DS #: 4740

APN: 140-31-501-021

PROJECT: Lamb Pines

SUBMITTAL: 1st Submittal & Supplement

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: July 14, 2015
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Lamb Pines**			**COPIES TO:** L. R. Nelson Consulting Engineers
Cross Streets:	SWQ of Lamb Boulevard & Bonanza Road			Nevada H.A.N.D.
File Number:	F:\Depot\DSMemos\DS4740A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	140-31-501-021			CCRFCD
Zoning Action:	SDR-58124; VAR-58121 to VAR-58123; GPA-57254 & ZON-57255			
FEMA Flood Zone	YES	NO	**X**	
Proposed Storm Drain	YES	NO	**X**	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal & Supplement	6/25/2015 & 7/14/2015	7/14/2015	See Comments Below	$400.00	403454: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS:

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Clark County Public Works Department concurrence.

1. Provide a copy of the zoning/planning conditions associated with this site (**SDR-58124; VAR-58121 to VAR-58123; GPA-57254 & ZON-57255**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.

2. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.

3. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

4. Grading and construction works are proposed along the west boundary in the adjacent property. Obtain a notarized letter of permission for the proposed offsite construction from the adjacent property owner prior to the final approval of the subject drainage study.

5. Add flow line elevations at regular intervals in the swale on the grading plan.

6. Coordinate with *Rosa Cortez* (702) 229-6264, *Engineering Project Manager* for the ongoing **Cedar Channel** project for boundary conditions along the south property line.

7. Label the base flood elevation (BFE) in the *Cedar Avenue Channel* with corresponding model river stations on the grading plans. Provide an additional station close to *Lamb Boulevard*.

8. Identify and label an existing dual 6'x12' box culvert across *Lamb Boulevard* with *City of Las Vegas* recorded drawing number on the grading plan.

9. Show and label an existing storm drain system in *Lamb Boulevard* with *City of Las Vegas* recorded drawing number. Identify any drop inlets in *Lamb Boulevard* with size and type information as well.

10. In the "Drainage Study" compliance block on the grading plan, revise the project number "DSXXXX" to "**DS 4740**".

11. **Detail Sections A/23** and **B/23**: Show a proposed offsite riprap swale in the details. Provide a 2'-valley gutter in the swale to reduce the maintenance burden for the adjacent property owner.

12. **Detail Section N/24** shows an incorrect right-of-way width of the existing channel. Review and revise accordingly.

13. Revise **Detail Section M/24** to remove "*W/RTC Bus Stop*".

14. Provide a structural detail of the proposed RCP connection to the trapezoidal concrete wall of the regional flood channel.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

END OF REMARKS

ays

T/R/S: T20S/R62E/31
AREA N-31

****
*** FAX TX REPORT ***
****

TRANSMISSION OK

JOB NO.	1914
DESTINATION ADDRESS	7024512296
PSWD/SUBADDRESS	
DESTINATION ID	
ST. TIME	07/14 15:52
USAGE T	00'38
PGS.	2
RESULT	OK

CITY OF LAS VEGAS
INTER-OFFICE MEMORANDUM

DATE: July 14, 2015

TO:
Land Development Services
Department of Building & Safety

FROM:
Albert Sung, P.E.
Flood Control Project Engineer
Department of Public Works

SUBJECT:	Drainage Study for: **Lamb Pines**
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Zoning Action:	SDR-58124; VAR-58121 to VAR-58123; GPA-57254 & ZON-57255

FEMA Flood Zone	YES	NO **X**
Proposed Storm Drain	YES	NO **X**

COPIES TO:
L. R. Nelson Consulting Engineers
Nevada H.A.N.D.
Bart Anderson, P.E., DevCo
CCRFCD

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
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2. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans

L.R. NELSON
CONSULTING ENGINEERS

LETTER OF TRANSMITTAL

TO: City of Las Vegas
Flood Control

DATE: 6/25/15
PROJECT NUMBER: 818-030-152
DESCRIPTION: Lamb Pines TDS

ATTN: Albert Sung

We are forwarding the following items by: ☐ Pickup ☒ Messenger ☐ Mail ☐ Airborne Ex ☐ Fed Ex

Number of Copies	Number of Originals	Description	Sheet No.
1		Technical Drainage Study for Lamb Pines	
1		Plan Set - Lamb Pines	
1		Review Fee ($400) Check No. 101168	
1		CD-ROM of TDS and Plans	

Remarks: This is for review and approval

This material is sent for your ☐ Perusal ☒ Approval ☐ Files ☐ Other

By: Thomas Kelley, PE

SIGNATURE BELOW INDICATES RECEIPT OF MATERIALS DESCRIBED ABOVE.

X _____ _____ _____
Signature Date Time

NEVADA ✹ 6765 West Russell Road, Suite 200 ✹ Las Vegas, NV 89118-1811 ✹ 702/ 798-7978 ✹ FAX 702/ 451-2296
UTAH ✹ 51 West 9000 South ✹ Sandy, UT 84070 ✹ 801/ 565-8580 ✹ FAX 801/ 565-9340

TECHNICAL DRAINAGE STUDY FOR LAMB PINES

CITY OF LAS VEGAS, NEVADA
Project Number: 818-030-152
June 2015

Prepared For: Nevada H.A.N.D, Inc.
295 E. Warm Springs, #101
Las Vegas, NV 89119
(702) 410-2730

Prepared By: L.R. Nelson Consulting Engineers
6765 W. Russell Rd., Suite 200
Las Vegas, Nevada 89118
(702) 798-7978

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Lamb Pines Date: Jun 25, 2015

Location of Development: a) Descriptive (Cross Streets) North/South: Lamb Boulevard

East/West: Diamond Head Drive

b) Section: 31 Township: 20S Range: 62E

c) APN : 140-31-501-021

Name of Owner: Nevada H.A.N.D.

Telephone No.: (702) 410-2730 Fax No.: E-Mail Address:

Address: 295 E. Warm Springs Road, #101, Las Vegas, NV 89119

Contact Person-Name: Thomas Kelley, P.E. **Telephone No.:** (702) 798-7978

* **E-Mail Address:** Thomas.Kelley@lrneng.com **Fax No.:** (702)451-2296

Firm: LR Nelson

Address: 6765 West Russell Road, Suite 200, Las Vegas, NV 89118

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☒	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☐	Planned Unit Development	☐	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit		

1. Total Owned Land Area: At Site: 12.6+/- acres Being Developed/Disturbed: 12.6+/- acres
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.): Residential Mulit Unit
5. Approximate upstream land area which drains to the subject site: 0.36 acres +/- drains towards the site
6. Has the site drainage been evaluated in the past? ☐ **YES** ☒ **NO** If yes, please identify documentation:
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Most of the site discharges into the Cedar Avenue Channel. The remaining portions discharge into Lamb Boulevard
8. Briefly describe your proposed schedule for the subject project: A.S.A.P

PROFESSIONAL ENGINEER - STATE OF NEVADA
THOMAS L. KELLEY
EXP. 6-30-17
CIVIL
No.017676
6/25/15

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.

***New Required Field**

****Review and concurrence of the Clark County Regional Flood Control District is required.**

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name:	Lamb Pines	Map ID:			
Firm Name:	LR Nelson	Engineers:	Thomas Kelley, PE		
Address:	6765 West Russell Road, Suite 200				
City:	Las Vegas	State:	NV	Zip:	89118
Phone Number:	(702) 798-7978	Fax Number:	(702) 451-2296		
Property Owner:	Nevada HAND				
Address:	295 E. Warm Springs Road Suite 101				
City:	Las Vegas	State:	NV	Zip:	89119

Reviewed By:	Date Received:	Date Accepted for Review:

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL).

This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

If the items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT

Yes	No	
X		Design Manual **Standard Form 1** with the engineer's seal and signature.
X		Design Manual **Standard Form 4**
X		2 Copies of the 24"x36" Drainage Plan
X		A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

X		A copy of a current Flood Insurance Map (FIRM) with the site delineated.
X		A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental area with the site delineated.

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

Yes	No	
X		Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.
X		On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
X		Vicinity Map with local and major cross streets identified and a north arrow.

II. DRAINAGE PLAN

Yes	No	
X		Sheet size: 24”x36” sealed by a registered engineer in the State of Nevada
X		Minimum scale: 1” = 60’
X		Project Name.
X		Vicinity Map with local and major cross streets.
X		Revision box.
X		North arrow and bar scale.
X		Engineer’s/consultants’s address and phone number
X		Elevation datum and benchmark
X		Legend for symbols and abbreviations
X		Cut/fill scarps, where applicable
X		Street names, grades, widths.
X		Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
X		Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where applicable.
X		Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
X		Proposed typical street sections

REFERENCE:	STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
N/A		Streets with off-set crowns.
X		Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes
X		Property Lines
X		Right-of-way lines and widths, existing and proposed.
X		Existing improvements and their elevations.
X		Delineation of proposed on-site drainage basin(s) indicating area and 10-year and 100-year storm peak flows at basin concentration points.
X		Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
X		Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
X		Location and cross-section of street capacity calculations.
X		Cross-sectional detail for channels. Including cutoff wall locations.
X		Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) starting size, material, shape, and slope with plan and profile and HGL calculations.
X		Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
N/A		Location and detail of existing, proposed, and future block wall openings. Minimum size is 16” x 48”. Wrought iron gate is required for flows > 10 cfs.
N/A		Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.
X		Perimeter retaining wall locations. All existing and proposed walls (retaining, screen & flood) must be shown with adjacent elevations. Flood wall with 8-inch concrete masonry unit.
X		Building and/or lot numbers
X		Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
N/A		Limits of existing floodplain based on current FIRM or best available information, limits of proposed floodplains based on best available information

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
N/A		For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish flood elevations must be a minimum of 18 inches above BFE.
X		Appropriately elevated "humps" 6 inches above the 100 year water surface elevations at site accesses where the intent is to protect the site from the Q_{100} flows.
X		Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
X		Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required)

IV. HYDROLOGIC ANALYSIS

Yes	No	
X		Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
X		Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
X		Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
X		Use of correct precipitation values in and around the McCarran Airport rainfall area.
X		A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
X		A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.
X		Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law
X		Calculation for impervious area for parking lots and LIDs (if required)

REFERENCE:	STANDARD FORM 2

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
N/A		Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
X		Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. Q_{100} d x v ≤ 8. Q_{10} d x v ≤ 6 and 12 foot dry lane rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the grading plan.
X		A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
N/A		Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
X		Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and fee intersection losses, where appropriate.
X		Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must be provided with 18 inches of freeboard above Q_{100} weir height or flow depth, which ever is greater.
N/A		A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross sections based on survey with proper encroachments. • A map showing the location of cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
X		Provide a 50 percent clogging factor in the capacity calculations for drop inlets.
X		Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
X		The mitigation of nuisance water, both during construction and in fully developed condition, must be addressed.
X		Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:	**STANDARD FORM 2**

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I. INTRODUCTION

A. Study Overview and Purpose

This study is intended to serve as the Technical Drainage Study (TDS) for the proposed Lamb Pines low income housing development. The development area is approximately 12.5 (+/-) acres. The site will consist of multi-unit apartment homes with associated parking and internal drive aisles.

This study is a stand-alone document for the residential development that presents the findings of a hydrologic and hydraulic analysis of the site and contributing watershed area. Flow rates are computed for the *10- and 100-Year Design Storm* to be used to in the design of flood protection facilities as recommended by current criteria and regulatory agency requirements. This study has been conducted in accordance with the criteria set forth by the Clark County Regional Flood Control District's (CCRFCD) *Hydrologic Criteria and Drainage Design Manual* (Reference #2).

B. Location

The majority of the project area is within the North Half (N 1/2) of the Northeast Quarter (NE 1/4) of Section 31, Township 20 South, Range 62 East, Mount Diablo Meridian City of the City of Las Vegas, Nevada. Additional portions of the site are located within the South Half (S 1/2) of the Northeast Quarter (NE 1/4) of Section 31, Township 20 South, Range 62 East. A general *Vicinity Map* is shown in Figure 1 showing the project site location within the Las Vegas valley. The project site is located near the intersection of Lamb Boulevard and Diamond Head Drive.

The Assessor's Parcel Number (APN) for the proposed residential development is 140-31-501-021.

C. Existing Site Description

As existing, half the onsite area is currently undeveloped. The other half, which is bordered to the east by Lamb Boulevard, was developed previously as a local carpenter's union training facility. The facility has since been abandoned. The northern portion of the site is bordered by an apartment complex. The western boundary is bordered by property used as onsite storage and training grounds for a local Trade Union. A small area currently exists along the western border with the Trade Union that directs a small amount of runoff to a depression that allows for ponded water. The southern boundary of the site is adjacent to the existing Cedar Avenue Channel. This channel is a Clark County Regional Flood Control facility. The majority of the site slopes from the north to the south at a slope approximately one percent. A swale area along the central portion of the site concentrates runoff and directs the flow towards an existing 30 inch CMP pipe that connects into the existing Cedar Avenue Channel. An approximate two acre portion of the site along the eastern property boundary slopes from west to east at one percent slope towards Lamb Boulevard.

Photo 1: Existing Onsite Condition (looking North towards adjacent Apartments)

The site slopes north to south looking from top to bottom of the above photograph.

Photo 2: Existing Onsite Conditions (looking East towards Lamb Boulevard)

The site is undeveloped except for the area along the old Union Center shown above. A swale along the center of the site directs runoff to an existing 30 inch CMP.

Photo 3: Existing Onsite Conditions (30 inch CMP connection with Cedar Avenue Channel)

The 30 inch CMP exits directly into the existing Cedar Avenue Channel.

D. FEMA Flood Plain Information

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community-Panel Number 32003C2187FF dated November 16, 2011, the site is located within Zone 'X'. Zone 'X' is described by FEMA as an area outside the 0.2% annual chance floodplain. A map depicting the FEMA the area described above is included in Appendix A of this TDS. The site boundary has been provided the map as a reference of the location of our project site.

E. CCRFCD Master Plan Information and Proposed City of Las Vegas Projects

As shown on Figure 4 in Appendix A which references *Clark County Regional Flood Control Districts 2013 Las Vegas Valley Flood Control Master Plan Update* (MPU) Figure F-32, the site is drains toward an existing Master Plan Flood Control Facility. The facility is the Cedar Avenue Channel, which is identified as CACH 0081, which is a 12'W 6'D 1.5:1 SS concrete channel. The channel directs flow towards a 12' x 6' RCBC structure at Lamb Boulevard (CACH 0079). Figure 4c in Appendix A (2008 MPU Figure H-32) has been provided showing our project location is a part of regional basins CA08-C.

Work is currently being performed as part of a major update to the Cedar Avenue Channel. Atkins North America has recently submitted preliminary plans and analysis to the City of Las Vegas for an update to the channel to address the recent flooding problems. Preliminary results of the hydrologic analysis based upon several scenarios for the channel indicate the possibility

for a significant increase in runoff within the channel. Our project design used information from the Atkins North America analysis that reflects the worst case scenario. Base flood elevations along the Cedar Avenue Channel for the worst case were used to set our finished floor elevations along the channel.

Based upon review of previously approved studies of the area, it is L. R. Nelson Consulting Engineer's opinion that these facilities will be not be impacted by the proposed project.

F. City of Las Vegas Central Neighborhood Master Plan

A review of the *City of Las Vegas 2005 Central Neighborhood Flood Control Master Plan the site falls within hydrologic basin CA09 (72/126 cfs). The master plan indicates that the flow will be contained within storm drain facilities (Local Facility LMB 160 – 53" x36" RCP) and that no flow will be directed to Lamb Boulevard. The drainage study for Saratoga Palms by Integrity Engineering (referenced below) used a conservative approach and determined that all the flow from basin CA09 went into Lamb Boulevard.*

G. Previous Drainage Studies

The following technical drainage studies listed below were referenced in preparation for this study:

- Technical Drainage Study for Saratoga Palms and addenda, by Integrity Engineering, February 2006.

  This study proposed a conversion of an existing apartment complex into a high density residential development. The study re-evaluated the drainage patterns and hydraulic analysis for the project area. This study is being referenced as a source for the flow depths in Lamb Boulevard. The study used a very conservative approach by estimating that all the runoff from Basin CA09 from the 2005 Central Neighborhood Study (72/126 cfs) enters Lamb Boulevard. This conservative approach established a flow depth of 0.91 ft in Lamb Boulevard.

- *Las Vegas Wash Central, Cedar Avenue Channel Preliminary Design Report, b*y Atkins North America. June 2015.

  References to this report include portions of the preliminary study mentioned above and several referenced hydraulic models that were prepared leading to the creating of the above referenced report. Of particular use is a preliminary model that was designed to incorporate flows generated from a proposed regional facility that is being planned along Bonanza Road. This particular model was not part of the preliminary report, but it was provided to LR Nelson by Atkins North America as part of the design record for the project. There were early concepts that may have directed the runoff from the proposed Bonanza regional facility into the Cedar Avenue Channel. Understanding that the incorporation of the flows mentioned above has a low probability of occurring and based upon notification by the City of Las Vegas, we have designed our project site as if they were incorporated.

Based upon a review of the above mention studies, L.R. Nelson Consulting Engineers agrees that they appear to meet the minimum criteria and concur with the results. This Study has provided the pertinent portions of these referenced drainage studies and have included the information in Appendix D.

II. METHODOLOGY

A. Compliance with Regulations

This Study was conducted in accordance with the City of Las Vegas standards and the criteria set forth by Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Design Manual* (HC&DDM), prepared by WRC Engineering and updated by Montgomery Watson, and updated in September 2013.

B. Hydrologic Criteria

1. Rainfall Criteria

The project site is located within the McCarran Airport Rainfall Area as indicated on Figure 513 of the HC&DDM. Precipitation values have been established by Clark County for areas located within the McCarran Rainfall Area. These values have been referenced from Table 505 of the HC&DDM. Since the site encompasses less than 8-square miles a Storm Distribution Number Three (SDN #3) was used for the HEC-1 model. No Depth-Area-Reduction Factors were used since the watershed area is approximately 0.002 sq. miles.

Table 1: McCarran Airport Rainfall Area Rainfall Values

10-Year 6-Hour (in)	100-Year 6-Hour (in)
1.58	2.77

2. Runoff Computations

For the onsite developed condition, the Soil Conservation Service or SCS dimensionless unit hydrograph method provided within the HEC-1 model was utilized to compute design storm hydrographs. The **U.S. Army Corps of Engineers HEC-1, *Flood Hydrograph Package Computer Model***, June 1998 Version 4.1 was utilized to model the surface runoff estimate of a given watershed to rainfall. The HEC-1 program represents the watershed as an interconnected system of hydraulic components. Each component represents an aspect of the rainfall runoff process within a portion of the watershed. The smaller portion is referred to as a sub-basin. The computed hydrographs from each sub-basin are then combined at appropriate locations to obtain the final discharge hydrograph. The HEC-1 parameter calculations are located in Appendix B of this study.

Lag Time T_L is defined as the time measured from the centroid of effective rainfall to the peak of the outflow hydrograph. It is a measure of the watershed's response time and is a coherent property to basin length, slope, roughness characteristics and land use. The lag-times for this study were estimated by calculating the drainage basins' time of concentration, T_C. The time of concentration consists of two components; the initial overland flow time, t_i, and the gutter or channel flow time, t_t. The equation for the time of concentration is $TC = t_i + t_t$. The equation for lag time is $T_L = 0.6T_C$. Standard Form 4 from the CCRFCD HC&DDM was utilized to establish the T_L for input into the HEC-1 models and is included in Appendix B for review.

3. Soils Classification

The United States Department of Agriculture (USDA) Soil Conservation Service (SCS) Web Soil Survey was reviewed to establish the Hydrologic Soil Group (HSG) information for the onsite watershed area only. The SCS results indicate the soil is listed as Land silty clay loam, Unit 282. This soil type is primarily Type 'C'. Soil group 'C' is typically characterized as soil type with a high infiltration rate and a low runoff potential. The onsite areas have been located on the Web Soil Survey referenced soils map Figure 5 in Appendix A. Curve Numbers for the onsite drainage basins were determined using Table 602 (page 1 of 4) AND Table 602A from the CCRFCD Manual Reference #1). The predominant land use category for the developed onsite basin is Commercial.

Table 2: CN Values Used for Design

Hydrologic Soil Group (HSG)*
Curve Number (CN) Determination**

Land Use Condition	HSG	CN
Existing Condition		
Commercial	C	94
Desert Shrub, Poor	C	85
Impervious	C	98
Developed Condition		
Apt/Condo, 72%	C	91
Impervious	C	98
Open Space, Good	C	74

* Ref. USDA SCS Web Soil Survey Las Vegas Valley Area Nevada

** Ref. CCRFCD DDM Table 602 (1 of 4) and Table 602A

Based upon review of the referenced information provided within the approved technical drainage studies mentioned above, the soil group information referenced above is consistent with previous construction projects in the area.

C. Hydraulic Analysis

Bentley Systems FlowMaster computer software was used to compute the normal depth and velocity for the onsite area. The software uses Manning's Equation to determine the results used to calculate depth times velocity values required by the HC&DDM.

III. DRAINAGE BASIN ANALYSIS

A. Existing Drainage Description

The onsite project area as mentioned previously is split between different stages of development. The western portion of the site is in an undeveloped state, while the eastern portion of the site was developed as part of an old Union Trade complex. The runoff for the project site is directed to three significant points of concentration. The majority of the runoff is directed towards concentration point XCP2. This location consists of a point of concentration just upstream of Lamb Boulevard crossing the Cedar Avenue Channel. The runoff at this point is composed of onsite runoff that sheet flows into the Cedar Avenue Channel. The second area of concentration is a point north along Lamb Boulevard (XCP1) that concentrates existing basin XON4 and the runoff generated in Lamb Boulevard.

The third major point of concentration is XCP3. This point of concentration consists of a very small landlocked depression that exists along the western property boundary between our project site and Trade union property to the west. Approximately 1 cfs is directed to this location during a 100 year storm event.

All existing and proposed models for the Cedar Avenue Channel have considered our project site as part of the channel flows already entering the channel. Because of this fact reference flow numbers for the channel are not significant to the respective basin maps and an analysis of our site will not change the numbers, therefore the information has not been included on the basin maps. The only referenced information used for the channel is that information indicating the flood elevations established in the worst case hydraulic modeling for the area.

Table 3: Existing Conditions Basin Summary

Existing Condition				
Basin	**Area (acres)**	**Q_{10} (cfs)**	**Q_{100} (cfs)**	**Remarks**
XON4	1.92	3	5	Onsite Basin to Lamb Blvd
DST1	0.81	2	3	Lamb Boulevard
XCP1		**4**	**8**	**Lamb Boulevard**
XON1	2.78	2	5	Onsite Basin
XON2	2.86	2	6	Onsite Basin
XON3	3.31	4	9	Onsite Basin
XCP2		**8**	**20**	**Runoff into Cedar Ave Channel**
XOF1	0.36	<1	1	Offsite Basin
XON5	0.23	<1	<1	Onsite Basin
XCP3		**<1**	**1**	**Runoff to Landlocked Depression**

The HEC-1 modeling output for the Existing Condition analysis, Standard Form 4, and weighted CN calculations can be found in Appendix B.

B. Interim Drainage Description

There are only two factors affecting our site in an interim situation. The first being the interim condition of the Cedar Avenue Channel. Under the worst case interim condition, the contributing basin that includes our project site is considered to be in a completely developed state. Due to the design of our site, offsite runoff will not impact our project site. Therefore no additional interim condition analysis is necessary.

The second factor affecting our site is the area of depression indicated on the existing basin map as XOF1 and XON5 contributes to an area of trapped water under existing conditions. Our proposed site's design addresses this issue providing for a swale along the offsite property boundary to allow for the small amount of runoff to sheet flow into the Cedar Avenue Channel. The swale was designed for an ultimate condition using commercial land use. This fact negates any interim affects upon our project or the adjacent offsite area. The two factors mentioned above negates the necessity of an interim condition analysis, therefore no basin map or calculations have been provided.

C. Ultimate Drainage Description

Under the ultimate condition assumptions, the site will be completely developed as an apartment/condo low income development.

Drainage patterns for the site are consistent with those in the existing condition. There are three points of concentration established in developed condition. DCP1 indicates the point on Lamb Boulevard that concentrates runoff from onsite Basin DON4 and the Lamb Boulevard Basin DST1. Concentration point DCP2 includes the remaining portion of the runoff from our project site. This point of concentration is established just upstream of the Lamb Boulevard crossing of the Cedar Avenue Channel. As mentioned previously in this study, the flows established in the Cedar Avenue Channel has included our sites development in the flows amounts, therefore only the flood elevations levels were referenced in our study.

Concentration point DCP3 was established to indicate the exit local of the 0.36 acres area of depression that has, in the developed condition, been regraded to provide a small drainage swale that expands to allow for sheet flow into the Cedar Avenue Channel. We are currently working with the owners of the offsite parcel to obtain the necessary permission for the proposed grading. Once obtained, a copy of the permission will be forwarded to the City of Las Vegas for their records.

Table 4: Ultimate Condition Basin Summary

Ultimate Condition				
Basin	**Area (acres)**	**Q_{10} (cfs)**	**Q_{100} (cfs)**	**Remarks**
DON4	1.31	2	4	Onsite Basin to Lamb Blvd
DST1	0.81	2	3	Lamb Boulevard
DCP1		**3**	**7**	**Lamb Boulevard**
DON1	5.91	8	16	
DON2	1.06	2	4	
DON3	2.81	3	7	
DCP2		**12**	**25**	**Runoff into Cedar Ave Channel**
DOF1	0.36	1	1	Offsite Basin
DCP3		**1**	**1**	**Offsite Basin Runoff to Swale**

The runoff for the site has been directed to grate inlets that direct runoff into a small storm drain system connected to the Cedar Avenue Channel. Further discussions regarding the storm drain system can be found later in this study.

The HEC-1 modeling output for the Ultimate Condition analysis, Standard Form 4, and weighted CN calculations can be found in Appendix B.

IV. HYDRAULIC DRAINAGE BASIN ANALYSIS

A. Street Hydraulics

Hydraulic calculations have been provided for all streets and parking areas proposed with our project. The typical interior section consists of either a 42 or 60 foot section with valley gutters,

associated parking and sidewalk. The majority of the site has been designed using longitudinal slopes averaging of 0.5 percent. To avoid ponding areas, cross slopes within the parking areas have been designed to be 1.5% slope. The majority of the runoff for the project site is direct to one of three curb openings that direct the runoff into rip rap swales. The rip rap swales serve both to direct runoff to the storm drain system and as water quality BMPs (discussed later in this study). An additional rip rap swale has been designed along the offsite portion of the western property boundary. This swale was needed due to a landlocked depression area that accepted approximately 1 cfs of runoff during the 100 year storm event. The swale is designed to flatten and spread our adjacent to the Cedar Avenue channel to promote sheet flow into the channel. The street hydraulics in Lamb Boulevard has not been analyzed because we are decreasing the flows being directed in Lamb Boulevard. Although, to establish flood levels in Lamb Boulevard, we are using referenced flood depths that were established in the previously approved Saratoga Palms drainage study (0.91 ft). The flood depths referenced in that study are extremely conservative in nature and should provide an additional factor of safety for our project site.

Bentley Systems computer software, Flowmaster, was used to analyze the normal depth and velocities for the street sections, swales and curb openings. The software uses Manning's Equation to determine the results used to calculate the depth times velocity values required by the HCCDM.

Table 5: Street Section Summary

Street Sections						
Section	Slopes (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (fps)	DV	Remarks
S1/TYP	0.40	16.00	0.36	1.99	0.72	Basin DON1
S2/D	0.50	16.00	0.34	2.15	0.73	Basin DON1
S3/D	0.50	4.00	0.21	1.46	0.31	Basin DON2
S4/D	0.40	7.00	0.34	1.81	0.62	Basin DON3
S5/D	0.50	7.00	0.26	1.67	0.43	Basin DON3

Table 6: Swale Calculations

Swale Sections						
Section	Slopes (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (fps)	DV	Remarks
SW1	1.00	16.00	1.31	3.09	4.05	Basin DON1
SW2	0.50	4.00	0.89	1.69	1.50	Basin DON2
SW3	1.00	7.00	0.96	2.52	2.42	Basin DON3
OF1	0.66	1.00	0.38	1.13	0.43	Basin DOF1

B. Storm Drain System

The storm drain system is composed of two sets of grate inlets and the downstream manholes and connecting pipes into the Cedar Avenue Channel. The grate inlets will accept onsite runoff

that is directed into upstream rip rap swales. The central pipe connect will occur at the same location that included an existing 30 inch CMP. This existing CMP pipe will be demolished and our proposed RCP pipe will take its place. A similar RCP pipe will be installed downstream to direct the remaining onsite runoff into the Cedar Avenue Channel.

The onsite storm drain system was designed using the knowledge that the HGL of the worst case condition flood elevations for the Cedar Avenue Channel will over top the grate inlets. This fact was discussed with representatives with the City of Las Vegas in a meeting held on June 10, 2015. The worst case flood event was determined to take place during an interim condition of the Cedar Avenue Channel. As mentioned above, a redesigned has been initiated for the channel. Atkins Engineering has provided the City of Las Vegas with preliminary analyses of the project. Several HEC-RAS models were created to demonstrate the flood levels during various interim phases of the project. The worst case of these interim conditions provides the highest flood levels for the Cedar Avenue Channel. To be conservative we used these flood levels as a basis of design for our project site. Excerpts from the HEC-RAS model that provide the worst case flood levels have been provided as a reference to this study.

All portions of our project site including the adjacent fill slopes and finished floor elevation have been designed to be 18 inches above the worst case flood elevation of the Cedar Avenue Channel. The parking lot areas along the southern portion of the project were designed to allow runoff from the site to enter rip rap drainage swales. The flowline elevations for the entry point into the swales were designed to be just above the flood elevation of the Cedar Avenue Channel during the worst case scenario. This was designed to always allow for our sites drainage to enter the channel even during the worst case 100 year flood event.

Bentley Systems Flowmaster was used to analyze the drop inlet capture capacity for the proposed drop inlets. Flowmaster uses calculations based upon the Federal Highway Administrations (FHWA) HEC-22 document.

C. Nuisance Flow

Nuisance flow will be carried onsite within the onsite landscape swales, curb and gutter and concrete valley gutters and be released into either a proposed storm drain system or within Lamb Boulevard.

D. Water Quality

The proposed site has been designed to direct runoff from approximately 90 percent of the project site. Due to the nature of the storm system provided, all of the site's runoff being direct into the storm drain system must be directed through rip rap swales (approximately 375 linear feet of swales). These swales also serve the dual purpose of being a water quality BMP. Normally calculations must be provided that indicates treatment of 75 percent of the parking lot area and that BMPs are sized for the 85th percentile storm. Since the rip rap swales are also serving to direct all the runoff into the storm drain system there is no need for the detailed calculations associated with water quality.

IV. CONCLUSIONS

The design of this low income apartment development and the runoff directed to the three offsite points of concentration associated with this project are consistent with previously existing flow regimes for the area. All analyzed results indicate that the project was also designed to meet criteria set forth in the HCCDM.

Nuisance flow as mentioned above will be carried onsite within the onsite curb and gutter and be released into the proposed storm drain system with the project site.

The drainage study for the Lamb Pines development meets and exceeds the minimum finished floor elevations for the onsite flow depths as all onsite generated storm water is contained below the tops of curbs. Finished floor elevations are in excess of twice the depth of flow throughout the project site.

V. RECOMMENDATIONS

The following recommendations are provided to facilitate safety, both public and private, for the proposed residential development.

1. Construction of the proposed storm drain system and grade the site in accordance to the improvement plans to meet the CCRFCD and City of Las Vegas drainage criteria for the 10 and 100 year, 6-hour design storm event.

2. Construct all proposed street and gutter improvements to allow proper conveyance of storm water.

V. REFERENCES

1. *CCRFCD Flood Control Master Plan*, by P.B.S. & J., Inc. and PB, Inc., 2008.

2. *CCRFCD Hydrologic Criteria and Drainage Design Manual*, WRC Engineering, 1999.

3. Flood Insurance Rate Map (FIRM) Community-Panel Number 32003C2595F dated November 16, 2011, *Clark County, Nevada*, Federal Emergency Management Agency.

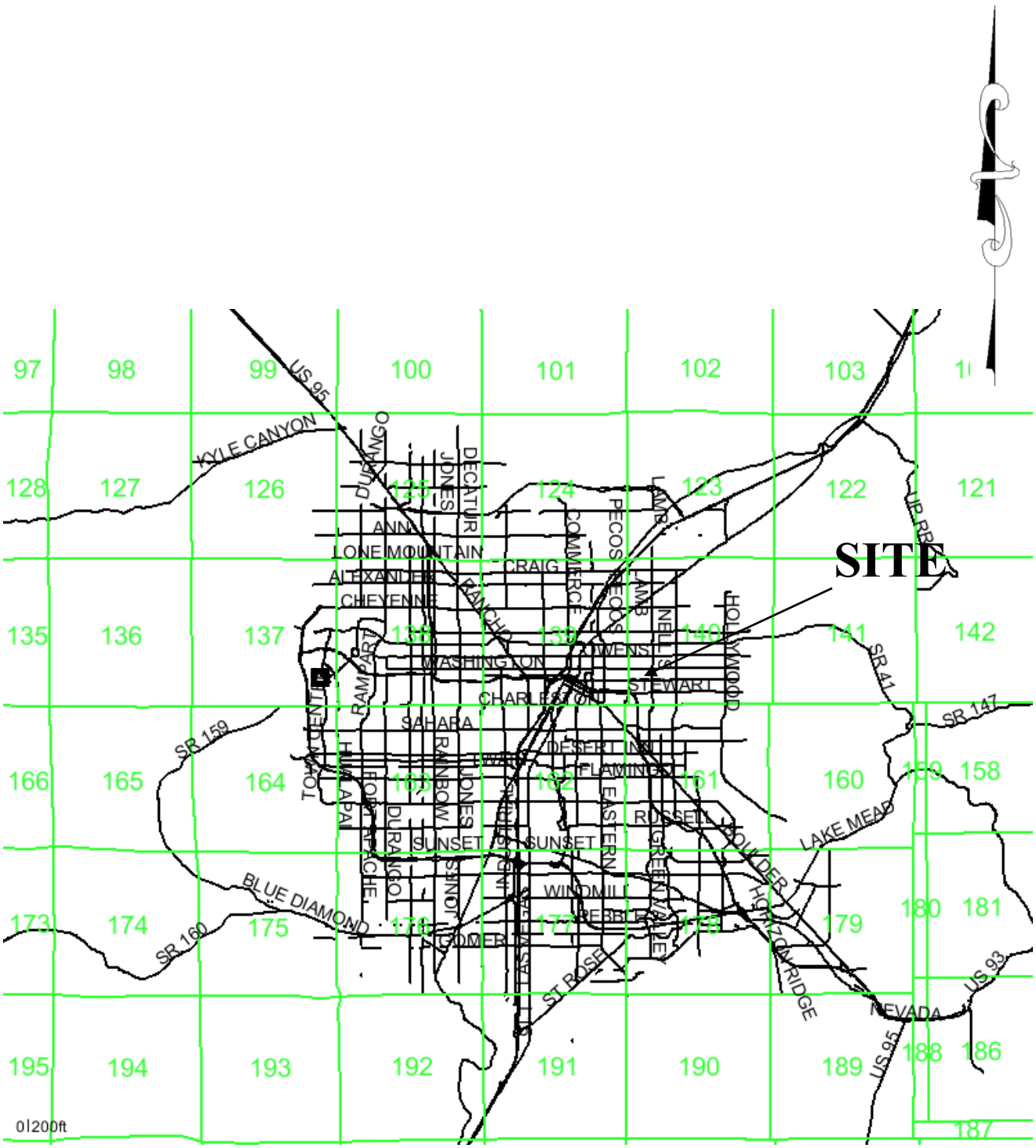
4. *Soil Conservation Service (SCS) Web Soil Survey, Custom Soil Resource Report for Las Vegas Valley Area, Nevada.*

5. *Technical Drainage Study for Saratoga Palms and addenda, by Integrity Engineering, April 2004, CTMA 2003620061*

6. Las Vegas Wash Central, Cedar Avenue Channel Preliminary Design Report, by Atkins, North America, June 2015

Appendix A: Figures

Figure 1: Vicinity Map
Figure 2: Assessor Parcel Map
Figure 3: FEMA FIRM Map
Figure 4: CCRFCD 2013 Las Vegas Valley Flood Control Facilities (MPU) F
Figure 5: CCRFCD 2008 Las Vegas Valley Flood Control Facilities (MPU) H
Figure 6: 2005 CLV Central Neighborhood Flood Control Master Plan
Figure 7: Existing Condition Drainage Basin Map
Figure 8: Interim Condition Drainage Basin Map



L.R. Nelson Consulting Engineers 6765 W. Russell Rd., Suite 200 Las Vegas, NV 89118	LAMB PINES NEVADA H.A.N.D.	Figure 1 General Vicinity Map

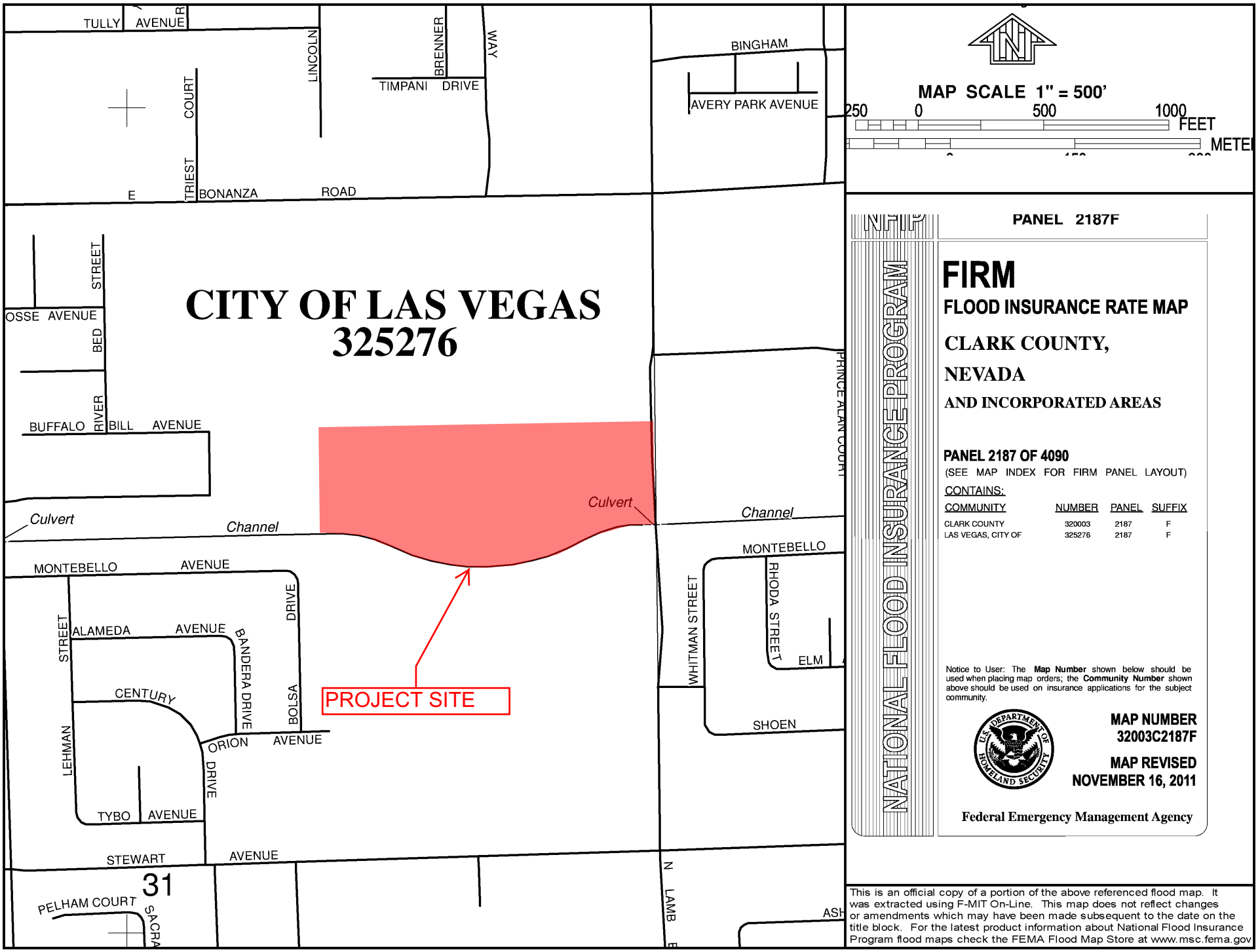

TULLY AVENUE
LINCOLN
BRENNER
WAY
TIMPANI DRIVE
BINGHAM
AVERY PARK AVENUE
COURT
TRIEST
E
BONANZA ROAD
CITY OF LAS VEGAS
325276
STREET
OSSE AVENUE
BED
RIVER
BUFFALO BILL AVENUE
Culvert
Channel
Culvert
Channel
PRINCE ALAN COURT
MONTEBELLO AVENUE
STREET
ALAMEDA AVENUE
BANDERA DRIVE
DRIVE
BOLSA
CENTURY
ORION AVENUE
LEHMAN
DRIVE
TYBO AVENUE
STEWART AVENUE
PROJECT SITE
MONTEBELLO
RHODA STREET
ELM
WHITMAN STREET
SHOEN
31
PELHAM COURT
N LAMB
ASH
MAP SCALE 1" = 500'
250 0 500 1000
FEET
METE
PANEL 2187F
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY,
NEVADA
AND INCORPORATED AREAS
PANEL 2187 OF 4090
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
CLARK COUNTY 320003 2187 F
LAS VEGAS, CITY OF 325276 2187 F
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
32003C2187F
MAP REVISED
NOVEMBER 16, 2011
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

FIGURE 2

NOTES

This map is for assessment use only and does NOT represent a survey.

No liability is assumed for the accuracy of the data deliniated herein. Information on roads and other non-assessed parcels may be obtained from the Road Document Listing in the Assessor's Office.

This map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information.

USE THIS SCALE(FEET) WHEN MAP REDUCED FROM 11X17 ORIGINAL

0 100 200 400 600 800

MAP LEGEND

PARCEL BOUNDARY
SUB BOUNDARY
PM/LD BOUNDARY
ROAD EASEMENT
MATCH / LEADER LINE
HISTORIC LOT LINE
HISTORIC SUB BOUNDARY
HISTORIC PM/LD BOUNDARY
SECTION LINE

CONDOMINIUM UNIT
AIR SPACE PCL
RIGHT OF WAY PCL
SUB-SURFACE PCL

001 ROAD PARCEL NUMBER
001 PARCEL NUMER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

ASSESSOR'S PARCELS - CLARK CO., NV.

Michele W. Shafe - Assessor

BOOK T20S R62E | SEC. 31 | MAP S 2 NE 4 | 140-31-6

125	124	123	122
138	139	140	141
163	162	161	160
176	177	178	179

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

8	4	8	4
5	1	5	1
6	2	6	2
7	3	7	3
8	4	8	4
5	1	5	1

Scale: 1" = 200 ' | Rev: 02/09/2011

CLARK COUNTY ASSESSOR MAPPING DIVISION NEVADA

PT 1
PT 1
PM 96-01
PT 140-31-501-021
R=860
R=455.23
R=500
601
PROJECT SITE
002
15.64
001
3.06
002
1.7
011
2.79
612
001
PB 26-6
THE CROSSROADS
602
PM 22-77
009
0.65
PM 35-84
PM 23-39
PM 24-73
PM 39-96
610
611
612
613
713
CITY OF LAS VEGAS FLOOD CONTROL
96-001
SANDHILL ESTATES UNIT NO 3-C
SANDHILL ESTATES UNIT NO 3-B
SANDHILL ESTATES UNIT NO 3-A
BEDFORD VILLAGE UNIT NO 3
AMD PARK RIDGE ADDITION
TREASURE PARK NO 2
RESUB OF STEWART ARMS SUBDIVISION
MONTEBELLO AVE
ALAMEDA AVE
CENTURY DR
TYBO AVE
TYBO CIR
ORION AVE
STEWART AVE
SANDHILL RD
GALVESTON ST
LEHMAN ST
BANDERA DR
BOLSA DR
LAMB BLVD
ELM AVE
PB 13-80
PB 13-35
PB 12-89

FIGURE 3A

TAX DIST 200

NOTES

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This map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information.

USE THIS SCALE(FEET) WHEN MAP REDUCED FROM 11X17 ORIGINAL

0 100 200 400 600 800

MAP LEGEND

- PARCEL BOUNDARY
- SUB BOUNDARY
- PM/LD BOUNDARY
- ROAD EASEMENT
- MATCH / LEADER LINE
- HISTORIC LOT LINE
- HISTORIC SUB BOUNDARY
- HISTORIC PM/LD BOUNDARY
- SECTION LINE
- CONDOMINIUM UNIT
- AIR SPACE PCL
- RIGHT OF WAY PCL
- SUB-SURFACE PCL

ASSESSOR'S PARCELS - CLARK CO., NV.

Michele W. Shafe - Assessor

- 001 ROAD PARCEL NUMBER
- 001 PARCEL NUMER
- 1.00 ACREAGE
- 202 PARCEL SUB/SEQ NUMBER
- PB 24-45 PLAT RECORDING NUMBER
- 5 BLOCK NUMBER
- 5 LOT NUMBER
- GL5 GOV. LOT NUMBER

BOOK T20S R62E

125	124	123	122
138	139	140	141
163	162	161	160
176	177	178	179

SEC. 31

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

MAP N 2 NE 4

8	4	8	4
5	1	5	1
6	2	6	2
7	3	7	3
8	4	8	4
5	1	5	1

140-31-5

CLARK COUNTY ASSESSOR MAPPING DIVISION NEVADA

Scale: 1" = 200 ' Rev: 02/09/2011

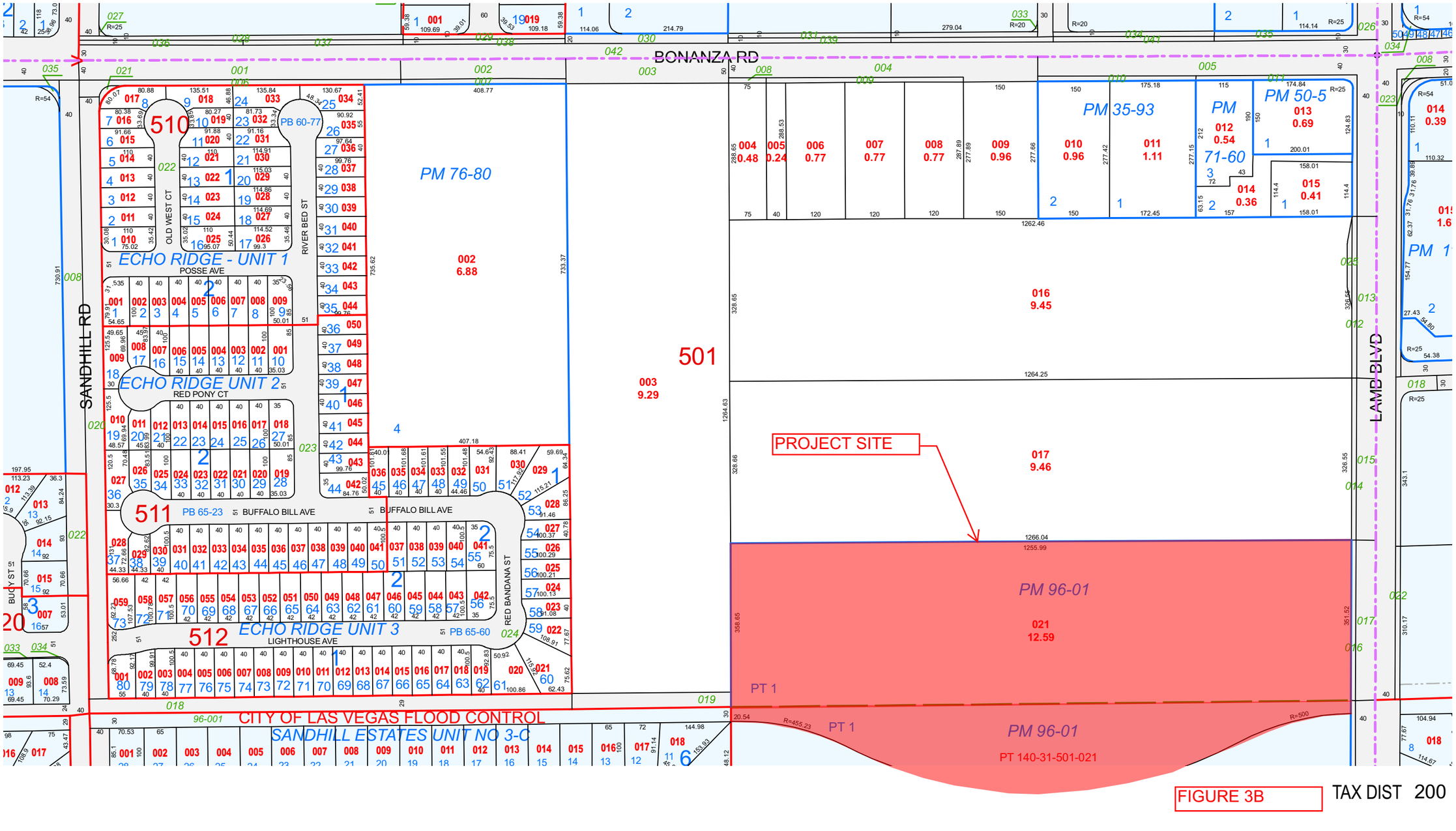


FIGURE 3B

TAX DIST 200

REGIONAL FLOOD CONTROL DISTRICT

2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F- 32
FLOOD CONTROL FACILITIES

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

Remove & Replace/Parallel Facilities

Category A	Category B
Channel	Channel
Stormdrain	Stormdrain

N

0 500 1,000 2,000 3,000
Feet

Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)

US95 I-15 I-215

	1	2	3			A1	A2
	4	5	6			A3	A4
		7	8	9	10	A5	A6
11	12	13	14	15	16	17	
	18	19	20	21	22	23	
	24	25	26	27	28		
	29	30	31	32	33	34	
	35	36	37	38	39	40	
	41	42	43	44	45	46	
	47	48	49	50	51	52	
	53	54	55	56			
	57	58	59				

FIGURE 4A

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BHSA		**BOULDER HIGHWAY SAHARA AVENUE**						
0000	P2	14' X 10' RCB	1350	3837	CSA13*	SW3	7.93	0.50
0026	P1	14' X 11' RCB	4000	3837	CSA13*	SW3	7.93	1.30
0075	P1	12' X 11' RCB	5280	3837	CSA13*	SW3	7.93	2.11
0175	P1	14' X 14' RCB	6000	3837	CSA13	SW3	7.93	0.67
CABZ		**CEDAR AVENUE - BONANZA**						
0000	E	72" RCP	525					0.30
0010	E	60" RCP	1450					0.30
CACH		**CEDAR AVENUE CHANNEL**						
0000	E	Conc Chnl 10'W 8'D 1.5:1 SS	1681	1544	CCA10-C	SW3	1.81	0.20
0027	E	2: 15'X5' RCBC @ Marion	82	1544	CCA10-C	SW3	1.81	0.35
0029	E	Conc Chnl 10'W 8'D 1.5:1 SS	1284	1544	CCA10-C	SW3	1.81	0.37
0051	E	2: 15'X5' RCBC @ Page	64	1544	CCA10-C	SW3	1.81	0.38
0053	E	Conc Chnl 10'W 6'D 1.5:1 SS	1275	1544	CCA10-C	SW3	1.81	0.38
0079	E	2: 12' X 6' RCBC @ Lamb	100	1387	CCA08-C	SW3	1.61	0.38
0081	E	Conc Chnl 12'W 6'D 1.5:1 SS	2562	1387	CCA08-C	SW3	1.61	0.20
0127	E	3: 12'X4' RCBC @ Sandhill	80	1387	CCA08-C	SW3	1.61	0.20
0129	E	Conc Chnl 10'W 8'D 1.5:1 SS	971	1387	CCA08-C	SW3	1.61	0.26
0146	E	2: 12' X 5.5' RCBC @ Honolulu	62	1387	CCA08-C	SW3	1.61	0.53
0148	E	Conc Chnl 10'W 8'D 1.5:1 SS	959	1387	CCA08-C	SW3	1.61	0.53
CACN		**CEDAR AVENUE - CHARLESTON**						
0000	E	72" RCP (Replace w/ CACN0001)	1867	933	CCA05	SW3	0.96	0.41
0001	P1	10 'X 9' RCB (Replaces CACN0000)	1867	933	CCA05	SW3	0.96	0.41
0034	E	2: 48" RCP (Replace w/ CACN0035)	685	254	CA05	SW3	0.24	0.30
0035	P0	6' X 6' RCB (Replaces CACN0034)	685	254	CA05	SW3	0.24	0.30
0049	E	66" RCP (Replace w/ CACN0050)	2146	254	CA05	SW3	0.24	0.60
0050	P0	6' X 5' RCB (Replaces CACN0049)	2146	254	CA05	SW3	0.24	0.60
CNST		**CEDAR AVENUE CHANNEL - STEWART**						
0000	P1	8' X 7' RCB	2120	690	CCA04	SW3	0.72	0.90
COLM		**COLORADO / LAMB**						
0000	E	72" RCP	1500	470	CCH94	SW3	0.63	0.87
FLAG		**FLAMINGO WASH - ALGONQUIN**						
0000	E	72" RCP	1080	513	FW21	FLAM3A	0.47	0.50
0020	E	66" RCP	460	513	FW21	FLAM3A	0.47	1.00
FLBN		**FLAMINGO - BOULDER HIGHWAY NORTH**						
0001	E	5: 10' X 6' RCB	350	4784	CCFR03	BOULDER4	11.13	0.58
0008	E	3: 14' X 12' RCB	1055	4784	CCFR03	BOULDER4	11.13	0.20
0028	E	3: 14' X 12' RCB	275	4784	CCFR03	BOULDER4	11.13	0.20
0033	E	3: 14' X 12' RCB	500	4784	CCFR03	BOULDER4	11.13	0.20
0038	P1	15' X 10' RCB	6600	2448	CFR03	SW3	3.46	0.59
0167	P1	2: 10' X 6' RCB	700	2046	CCH68-C	SW3	2.86	1.14
0180	P1	2: 10' X 6' RCB	1300	1799	CCCH67-C	SW3	2.55	1.31
0205	P1	10' X 6' RCB	4000	1461	CCH63-C	SW3	1.88	2.30
0281	P1	10' X 7' RCB	3100	1259	CCH56	SW3	1.64	1.33
0312	P1	7' X 4' RCB	1800	555	CCH52	SW3	0.55	4.20
0342	P1	7' X 4'' RCB	2500	555	CCH52	SW3	0.55	4.20
FLBS		**FLAMINGO - BOULDER HIGHWAY SOUTH**						
0000	E	Unlined Median Chnl 0'W 6.5'D 4.5:1 SS	4060	945	CB4	FLAM3A	1.38	1.30
0167	E	Unlined Median Chnl 0'W 3.5'D 9:1 SS	8850	452	CB4N	FLAM3A	0.63	0.90
FLDN		**DESERT INN DRAIN EAST**						
0000	E	60" RCP (Replace w/ FLDN0001)	6160	1267	CFW30AW	FLAM3A	2.12	1.22
0001	P0	12' X 6' RCB (Replaces FLDN0000)	6160	1267	CFW30AW	FLAM3A	2.12	1.22
0116	E	54" RCP (Replace w/ FLDN0117)	2330	1178	CFW29	FLAM3A	1.82	1.77
0117	P0	10' X 6' RCB (Replaces FLDN0116)	2330	1178	CFW29	FLAM3A	1.82	1.77
0160	E	48" RCP (Replace w/ FLDN0160)	2950	906	CFW28	FLAM3A	1.51	1.28
0161	P0	10' X 6' RCB (Replaces FLDN0161)	2950	906	CFW28	FLAM3A	1.51	1.28

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
FLMP		**FLAMINGO WASH-MARYLAND PARKWAY SYSTEM**						
0000	P1	8' X 6' RCB	3800	492	CCH60A-C	SW3	0.75	0.49
FLSP		**FLAMINGO WASH - SPENCER**						
0000	E	48" RCP	420	513	FW21	FLAM3A	0.47	1.10
FLWA		**FLAMINGO WASH**						
0000	E	Grass Chnl 107'W 5'D 2:1 SS (Replace w/ FLWA0001)	4570	10952	CFW36*	FLAM5B	36.14	0.40
0001	P1	Conc Chnl 100'W 7.5'D 1:1 SS (Replaces FLWA0000)	4570	10952	CFW36*	FLAM5B	36.14	0.40
0078	E	3 Span Bridge 108.25'W 5.5'D @ Nellis	120	10952	CFW36	FLAM5B	36.14	0.70
0080	E	Conc Chnl 50'W 8.5'D 1:1 SS	5080	10952	CFW36	FLAM5B	36.14	1.20
0174	E	9: 10' X 6' RCBC @ Lamb	110	10822	CFW34	FLAM5B	35.66	1.40
0176	E	Conc Chnl 60'W 9'D 1:1 SS	1180	10822	CFW34	FLAM5B	35.66	0.70
0200	E	Conc Chnl 70'W 8'D to 12'D w/ Pier 0:1 SS	1245	10822	CFW34	FLAM5B	35.66	0.50
0226	E	Free Span Bridge 100'W 10'D @ I-515	170	10822	CFW34	FLAM5B	35.66	0.80
0228	E	Conc Chnl 70'W 8'D to 12'D 0:1 SS	1500	10788	CFW33	FLAM5B	35.36	0.80
0255	E	2 Span Bridge 150'W 9'D @ Boulder Hwy	65	10788	CFW33	FLAM5B	35.36	1.00
0256	E	Conc Chnl 60'W 7.5'D 0:1 SS	40	8146	CFW33W	FLAM5B	24.23	1.00
0257	E	2 Span Bridge 150'W 9'D @ Boulder Hwy	60	8146	CFW33W	FLAM5B	24.23	1.00
0258	E	Conc Chnl 60'W 7.5'D 0:1 SS	750	8146	CFW33W	FLAM5B	24.23	0.44
0273	E	Free Span Bridge 60'W 9'D @ MMMHP	20	8146	CFW33W	FLAM5B	24.23	0.40
0274	E	Conc Chnl 60'W 8.1'D 0:1 SS	1370	8146	CFW33W	FLAM5B	24.23	1.00
0295	E	Conc Chnl 60'W 8.1'D 0:1 SS	430	7669	CFW31	FLAM5B	22.62	0.80
0307	E	Conc Chnl 60'W 8.1'D 2:1 SS	410	7669	CFW31	FLAM5B	22.62	0.70
0314	E	Conc Chnl 60'W 8.1'D 2:1 SS	1500	7195	CFW30B	FLAM5B	21.25	0.90
0347	E	5: 10' X 8' RCBC @ Mojave	80	7195	CFW30B	FLAM5B	21.25	0.94
0348	E	Conc Chnl 30'W 12'D 1:1 SS	1150	7195	CFW30B	FLAM5B	21.25	0.70
0375	E	5: 10' X 8' RCBC @ Desert Inn	140	7102	CFW30A	FLAM5B	20.96	2.70
0377	E	Conc Chnl 50'W 9.5'D 0:1 SS	1372	6964	CFW23	FLAM5B	19.36	1.04
0399	E	Free Span Bridge 60'W 16'D @ McLeod	120	6964	CFW23	FLAM5B	19.36	0.50
0401	E	Conc Chnl 50'W 11.5'D 0:1 SS	123	6964	CFW23	FLAM5B	19.36	0.50
0406	E	Conc Chnl 33'W 11.5'D 0:1 SS	690	6964	CFW23	FLAM5B	19.36	1.01
0419	E	Conc Chnl 33'-50'W 9.8'D 0:1 SS	200	6964	CFW23	FLAM5B	19.36	2.00
0423	E	Conc Chnl 50'W 9.8'D 0:1 SS	1686	6964	CFW23	FLAM5B	19.36	0.76
0455	E	Conc Chnl 50'-75'W 9.8'D 0:1 SS	169	6964	CFW23	FLAM5B	19.36	1.83
0458	E	Conc Chnl 75'-80'W 9.8'D 0:1 SS	347	6964	CFW23	FLAM5B	19.36	1.50
0471	E	5: 10' X 8' RCBC @ Eastern	110	5781	CFW22W	FLAM5B	14.95	1.30
0472	P1	Add 1: 22' X 8' RCBC @ Eastern	110	5781	CFW22W	FLAM5B	14.95	0.50
0473	E	Grass Chnl 60'W 15'D 2:1 SS	100	5781	CFW22W	FLAM5B	14.95	0.47
0477	E	3 Span Bridge 47'W 15'D	10	5781	CFW22W	FLAM5B	14.95	0.80
0478	E	Grass Chnl 60'W 15'D 2:1 SS	520	5781	CFW22W	FLAM5B	14.95	0.47
0481	E	3: 90° CMAP @ Tioga (Replace w/ FLWA0482)	60	5781	CFW22W	FLAM5B	14.95	0.87
0482	P1	4: 20' X 8' RCBC @ Tioga (Replaces FLWA0481)	60	5781	CFW22W	FLAM5B	14.95	0.87
0483	E	Grass Chnl 60'W 15'D 2:1 SS	300	5781	CFW22W	FLAM5B	14.95	0.63
0492	E	3 Span Bridge 47'W 15'D	10	5781	CFW22W	FLAM5B	14.95	0.50
0493	E	Grass Chnl 60'W 15'D 2:1 SS	1520	5781	CFW22W	FLAM5B	14.95	0.46
0555	E	3 Span Bridge 47'W 15'D	10	5701	CFW21	FLAM5B	14.55	0.50
0556	E	Earth Chnl 60'W 15'D 2:1 SS (Replace w/ FLWA0557)	520	5701	CFW21	FLAM5B	14.55	0.54
0557	P1	Gabion Chnl 30'W 10.5'D 2:1 SS (Replaces FLWA0556)	520	5701	CFW21	FLAM5B	14.55	0.54
LVBZ		**LAS VEGAS WASH - BONANZA**						
0000	P1	2: 12' X 7' RCB	3400	1636	CBN15-C	SW3	2.40	0.40
0064	P1	2: 12' X 6' RCB	2630	1449	CBN12-C	SW3	2.12	0.40
0114	P1	2: 12' X 6' RCB	2740	1256	CBN10-C	SW3	1.79	0.40
0166	E	54" RCP (Replace w/ LVBZ0167)	1095	1051	CBN09	SW3	1.54	0.45
0167	P0	10' X 9' RCB (Replaces LVBZ0166)	1095	1051	CBN09	SW3	1.54	0.45
0187	E	48" RCP (Replace w/ LVBZ0188)	1235	1051	CBN09	SW3	1.54	0.71
0188	P0	9' X 9' RCB (Replaces LVBZ0187)	1235	1051	CBN09	SW3	1.54	0.71
0210	E	42" RCP (Replace w/ LVBZ0211)	704	911	CBN08	SW3	1.30	1.37
0211	P0	8' X 7' RCB (Replaces LVBZ0210)	704	911	CBN08	SW3	1.30	1.37
0223	E	36" RCP (Replace w/ LVBZ0224)	2275	722	CBN03	SW3	1.09	0.72
0224	P0	8' X 7' RCB (Replaces LVBZ0223)	2275	722	CBN03	SW3	1.09	0.72

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVCA		**LAS VEGAS WASH - CHARLESTON**						
0000	P1	12' X 9' RCB	4600	1104	CCH77-C	SW3	1.34	0.30
LVCO		**COLORADO AVENUE SYSTEM**						
0000	E	18' X 8' RCB	610	1015	CNEL06	SW3	1.30	0.24
0012	E	14' X 8' RCB	2560	1015	CNEL06	SW3	1.30	0.24
0064	E	10' X 8' RCB	2165	827	CCCH94	SW3	0.98	0.24
0106	E	10' X 8' RCB	590	394	CCH92-C	SW3	0.35	0.24
0109	E	10' X 5' RCB	2350	394	CCH92-C	SW3	0.35	0.67
LVMD		**LAS VEGAS WASH - MIDDLE**						
1032	E	Earth Chnl 75'W 10'-12'D 1:1 SS (Replace w/ LVMD1033)	715	15156	CNLWY	CLVWASH5	118.28	0.30
1033	P1	Conc Chnl 75'W 11'D 1:1 SS (Replaces LVMD1032)	739	15156	CNLWY	CLVWASH5	118.28	0.30
1045	E	5 Span Bridge 75'W 10'D 1:1 SS (Replace w/ LVMD1046)	120	15156	CNLWY	CLVWASH5	118.28	0.52
1046	P1	Bridge 75'W 9.5'D 1:1 SS @ Nellis (Replaces LVMD1045)	120	15156	CNLWY	CLVWASH5	118.28	0.52
1047	E	Earth Chnl 80'W 8'D 2:1 SS (Replace w/ LVMD1048)	340	15083	CCNEL06	CLVWASH5	117.81	0.50
1048	P1	Conc Chnl 120'W 8'D 0:1 SS (Replaces LVMD1047)	340	15083	CCNEL06	CLVWASH5	117.81	0.50
1053	E	Earth Chnl 80'W 8'D 2:1 SS (Replace w/ LVMD1054)	860	14811	CNEL04-2	CLVWASH5	116.51	0.50
1054	P1	Conc Chnl 120'W 8'D 0:1 SS (Replaces LVMD1053)	860	14811	CNEL04-2	CLVWASH5	116.51	0.50
1068	E	5 Span Bridge 90'W 6'D 2:1 SS (Replace w/ LVMD1069)	120	14438	CCST03-C	CLVWASH5	114.87	0.50
1069	P1	5 Span Bridge 110'W 8'D 2:1 SS (Replaces LVMD1068)	120	14438	CCST03-C	CLVWASH5	114.87	0.50
1070	E	Earth Chnl 90'W 10'-12'D 1.5:1 SS (Replace w/ LVMD1071)	2587	14438	CCST03-C	CLVWASH5	114.87	0.43
1071	P1	Conc Chnl 90'W 9'D 1.5:1 SS (Replaces LVMD1070)	2587	14438	CCST03-C	CLVWASH5	114.87	0.43
1119	E	5 Span Bridge 90'W 12'D 2:1 SS @ Stewart	120	14354	CCCA10-C	CLVWASH5	114.40	0.20
1120	E	Earth Chnl 90'W 12'D 1:1 SS (Replace w/ LVMD1121)	1400	14354	CCCA10-C	CLVWASH5	114.40	0.20
1121	P1	Conc Chnl 90'W 10.5'D 1:1 SS (Replaces LVMD1120)	1400	14354	CCCA10-C	CLVWASH5	114.40	0.20
1148	E	Earth Chnl 70'W 18'-20'D 1.5:1 SS (Replace w/ LVMD1149)	1675	13944	CCBN15-C	CLVWASH5	112.59	0.41
1149	P1	Conc Chnl 70'W 10'D 1.5:1 SS (Replaces LVMD1148)	1675	13944	CCBN15-C	CLVWASH5	112.59	0.41
1176	E	5 Span Bridge 110'W 20'D 2:1 SS @ Bonanza	120	12690	CLVW04-C	CLVWASH5	106.80	0.57
1178	E	Earth Chnl 30'W 18'-20'D 2:1 SS (Replace w/ LVMD1179)	1500	12690	CLVW04-C	CLVWASH5	106.80	0.57
1179	P1	Conc Chnl 60'W 9.5'D 2:1 SS (Replaces LVMD1178)	1500	12690	CLVW04-C	CLVWASH5	106.80	0.57
LVNE		**LAS VEGAS WASH - NELLIS**						
0000	P1	2: 13' X 10' RCB	4675	2303	CNEL02-C	WEST3	3.39	0.20
LVOE		**OWENS AVENUE - EAST**						
0345	P1	13' X 11' RCB	1685	2369	DLVOE	SW5	22.79	0.60
LVWH		**WASHINGTON AVENUE CHANNEL**						
0389	E	12' X 8' RCB	2110	1607	(1/2) CV1-C	SW5SC	15.16	0.90
0426	E	16' X 8' RCB	150	1607	(1/2) CV1-C	SW5SC	15.16	1.08
0429	E	Splitter Structure (2: 12' X 8' RCB)	190	2870	DCLC21	SW5	22.79	1.90
0431	E	3: 14.33' X 10' RCB	665	2870	DCLC21	SW5	22.79	0.15
0446	E	Junction Structure	69	2870	DCLC21	SW5	22.79	0.15
0447	E	3: 14.33' X 10' RCB	1955	4978	CCAL93	SW5	22.19	0.15
NLFL		**NELLIS FLAMINGO STORM DRAIN**						
0028	P0	Add 1: 7' X 6' RCB	1530	338^	CM3^	FLAM3A	1.27	0.39
0029	E	76" & 48" RCP	1530	391^	CM3^	FLAM3A	1.27	0.39
0059	E	60" RCP	1370	143^	CM3^	FLAM3A	1.27	0.30
0060	P0	Add 1: 12' X 6' RCB	1370	586^	CM3^	FLAM3A	1.27	0.34
0084	E	48" RCP	2490	79^	CM2^	FLAM3A	0.98	0.30
0085	P0	Add 1: 11' X 6' RCB	2490	505^	CM2^	FLAM3A	0.98	0.30
0131	E	42" RCP	650	350	M1	FLAM3A	0.51	0.23
0144	E	36" RCP	620	350	M1	FLAM3A	0.51	0.20
NLWY		**NELLIS - WYOMING CHANNEL**						
0000	E	Conc Chnl 8'W 4'D 1.3:1 SS	260	338	FW35	FLAM3A	0.47	1.71
0004	E	15' X 6' RCAC	80	338	FW35	FLAM3A	0.47	1.30
0006	E	Conc Chnl 8'W 4'D 1.3:1 SS	400	338	FW35	FLAM3A	0.47	0.38
0014	E	12' X 4' RCBC @ Winterwood	70	338	FW35	FLAM3A	0.47	0.40
0015	E	Conc Chnl 8'W 4'D 1.3:1 SS	720	338	FW35	FLAM3A	0.47	0.38
0028	E	12' X 4' RCBC @ Wyoming	90	338	FW35	FLAM3A	0.47	0.80
0030	E	Conc Chnl 8'W 4'D 1.3:1 SS	250	338	FW35	FLAM3A	0.47	0.38
SAEA		**SAHARA AVENUE - EASTERN LATERAL**						
0000	P1	10' X 8' RCB	1440	564	CFR02	SW3	0.66	0.20

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
VAVD		**VEGAS VALLEY DRIVE**						
0000	P1	8' X 6' RCB	1300	606	CFW32WW	FLAM3A	0.84	2.10
0025	P1	84" RCP	5300	606	CFW32WW	FLAM3A	0.84	1.60
VBCH		**VAN BUSKIRK CHANNEL**						
0000	E	12' X 3' RCB	500	888	CVB16	FLAM3A	1.16	1.00
0008	E	8' X 5' RCB	5490	888	CVB16	FLAM3A	1.16	1.00
VBEA		**VAN BUSKIRK - EASTERN AVE**						
0000	P1	14' X 6' RCB	3020	1561	CVB11	FLAM3A	3.35	1.30
VBMC		**VAN BUSKIRK - McLEOD DRIVE**						
0000	E	2: 8' X 8' RCB	3850	997	CVB13	FLAM3A	3.43	0.50
VBTW		**VAN BUSKIRK - TWAIN**						
0000	E	18" RCP	6640	541	CB2	FLAM3A	0.74	0.70
WAGC		**WASHINGTON AVENUE CHANNEL - GRAND CENTRAL**						
0000	E	2: 12' X 4' RCB	700	557	LC21	SW3	0.60	0.20
0014	E	1: 12' X 4' RCB and 1: 11' X 4' RCB	2440	557	LC21	SW3	0.60	0.20
WAPR		**WASHINGTON AVENUE CHANNEL PARALLEL**						
0132	E	2: 9' X 8' RCB	387	1607	(1/2) CV1-C	SW5SC	15.16	1.67

** 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.*

^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).

REGIONAL FLOOD CONTROL DISTRICT

2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F - 32

LEGEND

ID (Facility Identifier) AABB
- Parent Stream Name
- Stream Name

River Mile 0000
- Distance Above Confluence with Parent Stream (Miles)
- Miles in Hundredths

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	Reinforced Concrete Arch Culvert	RCAC
Corrugated Metal Arch Pipe Culvert	CMAP	Reinforced Concrete Box	RCB
Corrugated Metal Pipe Culvert	CMPC	Reinforced Concrete Box Culvert	RCBC
High Density Polyethylene	HDPE	Reinforced Concrete Pipe	RCP
Horizontal Elliptical Reinforced Concrete Pipe	HERCP	Reinforced Concrete Pipe Culvert	RCPC
Reinforced Concrete Arch Pipe	RCAP	Storm Sewer Pipe	SSP

FIGURE 4B

REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H- 32
HYDROLOGIC SUMMARY

PROJECT SITE

LEGEND

- Ultimate Development Boundary
- Watershed Boundary
- Subbasin Boundary
- Drought Ordinance Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Category A Remove & Replace/ Parallel Facilities
- Category B Remove & Replace/ Parallel Facilities
- Type Hydrologic Soil Groups
  - A Low Runoff Potential
  - B Moderately Low Runoff Potential
  - C Moderately High Runoff Potential
  - D High Runoff Potential/Rock Outcrops

Typical Land Use

1		Undeveloped Land, Open Desert
2		Parks, Golf Courses
3		Rural
4 / 14*		Low Density Residential
5 / 15*		Medium Density Residential
6 / 16*		High Density Residential
7 / 17*		Public Facility, Residential
8 / 18*		Very High Density Residential
9 / 19*		Commerical, Retail, Casino, High Rise Condominiums
10 / 20*		Light Industrial
11 / 21*		Heavy Industrial
12 / 22*		Schools
13		Lakes

* Drought Ordinance Applied

N

0 500 1,000 2,000 3,000
Feet

Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)

US95 I-15 I-215

1	2	3														
4	5	6														
		7	8	9	10											
11	12	13	14	15	16	17										
		18	19	20	21	22	23									
		24	25	26	27	28										
		29	30	31	32	33	34									
		35	36	37	38	39	40									
		41	42	43	44	45	46									
		47	48	49	50	51	52									
		53	54	55	56											
		57	58	59												

PBS&J PB

FIGURE 5

City of Las Vegas

CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

LEGEND

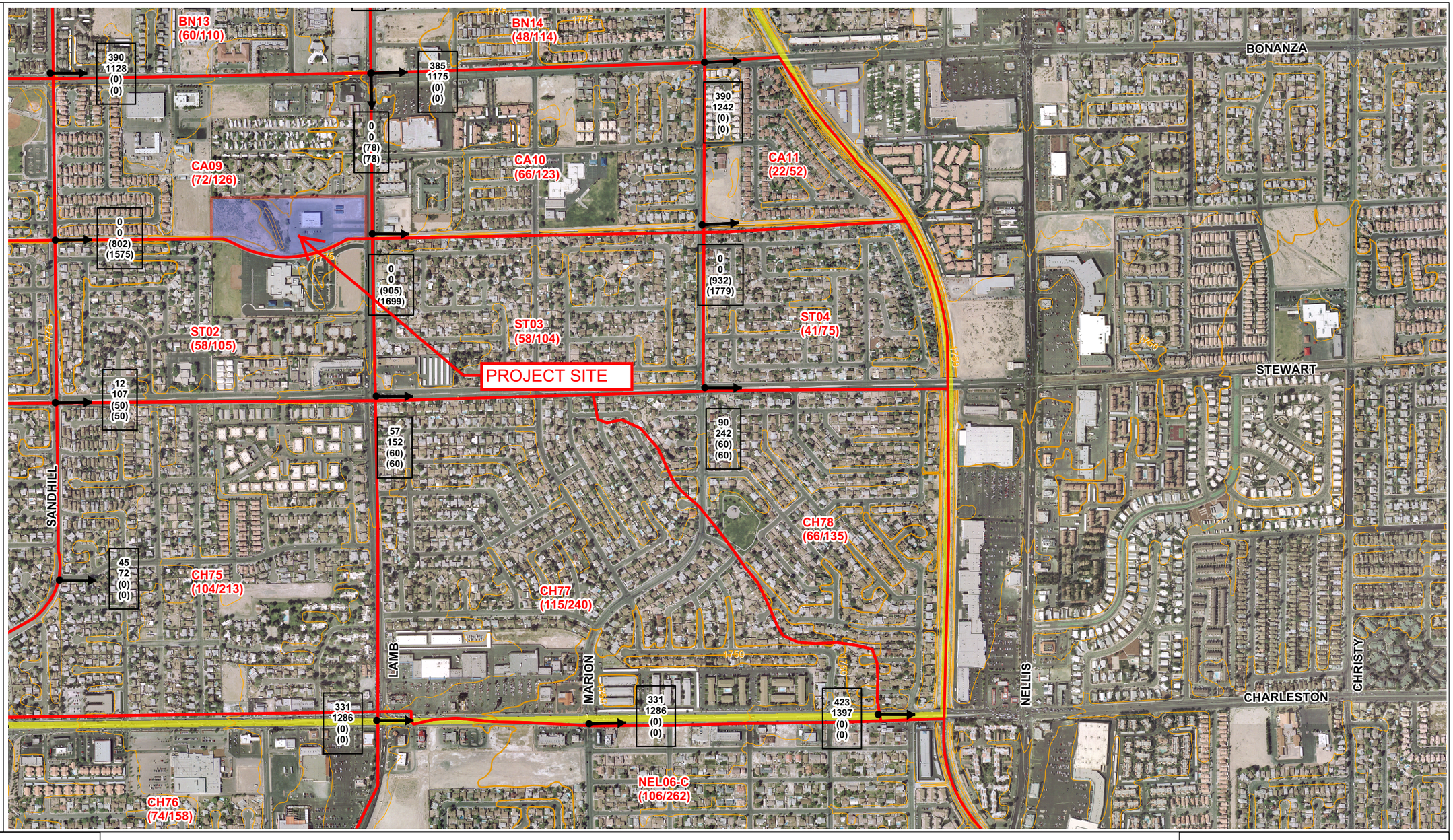
- Sub-basin Boundary
- LV12 — Basin ID
- (10yr./100yr.) — Contributing flow from the basin (cfs)
- Flow Arrow
- 250 / 500 / (300) / (800) — 10-Year Street Flow / 100-Year Street Flow / 10-Year Facility Flow / 100-Year Facility Flow

(Flows in CFS)

- Study Area Limit

PHOTO DATE: SPRING 2004

FIGURE E-12



EXISTING DRAINAGE CONDITIONS

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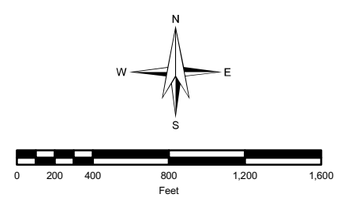
NOTE:
Existing conditions are based on future Curve Number values with only existing local and CCRFCD facilities in place.

100-Year flows at locations where a 100-Year subbasin concentration point does not exist in the hydrology model were based on an area-weighted ratio of the 100-Year flows from concentration points upstream and downstream of the location. See Volume I for a more detailed explaination.



SCALE: 1 inch = 800 feet

FIGURE 6A

City of Las Vegas

2004 CITY OF LAS VEGAS
CENTRAL NEIGHBORHOOD
FLOOD CONTROL MASTER PLAN

LEGEND

REGIONAL STREAM NAME DESIGNATOR	AABB
REGIONAL MILE	0000
LOCAL STREAM NAME DESIGNATOR	AAB
LOCAL ID NUMBER	000
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
LEFT SIDE SLOPE H:V	LSS
RIGHT SIDE SLOPE H:V	RSS
CORRUGATED METAL ARCH PIPE CULVERT	CMAP
CORRUGATED METAL PIPE CULVERT	CMP
DUCTILE IRON PIPE	DIP
HIGH DENSITY POLYETHYLENE PIPE	HDPE
HELICAL ELLIPTICAL REINFORCED CONCRETE PIPE	HERCP
PUBLIC DRAINAGE EASEMENT	PDE
POLYVINYL CHLORIDE PIPE	PVC
REINFORCED CONCRETE BOX	RCB
REINFORCED CONCRETE BOX CULVERT	RCBC
REINFORCED CONCRETE ELLIPTICAL PIPE	RCEP
REINFORCED CONCRETE PIPE	RCP
REINFORCED CONCRETE PIPE ARCH	RCPA
REINFORCED CONCRETE PIPE CULVERT	RCPC
STORM SEWER PIPE	SSP
VITRIFIED CLAY PIPE	VCP

NOTES:
FLOW = 100 YEAR HEC-1 FLOW (REGIONAL
FLOW = FACILITY CAPACITY (LOCAL FACILITIES)

FLOOD CONTROL FACILITIES INVENTORY

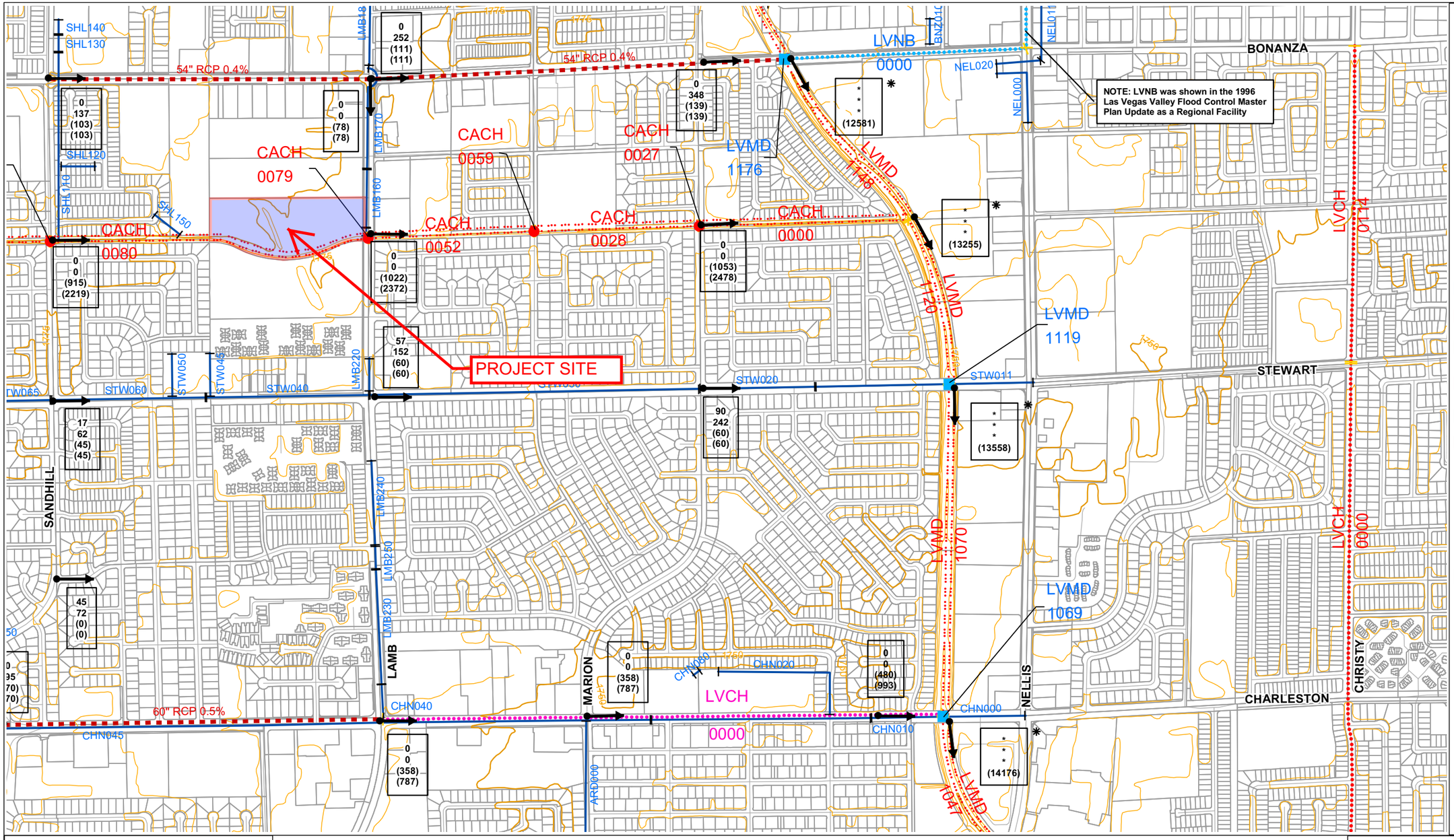
SHEET I - 8

PBS&J

ID	MILE	Status	Plan No.	Facility Description	Facility Length L (ft)	Channel Slope S (%)	Flow (cfs)
F-11							
LOCAL FACILITIES (continued)							
BNZ	084	E	107-V2325	15" RCP	130	0.30	3
BNZ	085	E	107-V2325	15" RCP	140	0.30	3
BNZ	086	E	107-V2325	12" RCP	240	0.30	2
BNZ	087	E	107-V2325	12" RCP	570	0.22	1
BNZ	088	E	107-V2325	15" RCP	175	0.80	6
BNZ	089	E	107-V2325	15" RCP	134	0.80	6
BNZ	090	E	107-V2325	12" RCP	105	0.80	6
BNZ	110	E	107-V849A	36" RCP	100		37
BNZ	113	E	107-V1515	12" PVC	2490		5
CDA	010	E	307-V640	60" RCP	2025		239
CDA	020	E	307-V640	48" RCP	1725		124
CDA	021	E	107-V2209	18" RCP	675	0.01	1
CDA	030	E	307-V640	36" RCP	1275		105
CHN	045	E	107-V943	18" RCP	10482		15
CHN	050	E	107-V943	54" RCP	1299		160
CHN	060	E	107-V943	48" RCP	705		128
CHN	065	E	107-V943	42" RCP	740		121
CHN	066	E	HWY BK # C-1	39" RCP	1500		83
CHN	067	E	107-V594	36" RCP	750		82
CHN	068	E	107-V829B	36" RCP	675		94
CHN	069	E	107-V829B	33" RCP	5560		75
CHN	070	E	107-V1632	12" PVC	678		2
CHN	071	E	327-V192/W11, 107V-1901	24" VCP	471		30
CHN	080	E	327-V12/V17/V21	12" VCP	1837		4
ETN	090	E	107-V835A	24" RCP	628		16
ETN	100	E	107-V594	27" RCP	790		22
ETN	110	E	HWY BK # F-1	18" RCP	94		7
MHV	030	E	327-100	48" RCP	1195		72
OKG	010	E		Basin - Size Unknown			
OKG	020	E	Bk 6, Sht 4	Basin - Size Unknown			
OKG	025	E	Bk 6, Sht 4	12" RCP	150		3
OKG	030	E	Bk 6, Sht 4	15" RCP	675		5
OKG	040	E	Bk 6, Sht 4	15" RCP	40		5
OKG	050	E	Bk 6, Sht 4	15" RCP	58		5
OKG	060	E	Bk 6, Sht 4	15" RCP	300		5
OKG	070	E	Bk 6, Sht 4	15" RCP	150		5
OKG	090	E	Bk 6, Sht 4	15" RCP	56		5
OKG	100	E	Bk 6, Sht 4	24" RCP	500		16
OKG	110	E	Bk 6, Sht 4	15" RCP	625		5
OKG	120	E	Bk 6, Sht 4	18" RCP	675		7
OKG	121	E	Bk 6, Sht 4	15" RCP	58		5
OKG	122	E	Bk 6, Sht 4	15" RCP	300		5
OKG	123	E	Bk 6, Sht 4	15" RCP	58		5
OKG	124	E	Bk 6, Sht 4	15" RCP	118		5
OKG	125	E	Bk 6, Sht 6	15" RCP	118		5
OKG	126	E	Bk 6, Sht 6	36" CMP	1958		29
OKG	127	E	Bk 6, Sht 6	15" RCP	118		5
OKG	128	E	Bk 6, Sht 6	15" RCP	118		5
OKG	129	E	Bk 6, Sht 6	15" RCP	118		5
OKG	130	E	Bk 6, Sht 6	15" RCP	118		5
OKG	131	E	Bk 6, Sht 6	15" RCP	118		5
OKG	132	E	Bk 6, Sht 6	15" RCP	118		5
OKG	133	E	Bk 6, Sht 6	15" RCP	118		5
OKG	140	E	Bk 1, Sht 25-26	Detention Basin - Size Unknown			
OKG	141	E	Bk 1, Sht 15-17	42" RCP	190		84
OKG	142	E	Bk 6, Sht 8	15" RCP	220		5
OKG	143	E	Bk 1, Sht 15-17	42" RCP	2400		82
OKG	144	E	Bk 1, Sht 17	15" RCP	240		5
OKG	145	E	Bk 1, Sht 17-18	36" RCP	1600		82
OKG	146	E	Bk 1 Sht 18-23	30" RCP	1200		16
OKG	150	E	HWY BK # 1	30" RCP	4725		18
PEC	000	E	107-V1890	18" RCP	60		7
PEC	020	E	107-V1890	29" x 45" RCPA	525		44
PEC	021	E	107-V1245	18" RCP	750		6
PEC	022	E	107-V1245	39" RCP	90		45
PEC	023	E	107-V1245	38" X 60" RCPA	120		79
PEC	024	E	107-V1245	66" RCP	120		184
PEC	030	E	107-V1890	2: 30" X 19" RCP	225		15
PEC	031	E	107-V1245	24" RCP	1197		10

ID	MILE	Status	Plan No.	Facility Description	Facility Length L (ft)	Channel Slope S (%)	Flow (cfs)
F-11							
LOCAL FACILITIES (continued)							
SHL	110	E	107-V849B	42" SSP	1075	0.30	
SHL	120	E	107Y-4296-3	18" RCP	34	2.00	13
SHL	130	E	107-V849B	53" X 34" SSP	52	0.30	
SHL	140	E	107-V849B	36" SSP	85	0.35	
STW	060	E	107-V819A	24" RCP	1800		45
STW	065	E	107-V819A	18" RCP	555		11
STW	070	E	107-V819A	24" RCP	2175		40
STW	080	E	107-V819C	18" RCP	375		9
STW	090	E	Hwy Bk I-515 #4	36" RCP	1275		56
STW	100	E	Hwy Bk I-515	36" RCP	3300		67
F-12							
REGIONAL FACILITIES							
CEDAR AVENUE CHANNEL							
CACH	0000	E	327-V179	Conc Chnl 14'W 8'D 1.5:1SS	1578	0.35	2518
CACH	0000	P1	2002 Master Plan Update	Conc Chnl 27'W 8'D 0:1SS	1524	0.35	2518
CACH	0027	E	327-V179	2: 5' X 15' RCBC @ Marion	100	0.35	2518
CACH	0027	P1	2002 Master Plan Update	3: 12' X 8' RCBC @ Marion	100	0.35	2518
CACH	0028	E	327-V179	Conc Chnl 10'W 8'D 1.5:1SS	1224	0.34	2518
CACH	0028	P1	2002 Master Plan Update	Conc Chnl 27'W 8'D 0:1SS	1224	0.34	2518
CACH	0051	E	327-V171	2: 5' X 15' RCBC @ Page	65	0.34	2518
CACH	0051	P1	2002 Master Plan Update	4: 11' X 8' RCBC @ Page	100	0.34	2518
CACH	0052	E	327-V179	Conc Chnl 10'W 6'D 1.5:1SS	1214	0.34	2518
CACH	0052	P1	2002 Master Plan Update	Conc Chnl 45'W 6'D 0:1SS	1198	0.34	2518
CACH	0079	E	327-V179	2: 6' X 12' RCBC @ Lamb	102	0.30	2372
CACH	0079	P1	2002 Master Plan Update	4: 12' X 7' RCBC @ Lamb	100	0.30	2372
CACH	0080	E	327-V179	Conc Chnl 12'W 6'D 1.5:1SS	2776	0.30	2372
CACH	0080	P1	2002 Master Plan Update	Conc Chnl 45'W 6'D 0:1SS	2640	0.30	2372
CACH	0127	E	327-V179	3: 4' X 12' RCBC @ Sandhill	130	0.30	2372
CACH	0127	P1	2002 Master Plan Update	3: 12' X 8' RCBC @ Sandhill	100	0.30	2372
CACH	0128	E	327-V179	Conc Chnl 10'W 8'D 1.5:1SS	900	0.30	2372
CACH	0128	P1	2002 Master Plan Update	Conc Chnl 28'W 8'D 0:1SS	900	0.30	2372
RANGE WASH - CHRISTY LATERAL							
LVCH	0000	P1	2002 Master Plan Update	12' X 9' RCB	6100	0.33	1072
LVCH	0114	P1	2002 Master Plan Update	10' X 7' RCB	2600	0.58	844
CHARLESTON DRAIN							
LVCR	0000	P1	2004 CNFCMP	12' X 9' RCB	4600	0.28	1104
LAS VEGAS WASH - MIDDLE							
LVMD	1047	E	2002 Master Plan Update	Earth Chnl 80'W 8'D 2:1 SS	1162	0.50	14176
LVMD	1047	P1	2002 Master Plan Update	Conc Chnl 120'W 8'D	1162	0.50	14176
LVMD	1069	E	2002 Master Plan Update	5 Span Bridge 90'W 8'D 2:1 SS @ Charleston	120	0.50	14176
LVMD	1070	E	2002 Master Plan Update	Earth Chnl 90'W 10'-12'D 1.5:1 SS	2587	0.43	13358
LVMD	1070	P1	2002 Master Plan Update	Conc Chnl 90'W 8.5'D 1.5:1 SS	2587	0.43	13358
LVMD	1119	E	2002 Master Plan Update	5 Span Bridge 90'W 12'D 2:1 SS @ Stewart	120	0.20	13358
LVMD	1120	E	2002 Master Plan Update	Earth Chnl 90'W 12'D 1:1 SS	1400	0.20	13255
LVMD	1120	P1	2002 Master Plan Update	Conc Chnl 90'W 10.5'D 1:1 SS	1400	0.20	13255
LVMD	1148	E	2002 Master Plan Update	Earth Chnl 70'W 18'-20'D 1.5:1 SS	1675	0.41	12581
LVMD	1148	P1	2002 Master Plan Update	Conc Chnl 70'W 9.5'D 1.5:1 SS	1675	0.41	12581
LVMD	1176	E	2002 Master Plan Update	5 Span Bridge 110'W 20'D 2:1 SS @ Bonanza	80	0.57	12581
LVMD	1178	E	2002 Master Plan Update	Earth Chnl 30'W 18'-20'D 2:1 SS	2900	0.57	12415
LVMD	1178	P1	2002 Master Plan Update	Conc Chnl 60'W 9.5'D 2:1 SS	2900	0.57	12415
LVNB	0000	E	107-V1789	96" RCP	1871		465
LVNB	0035	E	107-V1789	10' X 5' RCB	75		465
LOCAL FACILITIES							
BNZ	010	E	107-V349	Conc Chnl 7'W 3'D 1.5:1 SS	225		533
CHN	000	E	107-V943	18" RCP	525		47
CHN	010	E	107-V943	18" RCP	9957		5
CHN	020	E	107-V1129-11	Conc Chnl 3'W 3'D 0:1 SS	1158		109
CHN	040	E	107-V510	18" RCP	300		15
CHN	045	E	107-V943	18" RCP	10482		15
CHN	080	E	327-V12/V17/V21	12" VCP	1837		4
LMB	150	E	107-V849B	42" RCP	72	0.40	55
LMB	160	E	107-V849B	53" X 34" RCP	397	0.35	57
LMB	170	E	107-V849B	45" X 29" RCP	752	0.43	41
LMB	180	E	HWY-BK L7	38"X 24" HERCP	1465		
LMB	220	E	HWY-BK L7	18" RCP	625	0.90	10
LMB	230	E	HWY-BK L7	36" RCP	1210		
LMB	240	E	HWY-BK L7	18" RCP	600		
LMB	250	E	HWY-BK L7	30"X 19" HERCP	180	0.19	10

FIGURE 6B



CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

City of Las Vegas

LEGEND

- Existing Regional Facility
- Category A Proposed Regional Facility (2002 MPU)
- Category B Proposed Regional Facility (2002 MPU)
- Category A Proposed Regional Facility (2004 CNFCMP)
- Existing Local Facility
- Proposed Local Facility
- Regional Culvert
- Regional Bridge
- Regional Pipeline
- Regional Channel
- Regional Levee
- Regional Detention Basin
- Local Storm Drain
- Local Culvert
- Proposed Local Storm Drain
- Regional ID-Mile Separator
- Local Facility Separator

FIGURE F-12

N
W E
S

0 200 400 800 1,200 1,600
Feet

SCALE: 1 inch = 800 feet

Flow Arrow

250	10-Year Street Flow
500	100-Year Street Flow
(300)	10-Year Facility Flow
(800)	100-Year Facility Flow

(Flows in CFS)

NOTE:
Ultimate drainage conditions are based on future Curve Number values with all flood control facilities in place.

100-Year flows at locations where a 100-Year subbasin concentration point does not exist in the hydrology model were based on an area-weighted ratio of the 100-Year flows from concentration points upstream and downstream of the location. See Volume I for a more detailed explaination.

*** Flow rate taken from 2002 Las Vegas Valley Flood Control Master Plan Update.**

FUTURE DRAINAGE CONDITIONS

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FIGURE 6C

NOTES LEGEND

- TOTAL ONLY INCLUDES FLOWS FOR PROJECT SITE. CEDAR AVENUE STUDIES INCLUDE OUR FLOWS THEREFORE THEY ARE NOT RELEVENT TO OUR STUDY. ONLY THE FLOOD LEVELS ARE RELEVENT.
- ** FLOWS ARE ONLY FOR IMMEDIATE AREA OF LAMB BOULEVARD. FLOOD DEPTHS FOR LAMB REFENCED FROM SARATOGA PALMS TDS DS3947.

Existing Condition				
Basin/Node	Area (acres)	Q_{10} (cfs)	Q_{100} (cfs)	Remarks
XON4	1.92	3	5	Onsite Basin to Lamb Blvd
DST1	0.81	2	3	Lamb Boulevard
XCP1		**4**	**8**	**Lamb Boulevard**
XON1	2.78	2	5	Onsite Basin
XON2	2.86	2	6	Onsite Basin
XON3	3.31	4	9	Onsite Basin
XCP2		**8**	**20**	**Runoff into Cedar Ave Channel**
XOF1	0.36	<1	1	Offsite Basin
XON5	0.23	<1	<1	Oniste Basin
XCP3		**<1**	**1**	**Runoff to Landlocked Depression**

LAMB BOULEVARD

**XCP1
4/8

XOF1
0.36

XON5
0.23

XON1
2.78

XON2
2.86

XON2
2/6

XON3
3.31

XON4
1.92

XST1
0.81

XCP3
0/1

CEDAR AVE CHANNEL

*XCP2
8/20

DRAINAGE LEGEND

HS7 0.00	BASIN IDENTIFICATION
● C1	CONCENTRATION POINT ID
#12 ———	INLET ID / STORM DRAIN
→	FLOW PATH
XX/XXX	10-YR/100-YR FLOW (CFS)
HS7 E	HYDRAULIC SECTION CONDITION
XX	SWALE / CURB OPENING
———	BASIN BOUNDARY

FIGURE 7
EXISTING CONDITIONS
LAMB PINES

L. R. NELSON CONSULTING ENGINEERS, INC.

- STRUCTURAL
- CIVIL
- PLANNING
- SURVEY

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NOTES LEGEND

- • TOTAL ONLY INCLUDES FLOWS FOR PROJECT SITE. CEDAR AVENUE STUDIES INCLUDE OUR FLOWS THEREFORE THEY ARE NOT RELEVENT TO OUR STUDY. ONLY THE FLOOD LEVELS ARE RELEVENT.
- •• FLOWS ARE ONLY FOR IMMEDIATE AREA OF LAMB BOULEVARD. FLOOD DEPTHS FOR LAMB REFENCED FROM SARATOGA PALMS TDS DS3947.
- ••• APPROXIMATE WORST CASE FLOOD LEVELS FROM ATKINS HEC-RAS INLCUDING BONANZA FLOWS.

Street Sections						
Section	Slopes (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (fps)	DV	Remarks
S1/TYP	0.40	16.00	0.36	1.99	0.72	Basin DON1
S2/D	0.50	16.00	0.34	2.15	0.73	Basin DON1
S3/D	0.50	4.00	0.21	1.46	0.31	Basin DON2
S4/D	0.40	7.00	0.34	1.81	0.62	Basin DON3
S5/D	0.50	7.00	0.26	1.67	0.43	Basin DON3

Swale Sections						
Section	Slopes	Q_{100}	D_{100}	V_{100}	DV	Remarks
SW1	1.00	16.00	1.31	3.09	4.05	Basin DON1
SW2	0.50	4.00	0.89	1.69	1.50	Basin DON2
SW3	1.00	7.00	0.96	2.52	2.42	Basin DON3
OF1	0.66	1.00	0.38	1.13	0.43	Basin DOF1

Ultimate Condition				
Basin	**Area (acres)**	**Q_{10} (cfs)**	**Q_{100} (cfs)**	**Remarks**
DON4	1.31	2	4	Onsite Basin to Lamb Blvd
DST1	0.81	2	3	Lamb Boulevard
DCP1		**3**	**7**	**Lamb Boulevard**
DON1	5.91	8	16	
DON2	1.06	2	4	
DON3	2.81	3	7	
DCP2		**12**	**25**	**Runoff into Cedar Ave Channel**
DOF1	0.36	1	1	Offsite Basin
DCP3		**1**	**1**	**Offsite Basin Runoff to Swale**

LAMB BOULEVARD

**DCP1
3/7

DOF1
0.36

OFF

DON1
5.91

S1
TYP

DON3
2.81

S4
D

DON2
1.06

DON4
1.31

DST1
0.81

DCP3
1/1

S2
D

S3
D

S5
D

C1

C2

C3

SW1

SW2

SW3

***DESIGN FLOOD
ELEV. 73.40

***DESIGN FLOOD
ELEV. 73.00

CEDAR AVE CHANNEL

***DESIGN FLOOD
ELEV. 72.90

*DCP2
12/25

DRAINAGE LEGEND	
HS7 0.00	BASIN IDENTIFICATION
● C1	CONCENTRATION POINT ID
#12	INLET ID / STORM DRAIN
→	FLOW PATH
XX/XXX	10-YR/100-YR FLOW (CFS)
HS7 E	HYDRAULIC SECTION CONDITION
XX	SWALE / CURB OPENING
	BASIN BOUNDARY

FIGURE 8
ULTIMATE CONDITIONS
LAMB PINES

L. R. NELSON CONSULTING ENGINEERS, INC.

- • STRUCTURAL
- • CIVIL
- • PLANNING
- • SURVEY

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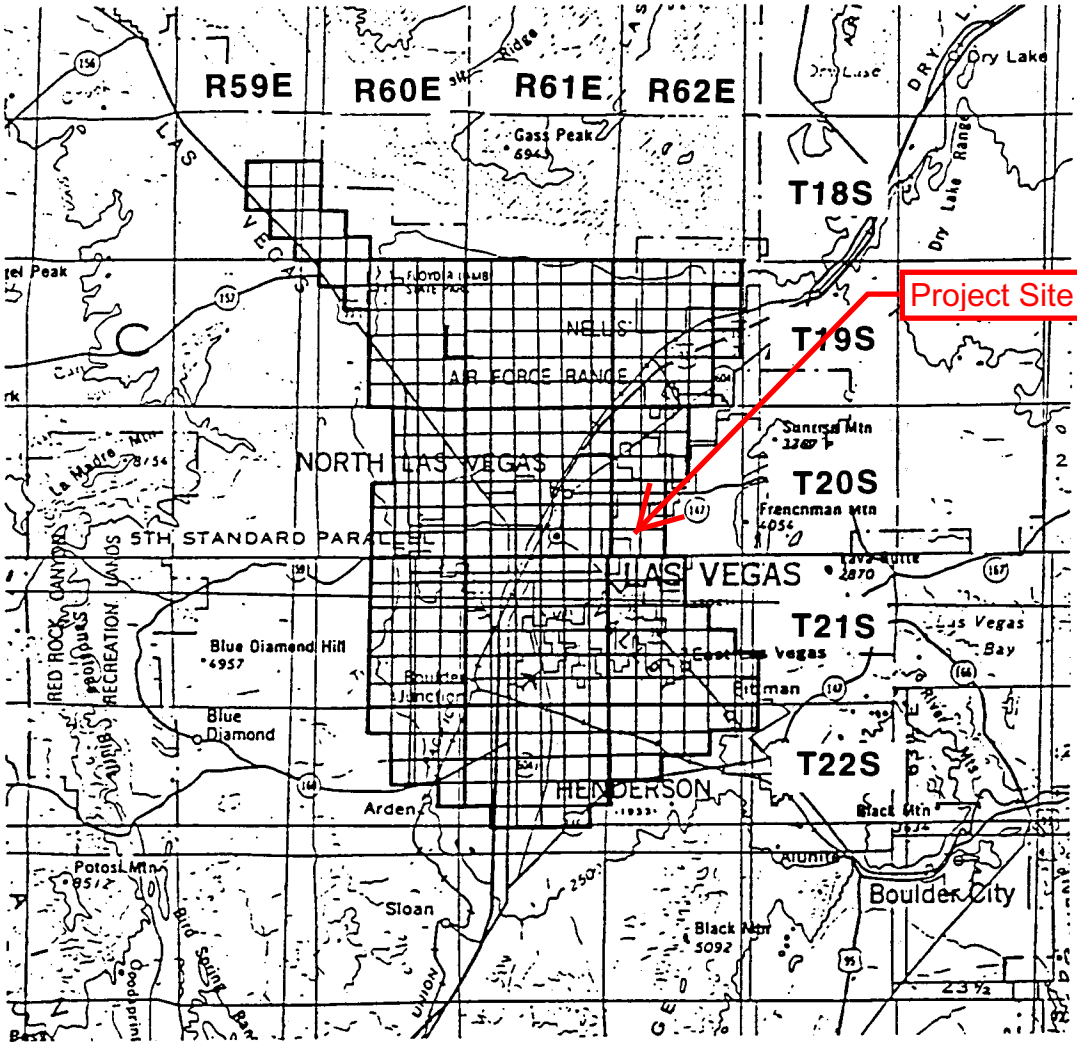
Appendix B: Hydrologic Analysis

Hydrologic Reference Material

Referenced from the CCRFCD HCCDM

McCARRAN AIRPORT RAINFALL AREA



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

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

Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 513

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA

(IN INCHES)

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

SIX-HOUR STORM DISTRIBUTIONS

Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5	Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

Notes:
1. For ~~drainage~~ areas less than 8 square miles in size, use SDN 3.
2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
4. A graphical representation of these values is presented on **Figure 515**.

Revision	Date

REFERENCE:

TABLE 503

RUNOFF CURVE NUMBERS
(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
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.

2 Actual percent impervious value should be compared to selected land use type.

3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

TABLE 602A

CN Calculations and Standard Form 4

Methods Taken from the CCRFCD HCCDM

Hydrologic Soil Group (HSG)*
Curve Number (CN) Determination**

* Ref. USDA SCS Soil Survey Las Vegas Valley Area Nevada (July 1985)

** Ref. CCRFCD DDM Table 602 (1 & 4 of 4)

Basin Name: XON1
Basin Area (Acres): 2.78

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
XON1	2.78	100.0%	Desert Shrub, Poor	Land silty clay loam	C	85	85.0
				Total Weighted CN			**85.0**

Basin Name: XON2
Basin Area (Acres): 2.86

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
XON2	2.86	100.0%	Desert Shrub, Poor	Land silty clay loam	C	85	85.0
				Total Weighted CN			**85.0**

Basin Name: XON3
Basin Area (Acres): 3.31

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
XOF3	3.31	100.0%	Commercial	Land silty clay loam	C	94	94.0
				Total Weighted CN			**94.0**

Basin Name: XON4
Basin Area (Acres): 1.92

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
XON4	1.92	100.0%	Commercial	Land silty clay loam	C	94	94.0
				Total Weighted CN			**94.0**

Basin Name: XON5
Basin Area (Acres): 0.23

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
XON5	0.23	100.0%	Desert Shrub, Poor	Land silty clay loam	C	85	85.0
				Total Weighted CN			**85.0**

Basin Name: XOF1
Basin Area (Acres): 0.36

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
XOF1	0.36	100.0%	Desert Shrub, Poor	Land silty clay loam	C	85	85.0
				Total Weighted CN			**85.0**

Basin Name: DST1
Basin Area (Acres): 0.81

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
XST1	0.81	100.0%	Imperivious	Land silty clay loam	C	98	98.0
				Total Weighted CN			**98.0**

Basin Name: DON1
Basin Area (Acres): 5.91

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
DON12	2.21	37.4%	Imperivious	Land silty clay loam	C	98	36.6
DON12	3.7	62.6%	Apt/Condos, 72% Imp	Land silty clay loam	C	91	57.0
				Total Weighted CN			**93.6**

Basin Name: DON2
Basin Area (Acres): 1.06

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
DON12	0.51	48.1%	Imperivious	Land silty clay loam	C	98	47.2
DON12	0.55	51.9%	Apt/Condos, 72% Imp	Land silty clay loam	C	91	47.2
				Total Weighted CN			**94.4**

Basin Name: DON3
Basin Area (Acres): 2.81

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
DON11	0.63	22.4%	Open Space, Good	Land silty clay loam	C	74	16.6
DON11	1.14	40.6%	Imperivious	Land silty clay loam	C	98	39.8
DON11	1.04	37.0%	Apt/Condos, 72% Imp	Land silty clay loam	C	91	33.7
				Total Weighted CN			**90.0**

Basin Name: DON4
Basin Area (Acres): 1.31

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
DON11	0.28	21.4%	Open Space, Good	Land silty clay loam	C	74	15.8
DON11	0.46	35.1%	Imperivious	Land silty clay loam	C	98	34.4
DON11	0.57	43.5%	Apt/Condos, 72% Imp	Land silty clay loam	C	91	39.6
				Total Weighted CN			**89.8**

Basin Name: DOF1
Basin Area (Acres): 0.36

Basin	Subbasin Area (ac)	% of Basin	Subbasin Cover Type	Soil Type	Subbasin Soil Type	CN	Subbasin % CN
XST1	0.36	100.0%	Commercial	Land silty clay loam	C	94	94.0
				Total Weighted CN			**94.0**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

L.R. NELSON CONSULTING ENGINEERS **PROJECT: Lamb and Diamond**

PROJECT NO. : 818-030-152 **CALCULATED BY: TLK**

Sub-Basin Data					Initial/Overland Time (T_i)			Travel Time (T_t)					T_c	T_c Check (Urbanized Basins)		Final T_c	T_{lag}	Remarks
DESIG	CN	K	AREA (acres)	AREA (mi^2)	LENGTH (ft)	SLOPE (%)	T_i (min)	LENGTH (ft)	SLOPE (%)	V_1 (fps)	V_2 (fps)	T_t (min)	$T_c=T_i+T_t$ (min)	TOTAL (ft)	T_c (min)	T_c (min)	T_{lag} (hrs)	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
EXISTING CONDITION																		
XON1	85.0	0.732	2.80	0.0044	200	0.5	11.8	370	0.8	1.32	N/A	4.7	16.5	N/A	N/A	16.46	0.165	
XON2	85.0	0.732	2.86	0.0045	83	2.4	4.5	571	0.7	1.24	2.46	7.2	11.7	N/A	N/A	11.72	0.117	
XON3	94.0	0.851	3.30	0.0052	200	0.5	8.0	232	0.4	1.28	N/A	3.0	11.0	432	12.4	11.02	0.110	
XON4	94.0	0.851	1.92	0.0030	104	1.0	4.6	400	0.3	1.11	N/A	6.0	10.6	504	12.8	10.60	0.106	
XON5	85.0	0.732	0.21	0.0003	50	2.0	3.7	124	2.0	2.09	N/A	1.0	4.7	N/A	N/A	4.70	0.100	
XOF1	85.0	0.732	0.36	0.0006	24	2.9	2.3	332	2.9	2.52	N/A	2.2	4.5	N/A	N/A	4.47	0.100	
DST1	98.0	0.904	0.80	0.0013	40	2.5	1.6	328	2.5	3.19	N/A	1.7	3.4	368	12.0	3.36	0.050	
DON1	93.6	0.846	5.91	0.0092	35	1.0	2.7	890	0.5	1.36	2.05	9.3	12.0	925	15.1	12.03	0.120	
DON2	94.4	0.856	1.06	0.0017	50	1.0	3.1	230	0.5	1.43	N/A	2.7	5.8	280	11.6	5.79	0.058	
DON3	90.0	0.798	2.81	0.0044	80	1.0	4.9	610	0.4	1.28	1.94	7.5	12.3	690	13.8	12.33	0.123	
DON4	89.8	0.795	1.31	0.0020	75	1.0	4.7	225	1.0	2.02	N/A	1.9	6.6	300	11.7	6.61	0.066	
DOF1	94.0	0.851	0.36	0.0006	24	2.9	1.5	332	2.9	3.44	N/A	1.6	3.1	356	12.0	3.15	0.050	

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

$T_c=T_i+T_t$

$K=0.0132(CN)-.39$

$T_{lag} = 0.6T_c$

For the travel time (T_t) calculations,
V_1 applies to the first 500 feet of travel distance;
V_2 applies to the remaining travel distance.

Travel Time Velocity Formulas

Existing	Developed
$V_1 = 14.8*(S/100)^{1/2}$	$V_1 = 20.2*(S/100)^{1/2}$
$V_2 = 29.4*(S/100)^{1/2}$	$V_2 = 30.6*(S/100)^{1/2}$

All basins over one square mile are calculated by the equation $T_{lag}=20Kn(L*L_c/S^{0.5})^{0.33}$ and denoted by shaded gray (See Worksheet).

REFERENCE: **CCRFCD HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL**

STANDARD FORM 4

Soils Map and Group Information

Information Obtained from NRCS Web Soil Survey Website

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Las Vegas Valley Area, Nevada, Part of Clark County

February 26, 2015

Custom Soil Resource Report
Map—Hydrologic Soil Group

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
Survey Area Data: Version 10, Aug 22, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2013—Feb 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Las Vegas Valley Area, Nevada, Part of Clark County (NV788)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
282	Land silty clay loam	C	12.6	100.0%
Totals for Area of Interest			**12.6**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Existing Condition HEC-1 Output

10 and 100 Year Storm Event – EXIST.OUT

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1****************************************
****************************************
 *                                      *                                                *
   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                *    U.S. ARMY CORPS OF ENGINEERS
   *
 *               JUN   1998             *                                                *    HYDROLOGIC ENGINEERING
CENTER    *
 *            VERSION 4.1               *                                                *          609 SECOND STREET
   *
 *                                      *                                                *       DAVIS, CALIFORNIA 95616
   *
 *  RUN DATE   23MAR15  TIME  17:08:19  *                                                *            (916) 756-1104
   *
 *                                      *                                                *
   *
 ****************************************
****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

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

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

1 HEC-1 INPUT PAGE 1

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

                        *DIAGRAM
            1           ID        ----------------------------------------------------------
            2           ID
            3           ID        TECHNICAL DRAINAGE STUDY FOR Lamb and Diamond
            4           ID        City of Las Vegas, NEVADA
            5           ID
            6           ID        PREPARED BY:       L.R. NELSON CONSULTING ENGINEERS, INC.
            7           ID                           6765 WEST RUSSELL ROAD, SUITE 200
            8           ID                           LAS VEGAS, NV 89118
            9           ID
           10           ID
           11           ID        FILE NAME:  EXIST10.DAT
           12           ID        PROJECT NO. 818-029-141
           13           ID        EXISTING CONDITIONS - 10/100 YEAR
           14           ID       ---> 6-HOUR / SDN 3 <---
           15           ID        INSIDEE MCCARRAN AIRPORT RAINFALL AREA
           16           ID        PRECIP = 1.58 (10 YEAR AS PER HCCDM)
           17           ID        PRECIP = 2.77 (100 YEAR AS PER HCCDM)
           18           ID    PRECIP 10 YEAR RATIO TO 100 YEAR = 0.57
           19           ID
           20           ID        ----------------------------------------------------------
           21           ID
           22           IT       5       0       0     300
           23           IO       5
           24           IN       5
           25           JR    PREC    0.57    1.00
                        *
           26           KK    XON1
           27           BA   .0044
           28           PB    2.77
           29           PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
           30           PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
           31           PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
           32           PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
           33           PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
           34           PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
           35           PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
           36           PC    .998    .999    1.00
           37           LS      0      85
           38           UD   .165
                        *
           39           KK    XON2
           40           BA   .0045
           41           LS      0      85
           42           UD   0.117
                        *
           43           KK    XON3
           44           BA   .0052
           45           LS      0      94
           46           UD    .110
                        *
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          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

            47          KK    XCP2
            48          KM   COMBINE XON1, XON2 AND XON3
            49          HC       3
                        *

            50          KK    XON5
            51          BA   .0003
            52          LS       0      85
            53          UD    .100
                        *

            54          KK    XOF1
            55          BA   .0006
            56          LS       0      85
            57          UD    .100
                        *

            58          KK    XCP3
            59          KM   COMBINE XOF1 AND XON5
            60          HC       2
                        *

            61          KK    XON4
            62          BA   .0030
            63          LS       0      94
            64          UD    .106
                        *

            65          KK    XST1
            66          BA   .0013
            67          LS       0      98
            68          UD    .050
                        *

            69          KK    XCP1
            70          KM   COMBINE XST1 AND XON4
            71          HC       2
                        *
            72          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    26        XON1
                .
                .
    39          .        XON2
                .           .
                .           .
    43          .           .        XON3
                .           .           .
                .           .           .
    47        XCP2.........................
                .
                .
    50          .        XON5
                .           .
                .           .
    54          .           .        XOF1
                .           .           .
                .           .           .
    58          .        XCP3............
                .           .
                .           .
    61          .           .        XON4
                .           .           .
                .           .           .
    65          .           .           .        XST1
                .           .           .           .
                .           .           .           .
    69          .           .        XCP1............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
****************************************
 *                                      *                                        *
   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                        *    U.S. ARMY CORPS OF ENGINEERS
   *
 *              JUN   1998              *                                        *    HYDROLOGIC ENGINEERING
CENTER    *
 *           VERSION 4.1                *                                        *          609 SECOND STREET
   *
 *                                      *                                        *       DAVIS, CALIFORNIA 95616
   *
 *  RUN DATE   23MAR15  TIME  17:08:19  *                                        *           (916) 756-1104
   *
 *                                      *                                        *
   *
 ****************************************
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```

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                                 ----------------------------------------------------------

                                 TECHNICAL DRAINAGE STUDY FOR Lamb and Diamond
                                 City of Las Vegas, NEVADA

                                 PREPARED BY:       L.R. NELSON CONSULTING ENGINEERS, INC.
                                                    6765 WEST RUSSELL ROAD, SUITE 200
                                                    LAS VEGAS, NV 89118


                                 FILE NAME:  EXIST10.DAT
                                 PROJECT NO. 818-029-141
                                 EXISTING CONDITIONS - 10/100 YEAR
                                ---> 6-HOUR / SDN 3 <---
                                 INSIDEE MCCARRAN AIRPORT RAINFALL AREA
                                 PRECIP = 1.58 (10 YEAR AS PER HCCDM)
                                 PRECIP = 2.77 (100 YEAR AS PER HCCDM)
                                PRECIP 10 YEAR RATIO TO 100 YEAR = 0.57

                                 ----------------------------------------------------------


   23 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
                     .57     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
                                                             .57     1.00

 HYDROGRAPH AT
+                  XON1       .00     1   FLOW              2.       5.
                                           TIME            3.58     3.58

 HYDROGRAPH AT
+                  XON2       .00     1   FLOW              2.       6.
                                           TIME            3.58     3.58

 HYDROGRAPH AT
+                  XON3       .01     1   FLOW              4.       9.
                                           TIME            3.50     3.50

   3 COMBINED AT
+                  XCP2       .01     1   FLOW              8.      20.
                                           TIME            3.58     3.58

 HYDROGRAPH AT
+                  XON5       .00     1   FLOW              0.       0.
                                           TIME            3.58     3.50

 HYDROGRAPH AT
+                  XOF1       .00     1   FLOW              0.       1.
                                           TIME            3.58     3.50

   2 COMBINED AT
+                  XCP3       .00     1   FLOW              0.       1.
                                           TIME            3.58     3.50

 HYDROGRAPH AT
+                  XON4       .00     1   FLOW              3.       5.
                                           TIME            3.50     3.50

 HYDROGRAPH AT
```

					EXIST.OUT
+	XST1	.00	1	FLOW	2. 3.
				TIME	3.50 3.50

2 COMBINED AT

+	XCP1	.00	1	FLOW	4. 8.
				TIME	3.50 3.50

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

Ultimate Condition HEC-1 Output

10 and 100 Year Storm Event – ULT.OUT

```
1****************************************
****************************************
 *                                      *                                                *
   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                *    U.S. ARMY CORPS OF ENGINEERS
   *
 *               JUN   1998             *                                                *    HYDROLOGIC ENGINEERING
CENTER    *
 *            VERSION 4.1               *                                                *          609 SECOND STREET
   *
 *                                      *                                                *       DAVIS, CALIFORNIA 95616
   *
 *  RUN DATE   24JUN15  TIME  14:59:15  *                                                *            (916) 756-1104
   *
 *                                      *                                                *
   *
 ****************************************
****************************************
```

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

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

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

1 HEC-1 INPUT PAGE 1

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

                        *DIAGRAM
            1           ID        ------------------------------------------------------------
            2           ID
            3           ID        TECHNICAL DRAINAGE STUDY FOR LAMB PINES
            4           ID        City of Las Vegas, NEVADA
            5           ID
            6           ID        PREPARED BY:       L.R. NELSON CONSULTING ENGINEERS, INC.
            7           ID                           6765 WEST RUSSELL ROAD, SUITE 200
            8           ID                           LAS VEGAS, NV 89118
            9           ID
           10           ID
           11           ID        FILE NAME:  ULT.DAT
           12           ID        PROJECT NO. 818-029-141
           13           ID        DEVELOPED CONDITIONS - 10/100 YEAR
           14           ID       ---> 6-HOUR / SDN 3 <---
           15           ID        INSIDEE MCCARRAN AIRPORT RAINFALL AREA
           16           ID        PRECIP = 1.58 (10 YEAR AS PER HCCDM)
           17           ID        PRECIP = 2.77 (100 YEAR AS PER HCCDM)
           18           ID    PRECIP 10 YEAR RATIO TO 100 YEAR = 0.57
           19           ID
           20           ID        ------------------------------------------------------------
           21           ID
           22           IT       5       0       0     300
           23           IO       5
           24           IN       5       0       0
           25           JR    PREC    0.57    1.00
                        *
           26           KK    DON1
           27           BA   .0092
           28           PB    2.77
           29           PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
           30           PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
           31           PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
           32           PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
           33           PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
           34           PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
           35           PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
           36           PC    .998    .999    1.00
           37           LS       0    93.6
           38           UD    .120
                        *
           39           KK    DON2
           40           BA   .0017
           41           LS       0    94.4
           42           UD   0.058
                        *
           43           KK    DON3
           44           BA   .0044
           45           LS       0    90.0
           46           UD    .123
                        *
```

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

            47          KK    DCP2
            48          KM   COMBINE DON1, DON2 AND DON3
            49          KO       1
            50          HC       3
                        *

            51          KK    DON4
            52          BA   .0020
            53          LS       0    89.8
            54          UD    .066
                        *

            55          KK    DST1
            56          BA   .0013
            57          LS       0      98
            58          UD    .050
                        *

            59          KK    DCP1
            60          KM   COMBINE DST1 AND DON4
            61          HC       2
                        *

            62          KK    XOF1
            63          BA   .0006
            64          LS       0      85
            65          UD    .100
                        *
            66          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

    26        DON1
                .
                .
    39          .        DON2
                .          .
                .          .
    43          .          .        DON3
                .          .          .
                .          .          .
    47        DCP2.........................
                .
                .
    51          .        DON4
                .          .
                .          .
    55          .          .        DST1
                .          .          .
                .          .          .
    59          .        DCP1............
                .          .
                .          .
    62          .          .        XOF1

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
****************************************
 *                                      *                                      *
   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                      *    U.S. ARMY CORPS OF ENGINEERS
   *
 *               JUN   1998             *                                      *    HYDROLOGIC ENGINEERING
CENTER    *
 *            VERSION 4.1               *                                      *          609 SECOND STREET
   *
 *                                      *                                      *       DAVIS, CALIFORNIA 95616
   *
 *  RUN DATE   24JUN15  TIME  14:59:15  *                                      *            (916) 756-1104
   *
 *                                      *                                      *
   *
 ****************************************
****************************************
```

TECHNICAL DRAINAGE STUDY FOR LAMB PINES
City of Las Vegas, NEVADA

PREPARED BY: L.R. NELSON CONSULTING ENGINEERS, INC.
6765 WEST RUSSELL ROAD, SUITE 200
LAS VEGAS, NV 89118

FILE NAME: ULT.DAT
PROJECT NO. 818-029-141
DEVELOPED CONDITIONS - 10/100 YEAR

```
                          ---> 6-HOUR / SDN 3 <---
                           INSIDEE MCCARRAN AIRPORT RAINFALL AREA
                           PRECIP = 1.58 (10 YEAR AS PER HCCDM)
                           PRECIP = 2.77 (100 YEAR AS PER HCCDM)
                          PRECIP 10 YEAR RATIO TO 100 YEAR = 0.57

                           ---------------------------------------------------------


   23 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
                     .57      1.00


 *** *** ***
```

0.	1	0055	12	0.	*	1	0710	87	0.	*	1	1325	162	0.	*	1	1940	237
0.	1	0100	13	0.	*	1	0715	88	0.	*	1	1330	163	0.	*	1	1945	238
0.	1	0105	14	0.	*	1	0720	89	0.	*	1	1335	164	0.	*	1	1950	239
0.	1	0110	15	0.	*	1	0725	90	0.	*	1	1340	165	0.	*	1	1955	240
0.	1	0115	16	0.	*	1	0730	91	0.	*	1	1345	166	0.	*	1	2000	241
0.	1	0120	17	0.	*	1	0735	92	0.	*	1	1350	167	0.	*	1	2005	242
0.	1	0125	18	0.	*	1	0740	93	0.	*	1	1355	168	0.	*	1	2010	243
0.	1	0130	19	0.	*	1	0745	94	0.	*	1	1400	169	0.	*	1	2015	244
0.	1	0135	20	0.	*	1	0750	95	0.	*	1	1405	170	0.	*	1	2020	245
0.	1	0140	21	0.	*	1	0755	96	0.	*	1	1410	171	0.	*	1	2025	246
0.	1	0145	22	0.	*	1	0800	97	0.	*	1	1415	172	0.	*	1	2030	247
0.	1	0150	23	0.	*	1	0805	98	0.	*	1	1420	173	0.	*	1	2035	248
0.	1	0155	24	0.	*	1	0810	99	0.	*	1	1425	174	0.	*	1	2040	249
0.	1	0200	25	0.	*	1	0815	100	0.	*	1	1430	175	0.	*	1	2045	250
0.	1	0205	26	0.	*	1	0820	101	0.	*	1	1435	176	0.	*	1	2050	251
0.	1	0210	27	0.	*	1	0825	102	0.	*	1	1440	177	0.	*	1	2055	252
0.	1	0215	28	1.	*	1	0830	103	0.	*	1	1445	178	0.	*	1	2100	253
0.	1	0220	29	1.	*	1	0835	104	0.	*	1	1450	179	0.	*	1	2105	254
0.	1	0225	30	1.	*	1	0840	105	0.	*	1	1455	180	0.	*	1	2110	255
0.	1	0230	31	1.	*	1	0845	106	0.	*	1	1500	181	0.	*	1	2115	256
0.	1	0235	32	0.	*	1	0850	107	0.	*	1	1505	182	0.	*	1	2120	257
0.	1	0240	33	1.	*	1	0855	108	0.	*	1	1510	183	0.	*	1	2125	258
0.	1	0245	34	1.	*	1	0900	109	0.	*	1	1515	184	0.	*	1	2130	259
0.	1	0250	35	1.	*	1	0905	110	0.	*	1	1520	185	0.	*	1	2135	260
0.	1	0255	36	0.	*	1	0910	111	0.	*	1	1525	186	0.	*	1	2140	261
0.	1	0300	37	1.	*	1	0915	112	0.	*	1	1530	187	0.	*	1	2145	262
0.	1	0305	38	1.	*	1	0920	113	0.	*	1	1535	188	0.	*	1	2150	263
0.	1	0310	39	2.	*	1	0925	114	0.	*	1	1540	189	0.	*	1	2155	264
0.	1	0315	40	3.	*	1	0930	115	0.	*	1	1545	190	0.	*	1	2200	265
0.	1	0320	41	6.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266
0.	1	0325	42	9.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267
0.	1	0330	43	12.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268
0.	1	0335	44	12.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269
0.	1	0340	45	9.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270
0.	1	0345	46	7.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271
0.	1	0350	47	5.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272
0.	1	0355	48	3.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273
0.	1	0400	49	3.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274
0.	1	0405	50	2.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275
0.	1	0410	51	1.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276
0.	1	0415	52	1.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277
0.	1	0420	53	1.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278
0.	1	0425	54	1.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279
0.	1	0430	55	2.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280
0.	1	0435	56	3.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281
0.	1	0440	57	2.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282
0.	1	0445	58	2.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283
0.	1	0450	59	2.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284
0.	1	0455	60	2.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285
0.	1	0500	61	2.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286
0.	1	0505	62	1.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287

0.	1	0510	63	1.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288	
0.	1	0515	64	1.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289	
0.	1	0520	65	0.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290	
0.	1	0525	66	0.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291	
0.	1	0530	67	0.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292	
0.	1	0535	68	0.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293	
0.	1	0540	69	0.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294	
0.	1	0545	70	0.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295	
0.	1	0550	71	0.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296	
0.	1	0555	72	0.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297	
0.	1	0600	73	0.	*	1	1215	148	0.	*	1	1830	223	0.	*	2	0045	298	
0.	1	0605	74	0.	*	1	1220	149	0.	*	1	1835	224	0.	*	2	0050	299	
0.	1	0610	75	0.	*	1	1225	150	0.	*	1	1840	225	0.	*	2	0055	300	
0.					*					*					*				

****

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 12.	3.50		2.	0.	0.	0.
		(INCHES)	.918	.918	.918	.918
		(AC-FT)	1.	1.	1.	1.

CUMULATIVE AREA = .02 SQ MI

****

HYDROGRAPH AT STATION DCP2
SUM OF 3 HYDROGRAPHS
PLAN 1, RATIO = 1.00

****

DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	0.	*	1		1230	151	0.	*	1		1845	226	0.
1		0005	2	0.	*	1		0620	77	0.	*	1		1235	152	0.	*	1		1850	227	0.
1		0010	3	0.	*	1		0625	78	0.	*	1		1240	153	0.	*	1		1855	228	0.
1		0015	4	0.	*	1		0630	79	0.	*	1		1245	154	0.	*	1		1900	229	0.
1		0020	5	0.	*	1		0635	80	0.	*	1		1250	155	0.	*	1		1905	230	0.
1		0025	6	1.	*	1		0640	81	0.	*	1		1255	156	0.	*	1		1910	231	0.
1		0030	7	1.	*	1		0645	82	0.	*	1		1300	157	0.	*	1		1915	232	0.
1		0035	8	1.	*	1		0650	83	0.	*	1		1305	158	0.	*	1		1920	233	0.
1		0040	9	1.	*	1		0655	84	0.	*	1		1310	159	0.	*	1		1925	234	0.
1		0045	10	0.	*	1		0700	85	0.	*	1		1315	160	0.	*	1		1930	235	0.
1		0050	11	0.	*	1		0705	86	0.	*	1		1320	161	0.	*	1		1935	236	0.
1		0055	12	0.	*	1		0710	87	0.	*	1		1325	162	0.	*	1		1940	237	0.
1		0100	13	0.	*	1		0715	88	0.	*	1		1330	163	0.	*	1		1945	238	0.
1		0105	14	0.	*	1		0720	89	0.	*	1		1335	164	0.	*	1		1950	239	0.
1		0110	15	0.	*	1		0725	90	0.	*	1		1340	165	0.	*	1		1955	240	0.
1		0115	16	0.	*	1		0730	91	0.	*	1		1345	166	0.	*	1		2000	241	0.
1		0120	17	1.	*	1		0735	92	0.	*	1		1350	167	0.	*	1		2005	242	0.
1		0125	18	1.	*	1		0740	93	0.	*	1		1355	168	0.	*	1		2010	243	0.
1		0130	19	1.	*	1		0745	94	0.	*	1		1400	169	0.	*	1		2015	244	0.
1		0135	20	2.	*	1		0750	95	0.	*	1		1405	170	0.	*	1		2020	245	0.
1		0140	21	2.	*	1		0755	96	0.	*	1		1410	171	0.	*	1		2025	246	0.
1		0145	22	2.	*	1		0800	97	0.	*	1		1415	172	0.	*	1		2030	247	

0.	1	0150	23	1.	*	1	0805	98	0.	*	1	1420	173	0.	*	1	2035	248
0.	1	0155	24	1.	*	1	0810	99	0.	*	1	1425	174	0.	*	1	2040	249
0.	1	0200	25	0.	*	1	0815	100	0.	*	1	1430	175	0.	*	1	2045	250
0.	1	0205	26	0.	*	1	0820	101	0.	*	1	1435	176	0.	*	1	2050	251
0.	1	0210	27	1.	*	1	0825	102	0.	*	1	1440	177	0.	*	1	2055	252
0.	1	0215	28	2.	*	1	0830	103	0.	*	1	1445	178	0.	*	1	2100	253
0.	1	0220	29	2.	*	1	0835	104	0.	*	1	1450	179	0.	*	1	2105	254
0.	1	0225	30	2.	*	1	0840	105	0.	*	1	1455	180	0.	*	1	2110	255
0.	1	0230	31	2.	*	1	0845	106	0.	*	1	1500	181	0.	*	1	2115	256
0.	1	0235	32	1.	*	1	0850	107	0.	*	1	1505	182	0.	*	1	2120	257
0.	1	0240	33	2.	*	1	0855	108	0.	*	1	1510	183	0.	*	1	2125	258
0.	1	0245	34	2.	*	1	0900	109	0.	*	1	1515	184	0.	*	1	2130	259
0.	1	0250	35	2.	*	1	0905	110	0.	*	1	1520	185	0.	*	1	2135	260
0.	1	0255	36	1.	*	1	0910	111	0.	*	1	1525	186	0.	*	1	2140	261
0.	1	0300	37	1.	*	1	0915	112	0.	*	1	1530	187	0.	*	1	2145	262
0.	1	0305	38	3.	*	1	0920	113	0.	*	1	1535	188	0.	*	1	2150	263
0.	1	0310	39	5.	*	1	0925	114	0.	*	1	1540	189	0.	*	1	2155	264
0.	1	0315	40	8.	*	1	0930	115	0.	*	1	1545	190	0.	*	1	2200	265
0.	1	0320	41	14.	*	1	0935	116	0.	*	1	1550	191	0.	*	1	2205	266
0.	1	0325	42	20.	*	1	0940	117	0.	*	1	1555	192	0.	*	1	2210	267
0.	1	0330	43	25.	*	1	0945	118	0.	*	1	1600	193	0.	*	1	2215	268
0.	1	0335	44	24.	*	1	0950	119	0.	*	1	1605	194	0.	*	1	2220	269
0.	1	0340	45	18.	*	1	0955	120	0.	*	1	1610	195	0.	*	1	2225	270
0.	1	0345	46	13.	*	1	1000	121	0.	*	1	1615	196	0.	*	1	2230	271
0.	1	0350	47	10.	*	1	1005	122	0.	*	1	1620	197	0.	*	1	2235	272
0.	1	0355	48	6.	*	1	1010	123	0.	*	1	1625	198	0.	*	1	2240	273
0.	1	0400	49	5.	*	1	1015	124	0.	*	1	1630	199	0.	*	1	2245	274
0.	1	0405	50	4.	*	1	1020	125	0.	*	1	1635	200	0.	*	1	2250	275
0.	1	0410	51	3.	*	1	1025	126	0.	*	1	1640	201	0.	*	1	2255	276
0.	1	0415	52	2.	*	1	1030	127	0.	*	1	1645	202	0.	*	1	2300	277
0.	1	0420	53	2.	*	1	1035	128	0.	*	1	1650	203	0.	*	1	2305	278
0.	1	0425	54	3.	*	1	1040	129	0.	*	1	1655	204	0.	*	1	2310	279
0.	1	0430	55	4.	*	1	1045	130	0.	*	1	1700	205	0.	*	1	2315	280
0.	1	0435	56	5.	*	1	1050	131	0.	*	1	1705	206	0.	*	1	2320	281
0.	1	0440	57	5.	*	1	1055	132	0.	*	1	1710	207	0.	*	1	2325	282
0.	1	0445	58	4.	*	1	1100	133	0.	*	1	1715	208	0.	*	1	2330	283
0.	1	0450	59	5.	*	1	1105	134	0.	*	1	1720	209	0.	*	1	2335	284
0.	1	0455	60	4.	*	1	1110	135	0.	*	1	1725	210	0.	*	1	2340	285
0.	1	0500	61	3.	*	1	1115	136	0.	*	1	1730	211	0.	*	1	2345	286
0.	1	0505	62	2.	*	1	1120	137	0.	*	1	1735	212	0.	*	1	2350	287
0.	1	0510	63	1.	*	1	1125	138	0.	*	1	1740	213	0.	*	1	2355	288
0.	1	0515	64	1.	*	1	1130	139	0.	*	1	1745	214	0.	*	2	0000	289
0.	1	0520	65	1.	*	1	1135	140	0.	*	1	1750	215	0.	*	2	0005	290
0.	1	0525	66	1.	*	1	1140	141	0.	*	1	1755	216	0.	*	2	0010	291
0.	1	0530	67	1.	*	1	1145	142	0.	*	1	1800	217	0.	*	2	0015	292
0.	1	0535	68	0.	*	1	1150	143	0.	*	1	1805	218	0.	*	2	0020	293
0.	1	0540	69	0.	*	1	1155	144	0.	*	1	1810	219	0.	*	2	0025	294
0.	1	0545	70	0.	*	1	1200	145	0.	*	1	1815	220	0.	*	2	0030	295
0.	1	0550	71	0.	*	1	1205	146	0.	*	1	1820	221	0.	*	2	0035	296
0.	1	0555	72	0.	*	1	1210	147	0.	*	1	1825	222	0.	*	2	0040	297
0.																		

```
     1     0600   73        0.   *    1     1215  148        0.   *    1     1830  223        0.   *    2     0045  298
0.
     1     0605   74        0.   *    1     1220  149        0.   *    1     1835  224        0.   *    2     0050  299
0.
     1     0610   75        0.   *    1     1225  150        0.   *    1     1840  225        0.   *    2     0055  300
0.
                            *                                  *                                  *
```

****

*****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
		(CFS)	3.	1.	1.	1.
25.	3.50	(INCHES)	2.007	2.008	2.008	2.008
		(AC-FT)	2.	2.	2.	2.

CUMULATIVE AREA = .02 SQ MI

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 .57	RATIO 2 1.00
HYDROGRAPH AT	DON1	.01	1	FLOW	8.	16.
				TIME	3.58	3.58
HYDROGRAPH AT	DON2	.00	1	FLOW	2.	4.
				TIME	3.50	3.50
HYDROGRAPH AT	DON3	.00	1	FLOW	3.	7.
				TIME	3.58	3.58
3 COMBINED AT	DCP2	.02	1	FLOW	12.	25.
				TIME	3.50	3.50
HYDROGRAPH AT	DON4	.00	1	FLOW	2.	4.
				TIME	3.50	3.50
HYDROGRAPH AT	DST1	.00	1	FLOW	2.	3.
				TIME	3.50	3.50
2 COMBINED AT	DCP1	.00	1	FLOW	3.	7.
				TIME	3.50	3.50
HYDROGRAPH AT	XOF1	.00	1	FLOW	0.	1.
				TIME	3.58	3.50

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

Appendix C: Hydraulic Analysis

Flowmaster Software Calculations

Street Sections
Swale Calculations
Curb Opening Calculations

Worksheet for S1/TYP_DON1_42 LF Wide Drive Aisle-100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00400	ft/ft
Discharge	16.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.90
0+06.00	0.78
0+06.50	0.78
0+06.50	0.28
0+23.00	0.03
0+24.50	0.00
0+26.00	0.03
0+48.50	0.37
0+48.50	0.87
0+49.00	0.87
0+54.00	0.97

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.90)	(0+06.50, 0.28)	0.013
(0+06.50, 0.28)	(0+23.00, 0.03)	0.016
(0+23.00, 0.03)	(0+26.00, 0.03)	0.013
(0+26.00, 0.03)	(0+48.50, 0.37)	0.016
(0+48.50, 0.37)	(0+54.00, 0.97)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for S1/TYP_DON1_42 LF Wide Drive Aisle-100 Yr_Ult

Results

Normal Depth		0.36	ft
Elevation Range	0.00 to 0.97 ft		
Flow Area		8.03	ft²
Wetted Perimeter		41.53	ft
Hydraulic Radius		0.19	ft
Top Width		41.44	ft
Normal Depth		0.36	ft
Critical Depth		0.33	ft
Critical Slope		0.00655	ft/ft
Velocity		1.99	ft/s
Velocity Head		0.06	ft
Specific Energy		0.42	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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.36	ft
Critical Depth	0.33	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.00655	ft/ft

Cross Section for S1/TYP_DON1_42 LF Wide Drive Aisle-100 Yr_Ult

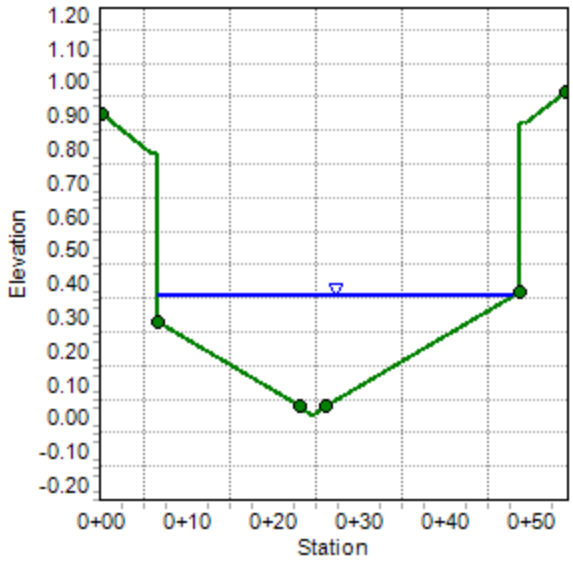
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00400	ft/ft
Normal Depth	0.36	ft
Discharge	16.00	ft³/s

Cross Section Image



Worksheet for S2/D_DON1_60 LF Parking Lot-100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	16.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.26
0+06.00	1.14
0+06.50	1.14
0+06.50	0.64
0+47.00	0.03
0+48.50	0.00
0+50.00	0.03
0+66.50	0.28
0+66.50	0.78
0+67.00	0.78
0+73.00	0.90

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.26)	(0+06.50, 0.64)	0.013
(0+06.50, 0.64)	(0+47.00, 0.03)	0.016
(0+47.00, 0.03)	(0+50.00, 0.03)	0.013
(0+50.00, 0.03)	(0+66.50, 0.28)	0.016
(0+66.50, 0.28)	(0+73.00, 0.90)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for S2/D_DON1_60 LF Parking Lot-100 Yr_Ult

Results

Normal Depth		0.34	ft
Elevation Range	0.00 to 1.26 ft		
Flow Area		7.44	ft²
Wetted Perimeter		40.56	ft
Hydraulic Radius		0.18	ft
Top Width		40.48	ft
Normal Depth		0.34	ft
Critical Depth		0.33	ft
Critical Slope		0.00654	ft/ft
Velocity		2.15	ft/s
Velocity Head		0.07	ft
Specific Energy		0.42	ft
Froude Number		0.88	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.34	ft
Critical Depth	0.33	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00654	ft/ft

Cross Section for S2/D_DON1_60 LF Parking Lot-100 Yr_Ult

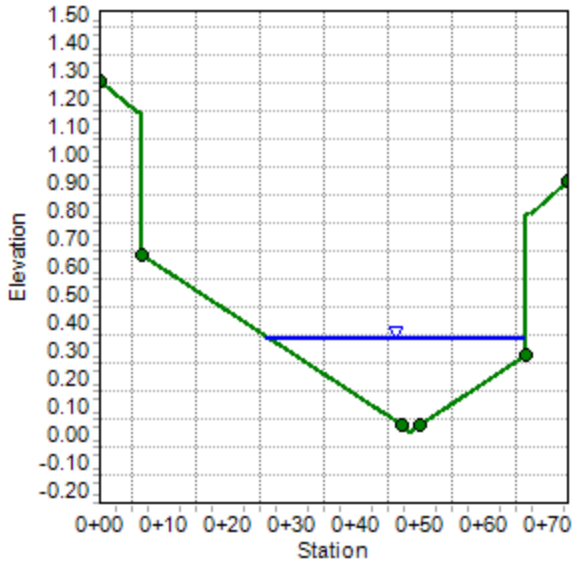
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.34	ft
Discharge	16.00	ft³/s

Cross Section Image



Worksheet for S3/D_DON2_60 LF Parking Lot-100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	4.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.26
0+06.00	1.14
0+06.50	1.14
0+06.50	0.64
0+47.00	0.03
0+48.50	0.00
0+50.00	0.03
0+66.50	0.28
0+66.50	0.78
0+67.00	0.78
0+73.00	0.90

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.26)	(0+06.50, 0.64)	0.013
(0+06.50, 0.64)	(0+47.00, 0.03)	0.016
(0+47.00, 0.03)	(0+50.00, 0.03)	0.013
(0+50.00, 0.03)	(0+66.50, 0.28)	0.016
(0+66.50, 0.28)	(0+73.00, 0.90)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for S3/D_DON2_60 LF Parking Lot-100 Yr_Ult

Results

Normal Depth		0.21	ft
Elevation Range	0.00 to 1.26 ft		
Flow Area		2.74	ft²
Wetted Perimeter		26.99	ft
Hydraulic Radius		0.10	ft
Top Width		26.99	ft
Normal Depth		0.21	ft
Critical Depth		0.19	ft
Critical Slope		0.00792	ft/ft
Velocity		1.46	ft/s
Velocity Head		0.03	ft
Specific Energy		0.24	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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.21	ft
Critical Depth	0.19	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00792	ft/ft

Cross Section for S3/D_DON2_60 LF Parking Lot-100 Yr_Ult

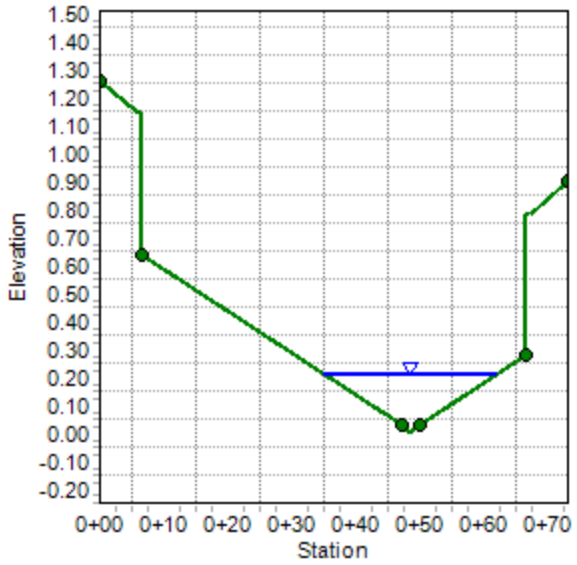
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.21	ft
Discharge	4.00	ft³/s

Cross Section Image



Worksheet for S4/D_DON3_42 LF Wide Drive Aisle-100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00400	ft/ft
Discharge	7.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.26
0+06.00	1.14
0+06.50	1.14
0+06.50	0.64
0+47.00	0.03
0+48.50	0.00
0+48.50	0.50
0+49.00	0.50
0+54.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.26)	(0+06.50, 0.64)	0.013
(0+06.50, 0.64)	(0+47.00, 0.03)	0.016
(0+47.00, 0.03)	(0+54.00, 0.60)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.35	ft
Elevation Range	0.00 to 1.26 ft	

Worksheet for S4/D_DON3_42 LF Wide Drive Aisle-100 Yr_Ult

Results

Flow Area		3.86	ft²
Wetted Perimeter		23.02	ft
Hydraulic Radius		0.17	ft
Top Width		22.67	ft
Normal Depth		0.35	ft
Critical Depth		0.31	ft
Critical Slope		0.00691	ft/ft
Velocity		1.81	ft/s
Velocity Head		0.05	ft
Specific Energy		0.40	ft
Froude Number		0.77	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.35	ft
Critical Depth	0.31	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.00691	ft/ft

Cross Section for S4/D_DON3_42 LF Wide Drive Aisle-100 Yr_Ult

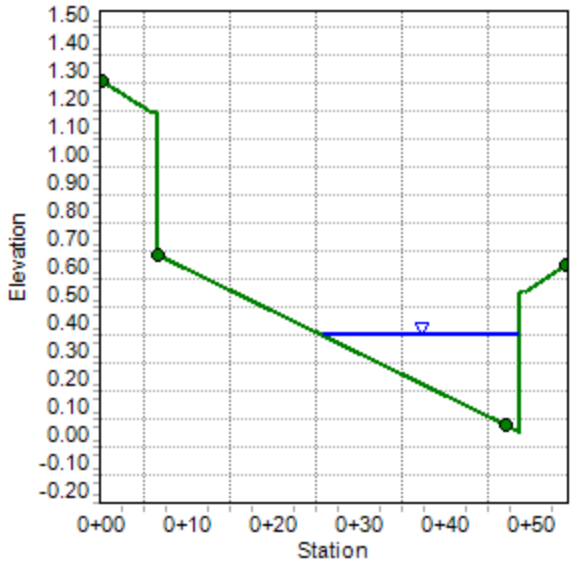
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00400	ft/ft
Normal Depth	0.35	ft
Discharge	7.00	ft³/s

Cross Section Image



Worksheet for S5/D_DON3_60 LF Parking Lot-100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	7.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.26
0+06.00	1.14
0+06.50	1.14
0+06.50	0.64
0+47.00	0.03
0+48.50	0.00
0+50.00	0.03
0+66.50	0.28
0+66.50	0.78
0+67.00	0.78
0+73.00	0.90

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.26)	(0+06.50, 0.64)	0.013
(0+06.50, 0.64)	(0+47.00, 0.03)	0.016
(0+47.00, 0.03)	(0+50.00, 0.03)	0.013
(0+50.00, 0.03)	(0+66.50, 0.28)	0.016
(0+66.50, 0.28)	(0+73.00, 0.90)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for S5/D_DON3_60 LF Parking Lot-100 Yr_Ult

Results

Normal Depth		0.26	ft
Elevation Range	0.00 to 1.26 ft		
Flow Area		4.19	ft²
Wetted Perimeter		33.38	ft
Hydraulic Radius		0.13	ft
Top Width		33.37	ft
Normal Depth		0.26	ft
Critical Depth		0.24	ft
Critical Slope		0.00740	ft/ft
Velocity		1.67	ft/s
Velocity Head		0.04	ft
Specific Energy		0.30	ft
Froude Number		0.83	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.26	ft
Critical Depth	0.24	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00740	ft/ft

Cross Section for S5/D_DON3_60 LF Parking Lot-100 Yr_Ult

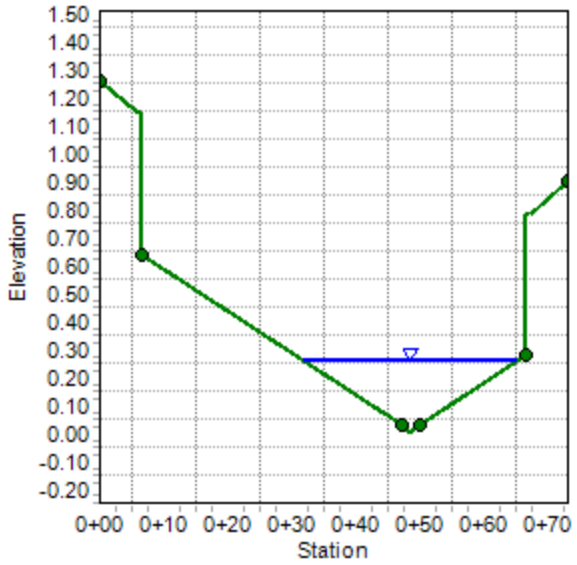
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.26	ft
Discharge	7.00	ft³/s

Cross Section Image



Worksheet for C1/D_Curb Opening_DON1_100 Yr_ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	16.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.67
0+00.00	0.17
0+09.00	0.03
0+10.50	0.00
0+12.00	0.03
0+12.00	0.53

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.67)	(0+09.00, 0.03)	0.013
(0+09.00, 0.03)	(0+12.00, 0.03)	0.016
(0+12.00, 0.03)	(0+12.00, 0.53)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.44	ft
Elevation Range	0.00 to 0.67 ft	
Flow Area	4.31	ft²
Wetted Perimeter	12.68	ft
Hydraulic Radius	0.34	ft

Worksheet for C1/D_Curb Opening_DON1_100 Yr_ult

Results

Top Width		12.00	ft
Normal Depth		0.44	ft
Critical Depth		0.46	ft
Critical Slope		0.00412	ft/ft
Velocity		3.72	ft/s
Velocity Head		0.21	ft
Specific Energy		0.65	ft
Froude Number		1.09	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.44	ft
Critical Depth	0.46	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00412	ft/ft

Cross Section for C1/D_Curb Opening_DON1_100 Yr_ult

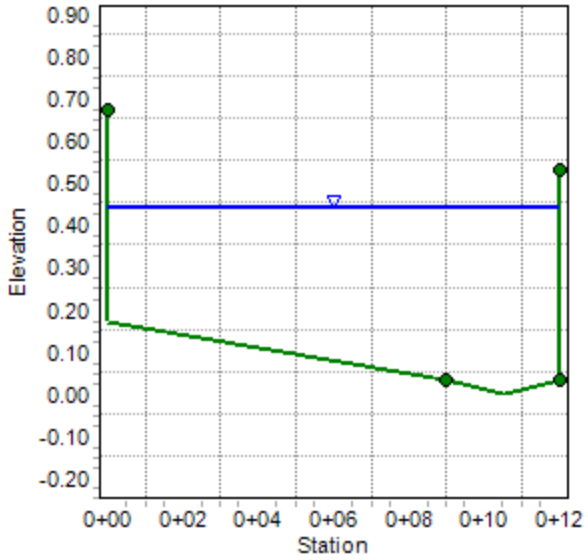
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.44	ft
Discharge	16.00	ft³/s

Cross Section Image



Worksheet for C2/D_Curb Opening_DON2_100 Yr_ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	4.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.53
0+00.00	0.03
0+01.50	0.00
0+03.00	0.03
0+03.00	0.53

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.53)	(0+03.00, 0.03)	0.013
(0+03.00, 0.03)	(0+03.00, 0.53)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.39	ft
Elevation Range	0.00 to 0.53 ft	
Flow Area	1.13	ft²
Wetted Perimeter	3.72	ft
Hydraulic Radius	0.30	ft
Top Width	3.00	ft
Normal Depth	0.39	ft

Worksheet for C2/D_Curb Opening_DON2_100 Yr_ult

Results

Critical Depth		0.40	ft
Critical Slope		0.00477	ft/ft
Velocity		3.55	ft/s
Velocity Head		0.20	ft
Specific Energy		0.59	ft
Froude Number		1.02	
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			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		0.39	ft
Critical Depth		0.40	ft
Channel Slope		0.00500	ft/ft
Critical Slope		0.00477	ft/ft

Cross Section for C2/D_Curb Opening_DON2_100 Yr_ult

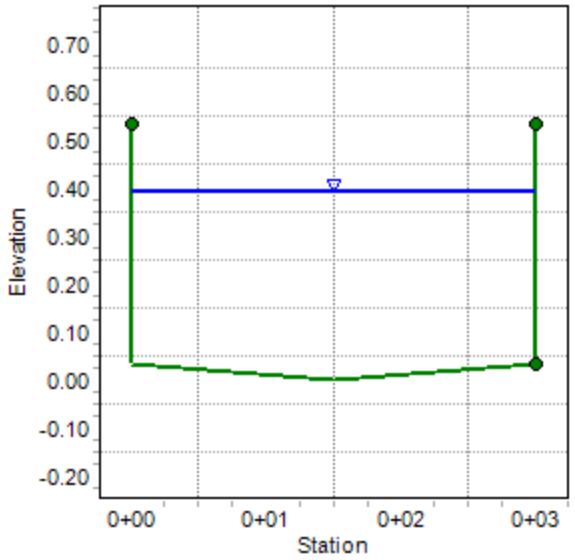
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.39	ft
Discharge	4.00	ft³/s

Cross Section Image



Worksheet for C3/D_Curb Opening_DON3_100 Yr_ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	7.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.53
0+00.00	0.03
0+01.50	0.00
0+03.00	0.03
0+04.00	0.05
0+04.00	0.55

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.53)	(0+03.00, 0.03)	0.013
(0+03.00, 0.03)	(0+04.00, 0.05)	0.016
(0+04.00, 0.05)	(0+04.00, 0.55)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.47	ft
Elevation Range	0.00 to 0.55 ft	
Flow Area	1.78	ft²
Wetted Perimeter	4.86	ft
Hydraulic Radius	0.37	ft

Worksheet for C3/D_Curb Opening_DON3_100 Yr_ult

Results

Top Width		4.00	ft
Normal Depth		0.47	ft
Critical Depth		0.48	ft
Critical Slope		0.00461	ft/ft
Velocity		3.93	ft/s
Velocity Head		0.24	ft
Specific Energy		0.71	ft
Froude Number		1.04	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.47	ft
Critical Depth	0.48	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00461	ft/ft

Cross Section for C3/D_Curb Opening_DON3_100 Yr_ult

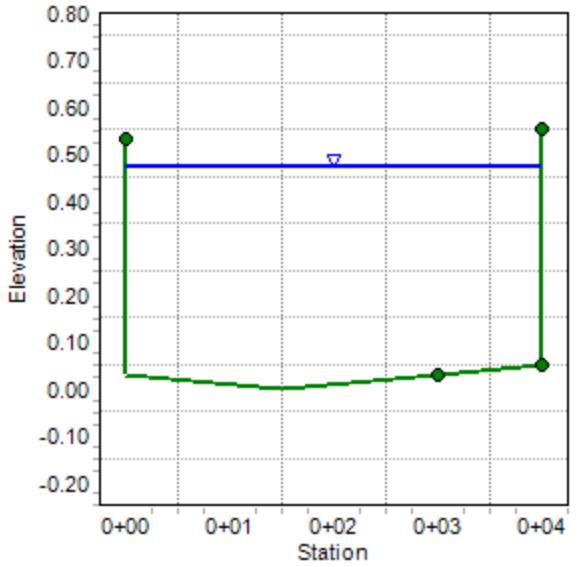
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.47	ft
Discharge	7.00	ft³/s

Cross Section Image



Worksheet for SW1_DON1_100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	16.00	ft³/s

Results

Normal Depth	1.31	ft
Flow Area	5.17	ft²
Wetted Perimeter	8.30	ft
Hydraulic Radius	0.62	ft
Top Width	7.88	ft
Critical Depth	1.12	ft
Critical Slope	0.02323	ft/ft
Velocity	3.09	ft/s
Velocity Head	0.15	ft
Specific Energy	1.46	ft
Froude Number	0.67	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.31	ft
Critical Depth	1.12	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.02323	ft/ft

Cross Section for SW1_DON1_100 Yr_Ult

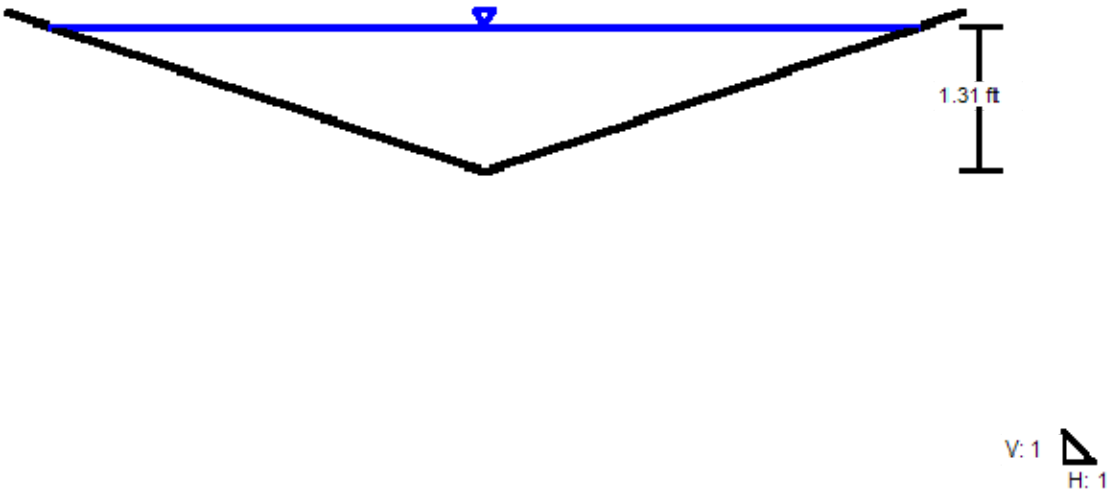
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Normal Depth	1.31	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	16.00	ft³/s

Cross Section Image



Worksheet for SW2_DON2_100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00500	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	4.00	ft³/s

Results

Normal Depth	0.89	ft
Flow Area	2.37	ft²
Wetted Perimeter	5.62	ft
Hydraulic Radius	0.42	ft
Top Width	5.33	ft
Critical Depth	0.64	ft
Critical Slope	0.02794	ft/ft
Velocity	1.69	ft/s
Velocity Head	0.04	ft
Specific Energy	0.93	ft
Froude Number	0.45	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.89	ft
Critical Depth	0.64	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.02794	ft/ft

Cross Section for SW2_DON2_100 Yr_Ult

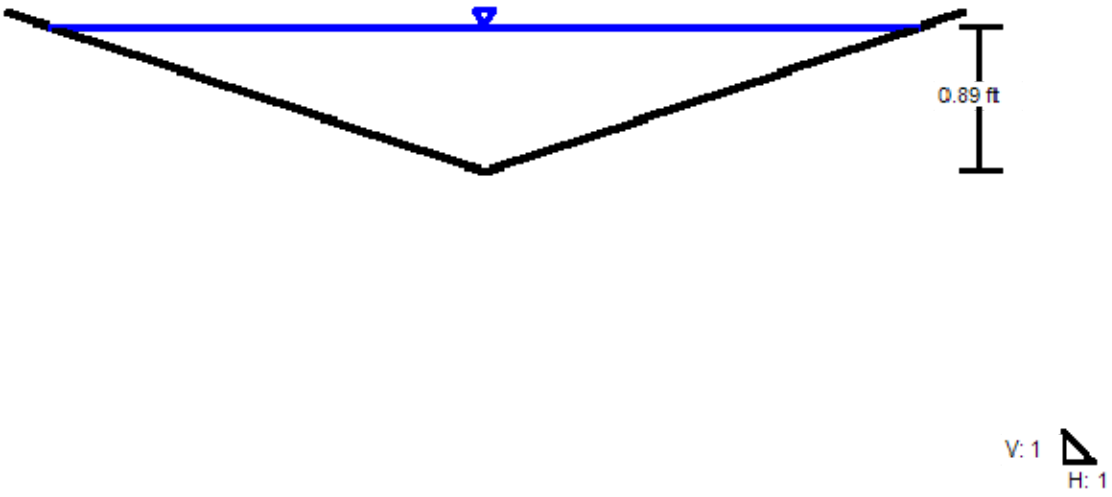
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00500	ft/ft
Normal Depth	0.89	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	4.00	ft³/s

Cross Section Image



Worksheet for SW3_DON3_100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	7.00	ft^3/s

Results

Normal Depth	0.96	ft
Flow Area	2.78	ft^2
Wetted Perimeter	6.09	ft
Hydraulic Radius	0.46	ft
Top Width	5.78	ft
Critical Depth	0.81	ft
Critical Slope	0.02593	ft/ft
Velocity	2.52	ft/s
Velocity Head	0.10	ft
Specific Energy	1.06	ft
Froude Number	0.64	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.96	ft
Critical Depth	0.81	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.02593	ft/ft

Cross Section for SW3_DON3_100 Yr_Ult

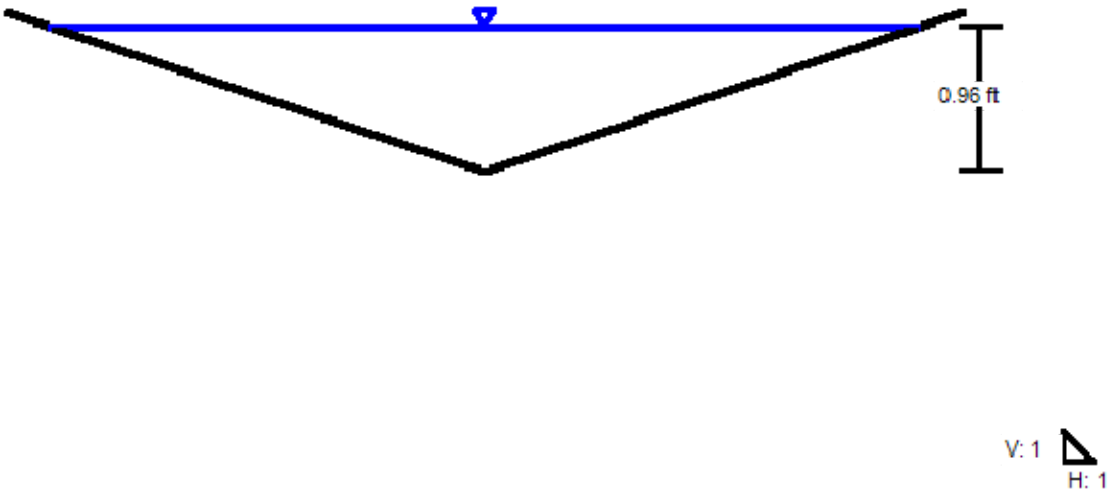
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Normal Depth	0.96	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	7.00	ft³/s

Cross Section Image



Worksheet for Offsite Swale_100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00650	ft/ft
Left Side Slope	6.00	ft/ft (H:V)
Right Side Slope	6.00	ft/ft (H:V)
Discharge	1.00	ft^3/s

Results

Normal Depth	0.38	ft
Flow Area	0.89	ft^2
Wetted Perimeter	4.67	ft
Hydraulic Radius	0.19	ft
Top Width	4.61	ft
Critical Depth	0.28	ft
Critical Slope	0.03500	ft/ft
Velocity	1.13	ft/s
Velocity Head	0.02	ft
Specific Energy	0.40	ft
Froude Number	0.45	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.38	ft
Critical Depth	0.28	ft
Channel Slope	0.00650	ft/ft
Critical Slope	0.03500	ft/ft

Cross Section for Offsite Swale_100 Yr_Ult

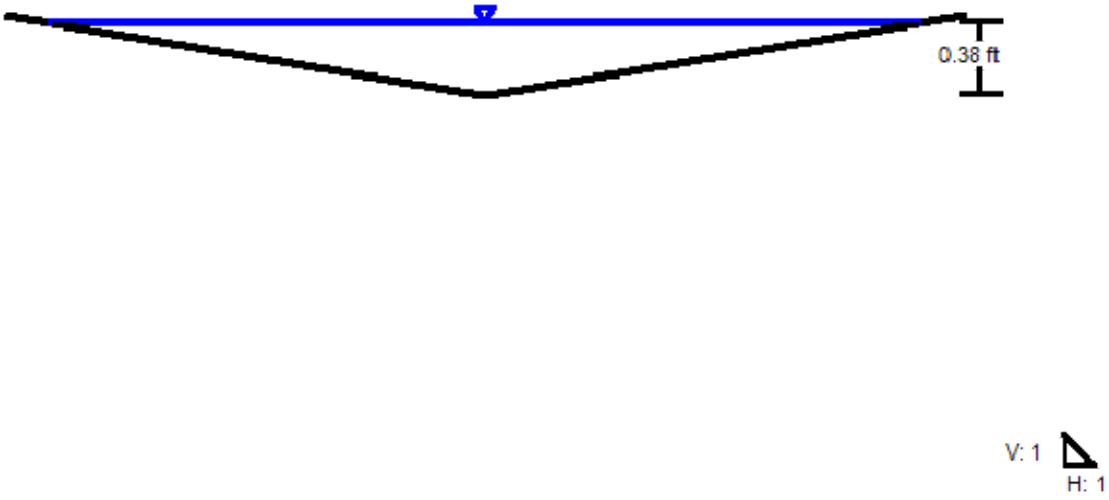
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00650	ft/ft
Normal Depth	0.38	ft
Left Side Slope	6.00	ft/ft (H:V)
Right Side Slope	6.00	ft/ft (H:V)
Discharge	1.00	ft³/s

Cross Section Image



Hydraulic Excel Spreadsheet Calculations

Flood Swale Riprap Size Calculations

Orifice Calculations

Rip Rap Calculations for Open Channels*

* Ref. HCCDM, CCRFCD, Revised September 12, 2013

Date: 6/12/2015
Channel Designation: Onsite Rip rap Swales

Channel Input Data

Velocity (ft/s) =	3.09
Slope (ft/ft) =	0.01
Spec. Gravity = (2.5 min)	2.5

Rip Rap Size Information

d_{50} (in) =	1.18
Use d_{50} (in) =	**2**
Thickness (in) =	**4**

Mannings Coefficient Information

$$n = 0.0395\ (d_{50})^{1/6}$$ * Section 705.4.5, Equations 732

$$V = 3\ (d_{50})^{0.5}\ (S_s - 1)/S^{0.17}$$ * Section 705.4.6, Equations 734

Calculated Mannings Value (n) = **0.029**

Will use 6 inch rip rap
Mannings 0.035

ORIFICE EQUATION

Description: Determine ponding depth at proposed Jensen Precast grate inlet
Project: DSN-03-002, (The Springs - Post Rd/Fort Apache)
Reference: *The Clark County Regional Flood Control District (CCRFCD) Manual*
Date: 6/25/2015

Orifice Equation: $Q = CA(2gh)^{1/2}$

where:

Q = 100-year event discharge = 20 cfs
C = discharge coefficient = 0.6
A = Effective area (ft^2) = 7.40 ft²
36x36 Jensen Precast Grate Inlets
Clogging Factor = = 0%
= 7.40 ft²
g = gravitational constant = 32.2 ft/s^2
h = Head, ponding depth (ft), (measured from centerline of orifice)

Solving for h, $h = \frac{(Q/cA)^2}{2g} = \frac{[\ 20cfs\ /\ (0.6*7.4ft^2)\ ]^2}{2*32.2ft/s^2} = 0.32\ ft$

Comments: Flow ponds to the depth of 0.74-ft, which does not overtop the proposed curb(s).

ORIFICE EQUATION

Description: Determine ponding depth at proposed Jensen Precast grate inlet
Project: DSN-03-002, (The Springs - Post Rd/Fort Apache)
Reference: *The Clark County Regional Flood Control District (CCRFCD) Manual*
Date: 6/25/2015

Orifice Equation: $Q = CA(2gh)^{1/2}$

where:

Q = 100-year event discharge = 7 cfs
C = discharge coefficient = 0.6
A = Effective area (ft^2) = 3.30 ft²
36x36 Jensen Precast Grate Inlets
Clogging Factor = = 0%
= 3.30 ft²
g = gravitational constant = 32.2 ft/s^2
h = Head, ponding depth (ft), (measured from centerline of orifice)

Solving for h, $h = \frac{(Q/cA)^2}{2g} = \frac{[\ 7cfs\ /\ (0.6*3.3ft^2)\ ]^2}{2*32.2ft/s^2} = 0.19\ ft$

Comments: Flow ponds to the depth of 0.74-ft, which does not overtop the proposed curb(s).

Appendix D: Referenced Information

Saratoga Palms

DS3947

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: April 3, 2007
TO: **Land Development Services** Department of Public Works				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Saratoga Palms (Condo Conversion) – Update #1**			**COPIES TO:** Integrity Engineering
Cross Streets:	Lamb Boulevard & Diamond Peak Drive			Amsia Management Corp.
File Number:	F:\Depot\DSMemos\DS3947C.doc			Bart Anderson, P.E., DevCo
Parcel Number:	14032103001			
Zoning Action:	SDR-7318 & TMP-9631			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1st Submittal	2/1/2006	2/17/2006	Not Approved	$400.00	37926: $400
2nd Submittal	5/2/2006	5/17/2006	Approved	$400.00	44547: $400
3rd Submittal	3/19/2007	4/2/2007	See Comments Below	$100.00	65257: $100
			TOTAL FEES (LDDRS):	**$900.00**	---

REMARKS:

3rd Submittal: Update #1

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	must have Clark County Department of Development Services concurrence

1. The topography presented in the grading plan shows local low point/sump area at the sidewalk/courtyard area between the "*Recreation Building/Building 2*" and "*Building 3*". The signatures of the tenants and the management company do not suffice to eliminate the previous proposed remediation works. The engineer must either re-survey the area to verify positive drainage in the area and revise the grading plan accordingly or re-pave the area and provide positive drainage as approved before.
2. Sheet C5.01: Section G-G and Section H-H show sawcut line which contradicts the update to eliminate any works. Address and clarify in the next submittal.

Land Development: This project is required to complete the DRAINAGE IMPROVEMENTS CONDOMINIUM CONVERSION COMPLETION AGREEMENT and post a Bond in the amount of $100,000 for on-site drainage related items. The items could include regrading to provide positive around buildings, repair of drainage appurtenances and necessary on-site drainage facilities as identified by the drainage study.

The following comments are repeated until they are complete:

3. *The City of Las Vegas has developed an Apartment/Condominium Conversion Drainage Compliance Report format for the Engineers' use. The report will require the Engineer at a minimum to attest that the site conditions are in substantial compliance with the approved grading plans on file with the City of Las Vegas and that positive drainage is provided away from and around each multi-family residential unit. Contact Peter Jackson (229-5266) for a copy of the Condominium Conversion Drainage Compliance Report. The reports of the Substantial Completion must be complete prior to the release of the Bond.*

4. *Revise all cross section to add dimensions. On Sections G, F and H show 6" Type II and dimension thickness for new concrete sidewalk.*

5. *Revise the section notes E and F on the grading plan to reference the correct Detail Sheet number C5.01.*

6. *The Final Map for the Condominium Conversion is approvable by the Flood Control Section and the Final Map mylar can go forward once the Bond in the amount of $100,000 has been posted.*

7. *The following drainage note is required and must be shown on the Final Map: "All Common Areas not occupied by a Building are Public Drainage Easements to be privately maintained by the HOA."*

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

END OF REMARKS
PBJ/ays

T/R/S: T20S/R62E/32
AREA N-32

ATKINS

Las Vegas Wash Central, Cedar Avenue Channel

Preliminary Design Report

June 22, 2015

Prepared for City of Las Vegas, Nevada

Prepared by ATKINS North America, Inc.
2270 Corporate Circle, Suite 200
Henderson NV 89074-7755
702.263.7275

06057 | AD | 15

ATKINS

June 22, 2015

Rosa Cortez, P.E.
Engineering Project Manager
City of Las Vegas.
Department of Public Works
333 Rancho Drive
Las Vegas, Nevada 89107

RE: Preliminary Design Report for Las Vegas Wash Central, Cedar Avenue Channel

Dear Ms. Cortez,

Transmitted herewith are the Preliminary Design Report and the 30% Design Plan Submittal for the Las Vegas Wash Central, Cedar Avenue Channel Project (Cedar Avenue Channel).

Please feel free to contact me if you have any questions.

Sincerely,

Harshal Desai, PE, CFM
Project Manager

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1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN  1998               *                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                    *          609 SECOND STREET           *
 *                                      *                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   03JUN15  TIME  11:32:48  *                    *           (916) 756-1104             *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

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


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

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

1                                                HEC-1 INPUT                                                PAGE  1

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

                         *DIAGRAM
 *** FREE ***
              1          ID    LAS VEGAS WASH CENTRAL-CEDAR AVENUE
              2          ID
              3          ID    INPUT FILE = CEDAR_INT.DAT
              4          ID    INPUT FILE DATE =  APRIL 2014
              5          ID    DESIGN STORM = 100-YEAR 6-HR STORM AND 100-YEAR 6-HR STORM
              6          ID    STORM DISTRIBUTION = SDN #3
              7          ID    MODELED BY ATKINS (MANOGYA KHANAL)
              8          ID    CHECKED BY ATKINS (BRIAN ROWLEY, PE, CFM)
              9          ID    NO STORM CENTERING
             10          ID    REFERENCED HYDROLOGIC MODELS:
             11          ID    2008 LAS VEGAS VALLEY FLOOD CONTROL DISTRICT
             12          ID    MASTER PLAN UPDATE (PBS&J, SEPTEMBER 2008)
             13          ID    CENTRAL NEIGHBORHOOD STUDY
             14          ID
             15          ID
             16          ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
             17          ID
             18          ID                       AREA       DARF
             19          ID                       SQ. MI.
             20          ID                       0-0.5     0.990
             21          ID                       0.5-1      0.975
             22          ID                       1-2       0.950
             23          ID                       2-3        0.925
             24          ID                       3-4        0.915
             25          ID                       4-5        0.908
             26          ID                       5-6        0.903
             27          ID
             28          IT       5       0       0     300
             29          IO       5       0       0
             30          IN       5       0       0
             31          JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903    0.57
                         *

             32          KK   CA03a
             33          BA   0.095
             34          PB    2.77
             35          PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
             36          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
             37          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
             38          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
             39          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
             40          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
             41          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
             42          PC   0.998   0.999   1.000
             43          LS       0    87.8
             44          UD   0.234
                         *
1                                                HEC-1 INPUT                                                PAGE  2

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

             45          KK   CA03c
             46          BA   0.022
             47          PB    2.77
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```
  48          LS       0    87.9
  49          UD   0.238
              *

  50          KK  CCA03c
  51          KM  COMBINE CA03a AND CA03c
  52          KM  EASTERN AND STEWART
  53          HC       2
              *

  54          KK   CA03b
  55          BA   0.079
  56          PB    2.77
  57          LS       0    87.9
  58          UD   0.257
              *

  59          KK   CCA03
  60          KM  COMBINE CCA03c AND CA03b
  61          KM  EASTERN AND STEWART
  62          HC       2
              *

  63          KK  RCCA03
  64          KM  ROUTE CCA03 TO CCA04b
  65          KM  STEWART
  66          RD    1240 0.01371   0.016       0    TRAP       0      50
              *

  67          KK   CA04b
  68          BA   0.060
  69          PB    2.77
  70          LS       0    88.1
  71          UD   0.203
              *

  72          KK  CCA04b
  73          KM  COMBINE RCCA03, CA04a AND CA04b
  74          KM  STEWART AT 28th STREET
  75          HC       2
              *

  76          KK RCCA04b
  77          KM  ROUTE CCA04b TO CCA04
  78          KM  STEWART
  79          RD    1780 0.00955   0.016       0    TRAP       0      50
              *
1                                      HEC-1 INPUT                                          PAGE  3

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

  80          KK   CA04a
  81          BA   0.039
  82          PB    2.77
  83          LS       0    87.5
  84          UD   0.224
              *

  85          KK   CA04c
  86          BA   0.031
  87          PB    2.77
  88          LS       0    90.7
  89          UD   0.199
              *

  90          KK CCA04-1
  91          KM  COMBINE RCCA04b, CA04a AND CA04c
  92          KM  STEWART AT MOJAVE
  93          HC       3
              *

  94          KK   CA04g
  95          BA   0.052
  96          PB    2.77
  97          LS       0    92.4
  98          UD   0.156
              *

  99          KK  RCA04g
 100          KM  ROUTE CA04g TO CCA04d
 101          KM  SUNRISE
 102          RD    3500   0.014   0.016       0    TRAP       0      50
              *

 103          KK   CA04d
 104          BA   0.052
 105          PB    2.77
 106          LS       0    91.2
 107          UD   0.191
              *

 108          KK  CCA04d
 109          KM  COMBINE RCA04g AND CA04d
 110          KM  SUNRISE AND EASTERN
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 111          HC       2
              *

 112          KK  RCA04d
 113          KM  ROUTE CA04c TO CCA04d
 114          KM  SUNRISE
 115          RD    3050 0.01148   0.016       0    TRAP       0      50
              *
1                                   HEC-1 INPUT                                          PAGE  4

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

 116          KK   CA04e
 117          BA   0.190
 118          PB    2.77
 119          LS       0    90.0
 120          UD   0.349
              *

 121          KK  CCA04e
 122          KM  COMBINE RCBN03 AND BN08
 123          KM  SUNRISE AND MOJAVE
 124          HC       2
              *

 125          KK RCCA04e
 126          KM  ROUTE CCA04e TO CCA04f
 127          KM  MOJAVE
 128          RD    1360 0.00368   0.016       0    TRAP       0      50
              *

 129          KK   CA04f
 130          BA   0.046
 131          PB    2.77
 132          LS       0    91.6
 133          UD   0.209
              *

 134          KK  CCA04f
 135          KM  COMBINE RCCA04d AND CA04e
 136          KM  MOJAVE AT STEWART
 137          HC       2
              *

 138          KK   CCA04
 139          KM  COMBINE CCA04 AND CCA04e
 140          KM  STEWART AT MOJAVE
 141          HC       2
              *

 142          KK  RCCA04
 143          KM  ROUTE CCA04 TO CCA05
 144          KM  STEWART
 145          RD    2130 0.00892   0.016       0    TRAP       0      50
              *

 146          KK   CA05a
 147          BA   0.036
 148          PB    2.77
 149          LS       0    91.0
 150          UD   0.215
              *
1                                   HEC-1 INPUT                                          PAGE  5

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

 151          KK   CA05b
 152          BA   0.050
 153          PB    2.77
 154          LS       0    91.9
 155          UD   0.232
              *

 156          KK CCA05-1
 157          KM  COMBINE RCCA04, CA05a AND CA05b
 158          KM  STEWART AT PECOS
 159          HC       3
              *

 160          KK  DCCA05
 161          KM  DIVERT BYPASS FLOW ON STEWART THAT CONTINUES EAST ON STEWART
 162          KM  REMAINING FLOW IS THE FLOW COLLECTED IN INLETS
 163          DT  DSTEWQ
 164          DI       0     200     400     430     600     745     900
 165          DQ       0       0       0       0     170     315     470
              *

 166          KK   CA05c
 167          BA   0.023
 168          PB    2.77
 169          LS       0    91.9
 170          UD   0.146
              *
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 171          KK  RCA05c
 172          KM  ROUTE CA05c TO CCA05e
 173          KM  SUNRISE
 174          RD     750 0.00933   0.016       0    TRAP       0      50
              *

 175          KK   CA05d
 176          BA   0.043
 177          PB    2.77
 178          LS       0    91.5
 179          UD   0.202
              *

 180          KK   CA05e
 181          BA   0.003
 182          PB    2.77
 183          LS       0    92.0
 184          UD   0.104
              *

 185          KK  CCA05e
 186          KM  COMBINE RCA05d AND CA05c
 187          KM  SUNRISE AT PECOS
 188          HC       3
              *
1                                       HEC-1 INPUT                                          PAGE  6

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

 189          KKDTCCA05e
 190          KM  DIVERT FLOW INTO THE STREET.
 191          KM  REMIANING WILL FLOW INTO 29"X45" RCEP.
 192          KM  AT PECOS NORTH OF SUNRISE
 193          DT  DTA05e
 194          DI       0    49.5      99
 195          DQ       0    26.5      53
              *

 196          KK   CA05f
 197          BA   0.009
 198          PB    2.77
 199          LS       0    92.0
 200          UD   0.123
              *

 201          KK DTCAO5f
 202          KM  DIVERT FLOW INTO THE STREET.
 203          KM  REMIANING WILL FLOW INTO 29"X45" RCEP.
 204          KM  AT PECOS NORTH OF SUNRISE
 205          DT  DTA05f
 206          DI       0     3.5       7
 207          DQ       0    1.75     3.5
              *

 208          KK  CCA05f
 209          KM  COMBINE RCA05e AND CA05f
 210          HC       2
              *

 211          KK RCCA05f
 212          KM  ROUTE CCA05f TO CCA05f
 213          KM  PECOS
 214          RD     820 0.00732   0.013       0    CIRC       3       0
              *

 215          KK   CA05h
 216          BA   0.003
 217          PB    2.77
 218          LS       0    92.0
 219          UD   0.101
              *

 220          KK   CA05i
 221          BA   0.004
 222          PB    2.77
 223          LS       0    92.0
 224          UD   0.093
              *
1                                       HEC-1 INPUT                                          PAGE  7

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

 225          KK   CA05k
 226          BA   0.010
 227          PB    2.77
 228          LS       0    91.9
 229          UD   0.105
              *

 230          KK  CCA05k
 231          KM  COMBINE RCCA05f, CA05h, CA05i AND CA05k
 232          KM  UNDEVELOPED PARCEL AT STEWART AND PECOS
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```
 233          HC       4
              *

 234          KK   CA05g
 235          BA   0.007
 236          PB    2.77
 237          LS       0    92.0
 238          UD   0.101
              *

 239          KK   CA05j
 240          BA   0.005
 241          PB    2.77
 242          LS       0    92.0
 243          UD   0.083
              *

 244          KK   CA05p
 245          BA   0.006
 246          PB    2.77
 247          LS       0    91.1
 248          UD   0.183
              *

 249          KK  CCA05p
 250          KM  COMBINE CA05g, CA05j AND CA05p
 251          KM  ON PECOS SOUTH OF STEWART
 252          HC       3
              *

 253          KK  DRA05e
 254          KM  RETURN FLOW FROM DIVERTED
 255          KM  FLOW ON THE STREET
 256          DR  DTA05e
              *

 257          KK  DRA05f
 258          KM  RETURN FLOW FROM DIVERTED
 259          KM  FLOW ON THE STREET
 260          DR  DTA05f
              *
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LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 261          KK CCA05-3
 262          KM  COMBINE DRA05f, DRA05e AND CCA05p
 263          KM  ON PECOS SOUTH OF STEWART
 264          HC       3
              *

 265          KKDTCCA053
 266          KM  DIVERT FLOW INTO THE STREET.
 267          KM  REMIANING WILL FLOW INTO THE DROPINTET
 268          KM  AT PECOS SOUTH OF STEWART, WEST
 269          DT DTA05-3
 270          DI       0    43.5      87
 271          DQ       0      40      80
              *

 272          KK CCA05-2
 273          KM  COMBINE CCA05-1 AND CCA05p
 274          KM  ON PECOS SOUTH OF STEWART
 275          HC       2
              *

 276          KKCCA05-2a
 277          KM  COMBINE CCA05-2 AND CCA05-1
 278          KM  ON STEWART AND PECOS
 279          HC       2
              *

 280          KK    CHAR
 281          BA  0.0365
 282          QI     0.0     0.0     0.0     0.0     0.0     0.3     0.8     1.3     1.8     1.5
 283          QI     1.3     0.8     0.5     0.5     0.5     0.8     1.0     1.3     2.3     2.8
 284          QI     3.1     2.8     2.6     2.1     1.8     1.8     2.3     3.6     3.9     3.6
 285          QI     3.6     3.6     3.6     3.6     3.6     4.6    11.3    18.0    27.0    36.0
 286          QI    42.2    43.0    39.4    33.7    27.3    17.8    14.2    11.3     9.3     8.2
 287          QI     8.5     9.3     9.8    10.0     9.8     9.0     7.7     6.4     4.9     3.9
 288          QI     3.1     2.3     1.8     1.3     1.3     1.0     1.0     0.8     0.5     0.5
 289          QI     0.3     0.3     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 290          QI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
              *

 291          KK   RCHAR
 292          KM  ROUTE CHAR TO CH70-C
 293          KM  LOCAL FACILITY PECOS ROAD STORM DRAIN
 294          RD    4600  0.0098   0.016       0    TRAP       0      50
              *

 295          KK  CH70-C
 296          BA   0.137
 297          PB    2.77
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```
 298          LS       0    92.7
 299          UD   0.305
              *
1                                        HEC-1 INPUT                                                PAGE  9

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


 300          KK   CCHAR
 301          KM  COMBINE CHAR AND CH70-C
 302          HC       2
              *

 303          KK  RCCHAR
 304          KM  ROUTE CCHAR TO CCA05-2
 305          KM  LOCAL FACILITY PECOS ROAD STORM DRAIN
 306          KM  LINING = RCP
 307          RD    1250  0.0096   0.013       0    CIRC     5.5       0
              *

 308          KK   CA05m
 309          BA   0.005
 310          PB    2.77
 311          LS       0    91.5
 312          UD   0.134
              *

 313          KK  CCA05n
 314          KM  COMBINE CHAR AND CA05m
 315          KM  ON PECOS AND SUNRISE
 316          HC       2
              *

 317          KK RCCA05m
 318          KM  ROUTE CCA05n TO CCA05-2
 319          KM  LOCAL FACILITY PECOS ROAD STORM DRAIN
 320          KM  LINING = RCP
 321          RD    1580 0.00633   0.013       0    CIRC     5.5       0
              *

 322          KK CCA05-4
 323          KM  COMBINE CCA05n AND CA05m
 324          KM  ON PECOS AND SUNRISE
 325          HC       2
              *

 326          KK   CA05n
 327          BA   0.004
 328          PB    2.77
 329          LS       0    91.4
 330          UD   0.106
              *

 331          KK   CA05q
 332          BA   0.013
 333          PB    2.77
 334          LS       0    82.5
 335          UD   0.215
              *
1                                        HEC-1 INPUT                                                PAGE 10

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


 336          KK  CCA05q
 337          KM  COMBINED FLOW IN EXISTING STORM DRAIN
 338          KM  STEWART AND PECOS
 339          HC       2
              *

 340          KK   CCA05
 341          KM  TOTAL FLOW ON SURFACE AND SYSTEM
 342          KM  STEWART AND PECOS
 343          HC       2
              *

 344          KK  RCCA05
 345          KM  ROUTE CCA05 TO CCA08
 346          KM  PROPOSED FACILITY IN PECOS ROAD
 347          KM  LINING = RCB
 348          RD    1310   0.005   0.013       0    TRAP      14       0
              *

 349          KK  CA06-C
 350          BA   0.407
 351          PB    2.77
 352          LS       0    82.5
 353          UD   0.465
              *

 354          KK  CH59-C
 355          BA   0.213
 356          PB    2.77
 357          LS       0    94.4
 358          UD   0.371
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                *
 359            KK DCH58-C
 360            KM  FLOW SPLIT TO CH58-C
 361            KM  SPLIT TO FLAMINGO WASH SYSTEM
 362            KM  DEVELOPED FROM CWH MODEL
 363            KM  CAPACITY = 144 CFS (100 YR STORM DRAIN CAPACITY)
 364            DT   DFLAM
 365            DI       0     144    1000
 366            DQ       0       0     856
                *
 367            KK  RDCH58
 368            KM  ROUTE DCH58-C TO CCH58-C
 369            KM  LAS VEGAS BLVD STORM DRAIN
 370            RD    5900    0.01   0.013       0    CIRC       4       0
                *
1                                       HEC-1 INPUT                                                 PAGE 11

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

 371            KK  CH58-C
 372            BA   0.128
 373            PB    2.77
 374            LS       0    93.4
 375            UD   0.312
                *
 376            KK CCH58-C
 377            KM  COMBINE DCH58-C AND CH58-C
 378            KM  US 95
 379            HC       2
                *
 380            KKDDCH59-C
 381            KM  FLOW SPLIT TO BN03-C
 382            KM  DIVERT Q EXCEEDING LAS VEGAS BLVD DRAIN CAPACITY:  48" PIPE, 167 CFS
 383            KM  DBN00 IN CWH
 384            DT   DBN03
 385            DI       0     167    1000
 386            DQ       0       0     833
                *
 387            KK  DDCH59
 388            KM  DIVERT FLOW OUT OF PECOS/BONANZA SYSTEM
 389            DT  DBN03a
 390            DI       0     167    1000
 391            DQ       0     167    1000
                *
 392            KK  BN06-C
 393            BA   0.340
 394            PB    2.77
 395            LS       0    89.1
 396            UD   0.201
                *
 397            KK  BN03-C
 398            BA   0.539
 399            PB    2.77
 400            LS       0    87.3
 401            UD   0.344
                *
 402            KK   DBN03
 403            KM  RETREIVE DBN03
 404            DR   DBN03
                *
 405            KK  RDBN03
 406            KM  ROUTE DBN03 TO CBN03
 407            KM  BONANZA
 408            RD    5900  0.0264   0.016       0    TRAP       0      50
                *
1                                       HEC-1 INPUT                                                 PAGE 12

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

 409            KK   CBN03
 410            KM  COMBINE BN06-C, BN03-C, AND RDBN03
 411            KM  BONANZA AND EASTERN
 412            HC       3
                *
 413            KK  RCBN03
 414            KM  ROUTE CBN03 TO CBN08
 415            KM  FACILITY = LAS VEGAS WASH - BONANZA
 416            KM  FACILITY # = LVBZ 0211,0224
 417            KM  LINING = RCB
 418            RD    2980  0.0072   0.015       0    TRAP       8       0
                *
 419            KK    BN08
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 420          BA   0.210
 421          PB    2.77
 422          LS       0    91.8
 423          UD   0.378
              *

 424          KK   CBN08
 425          KM  COMBINE RCBN03 AND BN08
 426          KM  BONANZA AND MOJAVE
 427          HC       2
              *

 428          KK  RCBN08
 429          KM  ROUTE CBN08 TO CBN09
 430          KM  FACILITY = LAS VEGAS WASH - BONANZA
 431          KM  FACILITY # = LVBZ 0167, 0188
 432          KM  LINING = RCB
 433          RD    2330   0.007   0.015       0    TRAP       9       0
              *

 434          KK    BN09
 435          BA   0.233
 436          PB    2.77
 437          LS       0    83.9
 438          UD   0.411
              *

 439          KK   CBN09
 440          KM  COMBINE RCBN08 AND BN09
 441          KM  BONANZA AND PECOS
 442          HC       2
              *

 443          KK   DBN09
 444          KM  FLOW SPLIT TO PECOS
 445          KM  DIVERT Q EXCEEDING 60" PIPE, 202 CFS
 446          DT  DBN09a
 447          DI       0     202    1000    2000
 448          DQ       0       0     798    1798
              *
1                                      HEC-1 INPUT                                                PAGE 13

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

 449          KK  CCBN09
 450          KM  COMBINE DDCH59 AND DBN09
 451          KM  SHOULD BE THE SAME AS CBN09
 452          KM  DDCH59 HAS ZERO FLOW
 453          KM  BONANZA AND PECOS
 454          HC       2
              *

 455          KK CCA06-1
 456          KM  BONANZA FLOW AND CA06-C
 457          HC       2
              *

 458          KK   CCA06
 459          KM  CEDAR AND PECOS
 460          HC       2
              *

 461          KK  RCCA06
 462          KM  ROUTE CCA05 TO CCA08
 463          KM  FACILITY = CEDAR AVENUE CHANNEL
 464          KM  FACILITY # = CACH 0127,0129,0146,0148
 465          KM  LINING = CONCRETE
 466          RD    1545  0.0026   0.015       0    TRAP      10     1.5
              *

 467          KK    CA08
 468          BA   0.073
 469          PB    2.77
 470          LS       0    85.4
 471          UD   0.258
              *

 472          KK   CCA08
 473          KM  CEDAR AND HONOLULU
 474          HC       2
              *

 475          KK  RCCA08
 476          KM  ROUTE CCA08 TO CCA09
 477          KM  FACILITY = CEDAR AVENUE CHANNEL
 478          KM  FACILITY # = CACH 0079,0081
 479          KM  LINING = CONCRETE
 480          RD    1050  0.0026   0.015       0    TRAP      10     1.5
              *

 481          KK    CA09
 482          BA   0.048
 483          PB    2.77
 484          LS       0    89.6
```

```
 485          UD   0.225
              *
1                                    HEC-1 INPUT                                        PAGE 14

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

 486          KK   CCA09
 487          KM  CEDAR AND SANDHILL
 488          HC       2
              *
 489          KK  RCCA09
 490          KM  ROUTE CCA09 TO CCA10
 491          KM  FACILITY = CEDAR AVENUE CHANNEL
 492          KM  FACILITY # = CACH 0000,0027,0029,0051,0053,0079
 493          KM  LINING = CONCRETE
 494          RD     935   0.002   0.015       0    TRAP      12     1.5
              *
 495          KK    CA10
 496          BA   0.032
 497          PB    2.77
 498          LS       0    93.0
 499          UD   0.221
              *
 500          KK   CCA10
 501          KM  CEDAR AVE CHANNEL
 502          HC       2
              *
 503          KK  RCCA10
 504          KM  ROUTE CCA10 TO CCA11
 505          KM  FACILITY = CEDAR AVENUE CHANNEL
 506          KM  FACILITY # = CACH 0000,0027,0029,0051,0053,0079
 507          KM  LINING = CONCRETE
 508          RD    1730   0.002   0.015       0    TRAP      12     1.5
              *
 509          KK    CA11
 510          BA   0.092
 511          PB    2.77
 512          LS       0    90.2
 513          UD   0.288
              *
 514          KK   CCA11
 515          KM  CEDAR AND LAMB
 516          HC       2
              *
 517          KK  RCCA11
 518          KM  ROUTE CCA11 TO CCA12
 519          KM  FACILITY = CEDAR AVENUE CHANNEL
 520          KM  FACILITY # = CACH 0000,0027,0029,0051,0053,0079
 521          KM  LINING = CONCRETE
 522          RD    1340  0.0038   0.015       0    TRAP      10     1.5
              *
1                                    HEC-1 INPUT                                        PAGE 15

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

 523          KK    CA12
 524          BA   0.062
 525          PB    2.77
 526          LS       0    94.1
 527          UD   0.245
              *
 528          KK   CCA12
 529          KM  CEDAR AND PAGE
 530          HC       2
              *
 531          KK  RCCA12
 532          KM  ROUTE CCA12 TO CCA13
 533          KM  FACILITY = CEDAR AVENUE CHANNEL
 534          KM  FACILITY # = CACH 0000,0027,0029,0051,0053,0079
 535          KM  LINING = CONCRETE
 536          RD    1365  0.0037   0.015       0    TRAP      10     1.5
              *
 537          KK   CA13a
 538          BA   0.065
 539          PB    2.77
 540          LS       0    95.9
 541          UD   0.247
              *
 542          KK  CCA13a
 543          KM  CEDAR AND MARION
 544          HC       2
              *
```

```
 545          KK  BN10-C
 546          BA   0.257
 547          PB    2.77
 548          LS       0    88.8
 549          UD   0.406
              *

 550          KK  DBN09a
 551          KM  RETREIVE DBN09a
 552          DR  DBN09a
              *

 553          KK CBN10-C
 554          KM  COMBINE DBN09a AND BN10-C
 555          KM  BONANZA AND SANDHILL
 556          HC       2
              *
1                                      HEC-1 INPUT                                              PAGE 16

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


 557          KKRCBN10-C
 558          KM  ROUTE CBN10-C TO CBN12-C
 559          KM  FACILITY = LAS VEGAS WASH - BONANZA
 560          KM  FACILITY # = LVBZ 0064
 561          KM  LINING = RCB
 562          RD    2630   0.004   0.015       0    TRAP      24       0
              *

 563          KK  BN12-C
 564          BA   0.323
 565          PB    2.77
 566          LS       0    87.4
 567          UD   0.397
              *

 568          KK CBN12-C
 569          KM  COMBINE RCBN10-C AND BN12-C
 570          KM  BONANZA AND LAMB
 571          HC       2
              *

 572          KKRCBN12-C
 573          KM  ROUTE CBN12-C TO CBN15-C
 574          KM  FACILITY = LAS VEGAS WASH - BONANZA
 575          KM  FACILITY # = LVBZ 0000
 576          KM  LINING = RCB
 577          RD    2740   0.004   0.015       0    TRAP      24       0
              *

 578          KK  BN15-C
 579          BA   0.283
 580          PB    2.77
 581          LS       0    87.0
 582          UD   0.414
              *

 583          KK CBN15-C
 584          KM  COMBINE  RCBN12-C AND BN15-C
 585          KM  LAS VEGAS WASH AND BONANZA
 586          HC       2
              *

 587          KKRCBN15-C
 588          KM  ROUTE CCBN15-C TO CCA13a
 589          KM  TO CEDAR CHANNEL FROM MARION DRIVE
 590          KM  LINING = RCB
 591          RD    1371  0.0073   0.015       0    TRAP      20       0
              *
1                                      HEC-1 INPUT                                              PAGE 17

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


 592          KK   CCA13
 593          KM  CEDAR CHANNEL AT MARION DRIVE
 594          KM  COMBINES FLOWS FROM CEDAR CHANNEL AND BONANZA
 595          HC       2
              *

 596          KK  RCCA13
 597          KM  ROUTE CCA13 TO CCA14
 598          KM  FACILITY = CEDAR AVENUE CHANNEL
 599          KM  FACILITY # = CACH 0000,0027,0029,0051,0053,0079
 600          KM  LINING = CONCRETE
 601          RD    1680   0.002   0.015       0    TRAP      14     1.5
              *

 602          KK    CA14
 603          BA   0.055
 604          PB    2.77
 605          LS       0    97.7
 606          UD   0.233
```

```
                    *

607                 KK   CCA14
608                 KM  CEDAR CHANNEL AT WASH
609                 HC       2
                    *

610                 KK DRDTA05
611                 KM  RETURN FLOW FROM DIVERTED
612                 KM  FLOW ON THE STREET FROM PECOS
613                 DR DTA05-3
                    *

614                 KK DRDSTEW
615                 KM  RETURN FLOW FROM DIVERTED
616                 KM  FLOW ON THE STREET FROM STEWART
617                 DR  DSTEWQ
                    *

618                 KK CSTEWBY
619                 KM  BYPASS FLOW ON STEWART
620                 HC       2
                    *
621                 ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    32       CA03a
                 .
                 .
    45           .       CA03c
                 .           .
                 .           .
    50      CCA03c............
                 .
                 .
    54           .       CA03b
                 .           .
                 .           .
    59       CCA03............
                 V
                 V
    63      RCCA03
                 .
                 .
    67           .       CA04b
                 .           .
                 .           .
    72      CCA04b............
                 V
                 V
    76     RCCA04b
                 .
                 .
    80           .       CA04a
                 .           .
                 .           .
    85           .           .       CA04c
                 .           .           .
                 .           .           .
    90     CCA04-1.........................
                 .
                 .
    94           .       CA04g
                 .           V
                 .           V
    99           .      RCA04g
                 .           .
                 .           .
   103           .           .       CA04d
                 .           .           .
                 .           .           .
   108           .      CCA04d............
                 .           V
                 .           V
   112           .      RCA04d
                 .           .
                 .           .
   116           .           .       CA04e
                 .           .           .
                 .           .           .
   121           .      CCA04e............
                 .           V
                 .           V
   125           .     RCCA04e
                 .           .
                 .           .
   129           .           .       CA04f
                 .           .           .
                 .           .           .
   134           .      CCA04f............
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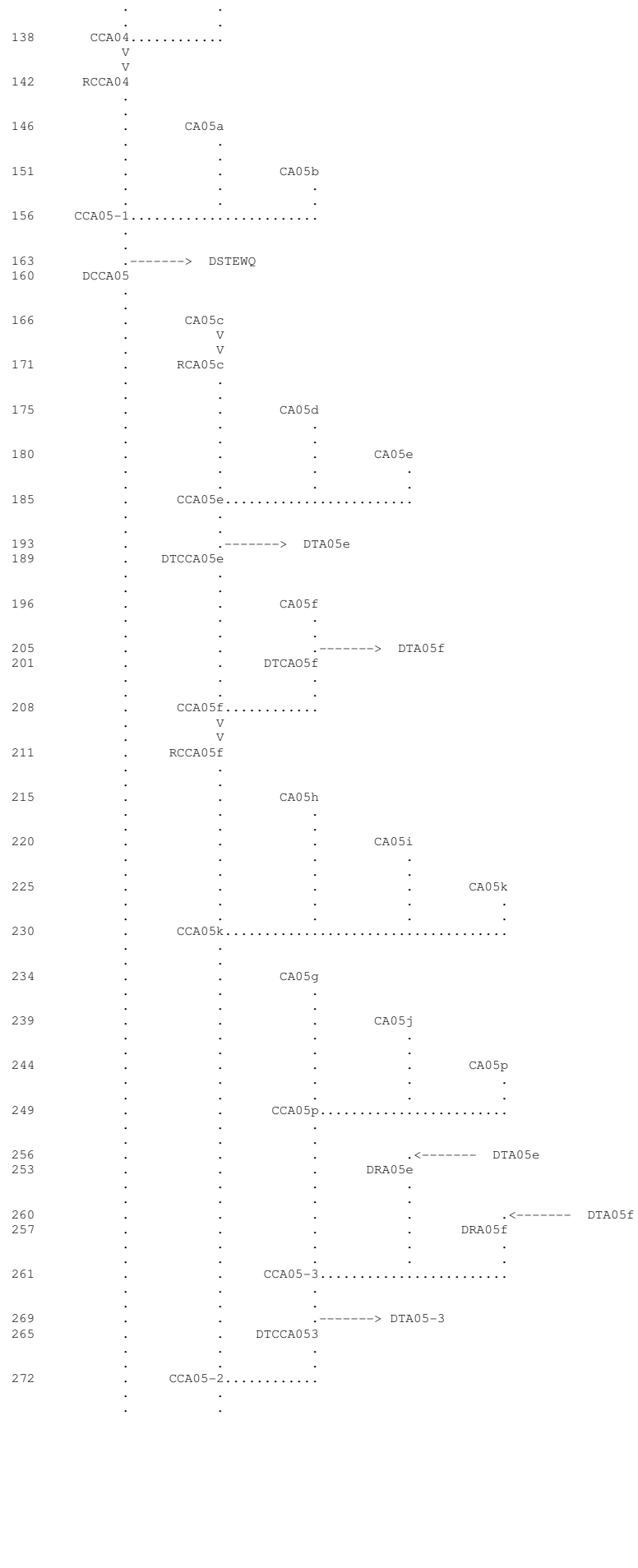
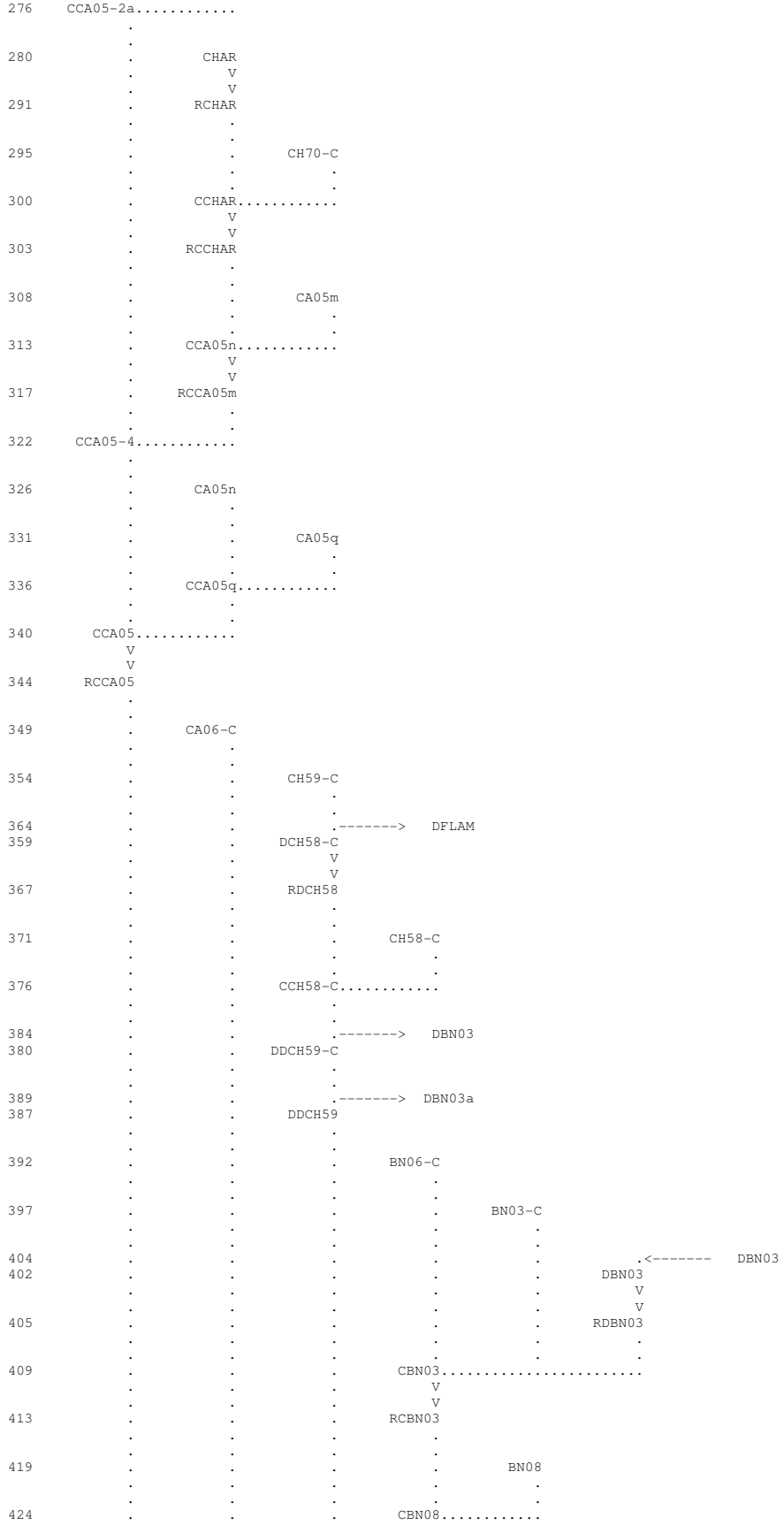
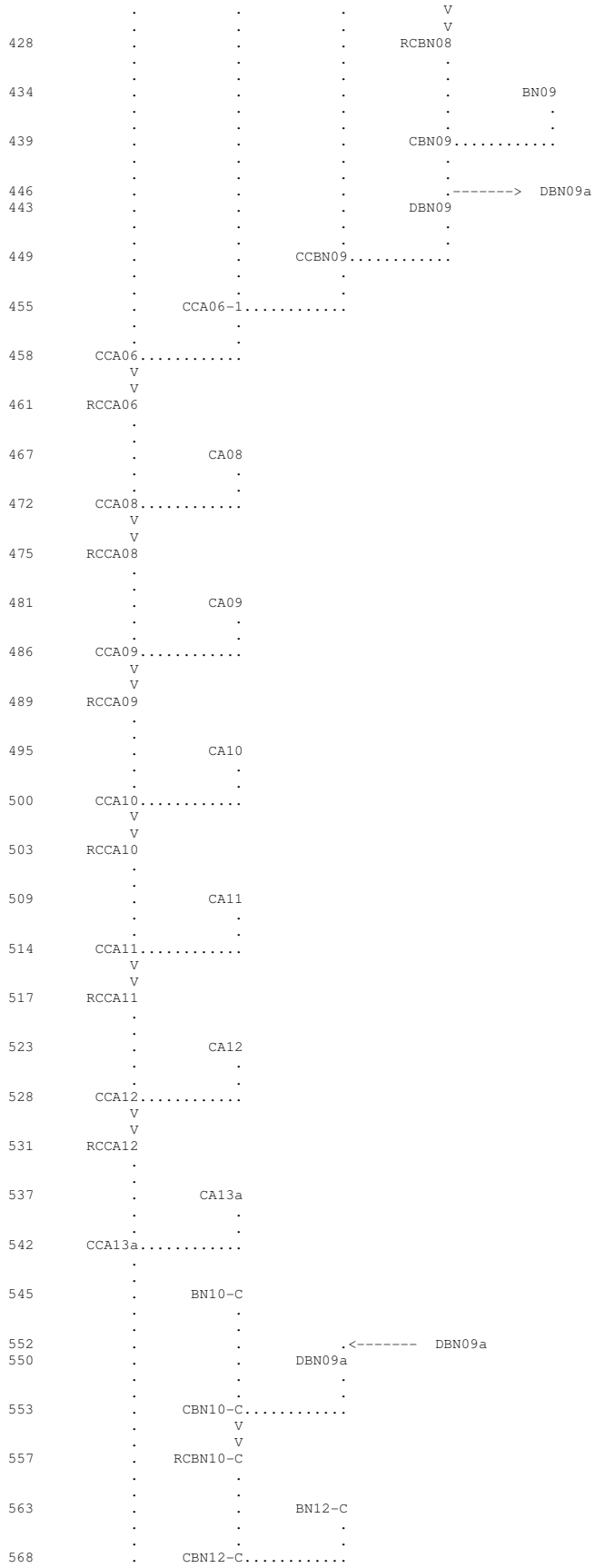
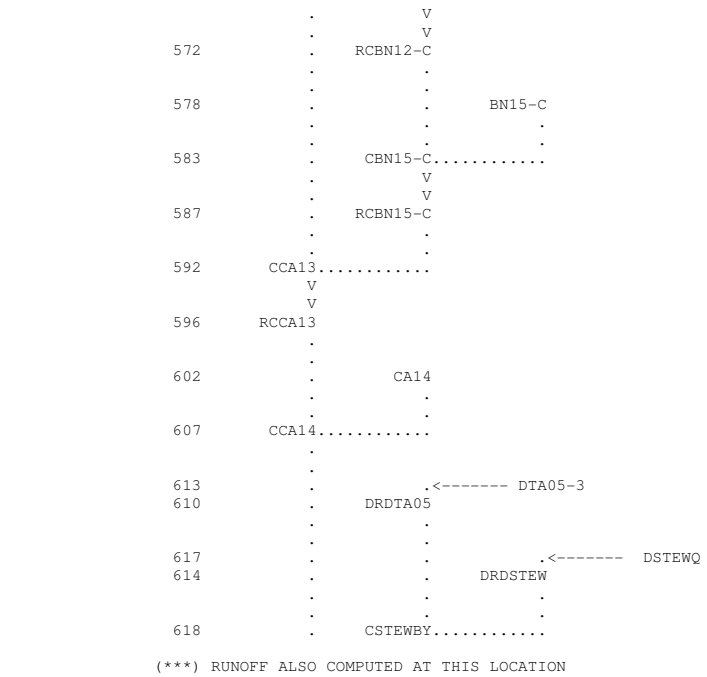

CCA04
RCCA04
CA05a
CA05b
CCA05-1
DSTEWQ
DCCA05
CA05c
RCA05c
CA05d
CA05e
CCA05e
DTA05e
DTCCA05e
CA05f
DTA05f
DTCAO5f
CCA05f
RCCA05f
CA05h
CA05i
CA05k
CCA05k
CA05g
CA05j
CA05p
CCA05p
DTA05e
DRA05e
DTA05f
DRA05f
CCA05-3
DTA05-3
DTCCA053
CCA05-2


276 CCA05-2a
280 CHAR
291 RCHAR
295 CH70-C
300 CCHAR
303 RCCHAR
308 CA05m
313 CCA05n
317 RCCA05m
322 CCA05-4
326 CA05n
331 CA05q
336 CCA05q
340 CCA05
344 RCCA05
349 CA06-C
354 CH59-C
364
359 DCH58-C
367 RDCH58
371 CH58-C
376 CCH58-C
384
380 DDCH59-C
389
387 DDCH59
392 BN06-C
397 BN03-C
404
402
405 RDBN03
409 CBN03
413 RCBN03
419 BN08
424 CBN08
DFLAM
DBN03
DBN03a
DBN03
DBN03


428 RCBN08
434 BN09
439 CBN09
446
443 DBN09
449 CCBN09
455 CCA06-1
458 CCA06
461 RCCA06
467 CA08
472 CCA08
475 RCCA08
481 CA09
486 CCA09
489 RCCA09
495 CA10
500 CCA10
503 RCCA10
509 CA11
514 CCA11
517 RCCA11
523 CA12
528 CCA12
531 RCCA12
537 CA13a
542 CCA13a
545 BN10-C
552
550 DBN09a
553 CBN10-C
557 RCBN10-C
563 BN12-C
568 CBN12-C
DBN09a
DBN09a



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   03JUN15  TIME  11:32:48   *
*                                       *
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```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

LAS VEGAS WASH CENTRAL-CEDAR AVENUE

INPUT FILE = CEDAR_INT.DAT
INPUT FILE DATE = APRIL 2014
DESIGN STORM = 100-YEAR 6-HR STORM AND 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY ATKINS (MANOGYA KHANAL)
CHECKED BY ATKINS (BRIAN ROWLEY, PE, CFM)
NO STORM CENTERING
REFERENCED HYDROLOGIC MODELS:
2008 LAS VEGAS VALLEY FLOOD CONTROL DISTRICT
MASTER PLAN UPDATE (PBS&J, SEPTEMBER 2008)
CENTRAL NEIGHBORHOOD STUDY

JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

AREA SQ. MI.	DARF
0-0.5	0.990
0.5-1	0.975
1-2	0.950
2-3	0.925
3-4	0.915
4-5	0.908
5-6	0.903

29 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
.99 .98 .95 .93 .92 .91 .90 .57
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 .99	RATIO 2 .98	RATIO 3 .95	RATIO 4 .93	RATIO 5 .92	RATIO 6 .91	RATIO 7 .90	RATIO 8 .57
HYDROGRAPH AT												
+	CA03a	.09	1	FLOW	107.	104.	100.	96.	95.	94.	93.	43.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	CA03c	.02	1	FLOW	25.	24.	23.	22.	22.	22.	22.	10.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT												
+	CCA03c	.12	1	FLOW	131.	128.	123.	119.	117.	115.	115.	53.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	CA03b	.08	1	FLOW	86.	84.	81.	77.	76.	75.	75.	35.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT												
+	CCA03	.20	1	FLOW	217.	212.	204.	196.	193.	191.	189.	88.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO												
+	RCCA03	.20	1	FLOW	211.	205.	199.	191.	188.	185.	183.	86.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT												
+	CA04b	.06	1	FLOW	71.	69.	66.	64.	63.	62.	62.	29.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
2 COMBINED AT												
+	CCA04b	.26	1	FLOW	278.	272.	262.	251.	248.	245.	242.	112.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
ROUTED TO												
+	RCCA04b	.26	1	FLOW	271.	270.	256.	248.	249.	243.	238.	113.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
HYDROGRAPH AT												
+	CA04a	.04	1	FLOW	44.	43.	41.	40.	39.	38.	38.	18.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT												
+	CA04c	.03	1	FLOW	41.	40.	39.	38.	37.	37.	36.	18.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT												
+	CCA04-1	.33	1	FLOW	345.	342.	326.	315.	315.	308.	303.	143.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT												
+	CA04g	.05	1	FLOW	81.	79.	77.	74.	73.	73.	72.	39.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO												
+	RCA04g	.05	1	FLOW	79.	77.	75.	71.	70.	69.	69.	38.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT												
+	CA04d	.05	1	FLOW	72.	70.	68.	66.	65.	64.	64.	33.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT												
+	CCA04d	.10	1	FLOW	140.	137.	133.	129.	127.	125.	123.	65.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
ROUTED TO												
+	RCA04d	.10	1	FLOW	142.	139.	135.	129.	128.	126.	125.	64.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92

HYDROGRAPH AT													
+	CA04e	.19	1	FLOW	194.	190.	184.	177.	174.	172.	171.	85.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
2 COMBINED AT													
+	CCA04e	.29	1	FLOW	333.	326.	315.	304.	299.	296.	294.	148.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO													
+	RCCA04e	.29	1	FLOW	321.	319.	306.	294.	293.	293.	291.	147.
				TIME	3.92	3.83	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT													
+	CA04f	.05	1	FLOW	61.	60.	58.	56.	55.	55.	54.	29.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
2 COMBINED AT													
+	CCA04f	.34	1	FLOW	363.	360.	344.	331.	329.	330.	328.	163.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
2 COMBINED AT													
+	CCA04	.67	1	FLOW	683.	675.	648.	623.	620.	617.	611.	292.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO													
+	RCCA04	.67	1	FLOW	669.	664.	637.	609.	607.	602.	601.	292.
				TIME	3.83	3.83	3.92	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT													
+	CA05a	.04	1	FLOW	47.	46.	44.	43.	42.	42.	41.	21.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CA05b	.05	1	FLOW	66.	65.	62.	60.	60.	59.	59.	31.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
3 COMBINED AT													
+	CCA05-1	.75	1	FLOW	751.	745.	714.	685.	682.	676.	674.	323.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
DIVERSION TO													
+	DSTEWQ	.75	1	FLOW	321.	315.	284.	255.	252.	246.	244.	0.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	.00
HYDROGRAPH AT													
+	DCCA05	.75	1	FLOW	430.	430.	430.	430.	430.	430.	430.	323.
				TIME	3.58	3.67	3.67	3.67	3.67	3.67	3.67	3.92
HYDROGRAPH AT													
+	CA05c	.02	1	FLOW	36.	35.	34.	33.	32.	32.	32.	17.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RCA05c	.02	1	FLOW	34.	33.	32.	31.	30.	30.	30.	16.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
HYDROGRAPH AT													
+	CA05d	.04	1	FLOW	58.	57.	55.	53.	53.	52.	52.	27.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
HYDROGRAPH AT													
+	CA05e	.00	1	FLOW	5.	5.	5.	5.	4.	4.	4.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT													
+	CCA05e	.07	1	FLOW	97.	95.	92.	89.	87.	86.	86.	44.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
DIVERSION TO													
+	DTA05e	.07	1	FLOW	52.	51.	49.	47.	47.	46.	46.	24.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	DTCCA05e	.07	1	FLOW	45.	44.	43.	41.	41.	40.	40.	21.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	CA05f	.01	1	FLOW	14.	14.	14.	13.	13.	13.	13.	7.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
DIVERSION TO													
+	DTA05f	.01	1	FLOW	7.	7.	7.	7.	6.	6.	6.	3.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	DTCAO5f	.01	1	FLOW	7.	7.	7.	7.	6.	6.	6.	3.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CCA05f	.08	1	FLOW	52.	51.	49.	48.	47.	47.	46.	24.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
ROUTED TO													
+	RCCA05f	.08	1	FLOW	50.	49.	48.	46.	45.	45.	44.	23.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67

HYDROGRAPH AT													
+	CA05h	.00	1	FLOW	5.	5.	5.	5.	5.	4.	4.	2.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	CA05i	.00	1	FLOW	7.	7.	7.	6.	6.	6.	6.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	CA05k	.01	1	FLOW	16.	16.	16.	15.	15.	15.	15.	8.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT													
+	CCA05k	.09	1	FLOW	77.	75.	73.	70.	69.	69.	68.	36.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	CA05g	.01	1	FLOW	12.	11.	11.	11.	11.	10.	10.	5.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	CA05j	.00	1	FLOW	9.	9.	8.	8.	8.	8.	8.	4.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	CA05p	.01	1	FLOW	8.	8.	8.	8.	8.	8.	7.	4.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	CCA05p	.02	1	FLOW	28.	27.	26.	25.	25.	25.	25.	13.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	DRA05e	.00	1	FLOW	52.	51.	49.	47.	47.	46.	46.	24.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	DRA05f	.00	1	FLOW	7.	7.	7.	7.	6.	6.	6.	3.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT													
+	CCA05-3	.02	1	FLOW	86.	84.	81.	79.	77.	77.	76.	40.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
DIVERSION TO													
+	DTA05-3	.02	1	FLOW	79.	77.	75.	72.	71.	71.	70.	37.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT													
+	DTCCA053	.02	1	FLOW	7.	7.	7.	6.	6.	6.	6.	3.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CCA05-2	.11	1	FLOW	84.	82.	79.	77.	75.	75.	74.	39.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CCA05-2a	.86	1	FLOW	514.	502.	500.	498.	497.	496.	496.	340.
				TIME	3.58	3.67	3.67	3.67	3.67	3.67	3.67	3.92
HYDROGRAPH AT													
+	CHAR	.04	1	FLOW	43.	43.	43.	43.	43.	43.	43.	43.
				TIME	3.42	3.42	3.42	3.42	3.42	3.42	3.42	3.42
ROUTED TO													
+	RCHAR	.04	1	FLOW	44.	44.	44.	44.	44.	44.	44.	44.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
HYDROGRAPH AT													
+	CH70-C	.14	1	FLOW	165.	162.	156.	151.	149.	148.	147.	79.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT													
+	CCHAR	.17	1	FLOW	206.	203.	198.	192.	190.	189.	188.	121.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
ROUTED TO													
+	RCCHAR	.17	1	FLOW	205.	202.	197.	192.	190.	188.	187.	120.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
HYDROGRAPH AT													
+	CA05m	.00	1	FLOW	8.	8.	7.	7.	7.	7.	7.	4.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CCA05n	.18	1	FLOW	210.	206.	201.	196.	194.	192.	191.	122.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
ROUTED TO													
+	RCCA05m	.18	1	FLOW	208.	205.	199.	194.	192.	191.	190.	121.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT													
+	CCA05-4	1.04	1	FLOW	699.	695.	688.	681.	678.	676.	674.	450.

				TIME	3.67	3.67	3.75	3.75	3.75	3.75	3.75	3.83
HYDROGRAPH AT													
+	CA05n	.00	1	FLOW	6.	6.	6.	6.	6.	6.	6.	3.
				TIME	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT													
+	CA05q	.01	1	FLOW	12.	11.	11.	10.	10.	10.	10.	4.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT													
+	CCA05q	.02	1	FLOW	17.	17.	16.	16.	15.	15.	15.	6.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
2 COMBINED AT													
+	CCA05	1.06	1	FLOW	715.	710.	702.	694.	692.	689.	687.	454.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.83
ROUTED TO													
+	RCCA05	1.06	1	FLOW	713.	708.	701.	693.	690.	688.	686.	449.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.92
HYDROGRAPH AT													
+	CA06-C	.41	1	FLOW	255.	248.	237.	226.	222.	219.	217.	83.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT													
+	CH59-C	.21	1	FLOW	246.	242.	234.	227.	224.	222.	221.	124.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
DIVERSION TO													
+	DFLAM	.21	1	FLOW	102.	98.	90.	83.	80.	78.	77.	0.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	.00
HYDROGRAPH AT													
+	DCH58-C	.21	1	FLOW	144.	144.	144.	144.	144.	144.	144.	124.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.83
ROUTED TO													
+	RDCH58	.21	1	FLOW	149.	147.	147.	148.	148.	148.	148.	125.
				TIME	3.67	3.67	3.75	3.75	3.75	3.75	3.75	3.92
HYDROGRAPH AT													
+	CH58-C	.13	1	FLOW	156.	153.	149.	144.	142.	141.	140.	77.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT													
+	CCH58-C	.34	1	FLOW	302.	299.	295.	292.	290.	289.	288.	194.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
DIVERSION TO													
+	DBN03	.34	1	FLOW	135.	132.	128.	125.	123.	122.	121.	27.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
HYDROGRAPH AT													
+	DDCH59-C	.34	1	FLOW	167.	167.	167.	167.	167.	167.	167.	167.
				TIME	3.50	3.50	3.50	3.58	3.58	3.58	3.58	3.75
DIVERSION TO													
+	DBN03a	.34	1	FLOW	167.	167.	167.	167.	167.	167.	167.	167.
				TIME	3.50	3.50	3.50	3.58	3.58	3.58	3.58	3.75
HYDROGRAPH AT													
+	DDCH59	.34	1	FLOW	0.	0.	0.	0.	0.	0.	0.	0.
				TIME	.00	.00	.00	.00	.00	.00	.00	.00
HYDROGRAPH AT													
+	BN06-C	.34	1	FLOW	420.	411.	396.	382.	376.	371.	368.	179.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.67
HYDROGRAPH AT													
+	BN03-C	.54	1	FLOW	496.	485.	466.	448.	440.	435.	431.	197.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
HYDROGRAPH AT													
+	DBN03	.00	1	FLOW	135.	132.	128.	125.	123.	122.	121.	27.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.83
ROUTED TO													
+	RDBN03	.00	1	FLOW	139.	144.	148.	119.	121.	122.	123.	27.
				TIME	3.92	3.92	3.83	3.92	3.92	3.92	3.92	4.08
3 COMBINED AT													
+	CBN03	.88	1	FLOW	868.	862.	873.	817.	807.	798.	790.	353.
				TIME	3.67	3.83	3.83	3.83	3.83	3.83	3.83	3.75
ROUTED TO													
+	RCBN03	.88	1	FLOW	861.	853.	852.	803.	794.	783.	778.	353.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.75
HYDROGRAPH AT													
+	BN08	.21	1	FLOW	220.	216.	209.	202.	199.	197.	196.	103.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
2 COMBINED AT													

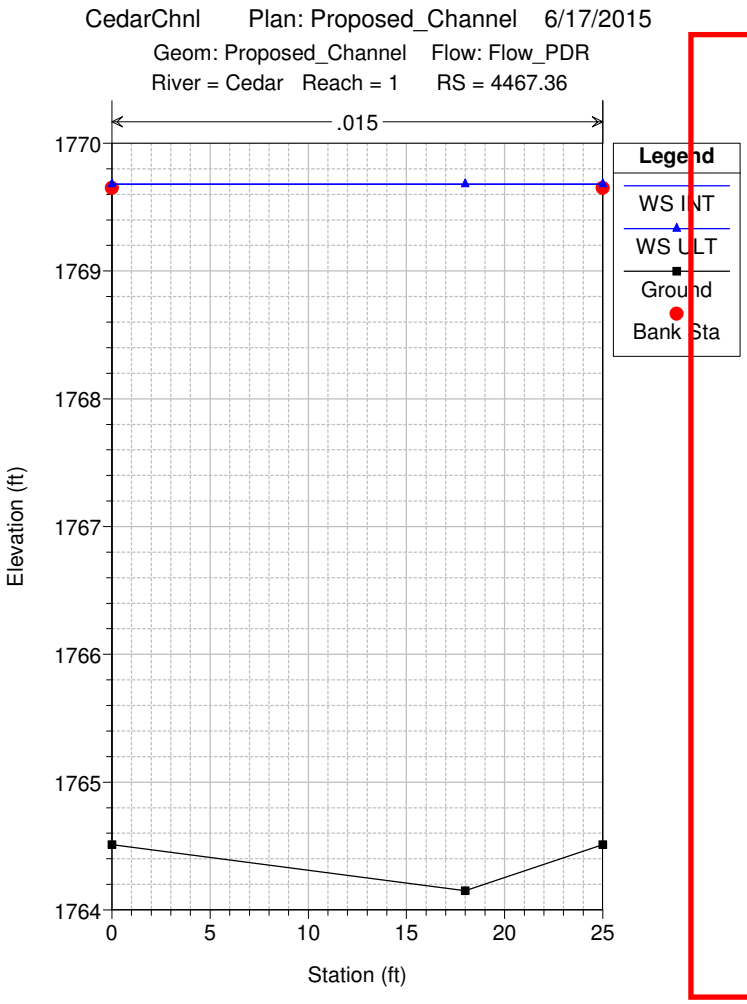
+	CBN08	1.09	1	FLOW	1082.	1069.	1061.	1005.	994.	980.	974.	453.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.75
ROUTED TO												
+	RCBN08	1.09	1	FLOW	1080.	1065.	1050.	998.	987.	974.	966.	445.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.75
HYDROGRAPH AT												
+	BN09	.23	1	FLOW	167.	163.	156.	149.	146.	144.	143.	59.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
2 COMBINED AT												
+	CBN09	1.32	1	FLOW	1247.	1228.	1206.	1147.	1133.	1118.	1109.	499.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
DIVERSION TO												
+	DBN09a	1.32	1	FLOW	1045.	1026.	1004.	945.	931.	916.	907.	297.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT												
+	DBN09	1.32	1	FLOW	202.	202.	202.	202.	202.	202.	202.	202.
				TIME	3.33	3.33	3.33	3.42	3.42	3.42	3.42	3.50
2 COMBINED AT												
+	CCBN09	1.66	1	FLOW	202.	202.	202.	202.	202.	202.	202.	202.
				TIME	3.33	3.33	3.33	3.42	3.42	3.42	3.42	3.50
2 COMBINED AT												
+	CCA06-1	2.07	1	FLOW	457.	450.	439.	428.	424.	421.	419.	285.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
2 COMBINED AT												
+	CCA06	3.13	1	FLOW	1138.	1128.	1110.	1092.	1085.	1080.	1077.	733.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
ROUTED TO												
+	RCCA06	3.13	1	FLOW	1136.	1126.	1108.	1090.	1083.	1078.	1075.	731.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT												
+	CA08	.07	1	FLOW	71.	69.	66.	63.	62.	61.	61.	26.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.75
2 COMBINED AT												
+	CCA08	3.20	1	FLOW	1196.	1184.	1164.	1144.	1136.	1131.	1127.	750.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
ROUTED TO												
+	RCCA08	3.20	1	FLOW	1193.	1182.	1162.	1141.	1133.	1127.	1123.	745.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT												
+	CA09	.05	1	FLOW	58.	57.	55.	53.	52.	52.	51.	25.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT												
+	CCA09	3.25	1	FLOW	1237.	1224.	1202.	1181.	1172.	1166.	1162.	760.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
ROUTED TO												
+	RCCA09	3.25	1	FLOW	1234.	1221.	1199.	1177.	1167.	1161.	1157.	753.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT												
+	CA10	.03	1	FLOW	44.	43.	42.	41.	40.	40.	39.	22.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT												
+	CCA10	3.28	1	FLOW	1265.	1252.	1229.	1206.	1196.	1189.	1185.	765.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
ROUTED TO												
+	RCCA10	3.28	1	FLOW	1256.	1242.	1218.	1194.	1183.	1174.	1170.	760.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	4.00
HYDROGRAPH AT												
+	CA11	.09	1	FLOW	103.	101.	97.	94.	92.	91.	91.	46.
				TIME	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
2 COMBINED AT												
+	CCA11	3.38	1	FLOW	1349.	1333.	1306.	1279.	1266.	1257.	1253.	789.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	4.00
ROUTED TO												
+	RCCA11	3.38	1	FLOW	1339.	1323.	1295.	1266.	1254.	1246.	1242.	787.
				TIME	3.83	3.83	3.83	3.83	3.92	3.92	3.92	4.00
HYDROGRAPH AT												
+	CA12	.06	1	FLOW	86.	85.	82.	80.	79.	78.	77.	43.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT												
+	CCA12	3.44	1	FLOW	1405.	1389.	1359.	1328.	1314.	1304.	1299.	809.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	4.00

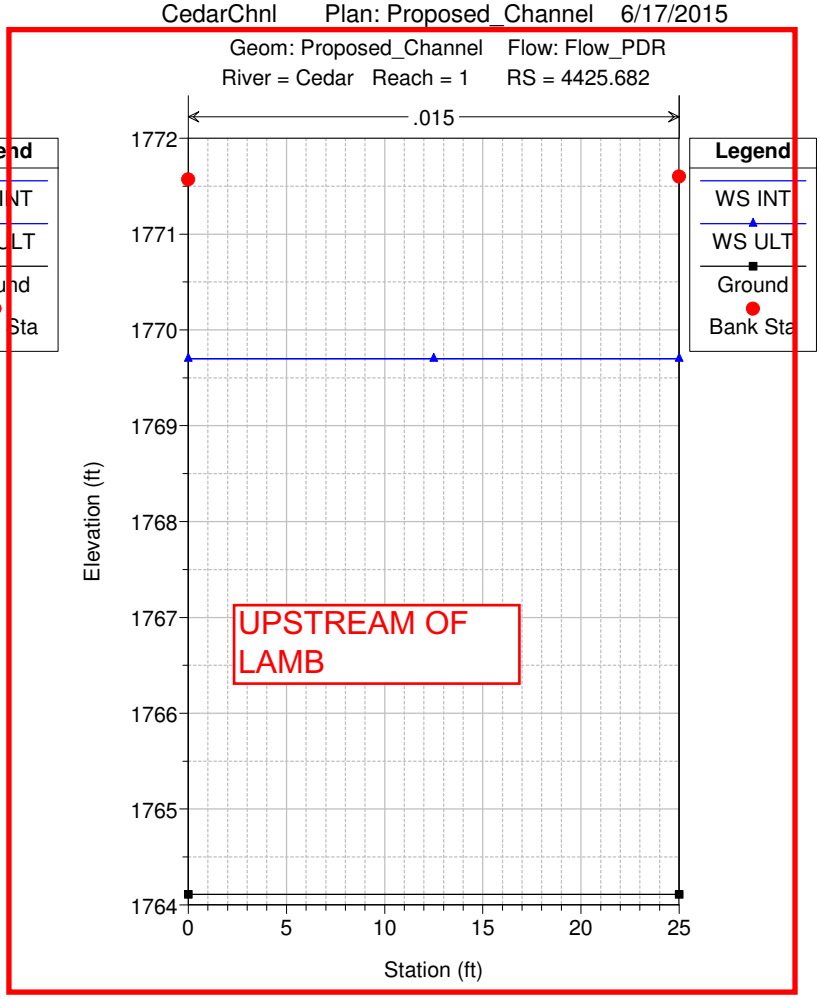
ROUTED TO												
+	RCCA12	3.44	1	FLOW	1394.	1375.	1345.	1316.	1305.	1296.	1291.	806.
				TIME	3.83	3.83	3.83	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT												
+	CA13a	.06	1	FLOW	95.	93.	91.	88.	87.	86.	86.	50.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT												
+	CCA13a	3.50	1	FLOW	1467.	1447.	1415.	1381.	1364.	1354.	1350.	830.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	4.00
HYDROGRAPH AT												
+	BN10-C	.26	1	FLOW	232.	227.	219.	211.	208.	205.	204.	97.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT												
+	DBN09a	.00	1	FLOW	1045.	1026.	1004.	945.	931.	916.	907.	297.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
2 COMBINED AT												
+	CBN10-C	.26	1	FLOW	1278.	1254.	1223.	1156.	1139.	1122.	1111.	394.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO												
+	RCBN10-C	.26	1	FLOW	1267.	1241.	1200.	1141.	1116.	1105.	1089.	392.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT												
+	BN12-C	.32	1	FLOW	278.	272.	262.	251.	247.	244.	242.	111.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
2 COMBINED AT												
+	CBN12-C	.58	1	FLOW	1545.	1513.	1462.	1392.	1363.	1349.	1331.	503.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
ROUTED TO												
+	RCBN12-C	.58	1	FLOW	1521.	1491.	1444.	1374.	1346.	1339.	1316.	498.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
HYDROGRAPH AT												
+	BN15-C	.28	1	FLOW	234.	229.	220.	211.	208.	205.	203.	92.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.92
2 COMBINED AT												
+	CBN15-C	.86	1	FLOW	1753.	1716.	1660.	1582.	1551.	1541.	1516.	589.
				TIME	3.83	3.92	3.92	3.92	3.92	3.92	3.92	3.92
ROUTED TO												
+	RCBN15-C	.86	1	FLOW	1750.	1715.	1658.	1580.	1549.	1538.	1513.	582.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
2 COMBINED AT												
+	CCA13	4.37	1	FLOW	3201.	3142.	3056.	2949.	2906.	2885.	2856.	1399.
				TIME	3.83	3.83	3.92	3.92	3.92	3.92	3.92	3.92
ROUTED TO												
+	RCCA13	4.37	1	FLOW	3190.	3135.	3051.	2939.	2895.	2872.	2849.	1388.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT												
+	CA14	.05	1	FLOW	85.	83.	81.	79.	78.	77.	77.	47.
				TIME	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
2 COMBINED AT												
+	CCA14	4.42	1	FLOW	3238.	3182.	3096.	2983.	2939.	2916.	2892.	1408.
				TIME	3.92	3.92	3.92	3.92	3.92	3.92	3.92	4.00
HYDROGRAPH AT												
+	DRDTA05	.00	1	FLOW	79.	77.	75.	72.	71.	71.	70.	37.
				TIME	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT												
+	DRDSTEW	.00	1	FLOW	321.	315.	284.	255.	252.	246.	244.	0.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	.00
2 COMBINED AT												
+	CSTEWBY	.00	1	FLOW	364.	357.	325.	294.	290.	285.	283.	37.
				TIME	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.58

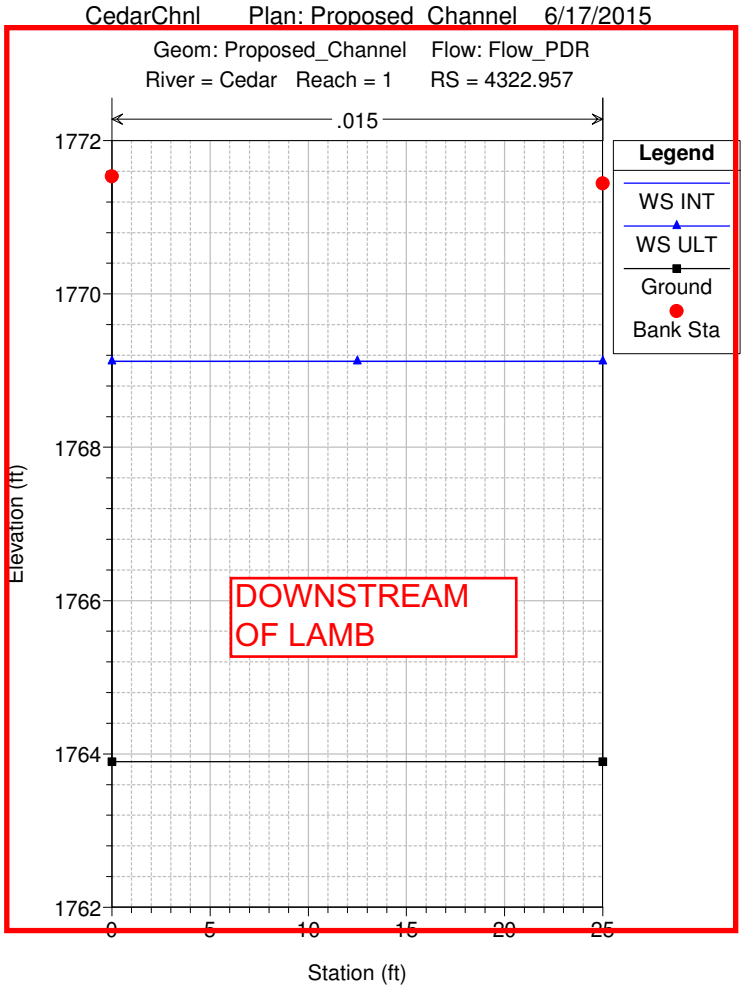
1

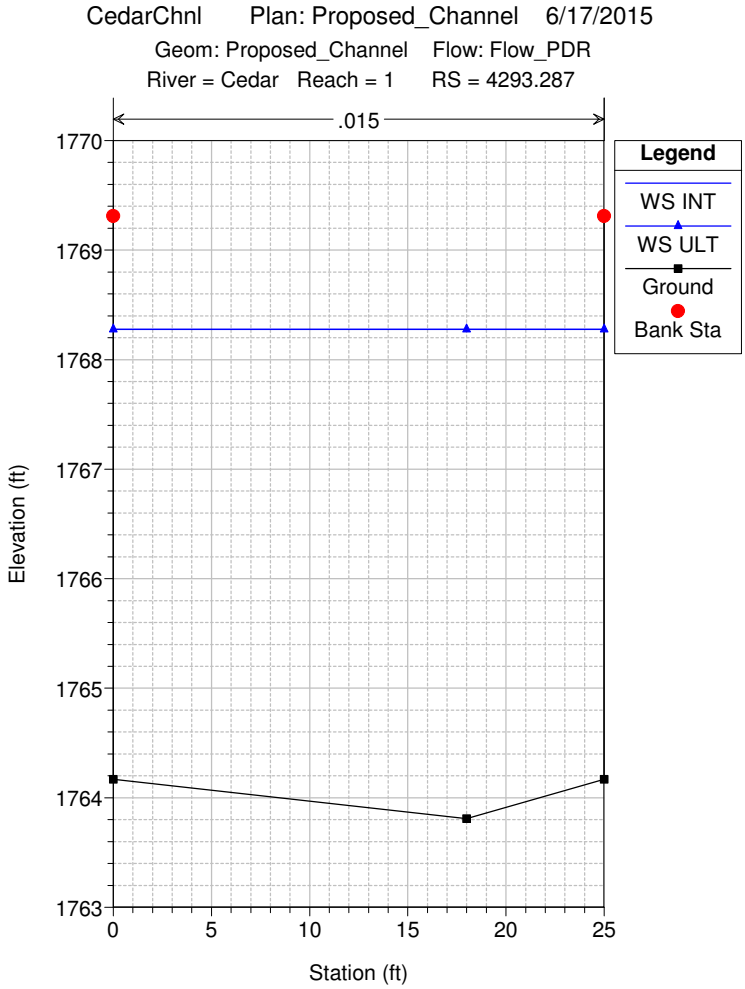
*** NORMAL END OF HEC-1 ***

Las Vegas Wash Central, Cedar Avenue Channel
Preliminary Design Report

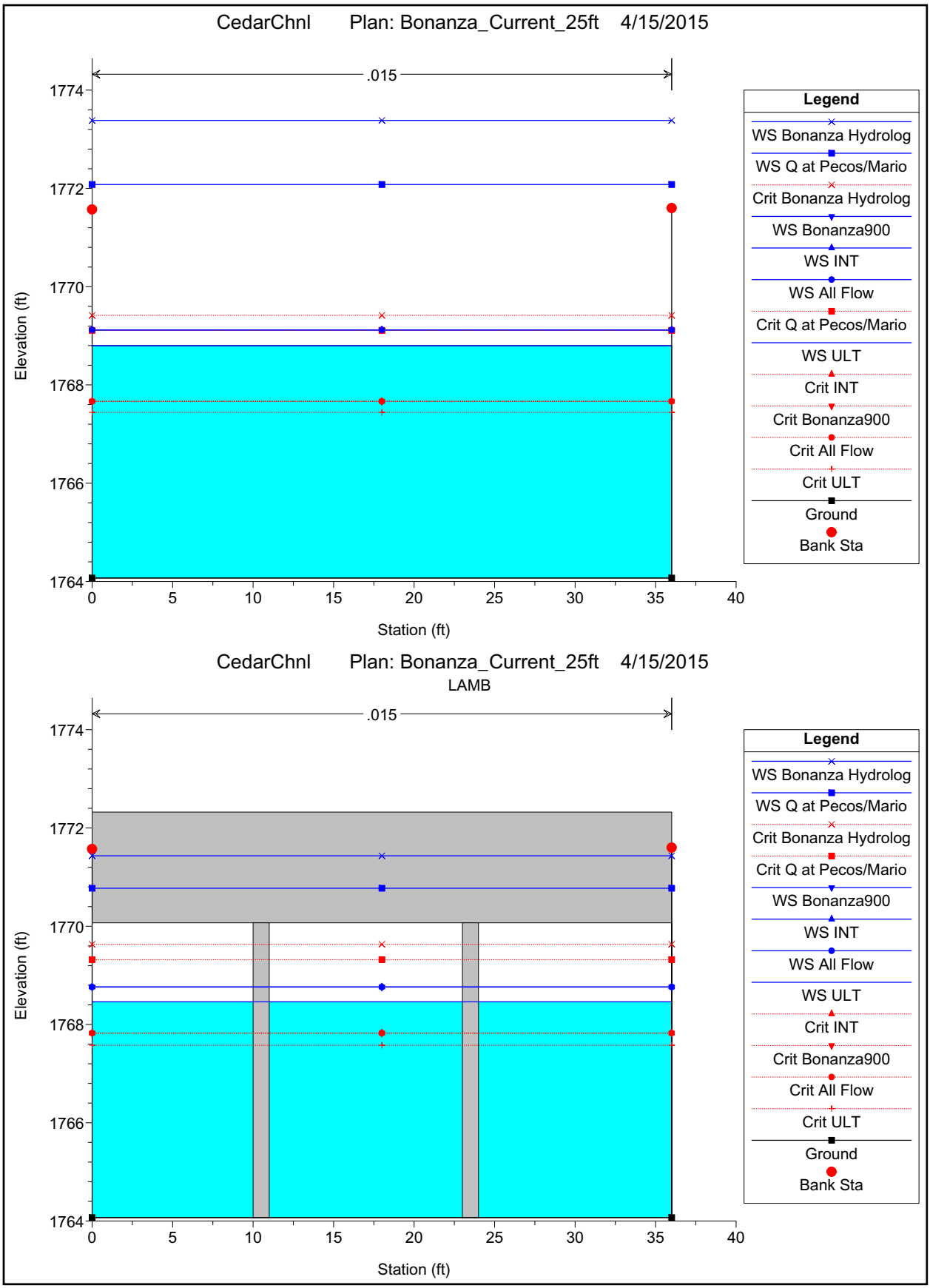

CedarChnl Plan: Proposed_Channel 6/17/2015
Geom: Proposed_Channel Flow: Flow_PDR
River = Cedar Reach = 1 RS = 4467.36
.015
Legend
WS INT
WS ULT
Ground
Bank Sta
Elevation (ft)
Station (ft)


CedarChnl Plan: Proposed_Channel 6/17/2015
Geom: Proposed_Channel Flow: Flow_PDR
River = Cedar Reach = 1 RS = 4425.682
.015
Legend
WS INT
WS ULT
Ground
Bank Sta
UPSTREAM OF LAMB
Elevation (ft)
Station (ft)


CedarChnl Plan: Proposed_Channel 6/17/2015
Geom: Proposed_Channel Flow: Flow_PDR
River = Cedar Reach = 1 RS = 4322.957
.015
Legend
WS INT
WS ULT
Ground
Bank Sta
DOWNSTREAM OF LAMB
Elevation (ft)
Station (ft)


CedarChnl Plan: Proposed_Channel 6/17/2015
Geom: Proposed_Channel Flow: Flow_PDR
River = Cedar Reach = 1 RS = 4293.287
.015
Legend
WS INT
WS ULT
Ground
Bank Sta
Elevation (ft)
Station (ft)

Early HEC-RAS Modeling Results that include flows from Future Bonanza Road Regional Facility as provided from Atkins North America


CedarChnl Plan: Bonanza_Current_25ft 4/15/2015
.015
1774
1772
1770
1768
1766
1764
Elevation (ft)
0
5
10
15
20
25
30
35
40
Station (ft)
Legend
WS Bonanza Hydrolog
WS Q at Pecos/Mario
Crit Bonanza Hydrolog
WS Bonanza900
WS INT
WS All Flow
Crit Q at Pecos/Mario
WS ULT
Crit INT
Crit Bonanza900
Crit All Flow
Crit ULT
Ground
Bank Sta
CedarChnl Plan: Bonanza_Current_25ft 4/15/2015
LAMB
.015
1774
1772
1770
1768
1766
1764
Elevation (ft)
0
5
10
15
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25
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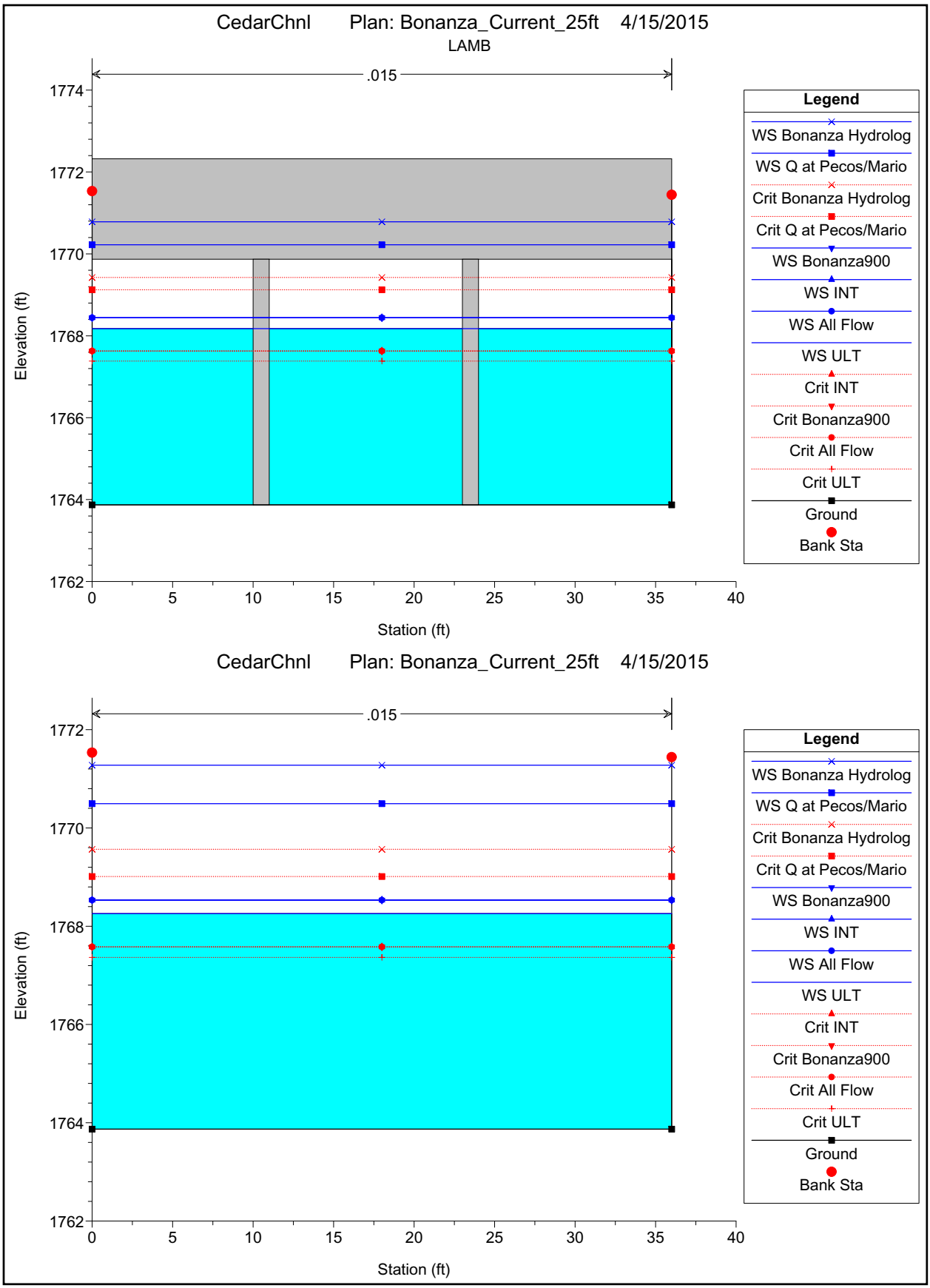
35
40
Station (ft)
Legend
WS Bonanza Hydrolog
WS Q at Pecos/Mario
Crit Bonanza Hydrolog
Crit Q at Pecos/Mario
WS Bonanza900
WS INT
WS All Flow
WS ULT
Crit INT
Crit Bonanza900
Crit All Flow
Crit ULT
Ground
Bank Sta


CedarChnl Plan: Bonanza_Current_25ft 4/15/2015
LAMB
.015
1774
1772
1770
1768
1766
1764
1762
Elevation (ft)
0
5
10
15
20
25
30
35
40
Station (ft)
Legend
WS Bonanza Hydrolog
WS Q at Pecos/Mario
Crit Bonanza Hydrolog
Crit Q at Pecos/Mario
WS Bonanza900
WS INT
WS All Flow
WS ULT
Crit INT
Crit Bonanza900
Crit All Flow
Crit ULT
Ground
Bank Sta
CedarChnl Plan: Bonanza_Current_25ft 4/15/2015
.015
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1762
Elevation (ft)
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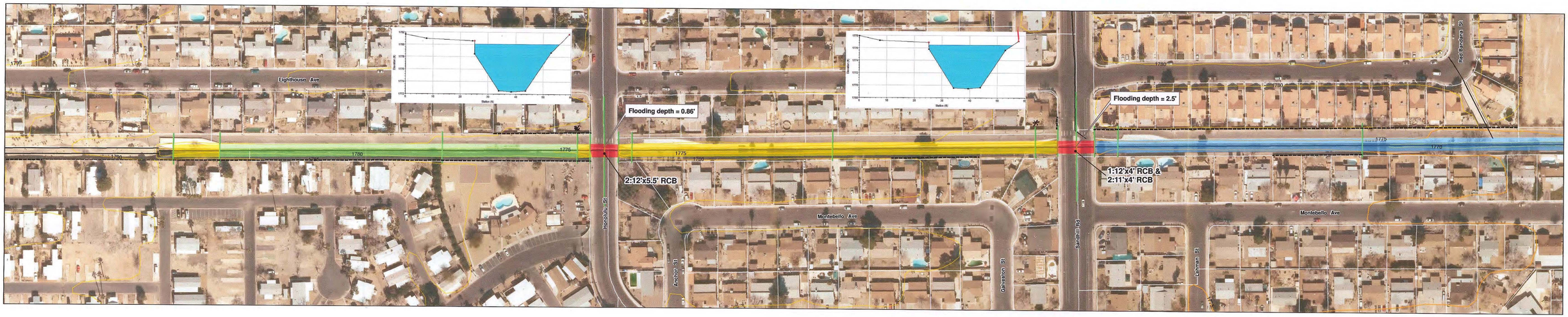
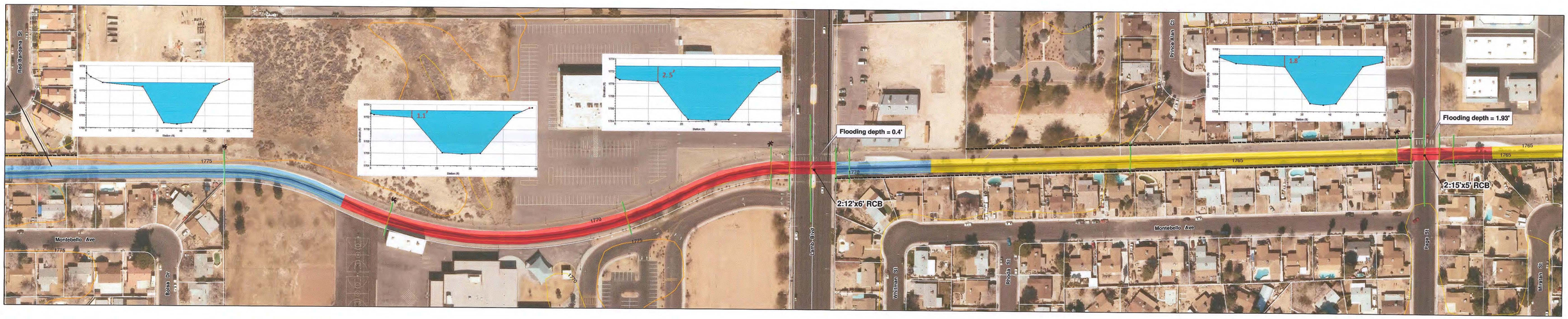
40
Station (ft)
Legend
WS Bonanza Hydrolog
WS Q at Pecos/Mario
Crit Bonanza Hydrolog
Crit Q at Pecos/Mario
WS Bonanza900
WS INT
WS All Flow
WS ULT
Crit INT
Crit Bonanza900
Crit All Flow
Crit ULT
Ground
Bank Sta

HEC-RAS Plan: Bonanza 25ft River: Cedar Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	4566.89*	Q at Pecos/Mario	2322.00	1764.35	1772.10	1769.58	1773.23	0.000787	8.52	272.53	36.00	0.55
1	4566.89*	All Flow	1400.00	1764.35	1769.16	1768.13	1770.26	0.001249	8.40	166.75	36.00	0.69
1	4517.12*	ULT	1271.00	1764.25	1768.80	1767.80	1769.81	0.001231	8.08	157.34	36.00	0.68
1	4517.12*	INT	1400.00	1764.25	1769.12	1768.02	1770.19	0.001203	8.29	168.82	36.00	0.67
1	4517.12*	Bonanza900	1400.00	1764.25	1769.12	1768.02	1770.19	0.001203	8.29	168.82	36.00	0.67
1	4517.12*	Bonanza Hydrolog	2527.00	1764.25	1773.38	1769.77	1774.34	0.000572	7.84	322.33	36.00	0.46
1	4517.12*	Q at Pecos/Mario	2322.00	1764.25	1772.08	1769.48	1773.18	0.000764	8.43	275.32	36.00	0.54
1	4517.12*	All Flow	1400.00	1764.25	1769.12	1768.02	1770.19	0.001203	8.29	168.82	36.00	0.67
1	4467.36	ULT	1271.00	1764.15	1768.76	1767.70	1769.75	0.001181	7.97	159.44	36.00	0.67
1	4467.36	INT	1400.00	1764.15	1769.08	1767.93	1770.12	0.001157	8.19	170.98	36.00	0.66
1	4467.36	Bonanza900	1400.00	1764.15	1769.08	1767.93	1770.12	0.001157	8.19	170.98	36.00	0.66
1	4467.36	Bonanza Hydrolog	2527.00	1764.15	1773.37	1769.67	1774.31	0.000557	7.77	325.37	36.00	0.46
1	4467.36	Q at Pecos/Mario	2322.00	1764.15	1772.06	1769.38	1773.14	0.000742	8.35	278.12	36.00	0.53
1	4467.36	All Flow	1400.00	1764.15	1769.08	1767.93	1770.12	0.001157	8.19	170.98	36.00	0.66
1	4425.682	ULT	1271.00	1764.07	1768.80	1767.44	1769.66	0.000977	7.47	170.24	36.00	0.61
1	4425.682	INT	1400.00	1764.07	1769.12	1767.67	1770.04	0.000970	7.70	181.77	36.00	0.60
1	4425.682	Bonanza900	1400.00	1764.07	1769.12	1767.67	1770.04	0.000970	7.70	181.77	36.00	0.60
1	4425.682	Bonanza Hydrolog	2527.00	1764.07	1773.38	1769.42	1774.27	0.000515	7.54	335.31	36.00	0.44
1	4425.682	Q at Pecos/Mario	2322.00	1764.07	1772.08	1769.11	1773.09	0.000674	8.05	288.32	36.00	0.50
1	4425.682	All Flow	1400.00	1764.07	1769.12	1767.67	1770.04	0.000970	7.70	181.77	36.00	0.60
1	4380		Bridge									
1	4322.957	ULT	1343.00	1763.87	1768.26	1767.37	1769.38	0.001372	8.50	157.95	36.00	0.72
1	4322.957	INT	1467.00	1763.87	1768.53	1767.58	1769.72	0.001360	8.74	167.78	36.00	0.71
1	4322.957	Bonanza900	1467.00	1763.87	1768.53	1767.58	1769.72	0.001360	8.74	167.78	36.00	0.71
1	4322.957	Bonanza Hydrolog	2792.00	1763.87	1771.28	1769.57	1772.98	0.001225	10.47	266.64	36.00	0.68
1	4322.957	Q at Pecos/Mario	2394.00	1763.87	1770.49	1769.01	1772.06	0.001255	10.04	238.41	36.00	0.69
1	4322.957	All Flow	1467.00	1763.87	1768.53	1767.58	1769.72	0.001360	8.74	167.78	36.00	0.71
1	4293.287	ULT	1343.00	1763.81	1767.85	1767.49	1769.30	0.002015	9.66	138.96	36.00	0.87
1	4293.287	INT	1467.00	1763.81	1768.16	1767.70	1769.64	0.001901	9.78	149.95	36.00	0.84
1	4293.287	Bonanza900	1467.00	1763.81	1768.16	1767.70	1769.64	0.001901	9.78	149.95	36.00	0.84
1	4293.287	Bonanza Hydrolog	2792.00	1763.81	1771.05	1769.70	1772.92	0.001401	10.99	254.01	36.00	0.73
1	4293.287	Q at Pecos/Mario	2394.00	1763.81	1770.24	1769.13	1772.00	0.001478	10.64	224.91	36.00	0.75
1	4293.287	All Flow	1467.00	1763.81	1768.16	1767.70	1769.64	0.001901	9.78	149.95	36.00	0.84

LAMB BOULEVARD





Cedar Avenue Channel Hydraulic Analysis
Interim Condition

- Flow meets Regional Criteria
- Flow contained in channel - Regional criteria NOT met
- Flow outside of channel within ROW
- Flow outside ROW / against walls
- Parcels
- Vertical Wall
- HEC-RAS Cross-sections
- 5-ft Contours
- 25-ft Index Contours

N

0 50 100 200 Feet

1 inch = 100 feet

ATKINS

Appendix E: Improvement Plans

LAMB PINES
IMPROVEMENT PLANS

501 NORTH LAMB BOULEVARD

CITY OF LAS VEGAS
STATE OF NEVADA
APN #140-31-501-021
12.59 GROSS/NET ACRES

NEVADA HAND

295 EAST WARM SPRINGS ROAD, #101
LAS VEGAS, NV 89119-4212
(702) 410-2730
CONTACT: ROBERT FEIBLEMAN

SHEET INDEX

1	COVER SHEET
2	GENERAL NOTES
3	GRADING PLAN 1
4	GRADING PLAN 2
5	GRADING PLAN 3
6	DETAIL SHEET 1
7	DETAIL SHEET 2
8	DETAIL SHEET 3

DEVELOPER \ OWNER

HAND PROPERTY HOLDING COMPANY
295 E WARM SPRINGS RD #101
LAS VEGAS NV 89119-4212

ENGINEER

L.R. NELSON CONSULTING ENGINEERS, INC.
6765 WEST RUSSELL ROAD SUITE 200
LAS VEGAS, NEVADA 89118-1811
CONTACT: THOMAS L. KELLEY, PE
PHONE : (702) 798-7978

LEGAL DESCRIPTION

THAT PORTION OF THE EAST HALF (E 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 31, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, NEVADA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PARCEL 1 AS SHOWN ON PARCEL MAP IN FILE 96, PAGE 01, RECORDED SEPTEMBER 7, 1999 IN BOOK 990907 AS INSTRUMENT NO. 00470 OF OFFICIAL RECORDS.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 1LV02 31C4

A RIVET AND PLATE IN THE TOP OF CURB AT THE SOUTHWEST CORNER OF STEWART AND SANDHILL.

ELEVATION = 539.670 METERS (1770.57 FEET) NAVD 1988

BASIS OF BEARING

NORTH 89°43'16" WEST, BEING THE BEARING OF THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 31, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., AS SHOWN ON A MAP ON FILE IN THE CLARK COUNTY, NEVADA RECORDER'S OFFICE AS FILE 15, PAGE 32 OF SURVEYS.

VICINITY MAP

APPROVALS

ALLEN PAVELKA, PE No. 9029 DATE
CITY OF LAS VEGAS CITY ENGINEER

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD. THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARD IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

CITY FIRE DEPARTMENT DATE

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES DATE
MANAGER PROJECT No. XXXXXX (SHEETS 1-3, 4, 14-16)

NEVADA POWER d.b.a. NV ENERGY DATE

NEVADA POWER d.b.a. NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER d.b.a. NV ENERGY 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.

CENTRAL TELEPHONE CO. d.b.a. CENTURYLINK DATE

"THE AFFIXED CENTURY LINK 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 STATUES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS."

COX COMMUNICATIONS LAS VEGAS, INC. DATE

SOUTHWEST GAS CORPORATION DATE

CHRIS KNIGHT, DIRECTOR OF BUILDING & SAFETY DATE
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT.

DISCLAIMER NOTE

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

Call before you Dig — Avoid cutting underground utility lines. It's safety. Call 811 — 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S SAFER. CALL BEFORE YOU DIG OVERHEAD — 1-702-227-2929

FAST Call before you UnderGround. 1-702-432-5300 — DEPARTMENT OF TRANSPORTATION SYSTEM OF TRANSPORTATION

H# XXXXX

PROFESSIONAL ENGINEER - STATE OF NEVADA
THOMAS L. KELLEY
EXP 6/30/17
CIVIL
No. 017676

DESIGNED BY:	MH	DRAWN BY:	MH	CHKD BY:	TLK
JOB NUMBER:	818-030-152	DATE:	June 2015		
NO.	REVISION			DATE	APPL

L. R. NELSON CONSULTING ENGINEERS, INC.
6765 West Russell Road, Suite 200
Las Vegas, Nevada 89118
• STRUCTURAL
• CIVIL (702) 798-7978
• PLANNING (702) 451-2296 FAX
• SURVEY

Nevada HAND — Housing And Neighborhood Development

COVER SHEET

LAMB PINES IMPROVEMENT PLANS — NEVADA — CITY OF LAS VEGAS

SHEET NUMBER 1 OF 8 SHEETS

H:\Land Projects\818030 Lamb-Diamond\DWG\Improv\01-818030 - COVER.dwg (MARVELLA HAARMANN) 6/25/2015 (12:16:02 PM)

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCES WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY THE (GEOTEK, INC. PROJECT #12108-LV6, DATED, NOVEMBER 26, 2014) APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE No. 625.380 AND CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE OFFSITE INSPECTION AND TESTING SECTION PRIOR TO PROJECT ACCEPTANCE. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND THE CONNECTION TO A DROP INLET, AND THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXITS THE PUBLIC RIGHT-OF-WAY. THE LOCATION SHALL BE DESCRIBED BY STATE PLANE COORDINATES WHICH SHALL BE BASED ON THE "NEVADA COORDINATE SYSTEM OF 1983, EAST ZONE" AS DEFINED BY THE NEVADA REVISED STATUTES CHAPTER 327, AND TIED TO THE CITY OF LAS VEGAS VERTICAL CONTROL BENCHMARK NETWORK. COORDINATES MUST BE CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINTIES +/- 0.1 METER (+/- 0.3 FEET). A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).
22. SANITARY SEWER SERVICE LATERALS REQUIRE THE INSTALLATION OF A MARKER BALL AT THE CONNECTION OF THE SEWER SERVICE LATERAL TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERAL EXITS THE PUBLIC RIGHT-OF-WAY. STORM DRAIN LATERALS REQUIRE THE INSTALLATION OF A MARKER BALL AT THE CONNECTION OF THE STORM DRAIN LATERAL TO THE STORM DRAIN MAIN AND WHERE THE STORM DRAIN LATERAL EXITS THE PUBLIC RIGHT-OF-WAY OR WHERE THE STORM DRAIN LATERAL CONNECTS TO A DROP INLET.
23. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST ADDITION.
24. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED 04/15/10

CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORSEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BY IMMEDIATELY NOTIFIED FOR DIRECTION.
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.
3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.
4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.
6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITH THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED.

	HORIZONTAL	VERTICAL	COMPACTION
A. PAVEMENT AREA SUBGRADE	0.1±	+0.0' TO -0.1'	SEE SOILS REPORT
B. ENGINEERED FILL	0.5±	+0.1 TO -0.1'	SEE SOILS REPORT

COMPACTION TESTING WILL BE PERFORMED BY THE OWNER AND HIS REPRESENTATIVE.

7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED
8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.
9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOILS, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.
10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

DEVIATION FROM STANDARDS

NONE

CITY OF LAS VEGAS SEWER NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENT OF THE ABOVE SPECIFICATIONS.
2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.
3. CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.
4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREET LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" 'S SHALL BE USED ON LINES TWELVE INCHES (12") AND ABOVE.
7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCHES (18") UNDER A WATER MAIN.
8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.
9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTIONS PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.
10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C-900 PVC PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

CITY OF LAS VEGAS STREET LIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND ANY ADOPTED SPECIAL AREA STANDARD.
2. NO DEVIATION OF STREETLIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF TRAFFIC ENGINEERING AND THE CITY ENGINEER.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
4. ALL STREET LIGHTING CONDUITS STUB SHALL AT LEAST ONE GREEN #8 THW WIRE INSTALLED, AS TRACER WIRE. WHEN "EMPTY" CONDUIT IS COMPLETELY INSTALLED FROM PB TO PB, IT SHALL HAVE MINIMUM OF 2 #4 AND 1 #8 THW WIRE WITH THE ENDS TAPED OR "SAFE OFF" PRIOR TO FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN ACCORDANCE WITH THE USD No. 320A.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TEFO PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINT SHALL BE COORDINATED WITH NV ENERGY COMPANY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICE POINTS SHALL BE SHOWN ON THE CIVIL PLANS.
8. IT SHALL BE ASSUMED THAT IN THE ABSENCE OF AN EXISTING, WORKABLE CIRCUIT TO ATTACH TO, ALL INSTALLATIONS SHALL REQUIRE A NEW SERVICE FOR OPERATION OF THE CIRCUIT.
9. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREET LIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED, AT NO EXPENSE TO THE CITY OF LAS VEGAS, BEFORE STREETLIGHT BASE ARE INSTALLED.
10. THE CONTRACTOR SHALL FURNISH COMPLETE SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON PLANS.
11. THE DEVELOPER/OWNER WILL BE REQUIRED TO SUPPLY POWER TO ALL NEW PUBLIC STREET LIGHTS INSTALLED UNDER THIS DESIGN PRIOR TO BOND RELEASE OR PROJECT COMPLETION. THE DEVELOPER/OWNER WILL BE RESPONSIBLE FOR ALL ITEMS ASSOCIATED WITH THE INSTALLATION, CONSTRUCTION, ENERGIZING, MAINTENANCE AND OPERATIONAL COST OF SAID STREET LIGHTS PRIOR TO PROJECT COMPLETION. REFER TO THE PLAN OF NEW SERVICE REQUIREMENTS. THE TRANSFER OF OWNERSHIP FROM THE DEVELOPER/OWNER TO THE CITY OF LAS VEGAS FOR ALL NEW PUBLIC STREET LIGHT/S AND/OR SERVICE/S INSTALLED UNDER THIS PLAN DESIGN WILL BE IN CONJUNCTION WITH THIS PROJECT COMPLETION. COORDINATE ALL MAINTENANCE AND OPERATIONAL TRANSFERS WITH THE CITY OF LAS VEGAS TRAFFIC ENGINEERING DEPARTMENT (TEFO) AT (702) 229-6331.

CITY OF LAS VEGAS TRAFFIC NOTES

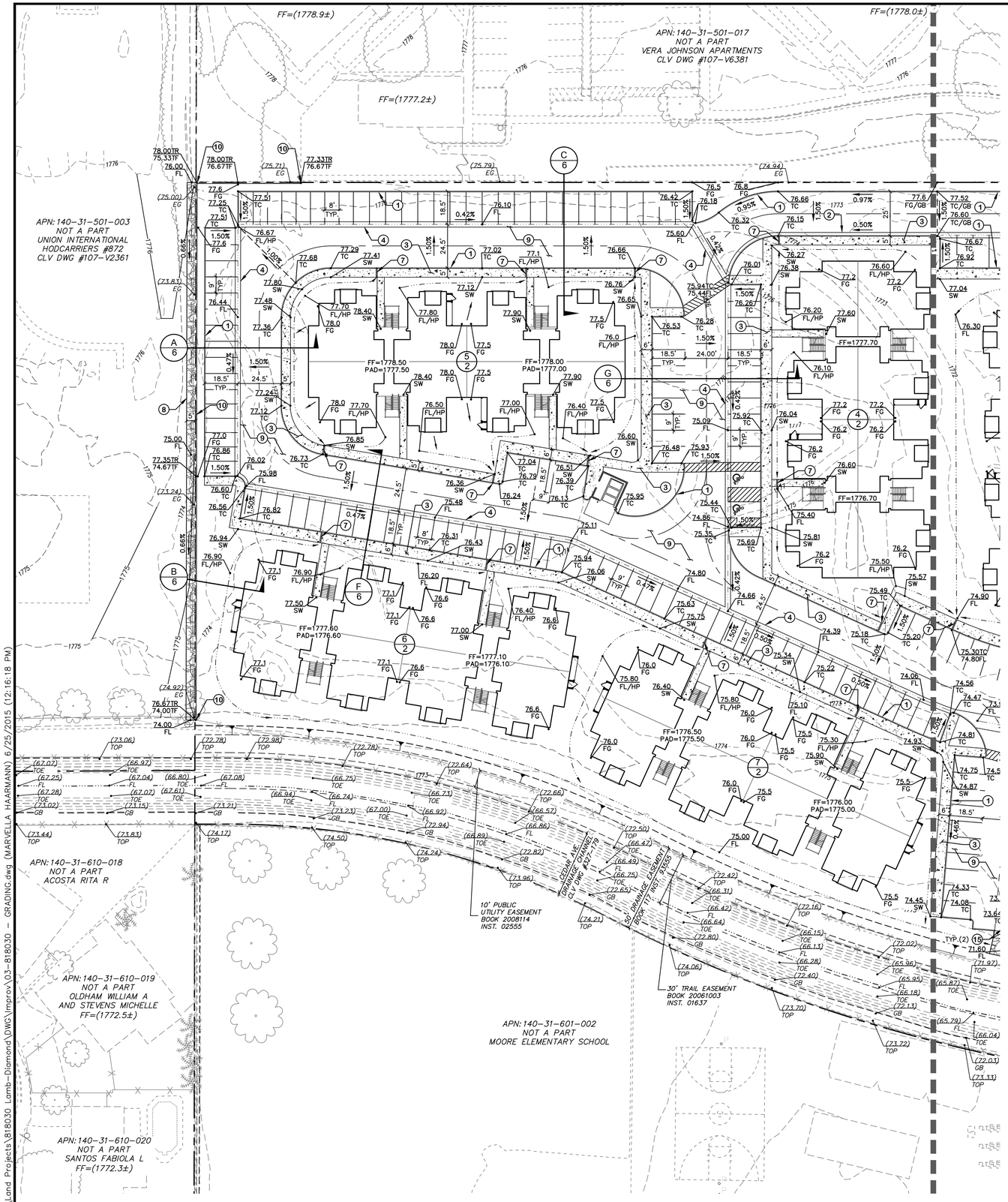
1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.
3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
4. WHEN A DESIGNATED "SAFE ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR CHILDREN TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.
5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL BE FABRICATED WITH DIAMOND GRADE VIP CLASS 6 REFLECTIVE SHEETING OR APPROVED EQUAL. ALL NEW TRAFFIC SIGNS, EXCEPT STREET NAME AND SCHOOL SPEED LIMIT SIGNS, SHALL HAVE A 3M SERIES 1160 OR APPROVED EQUIVALENT ANTI-GRAFFITI PROTECTIVE OVERLAY FILM; SCHOOL ZONE SIGNS SHALL HAVE 3M SERIES 1150 ANTI-GRAFFITI PROTECTIVE OVERLAY FILM. STREET NAMES SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARD.
7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREETLIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.
8. 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 HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
9. STREET SIGNS AND STOPS SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.
10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.
11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.
13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.
14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS OTHERWISE DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.
15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

LEGEND AND ABBREVIATIONS

00.00 FG	PROPOSED ELEVATION	0.50%	PROPOSED GRADE
00.00 FG	EXISTING ELEVATION	(0.50%)	EXISTING GRADE
XXXX	EXISTING CONTOUR		RIGHT-OF-WAY/PROPERTY LINE
6	CONSTRUCTION NOTE		CENTERLINE
	EXISTING STREETLIGHT		GRADE BREAK
	EXISTING SIGN		EXISTING EDGE OF PAVEMENT
	EXISTING "L" CURB & GUTTER		EXISTING WALL
	PROPOSED "L" CURB & GUTTER		EXISTING POWER POLE
	EXISTING BLOCK PROPERTY WALL		CONCRETE
	DIRECTION OF FLOW		PROPOSED RETAINING WALL
	PROPOSED SWALE		MATCHLINE

LAS VEGAS FIRE AND RESCUE GENERAL NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6325 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. AUTHORIZED FIRE HYDRANTS ARE AS FOLLOWS;
   - KENNEDY - GUARDIAN MODELS K81A AND K81D
   - MUELLER - SUPER CENTURION 250, MODEL A-423
   - CLOW - MEDALLION MODEL F-2546LVD
   - U.S.PIPE - METROFLOW/M-03
3. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPING FROM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. **[IFC 105.7.12]**
4. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. **[IFC 3310, 3312]**
5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. **[IFC 507.5.7.3]**
6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TEST WITH PRIOR FIRE PREVENTION APPROVAL. **[IFC 106.3]**
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. **[IFC 507.2.1, NFPA 24]**
8. PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. **[IFC 507]**
9. PRIVATE HYDRANTS SHALL BE PAINTED RED. **[IFC 507.5.7.1]**
10. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY THE LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. **[IFC 507]**
11. FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: **[IFC C102]**
    - RESIDENTIAL - 600 FT UNSPRINKLERED; 600 FT SPRINKLERED.
    - COMMERCIAL - 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.
12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FT ON AN ALTERNATING BASIS. **[IFC C102.8]**
13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL-DE-SAC OR WITHIN 20 FT OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. **[IFC C102.12]**
15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. **[IFC C102.4]**
16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. **[IFC C102.7]**
17. THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FT. **[IFC C102.6]**
18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. SECTIONAL CONTROL VALVE SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN. **[IFC C104]**
19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. **[IFC 503.2.3]**
20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12% ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FT PRIOR TO OR AFTER THE GRADE CH



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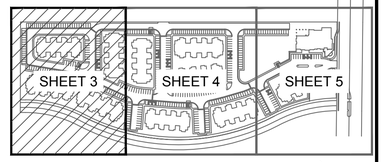
NORTH

GRAPHIC SCALE

30 0 15 30

(IN FEET)
1 inch = 30 ft.



SHEET INDEX

GRADING CONSTRUCTION NOTES

1. CONSTRUCT "A" TYPE CURB (CCAUSD #219)
2. CONSTRUCT "L" TYPE CURB & GUTTER (CCAUSD #216)
3. CONSTRUCT 4" CONCRETE SIDEWALK (CCAUSD #234)
4. CONSTRUCT 3' WIDE VALLEY GUTTER (DETAIL Q, SHEET 7)
5. CONSTRUCT 8' WIDE CROSS GUTTER (CCAUSD #228)
6. CONSTRUCT CURB OPENING FOR DRAINAGE (DETAIL R, SHEET 7)
7. CONSTRUCT 4" SIDEWALK UNDERDRAIN (DETAIL P, SHEET 7)
8. INSTALL RIP-RAP (D_{50}= 6", THICKNESS= 12")
9. CONSTRUCT 2.5" AC PAVEMENT WITH 9" TYPE II AGGREGATE BASE
10. CONSTRUCT 4' MAX. RETAINING WALL WITH 6' SCREEN WALL PER CITY BUILDING DEPARTMENT STANDARDS
11. CONSTRUCT CONCRETE FLUME (DETAIL S, SHEET 8) SEE PLANS FOR SIZE
12. CONSTRUCT SIDEWALK RAMPS USING ARMOR TILE TRUNCATED DOMES OR EQUIVALENT (CCAUSD #235)
13. CONSTRUCT HANDICAP PARKING AREA (DETAIL T, SHEET 8)
14. INSTALL PRECAST BUMPER BLOCK (CCAUSD #238)
15. INSTALL VEHICULAR PROTECTION BOLLARD (UDACS PLATE NO. 75) 4' O.C.

STORM DRAIN CONSTRUCTION NOTES

1. INSTALL PRECAST JENSEN DROP INLET (OR EQUIVALENT) SEE PLANS FOR INLET SIZE
2. INSTALL TYPE I MANHOLE WITH LOCKABLE/WATER TIGHT COVER (CCAUSD #403) SEE PLANS FOR SIZE
3. INSTALL 18" CLASS III RCP PIPE
4. INSTALL 30" CLASS III RCP PIPE
5. SAWCUT, REMOVE & REPLACE EXISTING CHANNEL SECTION. INSTALL 6" CONCRETE COLLAR. CUT END OF PIPE FLUSH WITH CHANNEL, GROUT AROUND PERIMETER OF PIPE AND EXPOSED FACE. (SEE DETAIL U, SHEET 8)

NOTES:

1. ALL WORK PERFORMED UNDER THE GRADING PERMIT REQUIRES SPECIAL INSPECTION PER SECTION 1704. (APPENDIX SECTION J105.2).
2. THE GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHER STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE. (APPENDIX SECTION J103.1 AS AMENDED)"

FEMA FLOOD PLAIN INFORMATION

ACCORDING TO THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY-PANEL NUMBER 32003C 2187F, REVISED NOVEMBER 16, 2011, THE SITE IS LOCATED WITHIN A ZONE 'X'. A ZONE 'X' IS DESCRIBED BY FEMA AS AN AREA OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN.

ESTIMATED EARTHWORK QUANTITIES

CUT: XX,XXX CY
FILL: XX,XXX CY

NET FILL: XX,XXX CY

THESE QUANTITIES ARE FOR ESTIMATING PURPOSE ONLY. THE FILL FIGURE INCLUDES A 15% AVERAGE SHRINKAGE FACTOR. OTHER CONSIDERATIONS SUCH AS OVEREXCAVATION, CALICHE, BOULDERS, ETC. WILL LIKELY AFFECT THE ACTUAL FIELD FILL AND CUT QUANTITIES. IT IS RECOMMENDED THAT THE CONTRACTOR CONSULT WITH THE SOILS ENGINEER AND PROVIDE HIS OWN FINAL QUANTITIES PRIOR TO BIDDING THE PROJECT. THE CIVIL ENGINEER ACCEPTS NO LIABILITY FOR VARIATIONS IN THE ACTUAL EARTHWORK QUANTITIES.

SOILS REPORT

GEOTEK, INC.
DATED: NOVEMBER 26, 2014
PROJECT NO. 12108-LV6

LEGAL DESCRIPTION

THAT PORTION OF THE EAST HALF (E 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 31, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, NEVADA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PARCEL 1 AS SHOWN ON PARCEL MAP IN FILE 96, PAGE 01, RECORDED SEPTEMBER 7, 1999 IN BOOK 990907 AS INSTRUMENT NO. 00470 OF OFFICIAL RECORDS.

BASIS OF BEARINGS

NORTH 89°43'16" WEST, BEING THE BEARING OF THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 31, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., AS SHOWN ON A MAP ON FILE IN THE CLARK COUNTY, NEVADA RECORDER'S OFFICE AS FILE 15, PAGE 32 OF SURVEYS.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 1LV02 31C4 – RIVET AND PLATE IN TOP OF CURB AT SOUTHWEST CORNER OF STEWART AND SANDHILL.

ELEVATION=539.670 (1770.57 FEET) NAVD 1988 DATUM.

DRAINAGE STUDY

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT DSXXXX

THOMAS L. KELLEY, PE #17676 DATE

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PART OF NATIONAL SYSTEM OF TRANSPORTATION

H# XXXXX

PROFESSIONAL ENGINEER - STATE OF NEVADA
THOMAS L. KELLEY
EXP 6/30/17
CIVIL
No. 017676

DESIGNED BY: MH	DRAWN BY: MH	CHKD BY: TLK
JOB NUMBER: 818-030-152	DATE: June 2015	
NO.	REVISION	DATE APPL

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Nevada HAND
Housing And Neighborhood Development

GRADING PLAN 1

LAMB PINES
IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

SHEET NUMBER
3
OF 8 SHEETS
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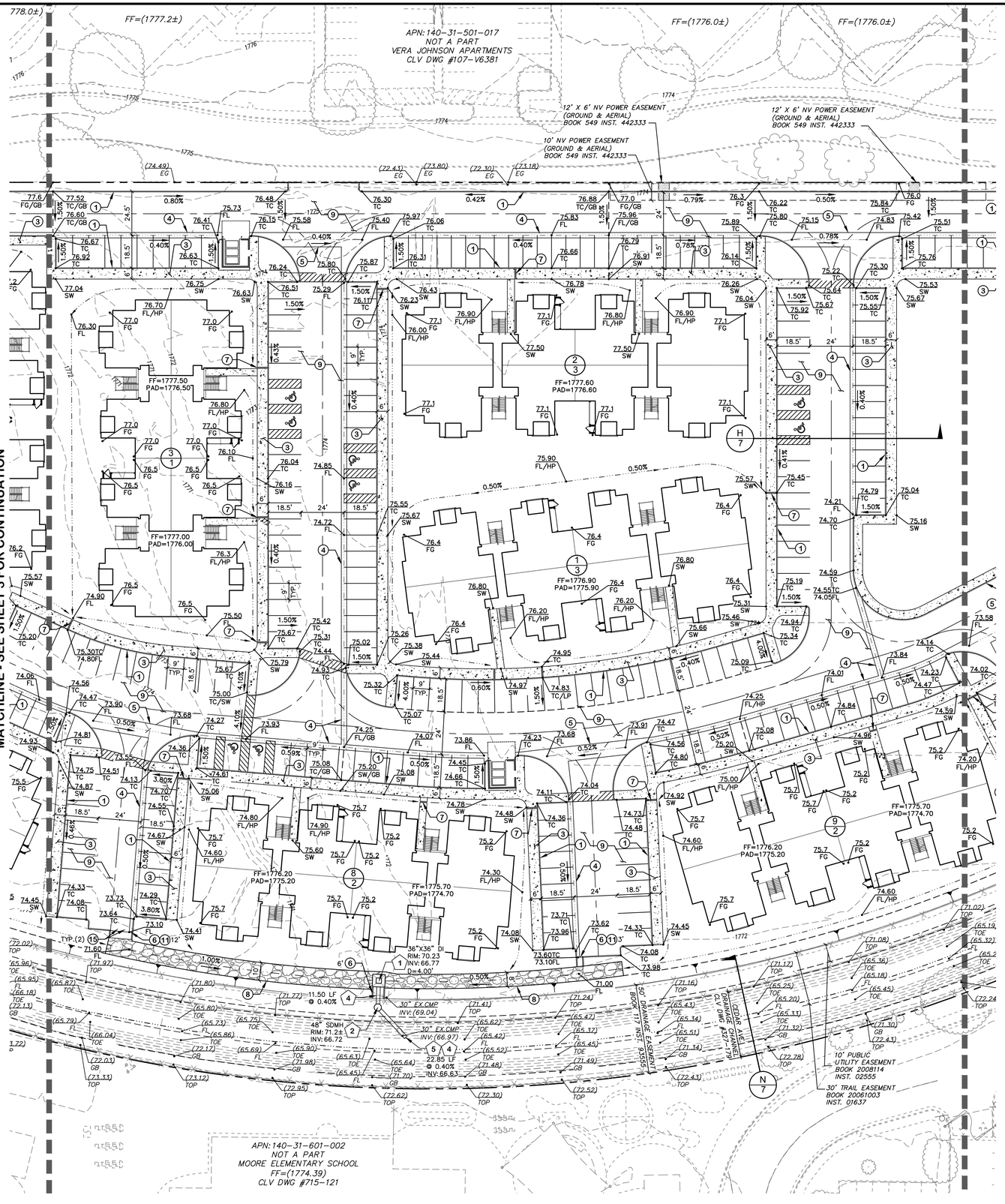

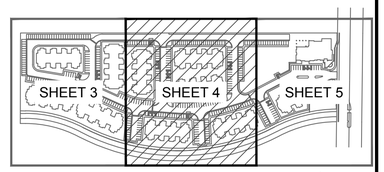

SHEET INDEX

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NOTES:

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ACCORDING TO THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY-PANEL NUMBER 32003C 2187F, REVISED NOVEMBER 16, 2011, THE SITE IS LOCATED WITHIN A ZONE 'X'. A ZONE 'X' IS DESCRIBED BY FEMA AS AN AREA OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN.

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CUT: XX,XXX CY
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THOMAS L. KELLEY, PE #17676 DATE

SOILS REPORT

GEOTEK, INC.
DATED: NOVEMBER 26, 2014
PROJECT NO. 1210B-LV6

LEGAL DESCRIPTION

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GRADING PLAN 2

LAMB PINES IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

SHEET NUMBER
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OF 8 SHEETS
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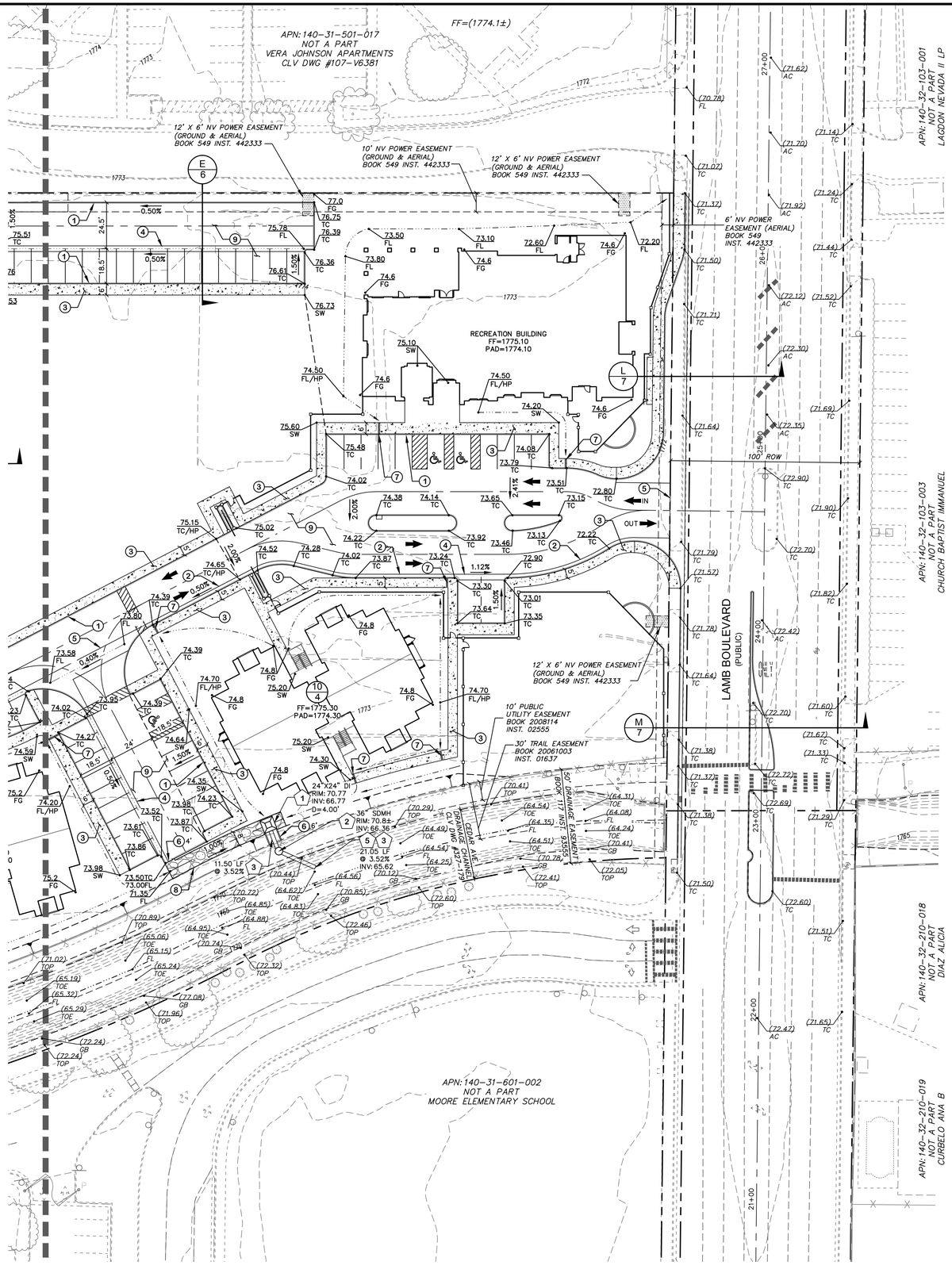

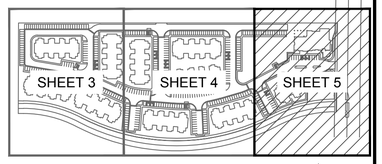

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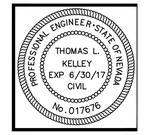

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GRADING PLAN 3

LAMB PINES
IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

SHEET NUMBER
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OF 8 SHEETS
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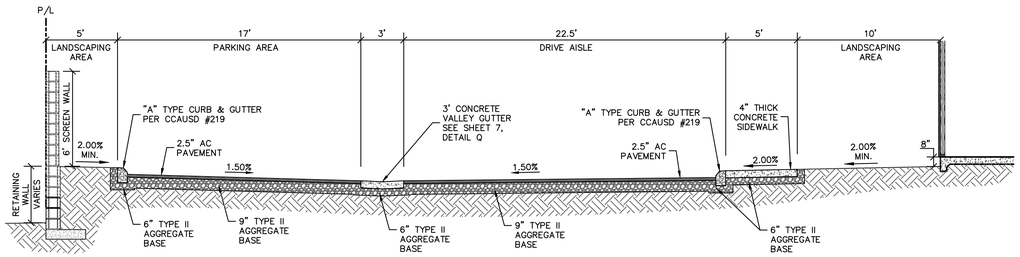

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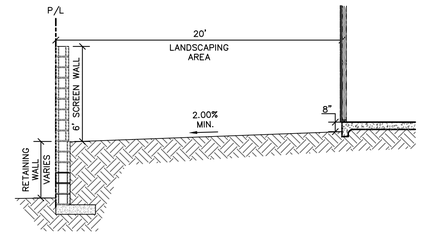

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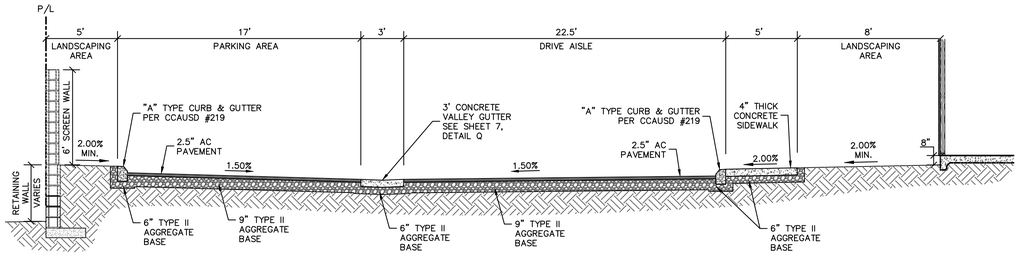

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D FIRE ACCESS SECTION

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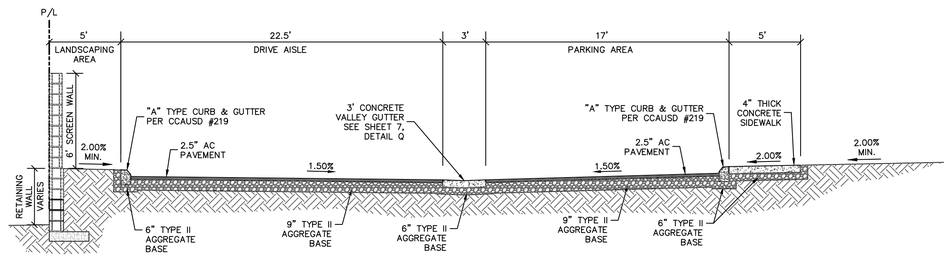

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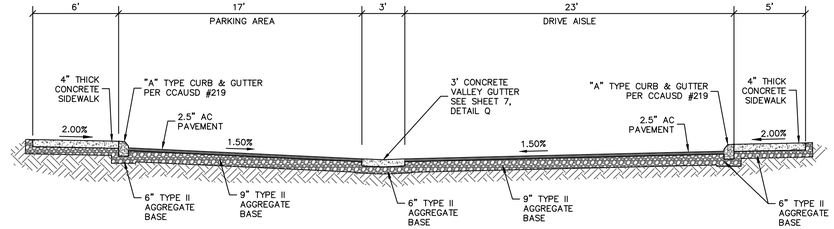

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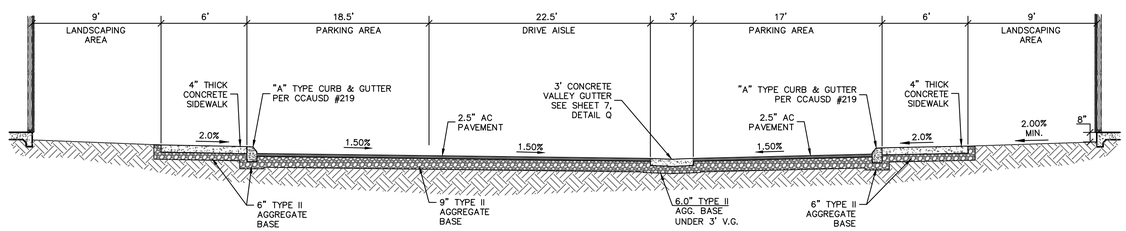

G SECTION

SCALE: NTS

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER

DATE _____ PROJECT NO. XXXXX

LVVWD APPROVED FIRE FLOW 1,750 GPM AT 20 P.S.I. RESIDUAL

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DESIGNED BY:	MH	DRAWN BY:	MH	CHKD BY:	TLK
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Nevada HAND — Housing And Neighborhood Development

DETAIL SHEET 1

LAMB PINES IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

SHEET NUMBER 6 OF 8 SHEETS

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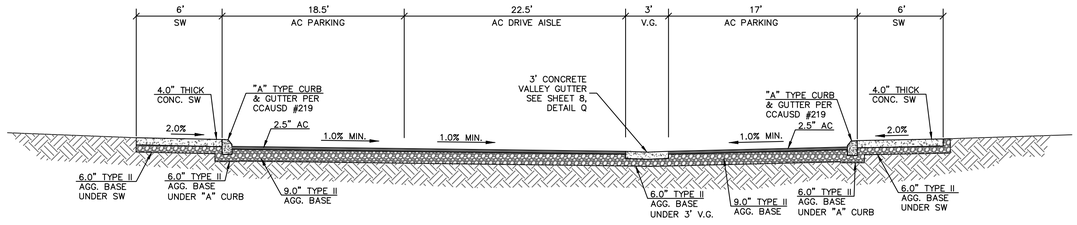

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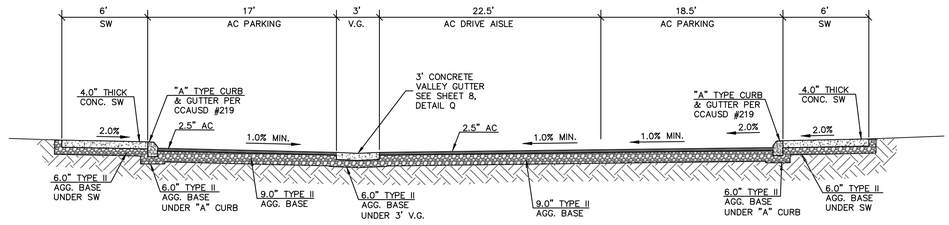

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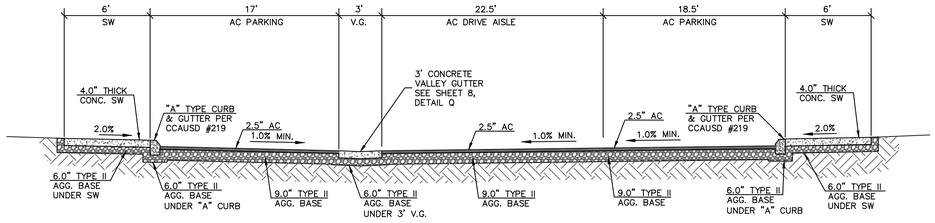

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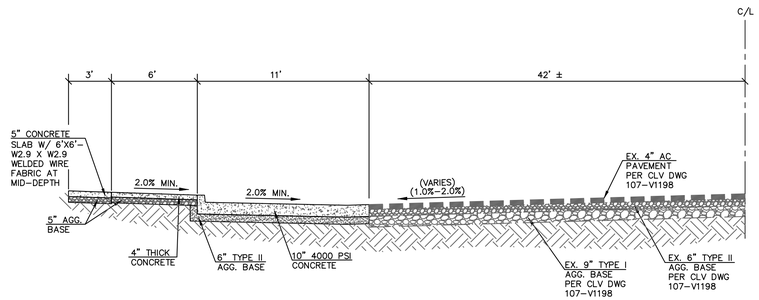

L LAMB BOULEVARD CROSS SECTION W/ RTC BUS STOP

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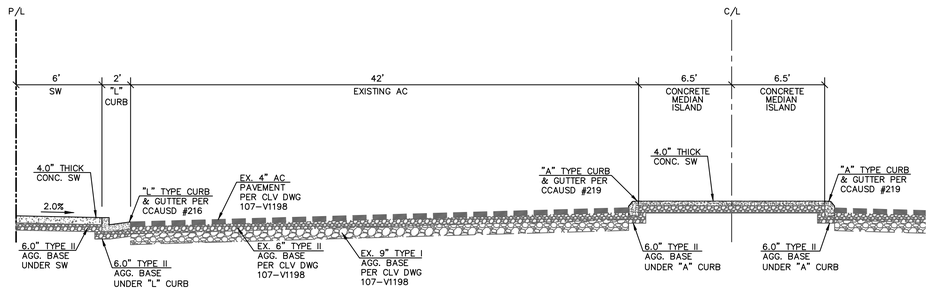

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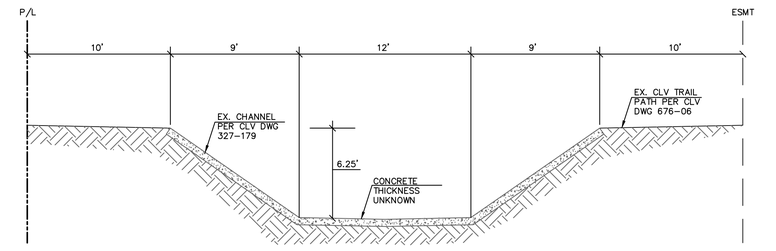

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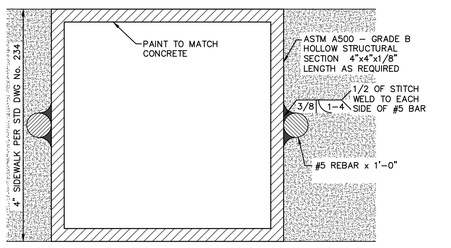
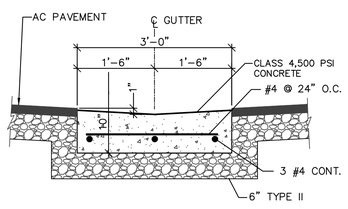


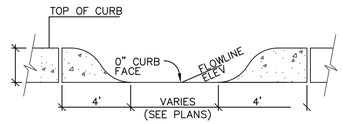
P SIDEWALK UNDERDRAIN

SCALE: NTS



Q 3' VALLEY GUTTER

SCALE: NTS



R DEPRESSED CURB OPENING

SCALE: NTS

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER

DATE _____ PROJECT NO. XXXXX

LVVWD APPROVED FIRE FLOW 1,750 GPM AT 20 P.S.I. RESIDUAL

DISCLAIMER NOTE

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

Call before you Dig — Avoid cutting underground utility lines. It's easy. Call 811 — 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S EASY! CALL BEFORE YOU DIG OVERHEAD — 1-702-227-2929

FAST — Call before you UnderGround. 1-702-432-5300 — FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

H# XXXXX

THOMAS L. KELLEY EXP 6/30/17 CIVIL No. 017676 — PROFESSIONAL ENGINEER - STATE OF NEVADA

DESIGNED BY: MH | DRAWN BY: MH | CHKD BY: TLK
JOB NUMBER: 818-030-152 | DATE: June 2015
NO. | REVISION | DATE | APPL

L. R. NELSON CONSULTING ENGINEERS, INC.
• STRUCTURAL • CIVIL • PLANNING • SURVEY
6765 West Russell Road, Suite 200
Las Vegas, Nevada 89118
(702) 798-7978
(702) 451-2296 FAX

Nevada HAND — Housing And Neighborhood Development

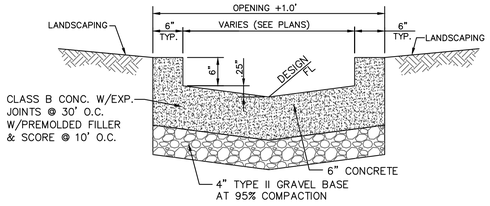
DETAIL SHEET 2

LAMB PINES IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

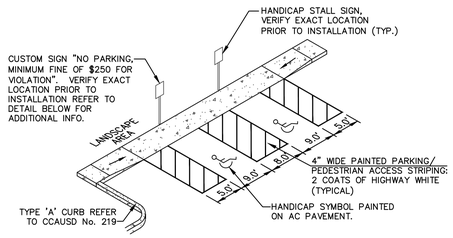
SHEET NUMBER 7 OF 8 SHEETS

H:\Land Projects\818030 Lamb-Diamond\DWG\Improv\08-818030 - DETAILS.dwg (MARVELLA HAARMANN) 6/25/2015 (12:16:39 PM)



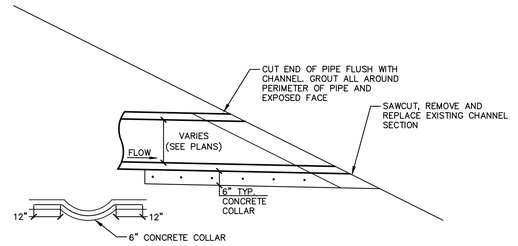
S CONCRETE FLUME

SCALE: NTS



T HANDICAP PARKING AREA

SCALE: NTS



U TRAPEZOIDAL WALL OPENING FOR RCP STORM DRAIN PIPES

SCALE: NTS

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER
DATE_____ PROJECT NO.___XXXXX___
LVVWD APPROVED FIRE FLOW 1,750 GPM AT 20 P.S.I. RESIDUAL

DISCLAIMER NOTE

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

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FAST Call before you UnderGround. 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

H# XXXXX

H:\Land Projects\818030 Lamb-Diamond\DWG\Improv\08-818030 - DETAILS.dwg (MARVELLA HAARMANN) 6/25/2015 (12:16:41 PM)

PROFESSIONAL ENGINEER-STATE OF NEVADA
THOMAS L. KELLEY
EXP 6/30/17
CIVIL
No. 017676

DESIGNED BY: MH	DRAWN BY: MH	CHKD BY: TLK
JOB NUMBER: 818-030-152	DATE: June 2015	

NO.	REVISION	DATE	APPL

L. R. NELSON CONSULTING ENGINEERS, INC.
6765 West Russell Road, Suite 200
Las Vegas, Nevada 89118
• STRUCTURAL • CIVIL • PLANNING • SURVEY
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Nevada HAND
Housing And Neighborhood Development

DETAIL SHEET 3

LAMB PINES
IMPROVEMENT PLANS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
8
OF 8 SHEETS
--

SUPPLEMENT NO. 1
TO THE TECHNICAL DRAINAGE STUDY FOR
LAMB PINES

CITY OF LAS VEGAS, NEVADA
DS4740
Project Number: 818-030-152
July 2015

Prepared For: Nevada H.A.N.D, Inc.
295 E. Warm Springs, #101
Las Vegas, NV 89119
(702) 410-2730

Prepared By: L.R. Nelson Consulting Engineers
6765 W. Russell Rd., Suite 200
Las Vegas, Nevada 89118
(702) 798-7978

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Lamb Pines Date: Jul 14, 2015

Location of Development: a) Descriptive (Cross Streets) North/South: Lamb Boulevard

East/West: Diamond Head Drive

b) Section: 31 Township: 20S Range: 62E

c) APN : 140-31-501-021

Name of Owner: Nevada H.A.N.D.

Telephone No.: (702) 410-2730 Fax No.: E-Mail Address:

Address: 295 E. Warm Springs Road, #101, Las Vegas, NV 89119

Contact Person-Name: Thomas Kelley, P.E. **Telephone No.:** (702) 798-7978

* **E-Mail Address:** Thomas.Kelley@lrneng.com **Fax No.:** (702)451-2296

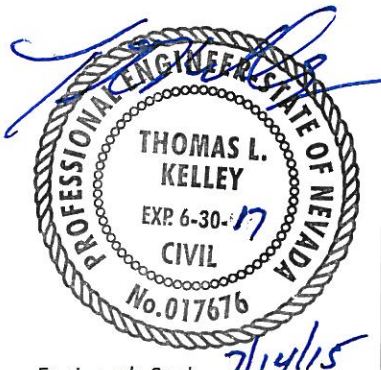
Firm: LR Nelson

Address: 6765 West Russell Road, Suite 200, Las Vegas, NV 89118

Type of Land Development/Land Disturbance Process:

☐	Rezoning	☒	Subdivision Map	☐	Clearing and Grading Only
☐	Parcel Map	☐	Planned Unit Development	☐	Other (Please specify below)
☐	Large Parcel Map	☐	Building Permit		

1. Total Owned Land Area: At Site: 12.6+/- acres Being Developed/Disturbed: 12.6+/- acres
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.): Residential Mulit Unit
5. Approximate upstream land area which drains to the subject site: 0.36 acres +/- drains towards the site
6. Has the site drainage been evaluated in the past? ☐ **YES** ☒ **NO** If yes, please identify documentation:
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Most of the site discharges into the Cedar Avenue Channel. The remaining portions discharge into Lamb Boulevard
8. Briefly describe your proposed schedule for the subject project: A.S.A.P



Engineer's Seal 7/14/15

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.

*New Required Field

**Review and concurrence of the Clark County Regional Flood Control District is required.

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

July 14, 2015

Mr. Albert Sung, P.E.
Flood Control
City of Las Vegas Public Works
333 N. Rancho Drive
Las Vegas, NV 89106

Subject: Supplement No. 1 to the TDS for Lamb Pines
DS4740

Dear Mr. Sung:

Submitted herewith for your review and approval is one (1) hard copy and one (1) digital copy (on CD-ROM) of Supplement No. 1 to the Technical Drainage Study (TDS) for **Lamb Pines (DS4740)** project within the City of Las Vegas, Nevada. This supplement is being provided due to a change in grading to the site. This site was lowered by approximately 6 inches to reduce the amount of fill on the site while still providing finished floor elevations at least 18 inches above the adjacent base flood elevations for the Cedar Avenue Channel.

The lowering of the site was allowed due to the use of a difference HEC-RAS model to establish design base flood elevations of the Cedar Avenue Channel. Originally, the model used for design had incorporated flow amounts that are meant for the future Bonanza Road Channel. After providing the original submittal package for the study, it was determined this model was only a "what if" model and should not have been used to set the design elevations. The revised site grading is now based upon a worst case interim conditions model provided by Atkins North America. A copy of this model has been provided as an attachment to this correspondence.

All onsite hydraulic calculations for the project remain the same except for the Flowmaster calculations for section S4/D. The slope in this section was revised to match the revised grading. A revised calculation sheet is provided with this correspondence and the ultimate condition basin map has also been revised accordingly. The ultimate condition basin map has also been revised to indicates the base flood elevations used to establish the revised grading and.

re accurate for the flows in this section. The western portion of the swale still directs the 12 cfs offsite flow through our site. This revision allows for more storage for the ponding situation. The water surface elevations for the proposed is now 1972.26 which is a decrease compared to the existing.

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by L.R. Nelson Consulting Engineers shall be without liability to L.R. Nelson Consulting Engineers.

If you have any questions regarding this Study, please contact our office at (702) 798-7978.

Sincerely,

Thomas Kelley, P.E.
Project Manager

LIST OF FIGURES

Figure 8: Ultimate Condition Drainage Basin Map

LIST OF APPENDICES

Appendix A: Figures

Appendix B: Hydraulic Analysis

Appendix C: Imporvement Plans

Appendix A: Figures

Figure 8: Ultimate Condition Drainage Basin Map

NOTES LEGEND

- TOTAL ONLY INCLUDES FLOWS FOR PROJECT SITE. CEDAR AVENUE STUDIES INCLUDE OUR FLOWS THEREFORE THEY ARE NOT RELEVENT TO OUR STUDY. ONLY THE FLOOD LEVELS ARE RELEVENT.
- ** FLOWS ARE ONLY FOR IMMEDIATE AREA OF LAMB BOULEVARD. FLOOD DEPTHS FOR LAMB REFENCED FROM SARATOGA PALMS TDS DS3947.
- *** APPROXIMATE WORST CASE FLOOD LEVELS FROM ATKINS HEC-RAS INTERIM CONDITION MODEL FROM THE PRELIMINARY LAS VEGAS WASH CENTRAL, CEDAR AVENUE CHANNEL REPORT.

Street Sections

Section	Slopes (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (fps)	DV	Remarks
S1/TYP	0.40	16.00	0.36	1.99	0.72	Basin DON1
S2/D	0.50	16.00	0.34	2.15	0.73	Basin DON1
S3/D	0.50	4.00	0.21	1.46	0.31	Basin DON2
S4/D	0.54	7.00	0.33	2.03	0.67	Basin DON3
S5/D	0.50	7.00	0.26	1.67	0.43	Basin DON3

Swale Sections

Section	Slopes	Q_{100}	D_{100}	V_{100}	DV	Remarks
SW1	1.00	16.00	1.31	3.09	4.05	Basin DON1
SW2	0.50	4.00	0.89	1.69	1.50	Basin DON2
SW3	1.00	7.00	0.96	2.52	2.42	Basin DON3
OF1	0.66	1.00	0.38	1.13	0.43	Basin DOF1

Ultimate Condition

Basin	Area (acres)	Q_{10} (cfs)	Q_{100} (cfs)	Remarks
DON4	1.31	2	4	Onsite Basin to Lamb Blvd
DST1	0.81	2	3	Lamb Boulevard
DCP1		**3**	**7**	**Lamb Boulevard**
DON1	5.91	8	16	
DON2	1.06	2	4	
DON3	2.81	3	7	
DCP2		**12**	**25**	**Runoff into Cedar Ave Channel**
DOF1	0.36	1	1	Offsite Basin
DCP3		**1**	**1**	**Offsite Basin Runoff to Swale**

LAMB BOULEVARD

**DCP1 3/7

DOF1 0.36

OFF

DON1 5.91

S1 TYP

DON3 2.81

S4 D

DON2 1.06

DON4 1.31

DST1 0.81

DCP3 1/1

S2 D

S3 D

S5 D

C1

SW1

SW2

C2

C3

SW3

***DESIGN FLOOD ELEV. 72.98

***DESIGN FLOOD ELEV. 72.80

CEDAR AVE CHANNEL

***DESIGN FLOOD ELEV. 72.72

***DESIGN FLOOD ELEV. 72.67

*DCP2 12/25

DRAINAGE LEGEND

HS7 0.00	BASIN IDENTIFICATION
● C1	CONCENTRATION POINT ID
#12	INLET ID / STORM DRAIN
→	FLOW PATH
XX/XXX	10-YR/100-YR FLOW (CFS)
HS7 E	HYDRAULIC SECTION CONDITION
XX	SWALE / CURB OPENING
	BASIN BOUNDARY

FIGURE 8
ULTIMATE CONDITIONS
LAMB PINES

L. R. NELSON CONSULTING ENGINEERS, INC.

- STRUCTURAL
- CIVIL
- PLANNING
- SURVEY

6765 West Russell Road, Suite 200
Las Vegas, Nevada 89118

(702) 798-7978
(702) 451-2296 FAX

Appendix B: Hydraulic Analysis

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

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

PROJECT DATA
Project Title: CedarChnl
Project File : CedarChnl.prj
Run Date and Time: 6/18/2015 11:37:05 AM

Project in English units

PLAN DATA

Plan Title: ExistingChannel
Plan File : t:\Drainage Studies\Lamb and Diamond\References\Atkins Cedar Avenue Channel\30 Percent HEC_RAS\HECRAS\CedarChnl.p02

Geometry Title: ExistingChannel
Geometry File : t:\Drainage Studies\Lamb and Diamond\References\Atkins Cedar Avenue Channel\30 Percent HEC_RAS\HECRAS\CedarChnl.g04

Flow Title : ExistingQ
Flow File : t:\Drainage Studies\Lamb and Diamond\References\Atkins Cedar Avenue Channel\30 Percent HEC_RAS\HECRAS\CedarChnl.f01

Plan Summary Information:
Number of: Cross Sections = 107 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 5 Lateral Structures = 0

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

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

FLOW DATA

Flow Title: ExistingQ
Flow File : t:\Drainage Studies\Lamb and Diamond\References\Atkins Cedar Avenue Channel\30 Percent HEC_RAS\HECRAS\CedarChnl.f01

Flow Data (cfs)

River	Reach	RS	EX	INT
Cedar	1	9025.193	870	1132
Cedar	1	8103.225	870	1132
Cedar	1	7068.177	903	1165
Cedar	1	6059.88	924	1186
Cedar	1	4425.682	987	1249
Cedar	1	3049.332	1029	1291
Cedar	1	1703.273	1081	1343
Cedar	1	536.6721	1119	1381

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Cedar	1	EX	Normal S = 0.00526	Normal S = 0.002

GEOMETRY DATA

Geometry Title: ExistingChannel
Geometry File : t:\Drainage Studies\Lamb and Diamond\References\Atkins Cedar Avenue Channel\30 Percent HEC_RAS\HECRAS\CedarChnl.g04

CROSS SECTION

RIVER: Cedar

REACH: 1 RS: 9025.193

INPUT
Description:
Station Elevation Data num= 13
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
01786.855.97009071786.31910.96952 1788.6713.507211788.78414.026471783.729
24.569211783.34725.521711783.071 34.72211777.20841.385571777.08747.613541777.154
54.058991782.20954.298531786.59160.246331786.699

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .01625.52171 .01554.29853 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
25.5217154.29853 102.95 102.42 102.41 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8922.776

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
01786.0136.3704391785.265 23.61784.82324.217781784.80724.479871782.638
33.492751776.76637.798951776.51943.241281776.755 58.251785.84258.655541786.088
59.307271786.205

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .01624.21778 .01558.65554 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
24.2177858.65554 98.45 98.41 98.41 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8824.36*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1785.57 6.34 1784.72 23.49 1784.3 24.1 1784.29 24.35 1782.15
33.32 1776.24 37.69 1775.99 43.05 1776.22 58.2 1785.49 58.61 1785.74
59.13 1785.83

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 24.1 .015 58.61 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
24.1 58.61 98.45 98.41 98.41 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8725.96*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1785.13 6.31 1784.18 23.38 1783.79 23.99 1783.77 24.22 1781.66
33.16 1775.72 37.59 1775.47 42.85 1775.68 58.15 1785.14 58.56 1785.39
58.95 1785.46

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 23.99 .015 58.56 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.99 58.56 98.45 98.41 98.41 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8627.55*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1784.69 6.28 1783.64 23.27 1783.27 23.88 1783.25 24.1 1781.17
32.99 1775.19 37.48 1774.94 42.66 1775.15 58.1 1784.79 58.52 1785.05
58.78 1785.09

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 23.88 .015 58.52 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.88 58.52 98.45 98.41 98.41 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8529.14*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1784.24 6.25 1783.1 23.16 1782.75 23.76 1782.74 23.97 1780.69
32.82 1774.67 37.38 1774.42 42.46 1774.61 58.05 1784.43 58.47 1784.7
58.6 1784.72

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 23.76 .015 58.47 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.76 58.47 98.45 98.41 98.41 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8430.738

INPUT
Description:
Station Elevation Data num= 8
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
01783.8026.2301931782.56323.65133 1782.22 23.84261780.19832.650481774.146
37.272571773.889 42.26541774.07658.421451784.351

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .01623.65133 .01558.42145 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.6513358.42145 99.67 99.67 99.67 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8331.07*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1783.09 6.35 1782.07 7.29 1782.02 23.33 1781.7 24.09 1781.69
24.23 1779.63 33.07 1773.61 37.63 1773.38 42.68 1773.56 52.09 1779.65
58.71 1783.48

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 24.09 .015 58.71 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
24.09 58.71 99.67 99.67 99.67 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8231.40*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1782.37 6.46 1781.57 7.43 1781.5 23.76 1781.17 24.54 1781.15
24.63 1779.05 33.49 1773.08 37.98 1772.88 43.09 1773.05 52.43 1779.18
59 1782.61

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 24.54 .015 59 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
24.54 59 99.67 99.67 99.67 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 8131.743

INPUT
Description:
Station Elevation Data num= 10
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1781.667.5618161780.982 24.191780.63324.977251780.61625.018251778.483
33.90261772.54638.336461772.37343.498151772.53852.775451778.71959.296541781.735

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .01624.97725 .01559.29654 .015

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

```
      24.9772559.29654            28.52   28.52   28.52              .3       .5

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 8103.225

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01779.652   25.491779.526   25.761772.303   49.771772.067   49.891779.551
   58.341779.477

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   25.49    .015   49.89    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.49   49.89             62.2   62.21    62.2              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    25.4    1782       F
      50   58.34    1782       F

BRIDGE


RIVER: Cedar
REACH: 1                  RS: 8070

INPUT
Description: HONOLULU
Distance from Upstream XS =       .5
Deck/Roadway Width        =    61.5
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   25.49 1779.53  1777.8   49.89 1779.55  1777.8

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01779.652   25.491779.526   25.761772.303   49.771772.067   49.891779.551
   58.341779.477

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   25.49    .015   49.89    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         25.49   49.89             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    25.4    1782       F
      50   58.34    1782       F

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   24.82 1779.39  1777.8   49.38 1779.37  1777.8

Downstream Bridge Cross Section Data
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1778.995.2797061779.01824.817511779.39324.997611772.30449.339051772.235
49.378111779.37257.138131779.322

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01624.81751    .01549.37811    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
      24.8175149.37811             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    24.8    1781       F
    49.557.13813    1781       F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream=    37.8    Downstream=      37
Upstream     num=       2
    Width   Elev    Width   Elev
       .2    1772       .2  1777.8
Downstream     num=       2
    Width   Elev    Width   Elev
       .2    1772       .2  1777.8

Number of Bridge Coefficient Sets =  1
```

```
Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 8041.023

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1778.995.2797061779.01824.817511779.39324.997611772.30449.339051772.235
49.378111779.37257.138131779.322

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01624.81751    .01549.37811    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      24.8175149.37811           30.12   30.12   30.12             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    24.8    1781       F
    49.557.13813    1781       F

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 8010.899

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01780.1952.5192831779.84921.913471779.106 22.05391778.06530.943131771.861
36.086721771.83440.726721771.91549.878511778.11156.316411780.283

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01621.91347    .01556.31641    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      21.9134756.31641           88.89   88.89   88.89             .1       .3

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 7922.01*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1780.05    2.57 1779.68    6.37 1779.44   22.38 1778.88   22.52 1777.83
   31.42 1771.68   36.56 1771.62   41.19 1771.72   50.24 1777.81   50.82 1778.04
    56.6    1780

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   22.38    .015    56.6    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         22.38    56.6           88.89   88.89   88.89             .1       .3

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 7833.12*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1779.9    2.63 1779.52     6.5 1779.18   22.85 1778.65      23 1777.59
    31.9  1771.5   37.04  1771.4   41.65 1771.52   50.59 1777.51   51.17 1777.77
   56.89 1779.71

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   22.85    .015   56.89    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         22.85   56.89           88.89   88.89   88.89             .1       .3
```

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 7744.23*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1779.76	2.68	1779.35	6.64	1778.91	23.32	1778.42	23.47	1777.35
32.37	1771.31	37.51	1771.19	42.11	1771.32	50.95	1777.21	51.52	1777.5
57.17	1779.43								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.32	.015	57.17	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.32	57.17	88.89	88.89	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 7655.34*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1779.61	2.74	1779.19	6.77	1778.64	23.79	1778.19	23.94	1777.11
32.85	1771.13	37.99	1770.97	42.57	1771.12	51.31	1776.9	51.87	1777.24
57.46	1779.15								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.79	.015	57.46	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.79	57.46	88.89	88.89	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 7566.459

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
01779.463	6.904227	1778.378	24.26433	1777.965	24.40941	776.8773	3.325251	770.948	
38.46563	1770.764	3.029461	770.9185	2.224721	776.9685	7.745061	778.861		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.01624.26433		.01557.74506		.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
24.26433	57.74506	89.82	89.81	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 7476.64*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1779.16	6.95	1778.15	7.21	1778.14	24.42	1777.75	24.57	1776.67
33.48	1770.67	38.66	1770.5	43.17	1770.66	52.27	1776.66	52.7	1776.83
57.73	1778.52								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	24.42	.015	57.73	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
24.42	57.73	89.82	89.81	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 7386.83*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1778.86	7	1777.93	7.25	1777.92	24.58	1777.54	24.72	1776.46
33.64	1770.4	38.85	1770.25	43.32	1770.4	52.32	1776.35	52.74	1776.54
57.72	1778.18								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	24.58	.015	57.72	.015

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         24.58   57.72             89.82   89.81   89.82             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 7297.02*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1778.56    7.04 1777.71     7.3 1777.69   24.75 1777.33   24.88 1776.25
    33.8 1770.13   39.05 1769.99   43.46 1770.15   52.37 1776.04   52.78 1776.26
   57.71 1777.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   24.75    .015   57.71    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         24.75   57.71             89.82   89.81   89.82             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 7207.21*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1778.26    7.09 1777.49    7.35 1777.46   24.91 1777.12   25.03 1776.04
   33.95 1769.85   39.24 1769.74   43.61 1769.89   52.41 1775.73   52.82 1775.97
    57.7  1777.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   24.91    .015    57.7    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         24.91    57.7             89.82   89.81   89.82             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 7117.403

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01777.9637.3949311777.23625.065531776.90925.188641775.82634.108681769.581
39.433131769.48343.754851769.63152.866711775.68957.687681777.159

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01625.06553    .01557.68768    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      25.0655357.68768             49.58   49.23   49.25             .3      .5

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 7068.177

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01774.55515.005431774.68219.165591774.867   19.171769.04254.672341769.044
55.046041774.94657.80225 1775.03

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01619.16559    .01555.04604    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      19.1655955.04604             79.61   79.53   79.52             .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      19 1777.89        F
   55.1357.80225 1777.94        F

BRIDGE


RIVER: Cedar
REACH: 1                  RS: 7030

INPUT
Description: SANDHILL
Distance from Upstream XS =      .5
Deck/Roadway Width        =     79
Weir Coefficient          =    2.6
Upstream  Deck/Roadway Coordinates
```

```
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  19.1661774.867 1773.04  55.0461774.946 1773.04

Upstream Bridge Cross Section Data
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01774.55515.005431774.68219.165591774.867   19.171769.04254.672341769.044
55.046041774.94657.80225 1775.03

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01619.16559    .01555.04604    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
      19.1655955.04604             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      19 1777.89       F
   55.1357.80225 1777.94       F

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   18.651774.789 1773.22   54.421774.665 1773.22

Downstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01774.952     1.3 1774.76   18.21 1774.76   18.651774.789    18.81768.812
   54.351769.219   54.421774.665   57.511774.673

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   18.65    .015   54.42    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         18.65   54.42             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   18.32 1777.98       F
   54.56   57.51 1777.93       F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  2

Pier Data
Pier Station     Upstream=   31.28    Downstream=      31
Upstream     num=       2
    Width   Elev    Width   Elev
      .5    1668      .5    1774
Downstream     num=       2
    Width   Elev    Width   Elev
      .5    1668      .5    1774

Pier Data
Pier Station     Upstream=   43.08    Downstream=    42.8
Upstream     num=       2
    Width   Elev    Width   Elev
       1    1668       1    1774
Downstream     num=       2
    Width   Elev    Width   Elev
       1    1668       1    1774

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 6988.652

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01774.952     1.3 1774.76   18.21 1774.76   18.651774.789    18.81768.812
```

```
   54.351769.219   54.421774.665   57.511774.673

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   18.65    .015   54.42    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         18.65   54.42             51.98   51.99   51.98             .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   18.32 1777.98       F
   54.56   57.51 1777.93       F

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6936.664

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01775.816    2.421775.512   21.321775.283   30.441769.294    36.41769.158
   42.211769.193   51.521775.305   57.651775.775

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.32    .015   57.65    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.32   57.65             90.34   90.36   90.38             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6846.30*

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1775.82    2.44 1775.47    5.54 1775.32   21.48 1775.14   30.61  1769.1
    36.5 1768.97   42.34 1769.03   51.63 1775.13   51.88 1775.17   57.76 1775.62

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.48    .015   57.76    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.48   57.76             90.34   90.36   90.38             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6755.94*

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1775.83    2.46 1775.44    5.58 1775.17   21.63    1775   30.79 1768.92
   36.59 1768.79   42.46 1768.86   51.75 1774.95      52 1775.02   57.86 1775.47

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.63    .015   57.86    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.63   57.86             90.34   90.36   90.38             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6665.58*

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1775.84    2.47  1775.4    5.62 1775.02   21.79 1774.86   30.97 1768.73
   36.69 1768.61   42.59 1768.69   51.86 1774.77   52.11 1774.86   57.97 1775.32

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.79    .015   57.97    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.79   57.97             90.34   90.36   90.38             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6575.21*

INPUT
Description:
```

```
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1775.84    2.49 1775.36    5.66 1774.87   21.95 1774.72   31.14 1768.54
   36.79 1768.42   42.72 1768.52   51.97 1774.59   52.22 1774.71   58.07 1775.17

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.95    .015   58.07    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.95   58.07             90.34   90.36   90.38             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6484.85*

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1775.85    2.51 1775.33     5.7 1774.71    22.1 1774.58   31.32 1768.35
   36.88 1768.24   42.84 1768.35   52.09 1774.41   52.34 1774.55   58.17 1775.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016    22.1    .015   58.17    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          22.1   58.17             90.34   90.36   90.38             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6394.496

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01775.859    5.741774.563   22.26 1774.44   31.491768.159   36.981768.058
   42.971768.186   52.451774.398   58.281774.861

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   22.26    .015   58.28    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         22.26   58.28             83.65   83.65   83.65             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6310.84*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1775.74    1.78 1775.31    5.78 1774.43    6.54 1774.41   22.37 1774.23
   22.44 1774.22   31.64    1768   37.14 1767.88   43.15 1768.03    52.4 1774.08
   52.66 1774.21   58.51 1774.75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   22.44    .015   58.51    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         22.44   58.51             83.65   83.65   83.65             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6227.18*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1775.61    1.79 1775.16    5.83  1774.3     6.6 1774.25   22.55 1774.01
   22.61 1774.01   31.78 1767.83   37.29 1767.71   43.33 1767.87   52.61 1773.93
   52.87 1774.03   58.74 1774.64

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   22.61    .015   58.74    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         22.61   58.74             83.65   83.65   83.65             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 6143.53*

INPUT
```

Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1775.49	1.81	1775.01	5.87	1774.16	6.65	1774.1	22.72	1773.8
22.79	1773.79	31.93	1767.67	37.45	1767.53	43.5	1767.72	52.82	1773.78
53.08	1773.85	58.97	1774.52						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	22.79	.015	58.97	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
22.79	58.97	83.65	83.65	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 6059.88

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1775.37	1.82	1774.86	5.92	1774.03	6.7	1773.95	22.9	1773.58
22.97	1773.58	32.08	1767.51	37.61	1767.36	43.68	1767.56	53.03	1773.63
59.2	1774.41								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	22.97	.015	59.2	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
22.97	59.2	83.65	83.65	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5976.22*

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1775.25	1.83	1774.71	5.97	1773.9	6.75	1773.8	23.08	1773.36
23.15	1773.37	32.23	1767.35	37.77	1767.18	43.86	1767.4	52.98	1773.31
53.24	1773.45	59.43	1774.3						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.15	.015	59.43	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.15	59.43	83.65	83.65	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5892.57*

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1775.12	1.84	1774.56	6.01	1773.76	6.8	1773.65	23.25	1773.15
23.32	1773.15	32.38	1767.18	37.93	1767.01	44.03	1767.25	53.19	1773.16
53.45	1773.27	59.66	1774.19						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.32	.015	59.66	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.32	59.66	83.65	83.65	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5808.91*

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1775	1.86	1774.41	6.06	1773.63	6.85	1773.5	23.43	1772.93
23.5	1772.94	32.53	1767.02	38.09	1766.83	44.21	1767.09	53.4	1773.01
53.66	1773.09	59.89	1774.07						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.5	.015	59.89	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.5	59.89	83.65	83.65	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5725.263

INPUT
Description:
Station Elevation Data num= 10
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
01774.8721.8701671774.2596.9054691773.35123.603571772.71723.676371772.722
32.676411766.85738.245531766.65644.387291766.93953.608331772.86360.119281773.963

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .01623.67637 .01560.11928 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.6763760.11928 96.86 95.32 94.33 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5629.94*

INPUT
Description:
Station Elevation Data num= 13
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1774.29 1.65 1773.78 1.68 1773.78 6.08 1773.08 20.79 1772.52
20.85 1772.52 29.9 1766.68 35.56 1766.48 41.56 1766.72 50.64 1772.54
52.02 1772.92 57.06 1773.87 57.27 1773.87

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 20.85 .015 57.06 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
20.85 57.06 96.86 95.32 94.33 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5534.62*

INPUT
Description:
Station Elevation Data num= 13
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1773.72 1.42 1773.31 1.45 1773.3 5.26 1772.8 17.97 1772.32
18.03 1772.32 27.13 1766.5 32.87 1766.29 38.72 1766.5 47.67 1772.21
49.03 1772.75 53.99 1773.77 54.42 1773.79

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 18.03 .015 53.99 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
18.03 53.99 96.86 95.32 94.33 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5439.30*

INPUT
Description:
Station Elevation Data num= 13
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1773.14 1.2 1772.83 1.23 1772.83 4.43 1772.53 15.15 1772.12
15.2 1772.12 24.35 1766.32 30.18 1766.11 35.89 1766.28 44.71 1771.88
46.04 1772.57 50.93 1773.67 51.56 1773.7

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 15.2 .015 50.93 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
15.2 50.93 96.86 95.32 94.33 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5343.98

INPUT
Description:
Station Elevation Data num= 9
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
01772.559.99869721772.35412.374391771.92321.578131766.138 27.48671765.934
33.060591766.05843.053231772.39247.865321773.57248.711561773.609

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .01612.37439 .01547.86532 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
12.3743947.86532 87.83 89.58 91.44 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5254.39*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1772.38	.72	1772.23	1	1772.18	12.35	1771.76	21.51	1765.97
27.48	1765.76	33.05	1765.89	42.89	1772.17	42.93	1772.19	47.69	1773.35
48.55	1773.39								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	12.35	.015	47.69	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.35	47.69	87.83	89.58	91.44	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5164.80*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1772.2	.72	1772.06	.99	1772.01	12.32	1771.6	21.44	1765.79
27.48	1765.58	33.04	1765.72	42.76	1771.97	42.8	1771.99	47.51	1773.12
48.39	1773.17								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	12.32	.015	47.51	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.32	47.51	87.83	89.58	91.44	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 5075.22*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1772.02	.72	1771.88	.99	1771.84	12.29	1771.44	21.37	1765.62
27.48	1765.4	33.03	1765.55	42.64	1771.77	42.68	1771.79	47.33	1772.89
48.22	1772.94								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	12.29	.015	47.33	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.29	47.33	87.83	89.58	91.44	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 4985.63*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1771.83	.71	1771.7	.99	1771.67	12.26	1771.28	21.3	1765.45
27.48	1765.22	33.01	1765.38	42.51	1771.57	42.55	1771.59	47.15	1772.67
48.06	1772.72								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	12.26	.015	47.15	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.26	47.15	87.83	89.58	91.44	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 4896.05*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1771.65	.71	1771.52	.99	1771.5	12.23	1771.12	21.23	1765.28
27.47	1765.05	33	1765.21	42.39	1771.37	42.43	1771.38	46.97	1772.44
47.9	1772.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	12.23	.015	46.97	.015

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         12.23   46.97             87.83   89.58   91.44             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4806.466

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01771.473 .7104711771.34312.199941770.96421.154741765.10727.469481764.868
32.991531765.03842.265281771.17446.787131772.21547.734871772.279

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01612.19994    .01546.78713    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      12.1999446.78713             86.33   84.78   82.71             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4721.68*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1771.35     .72  1771.2    1.22 1771.15   12.35 1770.81    21.3 1764.91
   27.55 1764.69   33.22 1764.86   41.91 1770.59   42.66 1771.01   47.26 1772.18
    48.2 1772.22

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   12.35    .015   47.26    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         12.35   47.26             86.33   84.78   82.71             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4636.91*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1771.24     .73 1771.06    1.23 1770.97    12.5 1770.65   21.44 1764.71
   27.64 1764.51   33.45 1764.68   42.29 1770.49   43.05 1770.85   47.73 1772.14
   48.67 1772.16

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016    12.5    .015   47.73    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          12.5   47.73             86.33   84.78   82.71             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4552.13*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1771.12     .74 1770.92    1.25  1770.8   12.64  1770.5   21.58  1764.5
   27.72 1764.33   33.68 1764.49   42.67 1770.38   43.44 1770.69    48.2 1772.11
   49.13  1772.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   12.64    .015    48.2    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         12.64    48.2             86.33   84.78   82.71             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4467.36

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01770.9991.2607131770.62212.792091770.34121.728151764.30327.807851764.153
33.908131764.31243.049371770.28148.669841772.074 49.59571772.039

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
       0    .01612.79209    .01548.66984    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      12.7920948.66984            41.68   41.68   41.73             .3       .5

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4425.682

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01771.5284.6845561771.59624.686471771.46725.387761771.57325.492471764.284
50.123671764.317 50.26051771.59956.710531771.553

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01625.38776    .015 50.2605    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      25.38776 50.2605           102.74  102.72  102.85             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   25.21 1773.93       F
   50.3656.71053 1773.86       F

BRIDGE


RIVER: Cedar
REACH: 1                  RS: 4380

INPUT
Description: LAMB
Distance from Upstream XS =       .5
Deck/Roadway Width        =     102
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       7
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       01772.418 1770.32  38.9411772.322 1770.32    73.2 1772.33 1770.32
  86.9611772.324          147.1041772.293          179.0581772.252
 217.1161772.407

Upstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01771.5284.6845561771.59624.686471771.46725.387761771.57325.492471764.284
50.123671764.317 50.26051771.59956.710531771.553

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01625.38776    .015 50.2605    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
      25.38776 50.2605             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   25.21 1773.93       F
   50.3656.71053 1773.86       F

Downstream  Deck/Roadway Coordinates
    num=       7
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       01772.418 1770.24  38.9411772.322 1770.24    73.2 1772.33 1770.24
  86.9611772.324          147.1041772.293          179.0581772.252
 217.1161772.407

Downstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01771.314 6.940181771.03418.830311771.175 19.58941771.533 19.70941763.993
43.992421764.241 44.12581771.44254.269871771.348

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016 19.5894    .015 44.1258    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
      19.5894 44.1258             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   19.47 1773.92       F
    44.254.26987 1773.96       F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream=   37.75    Downstream=   31.86
Upstream     num=       2
```

```
    Width   Elev    Width   Elev
      .5    1763      .5 1770.32
Downstream     num=       2
    Width   Elev    Width   Elev
      .5    1763      .5 1770.32

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4322.957

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01771.314 6.940181771.03418.830311771.175 19.58941771.533 19.70941763.993
43.992421764.241 44.12581771.44254.269871771.348

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016 19.5894    .015 44.1258    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       19.5894 44.1258            29.67   29.67    29.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   19.47 1773.92       F
    44.254.26987 1773.96       F

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4293.287

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01771.7754.0238071770.46823.002161769.916 23.34971769.82832.446591763.955
37.636681763.80542.846761764.056 51.76821770.066   58.231770.873 59.13871770.986

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016 23.3497    .015   58.23    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       23.3497   58.23            88.69    88.7    88.7             .1       .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4204.59*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1771.34    4.02 1770.13    5.63 1770.06      23 1769.55   23.35 1769.47
   32.46 1763.61   37.64 1763.45   42.76  1763.7   51.71 1769.68   51.95 1769.73
   58.19 1770.49   59.16 1770.61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.35    .015   58.19    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         23.35   58.19            88.69    88.7    88.7             .1       .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4115.89*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1770.9    4.02  1769.8    5.63 1769.69   23.01 1769.19   23.35 1769.12
```

```
   32.48 1763.26   37.65  1763.1   42.67 1763.34   51.65  1769.3   51.89 1769.37
   58.16 1770.11   59.18 1770.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.35    .015   58.16    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          23.35   58.16             88.69    88.7    88.7             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 4027.20*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1770.46    4.03 1769.46    5.63 1769.33   23.01 1768.82   23.36 1768.77
    32.5 1762.92   37.65 1762.75   42.58 1762.99   51.59 1768.92   51.84 1769.01
   58.12 1769.73   59.21 1769.85

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.36    .015   58.12    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          23.36   58.12             88.69    88.7    88.7             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3938.50*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1770.03    4.03 1769.12    5.63 1768.97   23.01 1768.46   23.36 1768.41
   32.52 1762.57   37.66  1762.4   42.49 1762.63   51.54 1768.54   51.78 1768.64
   58.09 1769.35   59.23 1769.48

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.36    .015   58.09    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          23.36   58.09             88.69    88.7    88.7             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3849.81*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1769.59    4.03 1768.79    5.63  1768.6   23.01 1768.09   23.36 1768.06
   32.53 1762.22   37.67 1762.05    42.4 1762.27   51.48 1768.16   51.72 1768.28
   58.05 1768.97   59.25  1769.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.36    .015   58.05    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          23.36   58.05             88.69    88.7    88.7             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3761.11*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1769.15    4.03 1768.45    5.63 1768.24   23.02 1767.73   23.36 1767.71
   32.55 1761.88   37.67  1761.7   42.32 1761.92   51.42 1767.78   51.67 1767.92
   58.02 1768.59   59.27 1768.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.36    .015   58.02    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          23.36   58.02             88.69    88.7    88.7             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3672.419

INPUT
```

```
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01768.714  5.63291767.87423.366221767.35432.568231761.53137.679191761.345
 42.22681761.56151.608441767.553   57.981768.20959.296531768.345

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01623.36622    .015   57.98    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      23.36622   57.98             98.75   98.76   98.76             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3573.66*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1768.37    5.64 1767.51    5.97  1767.5   23.41 1766.99   32.61 1761.16
   37.67 1760.96   42.22 1761.19   51.57 1767.13   51.66 1767.18   58.06 1767.84
   59.26 1767.97

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.41    .015   58.06    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         23.41   58.06             98.75   98.76   98.76             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3474.90*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1768.02    5.65 1767.15    5.98 1767.13   23.45 1766.63   32.65 1760.79
   37.66 1760.58   42.22 1760.81   51.62 1766.77   51.71 1766.81   58.15 1767.48
   59.22 1767.59

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.45    .015   58.15    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         23.45   58.15             98.75   98.76   98.76             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3376.15*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1767.68    5.66 1766.79    5.99 1766.76    23.5 1766.27   32.69 1760.41
   37.65  1760.2   42.21 1760.43   51.67  1766.4   51.76 1766.43   58.24 1767.11
   59.17 1767.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016    23.5    .015   58.24    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          23.5   58.24             98.75   98.76   98.76             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3277.39*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1767.33    5.68 1766.43       6 1766.39   23.54 1765.91   32.73 1760.04
   37.63 1759.82   42.21 1760.06   51.72 1766.03    51.8 1766.06   58.32 1766.74
   59.13 1766.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.54    .015   58.32    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         23.54   58.32             98.75   98.76   98.76             .1      .3

CROSS SECTION


RIVER: Cedar
```

```
REACH: 1                  RS: 3178.63*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1766.98    5.69 1766.07    6.01 1766.02   23.59 1765.54   32.77 1759.67
   37.62 1759.43   42.21 1759.68   51.77 1765.67   51.85 1765.68   58.41 1766.38
   59.09 1766.45

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   23.59    .015   58.41    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         23.59   58.41            98.75   98.76   98.76             .1       .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3079.883

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01766.638 6.024431765.65223.630221765.182 32.81521759.29737.611771759.052
42.201861759.30851.81687  1765.3   58.491766.00959.053051766.069

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01623.63022    .015   58.49    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      23.63022   58.49            30.55   30.55   30.54             .3       .5

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 3049.332

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01765.037   21.811765.385   22.161758.945   52.891759.039   53.071765.319
   59.021765.102

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.81    .015   53.07    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.81   53.07            63.44   63.44   63.42             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   21.39 1767.95       F
    53.4   59.02 1767.98       F

BRIDGE


RIVER: Cedar
REACH: 1                  RS: 3020

INPUT
Description: PAGE
Distance from Upstream XS =      .5
Deck/Roadway Width        =    62.5
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   21.811765.385 1763.94   53.071765.319 1764.04

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01765.037   21.811765.385   22.161758.945   52.891759.039   53.071765.319
   59.021765.102

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.81    .015   53.07    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
         21.81   53.07             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   21.39 1767.95       F
    53.4   59.02 1767.98       F

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   23.251765.032 1763.75   55.561765.237 1763.79

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01765.19823.253971765.03223.884691758.75354.706181758.78655.559881765.237
59.370411765.072

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01623.25397    .01555.55988    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
      23.2539755.55988            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   22.97 1767.95       F
   55.9159.37041 1767.91       F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream=   37.51    Downstream=    39.3
Upstream     num=       2
    Width   Elev    Width   Elev
      .7    1758      .7 1764.04
Downstream     num=       2
    Width   Elev    Width   Elev
      .7    1758      .7 1764.04

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 2985.898

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01765.19823.253971765.03223.884691758.75354.706181758.78655.559881765.237
59.370411765.072

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01623.25397    .01555.55988    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      23.2539755.55988           29.63   29.63   29.62             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   22.97 1767.95       F
   55.9159.37041 1767.91       F

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 2956.266

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01764.6533.5863651764.98423.974211764.74132.738131758.71238.04904 1758.49
42.978571758.69752.676171764.808 59.24621767.088

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01623.97421    .015 59.2462    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      23.97421 59.2462           88.11    88.1   88.11             .1       .3

CROSS SECTION


RIVER: Cedar
```

REACH: 1 RS: 2868.16*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1764.65	3.58	1764.89	6.27	1764.83	23.94	1764.6	24.14	1764.32
32.77	1758.38	37.98	1758.17	42.9	1758.39	52.08	1764.25	52.61	1764.57
59.19	1766.82								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.94	.015	59.19	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.94	59.19	88.11	88.1	88.11	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2780.06*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1764.64	3.58	1764.8	6.26	1764.71	23.91	1764.46	24.11	1764.03
32.81	1758.05	37.9	1757.85	42.83	1758.08	52.01	1764.03	52.55	1764.32
59.14	1766.55								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.91	.015	59.14	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.91	59.14	88.11	88.1	88.11	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2691.95*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1764.64	3.57	1764.7	6.25	1764.59	23.88	1764.31	24.08	1763.74
32.85	1757.72	37.83	1757.53	42.76	1757.77	51.95	1763.82	52.49	1764.08
59.08	1766.27								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.88	.015	59.08	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.88	59.08	88.11	88.1	88.11	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2603.85*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1764.63	3.57	1764.61	6.24	1764.47	23.85	1764.17	24.05	1763.45
32.88	1757.39	37.76	1757.22	42.68	1757.46	51.89	1763.6	52.43	1763.84
59.03	1766								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.85	.015	59.03	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.85	59.03	88.11	88.1	88.11	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2515.75*

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1764.63	3.56	1764.52	6.24	1764.35	23.81	1764.03	24.02	1763.16
32.92	1757.05	37.69	1756.9	42.61	1757.16	51.82	1763.38	52.36	1763.6
58.97	1765.73								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.016	23.81	.015	58.97	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
23.81	58.97	88.11	88.1	88.11	.1	.3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2427.65*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1764.62 3.56 1764.42 6.23 1764.23 23.78 1763.88 23.99 1762.87
32.96 1756.72 37.62 1756.58 42.53 1756.85 51.76 1763.16 52.3 1763.36
58.92 1765.46

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 23.78 .015 58.92 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.78 58.92 88.11 88.1 88.11 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2339.547

INPUT
Description:
Station Elevation Data num= 9
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
01764.6196.2188631764.11523.749941763.74223.956491762.57732.992661756.391
37.544571756.25942.458891756.53951.695151762.94458.86156 1765.19

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .01623.74994 .01558.86156 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.7499458.86156 86.7 86.71 86.69 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2252.83*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1764.47 6.31 1763.84 7.16 1763.79 24.1 1763.41 24.32 1762.29
33.27 1756.08 37.96 1755.94 42.87 1756.2 52.06 1762.63 52.07 1762.63
59.19 1764.87

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 24.1 .015 59.19 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
24.1 59.19 86.7 86.71 86.69 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2166.12*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1764.33 6.4 1763.56 7.26 1763.49 24.46 1763.09 24.68 1762.01
33.55 1755.77 38.38 1755.62 43.28 1755.86 52.43 1762.31 52.44 1762.32
59.52 1764.54

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 24.46 .015 59.52 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
24.46 59.52 86.7 86.71 86.69 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 2079.40*

INPUT
Description:
Station Elevation Data num= 11
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1764.18 6.5 1763.28 7.37 1763.18 24.81 1762.76 25.04 1761.73
33.82 1755.46 38.79 1755.3 43.69 1755.52 52.79 1761.99 52.8 1762
59.86 1764.22

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 24.81 .015 59.86 .015

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         24.81   59.86             86.7   86.71   86.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 1992.69*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1764.03    6.59    1763    7.47 1762.88   25.16 1762.43    25.4 1761.45
    34.1 1755.16   39.21 1754.98    44.1 1755.18   53.16 1761.68   53.17 1761.68
   60.19  1763.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   25.16    .015   60.19    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.16   60.19             86.7   86.71   86.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 1905.98*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1763.89    6.68 1762.72    7.58 1762.57   25.51  1762.1   25.76 1761.16
   34.38 1754.85   39.62 1754.66   44.51 1754.85   53.52 1761.36   53.53 1761.37
   60.52 1763.57

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   25.51    .015   60.52    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.51   60.52             86.7   86.71   86.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 1819.27*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1763.74    6.77 1762.44    7.68 1762.27   25.87 1761.78   26.13 1760.88
   34.66 1754.54   40.04 1754.34   44.91 1754.51   53.89 1761.04    53.9 1761.05
   60.85 1763.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   25.87    .015   60.85    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         25.87   60.85             86.7   86.71   86.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 1732.559

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01763.5927.7859251761.96526.220621761.44926.487711760.59734.933551754.229
40.453981754.01645.324141754.16854.264371760.73661.182151762.929

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01626.22062    .01561.18215    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      26.2206261.18215            29.29   29.29   29.28             .3      .5

CROSS SECTION


RIVER: Cedar
REACH: 1                 RS: 1703.273

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1760.6614.98949 1759.9928.036311760.65728.095041754.01558.515111753.822
58.733751760.59966.584781760.459

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
       0    .01628.03631    .01558.73375    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      28.0363158.73375           82.53   82.52   82.51             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   27.72 1763.94       F
   59.3766.58478 1763.94       F

BRIDGE


RIVER: Cedar
REACH: 1                 RS: 1660

INPUT
Description: MARION
Distance from Upstream XS =      .5
Deck/Roadway Width        =     82
Weir Coefficient          =    2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  28.0361760.657 1759.02  58.7341760.599 1758.82

Upstream Bridge Cross Section Data
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1760.6614.98949 1759.9928.036311760.65728.095041754.01558.515111753.822
58.733751760.59966.584781760.459

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01628.03631    .01558.73375    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
      28.0363158.73375           .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   27.72 1763.94       F
   59.3766.58478 1763.94       F

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  22.9531760.105 1758.62  53.7841760.161 1758.76

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01760.30922.952921760.105 23.05511753.62453.715681753.75553.784421760.161
59.96216 1760.54

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01622.95292    .01553.78442    .015

Bank Sta: Left   Right    Coeff Contr.   Expan.
      22.9529253.78442           .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   22.31 1761.98       F
   54.0659.96216 1761.97       F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream=   43.31    Downstream=   38.39
Upstream     num=       2
    Width   Elev    Width   Elev
       .6    1753      .6 1759.02
Downstream     num=       2
    Width   Elev    Width   Elev
       .6    1753      .6 1759.02

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line
```

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 1620.75

INPUT
Description:
Station Elevation Data num= 6
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
01760.30922.952921760.105 23.05511753.62453.715681753.75553.784421760.161
59.96216 1760.54

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .01622.95292 .01553.78442 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
22.9529253.78442 30.32 30.32 30.31 .3 .5
Ineffective Flow num= 2
Sta L Sta R Elev Permanent
0 22.31 1761.98 F
54.0659.96216 1761.97 F

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 1590.431

INPUT
Description:
Station Elevation Data num= 9
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
01761.7315.3423971761.669 20.45381761.54520.685151759.69329.736641753.898
36.903851753.651 43.51753.765 52.875 1759.94 60.1021762.758

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 20.4538 .015 60.102 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
20.4538 60.102 86.43 86.42 86.44 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 1504.00*

INPUT
Description:
Station Elevation Data num= 12
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1762.15 5.37 1761.96 7.92 1761.88 8.55 1761.76 20.56 1761.62
20.78 1759.53 29.85 1753.73 37 1753.47 43.55 1753.58 52.9 1759.75
60.1 1762.89 60.2 1762.89

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 20.56 .015 60.1 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
20.56 60.1 86.43 86.42 86.44 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 1417.58*

INPUT
Description:
Station Elevation Data num= 12
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1762.57 5.4 1762.25 7.96 1762.1 8.59 1761.87 20.66 1761.7
20.88 1759.37 29.97 1753.57 37.09 1753.28 43.6 1753.4 52.92 1759.56
60.11 1763.02 60.3 1763.02

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .016 20.66 .015 60.11 .015

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
20.66 60.11 86.43 86.42 86.44 .1 .3

CROSS SECTION

RIVER: Cedar
REACH: 1 RS: 1331.15*

INPUT
Description:
Station Elevation Data num= 12
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
0 1762.99 5.42 1762.54 8.01 1762.33 8.63 1761.99 20.77 1761.77
20.98 1759.21 30.09 1753.4 37.19 1753.1 43.65 1753.22 52.94 1759.37
60.11 1763.15 60.4 1763.15

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   20.77    .015   60.11    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          20.77   60.11             86.43   86.42   86.44             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 1244.73*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1763.41    5.45 1762.83    8.05 1762.56    8.68  1762.1   20.88 1761.85
   21.08 1759.05    30.2 1753.24   37.28 1752.92    43.7 1753.04   52.97 1759.18
   60.11 1763.28   60.51 1763.28

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   20.88    .015   60.11    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          20.88   60.11             86.43   86.42   86.44             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 1158.30*

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1763.83    5.48 1763.12    8.09 1762.79    8.72 1762.21   20.98 1761.93
   21.17 1758.89    30.32 1753.08   37.38 1752.73   43.75 1752.85   52.99    1759
   60.11 1763.41   60.61 1763.41

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   20.98    .015   60.11    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          20.98   60.11             86.43   86.42   86.44             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 1071.88

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01764.2538.1270731763.0158.7656731762.32721.085821762.004 21.27191758.724
30.434971752.91137.472761752.55143.805661752.67360.113031763.53660.707051763.539

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01621.08582    .01560.11303    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      21.0858260.11303             89.2    89.2    89.2             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 982.678*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1763.93    5.98 1762.98    8.14  1762.7    8.78 1762.12   21.13 1761.79
   21.29 1758.51   30.41 1752.71    37.5 1752.38   43.83  1752.5   60.14 1763.34
   60.76 1763.34

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.13    .015   60.14    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          21.13   60.14             89.2    89.2    89.2             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 893.477*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1763.61    5.99 1762.62    8.16 1762.38     8.8 1761.91   21.18 1761.58
```

```
    21.3  1758.3   30.39 1752.51   37.54 1752.21   43.86 1752.32   60.17 1763.13
   60.82 1763.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.18    .015   60.17    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.18   60.17             89.2    89.2    89.2             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 804.276*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1763.29    6.01 1762.25    8.18 1762.06    8.82  1761.7   21.22 1761.37
   21.31 1758.09   30.36 1752.31   37.57 1752.04   43.88 1752.15    60.2 1762.93
   60.88 1762.95

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.22    .015    60.2    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.22    60.2             89.2    89.2    89.2             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 715.074*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1762.97    6.02 1761.89     8.2 1761.74    8.84  1761.5   21.27 1761.15
   21.33 1757.88   30.34 1752.11    37.6 1751.86   43.91 1751.97   60.23 1762.73
   60.93 1762.75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.27    .015   60.23    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.27   60.23             89.2    89.2    89.2             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 625.873*

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1762.65    6.03 1761.53    8.21 1761.42    8.86 1761.29   21.31 1760.94
   21.34 1757.67   30.31 1751.91   37.63 1751.69   43.93  1751.8   60.26 1762.53
   60.99 1762.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   21.31    .015   60.26    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         21.31   60.26             89.2    89.2    89.2             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 536.6721

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1762.336.0450481761.16221.357261760.72921.357261757.45530.286131751.709
37.663611751.51943.957241751.62160.288711762.33261.043761762.361

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .01621.35726    .01560.28871    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      21.3572660.28871            98.85   99.26   99.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 437.408*

INPUT
Description:
```

```
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1761.86    5.22 1760.91   18.44 1760.54   18.48 1757.28   27.47 1751.53
   34.83 1751.32   41.08 1751.44   57.25 1762.03   58.11 1762.07

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   18.44    .015   57.25    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         18.44   57.25             98.85   99.26   99.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 338.145*

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1761.38    4.39 1760.66   15.52 1760.34   15.61 1757.11   24.65 1751.34
   31.99 1751.12   38.21 1751.26    54.2 1761.73   55.18 1761.77

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   15.52    .015    54.2    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         15.52    54.2             98.85   99.26   99.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 238.882*

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1760.91    3.56 1760.41   12.59 1760.15   12.73 1756.94   21.82 1751.16
   29.16 1750.92   35.34 1751.08   51.16 1761.43   52.24 1761.48

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016   12.59    .015   51.16    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         12.59   51.16             98.85   99.26   99.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 139.619*

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1760.43    2.74 1760.15    9.67 1759.96    9.86 1756.78      19 1750.98
   26.32 1750.72   32.46  1750.9   48.11 1761.12   49.31 1761.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .016    9.67    .015   48.11    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9.67   48.11             98.85   99.26   99.69             .1      .3

CROSS SECTION


RIVER: Cedar
REACH: 1                  RS: 40.35592

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       01759.9586.7528261759.7646.9841031756.60516.183811750.79623.487721750.526
29.589161750.72545.070641760.82346.374711760.895

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .0166.752826    .01545.07064    .015

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      6.75282645.07064             34.01   40.36   51.25             .1      .3


SUMMARY OF MANNING'S N VALUES

River:Cedar

      Reach          River Sta.       n1        n2        n3

 1                    9025.193          .016      .015      .015
```

1	8922.776	.016	.015	.015
1	8824.36*	.016	.015	.015
1	8725.96*	.016	.015	.015
1	8627.55*	.016	.015	.015
1	8529.14*	.016	.015	.015
1	8430.738	.016	.015	.015
1	8331.07*	.016	.015	.015
1	8231.40*	.016	.015	.015
1	8131.743	.016	.015	.015
1	8103.225	.016	.015	.015
1	8070	Bridge		
1	8041.023	.016	.015	.015
1	8010.899	.016	.015	.015
1	7922.01*	.016	.015	.015
1	7833.12*	.016	.015	.015
1	7744.23*	.016	.015	.015
1	7655.34*	.016	.015	.015
1	7566.459	.016	.015	.015
1	7476.64*	.016	.015	.015
1	7386.83*	.016	.015	.015
1	7297.02*	.016	.015	.015
1	7207.21*	.016	.015	.015
1	7117.403	.016	.015	.015
1	7068.177	.016	.015	.015
1	7030	Bridge		
1	6988.652	.016	.015	.015
1	6936.664	.016	.015	.015
1	6846.30*	.016	.015	.015
1	6755.94*	.016	.015	.015
1	6665.58*	.016	.015	.015
1	6575.21*	.016	.015	.015
1	6484.85*	.016	.015	.015
1	6394.496	.016	.015	.015
1	6310.84*	.016	.015	.015
1	6227.18*	.016	.015	.015
1	6143.53*	.016	.015	.015
1	6059.88	.016	.015	.015
1	5976.22*	.016	.015	.015
1	5892.57*	.016	.015	.015
1	5808.91*	.016	.015	.015
1	5725.263	.016	.015	.015
1	5629.94*	.016	.015	.015
1	5534.62*	.016	.015	.015
1	5439.30*	.016	.015	.015
1	5343.98	.016	.015	.015
1	5254.39*	.016	.015	.015
1	5164.80*	.016	.015	.015
1	5075.22*	.016	.015	.015
1	4985.63*	.016	.015	.015
1	4896.05*	.016	.015	.015
1	4806.466	.016	.015	.015
1	4721.68*	.016	.015	.015
1	4636.91*	.016	.015	.015
1	4552.13*	.016	.015	.015
1	4467.36	.016	.015	.015
1	4425.682	.016	.015	.015
1	4380	Bridge		
1	4322.957	.016	.015	.015
1	4293.287	.016	.015	.015
1	4204.59*	.016	.015	.015
1	4115.89*	.016	.015	.015
1	4027.20*	.016	.015	.015
1	3938.50*	.016	.015	.015
1	3849.81*	.016	.015	.015
1	3761.11*	.016	.015	.015
1	3672.419	.016	.015	.015
1	3573.66*	.016	.015	.015
1	3474.90*	.016	.015	.015
1	3376.15*	.016	.015	.015
1	3277.39*	.016	.015	.015
1	3178.63*	.016	.015	.015
1	3079.883	.016	.015	.015
1	3049.332	.016	.015	.015
1	3020	Bridge		
1	2985.898	.016	.015	.015
1	2956.266	.016	.015	.015
1	2868.16*	.016	.015	.015
1	2780.06*	.016	.015	.015
1	2691.95*	.016	.015	.015
1	2603.85*	.016	.015	.015
1	2515.75*	.016	.015	.015
1	2427.65*	.016	.015	.015
1	2339.547	.016	.015	.015
1	2252.83*	.016	.015	.015
1	2166.12*	.016	.015	.015
1	2079.40*	.016	.015	.015
1	1992.69*	.016	.015	.015
1	1905.98*	.016	.015	.015
1	1819.27*	.016	.015	.015
1	1732.559	.016	.015	.015
1	1703.273	.016	.015	.015
1	1660	Bridge		
1	1620.75	.016	.015	.015
1	1590.431	.016	.015	.015
1	1504.00*	.016	.015	.015
1	1417.58*	.016	.015	.015
1	1331.15*	.016	.015	.015
1	1244.73*	.016	.015	.015
1	1158.30*	.016	.015	.015
1	1071.88	.016	.015	.015
1	982.678*	.016	.015	.015

1	893.477*	.016	.015	.015
1	804.276*	.016	.015	.015
1	715.074*	.016	.015	.015
1	625.873*	.016	.015	.015
1	536.6721	.016	.015	.015
1	437.408*	.016	.015	.015
1	338.145*	.016	.015	.015
1	238.882*	.016	.015	.015
1	139.619*	.016	.015	.015
1	40.35592	.016	.015	.015

SUMMARY OF REACH LENGTHS

River: Cedar

Reach	River Sta.	Left	Channel	Right
1	9025.193	102.95	102.42	102.41
1	8922.776	98.45	98.41	98.41
1	8824.36*	98.45	98.41	98.41
1	8725.96*	98.45	98.41	98.41
1	8627.55*	98.45	98.41	98.41
1	8529.14*	98.45	98.41	98.41
1	8430.738	99.67	99.67	99.67
1	8331.07*	99.67	99.67	99.67
1	8231.40*	99.67	99.67	99.67
1	8131.743	28.52	28.52	28.52
1	8103.225	62.2	62.21	62.2
1	8070	Bridge		
1	8041.023	30.12	30.12	30.12
1	8010.899	88.89	88.89	88.89
1	7922.01*	88.89	88.89	88.89
1	7833.12*	88.89	88.89	88.89
1	7744.23*	88.89	88.89	88.89
1	7655.34*	88.89	88.89	88.89
1	7566.459	89.82	89.81	89.82
1	7476.64*	89.82	89.81	89.82
1	7386.83*	89.82	89.81	89.82
1	7297.02*	89.82	89.81	89.82
1	7207.21*	89.82	89.81	89.82
1	7117.403	49.58	49.23	49.25
1	7068.177	79.61	79.53	79.52
1	7030	Bridge		
1	6988.652	51.98	51.99	51.98
1	6936.664	90.34	90.36	90.38
1	6846.30*	90.34	90.36	90.38
1	6755.94*	90.34	90.36	90.38
1	6665.58*	90.34	90.36	90.38
1	6575.21*	90.34	90.36	90.38
1	6484.85*	90.34	90.36	90.38
1	6394.496	83.65	83.65	83.65
1	6310.84*	83.65	83.65	83.65
1	6227.18*	83.65	83.65	83.65
1	6143.53*	83.65	83.65	83.65
1	6059.88	83.65	83.65	83.65
1	5976.22*	83.65	83.65	83.65
1	5892.57*	83.65	83.65	83.65
1	5808.91*	83.65	83.65	83.65
1	5725.263	96.86	95.32	94.33
1	5629.94*	96.86	95.32	94.33
1	5534.62*	96.86	95.32	94.33
1	5439.30*	96.86	95.32	94.33
1	5343.98	87.83	89.58	91.44
1	5254.39*	87.83	89.58	91.44
1	5164.80*	87.83	89.58	91.44
1	5075.22*	87.83	89.58	91.44
1	4985.63*	87.83	89.58	91.44
1	4896.05*	87.83	89.58	91.44
1	4806.466	86.33	84.78	82.71
1	4721.68*	86.33	84.78	82.71
1	4636.91*	86.33	84.78	82.71
1	4552.13*	86.33	84.78	82.71
1	4467.36	41.68	41.68	41.73
1	4425.682	102.74	102.72	102.85
1	4380	Bridge		
1	4322.957	29.67	29.67	29.7
1	4293.287	88.69	88.7	88.7
1	4204.59*	88.69	88.7	88.7
1	4115.89*	88.69	88.7	88.7
1	4027.20*	88.69	88.7	88.7
1	3938.50*	88.69	88.7	88.7
1	3849.81*	88.69	88.7	88.7
1	3761.11*	88.69	88.7	88.7
1	3672.419	98.75	98.76	98.76
1	3573.66*	98.75	98.76	98.76
1	3474.90*	98.75	98.76	98.76
1	3376.15*	98.75	98.76	98.76
1	3277.39*	98.75	98.76	98.76
1	3178.63*	98.75	98.76	98.76
1	3079.883	30.55	30.55	30.54
1	3049.332	63.44	63.44	63.42
1	3020	Bridge		
1	2985.898	29.63	29.63	29.62
1	2956.266	88.11	88.1	88.11
1	2868.16*	88.11	88.1	88.11
1	2780.06*	88.11	88.1	88.11
1	2691.95*	88.11	88.1	88.11
1	2603.85*	88.11	88.1	88.11

1	2515.75*	88.11	88.1	88.11
1	2427.65*	88.11	88.1	88.11
1	2339.547	86.7	86.71	86.69
1	2252.83*	86.7	86.71	86.69
1	2166.12*	86.7	86.71	86.69
1	2079.40*	86.7	86.71	86.69
1	1992.69*	86.7	86.71	86.69
1	1905.98*	86.7	86.71	86.69
1	1819.27*	86.7	86.71	86.69
1	1732.559	29.29	29.29	29.28
1	1703.273	82.53	82.52	82.51
1	1660	Bridge		
1	1620.75	30.32	30.32	30.31
1	1590.431	86.43	86.42	86.44
1	1504.00*	86.43	86.42	86.44
1	1417.58*	86.43	86.42	86.44
1	1331.15*	86.43	86.42	86.44
1	1244.73*	86.43	86.42	86.44
1	1158.30*	86.43	86.42	86.44
1	1071.88	89.2	89.2	89.2
1	982.678*	89.2	89.2	89.2
1	893.477*	89.2	89.2	89.2
1	804.276*	89.2	89.2	89.2
1	715.074*	89.2	89.2	89.2
1	625.873*	89.2	89.2	89.2
1	536.6721	98.85	99.26	99.69
1	437.408*	98.85	99.26	99.69
1	338.145*	98.85	99.26	99.69
1	238.882*	98.85	99.26	99.69
1	139.619*	98.85	99.26	99.69
1	40.35592	34.01	40.36	51.25

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Cedar

Reach	River Sta.	Contr.	Expan.
1	9025.193	.1	.3
1	8922.776	.1	.3
1	8824.36*	.1	.3
1	8725.96*	.1	.3
1	8627.55*	.1	.3
1	8529.14*	.1	.3
1	8430.738	.1	.3
1	8331.07*	.1	.3
1	8231.40*	.1	.3
1	8131.743	.3	.5
1	8103.225	.3	.5
1	8070	Bridge	
1	8041.023	.3	.5
1	8010.899	.1	.3
1	7922.01*	.1	.3
1	7833.12*	.1	.3
1	7744.23*	.1	.3
1	7655.34*	.1	.3
1	7566.459	.1	.3
1	7476.64*	.1	.3
1	7386.83*	.1	.3
1	7297.02*	.1	.3
1	7207.21*	.1	.3
1	7117.403	.3	.5
1	7068.177	.3	.5
1	7030	Bridge	
1	6988.652	.3	.5
1	6936.664	.1	.3
1	6846.30*	.1	.3
1	6755.94*	.1	.3
1	6665.58*	.1	.3
1	6575.21*	.1	.3
1	6484.85*	.1	.3
1	6394.496	.1	.3
1	6310.84*	.1	.3
1	6227.18*	.1	.3
1	6143.53*	.1	.3
1	6059.88	.1	.3
1	5976.22*	.1	.3
1	5892.57*	.1	.3
1	5808.91*	.1	.3
1	5725.263	.1	.3
1	5629.94*	.1	.3
1	5534.62*	.1	.3
1	5439.30*	.1	.3
1	5343.98	.1	.3
1	5254.39*	.1	.3
1	5164.80*	.1	.3
1	5075.22*	.1	.3
1	4985.63*	.1	.3
1	4896.05*	.1	.3
1	4806.466	.1	.3
1	4721.68*	.1	.3
1	4636.91*	.1	.3
1	4552.13*	.1	.3
1	4467.36	.3	.5
1	4425.682	.3	.5
1	4380	Bridge	
1	4322.957	.3	.5
1	4293.287	.1	.3

1	4204.59*		.1	.3
1	4115.89*		.1	.3
1	4027.20*		.1	.3
1	3938.50*		.1	.3
1	3849.81*		.1	.3
1	3761.11*		.1	.3
1	3672.419		.1	.3
1	3573.66*		.1	.3
1	3474.90*		.1	.3
1	3376.15*		.1	.3
1	3277.39*		.1	.3
1	3178.63*		.1	.3
1	3079.883		.3	.5
1	3049.332		.3	.5
1	3020	Bridge		
1	2985.898		.3	.5
1	2956.266		.1	.3
1	2868.16*		.1	.3
1	2780.06*		.1	.3
1	2691.95*		.1	.3
1	2603.85*		.1	.3
1	2515.75*		.1	.3
1	2427.65*		.1	.3
1	2339.547		.1	.3
1	2252.83*		.1	.3
1	2166.12*		.1	.3
1	2079.40*		.1	.3
1	1992.69*		.1	.3
1	1905.98*		.1	.3
1	1819.27*		.1	.3
1	1732.559		.3	.5
1	1703.273		.3	.5
1	1660	Bridge		
1	1620.75		.3	.5
1	1590.431		.1	.3
1	1504.00*		.1	.3
1	1417.58*		.1	.3
1	1331.15*		.1	.3
1	1244.73*		.1	.3
1	1158.30*		.1	.3
1	1071.88		.1	.3
1	982.678*		.1	.3
1	893.477*		.1	.3
1	804.276*		.1	.3
1	715.074*		.1	.3
1	625.873*		.1	.3
1	536.6721		.1	.3
1	437.408*		.1	.3
1	338.145*		.1	.3
1	238.882*		.1	.3
1	139.619*		.1	.3
1	40.35592		.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	9025.193	INT	1132.00	1777.09	1781.31	1782.26	1784.57	0.005262	14.49	78.11	24.64	1.43
1	8922.776	INT	1132.00	1776.52	1782.24	1782.24	1784.14	0.002471	11.07	102.29	27.19	1.01
1	8824.36*	INT	1132.00	1775.99	1781.15	1781.72	1783.77	0.003807	12.99	87.11	25.23	1.23
1	8725.96*	INT	1132.00	1775.47	1780.49	1781.21	1783.35	0.004277	13.58	83.36	24.65	1.30
1	8627.55*	INT	1132.00	1774.94	1779.90	1780.70	1782.90	0.004538	13.90	81.44	24.28	1.34
1	8529.14*	INT	1132.00	1774.42	1779.34	1780.18	1782.44	0.004737	14.14	80.07	24.00	1.36
1	8430.738	INT	1132.00	1773.89	1778.79	1779.67	1781.96	0.004845	14.27	79.30	23.80	1.38
1	8331.07*	INT	1132.00	1773.38	1778.26	1779.16	1781.46	0.004934	14.38	78.74	23.68	1.39
1	8231.40*	INT	1132.00	1772.88	1777.73	1778.66	1780.97	0.004991	14.44	78.40	23.63	1.40
1	8131.743	INT	1132.00	1772.37	1779.57	1778.13	1780.56	0.000990	7.99	141.74	29.63	0.64
1	8103.225	INT	1132.00	1772.07	1779.75	1776.29	1780.35	0.000490	6.18	183.23	58.34	0.40
1	8070	Bridge										
1	8041.023	INT	1132.00	1772.24	1779.09	1776.34	1779.81	0.000654	6.79	166.70	33.51	0.46
1	8010.899	INT	1132.00	1771.83	1777.72	1777.50	1779.46	0.002139	10.60	106.84	26.76	0.93
1	7922.01*	INT	1132.00	1771.62	1777.55	1777.32	1779.26	0.002101	10.52	107.63	26.92	0.93
1	7833.12*	INT	1132.00	1771.40	1777.38	1777.11	1779.07	0.002048	10.42	108.68	27.09	0.92
1	7744.23*	INT	1132.00	1771.19	1777.25	1776.89	1778.87	0.001955	10.23	110.67	27.40	0.90
1	7655.34*	INT	1132.00	1770.97	1777.13	1776.71	1778.68	0.001837	9.99	113.34	27.76	0.87
1	7566.459	INT	1132.00	1770.76	1777.03	1776.51	1778.50	0.001721	9.75	116.08	28.00	0.84

1	7476.64*	INT	1132.00	1770.50	1776.97	1776.25	1778.32	0.001522	9.31
121.65	28.60	0.80							
1	7386.83*	INT	1132.00	1770.25	1776.93	1776.00	1778.15	0.001345	8.87
127.60	29.27	0.75							
1	7297.02*	INT	1132.00	1769.99	1776.90	1775.74	1778.01	0.001189	8.46
133.83	29.96	0.71							
1	7207.21*	INT	1132.00	1769.74	1776.87	1775.49	1777.87	0.001048	8.05
140.66	30.74	0.66							
1	7117.403	INT	1132.00	1769.48	1776.85	1775.23	1777.76	0.000926	7.66
147.75	31.58	0.62							
1	7068.177	INT	1165.00	1769.04	1777.16	1772.27	1777.41	0.000146	4.01
290.69	57.80	0.25							
1	7030		Bridge						
1	6988.652	INT	1165.00	1768.81	1776.59	1772.23	1776.88	0.000183	4.30
271.26	57.51	0.28							
1	6936.664	INT	1165.00	1769.16	1775.00	1774.53	1776.50	0.001763	9.82
118.69	29.30	0.86							
1	6846.30*	INT	1165.00	1768.97	1774.83	1774.38	1776.33	0.001764	9.82
118.58	29.22	0.86							
1	6755.94*	INT	1165.00	1768.79	1774.66	1774.20	1776.16	0.001775	9.85
118.26	29.15	0.86							
1	6665.58*	INT	1165.00	1768.61	1774.48	1774.02	1776.00	0.001782	9.87
118.01	29.07	0.86							
1	6575.21*	INT	1165.00	1768.42	1774.31	1773.87	1775.83	0.001785	9.88
117.86	28.98	0.86							
1	6484.85*	INT	1165.00	1768.24	1774.14	1773.69	1775.66	0.001793	9.91
117.61	28.91	0.87							
1	6394.496	INT	1165.00	1768.06	1773.96	1773.51	1775.49	0.001807	9.94
117.22	28.81	0.87							
1	6310.84*	INT	1165.00	1767.88	1773.84	1773.34	1775.33	0.001741	9.80
118.86	29.03	0.85							
1	6227.18*	INT	1165.00	1767.71	1773.73	1773.18	1775.17	0.001663	9.63
120.94	29.29	0.84							
1	6143.53*	INT	1165.00	1767.53	1773.63	1772.99	1775.02	0.001586	9.46
123.12	29.57	0.82							
1	6059.88	INT	1186.00	1767.36	1773.40	1772.89	1774.88	0.001708	9.77
121.44	29.45	0.85							
1	5976.22*	INT	1186.00	1767.18	1773.30	1772.70	1774.73	0.001629	9.59
123.61	29.71	0.83							
1	5892.57*	INT	1186.00	1767.01	1773.21	1772.53	1774.58	0.001545	9.41
126.07	31.88	0.81							
1	5808.91*	INT	1186.00	1766.83	1773.12	1772.36	1774.44	0.001455	9.20
129.40	36.07	0.79							
1	5725.263	INT	1186.00	1766.66	1773.05	1772.19	1774.30	0.001375	8.98
133.44	39.90	0.77							
1	5629.94*	INT	1186.00	1766.48	1772.98	1772.00	1774.15	0.001267	8.71
138.53	43.53	0.74							
1	5534.62*	INT	1186.00	1766.29	1772.92	1771.81	1774.01	0.001149	8.41
144.77	45.50	0.71							
1	5439.30*	INT	1186.00	1766.11	1772.87	1771.62	1773.88	0.001035	8.11
151.41	46.35	0.67							
1	5343.98	INT	1186.00	1765.93	1772.83	1771.42	1773.77	0.000929	7.80
158.04	44.86	0.64							
1	5254.39*	INT	1186.00	1765.76	1772.80	1771.25	1773.67	0.000856	7.55
164.04	45.43	0.62							
1	5164.80*	INT	1186.00	1765.58	1772.77	1771.07	1773.58	0.000785	7.29
170.52	46.05	0.59							
1	5075.22*	INT	1186.00	1765.40	1772.74	1770.89	1773.49	0.000719	7.03
177.22	46.71	0.57							
1	4985.63*	INT	1186.00	1765.22	1772.72	1770.72	1773.41	0.000654	6.79
184.08	48.03	0.54							
1	4896.05*	INT	1186.00	1765.05	1772.70	1770.54	1773.34	0.000583	6.55
191.27	47.90	0.52							
1	4806.466	INT	1186.00	1764.87	1772.68	1770.37	1773.28	0.000520	6.33
198.56	47.73	0.49							
1	4721.68*	INT	1186.00	1764.69	1772.67	1770.17	1773.22	0.000461	6.07
207.49	48.20	0.46							
1	4636.91*	INT	1186.00	1764.51	1772.67	1769.97	1773.17	0.000409	5.82
216.79	48.67	0.44							
1	4552.13*	INT	1186.00	1764.33	1772.67	1769.76	1773.13	0.000363	5.58
226.32	49.13	0.41							
1	4467.36	INT	1186.00	1764.15	1772.66	1769.56	1773.09	0.000324	5.37
235.82	49.60	0.39							
1	4425.682	INT	1249.00	1764.28	1772.42	1768.60	1773.02	0.000444	6.21
201.37	56.71	0.38							
1	4380		Bridge						
1	4322.957	INT	1249.00	1763.99	1771.35	1768.47	1772.12	0.000677	7.08
176.43	43.72	0.47							
1	4293.287	INT	1249.00	1763.81	1769.72	1769.72	1771.72	0.002452	11.37
109.89	27.72	1.01							
1	4204.59*	INT	1249.00	1763.45	1769.01	1769.37	1771.43	0.003164	12.48
100.08	26.65	1.13							
1	4115.89*	INT	1249.00	1763.10	1768.58	1769.03	1771.13	0.003399	12.81
97.50	26.37	1.17							
1	4027.20*	INT	1249.00	1762.75	1768.19	1768.69	1770.82	0.003540	13.00
96.08	26.22	1.20							
1	3938.50*	INT	1249.00	1762.40	1767.81	1768.35	1770.49	0.003647	13.14
95.06	26.13	1.21							
1	3849.81*	INT	1249.00	1762.05	1767.45	1768.01	1770.16	0.003718	13.23
94.40	26.06	1.22							
1	3761.11*	INT	1249.00	1761.70	1767.12	1767.67	1769.83	0.003698	13.20
94.61	26.10	1.22							
1	3672.419	INT	1249.00	1761.35	1766.76	1767.32	1769.50	0.003758	13.28
94.08	26.06	1.23							
1	3573.66*	INT	1249.00	1760.96	1766.39	1766.96	1769.13	0.003761	13.28
94.04	26.05	1.23							
1	3474.90*	INT	1249.00	1760.58	1766.02	1766.59	1768.76	0.003768	13.29
93.95	26.03	1.23							
1	3376.15*	INT	1249.00	1760.20	1765.65	1766.22	1768.40	0.003772	13.30

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93.90       26.00       1.23
  1          3277.39*    INT      1249.00    1759.82    1767.13    1765.87    1768.08    0.001053      7.99
169.08      57.84       0.68
  1          3178.63*    INT      1249.00    1759.43    1767.20    1765.50    1767.92    0.000722      7.05
194.85      59.09       0.57
  1          3079.883    INT      1249.00    1759.05    1767.24    1765.13    1767.82    0.000520      6.33
219.01      59.05       0.49
  1          3049.332    INT      1291.00    1758.95    1767.33    1762.78    1767.71    0.000234      4.97
260.33      59.02       0.30
  1          3020        Bridge

  1          2985.898    INT      1291.00    1758.75    1766.68    1762.55    1767.09    0.000262      5.14
251.62      59.37       0.33
  1          2956.266    INT      1291.00    1758.49    1764.54    1764.54    1766.58    0.002441     11.45
112.74      28.00       1.01
  1          2868.16*    INT      1291.00    1758.17    1764.03    1764.27    1766.32    0.002848     12.14
106.38      27.17       1.08
  1          2780.06*    INT      1291.00    1757.85    1763.91    1763.98    1766.02    0.002534     11.64
110.92      27.55       1.02
  1          2691.95*    INT      1291.00    1757.53    1763.42    1763.67    1765.76    0.002906     12.26
105.32      26.81       1.09
  1          2603.85*    INT      1291.00    1757.22    1763.29    1763.39    1765.46    0.002621     11.81
109.28      27.14       1.04
  1          2515.75*    INT      1291.00    1756.90    1762.85    1763.09    1765.19    0.002912     12.30
104.99      26.55       1.09
  1          2427.65*    INT      1291.00    1756.58    1762.71    1762.80    1764.89    0.002631     11.86
108.88      26.87       1.04
  1          2339.547    INT      1291.00    1756.26    1762.26    1762.51    1764.63    0.002925     12.34
104.59      26.29       1.09
  1          2252.83*    INT      1291.00    1755.94    1761.76    1762.19    1764.34    0.003277     12.88
100.21      25.73       1.15
  1          2166.12*    INT      1291.00    1755.62    1761.34    1761.87    1764.03    0.003465     13.16
98.10       25.43       1.18
  1          2079.40*    INT      1291.00    1755.30    1760.95    1761.51    1763.72    0.003597     13.35
96.68       25.20       1.20
  1          1992.69*    INT      1291.00    1754.98    1760.59    1761.19    1763.40    0.003669     13.46
95.92       25.05       1.21
  1          1905.98*    INT      1291.00    1754.66    1761.61    1760.84    1763.09    0.001539      9.76
132.27      28.66       0.80
  1          1819.27*    INT      1291.00    1754.34    1761.63    1760.50    1762.91    0.001273      9.06
142.48      29.82       0.73
  1          1732.559    INT      1291.00    1754.02    1761.65    1760.17    1762.75    0.001048      8.42
153.93      38.15       0.67
  1          1703.273    INT      1343.00    1753.82    1761.96    1757.84    1762.42    0.000304      5.45
247.09      66.58       0.34
  1          1660        Bridge

  1          1620.75     INT      1343.00    1753.62    1761.00    1757.60    1761.55    0.000407      5.97
225.59      59.96       0.39
  1          1590.431    INT      1343.00    1753.65    1759.59    1759.18    1761.21    0.001816     10.22
131.43      31.49       0.88
  1          1504.00*    INT      1343.00    1753.47    1759.42    1759.03    1761.04    0.001812     10.21
131.49      31.46       0.88
  1          1417.58*    INT      1343.00    1753.28    1759.24    1758.85    1760.88    0.001833     10.26
130.87      31.36       0.89
  1          1331.15*    INT      1343.00    1753.10    1759.07    1758.70    1760.71    0.001846     10.29
130.49      31.28       0.89
  1          1244.73*    INT      1343.00    1752.92    1758.89    1758.52    1760.55    0.001863     10.33
130.01      31.21       0.89
  1          1158.30*    INT      1343.00    1752.73    1758.71    1758.37    1760.38    0.001887     10.38
129.34      31.09       0.90
  1          1071.88     INT      1343.00    1752.55    1758.53    1758.19    1760.22    0.001904     10.42
128.87      31.02       0.90
  1          982.678*    INT      1343.00    1752.38    1758.39    1758.00    1760.03    0.001845     10.30
130.41      31.20       0.89
  1          893.477*    INT      1343.00    1752.21    1758.26    1757.80    1759.85    0.001765     10.13
132.59      31.45       0.87
  1          804.276*    INT      1343.00    1752.04    1758.15    1757.61    1759.68    0.001676      9.94
135.09      31.65       0.85
  1          715.074*    INT      1343.00    1751.86    1758.05    1757.42    1759.51    0.001566      9.71
138.32      31.81       0.82
  1          625.873*    INT      1343.00    1751.69    1757.96    1757.23    1759.36    0.001464      9.48
141.64      31.97       0.79
  1          536.6721    INT      1381.00    1751.52    1757.59    1757.14    1759.19    0.001742     10.16
135.97      31.70       0.86
  1          437.408*    INT      1381.00    1751.32    1757.40    1756.94    1759.01    0.001754     10.18
135.64      31.70       0.87
  1          338.145*    INT      1381.00    1751.12    1757.22    1756.78    1758.83    0.001756     10.19
135.57      31.70       0.87
  1          238.882*    INT      1381.00    1750.92    1757.03    1756.58    1758.65    0.001768     10.21
135.26      31.70       0.87
  1          139.619*    INT      1381.00    1750.72    1756.83    1756.40    1758.46    0.001792     10.26
134.62      31.68       0.88
  1          40.35592    INT      1381.00    1750.53    1756.49    1756.24    1758.26    0.002003     10.68
129.34      31.24       0.92
```
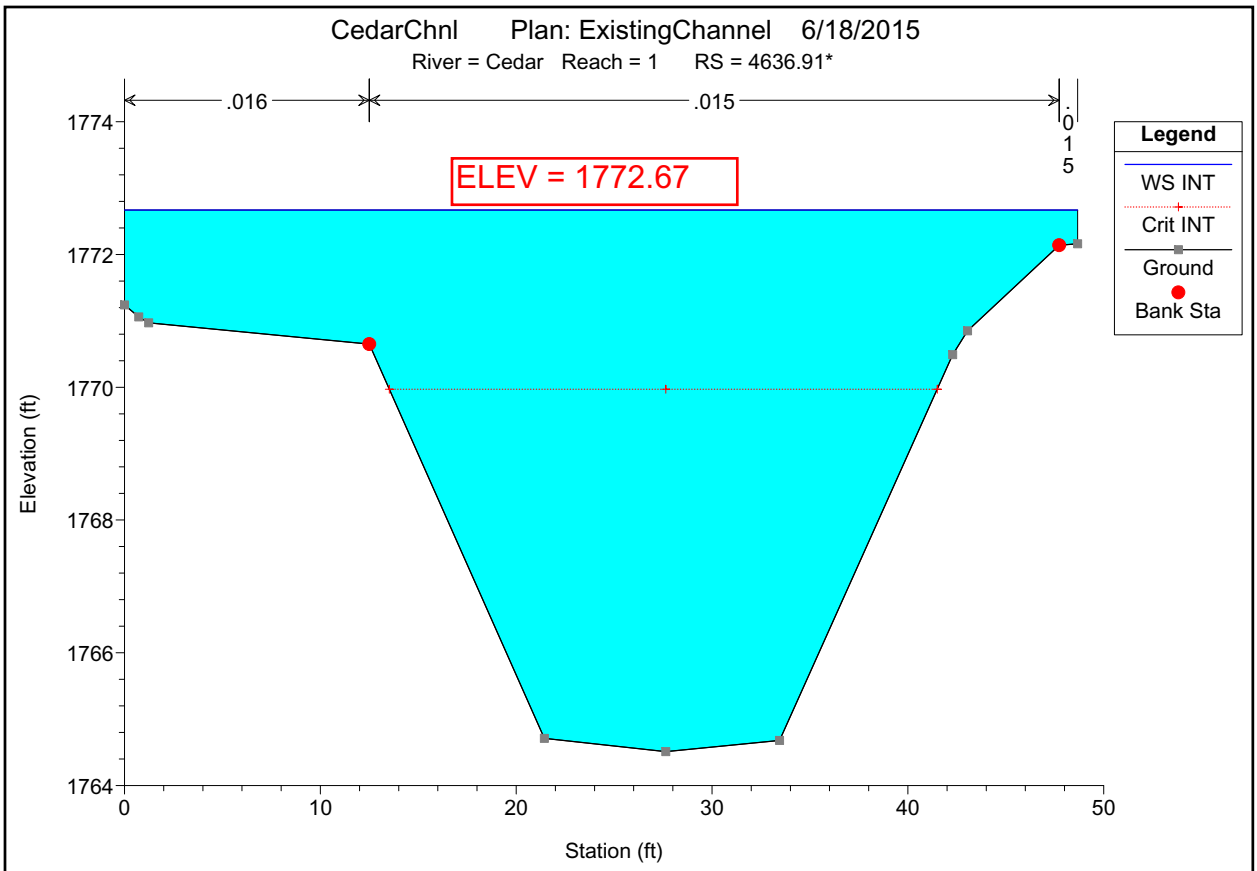
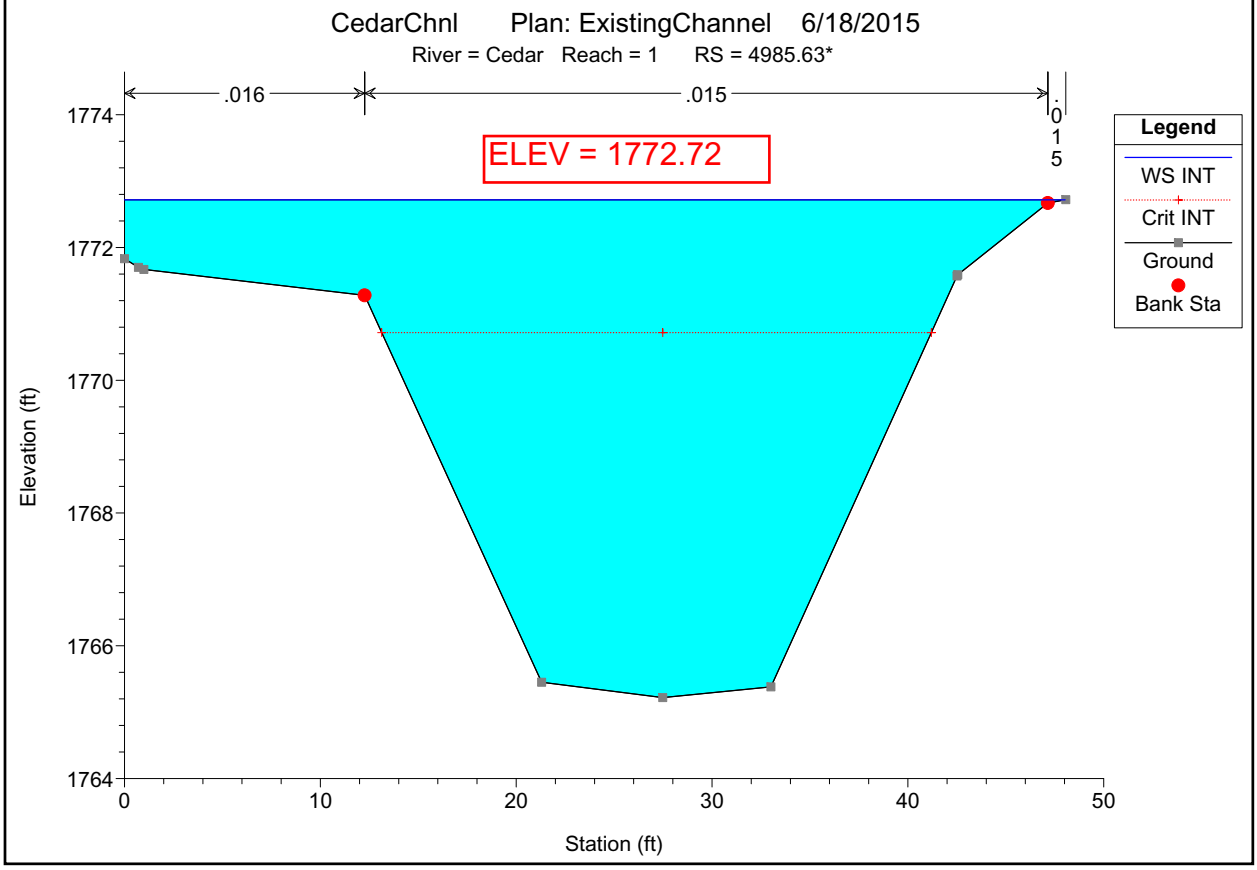
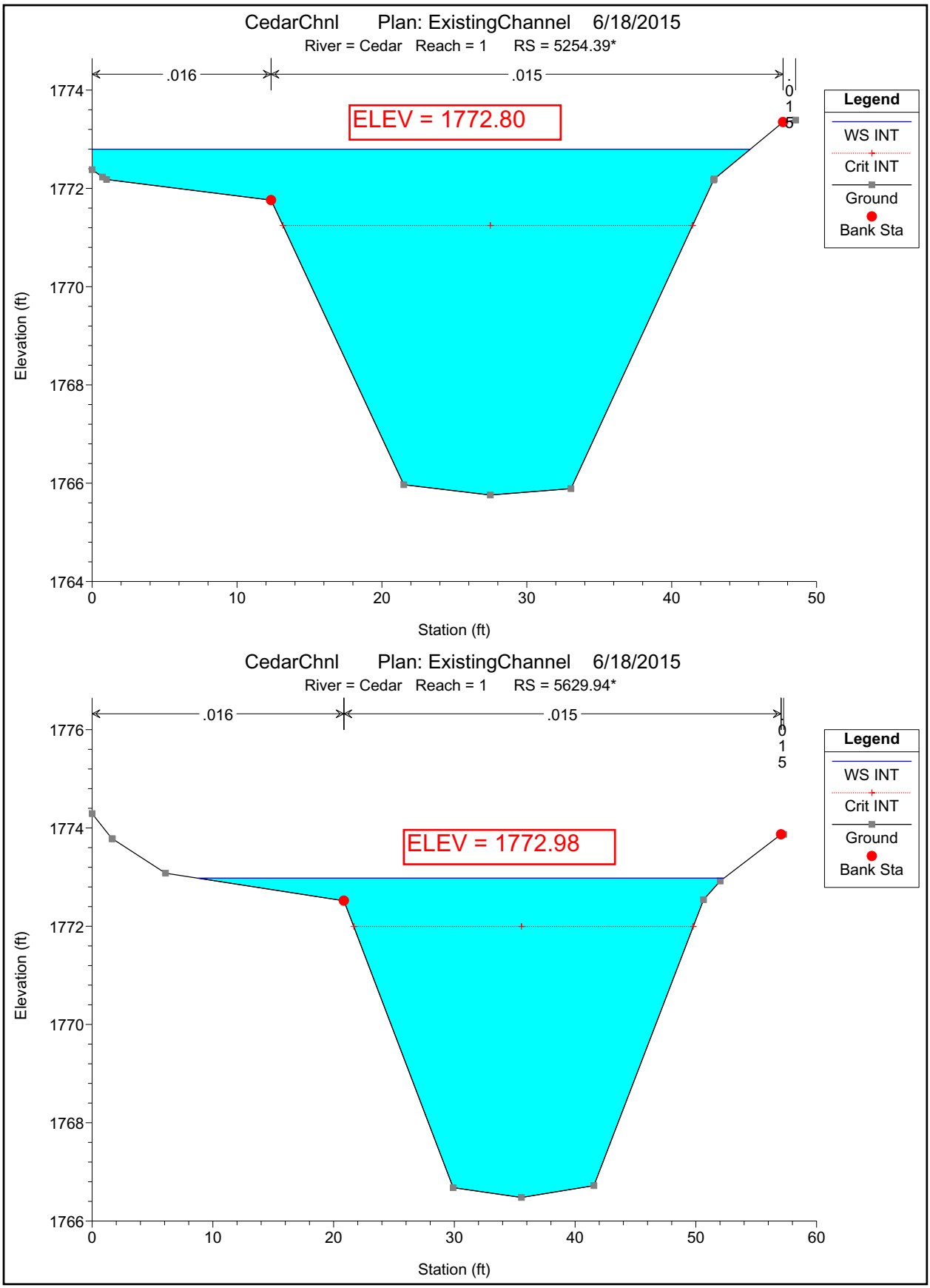

HEC-RAS Plan: Ex_Ch River: Cedar Reach: 1 Profile: INT

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	5629.94*	INT	1186.00	1766.48	1772.98	1772.00	1774.15	0.001267	8.71	138.53	43.53	0.74
1	5534.62*	INT	1186.00	1766.29	1772.92	1771.81	1774.01	0.001149	8.41	144.77	45.50	0.71
1	5439.30*	INT	1186.00	1766.11	1772.87	1771.62	1773.88	0.001035	8.11	151.41	46.35	0.67
1	5343.98	INT	1186.00	1765.93	1772.83	1771.42	1773.77	0.000929	7.80	158.04	44.86	0.64
1	5254.39*	INT	1186.00	1765.76	1772.80	1771.25	1773.67	0.000856	7.55	164.04	45.43	0.62
1	5164.80*	INT	1186.00	1765.58	1772.77	1771.07	1773.58	0.000785	7.29	170.52	46.05	0.59
1	5075.22*	INT	1186.00	1765.40	1772.74	1770.89	1773.49	0.000719	7.03	177.22	46.71	0.57
1	4985.63*	INT	1186.00	1765.22	1772.72	1770.72	1773.41	0.000654	6.79	184.08	48.03	0.54
1	4896.05*	INT	1186.00	1765.05	1772.70	1770.54	1773.34	0.000583	6.55	191.27	47.90	0.52
1	4806.466	INT	1186.00	1764.87	1772.68	1770.37	1773.28	0.000520	6.33	198.56	47.73	0.49
1	4721.68*	INT	1186.00	1764.69	1772.67	1770.17	1773.22	0.000461	6.07	207.49	48.20	0.46
1	4636.91*	INT	1186.00	1764.51	1772.67	1769.97	1773.17	0.000409	5.82	216.79	48.67	0.44
1	4552.13*	INT	1186.00	1764.33	1772.67	1769.76	1773.13	0.000363	5.58	226.32	49.13	0.41
1	4467.36	INT	1186.00	1764.15	1772.66	1769.56	1773.09	0.000324	5.37	235.82	49.60	0.39
1	4425.682	INT	1249.00	1764.28	1772.42	1768.60	1773.02	0.000444	6.21	201.37	56.71	0.38
1	4380		Bridge									
1	4322.957	INT	1249.00	1763.99	1771.35	1768.47	1772.12	0.000677	7.08	176.43	43.72	0.47
1	4293.287	INT	1249.00	1763.81	1769.72	1769.72	1771.72	0.002452	11.37	109.89	27.72	1.01
1	4204.59*	INT	1249.00	1763.45	1769.01	1769.37	1771.43	0.003164	12.48	100.08	26.65	1.13
1	4115.89*	INT	1249.00	1763.10	1768.58	1769.03	1771.13	0.003399	12.81	97.50	26.37	1.17


CedarChnl Plan: ExistingChannel 6/18/2015
River = Cedar Reach = 1 RS = 4636.91*
.016
.015
.015
ELEV = 1772.67
Legend
WS INT
Crit INT
Ground
Bank Sta
Elevation (ft)
Station (ft)
1774
1772
1770
1768
1766
1764
0
10
20
30
40
50


CedarChnl Plan: ExistingChannel 6/18/2015
River = Cedar Reach = 1 RS = 4985.63*
.016
.015
.015
ELEV = 1772.72
Legend
WS INT
Crit INT
Ground
Bank Sta
Elevation (ft)
Station (ft)
1774
1772
1770
1768
1766
1764
0
10
20
30
40
50


CedarChnl Plan: ExistingChannel 6/18/2015
River = Cedar Reach = 1 RS = 5254.39*
.016
.015
.015
ELEV = 1772.80
Legend
WS INT
Crit INT
Ground
Bank Sta
Elevation (ft)
Station (ft)
CedarChnl Plan: ExistingChannel 6/18/2015
River = Cedar Reach = 1 RS = 5629.94*
.016
.015
.015
ELEV = 1772.98
Legend
WS INT
Crit INT
Ground
Bank Sta
Elevation (ft)
Station (ft)

HEC-RAS Interim Condition Model
Atkins North America

Flowmaster Software Calculations for Section S4/D

Worksheet for S4/D_DON3_42 LF Wide Drive Aisle-100 Yr_Ult

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00540	ft/ft
Discharge	7.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.26
0+06.00	1.14
0+06.50	1.14
0+06.50	0.64
0+47.00	0.03
0+48.50	0.00
0+48.50	0.50
0+49.00	0.50
0+54.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.26)	(0+06.50, 0.64)	0.013
(0+06.50, 0.64)	(0+47.00, 0.03)	0.016
(0+47.00, 0.03)	(0+54.00, 0.60)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.33	ft
Elevation Range	0.00 to 1.26 ft	

Worksheet for S4/D_DON3_42 LF Wide Drive Aisle-100 Yr_Ult

Results

Flow Area		3.45	ft²
Wetted Perimeter		21.76	ft
Hydraulic Radius		0.16	ft
Top Width		21.43	ft
Normal Depth		0.33	ft
Critical Depth		0.31	ft
Critical Slope		0.00690	ft/ft
Velocity		2.03	ft/s
Velocity Head		0.06	ft
Specific Energy		0.39	ft
Froude Number		0.89	
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		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.33	ft
Critical Depth	0.31	ft
Channel Slope	0.00540	ft/ft
Critical Slope	0.00690	ft/ft

Cross Section for S4/D_DON3_42 LF Wide Drive Aisle-100 Yr_Ult

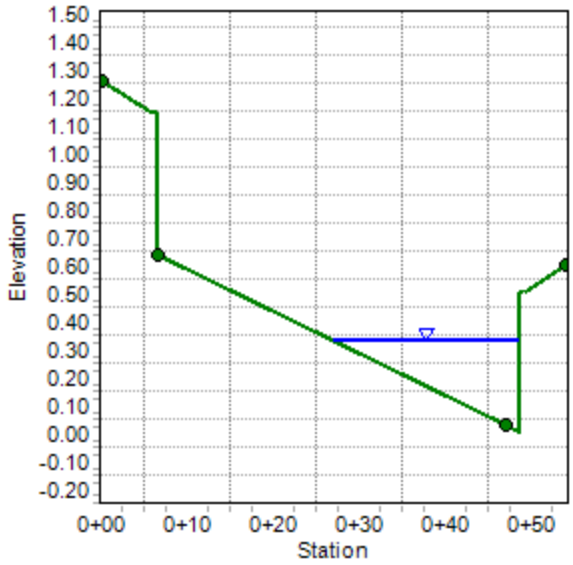
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00540	ft/ft
Normal Depth	0.33	ft
Discharge	7.00	ft³/s

Cross Section Image



Appendix C: Improvement Plans

LAMB PINES
IMPROVEMENT PLANS

501 NORTH LAMB BOULEVARD

CITY OF LAS VEGAS
STATE OF NEVADA
APN #140-31-501-021
12.59 GROSS/NET ACRES

NEVADA HAND

295 EAST WARM SPRINGS ROAD, #101
LAS VEGAS, NV 89119-4212
(702) 410-2730
CONTACT: ROBERT FEIBLEMAN

SHEET INDEX

1	COVER SHEET
2	VICINITY – LOCATION MAP
3	GENERAL NOTES
4	DEMOLITION PLAN 1
5	DEMOLITION PLAN 2
6	DEMOLITION PLAN 3
7	HORIZONTAL CONTROL PLAN 1
8	HORIZONTAL CONTROL PLAN 2
9	HORIZONTAL CONTROL PLAN 3
10	GRADING PLAN 1
11	GRADING PLAN 2
12	GRADING PLAN 3
13	UTILITY PLAN 1
14	UTILITY PLAN 2
15	UTILITY PLAN 3
16	PLAN & PROFILE SHEET 1
17	TRAFFIC & SIGNAGE PLAN 1
18	TRAFFIC & SIGNAGE PLAN 2
19	TRAFFIC & SIGNAGE PLAN 3
20	FIRE ACCESS PLAN 1
21	FIRE ACCESS PLAN 2
22	FIRE ACCESS PLAN 3
23	DETAIL SHEET 1
24	DETAIL SHEET 2
25	DETAIL SHEET 3

DEVELOPER \ OWNER

HAND PROPERTY HOLDING COMPANY
295 E WARM SPRINGS RD #101
LAS VEGAS NV 89119-4212

ENGINEER

L.R. NELSON CONSULTING ENGINEERS, INC.
6765 WEST RUSSELL ROAD SUITE 200
LAS VEGAS, NEVADA 89118-1811
CONTACT: THOMAS L. KELLEY, PE
PHONE : (702) 798-7978

LEGAL DESCRIPTION

THAT PORTION OF THE EAST HALF (E 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 31, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, NEVADA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PARCEL 1 AS SHOWN ON PARCEL MAP IN FILE 96, PAGE 01, RECORDED SEPTEMBER 7, 1999 IN BOOK 990907 AS INSTRUMENT NO. 00470 OF OFFICIAL RECORDS.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 1LV02 31C4

A RIVET AND PLATE IN THE TOP OF CURB AT THE SOUTHWEST CORNER OF STEWART AND SANDHILL.

ELEVATION = 539.670 METERS (1770.57 FEET) NAVD 1988

BASIS OF BEARING

NORTH 89°43'16" WEST, BEING THE BEARING OF THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 31, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., AS SHOWN ON A MAP ON FILE IN THE CLARK COUNTY, NEVADA RECORDER'S OFFICE AS FILE 15, PAGE 32 OF SURVEYS.

APPROVALS

ALLEN PAVELKA, PE No. 9029 DATE
CITY OF LAS VEGAS CITY ENGINEER

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD. THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARD IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

CITY FIRE DEPARTMENT DATE

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES DATE
MANAGER PROJECT No. XXXXXX (SHEETS 1-3, 13-16, 23)

NEVADA POWER d.b.a. NV ENERGY DATE

NEVADA POWER d.b.a. NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER d.b.a. NV ENERGY 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.

CENTRAL TELEPHONE CO. d.b.a. CENTURYLINK DATE

"THE AFFIXED CENTURY LINK 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 STATUES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS."

COX COMMUNICATIONS LAS VEGAS, INC. DATE

SOUTHWEST GAS CORPORATION DATE

CHRIS KNIGHT, DIRECTOR OF BUILDING & SAFETY DATE
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT.

DISCLAIMER NOTE

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

Call before you Dig — Avoid costly underground utility strike by simply... Call 811 — 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S QUICK & EASY! CALL BEFORE YOU DIG OVERHEAD — 1-702-227-2929

FAST — Call before you UnderGround. 1-702-432-5300 — FREE/NO COST NATIONAL SYSTEM OF NOTIFICATION

H# XXXXX

THOMAS L. KELLEY EXP 6/30/17 CIVIL No. 017676 — PROFESSIONAL ENGINEER - STATE OF NEVADA

DESIGNED BY:	MH	DRAWN BY:	MH	CHKD BY:	TLK
JOB NUMBER:	818-030-152	DATE:	July 2015		
NO.	REVISION			DATE	APPL

L. R. NELSON CONSULTING ENGINEERS, INC.
6765 West Russell Road, Suite 200
Las Vegas, Nevada 89118
•STRUCTURAL •CIVIL •PLANNING •SURVEY
(702) 798-7978
(702) 451-2296 FAX

Nevada HAND — Housing And Neighborhood Development

COVER SHEET
LAMB PINES IMPROVEMENT PLANS NEVADA
CITY OF LAS VEGAS

SHEET NUMBER 1 OF 25 SHEETS

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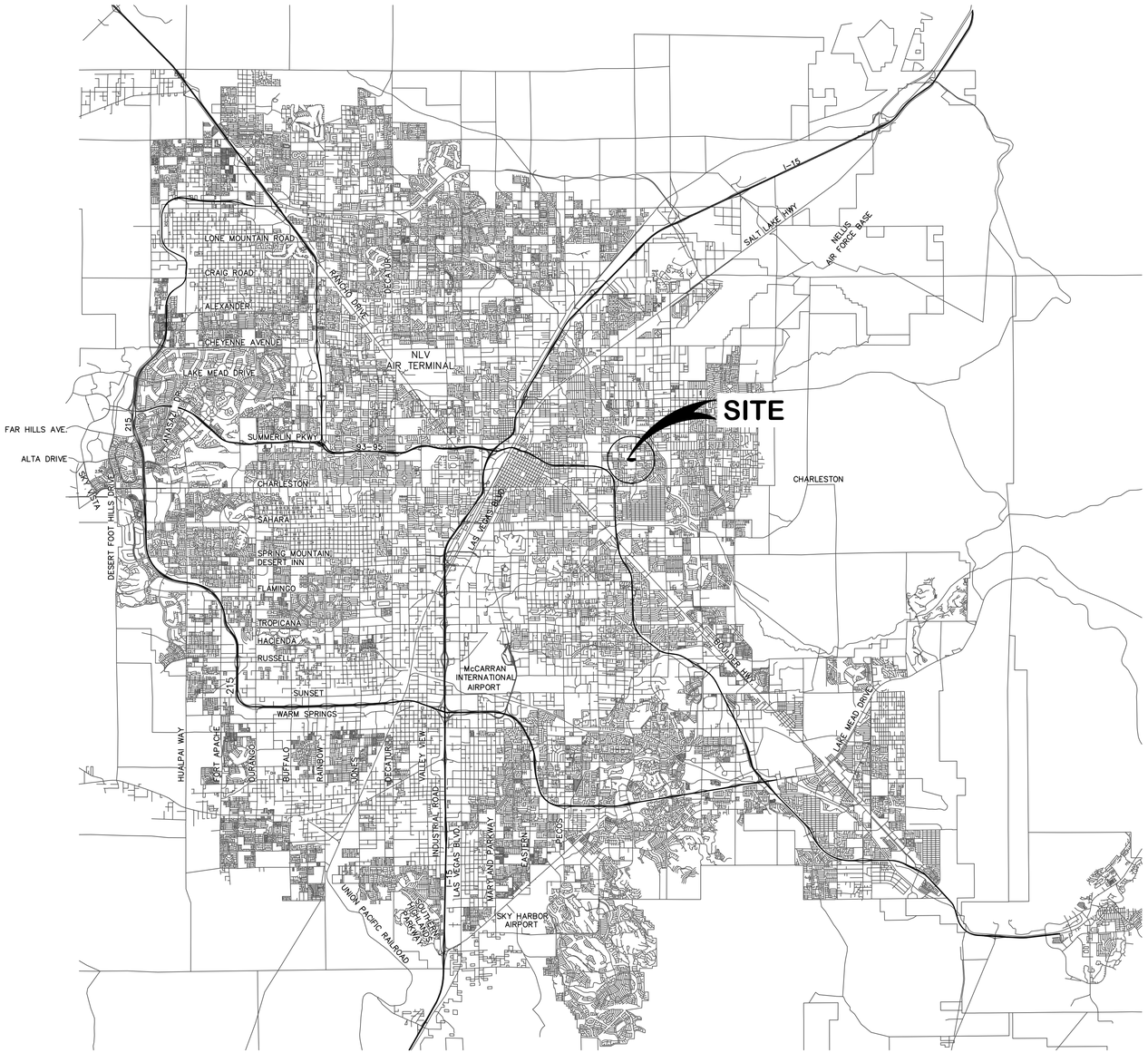
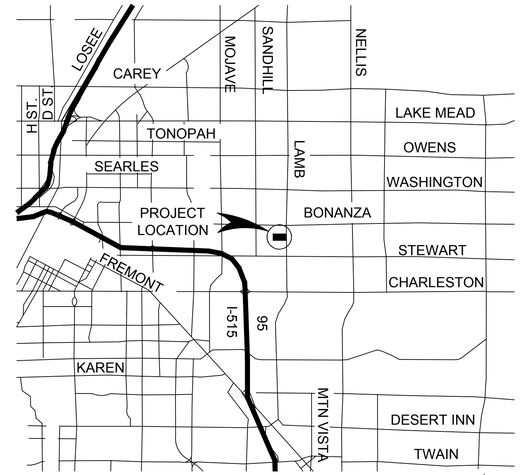


LOCATION MAP



VICINITY MAP

DEVELOPER \ OWNER

HAND PROPERTY HOLDING COMPANY
295 E WARM SPRINGS RD #101
LAS VEGAS NV 89119-4212

ENGINEER

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6765 WEST RUSSELL ROAD SUITE 200
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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER
DATE _____ PROJECT NO XXXXXX

DISCLAIMER NOTE

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THOMAS L. KELLEY
PROFESSIONAL ENGINEER-STATE OF NEVADA
EXP 6/30/17
CIVIL
No. 017676

DESIGNED BY: MH	DRAWN BY: MH	CHKD BY: TLK
JOB NUMBER: 818-030-152	DATE: July 2015	
NO.	REVISION	DATE APPL

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Nevada HAND — Housing And Neighborhood Development

VICINITY - LOCATION MAP

LAMB PINES IMPROVEMENT PLANS

NEVADA

CITY OF LAS VEGAS

SHEET NUMBER 2 OF 25 SHEETS

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CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".
2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCES WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.
9. CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.
10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.
11. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.
12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY THE (GEOTEK, INC. PROJECT #12108-LV6, DATED, NOVEMBER 26, 2014) APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.
13. EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.
14. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE No. 625.380 AND CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE OFFSITE INSPECTION AND TESTING SECTION PRIOR TO PROJECT ACCEPTANCE. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND THE CONNECTION TO A DROP INLET, AND THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXITS THE PUBLIC RIGHT-OF-WAY. THE LOCATION SHALL BE DESCRIBED BY STATE PLANE COORDINATES WHICH SHALL BE BASED ON THE "NEVADA COORDINATE SYSTEM OF 1983, EAST ZONE" AS DEFINED BY THE NEVADA REVISED STATUTES CHAPTER 327, AND TIED TO THE CITY OF LAS VEGAS VERTICAL CONTROL BENCHMARK NETWORK. COORDINATES MUST BE CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINTIES +/- 0.1 METER (+/- 0.3 FEET). A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).
22. SANITARY SEWER SERVICE LATERALS REQUIRE THE INSTALLATION OF A MARKER BALL AT THE CONNECTION OF THE SEWER SERVICE LATERAL TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERAL EXITS THE PUBLIC RIGHT-OF-WAY. STORM DRAIN LATERALS REQUIRE THE INSTALLATION OF A MARKER BALL AT THE CONNECTION OF THE STORM DRAIN LATERAL TO THE STORM DRAIN MAIN AND WHERE THE STORM DRAIN LATERAL EXITS THE PUBLIC RIGHT-OF-WAY OR WHERE THE STORM DRAIN LATERAL CONNECTS TO A DROP INLET.
23. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST ADDITION.

24. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED 04/15/10

CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORSEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BY IMMEDIATELY NOTIFIED FOR DIRECTION.
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.
3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.
4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.
6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITH THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED.

	HORIZONTAL	VERTICAL	COMPACTION
A. PAVEMENT AREA SUBGRADE	0.1±	+0.0' TO -0.1'	SEE SOILS REPORT
B. ENGINEERED FILL	0.5±	+0.1 TO -0.1'	SEE SOILS REPORT

COMPACTION TESTING WILL BE PERFORMED BY THE OWNER AND HIS REPRESENTATIVE.

7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED
8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.
9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOILS, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.
10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

DEVIATION FROM STANDARDS

NONE

CITY OF LAS VEGAS SEWER NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENT OF THE ABOVE SPECIFICATIONS.
2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.
3. CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.
4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREET LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" 'S SHALL BE USED ON LINES TWELVE INCHES (12") AND ABOVE.
7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCHES (18") UNDER A WATER MAIN.
8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.
9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTIONS PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.
10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C-900 PVC PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

CITY OF LAS VEGAS STREET LIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND ANY ADOPTED SPECIAL AREA STANDARD.
2. NO DEVIATION OF STREETLIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF TRAFFIC ENGINEERING AND THE CITY ENGINEER.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
4. ALL STREET LIGHTING CONDUITS STUB SHALL AT LEAST ONE GREEN #8 THW WIRE INSTALLED, AS TRACER WIRE. WHEN "EMPTY" CONDUIT IS COMPLETELY INSTALLED FROM PB TO PB, IT SHALL HAVE MINIMUM OF 2 #4 AND 1 #8 THW WIRE WITH THE ENDS TAPED OR "SAFE OFF" PRIOR TO FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN ACCORDANCE WITH THE USD No. 320A.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TEFO PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINT SHALL BE COORDINATED WITH NV ENERGY COMPANY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICE POINTS SHALL BE SHOWN ON THE CIVIL PLANS.
8. IT SHALL BE ASSUMED THAT IN THE ABSENCE OF AN EXISTING, WORKABLE CIRCUIT TO ATTACH TO, ALL INSTALLATIONS SHALL REQUIRE A NEW SERVICE FOR OPERATION OF THE CIRCUIT.
9. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREET LIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED, AT NO EXPENSE TO THE CITY OF LAS VEGAS, BEFORE STREETLIGHT BASE ARE INSTALLED.
10. THE CONTRACTOR SHALL FURNISH COMPLETE SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON PLANS.
11. THE DEVELOPER/OWNER WILL BE REQUIRED TO SUPPLY POWER TO ALL NEW PUBLIC STREET LIGHTS INSTALLED UNDER THIS DESIGN PRIOR TO BOND RELEASE OR PROJECT COMPLETION. THE DEVELOPER/OWNER WILL BE RESPONSIBLE FOR ALL ITEMS ASSOCIATED WITH THE INSTALLATION, CONSTRUCTION, ENERGIZING, MAINTENANCE AND OPERATIONAL COST OF SAID STREET LIGHTS PRIOR TO PROJECT COMPLETION. REFER TO THE PLAN OF RESPONSIBILITY NOTES. THE TRANSFER OF OWNERSHIP FROM THE DEVELOPER/OWNER TO THE CITY OF LAS VEGAS FOR ALL NEW PUBLIC STREET LIGHT/S AND/OR SERVICE/S INSTALLED UNDER THIS PLAN DESIGN WILL BE IN CONJUNCTION WITH THIS PROJECT COMPLETION. COORDINATE ALL MAINTENANCE AND OPERATIONAL TRANSFERS WITH THE CITY OF LAS VEGAS TRAFFIC ENGINEERING DEPARTMENT (TEFO) AT (702) 229-6331.

CITY OF LAS VEGAS TRAFFIC NOTES

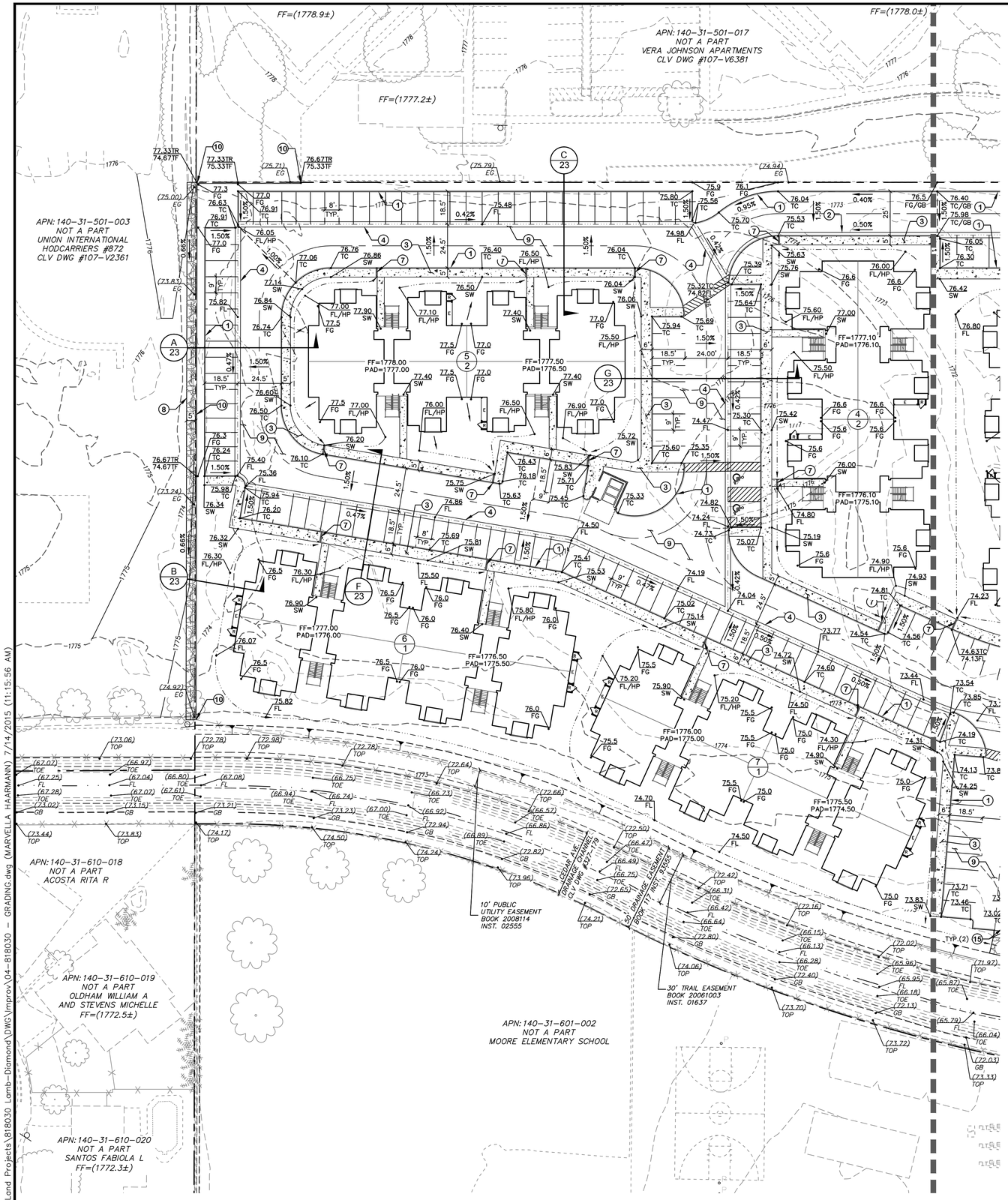
1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.
3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
4. WHEN A DESIGNATED "SAFE ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.
5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL BE FABRICATED WITH DIAMOND GRADE VIP CLASS 6 REFLECTIVE SHEETING OR APPROVED EQUAL. ALL NEW TRAFFIC SIGNS, EXCEPT STREET NAME AND SCHOOL SPEED LIMIT SIGNS, SHALL HAVE A 3M SERIES 1160 OR APPROVED EQUIVALENT ANTI-GRAFFITI PROTECTIVE OVERLAY FILM; SCHOOL ZONE SIGNS SHALL HAVE 3M SERIES 1150 ANTI-GRAFFITI PROTECTIVE OVERLAY FILM. STREET NAMES SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARD.
7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREETLIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.
8. 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 HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
9. STREET SIGNS AND STOPS SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.
10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.
11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.
13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.
14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS OTHERWISE DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.
15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

LEGEND AND ABBREVIATIONS

00.00 FG	PROPOSED ELEVATION	0.50%	PROPOSED GRADE
00.00 FG	EXISTING ELEVATION	(0.50%)	EXISTING GRADE
XXXX	EXISTING CONTOUR		RIGHT-OF-WAY/PROPERTY LINE
6	CONSTRUCTION NOTE		CENTERLINE
	EXISTING STREETLIGHT		GRADE BREAK
	EXISTING SIGN		EXISTING EDGE OF PAVEMENT
	EXISTING "L" CURB & GUTTER		EXISTING WALL
	PROPOSED "L" CURB & GUTTER		EXISTING POWER POLE
	EXISTING BLOCK PROPERTY WALL		CONCRETE
	DIRECTION OF FLOW		PROPOSED RETAINING WALL
	PROPOSED SWALE		MATCHLINE

LAS VEGAS FIRE AND RESCUE GENERAL NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6325 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. AUTHORIZED FIRE HYDRANTS ARE AS FOLLOWS;
   - KENNEDY – GUARDIAN MODELS K81A AND K81D
   - MUELLER – SUPER CENTURION 250, MODEL A-423
   - CLOW – MEDALLION MODEL F-2546LVD
   - U.S.PIPE – METROFLOW/M-03
3. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPING FROM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. **[IFC 105.7.12]**
4. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. **[IFC 3310, 3312]**
5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. **[IFC 507.5.7.3]**
6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TEST WITH PRIOR FIRE PREVENTION APPROVAL. **[IFC 106.3]**
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. **[IFC 507.2.1, NFPA 24]**
8. PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. **[IFC 507]**
9. PRIVATE HYDRANTS SHALL BE PAINTED RED. **[IFC 507.5.7.1]**
10. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY THE LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. **[IFC 507]**
11. FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: **[IFC C102]**
    - RESIDENTIAL – 600 FT UNSPRINKLERED; 600 FT SPRINKLERED.
    - COMMERCIAL – 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.
12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FT ON AN ALTERNATING BASIS. **[IFC C102.8]**
13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL-DE-SAC OR WITHIN 20 FT OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. **[IFC C102.12]**
15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. **[IFC C102.4]**
16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. **[IFC C102.7]**
17. THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FT. **[IFC C102.6]**
18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. SECTIONAL CONTROL VALVE SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN. **[IFC C104]**
19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. **[IFC 503.2.3]**
20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12% ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FT PRIOR TO OR AFTER THE GRADE CHANGE



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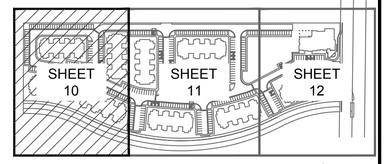
NORTH

GRAPHIC SCALE

30 0 15 30

(IN FEET)
1 inch = 30 ft.



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SOILS REPORT

GEOTEK, INC.
DATED: NOVEMBER 26, 2014
PROJECT NO. 12108-LV6

LEGAL DESCRIPTION

THAT PORTION OF THE EAST HALF (E 1/2) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 31, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., CLARK COUNTY, NEVADA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PARCEL 1 AS SHOWN ON PARCEL MAP IN FILE 96, PAGE 01, RECORDED SEPTEMBER 7, 1999 IN BOOK 990907 AS INSTRUMENT NO. 00470 OF OFFICIAL RECORDS.

BASIS OF BEARINGS

NORTH 89°43'16" WEST, BEING THE BEARING OF THE NORTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 31, TOWNSHIP 20 SOUTH, RANGE 62 EAST, M.D.M., AS SHOWN ON A MAP ON FILE IN THE CLARK COUNTY, NEVADA RECORDER'S OFFICE AS FILE 15, PAGE 32 OF SURVEYS.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 1LV02 31C4 – RIVET AND PLATE IN TOP OF CURB AT SOUTHWEST CORNER OF STEWART AND SANDHILL.

ELEVATION=539.670 (1770.57 FEET) NAVD 1988 DATUM.

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DRAINAGE STUDY

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT DSXXXX

THOMAS L. KELLEY, PE #17676 DATE

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H# XXXXX

PROFESSIONAL ENGINEER - STATE OF NEVADA
THOMAS L. KELLEY
EXP 6/30/17
CIVIL
No. 017676

DESIGNED BY: MH	DRAWN BY: MH	CHKD BY: TLK
JOB NUMBER: 818-030-152	DATE: July 2015	
NO.	REVISION	DATE APPL

L. R. NELSON CONSULTING ENGINEERS, INC.
6765 West Russell Road, Suite 200
Las Vegas, Nevada 89118
(702) 798-7978
(702) 451-2296 FAX
• STRUCTURAL
• CIVIL
• PLANNING
• SURVEY

Nevada HAND
Housing And Neighborhood Development

GRADING PLAN 1

LAMB PINES
IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

SHEET NUMBER
10
OF 25 SHEETS
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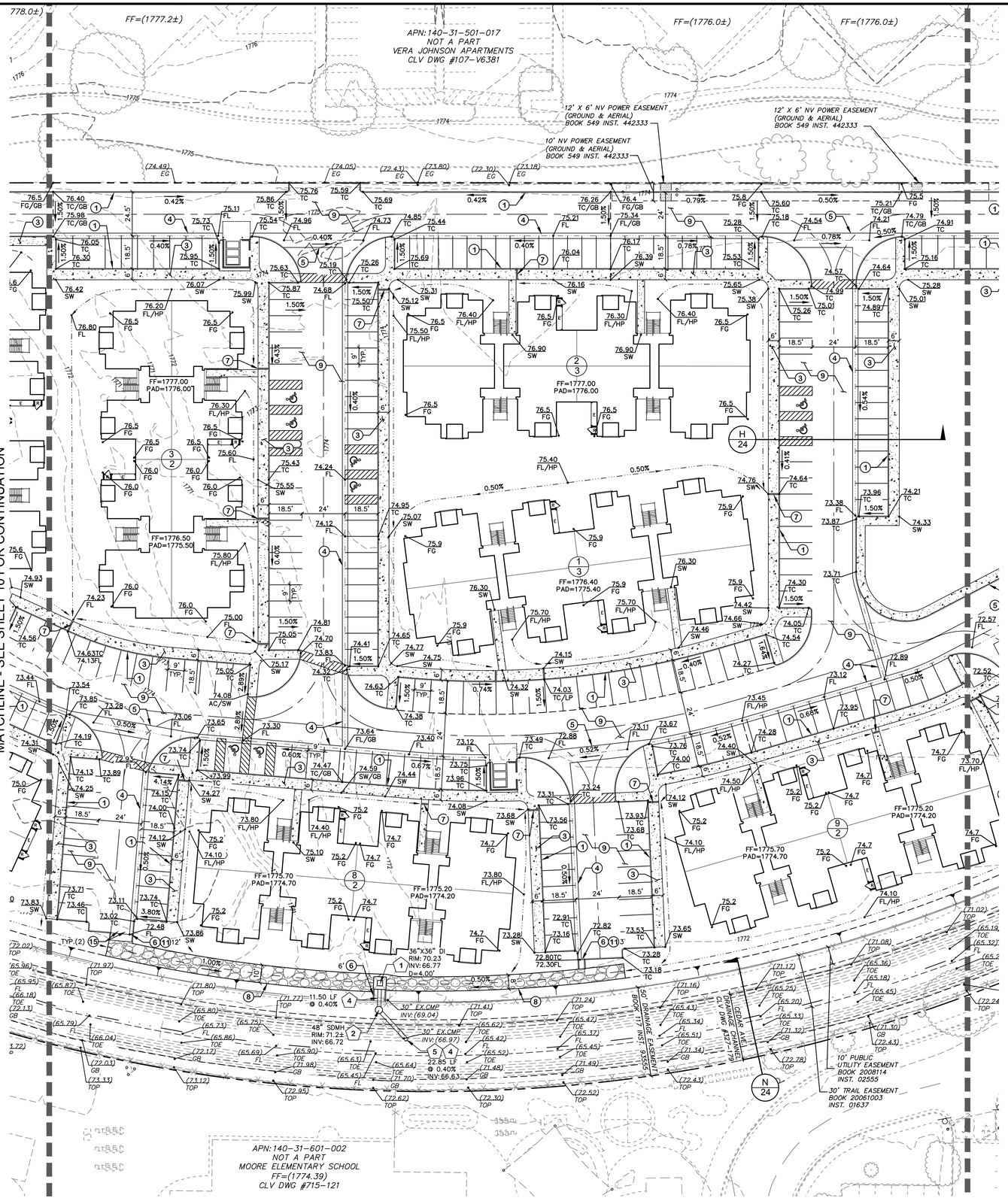

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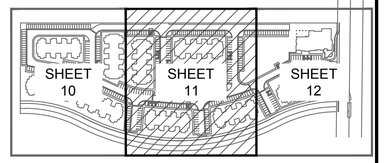

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GEOTEK, INC.
DATED: NOVEMBER 26, 2014
PROJECT NO. 12108-LV6

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H# XXXXX

PROFESSIONAL ENGINEER-STATE OF NEVADA
THOMAS L. KELLEY
EXP 6/30/17
CIVIL
No. 017676

DESIGNED BY: MH	DRAWN BY: MH	CHKD BY: TLK
JOB NUMBER: 818-030-152	DATE: July 2015	
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Nevada HAND
Housing And Neighborhood Development

GRADING PLAN 2

LAMB PINES IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

SHEET NUMBER
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OF 25 SHEETS
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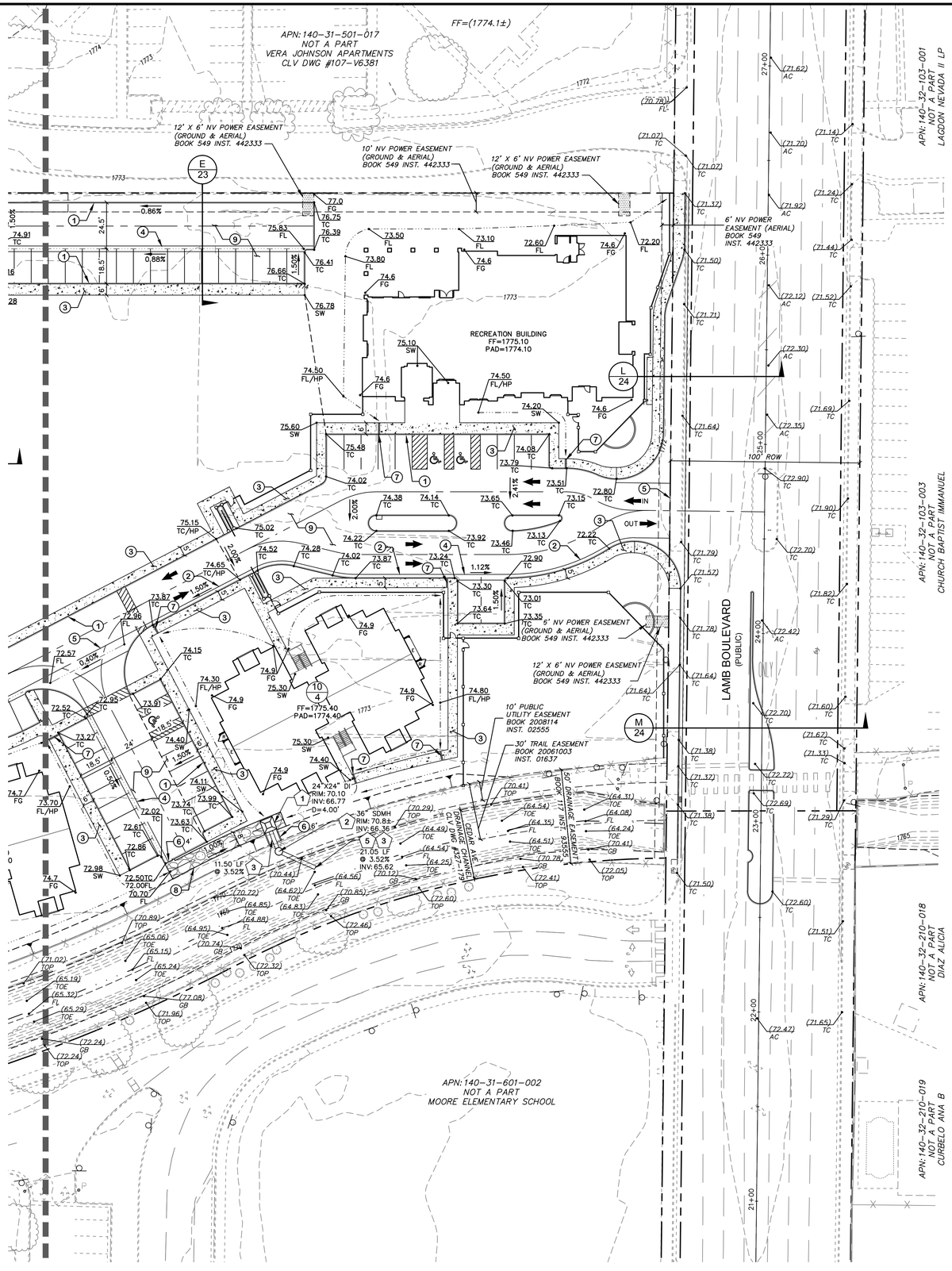

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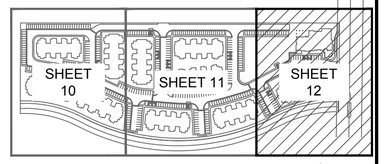

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DESIGNED BY:	MH	DRAWN BY:	MH	CHKD BY:	TLK
JOB NUMBER:	818-030-152	DATE:	July 2015		
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Nevada HAND — Housing And Neighborhood Development

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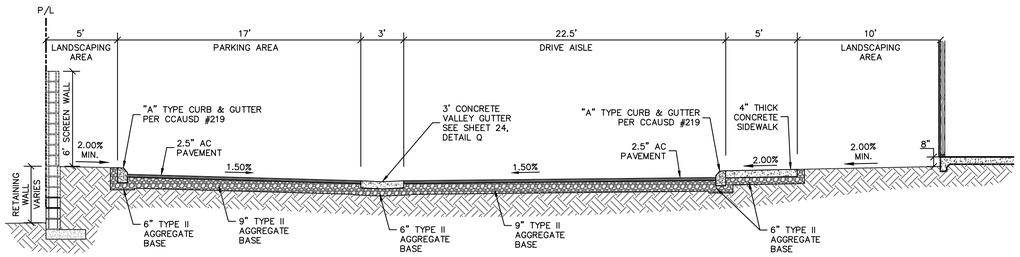

A SECTION

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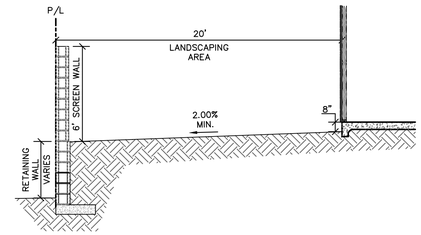

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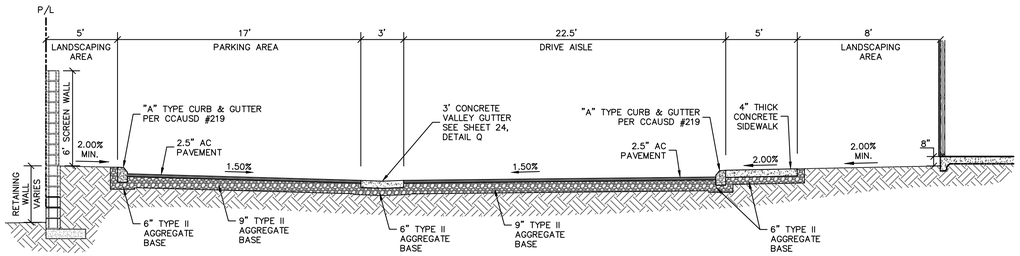
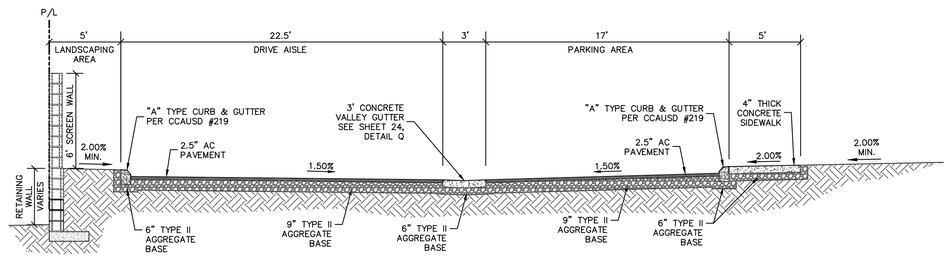


C SECTION

SCALE: NTS

D FIRE ACCESS SECTION

SCALE: NTS



E SECTION

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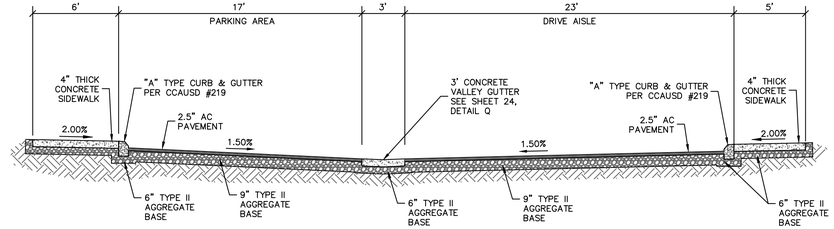

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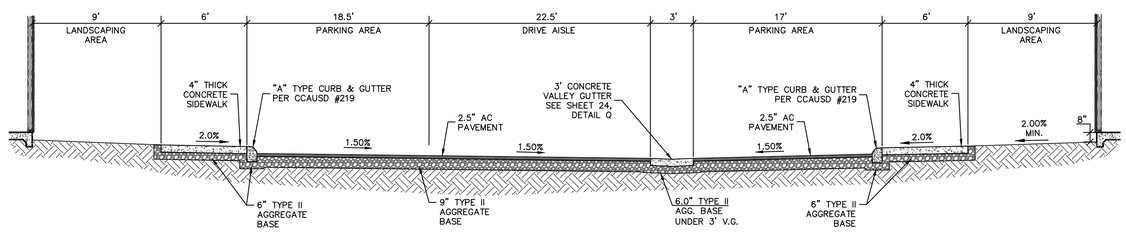

G SECTION

SCALE: NTS

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LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER

DATE _____ PROJECT NO. XXXXX

LVVWD APPROVED FIRE FLOW 1,750 GPM AT 20 P.S.I. RESIDUAL

DISCLAIMER NOTE

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H# XXXXX

PROFESSIONAL ENGINEER - STATE OF NEVADA
THOMAS L. KELLEY
EXP 6/30/17
CIVIL
No. 017676

DESIGNED BY:	MH	DRAWN BY:	MH	CHKD BY:	TLK
JOB NUMBER:	818-030-152	DATE:	July 2015		
NO.	REVISION			DATE	APPL.

L. R. NELSON CONSULTING ENGINEERS, INC.
6765 West Russell Road, Suite 200
Las Vegas, Nevada 89118
• STRUCTURAL (702) 798-7978
• CIVIL (702) 451-2296 FAX
• PLANNING
• SURVEY

Nevada HAND — Housing And Neighborhood Development

DETAIL SHEET 1

LAMB PINES IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

SHEET NUMBER 23 OF 25 SHEETS

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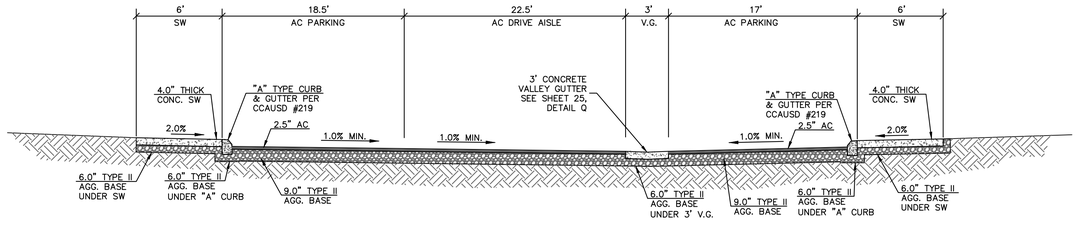
H:\Land Projects\818030 Lamb-Diamond\DWG\Improv\09-818030 - DETAILS.dwg (MARVELLA HAARMANN) 7/14/2015 (11:16:17 AM)



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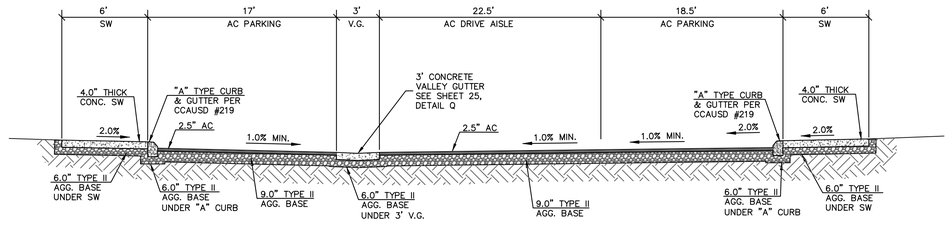

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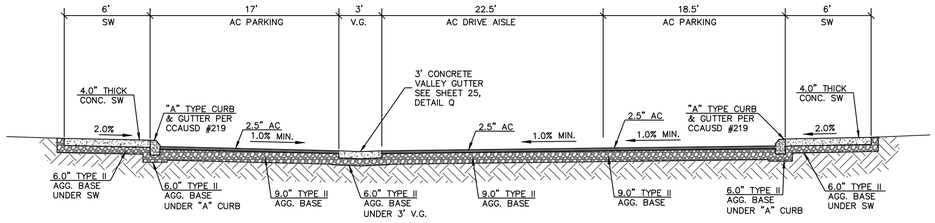

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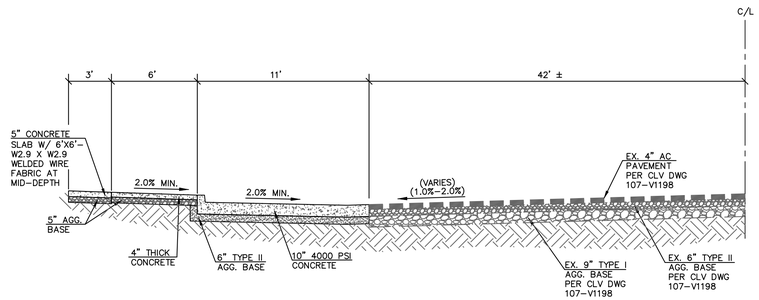

L LAMB BOULEVARD CROSS SECTION W/ RTC BUS STOP

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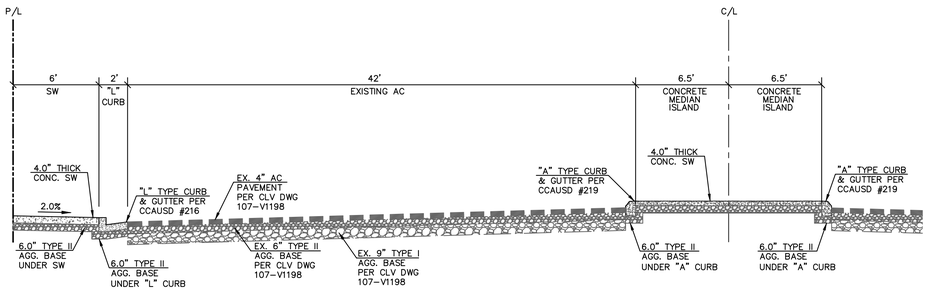

M LAMB BOULEVARD CROSS SECTION W/ RTC BUS STOP

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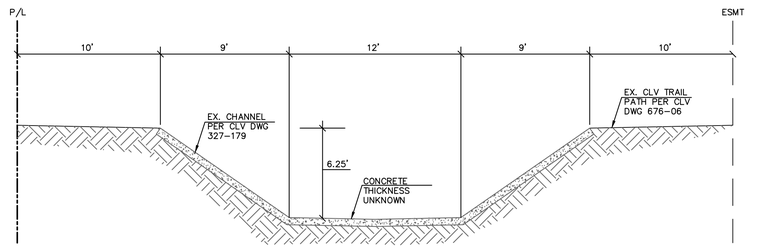

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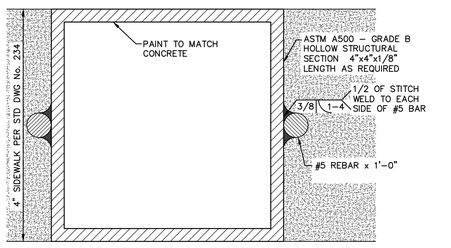
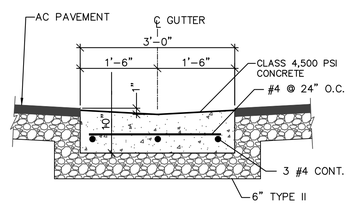


P SIDEWALK UNDERDRAIN

SCALE: NTS



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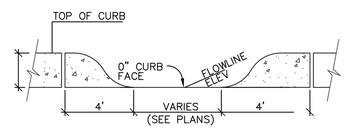
SCALE: NTS



R DEPRESSED CURB OPENING

SCALE: NTS

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER

DATE _____ PROJECT NO. XXXXX

LVVWD APPROVED FIRE FLOW 1,750 GPM AT 20 P.S.I. RESIDUAL

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PROFESSIONAL ENGINEER - STATE OF NEVADA
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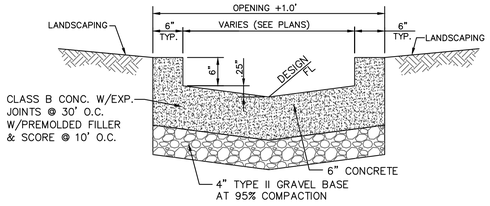
Nevada HAND — Housing And Neighborhood Development

DETAIL SHEET 2

LAMB PINES IMPROVEMENT PLANS

CITY OF LAS VEGAS NEVADA

SHEET NUMBER 24 OF 25 SHEETS



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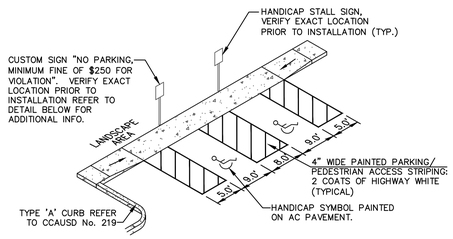
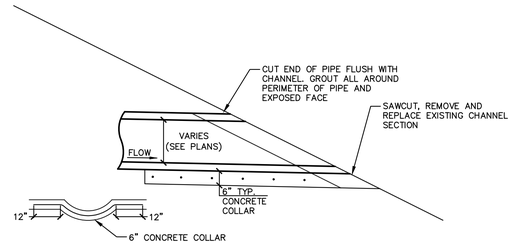


T HANDICAP PARKING AREA

SCALE: NTS



U TRAPEZOIDAL WALL OPENING FOR RCP STORM DRAIN PIPES

SCALE: NTS

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER
DATE_____ PROJECT NO.___XXXXX___
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Nevada HAND
Housing And Neighborhood Development

DETAIL SHEET 3

LAMB PINES
IMPROVEMENT PLANS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
25
OF 25 SHEETS
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