DS #: 4801

APN: 139-21-613-001 & 139-21-613-002

PROJECT: Taco Bell @ Lake Mead & Martin L. King

SUBMITTAL: 1st Submittal

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: June 6, 2016
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Taco Bell @ Lake Mead and Martin L. King**			**COPIES TO:** CivilWorks Inc.
Cross Streets:	NEC of Lake Mead Bl. & Martin L. King Bl.			First Street Development
File Number:	F:\Depot\DSMemos\DS4801A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	139-21-613-001 & 139-21-613-002			CCRFCD
Zoning Action:	SDR-63081			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	5/12/2016	6/6/2016	See Comments Below	$400.00	443720: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS:

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

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

1. Provide a copy of the zoning/planning conditions associated with this site (**SDR-63081**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.

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

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

4. **Sheet C6 (Detail Sheet)**: Section C: The landscape scarp is draining against a proposed perimeter wall. Provide a swale adjacent to the wall.

5. **Sheet C6 (Detail Sheet)**: Section D: It is not clear whether a wall at the property line is proposed or existing. The landscape in the adjacent parking stall appears to drain towards the subject site. If the wall is proposed, address how the adjacent drainage will be mitigated. It the wall is existing, it appears that the proposed landscaping is to be retained by the existing wall. Address whether the existing wall is a retaining wall.

6. Label an existing storm drain system in *Lake Mead Boulevard* with *City of Las Vegas* recorded drawing number on the grading plan. Identify all associated storm drain laterals, drop inlets and manholes with length, type and size information in the next submittal.

7. Label the finished floor elevation of all existing houses/buildings in the adjacent areas in all directions within a 100' limit on the grading plan.

8. The rough graded onsite without any permanent cover such as paving, building construction or planting, is considered ongoing project under construction whereas a *Stormwater Pollution Prevention Plan* must be kept active under the NDEP Permit. In order to close out the permit, the developer must install permanent cover to the site to stabilize and control stormwater pollution to the satisfaction of NDEP.

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

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

TRANSMISSION OK

JOB NO.	0145
DESTINATION ADDRESS	7025341825
PSWD/SUBADDRESS	
DESTINATION ID	
ST. TIME	06/06 13:15
USAGE T	00'38
PGS.	2
RESULT	OK

CITY OF LAS VEGAS
INTER-OFFICE MEMORANDUM

DATE: June 6, 2016

TO:
Land Development Services
Department of Building & Safety

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

SUBJECT: Drainage Study for:
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COPIES TO:
CivilWorks Inc.
First Street Development
Bart Anderson, P.E., DevCo
CCRFCD

Cross Streets:	NEC of Lake Mead Bl. & Martin L. King Bl.		
File Number:	F:\Depot\DSMemos\DS4801A.doc		
Parcel Number:	139-21-613-001 & 139-21-613-002		
Zoning Action:	SDR-63081		
FEMA Flood Zone	YES	NO	**X**
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TECHNICAL DRAINAGE STUDY
FOR
TACO BELL
@LAKE MEAD AND MARTIN LUTHER KING

Project No. 116915043.00

PREPARED FOR:

First Street Development
2929 E. Camelback Road, Suite 116
Phoenix, AZ 85016

PREPARED BY:

CivilWorksInc
Engineering with "sensible" solutions tailored to your "specific" needs.
4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825

May 2016

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Taco Bell @Lake Mead and MLK DATE: May 2016

Location of development: a) Descriptive (Cross Streets) North/South Martin L. King Blvd East/West Lake Mead Blvd

b) Sect. 21 Twn. 20 S Rng 61 E

Name of Owner: First Street Development Assessors Parcel No.: 139-21-613-001 and -002

Telephone No.: (602) 295-6247 Facsimile No.:

Address: 2929 E. Camelback Road, Suite 116

Phoenix, AZ 85016

Contact Person-Name: Jodi E. Jorjorian, P.E. Telephone No: 702-683-5172

Email: jej@civilworksonline.com

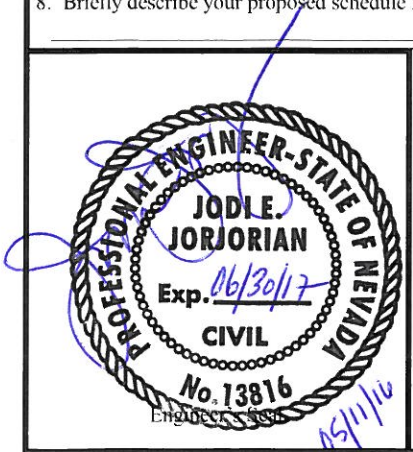
Firm: Civilworks

Address: 4945 W. Patrick Lane, Las Vegas, Nevada 89118

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: 1.72 +/- acres Being Developed/Disturbed 1.72 +/- acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? YES ☐ NO ☒
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? YES ☒ NO ☐
4. Proposed type of development (Residential, Commercial, Etc.)? Commercial
5. Approximate upstream land area, which drains to the subject site? 0.5 square miles
6. Has the site drainage been evaluated in the past? YES ☐ NO ☒ If yes, please documentation:
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
   The northern half of the site to Hart Avenue and the southern half to Lake Mead Boulevard
8. Briefly describe your proposed schedule for the subject project: Proposed construction to start in August 2016



Engineer's Stamp

05/11/16

Submit this form as part of the required drainage study to the local entity which has jurisdiction over The subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

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

Local Entity File No.

Revision	Date

REFERENCE: **STANDARD FORM 1**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Taco Bell@Lake Mead/MLK	Map ID:
Firm Name: Civilworks	Engineer: Jodi E. Jorjorian, P.E.
Address: 4945 W. Patrick Lane	
City: Las Vegas	State: NV Zip: 89118
Phone Number: 702-683-5172	Fax Number: 702-534-1825
Property Owner: FSD Lake Mead, LLC	
Address: 465 First Street West, Second Floor	
City: Sonoma	State: CA Zip: 95476

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 property evaluate the intended land use.

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

I. GENERAL REQUIREMENTS

YES	NO	
☒	☐	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.
N/A	☐	A notarized letter from the adjacent property owner (s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

YES	NO	
☒	☐	A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated
☒	☐	A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

YES	NO	
☒	☐	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 interim and future 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	
☒	☐	Sheet size 24”x36” 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.
N/A	☐	Cut/fill scarps, where applicable.
☒	☐	Street names, grades, widths.
☒	☐	Proposed future and existing spot grades for top of curbs and street crown 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.

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

YES	NO	
N/A	☐	Streets with off-set 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 storm Peak flows at basin concentration points.
☒	☐	Concentration points and drainage flow direction 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.
N/A	☐	Cross-sectional detail for channels, including cutoff wall locations.
☒	☐	Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalks, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, materials, 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 floodwalls 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.
N/A	☐	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

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

IV. HYDROLOGIC ANALYSIS

YES	NO	
☒	☐	Appropriate soil information and Soils Map for existing and future conditions with subbasins 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 future 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 subbasin 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.
☒	☐	Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:	**STANDARD FORM 2**

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

YES	NO	
N/A	☐	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
☒	☐	Normal depth street flow calculations and cross-section diagrams for all interior and perimeter streets. Provide "dxv" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. Q_{100} d x v $\leq$ 8. Q_{10} d x v $\leq$ 6 and 12 foot dry lane for rights-of –way $\geq$ 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.)
N/A	☐	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 requirements is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, which ever is greater.
N/A	☐	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of 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.
N/A	☐	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
N/A	☐	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public right-of-way, including headwater pool inundation.
☒	☐	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed
☒	☐	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:	**STANDARD FORM 2**

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFCD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCD Standard Form 2 prior to the City accepting a new drainage study for review. The engineer must contact the Flood Control Section at (702) 229-6541 to schedule a submittal appointment.

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

I. GENERAL REQUIREMENT		
Yes	No	
	NA	A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
X		Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
X		An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file. _____ by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

II. GRADING PLAN INFORMATION		
Yes	No	
X		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
X		Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required.
X		Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet* around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.)

II. GRADING PLAN INFORMATION		
Yes	No	
	NA	Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
X		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
X		Back of lot elevations and lot drainage pattern for all lots including common lots.
	NA	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	NA	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
X		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
X		Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
	NA	Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
	NA	The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
X		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
	NA	Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
	NA	Lots with "B and C Type Drainage" that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16" x 24" minimum block wall openings are required for both options.
	NA	Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided.

- Contact the Flood Control Section regarding the drainage study review fee. These fees are payable at the time of submittal.
- The Drainage Study must be conditionally approved prior to submitting improvement plans to the Civil and Planning Development of the Department of Building and Safety for review.

This document is intended as an **aid** in preparing Technical Drainage Studies for the City of Las Vegas. 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.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

I. INTRODUCTION

A. Study Overview and Purpose

This study is intended to serve as the technical hydrology study for a proposed Taco Bell development. The site comprises approximately 1.72 acres of proposed commercial development. This study is a stand-alone document that presents the findings of a hydrologic analysis of the site and contributing watershed area.

This report will identify any natural washes as well as any existing/proposed drainage facilities that contribute stormwater runoff to the site during a 100- and 10-year, 6-hour storm event. This study has been conducted in accordance with the criteria set forth by the Clark County Regional Flood Control District's (CCRFCD) *Hydrologic Criteria and Drainage Design Manual* (Reference #1).

B. Location

The project is generally located within the northern central part of the Las Vegas valley (See ***FIGURE 1 – VICINITY MAP***). More specifically, the site is located on 1350 W. Lake Mead Blvd., Las Vegas, NV 89106. This is also described as Lot One (1) of Isaiah Crossing, A Commercial Subdivision, as shown by map thereof on File in Book 142, of plats, Page 59, in the office of the County Recorder of Clark County, NV. The site is located on the northeast corner of Lake Mead Boulevard and Martin Luther King Boulevard, approximately 215 feet east of Martin Luther King Boulevard, within Section 21, Township 20 South, Range 61 East. The project is located on APNs 139-21-613-001 and -002.

C. Existing Site Description

The existing site is currently undeveloped. The site is bound by Hart Avenue on the north, by an existing Jack-in-the-Box commercial development on the west, Lake Mead Boulevard on the south and existing residential development on the east (See ***FIGURE 2 – SITE MAP*** and ***FIGURE 3 – ASSESSOR'S PARCEL MAP***). The site is divided into two Tax Parcels, but comprises one overall parcel. The site covering is natural desert terrain in poor hydrologic condition. The existing terrain is generally flat, sloping from west to east at a slope of 0.4%.

D. FEMA Flood Plain Information

A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) Community-Panel Number 32003C2160F,, effective date November 16, 2011 (Reference #5), indicates the site is located within a FEMA Zone 'X'. A Zone 'X' is described by FEMA as areas outside of the 0.2% annual chance floodplain. A map depicting the FEMA flood zones in the vicinity of the site is included in the **APPENDIX** of this study (See ***FIGURE 4- FEMA FIRM MAP***).

E. CCRFCD Master Plan Information

As shown on Figure F-26 from the *Flood Control Master Plan Update of the Las Vegas Valley* (see ***FIGURE 5 – MPU FACILITIES*** in the **APPENDIX**), prepared by PBS&J, Louis Berger Group, etc. (Reference #4), the subject site is adjacent to a proposed CCRFCD Master Plan facility in Lake Mead Boulevard. The facility is labeled LVLM 0060 and is a Category B storm drain that is proposed to replace LVLM 0059. LVLM 0060 is a proposed 12' x 6' RCB with a maximum future capacity of 994 cfs. **FIGURE 5A** is the facility inventory list for F-36.

F. Previous Drainage Studies

Just west of the proposed Taco Bell site is an existing Jack-In-The-Box commercial development. A drainage study was prepared and approved for the Jack-in-the-Box site. Portions of this reference drainage study were used in preparation of this drainage study. Excerpts of all information and assumptions used in this analysis are included in the **APPENDIX** at the back of this report. The assumptions and conclusions made in the referenced material have been reviewed and compared to the current conditions and the assumptions made and excerpts included in this study are deemed acceptable. Additionally, the proposed site was previously analyzed in the City of Las Vegas *Central Neighborhood Flood Control Master Plan*. The existing and future offsite flows within adjacent streets were obtained from the study and will be discussed in detail in Section III below.

II. METHODOLOGY

A. Compliance with Regulations

This study complies with the standards set forth within Reference #1, and City of Las Vegas drainage requirements.

B. Hydrologic Criteria

1. Rainfall Criteria

The project site is located within the McCarran Airport Rainfall Area. The depth-duration-frequency values for the 6-hour, 10-year and 100-year storm events were obtained from Figure 505 and are 1.58 and 2.77, for the 10- and 100-year values, respectively. The McCarran Airport Rainfall Area precipitation values do not require any adjustments. Since the tributary drainage area encompasses less than 8-square miles, a Storm Distribution Number three (SDN #3) was used in the HEC-1 model. The precipitation values are provided in **TABLE 1** below:

TABLE 1
DRAINAGE BASIN PARAMETERS

BASIN	AREA (acres)	CN	POINT PRECIP. (10 yr/100 yr)	PRECIP. RATIO	LAG (hr)
ONEX1	1.12	85.0	1.58/2.77	0.57/1.00	0.1000
ONEX2	0.59	85.0	1.58/2.77	0.57/1.00	0.1000
ONDEV1	0.45	93.0	1.58/2.77	0.57/1.00	0.1172
ONDEV2	0.42	87.0	1.58/2.77	0.57/1.00	0.1129
ONDEV3	0.49	93.0	1.58/2.77	0.57/1.00	0.1136
ONDEV4	0.35	87.0	1.58/2.77	0.57/1.00	0.1095

2. Runoff Computations

The U. S. Army Corps of Engineers HEC-1 flood hydrograph package was used to determine the peak runoff generated during the 100- and 10-year, 6-hour storm event. The HEC-1 computer model simulates the surface runoff response of a given watershed to rainfall. The HEC-1 program represents the watershed as an interconnected system of hydraulic components. Each component represents an aspect of the rainfall runoff process within a portion of the watershed. The smaller portion is referred to as a sub-basin. The computed hydrographs from each sub-basin are then combined at appropriate locations to obtain the final discharge hydrograph. The HEC-1 parameter calculations are located in appendix of this study.

The SCS curve number method was used to determine the infiltration rates for the drainage basins. The soil groups for the project site were determined using the SCS Soil Survey of the Las Vegas Valley. Curve numbers for the undeveloped onsite were determined using Table 602 (4 of 4) desert shrub in poor condition for the existing condition drainage analysis. Curve numbers for the developed onsite and offsite were determined using Table 602 (1 of 4) for areas assumed to be a commercial development, paved roadways and pervious desert landscaped areas. Soils information as well as a soils map depicting the soil type boundaries are located in the **APPENDIX** of this study in the section entitled *Hydrologic Parameters*.

Basin areas for the onsite drainage basins were determined using a scaled site plan. The existing and developed conditions include contours and existing spot elevations extending a minimum of 100 feet past the site boundary.

Lag Time T_L is defined as the time measured from the centroid of effective rainfall to the peak of the outflow hydrograph. It is a measure of the watershed's response time, and is a coherent property to basin length, slope, roughness characteristics, and land use. The lag-times for this study were estimated by calculating the drainage basins' time of concentration, T_C. The time of concentration consists of two components; the initial overland flow time, T_i, and the gutter or channel flow time, T_t. The equation for the time of concentration is $T_C = T_i + T_t$. The equation for lag time is $T_L = 0.6T_C$.

Precipitation in the Las Vegas Valley is characterized typically by long-duration, low-intensity winter storms and by short-duration, high-intensity summer storms. The winter storms, in general, do not produce major flooding events. The summer storms however can and do produce major flash flooding hazards in the Las Vegas Valley Area.

III. DRAINAGE BASIN DESCRIPTIONS

A. Existing Drainage Basins

1. Onsite Drainage Conditions

The existing area within the proposed parcel boundary consists of two distinct drainage basins labeled ONEX1 and ONEX2 (see **FIGURE 6** in the **APPENDIX** at the back of this report). Runoff from both basins flows across the site from northwest to southeast. Basin ONEX1 consists of the northern portion of the site. Runoff from ONEX1 currently sheets flows to the southeast and is discharged on to the existing parcel southeast of the site. The adjacent parcel contains a small commercial building surrounded unlined native soil. Ultimately, runoff from ONEX1 will be discharged to Lexington Avenue, routed south within the street, and combined with flows in Lake Mead Boulevard. Existing basin ONEX2 generally consists of the southern portion of the site. Stormwater flows from ONEX2 cross the existing site in the southeast direction and discharge directly in to Lake Mead Boulevard. The 10- and 100-year flow rates for basins ONEX1 and ONEX2 are 1 cfs/3 cfs and 1 cfs/1 cfs, for the 10- and 100-year rainfall events, respectively. The HEC-1 parameters, input data and output for the existing analysis are included in the **APPENDIX**. A flow summary showing the existing onsite basins is included below in **TABLE 2**.

2. Offsite Drainage Conditions

The City of Las Vegas Central Neighborhood Flood Control Master Plan was used to identify existing offsite flow rates adjacent to the proposed site. ***FIGURE E-2*** was reproduced from the aforementioned reference study and indicates Lake Mead is carrying surface flows rates of 0 cfs/1015 cfs for the 10- and 100-year conditions, respectively. Flowmaster software was used to calculate the normal depth for the existing cross-section of Lake Mead adjacent to the site. The cross-section accounts for the existing full street improvements adjacent to the southern site boundary. The results, using a maximum flow rate of 1015 cfs, show a normal depth in Lake Mead of 1.84 feet being conveyed at a velocity of 7.04 fps. The resulting depth times velocity product is 12.95, indicating that the maximum capacity of Lake Mead will be exceeded during a 100-year storm event and the depth will overtop the back of sidewalk, inundating adjacent parcels. Since this development is anticipated to be constructed prior to the completion of flood improvements in the upstream area, we are proposed to provide flood protection to the proposed Taco Bell Development by constructing a solid-grouted CMU cut-off wall. The wall height section will be a maximum of two (2) feet above the proposed elevations in the landscape area between the proposed building and the Lake Mead Boulevard Right-of-Way.

TABLE 2
10-YEAR / 100-YEAR, 6-HOUR STORM EVENT
EXISTING RUNOFF AMOUNTS

BASIN NAME/ CONCENTRATION POINT	AREA (acres)	10-YEAR FLOW (cfs)	100-YEAR FLOW (cfs)
ONEX1	1.21	1	2
ONEX2	0.59	<1	1
LAKE MEAD*	-	0	1015

Flow values per the CLV Central Neighborhood Flood Control Master Plan

B. Developed Drainage Conditions

1. *Developed Offsite*

The *City of Las Vegas Central Neighborhood Flood Control Master Plan* was used to identify existing offsite flow rates adjacent to the proposed site. ***FIGURE F-2*** was reproduced from the aforementioned reference study and indicates that in the future, Lake Mead is projected to carry no surface flows within the right-of-way. The CCRFCD Master Plan update indicates that a proposed box culvert will be constructed within Lake Mead that will capture the majority of the existing flows and route them below the surface to a downstream CCRFCD Regional detention facility. Other portions of the existing flows in Lake Mead will be diverted or routed away from Lake Mead and discharged in to new or improved drainage facilities located upstream of the site. ***FIGURE F-2*** from the *City of Las Vegas Central Neighborhood Flood Control Master Plan* has been included in the **APPENDIX** at the end of this report for your reference.

2. *Developed Onsite*

The onsite developed condition includes the construction of a Taco Bell restaurant and all adjacent parking, median and landscaping improvements as required to be completed per the Notice of Final Action from CLV Planning. In the future an additional commercial building will be constructed in the eastern half of the site. Specific building details are unknown at this time for the future building construction so this area will be rough graded to match the proposed Taco Bell improvement grades. Additionally, the proposed grading will include a future commercial pad and any additional grading needed to adequately convey runoff around the pad and to the adjacent streets. A drainage update will be prepared to address specific drainage requirements for the future pad prior to construction.

The developed site will generally be divided in to four drainage basins labeled ONDEV1 through ONDEV4 (see **FIGURE 7 – ONSITE DEVELOPED DRAINAGE BASINS** in the **APPENDIX** at the back of this report). ONDEV1 is comprised of the northwest

portion of the site and includes the north half of the proposed Taco Bell development and the north half of the adjacent improvements. Runoff from ONDEV1 will travel within the paved parking area and be discharged to Hart Avenue via a new entrance driveway. Runoff within ONDEV2 is comprised of the northeast portion of the site and consists of the rough graded area and the northern half of the future building pad. Grading of ONDEV2 will include a wide shallow swale that will temporarily convey runoff to Hart Avenue without impacting the adjacent proposed Taco Bell improvements to the west or the existing residential improvements to the east. Flows from ONDEV1 and ONDEV2 are combined in Hart Avenue at combination point 1 (CP1). Basin ONDEV3 is comprised of the southwest portion of the site and the south half of the Taco Bell Development and the south half of the adjacent onsite parking improvements, medians and landscaping. Flows within ONDEV3 will be conveyed through the onsite street and parking area and discharged to Lake Mead via a new Lake Mead driveway access. Runoff generated within ONDEV4 is runoff from the south half of the rough graded and future pad area. The area consists of the southeast portion of the site. Grading within ONDEV4 will create uniform slopes from the future commercial building bad to the existing grades at the site boundary. The drainage will mimic existing drainage conditions on the site. Flows from ONDEV4 will be discharged in to Lake Mead and combined within runoff from ONDEV3 at combination point 2 (CP2) as shown on **FIGURE 7**. A summary of the onsite flows is provided below in **TABLE 3**:

TABLE 3
10-YEAR / 100-YEAR, 6-HOUR STORM EVENT
DEVELOPED RUNOFF AMOUNTS

BASIN NAME/ CONCENTRATION POINT	AREA (acres)	10-YEAR FLOW (cfs)	100-YEAR FLOW (cfs)
ONDEV1	0.45	1	1
ONDEV2	0.42	<1	1
CP1	-	1	2
ONDEV3	0.49	1	1
ONDEV4	0.35	<1	1
CP2	-	1	2

C. Street Flow Calculations

Offsite street flow calculations for the 10-year and 100-year, 6-hour storm events were completed for Lake Mead. Flows within Hart Avenue are minimal and are therefore assumed to be negligible based on the assumption that the current improvements meet the minimum drainage criteria. The depth times velocity calculation within Lake Mead is summarized in the following **TABLE 4**:

TABLE 4
OFFSITE STREET FLOW CALCULATIONS

STREET	Q_{10}/Q_{100} (cfs)	D_{10}/D_{100} (ft)	V_{10}/V_{100} (ft\s)	V x D
LAKE MEAD (Section S1)	0/1015	0/1.84	0/7.04	0/12.88*

**The flows in Lake Mead do not meet the depth times velocity criteria for the developed condition. However, this criteria is an existing condition that is not being created by the proposed site development. This condition is temporary pending construction of a CCRFCD facility in Lake Mead that will capture the majority of the current surface flows and convey them underground to a CCRFCD detention facility.*

Onsite street flow calculations for the 10-year and 100-year, 6-hour storm events are summarized in the following **TABLE 5**:

TABLE 5
ONSITE STREET FLOW CALCULATIONS

STREET	Q_{10}/Q_{100} (cfs)	D_{10}/D_{100} (ft)	V_{10}/V_{100} (ft\s)	V x D
Section 1-1	1/1	0.10/0.10	1.61/1.61	0.16/0.16
Section 2-2	1/1	0.13/0.13	1.04/1.04	0.10/0.10

The street calculations show that the *CCRFCD Hydrologic Criteria & Drainage Design Manual* velocity/depth products criteria are met both onsite and offsite in the developed condition. The velocity/depth products are below 6 and 8 for the 10- and 100-year storms, respectively.

This project has provided BMP improvements per section 1500 of the CCRFCD Hydrologic Criteria & Drainage Design Manual. To meet the requirements outlined in Section 1500, the majority of onsite runoff will be through shallow, rock-lined swales as part of the proposed landscaping. Discharge from northerly and southerly basin areas will be routed these onsite swales prior to being discharged in to Hart Avenue and Lake Mead Boulevard, respectively (See grading plans in the map pocket at the back of this report).

IV. CONCLUSIONS

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

1. Elevate the proposed building to a finished floor elevation that is a minimum of 18 inches above the water surface elevation as measured at highest flowline elevation adjacent to the southern boundary of the site or a minimum of twice the existing 100-year depth of flow in Lake Mead Boulevard; whichever is greater.

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

3. Construct all swales for conveyance and mitigation of stormwater.

4. Nuisance water shall be captured onsite so adjacent properties are not affected during construction.

V. REFERENCES

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

2. *5-Foot Contours*, GISMO, Clark County.

3. *Soil Survey of Las Vegas Valley Area, Nevada, Part of Clark County*, Soil Conservation Service, 1985.

4. *2013 CCRFCD Flood Control Master Plan*, Post, Buckley, Schuh, and Jernigan, Inc., et al., 2013.

5. *Flood Insurance Rate Map, Community Panel Number* 32003C2160F*, Clark County, Nevada*, Federal Emergency Management Agency, effective November 16, 2011.

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

7. *FlowMaster User's Manual Version 8.0*, Haestad Methods, Inc., 2005.

8. *Technical Drainage Study for Jack in the Box*, 2004 (CLV# 04-2016).

APPENDIX

FIGURES

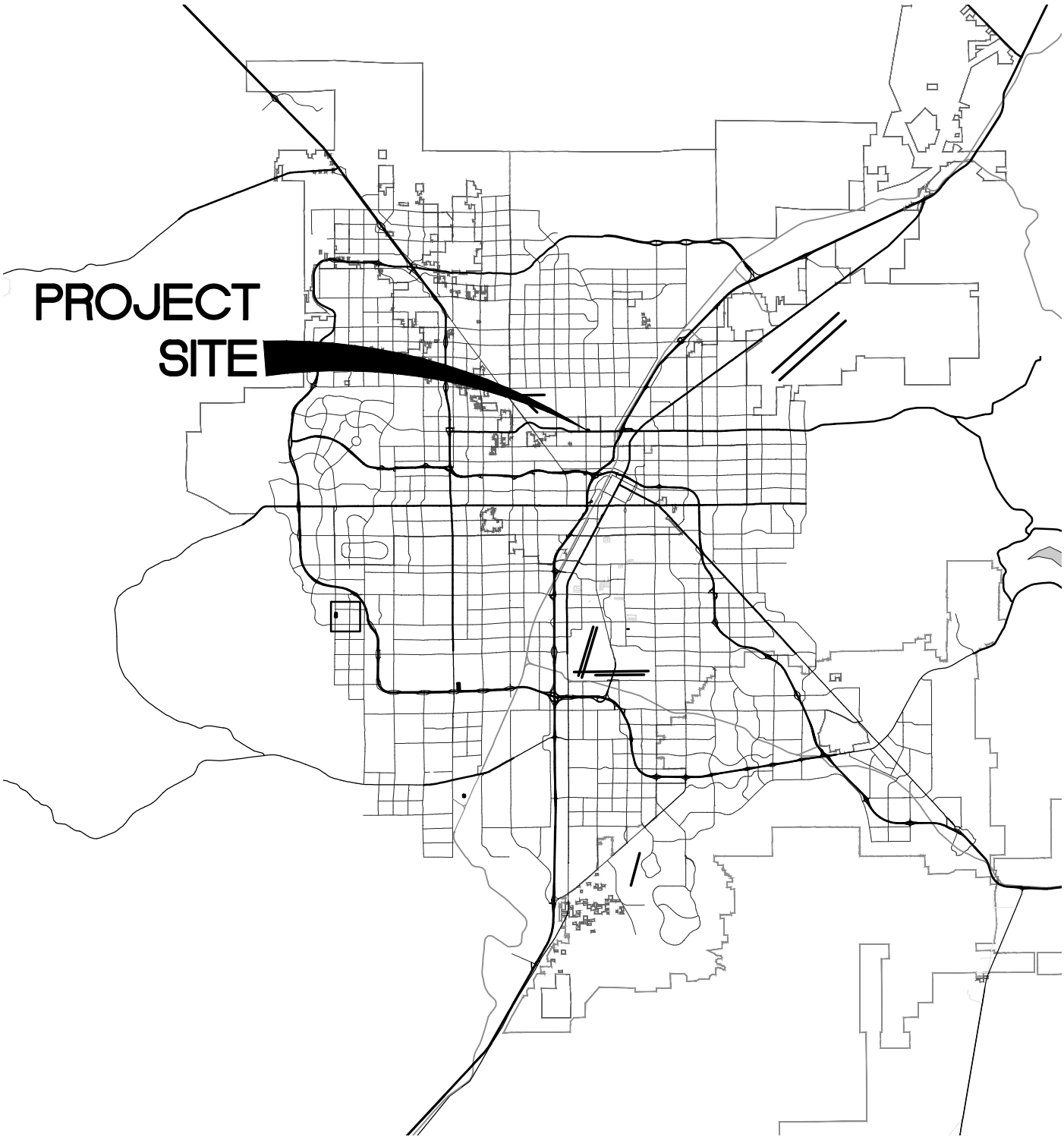


FIGURE 1

VICINITY MAP

CivilWorksInc
Engineering with "sensible" solutions tailored to your "specific" needs.
4945 W. Patrick Lane Las Vegas, NV 89118
Office #:(702) 876-3474 Fax #:(702) 876-1323

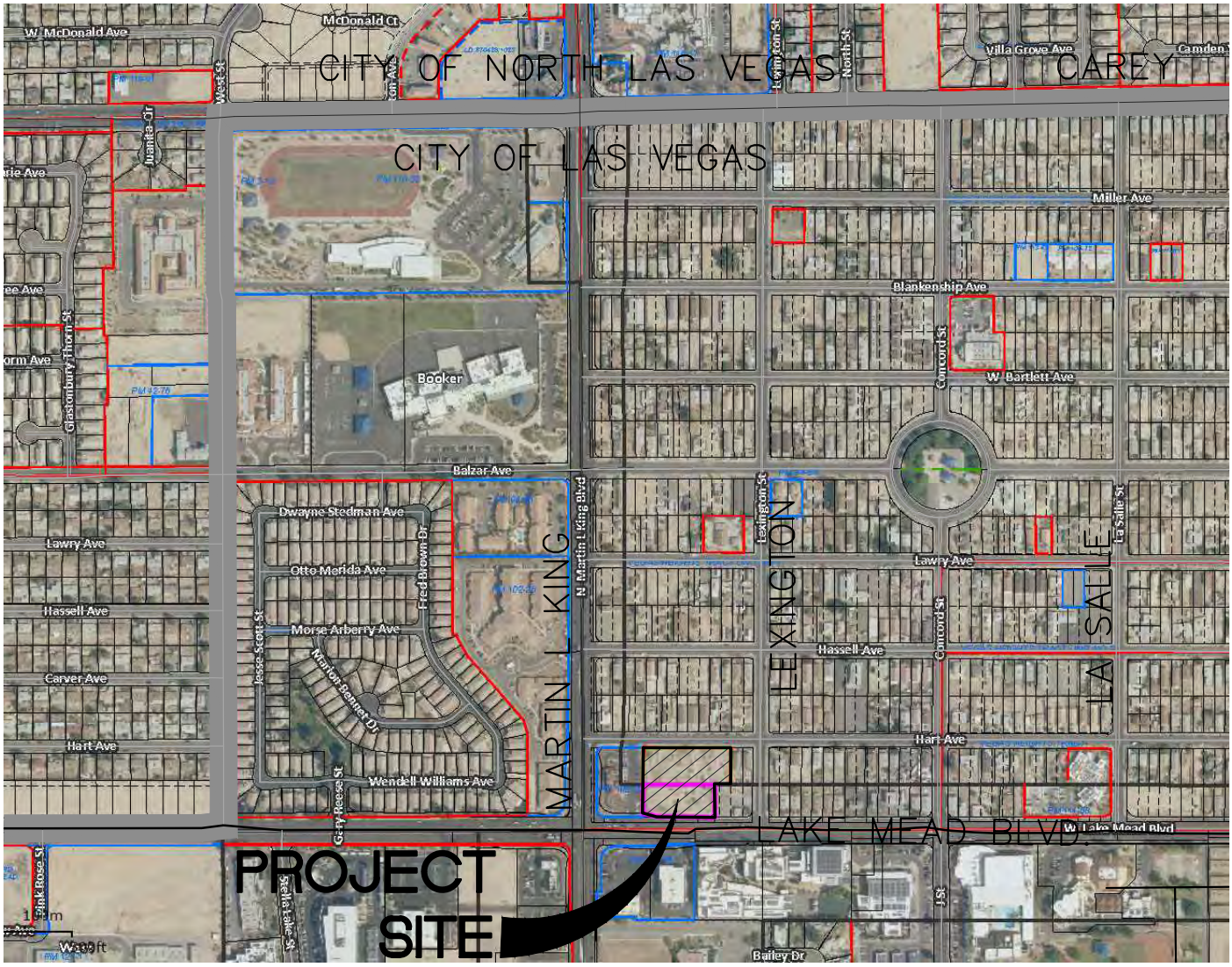


FIGURE 2

SITE MAP

CivilWorksInc
Engineering with "sensible" solutions tailored to your "specific" needs.
4945 W. Patrick Lane Las Vegas, NV 89118
Office #:(702) 876-3474 Fax #:(702) 876-1323

NOTES

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

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

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

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

0 100 200 400 600 800

MAP LEGEND

ASSESSOR'S PARCELS - CLARK CO., NV.
Michele W. Shafe - Assessor

- PARCEL BOUNDARY
- SUB BOUNDARY
- PM/LD BOUNDARY
- ROAD EASEMENT
- MATCH / LEADER LINE
- HISTORIC LOT LINE
- HISTORIC SUB BOUNDARY
- HISTORIC PM/LD BOUNDARY
- SECTION LINE
- CONDOMINIUM UNIT
- AIR SPACE PCL
- RIGHT OF WAY PCL
- SUB-SURFACE PCL
- 001 ROAD PARCEL NUMBER
- 001 PARCEL NUMER
- 1.00 ACREAGE
- 202 PARCEL SUB/SEQ NUMBER
- PB 24-45 PLAT RECORDING NUMBER
- 5 BLOCK NUMBER
- 5 LOT NUMBER
- GL5 GOV. LOT NUMBER

BOOK T20S R61E

SEC. 21

MAP S 2 NE 4

139-21-6

36	125	124	123			
37	138	139	140			
24	163	162	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
30	29	28	27	26	25
31	32	33	34	35	36

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

Scale: 1" = 200 '

Rev: 02/09/2011

CLARK COUNTY ASSESSOR MAPPING DIVISION NEVADA

FIGURE 3 - APN MAP TAX DIST 204,200

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole–foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC–3, #9202
1315 East–West Highway
Silver Spring, MD 20910–3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713–3242,** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the Clark County GIS Management Office (GISMO).

This map reflects more detailed and up–to–date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de–annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

The Digital Flood Insurance Rate Map (DFIRM) was produced through a unique partnership between Clark County and the Federal Emergency Management Agency (FEMA). Clark County has developed a long-term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the Clark County commitment to share and maintain floodplain layers within their Geographic Information System Management Office (GISMO).

This DFIRM reflects several innovative features. These include:
+ Southern Nevada GIS–Cooperation among local government agencies throughout Clark County. The foundation of cooperation is the GIS Interlocal Agreements formed between fourteen regional participants. In part, the agreements specify that the Clark County GIS Management Office (GISMO) will be responsible for maintaining a GIS data warehouse and associated Southern Nevada GIS metadata.

+ The GISMO's responsibilities go beyond maintaining the GIS data warehouse. GISMO also maintains the Street Centerline Database used by 911 dispatch services. This centerline database serves as the basemap for this DFIRM.

DIGITAL DATA AVAILABILITY: http://www.co.clark.nv.us/ceit/gismo/gismo.htm

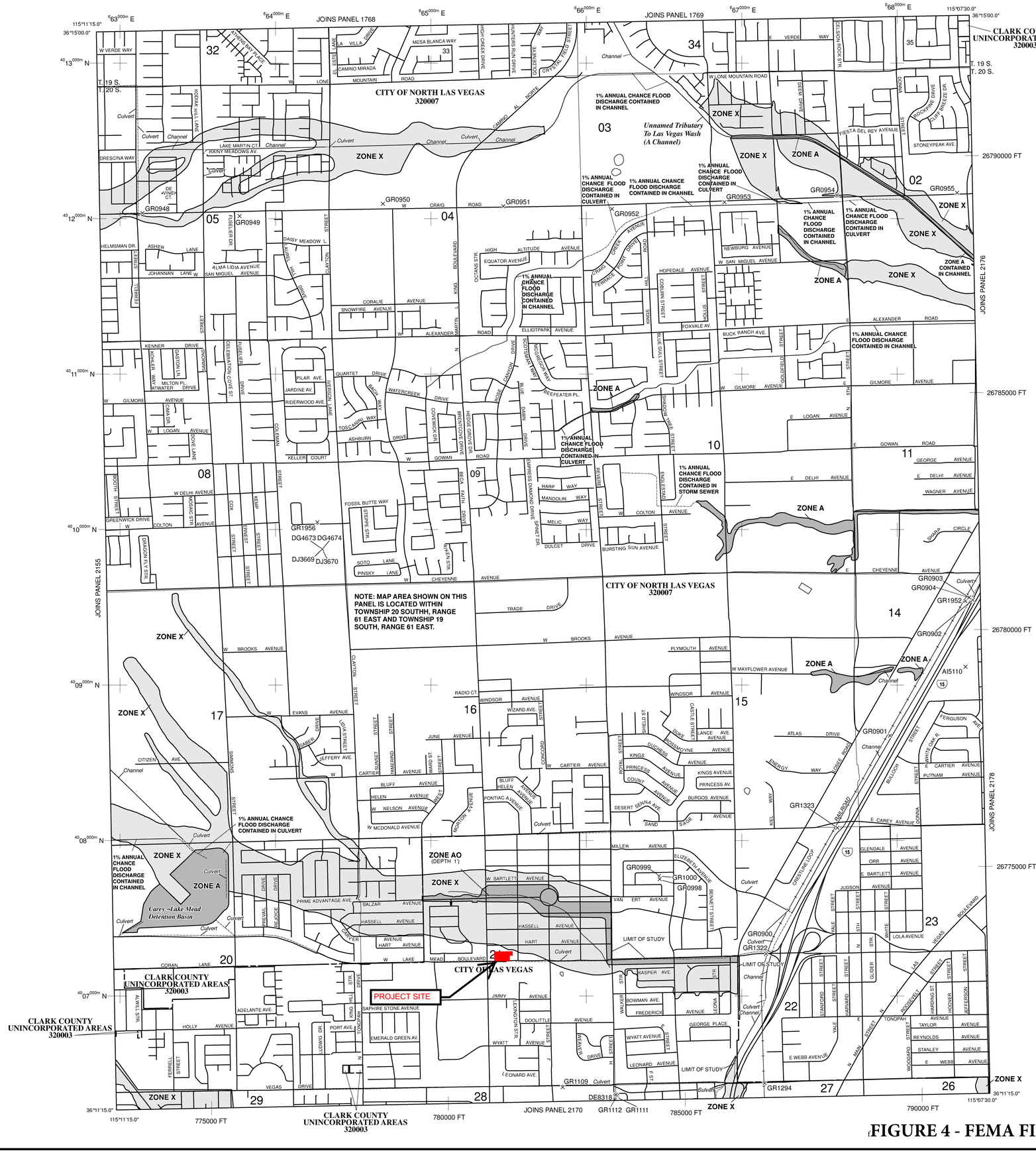


FIGURE 4 - FEMA FIRM MAP

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 11
- 6000000 FT — 5000-foot grid ticks: Nevada State Plane coordinate system, east zone (FIPSZONE 2701), Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 16, 1995
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 27, 2002

November 16, 2011 --to reflect updated topographic information, to change floodway, to add Base Flood Elevations, to update corporate limits, to change Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to change zone designations, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2160F

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
CLARK COUNTY	320003	2160	F
LAS VEGAS, CITY OF	325276	2160	F
NORTH LAS VEGAS, CITY OF	320007	2160	F

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

MAP NUMBER
32003C2160F

MAP REVISED
NOVEMBER 16, 2011

Federal Emergency Management Agency

REGIONAL FLOOD CONTROL DISTRICT

CLARK COUNTY NEVADA

REGIONAL FLOOD CONTROL DISTRICT

2013
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

- 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

PROJECT SITE

N

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

Scale: 1 inch = 2,000 feet

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

US95 I-15 I-215

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

FIGURE 5 - CCRFCD MPU FACILITIES

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
FW15		**FREEWAY CHANNEL FROM DESERT INN TO EXPRESSWAY**						
0000	E	3: 12' X 10' RCB	2170	3728	CAL93	SW4	10.63	0.17
GOOF		**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	699	CPT6B-C	GW3SC	1.08	0.50
LAAS		**NORTH LAS VEGAS AIR TERMINAL - SIMMONS**						
0000	E	14' X 6' RCB	760	698	CR2-CA	NW3	2.57	0.80
0014	E	12' X 6' RCB	1350	698	CR2-CA	NW3	2.57	1.12
0040	E	10' X 6' RCB	2105	698	CR2-CA	NW3	2.57	1.50
0080	E	66" RCP	157	285	R-C	NW3	0.27	1.10
0083	E	60" RCP	620	285	R-C	NW3	0.27	1.40
0095	E	54" RCP	400	285	R-C	NW3	0.27	1.44
0103	E	48" RCP	405	285	R-C	NW3	0.27	1.75
LAAT		**NORTH LAS VEGAS AIR TERMINAL**						
0000	E	3: 8' X 5' RCBC	650	1331	CB3-1	NW3	4.17	0.50
0006	E	Conc Chnl 20'W 8'D 1.5:1 SS	380	1331	CB3-1	NW3	4.17	0.50
0014	E	10' X 6' RCB	934	1331	CB3-1	NW3	4.17	1.84
0031	E	10' X 6' RCB	1618	1079	CB3-2	NW3	3.87	1.05
0062	E	12' X 8' RCB	511	1079	CB3-2	NW3	3.87	0.50
0070	E	12' X 6' RCB	376	1079	CB3-2	NW3	3.87	0.56
0078	E	10' X 6' RCB	1055	1079	CB3-2	NW3	3.87	0.58
0098	E	10' X 4' RCB	2207	677	CCA1-C	NW3	3.08	0.60
0140	E	Conc Chnl 6'W 4'D 1.5:1 SS	338	677	CCA1-C	NW3	3.08	0.64
0146	E	Conc Chnl 6'W 3'D 1.5:1 SS	1388	677	CCA1-C	NW3	3.08	0.68
0172	E	76" X 48" HERCP	536	480	CA1-C	NW3	2.87	0.75
0182	E	Conc Chnl 6'W 3'D 1.5:1 SS	997	480	CA1-C	NW3	2.87	0.83
0201	E	Conc Chnl 6'W 3'D 1.5:1 SS	184	294	A1-C1	NW3	0.31	0.37
0204	E	76" X 48" RCP	425	294	A1-C1	NW3	0.31	0.37
LANO		**NORTH LAS VEGAS AIR TERMINAL NORTH**						
0000	E	Conc Chnl 0'W 3'D 1.5:1 SS	470	294	A1-C1	NW3	0.31	0.30
LCCH		**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 6' RCB	2035	2894	CLC20-C	MEADOWS4	9.68	0.82
0051	E	2:14' X 7' RCB	3113	2894	CLC20-C	MEADOWS4	9.68	0.60
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 6' RCB	1650	1631	CCLC14-C	SW3	2.99	1.06
0188	E	2: 12' X 6' RCB	2225	1631	CCLC14-C	SW3	2.99	1.36
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	3940	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	1.60
0478	E	60" RCP	1110	162	CLC01-C	SW3	1.20	0.55
LCDE		**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

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LCJO		**LAS VEGAS CREEK - JONES**						
0000	E	6' X 6' RCB	380	358	AL01B-C	SW3	0.37	0.50
0007	E	6' X 5' RCB	675	358	AL01B-C	SW3	0.37	0.62
LCLT		**LAS VEGAS CREEK - LATERAL**						
0000	E	6' X 6' RCB	490	250	WA10D	SW3	0.45	0.50
0006	E	Conc Chnl 10'W 4'D 0:1 SS	1364	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		**LAS VEGAS CREEK - MEADOWS**						
0000	E	14' X 8' RCB	895	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/ LCME0018)		3300	MEADOWIN	SW3SC	5.67	
0018	P1	Modify Spillway, raise height by 1' (Replaces LCME0017)		3300	MEADOWIN	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	MEADOWIN	SW3SC	5.67	
0021	P1	Upgrade to 235 ac-ft Meadows Detention Basin		4713	MEADOWIN	SW3SC	5.67	
LCRA		**LAS VEGAS CREEK - RANCHO**						
0000	E	12' X 8' RCB	380	783	CLC16-C	SW3	1.71	0.60
0004	E	12' X 6' RCB	2367	783	CLC16-C	SW3	1.71	0.77
0050	E	8' X 6' RCB	355	526	WA13D	SW3	1.40	0.50
LMDE		**LAKE MEAD BOULEVARD - DECATUR BRANCH**						
0000	P1	10' X 5' RCB	2640	665	DCVG04-C	NW3	1.26	0.90
LV15		**FREEWAY CHANNEL**						
0316	E	11' X 6' RCB	3010	985	CWA20-C	NW3	4.46	0.59
0372	E	9' X 6' RCB	1970	985	CWA20-C	NW3	4.46	0.66
0409	E	7' X 6' RCB	815	542	CWA15A-C	NW3	3.67	0.91
0424	P1	8' X 6' RCB	2500	542	CWA15A-C	NW3	3.67	0.73
0472	P1	2: 66" RCP	1200	265	WA15A-C	NW3	0.37	0.42
0474	P1	8' X 6' RCB	2880	322	CCWA13-C	NW3	3.29	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
LVLM		**LAS VEGAS WASH - LAKE MEAD**						
0033	E	60" RCP (Replace w/ LVLM0034)	1186	994	CLM20-C	NW3SC	1.36	1.62
0034	P0	12' X 5' RCB (Replaces LVLM0033)	1186	994	CLM20-C	NW3SC	1.36	1.62
0059	E	72" RCP (Replace w/ LVLM0060)	5952	994	CLM20-C	NW3SC	1.36	0.66
0060	P0	12' X 6' RCB (Replaces LVLM0059)	5952	994	CLM20-C	NW3SC	1.36	0.66
0170	E	78" RCP	2421	378	CLM16A-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/ LVLM0226)	641	1933	CLM10-C	NW3	3.02	1.35
0226	P0	2: 10' X 8' RCB (Replaces LVLM0225)	641	1933	CLM10-C	NW3	3.02	0.50
0227	E	10,000 cfs PMF Spillway		10000	CARYLMIN	NW4	11.78	
0228	E	607 ac-ft Carey-Lake Mead Detention Basin		5184	CARYLMIN	NW4	11.78	
0270	E	90" RCP (Replace w/ LVLM0271)	3473	1933	CLM10-C	NW3	3.02	1.35
0271	P0	12' X 8' RCB (Replaces LVLM0270)	3473	1933	CLM10-C	NW3	3.02	1.35
0336	E	84" RCP (Replace w/ LVLM0337)	1050	1652	CLM06-C	NW3	2.61	1.16
0337	P0	12' X 8' RCB (Replaces LVLM0336)	1050	1652	CLM06-C	NW3	2.61	1.16
0355	E	90" RCP (Replace w/ LVLM0356)	1840	1652	CLM06-C	NW3	2.61	0.40
0356	P0	12' X 11' RCB (Replaces LVLM0355)	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	565	CLM03-C	NW3	0.63	1.28
0453	E	54" RCP	589	565	CLM03-C	NW3	0.63	2.37
0460	E	54" RCP	1464	235	LM02-C	NW3	0.29	2.05
0475	E	48" RCP	2632	235	LM02-C	NW3	0.29	1.24
0525	E	48" RCP	2600	542	CLM01-C	NW3	0.64	1.24
LVOE		**OWENS AVENUE - EAST**						
0345	P1	13' X 11' RCB	1685	2369	DLVOE	SW5	22.79	0.60

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVOW		**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	0.90
0241	E	66" RCP	5800	381	CVG20-C	NW3	1.57	1.40
0351	E	8' X 6' RCB	3000	829	CVG04-C	NW3	1.26	1.44
0360	P1	8' X 6' RCB	2300	829	CVG04-C	NW3	1.26	1.48
0460	P1	7' X 6' RCB	2700	616	CVG03-C	NW3	0.95	1.48
LVPK		**PEAK DRIVE SYSTEM**						
0000	E	Conc Chnl 15'W 6'D 0:1 SS	606	1024	CPD04B-C	NW3	1.59	1.22
0019	E	Conc Chnl 20'W 5.5'D 0:1 SS	2190	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	0.67	0.61
LVRA		**LAS VEGAS WASH - RANCHO**						
0000	E	12' X 8' RCB	612	1317	CCPD04BC	NW3	3.87	1.56
0012	E	12' X 8' RCB	2838	1317	CCPD04BC	NW3	3.87	0.78
0066	E	14' X 5' RCB	65	1317	CCPD04BC	NW3	3.87	1.22
LVSR		**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	66" RCP (Replace w/ LVSR0071)	4118	1244	CS1-C	NW3SC	1.42	0.73
0071	P1	10' X 9' 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
0198	P1	8' x 5' RCB (Replaces LVSR0197)	581	445	CR2-C	NW3SC	0.38	0.86
0208	E	54" RCP (Replace w/ LVSR0209)	2060	445	CR2-C	NW3SC	0.38	1.41
0209	P1	7' X 5' RCB (Replaces LVSR0208)	2060	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	0.63
0273	E	11' X 11' RCB	1140	2889	CB1-C	NW3	6.44	0.92
0295	E	11' X 11' RCB	510	2683	CCSR05B	NW3	6.16	2.85
0312	E	8' X 8' RCB	460	1607	CSR05B	NW3	2.30	1.63
0359	E	66" RCP (Replace w/ LVSR0360)	1690	1607	CSR05B	NW3	2.30	0.67
0360	P1	10' X 10' RCB (Replaces LVSR0359)	1690	1607	CSR05B	NW3	2.30	0.75
0396	E	60" RCP (Replace w/ LVSR0397)	2640	1461	CSR05D	NW3	1.94	1.14
0397	P1	10' X 9' RCB (Replaces LVSR0396)	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	1.64	1.27
0500	E	60" RCP	1290					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	2870	DCLC21	SW5	22.79	0.15
0446	E	Junction Structure	69	2870	DCLC21	SW5	22.79	0.15
0447	E	3: 14.33' X 10' RCB	1955	4978	CCAL93	SW5	22.19	0.15
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	0.60	0.20
0014	E	1: 12' X 4' RCB and 1: 11' X 4' RCB	2440	557	LC21	SW3	0.60	0.20

** The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.*

*** As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.*

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

REGIONAL FLOOD CONTROL DISTRICT

2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F - 26

LEGEND

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

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

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

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

Construction Features

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

FIGURE 5A - CCRFCD MPU FACILITY INVENTORY - F-26

City of Las Vegas

CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

LEGEND

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

(Flows in CFS)

- Study Area Limit

PHOTO DATE: SPRING 2004

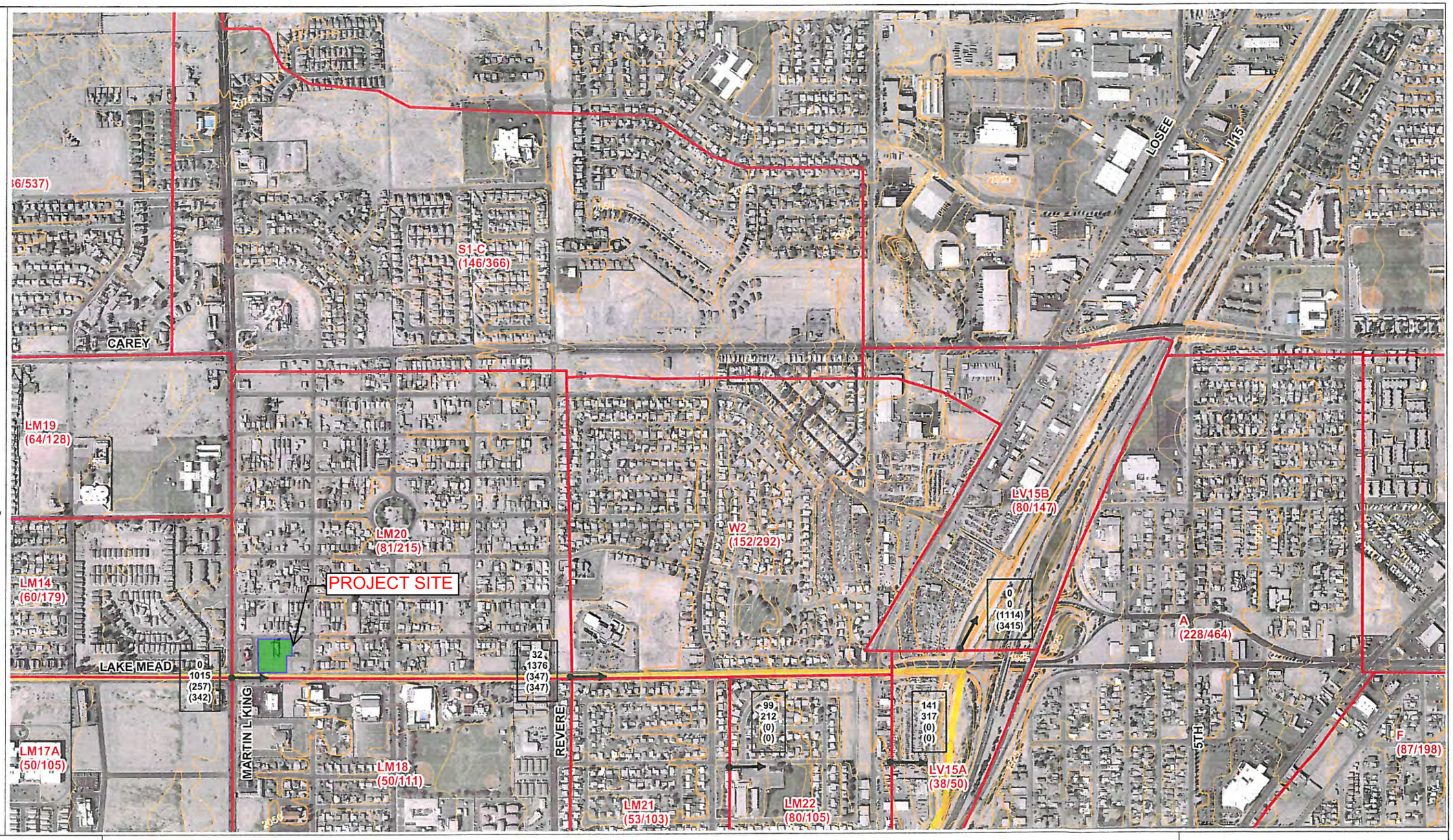


FIGURE E-2

EXISTING DRAINAGE CONDITIONS

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Fax: (702) 263-7200

	Durango	Rainbow	Decatur	Tonopah	5th	Pecos	Nellis
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			

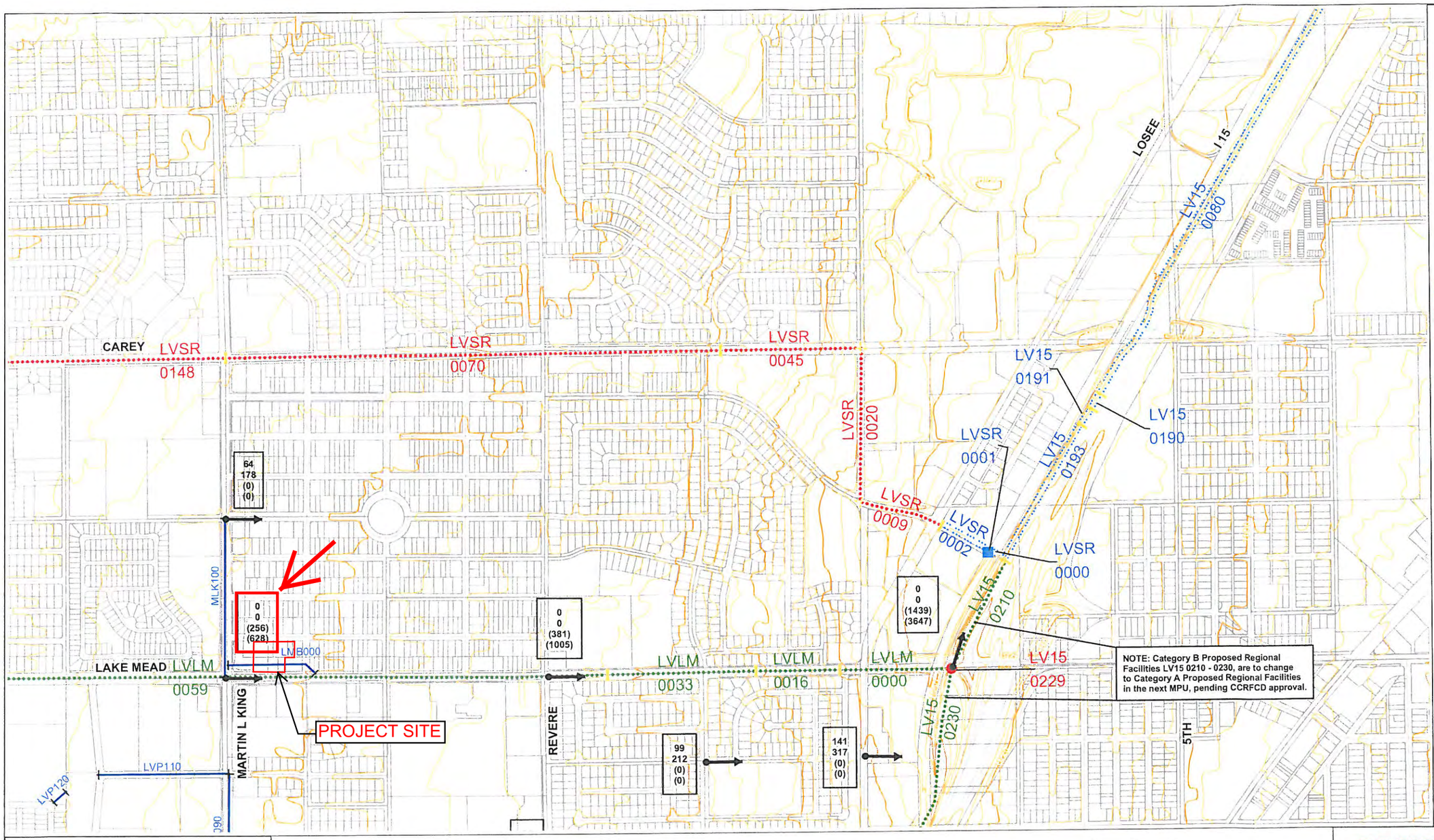
NOTE:
Existing conditions are based on future Curve Number values with only existing local and CCRFCD facilities in place

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 explaination.

N
W E
S

0 200 400 800 1,200 1,600
Feet

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-2

N W E S

0 200 400 800 1,200 1,600 Feet

SCALE: 1 inch = 800 feet

Flow Arrow

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

(Flows in CFS)

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

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

	Durango	Rainbow	Decatur	Tonopah	5th	Pecos	Nellis
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			

FUTURE DRAINAGE CONDITIONS

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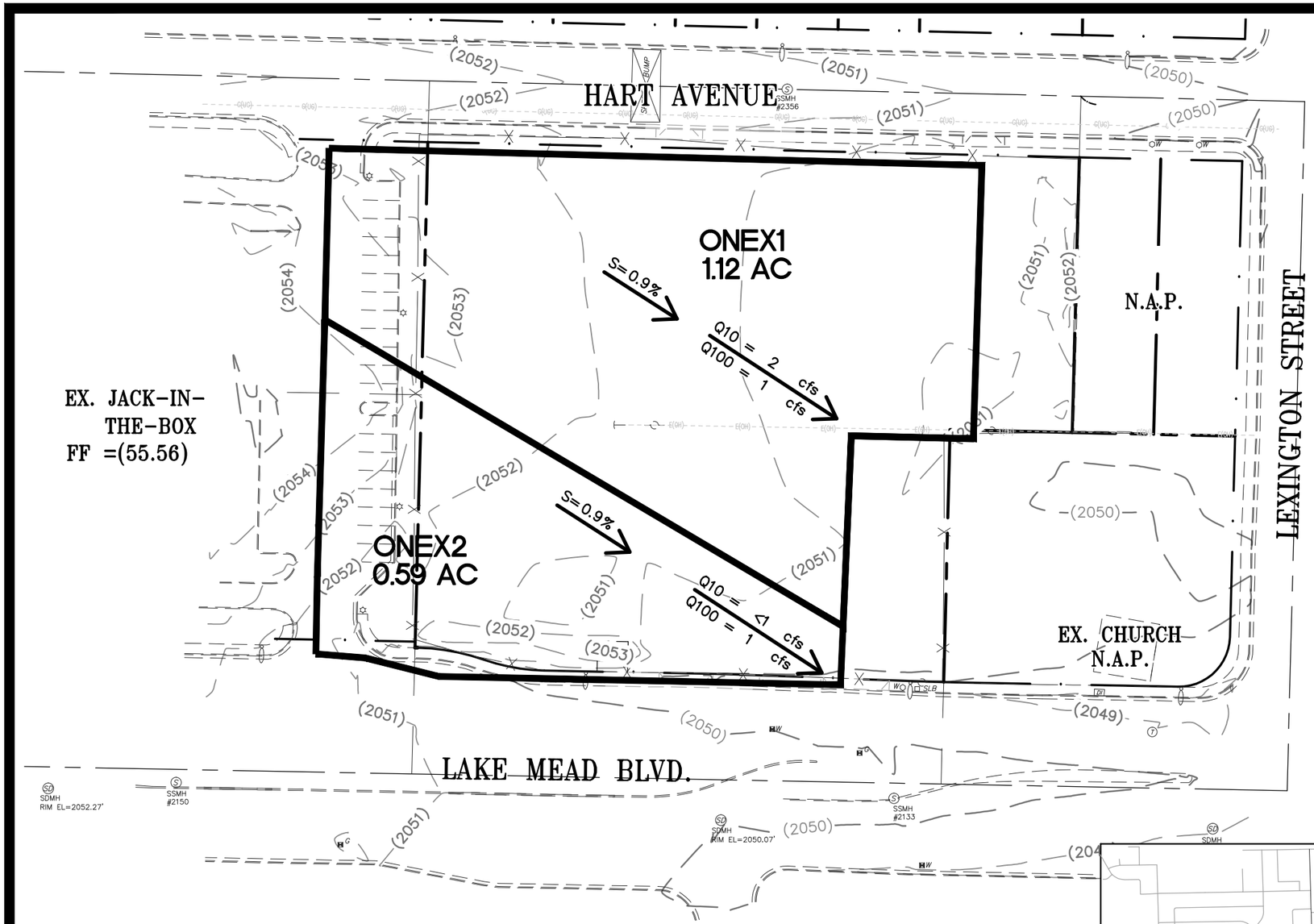
Fax: (702) 263-7200



N

GRAPHIC SCALE

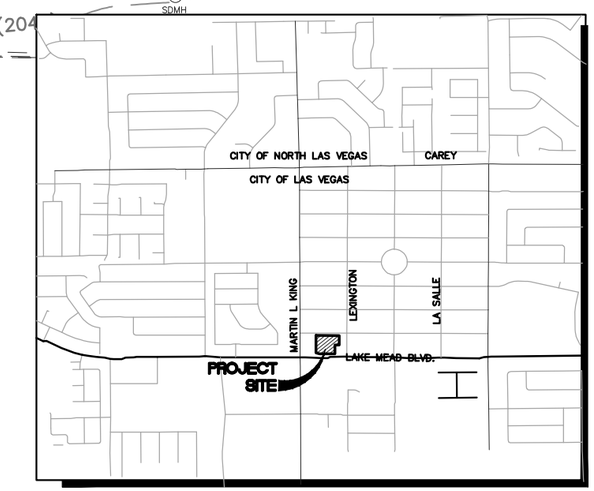
60 0 30 60 120

(IN FEET)
1 inch = 60 ft.

LEGEND

0.5 AC	BASIN AREA IN ACRES
→	FLOW DIRECTION
Q10 = xx cfs	10-YEAR FLOW RATE
Q100 = xx cfs	100-YEAR FLOW RATE
———	BASIN DELINEATION
ONEX1	BASIN DESIGNATION
● CP-1	COMBINATION POINT
(1)——(1)	HYDRAULIC CROSS SECTION

BASIN NAME/ CONCENTRATION POINT	AREA (acres)	10-YEAR FLOW (cfs)	100-YEAR FLOW (cfs)
ONEX1	1.12	1	2
ONEX2	0.59	<1	1



VICINITY MAP

FIGURE 6

ONSITE EXISTING BASIN MAP

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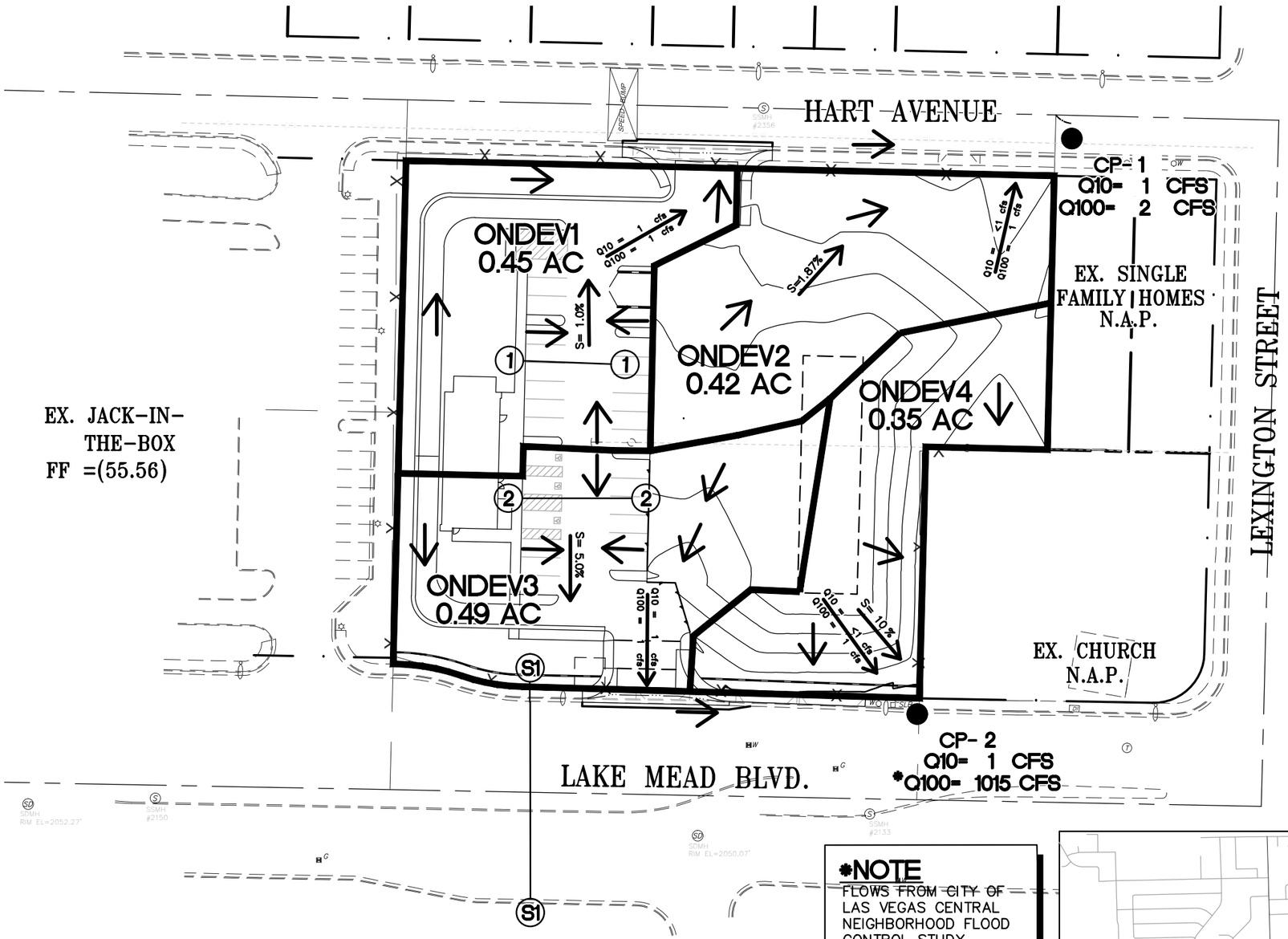


N

GRAPHIC SCALE

60 0 30 60 120

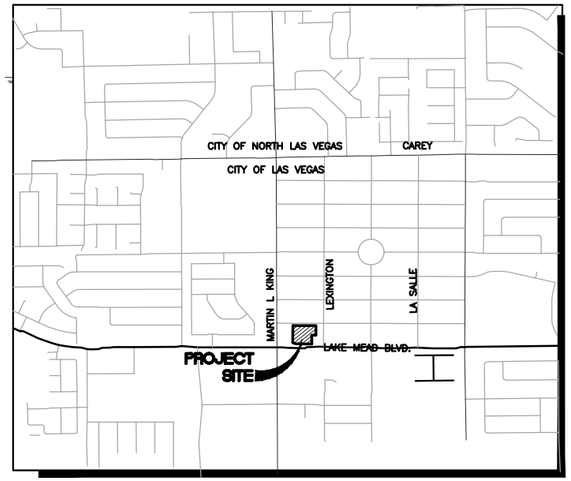
(IN FEET)
1 inch = 60 ft.

LEGEND

0.5 AC	BASIN AREA IN ACRES
→	FLOW DIRECTION
Q10 = xx cfs	10-YEAR FLOW RATE
Q100 = xx cfs	100-YEAR FLOW RATE
———	BASIN DELINEATION
ONEX1	BASIN DESIGNATION
● CP-1	COMBINATION POINT
① —— ①	HYDRAULIC CROSS SECTION

***NOTE**
FLOWS FROM CITY OF LAS VEGAS CENTRAL NEIGHBORHOOD FLOOD CONTROL STUDY

BASIN NAME/ CONCENTRATION POINT	AREA (acres)	10-YEAR FLOW (cfs)	100-YEAR FLOW (cfs)
ONDEV1	0.45	1	1
ONDEV2	0.42	<1	1
CP-1	-	1	2
ONDEV3	0.49	1	1
ONDEV4	0.35	<1	1
CP-2	-	1	2



VICINITY MAP

FIGURE 7

ONSITE DEVELOPED BASIN MAP

CivilWorksInc
Engineering with "sensible" solutions tailored to your "specific" needs.
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Office #:(702) 876-3474 Fax #:(702) 876-1323

HYDROLOGIC PARAMETERS

Rainfall Data
Curve Numbers
Soils Information
Standard Form 4

STANDARD FORM 4

MODIFIED USING AVERAGE VELOCITY METHOD

CivilWorksInc
Engineering with "sensible" solutions tailored to your "specific" needs.
4945 W. Patrick Lane Las Vegas, NV 89118
Office: (702) 534-7555 Fax: (702) 534-1825

Project: Taco Bell @Lake Mead and Martin L. King
Job No.: 15042
Date: 05/11/2016
Calculated by: jej

SUB-BASIN DATA			INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		Tc		TLAG	HEC-INPUT		REMARKS
Designation	K (Default by CN)	Area (Acres)	Length (feet)	Slope (%)	Ti (Min)	Length (feet)	Slope (%)	V1 (FPS) (Manning)	V2 (FPS) (Manning)	Tt (Min)	Total Length (feet)	Tc= (L/180)+10 (Min)	Final Tc = Ti +Tt (Min)	Min Tc	(Tc*0.6) (Hr)	Composite CN	Drainage Area (Sq. Mi.)	Tc>=10 for Non Urban Tc>=5 for Urban
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)					
ONEX1	0.73	1.12	61	0.80	5.59	303	0.50	1.05	2.08	4.82	363.85	N/A	10.40	10.00	0.10	85.0	0.0018	min. Tc used
ONEX2	0.73	0.59	74	1.00	5.70	233	1.10	1.55	3.08	2.50	307.00	N/A	8.20	10.00	0.100	85.0	0.0009	min. Tc used
ONDEV1	0.84	0.45	31	2.00	2.09	278	1.63	2.58	3.91	1.80	309.10	11.72	3.88	5.00	0.039	93.0	0.0007	Use 0.1172
ONDEV2	0.76	0.42	49	1.00	4.31	184	2.70	3.32	5.03	0.92	233.00	11.29	5.23	5.00	0.052	87.0	0.0007	Use 0.1129
ONDEV3	0.85	0.49	41	2.00	2.28	204	1.66	2.60	3.94	1.31	245.00	11.36	3.59	5.00	0.036	94.0	0.0008	Use 0.1136
ONDEV4	0.76	0.35	67	1.00	5.03	104	3.10	3.56	5.39	0.49	170.91	10.95	5.52	5.00	0.050	87.0	0.0005	Use 0.1095

K = 0.0132*Cn-0.39

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

Tt = L/(60*V)

Velocity values for Manning's estimates:

Existing Conditions
V1 = 14.8*(S/100)^0.5
V2 = 29.4*(S/100)^0.5

Developed Conditions
V1 = 20.2*(S/100)^0.5
V2 = 30.6*(S/100)^0.5

* V1 is used for the first 500 feet of length in column (7). V2 is used for the remainder.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

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

March 17, 2016

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

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

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

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	1.7	100.0%
Totals for Area of Interest		**1.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Las Vegas Valley Area, Nevada, Part of Clark County

236—Glencarb very fine sandy loam, saline

Map Unit Setting

National map unit symbol: hrb9
Elevation: 1,500 to 2,400 feet
Mean annual precipitation: 3 to 7 inches
Mean annual air temperature: 63 to 70 degrees F
Frost-free period: 240 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Glencarb and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glencarb

Setting

Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 6 inches: very fine sandy loam
H2 - 6 to 60 inches: stratified very fine sandy loam to silty clay loam

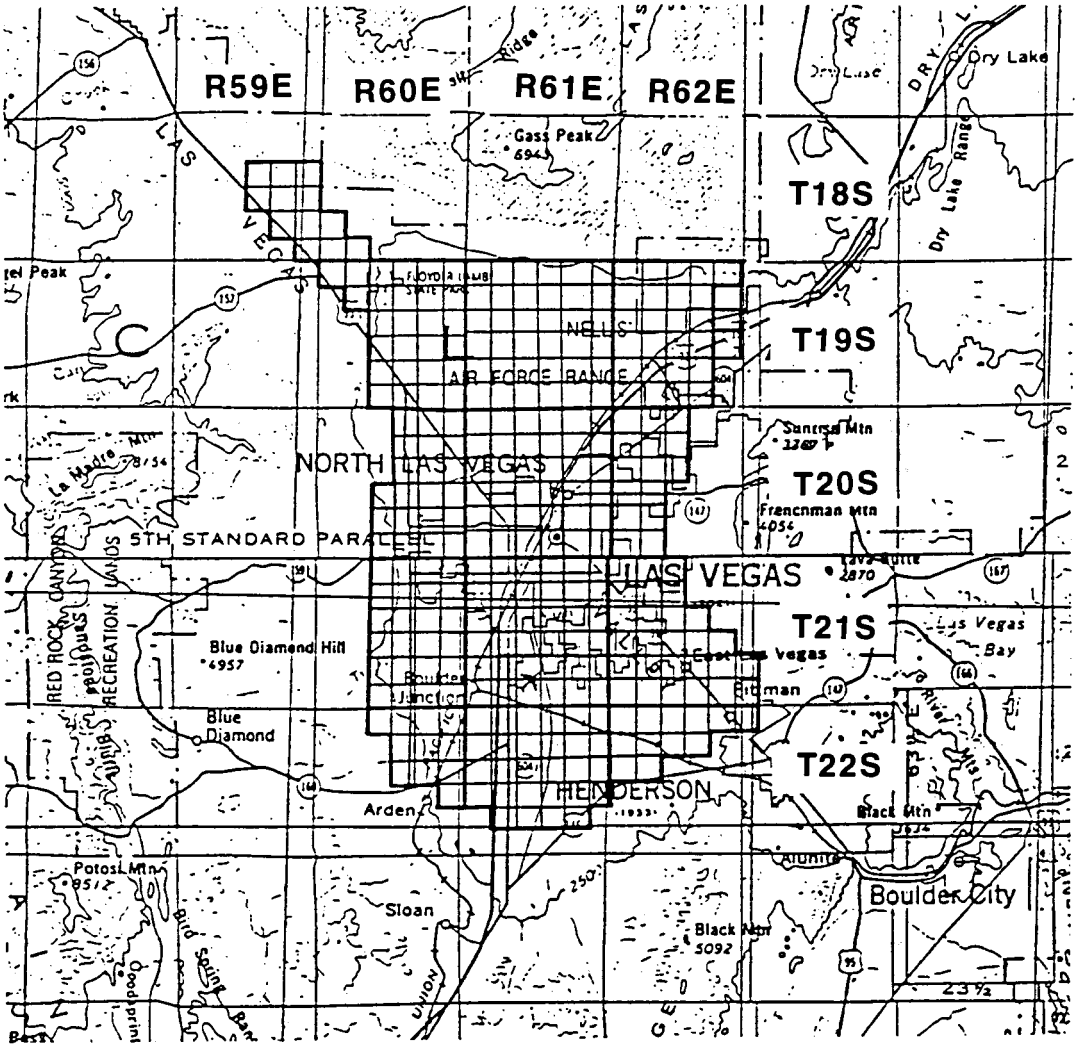
Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 60 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 60.0
Available water storage in profile: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: SODIC TERRACE (R030XY040NV)

McCARRAN AIRPORT RAINFALL AREA



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

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

Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 513

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA

(IN INCHES)

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

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

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

3. Table 501 adjustments not required.

Revision	Date

SIX-HOUR STORM DISTRIBUTIONS

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

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

Revision	Date

REFERENCE:

TABLE 503

SIX HOUR DEPTH-AREA REDUCTION FACTORS

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

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

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

Revision	Date

RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

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

See Table 602A

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

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

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

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

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

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

Revision	Date

RUNOFF CURVE NUMBERS
(SEMIARID RANGELANDS[1])

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

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

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

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

Revision	Date

CURVE NUMBER CALCULATIONS

ONSITE EXISTING AND DEVELOPED CONDITIONS

BASIN I.D.		SOIL TYPE	CURVE NUMBER	BASIN AREA (acres)	% OF AREA	WEIGHTED CURVE NUMBER	CUMULATIVE CURVE NUMBER
ONEX1	Desert Terrain	236	85	**1.12**	100.00	85	**85**
ONEX2	Desert Terrain	236	85	**0.59**	100.00	85	**85**
ONDEV1	Commercial	236	94	**0.45**	**100**	**94**	**94**
ONDEV2	Rough grade	236	87	**0.42**	**100**	**87**	**87**
ONDEV3	Commercial	236	94	**0.19**	100	94	**94**
ONDEV4	Rough grade	236	87	**0.50**	100	87	**87**

HEC-1 ANALYSES

Existing Condition
Developed Condition

EXISTING CONDITIONS

```
1****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
*               JUN   1998             *                    *    HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.1               *                    *          609 SECOND STREET           *
*                                      *                    *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE   22APR16  TIME  13:40:40  *                    *           (916) 756-1104             *
*                                      *                    *                                      *
****************************************                    ****************************************

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


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

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

1                                                  HEC-1 INPUT                                                  PAGE  1

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

     1           ID        THE TECHNICAL DRAINAGE STUDY FOR
     2           ID                TACO BELL@ LAKE MEAD AND MLK
     3           ID                 CITY OF LAS VEGAS, NEVADA
     4           ID
     5           ID        PREPARED FOR: FIRST STREET DEVELOPMENT
     6           ID
     7           ID        PREPARED BY:
     8           ID                     CIVILWORKS
     9           ID                     4845 W. PATRICK LANE
    10           ID                     LAS VEGAS, NV  89118
    11           ID
    12           ID    TACO BELL @LAKE MEAD AND MARTIN L. KING
    13           ID    EXISTING 100- & 10-YEAR MODEL
    14           ID    FILENAME: TACO-EX.TXT
    15           ID    JOB#15042.00
    16           ID
    17           ID
    18           ID
                 *DIAGRAM
    19           IT       5       0       0     300
    20           IO       5
    21           IN       5
    22           JR    PREC     1.0    0.57
                 *

    23           KK  ONEX1
    24           KM  EXISTING ONSITE BASIN 1
    25           BA  .0018
    26           PB    2.77
    27           PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
    28           PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
    29           PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
    30           PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
    31           PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
    32           PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
    33           PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
    34           PC    .998    .999    1.00
    35           LS       0    85.0
    36           UD   .1040
                 *

    37           KK  ONEX2
    38           KM  EXISTING ONSITE BASIN 2
```

```
      39           BA  .0009
      40           LS       0    85.0
      41           UD   .1000
                   *
      42           ZZ
  1
                   SCHEMATIC DIAGRAM OF STREAM NETWORK
   INPUT
    LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

      23      ONEX1
                   .
                   .
      37           .      ONEX2

   (***) RUNOFF ALSO COMPUTED AT THIS LOCATION


    1****************************************                    ****************************************
    *                                      *                    *                                      *
    *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
    *               JUN   1998             *                    *    HYDROLOGIC ENGINEERING CENTER     *
    *            VERSION 4.1               *                    *          609 SECOND STREET           *
    *                                      *                    *       DAVIS, CALIFORNIA 95616        *
    *  RUN DATE   22APR16  TIME  13:40:40  *                    *           (916) 756-1104             *
    *                                      *                    *                                      *
    ****************************************                    ****************************************



                          THE TECHNICAL DRAINAGE STUDY FOR
                                   HUALAPAI MINI STORAGE
                                    CLARK COUNTY, NEVADA

                          PREPARED FOR: HUALAPAI MINI STORAGE - HUALAPAI AND TOMPKINS

                          PREPARED BY:
                                       CIVILWORKS
                                       4845 W. PATRICK LANE
                                       LAS VEGAS, NV  89118

                     TACO BELL @LAKE MEAD AND MARTIN L. KING
                     EXISTING 100- & 10-YEAR MODEL
                     FILENAME: TACO-EX.TXT
                     JOB#15042.00



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

IT          HYDROGRAPH TIME DATA
                   NMIN           5  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1    0  STARTING DATE
                  ITIME        0000  STARTING TIME
                     NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      2    0  ENDING DATE
                 NDTIME        0055  ENDING TIME
                 ICENT           19  CENTURY MARK

               COMPUTATION INTERVAL     .08 HOURS
                    TOTAL TIME BASE   24.92 HOURS

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

           JP          MULTI-PLAN OPTION
                  NPLAN           1  NUMBER OF PLANS
```

```
      JR          MULTI-RATIO OPTION
           RATIOS OF PRECIPITATION
          1.00       .57
1
```

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00	RATIO 2 .57
HYDROGRAPH AT						
+	ONEX1	.00	1	FLOW	2.	1.
				TIME	3.50	3.58
HYDROGRAPH AT						
+	ONEX2	.00	1	FLOW	1.	0.
				TIME	3.50	3.58

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

DEVELOPED CONDITIONS

```
1****************************************    ****************************************
 *                                      *    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *    *          609 SECOND STREET           *
 *                                      *    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   11MAY16  TIME  15:11:37  *    *           (916) 756-1104             *
 *                                      *    *                                      *
 ****************************************    ****************************************

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

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,

DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION

KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


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

1           ID        THE TECHNICAL DRAINAGE STUDY FOR
2           ID                TACO BELL@LAKE MEAD AND MLK
3           ID                 CITY OF LAS VEGAS, NV
4           ID
5           ID        PREPARED FOR: FIRST STREET DEVELOPMENT
6           ID
7           ID        PREPARED BY:
8           ID                      CIVILWORKS
9           ID                      4845 W. PATRICK LANE
10           ID                      LAS VEGAS, NV  89118
11          ID
12          ID    TACO BELL @LAKE MEAD AND MARTIN L. KING
13          ID    DEVELOPED 100- & 10-YEAR MODEL
14          ID    FILENAME: TACO-DEV.TXT
15          ID    JOB#15042.00
16          ID
17          ID
18          ID
                        *DIAGRAM
19          IT       5       0       0     300
20          IO       5
21          IN       5
22          JR    PREC     1.0    0.57
                      *

23          KK  ONDEV1
24          KM  DEV ONSITE BASIN 1
25          BA  .0007
```

```
26           PB    2.77
27           PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
28           PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
29           PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
30           PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
31           PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
32           PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
33           PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
34           PC    .998    .999    1.00
35           LS       0    94.0
36           UD   .1172
                         *
37           KK  ONDEV2
38           KM  DEV ONSITE BASIN 2
39           BA  .0007
40           LS       0    87.0
41           UD   .1129
                         *

42           KK    CP1
43           KM   COMBINATION POINT 1
44           HC       2
                         *
1                                                    HEC-1 INPUT
PAGE  2

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


45           KK  ONDEV3
46           KM  DEV ONSITE BASIN 3
47           BA  .0008
48           LS       0    94.0
49           UD   .1136
             *

50           KK  ONDEV4
51           KM  DEV ONSITE BASIN 4
52           BA  .0005
53           LS       0    87.0
54           UD   .1095
             *

55           KK   CP2
56           KM   COMBINATION POINT 2
57           HC       2
             *
58           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    23      ONDEV1
                 .
                 .
    37           .      ONDEV2
                 .           .
                 .           .
    42         CP1 ...........
                 .
                 .
    45           .      ONDEV3
                 .           .
                 .           .
    50           .           .      ONDEV4
                 .           .           .
                 .           .           .
```

```
    55           .       CP2  ............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1****************************************    ****************************************
 *                                      *    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *    *          609 SECOND STREET           *
 *                                      *    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   11MAY16  TIME  15:11:37  *    *           (916) 756-1104             *
 *                                      *    *                                      *
 ****************************************    ****************************************



                                THE TECHNICAL DRAINAGE STUDY FOR
                                        TACO BELL@LAKE MEAD AND MLK
                                         CITY OF LAS VEGAS, NV

                                PREPARED FOR: FIRST STREET DEVELOPMENT

                                PREPARED BY:
                                             CIVILWORKS
                                             4845 W. PATRICK LANE
                                             LAS VEGAS, NV  89118

                               TACO BELL @LAKE MEAD AND MARTIN L. KING
                               DEVELOPED 100- & 10-YEAR MODEL
                               FILENAME: TACO-DEV.TXT
                               JOB#15042.00



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

      IT          HYDROGRAPH TIME DATA
                         NMIN           5  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      2    0  ENDING DATE
                       NDTIME        0055  ENDING TIME
                       ICENT          19  CENTURY MARK

                     COMPUTATION INTERVAL     .08 HOURS
                          TOTAL TIME BASE   24.92 HOURS

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

      JP          MULTI-PLAN OPTION
                        NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00       .57
1

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

FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00	RATIO 2 .57
HYDROGRAPH AT						
+	ONDEV1	.00	1	FLOW	1.	1.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ONDEV2	.00	1	FLOW	1.	0.
				TIME	3.58	3.58
2 COMBINED AT						
+	CP1	.00	1	FLOW	2.	1.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ONDEV3	.00	1	FLOW	1.	1.
				TIME	3.50	3.58
HYDROGRAPH AT						
+	ONDEV4	.00	1	FLOW	1.	0.
				TIME	3.58	3.58
2 COMBINED AT						
+	CP2	.00	1	FLOW	2.	1.
				TIME	3.50	3.58

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

HYDRAULIC ANALYSES

FlowMaster Cross Sections

Worksheet for SEC-1_ONDEV1-Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01600	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2055.10
0+13	2054.85
0+32	2054.47
0+56	2053.27
0+75	2053.46
0+85	2053.75
0+95	2053.46
1+49	2054.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2055.10)	(0+13, 2054.85)	0.013
(0+13, 2054.85)	(0+32, 2054.47)	0.016
(0+32, 2054.47)	(0+56, 2053.27)	0.016
(0+56, 2053.27)	(0+75, 2053.46)	0.016
(0+75, 2053.46)	(0+85, 2053.75)	0.035
(0+85, 2053.75)	(0+95, 2053.46)	0.035
(0+95, 2053.46)	(1+49, 2054.00)	0.035

Options

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

Worksheet for SEC-1_ONDEV1-Q10

Results

Normal Depth		0.10	ft
Elevation Range	2053.27 to 2055.10 ft		
Flow Area		0.62	ft²
Wetted Perimeter		12.21	ft
Hydraulic Radius		0.05	ft
Top Width		12.20	ft
Normal Depth		0.10	ft
Critical Depth		0.11	ft
Critical Slope		0.00976	ft/ft
Velocity		1.61	ft/s
Velocity Head		0.04	ft
Specific Energy		0.14	ft
Froude Number		1.26	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.10	ft
Critical Depth	0.11	ft
Channel Slope	0.01600	ft/ft
Critical Slope	0.00976	ft/ft

Cross Section for SEC-1_ONDEV1-Q10

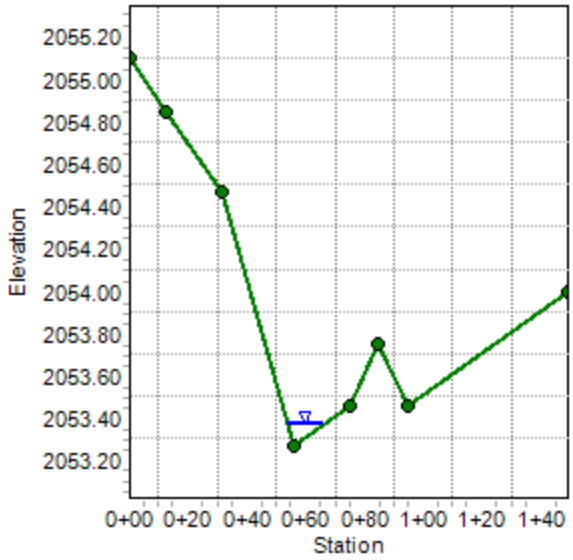
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01600	ft/ft
Normal Depth	0.10	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for SEC-1_ONDEV1-Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01600	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2055.10
0+13	2054.85
0+32	2054.47
0+56	2053.27
0+75	2053.46
0+85	2053.75
0+95	2053.46
1+49	2054.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2055.10)	(0+13, 2054.85)	0.013
(0+13, 2054.85)	(0+32, 2054.47)	0.016
(0+32, 2054.47)	(0+56, 2053.27)	0.016
(0+56, 2053.27)	(0+75, 2053.46)	0.016
(0+75, 2053.46)	(0+85, 2053.75)	0.035
(0+85, 2053.75)	(0+95, 2053.46)	0.035
(0+95, 2053.46)	(1+49, 2054.00)	0.035

Options

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

Worksheet for SEC-1_ONDEV1-Q10

Results

Normal Depth		0.10	ft
Elevation Range	2053.27 to 2055.10 ft		
Flow Area		0.62	ft²
Wetted Perimeter		12.21	ft
Hydraulic Radius		0.05	ft
Top Width		12.20	ft
Normal Depth		0.10	ft
Critical Depth		0.11	ft
Critical Slope		0.00976	ft/ft
Velocity		1.61	ft/s
Velocity Head		0.04	ft
Specific Energy		0.14	ft
Froude Number		1.26	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.10	ft
Critical Depth	0.11	ft
Channel Slope	0.01600	ft/ft
Critical Slope	0.00976	ft/ft

Cross Section for SEC-1_ONDEV1-Q100

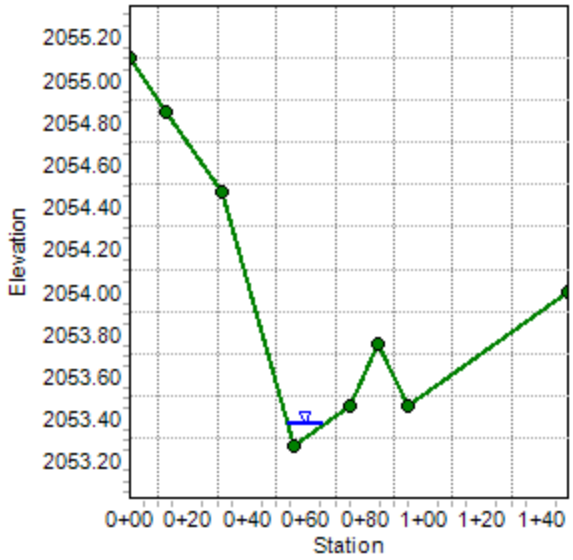
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01600	ft/ft
Normal Depth	0.10	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for SEC-2_ONDEV3-Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2055.10
0+13	2054.85
0+32	2054.47
0+56	2053.27
0+75	2053.46
0+85	2053.75
0+95	2053.46
1+49	2054.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2055.10)	(0+13, 2054.85)	0.013
(0+13, 2054.85)	(0+32, 2054.47)	0.016
(0+32, 2054.47)	(0+56, 2053.27)	0.016
(0+56, 2053.27)	(0+75, 2053.46)	0.016
(0+75, 2053.46)	(0+85, 2053.75)	0.035
(0+85, 2053.75)	(0+95, 2053.46)	0.035
(0+95, 2053.46)	(1+49, 2054.00)	0.035

Options

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

Worksheet for SEC-2_ONDEV3-Q10

Results

Normal Depth		0.13	ft
Elevation Range	2053.27 to 2055.10 ft		
Flow Area		0.96	ft²
Wetted Perimeter		15.16	ft
Hydraulic Radius		0.06	ft
Top Width		15.16	ft
Normal Depth		0.13	ft
Critical Depth		0.11	ft
Critical Slope		0.00976	ft/ft
Velocity		1.04	ft/s
Velocity Head		0.02	ft
Specific Energy		0.14	ft
Froude Number		0.73	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.13	ft
Critical Depth	0.11	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00976	ft/ft

Cross Section for SEC-2_ONDEV3-Q10

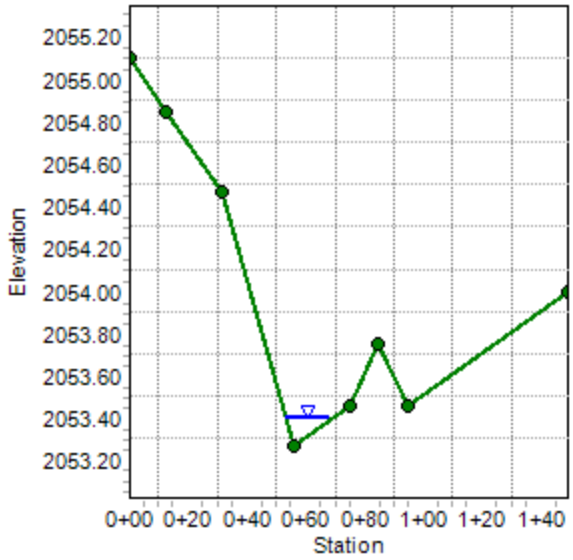
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.13	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for SEC-2_ONDEV3-Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	2055.10
0+13	2054.85
0+32	2054.47
0+56	2053.27
0+75	2053.46
0+85	2053.75
0+95	2053.46
1+49	2054.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 2055.10)	(0+13, 2054.85)	0.013
(0+13, 2054.85)	(0+32, 2054.47)	0.016
(0+32, 2054.47)	(0+56, 2053.27)	0.016
(0+56, 2053.27)	(0+75, 2053.46)	0.016
(0+75, 2053.46)	(0+85, 2053.75)	0.035
(0+85, 2053.75)	(0+95, 2053.46)	0.035
(0+95, 2053.46)	(1+49, 2054.00)	0.035

Options

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

Worksheet for SEC-2_ONDEV3-Q100

Results

Normal Depth		0.13	ft
Elevation Range	2053.27 to 2055.10 ft		
Flow Area		0.96	ft²
Wetted Perimeter		15.16	ft
Hydraulic Radius		0.06	ft
Top Width		15.16	ft
Normal Depth		0.13	ft
Critical Depth		0.11	ft
Critical Slope		0.00976	ft/ft
Velocity		1.04	ft/s
Velocity Head		0.02	ft
Specific Energy		0.14	ft
Froude Number		0.73	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.13	ft
Critical Depth	0.11	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00976	ft/ft

Cross Section for SEC-2_ONDEV3-Q100

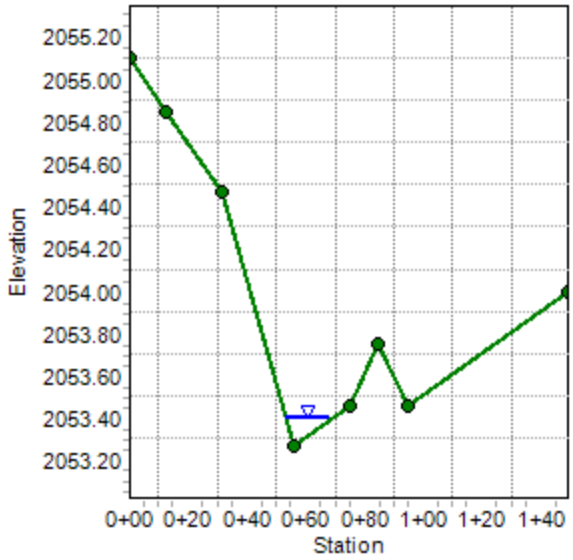
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.13	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for SECTION-S1_LAKE MEAD BLVD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00400	ft/ft
Discharge	1015.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	100.00
0+05	99.90
0+06	99.40
0+07	99.52
0+43	100.24
0+43	100.74
0+57	100.74
0+57	100.24
1+08	99.52
1+10	99.40
1+10	99.90
1+14	100.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 100.00)	(0+05, 99.90)	0.013
(0+05, 99.90)	(0+06, 99.40)	0.013
(0+06, 99.40)	(0+07, 99.52)	0.013
(0+07, 99.52)	(0+43, 100.24)	0.016
(0+43, 100.24)	(0+43, 100.74)	0.013
(0+43, 100.74)	(0+57, 100.74)	0.013
(0+57, 100.74)	(0+57, 100.24)	0.013
(0+57, 100.24)	(1+08, 99.52)	0.016
(1+08, 99.52)	(1+10, 99.40)	0.013

Worksheet for SECTION-S1_LAKE MEAD BLVD

Input Data

Start Station	Ending Station	Roughness Coefficient
(1+10, 99.40)	(1+10, 99.90)	0.013
(1+10, 99.90)	(1+14, 100.00)	0.013

Options

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

Results

Normal Depth		1.84	ft
Elevation Range	99.40 to 100.74 ft		
Flow Area		144.14	ft²
Wetted Perimeter		117.92	ft
Hydraulic Radius		1.22	ft
Top Width		114.00	ft
Normal Depth		1.84	ft
Critical Depth		1.93	ft
Critical Slope		0.00322	ft/ft
Velocity		7.04	ft/s
Velocity Head		0.77	ft
Specific Energy		2.61	ft
Froude Number		1.10	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.84	ft

Worksheet for SECTION-S1_LAKE MEAD BLVD

GVF Output Data

Critical Depth	1.93	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.00322	ft/ft

Cross Section for SECTION-S1_LAKE MEAD BLVD

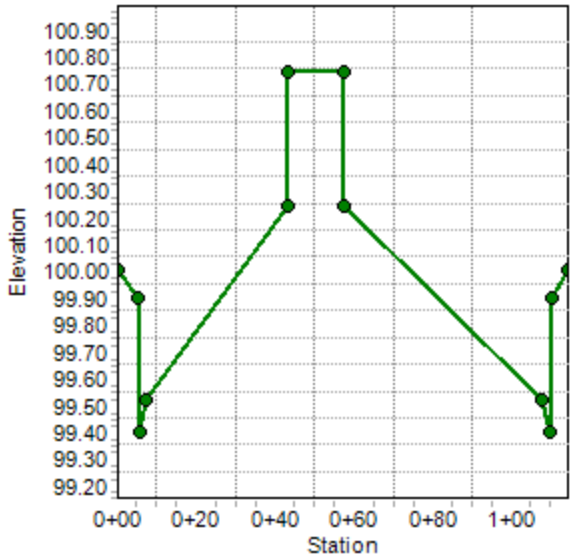
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00400	ft/ft
Normal Depth	1.84	ft
Discharge	1015.00	ft³/s

Cross Section Image



REFERENCE MATERIAL

--Excerpts from the *Technical Drainage Study for Jack-in-the-Box*

Comments are presented in **BOLD** type with the response following:

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

   Understood.

2. **The proposed rip-rap along Lake Mead Boulevard is not in compliance with the approved site development plan review and was denied by City of Las Vegas Current Planning. A stem wall solid grouted to four courses above the back of sidewalk or other erosion control alternatives must be provided.**

   We investigated an alternate means of protecting the referenced project from the high velocities within Lake Mead Boulevard (Approximately 10 fps). We had proposed riprap in our initial submittal but found this to be unacceptable to City of Las Vegas Planning and Development. We have revised our drawings (see enclosed) to replace the proposed riprap with an 8-inch solid grouted block wall constructed to a height of three (3) feet above the gutter flow line elevation. The wall will be adjacent to Lake Mead Boulevard and provide for the 100-year flow depth of 2.5 feet with 0.5 feet of freeboard. Where wall openings cannot be avoided we have returned the wall inward on the downstream side to provide a measure of protection against erosion. In areas where sight visibility prevents the planned wall from being flush with the existing street sidewalk we propose additional sidewalk to create an impervious surface.

3. **The proposed hump at the entrance in Lake Mead Boulevard is not high enough to prevent 100-year flow into the property. Either raise the hump to six inches above the 100-year water surface or obtain a notarized letter from the owner/developer acknowledging the potential inundation of a 100-year event into the subject site. Show the 100-year inundation limit in the grading plan. The letter must be obtained prior to final acceptance of the drainage study.**

   Our solutions is to provide the requested notarized letter and add the 100-year inundation limits (See letter and updated plans enclosed).

4. **The west side parking lot curb must be "L"-type curb and gutter.**

   See updated plan comply with this request.

101 Convention Center Drive, Suite 880 Las Vegas Nevada 89119 Tele. (702)-731-4711 Fax (702)-731-4788
e-✉ CornerStoneLV@aol.com

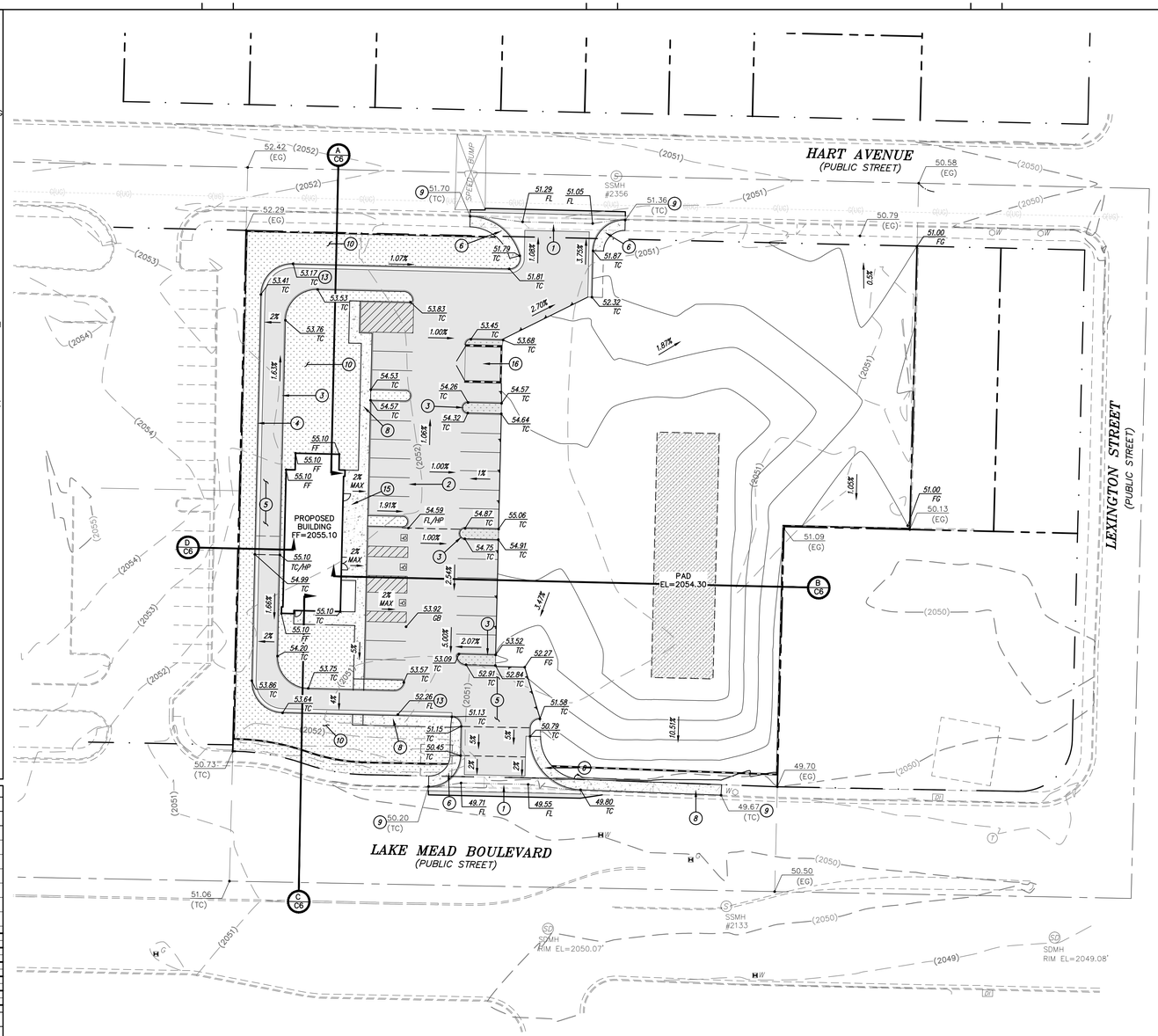
DRAINAGE PLANS

ABBREVIATIONS
(SEE CVR. SHT. FOR COMPLETE LIST)

AC	ASPHALTIC CONCRETE
ADJ	ADJUST
AGG	AGGREGATE
BC	BACK OF CURB
BCR	BEGINNING OF CURB RETURN
BEG	BEGIN
BSW	BACK OF SIDEWALK
CATV	CABLE TV
CCAUSD	CLARK COUNTY AREA UNIFORM STANDARD DRAWING
CCRFCD	CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
CL	CENTERLINE
CLV	CITY OF LAS VEGAS
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
COMM	COMMUNICATIONS
CONC	CONCRETE
COND	CONDUIT
CULV	CULVERT
DC	DEPRESSED CURB
DG	DECOMPOSED GRANITE
DIP	DUCTILE IRON PIPE
DOM	DOMESTIC
ELEC	ELECTRIC
EAC	EDGE OF AC
EC	END OF CURVE
ECR	END OF CURB RETURN
ELEV	ELEVATION
EP	EDGE OF PAVEMENT
EVC	END OF VERTICAL CURVE
EX	EXISTING
FAST	FREEWAY & ARTERIAL SYSTEM OF TRANSPORTATION
FF	FINISH FLOOR
FG	FINISH GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
FO	FIBER OPTICS
FS	FINISHED SURFACE
GB	GRADE BREAK
HDPE	HIGH DENSITY POLYETHYLENE
HDWL	HEADWALL
HGL	HYDRAULIC GRADE LINE
HP	HIGH POINT
INV	INVERT
IRR	IRRIGATION
LAT	LATERAL
LF	LINEAL FEET
LS	LANDSCAPE
LT	LEFT
LVVWD	LAS VEGAS VALLEY WATER DISTRICT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MTR	METER
PB	PULL BOX
PL	PROPERTY LINE
PP	POWER POLE
PROP	PROPOSED
PVC	POLY VINYL CHLORIDE PIPE
PVMT	PAVEMENT
RIM	TOP OF MANHOLE OR CLEANOUT
RT	RIGHT
ROW	RIGHT-OF-WAY
SS	SANITARY SEWER
SD	STORM DRAIN
SNWA	SOUTHERN NEVADA WATER AUTHORITY
STA	STATION
STLT	STREET LIGHT
SVZ	SIGHT VISIBILITY ZONE
SW	SIDEWALK
TEL	TELEPHONE
TC	TOP OF CURB
TF	TOP OF FOOTING
TW	TOP OF WALL
TYP	TYPICAL
UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS
VG	VALLEY GUTTER
WL	WATER LINE

LEGEND

DESCRIPTION	EXISTING	PROPOSED
UTILITIES		
B.O. VALVE		
FIRE HYDRANTS		
CLEAN OUT		
GATE VALVE		
METER		
REDUCER		
CAP		
11.25° ELBOW		
22.5° ELBOW		
45° ELBOW		
90° ELBOW		
CROSS		
TEE		
MANHOLES		
ELECTRICAL	(E)	(E)
SANITARY SEWER	(S)	(S)
STORM DRAIN	(D)	(D)
TELEPHONE	(T)	(T)
STREET LIGHTS		
100W HPS STLT.		
150W HPS STLT.		
200W HPS STLT.		
250W HPS STLT.		
400W HPS STLT.		
GRADING		
SPOT ELEV.	12.3± (TC)	12.34 TC
SLOPE	(1.27%±)	1.23%
5' CONT.	(2005)	2005
1' CONT.	(2007)	2007
SITE		
SIGN		
"L" CURB		
"A" CURB		
EDGE OF PVMT.		
WALL		
LINE TYPES		
CL OR SECTION LINE		
PROPERTY LINE		
RIGHT OF WAY LINE		
EASEMENT LINE		
SAWCUT LINE		
FLOW LINE		
SHADES		
HEAVY AC PAVEMENT		
LIGHT AC PAVEMENT		
CONCRETE PAVEMENT		



CONSTRUCTION NOTES

1. CONSTRUCT COMMERCIAL DRIVEWAY PER CCAUSD #225 WITH GEOMETRICS PER CCAUSD #222.1.
2. CONSTRUCT CROSS GUTTER PER CCAUSD #228.
3. CONSTRUCT 'A' TYPE CURB PER CCAUSD #219.
4. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD #216.
5. CONSTRUCT 0" AC PAVEMENT OVER 0" TYPE II AGGREGATE BASE. (ONSITE)
6. CONSTRUCT ADA RAMPS PER CCAUSD #235, CASE I, A&B=8'.
7. SAWCUT, TRENCH, BACKFILL AND PAVEMENT REPAIR PER CCAUSD #500.1, #500.2, AND #503.
8. CONSTRUCT 5' WIDE CONCRETE DETACHED SIDEWALK PER CCAUSD #234.
9. MATCH EXIST. ELEVATION
10. LANDSCAPE AREA. SEE LANDSCAPE ARCHITECT'S PLANS.
11. SAWCUT AND MATCH EXISTING SECTION.
12. CONSTRUCT RETAINING WALL PER DETAIL-X, ON SHEET-C9
13. CONSTRUCT CURB OPENING
14. CONSTRUCT UNDER SIDEWALK DRAIN PER CCAUSD #238
15. CONSTRUCT CONCRETE WALKWAY
16. TRASH ENCLOSURE SEE ARCHITECTURAL PLANS

STORMWATER MANAGEMENT NOTES:

1. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATED IN, THE PUBLIC RIGHTS OF WAY OF CLARK COUNTY, NEVADA AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.

2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN CLARK COUNTY TITLE 24.40 AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.

3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.

4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPs WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR 100000, SECTION III.A.12.

5. ACCUMULATED SEDIMENT IN BMPs SHALL BE REMOVED WITHIN SEVEN DAYS AFTER STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

GRADING NOTES:

1. SLOPES 4:1 OR STEEPER AND FINE-GRAINED MATERIALS THAT HAVE BEEN DISTURBED (SANDY AND SILTY MATERIALS) SHOULD BE PROTECTED WITH BURLAP OR OTHER EROSION CONTROL FABRIC/MATERIAL UNLESS OTHERWISE SPECIFIED BY LANDSCAPE DRAWINGS AND SPECIFICATIONS OR THE SOILS REPORT.

2. CONTRACTOR SHALL DETERMINE HIS OWN FOOTING OR BASEMENT EXCAVATION QUANTITIES, EVEN THOUGH SHOWN ON ROUGH GRADING PLANS. ADDITIONALLY, STRUCTURE BACKFILL COSTS SHOULD BE INCLUDED IN THE COST OF THE STRUCTURE, UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS.

3. CONTRACTOR SHALL NOTIFY CIVILWORKS INC WITHIN 24 HOURS OF OMISSIONS AND ERRORS DISCOVERED ON PLANS. CIVILWORKS INC WILL NOT BE RESPONSIBLE FOR ANY "CORRECTIVE" WORK DONE BY OTHERS.

FLOODZONE NOTE:

THE SUBJECT LIES WITHIN FEMA ZONE X PER MAP NUMBER 32003C2553F, EFFECTIVE DATE NOVEMBER 16, 2011, INDICATES THE SITE IS LOCATED WITHIN A FEMA ZONE 'X' AND SHADED ZONE 'X'. A ZONE X IS AN AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN. A SHADED ZONE 'X' IS DESCRIBED BY FEMA AS AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN ONE SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM THE 1% ANNUAL CHANCE FLOOD.

N

GRAPHIC SCALE
30 0 15 30 60
(IN FEET)
1 inch = 30 ft.

BENCHMARK

#14LV0121C4 ELEVATION = 2052.15 METERS/2052.32 FEET BEING A RIVET AND PLATE IN TOP OF CURB AT THE SOUTHEAST CORNER OF MARTIN LUTHER KING AND LAKE MEAD BOULEVARD.

BASIS OF BEARING

NORTH 88°39'17" WEST BEING THE CENTER LINE OF HART AVENUE LOCATED IN THE NORTHEAST QUARTER (NE 1/4) OF SECTION 21, TOWNSHIP 20 SOUTH, RANGE 61 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN IN BOOK 142 PAGE 59 OF PLATS, RECORDED IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

GEOTECHNICAL NOTES:

A GEOLOGIST OR GEOTECHNICAL ENGINEER SHALL BE ON SITE DURING EXCAVATION AND MASS GRADING OPERATIONS TO EXAMINE THE SOIL CHARACTERISTICS AND GEOLOGICAL CONDITIONS ENCOUNTERED, AND TO PROVIDE PROFESSIONAL ADVICE TO THE OWNER IN THE EVENT THAT UNANTICIPATED SOIL PROBLEMS ARISE AND/OR SUBSURFACE SITE CONDITIONS ARE FOUND TO BE SIGNIFICANTLY DIFFERENT THAN DEFINED BY PRE-DESIGN EXPLORATION AND TESTING.

CONTRACTOR TO ENSURE POSITIVE DRAINAGE. NO PONDING ALLOWED. CONTRACTOR TO FOLLOW RECOMMENDATIONS AS OUTLINE IN THE PROJECT GEOTECHNICAL REPORT, INCLUDING BUT NOT LIMITED TO EXCAVATION, GRADING AND COMPACTION. REFER TO THE REPORT PREPARED BY:

0000000000000000
DATE: 0000000000000000
PROJECT NUMBER: 0000000000

EARTHWORK QUANTITIES

NOTE: THIS QUANTITY IS FOR ESTIMATING PURPOSES ONLY.CONTRACTOR TO DETERMINE INDEPENDENT ESTIMATIONS.

CUT _____ CY

FILL _____ CY

NOTE:

ALL LANDSCAPE AREAS LOCATED WITHIN 5 FEET OR LESS FROM AN EXISTING OR PROPOSED WALL OR STRUCTURE SHALL BE CONTAINED WITH A SEALED AND/OR WATER TIGHT AREA.

GRADING PLAN CERTIFICATION

JODI E. JORJORIAN PE #13816 DATE:

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH APPROVED DRAINAGE STUDY HTE # FOR THIS SITE ON FILE AT CLARK COUNTY FOR THIS PROJECT.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW

ACCEPTANCE OF PLANS FOR FILING:

BY: _____ DATE: _____

ACCEPTANCE OF THESE PLANS FOR FILING SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS AND/OR SPECIFICATIONS. CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THE CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN. NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION, BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

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

FAST
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you UnderGround 1-702-432-5300

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

architecture/engineering/site planning/interior design
GARY GUY WILSON AIA ARCHITECTS, PC
4945 West Patrick Lane Las Vegas, Nevada 89118 (702)534-7888
professional corp / certified n.c.e.r.b.

CivilWorks inc
engineering with sensible solutions tailored to your specific needs.
4945 W. Patrick Lane Las Vegas, NV 89118
Office#: (702)534-1616 Fax#: (702)534-1825

TACO BELL @ LAKE MEAD AND MLK

NEW COMMERCIAL CONSTRUCTION
FOR: FIRST STREET DEVELOPMENT
LAS VEGAS, NEVADA

GRADING PLAN 1

PROJ.NO.	15043.00
PRIN.ARCH.	G.G.WILSON,AIA
PROJ.ARCH.	GGW
JOB CAPT.	JJC
TECH'N	JEJ
ARCH.CHK.	JLC
PH-2/3	-
PH-4	-
PH-5	-

REVISIONS

PRINTS REQUIRE ARCHITECT'S SEAL & SIGN. FOR PROOF OF VALIDITY

PROFESSIONAL ENGINEER-STATE OF NEVADA
JODI E. JORJORIAN
Exp: 6/30/17
CIVIL
No. 13816

HTE # 00-00000

SHT.NO. C5 OF X

ABBREVIATIONS
(SEE CVR. SHT. FOR COMPLETE LIST)

AC	ASPHALTIC CONCRETE
ADJ	ADJUST
AGG	AGGREGATE
BC	BACK OF CURB
BCR	BEGINNING OF CURB RETURN
BEG	BEGIN
BSW	BACK OF SIDEWALK
CATV	CABLE TV
CCAUSD	CLARK COUNTY AREA UNIFORM STANDARD DRAWING
CCRFCD	CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
CL	CENTERLINE
CLV	CITY OF LAS VEGAS
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
COMM	COMMUNICATIONS
CONC	CONCRETE
COND	CONDUIT
CULV	CULVERT
DC	DEPRESSED CURB
DG	DECOMPOSED GRANITE
DIP	DUCTILE IRON PIPE
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ELEV	ELEVATION
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SD	STORM DRAIN
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TYP	TYPICAL
UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS
VG	VALLEY GUTTER
WL	WATER LINE

LEGEND

DESCRIPTION	EXISTING	PROPOSED
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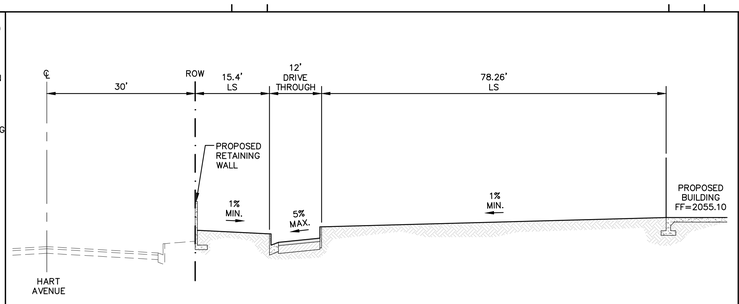
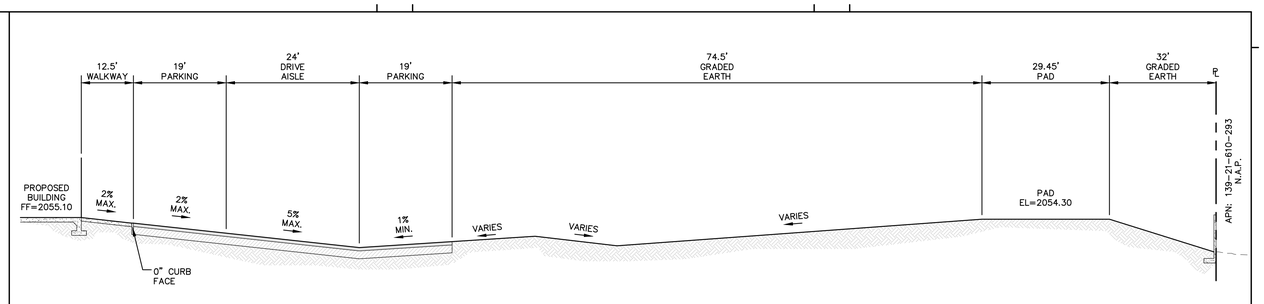
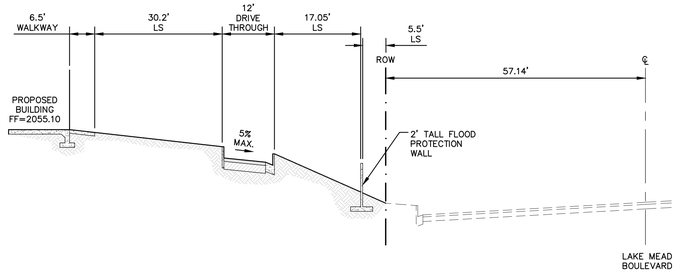
B.O. VALVE		
FIRE HYDRANTS		
CLEAN OUT		
GATE VALVE		
METER		
REDUCER		
CAP		
11.25° ELBOW		
22.5° ELBOW		
45° ELBOW		
90° ELBOW		
CROSS		
TEE		
MANHOLES		
ELECTRICAL	(E)	(E)
SANITARY SEWER	(S)	(S)
STORM DRAIN	(D)	(D)
TELEPHONE	(T)	(T)
STREET LIGHTS		
100W HPS STLT.		
150W HPS STLT.		
200W HPS STLT.		
250W HPS STLT.		
400W HPS STLT.		
GRADING		
SPOT ELEV.	12.3± (TC)	12.34 TC
SLOPE	(1.2%±)	1.23%
5' CONT.	(2005)	2005
1' CONT.	(2007)	2007
SITE		
SIGN		
"L" CURB		
"A" CURB		
EDGE OF PVMT.		
WALL		
LINE TYPES		
CL OR SECTION LINE		
PROPERTY LINE		
RIGHT OF WAY LINE		
EASEMENT LINE		
SAWCUT LINE		
FLOW LINE		
SHADES		
HEAVY AC PAVEMENT		
LIGHT AC PAVEMENT		
CONCRETE PAVEMENT		



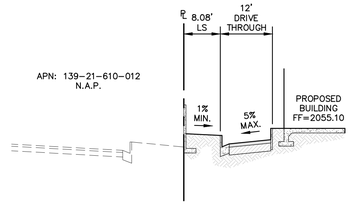
A SECTION
NO SCALE



B SECTION
NO SCALE



C SECTION
NO SCALE



D SECTION
NO SCALE

architecture/engineering/site planning/interior design
GARY GUY WILSON AIA ARCHITECTS, PC
4945 West Patrick Lane
Las Vegas, Nevada 89118
(702)534-7888
professional corp / certified n.c.a.r.b.

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Engineering with sensible solutions tailored to your specific needs.
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Office#: (702)534-1616 Fax#: (702)534-1825

TACO BELL @ LAKE MEAD AND MLK

NEW COMMERCIAL CONSTRUCTION
FOR: FIRST STREET DEVELOPMENT
LAS VEGAS, NEVADA

DETAIL SHEET

PROJ.NO.	15043.00
PRIN.ARCH.	G.G.WILSON,AIA
PROJ.ARCH.	GGW
JOB CAPT.	JJC
TECH'N	JEJ
ARCH.CHK.	JLC
PH-2/3	-
PH-4	-
PH-5	-

REVISIONS

PRINTS REQUIRE ARCHITECT'S SEAL & SIGN. FOR PROOF OF VALIDITY

PROFESSIONAL ENGINEER STATE OF NEVADA
JODI E. JORJORIAN
Exp: 6/30/17
CIVIL
No. 13816

HTE # 00-00000

SHT.NO. C6 OF X