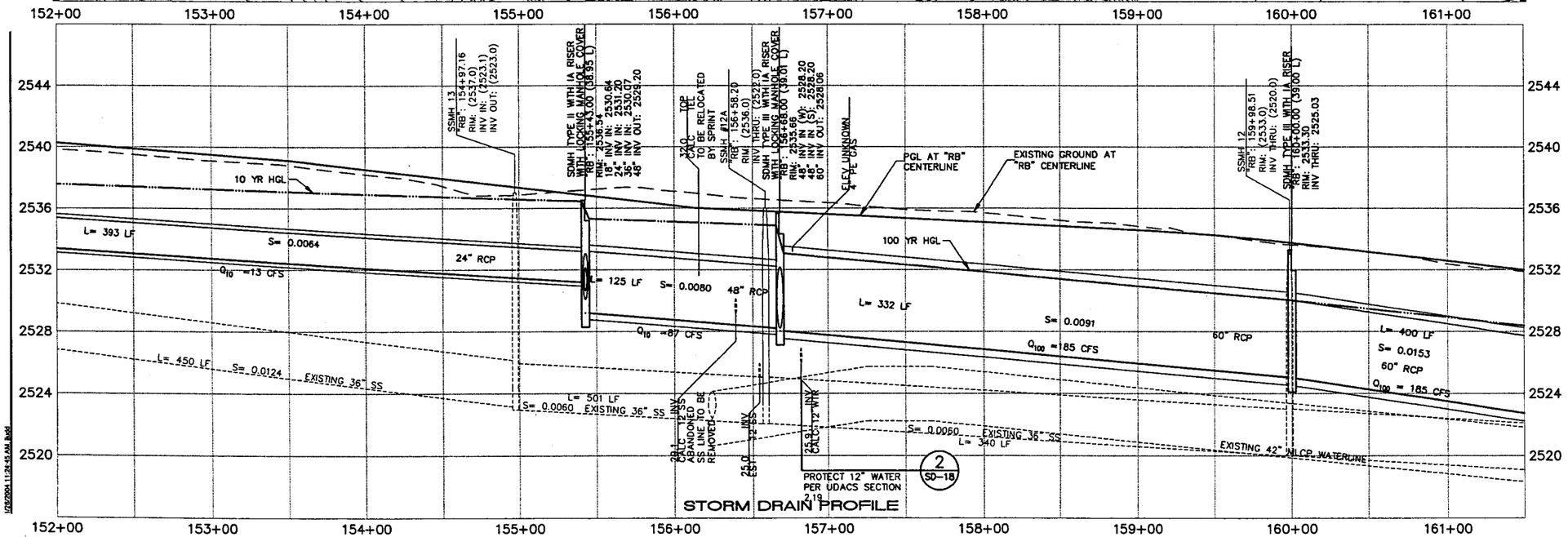
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000• FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-3
SHT. ___ OF ___

F:\500\SD\Dwg\prop-u1RB.dgn
2/6/2004 11:24:40 AM jkelt





UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

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LVVWD SIGNATURE DATE

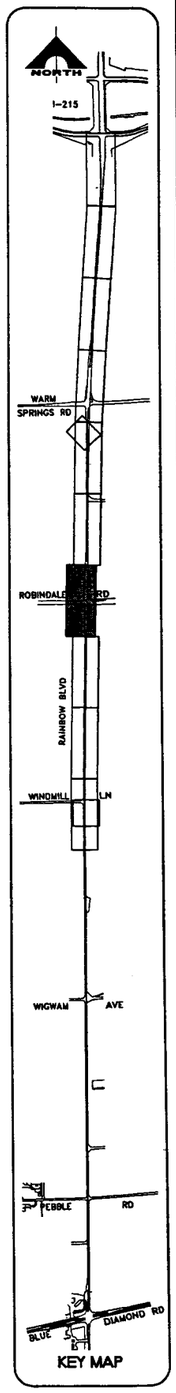
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

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4. ALL STORM DRAIN PIPE IS CLASS III UNLESS OTHERWISE NOTED.

40 0 40 80
SCALE FEET







RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

STORM DRAIN PLAN AND PROFILE

"RB" 152+00.00 TO "RB" 161+50.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

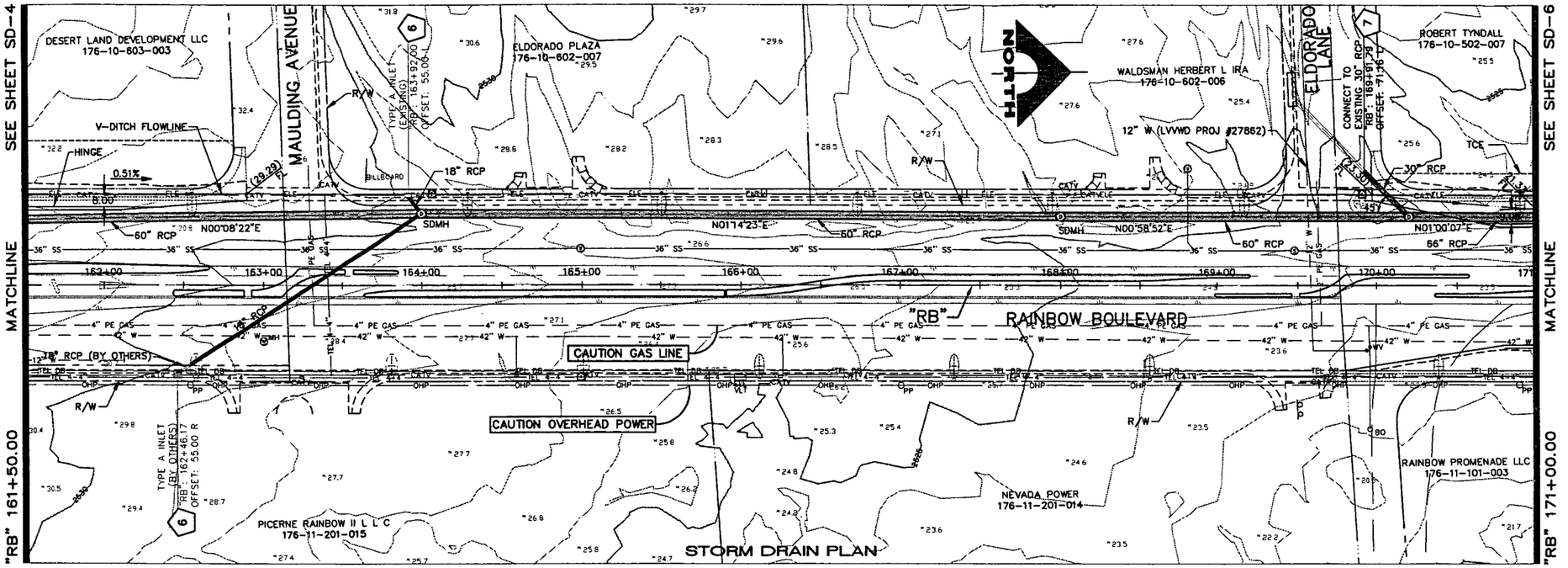
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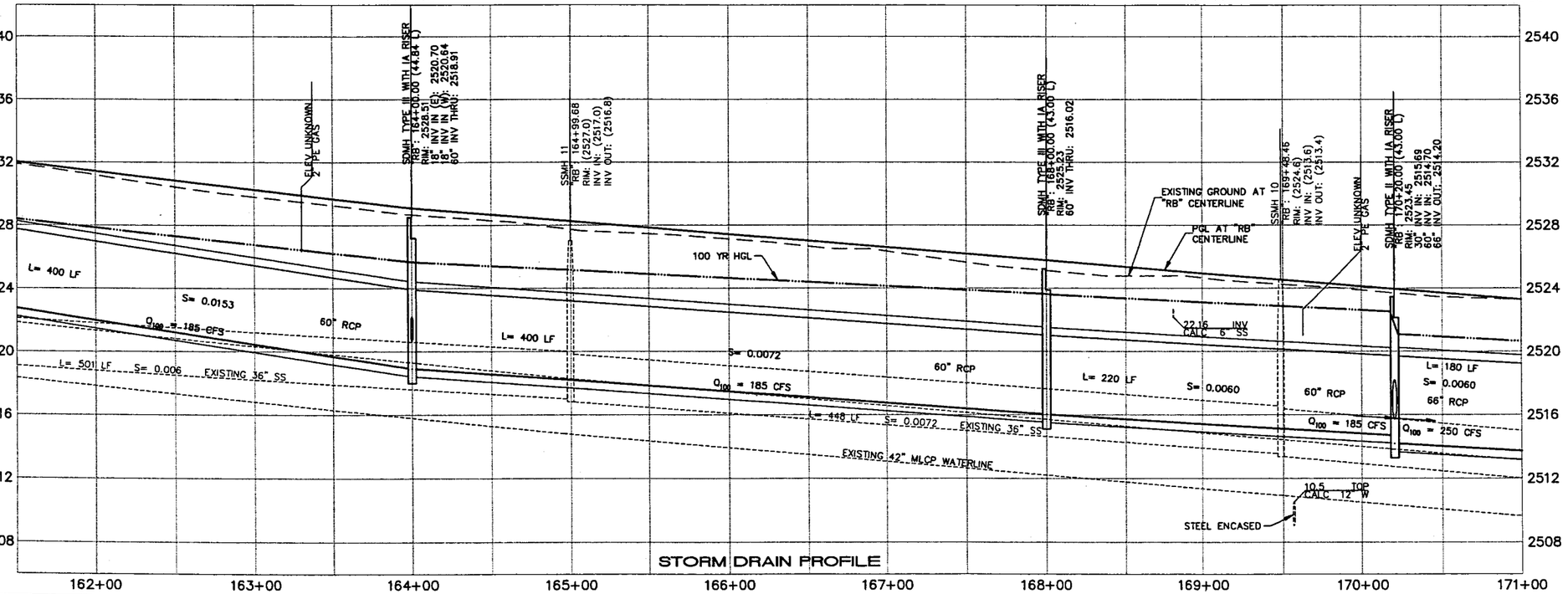
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

PROJECT No: 500.854	DRAWN BY: JPJ/KLT
DESIGNED BY: KLT/RRB	CHECKED BY: RRB
APPROVED BY	
SCALE	
HORIZ: AS SHOWN	
VERT: AS SHOWN	
FIELD BOOK	

L-1728A
DRAWING NO.
SD-4
SHT. ___ OF ___

F:\500-854\dwg\mxrox-p1(RB).SD
1/26/2004 11:24:45 AM, jkidd





UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

PROTECT WATERLINES IN PLACE. WHERE A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CAN NOT BE MET, BACKFILL TRENCH WITH CEMENT SLURRY OR FLOWABLE BACKFILL TO THE SPRINGLINE OF THE WATERLINE.

LVVWD SIGNATURE DATE

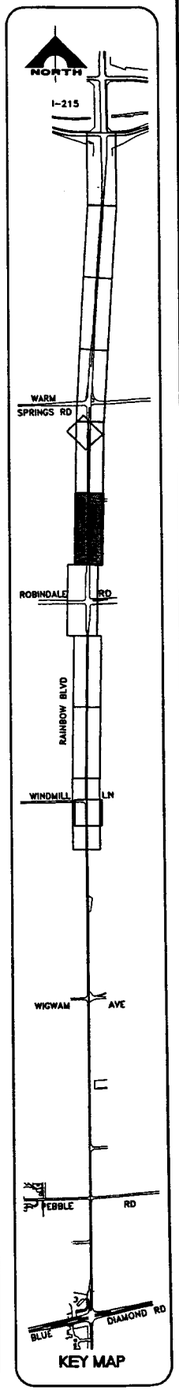
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

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40 0 40 80
SCALE FEET



Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)



REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

STORM DRAIN PLAN AND PROFILE

"RB" 161+50.00 TO "RB" 171+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

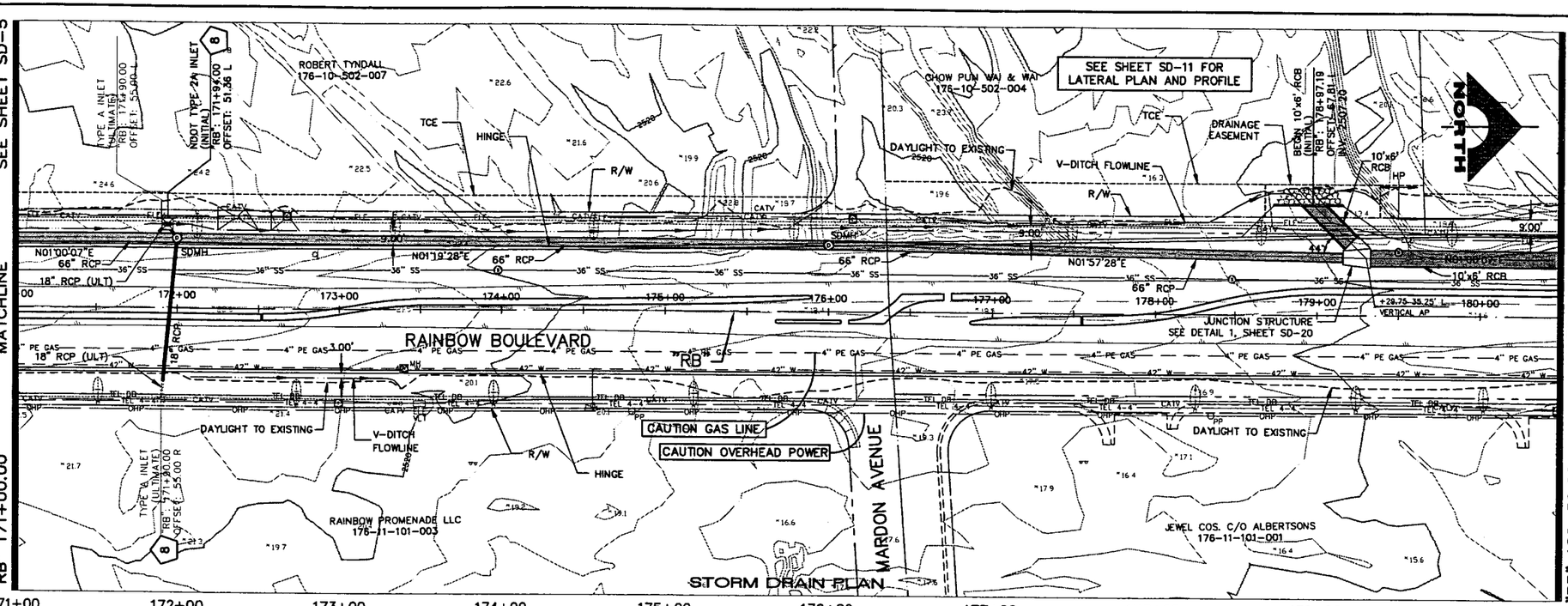
PROJECT No: 500.854 DRAWN BY: JPJ/KLT
DESIGNED BY: KLT/RRB CHECKED BY: RRB
APPROVED BY

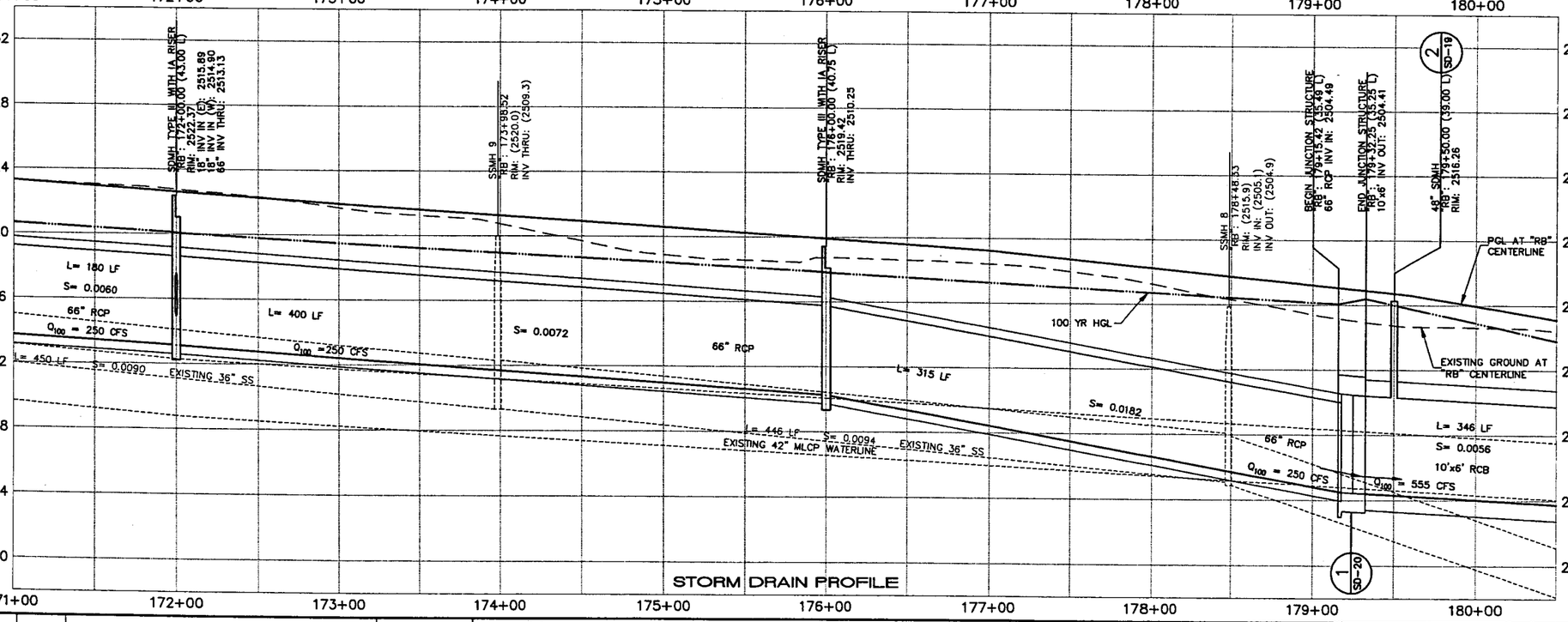
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-5
SHT. ___ OF ___

1/6/2004 11:24:50 AM kdd
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UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

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LVVWD SIGNATURE DATE

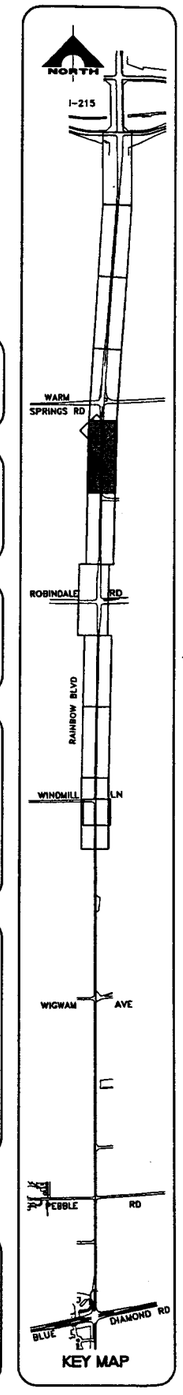
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

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40 0 40 80
SCALE FEET



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UNDERGROUND SERVICE (USA)



REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN PLAN AND PROFILE
"RB" 171+00.00 TO "RB" 180+50.00
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: JPJ/KLT
DESIGNED BY: KLT/RRB CHECKED BY: RRB
APPROVED BY

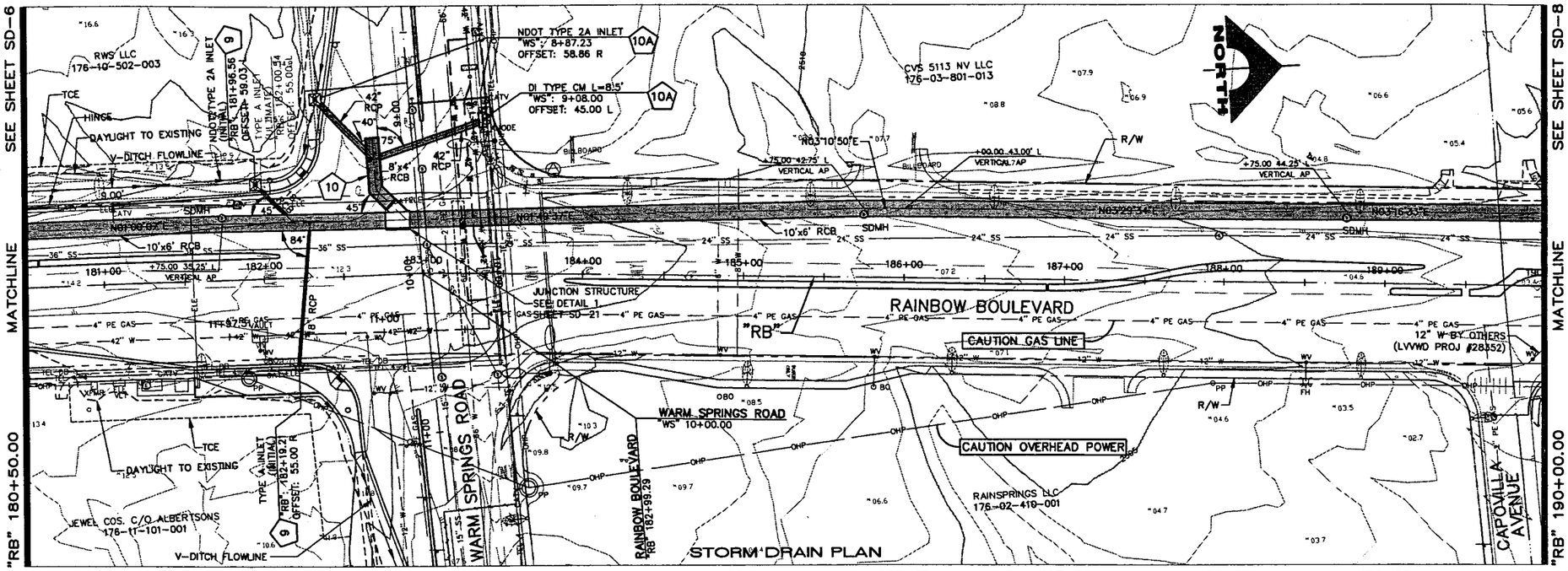
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

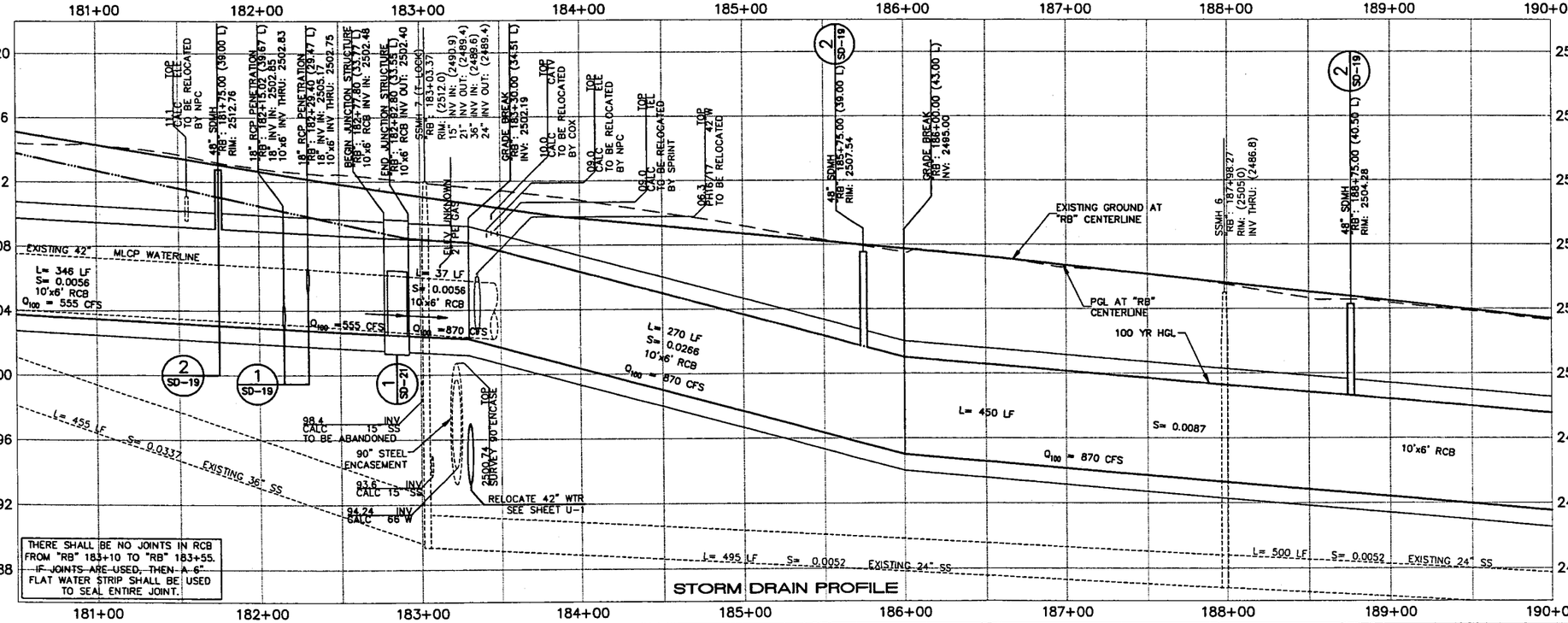
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HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-6
SHT. ___ OF ___

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3/26/2004 11:24:55 AM, jkeld





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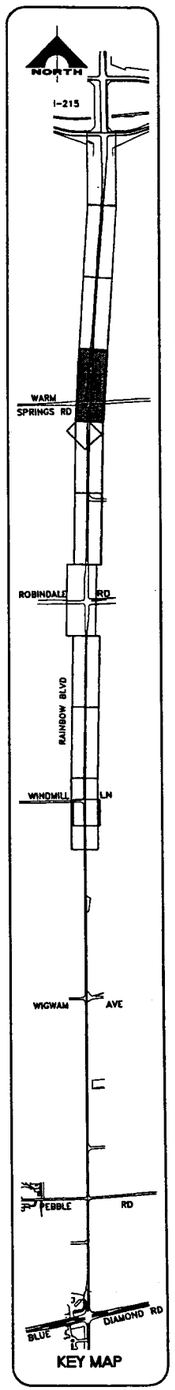
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

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40 0 40 80
SCALE FEET



Call before you Dig. 1-800-227-2600



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

STORM DRAIN PLAN AND PROFILE

"RB" 180+50.00 TO "RB" 190+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

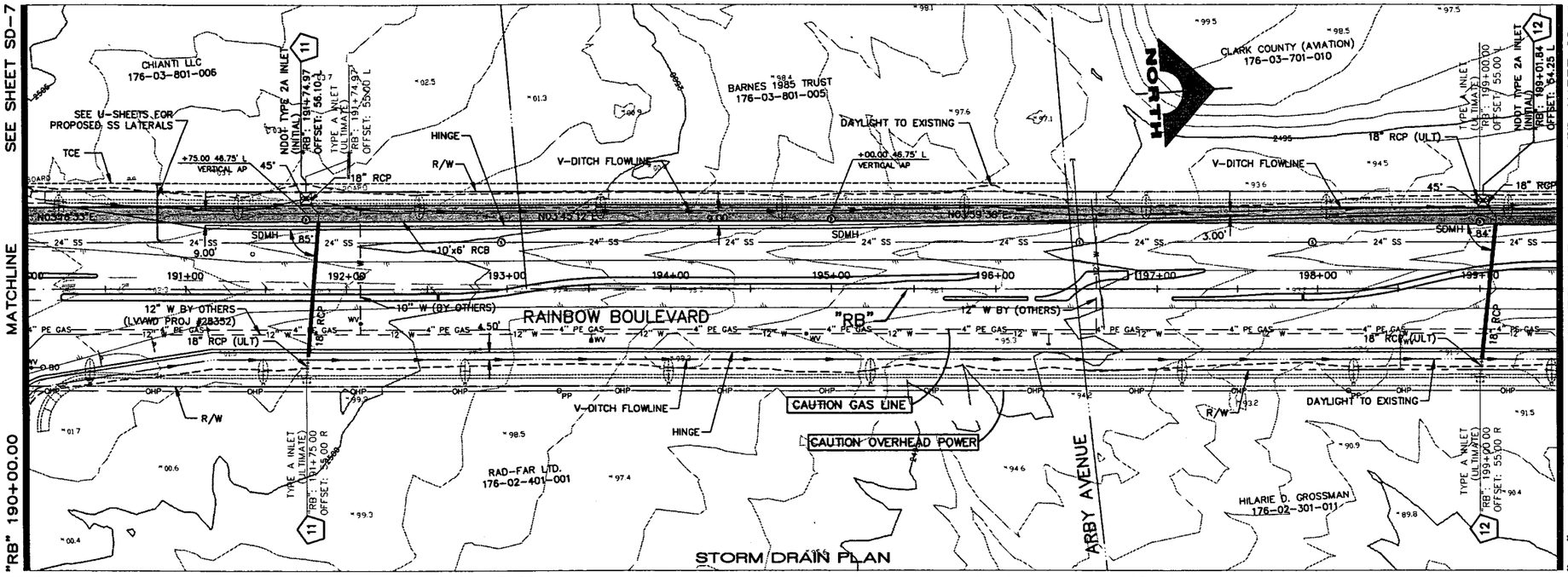
PROJECT No:	500.854	DRAWN BY:	JPJ/KLT
DESIGNED BY:	KLT/RRB	CHECKED BY:	RRB
APPROVED BY			

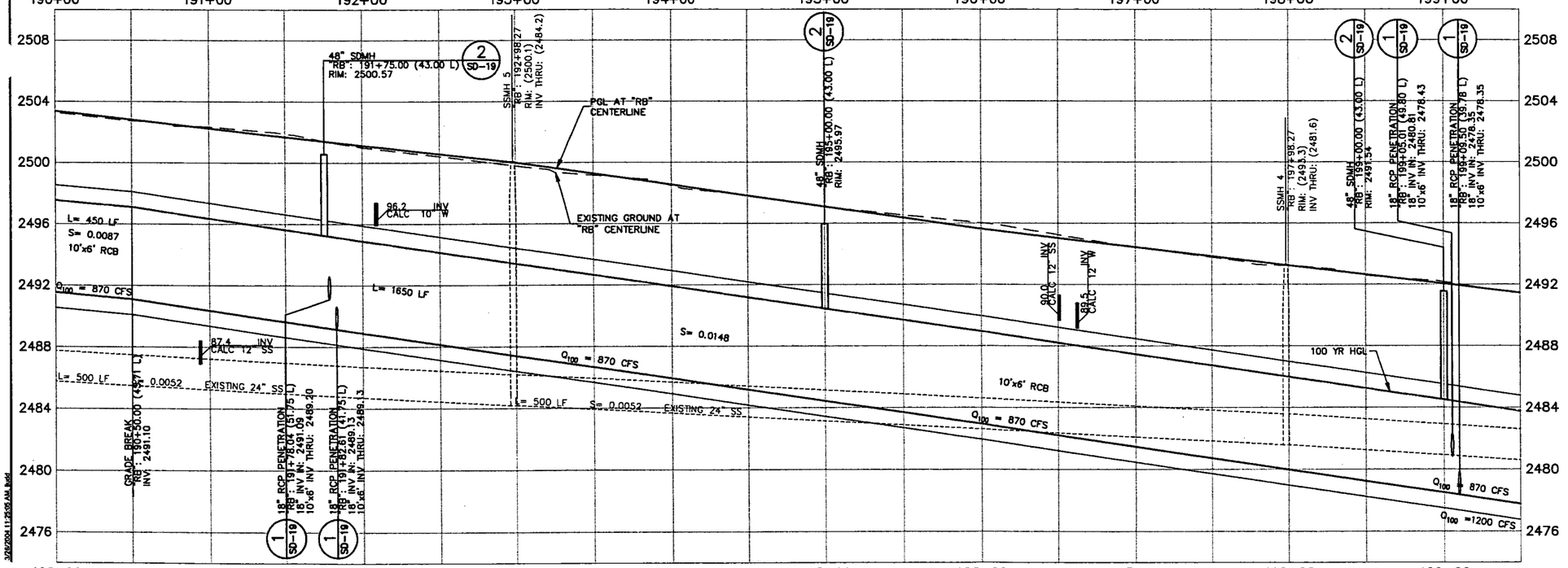
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE	L-1728A
HORIZ: AS SHOWN	DRAWING NO.
VERT: AS SHOWN	SD-7
FIELD BOOK	
	SHT. ___ OF ___

J:\28\2004 11:25:09 AM\ksfield

F:\500-854\dwg\improv-d1998.STS





UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

PROTECT WATERLINES IN PLACE. WHERE A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CAN NOT BE MET, BACKFILL TRENCH WITH CEMENT SLURRY OR FLOWABLE BACKFILL TO THE SPRINGLINE OF THE WATERLINE.

LVVWD SIGNATURE DATE

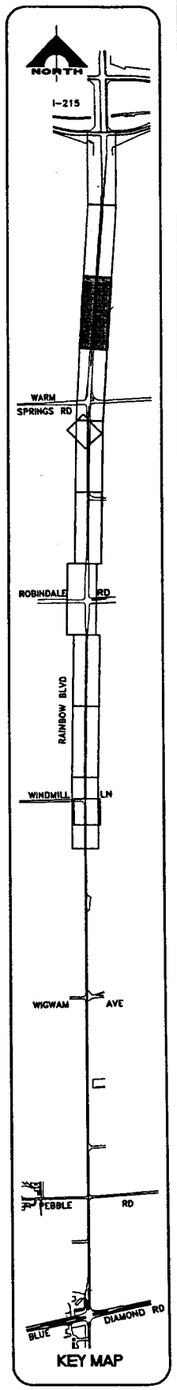
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

STORM DRAIN NOTES:
1. STORM DRAIN FACILITIES SHOWN ON PLANS TO BE BUILT DURING INITIAL CONSTRUCTION PHASE UNLESS SPECIFICALLY LABELED AS ULTIMATE.
2. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
3. STORM DRAIN MANHOLES AS SHOWN IN PROFILE SHALL BE CONSTRUCTED PER "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" LATEST EDITION, UNLESS OTHERWISE NOTED.
4. ALL STORM DRAIN PIPE IS CLASS III UNLESS OTHERWISE NOTED.

40 0 40 80
SCALE FEET



Avoid cutting underground utility lines. It's easy.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

F:\500.854\drwings\rpro\RB_SD...
2/26/2004 11:27:05 AM jkeid

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

STORM DRAIN PLAN AND PROFILE

"RB" 190+00.00 TO "RB" 199+50.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

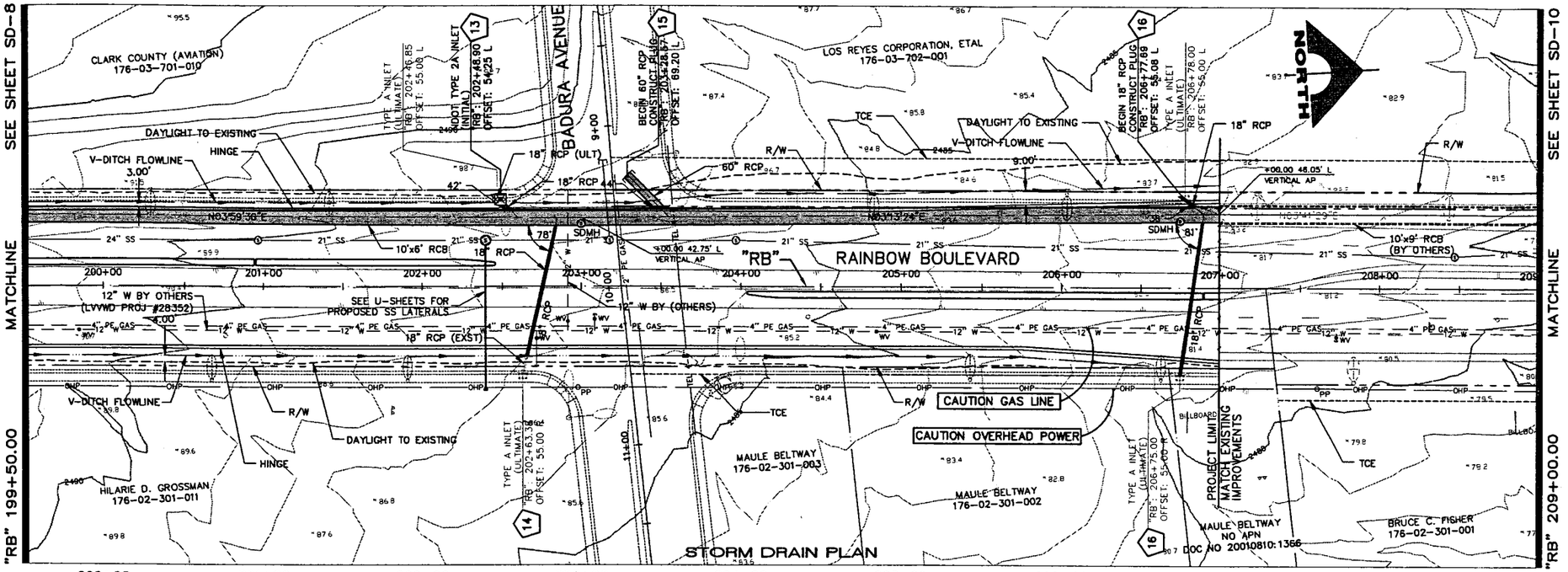
FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

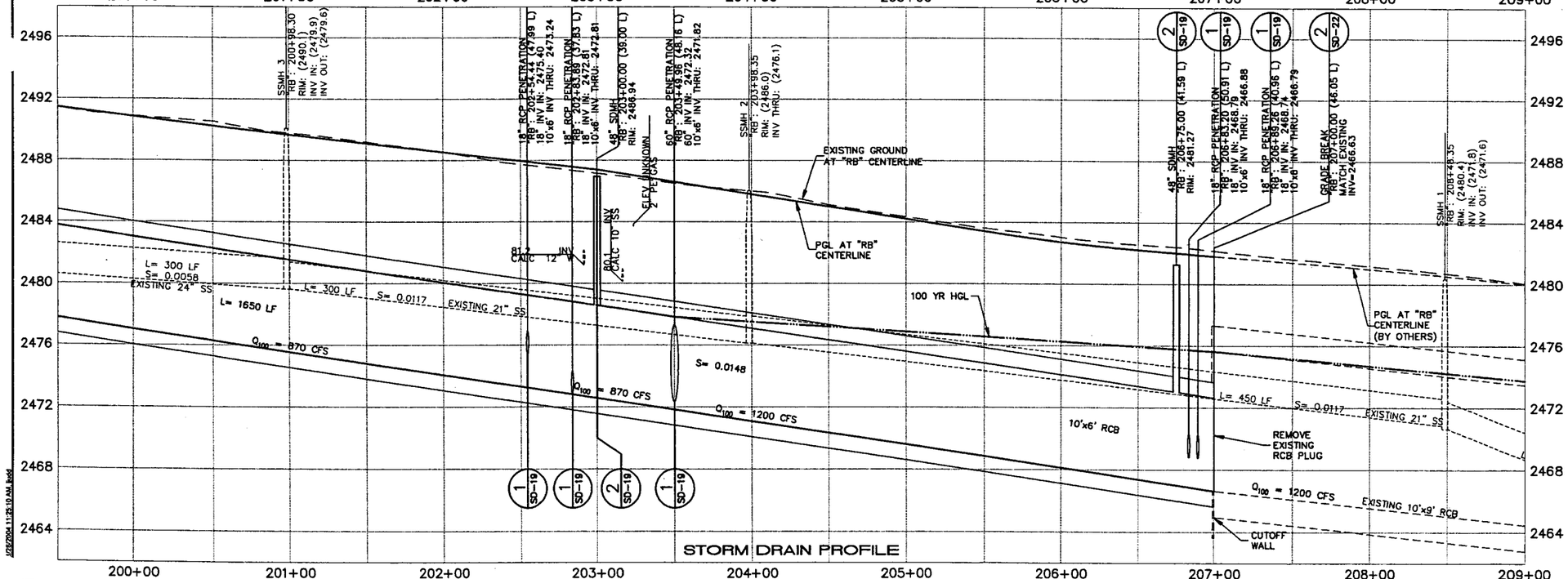
PROJECT No: 500.854 DRAWN BY: JPJ/KLT
DESIGNED BY: KLT/RRB CHECKED BY: RRB
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-8
SHT. ___ OF ___





UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

PROTECT WATERLINES IN PLACE. WHERE A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CAN NOT BE MET, BACKFILL TRENCH WITH CEMENT SLURRY OR FLOWABLE BACKFILL TO THE SPRINGLINE OF THE WATERLINE.

LVVWD SIGNATURE DATE

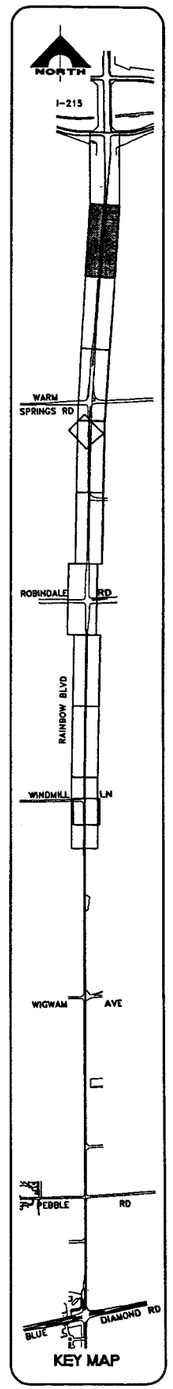
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

STORM DRAIN NOTES:
1. STORM DRAIN FACILITIES SHOWN ON PLANS TO BE BUILT DURING INITIAL CONSTRUCTION PHASE UNLESS SPECIFICALLY LABELED AS ULTIMATE.
2. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
3. STORM DRAIN MANHOLES AS SHOWN IN PROFILE SHALL BE CONSTRUCTED PER "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" LATEST EDITION, UNLESS OTHERWISE NOTED.
4. ALL STORM DRAIN PIPE IS CLASS III UNLESS OTHERWISE NOTED.

40 0 40 80
SCALE FEET



Call before you Dig. 1-800-227-2600



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

STORM DRAIN PLAN AND PROFILE

"RB" 199+50.00 TO "RB" 209+00.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No:	500.854	DRAWN BY:	JPJ/KLT
DESIGNED BY:	KLT/RRB	CHECKED BY:	RRB
APPROVED BY			

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

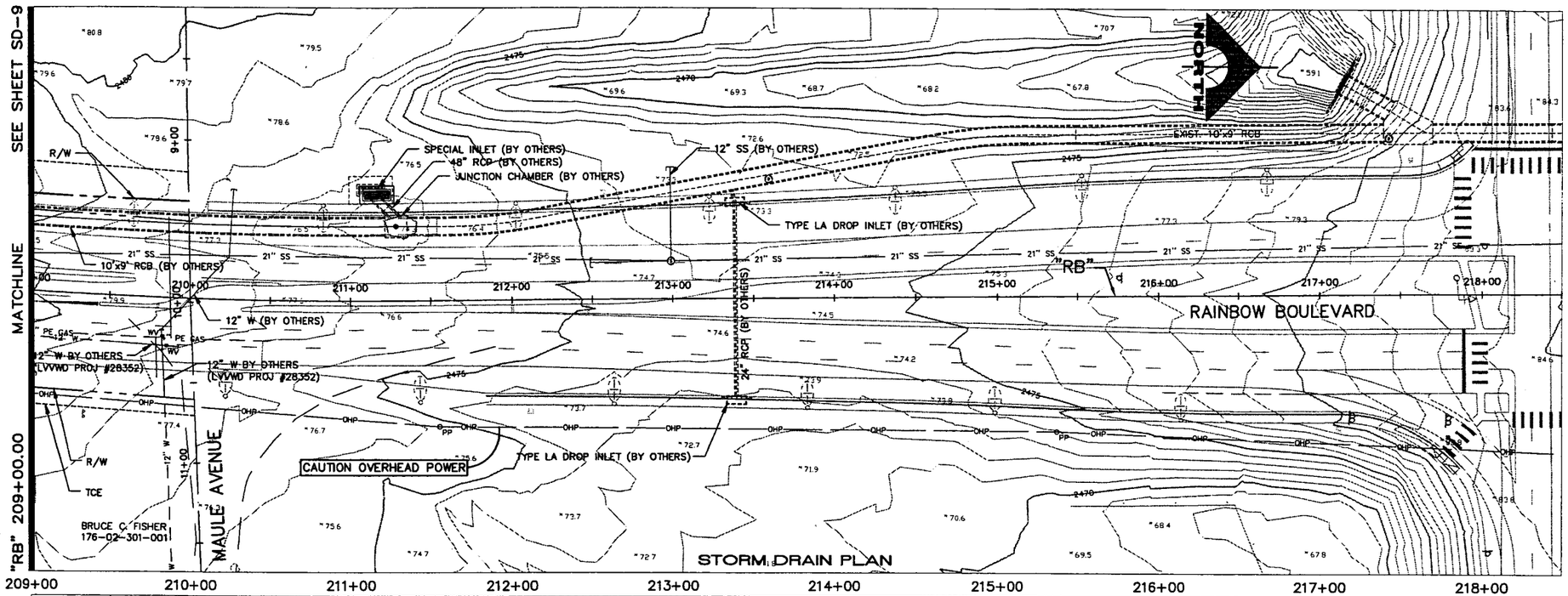
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HORIZ: AS SHOWN	
VERT: AS SHOWN	
FIELD BOOK	

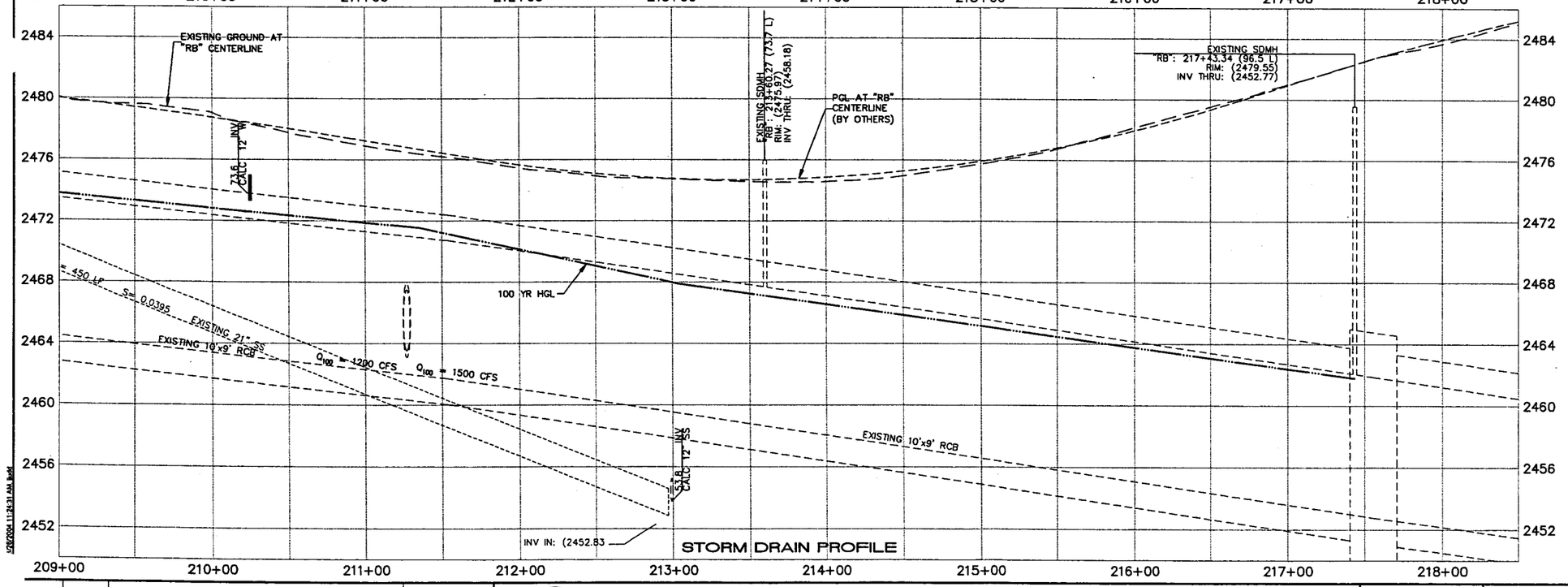
L-1728A

DRAWING NO. SD-9

SHT. ___ OF ___

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UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

LVVWD SIGNATURE DATE

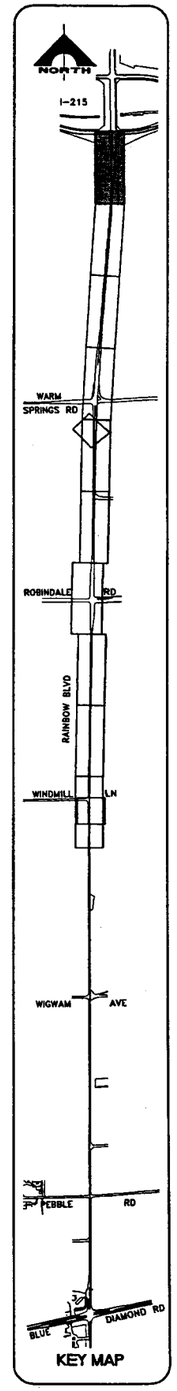
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 5B	SD-12
6 THRU 10A	SD-13
11 THRU 16	SD-14

STORM DRAIN NOTES:
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3. STORM DRAIN MANHOLES AS SHOWN IN PROFILE SHALL BE CONSTRUCTED PER "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" LATEST EDITION, UNLESS OTHERWISE NOTED.
4. ALL STORM DRAIN PIPE IS CLASS III UNLESS OTHERWISE NOTED.

40 0 40 80
SCALE FEET







RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

STORM DRAIN PLAN AND PROFILE

"RB" 209+00.00 TO "RB" 218+50.00

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

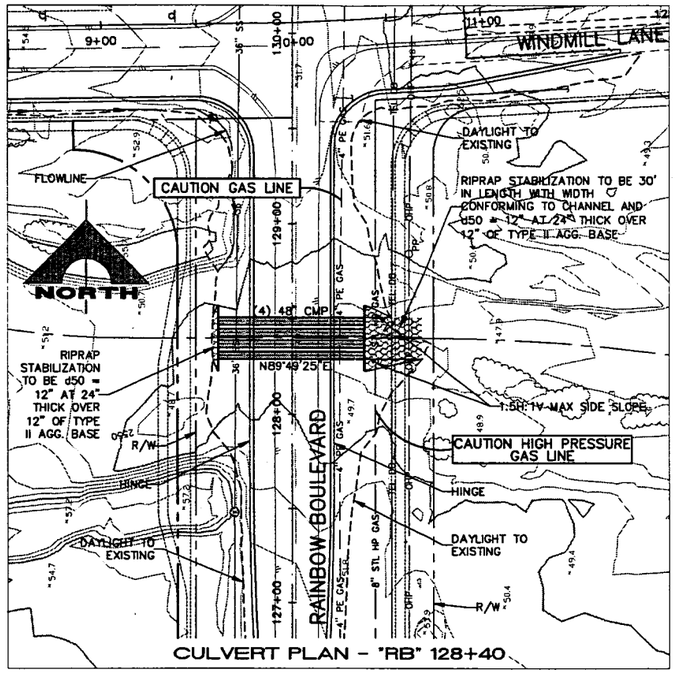
PROJECT No: 500.854 DRAWN BY: JPJ/KLT
DESIGNED BY: KLT/RRB CHECKED BY: RRB
APPROVED BY

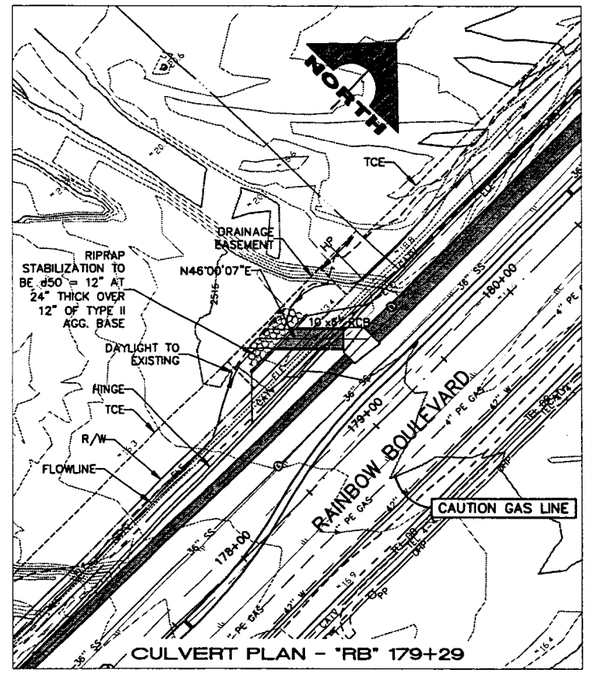
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

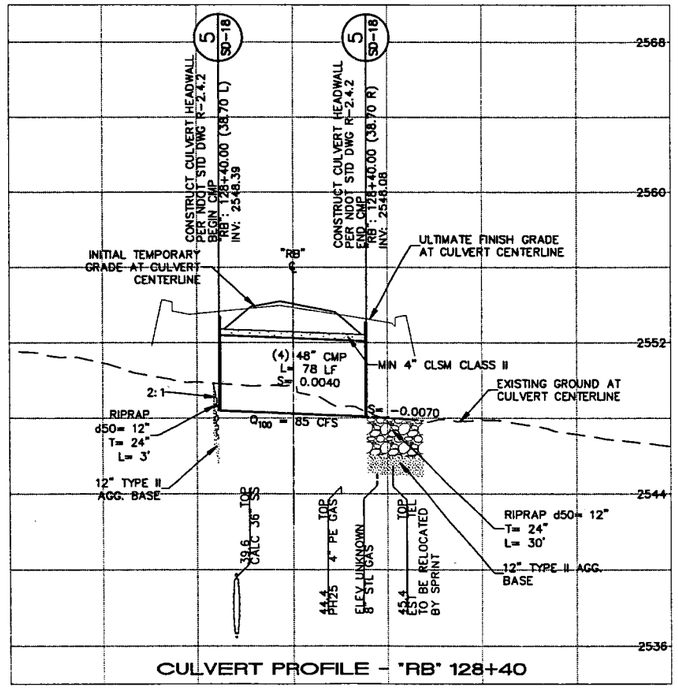
SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

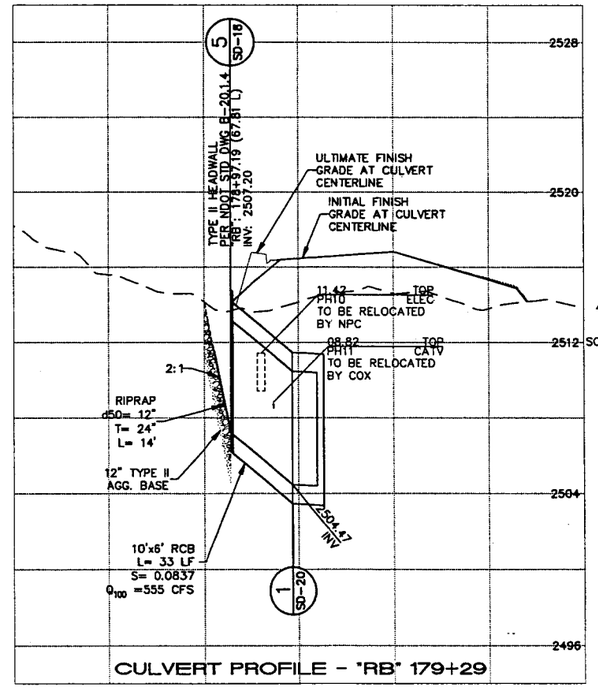
L-1728A
DRAWING NO.
SD-10
SHT. ___ OF ___

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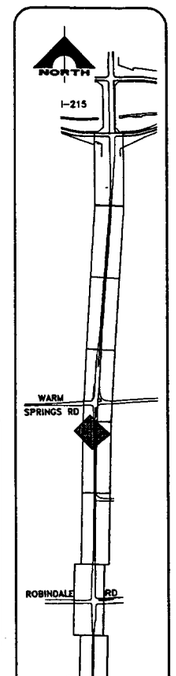


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4. BOX CULVERTS TO BE CONSTRUCTED PER ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, STD DRAWINGS B-20.1.1. TO B-20.1.3.1 AS APPLICABLE.

40 0 40
SCALE FEET

AVOID HITTING OVERHEAD POWER LINES (13 FEET)
CALL BEFORE YOU DO OVERHEAD
1-702-593-8111

Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)



RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN CULVERTS
PLAN AND PROFILE
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

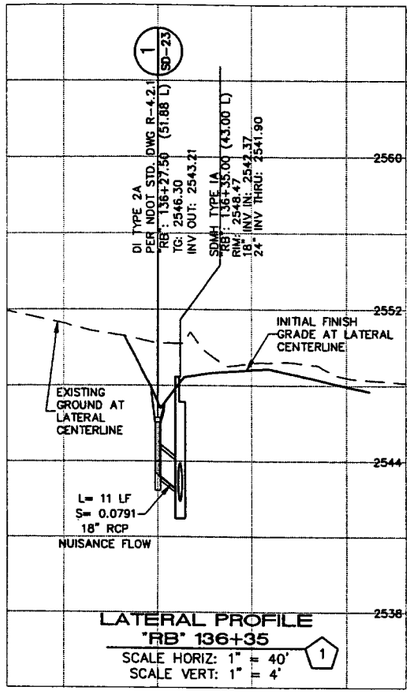
PROJECT No: 500.854 DRAWN BY: KLT
DESIGNED BY: KLT/RRB CHECKED BY: RRB
APPROVED BY

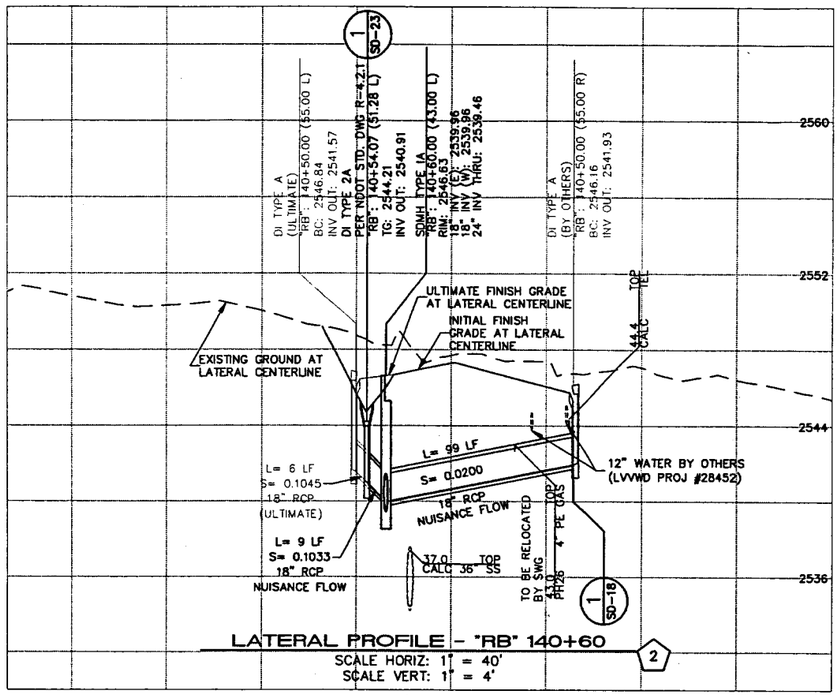
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

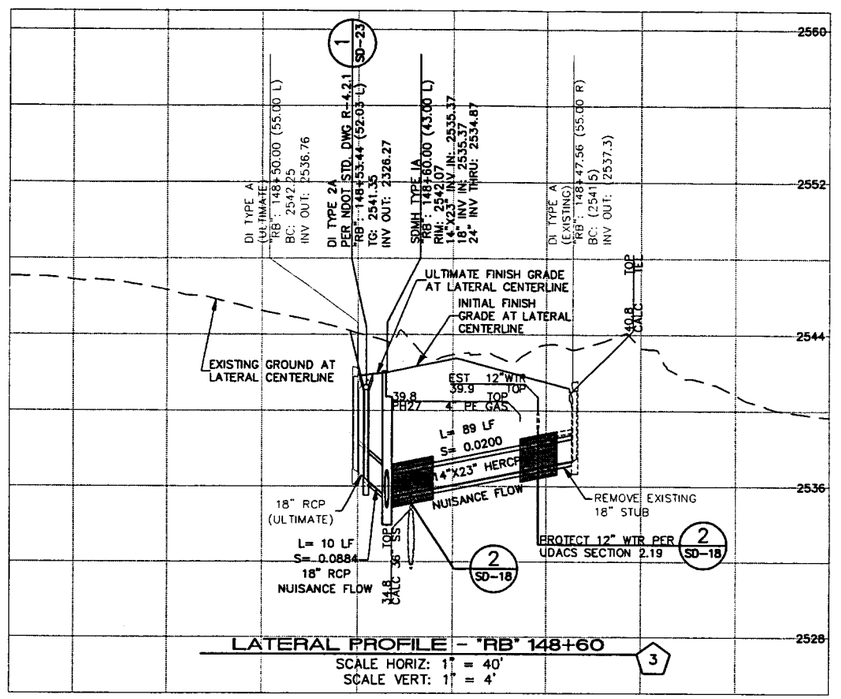
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HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-11
SHT. ___ OF ___

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dp 03/26/2004 11:25:19 AM kidd





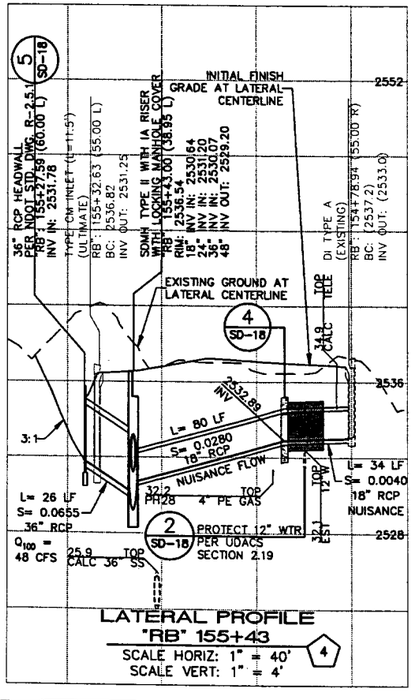


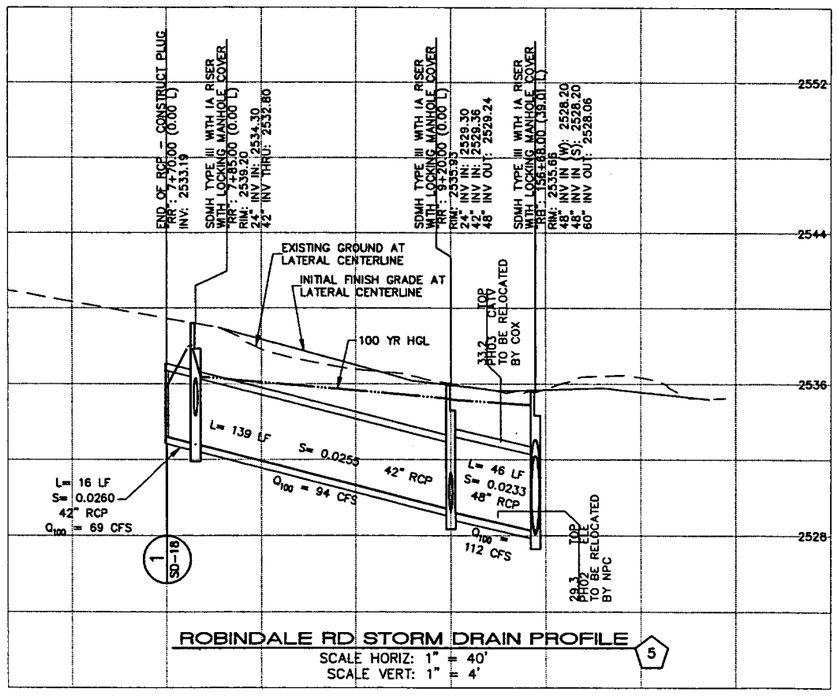
UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

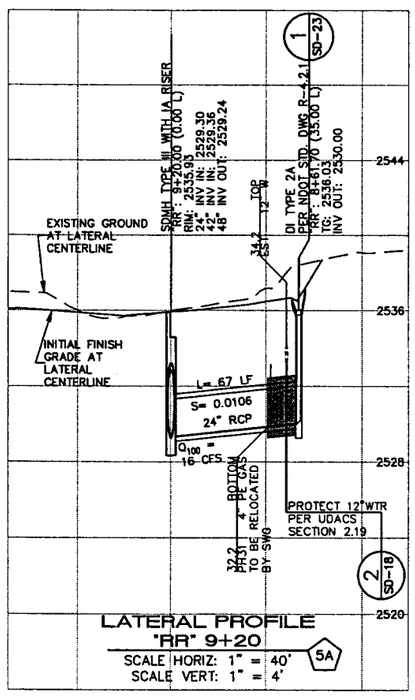
PROTECT WATERLINES IN PLACE. WHEREVER A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CONTROL LOW STRENGTH MATERIAL (CLSM) TO THE SPRINGLINE OF THE WATERLINE. THIS REQUIREMENT IS FOR STRUCTURAL SUPPORT ONLY, ADDITIONAL HEALTH REGULATIONS MAY APPLY PER UDACS 2.19

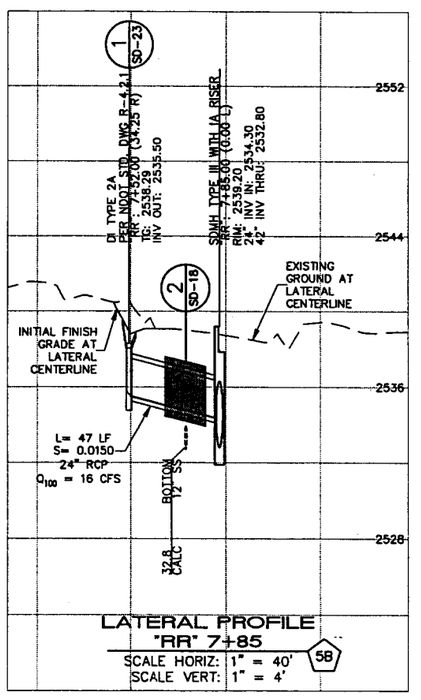
LVVWD SIGNATURE DATE

STORM DRAIN NOTES:
1. STORM DRAIN FACILITIES SHOWN ON PLANS TO BE BUILT DURING INITIAL CONSTRUCTION PHASE UNLESS SPECIFICALLY LABELED AS ULTIMATE.
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4. BOX CULVERTS TO BE CONSTRUCTED PER NDOT STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, STD DRAWINGS B-20.1.1. TO B-20.1.3.1 AS APPLICABLE.
5. NDOT TYPE 2A DROP INLETS TO BE CONSTRUCTED PER NDOT STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION, STD. DRAWING R-4.2.1. COLLARS FOR NDOT TYPE 2A INLETS ARE SHOWN ON SHEET SD-23









Call before you Dig. 1-800-227-2600 (UNDERGROUND SERVICE (USA))

CALL BEFORE YOU DO OVERHEAD 1-702-593-6111

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN LATERALS
PROFILE
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

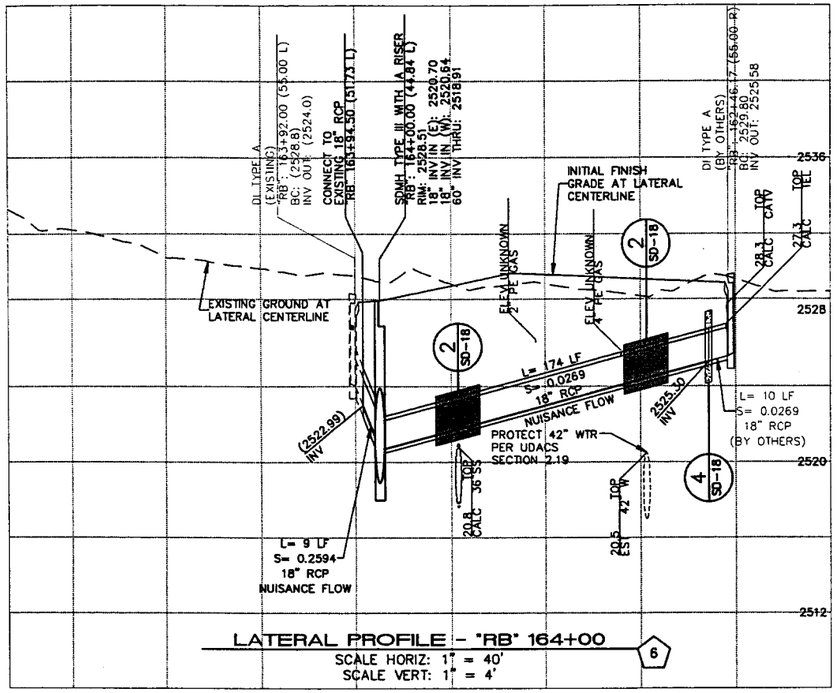
PROJECT No: 500.854 DRAWN BY: MDM/KLT
DESIGNED BY: KLT/MDM CHECKED BY: RRB
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-12
SHT. ___ OF ___

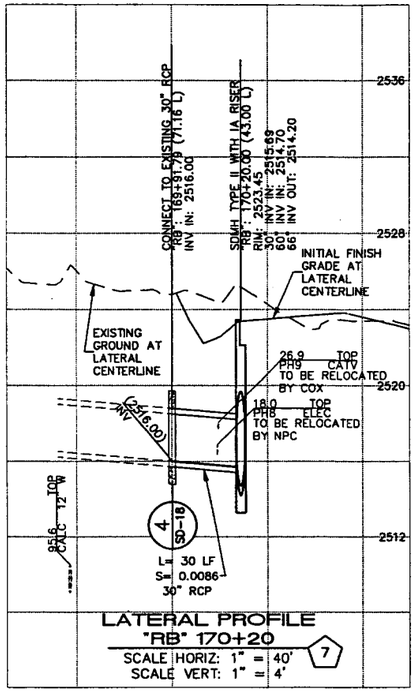
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LATERAL PROFILE - "RB" 164+00

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

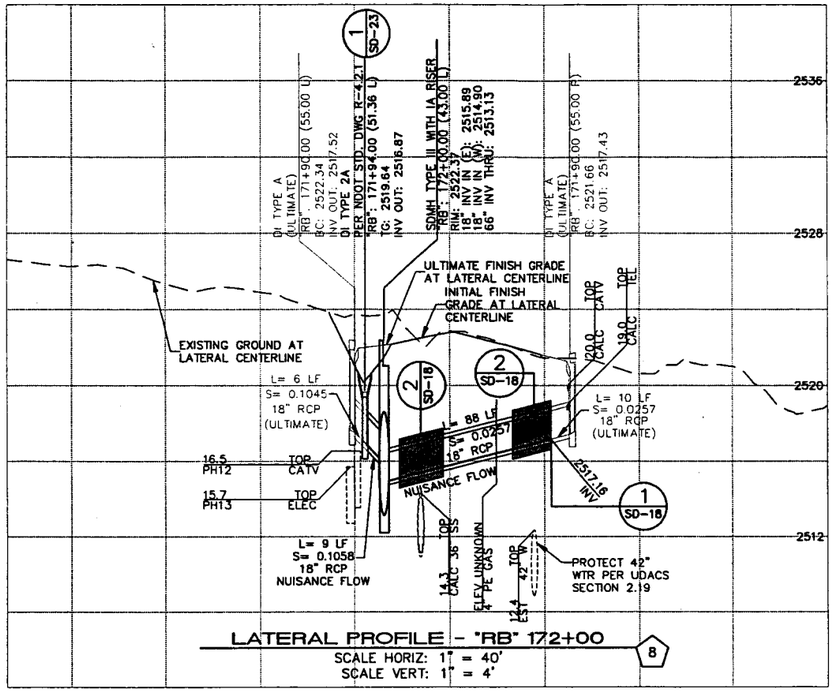
6



LATERAL PROFILE
"RB" 170+20

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

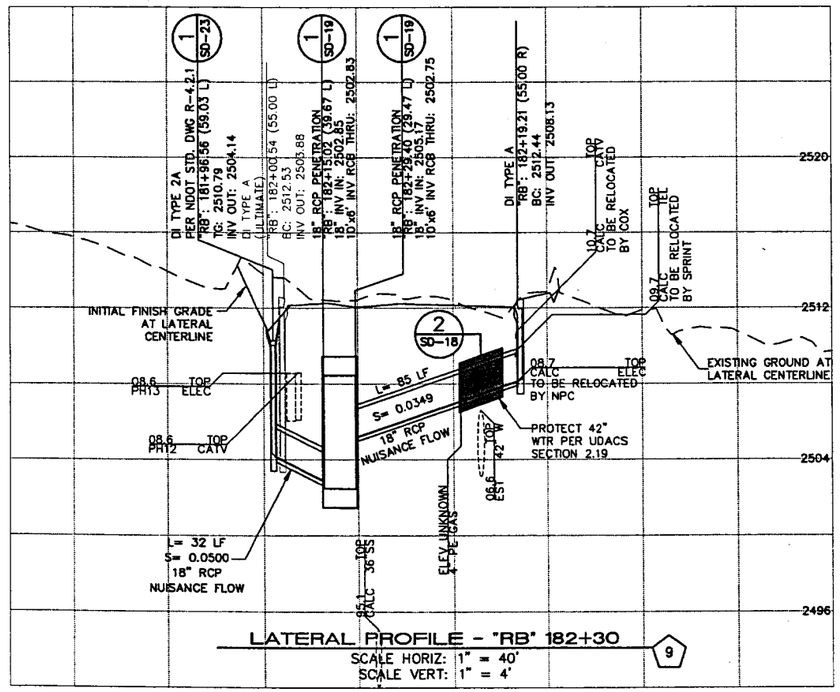
7



LATERAL PROFILE - "RB" 172+00

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

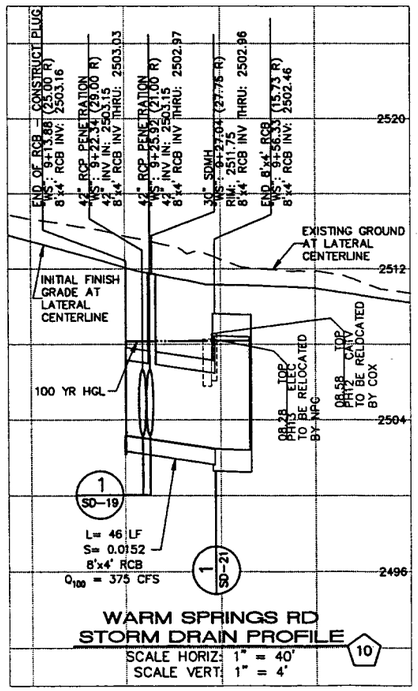
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LATERAL PROFILE - "RB" 182+30

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

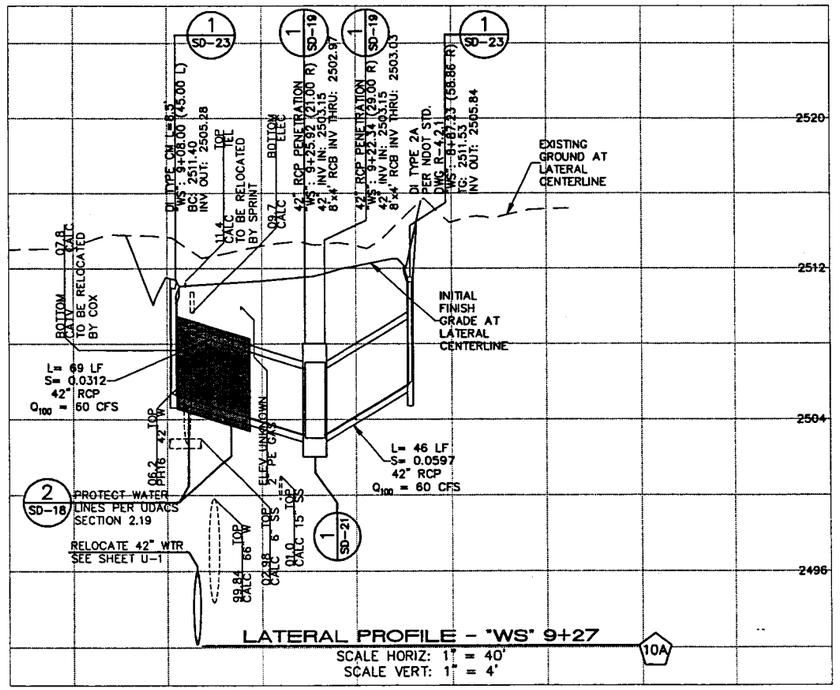
9



WARM SPRINGS RD
STORM DRAIN PROFILE

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

10



LATERAL PROFILE - "WS" 9+27

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

10A

UNLESS INDICATED BY POTHOLE (PH), GAS LINE LOCATIONS ARE APPROXIMATE, AND ARE SOLELY INTENDED TO ALERT THE CONTRACTOR TO THE PRESENCE OF THE GAS LINE.

PROTECT WATERLINES IN PLACE. WHEREVER A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CONTROL LOW STRENGTH MATERIAL (CLSM) TO THE SPRINGLINE OF THE WATERLINE. THIS REQUIREMENT IS FOR STRUCTURAL SUPPORT ONLY, ADDITIONAL HEALTH REGULATIONS MAY APPLY PER UDACS 2.19

LVVWD SIGNATURE DATE

STORM DRAIN NOTES:
1. STORM DRAIN FACILITIES SHOWN ON PLANS TO BE BUILT DURING INITIAL CONSTRUCTION PHASE UNLESS SPECIFICALLY LABELED AS ULTIMATE.
2. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
3. STORM DRAIN MANHOLES AS SHOWN IN PROFILE SHALL BE CONSTRUCTED PER "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" LATEST EDITION, UNLESS OTHERWISE NOTED.
4. BOX CULVERTS TO BE CONSTRUCTED PER NDOT STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, STD DRAWINGS B-20.1.1. TO B-20.1.3.1 AS APPLICABLE.
5. NDOT TYPE 2A DROP INLETS TO BE CONSTRUCTED PER NDOT STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION, STD. DRAWING R-4.2.1. COLLARS FOR NDOT TYPE 2A INLETS ARE SHOWN ON SHEET SD-23

Call before you Dig. 1-800-227-2600 UNDERGROUND SERVICE (USA)

CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN LATERALS
PROFILE
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: MDM/KLT
DESIGNED BY: KLT/MDM CHECKED BY: RRB
APPROVED BY

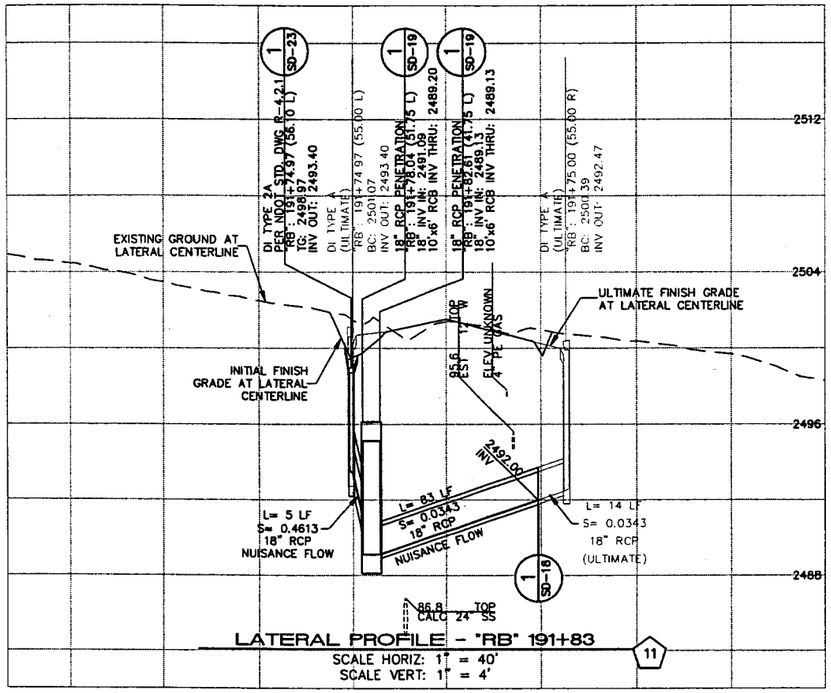
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-13
SHT. ___ OF ___

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

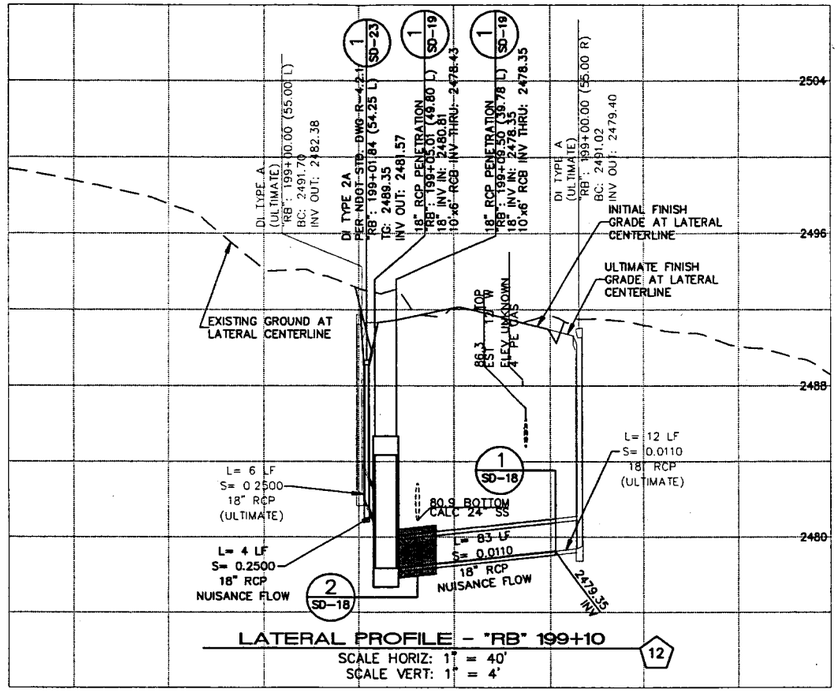
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LATERAL PROFILE - "RB" 191+83

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

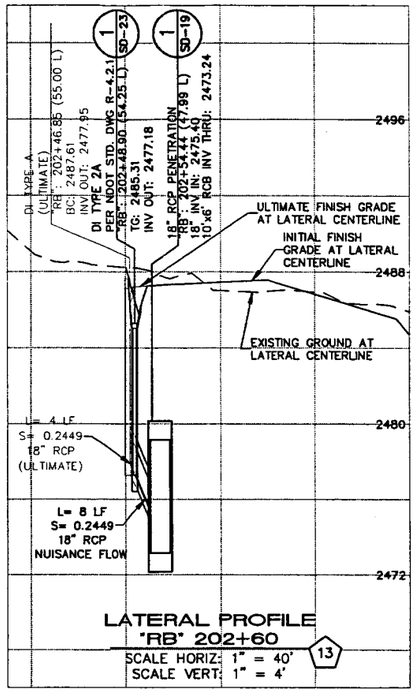
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LATERAL PROFILE - "RB" 199+10

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

12



LATERAL PROFILE "RB" 202+60

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

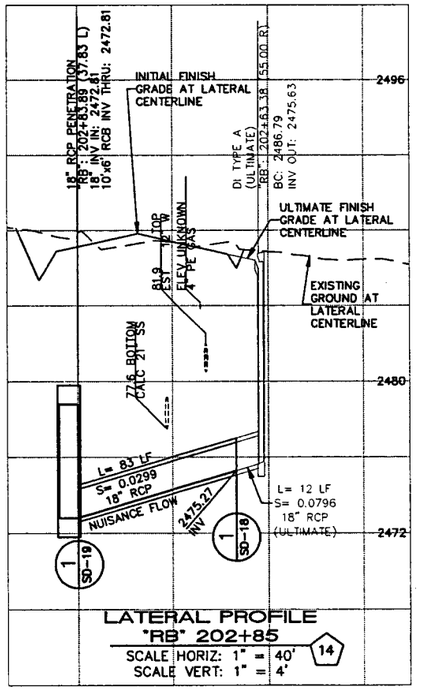
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PROTECT WATERLINES IN PLACE. WHEREVER A WATERLINE IS WITHIN 18" ABOVE A STORM DRAIN LINE, OR WHERE COMPACTION UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CONTROL LOW STRENGTH MATERIAL (CLSM) TO THE SPRINGLINE OF THE WATERLINE. THIS REQUIREMENT IS FOR STRUCTURAL SUPPORT ONLY, ADDITIONAL HEALTH REGULATIONS MAY APPLY PER UDACS 2.19

LVVWD SIGNATURE DATE

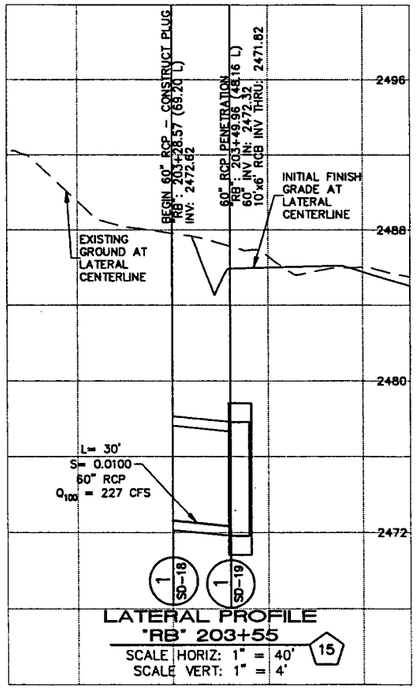
STORM DRAIN NOTES:
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LATERAL PROFILE "RB" 202+85

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

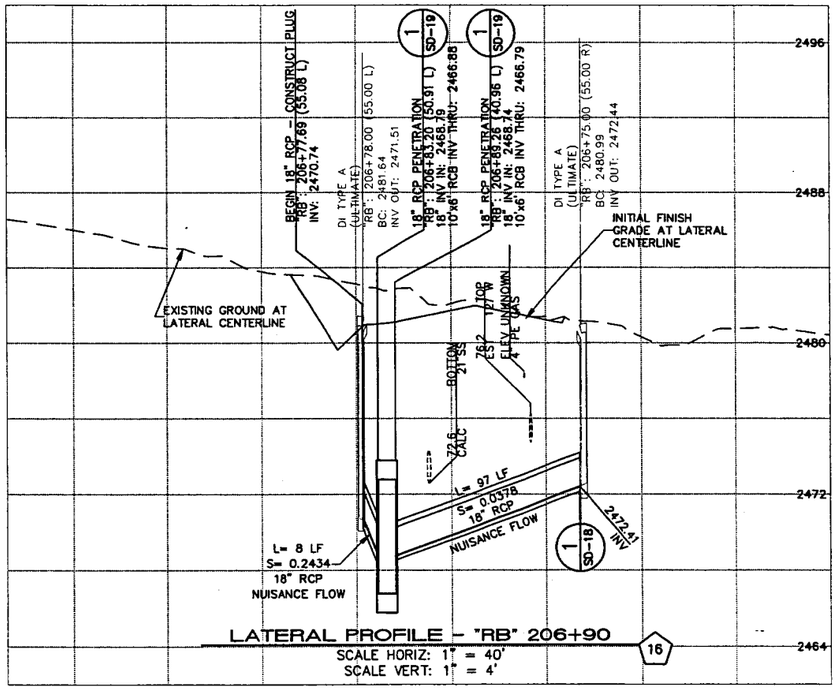
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LATERAL PROFILE "RB" 203+55

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

15



LATERAL PROFILE - "RB" 206+90

SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'

16

Call before you Dig. 1-800-227-2600

CALL BEFORE YOU DO OVERHEAD 1-702-593-6111

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

STORM DRAIN LATERALS PROFILE

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

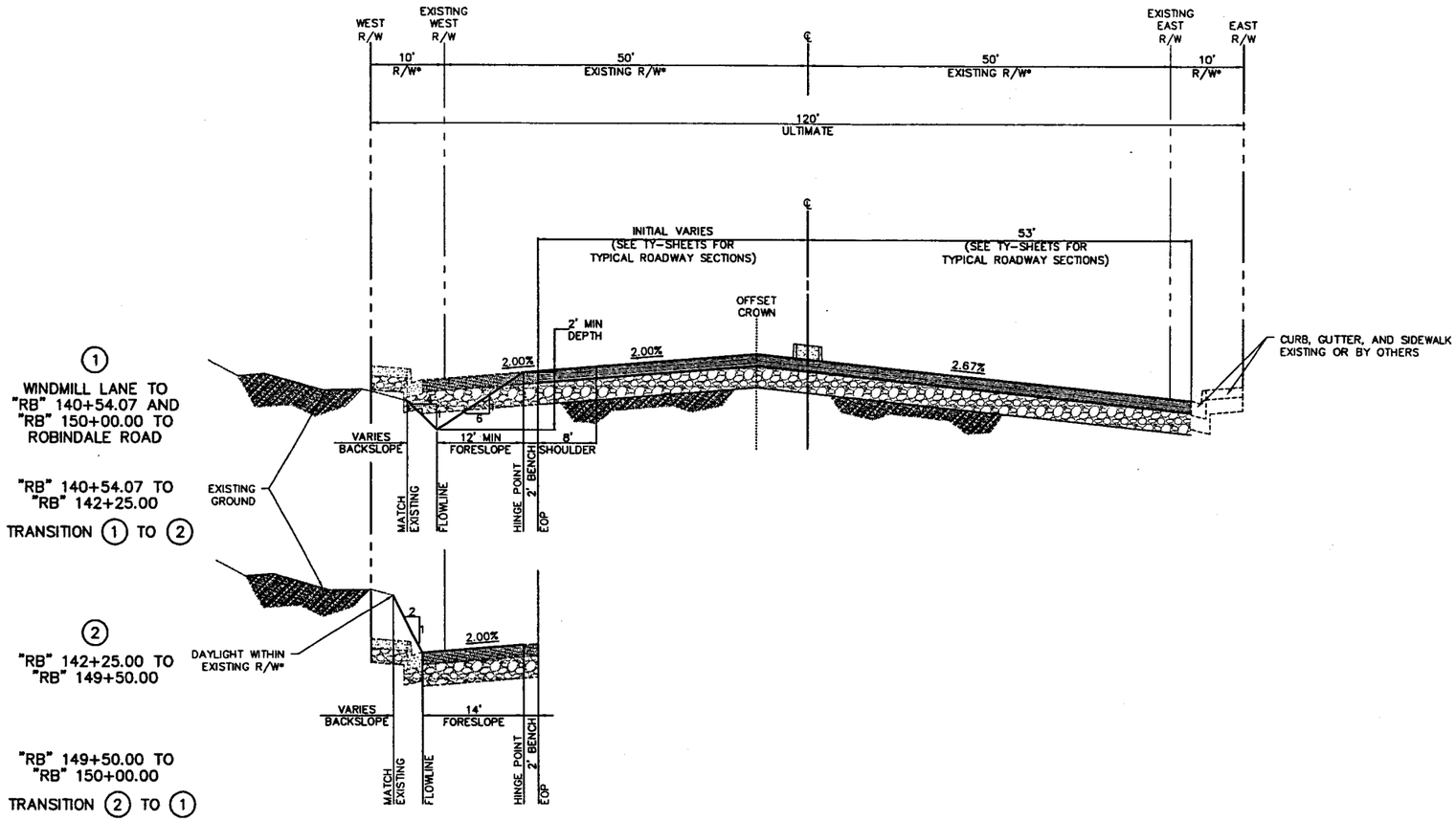
PROJECT No: 500.854 DRAWN BY: MDM/KLT
DESIGNED BY: KLT/MDM CHECKED BY: RRB
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-14
SHT. ___ OF ___

Date: 07/26/2004 11:26:45 AM Model



① WINDMILL LANE TO "RB" 140+54.07 AND "RB" 150+00.00 TO ROBINDALE ROAD

"RB" 140+54.07 TO "RB" 142+25.00
TRANSITION ① TO ②

② "RB" 142+25.00 TO "RB" 149+50.00

"RB" 149+50.00 TO "RB" 150+00.00
TRANSITION ② TO ①

NOTE:

PROPOSED DRAINAGE AND TEMPORARY CONSTRUCTION EASEMENTS REQUIRED FOR ROADSIDE AND CULVERT GRADING ARE SHOWN ON PLAN SHEETS.

CONSTRUCT FULL-DEPTH PAVEMENT SECTION TO LIP OF GUTTER AS SHOWN ON C-SHEETS.

* AS SHOWN ON PLAN SHEETS.

RAINBOW BOULEVARD
WINDMILL LANE TO ROBINDALE ROAD

AVOID HITTING OVERHEAD POWER LINES. IT'S EASY!
CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

RAINBOW BOULEVARD – BLUE DIAMOND ROAD TO SOUTHERN BELTWAY – PHASE I – FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN GRADING
TYPICAL SECTIONS
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

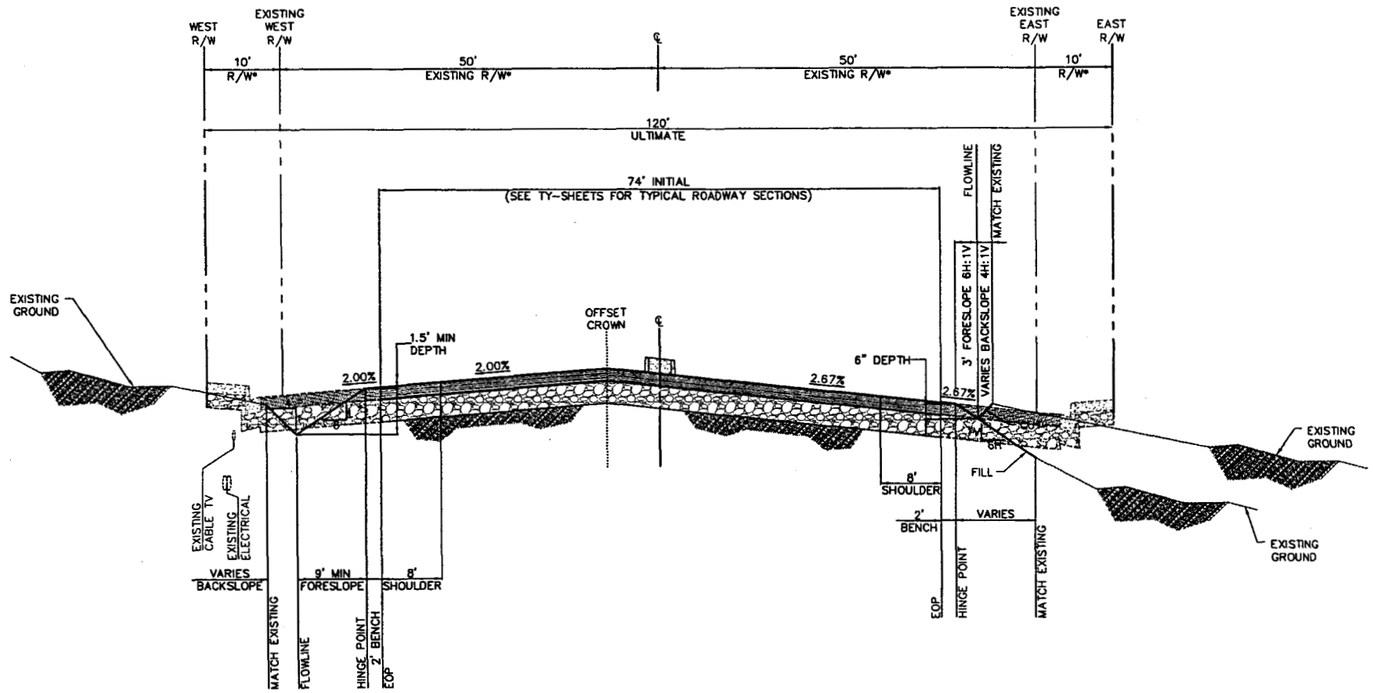
PROJECT No: 500.854 DRAWN BY: KLT
DESIGNED BY: JRT/KLT/RRB CHECKED BY: RRB
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-15
SHT. ___ OF ___

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NOTE:

PROPOSED DRAINAGE AND TEMPORARY CONSTRUCTION EASEMENTS REQUIRED FOR ROADSIDE AND CULVERT GRADING ARE SHOWN ON PLAN SHEETS.

CONSTRUCT FULL-DEPTH PAVEMENT SECTION TO LIP OF GUTTER AS SHOWN ON C-SHEETS.

* AS SHOWN ON PLAN SHEETS.

RAINBOW BOULEVARD
ROBINDALE ROAD TO WARM SPRINGS ROAD

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)

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN GRADING
TYPICAL SECTIONS
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: KLT
DESIGNED BY: JRT/KLT/RRB CHECKED BY: RRB
APPROVED BY

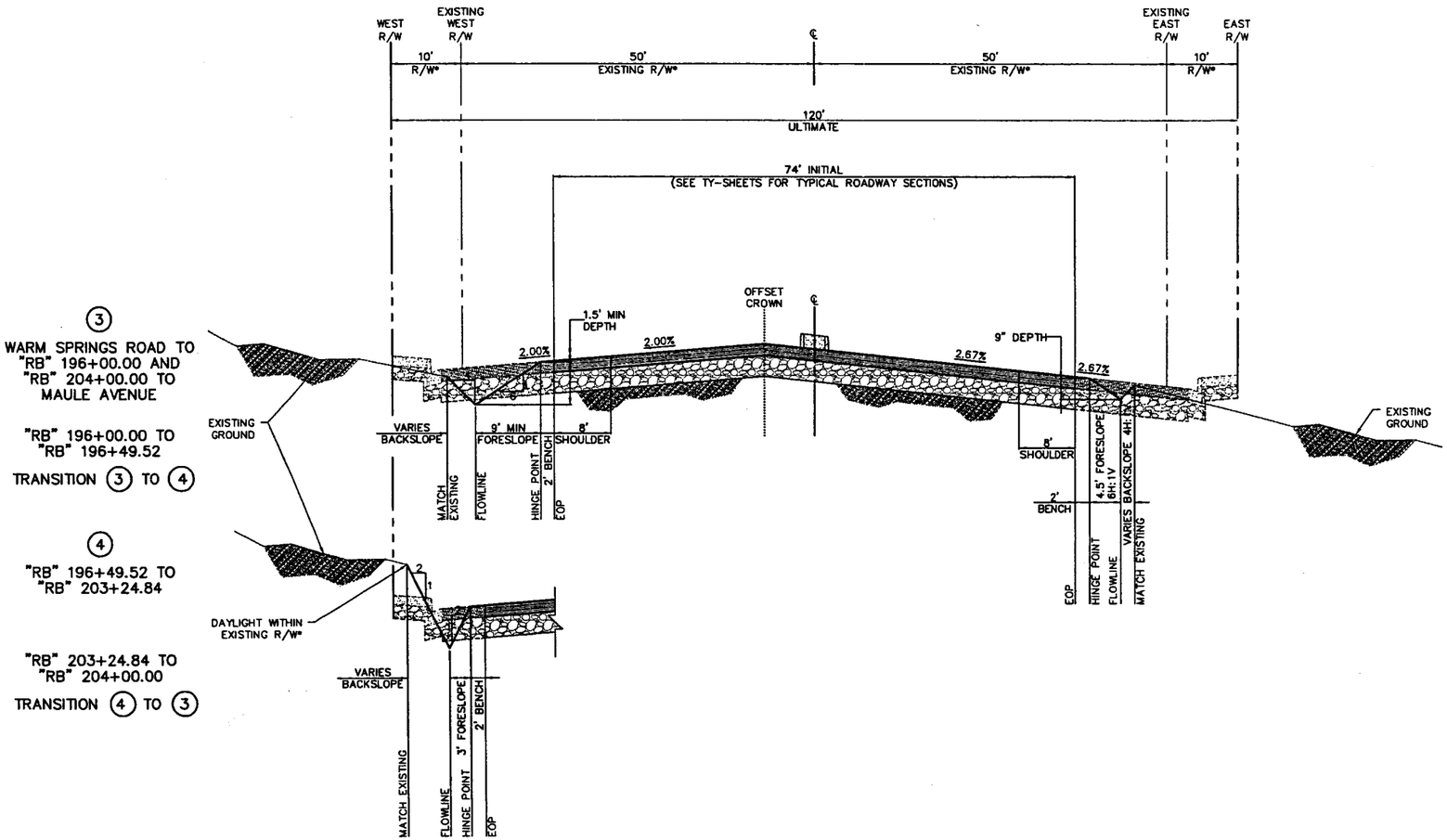
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-16
SHT. ___ OF ___

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

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F:\500\854\dwg\temp\rb-sd16.dgn SD



③
WARM SPRINGS ROAD TO "RB" 196+00.00 AND "RB" 204+00.00 TO MAULE AVENUE

"RB" 196+00.00 TO "RB" 196+49.52
TRANSITION ③ TO ④

④
"RB" 196+49.52 TO "RB" 203+24.84

"RB" 203+24.84 TO "RB" 204+00.00
TRANSITION ④ TO ③

NOTE:

PROPOSED DRAINAGE AND TEMPORARY CONSTRUCTION EASEMENTS REQUIRED FOR ROADSIDE AND CULVERT GRADING ARE SHOWN ON PLAN SHEETS.

CONSTRUCT FULL-DEPTH PAVEMENT SECTION TO LIP OF GUTTER AS SHOWN ON C-SHEETS.

* AS SHOWN ON PLAN SHEETS.

RAINBOW BOULEVARD
WARM SPRINGS ROAD TO "RB" 207+00

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN GRADING
TYPICAL SECTIONS
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

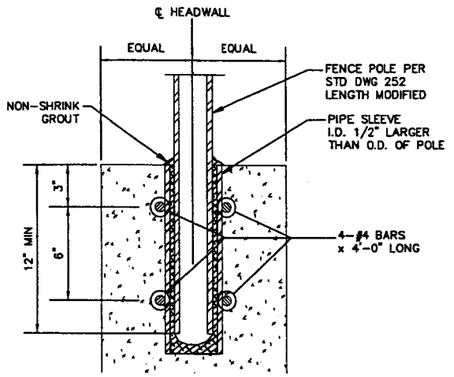
PROJECT No: 500.854 DRAWN BY: KLT
DESIGNED BY: JRT/KLT/RRB CHECKED BY: RRB
APPROVED BY

G.C. WALLACE, INC.
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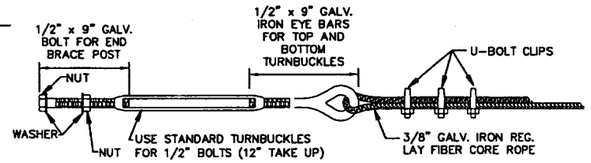
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VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-17
SHT. ___ OF ___

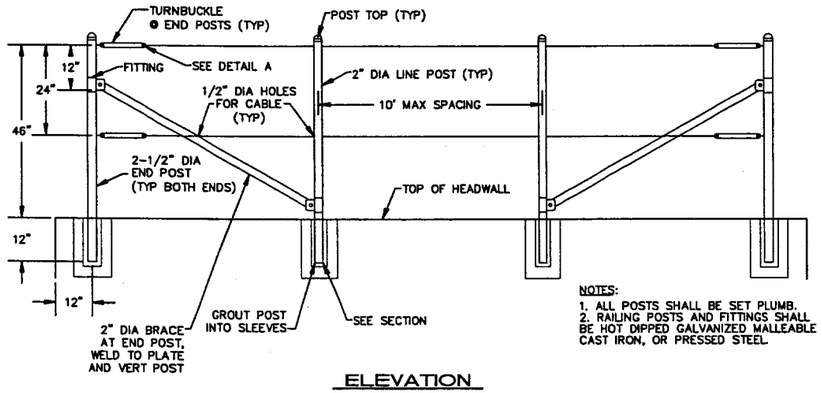
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SECTION



DETAIL A

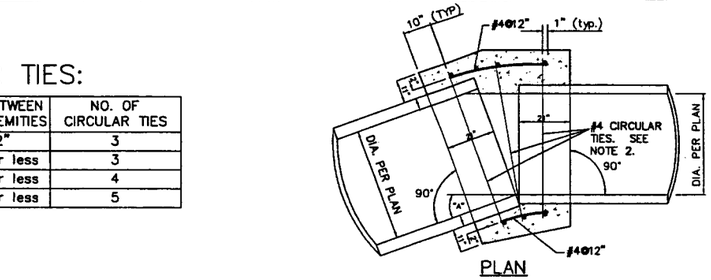


NOTES:
1. ALL POSTS SHALL BE SET PLUMB.
2. RAILING POSTS AND FITTINGS SHALL BE HOT DIPPED GALVANIZED MALLEABLE CAST IRON, OR PRESSED STEEL.

ELEVATION

POST AND CABLE RAILING DETAIL
NO SCALE

5 SD-18



NOTES:
1) NAIL 1-1/8" PLYWOOD TO VERTICAL SUPPORT WITH 40d GALVANIZED NAILS 3" O/C.
2) ALL LUMBER SHALL BE WATER-PROOFED DOUGLAS FIR, CONSTRUCTION GRADE.

RCP PLUG DETAIL
NO SCALE

1 SD-18

CIRCULAR TIES:

PIPE DIAMETER	SPACE BETWEEN PIPE EXTREMITIES	NO. OF CIRCULAR TIES
21" or less	2 1/2"	3
24" to 30"	2 1/2" or less	3
33" to 57"	2 1/2" or less	4
60" to 66"	2 1/2" or less	5

PLAN

NOTES:

1) WHERE THE SLOPE OF THE UPSTREAM PIPE IS GREATER THAN THE SLOPE OF THE DOWNSTREAM PIPE, JOIN SOFFITS. WHERE THE SLOPE OF THE UPSTREAM PIPE IS LESS THAN THE SLOPE OF THE DOWNSTREAM PIPE, JOIN INVERTS.

2) WHERE THE SPACE BETWEEN THE PIPE EXTREMITIES EXCEEDS 2 1/2 INCHES, THE NUMBER OF CIRCULAR TIES SHALL BE INCREASED TO MAINTAIN A MAXIMUM SPACING OF 6 INCHES CENTER TO CENTER. CIRCULAR TIES SHALL HAVE A DIAMETER 5 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE LARGER PIPE.

CONCRETE COLLAR DETAIL
NO SCALE

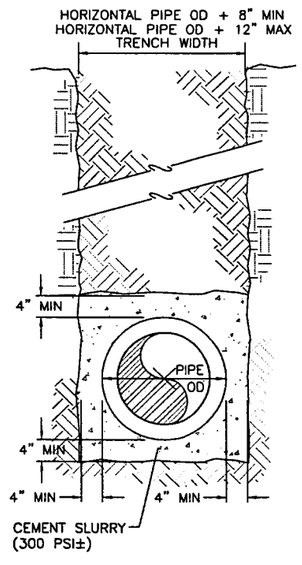
4 SD-18

NOTES:

1) ENCASEMENT SHALL EXTEND 10' EACH WAY FROM THE OUTSIDE EDGE OF THE CROSSING UTILITY. FOR OTHER THAN 90° CROSSINGS, ENCASEMENT SHALL EXTEND TO THE POINT AT WHICH 10' SEPARATION BETWEEN THE CROSSING UTILITIES IS ACHIEVED (10/SINE OF THE CROSSING ANGLE).

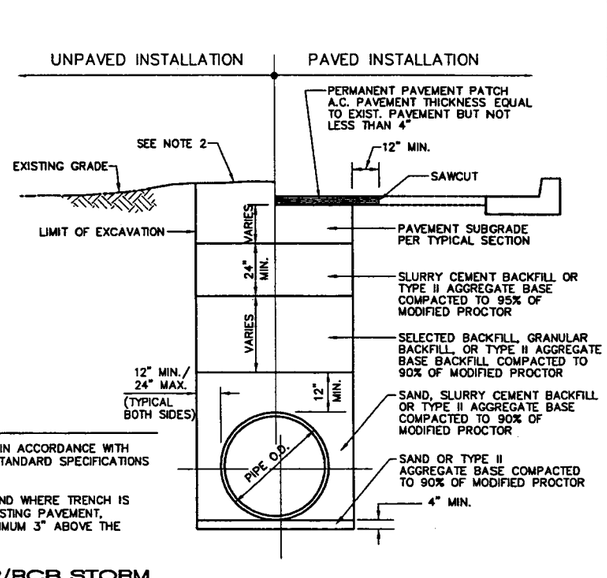
2) REASONABLE EFFORTS SHALL BE MADE TO KEEP SEWER AND STORM DRAIN JOINTS AN EQUAL DISTANCE FROM THE CROSSING POINT.

3) WHERE SEWER AND WATER ARE WITHIN 20' OF EACH OTHER AND IN CONFLICT WITH STORM DRAIN, THE STORM DRAIN PIPE SHALL BE ENCASED WITH CEMENT SLURRY CONTINUOUS BETWEEN THE SEWER AND WATER CROSSINGS AND TO 10' BEYOND THE OUTSIDE EDGE OF EACH CROSSING UTILITY AS SHOWN IN NOTE 1.



SEWER/STORM DRAIN CROSSING DETAIL
NO SCALE

2 SD-18



NOTES:
1. SLOPE TRENCH SIDES IN ACCORDANCE WITH THE CLARK COUNTY STANDARD SPECIFICATIONS SECTION 208.03.01
2. IN UNPAVED AREAS AND WHERE TRENCH IS NOT PARALLEL TO EXISTING PAVEMENT, BACKFILL TRENCH MINIMUM 3" ABOVE THE EXISTING GRADE.

TYPICAL RCP/RCB STORM DRAIN TRENCH DETAIL
NO SCALE

3 SD-18



Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

STORM DRAIN DETAILS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

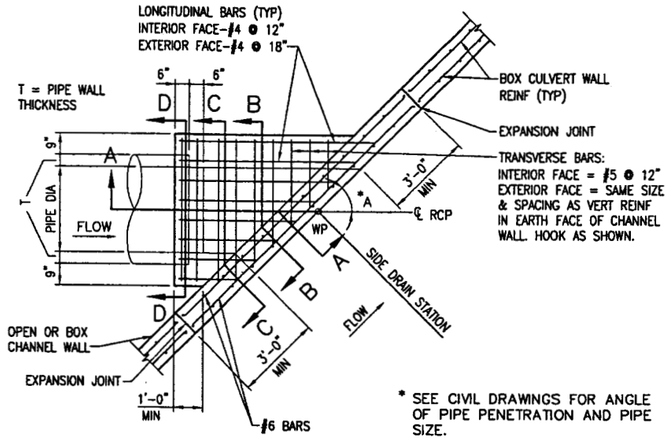
FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: KLT
DESIGNED BY: RRB CHECKED BY: RRB
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

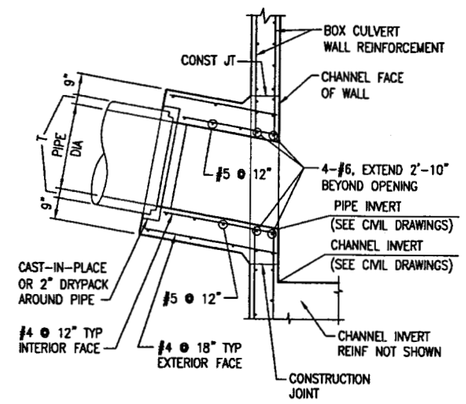
L-1728A
DRAWING NO.
SD-18
SHT. ___ OF ___



TYPICAL WALL PIPE PENETRATION DETAIL

NOT TO SCALE

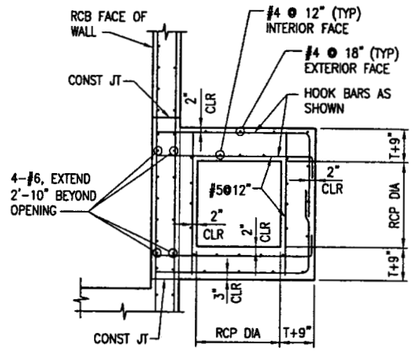
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SECTION

NOT TO SCALE

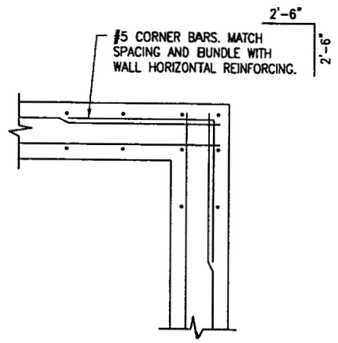
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SECTION

NOT TO SCALE

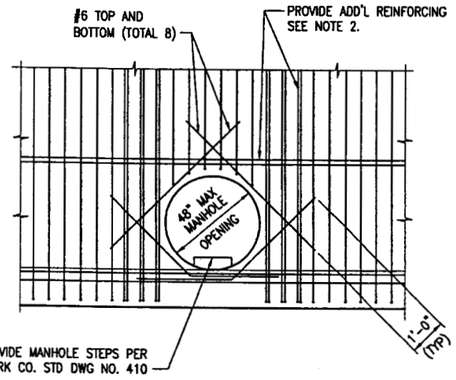
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TYPICAL CORNER DETAIL

3/4" = 1'-0"

3



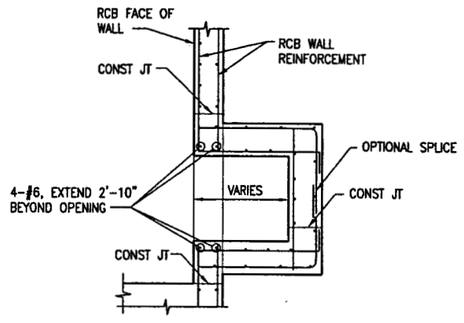
NOTES:

1. FIELD CUT ALL REINFORCING 2" CLR OF OPENINGS.
2. EVERY REBAR DISCONTINUED AT OPENING SHALL BE REPLACED BY AN EXTRA REBAR PLACED AT THE SIDE OF THE OPENING AS SHOWN. THE LENGTH OF THE EXTRA REBARS SHALL EQUAL THE LENGTH OF THE SCHEDULE REBARS THAT ARE NOT DISCONTINUED AT THE OPENING.
3. PROVIDE MINIMUM 2" CLR BETWEEN ALL REINFORCING BARS.

CAST-IN-PLACE RCB ADD'L MANHOLE REINFORCING DETAIL

NOT TO SCALE

2

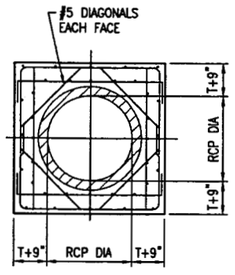


NOTE:
CONCRETE DIMENSIONS, REBAR SIZE, SPACING AND CLEARANCES ARE SAME SIZE WITH SECTION C-C.

SECTION

NOT TO SCALE

B



SECTION

NOT TO SCALE

D

GENERAL STRUCTURAL NOTES:

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.

THE CONTRACTOR HAS THE OPTION TO USE CAST-IN-PLACE BOX CULVERTS OR PRE-CAST BOX CULVERTS. DETAILS 1 AND 2 ON THIS DRAWING ARE ONLY NECESSARY WHEN CAST-IN-PLACE BOX CULVERTS ARE USED. IF PRE-CAST RCB's ARE USED THE PRE-CAST SUPPLIER WILL PROVIDE PIPE PENETRATION DETAILS.

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

GENERAL NOTES AND STRUCTURAL DETAILS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: NO
DESIGNED BY: EGG CHECKED BY:
APPROVED BY

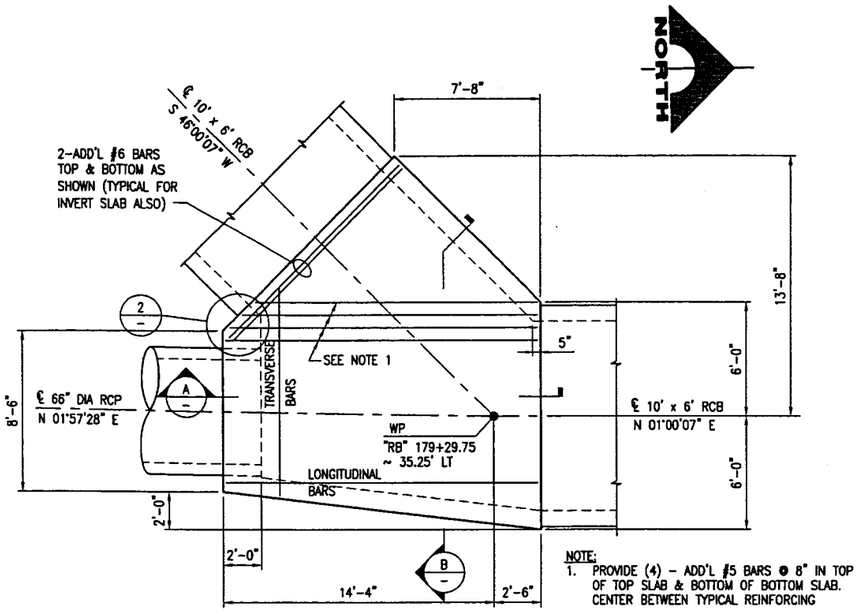
G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-19
SHT. ___ OF ___

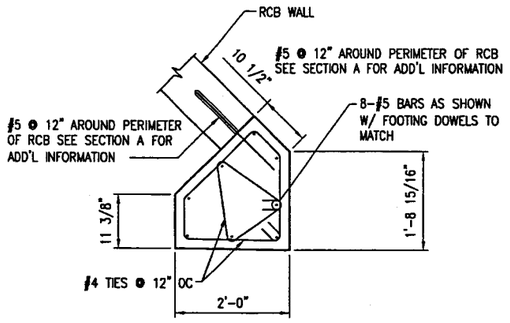
RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

P:\500.854\dwl\macro-plot.dwg 03/25/2004 11:28:02 AM jbyrd



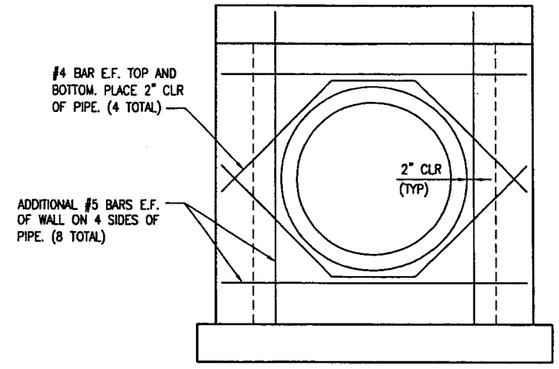
PLAN - JUNCTION STRUCTURE AT BLUE DIAMOND WASH (1/-)

1/4" = 1'-0"



DETAIL (2/-)

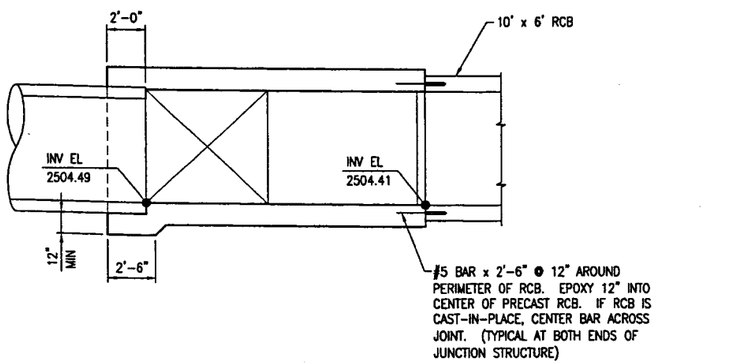
3/4" = 1'-0"



NOTE: FIELD CUT TYPICAL WALL REINFORCING 2" CLR OF PIPE.

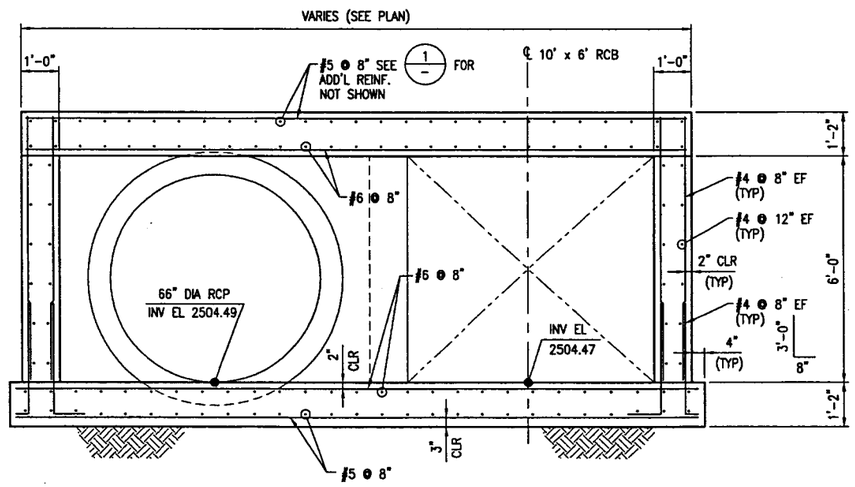
TYPICAL WALL PIPE PENETRATION DETAIL (3/-)

1/2" = 1'-0"



SECTION (A/-)

1/4" = 1'-0"



SECTION (B/-)

1/2" = 1'-0"

SEE GENERAL STRUCTURAL NOTES ON SHEET SD-19

REV. NO.	DATE	DESCRIPTION	APPROVED

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

JUNCTION STRUCTURE DETAILS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: NO
DESIGNED BY: EGG CHECKED BY:
APPROVED BY:

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

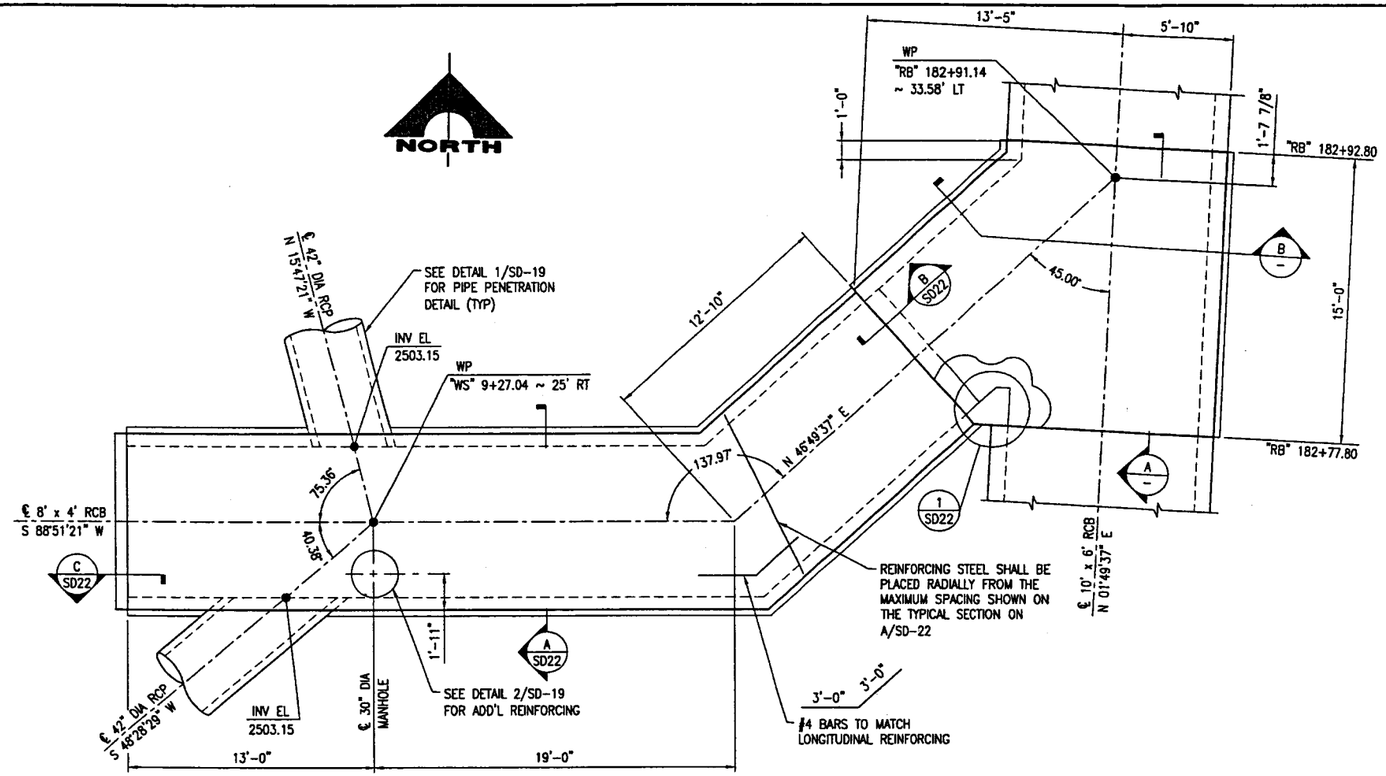
SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-20
SHT. ___ OF ___

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

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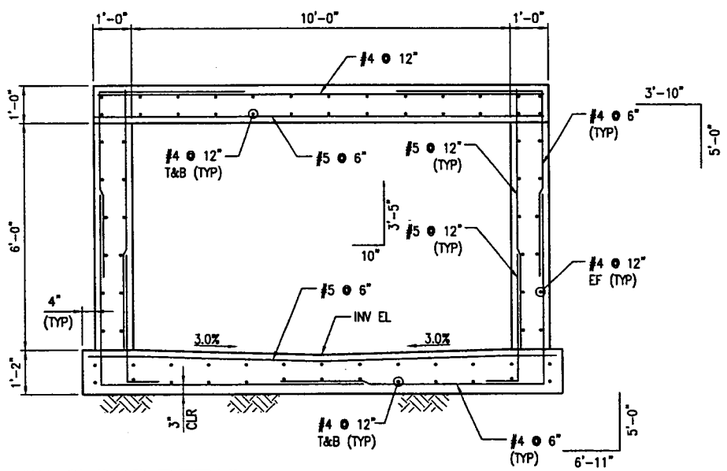
F:\500-854\dwg\engrpw\1RB_SC



PLAN - JUNCTION STRUCTURE AT WARM SPRINGS ROAD / RAINBOW BLVD

1/4" = 1'-0"

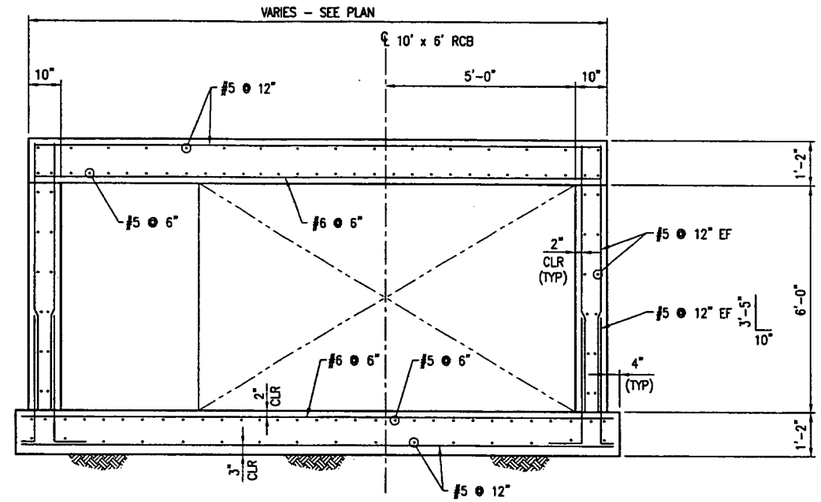
1



10'x6' RCB DETAIL

1/2" = 1'-0"

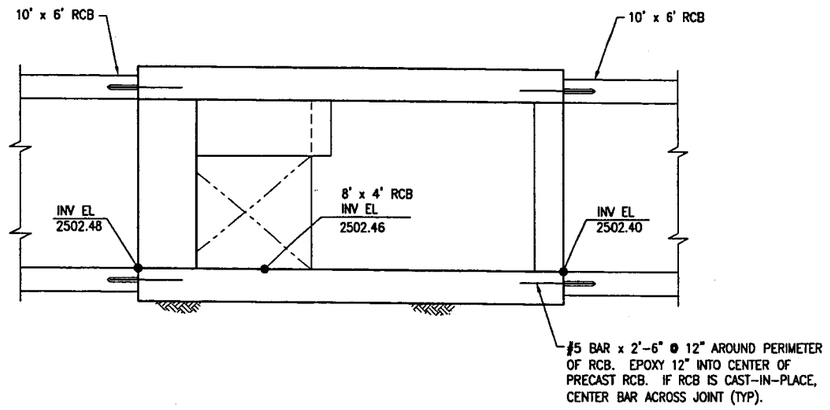
2



SECTION

1/2" = 1'-0"

B



SECTION

3/8" = 1'-0"

A

SEE "GENERAL STRUCTURAL NOTES" ON SHEET SD-19

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

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REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

JUNCTION STRUCTURE DETAILS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

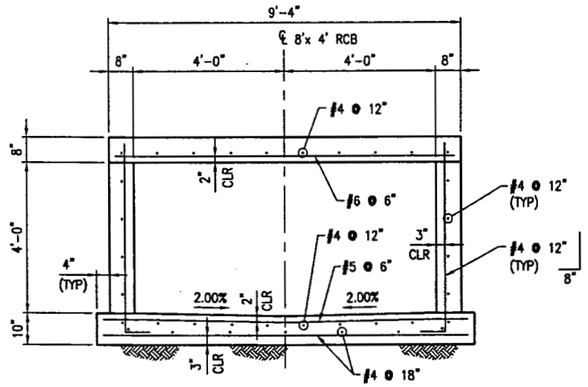
PROJECT No: 500.854 DRAWN BY: NO
DESIGNED BY: EGG CHECKED BY:
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-21
SHT. ___ OF ___

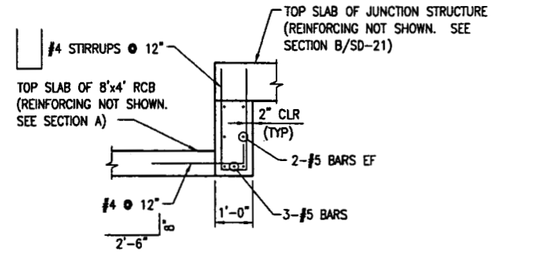
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SECTION 8'x 4' RCB

1/2" = 1'-0"

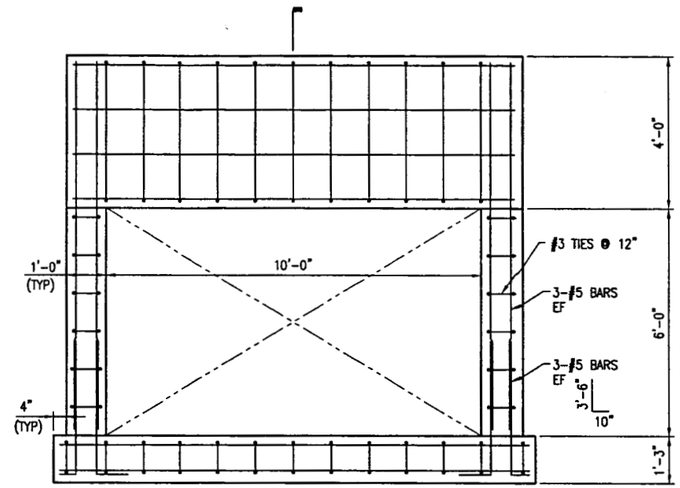
A



SECTION

1/2" = 1'-0"

B



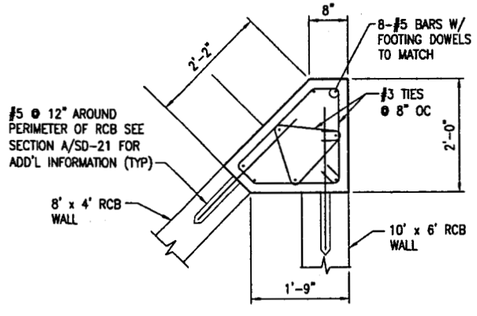
D

1. SEE CIVIL DRAWINGS FOR LOCATION OF STRUCTURE AND INVERT ELEVATIONS
2. SEE SECTION D FOR REINFORCING NOT SPECIFIED

CONNECTION DETAIL FOR 10' X 6' RCB TO 10' X 9' RCB

1/2" = 1'-0"

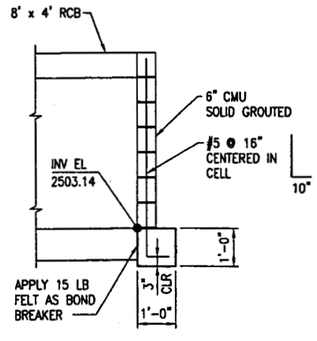
2



DETAIL

3/4" = 1'-0"

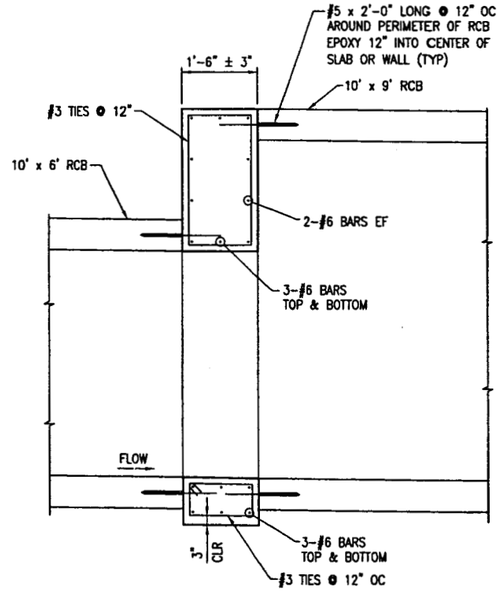
1



RCB PLUG

1/2" = 1'-0"

C



SEE GENERAL STRUCTURAL NOTES ON SHEET SD-19

SECTION

1/2" = 1'-0"

D

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

JUNCTION STRUCTURE DETAILS

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: NO
DESIGNED BY: EGG CHECKED BY:
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
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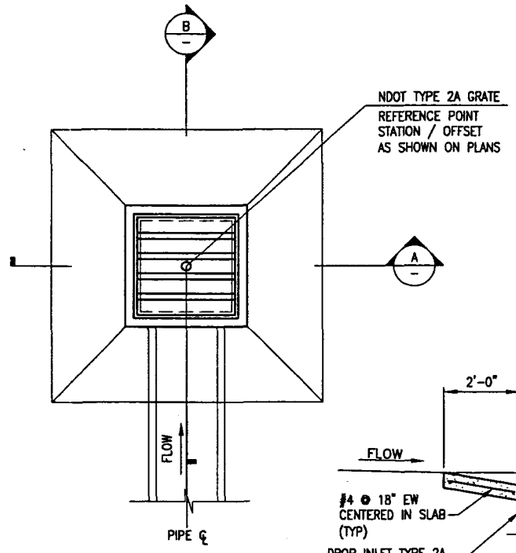
SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-22
SHT. ___ OF ___

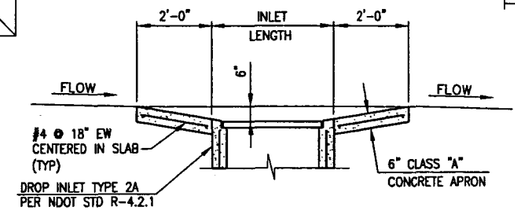
RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

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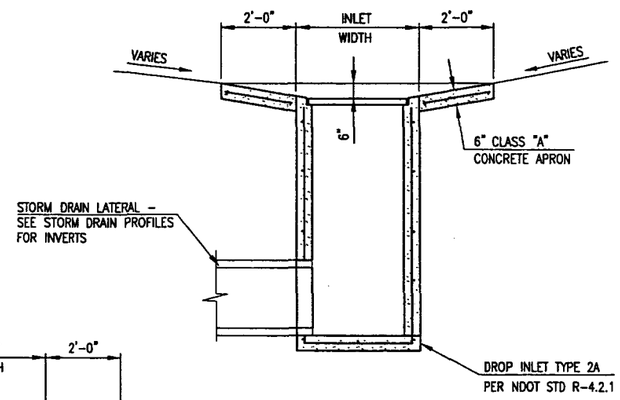
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PLAN



SECTION A–A



SECTION B–B

CONCRETE APRON DETAIL

1

3/4" = 1'-0"

SEE GENERAL STRUCTURAL NOTES ON SHEET SD-19

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I - FINAL SUBMITTAL

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I

CONCRETE APRON DETAIL

CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: NO

DESIGNED BY: EGG CHECKED BY:

APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE

HORIZ: AS SHOWN

VERT: AS SHOWN

FIELD BOOK

L-1728A

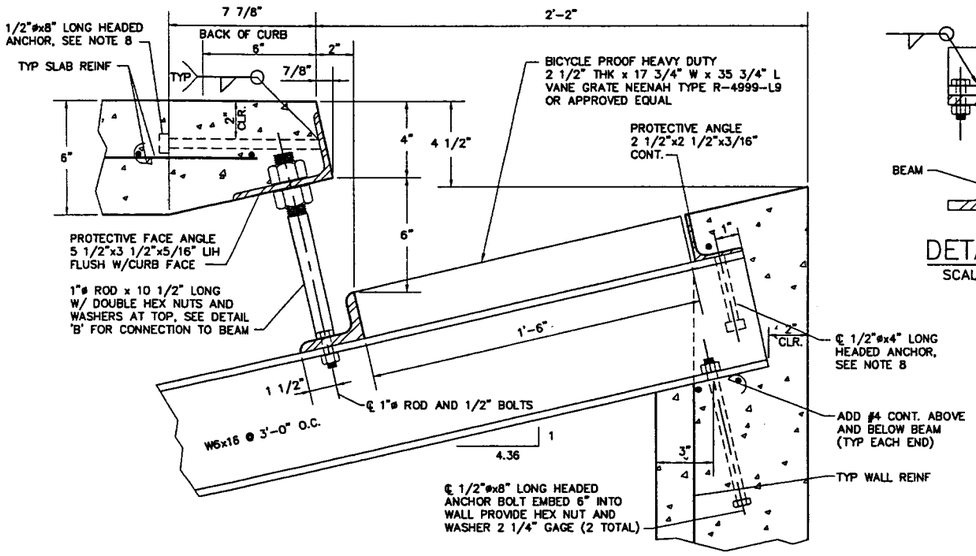
DRAWING NO.

SD-23

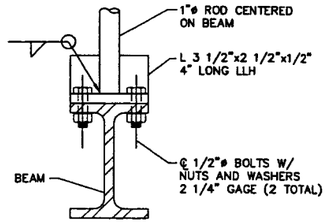
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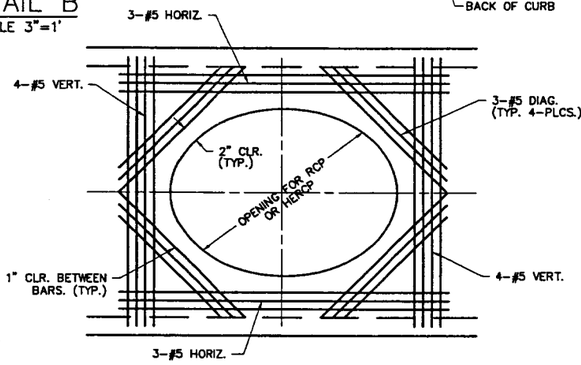
am 8/26/2004 11:28:12 AM Bob



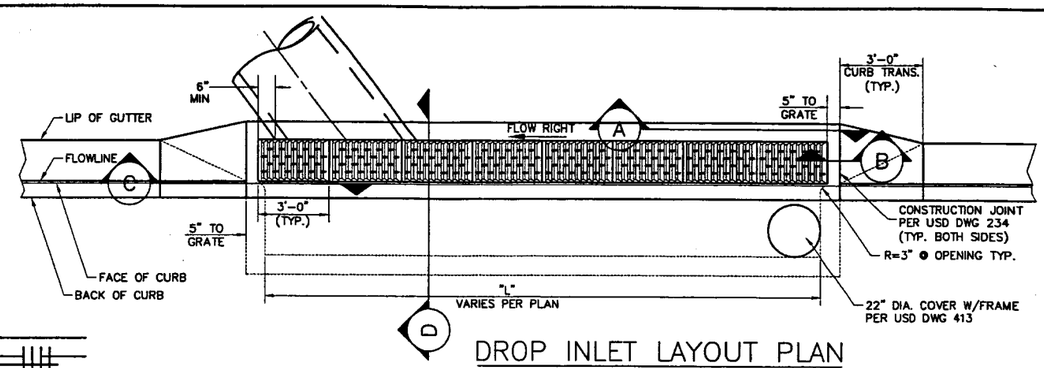
DETAIL A – PROTECTIVE FACE & ROD
SCALE 3"=1'



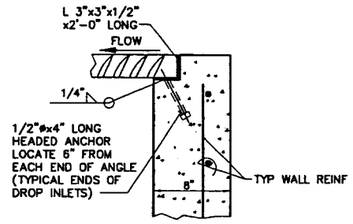
DETAIL B
SCALE 3"=1'



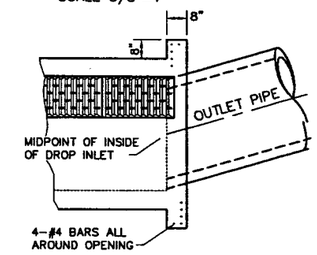
SECTION A
SCALE 3/4"=1'



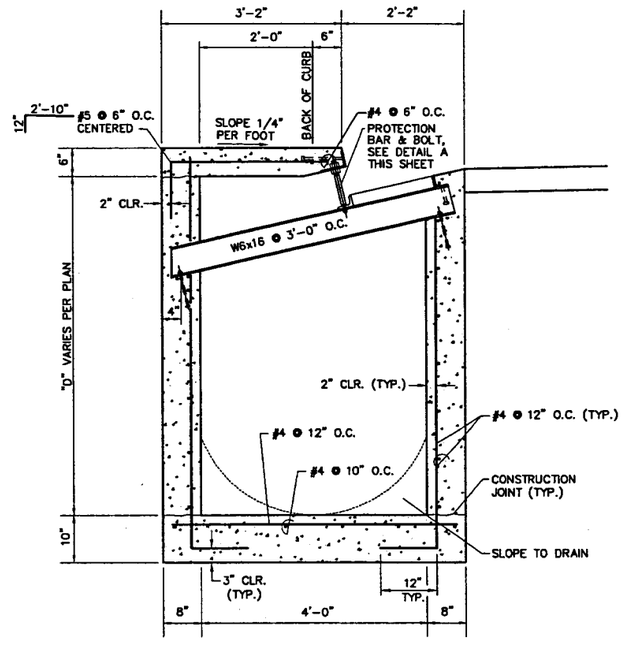
DROP INLET LAYOUT PLAN
SCALE 3/8"=1'



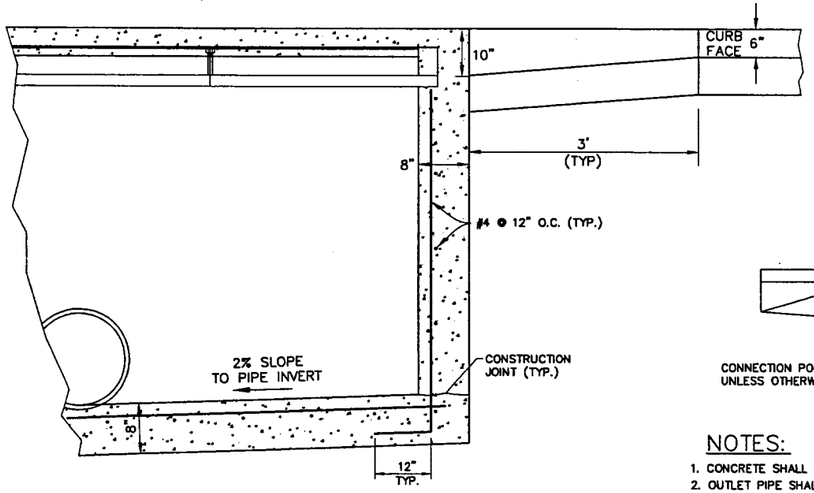
SECTION B
SCALE 1–1/2"=1'



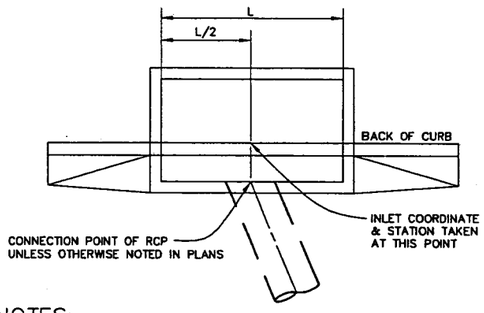
END CONNECTION DETAIL
(SIDE ENTRY CONDITION) SCALE 3/8"=1'



TYPE "CM" DROP INLET SECTION D
SCALE 3/4"=1'



SECTION C
NO SCALE



DROP INLET GRATE SCHEDULE

TYPE	"L"	NO. OF GRATES
CM	5.5'	2
CM	8.5'	3
CM	11.5'	4
CM	14.5'	5

NOTES:

1. CONCRETE SHALL BE CLASS "D" OR "DA".
2. OUTLET PIPE SHALL BE TRIMMED FLUSH WITH INSIDE FACE OF INLET.
3. GRATES SHOWN ON THIS SHEET ARE FOR FLOW RIGHT CONDITIONS.
4. ALL EXPOSED METALS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
5. PROVIDE 1/2" (MIN.) CLEARANCE ALL AROUND THE STEEL BEAM, DRY PACK AFTER INSTALLATION.
6. WHEN REQUIRED BY THE LENGTH OF OPENING, PLATE ANGLE MAY BE DELIVERED IN SECTIONS AND BUTT WELDED IN PLACE.
7. ALL GALVANIZING DAMAGED BY WELDING SHALL RECEIVE TWO COATS OF GALVALLOY OR EQUAL.
8. ANGLE ANCHORS SHALL BE EMBEDDED MIDPOINT IN EACH ENDWALL AND EVENLY SPACED (MAXIMUM SPACING OF 2').

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY!
CALL BEFORE YOU DO OVERHEAD
1-702-593-6111

Avoid cutting underground utility lines. It's costly.
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)

REV. NO.	DATE	DESCRIPTION	APPROVED

CLARK COUNTY NEVADA

RAINBOW BOULEVARD - BLUE DIAMOND ROAD TO SOUTHERN BELTWAY - PHASE I
STORM DRAIN DETAILS
CLARK COUNTY, NEVADA, DEPARTMENT OF PUBLIC WORKS

FINAL SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION

PROJECT No: 500.854 DRAWN BY: KLT
DESIGNED BY: RRB CHECKED BY: RRB
APPROVED BY

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SCALE
HORIZ: AS SHOWN
VERT: AS SHOWN
FIELD BOOK

L-1728A
DRAWING NO.
SD-24
SHT. ___ OF ___

RAINBOW BOULEVARD – BLUE DIAMOND ROAD TO SOUTHERN BELTWAY – PHASE I – FINAL SUBMITTAL

03/29/2004 11:28:14 AM kb68

2ND RESPONSE TO COMMENTS TO THE UPPER BLUE DIAMOND DIVERSION CHANNEL REQUEST FOR CONDITIONAL LETTER OF MAP REVISION

Case No.: 04-09-1759R
Community: Clark County, Nevada
Community No.: 320003

Prepared for:

Clark County Regional Flood Control District
500 South Grand Central Parkway
Las Vegas, NV 89155

Prepared by:

PBS&J
2270 Corporate Circle, Suite 100
Henderson, Nevada 89074

Reference Number: 511606.00
February 2005

February 10, 2005

Ms. Sheila M. Norlin
National LOMC Manager
Michael Baker Jr., Inc.
3601 Eisenhower Avenue
Alexandria, Virginia 22304-6425

RE: CASE NO.: 04-09-1759R
COMMUNITY: CLARK COUNTY, NV
COMMUNITY NO.: 320003

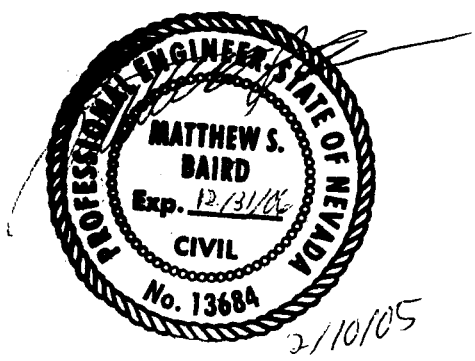
Dear Ms. Norlin:

Submitted for your review is the 2nd Response to Comments for the Upper Blue Diamond Diversion Channel Request for Conditional Letter of Map Revision.

If you have any questions regarding this report, please contact our office at (702) 263-7275.

Sincerely,

PBS&J



Brian K. Loffman, CFM
Hydrologist

Matt Baird, P.E., CFM
Sr. Program Manager

The response to comments in a letter dated February 4, 2005 from Michael Baker Jr., Inc. (MBJ) are included below, see Appendix A for a copy of the comment letter.

Comment 1: **The submitted report entitled "Rainbow Boulevard Collector System" prepared by G.C. Wallace, Inc., dated September 2001, makes reference to Figures 5, 6, and 7, which provide onsite and offsite subbasins used for each of the studied hydrologic models. However, these figures were not included in the submitted report. Please provide the subbasin maps referenced in the submitted report.**

Response 1: Please refer to Appendix B for Figures 5, 6, and 7 from the G.C. Wallace report dated September of 2001.

Comment 2: **Our detailed review revealed that a digital copy of the hydraulic analyses for the revised conditions along the Rainbow Boulevard collector system was not submitted. Please provide a digital copy of the input and output files for all submitted hydraulic models.**

Response 2: PBS&J had a telephone conversation with Ms. Jezebele Alicea of MBJ on February 9, 2005. Ms. Alicea noted that she had found the hydraulic models on the CD provided in the November 2004 submittal and thus the comment could be disregarded.

Appendix A: Comment Letter

NATIONAL FLOOD INSURANCE PROGRAM

FEMA MAP COORDINATION CONTRACTOR

FEB 04 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

IN REPLY REFER TO:
Case No.: 04-09-1759R
Community: Clark County, NV
Community No.: 320003

316-AD

Dear Mr. Eubanks:

This is in regard to your October 26, 2004, request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a Conditional Letter of Map Revision for the above-referenced community. 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. The submitted report entitled "Rainbow Boulevard Collector System" prepared by G. C. Wallace, Inc., dated September 2001, makes reference to Figures 5, 6, and 7, which provide onsite and offsite subbasins used for each of the studied hydrologic models. However, these figures were not included in the submitted report. Please provide the subbasin maps referenced in the submitted report.

2. Our detailed review revealed that a digital copy of the hydraulic analyses for revised conditions along the Rainbow Boulevard collector system was not submitted. Please provide a digital copy of the input and output files for all submitted hydraulic models.

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, CFM, who may be reached at (703) 960-8800, ext. 3028.

Sincerely,

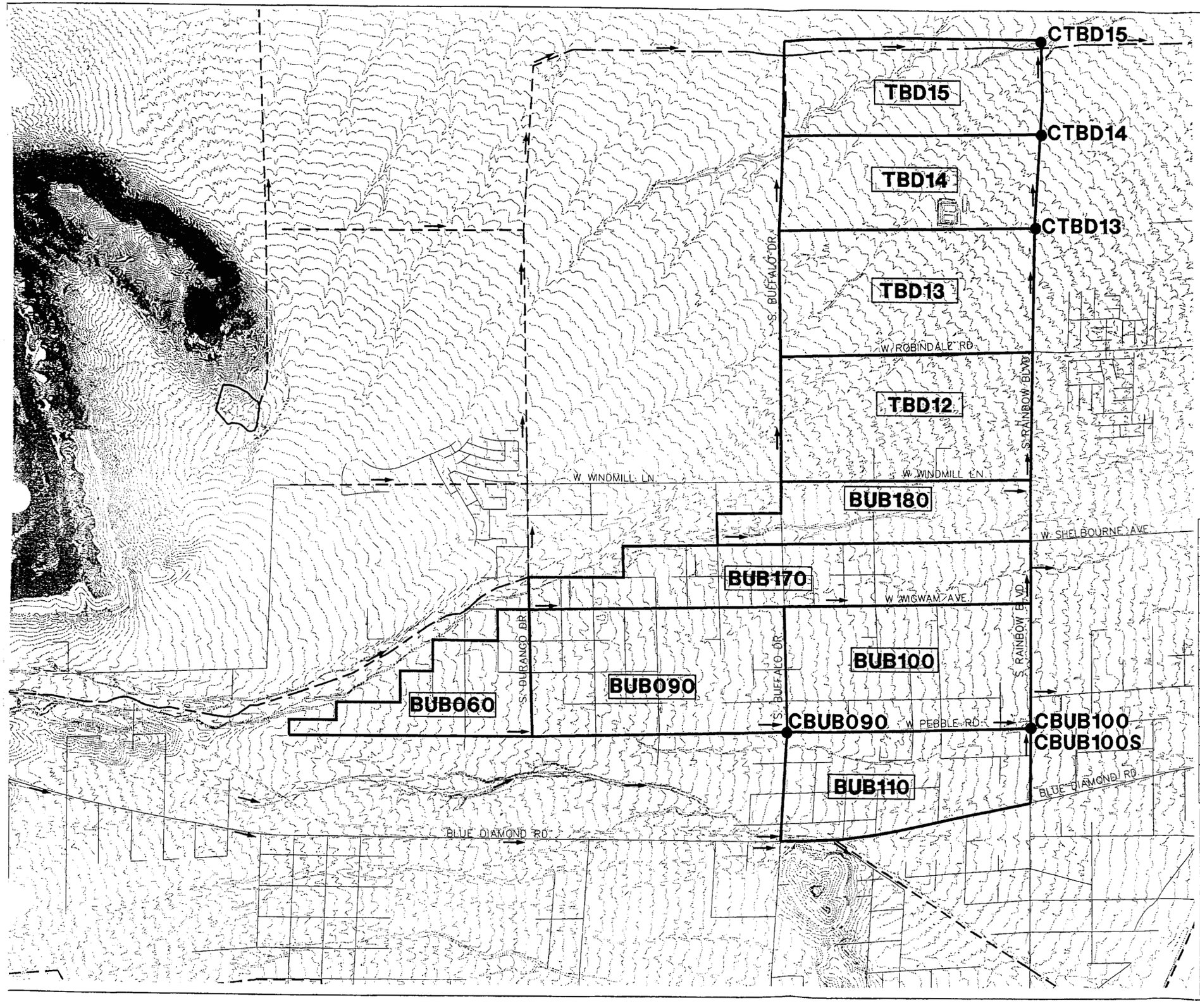
Sheila M. Norlin, CFM
National LOMC Manager
Michael Baker Jr., Inc.

Enclosure

cc: Mr. David Betley, P.E.
Principal Engineer
Department of Public Works
Clark County

Mr. Mathew S. Baird, P.E., CFM
Senior Program Manager
PBS&J

Appendix B: Figures



NORTH

SCALE 1"=2000'

GRAPHIC SCALE

2000 0 1000 2000

(IN FEET)

1 inch = 2000 ft.

LEGEND

BUB090	DRAINAGE SUBBASIN
●CBUB100	CONCENTRATION POINT
———	SUBBASIN BOUNDARY
→	FLOW DIRECTION
- - - - - -	PROPOSED CCRFCD MASTER PLAN FACILITIES

SUMMARY OF HEC-1 MODEL

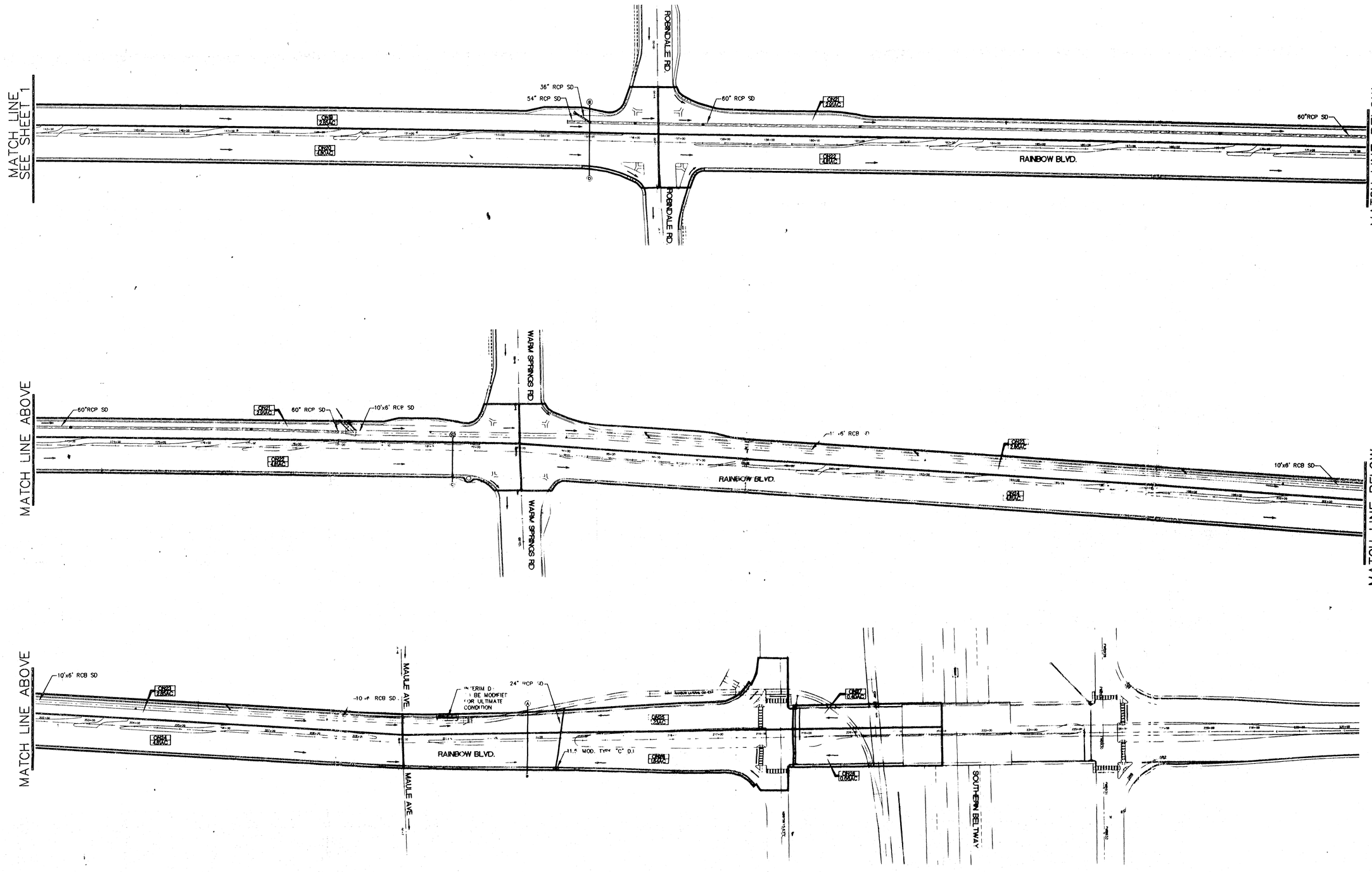
BASIN OR LOCATION	AREA (AC)	Q100 (CFS)
BUB060	153.6	234
BUB090	326.4	455
BUB100	313.6	408
BUB110	236.8	408
CBUB090	–	677
CBUB100	–	1002
CBUB100S	–	1277
CTBD13	–	552
CTBD14	–	857
CTBD15S	–	1209
TBD12	326.4	219
TBD13	320.0	347
TBD14	243.2	373
TBD15	249.6	402

RAINBOW BLVD. IMPROVEMENTS

FIGURE 6

ULTIMATE CONDITIONS DRAINAGE PLAN

G.C. WALLACE, INC.
Engineering/Architecture 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146



NORTH

SCALE 1" = 100'

100 0 100 200

SCALE FEET

SUMMARY OF MODIFIED RATIONAL METHOD

SUBBASIN OR CONCENTRATION POINT	Q10 (CFS)	Q100 (CFS)
ON1	2	4
ON2	3	6
ON3	2	3
ON4	2	4
ON5	1	2
ON6	1	2
ON7	2	4
ON8	3	6
ON9	1	2
ON10	2	4
ON11	2	4
ON12	2	4
ON13	2	3
ON14	2	4
ON15	2	4
ON16	3	6
ON17	1	3
ON18	2	4
ON19	5	10
ON20	9	17
ON21	5	10
ON22	9	17
ON23	5	10
ON24	9	17
ON25	2	4
ON26	3	6
ON27	1	1
ON28	1	2

LEGEND

- SUBBASIN BOUNDARY
- FLOW DIRECTION
- HP HIGH POINT
- LP LOW POINT
- DEPTH OF FLOW CROSS SECTION

SHEET 2 OF 2

CLARK COUNTY PUBLIC WORKS
RAINBOW BOULEVARD IMPROVEMENTS

FIGURE 7

ULTIMATE CONDITIONS LOCAL DRAINAGE PLAN

G.C. WALLACE, INC.
Engineers/Planners/Surveyors

SUMMARY OF HEC-1 MODEL

BASIN OR LOCATION	AREA (AC.)	Q100 (CFS)
BD	N/A	209
OFF-S	381.00	418
OFF-1	577.28	508
OFF-2	174.20	179
OFF-3	79.36	111
OFF-4	491.51	427
OFF-5	74.24	35
OFF-6	204.80	83
OFF-7	83.84	25
OFF-8	44.80	31
OFF-9	42.24	23
OFF-10	490.99	457
OFF-10A	472.96	211
OFF-11	180.48	227
OFF-12	1002.88	665
C10-1	N/A	999
C10-2	N/A	723
C10-3	N/A	747
C6-1	N/A	535
COMB	N/A	557
C8-1	N/A	51
C9-1	N/A	70
C6-1	N/A	546
C11-1	N/A	803
C12-1	N/A	1346

PROPOSED FLOOD CONTROL FACILITIES

FACILITY ID	FACILITY DESCRIPTION
BDRB0000 EXISITNG	EXISTING 10'x9' RCB CULVERT
BDRB0000 PROPOSED	INTERIM/ ULTIMATE 10'x6' RCB STORM DRAIN
BDRB0074 PROPOSED	INTERIM/ ULTIMATE 54" OR 60" RCP STORM DRAIN
1	INTERIM ROADSIDE V-DITCH
1A	INTERIM SPECIAL STORM DRAIN INLET
1B	INTERIM/ ULTIMATE DROP INLET AND 24" RCP STORM DRAIN
2	INTERIM/ ULTIMATE 10'x6' RCB STORM DRAIN INLET
3	INTERIM/ ULTIMATE ROADSIDE V-DITCH
4	INTERIM/ ULTIMATE ROADSIDE V-DITCH
5	INTERIM/ ULTIMATE ROADSIDE V-DITCH
5A	INTERIM/ ULTIMATE 36" RCP STORM DRAIN INLET
6	INTERIM/ ULTIMATE ROADSIDE V-DITCH
7	INTERIM/ ULTIMATE 12'x5' RCB CULVERT
8	INTERIM ROADSIDE V-DITCH
9	INTERIM/ ULTIMATE 36" CULVERT
10	INTERIM ROADSIDE V-DITCH
11	INTERIM/ ULTIMATE 12'x5' RCB CULVERT
12	INTERIM ROADSIDE V-DITCH
13	INTERIM/ ULTIMATE 12'x4' RCB CULVERT
14	INTERIM ROADSIDE V-DITCH
15	INTERIM/ ULTIMATE 12'x4' RCB CULVERT
16	INTERIM ROADSIDE V-DITCH
17	INTERIM/ ULTIMATE 12'x5' RCB CULVERT
18	INTERIM/ ULTIMATE 5'x4' RCB CULVERT
19	INTERIM ROADSIDE V-DITCH
20	INTERIM/ ULTIMATE (2) 12'x4' RCB CULVERT
21	INTERIM ROADSIDE V-DITCH

THIS DRAINAGE AREA LIMIT LINE WAS TAKEN FROM PLANS PREPARED BY HUNSAKER & ASSOCIATES NEVADA, INC. FOR THE RHODES RANCH DEVELOPMENT.

55/45 FLOW SPLIT PER REPORT ENTITLED, "CLOMR FOR AREA DOWNSTREAM OF UPPER BLUE DIAMOND DETENTION BASIN BASED ON POST-DETENTION BASIN FLOWS", AS PREPARED BY PBS&J, INC.

APPROXIMATE SUBBASIN BOUNDARY. 100-YEAR PEAK FLOW RATES FOR THIS SUBBASIN ARE REFERENCED FROM THE SOUTHWEST LAS VEGAS VALLEY DEVELOPMENT GUIDELINES AREA1, JULY 1996, BY WILLDAN ASSOCIATES.

SOUTHERN BELTWAY
WARM SPRINGS ROAD
BUFFALO DRIVE
FORT APACHE ROAD
DURANGO BLVD
RAINBOW BOULEVARD
RHODES RANCH DEVELOPMENT
WINDMILL LANE
WIGWAM STREET
PEBBLE STREET
BLUE DIAMOND WASH
BLUE DIAMOND ROAD
HUALAPAI
SERENE
UPPER BLUE DIAMOND DETENTION BASIN
C12-1, 1A, C11-1, 1, C10-2, C10-3, 3, C9-1, 4, 5, 6, C6-1, 8, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 21, 20, C10-1, COMB, BD
OFF-11, OFF-9, OFF-12 665, OFF-10A, OFF-7 25, OFF-6 83, OFF-5 35, OFF-4 427, OFF-3 111, OFF-2 179, OFF-10 459, OFF-1 508, OFF-S 418
703 CFS, 1100 CFS, 550 CFS, 550 CFS, 5008 CFS, 3134 CFS

NORTH
SCALE 1"=800'
GRAPHIC SCALE
0 400 800
(IN FEET)
1 inch = 800 ft.

LEGEND

- OFF-1 — DRAINAGE SUBBASIN
- C3-1 — COMBINATION POINT
- SUBBASIN BOUNDARY
- FLOW DIRECTION
- CULVERT LOCATION
- PROPOSED ROADSIDE DITCH
- PROPOSED STORM DRAIN FACILITY
- EXISTING STORM DRAIN FACILITY
- 5 — EXISTING REGIONAL FACILITY
- OPEN DESERT POOR CONDITION
- MEDIUM DENSITY RESIDENTIAL
- HIGH DENSITY RESIDENTIAL
- LIGHT INDUSTRIAL

30% Preliminary Design Submittal dated September, 2001

RAINBOW
BLUE DIAMOND

FIGU
INTERIM
DRAIN

G.C. WALLACE
Engineers/Planners/

PBS&J

ENGINEERING • PLANNING
CONSTRUCTION SERVICES
SURVEYING

May 19, 2006

SENT
5/30/06

Ms. Sheila M. Norlin
National LOMC Manager
Michael Baker Jr., Inc.
3601 Eisenhower Avenue
Alexandria, Virginia 22304-6425

RE: CASE NO.: 06-09-B777P (FORMERLY 04-09-1759R)
COMMUNITY: CLARK COUNTY, NEVADA
COMMUNITY NO.: 320003

Dear Ms. Norlin:

Submitted for your review is the revised Annotated FIRM exhibit for the Upper Blue Diamond Diversion Channel Request for Conditional Letter of Map Revision. Included in this submittal are both the digital and hardcopy formats as requested in your letter dated May 8, 2006 (see Appendix A). The hardcopy Annotated FIRM is located in Appendix B and a CD containing the digital version can be found in Appendix C.

Note that the Beltway Channel has been previously delineated on the current effective FIRM from the Tropicana Detention Basin to approximately 500 feet west of Jones Boulevard. The delineation shown on the revised Annotated FIRM exhibit shows the same alignment; however, our delineation is shifted approximately 350 feet to the east. PBS&J created this alignment based on the centerline of the channel from Clark County GIS aerial photography using the same coordinate system and projection as the Annotated FIRM exhibit and believes this represents the most accurate delineation.

If you have any questions regarding this submittal, please contact our office at (702) 263-7275.

Sincerely,

PBS&J

PROFESSIONAL ENGINEER STATE OF NEVADA
MATTHEW S. BAIRD
Exp. 12/31/06
CIVIL
No. 13684

5/19/06

Brian K. Loffman, CFM
Hydrologist

Matt Baird, P.E., CFM
Associate Vice President

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

Appendix A: FEMA Letter

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

May 8, 2006

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.: 06-09-B777P
Community: Clark County, NV
Community No.: 320003

316-AD

Dear Mr. Eubanks:

This responds to your request dated April 20, 2006, 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:	Upper Blue Diamond Diversion Channel and Rainbow Collector
Flooding Source:	Blue Diamond Wash
FIRM Panel(s) Affected:	32003C2535 E, 2545 E, 2553 E, and 2561 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.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. In addition, as a result of the aftermath of recent hurricanes, many FEMA employees have been deployed to assist in disaster relief efforts. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data/fee **must** be submitted within 90 days of the date of the letter.

We will continue to work expeditiously to review all submittals in accordance with National Flood Insurance Program (NFIP) regulations, and will aim to meet the regulatory timeframe for the review of all requests. However, requesters should be aware that delays may occur in the review process because of the current emergency situation. We appreciate the patience and cooperation of all requesters as FEMA assists in hurricane relief efforts.

If you have general questions about your request, FEMA policy, or the NFIP, 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. Robert Thompson, P.E.
Principal Engineer
Civil Engineering Division
Department of Development Services
Clark County

Mr. Dave Betley, P.E.
Senior Civil Engineer
Civil Engineering Division
Department of Development Services
Clark County

NATIONAL FLOOD INSURANCE PROGRAM

FEMA NATIONAL SERVICE PROVIDER

Summary of Additional Data Required to Support a
Letter of Map Revision

Case No.: 06-09-B777P

Requester: Mr. Kevin Eubanks, P.E., CFM

Community: Clark County, NV

Community No.: 320003

The issues below must be addressed before we can continue the review of your request.

Please submit, in digital and hardcopy formats, an annotated Flood Insurance Rate Map (FIRM), at the scale of the effective FIRM, that shows the proposed conditions floodplain boundary delineations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for Blue Diamond Wash and its tributaries. Please delineate the Upper Blue Diamond diversion channel, the Blue Diamond beltway channel, and the Rainbow Boulevard storm drain on this annotated FIRM.

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.

Effective October 30, 2005, the Federal Emergency Management Agency (FEMA) revised the fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register*, is enclosed for your information. In accordance with this schedule, the fee for your request is $5,600 and must be submitted before we can continue processing your request. Payment of this fee must be made in the form of a check or money order, payable in U.S. funds to the National Flood Insurance Program, or a credit card payment. For identification purposes, the case number referenced above must be included on the check or money order. We will not perform a detailed technical review of your request until we receive this payment.

Payment must be forwarded to one of the addresses listed below.

Using U.S. Postal Service:
Federal Emergency Management Agency
Fee-Charge System Administrator
P.O. Box 22787
Alexandria, VA 22304

Using overnight service:
FEMA Fee-Charge System Administrator
c/o Michael Baker Jr., Inc.
3601 Eisenhower Avenue
Alexandria, VA 22304

Appendix B: Annotated FIRM

TROPICANA DETENTION BASIN

100-YEAR FLOOD CONTAINED IN CHANNEL

100-YEAR FLOOD CONTAINED IN CHANNEL

100-YEAR FLOOD CONTAINED IN STORM DRAIN

100-YEAR FLOOD CONTAINED IN STORM DRAIN

100-YEAR FLOOD CONTAINED IN CHANNEL

100-YEAR FLOOD CONTAINED IN STORM DRAIN

100-YEAR FLOOD CONTAINED IN CHANNEL

100-YEAR FLOOD CONTAINED IN CHANNEL

100-YEAR FLOOD CONTAINED IN STORM DRAIN

100-YEAR FLOOD CONTAINED IN CHANNEL

100-YEAR FLOOD CONTAINED IN CHANNEL

100-YEAR FLOOD CONTAINED IN CHANNEL

Appendix C: Data CD