

DS #: 4522

APN: 139-21-313-016

PROJECT: NEVADA HEALTH CENTER - ENTERPRISE PARK

SUBMITTAL: 1ST

SCANNED BY/DATE: _____

CHECKED BY/DATE: _____



CITY OF LAS VEGAS		DATE: Revision
INTER-OFFICE MEMORANDUM		April 26, 2011
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:	
	Nevada Health Center – Enterprise Park	
Cross Streets:	SEC of Stella Lake St. & Mount Mariah Dr.	COPIES TO: JHR Associates
File Number:	F:\Depot\DSMemos\DS4522A-Rev.doc	Nevada Health Center, Inc.
Parcel Number:	139-21-313-016	Bart Anderson, P.E., DevCo
Zoning Action:	SDR-40766	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES	NO X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1 st Submittal & Supplement	2/24/2011 & 4/13/2011	4/18/2011	Approved	\$400.00	163351: \$400
Revision	4/25/2011	4/26/2011	Approved	N/C	N/C
			TOTAL FEES (LDDRS):	\$400.00	----

REMARKS:

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

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

In an effort to increase administrative efficiency, the City of Las Vegas Public Works will be requiring all soils report, drainage study and traffic impact analysis submittals to be accompanied by an electronic copy of the submittal. Electronic documents must be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output replicating your submittal to be used for archival or display purposes. This may be more than one file if necessary. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats, but provided it is a high quality digitized replication of the submittal, other formats may be acceptable. If figures are in color, they must be scanned in color and saved as a separate file. The new submittal requirements will become effective on July 1, 2011. If there are any questions regarding these new requirements, please contact Robert Welch in the Flood Section at (702) 229-2177 or Rick Schroder in Traffic Engineering at (702) 229-6327.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

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/R61E/21
AREA M-21

Rec'd: 2/24/11
44/13/11

DS 4522

**TECHNICAL DRAINAGE STUDY
for
NEVADA HEALTH CENTER – ENTERPRISE PARK**

A portion of APN 139-21-313-016

M-21

\$400-

Prepared For:
10 Nine Design Group
3579 Redrock St
Las Vegas NV 89103
Phone: 702-870-7076
Fax: 702-258-6326

SDR - 40766

February 2011

Project No. 124-10-698

JHR Associates, Ltd.
Civil Engineers & Land Surveyors

4880 West University Ave., Suite B2
Las Vegas, Nevada 89103

Ph: (702) 876-2341
Fax: (702) 876-8395

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Nevada Health Center - Enterprise Park Date: 02-17-2011

Location of Development: a) Descriptive (Cross Streets) North/South: Stella Lake St
East/West: Mount Mariah Dr

b) Section: 21 Township: 20S Range: 61E

c) APN: A portion of 139-21-313-016

Name of Owner: Nevada Health Center, Inc.

Telephone No.: 702-887-1590 EXT. 1114 Fax No.: _____ E-Mail Address: _____

Address: 1802 N. Carson St #100 Carson City, NV 89701

Contact Person-Name: Reese P. Jarrell, P.E Telephone No.: 702-876-2341

* E-Mail Address: rjarrell@jhrassociates.com Fax No.: 876-8395

Firm: JHR Associates, LTD

Address: 4880 West University Ave. Ste B2 Las Vegas, NV 89103

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: 2.42 Being Developed/Disturbed: 2.42

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No

4. Proposed type of development (Residential, Commercial, Etc.): Commercial

5. Approximate upstream land area which drains to the subject site: see report

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: _____

TDS for Las Vegas Enterprise Park (DS 1731)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Mount Mariah Dr via commercial driveway

8. Briefly describe your proposed schedule for the subject project: ASAP

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.**

Local Entity File No.	Revision	Date

REFERENCE: STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL			
DRAINAGE SUBMITTAL CHECKLIST			
Project Name:	Nevada Health Center - Enterprise Park	Map ID:	
Firm Name:	JHR Associates, LTD.	Engineer:	Reese P. Jarrell
Address:	4880 W. University Avenue, Suite B2		
City:	Las Vegas	State:	Nevada
Phone No.:	(702) 876-2341	Zip:	89103
		Fax No.:	(702) 876-8395
Property Owner:	Nevada Health Center, Inc.		
Address:	1802 N Carson St #100		
City:	Carson City	State:	NV
		Zip:	89701
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 items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT

YES NO N/A

- | | | | |
|-------------------------------------|--------------------------|-------------------------------------|--|
| ☒ | ☐ | ☐ | Design Manual Standard Form 1 with the Engineer's seal and signature. |
| ☒ | ☐ | ☐ | Design Manual Standard Form 4 . |
| ☒ | ☐ | ☐ | 2 copies of the 24" x 36" Drainage Plan . |
| ☐ | ☐ | ☒ | A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. |

II. MAPS AND EXHIBITS

YES NO N/A

- | | | | |
|-------------------------------------|--------------------------|--------------------------|--|
| ☒ | ☐ | ☐ | A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. |
| ☒ | ☐ | ☐ | A copy of the current CCRCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated. |
| ☒ | ☐ | ☐ | Off-site drainage basin maps for existing, interim, and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs. |
| ☒ | ☐ | ☐ | 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. |
| ☒ | ☐ | ☐ | Vicinity Map with local and major cross streets identified and a north arrow. |

III. DRAINAGE PLAN

YES	NO	N/A	
☒	☐	☐	Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
☒	☐	☐	Minimum scale: 1" = 60'
☒	☐	☐	Project name.
☒	☐	☐	Vicinity Map with local and major cross streets.
☒	☐	☐	Revision box.
☒	☐	☐	North arrow and bar scale.
☒	☐	☐	Engineer's/consultant's address and phone number.
☒	☐	☐	Elevation datum and benchmark.
☒	☐	☐	Legend for symbols and abbreviations.
☐	☐	☒	Cut/Fill scarps, where applicable.
☒	☐	☐	Street names, grades, widths.
☒	☐	☐	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.
☒	☐	☐	Existing contours encompassing the site and 100-feet beyond with spot elevations for important locations, where appropriate.
☒	☐	☐	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
☐	☐	☒	Proposed typical street sections.
☐	☐	☒	Streets with offset crowns.
☒	☐	☐	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
☒	☐	☐	Property lines.
☒	☐	☐	Right-of-way lines and widths, existing and proposed.
☒	☐	☐	Existing improvements and their elevations.
☒	☐	☐	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year peak flows at basin concentration points.
☒	☐	☐	Concentration points and drainage flow directions with Q_{100} and V_{100} and D_{100} in streets.
☒	☐	☐	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
☒	☐	☐	Location and cross-section of street capacity calculations.
☐	☐	☒	Cross-sectional detail for channels, including cutoff wall locations.

III. DRAINAGE PLAN (CONTINUED)

YES	NO	N/A	
☒	☐	☐	Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk ditches, swales, storm drain systems, unimproved channels, and culverts, etc.) stating size, material shape, and slope with plan and profile and HGL calculations.
☒	☐	☐	Existing and proposed drainage easements and widths shown with sufficient detail. A cross-sectional detail must be provided that shows appropriate lining and reinforcement.
☐	☐	☒	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16"x48". Wrought iron gate is required for flows > 10 cfs.
☒	☐	☐	Location and detail of flood-wall(s) illustrating depth of flow, proposed grouting height, etc.
☒	☐	☐	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
☐	☐	☒	Building and/or lot numbers.
☐	☐	☒	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
☒	☐	☐	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.
☐	☐	☒	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 floor elevations must be a minimum of 18 inches above BFE.
☐	☐	☒	Appropriately elevated "humps" 6 inches above the 100-year water surface elevation at the accesses where the intent is to protect the site from the Q ₁₀₀ flows.
☐	☐	☒	Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

IV. HYDROLOGIC ANALYSIS

YES	NO	N/A	
☒	☐	☐	Appropriate soil information and Soils Map for existing and future conditions with sub-basins and property delineated.
☒	☐	☐	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.
☒	☐	☐	Input and Output information for proposed conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	☐	Use of correct precipitation values in and around the McCarran Airport rainfall area.
☒	☐	☐	A discussion in the text of the hydrologic analysis justifying sub-basin boundaries and cutoffs, supporting assumptions, and calculations.
☒	☐	☐	A summary table of stormwater flows showing basin area Q ₁₀ and Q ₁₀₀ for both individual basins and combined basin flows, where applicable.
☒	☐	☐	Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
☒	☐	☐	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

V. HYDRAULIC ANALYSIS

YES	NO	N/A	
☒	☐	☐	Flow split calculations and supporting documentation or reference for the method of flow calculation used.
☒	☐	☐	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. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
☒	☐	☐	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.
☐	☐	☒	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
☐	☐	☒	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
☒	☐	☐	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. Building adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.
☐	☐	☒	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 the 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.
☐	☐	☒	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
☐	☐	☒	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drainpipes in public rights-of-way, including headwater pool inundation.
☒	☐	☐	The mitigation of nuisance water, both during construction and in the fully developed condition must be addressed.

JHR Associates, Ltd.

Civil Engineers & Land Surveyors

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Ste B2

Las Vegas NV 89103

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February 17, 2011

City of Las Vegas
Public Works Department
Flood Control Section
333 N Rancho Dr
Las Vegas NV 89106

Attn: Mr. Albert Sung, P.E.

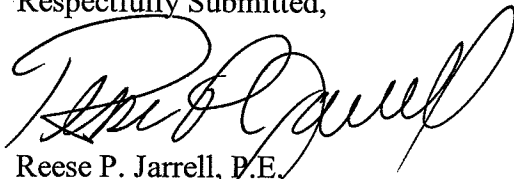
**Re: Technical Drainage Study for Nevada Health Center – Enterprise Park
(portion of APN 139-21-313-016)**

Dear Mr. Sung,

Submitted herewith is the Technical Drainage Study for Nevada Health Center – Enterprise Park.

If you have any questions regarding this submittal or require additional information to accomplish your review please call our office.

Respectfully Submitted,



Reese P. Jarrell, P.E.
Principal/Engineer

James Reynolds
Hydrologist

JHR Associates, Ltd.

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APPENDICES

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1.0 GENERAL LOCATION AND DEVELOPMENT DESCRIPTION

1.1 PURPOSE OF STUDY

The purpose of this Technical Drainage Study is to provide a detailed hydrologic and hydraulic analysis for the proposed development in the existing, interim and developed conditions, in accordance with the Clark County Regional Flood Control District's (CCRFCD) Hydrologic Criteria and Drainage Design Manual (HC&DDM or Design Manual).

1.2 LOCATION OF PROPERTY

The project site is located on the southeast corner of Stella Lake St and Mount Mariah Dr in the Las Vegas Enterprise Park, located within the Southwest Quarter (SW ¼) of Section 21, Township 20 South, Range 61 East, M.D.M., Clark County, Nevada, and is a portion of Assessor's Parcel Number 139-21-313-016. Refer to **Figure 1 (Vicinity/Area Map)** and **APN Map 139-21-3** located in Appendix A of this report. The project site is bounded by Mount Mariah Dr to the north, undeveloped land to the east and south, and Stella Lake St to the west.

1.3 DESCRIPTION OF PROPERTY

The project site contains 2.42 acres, more or less, is currently undeveloped and consists of desert terrain with sparse vegetation considered to be in poor hydrologic condition. The project site generally slopes from the west to the east at 0.4%±.

Mount Mariah Dr (60' public R/W) to the north is fully-improved with the exception of sidewalk on a portion of the north side and all of the south (project) side. Stella Lake St (60' public R/W) to the west is fully-improved with the exception of sidewalk on the east (project) side. Undeveloped land to the east and south is desert terrain considered to be in poor hydrologic condition.

1.4 MASTER PLANNING INFORMATION

The project site lies within regional drainage basin sub-area LM14-C of the Central Watershed. Refer to **Figure H-26 (Hydrologic Subareas, Land Use & Soils)** as obtained from the 2008 CCRFCD Master Plan Update (MPU) located in Appendix A.

The project site's characteristic soil type classification is "B," which is indicative of moderately low runoff potential. Refer to the Web Soil Survey as obtained from the Natural Resources Conservation Service Website located in Appendix B.

The project site is not adjacent to any existing or proposed CCRFCD facilities. The nearest CCRFCD proposed facility is LVLM 0060, located approximately 750' to the north in Lake Mead Blvd. Refer to **Figure F-26 (Flood Control Facilities and Facility Inventory)** as obtained from the 2008 CCRFCD MPU located in Appendix A. LVLM 0060 is not currently scheduled for construction per the 10-year CCRFCD Construction Plan.

1.5 FLOODPLAIN INFORMATION

The subject parcels lie within a Federal Emergency Management Agency (FEMA) Zone X, which is an area defined as being outside the 0.2% annual chance flood plain.

This flood designation is based on FEMA Flood Insurance Rate Map (FIRM) Panel No. 32003C2160E, with an effective date of September 27, 2002 and revised to reflect LOMR dated December 11, 2003. Refer to **Figure 2 (FEMA Map)** located in Appendix A.

1.6 PREVIOUS DRAINAGE STUDIES

The following previously approved Technical Drainage Studies were reviewed in preparation of this report.

The *Technical Drainage Study for Las Vegas Enterprise Park* (DS 1731), prepared by Kercheval Engineers, initial study dated September 13, 1995.

The *Update to the Technical Drainage Study for Las Vegas Enterprise Park - LVMPD Larry C. Bolden Area Command Center* (DS 2846), prepared by Lochsa Engineering, initial study dated February 12, 2001.

The *Update to the Technical Drainage Study for Las Vegas Enterprise Park - Light Manufacturing for Michele Curran*, prepared by JHR Associates, initial study dated May 9, 2001.

The *Technical Drainage Study for Stella Lake* (DS 3581), prepared by Carter Burgess, initial study dated May 18, 2004.

While JHR Associates concurs with the findings of each, the calculated off-site flow discharged in to the intersection of Stella Lake St and Mount Mariah Dr per the original Technical Drainage Study for Enterprise Park utilized an off-site basin area comprised of the then proposed Diamond Pointe residential subdivision, when what is now West Prep High School was constructed on nearly 20 acres of the total tributary area. The previously approved Technical Drainage Study for Stella Lake by Carter Burgess analyzed the tributary area to account for the change in off-site development and curve number. This study utilizes these flows for the intersection of Stella Lake St and Mount Mariah Dr.

2.0 DRAINAGE BASIN DESCRIPTION

2.1 EXISTING CONDITION

OFF-SITE – The project site is impacted by off-site flows in the two adjacent rights-of-way. Peak flows have been quantified in the previously approved Technical Drainage Study for Stella Lake as follows:

Mount Mariah Dr (impacts from north) – 69/175 cfs is the combined flow in the intersection of Stella Lake St and Mount Mariah Dr at the northeast corner of the project site, and includes the outfall from the existing 20' wide drainage easement/channel and flow conveyed from the north and south in Stella Lake St. From the intersection, this flow is conveyed easterly on the surface, with the flow rate increasing to 73/184 cfs at east end of the Stella Lake development (FBI building).

Stella Lake St (impacts from west) – 6/12 cfs is conveyed northerly on the surface past the project site. This is the calculated peak flow from the existing LVMPD facility, of which a portion is precluded from impacting the project site due to a high point in Stella Lake St approximately 260 feet south of the project site's southern boundary.

Refer to *Figure 3 – Existing Condition Drainage Map* and *Figure 5 – Developed Condition Drainage Map* from the Stella Lake study located in Appendix E.

ON-SITE – The project site is considered one (1) basin and is delineated on **Figure 3 (On-Site Drainage Basin Map)** located in Appendix A.

ONX1 (2.42 acres) consists entirely of undeveloped desert terrain. The calculated peak flow for ONX1 (1/3 cfs) is generally conveyed easterly via sheet flow.

None of the off-site flow conveyed through or adjacent to the project site outfalls from an upstream CCRFCD facility.

EXISTING BASIN DATA SUMMARY				
Basin ID	Area (acres)	Soil Group	RCN	Cover Description
ONX1	2.42	B	77	Desert shrub

2.2 INTERIM / PROPOSED CONDITION

OFF-SITE – Referenced off-site peak flows remain unchanged from the existing condition in the interim condition.

ON-SITE – The project site is considered two (2) basins and are delineated on **Sheet D1 (Drainage Plan)** contained in a pocket of this report.

OND1 (1.88 acres) comprises the western $\frac{3}{4}$ of the proposed development, and consists of the proposed building, two (2) commercial driveways, asphalt and concrete pavement, concrete valley gutter, curb, gutter and sidewalk and areas of landscaping. The calculated peak flow for OND1 (3/6 cfs) is generally conveyed easterly via sheet flow over asphalt and concrete pavement to 2' concrete valley gutter, which conveys flows northerly where runoff is discharged in to Mount Mariah Dr via a proposed 32' commercial driveway.

OND2 (0.54 acres) comprises the eastern $\frac{1}{4}$ of the proposed development and consists of asphalt and concrete pavement, valley gutter, curb and areas of landscaping. The calculated peak flow for OND2 (<1/1 cfs) is generally conveyed westerly via sheet flow over asphalt pavement to the aforementioned 2' concrete valley gutter and ultimately discharged in to Mount Mariah Dr via the proposed driveway.

PROPOSED BASIN DATA SUMMARY				
Basin ID	Area (acres)	Soil Group	RCN	Cover Description
OND1	1.88	B	98	impervious
OND2	0.54	B	98	impervious

2.3 DEVELOPED / FUTURE CONDITION

OFF-SITE – All off-site tributary areas are considered fully-developed and all proposed flood control facilities are assumed to be constructed in the developed/future condition.

Referenced off-site peak flows discharged into the adjacent rights-of-way remain unchanged from the interim condition in the developed condition.

Future development to the south will not impact the proposed development as existing topography precludes any future development from discharging runoff into Stella Lake St.

ON-SITE – On-site basins remain unchanged from the interim condition in the developed condition.

3.0 PROPOSED DRAINAGE FACILITIES

3.1 GENERAL DESCRIPTION

Runoff from OND1 and OND2 is discharged to Mount Mariah Dr via concrete valley gutter and commercial driveway.

3.2 HYDROLOGIC ANALYSIS

Drainage basins as defined in Section 2.0 of this report were analyzed using the US Army Corps of Engineers HEC-1 Flood Hydrograph Package. The hydrologic parameters utilized and methodologies implemented in the analyses are described as follows:

Precipitation

The project site is located outside the McCarran Airport Rainfall area. Refer to **Figures 505 and 506** located in Appendix B. A rainfall total of 1.61 and 2.86 inches for the Q_{10} and Q_{100} six-hour storm event, respectively, is used in accordance with **Table 501** located in Appendix B. The six-hour storm distribution for the Q_{10} and Q_{100} storm events are based on an SDN 3 storm distribution for areas less than 8 square miles. Refer to **Table 503** located in Appendix B. No Depth Area Reduction factors were used in the HEC-1 analysis.

Hydrologic Soil Group

The general hydrologic soil group for the project site is soil type "B" as shown on Figure H-26: Hydrologic Subareas of the 2008 CCRFCD MPU located in Appendix A. A soil classification type "B" is representative of moderately low runoff potential.

Runoff Curve Number (RCN)

The weighted RCN values used in the HEC-1 models for are summarized on the appropriate Runoff Curve Number Calculation Worksheet located in Appendix B. All unadjusted RCN values are taken directly from Table 602 of the Design Manual located in Appendix B.

Travel Time/ T_{LAG}

Lag time is the elapsed time from the centroid of rainfall excess to the centroid of direct runoff. It is a measure of the watershed's response time and is a coherent property to basin length, slope and the basin's roughness characteristics. An iterative process of velocity and T_{LAG} determined the travel time velocities. The velocities ultimately used in the analysis are calculated with FlowMaster. A minimum time of concentration value of 5 minutes ($T_{LAG} = 0.05$) is applied as necessary in accordance with Section 602 of the Design Manual. Refer to FlowMaster main conveyance velocity calculations for the appropriate drainage basins located in [Appendix C](#).

A summary of the calculated peak flow from drainage basins for both the existing and developed conditions are summarized as follows:

PEAK FLOW SUMMARY		
Basin ID	Q_{10} (cfs)	Q_{100} (cfs)
ONX1	1	3
OND1	3	6
OND2	<1	1

3.3 FACILITY DESIGN CALCULATIONS

One (1) normal depth calculation is provided for Stella Lake St. Section A-A (6/12 cfs) models a standard street section south of the Mount Mariah Dr intersection at the upstream end of the proposed building.

One (1) normal depth calculation is provided for Mount Mariah Dr. Section B-B (69/175 cfs) models a standard street section east of the Stella Lake St intersection at the upstream end of the proposed building.

Note the existing 18" RCP storm drain in Mount Mariah is not considered to remove a significant amount of flow in the 10 and 100-year storm events.

STREET HYDRAULIC SUMMARY									
FlowMaster Section	RoW (ft)	10-Year				100-Year			
		Q ₁₀ (cfs)	D ₁₀ (ft)	V ₁₀ (fps)	DxV	Q ₁₀₀ (cfs)	D ₁₀₀ (ft)	V ₁₀₀ (fps)	DxV
Section A-A	60	6	0.45	1.51	0.68	12	0.55	1.68	0.92
Section B-B	60	69	0.84	2.92	2.45	175	1.13	4.22	4.77

One (1) normal depth calculation is provided for on-site conveyance. Because the proposed building is on the high-side of the 2.42 acre site, on-site runoff near the building is negligible. Section C-C models the 2' valley gutter at the proposed driveway using the combined runoff from OND1 and OND2 (4/7 cfs).

The locations of all hydraulic cross-sections are indicated on the **Drainage Plan** contained in a pocket of this report. FlowMaster worksheets are located in Appendix D.

4.0 CONCLUSIONS

4.1 PAD/FINISH FLOOR ELEVATIONS

The finish floor elevation of the proposed building (2058.50) is approximately 1.5 feet above the calculated worst-case Water Surface Elevation (WSE) in the adjacent Mount Mariah Dr right-of-way, and 1.2 feet above the calculated WSE in the adjacent Stella Lake St right-of-way.

The finish floor elevation of the proposed building is more than twice-the-depth-of-flow for on-site conveyance.

FINISH FLOOR ELEVATIONS SUMMARY			
Finish Floor (ft)	FlowMaster Section	WSE ¹ (ft)	Depth (ft)
2058.50	A-A	2057.28	0.49
2058.50	B-B	2057.04	1.13
2058.50	C-C	2055.23	0.28

¹ WSE = calculated Depth in gutter @ section

4.2 COMPLIANCE WITH REGULATIONS AND ADOPTED PLANS

1. The proposed development does not adversely impact any Master Planned Flood Control Facility in the project vicinity as listed in Section 1.4 of this report, nor is the subject property part of a Master Plan;

2. The proposed development is in compliance with FEMA floodplain regulations and does not alter any FEMA regulated floodplain;

3. The subject property is not part of an alluvial fan;

4. The project site was included in the original Technical Drainage Study for Las Vegas Enterprise Park as noted in Section 1.6 of this report;

5. The proposed development is in compliance with Title 20 (Flood Control) of the Las Vegas Municipal Code;

6. The proposed development is in compliance with Uniform Regulations;

7. The proposed development is in compliance with the Design Manual.

5.0 REFERENCES

1. Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual, October 1996, WRD Engineering, Inc.
2. Federal Emergency Management Agency Flood Insurance Rate Map Clark County, Nevada and Incorporated Areas Map Number 32003C2160E, dated September 27, 2002.
3. Clark County Regional Flood Control District 2008 Las Vegas Valley Flood Control Master Plan Update, PBS&J.
4. United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Web Soil Survey (WSS) <http://websoilsurvey.nrcs.usda.gov/app/>

APPENDIX A

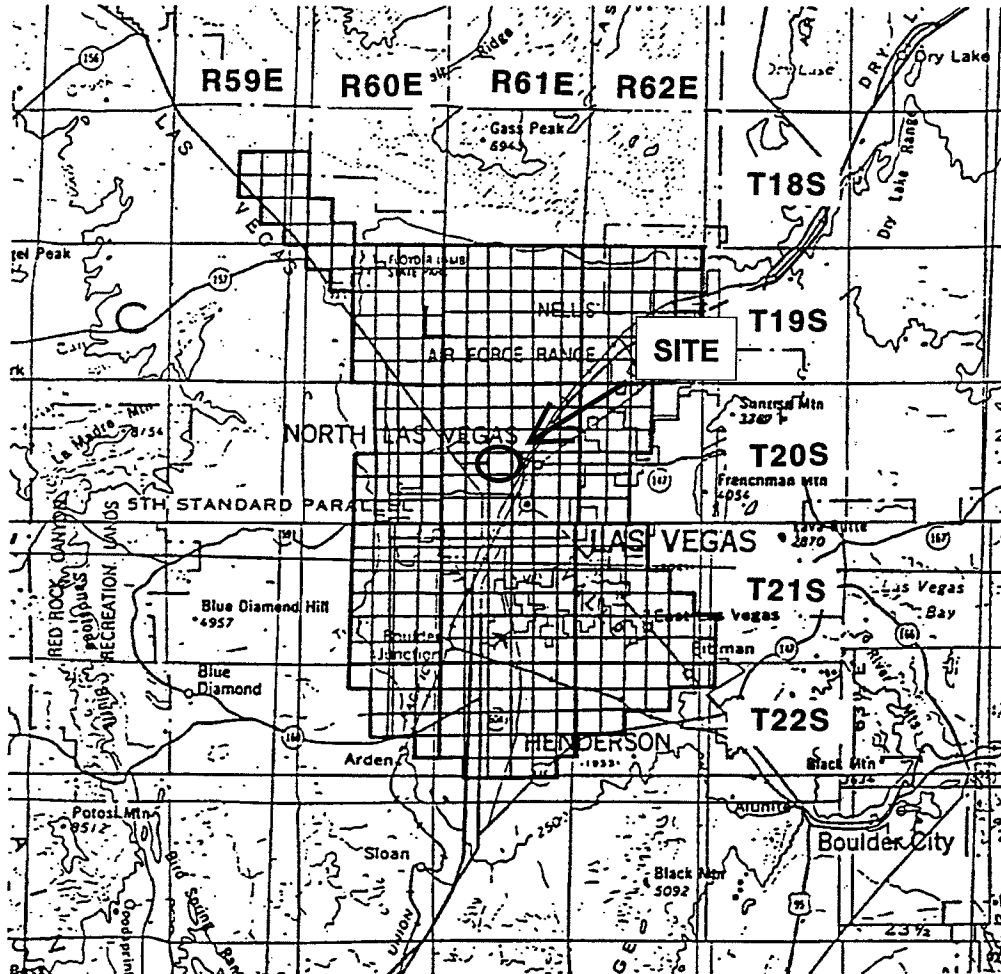
FIGURES

APPENDIX B

HYDROLOGIC PARAMETERS

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

Percent of Total Storm Depth				Percent of Total Storm Depth			
Storm Time (In Minutes)	SDN3	SDN4	SDN5	Storm Time (In Minutes)	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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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

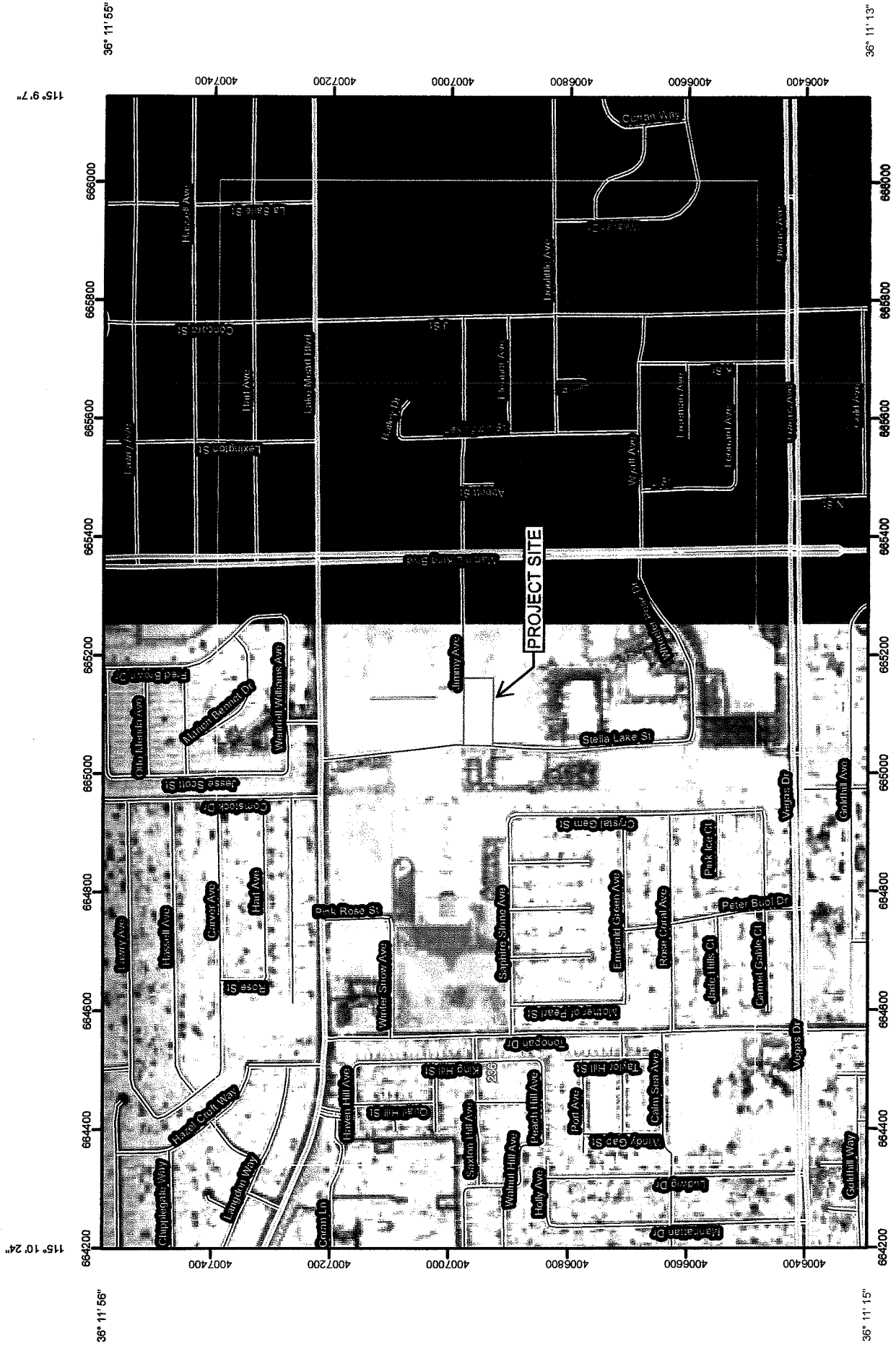
**WRC
ENGINEERING**

REFERENCE:

USACE, Los Angeles District, 1988

TABLE 505

Soil Map—Las Vegas Valley Area, Nevada, Part of Clark County



Map Scale: 1:9,220 If printed on A size (8.5" x 11") sheet.



MAP LEGEND

	Area of Interest (AOI)		Very Stony Spot
	Soils		Wet Spot
	Soil Map Units		Other
	Special Point Features		Special Line Features
	Blowout		Gully
	Borrow Pit		Short Steep Slope
	Clay Spot		Other
	Closed Depression		Political Features
	Gravel Pit		Cities
	Gravelly Spot		Water Features
	Landfill		Oceans
	Lava Flow		Streams and Canals
	Marsh or swamp		Transportation
	Mine or Quarry		Rails
	Miscellaneous Water		Interstate Highways
	Perennial Water		US Routes
	Rock Outcrop		Major Roads
	Saline Spot		Local Roads
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		
	Spoil Area		
	Stony Spot		

MAP INFORMATION

Map Scale: 1:9,220 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000. Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: UTM Zone 11N NAD83

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 6, Nov 10, 2009
 Date(s) aerial images were photographed: 5/25/2006

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.

Map Unit Legend

Las Vegas Valley Area, Nevada, Part of Clark County (NV788)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
236	Glencarb very fine sandy loam, saline	373.4	100.0%
Totals for Area of Interest		373.4	100.0%

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
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 $I_p = 0.25$.

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

WRC
ENGINEERING

REFERENCE:
SCS TR-55, USDA, June 1986.

TABLE 602
1 of 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

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

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

²Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: >70% ground cover.

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

Revision	Date

**WRC
ENGINEERING**

REFERENCE: SCS TR-55, USDA, June 1986.

**TABLE 602
4 of 4**

APPENDIX C

HYDROLOGIC ANALYSIS

STANDARD FORM 4

124-10-698 Nevada Health Center - Enterprise Park

BASIN IDENTIFIER		TOTAL AREA (acres)	TOTAL AREA (miles ²)	L (ft)	SLOPE (%)	T _i (min)	L (ft)	SLOPE (%)	V (ft/sec)	T _t (min)	TOTAL L (ft)	T _c =T _i +T _t (min)	CHECK T _c =(L/180)+10 (min)	ACCEPTED T _c (min)	TLAG (hrs)	COMMENTS
(1)	(2)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)

ON-SITE DRAINAGE BASIN - EXISTING CONDITION

ONX1	77	0.626	2.42	0.0038	120	0.4	12.67	440	0.4	0.49	14.97	560	27.64	13.11	13.11	0.131	Desert Shrub - Undeveloped
------	----	-------	------	--------	-----	-----	-------	-----	-----	------	-------	-----	-------	-------	-------	-------	----------------------------

ON-SITE DRAINAGE BASINS - DEVELOPED CONDITION

OND1	98	0.904	1.88	0.0029	140	0.8	4.51	535	0.5	1.37	6.51	675	11.01	13.75	11.01	0.110	Impervious - paved parking lot/roof
OND2	98	0.904	0.54	0.0008	83	1.0	3.22	210	0.4	1.03	3.40	293	6.62	11.63	6.62	0.066	Impervious - paved parking lot/roof

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

$$K = 0.0132 * RCN - 0.39$$

$$TLAG = (T_c * 0.6) / 60$$

[illegible]

Velocity Calc for ONX1

Worksheet for Triangular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	ONX1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.004000	ft/ft
Left Side Slope	250.000000	H : V
Right Side Slope	250.000000	H : V
Discharge	3.00	cfs

Results		
Depth	0.16	ft
Flow Area	6.11	ft ²
Wetted Perimeter	78.18	ft
Top Width	78.17	ft
Critical Depth	0.10	ft
Critical Slope	0.048813	ft/ft
Velocity	0.49	ft/s
Velocity Head	0.37e-2	ft
Specific Energy	0.16	ft
Froude Number	0.31	
Flow is subcritical.		

Velocity Calc for ONX1
Cross Section for Triangular Channel

Project Description

Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	ONX1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.035
Channel Slope	0.004000 ft/ft
Depth	0.16 ft
Left Side Slope	250.000000 H : V
Right Side Slope	250.000000 H : V
Discharge	3.00 cfs



0.16 ft

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Velocity Calc for OND1 Worksheet for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	OND1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	0.005000 ft/ft			
Elevation range: 56.01 ft to 56.85 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	56.85	0.00	0.50	0.013
0.50	56.85	0.50	45.50	0.017
0.50	56.35	45.50	47.50	0.013
45.50	56.18			
47.00	56.01			
47.00	56.51			
47.50	56.51			
Discharge	6.00	cfs		

Results		
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	56.35	ft
Flow Area	4.37	ft ²
Wetted Perimeter	46.86	ft
Top Width	46.50	ft
Height	0.34	ft
Critical Depth	56.34	ft
Critical Slope	0.009521	ft/ft
Velocity	1.37	ft/s
Velocity Head	0.03	ft
Specific Energy	56.38	ft
Froude Number	0.79	
Flow is subcritical.		

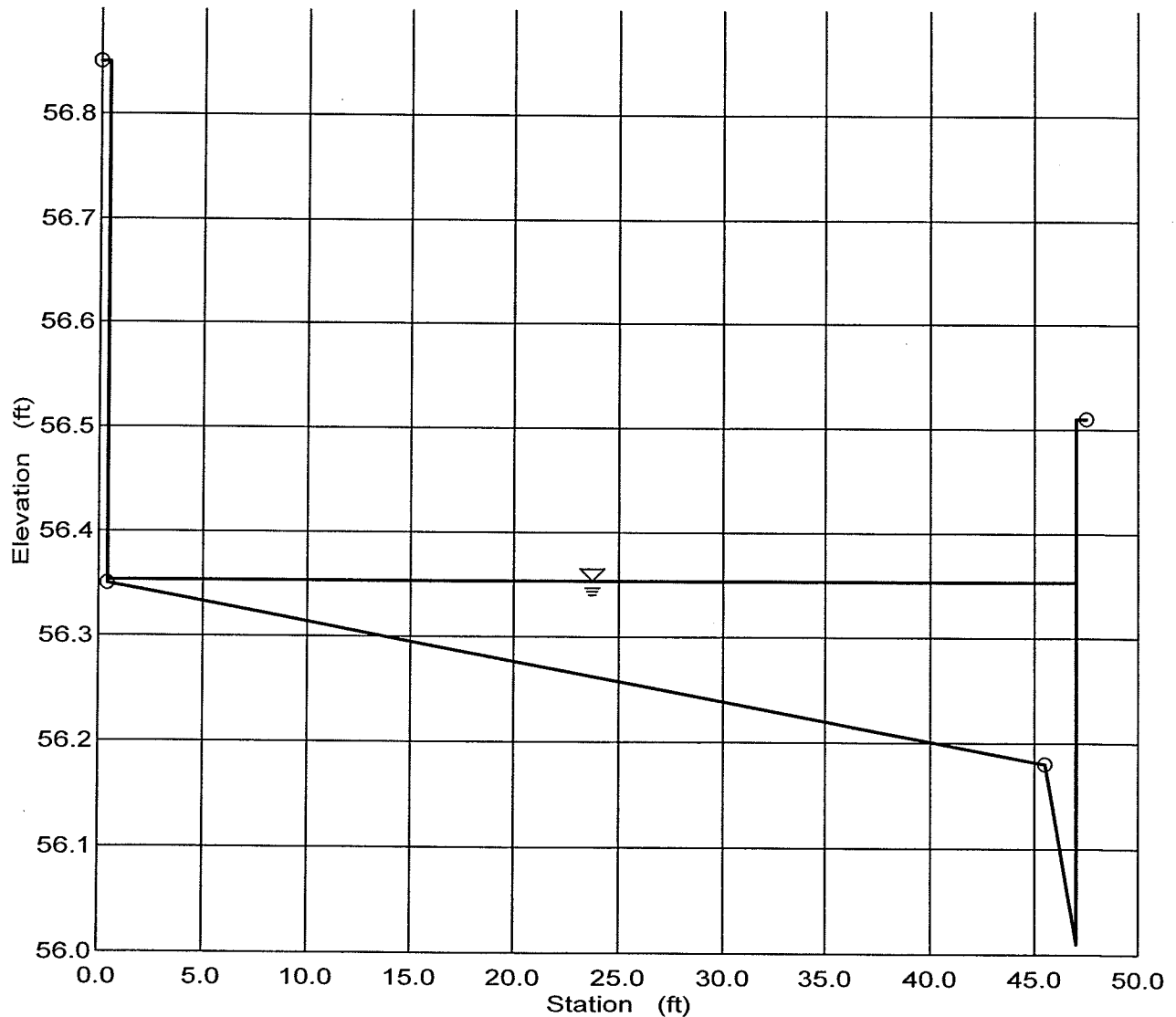
Velocity Calc for OND1
Cross Section for Irregular Channel

Project Description

Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	OND1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data

Wtd. Mannings Coefficient	0.016
Channel Slope	0.005000 ft/ft
Water Surface Elevation	56.35 ft
Discharge	6.00 cfs



Velocity Calc for OND2 Worksheet for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	OND2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

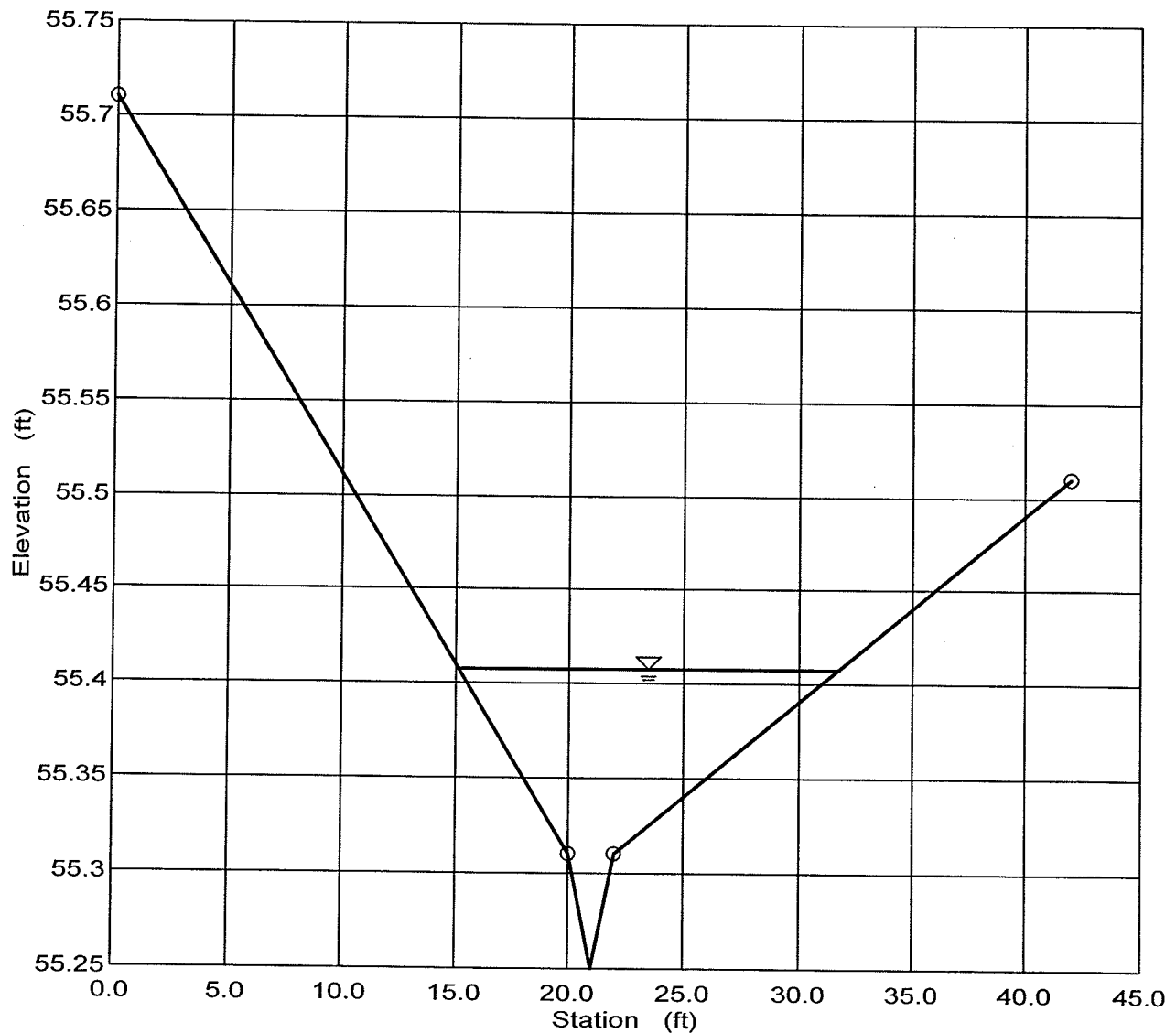
Input Data					
Channel Slope		0.004000 ft/ft			
Elevation range: 55.25 ft to 55.71 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	55.71	0.00	20.00	0.017	
20.00	55.31	20.00	22.00	0.013	
21.00	55.25	22.00	42.00	0.017	
22.00	55.31				
42.00	55.51				
Discharge	1.00	cfs			

Results		
Wtd. Mannings Coefficient	0.014	
Water Surface Elevation	55.41	ft
Flow Area	0.97	ft ²
Wetted Perimeter	16.69	ft
Top Width	16.68	ft
Height	0.16	ft
Critical Depth	55.39	ft
Critical Slope	0.006990	ft/ft
Velocity	1.03	ft/s
Velocity Head	0.02	ft
Specific Energy	55.42	ft
Froude Number	0.75	
Flow is subcritical.		

Velocity Calc for OND2 Cross Section for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	OND2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.014
Channel Slope	0.004000 ft/ft
Water Surface Elevation	55.41 ft
Discharge	1.00 cfs



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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RGMHEC2000 HEC-1.COM *
* RUN DATE 14FEB11 TIME 11:54:30 *
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*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *
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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 -AMSK- 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

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1         ID
2         *DIAGRAM
3         ID
4         ID ***** TECHNICAL DRAINAGE STUDY FOR
5         ID ***** NEVADA HEALTH CENTER - ENTERPRISE PARK
6         ID ***** LOCATED ON THE SOUTHEAST CORNER OF
7         ID ***** MOUNT MARIAH DR AND STELLA LAKE ST
8         ID ***** JHR PROJECT NO. 124-10-698
9         ID ***** EXISTING AND DEVELOPED CONDITIONS ANALYSES
10        ID ***** FILENAME: NHCEP.DAT
11        ID
12        ID ANALYSIS BY: JHR ASSOCIATES, LTD.
13        ID 4880 W.UNIVERSITY AVE., STE B2
14        ID LAS VEGAS, NV 89103
15        ID (702) 876-2341
16        ID
17        ID 10-YR STORM EVENT RATIO FOR (JR) CARD: 0.5704
18        ID 100-YR STORM EVENT RATIO FOR (JR) CARD: 1.0000
19        ID
20        ID THE PRECIPITATION RATIOS USED FOR THE 10 AND 100-YEAR STORM EVENTS
21        ID ARE DERIVED FROM THE DEPTH-DURATION FREQUENCY VALUES FOR MCCARRAN AIRPORT
22        ID RAINFALL AREA, PER TABLE 505 OF CCRFCD DESIGN MANUAL
23        ID 10-YR 6-HR STORM EVENT - 1.58 INCHES
24        ID 100-YR 6-HR STORM EVENT - 2.77 INCHES
25        ID
26        ID 5 0 0 300
27        ID 5 0 0
28        ID 5 0 0
29        ID JR PREC 0.5704 1.0000
30
31        KK ONX1
32        KM PEAK RUNOFF FROM EXISTING ON-SITE BASIN ONX1
33        BA 0.0038
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 77
44        UD 0.131
45
46        KK OND1
47        KM PEAK RUNOFF FROM DEVELOPED ON-SITE BASIN OND1
48        BA 0.0029
49        PB 2.77
50        LS 0 98
51        UD 0.110
52
53        KK OND2
54        KM PEAK RUNOFF FROM DEVELOPED ON-SITE BASIN OND2
55        BA 0.0008
56        PB 2.77
57        LS 0 98
58        UD 0.66
59        ZZ

```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
LINE	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
NO.		
30	ONX1	
	.	
44	.	OND1
	.	.
50	.	OND2

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

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* JUN 1998
* VERSION 4.1
* RGMHEC2000 HEC-1.COM
* RUN DATE 14FEB11 TIME 11:54:30
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*****
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

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***** TECHNICAL DRAINAGE STUDY FOR
***** NEVADA HEALTH CENTER - ENTERPRISE PARK
***** LOCATED ON THE SOUTHEAST CORNER OF
***** MOUNT MARIAH DR AND STELLA LAKE ST
***** JHR PROJECT NO. 124-10-698
***** EXISTING AND DEVELOPED CONDITIONS ANALYSES
***** FILENAME: NHCEP.DAT

```

```

ANALYSIS BY: JHR ASSOCIATES, LTD.
4880 W.UNIVERSITY AVE., STE B2
LAS VEGAS, NV 89103
(702) 876-2341

```

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10-YR STORM EVENT RATIO FOR (JR) CARD: 0.5704
100-YR STORM EVENT RATIO FOR (JR) CARD: 1.0000

```

```

THE PRECIPITATION RATIOS USED FOR THE 10 AND 100-YEAR STORM EVENTS
ARE DERIVED FROM THE DEPTH-DURATION FREQUENCY VALUES FOR MCCARRAN AIRPORT
RAINFALL AREA, PER TABLE 505 OF CCRFCD DESIGN MANUAL
10-YR 6-HR STORM EVENT - 1.58 INCHES
100-YR 6-HR STORM EVENT - 2.77 INCHES

```

```

27 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

```

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	RATIO 2
					.57	1.00
HYDROGRAPH AT						
+	ONX1	.00	1	FLOW	1.	3.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	OND1	.00	1	FLOW	3.	6.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	OND2	.00	1	FLOW	0.	1.
				TIME	4.08	4.08

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

APPENDIX D

HYDRAULIC CALCULATIONS

Section A-A - Stella Lake St (10-Year)
Worksheet for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section A-A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

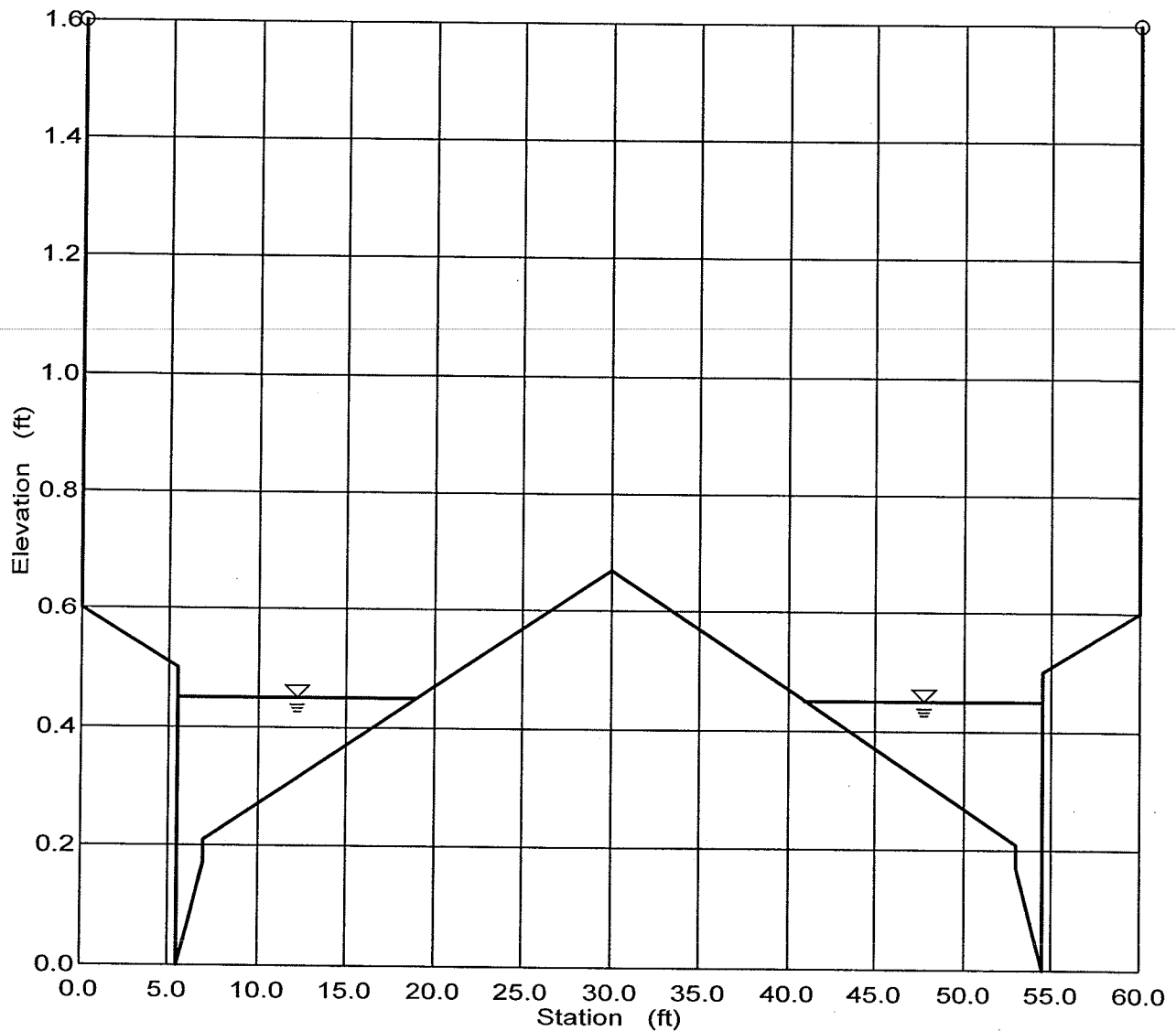
Input Data				
Channel Slope		0.004000 ft/ft		
Elevation range: 0.00 ft to 1.60 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1.60	0.00	60.00	0.017
0.00	0.60			
5.50	0.50			
5.50	0.00			
7.00	0.17			
7.00	0.21			
30.00	0.67			
53.00	0.21			
53.00	0.17			
54.50	0.00			
54.50	0.50			
60.00	0.60			
60.00	1.60			
Discharge	6.00	cfs		

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	0.45	ft
Flow Area	3.99	ft ²
Wetted Perimeter	28.04	ft
Top Width	27.04	ft
Height	0.45	ft
Critical Depth	0.41	ft
Critical Slope	0.008788	ft/ft
Velocity	1.51	ft/s
Velocity Head	0.04	ft
Specific Energy	0.49	ft
Froude Number	0.69	
Flow is subcritical.		
Flow is divided.		

Section A-A - Stella Lake St (10-Year)
Cross Section for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section A-A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.017
Channel Slope	0.004000 ft/ft
Water Surface Elevation	0.45 ft
Discharge	6.00 cfs



Section A-A - Stella Lake St (100-Year)
Worksheet for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section A-A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

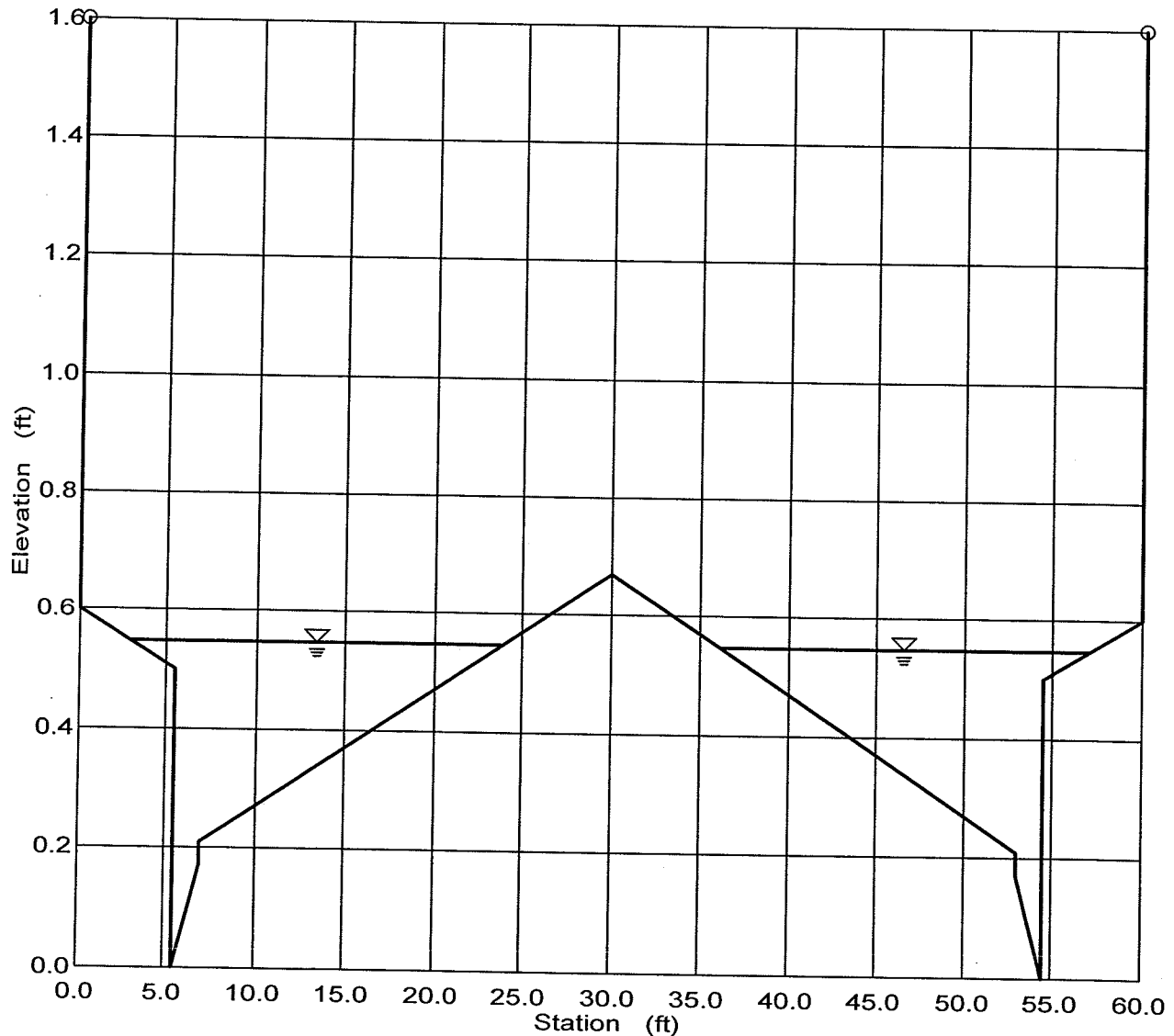
Input Data					
Channel Slope		0.004000 ft/ft			
Elevation range: 0.00 ft to 1.60 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	1.60	0.00	60.00	0.017	
0.00	0.60				
5.50	0.50				
5.50	0.00				
7.00	0.17				
7.00	0.21				
30.00	0.67				
53.00	0.21				
53.00	0.17				
54.50	0.00				
54.50	0.50				
60.00	0.60				
60.00	1.60				
Discharge	12.00	cfs			

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	0.55	ft
Flow Area	7.16	ft ²
Wetted Perimeter	42.82	ft
Top Width	41.72	ft
Height	0.55	ft
Critical Depth	0.49	ft
Critical Slope	0.008014	ft/ft
Velocity	1.68	ft/s
Velocity Head	0.04	ft
Specific Energy	0.59	ft
Froude Number	0.71	
Flow is subcritical.		
Flow is divided.		

Section A-A - Stella Lake St (100-Year)
Cross Section for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section A-A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.017
Channel Slope	0.004000 ft/ft
Water Surface Elevation	0.55 ft
Discharge	12.00 cfs



Section B-B - Mount Mariah Dr (10-Year)
Worksheet for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

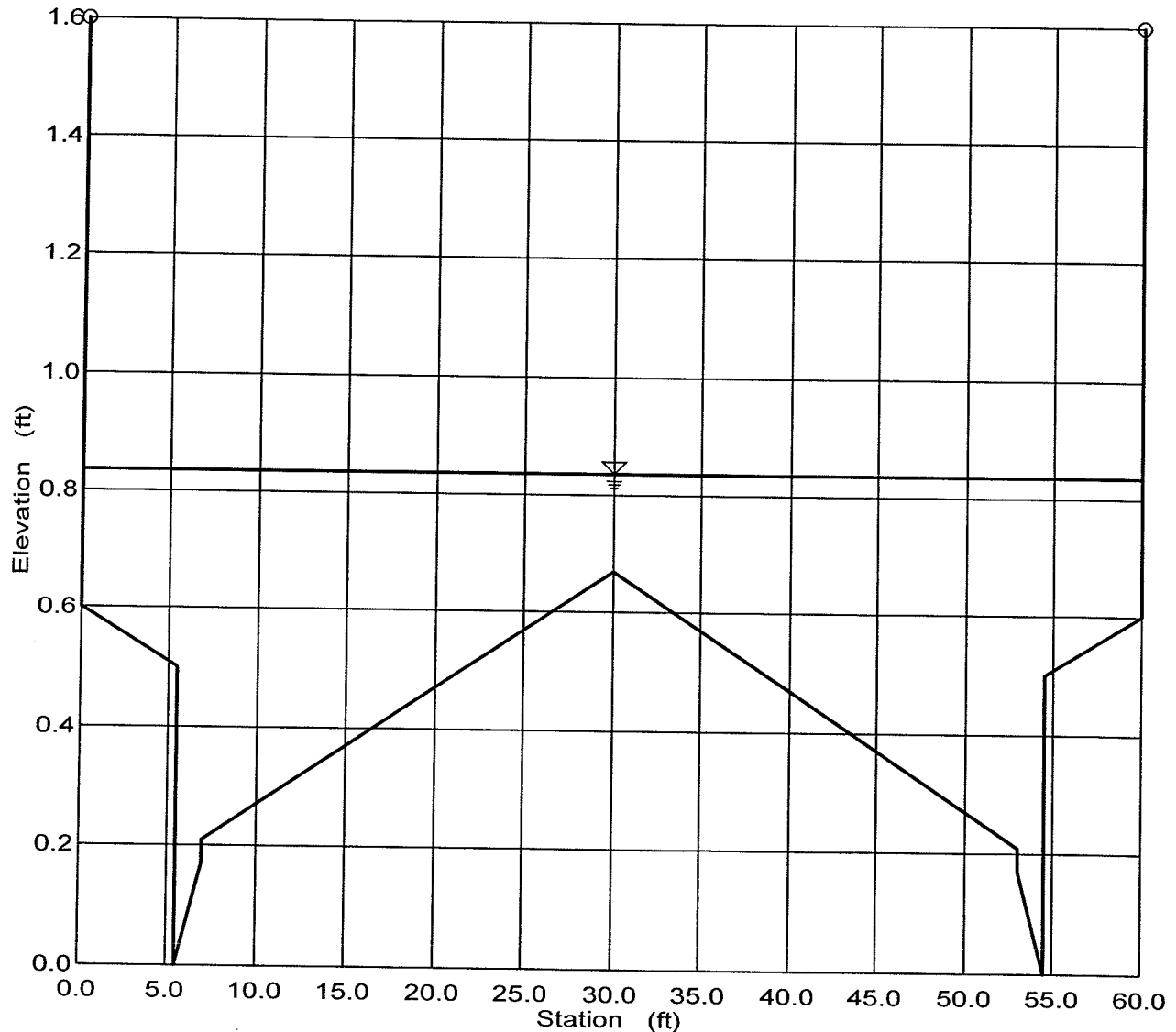
Input Data				
Channel Slope	0.004000 ft/ft			
Elevation range: 0.00 ft to 1.60 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1.60	0.00	60.00	0.017
0.00	0.60			
5.50	0.50			
5.50	0.00			
7.00	0.17			
7.00	0.21			
30.00	0.67			
53.00	0.21			
53.00	0.17			
54.50	0.00			
54.50	0.50			
60.00	0.60			
60.00	1.60			
Discharge	69.00	cfs		

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	0.84	ft
Flow Area	23.63	ft ²
Wetted Perimeter	61.58	ft
Top Width	60.00	ft
Height	0.84	ft
Critical Depth	0.79	ft
Critical Slope	0.006203	ft/ft
Velocity	2.92	ft/s
Velocity Head	0.13	ft
Specific Energy	0.97	ft
Froude Number	0.82	
Flow is subcritical.		

Section B-B - Mount Mariah Dr (10-Year)
Cross Section for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.017
Channel Slope	0.004000 ft/ft
Water Surface Elevation	0.84 ft
Discharge	69.00 cfs



Section B-B - Mount Mariah Dr (100-Year)
Worksheet for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

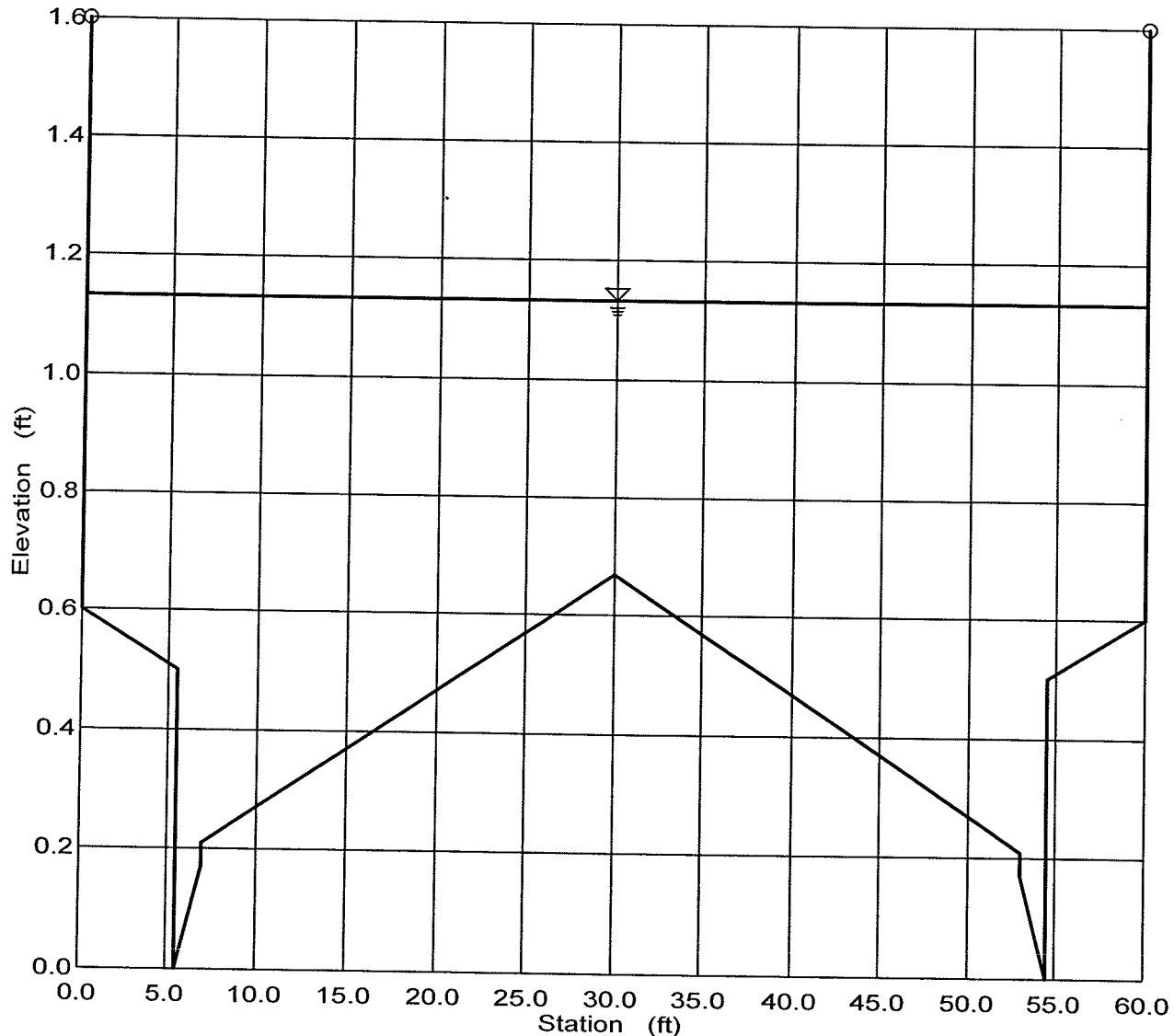
Input Data					
Channel Slope		0.004000 ft/ft			
Elevation range: 0.00 ft to 1.60 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	1.60	0.00	60.00	0.017	
0.00	0.60				
5.50	0.50				
5.50	0.00				
7.00	0.17				
7.00	0.21				
30.00	0.67				
53.00	0.21				
53.00	0.17				
54.50	0.00				
54.50	0.50				
60.00	0.60				
60.00	1.60				
Discharge	175.00	cfs			

Results			
Wtd. Mannings Coefficient	0.017		
Water Surface Elevation	1.13	ft	
Flow Area	41.47	ft ²	
Wetted Perimeter	62.18	ft	
Top Width	60.00	ft	
Height	1.13	ft	
Critical Depth	1.08	ft	
Critical Slope	0.005109	ft/ft	
Velocity	4.22	ft/s	
Velocity Head	0.28	ft	
Specific Energy	1.41	ft	
Froude Number	0.89		
Flow is subcritical.			

Section B-B - Mount Mariah Dr (100-Year)
Cross Section for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data	
Wtd. Mannings Coefficient	0.017
Channel Slope	0.004000 ft/ft
Water Surface Elevation	1.13 ft
Discharge	175.00 cfs



Section C-C - On-Site Conc VG
Worksheet for Irregular Channel

Project Description	
Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section C-C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope		0.004000 ft/ft		
Elevation range: 54.95 ft to 55.44 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	55.44	0.00	39.00	0.017
39.00	55.01	39.00	41.00	0.013
40.00	54.95	41.00	80.00	0.017
41.00	55.01			
80.00	55.40			
Discharge	7.00	cfs		

Results		
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	55.23	ft
Flow Area	4.96	ft ²
Wetted Perimeter	43.27	ft
Top Width	43.26	ft
Height	0.28	ft
Critical Depth	55.20	ft
Critical Slope	0.007516	ft/ft
Velocity	1.41	ft/s
Velocity Head	0.03	ft
Specific Energy	55.26	ft
Froude Number	0.74	
Flow is subcritical.		

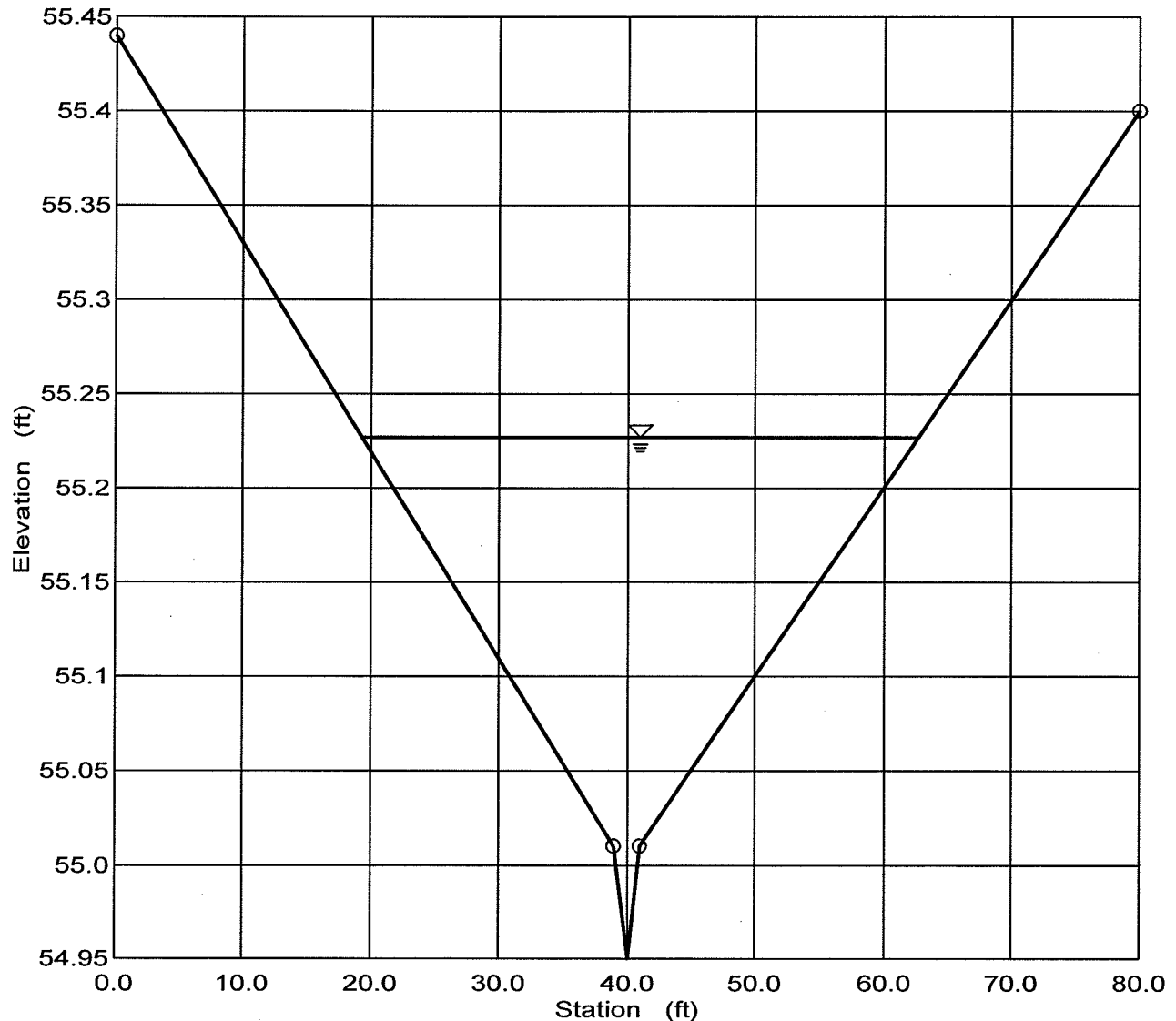
Section C-C - On-Site Conc VG Cross Section for Irregular Channel

Project Description

Project File	i:\jhr-2005\projects\enterprise medical center\drainage\tds\enterpri.fm2
Worksheet	Section C-C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data

Wtd. Mannings Coefficient	0.016
Channel Slope	0.004000 ft/ft
Water Surface Elevation	55.23 ft
Discharge	7.00 cfs



APPENDIX E

REFERENCE APPENDIX

DS 3581

APPROVED TDS FOR STELLA LAKE

CARTER BURGESS
JUNE 28, 2004

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

June 28, 2004

TO:

Land Development Services
Department of Public Works

FROM:

Peter Jackson
Flood Control Section
Department of Public Works

SUBJECT:

Drainage Study for:

STELLA LAKE OFFICE BUILDING

COPIES TO:

Carter Burgess

Cross Streets:

Lake Mead & Stella Lake

Page Southerland Page L.L.P.

File Number:

F:\Depot\DSMemos\DS3581B.doc

Bart Anderson, P.E., DevCo

Parcel Number:

139-21-313-002

Bill Arent, CLV - OBD

Zoning Action:

SDR 4298

FEMA Flood Zone

YES

NO

X

Proposed Storm Drain

YES

NO

X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID G.R. No.
1 st Submittal & Supplemental	5/18/2004 & 6/8/2004	6/8/2004	Conditionally Approved	\$400.00	125334: \$400
2nd Submittal	6/28/2004	6/28/2004	See Comments Below	N/C	
TOTAL FEES (LDDRS):				\$400.00	---

REMARKS:

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

X	is approved subject to conformance to all City standards and the following conditions:
	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

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

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

T/R/S: T20S/R61E/S21
AREA M21

TECHNICAL DRAINAGE STUDY

FOR STELLA LAKE

C&B JOB #241027

Prepared by:
Carter-Burgess

6655 Bermuda Road
Las Vegas, Nevada 89119

Submitted to:
City of Las Vegas
Flood Control Division
731 S. Fourth Street
Las Vegas, Nevada 89101

May 2004

DS 3581
400—
M-21
5/18/04

2.0 DRAINAGE BASIN DESCRIPTION

2.1 Existing Drainage Description

In general, the runoff generated by drainage areas upstream of the site flows west to east. The upstream drainage areas which impact the site are mostly developed with only a few open undeveloped parcels. The majority of the offsite flows are conveyed within Lake Mead Boulevard, which is fully improved. All perimeter streets (Lake Mead Boulevard, Stella Lake Boulevard, and Mount Mariah Drive) to the site are fully improved, and they serve to route offsite flows around the site. Other offsite flows that impact the site on Mount Mariah Drive are flows that discharged through a drainage easement from the Lake Mead Tonopah Middle School (basin OFF4). Please see Figure 3 - *Existing Condition Drainage Map*. The flow within Lake Mead Boulevard has been referenced from the latest Central Neighborhood Flood Control Master Plan, which is still pending final approval from the City but has been provided to Carter and Burgess by the City for the purpose of this drainage study. Per Carter and Burgess' meeting with Peter Jackson on May 10, 2004, it was agreed that the surface flow (1015 cfs) within Lake Mead Boulevard from the Central Neighborhood Flood Control Master Plan will be used for the design of this project site. The flow discharging through a drainage easement and impacting Mount Mariah Drive is from offsite basin OFF4 as shown on Figure 3. Basin OFF4 is mostly developed and consists of a school, apartments and single family home residential developments. The other offsite basins are OFF1, OFF2 and OFF3, which contribute flows directly onto Stella Lake Boulevard. The offsite basins have been delineated based on the aerial photos, GIS topography, and field investigation.

The project site is undeveloped desert and slopes from west to east at approximately 1.0%. The site is composed of type B soils (see Figure 3 - *Existing Condition Drainage Map* or Figure H-12 - *Hydrologic Subareas, Land Use & Soils*). The storm flow summary for the existing drainage conditions is summarized in Table 1.

TABLE 1
EXISTING CONDITIONS
PEAK FLOW RATE SUMMARY

BASIN NAME / CONC. POINT	AREA, ACRES	10-YR FLOW, CFS	100-YR FLOW, CFS
SITE	5.32	1	6
OFF1	1.41	2	4
OFFX2	2.42	1	4
OFF3	4.63	6	12
OFF4	77.32	65	140
OFF5	0.42	1	2
CP1 *	-	2	33
CP2 *	-	67	173
CP3 *	-	70	180

* Includes flow (Q100=29 cfs) that overtops Stella Lake high point from flow within Lake Mead Boulevard. See Figure 3.

2.2 FEMA Flood Hazard Zone

The Special Flood Hazard Areas for Clark County, Nevada are outlined in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps dated September 27, 2002. The project site lies within Community Panel No. 32003 C 2160 E, which has been revised to reflect LOMR dated December 11, 2003. Upon reviewing Panel No. 32003 C 2160 E, the site is located within a Zone "X". A Zone "X" is described as outside of a Special Flood Hazard Area. (See Figure 3, *Flood Insurance Rate Map*.)

2.3 Regional Flood Control Master Plan Update

The 2002 Regional Flood Control Master Plan Update shows the site is adjacent to a Master Planned Facility, LVLM 0059, located within Lake Mead Boulevard, north of the project site (see Figure F-12 - *Flood Control Facilities*). In the Regional Flood Control Master Plan Update the facility LVLM 0059 is labeled as both an existing 66" RCP and as a future proposed a 8' x 8' RCB that convey 1005 cfs. Whereas, in the City of Las Vegas' Central Neighborhood Flood Control Master Plan, the facility LVLM 0059 is shown as an existing 72" RCP that conveys 342 cfs.

The project site is located within regional basin LM14-C (see Figure H-12 - *Hydrologic Subareas, Land Use & Soils*).

2.4 Referenced Drainage Studies

The Technical Drainage Study for Las Vegas Enterprise Park Drainage Study and Technical Drainage Study for Lake Mead Tonopah Middle School, prepared in 1995 and 1996, respectively, have been reviewed but not referenced because of the ages of those studies. Those studies quantified flows which discharge onto the drainage easement from the Lake Mead Tonopah Middle School, but from the referenced materials the offsite drainage area in which the flows were determined are unclear. Therefore, the offsite basin OFF4 delineated in this study is believed to more accurately represents the flows that discharge through the drainage easement.

As discussed above, the flow within Lake Mead Boulevard has been referenced from the latest Central Neighborhood Flood Control Master Plan.

3.0 PROPOSED DRAINAGE FACILITIES

3.1 General Description

The project site consists of an office building, a parking structure and open parking areas, and 2-ft concrete valley gutters provided for drainage of the parking areas. Roof drains will drain the building's roof runoff. Stem wall in combination of berm with sufficient freeboard along Lake Mead Boulevard is provided to keep flow within Lake Mead Boulevard from encroaching onto the site.

The developed conditions is shown on Figure 5, *Developed Condition Drainage Map*. The only difference between the interim and future conditions is basin OFFX2 and basin OFFD2, two of the same basin area, whereas OFFX2 is undeveloped and OFFD2 is developed. The developed conditions flow summary is shown below in Table 2.

**TABLE 2
DEVELOPED CONDITIONS
PEAK FLOW RATE SUMMARY**

BASIN NAME / CONC. POINT	AREA, ACRES	10-YR FLOW, CFS	100-YR FLOW, CFS
OFF1	1.41	2	4
OFFD2	2.42	3	7
OFF3	4.63	6	12
OFF4	77.32	65	140
OFF5	0.42	1	2
ON1	0.42	3	6
ON2	0.42	0	1
ON3	0.42	0	1
ON4	0.42	2	4
ON5	0.42	2	3
CP1 *	-	3	34
CP2 *	-	69	175
CP3 *	-	73	184

* Includes flow (Q100=29 cfs) that overtops Stella Lake high point from flow within Lake Mead Boulevard. See Figure 5.

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* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
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* JUN 1998 *
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* VERSION 4.1 *
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* RUN DATE 17MAY04 TIME 10:12:24 *
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* U.S. ARMY CORPS OF ENGINEERS
*
* HYDROLOGIC ENGINEERING CENTER
*
* 609 SECOND STREET
*
* DAVIS, CALIFORNIA 95616
*
* (916) 756-1104
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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

HEC-1 INPUT

PAGE 1

```

1
LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*DIAGRAM
1 ID
2 ID
3 ID STELLA LAKE TECHNICAL DRAINAGE STUDY
4 ID BY: CARTER BURGESS-JYL
5 ID
6 ID INTERIM CONDITIONS
7 ID DATA FILE=L:\241027\DRAINAGE\HYDROLOGY\INT.DAT
8 ID
9 ID BASINS MODELED WITH 6-HOUR STORM DISTRIBUTION #3
10 ID
11 ID
12 IT 5 0 0 300
13 IO 5 0 0
14 IN 5 0 0
15 JR PREC 0.57 1
16 KK OFF1
17 BA .0022
18 PB 2.77
19 PC 0.000 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
20 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
21 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
22 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
23 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
24 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
25 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
26 PC 0.998 0.999 1.000
27 LS 0 93.2
28 UD 0.090
*
29 KK ON2
30 BA .0005
31 LS 0 92
32 UD 0.050
*
33 KK ON3
34 BA .0005
35 LS 0 92
36 UD 0.050
*
37 KK CP1

```

38 KM COMBINE BASINS OFF1, ON2 AND ON3
 39 HC 3
 *
 40 KK OFFX2
 41 BA .0038
 42 LS 0 81.2
 43 UD 0.149
 *

HEC-1 INPUT

PAGE 2

1

LINE	ID	1	2	3	4	5	6	7	8	9	10
44	KK	ON4									
45	BA	.0020									
46	LS	0	92								
47	UD	0.069									
	*										
48	KK	OFF4									
49	BA	.1208									
50	LS	0	92.2								
51	UD	0.333									
	*										
52	KK	CP2									
53	KM	COMBINE BASINS OFFD2, ON4 AND OFF4 WITH CP1									
54	HC	4									
	*										
55	KK	OFF3									
56	BA	.0072									
57	LS	0	93.2								
58	UD	0.131									
	*										
59	KK	OFF5									
60	BA	.0007									
61	LS	0	98								
62	UD	0.053									
	*										
63	KK	ON5									
64	BA	.0017									
65	LS	0	92								
66	UD	0.069									
	*										
67	KK	CP3									
68	KM	COMBINE BASINS OFF3, OFF5 AND ON5 WITH CP2									
69	HC	4									
	*										
70	KK	ON1									
71	BA	.0033									
72	LS	0	92								
73	UD	0.101									
	*										
74	ZZ										

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE
 (V) ROUTING (--->) DIVERSION OR PUMP FLOW
 NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

16 OFF1
 .
 29 . ON2
 .
 33 . ON3
 .
 37 CP1.....**SPLIT FLOW**
 .
 40 OFFX2
 .
 44 . ON4
 .
 48 . OFF4
 .
 52 CP2.....
 .
 55 OFF3

```

*****
*
*
*      FLOOD HYDROGRAPH PACKAGE   (HEC-1)
*
*      JUN      1998
*
*      VERSION 4.1
*
*
*
*      RUN DATE   17MAY04   TIME   10:12:24
*
*
*
*****
*****
*****

```

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

```
STELLA LAKE TECHNICAL DRAINAGE STUDY
BY: CARTER BURGESS-JYL

INTERIM CONDITIONS
DATA FILE=L:\241027\DRAINAGE\HYDROLOGY\INT.DAT

BASINS MODELED WITH 6-HOUR STORM DISTRIBUTION #3
```

```

13 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

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	RATIO 2
				.57	1.00

HYDROGRAPH AT	OFF1	.00	1	FLOW TIME	2. 3.50	4. 3.50
HYDROGRAPH AT	ON2	.00	1	FLOW TIME	0. 3.50	1. 3.50
HYDROGRAPH AT	ON3	.00	1	FLOW TIME	0. 3.50	1. 3.50
3 COMBINED AT	CP1	.00	1	FLOW TIME	3. 3.50	6. 3.50 +29 = 35
HYDROGRAPH AT	OFFX2	.00	1	FLOW TIME	1. 3.58	4. 3.58
HYDROGRAPH AT	ON4	.00	1	FLOW TIME	2. 3.50	4. 3.50
HYDROGRAPH AT	OFF4	.12	1	FLOW TIME	65. 3.75	140. 3.75
4 COMBINED AT	CP2	.13	1	FLOW TIME	68. 3.75	146. 3.75 +29 = 175
HYDROGRAPH AT	OFF3	.01	1	FLOW TIME	6. 3.58	12. 3.58
HYDROGRAPH AT	OFF5	.00	1	FLOW TIME	1. 3.50	2. 3.50
HYDROGRAPH AT	ON5	.00	1	FLOW TIME	2. 3.50	3. 3.50
4 COMBINED AT	CP3	.14	1	FLOW TIME	72. 3.75	155. 3.75 +29 = 184
HYDROGRAPH AT	ON1	.00	1	FLOW TIME	3. 3.50	6. 3.50

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

Weir Calculations (100-Year) - Flow Split over Stella Lake High Point **Flow Split Location @ Lake Mead/Stella Lake**

Total flow at intersection is 1015 cfs

Stella Lake High Point

West Side (Upstream) Sidewalk	
Sect. Length	5.50 ft
Weir Length (L)	5.50 ft
WSE Up	59.97 ft
WSE Dn	59.91 ft
Crest Up	59.62 ft
Crest Dn	59.52 ft
C_w	3.0
h	0.37 ft
Flow Area	2.2
Velocity (ft/s)	1.7
DxV	0.6

$$Q = C_w * L * h^{3/2}$$

$$Q = 3.7$$

Stella Lake High Point

West Side (Upstream) Street Section	
Sect. Length	24.50 ft
Weir Length (L)	24.50 ft
WSE Up	59.91 ft
WSE Dn	59.61 ft
Crest Up	59.61 ft
Crest Dn	59.02 ft
C_w	3.0
h	0.45 ft
Flow Area	14.6
Velocity (ft/s)	1.5
DxV	0.7

$$Q = C_w * L * h^{3/2}$$

$$Q = 21.8$$

Stella Lake High Point

East Side (Downstream) Sidewalk	
Sect. Length	5.50 ft
Weir Length (L)	5.50 ft
WSE Up	59.30 ft
WSE Dn	59.24 ft
Crest Up	59.62 ft
Crest Dn	59.52 ft
C_w	3.0
h	-0.14 ft
Flow Area	-0.4
Velocity (ft/s)	0.0
DxV	0.0

$$Q = C_w * L * h^{3/2}$$

$$Q = 0.0$$

Stella Lake High Point

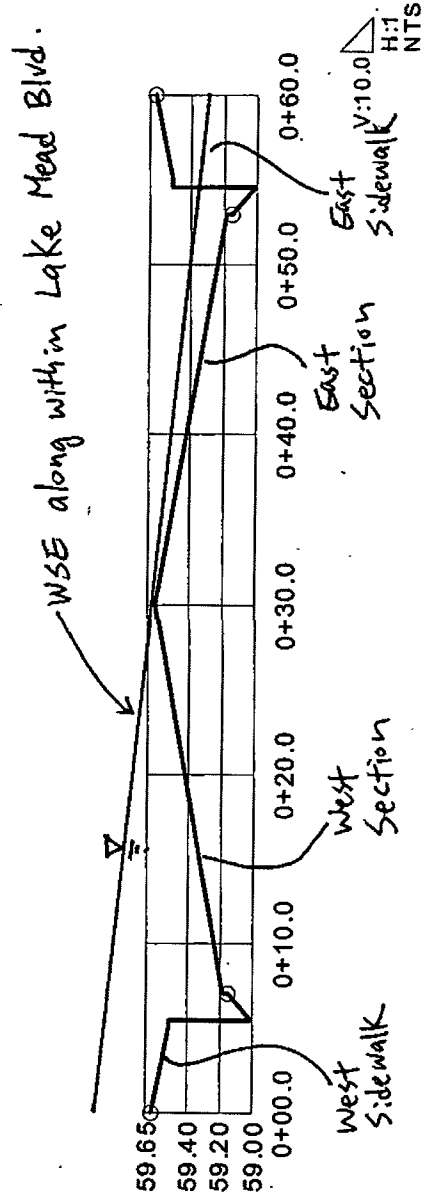
East Side (Downstream) Street Section	
Sect. Length	24.50 ft
Weir Length (L)	24.50 ft
WSE Up	59.61 ft
WSE Dn	59.30 ft
Crest Up	59.61 ft
Crest Dn	59.02 ft
C_w	3.0
h	0.14 ft
Flow Area	1.7
Velocity (ft/s)	2.2
DxV	0.3

$$Q = C_w * L * h^{3/2}$$

$$Q = 3.9$$

Total Flow overtopping Stella Lake High Point and convey south on Stella Lake
= 29.4 cfs

WSEs are based on flow depth (1.54-ft) within Lake Mead Boulevard plus the flow line elevation at upstream and downstream of section.



Albert Sung

From: Reese P. Jarrell [rjarrell@jhrassociates.com]
Sent: Wednesday, April 13, 2011 3:10 PM
To: Albert Sung
Subject: Conditions of Approval
Attachments: City Council- NOFA NVHC.pdf

Albert,

Attached are the Conditions of Approval (SDR 40766) for the Health Center Project in the Enterprise Business Park in the City. This project is a part of APN 139-21-313-016 at the southeast corner of Stella Lake Street and Mount Mariah Drive. If you need anything further to complete your review please let me know.

Sincerely,

Reese P. Jarrell P.E.

JHR Associates Ltd.

4880 West University Avenue
Suite B2
Las Vegas, Nevada 89103
Phone: (702) 876-2341
Fax: (702) 876-8395
E-mail: rjarrell@jhrassociates.com

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April 7, 2011

LAS VEGAS CITY COUNCIL

OSCAR B. GOODMAN
MAYOR

GARY REESE
MAYOR PRO TEM

STEVE WOLFSON

LOIS TARKANIAN

STEVEN D. ROSS

RICKI Y. BARLOW

STAVROS S. ANTHONY

ELIZABETH N. FRETWELL
CITY MANAGER

Mr. Darren Harris
City of Las Vegas
400 Stewart Avenue
Las Vegas, Nevada 89101

RE: SDR-40766 – SITE DEVELOPMENT PLAN REVIEW
CITY COUNCIL MEETING OF APRIL 6, 2011

Dear Mr. Harris:

The City Council at a regular meeting held April 6, 2011, APPROVED the request for a Site Development Plan Review FOR A PROPOSED TWO-STORY, 30,800 SQUARE-FOOT MEDICAL OFFICE on a 2.39 acre portion of a 6.07-acre lot at the southeast corner of Mount Mariah Drive and Stella Lake Street (APN 139-21-313-016), C-PB (Planned Business Park) Zone. The Notice of Final Action was filed with the Las Vegas City Clerk on April 7, 2011. This approval is subject to:

Planning

1. Conformance to the Conditions of Approval for Rezoning (Z-136-94) and Plot Plan Review [Z-0136-94(1)] shall be required, if approved.
2. This approval shall be void two years from the date of final approval, unless a building permit has been issued for the principal building on the site. An Extension of Time may be filed for consideration by the City of Las Vegas.
3. All development shall be in conformance with the site plan, landscape plan, and building elevations, date stamped 01/20/11, except as amended by conditions herein.
4. An Exception from Title 19.10.010(J)11 is hereby approved, to allow 15 trees within the Parking Lot where 18 trees are required.
5. Any changes based upon right-of-way, traffic or drainage studies or street improvements required by the city or public utilities shall not reduce the widths of perimeter landscape buffers, height of walls or quantities of plant materials from that on submitted landscape plans date stamped 01/20/11. Any changes based upon subsequently submitted studies must be accommodated elsewhere on the site.

CITY OF LAS VEGAS
400 STEWART AVENUE
LAS VEGAS, NEVADA 89101

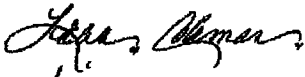
VOICE 702.229.6011
TTY 702.386.9108
www.lasvegasnevada.gov

FM-0044-08-09

Mr. Darren Harris
SDR-40766 – Page Two
April 7, 2011

17. The proposed new driveways accessing this site from Lake Stella Lake Street and Mount Mariah Drive are hereby approved as deviations from standards. Any further deviations, if any, to width, ingress/egress radii, or throat depth will require separate approval from the City Engineer.
18. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits, submittal of any construction drawings or the submittal of a Map subdividing this site, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.
19. Site development to comply with all applicable conditions of approval for Z-136-94, the Las Vegas Enterprise Park (Commercial Subdivision) and all other subsequent site-related actions.

Sincerely,



Lean Coleman
Deputy City Clerk II for
Beverly K. Bridges, MMC, City Clerk

cc: Mr. Gary Gifford
Nevada Health Centers
4415 Spring Mountain Road
Las Vegas, Nevada 89102

Mr. Ben Giradin
10 Nine Design Group
3579 Red Rock Street
Las Vegas, Nevada 89103

LETTER OF TRANSMITTAL

JAR Associates Ltd.

4880 W. University, Suite B-2
Las Vegas, Nevada 89103
(702)876-2341 Fax (702)876-8395

Date: 02-23-11	Job No.: 124-10-698
Attention: Flood Control Civil Engineer	
Re: Nevada Health Centers	
Technical Drainage Study	

To: City of Las Vegas

Public Works Department - Flood Control Section

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via:

COPIES	DATE	NO.	DESCRIPTION
1 orig	02-23-11		Technical Drainage Study
1	02-23-11		check in the amount of \$400 for TDS submittal fee

THESE ARE TRANSMITTED AS CHECKED BELOW:

☒ For Approval ☐ For Your Use ☐ As Requested ☐ For Comment
☒ Review ☐ Other _____

REMARKS:

SIGNED:


Jahan Azodi

RECEIVED BY: _____

Albert Sung

From: Reese P. Jarrell [rjarrell@jhrassociates.com]
Sent: Friday, April 22, 2011 11:56 AM
To: Albert Sung
Cc: 'Jahan Azodi'; james.g.reynolds@me.com
Subject: Nevada Health Center DS4522A or Hansen 41203
Attachments: Landscape - NVHC.pdf

Albert,

I have attached the landscape plans for the proposed Health Center project (DS4522A) we discussed briefly yesterday. The landscape plan calls for tree planting around the perimeter of the site to be irrigated with a drip irrigation system. It is my intent to provide a swale approximately 6-inches deep and 2-feet wide to intercept any irrigation runoff (nuisance water) before it crosses the property line. These swales are provided along the south and east boundaries to address Planning and Drainage redline comments and will serve to retain any flows rather than convey them to the public right of way. As we discussed, the whole area is essentially flat and to get what amounts to insignificant nuisance flows to the existing public rights of way does not appear to be practical in this case. Your consideration in this matter is greatly appreciated. If you have additional questions or comments please let me know or I will make myself available to meet with Flood Control next week if necessary.

Respectfully Submitted,

Reese P. Jarrell P.E.
JHR Associates Ltd.
4880 West University Avenue
Suite B2
Las Vegas, Nevada 89103
Phone: (702) 876-2341
Fax: (702) 876-8395
E-mail: rjarrell@jhrassociates.com

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**** Duplicate Receipt ****

City of Las Vegas

Development Services Center

731 South Fourth Street

Las Vegas, NV 89101

02/24/2011 11:22 Trn 163331
Cashier 690381

PRJ Permit # 054522 \$400.00

Subtotal \$400.00

Tax 10.00

Total \$400.00

Received On DA \$400.00

Check # 1061

Cashier 690381 \$400.00

For questions related to this receipt call

702-775-6210



City of Las Vegas

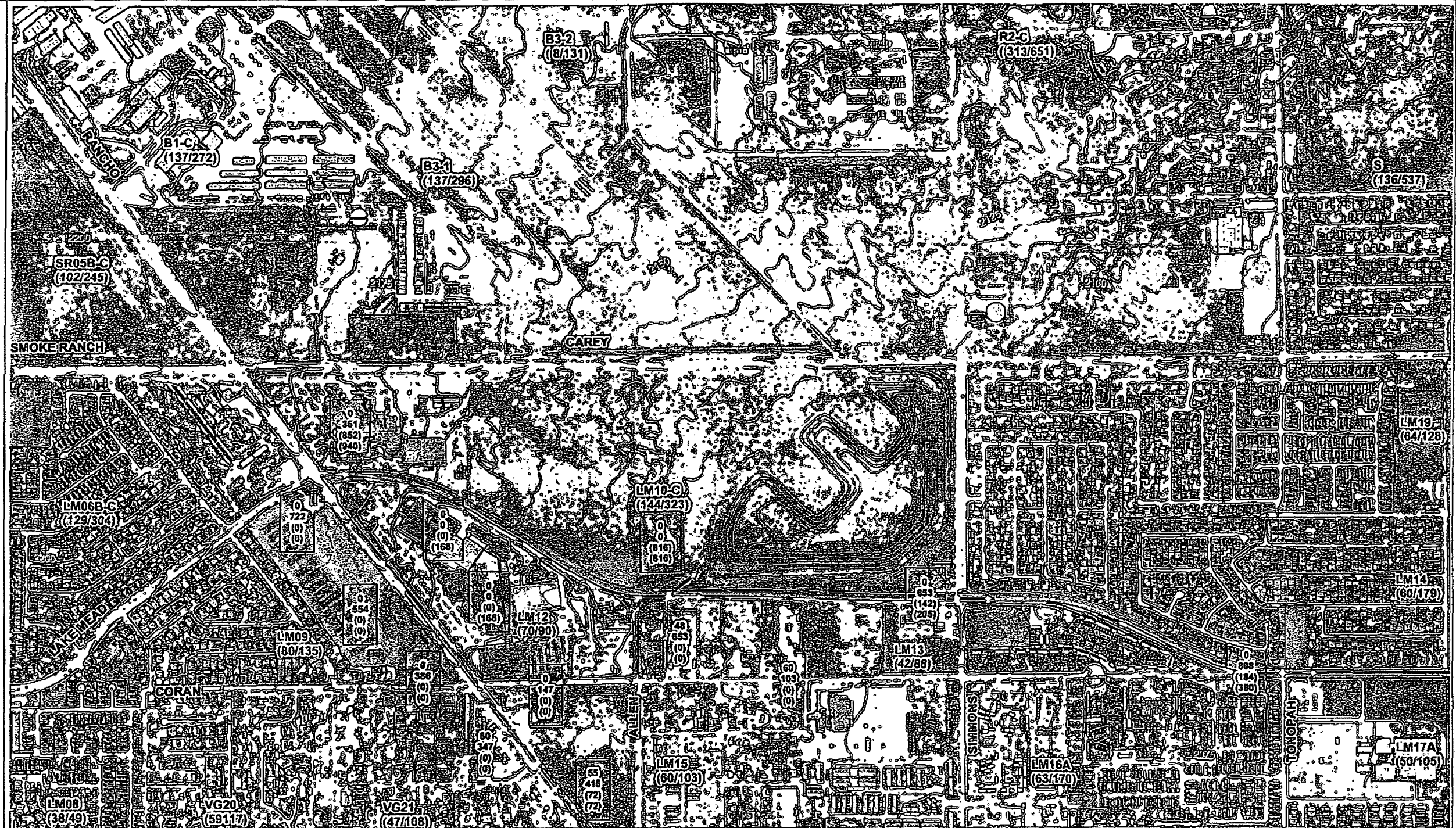
CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

LEGEND

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

PHOTO DATE: MARCH 2003

FIGURE E-1



EXISTING DRAINAGE CONDITIONS



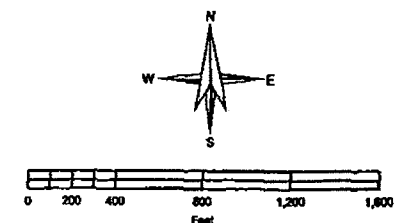
2270 Corporate Circle, Suite 100
Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200

	Durango	Rainbow	Decatur	Tonopah	5th	Pease	Neills
Lake Mead				1	2		
Washington				3	4	5	6
Charleston	7	8	9	10	11	12	
Sahara	13	14	15	16	17		
Desert Inn		18	19				

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 explanation.



SCALE: 1 inch = 800 feet

NOTES

This map is for assessment use only and does NOT represent a survey.
No liability is assumed for the accuracy of the data delineated 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

50

100

200

400

600

800

AVERAGE
QA VALUE
35

MAP LEGEND

——

PARCEL BOUNDARY

——

SUBD BOUNDARY

ROAD EASEMENT

PM/LD BOUNDARY

NON-PARCEL LOT LINE

MATCH LINE / LEADER LINE

ROAD ID NUMBER

ASSESSOR'S PARCELS - CLARK CO., NV.
M. W. Schofield, Assessor

BOOK

T20S R61E

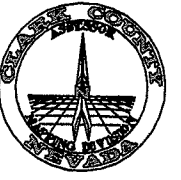
SEC

21

MAP

N 2 SW 4

139-21-3



001

PARCEL NUMBER

1.00

ACREAGE

202

PARCEL SUB/SEQ NUMBER

PB 25-45

PLAT RECORDING NUMBER

5

BLOCK NUMBER

5

LOT NUMBER

GL5

GOV. LOT NUMBER

R60E

125

R61E

124

R62E

123

T20S

138

T21S

139

T22S

140

T23S

163

T24S

162

T25S

161

6

5

4

3

2

1

7

8

9

10

11

12

18

17

16

15

14

13

19

20

21

22

23

24

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36

8

4

5

1

6

2

7

3

8

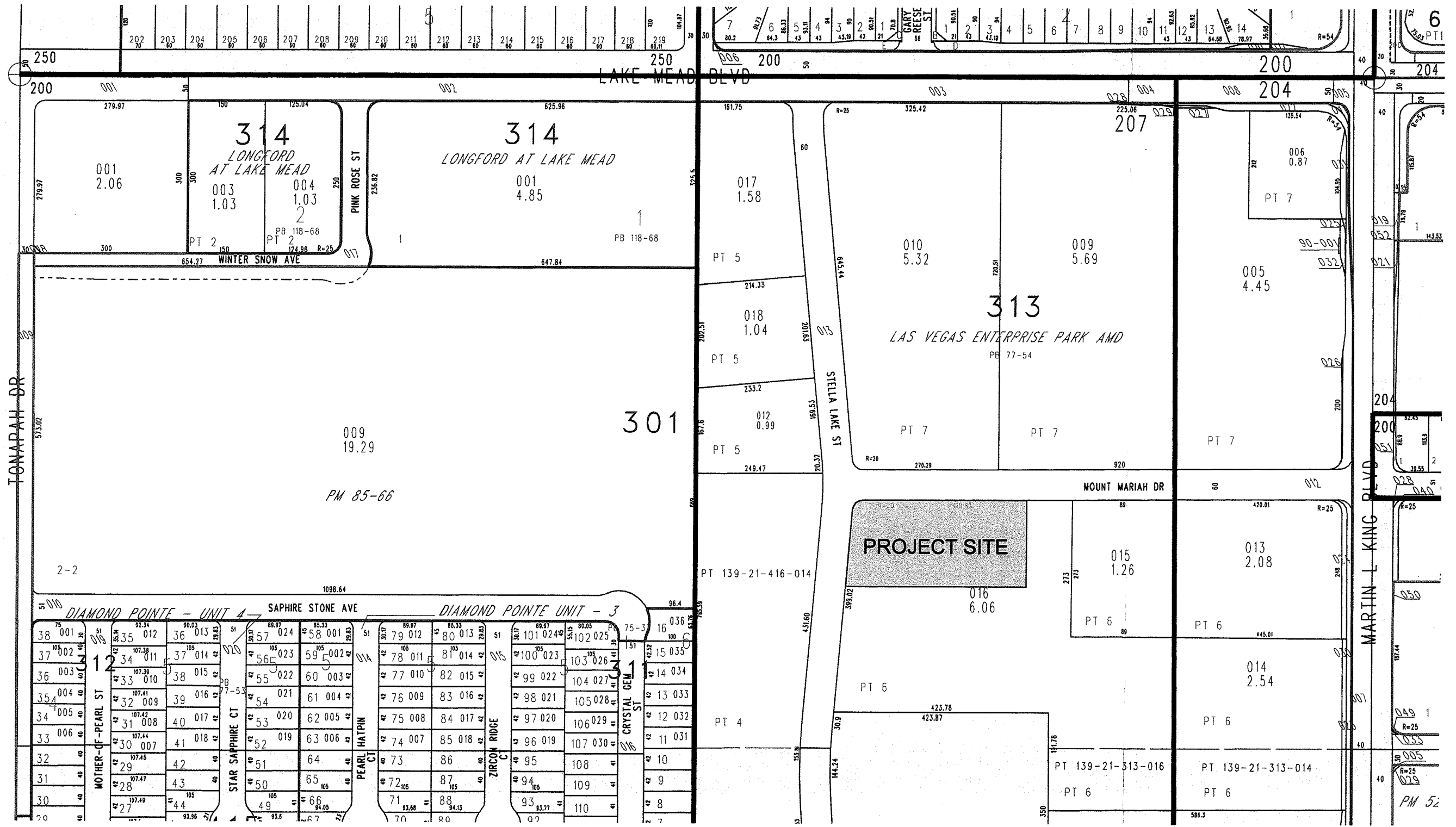
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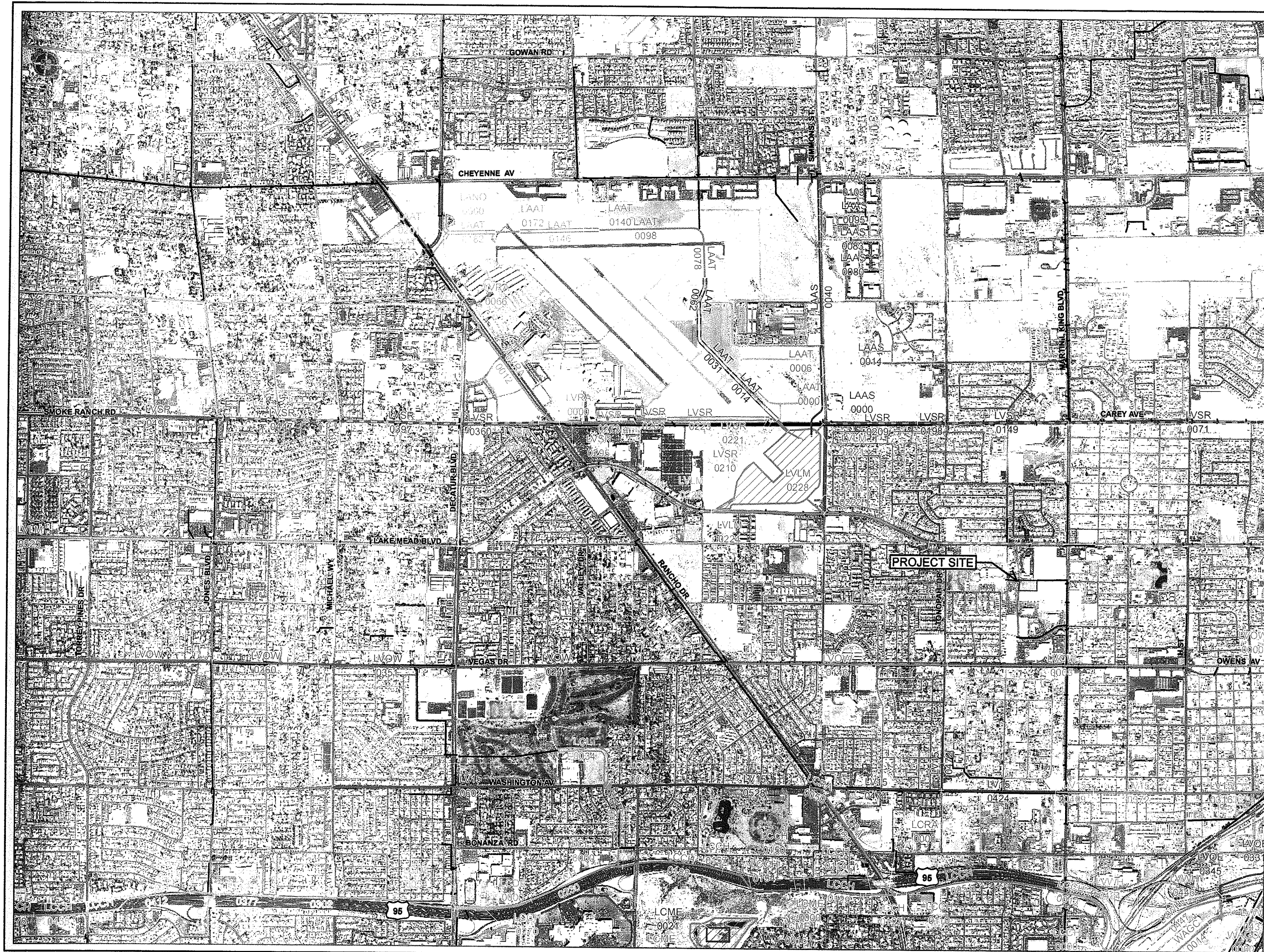
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1

Scale:1"=200'

Rev:03/03/10





2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

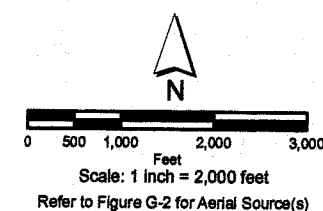
**FIGURE F-26
FLOOD CONTROL FACILITIES**

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin
- Culvert or Bridge Crossing
- 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 |
| Crossing | Crossing |



US95

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	60

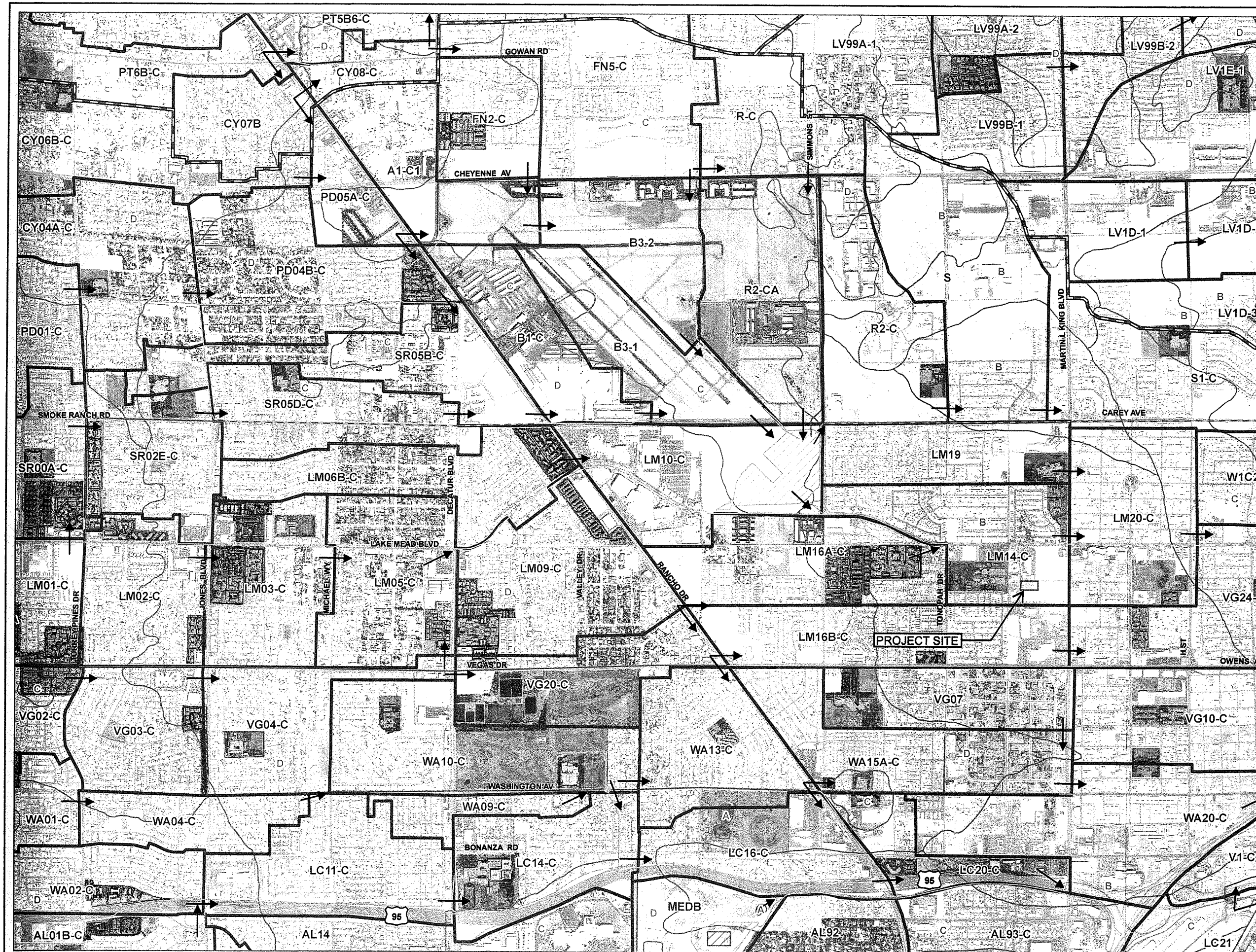
I-15



ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
FW15	E	FREEWAY CHANNEL FROM DESERT INN TO EXPRESSWAY						
0000	E	3: 12' X 10' RCB	2170	3728	CAL93	SW4	10.63	0.17
GOOF	E	GOWAN OUTFALL FACILITIES						
0485	E	90" RCP	1160	630	DGOW2A	GW3SC	1.38	0.47
0486	E	8' X 5' RCB	3300	630	DGOW2A	GW3SC	1.38	0.60
0511	E	8' X 5' RCB	8390	689	CPT6B-C	GW3SC	1.08	0.50
LAAS	E	NORTH LAS VEGAS AIR TERMINAL - SIMMONS						
0000	P3	14' X 8' RCB	760	688	CR2-CA	NW3	2.57	0.80
0014	P3	12' X 6' RCB	1350	688	CR2-CA	NW3	2.57	1.12
0040	P3	10' X 8' RCB	2105	688	CR2-CA	NW3	2.57	1.50
0080	P3	66" RCP	157	285	R-C	NW3	0.27	1.10
0083	P3	60" RCP	620	285	R-C	NW3	0.27	1.40
0085	P3	54" RCP	400	285	R-C	NW3	0.27	1.44
0103	P3	48" RCP	405	285	R-C	NW3	0.27	1.75
LAAT	E	NORTH LAS VEGAS AIR TERMINAL						
0000	E	RCBC - Unknown Characteristics	345	1331	CB3-1	NW3	4.17	0.50
0006	E	Conc Chnl - Unknown Characteristics	375	1331	CB3-1	NW3	4.17	0.50
0013	E	Earth Chnl 27'W 5'-8.5'D 1.5:1 SS (Replace w/ LAAT0014)	934	1331	CB3-1	NW3	4.17	0.50
0014	P3	10' X 8' RCB (Replaces LAAT0013)	934	1331	CB3-1	NW3	4.17	1.84
0030	E	Earth Chnl 27'W 5'-8.5'D 1.5:1 SS (Replace w/ LAAT0031)	1618	1079	CB3-2	NW3	3.87	0.50
0031	P3	10' X 8' RCB (Replaces LAAT0030)	1618	1079	CB3-2	NW3	3.87	1.05
0081	E	Earth Chnl 27'W 5'-8.5'D 1.5:1 SS (Replace w/ LAAT0062)	887	1079	CB3-2	NW3	3.87	0.50
0082	P1	12' X 8' RCB (Replaces LAAT0081)	887	1079	CB3-2	NW3	3.87	0.50
0078	E	10' X 8' RCB	1055	1079	CB3-2	NW3	3.87	0.58
0088	E	10' X 4' RCB	2207	677	CCA1-C	NW3	3.08	0.60
0140	E	Conc Chnl 8'W 4'D 1.5:1 SS	338	677	CCA1-C	NW3	3.08	0.84
0148	E	Conc Chnl 8'W 3'D 1.5:1 SS	1388	677	CCA1-C	NW3	3.08	0.68
0172	E	76" X 48" HERCP	538	480	CA1-C	NW3	2.87	0.75
0182	E	Conc Chnl 8'W 3'D 1.5:1 SS	997	480	CA1-C	NW3	2.87	0.83
0201	E	Conc Chnl 8'W 3'D 1.5:1 SS	184	284	A1-C1	NW3	0.31	0.37
0204	E	76" X 48" RCP	425	284	A1-C1	NW3	0.31	0.37
LANO	E	NORTH LAS VEGAS AIR TERMINAL NORTH						
0000	E	Conc Chnl 0'W 3'D 1.5:1 SS	470	284	A1-C1	NW3	0.31	0.30
LCCH	E	LAS VEGAS CREEK CHANNEL						
0000	E	2: 12' X 7' RCB	730	2894	CLC20-C	MEADOWS4	9.68	1.28
0013	E	2: 12' X 8' RCB	2035	2894	CLC20-C	MEADOWS4	9.68	0.82
0051	E	2:14' X 7' RCB	3113	2894	CLC20-C	MEADOWS4	9.68	0.80
0110	E	Transition Structure	220	2798	CCLC16-C	MEADOWS4	9.51	
0114	E	2: 14' X 7' RCB	670	2329	CRMEDET	MEADOWS4	8.25	0.80
0127	E	Transition Structure	110	2329	CRMEDET	MEADOWS4	8.25	
0129	E	2: 14' X 7' RCB	1130	2329	CRMEDET	MEADOWS4	8.25	0.50
0150	E	2: 13' X 7' RCB	200	2329	CRMEDET	MEADOWS4	8.25	0.95
0154	E	Transition Structure	190	2329	CRMEDET	MEADOWS4	8.25	
0157	E	2: 12' X 8' RCB	1650	1631	CCLC14-C	SW3	2.89	1.08
0188	E	2: 12' X 8' RCB	2225	1631	CCLC14-C	SW3	2.89	1.38
0230	E	12' X 6' RCB	2140	1381	CLC14-C	SW3	2.54	1.74
0270	E	12' X 6' RCB	1705	774	CCWA02-C	SW3	1.84	0.54
0302	E	8' X 6' RCB	3840	774	CCWA02-C	SW3	1.84	2.49
0377	E	10' X 7' RCB	1226	774	CCWA02-C	SW3	1.84	0.74
0400	E	Transition Structure	110	437	CWA02-C	SW3	1.47	0.49
0402	E	8' X 6' RCB @ Jones	535	437	CWA02-C	SW3	1.47	0.49
0412	E	60" RCP	1370	437	CWA02-C	SW3	1.47	1.08
0438	E	60" RCP	1090	162	CLC01-C	SW3	1.20	1.60
0458	E	60" RCP	1060	162	CLC01-C	SW3	1.20	1.80
0478	E	60" RCP	1110	162	CLC01-C	SW3	1.20	0.55
LCDE	E	LAS VEGAS CREEK - DECATUR						
0000	E	6' X 5' RCB	1800	404	LC11-C	SW3	0.38	1.26
0034	E	72" RCP	700	404	LC11-C	SW3	0.38	0.50
LCJO	E	LAS VEGAS CREEK - JONES						
0000	E	8' X 6' RCB	380	358	AL01B-C	SW3	0.37	0.50
0007	E	8' X 5' RCB	675	358	AL01B-C	SW3	0.37	0.82

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
LCLT	E	LAS VEGAS CREEK - LATERAL						
0000	E	8' X 8' RCB	490	250	WA10D	SW3	0.45	0.50
0006	E	Conc Chnl 10'W 4'D 0:1 SS	1384	250	WA10D	SW3	0.45	0.50
0033	E	10' X 4' RCBC @ Washington	96	405	WA10-C	NW3	0.45	0.50
0034	E	Grass Chnl 12'W 5'D 1:1 SS	1750	405	WA10-C	SW3	0.45	0.20
LCME	E	LAS VEGAS CREEK - MEADOWS						
0000	E	14' X 8' RCB	885	1423	MEADOWDB	SW3SC	5.67	0.72
0016	E	Stilling Basin	140	1423	MEADOWDB	SW3SC	5.67	0.21
0017	E	3,300 cfs Spillway (Replace w/ LCME0016)	3300	3300	MEADOWWIN	SW3SC	5.67	
0018	P1	Modify Spillway, raise height by 1' (Replaces LCME0017)	3300	3300	MEADOWWIN	SW3SC	5.67	
0019	E	1: 11' X 5' RCB and 1: 11.5' X 5' RCB	110	1423	MEADOWDB	SW3SC	5.67	0.81
0020	E	213 ac-ft Meadows Detention Basin	4713	4713	MEADOWWIN	SW3SC	5.67	
0021	P1	Upgrade to 235 ac-ft Meadows Detention Basin	4713	4713	MEADOWWIN	SW3SC	5.67	
LCRA	E	LAS VEGAS CREEK - RANCHO						
0000	E	12' X 8' RCB	380	783	CLC16-C	SW3	1.71	0.60
0004	E	12' X 8' RCB	2367	783	CLC16-C	SW3	1.71	0.77
0050	E	8' X 8' RCB	355	528	WA13D	SW3	1.40	0.50
LMDE	E	LAKE MEAD BOULEVARD - DECATUR BRANCH						
0000	P1	10' X 5' RCB	2840	885	DCVG04-C	NW3	1.28	0.80
LV15	E	FREEWAY CHANNEL						
0316	E	11' X 8' RCB	3010	985	CWA20-C	NW3	4.46	0.59
0372	E	8' X 8' RCB	1970	985	CWA20-C	NW3	4.46	0.88
0408	E	7' X 8' RCB	815	542	CWA15A-C	NW3	3.67	0.81
0424	P1	8' X 8' RCB	2500	542	CWA15A-C	NW3	3.67	0.73
0472	P1	2: 86" RCP	1200	265	WA15A-C	NW3	0.37	0.42
0474	P1	8' X 8' RCB	2880	322	CCWA13-C	NW3	3.28	0.73
0528	P1	8' X 7' RCB	4420	869	CWA13-C	NW3	1.39	1.19
0602	P1	2: 66" RCP	5980	504	CWA09-C	NW3	0.61	1.59
LVLN	E	LAS VEGAS WASH - LAKE MEAD						
0033	E	60" RCP (Replace w/ LVLN0034)	1186	994	CLM20-C	NW3SC	1.38	1.62
0034	P0	12' X 5' RCB (Replaces LVLN0033)	1186	994	CLM20-C	NW3SC	1.38	1.62
0058	E	72" RCP (Replace w/ LVLN0060)	5952	994	CLM20-C	NW3SC	1.38	0.68
0060	P0	12' X 6' RCB (Replaces LVLN0058)	5952	994	CLM20-C	NW3SC	1.38	0.68
0170	E	78" RCP	2421	378	CLM18A-C	NW3SC	0.38	1.17
0221	E	48" RCP Outlet	270	168	DR2	NW4	11.78	
0222	E	48" RCP Outlet	500	208	DCAREY	NW4	11.78	
0224	E	36" RCP	2429				0.53	
0225	E	90" RCP (Replace w/ LVLN0226)	641	1933	CLM10-C	NW3	3.02	1.35
0226	P0	2: 10' X 8' RCB (Replaces LVLN0225)	641	1933	CLM10-C	NW3	3.02	0.50
0227	E	10,000 cfs PMF Spillway		10000	CARYLMN	NW4	11.78	
0228	E	607 ac-ft Carey-Lake Mead Detention Basin	5184		CARYLMN	NW4	11.78	
0270	E	90" RCP (Replace w/ LVLN0271)	3473	1933	CLM10-C	NW3	3.02	1.35
0271	P0	12' X 8' RCB (Replaces LVLN0270)	3473	1933	CLM10-C	NW3	3.02	1.35
0336	E	84" RCP (Replace w/ LVLN0337)	1050	1652	CLM06-C	NW3	2.61	1.16
0337	P0	12' X 8' RCB (Replaces LVLN0336)	1050	1652	CLM06-C	NW3	2.61	1.16
0355	E	90" RCP (Replace w/ LVLN0356)	1840	1652	CLM06-C	NW3	2.61	0.40
0356	P0	12' X 11' RCB (Replaces LVLN0355)	1840	1652	CLM06-C	NW3	2.61	0.40
0388	E	84" RCP	520	852	CLM05-C	NW3	1.00	1.40
0399	E	78" RCP	803	852	CLM05-C	NW3	1.00	1.07
0416	E	72" RCP	1320	852	CLM05-C	NW3	1.00	1.00
0442	E	60" RCP	725	585	CLM03-C	NW3	0.63	1.28
0453	E	54" RCP	589	585	CLM03-C	NW3	0.63	2.37
0460	E	54" RCP	1484	235	LM02-C	NW3	0.28	2.05
0475	E	48" RCP	2632	235	LM02-C	NW3	0.28	1.24
0525	E	48" RCP	2600	542	CLM01-C	NW3	0.64	1.24
LV0E	E	OWENS AVENUE - EAST						
0345	P1	13' X 11' RCB	1685	2369	DLVOE	SW5	22.79	0.60
LVOW	E	OWENS AVENUE SYSTEM						
0003	E	96" RCP	7500	1089	CLM16B-C	NW3	2.40	0.70
0146	E	84" RCP	4800	570	DCVG20-C	NW3	2.02	0.80
0241	P3	86" RCP	5800	381	CVG20-C	NW3	1.57	1.40

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVOW								
0351	P3	8' X 6' RCB	3000	828	CVG04-C	NW3	1.26	1.44
0360	P1	8' X 6' RCB	2300	828	CVG04-C	NW3	1.26	1.48
0480	P1	7' X 6' RCB	2700	616	CVG03-C	NW3	0.95	1.48
LVPK								
0000	E	Conc Chnl 15W 8'D 0:1 SS	806	1024	CPD04B-C	NW3	1.59	1.22
0019	E	Conc Chnl 20W 5.5'D 0:1 SS	2180	1024	CPD04B-C	NW3	1.59	0.57
0056	E	10' X 5' RCB	103	703	CCY04A-C	NW3	1.12	0.40
0058	E	9' X 6' RCB	2542	703	CCY04A-C	NW3	1.12	0.95
0104	E	10' X 6' RCB	76	703	CCY04A-C	NW3	1.12	1.26
0106	E	8' X 6' RCB	1235	703	CCY04A-C	NW3	1.12	0.54
0130	E	7' X 5' RCB	1435	400	CPD01-C	NW3	0.87	0.61
LVRA								
0000	E	12' X 8' RCB	812	1317	CCPD04BC	NW3	3.87	1.56
0012	E	12' X 8' RCB	2838	1317	CCPD04BC	NW3	3.87	0.78
0068	E	14' X 5' RCB	85	1317	CCPD04BC	NW3	3.87	1.22
LVBR								
LAS VEGAS WASH - SMOKE RANCH								
0045	E	54" RCP (Replace w/ LVSR0046)	1180	1244	CS1-C	NW3SC	1.42	3.41
0046	P1	10' X 5' RCB (Replaces LVSR0045)	1180	1244	CS1-C	NW3SC	1.42	3.41
0070	E	86" RCP (Replace w/ LVSR0071)	4118	1244	CS1-C	NW3SC	1.42	0.73
0071	P1	10' X 8' RCB (Replaces LVSR0070)	4118	1244	CS1-C	NW3SC	1.42	0.73
0148	E	54" RCP (Replace w/ LVSR0149)	2587	951	CS	NW3SC	0.95	0.58
0149	P1	11' X 7' RCB (Replaces LVSR0148)	2587	951	CS	NW3SC	0.95	0.58
0197	E	30" RCP (Replace w/ LVSR0198)	581	445	CR2-C	NW3SC	0.38	0.86
0189	P1	8' x 5' RCB (Replaces LVSR0197)	581	445	CR2-C	NW3SC	0.38	0.86
0208	E	54" RCP (Replace w/ LVSR0209)	2080	445	CR2-C	NW3SC	0.38	1.41
0209	P1	7' X 5' RCB (Replaces LVSR0208)	2080	445	CR2-C	NW3SC	0.38	1.41
0210	E	14' X 8' RCB	800	2889	CB1-C	NW3	6.44	1.73
0221	E	Transition Structure	100	2889	CB1-C	NW3	6.44	7.08
0223	E	Conc Chnl 14'W 8'D 1.5:1 SS	2150	2889	CB1-C	NW3	6.44	0.96
0263	E	14' X 8' RCB	707	2889	CB1-C	NW3	6.44	0.83
0273	E	11' X 11' RCB	1140	2889	CB1-C	NW3	6.44	0.92
0285	E	11' X 11' RCB	510	2883	CSR05B	NW3	6.16	2.85
0312	E	8' X 8' RCB	480	1607	CSR05B	NW3	2.30	1.83
0359	E	68" RCP (Replace w/ LVSR0360)	1690	1607	CSR05B	NW3	2.30	0.87
0360	P1	10' X 10' RCB (Replaces LVSR0359)	1690	1607	CSR05B	NW3	2.30	0.75
0386	E	80" RCP (Replace w/ LVSR0387)	2640	1461	CSR05D	NW3	1.94	1.14
0397	P1	10' X 8' RCB (Replaces LVSR0386)	2640	1461	CSR05D	NW3	1.94	0.87
0446	E	54" RCP (Replace w/ LVSR0447)	2530	1461	CSR05D	NW3	1.94	1.14
0447	P1	10' X 8' RCB (Replaces LVSR0446)	2530	1461	CSR05D	NW3	1.94	1.25
0496	P1	10' X 7' RCB	2855	1245	CSR02E	NW3	1.84	1.27
0500	E	60" RCP	1280					1.97
0525	E	54" RCP	1340					0.30
0546	P1	8' X 8' RCB	2640	758	CSR00A	NW3	1.01	0.57
LVWH								
WASHINGTON AVENUE CHANNEL								
0431	E	3: 14.33' X 10' RCB	665	2670	DCLC21	SW5	22.79	0.15
0446	E	Junction Structure	69	2670	DCLC21	SW5	22.79	0.15
0447	E	3: 14.33' X 10' RCB	1955	4978	CCAL93	SW5	22.19	0.15
0484	E	Confluence Structure	455	4978	CCAL93	SW5	22.19	0.15
WAGC								
WASHINGTON AVENUE CHANNEL - GRAND CENTRAL								
0000	E	2: 12' X 4' RCB	700	557	LC21	SW3	0.80	0.20
0014	E	1: 12' X 4' RCB and 1: 11' X 4' RCB	2440	557	LC21	SW3	0.80	0.20



2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE H-26
HYDROLOGIC SUMMARY

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

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

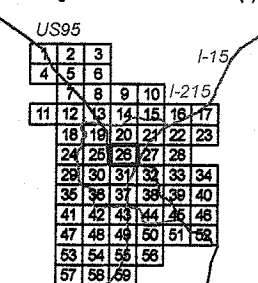
- 1 Undeveloped Land, Open Desert
- 2 Parks, Golf Courses
- 3 Rural
- 4 / 14* Low Density Residential
- 5 / 15* Medium Density Residential
- 6 / 16* High Density Residential
- 7 / 17* Public Facility, Residential
- 8 / 18* Very High Density Residential
- 9 / 19* Commercial, Retail, Casino, High Rise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

* Drought Ordinance Applied

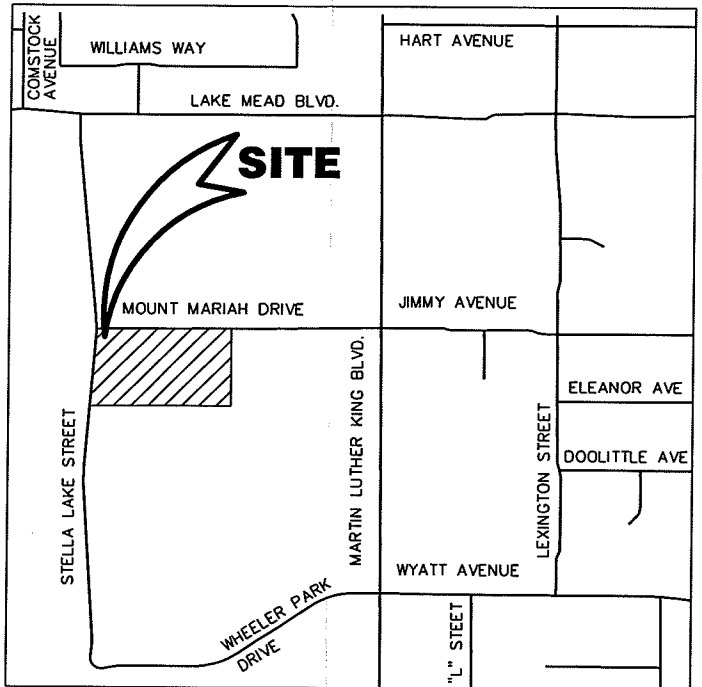
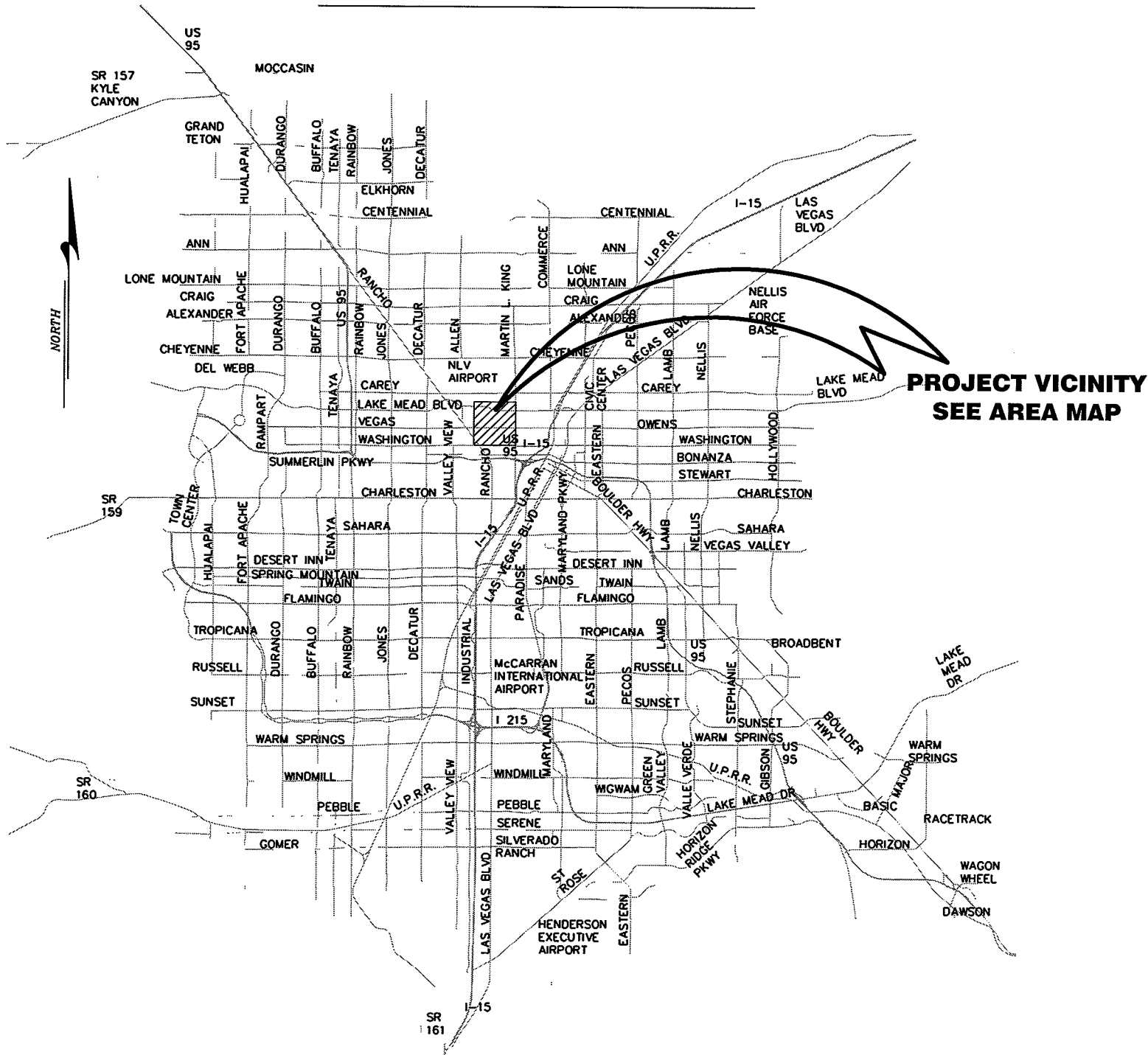
0 500 1,000 2,000 3,000
Feet

Scale: 1 inch = 2,000 feet

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



VICINITY MAP
LAS VEGAS METROPOLITAN AREA



AREA MAP

N.T.S.

THE PROJECT SITE IS LOCATED IN TOWNSHIP 20 SOUTH,
RANGE 61 EAST, SECTION 21.

A PORTION OF APN 139-21-313-016

JHR Associates, Ltd.
4880 WEST UNIVERSITY AVENUE, SUITE B2
LAS VEGAS, NEVADA 89103
PH: (702) 876-2341 FAX: (702) 876-8395

DATE:	02/11	BY:	JA
PROJECT #:	124-10-698	SCALE:	N/A

DESCRIPTION:

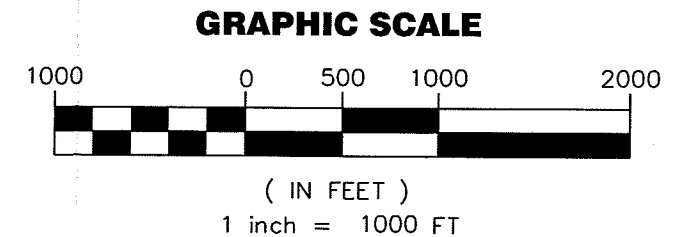
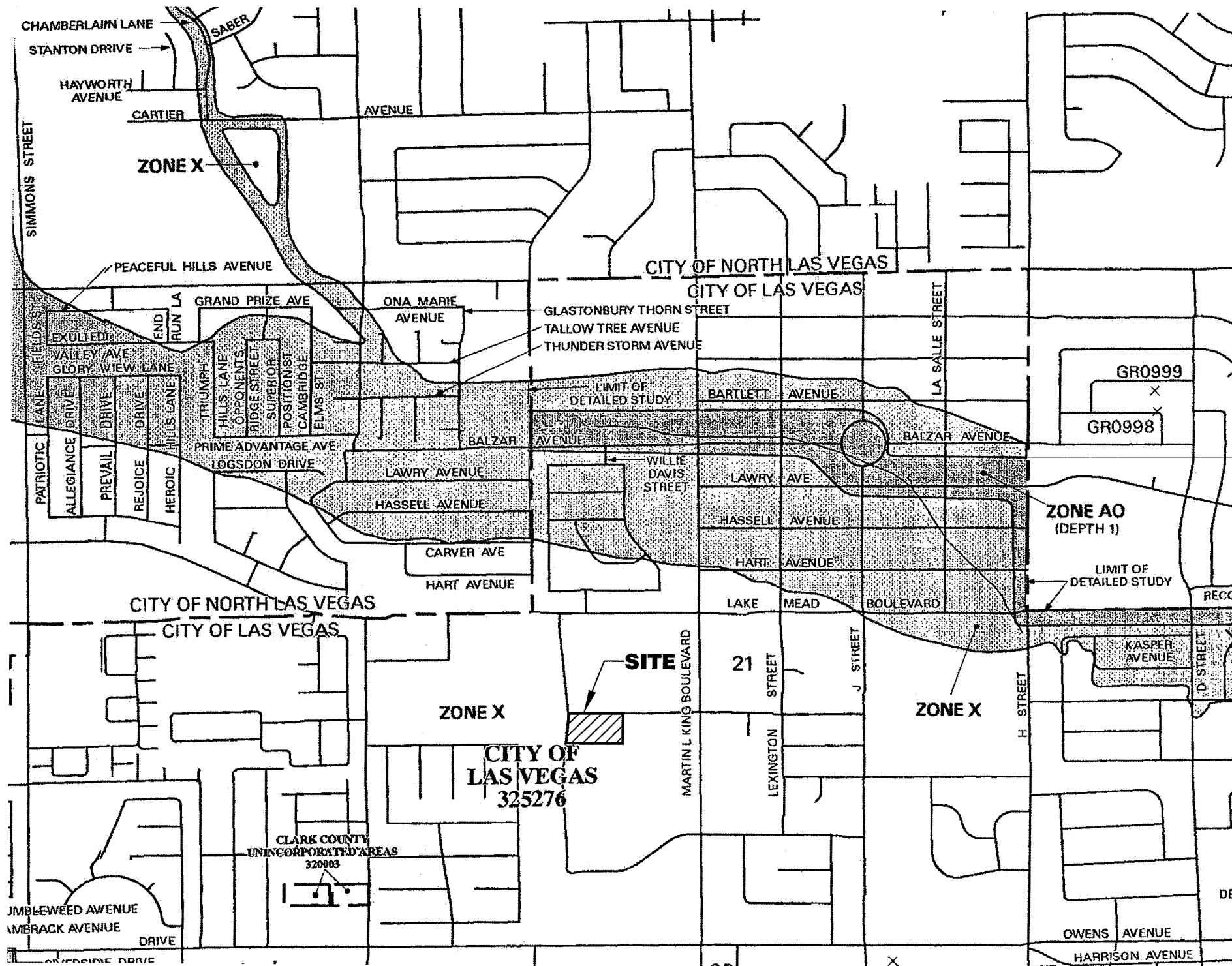
VICINITY/AREA MAP
NEVADA HEALTH CENTER - ENTERPRISE PARK

CITY OF LAS VEGAS, NEVADA

FIGURE:

1

1 OF 1



NORTH
1" = 1000'

PANEL 2160E

FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY,
NEVADA
AND INCORPORATED AREAS

PANEL 2160 OF 4090
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
NORTH LAS VEGAS, CITY OF	320007	2160	E
LAS VEGAS, CITY OF	325276	2160	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	2160	E

REVISED TO
REFLECT LOMR
DATED DEC 11 2003

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

MAP NUMBER
32003C2160E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

THE SUBJECT PROPERTIES LIE WITHIN A FEMA DESIGNATED ZONE X, WHICH ARE DEFINED AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

JHR Associates, Ltd.

4880 WEST UNIVERSITY AVENUE, SUITE B2
LAS VEGAS, NEVADA 89103
PH: (702) 876-2341 FAX: (702) 876-8395

DATE: 02/22
PROJECT #: 124-10-698

BY: JA
SCALE: 1"=1000'

DESCRIPTION:
FEMA MAP
NEVADA HEALTH CENTER - ENTERPRISE PARK

FIGURE:
2

CITY OF LAS VEGAS, NEVADA

1 OF 1

LEGEND / ABBREVIATIONS

- CHANNEL FLOW DIRECTION
- OVERLAND FLOW DIRECTION
- BASIN BOUNDARY
- ONX1

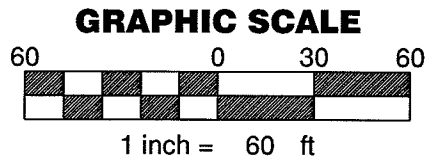
BASIN IDENTIFIER
- (5/10 CFS)

EXISTING 10-YEAR/100-YEAR PEAK SURFACE FLOW
- CFS

CUBIC FEET PER SECOND

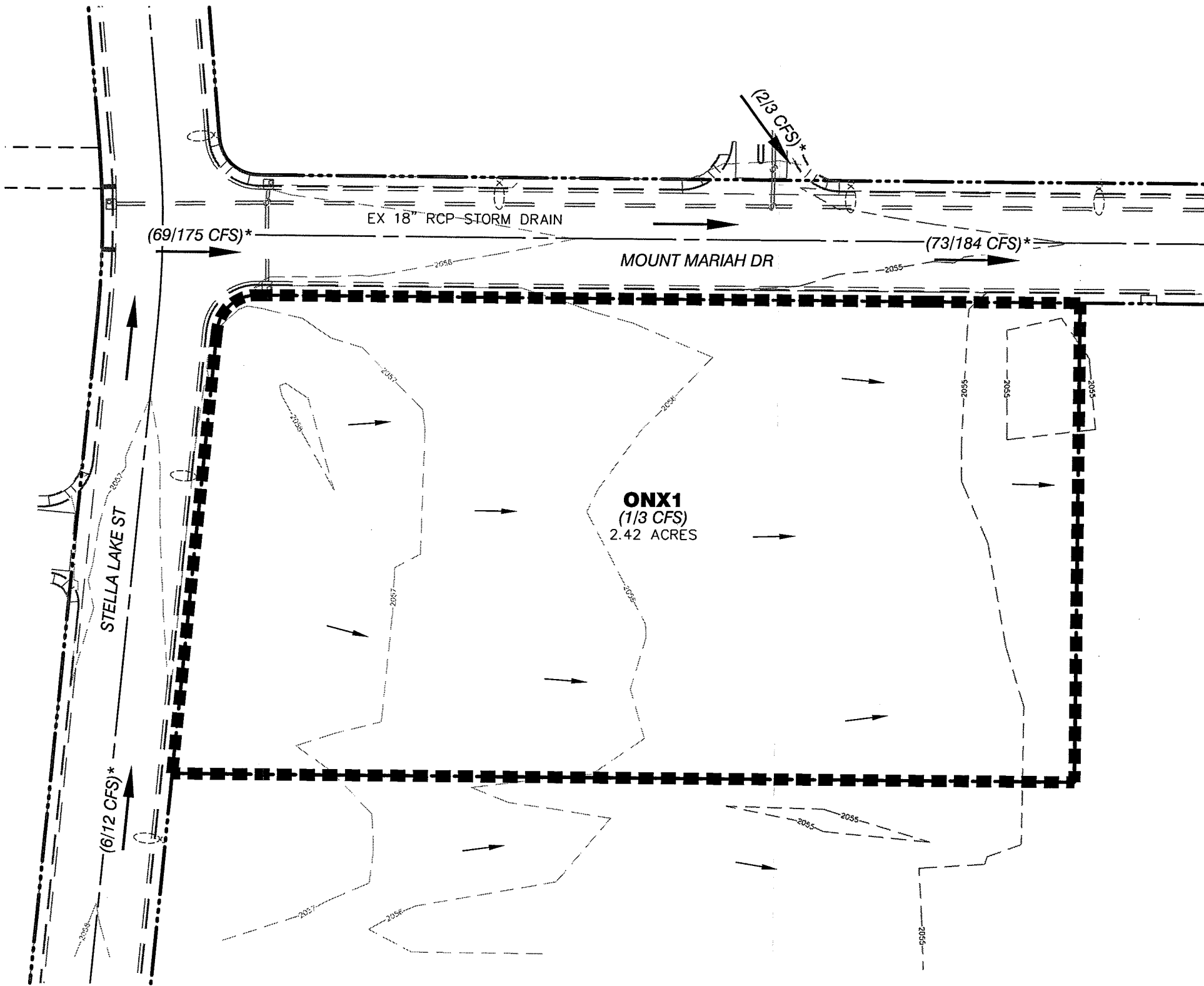
NOTES:

*REFERENCED FROM STELLA LAKE STUDY (DS 3581)
SEE APPENDIX E OF REPORT



ON-SITE BASIN DATA				
BASIN ID	AREA (ACRES)	SOIL GROUP	RCN	COMMENTS
ONX1	2.42	B	77	SEE REPORT

PEAK FLOW SUMMARY		
BASIN ID	Q10 (CFS)	Q100 (CFS)
ONX1	1	3



THE PROJECT SITE LIES WITHIN DRAINAGE BASIN SUB-AREA LM14-C OF THE CENTRAL WATERSHED.

THE SOIL CLASSIFCATION FOR THE PROJECT SITE IS "B," WHICH IS INDICATIVE OF MODERATELY LOW RUNOFF POTENTIAL.

JHR Associates, Ltd.

4880 WEST UNIVERSITY AVENUE, SUITE B2
LAS VEGAS, NEVADA 89103
PH: (702) 876-2341 FAX: (702) 876-8395

DATE: 02/11
PROJECT #: 124-10-698

BY: JA
SCALE: 1"=60'

DESCRIPTION:

ON-SITE BASINS MAP
EXISTING CONDITION
NEVADA HEALTH CENTER - ENTERPRISE PARK

CITY OF LAS VEGAS, NEVADA

FIGURE:

3

1 OF 1



City of Las Vegas

CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

LEGEND

- Sub-basin Boundary
- Basin ID
- Contributing flow from the basin (cfs)
- Flow Arrow
- 10-Year Street Flow
100-Year Street Flow
10-Year Facility Flow
100-Year Facility Flow
(Flows in CFS)
- Study Area Limit

OTO DATE: MARCH 2003

FIGURE E-2



EXISTING DRAINAGE CONDITIONS

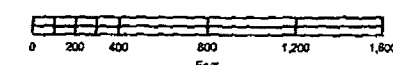
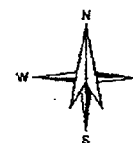


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Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200

	Durango	Rainbow	Decatur	Tonopah	Sh	Pease	Neills
Lake Mead				1	2		
Washington				3	4	5	6
Charleston	7	8	9	10	11	12	
Sahara	13	14	15	16	17		
Desert Inn		18	19				

NOTE:
Existing conditions are based on future
Curve Number values with only existing local and
CORFCD 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 explanation.



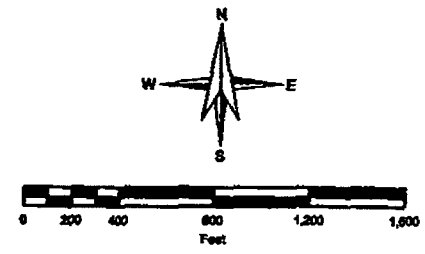
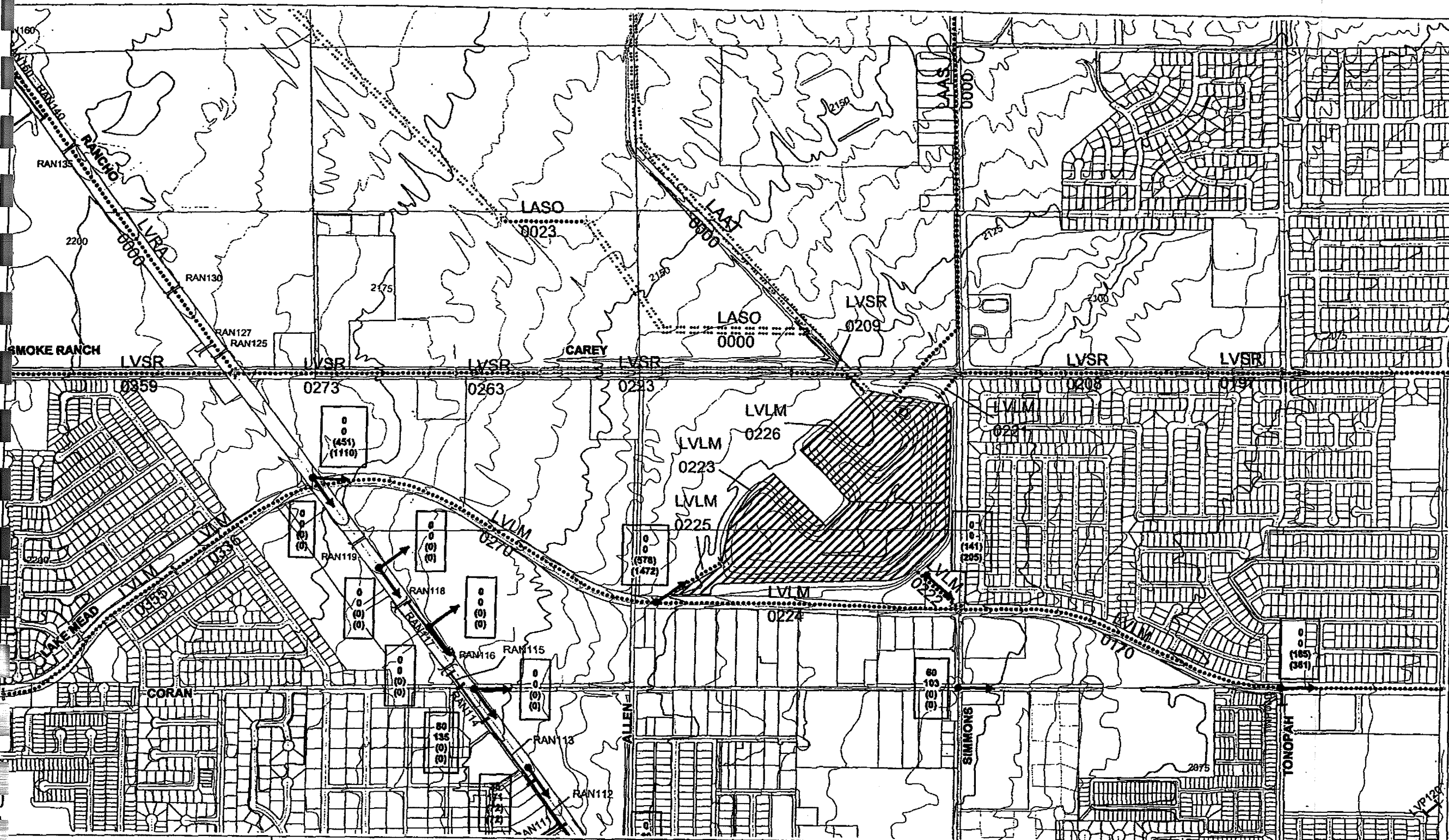
SCALE: 1 inch = 800 feet



City of Las Vegas
**CENTRAL
NEIGHBORHOOD
FLOOD CONTROL
MASTER PLAN
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-1



Flow Arrow

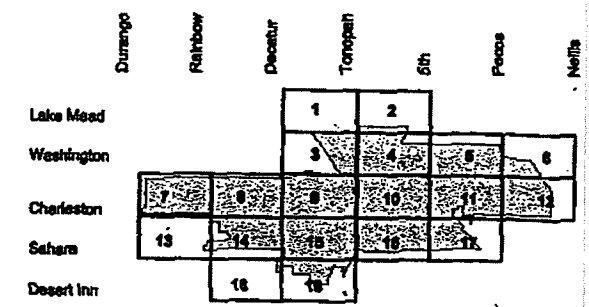
250	10-Year Street Flow
500	10-Year Street Flow
(300)	10-Year Facility Flow
(800)	10-Year Facility Flow

(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 explanation.

DRAFT

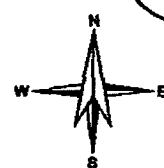
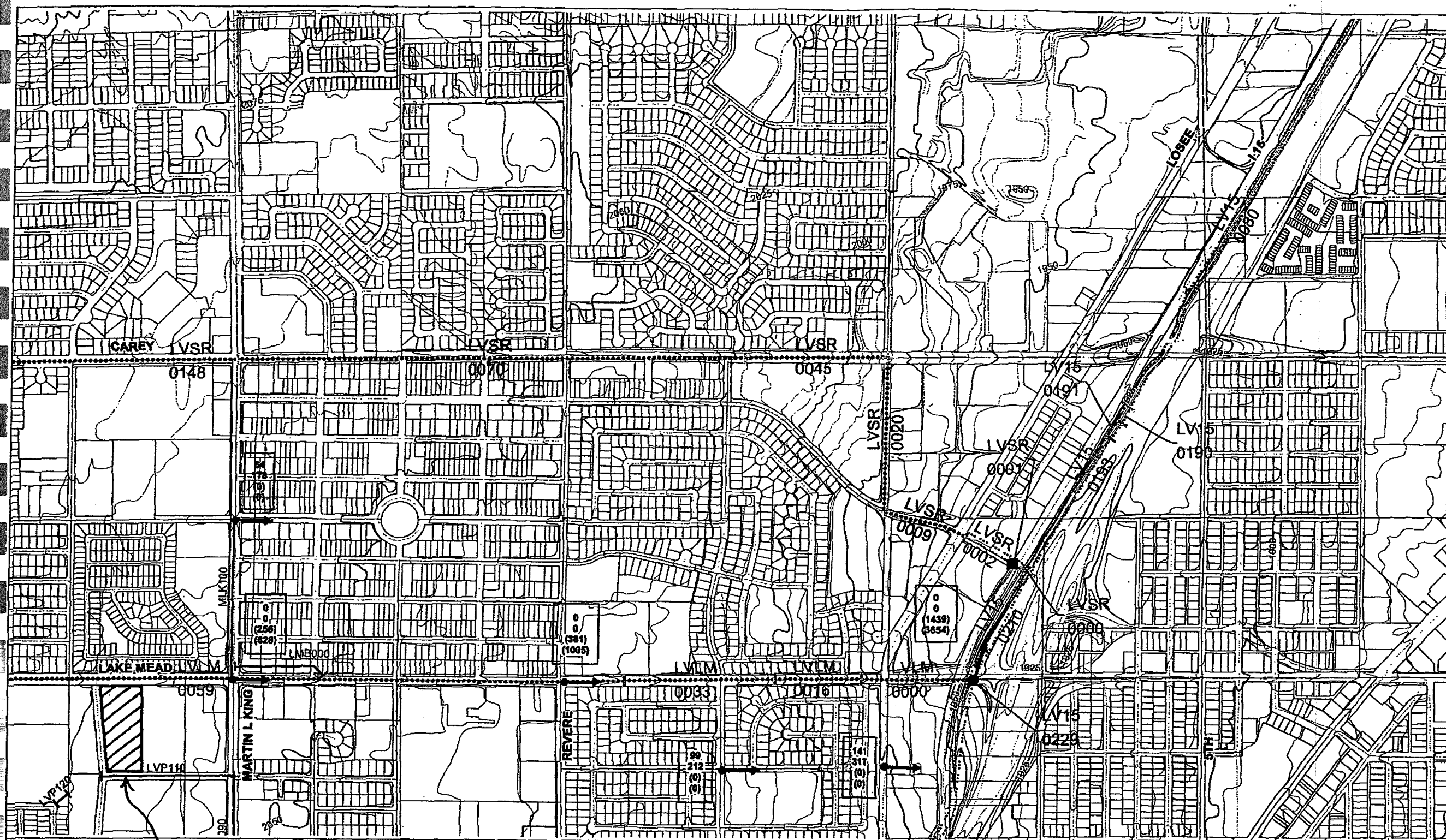


PBS
2270 Corporate Circle, Suite 100
Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200



	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- 2



PROJECT
SITE



SCALE: 1 inch = 800 feet



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

(Flows in CFS)

NOTE:

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 explanation.

FUTURE DRAINAGE CONDITIONS

PBS

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1997 CITY OF LAS VEGAS
CITY-WIDE HYDROLOGY ANALYSIS

LEGEND

REGIONAL STREAM NAME DESIGNATOR	AABB
PARENT STREAM NAME	
STREAM NAME	
REGIONAL ID / RIVER MILE	0000
DISTANCE ABOVE	
CONFLUENCE WITH PARENT STREAM	
MILES	
TENTHS OF A MILE	
LOCAL STREAM NAME DESIGNATOR	AAB
LOCAL ID NUMBER	000
EXISTING FACILITY	E
PROPOSED OR MODIFIED FACILITY	P
CONTINGENCY LEVEL:	
MASTER PLAN	P1
FACILITY PLAN	P2
PRELIMINARY DESIGN	P3
DESIGN	P4
BOTTOM WIDTH	W
DEPTH	D
SIDE SLOPE, H:V	SS
CORRUGATED METAL PIPE	CMP
CULVERT	
CORRUGATED METAL ARCH	CMAF
PIPE CULVERT	
REINFORCED CONCRETE BOX	RCB
RCB CULVERT	RCBC
REINFORCED CONCRETE PIPE	RCP
RCP CULVERT	RCPC
REINFORCED CONCRETE	RCACP
ARCH PIPE CULVERT	
GENERAL COMMENT	G1
FACILITY SPECIFIC COMMENT	S1

NOTES:

FLOW = 100 YEAR DESIGN FLOW
(REGIONAL FACILITIES)
FLOW = FACILITY CAPACITY
(LOCAL FACILITIES)

FLOOD CONTROL FACILITIES
INVENTORY

SHEET F-10

PBS&J, INC

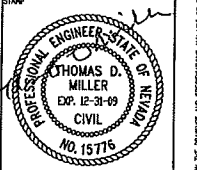
ID	ID No.	E/P	Plan No.	Facility Description	Fac Length	Slope (%)	Flow (cfs)
LOCAL FACILITIES							
LMB	000	E	327-V163 / 107-V1607	21" RCP (Ties into LVLM)	700		15
LVP	100	E	530-V2	18" RCP	1,037	0.40	6
LVP	110	E	530-V2	18" RCP	1,078	0.40	6
MLK	090	E	107-V856A	18" RCP	1,780		4
MLK	100	E	327-V163	21" RCP	1,315		8
RAN	090	E	107-V1666, Hwy Bk T-2	42" RCP	908		88
RAN	110	E	107-V1666, Hwy Bk T-2	42" RCP	690		142
RAN	111	E	107-V1666, Hwy Bk T-2	43" x 27" RCP	101		29
RAN	112	E	Hwy Bk T-2	36" RCP	434		72
RAN	113	E	HWY BK # T-2	30" RCP	660		50
RAN	114	E	HWY BK # T-2	24" CMP	216		31
RAN	115	E	Hwy Bk T-2	6" x 3' RCBC	106		126
RAN	116	E	Hwy Bk T-2	24" CMP	112		
RAN	117	E	Field Verified	48" RCP			

ID	ID No.	E/P	Plan No.	Facility Description	Fac Length	Slope (%)	Flow (cfs)
REGIONAL FACILITIES							
GOOF	GOOF 0275	P1	1996 Master Plan Update	GOWAN OUTFALL FACILITIES 90" RCP	5,900		670
LAAS	LAAS 0000	P1	1996 Master Plan Update	NORTH LAS VEGAS AIR TERMINAL - SIMMONS 60" RCP	5,500	0.70	315
LAAT	LAAT 0000	E	731-51	NORTH LAS VEGAS AIR TERMINAL 3: 8' x 5' RCB	632		
LAAT	0001	E	731-51	Conc Chnl 20'W 7'D 1.5:1 SS	400		
LAAT	0005	E	731-51	Unlined Chnl 12'W 6'D 1.5:1 SS	3,696		
LAAT	0070	E	1996 Master Plan Update	10' x 6' RCB Culvert	898		721
LAAT	0087	E	1996 Master Plan Update	10' x 4' RCB Culvert	195		721
LASO	LASO 0000	E	731-51	NORTH LAS VEGAS AIR TERMINAL SOUTH Earth Chnl 14'W 3'D 3:1SS	1,518	1.10	450
LASO	0023	E	1996 Master Plan Update	54" RCP	700	0.40	450
LV05	LV05 0131	E	1996 Master Plan Update	TRIBUTARY TO WESTERN TRIB @ ALEXANDER RD Earth Chnl 3'D 8'W 2:1 SS	6,100	0.70	520
LV05	0131	P1	1996 Master Plan Update	Conc Chnl 3'D 8'W 2:1 SS	6,100	0.70	520
LV06	LV06 0102	E	1996 Master Plan Update	TRIBUTARY TO WESTERN TRIB @ CRAIG RD 7' x 11' RCBC @ Alexander	60		610
LV06	0138	P1	1996 Master Plan Update	Conc Chnl 5'D 10'W 2:1 SS	1,000		610
LV06	0199	E	1996 Master Plan Update	30" - 72" RCP	4,000	2.00	610
LV15	LV15 0038	E	1996 Master Plan Update	FREEWAY CHANNEL 2: 15' x 12' RCBC	2,200		3,200
LV15	0080	E	1996 Master Plan Update	Conc Chnl 20'W 10'D 1:1SS	5,700	0.18	2,500
LV15	0190	E	1996 Master Plan Update	Drop Structure 20'W 1'D 1:1SS			1,700
LV15	0190	E	1996 Master Plan Update	Conc Chnl 20'W 10'D 1:1SS	100		1,700
LV15	0191	E	1996 Master Plan Update	Drop Structure 20'W 1'D 1:1SS			1,700
LV15	0191	E	1996 Master Plan Update	Conc Chnl 20'W 10'D 1:1SS	100		1,700
LV15	0193	E	1996 Master Plan Update	Drop Structure 20'W 1'D 1:1SS			1,700
LV15	0193	E	1996 Master Plan Update	Conc Chnl 20'W 10'D 1:1SS	900		1,700
LV15	0210	E	1996 Master Plan Update	Conc. Chnl 8'W 8'D 1:1SS	1,000	0.18	1,133
LV15	0229	E	1996 Master Plan Update	2: 7.5' x 3' RCBC	80		977
LV15	0229	P1	1996 Master Plan Update	2: 8' x 6' RCBC	80		977
LV15	0230	E	1996 Master Plan Update	Conc Chnl 8'W 8'D 1:1SS	2,900	0.18	977
LVBR	LVBR 0000	P1	1996 Master Plan Update	LAS VEGAS - BROOK Conc Chnl 5'D 6'W 2:1 SS	700	2.00	610
LVBR	0011	P1	1996 Master Plan Update	6' x 8' RCBC @ N 5th St	100		610
LVBR	0013	P1	1996 Master Plan Update	Conc Chnl 5'D 6'W 2:1 SS	850	2.00	610
LVBR	0014	P1	1996 Master Plan Update	6' x 8' RCBC @ Losee	100		610
LVBR	0028	P1	1996 Master Plan Update	Conc Chnl 5'D 6'W 2:1 SS	850	2.00	610
LVCL	LVCL 0000	P1	1996 Master Plan Update	LAS VEGAS WASH - COLTON 84" RCP	6,000	0.67	480
LVLM	LVLM 0000	E	107-V1607	LAS VEGAS WASH - LAKE MEAD 54" RCP	978	4.48	762
LVLM	0016	E	107-V1607	42" x 68" HERCP	772		393
LVLM	0033	E	107-V1607	60" RCP	1,186	1.26	538
LVLM	0059	E	107-V1607	72" RCP	5,952	1.07	340
LVLM	0072	E	107-V1607-2	72" RCP	107	0.65	340
LVLM	0170	E	107-V1607-2	78" RCP	2,819	1.17	302
LVLM	0222	E	731-51 / 107-V1607-2	48" RCP	516		
LVLM	0223	E	731-51	Carey Ave/Lake Mead Det. Basin (515 ac-ft)			3185 / 302
LVLM	0223	E	731-51	10,000 cfs spillway			10,000
LVLM	0224	E	107-V1607-2	36" RCP	2,061	0.53	60
LVLM	0225	E	731-51 / 107-V1607-2	90" RCP	641		
LVLM	0270	E	107-V1607-2	90" RCP	3,300	1.44	1,491
LVSR	LVSR 0000	E	1996 Master Plan Update	LAS VEGAS WASH - SMOKE RANCH Conc Chnl 22'W 8'D	50	1.67	606
LVSR	0001	E	1996 Master Plan Update	Free Span Bridge 22'W 10'D	100		606
LVSR	0002	E	1996 Master Plan Update	Conc Chnl 22'W 8'D	370	1.67	606
LVSR	0009	E	1996 Master Plan Update	72" RCP	581		606
LVSR	0020	E	1996 Master Plan Update	60" RCP	1,320		606
LVSR	0045	E	1996 Master Plan Update	54" RCP	1,320		606
LVSR	0070	E	1996 Master Plan Update	66" RCP	4,118		441
LVSR	0148	E	1996 Master Plan Update	54" RCP	2,587		340
LVSR	0197	E	1996 Master Plan Update	30" RCP	581		302
LVSR	0208	E	1996 Master Plan Update	54" RCP	8,000		302

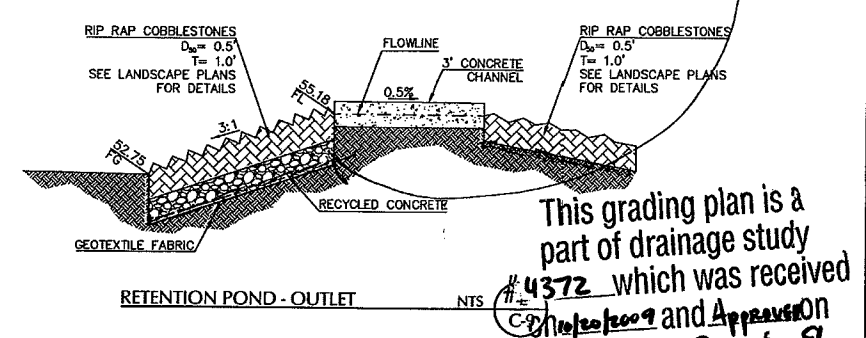
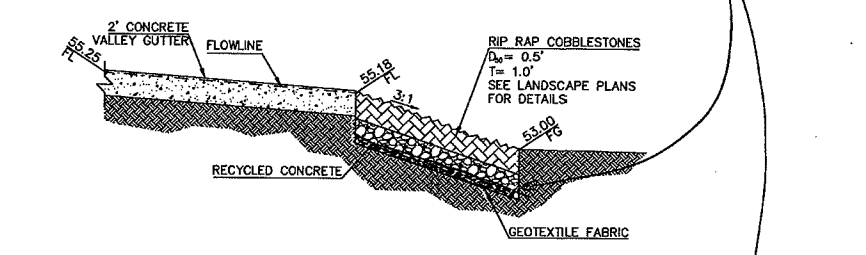
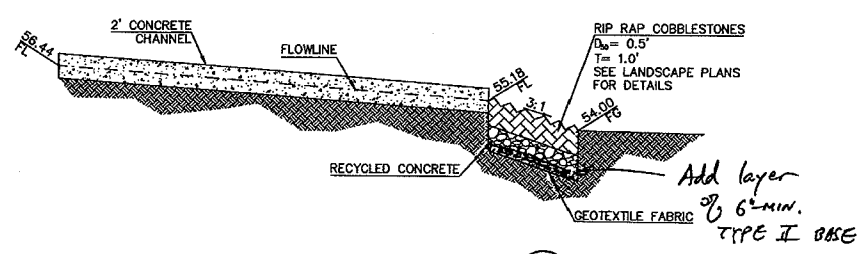
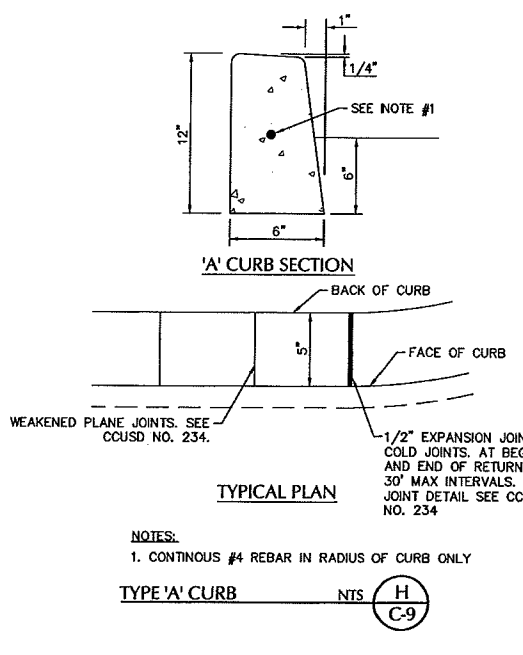
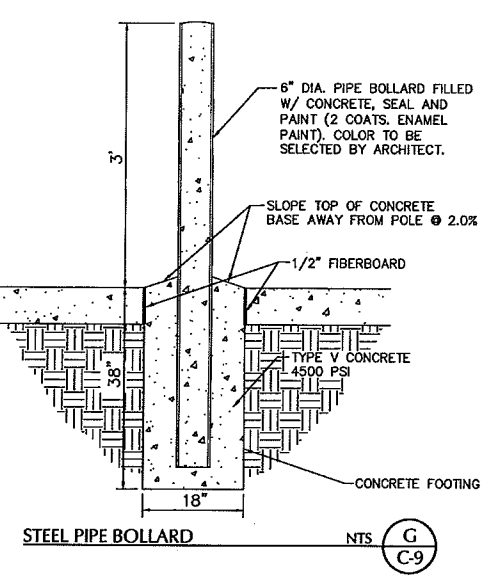
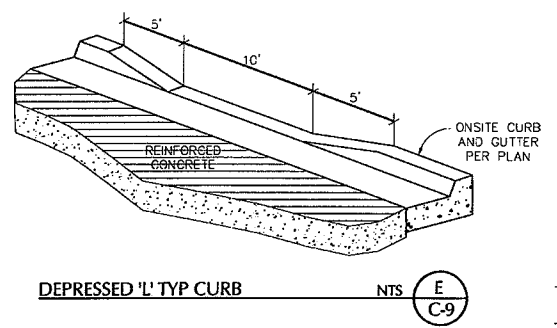
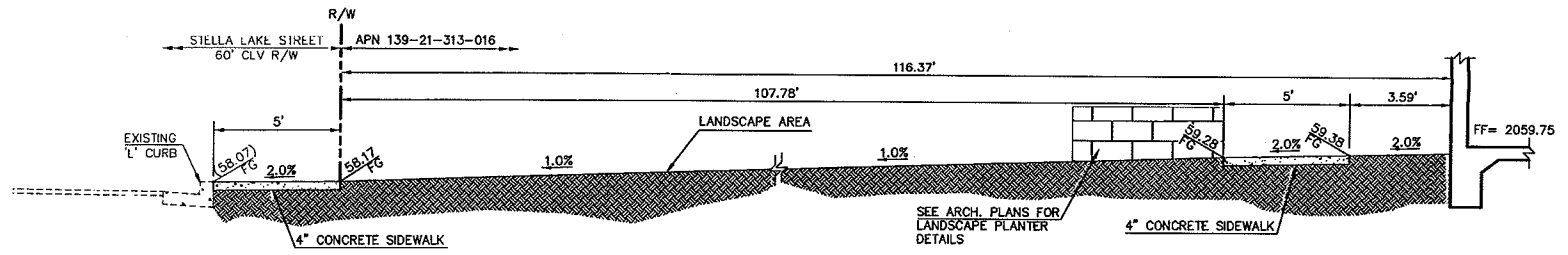
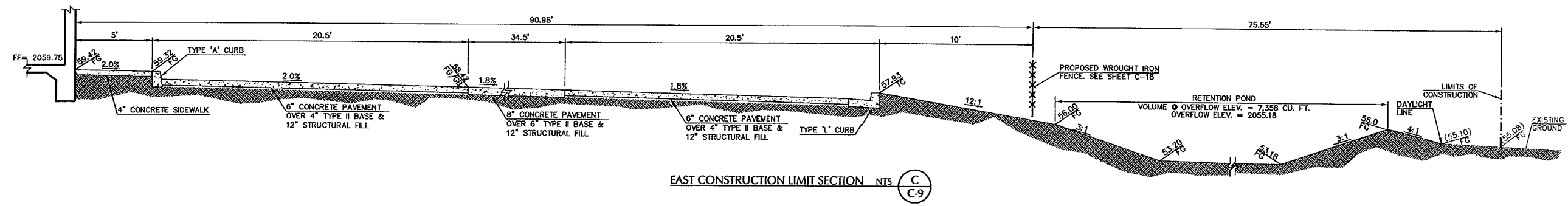
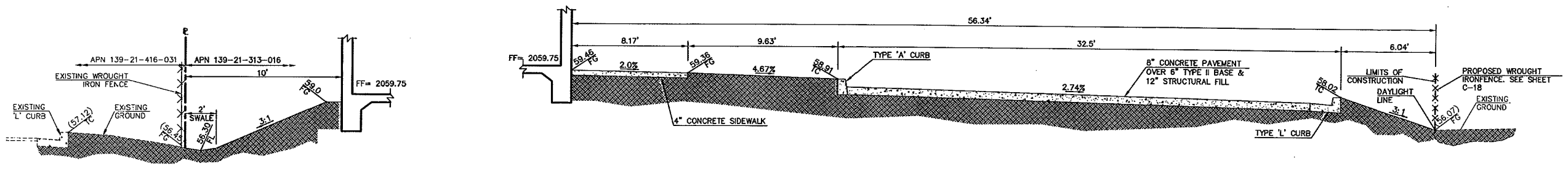


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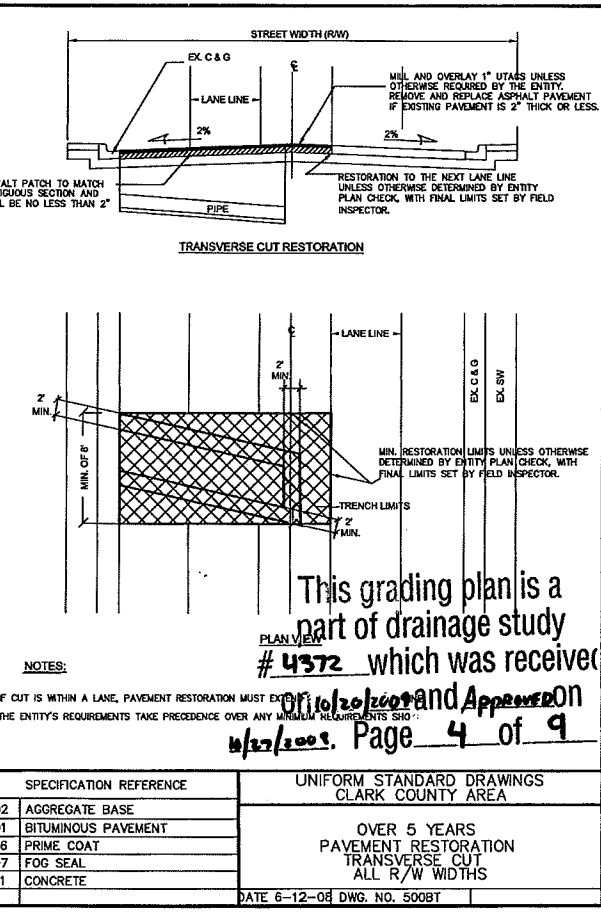
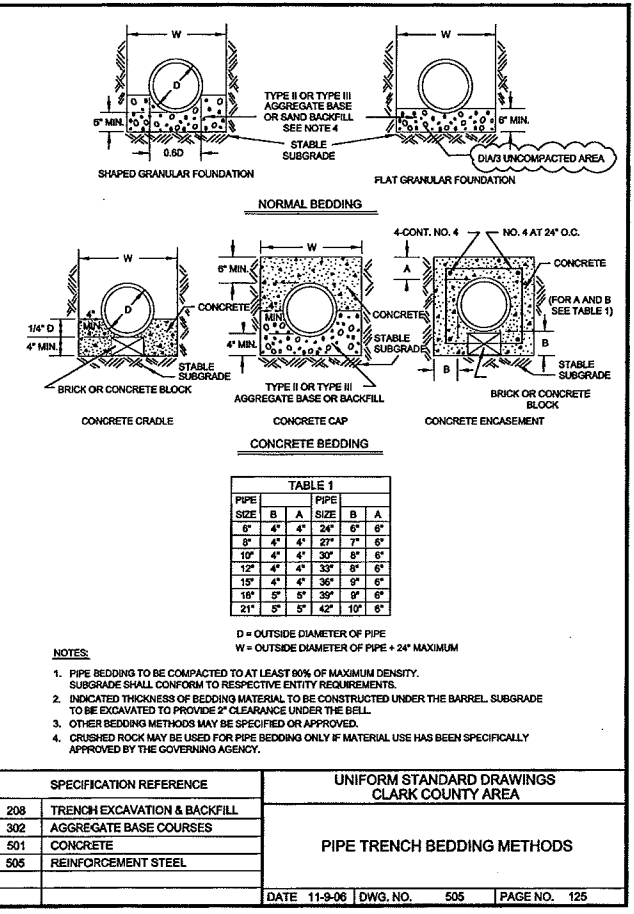
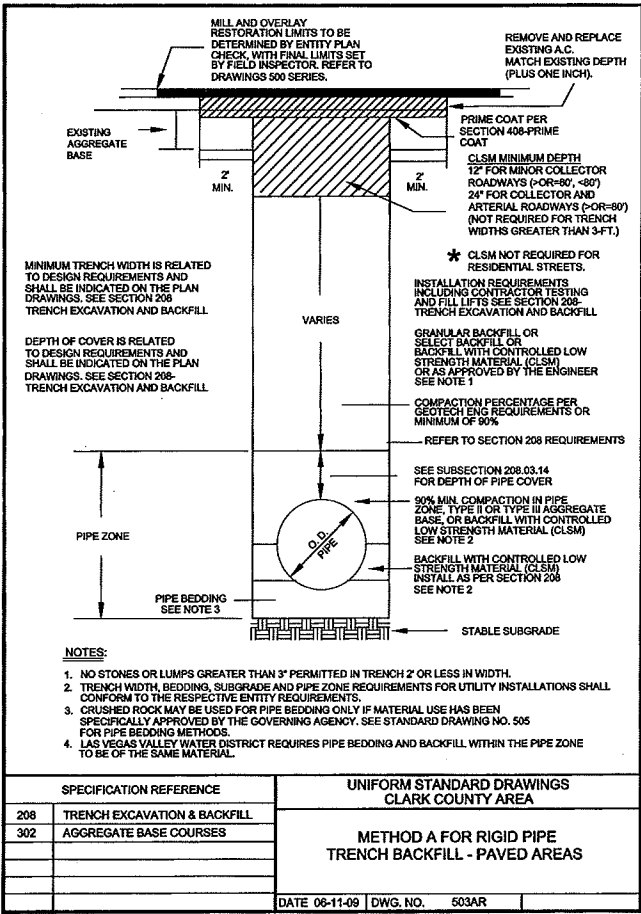
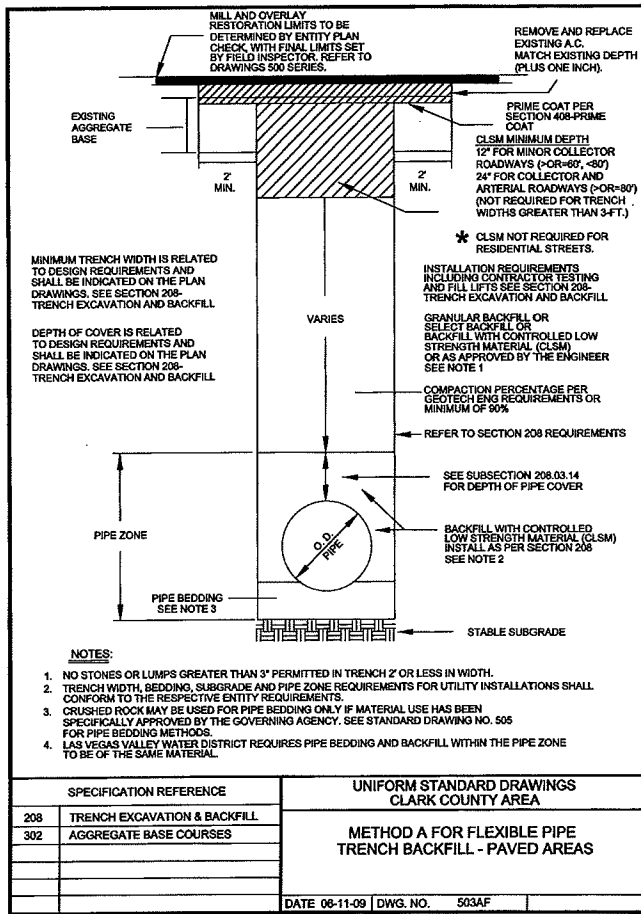
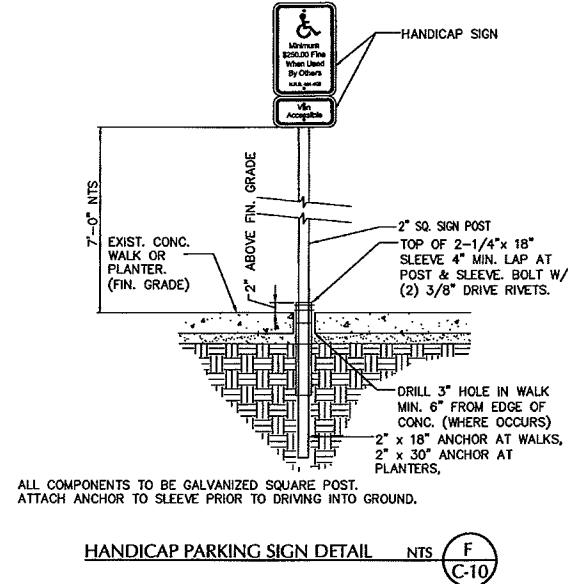
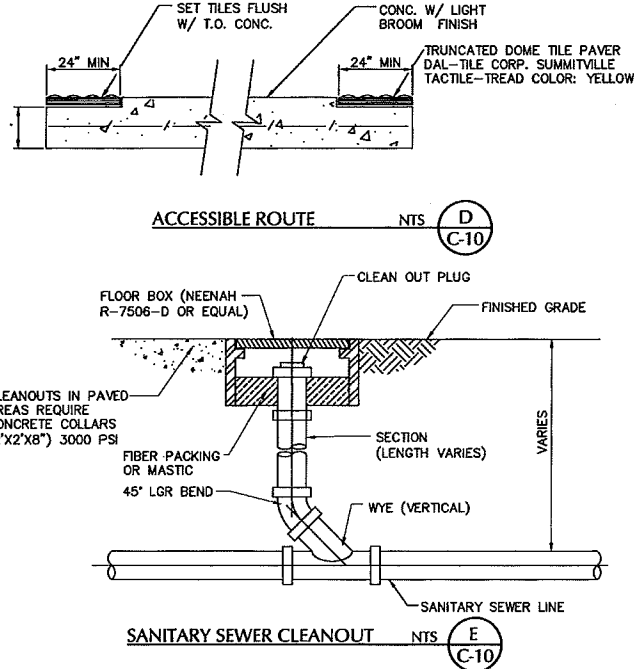
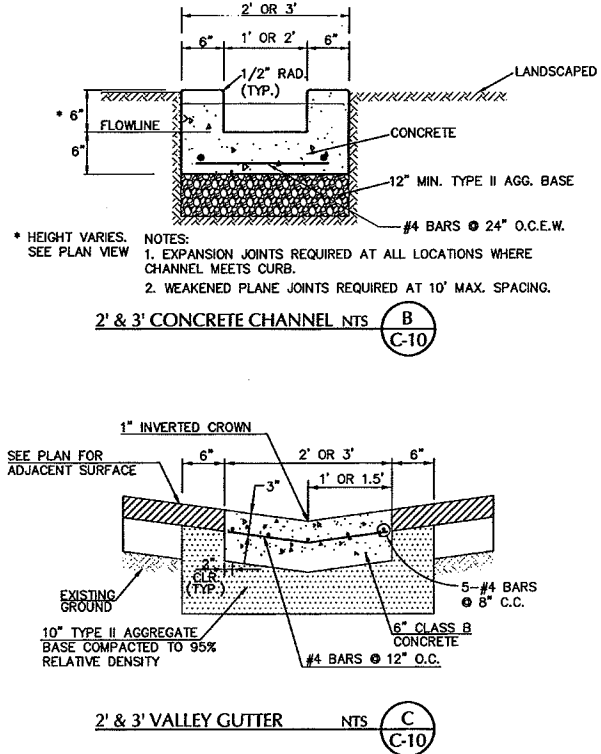
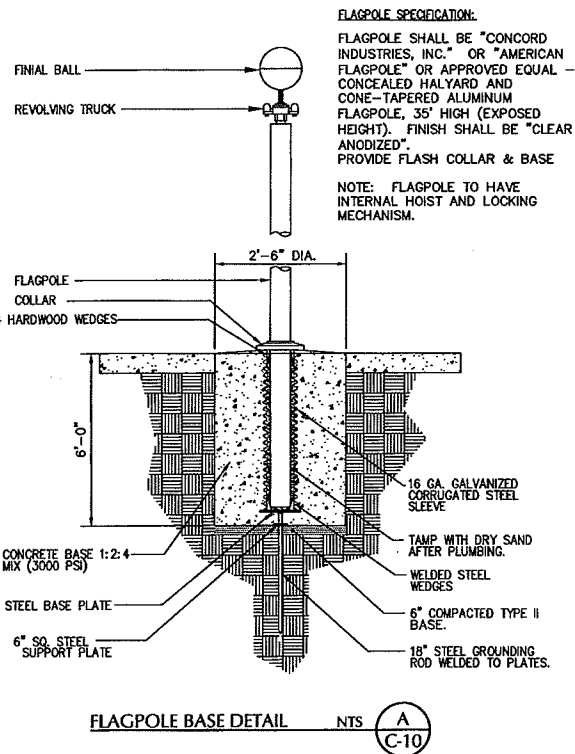
CITY OF LAS VEGAS, NEVADA
FIRE STATION #106
(STELLA LAKE AVE. & MT. MARIAH DR.)
CONSTRUCTION DETAILS



OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES
ARCHITECT OF RECORD
SAMUEL D. TOLMAN, AIA, NCARB
400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89101
PHONE: (702) 229-6333
FAX: (702) 362-3232
TEXT: (702) 366-9168
PROJECT NO. 3072
DATE 10/19/2009
SCALE AS SHOWN
SHEET NO. C-9
9 OF 22



This grading plan is a part of drainage study #4372 which was received 10/27/2009 and approved 10/27/2009. Page 3 of 9



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CITY OF LAS VEGAS, NEVADA
FIRE STATION #106
(STELLA LAKE AVE. & MT. MARIAH DR.)
CONSTRUCTION DETAILS

PROFESSIONAL ENGINEER - STATE OF NEVADA
THOMAS D. MILLER
EXP. 12-31-09
CIVIL
NO. 15776

OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

ARCHITECT OF RECORD
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LAS VEGAS, NEVADA 89101
PHONE: (702) 225-6535
FAX: (702) 386-3330
TDD: (702) 386-9108

DATE 06-11-09 | DWG. NO. 503AF

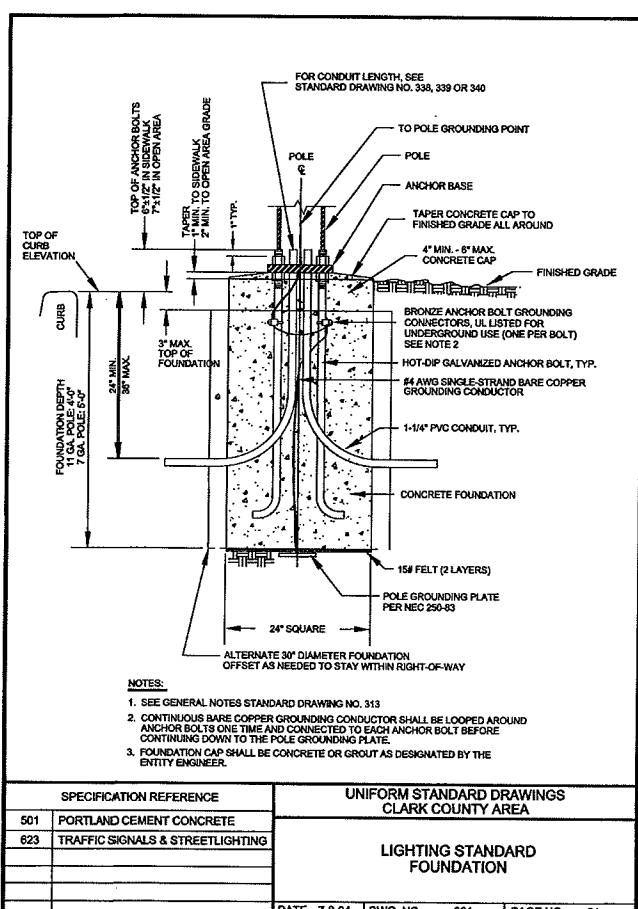
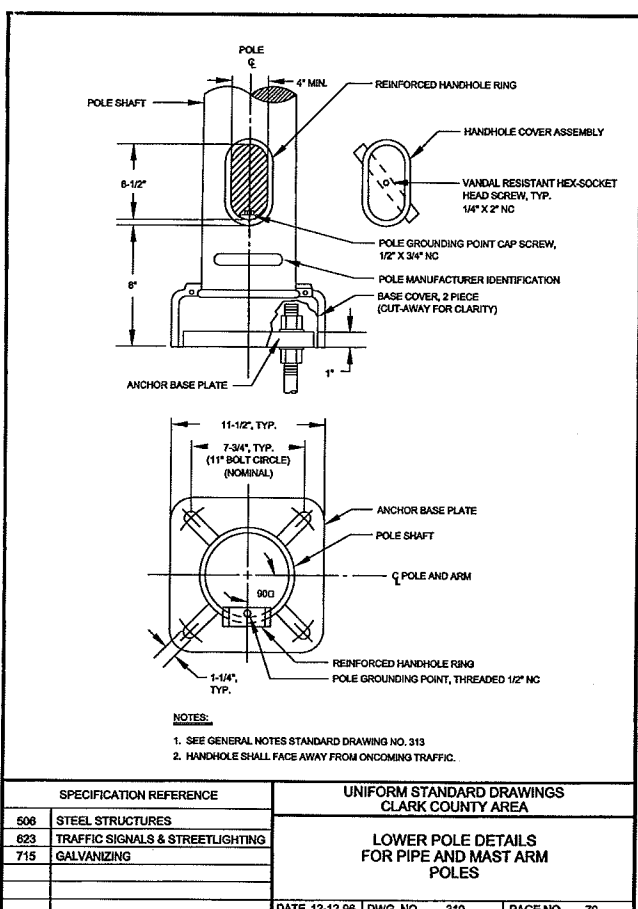
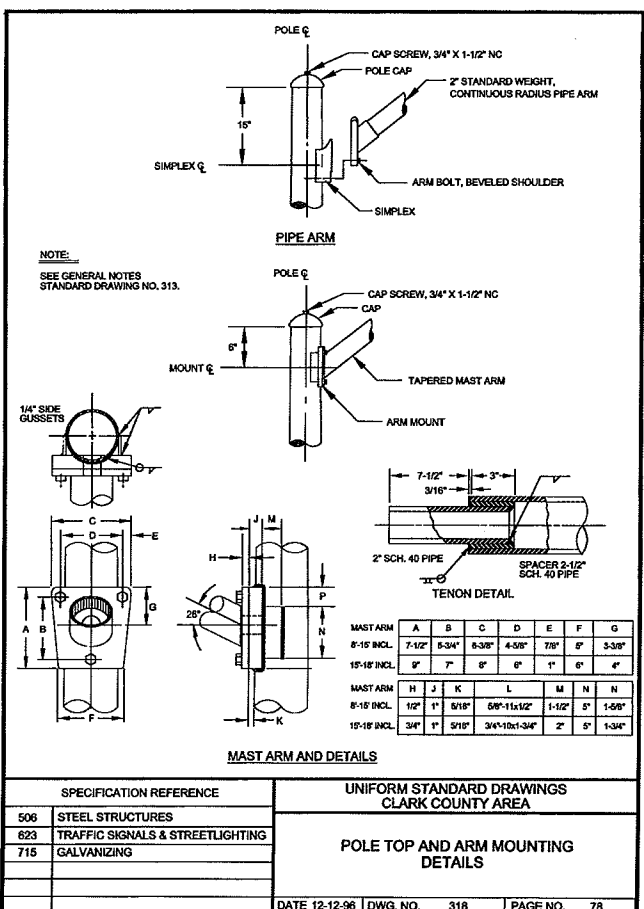
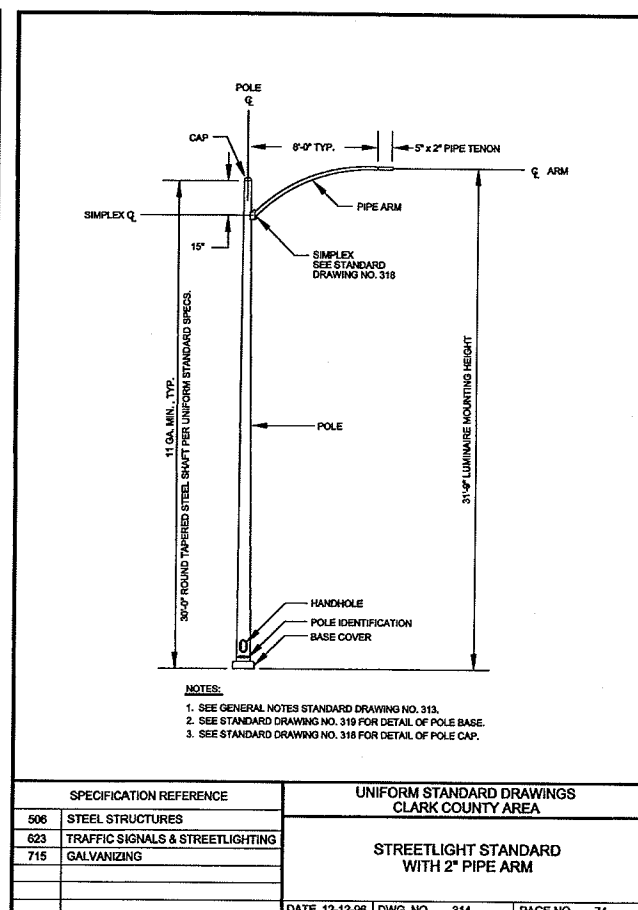
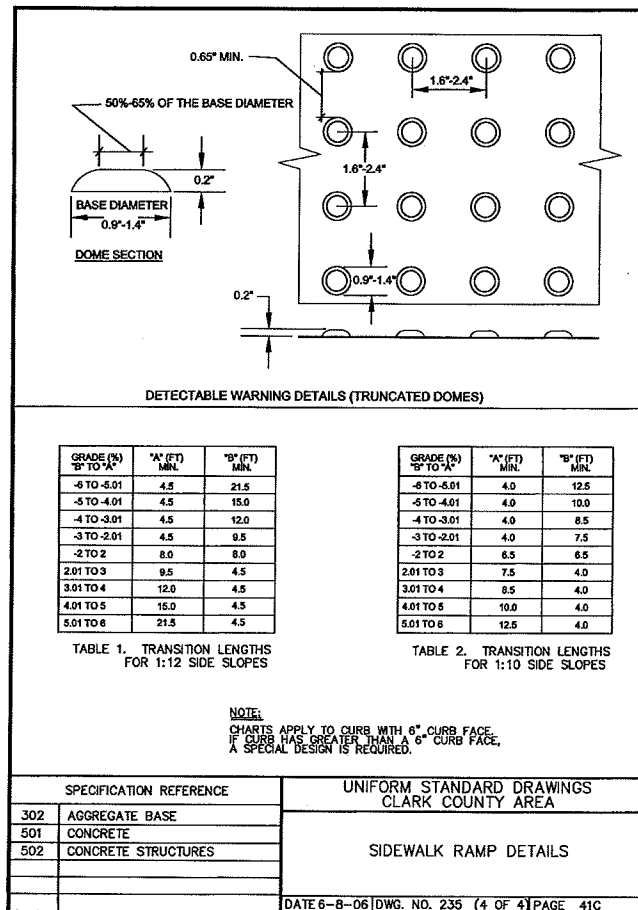
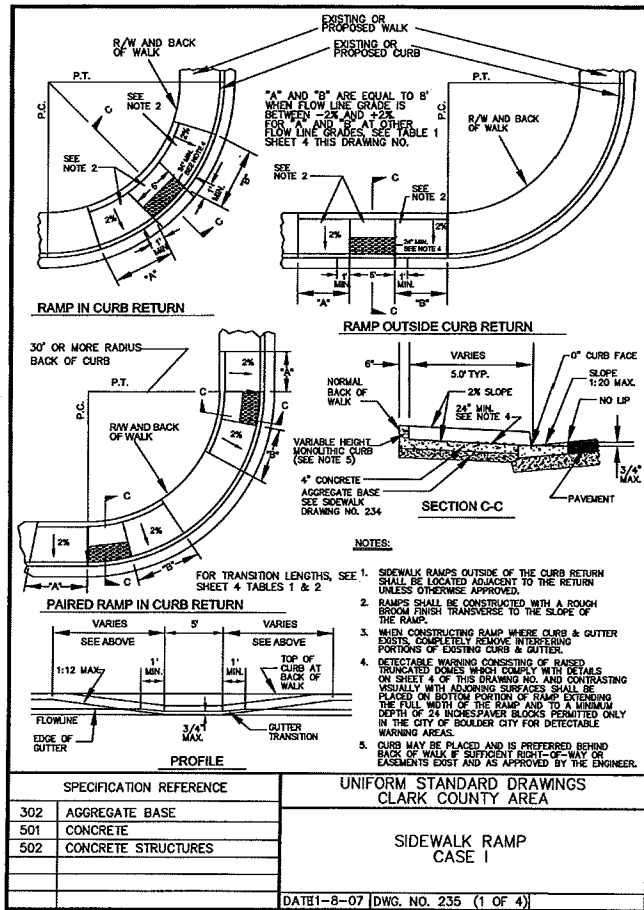
DATE 11-9-06 | DWG. NO. 505 | PAGE NO. 125

DATE 6-12-08 | DWG. NO. 500BT

OVER 5 YEARS
PAVEMENT RESTORATION
TRANSVERSE CUT
ALL R/W WIDTHS

C-10

10 OF 22



This grading plan is a part of drainage study #4372 which was received on 11/20/2009 and approved on 11/27/2009. Page 6 of 9

CITY OF LAS VEGAS

DEPARTMENT OF PUBLIC WORKS

MARTIN & MARTIN

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CITY OF LAS VEGAS, NEVADA
FIRE STATION #106
(STELLA LAKE AVE. & MT. MARIAH DR.)
CONSTRUCTION DETAILS

PROFESSIONAL ENGINEER - STATE OF NEVADA
THOMAS D. MILLER
EXP. 12-31-09
CIVIL
NO. 15776

OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

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PHONE: (702) 229-6535
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TDD: (702) 388-9100

DATE 10/19/2009
SCALE AS SHOWN
C-12
12 OF 22



LICENSED				

CONSULTANT

WORKS

MARTIN

&

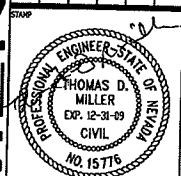
Civil Engineers

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CITY OF LAS VEGAS, NEVADA

FIRE STATION #106

TRASH ENCLOSURE DETAILS



OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

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FAX: (702) 382-3232
TDD: (702) 386-9108

DRAWN	R. GOEBEL
JOB NO	

3072
DATE 10/19/2009

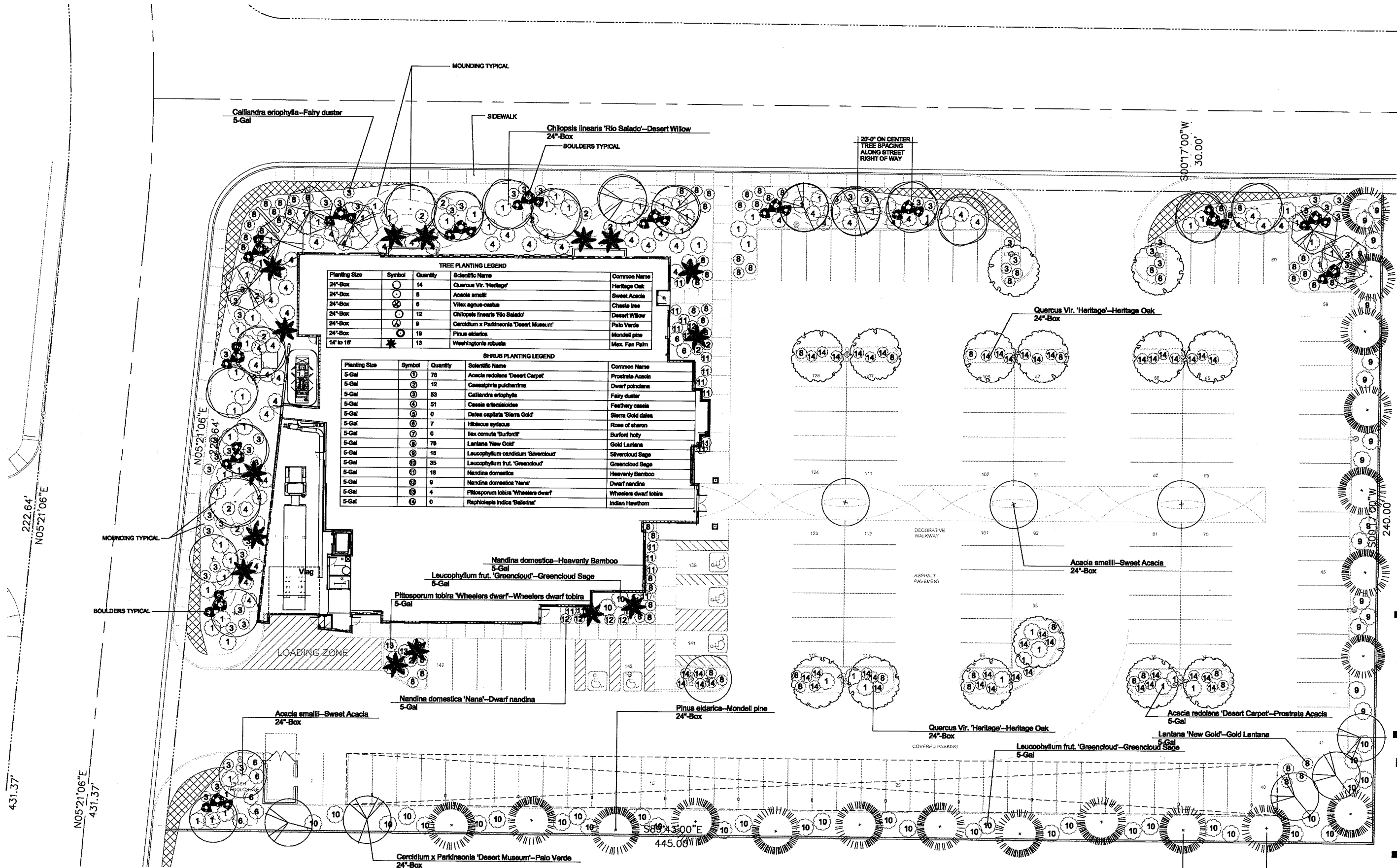
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GRID NO	

CLY DWG NO	
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C-18

SHIT NO

MAHIN RD 33



Issued For: _____ Date: _____

Drawn: _____
 Checked: _____
 Approved: _____

MICHAEL E. STEIDING
 LANDSCAPE ARCHITECT
 1160 DEL LILLY LANE
 LAS VEGAS, NV 89123
 (702) 887-1088
 NV RLA # 137 JOB NO. 210091



3579 Paul Road, Street
 Las Vegas, NV 89123
 P: (702) 876-7076
 F: (702) 255-6325

Project Title

Nevada Health Centers
 MLK Family Health
 Center / Admin. Offices
 SE Corner of Mount Mariah
 Drive & Stella Lake Street
 Las Vegas, NV

Sheet Title

PLANTING PLAN

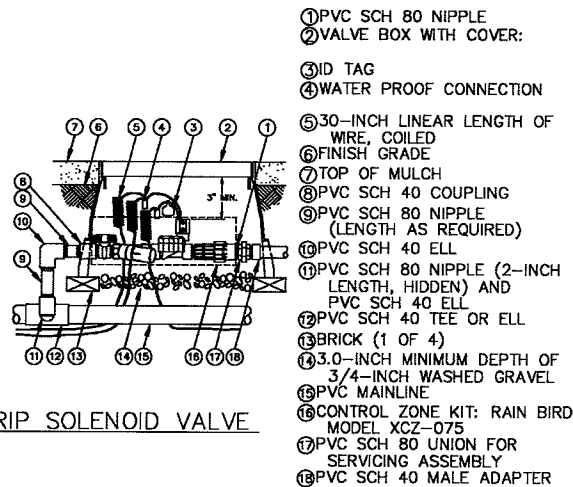
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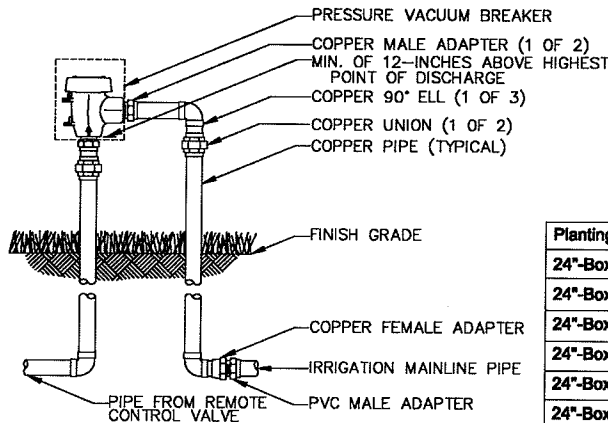
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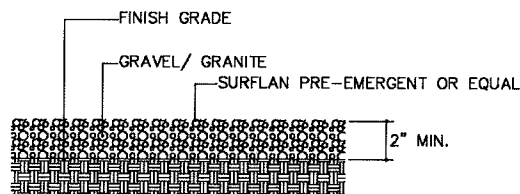
NORTH
 SCALE: 1/16" = 1'-0"



DRIP SOLENOID VALVE

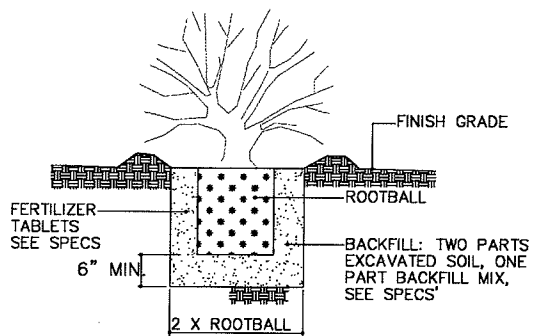


BACKFLOW DEVICE

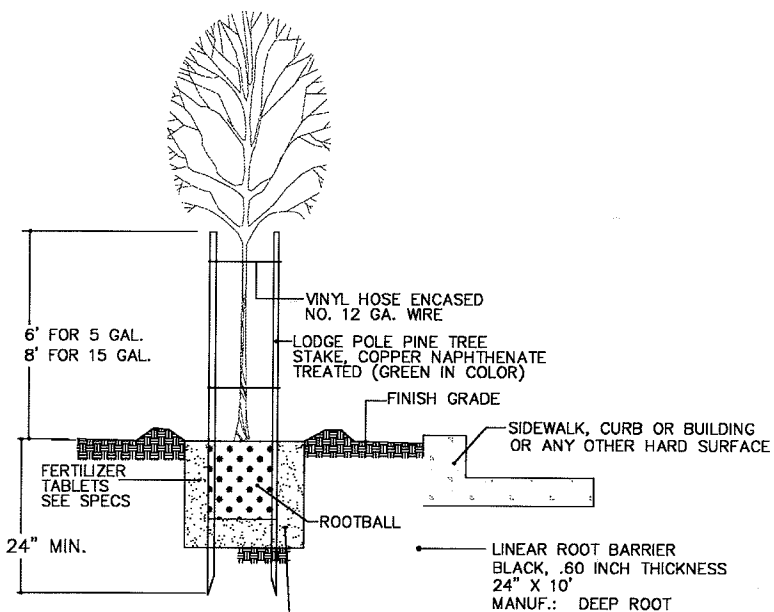


NOTE: PRE-EMERGENT SHALL BE APPLIED TO FINISH GRADE BEFORE INSTALLATION OF GRAVEL.

GRAVEL / GRANITE INSTALLATION



SHRUB PLANTING



NOTES:

1. ANY TREE WITHIN 5 FT. OF HARDSCAPE SHALL HAVE A ROOT BARRIER.
2. CONTRACTOR SHALL INSTALL PER MANUF. SPECIFICATIONS.
3. BARRIER SHALL BE LOCATED BELOW ROCK MULCH.
4. HOLE SIZE 1 1/2 TO 2 TIMES SIZE OF ROOT BALL.
5. PROVIDE (1) ONE DEEP ROOT IRRIGATION PIPE (2"-4" X 36" - 48" LONG) PROVIDE (2) TWO FOR LARGE TREES.

TREE PLANTING

IRRIGATION LEGEND									
QTY.	KEY	MANUF.	MODEL NO.	GPM	NOZ	PSI	RAD	DESCRIPTION	
		HARDIE	DPJ08	2 GPH		10-50		TURBO-SC EMITTER	
				SIZE	DESCRIPTION				
		RAIN BIRD	ESP-4M W/ESP-SM3	4 STA	WALL MOUNT CONTROLLER W/ ESP-SM3 EXPANSION MODULE				
		RAIN BIRD	XCZ-075	3/4"	DRIP SOLENOID VALVE DRIP ASSEMBLY WITH LEMA 1600HE SOLENOID AND #30-921 SOLENOID ADAPTOR FOR R.B. VALVE BACKFLOW DEVICE				
		FEBCO	765	1 1/4"	SCH.40 PVC SLEEVING SCH.40 PVC MAIN LINE CLASS 315 PVC (1/2"), CLASS 200 PVC (3/4" PLUS)				
		HARDIE	EHD2057	3/4"	DURA-POL BLUE STRIPE DRIP TUBING				

** TWO TIMES LATERAL OR MAINLINE SIZE.

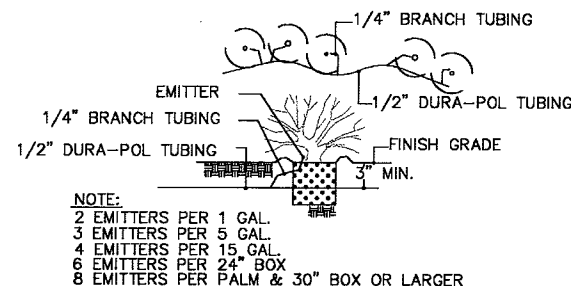
TREE PLANTING LEGEND

Planting Size	Symbol	Quantity	Scientific Name	Common Name
24"-Box		14	Quercus Vir. 'Heritage'	Heritage Oak
24"-Box		10	Acacia smallii	Sweet Acacia
24"-Box		8	Vitex agnus-castus	Chaste tree
24"-Box		12	Chilopsis linearis 'Rio Salado'	Desert Willow
24"-Box		9	Cercidium x Parkinsonia 'Desert Museum'	Palo Verde
24"-Box		19	Pinus edlarica	Mondell pine
14' to 16'		19	Washington robusta	Mex. Fan Palm

SHRUB PLANTING LEGEND

Planting Size	Symbol	Quantity	Scientific Name	Common Name
5-Gal	①	76	Acacia redolens 'Desert Carpet'	Prostrate Acacia
5-Gal	②	12	Caesalpinia pulcherrima	Dwarf poinciana
5-Gal	③	53	Calliandra eriophylla	Fairy duster
5-Gal	④	51	Cassia artemisioides	Feathery cassia
5-Gal	⑤	0	Dalea capitata 'Sierra Gold'	Sierra Gold dalea
5-Gal	⑥	7	Hibiscus syriacus	Rose of sharon
5-Gal	⑦	0	Ilex cornuta 'Burfordii'	Burford holly
5-Gal	⑧	76	Lantana 'New Gold'	Gold Lantana
5-Gal	⑨	16	Leucophyllum candidum 'Silvercloud'	Silvercloud Sage
5-Gal	⑩	35	Leucophyllum frut. 'Greencloud'	Greencloud Sage
5-Gal	⑪	18	Nandina domestica	Heavenly Bamboo
5-Gal	⑫	9	Nandina domestica 'Nana'	Dwarf nandina
5-Gal	⑬	1	Pittosporum tobira 'Wheeler's dwarf'	Wheeler's dwarf tobira
5-Gal	⑭	44	Raphiolepis indica 'Ballerina'	Indian Hawthorn

* PLANT QUANTITIES FOR REFERENCE ONLY, CONTRACTOR TO VERIFY QUANTITIES.



DRIP INSTALLATION

Issued For: _____ Date: _____

Drawn: _____
Checked: _____
Approved: _____

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Project Title

Nevada Health Center
MLK Family Health
Center / Admin. Offices
SE Corner of Mount Marit
Drive & Stella Lake Street
Las Vegas, NV

Sheet Title

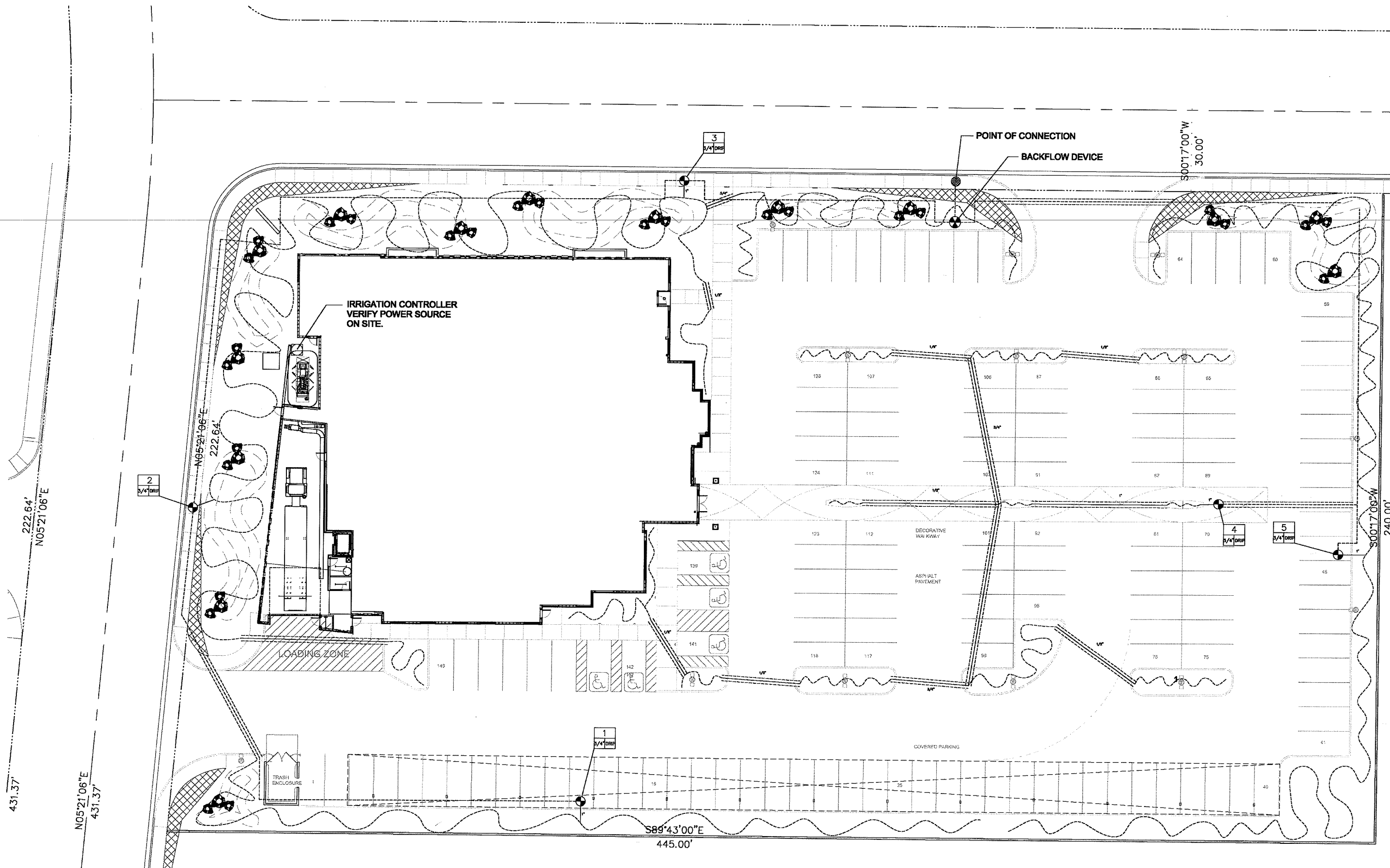
LEGENDS & DETAILS

Project Number

210099

Sheet Number

L3.0



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Checked: _____
Approved: _____

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Sheet Title

IRRIGATION PLAN

Project Number

210099

Sheet Number

L2.0