

DS #: 05297

APN: 138-07-401-001

PROJECT: Hualapai ? Isaac Newton Single Family Residential

SUBMITAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		August 10, 2020
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:	COPIES TO:
	Hualapai & Isaac Newton Single Family Residential	VTN Nevada
Cross Streets:	NEQ of Hualapai Way & Isaac Newton Way	AMH Development West GC, LLC
File Number:	F:\Depot\DSMemos\DS5297A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	138-07-401-001	
Zoning Action:	GPA-77926; MOD-77927; SDR-77928; TMP-77930 & VAR-77931	
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	7/21/2020 (Paid on 7/31/2020)	8/10/2020	See Comments Below	\$400.00	3935347: \$400
			TOTAL FEES (LDDRS):	\$400.00	----

REMARKS:

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

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

- Provide a copy of the zoning/planning conditions associated with this site (**GPA-77926; MOD-77927; SDR-77928; TMP-77930 & VAR-77931**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.
- Sites with a grade difference of 2 feet above or below existing grades are required to have approval from the *City of Las Vegas Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide *City Planning* approval with the next submittal.
- Provide rainfall depth calculations for outside of the McCarran rainfall area. Show the site location on Figures 503 and 506 from the HCDDM.
- In *Standard Form 1*, correct the "Range" information from R50E to R60E.
- In *Standard Form 4*, the basin areas are off when converting from square miles to acres. EX basin EX1: 0.0073 sq-mi = 4.67 ac, instead it is showing 4.64 ac. Verify conversions accordingly.

6. Verify the slopes in Pima County Flow Split Calculations – Ultimate Condition for Isaac (10-yr) and Isaac (100-yr). The Slopes between 10 and 100 year differ.
7. **Figure 6 (Existing Condition Drainage Map):** Provide a concentration point at the northeast corner of the subject site on the plan and the *HEC-1 Summary Table* in the next submittal.
8. **Sheet GR1:** Show and label the slope in the bulb of *Roseum Court*. Note that the minimum slope in the bulb is 1%.
9. **Sheet GR2:** CE “F” must also be dedicated as a “Public Drainage Easement to be Privately Maintained by the HOA”.
10. **Sheet GR2:** Identify an existing drainage easement in the adjacent apartment complex to the east and label with recorded document or final map number on the grading plan.
11. **Sheet GR2:** Between CE “F” and the adjacent existing drainage easement, should there be a wrought iron fence/gate to separate the two communities? Provide as such in the next submittal.
12. **Sheet GR3:** Show and label the slope in the bulb of *Aconitum Court*.
13. **Sheet GR3:** The linetype in Lot 16 appears that it doesn’t have a wall along *Hualapai Way*. Revise the linetype accordingly.
14. **Sheet DT1:** Typical Section C: A 2’-gap is proposed between an existing wall and the new wall. This will create a no-man land and difficult to maintain. Obtain direction from *City Planning* for possible mitigation prior to the final approval of the subject drainage study.
15. **Sheet DT1:** Typical Sections I, L and Q: Clearly specify the bottom 3 courses of the floodwall to be solid grouted 8”-CMU or equivalent thickness block.
16. Private streets must be public drainage easements. Provide a note on the grading plans, “Note: All private streets are P.U.E., Public Sewer Easements and Public Drainage Easements to be privately maintained by HOA”.
17. All drainage easements must be public drainage easements to be privately maintained and common lots to be labeled on the grading plans and to be dedicated as such in the final map.
18. The engineer must provide a table on the grading plans that shows a quantity estimate of all drainage improvements within Public Drainage Easements. All drainage improvements within Public Drainage Easements must be bonded and inspected.

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
HDR/AYS

T/R/S: T20S/R60E/07
AREA L-07

138-07-401-001

TMP-77930
SDR-77928
PRJ-77880

August 17, 2020
W.O. #8031

City of Las Vegas
Planning & Development
333 N. Rancho Blvd, 3rd Floor
Las Vegas, NV 89106

PLANS APPROVED
PLANNING
Dept. of Planning
City of Las Vegas, Nevada
2' +/- GRADE DIFFERENCE
LHM AUG 25 2020 ONLY

Conforms to the minimum requirement of
LVMC Title 19; applicable Master Plan
Development standards and/or Conditions of
Approval. Make No Change Without Approval.
Plan is Not a Permit to Violate Any Ordinance.

SUBJECT: HUALAPAI AND ISAAC NEWTON SINGLE FAMILY RESIDENTIAL

To Whom it May Concern:

This letter is being submitted to the *City of Las Vegas Planning and Development Department* at the request of the *City of Las Vegas Flood Control Department* due to the subject site having existing and finish grades that differ by more than 2-feet. This letter is intended to justify the grade differences shown on the grading plan. A copy of the plans for the subject project and the drainage study comment letter (see Comment #2) are also being submitted for your review. The CLV Flood Control requires Planning Department approval prior to the approval of the drainage study.

The subject site is bound by the fully developed Hualapai Way to the west, Isaac Newton Way to the south, and condominium site to the north and east. The site is constrained by the existing grades set by the streets and developments bounding the site. The onsite water line will connect to the existing water main in Hualapai Way at the west end of Aconitum Court. The Las Vegas Valley Water District (LVVWD) easement at the west end of Aconitum Court is subject to meeting drivable criteria, therefore slopes at the west of the site are limited. In addition, the developer of the adjacent condominium site to the east has set finished floor elevations lower than existing grades. The aforementioned constraints result in retaining wall height up to 9-feet on the southeast side of the project. Please note that the east retaining wall height gradually reduces to the north.

The grading constraints and possible design alternatives were coordinated with City of Las Vegas Flood Control prior to the submittal of drainage study and grading plans. To minimize the amount of retaining required, the west side of the site has been lowered as much as possible while still meeting LVVWD easement criteria. The driveway entrance "hump" elevation to Isaac Newton Way was reduced as much as possible, below what is typically required by drainage criteria, in order to reduce site elevations. Other alternatives such as utilizing an offsite crown or superelevating Blodwen Street, and Type B drainage for Lots 21 to 37, were also considered and discussed with the Flood Control Department. However, these alternatives were not utilized because they would cause unfavorable drainage conditions, and the back of Lots 21 to 37 do not have adequate space for a concrete drainage easement. It was also determined that at most these alternatives would reduce maximum retaining by only 1-1.5 feet which would still leave large retaining walls and in addition to unfavorable drainage conditions.

The CLV Flood Control Department is aware of the grading constraints, and VTN has designed the site according to the most preferable alternatives which account for drainage considerations. The engineer respectfully requests that the Planning Department approves the grading plan with the justifications summarized in this letter.

Additional Comment #14

Please refer to Comment #14 in the drainage study comment letter. Section C on Sheet DT1 proposes a 2-foot gap between the adjacent property screen wall and proposed retaining wall. Flood Control has requested that we obtain direction from the Planning Department for possible mitigation due to maintenance concerns. Please also include direction for Comment #14 as requested by Flood Control to the engineer, if any.

If any additional information or further coordination is required, please do not hesitate to contact this office.

Respectfully Submitted,

A handwritten signature in blue ink, appearing to read 'J. Ayson', with a stylized flourish at the end.

Joanna Ayson, P.E.

Office: (702) 873-2550

Direct: (702) 253-2462

Email: jayson@vtnnv.com

Albert Sung

From: Linda Hartman-Maynard
Sent: Wednesday, August 26, 2020 7:12 AM
To: jayson@vtnnv.com
Cc: Albert Sung
Subject: FW: Scanned image from City of Las Vegas
Attachments: MFD-200_20200825_132736.pdf

Good Morning,

Please see the attached approval of a 2-foot plus or minus grade difference for Hualapai and Isaac Newton single family subdivision.

Please note on sheet DT1, detail c, indicate two walls adjacent to one another, separated by a two-foot space between them.

Title 19.06, section H, Fences and Walls, (3) (c) Wall separation. Where a screen or perimeter walls abuts another screen or perimeter wall, the separation shall either be:

i. A minimum of three feet from face of wall to face of wall, with access provided to the area between the walls for maintenance; or ii. A maximum of eight inches, with the resulting gap between the walls to be filled and capped with a cementitious material that:

- A) Will not increase the load on the walls; and
- B) Has been approved by the Departments of Planning and Building and safety.

Regards,

Linda Hartman-Maynard
Planner
Planning Department | Permits
(702)229-6899
333 N Rancho Dr. | Las Vegas, NV 89106
lasvegasnevada.gov

-----Original Message-----

From: MFD-200@LASVEGASNEVADA.GOV <MFD-200@LASVEGASNEVADA.GOV>
Sent: Tuesday, August 25, 2020 1:28 PM
To: Linda Hartman-Maynard <lmaynard@LasVegasNevada.GOV>
Subject: Scanned image from City of Las Vegas

Reply to: MFD-200 <MFD-200@LASVEGASNEVADA.GOV> **Device Name:** City of Las Vegas **Device Model:** MX-5070V
Location: Development Service Center 333 N. Rancho

File Format: PDF (Medium)
Resolution: 300dpi x 300dpi

Attached file is scanned image in PDF format.
Use Acrobat(R)Reader(R) or Adobe(R)Reader(R) of Adobe Systems Incorporated to view the document.

Technical Drainage Study for

Hualapai & Isaac Newton Single Family Residential

Las Vegas, Nevada

Prepared for:

AMH Development

Submitted to:

City of Las Vegas
Public Works



HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Hualapai & Isaac Newton Single Family Residential Date: Jul 21, 2020

Location of Development: a) Descriptive (Cross Streets) North/South: Hualapai Way
East/West: Isaac Newton Way

b) Section: 7 Township: 20S Range: 50E

c) APN : 138-07-401-001

Name of Owner: AMH Development West GC, LLC

Telephone No.: (702) 703-5319 Fax No.: (702) 477-0429 E-Mail Address: tkolstad@ah4r.com

Address: 280 Pilot Road, Suite 200, Las Vegas, Nevada 89119

Contact Person-Name: Joanna Ayson Telephone No.: (702)-873-7550

* E-Mail Address: jayson@vtnnv.com Fax No.: (702)-362-2597

Firm: VTN Nevada

Address: 2727 S. Rainbow Blvd, LV, NV, 89146

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: +/- 1.23 Acres Being Developed/Disturbed: +/-1.23 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

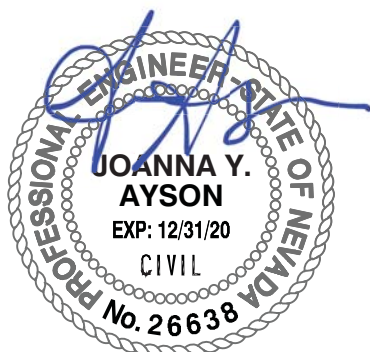
4. Proposed type of development (Residential, Commercial, Etc.): Residential

5. Approximate upstream land area which drains to the subject site: +/- 0 acres

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: TDS for The Boulders Condominium Conversion (DS 3736), TDS for Tiara Summit (DS 3478), TDS for Cheyenne/Hualapai Units 3 and 4 (DS 2279)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: 10' drainage easement at northeast corner of project towards the Boulders Condominiums

8. Briefly describe your proposed schedule for the subject project: As soon as possible



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



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

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

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

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
N/A		Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
X		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
X		Back of lot elevations and lot drainage pattern for all lots including common lots.
X		Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
N/A		This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
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.
X		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
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.

July 20, 2020

Albert Sung, P.E.
Flood Control Division
Department of Public Works
CITY OF LAS VEGAS
333 N. Rancho Blvd, 7th Floor
Las Vegas, NV 89106

Subject: Technical Drainage Study for Hualapai & Isaac Newton Single Family Residential

Mr. Sung:

This letter certifies that all items on the **Technical Drainage Study for Hualapai & Isaac Newton Single Family Residential** electronic submittal matches the paper version bound into the study.

Respectfully submitted,



Joanna Ayson, P.E.

TECHNICAL DRAINAGE STUDY
FOR
HUALAPAI & ISAAC NEWTON
SINGLE FAMILY RESIDENTIAL
CLARK COUNTY, NEVADA
W.O. # 8031

Prepared for:
AMH DEVELOPMENT WEST GC, LLC

Submitted to:
CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS





July 21, 2020
W.O. #8031

City of Las Vegas
Land Development Services
Department of Building Safety

Attention: Albert Sung, P.E., CFM
Flood Control Project Engineer

SUBJECT: TECHNICAL DRAINAGE STUDY FOR HUALAPAI & ISAAC NEWTON SINGLE FAMILY RESIDENTIAL

Mr. Albert Sung, P.E. CFM,

Transmitted herewith for your review is one (1) copy of the *Technical Drainage Study for Hualapai & Isaac Newton Single Family Residential*. The site is a ±4.6-acre residential development located within a portion of Section 7, Township 20 South, Range 60 East, M.D.M, Clark County, Nevada.

If there are any questions concerning this study or if additional information is needed, please do not hesitate to contact this office.

Respectfully Submitted,

VTN Nevada

Joanna Y. Ayson, P.E.

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I. INTRODUCTION

A. STUDY OVERVIEW AND PURPOSE

AMH Development West GC, LLC is proposing to construct a Single-Family Residential development located northeast of the Hualapai Way and Isaac Newton Way intersection. The proposed project consists of residential unites situated on ± 4.6 acres. This *Technical Drainage Study for Hualapai & Isaac Newton Single Family Residential* serves to analyze the drainage conditions for the proposed development and to determine adequate flood protection for the project. The methodology presented in this study is in accordance with the criteria set forth in the Clark County Regional Flood Control District (CCRFCDD) *Hydrologic Criteria and Drainage Design Manual* (HCDDM) (Hereinafter referred to as the Manual).

B. LOCATION

The project site lies within a portion of Section 7, Township 20 South, Range 60 East, M.D.M, Clark County, Nevada. Specifically, the site is located northeast of the Hualapai Way Isaac Newton Way intersection (Refer to *Figure 1: Vicinity Map*).

C. DESCRIPTION

The site generally slopes from southwest to northeast at approximately $\pm 3.5\%$ and is bound by an existing residential development to the north and east, Hualapai Way to the west, and Isaac Newton Way to the south. (Refer to *Figure 2: Site Description Map*)

D. FLOODPLAIN INFORMATION

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community Panel Numbers 32003C2150E, Clark County, Nevada, and Incorporated Areas, dated September 27, 2002, the site is located within a Zone "X". A Zone "X" is described as an area determined to be outside the 0.2% annual chance floodplain. (Refer to *Figure 3: Flood Insurance Rate Map*)

E. MASTER PLANNING INFORMATION

The proposed site is delineated on Figures F-23 and W-6, which were referenced from the 2018 Clark County Regional Flood Control District (CCRFCDD) Las Vegas Valley Flood Control Master Plan Update (MPU). The site land use is described as Residential, 8-12 units/acre, and lies within the Flamingo/Tropicana Watershed. No existing or proposed CCRFCDD MPU Facilities are adjacent to or within the project. (Refer to *Figures 4A and 4B, MPU Facilities Map and MPU Hydrologic Map*)

F. REFERENCED HYDROLOGY STUDIES

The following drainage studies have been reviewed by the engineer and have been determined to be acceptable for use as reference material for this drainage study:

- *Technical Drainage Study for Cheyenne/Hualapai Units 3 and 4* by VTN Nevada (hereinafter referred to as the Cheyenne Study), approved by City of Las Vegas on May 24, 1999 (CLV DS# 2279E).
- *Technical Drainage Study for Tiara Summit* by Taney Engineering by Taney Engineering (hereinafter referred to as the Tiara Summit Study), approved by City of Las Vegas (CLV) on May 12, 2004 (CLV DS# 3478).
- *Technical Drainage Study The Boulders Condominium Conversion* by Stanley Consultants (hereinafter referred to as The Boulders Study), approved by CLV on May 23, 2006 (CLV DS# 3736)

II. HYDROLOGIC ANALYSIS

A. METHOD OF ANALYSIS

The hydrologic modeling for this study was prepared using the SCS Unit Hydrograph Methodology in conjunction with the HEC-1 computer program from the U.S. Army Corps of Engineers (USACOE) as outlined in the CCRFCD *Hydrologic Criteria and Drainage Design Manual*. The computation and analyses have been included in the Appendix of this study.

B. RAINFALL CRITERIA

According to Figure 513 of the Manual, the site is located outside the McCarran Airport Rainfall Area. Precipitation values have been taken from the NOAA ATLAS 2, then adjusted per table 501 in the Manual. The design precipitation depth for the 10-year and 100-year storm events are 1.67 inches and 3.00 inches, respectively. Rainfall calculations are included in Appendix B.

C. RUNOFF COMPUTATION

The site consists of Soil Type 152. Soil Type 152 is characterized as Cave gravelly fine sandy loam with 0 to 4 percent slopes. Curve Numbers (CNs) were taken from the 2018 CCRFCD MPU assuming a land cover of *Undeveloped Land, Open Desert* for the site in its existing state, *Impervious* for offsite streets, and *High Density Residential, 4-8 units per acre* for the site in its developed state and additional offsite residential areas. The soil report and curve number calculations have been included in Appendix B.

The lag times quantify how long before basins are contributing to flow at the outlet and is a representative scale of an individual basin that were determined using Standard Form 4. Velocities used in Standard Form 4 have been calculated using the equation $V = CS^{1/2}$ from the *Manual*. The coefficient $C = 14.8$ represents wide channel flow with $D = 0.25$ and $n = 0.04$ for undeveloped conditions. The coefficient $C = 29.4$ represents wide channel flow with $D = 0.7$ and $n = 0.04$ for undeveloped conditions. The coefficient $C = 20.2$ represents street flow with $n = 0.016$ and a depth in the gutter of 0.3 feet for developed conditions. The coefficient $C = 30.6$ represents curb height street flow for developed conditions.

Travel Time velocities have been calculated based on the equation $V = CS^{1/2}$ from section 602.1 of the *Manual*. For basins analyzed in this study, the first 500 feet of the Travel Time Length uses the V_1 set of C coefficients from the *Manual* and the remaining Travel Time Length uses the larger V_2 set of coefficients. The Standard Form 4 computes the Travel Time separately for the V_1 and V_2 portions of the basin and adds them together to give the total Travel Time for the basin. Based on the hydrologic properties and land usages of the basins within this study, we feel that the 500-foot break point provides a conservative but representative assumption to where enough flow can be generated within the basin to warrant the use of the higher velocity coefficients. In summary,

Non-Urban Conditions $V_1 = 14.8*(S/100)^{1/2}$ $V_2 = 29.4*(S/100)^{1/2}$	Urban Conditions $V_1 = 20.2*(S/100)^{1/2}$ $V_2 = 30.6*(S/100)^{1/2}$
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D. PEAK FLOWS

The following table summarizes the peak flow generated for the listed conditions. A discussion of each drainage condition may be found in the following section of this report.

TABLE 1 EXISTING CONDITION HEC-1 SUMMARY TABLE			
BASIN/CP	AREA (AC)	Q100 (CFS)	Q10 (CFS)
EX1	4.64	12	5
CHEY*	-	26	14
OFF1	1.17	5	2
OFF2	0.44	2	1
C1	-	29	16
OFF3	4.13	13	6
OFF4	1.10	4	2
C2	-	17	8
OFF5	0.75	3	2

Flow rate in Cheyenne Avenue (CHEY) referenced from the TDS for Cheyenne/Hualapai Units 3 and 4.

TABLE 2 ULTIMATE CONDITION HEC-1 SUMMARY TABLE			
BASIN/CP	AREA (AC)	Q100 (CFS)	Q10 (CFS)
ON1	4.64	14	6
CHEY*	-	26	14
OFF1	1.17	5	2
OFF2	0.44	2	1
C1	-	29	16
C1-E	-	25	15

C1-N	-	4	1
C3	-	17	6
OFF3	4.13	13	6
OFF4	1.10	4	2
C2	-	17	8
OFF5	0.75	3	2

Flow rate in Cheyenne Avenue (CHEY) referenced from the TDS for Cheyenne/Hualapai Units 3 and 4.

III. EXISTING AND DEVELOPED CONDITION ANALYSIS

A. EXISTING CONDITION ANALYSIS

Existing condition for the project is depicted on *Figure 6: Existing Drainage Map* (hereinafter referred to as Figure 6). Figure 6 has been included in Appendix A. In existing condition, the proposed project is undeveloped surrounding areas are fully developed. Offsite flows do not enter the project.

1. OFFSITE DRAINAGE BASIN DESCRIPTION

Offsite basins have been delineated to determine the flow conveyed by the perimeter streets of the project. Offsite flow patterns were determined using Clark County GIS 2-foot contours and referenced drainage studies.

According to the Cheyenne study, a 10-year and 100-year flow rate of 14-cfs and 26-cfs, respectively, is conveyed easterly in Cheyenne Avenue south of the project (referred to as CHEY*). The Tiara Summit study also shows a consistent flow rate in Cheyenne Avenue, and assumes flow continues in easterly Cheyenne Avenue and does not enter Hualapai Way. However, Clark County 2-foot topography suggests that the existing slopes at the Cheyenne and Hualapai intersection will direct flow from CHEY* northerly into Hualapai Way. In addition, there is no cross gutter in Cheyenne Avenue to direct flows across Hualapai Way to allow flows to continue easterly in Cheyenne Avenue. Therefore, this drainage study conservatively assumes the total flow from CHEY* turns north and combines with runoff generated by OFF1. The flow will subsequently turn east into Isaac Newton Way and combine with OFF2 at concentration point C1. The resulting 100-year flow rate in Isaac Newton Way adjacent to the project is 29 cfs.

The storm flow conveyed in the west half of Hualapai Way was obtained from OFF3 and OFF4 which combine at Concentration Point C2. The storm flow from C2 is contained within the west half of Hualapai Way and does not impact the project. The storm flow conveyed in the east half of Hualapai Way is obtained from a single basin OFF5.

2. ONSITE DRAINAGE BASIN DESCRIPTION

A single onsite basin EX1 has been delineated to determine the storm runoff generated by the project site in its undeveloped state. In existing condition, a 100-year flow rate of 12-cfs is generated by the site and will discharge northeast through a drainage easement onto the adjacent property *Boulders*.

B. ULTIMATE CONDITION ANALYSIS

Ultimate condition assumes that the Hualapai & Isaac Newton residential site and immediate offsite areas fully developed. Developed Condition is depicted on *Figure 7: Ultimate Condition Drainage Map* (hereinafter referred to as Figure 7).

1. OFFSITE DRAINAGE BASIN DESCRIPTION

Presently, offsite areas tributary and adjacent to the proposed project are fully developed. Therefore, ultimate condition offsite basins are consistent with existing condition. Construction of this project does not obstruct offsite flows or increase existing offsite flow rates.

When the proposed residential site is fully developed, it is assumed that the portion of the flows in Isaac Newton Way may enter the site by Blodwen Street. The driveway hump at the site entrance does not provide 6-inches of freeboard above the water surface elevation in Isaac Newton Way. To assess the impacts of accepting offsite flow and discharging it into the downstream development, this drainage study assumes a flow split will occur at the entrance. The flow split calculation included in Appendix C conservatively assumes that there is no high point at the entrance, and the assumption results in a maximum 100-year offsite flow of 4-cfs entering the site in developed condition. The flow split is reflected by the HEC-1 analysis in Appendix B as concentration points C1-N and C1-E. The impacts of accepting the offsite flow are discussed in more detail in the following sections of this report.

2. ONSITE DRAINAGE BASIN DESCRIPTION

A single onsite basin ON1 has been delineated to determine the storm runoff generated by the project site in its fully developed state. A 100-year ultimate condition flow rate of 14-cfs is generated by the site, which is 2-cfs greater than the flow generated in existing condition. Although it is unlikely, the analysis assumes that offsite flow from C1-N will enter the project and combine with ON1 at concentration point C3. The onsite storm flow C3 will discharge northeast by a drainage easement onto the adjacent property *The Boulders* as it did previously in existing condition.

According to the referenced *The Boulders Study*, the downstream easement was designed to accept up to 17-cfs from this project. This project discharges 17-cfs (C3), therefore, the total flow being discharged by this project is within the approved limit and will not adversely impact the downstream facilities or properties.

IV. GRADING CONSTRAINTS

The site grading is constrained by the existing grades of the fully developed streets and condominium site bounding the project, including Hualapai Way to the west, Isaac Newton Way to the south, and the The Boulders Condominium development to the north and east. The adjacent developer has set finished floor elevations up to approximately 6-feet lower than existing grades. In addition, the Las Vegas Valley Water District (LVVWD) easement at the west end of Aconitum Court is subject to meeting drivable criteria. The aforementioned constraints result in retaining wall height up to 9-feet on the southeast side of the project. The east retaining wall height gradually reduces to the north.

The grading constraints and possible design alternatives have been communicated with the City of Las Vegas prior to the completion of this drainage study. To reduce the amount of retaining required, the west side of the site has been lowered as much as possible while still meeting LVVWD easement criteria. In addition, the driveway entrance hump was lowered as much as possible. Other alternatives such as utilizing an offsite crown, superelevating Blodwen Street, and Type B drainage for Lots 21 to 37, were also discussed with the City of Las Vegas. However, these alternatives were not utilized because an offsite crown would cause unfavorable drainage conditions in the street, and the back of the lots do not have adequate space for a concrete drainage easement.

V. STREET FLOW

The program FlowMaster, by Haestad Methods, has been utilized to determine the normal depth and velocity of the anticipated storm flows within the onsite streets, easements, and offsite streets Hualapai Way and Isaac Newton Way. The results of the street flow analysis are summarized in Table 3 and Table 4. Refer to Figure 7 for the locations of the cross sections used in the analysis. Hydraulic calculations are included in Appendix C.

TABLE 3 PERIMETER STREET NORMAL DEPTH SUMMARY TABLE						
Section	Q100 (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV	Tributary Basin/CP
1	29	4.90	0.45	6.17	2.78	C1
2 (East Half)	3	2.00	0.32	3.30	1.06	OFF5
2 (West Half)	17	2.00	0.53	4.32	2.29	C2

TABLE 4 ONSITE STREET/EASEMENT NORMAL DEPTH SUMMARY TABLE						
Section	Q100 (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV	Tributary Basin/CP
3	4	4.00	0.23	3.57	0.82	ON1A
4	10	4.00	0.29	4.34	1.26	ON1A + ON1B + C1-N
5	4	4.50	0.22	3.74	0.82	ON1E
6	17	1.70	0.39	3.52	1.37	C3
7	17	2.51	0.33	3.31	1.09	C3

The product $V \times D$ has been calculated for each section to show that the flow within the drive aisles meets the Manual requirement. The manual requires the $V \times D$ to be less than 6

in the 10-year storm event and less than 8 in the 100-year storm event. The results show that the V x D requirements for both the 10-year and 100-year events have been met.

DRIVEWAY ENTRANCE ELEVATION

A driveway high point at the site entrance has been elevated to 2727.16-feet. The flowline elevation and water surface elevation in Isaac Newton Way is 2726.60-feet and 2727.05-feet, respectively. Due to grading constraints, the driveway hump does not provide 6-inches of freeboard above the water surface elevation in Isaac Newton Way. These constraints have been communicated with CLV prior to the completion of this drainage study. To ensure that the site and downstream developments are adequately protected without a driveway hump at the entrance as discussed previously in this report, it is assumed that a flow split will occur at the site entrance and 4-cfs of offsite flow will enter Blodwen Street. The manual requirements for onsite drive aisles have been met and finished floors are protected considering the additional offsite flow being conveyed through the site. In addition, the downstream development The Boulders Condominiums has been designed to accept the additional flow.

VI. FINISHED FLOOR PROTECTION

Finished floors have been set at or above twice the depth of flow in the adjacent streets. Finished floor verification calculations are included in Appendix C. Solid grouted flood walls have been provided to protect the lots whose finished floor elevations are not at or above twice the depth of flow in the adjacent onsite streets. Specifically, flood walls are provided adjacent to Lots 7 and 14.

Solid grouted flood walls are also provided for the lots adjacent to Hualapai Way and Isaac Newton Way. The flow depth in Hualapai Way is 0.32-feet, which is below the top of curb. A small berm is also provided in the common element adjacent to Hualapai Way to add additional freeboard against flows in the street. Although it is unlikely that flow from Hualapai Way will impact the retaining wall parallel to Hualapai Way along Lots 1, 5, 6, 10, 11, and 17, solid grout has been provided on the walls as an additional measure of protection. The flow depth in Isaac Newton Way is 0.45-feet which is also below the top of curb. Due to the finished floor elevations of lots 17-20 not having adequate freeboard above the flow depth in Isaac Newton Way, a solid grouted flood wall is provided behind Lots 17-20 to protect finished floors.

Weir calculations have been provided for the depressed curb discharge location and drainage easement discharge location to account for backflow and to show the adjacent lots are protected. The finished floors adjacent to the discharge easements have been set at least twice the depth of flow or the depth of flow plus 18-inches above the flowline.

VII. CONCLUSIONS

The Hualapai & Isaac Newton Single Family Residential site has been designed to control storm water runoff for the 6-hour, 10-year, and 100-year floods as calculated in this study. This methodology used in this study is compliant with the Criteria established in the Manual.

The proposed development does not adversely impact any proposed or existing CCRFCD MPU facilities. The proposed development does not increase flow rates upstream or downstream of the project, therefore there are no adverse effects on upstream or downstream properties due to the proposed improvements.

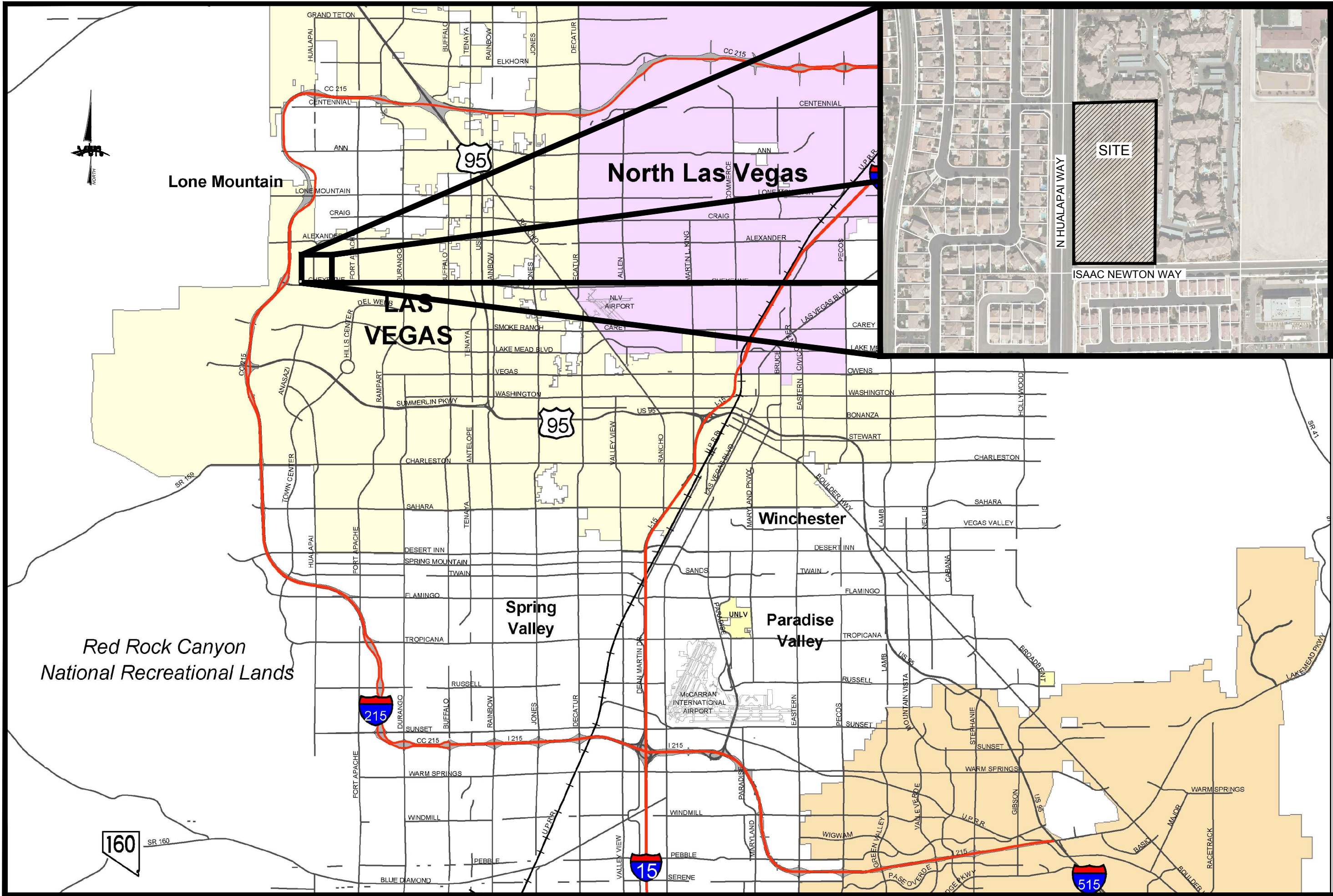
REFERENCES

1. *Hydrologic Criteria and Drainage Design Manual*, Clark County Regional Flood Control District, 1999.
2. *CCRFCD Las Vegas Valley Flood Control Master Plan Update*, 2008 and 2013.
3. *Flood Insurance Rate Map*, Community Panel Number 32003C2535F, Clark County, Nevada and Incorporated Areas, effective date November 16, 2011, and is a digital duplication of the FIRM Map derived from the Clark County GIS database.
4. *Soil Survey of Las Vegas, Nevada, Part of Clark County*, by the United States Department of Agriculture, Soil Conservation Service.
5. *Technical Drainage Study for Cheyenne/Hualapai Units 3 and 4* by VTN Nevada, approved by City of Las Vegas on May 24, 1999 (CLV DS# 2279).
6. *Technical Drainage Study for Tiara Summit*, Taney Engineering, approved by City of Las Vegas (CLV) on May 12, 2004 (CLV DS# 3478).
7. *Technical Drainage Study The Boulders Condominium Conversion*, Stanley Consultants, approved by CLV on May 23, 2006 (CLV DS# 3736)

APPENDIX

APPENDIX A

FIGURES



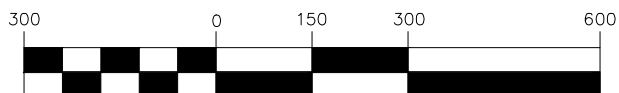
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BY:	FH
SCALE:	N/A
SHEET	1 OF 1

**FIGURE 1: VICINITY MAP
HUALAPAI & ISAAC NEWTON
SINGLE FAMILY RESIDENTIAL**

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GRAPHIC SCALE



1" = 300'



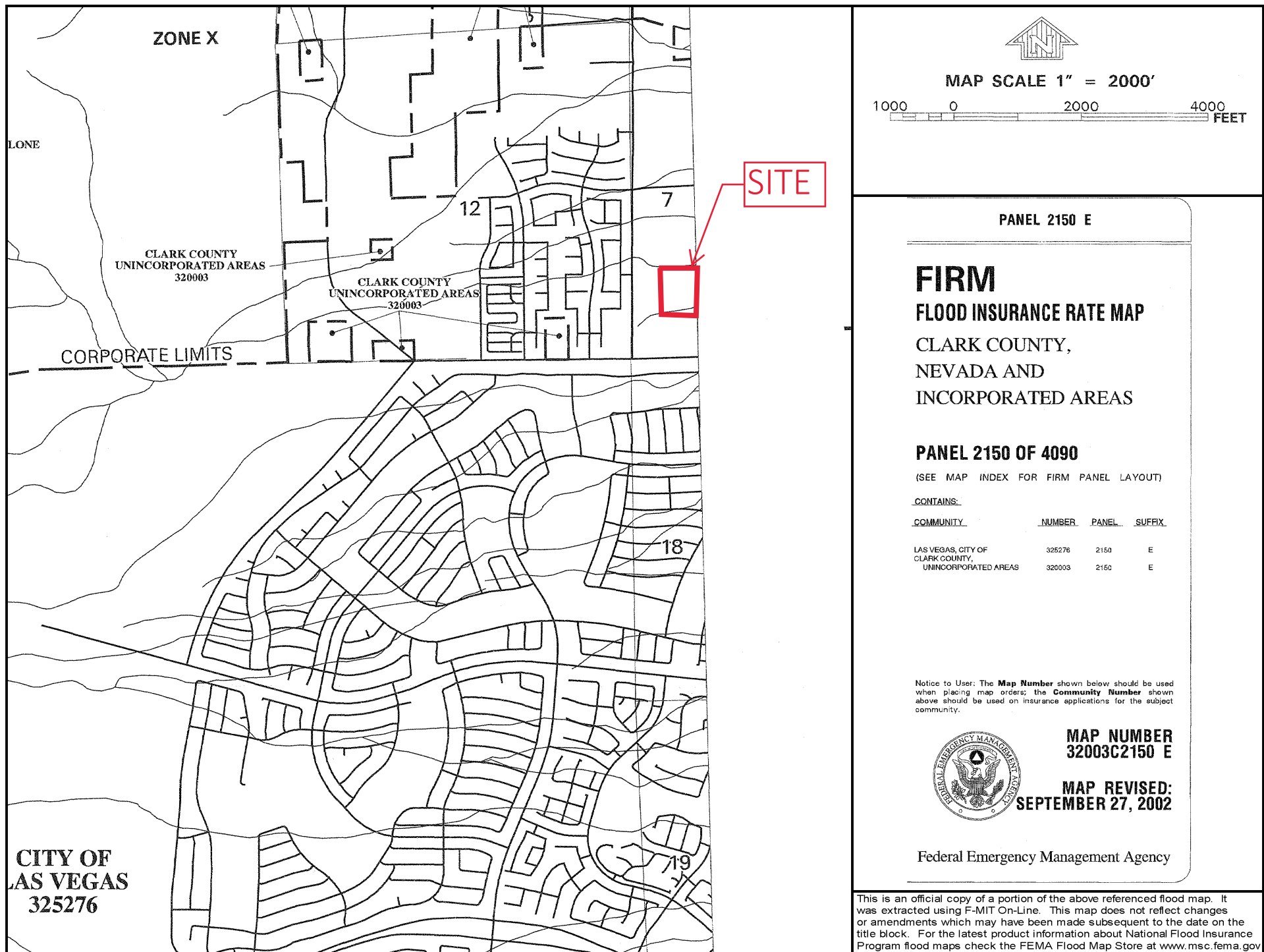
vtm
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

**HUALAPAI & ISAAC NEWTON
SINGLE FAMILY RESIDENTIAL**

**FIGURE 2
SITE DESCRIPTION MAP**

SCALE	HORZ.	1" = 300'
	VERT.	N/A
W.O. NO.		8031
DRAWN BY:		FH
DATE:		05/13/2020
SHEET		1 OF 1

Figure 3: FIRMette Panel





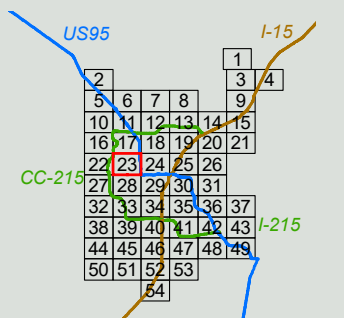
2018
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-23
FLOOD CONTROL FACILITIES

- LEGEND**
- Ultimate Development Boundary
 - Existing Facilities
 - Category A Proposed Facilities
 - Category B Proposed Facilities
 - Local Existing Facilities
 - Detention Basin
 - Culvert or Bridge Crossing
 - Stormdrain
 - Lined Channel
 - Unlined Channel
 - Levee/Dike
 - Natural Wash/Floodway
 - ID-Mile Separator
- Remove & Replace/Parallel Facilities**
- | Category A | Category B |
|------------|------------|
| Channel | Channel |
| Stormdrain | Stormdrain |
| Crossing | Crossing |

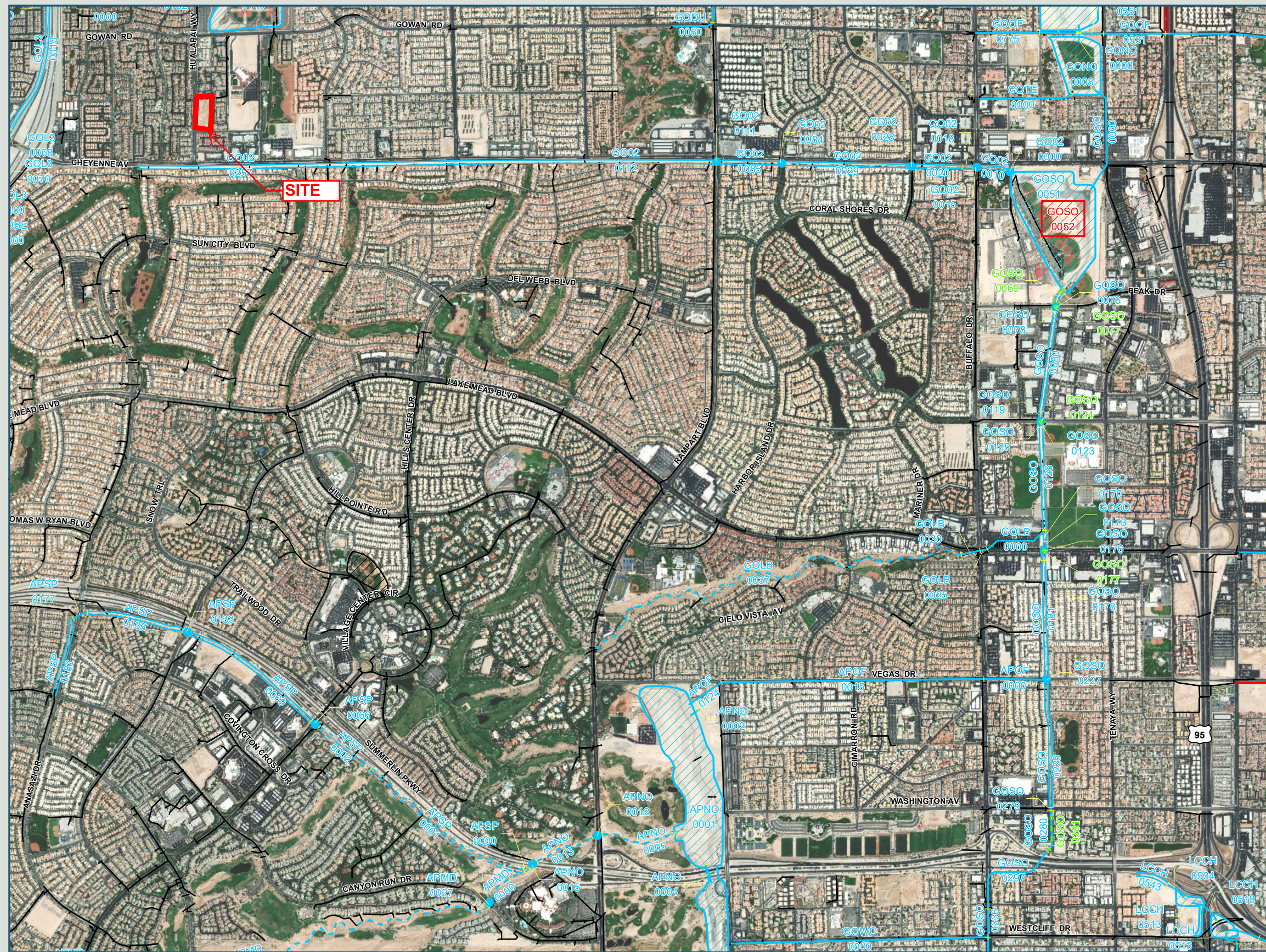
FIGURE 4A:
FLOOD CONTROL
FACILITIES MAP

0 500 1,000 2,000 3,000
Feet
Scale: 1 inch = 2,000 feet
AerialSource:Esri World Imagery 2017



ATKINS
Member of the SNC-Lavalin Group

Louis Berger



ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APMD		ANGEL PARK - MIDDLE BRANCH						
0000	E	NATURAL WASH	940	5058	C11A-1*	GOW4A	11.81	2.90
0027	E	1: 12' X 10' AND 2: 12' X 2' RCBC @ CANYON RUN	170	5058	C11A-1*	GOW4A	11.81	3.00
0030	E	NATURAL WASH	7000	5058	C11A-1*	GOW4A	11.81	3.00
APNO		ANGEL PARK DETENTION BASIN						
0001	E	1,654 AC-FT ANGEL PARK DETENTION BASIN		8677	ANGLPKIN	GOW5A	22.71	
0002	E	2: 33" & 1: 42" RCP EMERGENCY OUTLET	190	344	ANGLPKDB	GOW5A	22.71	
0004	E	14' X 12' RCBC CONNECTOR PIPE UNDER SUMMERLIN PKWY	380					1.00
0005	E	NATURAL WASH	1559	7095	CSF2-C	GOW3B	7.61	2.00
0012	E	3: 12' X 10' RCBC @ RAMPART	232	7095	CSF2-C	GOW3B	7.61	1.00
0013	E	NATURAL WASH	1283	6867	CC3B-2B	GOW3B	7.22	1.40
0015	E	TWO SPAN BRIDGE 28' W 14'D @ SUMMERLIN	236	6867	CC3B-2B	GOW3B	7.22	1.00
APOF		ANGEL PARK OUTFALL						
0000	E	66" RCP	1297	764	CGD34AC	GOW3B	0.66	1.90
0015	E	60" RCP	5472	394	CGD34AB	GOW5A	22.98	2.20
0124	E	54" RCP OUTLET	810	344	ANGLPKDB	GOW5A	22.71	2.50
APSP		ANGEL PARK - SUMMERLIN PARKWAY						
0000	E	CONCRETE CHUTE DROP	103	6867	CC3B-2B	GOW3B	7.22	3.00
0001	E	UNLINED CHNL W/ GABION DROPS 20"W DEPTH VARIES 2:1 SS	3924	2725	C3B-2B	GOW3A	2.68	3.00
0002	E	UNLINED CHNL W/ GABION DROPS 50"W 3:1 SS	1424	2451	CC3B-2A	GOW3A	2.40	3.50
0066	E	5: 8' X 4' RCBC @ TOWN CENTER DR.	200	1666	C8B-2	GOW3A	1.56	2.40
0069	E	CONC CHNL 10"W 6"D 2:1 SS	3122	1666	C8B-2	GOW3A	1.56	2.40
0133	E	3: 9' X 4' RCBC @ CRESTDALE	180	1156	C8B-1	GOW3A	1.14	2.33
0135	E	CONC CHNL 10"W 6"D 2:1 SS	2030	1156	C8B-1	GOW3A	1.14	2.40
0177	E	9' X 8' RCBC @ ANASAZI	330	884	C11B-1	GOW3A	0.84	1.70
0183	E	CONC CHNL 10"W 6"D 2:1 SS	1680	884	C11B-1	GOW3A	0.84	1.70
GO02		GOWAN SOUTH FACILITIES (CHEYENNE CHANNEL)						
0000	E	FREE SPAN BRIDGE 34"W 9.25'D @ RONEMUS	100	4190	C16-C	GOW3A	7.29	0.50
0010	E	CONC CHNL 30"W 9'D 0:1 SS	600	4190	C16-C	GOW3A	7.29	0.50
0015	E	FREE SPAN BRIDGE 31"W 7.25'D @ BUFFALO	102	4190	C16-C	GOW3A	7.29	1.40
0018	E	CONC CHNL 30"W 9'D 0:1 SS	250	4190	C16-C	GOW3A	7.29	1.50
0020	E	CONC CHNL 10"W 7.25'D 1.5:1 SS	1000	4190	C16-C	GOW3A	7.29	1.50
0028	E	FREE SPAN BRIDGE 35"W 7'D @ SOFT BREEZES	72	4088	CC7-C	GOW3A	6.78	2.20
0029	E	CONC CHNL 10"W 7.25'D 1.5:1 SS	2700	4088	CC7-C	GOW3A	6.78	1.50
0084	E	FREE SPAN BRIDGE 35"W 7'D @ SOARING GULLS	95	3965	CCB-C	GOW3A	6.07	1.30
0085	E	CONC CHNL 10"W 7.25'D 1.5:1 SS	1240	3965	CCB-C	GOW3A	6.07	1.50
0111	E	FREE SPAN BRIDGE 35"W 7'D @ RAMPART	127	3965	CCB-C	GOW3A	6.07	2.90
0112	E	CONC CHNL 10"W 7'D 1.5:1 SS	2640	3603	CC-C	GOW3A	5.40	2.30
0257	E	CONC CHNL 10"W 6.75'D 1.5:1 SS	4293	2173	CCJ-C	GOW3A	2.97	4.10
GO95		GOWAN OUTFALL - U.S. 95 CHANNEL						
0000	P	CONC CHNL 12"W 4'D 2:1 SS	2640	318	GD17BG-C	GOW3A	0.36	0.30
GODU		GOWAN NORTH - DURANGO BRANCH						
0000	E	12' X 6' RCB	2629	905	CLV14-C	GOW3A	1.40	0.91
0050	E	9' X 6' RCB	865	681	CLV20-C	GOW3A	0.98	1.50
GOL3		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3						
0010	E	CONC CHNL 20"W 10'D 0:1 SS	3037	3277	CRLMT1R	GOW3A	7.31	2.78
0068	E	TRANSITION STRUCTURE	100	3277	CRLMT1R	GOW3A	7.31	3.50
0070	E	20' X 6' RCBC @ CLIFF SHADOWS	350	1271	CRCSV22	GOW3A	4.99	2.44
GOL4		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4						
0000	E	14' X 8' RCB	554	2243	CLMT1R	GOW3A	2.33	2.50
GOLB		GOWAN LAKE MEAD-BUFFALO						
0000	E	12' X 6' RCB	1284	1264	CCVILL23	GOW3A	1.46	1.50
0025	E	10' X 7' RCB	145	1264	CCVILL23	GOW3A	1.46	0.50
0030	E	2: 8' X 4' RCB	408	1264	CCVILL23	GOW3A	1.46	0.85
0037	E	NATURAL WASH	9015	1264	CCVILL23	GOW3A	1.46	2.00
GOLM		LONE MOUNTAIN DETENTION BASIN						
0146	E	888 AC-FT LONE MOUNTAIN DETENTION BASIN		6518	LMTNIN	GOW3B	6.43	
GONO		GOWAN NORTH SYSTEM						
0000	E	8' X 8' RCB OUTLET	184	523	GWNNDB	GOW5A	68.55	0.51
0001	E	8' X 8' RCB OUTLET	156	523	GWNNDB	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	

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOOF		GOWAN OUTFALL FACILITIES						
0511	E	8' X 5' RCB	8390	740	CPT6B-C	GOW3B	1.08	0.50
0531	E	8' X 5' RCB	1300	523	GWNNDB	GOW5A	68.55	0.50
0551	E	72" RCP	524	523	GWNNDB	GOW5A	68.55	0.62
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
GOSO		GOWAN SOUTH FACILITIES						
0000	E	72" RCP OUTLET	2301	451	GWNSDB	GOW4C	11.98	0.53
0050	E	39,030 CFS PMF SPILLWAY		39030	GWNSIN	GOW4C	11.98	
0051	E	624 AC-FT GOWAN SOUTH DETENTION BASIN		6415	GWNSIN	GOW4C	11.98	
0052	P	UPGRADE TO 686 AC-FT GOWAN SOUTH DETENTION BASIN		6415	GWNSIN	GOW4C	11.98	
0068	E	CONC CHNL 15"W 7'D 2:1 SS (REPLACED W/ GOSO0069)	380	3971	CBUF01-C	GOW3B	4.89	0.40
0069	P0	CONC CHNL 50"W 7'D 0:1 SS (REPLACES GOSO0068)	380	3971	CBUF01-C	GOW3B	4.89	0.40
0076	E	2: 10' X 7' RCBC @ PEAK DR	80	2119^	CBUF01-C^	GOW3B	4.89	0.56
0077	P0	ADD 2: 14' X 7' RCBC @ PEAK DR	80	1852^	CBUF01-C^	GOW3B	4.89	0.56
0078	E	CONC CHNL 22"W 10'D 0:1 SS	60	3971	CBUF01-C	GOW3B	4.89	0.56
0080	E	CONC CHNL 12"W 7'D 2:1 SS	2078	3971	CBUF01-C	GOW3B	4.89	0.56
0119	E	CONC CHNL 22"W 10'D 0:1 SS	180	3772	CCCVIL23	GOW3B	4.53	0.95
0123	E	2: 10' X 7' RCBC @ SMOKE RANCH	100	2229^	CCCVIL23^	GOW3B	4.53	0.62
0124	P0	ADD 2: 11' X 7' RCBC @ SMOKE RANCH	100	1543^	CCCVIL23^	GOW3B	4.53	0.62
0125	E	CONC CHNL 22"W 9'D 0:1 SS	50	3772	CCCVIL23	GOW3B	4.53	0.62
0126	E	CONC CHNL 12"W 7'D 2:1 SS	2155	3772	CCCVIL23	GOW3B	4.53	0.62
0170	E	CONC CHNL 12"W 7'D 2:1 SS	220	2774	CCGD34AC	GOW3B	3.07	0.62
0173	E	CONC CHNL 22"W 7'D 0:1 SS	158	2774	CCGD34AC	GOW3B	3.07	0.62
0176	E	2: 10' X 7' RCBC @ LAKE MEAD	100	2229^	CCGD34AC^	GOW3B	3.07	0.62
0177	P0	ADD 1: 10' X 7' RCBC @ LAKE MEAD	100	545^	CCGD34AC^	GOW3B	3.07	0.62
0178	E	CONC CHNL 22"W 7'D 0:1 SS	150	2774	CCGD34AC	GOW3B	3.07	1.00
0181	E	CONC CHNL 12"W 7'D 2:1 SS	2429	2774	CCGD34AC	GOW3B	3.07	0.58
0227	E	2: 10' X 7' RCBC @ VEGAS DRIVE	100	2153	CGD34AA	GOW3A	2.41	1.36
0229	E	CONC CHNL 12"W 7'D 1:1 SS	2604	2153	CGD34AA	GOW3A	2.41	1.36
0279	E	12' X 7' RCB	80	2153	CGD34AA	GOW3A	2.41	1.36
0280	E	12' X 8' RCB	875	1261^	CGD34AA^	GOW3A	2.41	0.34
0281	P0	ADD: 12' X 8' RCB	875	892^	CGD34AA^	GOW3A	2.41	0.34
0297	E	12' X 7' RCB	2124	1987	CW1BB-C	GOW3A	2.14	1.60
0336	E	12' X 7' RCB	602	1745	C1-WESTC	GOW3A	1.84	3.40
0352	E	2: 8' X 5' RCB	2740	1513	C1-DUCHC	GOW3A	1.60	0.73
GOTE		GOWAN -TENAYA BRANCH						
0000	E	60" RCP	1954	233	LV29-C	GOW3A	0.28	1.30
GOWC		GOWAN SOUTH FACILITIES - WEST CLIFF						
0000	E	24" RCP	5400	272	1-WEST-C	GOW3A	0.24	1.67
LCCH		LAS VEGAS CREEK CHANNEL						
0478	E	60" RCP	1110	171	CLC01-C	SW3	1.20	0.55
0499	E	42" RCP OUTLET	660	87	RAINBWDB	SW3	1.11	1.88
0513	E	102 AC-FT RAINBOW DETENTION BASIN		1027	RAINBWIN	SW3	1.11	
0518	E	60" RCP CONNECTOR PIPE UNDER RAINBOW BLVD	670					1.85
0534	E	60" RCP	460	288	AL00A-C	SW3	0.23	5.38
0543	E	CONC CHNL 10"W 4'D 0:1 SS	700	288	AL00A-C	SW3	0.23	1.88
LCLO		LAS VEGAS CREEK - LORENZI						
0000	E	7' X 6' RCB	445	285	DAL00A	SW3	0.41	3.37
0008	E	7' X 6' RCB	2983	285	DAL00A	SW3	0.41	0.40
LVLN		LAS VEGAS WASH - LAKE MEAD						
0525	E	48" RCP	2600	565	CLM01-C	NW3	0.64	1.24
LVOW		OWENS AVENUE SYSTEM						
0513	P	6' X 5' RCB	2615	463	CVG02-C	NW3	0.68	1.68

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

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

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



2018 LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FACILITY INVENTORY
FIGURE F-23

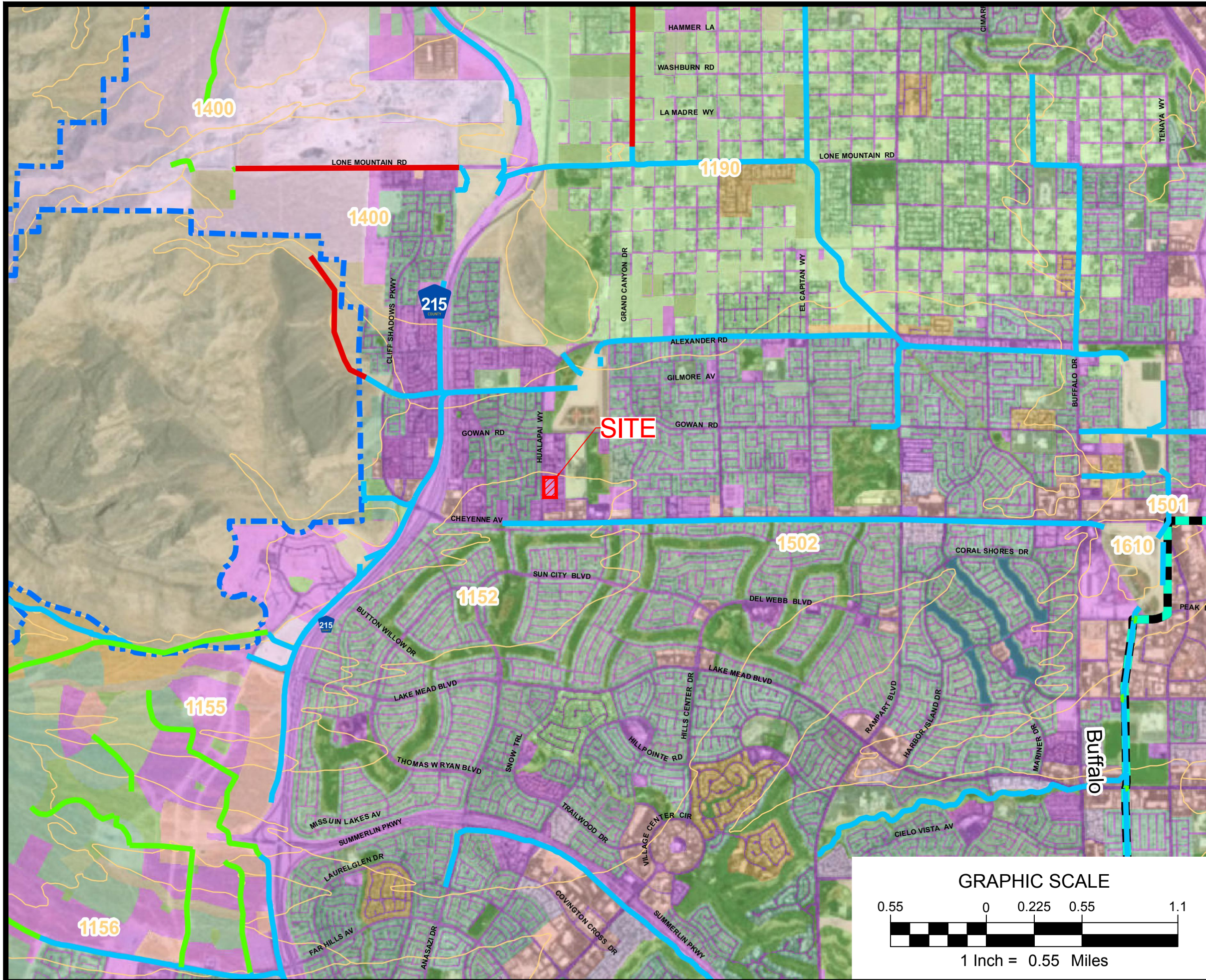
L E G E N D	ID (Facility Identifier)	AABB
	Parent Stream Name	
	Stream Name	
	Mile	0000
	Distance Above Confluence with Parent Stream (Miles)	
	Miles in Hundredths	

Existing Facility.....E
Proposed or Modified Facility.....P
Contingency Level
Category A.....P
Category B.....P0

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

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



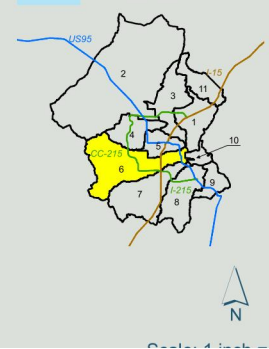


2018 Las Vegas Valley Master Plan Update

Figure W-6
Flamingo/Tropicana Watershed

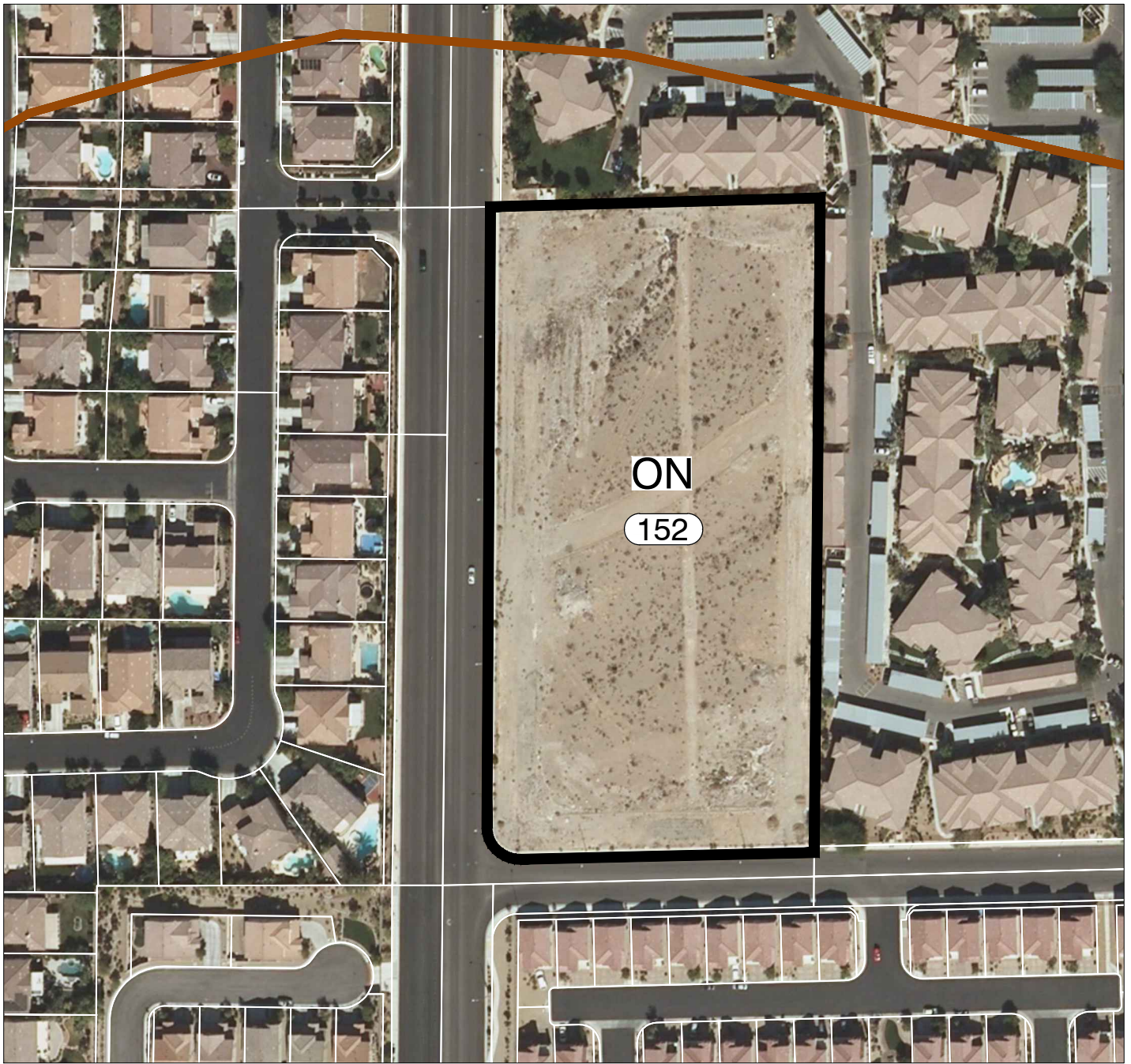
Legend

- Flow Arrows
- Concentration Points
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- USACE Boundary*
- Ultimate Development Boundary
- Watershed
- Subbasins
- Soils
- 1: Undeveloped Land, Open desert
- 2: Parks, Golf Courses
- 3: Rural, 0.5-1 units per acre (uses 1 unit/acre)
- 4: Low-Density Residential, 1-2 units per acre (uses 2 units/acre)
- 5: Medium-Density Residential, 2-4 units per acre (uses 3 units/acre)
- 6: High-Density Residential, 4-8 units per acre (uses 6 units/acre)
- 7: Public Facility and Residential, 8-12 units/acre
- 8: Very High-Density Residential, 12 units/acre or more
- 9: Commercial, Retail, Casino, High Rise Condominiums
- 10: Light Industrial
- 11: Heavy Industrial
- 12: Schools
- 13: Lakes



- Range
- Upper Northern Las Vegas Wash
- Lower Northern Las Vegas Wash
- Gowan
- Central
- Flamingo/Tropicana
- Duck Creek/Blue Diamond
- Pittman
- C-1
- Lower Las Vegas Wash
- Apex

FIGURE 4B- N HUALAPAI WAY/ ISAAC
NEWTON WAY
TRUNCATED W-6 FLAMINGO/ TROPICANA
CCRFC 2018 MPU



LEGEND

— SITE BOUNDARY

152 SOIL NUMBER

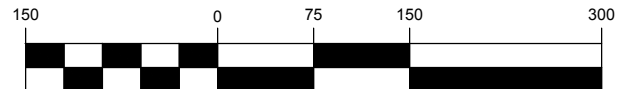
— SOIL BOUNDARY

NOTE:

1. This data was taken from the following website:
<http://soildatamart.nrcs.usda.gov>
2. This data is in state plane coordinates



GRAPHIC SCALE



1" = 150'

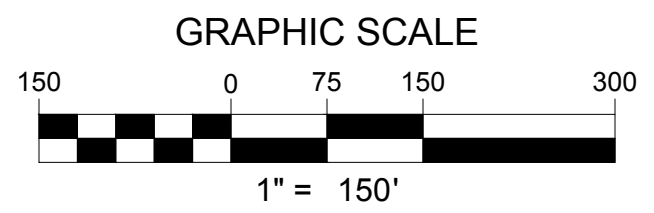
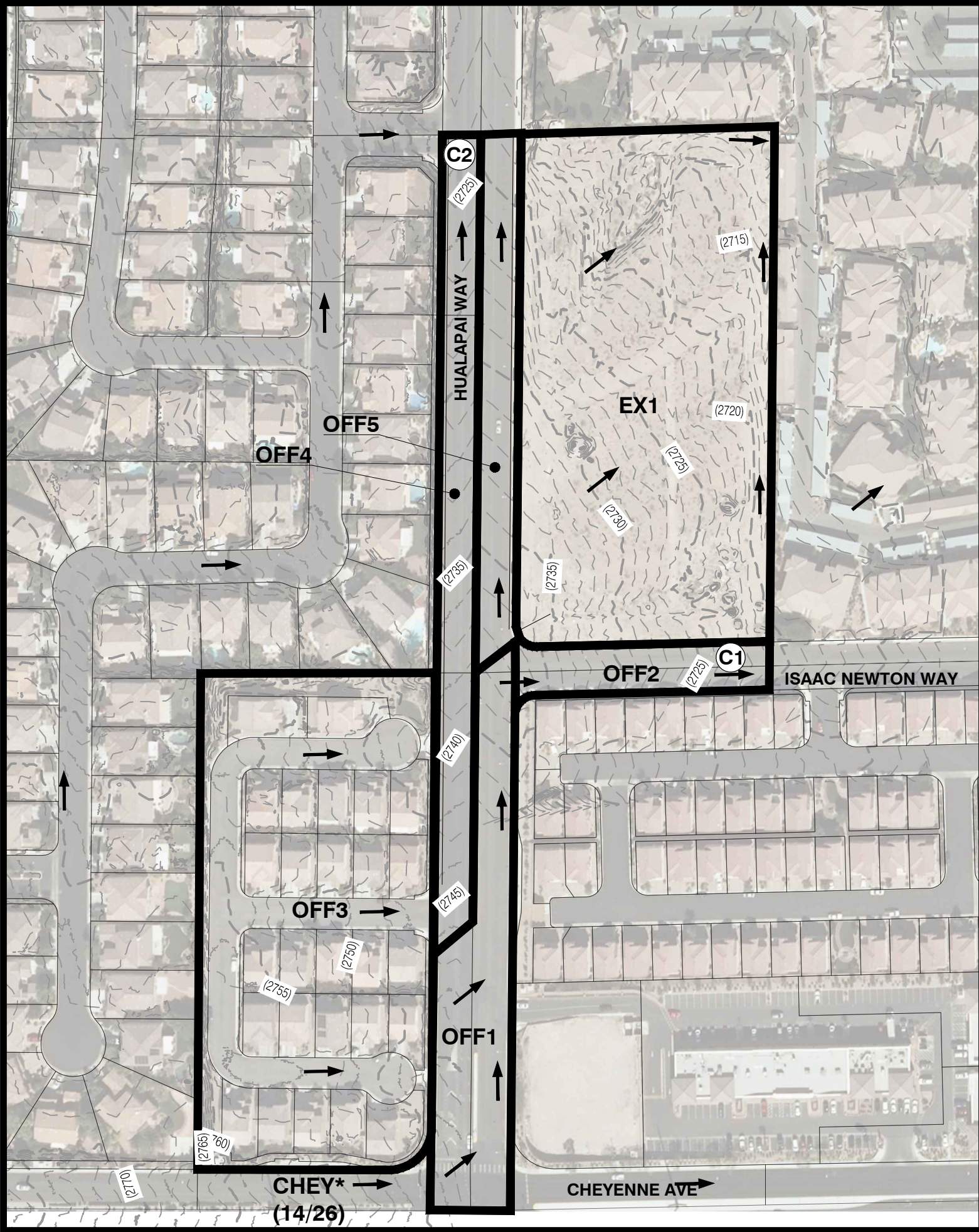
H:\8031\Drainage\TDSA Figures and Exhibits\Figure 5 - Soils Map.dwg

vtm
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

FIGURE 5 SOILS MAP

**N HUALAPAI WAY / ISAAC NEWTON
WAY**

SCALE	HORZ.	1"=150'
	VERT.	n/a
W.O. NO.		8031
DRAWN BY:		FH
DATE:		05/13/2020
SHEET		1 OF 1



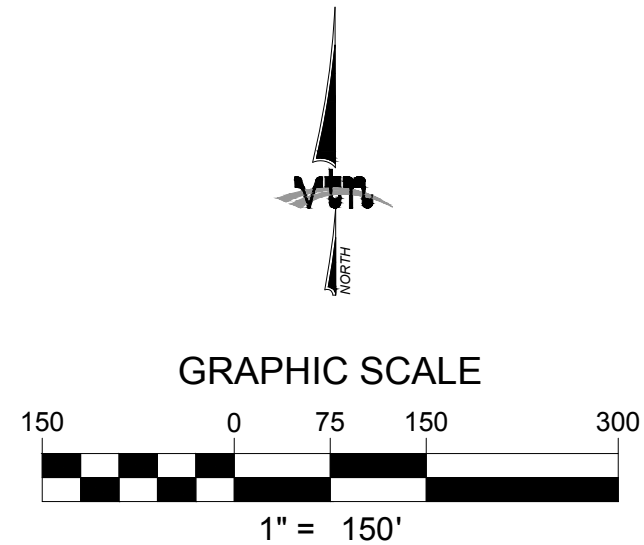
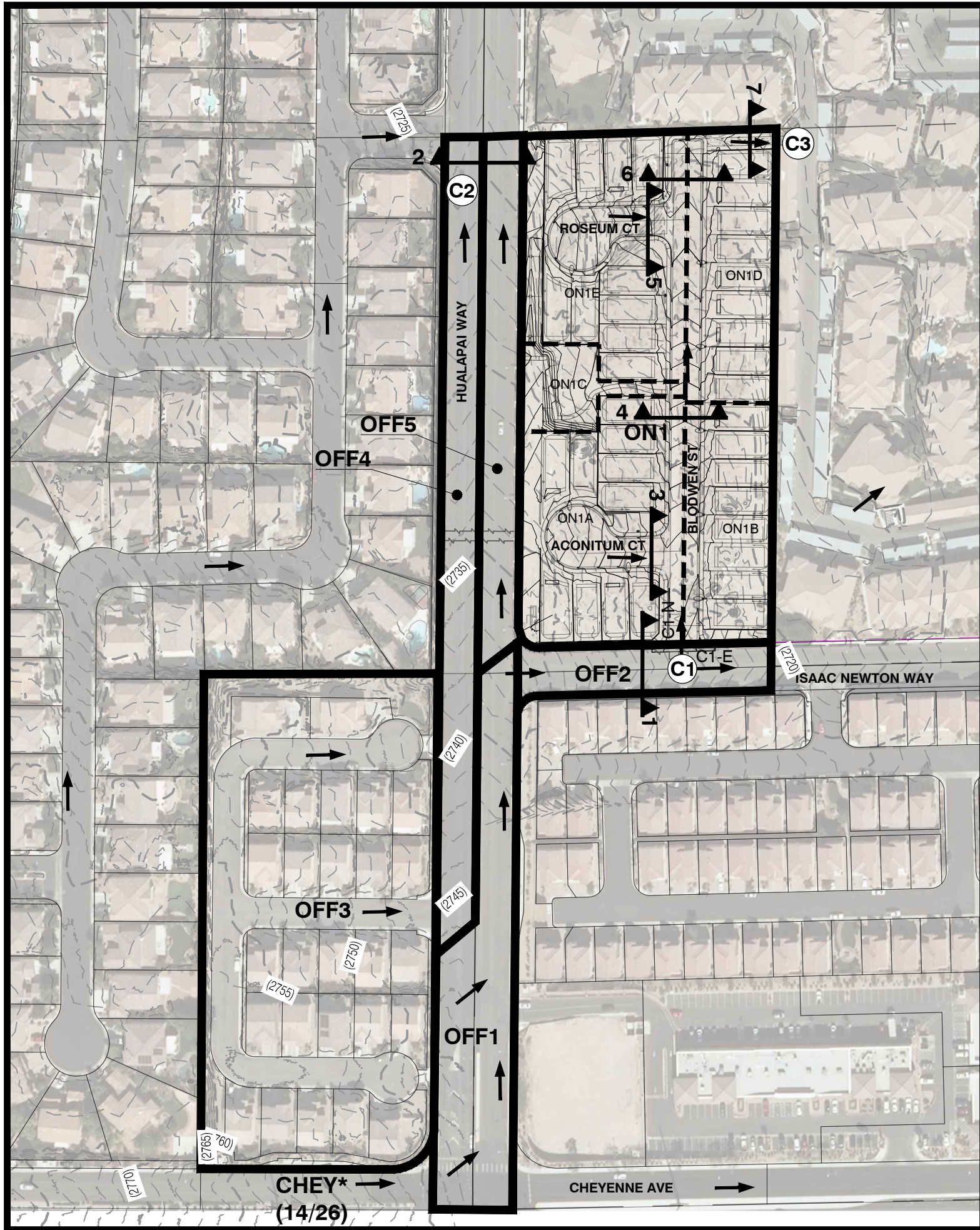
LEGEND

- BASIN BOUNDARY
- EX1** BASIN DESIGNATION
- FLOW ARROW
- (C1)** COMBINATION POINT

EXISTING CONDITION HEC-1 SUMMARY TABLE			
BASIN/CP	AREA (AC)	Q100 (CFS)	Q10 (CFS)
EX1	4.64	12	5
CHEY*	-	26	14
OFF1	1.17	5	2
OFF2	0.44	2	1
C1	-	29	16
OFF3	4.13	13	6
OFF4	1.10	4	2
C2	-	17	8
OFF5	0.75	3	2

Flow rate in Cheyenne Avenue (CHEY) referenced from the TDS for Cheyenne/Hualapai Units 3 and 4. Basins tributary to CHEY* are not depicted on this figure or included in this table. Refer to Appendix D.

FIGURE 6: EXISTING CONDITION DRAINAGE MAP
HUALAPAI AND ISAAC NEWTON



LEGEND	
	BASIN BOUNDARY
	PRORATED SUBBASIN BOUNDARY
	BASIN DESIGNATION
	PRORATED SUBBASIN DESIGNATION
	FLOW ARROW
	NORMAL DEPTH SECTION
	COMBINATION POINT

ULTIMATE CONDITION HEC-1 SUMMARY TABLE			
BASIN/CP	AREA (AC)	Q100 (CFS)	Q10 (CFS)
ON1	4.64	14	6
CHEY*	-	26	14
OFF1	1.17	5	2
OFF2	0.44	2	1
C1	-	29	16
C1-E	-	25	15
C1-N	-	4	1
C3	-	17	6
OFF3	4.13	13	6
OFF4	1.10	4	2
C2	-	17	8
OFF5	0.75	3	2

Flow rate in Cheyenne Avenue (CHEY) referenced from the TDS for Cheyenne/Hualapai Units 3 and 4. Basins tributary to CHEY* are not depicted on this figure or included in this table. Refer to Appendix D.

PRORATED SUBBASIN SUMMARY			
BASIN	AREA (acre)		Q100
ON1	4.64		14
SUBBASIN	AREA (acre)	AREA (%)	Q100
ON1A	1.36	29.3%	4
ON1B	0.76	16.4%	2
ON1C	0.29	6.3%	1
ON1D	0.87	18.8%	3
ON1E	1.36	29.3%	4

PERIMETER STREET NORMAL DEPTH SUMMARY TABLE						
Section	Q100 (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV	Tributary Basin/CP
1	29	4.90	0.45	6.17	2.78	C1
2 (East Half)	3	2.00	0.32	3.30	1.06	OFF5
2 (West Half)	17	2.00	0.53	4.32	2.29	C2

ONSITE STREET/EASEMENT NORMAL DEPTH SUMMARY TABLE						
Section	Q100 (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV	Tributary Basin/CP
3	4	4.00	0.23	3.57	0.82	ON1A
4	10	4.00	0.29	4.34	1.26	ON1A + ON1B + C1-N
5	4	4.50	0.22	3.74	0.82	ON1E
6	17	1.70	0.39	3.52	1.37	C3
7	17	2.51	0.33	3.31	1.09	C3

APPENDIX B

HYDROLOGIC

CALCULATIONS

RAINFALL INFORMATION

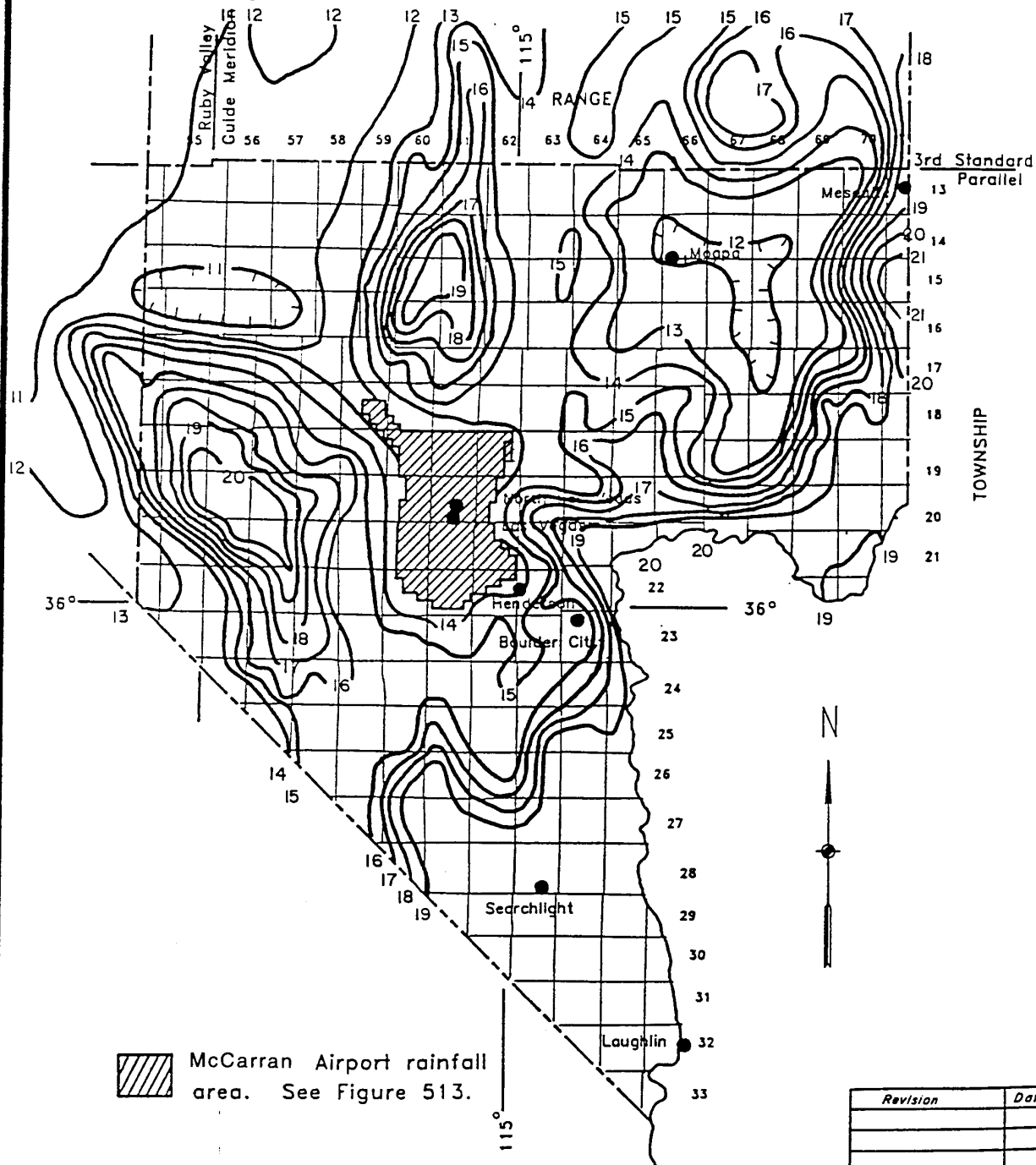
PRECIPITATION ADJUSTMENT RATIOS

<u>Recurrence Interval</u>	<u>Ratio to NOAA Atlas 2</u>
2-year	1.00
5-year	1.16
10-year	1.24
25-year	1.33
50-year	1.39
100-year	1.43

- NOTE: 1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.
2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.
3. Tables 505 and 506 require no adjustments.

<i>Revision</i>	<i>Date</i>

RAINFALL DEPTH-DURATION-FREQUENCY 10-YEAR, 6-HOUR (DEPTHS IN TENTHS OF INCHES)



McCarran Airport rainfall area. See Figure 513.

Revision	Date

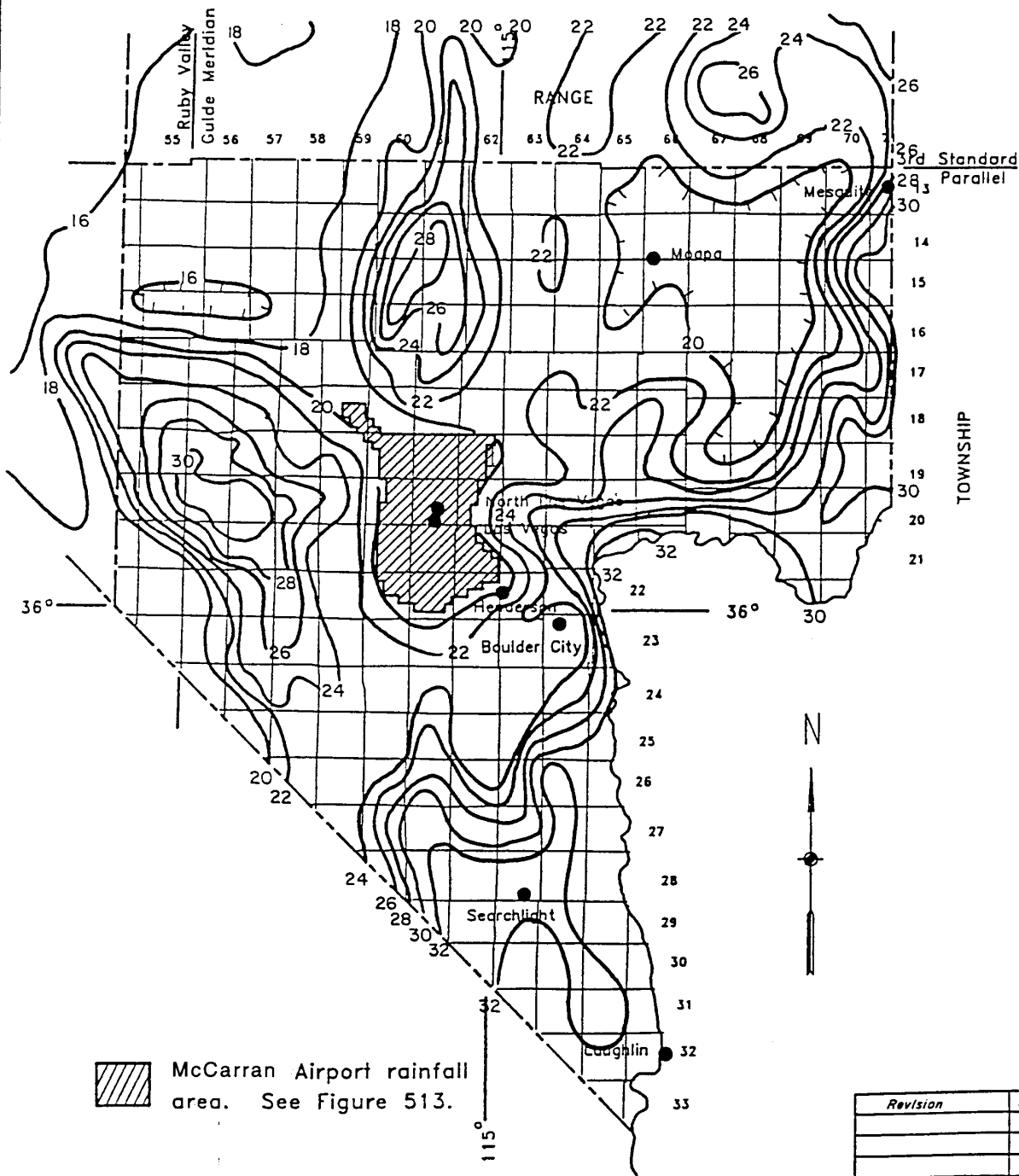
WRC
ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 503

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RAINFALL DEPTH-DURATION-FREQUENCY 100-YEAR, 6-HOUR (DEPTHS IN TENTHS OF INCHES)



Revision	Date

WRC
ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

CURVE NUMBER INFORMATION



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



May 21, 2020

Preface

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

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

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

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

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

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

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Soil Map.....	9
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152—Cave gravelly fine sandy loam, 0 to 4 percent slopes.....	14
References	15

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

Custom Soil Resource Report

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

Soil Map

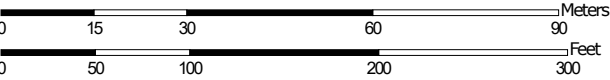
The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Soil Map may not be valid at this scale.

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



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
Survey Area Data: Version 14, Sep 16, 2019

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

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

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

MAP LEGEND

MAP INFORMATION

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
152	Cave gravelly fine sandy loam, 0 to 4 percent slopes	5.9	100.0%
Totals for Area of Interest		5.9	100.0%

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Las Vegas Valley Area, Nevada, Part of Clark County

152—Cave gravelly fine sandy loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: hr9v
Elevation: 2,000 to 4,800 feet
Mean annual precipitation: 4 to 12 inches
Mean annual air temperature: 57 to 70 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Cave

Setting

Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 12 inches: gravelly fine sandy loam
H2 - 12 to 36 inches: indurated
H3 - 36 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: 4 to 20 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 to 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: 40 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 1.2 inches)

Interpretive groups

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

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Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

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CURVE NUMBER CALCULATIONS

DEVELOPMENT: **Hualapai & Isaac Newton**

W.O. # **8031**

CALCULATED BY: **JYA**

Soil #152: Cave gravelley fine sandy loam, 0 to 4 percent slopes					
Soil	Percent	Group	1-Undeveloped	6-Residential	Impervious
Cave	100%	D	88	91	98
Total	100%		88	91	98

Note: Curve Numbers referenced from 2018 CCRFCD MPU Methodology

1- Undeveloped Land, Open Desert

6- High Density Residential, 4-8 units per acre

Curve Number calculations for basins

Basin	Soil	Percentage	1-Undeveloped	6-Residential	Impervious	CN Value
Existing Condition						
EX1	152	100%	100%			88
ON1	152	100%		100%		91
OFF1	152	100%			100%	98
OFF2	152	100%			100%	98
OFF3	152	100%		100%		91
OFF4	152	100%			100%	98
OFF5	152	100%			100%	98

LAG TIME CALCULATIONS

TRAVEL TIME CALCULATIONS

DEVELOPMENT: **Hualapai & Isaac Newton**

W.O. # **8031**

CALCULATED BY: **JYA**

$$Velocity = CS^{1/2}$$

C1 applies to the first 500 feet of travel distance
C2 applies to the remaining travel distance

Non Urbanized:		Urbanized:	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

Basin	Length (ft)	High Elev (ft)	Low Elev (ft)	Slope (ft/ft)	First 500 feet		Remaining Travel Distance	
					C1	V1 (fps)	C2	V2 (fps)
EX1	830	2734.9	2710.6	0.029	14.8	2.5	29.4	5.0
ON1	790	2730.6	2710.8	0.025	20.2	3.2	30.6	4.8
OFF1	633	2755.0	2737.0	0.028	20.2	3.4	30.6	5.2
OFF2	300	2737.0	2721.1	0.053	20.2	4.7	30.6	7.0
OFF3	375	2758.0	2745.8	0.033	20.2	3.6	30.6	5.5
OFF4	980	2745.8	2723.8	0.022	20.2	3.0	30.6	4.6
OFF5	660	2736.4	2723.8	0.019	20.2	2.8	30.6	4.2

STANDARD FORM 4

DEVELOPMENT: Hualapai & Isaac Newton

W.O. # 8031

CALCULATED BY: JYA

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance			
Non-Urbanized:		Urbanized	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

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

$$k = 0.0132C_n - 0.39$$

$$T_t = \frac{L}{60V}$$

$$T_c = T_i + T_t$$

SUB-BASIN DATA					INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS
DESIG. (1)	Cn	K (2)	AREA Ac. (3)	AREA Mi^2	LENGTH Ft (4)	SLOPE % (5)	Ti Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	V1 fps (9a)	V2 fps (9b)	Tt Min. (10)	TOTAL LENGTH (11)	Tc Min. (12)	Min.	TLAG Hr.	
EX1	88	0.7716	4.64	0.0073	50	3.0	2.90	830	2.9	2.5	5.0	4.39	880	14.89	7.29	0.100	
ON1	91	0.8112	4.64	0.0073	100	1.0	5.20	790	2.5	3.2	4.8	3.60	890	14.94	8.80	0.088	
OFF1	98	0.9036	1.17	0.0018	50	2.0	1.98	633	2.8	3.4	5.2	2.88	683	13.79	4.86	0.050	
OFF2	98	0.9036	0.44	0.0007	25	2.0	1.40	300	5.3	4.7	7.0	1.08	325	11.81	2.48	0.050	
OFF3	91	0.8112	4.13	0.0065	100	1.0	5.20	375	3.3	3.6	5.5	1.72	475	12.64	6.91	0.069	
OFF4	98	0.9036	1.10	0.0017	50	2.0	1.98	980	2.2	3.0	4.6	4.50	1030	15.72	6.48	0.065	
OFF5	98	0.9036	0.75	0.0012	50	2.0	1.98	660	1.9	2.8	4.2	3.61	710	13.94	5.59	0.056	
															Tc Min (URB)= 5 min		
															Tc Min (NON-URB)= 10 min		

**EXISTING CONDITION
HEC-1 ANALYSIS**

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 16JUL20 TIME 11:19:52
*
*****

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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      X
      XXXXXX XXXX X      XXXXX X
      X   X X      X   X      X
      X   X X      X   X      X
      X   X XXXXXXX XXXXX      XXX

```

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

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

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

*** FREE ***

```

1 ID EXISTING CONDITION HYDROLOGIC MODEL
2 ID INPUT FILE DATE = MAY 20, 2020
3 ID DESIGN STORM = 100-YEAR 6-HR STORM
4 ID STORM DISTRIBUTION = SDN #3
5 ID MODELED BY VTN (JYA)
6 ID
7 ID *****
8 ID * TECHNICAL DRAINAGE STUDY FOR *
9 ID * HUALAPAI AND ISAAC NEWTON *
10 ID *****
11 ID
12 ID
13 ID
14 ID 10YR AND 100YR STORM EVENT FOR 6 HOUR STORM
15 IT 5 0 0 300
16 IN 5 0 0
17 IO 5 0 0
18 JR PREC 1.00 0.56
*

```

```

19 KK EX1
20 KM UNDEVELOPED ONSITE BASIN
21 BA 0.0073
22 PB 3.00
23 PC 0 0.02 0.057 0.07 0.087 0.108 0.124 0.13 0.13 0.130
24 PC 0.13 0.13 0.13 0.133 0.14 0.142 0.148 0.158 0.172 0.181
25 PC 0.19 0.197 0.199 0.2 0.201 0.204 0.214 0.229 0.241 0.249
26 PC 0.251 0.256 0.27 0.278 0.281 0.283 0.295 0.322 0.352 0.409
27 PC 0.499 0.59 0.71 0.744 0.781 0.812 0.819 0.835 0.851 0.856
28 PC 0.86 0.868 0.876 0.888 0.91 0.926 0.937 0.95 0.97 0.976
29 PC 0.982 0.985 0.987 0.989 0.99 0.993 0.993 0.994 0.995 0.998
30 PC 0.998 0.999 1
31 LS 0 88.0
32 UD 0.100
*

```

```

33 KK CHEY1*
34 KM REFERENCED OFFSITE BASIN
35 PB 3.17
36 BA 0.0053
37 LS 0 98.0
38 UD 0.0926
*

```

```

39 KK CHEY2*
40 KM REFERENCED OFFSITE BASIN
41 BA 0.0027
42 LS 0 98.0
43 UD 0.0519
*

```

1 HEC-1 INPUT PAGE 2

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
44	KK CHEY3*
45	KM REFERENCED OFFSITE BASIN
46	BA 0.0023
47	LS 0 98.0
48	UD 0.050
	*
49	KK CHEY*
50	KM COMBINE CHEY, CHEY2, CHEY3
51	KM REFERENCED FROM CHEYENNE STUDY
52	HC 3
	*
53	KK RCHEY
54	KM ROUTE CHEY* TO C1
55	RD 1000 .035 0.016 0 TRAP 41 0
	*
56	KK OFF1
57	KM OFFSITE STREET BASIN
58	PB 3.00
59	BA 0.0018
60	LS 0 98.0
61	UD 0.050
	*
62	KK OFF2
63	KM OFFSITE STREET BASIN
64	BA 0.0007
65	LS 0 98.0
66	UD 0.050
	*
67	KK C1
68	KM COMBINE CHEY*, OFF1 AND OFF2
69	HC 3
	*
70	KK OFF3
71	KM OFFSITE DEVELOPED BASIN
72	BA 0.0065
73	LS 0 91.0
74	UD 0.069
	*
75	KK OFF4
76	KM OFFSITE STREET BASIN
77	BA 0.0017
78	LS 0 98.0
79	UD 0.065
	*

1

HEC-1 INPUT

PAGE 3

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
80	KK C2
81	KM COMBINE OFF3 AND OFF4
82	HC 2
	*
83	KK OFF5
84	KM OFFSITE STREET BASIN
85	BA 0.0012
86	LS 0 98.0
87	UD 0.056
	*
88	ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
19	EX1	
	.	
33	.	CHEY1*
	.	
39	.	CHEY2*
	.	
44	.	CHEY3*
	.	
	.	

49 . CHEY*.....
 . V
 . V
53 . RCHEY
 .
 .
56 . OFF1
 .
 .
62 . OFF2
 .
 .
67 . C1.....
 .
 .
70 . OFF3
 .
 .
75 . OFF4
 .
 .
80 . C2.....
 .
 .
83 . OFF5
 .

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 16JUL20 TIME 11:19:52 *
*

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

EXISTING CONDITION HYDROLOGIC MODEL
INPUT FILE DATE = MAY 20, 2020
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (JYA)

* TECHNICAL DRAINAGE STUDY FOR *
* HUALAPAI AND ISAAC NEWTON *

10YR AND 100YR STORM EVENT FOR 6 HOUR STORM

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

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

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00 .56

1

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

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 1.00	RATIO 2 .56
HYDROGRAPH AT +	EX1	.01	1 FLOW TIME	12. 3.50	5. 3.50
HYDROGRAPH AT +	CHEY1*	.01	1 FLOW TIME	12. 3.50	7. 3.50
HYDROGRAPH AT +	CHEY2*	.00	1 FLOW TIME	7. 3.50	4. 3.50
HYDROGRAPH AT +	CHEY3*	.00	1 FLOW TIME	6. 3.50	3. 3.50
3 COMBINED AT +	CHEY*	.01	1 FLOW TIME	26. 3.50	14. 3.50
ROUTED TO +	RCHEY	.01	1 FLOW TIME	23. 3.50	13. 3.58
HYDROGRAPH AT +	OFF1	.00	1 FLOW TIME	5. 3.50	2. 3.50
HYDROGRAPH AT +	OFF2	.00	1 FLOW TIME	2. 3.50	1. 3.50
3 COMBINED AT +	C1	.01	1 FLOW TIME	29. 3.50	16. 3.50
HYDROGRAPH AT +	OFF3	.01	1 FLOW TIME	13. 3.50	6. 3.50
HYDROGRAPH AT +	OFF4	.00	1 FLOW TIME	4. 3.50	2. 3.50
2 COMBINED AT +	C2	.01	1 FLOW TIME	17. 3.50	8. 3.50
HYDROGRAPH AT +	OFF5	.00	1 FLOW TIME	3. 3.50	2. 3.50

1

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME
							PEAK	TIME TO PEAK	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1	RATIO=	.00							
RCHEY	MANE	2.87	24.57	212.10	2.94	5.00	23.06	210.00	2.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1612E+01 EXCESS= .0000E+00 OUTFLOW= .1615E+01 BASIN STORAGE= .1179E-02 PERCENT ERROR= -.3

FOR PLAN = 1	RATIO=	.00							
RCHEY	MANE	2.75	13.23	211.75	1.55	5.00	12.60	215.00	1.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8520E+00 EXCESS= .0000E+00 OUTFLOW= .8537E+00 BASIN STORAGE= .1556E-02 PERCENT ERROR= -.4

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

**ULTIMATE CONDITION
HEC-1 ANALYSIS**

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 16JUL20 TIME 11:20:02 *
*
*****

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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  XXXXXX  XXXX  X
      X  X  X      X  X  XX
      X  X  X      X  X  X
      XXXXXX XXXX  X      XXXX  X
      X  X  X      X      X  X
      X  X  X      X  X  X
      X  X  XXXXXX  XXXX  XXX

```

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

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

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

*** FREE ***

```

1 ID ULTIMATE CONDITION HYDROLOGIC MODEL
2 ID INPUT FILE DATE = MAY 20, 2020
3 ID DESIGN STORM = 100-YEAR 6-HR STORM
4 ID STORM DISTRIBUTION = SDN #3
5 ID MODELED BY VTN (JYA)
6 ID
7 ID *****
8 ID * TECHNICAL DRAINAGE STUDY FOR *
9 ID * HUALAPAI AND ISAAC NEWTON *
10 ID *****
11 ID
12 ID
13 ID
14 ID 10YR AND 100YR STORM EVENT FOR 6 HOUR STORM
15 IT 5 0 0 300
16 IN 5 0 0
17 IO 5 0 0
18 JR PREC 1.00 0.56
*

```

```

19 KK ON1
20 KM DEVELOPED ONSITE BASIN
21 BA 0.0073
22 PB 3.00
23 PC 0 0.02 0.057 0.07 0.087 0.108 0.124 0.13 0.13 0.130
24 PC 0.13 0.13 0.13 0.133 0.14 0.142 0.148 0.158 0.172 0.181
25 PC 0.19 0.197 0.199 0.2 0.201 0.204 0.214 0.229 0.241 0.249
26 PC 0.251 0.256 0.27 0.278 0.281 0.283 0.295 0.322 0.352 0.409
27 PC 0.499 0.59 0.71 0.744 0.781 0.812 0.819 0.835 0.851 0.856
28 PC 0.86 0.868 0.876 0.888 0.91 0.926 0.937 0.95 0.97 0.976
29 PC 0.982 0.985 0.987 0.989 0.99 0.993 0.993 0.994 0.995 0.998
30 PC 0.998 0.999 1
31 LS 0 91.0
32 UD 0.088
*

```

```

33 KK CHEY1*
34 KM REFERENCED OFFSITE BASIN
35 PB 3.17
36 BA 0.0053
37 LS 0 98.0
38 UD 0.0926
*

```

```

39 KK CHEY2*
40 KM REFERENCED OFFSITE BASIN
41 BA 0.0027
42 LS 0 98.0
43 UD 0.0519
*

```

1 HEC-1 INPUT PAGE 2

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

```

44 KK CHEY3*
45 KM REFERENCED OFFSITE BASIN
46 BA 0.0023
47 LS 0 98.0
48 UD 0.050
*

49 KK CHEY*
50 KM COMBINE CHEY, CHEY2, CHEY3
51 KM REFERENCED FROM CHEYENNE STUDY
52 HC 3
*

53 KK RCHEY
54 KM ROUTE CHEY* TO C1
55 RD 1000 .035 0.016 0 TRAP 41 0
*

56 KK OFF1
57 KM OFFSITE STREET BASIN
58 PB 3.00
59 BA 0.0018
60 LS 0 98.0
61 UD 0.050
*

62 KK OFF2
63 KM OFFSITE STREET BASIN
64 BA 0.0007
65 LS 0 98.0
66 UD 0.050
*

67 KK C1
68 KM COMBINE CHEY*, OFF1 AND OFF2
69 HC 3
*

70 KK C1-N
71 KM FLOW SPLIT
72 KM FLOW FROM C1 ENTERING THE PROJECT
73 DT C1-E
74 DI 16 29
75 DQ 15 25
*

76 KK RC1-N
77 KM ROUTE C1-N TO C3
78 RD 715 .020 0.016 0 TRAP 49 0
*

```

1

HEC-1 INPUT

PAGE 3

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

```

79 KK C3
80 KM COMBINE ON1 AND C1-N
81 HC 2
*

82 KK OFF3
83 KM OFFSITE DEVELOPED BASIN
84 BA 0.0065
85 LS 0 91.0
86 UD 0.069
*

87 KK OFF4
88 KM OFFSITE STREET BASIN
89 BA 0.0017
90 LS 0 98.0
91 UD 0.065
*

92 KK C2
93 KM COMBINE OFF3 AND OFF4
94 HC 2
*

95 KK OFF5
96 KM OFFSITE STREET BASIN
97 BA 0.0012
98 LS 0 98.0
99 UD 0.056
*

100 ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
19	ON1	
	.	
33	CHEY1*	
	.	
39	CHEY2*	
	.	
44	CHEY3*	
	.	
49	CHEY*.....	
	V	
	V	
53	RCHEY	
	.	
56	OFF1	
	.	
62	OFF2	
	.	
67	C1.....	
	.	
73	-----> C1-E	
70	C1-N	
	V	
	V	
76	RC1-N	
	.	
79	C3.....	
	.	
82	OFF3	
	.	
87	OFF4	
	.	
92	C2.....	
	.	
95	OFF5	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 16JUL20 TIME 11:20:02 *
*
*****

```

```

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

```

ULTIMATE CONDITION HYDROLOGIC MODEL
 INPUT FILE DATE = MAY 20, 2020
 DESIGN STORM = 100-YEAR 6-HR STORM
 STORM DISTRIBUTION = SDN #3
 MODELED BY VTN (JVA)

```

*****
* TECHNICAL DRAINAGE STUDY FOR *
* HUALAPAI AND ISAAC NEWTON *
*****

```

10YR AND 100YR STORM EVENT FOR 6 HOUR STORM

17 IO	OUTPUT CONTROL VARIABLES
	IPRNT 5 PRINT CONTROL
	IPLST 0 PLOT CONTROL
	QSCAL 0. HYDROGRAPH PLOT SCALE
IT	HYDROGRAPH TIME DATA
	NMIN 5 MINUTES IN COMPUTATION INTERVAL

IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 2 0 ENDING DATE
 NDTIME 0055 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
 NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 1.00 .56

1

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 1.00	RATIO 2 .56
HYDROGRAPH AT +	ON1	.01	1 FLOW TIME	14. 3.50	6. 3.50
HYDROGRAPH AT +	CHEY1*	.01	1 FLOW TIME	12. 3.50	7. 3.50
HYDROGRAPH AT +	CHEY2*	.00	1 FLOW TIME	7. 3.50	4. 3.50
HYDROGRAPH AT +	CHEY3*	.00	1 FLOW TIME	6. 3.50	3. 3.50
3 COMBINED AT +	CHEY*	.01	1 FLOW TIME	26. 3.50	14. 3.50
ROUTED TO +	RCHEY	.01	1 FLOW TIME	23. 3.50	13. 3.58
HYDROGRAPH AT +	OFF1	.00	1 FLOW TIME	5. 3.50	2. 3.50
HYDROGRAPH AT +	OFF2	.00	1 FLOW TIME	2. 3.50	1. 3.50
3 COMBINED AT +	C1	.01	1 FLOW TIME	29. 3.50	16. 3.50
DIVERSION TO +	C1-E	.01	1 FLOW TIME	25. 3.50	15. 3.50
HYDROGRAPH AT +	C1-N	.01	1 FLOW TIME	4. 3.50	1. 3.50
ROUTED TO +	RC1-N	.01	1 FLOW TIME	4. 3.58	0. 3.75
2 COMBINED AT +	C3	.02	1 FLOW TIME	17. 3.50	6. 3.50
HYDROGRAPH AT +	OFF3	.01	1 FLOW TIME	13. 3.50	6. 3.50

HYDROGRAPH AT
+ OFF4 .00 1 FLOW 4. 2.
TIME 3.50 3.50

2 COMBINED AT
+ C2 .01 1 FLOW 17. 8.
TIME 3.50 3.50

HYDROGRAPH AT
+ OFF5 .00 1 FLOW 3. 2.
TIME 3.50 3.50

1
SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
INTERPOLATED TO
COMPUTATION INTERVAL
ISTAQ ELEMENT DT PEAK TIME TO VOLUME DT PEAK TIME TO VOLUME
PEAK TIME TO PEAK
(MIN) (CFS) (MIN) (IN) (MIN) (CFS) (MIN) (IN)
FOR PLAN = 1 RATIO= .00
RCHEY MANE 2.87 24.57 212.10 2.94 5.00 23.06 210.00 2.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1612E+01 EXCESS= .0000E+00 OUTFLOW= .1615E+01 BASIN STORAGE= .1179E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
RCHEY MANE 2.75 13.23 211.75 1.55 5.00 12.60 215.00 1.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8520E+00 EXCESS= .0000E+00 OUTFLOW= .8537E+00 BASIN STORAGE= .1556E-02 PERCENT ERROR= -.4

FOR PLAN = 1 RATIO= .00
RC1-N MANE .75 4.01 214.50 .13 5.00 4.00 215.00 .13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8858E-01 EXCESS= .0000E+00 OUTFLOW= .8911E-01 BASIN STORAGE= .1099E-02 PERCENT ERROR= -1.8

FOR PLAN = 1 RATIO= .00
RC1-N MANE .25 1.07 219.50 .01 5.00 .28 225.00 .01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5124E-02 EXCESS= .0000E+00 OUTFLOW= .5742E-02 BASIN STORAGE= .1194E-02 PERCENT ERROR= -35.4

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

APPENDIX C

HYDRAULIC CALCULATIONS

NORMAL DEPTH CALCULATIONS

Project Description

Input Data

Station (ft)	Elevation (ft)
--------------	----------------

Roughness Segment Definitions

Options

Bentley Systems, Inc. Haestad Methods Software
7/15/2020 3:29:54 PM 27 Siemons Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 2

Worksheet for 1 - Isaac Newton (10-Year)

Results

Normal Depth		0.38	ft
Elevation Range	0.00 to 0.67 ft		
Flow Area		2.97	ft ²
Wetted Perimeter		23.17	ft
Hydraulic Radius		0.13	ft
Top Width		22.32	ft
Normal Depth		0.38	ft
Critical Depth		0.51	ft
Critical Slope		0.00643	ft/ft
Velocity		5.38	ft/s
Velocity Head		0.45	ft
Specific Energy		0.83	ft
Froude Number		2.60	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.38	ft
Critical Depth	0.51	ft
Channel Slope	4.90	%
Critical Slope	0.00643	ft/ft

Cross Section for 1 - Isaac Newton (10-Year)

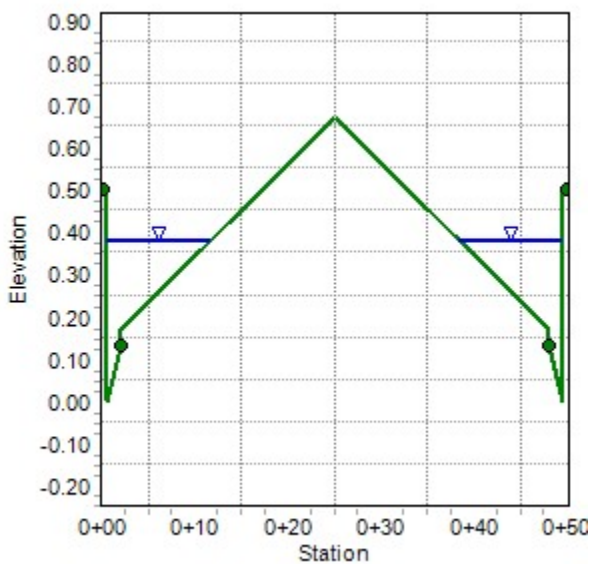
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.90	%
Normal Depth	0.38	ft
Discharge	16.00	ft ³ /s

Cross Section Image



Project Description

Input Data

Station (ft)	Elevation (ft)
--------------	----------------

Roughness Segment Definitions

Options

Bentley Systems, Inc. Haestad Methods Solution Center
7/15/2020 7:59:02 PM 27 Siemons Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 2

Worksheet for 1 - Isaac Newton (100-Year)

Results

Normal Depth		0.45	ft
Elevation Range	0.00 to 0.67 ft		
Flow Area		4.70	ft ²
Wetted Perimeter		29.57	ft
Hydraulic Radius		0.16	ft
Top Width		28.57	ft
Normal Depth		0.45	ft
Critical Depth		0.61	ft
Critical Slope		0.00598	ft/ft
Velocity		6.17	ft/s
Velocity Head		0.59	ft
Specific Energy		1.04	ft
Froude Number		2.68	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.45	ft
Critical Depth	0.61	ft
Channel Slope	4.90	%
Critical Slope	0.00598	ft/ft

Cross Section for 1 - Isaac Newton (100-Year)

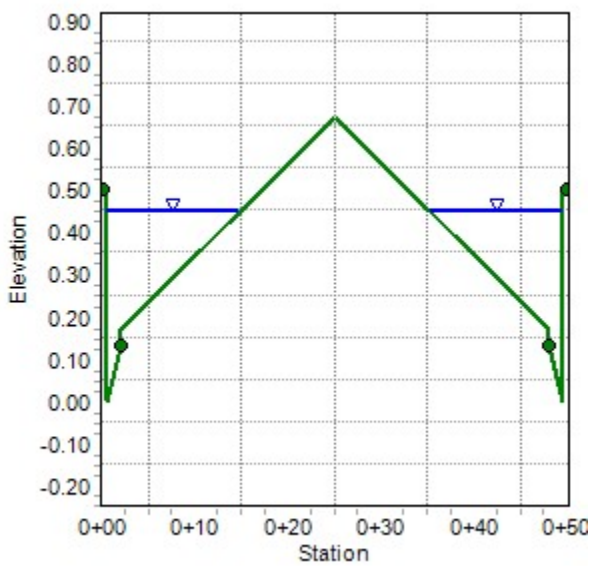
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.90	%
Normal Depth	0.45	ft
Discharge	29.00	ft ³ /s

Cross Section Image



Worksheet for 2 East - Hualapai

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.00	%
Discharge	3.00	ft ³ /s
Section Definitions		

Station (ft)	Elevation (ft)
--------------	----------------

0+00.00	1.03
0+43.00	0.17
0+43.00	0.13
0+44.50	0.00
0+44.50	0.50
0+45.00	0.50
0+50.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.03)	(0+43.00, 0.13)	0.013
(0+43.00, 0.13)	(0+50.00, 0.60)	0.016

Options

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

Results

Normal Depth	0.32	ft
Elevation Range	0.00 to 1.03 ft	
Flow Area	0.91	ft²
Wetted Perimeter	9.16	ft
Hydraulic Radius	0.10	ft

Worksheet for 2 East - Hualapai

Results

Top Width	8.80	ft
Normal Depth	0.32	ft
Critical Depth	0.37	ft
Critical Slope	0.00565	ft/ft
Velocity	3.30	ft/s
Velocity Head	0.17	ft
Specific Energy	0.49	ft
Froude Number	1.81	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	0.37	ft
Channel Slope	2.00	%
Critical Slope	0.00565	ft/ft

Cross Section for 2 East - Hualapai

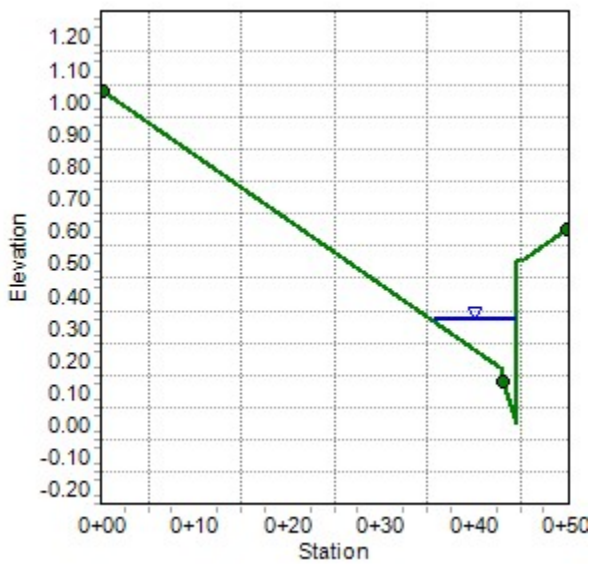
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.00	%
Normal Depth	0.32	ft
Discharge	3.00	ft ³ /s

Cross Section Image



Project Description

Manning Formula

Normal Depth

Channel Slope	2.00	%
Discharge	17.00	ft ³ /s
Section Definitions		

Station (ft)	Elevation (ft)
0+00.00	0.66
0+05.00	0.50
0+05.50	0.50
0+05.50	0.00
0+07.00	0.13
0+07.00	0.17
0+50.00	1.03

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.60)	(0+07.00, 0.17)	0.013
(0+07.00, 0.17)	(0+50.00, 1.03)	0.016

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

Normal Depth		0.53	ft
Elevation Range	0.00 to 1.03 ft		
Flow Area		3.93	ft²
Wetted Perimeter		21.86	ft
Hydraulic Radius		0.18	ft

Worksheet for 2 West - Hualapai

Results

Top Width	21.31	ft
Normal Depth	0.53	ft
Critical Depth	0.62	ft
Critical Slope	0.00598	ft/ft
Velocity	4.32	ft/s
Velocity Head	0.29	ft
Specific Energy	0.82	ft
Froude Number	1.77	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.53	ft
Critical Depth	0.62	ft
Channel Slope	2.00	%
Critical Slope	0.00598	ft/ft

Cross Section for 2 West - Hualapai

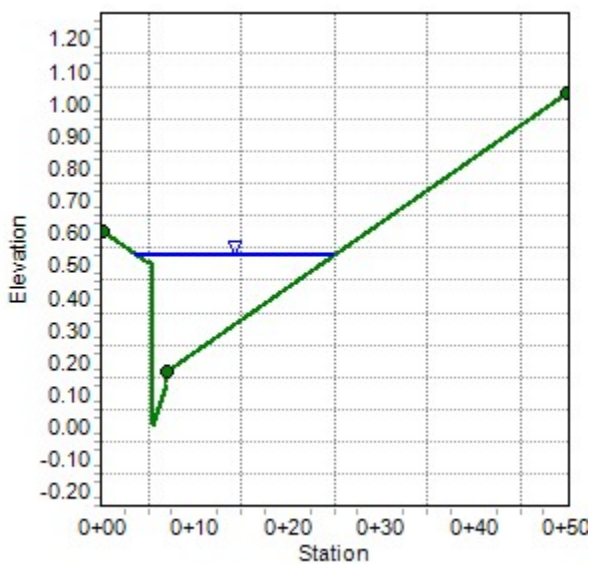
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.00	%
Normal Depth	0.53	ft
Discharge	17.00	ft ³ /s

Cross Section Image



Worksheet for 3 - Aconitum Ct

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.00	%
Discharge	4.00	ft ³ /s
Section Definitions		

Station (ft)	Elevation (ft)
0+00.00	0.38
0+00.38	0.33
0+00.94	0.14
0+01.50	0.00
0+02.50	0.08
0+02.50	0.12
0+19.50	0.46
0+36.50	0.12
0+36.50	0.08
0+37.50	0.00
0+38.06	0.14
0+38.62	0.33
0+39.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+02.50, 0.08)	0.013
(0+02.50, 0.08)	(0+36.50, 0.08)	0.016
(0+36.50, 0.08)	(0+39.00, 0.38)	0.013

Options

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

Worksheet for 3 - Aconitum Ct

Results

Normal Depth		0.23	ft
Elevation Range	0.00 to 0.46 ft		
Flow Area		1.12	ft ²
Wetted Perimeter		14.30	ft
Hydraulic Radius		0.08	ft
Top Width		14.15	ft
Normal Depth		0.23	ft
Critical Depth		0.29	ft
Critical Slope		0.00728	ft/ft
Velocity		3.57	ft/s
Velocity Head		0.20	ft
Specific Energy		0.42	ft
Froude Number		2.24	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.23	ft
Critical Depth	0.29	ft
Channel Slope	4.00	%
Critical Slope	0.00728	ft/ft

Cross Section for 3 - Aconitum Ct

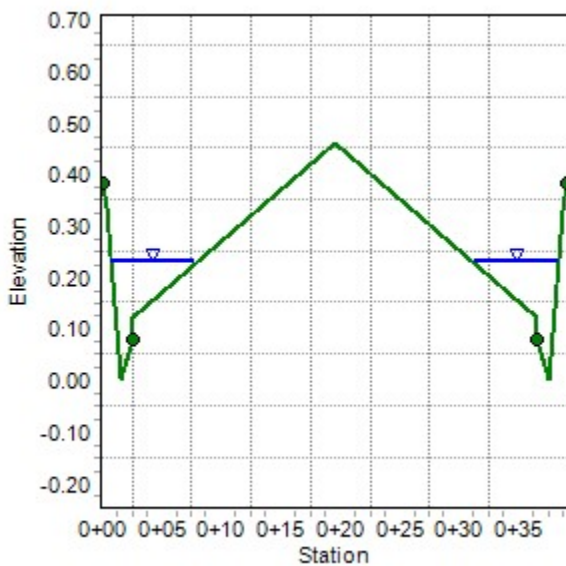
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.00	%
Normal Depth	0.23	ft
Discharge	4.00	ft ³ /s

Cross Section Image



Project Description

Solve For Normal Depth

Channel Slope	4.00	%
Discharge	10.00	ft ³ /s
Section Definitions		

Station (ft)	Elevation (ft)
0+00.00	0.38
0+00.38	0.33
0+00.94	0.14
0+01.50	0.00
0+02.50	0.08
0+02.50	0.12
0+19.50	0.46
0+36.50	0.12
0+36.50	0.08
0+37.50	0.00
0+38.06	0.14
0+38.62	0.33
0+39.00	0.38

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+02.50, 0.08)	0.013
(0+02.50, 0.08)	(0+36.50, 0.08)	0.016
(0+36.50, 0.08)	(0+39.00, 0.38)	0.013

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

Worksheet for 4 - Blodwen St

Results

Normal Depth		0.29	ft
Elevation Range	0.00 to 0.46 ft		
Flow Area		2.31	ft ²
Wetted Perimeter		21.42	ft
Hydraulic Radius		0.11	ft
Top Width		21.24	ft
Normal Depth		0.29	ft
Critical Depth		0.38	ft
Critical Slope		0.00665	ft/ft
Velocity		4.34	ft/s
Velocity Head		0.29	ft
Specific Energy		0.58	ft
Froude Number		2.32	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.29	ft
Critical Depth	0.38	ft
Channel Slope	4.00	%
Critical Slope	0.00665	ft/ft

Cross Section for 4 - Blodwen St

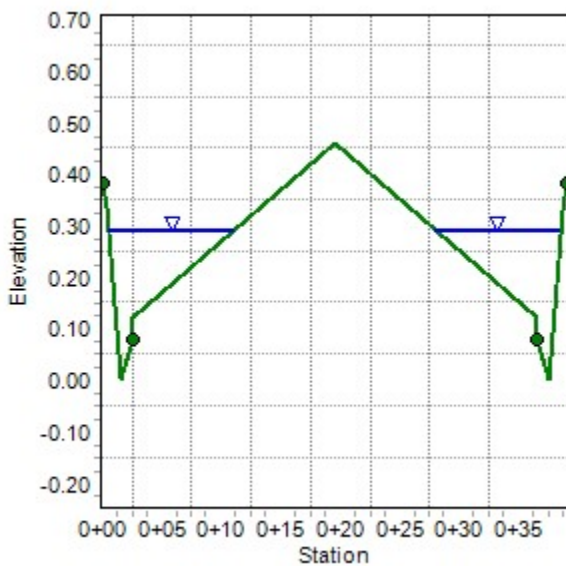
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.00	%
Normal Depth	0.29	ft
Discharge	10.00	ft ³ /s

Cross Section Image



Worksheet for 5 - Roseum Ct

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 4.50 %
Discharge 4.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+00.38	0.33
0+00.94	0.14
0+01.50	0.00
0+02.50	0.08
0+02.50	0.12
0+19.50	0.46
0+36.50	0.12
0+36.50	0.08
0+37.50	0.00
0+38.06	0.14
0+38.62	0.33
0+39.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+02.50, 0.08)	0.013
(0+02.50, 0.08)	(0+36.50, 0.08)	0.016
(0+36.50, 0.08)	(0+39.00, 0.38)	0.013

Options

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

Worksheet for 5 - Roseum Ct

Results

Normal Depth		0.22	ft
Elevation Range	0.00 to 0.46 ft		
Flow Area		1.07	ft ²
Wetted Perimeter		13.91	ft
Hydraulic Radius		0.08	ft
Top Width		13.76	ft
Normal Depth		0.22	ft
Critical Depth		0.29	ft
Critical Slope		0.00727	ft/ft
Velocity		3.74	ft/s
Velocity Head		0.22	ft
Specific Energy		0.44	ft
Froude Number		2.37	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.22	ft
Critical Depth	0.29	ft
Channel Slope	4.50	%
Critical Slope	0.00727	ft/ft

Cross Section for 5 - Roseum Ct

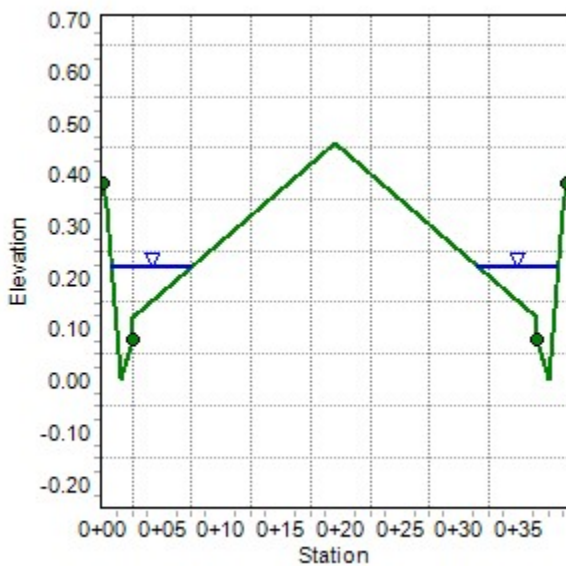
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.50	%
Normal Depth	0.22	ft
Discharge	4.00	ft ³ /s

Cross Section Image



Worksheet for 6 - Blodwen St

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 1.70 %
Discharge 17.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+00.38	0.33
0+00.94	0.14
0+01.50	0.00
0+02.50	0.08
0+02.50	0.12
0+19.50	0.46
0+36.50	0.12
0+36.50	0.08
0+37.50	0.00
0+38.06	0.14
0+38.62	0.33
0+39.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+02.50, 0.08)	0.013
(0+02.50, 0.08)	(0+36.50, 0.08)	0.016
(0+36.50, 0.08)	(0+39.00, 0.38)	0.013

Options

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

Worksheet for 6 - Blodwen St

Results

Normal Depth		0.39	ft
Elevation Range	0.00 to 0.46 ft		
Flow Area		4.83	ft ²
Wetted Perimeter		31.97	ft
Hydraulic Radius		0.15	ft
Top Width		31.76	ft
Normal Depth		0.39	ft
Critical Depth		0.45	ft
Critical Slope		0.00627	ft/ft
Velocity		3.52	ft/s
Velocity Head		0.19	ft
Specific Energy		0.58	ft
Froude Number		1.59	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.39	ft
Critical Depth	0.45	ft
Channel Slope	1.70	%
Critical Slope	0.00627	ft/ft

Cross Section for 6 - Blodwen St

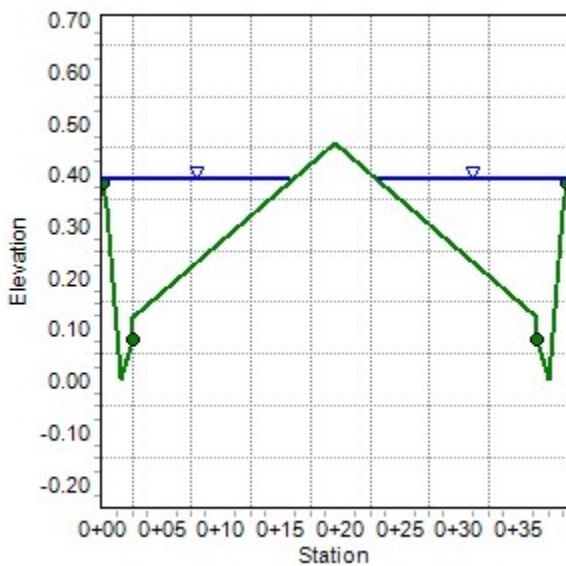
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.70	%
Normal Depth	0.39	ft
Discharge	17.00	ft ³ /s

Cross Section Image



Worksheet for 7 - Drainage Easement

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.51 %
Discharge 17.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.00
0+00.00	0.25
0+07.50	0.10
0+12.50	0.00
0+17.50	0.10
0+25.00	0.25
0+25.00	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.00)	(0+07.50, 0.10)	0.030
(0+07.50, 0.10)	(0+17.50, 0.10)	0.013
(0+17.50, 0.10)	(0+25.00, 1.00)	0.030

Options

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

Results

Normal Depth 0.33 ft
Elevation Range 0.00 to 1.00 ft
Flow Area 5.14 ft²
Wetted Perimeter 25.17 ft

Worksheet for 7 - Drainage Easement

Results

Hydraulic Radius	0.20	ft
Top Width	25.00	ft
Normal Depth	0.33	ft
Critical Depth	0.37	ft
Critical Slope	0.01441	ft/ft
Velocity	3.31	ft/s
Velocity Head	0.17	ft
Specific Energy	0.50	ft
Froude Number	1.29	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.33	ft
Critical Depth	0.37	ft
Channel Slope	2.51	%
Critical Slope	0.01441	ft/ft

Cross Section for 7 - Drainage Easement

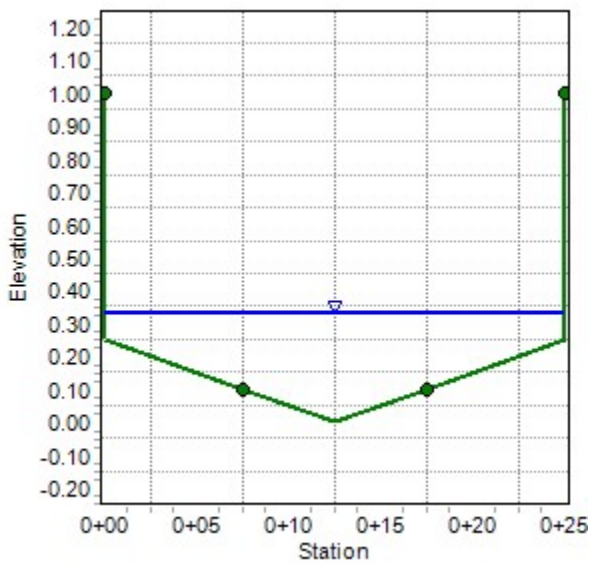
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.51	%
Normal Depth	0.33	ft
Discharge	17.00	ft ³ /s

Cross Section Image



FLOW SPLIT CALCULATIONS

FLOW CALCULATIONS FOR PIMA COUNTY FLOW SPLIT - ULTIMATE CONDITION

Notes:

2- Overbank Flow is $Q=V*A$, where Velocity and Area are determined from the Flowmaster Cross Section

3- Depth of Q100 flow, assume 0.5 ft high curb with 5-foot wide sidewalk for area calculation

4- Gutter flow used in the Pima County Flow Split Calculations is Q100 in the Street minus the overbank flow

5- Including 5-foot sidewalk each side of road

[illegible]

PIMA COUNTY FLOW SPLIT CALCULATIONS - ULTIMATE CONDITION

$$Q_L = 0.042 \left[\frac{(Q_m^{0.93})(W_{ss}^{0.85})}{(S_m^{0.41})(W_m^{0.79})} \right]$$

$$Q_o = 46.8 \times W_{ss} \times Y_o \times S_{ss}^{0.5} - Q_L$$

$$Q_T = Q_L + Q_o$$

Where: Q_m = Main street flow measured between the curbs (cfs)
 S_m = Longitudinal slope of the main street (ft / ft)
 W_m = Width of the main street (ft)
 W_{ss} = Width of side street (ft)
 S_{ss} = Longitudinal slope of the side street (feet/foot)
 Y_o = Average depth of overbank flow intercepted by the side street (ft)
 Q_{OB} = Overbank flow on downstream side of Main Street (cfs)
 Q_L = Lateral flow into the side street (cfs)
 Q_o = Overbank flow intercepted by the side street (cfs)
 Q_T = Total flow intercepted by the side street (cfs)
 Q_R = Flow remaining in Main Street after split (cfs)

DESCRIPTIONS			INPUT							OUTPUT		RESULTS	
Hec-1 Flow Split Identifier	Main Street	Side Street	Q_m (cfs)	S_m (ft/ft)	W_m (ft)	W_{ss} (ft)	S_{ss} (ft/ft)	Y_o (ft)	Q_{OB} (cfs)	Q_L (cfs)	Q_o (cfs)	Q_T (cfs)	Q_R (cfs)
Isaac	Isaac (100-yr)	Blodwen	29	0.049	60	49	0	-0.10	0	4	0	4	25
Isaac	Isaac (10-yr)	Blodwen	16	1.049	60	49	0	-0.17	0	1	0	1	15

FINISHED FLOOR VERIFICATION

FINISHED FLOOR VERIFICATION

Development: Hualapai/Isaac Newton

W.O. # 8031

Calculated By: JYA

EQUATIONS AND NOTES

Freeboard requires the set finished floor elevations of all proposed buildings are 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.

$$\text{Additional Freeboard} = \text{Actual Freeboard} - \text{Required Freeboard}$$

Lot	Flow Depth (ft)	High Side T.O.C.	Type of Curb ("L" or Roll)	Flowline Elevation	Required Finish Floor Elevation	Actual Finish Floor Elevation	Additional Freeboard (ft)	Flowmaster Section
1	0.22	21.13	Roll	20.75	21.63	22.1	0.47	5
2	0.22	19.03	Roll	18.65	19.53	20.3	0.77	5
3	0.22	17.48	Roll	17.10	17.98	18.7	0.72	5
4	0.22	15.93	Roll	15.55	16.43	17.2	0.77	5
5	0.22	21.19	Roll	20.81	21.69	22.3	0.61	5
6	0.22	19.42	Roll	19.04	19.92	21.2	1.28	5
7	0.39	16.16	Roll	15.78	16.56	17.9	1.34	6
8	0.39	17.21	Roll	16.83	17.61	18.8	1.19	6
9	0.39	18.54	Roll	18.16	18.94	19.9	0.96	6
10	0.39	19.96	Roll	19.58	20.36	21.3	0.94	6
11	0.29	22.12	Roll	21.74	22.32	23.5	1.18	4
12	0.29	23.56	Roll	23.18	23.76	24.9	1.14	4
13	0.29	25.00	Roll	24.62	25.20	26.3	1.10	4
14	0.23	26.35	Roll	25.97	26.85	27.8	0.95	3
15	0.23	31.91	Roll	31.53	32.41	33.5	1.09	3
16	0.23	33.59	Roll	33.21	34.09	34.7	0.61	3
17	0.23	33.59	Roll	33.21	34.09	34.6	0.51	3
18	0.23	31.59	Roll	31.21	32.09	33.0	0.91	3
19	0.23	30.22	Roll	29.84	30.72	31.6	0.88	3
20	0.23	28.81	Roll	28.43	29.31	30.2	0.89	3
21	0.29	25.80	Roll	25.42	26.00	28.4	2.40	4
22	0.29	26.66	Roll	26.28	26.86	29.1	2.24	4
23	0.29	27.49	Roll	27.11	27.69	29.3	1.61	4
24	0.29	27.23	Roll	26.85	27.43	28.9	1.47	4
25	0.29	26.46	Roll	26.08	26.66	27.9	1.24	4
26	0.29	25.18	Roll	24.80	25.38	26.5	1.12	4
27	0.29	23.78	Roll	23.40	23.98	25.1	1.12	4
28	0.29	22.38	Roll	22.00	22.58	23.7	1.12	4
29	0.29	20.99	Roll	20.61	21.19	22.3	1.11	4
30	0.39	19.59	Roll	19.21	19.99	20.9	0.91	6
31	0.39	18.19	Roll	17.81	18.59	19.6	1.01	6
32	0.39	16.97	Roll	16.59	17.37	18.6	1.23	6
33	0.39	16.00	Roll	15.62	16.40	17.7	1.30	6
34	0.39	15.27	Roll	14.89	15.67	16.9	1.23	6
35	0.39	14.68	Roll	14.30	15.08	16.3	1.22	6
36	0.39	14.08	Roll	13.70	14.48	15.7	1.22	6
37	0.39	13.52	Roll	13.14	13.92	15.2	1.28	6

FINISHED FLOOR VERIFICATION - T INTERSECTION

Development Hualapai & Isaac Newton Residential

W.O. # 8031

Calculated By: JYA

EQUATIONS AND NOTES

Finished floors located at T-intersections are impacted by additional flow depth created by the velocity head of the terminating street. This velocity head has been subtracted from the *Additional Freeboard* value to determine the *Final Additional Freeboard*.

$$\text{Final Additional Freeboard} = \text{Additional Freeboard} - \text{Velocity Head}$$

Lot	Flow Depth (ft)	Additional Freeboard (ft)	FlowMaster Section	Velocity Head (ft)	Final Additional Freeboard (ft)
23	0.23	1.61	3	0.20	1.41
24	0.23	1.47	3	0.20	1.27
35	0.22	1.22	5	0.22	1.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00

WEIR CALCULATIONS

Hualapai & Isaac Newton
W.O.# 8031

**WEIR FLOW CALCULATIONS
DEPRESSED CURB TO DRAINAGE EASEMENT**

WEIR EQUATION

$$Q = C_d \times L \times H^{1.5} \quad \text{or} \quad H = \left(\frac{Q}{C_d \times L} \right)^{\frac{2}{3}}$$

Where:

L = Length of Weir, ft.

Q = Flow Capacity, cfs

H = Height of Weir, ft.

C_d = Weir Coefficient = 3.0

INPUT

Q = 17 cfs

C_d = 3.0

L = 2.5 ft.

RESULT

H = 1.73 ft.

WEIR WATER SURFACE ELEVATION (W.W.S.E.)

FLOWLINE = 12.39 ft

W.W.S.E. = 14.12 ft

Hualapai & Isaac Newton
W.O.# 8031

**WEIR FLOW CALCULATIONS
AT 10' WIDE DRAINAGE EASEMENT DISCHARGE POINT**

WEIR EQUATION

$$Q = C_d \times L \times H^{1.5} \quad \text{or} \quad H = \left(\frac{Q}{C_d \times L} \right)^{\frac{2}{3}}$$

Where:

L = Length of Weir, ft.

Q = Flow Capacity, cfs

H = Height of Weir, ft.

C_d = Weir Coefficient = 3.0

INPUT

Q = 17 cfs

C_d = 3.0

L = 10 ft.

RESULT

H = 0.68 ft.

WEIR WATER SURFACE ELEVATION (W.W.S.E.)

FLOWLINE = 10.35 ft

W.W.S.E. = 11.03 ft

APPENDIX D

REFERENCE MATERIAL

**TECHNICAL DRAINAGE STUDY
FOR
CHEYENNE/HUALAPAI UNITS 3 AND 4

CLV DS# 2279**

FILE

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: May 24, 1999
TO: Land Development Services Department of Public Works		FROM: Randy L. Fultz, P.E. <i>RLF</i> Flood Control Project Manager Department of Public Works
SUBJECT: Drainage Study for: Cheyenne/Hualapai Units 3 and 4 Unit 3 Clubhouse Update FILE NO. \\KHAN\flood\Depot\DSMEMOS\DS2279E.doc		COPIES TO: VTN Nevada Perma-Bilt Homes Cheri Edleman, P.E. DEVCO
FEMA Flood Zone	YES No X	
Proposed Storm Drain	YES No X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	5/12/98	5/26/98	Not Accepted	\$250.00
2nd Submittal	7/8/98	7/16/98	Not Accepted	\$250.00
3rd Submittal	7/23/98	7/28/98	Conditionally Accepted	\$250.00
4th Submittal	12/15/98	12/15/98	Conditionally Accepted	\$100.00
5th Submittal	5/21/99	5/24/99	See Comments Below	N/C
TOTAL FEES				\$850.00

REMARKS:

5th Submittal, Unit 3 Clubhouse Update

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

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

The following comments were from the previous CLV memorandum dated October 19, 1998:

- The review fees for the Lone Mountain Planned Development drainage study must be paid prior to the release of any grading permits within Unit 4. The total review fees are \$750.00 for the Lone Mountain Planned Development drainage study.**
- All drainage easements shown on the plans must be labeled as Public Drainage Easements to be Privately Maintained and granted as such by the final map. The drainage easements should also be made common lots within the subdivisions. The 20 foot drainage easement to the west of Unit 3 must be granted as a Public Drainage Easement to be Privately Maintained prior to the release of any building permits.

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









the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction.

PLANS SENT TO LAND DEVELOPMENT YES (initial)

END OF REMARKS

gam

T/R/S: 20S/59E/12

AREA K-12

**TECHNICAL DRAINAGE STUDY
FOR
TIARA SUMMIT**

CLV DS# 3478

CITY OF LAS VEGAS		DATE: REVISION <i>MS</i>
INTER-OFFICE MEMORANDUM		May 12, 2004
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: Tiara Summit	COPIES TO: Taney Engineering
Cross Streets:	NEC of Hualapai Way & Cheyenne Avenue	Desert Wind Homes
File Number:	F:\Depot\DSMemos\DS3478C-REV.doc	Bart Anderson, P.E., DevCo
Parcel Number:	138-07-401-003 & -004	
Zoning Action:		
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES	NO X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID G.R. No.
1 st Submittal	1/7/2004	1/22/2004	Not Approved	\$400.00	117189: \$400
2 nd Submittal	3/4/2004	3/18/2004	Not Approved	\$400.00	120632: \$400
3 rd Submittal	4/7/2004	4/14/2004	Approved	\$400.00	122639: \$400
Revision	5/12/2004	5/12/2004	See Comments Below	N/C	N/C
TOTAL FEES (LDDRS):				\$1,200.00	----

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.

1. Previous comment #7 is repeated until it is complete: *On Detail D of Sheet GD1 provide structural calculations supporting this design and provide proof of approval from the City's Building Department prior to issuance of any building permits.*

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

NOTE: All land surface area disturbances over 1 acre require a stormwater discharge permit issued by the Nevada Division of Environmental Protection (NDEP). 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. A stormwater discharge permit application and associated information may be downloaded from the web site:

<http://ndep.nv.gov/bwpc/bwpc01.htm>

Projects that disturb more than one acre of land must submit to NDEP a "Notice of Intent" for inclusion under Stormwater Permit No. NVR100000 along with the appropriate filling fee. Contact NDEP at (775) 687-9417 for more information."

END OF REMARKS

B&H/ays

T/R/S: T20S/R60E/07

AREA L-07



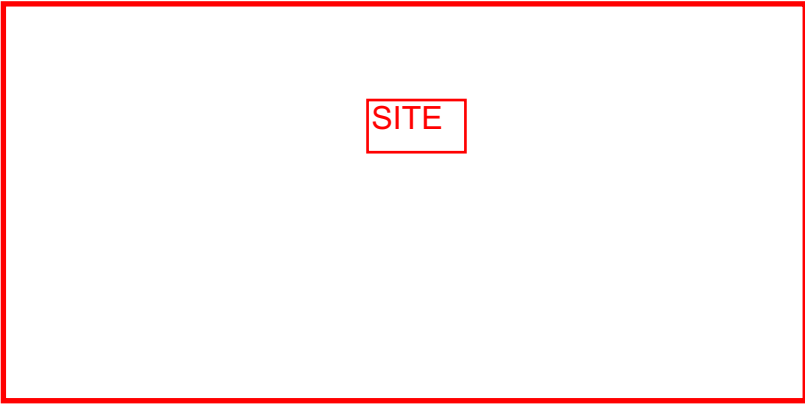
SITE



REFERENCED
STREET FLOW IN
CHEYENNE AVENUE.
REFERRED TO AS
CHEY*

**TECHNICAL DRAINAGE STUDY
FOR
THE BOULDERS CONDOMINIUM CONVERSION**

CLV DS# 3736



SITE

HUALAPAI & ISAAC NEWTON SINGLE FAMILY RESIDENTIAL

APN: 138-07-401-001 LOTS: 37
ACREAGE/AREA OF DISTURBANCE: 5.64

CITY OF LAS VEGAS
STATE OF NEVADA

DEVELOPED BY:
AMH DEVELOPMENT WEST GC, LLC

280 PILOT RD, SUITE 200
LAS VEGAS, NV 89119
(702)703-5319

OWNER
AMH DEVELOPMENT WEST GC, LLC
280 PILOT RD, SUITE 200
LAS VEGAS, NV 89119
(702)703-5319

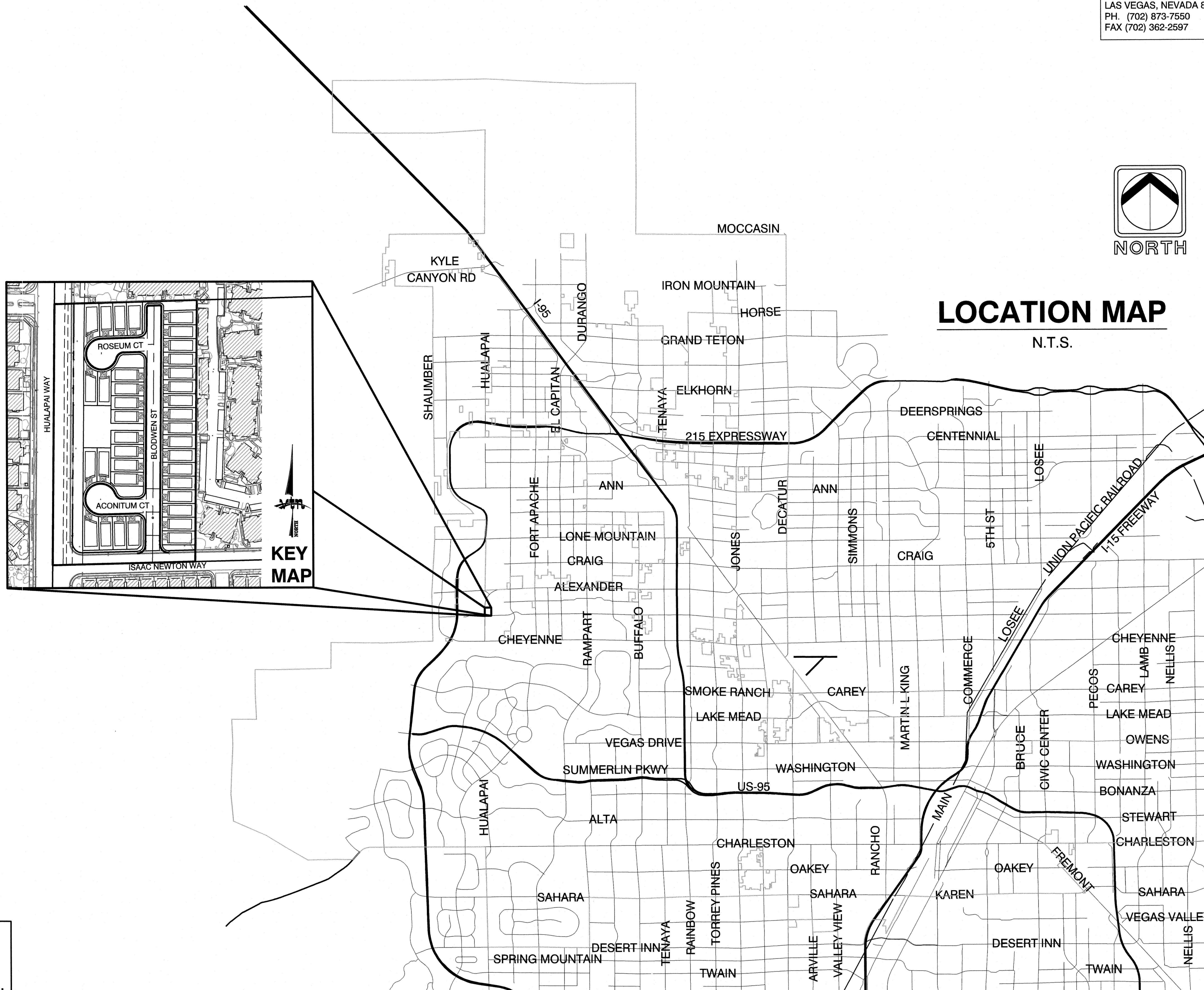
DEVELOPER
AMH DEVELOPMENT WEST GC, LLC
280 PILOT RD, SUITE 200
LAS VEGAS, NV 89119
(702)703-5319

ENGINEERING FIRM
VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550
FAX (702) 362-2597



LOCATION MAP

N.T.S.



FIRE DEPARTMENT APPROVAL

APPROVAL BY THE FIRE DEPARTMENT HAVING
JURISDICTION IS REQUIRED PRIOR TO OBTAINING
FINAL APPROVAL FROM THE LVVWD.

OVERALL SITE DATA

CURRENT ZONING: P-D
PROPOSED ZONING: R-CL
GROSS AREA: 5.64 AC
NUMBER OF LOTS: 37
NUMBER OF COMMON ELEMENTS: 6
OPEN SPACE REQUIRED: NONE
USABLE OPEN SPACE PROVIDED: 36,303 S.F.
LANDSCAPE SPACE PROVIDED: XXXX S.F.
CUT: 8,078 C.Y.
FILL: 14,088 C.Y.
TOTAL (FILL): 6,010 C.Y.

NOTE:

FOR ALL REFERENCES TO FINAL MAP #
SHOWN THROUGHOUT THIS SET OF PLANS,
SEE PLAN BOOK PAGE _____

BASIS OF BEARING

S 00°34'03"W
BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF
THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 7, TOWNSHIP 7
SOUTH, RANGE 80 EAST, M.D.M., CITY OF LAS VEGAS, CLARK
COUNTY, NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP IN
FILE 108, PAGE 06, OFFICIAL RECORDS OF CLARK COUNTY,
NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK
MONUMENT ID: 7LV007SWW8
RIVET & PLATE TOP CURB E. SIDE OF HUALAPAI WAY AT
SUGARLAND AV. (NE OF PI) ELEVATION 830.05 METERS (NAVD 88)
2,723.25 FEET

UTILITY SERVICES PROVIDER LIST

UTILITY	PROVIDED BY
WATER	LAS VEGAS VALLEY WATER DISTRICT
SEWER	CITY OF LAS VEGAS
POWER	NV ENERGY
GAS	SOUTHWEST GAS CORP.
CABLE	COX COMMUNICATIONS
SOLID WASTE DISPOSAL	REPUBLIC SERVICES
TELEPHONE	CENTURY LINK

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER AND INTENDED SOLELY AS A GENERAL GUIDELINE FOR CONSTRUCTION. ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS AND ORDINANCES, INCLUDING BUT NOT LIMITED TO THE FEDERAL FAIR HOUSING AMENDMENTS ACT, AMERICANS WITH DISABILITIES ACT, THE ARCHITECTURAL BARRIERS ACT AND ANY APPLICABLE UNIFORM STANDARDS, SPECIFICATIONS OR DRAWINGS. THE PERSON OR ENTITY PERFORMING THE CONSTRUCTION SHALL BE SOLELY RESPONSIBLE TO MAKE SURE CONSTRUCTION IS IN CONFORMANCE WITH ALL LOCAL, STATE AND FEDERAL STATUTES, LAWS, CODES, REGULATIONS, STANDARDS, GUIDELINES AND ORDINANCES AND FURTHER, IS IN CONFORMANCE WITH ANY APPLICABLE DESIGN CRITERIA, INCLUDING BUT NOT LIMITED TO SOILS REPORTS, TRAFFIC STUDIES, GEOTECHNICAL REPORTS, ARCHITECTURAL PLANS AND SPECIFICATIONS, DRAINAGE PLANS OR STUDIES AND ANY OTHER CRITERIA, STANDARDS OR REQUIREMENTS LISTED IN THE PLANS OR THE GENERAL NOTES RELATED TO THESE PLANS OR PROVIDED BY ANYONE IN REFERENCE TO THIS PROJECT.

APPROVALS

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK _____ DATE _____

THE AFFIXED CENTURY LINK NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY _____ DATE _____

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

COX COMMUNICATIONS LAS VEGAS, INC. _____ DATE _____

SOUTHWEST GAS CORPORATION _____ DATE _____

LAS VEGAS VALLEY WATER DISTRICT

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT PLANNING ENGINEERING SERVICES MANAGER

PROJECT: _____ DATE: _____

SHEETS: _____

SHEET INDEX

SHEET #	SHEET	DESCRIPTION
1	CV	COVER SHEET
2	NT	NOTE SHEET
3	MFA	MASTER FIRE ACCESS
4	HC1	HORIZONTAL CONTROL PLAN 1
5	HC2	HORIZONTAL CONTROL PLAN 2
6	HC3	HORIZONTAL CONTROL PLAN 3
7	HC4	HORIZONTAL CONTROL PLAN 4
8	MUT	MASTER UTILITY SHEET
9	UT1	UTILITY PLAN 1
10	UT2	UTILITY PLAN 2
11	GR1	GRADING PLAN 1
12	GR2	GRADING PLAN 2
13	GR3	GRADING PLAN 3
14	GR4	GRADING PLAN 4
15	DT1	DETAIL SHEET 1
16	ST1	STREET PLAN & PROFILE 1
17	ST2	STREET PLAN & PROFILE 2
18	ST3	STREET PLAN & PROFILE 3
19	ST4	STREET PLAN & PROFILE 4
20	UP1	UTILITY PLAN & PROFILE 1
21	UP2	UTILITY PLAN & PROFILE 2
22	UP3	UTILITY PLAN & PROFILE 3
23	UP4	UTILITY PLAN & PROFILE 4
24	UP5	UTILITY PLAN & PROFILE 5
25	TR1	TRAFFIC PLAN 1
26	TR2	TRAFFIC PLAN 2
27	TR3	TRAFFIC PLAN 3
28	TR4	TRAFFIC PLAN 4
29	S1	STRUCTURAL SHEET

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

CALL BEFORE YOU DIG

1-702-227-2929

Call before you Dig

Avoid cutting underground utility lines. It's costly.

811

1-800-227-2600

1-702-455-7511

1-702-455-8000

CLARK COUNTY TRAFFIC OPERATIONS

Call before you Dig

Avoid cutting underground utility lines. It's costly.

811

1-702-455-7511

1-702-455-8000

CLARK COUNTY TRAFFIC OPERATIONS

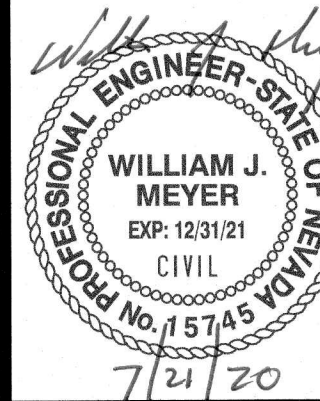
CITY OF LAS VEGAS

AMH DEVELOPMENT WEST GC, LLC

COVER SHEET

HUALAPAI & ISAAC NEWTON
SINGLE FAMILY RESIDENTIAL

DRAWN BY: ECC	DESIGNED BY: DEH	CHECKED BY: WJM	PROJECT NO: 9331
05/19/2020	05/19/2020	07/20/2020	SCALE: N/A
			HORIZ. VERT.



SHEET
CV
1 OF 28 SHEETS
DRAWING NO.

CITY OF LAS VEGAS GENERAL NOTES

1.

ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST EDITION, THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION, THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA, AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY, THE UNIFORM BUILDING CODE, AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".

2.

THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCES WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.

3.

THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.

4.

ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.

5.

TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.

6.

PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.

7.

EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.

8.

AC PAVEMENT TO BE ONE-HALF INCH (1/2") ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS AND CROSS GUTTERS.

9.

CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY OF LAS VEGAS SHALL BE REMOVED AND REPLACED PER STANDARD DRAWING 216.

10.

SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY INSPECTOR.

11.

CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF THE TRANSITIONS TO BE AS SHOWN ON PLANS.

12.

ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: GEOTEK RESIDENTIAL, LLC, PROJECT NO. 15083-LVR, DATED JANUARY 13, 2020.
APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLANS.

13.

EXACT LOCATION OF ALL SAWCUT LINES MAY BE ADJUSTED OR DETERMINED IN THE FIELD BY A CITY OF LAS VEGAS ENGINEER IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.

14.

THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS IN ACCORDANCE WITH N.R.S. STATUTE NO. 625.360 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.

15.

UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

16.

ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE BUILDING DEPARTMENT.

17.

ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHT OF WAY.

18.

CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, AND SEWER CLEAN OUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.

19.

MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF MDOT OR THE CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.

20.

WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC., THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO OFFSITE INSPECTION AND TESTING CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.

21.

SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S) SHALL BE PROVIDED TO THE CITY AND APPROVED PRIOR TO ACCEPTANCE OF FACILITY VIDEO INSPECTION. THE MAP(S) SHALL INCLUDE THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES AND TRANSITION STRUCTURES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXIT THE PUBLIC RIGHT-OF-WAY, AND STORM DRAIN MAIN ALIGNMENT, INCLUDING DEFLECTION POINTS. THE LOCATION SHALL BE DESCRIBED BY COORDINATES WHICH SHALL BE BASED ON THE OFFICIAL HORIZONTAL AND VERTICAL CONTROL NETWORKS OF THE CITY OF LAS VEGAS. FINAL LOCATION MAPS MUST BE SEALED AND CERTIFIED BY A NEVADA PROFESSIONAL LAND SURVEYOR TO HAVE POSITIONAL CERTAINITIES OF ± 0.09 METERS (± 0.3 FEET) HORIZONTALLY AND VERTICALLY. A SEPARATE ELECTRONIC COMMA DELIMITED FILE FOR THE SANITARY SEWER AND STORM DRAIN COORDINATES SHALL ALSO ACCOMPANY THE SANITARY SEWER AND STORM DRAIN FINAL LOCATION MAP(S).
OR
SANITARY SEWER AND STORM DRAIN FACILITIES SHOWN ON THESE PLANS SHALL BE USED TO MEET THE REQUIREMENTS OF NRS 465 AND SHALL SHOW AT A MINIMUM THE HORIZONTAL AND VERTICAL (INVERT) LOCATION OF PUBLIC SEWER MANHOLES, STORM DRAIN MANHOLES, STORM DRAIN LATERALS AT THE CONNECTION TO THE STORM DRAIN MAIN AND AT THE CONNECTION TO A DROP INLET, AND THE CONNECTION OF SEWER SERVICE LATERALS TO THE SEWER MAIN AND WHERE THE SEWER SERVICE LATERALS EXIT THE PUBLIC RIGHT-OF-WAY. ANY DEVIATIONS FROM THE INFORMATION SHOWN SHALL BE NOTED AND SUBMITTED AS A REVISION TO THE PLANS AND APPROVED PRIOR TO ACCEPTANCE OF FACILITY VIDEO INSPECTION.

22.

CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST EDITION.

23.

A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

24.

REVISED 02/03/15

CITY OF LAS VEGAS STREETLIGHT NOTES:

1.

ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION (USS), AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (USD), LATEST REVISION.

2.

NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS, ETC., LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC AND CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE USS.

3.

ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS.

4.

ALL EMPTY CONDUIT SHALL HAVE AT LEAST ONE GREEN NO. #8 AWG WIRE INSTALLED AS TRACER WIRE IN ACCORDANCE WITH SECTION 623 G.02.01 OF THE USS PRIOR TO BACKFILLING AND FINAL INSPECTION.

5.

ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN COMPLIANCE WITH USD NO. 323A WHEN POLE IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.

6.

AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TRAFFIC ENGINEERING DIVISION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.

7.

SERVICE POINTS SHALL BE COORDINATED WITH NV ENERGY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICEPOINTS SHALL BE SHOWN ON THE PLANS.

8.

WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREETLIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BUSES ARE INSTALLED. AT NO EXPENSE TO THE CITY OF LAS VEGAS.

9.

THE CONTRACTOR SHALL FURNISH COMPLETE CONDUIT, WIRE, ETC. FROM SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON THE PLANS.

REVISED JUNE 28, 2016 (LD VERSION)

LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES 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 THE CITY OF LAS VEGAS 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 THE CITY OF LAS VEGAS 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 NR100000, SECTION III.A.5.

4.

AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPs WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NR100000, 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.

CITY OF LAS VEGAS FIRE DEPARTMENT NOTES

1.

ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6631 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.

2.

ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALEY WATER DISTRICTS' - APPROVED PRODUCTS LIST ARE ALLOWED TO BE INSTALLED.

3.

A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON-SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. [IFC § 105.6.15]

4.

ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING 1.0 P.S.I. PRESSURE AT 350 FEET. [IFC § 3310, § 3312]

5.

TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTERLINE OF THE STREET ADJACENT TO THE FIRE HYDRANTS. [IFC § 507.5.7.3]

6.

ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLOW VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TESTS WITH PRIOR FIRE PREVENTION APPROVAL. [IFC § 106.5]

7.

ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.M.W.A. APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC § 507.5.1, NFA 24]

8.

PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. [IFC § 507]

9.

PRIVATE HYDRANTS SHALL BE PAINTED RED. [IFC § 507.5.7.1]

10.

PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. [IFC § 507]

11.

FIRE HYDRANT SPACING SHALL BE AS FOLLOWS: [IFC § C102]
RESIDENTIAL - 500 FT UNSPRINKLERED; 600 FT SPRINKLERED.
COMMERCIAL - 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.

12.

WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS, WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 10,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FT ON AN ALTERNATING BASIS. [IFC § C102.8]

13.

NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL-DE-SAC OR WITHIN 20 FT OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.

14.

NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FT OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. [IFC § C102.10]

15.

A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE-TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC § C102.4]

16.

THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC § C102.7]

17.

THE MAXIMUM DISTANCE FROM A HYDRANT TO THE END OF A DEAD-END STREET SHALL NOT EXCEED 200 FT. [IFC § C102.6]

18.

TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. FOR SYSTEMS REQUIRED TO HAVE TWO (2) SOURCES OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 3 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD-INS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. FOR SYSTEMS PERMITTED TO HAVE ONE SOURCE OF WATER SUPPLY, SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 3 FIRE HYDRANTS AND/OR FIRE SPRINKLER LEAD-INS CAN BE OUT OF SERVICE DUE TO A SERVICE INTERRUPTION. [IFC § C104]

19.

ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. [IFC § 503.2.3]

20.

THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12%, ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FT PRIOR TO OR AFTER THE GRADE CHANGE ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%. [IFC § 503.2.7, § 503.2.8]

21.

THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FT OUTSIDE AND 28 FT INSIDE TURNING RADIUS. [IFC § 503.2.4]

22.

VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13FT 6 INS. [IFC § 503.2.1]

23.

FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 33 FT WITH PARKING ON BOTH SIDES MEASURED TO FACE OF CURB, NOT LESS THAN 28 FT WIDE WITH PARKING RESTRICTED TO ONE SIDE MEASURED TO FACE OF CURB, NOT LESS THAN 24 FT WIDE WITH NO PARKING ON EITHER SIDE MEASURED TO FACE OF CURB. FIRE LANES THROUGH PARKING LOTS SHALL BE NOT LESS THAN 24 FT. [IFC § 503.2.1.1]

24.

A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL OF THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASED TO 250 FT IF THE BUILDING IS SPRINKLERED. [IFC § 503.1.1]

25.

APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 200 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS, COMMERCIAL AND INDUSTRIAL DEVELOPMENTS WHERE BUILDINGS EXCEED 2 STORIES OR 30 FEET IN HEIGHT, OR EXCEEDING 62,000 SQUARE FEET IN AREA. [IFC § 503.1.2]

26.

ALL DEAD-END FIRE APPARATUS ROADS AND/OR FIRE LINES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FT IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND HAVING A MINIMUM DIAMETER OF 81 FT. [IFC § 503.2.5]

27.

ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS OF 100 FT ALONG THE DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE INSTALLED NO HIGHER THAN 10 FT OR LESS THAN 6 FT FROM THE ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT (IF NO CURB IS PROVIDED) SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS. [IFC § 503.3]

28.

ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. [IFC § 503.6]

EFFECTIVE DATE: FEBRUARY 4th, 2019

CITY OF LAS VEGAS TRAFFIC NOTES

1.

ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.

2.

THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.

3.

BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.

4.

WHEN A DESIGNATED "SUGGESTED ROUTE TO SCHOOL" IS ENCLOSED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.

5.

IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.

6.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL UTILIZE TYPE XI RETROREFLECTIVE SHEETING IN ACCORDANCE WITH CCAUSS 627 AND 716 AND SHALL HAVE AN ANTI-GRAFFITI PROTECTIVE OVERLAY FILM THAT IS A MATCHING COMPONENT TO, AND OF THE SAME MANUFACTURER AS THE RETROREFLECTIVE SHEETING TO WHICH IT IS APPLIED. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.

7.

WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5) FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.

8.

ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.

9.

STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.

10.

THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.

11.

WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.

12.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.

13.

GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.

14.

ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.

15.

THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

REVISED 7/3/13

LAS VEGAS VALLEY WATER DISTRICT 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 THE PROJECT 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 STANDARD SPECIFICATIONS FOR POTABLE WATER SYSTEMS. ANY REPAIR WORK DONE 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 LEADED PRODUCT MAY NOT BE REUSED.

CITY OF LAS VEGAS SEWER NOTES

1.

ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.

2.

IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.

3.

CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.

4.

POLYNYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACK FILL OF TYPE II AGGREGATE BASE.

5.

ALL MANHOLES IN PAVED STREETS 80' R/W AND LARGER, SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80) FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.

6.

TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" S SHALL BE USED ON LINES TWELVE INCHES (12") OR ABOVE.

7.

WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18") UNDER A WATER MAIN.

8.

ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.

9.

THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT. THE CONTRACTOR SHALL PROVIDE CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.

10.

INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C-900 PVC PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

REVISED 04/05/10

CITY OF LAS VEGAS GRADING NOTES

1.

IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.

2.

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.

3.

CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.

4.

THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.

5.

THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.

6.

CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

	HORIZONTAL	VERTICAL	COMPACTION
A PAVEMENT AREA SUBGRADE	0.1" ±	+0.070-0.1" ±	SEE SOILS REPORT
B ENGINEERED FILL	0.5" ±	+0.110-0.1" ±	SEE SOILS REPORT

REPORT COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE.

7.

ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.

8.

THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.

9.

THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT-OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.

10.

IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, THE OWNER AGREES TO PROVIDE AND INSTALL SUCH ITEM AT HIS OWN EXPENSE AND AT THE DIRECTION OF THE CITY ENGINEER. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED 04/15/10

BASIS OF BEARING

S 0°34'03"W

BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW ¼) OF THE SOUTHWEST QUARTER (SW ¼) OF SECTION 7, TOWNSHIP 36 NORTH, RANGE 90 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP IN FILE 108, PAGE 06, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS, BENCHMARK MONUMENT ID: 7LV00755W6

RIVET & PLATE TOP CURB E, SIDE OF HUALAPAI WAY AT SUGARLAND AV. (NE OF R/I) ELEVATION 830.05 METERS (NAVD 88) 2,723.25 FEET

EARTHWORK QUANTITIES

CUT	FILL	NET
10.202 CUBIC YARDS	10.188 CUBIC YARDS	14 CUBIC YARDS (CUT)

ESTIMATED TRAFFIC QUANTITIES (CONT.)

	PUBLIC
STREETLIGHT (STANDARD BASE)	0 EA
125 AMP SERVICE PEDESTAL	0 EA
200 AMP SERVICE PEDESTAL	0 EA
2" PVC CONDUIT (STREETLIGHT)	0 LF
#3 PULL BOXES	0 EA
8" WIDE WHITE EDGE LINE	0 LF
RED PAINTED CURB	0 LF

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

• NONE

WILLIAM J MEYER, P.E. LICENSE # 15745 DATE

ESTIMATE OF QUANTITIES

ESTIMATED UTILITY QUANTITIES	PUBLIC
FIRE HYDRANT ASSEMBLY PER PLATE #40	5 EA
8" GATE VALVE (PER UDACS PLATE #39)	6 EA
8" CAP & 2" BLOW OFF (PER UDACS PLATE 36)	2 EA
12" X 8" TAPPING SLEEVE WITH 8" TAPPING VALVE (PER UDACS PLATE #35 & #39)	2 EA
8" X 8" TEE (PER UDACS PLATE #31)	2 EA
8" 45° VERTICAL BEND (PER UDACS PLATE #31)	4 EA
1" LATERAL COPPER WATER SERVICE (3/4" METER)	37 EA
1.5" LATERAL COPPER WATER SERVICE (1.5" METER) W/ RPPA	0 EA
8" PVC WATER	1,072 LF
WATER LATERAL	1,051 LF
8" PVC SANITARY SEWER MAIN	1,080 LF
4" C-900 SEWER LATERALS	584 LF
4" PVC SEWER LATERALS	489 LF
48" SANITARY SEWER MANHOLE	8 EA
IRRIGATION SLEEVES (PRIVATE)	220 LF
SEWER SERVICE	37 EA
POWER SERVICE	37 EA
TELEPHONE SERVICE	37 EA
GAS SERVICE	37 EA

ESTIMATED GRADING QUANTITIES

	PUBLIC
2" ASPHALT CONCRETE PAVING	4,026 SY
10" TYPE II GRAVEL BASE	1,118 CY
1" CURB AND GUTTER PER STD DWG 216	63 LF
30" ROLL CURB	1,902 LF
CROSS GUTTER PER STD DWG 228	1,704 SF
EARTHWORKS TOTAL (FILL)	254 CY
RESIDENTIAL DRIVEWAYS PER STD DWG 223	37 EA
SIDE WALK PER STD DWG 234	10,980 SF
HANDICAP RAMP CASE 1 PER STD DWG 235	6 EA
SURVEY MONUMENTS	0 EA

ESTIMATED TRAFFIC QUANTITIES

	PUBLIC
PAVEMENT MARKERS (REFLECTIVE)	0 EA
PAVEMENT MARKERS (NON-REFLECTIVE)	0 EA
STREET SIGNS	0 EA

FF

FINISH FLOOR

FL

FINISH GRADE

FG

FLOW LINE

TC

TOP OF CURB

TRC

TOP OF ROLL CURB

EOP

EDGE OF ASPHALT PAVEMENT

FUT

FUTURE

EX

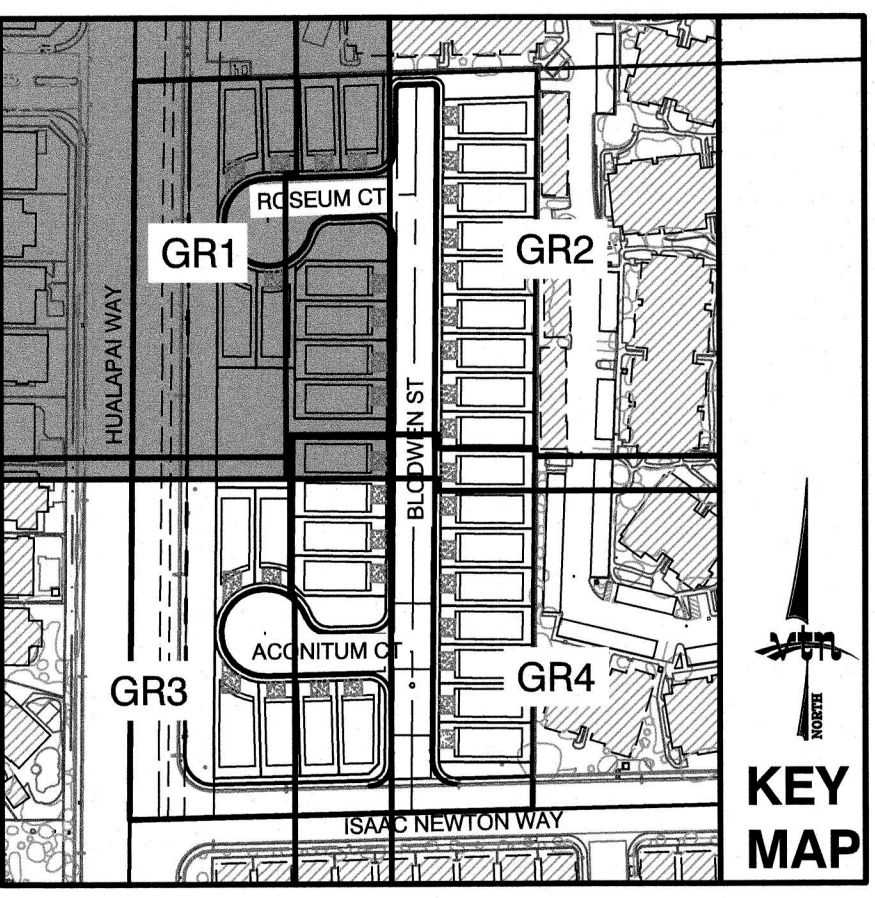
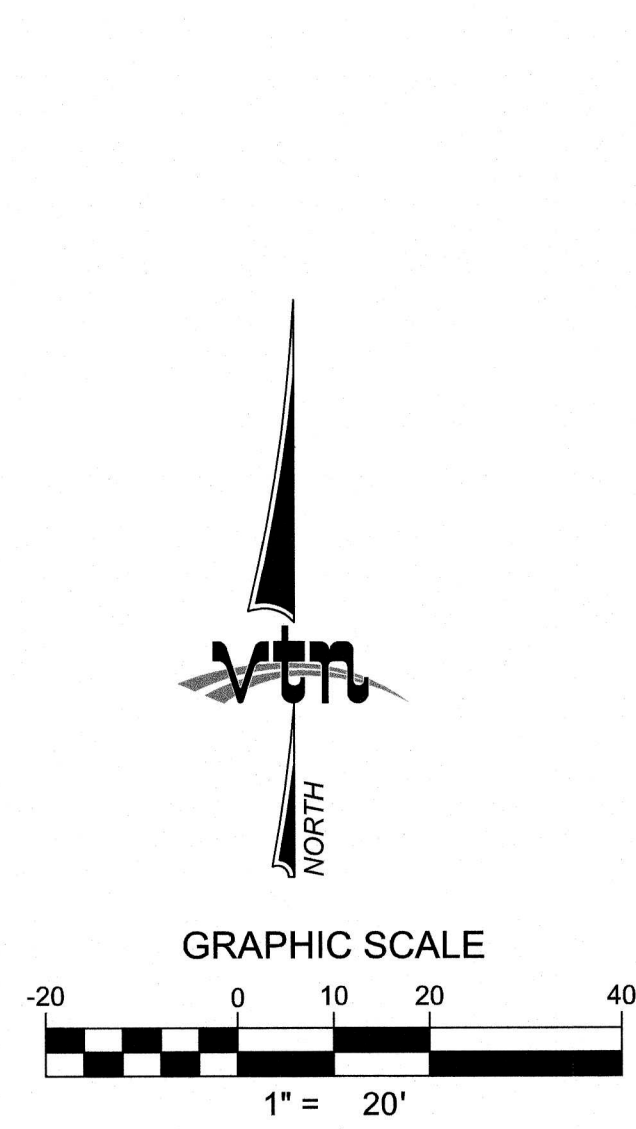
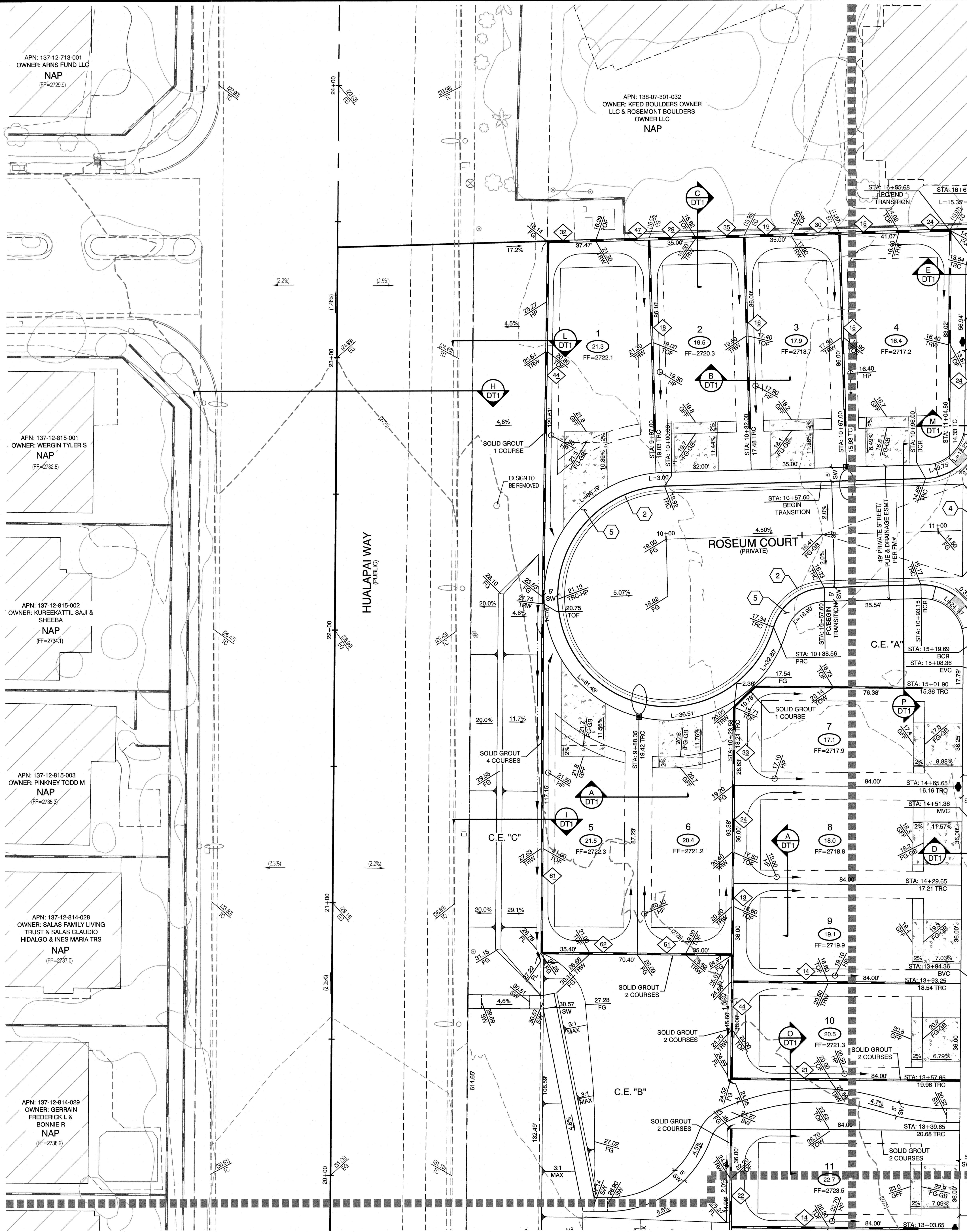
EXISTING

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VALLEY GUTTER

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NATURAL GROUND</



BASIS OF BEARING

S 00°34'03" W

BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW 4) OF THE SOUTHWEST QUARTER (SW 4) OF SECTION 7, TOWNSHIP 0 SOUTH, RANGE 80 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP IN FILE 108, PAGE 06, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK
MONUMENT ID: 7LV007SWW6

RIVET & PLATE TOP CURB E. SIDE OF HUALAPAI WAY AT SUGARLAND AV. (NE OF PI) ELEVATION 830.05 METERS (NAVD 88) 2,723.25 FEET

EARTHWORK QUANTITIES		
CUT	FILL	NET
10,202 CUBIC YARDS	10,188 CUBIC YARDS	14 CUBIC YARDS (CUT)

- CONSTRUCTION NOTES**
- CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
 - CONSTRUCT 30" ROLL CURB PER STD. DWG. 217.2.S1.
 - CONSTRUCT 10' CURB TRANSITION SEE DETAIL ON SHEET DT2.
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 - CONSTRUCT HANDICAP RAMP PER STD. DWG. 235 CASE 1
 - SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.4, #500.5 & #503.
 - FIELD VERIFY AND MATCH EXISTING
 - RETAINING HEIGHT BASED ON DIFFERENCE BETWEEN PADS (4=FEET 2=TENTH)

GRADING PERMIT NOTE

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: GEOTEK RESIDENTIAL, LLC PROJECT #15083-LVR, DATED JANUARY 13, 2020

SIDEWALK RAMPS TABLE			
(PER CCAUSD No. 235, CASE 1)			
NO.	DIM "A"	DIM "B"	CASE
1	4.5'	15'	I
2	4.5'	12'	I
3	4.5'	9.5'	I
4	8'	8'	I
5	12'	4.5'	I

SIGHT VISIBILITY ZONES:

NO STRUCTURE, WALLS, VEGETATION, OR OBJECT OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

ENGINEER DISCLAIMER NOTE:

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #-----

WILLIAM J MEYER, P.E. No. 15745 DATE



Call before you Dig

1-702-227-2929

OR

1-800-227-2600

AND

1-702-455-6000

CLARK COUNTY TRAFFIC OPERATIONS

AMH DEVELOPMENT WEST CO, LLC

280 PILOT RD, SUITE 200
LAS VEGAS, NEVADA 89166-5148
PH: (702) 873-7550 FAX: (702) 882-2587 WEB: WWW.AMHDEV.COM

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7550 FAX: (702) 882-2587 WEB: WWW.VTNV.COM

GRADING PLAN 1

11 OF 28 SHEETS

DRAWN BY: BOC

DESIGNED BY: DEH

CHECKED BY: WJM

PROJECT NO: 9031

05/19/2020

05/19/2020

07/20/2020

SCALE: 1"=20'

VERT: N/A

HORIZONTAL: 1"=20'

WILLIAM J MEYER

PROFESSIONAL ENGINEER - STATE OF NEVADA

NO. 15745

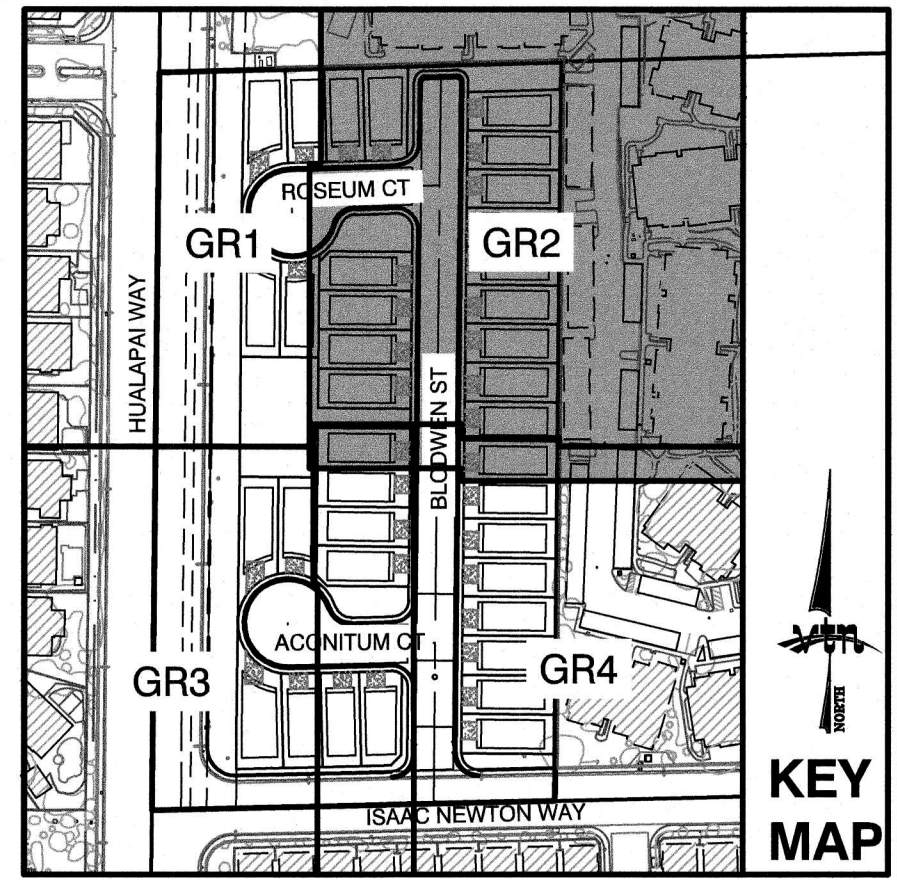
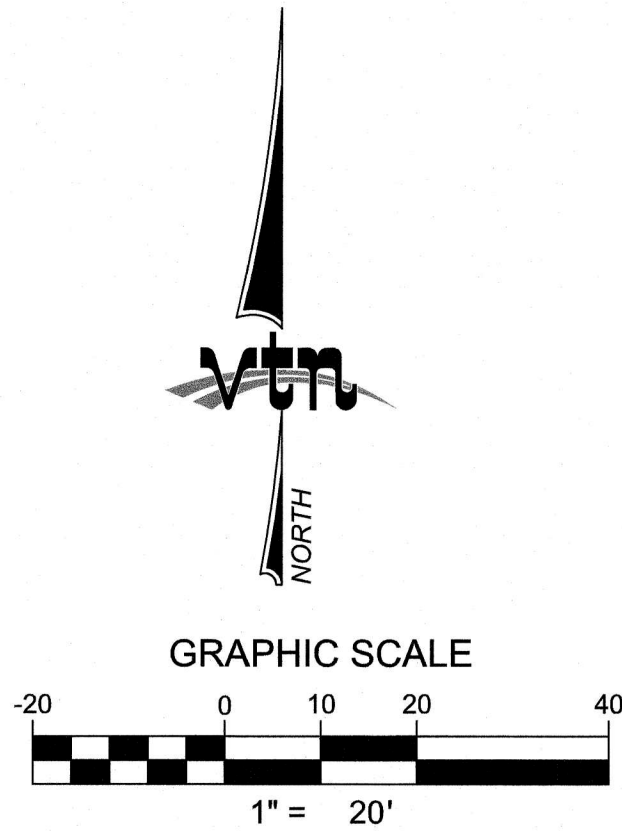
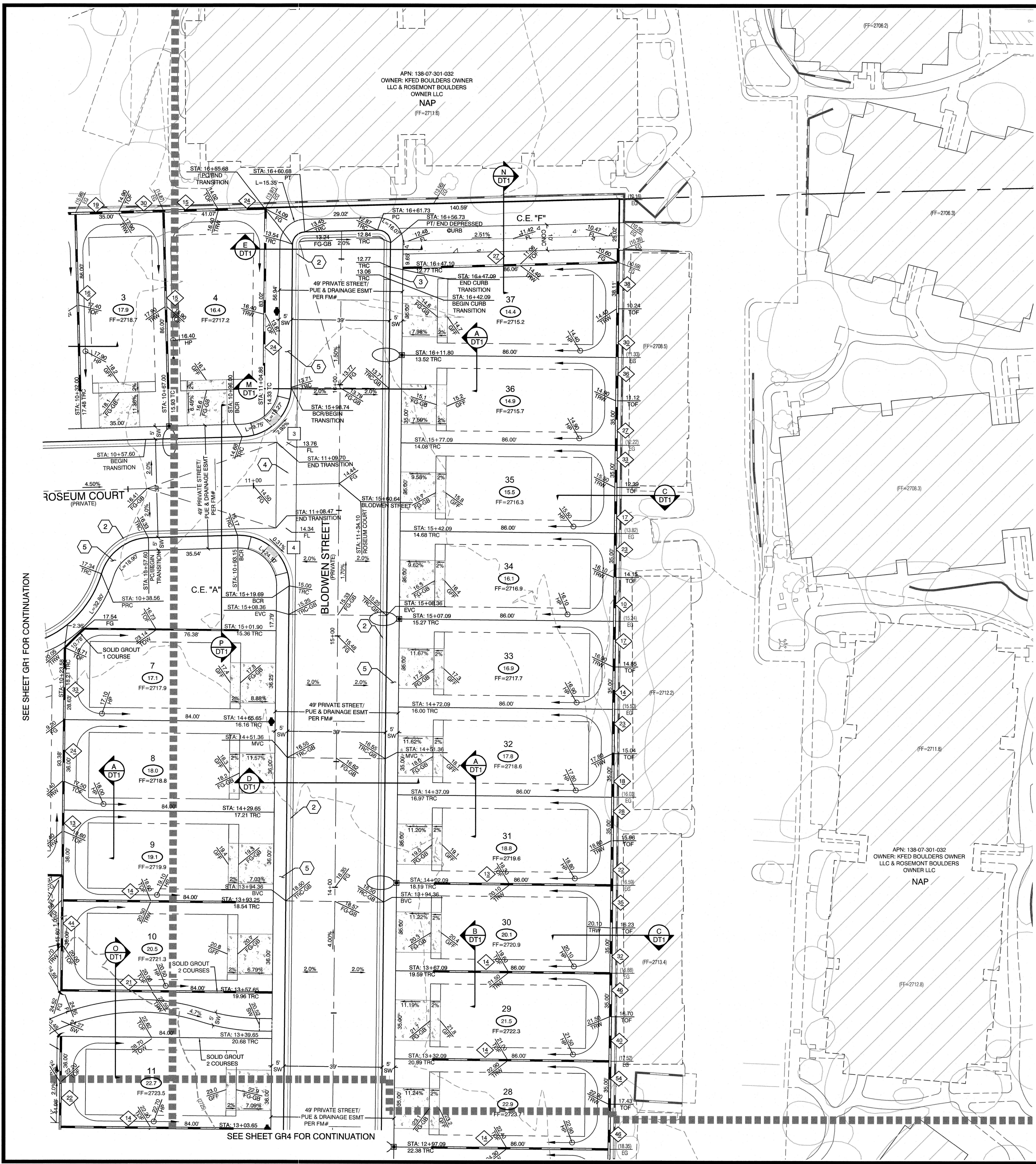
EXP. 12/31/21

CIVIL

7/21/20

DATE

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BASIS OF BEARING
S 00°34'03"W
BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW 4) OF THE SOUTHWEST QUARTER (SW 4) OF SECTION 7, TOWNSHIP 0 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP IN FILE 108, PAGE 06, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA.

BENCHMARK
CITY OF LAS VEGAS BENCHMARK
MONUMENT ID: 7LV007SWW6
RIVET & PLATE TOP CURB E. SIDE OF HUALAPAI WAY AT SUGARLAND AV. (NE OF P.I.) ELEVATION 830.05 METERS (NAVD 88) 2.723.25 FEET

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 - FIELD VERIFY AND MATCH EXISTING
 - RETAINING HEIGHT BASED ON DIFFERENCE BETWEEN PADS (4'-FEET 2'-TENTH)

GRADING PERMIT NOTE
THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:
REFER TO SOILS REPORT: GEOTEK RESIDENTIAL, LLC PROJECT #15083-LVR, DATED JANUARY 13, 2020

SIDEWALK RAMPS TABLE (PER CCAUSD No. 235, CASE I)			
NO.	DIM "A"	DIM "B"	CASE
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WILLIAM J MEYER, P.E. No. 15745 DATE

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PH: (702) 875-7550 FAX: (702) 362-2597 WEB: WWW.AMH.COM
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

GRADING PLAN 2

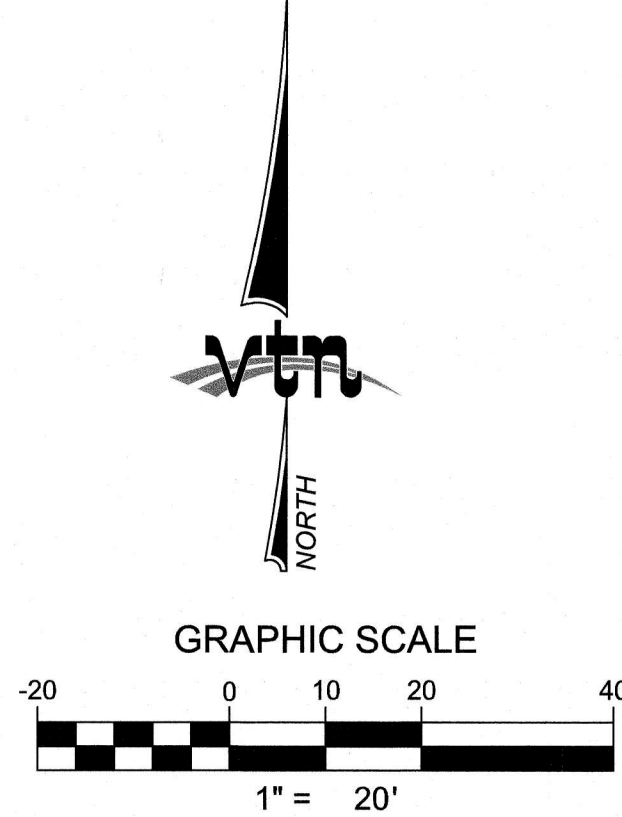
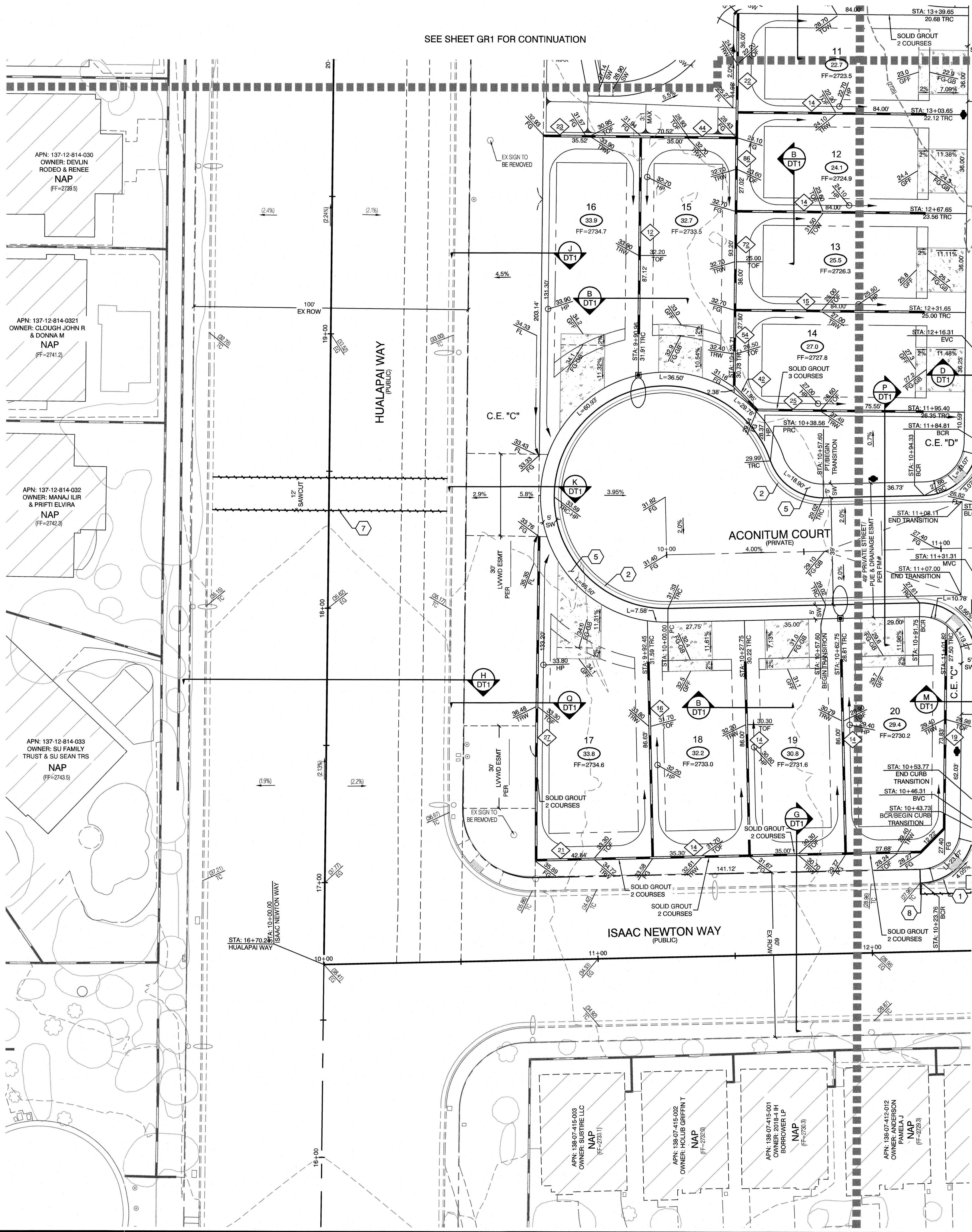
**HUALAPAI & ISAAC NEWTON
SINGLE FAMILY RESIDENTIAL**

DRAWN BY: BCC
DESIGNED BY: DEB
CHECKED BY: WJM
PROJECT NO: 801

DATE: 05/19/2020
DATE: 05/19/2020
DATE: 07/20/2020
SCALE: 1"=20'
HORIZ. VERT.

12 OF 28 SHEETS
DRAWING NO: GR2

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP. 12/31/21
No. 15745
7/21/20
SHEET
12 OF 28 SHEETS
DRAWING NO: GR2



BASIS OF BEARING

S 00°34'03"W

BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW 4) OF THE SOUTHWEST QUARTER (SW 4) OF SECTION 7, TOWNSHIP 0 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP IN FILE 108, PAGE 08, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA.

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CITY OF LAS VEGAS BENCHMARK
MONUMENT ID: 7LV007SWW6

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: GEOTEK RESIDENTIAL, LLC PROJECT #15083-LVR, DATED JANUARY 13, 2020 HTE #---

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(PER CAUSD No. 235, CASE I)			
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3	4.5'	9.5'	I
4	8'	8'	I
5	12'	4.5'	I

SIGHT VISIBILITY ZONES:

NO STRUCTURE, WALLS, VEGETATION, OR OBJECT OF ANY KIND IS PERMITTED OVER TWENTY-FOUR (24) INCHES IN HEIGHT (MEASURED FROM THE TOP OF ADJACENT CURB IF CURB EXISTS) WITHIN THE SIGHT VISIBILITY ZONES.

ENGINEER DISCLAIMER NOTE:

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I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #---

WILLIAM J MEYER, P.E. No. 15745 DATE

Call before you Dig

1-702-455-7511

CLARK COUNTY TRAFFIC OPERATIONS

1-702-229-2929

Call before you Dig

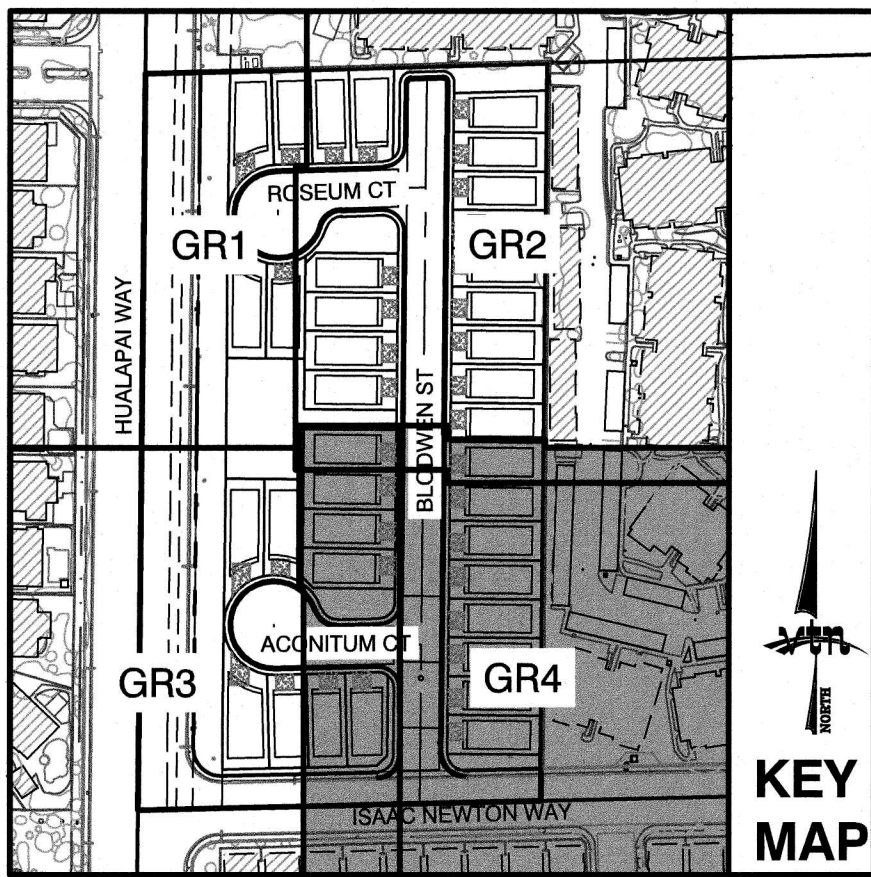
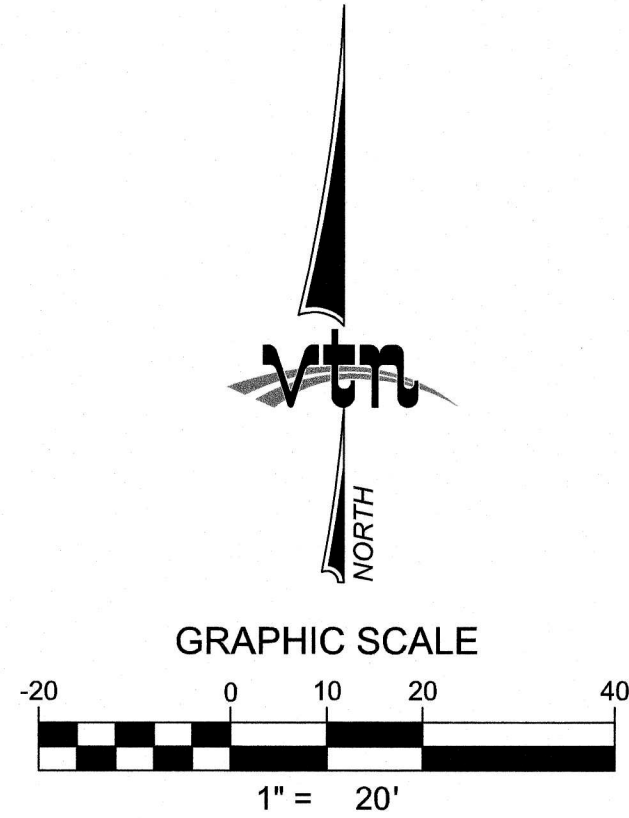
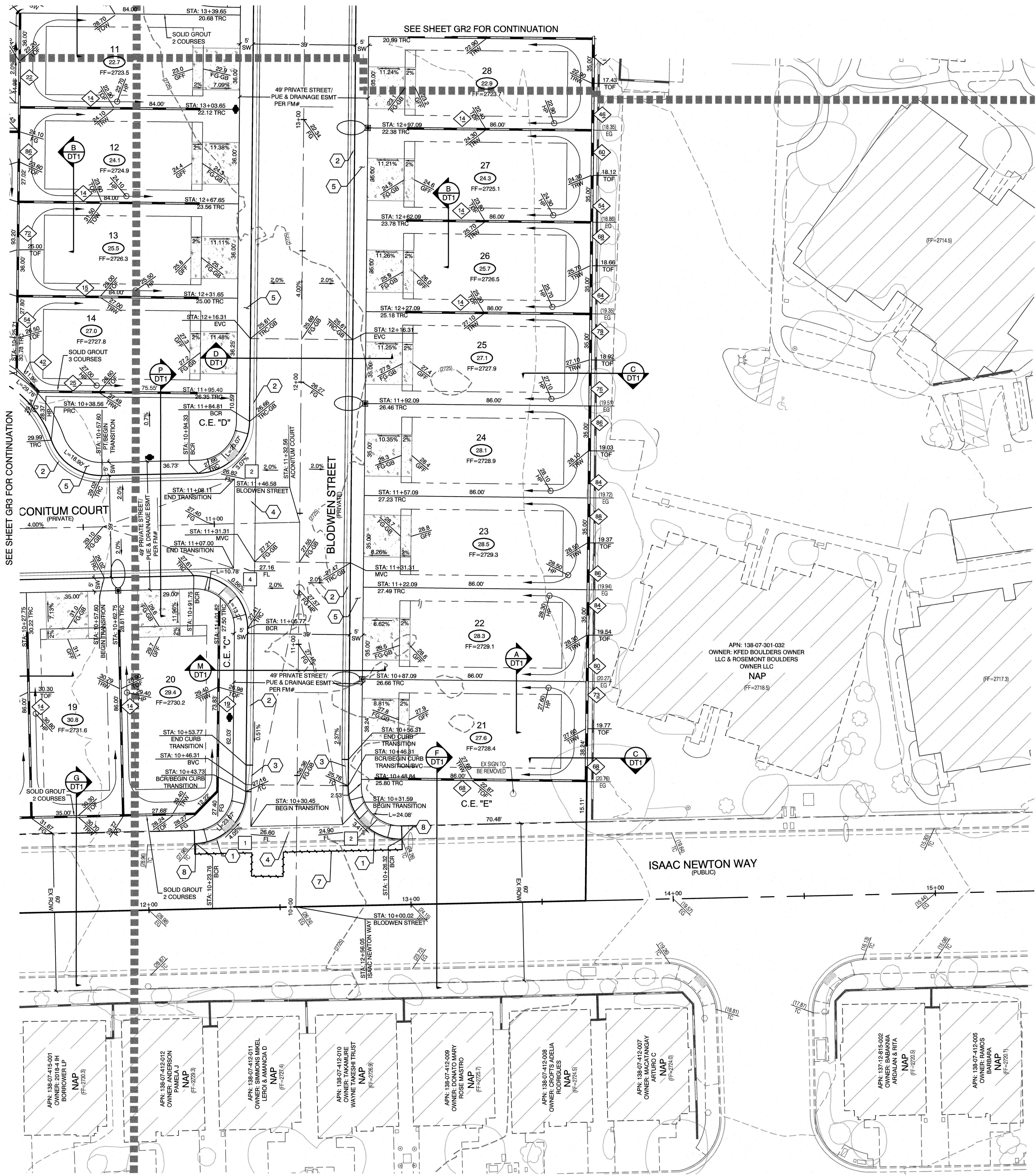
1-800-227-2600

AND

1-702-455-6000

CLARK COUNTY TRAFFIC OPERATIONS

AMH DEVELOPMENT WEST GC, LLC		CITY OF LAS VEGAS	
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH: (702) 877-7550 FAX: (702) 382-2897 WEB: WWW.VTNM.COM		CONSULTING ENGINEERS & PLANNERS AND SURVEYORS	
GRADING PLAN 3		HUALAPAI & ISAAC NEWTON SINGLE FAMILY RESIDENTIAL	
DRAWN BY: BCC	06/19/2020	CHECKED BY: WJM	07/20/2020
DESIGNED BY: DEH	06/19/2020	PROJECT NO: 8931	SCALE: 1"=20'
SHEET GR3		13 OF 28 SHEETS	
DRAWING NO.		---	



BASIS OF BEARING

S 00°34'03"W

BEING THE WEST LINE OF THE SOUTHWEST QUARTER (SW 4) OF THE SOUTHWEST QUARTER (SW 4) OF SECTION 7, TOWNSHIP 0 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN ON THAT CERTAIN PARCEL MAP IN FILE 108, PAGE 08, OFFICIAL RECORDS OF CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK
MONUMENT ID: 7LV007SWW6

RIVET & PLATE TOP CURB E. SIDE OF HUALAPAI WAY AT SUGARLAND AV. (NE OF P.I.) ELEVATION 830.05 METERS (NAVD 88) 2,723.25 FEET

EARTHWORK QUANTITIES		
CUT	FILL	NET
10,202 CUBIC YARDS	10,188 CUBIC YARDS	14 CUBIC YARDS (CUT)

- CONSTRUCTION NOTES**
- CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
 - CONSTRUCT 30" ROLL CURB PER STD. DWG. 217.2.S1.
 - CONSTRUCT 10' CURB TRANSITION SEE DETAIL ON SHEET DT2.
 - CONSTRUCT CROSS GUTTER PER STD. DWG. 228.
 - CONSTRUCT 5' SIDEWALK PER STD. DWG. 234.
 - CONSTRUCT HANDICAP RAMP PER STD. DWG. 235 CASE I
 - SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.4, #500.5 & #503.
 - FIELD VERIFY AND MATCH EXISTING
 - RETAINING HEIGHT BASED ON DIFFERENCE BETWEEN PADS (4=FEET 2=TENTH)

GRADING PERMIT NOTE

THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHER STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: GEOTEK RESIDENTIAL, LLC PROJECT #15083-LVR, DATED JANUARY 13, 2020 HTE #----

SIDEWALK RAMPS TABLE			
(PER CCAUSD No. 235, CASE I)			
NO.	DIM "A"	DIM "B"	CASE
1	4.5'	15'	I
2	4.5'	12'	I
3	4.5'	9.5'	I
4	8'	8'	I
5	12'	4.5'	I

SIGHT VISIBILITY ZONES:

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WILLIAM J MEYER, P.E. No. 15745 DATE

Call before you Dig
1-702-227-2929

Call before you Dig
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

AMH DEVELOPMENT WEST GC, LLC

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 672-7550 FAX: (702) 382-2597 WEB: WWW.VTNV.COM
CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

GRADING PLAN 4

**HUALAPAI & ISAAC NEWTON
SINGLE FAMILY RESIDENTIAL**

DRAWN BY: BCC
DESIGNED BY: DEH
CHECKED BY: WJM
PROJECT NO: 8031

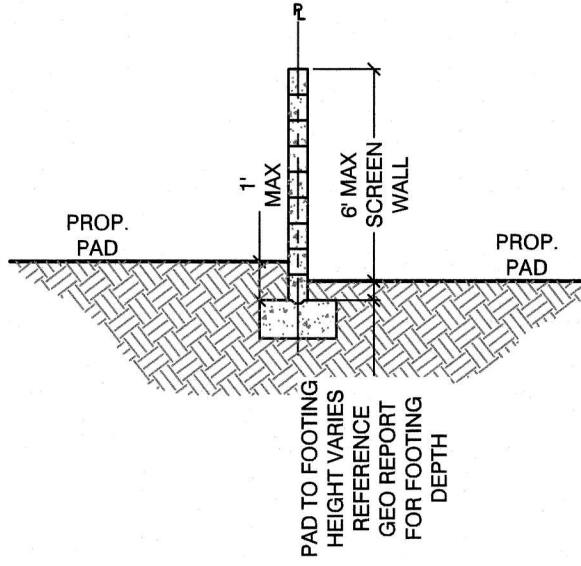
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DATE: 05/19/2020
DATE: 07/20/2020

SCALE: 1"=20'
HORIZ. VERT.

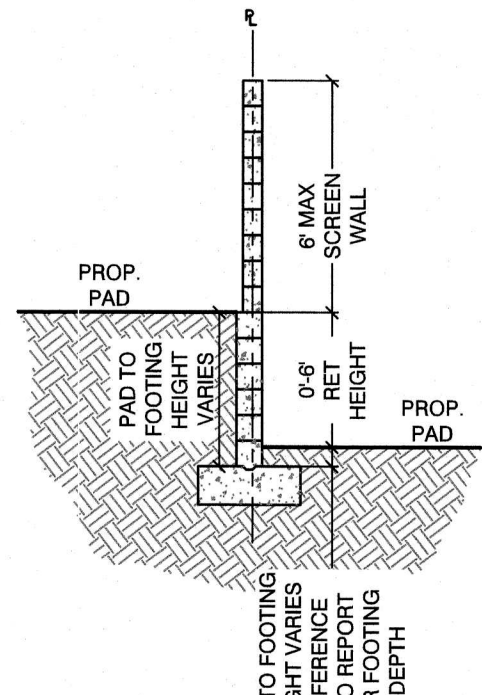
WILLIAM J. MEYER
EXP: 12/31/21
CIVIL
No. 15745

REVISION

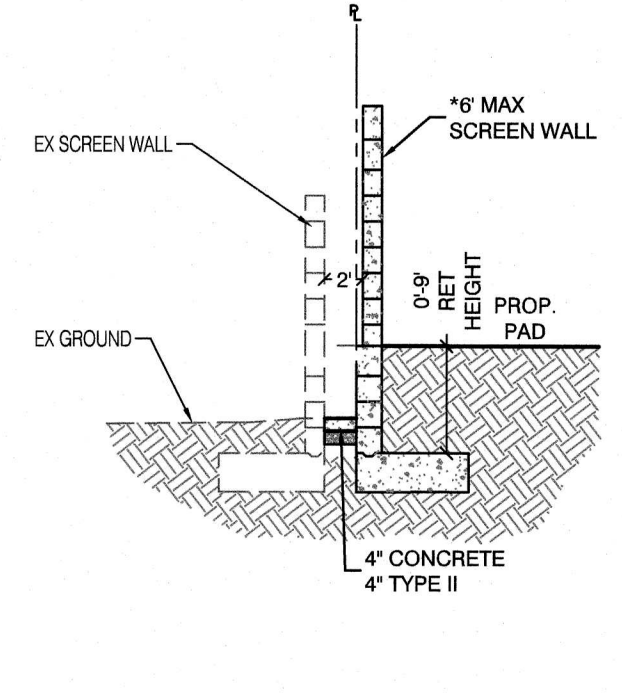
REV	DATE	BY



TYPICAL SECTION A
NTS

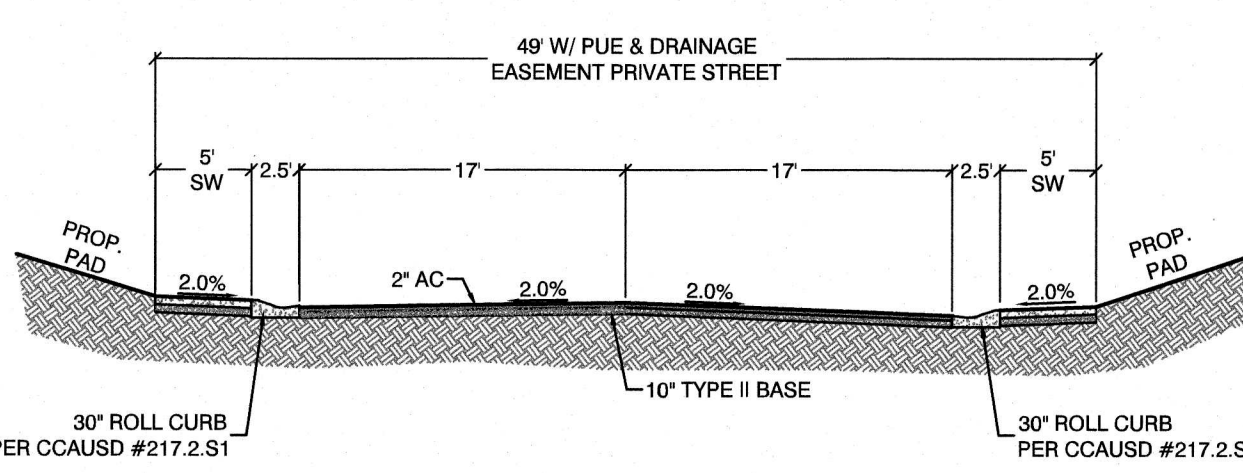


TYPICAL SECTION B
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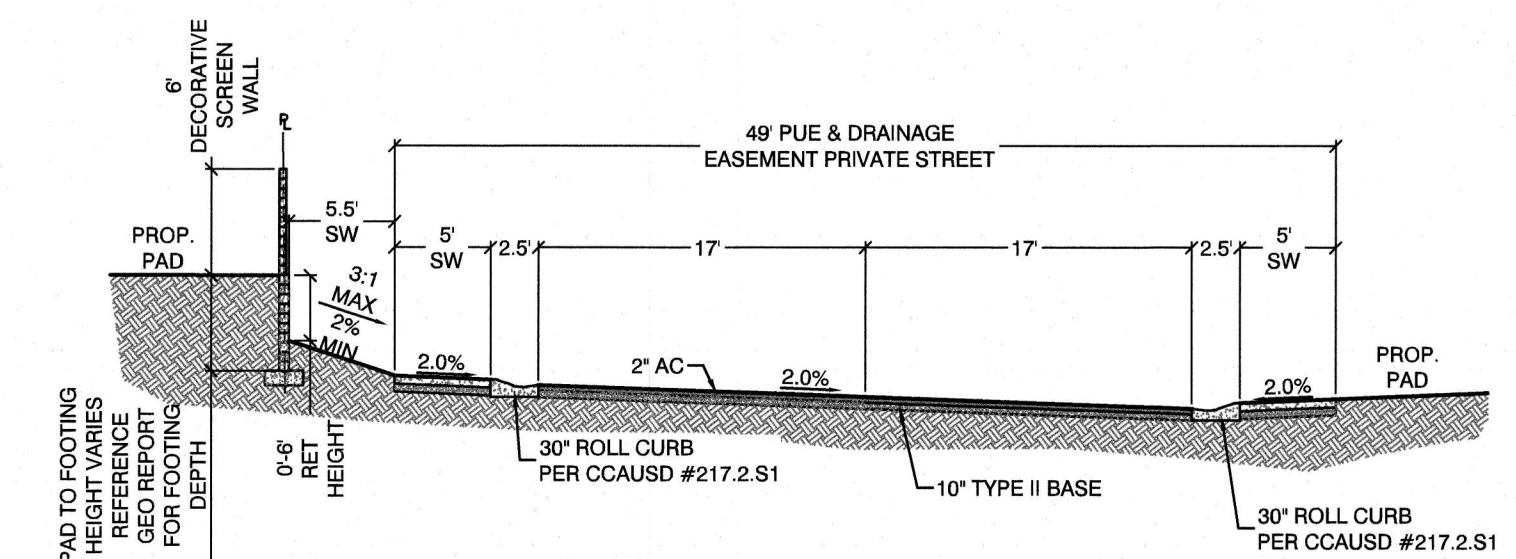


TYPICAL SECTION C
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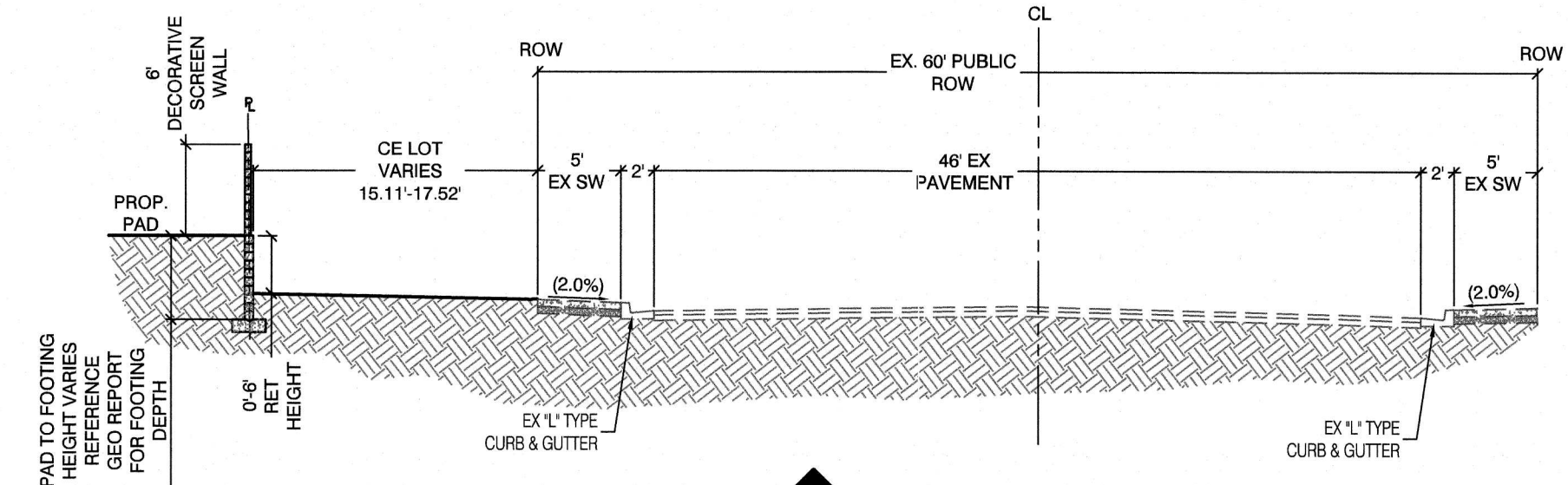
* IF PROPOSED WALL IS ABOVE EXISTING WALL, PROPOSED WALL IS TO BE PAINTED IN LIKENESS AND COLOR OF EXISTING WALL.



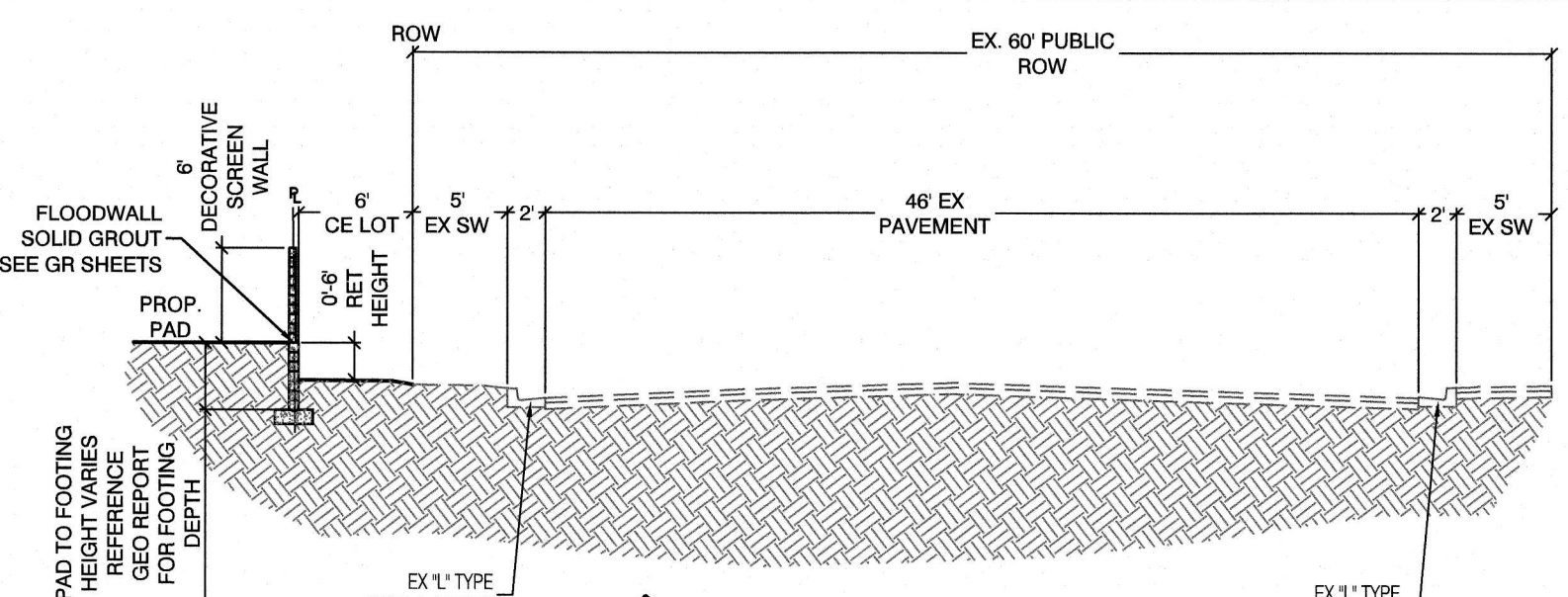
TYPICAL SECTION D
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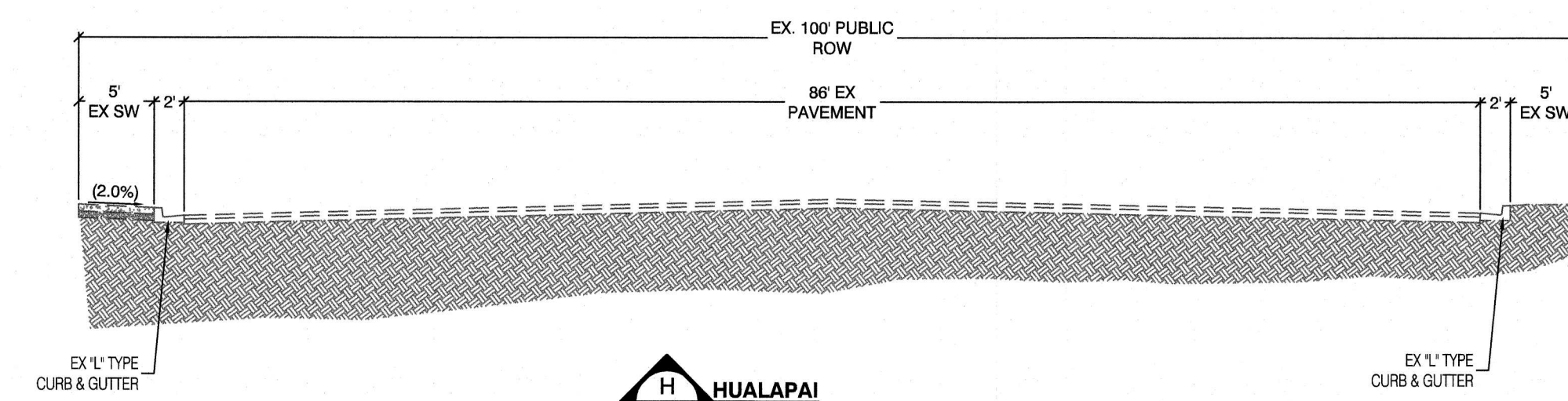
TYPICAL SECTION E
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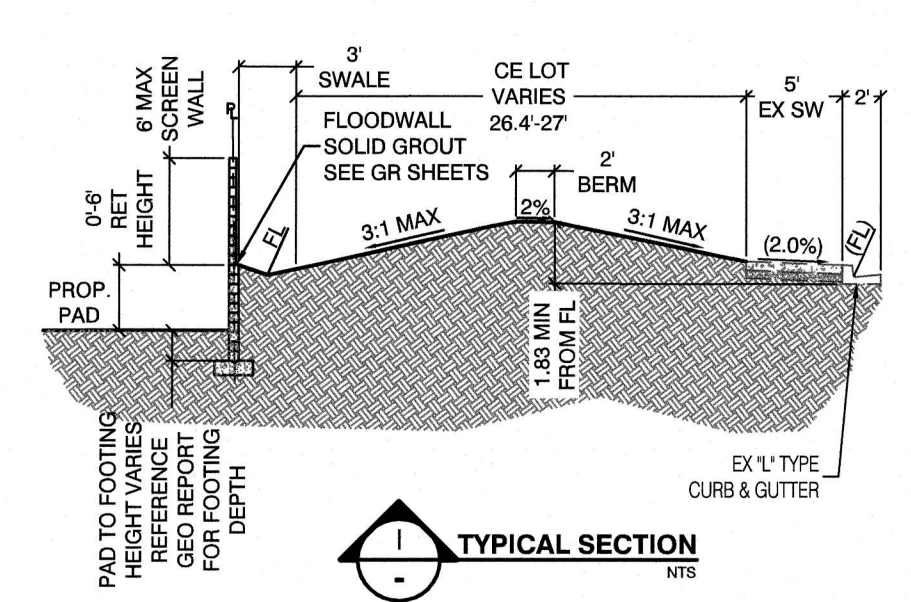
ISAAC NEWTON
NTS



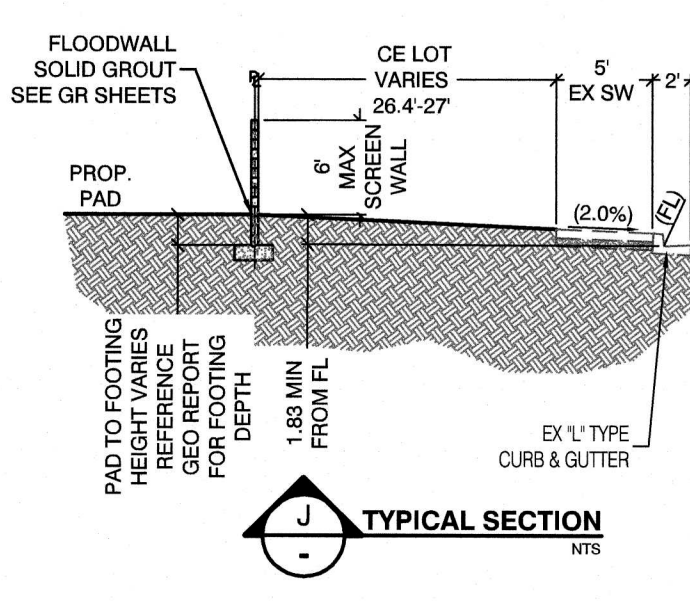
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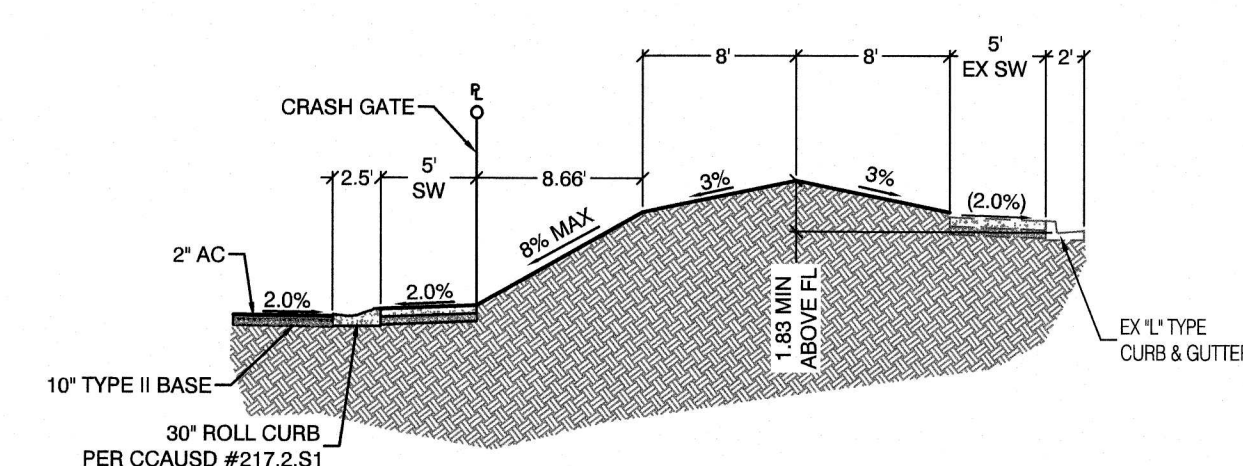
HUALAPAI
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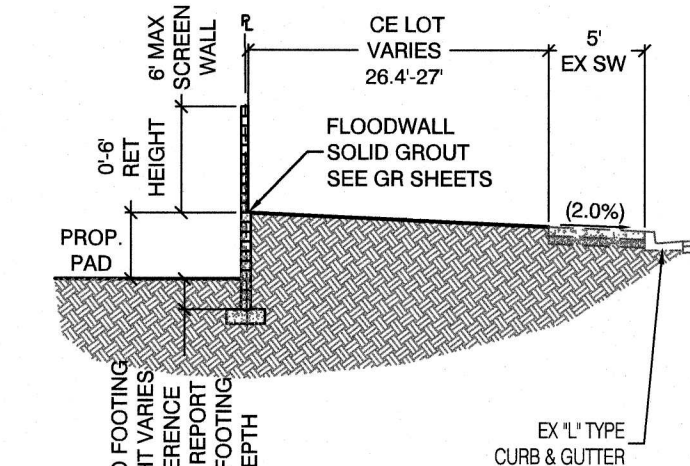
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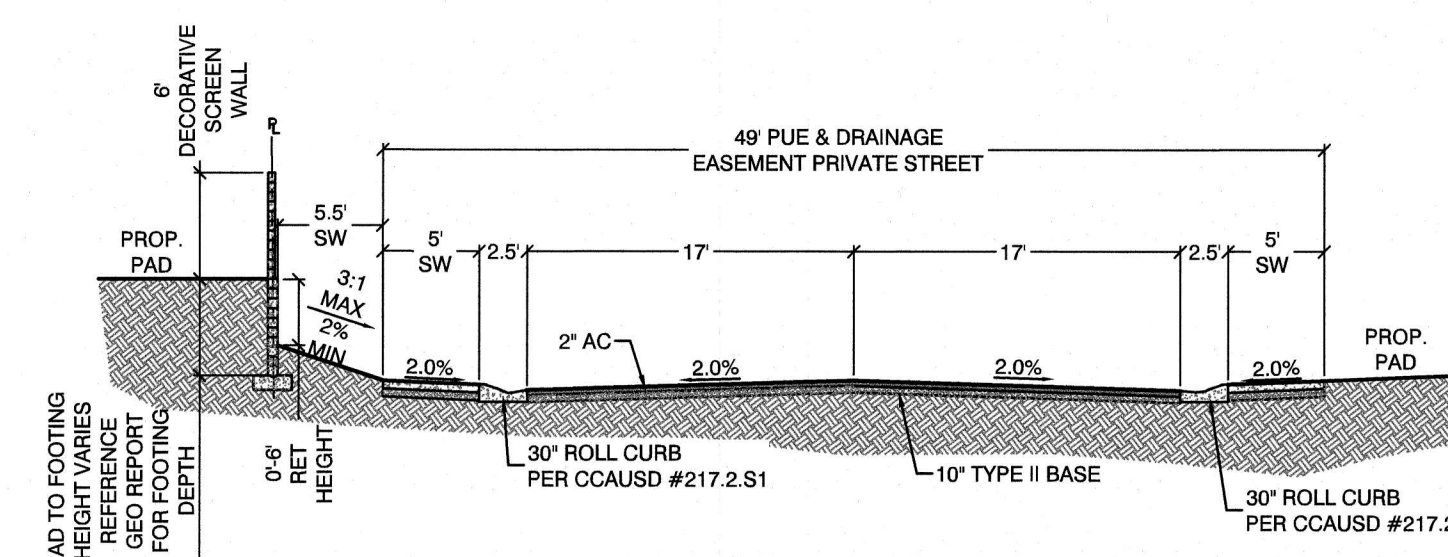
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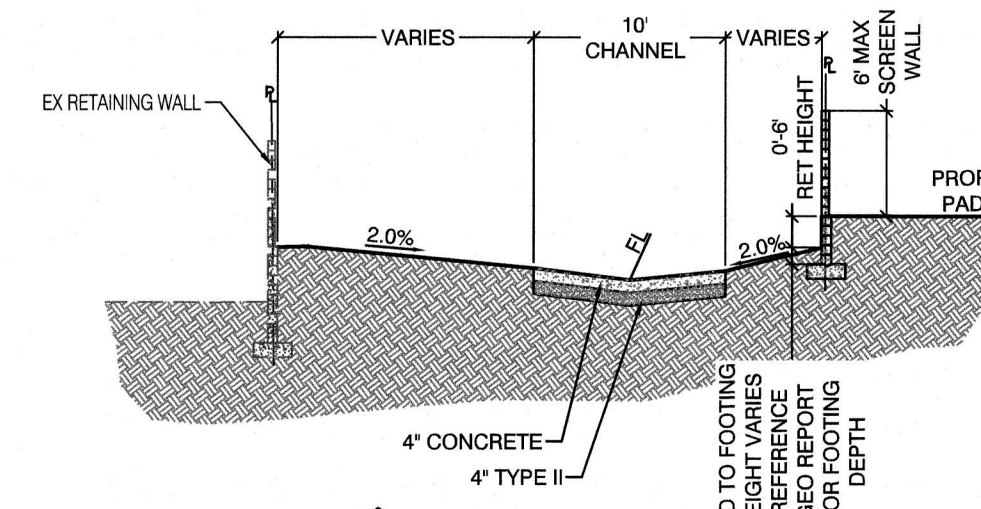
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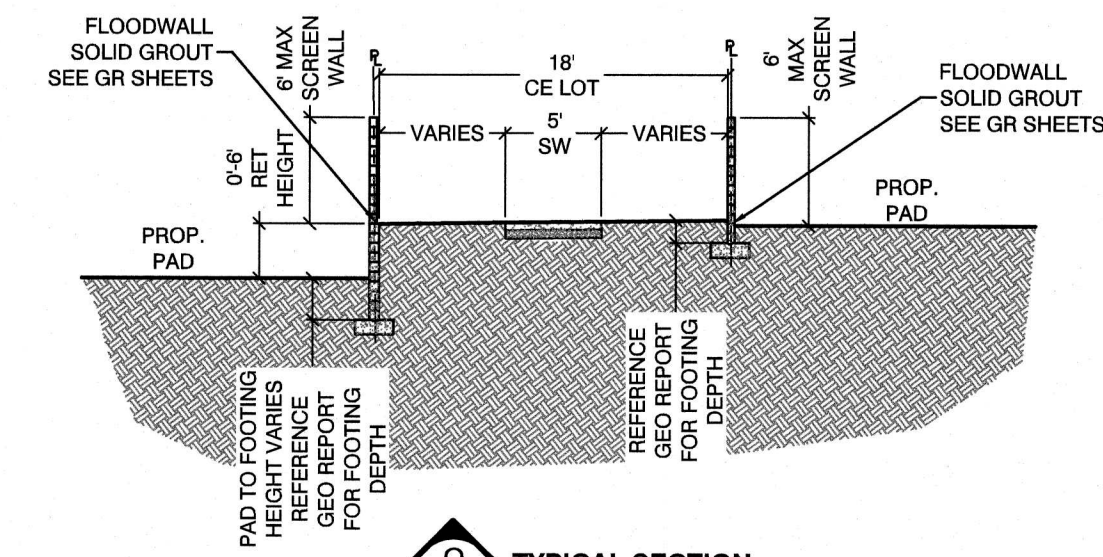
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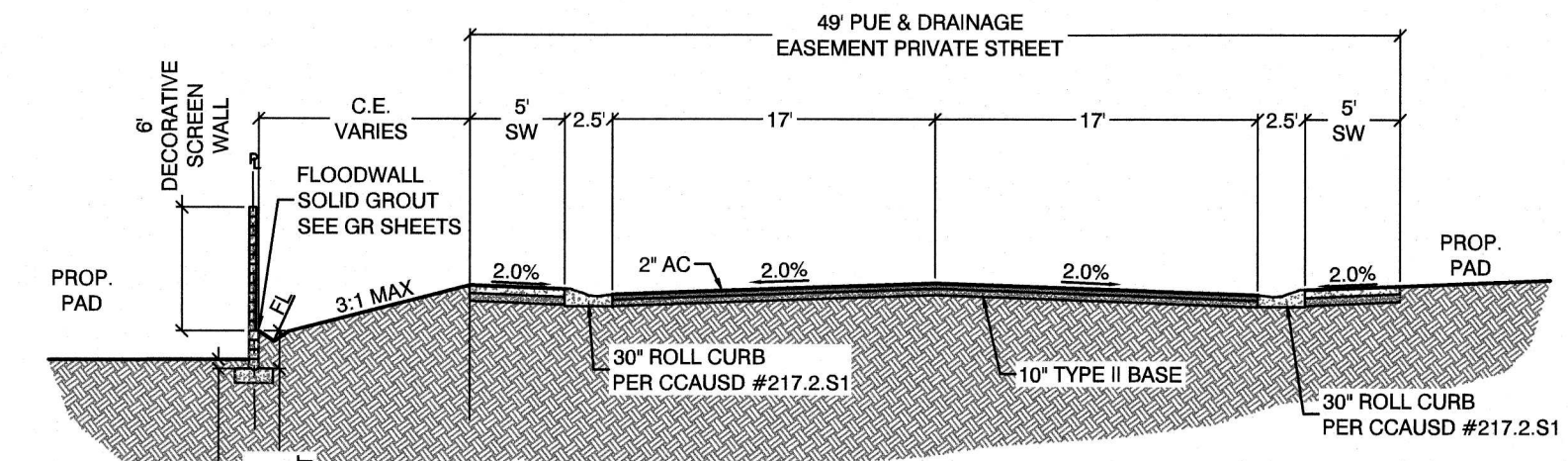
TYPICAL SECTION M
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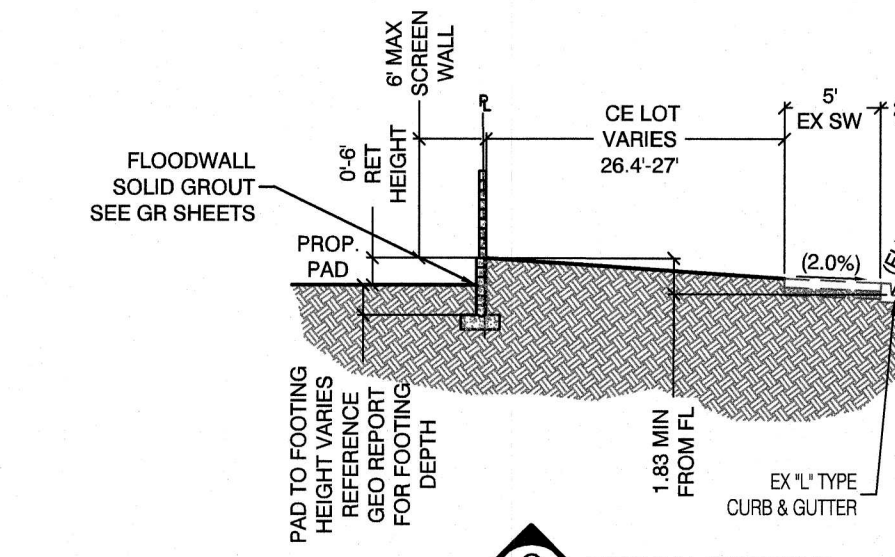
TYPICAL SECTION N
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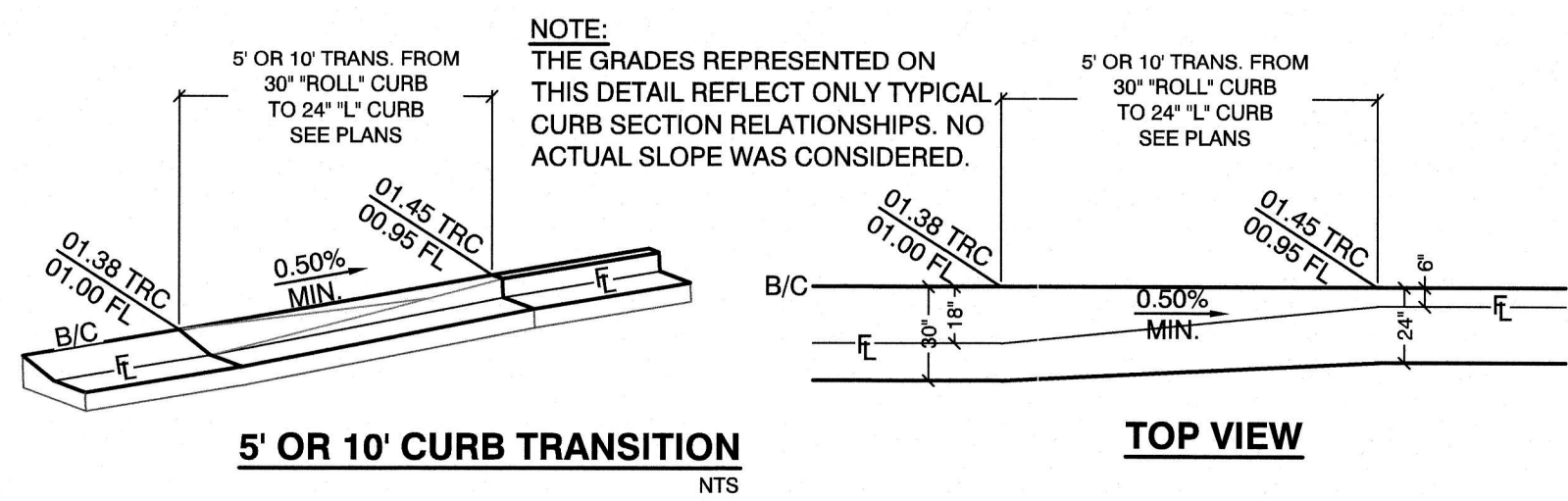
TYPICAL SECTION O
NTS



TYPICAL SECTION P
NTS

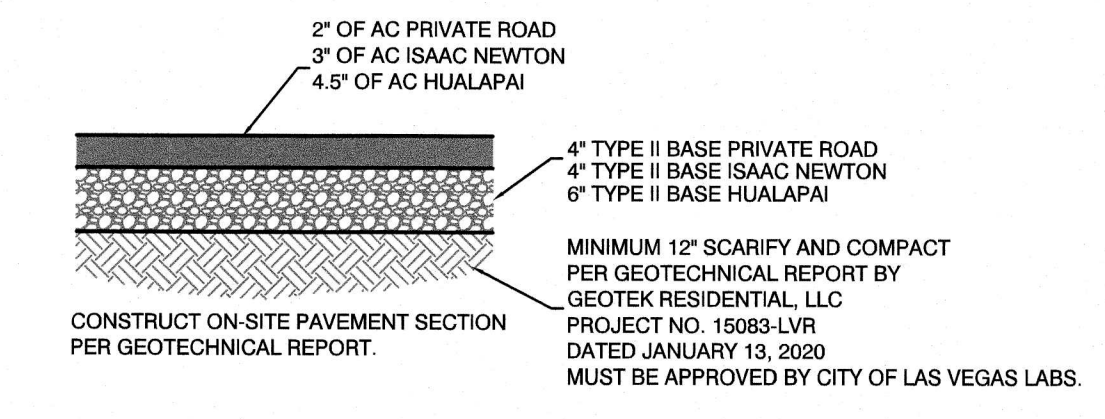


TYPICAL SECTION Q
NTS

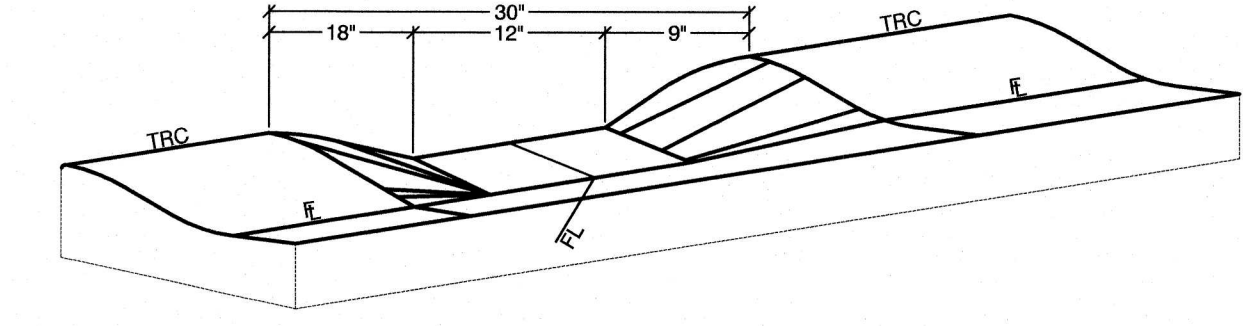


5' OR 10' CURB TRANSITION
NTS

TOP VIEW



ON-SITE ASPHALT CONCRETE PAVEMENT SECTION
NTS



DEPRESSED ROLL CURB DETAIL
NTS

CITY OF LAS VEGAS		AMH DEVELOPMENT WEST GC, LLC		2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 972-7550 FAX. (702) 382-2597 WEB WWW.VTNW.COM CONSULTING ENGINEERS PLANNERS LAND SURVEYORS	
REVISION	BY	DATE	REV	DATE	REV
DETAIL SHEET 1			HUALAPAI & ISAAC NEWTON SINGLE FAMILY RESIDENTIAL		
DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO.:	SCALE:	HORIZ. VERT.
BCC	DEH	WJM	8031	NA	NA
05/19/2020	05/19/2020	07/20/2020			
			SHEET DT1 15 OF 28 SHEETS DRAWING NO.		