

DS #:

5228

APN:

125-33-805-008

PROJECT:

PM 19-600023

SUBMITAL:

1st

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		December 17, 2019
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: PM 19-600023 (Project in Clark County for City of Las Vegas Concurrence)	
Cross Streets:	NWC of Lone Mountain Road & Valadez St.	Angel Diaz & Joan Kissling
File Number:	F:\Depot\DSMemos\DS5228A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	125-33-805-008	CCPW
Zoning Action:	N/A	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES	NO X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	12/3/2019	12/17/2019	See Comments Below	\$400.00	3665726: \$400
			TOTAL FEES (LDDRS):	\$400.00	----

REMARKS:

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

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

Note that the Clark County Regional Flood Control District (District) has begun efforts to update the *Hydrologic Criteria and Drainage Design Manual (HCDDM)* and is requesting participation from the engineering community. The District is collecting comments and suggestions on errors, clarifications, or changes needed to the current Manual and/or content and usability enhancements to be incorporated into the updated Manual. Additional information on procedures and deadline to provide feedback and comments are available online at <http://www.ccrfed.org/hcddmupdate.html>.

City of Las Vegas Flood Control staff has reviewed the *Technical Drainage Study*, including the *Supplement* for the subject development "PM 19-600023" within the jurisdiction of **County of Clark**. **City of Las Vegas** concurs with the acceptance of the drainage study by the **Clark County Public Works Department**. The review of this project was limited to issues of flood control significance to the **City of Las Vegas**.

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

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

END OF REMARKS

ays

T/R/S: T19S/R60E/33
AREA G-33



Department of Public Works

500 S Grand Central Pky • Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

Denis Cederburg, P.E., Director • E-Mail: dlc@ClarkCountyNV.gov

Drainage Study Approval Letter

Date: November 13, 2019
Firm: Baughman & Turner, Inc.
Engineer: John Gustafson, P.E.
Address: 1210 Hinson Street, Las Vegas, NV 89102
Phone: (702) 870-8771
Fax: (702) 878-2695
E-mail: johng@baughman-turner.com

SCANNED

Subject: Technical Drainage Study for Diaz Kissling MSM 19-600023
Location: NWC of Lone Mountain Road & Valadez Street
APN: 125-33-805-008
Sec, Township, Range: S33, T19S, R60E
Flood Zone & Panel: Zone X, 2135F, dated November 16, 2011
Application Number: PW19-18375

Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Technical	10/08/2019	10/29/2019	EC	
Supplement	11/08/2019	11/13/2019	EC	

Concurrence Required: (Must be obtained prior to permit issuance)		Reason Concurrence is Required
	Boulder City	Adjacent to or Impacts Jurisdiction
	City of Mesquite	Adjacent to or Impacts Jurisdiction
	City of Henderson	Adjacent to or Impacts Jurisdiction
X	City of Las Vegas	Adjacent to or Impacts Jurisdiction
	City of North Las Vegas	Adjacent to or Impacts Jurisdiction
	Nevada Department of Transportation	Adjacent to or Impacts NDOT Facility
	Union Pacific Rail Road	Adjacent to or Impacts a UPRR Facility
	US Army Corps of Engineers	Impacts a USACE Facility
	Clark County Regional Flood Control District	Regional Significance, Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

The referenced **Technical Drainage Study** has been reviewed and is accepted as complying with minimum improvement standards. As set forth in the subject drainage study, the following measures will be taken to mitigate flood hazards.

The site shall be graded with respect to drainage as shown on **"Diaz Kissling"** grading plan sheet C1.0 and C1.1, signed and sealed by John Gustafson, P.E., on October 7, 2019 and **"PM 19-600023"** grading plan sheet C2.0 and C2.1, signed and sealed by John Gustafson, P.E., on November 8, 2019.

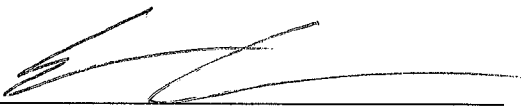
Check appropriate conditions

	Retaining/screen wall combination may be in excess of current Clark County Unified Development Code, Chapter 30.64.050.
	A FEMA Elevation Certificate, completed by a licensed surveyor, must be submitted to and approved by CCPW Development Review Plan Check prior to the issuance of Certificates of Occupancy for those structures.
X	Mylars of the grading plan must be submitted to the CCPW Development Review Plan Check for approval signatures prior to map recordation (residential) or permit issuance (commercial).
	An administrative variance to allow the finished floor elevation(s) to be set below the current Clark County criteria must be approved. The finished floor variance must be submitted to CCPW Development Review front counter after drainage study approval and prior to offsite final review.
X	The grading plan will be reviewed by the Building Office Operations Division to ensure compliance with the ADA access requirements. Revisions to the grading plan may be required if the site accessibility design does not comply with the requirements set forth in the Accessibility Chapter of the Clark County Building Code.
	The plans show work is proposed on another property. Notarized written permission must be obtained prior to plan approval. A grading permit must be obtained from Building Dept prior to grading.
	Right-of-way dedication must be verified.
	Any previously approved drainage easements that are not being used must be vacated.
	Per <i>Regional Flood Control District policies and Procedures manual, Section VIII. D. 13. Uniform Regulations for the Control of Drainage</i> , the Engineer of Record shall provide As-Built plans or record drawings to the District after completion and final inspection of such privately installed flood control facilities that have regional flood control significance.
	Structural calculations are required. The structural calculations, plans, and details must be approved prior to "Offsite" submittal and prior to CCRFCD submittal, if applicable.
X	Plan revisions can be found on the red-lined plans and must be addressed.
	Prepare drainage easement documents as shown on the grading plans.

Additional Conditions:

1. Any improvements not depicted on the above mentioned grading plans may require an Update to this Technical Drainage Study.

The County's review is solely based on the information submitted by the Engineer of Record. The County's review is strictly limited to compliance with minimum County Codes and Standards. The Engineer of Record is responsible for researching and addressing situations that may require designs above and beyond the minimum codes for issues of public safety and impacts to upstream, downstream and adjacent properties. The County assumes no liability for information data, designs or conclusions of the Engineer of Record.



Ernie Corn, E.I.
Associate Engineer
Development Review
Ernie.corn@ClarkCountyNV.gov



W. Layne Weber, P.E., CFM
Principal Engineer
Development Review
wlweber@ClarkCountyNV.gov

**TECHNICAL DRAINAGE STUDY FOR
PM 19-600023
SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST
CLARK COUNTY, NEVADA**

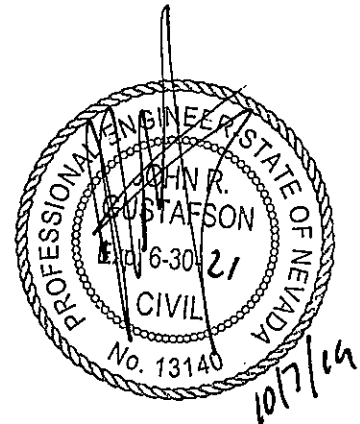
October 3, 2019

PREPARED FOR:

ANGEL DIAZ & JOAN KISSLING
7920 LONE MOUNTAIN ROAD
LAS VEGAS, NV 89129

PREPARED BY:

BAUGHMAN & TURNER, INC.
1210 HINSON STREET
LAS VEGAS, NEVADA 89102
TEL: (702) 870-8771/FAX: (702) 878-2695



**TECHNICAL DRAINAGE STUDY FOR
PM 19-600023
SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST
CLARK COUNTY, NEVADA**

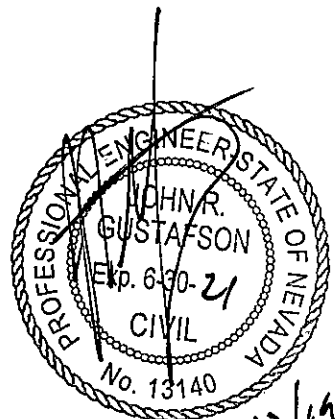
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HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Pm 19-19-600023 Date: September 24, 2019
 Location of Development: a) Descriptive (Cross Streets) North/South: Valadez Street
 East/West: Lone Mountain Road
 b) Section: 33 Township: 19 S Range: 60 E
 c) APN: 125-33-805-008

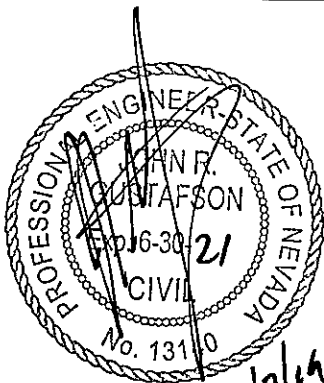
Name of Owner: Angel Diaz & Joan Kissling
 Telephone No.: (702) 658-8775 Fax No.: 702-878-2695 E-Mail Address: _____
 Address 7920 Lone Mountain Road Las Vegas NV 89129

Contact Person-Name: Pamela Pitcher Telephone No.: 702-870-8771
 *E-Mail Address: pamp@baughman-turner.com Fax No.: 702-878-2695

Firm: Baughman & Turner, Inc.
 Address: 1210 Hinson Street Las Vegas, NV 89102

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: 4.35 acres Being Developed/Disturbed: 4.35 acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No
4. Proposed type of development (Residential, Commercial, Etc.): Residential - 2 lot parcel map
5. Approximate upstream land area which drains to the subject site: 22 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: Southeast to Valadez Street then South to Lone Mountain as it does in the existing condition.
8. Briefly describe your proposed schedule for the subject project: ASAP



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 MANUAL

DRAINAGE STUDY INFORMATION FORM

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 East/West: Lone Mountain Road
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 c) APN: 125-33-805-008

Name of Owner: Angel Diaz & Joan Kissling
 Telephone No.: (702) 658-8775 Fax No.: 702-878-2695 E-Mail Address: _____
 Address 7920 Lone Mountain Road Las Vegas NV 89129

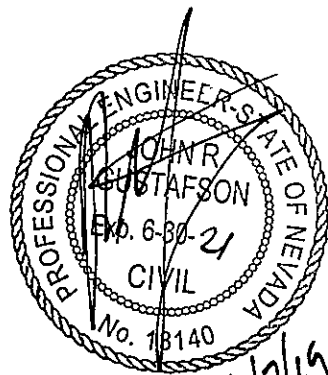
Contact Person-Name: Pamela Pitcher Telephone No.: 702-870-8771
 *E-Mail Address: pamp@baughman-turner.com Fax No.: 702-878-2695

Firm: Baughman & Turner, Inc.
 Address: 1210 Hinson Street Las Vegas, NV 89102

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	

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***New Required Field**

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Revision	Date

Local Entity File No. _____

REFERENCE:

STANDARD FORM 1

Baughman & Turner, Inc.

Consulting Engineers & Land Surveyors

1210 HINSON ST.
LAS VEGAS, NEVADA 89102-1604

PHONE (702) 870-8771
FAX (702) 878-2695

October 3, 2019
33-19-60

Clark County Development Services

Attn.: Mr. Layne Weber, PE

500 S. Grand Central Parkway
Las Vegas, Nevada 89155

Re: Technical Drainage Study for PM 19-600023

Dear Mr. Weber,

Transmitted herewith for your approval are two (2) copies of the hydrology study for PM 19-600023. The property lies at the northwest corner of the intersection of Lone Mountain Road and Valadez Street. The proposed development is for 2-lot parcel map on 4.35 acres.

If there are any questions concerning this study, please contact this office.

Sincerely,

Baughman & Turner, Inc.

Pamela Pitcher
Hydrology and Traffic Manager

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I. INTRODUCTION

This study analyzes the development of a two (2) lot residential parcel map on 4.35 acres. Analysis presented herein was established after first consulting with the CCRFCD's 2018 Master Plan Update, FEMA regulations and policies, and the CCRFCD's Hydrologic Criteria and Drainage Design Manual (referred to hereafter as the HCDDM).

II. GENERAL DESCRIPTION

A. Location

The site consists of approximately 4.35 acres of undeveloped land, located in a portion of the South Half (S½) of the Southeast Quarter (SE¼) of Section 33, Township 19 South, Range 60 East, M.D.B. & M., Clark County, Nevada. The property, described as Assessor Parcel Numbers 125-33-805-008, (see Figure 1, Vicinity Map and Figure 2, Assessor's Parcel Map). It should be noted here that the Assessor's Parcel map indicates that the site acreage is 3.94, however, the actual field survey has determined that the lot acreage is 4.35.

B. Property Description

The property is about 4.35 acres of partially developed (south half) and partially undeveloped (north half) land. The proposed site is surrounded by developed rural residential SFR properties to the north, south, west and east (See Figure 3 and 4, Aerial Map). The site is bordered by Lone Mountain to the south, Valadez Street to the east, Verde Way to the north and existing residences to the west. In the existing condition, the property slopes from the northwest to the southeast at about 0.6%.

C. Master Planning Information

The Clark County Regional Flood Control District's (CCRFCD) 2018 Master Plan Update, a comprehensive plan to facilitate construction of regionally significant flood control structures to alleviate flooding in the Las Vegas Valley, shows no existing or proposed facilities crossing or bordering the property.

A review of the 2018 CCRFCD's Master Plan Update, Figure F-17, (see Figure 5A and 5B, Flood Control Facilities), indicates that the closest regional facility is downstream about 700 ft in the Conough Lane alignment then east in Lone Mountain Road. The existing facility is a 5' x 5' RCB identified as GOBU 0136 (Gowan North – Buffalo Branch). The proposed development is located at the downstream end of sub-basin GD20AB-C within the Gowan Watershed, as shown on Master Plan Figure W-4 (see Figure 6, Hydrologic Sub-basins).

The City of Las Vegas' Northwest Neighborhood study Future Drainage Conditions Figure F-8 (See Figure 7, Northwest Study), indicates that there is an existing storm drain in Lone Mountain and Cimarron. The facility is a 36" RCP. There is also a proposed 48" RCP facility in Lone Mountain, however, construction of the Gowan North Buffalo Branch storm drain system has been completed. Facilities include a 7' x 5' RCB in Lone Mountain Road with associated drop inlets to collect, at a minimum, the 10-year storm (See Appendix G).

D. Floodplain Information

The Flood Insurance Rate Map, Clark County, Nevada, Community Panel No. 32003 C 2135 F (effective date November 16, 2011), published by the Federal Emergency Management Agency (FEMA), indicates that the site is located in a Zone X. A Zone X is determined to be

an area outside the 0.2% annual chance floodplain (see Figure 8, Flood Insurance Rate Map).

E. Previous Hydrology Studies

The following approved drainage studies were utilized in preparation of this study. Baughman & Turner, Inc. concurs with the engineering analyses presented in the studies, subject to the modifications discussed in the text of this report.

Lone Mountain Final Technical Drainage Study and subsequent addendums, by VTN, dated September 2017, **approved August 1, 2017** (referred to hereafter as the Lone Mountain Study). HTE #17-2844.

This study identifies the regional offsite basins north and west of the site and establishes the flows in Lone Mountain and surrounding streets. See Appendix G for referenced material.

Technical Drainage Study for Lone Mountain 5 and subsequent addendums by Triton Engineering, dated July 2013 and **approved November 22, 2016** (referred to hereafter as the LM5 Study). HTE #13-27735.

This study discusses the offsite flows in Lone Mountain and although it was reviewed, the Lone Mountain study was more heavily referenced. No flows were specifically referenced from this study. See Appendix H for referenced material.

III. HYDROLOGY

A. Existing Drainage Conditions

The existing offsite extends west to Cimarron, north to La Madre, and south to Lone Mountain. The offsite basin is entirely developed as single family residential and rural residential homes with the exception of the site. The three (3) offsite basins have been prorated from the basin established with the Lone Mountain study, LNM3 (See reference Figure 7c, Existing/Interim Basin Map, shown here as Figure 9). Basin LNM3A is the 7.86 acres lying north and west of the site and produce the flows in W. Verde Way. Basin LNM3A generates 2 and 8 cfs in the 10 and 100-yr, 6-hour storm. These flows travel south to W. Verde Way, then east past the site to W. Valadez Street where they combine with flows from basin LNM3C at CP2.

Basin LNM3C is the 4.45 acres lying north of the site and produce the flows associated with Valadez Street. Basin LNM3C generates 1 and 5 cfs in the minor and major storm event. Runoff associated with Basin LNM3C travel south in Valadez to Lone Mountain.

Basin LNM3B is the 2.05 ac directly west of the site. Basin LNM3B generates <1 and 2 cfs in the 10 and 100-yr storm. Flows produced by basin LNM3B travel south and discharge to Lone Mountain. These flows combine with flows established by the Lone Mountain study at CPLNM1 (55 cfs and 261 cfs) at CP1.

The site is also prorated from the approved Lone Mountain study basin LNM3. Basin SITEEX is the 4.35 ac site and produces 2 and 5 cfs for the 10 and 100-yr storm events (See Figure 10, On-site Existing Condition Map). These flows travel southeast and discharge from the

site to Valadez Street and Lone Mountain Road. Here all the on and offsite flows combine at CP3 in Lone Mountain Rd. All on and offsite flows are collected by Lone Mountain and directed east away from the site.

The prorated basin calculations can be found in Appendix D. Reference studies can be found in Appendix G. Table 1 below summarizes the storm flows for the existing conditions.

B. Future Drainage Conditions

In the future condition, the offsite drainage patterns will remain the same as in the existing condition since everything is fully developed, see referenced Figure 8b, Ultimate Basin Map shown here as Figure 11. The site has been subdivided and the two new basins prorated from the reference basin LNM3. Lot 1 is the developed southerly portion of the site. Lot 1 generates 1 and 2 cfs for the 10 and 100-year, 6-hour storm event. These flows travel southeast and exit the site to Lone Mountain and Valadez Street. The balance of the site, Lot 2, is the northerly 2.17 acres. This basin will generate about 1 and 3 cfs in the 10 and 100-year storm event. Flow associated with Lot 2 will travel southeast and discharge to Valadez Street (See Figure 12, On-site Developed Condition Map). All on and off-site flow eventually combines at the intersection of Valadez street and Lone Mountain at CP3. Table 2 summarizes the storm flows for the developed/future conditions.

C. Compliance with Regulations and Adopted Plans

All design criteria has been established after first consulting with the CCRFCD's 2018 Master Plan Update, FEMA regulations and policies, and the CCRFCD's Hydrologic Criteria and Drainage Design Manual. Clark County will review this study as it relates to development standards. CCRFCD will review this study as it relates to regional issues and facilities.

IV. HYDROLOGIC/HYDRAULIC CRITERIA

A. Soil Classification

The native soils associated with the onsite and offsite basins have been classified by the United States Department of Agriculture Soils Natural Resources Conservation Service (NRCS) in their soil survey of Las Vegas Valley Area. Soils have been identified as Soil Unit 190, Dalian very gravelly fine sandy loam and Soil Unit 400, Tencee very gravelly fine sandy loam. Dalian very gravelly fine sandy loam has a weighted hydrologic soils group of A. Tencee very gravelly fine sandy loam has a weighted hydrologic soils group of D. The curve number for the onsite existing and developed drainage areas were calculated using Table 602 and Table 602A of the HCDDM. The on and off-site associated curve numbers can be found in Appendix B along with the soils information. The offsite basin curve numbers can also be found in the approved referenced drainage studies. No HEC-1 analysis was prepared for this study so this is for information only.

B. Precipitation

The site and its related off-site basins are located outside the McCarran Airport Rainfall Area; therefore, precipitation values were determined using Figures 503 and 506 in CCRFCD's Hydrologic Criteria and Drainage Design Manual, Section 500. The 100-year and 10-year, 6-hour rainfall depth duration frequency values for the off-site basin are 3.13 and 1.67. No aerial depth reduction factor was used. The aforementioned HCDDM figures and tables are included in Appendix C.

In accordance with the CCRFCD's Hydrologic Criteria and Drainage Design Manual, the design storm selected was a 6-hour duration storm. Three different 6-hour storm distributions are allowed in the Clark County area, labeled SDN-3, SDN-4, and SDN-5 (see Table 503). For drainage areas less than 8 square miles, an SDN-3 is required. The drainage area associated with this site is less than 8 square miles; therefore, an SDN-3 was used. No HEC-1 analysis was prepared for this study so this is for information only.

C. Time of Concentration and Lag Time

The Criteria Manual's Standard Form 4 was completed to determine the time of concentration for each drainage basin.

For all basins, which comprise less than 1 square mile, the time of concentration was calculated as follows:

$$T_c = T_i + T_t$$

Where: T_c = Time of Concentration
 T_i = Initial, inlet or overland flow time
 T_t = Travel time in the ditch, gutter, etc.

The time of concentration is the sum of the initial flow time, T_i and the travel time, T_t . The minimum T_c recommended for non-urban watersheds is 10 minutes and 5 minutes minimum for urban watersheds.

Initial flow time was calculated as follows:

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

Where: T_i = Initial overland flow time (in minutes)
 $K = 0.0132CN - 0.39$ L_o = Length of overland flow (maximum 500 feet)
 CN = Curve Number S = Average basin slope (in percent)

The lag time was calculated as follows:

$$T_{lag} = 0.6T_c \text{ (in hours)}$$

No HEC-1 analysis was prepared for this study so this is for information only.

D. Summary of Findings

Tables 1 and 2 list the 100-year and 10-year, 6-hour storm flows. The prorated calculations can be found in Appendix E.

Table 1. Peak Flow Summary

Existing Condition			
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
CP8*	--	394	30
LMN3C**	2.05	2	<1
CP1	--	396	30
LNM3A**	7.86	8	2

LNM3B**	4.45	5	1
CP2	---	13	3
SITEEX**	4.35	5	2
Flow in Valdez after DI*	--	4	<1
CP3	--	400	31

*Includes referenced flows from Lone Mountain study

**Prorated from flows from Gowan North Buffalo Branch Study

Table 2. Peak Flow Summary

Ultimate Condition			
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
UCP10*	--	593	296
LMN3C**	2.05	2	<1
CP1	--	595	296
LNM3A**	7.86	8	2
LNM3B**	4.45	5	1
CP2	---	13	3
LOT1**	2.18	2	1
LOT2**	2.17	3	1
Flow in Valdez after DI*	--	4	<1
CP3	---	599	297

*Includes referenced flows from Lone Mountain study (before storm drain)

**Prorated from flows from Gowan North Buffalo Branch Study–Basin LNM3

Analysis to determine peak flow rates were achieved using the approved flows for the Lone Mountain storm drain from the Lone Mountain study – Basin LNM3. Calculations have been provided in Appendix D. The input parameters discussed in Section IV, A – C were used in the approved reference study and the results are shown in the tables above. A summary of input parameters and the reference HEC-1 printouts can be found in Appendix G.

E. Facility Design Calculations

1. Street Capacity

The referenced Lone Mountain Study indicates that the primary function of the storm drain in Lone Mountain is to collect the enough of the 10-yr storm to provide the required 10-yr dry lane. Referenced street flow exhibits, SF7 and SF8 indicate that the 10 and 100-yr storm flows at the site are collected by the storm drain system with little flow left in the street; neither 10 yr or 100-yr. Street capacity analyses were performed to determine the depth of flow in the surrounding streets. Table 4 summarizes the 100 and 10-year flow in the street.

Table 3.

Street Capacity Summary							
Section	Location	Slope	Q (cfs)	D (ft)	V (fps)	VxD	Remarks
10-Year Flow – Developed Conditions							
HS1	Lone Mountain 1/4 St	0.7%	3	0.40	2.02	0.81	VxD <6 is met; D less than 1; dry lane is met
HS2	Valdez	0.44%	3	0.4	0.91	0.36	VxD <6 is met; D less than 1;
HS3	Verde	0.75%	2	0.2	0.89	0.18	VxD <6 is met; D less than 1
100-Year Flow – Developed Conditions							
HS1	Lone Mountain 1/4 St	0.7%	9	0.50	2.47	1.24	VxD <8 is met; D less than 2;
HS2	Valdez	0.44%	13	0.5	1.44	0.72	VxD <8 is met; D less than 2;
HS3	Verde	0.75%	8	0.4	1.37	0.55	VxD <8 is met; D less than 2
	Drainage easement	0.78%	3	0.7	1.75	1.23	
100-Year Flow – Future Conditions							
HS1	Lone Mountain (100 yr-10-yr)	0.7%	297*	1.4	4.50	6.30	VxD <8 is met; D less than 2

*100-yr reference flow of 593 minus the 10-yr reference flow 296 (collected by storm drain system = 297 cfs)

See Appendix E for street capacity calculations. As shown in the hydraulic criteria tables (tables 1-4), the *HCDDM* hydraulic criteria are met as follows:

- 10-year DxV products are less than 6, and with depths of flow less than 1 foot; the dry lane criteria is met on Lone Mountain.
- 100-year DxV products are less than 8, and with depths of flow less than 2 feet.
- The interior drive aisles and swales will safely convey storm water towards the proposed drainage easements located on the south and east sides of the site.

2. Finished Floor Calculations

Street capacity analyses were performed to determine the depth of flow in the streets and the future finished floor elevation for Lot 2 is established. The buildings on Lot 1 are all existing and they are elevated about the flow depth. Additionally, a block wall surrounds Lot 1. Table 5 below summarizes the method to determine the proposed finished floor elevation.

Table 4. Minimum Finished Floor Elevation Determination

	Centerline of adjacent street	Free- board	FF Based on CL of adjacent street	Flowline Elevation	Depth of Flow	Free- board	Finished Floor Based on Depth of Flow	Proposed Minimum Elevation
Lot #1	72.53	1.5	73.69	71.22	1.4	1.4	74.02	2374.29
Lot #2	73.65	1.5	75.15	73.00	0.4	0.4	73.80	2375.15

Finish Floor Elevation analysis for the building was determined according to the specifications outlined in the CCRFCD's *Hydrologic Criteria and Drainage Manual*. The finished floor must be set a minimum of twice the depth of flow, or 18-inches above the centerline of street, whichever is highest.

The existing and proposed finished floor elevations have met these conditions based off of Lone Mountain for Lot #1 and Verde Way for Lot #2 (the addressing street). The onsite grading will direct flows away from the building.

3. Best Management Practices

The proposed 8-lot residential site is not required to conform to the Section 1500; Structural Best Management Practices as referenced within the Clark County Flood Control District (CCRFCD) Hydrologic and Drainage Design Manual (HCDDM).

4. Proposed Facilities

The drainage facilities required for this site consist of:

- Positive onsite grading
- 5' private drainage easement to be privately maintained on the south side of Lot #2
- Future block wall opening

V. CONCLUSIONS

A. Compliance with Agency Regulations

Clark County will review the Hydrology Study as it relates to development standards and overall facility effectiveness. Below is a discussion of the effectiveness of the proposed drainage scheme. This study complies with the standards as set forth in the CCRFCD's Hydrologic Criteria and Drainage Design Manual.

B. Overall Facility Effectiveness

Development of this site will not adversely affect surrounding property owners, since current drainage patterns have not been significantly changed. In the developed condition, there will be a small decrease in runoff generated by the developed site.

VI. REFERENCES

The following documents were used in the preparation of this hydrology study update:

- 1) DRAINAGE DESIGN MANUAL, 1999 - Hydrologic Criteria and Drainage Design Manual, Clark County Regional Flood Control District.
- 2) CCRFCD, 2018 - Flood Control Master Plan Update, Volume 1, Clark County Regional Flood Control District, James M. Montgomery Consulting Engineers, Inc., September, 2013.
- 3) NRCS, 2019 - Soil Survey of the Las Vegas Valley Area, Nevada, United States Department of Agriculture Soils, Natural Resources Conservation Service, Washington D.C., March 11, 2019.

- 4) FEMA, 2011 - Flood Insurance Rate Maps, Clark County, Nevada, U.S. Federal Emergency Management Agency, November 16, 2011.
- 5) HEC, 1988 - HEC-1 Flood Hydrograph Package, User's Manual, U.S. Army Corps of Engineers, the Hydrologic Engineering Center, Davis, California, 1988.
- 6) Technical Drainage Study for Lone Mountain Road CC-215 to Tenaya Way and subsequent Addendums, by VTN Nevada dated September 22, 2017.
- 7) Technical Drainage Study for Lone Mountain 5 and subsequent addendums by G.C.Wallace Companies dated July 2013 and approved November 22, 2016 (HTE #16-38647)

FIGURE 1



BAUGHMAN & TURNER, INC.
CIVIL ENGINEERS LAND SURVEYORS LAND PLANNERS
1210 HINSON STREET LAS VEGAS, NEVADA
(702) 870-8771 89102

PREPARED FOR :

DIAZ/KISSLING

DATE: 2019
DESIGN: PJP
DRAWN: PJP
JOB: 33-19-60

NOTES

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

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

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

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

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

5 BLOCK NUMBER

5 LOT NUMBER

GL5 GOV. LOT NUMBER

BOOK

T19S R60E

SEC.

33

MAP

S 2 SE 4

125-33-8

099 100 101

126 125 124

137 138 139

164 163 162

6 5 4 3 2 1

7 8 9 10 11 12

18 17 16 15 14 13

19 20 21 22 23 24

30 29 28 27 26 25

31 32 33 34 35 36

8 4 8 4

5 1 5 1

6 2 6 2

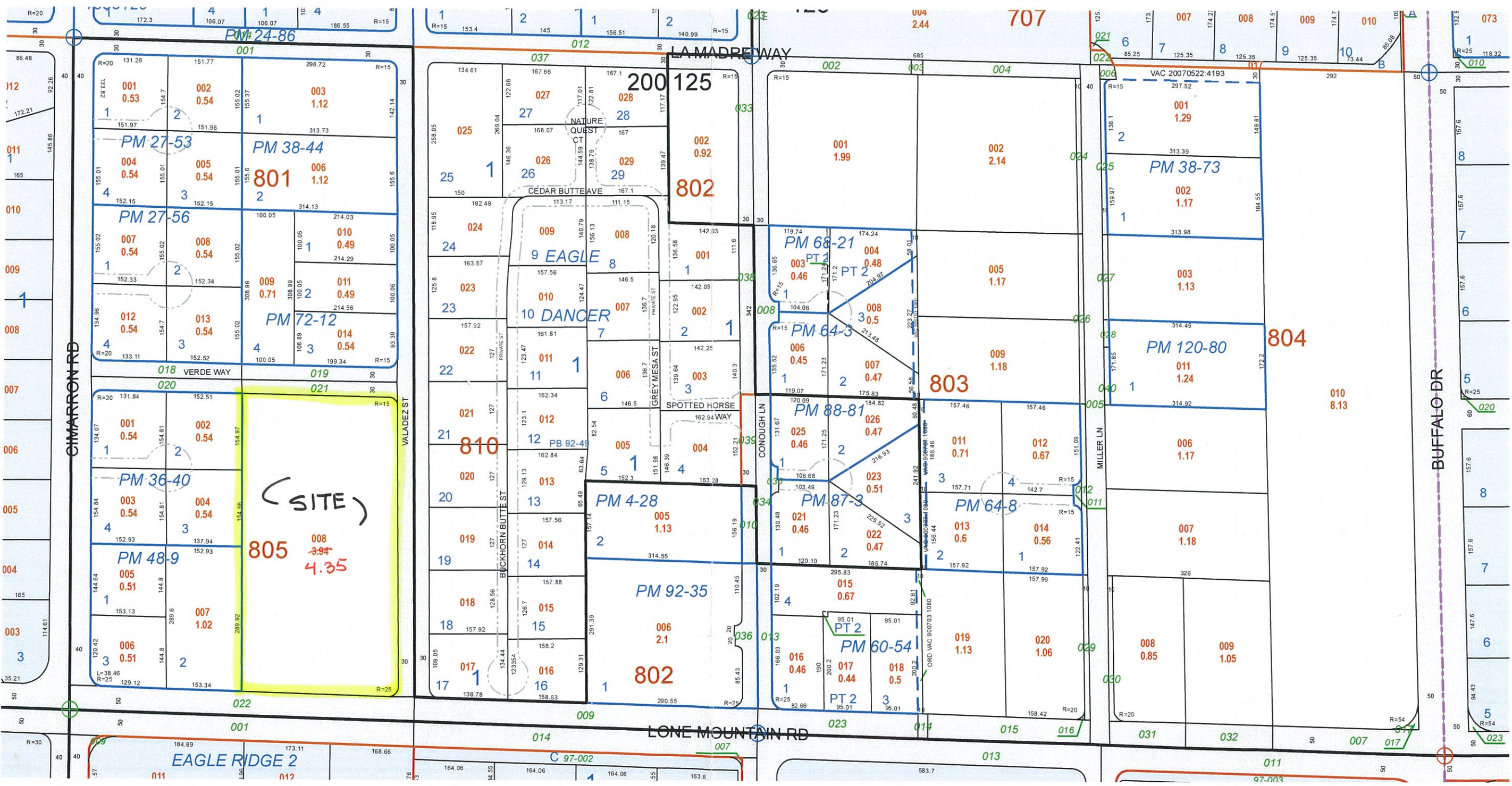
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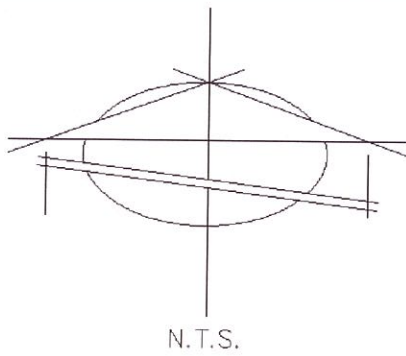
5 1 5 1

Scale: 1" = 200'

Rev: 1/8/2019



TAX DIST 125,200
FIGURE 2



AERIAL VIEW

FIGURE 3

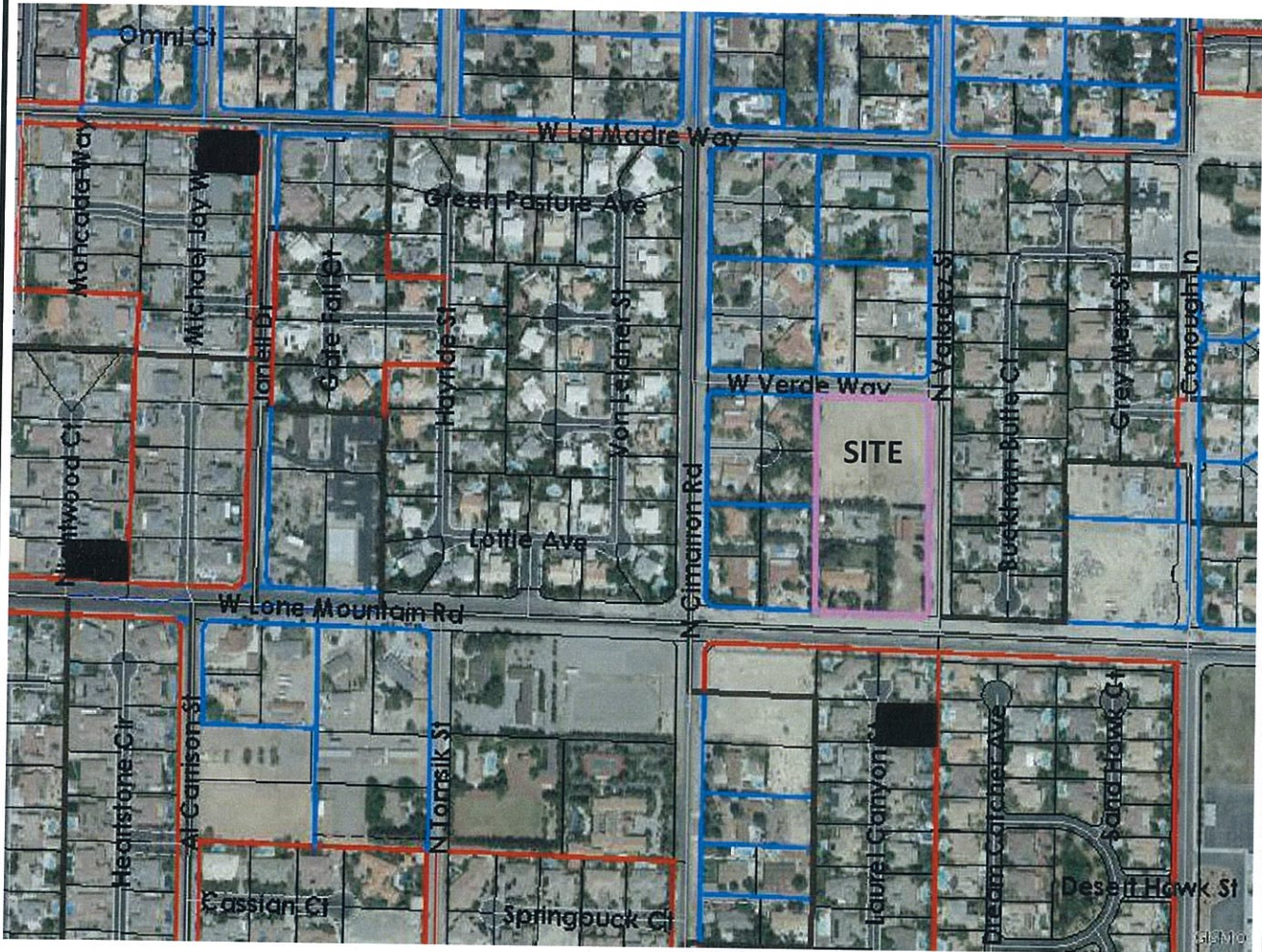
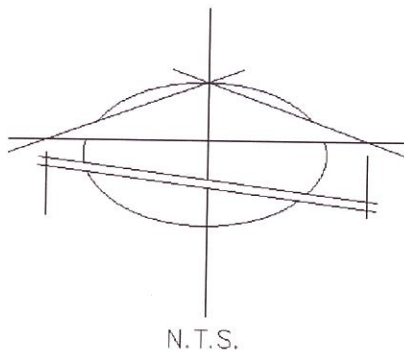


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GENERAL AERIAL VIEW

FIGURE 4



BAUGHMAN & TURNER, INC.
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 LAND SURVEYORS
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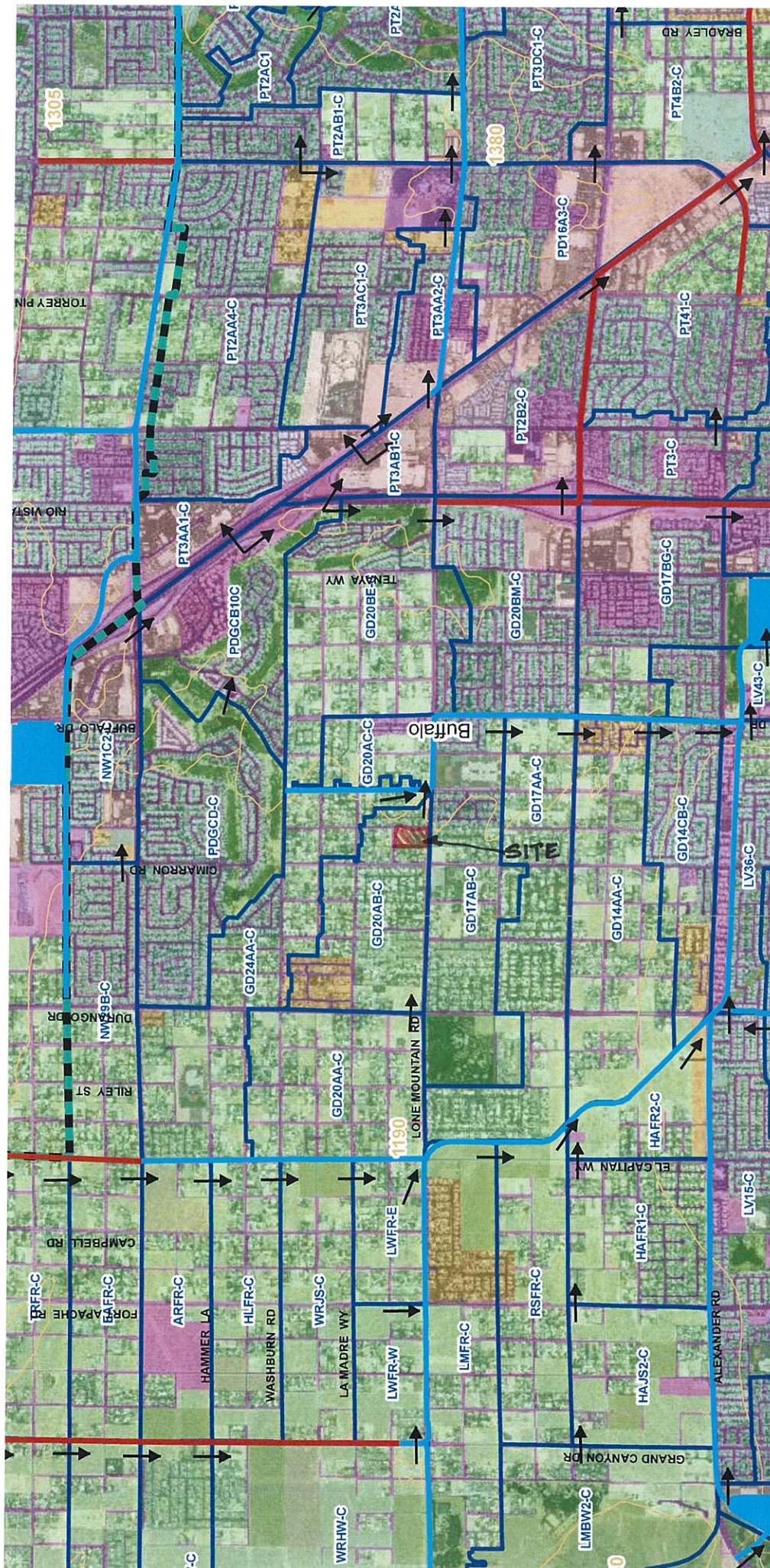
DATE: 2019
 DESIGN: PJP
 DRAWN: PJP
 JOB: 33-19-60



ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
ANRB		ANN ROAD CHANNEL WEST - RAINBOW						
0000	E	9' X 5' RCB	167	817	CNW2B5-C	WEST3	0.89	0.30
0028	E	11' X 5' RCB	1140	817	CNW2B5-C	WEST3	0.89	0.23
0050	E	10' X 3' RCB	1240	517	CNW2A3-C	WEST3	0.83	0.35
ANWE		ANN ROAD CHANNEL WEST						
0290	E	8' X 5' RCB	2050	817	2CNW2B5C	CWEST3	0.89	0.70
0327	E	6' X 5' RCB	2380	135	RCHODB	WEST3	4.61	0.87
0371	E	6' X 5' RCB	790	135	RCHODB	WEST3	4.61	0.34
0385	E	54" RCP	1950	135	RCHODB	WEST3	4.61	1.17
CNWE		CENTENNIAL PKWY CHANNEL WEST						
0195	E	CONC CHNL 36" 9D 0.1 SS	1130	3771	CNW3B3-C	WEST3	5.64	0.80
0200	E	CONC CHNL 36" 9D 0.1 SS	1340	3523	CNW2D4-C	WEST3	5.14	1.00
0226	E	2' 18" X 8.5" RCBC @ RIO VISTA	100	3523	CNW2D4-C	WEST3	5.14	0.51
0241	E	CONC CHNL 36" 9D 0.1 SS	405	3523	CNW2D4-C	WEST3	5.14	0.51
0251	E	CONC CHNL 36" 9D 0.1 SS	575	3234	CNW2D3-C	WEST3	4.64	0.51
0271	E	CONC CHNL 32" 10D 0.1 SS	229	3234	CNW2D3-C	WEST3	4.64	0.51
0274	E	32' X 10' RCBC @ TEMAYA	142	3234	CNW2D3-C	WEST3	4.64	0.51
0277	E	CONC CHNL 32" 9D 0.1 SS	579	3234	CNW2D3-C	WEST3	4.64	0.84
0287	E	CONC CHNL 32" 8D 0.1 SS	885	2992	CNW2B2-C	WEST3	3.83	1.59
0301	E	2' 15" X 7" RCB	1738	2892	CNW2B2-C	WEST3	3.83	1.30
0304	E	22' X 7' RCB	3410	2992	CNW2B2-C	WEST3	3.83	1.85
G095		GOWAN OUTFALL - U.S. 95 CHANNEL						
0000	P	CONC CHNL 12" 4D 2.1 SS	2640	318	GD17BG-C	GOW3A	0.36	0.30
0050	P	CONC CHNL 12" 4D 2.1 SS	2450	318	GD17BG-C	GOW3A	0.36	0.30
GOAL		GOWAN OUTFALL - ALEXANDER ROAD FACILITIES						
0168	P	10' X 7' RCB	4200	829	CPT2B2	GOW3A	2.32	0.50
0247	P	CONC CHNL 12" 5.5D 2.1 SS	2640	574	CGD20BMC	GOW3A	2.02	0.30
GOBU		GOWAN NORTH - BUFFALO BRANCH						
0000	E	2' 12" X 5' RCB	1705	421	CGD14CBC	GOW3A	2.52	0.20
0032	E	2' 12" X 5' RCB	1248	343	CGD14AAC	GOW3A	2.29	0.25
0058	E	2' 11" X 4' RCB	1398	301	CGD17AAC	GOW3A	1.87	0.25
0085	E	11' X 5' RCB	1356	241	CGD17ABC	GOW3A	1.49	0.25
0112	E	8' X 5' RCB	1380	180	CGD20ACC	GOW3A	1.12	0.85
0136	E	5' X 5' RCB	2740	72	GD24AA-C	GOW3A	0.44	0.50
GOBW		GOWAN BELTWAY WEST						
0000	E	48" RCP	2527	115	LM5WDB	GOW4A	10.81	4.37
0048	E	72" RCP	131	115	LM5WDB	GOW4A	10.81	2.21
0051	E	72" RCP OUTLET	1522	115	LM5WDB	GOW4A	10.81	0.30
0052	E	585 AC-FT LONE MOUNTAIN-BELTWAY DETENTION BASIN		5316	CLMEW1	GOW3B	3.64	
0082	E	17,100 CFS PMF SPILLWAY		17100	CLMEW1	GOW3B	3.64	
0097	E	60" RCP	375	680	UVB1-1	GOW3A	0.37	8.06
0100	E	ENERGY DISSIPATOR	182	680	UVB1-1	GOW3A	0.37	50.00
0103	E	42" RCP	92	680	UVB1-1	GOW3A	0.37	7.00
0106	E	8' X 5' RCB CONNECTOR PIPE UNDER LONE MOUNTAIN	696					0.25
0128	E	20' X 10' RCB	100	3589	CWR5W1	GOW3B	2.41	25.00
0132	E	14' X 9' RCB	548	3156	CHLBW1-C	GOW3A	5.83	1.27
0156	E	14' X 9' RCB	1182	3156	CHLBW1-C	GOW3A	5.83	2.89
0183	E	14' X 9' RCB	3414	3156	CHLBW1-C	GOW3A	5.83	1.77
0227	E	10' X 8' RCB	735	1823	CEFFOA2	GOW3A	4.94	2.78
GOBX		GOWAN BOX CANYON						
0000	E	66" RCP	258	696	LWSW1	GOW3A	0.47	10.00
0005	E	ENERGY DISSIPATOR	206	696	LWSW1	GOW3A	0.47	39.00
0009	E	6' X 4' RCB	95	696	LWSW1	GOW3A	0.47	4.72
0015	P	66" RCP	6783	39	BOXDET	GOW3A	3.41	8.55
GODU		GOWAN NORTH - DURANGO BRANCH						
0000	E	12' X 5' RCB	2629	905	CLV14-C	GOW3A	1.40	0.91
0050	E	9' X 5' RCB	885	681	CLV20-C	GOW3A	0.98	1.50
GOEC		GOWAN NORTH - EL CAPITAN BRANCH						
0000	E	10' X 5' RCB	1436	474	CWRJ5-C	GOW3A	1.95	1.07
0026	E	10' X 7' RCB	1330	474	CWRJ5-C	GOW3A	1.95	0.82
0051	E	10' X 7' RCB	1290	439	CHLFR-C	GOW3A	1.69	1.08
0076	E	10' X 7' RCB	1335	392	CARFR-C	GOW3A	1.45	0.54

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOEC		GOWAN NORTH - EL CAPITAN BRANCH						
0100	P	10' X 5' RCB	1320	321	CEAFR-C	GOW3A	1.21	0.76
0126	P	10' X 7' RCB	1320	290	CTFRH-C	GOW3A	0.96	0.38
0152	P	7' X 5' RCB	1320	238	CARFP-C	GOW3A	0.70	0.77
0176	P	78" RCP	1320	180	CCPRF-C	GOW3A	0.46	1.15
GOL2		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 2						
0000	E	5' X 4' RCB	150	359	CRSW	GOW3A	0.36	14.80
0003	E	66" RCP	907	359	CRSW	GOW3A	0.36	1.97
0014	E	84" RCP @ ALEXANDER	125	359	CRSW	GOW3A	0.36	4.00
GOL3		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3						
0000	E	2' 10' X 10' RCBC @ BELTWAY	500	3713	CLMT5	GOW3A	7.83	3.39
0010	E	CONC CHNL 20" 10D 0.1 SS	3037	3277	CRCLMT1R	GOW3A	7.31	2.78
GOL5		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 5						
0000	E	6' X 5' RCB	309	421	UVB2	GOW3A	0.33	7.69
0006	E	CONC CHNL 6" 5D 0.1 SS	740	421	UVB2	GOW3A	0.33	3.85
0020	E	6' X 5' RCBC @ ALEXANDER RD	615	421	UVB2	GOW3A	0.33	2.08
0032	E	CONC CHNL 6" 5D 0.1 SS	1756	421	UVB2	GOW3A	0.33	1.87
GOLM		GOWAN LONE MOUNTAIN SYSTEM						
0000	E	78" RCP	2590	278	CLV15-C	GOW4A	11.09	1.80
0049	E	6' X 5' RCB	885	278	CLV15-C	GOW4A	11.09	1.87
0050	E	66" RCP	817	278	CLV15-C	GOW4A	11.09	2.40
0075	E	60" RCP	1385	278	CLV15-C	GOW4A	11.09	2.55
0101	E	54" RCP	700	184	LMTNDB	GOW4A	10.74	1.74
0115	E	48" RCP	1799	184	LMTNDB	GOW4A	10.74	3.08
0140	E	42" RCP	438	184	LMTNDB	GOW4A	10.74	1.80
0142	E	48" RCP	348	184	LMTNDB	GOW4A	10.74	2.14
0144	E	66" RCP	196	184	LMTNDB	GOW4A	10.74	5.44
0145	E	66" RCP OUTLET	378	184	LMTNDB	GOW4A	10.74	0.90
0146	E	888 AC-FT LONE MOUNTAIN DETENTION BASIN		6518	LMTNIN	GOW3B	8.43	
0147	E	36,000 CFS PMF SPILLWAY		36000	LMTNIN	GOW3B	8.43	
0150	E	DROP STRUCTURE	481	5731	CGABW	GOW3B	5.49	
0162	E	28' X 5' RCBC @ HUALAPAI	625	5731	CGABW	GOW3B	5.49	1.86
0174	E	CONC CHNL 28" 8D 0.1 SS	2715	5532	CCLMT5	GOW3B	5.19	3.20
0226	E	10' X 10' RCBC @ BELTWAY	246	2246	CUVB2	GOW3A	1.67	2.50
0230	E	10' X 10' RCB	280	1931	CLMT3	GOW3A	1.34	2.50
0236	E	CONC CHNL 15" 8D 0.1 SS	869	1931	CLMT3	GOW3A	1.34	3.69
GOLO		GOWAN OUTFALL - LONE MTN. ROAD BRANCH						
0275	E	8' X 5' RCB	3300	580	CPT3AA2	GOW3A	1.17	1.04
0332	E	8' X 5' RCB	150	482	CC3AA1	GOW3A	1.02	1.90
GONO		GOWAN NORTH SYSTEM						
0000	E	8' X 5' RCB OUTLET	184	523	GWNINDB	GOW5A	68.55	0.51
0001	E	8' X 5' RCB OUTLET	156	523	GWNINDB	GOW5A	68.55	0.63
0006	E	30,780 CFS PMF SPILLWAY		30780	CCLV43-C*	GOW4B	11.91	
0008	E	921 AC-FT GOWAN NORTH DETENTION BASIN		2599	CCLV43-C*	GOW4B	11.91	
0009	E	3' 13" X 5' RCB	1862	2281	CLV43-C	GOW4B	11.22	0.62
0012	E	CONC CHNL 30" 8.5D 0.1 SS	2965	2131	CCLV36-C	GOW4B	8.53	1.18
0062	E	BRIDGE 30" 8.5D @ CIMARRON	80	1912	CCLV15-C	GOW4B	8.02	0.30
0063	E	CONC CHNL 30" 8.5-10D 0.1 SS	2302	1912	CCLV15-C	GOW4B	8.02	1.00
0110	E	2' 12" X 5' RCAC @ ALEXANDER	547	1392	CHAFR2-C	GOW3B	8.26	1.00
0117	E	2' 12" X 5' RCAP	424	1392	CHAFR2-C	GOW3B	8.26	1.10
0124	E	CONC CHNL 24" 9D 0.1 SS	987	1392	CHAFR2-C	GOW3B	8.26	1.36
0141	E	CONC CHNL 24" 9-10.5D 0.1 SS	2084	1367	CCRSFR-C	GOW3B	6.12	0.59
0181	E	BRIDGE 30" 7D @ CRAIG	142	1367	CCRSFR-C	GOW3B	6.12	0.65
0183	E	CONC CHNL 22" 8-10.5D 0.1 SS	2193	1185	CCRSFR-C	GOW3B	5.19	0.72
0225	E	CONC CHNL WIDTH VARIES DEPTH VARIES 0.1 SS	508	1144	CCLWFR-E	GOW3B	4.54	1.05
0230	E	13' X 5' RCB	256	766	CLWFR-W	GOW3B	2.46	2.78
0234	E	12' X 5' RCB	2010	766	CLWFR-W	GOW3B	2.46	1.67
0272	E	10' X 5' RCB	2797	766	CLWFR-W	GOW3B	2.46	3.15
0325	E	15' X 7' RCB	251	749	CCWRHW-C	GOW3B	2.34	4.20
0335	E	15' X 7' RCB	929	749	CWRHW-C	GOW3A	2.34	0.40
0350	P	10' X 5' RCB	3473	749	CWRHW-C	GOW3A	2.34	0.88
0411	P	10' X 5' RCB	1320	678	CARHW-C	GOW3A	1.84	0.76

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GONO								
0436	P	8' X 6' RCB	1320	607	CEAHW-C	GOW3A	1.50	1.14
0461	P	8' X 7' RCB	1320	508	CTRHWC	GOW3A	1.21	0.38
0486	P	7' X 5' RCB	1320	400	CADHW-C	GOW3A	0.90	0.78
0511	P	6' X 5' RCB	1320	326	CCPHWC	GOW3A	0.80	1.14
GOOF								
GOWAN OUTFALL FACILITIES								
0511	E	8' X 5' RCB	8390	740	CPT6B-C	GOW3B	1.08	0.50
0531	E	8' X 5' RCB	1300	523	GWNINDB	GOW5A	68.55	0.50
0551	E	72" RCP	524	523	GWNINDB	GOW5A	68.55	0.82
0773	E	60" RCP	803	255	LV30-C	GOW3A	0.42	1.40
0775	E	60" RCP	1300	255	LV30-C	GOW3A	0.42	1.00
RCBC								
0140	E	RANCHO ROAD SYSTEM - BELTWAY CHANNEL CONC CHNL 10"W 5'D 0.1 SS	2165	475	CDMIA1	WEST3	0.43	1.85
RCHB								
RANCHO ROAD SYSTEM - BELTWAY								
0000	E	2' 12" X 8.5" RCAP	1700	1766	CNW1C-W*	WEST3	3.91	0.83
0034	E	CONC CHNL 21"W 8'D 0.1 SS	1000	1766	CNW1C-W	WEST3	3.91	1.19
0053	E	2' 12" X 8" RCBC @ SOUTH RAMP CONNECTOR	85	1485	CDW1C1-C	WEST3	3.55	1.40
0054	E	CONC CHNL 21"W 8'D 0.1 SS	432	1465	CDW1C1-C	WEST3	3.55	1.51
0082	E	TRANSITION STRUCTURE	130	1485	CDW1C1-C	WEST3	3.55	1.51
0085	E	24' X 7' RCB	480	1465	CDW1C1-C	WEST3	3.55	0.30
0074	E	24' X 6' RCB	50	1414	CNWBC6-C	WEST3	3.41	0.30
0075	E	20' X 6' RCBC @ BELTWAY	428	1414	CNWBC6-C	WEST3	3.41	2.81
0083	P	20' X 4' RCB	950	1414	CNWBC6-C	WEST3	3.41	2.49
0101	P	CONC CHNL 20"W 5'D 0.1 SS	980	1414	CNWBC6-C	WEST3	3.41	2.38
0120	E	20' X 6' RCBC @ GRAND MONTECITO	120	1414	CNWBC6-C	WEST3	3.41	1.00
0122	P	CONC CHNL 16"-20"W 6'D 0.1 SS	350	1414	CNWBC6-C	WEST3	3.41	1.84
RCHO								
RANCHO ROAD SYSTEM								
0000	E	60" RCP W/ 36" ORIFICE PLATE	1183	135	RCHODB	WEST3	4.61	0.74
0025	E	321 AC-FT RANCHO ROAD DETENTION BASIN		2057	RCHOIN	WEST3	4.61	
0027	E	18,000 CFS PMF SPILLWAY		18000	RCHOIN	WEST3	4.61	
0050	E	ENERGY DISSIPATOR	65	240	CNW1A1-C	WEST3	0.50	
0052	E	CONC CHNL 10"W 10'D 0.1 SS	115	240	CNW1A1-C	WEST3	0.50	11.73
0054	E	10' X 5' RCB	115	240	CNW1A1-C	WEST3	0.50	0.50
0056	E	10' X 5' RCB	805	240	CNW1A1-C	WEST3	0.50	0.49
0071	E	72" RCP	3126	240	CNW1A1-C	WEST3	0.50	1.80



NTS

Gowan Klatsershed

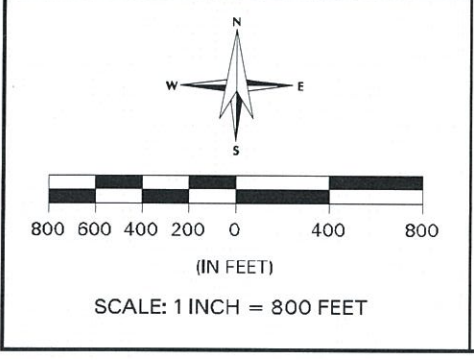
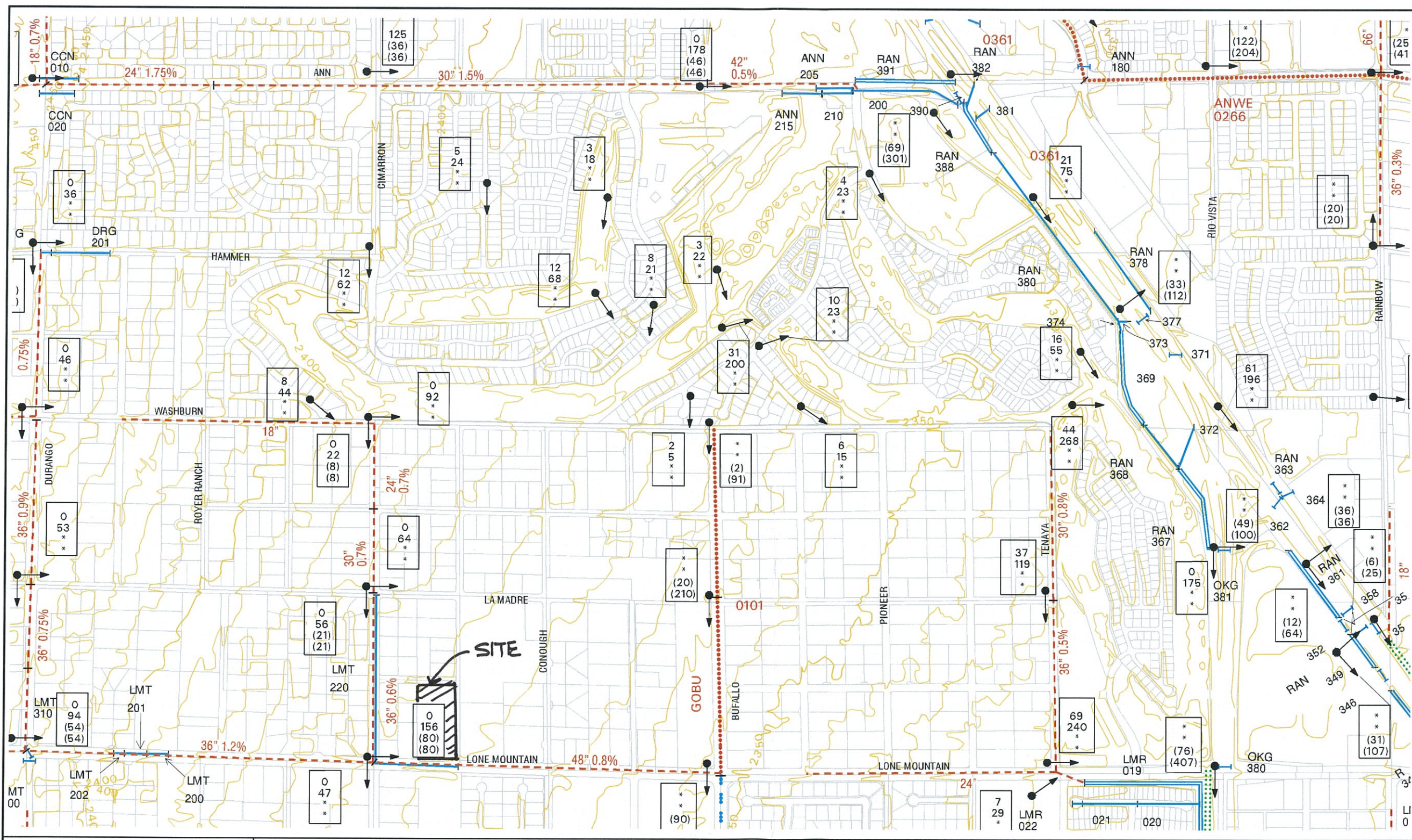
FIGURE 6



NORTHWEST NEIGHBORHOOD STUDY

- ## LEGEND
- EXISTING REGIONAL DETENTION BASINS
 - PROPOSED REGIONAL DETENTION BASINS
 - EXISTING LOCAL DETENTION BASINS
 - EXISTING REGIONAL BRIDGES
 - PROPOSED REGIONAL BRIDGES
 - EXISTING LOCAL BRIDGES
 - EXISTING REGIONAL CULVERT
 - PROPOSED REGIONAL CULVERT
 - EXISTING LOCAL CULVERT
 - EXISTING REGIONAL PIPELINE
 - PROPOSED REGIONAL PIPELINE
 - EXISTING LOCAL PIPELINE
 - PROPOSED LOCAL PIPELINE
 - EXISTING REGIONAL CHANNEL
 - PROPOSED REGIONAL CHANNEL
 - EXISTING LOCAL CHANNEL
 - PROPOSED REGIONAL CHANNEL (Not included in 1996 MPU)
 - EXISTING REGIONAL DIKE/LEVEE
 - PROPOSED REGIONAL DIKE/LEVEE
 - EXISTING LOCAL DIKE/LEVEE
 - EXISTING STORM WATER PUMPING STATION
 - PROPOSED BELTWAY ALIGNMENT

FIGURE F-8



→ FLOW ARROW

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

(FLOWS IN CFS)

NOTE:
Ultimate drainage conditions are based on future CN values with all flood control facilities in place
See the "September 1999 City of Las Vegas Northwest Neighborhood Study Phase 2" for proposed facilities in and north of Elkhorn.

REVISED SEPTEMBER 1999

HUALPAI	FT. APACHE	DURANGO	BUFFALO	RAINBOW	JONES	DECATUR	ELKHORN
1	2	3	4	5	6	7	CENTENNIAL
8	9	10	11	12	13	14	ANN
15	16	17	18	19	20	21	LONE MOUNTAIN
22	23	24	25	26	27	28	ALEXANDER
29	30	31	32	33	34	35	CHEYENNE
36	37	38	39	40	41	42	SMOKE RANCH

FUTURE DRAINAGE CONDITIONS

PBS&J

901 North Green Valley Parkway, Suite 100
Henderson, Nevada 89014-6139
Phone: 702/263-7275
Fax: 702/263-7200

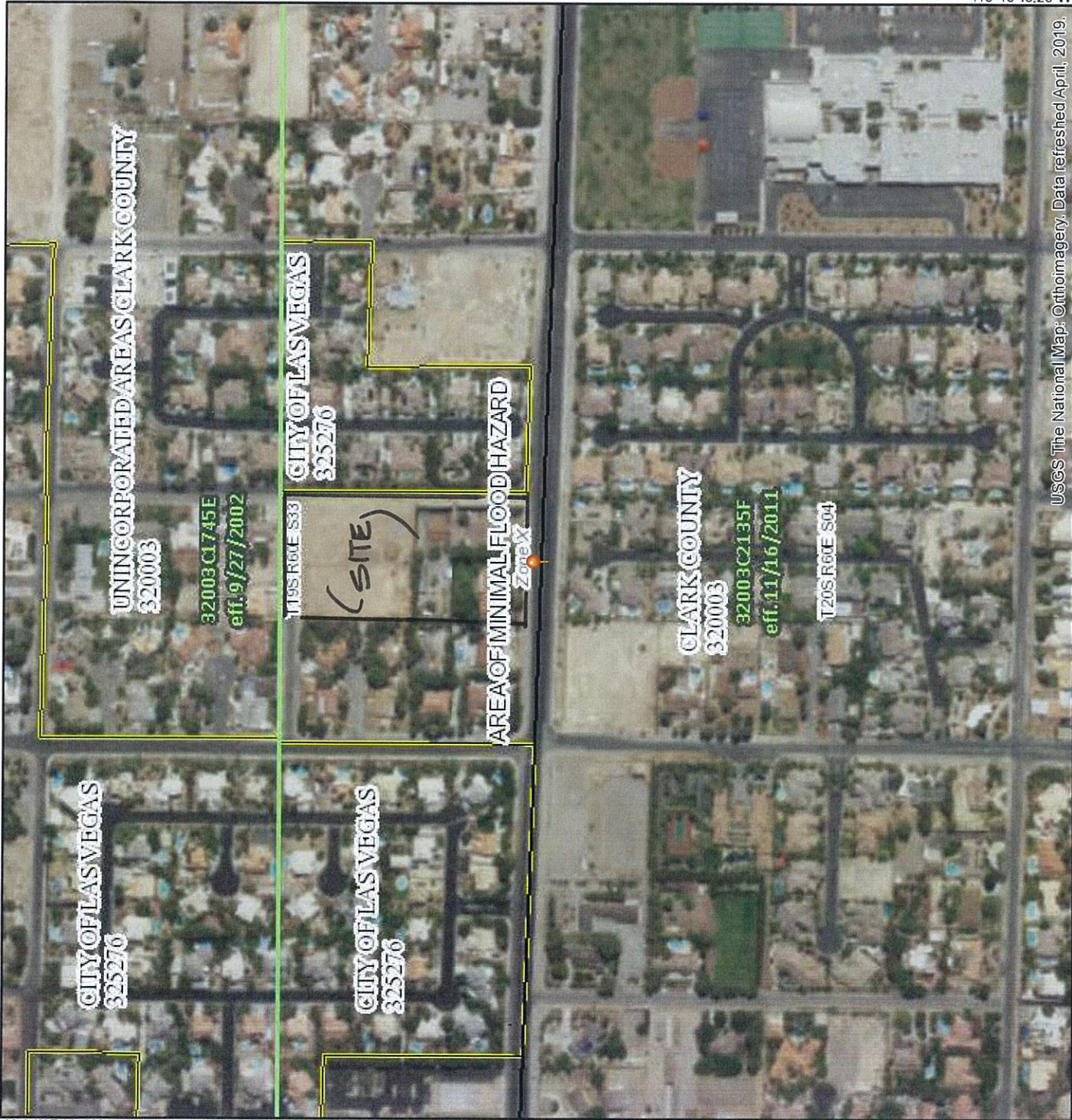
ENGINEERING PLANNING GIS SURVEYING CONSTRUCTION SERVICES

FIGURE 7

National Flood Hazard Layer FIRMette



36°15'7.49"N



USGS The National Map: Orthoimagery, Data refreshed April, 2019.
36°14'38.48"N



115°15'46.25"W

Legend

SEE THIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

Without Base Flood Elevation (BFE)
Zone A, V, A99
With BFE or Depth Zone AE, AO, AH, VE, AR
Regulatory Floodway

0.2% Annual Chance Flood Hazard, Area of 1% Annual Chance Flood with average depth less than one foot or with drainage areas of less than one square mile (Zone X)

Future Conditions 1% Annual Chance Flood Hazard (Zone X)

Area with Reduced Flood Risk due to Levee, See Notes, Zone X

Area with Flood Risk due to Levee (Zone D)

OTHER AREAS OF FLOOD HAZARD

NO SCREEN
Area of Minimal Flood Hazard (Zone X)
Effective LOMRs

Area of Undetermined Flood Hazard (Zone X)

OTHER AREAS

GENERAL STRUCTURES
Channel, Culvert, or Storm Sewer
Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance Water Surface Elevation
Coastal Transect
Base Flood Elevation Line (BFE)
Limit of Study

OTHER FEATURES
Coastal Transect Baseline
Profile Baseline
Hydrographic Feature

MAP PANELS
Digital Data Available
No Digital Data Available
Unmapped



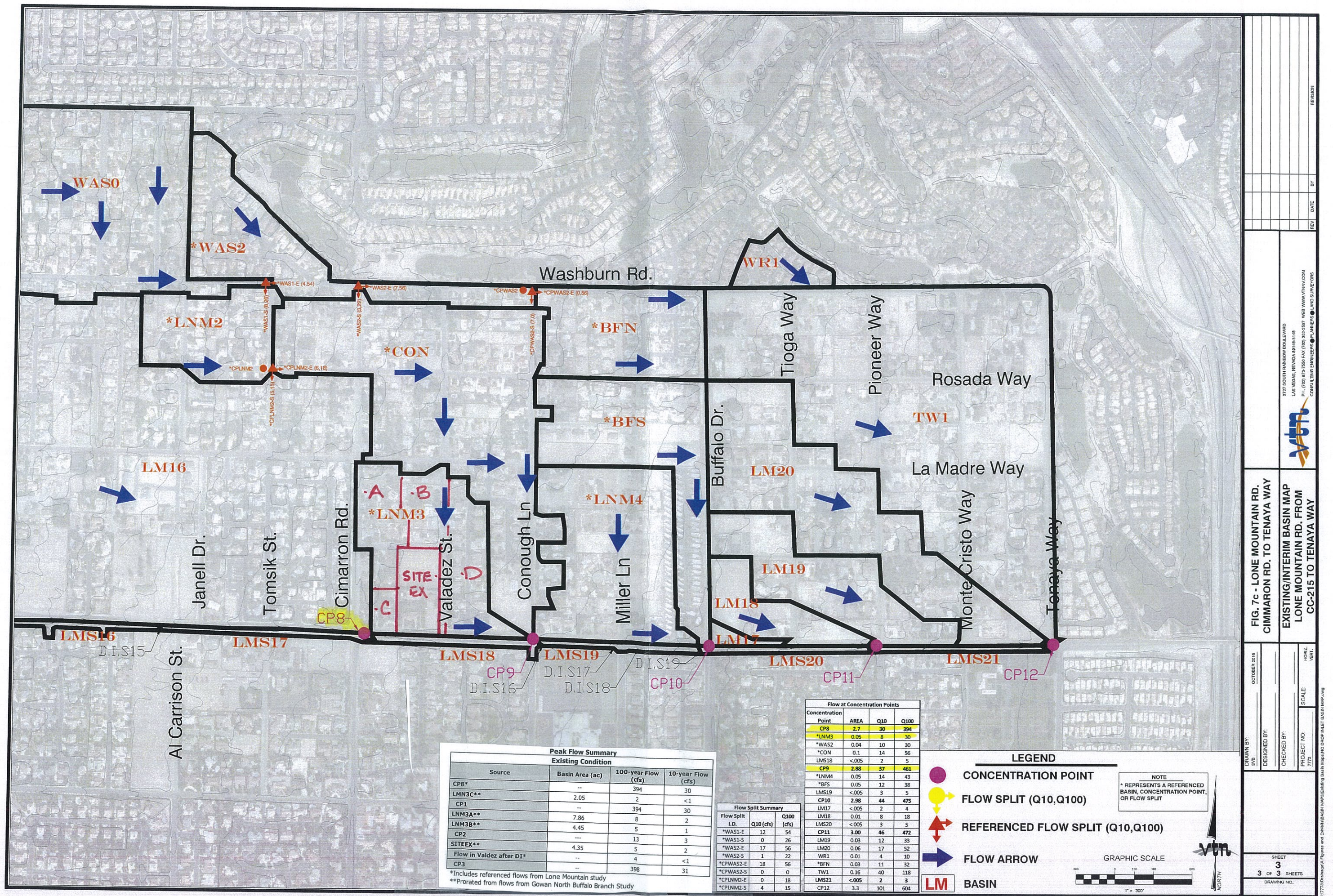
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/9/2019 at 12:11:01 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ENCLOSURE



Peak Flow Summary
Existing Condition

Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
CP8*	--	394	30
LMN3C**	2.05	2	<1
CP1	--	394	30
LMN3A**	7.86	8	2
LMN3B**	4.45	5	1
CP2	--	13	3
SITEEX**	4.35	5	2
Flow in Valdez after DI*	--	4	<1
CP3	--	398	31

*Includes referenced flows from Lone Mountain study
**Prorated from flows from Gowan North Buffalo Branch Study

Flow Split Summary

Flow Split ID	Q10 (cfs)	Q100 (cfs)
*WAS1-E	12	54
*WAS1-S	0	26
*WAS2-E	17	56
*WAS2-S	1	22
*CPWAS2-E	18	56
*CPWAS2-S	0	0
*CPUNM2-E	0	18
*CPUNM2-S	4	15

Flow at Concentration Points

Concentration Point	AREA	Q10	Q100
CP8	2.7	30	394
*LNM3	0.05	8	30
*WAS2	0.04	10	30
*CON	0.1	14	56
UNM18	<.005	2	5
CP9	2.88	37	461
*LNM4	0.05	14	43
*BFS	0.05	12	38
UNM19	<.005	3	5
CP10	2.98	44	475
LM17	<.005	2	4
LM18	0.01	8	18
UNM20	<.005	3	5
CP11	3.00	46	472
LM19	0.03	12	33
LM20	0.06	17	52
WR1	0.01	4	10
*BFN	0.03	11	32
TW1	0.16	40	118
UNM21	<.005	2	3
CP12	3.3	101	604

LEGEND

- CONCENTRATION POINT
- FLOW SPLIT (Q10, Q100)
- REFERENCED FLOW SPLIT (Q10, Q100)
- FLOW ARROW
- LM BASIN

NOTE
* REPRESENTS A REFERENCED BASIN, CONCENTRATION POINT, OR FLOW SPLIT

GRAPHIC SCALE
1" = 300'

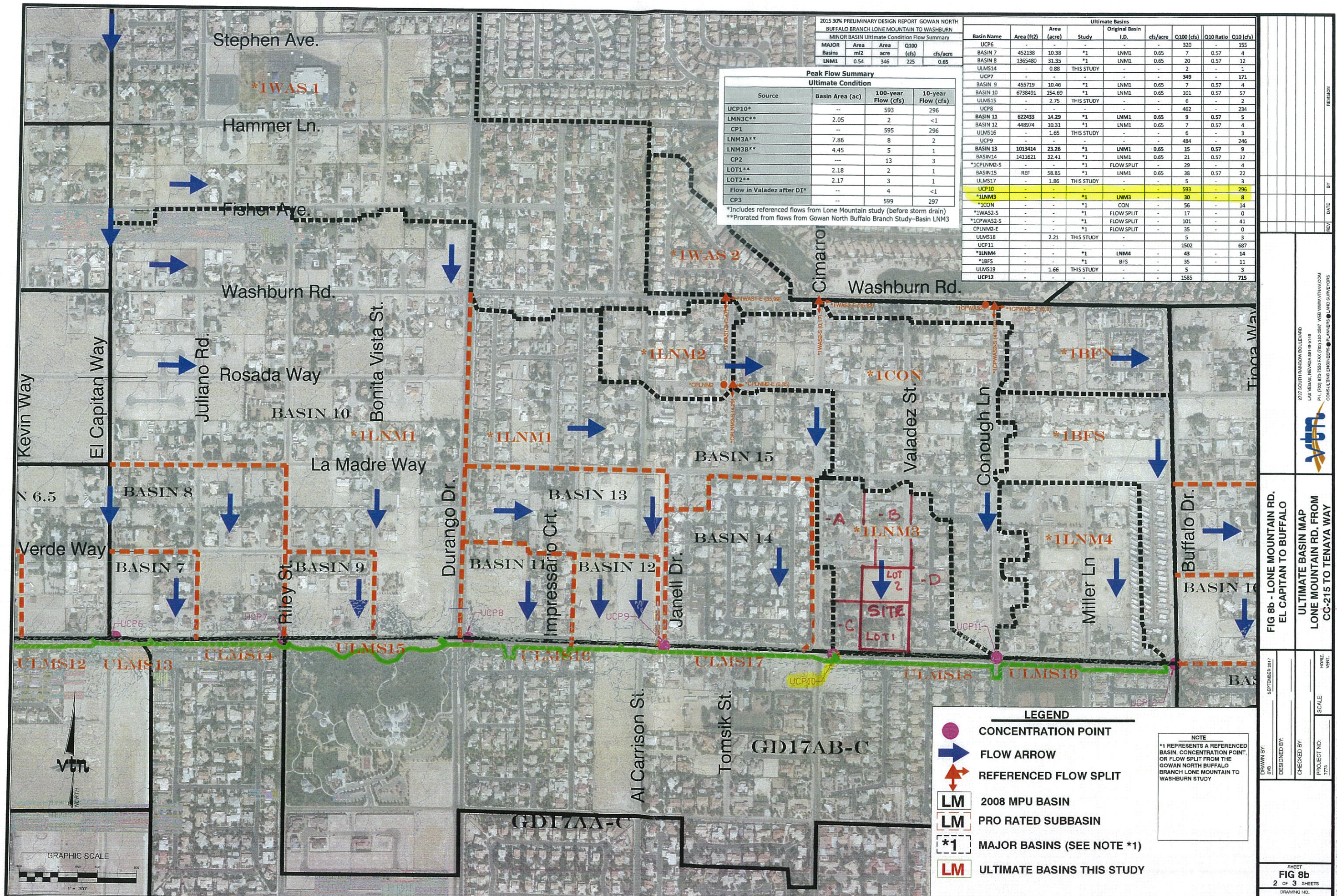


FIGURE 11



United States
Department of
Agriculture

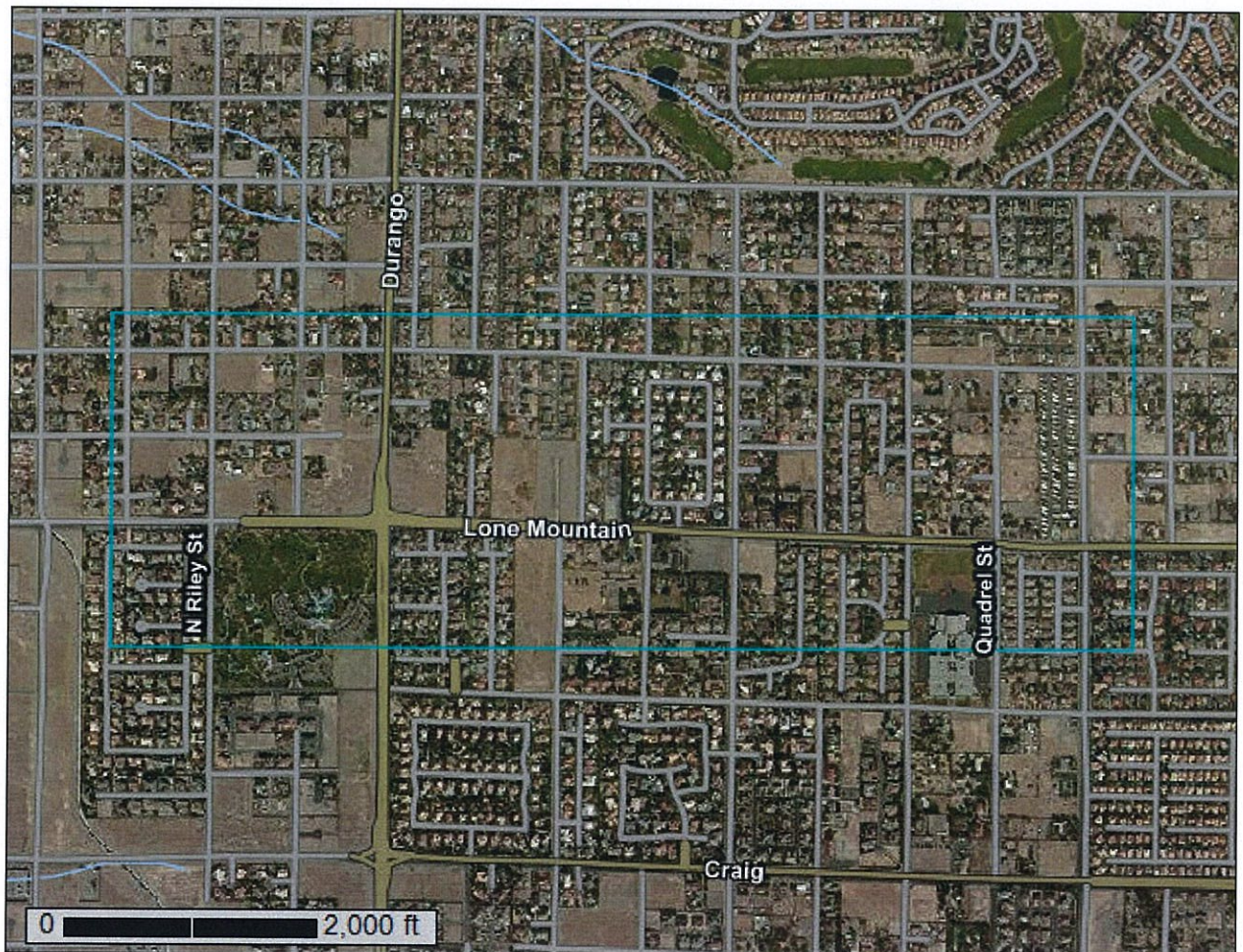
NRCS

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

Diaz Kissling

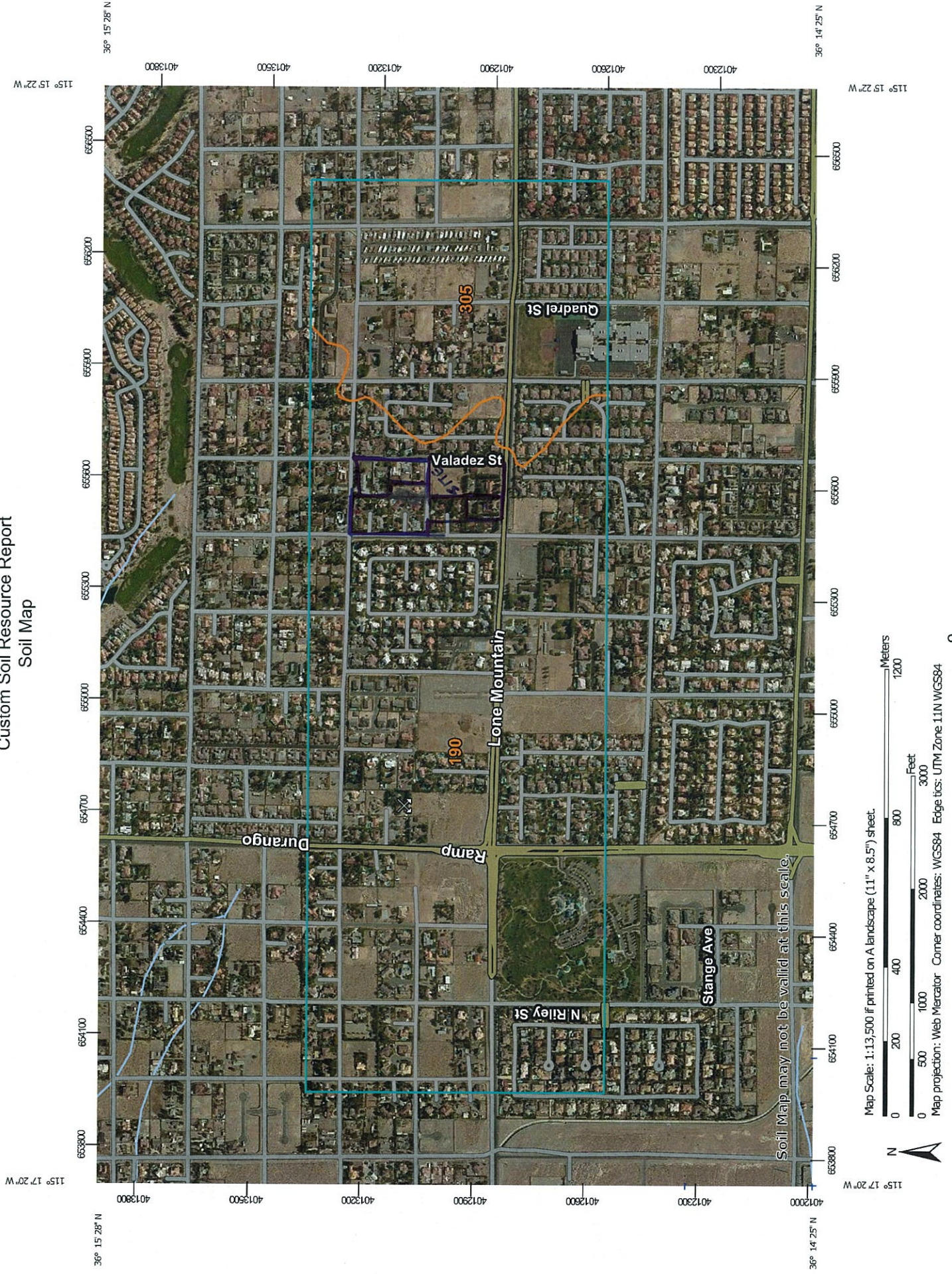


July 8, 2019

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



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
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 13, Sep 14, 2018

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

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

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

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
190	Dalian very gravelly fine sandy loam, 2 to 4 percent slopes	361.4	74.4%
305	Las Vegas-DeStazo complex, 0 to 2 percent slopes	124.0	25.6%
Totals for Area of Interest		485.4	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,

Custom Soil Resource Report

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

190—Dalian very gravelly fine sandy loam, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: hrb3

Elevation: 2,200 to 3,400 feet

Mean annual precipitation: 4 to 6 inches

Mean annual air temperature: 61 to 66 degrees F

Frost-free period: 210 to 250 days

Farmland classification: Not prime farmland

Map Unit Composition

Dalian and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dalian

Setting

Landform: Fan skirts

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Alluvium derived from limestone and dolostone

Typical profile

H1 - 0 to 4 inches: very gravelly fine sandy loam

H2 - 4 to 61 inches: extremely gravelly fine sandy loam

Properties and qualities

Slope: 2 to 4 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 60 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: A

Hydric soil rating: No

305—Las Vegas-DeStazo complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hrbs
Elevation: 1,400 to 5,200 feet
Mean annual precipitation: 3 to 10 inches
Mean annual air temperature: 55 to 70 degrees F
Frost-free period: 180 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Las Vegas and similar soils: 60 percent
Destazo and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Vegas

Setting

Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone

Typical profile

H1 - 0 to 2 inches: gravelly fine sandy loam
H2 - 2 to 8 inches: fine sandy loam
H3 - 8 to 12 inches: gravelly sandy clay loam
H4 - 12 to 16 inches: indurated

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 3 to 14 inches to petrocalcic
Natural 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 in profile: 85 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 12.0
Available water storage in profile: Very low (about 1.6 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

Description of Destazo

Setting

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

Typical profile

H1 - 0 to 11 inches: fine sandy loam
H2 - 11 to 51 inches: very gravelly sandy clay loam
H3 - 51 to 62 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)
Hydric soil rating: No

Minor Components

Glencarb

Percent of map unit: 5 percent
Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: LOAMY BOTTOM (030XB020NV)
Hydric soil rating: No

Bluepoint

Percent of map unit: 5 percent
Landform: Sand sheets, fan piedmonts
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Other vegetative classification: LIMY SAND 5-7" P.Z. (030XB037NV_2)
Hydric soil rating: No

Skyhaven

Percent of map unit: 5 percent
Landform: Alluvial flats
Down-slope shape: Linear

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group--			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.):					
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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage ¹	Percent Impervious ²	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

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

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

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

Revision	Date

REFERENCE:

TABLE 602A

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

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

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

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

Fair: 30 to 70% ground cover.

Good: >70% ground cover.

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

Revision	Date

WRC
ENGINEERING

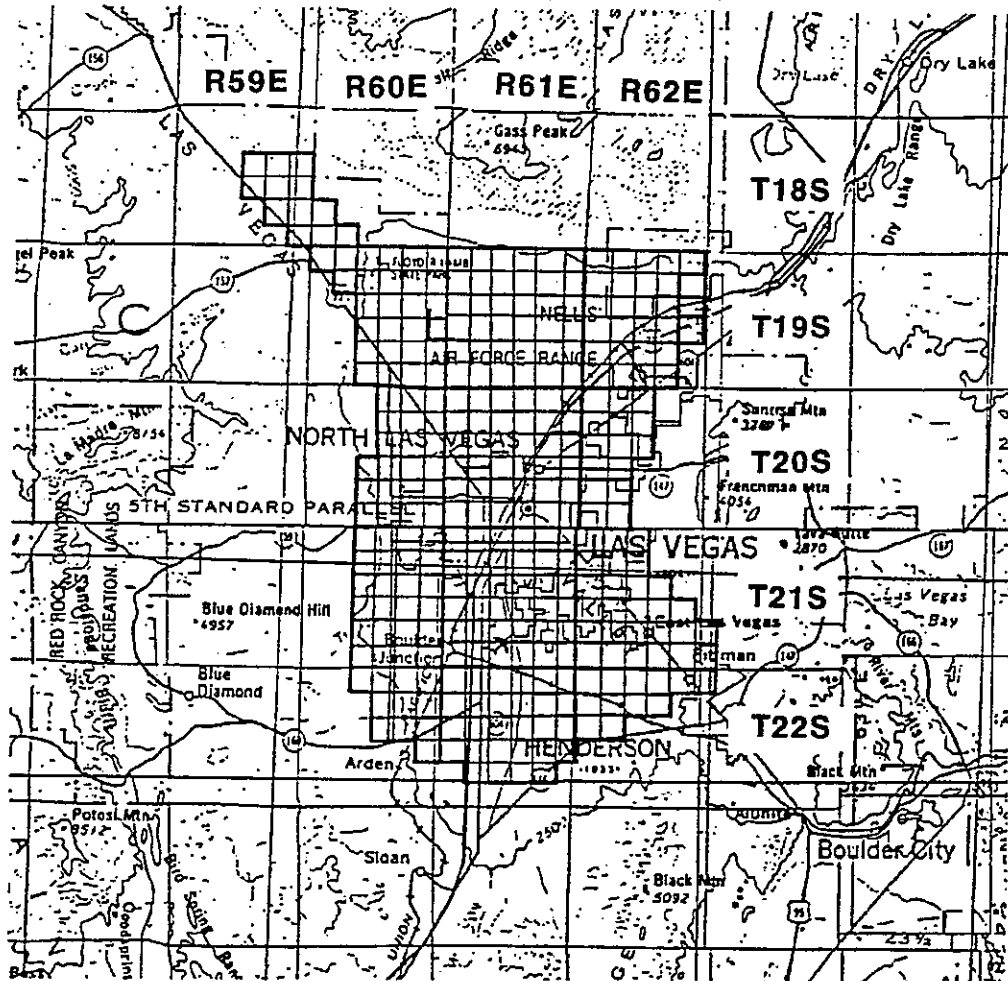
REFERENCE:

SCS TR-55, USDA, June 1986.

TABLE 602
4 of 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



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

Notes:

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

Revision	Date

**WRC
ENGINEERING**

REFERENCE:

USACE, Los Angeles District, 1988

FIGURE 513

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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

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

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

Revision	Date

**WRC
ENGINEERING**

REFERENCE:

USACE, Los Angeles District, 1988

TABLE 505

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

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

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

Revision	Date

REFERENCE:

TABLE 503

Project:	Diaz/Kissling
Title:	Flow calculation
Subtitle:	Prorated from Lone Mountain study basin LNM3
By:	PP
Date:	9/24/2019

EXISTING CONDITION					
	BASIN	ACREAGE	% OF BASIN	Q100	Q10
ORIGINAL	LNM3	28.56	100	30	8
	LNM3A	7.86	27.52%	8	2
	LNM3B	4.45	15.58%	5	1
	LNM3C	2.05	7.18%	2	<1
	SITEEX	4.35	15.23%	5	2
	LNM3D**	9.85	34.49%	10	3
TOTAL:		28.56	100.00%	30	8

** REMNENT PARCEL DOWNSTREAM OF SITE

DEVELOPED CONDITION					
	BASIN	ACREAGE	% OF BASIN	Q100	Q10
ORIGINAL	LNM3	28.56	100	30	8
	LNM3A	7.86	27.52%	8	2
	LNM3B	4.45	15.58%	5	1
	LNM3C	2.05	7.18%	2	<1
	LOT1	2.18	7.63%	2	1
	LOT2	2.17	7.60%	3	1
	LNM3D**	9.85	34.49%	10	3
TOTAL:		28.56	100.00%	30	8

** REMNENT PARCEL DOWNSTREAM OF SITE

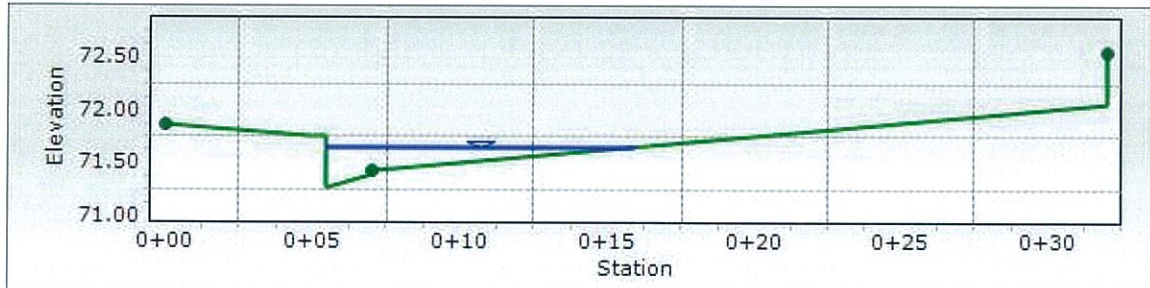
HS1 Lone Mountain 1/2 street Q10

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0070 ft/ft
Normal Depth	0.4 ft
Discharge	3.00 cfs



Worksheet for HS1 Lone Mountain 1/2 street Q10

Project Description			
Friction Method	Manning		
	Formula		
Solve For	Normal Depth		
Input Data			
Channel Slope	0.0070 ft/ft		
Discharge	3.00 cfs		
Section Definitions			
	Station (ft)	Elevation (ft)	
	0+00.00		71.87
	0+05.00		71.77
	0+05.50		71.77
	0+05.50		71.27
	0+07.00		71.40
	0+07.00		71.44
	0+32.00		72.06
	0+32.00		72.56
Roughness Segment Definitions			
Start Station	Ending Station	Roughness Coefficient	
(0+00.00, 71.87)	(0+07.00, 71.44)	0.013	
(0+07.00, 71.44)	(0+32.00, 72.56)	0.017	
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	0.4 ft		
Elevation Range	71.27 to 72.56 ft		
Flow Area	1.5 ft ²		
Wetted Perimeter	10.91 ft		
Hydraulic Radius	0.1 ft		
Top Width	10.46 ft		
Normal Depth	0.4 ft		
Critical Depth	0.4 ft		
Critical Slope	0.0080 ft/ft		
Velocity	2.02 ft/s		
Velocity Head	0.06 ft		
Specific Energy	0.46 ft		

street capacity.fm8
10/3/2019

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

FlowMaster
[10.02.00.01]
Page 1 of 2

Worksheet for HS1 Lone Mountain 1/2 street Q10

Results

Froude Number	0.943
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.4 ft
Critical Depth	0.4 ft
Channel Slope	0.0070 ft/ft
Critical Slope	0.0080 ft/ft

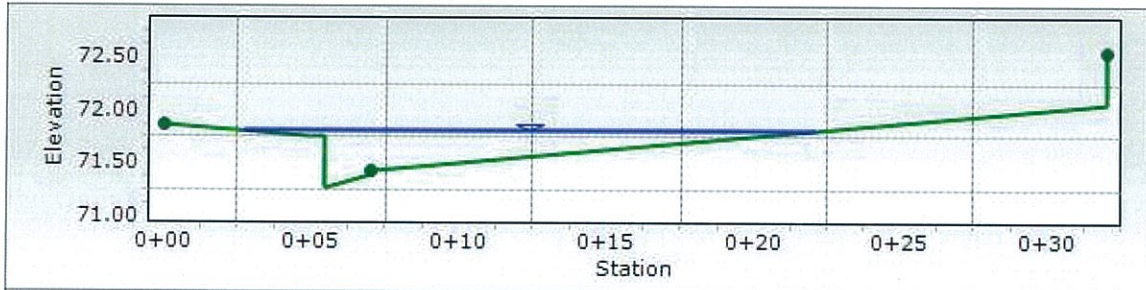
HS1 Lone Mountain 1/2 street Q100

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0070 ft/ft
Normal Depth	0.5 ft
Discharge	9.00 cfs



Worksheet for HS1 Lone Mountain 1/2 street Q100

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.0070 ft/ft
Discharge	9.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	71.87
0+05.00	71.77
0+05.50	71.77
0+05.50	71.27
0+07.00	71.40
0+07.00	71.44
0+32.00	72.06
0+32.00	72.56

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 71.87)	(0+07.00, 71.44)	0.013
(0+07.00, 71.44)	(0+32.00, 72.56)	0.017

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	0.5 ft
Elevation Range	71.27 to 72.56 ft
Flow Area	3.6 ft ²
Wetted Perimeter	19.97 ft
Hydraulic Radius	0.2 ft
Top Width	19.42 ft
Normal Depth	0.5 ft
Critical Depth	0.5 ft
Critical Slope	0.0069 ft/ft
Velocity	2.47 ft/s
Velocity Head	0.10 ft
Specific Energy	0.64 ft

Worksheet for HS1 Lone Mountain 1/2 street Q100

Results

Froude Number	1.008
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.5 ft
Critical Depth	0.5 ft
Channel Slope	0.0070 ft/ft
Critical Slope	0.0069 ft/ft

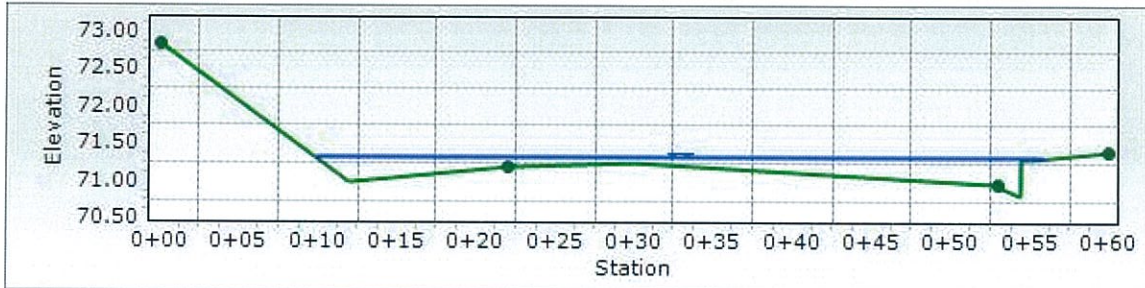
HS2 Valadez Q100

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0044 ft/ft
Normal Depth	0.5 ft
Discharge	13.00 cfs



Worksheet for HS2 Valadez Q100

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.0044 ft/ft
Discharge	13.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	72.85
0+12.00	71.00
0+22.00	71.19
0+30.00	71.24
0+53.00	70.97
0+53.00	70.93
0+54.50	70.80
0+54.50	71.30
0+55.00	71.30
0+60.00	71.40

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 72.85)	(0+22.00, 71.19)	0.035
(0+22.00, 71.19)	(0+53.00, 70.97)	0.017
(0+53.00, 70.97)	(0+60.00, 71.40)	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	0.5 ft
Elevation Range	70.80 to 72.85 ft
Flow Area	9.0 ft ²
Wetted Perimeter	46.58 ft
Hydraulic Radius	0.2 ft
Top Width	46.01 ft
Normal Depth	0.5 ft
Critical Depth	0.5 ft
Critical Slope	0.0149 ft/ft

Worksheet for HS2 Valadez Q100

Results

Velocity	1.44 ft/s
Velocity Head	0.03 ft
Specific Energy	0.55 ft
Froude Number	0.574
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.5 ft
Critical Depth	0.5 ft
Channel Slope	0.0044 ft/ft
Critical Slope	0.0149 ft/ft

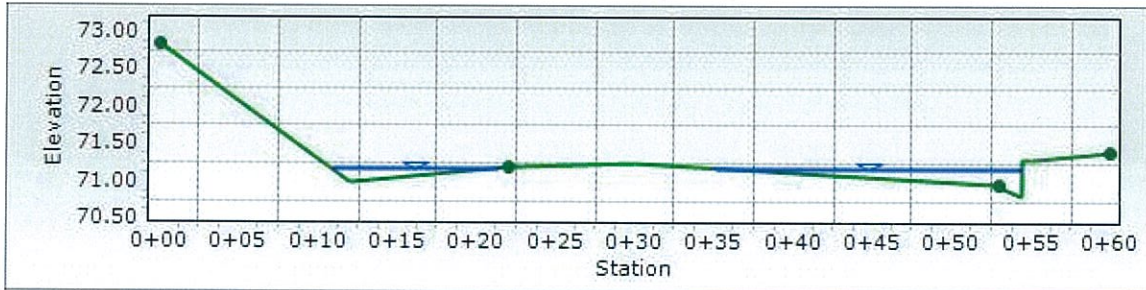
HS2 Valadez Q10

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0044 ft/ft
Normal Depth	0.4 ft
Discharge	3.00 cfs



Worksheet for HS2 Valadez Q10

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.0044 ft/ft
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	72.85
0+12.00	71.00
0+22.00	71.19
0+30.00	71.24
0+53.00	70.97
0+53.00	70.93
0+54.50	70.80
0+54.50	71.30
0+55.00	71.30
0+60.00	71.40

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 72.85)	(0+22.00, 71.19)	0.035
(0+22.00, 71.19)	(0+53.00, 70.97)	0.017
(0+53.00, 70.97)	(0+60.00, 71.40)	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	0.4 ft
Elevation Range	70.80 to 72.85 ft
Flow Area	3.3 ft ²
Wetted Perimeter	30.42 ft
Hydraulic Radius	0.1 ft
Top Width	29.98 ft
Normal Depth	0.4 ft
Critical Depth	0.3 ft
Critical Slope	0.0207 ft/ft

Worksheet for HS2 Valadez Q10

Results

Velocity	0.91 ft/s
Velocity Head	0.01 ft
Specific Energy	0.39 ft
Froude Number	0.484
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.4 ft
Critical Depth	0.3 ft
Channel Slope	0.0044 ft/ft
Critical Slope	0.0207 ft/ft

Messages

Messages	Flow is divided.
----------	------------------

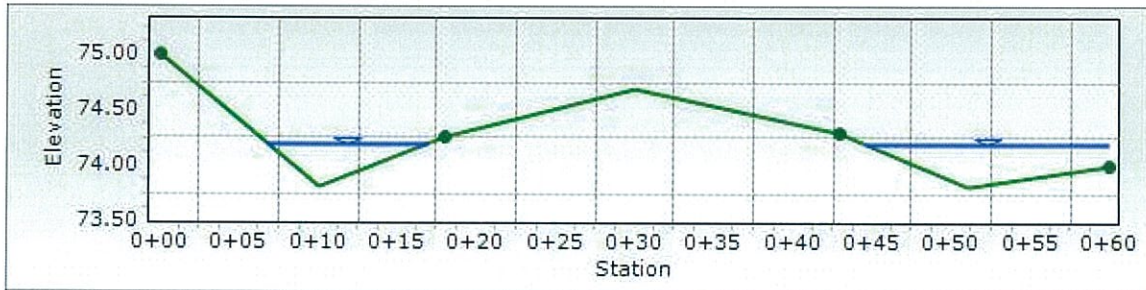
HS3 Verde Q100

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0075 ft/ft
Normal Depth	0.4 ft
Discharge	8.00 cfs



Worksheet for HS3 Verde Q100

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.0075 ft/ft
Discharge	8.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	75.00
0+10	73.80
0+18	74.25
0+30	74.68
0+43	74.29
0+51	73.80
0+60	74.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 75.00)	(0+18, 74.25)	0.035
(0+18, 74.25)	(0+43, 74.29)	0.017
(0+43, 74.29)	(0+60, 74.00)	0.035

Options

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

Results

Normal Depth	0.4 ft
Elevation Range	73.80 to 75.00 ft
Flow Area	5.8 ft ²
Wetted Perimeter	25.81 ft
Hydraulic Radius	0.2 ft
Top Width	25.57 ft
Normal Depth	0.4 ft
Critical Depth	0.3 ft
Critical Slope	0.0329 ft/ft
Velocity	1.37 ft/s
Velocity Head	0.03 ft
Specific Energy	0.42 ft

Worksheet for HS3 Verde Q100

Results

Froude Number	0.504
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.4 ft
Critical Depth	0.3 ft
Channel Slope	0.0075 ft/ft
Critical Slope	0.0329 ft/ft

Messages

Messages	Water Surface Elevation exceeds lowest end station by 0.190439946 130738ft. Flow is divided.
----------	---

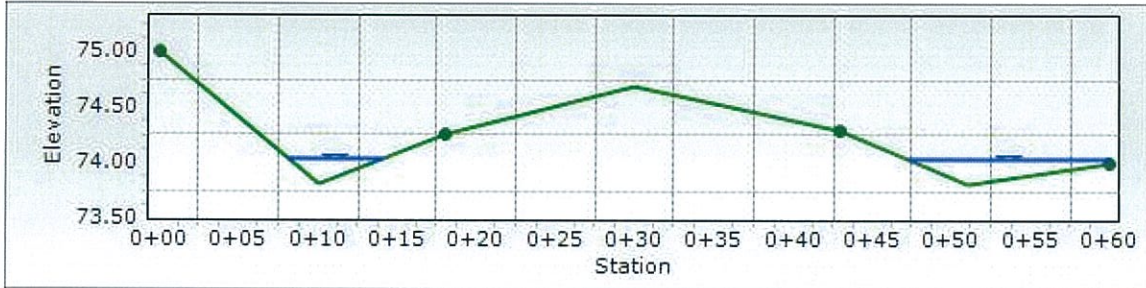
HS3 Verde Q10

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0075 ft/ft
Normal Depth	0.2 ft
Discharge	2.00 cfs



Worksheet for HS3 Verde Q10

Project Description			
Friction Method	Manning	Formula	
Solve For	Normal Depth		
Input Data			
Channel Slope	0.0075 ft/ft		
Discharge	2.00 cfs		
Section Definitions			
Station (ft)			Elevation (ft)
	0+00		75.00
	0+10		73.80
	0+18		74.25
	0+30		74.68
	0+43		74.29
	0+51		73.80
	0+60		74.00
Roughness Segment Definitions			
Start Station	Ending Station	Roughness Coefficient	
(0+00, 75.00)	(0+18, 74.25)	0.035	
(0+18, 74.25)	(0+43, 74.29)	0.017	
(0+43, 74.29)	(0+60, 74.00)	0.035	
Options			
Current Roughness Weighted Method	Pavlovskii's Method		
Open Channel Weighting Method	Pavlovskii's Method		
Closed Channel Weighting Method	Pavlovskii's Method		
Results			
Normal Depth	0.2 ft		
Elevation Range	73.80 to 75.00 ft		
Flow Area	2.2 ft ²		
Wetted Perimeter	18.70 ft		
Hydraulic Radius	0.1 ft		
Top Width	18.64 ft		
Normal Depth	0.2 ft		
Critical Depth	0.2 ft		
Critical Slope	0.0409 ft/ft		
Velocity	0.89 ft/s		
Velocity Head	0.01 ft		
Specific Energy	0.24 ft		

Worksheet for HS3 Verde Q10

Results

Froude Number	0.454
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.2 ft
Critical Depth	0.2 ft
Channel Slope	0.0075 ft/ft
Critical Slope	0.0409 ft/ft

Messages

Messages	Water Surface Elevation exceeds lowest end station by 0.027142770 4853551ft. Flow is divided.
----------	--

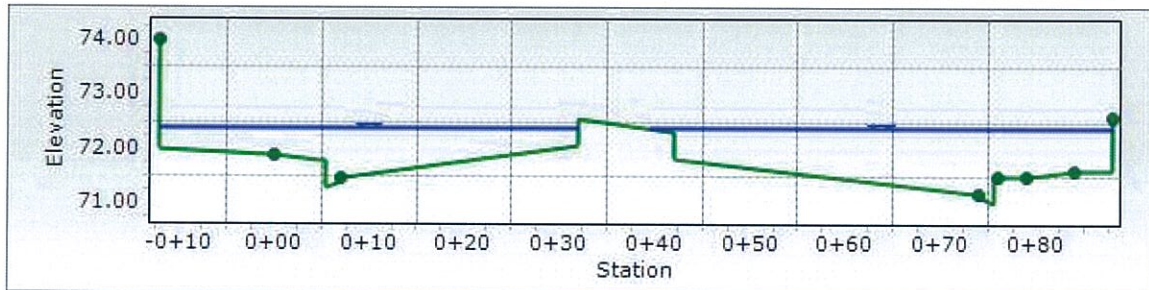
HS1 Lone Mountain full Q100

Project Description

Friction Method	Manning
	Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.0070 ft/ft
Normal Depth	1.4 ft
Discharge	297.00 cfs



ultimate 100-yr flow @ UCPI less 10-yr flows
collected by storm drain.
 $593 - 296 = 297$ cfs remaining in street

Worksheet for HS1 Lone Mountain full Q100

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.0070 ft/ft
Discharge	297.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+12.00	74.00
-0+12.00	72.00
0+00.00	71.87
0+05.00	71.77
0+05.50	71.77
0+05.50	71.27
0+07.00	71.40
0+07.00	71.44
0+32.00	72.06
0+32.00	72.56
0+42.00	72.31
0+42.00	71.81
0+74.00	71.17
0+74.00	71.13
0+75.50	71.00
0+75.50	71.50
0+76.00	71.50
0+79.00	71.50
0+84.00	71.60
0+88.00	71.60
0+88.00	72.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12.00, 74.00)	(0+00.00, 71.87)	0.035
(0+00.00, 71.87)	(0+07.00, 71.44)	0.013
(0+07.00, 71.44)	(0+74.00, 71.17)	0.017
(0+74.00, 71.17)	(0+76.00, 71.50)	0.013
(0+76.00, 71.50)	(0+79.00, 71.50)	0.035
(0+79.00, 71.50)	(0+84.00, 71.60)	0.013
(0+84.00, 71.60)	(0+88.00, 72.60)	0.035

Options	
Current Roughness Weighted Method	Pavlovskii's Method

Worksheet for HS1 Lone Mountain full Q100

Options	
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method
Results	
Normal Depth	1.4 ft
Elevation Range	71.00 to 74.00 ft
Flow Area	66.1 ft ²
Wetted Perimeter	95.61 ft
Hydraulic Radius	0.7 ft
Top Width	92.54 ft
Normal Depth	1.4 ft
Critical Depth	1.3 ft
Critical Slope	0.0080 ft/ft
Velocity	4.50 ft/s
Velocity Head	0.31 ft
Specific Energy	1.69 ft
Froude Number	0.938
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.4 ft
Critical Depth	1.3 ft
Channel Slope	0.0070 ft/ft
Critical Slope	0.0080 ft/ft
Messages	
Messages	Flow is divided.

HSI

Cross Section for 159+91 to 165+84

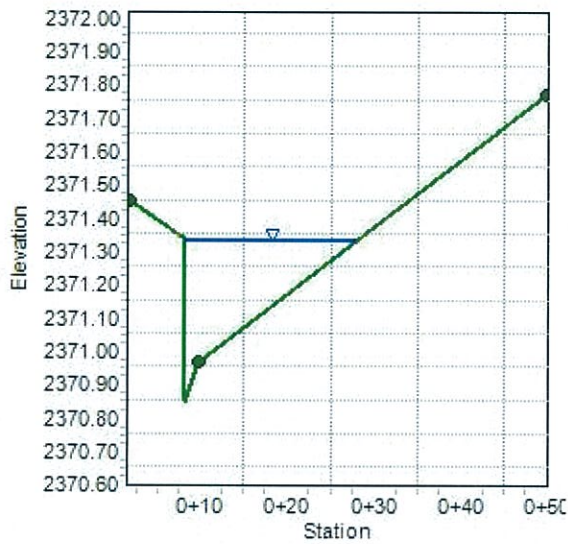
Project Description

Friction Method Manning Formula
Solve For Discharge

Input Data

Channel Slope 0.00700 ft/ft
Normal Depth 0.49 ft
Discharge 10.40 ft³/s

Cross Section Image



REFERENCE
VTN study

Worksheet for 159+91 to 165+84

Project Description

Friction Method Manning Formula
Solve For Discharge

Input Data

Channel Slope 0.00700 ft/ft
Normal Depth 0.49 ft
Section Definitions

Station (ft)	Elevation (ft)
0+01.76	2371.45
0+06.08	2371.37
0+07.76	2371.34
0+07.89	2371.34
0+08.26	2371.34
0+08.32	2370.98
0+08.34	2370.84
0+09.36	2370.93
0+09.76	2370.97
0+38.62	2371.55
0+49.76	2371.77

REFERENCE

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+01.76, 2371.45)	(0+09.76, 2370.97)	0.013
(0+09.76, 2370.97)	(0+49.76, 2371.77)	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

Discharge 10.40 ft³/s

Worksheet for 159+91 to 165+84

Results

Elevation Range	2370.84 to 2371.77 ft
Flow Area	3.90 ft ²
Wetted Perimeter	20.0286 ft
Hydraulic Radius	0.19 ft
Top Width	19.6041 ft
Normal Depth	0.49 ft
Critical Depth	0.50 ft
Critical Slope	0.00624 ft/ft
Velocity	2.67 ft/s
Velocity Head	0.11 ft
Specific Energy	0.60 ft
Froude Number	1.06
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.00 ft
Length	0.0000 ft
Number Of Steps	0

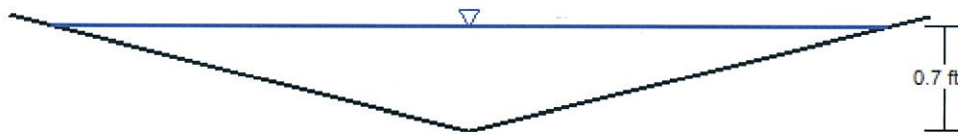
GVF Output Data

Upstream Depth	0.00 ft
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.49 ft
Critical Depth	0.50 ft
Channel Slope	0.00700 ft/ft
Critical Slope	0.00624 ft/ft

REFERENCE

Cross Section for private drainage easement

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	0.0078 ft/ft
Normal Depth	0.7 ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	3.00 cfs



V: 1
H: 1

Worksheet for private drainage easement

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.035
Channel Slope	0.0078 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Discharge	3.00 cfs
Results	
Normal Depth	0.7 ft
Flow Area	1.7 ft ²
Wetted Perimeter	5.41 ft
Hydraulic Radius	0.3 ft
Top Width	5.24 ft
Critical Depth	0.5 ft
Critical Slope	0.0293 ft/ft
Velocity	1.75 ft/s
Velocity Head	0.05 ft
Specific Energy	0.70 ft
Froude Number	0.537
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.7 ft
Critical Depth	0.5 ft
Channel Slope	0.0078 ft/ft
Critical Slope	0.0293 ft/ft

Block Wall Opening Computation

FACILITY DESCRIPTION

Project Name: Diaz/Kissling

Date: 9/26/2019

File Name: _____

By: PJP

Known Information:

H = Height of Opening (ft)	1.33
L = Length of Opening (ft)	4.00
Cf = Clogging Factor (%)	50

Weir Conditions:

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

Cw = Weir Coefficient	2.70
H _{clg} = Height with clogging	0.7
Q = Flow allowed through opening	5.9

Orifice Conditions:

$$Q = C_o * A_{clg} * (2gH_{clg})^{1/2}$$

Co = Orifice Coefficient	0.67
A _{clg} = Area with clogging	2.66
Q = Flow allowed through opening	8.2

Worst Case Scenario Occurs Under Weir Conditions

Allowed Flow Through Opening = **5.9 cfs** > 3 cfs OK

TECHNICAL DRAINAGE STUDY

FOR

**LONE MOUNTAIN ROAD
CC-215 TO TENAYA WAY**

**CLARK COUNTY, NEVADA
W.O. # 7773**

Prepared for:
**CA GROUP
2727 S. RAINBOW BLVD.
LAS VEGAS, NV 89146**

Submitted to:
**PUBLIC WORKS DEPARTMENT
CLARK COUNTY, NEVADA**

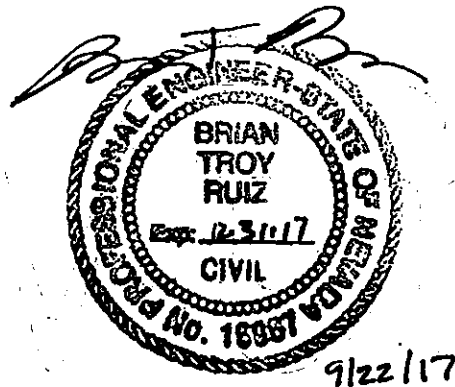


Figure 2

Ultimate Basins								
Basin Name	Area (ft ²)	Area (acre)	Study	Original Basin I.D.	cfs/acre	Q100 (cfs)	Q10 Ratio	Q10 (cfs)
UPro 1	2129744.00	48.89	2008 MPU	WRHW-C	0.75	36	0.55	20
Basin 1	443199.00	10.17	2008 MPU	WRHW-C	0.75	8	0.55	4
Basin 1.5	Ref	30.42	2008 MPU	WRHW-C	0.75	23	0.55	12
ULMS1	-	0.59	THIS STUDY	-	-	3	-	1
UCP1	-	-	-	-	-	70	-	38
Basin 2	426280.000	9.79	2008 MPU	WRHW-C	0.75	7	0.55	4
Basin 2.5	Ref	30.53	2008 MPU	GD20AB-C	0.75	23	0.55	13
*2PARK	Ref	30.90	*2	OND3 + CP1	-	64	-	22
ULMS2	-	1.00	THIS STUDY	-	-	4	-	2
ULMS3	-	0.34	THIS STUDY	-	-	3	-	1
ULMS4	-	0.4	THIS STUDY	-	-	3	-	2
UCP2	-	-	THIS STUDY	-	-	149	-	66
Basin 3	437634.000	10.05	2008 MPU	LWFR-C	0.97	10	0.55	5
Basin 3.5	Ref	30.80	2008 MPU	LWFR-C	0.97	30	0.55	16
ULMS5	-	0.73	THIS STUDY	-	-	3	-	2
ULMS6	-	2.72	THIS STUDY	-	-	2	-	0
UCP3	-	-	-	-	-	191	-	90
Basin 4	430873.000	9.89	2008 MPU	LWFR-C	0.97	10	0.55	5
Basin 4.5	Ref	29.72	2008 MPU	LWFR-C	0.97	29	0.55	16
ULMS7	-	0.60	THIS STUDY	-	-	3	-	1
ULMS8	-	0.54	THIS STUDY	-	-	3	-	1
UCP4	-	-	-	-	-	232	-	112
Basin 5	454561.000	10.44	2008 MPU	LWFR-C	0.97	10	0.55	6
Basin 5.5	Ref	30.96	2008 MPU	LWFR-C	0.97	30	0.55	16
ULMS9	-	0.69	THIS STUDY	-	-	2	-	1
ULMS10	-	0.97	THIS STUDY	-	-	5	-	3
UCP5	-	-	-	-	-	274	-	135
Basin 6	448731.000	10.30	2008 MPU	LWFR-C	0.97	10	0.55	5
Basin 6.5	Ref	31.38	2008 MPU	0.000	0.97	30	0.55	17
ULMS11	-	1.01	THIS STUDY	-	-	5	-	3
ULMS12	-	0.88	THIS STUDY	-	-	2	-	1
ULMS13	-	0.4	THIS STUDY	-	-	2	-	1
UCP6	-	-	-	-	-	320	-	155
BASIN 7	452138	10.38	*1	LNMI	0.65	7	0.57	4
BASIN 8	1365480	31.35	*1	LNMI	0.65	20	0.57	12
ULMS14	-	0.88	THIS STUDY	-	-	2	-	1
UCP7	-	-	-	-	-	349	-	171
BASIN 9	455719	10.46	*1	LNMI	0.65	7	0.57	4
BASIN 10	6738491	154.69	*1	LNMI	0.65	101	0.57	57
ULMS15	-	2.75	THIS STUDY	-	-	6	-	2
UCP8	-	-	-	-	-	462	-	234
BASIN 11	622433	14.29	*1	LNMI	0.65	9	0.57	5
BASIN 12	448974	10.31	*1	LNMI	0.65	7	0.57	4
ULMS16	-	1.65	THIS STUDY	-	-	6	-	3
UCP9	-	-	-	-	-	484	-	246
BASIN 13	1013414	23.26	*1	LNMI	0.65	15	0.57	9
BASIN14	1411621	32.41	*1	LNMI	0.65	21	0.57	12
*1CP1NM2-S	-	-	*1	FLOW SPLIT	-	29	-	4
BASIN15	REF	58.85	*1	LNMI	0.65	38	0.57	22
ULMS17	-	1.86	THIS STUDY	-	-	5	-	3
UCP10	-	-	-	-	-	593	-	296
*1LNMI3	-	-	*1	LNMI3	-	30	-	8
*1CON	-	-	*1	CON	-	56	-	14
*1WAS2-S	-	-	*1	FLOW SPLIT	-	17	-	0
*1CPWAS2-S	-	-	*1	FLOW SPLIT	-	101	-	41
CPLNM2-E	-	-	*1	FLOW SPLIT	-	35	-	0
ULMS18	-	2.21	THIS STUDY	-	-	5	-	3
UCP11	-	-	-	-	-	1502	-	687
*1LNMI4	-	-	*1	LNMI4	-	43	-	14
*1BFS	-	-	*1	BFS	-	35	-	11
ULMS19	-	1.66	THIS STUDY	-	-	5	-	3
UCP12	-	-	-	-	-	1585	-	715
Basin 16	449621	10.32	2008 MPU	GD20BE-C	0.99	10	0.57	6
Basin 17	1408710	32.34	2008 MPU	GD20BE-C	0.99	32	0.57	18
BASIN S16	496304	11.39	2008 MPU	GD20BE-C	0.99	11	0.57	6
UCP13	-	-	-	-	-	1639	-	745
Basin 18	468579	10.76	2008 MPU	GD20BE-C	0.99	11	0.57	6
Basin 19	5193097	119.22	2008 MPU	GD20BE-C	0.99	118	0.57	67
*1BFN	-	-	*1	BFN	-	32	-	10
*1CPWAS2-E	-	-	*1	FLOW SPLIT	-	3	-	0
BASIN S17	813075	18.67	2008 MPU	GD20BE-C	0.99	19	0.57	11
UCP14	-	-	-	-	-	1821	-	839

4.0 ROADWAY AND FACILITY DESIGN

The purpose of the Lone Mountain Road Improvement Project is to design a hydraulically efficient roadway and storm water conveyance facility that meets the design criteria presented in the CCRFCD HCDDM. Based on the established 10-year and 100-year flows from this report, the storm drain required is primarily to serve as a 10-year storm drain system to meet 10-year 12-foot dry lane criteria.

4.1 STREET FLOW

Street flow calculations were performed based on the results of the hydrology. To ensure the CCRFCD street flow criterion is being met FlowMaster normal depth cross sections were developed. Normal depth calculations are included in *Appendix C.2*. A Storm Drain Exhibit is also included in *Appendix A, Exhibit 10 (SD1-SD10)*.

Between drop inlets situated along Lone Mountain Rd. a section of proposed roadway has been analyzed using Flowmaster software. The analysis determines street flow capacities for sections of road along Lone Mountain. The station information and street capacities has been added to a summary table and attached below. The proposed Lone Mountain Rd. is similar on the north and south halves of the street; therefore only 1 section is analyzed from station to station for both the north and south halves of Lone Mountain Rd. In the analysis the proposed surface was analyzed. At each of the cross section there is a defined station where the concrete for the gutter ends and where the asphalt begins. At this point the 12' dry lane was calculated by adding 18' multiplied by the 2% cross slope to determine the elevation needed to have a 12' dry lane. For all of the cross sections the normal depth is below the 0.5' curb line. Therefore the analysis does not account for the higher manning's n that maybe found in the landscape areas. The street flow capacities were then compared with the Ultimate Condition flowrates. In all cases the Ultimate Condition analysis flowrate values were the highest and considered the most conservative when compared to existing conditions. Lone Mountain Road is equal to or greater than an 80 foot right-of-way; therefore, the street has been designed to meet 10-year HCCDM dry lane criteria. At intersections with a ROW width greater than or equal to 80 feet a flow depth of 0.50 feet or less was maintained just before the intersection.

STREET DRY LANE SUMMARY - NORTH SIDE OF LONE MOUNTAIN RD.						
El Capitan to Cimmaron						
DROP INLET	Station	DI on Street	10-YR FLOW	STREET FLOW CAPACITY	REQUIRED COLLECTIO	ACTUAL COLLECTION
	Align "L"		(CFS)	(CFS)	(CFS)	(CFS)
PDI1N	116+54	Lone Mountain	19	15	4	11
PDI1N	121+71	Lone Mountain	8	15	0	2
PDI2N	128+07	Lone Mountain	10	15	0	6
PDI5N	130+30	Lone Mountain	12	14	0	4
PDI6N	136+88	Lone Mountain	9	15	0	8
NWDI1	141+35	Lone Mountain	4	13	0	1
PDI7N	144+07	Lone Mountain	7	14	0	5
PDI8N	145+55	Lone Mountain	12	14	0	8

STREET DRY LANE SUMMARY - NORTH SIDE OF LONE MOUNTAIN RD. n						
El Capitan to Cimmaron						
DROP INLET	Station	DI on Street	10-YR FLOW	STREET FLOW CAPACITY	REQUIRED COLLECTIO	ACTUAL COLLECTION
	Align "L"		(CFS)	(CFS)	(CFS)	(CFS)
DIS15	141+35	Lone Mountain	9	13	0	2

4.1.3 CIMMARON RD. TO BUFFALO DR.

(See Appendix C.1 for inlet interception, See Appendix A Figures SD7 through SD9 for a storm drain exhibit, See Appendix D.3 for Reference Information regarding the North Buffalo Branch Study, See Appendix C.2.1 for Flowmaster Normal Depth Calculations)

A storm drain assumed to be built in the existing/interim condition of this project is scheduled to be constructed within Lone Mountain Rd. This storm drain has been referred to as the concurrent North Buffalo Branch System. This storm drain system has been designed by Parsons Brinckerhoff, and is currently in the 90% design phase. Review of the North Buffalo Branch study shows the on-site runoff will be discharged from the street via storm drain drop inlets located along Lone Mountain Rd. Off-site run-off will be collected in 2 laterals. The planned lateral storm drains will be located along Conough

Ln. and Washburn Rd. and the other in Buffalo Dr. (See appendix D.3.2.1 for the alignment of the proposed storm drain). Drop inlet sizing and location was referenced from the North Buffalo Branch study and added to the inlet interception spread sheets from this (VTN) study in order to determine the downstream flowrates east of Buffalo. Below is a table of the Street Dry Lane Summary from Cimmaron Rd. to Buffalo Dr.

STREET DRY LANE SUMMARY - NORTH SIDE OF LONE MOUNTAIN RD.						
Cimmaron to Buffalo						
DROP INLET	Station	DI on Street	10-YR FLOW	STREET FLOW CAPACITY	REQUIRED COLLECTION	ACTUAL COLLECTION
	Align "L"		(CFS)	(CFS)	(CFS)	(CFS)
*LMDI-1	154+70	Lone Mountain	5	14	0	3
*LMDI-2	155+17	Lone Mountain	2	14	0	1
*LMDI-7	161+20	Lone Mountain	3	10	0	2
*LMDI-10	165+86	Lone Mountain	5	9	0	3
*LMDI-11	169+91	Lone Mountain	5	8	0	3
*LMDI-13	171+55	Lone Mountain	2	11	0	1
*LMDI-12	176+80	Lone Mountain	15	12	3	7
*EXDI-4	183+32	Lone Mountain	8	14	0	5
*EXDI-5	183+72	Lone Mountain	3	14	0	2

SOUTH

STREET DRY LANE SUMMARY - NORTH SIDE OF LONE MOUNTAIN RD.						
Cimmaron to Buffalo						
DROP INLET	Station	DI on Street	10-YR FLOW	STREET FLOW CAPACITY	REQUIRED COLLECTION	ACTUAL COLLECTION
	Align "L"		(CFS)	(CFS)	(CFS)	(CFS)
*LMDI-5	155+48	Lone Mountain	9.06	12	0	4
*LMDI-6	156+11	Lone Mountain	4.64	12	0	3
*LMDI-8	157+98	Lone Mountain	2.13	12	0	1
*EXDI-1	171+47	Lone Mountain	3.85	11	0	1
*EXDI-2	177+02	Lone Mountain	3.31	12	0	1
*EXDI-3	179+27	Lone Mountain	2.00	12	0	1
*EXDI-7	183+78	Lone Mountain	4.05	14	0	3

4.1.4 BUFFALO DR. TO TENAYA WAY

(See Appendix C.1 for inlet interception, See Appendix A Figures SD9 and SD10 for a storm drain exhibit, See Appendix D.3 for Reference Information regarding the North Buffalo Branch Study, See Appendix C.2.2 Roadway Geometry Hinge for Hinged Roadway Normal Depth Calculations)

This area drain was connected to an existing 36" RCP that outlets into the vacant lot on the southwest corner of El Capitan and Fort Apache. In the proposed condition this area drain will be removed leaving the 36" RCP abandoned.

4.2.2 STORM DRAIN (EL CAPITAN TO CIMARRON)

(Refer to *Appendix A.10 Figures SF1 through SF4* for a *Street Flow Exhibit*)

There is currently no existing storm drain from El Capitan Rd to Nightwood Court. There is an existing 36" RCP extending from Nightwood Crt. to Janell Drive. This section of 36" RCP is at 1.29% slope. *See Appendix D.6 for referenced plans.* From Janell Drive to Cimarron there is currently no storm drain.

The proposed RCP mainline will extend from just east of Riley St. to just west of Cimarron Rd. a distance of approximately 3,800. The proposed storm drain will start out as a 24" RCP, conveying $Q_{10}=11\text{cfs}$. The RCP will need to be upsized to a 48" RCP at Durango Rd. The proposed 48" RCP will convey $Q_{10}=99\text{cfs}$ and will continue to Cimarron Rd. where it will connect to the concurrent North Buffalo Branch storm drain. The existing 36" RCP storm drain starting near Nightwood Crt. and terminating just west of Janell Dr. will not be used. A proposed section of 48" RCP will be used. Preliminary analysis utilizing Flowmaster software shows that the existing 36" RCP has the capabilities of conveying up to 76cfs, at the existing 1.29% slope. By the end of the existing 36" RCP Q_{10} for this study would equal 89cfs.

4.2.3 STORM DRAIN (CIMARRON TO BUFFALO)

(Refer to *Appendix D.3.2.1 for a 90% Submittal Plan Set Page SD-1 through SD-4 for plans referring to the Lone Mountain Rd. storm drain* Refer to *Appendix D.3.2.3 for a Drop Inlet Summary by Parsons Brinckerhoff.* Refer to *Appendix C.1 for Inlet Interception Calculations from this Study*)

From Cimarron Rd. to Buffalo Drive there is a storm drain currently being proposed by Parsons Brinckerhoff. The study is referred to as the Gowan North Buffalo Branch – Lone Mountain to Washburn Final Design Report. Storm drain inlet have been sized for

this section of Lone Mountain Road within the above mentioned study, and added to the drop inlet calculation sheet for this study. See inlets with a *1 included with their inlet ID.

4.2.4 STORM DRAIN (BUFFALO TO TENAYA)

Currently past Buffalo Drive there is no existing storm drain in Lone Mountain Rd. As previously discussed in section 4.1.4 the storm drain is not a viable option for this section of road.

5.0 CONCLUSION AND RECOMMENDATIONS

The following conclusions have been determined:

- Offsite hydrologic analysis has been performed and design point flow rates established for design of proposed storm drain facilities. Hydrology models prepared for the project include Existing, and Ultimate Conditions.
- The hydrologic analysis, along with street flow calculations, have been provided and used to determine storm water interception locations, and inlet sizing.
- Hydraulic analysis has been performed for the proposed local facility mainline. Analysis has also been performed for laterals connecting proposed inlets to the mainline. Hydraulic grade lines have been incorporated into the storm drain plan profiles based on the results of mainline and lateral hydraulic analysis.
- (Refer to *Appendix A Figure 9 Durango Drop Inlets Basin Map*, see also *Appendix C Drop Inlets Along Durango Drive*, and in *Appendix C Drop Inlets along Lone Mountain Rd.*)

Durango Drive has an existing storm drain system starting near Fisher Ave. and terminating on Lone Mountain Rd. just east of Durango Drive. Drainage information pertaining to the storm drain abilities have not been found, however drop inlets have been analyzed within this report to determine how much flow may be found with in this system. Basins for this analysis were prorated from basin WAS1 and Basin 10. Existing storm drain DRZ-1 collects runoff from basin DRZ-1. Existing storm drain DRZ-2 collects runoff from basin DRZ-2 and so on to DRZ-7. A total of $Q_{10}=57\text{cfs}$ and $Q_{100}=101\text{cfs}$ from Basin 10 gets to the intersection of Lone Mountain Rd. and Durango Dr. As is, the Durango Drive storm drain conveys 14cfs and 24cfs in the 10-yr and 100-yr respectively; of that flow 1cfs and

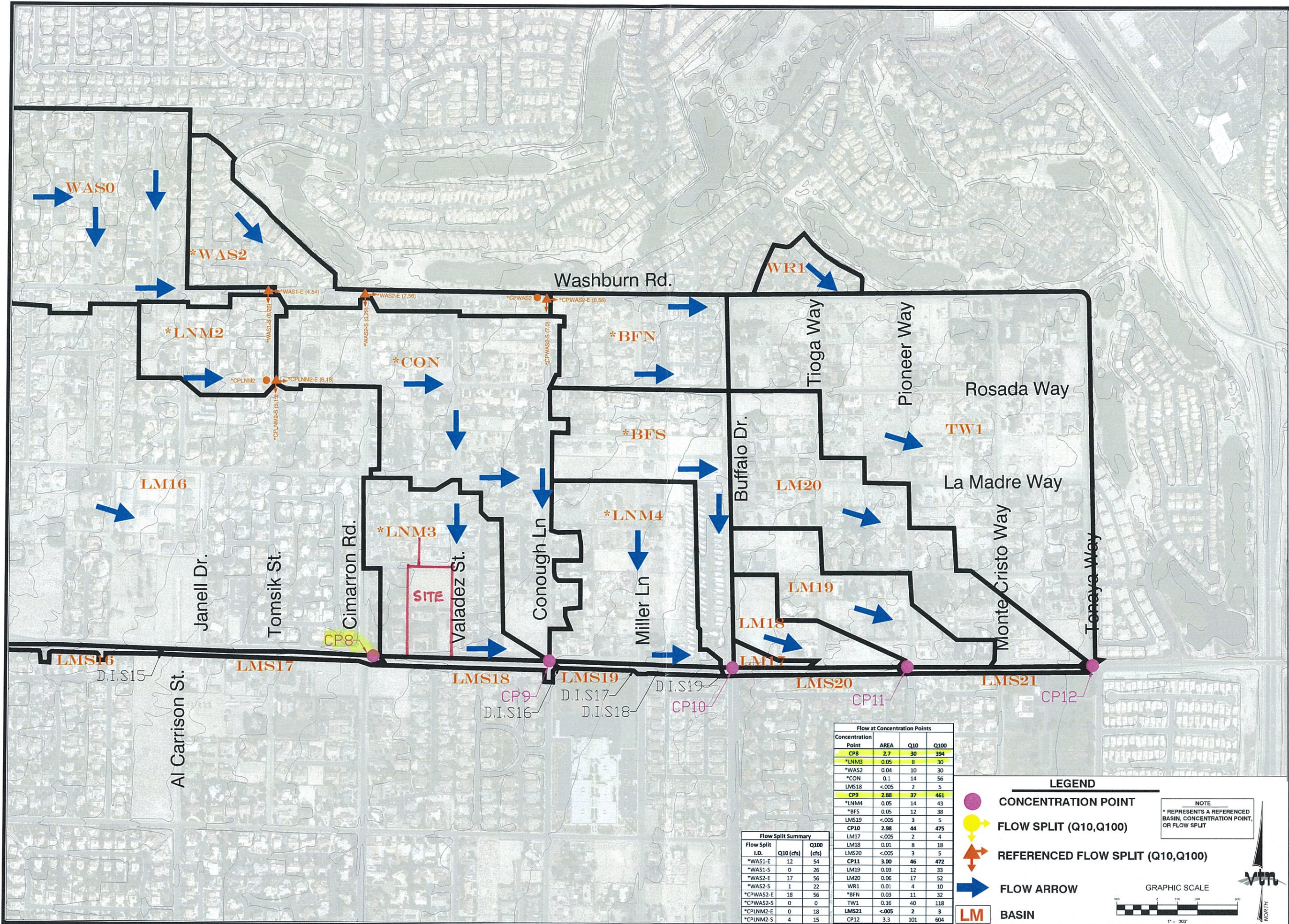
Lone Mountain Road – CC-215 to Tenaya Way

Reviewer: Brian Churchill, P.E.

Date: May 16, 2017

Documents: Preliminary Technical Drainage Study

Section	Comment	Response																																																																																																																																																																																				
1.	The street capacity analysis for 10-year criteria for Lone Mountain cannot be verified. The street slope is not labeled. Provide a table for capacity of the street from station to station. Flow rates over the capacity will need to be intercepted in this system.	A Capacity from station to station table has been made and is attached to this comment letter below, and included in section 4.1 Street Flow of the report. Flow rates over the capacity of the road are intercepted in the proposed system. <table><tr><th colspan="5">Capacity from Station to Station</th></tr><tr><th colspan="5">Lone Mountain Rd. - CC215 to Tenaya</th></tr><tr><th>From</th><th>To</th><th>Capacity</th><th>Slope</th><th></th></tr><tr><th>Sta:</th><th>Sta:</th><th>cfs</th><th>%</th><th></th></tr><tr><td>23+57</td><td>29+45</td><td>28</td><td>5.67%</td><td></td></tr><tr><td>29+45</td><td>35+75</td><td>30</td><td>5.83%</td><td></td></tr><tr><td>35+75</td><td>42+24</td><td>24</td><td>4.15%</td><td></td></tr><tr><td>42+24</td><td>48+58</td><td>25</td><td>4.27%</td><td></td></tr><tr><td>48+58</td><td>55+18</td><td>26</td><td>4.27%</td><td></td></tr><tr><td>55+18</td><td>61+59</td><td>23</td><td>3.72%</td><td></td></tr><tr><td>61+59</td><td>68+02</td><td>24</td><td>3.51%</td><td></td></tr><tr><td>68+02</td><td>74+19</td><td>22</td><td>3.25%</td><td></td></tr><tr><td>74+19</td><td>81+27</td><td>22</td><td>3.33%</td><td></td></tr><tr><td>81+27</td><td>86+68</td><td>19</td><td>2.39%</td><td></td></tr><tr><td>86+68</td><td>94+88</td><td>18</td><td>2.00%</td><td></td></tr><tr><td>94+88</td><td>100+63</td><td>18</td><td>2.00%</td><td></td></tr><tr><td>100+63</td><td>103+15</td><td>17</td><td>2.10%</td><td></td></tr><tr><td>103+15</td><td>116+54</td><td>15</td><td>1.68%</td><td></td></tr><tr><td>116+54</td><td>121+71</td><td>15</td><td>1.46%</td><td></td></tr><tr><td>121+71</td><td>128+07</td><td>15</td><td>1.46%</td><td></td></tr><tr><td>128+07</td><td>130+29</td><td>15</td><td>1.45%</td><td></td></tr><tr><td>130+29</td><td>136+87</td><td>14</td><td>1.22%</td><td></td></tr><tr><td>136+87</td><td>141+35</td><td>15</td><td>1.52%</td><td></td></tr><tr><td>141+35</td><td>144+07</td><td>13</td><td>1.26%</td><td></td></tr><tr><td>144+07</td><td>145+55</td><td>14</td><td>1.26%</td><td></td></tr><tr><td>145+55</td><td>154+70</td><td>14</td><td>1.26%</td><td></td></tr><tr><td>154+70</td><td>159+91</td><td>12</td><td>0.93%</td><td></td></tr><tr><td>159+91</td><td>165+84</td><td>10</td><td>0.70%</td><td></td></tr><tr><td>165+84</td><td>169+91</td><td>9</td><td>0.52%</td><td></td></tr><tr><td>169+91</td><td>171+46</td><td>8</td><td>0.44%</td><td></td></tr><tr><td>171+46</td><td>176+80</td><td>11</td><td>0.82%</td><td></td></tr><tr><td>176+80</td><td>183+32</td><td>12</td><td>0.95%</td><td></td></tr><tr><td>183+32</td><td>191+43</td><td>14</td><td>1.15%</td><td></td></tr><tr><td>191+43</td><td>198+14</td><td>11</td><td>0.89%</td><td></td></tr><tr><td>198+14</td><td>204+78</td><td>11</td><td>0.81%</td><td></td></tr><tr><td>204+78</td><td>210+99</td><td>10</td><td>0.68%</td><td></td></tr></table> 4148 cfs	Capacity from Station to Station					Lone Mountain Rd. - CC215 to Tenaya					From	To	Capacity	Slope		Sta:	Sta:	cfs	%		23+57	29+45	28	5.67%		29+45	35+75	30	5.83%		35+75	42+24	24	4.15%		42+24	48+58	25	4.27%		48+58	55+18	26	4.27%		55+18	61+59	23	3.72%		61+59	68+02	24	3.51%		68+02	74+19	22	3.25%		74+19	81+27	22	3.33%		81+27	86+68	19	2.39%		86+68	94+88	18	2.00%		94+88	100+63	18	2.00%		100+63	103+15	17	2.10%		103+15	116+54	15	1.68%		116+54	121+71	15	1.46%		121+71	128+07	15	1.46%		128+07	130+29	15	1.45%		130+29	136+87	14	1.22%		136+87	141+35	15	1.52%		141+35	144+07	13	1.26%		144+07	145+55	14	1.26%		145+55	154+70	14	1.26%		154+70	159+91	12	0.93%		159+91	165+84	10	0.70%		165+84	169+91	9	0.52%		169+91	171+46	8	0.44%		171+46	176+80	11	0.82%		176+80	183+32	12	0.95%		183+32	191+43	14	1.15%		191+43	198+14	11	0.89%		198+14	204+78	11	0.81%		204+78	210+99	10	0.68%	
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Flow at Concentration Points				
Point	AREA	Q10	Q100	
CP8	2.7	30	394	
*LNM3	0.05	8	30	
*WAS2	0.04	10	30	
*CON	0.1	14	56	
LMS18	<.005	2	5	
CP9	2.88	37	461	
*LNM4	0.05	14	43	
*BFS	0.05	12	38	
LMS19	<.005	3	5	
CP10	2.98	44	475	
LM17	<.005	2	4	
LM18	0.01	8	18	
LMS20	<.005	3	5	
CP11	3.00	46	472	
LM19	0.03	12	33	
LM20	0.06	17	52	
WR1	0.01	4	10	
*BFN	0.03	11	32	
TW1	0.16	40	118	
LMS21	<.005	2	3	
CP12	3.3	101	604	

Flow Split Summary		
Flow Split ID	Q10 (cfs)	Q100 (cfs)
*WAS1-E	12	54
*WAS1-S	0	26
*WAS2-E	17	56
*WAS2-S	1	22
*CPWAS2-E	18	56
*CPWAS2-S	0	0
*CPINM2-E	0	18
*CPINM2-S	4	15

LEGEND

- CONCENTRATION POINT
- FLOW SPLIT (Q10,Q100)
- REFERENCED FLOW SPLIT (Q10,Q100)
- FLOW ARROW
- LM BASIN

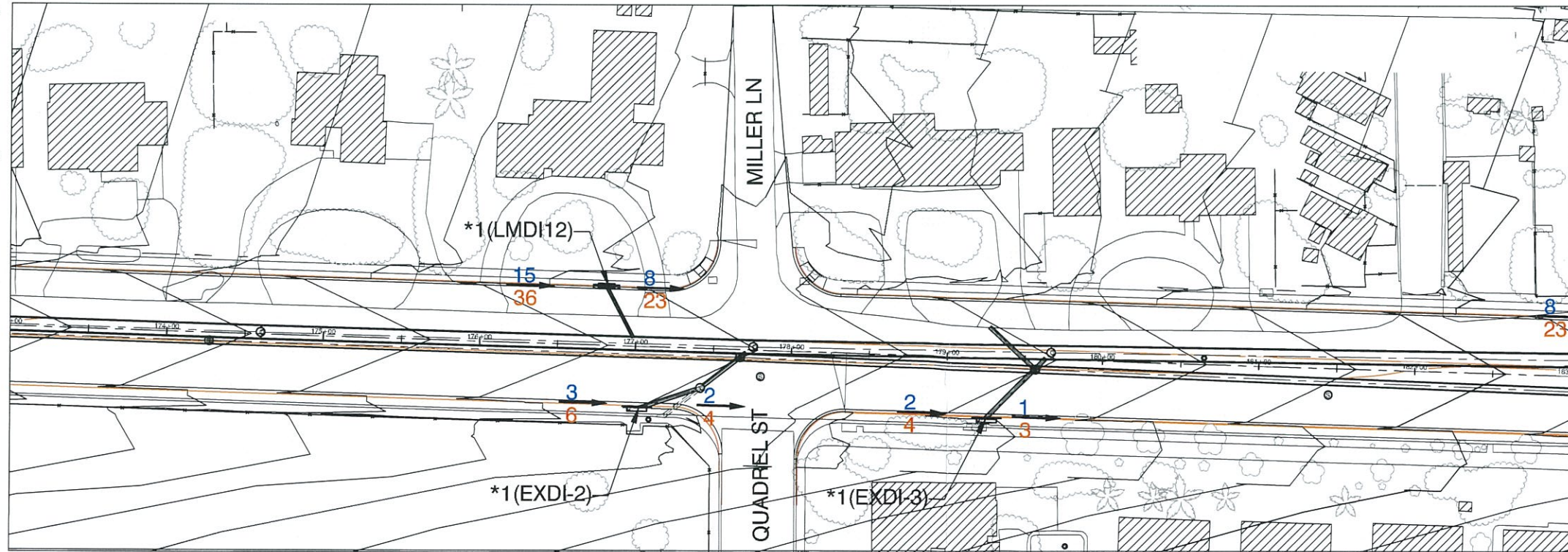
NOTE

* REPRESENTS A REFERENCE BASIN, CONCENTRATION POINT, OR FLOW SPLIT

GRAPHIC SCALE

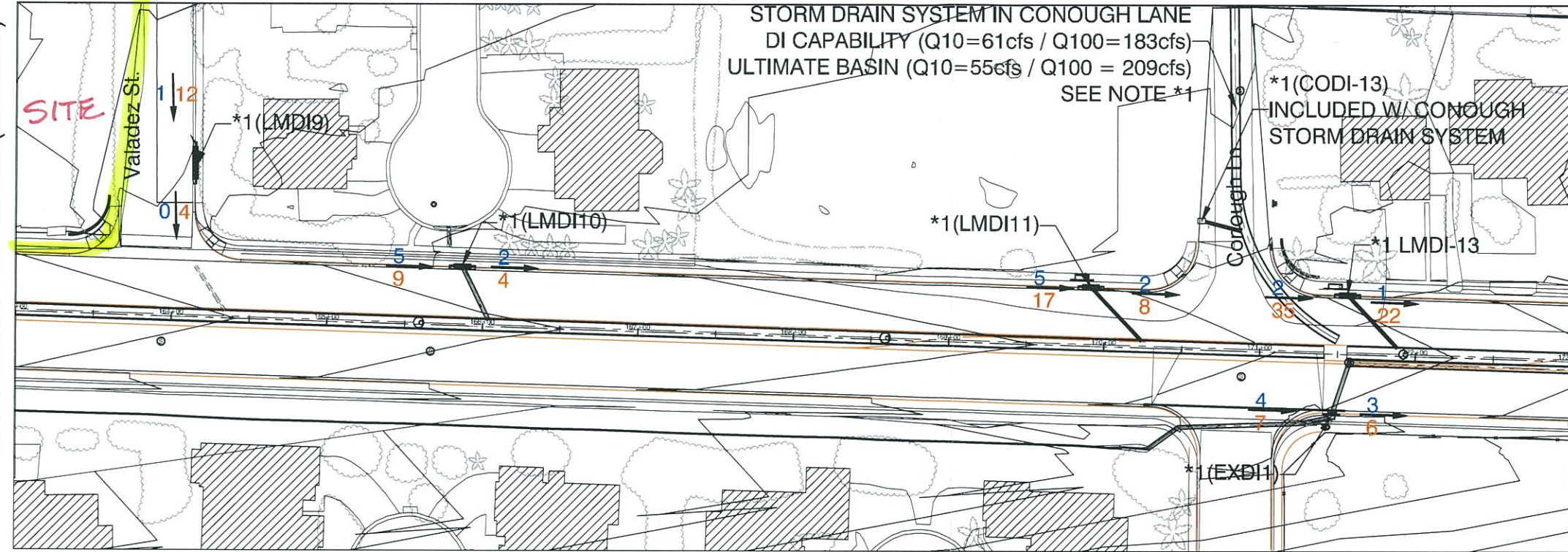
1" = 300'

MATCH LINE - "L" 173+00 (SEE UPPER)

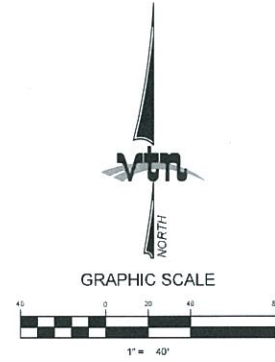


MATCH LINE - "L" 183+00 (SEE SD9)

MATCH LINE - "L" 163+00 (SEE SD7)



MATCH LINE - "L" 173+00(SEE LOWER)



- XX 10-YEAR FLOW (CFS)
→ FLOW DIRECTION
XX 100-YEAR FLOW (CFS)

DROP INLETS PROPOSED
IN GOWAN NORTH
BUFFALO BRANCH - LONE
MOUNTAIN TO WASHBURN

- LMDI9 - 20' MODIFIED TYPE D
LMDI10- 10' MODIFIED TYPE D'
LMDI11 - 10' MODIFIED TYPE D
LMDI12 - 10' MODIFIED TYPE D
LMDI13 - 10' MODIFIED TYPE D
EXDI1 - 4' TYPE A
EXDI2 - 12' TYPE A
EXDI3 - 12' TYPE A

NOTE
*1 - REFERENCE GOWAN
NORTH BUFFALO BRANCH -
LONE MOUNTAIN TO
WASHBURN 90% PRELIMINARY
DESIGN REPORT.

DRAWN BY: SJB		8/20/17	A.10 STREET FLOW EXHIBIT 163+00 TO 183+00 LONE MOUNTAIN CC-215 TO TENAYA	 2727 SOUTH HANCOCK BOULEVARD LAS VEGAS, NEVADA 89146-3148 PH: (702) 875-7550 FAX: (702) 333-2557 WEB: WWW.VTNN.COM CONSULTING ENGINEERS & PLANNERS & LAND SURVEYORS
DESIGNED BY:				
CHECKED BY:				
PROJECT NO: 7773		SCALE: HORIZ. VERT.		
SHEET SF8 8 OF 10 SHEETS DRAWING NO.			REVISION	



Clark County, Nevada
Public Works

Lone Mountain Road

CC-215 to Tenaya Way

Final Technical Drainage Study

D.3.1.1

Major Basin Rainfall Depths



GOWAN NORTH BUFFALO BRANCH - LONE MOUNTAIN TO WASHBURN

MAJOR BASIN RAINFALL DEPTHS

Project #: 31698
 Made by: JS
 Date: 03/09/15
 Checked by: NSA
 Date: 03/09/15

BASIN	Total Basin Area	Rainfall Depth	Area	Percent of Basin	Fractional Rainfall Depth	Weighted Basin Rainfall Depth
	(ac)	(in)	(ac)	(%)	(in)	(in)
BFN	20.53	2.77	20.53	100	2.77	2.77
BFS	29.20	2.77	29.20	100	2.77	2.77
CON	63.89	2.77	63.89	100	2.77	2.77
LNM1	348.09	2.87	24.13	7	0.20	2.80
		2.83	76.45	22	0.62	
		2.77	172.70	50	1.38	
		2.80	74.80	21	0.60	
LNM2	15.30	2.77	15.30	100	2.77	2.77
LNM3	29.22	2.77	29.22	100	2.77	2.77
LNM4	31.02	2.77	31.02	100	2.77	2.77
WAS1	179.83	2.87	17.19	10	0.27	2.81
		2.83	10.54	6	0.17	
		2.77	70.72	39	1.09	
		2.80	47.01	26	0.73	
		2.85	34.36	19	0.54	
WAS2	22.48	2.77	22.48	100	2.77	2.77



Clark County, Nevada
Public Works

Lone Mountain Road

CC-215 to Tenaya Way

Final Technical Drainage Study

D.3.1.2

Major Basin 10-Year HEC-1

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JAN 1997
*   VERSION 4.1
*
* RUN DATE 29OCT15 TIME 11:54:16
*
*****

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

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

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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

*DIAGRAM

*** FREE ***

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1 ID GOWAN NORTH BUFFALO BRANCH - LONE MOUNTAIN TO WASHBURN
2 ID 70% ALTERNATIVE ANALYSIS STUDY
3 ID ULTIMATE CONDITION - 10-YR MAJOR BASIN
4 ID 10/20/2015
5 ID
6 ID DESIGN STORM = 10-YEAR 6-HR STORM
7 ID STORM DISTRIBUTION = SDN #3
8 ID
9 ID JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
10 ID
11 ID AREA DARF
12 ID SQ. MI.
13 ID 0-0.5 0.99
14 ID 0.5-1 0.975
15 ID
16 ID JR CARD RATIOS REPRESENT DEPTH-AREA REDUCTION FACTORS (DARF'S)
17 ID
18 IT 5 0 0 300
19 IO 5 0 0
20 IN 5 0 0
21 JR PREC 0.99 0.975
*
22 KK WAS1
23 BA 0.2810
24 PB 1.60
25 PC 0 0.02 0.057 0.07 0.087 0.108 0.124 0.13 0.13 0.13
26 PC 0.13 0.13 0.13 0.133 0.14 0.142 0.148 0.158 0.172 0.181
27 PC 0.19 0.197 0.199 0.2 0.201 0.204 0.214 0.229 0.241 0.249
28 PC 0.251 0.256 0.27 0.278 0.281 0.283 0.295 0.322 0.352 0.409
29 PC 0.499 0.59 0.71 0.744 0.781 0.812 0.819 0.835 0.851 0.856
30 PC 0.86 0.868 0.876 0.888 0.91 0.926 0.937 0.95 0.97 0.976
31 PC 0.982 0.985 0.987 0.989 0.99 0.993 0.993 0.994 0.995 0.998
32 PC 0.998 0.999 1
33 LS 0 77.0
34 UD 0.392
*
35 KK WAS1-E
36 KM DIVERT FLOW AT TOMSIK AND WASHBURN (100% EAST, 0% SOUTH)
37 DT WAS1-S

```

38	DI	0	100	200	300
39	DQ	0	0	0	0
	*				

40	KK	WAS2-E			
41	KM	DIVERT FLOW AT WASHBURN AND CIMARRON (0 CFS SOUTH)			
42	DT	WAS2-S			
43	DI	0	100	200	300
44	DQ	0	0	0	0
	*				

1

HEC-1 INPUT

PAGE 2

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
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45	KK	RWAS2-E			
46	KM	ROUTE WAS2-E TO INTERSECTION OF WASHBURN AND CONOUGH			
47	RD	1400 0.0083 0.016 0 TRAP 60 0			
	*				

48	KK	WAS2			
49	BA	0.0351			
50	PB	1.58			
51	LS	0	83.0		
52	UD	0.264			
	*				
53	KK	CPWAS2			
54	KM	COMBINE WAS2 AND RWAS2-E			
55	HC	2			
	*				
56	KKCPWAS2-E				
57	KM	DIVERT FLOW AT WASHBURN AND CONOUGH (100% SOUTH, 0% EAST)			
58	DTCPWAS2-S				
59	DI	0	100	200	300
60	DQ	0	100	200	300
	*				

61	KKRCPWAS2E				
62	KM	ROUTE CPWAS2-E TO INTERSECTION OF WASHBURN AND BUFFALO			
63	RD	1130 0.0083 0.016 0 TRAP 60 0			
	*				

64	KK	BFN			
65	BA	0.0321			
66	PB	1.58			
67	LS	0	83.0		
68	UD	0.180			
	*				

69	KK	CPBFN			
70	KM	COMBINE CPBFN AND RCPWAS2E AT INTERSECTION OF WASHBURN AND BUFFALO			
71	HC	2			
	*				

72	KK	WAS1-S			
73	KM	RETRIEVE WAS1-S AT INTERSECTION OF TOMSIK AND WASHBURN			
74	DR	WAS1-S			
	*				

75	KK	RWAS1-S			
76	KM	ROUTE WAS1-S TO INTERSECTION OF ROSADA AND TOMSIK			
77	RD	660 0.0039 0.016 0 TRAP 60 0			
	*				

1

HEC-1 INPUT

PAGE 3

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
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78	KK	LNM2			
79	BA	0.0239			
80	PB	1.58			
81	LS	0	77.0		
82	UD	0.190			
	*				
83	KK	CPLNM2			
84	KM	COMBINE LNM2 AND RWAS1-S AT INTERSECTION OF ROSADA AND TOMSIK			
85	HC	2			
	*				


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86      KKCPNM2-S
87      KM   DIVERT FLOW AT TOMSIK AND ROSADA (100% SOUTH, 0% EAST)
88      DTCPLNM2-E
89      DI      0      100      200      300
90      DQ      0      0      0      0
      *

91      KKRCPLNM2S
92      KM   ROUTE CPLNMW-S TO INTERSECTION OF CIMARRON AND LONE MOUNTAIN
93      RD   2700  0.0078  0.016      0      TRAP      80      0
      *

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94      KK   LNM1
95      BA   0.5439
96      PB   1.60
97      LS      0      76.0
98      UD   0.499
      *

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99      KK   PARK
100     KM   FLOW FROM MOUNTAIN CREST PARK AT SW CORNER OF DURANGO AND LONE MOUNTAIN
101     KM   CONTRIBUTES TO ONSITE FLOWS. A DUMMY OFFSITE BASIN AREA IS CREATED FOR MODEL.
102     KM   SEE REPORT FOR DISCUSSION ON PARK FLOWS
103     BA   0.048
104     PB   1.61
105     LS      0      80.0
106     UD   0.100
      *

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FLOW FROM PARK IS IN ON
SOUTH SIDE OF LONE
MOUNTAIN

```

107     KK   CPLNM1
108     KM   COMBINE PARK, LNM1, AND RCPLNM2S
109     HC      3
      *

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110     KK   RCPLNM1
111     KM   ROUTE CPLNM1 TO JUST WEST OF INTERSECTION OF CONOUGH AND LONE MOUNTAIN
112     RD   1340  0.0058  0.016      0      TRAP      100      0
      *

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HEC-1 INPUT

PAGE 4

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

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113     KK   LNM3
114     BA   0.0457
115     PB   1.58
116     LS      0      78.0
117     UD   0.262
      *

118     KK   CPLNM3
119     KM   COMBINE LNM3 AND RCPLNM1
120     HC      2
      *

121     KK   CON
122     BA   0.0998
123     PB   1.58
124     LS      0      78.0
125     UD   0.366
      *

126     KKCPNM2-E
127     KM   RETREIVE CPLNM2-E AT INTERSECTION OF ROSADA AND TOMSIK
128     DRCPLNM2-E
      *

129     KKRCPLNM2E
130     KM   ROUTE RCPLNM2E TO INTERSECTION OF LONE MOUNTAIN AND CONOUGH
131     RD   4120  0.0070  0.016      0      TRAP      60      0
      *

132     KK   WAS2-S
133     KM   RETRIEVE CPWAS2-S AT INTERSECTION OF WASHBURN AND CIMARRON
134     DR   WAS2-S
      *

135     KK   RWAS2S
136     KM   ROUTE WAS2-S TO INTERSECTION OF LONE MOUNTAIN AND CONOUGH
137     RD   4100  0.0070  0.016      0      TRAP      60      0

```

*

138 KKCPWAS2-S
139 KM RETRIEVE CPWAS2-S AT INTERSECTION OF WASHBURN AND CONOUGH
140 DRCPWAS2-S
*

141 KKRCPWAS2S
142 KM ROUTE CPWAS2-S TO INTERSECTION OF LONE MOUNTAIN AND CONOUGH
143 RD 2700 0.0035 0.016 0 TRAP 60 0
*

HEC-1 INPUT

PAGE 5

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

144 KK CPCON
145 KM COMBINE RWAS2S, RCPWAS2S, RCPLNM2E AND CON
146 HC 4
*

147 KK CPCON1
148 KM COMBINE CPCON AND CPLNM3. FLOW ON CONOUGH COMBINES WITH FLOW ON
149 KM LONE MOUNTAIN AT INTERSECTION OF LONE MOUNTAIN AND CONOUGH.
150 HC 2
*

151 KK RCPCON1
152 KM ROUTE CPCON1 TO JUST WEST OF INTERSECTION OF LONE MOUNTAIN AND BUFFALO
153 RD 1310 0.0100 0.016 0 TRAP 100 0
*

154 KK LNM4
155 BA 0.0485
156 PB 1.58
157 LS 0 83.0
158 UD 0.244
*

159 KK CPLNM4
160 KM COMBINE LNM4 AND RCPCON1
161 HC 2
*

162 KK RCPLNM4
163 KM ROUTE CPLNM4 TO INTERSECTION OF LONE MOUNTAIN AND BUFFALO
164 RD 100 0.0100 0.016 0 TRAP 100 0
*

165 KK BFS
166 BA 0.0456
167 PB 1.58
168 LS 0 82.0
169 UD 0.297
*

170 KK CPBFS
171 KM COMBINE BFS AND RCPLNM4
172 HC 2
*
173 ZZ

SCHEMATIC DIAGRAM OF STREAM NETWORK

1
INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
22 WAS1
.
.
37 .-----> WAS1-S
35 WAS1-E
.
.
42 .-----> WAS2-S
40 WAS2-E
V
V
45 RWAS2-E
.
.

```

48      . WAS2
      .
53      CPWAS2.....
      .
58      ----->CPWAS2-S
56      CPWAS2-E
      V
      V
61      RCPWAS2E
      .
64      BFN
      .
69      CPBFN.....
      .
74      .<----- WAS1-S
72      WAS1-S
      V
      V
75      RWAS1-S
      .
78      LNM2
      .
83      CPLNM2.....
      .
88      ----->CPLNM2-E
86      CPLNM2-S
      V
      V
91      RCPLNM2S
      .
94      LNM1
      .
99      PARK
      .
107     CPLNM1.....
      V
      V
110     RCPLNM1
      .
113     LNM3
      .
118     CPLNM3.....
      .
121     CON
      .
128     .<-----CPLNM2-E
126     CPLNM2-E
      V
      V
129     RCPLNM2E
      .
134     .<----- WAS2-S
132     WAS2-S
      V
      V
135     RWAS2S
      .
140     .<-----CPWAS2-S
138     CPWAS2-S
      V
      V
141     RCPWAS2S

```


TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
 NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 .99 .98

1

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION	
					RATIO 1 .99	RATIO 2 .98
HYDROGRAPH AT						
+	WAS1	.28	1	FLOW	35.	34.
				TIME	3.92	3.92
DIVERSION TO						
+	WAS1-S	.28	1	FLOW	0.	0.
				TIME	.00	.00
HYDROGRAPH AT						
+	WAS1-E	.28	1	FLOW	35.	34.
				TIME	3.92	3.92
DIVERSION TO						
+	WAS2-S	.28	1	FLOW	0.	0.
				TIME	.00	.00
HYDROGRAPH AT						
+	WAS2-E	.28	1	FLOW	35.	34.
				TIME	3.92	3.92
ROUTED TO						
+	RWAS2-E	.28	1	FLOW	35.	33.
				TIME	4.00	4.00
HYDROGRAPH AT						
+	WAS2	.04	1	FLOW	10.	10.
				TIME	3.75	3.75
2 COMBINED AT						
+	CPWAS2	.32	1	FLOW	41.	39.
				TIME	4.00	4.00
DIVERSION TO						
+	CPWAS2-S	.32	1	FLOW	41.	39.
				TIME	4.00	4.00
HYDROGRAPH AT						
+	CPWAS2-E	.32	1	FLOW	0.	0.
				TIME	.00	.00
ROUTED TO						
+	RCPWAS2E	.32	1	FLOW	0.	0.
				TIME	.00	.00
HYDROGRAPH AT						
+	BFN	.03	1	FLOW	10.	10.
				TIME	3.67	3.67
2 COMBINED AT						
+	CPBFN	.35	1	FLOW	10.	10.
				TIME	3.67	3.67
HYDROGRAPH AT						
+	WAS1-S	.00	1	FLOW	0.	0.
				TIME	.00	.00
ROUTED TO						
+	RWAS1-S	.00	1	FLOW	0.	0.
				TIME	.00	.00
HYDROGRAPH AT						
+	LM2	.02	1	FLOW	4.	4.

				TIME	3.67	3.67
2 COMBINED AT						
+	CPLNM2	.02	1	FLOW TIME	4. 3.67	4. 3.67
DIVERSION TO						
+	CPLNM2-E	.02	1	FLOW TIME	0. .00	0. .00
HYDROGRAPH AT						
+	CPLNM2-S	.02	1	FLOW TIME	4. 3.67	4. 3.67
ROUTED TO						
+	RCPLNM2S	.02	1	FLOW TIME	3. 4.17	4. 4.17
HYDROGRAPH AT						
+	LN1	.54	1	FLOW TIME	52. 4.08	50. 4.08
HYDROGRAPH AT						
+	PARK	.05	1	FLOW TIME	15. 3.58	14. 3.58
3 COMBINED AT						
+	CPLNM1	.62	1	FLOW TIME	56. 4.08	55. 4.17
ROUTED TO						
+	RCPLNM1	.62	1	FLOW TIME	56. 4.17	53. 4.25
HYDROGRAPH AT						
+	LN3	.05	1	FLOW TIME	8. 3.75	7. 3.75
2 COMBINED AT						
+	CPLNM3	.66	1	FLOW TIME	60. 4.17	57. 4.17
HYDROGRAPH AT						
+	CON	.10	1	FLOW TIME	14. 3.92	13. 3.92
HYDROGRAPH AT						
+	CPLNM2-E	.00	1	FLOW TIME	0. .00	0. .00
ROUTED TO						
+	RCPLNM2E	.00	1	FLOW TIME	0. .00	0. .00
HYDROGRAPH AT						
+	WAS2-S	.00	1	FLOW TIME	0. .00	0. .00
ROUTED TO						
+	RWAS2S	.00	1	FLOW TIME	0. .00	0. .00
HYDROGRAPH AT						
+	CPWAS2-S	.00	1	FLOW TIME	41. 4.00	39. 4.00
ROUTED TO						
+	RCPWAS2S	.00	1	FLOW TIME	41. 4.17	39. 4.17
4 COMBINED AT						
+	CPCON	.10	1	FLOW TIME	52. 4.08	49. 4.08
2 COMBINED AT						
+	CPCON1	.76	1	FLOW TIME	111. 4.08	106. 4.08
ROUTED TO						
+	RCPCON1	.76	1	FLOW TIME	110. 4.17	105. 4.17

HYDROGRAPH AT
+ LNM4 .05 1 FLOW 14. 13.
TIME 3.67 3.75

2 COMBINED AT
+ CPLNM4 .81 1 FLOW 116. 110.
TIME 4.17 4.17

ROUTED TO
+ RCPLNM4 .81 1 FLOW 115. 110.
TIME 4.17 4.17

HYDROGRAPH AT
+ BFS .05 1 FLOW 11. 11.
TIME 3.75 3.75

2 COMBINED AT
+ CPBFS .86 1 FLOW 121. 116.
TIME 4.17 4.17

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	DT (MIN)	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME (IN)
							PEAK (CFS)	TIME TO PEAK (MIN)	
FOR PLAN = 1 RATIO= .00									
RWAS2-E	MANE	2.25	35.04	240.75	.25	5.00	34.94	240.00	.25

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3671E+01 EXCESS= .0000E+00 OUTFLOW= .3674E+01 BASIN STORAGE= .2932E-02 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00									
RWAS2-E	MANE	2.25	33.36	240.75	.23	5.00	33.24	240.00	.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3516E+01 EXCESS= .0000E+00 OUTFLOW= .3520E+01 BASIN STORAGE= .3389E-02 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00									
RCPWAS2E	MANE	.50	.00	445.00	.00	5.00	.00	445.00	.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5131E-08 EXCESS= .0000E+00 OUTFLOW= .5131E-08 BASIN STORAGE= .3931E-05 PERCENT ERROR=*****

FOR PLAN = 1 RATIO= .00									
RCPWAS2E	MANE	.50	.00	359.50	.00	5.00	.00	360.00	.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1973E-07 EXCESS= .0000E+00 OUTFLOW= .1973E-07 BASIN STORAGE= .9031E-05 PERCENT ERROR=*****

FOR PLAN = 1 RATIO= .00									
RWAS1-S	MANE	5.00	.00	.00	-1.00	5.00	.00	360.00	-1.00

FOR PLAN = 1 RATIO= .00									
RWAS1-S	MANE	5.00	.00	.00	-1.00	5.00	.00	360.00	-1.00

FOR PLAN = 1 RATIO= .00									
RCPLNM2S	MANE	1.50	5.87	249.00	.24	5.00	2.88	250.00	.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3013E+00 EXCESS= .0000E+00 OUTFLOW= .3121E+00 BASIN STORAGE= .6556E-02 PERCENT ERROR= -5.7

FOR PLAN = 1 RATIO= .00									
RCPLNM2S	MANE	1.50	6.37	249.00	.23	5.00	4.44	250.00	.25

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2884E+00 EXCESS= .0000E+00 OUTFLOW= .2992E+00 BASIN STORAGE= .6884E-02 PERCENT ERROR= -6.1

FOR PLAN = 1	RATIO=	.00							
RCPLNM1	MANE	3.25	56.12	250.25	.23	5.00	56.10	250.00	.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7537E+01 EXCESS= .0000E+00 OUTFLOW= .7543E+01 BASIN STORAGE= .3867E-02 PERCENT ERROR= -.1

FOR PLAN = 1	RATIO=	.00							
RCPLNM1	MANE	3.50	53.59	252.00	.22	5.00	53.46	255.00	.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7251E+01 EXCESS= .0000E+00 OUTFLOW= .7258E+01 BASIN STORAGE= .4202E-02 PERCENT ERROR= -.2

FOR PLAN = 1	RATIO=	.00							
RCPLNM2E	MANE	5.00	.00	.00	-1.00	5.00	.00	255.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RCPLNM2E	MANE	5.00	.00	.00	-1.00	5.00	.00	255.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RWAS2S	MANE	5.00	.00	.00	-1.00	5.00	.00	255.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RWAS2S	MANE	5.00	.00	.00	-1.00	5.00	.00	255.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RCPWAS2S	MANE	4.25	40.70	246.50	-1.00	5.00	40.58	250.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RCPWAS2S	MANE	4.25	39.01	246.50	-1.00	5.00	38.67	250.00	-1.00

FOR PLAN = 1	RATIO=	.00							
RCPCON1	MANE	4.35	110.28	247.69	.35	5.00	110.20	250.00	.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1403E+02 EXCESS= .0000E+00 OUTFLOW= .1405E+02 BASIN STORAGE= .3264E-02 PERCENT ERROR= -.1

FOR PLAN = 1	RATIO=	.00							
RCPCON1	MANE	4.43	105.39	248.20	.33	5.00	105.22	250.00	.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1349E+02 EXCESS= .0000E+00 OUTFLOW= .1350E+02 BASIN STORAGE= .3933E-02 PERCENT ERROR= -.1

FOR PLAN = 1	RATIO=	.00							
RCPLNM4	MANE	.33	115.58	250.35	.35	5.00	115.28	250.00	.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1512E+02 EXCESS= .0000E+00 OUTFLOW= .1512E+02 BASIN STORAGE= .2439E-03 PERCENT ERROR= .0

FOR PLAN = 1	RATIO=	.00							
RCPLNM4	MANE	.33	110.40	250.29	.34	5.00	110.03	250.00	.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1454E+02 EXCESS= .0000E+00 OUTFLOW= .1454E+02 BASIN STORAGE= .2466E-03 PERCENT ERROR= .0

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



GOWAN NORTH BUFFALO BRANCH - LONE MOUNTAIN TO WASHBURN

MAJOR BASIN RAINFALL DEPTHS

Project #: 31698
 Made by: JS
 Date: 03/09/15
 Checked by: NSA
 Date: 03/09/15

BASIN	Total Basin Area	Rainfall Depth	Area	Percent of Basin	Fractional Rainfall Depth	Weighted Basin Rainfall Depth
	(ac)	(in)	(ac)	(%)	(in)	(in)
BFN	20.53	2.77	20.53	100	2.77	2.77
BFS	29.20	2.77	29.20	100	2.77	2.77
CON	63.89	2.77	63.89	100	2.77	2.77
LNM1	348.09	2.87	24.13	7	0.20	2.80
		2.83	76.45	22	0.62	
		2.77	172.70	50	1.38	
		2.80	74.80	21	0.60	
LNM2	15.30	2.77	15.30	100	2.77	2.77
LNM3	29.22	2.77	29.22	100	2.77	2.77
LNM4	31.02	2.77	31.02	100	2.77	2.77
WAS1	179.83	2.87	17.19	10	0.27	2.81
		2.83	10.54	6	0.17	
		2.77	70.72	39	1.09	
		2.80	47.01	26	0.73	
		2.85	34.36	19	0.54	
WAS2	22.48	2.77	22.48	100	2.77	2.77

GOWAN NORTH
BUFFALO BRANCH
LONE MTN. TO WASHBURN



ULTIMATE CONDITION
MAJOR BASIN MAP

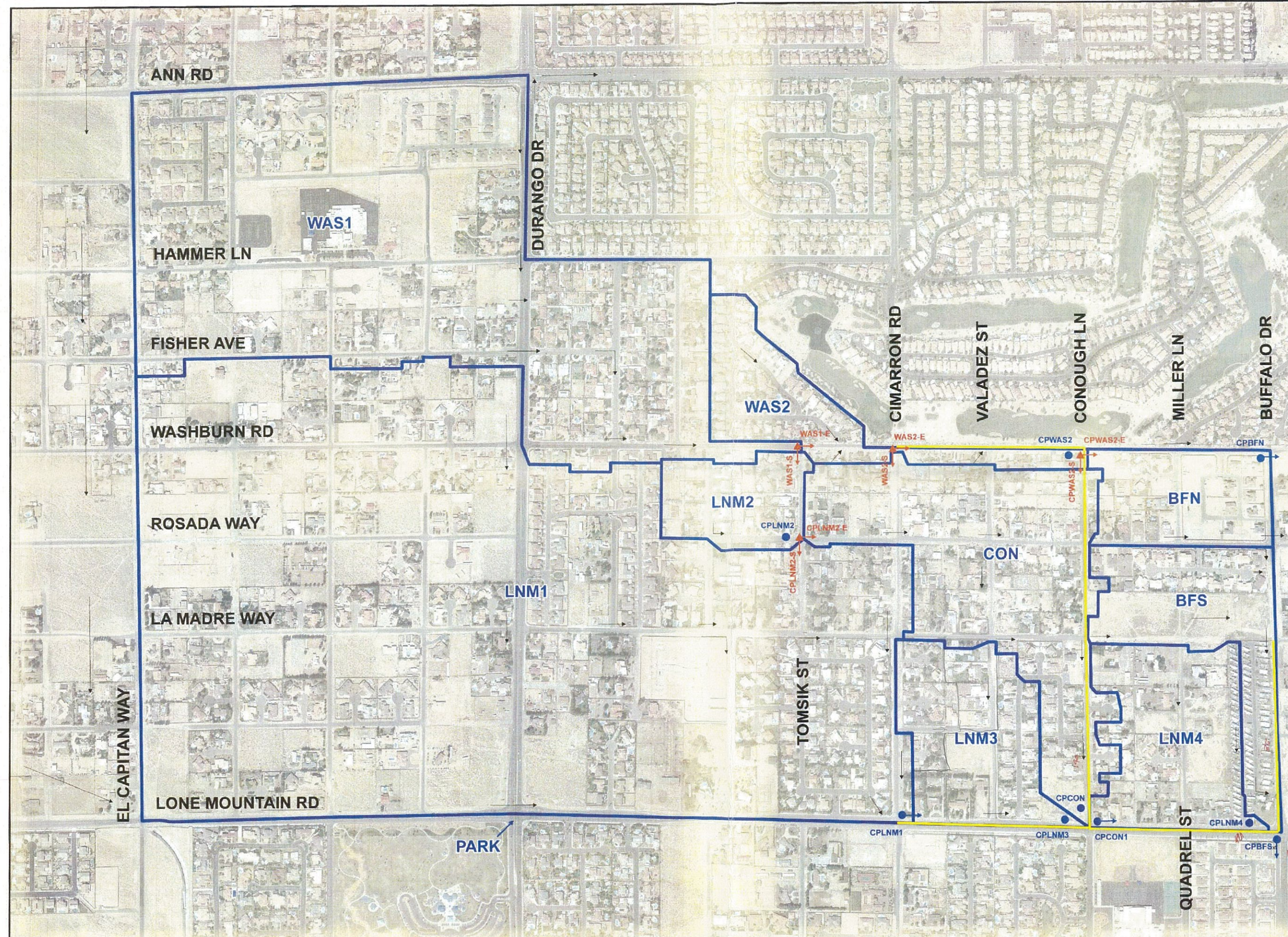
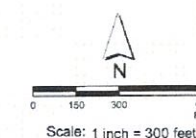
Legend

- Proposed Storm Drain
- Flow Pattern
- Major Basins
- COMBINATION POINT
- ▲ DIVERSION

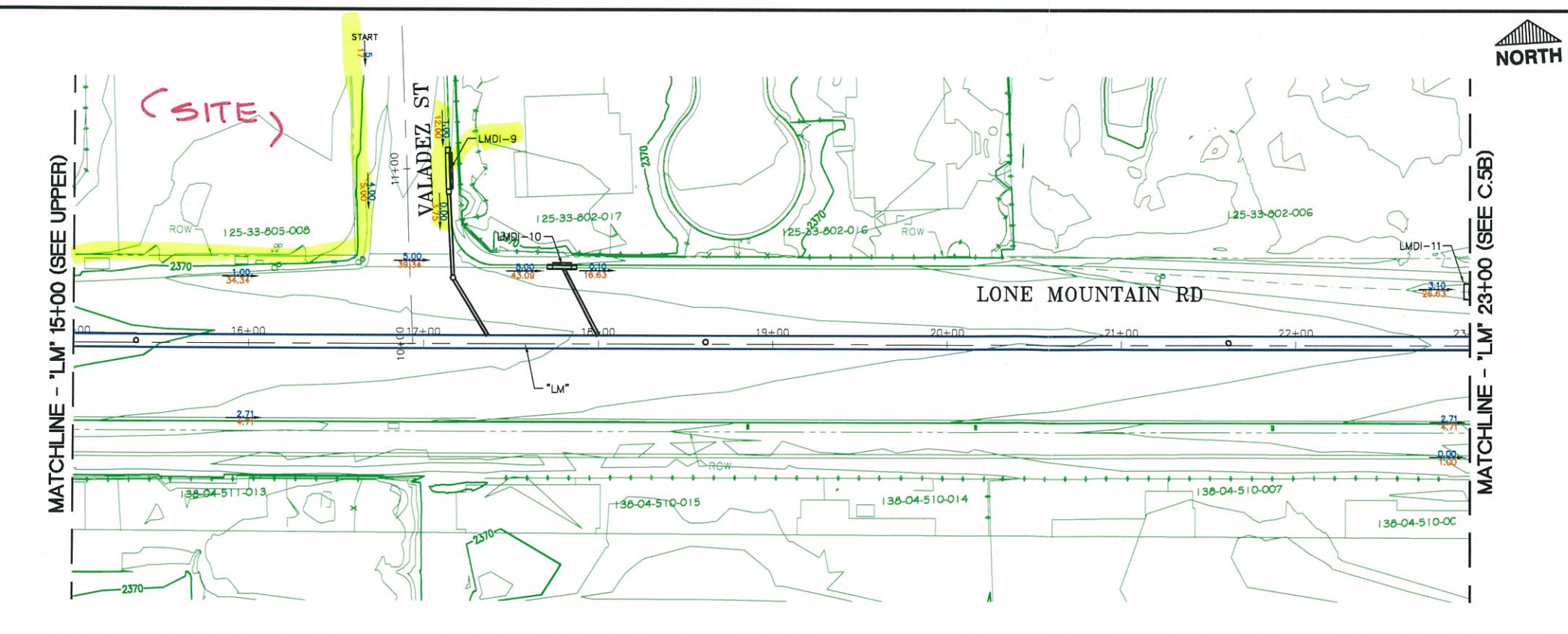
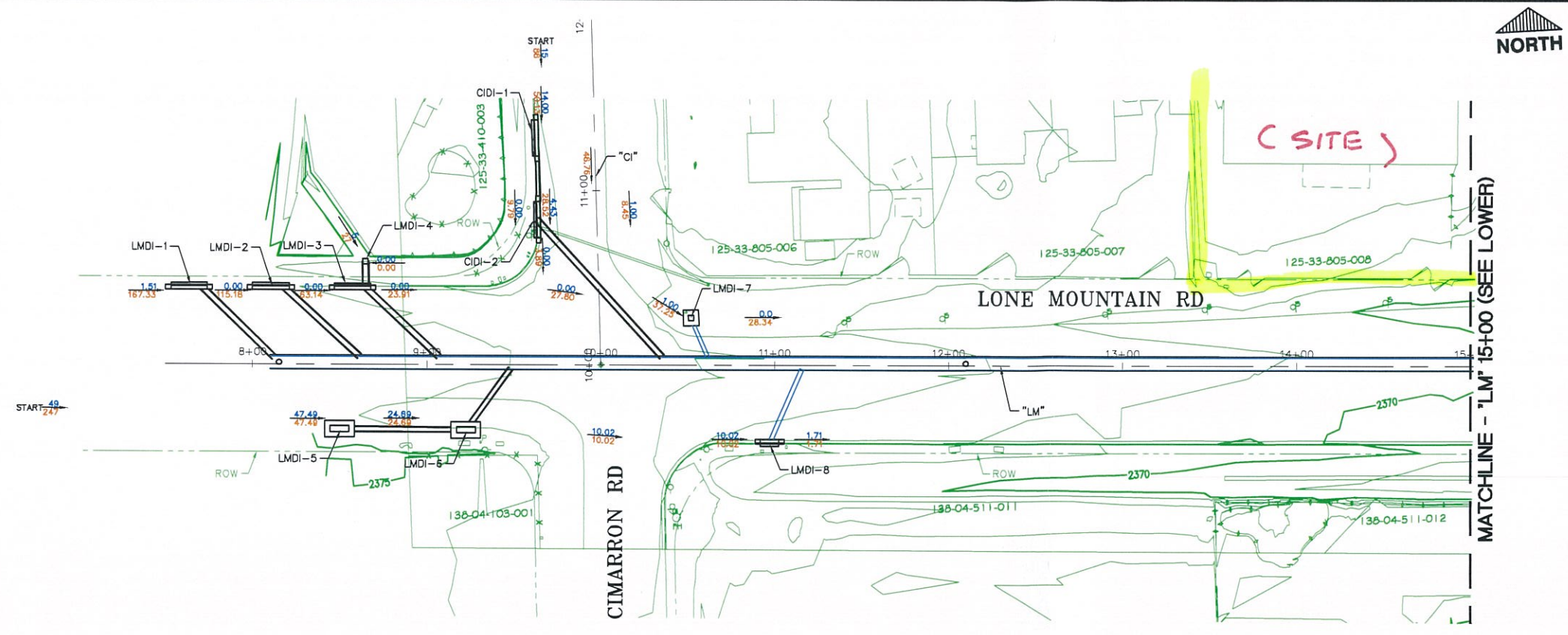
MAJOR BASIN	10-YR FLOW	100-YR FLOW
BFN	10	32
BFS	11	35
CON	14	56
LN1M1	50	225
LN1M2	4	17
LN1M3	8	30
LN1M4	14	43
PARK*	15	48
WAS1	35	146
WAS2	30	30

COMBINATION POINT	10-YR FLOW	100-YR FLOW
CPBFN	10	32
CPBFS	116	499
CPCON	52	199
CPCON1	106	466
CPLNM1	55	261
CPLNM2	4	64
CPLNM3	57	276
CPLNM4	110	482
CPWAS2	41	104

DIVERSION	10-YR FLOW	100-YR FLOW
CPLNM2-E	0	35
CPLNM2-S	4	29
CPWAS2-E	0	3
CPWAS2-S	41	101
WAS1-E	35	99
WAS1-S	0	47
WAS2-E	35	82
WAS2-S	0	17



4/11/16 J:\31688-BUFFALO\5.0 PROJECT DATA\EXHIBITS\STREET FLOWC-SADWG



GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.

LEGEND
XX.XX 10-YEAR FLOW (CFS)
→ FLOW DIRECTION
XX.XX 100-YEAR FLOW (CFS)

KEY MAP
C.5E C.5F Washburn Rd
C.5D C.5C Miller Ln
C.5A C.5B Buffalo Dr
C.5G

NO. DATE DESCRIPTION

DESIGNED BY: JS
DRAWN BY: JS
CHECKED BY: NSA
DATE: 5/6/2015

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

PARSONS
BRINCKERHOFF
3753 Howard Hughes Parkway, Suite 135
Las Vegas, NV 89169
Phone: 702.697.9100

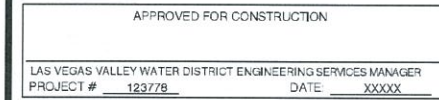
TITLE: GOWAN NORTH BUFFALO BRANCH
LONE MOUNTAIN TO WASHBURN
SHEET: STREET FLOW EXHIBIT
"LM" 8+00 TO 23+00

Sheet
C.5A
1 of 7
DRAWING NO.
XXXX

D.3.1.6

70% SUBMITTAL NOT FOR CONSTRUCTION

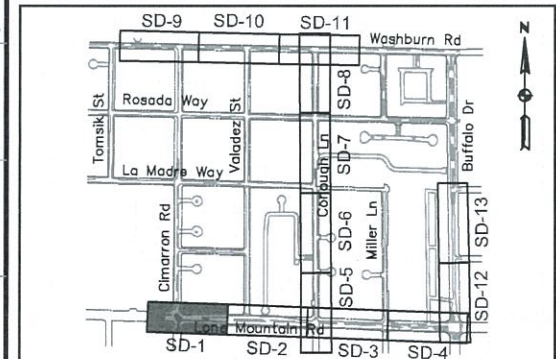
REDUCED SIZE PRINT



1. ALL LATERAL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO INSIDE EDGE OF MANHOLE, EDGE OF DI, RCB, OR STRUCTURE. ALL MAINLINE PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE.
2. ALL DROP INLETS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDOCA STD. DWG. NO. 421.

GRID NORTH AS DEFINED BY THE CENTRAL MEDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS AND LAS VEGAS HIGH ELEVATION ZONES, NORTH AMERICAN DATUM OF 1983. SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN. THE REFERENCE FRAME BEING NAD 83 (2011) EPOCH 2010

CITY OF LAS VEGAS BENCHMARK: 8LV9033E4 RIVET
AND PLATE IN TOP OF CURB ON THE NORTH SIDE OF
WASHBURN ROAD AT BUFFALO DRIVE, 2008
ADJUSTMENT.
ELEV. = 720.418 (METRIC)
2363.57 (US SURVEY FEET)



SD-1
30 of 88
DRAWING NO.
XXXX

PROGRESS PRINT - NOT FOR CONSTRUCTION

REDUCED SIZE PRINT



GOWAN NORTH BUFFALO BRANCH - LONE MOUNTAIN TO WASHBURN

DROP INLET ANALYSIS - ULTIMATE CONDITION

D.3.2.3

Project #: 31698
Made by: JS
Date: 11/9/2016
Checked by: BQ
Date: 11/15/2016

Drop Inlet ID	Drop Inlet Station/Offset	Sheet	Type	Grate Dimensions (FT)	Curb Opening Length (FT)	Slope		Flow Contributions			10-Year						100-Year					
						Longitudinal (%)	Cross (%)	Drainage Basins	Flowsplit	Upstream Drop Inlet	Basin Q (CFS)	Surface ^ Flowsplit Q (CFS)	Upstream Drop Inlet Bypass Q (CFS)	Total Q to Drop Inlet (CFS)	Intercept Q (CFS)	Bypass Q (CFS)	Basin Q (CFS)	Surface ^ Flowsplit Q (CFS)	Upstream Drop Inlet Bypass Q (CFS)	Total Q to Drop Inlet (CFS)	Intercept Q (CFS)	Bypass Q (CFS)
LMDI-1	"LM" 7+71, 44' LT	SD-1	DM	17.5	20	1.30	2.00	HALF STREET ⁴	N/A	N/A	1.51	0.00	0.00	1.51	1.51	0.00	167.33	0.00	0.00	167.33	76.73	90.60
LMDI-2	"LM" 8+18, 44' LT	SD-1	DM	17.5	20	1.30	2.00	HALF STREET ⁵	N/A	LMDI-1	0.00	0.00	0.00	0.00	0.00	0.00	115.18	0.00	0.00	115.18	59.64	55.54
LMDI-3	"LM" 8+64, 44' LT	SD-1	DM	17.5	20	1.30	2.00	HALF STREET ⁶	N/A	LMDI-2	0.00	0.00	0.00	0.00	0.00	0.00	63.14	0.00	0.00	63.14	39.23	23.91
LMDI-4	"LM" 8+64, 59' LT	SD-1	MOD Type 2B	2.5x10	N/A	SUMP	N/A	LM-CM	N/A	N/A	5.00	0.00	0.00	5.00	5.00	0.00	27.00	0.00	0.00	27.00	27.00	0.00
LMDI-5	"LM" 8+50, 44' RT	SD-1	DM	7.5	10	1.30	2.00	HALF STREET ⁷	N/A	N/A	47.49	0.00	0.00	47.49	17.98	29.51	47.49	0.00	0.00	47.49	17.98	29.51
LMDI-6	"LM" 9+08, 44' RT	SD-1	DM	7.5	10	1.30	2.00	N/A	N/A	LMDI-5	0.00	0.00	29.51	29.51	13.58	15.93	0.00	0.00	29.51	29.51	13.58	15.93
LMDI-8	"LM" 10+97, 44' RT	SD-1	DM	7.5	10	0.70	3.70	N/A	N/A	LMDI-6	0.00	0.00	15.93	15.93	11.74	4.19	0.00	0.00	15.93	15.93	11.74	4.19
CIDI-1	"CI" 11+80, 33' LT	SD-1	DM	17.5	20	0.47	2.00	HALF STREET ⁸	N/A	N/A	14.00	0.00	0.00	14.00	13.24	0.76	50.13	0.00	0.00	50.13	39.24	10.89
CIDI-2	"CI" 11+33, 33' LT	SD-1	DM	17.5	20	0.47	2.00	HALF STREET ⁹	N/A	CIDI-1	0.00	0.00	0.76	0.76	0.76	0.00	28.52	0.00	0.00	28.52	24.63	3.89
EXCIDI-3	"CI" 10+80, 33' LT	SD-1	Curb	N/A	10	0.47	2.00	N/A	N/A	CIDI-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.89	3.89	3.71	0.18
LMDI-7	"LM" 13+06, 44' LT	SD-1	DM	7.5	10	0.30	2.00	HALF STREET ¹⁰	N/A	EXDI-8 & LMDI-3	1.00	0.00	0.00	1.00	1.00	0.00	9.45	0.00	24.09	33.54	18.26	15.28
LMDI-9	"LM" 17+14, 91' LT	SD-2	DM	17.5	20	0.70	2.20	HALF STREET ¹¹	N/A	N/A	1.00	0.00	0.00	1.00	1.00	0.00	12.00	0.00	0.00	12.00	8.25	3.75
LMDI-10	"LM" 18+85, 45' LT	SD-2	DM	7.5	10	1.40	3.80	LM-VD	N/A ¹²	LMDI-9 & LMDI-7	1.00	4.00	0.00	5.00	4.59	0.41	6.00	5.00	19.03	30.03	16.95	13.08
LMDI-11	"LM" 22+87, 44' LT	SD-3	DM	7.5	10	1.10	3.60	LM-CN1	N/A	LMDI-10	3.00	0.00	0.41	3.41	3.30	0.11	10.00	0.00	13.08	23.08	14.13	8.95
LMDI-13	"LM" 24+50, 44' LT	SD-3	DM	7.5	10	0.90	3.20	1/2 CN-CN, CN-LM2	N/A	LMDI-11, CODI-13, CODI-10	1.50	0.00	0.32	1.82	1.82	0.00	3.50	0.00	13.77	17.27	11.50	5.77
LMDI-12	"LM" 29+79, 44' LT	SD-3	DM	7.5	10	0.90	2.20	N/A	N/A	LMDI-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.77	5.77	4.93	0.84
EXDI-1	"LM" 24+49, 43' RT	SD-3	DM	N/A	5	0.90	3.20	LM-CN2	N/A	LMDI-8	1.00	0.00	4.19	5.19	4.87	0.32	3.00	0.00	4.19	7.19	6.39	0.80
EXDI-2	"LM" 30+18, 43' RT	SD-3	DM	17.5	20	1.70	1.80	LM-QD1	N/A	EXDI-1	2.00	0.00	0.32	2.32	2.29	0.03	5.00	0.00	0.80	5.80	4.75	1.05
EXDI-3	"LM" 32+23, 43' RT	SD-4	DM	15.0	15	1.30	1.80	LM-QD2	N/A	EXDI-2	1.00	0.00	0.03	1.03	1.03	0.00	2.00	0.00	1.05	3.05	3.02	0.03
EXDI-4	"LM" 36+36, 44' LT	SD-4	DM	17.5	20	1.10	1.70	LM-BF1	N/A	LMDI-12	14.00	0.00	0.00	14.00	12.56	1.44	44.00	0.00	0.84	44.84	31.49	13.35
EXDI-5	"LM" 36+79, 44' LT	SD-4	DM	17.5	20	0.40	1.30	N/A	N/A	EXDI-4	0.00	0.00	1.44	1.44	1.44	0.00	0.00	0.00	13.35	13.35	8.49	4.86
EXDI-6	"LM" 36+44, 44' RT	SD-4	DM	17.5	20	1.80	1.90	LM-BF2	N/A	EXDI-3	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.03	1.03	1.03	0.00
EXDI-7	"LM" 36+86, 44' RT	SD-4	DM	17.5	20	1.80	2.00	N/A	N/A	EXDI-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WDI-1	"W" 9+98, 24' LT	SD-9	DM	17.5	20	0.85	2.20	WS-CM	CPWSTM-E	N/A	10.00	41.00	0.00	51.00	31.33	9.67	28.00	109.00	0.00	137.00	76.90	60.10
WDI-2	"W" 16+37, 24' LT	SD-10	DM	17.5	20	0.80	2.50	1/2 WS-CN	CPWSCM-E	WDI-1	1.00	9.67	0.00	10.67	10.30	0.40	4.00	43.00	0.00	47.00	36.09	10.91
WDI-3	"W" 23+17, 23' LT	SD-11	DM	17.5	20	0.60	0.70	1/2 WS-CN	N/A	WDI-2	1.00	0.00	0.40	1.40	1.40	0.00	4.00	0.00	10.91	14.91	12.17	2.73
RDI-1	"R" 24+91, 20' RT	SD-7	DM	17.5	20	0.50	3.30	RS-CN1, CN-RS1, RS-CN2 ¹	CPTMRS-E, CPWSCM-S	N/A	7.00	0.00	0.00	7.00	6.99	0.01	29.00	58.00	0.00	87.00	66.86	20.14
RDI-2	"R" 24+24, 21' RT	SD-7	DM	17.5	20	SUMP	N/A	HALF STREET ²	N/A	RDI-1	0.00	0.00	0.01	0.01	0.01	N/A	0.00	0.00	18.94	18.94	18.94	N/A
RDI-3	"R" 24+23, 23' LT	SD-7	DM	17.5	20	0.90	1.10	HALF STREET ²	N/A	RDI-1	0.00	0.00	0.00	NUISANCE	0.00	0.00	0.00	0.00	1.20	1.20	1.20	0.00
CODI-3	"CO" 28+61, 25' RT	SD-7	MOD Type 2B	2.5x2	N/A	0.04	N/A	N/A	N/A	N/A	0.00	0.00	0.00	NUISANCE	0.00	0.00	0.00	0.00	0.00	NUISANCE	0.00	0.00
CODI-4	"CO" 27+19, 25' RT	SD-7	MOD Type 2B	2.5x2	N/A	0.80	N/A	CN-LA2 ³	N/A	CODI-3	1.00	0.00	0.00	1.00	1.00	0.00	2.00	0.00	0.00	2.00	1.30	0.70
CODI-6	"CO" 24+00, 31' LT	SD-7	MOD Type 2B	2.5x2	N/A	0.70	N/A	CN-LA1 & LA-CN1	N/A	N/A	2.00	0.00	0.00	2.00	1.28	0.72	8.00	0.00	0.00	8.00	3.07	4.93
LAMDI-1	"LAM" 11+77, 23' LT	SD-7	DM	17.5	20	0.90	2.40	LA-CN2	CPCMLA-E	N/A	4.00	0.00	0.00	4.00	4.00	0.00	15.00	0.00	0.00	15.00	13.76	1.24
CODI-7	"CO" 23+42, 42' RT	SD-7	MOD Type 2B	2.5x2	N/A	SUMP	N/A	N/A	N/A	CODI-4	0.00	0.00	0.00	0.00	0.00	N/A	0.00	0.00	0.70	0.70	0.70	N/A
CODI-10	"CO" 18+84, 26' RT	SD-6	MOD Type 2B	2.5x2	N/A	0.50	N/A	1/2 CN-CN	N/A	N/A	0.50	0.00	0.00	0.50	0.42	0.08	1.50	0.00	0.00	1.50	0.86	0.64
CODI-2	"CO" 20+34, 26' LT	SD-6	MOD Type 2B	2.5x2	N/A	SUMP	N/A	CN-CN	CPLACO-S	N/A	0.00	0.72	0.00	0.72	0.72	N/A	0.00	6.17	0.00	6.17	6.17	N/A
CODI-12	"CO" 15+30, 25' LT	SD-6	DM	7.5	10	0.40	2.70	CN-HH	N/A	N/A	3.00	0.00	0.00	3.00	3.00	0.00	11.00	0.00	0.00	11.00	8.77	2.23
CODI-13	"CO" 10+84, 21' LT	SD-5	MOD Type 2B	2.5x2	N/A	1.00	N/A	CN-LM1	N/A	CODI-12	1.00	0.00	0.00	1.00	0.87	0.13	5.00	0.00	2.23	7.23	3.05	4.18
BDI-1	"B" 23+96, 59' LT	SD-13	MOD Type 2B	2.5x2	N/A	SUMP	N/A	LA-BF	CPLACO-E	N/A	8.00	0.00	0.00	8.00	8.00	0.00	28.00	0.00	0.00	28.00	28.00	0.00
BDI-4	"B" 17+59, 32' LT	SD-13	MOD Type 2B	2.5x2	N/A	0.40	N/A	1/2 BF-LM	N/A	N/A	2.50	0.00	0.00	2.50	1.70	0.80	7.00	0.00	0.00	3.88 ¹³	2.24	1.64
BDI-5	"B" 17+58, 36' RT	SD-13	MOD Type 2B	2.5x2	N/A	0.40	N/A	HALF STREET ¹⁴	N/A	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.12	3.12	2.20	0.92
BDI-6	"B" 13+09, 34' LT	SD-12	MOD Type 2B	2.5x2	N/A	SUMP	N/A	1/2 BF-LM	N/A	BDI-4	2.50	0.00	0.80	3.30	3.30	N/A	7.00	0.00	1.64	8.64	8.64	N/A
EXDI-8	"B" 10+86, 46' LT	SD-4	DM	3	3	0.30	0.10	NUISANCE	N/A	N/A	0.00	0.00	0.00	NUISANCE	0.00	0.00	0.00	0.00	0.00	NUISANCE	0.00	0.00
BDI-7	"B" 10+78, 45' RT	SD-12	DM	7.5	10	0.10	1.60	N/A	N/A	BDI-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.92	0.92	0.00



GOWAN NORTH BUFFALO BRANCH - LONE MOUNTAIN TO WASHBURN

DROP INLET ANALYSIS - ULTIMATE CONDITION

Project #: 31698
Made by: JS
Date: 11/9/2016
Checked by: BQ

NOTES:

- 1 Flow depth is above crown upstream of RDI-1. Therefore, flow contributing from both N and S of Rosada is available for capture at RDI-1. The street geometry drains to the N.
- 2 The bypass from RDI-1 is above street crown in 100-yr. The WSE of 2373.67 is established DS of RDI-1.
It is assumed that the flow contributing to RDI-3 is the S half street capacity of Rosada, and the flow contributing to RDI-2 is the N half capacity of Rosada.
The flow to RDI-3 is determined in the flowmaster cross section US of RDI-3 at WSE 2373.49. The remainder contributes to RDI-2.
For 10-yr, RDI-2 accepts the bypass from RDI-1 and RDI-3 accepts nuisance flow.
- 3 Assumed Minor sub-basin CN-LA2 fully contributes to catch basin CODI-4.
- 4 The total flow at CPLM-CM is 49 cfs in the 10-year and 247 cfs in the 100-yr. To be conservative, it is assumed that water initially approaches the intersection of Lone Mountain and Cimarron on the S half of Lone Mountain.
10-yr: The half street capacity of the S half of Lone Mountain at crown elevation is 47.49 cfs. Therefore, 47.49 cfs will continue on the S half of Lone Mountain to LMDI-5 while the remaining 1.51 cfs will weir over the crown and contribute to LMDI-1.
100-yr: Flow depths are above crown at an elevation of 2374.51. The flow impacting LMDI-1 is the N half street capacity at this depth. N half = 167.33 cfs, S half = 77.67 cfs.
- 5 10-yr: Flow to LMDI-2 equals the bypass from LMDI-1.
100-yr: Flow depths are above crown at an elevation of 2374.40. Therefore, the 100-yr flow DS of LMDI-1 is the combined flow of the S half of Lone Mountain (77.67 cfs) and the bypass from LMDI-1 (90.6 cfs); totaling 170.27 cfs.
The 100-yr flow impacting LMDI-2 is the N half street capacity at this depth. N half = 115.18 cfs, S half = 55.09 cfs.
- 6 10-yr: Flow to LMDI-3 equals the bypass from LMDI-2.
100-yr: The 100-yr flow DS of LMDI-2 is the combined flow of the S half of Lone Mountain (55.09 cfs) and the bypass from LMDI-2 (55.54 cfs); totaling 110.63 cfs.
During interception at LMDI-2, the 100-yr flow depth is drawn down to below crown. It is assumed that water is approaching from the S half. The S half capacity is determined at crown to be 47.49 cfs.
Therefore, it is assumed that 47.49 cfs is contained on the S half of Lone Mountain, while the remainder (63.14 cfs) weirs to the N side and is conveyed to LMDI-3.
- 7 This is the first inlet on the S half of Lone Mountain. To be conservative, it is assumed that water approaches the intersection of Lone Mountain and Cimarron on the S half of Lone Mountain.
10-yr: Flow to LMDI-5 equals the S half street capacity of Lone Mountain of 47.49 cfs. The remaining 1.51 cfs weirs N.
100-yr: This inlet is located slightly DS of LMDI-2. After interception at LMDI-2, the 100-yr WSE in Lone Mountain is below crown. It is assumed that 47.49 cfs is contained on the S half of Lone Mountain, while the remainder (63.14 cfs) weirs to the N side and is conveyed to LMDI-3.
- 8 Total flow in Cimarron is taken from HEC-1 combination point CPCMLA-LM. 10-yr is 15 cfs, 100-yr is 86 cfs.
10-yr: Since the valley gutter at diversion CPCMLA-S is on the W half of Cimarron, water in Cimarron approaches the intersection primarily on the W half of Cimarron. CM-LM2 generates 1 cfs, therefore 1 cfs is on the E half of Cimarron and the remaining 14 cfs is on the W half.
100-yr: Flow depth is above crown. Water flows on both sides of the street and in the parallel ditch on the W half of Cimarron. Starting WSE is 2373.85. The capacity of the W half of Cimarron (between crown and curb) is 50.13 cfs (remainder is 35.87 cfs).
- 9 10-yr: Flow to CIDI-2 is the bypass from CIDI-1.
100-yr: Bypass from CIDI-1 is 10.89 cfs. Remainder of flow from US cross section is 35.87 cfs. Therefore, total 100-yr flow in Cimarron DS of CIDI-1 is 46.76 cfs. Flow depth is above crown.
During interception at CIDI-2, the WSE will drop below crown and CIDI-2 will capture all available flow in the west gutter. Any flow on the E half of Cimarron or in the W ditch below the crown elevations will be contained there (E half=8.45 cfs, Ditch=9.79 cfs).
Therefore, the flow available for capture in the W gutter is 46.76 cfs - 8.45 cfs - 9.79 cfs = 28.52 cfs.
Downstream of CIDI-2: 100-yr inlet bypass from CIDI-2 is 3.89 cfs which will bypass to existing Cimarron inlet EXDI-8
Additionally, 8.45 cfs will stay on E half of Cimarron and drain toward LMDI-7. Lastly, 9.79 cfs will stay in west ditch and drain to the dual elliptical orifice connected to the back of CIDI-2.
- 10 10-yr: Since the valley gutter at diversion CPCMLA-S is on the W half of Cimarron, water in Cimarron approaches the intersection primarily on the W half of Cimarron. CM-LM2 generates 1 cfs, therefore 1 cfs is on the E half of Cimarron and the remaining 14 cfs is on the W half.
100-yr: 8.45 cfs from E half street capacity of Cimarron, plus inlet bypass from LMDI-3 and EXDI-8, plus 1 cfs from basin LM-CM3.
- 11 Total flow in Valadez is taken from HEC-1 sum of VD-LM1 and VD-LM2. 10-yr is 5 cfs, 100-yr is 17 cfs.
10-yr: Contributing flow is HEC-1 basin VD-LM2.
100-yr: Flow depth exceeds crown elevation. Total flow in Valadez is taken from HEC-1 sum of VD-LM1 and VD-LM2 which is 17 cfs. The W half street capacity of Valadez is 5 cfs. Therefore, 12 cfs will weir to the E and contribute to VDI-1.
- 12 LMDI-10 also captures the flow that was contained on the W half of Valadez, which crosses Valadez in a valley gutter (10-yr = 4 cfs, 100-yr = 5 cfs).
- 13 The half street capacity of the W side of Buffalo is 3.88 cfs. The 10-yr flow is contained on the W half. All 100-yr flow in excess of 3.88 cfs weirs over to the E half, to be collected by BDI-5.
- 14 This inlet captures flow in excess of the W half street capacity for the 100-yr storm and nuisance flow in the 10-yr storm.

SYMBOLS:

- ^ Contribution from upstream surface flowsplit. See Minor Basin Flowsplits - Ultimate Table.
XX Flowsplit through intersection. See Minor Basin Flowsplits - Ultimate Table.

ABBREVIATIONS:

- CFS Cubit Feet Per Second
DS Downstream
E East
FT Feet
ID Identification
N North
Q Flow
S South
US Upstream
W West
WSE Water Surface Elevation

TDS

13-27735
7/8/13
D/S

**TECHNICAL DRAINAGE STUDY
FOR
LONE MOUNTAIN 5**

764-A105-001

July 2013

Prepared For:

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Las Vegas, NV 89113
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G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

Curve Numbers (CN) –The soils information for the project watershed was referenced from the H figures in the 2008 MPU (Reference 1). Figure H-19 has been included in Appendix A. This figure delineates families of soil types and hydrologic soil group of each family. The figure shows that the project area is comprised of 100 percent HSG "B".

The land uses or land covers used throughout the site consist of Western Desert Urban Areas: Natural Desert Landscaping for the existing graded lot, and residential districts with average lot sizes of 14,000 square feet for onsite developed areas. Curve numbers for existing and developed conditions subbasins, as well as a curve number matrix of each soil type and for each land use, is included in Appendix A.

For the given soils, CN values were determined from appropriate columns of Table 602 of the Manual. Curve numbers were determined for the existing and developed conditions subbasins to be 77 and 72 respectively.

Drainage Areas and Flow Patterns - The onsite and offsite subbasins and flow patterns used in the hydrologic modeling were determined from grading plans and aerial topography with a 1-foot contour interval.

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 (T_c) by the following relationship: $TLAG = 0.6 (T_c)$. The time of concentration (T_c) 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 T_c 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.

VI. EXISTING CONDITIONS

Existing conditions for the project assumes a "Western Desert Urban Areas: Natural Desert Landscaping" with an associated curve number of 77. Figure 5, Existing Conditions Drainage Map, depicts the onsite subbasin and drainage patterns used in the existing conditions hydrologic analysis for this project.

Lone Mountain Road

The project site and surrounding areas fall within the areas evaluated in the City of Las Vegas *Northwest Neighborhood Study*, dated September 1999. Pertinent sheets from the *Northwest Neighborhood Study* are included in Appendix C. The *Northwest Neighborhood Study* evaluates two scenarios: 1) Existing Drainage Conditions which assumes the current developed or undeveloped conditions at the time of the study and 2) Future Drainage Conditions which assumes full built out conditions of the evaluation area, taking credit for the recommended flood control facilities. In reality, the current conditions are a mixture of the *Northwest Neighborhood Study's* existing condition with large flows in the street and the future conditions with little flows in the street and large flows in the fully built-out storm drain facilities. For the purpose of this project, the existing flow will be conservatively assumed as the existing drainage condition flow of 831 cfs in Lone Mountain Road. We believe this is a conservative flow value since upstream storm drain facilities have been constructed which would mitigate this existing flow rate. Specifically, the main trunk line in Lone Mountain Road west of Durango has been constructed since the *Northwest Neighborhood Study*, and would mitigate a portion of the upstream tributary.

Adjacent Developments

The project is nestled within surrounding existing developments on its west, north and east boundary. Per referenced Figure 6 from the *Technical Drainage Study for Janell & LaMadre Residential Subdivision*, (hereinafter referred to as the *Janell & LaMadre Study*), by Taney Engineering, approved July 8, 2005, the offsite 100-year flow of 94 cfs is conveyed east outside the property along the northerly property line and enters a concrete drainage easement located at the northeast corner of the site.

Excerpts of the *Northwest Neighborhood Study* and *Janell & LaMadre Study* are included in Appendix C.

Hydrologic calculations have been included in Appendix A. Table 1 summarizes the HEC-1 results for existing conditions. Hydrologic calculations have been included in Appendix A.

TABLE 1 SUMMARY OF EXISTING CONDITIONS HEC-1 MODEL			
SUBBASIN OR CONCENTRATION POINT	AREA (AC)	100 YR (CFS)	10 YR (CFS)
C3I*	-	94	5
EXON1	5.1	7	2
Lone Mountain Road**	-	831	259

See Figure 5.

*- Referenced from the *Technical Drainage Study for Janell & La Madre Residential Subdivision*

** - Referenced from the *Northwest Neighborhood Study*

VII. INTERIM CONDITIONS

The interim conditions hydrologic analysis considers existing conditions for the offsite tributary subbasins, and developed conditions for the proposed development.

As described in the existing conditions description, the flow within Lone Mountain Road is 831 cfs with an associated depth of flow of 1.43-feet. The project will set finished floor elevations adjacent to Lone Mountain Road using this established flow and associated depths.

Figure 6, Interim Conditions Drainage Map, depicts the subbasins and drainage patterns used in the interim conditions hydrologic analysis for this project. Hydrologic calculations have been included in Appendix A. Table 2 summarizes the HEC-1 results for interim conditions. Hydrologic calculations have been included in Appendix A.

SUBBASIN OR CONCENTRATION POINT	AREA (AC)	100 YR (CFS)	10 YR (CFS)
C31*	-	94	5
OND1	5.1	5	1
Lone Mountain Road**	-	831	259

See Figure 6.

*- Referenced from the *Technical Drainage Study for Janell & La Madre Residential Subdivision*

** - Referenced from the *Northwest Neighborhood Study*

Onsite Subbasin OND1 generates 5 cfs in the 100-year storm event and drains south in Palomino Court to Lone Mountain Road. This flow is lower than the existing flow of 7 from Subbasin EXON1 due to the large lot sizes of the residential subdivision, therefore, not contributing to increase of flow in Lone Mountain Road between existing and developed onsite conditions.

The offsite flows north of the project (100-year flow = 94 cfs per referenced Figure 6 from the *Janell & LaMadre Study*) continue to flow east along the northerly property line as they do in existing conditions and do not impact the project site. A normal depth calculation indicates the depth of flow in this existing swale is 1.8-ft. The northerly wall will be solid grouted a minimum 2-ft above the existing swale flowline and a cutoff wall will be provided to prevent undercutting.

VIII. ULTIMATE CONDITIONS

The ultimate conditions hydrologic analysis considers developed conditions for the offsite tributary subbasins, and developed conditions for the proposed development.

Lone Mountain Road

As described under the existing conditions description, the project site and surrounding areas are located within the areas evaluated in the City of Las Vegas *Northwest Neighborhood Study*, dated September 1999. For the purpose of this project, the ultimate flows are referenced from the Future Drainage Conditions from the *Northwest Neighborhood Study* with a 100-year flow rate of 94 cfs in Lone Mountain Road. As of this date, a portion of the ultimate regional facilities are constructed. Figure 4 (Figure F-19 from the 2008 MPU) indicates the upstream main trunk line facilities GONO in Lone Mountain Road has been constructed. However, the significant flow reduction from interim to ultimate conditions may not be realized until the regional lateral facilities are extended north in Grand Canyon Drive and El Capitan Way.

The offsite flows north of the project (100-year flow = 12 cfs per referenced Figure 7 from the *Janell & LaMadre Study*) is significantly reduced due to construction of upstream regional and local flood control facilities as described in the *Northwest Neighborhood Study*. The remaining flow continues east along the property line and does not impact the project site.

Figure 7, Ultimate Conditions Drainage Map, depicts the subbasins and drainage patterns used in the ultimate conditions hydrologic analysis for this project. Hydrologic calculations have been included in Appendix A. Table 3 summarizes the HEC-1 results for ultimate conditions. Hydrologic calculations have been included in Appendix A.

TABLE 3 SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL			
SUBBASIN OR CONCENTRATION POINT	AREA (AC)	100 YR (CFS)	10 YR (CFS)
C3D*	-	12	1
OND1	5.1	5	1
Lone Mountain Road**	-	94	1

See Figure 7.

*- Referenced from the *Technical Drainage Study for Janell & La Madre Residential Subdivision*

** - Referenced from the *Northwest Neighborhood Study*

VIII. STREET HYDRAULICS / FLOOD PROTECTION FACILITIES

Normal depth calculations were performed to determine the street flow capacity for Lone Mountain Road adjacent to the site. The street flow summary has been presented in Tables 4 and 5. Figure 6 shows the locations of the cross sections corresponding to the calculations included in Tables 4 and 5. Hydraulic calculations have been included in Appendix B.

TABLE 4
STREET FLOW CHARACTERISTICS
INTERIM CONDITIONS

Location	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (ft/s)	V*D	Dry Lane (ft)
Lone Mountain Rd - 100-year**	1.44	831	1.43	9.8	14.0	N/A
Lone Mountain Rd - 10-year**	1.44	259	0.99	6.3	6.2	0
Palomino Court - 100-year	0.50	5	0.34	1.6	0.5	N/A
Palomino Court - 10-year	0.50	1	0.22	1.1	0.2	N/A

* See Figure 6

** Referenced from the Northwest Neighborhood Study

TABLE 5
STREET FLOW CHARACTERISTICS
ULTIMATE CONDITIONS

Location	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (ft/s)	V*D	Dry Lane (ft)
Lone Mountain Rd - 100-year	1.44	94	0.73	4.7	3.4	N/A
Lone Mountain Rd - 10-year	1.44	1	0.21	1.9	0.4	34
Palomino Court - 100-year	0.50	5	0.34	1.6	0.5	N/A
Palomino Court - 10-year	0.50	1	0.22	1.1	0.2	N/A

* See Figure 7

** Referenced from the Northwest Neighborhood Study

Based on the calculated flow characteristics, the Manual criteria for depth (D) and velocity times depth (V*D) during the 100-year and 10-year storm event is not met under interim conditions in Lone Mountain Road. Additionally, the 10-year dry lane criteria is not met. However, this is an existing condition and the proposed development is not exacerbating the existing flow condition. As discussed in the interim condition discussion, the finished floor elevations adjacent to Lone Mountain Road are sufficiently elevated to protect from interim flows in Lone Mountain Road. Under ultimate conditions, V*D and dry lane criteria will be met.

The finished floor elevations for the proposed lots have been set at a minimum of twice the depth of flow in Palomino Court. Lots adjacent to Lone Mountain Road will also have their finished floor elevations a minimum of twice the depth of flow in Lone Mountain Road.

The finished floor elevations for the proposed lots have been set a minimum of eighteen inches above the street centerline or top of curb, whichever is higher, measured at the center of the building.

In general, the proposed development does not significantly alter existing peak flows or the character of flows downstream of the development and does not cause any negative impacts on downstream facilities or development.



Department of Public Works

500 S Grand Central Pky • Box 554000 • Las Vegas NV 89155-4000
(702) 455-6000 • Fax (702) 455-6040

Denis Cederburg, P.E., Director • E-Mail: dlc@ClarkCountyNV.gov

April 22, 2019

Baughman & Turner, Inc.
Josh Harney
1210 Hinson Street
Las Vegas, NV 89102

RE: **MINOR SUBDIVISION MAP PRELIMINARY REVIEW**
MSM-19-600023

The parcel map preliminary review of the above mentioned map has been completed by this office and the applicable agencies. The following corrections and/or comments need to be addressed prior to submitting the parcel map technical review.

The listed requirements must be met and the parcel map must be recorded no later than APRIL 22, 2020. A request for an extension of time and a fee must be submitted to the Map Team on or before the expiration date (appointment required). An extension of time may be approved for one additional year.

The following requirements are necessary conditions that need to be met for you to proceed with subdividing the property:

MAP TEAM, PLANNING COMMENTS AND/OR CORRECTIONS:

For questions on the following, contact Tina Garrison-Bermudez at (702) 455-5012.

All easements that exist for this map must be plotted showing ties to the boundary and recording information, including date, when you submit for technical review.

If the title report indicates a trust deed exists on this property, a beneficiary statement, signed by all beneficiaries, or their authorized agent, with proper acknowledgement is required on the mylar, or may be submitted as a separate document at time of recordation.

Per 30.32.040.a.9, please provide a plan that shows a cross-section extending a minimum of 100 feet beyond the limits of the project, at each property line, showing the location and finished grade elevations of adjacent structures. If the finished grade exceeds the allowable 18 inches, a design review will be required. Please contact Comprehensive Planning, Current Planning Division at 702-455-4314 for more information on the design review process, if necessary.

Please show and identify all existing structures and other physical features. Our records indicate that improvements exist on this parcel but are not shown on the site plan. Please provide a **separate** plan that locates the existing structure(s) to verify there are not setback or code conflicts. If there are conflicts, they must be resolved prior to approval of this parcel map.

Our records indicate there is a well on the property serving the existing house. Please provide a plan to show location of well in correlation with proposed lots.

BOARD OF COUNTY COMMISSIONERS
MARILYN KIRKPATRICK, Chair • LAWRENCE WEEKLY, Vice Chair
LARRY BROWN • JAMES B. GIBSON • JUSTIN C. JONES • MICHAEL NAFT • TICK SEGERBLOM
YOLANDA T. KING, County Manager

MSM-19-600023

Page 2

If the well is serving the house, and will remain on the proposed lot the house will be on, then the well can stay and serve the house. If the well will end up on a vacant lot, then the well must be capped.

If the well is to be capped, please provide a copy of the well log from the Nevada Division of Water Resources indicating that the well has been property abandoned.

If the well is able to continue serving the existing house, and the property is within 1,250 feet of an existing water line, you must connect all vacant lots to City water. You must contact the Las Vegas Valley Water District and inform them that you will only be connecting the lots not being served by the well. This way, they will update their commitment requirement to only be the vacant lots.

Provide approval from the Las Vegas Valley Water District.

Be aware that we have not received all required comments from the utility companies; therefore, additional comments / conditions may be required once received

SOUTHERN NEVADA HEALTH DISTRICT COMMENTS AND/OR CORRECTIONS:

For questions on the following, contact Daniel LaRubio, Jr. or Robert Fyda (702) 759-0660.

Municipal sewer does appear to be available. Municipal water does appear to be available. The existing septic and well serving proposed lot 1 and the existing SFR meet the lot size requirements. No new individual sewage disposal system permits will be issued.

Approval for this minor subdivision requires the following:

- A \$200 review fee payable to SNHD
- A TO SCALE parcel map showing the well and septic location

MAP TEAM, RIGHT OF WAY COMMENTS AND/OR CORRECTIONS:

For questions on the following, contact Alton Tai (702) 455-2025.

Drainage study and compliance is required. Drainage study must be approved prior to technical review submittal.

Pavement is required for Valadez Street. Street improvement plans must be prepared by a civil engineer and submitted to the County for review prior to technical review submittal. Improvements plans must be approved and bonded or constructed prior to minor subdivision map mylar submittal.

Full off-site improvements are required for Lone Mountain road. Street improvement plans must be prepared by a civil engineer and submitted to the County for review prior to technical review submittal. Improvements plans must be approved and bonded or constructed prior to minor subdivision map mylar submittal.

Execute a Restrictive Covenant Running With The Land. Return original signed document with an original legal description of the entire parcel attached as Exhibit "A" to the Clark County Public Works, Survey Division, Map Team. Return document with next submittal. This form can be found on line at <http://www.clarkcountynv.gov/public-works/surveyor/Pages/forms.aspx>.

Provide corporate documents that show the signatories that may sign the restrictive covenant on behalf of all the owners listed.

NOTE: If required, verification that the improvement plans, including grading plan, match the parcel map must occur prior to parcel map submittal. If the improvement plans and the parcel map are not in concurrence with each other, the parcel map mylar cannot be accepted for recordation.

NOTE: If required, off-site improvement plans must be approved and fees paid prior to parcel map mylar submittal. This will be verified prior to scheduling an appointment for mylar submittal.

STANDARD CONDITIONS

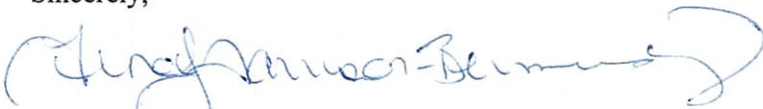
1. This map is subject to all conditions and requirements of County Code, Title 30 (as applicable) and also required compliance to all applicable State statutes.
2. All pertinent land use applications must be active at the time of the parcel map mylar submittal and/or recordation.
3. If changes are made regarding the number of lots, area or configuration on the original site plan submitted, a new **preliminary review** submittal will be required, with this application being withdrawn.
4. After all requirements of the preliminary review have been met, you may file for a Minor Subdivision Parcel Map Technical Review.

TECHNICAL REVIEW SUBMITTAL - Appointment required for this submittal.

1. See minor subdivision map application on Public Works, Survey web site for submittal requirements.
2. The parcel map must be prepared by a professional land surveyor licensed in the State of Nevada who will prepare the map for submittal and review by the Map Team.

Should you have any questions, do not hesitate to contact the above referenced staff.

Sincerely,



Tina Garrison-Bermudez
Map Team

cc: file

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: <u>PM 19-000023</u>	Map ID:	
Firm Name: <u>Baughman & Turner, Inc</u>	Engineer: <u>Jodi Lorjorian</u>	
Address: <u>1210 Winson St</u>		
City: <u>Las Vegas</u>	State: <u>NV</u>	Zip: <u>89102</u>
Phone Number: <u>702-870-8771</u>	Fax Number: <u>702-878-2695</u>	
Property Owner: <u>ADK Family Trust 2000</u>		
Address: <u>7920 Lone Mountain</u>		
City: <u>Las Vegas</u>	State: <u>NV</u>	Zip: <u>89129</u>
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 | |
|-------------------------------------|-------------------------------------|--|
| ☒ | ☐ | Design Manual Standard Form 1 with the engineer's seal and signature. |
| ☐ | ☒ | Design Manual Standard Form 4 . |
| ☒ | ☐ | 2 copies of the 24" x 36" Drainage Plan. |
| ☐ | ☒ | A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. |

II. MAPS AND EXHIBITS

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

REFERENCE:

STANDARD FORM 2

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	
<u>N/A</u>	☐	Streets with off-set crowns.
☒	☐	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
☒	☐	Property lines.
☒	☐	Right-of-way lines and widths, existing and proposed.
☒	☐	Existing improvements and their elevations.
☒	☐	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
☒	☐	Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
☒	☐	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
☒	☐	Location and cross-section of street capacity calculations.
☒	☐	Cross-sectional detail for channels, including cutoff wall locations.
☒	☐	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.
☒	☐	Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
☒	☐	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs.
<u>N/A</u>	☐	Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.
<u>N/A</u>	☐	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
☒	☐	Building and/or lot numbers.
☒	☐	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
☒	☐	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

- | Yes | No | |
|------------|--------------------------|--|
| <u>N/A</u> | ☐ | 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. |
| <u>N/A</u> | ☐ | 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. |
| <u>N/A</u> | ☐ | Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent. |
| <u>N/A</u> | ☐ | 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. |
| <u>N/A</u> | ☐ | 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	
<u>N/A</u>		Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
<u>✓</u>		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.
<u>✓</u>		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.
<u>N/A</u>		Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
<u>N/A</u>		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.
<u>✓</u>		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.
<u>N/A</u>		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.
<u>N/A</u>		Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
<u>N/A</u>		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.
<u>N/A</u>		The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
<u>N/A</u>		Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFGD) 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 CCRFGD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFGD 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.)
✓		Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
✓		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	
✓		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
✓		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.
✓		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.
✓		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.
✓		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.
✓		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.
✓		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.
N/A		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.
✓		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.
N/A		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.

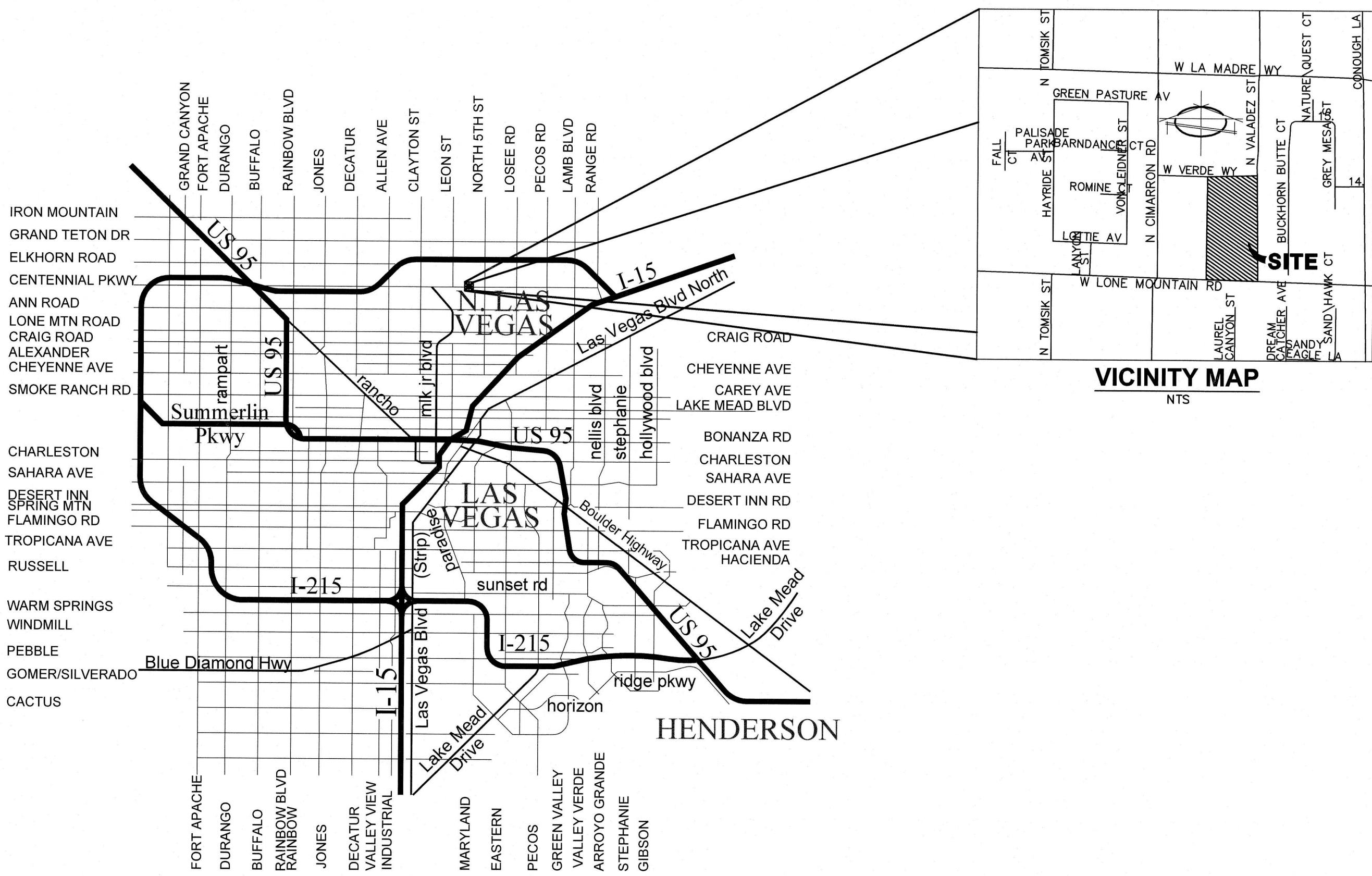
This document is intended as an aid in preparing Technical Drainage Studies for the City of Las Vegas. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations or exhibits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

IMPROVEMENT PLANS
FOR
DIAZ KISSLING
7920 LONE MTN RD
CLARK COUNTY, NV
APN 125-33-805-008

Sheet List Table	
Sheet Number	Sheet Title
C1.0	COVER SHEET
C1.1	GENERAL NOTES
C2.0	GRADING PLAN
C2.1	C2.1 GRADING DETAILS

1. COMPLETION OF SECTION II
OF DRAINAGE COMPLIANCE
REPORT REQUIRED.

2. PRE-DEVELOPMENT MEETING WITH
DEPARTMENT OF PUBLIC WORKS
DEVELOPMENT REVIEW DIVISION, OFF-SITE
INSPECTOR REQUIRED. CONTACT CIVIL
ENGINEERING INSPECTOR AT
(702)-455-4610.



APPROVALS

CLARK COUNTY FIRE DEPARTMENT DATE

APPROVAL OF THESE PLANS SHALL NOT CONSTRUED TO BE
A PERMIT FOR, OR AN APPROVAL OF ANY VIOLATION OF
ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS.
FIRE FLOW = GPM AT 20 PSI RESIDUAL

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

PROJECT NO. FIRST APPROVED DATE:
LVVWD APPROVED FIRE FLOW: TOTAL GPM/ONSITE GPM

LVVWD APPROVAL IS VALID FOR ONE (1) YEAR FROM SIGNATURE DATE.
IF CONSTRUCTION IS NOT STARTED, PLANS MUST BE RESUBMITTED FOR
REVIEW AND APPROVAL.

CLARK COUNTY WATER RECLAMATION DISTRICT DATE

DISTRICT PIPES NUMBER IS 19,840
SIGNATURE ON THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT
FOR OR AN APPROVAL OF ANY VIOLATION OF CLARK COUNTY WATER
RECLAMATION DISTRICT RULES, REGULATIONS, OR DESIGN AND
CONSTRUCTION STANDARDS.

OWNER/DEVELOPER

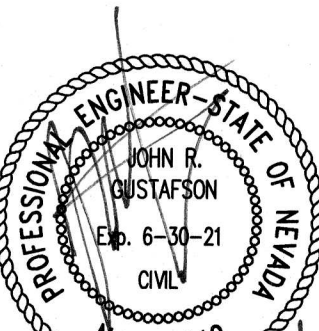
JOAN KISSLING
7920 LONE MTN RD
LAS VEGAS, NV 89129
(702)658-8775
joankissling@gmail.com

NEVADA POWER COMPANY

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE
TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT.
NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE
FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE
ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULE AND REGULATIONS.

DISCLAIMER NOTE

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



BENCHMARK

CITY OF LAS VEGAS BENCHMARK 1LV90 33C4 - BEING
A RIVET AND PLATE IN THE TOP OF CURB AT THE
NORTHEAST CORNER OF WASHBURN AND CIMARRON.

728.611 METERS NAVD 88 DATUM 2390.45 FEET

BASIS OF BEARING

SOUTH 88°31'54" EAST - BEING THE CENTERLINE
OF LA MADRE WAY AS SHOWN IN FILE 72 OF PARCEL
MAPS, PAGE 12, CLARK COUNTY RECORDER'S OFFICE,
CLARK COUNTY, NEVADA.

LEGAL DESCRIPTION

THE EAST HALF (E 1/2) OF THE WEST HALF (W 1/2) OF THE SOUTH
HALF (S 1/2) OF THE SOUTHWEST QUARTER (SW 1/4) OF THE
SOUTHEAST QUARTER (SE 1/4) OF SECTION 33, TOWNSHIP 19 SOUTH,
RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA.

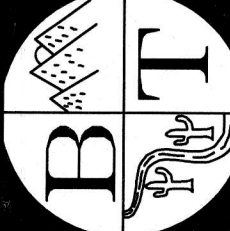
EXCEPTING THEREFROM THE INTEREST IN AND TO THE EAST 30 FEET
AND THE SOUTH 50 FEET AS CONVEYED TO THE COUNTY OF CLARK,
STATE OF NEVADA, BY DEEDS RECORDED IN THE OFFICE OF THE
COUNTY RECORDER AS DOCUMENT NUMBERS 570904 AND 462929,
OFFICIAL RECORDS CLARK COUNTY, NEVADA.

FURTHER EXCEPTING THEREFROM THAT SPANDREL AREA LOCATED IN
THE SOUTHEAST CORNER THEREOF AS CONVEYED TO THE COUNTY OF
CLARK, BY A DEED RECORDED APRIL 12, 1976 AS DOCUMENT NO.
570904, OFFICIAL RECORDS.

PREPARED FOR :
JOAN KISSLING
7920 LONE MTN RD
LAS VEGAS, NV 89129
(702)658-8775

DATE 9/3/2019
DESIGN JRG
DRAW EC
CHECK JRG
SCALE

BAUGHMAN & TURNER, INC.
CIVIL ENGINEERS LAND PLANNERS
1210 HINSON STREET LAS VEGAS, NEVADA
PHONE: (702) 870-8771 FAX: (702) 878-2695



SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M.
CLARK COUNTY, NEVADA
DIAZ KISSLING
COVER SHEET
APN 125-33-805-008

SHEET
C1.0
1 OF 4
PROJ. NO.
D151

CLARK COUNTY TRAFFIC NOTES

1. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HEREUNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
2. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY GROUND MOUNTED STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING COUNTY STREETS IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
3. ALL CONSTRUCTION SIGNING, BARRICADING AND PAVEMENT MARKINGS SHALL CONFORM TO THE NEVADA WORK ZONE TRAFFIC CONTROL HANDBOOK – 1986 AND TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, CURRENT EDITION.
4. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL, OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE COUNTY TRAFFIC MANAGER.
5. THE DEVELOPER SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL ALL PERMANENT SIGNS SHOWN ON THE PLANS. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CLARK COUNTY AREA STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POST SHALL BE INSTALLED IN ACCORDANCE WITH CLARK COUNTY AREA STANDARDS. ALL SIGNS SHALL USE CLASS VI SHEETING.
6. IF A PROPOSED STREET LIGHT STANDARD IS FIELD LOCATED TO WITHIN (5) FEET OF ANY SIGN SHOWN HEREON TO BE MOUNTED ON A SIGN POST, CHANGE SIGN MOUNTING TO ONE ON THE STREET LIGHT STANDARD.
7. PRIOR TO CONSTRUCTION, THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE CURRENT PLANNING DIVISION OF THE DEPARTMENT OF COMPREHENSIVE PLANNING.
8. ALL TRAFFIC SIGNAL POLE ASSEMBLIES, STEEL PEDESTAL FOR CABINETS, AND STREET LIGHT POLES SHALL BE GALVANIZED PER ASTM A-123.
9. ALL STREET LIGHTING INSTALLATIONS SHALL CONFORM TO THE UNIFORM STANDARD DRAWING AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS CLARK COUNTY AREA, NEVADA LATEST EDITION OF EACH EXCEPT AS NOTED ON THE STREET LIGHTING PLANS AND LED LUMINARIES REFER TO CLARK COUNTY PUBLIC WORKS QUALIFIED PRODUCTS LIST "QPL" FOR LED LUMINARIES. QPL CAN BE FOUND ONLINE AT [HTTP://WWW.CLARKCOUNTYNV.GOV/PUBLIC-WORKS/PAGES/DEFAULT.ASPX](http://www.clarkcountynv.gov/public-works/pages/default.aspx)
10. THE FOLLOWING CLARK COUNTY UNDERGROUND FACILITIES MAY BE LOCATED IN YOUR PROJECT AREA: STREET LIGHTING, TRAFFIC SIGNALS, FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST) INTERCONNECT CABLE. YOU MUST CONTACT CLARK COUNTY TRAFFIC MANAGEMENT DIVISION, OPERATIONS UNIT AT 455-6000 FOR LOCATIONS AT LEAST 48 HOURS PRIOR TO WORKING IN THE AREA. CLARK COUNTY IS NOT A MEMBER OF CALL BEFORE YOU DIG (UNDERGROUND SERVICE ALERT), AND A CALL TO THAT ORGANIZATION DOES NOT RELIEVE YOU OF LIABILITY FOR CLARK COUNTY FACILITIES.
11. F.A.S.T. INTERCONNECT CABLE POLICY IS IN EFFECT. INTERCONNECT CABLE MUST BE MAINTAINED AT ALL TIMES. DEVELOPER/CONTRACTOR SHALL PROVIDE TEMPORARY OVERHEAD INTERCONNECT CABLE, WHILE PERMANENT CABLE IS BEING RELOCATED. TEMPORARY AERIAL INSTALLATION MUST BE ACCEPTABLE TO THE COUNTY TRAFFIC MANAGER AND TO F.A.S.T., ANY DAMAGE TO THIS CABLE IS DEEMED IN EMERGENCY BY F.A.S.T., CITY OF LAS VEGAS, CLARK COUNTY AND NDOT AND MUST BE REPAIRED IMMEDIATELY TO F.A.S.T. ACCEPTANCE. \$2500 PER DAY DAMAGES MAY BE ASSESSED AFTER 24 HOURS HAS ELAPSED FROM TIME OF BREAK OR DAMAGE.
12. ALL NEW OR REPLACEMENT TRAFFIC SIGNAL LOOPS SHALL BE INSTALLED USING CABLE-IN-DUCT WIRING, SHALL HAVE INDEPENDENT LEAD-IN WIRES FOR EACH LOOP FROM THE CONTROLLER TO THE PULL-BOX, AND EACH LEAD-IN SHALL BE INDIVIDUALLY TAGGED.
13. TRAFFIC SIGNAL PEDESTRIAN HEADS SHALL BE THE L.E.D. TYPE.
14. ELECTRICAL POWER SERVICE POINT LOCATION(S) FOR STREET LIGHTING AND TRAFFIC SIGNALS MUST BE INDICATED ON THE PLANS. IF CONNECTING TO AN EXISTING CIRCUIT, INDICATE LOCATION OF EXISTING SERVICE POINT FOR EACH CIRCUIT.
15. WHEN STREET LIGHTS ARE TO BE CONNECTED TO AN EXISTING CIRCUIT, THE ENGINEER MUST CERTIFY THAT THE EXISTING CIRCUIT IS CAPABLE OF HANDLING THE ADDITIONAL CIRCUIT LOAD.
16. CLARK COUNTY RESERVES THE RIGHT TO REJECT STREET LIGHT AND TRAFFIC SIGNAL POLES AND ASSEMBLIES WHICH HAVE "STRIPPED" APPEARANCE.
17. TWO (2) WEEKS PRIOR TO BEGINNING OF CONSTRUCTION, MODIFICATION, OR RELOCATION OF ANY TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION OF THE DATE THAT WORK WILL BEGIN.
18. THREE (3) NORMAL WORKING DAYS PRIOR TO TURN-ON OR COMPLETION OF MODIFICATION(S) TO A TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION THAT WORK IS BEING COMPLETED AND THE PROPOSED DATE OF COMPLETION.

STORMWATER MANAGEMENT NOTES

1. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATED IN, THE PUBLIC RIGHTS OF WAY OF CLARK COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN CLARK COUNTY TITLE 24.40 AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPs WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTION TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO NEVADA GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12
5. ACCUMULATED SEDIMENT IN BMPs SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

COMMON ELEMENT / EASEMENT REQUIREMENTS

1. ISOLATION VALVES ARE REQUIRED AT THE POINT OF CONNECTION (EXTERIOR) AND WITHIN 10 FEET OF THE BACK OF CURB (INTERIOR), WITH NO SERVICE CONNECTIONS BETWEEN TEN VALVES.
2. THE PIPE MATERIAL BETWEEN THE VALVES MUST BE CLASS 53 DIP, DOUBLE WRAPPED RESTRAINED JOINTS.
3. THE PIPELINE MUST BE PLACED AT A MINIMUM OF 6 FOOT DEPTH OF COVER.
4. THE PIPELINE MUST BE PLACED IN A STEEL CASING FOR THE ENTIRE LENGTH OF THE EASEMENT / COMMON ELEMENT PER UDACS PLATE #23.
5. AT A MINIMUM, THE JOINTS MUST BE BONDED AND A TEST STATION INSTALLED AT ONE END OF THE EASEMENT.
6. FOR ALL PIPELINES 16-INCH AND GREATER, A TEST PORT WILL BE REQUIRED TO FACILITATE PIPELINE CONDITION ASSESSMENT.
7. THE ENTIRE TRENCH BACKFILL MUST BE CLASS 1 CLSM.
8. THE EASEMENT MUST BE A MINIMUM OF 30 FEET WIDE.
9. THE PIPELINE MUST BE LOCATED A MINIMUM OF 10 FEET FROM THE EDGE OF THE EASEMENT.
10. A CROSS SECTION OF THE EASEMENT MUST BE SHOWN ON THE PLANS WITH CURB & GUTTER OR BLOCK WALL USED TO DELINEATE THE BOUNDARY OF THE EASEMENT.
11. THE PIPELINE MUST BE SHOWN IN A PROFILE VIEW THE ENTIRE LENGTH OF THE COMMON ELEMENT / EASEMENT.
12. NO BUILDINGS, STRUCTURES, WALLS, FENCES OR TREES SHALL BE PLACES UPON, OVER OR UNDER SAID EASEMENT FOR THE DURATION OF THIS EASEMENT EXCEPT THAT SAID EASEMENT MAY BE IMPROVED AND USED FOR STREETS, ROADS OR DRIVEWAY PURPOSES, TRAIL, PATH, PARKING LOT, PLAYGROUND, NON-VEHICULAR UTILITY, INSOFAR AS SUCH USE DOES NOT INTERFERE WITH ITS USE BY THE DISTRICT FOR THE PURPOSES FOR WHICH IT IS GRANTED.
13. CARSONITA OR BRASS MARKERS MUST BE USED TO DELINEATE THE LOCATION / ALIGNMENT OF THE PIPELINE WITHIN THE EASEMENT.
14. THE FINAL MAP MUST DEDICATE THE SUBJECT EASEMENT AREA AS A COMMON ELEMENT AND A SEPARATE EASEMENT DOCUMENT IS REQUIRED.
15. A SURFACE MAINTENANCE / REPAIR AGREEMENT WILL BE REQUIRED STATING THE DEVELOPER AGREES TO SURFACE RESTORATION / REPAIR AT SOLE COST, IN PERPETUITY.

L.V.V.W.D. STANDARD NOTES

- LVVWD PROJECT #
(Revised 08/01/2017)
1. No work shall begin until the water plans have been approved for construction by the LVVWD. Following water plan approval, notice shall be given to the LVVWD Communication Support Center (258-7171) two (2) working days prior to the start of construction. For future inspections, notice must be given by 2:00 p.m. the business day prior to the requested LVVWD inspection. When requesting inspections, please refer to the Project # identified above.
 2. All work shall conform to LVVWD Standard Plates, Drawings, and Specifications, and to the 2010 Edition of the Uniform Design and Construction Standards for Potable Water Systems (UDACS). The latest edition of UDACS shall supersede any conflicts contained in the approved drawings and/or specifications.
 3. All work, except as modified by these plans or by Note 2 above, shall be done in accordance with the most recent draft or edition of the Uniform Standard Specifications for Public Works Construction Offsite Improvement, Clark County Area.
 4. A single pipe material shall be used throughout the project unless otherwise approved by the LVVWD.
 5. All service laterals two (2) inches in diameter and smaller shall be Type K copper tubing with LVVWD approved service saddles.
 6. All water meter boxes shall be located outside of driveway areas.
 7. All valves shall be located outside of driveways, valley and curb gutters.
 8. All water and storm drain or sanitary sewer crossings shall conform to Section 2.22 of the 2010 Edition of the UDACS.
 9. All water facilities and appurtenances shall be disinfected, pressure tested, and have an acceptable passing health water sample obtained prior to operation and use.
 10. The contractor must obtain all meters two (2) inches and smaller from LVVWD Central Stores. Telephone 258-3152 or 258-3802, two (2) working days prior to meter pickup.
 11. Any interruption of service must be performed in accordance with UDACS Section 3.14.01, and approved by the LVVWD Inspection Division prior to shutdown. Proper written notification must be given to all affected customers.
 12. All water facility construction materials used must be as listed on the LVVWD Approved Products List for New Facilities, latest revision, or specifically approved on these plans by submitting shop drawings.
 13. Telephone "Call Before You Dig" at '811' or 1-800-227-2600.
 14. The installation of (LVVWD) municipal water facilities within all streets is assumed to be in compliance with the Uniform Standards, including the placement of asphalt paving street surfaces. Any repair work done by the LVVWD to the municipal water facilities will include the placement of an appropriately sized asphalt repair patch on the street surface.

Any decorative paving surface within the street is the responsibility of the Owner's Association, or the individual property owners if no Owner's Association is in existence, or the agency having jurisdiction. Decorative surface materials placed within the ten foot easement abutting a public or private street, if disturbed by the LVVWD during the repair or operation of its facilities, will be replaced by LVVWD with an appropriately sized plain finish concrete patch. The LVVWD will not restore, and will not be responsible for the restoration of, any decorative paving surface within the street. The LVVWD will not attempt to match color or finish of any adjacent materials.

15. NO LEAD COMPLIANCE NOTE:
TO COMPLY WITH THE FEDERAL SAFE DRINKING WATER ACT, ALL WATER WORKS BRASS PRODUCTS PROPOSED TO BE RELOCATED, OR INSTALLED AS NEW MUST BE INSTALLED WITH THE LEAD FREE APPROVED PRODUCT. THE OLD LEAD PRODUCT MAY NOT BE REUSED.

CLARK COUNTY GRADING NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS AND STANDARD DRAWINGS CLARK COUNTY AREA NEVADA" AND CLARK COUNTY SUPPLEMENT TO "UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS", LATEST REVISION.
2. COMPLIANCE WITH AIR POLLUTION CONTROL REGULATIONS WILL BE REQUIRED AT ALL TIMES.
3. CONTRACTOR TO COORDINATE WITH CLARK COUNTY INSPECTOR AS TO THE EXACT LOCATION OF ALL SAWCUT LINES.
4. 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 COUNTY STREETS IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
5. ALL CONSTRUCTION SIGNING, BARRICADING AND TRAFFIC DELINEATION SHALL CONFORM TO THE "NEVADA WORK ZONE TRAFFIC CONTROL HANDBOOK – 1986" AND TO THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES – 1988".
6. ANY AND ALL POWER POLES TO BE RELOCATED ARE TO BE DONE AT NO EXPENSE TO CLARK COUNTY.
7. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CLARK COUNTY ENGINEER.
8. THE DEVELOPER SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL ALL PERMANENT SIGNS SHOWN ON PLANS. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CLARK COUNTY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POST SHALL BE INSTALLED IN ACCORDANCE WITH CLARK COUNTY STANDARDS.
9. IF A PROPOSED STREET LIGHT STANDARD IS FIELD LOCATED TO WITHIN (5) FEET OF ANY SIGN SHOWN HEREON TO BE MOUNTED ON A SIGN POST, THEN CHANGE SIGN MOUNTING TO ONE ON THE STREET LIGHT STANDARD.
10. 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.
11. WHEELCHAIR RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235, CLARK COUNTY AREA STANDARDS. EXACT LOCATION OF RAMPS SHALL BE DETERMINED IN THE FIELD BY A CLARK COUNTY INSPECTOR.
12. CURB AND GUTTER WITH A GRADE OF LESS THAN FOUR TENTHS OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
13. PRIVATE STREETS, CURB & GUTTER AND VALLEY GUTTERS REFLECTED ON THESE PLANS ARE TO BE INSPECTED BY A CLARK COUNTY INSPECTOR.
14. ALL WORK PERFORMED OUTSIDE THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENT HAS BEEN OBTAINED FROM THE OWNER.
15. FINAL ASPHALTIC CONCRETE(AC) PAVEMENT SURFACES SHALL BE ONE-HALF (1/2") INCH

CLARK COUNTY WATER RECLAMATION (CCWRD) GENERAL NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEM, LATEST EDITION AND THE UNIFORM STANDARDS FOR PUBLIC WORKS OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, LATEST EDITION.
2. ANY CONFLICTS BETWEEN THESE DOCUMENTS AND THE STANDARDS REFERENCED IN NOTE 1 MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER OF RECORD PRIOR TO PERFORMING ANY WORK.
3. ALL REVISIONS OF THE APPROVED PLANS MUST BE SUBMITTED TO THE CLARK COUNTY WATER RECLAMATION DISTRICT (DISTRICT) FOR REVIEW AND BE APPROVED PRIOR TO PROCEEDING WITH THE WORK. ALL WORK CONSTRUCTED WITHOUT THE APPROVAL OF THE DISTRICT MUST BE REMOVED AT THE CONTRACTORS EXPENSE.
4. ALL SANITARY SEWERS SHALL BE PVC SDR-35 SOLID WALL UNLESS OTHERWISE NOTED.
5. ALL SANITARY SEWER MAINS 8 INCHES AND LARGER AND ALL STUBS 8 INCHES AND LARGER ENTIRELY WITHIN THE PUBLIC RIGHT OF WAY SHALL BE PUBLIC UNLESS OTHERWISE NOTED. ALL ON SITE SEWER INFRASTRUCTURE SHALL BE PRIVATE UNLESS OTHERWISE NOTED.
6. ALL SANITARY SEWER MAINS SHALL BE THE SAME MATERIAL, SIZE, & SLOPE BETWEEN MANHOLES.
7. ALL SEWER MAINS SHALL BE IN THEIR OWN TRENCHES. THERE WILL BE NO SHARED TRENCHES ALLOWED.
8. THE MINIMUM SLOPES FOR ALL PIPES SHALL BE IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION STANDARDS.
9. ALL SANITARY SEWER MANHOLES MUST BE LOCATED SUCH THAT THEY ARE ACCESSIBLE IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION STANDARDS.
10. A DEBRIS TRAP MUST BE INSTALLED IN THE EXISTING SYSTEM AT THE POINT OF CONNECTION IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION STANDARDS.
11. ALL EXISTING MANHOLE CORROSION PROTECTION SYSTEMS MUST BE RESTORED TO THEIR ORIGINAL CONDITION, IF MODIFIED.
12. LOCATOR RIBBON AND MARKER BALLS SHALL BE PLACED ABOVE ALL NEW SEWER MAINS AND LATERALS IN ACCORDANCE WITH THE DESIGN AND CONSTRUCTION STANDARDS.
13. ALL EXISTING GRADE MUST BE RAISED TO WITHIN 18-INCHES OF FINAL GRADE PRIOR TO ANY SEWER TRENCHING.
14. PRIVATE SANITARY SEWER NOT REVIEWED OR APPROVED BY CCWRD.

I CERTIFY THAT THE ONLY DEVIATIONS FROM THE DESIGN AND CONSTRUCTION STANDARDS THAT ARE APPROVED BY THE CCWRD ARE LISTED BELOW:

- NONE

JOHN R. GUSTAFSON, P.E. LICENSE NO 13140 DATE

PROPOSED WASTEWATER CONTRIBUTIONS:

PARCEL(S):

APPROVED POC: ---- GPD

BUILDING C(type of establishment)
(bldg sq ft) SF X (GPD/lk gross bldg sqft) = ---- GPD

BUILDING B (RESTAURANT)
4,050 SF X 0.500 = 2025 GPD

BUILDING D (MEDICAL BLDG & CLINICS)
7,181 SF X 0.300 = 2154.3 GPD

BUILDING TOTAL GPD
1202.5+2025+1462.5+2154.3= 6844.3 GPD

REMAINING CAPACITY
POC GPD-TOTAL BLDG GPD= ----- GPD

FUTURE DEVELOPMENT- NONE

CLARK COUNTY WATER RECLAMATION DISTRICT DATE

CCWRD PIPES 19.940

SIGNATURE ON THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF CLARK COUNTY WATER RECLAMATION DISTRICT RULES, REGULATIONS, OR DESIGN AND CONSTRUCTION STANDARDS.

FIRE DEPARTMENT GENERAL NOTES

- A. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CLARK COUNTY FIRE CODE AS AMENDED, AND THE 2007 EDITION OF NATIONAL FIRE PROTECTION ASSOCIATION PAMPHLET #24
- B. FIRE HYDRANTS AND WATER SUPPLIES FOR FIRE PROTECTION SHALL BE AND MADE SERVICEABLE PRIOR TO AND DURING THE TIME OF CONSTRUCTION IN ACCORDANCE WITH SECTION 1412 OF THE CLARK COUNTY FIRE CODE, AS AMENDED.
- C. IF DURING CONSTRUCTION IT BECOMES NECESSARY TO CLOSE ANY CONTROL VALVE OR PLACE A HYDRANT OUT OF SERVICE, APPROVAL SHALL BE OBTAINED FROM THE FIRE DEPARTMENT PRIOR TO PLACING THE HYDRANT OUT OF SERVICE.
- D. PAINTING OF CURBS AND/OR STRIPING OF ASPHALT AREAS AND PROTECTION OF HYDRANTS FROM PHYSICAL INJURY SHALL BE PER THE FIRE HYDRANT INSTALLATION SPECIFICATIONS OF THE FIRE PREVENTION DIVISION.
- E. NO FIRE HYDRANT SHALL BE LOCATED WITHIN 25 FEET OF ANY STRUCTURE, OR 6 FEET OF A DRIVEWAY, POWER POLE, LIGHT STANDARD, OR ANY OTHER OBSTRUCTION. FOR WALL, FENCE AND PLANTER LOCATIONS, A PERIMETER AROUND THE HYDRANT MEASURING A MINIMUM OF 3 FEET FROM ITS EXTERIOR SHALL BE MAINTAINED CLEAR OF ALL OBSTRUCTION AT ALL TIMES.
- F. FIRE APPARATUS ACCESS ROADS SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF FIRE APPARATUS, WITH A MINIMUM VEHICLE LOAD OF 18,000 POUNDS PER AXLE, AND SHALL BE SURFACED AND PAVED SO AS TO PROVIDE ALL WEATHER DRIVING CAPABILITIES.
EXCEPTION: TEMPORARY ACCESS ROADS SERVING ONLY BUILDINGS UNDER CONSTRUCTION SHALL NOT BE REQUIRED TO BE PAVED, BUT SHALL COMPLY WITH ALL OTHER REQUIREMENTS OF SECTION OF THE CLARK COUNTY FIRE CODE.
- G. PRIOR TO ACCEPTANCE OF ANY FIRE SERVICE MAIN, A SATISFACTORY HYDROSTATIC TEST WITH PIPING JOINTS UNCOVERED MUST BE CONDUCTED. APPROVED PLANS, AN INSTALLATION PERMIT AND A CONTRACTOR'S MATERIALS AND TEST CERTIFICATE MUST BE PROVIDED AT TIME OF INSPECTION. SCHEDULE INSPECTION AT WWW.CLARKCOUNTYNV.GOV/BUILDING/FIRE-PREVENTION/PAGES/INSPECTIONSERVICES.ASPX
- H. FIRE HYDRANTS SHALL BE LOCATED 4' TO 7' FROM BACK OF CURB AND A MINIMUM OF 6 FEET AWAY FROM TURNS.
- I. BLUE REFLECTIVE MARKERS MUST BE INSTALLED BEFORE FINAL HYDRANT ACCEPTANCE CAN BE ATTAINED (SECTION C107 OF THE CLARK COUNTY FIRE CODE, AS AMENDED)
- J. HYDRANTS THAT ARE PROPOSED FOR INSTALLATION IN PUBLIC WATER SYSTEMS SHALL BE IN ACCORDANCE WITH APPROVED FIRE HYDRANTS AS ALLOWED BY THE WATER PURVEYOR. HYDRANTS PROPOSED FOR INSTALLATION ON PRIVATE WATER SYSTEMS SHALL BE IN ACCORDANCE WITH APPROVED FIRE HYDRANTS AS ALLOWED BY THE FIRE DEPARTMENT.

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS NOTES

1. INSPECTIONS ARE REQUIRED. CALL 24 HOURS IN ADVANCE, 455-4610. YOUR PERMIT APPROVED PLANS, AND BARRICADE PLANS FOR THIS WORK MUST BE ON THE JOB AT ALL TIMES.
2. EXACT LOCATION OF ALL SAW-CUT LINES SHALL BE DETERMINED IN THE FIELD BY A CLARK COUNTY INSPECTOR.
3. CURB AND GUTTER WITH A GRADE OF LESS THAN 4/10 OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
4. FINAL ASPHALTIC CONCRETE (AC) PAVEMENT SURFACES SHALL BE ONE-HALF (1/2") INCH ABOVE THE LIP OF THE GUTTER (INCLUDING OPEN GRADE).
5. ALL OFF-SITE IMPROVEMENT CONSTRUCTION SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS AND STANDARD DRAWINGS CLARK COUNTY AREA NEVADA AND CLARK COUNTY SUPPLEMENT TO UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS, LATEST REVISION EXCEPT FOR LUMINARIES. REFER TO CLARK COUNTY PUBLIC WORKS QUALIFIED PRODUCTS LIST "QPL" FOR LED LUMINARIES. QPL CAN BE FOUND ONLINE AT [HTTP://WWW.CLARKCOUNTYNV.GOV/PUBLIC-WORKS/PAGES/DEFAULT.ASPX](http://WWW.CLARKCOUNTYNV.GOV/PUBLIC-WORKS/PAGES/DEFAULT.ASPX).
6. PRIVATE STREETS, CURB & GUTTER AND VALLEY GUTTERS REFLECTED ON THESE PLANS ARE TO BE INSPECTED BY A CLARK COUNTY INSPECTOR.
7. WHEEL CHAIR RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235, EXACT LOCATION OF RAMPS SHALL BE DETERMINED IN THE FIELD BY A CLARK COUNTY INSPECTOR.
8. PROPER SIGNS, BARRIERS, BARRICADES AND LIGHTS SHALL BE PLACED AND MAINTAINED IN ACCORDANCE WITH THE LATEST "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS", TRAFFIC, SCHOOL, OR STREET SIGNS OF ANY KIND ARE NOT TO BE MOVED FOR ANY REASON WITHOUT FIRST COORDINATING WITH THE DEPARTMENT OF PUBLIC WORKS INSPECTIONS AT ☎ (702)-455-4610.
9. THIS PLAN DOES NOT AUTHORIZED CLOSURE OF ANY ROAD OR STREET.
10. NO OPEN TRENCH SHALL BE ALLOWED ACROSS ANY STREET OR WITHIN TEN (10') OF ANY TRAVEL-WAY, EXCEPT WHEN WORK IS IN ACTUAL PROGRESS. AREAS COVERED BY ACCEPTABLE STEEL PLATE ARE NOT TO BE CONSTRUCTED AS A TRENCH. NO OPEN TRENCH IS PERMITTED IN EXCESS OF 500 FEET OR LENGTH NECESSARY TO ACCOMMODATE PIPE INSTALLATION IN A SINGLE DAY, WHICH EVER IS GREATER. ALL TRENCH CROSSINGS AND BACKFILL SHALL MEET THE STANDARD SPECIFICATION UNLESS OTHERWISE STATED.
11. A TEMPORARY PATCH IS TO BE IN PLACE AT THE END OF EACH WORK DAY WHERE THE BACKFILL IN THE TRENCH HAS BEEN COMPLETED AND PRIOR TO OPENING THE WORK AREA BACK TO TRAFFIC AND IS TO BE MAINTAINED BY THE PERMITEE. A PERMANENT PATCH IS TO BE IN PLACE WITHIN THIRTY (30) DAYS AFTER THE INSTALLATION OF T THE TEMPORARY PATCH.
12. COMPACTION TESTS ARE REQUIRED.

ABBREVIATION LEGEND

AB		AGGREGATE BASE
AC	.....	ASPHALTIC CONCRETE
BC	.....	BEGIN CURVE
BCR	.....	BEGIN CURVE RETURN
BFE	.....	BASE FLOOD ELEVATION
BVC	.....	BEGIN VERTICAL CURVE
BS	.....	BACK OF SIDEWALK
CO	.....	CENTERLINE
CONC	.....	CLEAN OUT
CONC	.....	CONCRETE
DE	.....	DRAINAGE EASEMENT
ELEV	.....	EDGE OF ASPHALTIC CONCRETE
EC	.....	ELEVATION
END	.....	END OF CURVE
EVG	.....	END OF VERTICAL CURVE
EXIST	.....	EXISTING GRADE
EG	.....	EXISTING GRADE
FF	.....	FINISH FLOOR
FL	.....	FIRE HYDRANT
FL	.....	FLOW LINE
FS	.....	FINISH SURFACE
G	.....	GAS
GB	.....	GRADE BREAK
HORIZ	.....	HORIZONTAL
HP	.....	HIGH POINT
INT	.....	INTERSECTION
L	.....	LENGTH
LF	.....	LINEAL FEET
MANH	.....	MANHOLE
NTS	.....	NOT TO SCALE
PI	.....	POINT OF INTERSECTION
PRC	.....	POINT OF REVERSE CURVATURE
POT	.....	POINT OF TANGENT
PL	.....	PROPERTY LINE
R	.....	RADIUS
REF	.....	REFERENCE
RCF	.....	REINFORCED CONCRETE PIPE
R/W	.....	RIGHT OF WAY
SS	.....	SANITARY SEWER
SW	.....	SIDEWALK
S	.....	SLOPE
SHT	.....	SHEET
STA	.....	STATION
ST LT	.....	STREET LIGHT
T	.....	TANGENT
TC	.....	TOP OF CURB
TCO	.....	TRAFFIC CONTROL DEVICE
TW	.....	TOP OF WALL
TRW	.....	TOP OF RETAINING WALL
TW	.....	TOS OF PARASOL WALL
TFW	.....	TOP OF FLOOD WALL
TF	.....	TOP OF FOOTING
TYP	.....	TYPICAL
VER	.....	VERTICAL
VC	.....	VERTICAL CURVE
W	.....	WATER

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

PROJECT NO. FIRST APPROVED DATE: _____

LVVWD APPROVED FIRE FLOW: TOTAL GPM/ONSITE GPM

LVVWD APPROVAL IS VALID FOR ONE (1) YEAR FROM SIGNATURE DATE. IF CONSTRUCTION IS NOT STARTED, PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL.

NEVADA POWER COMPANY DATE

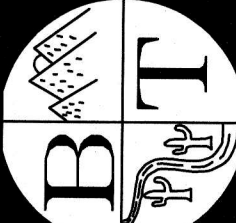
NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULE AND REGULATIONS.

DISCLAIMER NOTE

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BAUGHMAN & TURNER, INC.



CIVIL ENGINEERS
1210 HINSON STREET
LAS VEGAS, NEVADA 89102
PHONE: (702) 870-8771 FAX: (702) 878-2695

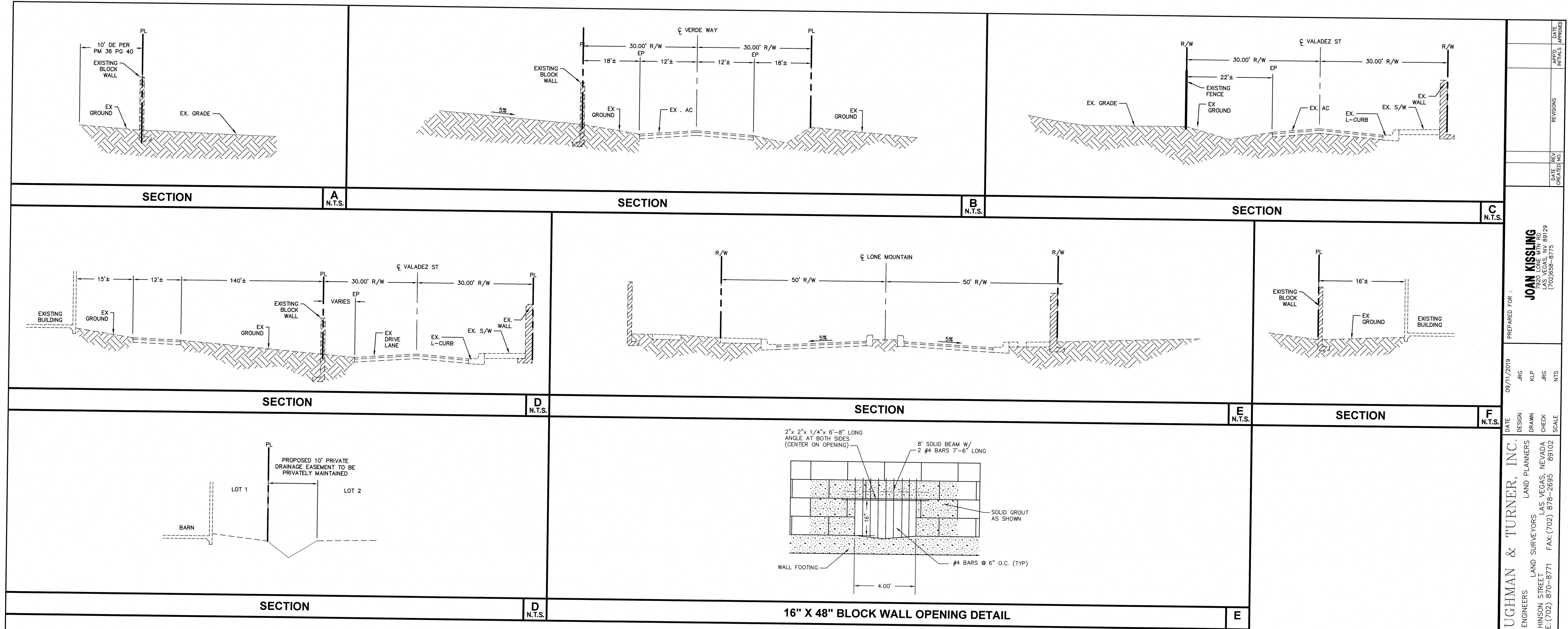
SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M. CLARK COUNTY NEVADA

DIAZ KISSLING GENERAL NOTES
APN 125-33-38-805-008

SHEET

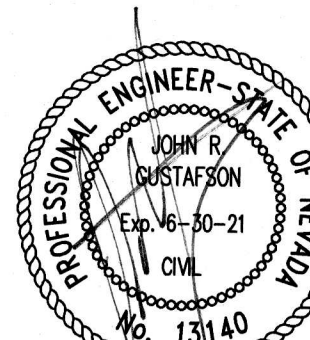
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2 OF 4
PROJ. NO. D151

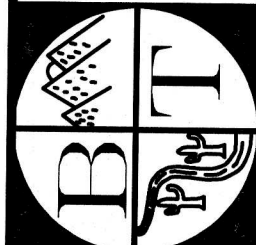


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PM 19-600023
GRADING DETAILS
 SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M. CLARK COUNTY NEVADA
APN 125-33-805-008

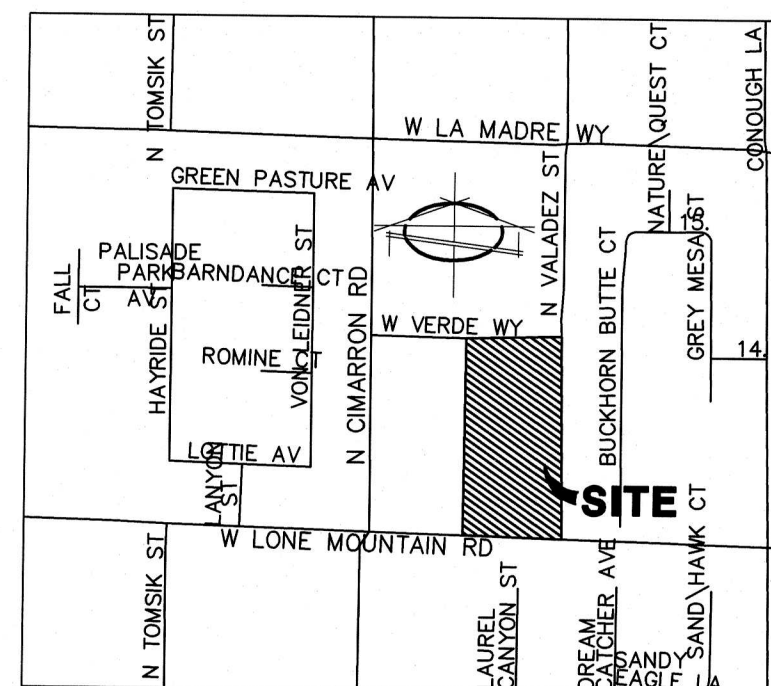
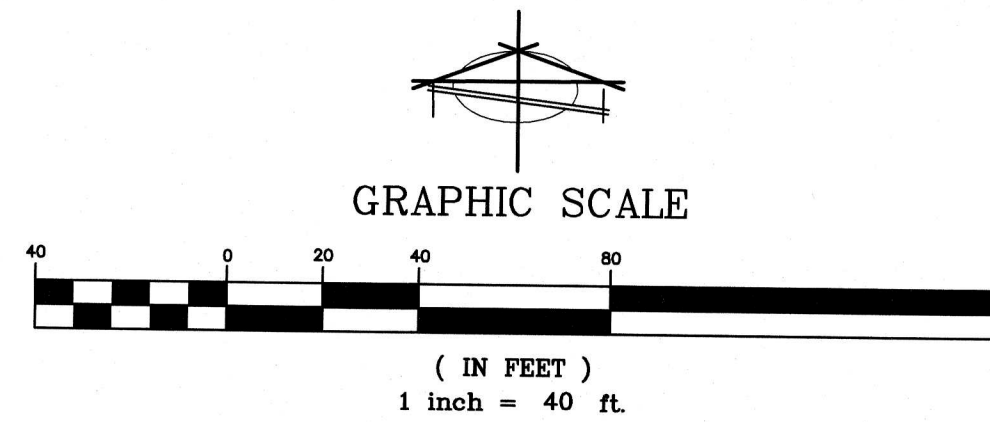
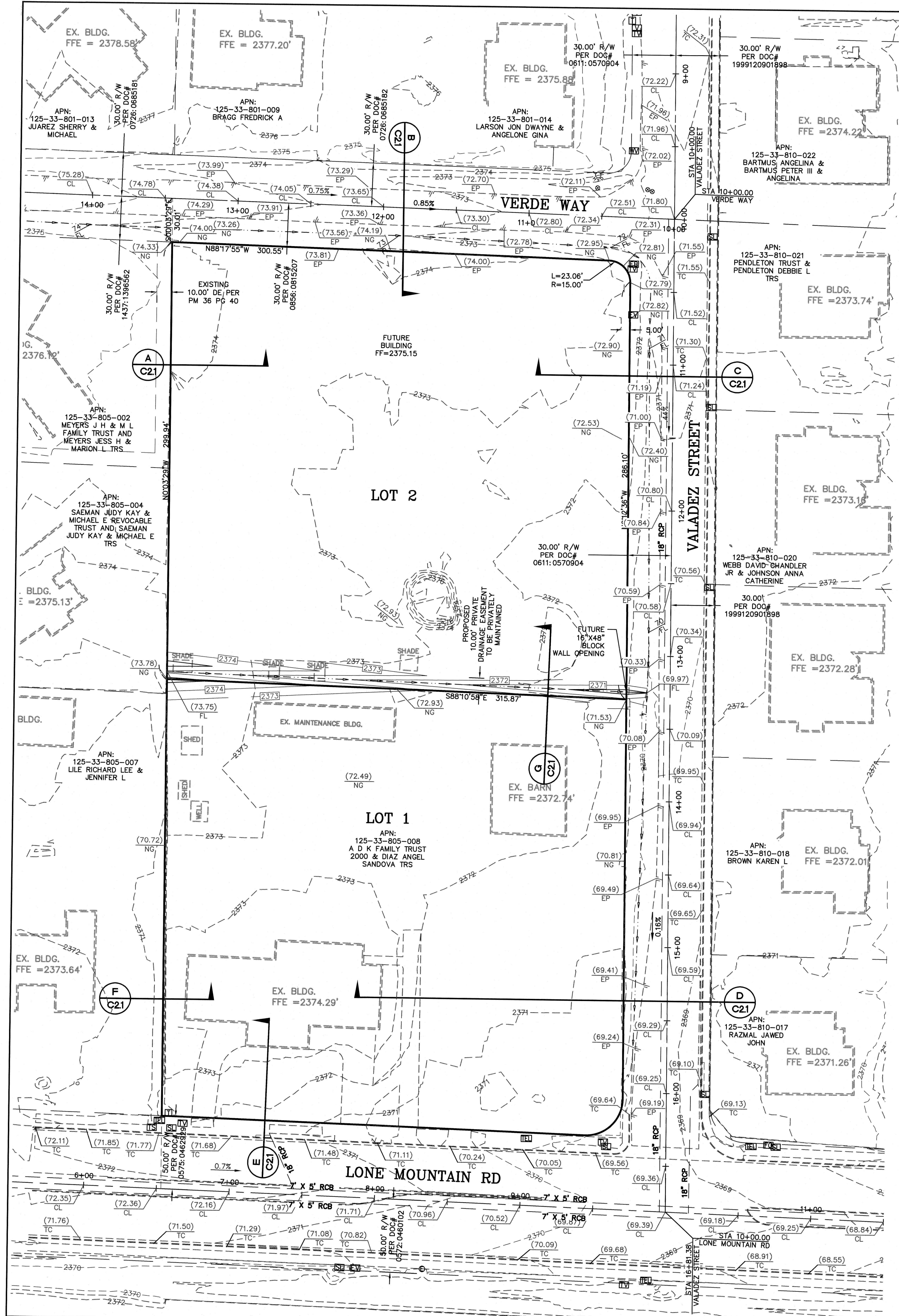


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 CIVIL ENGINEERS LAND PLANNERS
 1210 HINSON STREET LAS VEGAS, NEVADA 89102
 PHONE: (702) 870-8771 FAX: (702) 878-2695

PREPARED FOR :
JOAN KISSING
 7230 LONE MOUNTAIN RD
 LAS VEGAS, NV 89129
 (702) 658-8775

DATE	REV	REVISIONS	APP'D	INITIALS	APPROVED
09/11/2019	JRG	DESIGN			
	KLP	DRAWN			
	JRG	CHECK			
	NTS	SCALE			

SHEET
C2.1
 4 OF 4
 PROJ. NO. D151



LEGEND	
	PROPERTY LINE
	STREET CENTERLINE
	LOT LINE
	BUILDING SETBACK LINE
	PROPOSED ROLL CURB
	EXISTING "L" CURB & GUTTER
	EXISTING CONTOUR LINES
	PROPOSED FLOW LINE
	SAW CUT LINE
	PROPOSED EDGE OF PAVEMENT
	EXIST. EDGE OF PAVEMENT
	PROPOSED BLOCK WALL
	EXIST. BLOCK WALL
	SAW CUT AREA
	MATCHLINE
	PROPOSED ELEVATION & LOCATION
	EXISTING ELEVATION & LOCATION
	PROPOSED GRADE
	CONSTRUCTION NOTE
	PROPOSED HYDRANT
	SIGHT VISIBILITY ZONE*
	ROADWAY EASEMENT
	ASPHALTIC CONCRETE CENTERLINE
	TOP OF CURB
	EDGE OF PAVEMENT
	FINISHED GRADE
	TOP OF FOOTING
	TOP OF RETAINING WALL
	TOP OF FLOOD WALL
	TOP OF STEM WALL
	BACK OF SIDEWALK
	GRADE BREAK
	BEGIN VERTICAL CURVE
	END VERTICAL CURVE
	FLOW LINE
	HIGH POINT
	INVERT
	LINEAR FEET
	LOW POINT
	LANDSCAPE
	SOUTHWEST GAS
	PUBLIC UTILITY EASEMENT
	PRIVATE DRAINAGE EASEMENT
	PRIVATE SEWER EASEMENT
	PRIVATE LANDSCAPE EASEMENT

*NOTE: NOTHING OVER 24" IN HEIGHT ALLOWED IN SIGHT VISIBILITY ZONE EXCEPT TRAFFIC CONTROL DEVICES.

ENGINEERS CERTIFICATE

I CERTIFY THAT THIS GRADING PLAN IS IN ACCORDANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT CLARK COUNTY FOR THIS PROJECT. ----

JOHN R. GUSTAFSON, P.E.

DATE

APPROVALS

CLARK COUNTY
DEPARTMENT OF PUBLIC WORKS
DEVELOPMENT REVIEW

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

OWNER/DEVELOPER

7920 LONE MTN RD
LAS VEGAS, NV 89129
(702)658-8775
joankissling@gmail.com

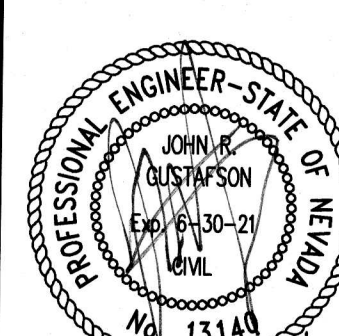
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FAST
Call before you Dig
UnderGround
1-702-432-5300
SYSTEM OF TRANSPORTATION



PM 19-600023
GRADING PLAN

SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M. NEVADA
CLARK COUNTY

C2.0

3 OF 4
PROJ. NO. D151

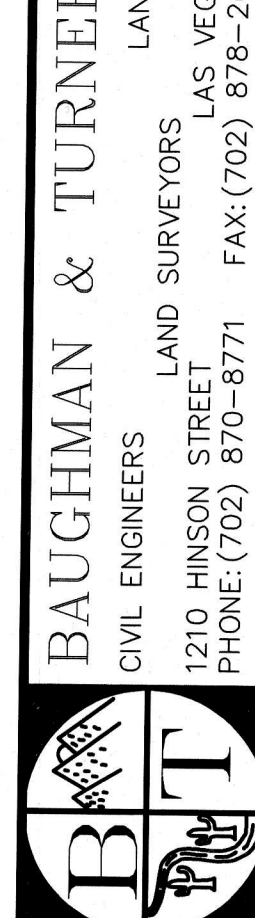
JOAN KISSLING
7920 LONE MOUNTAIN RD
LAS VEGAS, NV 89129
(702)658-8775

JRG EC JRG

DATE DESIGN DRAWN CHECK SCALE

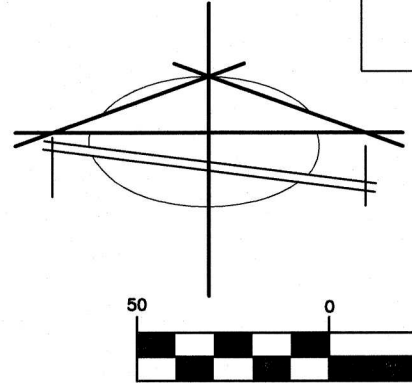
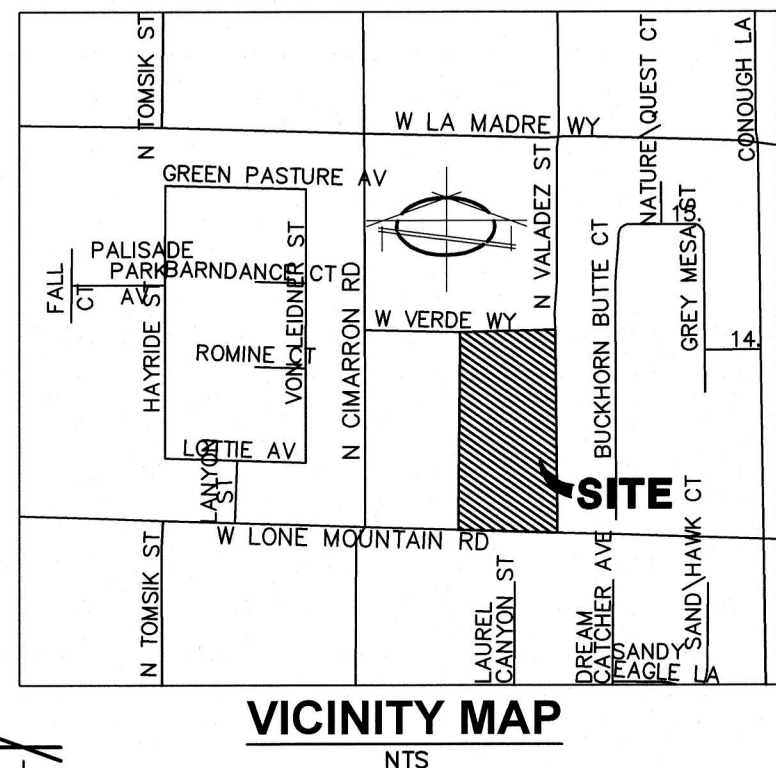
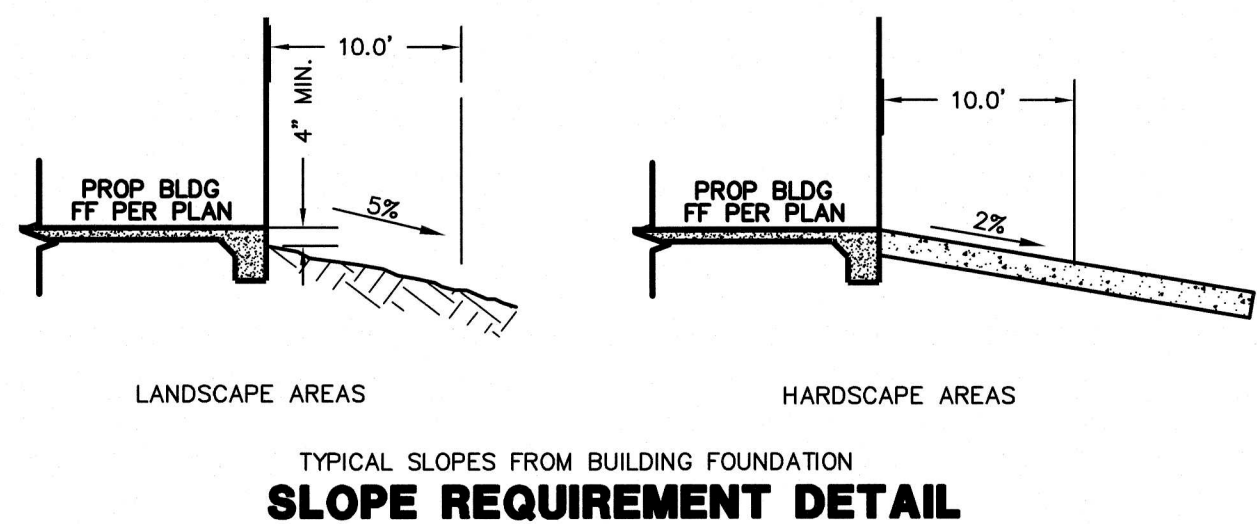
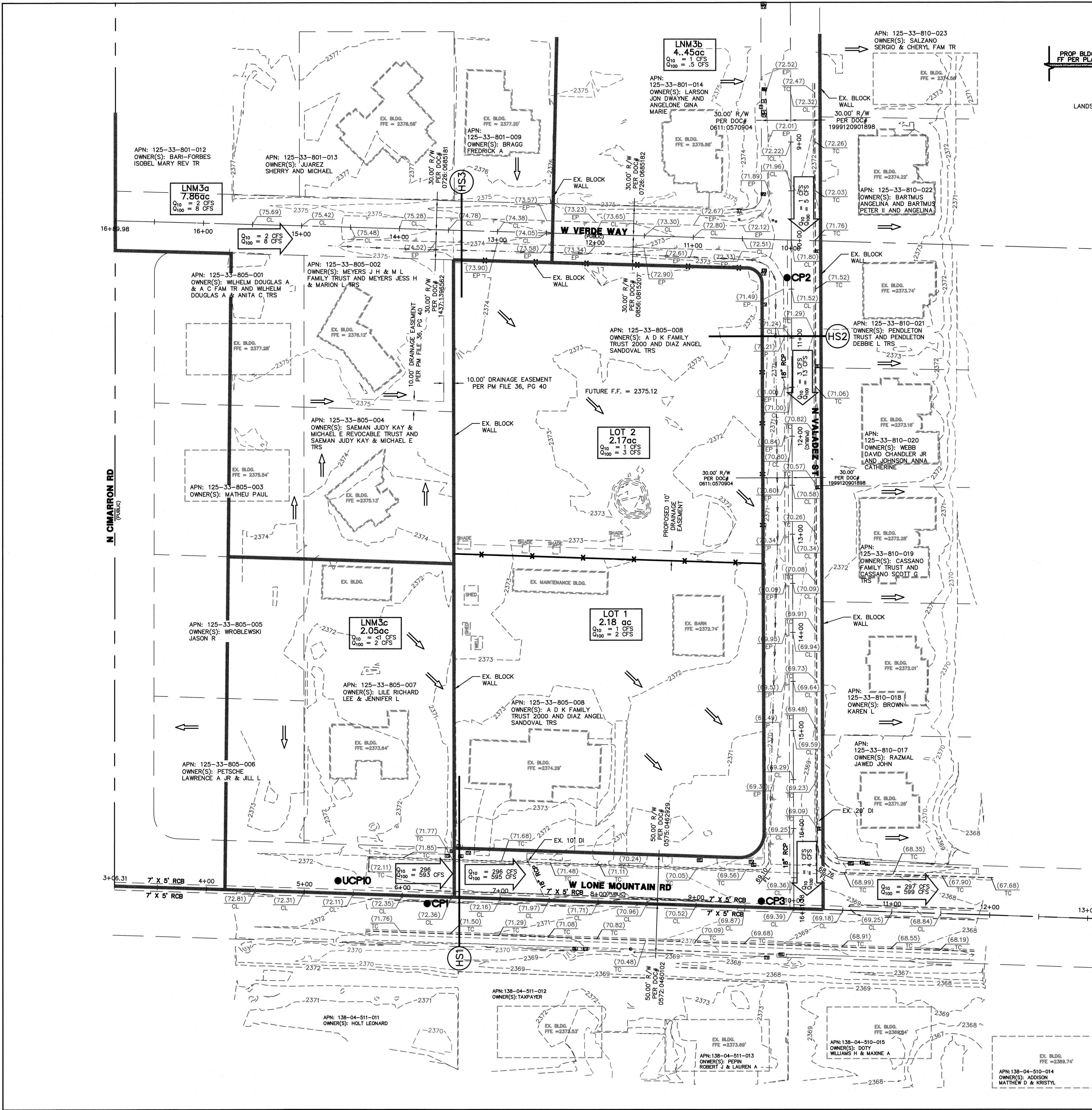
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CIVIL ENGINEERS LAND PLANNERS LAND SURVEYORS

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SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M. NEVADA
CLARK COUNTY

APN 125-33-805-008



EARTHWORK QUANTITIES

CUT: 2.88 CY
FILL: 746.99 CY
NET: 744.11 CY (FILL)

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 1LV90 33C4 - BEING A RIVET AND PLATE IN THE TOP OF CURB AT THE NORTHEAST CORNER OF WASHBURN AND CIMARRON.

728.611 METERS NAVD 88 DATUM 2390.45 FEET

BASIS OF BEARING

SOUTH 88°31'54" EAST - BEING THE CENTERLINE OF LA MADRE WAY AS SHOWN IN FILE 72 OF PARCEL MAPS, PAGE 12, CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA.

LAND DISTURBANCE

OFFSITE: 0.0 ACRES
ONSITE: 0.4 ACRES

FLOOD ZONE INFORMATION

THE FLOOD INSURANCE RATE MAP, CLARK COUNTY, NEVADA, COMMUNITY PANEL NO. 32003C2135F (EFFECTIVE DATE NOVEMBER 16, 2011), PUBLISHED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA), INDICATES THAT THE SITE IS LOCATED IN A ZONE X. A ZONE X IS DETERMINED TO BE AN AREA OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

Peak Flow Summary			
Ultimate Condition			
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
UCP10*	---	593	296
LNMB3**	2.05	2	<1
CP1	---	595	296
LNMB3**	7.86	8	2
LNMB3**	4.45	5	1
CP2	---	13	3
LOT1**	2.18	2	1
LOT2**	2.17	3	1
Flow in Valadez after DI*	---	4	<1
CP3	---	599	297

*Includes referenced flows from Lone Mountain study
**Prorated from flows from Gowan North Buffalo Branch

Street Capacity Summary					
Section	Location	Slope	Q (cfs)	D (ft)	V (fps)
10-Year Flow - Developed Conditions					
HS1	Lone Mountain 1/2 St	0.70%	3	0.4	2.02
HS2	Valadez	0.44%	3	0.4	0.91
HS3	Verde	0.75%	2	0.2	0.89
100-Year Flow - Developed Conditions					
HS1	Lone Mountain 1/2 St	0.70%	9	0.5	2.47
HS2	Valadez	0.44%	13	0.5	1.44
HS3	Verde	0.75%	8	0.4	1.37
	Drainage easement	0.78%	3	0.7	1.75
100-Year Flow - Future Conditions					
HS1	Lone Mountain (100 yr-10 yr)	0.70%	297*	1.4	4.5

*100-yr reference flow of 593 minus the 10-yr reference flow 296 (collected by storm drain system = 297 cfs)

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PREPARED FOR: **JOAN KISSLING**
7920 LONE MOUNTAIN RD
LAS VEGAS, NV 89129
(702) 858-3775

DATE: 11/14/2018
DESIGN: JRG
DRAWN: EC
CHECK: JRG
SCALE:

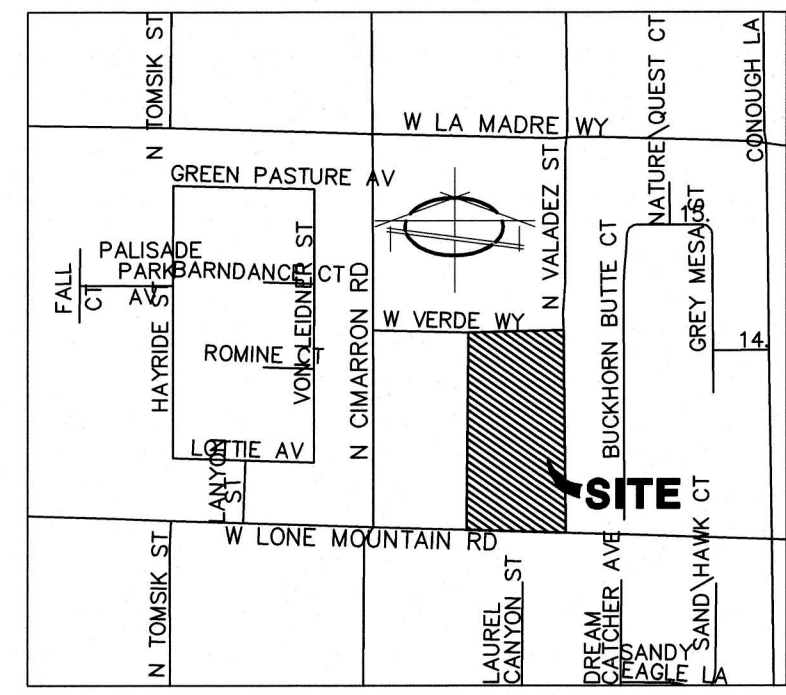
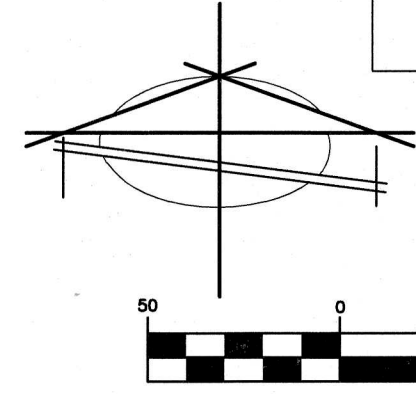
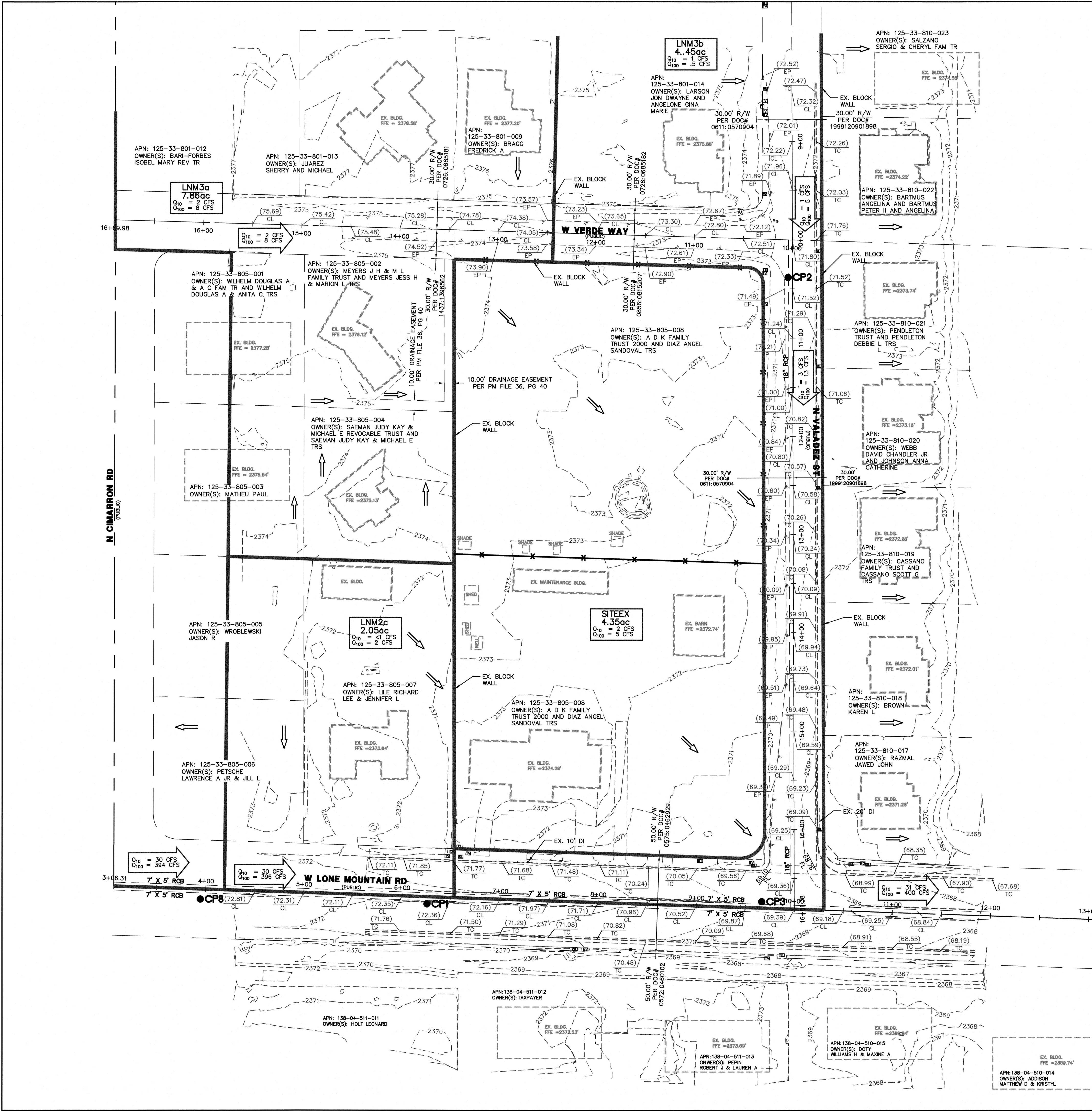
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PM-1960023
ON-SITE DEVELOPED CONDITIONS MAP
SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M. NEVADA
CLARK COUNTY

APN 125-33-805-008

SHEET
FIG12

PROJ. NO. D151



VICINITY MAP

GRAPHIC SCALE

(IN FEET)

1 inch = 60 ft.

DRAINAGE LEGEND

- PROPERTY LINE
- LOT LINE
- STREET CENTERLINE
- PROPOSED WALL
- EXISTING WALL
- RETAINING FLOOD WALL
- PROPOSED "L" CURB & GUTTER
- EXISTING "L" CURB & GUTTER
- EXISTING CONTOUR LINES
- PROPOSED CONTOUR LINES
- EXISTING EDGE OF PAVEMENT
- PROP. ELEVATION & LOCATION
- EX. ELEVATION & LOCATION
- PROPOSED GRADE
- EXISTING DRAINAGE FLOW CENTERLINE
- TOP OF CURB
- EDGE OF PAVEMENT
- FINISHED GRADE
- GRADE BREAK
- FINISHED FLOOR
- HIGHPOINT
- ASPHALTIC CONCRETE
- BLANKET THICKNESS
- OVERHEAD ELECTRIC LINES
- DRAINAGE BASIN BOUNDARY
- COMBINATION POINT
- BASIN NAME & FLOW DATA
- DIRECTION OF FLOWS
- STREET CAPACITY LOCATION

Peak Flow Summary			
Existing Condition			
Source	Basin Area (ac)	100-year Flow (cfs)	10-year Flow (cfs)
CP8*	--	394	30
LNMBG**	2.05	2	<1
CP1	--	396	30
LNMA**	7.86	8	2
LNMB**	4.45	5	1
CP2	--	13	3
SITEEX**	4.35	5	2
Flow in Valdez after DI*	--	4	<1
CP3	--	400	31

*Includes referenced flows from Lone Mountain study
**Prorated from flows from Gowan North Buffab Branch

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FREEMAN AND ARTERIAL SYSTEM OF TRANSPORTATION

PREPARED FOR:
JOAN KISSLING
LAS VEGAS, NV 89129
(702) 658-8775

DATE: 11/14/2018
DESIGN: JRG
DRAWN: EC
CHECK: JRG
SCALE:

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PM-1960023
FIG10 ON-SITE EXISTING CONDITIONS
SECTION 33, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.B. & M. NEVADA
CLARK COUNTY
APN 125-33-805-008

SHEET
FIG10
PROJ. NO. D151