



ARCHITECTURAL CIVIL GROUP

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**TECHNICAL DRAINAGE STUDY
FOR
LIVING GRACE FOURSQUARE CHURCH**

APRIL 2021
Project No: 200279

Prepared by:

ACG Design
4310 Cameron St, Suite 12-A
Las Vegas, NV 89103

Prepared for:

Church International Foursquare Gospel
2400 N. Michael Way
Las Vegas, NV 89108



4/9/2021



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 (CCRFCDD) 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 CCRFCDD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCDD 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	
N/A		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.)

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
n/a		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.
n/a		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.)
n/a		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	
n/a		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.
n/a		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.
n/a		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.
X		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.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
n/a		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.
n/a		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.

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: LIVING GRACE FOURSQUARE CHURCH Date: 04/07/21
Location of Development: a) Descriptive (Cross Streets) North/South: Michael Way
East/West: Smoke Ranch
b) Section: 13 Township: 20 S Range: 60E
c) APN: 138-13-403-001

Name of Owner: Church International Foursquare Gospel
Telephone No.: _____ Fax No.: NA E-Mail Address: _____
Address: 2400 N. Michael Way Las Vegas NV 89108

Contact Person-Name: Hailey Shinton Telephone No.: 702-931-2992
* E-Mail Address: hshinton@acg.design Fax No.: NA
Firm: ACG DESIGN
Address: 4310 CAMERON STREET, SUITE 12-A, LAS VEGAS 89103

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: 2.50 ACRES Being Developed/Disturbed: 2.5 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.): Commerical
5. Approximate upstream land area which drains to the subject site: 0 ACRES
6. Has the site drainage been evaluated in the past? ☐ YES ☒ NO If yes, please identify documentation: _____
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Smoke Ranch Road (neglible) and Michael Way
8. Briefly describe your proposed schedule for the subject project: ASAP



4/9/2021
Engineer's Seal

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

***New Required Field**

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

	Revision	Date
Local Entity File No. _____		

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Living Grace Foursquare Church

Map ID: 138-13-403-001

Firm Name: ACG DESIGN

Engineer: RANDOLPH SKORPINSKI

Address: 4310 CAMERON STREET, SUITE 12-A

City: LAS VEGAS

State: NV

Zip: 89131

Phone Number: 702-569-9157

Fax Number: N/A

Property Owner: **Church International Foursquare**

Address: **2400 N. Michael Way Las Vegas, NV 89108**

City:

State:

Zip:

Reviewed By:

Date Received:

Date Accepted for Review:

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

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

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

I. GENERAL REQUIREMENT

Yes No

X _____ Design Manual **Standard Form 1** with the engineer's seal and signature.

X _____ Design Manual **Standard Form 4**.

X _____ 2 copies of the 24" 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

X _____ A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.

X _____ A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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 and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
☒	☐	Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

Yes	No	
☒	☐	Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
☒	☐	Minimum scale: 1" = 60'.
☒	☐	Project name.
☒	☐	Vicinity Map with local and major cross streets.
☒	☐	Revision box.
☒	☐	North arrow and bar scale.
☒	☐	Engineer's/consultant's address and phone number.
☒	☐	Elevation datum and benchmark.
☒	☐	Legend for symbols and abbreviations.
☒	☐	Cut/fill scarps, where applicable.
☒	☐	Street names, grades, widths.
☒	☐	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
☒	☐	Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.
☒	☐	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
☒	☐	Proposed typical street sections.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes N/A	No	
☐	☐	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 the 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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
N/A		Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
X		Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
X		A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
N/A		Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
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.
X		Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever 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 rights-of-way, including headwater pool inundation.
X		The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
N/A		Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
Mayor

STAVROS S. ANTHONY
Mayor Pro Tem

MICHELE FIORE

CEDRIC CREAR

BRIAN KNUDSEN

VICTORIA SEAMAN

OLIVIA DÍAZ

SCOTT D. ADAMS
City Manager

DEPARTMENT OF PLANNING

ROBERT SUMMERFIELD

DIRECTOR

**DEVELOPMENT
SERVICES CENTER**

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cityoflasvegas
lasvegasnevada.gov

September 9, 2020

First Thai-Loatian Presbyterian Church
2744 Childress Drive
Las Vegas, Nevada 89134

**RE: 20-0071-SUP1 AND 20-0071-SDR1
PLANNING COMMISSION MEETING OF SEPTEMBER 8, 2020**

Dear Applicant:

The Planning Commission at a regular meeting held on *September 8, 2020* voted to recommend **APPROVAL** of the following Land Use Entitlement project requests on 2.50 acres at 2400 North Michael Way (APN 138-13-403-001), R-E (Residence Estates) Zone, Ward 5 (Crear).

20-0071-SUP1 - FOR A CHURCH/HOUSE OF WORSHIP USE.

20-0071-SDR1 - FOR A 16,870 SQUARE-FOOT CHURCH/HOUSE OF WORSHIP.

This approval is subject to the following conditions:

20-0071-SUP1 CONDITIONS

Planning

1. Conformance to all Minimum Requirements under LVMC Title 19.12 for a Church/House of Worship use.
2. Approval of and conformance to the Conditions of Approval for Site Development Plan Review (20-0071-SDR1) shall be required, if approved.
3. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
4. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.

5. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit, as well as submitted as part of any business license application.
6. Prior to or at the time of submittal for any building permit, the applicant shall provide written verification by the FAA and/or the Clark County Department of Aviation of the following:
 - Applicant is required to file a valid FAA Form 7460-1, "Notice of Proposed Construction or Alteration" with the FAA, in accordance with 14 CFR Part 77, or submit to the Clark County Director of Aviation a "Property Owner's Shielding Determination Statement" and request written concurrence from the Clark County Department of Aviation;
 - No Building Permit or other construction permit shall be issued for any structure greater than 35 feet above the surface of land that, based upon the FAA's 7460 airspace determination (the outcome of filing the FAA Form 7460-1) would (a) constitute a hazard to air navigation, (b) would result in an increase to minimum flight altitudes during any phase of flight (unless approved by the Department of Aviation), or (c) would otherwise be determined to pose a significant adverse impact on airport or aircraft operations.
 - Applicant is advised that FAA's airspace determinations are dependent on petitions by any interested party and the height that will not present a hazard as determined by the FAA may change based on these comments.
7. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

20-0071-SDR1 CONDITIONS

Planning

1. Approval of and conformance to the Conditions of Approval for Special Use Permit (20-0071-SUP1) shall be required, if approved.
2. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
3. All development shall be in conformance with the site plan and landscape plan date stamped on 08/24/20, and the building elevations date stamped on 09/02/20, except as amended by conditions herein.

4. An Exception from 19.06.0400 is hereby approved to allow 24-inch box trees to be planted at 35 feet on center where 20 feet is required along right-of-way lines.
5. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
6. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
7. A technical landscape plan, signed and sealed by a Registered Architect, Landscape Architect, Residential Designer or Civil Engineer, must be submitted prior to or at the same time application is made for a building permit. A permanent underground sprinkler system is required, which shall be permanently maintained in a satisfactory manner; the landscape plan shall include irrigation specifications. Installed landscaping shall not impede visibility of any traffic control device.
8. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.
9. Prior to or at the time of submittal for any building permit, the applicant shall provide written verification by the FAA and/or the Clark County Department of Aviation of the following:
 - Applicant is required to file a valid FAA Form 7460-1, "Notice of Proposed Construction or Alteration" with the FAA, in accordance with 14 CFR Part 77, or submit to the Clark County Director of Aviation a "Property Owner's Shielding Determination Statement" and request written concurrence from the Clark County Department of Aviation;
 - No Building Permit or other construction permit shall be issued for any structure greater than 35 feet above the surface of land that, based upon the FAA's 7460 airspace determination (the outcome of filing the FAA Form an increase to minimum flight altitudes during any phase of flight (unless approved by the Department of Aviation), or (c) would otherwise be determined to pose a significant adverse impact on airport or aircraft operations.7460-1) would (a) constitute a hazard to air navigation, (b) would result in
 - Applicant is advised that FAA's airspace determinations are dependent on petitions by any interested party and the height that will not present a hazard as determined by the FAA may change based on these comments.
 - Applicant is advised that the FAA's airspace determinations include expiration dates and that the separate airspace determinations will be needed for construction cranes or other temporary equipment.

10. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

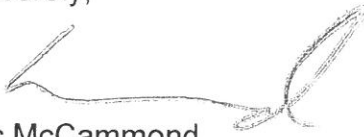
Public Works

11. Prior to the issuance of any permits, dedicate an additional 10-feet of right-of-way for a total half street width of 40-feet on Michael Way and the right turn lane/bus turnout on Smoke Ranch Road as shown on the site plan. Additionally, grant a Bus Shelter Pad Easement on Smoke Ranch Road adjacent to this site prior to the issuance of permits unless the Regional Transportation Commission (RTC) acknowledges in writing that this easement is not required.
12. Construct all incomplete half-street improvements on Michael Way meeting current City Standards concurrent with development of this site. All existing paving damaged or removed by this development shall be restored at its original location and to its original width concurrent with development of this site.
13. The sidewalk along Smoke Ranch Road adjacent to this site shall meet Public Right-of-Way Accessibility Guidelines (PROWAG) in accordance with code requirements of Title 13.56.040 to the satisfaction of the City Engineer concurrent with development of this site.
14. This site shall connect to the public sewer line in Michael Way.
15. Submit a License Agreement for landscaping and private improvements in the public rights of way, if any, adjacent to this site prior to this issuance of permits for these improvements. The applicant must carry an insurance policy for the term of the License Agreement and add the City of Las Vegas as an additionally insured entity on this insurance policy. If requested by the City, the applicant shall remove property encroaching in the public right-of-way at the applicant's expense pursuant to the terms of the City's License Agreement. The installation and maintenance of all private improvements in the public right of way shall be the responsibility of the adjacent property owner(s) and shall be transferred with the sale of the property for the entire term of the License Agreement.
16. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or submittal of any construction drawings, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.

20-0071-SUP1 AND 20-0071-SDR1 - Page Five
September 9, 2020

This item will be considered by the City Council on October 21, 2020. This meeting will be held at 9:00 A.M. at the Council Chambers of City Hall, 495 South Main Street, Las Vegas, Nevada. ***The Council requires that you or your representative be present at this meeting.*** If you or your representative chooses not to attend, the City Council may act in your absence without your input.

Sincerely,

A handwritten signature in black ink, appearing to read 'Eric McCammond', with a stylized flourish at the end.

Eric McCammond
Senior Management Analyst
Case Planning Division

EM:nl

cc:

Pastor Richard Box
Living Grace Fourquare Church
3013 North Rancho Drive, Ste. 128
Las Vegas, Nevada 89130

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I. INTRODUCTION

Church International Foursquare Gospel is proposing commercial development at the northwest corner of Smoke Ranch Road and Michael Way within City of Las Vegas. The purpose of this report is to present a detailed hydrologic and hydraulic analysis for the existing and developed onsite and offsite conditions and determine adequate protection for the project from offsite and onsite flows. The following tasks were performed in the preparation of this report:

- Identify previous drainage studies for the project site and surrounding areas.
- Identify the FEMA floodplain designation for the project site.
- Identify existing and proposed regional drainage facilities adjacent to the site.
- Estimate runoff generated for the peak 10-year, and 100-year return period storms for existing and proposed conditions.
- Recommend drainage facilities to protect the site from storm runoff.

II. LOCATION AND DESCRIPTION

The project site is located in Section 13, Township 20 South, Range 60 East, M.D.M., within Las Vegas, Nevada. The Assessor's Parcel Number is 138-13-403-001. The site is bordered on the North and West by existing residential development, the East by Michael Way, and the South by Smoke Ranch Road. Please refer to **Figures 1 and 2** for the vicinity and location of the project site. The existing site is comprised of undeveloped land. The project site generally slopes east. The existing site consists of approximately 2.5 acres zoned Residence Estates District (R-E).

III. FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD HAZARD ANALYSIS

The Special Flood Hazard Areas (SFHA) for Clark County, Nevada and incorporated areas are outlined in the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps. The project site lies within FIRM Community Panel 32003C2155F. Per the FIRM panel, the site lies in unshaded Zone X, areas determined to be outside 0.2% annual chance floodplain. Refer to **Figure 3** for FIRM Panel.

IV. CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) FACILITIES

Figure 4A and 4B are reproduced from Figure F-24 of the 2018 Clark County Regional Flood Control District (CCRFCD) Master Plan Update (Reference 3). This figure depicts the project site in relation to existing and proposed CCRFCD Facilities. As shown on the figure, the site is adjacent to existing and proposed CCRFCD Facilities. A 54" RCP currently existing within Smoke Ranch Road that is designed to contain 1,483 cfs. Future improvements propose to replace the existing 54" RCP with a 10' x 8' RCB, which is also designed to contain 1,483 cfs.

V. REVIEWED/REFERENCED DRAINAGE STUDIES

While numerous drainage studies were reviewed for the area, they are over twenty years old and not utilized as reference material for the subject drainage study.



FIGURE 1
VICINITY MAP

This map is for assessment use only and does NOT represent a survey.
No liability is assumed for the accuracy of the data delineated herein.
Information on roads and other non-assessed parcels may be obtained from the Road Document Listing in the Assessor's Office.

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

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

0 100 200 300 400 500 600 700 800 900

ASSESSOR'S PARCELS - CLARK COUNTY, NV.
Briana Johnson - Assessor

MAP LEGEND

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

T20S R60E

126	125	124	12
137	138	139	14
164	163	162	16

13

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

S 2 SW 4

138-13-4

Scale: 1" = 200'

Rev: 1/8/2019



PROJECT SITE

TAX DIST 200

FIGURE 2

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 to 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. 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, NNGS12
National Geodetic Survey
SSM-C-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.

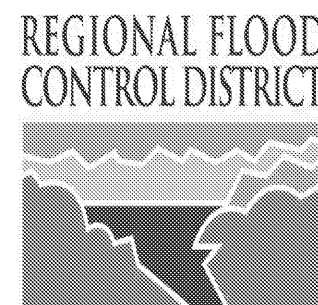
For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the 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 base map for this DFIRM.

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



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, vehicles also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently identified. 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
- Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

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

- Cross section line
- Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 1000-meter Universal Transverse Mercator grid ticks, zone 11
- 5000-foot grid ticks: Nevada State Plane coordinate system, east zone (FIPSZONE 2701), Transverse Mercator
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- River Mile

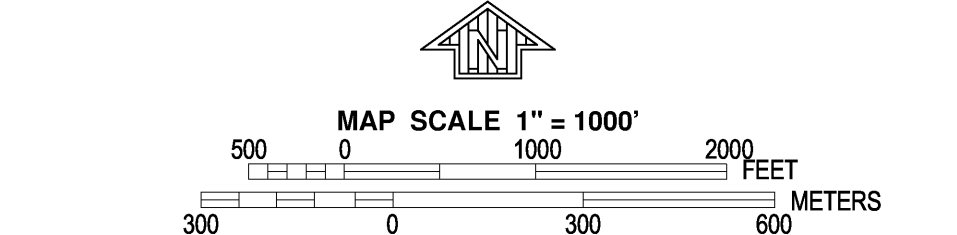
MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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.



PANEL 2155F

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

PANEL 2155 OF 4090
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

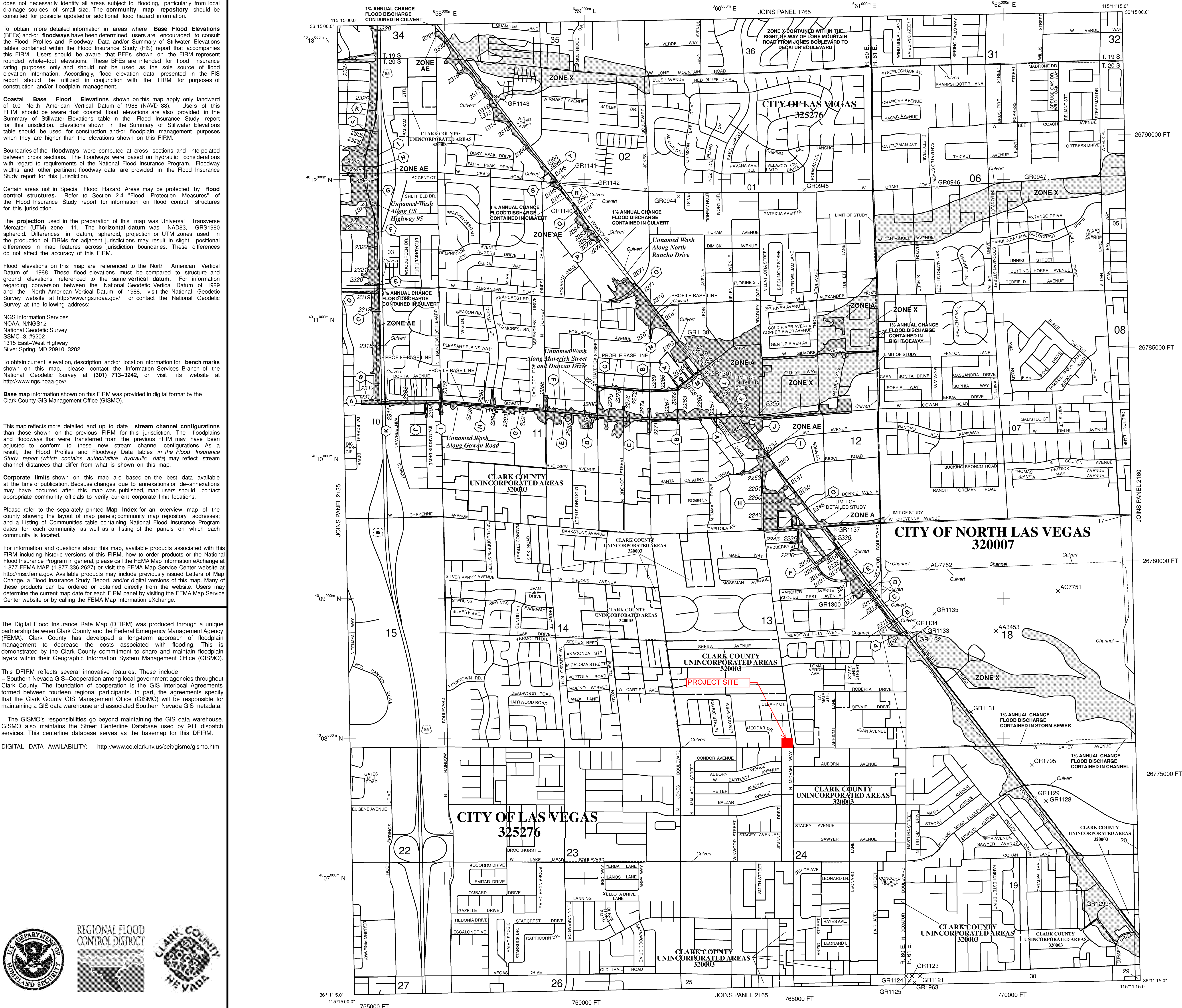
COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY	320003	2155	F
LAS VEGAS, CITY OF	325276	2155	F
NORTH LAS VEGAS, CITY OF	320007	2155	F

Notes 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
32003C2155F

MAP REVISED
NOVEMBER 16, 2011

Federal Emergency Management Agency





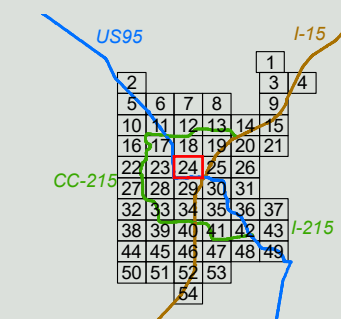
LEGEND

- ### Remove & Replace/Parallel Facilities

-

Scale: 1 inch = 2,000 feet

AerialSource:Esri World Imagery 2017



ATKINS
Member of the SNC-Lavalin Group



ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOOF		GOWAN OUTFALL FACILITIES						
0485	E	90" RCP	1080	630	DGOW2A	GOW3B	1.37	0.47
0486	E	8" X 5' RCB	3200	630	DGOW2A	GOW3B	1.37	0.60
0511	E	8" X 5' RCB	8390	740	CPT6B-C	GOW3B	1.08	0.50
LAAS		NORTH LAS VEGAS AIR TERMINAL - SIMMONS						
0000	E	14" X 6" RCB	580	728	CR2-CA	NW3	2.57	0.50
0014	E	9" X 6" RCB	1489	728	CR2-CA	NW3	2.57	1.44
0040	E	8" X 6" RCB	1111	728	CR2-CA	NW3	2.57	1.74
0060	E	10" X 6" RCB	864	728	CR2-CA	NW3	2.57	0.60
0080	E	66" RCP	157	294	R-C	NW3	0.27	0.50
0083	E	60" RCP	627	294	R-C	NW3	0.27	1.42
0095	E	54" RCP	373	294	R-C	NW3	0.27	1.44
0103	E	48" RCP	400	294	R-C	NW3	0.27	1.75
LAAT		NORTH LAS VEGAS AIR TERMINAL						
0000	E	3: 8" X 5' RCB	650	1364	CB3-1	NW3	4.17	0.50
0006	E	CONC CHNL 20"W 8'D 1.5:1 SS	380	1364	CB3-1	NW3	4.17	0.50
0014	E	10" X 6" RCB	934	1364	CB3-1	NW3	4.17	1.84
0031	E	10" X 6" RCB	1618	1105	CB3-2	NW3	3.87	1.05
0062	E	12" X 8" RCB	511	1105	CB3-2	NW3	3.87	0.50
0070	E	12" X 6" RCB	376	1105	CB3-2	NW3	3.87	0.56
0078	E	10" X 6" RCB	1055	1105	CB3-2	NW3	3.87	0.58
0098	E	10" X 4" RCB	2207	696	CCA1-C	NW3	2.98	0.60
0140	E	CONC CHNL 6"W 4'D 1.5:1 SS	338	696	CCA1-C	NW3	2.98	0.64
0146	E	CONC CHNL 6"W 3'D 1.5:1 SS	1388	696	CCA1-C	NW3	2.98	0.68
0172	E	76" X 48" HERCP	536	494	CA1-C	NW3	2.77	0.75
0182	E	CONC CHNL 6"W 3'D 1.5:1 SS	997	494	CA1-C	NW3	2.77	0.83
0201	E	CONC CHNL 6"W 3'D 1.5:1 SS	184	494	CA1-C	NW3	2.77	0.37
0204	E	48" RCP	425	494	CA1-C	NW3	2.77	0.37
LANO		NORTH LAS VEGAS AIR TERMINAL NORTH						
0000	E	CONC CHNL 0"W 3'D 1.5:1 SS	470	494	CA1-C	NW3	2.77	0.30
0010	P	6" X 4' RCB	3375	211	DA1-C	NW3	2.46	1.13
LOCH		LAS VEGAS CREEK CHANNEL						
0013	E	2: 12" X 6" RCB	2035	3050	CLC20-C	MEADOWS4	9.60	0.82
0051	E	2: 14" X 7" RCB	3113	3050	CLC20-C	MEADOWS4	9.60	0.60
0110	E	TRANSITION STRUCTURE	220	3001	CLC16-C	MEADOWS4	9.50	
0114	E	2: 14" X 7" RCB	670	2386	CRMEDET	MEADOWS4	8.19	0.80
0127	E	TRANSITION STRUCTURE	110	2386	CRMEDET	MEADOWS4	8.19	
0129	E	2: 14" X 7" RCB	1130	2386	CRMEDET	MEADOWS4	8.19	0.50
0150	E	2: 13" X 7" RCB	200	2386	CRMEDET	MEADOWS4	8.19	0.95
0154	E	TRANSITION STRUCTURE	190	2386	CRMEDET	MEADOWS4	8.19	
0157	E	2: 12" X 6" RCB	1650	1700	CLC14-C	SW3	2.93	1.06
0188	E	2: 12" X 6" RCB	2225	1700	CLC14-C	SW3	2.93	1.36
0230	E	12" X 6" RCB	2140	1450	CLC14-C	SW3	2.53	1.74
0270	E	12" X 6" RCB	1705	814	CCWA02-C	SW3	1.84	0.54
0302	E	8" X 6" RCB	3940	814	CCWA02-C	SW3	1.84	2.49
0377	E	10" X 7" RCB	1226	814	CCWA02-C	SW3	1.84	0.74
0400	E	TRANSITION STRUCTURE	110	458	CWA02-C	SW3	1.47	0.49
0402	E	8" X 6" RCB @ JONES	535	458	CWA02-C	SW3	1.47	0.49
0412	E	60" RCP	1370	458	CWA02-C	SW3	1.47	1.08
0438	E	60" RCP	1090	171	CLC01-C	SW3	1.20	1.60
0458	E	60" RCP	1060	171	CLC01-C	SW3	1.20	1.60
0478	E	60" RCP	1110	171	CLC01-C	SW3	1.20	0.55
0499	E	42" RCP OUTLET	660	87	RAINBOWDB	SW3	1.11	1.88
0513	E	102 AC-FT RAINBOW DETENTION BASIN		1027	RAINBWIN	SW3	1.11	
LCDE		LAS VEGAS CREEK - DECATUR						
0000	E	6" X 5' RCB	1800	430	LC11-C	SW3	0.38	1.26
0034	E	72" RCP	700	430	LC11-C	SW3	0.38	0.50
LCJO		LAS VEGAS CREEK - JONES						
0000	E	6" X 6" RCB	380	381	AL01B-C	SW3	0.37	0.50
0007	E	6" X 5' RCB	675	381	AL01B-C	SW3	0.37	0.62
LCLO		LAS VEGAS CREEK - LORENZI						
0000	E	7" X 6" RCB	445	285	DAL00A	SW3	0.41	3.37
ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LCLO		LAS VEGAS CREEK - LORENZI						
0008	E	7" X 6" RCB	2983	285	DAL00A	SW3	0.41	0.40
LCLT		LAS VEGAS CREEK - LATERAL						
0000	E	6" X 6" RCB	620	250	WA10D	SW3	0.40	0.50
0006	E	CONC CHNL 10"W 4'D 0:1 SS	1230	125^	WA10D^	SW3	0.40	0.62
0007	E	23" x 14" HERCP	1230	125^	WA10D^	SW3	0.40	0.62
0033	E	10" X 4" RCBC @ WASHINGTON	96	372	WA10-C	SW3	0.40	0.50
0034	E	GRASS CHNL 12"W 5'D 1:1 SS	1750	372	WA10-C	SW3	0.40	0.20
LCME		LAS VEGAS CREEK - MEADOWS						
0000	E	14" X 8" RCB	895	1484	MEADOWDB	SW3SC	5.67	0.72
0016	E	STILLING BASIN	140	1484	MEADOWDB	SW3SC	5.67	0.21
0017	E	3,300 CFS SPILLWAY (REPLACE W/ LCME0018)		3300	MEADOWDB	SW3SC	5.67	
0018	P	MODIFY SPILLWAY, RAISE HEIGHT BY 1' (REPLACES LCME0017)		3300	MEADOWDB	SW3SC	5.67	
0019	E	1: 11" X 5' RCB AND 1: 11.5' X 5' RCB	110	1484	MEADOWDB	SW3SC	5.67	0.81
0020	E	213 AC-FT MEADOWS DETENTION BASIN		4909	MEADOWIN	SW3SC	7.55	
LCRA		LAS VEGAS CREEK - RANCHO						
0000	E	12" X 8" RCB	380	931	CLC16-C	SW3	1.71	0.60
0004	E	12" X 6" RCB	2367	931	CLC16-C	SW3	1.71	0.77
0050	E	8" X 6" RCB	355	694	WA13D	SW3	1.39	0.50
LMDE		LAKE MEAD BOULEVARD - DECATUR BRANCH						
0000	P	10" X 5' RCB	2640	673	DCVG04-C	NW3	1.25	0.90
LV15		FREEWAY CHANNEL						
0372	E	9" X 6" RCB	1970	1152	CWA20-C	NW3	4.52	0.66
0409	E	7" X 6" RCB	815	841	CVG07	NW3	4.09	0.91
0424	E	10" X 5' RCB	130	841	CVG07	NW3	4.09	0.40
0427	E	8" X 6" RCB	2411	841	CVG07	NW3	4.09	0.60
0460	E	6" X 5' RCB	1242	253	CCWA13-C	NW3	3.31	1.50
0472	E	60" RCP	713	410	WA15A-C	NW3	0.43	0.30
0474	E	5" X 5' RCB	1625	253	CCWA13-C	NW3	3.31	1.00
0528	P	8" X 8" RCB	4420	959	CWA13-C	SW3	1.39	1.19
0602	P	2: 66" RCP	5980	551	CWA09-C	SW3	0.63	1.59
LVLN		LAS VEGAS WASH - LAKE MEAD						
0059	E	72" RCP (REPLACE W/ LVLN0060)	5952	1159	CLM20-C	NW3SC	1.36	0.66
0060	P0	12" X 7" RCB (REPLACES LVLN0059)	5952	1159	CLM20-C	NW3SC	1.36	0.66
0170	E	78" RCP	2421	454	CLM16A-C	NW5	12.15	1.17
0221	P	48" RCP OUTLET	270	195	DR2	NW4	11.77	
0222	E	48" RCP OUTLET	500	368	DCAREY	NW4	11.77	
0224	E	36" RCP	2429					0.53
0225	E	90" RCP (REPLACE W/ LVLN0226)	641	2077	CLM10-C	NW3	3.01	1.35
0226	P0	2: 10" X 9" RCB (REPLACES LVLN0225)	641	2077	CLM10-C	NW3	3.01	0.50
0227	E	10,000 CFS PMF SPILLWAY		10000	CARYLMDB	NW4	11.77	
0228	E	607 AC-FT CAREY-LAKE MEAD DETENTION BASIN		5499	CARYLMIN	NW4	11.78	
0270	E	90" RCP (REPLACE W/ LVLN0271)	3473	2077	CLM10-C	NW3	3.01	1.35
0271	P0	12" X 8" RCB (REPLACES LVLN0270)	3473	2077	CLM10-C	NW3	3.01	1.35
0336	E	84" RCP (REPLACE W/ LVLN0337)	1050	1769	CLM06-C	NW3	2.60	1.16
0337	P0	12" X 8" RCB (REPLACES LVLN0336)	1050	1769	CLM06-C	NW3	2.60	1.16
0355	E	90" RCP (REPLACE W/ LVLN0356)	1840	1769	CLM06-C	NW3	2.60	0.40
0356	P0	12" X 11" RCB (REPLACES LVLN0355)	1840	1769	CLM06-C	NW3	2.60	0.40
0388	E	84" RCP	520	913	CLM05-C	NW3	1.00	1.40
0399	E	78" RCP	803	913	CLM05-C	NW3	1.00	1.07
0416	E	72" RCP	1320	913	CLM05-C	NW3	1.00	1.00
0442	E	60" RCP	725	591	CLM03-C	NW3	0.63	1.28
0453	E	54" RCP	589	591	CLM03-C	NW3	0.63	2.37
0460	E	54" RCP	1464	591	CLM03-C	NW3	0.63	2.05
0475	E	48" RCP	2632	242	LM02-C	NW3	0.29	1.24
0525	E	48" RCP	2600	565	CLM01-C	NW3	0.64	1.24
LVOW		OWENS AVENUE SYSTEM						
0003	E	96" RCP	7500	1219	CLM16B-C	NW3	2.43	0.70
0146	E	84" RCP	4800	570	DCVG20-C	NW3	2.04	0.90
0241	E	72" RCP	4832	416	CVG20-C	NW3	1.56	1.65
0327	E	7" X 5' RCB	360	416	CVG20-C	NW3	1.56	1.26
0351	E	72" RCP	2250	837	CVG04-C	NW3	1.25	1.44
ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVOW		OWENS AVENUE SYSTEM						
0355	E	8" X 5' RCB	491	837	CVG04-C	NW3	1.25	0.40
0360	P	8" X 6" RCB	2300	837	CVG04-C	NW3	1.25	1.48
0460	P	7" X 6" RCB	2700	615	CVG03-C	NW3	0.95	1.48
0513	P	8" X 5' RCB	2615	463	CVG02-C	NW3	0.68	1.68
LVPK		PEAK DRIVE SYSTEM						
0000	E	CONC CHNL 15"W 6'D 0:1 SS	606	1081	CPD04B-C	NW3	1.59	1.22
0019	E	CONC CHNL 20"W 5.5'D 0:1 SS	2190	1081	CPD04B-C	NW3	1.59	0.57
0056	E	10" X 5' RCB	103	723	CCY04A-C	NW3	1.12	0.40
0058	E	9" X 6" RCB	2542	723	CCY04A-C	NW3	1.12	0.95
0104	E	10" X 6" RCB	76	723	CCY04A-C	NW3	1.12	1.26
0106	E	7" X 5' RCB	1235	723	CCY04A-C	NW3	1.12	0.61
0130	E	7" X 5' RCB	1435	383	CPD01-C	NW3	0.67	0.61
LVRA		LAS VEGAS WASH - RANCHO						
0000	E	12" X 8" RCB	612	1438	CCPD04BC	NW3	3.77	1.56
0012	E	12" X 8" RCB	2838	1438	CCPD04BC	NW3	3.77	0.78
0066	E	14" X 5' RCB	65	1438	CCPD04BC	NW3	3.77	1.22
LVSR		LAS VEGAS WASH - SMOKE RANCH						
0070	E	66" RCP (REPLACE W/ LVSR0071)	4118	1086	CS1-C	NW3SC	1.42	0.73
0071	P	10" X 8" RCB (REPLACES LVSR0070)	4118	1086	CS1-C	NW3SC	1.42	0.73
0148	E	54" RCP (REPLACE W/ LVSR0149)	2587	823	CS	NW3SC	0.95	0.58
0149	P	11" X 6" RCB (REPLACES LVSR0148)	2587	823	CS	NW3SC	0.95	0.58
0197	E	30" RCP (REPLACE W/ LVSR0198)	581	368	CR2-C	NW3SC	0.38	0.86
0198	P	8" X 4" RCB (REPLACES LVSR0197)	581	368	CR2-C	NW3SC	0.38	0.86
0208	E	54" RCP (REPLACE W/ LVSR0209)	2060	368	CR2-C	NW3SC	0.38	1.41
0209	P	7" X 4" RCB (REPLACES LVSR0208)	2060	368	CR2-C	NW3SC	0.38	1.41
0210	E	14" X 8" RCB	800	3092	CB1-C	NW3	6.34	1.73
0221	E	TRANSITION STRUCTURE	100	30				

VI. HYDROLOGY

The methodology presented in this study is in compliance with the CCRFCD Hydrologic Criteria and Drainage Design Manual (Reference 3, hereinafter referred to as the Manual).

The existing and developed drainage basins were determined from aerial photography, field investigations and boundary and topographical survey. The watersheds were modeled using the SCS Unit Hydrograph method within the U.S. Army Corps of Engineers HEC-1 Flood Hydrograph Package.

Precipitation - The project site is located within the McCarran Rainfall Area as identified in the Manual, Figure 513. The 6-hour depths used for the HEC-1 analysis are 1.58 inches for the 10-year storm event and 2.77 inches for the 100-year storm event, per Rainfall Depth-Duration-Frequency Table 505. Reference material has been provided in Appendix C.

Curve Numbers (CN) – The project site is within Hydrologic Soils Group D.

For the Existing condition, the CN value of 88 for the subject site was determined per Table 602, 1 of 4 of the Manual. For the Developed condition, the CN value of 95 for the subject site was utilized using Table 602, 1 of 4 of the Manual.

Drainage Areas and Flow Patterns - The subbasins and flow patterns used for the hydrologic modeling were determined from digital grading and design files for site.

Onsite & Offsite Basin Analysis – Two conditions were utilized to estimate onsite and offsite flows impacting the proposed site. The conditions are Existing and Developed, which are further explained. No further development is anticipated within the area after this project is completed.

Lag Time - The lag time (TLAG) is described as the time between the center of mass of rainfall and the time of peak discharge from a basin. Lag Time can be related to time of concentration (Tc) by the following relationship: $TLAG = 0.6 (Tc)$. The time of concentration (Tc) is defined as the time required for runoff to flow from the most hydraulically distant area of the basin to the outlet of the basin or a design point. The procedure for calculating (Tc) is outlined in Section 602 of the Manual. Lag Time calculations for the drainage subbasins have been included in Appendix A on Standard Form 4.

VII. EXISTING CONDITION

For the Existing condition, the hydrologic analysis consists of 1 onsite basin and two offsite basins. The site generates a total of 6 cfs under Existing Conditions for the 100-year storm event. **Figure 5** depicts the basins and drainage patterns used in the Existing Conditions hydrologic analysis. An Existing Condition HEC-1 model has been included in Appendix A. **Table 1** summarizes the HEC-1 results for Existing Conditions.

The first offsite basin, SMOKE RANCH, represents the flow within Smoke Ranch Road, adjacent to the subject site. The existing flow within Smoke Ranch Road was determined per the City of Las Vegas Northwest Neighborhood Study, Figure E-16. The flow prior to the intersection of Michael Way is 263 cfs and 866 cfs for the 10-year and 100-years storm respectively. The existing facility within Smoke Ranch Road captures 231 cfs within the existing storm drain system, therefore the surface flow within Smoke Ranch Road is 32-cfs and 635-cfs for the 10-year and 100-year storm flows.

The second offsite basin, MICHAEL, represents the flow within Michael Way, adjacent to the subject site. The existing flow within Michael Way prior to the intersection of Smoke Ranch Road was determined per the City of Las Vegas Northwest Neighborhood Study, Figure E-16. Only half street improvements within the existing condition, there is no curb, gutter or sidewalk on the west side of Michael Way. The flow prior to the intersection of Michael Way is 36 cfs and 83 cfs for the 10-year and 100-years storm respectively.

Onsite basin, EX1, represents the subject site, existing flow is conveyed west to east towards Michael Way. The calculated flows are 3-cfs and 6-cfs for the 10-year and 100-year storm events, respectively.

Table 1: Summary of Existing Conditions

BASIN	AREA (AC)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
SMOKE RANCH	n/a	263	866
MICHAEL	n/a	36	83
EX1	2.50	3	6

Existing Condition Street Flow Summary:

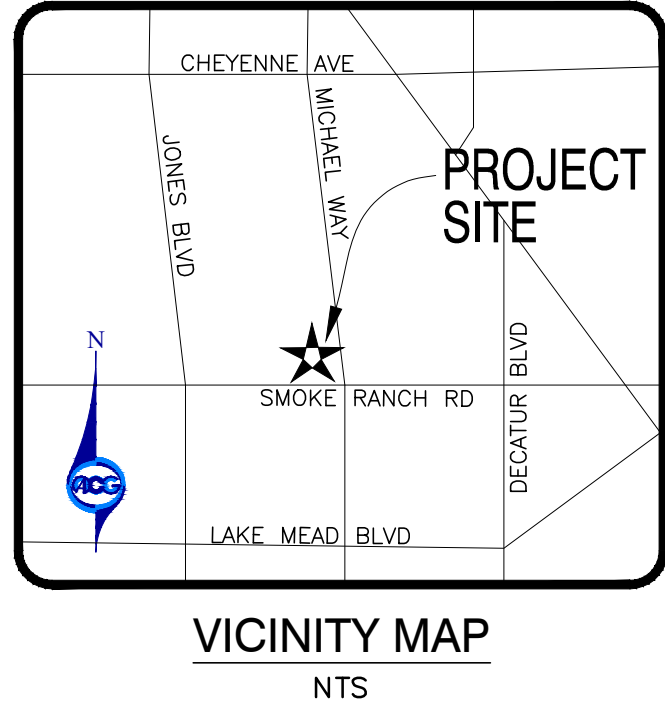
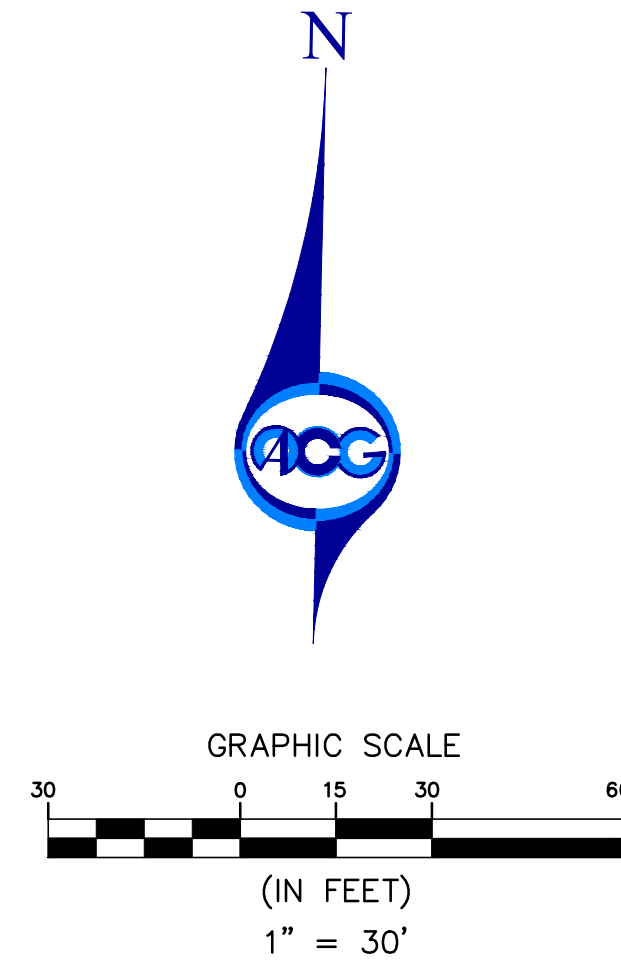
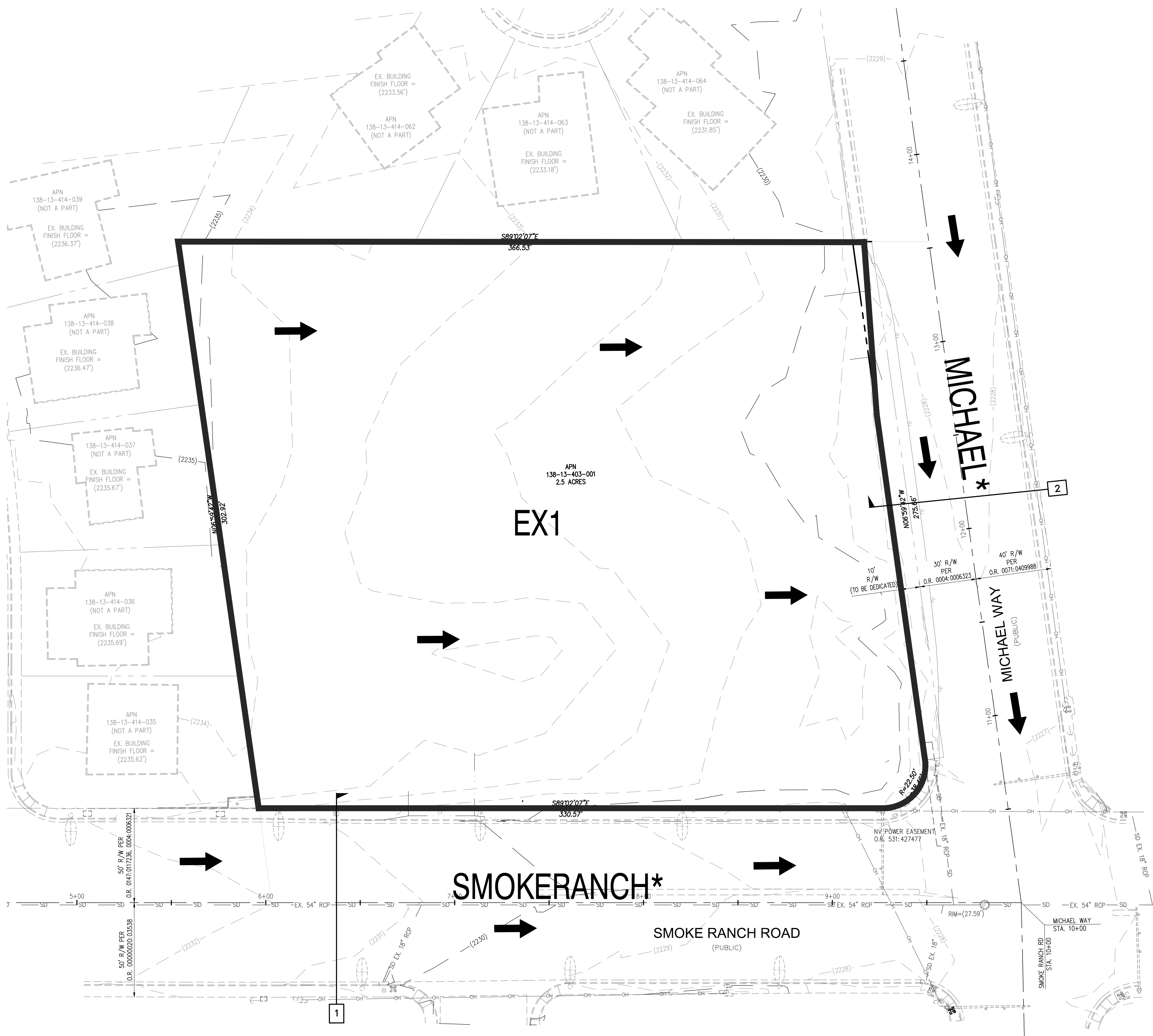
Cross-section characteristics for the Existing Condition are presented below. **Figure 5** shows the locations of the cross sections corresponding to the calculations included in **Table 2**. Refer to Appendix B for street flow hydraulic calculations.

Table 2: Existing Cross-Section Characteristics: 10-year and 100-year

Description	Slope, %	Q ₁₀₀ , cfs	D ₁₀₀ , ft	V ₁₀₀ , fps	D*V ₁₀₀	Q ₁₀ , cfs	D ₁₀ , ft	V ₁₀ , fps	D*V ₁₀
1A/1B – Smoke Ranch	1.00	635	1.49	8.03	11.96	32	0.58	3.53	2.04
2A/2B – Michael Way	0.30	83	0.85	2.51	2.13	36	0.65	1.94	1.26

Cross Section 1 represents the surface flow within Smoke Ranch Road, which is 32-cfs and 635-cfs for the 10-year and 100-year storm flows respectively. For Q_{100} , the flow depth, D , is 1.49 feet, the flow velocity, V , is 8.03 feet per second using a slope of 1.00%. The product of $D \cdot V$ is 11.96. The calculated $D \cdot V$ is greater than 8 in the existing condition for the 100-year flow. As indicated in Cross Section 1A, dry lane criteria is met for the 10-year flow with approximately 27' of dry lane on the north half of Smoke Ranch Road. See Appendix B for Cross Section calculations.

Cross Section 2 represents the surface flow within Michael Way, which is 36-cfs and 83-cfs for the 10-year and 100-year storm flows respectively. For Q_{100} , the flow depth, D , is 0.85 feet, the flow velocity, V , is 2.51 feet per second using a slope of 0.30%. The product of $D \cdot V$ is 2.13. As indicated in Cross Section 2A, dry lane criteria is met for the 10-year flow. There is approximately 6' of dry lane on the west half of Michael Way but the overall dry lane for the roadway is 15'. See Appendix B for Cross Section calculations.



LEGEND

- BASIN BOUNDARY
- BASIN NAME
- FLOW DIRECTION
- EXISTING CONTOURS
- COMBINATION POINT
- FLOWMASTER SECTION

SUMMARY OF FLOWS EXISTING CONDITIONS				
BASIN NAME	AREA (AC)	Q ₁₀ (CFS)	Q ₁₀₀ (CFS)	
SMOKERANCH*	N/A	263	866	
MICHAEL*	N/A	36	83	
EX1	2.50	3	6	

*REFERENCED FROM THE NORTHWEST NEIGHBORHOOD STUDY, FIGURE E-16

FLOW CHARACTERISTICS - EXISTING CONDITION (10 YEAR)						
SECTION NUMBER	FLOW	SLOPE (%)	Q ₁₀ (cfs)	DEPTH (ft)	VELOCITY (ft/s)	D*V
1A	SMOKE RANCH	1.00	32	0.58	3.53	2.04
2A	MICHAEL	0.30	36	0.65	1.94	1.26

FLOW CHARACTERISTICS - EXISTING CONDITION (100 YEAR)						
SECTION NUMBER	FLOW	SLOPE (%)	Q ₁₀₀ (cfs)	DEPTH (ft)	VELOCITY (ft/s)	D*V
1B	SMOKE RANCH	1.00	635	1.49	8.03	11.96
2B	MICHAEL	0.30	83	0.85	2.51	2.13

APPROVAL		REVISIONS		DESCRIPTION	
APPROVED BY	DATE	REV	DESCRIPTION	APPROVED BY	DATE

LIVING GRACE FOURSQUARE CHURCH

EXISTING CONDITIONS BASIN MAP

APN: 138-13-403-001
2400 N MICHAEL WAY
LAS VEGAS, NEVADA 89108



ENGINEER'S SEAL

DATE: 04/02/21
PROJ. NO: 200279
DRAWN BY: ARB
CHECKED BY: RAS
SCALE: AS NOTED
JURISDICTION: LAS VEGAS

DRAWING NUMBER:

FIG5

AGENCY NUMBER:

VIII. DEVELOPED CONDITION

For the Developed Condition, the hydrologic analysis consists of 3 onsite basins and two offsite basins. The site generates a total of 9 cfs under Developed Conditions for the 100-year storm event. **Figure 6** depicts the basins and drainage patterns used in the Developed Conditions hydrologic analysis. A Developed Condition HEC-1 model has been included in Appendix A. **Table 1** summarizes the HEC-1 results for Developed Conditions.

The first offsite basin, SMOKE RANCH, represents the flow within Smoke Ranch Road, adjacent to the subject site. The existing flow within Smoke Ranch Road was determined per the City of Las Vegas Northwest Neighborhood Study, Figure E-16. The flow prior to the intersection of Michael Way is 263 cfs and 866 cfs for the 10-year and 100-years storm respectively. The existing facility within Smoke Ranch Road captures 231 cfs within the existing storm drain system, therefore the surface flow within Smoke Ranch Road is 32-cfs and 635-cfs for the 10-year and 100-year storm flows.

The second offsite basin, MICHAEL, represents the flow within Michael Way, adjacent to the subject site. The existing flow within Michael Way prior to the intersection of Smoke Ranch Road was determined per the City of Las Vegas Northwest Neighborhood Study, Figure E-16. The flow prior to the intersection of Michael Way is 36 cfs and 83 cfs for the 10-year and 100-years storm respectively.

Onsite basin, ON1, represents the northerly portion of the subject site, this flow is conveyed east towards Michael Way. The calculated flows are 1-cfs and 2-cfs for the 10-year and 100-year storm events, respectively. Onsite basin, ON2, represents the easterly portion of the subject site, this flow is conveyed east towards Michael Way. The calculated flows are 2-cfs and 4-cfs for the 10-year and 100-year storm events, respectively. Onsite basin, ON3, represents the westerly portion of the subject site, this flow is conveyed south towards Smoke Ranch Road. The calculated flows are 2-cfs and 3-cfs for the 10-year and 100-year storm events, respectively.

BMP Measures have been proposed as required per the Manual. The total site area is 2.5 acres, the total parking area is 1.65 acres. Based on the requirements, approximately 1.23 acres would need to provide BPM implementation. The treated area for Basin ON2 is 0.64 and the treated area for Basin ON3 is 0.64, for a combined total of 1.25 acres therefore meeting the required BPM implementation.

Table 3: Summary of Developed Conditions

BASIN	AREA (AC)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
SMOKE RANCH	n/a	263	866
MICHAEL	n/a	36	83
ON1	0.64	1	2
ON2	1.05	2	4
ON3	0.81	1	3

Developed Condition Street Flow Summary:

Cross-section characteristics for the Developed Condition are presented below. **Figure 6** shows the locations of the cross sections corresponding to the calculations included in **Table 2**. Refer to Appendix B for street flow hydraulic calculations.

Table 4: Developed Cross-Section Characteristics: 10-year and 100-year

Description	Slope, %	Q ₁₀₀ , cfs	D ₁₀₀ , ft	V ₁₀₀ , fps	D*V ₁₀₀	Q ₁₀ , cfs	D ₁₀ , ft	V ₁₀ , fps	D*V ₁₀
3A/3B – Smoke Ranch	1.00	638	1.49	8.05	11.99	33	0.59	3.55	2.09
4A/4B – Michael Way	0.30	83	0.83	2.73	2.27	36	0.65	2.14	1.39
5 – Onsite Calc ON2	0.50	4	0.43	2.27	0.98	-	-	-	-
6 – Onsite Calc ON2	1.00	4	0.33	3.21	1.06	-	-	-	-

Cross Section 3 represents the surface flow within Smoke Ranch Road, which is 34-cfs and 638-cfs for the 10-year and 100-year storm flows respectively. This flow combines the existing flow plus the onsite flow from Basin ON3. For **Q₁₀₀**, the flow depth, D, is 1.49 feet, the flow velocity, V, is 8.05 feet per second using a slope of 1.00%. The product of D*V is 11.99. The increase in onsite flow (ON3) to Smoke Ranch Road is negligible compared to the existing condition. The calculated D*V is greater than 8 in the developed condition for the 100-year flow. As indicated in Cross Section 3A, dry lane criteria is met for the 10-year flow with approximately 27' of dry lane on the north half of Smoke Ranch Road. See Appendix B for Cross Section calculations.

Cross Section 4 represents the surface flow within Michael Way. The calculated flows for the project site in the existing condition were 3-cfs and 6-cfs for the 10-year and 100-year flows respectively, which conveyed into Michael Way. The developed flows from ON1 and ON2 which convey to Michael Way is the same at 3-cfs and 6-cfs. Therefore, the overall flow within Michael Way remains the same in the Developed Condition. The proposed development includes full offsite improvements for the west half of Michael Way. For **Q₁₀₀**, the flow depth, D, is 0.83 feet, the flow velocity, V, is 2.73 feet per second using a slope of 0.30%. The product of D*V is 2.27. As indicated in Cross Section 4A, dry lane criteria is met for the 10-year flow. There is approximately 6' of dry lane on the west half of Michael Way but the overall dry lane for the roadway is 15'. The proposed full offsite improvements on the west half of Michael Way does not significantly change the depth of flow or dry lane requirements compared to the Existing Condition. See Appendix B for Cross Section calculations.

Cross Section 5 represents the surface flow adjacent to the proposed building, within Basin ON2, which is 4-cfs for the 100-year storm. For **Q₁₀₀**, the flow depth, D, is 0.43 feet, the flow velocity, V, is 2.27 feet per second using a slope of 0.50%. The product of D*V is 0.98. See Appendix B for Cross Section calculations.

Cross Section 6 represents the surface flow adjacent to the proposed building, within Basin ON2, which is 4-cfs for the 100-year storm. For **Q₁₀₀**, the flow depth, D, is 0.33 feet, the flow velocity, V, is 3.21 feet per second using a slope of 1.00%. The product of D*V is 1.06. See Appendix B for Cross Section calculations.

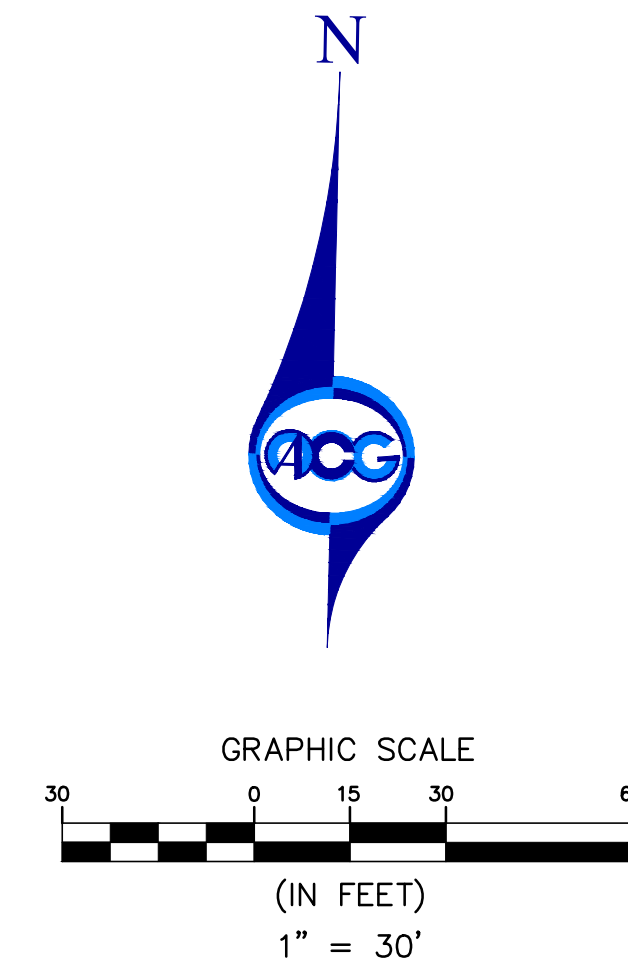


Diagram illustrating the components of a flowmaster section symbol:

- BASIN BOUNDARY
- BASIN NAME
- FLOW DIRECTION
- EXISTING CONTOURS
- COMBINATION POINT
- FLOWMASTER SECTION

SUMMARY OF FLOWS EXISTING CONDITIONS			
BASIN NAME	AREA (AC)	Q _{in} (CFS)	Q _{out} (CFS)
SMOKERANCH*	N/A	263	866
MICHAEL*	N/A	36	83
ON1	0.64	1	2
ON2	1.05	2	4
ON3	0.81	1	3

*REFERENCED FROM THE NORTHWEST NEIGHBORHOOD STUDY, FIGURE E-16

FLOW CHARACTERISTICS - EXISTING CONDITION (10 YEAR)						
SECTION NUMBER	FLOW	SLOPE (%)	Q _w (cfs)	DEPTH (ft)	VELOCITY (ft/s)	D ₅₀
3A	SMOKE RANCH	1.00	33	0.59	3.55	2.09
4A	MICHAEL	0.30	36	0.65	2.14	1.39

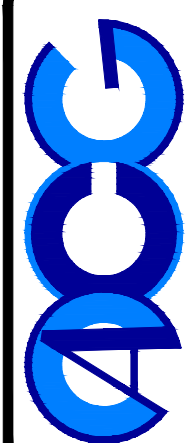
FLOW CHARACTERISTICS - EXISTING CONDITION (100 YEAR)						
SECTION NUMBER	FLOW	SLOPE (%)	Q _{max} (cfs)	DEPTH (ft)	VELOCITY (ft/s)	D ₅₀
3B	SMOKE RANCH	1.00	638	1.49	8.05	11.95
4B	MICHAEL	0.30	83	0.83	2.73	2.27
5	ONSITE CALC - ON2	0.50	4	0.43	2.27	0.98
6	ONSITE CALC - ON2	1.00	4	0.33	3.21	1.06

REVISIONS		APPROVAL	
REV.	DESCRIPTION	APPRD. BY	DATE

LIVING GRACE FOURSQUARE CHURCH

DEVELOPED CONDITIONS BASIN MAP

APN: 138-13-403-001
2400 N MICHAEL WAY
LAS VEGAS, NEVADA 891



ACG DESIGN
4310 CAMERON ST., SUITE 12-A
LAS VEGAS, NEVADA 89103
OFFICE: 702.448.8737
WEBSITE: WWW.ACG.DESIGN

ENGINEER'S SEAL

DATE:	04/02/21
PROJ. NO:	200279
DRAWN BY:	ARB
CHECKED BY:	RAS
SCALE:	AS NOTED
JURISDICTION:	LAS VEGAS

DRAWING NUMBER

FIG6

AGENCY NUMBER

IX. FINISHED FLOOR ELEVATION

The site has been designed as commercial development, the Finish Floor elevations of the proposed building has been set a minimum of 6" above the highest adjacent flowline.

The proposed Finish Floor Elevations also meet the requirement of the Manual criteria for non-special flood hazard areas in which the minimum finished floor elevation shall be at least twice the depth of flow above the gutter line (measured at the high side of the building).

X. CONCLUSIONS AND RECOMMENDATIONS

1. Methodology used in this report complies with Clark County Regional Flood Control District (CCRFCD) and Clark County criteria.
2. This project site is not located within a FEMA designated SFHA.
3. The proposed development will not have a negative impact on downstream or adjacent properties or facilities.
4. The proposed development does not alter the existing flow patterns.
5. The proposed finished floor elevations have been placed at elevations greater than 18 inches above the highest centerline or top of curb elevation of the addressed street at the center of the building.

XI. REFERENCES

1. Clark County Regional Flood Control District – The 2013 Las Vegas Valley Flood Control Master Plan Update, 2013.
2. Post, Buckley, Schuh & Jernigan Inc., Louis Berger Group, Clark County Regional Flood Control District – The 2008 Las Vegas Valley Flood Control Master Plan Update, 2008.
3. Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual, updated August 12, 1999.
4. U.S. Army Corps of Engineers, HEC-1 Flood Hydrograph Package, June 1998.
5. Soil Survey of Las Vegas Valley Area, Nevada. U.S. Department of Agriculture, Soil Conservation Service, July 1985.

Appendices

Appendix A:

- Standard Form 4 – Existing & Developed Condition
- HEC-1 Calculation – Existing Condition
- HEC-1 Calculation – Developed Condition
- Northwest Neighborhood Study – Figure E-16

Appendix B:

- Section 1A - Smoke Ranch (Existing - 10-Year)
- Section 1B - Smoke Ranch (Existing - 100-Year)
- Section 2A - Michael Way (Existing - 10-Year)
- Section 2B - Michael Way (Existing - 100-Year)
- Section 3A - Smoke Ranch (Developed - 10-Year)
- Section 3B - Smoke Ranch (Developed - 100-Year)
- Section 4A - Michael Way (Developed - 10-Year)
- Section 4B - Michael Way (Developed - 100-Year)
- Section 5 - Onsite Calc (Developed, ON2 - 100-Year)
- Section 6 - Onsite Calc (Developed, ON2 - 100-Year)

Appendix C:

- Figure 513 – McCarran Airport Rainfall Area
- Table 505 – Depth-Duration-Frequency Values for McCarran Airport Rainfall Area
- Table 602, 1 of 4 – Runoff Curve Numbers (Urban Areas)
- Soil Survey Map –Living Grace

Appendix D:

- Proposed Improvement Plan Package

APPENDIX A

TIME OF CONCENTRATION																	
LIVING GRACE																	
EXISTING AND DEVELOPED CONDITIONS																	
ACG Design												Date:04/07/21 Calculated by: SDS					
Project No: 200279												Date:04/07/21 Checked by: RAS					
SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tag	REMARKS
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS	V2 VELOCITY FPS	Tt Min			Tag= 0.6Tc/60 Hours	RAINFALL Inches
EX1	E	88.0	0.7716	2.50	0.0039	65	1.20	4.5	365	2.00	2.1	-	2.9	7.4	N/A	0.074	1.58/2.77
ON1	D	95.0	0.8640	0.64	0.0010	55	2.00	2.5	285	1.20	2.2	3.0	2.1	4.6	11.9	0.050	1.58/2.77
ON2	D	95.0	0.8640	1.05	0.0016	45	3.00	2.0	200	1.00	2.0	2.9	1.7	3.6	11.4	0.050	1.58/2.77
ON3	D	95.0	0.8640	0.81	0.0013	25	2.00	1.7	300	0.50	1.4	2.4	3.5	5.2	11.8	0.052	1.58/2.77
Tc = Ti + Tt Tlag = 0.6 Tc Ti = 1.8 (1.1 - K) L^1/2 / S^1/3 K = 0.0132 (CN) - 0.39 Tc Check = L/180+10						For the travel time (Tt) calculations, V1 applies to the first 500 feet of travel distance; V2 applies to the remaining travel distance.						Existing V1 = 14.8*(S/100)^1/2 Existing V2 = 29.4*(S/100)^1/2 Developed V1 = 20.2*(S/100)^1/2 Developed V2 = 30.6*(S/100)^1/2					
														STANDARD FORM 4			

<pre> 1***** * * FLOOD HYDROGRAPH PACKAGE (HEC-1) * * JUN 1998 * * VERSION 4.1 * * * RUN DATE 05APR21 TIME 08:00:08 * * ***** </pre>	Existing <pre> ***** * * U.S. ARMY CORPS OF ENGINEERS * * HYDROLOGIC ENGINEERING CENTER * * 609 SECOND STREET * * DAVIS, CALIFORNIA 95616 * * (916) 756-1104 * * ***** </pre>
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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 XXXXXXXX XXXXX XXX

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

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

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

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

DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1	*DIAGRAM
2	ID *****
3	ID *
4	ID * : LIVING GRACE
5	ID * : DRAINAGE STUDY
6	ID * : EXISTING CONDITIONS
7	ID *
8	ID * : RETURN PERIOD ___ 100-YEAR & 10-YEAR
9	ID * : DISTRIBUTION ___ 6-HOUR SDN3
10	ID * : PROJECT NO ___ 200279
11	ID * : FILENAME ___ EXISTING.H1
12	ID * : DATE MODELED ___ 040221
13	ID * : MODELED BY ___ SDS
14	ID *
15	ID * :
16	ID *
17	ID *****
18	ID
19	ID
20	ID
21	IT 5 0 0 300
22	IO 5
23	IN 5 0 0
24	JR PREC .57 1
25	KK EX1

```

Existing
26 KM SUBBASIN EX1
27 KM AREA 2.50 AC
28 PB 2.77
29 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
30 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
31 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
32 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
33 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
34 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
35 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
36 PC .998 .999 1.00
37 BA .0039
38 LS 0 88.0
39 UD .074
*
40 ZZ

1 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW

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

25 EX1

(***) 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 05APR21 TIME 08:00:08 * * (916) 756-1104 *
* * * * *
*****

*****
*
* .....
* :
* : LIVING GRACE
* : DRAINAGE STUDY
* : EXISTING CONDITIONS
* :
* : .....
* : RETURN PERIOD ___ 100-YEAR & 10-YEAR
* : DISTRIBUTION ___ 6-HOUR SDN3
* : PROJECT NO ___ 200279
* : FILENAME ___ EXISTING.H1
* : DATE MODELED ___ 040221
* : MODELED BY ___ SDS
* :
* : .....
* :
* : .....
*****

22 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

```

Existing

NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 2 0 ENDING DATE
 NDTIME 0055 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
 NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 .57 1.00

1

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

		RATIOS APPLIED TO PRECIPITATION			
OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2
		.57	1.00		

HYDROGRAPH AT					
+	EX1	.00	1	FLOW	3. 6.
				TIME	3.50 3.50

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


```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   JUN 1998   *
*   VERSION 4.1   *
* RUN DATE 06APR21 TIME 16:28:56 *
*
*****

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

```

```

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

```

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

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

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

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

DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```

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

*DIAGRAM
1 ID *****
2 ID * .....
3 ID * :
4 ID * : LIVING GRACE
5 ID * : DRAINAGE STUDY
6 ID * : EXISTING CONDITIONS
7 ID * : .....
8 ID * : RETURN PERIOD ___ 100-YEAR & 10-YEAR
9 ID * : DISTRIBUTION ___ 6-HOUR SDN3
10 ID * : PROJECT NO ___ 200279
11 ID * : FILENAME ___ DEVELOPED.H1
12 ID * : DATE MODELED ___ 040221
13 ID * : MODELED BY ___ SDS
14 ID * : .....
15 ID * :
16 ID * : .....
17 ID *****
18 ID
19 ID
20 ID
21 IT 5 0 0 300
22 IO 5
23 IN 5 0 0
24 JR PREC .57 1
*

25 KK ON1

```

Developed

26	KM	SUBBASIN ON1									
27	KM	AREA	0.64 AC								
28	PB	2.77									
29	PC	.000	.020	.057	.070	.087	.108	.124	.130	.130	.130
30	PC	.130	.130	.130	.133	.140	.142	.148	.158	.172	.181
31	PC	.190	.197	.199	.200	.201	.204	.214	.229	.241	.249
32	PC	.251	.256	.270	.278	.281	.283	.295	.322	.352	.409
33	PC	.499	.590	.710	.744	.781	.812	.819	.835	.851	.856
34	PC	.860	.868	.876	.888	.910	.926	.937	.950	.970	.976
35	PC	.982	.985	.987	.989	.990	.993	.993	.994	.995	.998
36	PC	.998	.999	1.00							
37	BA	.0010									
38	LS	0	95.0								
39	UD	.050									

*

40	KK	ON2									
41	KM	SUBBASIN ON2									
42	KM	AREA	1.05 AC								
43	PB	2.77									
44	BA	.0016									
45	LS	0	95.0								
46	UD	.050									

*

1 HEC-1 INPUT PAGE 2

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

47	KK	ON3									
48	KM	SUBBASIN ON3									
49	KM	AREA	0.81 AC								
50	PB	2.77									
51	BA	.0013									
52	LS	0	95.0								
53	UD	.052									

*

54 ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT

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

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

25	ON1										
	.										
40	.	ON2									
	.	.									
47	.	.	ON3								

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

*****		*****	
*	*	*	*
* 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 06APR21 TIME 16:28:56 *		* (916) 756-1104 *	
*	*	*	*
*****		*****	

*

Developed

```
*:
*:
*: LIVING GRACE
*: DRAINAGE STUDY
*: EXISTING CONDITIONS
*:
*: .....
*: RETURN PERIOD ___ 100-YEAR & 10-YEAR
*: DISTRIBUTION ___ 6-HOUR SDN3
*: PROJECT NO ___ 200279
*: FILENAME ___ DEVELOPED.H1
*: DATE MODELED ___ 040221
*: MODELED BY ___ SDS
*:
*: .....
*:
*: .....
*****
```

22 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

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 RATIOS OF PRECIPITATION
 .57 1.00

1

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

OPERATION	STATION	AREA	RATIOS APPLIED TO PRECIPITATION		
			PLAN	RATIO 1	RATIO 2
		.57	1.00		

HYDROGRAPH AT					
+	ON1	.00	1	FLOW	1.
				TIME	3.50
					3.50

HYDROGRAPH AT					
+	ON2	.00	1	FLOW	2.
				TIME	3.50
					3.50

HYDROGRAPH AT
+ ON3 .00 1 FLOW 1. 3.
TIME 3.50 3.50

Developed

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



NORTHWEST NEIGHBORHOOD STUDY

LEGEND

SUB-BASIN BOUNDARY

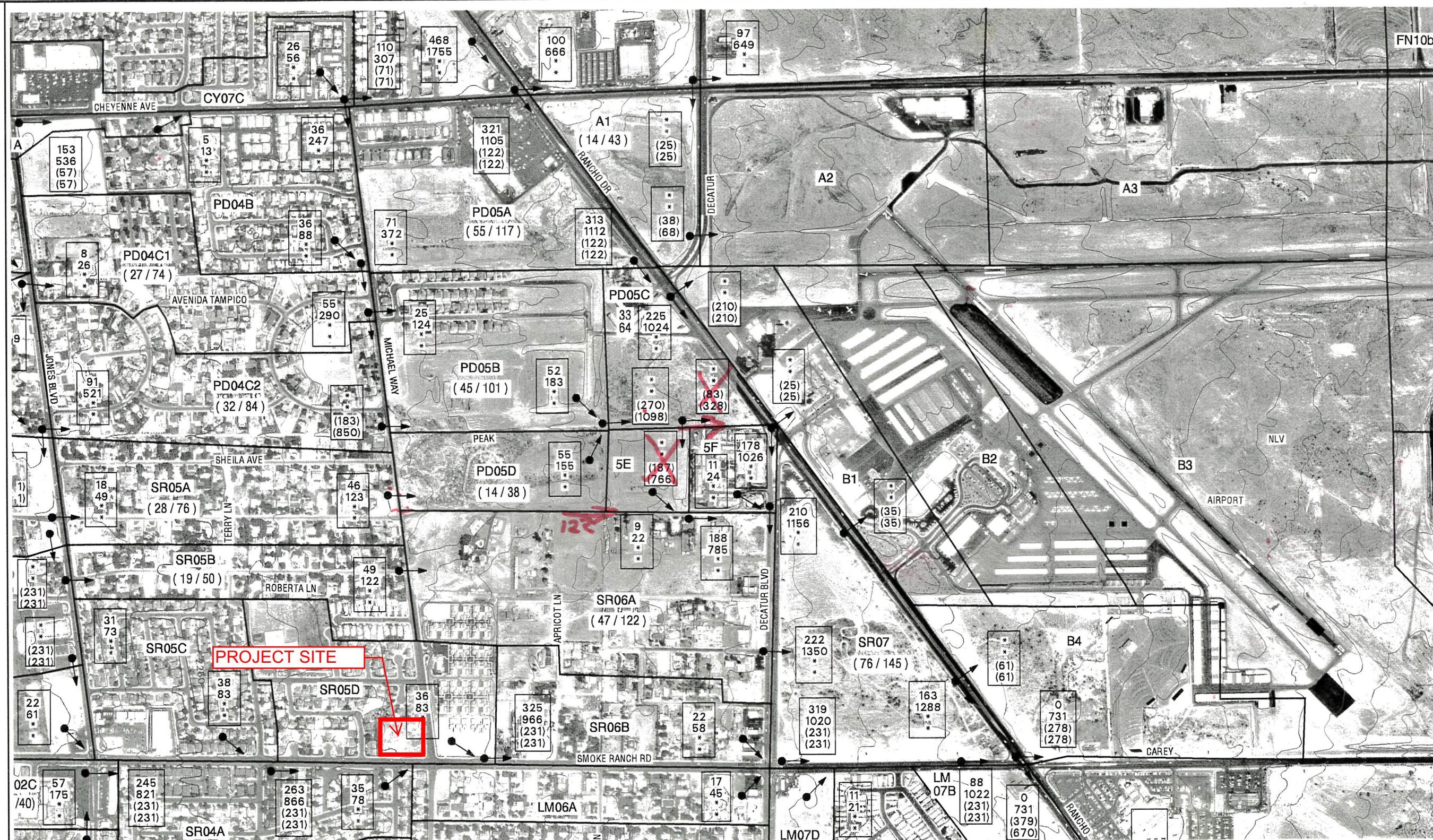
FLOW ARROW

250 10-YEAR STREET FLOW
500 100-YEAR STREET FLOW
300 10-YEAR FACILITY FLOW
800 100-YEAR FACILITY FLOW
(FLOWS IN CFS)

BWJS Basin-ID
(13 / 59) Contributing flow
(10-Year / 100-Year)
from the basin (cfs)

PHOTO DATE: APRIL 1996

FIGURE E-16



EXISTING DRAINAGE CONDITIONS

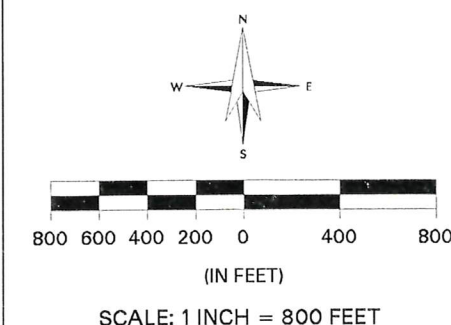
PBSJ POST,
BUCKLEY,
SCHUH &
JERNIGAN, INC.

ENGINEERING PLANNING SURVEYING GIS
901, N. Green Valley Pkwy, Ste 100, Henderson NV 89014
Phone: (702) 263-7275 Fax: (702) 263-7200

HUALAPAI	FT. APACHE	DURANGO	BUFFALO	RAINBOW	JONES	DECATUR	ELKHORN
1	2	3					CENTENNIAL
4	5	6					ANN
7	8	9					LONE MOUNTAIN
10	11	12					ALEXANDER
	13	14					CHEYENNE
	15	16					SMOKE RANCH
	17	18					

NOTE:

Existing conditions are based on future
CN values with only existing local and
CCRFCD facilities in place



APPENDIX B

Section 1A - Smoke Ranch (Existing - 10-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.010
Discharge	32.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	31.33
0+05.00	31.19
0+05.50	31.19
0+05.50	30.33
0+07.00	30.41
0+50.00	31.46
0+93.00	30.28
0+94.50	30.20
0+94.50	30.70
0+95.00	30.70
1+00.00	30.88

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 31.33)	(0+05.00, 31.19)	0.013
(0+05.00, 31.19)	(0+05.50, 31.19)	0.013
(0+05.50, 31.19)	(0+05.50, 30.33)	0.013
(0+05.50, 30.33)	(0+07.00, 30.41)	0.013
(0+07.00, 30.41)	(0+50.00, 31.46)	0.016
(0+50.00, 31.46)	(0+93.00, 30.28)	0.016
(0+93.00, 30.28)	(0+94.50, 30.20)	0.013
(0+94.50, 30.20)	(0+94.50, 30.70)	0.013
(0+94.50, 30.70)	(0+95.00, 30.70)	0.013
(0+95.00, 30.70)	(1+00.00, 30.88)	0.013

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

Results	
Normal Depth	0.58
Elevation Range	30.20 to 31.46 ft
Flow Area	9.1
Wetted Perimeter	40.48
Hydraulic Radius	0.22
Top Width	39.51

Section 1A - Smoke Ranch (Existing - 10-Year)

Results	
Normal Depth	0.58
Critical Depth	0.64
Critical Slope	0.006
Velocity	3.53
Velocity Head	0.19
Specific Energy	0.78
Froude Number	1.299
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	0.58
Critical Depth	0.64
Channel Slope	0.010
Critical Slope	0.006

Cross Section for Section 1A - Smoke Ranch (Existing - 10-Year)

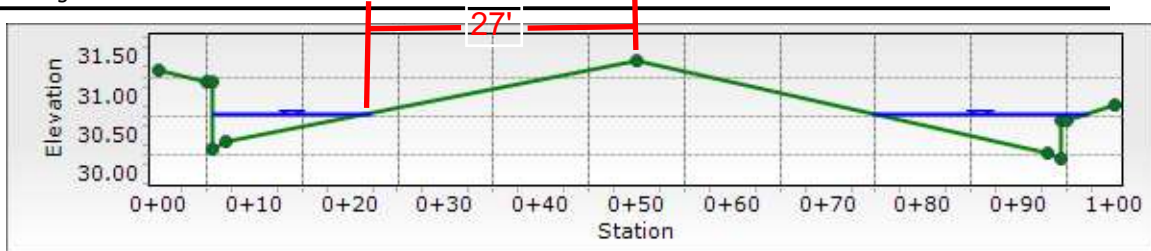
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.010
Normal Depth	0.58
Discharge	32.00

10-year Dry Lane Met



Section 1B - Smoke Ranch (Existing - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.010
Discharge	635.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	31.33
0+05.00	31.19
0+05.50	31.19
0+05.50	30.33
0+07.00	30.41
0+50.00	31.46
0+93.00	30.28
0+94.50	30.20
0+94.50	30.70
0+95.00	30.70
1+00.00	30.88

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 31.33)	(0+05.00, 31.19)	0.013
(0+05.00, 31.19)	(0+05.50, 31.19)	0.013
(0+05.50, 31.19)	(0+05.50, 30.33)	0.013
(0+05.50, 30.33)	(0+07.00, 30.41)	0.013
(0+07.00, 30.41)	(0+50.00, 31.46)	0.016
(0+50.00, 31.46)	(0+93.00, 30.28)	0.016
(0+93.00, 30.28)	(0+94.50, 30.20)	0.013
(0+94.50, 30.20)	(0+94.50, 30.70)	0.013
(0+94.50, 30.70)	(0+95.00, 30.70)	0.013
(0+95.00, 30.70)	(1+00.00, 30.88)	0.013

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

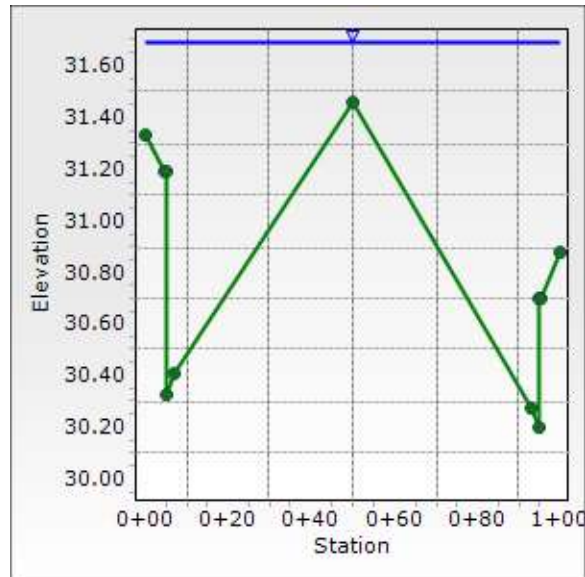
Results	
Normal Depth	1.49
Elevation Range	30.20 to 31.46 ft
Flow Area	79.1
Wetted Perimeter	102.56
Hydraulic Radius	0.77
Top Width	100.00

Section 1B - Smoke Ranch (Existing - 100-Year)

Results	
Normal Depth	1.49
Critical Depth	1.78
Critical Slope	0.004
Velocity	8.03
Velocity Head	1.00
Specific Energy	2.49
Froude Number	1.593
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.49
Critical Depth	1.78
Channel Slope	0.010
Critical Slope	0.004

Cross Section for Section 1B - Smoke Ranch (Existing - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.010
Normal Depth	1.49
Discharge	635.00



Section 2A - Michael Way (Existing - 10-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.003
Discharge	36.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	28.20
0+15.00	27.53
0+40.00	28.38
0+73.00	27.66
0+74.50	27.58
0+74.50	28.08
0+75.00	28.08
0+80.00	28.18

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 28.20)	(0+15.00, 27.53)	0.025
(0+15.00, 27.53)	(0+40.00, 28.38)	0.016
(0+40.00, 28.38)	(0+73.00, 27.66)	0.016
(0+73.00, 27.66)	(0+74.50, 27.58)	0.013
(0+74.50, 27.58)	(0+74.50, 28.08)	0.013
(0+74.50, 28.08)	(0+75.00, 28.08)	0.013
(0+75.00, 28.08)	(0+80.00, 28.18)	0.013

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

Results	
Normal Depth	0.65
Elevation Range	27.53 to 28.38 ft
Flow Area	18.6
Wetted Perimeter	65.47
Hydraulic Radius	0.28
Top Width	64.93
Normal Depth	0.65
Critical Depth	0.55
Critical Slope	0.008
Velocity	1.94
Velocity Head	0.06
Specific Energy	0.71

Section 2A - Michael Way (Existing - 10-Year)

Results	
Froude Number	0.640
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	0.00
Upstream Velocity	0.00
Normal Depth	0.65
Critical Depth	0.55
Channel Slope	0.003
Critical Slope	0.008
Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.00434549728514ft. Flow is divided.

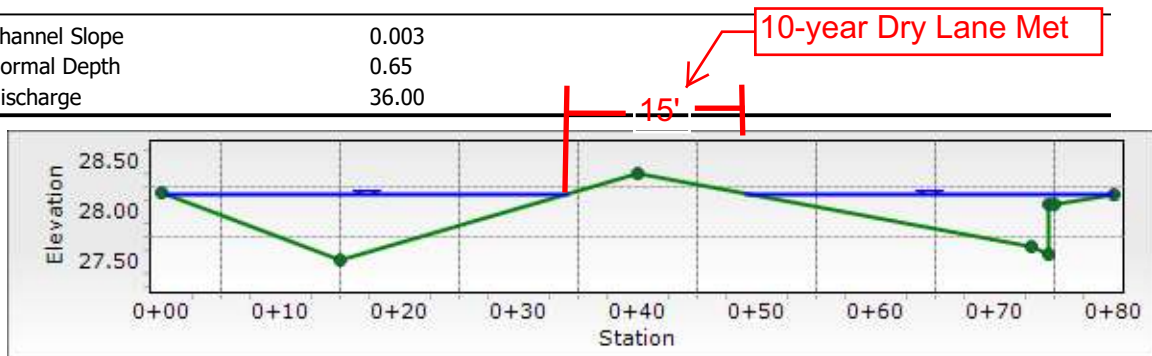
Cross Section for Section 2A - Michael Way (Existing - 10-Year)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.003
Normal Depth	0.65
Discharge	36.00



Section 2B - Michael Way (Existing - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.003
Discharge	83.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	28.20
0+15.00	27.53
0+40.00	28.38
0+73.00	27.66
0+74.50	27.58
0+74.50	28.08
0+75.00	28.08
0+80.00	28.18

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 28.20)	(0+15.00, 27.53)	0.025
(0+15.00, 27.53)	(0+40.00, 28.38)	0.016
(0+40.00, 28.38)	(0+73.00, 27.66)	0.016
(0+73.00, 27.66)	(0+74.50, 27.58)	0.013
(0+74.50, 27.58)	(0+74.50, 28.08)	0.013
(0+74.50, 28.08)	(0+75.00, 28.08)	0.013
(0+75.00, 28.08)	(0+80.00, 28.18)	0.013

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

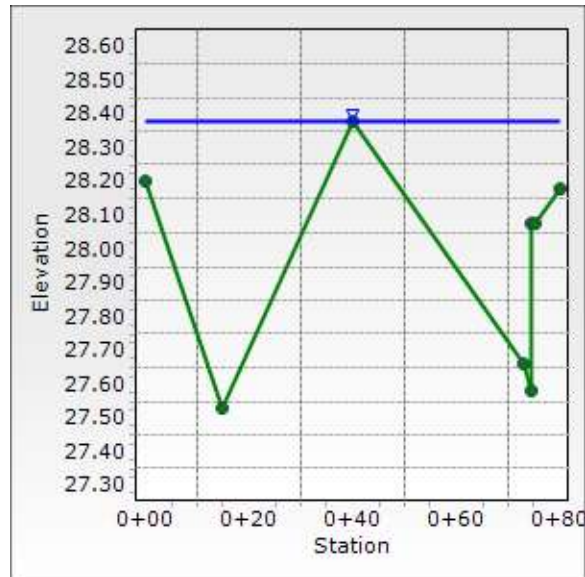
Results	
Normal Depth	0.85
Elevation Range	27.53 to 28.38 ft
Flow Area	33.0
Wetted Perimeter	80.93
Hydraulic Radius	0.41
Top Width	80.00
Normal Depth	0.85
Critical Depth	0.75
Critical Slope	0.007
Velocity	2.51
Velocity Head	0.10
Specific Energy	0.95

Section 2B - Michael Way (Existing - 100-Year)

Results	
Froude Number	0.690
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	0.00
Upstream Velocity	0.00
Normal Depth	0.85
Critical Depth	0.75
Channel Slope	0.003
Critical Slope	0.007
Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.203023372739494ft.

Cross Section for Section 2B - Michael Way (Existing - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.003
Normal Depth	0.85
Discharge	83.00



Section 3A - Smoke Ranch (Developed - 10-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.010
Discharge	33.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	31.33
0+05.00	31.19
0+05.50	31.19
0+05.50	30.33
0+07.00	30.41
0+50.00	31.46
0+93.00	30.28
0+94.50	30.20
0+94.50	30.70
0+95.00	30.70
1+00.00	30.88

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 31.33)	(0+05.00, 31.19)	0.013
(0+05.00, 31.19)	(0+05.50, 31.19)	0.013
(0+05.50, 31.19)	(0+05.50, 30.33)	0.013
(0+05.50, 30.33)	(0+07.00, 30.41)	0.013
(0+07.00, 30.41)	(0+50.00, 31.46)	0.016
(0+50.00, 31.46)	(0+93.00, 30.28)	0.016
(0+93.00, 30.28)	(0+94.50, 30.20)	0.013
(0+94.50, 30.20)	(0+94.50, 30.70)	0.013
(0+94.50, 30.70)	(0+95.00, 30.70)	0.013
(0+95.00, 30.70)	(1+00.00, 30.88)	0.013

Options

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

Results

Normal Depth	0.59
Elevation Range	30.20 to 31.46 ft
Flow Area	9.3
Wetted Perimeter	41.07
Hydraulic Radius	0.23
Top Width	40.09

Section 3A - Smoke Ranch (Developed - 10-Year)

Results	
Normal Depth	0.59
Critical Depth	0.64
Critical Slope	0.006
Velocity	3.55
Velocity Head	0.20
Specific Energy	0.79
Froude Number	1.301
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	0.59
Critical Depth	0.64
Channel Slope	0.010
Critical Slope	0.006

Cross Section for Section 3A - Smoke Ranch (Developed - 10-Year)

Project Description

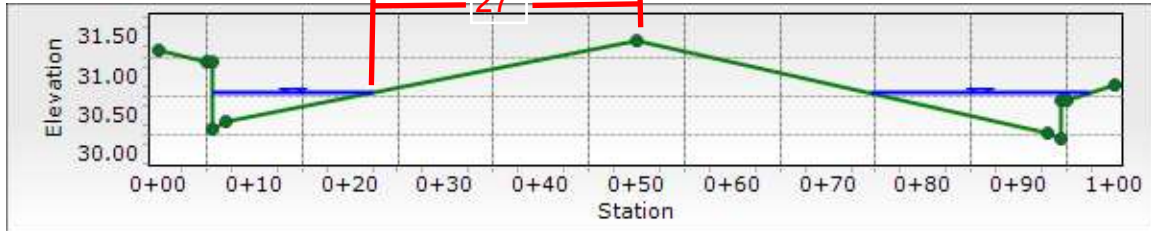
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.010
Normal Depth	0.59
Discharge	33.00

10-year Dry Lane Met

27"



Section 3B - Smoke Ranch (Developed - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.010
Discharge	638.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	31.33
0+05.00	31.19
0+05.50	31.19
0+05.50	30.33
0+07.00	30.41
0+50.00	31.46
0+93.00	30.28
0+94.50	30.20
0+94.50	30.70
0+95.00	30.70
1+00.00	30.88

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 31.33)	(0+05.00, 31.19)	0.013
(0+05.00, 31.19)	(0+05.50, 31.19)	0.013
(0+05.50, 31.19)	(0+05.50, 30.33)	0.013
(0+05.50, 30.33)	(0+07.00, 30.41)	0.013
(0+07.00, 30.41)	(0+50.00, 31.46)	0.016
(0+50.00, 31.46)	(0+93.00, 30.28)	0.016
(0+93.00, 30.28)	(0+94.50, 30.20)	0.013
(0+94.50, 30.20)	(0+94.50, 30.70)	0.013
(0+94.50, 30.70)	(0+95.00, 30.70)	0.013
(0+95.00, 30.70)	(1+00.00, 30.88)	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	1.49
Elevation Range	30.20 to 31.46 ft
Flow Area	79.3
Wetted Perimeter	102.57
Hydraulic Radius	0.77
Top Width	100.00

Section 3B - Smoke Ranch (Developed - 100-Year)

Results	
Normal Depth	1.49
Critical Depth	1.78
Critical Slope	0.004
Velocity	8.05
Velocity Head	1.01
Specific Energy	2.50
Froude Number	1.593
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.49
Critical Depth	1.78
Channel Slope	0.010
Critical Slope	0.004

Cross Section for Section 3A - Smoke Ranch (Developed - 10-Year)

Project Description

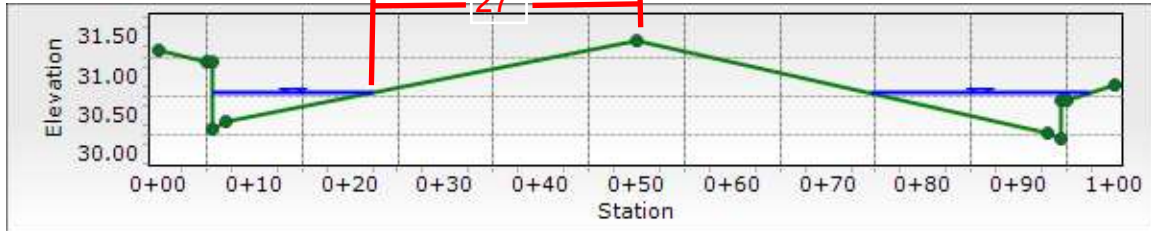
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.010
Normal Depth	0.59
Discharge	33.00

10-year Dry Lane Met

27"



Section 4A - Michael Way (Developed - 10-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.003
Discharge	36.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	28.16
0+05.00	28.06
0+05.50	28.06
0+05.50	27.56
0+07.00	27.64
0+40.00	28.38
0+73.00	27.66
0+74.50	27.58
0+74.50	28.08
0+75.00	28.08
0+80.00	28.18

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 28.16)	(0+05.00, 28.06)	0.013
(0+05.00, 28.06)	(0+05.50, 28.06)	0.013
(0+05.50, 28.06)	(0+05.50, 27.56)	0.013
(0+05.50, 27.56)	(0+07.00, 27.64)	0.013
(0+07.00, 27.64)	(0+40.00, 28.38)	0.016
(0+40.00, 28.38)	(0+73.00, 27.66)	0.016
(0+73.00, 27.66)	(0+74.50, 27.58)	0.013
(0+74.50, 27.58)	(0+74.50, 28.08)	0.013
(0+74.50, 28.08)	(0+75.00, 28.08)	0.013
(0+75.00, 28.08)	(0+80.00, 28.18)	0.013

Options

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

Results

Normal Depth	0.65
Elevation Range	27.56 to 28.38 ft
Flow Area	16.8
Wetted Perimeter	65.43
Hydraulic Radius	0.26
Top Width	64.34

Section 4A - Michael Way (Developed - 10-Year)

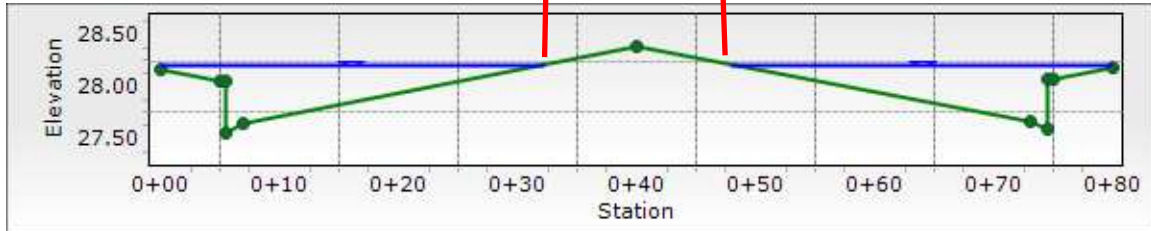
Results	
Normal Depth	0.65
Critical Depth	0.59
Critical Slope	0.006
Velocity	2.14
Velocity Head	0.07
Specific Energy	0.72
Froude Number	0.739
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	0.00
Upstream Velocity	0.00
Normal Depth	0.65
Critical Depth	0.59
Channel Slope	0.003
Critical Slope	0.006
Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.046796849123826ft. Flow is divided.

Cross Section for Section 4A - Michael Way (Developed - 10-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.003
Normal Depth	0.65
Discharge	36.00

10-year Dry Lane Met

15'



Section 4B - Michael Way (Developed - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.003
Discharge	83.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	28.16
0+05.00	28.06
0+05.50	28.06
0+05.50	27.56
0+07.00	27.64
0+40.00	28.38
0+73.00	27.66
0+74.50	27.58
0+74.50	28.08
0+75.00	28.08
0+80.00	28.18

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 28.16)	(0+05.00, 28.06)	0.013
(0+05.00, 28.06)	(0+05.50, 28.06)	0.013
(0+05.50, 28.06)	(0+05.50, 27.56)	0.013
(0+05.50, 27.56)	(0+07.00, 27.64)	0.013
(0+07.00, 27.64)	(0+40.00, 28.38)	0.016
(0+40.00, 28.38)	(0+73.00, 27.66)	0.016
(0+73.00, 27.66)	(0+74.50, 27.58)	0.013
(0+74.50, 27.58)	(0+74.50, 28.08)	0.013
(0+74.50, 28.08)	(0+75.00, 28.08)	0.013
(0+75.00, 28.08)	(0+80.00, 28.18)	0.013

Options

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

Results

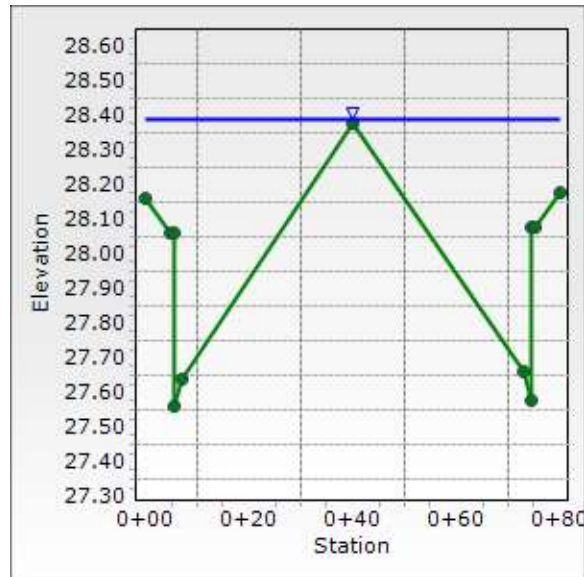
Normal Depth	0.83
Elevation Range	27.56 to 28.38 ft
Flow Area	30.4
Wetted Perimeter	81.47
Hydraulic Radius	0.37
Top Width	80.00

Section 4B - Michael Way (Developed - 100-Year)

Results	
Normal Depth	0.83
Critical Depth	0.77
Critical Slope	0.005
Velocity	2.73
Velocity Head	0.12
Specific Energy	0.95
Froude Number	0.780
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	0.00
Upstream Velocity	0.00
Normal Depth	0.83
Critical Depth	0.77
Channel Slope	0.003
Critical Slope	0.005
Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.234058666165659ft.

Cross Section for Section 4B - Michael Way (Developed - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.003
Normal Depth	0.83
Discharge	83.00



Section 5 - Onsite Calc (Developed, ON2 - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.005
Discharge	4.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	32.38
0+00.50	32.38
0+00.50	31.88
0+29.00	30.39

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 32.38)	(0+00.50, 32.38)	0.013
(0+00.50, 32.38)	(0+00.50, 31.88)	0.013
(0+00.50, 31.88)	(0+29.00, 30.39)	0.016

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

Results	
Normal Depth	0.43
Elevation Range	30.39 to 32.38 ft
Flow Area	1.8
Wetted Perimeter	8.65
Hydraulic Radius	0.20
Top Width	8.21
Normal Depth	0.43
Critical Depth	0.40
Critical Slope	0.007
Velocity	2.27
Velocity Head	0.08
Specific Energy	0.51
Froude Number	0.865
Flow Type	Subcritical

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

Section 5 - Onsite Calc (Developed, ON2 - 100-Year)

GVF Output Data

Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	0.00
Upstream Velocity	0.00
Normal Depth	0.43
Critical Depth	0.40
Channel Slope	0.005
Critical Slope	0.007

Messages

Messages	Water Surface Elevation exceeds lowest end station by 0.428980061720392ft.
----------	---

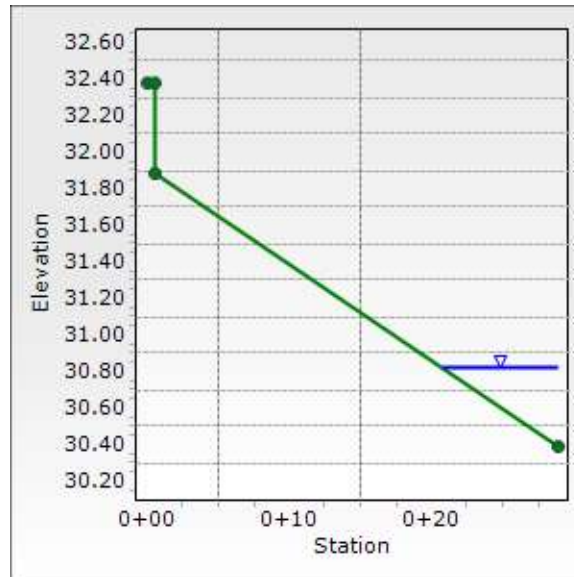
Cross Section for Section 5 - Onsite Calc (Developed, ON2 - 100-Year)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.005
Normal Depth	0.43
Discharge	4.00



Section 6 - Onsite Calc (Developed, ON2 - 100-Year)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.010
Discharge	4.00

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	32.35
0+00.50	32.35
0+00.50	31.85
0+23.00	30.50
0+24.50	30.40
0+26.00	30.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 32.35)	(0+00.50, 32.35)	0.013
(0+00.50, 32.35)	(0+00.50, 31.85)	0.013
(0+00.50, 31.85)	(0+23.00, 30.50)	0.016
(0+23.00, 30.50)	(0+24.50, 30.40)	0.013
(0+24.50, 30.40)	(0+26.00, 30.50)	0.013

Options

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

Results

Normal Depth	0.33
Elevation Range	30.40 to 32.35 ft
Flow Area	1.2
Wetted Perimeter	6.99
Hydraulic Radius	0.18
Top Width	6.75
Normal Depth	0.33
Critical Depth	0.37
Critical Slope	0.006
Velocity	3.21
Velocity Head	0.16
Specific Energy	0.48
Froude Number	1.315
Flow Type	Supercritical

Section 6 - Onsite Calc (Developed, ON2 - 100-Year)

GVF Input Data	
Downstream Depth	0.00
Length	0.00
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00
Profile Description	N/A
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	0.33
Critical Depth	0.37
Channel Slope	0.010
Critical Slope	0.006

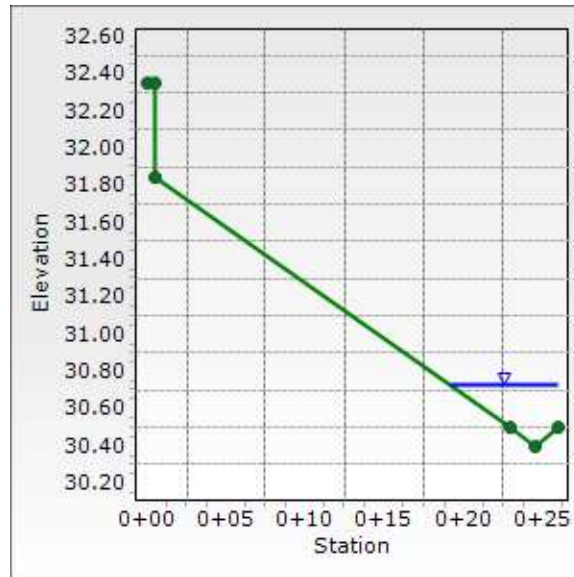
Cross Section for Section 6 - Onsite Calc (Developed, ON2 - 100-Year)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

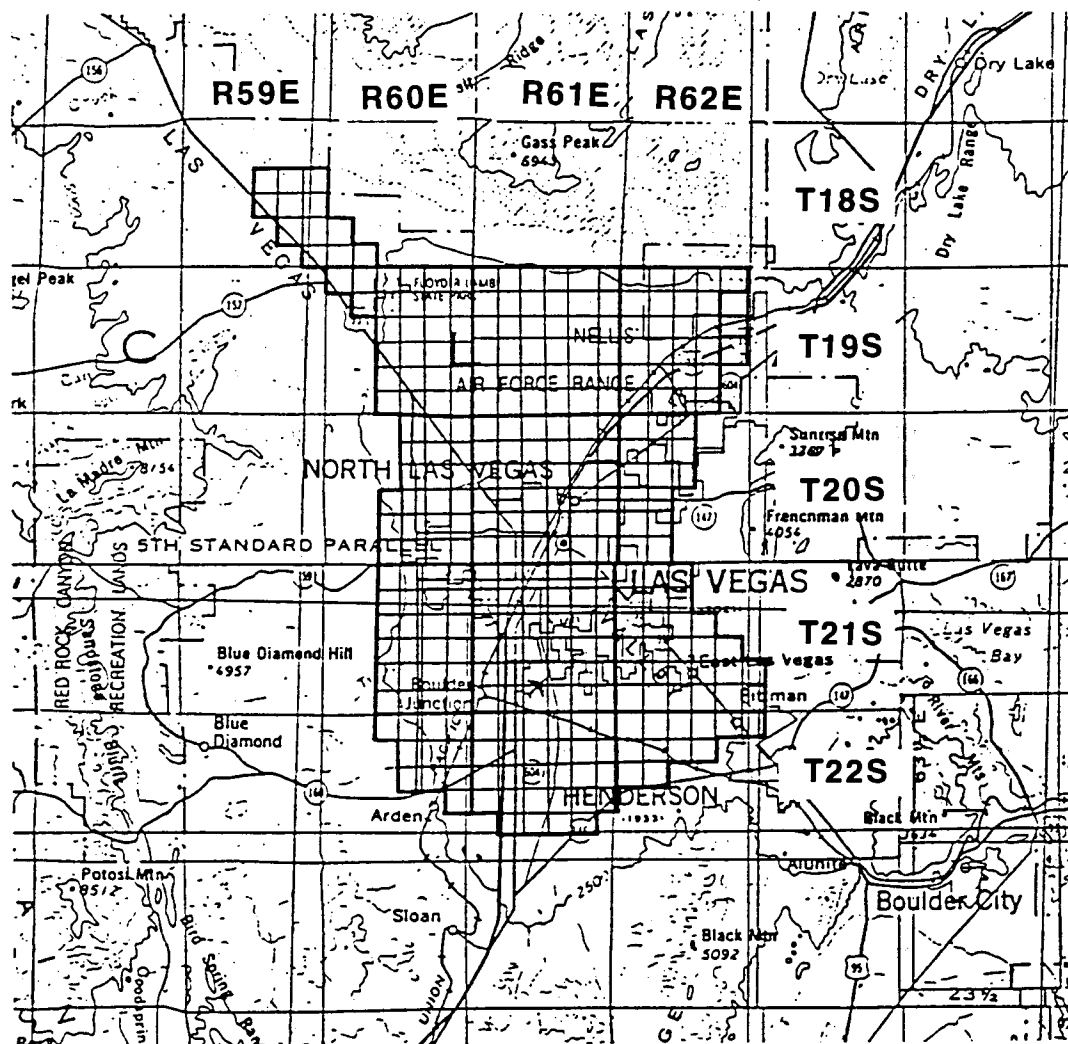
Channel Slope	0.010
Normal Depth	0.33
Discharge	4.00



APPENDIX C

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP RANGE SECTIONS

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

TOWNSHIP RANGE SECTIONS

20 South	62 East	4-9,16-20,29-32
21 South	60 East	1-4,9-16,21-28,33-36
21 South	61 East	ALL SECTIONS
21 South	62 East	4-9,15-23, 25-36
22 South	60 East	1-4,10-15,24
22 South	61 East	1-24,26-29
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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA (IN INCHES)

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

- NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.
2. The 24 hour values presented above are for use with TR-55 only.
3. Table 501 adjustments not required.

Revision	Date

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

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

See Table 602A

Developing urban areas

Newly graded areas (pervious areas only, no vegetation) ⁵	77	86	91	94
--	----	----	----	----

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

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



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**

Living Grace



April 2, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

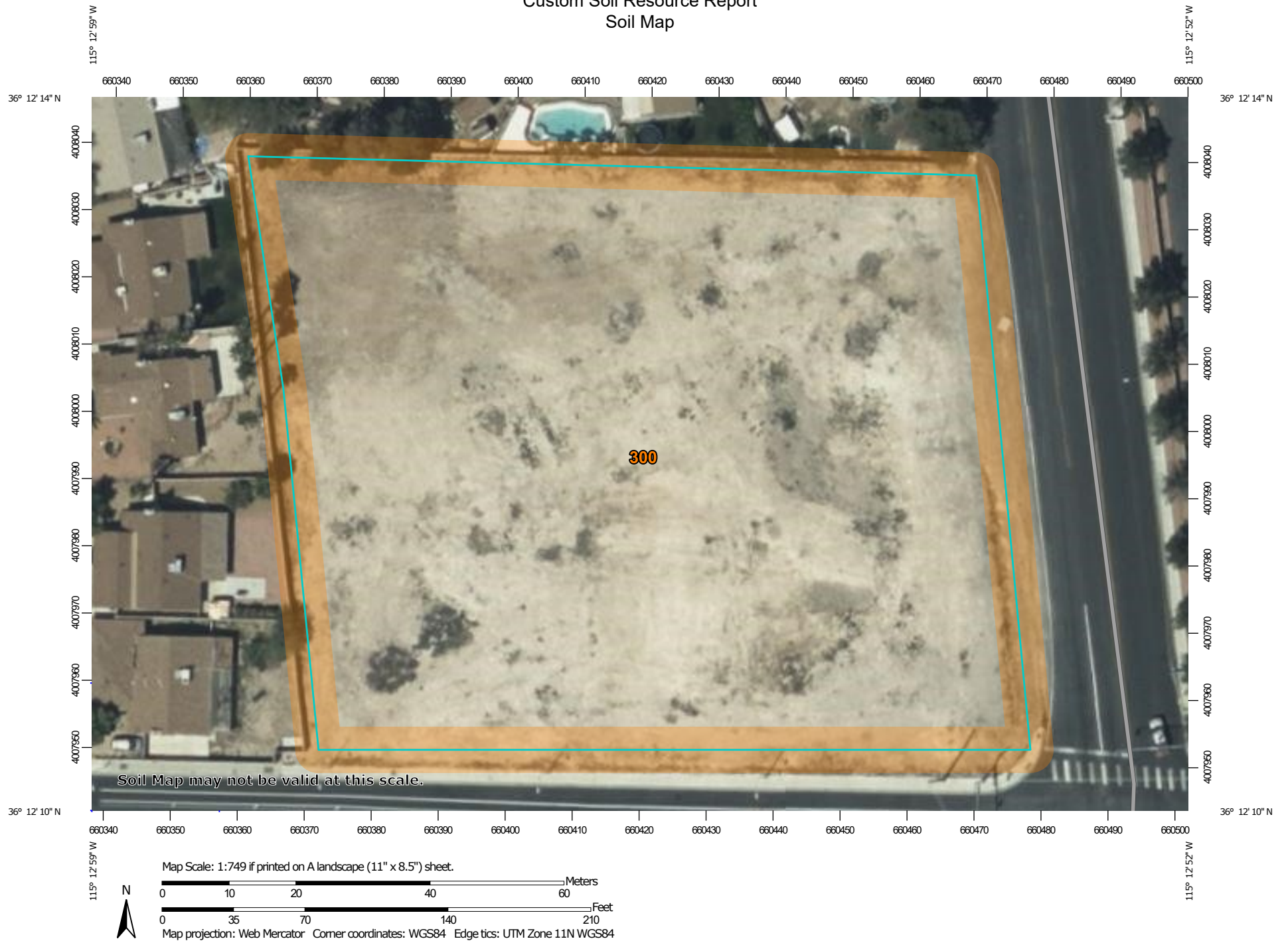
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

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:

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 16, Aug 26, 2020

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

Date(s) aerial images were photographed: Apr 3, 2019—May 14, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
300	Las Vegas gravelly fine sandy loam, 0 to 2 percent slopes	2.3	100.0%
Totals for Area of Interest		2.3	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.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Las Vegas Valley Area, Nevada, Part of Clark County

300—Las Vegas gravelly fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hrbp
Elevation: 1,800 to 2,600 feet
Mean annual precipitation: 4 to 6 inches
Mean annual air temperature: 63 to 68 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Las Vegas

Setting

Landform: Basin-floor remnants
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone

Typical profile

H1 - 0 to 1 inches: gravelly fine sandy loam
H2 - 1 to 7 inches: fine sandy loam
H3 - 7 to 11 inches: gravelly sandy clay loam
H4 - 11 to 15 inches: indurated

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 3 to 14 inches to petrocalcic
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 85 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 12.0
Available water capacity: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)
Hydric soil rating: No

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APPENDIX D

CITY OF LAS VEGAS GENERAL NOTES

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

WALL NOTES:

16. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS, NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.
17. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.
18. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.
19. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.
20. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC. THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.
21. AFTER HAUNCHING AND PRIOR TO BACKFILL OPERATIONS WHICH WOULD COVER SANITARY SEWER AND STORM DRAIN FACILITIES, CONTRACTOR IS REQUIRED TO SCHEDULE CL OPEN - TRENCH UTILTY SURVEY INSPECTION OR DETERMINATION OF FINAL LOCATION COORDINATES. UTILITIES TO BE INSPECTED BY CLV SHALL INCLUDE A MINIMUM THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLE, STORM DRAIN MANHOLES AND TRANSITION STRUCTURES, STORM DRAIN LATERALS AND THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE STORM DRAIN MAIN ALIGNMENT, INCLUDING DEFLECTION POINTS.
22. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST ADDITION.
23. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.  OR 1-800-642-2444	AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DIG OVERHEAD  1-702-227-2929	FAST Call before you UnderGround 1-702-432-5300 FREEMAN AND AERIAL SYSTEMS OF TRANSPORTATION
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NOTICE TO CONTRACTOR

1. CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR SHALL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD DESIGN PROFESSIONALS HARMLESS FROM ALL LIABILITY, REAL OR ALLEGED IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF DESIGN PROFESSIONAL.
2. CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND SHALL REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.
3. THE EXISTENCE AND APPROXIMATE LOCATION OF ANY UNDERGROUND FACILITIES SHOWN HEREON WERE OBTAINED FROM A SEARCH OF AVAILABLE RECORDS. THERE MAY, HOWEVER, BE EXISTING UTILITIES NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT THE UTILITIES OR STRUCTURES SHOWN HEREON AND ANY OTHER NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
4. 14 GAUGE SOLID COPPER WIRE FOR LINE LOCATION SHALL BE REQUIRED OVER ALL SERVICE LATERALS NOT INSTALLED PERPENDICULAR TO THE MAIN IN ACCORDANCE WITH UDACS PLATE No. 27.
5. SEE PLAN AND PROFILE AND MASTER UTILITY SHEETS FOR COMPLETE WATER AND SEWER DESIGN.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR DUST AND EROSION CONTROL DURING CONSTRUCTION.
7. SEE LANDSCAPE PLANS FOR LANDSCAPING. (SEE ARCH PACKAGE- COMPLETED BY OTHERS)

CITY OF LAS VEGAS GRADING NOTES

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

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

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

CITY OF LAS VEGAS TRAFFIC NOTES

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

CITY OF LAS VEGAS SEWER NOTES

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

CITY OF LAS VEGAS STREETLIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION (USS), AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (USD), LATEST REVISION.
2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS, ETC., LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF TRAFFIC ENGINEERING AND THE CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE USS.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS..
4. ALL EMPTY CONDUIT SHALL HAVE AT LEAST ONE GREEN #8 AWG WIRE INSTALLED AS TRACER WIRE IN ACCORDANCE WITH SECTION 623 G.02.01 OF THE USS PRIOR TO BACKFILLING AND FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN ACCORDANCE WITH THE USD NO. 320A WHEN POLE IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TRAFFIC ENGINEERING DIVISION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINT SHALL BE COORDINATED WITH NV ENERGY COMPANY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICE POINTS SHALL BE SHOWN ON THE CIVIL PLANS.
8. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREETLIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BASES ARE INSTALLED. AT NO EXPENSE TO THE CITY OF LAS VEGAS.
9. THE CONTRACTOR SHALL FURNISH COMPLETE CONDUIT, WIRE, ETC., FROM SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON PLANS.

Z:\PROJECTS-CURRENT\COMMERCIAL-CLIENTS\SHOWCASE-CONTRACTING\200279-LIVING GRACE\ENGINEERING\DWG DRAWINGS\IMPROVEMENT PLANS\200279-CI-CA-CO.DWG 3/19/2021 8:41 AM

ABBREVIATIONS

ABAN	ABANDON	GB	GRADE BREAK
AB	AGGREGATE BASE	GM	GAS METER
ABS	ABSOLUTE	GPM	GALLONS PER MINUTE
AC	ASPHALTIC CONCRETE	GRD	GRADE
ACKV	AUTOMATIC CHECK VALVE	GRT	GRATE
ADA	AMERICAN DISABILITY ACT	GUT	GUTTER
ADDL	ADDITIONAL	GV	GATE VALVE
ADDM	ADDENDUM	HERCP	HORIZONTAL/ELLIPTICAL REINFORCED CONCRETE PIPE
ADJ	ADJUSTABLE	HP	HIGH POINT
AGG	AGGREGATE	IN	INCH
AL	ALUMINUM	INSTR	INSTRUMENT
AMT	AMOUNT	INT	INTERIOR
&	AND	INV	INVERT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	IRR	IRRIGATION
APN	ASSESSOR PARCEL NUMBER	LEN OR L	LENGTH OF CURVATURE
APPROX	APPROXIMATE	LF	LINEAR FOOT
APPROV	APPROVED	LT	LEFT/LIGHT
ASPH	ASPHALT	LVVWD	LAS VEGAS VALLEY WATER DISTRICT
ASSN	ASSOCIATION	M	METER
ASSY	ASSEMBLY	MAX	MAXIMUM
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS	N	NORTH
AVE	AVENUE	NAP	NOT-A-PART
AWWA	AMERICAN WATER WORKS ASSOCIATION	NDOT	NEVADA DEPARTMENT OF TRANSPORTATION
BC	BOLT CIRCLE/BACK OF CURB	NE	NORTHEAST
BCR	BACK OF CURB RADIUS BEGINNING OF CURVE RETURN	NG	NATURAL GROUND
BORY LINE	BOUNDARY LINE	NO. #	NUMBER
BETW, B/W	BETWEEN	NPC	NEVADA POWER COMPANY
BK	BOOK/BACK	NTS	NOT TO SCALE
BLDG	BUILDING	NW	NORTHWEST
BLK	BLOCK	MH	MANHOLE
BLM	BUREAU OF LAND MANAGEMENT	MIN	MINIMUM
BLVD	BOULEVARD	OHP	OVER HEAD POWER
BM	BENCHMARK	OHTEL	OVER HEAD TELEPHONE
BO	BLOW OFF ASSEMBLY	P	POLE/PRESSURE/PIPE/POWER
BC, BOC	BACK OF CURB	P/L / R	PROPERTY LINE
BOT	BOTTOM	PERP	PERPENDICULAR
BW, BOW	BACK OF WALK	PG	PRESSURE GAGE
BPV	BACK PRESSURE VALVE	PRV	PRESSURE REDUCING VALVE
BRG	BEARING	PSI	POUNDS PER SQUARE INCH
BS	BACK SIGHT	PVC	POLYVINYL CHLORIDE PIPE
BVC	BEGINNING OF VERTICAL CURVE	QTY	QUANTITY
BSW	BACK OF SIDEWALK	R	RADIUS
C	CONDUIT	(R)	RADIAL
C&G	CURB & GUTTER	R.D.O.	ROOF DRAIN OUTLET PIPE LOCATION
CAP	CAPACITY	RPDA	REDUCED PRESSURE DETECTOR ASSEMBLY
CATV	CABLE TELEVISION	RPPA	REDUCED PRESSURE PRINCIPLE ASSEMBLY
CAV	COMBINATION AIR VALVE	RR	RAILROAD
CC	CLARK COUNTY	ROW	RIGHT OF WAY
CCWRD	CLARK COUNTY WATER RECLAMATION DISTRICT	S/C	SAW CUT
CI	CAST IRON	SCOP	STEEL CYLINDER CONCRETE PIPE
OIP	CAST IRON PIPE/CAST IN PLACE	SD	STORM DRAIN
CIR	CIRCLE	SDMH	STORM DRAIN MANHOLE
CIRCUM	CIRCUMFERENCE	SW, SDWK	SIDEWALK
CL OR ☉	CENTERLINE	SE	SOUTHEAST
CO	COUNTY/COMPANY/CONTRACT	SEC	SECTION/SECOND(ARY)
COL	COLUMN	SHT	SHEET
CONC	CONCRETE	SIG	SIGNAL
CONST	CONSTRUCTION	SF, SQ FT	SQUARE FOOT (FEET)
COR	CORNER	SY, SQ YD	SQUARE YARD
CONC	CONCRETE	SNBORS	SOUTHERN NEVADA BUILDING OFFICIALS REGIONAL STANDARD
CONN	CONNECTION	SS	SANITARY SEWER
CONT	CONTINUE OR CONTINUOUS	ST	STREET
CTR	CENTER	STA	STATION
CU	CUBIC	STD	STANDARD
CY	CUBIC YARD	SL, STL	STREET LIGHT
D OR Δ	DELTA ANGLE	SUR	SURVEY
D/W	DRIVEWAY	SVZ	SITE VISIBILITY ZONE
DBO	DESIGNED BY OTHERS	T	TELEPHONE/TANGENT
DCSWCS	DESIGN AND CONSTRUCTION STANDARDS FOR WASTE WATER COLLECTION SYSTEMS	TAN	TANGENT
DEMO	DEMOLITION	TC	TOP OF CURB
DEPT	DEPARTMENT	TF	TOP OF FOOTING
DET	DETAIL	TFW	TOP OF FLOOD WALL
DEV	DEVELOPMENT	TMH	TOP OF MANHOLE
DI	DROP INLET OR DUCTILE IRON	TR.DR.	TRENCH DRAIN
DIA OR Ø	DIAMETER	TRW	TOP OF RETAINING WALL
DIM	DIMENSION	TOT	TOTAL
DIP	DUCTILE IRON PIPE	TW	TOP OF WALL
DIR	DIRECTION	TS	TRAFFIC SIGNAL
DIST	DISTANCE	TRANS	TRANSITION/TRANSMISSION
DMH	DROP MANHOLE	(TYP)	TYPICAL
DOM	DOMESTIC	UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS
DR	DRIVE	USD	UNIFORM STANDARD DRAWINGS
DWG	DRAWING	VC	VERTICAL CURVE
DWY	DRIVEWAY	VERT	VERTICAL
E	EAST	VG	VALLEY GUTTER
EC	EXISTING CONCRETE	W/	WITH
ECR	END OF CURVE RETURN	WM	WATER METER
EOC	END OF CURVE	W	WATER
EOP	EDGE OF PAVEMENT	WV	WATER VALVE
EOS	EDGE OF SHOULDER	YD	YARD
ESMT	EASEMENT		
EVC	END OF VERTICAL CURVE		
EX	EXISTING		
FC	FACE OF CURB		
FF	FINISHED FLOOR		
FG	FINISHED GRADE		
FH	FIRE HYDRANT		
FL OR ☉	FLOW LINE		
FN	FENCE		
FW	FACE OF WALL		
FASTNR	FASTENER		
FT	FOOT OR FEET		
FUT	FUTURE		

NOTE:
THIS IS A STANDARD ABBREVIATION SHEET.
SOME ABBREVIATIONS MAY APPEAR ON THIS SHEET
BUT NOT USED IN THE PLANS. ALL ABBREVIATIONS
USED ON THE PLANS MUST APPEAR ON THIS SHEET.

UTILITY

WATER PIPELINE

BLOWOFF

COMBINATION AIR VALVE

REDUCER

WATER VALVE

FIRE HYDRANT ASSEMBLY

WATER METER

SANITARY SEWER MANHOLE

STREET LIGHT (GENERIC SYMBOL NOT RELATED TO WATTAGE)

ELECTRICAL BOX

ELECTRICAL PANEL BOX

CABLE TV

GAS LINE

SANITARY SEWER

UNDERGROUND POWER

UNDERGROUND TELEPHONE

VALVE (INITIALS INDICATE OWNERSHIP AND/ OR TYPE)

UTILITY BOX (INITIALS INDICATE OWNER AND / OR TYPE)

UTILITY STUB-OUT

TRAFFIC CONTROL SIGN

100 W LUMINAIRE

150 W LUMINAIRE

200 W LUMINAIRE

250 W LUMINAIRE

400 W LUMINAIRE

750 W LUMINAIRE

TRAFFIC SIGNAL POLE

GATE VALVE

DOUBLE CHECK DETECTOR ASSEMBLY (DCDA)

REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA)

ROOF DRAIN OUTLET PIPE LOCATION

GEOMETRIC

EDGE OF PAVEMENT

FENCE

CURB, GUTTER AND SIDEWALK

CENTER LINE

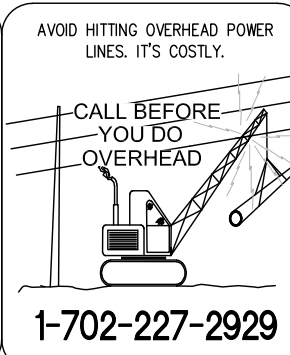
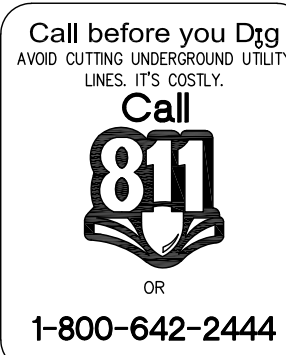
BLOCK WALL/RETAINING WALL

SCREEN WALL

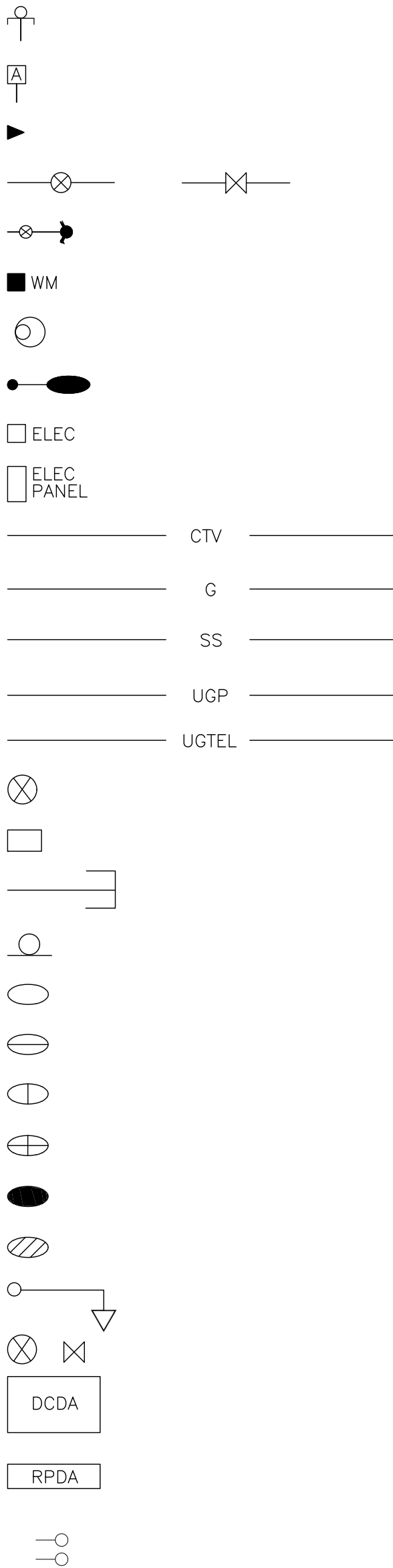
STREET NAME SIGN

DRIVEWAY

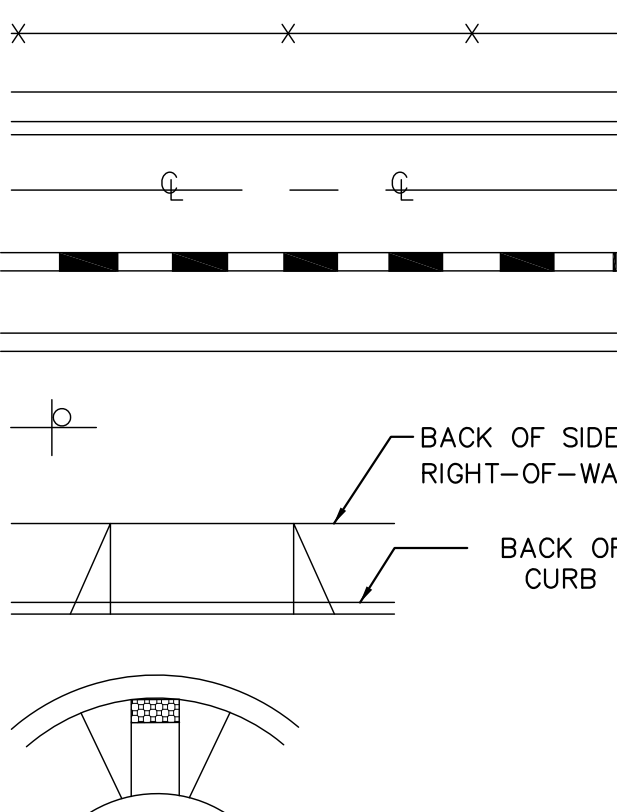
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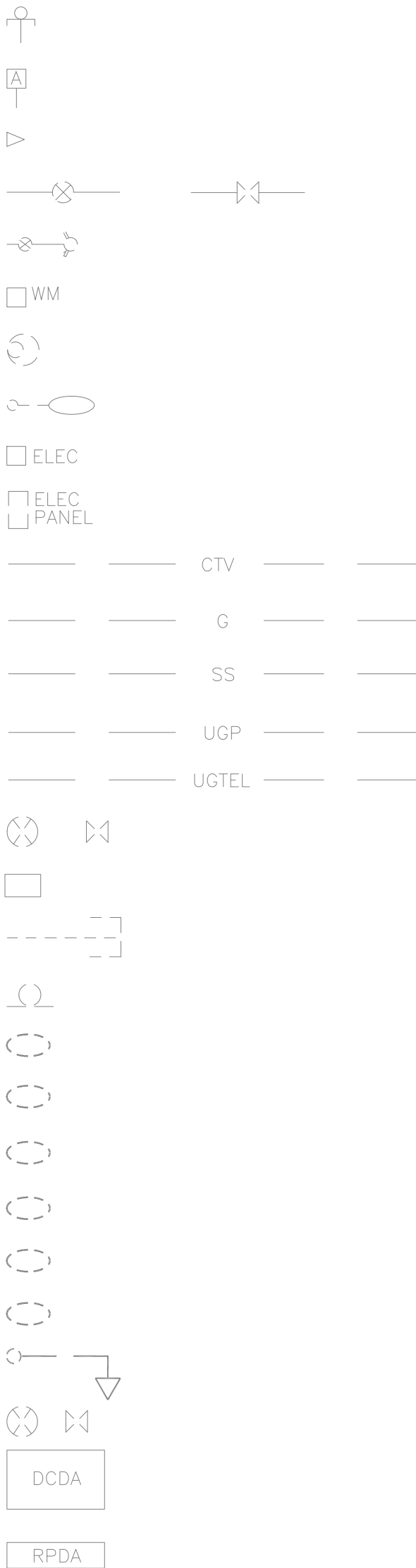
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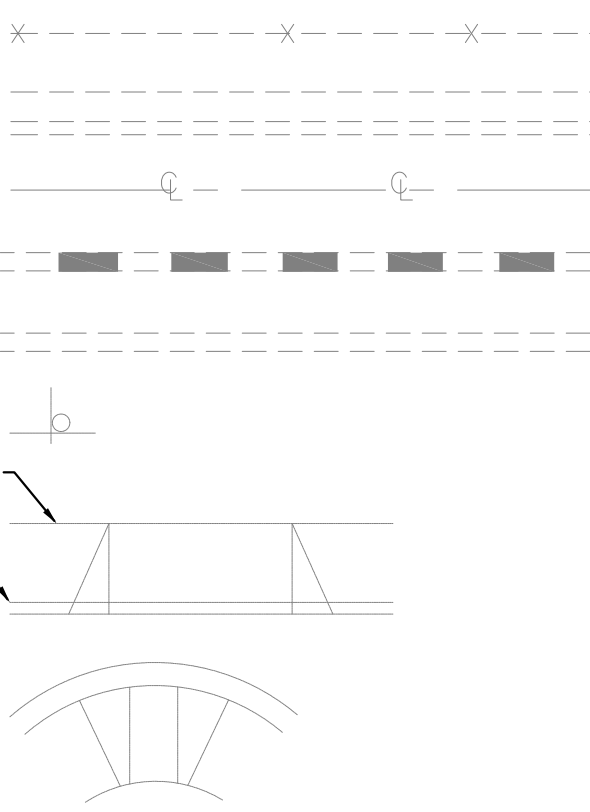
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EXISTING



EXISTING



SITE PLAN

STEPS (NOTE TYPE AND NO. OF RISERS)

EXISTING BUILDING & FOUNDATION

MISCELLANEOUS

REFERENCE BUBBLE

IDENTIFICATION HEXAGON

SAW CUT LINE-ASPHALT CONC. OR PCC CONC.

DRAINAGE / GRADING

STORM DRAIN MANHOLE (SIZE AS NOTED PER PLAN)

CONTOURS

STORM DRAIN (SIZE AS NOTED PER PLAN)

DIRECTION OF FLOW

FLOW LINE OF DITCH OR CHANNEL

DROP INLET

ELEVATIONS

CUT OR FILL SLOPES

VALLEY GUTTER

SPECIAL SURVEY LEGEND & ABBREVIATIONS

W	WATER PULLBOX/ METER/SHUT OFF	☼	FIRE HYDRANT
E	ELECTRIC PULLBOX/ METER/TRANSFORMER	☼W	WATER VALVE
T	TELEPHONE	☼GAS	GAS METER
FO	FIBER OPTIC PULLBOX/HANDHOLE	☼SS	SEWER MANHOLE
SL	STREETLIGHT PULLBOX/HANDHOLE	☼GV	GAS VALVE
TS	TRAFFIC SIGNAL PULLBOX/HANDHOLE	☼SSCO	SEWER CLEANOUT
ICV	IRRIGATION CONTROL VALVE	★	AREA LIGHT
SS	SANITARY SEWER	☼	STREET LIGHT
CTV	CATV PULLBOX/HANDHOLE	☼M	SIGN
AL	AREA LIGHT PULLBOX/HANDHOLE	☼	INTERCEPTOR MANHOLE
RB	RED BOX DVD RENTAL KIOSK	☼	TILE WALKWAY
		☼	DESERT LANDSCAPE AREA
		☼B	8" CONCRETE BOLLARD
		☼	TRAFFIC SIGNAL POLE
		☼	AREA LIGHT
		☼	STORM MANHOLE
		☼	SHRUB
		☼	FLOWERS/PLANT
		☼	TREE
		☼	PALM TREE
		☼	BUILDING COLUMN
		☼C	TRASH CAN

SURVEY

SURVEY MONUMENT

PROPERTY LINE

RIGHT-OF-WAY LINE

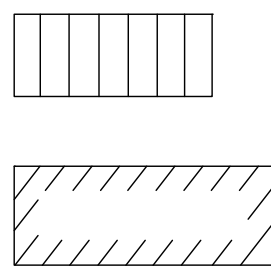
PATENT RESERVATION OR EASEMENT LINE

SECTION LINE

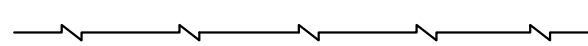
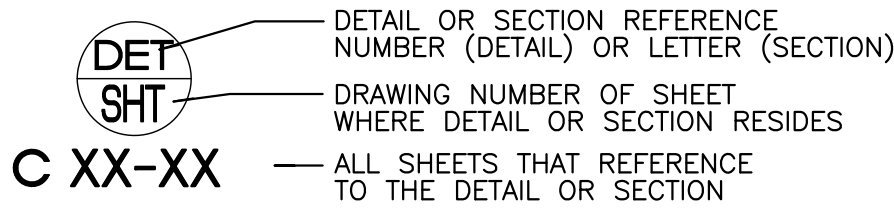
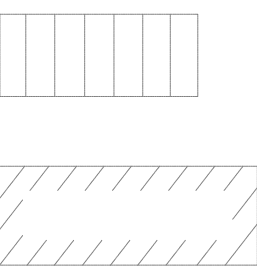
CONCRETE MONUMENT

CONCRETE MONUMENT SURVEY LINE

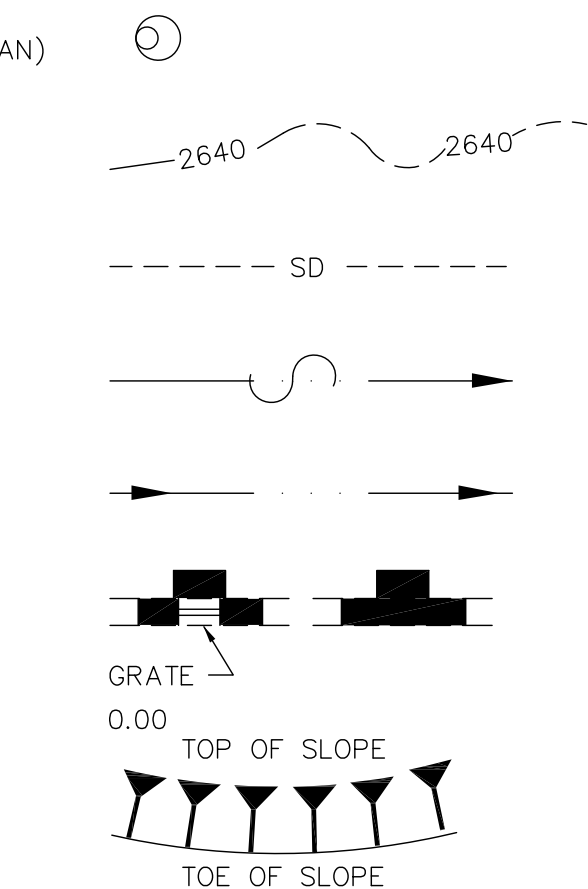
PROPOSED



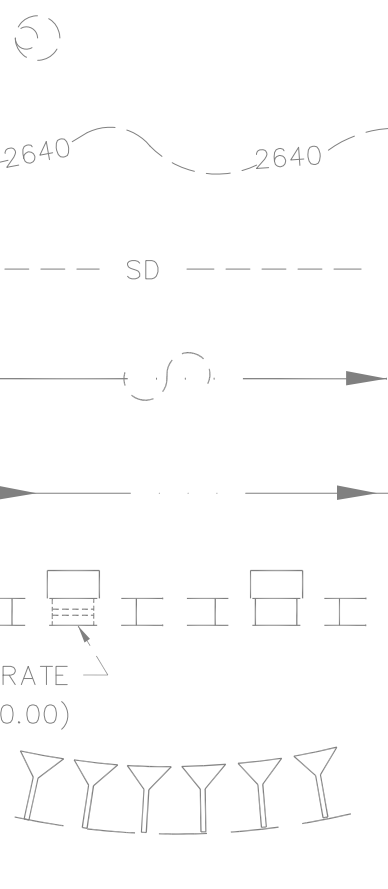
EXISTING



PROPOSED



EXISTING



APPROVAL

REVISIONS

LIVING GRACE FOURSQUARE CHURCH

LEGEND & ABBREVIATIONS

ENGINEER'S SEAL

DRAWING NUMBER:
C4
SHEET 4 OF 9
AGENCY NUMBER:

APRVD. BY

REV.

APN: 138-13-403-001
2400 N MICHAEL WAY
LAS VEGAS, NEVADA 89108

DATE: 3/19/2021
PROJ. NO: 200279
DRAWN BY: ARB
CHECKED BY: RAS
SCALE: AS NOTED
JURISDICTION: LAS VEGAS

	PROPOSED AC PAVEMENT
	PROPOSED CONCRETE
	LIMITS OF PAVEMENT RESTORATION PER USD NO. 500.5
	PROPOSED NO PARKING AREA AND ADA ACCESSIBLE ROUTE

CONTRACTOR TO COMPLY WITH ALL ADA REQUIREMENTS. IF CONTRACTOR FINDS DISCREPANCIES WITH ANY INFORMATION INDICATED ON THESE PLANS, ACG DESIGN LLC IS TO BE NOTIFIED BY CONTRACTOR IMMEDIATELY.

REFER TO ARCHITECTURAL/PLUMBING PLANS (BY OTHERS) FOR THE TREATMENT OF ROOF DRAIN OUTLETS.

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, OR ACCUMULATED, ON THE PUBLIC RIGHTS OF WAY OF CLARK COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION. SUCH DEBRIS, MUD, AND SEDIMENT 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 SUBMITTED TO CLARK COUNTY, SUB NO. 24-40 AND THE LAS VEGAS 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. THE SUBMITTER OF THE CONSTRUCTION SITE PLAN SHALL OBTAIN A GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NR1000000, 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 ENTRANCES AND EXITS, AND ALL BMP'S WEEKLY, AND WITHIN 24 HOURS AFTER A 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 BE APPROPRIATE IN THE EVENT OF A MAJOR DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NR1000000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMP'S SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT MAJOR STORMWATER RUNOFF EVENT. SEDIMENT ACCUMULATED IN BMP'S BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.
6. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL RESPOND TO STORMWATER INSPECTION CORRECTIVE ACTIONS IN THE MANNER PRESCRIBED BY CLARK COUNTY, INCLUDING BUT NOT LIMITED TO THE FOLLOWING: THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CORRECTIONS COMPLETED BY THE CONTRACTOR OR HIS AGENT.

NORTH 89°02'07" WEST
BEING THE BEARING OF THE SOUTH LINE OF THE SOUTHEAST QUARTER
(SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 13,
TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS,
CLARK COUNTY, NEVADA, SHOWN AS THE CENTERLINE OF SMOKE RANCH
ROAD IN BOOK 23 OF PLATS, PAGE 100, CLARK COUNTY, NEVADA
OFFICIAL RECORDS.

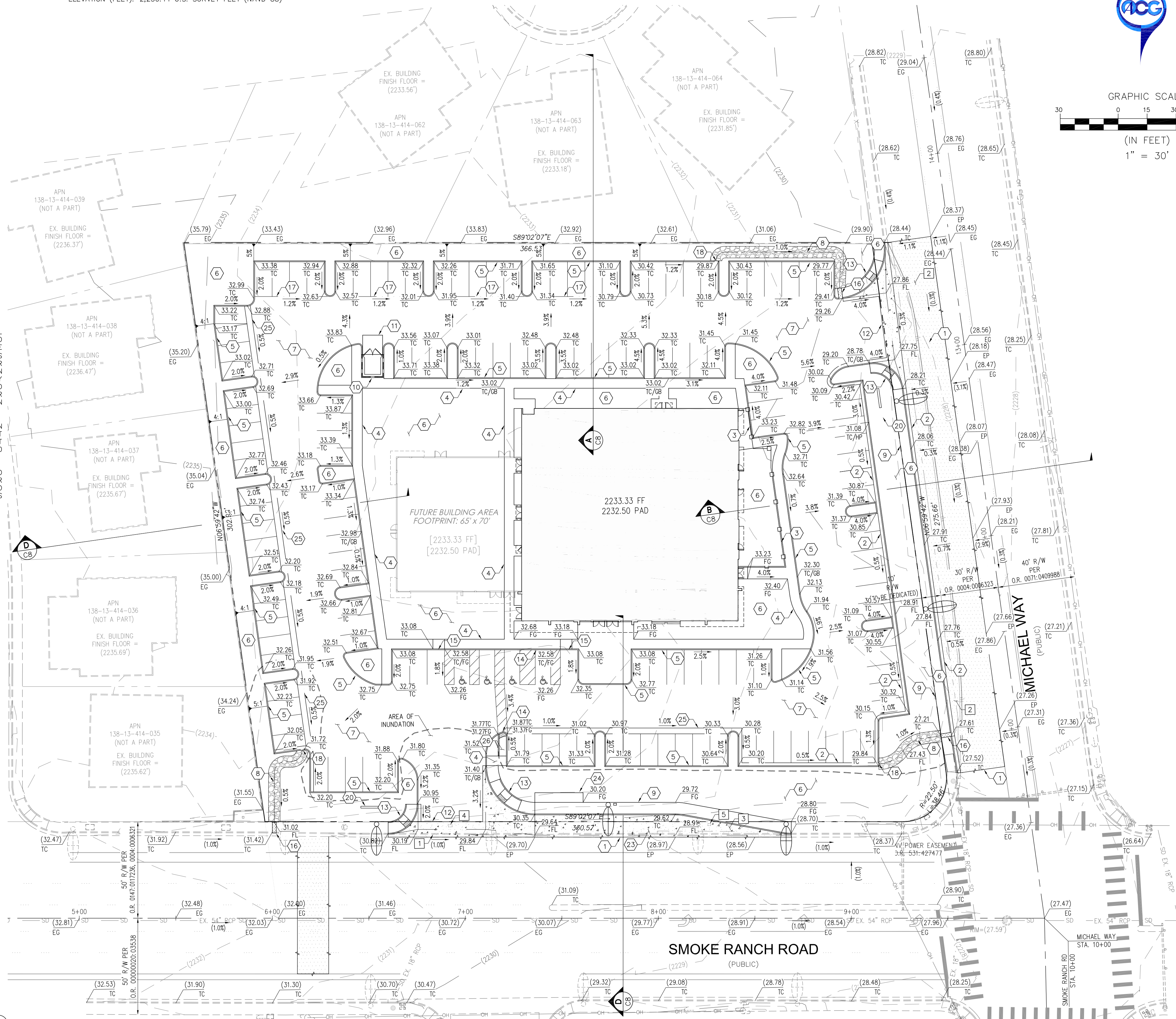
CITY OF LAS VEGAS BENCHMARK 5LV0013S6
RIVET & PLATE IN TOP OF CURB AT NW CORNER OF MICHAEL WAY &
CLEARY CT
ELEVATION (METERS): 679.84
ELEVATION (FEET): 2,230.44 U.S. SURVEY FEET (NAVD 88)

THE SOUTH 350 FEET OF THE EAST 393 FEET OF THE SOUTHEAST QUARTER (SE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 13, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA.

EXCEPTING THEREFROM THOSE PORTIONS AS CONVEYED FOR ROADWAY PURPOSES BY DEEDS RECORDED MARCH 26, 1954 IN BOOK 4 AS DOCUMENT NOS. 6321 AND 6322, AND RECORDED JULY 28, 1971 IN BOOK 147 AS DOCUMENT NO. 117236, OF OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

AS SHOWN BY FLOOD INSURANCE RATE MAP NO. 32003C2170F, DATED NOVEMBER 16, 2011, LOCATED IN UNSHADED ZONE X, AN AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

REMOVE ALL EXISTING LANDSCAPE FEATURES SUCH AS TREES, SHRUBS, GRASS, DECORATIVE ROCK, TREE WELLS, ETC IN CONFLICT WITH PROPOSED IMPROVEMENTS. REFER TO ARCHITECTURAL LANDSCAPE PLAN.

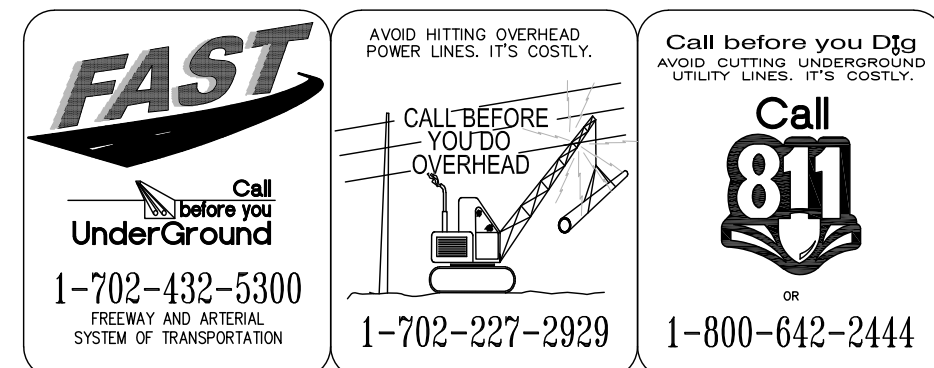


- 1 REMOVE EXISTING "L"-TYPE C&G.
- 2 REMOVE EXISTING AC PAVEMENT.
- 3 REMOVE EXISTING CONCRETE SIDEWALK.
- 4 RELOCATE EXISTING TRAFFIC SIGNAL VAULT AND CONDUIT. COORDINATE WITH APPROPRIATE AGENCY.
- 5 RELOCATE EXISTING STREET LIGHT VAULT AND CONDUIT. COORDINATE WITH APPROPRIATE AGENCY.

- 1 SAWCUT & MATCH EXISTING PAVEMENT.
- 2 CONSTRUCT "T" CURB AND GUTTER PER CAAUSD NO. 216.
- 3 INSTALL 6" HIGH WROUGHT IRON FENCE FOR ARCHITECTURAL PLANS.
- 4 CONSTRUCT ON-SITE CONCRETE SIDEWALK PER DETAIL 6, SHEET C9.
- 5 CONSTRUCT MODIFIED "A" TYPE CURB PER DETAIL 1, SHEET C9.
- 6 LANDSCAPE AREA (DESIGNED BY OTHERS)
- 7 CONSTRUCT "3" ON-SITE PAVEMENT OVER "4" TYPE II AGGREGATE BASE (95% COMPACTION).
6" MINIMUM SCARIFICATION AND COMPACTION. REFER TO DETAIL 2, SHEET C9.
- 8 FLOWLINE OF PROPOSED SWALE PER BMP DESIGN CRITERIA. $D_{50} \geq 3$ INCHES MIN, THICKNESS = 9 INCHES. 4:1 MAXIMUM SIDE SLOPES, 40' LONG X 6' WIDE MINIMUM. REFER TO LIMITS SHOWN ON PLAN AND DETAIL 9, SHEET C9.
- 9 CONSTRUCT OFF-SITE CONCRETE SIDEWALK PER CAAUSD NO. 234.
- 10 CONSTRUCT TRASH ENCLOSURE FOR ARCHITECTURAL PLANS.
- 11 CONSTRUCT CONCRETE APRON FOR TRASH ENCLOSURE (6" CONCRETE SLAB WITH 606/1.4X1.4 W.W.F.) OVER "8" TYPE II AGGREGATE BASE. REFER TO DETAIL 4, SHEET C8.
- 12 CONSTRUCT 8" CONCRETE CROSS GUTTER AND SPANDRELS PER CAAUSD NO. 228 FOR COMMERCIAL DRIVEWAY PER CAAUSD NO. 222A & 225.
- 13 CONSTRUCT CONCRETE SIDEWALK RAMP WITH DETECTABLE TACTILE WARNINGS PER CAAUSD NO. 235. (CASE 1, A=B, B=B" UNLESS OTHERWISE NOTED). 2% MAX. SLOPE IN LANDING AREA.
- 14 CONSTRUCT 4" INCH TO 8" INCH CURVE FACE PER DETAIL 7, SHEET C8.
- 15 CONSTRUCT 0-INCH TO 6-INCH CURVE FACE TRANSITION.
- 16 CONSTRUCT SIDEWALK DRAIN PER CAAUSD NO. 236.
- 17 CONSTRUCT FLOWLINE IN AC PAVEMENT. PROVIDE POSITIVE DRAINAGE AS INDICATED PER GRADES ON PLAN. (1% MINIMUM SLOPE).
- 18 PROVIDE 2" CURB OPENING TO ALLOW RUN-OFF TO SPILL OUT OF CURB. REFER TO DETAIL 10, SHEET C8.
- 19 MONUMENT SIGN (BY SEPARATE PERMIT).
- 20 INSTALL AREA LIGHT PER ELECTRICAL SITE PLAN (BY OTHERS).
- 21 LIMITS OF TRENCH BACKFILL AND PAVEMENT RESTORATION PER CAAUSD NO. 500.4 & 500.5 & 503.
- 22 CONSTRUCT CONCRETE BUS TURNOUT LANE PER CAAUSD NO. 234.4. REFER TO TYPICAL BUS TURNOUT DETAIL PER CAAUSD NO. 234.1.
- 23 CONSTRUCT CONCRETE BUS STOP PASSENGER LOADING W/SHELF PAD PER CAAUSD NO. 234.2 & 234.4.
- 24 CONSTRUCT "3" VALLEY GUTTER PER DETAIL 5, SHEET C9.
- 25 CONSTRUCT CONCRETE SIDEWALK RAMP. ENSURE 5% MAXIMUM LONGITUDINAL SLOPE AND 2% MAXIMUM CROSS SLOPE.

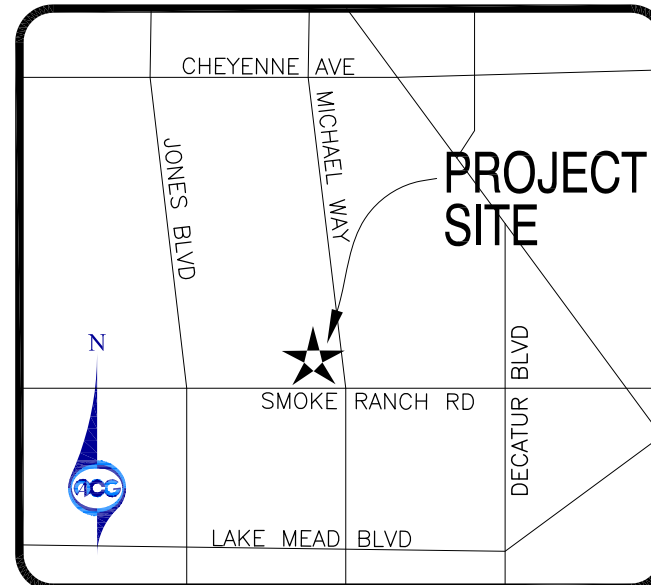
THESE PLANS SHALL NOT, IN PART OR IN WHOLE, BE USED FOR CONSTRUCTION UNTIL
APPROVED AND SIGNED BY THE GOVERNING AGENCY.

ENGINEER TO BE NOTIFIED OF ANY DISCREPANCIES IMMEDIATELY.



I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS.

RANDOLPH SKORPINSKI, P.E. DATE
(NV #14985)

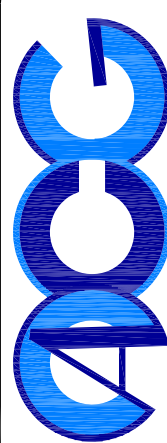
VICINITY MAP
NTS

REVISIONS		APPROVAL
REV.	DESCRIPTION	APPROVED BY DATE

LIVING GRACE FOURSQUARE CHURCH

GRADING PLAN

APN: 138-13-403-001
2400 N MICHAEL WAY
LAS VEGAS, NEVADA 891



ACG DESIGN
3310 CAMERON ST., SUITE 12-A
LAS VEGAS, NEVADA 89103
OFFICE: 702.448.8737
WEBSITE: WWW.ACG.DESIGN

ENGINEER'S SEA



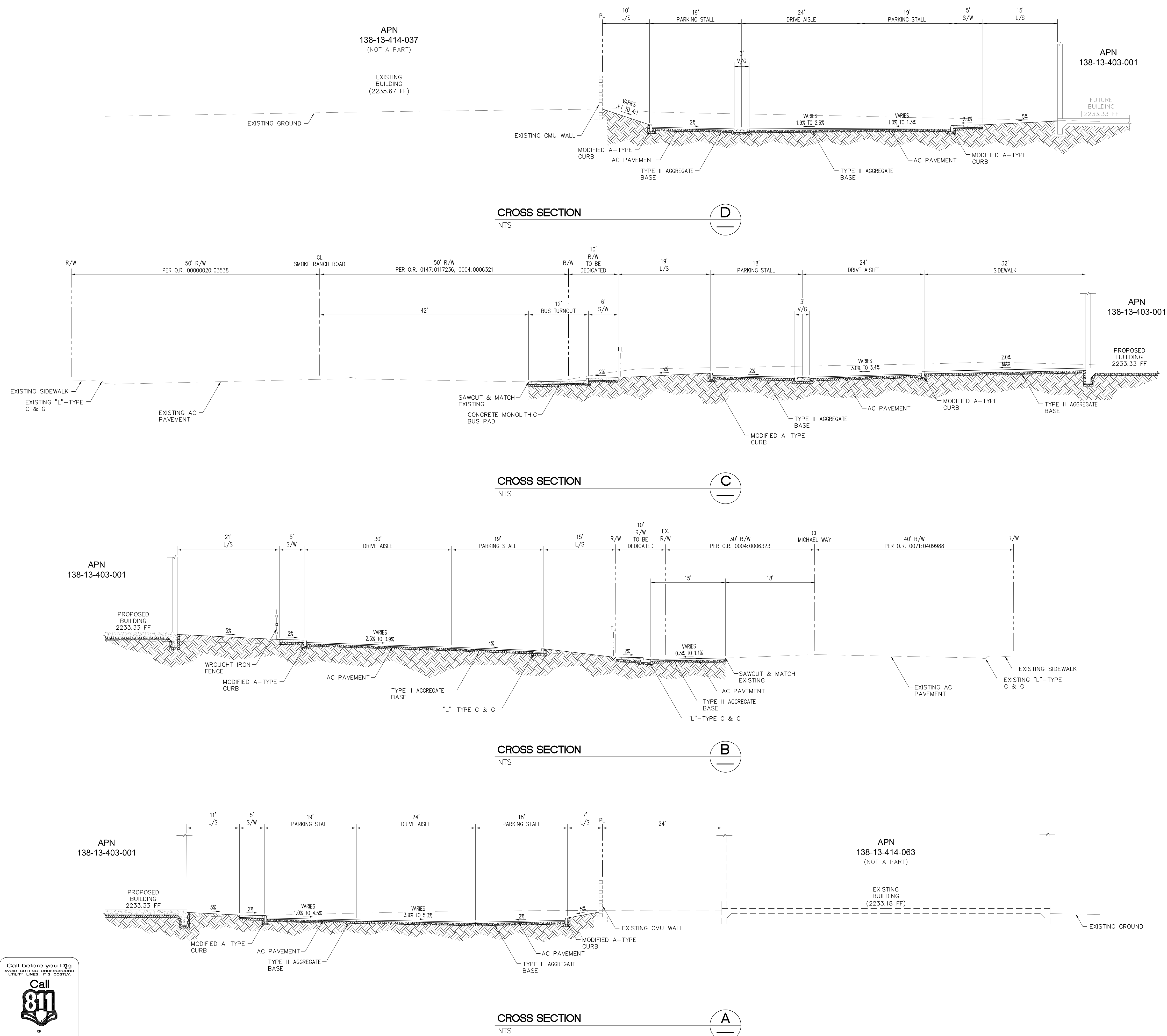
4/9/2021

DATE:	4/8/2021
PROJ. NO:	200279
DRAWN BY:	ARB
CHECKED BY:	RAS
SCALE:	AS NOTED
JURISDICTION:	LAS VEGA

DRAWING NUMBER:

C6

AGENCY NUMBER:



REVISIONS		APPROVAL	
REV.	DESCRIPTION	APPRD. BY	DATE

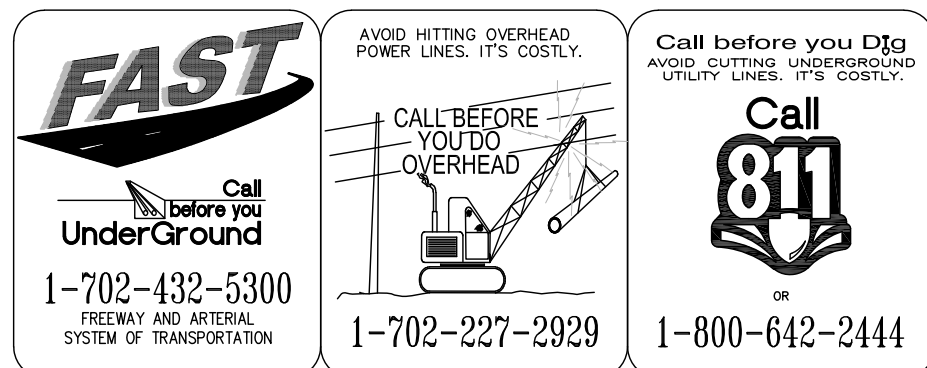
LIVING GRACE FOURSQUARE CHURCH

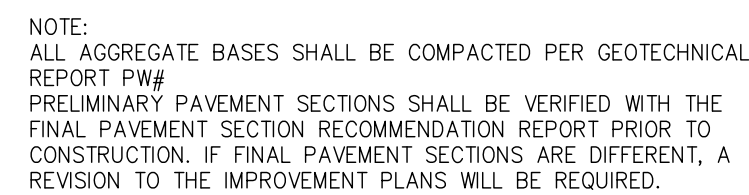
CROSS SECTIONS
APN: 138-13-403-001
2400 N MICHAEL WAY
LAS VEGAS, NEVADA 89108



DATE:	4/9/2021
PROJ. NO:	200279
DRAWN BY:	ARB
CHECKED BY:	RAS
SCALE:	AS NOTED
JURISDICTION:	LAS VEGAS

DRAWING NUMBER:
C8
SHEET 8 OF 9
AGENCY NUMBER:



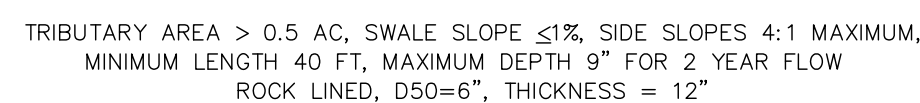


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NTS



NTS



9

NTS

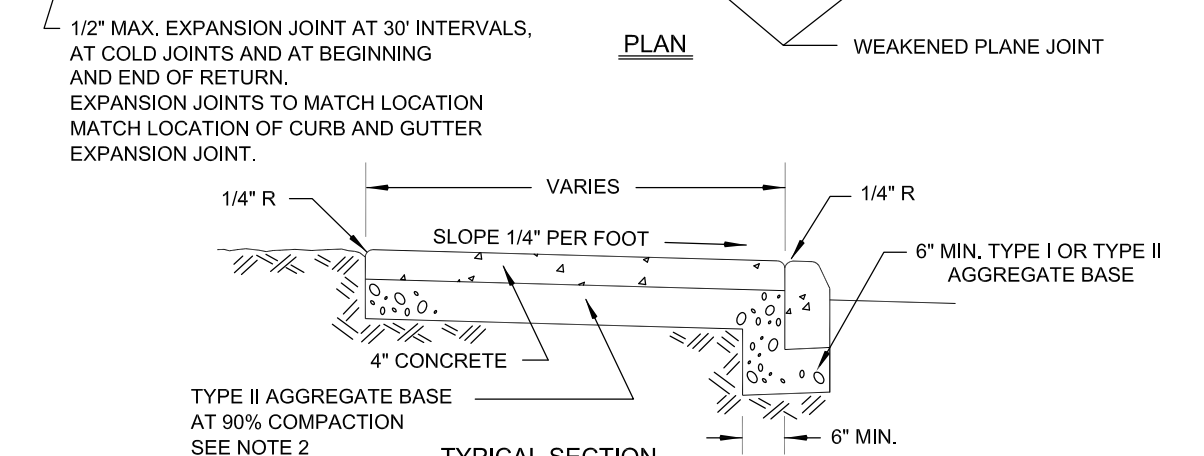


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N.T.



NTS



EXPANSION JOINT

1. ON ALL CURB RETURNS A 1/2" MAX. EXPANSION JOINT SHALL BE CONSTRUCTED BETWEEN THE BACK OF CURB AND THE SIDEWALK FOR THE ENTIRE LENGTH OF THE RETURN.
2. THE TYPE II AGGREGATE BASE THICKNESS IS SHOWN ON THE TYPICAL SECTION DRAWINGS PER USD NO. 202 -207.
3. LONGITUDINAL WEAKENED PLANE JOINT REQUIRED AT MIDPOINT OF SIDEWALK 10' OR WIDER.
4. CONTRACTOR HAS THE OPTION TO SAWCUT OR TOOL WEAKENED PLANE JOINT.

6

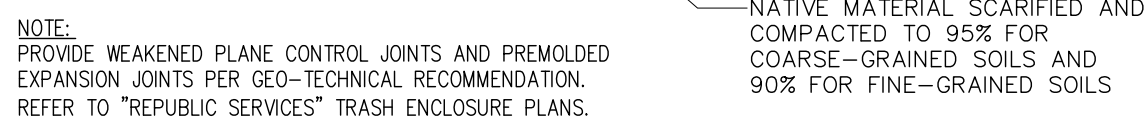
NTS



1. FINISHED ASPHALT CONCRETE SURFACE TO BE FLUSH WITH VALLEY GUTTER LIP.

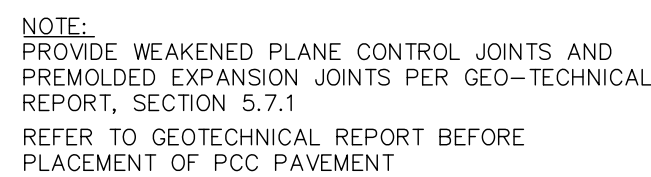
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NTS



4

NTS



3

NTS



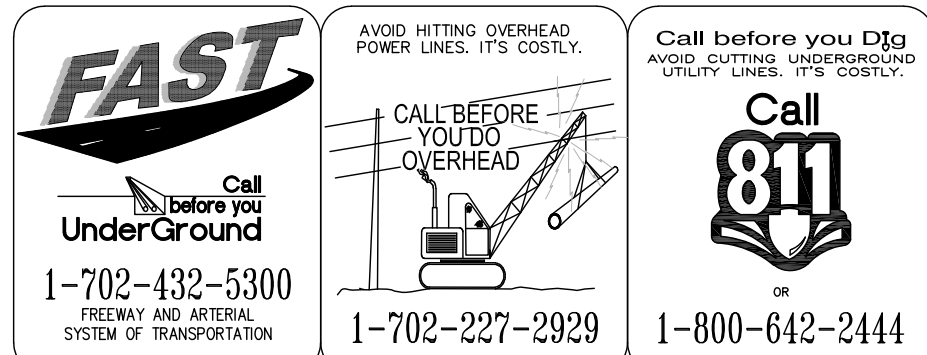
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NTS



1

NTS



REVISIONS		APPROVAL
REV:	DESCRIPTION	APPROV. BY DATE

LIVING GRACE FOURSQUARE CHURCH

DETAILS

APN: 138-13-403-001
2400 N MICHAEL WAY
LAS VEGAS, NEVADA 89108



ENGINEER'S SEAL



4/9/2021

DATE:	3/25/2021
PROJ. NO:	200279
DRAWN BY:	ARB
CHECKED BY:	RAS
SCALE:	AS NOTED
JURISDICTION:	LAS VEGAS

DRAWING NUMBER:

C9

ET 9 OF 9

AGENCY NUMBER: