DS #: 5201

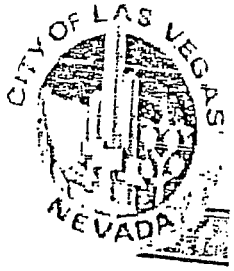
APN: 137-26-112-001

PROJECT: Highline - Summerlin West Village 21 - Parcel 1

SUBMITTAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: November 18, 2019
TO: **Land Development Services** Department of Building & Safety			**FROM:** Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Highline – Summerlin West Village 21 - Parcel I**		**COPIES TO:** Kimley Horn and Associates, Inc.
Cross Streets:	Carriage Hill Drive and Redpoint Drive		Lennar, Robert Flaxa
File Number:	F:\Depot\DSMemos\DS5201A.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-26-112-001		CCRFCD
Zoning Action:	TMP-77187		CCPW
FEMA Flood Zone	YES	NO **X**	
Proposed Storm Drain	YES **X**	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	10/14/2019 & 10/31/2019	11/18/2019	See Comments Below	$400.00	3608643: $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.

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

1. Provide a copy of the zoning/planning conditions associated with this site **(TMP-77187**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.
2. The subject development is under the premise of flood protection by the improved *Carriage Hill Drive* with a regional storm drain to the west, *Redpoint Drive* to the south and the *Modified Beltway Channel* (from *Summerlin Parkway* to the *NV Energy Facility*) to the east. No occupancy permit of the houses will be issued prior to the substantial buildout of the perimeter facilities.

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

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

4. The site is also adjacent to the ongoing Clark County Beltway project. The engineer must coordinate with *Clark County Public Works Department* (CCPW) and incorporate any concerns for boundary conditions along the east border. CCPW concurrence is required prior to final acceptance of the study.

5. The engineer/developer proposed offsite grading for swale in the adjacent *Parcel U* to the north. Obtain a notarized letter of permission for offsite grading from the adjacent property owner prior to the final approval of the drainage study.

6. The engineer/developer also proposed interior private drives in north-south alignment with offset crown: the west half (9.5' width) has a 1% cross slope and the east half (25.5' width) has a cross slope of 4%. This may cause drivability issue for future residents. Coordinate with Mr. Victor Bolanos of City Traffic for review and approval prior to the final acceptance of the subject drainage study.

7. The proposed residential project consists of lots with 5'-long driveway leading into the individual garage and finished floor.

   In comparison to the traditional residential lots, normally with 20'-long driveway leading to the garage will provide a minimum of 0.5' freeboard from the garage elevation to the adjacent top of curb. However, the proposed GFFs do not meet the requirement. For example, in Sheet C2.1, at Lot 202, the high side TC is at 74.07 but the proposed GFF is only 74.08. Review and revise accordingly.

   In the next submittal, provide a table to list garage elevation (GFF) of all lots to verify that a minimum of 0.5' freeboard is provided relative to the adjacent high side TC.

8. The locations that have storm drain running through the backyard of adjacent lots (running through private property). Or locations where storm water flow will surface run between private lots is to be designated a Public Drainage Easement. For example, all locations that show a storm drain with small grate inlets on private residences and locations where block wall openings allowing flow between private residences will require a Public Drainage Easement.

   Provide an overall plan that delineates all the required public drainage easements (privately maintained) across the site in the next submittal.

   Upsize all onsite storm drains to 8"-diameter minimum, although 12" is preferable.

9. ***Table 7: Drainage Swale Calculation*** shows the velocity (ft/s) as 3.37 for Section OFF3 (MIN) while the worksheet for *OFF3 (MIN) Project Description* shows the velocity 3.73 ft/s. Revise for consistency.

10. Worksheet for Table 7 (Drainage Swale Calculation) does not provide all side slopes and total depth (ft) information.

11. The Storm Drain sheet inlet names do not match the names on the Drop Inlet Summary Table, and the inlets are not numbered on FAC-1. Provide matching names and show them on the facility map for review.

12. The Emergency Overflow condition is designated at the end of Private Drive K however, the grading plans show 2 masonry walls at this location preventing the flow from entering into the Angel Park Beltway Channel. Provide an opening (wrought iron fence/gate) for the flow at the masonry walls to allow flow conveyance. Additionally, provide finished grade elevations at the openings in the masonry walls.

13. D.I. #19 is about 17'-deep will require a special structural detail and calculation. Submit structural design and calculations to *City Building & Safety Department* for review and approval prior to the final approval of the drainage study.

14. Provide clarification of what the "STEP" listed on the grading plans is for the GFF. For example, on sheet C2.2 lots 61, 62, and 63 list a 15", 10", and 4" STEP. These values do not correlate the FFE of 3248.00 or the TC.

15. The offset crowning of the road should show a consistent portion of flow on either side of the street. For example basin 1-4 shows 3 cfs being captured on one side, and 1 cfs being captured on the other. However on Private Street F 100% of the flow is considered on one side of the street. Revise calculations to show the correct percentage of flow based on the offset crown on either side of the street.

16. The Finished Floor Elevations for lots 34, 35, 36 are 3240.0'. The low point (LP) adjacent to these lots is 3239.42'. The lots needs to adequately clear twice the depth of flow of all emergency overflow that will run along the south of lot 36. Provide flow depth calculations along with more grade information along the south of lot 36 on grading plans, along the route the emergency flow will be conveyed.

17. The following Finished Floors do not meet the twice the depth of flow, or minimum 6" above the adjacent TC:

Location	TC	FF Shown	FF Required
Unmarked building shown on C 2.3	3274.15	3274.50	3274.65

18. Label the size and provide *City of Las Vegas* recorded drawing numbers of all existing storm drain systems in the perimeter streets on all pertinent grading plans in the next submittal.

19. 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."

20. 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.

21. 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.

22. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

23. Provide a note on the grading plans: All Onsite Storm Drains and the associated facilities are Privately Owned and to be Privately Maintained by the HOA.

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/R59E/26
AREA K-26

Technical Drainage Study

for

HIGHLINE
VILLAGE 21– PARCEL I

Date Prepared:
September 2019

Prepared for:
Lennar
9275 W Russell Rd, Suite 400
Las Vegas, NV 89148
702.821.4651

Prepared by:
Kimley-Horn and Associates, Inc.
6671 Las Vegas Boulevard South, Suite 320
Las Vegas, NV 89119
702.862.3600

Kimley»Horn

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Highline - Village 21 - Parcel I Date: September 2019

Location of Development: a) Descriptive (Cross Streets) North/South: Carriage Hill Drive

East/West: Redpoint Drive

b) Section: 26 Township: 20S Range: 59E

c) APN : A portion of 137-26-101-001

Name of Owner: Lennar - Robert Flaxa

Telephone No.: 702.821.4651 Fax No.: E-Mail Address: robert.flaxa@lennar.com

Address: 9275 W Russell Rd, Suite 400 Las Vegas, NV 89148

Contact Person-Name: Rachael R. Dennis, P.E. **Telephone No.:** 702.734.5666

* **E-Mail Address:** rachael.dennis@kimley-horn.com **Fax No.:**

Firm: KIMLEY-HORN

Address: 6671 Las Vegas Boulevard South, Suite 320 Las Vegas, NV 89119

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	GRADING PERMIT	

1. Total Owned Land Area: At Site: +/- 18.69 acres Being Developed/Disturbed: +/- 18.69 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.): Single Family 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: Summerlin West Village 21
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: 42" RCP South end of the project site
8. Briefly describe your proposed schedule for the subject project: ASAP

Engineer's Seal

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

***New Required Field**

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

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

Kimley»Horn

September 30, 2019

Mr. Albert Sung, P.E.
City of Las Vegas Flood Control
333 Rancho Drive
Las Vegas, NV 89106

RE: ***Technical Drainage Study for Highline: Village 21 - Parcel I***

Dear Mr. Sung,

This letter certifies that all items provided on the Technical Drainage Study for Highline: Village 21- Parcel I electronic submittal matches the paper version bound into the study.

With Kimley-Horn, you should expect more and will experience better. Please contact me at (702) 734-5666 or rachael.dennis@kimley-horn.com should you have any questions or concerns.

Sincerely,

Rachael R. Dennis, P.E.

Autumn Lyn Donovan, E.I.T

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name:	**Highline Village 21 -Parcel I**	Map ID:	
Firm Name:	**Kimley-Horn**	Engineer:	**Rachael R. Dennis**
Address:	**6671 Las Vegas Boulevard South, Suite 320**		
City:	**Las Vegas** State: **Nevada**	Zip:	**89119**
Phone No.:	**(702) 862-3600**	Fax No.	
Property Owner:	**Lennar – Roberta Flax**		
Address:	**9275 W Russell Rd, Suite 400**		
City:	**Las Vegas** State: **NV**	Zip:	**89148**

Reviewed By:	**Date Received:**	**Date Accepted for Review:**

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

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

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

I. GENERAL REQUIREMENT

YES	NO	N/A	
☒	☐	☐	Design Manual **Standard Form 1** with the Engineer's seal and signature.
☒	☐	☐	Design Manual **Standard Form 4.**
☒	☐	☐	2 copies of the 24" x 36" **Drainage Plan.**
☐	☐	☒	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

YES	NO	N/A	
☒	☐	☐	A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
☒	☐	☐	A copy of the current CCRCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.
☒	☐	☐	Off-site drainage basin maps for existing, interim, and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.

II. MAPS AND EXHIBITS (CONTINUED)

☒	☐	☐	Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

YES	NO	N/A	
☒	☐	☐	Sheet size: 24"x36" sealed by a registered engineer in the State of Nevada.
☒	☐	☐	Minimum scale: 1"=60'
☒	☐	☐	Project name.
☒	☐	☐	Vicinity Map with local and major cross streets.
☒	☐	☐	Revision box.
☒	☐	☐	North arrow and bar scale.
☒	☐	☐	Engineer's/consultant's address and phone number.
☒	☐	☐	Elevation datum and benchmark.
☒	☐	☐	Legend for symbols and abbreviations.
☒	☐	☐	Cut/Fill scarps, where applicable.
☒	☐	☐	Street names, grades, widths.
☒	☐	☐	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
☒	☐	☐	Existing contours encompassing the site and 100-feet beyond with spot elevations for important locations, where appropriate.
☒	☐	☐	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
☒	☐	☐	Proposed typical street sections.
☒	☐	☐	Streets with offset crowns.
☒	☐	☐	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
☒	☐	☐	Property lines.
☒	☐	☐	Right-of-way lines and widths, existing and proposed.
☒	☐	☐	Existing improvements and their elevations.
☒	☐	☐	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year peak flows at basin concentration points.
☒	☐	☐	Concentration points and drainage flow directions with Q_{100} and V_{100} and D_{100} in streets.
☒	☐	☐	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
☒	☐	☐	Location and cross-section of street capacity calculations.
☒	☐	☐	Cross-sectional detail for channels, including cutoff wall locations.

III. DRAINAGE PLAN (CONTINUED)

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

IV. HYDROLOGIC ANALYSIS

YES	NO	N/A	
☒	☐	☐	Appropriate soil information and Soils Map for existing and future conditions with sub-basins and property delineated.
☒	☐	☐	Input and Output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	☐	Input and Output information for proposed conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	☐	Use of correct precipitation values in and around the McCarran Airport rainfall area.
☒	☐	☐	A discussion in the text of the hydrologic analysis justifying sub-basin boundaries and cutoffs, supporting assumptions, and calculations.
☒	☐	☐	A summary table of stormwater flows showing basin area Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.

IV. HYDROLOGIC ANALYSIS (CONTINUED)

☒	☐	☐	Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
☒	☐	☐	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
☐	☐	☒	Calculation for impervious area for parking lots and LIDs (if required)

V. HYDRAULIC ANALYSIS

YES	NO	N/A	
☐	☐	☒	Flow split calculations and supporting documentation or reference for the method of flow calculation used.
☒	☐	☐	Normal depth street flow calculations and cross-section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. Q_{100} d x v ≤ 8. Q_{10} d x v ≤ 6 and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the **Grading Plan**.
☒	☐	☐	A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
☒	☐	☐	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
☒	☐	☐	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
☒	☐	☐	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Building adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.
☐	☐	☒	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
☒	☐	☐	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
☒	☐	☐	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drainpipes in public rights-of-way, including headwater pool inundation.
☒	☐	☐	The mitigation of nuisance water, both during construction and in the fully developed condition must be addressed.
☐	☐	☒	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required)

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

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

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

II. GRADING PLAN INFORMATION		
Yes	No	
X		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.)
X		This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
X		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

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

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

Kimley»Horn

Technical Drainage Study

for

HIGHLINE
VILLAGE 21– PARCEL I

Date Prepared:
September 2019

Prepared for:
Lennar
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Table of Contents

INTRODUCTION 2

LOCATION AND DEVELOPMENT DESCRIPTION 2

PREVIOUS DRAINAGE STUDIES 4

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) MASTER PLAN FACILITIES 5

FEMA FLOOD HAZARD DESIGNATION 6

HYDROLOGIC METHODOLOGY 6

HYDROLOGY 6

EXISTING CONDITIONS 6

ULTIMATE CONDITIONS 7

HYDRAULIC CALCULATIONS 8

- STREETS 8
- STORM DRAIN FACILITIES AND PROTECTION 10
- pROPOSED DRAINAGE SWALES 12

FINISHED FLOOR ELEVATION 13

CONCLUSIONS AND RECOMMENDATIONS 14

REFERENCES 15

INTRODUCTION

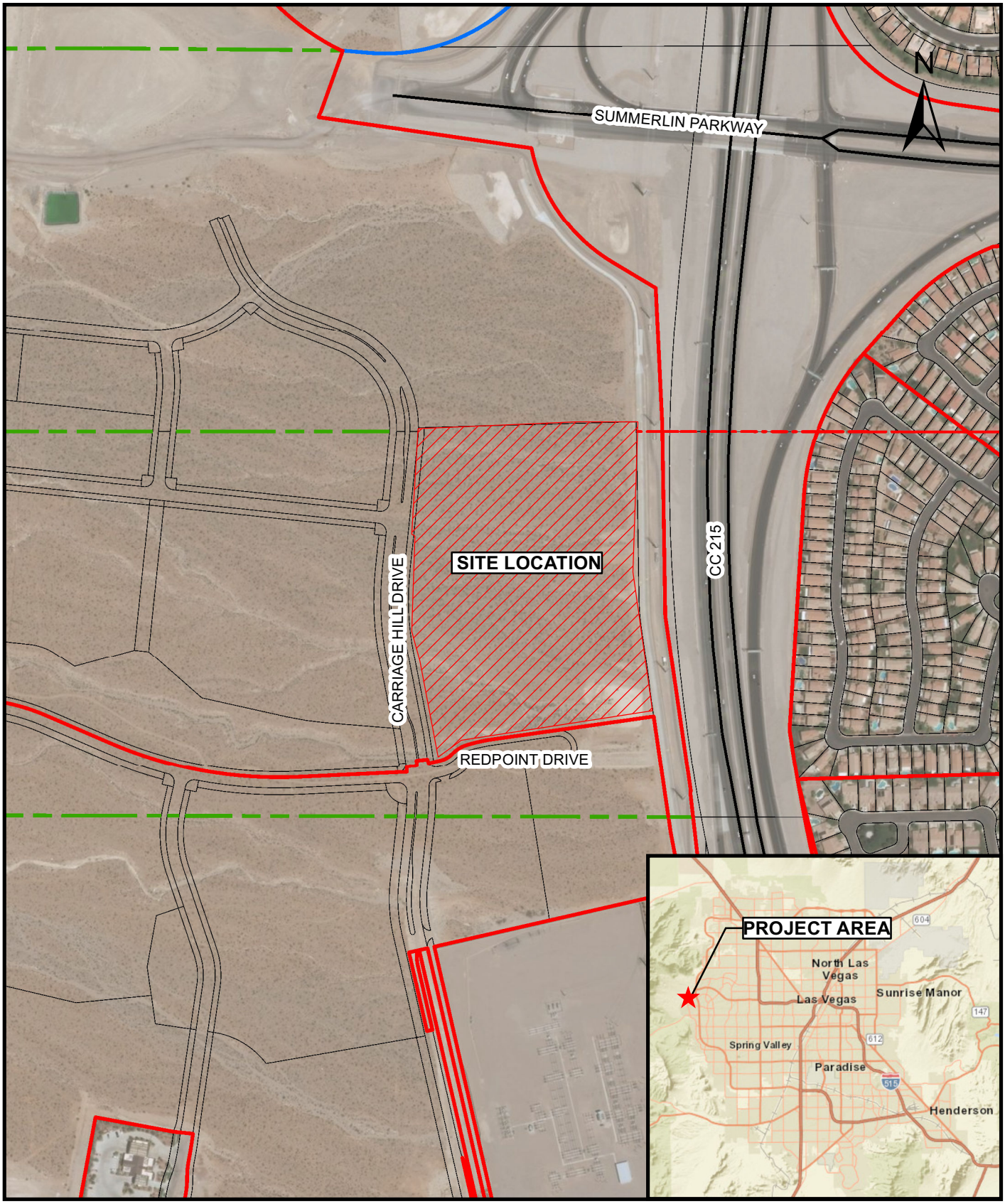
Lennar Homes is proposing to develop **Highline Village 21 – Parcel I** (hereinafter referred to as Highline) as a residential subdivision located within the Summerlin West Master Planned Community. The purpose of this report is to accompany the grading plans and to provide detailed hydrologic and hydraulic analyses for the proposed residential site. The following tasks were performed in the preparation of this report:

1. Identify previous drainage studies for the project site and surrounding areas.
2. Identify the FEMA floodplain designation for the project site.
3. Identify existing and proposed regional drainage facilities adjacent to the site.
4. Estimate runoff generated for the peak 100-year return period storms for existing, proposed and ultimate conditions.
5. Verify proposed finished floor elevations meet CLV Criteria.
6. Recommend drainage features to protect the project from storm runoff.

LOCATION AND DEVELOPMENT DESCRIPTION

Highline is located within Section 26, Township 20 South, Range 59 East, M.D.M., in Clark County, Nevada. The proposed project will consist of **249 single-family attached residential units** within **±18.69 acres** of **APN 137-12-101-007**. A copy of the *Assessor's Parcel Map* is included in **Appendix A**. The proposed interior streets with a north-south alignment will consist of 35-foot wide private drive aisles with offset crown sections, roll-type curb and gutter, and a 4-foot sidewalk on one side. The proposed interior streets with an east-west alignment will consist of 35-foot wide private drive aisles with normal crown sections, roll-type curb and gutter, and a 4-foot sidewalk on one side. Drive K is the southernmost drive aisle, and will consist of a normal crown section, L-type curb and gutter, and a 4-foot sidewalk on one side.

Currently, the site is undeveloped with sparse vegetation. Highline is bordered by Carriage Hill Drive to the west, Redpoint Drive to the south, the CC 215 Beltway Channel to the east, and the undeveloped Parcel U to the north. Carriage Hill Drive and Redpoint Drive will be constructed prior to the construction of this site. Therefore, the flood protection provided by the adjacent roadway improvements has been assumed to be in place. Please refer to **Figure 1** for the location of the project.



VICINITY MAP
HIGHLINE
VILLAGE 21 - PARCEL I

Date: September 2019

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PREVIOUS DRAINAGE STUDIES

Previous hydrology studies that were utilized in the preparation of this report:

1. *Update #1 to the Flood Control Master Plan Update – Summerlin West Planning Area* (Master Study, April 2019, CLV DS-4926)

    a. A comprehensive master drainage study for Summerlin West which establishes ultimate conditions flowrates for the Village 21 parcels. The *Master Study* established a developed condition 100-year flowrate of **61 cfs** for **Parcel I**.

2. *Technical Drainage Study for Summerlin West Village 21 – Beltway Channel (Far Hills Avenue to Sky Vista Drive),* (Beltway Channel Study, August 2019, CLV DS-5139).

    a. Establishes storm drain lateral connections to the existing beltway channel located directly east of the proposed Highline improvements. The *Beltway Channel Study* proposed extension of the existing walls along the Western Beltway Channel to contain the increase of ultimate condition runoff from the *Master Study*. Storm drain laterals will collect and convey developed condition offsite runoff from Parcels U and I. A 36" RCP storm drain lateral at the southeast corner of Parcel U was sized to collect and convey 73 cfs into the existing beltway channel. A **42" RCP lateral** at the southeast corner of Parcel I was sized to collect and convey **61 cfs** into the existing beltway channel. Additionally, the *Beltway Channel Study* established the ultimate conditions water surface elevations (WSE) in the adjacent channel. A **starting WSE of 3219.91'** has been referenced at the 42" RCP lateral for design of the Highline storm drain.

3. *Update #2 to the Technical Drainage Study for Summerlin West Village 21 – Carriage Hill Drive (Redpoint Drive to Summerlin Parkway),* (Carriage Hill Study, April 2019, CLV DS-5064)

    a. The *Carriage Hill Study* includes full street roadway improvements west of Highline between Redpoint Drive and Summerlin Parkway Eastbound and includes construction of the Clark County Regional Flood Control Facility **(CCRFCD) APCH 0031 60" RCP** storm drain system in Carriage Hill Drive. Carriage Hill Drive will convey a maximum 100-year surface flowrate of **6 cfs** with a flow depth of **0.33'** adjacent to the Highline development. Storm Drain infrastructure within Carriage Hill Drive will collect and convey offsite flows west and south of Highline.

4. *Technical Drainage Study for Summerlin West Village 21 – Street A (Carriage Hill to Parcel H),* (Redpoint Study, August 2018, CLV DS-5007).

    a. The *Redpoint Study* includes full street roadway improvements for Redpoint Drive (formally named "Street A") south of Highline. Redpoint Drive will convey a total 100-year flowrate of **5 cfs** east within a 30-foot wide Public Drainage Easement located at

the outlet of the Redpoint Drive cul-de-sac. Flows from the cul-de-sac will be conveyed east into the existing Beltway Channel via a **12-foot wide unlined v-ditch with 3:1 side slopes**.

5. *Technical Drainage Study for Summerlin West Village 21 – Parcel U Stockpile,* (Parcel U Stockpile Study, August 2019, DS-5172)
    a. The *Parcel U Stockpile Study* includes construction of a stockpile on ±12.3 acres of Parcel U and establishes the offsite existing condition north of Highline. A total 100-year flowrate of **4 cfs** from **Subbasins OFF2** (2 cfs) and **OFF3** (2 cfs) will impact the northern boundary of Highline.

6. *The Technical Drainage Study for Summerlin West Village 21 – Parcel I Stockpile,* (Parcel I Stockpile Study, June 2019, CLV DS-5137)

    a. The *Parcel I Stockpile Study* includes construction of a stockpile on ±7.2 acres of Parcel I and **establishes the existing condition** for Highline.

Kimley-Horn has reviewed the reference studies listed and agrees with the information included therein. The information referenced is for determining the existing and future development patterns and quantities of flow adjacent to the proposed project site. Flows referenced are indicated throughout this report and are accepted by Kimley-Horn for this study. Pertinent reference material is included in **Appendix C**.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) MASTER PLAN FACILITIES

"*The Las Vegas Valley Flood Control Master Plan Update*", **Figure F-22**, dated December 2018, as prepared by the Clark County Regional Flood Control District (CCRFCD) illustrates the existing and proposed master planned facilities in the area (**See Appendix A**). As shown on the figure, the project site is located adjacent to the existing **CCRFCD Angel Park - Beltway Branch (APBE) Facility 0122** located east of the project site. CCRFCD Facility APBE 0122 consists of a concrete-lined trapezoidal channel with a 10-foot wide bottom width and 2:1 side slopes and will collect and convey the ultimate condition 100-year storm event of **913 cfs** (referenced from the *Beltway Channel Study*).

Additionally, the project site is located adjacent to the proposed **CCRFCD Angel Park – Carriage Hill Branch (APCH) Facility 0031** located west of the project site. The proposed CCRFCD Facility APCH 0031 is located west of the proposed site within the future Carriage Hills Drive and ranges in size from a 30" RCP to a 60" RCP. CCRFCD Facility APCH 0031 will collect and convey a 100-year storm event of **222 cfs** (referenced from the *Carriage Hill Study*).

FEMA FLOOD HAZARD DESIGNATION

The Special Flood Hazard Areas (SFHA) for both the unincorporated and the incorporated portions of Clark County, Nevada, are outlined in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps. This subject site is located on FEMA Flood Insurance Rate Map (FIRM) Community Panel No. **32003C 22150E**, revised September 27, 2002. As shown on the FEMA FIRM Exhibit (see **Appendix A**), the subject site is located within a FEMA-designated **Zone X**. Therefore, this project is not currently located in a FEMA-designated SFHA. Areas described as Zone X are areas determined to be outside the 0.2% annual chance (500-year) floodplain.

HYDROLOGIC METHODOLOGY

The hydrologic model and design of this site development are in compliance with local requirements, including Clark County (CC), the CCRFCD's "*Hydrologic Criteria and Drainage Design Manual*", and the CCRFCD's "*Flood Control Master Plan Update*".

HYDROLOGY

Existing and ultimate conditions hydrology has been referenced from several studies as discussed earlier in the "*Previous Drainage Studies*" section of this report. Ultimate conditions flows for the proposed site have been referenced and prorated from the *Master Study*. The referenced *Master Study* **Figure A.6.6 - Village 21 Drainage Basin Map** in **Appendix C** depicts the subbasins and drainage patterns used in the ultimate conditions hydrologic analysis for the site and quantifies a developed condition flowrate of **61 cfs** for Parcel I. Referenced hydrologic calculations from the *Master Study* have been included in **Appendix C**.

EXISTING CONDITIONS

Offsite improvements will be constructed prior to or concurrently with the development of Highline. Therefore, it is assumed for the purposes of this report, that all offsite facilities and roadways are fully-developed in the existing condition with the Parcel U Stockpile constructed to the north. Offsite flows west of the site are intercepted by the Carriage Hill Drive improvements. Flows the north of the project site have been referenced from the *Parcel U Stockpile Study* **Figure 6 - Proposed Condition Basin Map** in **Appendix C**. A total offsite flowrate of 4 cfs generated by referenced Subbasins OFF2 (2 cfs) and OFF3 (2 cfs) will impact the proposed northern boundary of Highline to be ultimately discharged east as sheet flow into the existing Beltway Channel.

The drainage impacts of the development of Highline has been addressed in the *Master Study*. The *Master Study* has determined that the development of Parcel I will not adversely impact existing downstream facilities. Therefore, a site-specific existing condition hydrologic analysis is not necessary for this study.

ULTIMATE CONDITIONS

The ultimate conditions drainage patterns assume the site and offsite parcels as fully-developed. The project-specific ultimate conditions hydrology references the *Master Study* **Basin I**. **Figure ULT-1 – Ultimate Condition Basin Map**, depicts the referenced subbasins and drainage patterns used in the ultimate conditions for this project. A copy of **Figure ULT-1** is included in **Appendix A**. The subbasins and flow patterns used to determine the onsite flowrates impacting the proposed improvements were prorated. A unit flowrate (cfs/acre) for the onsite subbasin was calculated by dividing the total flowrate of the subbasin by the overall subbasin area. The total flowrate generated by the areas shown on **Figure ULT-1** is approximated by multiplying the calculated unit flow rate (cfs/acre) by the delineated portion of tributary area (acres). Prorate calculations for the onsite subbasins have been included on **Figure ULT-1**. **Table 1** summarizes the referenced *Master Study* HEC-1 results for ultimate conditions and the prorated ultimate conditions flowrates. Referenced hydrologic calculations have been included in **Appendix C**.

Table 1: Ultimate Condition Prorated Flow Summary

ULTIMATE CONDITION PRORATED FLOW SUMMARY			
Ultimate Basins			
SUBBASIN	**Q_{100} (cfs)**	**AREA (ac)**	**CFS/ACRE**
I*	61	18.69	3.26
Ultimate Onsite Prorated Basins			
SUBBASIN	**Q_{100} (cfs)**	**AREA (ac)**	**CFS/ACRE**
I-1	5	1.56	3.26
I-2A	2	0.56	3.26
I-2B	1	0.23	3.26
I-2C	1	0.25	3.26
I-3	1.5	0.53	3.26
I-4A	3	0.86	3.26
I-4B	1	0.26	3.26
I-4C	1	0.40	3.26
I-5A	5	1.41	3.26
I-5B	1	0.22	3.26
I-6	3	0.88	3.26
I-7A	2.5	0.78	3.26
I-7B	1.5	0.45	3.26
I-7C	1	0.42	3.26
I-8	2	0.65	3.26
I-9A	1	0.39	3.26
I-9B	1	0.25	3.26
I-9C	1	0.22	3.26
I-10	1	0.35	3.26

ULTIMATE CONDITION PRORATED FLOW SUMMARY			
Ultimate Basins			
SUBBASIN	**Q_{100} (cfs)**	**AREA (ac)**	**CFS/ACRE**
I*	61	18.69	3.26
Ultimate Onsite Prorated Basins			
SUBBASIN	**Q_{100} (cfs)**	**AREA (ac)**	**CFS/ACRE**
I-11A	4	1.34	3.26
I-11B	1	0.36	3.26
I-12	3	1.02	3.26
I-13A	3	0.93	3.26
I-13B	0	0.11	3.26
I-13C	0	0.12	3.26
I-14	1	0.26	3.26
I-15A	4	1.15	3.26
I-15B	1.5	0.51	3.26
I-16A	4	1.11	3.26
I-16B	4	1.11	3.26
TOTAL	**61**	**18.69**	**NA**

*Referenced from the *Master Study*

HYDRAULIC CALCULATIONS

STREETS

The resulting street flow data based on the flows generated during ultimate conditions has been presented in **Tables 2** and **3**. **Figure ULT-1** in **Appendix A** shows the locations of the cross sections corresponding to the calculations included in **Tables 2** and **3**. Hydraulic calculations have been included in **Appendix B**. The onsite normal depth sections and flow rates have been calculated from their respective tributary subbasins. Private drive aisles (35') with a north-south alignment have been modeled as half street sections due to the proposed offset crown. The west half of the roadway (9.5') has a 1% cross slope and the east half of the roadway (25.5') has a 4% cross slope with Roll-Type curb and gutter on both sides, and a 4-foot wide sidewalk on one side. Private drive aisles (35') with an east-west alignment have been modeled as full street sections with a normal crown and 2% cross slopes with Roll Type-Curb and gutter on both sides and a 4-foot wide sidewalk on one side. Drive K (35') is the southernmost drive aisle, and will consist of a normal crown section, L-type curb and gutter, and a 4-foot sidewalk on one side. Drive K has been modeled as half street sections.

Cross Sections for the 9.5' half street show the west half of the proposed drive aisle will convey a total flowrate of **0.50 cfs** before overtopping the crown and combining with the flows on the east half of the roadway. Proposed storm drain infrastructure and drop inlets have been provided to maintain a maximum flow depth of **0.38'** (top of curb) in the proposed private drive aisles.

The offsite flow rates and normal depth sections for the adjacent roadways have been referenced from *the Carriage Hill* and *Redpoint Studies*. Offsite hydraulic sections adjacent to the site have been included in **Table 4**. Pertinent reference material has been included in **Appendix C**.

Table 2: Full Street Ultimate Condition Hydraulic Sections

STREET SECTION	CHANNEL SLOPE	Q_{100}	FLOW DEPTH	VELOCITY	D*V
	%	(cfs)	(ft)	(ft/s)	ft^2/s
I-1B	2.90	5.0	0.26	3.18	0.83
I-3	5.67	2.5	0.20	3.63	0.73
I-13A N	3.90	3.0	0.30	3.79	1.14
I-13A S	3.90	0.5	0.16	3.52	0.56
I-14	1.00	1.0	0.27	1.76	0.48
I-16	4.90	8.5	0.38	5.23	1.99
I-1B	2.90	5.0	0.26	3.18	0.83

Table 3: Half Street Ultimate Condition Flow Summary

STREET SECTION	CHANNEL SLOPE	9.5' HALF STREET SECTIONS (WEST)				25.5' HALF STREET SECTIONS (EAST)			
		Q_{100}	FLOW DEPTH	VELOCITY	D*V	Q_{100}	FLOW DEPTH	VELOCITY	D*V
	%	(cfs)	(ft)	(ft/s)	ft^2/s	(cfs)	(ft)	(ft/s)	ft^2/s
I-1A	1.90	0.5	0.18	1.68	0.30	-	-	-	-
I-2	0.60	0.5	0.20	1.03	0.21	1.5	0.31	1.79	0.55
I-4A	1.33	0.5	0.18	1.44	0.26	4.0	0.37	3.06	1.13
I-5A	1.36	0.5	0.18	1.46	0.26	4.5	0.38	3.17	1.20
I-6	1.90	0.5	0.18	1.68	0.30	2.5	0.30	3.15	0.95
I-7A	1.63	0.5	0.18	1.57	0.28	2.5	0.31	2.96	0.92
I-8	0.50	0.5	0.20	0.98	0.20	1.5	0.31	1.68	0.52
I-9A	0.50	0.5	0.20	0.98	0.20	1.0	0.28	1.53	0.43
I-10	0.50	0.5	0.20	0.98	0.20	0.5	0.22	1.32	0.29
I-11A	1.78	0.5	0.18	1.63	0.29	3.5	0.34	3.33	1.13
I-11B	1.78	0.5	0.18	1.63	0.29	1.0	0.22	2.52	0.55
I-12	1.92	0.5	0.18	1.68	0.30	3.0	0.32	3.29	1.05
I-15A	1.89	0.5	0.18	1.67	0.30	3.5	0.33	3.40	1.12
I-15B	1.13	0.5	0.19	1.34	0.25	1.0	0.24	2.11	0.51
I-16A	1.13	0.5	0.19	1.34	0.25	4.0	0.38	2.88	1.09
I-16B	1.36	0.5	0.18	1.46	0.26	3.5	0.35	3.00	1.05

Table 4: Offsite Ultimate Condition Hydraulic Sections

SECTION NAME	CHANNEL SLOPE %	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V
7850****	0.6	852	3.38	15.05	50.84
C.6***	3.3	5	0.29	3.55	1.03
FM2 MAX***	1.00	5	0.75	2.98	2.24
FM2 MIN***	0.88	5	0.77	2.84	2.19
3**	1.65	5	0.32	2.66	0.85
4**	1.65	6	0.33	2.77	0.91
5**	1.66	4	0.30	2.55	0.77

** Referenced from the Carriage Hill Study
*** Referenced from the Redpoint Study
****Referenced from the Beltway Study

Based on the calculated flow characteristics, the Manual criteria for depth (D) and velocity times depth (V*D) during the 100-year storm event will be met.

STORM DRAIN FACILITIES AND PROTECTION

The proposed flood control facilities for the site include swales, storm drain, and drop inlets. All existing and proposed flood control facilities have been shown on the **Figure FAC-1** and the plans included in **Appendix D**. All proposed facilities have been sized to convey the ultimate conditions flowrates. Proposed drop inlets have been sized to collect flows and discharge them into proposed mainline storm drain systems. The proposed storm drain system will connect to the existing 42" RCP at the southeast corner of the project site per the **Beltway Study.** Standard Form 6 models for the proposed mainline and laterals have been included in **Appendix B**. The **starting HGL of 3219.91'** has been referenced from the *Beltway Study***.** Pertinent reference material has been included in **Appendix C**. Normal depth calculations for the proposed 6-inch and 8-inch PVC storm drain within the back and side courtyards have been included in **Appendix B.**

The proposed drop inlet calculations are summarized in Table 6. All drop inlet calculations contain a minimum 50 percent clogging factor. Drop inlet calculations are included in **Appendix B**.

Table 5: Full Street Ultimate Condition Hydraulic Sections

DROP INLET ID	Q_{100}	SLOPE	FLOW DEPTH	Q_{INT}	Q_{BYP}	DI TYPE
	(cfs)	(%)	(ft)	(cfs)	(cfs)	
I-1A	2.50	2.90	0.27	2.15	0.35	NEENAH R-3501-R
I-1B	0.35	2.90	0.13	0.35	0.00	NEENAH R-3501-R
I-2A	0.50	0.60	0.21	0.49	0.01	NEENAH R-3501-R
I-2A1	1.50	0.60	0.30	1.29	0.21	NEENAH R-3501-R
I-2A2	0.21	0.60	0.15	0.21	0.00	NEENAH R-3501-R
I-3	1.25	5.67	0.19	1.25	0.00	NEENAH R-3501-R
I-4A	0.50	1.33	0.18	0.50	0.00	NEENAH R-3501-R
I-4A1	2.50	1.33	0.32	2.08	0.42	NEENAH R-3501-R
I-4A2	0.42	1.33	0.17	0.42	0.00	NEENAH R-3501-R
I-5A	0.50	1.36	0.18	0.50	0.00	NEENAH R-3501-R
I-5A1	4.50	1.36	0.38	3.24	1.26	NEENAH R-3501-R
I-5A2	1.26	1.36	0.25	1.19	0.07	NEENAH R-3501-R
I-6A	2.50	1.90	0.30	2.15	0.35	NEENAH R-3501-R
I-6B	0.35	1.90	0.15	0.35	0.00	NEENAH R-3501-R
I-7A	0.50	1.63	0.17	0.50	0.00	NEENAH R-3501-R
I-7A1	2.50	1.63	0.31	2.12	0.38	NEENAH R-3501-R
I-7A2	0.38	1.63	0.15	0.38	0.00	NEENAH R-3501-R
I-8A	1.50	0.50	0.31	1.27	0.23	NEENAH R-3501-R
I-8B	0.23	0.50	0.16	0.23	0.00	NEENAH R-3501-R
I-9A	0.50	0.50	0.21	0.49	0.01	NEENAH R-3501-R
I-9A1	1.00	0.50	0.27	0.91	0.09	NEENAH R-3501-R
I-9A2	0.09	0.50	0.11	0.09	0.00	NEENAH R-3501-R
I-10 (SUMP)	1.50	N/A	0.20	1.50	0.00	5' TYPE DM2
I-11A1	3.50	1.78	0.34	2.77	0.73	NEENAH R-3501-R
I-11A2	0.73	1.78	0.19	0.73	0.00	NEENAH R-3501-R
I-11B1	1.00	1.78	0.22	0.98	0.02	NEENAH R-3501-R
I-11B2	0.02	1.78	0.05	0.02	0.00	NEENAH R-3501-R
I-12A	3.00	1.92	0.32	2.48	0.52	NEENAH R-3501-R
I-12B	0.52	1.92	0.17	0.52	0.00	NEENAH R-3501-R
I-13A N	3.00	3.90	0.25	2.94	0.06	10' TYPE DM2
I-13A S	0.50	3.90	0.15	0.50	0.00	5' TYPE DM2
I-15A	0.50	1.89	0.17	0.50	0.00	NEENAH R-3501-R
I-15A1	3.50	1.89	0.33	2.79	0.71	NEENAH R-3501-R
I-15A2	0.71	1.89	0.19	0.71	0.00	NEENAH R-3501-R
I-15B1	1.00	1.13	0.24	0.96	0.04	NEENAH R-3501-R
I-15B2	0.04	1.13	0.07	0.04	0.00	NEENAH R-3501-R

In the unlikely event the drop inlets at the existing/proposed low points become completely clogged, emergency overflow paths have been provided to protect the adjacent finished floors. Normal depth and weir calculations for the emergency overflow paths have been included in **Appendix B**. Emergency overflow paths have been provided at the following locations:

1. Cross Section I-14 – The emergency overflow path for the drop inlet, located at the low point in the east end of Drive Aisle K, is provided south of Building 56. Emergency overflows at this location will be discharged east into the existing Beltway Channel. Emergency overflow normal depth and weir calculations have been included in **Appendix B**. Please note that this is an emergency overflow condition only and the proposed systems are designed to intercept and convey all onsite nuisance and storm flows up to a 100-year storm event.

2. Typical Hudson Courtyard (Plan Detail G/C9.2) – The emergency overflow path for the Hudson Courtyard area drains located in the common lot area at the back of proposed Buildings 10, 25, 33-36, and 44-61 is provided between the buildings. Emergency overflows at these locations will be discharged to the adjacent street. Two drain blocks between the lots for been provided for the emergency overflow path. Please note that this is an emergency overflow condition only and the proposed systems are designed to intercept and convey all onsite nuisance and storm flows up to a 100-year storm event.

PROPOSED DRAINAGE SWALES

Proposed onsite swales have been provided to direct flows away from onsite structures and ultimately into proposed or existing storm drain facilities. Facility names for the proposed swales in the calculations correspond with the tributary subbasin/Cross Section Identifier. Information for the swales has been included on **Figure ULT-1** and summarized in **Table 7**. Normal depth calculations have been included in **Appendix B**.

Table 7: Drainage Swale Calculations

SECTION	SLOPE (%)	Q_{100} (cfs)	FLOW DEPTH (ft)	TOTAL DEPTH (ft)	VELOCITY (ft/s)	TYPE	SIDE SLOPES		Req'd d50 (in)
OFF3 (MIN)	3.37	4*****	0.41	1	3.37	V	10:1	3:1	N/A
OFF3 (MAX)	25.00	4*****	0.34	1	5.17	V	10:1	3:1	24"
H.25 West	1.00	0.25	0.11	0.68	1.05	-	5%	5%	N/A
H.50 West	1.00	0.50	0.13	0.68	1.25	-	5%	5%	N/A
H.75 West	1.00	0.75	0.17	0.68	1.19	-	5%	5%	N/A
H.25 East	1.00	0.25	0.11	0.69	1.06	-	6%	6%	N/A
H.50 East	1.00	0.50	0.14	0.69	1.31	-	6%	6%	N/A
H.75 East	1.00	0.75	0.18	0.69	1.20	-	6%	6%	N/A
O.25	1.00	0.25	0.11	0.84	0.86	-	5%	5%	N/A

SECTION	SLOPE (%)	Q_{100} (cfs)	FLOW DEPTH (ft)	TOTAL DEPTH (ft)	VELOCITY (ft/s)	TYPE	SIDE SLOPES		Req'd d50 (in)
O.50	1.00	0.50	0.14	0.84	1.03	-	5%	5%	N/A
O.75	1.00	0.75	0.16	0.84	1.15	-	5%	5%	N/A

****Referenced from the Parcel U Stockpile Study

FINISHED FLOOR ELEVATION

The Clark County Regional Flood Control District requirement for the finish floor elevation (FF) is that it must be 18 inches above the centerline grade of the adjacent street or be elevated to twice the depth of flow up to 18 inches above the water surface elevation (WSE). Additional criteria requires the finished floor elevation to be 6 inches above adjacent on-site flowline high point. The proposed and existing finished floor and garage floor elevations have been elevated to or above at least twice the depth of flow in the adjacent drive aisles.

Referenced *Carriage Hill Study* Cross Section 3 (5 cfs) and Cross Section 4 (6 cfs) are located within Carriage Hill Drive near the site's western driveway entrances at Private Drive A and Private Drive B, respectively. No flows will enter the site from Carriage Hill Drive due to drop inlets located directly upstream of the proposed driveways per the *Carriage Hill Study*. Additionally, due to grading constraints, a hump located at the driveway entrances of the development which will provide a minimum of **0.23 feet of freeboard at Private Drive A** and **0.26 feet of freeboard at Private Drive B**.

Corner lots 3, 4, 8, 37, 50, do not meet the above-mentioned criteria based on elevations of the adjacent side streets, or these lots, the adjacent side street has a top-of-curb elevation at or above the finished floor elevation. A solid grouted knee wall to a minimum of twice the depth of flow above the adjacent flow line elevation will provide the required freeboard protection for these lots. Please refer to the grading plans included in **Appendix F**.

CONCLUSIONS AND RECOMMENDATIONS

The proposed Highline development will not adversely impact the surrounding areas in the 100-year storm events. The development of this project site is in compliance with the *CCFCD Hydrologic Criteria and Design Manual* and Clark County criteria.

1. This project is in compliance with the applicable drainage laws recognized by the State of Nevada.

2. This project is in compliance with the CCRFCD's "*Master Plan Update*", and will **not** conflict with any Master Planned Facilities.

3. This project is in compliance with the CCRFCD's "*Hydrologic Criteria and Drainage Design Manual*", with the exceptions noted in the study.

4. This project lies within FEMA-designated **Shaded Flood Zone X**. Therefore, the project is not currently located in a FEMA-designated Special Flood Hazard Area.

5. The drainage facilities for this project have been designed to control and convey the onsite runoff from the 100-year storm safely through the site to the existing Beltway Channel. In addition, they have been designed based upon generally accepted engineering practices and in accordance with local requirements.

6. The proposed drainage patterns in this report are generally consistent with those presented in the *Master Study*.

7. Homes to be constructed with this project will have adequate freeboard protection from flows conveyed in the adjacent streets.

8. Runoff generated from, or conveyed by, the project will not adversely impact any downstream properties or facilities

REFERENCES

1. Clark County Regional Flood Control District, "*Hydrologic Criteria and Drainage Design Manual*," August 1999, Revise September 2013.

2. Clark County Regional Flood Control District, "*2008/2013 Las Vegas Valley Flood Control Master Plan Update*," September 2008, 2013.

3. U. S. Department of Agriculture Soil Conservation Service, *Soil Survey of Las Vegas Valley Area, Nevada, Part of Clark County*, September 2018, Version 13.

4. U.S. Army Corps of Engineers. HEC-1 Flood Hydrograph Package. Revised June 1998.

5. *Addendum #1 to the Update #1 to the Flood Control Master Plan Update Summerlin West Planning Area*; Prepared by VTN. January 31, 2019

6. *Supplement to Addendum #1 to the Technical Drainage Study for Summerlin West Village 21 Beltway Channel (Far Hills Avenue to Sky Vista Drive);* Prepared by VTN. August 1, 2019

7. *Update #2 to the Technical Drainage Study for Summerlin West Village 21 Carriage Hill Drive (Redpoint Drive to Summerlin Parkway);* Prepared by VTN. April 4, 2015

8. *Addendum #1 to the Technical Drainage Study for Summerlin West Village 21 Street A Carriage Hill to Parcel H*; Prepared by VTN. August 14, 2018

9. *Technical Drainage Study for Summerlin West Village 21 – Parcel U Stockpile*; Prepared by VTN. August 13, 2009

10. *Technical Drainage Study for Summerlin West Village 21 – Parcel I Stockpile*; Prepared by VTN. June 21, 2019

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LIST OF APPENDICES

Appendix A – Documents & Figures

- ULT-1 Ultimate Conditions Basin Map
- FAC-1 Facility Map
- Assessor's Parcel Map
- FIRM Exhibit
- Figure F-22 Flood Control Facilities
- Figure W4 Hydrologic Subareas, Land Use & Soils

Appendix B – Hydraulic Calculations

- Hydraulic Sections – Streets
- Hydraulic Sections – Onsites
- Offsite Swale Calculations
- RipRap Calculation
- Manning's "n" Calculation
- Standard Form 6 Calculations
- Drop Inlet Calculations
- Courtyard PVC Pipe Calculations
- Emergency Overflow Calculation
- D-Load Calculations
- Finished Floor and Garage Finished Floor Elevation Checks

Appendix C – Reference Materials

- *Addendum #1 to the Update #1 to the Flood Control Master Plan Update Summerlin West Planning Area;* Prepared by VTN. January 31, 2019
- *Supplement to Addendum #1 to the Technical Drainage Study for Summerlin West Village 21 Beltway Channel (Far Hills Avenue to Sky Vista Drive);* Prepared by VTN. August 1, 2019
- *Update #2 to the Technical Drainage Study for Summerlin West Village 21 Carriage Hill Drive (Redpoint Drive to Summerlin Parkway);* Prepared by VTN. April 4, 2015
- *Addendum #1 to the Technical Drainage Study for Summerlin West Village 21 Street A Carriage Hill to Parcel H;* Prepared by VTN. August 14, 2018
- *Technical Drainage Study for Summerlin West Village 21 – Parcel U Stockpile*; Prepared by VTN. August 13, 2009
- *Technical Drainage Study for Summerlin West Village 21 – Parcel I Stockpile;* Prepared by VTN. June 21, 2019

Appendix D – Improvement Plans

Technical Drainage Study

for

HIGHLINE
VILLAGE 21– PARCEL I

Date Prepared:
September 2019

Prepared for:
Lennar
9275 W Russell Rd, Suite 400
Las Vegas, NV 89148
702.821.4651

Prepared by:
Kimley-Horn and Associates, Inc.
6671 Las Vegas Boulevard South, Suite 320
Las Vegas, NV 89119
702.862.3600

Kimley»Horn

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Highline - Village 21 - Parcel I Date: September 2019

Location of Development: a) Descriptive (Cross Streets) North/South: Carriage Hill Drive

East/West: Redpoint Drive

b) Section: 26 Township: 20S Range: 59E

c) APN : A portion of 137-26-101-001

Name of Owner: Lennar - Robert Flaxa

Telephone No.: 702.821.4651 Fax No.: E-Mail Address: robert.flaxa@lennar.com

Address: 9275 W Russell Rd, Suite 400 Las Vegas, NV 89148

Contact Person-Name: Rachael R. Dennis, P.E. **Telephone No.:** 702.734.5666

* **E-Mail Address:** rachael.dennis@kimley-horn.com **Fax No.:**

Firm: KIMLEY-HORN

Address: 6671 Las Vegas Boulevard South, Suite 320 Las Vegas, NV 89119

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	GRADING PERMIT	

1. Total Owned Land Area: At Site: +/- 18.69 acres Being Developed/Disturbed: +/- 18.69 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.): Single Family 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: Summerlin West Village 21
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: 42" RCP South end of the project site
8. Briefly describe your proposed schedule for the subject project: ASAP

Engineer's Seal

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

***New Required Field**

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

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

Kimley»Horn

September 30, 2019

Mr. Albert Sung, P.E.
City of Las Vegas Flood Control
333 Rancho Drive
Las Vegas, NV 89106

RE: ***Technical Drainage Study for Highline: Village 21 - Parcel I***

Dear Mr. Sung,

This letter certifies that all items provided on the Technical Drainage Study for Highline: Village 21- Parcel I electronic submittal matches the paper version bound into the study.

With Kimley-Horn, you should expect more and will experience better. Please contact me at (702) 734-5666 or rachael.dennis@kimley-horn.com should you have any questions or concerns.

Sincerely,

Rachael R. Dennis, P.E.

Autumn Lyn Donovan, E.I.T

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name:	**Highline Village 21 -Parcel I**	Map ID:	
Firm Name:	**Kimley-Horn**	Engineer:	**Rachael R. Dennis**
Address:	**6671 Las Vegas Boulevard South, Suite 320**		
City:	**Las Vegas** State: **Nevada**	Zip:	**89119**
Phone No.:	**(702) 862-3600**	Fax No.	
Property Owner:	**Lennar – Roberta Flax**		
Address:	**9275 W Russell Rd, Suite 400**		
City:	**Las Vegas** State: **NV**	Zip:	**89148**

Reviewed By:	**Date Received:**	**Date Accepted for Review:**

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

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

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

I. GENERAL REQUIREMENT

YES	NO	N/A	
☒	☐	☐	Design Manual **Standard Form 1** with the Engineer's seal and signature.
☒	☐	☐	Design Manual **Standard Form 4.**
☒	☐	☐	2 copies of the 24" x 36" **Drainage Plan.**
☐	☐	☒	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

YES	NO	N/A	
☒	☐	☐	A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
☒	☐	☐	A copy of the current CCRCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.
☒	☐	☐	Off-site drainage basin maps for existing, interim, and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.

II. MAPS AND EXHIBITS (CONTINUED)

☒	☐	☐	Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

YES	NO	N/A	
☒	☐	☐	Sheet size: 24"x36" sealed by a registered engineer in the State of Nevada.
☒	☐	☐	Minimum scale: 1"=60'
☒	☐	☐	Project name.
☒	☐	☐	Vicinity Map with local and major cross streets.
☒	☐	☐	Revision box.
☒	☐	☐	North arrow and bar scale.
☒	☐	☐	Engineer's/consultant's address and phone number.
☒	☐	☐	Elevation datum and benchmark.
☒	☐	☐	Legend for symbols and abbreviations.
☒	☐	☐	Cut/Fill scarps, where applicable.
☒	☐	☐	Street names, grades, widths.
☒	☐	☐	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
☒	☐	☐	Existing contours encompassing the site and 100-feet beyond with spot elevations for important locations, where appropriate.
☒	☐	☐	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
☒	☐	☐	Proposed typical street sections.
☒	☐	☐	Streets with offset crowns.
☒	☐	☐	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
☒	☐	☐	Property lines.
☒	☐	☐	Right-of-way lines and widths, existing and proposed.
☒	☐	☐	Existing improvements and their elevations.
☒	☐	☐	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year peak flows at basin concentration points.
☒	☐	☐	Concentration points and drainage flow directions with Q_{100} and V_{100} and D_{100} in streets.
☒	☐	☐	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
☒	☐	☐	Location and cross-section of street capacity calculations.
☒	☐	☐	Cross-sectional detail for channels, including cutoff wall locations.

III. DRAINAGE PLAN (CONTINUED)

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

IV. HYDROLOGIC ANALYSIS

YES	NO	N/A	
☒	☐	☐	Appropriate soil information and Soils Map for existing and future conditions with sub-basins and property delineated.
☒	☐	☐	Input and Output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	☐	Input and Output information for proposed conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	☐	Use of correct precipitation values in and around the McCarran Airport rainfall area.
☒	☐	☐	A discussion in the text of the hydrologic analysis justifying sub-basin boundaries and cutoffs, supporting assumptions, and calculations.
☒	☐	☐	A summary table of stormwater flows showing basin area Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.

IV. HYDROLOGIC ANALYSIS (CONTINUED)

☒	☐	☐	Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
☒	☐	☐	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
☐	☐	☒	Calculation for impervious area for parking lots and LIDs (if required)

V. HYDRAULIC ANALYSIS

YES	NO	N/A	
☐	☐	☒	Flow split calculations and supporting documentation or reference for the method of flow calculation used.
☒	☐	☐	Normal depth street flow calculations and cross-section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. Q_{100} d x v ≤ 8. Q_{10} d x v ≤ 6 and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the **Grading Plan**.
☒	☐	☐	A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
☒	☐	☐	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
☒	☐	☐	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
☒	☐	☐	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Building adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.
☐	☐	☒	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
☒	☐	☐	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
☒	☐	☐	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drainpipes in public rights-of-way, including headwater pool inundation.
☒	☐	☐	The mitigation of nuisance water, both during construction and in the fully developed condition must be addressed.
☐	☐	☒	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required)

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

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

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

II. GRADING PLAN INFORMATION		
Yes	No	
X		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.)
X		This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
X		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

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

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

Kimley»Horn

Technical Drainage Study

for

HIGHLINE
VILLAGE 21– PARCEL I

Date Prepared:
September 2019

Prepared for:
Lennar
9275 W Russell Rd, Suite 400
Las Vegas, NV 89148
702.821.4651

Prepared by:
Kimley-Horn and Associates, Inc.
6671 Las Vegas Boulevard South, Suite 320
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702.862.3600

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September 2019
KH Project #092935004

Kimley»Horn

Table of Contents

INTRODUCTION 2

LOCATION AND DEVELOPMENT DESCRIPTION 2

PREVIOUS DRAINAGE STUDIES 4

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) MASTER PLAN FACILITIES 5

FEMA FLOOD HAZARD DESIGNATION 6

HYDROLOGIC METHODOLOGY 6

HYDROLOGY 6

EXISTING CONDITIONS 6

ULTIMATE CONDITIONS 7

HYDRAULIC CALCULATIONS 8

- STREETS 8
- STORM DRAIN FACILITIES AND PROTECTION 10
- pROPOSED DRAINAGE SWALES 12

FINISHED FLOOR ELEVATION 13

CONCLUSIONS AND RECOMMENDATIONS 14

REFERENCES 15

INTRODUCTION

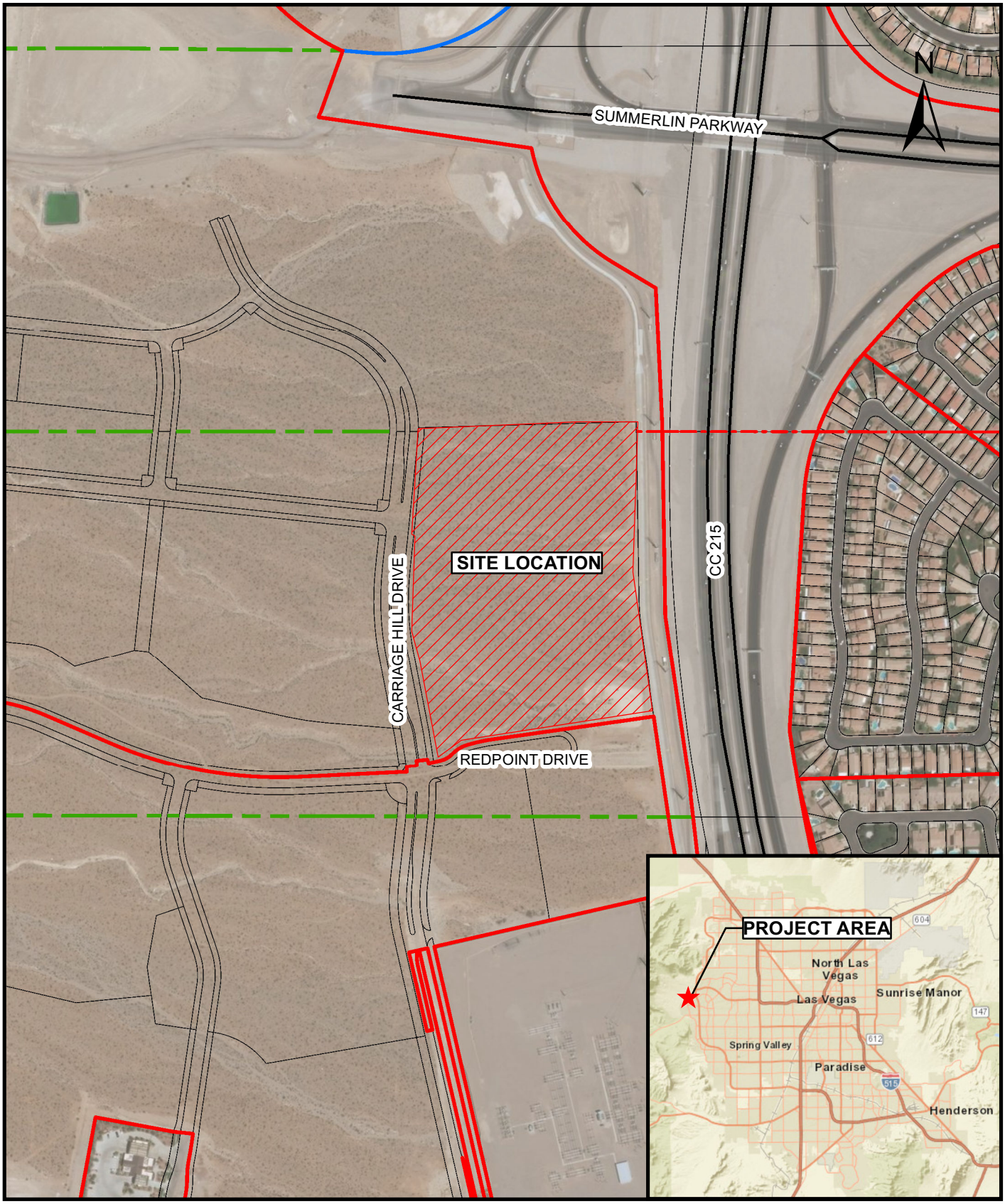
Lennar Homes is proposing to develop **Highline Village 21 – Parcel I** (hereinafter referred to as Highline) as a residential subdivision located within the Summerlin West Master Planned Community. The purpose of this report is to accompany the grading plans and to provide detailed hydrologic and hydraulic analyses for the proposed residential site. The following tasks were performed in the preparation of this report:

1. Identify previous drainage studies for the project site and surrounding areas.
2. Identify the FEMA floodplain designation for the project site.
3. Identify existing and proposed regional drainage facilities adjacent to the site.
4. Estimate runoff generated for the peak 100-year return period storms for existing, proposed and ultimate conditions.
5. Verify proposed finished floor elevations meet CLV Criteria.
6. Recommend drainage features to protect the project from storm runoff.

LOCATION AND DEVELOPMENT DESCRIPTION

Highline is located within Section 26, Township 20 South, Range 59 East, M.D.M., in Clark County, Nevada. The proposed project will consist of **249 single-family attached residential units** within **±18.69 acres** of **APN 137-12-101-007**. A copy of the *Assessor's Parcel Map* is included in **Appendix A**. The proposed interior streets with a north-south alignment will consist of 35-foot wide private drive aisles with offset crown sections, roll-type curb and gutter, and a 4-foot sidewalk on one side. The proposed interior streets with an east-west alignment will consist of 35-foot wide private drive aisles with normal crown sections, roll-type curb and gutter, and a 4-foot sidewalk on one side. Drive K is the southernmost drive aisle, and will consist of a normal crown section, L-type curb and gutter, and a 4-foot sidewalk on one side.

Currently, the site is undeveloped with sparse vegetation. Highline is bordered by Carriage Hill Drive to the west, Redpoint Drive to the south, the CC 215 Beltway Channel to the east, and the undeveloped Parcel U to the north. Carriage Hill Drive and Redpoint Drive will be constructed prior to the construction of this site. Therefore, the flood protection provided by the adjacent roadway improvements has been assumed to be in place. Please refer to **Figure 1** for the location of the project.



VICINITY MAP
HIGHLINE
VILLAGE 21 - PARCEL I

Date: September 2019

Kimley»Horn

PREVIOUS DRAINAGE STUDIES

Previous hydrology studies that were utilized in the preparation of this report:

1. *Update #1 to the Flood Control Master Plan Update – Summerlin West Planning Area* (Master Study, April 2019, CLV DS-4926)

    a. A comprehensive master drainage study for Summerlin West which establishes ultimate conditions flowrates for the Village 21 parcels. The *Master Study* established a developed condition 100-year flowrate of **61 cfs** for **Parcel I**.

2. *Technical Drainage Study for Summerlin West Village 21 – Beltway Channel (Far Hills Avenue to Sky Vista Drive),* (Beltway Channel Study, August 2019, CLV DS-5139).

    a. Establishes storm drain lateral connections to the existing beltway channel located directly east of the proposed Highline improvements. The *Beltway Channel Study* proposed extension of the existing walls along the Western Beltway Channel to contain the increase of ultimate condition runoff from the *Master Study*. Storm drain laterals will collect and convey developed condition offsite runoff from Parcels U and I. A 36" RCP storm drain lateral at the southeast corner of Parcel U was sized to collect and convey 73 cfs into the existing beltway channel. A **42" RCP lateral** at the southeast corner of Parcel I was sized to collect and convey **61 cfs** into the existing beltway channel. Additionally, the *Beltway Channel Study* established the ultimate conditions water surface elevations (WSE) in the adjacent channel. A **starting WSE of 3219.91'** has been referenced at the 42" RCP lateral for design of the Highline storm drain.

3. *Update #2 to the Technical Drainage Study for Summerlin West Village 21 – Carriage Hill Drive (Redpoint Drive to Summerlin Parkway),* (Carriage Hill Study, April 2019, CLV DS-5064)

    a. The *Carriage Hill Study* includes full street roadway improvements west of Highline between Redpoint Drive and Summerlin Parkway Eastbound and includes construction of the Clark County Regional Flood Control Facility **(CCRFCD) APCH 0031 60" RCP** storm drain system in Carriage Hill Drive. Carriage Hill Drive will convey a maximum 100-year surface flowrate of **6 cfs** with a flow depth of **0.33'** adjacent to the Highline development. Storm Drain infrastructure within Carriage Hill Drive will collect and convey offsite flows west and south of Highline.

4. *Technical Drainage Study for Summerlin West Village 21 – Street A (Carriage Hill to Parcel H),* (Redpoint Study, August 2018, CLV DS-5007).

    a. The *Redpoint Study* includes full street roadway improvements for Redpoint Drive (formally named "Street A") south of Highline. Redpoint Drive will convey a total 100-year flowrate of **5 cfs** east within a 30-foot wide Public Drainage Easement located at

the outlet of the Redpoint Drive cul-de-sac. Flows from the cul-de-sac will be conveyed east into the existing Beltway Channel via a **12-foot wide unlined v-ditch with 3:1 side slopes**.

5. *Technical Drainage Study for Summerlin West Village 21 – Parcel U Stockpile,* (Parcel U Stockpile Study, August 2019, DS-5172)
    a. The *Parcel U Stockpile Study* includes construction of a stockpile on ±12.3 acres of Parcel U and establishes the offsite existing condition north of Highline. A total 100-year flowrate of **4 cfs** from **Subbasins OFF2** (2 cfs) and **OFF3** (2 cfs) will impact the northern boundary of Highline.

6. *The Technical Drainage Study for Summerlin West Village 21 – Parcel I Stockpile,* (Parcel I Stockpile Study, June 2019, CLV DS-5137)

    a. The *Parcel I Stockpile Study* includes construction of a stockpile on ±7.2 acres of Parcel I and **establishes the existing condition** for Highline.

Kimley-Horn has reviewed the reference studies listed and agrees with the information included therein. The information referenced is for determining the existing and future development patterns and quantities of flow adjacent to the proposed project site. Flows referenced are indicated throughout this report and are accepted by Kimley-Horn for this study. Pertinent reference material is included in **Appendix C**.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) MASTER PLAN FACILITIES

"*The Las Vegas Valley Flood Control Master Plan Update*", **Figure F-22**, dated December 2018, as prepared by the Clark County Regional Flood Control District (CCRFCD) illustrates the existing and proposed master planned facilities in the area (**See Appendix A**). As shown on the figure, the project site is located adjacent to the existing **CCRFCD Angel Park - Beltway Branch (APBE) Facility 0122** located east of the project site. CCRFCD Facility APBE 0122 consists of a concrete-lined trapezoidal channel with a 10-foot wide bottom width and 2:1 side slopes and will collect and convey the ultimate condition 100-year storm event of **913 cfs** (referenced from the *Beltway Channel Study*).

Additionally, the project site is located adjacent to the proposed **CCRFCD Angel Park – Carriage Hill Branch (APCH) Facility 0031** located west of the project site. The proposed CCRFCD Facility APCH 0031 is located west of the proposed site within the future Carriage Hills Drive and ranges in size from a 30" RCP to a 60" RCP. CCRFCD Facility APCH 0031 will collect and convey a 100-year storm event of **222 cfs** (referenced from the *Carriage Hill Study*).

FEMA FLOOD HAZARD DESIGNATION

The Special Flood Hazard Areas (SFHA) for both the unincorporated and the incorporated portions of Clark County, Nevada, are outlined in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps. This subject site is located on FEMA Flood Insurance Rate Map (FIRM) Community Panel No. **32003C 22150E**, revised September 27, 2002. As shown on the FEMA FIRM Exhibit (see **Appendix A**), the subject site is located within a FEMA-designated **Zone X**. Therefore, this project is not currently located in a FEMA-designated SFHA. Areas described as Zone X are areas determined to be outside the 0.2% annual chance (500-year) floodplain.

HYDROLOGIC METHODOLOGY

The hydrologic model and design of this site development are in compliance with local requirements, including Clark County (CC), the CCRFCD's "*Hydrologic Criteria and Drainage Design Manual*", and the CCRFCD's "*Flood Control Master Plan Update*".

HYDROLOGY

Existing and ultimate conditions hydrology has been referenced from several studies as discussed earlier in the "*Previous Drainage Studies*" section of this report. Ultimate conditions flows for the proposed site have been referenced and prorated from the *Master Study*. The referenced *Master Study* **Figure A.6.6 - Village 21 Drainage Basin Map** in **Appendix C** depicts the subbasins and drainage patterns used in the ultimate conditions hydrologic analysis for the site and quantifies a developed condition flowrate of **61 cfs** for Parcel I. Referenced hydrologic calculations from the *Master Study* have been included in **Appendix C**.

EXISTING CONDITIONS

Offsite improvements will be constructed prior to or concurrently with the development of Highline. Therefore, it is assumed for the purposes of this report, that all offsite facilities and roadways are fully-developed in the existing condition with the Parcel U Stockpile constructed to the north. Offsite flows west of the site are intercepted by the Carriage Hill Drive improvements. Flows the north of the project site have been referenced from the *Parcel U Stockpile Study* **Figure 6 - Proposed Condition Basin Map** in **Appendix C**. A total offsite flowrate of 4 cfs generated by referenced Subbasins OFF2 (2 cfs) and OFF3 (2 cfs) will impact the proposed northern boundary of Highline to be ultimately discharged east as sheet flow into the existing Beltway Channel.

The drainage impacts of the development of Highline has been addressed in the *Master Study*. The *Master Study* has determined that the development of Parcel I will not adversely impact existing downstream facilities. Therefore, a site-specific existing condition hydrologic analysis is not necessary for this study.

ULTIMATE CONDITIONS

The ultimate conditions drainage patterns assume the site and offsite parcels as fully-developed. The project-specific ultimate conditions hydrology references the *Master Study* **Basin I**. **Figure ULT-1 – Ultimate Condition Basin Map**, depicts the referenced subbasins and drainage patterns used in the ultimate conditions for this project. A copy of **Figure ULT-1** is included in **Appendix A**. The subbasins and flow patterns used to determine the onsite flowrates impacting the proposed improvements were prorated. A unit flowrate (cfs/acre) for the onsite subbasin was calculated by dividing the total flowrate of the subbasin by the overall subbasin area. The total flowrate generated by the areas shown on **Figure ULT-1** is approximated by multiplying the calculated unit flow rate (cfs/acre) by the delineated portion of tributary area (acres). Prorate calculations for the onsite subbasins have been included on **Figure ULT-1**. **Table 1** summarizes the referenced *Master Study* HEC-1 results for ultimate conditions and the prorated ultimate conditions flowrates. Referenced hydrologic calculations have been included in **Appendix C**.

Table 1: Ultimate Condition Prorated Flow Summary

ULTIMATE CONDITION PRORATED FLOW SUMMARY			
Ultimate Basins			
SUBBASIN	**Q_{100} (cfs)**	**AREA (ac)**	**CFS/ACRE**
I*	61	18.69	3.26
Ultimate Onsite Prorated Basins			
SUBBASIN	**Q_{100} (cfs)**	**AREA (ac)**	**CFS/ACRE**
I-1	5	1.56	3.26
I-2A	2	0.56	3.26
I-2B	1	0.23	3.26
I-2C	1	0.25	3.26
I-3	1.5	0.53	3.26
I-4A	3	0.86	3.26
I-4B	1	0.26	3.26
I-4C	1	0.40	3.26
I-5A	5	1.41	3.26
I-5B	1	0.22	3.26
I-6	3	0.88	3.26
I-7A	2.5	0.78	3.26
I-7B	1.5	0.45	3.26
I-7C	1	0.42	3.26
I-8	2	0.65	3.26
I-9A	1	0.39	3.26
I-9B	1	0.25	3.26
I-9C	1	0.22	3.26
I-10	1	0.35	3.26

ULTIMATE CONDITION PRORATED FLOW SUMMARY			
Ultimate Basins			
SUBBASIN	**Q_{100} (cfs)**	**AREA (ac)**	**CFS/ACRE**
I*	61	18.69	3.26
Ultimate Onsite Prorated Basins			
SUBBASIN	**Q_{100} (cfs)**	**AREA (ac)**	**CFS/ACRE**
I-11A	4	1.34	3.26
I-11B	1	0.36	3.26
I-12	3	1.02	3.26
I-13A	3	0.93	3.26
I-13B	0	0.11	3.26
I-13C	0	0.12	3.26
I-14	1	0.26	3.26
I-15A	4	1.15	3.26
I-15B	1.5	0.51	3.26
I-16A	4	1.11	3.26
I-16B	4	1.11	3.26
TOTAL	**61**	**18.69**	**NA**

*Referenced from the *Master Study*

HYDRAULIC CALCULATIONS

STREETS

The resulting street flow data based on the flows generated during ultimate conditions has been presented in **Tables 2** and **3**. **Figure ULT-1** in **Appendix A** shows the locations of the cross sections corresponding to the calculations included in **Tables 2** and **3**. Hydraulic calculations have been included in **Appendix B**. The onsite normal depth sections and flow rates have been calculated from their respective tributary subbasins. Private drive aisles (35') with a north-south alignment have been modeled as half street sections due to the proposed offset crown. The west half of the roadway (9.5') has a 1% cross slope and the east half of the roadway (25.5') has a 4% cross slope with Roll-Type curb and gutter on both sides, and a 4-foot wide sidewalk on one side. Private drive aisles (35') with an east-west alignment have been modeled as full street sections with a normal crown and 2% cross slopes with Roll Type-Curb and gutter on both sides and a 4-foot wide sidewalk on one side. Drive K (35') is the southernmost drive aisle, and will consist of a normal crown section, L-type curb and gutter, and a 4-foot sidewalk on one side. Drive K has been modeled as half street sections.

Cross Sections for the 9.5' half street show the west half of the proposed drive aisle will convey a total flowrate of **0.50 cfs** before overtopping the crown and combining with the flows on the east half of the roadway. Proposed storm drain infrastructure and drop inlets have been provided to maintain a maximum flow depth of **0.38'** (top of curb) in the proposed private drive aisles.

The offsite flow rates and normal depth sections for the adjacent roadways have been referenced from *the Carriage Hill* and *Redpoint Studies*. Offsite hydraulic sections adjacent to the site have been included in **Table 4**. Pertinent reference material has been included in **Appendix C**.

Table 2: Full Street Ultimate Condition Hydraulic Sections

STREET SECTION	CHANNEL SLOPE	Q_{100}	FLOW DEPTH	VELOCITY	D*V
	%	(cfs)	(ft)	(ft/s)	ft^2/s
I-1B	2.90	5.0	0.26	3.18	0.83
I-3	5.67	2.5	0.20	3.63	0.73
I-13A N	3.90	3.0	0.30	3.79	1.14
I-13A S	3.90	0.5	0.16	3.52	0.56
I-14	1.00	1.0	0.27	1.76	0.48
I-16	4.90	8.5	0.38	5.23	1.99
I-1B	2.90	5.0	0.26	3.18	0.83

Table 3: Half Street Ultimate Condition Flow Summary

STREET SECTION	CHANNEL SLOPE	9.5' HALF STREET SECTIONS (WEST)				25.5' HALF STREET SECTIONS (EAST)			
		Q_{100}	FLOW DEPTH	VELOCITY	D*V	Q_{100}	FLOW DEPTH	VELOCITY	D*V
	%	(cfs)	(ft)	(ft/s)	ft^2/s	(cfs)	(ft)	(ft/s)	ft^2/s
I-1A	1.90	0.5	0.18	1.68	0.30	-	-	-	-
I-2	0.60	0.5	0.20	1.03	0.21	1.5	0.31	1.79	0.55
I-4A	1.33	0.5	0.18	1.44	0.26	4.0	0.37	3.06	1.13
I-5A	1.36	0.5	0.18	1.46	0.26	4.5	0.38	3.17	1.20
I-6	1.90	0.5	0.18	1.68	0.30	2.5	0.30	3.15	0.95
I-7A	1.63	0.5	0.18	1.57	0.28	2.5	0.31	2.96	0.92
I-8	0.50	0.5	0.20	0.98	0.20	1.5	0.31	1.68	0.52
I-9A	0.50	0.5	0.20	0.98	0.20	1.0	0.28	1.53	0.43
I-10	0.50	0.5	0.20	0.98	0.20	0.5	0.22	1.32	0.29
I-11A	1.78	0.5	0.18	1.63	0.29	3.5	0.34	3.33	1.13
I-11B	1.78	0.5	0.18	1.63	0.29	1.0	0.22	2.52	0.55
I-12	1.92	0.5	0.18	1.68	0.30	3.0	0.32	3.29	1.05
I-15A	1.89	0.5	0.18	1.67	0.30	3.5	0.33	3.40	1.12
I-15B	1.13	0.5	0.19	1.34	0.25	1.0	0.24	2.11	0.51
I-16A	1.13	0.5	0.19	1.34	0.25	4.0	0.38	2.88	1.09
I-16B	1.36	0.5	0.18	1.46	0.26	3.5	0.35	3.00	1.05

Table 4: Offsite Ultimate Condition Hydraulic Sections

SECTION NAME	CHANNEL SLOPE %	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V
7850****	0.6	852	3.38	15.05	50.84
C.6***	3.3	5	0.29	3.55	1.03
FM2 MAX***	1.00	5	0.75	2.98	2.24
FM2 MIN***	0.88	5	0.77	2.84	2.19
3**	1.65	5	0.32	2.66	0.85
4**	1.65	6	0.33	2.77	0.91
5**	1.66	4	0.30	2.55	0.77

** Referenced from the Carriage Hill Study
*** Referenced from the Redpoint Study
****Referenced from the Beltway Study

Based on the calculated flow characteristics, the Manual criteria for depth (D) and velocity times depth (V*D) during the 100-year storm event will be met.

STORM DRAIN FACILITIES AND PROTECTION

The proposed flood control facilities for the site include swales, storm drain, and drop inlets. All existing and proposed flood control facilities have been shown on the **Figure FAC-1** and the plans included in **Appendix D**. All proposed facilities have been sized to convey the ultimate conditions flowrates. Proposed drop inlets have been sized to collect flows and discharge them into proposed mainline storm drain systems. The proposed storm drain system will connect to the existing 42" RCP at the southeast corner of the project site per the **Beltway Study.** Standard Form 6 models for the proposed mainline and laterals have been included in **Appendix B**. The **starting HGL of 3219.91'** has been referenced from the *Beltway Study***.** Pertinent reference material has been included in **Appendix C**. Normal depth calculations for the proposed 6-inch and 8-inch PVC storm drain within the back and side courtyards have been included in **Appendix B.**

The proposed drop inlet calculations are summarized in Table 6. All drop inlet calculations contain a minimum 50 percent clogging factor. Drop inlet calculations are included in **Appendix B**.

Table 5: Full Street Ultimate Condition Hydraulic Sections

DROP INLET ID	Q_{100}	SLOPE	FLOW DEPTH	Q_{INT}	Q_{BYP}	DI TYPE
	(cfs)	(%)	(ft)	(cfs)	(cfs)	
I-1A	2.50	2.90	0.27	2.15	0.35	NEENAH R-3501-R
I-1B	0.35	2.90	0.13	0.35	0.00	NEENAH R-3501-R
I-2A	0.50	0.60	0.21	0.49	0.01	NEENAH R-3501-R
I-2A1	1.50	0.60	0.30	1.29	0.21	NEENAH R-3501-R
I-2A2	0.21	0.60	0.15	0.21	0.00	NEENAH R-3501-R
I-3	1.25	5.67	0.19	1.25	0.00	NEENAH R-3501-R
I-4A	0.50	1.33	0.18	0.50	0.00	NEENAH R-3501-R
I-4A1	2.50	1.33	0.32	2.08	0.42	NEENAH R-3501-R
I-4A2	0.42	1.33	0.17	0.42	0.00	NEENAH R-3501-R
I-5A	0.50	1.36	0.18	0.50	0.00	NEENAH R-3501-R
I-5A1	4.50	1.36	0.38	3.24	1.26	NEENAH R-3501-R
I-5A2	1.26	1.36	0.25	1.19	0.07	NEENAH R-3501-R
I-6A	2.50	1.90	0.30	2.15	0.35	NEENAH R-3501-R
I-6B	0.35	1.90	0.15	0.35	0.00	NEENAH R-3501-R
I-7A	0.50	1.63	0.17	0.50	0.00	NEENAH R-3501-R
I-7A1	2.50	1.63	0.31	2.12	0.38	NEENAH R-3501-R
I-7A2	0.38	1.63	0.15	0.38	0.00	NEENAH R-3501-R
I-8A	1.50	0.50	0.31	1.27	0.23	NEENAH R-3501-R
I-8B	0.23	0.50	0.16	0.23	0.00	NEENAH R-3501-R
I-9A	0.50	0.50	0.21	0.49	0.01	NEENAH R-3501-R
I-9A1	1.00	0.50	0.27	0.91	0.09	NEENAH R-3501-R
I-9A2	0.09	0.50	0.11	0.09	0.00	NEENAH R-3501-R
I-10 (SUMP)	1.50	N/A	0.20	1.50	0.00	5' TYPE DM2
I-11A1	3.50	1.78	0.34	2.77	0.73	NEENAH R-3501-R
I-11A2	0.73	1.78	0.19	0.73	0.00	NEENAH R-3501-R
I-11B1	1.00	1.78	0.22	0.98	0.02	NEENAH R-3501-R
I-11B2	0.02	1.78	0.05	0.02	0.00	NEENAH R-3501-R
I-12A	3.00	1.92	0.32	2.48	0.52	NEENAH R-3501-R
I-12B	0.52	1.92	0.17	0.52	0.00	NEENAH R-3501-R
I-13A N	3.00	3.90	0.25	2.94	0.06	10' TYPE DM2
I-13A S	0.50	3.90	0.15	0.50	0.00	5' TYPE DM2
I-15A	0.50	1.89	0.17	0.50	0.00	NEENAH R-3501-R
I-15A1	3.50	1.89	0.33	2.79	0.71	NEENAH R-3501-R
I-15A2	0.71	1.89	0.19	0.71	0.00	NEENAH R-3501-R
I-15B1	1.00	1.13	0.24	0.96	0.04	NEENAH R-3501-R
I-15B2	0.04	1.13	0.07	0.04	0.00	NEENAH R-3501-R

In the unlikely event the drop inlets at the existing/proposed low points become completely clogged, emergency overflow paths have been provided to protect the adjacent finished floors. Normal depth and weir calculations for the emergency overflow paths have been included in **Appendix B**. Emergency overflow paths have been provided at the following locations:

1. Cross Section I-14 – The emergency overflow path for the drop inlet, located at the low point in the east end of Drive Aisle K, is provided south of Building 56. Emergency overflows at this location will be discharged east into the existing Beltway Channel. Emergency overflow normal depth and weir calculations have been included in **Appendix B**. Please note that this is an emergency overflow condition only and the proposed systems are designed to intercept and convey all onsite nuisance and storm flows up to a 100-year storm event.

2. Typical Hudson Courtyard (Plan Detail G/C9.2) – The emergency overflow path for the Hudson Courtyard area drains located in the common lot area at the back of proposed Buildings 10, 25, 33-36, and 44-61 is provided between the buildings. Emergency overflows at these locations will be discharged to the adjacent street. Two drain blocks between the lots for been provided for the emergency overflow path. Please note that this is an emergency overflow condition only and the proposed systems are designed to intercept and convey all onsite nuisance and storm flows up to a 100-year storm event.

PROPOSED DRAINAGE SWALES

Proposed onsite swales have been provided to direct flows away from onsite structures and ultimately into proposed or existing storm drain facilities. Facility names for the proposed swales in the calculations correspond with the tributary subbasin/Cross Section Identifier. Information for the swales has been included on **Figure ULT-1** and summarized in **Table 7**. Normal depth calculations have been included in **Appendix B**.

Table 7: Drainage Swale Calculations

SECTION	SLOPE (%)	Q_{100} (cfs)	FLOW DEPTH (ft)	TOTAL DEPTH (ft)	VELOCITY (ft/s)	TYPE	SIDE SLOPES		Req'd d50 (in)
OFF3 (MIN)	3.37	4*****	0.41	1	3.37	V	10:1	3:1	N/A
OFF3 (MAX)	25.00	4*****	0.34	1	5.17	V	10:1	3:1	24"
H.25 West	1.00	0.25	0.11	0.68	1.05	-	5%	5%	N/A
H.50 West	1.00	0.50	0.13	0.68	1.25	-	5%	5%	N/A
H.75 West	1.00	0.75	0.17	0.68	1.19	-	5%	5%	N/A
H.25 East	1.00	0.25	0.11	0.69	1.06	-	6%	6%	N/A
H.50 East	1.00	0.50	0.14	0.69	1.31	-	6%	6%	N/A
H.75 East	1.00	0.75	0.18	0.69	1.20	-	6%	6%	N/A
O.25	1.00	0.25	0.11	0.84	0.86	-	5%	5%	N/A

SECTION	SLOPE (%)	Q_{100} (cfs)	FLOW DEPTH (ft)	TOTAL DEPTH (ft)	VELOCITY (ft/s)	TYPE	SIDE SLOPES		Req'd d50 (in)
O.50	1.00	0.50	0.14	0.84	1.03	-	5%	5%	N/A
O.75	1.00	0.75	0.16	0.84	1.15	-	5%	5%	N/A

****Referenced from the Parcel U Stockpile Study

FINISHED FLOOR ELEVATION

The Clark County Regional Flood Control District requirement for the finish floor elevation (FF) is that it must be 18 inches above the centerline grade of the adjacent street or be elevated to twice the depth of flow up to 18 inches above the water surface elevation (WSE). Additional criteria requires the finished floor elevation to be 6 inches above adjacent on-site flowline high point. The proposed and existing finished floor and garage floor elevations have been elevated to or above at least twice the depth of flow in the adjacent drive aisles.

Referenced *Carriage Hill Study* Cross Section 3 (5 cfs) and Cross Section 4 (6 cfs) are located within Carriage Hill Drive near the site's western driveway entrances at Private Drive A and Private Drive B, respectively. No flows will enter the site from Carriage Hill Drive due to drop inlets located directly upstream of the proposed driveways per the *Carriage Hill Study*. Additionally, due to grading constraints, a hump located at the driveway entrances of the development which will provide a minimum of **0.23 feet of freeboard at Private Drive A** and **0.26 feet of freeboard at Private Drive B**.

Corner lots 3, 4, 8, 37, 50, do not meet the above-mentioned criteria based on elevations of the adjacent side streets, or these lots, the adjacent side street has a top-of-curb elevation at or above the finished floor elevation. A solid grouted knee wall to a minimum of twice the depth of flow above the adjacent flow line elevation will provide the required freeboard protection for these lots. Please refer to the grading plans included in **Appendix F**.

CONCLUSIONS AND RECOMMENDATIONS

The proposed Highline development will not adversely impact the surrounding areas in the 100-year storm events. The development of this project site is in compliance with the *CCFCD Hydrologic Criteria and Design Manual* and Clark County criteria.

1. This project is in compliance with the applicable drainage laws recognized by the State of Nevada.

2. This project is in compliance with the CCRFCD's "*Master Plan Update*", and will **not** conflict with any Master Planned Facilities.

3. This project is in compliance with the CCRFCD's "*Hydrologic Criteria and Drainage Design Manual*", with the exceptions noted in the study.

4. This project lies within FEMA-designated **Shaded Flood Zone X**. Therefore, the project is not currently located in a FEMA-designated Special Flood Hazard Area.

5. The drainage facilities for this project have been designed to control and convey the onsite runoff from the 100-year storm safely through the site to the existing Beltway Channel. In addition, they have been designed based upon generally accepted engineering practices and in accordance with local requirements.

6. The proposed drainage patterns in this report are generally consistent with those presented in the *Master Study*.

7. Homes to be constructed with this project will have adequate freeboard protection from flows conveyed in the adjacent streets.

8. Runoff generated from, or conveyed by, the project will not adversely impact any downstream properties or facilities

REFERENCES

1. Clark County Regional Flood Control District, "*Hydrologic Criteria and Drainage Design Manual*," August 1999, Revise September 2013.

2. Clark County Regional Flood Control District, "*2008/2013 Las Vegas Valley Flood Control Master Plan Update*," September 2008, 2013.

3. U. S. Department of Agriculture Soil Conservation Service, *Soil Survey of Las Vegas Valley Area, Nevada, Part of Clark County*, September 2018, Version 13.

4. U.S. Army Corps of Engineers. HEC-1 Flood Hydrograph Package. Revised June 1998.

5. *Addendum #1 to the Update #1 to the Flood Control Master Plan Update Summerlin West Planning Area*; Prepared by VTN. January 31, 2019

6. *Supplement to Addendum #1 to the Technical Drainage Study for Summerlin West Village 21 Beltway Channel (Far Hills Avenue to Sky Vista Drive);* Prepared by VTN. August 1, 2019

7. *Update #2 to the Technical Drainage Study for Summerlin West Village 21 Carriage Hill Drive (Redpoint Drive to Summerlin Parkway);* Prepared by VTN. April 4, 2015

8. *Addendum #1 to the Technical Drainage Study for Summerlin West Village 21 Street A Carriage Hill to Parcel H*; Prepared by VTN. August 14, 2018

9. *Technical Drainage Study for Summerlin West Village 21 – Parcel U Stockpile*; Prepared by VTN. August 13, 2009

10. *Technical Drainage Study for Summerlin West Village 21 – Parcel I Stockpile*; Prepared by VTN. June 21, 2019

Kimley»Horn

LIST OF APPENDICES

Appendix A – Documents & Figures

- ULT-1 Ultimate Conditions Basin Map
- FAC-1 Facility Map
- Assessor's Parcel Map
- FIRM Exhibit
- Figure F-22 Flood Control Facilities
- Figure W4 Hydrologic Subareas, Land Use & Soils

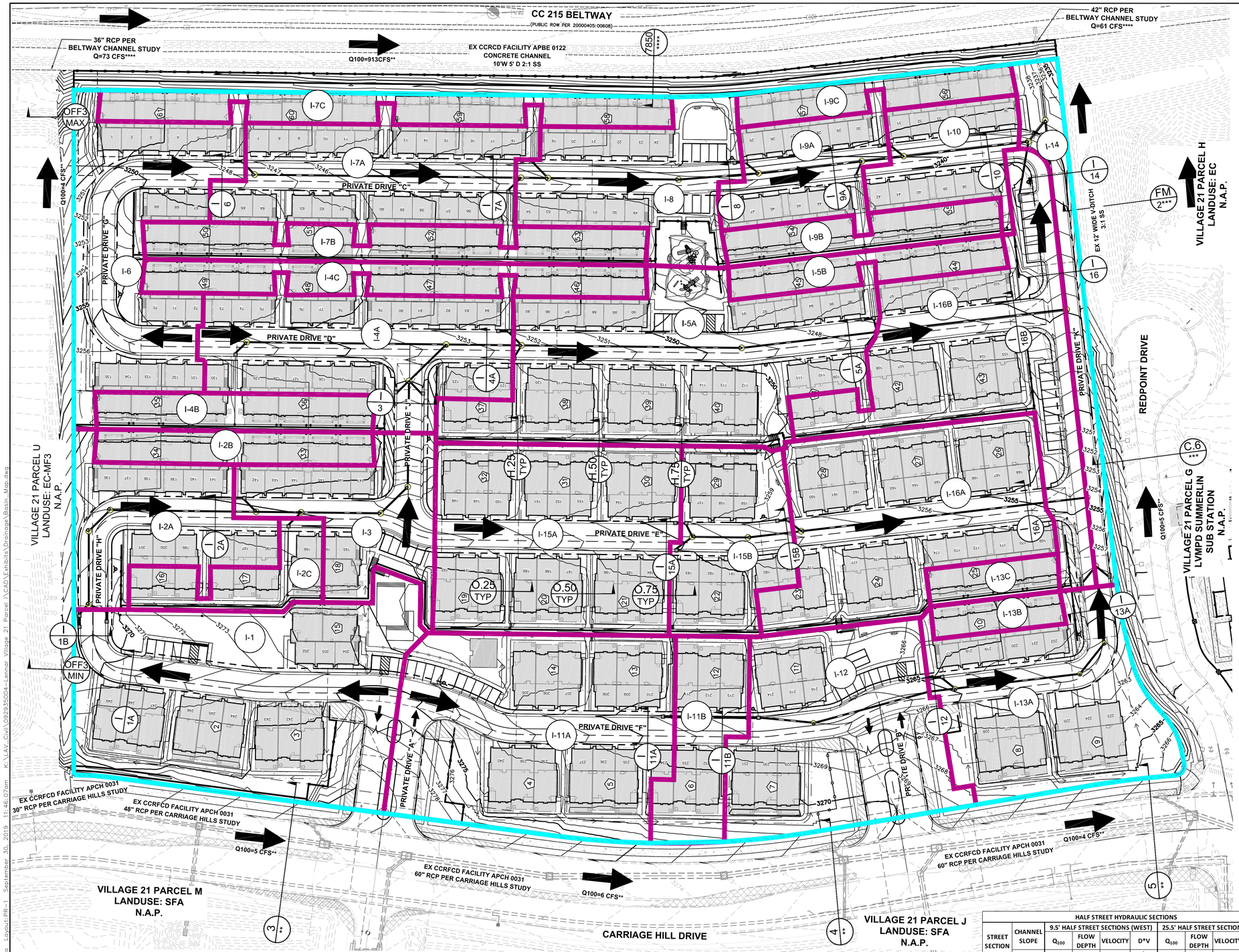
Appendix B – Hydraulic Calculations

- Hydraulic Sections – Streets
- Hydraulic Sections – Onsites
- Offsite Swale Calculations
- RipRap Calculation
- Manning's "n" Calculation
- Standard Form 6 Calculations
- Drop Inlet Calculations
- Courtyard PVC Pipe Calculations
- Emergency Overflow Calculation
- D-Load Calculations
- Finished Floor and Garage Finished Floor Elevation Checks

Appendix C – Reference Materials

- *Addendum #1 to the Update #1 to the Flood Control Master Plan Update Summerlin West Planning Area;* Prepared by VTN. January 31, 2019
- *Supplement to Addendum #1 to the Technical Drainage Study for Summerlin West Village 21 Beltway Channel (Far Hills Avenue to Sky Vista Drive);* Prepared by VTN. August 1, 2019
- *Update #2 to the Technical Drainage Study for Summerlin West Village 21 Carriage Hill Drive (Redpoint Drive to Summerlin Parkway);* Prepared by VTN. April 4, 2015
- *Addendum #1 to the Technical Drainage Study for Summerlin West Village 21 Street A Carriage Hill to Parcel H;* Prepared by VTN. August 14, 2018
- *Technical Drainage Study for Summerlin West Village 21 – Parcel U Stockpile*; Prepared by VTN. August 13, 2009
- *Technical Drainage Study for Summerlin West Village 21 – Parcel I Stockpile;* Prepared by VTN. June 21, 2019

Appendix D – Improvement Plans



LEGEND

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100
SCALE 1" = 50'

- XXX — BASIN ID
- BASIN BOUNDARY
- PRORATED BASIN BOUNDARY
- FLOW ARROW
- X / XX — SECTION ID
- XX — BUILDING NUMBER

ULTIMATE CONDITION PRORATED FLOW SUMMARY

Ultimate Onsites			
SUBBASIN	Q_{100} (cfs)	AREA (ac)	CFS/ACRE
I*	61	18.69	3.26
Ultimate Onsite Prorated Basins			
SUBBASIN	Q_{100} (cfs)	AREA (ac)	CFS/ACRE
I-1	5	1.56	3.26
I-2A	2	0.56	3.26
I-2B	1	0.23	3.26
I-2C	1	0.25	3.26
I-3	1.5	0.53	3.26
I-4A	3	0.86	3.26
I-4B	1	0.26	3.26
I-4C	1	0.40	3.26
I-5A	5	1.41	3.26
I-5B	1	0.22	3.26
I-6	3	0.88	3.26
I-7A	2.5	0.78	3.26
I-7B	1.5	0.45	3.26
I-7C	1	0.42	3.26
I-8	2	0.65	3.26
I-9A	1	0.39	3.26
I-9B	1	0.25	3.26
I-9C	1	0.22	3.26
I-10	1	0.35	3.26
I-11A	4	1.34	3.26
I-11B	1	0.36	3.26
I-12	3	1.02	3.26
I-13A	3	0.93	3.26
I-13B	0	0.11	3.26
I-13C	0	0.12	3.26
I-14	1	0.26	3.26
I-15A	4	1.15	3.26
I-15B	1.5	0.51	3.26
I-16A	4	1.11	3.26
I-16B	4	1.11	3.26
TOTAL	61	18.69	NA

*Referenced from the Master Study

DROP INLET SUMMARY TABLE

DROP INLET ID	Q_{100} (cfs)	SLOPE (%)	FLOW DEPTH (ft)	Q_{INT} (cfs)	Q_{BYP} (cfs)	DI TYPE
I-1A	2.50	2.90	0.27	2.15	0.35	NEENAH R-3501-R
I-1B	0.35	2.90	0.13	0.35	0.00	NEENAH R-3501-R
I-2A	0.50	0.60	0.21	0.49	0.01	NEENAH R-3501-R
I-2A1	1.50	0.60	0.30	1.29	0.21	NEENAH R-3501-R
I-2A2	0.21	0.60	0.15	0.21	0.00	NEENAH R-3501-R
I-3	1.25	5.67	0.19	1.25	0.00	NEENAH R-3501-R
I-4A	0.50	1.33	0.18	0.50	0.00	NEENAH R-3501-R
I-4A1	2.50	1.33	0.32	2.08	0.42	NEENAH R-3501-R
I-4A2	0.42	1.33	0.17	0.42	0.00	NEENAH R-3501-R
I-5A	0.50	1.36	0.18	0.50	0.00	NEENAH R-3501-R
I-5A1	4.50	1.36	0.38	3.24	1.26	NEENAH R-3501-R
I-5A2	1.26	1.36	0.25	1.19	0.07	NEENAH R-3501-R
I-6A	2.50	1.90	0.30	2.15	0.35	NEENAH R-3501-R
I-6B	0.35	1.90	0.15	0.35	0.00	NEENAH R-3501-R
I-7A	0.50	1.63	0.17	0.50	0.00	NEENAH R-3501-R
I-7A1	2.50	1.63	0.31	2.12	0.38	NEENAH R-3501-R
I-7A2	0.38	1.63	0.15	0.38	0.00	NEENAH R-3501-R
I-8A	1.50	0.50	0.31	1.27	0.23	NEENAH R-3501-R
I-8B	0.23	0.50	0.16	0.23	0.00	NEENAH R-3501-R
I-9A	0.50	0.50	0.21	0.49	0.01	NEENAH R-3501-R
I-9A1	1.00	0.50	0.27	0.91	0.09	NEENAH R-3501-R
I-9A2	0.09	0.50	0.11	0.09	0.00	NEENAH R-3501-R
I-10 (SUMP)	1.50	N/A	0.20	1.50	0.00	5' TYPE DM2
I-11A1	3.50	1.78	0.34	2.77	0.73	NEENAH R-3501-R
I-11A2	0.73	1.78	0.19	0.73	0.00	NEENAH R-3501-R
I-11B1	1.00	1.78	0.22	0.98	0.02	NEENAH R-3501-R
I-11B2	0.02	1.78	0.05	0.02	0.00	NEENAH R-3501-R
I-12A	3.00	1.92	0.32	2.48	0.52	NEENAH R-3501-R
I-12B	0.52	1.92	0.17	0.52	0.00	NEENAH R-3501-R
I-13A N	3.00	3.90	0.25	2.94	0.06	10' TYPE DM2
I-13A S	0.50	3.90	0.15	0.50	0.00	5' TYPE DM2
I-15A	0.50	1.89	0.17	0.50	0.00	NEENAH R-3501-R
I-15A1	3.50	1.89	0.33	2.79	0.71	NEENAH R-3501-R
I-15A2	0.71	1.89	0.19	0.71	0.00	NEENAH R-3501-R
I-15B1	1.00	1.13	0.24	0.96	0.04	NEENAH R-3501-R
I-15B2	0.04	1.13	0.07	0.04	0.00	NEENAH R-3501-R
I-16 (SUMP)	9	N/A	0.47	9.00	0.00	7.5' TYPE DM2

STREET HYDRAULIC SECTIONS
35' STREET SECTIONS

STREET SECTION	CHANNEL SLOPE %	Q_{100} (cfs)	FLOW DEPTH (ft)	VELOCITY (ft/s)	D*V ft^2/s
I-1B	2.90	5.0	0.26	3.18	0.83
I-3	5.67	2.5	0.20	3.63	0.73
I-13A N	3.90	3.0	0.30	3.79	1.14
I-13A S	3.90	0.5	0.16	3.52	0.56
I-14	1.00	1.0	0.27	1.76	0.48
I-16	4.90	8.5	0.38	5.23	1.99

SWALE SECTIONS

SECTION	SLOPE (%)	Q_{100} (cfs)	FLOW DEPTH (ft)	TOTAL DEPTH (ft)	VELOCITY (ft/s)	TYPE	SIDE SLOPES		Req'd d_{50} (in)
OFF3 (MIN)	3.37	4*****	0.41	1	3.37	V	10:1	3:1	N/A
OFF3 (MAX)	25.00	4*****	0.34	1	5.17	V	10:1	3:1	24"
H.25 West	1.00	0.25	0.11	0.68	1.05	-	5%	5%	N/A
H.50 West	1.00	0.50	0.13	0.68	1.25	-	5%	5%	N/A
H.75 West	1.00	0.75	0.17	0.68	1.19	-	5%	5%	N/A
H.25 East	1.00	0.25	0.11	0.69	1.06	-	6%	6%	N/A
H.50 East	1.00	0.50	0.14	0.69	1.31	-	6%	6%	N/A
H.75 East	1.00	0.75	0.18	0.69	1.20	-	6%	6%	N/A
O.25	1.00	0.25	0.11	0.84	0.86	-	5%	5%	N/A
O.50	1.00	0.50	0.14	0.84	1.03	-	5%	5%	N/A
O.75	1.00	0.75	0.16	0.84	1.15	-	5%	5%	N/A

*****Referenced from the Parcel U Stockpile Study

REFERENCED HYDRAULIC SECTIONS

SECTION NAME	CHANNEL SLOPE %	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V
7850****	0.6	852	3.38	15.05	50.84
C.6***	3.3	5	0.29	3.55	1.03
FM2 MAX***	1.00	5	0.75	2.98	2.24
FM2 MIN***	0.88	5	0.77	2.84	2.19
3**	1.65	5	0.32	2.66	0.85
4**	1.65	6	0.33	2.77	0.91
5**	1.66	4	0.30	2.55	0.77

** Referenced from the Carriage Hill Study
*** Referenced from the Redpoint Study
****Referenced from the Beltway Study

HALF STREET HYDRAULIC SECTIONS

STREET SECTION	CHANNEL SLOPE	9.5' HALF STREET SECTIONS (WEST)				25.5' HALF STREET SECTIONS (EAST)			
		Q_{100}	FLOW DEPTH	VELOCITY	D*V	Q_{100}	FLOW DEPTH	VELOCITY	D*V
	%	(cfs)	(ft)	(ft/s)	ft^2/s	(cfs)	(ft)	(ft/s)	ft^2/s
I-1A	1.90	0.5	0.18	1.68	0.30	-	-	-	-
I-2	0.60	0.5	0.20	1.03	0.21	1.5	0.31	1.79	0.55
I-4A	1.33	0.5	0.18	1.44	0.26	4.0	0.37	3.06	1.13
I-5A	1.36	0.5	0.18	1.46	0.26	4.5	0.38	3.17	1.20
I-6	1.90	0.5	0.18	1.68	0.30	2.5	0.30	3.15	0.95
I-7A	1.63	0.5	0.18	1.57	0.28	2.5	0.31	2.96	0.92
I-8	0.50	0.5	0.20	0.98	0.20	1.5	0.31	1.68	0.52
I-9A	0.50	0.5	0.20	0.98	0.20	1.0	0.28	1.53	0.43
I-10	0.50	0.5	0.20	0.98	0.20	0.5	0.22	1.32	0.29
I-11A	1.78	0.5	0.18	1.63	0.29	3.5	0.34	3.33	1.13
I-11B	1.78	0.5	0.18	1.63	0.29	1.0	0.22	2.52	0.55
I-12	1.92	0.5	0.18	1.68	0.30	3.0	0.32	3.29	1.05
I-15A	1.89	0.5	0.18	1.67	0.30	3.5	0.33	3.40	1.12
I-15B	1.13	0.5	0.19	1.34	0.25	1.0	0.24	2.11	0.51
I-16A	1.13	0.5	0.19	1.34	0.25	4.0	0.38	2.88	1.09
I-16B	1.36	0.5	0.18	1.46	0.26	3.5	0.35	3.00	1.05

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

No.	REVISIONS	DATE	BY

KHA PROJECT 092935004
DATE 09/30/19
SCALE AS SHOWN
DESIGNED BY AD
DRAWN BY AD
CHECKED BY RRD

ULTIMATE CONDITION BASIN MAP

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

ULT-1

Plotted By:Donovon_Autumlyn Sheet Set:Kha Layout:PR-1 September 30, 2019 11:46:07am K:\LAV_Civil\092935004_Lennar Village 21 Parcel I\CAD\Exhibits\Drainage\Basin_Map.dwg

CC 215 BELTWAY
(PUBLIC ROW PER 20000405:00608)

EX CCRCD FACILITY APBE 0122
CONCRETE CHANNEL
10'W 5' D 2:1 SS Q_{100}= 913 CFS

EXISTING 36" RCP
Q100=73 CFS

EXISTING 42" RCP
Q100=61 CFS

PROP. 42" RCP
Q100=61 CFS

EX 12' WIDE V-DITCH
3:1 SIDE SLOPES

PROP. 24" RCP
Q100=37.5 CFS

PRIVATE DRIVE "C"

PRIVATE DRIVE "G"

PRIVATE DRIVE "D"

PRIVATE DRIVE "J"

PRIVATE DRIVE "K"

REDPOINT DRIVE

PRIVATE DRIVE "E"

PRIVATE DRIVE "H"

PRIVATE DRIVE "F"

PRIVATE DRIVE "A"

PRIVATE DRIVE "B"

PROP. 18" RCP
Q100=16 CFS

PROP. TYPE DM2

EX CCRFCD FACILITY APCH 0031
30" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
48" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
60" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
60" RCP PER CARRIAGE HILLS STUDY

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100
SCALE 1" = 50'

LEGEND

- STORM DRAIN MAINLINE
- STORM DRAIN LATERAL DRIVE C
- STORM DRAIN LATERAL DRIVE D
- STORM DRAIN LATERAL DRIVE E
- STORM DRAIN LATERAL DRIVE F TO DRIVE K
- PVC STORM DRAIN
- EXISTING STORM DRAIN
- FLOW ARROW
- BUILDING NUMBER

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
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WWW.KIMLEY-HORN.COM

KHA PROJECT 092935004
DATE 09/30/19
SCALE AS SHOWN
DESIGNED BY AD
DRAWN BY AD
CHECKED BY RRD

FACILITY MAP

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

FAC-1

Plotted By:Donovan, Autumlyn Sheet Set:Kha Layout:FAC-1 September 30, 2019 11:49:08am K:\LAV_Civil\092935004 Lennar Village 21 Parcel I\CAD\Exhibits\Drainage\Facility_Map.dwg

NOTES

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

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

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

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

0 100 200 400 600 800

MAP LEGEND

PARCEL BOUNDARY
SUB BOUNDARY
PM/LD BOUNDARY
ROAD EASEMENT
MATCH / LEADER LINE
HISTORIC LOT LINE
HISTORIC SUB BOUNDARY
HISTORIC PM/LD BOUNDARY
SECTION LINE

CONDOMINIUM UNIT
AIR SPACE PCL
RIGHT OF WAY PCL
SUB-SURFACE PCL

001 ROAD PARCEL NUMBER
001 PARCEL NUMER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

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

BOOK T20S R59E

127	126	12512
136	137	13813
165	164	16316

Scale: 1" = 200'

SEC. 26

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Rev: 7/10/2019

MAP N 2 NW 4

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

137-26-1

CLARK COUNTY NEVADA

PT O
PT M
PT 137-23-410-002
CLOWDER SPRING WAY
KINDLE CORNER WAY
CARRIAGE HILL DR
DESERT FOOTHILLS DR
REDPOINT DR
112
SUMMERLIN VILLAGE 21 - UNIT 3
PB 159-50
110
SUMMERLIN VILLAGE 21 UNIT 1 -LARGE LOT FINAL MAP
PB 158-87
PT 137-26-212-003
PT 137-26-212-002
PT 137-26-212-005
PT 137-26-212-006
PT 137-23-410-001
COS-1
COS -2
PT B
PT C
PT G
PT H
PT 1
003 8.19
004 3.45
001 19.23
002 11.74
005 7.79
006 0.58
003 2.00

TAX DIST 200

NOTES TO USERS

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

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

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

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

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

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

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

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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

Base map information shown on this FIRM was provided in digital format by Clark County Regional Flood Control District. This information was converted using Orthophotography, dated 1999 or newer, and GBF/DIME data. Segments were digitized off of the orthophotography based on center of pavement.

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

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

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for infomation on all related products available from FEMA:

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

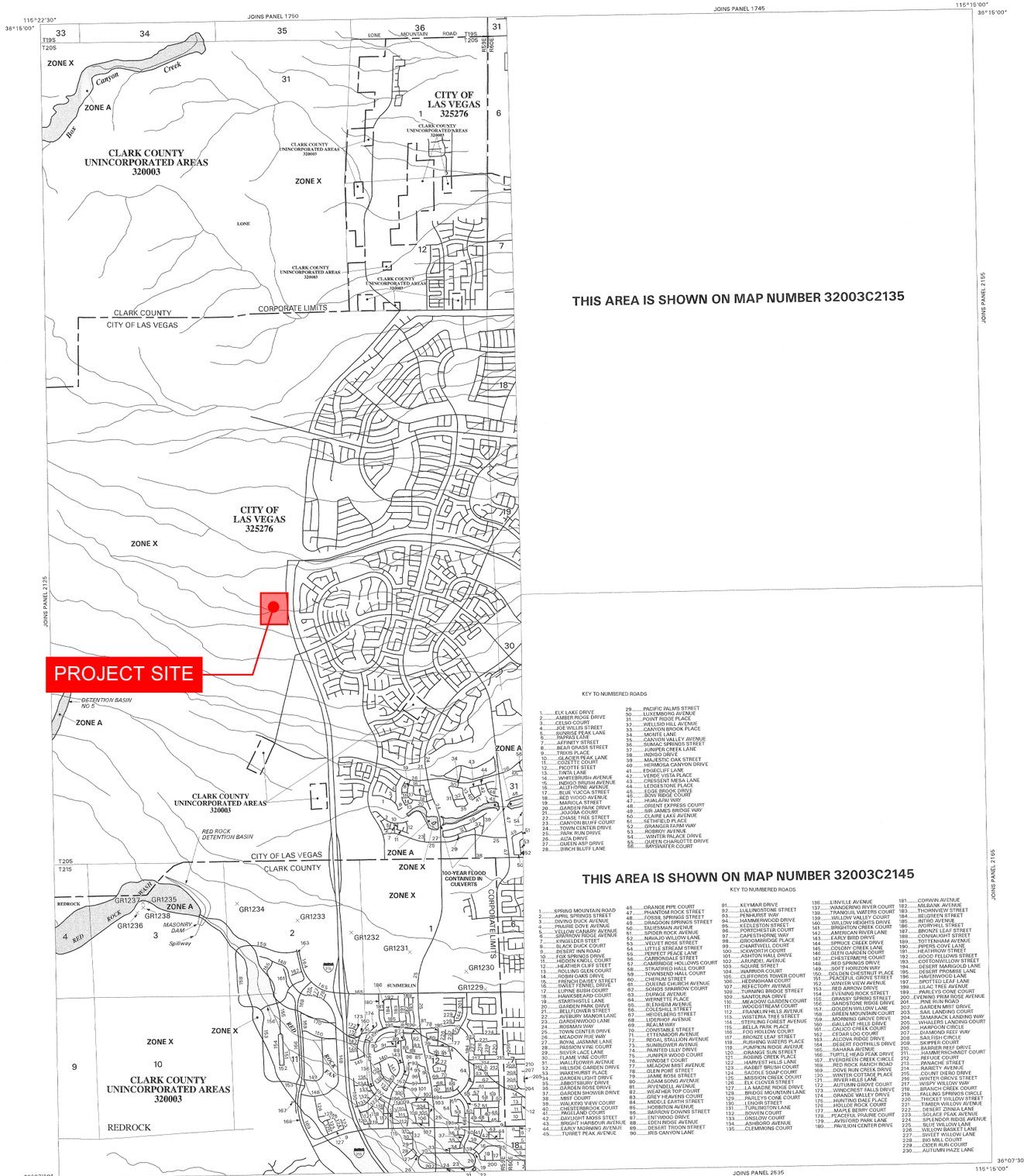
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result,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

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

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

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

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



KEY TO NUMBERED ROADS

1 ELK LAKE DRIVE
2 AMBER RIDGE DRIVE
3 CELSO COURT
4 JOE WILLIS STREET
5 SUNRISE PEAK LANE
6 PAPPAS LANE
7 AFFINITY STREET
8 BEAUTY BUSH STREET
9 IRIS PLACE
10 GLACIER PEAK LANE
11 COZETTE COURT
12 PICOTTE STEET
13 TINTIL LANE
14 WHITEBRUSH AVENUE
15 INDIGO BRUSH AVENUE
16 ALLITHORNE AVENUE
17 BLUE YUCCA STREET
18 RED WOOD AVENUE
19 MARIOLA STREET
20 GARDEN PARK DRIVE
21 BELLFLOWER STREET
22 CHANG TREE STREET
23 CANYON BLUFF COURT
24 TOWN CENTER DRIVE
25 PARK RUN DRIVE
26 AIZA DRIVE
27 QUEEN ASP DRIVE
28 BIRCH BLUFF LANE
29 PACIFIC PALMS STREET
30 LUXEMBORG AVENUE
31 POINT RIDGE PLACE
32 WELLSID HILL AVENUE
33 CANYON BROOK PLACE
34 MONTE LANE
35 CANYON VALLEY AVENUE
36 SUMAC SPRINGS STREET
37 JUNIPER CREEK LANE
38 INDIGO DRIVE
39 MAJESTIC OAK STREET
40 HERMOSA CANYON DRIVE
41 EDGECLIFF LANE
42 VERDE VISTA PLACE
43 CRESSENT MESA LANE
44 LEDGESTONE PLACE
45 TURRET PEAK AVENUE
46 ROSE RIDGE COURT
47 HUALAPAI WAY
48 ORIENT EXPRESS COURT
49 SIR JAMES BRIDGE WAY
50 CLAIRE LAKE AVENUE
51 SETHFIELD PLACE
52 GRANGER FARM WAY
53 ROBROY AVENUE
54 WINTER PALACE DRIVE
55 QUEEN CHARLOTTE DRIVE
56 BAYSWATER COURT
91 KEYMAR DRIVE
92 LILLINGSTONE STREET
93 PENHURST WAY
94 HAMMERWOOD DRIVE
95 KEDLESTON STREET
96 PORTCHESTER COURT
97 CAPESTHORNE WAY
98 GROOMBRIDGE PLACE
99 CHARTWELL COURT
100 ICKWORTH COURT
101 ASHTON HALL DRIVE
102 ARUNDEL AVENUE
103 SQUIRE STREET
104 WARRIOR COURT
105 CLIFFORDS MANOR COURT
106 HEDINGHAM COURT
107 ROSEMARY AVENUE
108 SPRING BRIDGE STREET
109 SANTOLINA DRIVE
110 MEADOW GARDEN COURT
111 WOODSTREAM COURT
112 FRANKLIN HILLS AVENUE
113 WISTERIA TREE STREET
114 STERLING FOREST AVENUE
115 BELLA PARK PLACE
116 FOG HOLLOW COURT
117 BRONZE LEAF STREET
118 RUNNING WATERS PLACE
119 PUMPKIN RIDGE AVENUE
120 ORANGE SUN STREET
121 ROBINS CREEK PLACE
122 HARVEST MOON LANE
123 RABBIT BRUSH COURT
124 SADDLE SOAP COURT
125 MISSION CREEK COURT
126 ELK CLOVER STREET
127 LA MADRE RIDGE DRIVE
128 BRIDGE MOUNTAIN LANE
129 PARLEYS CONE COURT
130 LEHOIR STREET
131 TURLINGTON LANE
132 BOWEN COURT
133 ONSLOW COURT
134 ASHBORO AVENUE
135 CLEMMONS COURT
136 LINVILLE AVENUE
137 WANDERING RIVER COURT
138 TRANQUIL WATERS COURT
139 WILLOW VALLEY COURT
140 WILLOW HEIGHTS DRIVE
141 BRIGHTON CREEK COURT
142 AMERICAN RIVER LANE
163 EARLY BIRD DRIVE
144 SPRUCE GROVE DRIVE
145 MISTY CREEK LANE
146 GLEN GARDEN COURT
147 CHESTERMERE COURT
148 RED SPRINGS DRIVE
149 SOFT HORIZON WAY
150 GOLDEN CHESTNUT PLACE
151 PEACEFUL GROVE STREET
152 WINTER VIEW AVENUE
153 RED ARROW DRIVE
154 EVENING ROCK STREET
155 GRASSY SPRING STREET
156 SANDSTONE RIDGE DRIVE
157 GOLDEN WILLOW LANE
158 GREEN MOUNTAIN COURT
159 MORNING MIST LANE
160 GALLO CREEK COURT
161 CEDAR LOG COURT
163 ALCOVA RIDGE DRIVE
164 DESERT FOOTHILLS DRIVE
165 SAHARA AVENUE
166 TURTLE HEAD PEAK DRIVE
167 EVERGREEN CREEK CIRCLE
168 RED ROCK RANCH ROAD
169 DOVE RUN CREEK DRIVE
170 WINTER COTTAGE PLACE
171 RIVER HILLS LANE
172 AUTUMN GROVE COURT
173 WINDCREST FALLS DRIVE
174 ORANDE VALLEY PLACE
176 HUNTINGDALE PLACE
177 MAPLE BERRY COURT
179 MAPLE BERRY COURT
178 PEACEFUL PRAIRIE COURT
179 AVISFORD PARK LANE
180 PAVILION CENTER DRIVE
181 CORWIN AVENUE
182 MILBANK AVENUE
183 THORNVIEW STREET
184 REGENTS STREET
185 ALLEN AVENUE
186 LARK WHEEL STREET
187 BRONZE LEAF STREET
188 CONNAUGHT STREET
189 TOTTENHAM AVENUE
190 PIPERS COVE LANE
191 HEATHROW STREET
192 GOOD FELLOWS STREET
193 COTTONWILLOW STREET
194 DESERT MARIGOLD LANE
195 DESERT PROMISE LANE
196 HAVERWOOD LANE
197 SPOTTED LEAF LANE
198 LILAC TREE POINT
199 PARLEYS CONE COURT
200 EVENING RIDGE AVENUE
205 PINE RUN ROAD
202 GARDEN MIST DRIVE
203 SAIL LANDING COURT
204 TAMARACK LANDING WAY
205 WHALERS LANDING COURT
208 HARPOON CIRCLE
207 DIAMOND REEF WAY
208 SAILFISH CIRCLE
209 SKIPPER COURT
210 BARRIER REEF DRIVE
211 HAMMERSCHMIDT COURT
212 REFUGE COURT
213 PINNACHE STREET
214 RARIETY AVENUE
215 COVE POINT DRIVE
216 WISTER DRIVE STREET
217 MISTY WILLOW WAY
218 BRANCH CREEK COURT
219 FALLING SPRINGS CIRCLE
220 THICKET WILLOW STREET
221 TIMBER WILLOW AVENUE
222 DESERT ZINNIA LANE
223 SOLACE PEAK AVENUE
224 SPLENDOR RIDGE AVENUE
225 BLUE WILLOW LANE
226 WILLOW BASKET LANE
227 SWEET WILLOW LANE
228 BIG MILL COURT
229 CIDER RUN COURT
230 AUTUMN HAZE LANE

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

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

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

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

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

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

*Referenced to the North American Vertical Datum of 1988

A — A Cross Section Line
23 — 23 Transect Line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276 mN Universal Transverse Mercator grid values, zone 11
600000 FT State Plane grid ticks
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
AUGUST 16, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 27, 2002: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to delete special flood hazard areas, to change zone designations, to add roads and road names, to incorporate previously issued letters of map revision, to incorporate previously issued letters of map amendment, and to change floodway.

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

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

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2150 E

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

PANEL 2150 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAS VEGAS, CITY OF	325276	2150	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	2150	E

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

MAP NUMBER 32003C2150 E

MAP REVISED: SEPTEMBER 27, 2002

Federal Emergency Management Agency

REGIONAL FLOOD CONTROL DISTRICT

2018
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-22
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

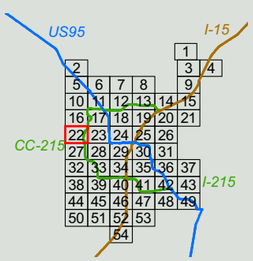
Category A	Category B
Channel	Channel
Stormdrain	Stormdrain
Crossing	Crossing

N

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

Scale: 1 inch = 2,000 feet

AerialSource:Esri World Imagery 2017



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ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APAD		**ANGEL PARK - ALTA DRIVE BRANCH**						
0203	E	2: 7' X 5.5' RCB	1104	2200	CSWAA-1	GOW3A	6.95	5.28
0225	E	2: 7' X 5.5' RCB OUTLET	360	2137	SUM5DB	GOW3A	6.73	3.40
APBE		**ANGEL PARK - BELTWAY BRANCH**						
0022	E	CONC CHNL 20'W 7'D 2:1 SS	1556	3366	CCSWFH15	GOW3A	3.39	1.81
0051	E	CONC CHNL 20'W 7'D 2:1 SS	1583	3366	CCSWFH15	GOW3A	3.39	2.77
0081	E	8' X 8' RCBC @ FAR HILLS	777	1048	CSWFH-15	GOW3A	0.59	2.32
0094	E	CONC CHNL 10'W 5'D 2:1 SS	1465	1048	CSWFH-15	GOW3A	0.59	1.88
0122	E	CONC CHNL 10'W 4'D 2:1 SS	1685	1048	CSWFH-15	GOW3A	0.59	0.80
0154	P0	8' X 6' RCB	5012	781	CSWFH-12	GOW3A	0.41	1.30
0249	P0	6' X 5' RCB	2858	606	CSWFH-11	GOW3A	0.31	3.00
APCH		**ANGEL PARK - CARRIAGE HILL BRANCH**						
0000	E	8' X 6' RCB	152	399	CSWFH-14	GOW3A	0.21	0.87
0003	P0	72" RCP	1685	399	CSWFH-14	GOW3A	0.21	2.00
0031	P0	60" RCP	2008	206	SWFH-13	GOW3A	0.10	1.38
APD2		**ANGEL PARK - DESERT FOOTHILLS 2 BRANCH**						
0002	E	7' X 6' RCB	883	674	SWAA-2	GOW3A	0.68	1.08
APDF		**ANGEL PARK - DESERT FOOTHILLS BRANCH**						
0000	P0	10' X 6' RCB	1788	1428	CSWFH-9	GOW3B	0.80	3.55
0026	P0	8' X 6' RCB	1813	968	CSWFH-8	GOW3A	1.80	2.00
0073	P0	6' X 4' RCB	1922	486	CSWFH-4	GOW3A	1.52	4.40
0123	P0	42" RCP	1076	141	GPDB	GOW3A	1.29	6.00
0125	P0	130 AC-FT GRAND PARK DETENTION BASIN		1543	CSWFH-3	GOW3A	1.29	
0127	P0	6' X 6' RCB	2977	853	SWFH-1	GOW3A	0.69	3.80
0128	P0	5' X 4' RCB	2197	509	SWFH-2	GOW3A	0.37	5.70
APFH		**ANGEL PARK - FAR HILLS BRANCH**						
0000	E	2: 8' X 8' RCB	1070	2494	CCSWFH14	GOW3B	1.51	3.50
0019	E	2: 8' X 8' RCB	250	2149	CCSWFH-9	GOW3B	1.30	4.19
0024	E	16' X 8' RCAP	1951	2149	CCSWFH-9	GOW3B	1.30	5.10
0061	E	8' X 6' RCB	1435	839	CSWFH-7	GOW3A	0.50	2.00
0089	E	8' X 6' RCB	2946	839	CSWFH-7	GOW3A	0.50	2.00
0144	P0	5' X 4' RCB	2497	456	SWFH-6	GOW3A	0.28	5.50
APM5		**DETENTION BASIN #5**						
0000	E	384 AC-FT DETENTION BASIN #5		6856	SUM5IN	GOW3A	6.73	
0008	P0	CONC CHNL 50'W 4.5'D 2:1 SS	2102	3634	CCDB54-7	GOW3A	4.13	5.20
0009	P0	CONC CHNL 50'W 4'D 2:1 SS	4180	3495	CDB55-7	GOW3A	2.60	5.80
0047	E	DIVERSION BERM WITH GABION BANK PROTECTION	1000	3634	CCDB54-7	GOW3A	4.13	1.30
0056	P0	CONC CHNL 80'W 4'D 2:1 SS	264	3634	CCDB54-7	GOW3A	4.13	1.30
0057	P0	CONC CHNL 50'W 3'D 2:1 SS	9922	1664	CDB54-4	GOW3A	0.81	6.80
0059	P0	CONC CHNL 100'W 3'D 2:1 SS	9075	2606	CDB54-7	GOW3A	3.31	7.00
0212	P0	CONC CHNL 30'W 3'D 2:1 SS	6695	1092	DB55-1	GOW3A	0.64	7.50
0213	P0	CONC CHNL 50'W 3'D 2:1 SS	6522	1729	CDB55-5	GOW3A	1.30	7.30
APSP		**ANGEL PARK - SUMMERLIN PARKWAY**						
0183	E	CONC CHNL 10'W 6'D 2:1 SS	1680	884	C11B-1	GOW3A	0.84	1.70
GOB3		**GOWAN LONE MOUNTAIN SYST. 3 BELTWAY**						
0000	E	66" RCP	1370	341	SV22-1	GOW3A	0.18	4.50
GOBE		**GOWAN LONE MOUNTAIN SYST. BELTWAY**						
0000	E	20' X 10' RCBC @ ACCESS RD	30	1044	CSV22	GOW3A	0.67	5.67
0001	E	CONC CHNL 20'W 5'D 2:1 SS	1100	1044	CSV22	GOW3A	0.67	6.50
0021	E	CONC CHNL 11'W 6.8'D 0:1 SS	2143	1044	CSV22	GOW3A	0.67	6.50
0058	E	CONC CHNL 15'W 7.5'D 0:1 SS	487	1044	CSV22	GOW3A	0.67	3.93
0065	E	CONC CHNL 17'W 7.5'D 0:1 SS	844	1044	CSV22	GOW3A	0.67	0.76
0088	E	2: 10' X 9' RCBC @ LAKE MEAD	400	782	SV22-2	GOW3A	0.49	0.50
0096	E	CONC CHNL 20'W 9'D 2:1 SS	627	782	SV22-2	GOW3A	0.49	0.50
0108	E	CONC CHNL 20'W 6'D 2:1 SS	1021	782	SV22-2	GOW3A	0.49	0.50
0127	E	CONC CHNL 20'W 6'D 2:1 SS	638	782	SV22-2	GOW3A	0.49	0.50
0139	E	CONC CHNL 10'W 5.5'D 2:1 SS	1500	782	SV22-2	GOW3A	0.49	1.02
GOL3		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3**						
0010	E	CONC CHNL 20'W 10'D 0:1 SS	3037	3277	CRCLMT1R	GOW3A	7.31	2.78
0068	E	TRANSITION STRUCTURE	100	3277	CRCLMT1R	GOW3A	7.31	3.50
0070	E	20' X 6' RCBC @ CLIFF SHADOWS	350	1271	CRCSV22	GOW3A	4.99	2.44
0077	E	CONC CHNL 20'W 6'D 0:1 SS	1229	1271	CRCSV22	GOW3A	4.99	6.11

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOL3		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3**						
0100	E	CONC CHNL 20'W 10'D 0:1 SS	200	1271	CRCSV22	GOW3A	4.99	5.67
0115	E	96" RCP OUTLET	670	666	DET26	GOW3A	4.31	0.29
0128	E	305 AC-FT VILLAGE 26 DETENTION BASIN		3615	VIL26IN	GOW3A	4.31	
0137	E	CONC CHNL 20'W 7.5'D 0:1 SS	2720	3615	VIL26IN	GOW3A	4.31	6.50
0188	E	CONC CHNL 20'W 8'D 0:1 SS	563	3615	VIL26IN	GOW3A	4.31	3.91
0197	E	14' X 14' RCB	890	3615	VIL26IN	GOW3A	4.31	0.88
0214	E	Dual 10' X 14' RCB	124	3615	VIL26IN	GOW3A	4.31	0.57
0216	P0	CONC CHNL 50'W 4'D 2:1 SS	4060	3524	CSV26-1	GOW3A	4.02	6.08
0289	P0	CONC CHNL 50'W 3.5'D 2:1 SS	6215	2281	30	GOW3A	2.44	7.95
0290	E	NATURAL WASH 363'W	4850	1410	SV26-1	GOW3A	1.59	22.50
0370	E	NATURAL WASH 450'W	7000	2281	30	GOW3A	2.44	8.50
GOL4		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4**						
0000	E	14' X 8' RCB	554	2243	CLMT1R	GOW3A	2.33	2.50
0010	E	2: 9' X 8' RCB	820	2243	CLMT1R	GOW3A	2.33	4.74
0025	E	SOIL CEMENT CHNL 60'W 8'D 3-4:1 SS	320	2243	CLMT1R	GOW3A	2.33	2.00
0026	E	SOIL CEMENT CHNL 42'W 6'D 3-4:1 SS	700	2243	CLMT1R	GOW3A	2.33	1.00

*The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.
**As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.
^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e. HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).

REGIONAL FLOOD CONTROL DISTRICT

2018 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F-22

LEGEND

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	CMAP	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

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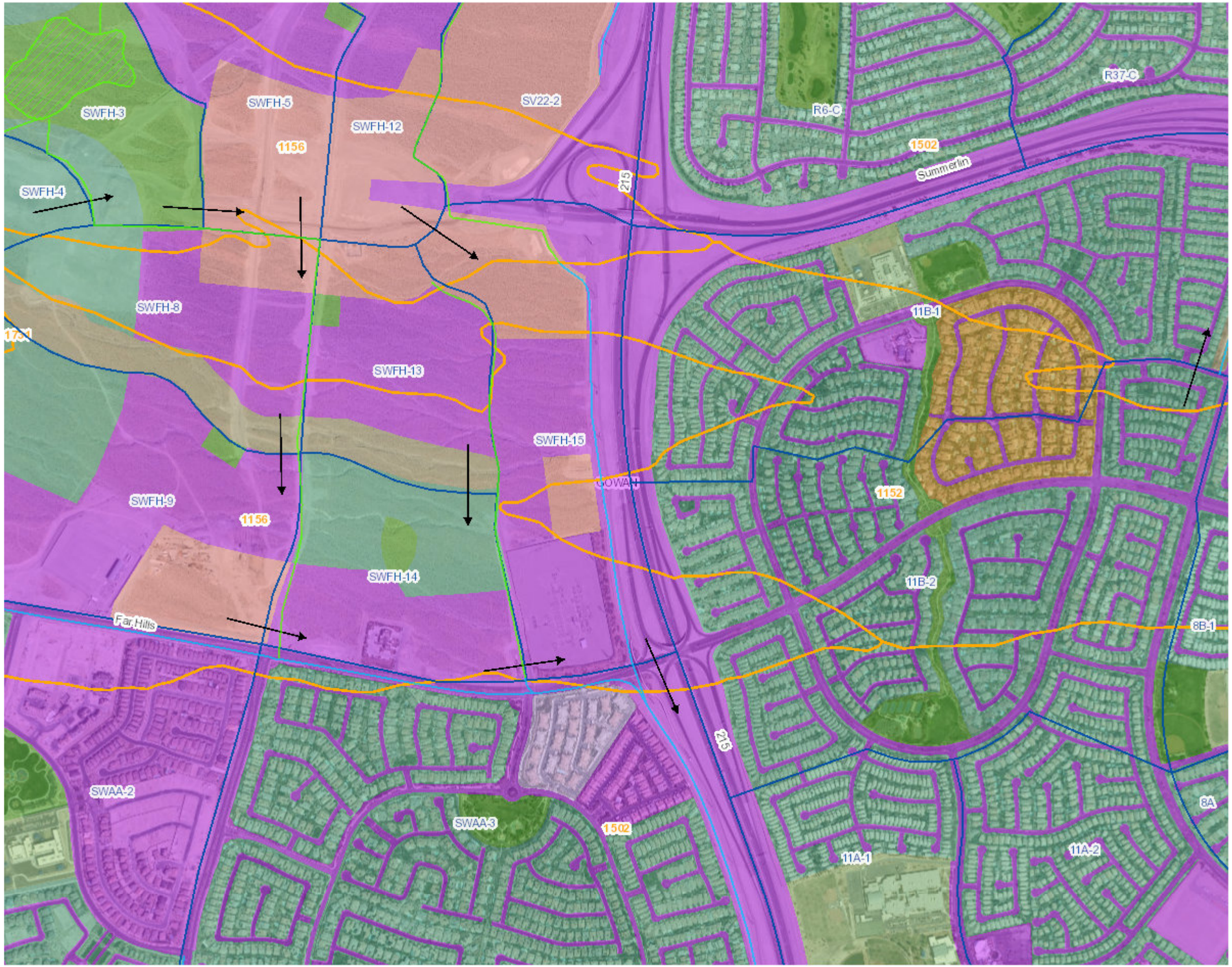
Village 21 - Parcel I



Legend

- Flow Arrows
- NodeID flow(cfs) — Concentration Points
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Ultimate Development Boundary
- Watershed
- BasinID — Subbasins
- MUSYM — 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
- SFHA Zone AE
- SFHA Zone A
- SFHA Zone AO
- Zone X (Shaded)

1 inch = 833 feet

N

0 415 830 1,660 Feet

REGIONAL FLOOD CONTROL DISTRICT

Worksheet for I-1A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.29 ft
Hydraulic Radius	0.05 ft
Top Width	6.22 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.349
Flow Type	Supercritical

GVF Input Data

Worksheet for I-1A 9.5' Half Street

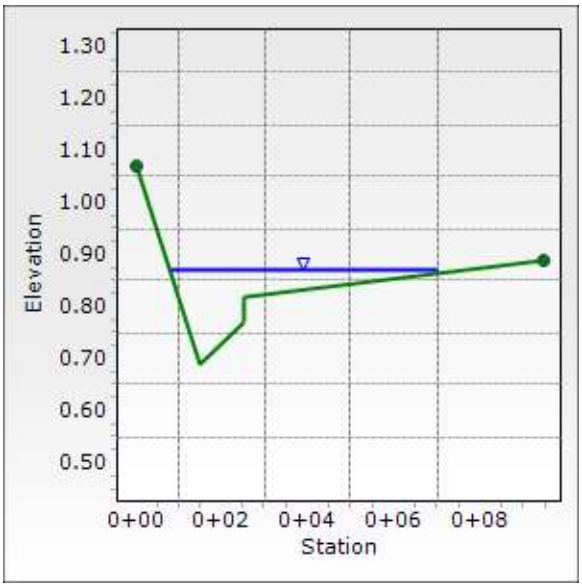
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.900 %
Critical Slope	1.018 %

Cross Section for I-1A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-1B 35' Typical (30" Roll Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.900 %
Discharge	5.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+15.50	0.39
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+35.00, 0.46)	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	0.26 ft
Elevation Range	0.00 to 0.46 ft
Flow Area	1.6 ft²
Wetted Perimeter	17.35 ft
Hydraulic Radius	0.09 ft
Top Width	17.17 ft
Normal Depth	0.26 ft
Critical Depth	0.31 ft
Critical Slope	0.777 %
Velocity	3.18 ft/s
Velocity Head	0.16 ft

Worksheet for I-1B 35' Typical (30" Roll Curb)

Results	
Specific Energy	0.42 ft
Froude Number	1.856
Flow Type	Supercritical

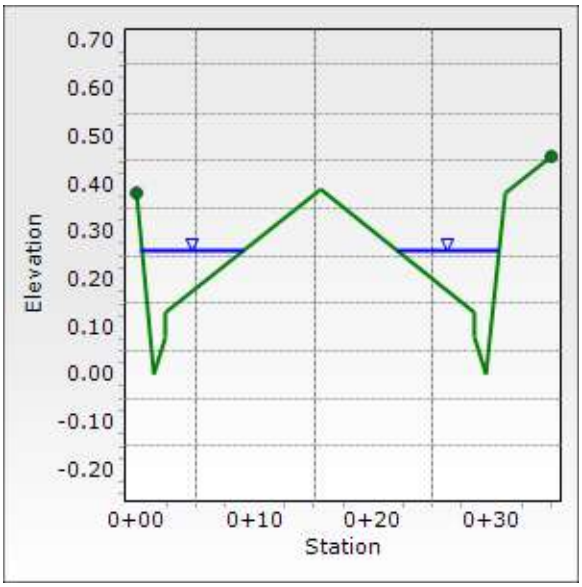
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.26 ft
Critical Depth	0.31 ft
Channel Slope	2.900 %
Critical Slope	0.777 %

Cross Section for I-1B 35' Typical (30" Roll Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.900 %
Normal Depth	0.26 ft
Discharge	5.00 cfs



Worksheet for I-2 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.600 %
Discharge	1.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.31 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.8 ft²
Wetted Perimeter	6.69 ft
Hydraulic Radius	0.12 ft
Top Width	6.60 ft
Normal Depth	0.31 ft
Critical Depth	0.29 ft
Critical Slope	0.768 %
Velocity	1.79 ft/s
Velocity Head	0.05 ft
Specific Energy	0.36 ft
Froude Number	0.889
Flow Type	Subcritical

Worksheet for I-2 25.5' Half Street

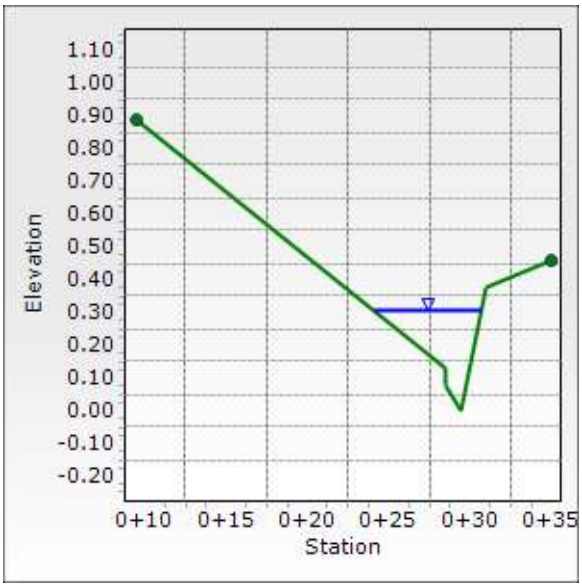
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.31 ft
Critical Depth	0.29 ft
Channel Slope	0.600 %
Critical Slope	0.768 %

Cross Section for I-2 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.600 %
Normal Depth	0.31 ft
Discharge	1.50 cfs



Worksheet for I-2 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	0.600	%
Discharge	0.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.20	ft
Elevation Range	0.69 to 1.07	ft
Flow Area	0.5	ft²
Wetted Perimeter	8.87	ft
Hydraulic Radius	0.05	ft
Top Width	8.79	ft
Normal Depth	0.20	ft
Critical Depth	0.19	ft
Critical Slope	1.018	%
Velocity	1.03	ft/s
Velocity Head	0.02	ft
Specific Energy	0.22	ft
Froude Number	0.775	
Flow Type	Subcritical	

GVF Input Data

Worksheet for I-2 9.5' Half Street

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

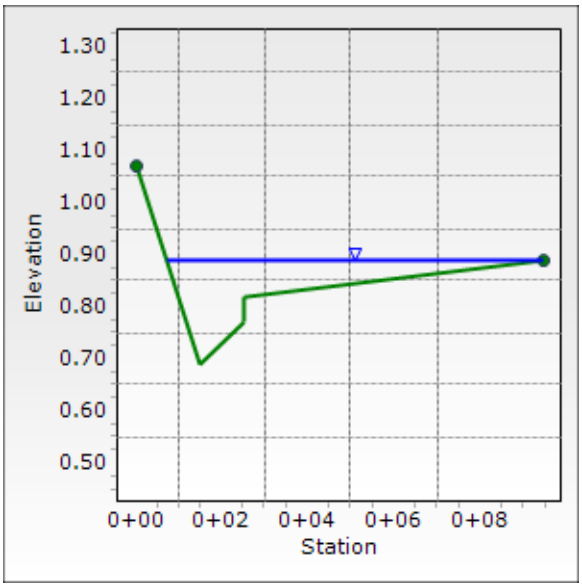
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Channel Slope	0.600 %
Critical Slope	1.018 %

Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.000103507975810935ft.

Cross Section for I-2 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.600 %
Normal Depth	0.20 ft
Discharge	0.50 cfs



Worksheet for I-3 35' Typical (30" Roll Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.670 %
Discharge	2.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+15.50	0.39
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+35.00, 0.46)	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	0.20 ft
Elevation Range	0.00 to 0.46 ft
Flow Area	0.7 ft²
Wetted Perimeter	10.38 ft
Hydraulic Radius	0.07 ft
Top Width	10.22 ft
Normal Depth	0.20 ft
Critical Depth	0.26 ft
Critical Slope	0.847 %
Velocity	3.63 ft/s
Velocity Head	0.20 ft

Worksheet for I-3 35' Typical (30" Roll Curb)

Results	
Specific Energy	0.40 ft
Froude Number	2.466
Flow Type	Supercritical

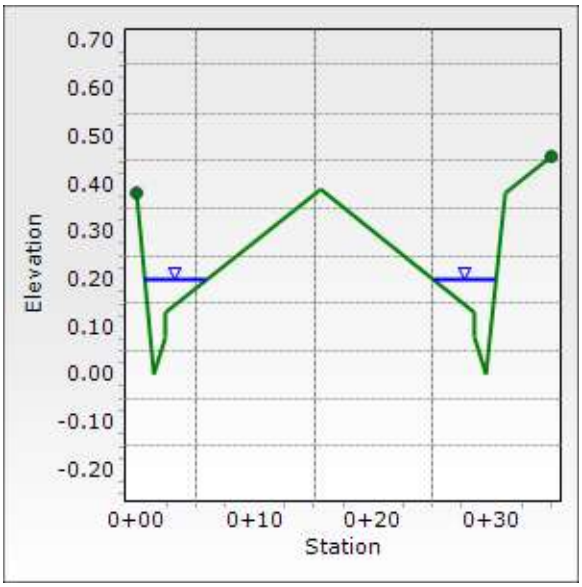
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.26 ft
Channel Slope	5.670 %
Critical Slope	0.847 %

Cross Section for I-3 35' Typical (30" Roll Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.670 %
Normal Depth	0.20 ft
Discharge	2.50 cfs



Worksheet for I-4A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.330	%
Discharge	4.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.37	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.3	ft²
Wetted Perimeter	8.51	ft
Hydraulic Radius	0.15	ft
Top Width	8.41	ft
Normal Depth	0.37	ft
Critical Depth	0.42	ft
Critical Slope	0.704	%
Velocity	3.06	ft/s
Velocity Head	0.15	ft
Specific Energy	0.51	ft
Froude Number	1.371	
Flow Type	Supercritical	

Worksheet for I-4A 25.5' Half Street

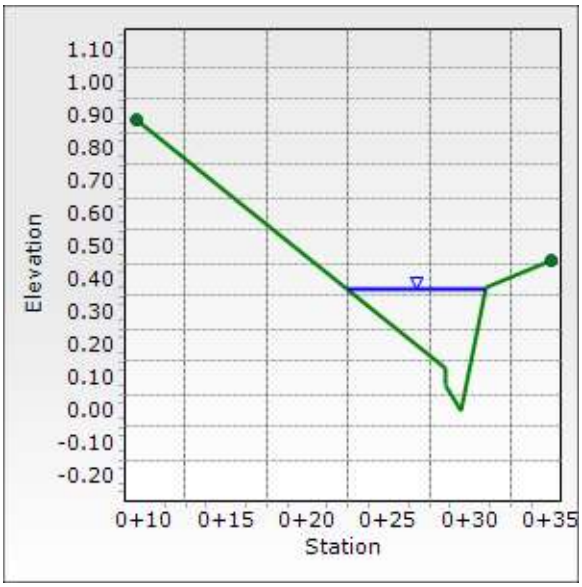
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.37 ft
Critical Depth	0.42 ft
Channel Slope	1.330 %
Critical Slope	0.704 %

Cross Section for I-4A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.330 %
Normal Depth	0.37 ft
Discharge	4.00 cfs



Worksheet for I-4A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.330 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	7.05 ft
Hydraulic Radius	0.05 ft
Top Width	6.98 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.44 ft/s
Velocity Head	0.03 ft
Specific Energy	0.21 ft
Froude Number	1.141
Flow Type	Supercritical

GVF Input Data

Worksheet for I-4A 9.5' Half Street

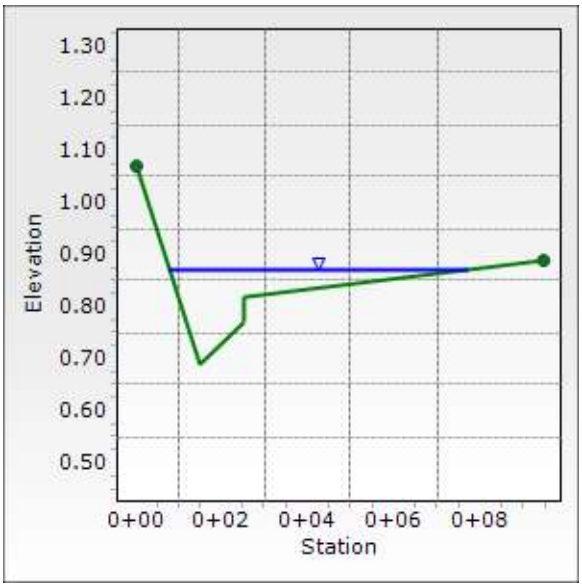
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.330 %
Critical Slope	1.018 %

Cross Section for I-4A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.330 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-5A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Discharge	4.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.38 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	1.4 ft²
Wetted Perimeter	8.97 ft
Hydraulic Radius	0.16 ft
Top Width	8.86 ft
Normal Depth	0.38 ft
Critical Depth	0.44 ft
Critical Slope	0.701 %
Velocity	3.17 ft/s
Velocity Head	0.16 ft
Specific Energy	0.54 ft
Froude Number	1.397
Flow Type	Supercritical

Worksheet for I-5A 25.5' Half Street

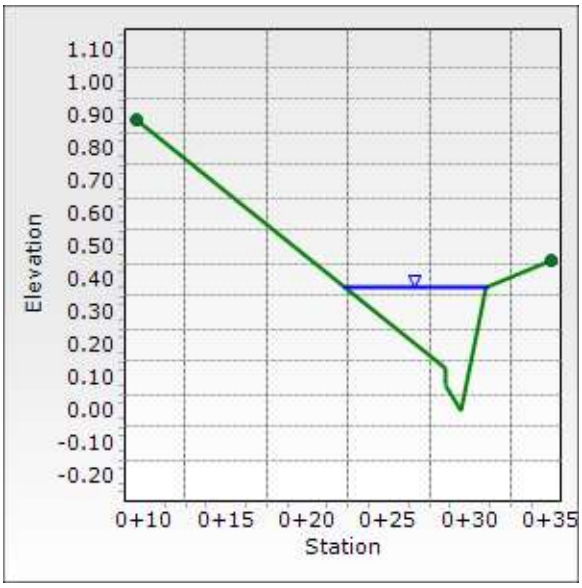
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.38 ft
Critical Depth	0.44 ft
Channel Slope	1.360 %
Critical Slope	0.701 %

Cross Section for I-5A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Normal Depth	0.38 ft
Discharge	4.50 cfs



Worksheet for I-5A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.360	%
Discharge	0.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	7.00 ft
Hydraulic Radius	0.05 ft
Top Width	6.93 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.46 ft/s
Velocity Head	0.03 ft
Specific Energy	0.22 ft
Froude Number	1.154
Flow Type	Supercritical

GVF Input Data

Worksheet for I-5A 9.5' Half Street

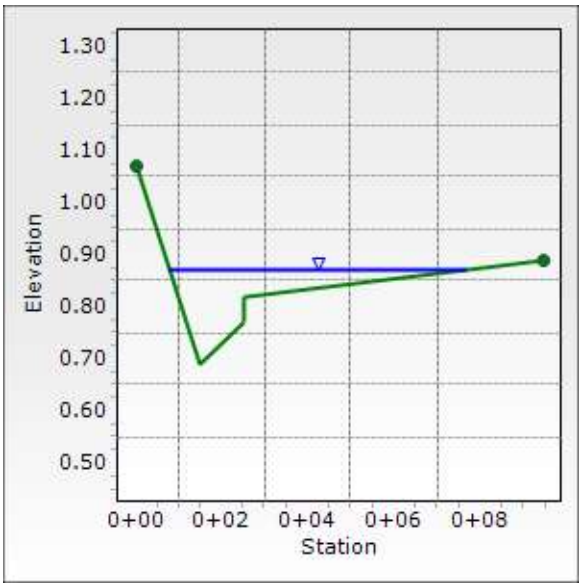
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.360 %
Critical Slope	1.018 %

Cross Section for I-5A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-6 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.900	%
Discharge	2.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.30	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	0.8	ft²
Wetted Perimeter	6.51	ft
Hydraulic Radius	0.12	ft
Top Width	6.41	ft
Normal Depth	0.30	ft
Critical Depth	0.35	ft
Critical Slope	0.720	%
Velocity	3.15	ft/s
Velocity Head	0.15	ft
Specific Energy	0.45	ft
Froude Number	1.577	
Flow Type	Supercritical	

Worksheet for I-6 25.5' Half Street

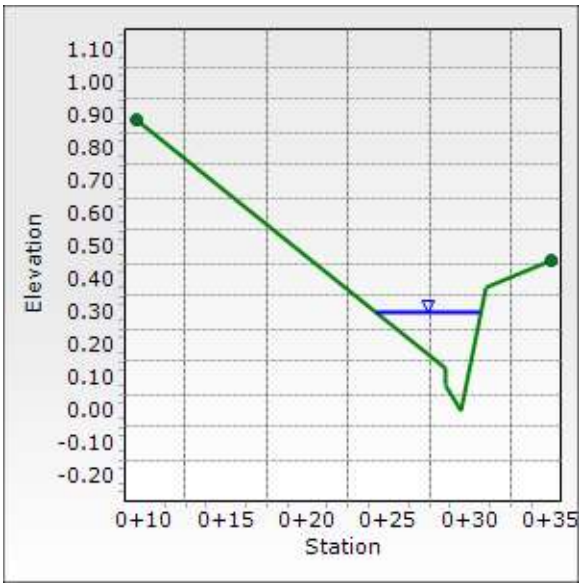
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.30 ft
Critical Depth	0.35 ft
Channel Slope	1.900 %
Critical Slope	0.720 %

Cross Section for I-6 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Normal Depth	0.30 ft
Discharge	2.50 cfs



Worksheet for I-6 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.29 ft
Hydraulic Radius	0.05 ft
Top Width	6.22 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.349
Flow Type	Supercritical

GVF Input Data

Worksheet for I-6 9.5' Half Street

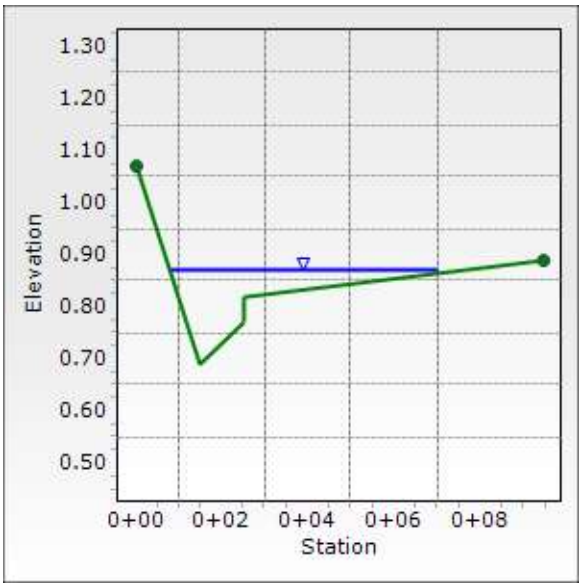
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.900 %
Critical Slope	1.018 %

Cross Section for I-6 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-7A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.630	%
Discharge	2.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.31	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	0.8	ft²
Wetted Perimeter	6.73	ft
Hydraulic Radius	0.13	ft
Top Width	6.63	ft
Normal Depth	0.31	ft
Critical Depth	0.35	ft
Critical Slope	0.720	%
Velocity	2.96	ft/s
Velocity Head	0.14	ft
Specific Energy	0.44	ft
Froude Number	1.465	
Flow Type	Supercritical	

Worksheet for I-7A 25.5' Half Street

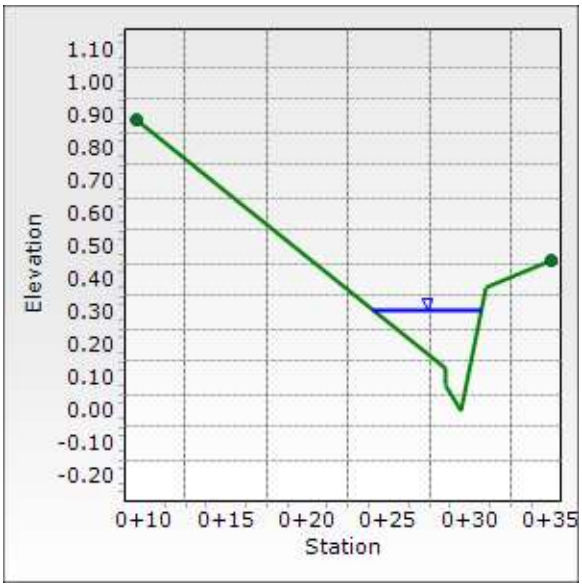
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.31 ft
Critical Depth	0.35 ft
Channel Slope	1.630 %
Critical Slope	0.720 %

Cross Section for I-7A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.630 %
Normal Depth	0.31 ft
Discharge	2.50 cfs



Worksheet for I-7A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.630 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.63 ft
Hydraulic Radius	0.05 ft
Top Width	6.55 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.57 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.253
Flow Type	Supercritical

GVF Input Data

Worksheet for I-7A 9.5' Half Street

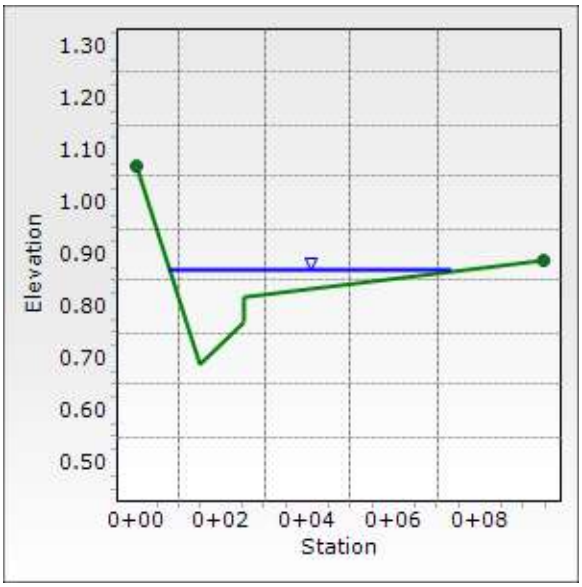
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.630 %
Critical Slope	1.018 %

Cross Section for I-7A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.630 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-8 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	1.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.31 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.9 ft²
Wetted Perimeter	6.95 ft
Hydraulic Radius	0.13 ft
Top Width	6.85 ft
Normal Depth	0.31 ft
Critical Depth	0.29 ft
Critical Slope	0.768 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.36 ft
Froude Number	0.819
Flow Type	Subcritical

Worksheet for I-8 25.5' Half Street

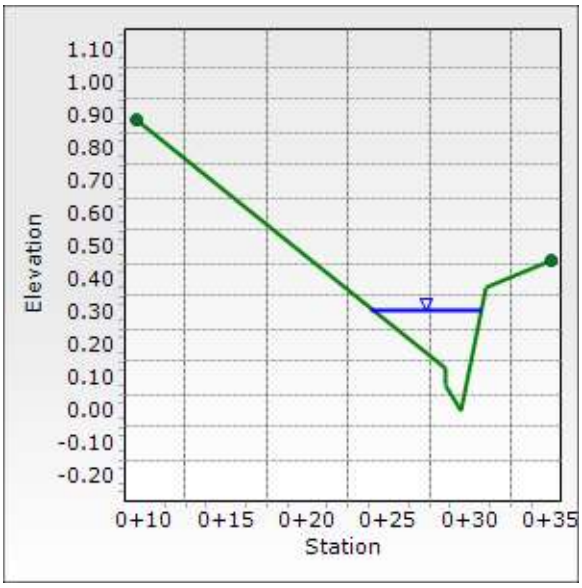
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.31 ft
Critical Depth	0.29 ft
Channel Slope	0.500 %
Critical Slope	0.768 %

Cross Section for I-8 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.31 ft
Discharge	1.50 cfs



Worksheet for I-8 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.20 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.5 ft²
Wetted Perimeter	8.88 ft
Hydraulic Radius	0.06 ft
Top Width	8.80 ft
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Critical Slope	1.017 %
Velocity	0.98 ft/s
Velocity Head	0.01 ft
Specific Energy	0.22 ft
Froude Number	0.717
Flow Type	Subcritical

GVF Input Data

Worksheet for I-8 9.5' Half Street

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	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Channel Slope	0.500 %
Critical Slope	1.017 %

Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.003067761 51974553ft.

Worksheet for I-9A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.28 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.7 ft²
Wetted Perimeter	5.84 ft
Hydraulic Radius	0.11 ft
Top Width	5.75 ft
Normal Depth	0.28 ft
Critical Depth	0.26 ft
Critical Slope	0.808 %
Velocity	1.53 ft/s
Velocity Head	0.04 ft
Specific Energy	0.31 ft
Froude Number	0.797
Flow Type	Subcritical

Worksheet for I-9A 25.5' Half Street

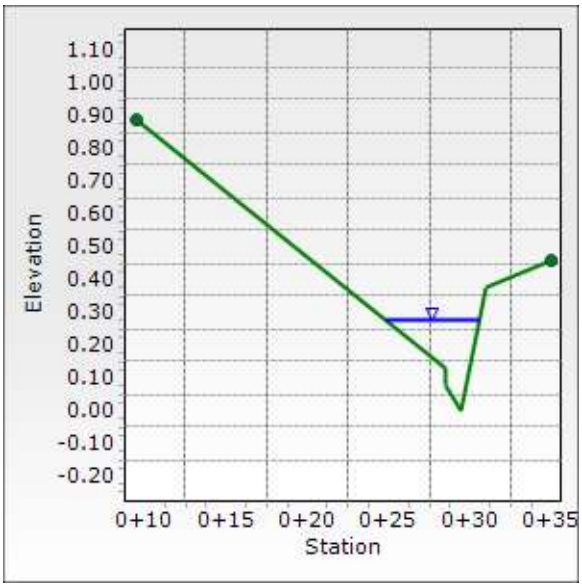
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.28 ft
Critical Depth	0.26 ft
Channel Slope	0.500 %
Critical Slope	0.808 %

Cross Section for I-9A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.28 ft
Discharge	1.00 cfs



Worksheet for I-9A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.20 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.5 ft²
Wetted Perimeter	8.88 ft
Hydraulic Radius	0.06 ft
Top Width	8.80 ft
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Critical Slope	1.017 %
Velocity	0.98 ft/s
Velocity Head	0.01 ft
Specific Energy	0.22 ft
Froude Number	0.717
Flow Type	Subcritical

GVF Input Data

Worksheet for I-9A 9.5' Half Street

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

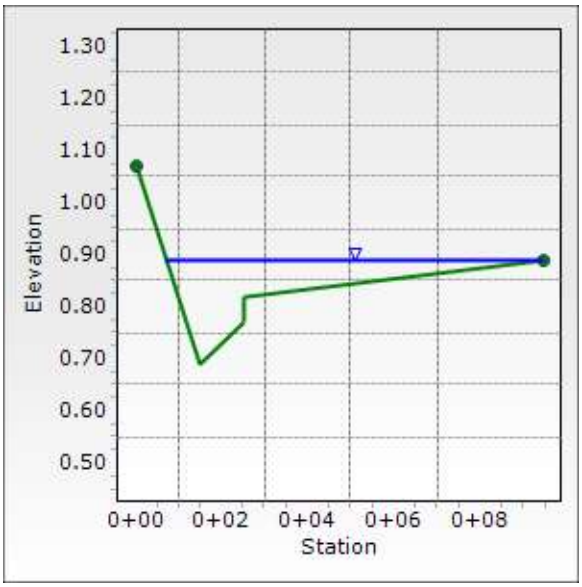
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Channel Slope	0.500 %
Critical Slope	1.017 %

Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.003067761 51974553ft.

Cross Section for I-9A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.20 ft
Discharge	0.50 cfs



Worksheet for I-10 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.22 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.4 ft²
Wetted Perimeter	4.21 ft
Hydraulic Radius	0.09 ft
Top Width	4.13 ft
Normal Depth	0.22 ft
Critical Depth	0.20 ft
Critical Slope	0.874 %
Velocity	1.32 ft/s
Velocity Head	0.03 ft
Specific Energy	0.25 ft
Froude Number	0.769
Flow Type	Subcritical

Worksheet for I-10 25.5' Half Street

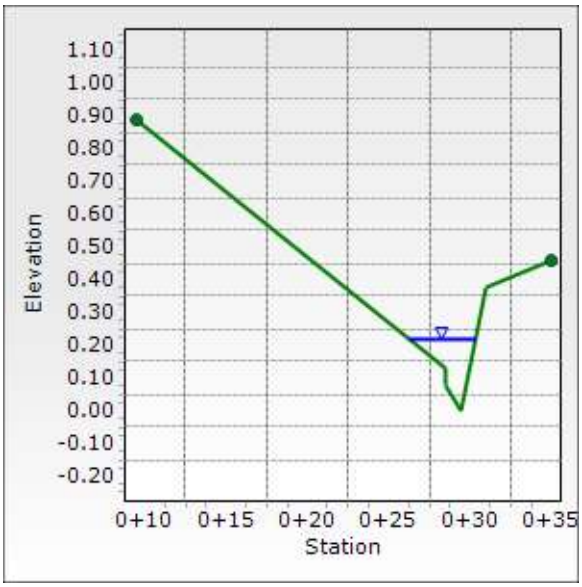
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.22 ft
Critical Depth	0.20 ft
Channel Slope	0.500 %
Critical Slope	0.874 %

Cross Section for I-10 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.22 ft
Discharge	0.50 cfs



Worksheet for I-10 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.20 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.5 ft²
Wetted Perimeter	8.88 ft
Hydraulic Radius	0.06 ft
Top Width	8.80 ft
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	0.98 ft/s
Velocity Head	0.01 ft
Specific Energy	0.22 ft
Froude Number	0.717
Flow Type	Subcritical

GVF Input Data

Worksheet for I-10 9.5' Half Street

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

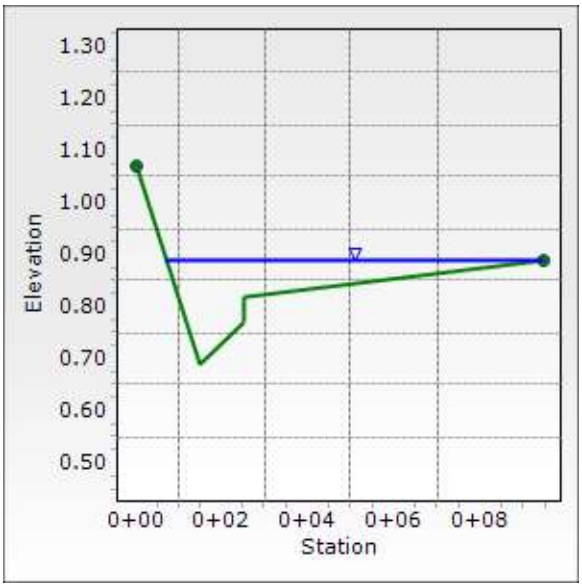
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Channel Slope	0.500 %
Critical Slope	1.018 %

Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.003002992 2372744ft.

Cross Section for I-10 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.20 ft
Discharge	0.50 cfs



Worksheet for I-11A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.780	%
Discharge	3.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.34	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.1	ft²
Wetted Perimeter	7.59	ft
Hydraulic Radius	0.14	ft
Top Width	7.49	ft
Normal Depth	0.34	ft
Critical Depth	0.40	ft
Critical Slope	0.702	%
Velocity	3.33	ft/s
Velocity Head	0.17	ft
Specific Energy	0.51	ft
Froude Number	1.564	
Flow Type	Supercritical	

Worksheet for I-11A 25.5' Half Street

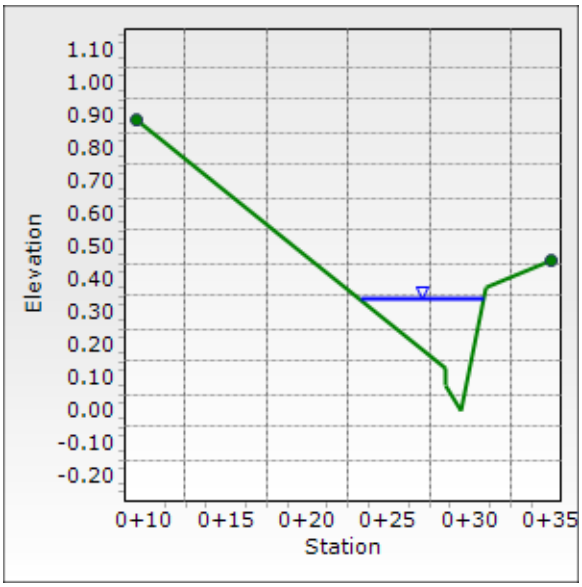
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.34 ft
Critical Depth	0.40 ft
Channel Slope	1.780 %
Critical Slope	0.702 %

Cross Section for I-11A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Normal Depth	0.34 ft
Discharge	3.50 cfs



Worksheet for I-11A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.780	%
Discharge	0.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18	ft
Elevation Range	0.69 to 1.07	ft
Flow Area	0.3	ft²
Wetted Perimeter	6.44	ft
Hydraulic Radius	0.05	ft
Top Width	6.36	ft
Normal Depth	0.18	ft
Critical Depth	0.19	ft
Critical Slope	1.018	%
Velocity	1.63	ft/s
Velocity Head	0.04	ft
Specific Energy	0.22	ft
Froude Number	1.307	
Flow Type	Supercritical	

GVF Input Data

Worksheet for I-11A 9.5' Half Street

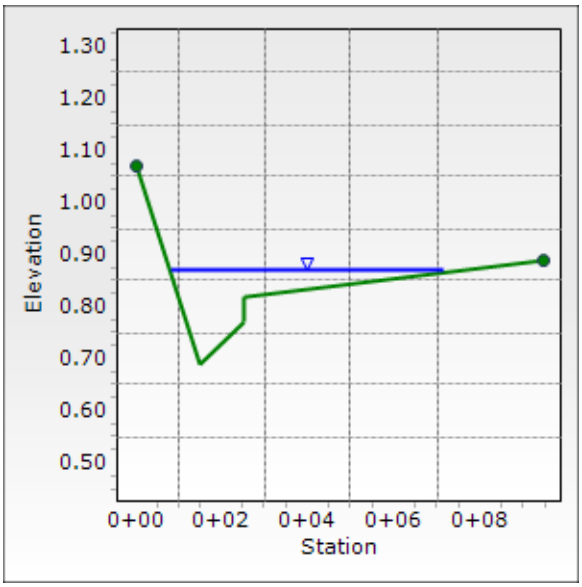
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.780 %
Critical Slope	1.018 %

Cross Section for I-11A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-11B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.22 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.4 ft²
Wetted Perimeter	4.34 ft
Hydraulic Radius	0.09 ft
Top Width	4.25 ft
Normal Depth	0.22 ft
Critical Depth	0.26 ft
Critical Slope	0.808 %
Velocity	2.52 ft/s
Velocity Head	0.10 ft
Specific Energy	0.32 ft
Froude Number	1.457
Flow Type	Supercritical

Worksheet for I-11B 25.5' Half Street

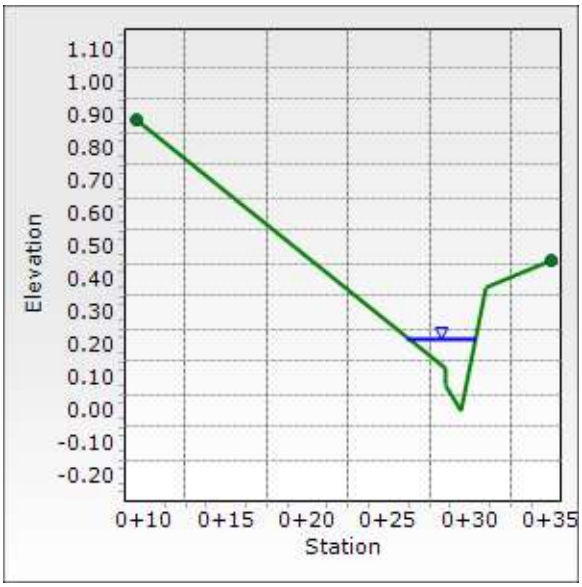
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.22 ft
Critical Depth	0.26 ft
Channel Slope	1.780 %
Critical Slope	0.808 %

Cross Section for I-11B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Normal Depth	0.22 ft
Discharge	1.00 cfs



Worksheet for I-11B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.44 ft
Hydraulic Radius	0.05 ft
Top Width	6.36 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.63 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.307
Flow Type	Supercritical

GVF Input Data

Worksheet for I-11B 9.5' Half Street

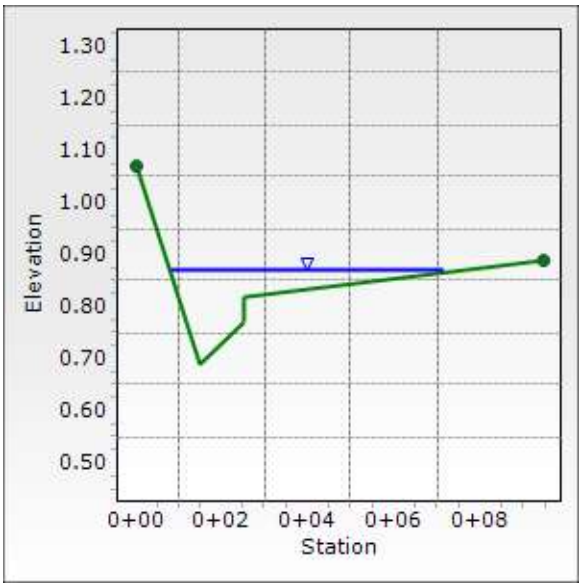
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.780 %
Critical Slope	1.018 %

Cross Section for I-11B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-12 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.920	%
Discharge	3.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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 0.89	ft
Flow Area	0.9	ft²
Wetted Perimeter	7.02	ft
Hydraulic Radius	0.13	ft
Top Width	6.92	ft
Normal Depth	0.32	ft
Critical Depth	0.37	ft
Critical Slope	0.703	%
Velocity	3.29	ft/s
Velocity Head	0.17	ft
Specific Energy	0.49	ft
Froude Number	1.600	
Flow Type	Supercritical	

Worksheet for I-12 25.5' Half Street

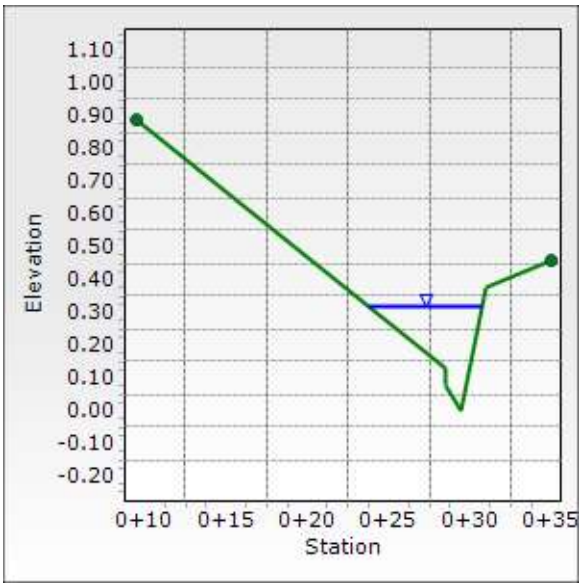
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
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	1.920 %
Critical Slope	0.703 %

Cross Section for I-12 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.920 %
Normal Depth	0.32 ft
Discharge	3.00 cfs



Worksheet for I-12 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.920 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.27 ft
Hydraulic Radius	0.05 ft
Top Width	6.19 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.017 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.356
Flow Type	Supercritical

GVF Input Data

Worksheet for I-12 9.5' Half Street

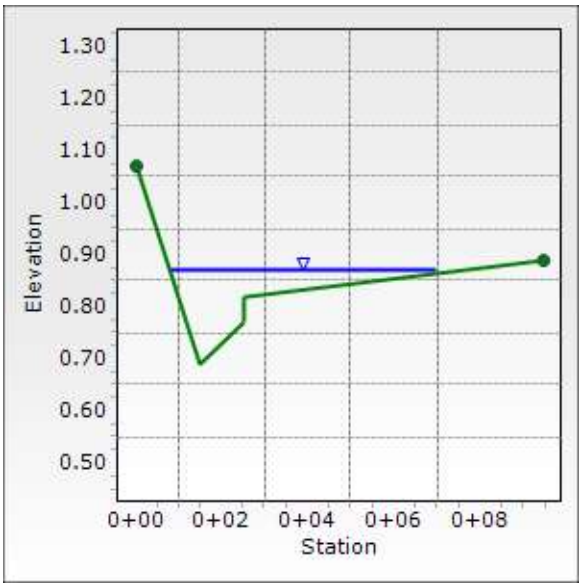
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.920 %
Critical Slope	1.017 %

Cross Section for I-12 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.920 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-13A North 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.900 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+15.50	0.44
0+29.00	0.17
0+29.00	0.13
0+30.50	0.00
0+30.50	0.48
0+31.00	0.50
0+35.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+15.50, 0.44)	(0+35.00, 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	0.30 ft
Elevation Range	0.00 to 0.60 ft
Flow Area	0.8 ft²
Wetted Perimeter	8.45 ft
Hydraulic Radius	0.09 ft
Top Width	8.10 ft
Normal Depth	0.30 ft
Critical Depth	0.37 ft
Critical Slope	0.777 %
Velocity	3.79 ft/s
Velocity Head	0.22 ft
Specific Energy	0.53 ft
Froude Number	2.139
Flow Type	Supercritical

Worksheet for I-13A North 35' Half Street (L Curb)

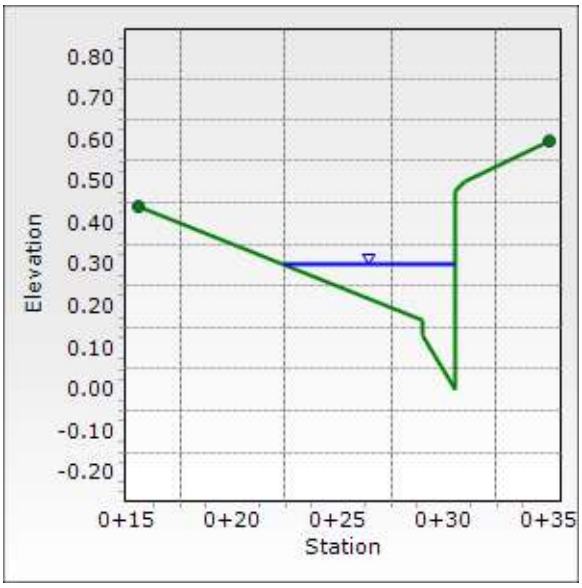
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.30 ft
Critical Depth	0.37 ft
Channel Slope	3.900 %
Critical Slope	0.777 %

Cross Section for I-13A North 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.900 %
Normal Depth	0.30 ft
Discharge	3.00 cfs



Worksheet for I-13A South 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.900 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+15.50	0.44

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+15.50, 0.44)	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	0.16 ft
Elevation Range	0.00 to 0.50 ft
Flow Area	0.1 ft²
Wetted Perimeter	1.70 ft
Hydraulic Radius	0.08 ft
Top Width	1.50 ft
Normal Depth	0.16 ft
Critical Depth	0.23 ft
Critical Slope	0.962 %
Velocity	3.52 ft/s
Velocity Head	0.19 ft
Specific Energy	0.35 ft
Froude Number	2.015
Flow Type	Supercritical

Worksheet for I-13A South 35' Half Street (L Curb)

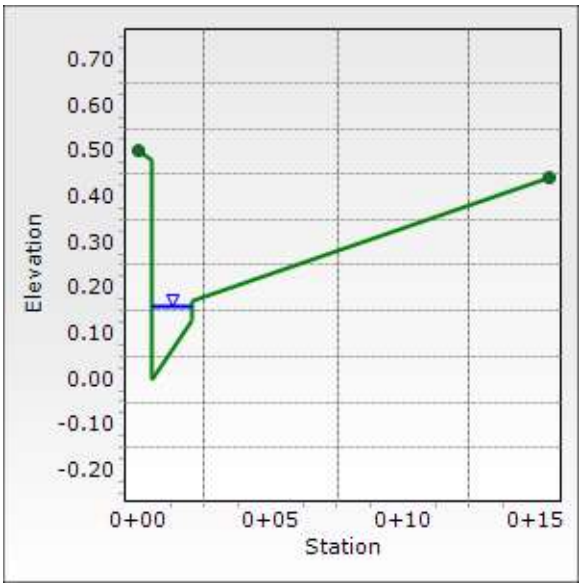
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.16 ft
Critical Depth	0.23 ft
Channel Slope	3.900 %
Critical Slope	0.962 %

Cross Section for I-13A South 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.900 %
Normal Depth	0.16 ft
Discharge	0.50 cfs



Worksheet for I-14 South 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+15.50	0.44

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+15.50, 0.44)	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	0.27 ft
Elevation Range	0.00 to 0.50 ft
Flow Area	0.6 ft²
Wetted Perimeter	6.90 ft
Hydraulic Radius	0.08 ft
Top Width	6.58 ft
Normal Depth	0.27 ft
Critical Depth	0.28 ft
Critical Slope	0.893 %
Velocity	1.76 ft/s
Velocity Head	0.05 ft
Specific Energy	0.32 ft
Froude Number	1.057
Flow Type	Supercritical

Worksheet for I-14 South 35' Half Street (L Curb)

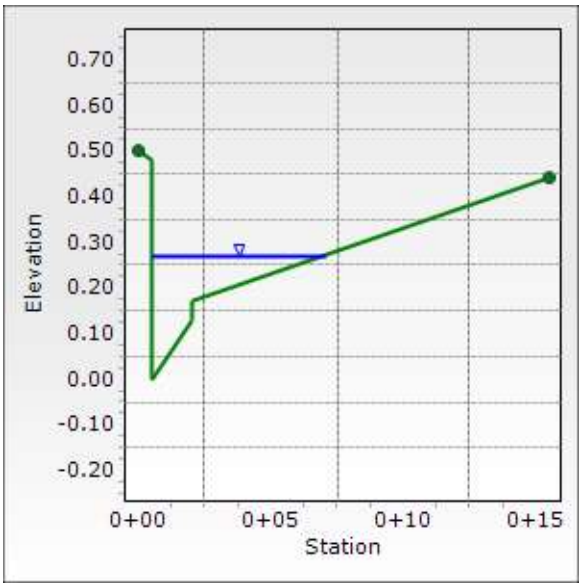
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.27 ft
Critical Depth	0.28 ft
Channel Slope	1.000 %
Critical Slope	0.893 %

Cross Section for I-14 South 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.27 ft
Discharge	1.00 cfs



Worksheet for I-15A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.890	%
Discharge	3.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.33	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.0	ft²
Wetted Perimeter	7.50	ft
Hydraulic Radius	0.14	ft
Top Width	7.40	ft
Normal Depth	0.33	ft
Critical Depth	0.40	ft
Critical Slope	0.702	%
Velocity	3.40	ft/s
Velocity Head	0.18	ft
Specific Energy	0.51	ft
Froude Number	1.608	
Flow Type	Supercritical	

Worksheet for I-15A 25.5' Half Street

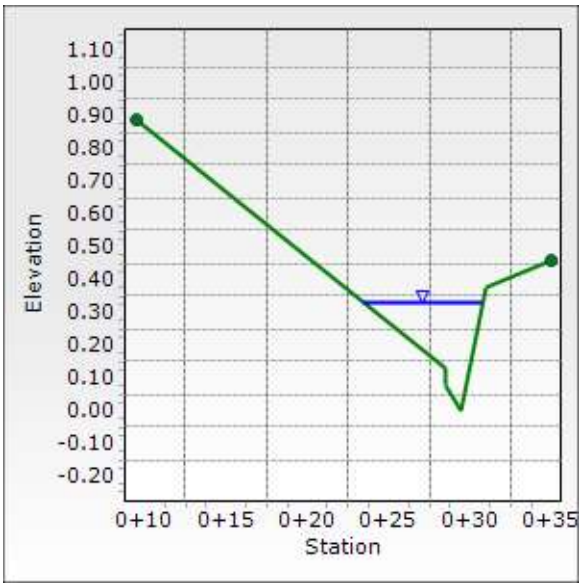
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.33 ft
Critical Depth	0.40 ft
Channel Slope	1.890 %
Critical Slope	0.702 %

Cross Section for I-15A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Normal Depth	0.33 ft
Discharge	3.50 cfs



Worksheet for I-15A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.30 ft
Hydraulic Radius	0.05 ft
Top Width	6.23 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.67 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.346
Flow Type	Supercritical

GVF Input Data

Worksheet for I-15A 9.5' Half Street

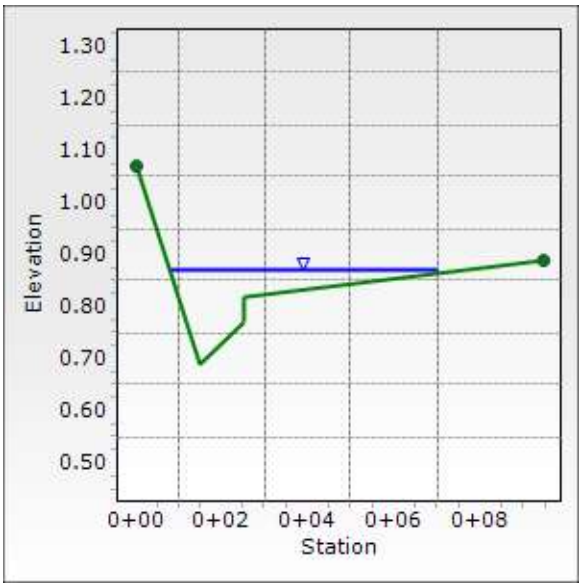
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.890 %
Critical Slope	1.018 %

Cross Section for I-15A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-15B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.130	%
Discharge	1.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.24	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	0.5	ft²
Wetted Perimeter	4.84	ft
Hydraulic Radius	0.10	ft
Top Width	4.76	ft
Normal Depth	0.24	ft
Critical Depth	0.26	ft
Critical Slope	0.808	%
Velocity	2.11	ft/s
Velocity Head	0.07	ft
Specific Energy	0.31	ft
Froude Number	1.175	
Flow Type	Supercritical	

Worksheet for I-15B 25.5' Half Street

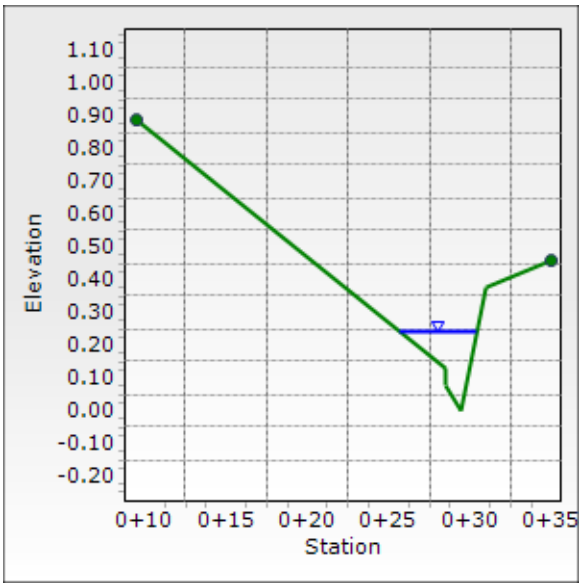
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.24 ft
Critical Depth	0.26 ft
Channel Slope	1.130 %
Critical Slope	0.808 %

Cross Section for I-15B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Normal Depth	0.24 ft
Discharge	1.00 cfs



Worksheet for I-15B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.19 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.4 ft²
Wetted Perimeter	7.44 ft
Hydraulic Radius	0.05 ft
Top Width	7.36 ft
Normal Depth	0.19 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.34 ft/s
Velocity Head	0.03 ft
Specific Energy	0.21 ft
Froude Number	1.052
Flow Type	Supercritical

GVF Input Data

Worksheet for I-15B 9.5' Half Street

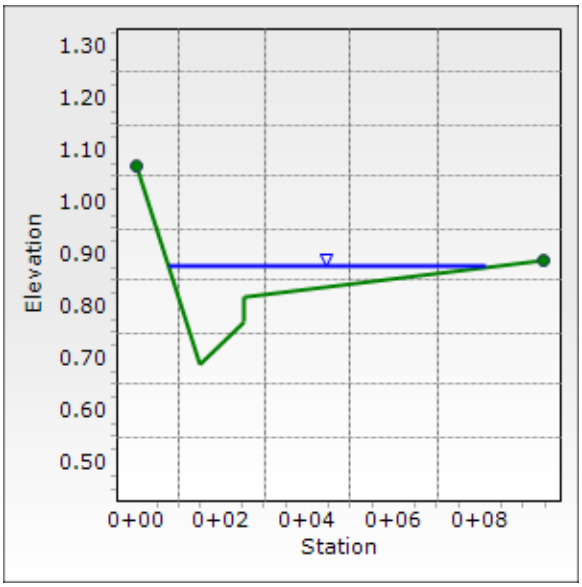
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.19 ft
Critical Depth	0.19 ft
Channel Slope	1.130 %
Critical Slope	1.018 %

Cross Section for I-15B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Normal Depth	0.19 ft
Discharge	0.50 cfs



Worksheet for I-16 North 35' Typical (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.900 %
Discharge	8.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+15.50	0.44
0+29.00	0.17
0+29.00	0.13
0+30.50	0.00
0+30.50	0.48
0+31.00	0.50
0+35.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+15.50, 0.44)	(0+35.00, 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	0.38 ft
Elevation Range	0.00 to 0.60 ft
Flow Area	1.6 ft²
Wetted Perimeter	12.63 ft
Hydraulic Radius	0.13 ft
Top Width	12.20 ft
Normal Depth	0.38 ft
Critical Depth	0.50 ft
Critical Slope	0.658 %
Velocity	5.23 ft/s
Velocity Head	0.43 ft
Specific Energy	0.81 ft
Froude Number	2.530
Flow Type	Supercritical

Worksheet for I-16 North 35' Typical (L Curb)

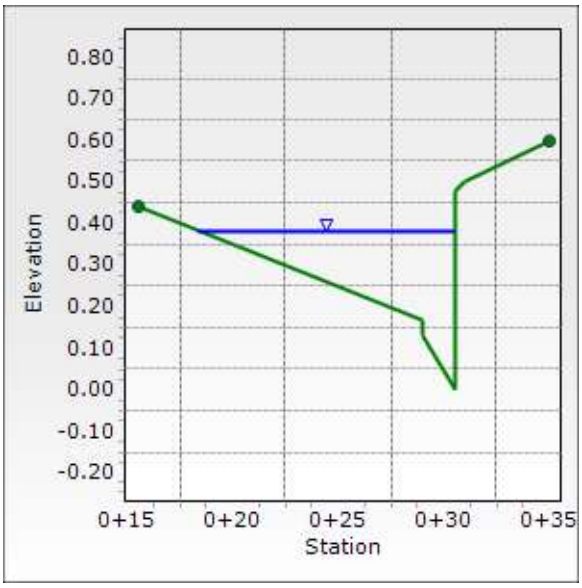
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.38 ft
Critical Depth	0.50 ft
Channel Slope	4.900 %
Critical Slope	0.658 %

Cross Section for I-16 North 35' Typical (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.900 %
Normal Depth	0.38 ft
Discharge	8.50 cfs



Worksheet for I-16A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.130	%
Discharge	4.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.38	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.4	ft²
Wetted Perimeter	8.79	ft
Hydraulic Radius	0.16	ft
Top Width	8.68	ft
Normal Depth	0.38	ft
Critical Depth	0.42	ft
Critical Slope	0.704	%
Velocity	2.88	ft/s
Velocity Head	0.13	ft
Specific Energy	0.51	ft
Froude Number	1.273	
Flow Type	Supercritical	

Worksheet for I-16A 25.5' Half Street

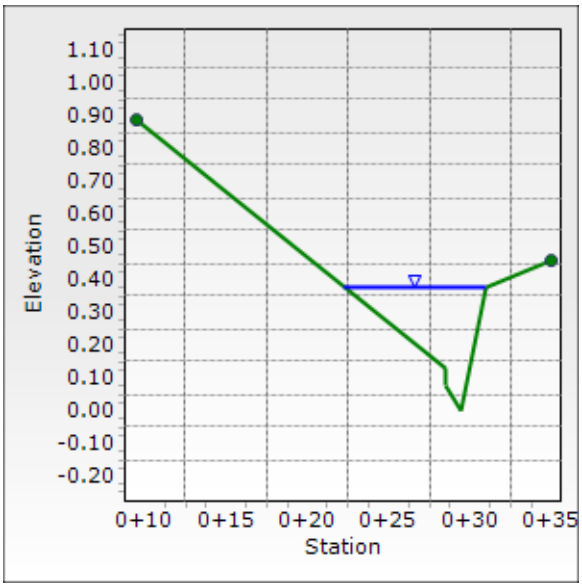
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.38 ft
Critical Depth	0.42 ft
Channel Slope	1.130 %
Critical Slope	0.704 %

Cross Section for I-16A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Normal Depth	0.38 ft
Discharge	4.00 cfs



Worksheet for I-16A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.19 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.4 ft²
Wetted Perimeter	7.44 ft
Hydraulic Radius	0.05 ft
Top Width	7.36 ft
Normal Depth	0.19 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.34 ft/s
Velocity Head	0.03 ft
Specific Energy	0.21 ft
Froude Number	1.052
Flow Type	Supercritical

GVF Input Data

Worksheet for I-16A 9.5' Half Street

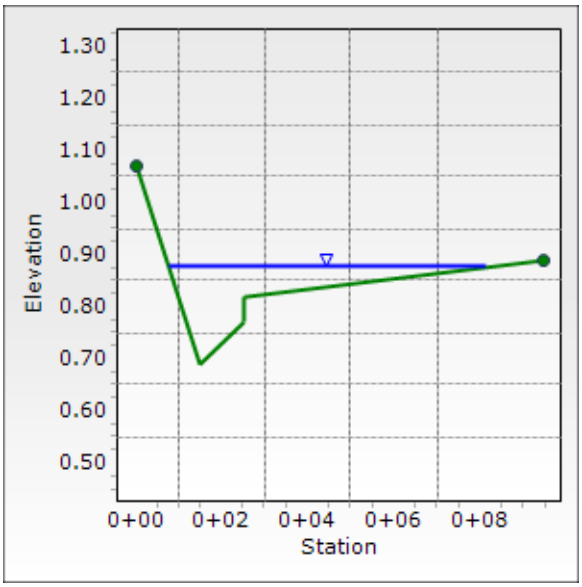
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.19 ft
Critical Depth	0.19 ft
Channel Slope	1.130 %
Critical Slope	1.018 %

Cross Section for I-16A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Normal Depth	0.19 ft
Discharge	0.50 cfs



Worksheet for I-16B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.360	%
Discharge	3.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.35	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.2	ft²
Wetted Perimeter	8.02	ft
Hydraulic Radius	0.15	ft
Top Width	7.92	ft
Normal Depth	0.35	ft
Critical Depth	0.40	ft
Critical Slope	0.702	%
Velocity	3.00	ft/s
Velocity Head	0.14	ft
Specific Energy	0.49	ft
Froude Number	1.379	
Flow Type	Supercritical	

Worksheet for I-16B 25.5' Half Street

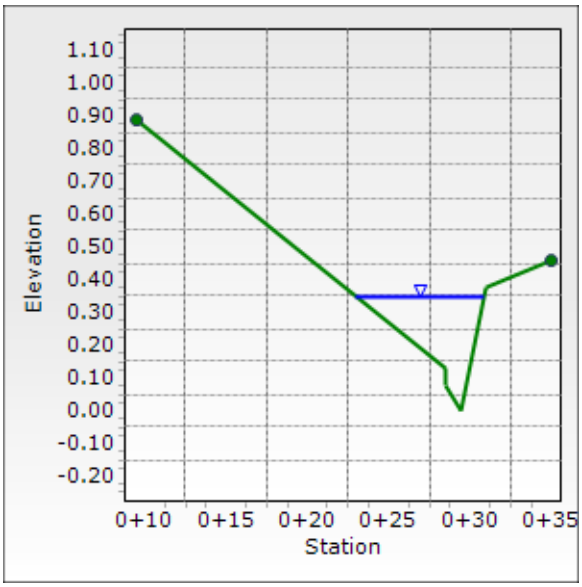
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.35 ft
Critical Depth	0.40 ft
Channel Slope	1.360 %
Critical Slope	0.702 %

Cross Section for I-16B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Normal Depth	0.35 ft
Discharge	3.50 cfs



Worksheet for I-16B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.360	%
Discharge	0.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18	ft
Elevation Range	0.69 to 1.07	ft
Flow Area	0.3	ft²
Wetted Perimeter	7.01	ft
Hydraulic Radius	0.05	ft
Top Width	6.93	ft
Normal Depth	0.18	ft
Critical Depth	0.19	ft
Critical Slope	1.017	%
Velocity	1.46	ft/s
Velocity Head	0.03	ft
Specific Energy	0.22	ft
Froude Number	1.154	
Flow Type	Supercritical	

GVF Input Data

Worksheet for I-16B 9.5' Half Street

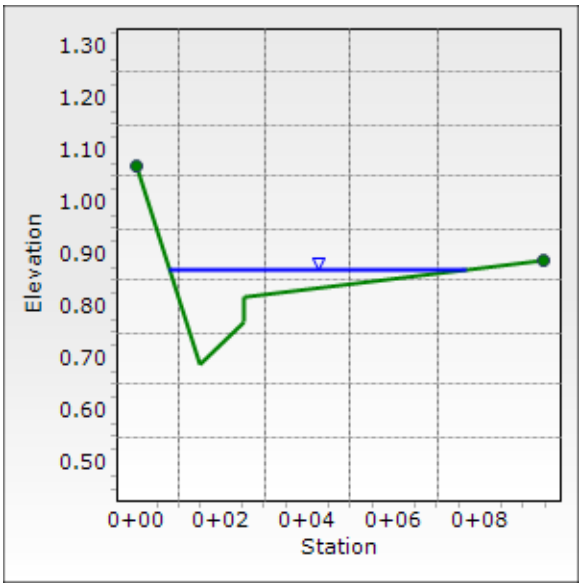
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.360 %
Critical Slope	1.017 %

Cross Section for I-16B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for H.25 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.06
0+00.00	0.06
0+01.00	0.00
0+02.00	0.06
0+06.00	0.14
0+08.00	0.18
0+17.00	0.36
0+17.00	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.06)	(0+00.00, 0.06)	0.013
(0+00.00, 0.06)	(0+02.00, 0.06)	0.025
(0+02.00, 0.06)	(0+06.00, 0.14)	0.013
(0+06.00, 0.14)	(0+08.00, 0.18)	0.035
(0+08.00, 0.18)	(0+17.00, 0.69)	0.013

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

Results	
Normal Depth	0.11 ft
Elevation Range	0.00 to 3.06 ft
Flow Area	0.2 ft²
Wetted Perimeter	4.69 ft
Hydraulic Radius	0.05 ft
Top Width	4.63 ft
Normal Depth	0.11 ft
Critical Depth	0.11 ft
Critical Slope	1.486 %

Worksheet for H.25 (TYP) East - Irregular Section

Results	
Velocity	1.06 ft/s
Velocity Head	0.02 ft
Specific Energy	0.13 ft
Froude Number	0.834
Flow Type	Subcritical

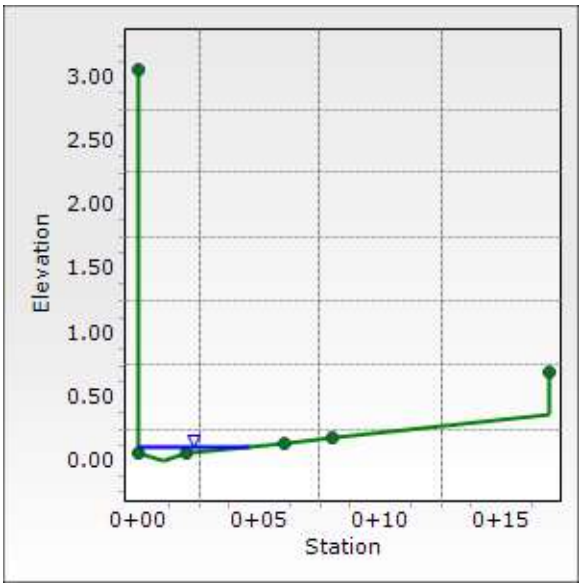
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.11 ft
Critical Depth	0.11 ft
Channel Slope	1.000 %
Critical Slope	1.486 %

Cross Section for H.25 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.11 ft
Discharge	0.25 cfs



Worksheet for H.25 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.68
0+00.00	0.35
0+09.00	0.17
0+11.00	0.13
0+15.00	0.05
0+16.00	0.00
0+17.00	0.05
0+17.00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.68)	(0+00.00, 0.35)	0.013
(0+00.00, 0.35)	(0+09.00, 0.17)	0.013
(0+09.00, 0.17)	(0+11.00, 0.13)	0.035
(0+11.00, 0.13)	(0+15.00, 0.05)	0.013
(0+15.00, 0.05)	(0+17.00, 0.05)	0.025
(0+17.00, 0.05)	(0+17.00, 2.50)	0.013

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

Results	
Normal Depth	0.11 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	0.2 ft²
Wetted Perimeter	4.83 ft
Hydraulic Radius	0.05 ft
Top Width	4.77 ft
Normal Depth	0.11 ft
Critical Depth	0.10 ft

Worksheet for H.25 (TYP) West - Irregular Section

Results	
Critical Slope	1.474 %
Velocity	1.05 ft/s
Velocity Head	0.02 ft
Specific Energy	0.12 ft
Froude Number	0.832
Flow Type	Subcritical

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

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.11 ft
Critical Depth	0.10 ft
Channel Slope	1.000 %
Critical Slope	1.474 %

Worksheet for H.25 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.68
0+00.00	0.35
0+09.00	0.17
0+11.00	0.13
0+15.00	0.05
0+16.00	0.00
0+17.00	0.05
0+17.00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.68)	(0+00.00, 0.35)	0.013
(0+00.00, 0.35)	(0+09.00, 0.17)	0.013
(0+09.00, 0.17)	(0+11.00, 0.13)	0.035
(0+11.00, 0.13)	(0+15.00, 0.05)	0.013
(0+15.00, 0.05)	(0+17.00, 0.05)	0.025
(0+17.00, 0.05)	(0+17.00, 2.50)	0.013

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

Results	
Normal Depth	0.11 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	0.2 ft²
Wetted Perimeter	4.83 ft
Hydraulic Radius	0.05 ft
Top Width	4.77 ft
Normal Depth	0.11 ft
Critical Depth	0.10 ft

Worksheet for H.25 (TYP) West - Irregular Section

Results	
Critical Slope	1.474 %
Velocity	1.05 ft/s
Velocity Head	0.02 ft
Specific Energy	0.12 ft
Froude Number	0.832
Flow Type	Subcritical

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

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.11 ft
Critical Depth	0.10 ft
Channel Slope	1.000 %
Critical Slope	1.474 %

Worksheet for H.50 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.06
0+00.00	0.06
0+01.00	0.00
0+02.00	0.06
0+06.00	0.14
0+08.00	0.18
0+17.00	0.36
0+17.00	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.06)	(0+00.00, 0.06)	0.013
(0+00.00, 0.06)	(0+02.00, 0.06)	0.025
(0+02.00, 0.06)	(0+06.00, 0.14)	0.013
(0+06.00, 0.14)	(0+08.00, 0.18)	0.035
(0+08.00, 0.18)	(0+17.00, 0.69)	0.013

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

Results	
Normal Depth	0.14 ft
Elevation Range	0.00 to 3.06 ft
Flow Area	0.4 ft²
Wetted Perimeter	6.10 ft
Hydraulic Radius	0.06 ft
Top Width	6.02 ft
Normal Depth	0.14 ft
Critical Depth	0.14 ft
Critical Slope	1.210 %

Worksheet for H.50 (TYP) East - Irregular Section

Results	
Velocity	1.31 ft/s
Velocity Head	0.03 ft
Specific Energy	0.17 ft
Froude Number	0.916
Flow Type	Subcritical

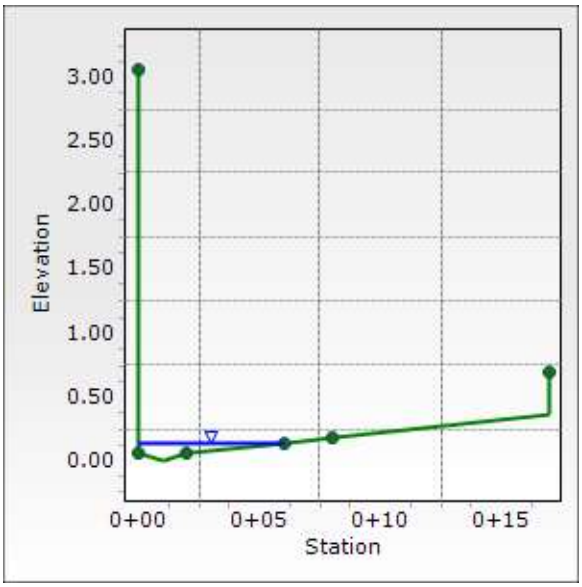
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.14 ft
Critical Depth	0.14 ft
Channel Slope	1.000 %
Critical Slope	1.210 %

Cross Section for H.50 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.14 ft
Discharge	0.50 cfs



Worksheet for H.50 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.68
0+00.00	0.35
0+09.00	0.17
0+11.00	0.13
0+15.00	0.05
0+16.00	0.00
0+17.00	0.05
0+17.00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.68)	(0+00.00, 0.35)	0.013
(0+00.00, 0.35)	(0+09.00, 0.17)	0.013
(0+09.00, 0.17)	(0+11.00, 0.13)	0.035
(0+11.00, 0.13)	(0+15.00, 0.05)	0.013
(0+15.00, 0.05)	(0+17.00, 0.05)	0.025
(0+17.00, 0.05)	(0+17.00, 2.50)	0.013

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

Results	
Normal Depth	0.13 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	0.4 ft²
Wetted Perimeter	6.32 ft
Hydraulic Radius	0.06 ft
Top Width	6.24 ft
Normal Depth	0.13 ft
Critical Depth	0.13 ft

Worksheet for H.50 (TYP) West - Irregular Section

Results	
Critical Slope	1.333 %
Velocity	1.25 ft/s
Velocity Head	0.02 ft
Specific Energy	0.16 ft
Froude Number	0.873
Flow Type	Subcritical

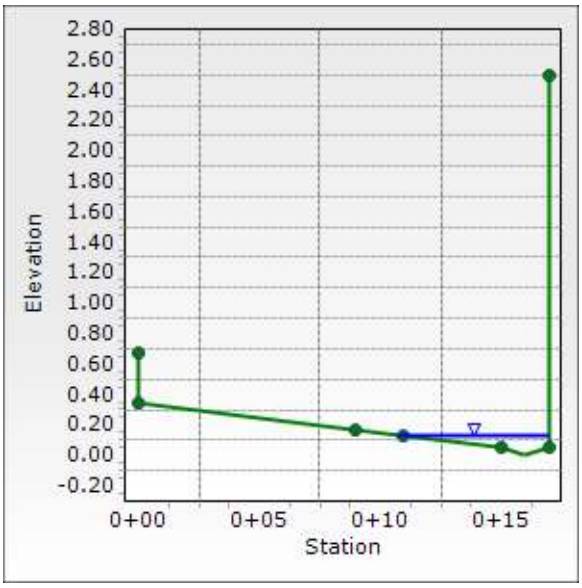
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.13 ft
Critical Depth	0.13 ft
Channel Slope	1.000 %
Critical Slope	1.333 %

Cross Section for H.50 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.13 ft
Discharge	0.50 cfs



Worksheet for H.75 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.75 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.06
0+00.00	0.06
0+01.00	0.00
0+02.00	0.06
0+06.00	0.14
0+08.00	0.18
0+17.00	0.36
0+17.00	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.06)	(0+00.00, 0.06)	0.013
(0+00.00, 0.06)	(0+02.00, 0.06)	0.025
(0+02.00, 0.06)	(0+06.00, 0.14)	0.013
(0+06.00, 0.14)	(0+08.00, 0.18)	0.035
(0+08.00, 0.18)	(0+17.00, 0.36)	0.013
(0+17.00, 0.36)	(0+17.00, 0.69)	0.013

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

Results	
Normal Depth	0.18 ft
Elevation Range	0.00 to 3.06 ft
Flow Area	0.6 ft²
Wetted Perimeter	7.90 ft
Hydraulic Radius	0.08 ft
Top Width	7.78 ft
Normal Depth	0.18 ft
Critical Depth	0.16 ft

Worksheet for H.75 (TYP) East - Irregular Section

Results	
Critical Slope	1.869 %
Velocity	1.20 ft/s
Velocity Head	0.02 ft
Specific Energy	0.20 ft
Froude Number	0.746
Flow Type	Subcritical

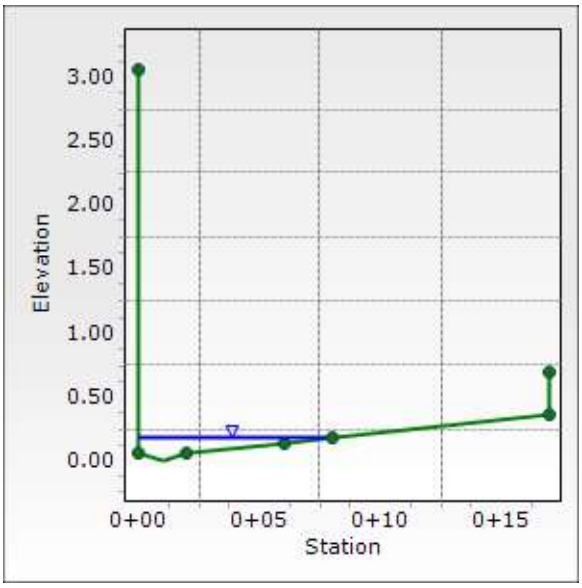
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.18 ft
Critical Depth	0.16 ft
Channel Slope	1.000 %
Critical Slope	1.869 %

Cross Section for H.75 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.18 ft
Discharge	0.75 cfs



Worksheet for H.75 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.75 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.68
0+00.00	0.35
0+09.00	0.17
0+11.00	0.13
0+15.00	0.05
0+16.00	0.00
0+17.00	0.05
0+17.00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.68)	(0+00.00, 0.35)	0.013
(0+00.00, 0.35)	(0+09.00, 0.17)	0.013
(0+09.00, 0.17)	(0+11.00, 0.13)	0.035
(0+11.00, 0.13)	(0+15.00, 0.05)	0.013
(0+15.00, 0.05)	(0+17.00, 0.05)	0.025
(0+17.00, 0.05)	(0+17.00, 2.50)	0.013

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

Results	
Normal Depth	0.17 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	0.6 ft²
Wetted Perimeter	8.01 ft
Hydraulic Radius	0.08 ft
Top Width	7.89 ft
Normal Depth	0.17 ft
Critical Depth	0.15 ft

Worksheet for H.75 (TYP) West - Irregular Section

Results	
Critical Slope	1.906 %
Velocity	1.19 ft/s
Velocity Head	0.02 ft
Specific Energy	0.19 ft
Froude Number	0.739
Flow Type	Subcritical

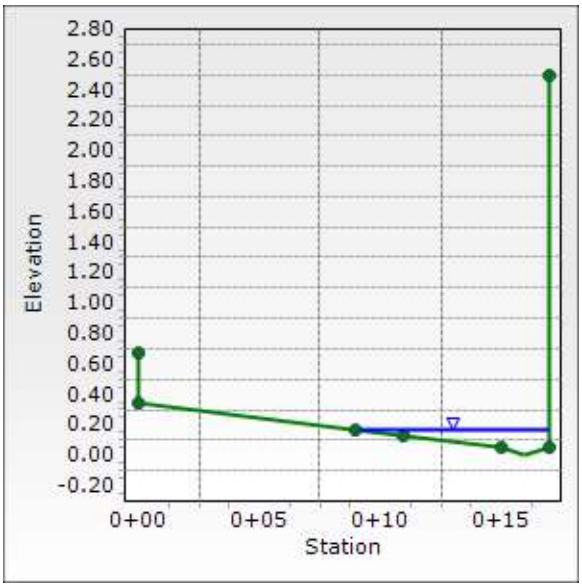
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.17 ft
Critical Depth	0.15 ft
Channel Slope	1.000 %
Critical Slope	1.906 %

Cross Section for H.75 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.17 ft
Discharge	0.75 cfs



Worksheet for O.25 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.84
0+00.00	0.18
0+02.50	0.05
0+03.50	0.00
0+04.50	0.05
0+08.50	0.13
0+13.00	1.63
0+13.00	2.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.84)	(0+00.00, 0.18)	0.013
(0+00.00, 0.18)	(0+02.50, 0.05)	0.035
(0+02.50, 0.05)	(0+04.50, 0.05)	0.025
(0+04.50, 0.05)	(0+08.50, 0.13)	0.013
(0+08.50, 0.13)	(0+13.00, 1.63)	0.035
(0+13.00, 1.63)	(0+13.00, 2.30)	0.013

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

Results	
Normal Depth	0.11 ft
Elevation Range	0.00 to 2.30 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.16 ft
Hydraulic Radius	0.05 ft
Top Width	6.15 ft
Normal Depth	0.11 ft
Critical Depth	0.10 ft

Worksheet for O.25 (TYP) - Irregular Section

Results	
Critical Slope	2.195 %
Velocity	0.86 ft/s
Velocity Head	0.01 ft
Specific Energy	0.12 ft
Froude Number	0.694
Flow Type	Subcritical

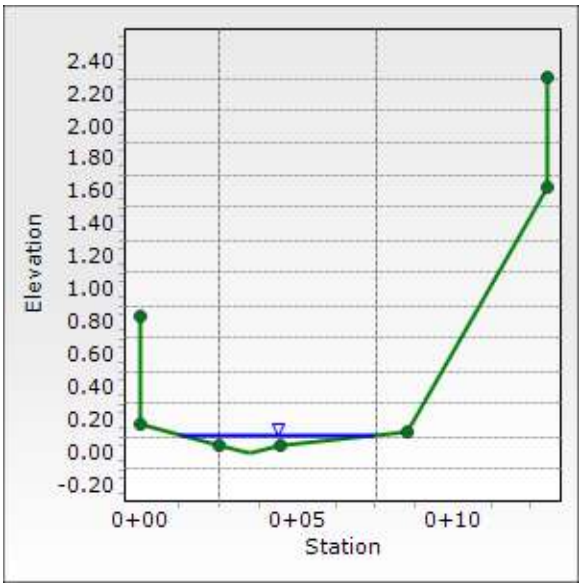
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.11 ft
Critical Depth	0.10 ft
Channel Slope	1.000 %
Critical Slope	2.195 %

Cross Section for O.25 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.11 ft
Discharge	0.25 cfs



Worksheet for O.50 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.84
0+00.00	0.18
0+02.50	0.05
0+03.50	0.00
0+04.50	0.05
0+08.50	0.13
0+13.00	1.63
0+13.00	2.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.84)	(0+00.00, 0.18)	0.013
(0+00.00, 0.18)	(0+02.50, 0.05)	0.035
(0+02.50, 0.05)	(0+04.50, 0.05)	0.025
(0+04.50, 0.05)	(0+08.50, 0.13)	0.013
(0+08.50, 0.13)	(0+13.00, 1.63)	0.035
(0+13.00, 1.63)	(0+13.00, 2.30)	0.013

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

Results	
Normal Depth	0.14 ft
Elevation Range	0.00 to 2.30 ft
Flow Area	0.5 ft²
Wetted Perimeter	7.77 ft
Hydraulic Radius	0.06 ft
Top Width	7.76 ft
Normal Depth	0.14 ft
Critical Depth	0.12 ft

Worksheet for O.50 (TYP) - Irregular Section

Results	
Critical Slope	2.035 %
Velocity	1.03 ft/s
Velocity Head	0.02 ft
Specific Energy	0.15 ft
Froude Number	0.721
Flow Type	Subcritical

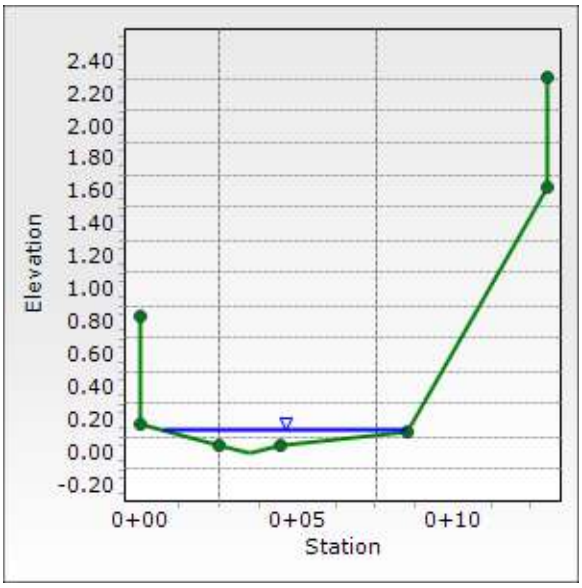
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.14 ft
Critical Depth	0.12 ft
Channel Slope	1.000 %
Critical Slope	2.035 %

Cross Section for O.50 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.14 ft
Discharge	0.50 cfs



Worksheet for O.75 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.75 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.84
0+00.00	0.18
0+02.50	0.05
0+03.50	0.00
0+04.50	0.05
0+08.50	0.13
0+13.00	1.63
0+13.00	2.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.84)	(0+00.00, 0.18)	0.013
(0+00.00, 0.18)	(0+02.50, 0.05)	0.035
(0+02.50, 0.05)	(0+04.50, 0.05)	0.025
(0+04.50, 0.05)	(0+08.50, 0.13)	0.013
(0+08.50, 0.13)	(0+13.00, 1.63)	0.035
(0+13.00, 1.63)	(0+13.00, 2.30)	0.013

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

Results	
Normal Depth	0.16 ft
Elevation Range	0.00 to 2.30 ft
Flow Area	0.7 ft²
Wetted Perimeter	8.24 ft
Hydraulic Radius	0.08 ft
Top Width	8.23 ft
Normal Depth	0.16 ft
Critical Depth	0.14 ft

Worksheet for O.75 (TYP) - Irregular Section

Results	
Critical Slope	2.046 %
Velocity	1.15 ft/s
Velocity Head	0.02 ft
Specific Energy	0.18 ft
Froude Number	0.722
Flow Type	Subcritical

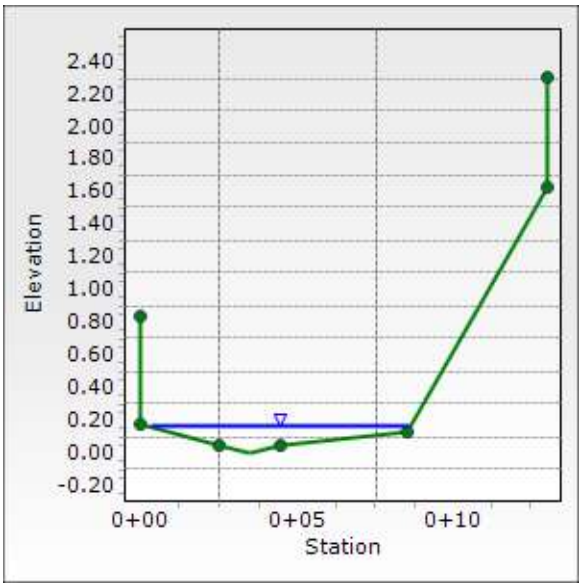
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.16 ft
Critical Depth	0.14 ft
Channel Slope	1.000 %
Critical Slope	2.046 %

Cross Section for O.75 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.16 ft
Discharge	0.75 cfs



Worksheet for (MIN) OFF3 - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.025
Channel Slope	3.370 %
Left Side Slope	10.000 H:V
Right Side Slope	3.000 H:V
Discharge	4.00 cfs

Results	
Normal Depth	0.41 ft
Flow Area	1.1 ft²
Wetted Perimeter	5.37 ft
Hydraulic Radius	0.20 ft
Top Width	5.28 ft
Critical Depth	0.47 ft
Critical Slope	1.505 %
Velocity	3.73 ft/s
Velocity Head	0.22 ft
Specific Energy	0.62 ft
Froude Number	1.459
Flow Type	Supercritical

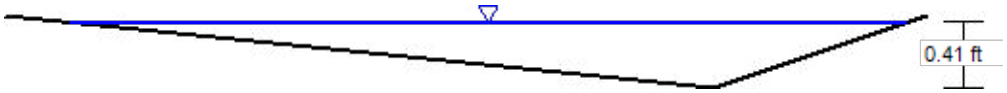
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

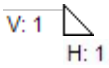
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.41 ft
Critical Depth	0.47 ft
Channel Slope	3.370 %
Critical Slope	1.505 %

Cross Section for (MIN) OFF3 - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.025
Channel Slope	3.370 %
Normal Depth	0.41 ft
Left Side Slope	10.000 H:V
Right Side Slope	3.000 H:V
Discharge	4.00 cfs





Worksheet for (MAX) OFF3 - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.044
Channel Slope	25.000 %
Left Side Slope	10.000 H:V
Right Side Slope	3.000 H:V
Discharge	4.00 cfs

Results	
Normal Depth	0.34 ft
Flow Area	0.8 ft²
Wetted Perimeter	4.56 ft
Hydraulic Radius	0.17 ft
Top Width	4.48 ft
Critical Depth	0.47 ft
Critical Slope	4.663 %
Velocity	5.17 ft/s
Velocity Head	0.42 ft
Specific Energy	0.76 ft
Froude Number	2.197
Flow Type	Supercritical

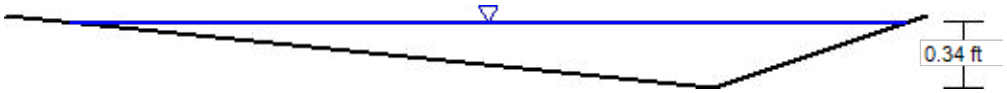
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

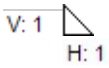
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.34 ft
Critical Depth	0.47 ft
Channel Slope	25.000 %
Critical Slope	4.663 %

Cross Section for (MAX) OFF3 - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.044
Channel Slope	25.000 %
Normal Depth	0.34 ft
Left Side Slope	10.000 H:V
Right Side Slope	3.000 H:V
Discharge	4.00 cfs





Date 09/24/19 Project 92935004

Calced by AD

Riprap Lining Calculation
Swale #1 - OFF3 (Max)

d_{50} = (3V* (S^0.17/S_s-1))^2

V = 7.9 ft/s

S = 0.25 ft/ft

S_S = 2.65 Specific Gravity

d_{50} = 1.5898 = 1.5898 x 12in/ft = 19.08-inches → Use d_{50} = 24-inches

Mannings N Calculator Using Equation 732 in the HCDDM			
Channel	d_{50} (in)	d_{50} (ft)	n
DITCH OFF3	24	2	0.044

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED MAINLINE - Connect to EX 42" RCP at Beltway Channel to Drive K to Drive D to Drive J to Drive E to Drive H

DATE: 09/26/19 FILE: SF6.xls

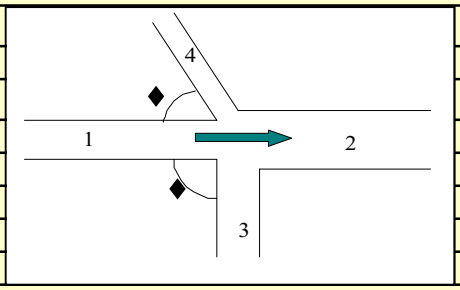
Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA								ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																			PIPE	TRANSITION																										
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S																																		
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(S_f) (ft/ft)	H_f (ft)	H_f (ft)	Θ (deg)	K_{mh}	H_{mh} (ft)	Θ (deg)	K_j	H_j (ft)	Inlet/ Cont	K_i	H_c (ft)	Θ (deg)	K_o	H_o (ft)	R_{bend} (ft)	Θ (deg)	K_b	H_b (ft)	H_m (ft)	Total (ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	PART FLOW	CRTL	
1		1000.00		42							17.54																				Outlet K_o=	1.0													CHAN
2	1000.00	1051.70	R	42					1	17.54	17.80	51.7	0.50%	9.62	0.0049	61.0	6.34	0.62	0.0037	0.0037	0.19																		0.00	21.92	21.30			PART	D/S	
3	1051.70	1056.70	T	42					1	17.80	17.95	5.0	3.00%	9.62	0.0049	61.0	6.34	0.62	0.0037	0.0037		0.02	0	0.02	0.01														0.03			22.07	21.45	FULL	D/S	SDMH18
4	1056.70	1095.14	R	42					1	17.95	20.06	38.4	5.50%	9.62	0.0049	61.0	6.34	0.62	0.0037	0.0037	0.14																		0.00	24.19	23.56			PART	D/S	
5	1095.14	1100.14	T	24					1	20.06	20.37	5.0	6.17%	3.14	0.0049	37.5	11.94	2.21	0.0274	0.0155		0.08	0	0.02	0.01														0.09			24.58	22.37	FULL	D/S	SDMH17
6	1100.14	1294.14	R	24					1	20.37	33.63	194.0	6.83%	3.14	0.0049	37.5	11.94	2.21	0.0274	0.0274	5.31																		0.00	37.84	35.63			PART	D/S	
7	1294.14	1299.14	T	24					1	33.63	33.83	5.0	4.06%	3.14	0.0049	21.5	6.84	0.73	0.0090	0.0182		0.09	90	1.33	2.94	0	0.85	1.59												4.63			42.47	41.74	FULL	U/S	SDMH14
8	1299.14	1493.82	R	24					1	33.83	36.37	194.7	1.30%	3.14	0.0049	21.5	6.84	0.73	0.0090	0.0090	1.75																		0.00	44.22	43.50			FULL	U/S	
9	1493.82	1498.82	T	24					1	36.37	36.44	5.0	1.50%	3.14	0.0049	15.5	4.93	0.38	0.0047	0.0068		0.03	0	0.02	0.01													0.68	0.73			44.95	44.57	FULL	U/S	SDMH13
10	1498.82	1636.01	R	24					1	36.44	38.76	137.2	1.69%	3.14	0.0049	15.5	4.93	0.38	0.0047	0.0047	0.64																		0.00	45.59	45.22			FULL	U/S	
11	1636.01	1641.01	T	24					1	38.76	38.83	5.0	1.50%	3.14	0.0049	15.5	4.93	0.38	0.0047	0.0047		0.02	8	0.05	0.02														0.04			45.64	45.26	FULL	U/S	SDMH12
12	1641.01	1867.03	R	24					1	38.83	41.77	226.0	1.30%	3.14	0.0049	15.5	4.93	0.38	0.0047	0.0047	1.06																		0.00	46.69	46.32			FULL	U/S	
13	1867.03	1872.03	T	18					1	41.77	41.84	5.0	1.42%	1.77	0.0049	11.5	6.51	0.66	0.0119	0.0083		0.04	0	0.02	0.01													0.99	1.04			47.73	47.07	FULL	U/S	SDMH11
14	1872.03	1944.56	R	18					1	41.84	42.96	72.5	1.55%	1.77	0.0049	11.5	6.51	0.66	0.0119	0.0119	0.87																		0.00	48.60	47.94			FULL	U/S	
15	1944.56	1949.56	T	18					1	42.96	43.07	5.0	2.16%	1.77	0.0049	10.5	5.94	0.55	0.0100	0.0109		0.05	0	0.02	0.01	45	0.50	0.38											0.45			49.05	48.50	FULL	U/S	SDMH9
16	1949.56	1998.89	R	18					1	43.07	44.43	49.3	2.76%	1.77	0.0049	10.5	5.94	0.55	0.0100	0.0100	0.49																		0.00	49.54	48.99			FULL	U/S	
17	1998.89	2003.89	T	18					1	44.43	44.67	5.0	4.73%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0079		0.04	45	0.46	0.25													0.44	0.73			50.27	49.95	FULL	U/S	SDMH8
18	2003.89	2109.49	R	18					1	44.67	51.73	105.6	6.69%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.61																		0.00	53.55	53.23			PART	D/S	
19	2109.49	2114.49	T	18					1	51.73	52.03	5.0	5.87%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058		0.03	45	0.46	0.15														0.18			53.84	53.53	FULL	D/S	SDMH7
20	2114.49	2149.06	R	18					1	52.03	53.77	34.6	5.05%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.20																		0.00	55.59	55.27			PART	D/S	
21	2149.06	2154.06	T	18					1	53.77	53.92	5.0	2.83%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0054		0.03	45	0.46	0.15														0.17			55.77	55.49	FULL	U/S	SDMH6
22	2154.06	2231.67	R	18					1	53.92	54.38	77.6	0.61%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.39																		0.00	56.16	55.88			FULL	D/S	
23	2231.67	2236.67	T	18					1	54.38	54.42	5.0	0.72%	1.77	0.0049	5	2.83	0.12	0.0023	0.0037		0.02	0	0.02	0.01	45	0.50	0.22											0.24			56.41	56.28	FULL	U/S	SDMH5
24	2236.67	2279.08	R	18					1	54.42	54.78	42.4	0.84%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023	0.10																		0.00	56.50	56.38			FULL	U/S	
25	2279.08	2284.08	T	18					1	54.78	54.81	5.0	0.65%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023		0.01	0	0.02	0.00	45	0.50	0.06											0.08			56.58	56.45	FULL	U/S	SDMH4
26	2284.08	2431.72	R	18					1	54.81	55.49	147.6	0.46%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023	0.33																		0.00	57.11	56.99			FULL	D/S	
27	2431.72	2436.72	T	18					1	55.49	55.53	5.0	0.87%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023		0.01	46	0.46	0.06														0.07			57.18	57.06	FULL	U/S	SDMH3
28	2436.72	2462.96	R	18					1	55.53	55.87	26.2	1.28%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023	0.06																		0.00	57.49	57.37			FULL	D/S	
29	2462.96	2467.96	T	18					1	55.87	55.95	5.0	1.67%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023		0.01	46	0.46	0.06														0.07			57.58	57.45	FULL	D/S	SDMH2
30	2467.96	2540.35	R	18					1	55.95	57.45	72.4	2.07%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023	0.16																		0.00	59.07	58.95			PART	D/S	
31	2540.35	2545.35	T	18					1	57.45	58.13	5.0	13.63%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0014		0.01	71	0.85	0.11	45	0.50	0.11											0.22			59.66	59.63	PART	D/S	SDMH1
32	2545.35	2558.22	R	18					1	58.13	61.37	12.9	25.19%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																		0.00	62.90	62.87			PART	D/S	
33	2558.22	2563.22	T	18					1	61.37	62.01	5.0	12.85%	1.77	0.0049	2.2	1.22	0.02	0.0004	0.0005		0.00	71	0.85	0.03	45	0.50	0.02											0.05			63.54	63.51	PART	D/S	DI4
34	2563.22	2572.22	R	18					1	62.01	62.06	9.0	0.50%	1.77	0.0049	2.2	1.22	0.02	0.0004	0.0004	0.00																		0.00	63.58	63.56			FULL	D/S	
35	2572.22	2572.22	R	18					1	62.06	62.06	0.0		1.77	0.0049	2.2	1.22	0.02	0.0004	0.0004	0.00																		0.02			63.60	63.60	FULL	U/S	DI3
36																													Ki=	0.4	0.01												
37																																												
38																																												
39																																												

Junction Head Loss Calculation

Known

Diameter of Pipe 1 (in)	24.0
Diameter of Pipe 2 (in)	24.0
Diameter of Pipe 3 (in)	18.0
Diameter of Pipe 4 (in)*	18.0
Flow in Pipe 1 (cfs)	16
Flow in Pipe 2 (cfs)	22
Flow in Pipe 3 (cfs)	1
Flow in Pipe 4 (cfs)*	6
Angle of Pipe 3	45
Angle of Pipe 4*	84



*Optional

Headloss is applied at Entrance to Junction

Solve For

Insert Loss in Misc. Loss Column and leave Junction Loss Column Blank

Area of Pipe 1 (ft^2)	3.14
Area of Pipe 2 (ft^2)	3.14
Area of Pipe 3 (ft^2)	1.77
Area of Pipe 4 (ft^2)	1.77
Head Loss at Junction (ft)	**0.68**

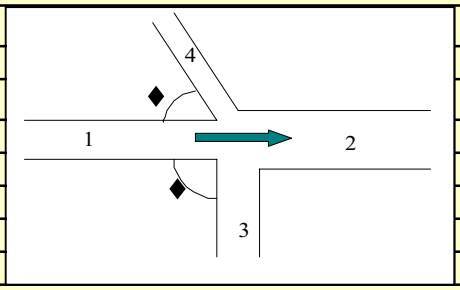
Equation Used:

Incorporates Pressure plus Momentum Laws

$$Hj=((Q_2^2/A_{2*g}-Q_1^2/A_{1*g}-Q_3^2*\cos(Ang3)/A_{3*g}-Q_4^2*\cos(Ang4)/A_{4*g})*2/(A_1+A_2)-D_1+D_2)$$

Junction Head Loss Calculation

Known		
Diameter of Pipe 1 (in)	18.0	
Diameter of Pipe 2 (in)	18.0	
Diameter of Pipe 3 (in)	18.0	
Diameter of Pipe 4 (in)*	18.0	
Flow in Pipe 1 (cfs)	12	
Flow in Pipe 2 (cfs)	16	
Flow in Pipe 3 (cfs)	1	
Flow in Pipe 4 (cfs)*	4	
Angle of Pipe 3	63	
Angle of Pipe 4*	45	



*Optional

Headloss is applied at Entrance to Junction

Solve For		
Area of Pipe 1 (ft^2)	1.77	Insert Loss in Misc. Loss Column and
Area of Pipe 2 (ft^2)	1.77	leave Junction Loss Column Blank
Area of Pipe 3 (ft^2)	1.77	
Area of Pipe 4 (ft^2)	1.77	
Head Loss at Junction (ft)	**0.99**	

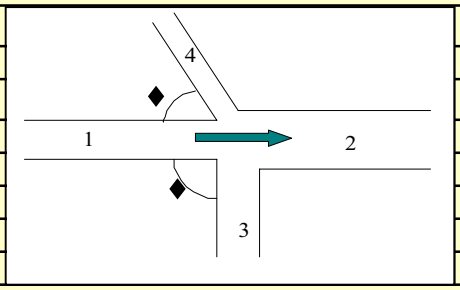
Equation Used:

Incorporates Pressure plus Momentum Laws

$$Hj=((Q_2^2/A_{2*g}-Q_1^2/A_{1*g}-Q_3^2*\cos(Ang3)/A_{3*g}-Q_4^2*\cos(Ang4)/A_{4*g})*2/(A_1+A_2)-D_1+D_2)$$

Junction Head Loss Calculation

Known		
Diameter of Pipe 1 (in)	18.0	
Diameter of Pipe 2 (in)	18.0	
Diameter of Pipe 3 (in)	18.0	
Diameter of Pipe 4 (in)*	18.0	
Flow in Pipe 1 (cfs)	8	
Flow in Pipe 2 (cfs)	11	
Flow in Pipe 3 (cfs)	1	
Flow in Pipe 4 (cfs)*	1	
Angle of Pipe 3	45	
Angle of Pipe 4*	45	



*Optional

Headloss is applied at Entrance to Junction

Insert Loss in Misc. Loss Column and leave Junction Loss Column Blank

Solve For	
Area of Pipe 1 (ft^2)	1.77
Area of Pipe 2 (ft^2)	1.77
Area of Pipe 3 (ft^2)	1.77
Area of Pipe 4 (ft^2)	1.77
Head Loss at Junction (ft)	**0.44**

Equation Used:

Incorporates Pressure plus Momentum Laws

$$Hj=((Q_2^2/A_{2*g}-Q_1^2/A_{1*g}-Q_3^2*\cos(Ang3)/A_{3*g}-Q_4^2*\cos(Ang4)/A_{4*g})*2/(A_1+A_2)-D_1+D_2)$$

Mainline - Summary of Results

						(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	17.54	21.04	20.53	19.91	21.41	CHAN		OK	NO
1051.70	17.80	21.30	21.92	21.30	36.73	SDMH18		OK	NO
1056.70	17.95	21.45	22.07	21.45	36.73			OK	NO
1095.14	20.06	23.56	24.19	23.56	38.16	SDMH17		OK	NO
1100.14	20.37	22.37	24.58	22.37	38.16			OK	NO
1294.14	33.63	35.63	37.84	35.63	44.84	SDMH14		OK	NO
1299.14	33.83	35.83	42.47	41.74	44.84			OK	YES
1493.82	36.37	38.37	44.22	43.50	47.37	SDMH13		OK	YES
1498.82	36.44	38.44	44.95	44.57	47.37			OK	YES
1636.01	38.76	40.76	45.59	45.22	49.31	SDMH12		OK	NO
1641.01	38.83	40.83	45.64	45.26	49.31			OK	NO
1867.03	41.77	43.77	46.69	46.32	52.42	SDMH11		OK	NO
1872.03	41.84	43.34	47.73	47.07	52.42			OK	NO
1944.56	42.96	44.46	48.60	47.94	53.46	SDMH9		OK	NO
1949.56	43.07	44.57	49.05	48.50	53.46			OK	NO
1998.89	44.43	45.93	49.54	48.99	55.00	SDMH8		OK	NO
2003.89	44.67	46.17	50.27	49.95	55.00			OK	NO
2109.49	51.73	53.23	53.55	53.23	62.39	SDMH7		OK	NO
2114.49	52.03	53.53	53.84	53.53	62.39			OK	NO
2149.06	53.77	55.27	55.59	55.27	64.41	SDMH6		OK	NO
2154.06	53.92	55.42	55.77	55.49	64.41			OK	NO
2231.67	54.38	55.88	56.16	55.88	64.94	SDMH5		OK	NO
2236.67	54.42	55.92	56.41	56.28	64.94			OK	NO
2279.08	54.78	56.28	56.50	56.38	65.22	SDMH4		OK	NO
2284.08	54.81	56.31	56.58	56.45	65.22			OK	NO
2431.72	55.49	56.99	57.11	56.99	66.03	SDMH3		OK	NO
2436.72	55.53	57.03	57.18	57.06	66.03			OK	NO
2462.96	55.87	57.37	57.49	57.37	66.36	SDMH2		OK	NO
2467.96	55.95	57.45	57.58	57.45	66.36			OK	NO
2540.35	57.45	58.95	59.07	58.95	68.04	SDMH1		OK	NO
2545.35	58.13	59.63	59.66	59.63	68.04			OK	NO
2558.22	61.37	62.87	62.90	62.87	67.97	DI4		OK	NO
2563.22	62.01	63.51	63.54	63.51	67.97			OK	NO
2572.22	62.06	63.56	63.58	63.56	68.30	DI3		OK	NO
2572.22	62.06	63.56	63.60	63.60	68.30			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH1 North

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							57.50																			Outlet K_o=	1.0													59.66	59.63			SDMH1
2	1000.00	1010.94	R	18					1	57.50	61.00	10.9	31.99%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																		0.00	62.53	62.50			PART	D/S	
3	1010.94	1015.94	T	18					1	61.00	61.81	5.0	16.25%	1.77	0.0049	2.2	1.24	0.02	0.0004	0.0005		0.00	47	0.46	0.01	45	0.50	0.02										0.04			63.34	63.31	PART	D/S	DI2
4	1015.94	1026.69	R	18					1	61.81	61.87	10.8	0.50%	1.77	0.0049	2.2	1.24	0.02	0.0004	0.0004	0.00																		0.00	63.39	63.37			FULL	D/S	
5	1026.69	1026.69	R	18					1	61.87	61.87	0.0		1.77	0.0049	2.2	1.24	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01							0.02			63.41	63.41	FULL	U/S	DI1
6																																													

SDMH 1 North - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	57.50	59.00	59.66	59.63	68.04	SDMH1		OK	NO
1010.94	61.00	62.50	62.53	62.50	68.08	DI2		OK	NO
1015.94	61.81	63.31	63.34	63.31	68.08			OK	NO
1026.69	61.87	63.37	63.39	63.37	68.46	DI1		OK	NO
1026.69	61.87	63.37	63.41	63.41	68.46			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH4

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							54.80																				Outlet K_o=	1.0												56.48	56.45			SDMH4
2	1000.00	1015.18	R	18					1	54.80	58.23	15.2	22.63%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																		0.00	59.77	59.73			PART	D/S	
3	1015.18	1020.18	T	18					1	58.23	58.81	5.0	11.57%	1.77	0.0049	2.3	1.30	0.03	0.0005	0.0005		0.00	45	0.46	0.01	45	0.50	0.02											0.03			60.34	60.31	PART	D/S	DI6
4	1020.18	1029.18	R	18					1	58.81	58.86	9.0	0.50%	1.77	0.0049	2.3	1.30	0.03	0.0005	0.0005	0.00																		0.00	60.38	60.36			FULL	D/S	
5	1029.18	1029.18	R	18					1	58.86	58.86	0.0		1.77	0.0049	2.3	1.30	0.03	0.0005	0.0005	0.00					45	0.50	0.01	Ki=	0.4	0.01								0.02			60.41	60.41	FULL	U/S	DI5
6																																													

SDMH 4 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	54.80	56.30	56.48	56.45	65.22	SDMH4		OK	NO
1015.18	58.23	59.73	59.77	59.73	64.86	DI6		OK	NO
1020.18	58.81	60.31	60.34	60.31	64.86			OK	NO
1029.18	58.86	60.36	60.38	60.36	64.93	DI5		OK	NO
1029.18	58.86	60.36	60.41	60.41	64.93			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH5

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont			(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							54.40																				Outlet K_o=	1.0											56.28	56.28			SDMH5
2	1000.00	1019.56	R	18					1	54.40	59.20	19.6	24.54%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	60.70	60.70			PART	D/S	
3	1019.56	1019.56	R	18					1	59.20	59.20	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00			45	0.50	0.00	Ki=	0.4	0.00									0.00			60.70	60.70	FULL	U/S	DI7
4																																													
5																																													
6																																													

SDMH 5 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	54.40	55.90	56.28	56.28	64.94	SDMH5		OK	NO
1019.56	59.20	60.70	60.70	60.70	65.17	DI7		OK	NO
1019.56	59.20	60.70	60.70	60.70	65.17			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH8 North

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA											FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																					PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							44.50																			Outlet K_o=		1.0												49.96	49.95			SDMH8
2	1000.00	1016.97	R	18					1	44.50	49.40	17.0	28.87%	1.77	0.0049	1.3	0.71	0.01	0.0001	0.0001	0.00																		0.00	50.91	50.90			PART	D/S
3	1016.97	1016.97	R	18					1	49.40	49.40	0.0		1.77	0.0049	1.3	0.71	0.01	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00								0.01			50.91	50.91	FULL	U/S	DI9
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SDMH 8 North - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	44.50	46.00	49.96	49.95	55.00	SDMH8		OK	NO
1016.97	49.40	50.90	50.91	50.90	55.29	DI9		OK	NO
1016.97	49.40	50.90	50.91	50.91	55.29			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH8 South

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							44.50																			Outlet K_o=		1.0												49.96	49.95			SDMH8
2	1000.00	1018.39	R	18					1	44.50	49.40	18.4	26.65%	1.77	0.0049	1.3	0.71	0.01	0.0001	0.0001	0.00																		0.00	50.91	50.90			PART	D/S	
3	1018.39	1018.39	R	18					1	49.40	49.40	0.0		1.77	0.0049	1.3	0.71	0.01	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00							0.01			50.91	50.91	FULL	U/S	DI11
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SDMH 8 South - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	44.50	46.00	49.96	49.95	55.00	SDMH8		OK	NO
1018.39	49.40	50.90	50.91	50.90	55.34	DI11		OK	NO
1018.39	49.40	50.90	50.91	50.91	55.34			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH9

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= D | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total					PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	H_f (ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)				(ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	FLOW	
1		1000.00		18							43.00																																				SDMH9
2	1000.00	1205.92	R	18					1	43.00	45.67	205.9	1.30%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.02																												
3	1205.92	1210.92	T	18					1	45.67	46.21	5.0	10.80%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001		0.00	45	0.46	0.00																									SDMH10
4	1210.92	1224.68	R	18					1	46.21	49.00	13.8	20.29%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00																												
5	1224.68	1224.68	R	18					1	49.00	49.00	0.0		1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00																DI12
6																																													

SDMH 9 - Summary of Results

						(Optional)			HGL with respect	Pressure Gasket
	STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1	1000.00	43.00	44.50	48.50	48.50	53.46	SDMH9		OK	NO
2	1205.92	45.67	47.17	48.52	48.52	56.23	SDMH10		OK	NO
3	1210.92	46.21	47.71	48.53	48.52	56.23			OK	NO
4	1224.68	49.00	50.50	50.50	50.50	56.50	DI12		OK	NO
5	1224.68	49.00	50.50	50.51	50.51	56.50			OK	NO
6										
7										
8										
9										
10										
11										
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Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH11 East

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(deg)		(ft)	(ft)	(deg)				EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							41.80																			Outlet K_o=	1.0											47.13	47.07			SDMH11
2	1000.00	1015.08	R	18					1	41.80	45.40	15.1	23.89%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0011	0.02																		0.00	47.15	47.09			FULL	U/S
3	1015.08	1020.08	T	18					1	45.40	46.01	5.0	12.20%	1.77	0.0049	2.1	1.19	0.02	0.0004	0.0008		0.00	48	0.46	0.03	45	0.50	0.05											0.08			47.53	47.51	PART	D/S	DI14
4	1020.08	1029.08	R	18					1	46.01	46.06	9.0	0.50%	1.77	0.0049	2.1	1.19	0.02	0.0004	0.0004	0.00																		0.00	47.58	47.56			FULL	D/S
5	1029.08	1029.08	R	18					1	46.06	46.06	0.0		1.77	0.0049	2.1	1.19	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01								0.02			47.60	47.60	FULL	U/S	DI13
6																																													

SDMH 11 East - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	41.80	43.30	47.13	47.07	52.42	SDMH11		OK	NO
1015.08	45.40	46.90	47.15	47.09	51.98	DI14		OK	NO
1020.08	46.01	47.51	47.53	47.51	51.98			OK	NO
1029.08	46.06	47.56	47.58	47.56	52.13	DI13		OK	NO
1029.08	46.06	47.56	47.60	47.60	52.13			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH11 West

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA											FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																					PIPE	TRANSITION																												
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend			Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(deg)		(ft)	(ft)	(deg)				(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							41.80																			Outlet K_o=		1.0												47.07	47.07			SDMH11
2	1000.00	1013.49	R	18					1	41.80	46.70	13.5	36.32%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	48.20	48.20			PART	D/S
3	1013.49	1013.49	R	18					1	46.70	46.70	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00					45	0.50	0.00	Ki=	0.4	0.00								0.00			48.20	48.20	FULL	U/S	DI15
4																																													
5																																													
6																																													

SDMH 11 West - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	41.80	43.30	47.07	47.07	52.42	SDMH11		OK	NO
1013.49	46.70	48.20	48.20	48.20	52.66	DI15		OK	NO
1013.49	46.70	48.20	48.20	48.20	52.66			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH13 East

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							36.40																			Outlet K_o=	1.0																SDMH13
2	1000.00	1010.59	R	18					1	36.40	39.23	10.6	26.75%	1.77	0.0049	5.5	3.11	0.15	0.0027	0.0027	0.03																		0.00	44.75	44.60		44.72	44.57	FULL	U/S	
3	1010.59	1015.59	T	18					1	39.23	39.91	5.0	13.63%	1.77	0.0049	3.2	1.81	0.05	0.0009	0.0018		0.01	83	1.06	0.16	45	0.50	0.12											0.29			45.04	44.99	FULL	U/S	DI18
4	1015.59	1024.59	R	18					1	39.91	39.96	9.0	0.50%	1.77	0.0049	3.2	1.81	0.05	0.0009	0.0009	0.01																		0.00	45.05	45.00			FULL	U/S	
5	1024.59	1024.59	R	18					1	39.96	39.96	0.0		1.77	0.0049	3.2	1.81	0.05	0.0009	0.0009	0.00					45	0.50	0.03	Ki=	0.4	0.02								0.05			45.10	45.10	FULL	U/S	DI17
6																																													

SDMH 13 East - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	36.40	37.90	44.72	44.57	47.37	SDMH13		OK	YES
1010.59	39.23	40.73	44.75	44.60	46.79	DI18		OK	NO
1015.59	39.91	41.41	45.04	44.99	46.79			OK	NO
1024.59	39.96	41.46	45.05	45.00	46.95	DI17		OK	NO
1024.59	39.96	41.46	45.10	45.10	46.95			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH13 West

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM (ft)	TO (ft)	T/R	D (in)	SPAN (ft)	RISE (ft)	AREA (ft^2)	HYD RAD (ft)		D/S (ft)	U/S (ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	S_f (ft/ft)	H_f (ft)	H_f (ft)	Θ (deg)	K_{mh}	H_{mh} (ft)	Θ (deg)	K_j	H_j (ft)	Inlet/ Cont	K_j	H_c (ft)	Θ (deg)	K_o	H_o (ft)	R_{bend} (ft)	Θ (deg)	K_b	H_b (ft)	H_m (ft)	Total (ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	PART FLOW	CRTL	
1		1000.00		18							36.40																																			SDMH13
																															Outlet K_o=	1.0														
2	1000.00	1016.97	R	18					1	36.40	41.70	17.0	31.23%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	44.57	44.57			FULL	U/S	
3	1016.97	1016.97	R	18					1	41.70	41.70	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00				45	0.50	0.00	Ki=	0.4	0.00									0.00			44.57	44.57	FULL	U/S	DI16
4																																												
5																																												
6																																												

SDMH 13 West - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	36.40	37.90	44.57	44.57	47.37	SDMH13		OK	YES
1016.97	41.70	43.20	44.57	44.57	47.69	DI16		OK	NO
1016.97	41.70	43.20	44.57	44.57	47.69			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH14 MAINLINE DRIVE F TO DRIVE K

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																					EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																									
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)			(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)				EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18						33.80																				Outlet K_o=	1.0											43.01	41.74			
2	1000.00	1194.84	R	18					1	33.80	43.87	194.8	5.17%	1.77	0.0049	16.0	9.05	1.27	0.0231	0.0231	4.50																		0.00	47.52	46.24			FULL	U/S	SDMH14
3	1194.84	1199.84	T	18					1	43.87	44.12	5.0	4.97%	1.77	0.0049	11.0	6.22	0.60	0.0109	0.0170		0.09	0	0.02	0.03	90	0.25	1.12										1.23			48.75	48.15	FULL	U/S	SDMH27
4	1199.84	1267.09	R	18					1	44.12	47.33	67.3	4.78%	1.77	0.0049	11.0	6.22	0.60	0.0109	0.0109	0.73																0.00	49.48	48.88			FULL	U/S	
5	1267.09	1272.09	T	18					1	47.33	47.54	5.0	4.28%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0080		0.04	0	0.02	0.01											0.58	0.63			50.11	49.83	FULL	U/S	SDMH30
6	1272.09	1347.84	R	18					1	47.54	50.41	75.8	3.78%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.38																0.00	52.19	51.91			PART	D/S	
7	1347.84	1352.84	T	18					1	50.41	50.58	5.0	3.47%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051		0.03	45	0.46	0.13											0.15			52.36	52.08	FULL	D/S	SDMH31
8	1352.84	1388.96	R	18					1	50.58	51.72	36.1	3.16%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.18																0.00	53.50	53.22			PART	D/S	
9	1388.96	1393.96	T	18					1	51.72	51.85	5.0	2.57%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051		0.03	45	0.46	0.13											0.15			53.65	53.38	FULL	U/S	SDMH32
10	1393.96	1520.08	R	18					1	51.85	54.35	126.1	1.98%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.64																0.00	56.13	55.85			PART	D/S	
11	1520.08	1525.08	T	18					1	54.35	54.45	5.0	1.89%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0035		0.02	0	0.02	0.01	45	0.50	0.23										0.25			56.38	56.28	FULL	U/S	SDMH33
12	1525.08	1547.90	R	18					1	54.45	54.86	22.8	1.80%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.04																0.00	56.46	56.36			FULL	D/S	
13	1547.90	1552.90	T	18					1	54.86	54.93	5.0	1.54%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018		0.01	9	0.05	0.01											0.01			56.53	56.43	FULL	D/S	SDMH34
14	1552.90	1672.53	R	18					1	54.93	56.47	119.6	1.28%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.22																0.00	58.07	57.97			PART	D/S	
15	1672.53	1677.53	T	18					1	56.47	56.66	5.0	3.76%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018		0.01	21	0.11	0.01											0.02			58.26	58.16	FULL	D/S	SDMH35
16	1677.53	1728.58	R	18					1	56.66	59.84	51.1	6.24%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.09																0.00	61.44	61.34			PART	D/S	
17	1728.58	1733.58	T	18					1	59.84	60.01	5.0	3.37%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018		0.01	6	0.05	0.01	45	0.50	0.05										0.06			61.61	61.51	FULL	D/S	DI38
18	1733.58	1741.86	R	18					1	60.01	60.05	8.3	0.50%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.02																0.00	61.65	61.55			FULL	D/S	
19	1741.86	1746.86	T	18					1	60.05	60.15	5.0	1.98%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0015		0.01	0	0.02	0.00	45	0.50	0.07										0.08			61.73	61.67	FULL	U/S	DI39
20	1746.86	1819.56	R	18					1	60.15	62.66	72.7	3.45%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0011	0.08																0.00	64.22	64.16			PART	D/S	
21	1819.56	1824.56	T	18					1	62.66	62.76	5.0	1.98%	1.77	0.0049	2.8	1.58	0.04	0.0007	0.0009		0.00	0	0.02	0.00	45	0.50	0.04										0.05			64.30	64.26	FULL	D/S	DI8
22	1824.56	1832.56	R	18					1	62.76	62.80	8.0	0.50%	1.77	0.0049	2.8	1.58	0.04	0.0007	0.0007	0.01																0.00	64.34	64.30			FULL	D/S	
23	1832.56	1832.56	R	18					1	62.80	62.80	0.0		1.77	0.0049	2.8	1.58	0.04	0.0007	0.0007	0.00						45	0.50	0.02	Ki=	0.4	0.02							0.04			64.37	64.37	FULL	U/S	DI10
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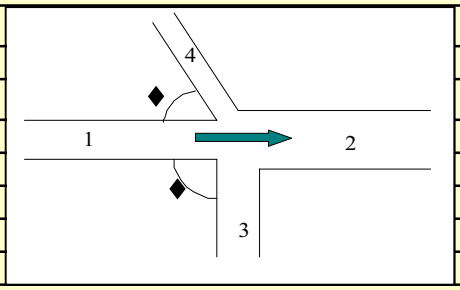
Junction Head Loss Calculation

Known		
Diameter of Pipe 1 (in)	18.0	
Diameter of Pipe 2 (in)	18.0	
Diameter of Pipe 3 (in)	18.0	
Diameter of Pipe 4 (in)*	18.0	
Flow in Pipe 1 (cfs)	8	
Flow in Pipe 2 (cfs)	11	
Flow in Pipe 3 (cfs)	1	
Flow in Pipe 4 (cfs)*	3	
Angle of Pipe 3	45	
Angle of Pipe 4*	45	



*Optional

Headloss is applied at Entrance to Junction

Solve For		
Area of Pipe 1 (ft^2)	1.77	Insert Loss in Misc. Loss Column and
Area of Pipe 2 (ft^2)	1.77	leave Junction Loss Column Blank
Area of Pipe 3 (ft^2)	1.77	
Area of Pipe 4 (ft^2)	1.77	

Head Loss at Junction (ft)	**0.58**

Equation Used:

Incorporates Pressure plus Momentum Laws

$$Hj=((Q_2^2/A_{2*g}-Q_1^2/A_{1*g}-Q_3^2*\cos(Ang3)/A_{3*g}-Q_4^2*\cos(Ang4)/A_{4*g})*2/(A_1+A_2)-D_1+D_2)$$

SDMH14 Mainline Drive F To Drive K - Summary of Results

						(Optional)			HGL with respect	Pressure Gasket
	STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1	1000.00	33.80	35.30	43.01	41.74	44.84	SDMH14		OK	YES
2	1194.84	43.87	45.37	47.52	46.24	54.51	SDMH27		OK	NO
3	1199.84	44.12	45.62	48.75	48.15	54.51			OK	NO
4	1267.09	47.33	48.83	49.48	48.88	57.95	SDMH30		OK	NO
5	1272.09	47.54	49.04	50.11	49.83	57.95			OK	NO
6	1347.84	50.41	51.91	52.19	51.91	61.04	SDMH31		OK	NO
7	1352.84	50.58	52.08	52.36	52.08	61.04			OK	NO
8	1388.96	51.72	53.22	53.50	53.22	62.30	SDMH32		OK	NO
9	1393.96	51.85	53.35	53.65	53.38	62.30			OK	NO
10	1520.08	54.35	55.85	56.13	55.85	64.86	SDMH33		OK	NO
11	1525.08	54.45	55.95	56.38	56.28	64.86			OK	NO
12	1547.90	54.86	56.36	56.46	56.36	65.40	SDMH34		OK	NO
13	1552.90	54.93	56.43	56.53	56.43	65.40			OK	NO
14	1672.53	56.47	57.97	58.07	57.97	67.01	SDMH35		OK	NO
15	1677.53	56.66	58.16	58.26	58.16	67.01			OK	NO
16	1728.58	59.84	61.34	61.44	61.34	67.04	DI38		OK	NO
17	1733.58	60.01	61.51	61.61	61.51	67.04			OK	NO
18	1741.86	60.05	61.55	61.65	61.55	67.23	DI39		OK	NO
19	1746.86	60.15	61.65	61.73	61.67	67.23			OK	NO
20	1819.56	62.66	64.16	64.22	64.16	68.62	DI8		OK	NO
21	1824.56	62.76	64.26	64.30	64.26	68.62			OK	NO
22	1832.56	62.80	64.30	64.34	64.30	68.81	DI10		OK	NO
23	1832.56	62.80	64.30	64.37	64.37	68.81			OK	NO
24										
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Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH15

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	H_f (ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							47.37																			Outlet K_o=		1.0										48.92	48.92			SDMH15
2	1000.00	1014.47	R	18					1	47.37	50.81	14.5	23.74%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00																		0.00	52.31	52.31			PART	D/S	
3	1014.47	1019.47	T	18					1	50.81	51.41	5.0	12.12%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001		0.00	45	0.46	0.00	45	0.50	0.00											0.01			52.92	52.91	PART	D/S	DI41
4	1019.47	1028.47	R	18					1	51.41	51.46	9.0	0.50%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00																		0.00	52.96	52.96			FULL	D/S	
5	1028.47	1028.47	R	18					1	51.46	51.46	0.0		1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00								0.00			52.97	52.97	FULL	U/S	DI40
6																																													

SDMH 15 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	47.37	48.87	48.92	48.92	57.76	SDMH15		OK	NO
1014.47	50.81	52.31	52.31	52.31	57.33	DI41		OK	NO
1019.47	51.41	52.91	52.92	52.91	57.33			OK	NO
1028.47	51.46	52.96	52.96	52.96	57.46	DI40		OK	NO
1028.47	51.46	52.96	52.97	52.97	57.46			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH17 MAINLINE DRIVE C

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA								ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																			PIPE	TRANSITION																										
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend					Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)			(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							20.20																				Outlet K_o=	1.0														SDMH17
2	1000.00	1014.20	R	18					1	20.20	22.15	14.2	13.76%	1.77	0.0049	23.5	13.30	2.75	0.0498	0.0498	0.71																				0.00	27.01	24.27					
3	1014.20	1019.20	T	18					1	22.15	22.84	5.0	13.76%	1.77	0.0049	22.0	12.45	2.41	0.0437	0.0468		0.23	0	0.02	0.05	45	0.50	1.54												1.83			28.85	26.44	FULL	U/S	SDMH19
4	1019.20	1025.85	R	18					1	22.84	23.76	6.7	13.76%	1.77	0.0049	22.0	12.45	2.41	0.0437	0.0437	0.29																				0.00	29.14	26.73			FULL	U/S	
5	1025.85	1030.85	T	18					1	23.76	24.18	5.0	8.37%	1.77	0.0049	13.0	7.36	0.84	0.0153	0.0295		0.15	45	0.46	1.11	29	0.72	1.80												3.06			32.19	31.35	FULL	U/S	DI19
6	1030.85	1157.04	R	18					1	24.18	27.93	126.2	2.97%	1.77	0.0049	13.0	7.36	0.84	0.0153	0.0153	1.92																				0.00	34.12	33.28			FULL	U/S	
7	1157.04	1162.04	T	18					1	27.93	28.07	5.0	2.85%	1.77	0.0049	11.0	6.22	0.60	0.0109	0.0131		0.07	0	0.02	0.02	45	0.50	0.54												0.62			34.74	34.14	FULL	U/S	SDMH20
8	1162.04	1201.05	R	18					1	28.07	29.13	39.0	2.73%	1.77	0.0049	11.0	6.22	0.60	0.0109	0.0109	0.43																				0.00	35.17	34.56			FULL	U/S	
9	1201.05	1206.05	T	18					1	29.13	29.22	5.0	1.85%	1.77	0.0049	9.0	5.09	0.40	0.0073	0.0091		0.05	0	0.02	0.01	60	0.35	0.46												0.52			35.68	35.28	FULL	U/S	SDMH21
10	1206.05	1309.54	R	18					1	29.22	30.23	103.5	0.97%	1.77	0.0049	9.0	5.09	0.40	0.0073	0.0073	0.76																				0.00	36.44	36.04			FULL	U/S	
11	1309.54	1314.54	T	18					1	30.23	30.26	5.0	0.72%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0065		0.03	3	0.02	0.01	45	0.50	0.24												0.28			36.72	36.41	FULL	U/S	SDMH22
12	1314.54	1393.52	R	18					1	30.26	30.64	79.0	0.48%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.46																				0.00	37.18	36.86			FULL	U/S	
13	1393.52	1398.52	T	18					1	30.64	30.67	5.0	0.63%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058		0.03	6	0.05	0.02															0.04			37.23	36.91	FULL	U/S	SDMH23
14	1398.52	1529.82	R	18					1	30.67	31.68	131.3	0.77%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.76																				0.00	37.98	37.67			FULL	U/S	
15	1529.82	1534.82	T	18					1	31.68	31.75	5.0	1.30%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0038		0.02	0	0.02	0.01	45	0.50	0.27												0.29			38.28	38.18	FULL	U/S	SDMH24
16	1534.82	1558.08	R	18					1	31.75	32.17	23.3	1.84%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.04																				0.00	38.32	38.22			FULL	U/S	
17	1558.08	1563.08	T	18					1	32.17	32.26	5.0	1.82%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0012		0.01	0	0.02	0.00	45	0.50	0.09												0.09			38.41	38.38	FULL	U/S	SDMH25
18	1563.08	1836.27	R	18					1	32.26	37.16	273.2	1.79%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.15																				0.00	38.69	38.66			FULL	D/S	
19	1836.27	1841.27	T	18					1	37.16	37.81	5.0	13.12%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006		0.00	45	0.46	0.01													0.02			39.34	39.31	PART	D/S	SDMH26
20	1841.27	1853.24	R	18					1	37.81	40.74	12.0	24.45%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																				0.00	42.27	42.24			PART	D/S	
21	1853.24	1858.24	T	18					1	40.74	41.36	5.0	12.48%	1.77	0.0049	2.2	1.24	0.02	0.0004	0.0005		0.00	45	0.46	0.01	45	0.50	0.02												0.04			42.89	42.86	PART	D/S	DI29
22	1858.24	1867.24	R	18					1	41.36	41.41	9.0	0.50%	1.77	0.0049	2.2	1.24	0.02	0.0004	0.0004	0.00																				0.00	42.93	42.91			FULL	D/S	
23	1867.24	1867.24	R	18					1	41.41	41.41	0.0		1.77	0.0049	2.2	1.24	0.02	0.0004	0.0004	0.00						45	0.50	0.01	Ki=	0.4	0.01								0.02			42.95	42.95	FULL	U/S	DI30
24																																												

SDMH 17 Mainline Drive C - Summary of Results

						(Optional)			HGL with respect	Pressure Gasket
	STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1	1000.00	20.20	21.70	26.31	23.56	38.16	SDMH17		OK	NO
2	1014.20	22.15	23.65	27.01	24.27	39.11	DI19		OK	NO
3	1019.20	22.84	24.34	28.85	26.44	39.11			OK	NO
4	1025.85	23.76	25.26	29.14	26.73	39.11	SDMH19		OK	NO
5	1030.85	24.18	25.68	32.19	31.35	39.11			OK	YES
6	1157.04	27.93	29.43	34.12	33.28	39.99	SDMH20		OK	NO
7	1162.04	28.07	29.57	34.74	34.14	39.99			OK	NO
8	1201.05	29.13	30.63	35.17	34.56	40.19	SDMH21		OK	NO
9	1206.05	29.22	30.72	35.68	35.28	40.19			OK	NO
10	1309.54	30.23	31.73	36.44	36.04	40.73	SDMH22		OK	NO
11	1314.54	30.26	31.76	36.72	36.41	40.73			OK	NO
12	1393.52	30.64	32.14	37.18	36.86	41.16	SDMH23		OK	NO
13	1398.52	30.67	32.17	37.23	36.91	41.16			OK	NO
14	1529.82	31.68	33.18	37.98	37.67	41.98	SDMH24		OK	NO
15	1534.82	31.75	33.25	38.28	38.18	41.98			OK	NO
16	1558.08	32.17	33.67	38.32	38.22	42.36	SDMH25		OK	NO
17	1563.08	32.26	33.76	38.41	38.38	42.36			OK	NO
18	1836.27	37.16	38.66	38.69	38.66	47.60	SDMH26		OK	NO
19	1841.27	37.81	39.31	39.34	39.31	47.60			OK	NO
20	1853.24	40.74	42.24	42.27	42.24	47.27	DI29		OK	NO
21	1858.24	41.36	42.86	42.89	42.86	47.27			OK	NO
22	1867.24	41.41	42.91	42.93	42.91	47.49	DI30		OK	NO
23	1867.24	41.41	42.91	42.95	42.95	47.49			OK	NO
24										

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH19

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	(ft)	(deg)		(ft)	(deg)			Cont			(deg)		(ft)		(deg)				EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18						24.10																				Outlet K_o=	1.0													31.75	31.35			SDMH19
2	1000.00	1055.26	R	18					1	24.10	34.80	55.3	19.36%	1.77	0.0049	9.0	5.09	0.40	0.0073	0.0073	0.40																		0.00	36.70	36.30			PART	D/S	
3	1055.26	1055.26	R	18					1	34.80	34.80	0.0		1.77	0.0049	9.0	5.09	0.40	0.0073	0.0073	0.00			45	0.50	0.20	Ki=	0.4	0.16									0.36			37.07	37.07	FULL	U/S	DI20
4																																													
5																																													
6																																													

SDMH 19 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	24.10	25.60	31.75	31.35	39.11	SDMH19		OK	YES
1055.26	34.80	36.30	36.70	36.30	39.44	DI20		OK	NO
1055.26	34.80	36.30	37.07	37.07	39.44			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH20

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)				(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18						28.00																			Outlet K_o=		1.0															SDMH20
2	1000.00	1014.47	R	18					1	28.00	31.92	14.5	27.11%	1.77	0.0049	2.0	1.13	0.02	0.0004	0.0004	0.01																		0.00	34.17	34.15			34.16	34.14	FULL	U/S	
3	1014.47	1019.47	T	18					1	31.92	32.61	5.0	13.81%	1.77	0.0049	1.9	1.08	0.02	0.0003	0.0003		0.00	45	0.46	0.01	45	0.50	0.01											0.02			34.19	34.17	FULL	U/S	DI21
4	1019.47	1028.47	R	18					1	32.61	32.66	9.0	0.50%	1.77	0.0049	1.9	1.08	0.02	0.0003	0.0003	0.00																		0.00	34.19	34.17					FULL	U/S	
5	1028.47	1028.47	R	18					1	32.66	32.66	0.0		1.77	0.0049	1.9	1.08	0.02	0.0003	0.0003	0.00					45	0.50	0.01	Ki=	0.4	0.01								0.02			34.21	34.21	FULL	U/S	DI22
6																																													

SDMH 20 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	28.00	29.50	34.16	34.14	39.97	SDMH20		OK	NO
1014.47	31.92	33.42	34.17	34.15	39.47	DI21		OK	NO
1019.47	32.61	34.11	34.19	34.17	39.47			OK	NO
1028.47	32.66	34.16	34.19	34.17	39.53	DI22		OK	NO
1028.47	32.66	34.16	34.21	34.21	39.53			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH21

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							29.20																			Outlet K_o=		1.0												35.29	35.28			SDMH21
2	1000.00	1015.01	R	18					1	29.20	34.40	15.0	34.64%	1.77	0.0049	1.5	0.85	0.01	0.0002	0.0002	0.00																		0.00	35.91	35.90			PART	D/S
3	1015.01	1015.01	R	18					1	34.40	34.40	0.0		1.77	0.0049	1.5	0.85	0.01	0.0002	0.0002	0.00					45	0.50	0.01	Ki=	0.4	0.00							0.01			35.92	35.92	FULL	U/S	DI23
4																																												
5																																												
6																																												

SDMH 21 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	29.20	30.70	35.29	35.28	40.19	SDMH21		OK	NO
1015.01	34.40	35.90	35.91	35.90	40.42	DI23		OK	NO
1015.01	34.40	35.90	35.92	35.92	40.42			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH22

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																					EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																									
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							30.25																				Outlet K_o=	1.0														SDMH22
2	1000.00	1014.47	R	18					1	30.25	33.70	14.5	23.86%	1.77	0.0049	1.5	0.85	0.01	0.0002	0.0002	0.00																		0.00	36.42	36.41			FULL	U/S	
3	1014.47	1019.47	T	18					1	33.70	34.31	5.0	12.18%	1.77	0.0049	1.3	0.74	0.01	0.0002	0.0002		0.00	45	0.46	0.01	45	0.50	0.01											0.01			36.44	36.43	FULL	U/S	DI24
4	1019.47	1028.47	R	18					1	34.31	34.36	9.0	0.50%	1.77	0.0049	1.3	0.74	0.01	0.0002	0.0002	0.00																		0.00	36.44	36.43			FULL	U/S	
5	1028.47	1028.47	R	18					1	34.36	34.36	0.0		1.77	0.0049	1.3	0.74	0.01	0.0002	0.0002	0.00					45	0.50	0.00	Ki=	0.4	0.00							0.01			36.45	36.45	FULL	U/S	DI25
6																																												

SDMH 22 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	30.25	31.75	36.42	36.41	40.73	SDMH22		OK	NO
1014.47	33.70	35.20	36.42	36.41	40.23	DI24		OK	NO
1019.47	34.31	35.81	36.44	36.43	40.23			OK	NO
1028.47	34.36	35.86	36.44	36.43	40.24	DI25		OK	NO
1028.47	34.36	35.86	36.45	36.45	40.24			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH24

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																										
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						FLOW	
1		1000.00		18							31.70																			Outlet K_o=	1.0											38.24	38.18			SDMH24
2	1000.00	1020.13	R	18					1	31.70	34.64	20.1	14.58%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0011	0.02																	0.00	38.26	38.20			FULL	U/S	
3	1020.13	1025.13	T	18					1	34.64	35.01	5.0	7.54%	1.77	0.0049	2.1	1.19	0.02	0.0004	0.0008		0.00	45	0.46	0.03	45	0.50	0.05											0.08			38.34	38.32	FULL	U/S	DI26
4	1025.13	1033.83	R	18					1	35.01	35.06	8.7	0.50%	1.77	0.0049	2.1	1.19	0.02	0.0004	0.0004	0.00																	0.00	38.35	38.33			FULL	U/S	
5	1033.83	1033.83	R	18					1	35.06	35.06	0.0		1.77	0.0049	2.1	1.19	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01							0.02			38.37	38.37	FULL	U/S	DI27
6																																												

SDMH 24 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	31.70	33.20	38.24	38.18	41.98	SDMH24		OK	NO
1020.13	34.64	36.14	38.26	38.20	41.99	DI26		OK	NO
1025.13	35.01	36.51	38.34	38.32	41.99			OK	NO
1033.83	35.06	36.56	38.35	38.33	42.15	DI27		OK	NO
1033.83	35.06	36.56	38.37	38.37	42.15			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH25

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							32.22																			Outlet K_o=		1.0												38.40	38.38			SDMH25
2	1000.00	1018.39	R	18					1	32.22	35.80	18.4	19.47%	1.77	0.0049	2.0	1.13	0.02	0.0004	0.0004	0.01																	0.00	38.41	38.39			FULL	U/S	
3	1018.39	1018.39	R	18					1	35.80	35.80	0.0		1.77	0.0049	2.0	1.13	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01						0.02			38.42	38.42	FULL	U/S	DI28
4																																												
5																																												
6																																												

SDMH 25 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	32.22	33.72	38.40	38.38	42.36	SDMH25		OK	NO
1018.39	35.80	37.30	38.41	38.39	42.77	DI28		OK	NO
1018.39	35.80	37.30	38.42	38.42	42.77			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH27 MAINLINE DRIVE E

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							44.00																			Outlet K_o=	1.0											48.27	48.15			SDMH27
2	1000.00	1279.10	R	18					1	44.00	47.12	279.1	1.12%	1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.63																		0.00	48.90	48.78			FULL	U/S	
3	1279.10	1284.10	T	18					1	47.12	47.18	5.0	1.12%	1.77	0.0049	4.0	2.26	0.08	0.0014	0.0019		0.01	0	0.02	0.00	45	0.50	0.08											0.10			49.00	48.92	FULL	U/S	SDMH15
4	1284.10	1355.06	R	18					1	47.18	47.97	71.0	1.12%	1.77	0.0049	4.0	2.26	0.08	0.0014	0.0014	0.10																		0.00	49.55	49.47			PART	D/S	
5	1355.06	1360.06	T	18					1	47.97	48.05	5.0	1.51%	1.77	0.0049	4.0	2.26	0.08	0.0014	0.0014		0.01	8	0.05	0.00													0.01			49.63	49.55	FULL	D/S	SDMH28
6	1360.06	1413.02	R	18					1	48.05	49.05	53.0	1.90%	1.77	0.0049	4.0	2.26	0.08	0.0014	0.0014	0.08																		0.00	50.63	50.55			PART	D/S	
7	1413.02	1418.02	T	18					1	49.05	50.30	5.0	24.95%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0013		0.01	63	0.63	0.05	37	0.60	0.04										0.10			51.86	51.80	PART	D/S	SDMH29
8	1418.02	1427.13	R	18					1	50.30	54.67	9.1	48.00%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0011	0.01																		0.00	56.23	56.17			PART	D/S	
9	1427.13	1432.13	T	18					1	54.67	55.88	5.0	24.17%	1.77	0.0049	2.7	1.53	0.04	0.0007	0.0009		0.00	63	0.63	0.04	45	0.50	0.04										0.09			57.42	57.38	PART	D/S	DI31
10	1432.13	1441.13	R	18					1	55.88	55.93	9.0	0.50%	1.77	0.0049	2.7	1.53	0.04	0.0007	0.0007	0.01																		0.00	57.46	57.43			FULL	D/S	
11	1441.13	1441.13	R	18					1	55.93	55.93	0.0		1.77	0.0049	2.7	1.53	0.04	0.0007	0.0007	0.00					45	0.50	0.02	Ki=	0.4	0.01									0.03			57.50	57.50	FULL	U/S	DI32
12																																													

SDMH 27 Mainline Drive E - Summary of Results

						(Optional)			HGL with respect	Pressure Gasket
	STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1	1000.00	44.00	45.50	48.27	48.15	54.51	SDMH27		OK	NO
2	1279.10	47.12	48.62	48.90	48.78	57.55	SDMH15		OK	NO
3	1284.10	47.18	48.68	49.00	48.92	57.55			OK	NO
4	1355.06	47.97	49.47	49.55	49.47	58.52	SDMH28		OK	NO
5	1360.06	48.05	49.55	49.63	49.55	58.52			OK	NO
6	1413.02	49.05	50.55	50.63	50.55	59.61	SDMH29		OK	NO
7	1418.02	50.30	51.80	51.86	51.80	59.61			OK	NO
8	1427.13	54.67	56.17	56.23	56.17	59.16	DI31		OK	NO
9	1432.13	55.88	57.38	57.42	57.38	59.16			OK	NO
10	1441.13	55.93	57.43	57.46	57.43	59.37	DI32		OK	NO
11	1441.13	55.93	57.43	57.50	57.50	59.37			OK	NO
12										
13										
14										
15										
16										
17										
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Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH29

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																												
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_i	H_i	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(deg)		(ft)	(ft)	(deg)				EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							49.10																			Outlet K_o=	1.0											51.80	51.80			SDMH29
2	1000.00	1020.74	R	18					1	49.10	54.00	20.7	23.63%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																	0.00	55.50	55.50			PART	D/S
3	1020.74	1020.74	R	18					1	54.00	54.00	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00			45	0.50	0.00	Ki=	0.4	0.00									0.00			55.50	55.50	FULL	U/S	DI33
4																																												
5																																												
6																																												

SDMH 29 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	49.10	50.60	51.80	51.80	59.61	SDMH29		OK	NO
1020.74	54.00	55.50	55.50	55.50	60.10	DI33		OK	NO
1020.74	54.00	55.50	55.50	55.50	60.10			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH30 North

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	H_f (ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)				(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							47.45																			Outlet K_o=		1.0															SDMH30
2	1000.00	1020.98	R	18					1	47.45	51.20	21.0	17.88%	1.77	0.0049	3.0	1.70	0.04	0.0008	0.0008	0.02																		0.00	52.74	52.70			PART	D/S	
3	1020.98	1020.98	R	18					1	51.20	51.20	0.0		1.77	0.0049	3.0	1.70	0.04	0.0008	0.0008	0.00					45	0.50	0.02	Ki=	0.4	0.02							0.04			52.79	52.79	FULL	U/S	DI34
4																																												
5																																												
6																																												

SDMH30 North - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	47.45	48.95	49.87	49.83	57.95	SDMH30		OK	NO
1020.98	51.20	52.70	52.74	52.70	58.26	DI34		OK	NO
1020.98	51.20	52.70	52.79	52.79	58.26			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH30 South

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																												
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont			(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							47.45																			Outlet K_o=		1.0												49.83	49.83			SDMH30
2	1000.00	1016.73	R	18					1	47.45	52.20	16.7	28.38%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	53.70	53.70			PART	D/S	
3	1016.73	1016.73	R	18					1	52.20	52.20	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00			45	0.50	0.00	Ki=	0.4	0.00									0.00			53.70	53.70	FULL	U/S	DI35
4																																												
5																																												
6																																												

SDMH30 South - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	47.45	48.95	49.83	49.83	57.95	SDMH30		OK	NO
1016.73	52.20	53.70	53.70	53.70	58.18	DI35		OK	NO
1016.73	52.20	53.70	53.70	53.70	58.18			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH33

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							54.40																			Outlet K_o=		1.0											56.32	56.28			SDMH33
2	1000.00	1014.47	R	18					1	54.40	57.98	14.5	24.75%	1.77	0.0049	3.0	1.70	0.04	0.0008	0.0008	0.01																		0.00	59.53	59.48			PART	D/S	
3	1014.47	1019.47	T	18					1	57.98	58.61	5.0	12.63%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0007		0.00	45	0.46	0.02	45	0.50	0.03											0.05			60.14	60.11	PART	D/S	DI36
4	1019.47	1028.47	R	18					1	58.61	58.66	9.0	0.50%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																		0.00	60.19	60.16			FULL	D/S	
5	1028.47	1028.47	R	18					1	58.66	58.66	0.0		1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.00					45	0.50	0.02	Ki=	0.4	0.01								0.03			60.22	60.22	FULL	U/S	DI37
6																																													

SDMH 33 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	54.40	55.90	56.32	56.28	64.86	SDMH33		OK	NO
1014.47	57.98	59.48	59.53	59.48	64.53	DI36		OK	NO
1019.47	58.61	60.11	60.14	60.11	64.53			OK	NO
1028.47	58.66	60.16	60.19	60.16	64.75	DI37		OK	NO
1028.47	58.66	60.16	60.22	60.22	64.75			OK	NO

Worksheet for I-1A Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.50 cfs
Slope	2.900 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	2.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	85.80 %
Intercepted Flow	2.15 cfs
Bypass Flow	0.35 cfs
Spread	6.10 ft
Depth	0.27 ft
Flow Area	0.6 ft²
Gutter Depression	1.8 in
Total Depression	1.8 in
Velocity	4.47 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.045
Grate Flow Ratio	0.851
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-1B Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.35	cfs
Slope	2.900	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	2.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.35	cfs
Bypass Flow	0.00	cfs
Spread	1.68	ft
Depth	0.13	ft
Flow Area	0.1	ft^2
Gutter Depression	1.8	in
Total Depression	1.8	in
Velocity	3.11	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.083	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-2A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	1.50	cfs
Slope	0.600	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	86.20	%
Intercepted Flow	1.29	cfs
Bypass Flow	0.21	cfs
Spread	5.12	ft
Depth	0.30	ft
Flow Area	0.6	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.31	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.134	
Grate Flow Ratio	0.841	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-2A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.21	cfs
Slope	0.600	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.21	cfs
Bypass Flow	0.00	cfs
Spread	1.86	ft
Depth	0.15	ft
Flow Area	0.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.51	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.249	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-2A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	0.600	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	98.71	%
Intercepted Flow	0.49	cfs
Bypass Flow	0.01	cfs
Spread	3.11	ft
Depth	0.21	ft
Flow Area	0.3	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	1.87	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.185	
Grate Flow Ratio	0.984	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-3 Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.25 cfs
Slope	5.670 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	2.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	99.95 %
Intercepted Flow	1.25 cfs
Bypass Flow	0.00 cfs
Spread	2.38 ft
Depth	0.19 ft
Flow Area	0.2 ft²
Gutter Depression	1.8 in
Total Depression	1.8 in
Velocity	5.49 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.032
Grate Flow Ratio	1.000
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-4A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.50 cfs
Slope	1.330 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	83.14 %
Intercepted Flow	2.08 cfs
Bypass Flow	0.42 cfs
Spread	5.41 ft
Depth	0.32 ft
Flow Area	0.7 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	3.52 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.068
Grate Flow Ratio	0.819
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-4A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.42	cfs
Slope	1.330	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.42	cfs
Bypass Flow	0.00	cfs
Spread	2.08	ft
Depth	0.17	ft
Flow Area	0.2	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.43	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.124	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-4A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	1.330	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.22	ft
Depth	0.18	ft
Flow Area	0.2	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	2.54	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.116	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-5A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	4.50	cfs
Slope	1.360	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	71.91	%
Intercepted Flow	3.24	cfs
Bypass Flow	1.26	cfs
Spread	7.09	ft
Depth	0.38	ft
Flow Area	1.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	3.98	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.055	
Grate Flow Ratio	0.703	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-5A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	1.26	cfs
Slope	1.360	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	94.11	%
Intercepted Flow	1.19	cfs
Bypass Flow	0.07	cfs
Spread	3.72	ft
Depth	0.25	ft
Flow Area	0.4	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	3.14	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.082	
Grate Flow Ratio	0.936	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-5A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	1.360	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.21	ft
Depth	0.18	ft
Flow Area	0.2	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	2.56	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.114	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-6A Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.50 cfs
Slope	1.900 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	86.07 %
Intercepted Flow	2.15 cfs
Bypass Flow	0.35 cfs
Spread	4.95 ft
Depth	0.30 ft
Flow Area	0.6 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	4.07 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.053
Grate Flow Ratio	0.853
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-6B Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.35	cfs
Slope	1.900	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.35	cfs
Bypass Flow	0.00	cfs
Spread	1.82	ft
Depth	0.15	ft
Flow Area	0.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.65	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.108	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-7A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.50 cfs
Slope	1.630 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	84.81 %
Intercepted Flow	2.12 cfs
Bypass Flow	0.38 cfs
Spread	5.14 ft
Depth	0.31 ft
Flow Area	0.7 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	3.82 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.059
Grate Flow Ratio	0.839
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-7A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.38	cfs
Slope	1.630	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.38	cfs
Bypass Flow	0.00	cfs
Spread	1.93	ft
Depth	0.15	ft
Flow Area	0.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.55	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.114	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-7A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	1.630	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.14	ft
Depth	0.17	ft
Flow Area	0.2	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	2.74	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.102	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-8A Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	1.50	cfs
Slope	0.500	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	84.98	%
Intercepted Flow	1.27	cfs
Bypass Flow	0.23	cfs
Spread	5.35	ft
Depth	0.31	ft
Flow Area	0.7	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.15	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.150	
Grate Flow Ratio	0.823	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-8B Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.23	cfs
Slope	0.500	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.23	cfs
Bypass Flow	0.00	cfs
Spread	1.99	ft
Depth	0.16	ft
Flow Area	0.2	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.45	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.265	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-9A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.00 cfs
Slope	0.500 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	91.37 %
Intercepted Flow	0.91 cfs
Bypass Flow	0.09 cfs
Spread	4.34 ft
Depth	0.27 ft
Flow Area	0.5 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	1.99 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.168
Grate Flow Ratio	0.896
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-9A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.09	cfs
Slope	0.500	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.09	cfs
Bypass Flow	0.00	cfs
Spread	1.40	ft
Depth	0.11	ft
Flow Area	0.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.14	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.355	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-9A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.50 cfs
Slope	0.500 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	1.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	98.03 %
Intercepted Flow	0.49 cfs
Bypass Flow	0.01 cfs
Spread	3.80 ft
Depth	0.21 ft
Flow Area	0.3 ft²
Gutter Depression	2.1 in
Total Depression	2.1 in
Velocity	1.72 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.209
Grate Flow Ratio	0.975
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-10 Sump 5' Type DM2

Project Description	
Solve For	Spread

Input Data	
Discharge	1.50 cfs
Gutter Width	1.50 ft
Gutter Cross Slope	8.330 %
Road Cross Slope	2.000 %
Local Depression	5.0 in
Local Depression Width	18.0 in
Grate Width	1.50 ft
Grate Length	2.50 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %
Curb Opening Length	4.50 ft
Opening Height	0.50 ft
Curb Throat Type	Horizontal
Throat Incline Angle	90.00 degrees

Options	
Calculation Option	Use Both

Results	
Spread	5.11 ft
Depth	0.20 ft
Gutter Depression	1.1 in
Total Depression	6.1 in
Open Grate Area	1.7 ft²
Active Grate Weir Length	4.00 ft

Worksheet for I-11A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	3.50	cfs
Slope	1.780	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	79.22	%
Intercepted Flow	2.77	cfs
Bypass Flow	0.73	cfs
Spread	5.93	ft
Depth	0.34	ft
Flow Area	0.8	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	4.22	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.050	
Grate Flow Ratio	0.781	
Active Grate Length	1.13	ft

Worksheet for I-11A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.73 cfs
Slope	1.780 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	99.92 %
Intercepted Flow	0.73 cfs
Bypass Flow	0.00 cfs
Spread	2.42 ft
Depth	0.19 ft
Flow Area	0.2 ft^2
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	3.11 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.083
Grate Flow Ratio	0.999
Active Grate Length	1.13 ft

Worksheet for I-11B1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.00 cfs
Slope	1.780 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	97.58 %
Intercepted Flow	0.98 cfs
Bypass Flow	0.02 cfs
Spread	2.95 ft
Depth	0.22 ft
Flow Area	0.3 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	3.35 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.074
Grate Flow Ratio	0.974
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-11B2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.02	cfs
Slope	1.780	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.02	cfs
Bypass Flow	0.00	cfs
Spread	0.63	ft
Depth	0.05	ft
Flow Area	0.0	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.26	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.315	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-12A East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.00 cfs
Slope	1.920 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	82.83 %
Intercepted Flow	2.48 cfs
Bypass Flow	0.52 cfs
Spread	5.41 ft
Depth	0.32 ft
Flow Area	0.7 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	4.22 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.050
Grate Flow Ratio	0.819
Active Grate Length	1.13 ft

Worksheet for I-12B East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.52	cfs
Slope	1.920	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.52	cfs
Bypass Flow	0.00	cfs
Spread	2.10	ft
Depth	0.17	ft
Flow Area	0.2	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.94	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.091	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Worksheet for I-13A North 10' Type DM2

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.00 cfs
Slope	3.900 %
Gutter Width	1.50 ft
Gutter Cross Slope	8.330 %
Road Cross Slope	2.000 %
Roughness Coefficient	0.016
Local Depression	5.0 in
Local Depression Width	18.0 in
Grate Width	1.50 ft
Grate Length	7.50 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %
Curb Opening Length	9.50 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results	
Efficiency	97.89 %
Intercepted Flow	2.94 cfs
Bypass Flow	0.06 cfs
Spread	7.67 ft
Depth	0.25 ft
Flow Area	0.7 ft²
Gutter Depression	1.1 in
Total Depression	6.1 in
Velocity	4.55 ft/s
Splash Over Velocity	11.14 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.154
Grate Flow Ratio	0.567
Equivalent Cross Slope	21.336 %
Active Grate Length	3.75 ft
Length Factor	0.529
Total Interception Length	10.86 ft

Messages

Worksheet for I-13A North 10' Type DM2

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

Worksheet for I-13A South 5' Type DM2

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	3.900	%
Gutter Width	1.50	ft
Gutter Cross Slope	8.330	%
Road Cross Slope	2.000	%
Roughness Coefficient	0.016	
Local Depression	5.0	in
Local Depression Width	18.0	in
Grate Width	1.50	ft
Grate Length	2.50	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%
Curb Opening Length	4.50	ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.57	ft
Depth	0.15	ft
Flow Area	0.1	ft^2
Gutter Depression	1.1	in
Total Depression	6.1	in
Velocity	3.64	ft/s
Splash Over Velocity	6.35	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.021	
Grate Flow Ratio	0.976	
Equivalent Cross Slope	35.277	%
Active Grate Length	1.25	ft
Length Factor	0.859	
Total Interception Length	3.79	ft

Messages

Worksheet for I-13A South 5' Type DM2

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

Worksheet for I-15A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	3.50	cfs
Slope	1.890	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	79.75	%
Intercepted Flow	2.79	cfs
Bypass Flow	0.71	cfs
Spread	5.85	ft
Depth	0.33	ft
Flow Area	0.8	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	4.32	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.048	
Grate Flow Ratio	0.787	
Active Grate Length	1.13	ft

Worksheet for I-15A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.71	cfs
Slope	1.890	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	99.97	%
Intercepted Flow	0.71	cfs
Bypass Flow	0.00	cfs
Spread	2.37	ft
Depth	0.19	ft
Flow Area	0.2	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	3.16	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.081	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Worksheet for I-15A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	1.890	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.08	ft
Depth	0.17	ft
Flow Area	0.2	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	2.89	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.094	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Worksheet for I-15B1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.00 cfs
Slope	1.130 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	95.72 %
Intercepted Flow	0.96 cfs
Bypass Flow	0.04 cfs
Spread	3.42 ft
Depth	0.24 ft
Flow Area	0.4 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	2.79 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.100
Grate Flow Ratio	0.952
Active Grate Length	1.13 ft

Worksheet for I-15B2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.04	cfs
Slope	1.130	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.04	cfs
Bypass Flow	0.00	cfs
Spread	0.89	ft
Depth	0.07	ft
Flow Area	0.0	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.27	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.314	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Worksheet for I-16 Sump 7.5' Type DM2

Project Description	
Solve For	Spread

Input Data	
Discharge	9.00 cfs
Gutter Width	1.50 ft
Gutter Cross Slope	8.330 %
Road Cross Slope	2.000 %
Local Depression	5.0 in
Local Depression Width	18.0 in
Grate Width	1.50 ft
Grate Length	5.00 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %
Curb Opening Length	7.00 ft
Opening Height	0.50 ft
Curb Throat Type	Horizontal
Throat Incline Angle	90.00 degrees

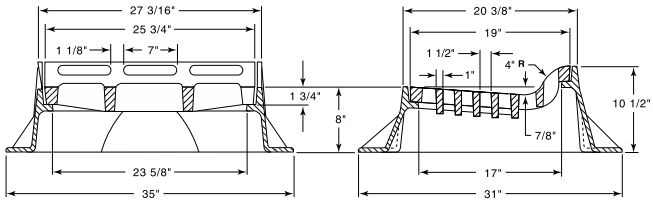
Options	
Calculation Option	Use Both

Results	
Spread	18.73 ft
Depth	0.47 ft
Gutter Depression	1.1 in
Total Depression	6.1 in
Open Grate Area	3.4 ft²
Active Grate Weir Length	6.50 ft

■ Note: When specifying/ordering grates, refer to "Choosing the Proper Inlet Grate" on pages 125-126.
For a complete listing of FREE OPEN AREAS and WEIR PERIMETERS of all NEENAH grates, refer to pages 327-332.

R-3501-P
Inlet for Roll Type Curb

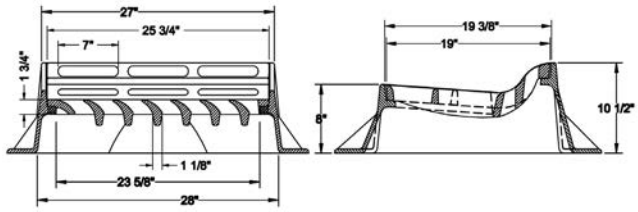
Heavy Duty



CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3501-P	C	1.5	4.3

R-3501-PR
Inlet for Roll Type Curb

Heavy Duty

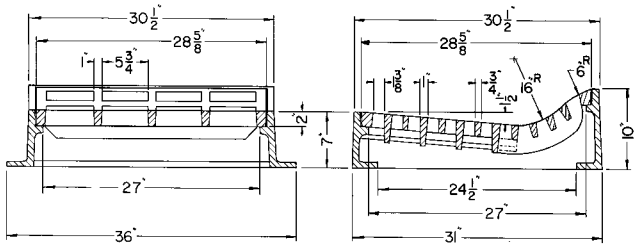


CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3501-PR	L	1.6	4.7
R-3501-PL	L	1.6	4.7

Illustrating **R-3501-PR** (flow right).
If flow left required, order **R-3501-PL**.

R-3501-R
Inlet for Roll Type Curb

Heavy Duty

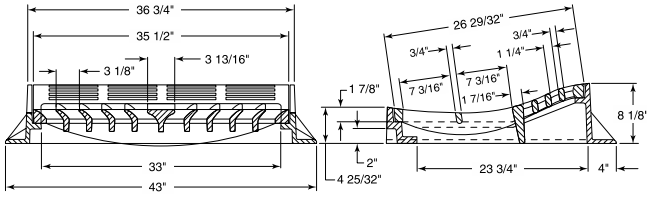


CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3501-R	C	2.6	5.5

Available with 4-flange frame, order **R-3501-RA.**

R-3501-TB
Inlet for Roll Type Curb

Heavy Duty



CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3501-TB	L	3.1	5.7

Worksheet for 6" PVC Max Flow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.010	
Channel Slope	1.000	%
Diameter	6.0	in
Discharge	0.50	cfs

Results		
Normal Depth	0.30	ft
Flow Area	0.1	ft²
Wetted Perimeter	0.89	ft
Hydraulic Radius	0.14	ft
Top Width	0.49	ft
Critical Depth	0.36	ft
Percent Full	60.8	%
Critical Slope	0.621	%
Velocity	4.00	ft/s
Velocity Head	0.25	ft
Specific Energy	0.55	ft
Froude Number	1.394	
Maximum Discharge	0.78	cfs
Discharge Full	0.73	cfs
Slope Full	0.470	%
Flow Type	Supercritical	

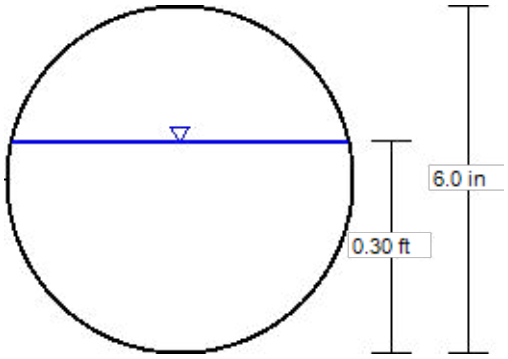
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

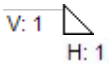
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	60.8	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.30	ft
Critical Depth	0.36	ft
Channel Slope	1.000	%
Critical Slope	0.621	%

Cross Section for 6" PVC Max Flow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	1.000 %
Normal Depth	0.30 ft
Diameter	6.0 in
Discharge	0.50 cfs





Worksheet for 8" PVC Max Flow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.010	
Channel Slope	1.000	%
Diameter	8.0	in
Discharge	1.50	cfs

Results		
Normal Depth	0.52	ft
Flow Area	0.3	ft²
Wetted Perimeter	1.45	ft
Hydraulic Radius	0.20	ft
Top Width	0.55	ft
Critical Depth	0.57	ft
Percent Full	78.2	%
Critical Slope	0.846	%
Velocity	5.12	ft/s
Velocity Head	0.41	ft
Specific Energy	0.93	ft
Froude Number	1.239	
Maximum Discharge	1.69	cfs
Discharge Full	1.57	cfs
Slope Full	0.912	%
Flow Type	Supercritical	

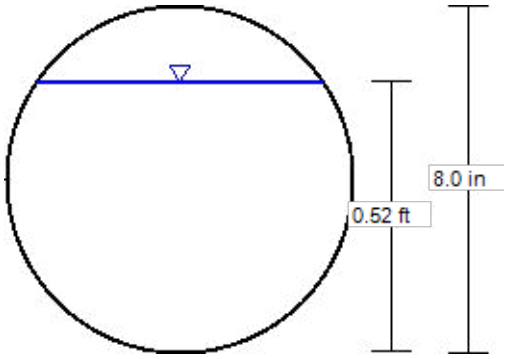
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

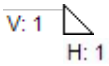
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	78.2	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.52	ft
Critical Depth	0.57	ft
Channel Slope	1.000	%
Critical Slope	0.846	%

Cross Section for 8" PVC Max Flow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	1.000 %
Normal Depth	0.52 ft
Diameter	8.0 in
Discharge	1.50 cfs





WEIR CALCULATION

Emergency Overflow

GIVEN			CALCULATED		
Weir Length, L =	20	(ft)	**Flow[1], Q =**	**20.0**	(cfs)
Assumed Head, H1 =	0.48	(ft)	**Minimum FF[2]=**	**3239.58**	(ft)
Weir Coefficient, C=	3.0				
Weir Elev. =	3239.10	(ft)			
Freeboard =	0.00	(ft)			

[1] $Q = CL(H)^{3/2}$ (*HCDDM*)

[2] Minimum FF = Weir Elev. + H1 + Freeboard

Worksheet for Emergency Overflow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.025
Channel Slope	1.000 %
Left Side Slope	6.500 H:V
Right Side Slope	6.500 H:V
Discharge	10.50 cfs

Results	
Normal Depth	0.73 ft
Flow Area	3.5 ft²
Wetted Perimeter	9.62 ft
Hydraulic Radius	0.36 ft
Top Width	9.51 ft
Critical Depth	0.70 ft
Critical Slope	1.316 %
Velocity	3.02 ft/s
Velocity Head	0.14 ft
Specific Energy	0.87 ft
Froude Number	0.879
Flow Type	Subcritical

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

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.73 ft
Critical Depth	0.70 ft
Channel Slope	1.000 %
Critical Slope	1.316 %

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design data 7

american concrete pipe association

CONCRETE PIPE SELECTION: Trench Installations

Trench conduits are usually installed in relatively narrow trenches excavated in undisturbed soil and backfilled to the original ground surface.

When a rigid conduit is installed in a narrow trench and backfilled, the backfill material will tend to settle. This downward movement generates frictional forces along the trench walls, which act upward to help support the weight of the backfill material. The magnitude of the frictional forces depends on the unit weight of the backfill material w, the value of Rankine's lateral pressure ratio K, and the coefficient of sliding friction μ' between the backfill material and the trench walls.

The backfill load on a conduit installed in a trench condition is equal to the weight of the mass of fill material within the trench less the summation of the frictional load transfers, and is expressed by the equation:

$$W_d = C_d \, w \, B_d^2$$

where

W_d=backfill load, pounds per linear foot
C_d=load coefficient for trench condition
w=unit weight of backfill material, pounds per cubic foot
B_d=width of trench at the top of the conduit, feet

Figures 2 through 5, based on the above equation, enable a direct determination of backfill load for a given trench width and depth of cover. As the trench width increases for a given depth of cover and pipe diameter, a point is reached at which an embankment condition develops. The curves showing pipe size indicate the limiting trench width for each pipe diameter beyond which greater trench widths will not affect the load. When this condition occurs, the load on the conduit remains constant. This load should be determined by the intersection of the vertical line representing the depth of cover and the dashed line representing the particular pipe diameter under consideration. For intermediate pipe sizes not shown in *Figures 2 through 5*, interpolation should be used.

The field supporting strength of a concrete pipe line is dependent on the inherent strength of the pipe, the type of foundation on which the pipe is installed and the compaction of the sidefill material adjacent to the pipe. A common method used to determine the inherent strength of a pipe is the three-edge bearing test, in which the pipe is subjected to concentrated loads at the crown and invert. The load that a pipe will support under this condition of loading is called the *three-edge bearing strength* and is expressed in pounds per linear foot.

ASTM Specification C14 covers three strength classes for non-reinforced concrete pipe — Class 1, 2 and 3. These three classes are specified to meet ultimate loads, expressed in terms of minimum strength in three-edge-bearing as listed in *Table I*.

TABLE I: Strength Requirements Non-reinforced Concrete Pipe ASTM C14

Pipe Diameter, Inches	Minimum Three-Edge Bearing Strengths, Pounds per Linear Foot		
	Class 1	Class 2	Class 3
4	1500	2000	2400
6	1500	2000	2400
8	1500	2000	2400
10	1600	2000	2400
12	1800	2250	2600
15	2000	2600	2900
18	2200	3000	3300
21	2400	3300	3850
24	2600	3600	4400
27	2800	3950	4600
30	3000	4300	4750
33	3150	4400	4875
36	3300	4500	5000

Another means of expressing pipe strength is in terms of D-load. The D-load of a pipe is the supporting strength of a pipe loaded under three-edge-bearing test conditions expressed in pounds per linear foot per foot of inside diameter. Thus the bearing strength may be converted to D-load by dividing by the inside diameter in feet.

ASTM Specification C76 specifies five strength classes reinforced concrete pipe. These strength classes are expressed in terms of D-load at 0.01-inch crack and for ultimate load. The D-load to produce the 0.01-inch crack $D_{0.01}$ is the maximum load applied to the concrete pipe before a crack occurs having a width of 0.01-inch measured at close intervals, throughout a length of at least 1-foot. The D-load to produce ultimate load D_u is the maximum three-edge-bearing test load carried by a pipe, expressed as D-load. *Table II* lists 0.01-inch crack and ultimate D-loads for the strength classes covered by ASTM Specification C76.

TABLE II: Strength Requirements Reinforced Concrete Pipe ASTM C76

Strength Class	Minimum D-Load in Three-Edge Bearing Pounds per Linear Foot per Foot of Internal Diameter	
	0.01 Inch Crack-$D_{0.01}$	Ultimate-D_u
I	800	1200
II	1000	1500
→ III	1350	2000
IV	2000	3000
V	3000	3750

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 18 IN. DIAMETER CIRCULAR PIPE

****

P I P E D A T A

DIAMETER (in.)	18.00
WALL B, THICKNESS (in.)	2.500

I N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	5.90
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

R E S U L T S O F A N A L Y S I S

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SSSSSSSSS   AAAAAAAAA   MMM   MMM   MMM   MMM
SS          AA     AA   MM M M MM   MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM   MM  M  MM
       SS   AA     AA   MM     MM   MM     MM
SSSSSSSSS   AA     AA   MM     MM   MM     MM
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P R O G R A M S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT. (lb/ft/ft)
1.0	1.11	Y	297.	2603.	0.	2900.	1.90	1018.	1527.
1.5	1.17	Y	470.	1971.	0.	2440.	1.90	856.	1284.
2.0	1.23	Y	660.	1455.	0.	2115.	1.90	742.	1113.
2.5	1.30	Y	871.	1032.	0.	1903.	1.90	668.	1002.
3.0	1.37	Y	1104.	751.	0.	1855.	1.90	651.	976.
3.5	1.45	Y	1362.	616.	0.	1978.	1.90	694.	1041.
4.0	1.47	Y	1573.	516.	0.	2089.	1.90	733.	1100.
4.5	1.47	Y	1776.	439.	0.	2215.	1.90	777.	1166.
5.0	1.48	Y	1979.	378.	0.	2357.	1.90	827.	1241.
5.5	1.48	Y	2185.	329.	0.	2514.	1.90	882.	1323.
6.0	1.48	Y	2387.	290.	0.	2677.	1.90	939.	1409.
6.5	1.48	Y	2590.	257.	0.	2847.	1.90	999.	1498.
7.0	1.49	Y	2792.	229.	0.	3022.	1.90	1060.	1590.
7.5	1.49	Y	2995.	206.	0.	3201.	1.90	1123.	1685.
8.0	1.49	Y	3197.	186.	0.	3384.	1.90	1187.	1781.
8.5	1.49	Y	3400.	169.	0.	3569.	1.90	1252.	1879.
9.0	1.49	Y	3602.	155.	0.	3757.	1.90	1318.	1977.
9.5	1.49	Y	3805.	142.	0.	3947.	1.90	1385.	2077.
10.0	1.49	Y	4008.	130.	0.	4138.	1.90	1452.	2178.
10.5	1.49	Y	4210.	120.	0.	4330.	1.90	1519.	2279.
11.0	1.50	Y	4413.	111.	0.	4524.	1.90	1587.	2381.
11.5	1.50	Y	4616.	103.	0.	4719.	1.90	1656.	2484.
12.0	1.50	Y	4818.	96.	0.	4915.	1.90	1724.	2587.
12.5	1.49	Y	5014.	90.	0.	5103.	1.90	1791.	2686.
13.0	1.50	Y	5216.	84.	0.	5300.	1.90	1860.	2789.
13.5	1.50	Y	5418.	79.	0.	5497.	1.90	1929.	2893.

14.0	1.50	Y	5620.	74.	0.	5694.	1.90	1998.	2997.
14.5	1.50	Y	5823.	70.	0.	5892.	1.90	2067.	3066.
15.0	1.50	Y	6025.	66.	0.	6091.	1.90	2137.	3132.
15.5	1.50	Y	6227.	62.	0.	6289.	1.90	2207.	3196.
16.0	1.50	Y	6429.	59.	0.	6488.	1.90	2277.	3257.
16.5	1.50	Y	6632.	56.	0.	6687.	1.90	2346.	3316.
17.0	1.50	Y	6834.	53.	0.	6887.	1.90	2416.	3373.
17.5	1.50	Y	7036.	50.	0.	7087.	1.90	2487.	3427.
18.0	1.50	Y	7239.	48.	0.	7287.	1.90	2557.	3479.
18.5	1.50	Y	7441.	46.	0.	7487.	1.90	2627.	3529.
19.0	1.50	Y	7644.	43.	0.	7687.	1.90	2697.	3576.
19.5	1.50	Y	7846.	41.	0.	7887.	1.90	2768.	3620.
20.0	1.50	Y	8048.	40.	0.	8088.	1.90	2838.	3662.

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 24 IN. DIAMETER CIRCULAR PIPE

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P I P E D A T A

DIAMETER (in.)	24.00
WALL B, THICKNESS (in.)	3.000

I N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	6.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.0165
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

E S U L T S O F A N A L Y S I S

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SSSSSSSSS   AAAAAAAAA   MMM   MMM   MMM   MMM
SS          AA     AA   MM M M MM   MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM   MM  M  MM
      SS    AA     AA   MM     MM   MM     MM
SSSSSSSSS   AA     AA   MM     MM   MM     MM
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P R O G R A M S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT. (lb/ft/ft)
1.0	1.08	Y	378.	3008.	0.	3386.	1.90	891.	1337.
1.5	1.12	Y	591.	2400.	0.	2991.	1.90	787.	1181.
2.0	1.17	Y	820.	1781.	0.	2600.	1.90	684.	1026.
2.5	1.22	Y	1067.	1269.	0.	2336.	1.90	615.	922.
3.0	1.27	Y	1334.	927.	0.	2261.	1.90	595.	893.
3.5	1.33	Y	1623.	763.	0.	2386.	1.90	628.	942.
4.0	1.38	Y	1935.	641.	0.	2575.	1.90	678.	1017.
4.5	1.44	Y	2272.	546.	0.	2818.	1.90	742.	1112.
5.0	1.46	Y	2562.	472.	0.	3034.	1.90	798.	1197.
5.5	1.47	Y	2827.	412.	0.	3239.	1.90	852.	1278.
6.0	1.47	Y	3091.	363.	0.	3454.	1.90	909.	1363.
6.5	1.47	Y	3356.	322.	0.	3678.	1.90	968.	1452.
7.0	1.48	Y	3625.	288.	0.	3913.	1.90	1030.	1545.
7.5	1.48	Y	3889.	260.	0.	4149.	1.90	1092.	1638.
8.0	1.48	Y	4153.	235.	0.	4388.	1.90	1155.	1732.
8.5	1.48	Y	4417.	214.	0.	4631.	1.90	1219.	1828.
9.0	1.49	Y	4682.	195.	0.	4877.	1.90	1283.	1925.
9.5	1.49	Y	4946.	179.	0.	5125.	1.90	1349.	2023.
10.0	1.49	Y	5210.	165.	0.	5375.	1.90	1414.	2122.
10.5	1.49	Y	5474.	152.	0.	5627.	1.90	1481.	2221.
11.0	1.49	Y	5738.	141.	0.	5880.	1.90	1547.	2321.
1.5	1.49	Y	6003.	131.	0.	6134.	1.90	1614.	2421.
12.0	1.49	Y	6267.	122.	0.	6389.	1.90	1681.	2522.
12.5	1.49	Y	6531.	114.	0.	6645.	1.90	1749.	2623.
13.0	1.49	Y	6795.	107.	0.	6902.	1.90	1816.	2725.
13.5	1.49	Y	7060.	100.	0.	7160.	1.90	1884.	2826.

14.0	1.49	Y	7324.	94.	0.	7418.	1.90	1952.	2928.
14.5	1.50	Y	7588.	89.	0.	7677.	1.90	2020.	3020.
15.0	1.50	Y	7853.	84.	0.	7937.	1.90	2089.	3087.
15.5	1.50	Y	8117.	79.	0.	8196.	1.90	2157.	3151.
16.0	1.49	Y	8369.	75.	0.	8444.	1.90	2222.	3210.
16.5	1.49	Y	8633.	71.	0.	8704.	1.90	2291.	3269.
17.0	1.50	Y	8897.	68.	0.	8964.	1.90	2359.	3327.
17.5	1.50	Y	9160.	64.	0.	9225.	1.90	2428.	3382.
18.0	1.50	Y	9424.	61.	0.	9485.	1.90	2496.	3435.
18.5	1.50	Y	9688.	58.	0.	9746.	1.90	2565.	3485.
19.0	1.50	Y	9952.	56.	0.	10008.	1.90	2634.	3533.
19.5	1.50	Y	10216.	53.	0.	10269.	1.90	2702.	3579.
20.0	1.50	Y	10480.	51.	0.	10530.	1.90	2771.	3622.

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 42 IN. DIAMETER CIRCULAR PIPE

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? I P E D A T A

DIAMETER (in.)	42.00
WALL B, THICKNESS (in.)	4.500

I N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	0.50
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	8.83
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

R E S U L T S O F A N A L Y S I S

PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT.
0.5	1.02	Y	304.	2856.	0.	3160.	1.90	475.	713.
1.0	1.05	Y	623.	2550.	0.	3172.	1.90	477.	716.
1.5	1.07	Y	956.	2768.	0.	3724.	1.90	560.	840.
2.0	1.10	Y	1305.	2556.	0.	3860.	1.90	580.	871.
2.5	1.12	Y	1669.	1840.	0.	3509.	1.90	528.	792.
3.0	1.15	Y	2051.	1356.	0.	3407.	1.90	512.	768.
3.5	1.18	Y	2450.	1126.	0.	3576.	1.90	538.	807.
4.0	1.21	Y	2868.	952.	0.	3820.	1.90	574.	862.
4.5	1.23	Y	3305.	817.	0.	4122.	1.90	620.	930.
5.0	1.26	Y	3763.	710.	0.	4473.	1.90	673.	1009.
5.5	1.30	Y	4241.	623.	0.	4864.	1.90	731.	1097.
6.0	1.33	Y	4742.	552.	0.	5294.	1.90	796.	1194.
6.5	1.36	Y	5266.	493.	0.	5758.	1.90	866.	1299.
7.0	1.40	Y	5814.	442.	0.	6257.	1.90	941.	1411.
7.5	1.43	Y	6388.	400.	0.	6788.	1.90	1021.	1531.
8.0	1.46	Y	6946.	363.	0.	7309.	1.90	1099.	1649.
8.5	1.46	Y	7404.	331.	0.	7735.	1.90	1163.	1745.
9.0	1.47	Y	7854.	304.	0.	8158.	1.90	1227.	1840.
9.5	1.47	Y	8304.	280.	0.	8583.	1.90	1291.	1936.
10.0	1.47	Y	8754.	258.	0.	9012.	1.90	1355.	2033.
10.5	1.47	Y	9203.	239.	0.	9442.	1.90	1420.	2130.
11.0	1.47	Y	9653.	222.	0.	9875.	1.90	1485.	2227.
11.5	1.48	Y	10116.	207.	0.	10323.	1.90	1552.	2328.
12.0	1.48	Y	10565.	193.	0.	10758.	1.90	1618.	2427.
12.5	1.48	Y	11015.	181.	0.	11195.	1.90	1684.	2525.
13.0	1.48	Y	11464.	170.	0.	11633.	1.90	1749.	2624.
13.5	1.48	Y	11913.	159.	0.	12072.	1.90	1815.	2723.
14.0	1.48	Y	12362.	150.	0.	12512.	1.90	1882.	2822.
14.5	1.48	Y	12811.	142.	0.	12953.	1.90	1948.	2922.
15.0	1.49	Y	13260.	134.	0.	13394.	1.90	2014.	3014.
15.5	1.49	Y	13710.	127.	0.	13836.	1.90	2081.	3079.
16.0	1.49	Y	14159.	120.	0.	14279.	1.90	2147.	3142.
16.5	1.49	Y	14608.	114.	0.	14722.	1.90	2214.	3202.
17.0	1.49	Y	15057.	108.	0.	15165.	1.90	2281.	3261.
17.5	1.49	Y	15506.	103.	0.	15609.	1.90	2347.	3317.
18.0	1.49	Y	15955.	98.	0.	16054.	1.90	2414.	3371.
18.5	1.49	Y	16404.	94.	0.	16498.	1.90	2481.	3423.
19.0	1.49	N	16817.	90.	0.	16906.	1.90	2542.	3469.
19.5	1.48	N	17118.	86.	0.	17203.	1.90	2587.	3501.
20.0	1.46	N	17413.	82.	0.	17495.	1.90	2631.	3531.

BUILDING #	FF	High	Low	Criteria	Freeboard	Remarks
Sheet						
61N	51.30	50.70	49.26	0.88	0.10	
61S	49.80	49.05	47.94	0.88	0.25	
60N	48.40	47.44	46.32	0.88	0.46	
60S	46.90	46.17	45.01	0.88	0.23	
59N	45.50	44.52	43.41	0.88	0.48	
59S	44.00	43.20	42.09	0.88	0.30	
58N	43.00	41.77	41.31	0.88	0.73	
58S	42.00	41.25	40.94	0.88	0.25	
57N	41.30	40.53	40.24	0.88	0.27	
57S	41.30	40.19	39.90	0.88	0.61	
56N	40.80	39.76	39.47	0.88	0.54	
56S	40.80	39.42	39.04	0.88	0.88	
55S	41.50	40.26	39.95	0.88	0.74	
55S	41.50	39.82	39.62	0.88	1.18	
55N	41.50	40.60	40.31	0.88	0.40	
54S	42.50	41.03	40.73	0.88	0.97	
54N	42.50	41.38	41.08	0.88	0.62	
53S	43.00	42.08	41.78	0.88	0.42	
53N	44.00	42.80	42.14	0.88	0.70	
52S	45.00	44.34	43.24	0.88	0.16	
52N	46.50	45.66	44.55	0.88	0.34	
51	48.00	47.27	46.16	0.88	0.23	
50S	49.50	48.82	47.71	0.88	0.18	
50N	51.00	50.14	49.03	0.88	0.36	
50N	51.00	51.51	50.51	0.88	-1.01	Extend SG knee wall along Drive "G" to "TC" 51.51'
49N	57.00	55.77	56.35	0.88	0.73	
49N	57.00	55.60	54.80	0.88	0.90	
49S	57.00	56.30	55.62	0.88	0.20	
48	56.00	55.33	54.54	0.88	0.17	
47N	55.00	54.29	53.41	0.88	0.21	
47S	54.00	53.28	52.40	0.88	0.22	
46N	53.00	52.15	51.63	0.88	0.35	
46S	52.00	51.22	50.43	0.88	0.28	
45N	49.80	49.04	48.23	0.88	0.26	
45S	48.90	48.08	47.29	0.88	0.32	
44N	47.70	47.03	46.14	0.88	0.17	
44S	46.70	45.99	45.18	0.88	0.21	
43	47.60	46.74	45.87	0.88	0.36	
42	48.90	47.98	47.05	0.88	0.42	
41	49.90	49.06	48.21	0.88	0.34	
40	51.50	50.37	49.42	0.88	0.63	
39	52.70	51.53	50.68	0.88	0.67	
38	53.80	52.76	51.84	0.88	0.54	
37	54.80	53.89	52.91	0.88	0.41	
37	54.80	54.87	53.89	0.88	-0.57	Extend SG knee wall along to "TC" 54.30'
36S	56.80	55.76	54.83	0.88	0.54	
36N	57.80	56.77	55.91	0.88	0.53	
35S	58.00	57.00	56.88	0.88	0.50	
35N	57.50	56.74	55.52	0.88	0.26	
34N	67.50	66.14	65.61	0.88	0.86	

BUILDING #	FF	High	Low	Criteria	Freeboard	Remarks
34S	66.50	65.54	65.19	0.88	0.46	
33N	65.80	65.04	64.69	0.88	0.26	
33S	65.80	64.62	64.27	0.88	0.68	
32	64.40	63.79	63.01	0.88	0.11	
31	63.30	62.59	61.40	0.88	0.21	
30	61.70	60.97	59.79	0.88	0.23	
29	60.10	59.35	58.14	0.88	0.25	
28	58.10	57.51	56.72	0.88	0.09	
27	57.10	56.47	55.76	0.88	0.13	
26	56.10	55.50	54.79	0.88	0.10	
25S	57.50	55.96	55.40	0.88	1.04	
25N	57.50	56.74	56.08	0.88	0.26	
24	58.80	57.73	57.02	0.88	0.57	
23	59.80	58.80	58.05	0.88	0.50	
22	61.10	60.27	58.98	0.88	0.33	
21	62.70	61.87	60.68	0.88	0.33	
20	64.30	63.48	62.29	0.88	0.32	
19	65.80	64.50	63.85	0.88	0.80	
18	66.50	65.39	65.04	0.88	0.61	
17	66.70	65.92	65.62	0.88	0.28	
16	67.20	66.47	66.05	0.88	0.23	
16	67.20	66.66	66.66	0.88	0.04	
15	75.50	74.74	73.72	0.88	0.26	
14	72.70	71.85	70.73	0.88	0.35	
13	71.30	70.34	69.22	0.88	0.46	
12	69.60	68.83	67.71	0.88	0.27	
11	68.10	67.27	66.73	0.88	0.33	
10N	65.70	64.82	63.70	0.88	0.38	
10S	64.20	63.70	62.36	0.88	0.00	
9	64.50	63.32	61.63	0.88	0.68	
8	67.00	64.94	63.74	0.88	1.56	
8	67.00	66.90	66.90	0.88	-0.40	Extend SG knee wall to "TC" 66.50'
7	70.10	68.44	67.73	0.88	1.16	
6	70.60	69.95	68.83	0.88	0.15	
5	72.10	71.46	70.34	0.88	0.14	
4	73.90	73.09	71.85	0.88	0.31	
4	73.90	73.90	73.90	0.88	-0.50	Extend knee wall along Drive "F" south to "TC"
3	75.60	73.58	74.87	0.88	1.52	
3	75.60	75.32	75.32	0.88	-0.22	Extend SG knee wall to "TC" 75.10' along south
2	74.10	73.39	72.20	0.88	0.21	
1	72.60	71.86	70.23	0.88	0.24	

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
Sheet								
1	50.80	50.69	50.13	0.76	0.19	0.11	I6E	Prorated Flow
2	50.30	50.13	49.56	0.76	0.21	0.13	I6E	Prorated Flow
3	49.88	49.56	49.26	0.76	0.23	0.23	I6E	Prorated Flow
4	49.30	49.05	48.73	0.76	0.26	0.12	I6E	Prorated Flow
5	48.97	48.73	48.30	0.76	0.28	0.06	I6E	Prorated Flow
6	48.63	48.30	47.94	0.76	0.30	0.10	I6E	Prorated Flow
7	47.73	47.44	47.07	0.76	0.03	0.62	I7AE	Prorated Flow
8	47.23	47.07	46.68	0.76	0.05	0.44	I7AE	Prorated Flow
9	46.98	46.68	46.33	0.76	0.08	0.53	I7AE	Prorated Flow
10	46.23	46.12	45.77	0.76	0.10	0.28	I7AE	Prorated Flow
11	45.73	45.77	45.37	0.76	0.13	0.08	I7AE	Prorated Flow
12	45.48	45.37	45.01	0.76	0.15	0.18	I7AE	Prorated Flow
13	44.83	44.52	44.15	0.76	0.18	0.33	I7AE	Prorated Flow
14	44.50	44.15	43.72	0.76	0.21	0.32	I7AE	Prorated Flow
15	44.08	43.72	43.41	0.76	0.23	0.28	I7AE	Prorated Flow
16	43.50	43.20	42.84	0.76	0.26	0.16	I7AE	Prorated Flow
17	43.17	42.84	42.45	0.76	0.28	0.14	I7AE	Prorated Flow
18	42.83	42.45	42.13	0.76	0.31	0.14	I7AE	Prorated Flow
19	42.00	41.77	41.57	0.76	0.03	0.54	I8E	Prorated Flow
20	42.00	41.57	41.41	0.76	0.07	0.67	I8E	Prorated Flow
21	42.00	41.41	41.31	0.76	0.10	0.76	I8E	Prorated Flow
22	41.50	41.25	41.16	0.76	0.14	0.35	I8E	Prorated Flow
23	41.50	41.16	41.06	0.76	0.17	0.38	I8E	Prorated Flow
24	41.50	41.06	40.94	1.50	0.21	0.41	I8E	Prorated Flow
25	40.80	40.53	40.44	0.76	0.05	0.56	I9AE	Prorated Flow
26	40.80	40.44	40.34	0.76	0.09	0.55	I9AE	Prorated Flow
27	40.63	40.34	40.24	0.76	0.14	0.39	I9AE	Prorated Flow
28	40.63	40.19	40.09	0.76	0.19	0.45	I9AE	Prorated Flow
29	40.30	40.09	39.98	0.76	0.23	0.12	I9AE	Prorated Flow
30	40.30	39.98	39.90	0.76	0.28	0.14	I9AE	Prorated Flow
31	40.13	39.76	39.67	0.76	0.04	0.68	I0E	Prorated Flow
32	40.13	39.67	39.57	0.76	0.07	0.69	I0E	Prorated Flow
33	39.80	39.57	39.48	0.76	0.11	0.39	I0E	Prorated Flow
34	39.80	39.42	39.32	0.76	0.15	0.47	I0E	Prorated Flow
35	39.63	39.32	39.18	0.76	0.18	0.32	I0E	Prorated Flow
36	39.63	39.18	39.04	0.76	0.22	0.39	I0E	Prorated Flow
37	40.50	40.06	39.95	0.76	0.20	0.42	I10W	
38	40.50	40.17	40.06	0.76	0.20	0.31	I10W	
39	40.83	40.26	40.17	0.76	0.20	0.55	I10W	
40	40.83	40.41	40.31	0.76	0.20	0.40	I10W	
41	41.00	40.51	40.41	0.76	0.20	0.47	I10W	
42	41.00	40.60	40.51	0.76	0.20	0.38	I10W	
43	41.33	40.83	40.73	0.76	0.20	0.48	I9AW	
44	41.33	40.93	40.83	0.76	0.20	0.38	I9AW	
45	41.50	41.03	40.93	0.76	0.20	0.45	I9AW	
46	41.50	41.17	41.08	0.76	0.20	0.31	I9AW	
47	41.83	41.26	41.17	0.76	0.20	0.55	I9AW	
48	41.83	41.36	41.26	0.76	0.20	0.45	I9AW	
49	42.33	41.87	41.78	0.76	0.20	0.44	I8W	
50	42.33	41.98	41.87	0.76	0.20	0.33	I8W	

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
51	42.33	42.04	41.98	0.76	0.20	0.27	I8W	
52	42.58	42.30	42.14	0.76	0.20	0.26	I8W	
53	42.83	42.53	42.30	0.76	0.20	0.28	I8W	
54	43.00	42.80	42.53	0.76	0.20	0.18	I8W	
55	43.83	43.59	43.24	0.76	0.20	0.22	I7AW	
56	44.17	43.99	43.59	0.76	0.20	0.16	I7AW	
57	44.50	44.34	43.99	0.76	0.20	0.14	I7AW	
58	45.08	44.91	44.55	0.76	0.20	0.15	I7AW	
59	45.33	45.30	44.91	0.76	0.20	0.01	I7AW	
60	45.83	45.66	45.30	0.76	0.20	0.15	I7AW	
61	46.58	46.50	46.16	0.76	0.20	0.06	I7AW	
62	47.00	46.90	46.50	0.76	0.20	0.08	I7AW	
63	47.50	47.27	46.90	0.76	0.20	0.21	I7AW	
64	48.33	48.07	47.71	0.76	0.20	0.24	I7AW	
65	48.50	48.47	48.07	0.76	0.20	0.01	I7AW	
66	49.00	48.82	48.47	0.76	0.20	0.16	I7AW	
67	49.58	49.42	49.03	0.76	0.20	0.14	I6W	
68	50.00	49.78	49.42	0.76	0.20	0.20	I6W	
69	50.50	50.14	49.78	0.76	0.20	0.34	I6W	
70	56.33	56.16	55.90	0.76	0.00	0.55	I6E	Prorated Flow
71	56.50	56.32	56.16	0.76	0.02	0.53	I6E	Prorated Flow
72	56.50	56.35	56.32	0.76	0.03	0.47	I6E	Prorated Flow
73	56.50	56.30	56.15	0.76	0.03	0.52	I4AE	Prorated Flow
74	56.33	56.15	55.88	0.76	0.06	0.44	I4AE	Prorated Flow
75	56.17	55.88	55.63	0.76	0.09	0.49	I4AE	Prorated Flow
76	55.50	55.33	55.06	0.76	0.12	0.31	I4AE	Prorated Flow
77	55.33	55.06	54.78	0.76	0.15	0.34	I4AE	Prorated Flow
78	55.00	54.78	54.54	0.76	0.18	0.23	I4AE	Prorated Flow
79	54.43	54.19	53.94	0.76	0.21	0.19	I4AE	Prorated Flow
80	54.27	53.94	53.66	0.76	0.25	0.22	I4AE	Prorated Flow
81	53.93	53.66	53.41	0.76	0.28	0.10	I4AE	Prorated Flow
82	53.60	53.26	53.02	0.76	0.31	0.11	I4AE	Prorated Flow
83	53.43	53.02	52.74	0.76	0.34	0.11	I4AE	Prorated Flow
84	53.10	52.74	52.49	0.76	0.37	0.00	I4AE	Prorated Flow
85	52.50	52.15	51.90	0.76	0.03	0.68	I5AE	Prorated Flow
86	52.00	51.90	51.63	0.76	0.05	0.38	I5AE	Prorated Flow
87	51.83	51.63	51.37	0.76	0.08	0.43	I5AE	Prorated Flow
88	51.50	51.22	50.97	0.76	0.10	0.46	I5AE	Prorated Flow
89	51.33	50.97	50.69	0.76	0.13	0.49	I5AE	Prorated Flow
90	50.83	50.69	50.43	0.76	0.15	0.22	I5AE	Prorated Flow
91	49.30	49.04	48.77	0.76	0.25	0.13	I5AE	Prorated Flow
92	49.13	48.77	48.48	0.76	0.28	0.18	I5AE	Prorated Flow
93	48.80	48.48	48.23	0.76	0.30	0.09	I5AE	Prorated Flow
94	48.40	48.08	47.83	0.76	0.33	0.04	I5AE	Prorated Flow
95	48.23	47.83	47.56	0.76	0.35	0.07	I5AE	Prorated Flow
96	48.07	47.56	47.29	0.76	0.38	0.13	I5AE	Prorated Flow
97	47.20	46.93	46.68	0.76	0.05	0.54	I16BE	Prorated Flow
98	47.03	46.68	46.39	0.76	0.11	0.52	I16BE	Prorated Flow
99	46.70	46.39	46.14	0.76	0.16	0.37	I16BE	Prorated Flow

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
100	46.20	45.99	45.74	0.76	0.21	0.17	I16BE	Prorated Flow
101	46.03	45.74	45.45	0.76	0.27	0.14	I16BE	Prorated Flow
102	45.70	45.45	45.18	0.76	0.31	0.01	I16BE	Prorated Flow
103	46.43	46.16	45.87	0.76	0.18	0.29	I16BW	
104	46.60	46.47	46.16	0.76	0.18	0.15	I16BW	
105	46.93	46.74	46.47	0.76	0.18	0.21	I16BW	
106	47.73	47.33	47.05	0.76	0.18	0.42	I16BW	
107	47.90	47.63	47.33	0.76	0.18	0.29	I16BW	
108	48.23	47.90	47.63	0.76	0.18	0.35	I16BW	
109	48.73	48.48	48.21	0.76	0.20	0.23	I5AW	
110	48.90	48.80	48.48	0.76	0.20	0.08	I5AW	
111	49.23	49.06	48.80	0.76	0.20	0.15	I5AW	
112	50.08	49.83	49.61	0.76	0.20	0.23	I5AW	
113	50.33	50.10	49.83	0.76	0.20	0.21	I5AW	
114	50.96	50.37	50.10	0.76	0.20	0.57	I5AW	
115	51.28	50.96	50.68	0.76	0.20	0.30	I5AW	
116	51.53	51.26	50.96	0.76	0.20	0.25	I5AW	
117	51.70	51.53	51.26	0.76	0.20	0.15	I5AW	
118	52.38	52.11	51.84	0.76	0.20	0.25	I5AW	
119	52.63	52.42	52.11	0.76	0.20	0.19	I5AW	
120	53.13	52.68	52.42	0.76	0.20	0.43	I5AW	
121	53.63	53.25	52.99	0.76	0.20	0.36	I4AW	
122	53.80	53.56	53.25	0.76	0.20	0.22	I4AW	
123	54.13	53.82	53.56	0.76	0.20	0.29	I4AW	
124	55.38	55.16	54.98	0.76	0.20	0.20	I4AW	
125	55.80	55.44	55.16	0.76	0.20	0.34	I4AW	
126	56.13	55.68	55.44	0.76	0.20	0.43	I4AW	
127	56.38	56.08	55.83	0.76	0.20	0.28	I4AW	
128	56.63	56.31	56.08	0.76	0.20	0.30	I4AW	
129	56.80	56.61	56.31	0.76	0.20	0.17	I4AW	
130	57.33	57.03	56.92	0.76	0.20	0.28	I4AW	
131	57.50	57.01	57.04	0.76	0.18	0.51	I6W	
132	57.33	57.01	56.88	0.76	0.18	0.34	I6W	
133	57.00	56.74	56.47	0.76	0.18	0.28	I6W	
134	56.83	56.43	56.03	0.76	0.18	0.42	I6W	
135	56.50	56.03	55.67	0.76	0.18	0.49	I6W	
136	67.00	66.14	65.90	0.76	0.16	0.92	I2AE	Prorated Flow
137	66.33	65.90	65.72	0.76	0.19	0.43	I2AE	Prorated Flow
138	66.08	65.72	65.61	0.76	0.22	0.30	I2AE	Prorated Flow
139	65.83	65.54	65.43	0.76	0.25	0.17	I2AE	Prorated Flow
140	65.83	65.43	65.31	0.76	0.28	0.22	I2AE	Prorated Flow
141	65.67	65.31	65.19	0.76	0.31	0.12	I2AE	Prorated Flow
142	65.30	65.04	64.92	0.76	0.03	0.58	I2E	Prorated Flow
143	65.30	64.92	64.80	0.76	0.06	0.64	I2E	Prorated Flow
144	65.13	64.80	64.69	0.76	0.09	0.53	I2E	Prorated Flow
145	64.80	64.62	64.51	0.76	0.12	0.32	I2E	Prorated Flow
146	64.63	64.51	64.38	0.76	0.15	0.20	I2E	Prorated Flow
147	64.63	64.38	64.27	0.76	0.18	0.27	I2E	Prorated Flow
148	63.90	63.79	63.59	0.76	0.04	0.42	I15AE	Prorated Flow
149	63.73	63.59	63.31	0.76	0.07	0.37	I15AE	Prorated Flow
150	63.40	63.31	63.01	0.76	0.11	0.25	I15AE	Prorated Flow
151	62.80	62.59	62.21	0.76	0.15	0.30	I15AE	Prorated Flow
152	62.30	62.21	61.78	0.76	0.18	0.10	I15AE	Prorated Flow
153	61.88	61.78	61.40	0.76	0.22	0.04	I15AE	Prorated Flow

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
154	61.23	60.97	60.60	0.76	0.26	0.13	I15AE	Prorated Flow
155	60.90	60.60	60.19	0.76	0.29	0.09	I15AE	Prorated Flow
156	60.48	60.19	59.79	0.76	0.33	0.01	I15AE	Prorated Flow
157	59.60	59.35	58.98	0.76	0.06	0.50	I15BE	Prorated Flow
158	59.10	58.98	58.54	0.76	0.13	0.25	I15BE	Prorated Flow
159	58.68	58.54	58.14	0.76	0.19	0.14	I15BE	Prorated Flow
160	57.60	57.43	57.21	0.76	0.04	0.47	I16AE	Prorated Flow
161	57.10	57.21	56.94	0.76	0.08	0.10	I16AE	Prorated Flow
162	57.43	56.94	56.72	0.76	0.13	0.62	I16AE	Prorated Flow
163	56.60	56.47	56.24	0.76	0.17	0.17	I16AE	Prorated Flow
164	56.43	56.24	55.98	0.76	0.21	0.15	I16AE	Prorated Flow
165	56.10	55.98	55.76	0.76	0.25	0.00	I16AE	Prorated Flow
166	55.80	55.50	55.28	0.76	0.29	0.09	I16AE	Prorated Flow
167	55.63	55.28	55.02	0.76	0.34	0.06	I16AE	Prorated Flow
168	55.47	55.02	54.79	0.76	0.38	0.07	I16AE	Prorated Flow
169	56.08	55.48	55.40	0.76	0.19	0.60	I16AW	
170	56.08	55.75	55.48	0.76	0.19	0.33	I16AW	
171	56.33	55.96	55.75	0.76	0.19	0.37	I16AW	
172	56.50	56.29	56.08	0.76	0.19	0.21	I16AW	
173	56.83	56.61	56.29	0.76	0.19	0.22	I16AW	
174	57.00	56.74	56.61	0.76	0.19	0.26	I16AW	
175	57.63	57.24	57.02	0.76	0.19	0.39	I16AW	
176	57.80	57.50	57.24	0.76	0.19	0.30	I16AW	
177	58.13	57.73	57.50	0.76	0.19	0.40	I16AW	
178	58.63	58.27	58.05	0.76	0.19	0.36	I15BW	
179	58.80	58.53	58.27	0.76	0.19	0.27	I15BW	
180	59.13	58.80	58.53	0.76	0.19	0.33	I15BW	
181	59.68	59.45	48.98	0.76	0.19	0.23	I15BW	
182	60.10	59.89	59.45	0.76	0.19	0.21	I15BW	
183	60.43	60.27	59.89	0.76	0.19	0.16	I15BW	
184	61.28	61.06	60.68	0.76	0.20	0.20	I15AW	
185	61.70	61.50	61.06	0.76	0.20	0.18	I15AW	
186	62.03	61.87	61.50	0.76	0.20	0.14	I15AW	
187	62.88	62.65	62.29	0.76	0.20	0.21	I15AW	
188	63.30	63.10	62.65	0.76	0.20	0.18	I15AW	
189	63.63	63.48	63.10	0.76	0.20	0.13	I15AW	
190	64.38	64.12	63.85	0.76	0.20	0.24	I15AW	
191	64.63	64.35	64.12	0.76	0.20	0.26	I15AW	
192	64.80	64.50	64.35	0.76	0.20	0.28	I15AW	
193	65.50	65.16	65.04	0.76	0.20	0.32	I2AW	
194	65.50	65.28	65.16	0.76	0.20	0.20	I2AW	
195	66.00	65.39	65.28	0.76	0.20	0.59	I2AW	
196	66.03	65.66	65.62	0.76	0.20	0.35	I2AE	
197	66.20	65.80	65.66	0.76	0.20	0.38	I2AE	
198	66.20	65.92	65.80	0.76	0.20	0.26	I2AE	
199	66.53	66.17	66.05	0.76	0.20	0.34	I2AE	
200	66.70	66.31	66.17	0.76	0.20	0.37	I2AE	
201	66.70	66.47	66.31	0.76	0.20	0.21	I2AE	
202	74.08	74.07	73.72	0.76	0.02	0.36	I1E	Prorated Flow
203	74.50	74.47	74.07	0.76	0.03	0.35	I1E	Prorated Flow
204	75.00	74.74	74.47	0.76	0.05	0.54	I1E	Prorated Flow
205	72.03	71.85	71.50	0.76	0.22	0.12	I11AE	Prorated Flow
206	71.70	71.50	71.09	0.76	0.25	0.09	I11AE	Prorated Flow
207	71.28	71.09	70.73	0.76	0.27	0.03	I11AE	Prorated Flow

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
208	70.63	70.34	69.98	0.76	0.29	0.08	I11AE	Prorated Flow
209	70.30	69.98	69.54	0.76	0.32	0.07	I11AE	Prorated Flow
210	69.88	69.54	69.22	0.76	0.34	0.04	I11AE	Prorated Flow
211	69.10	68.83	68.48	0.76	0.07	0.50	I11BE	Prorated Flow
212	68.60	68.48	68.07	0.76	0.15	0.21	I11BE	Prorated Flow
213	68.18	68.07	67.71	0.76	0.22	0.05	I11BE	Prorated Flow
214	67.60	67.45	67.13	0.76	0.04	0.46	I12E	Prorated Flow
215	67.43	67.13	66.91	0.76	0.07	0.54	I12E	Prorated Flow
216	67.10	66.91	66.73	0.76	0.11	0.36	I12E	Prorated Flow
217	65.03	64.82	64.46	0.76	0.02	0.54	I13E	Prorated Flow
218	64.70	64.46	64.05	0.76	0.05	0.52	I13E	Prorated Flow
219	64.28	64.05	63.70	0.76	0.07	0.47	I13E	Prorated Flow
220	63.70	63.38	63.12	0.76	0.10	0.51	I13E	Prorated Flow
221	63.20	63.12	62.73	0.76	0.12	0.22	I13E	Prorated Flow
222	63.03	62.73	62.36	0.76	0.14	0.39	I13E	Prorated Flow
223	64.00	62.30	61.63	0.76	0.18	1.72	I13W	
224	64.00	62.89	62.30	0.76	0.18	1.13	I13W	
225	64.00	63.32	62.89	0.76	0.18	0.70	I13W	
226	65.58	64.07	63.74	0.76	0.18	1.53	I13W	
227	66.00	64.57	64.07	0.76	0.18	1.45	I13W	
228	66.50	64.94	64.57	0.76	0.18	1.58	I13W	
229	68.68	67.96	67.73	0.76	0.18	0.74	I12W	
230	68.68	68.14	67.96	0.76	0.18	0.56	I12W	
231	68.68	68.44	68.14	0.76	0.18	0.26	I12W	
232	69.43	69.19	68.83	0.76	0.18	0.26	I11BW	
233	69.60	69.59	69.19	0.76	0.18	0.03	I11BW	
234	70.10	69.95	69.59	0.76	0.20	0.13	I11AW	
235	70.93	70.69	70.34	0.76	0.20	0.22	I11AW	
236	71.27	71.11	70.69	0.76	0.20	0.14	I11AW	
237	71.60	71.46	71.11	0.76	0.20	0.12	I11AW	
238	72.48	72.21	71.85	0.76	0.20	0.25	I11AW	
239	72.73	72.57	72.21	0.76	0.20	0.14	I11AW	
240	73.23	73.09	72.57	0.76	0.20	0.12	I11AW	
241	75.10	74.87	74.49	0.76	0.20	0.21	I1	
242	74.60	74.49	74.06	0.76	0.20	0.09	I1	
243	74.18	74.06	73.76	0.76	0.20	0.10	I1	
244	73.60	73.39	73.01	0.76	0.20	0.19	I1	
245	73.10	73.01	72.57	0.76	0.20	0.07	I1	
246	72.68	72.57	72.20	0.76	0.20	0.09	I1	
247	72.10	71.86	71.41	0.76	0.20	0.22	I1	
248	71.43	71.41	70.88	0.76	0.20	0.00	I1	
249	71.43	70.88	70.42	0.76	0.20	0.53	I1	

Addendum #1 to Update #1 to the FLOOD CONTROL MASTER PLAN UPDATE

SUMMERLIN WEST PLANNING AREA

Las Vegas, Nevada

W.O. # 7809

Prepared for:
Howard Hughes Corp.

Submitted to:
Public Works Department
City of Las Vegas

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: April 17, 2019
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Planning Area Master Plan Update**			**COPIES TO:** VTN Nevada
Cross Streets:	West of I-215 between Lake Mead Boulevard and Charleston Boulevard			The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS4926H.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017			CCRFCD
Zoning Action:				CCPW
FEMA Flood Zone	YES **X**	NO		
Proposed Storm Drain	YES **X**	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	10/9/2017 & 10/25/2017	11/8/2017	Not Approved	$400.00	490518: $400
2nd Submittal	12/6/2017	12/20/2017 & 1/10/2018	Not Approved	$400.00	492005: $400
3rd Submittal	2/27/2018	3/24/2018	Not Approved	$400.00	493739: $400
4th Submittal & Supplement	4/23/2018 & 5/22/2018	5/22/2018	See Comments Below	$400.00	495223: $400
CCPW & CCRFCD	7/30/2018	7/30/2018	Concurrence Recv'd	N/C	N/C
5th Submittal	1/3/2019 (Paid on 1/7/2019)	1/30/2019	Not Approved	$100.00	502286: $100
6th Submittal	2/19/2019	3/13/2019	Conditional Approval	$400.00	503267: $400
CCPW & CCRFCD	4/15/2019	4/17/2019	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	**$2,100.00**	----

REMARKS:

5th & 6th Submittals: Update #1 & Addendum #1 to address Land Use Changes in the Summerlin West Planning Area

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

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

1. The proposed revision of the overall *Summerlin West Planning Area* (SWPA) will have impact to the various existing downstream regional facilities. All impacted downstream facilities must be modified and substantially completed prior to the onsite development of upstream Villages.

   With the exception of ***Summerlin West Villages 21 and 22***, no occupancy permits will be issued to the remaining villages prior to the pertinent downstream facility modifications being completed.

2. The *Study* states that ***Detention Basin 5*** (**DB5**) needs additional capacity to accommodate the increased flows from the proposed SWPA revision. An update to the **DB5** technical drainage study must be submitted and approved prior to any upstream Villages development with the exception of Villages 21 and 22.

3. The *Study* states that a portion of the existing *Beltway Channel* between *Far Hills Avenue* and *Summerlin Parkway* requires modification with heightened stem walls. An update to the Western Beltway Channel modification must be submitted and approved prior to any upstream Villages development with the exception of Villages 21 and 22.

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

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

END OF REMARKS
WSP/AYS

T/R/S: T21S/R69E/22
AREA K-22

REGIONAL FLOOD CONTROL DISTRICT

Rec'd: 4/15/19

Steven C. Parrish, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

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Isaac Barron
City of North Las Vegas

Mayor Pro Tem
Dr. Lois Tarkanian
City of Las Vegas

layor Rodney Woodbury
City of Boulder City

April 4, 2019

Mr. Oh Sang Kwon, P.E.
City of Las Vegas Department of Public Works
333 North Rancho Drive
Las Vegas, NV 89106

DISTRICT CONCURRENCE: **SUMMERLIN WEST PLANNING AREA MASTER PLAN UPDATE (DS4926G) (RFCD No. 19-11232)**

Dear Mr. Kwon:

Clark County Regional Flood Control District (District) reviewed Technical Drainage Study dated January 3, 2019, and Addendum No. 1 dated February 19, 2019 for above-mentioned project as submitted by VTN NEVADA. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas Department of Public Works dated March 13, 2019.

District concurs with acceptance of this Technical Drainage Study by City of Las Vegas Department of Public Works.

District's review of this project was limited to issues of Regional Flood Control Significance as defined in *Uniform Regulations for the Control of Drainage*.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, information submitted by VTN NEVADA may be superseded. Compliance with regulatory elements and design standards specified in *Uniform Regulations for the Control of Drainage* does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for information, data, or conclusions presented by consulting engineers. We, therefore, make no warranties, either expressed or implied, in conducting this review.

STEVEN C. PARRISH, P.E.
General Manager/Chief Engineer

BY: _____
Ching C. Wang, P.E.
Senior Civil Engineer

CCW:dd

c: Brian Troy Ruiz, P.E., VTN Nevada
P:\Letters and Memos\Local Drainage\Land Development & Drainage\2019\L-19-11232.doc

600 S. Grand Central Parkway, Suite 300 • Las Vegas, Nevada 89106-4511
(702) 685-0000 • FAX: (702) 685-0001
Website: http://www.regionalflood.org

Department of Public Works

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

Rec'd: 4/15/19

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

Drainage Study Concurrence Letter

Date: April 10, 2019
Firm: VTN Nevada
Engineer: Joanna Ayson / Brian Ruiz
Address: 2727 South Rainbow Boulevard, Las Vegas, NV 89146
Phone: (702) 873-7550
Fax: (702) 362-2597
E-mail: jayson@vtnnv.com; bruiz@vtnnv.com

Subject: Update for Summerlin West Planning Area Master Plan Update
Location: West of I-215 between Lake Mead Blvd and Charleston Blvd
APN: 137-21-000-002, 137-26-101-001 and others
Sec, Township, Range: S33 and others T20S, R59E
Flood Zone & Panel: Zone A and Zone X, 2125E and 2150E, Dated September 27, 2002
Application Number: PW19-12378

Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Update	03/21/2019	04/10/2019	CR	
Addendum 1	03/21/2019	04/10/2019	CR	

The above-referenced project is located within the **City of Las Vegas** adjacent to Clark County unincorporated areas. The drainage study was submitted to the County for concurrence on March 21, 2019. In addition, the County has received the City of Las Vegas acceptance letter dated March 13, 2019 for the Technical Drainage Study (DS4926G).

The County concurs with the acceptance of this Drainage Study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

BOARD OF COUNTY COMMISSIONERS
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YOLANDA T. KING, County Manager

This update addresses; changes to land densities and parcel configurations; addition of drainage channels to Village 27; interim flood control berm to Village 21; revisions to existing washes to be designated as MPU facilities; upsizing Detention Basins DB5 and Grand Central Park to account for increased flow routing. The previously approved Technical Drainage Studies are: PW18-14248.

Additional Conditions:

1. The individual Technical Drainage Studies for the areas adjacent to the County to the west of the project site will need to be submitted for County review to verify acceptance of drainage flows.

2. Exhibits in future submittals need to show parcel lines and numbers; entity boundaries; ultimate development boundary; street names; etc.

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

Crissy Riland, P.E.
Senior Civil Engineer
Development Review
crissy@ClarkCountyNV.gov

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

LEGEND

- ONSITE BASIN BOUNDARY
- OFFSITE BASIN BOUNDARY
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- FLOW ARROW

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

NORTH

HEC-1 SUMMARY TABLE
VILLAGE 21
ULTIMATE CONDITION

Basin / Concentration Point	Area (Acre)			Q_{100} (cfs)			SDN
	Update	Previous	Difference	Update	Previous	Difference	
SUMM3	7.73	5.00	2.73	13	30	-17	SDN3
Z	4.50	4.50	0.00	18	17	1	SDN3
AA	4.02	3.71	0.31	17	14	3	SDN3
CAA	16.25	13.21	3.04	48	-	N/A	SDN3
NP-4	1.05	N/A	N/A	3	0	n/a	SDN3
NP-3	1.14	1.49	-0.35	3	4	-1	SDN3
CNP-3	2.18	1.49	0.69	7	-	N/A	SDN3
SUMM1	5.05	5.00	0.05	20	19	1	SDN3
Y	3.98	3.98	0.00	16	15	1	SDN3
X	3.94	3.63	0.31	16	14	2	SDN3
DES1	1.80	1.83	-0.03	8	7	1	SDN3
CSUMM1	33.20	N/A	N/A	113	-	N/A	SDN3
S	6.33	6.56	-0.23	24	25	-1	SDN3
V25-G	11.44	N/A	N/A	45	-	N/A	SDN3
R	3.07	3.10	-0.03	12	11	1	SDN3
CR	14.51	3.10	11.41	56	-	N/A	SDN3
Q	3.16	3.16	0.00	12	11	1	SDN3
CQ	17.67	6.26	11.41	68	-	N/A	SDN3
ST1	1.50	1.62	-0.12	7	6	1	SDN3
CST1	19.18	14.44	4.74	74	54	20	SDN3
P	3.00	3.17	-0.17	11	11	0	SDN3
DES2	2.39	2.27	0.12	10	9	1	SDN3
CDES2	30.89	N/A	N/A	119	-	N/A	SDN3
DES3	3.73	3.78	-0.05	17	15	2	SDN3
L	7.44	7.36	0.08	30	26	4	SDN3
COS-3	5.90	6.10	-0.20	17	18	-1	SDN3
DES4	2.79	2.88	-0.09	12	11	1	SDN3
V25-F	10.45	N/A	N/A	43	-	N/A	SDN3
V25-COS4	4.64	N/A	N/A	15	-	N/A	SDN3
V25-FOXN	3.23	N/A	N/A	14	-	N/A	SDN3
CFOXN	18.32	N/A	N/A	72	-	N/A	SDN3
V25-B	19.93	N/A	N/A	67	-	N/A	SDN3
V25-FOXS	3.19	N/A	N/A	11	-	N/A	SDN3
CFOXS	23.11	N/A	N/A	77	-	N/A	SDN3
V25-C	26.54	N/A	N/A	86	-	N/A	SDN3
V25-COS2	1.79	N/A	N/A	5	-	N/A	SDN3
STA1	2.98	N/A	N/A	13	-	N/A	SDN3
CSTA1	72.75	N/A	N/A	238	-	N/A	SDN3
V25-E	17.13	N/A	N/A	65	-	N/A	SDN3
V25-COS3	2.37	N/A	N/A	8	-	N/A	SDN3
ST2	2.88	2.93	-0.05	12	12	0	SDN3
CST2	95.12	2.93	92.19	291	-	N/A	SDN3
F	16.58	16.88	-0.30	65	59	6	SDN3
E	20.15	20.20	-0.05	78	77	1	SDN3
DES5	5.83	5.46	0.37	22	20	2	SDN3
CDES5	185.60	N/A	N/A	624	-	N/A	SDN3
C	14.83	14.05	0.78	54	44	10	SDN3
NP-1	1.27	1.35	-0.08	4	5	-1	SDN3
ST7	2.30	2.30	0.00	9	9	0	SDN3
D	14.73	15.42	-0.69	56	53	3	SDN3
CST7	33.13	33.12	0.01	124	108	16	SDN3
W	8.31	7.11	1.20	31	27	4	SDN3
SUMM2	3.63	3.28	0.35	16	13	3	SDN3
T	5.98	5.99	-0.01	23	23	0	SDN3
NP-2	0.93	0.87	0.06	3	3	0	SDN3
ST3	1.70	2.09	-0.39	8	8	0	SDN3
CST3	2.63	8.08	-5.45	11	43	-32	SDN3
CARR1	3.52	3.52	0.00	15	14	1	SDN3
M	9.11	9.11	0.00	32	32	0	SDN3
CCARR1	32.00	N/A	N/A	129	-	N/A	SDN3
N	2.54	2.54	0.00	10	9	1	SDN3
O	3.47	3.43	0.04	13	13	0	SDN3
STD	0.88	N/A	N/A	4	-	N/A	SDN3
CSTD	6.90	5.97	0.93	26	-	N/A	SDN3
K	8.20	8.01	0.19	30	29	1	SDN3
STB	2.65	N/A	N/A	12	-	N/A	SDN3
CSTB	17.75	8.01	9.74	68	-	N/A	SDN3
J	11.83	11.83	0.00	42	42	0	SDN3
COS-2	0.58	N/A	N/A	2	-	N/A	SDN3
COS-1	7.80	7.78	0.02	22	22	0	SDN3
CCOS-1	8.38	7.78	0.60	24	-	N/A	SDN3
CARR2	2.45	2.49	-0.04	10	10	0	SDN3
ST6	3.08	3.01	0.07	13	12	1	SDN3
CCARR2	76.80	N/A	N/A	286	-	N/A	SDN3
B	13.90	13.71	0.19	54	46	8	SDN3
A	14.15	14.36	-0.21	51	47	4	SDN3
CARR3	4.87	4.85	0.02	19	19	0	SDN3
CCARR3	109.72	N/A	N/A	410	-	N/A	SDN3
V	7.25	7.19	0.06	29	27	2	SDN3
SUMM4	4.87	N/A	N/A	21	-	N/A	SDN3
CSUMM4	12.12	7.19	N/A	50	-	N/A	SDN3
DC-2	1.19	1.40	-0.21	5	5	0	SDN3
U	20.17	20.42	-0.25	73	74	-1	SDN3
I	18.69	18.50	0.19	61	60	1	SDN3
STA	1.01	0.00	n/a	5	0	n/a	SDN3
G	5.01	5.71	-0.70	19	21	-2	SDN3
H	5.79	6.26	-0.47	21	22	-1	SDN3
CGH	10.80	11.97	-1.17	39	-	N/A	SDN3
DC-1	8.19	8.19	0.00	23	25	-2	SDN3
NVE	21.74	21.74	0.00	75	79	-4	SDN3
CDC1	104.69	101.38	3.31	326	-	N/A	SDN3
CFAR	454.4	N/A	N/A	1598	-	N/A	SDN3

THE HOWARD HUGHES CORPORATION
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5145
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

2018 UPDATE TO
SUMMERLIN WEST
PLANNING AREA

A.6.6
VILLAGE 21
DRAINAGE BASIN MAP

DRAWN BY: JYA/SS	NOV 2018		
DESIGNED BY: JYA/SS	NOV 2018		
CHECKED BY: WJM	FEB 2019	SCALE:	N/A HORZ. N/A VERT.
PROJECT NO: 7609			

SHEET
A.6.6
OF SHEETS
DRAWING NO.

H:\7609\Drainage\A_JP\A Figures\A.6.6 Village 21 Drainage Basin Map\A.6.6 Area 1 Drainage Basin Map.dwg

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

NORTH

LEGEND

- REGIONAL STORM DRAIN ALIGNMENT
- EXISTING STORM DRAIN ALIGNMENT
- INTERIM BERM/CHANNEL ALIGNMENT
- VILLAGE 21 LOCAL STORM DRAIN ALIGNMENT
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- (1) LOCAL FACILITY DESIGNATION
- DEVELOPED CONDITION FLOW ARROW

VILLAGE 21 LOCAL FLOOD PROTECTION FACILITIES

Facility Label	Design Slope (%)	Q100 ULT (cfs)		Tributary Basin/CP		Facility		Technical Drainage Study
		Previous	Updated	Previous	Updated	Previous	Updated	
1	9.0%	59	65	F	F	30" RCP	36" RCP	Reference 1
2	8.8%	77	78	E	E	30" RCP	36" RCP	Reference 1
3	4.2%	27	29	V	V	24" RCP	24" RCP	
5	4.8%	27	31	W	W	24" RCP	24" RCP	
6	1.3%	14	17	AA	AA	24" RCP	24" RCP	
7	1.0%	18	18	Z	Z	24" RCP	24" RCP	
8	4.2%	31	18	CZAA	Z	24" RCP	24" RCP	
9	4.2%	35	18	CNP-4A	CAA	24" RCP	24" RCP	
11	1.0%	15	16	Y	Y	24" 4CP	24" RCP	
13	3.3%	14	16	X	X	24" RCP	24" RCP	
15	0.5%	4	7	NP-3	CNP-3	24" 4CP	24" RCP	
20A	5.4%	n/a	45	n/a	V25-G	N/A	30" RCP	
20	2.1%	11	12	R	R	24" RCP	24" RCP	
21	5.4%	11	56	R	CR	24" RCP	30" RCP	
22	1.0%	11	12	Q	Q	24" RCP	24" RCP	
23	5.4%	23	68	CQR	CQ	24" RCP	36" RCP	
24	10.0%	25	24	S	S	24" RCP	30" RCP	Reference 6
25	8.0%	54	74	CST1	CST1	30" RCP	36" RCP	Reference 6
26	10.0%	11	11	P	P	24" RCP	30" RCP	Reference 6
27	10.0%	n/a	17	n/a	DES3	N/A	30" RCP	Reference 6
27A	10.0%	26	30	L	L	30" RCP	30" RCP	Reference 6
28	1.5%	3	3	NP-2	NP-2	24" RCP	24" RCP	
29	5.0%	3	11	NP-2	CST3	24" RCP	24" RCP	Reference 7
32	3.0%	23	23	T	T	24" RCP	24" RCP	Reference 7
33	3.0%	N/A	55	N/A	N/A	N/A	24" RCP	Reference 7
34	3.2%	N/A	66	N/A	N/A	N/A	36" RCP	Reference 7
35	5.0%	32	32	M	M	30" RCP	36" RCP	Reference 7
36	1.5%	N/A	104	N/A	N/A	N/A	48"	Reference 7
37	6.0%	N/A	22	CNO	CNO	N/A	24" RCP	
38	0.5%	29	30	K	K	30" RCP	36" RCP	
38B	4.0%	108	68	CST4	CSTB	36" RCP	36" RCP	Reference 7
39	6.1%	n/a	360	n/a	CST2	N/A	54" RCP	Reference 1
40	4.0%	42	42	J	J	24" RCP	42" RCP	Reference 7
41	6.3%	18	17	COS-3	COS-3	24" RCP	10'X10' RCB*	Reference 1
42	10.0%	22	24	COS-1	CCOS1	24" RCP	24" RCP	Reference 7
43A	1.5%	44	58	C	C, NP-1	36" RCP	42" RCP	Reference 3
43B	1.3%	58	58	C, NP-1, ST7	C, NP-1	36" RCP	42" RCP	Reference 3
44	5.6%	12	13	ST6	ST6	24" RCP	24" RCP	Reference 4
45	6.0%	46	54	B	B	30" RCP	36" RCP	Reference 2
46	6.0%	47	51	A	A	30" RCP	36" RCP	Reference 2
47A	N/A	N/A	N/A	N/A	For Flexibility	N/A	24" RCP	Reference 3
47	4.0%	53	56	D	D	30" RCP	36" RCP	Reference 3
48	1.3%	108	124	CST7	CST7	42" RCP	54" RCP	Reference 3
49	6.0%	74	73	U	U	30" RCP	36" RCP	
50	2.0%	60	61	I	I	36" RCP	42" RCP	
51	0.9%	43	39	G, H	CGH	24" RCP	Riprap Chnl	Reference 5
52	N/A	N/A	5	N/A	STA	N/A	24" RCP	

References:
1- Desert Foothills (Far Hills to Redpoint)
2- Carriage Hill (Far Hills to Street A)
3- Ridge Pine Street
4-Street A (Carriage Hill to Desert Foothills)
5-Street A (Carriage Hill to Parcel H)
6- Desert Foothills (Redpoint to Summerlin Parkway)
7- Carriage Hill (Redpoint to Summerlin Parkway)

REVISION | BY | DATE | REV

THE HOWARD HUGHES CORPORATION
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2627 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

2018 UPDATE TO SUMMERLIN WEST PLANNING AREA

A.6.7
VILLAGE 21 LOCAL FLOOD CONTROL FACILITIES MAP

DRAWN BY: JYA/GSB — NOV 2018
DESIGNED BY: JVG/GSB — NOV 2018
CHECKED BY:
PROJECT NO.: 7929
SCALE: 1"=300' HORIZ. NA VERT.

SHEET A.6.
OF
DRAWI

...ments Facilities Maps\A.6.7 Village 21 Local Flood Control Facilities Map.dwg

STANDARD FORM 4

DEVELOPMENT: Village 21

W.O. # 7809 CALCULATED BY: GB

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Existing:		Developed:	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132 C_n - 0.39 \qquad T_c = T_i + T_t$$

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.	
DEVELOPED CONDITION ONSITE																	
A	94.9	0.863	14.15	0.0221	100	1.0	4.27	1614	3.7	3.9	5.9	5.33	1714	19.52	9.60	0.096	
B	95.0	0.864	13.90	0.0217	100	1.0	4.25	1039	4.1	4.1	6.2	3.47	1139	16.33	7.72	0.077	
C	95.0	0.864	14.83	0.0232	100	1.0	4.25	1596	3.3	3.7	5.6	5.54	1696	19.42	9.79	0.098	
D	95.0	0.864	14.73	0.0230	100	1.0	4.25	1240	4.4	4.3	6.4	3.87	1340	17.44	8.12	0.081	
E	95.0	0.864	20.15	0.0315	100	1.0	4.25	1545	6.5	5.2	7.8	3.84	1645	19.14	8.09	0.081	
F	95.0	0.864	16.58	0.0259	100	1.0	4.25	1350	5.8	4.9	7.4	3.64	1450	18.06	7.89	0.079	
G	95.0	0.864	5.01	0.0078	100	1.0	4.25	780	1.5	2.5	3.8	4.56	880	14.89	8.80	0.088	
H	95.0	0.864	5.79	0.0091	100	1.0	4.25	1078	1.5	2.5	3.7	5.97	1178	16.54	10.22	0.102	
I	92.0	0.824	18.69	0.0292	100	1.0	4.96	1599	3.2	3.6	5.5	5.66	1699	19.44	10.62	0.106	
J	92.0	0.824	11.83	0.0185	100	1.0	4.96	1010	4.8	4.4	6.7	3.17	1110	16.17	8.13	0.081	
K	92.0	0.824	8.20	0.0128	100	1.0	4.96	867	5.1	4.6	6.9	2.72	967	15.37	7.68	0.077	
L	95.0	0.864	7.44	0.0116	100	1.0	4.25	1027	5.5	4.7	7.1	3.00	1127	16.26	7.24	0.072	
M	92.0	0.824	9.11	0.0142	100	1.0	4.96	1027	5.5	4.7	7.1	3.00	1127	16.26	7.96	0.080	
N	92.2	0.827	2.54	0.0040	100	1.0	4.91	558	4.1	4.1	6.2	2.19	658	13.66	7.10	0.071	
O	92.1	0.826	3.47	0.0054	100	1.0	4.93	779	5.3	4.6	7.0	2.46	879	14.88	7.39	0.074	
P	92.1	0.826	3.00	0.0047	100	1.0	4.93	644	2.8	3.4	5.1	2.94	744	14.13	7.86	0.079	
Q	92.2	0.826	3.16	0.0049	100	1.0	4.93	587	2.1	2.9	4.4	3.17	687	13.82	8.10	0.081	
R	92.2	0.826	3.07	0.0048	100	1.0	4.93	555	4.0	4.0	6.1	2.22	655	13.64	7.15	0.071	
S	94.2	0.853	6.33	0.0099	100	1.0	4.44	1240	4.8	4.4	6.7	3.71	1340	17.44	8.15	0.081	
T	94.2	0.853	5.98	0.0093	100	1.0	4.44	1100	4.3	4.2	6.3	3.58	1200	16.67	8.01	0.080	
U	94.2	0.853	20.17	0.0315	100	1.0	4.44	1700	4.5	4.3	6.5	5.01	1800	20.00	9.45	0.094	
V	94.2	0.853	7.25	0.0113	100	1.0	4.44	1020	7.8	5.7	8.6	2.48	1120	16.22	6.92	0.069	
W	94.2	0.853	8.31	0.0130	100	1.0	4.44	1290	5.0	4.5	6.8	3.78	1390	17.72	8.22	0.082	
X	94.2	0.853	3.94	0.0061	100	1.0	4.44	636	4.1	4.1	6.2	2.41	736	14.09	6.84	0.068	
Y	94.2	0.853	3.98	0.0062	100	1.0	4.44	721	6.1	5.0	7.6	2.16	821	14.56	6.60	0.066	
Z	94.2	0.853	4.50	0.0070	100	1.0	4.44	785	7.6	5.6	8.5	2.05	885	14.92	6.49	0.065	
AA	94.2	0.853	4.02	0.0063	100	1.0	4.44	462	6.3	5.1	7.7	1.52	562	13.12	5.96	0.060	
COS-3	88.0	0.772	5.90	0.0092	100	1.0	5.91	1556	5.8	3.6	7.1	4.83	1656	19.20	10.74	0.107	
COS-2	88.3	0.776	0.58	0.0009	50	1.0	4.13	506	0.4	0.9	1.8	9.01	556	13.09	13.09	0.131	
COS-1	88.0	0.772	7.80	0.0122	100	1.0	5.91	1604	5.5	3.5	6.9	5.05	1704	19.47	10.96	0.110	
NP-4	88.0	0.772	1.05	0.0016	100	1.0	5.91	896	6.5	5.1	7.8	2.47	996	15.53	8.38	0.084	
NP-3	88.0	0.772	1.14	0.0018	100	1.0	5.91	750	1.7	2.7	4.0	4.17	850	14.72	10.08	0.101	
NP-2	89.0	0.785	0.93	0.0015	100	1.0	5.67	389	3.9	4.0	6.0	1.63	489	12.72	7.31	0.073	
NP-1	88.0	0.772	1.27	0.0020	100	1.0	5.91	218	4.1	4.1	6.2	0.89	318	11.77	6.80	0.068	
SUMM1	98.0	0.904	5.05	0.0079	40	2.0	1.77	2080	2.9	3.4	5.2	7.50	2120	21.78	9.27	0.093	
SUMM2	98.0	0.904	3.63	0.0057	40	2.0	1.77	1370	6.2	5.0	7.6	3.56	1410	17.83	5.33	0.053	
SUMM3	98.0	0.904	2.85	0.0045	40	2.0	1.77	1070	5.2	4.6	7.0	3.16	1110	16.17	4.93	0.049	

```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                *                    *         609 SECOND STREET            *
 *                                      *                    *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   27DEC18  TIME  16:51:33  *                    *          (916) 756-1104              *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

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

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

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


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

                        *DIAGRAM
 *** FREE ***
             1          ID    INPUT FILE DATE = SEPTEMBER 12,2017
             2          ID    DESIGN STORM = 100-YEAR 6-HR STORM
             3          ID    STORM DISTRIBUTION = SDN #3
             4          ID    MODELED BY VTN (JYA)
             5          ID
             6          ID    ****************************************************************
             7          ID    * VILLAGE 21 (PREVIOUSLY AREA 1) HEC-1 MODE                    *
             8          ID    * REFER TO LAND USE EXHIBIT BY VTN FOR LOCATION OF AREAS 1      *
             9          ID    *                                                              *
            10          ID    ****************************************************************
            11          ID
            12          ID
            13          ID
            14          ID  100-YEAR,  6-HOUR STORM,  SDN3
            15          ID
            16          IT       5       0       0     100
            17          IO       5       0       0
            18          IN       5       0       0
            19          JR    PREC    1.00
                        *

            20          KK   SUMM3
            21          BA  0.0045
            22          PB    3.40
            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      98
            32          UD   0.050
                        *

            33          KK       Z
            34          BA  0.0070
            35          PB    3.41
            36          LS       0    94.2
            37          UD   0.065
                        *

            38          KK      AA
            39          BA  0.0063
            40          PB    3.40
            41          LS       0    94.2
            42          UD   0.060
                        *
```

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

  43          KK     CAA
  44          KM   COMBINES SUMM3, Z, AND AA
  45          HC       3
              *

  46          KK    NP-4
  47          BA  0.0016
  48          PB    3.40
  49          LS       0    88.0
  50          UD   0.084
              *

  51          KK    NP-3
  52          BA  0.0018
  53          PB    3.38
  54          LS       0    88.0
  55          UD   0.101
              *

  56          KK   CNP-3
  57          KM   COMBINES NP-3 AND NP-4
  58          HC       2
              *

  59          KK   SUMM1
  60          PB    3.40
  61          BA  0.0079
  62          LS       0     98
  63          UD   0.093
              *

  64          KK       Y
  65          PB    3.40
  66          BA  0.0062
  67          LS       0    94.2
  68          UD   0.066
              *

  69          KK       X
  70          PB    3.40
  71          BA  0.0061
  72          LS       0    94.2
  73          UD   0.068
              *

  74          KK    DES1
  75          BA  0.0028
  76          PB    3.38
  77          LS       0     98
  78          UD   0.066
              *
```



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

  79          KK  CSUMM1
  80          KM   RFCD FACILITY IN DESERT FOOTHILLS DRIVE
  81          HC       6
              *

  82          KK       S
  83          BA  0.0099
  84          PB    3.40
  85          LS       0    94.2
  86          UD   0.081
              *

  87          KK   V25-G
  88          KM   OLD PARCEL NAME IS W48
  89          BA  0.0179
  90          PB    3.41
  91          LS       0    93.0
  92          UD   0.069
              *

  93          KK       R
  94          BA  0.0048
  95          PB    3.40
  96          LS       0    92.2
  97          UD   0.071
              *

  98          KK     CR
```

```
 99          KM   COMBINE Q AND R
100          HC       2
             *

101          KK       Q
102          BA  0.0049
103          PB    3.40
104          LS       0    92.2
105          UD   0.075
             *

106          KK      CQ
107          KM   COMBINE Q AND CR
108          HC       2
             *

109          KK     RCQ
110          KM   ROUTE CQR TO CST1
111          RD     330   0.055   0.013       0    CIRC       3
             *
1                                    HEC-1 INPUT                                        PAGE  4

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

112          KK     ST1
113          BA  0.0023
114          PB    3.40
115          LS       0      98
116          UD   0.050
             *

117          KK    CST1
118          KM   COMBINES CQ AND ST1
119          HC       2
             *

120          KK  DUMMY2
121          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
122          HC       2
             *

123          KK       P
124          BA  0.0047
125          PB    3.40
126          LS       0    92.1
127          UD   0.079
             *

128          KK    DES2
129          PB    3.40
130          BA  0.0037
131          LS       0      98
132          UD   0.062
             *

133          KK   CDES2
134          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
135          HC       3
             *

136          KK    DES3
137          BA  0.0058
138          PB    3.40
139          LS       0      98
140          UD   0.050
             *

141          KK       L
142          BA  0.0116
143          PB    3.40
144          LS       0    95.0
145          UD   0.072
             *
1                                    HEC-1 INPUT                                        PAGE  5

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

146          KK   COS-3
147          BA  0.0092
148          PB    3.39
149          LS       0    88.0
150          UD   0.107
             *

151          KK    DES4
152          BA  0.0044
153          PB    3.40
```

```
 154          LS       0    98.0
 155          UD   0.076
              *

 156          KK   CDES4
 157          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 158          HC       5
              *

 159          KK   V25-F
 160          BA  0.0163
 161          PB    3.44
 162          LS       0    95.0
 163          UD   0.067
              *

 164          KKV25-COS4
 165          BA  0.0073
 166          PB    3.43
 167          LS       0    88.0
 168          UD   0.089
              *

 169          KKV25-FOXN
 170          BA  0.0050
 171          PB    3.41
 172          LS       0    98.0
 173          UD   0.062
              *

 174          KK   CFOXN
 175          KM   COMBINE V25-F, V25-COS4, V25-FOXN
 176          HC       3
              *

 177          KK   V25-B
 178          KM   OLD BASIN NAME GP20
 179          BA  0.0311
 180          PB    3.42
 181          LS       0    91.0
 182          UD   0.097
              *
```



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

 183          KKV25-FOXS
 184          BA  0.0050
 185          PB    3.40
 186          LS       0    98.0
 187          UD   0.179
              *

 188          KK   CFOXS
 189          KM   COMBINE V25-B, AND V25-FOXS
 190          HC       2
              *

 191          KK   V25-C
 192          BA  0.0415
 193          PB    3.45
 194          LS       0    90.7
 195          UD   0.109
              *

 196          KK  RV25-C
 197          KM   ROUTE V25-C TO CSTA1
 198          RD    2047   0.013   0.023       0    CIRC     3.5
              *

 199          KKV25-COS2
 200          BA  0.0028
 201          PB    3.43
 202          LS       0    88.0
 203          UD   0.128
              *

 204          KKRV25-COS2
 205          KM   ROUTE V25-COS2
 206          RD    1947   0.013   0.023       0    CIRC     3.5
              *

 207          KK    STA1
 208          KM   OLD PARCEL NAME IS SAME
 209          BA  0.0046
 210          PB    3.43
 211          LS       0    98.0
 212          UD   0.051
```

```
                *

 213            KK   CSTA1
 214            KM   COMBINE V25-FOXS, V25-C, CFOXS, V25-COS2, STA1, AND CFOXS
 215            HC       5
                *
1                                       HEC-1 INPUT                                             PAGE  7

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


 216            KK  RCSTA1
 217            KM   ROUTE STA1 TO CST2
 218            RD    1530   0.013   0.060       0    CIRC     3.5
                *

 219            KK   V25-E
 220            KM   OLD PARCEL NAME IS W63
 221            BA  0.0268
 222            PB    3.40
 223            LS       0    95.0
 224            UD   0.088
                *

 225            KK  RV25-E
 226            KM   ROUTE V25-E TO CST2
 227            RD     702   0.013   0.060       0    CIRC     3.5
                *

 228            KKV25-COS3
 229            KM   OLD PARCEL NAME IS GPPW3
 230            BA  0.0037
 231            PB    3.41
 232            LS       0    88.1
 233            UD   0.070
                *

 234            KK     ST2
 235            BA  0.0045
 236            PB    3.39
 237            LS       0      98
 238            UD   0.059

 239            KK    CST2
 240            KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 241            HC       4
                *

 242            KK  DUMMY5
 243            KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 244            HC       2
                *

 245            KK       F
 246            BA  0.0259
 247            PB    3.39
 248            LS       0    95.0
 249            UD   0.079
                *
1                                       HEC-1 INPUT                                             PAGE  8

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


 250            KK       E
 251            BA  0.0315
 252            PB    3.38
 253            LS       0    95.0
 254            UD   0.081
                *

 255            KK    DES5
 256            BA  0.0091
 257            PB    3.38
 258            LS       0    98.0
 259            UD   0.108
                *

 260            KK   CDES5
 261            KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 262            HC       4
                *

 263            KK       C
 264            BA  0.0232
 265            PB    3.36
 266            LS       0    95.0
 267            UD   0.098
                *
```

```
 268          KK    NP-1
 269          BA  0.0020
 270          PB    3.36
 271          LS       0    88.0
 272          UD   0.068
              *

 273          KK     ST7
 274          BA  0.0036
 275          PB    3.36
 276          LS       0      98
 277          UD   0.089
              *

 278          KK       D
 279          BA  0.0230
 280          PB    3.36
 281          LS       0    95.0
 282          UD   0.081
              *

 283          KK    CST7
 284          KM   COMBINES IN RIDGE PINE ST
 285          HC       4
              *
1                                      HEC-1 INPUT                                      PAGE  9

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


 286          KK  DUMMY7
 287          KM   RFCD FACILITY IN FAR HILLS
 288          HC       2
              *

 289          KK       W
 290          BA  0.0130
 291          PB    3.38
 292          LS       0    94.2
 293          UD   0.082
              *

 294          KK   SUMM2
 295          BA  0.0057
 296          PB    3.38
 297          LS       0      98
 298          UD   0.053
              *

 299          KK       T
 300          PB    3.38
 301          BA  0.0093
 302          LS       0    94.2
 303          UD   0.080
              *

 304          KK    NP-2
 305          BA  0.0015
 306          PB    3.38
 307          LS       0    89.0
 308          UD   0.073
              *

 309          KK     ST3
 310          BA  0.0027
 311          PB    3.38
 312          LS       0    98.0
 313          UD   0.050
              *

 314          KK    CST3
 315          KM   COMBINE NP-2 AND ST3
 316          HC       2
              *

 317          KK  DUMMY8
 318          KM   COMBINE CT AND CST3
 319          HC       4
              *
1                                      HEC-1 INPUT                                      PAGE 10

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


 320          KK   CARR1
 321          BA  0.0055
 322          PB    3.36
 323          LS       0    98.0
```

```
 324          UD   0.060
              *

 325          KK       M
 326          BA  0.0142
 327          PB    3.36
 328          LS       0    92.0
 329          UD   0.083
              *

 330          KK  CCARR1
 331          KM   RFCD FACILITY IN CARRIAGE HILL DR
 332          HC       3
              *

 333          KK       N
 334          BA  0.0040
 335          PB    3.38
 336          LS       0    92.2
 337          UD   0.071
              *

 338          KK       O
 339          BA  0.0054
 340          PB    3.38
 341          LS       0    92.1
 342          UD   0.074
              *

 343          KK     STD
 344          BA  0.0014
 345          PB    3.38
 346          LS       0     98
 347          UD   0.050
              *

 348          KK    CSTD
 349          KM   COMBINE N, O, AND STD
 350          HC       3
              *

 351          KK       K
 352          BA  0.0128
 353          PB    3.37
 354          LS       0    92.0
 355          UD   0.077
              *
```



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

 356          KK     STB
 357          BA  0.0041
 358          PB    3.38
 359          LS       0     98
 360          UD   0.050
              *

 361          KK    CSTB
 362          HC       3
              *

 363          KK DUMMY10
 364          KM   RFCD FACILITY IN CARRIAGE HILL DR
 365          HC       2
              *

 366          KK       J
 367          BA  0.0185
 368          PB    3.35
 369          LS       0    92.0
 370          UD   0.081
              *

 371          KK DUMMY11
 372          KM   RFCD FACILITY IN CARRIAGE HILL DR
 373          HC       2
              *

 374          KK   COS-2
 375          BA  0.0009
 376          PB    3.37
 377          LS       0    88.3
 378          UD   0.131
              *

 379          KK   COS-1
 380          BA  0.0122
```

```
          381          PB    3.37
          382          LS       0    88.0
          383          UD   0.110
                       *

          384          KK  CCOS-1
          385          HC       2
                       *

          386          KK   CARR2
          387          BA  0.0038
          388          PB    3.35
          389          LS       0    98.0
          390          UD   0.068
                       *
1                                       HEC-1 INPUT                                          PAGE 12

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


          391          KK     ST6
          392          BA  0.0048
          393          PB    3.37
          394          LS       0      98
          395          UD   0.058
                       *

          396          KK  CCARR2
          397          KM   RFCD FACILITY IN CARRIAGE HILL DR
          398          HC       4
                       *

          399          KK       B
          400          BA  0.0217
          401          PB    3.34
          402          LS       0    95.0
          403          UD   0.077
                       *

          404          KK       A
          405          BA  0.0221
          406          PB    3.33
          407          LS       0    94.9
          408          UD   0.096
                       *

          409          KK   CARR3
          410          BA  0.0076
          411          PB    3.34
          412          LS       0      98
          413          UD   0.089
                       *

          414          KK  CCARR3
          415          KM   RFCD FACILITY IN CARRIAGE HILL DR
          416          HC       4
                       *

          417          KK DUMMY13
          418          KM   RFCD FACILITY IN FAR HILLS
          419          HC       3
                       *

          420          KK       V
          421          BA  0.0113
          422          PB    3.38
          423          LS       0    94.2
          424          UD   0.069
                       *
1                                       HEC-1 INPUT                                          PAGE 13

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


          425          KK   SUMM4
          426          BA  0.0076
          427          PB    3.38
          428          LS       0      98
          429          UD   0.055
                       *

          430          KK  CSUMM4
          431          KM   COMBINES IN EX BELTWAY CHANNEL
          432          HC       2
                       *

          433          KK    DC-2
          434          BA  0.0019
          435          PB    3.36
```

```
          436          LS       0    93.0
          437          UD   0.057
                       *

          438          KK       U
          439          BA  0.0315
          440          PB    3.36
          441          LS       0    94.2
          442          UD   0.094
                       *

          443          KK       I
          444          BA  0.0292
          445          PB    3.35
          446          LS       0    92.0
          447          UD   0.106
                       *

          448          KK     STA
          449          BA  0.0016
          450          PB    3.35
          451          LS       0    98.0
          452          UD   0.050
                       *

          453          KK       G
          454          BA  0.0078
          455          PB    3.35
          456          LS       0    95.0
          457          UD   0.088
                       *

          458          KK       H
          459          BA  0.0091
          460          PB    3.33
          461          LS       0    95.0
          462          UD   0.102
                       *
```



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

          463          KK     CGH
          464          KM   COMBINES G AND H
          465          HC       2
                       *

          466          KK    DC-1
          467          BA  0.0128
          468          PB    3.33
          469          LS       0    93.0
          470          UD   0.207
                       *

          471          KK     NVE
          472          BA  0.0340
          473          PB    3.32
          474          LS       0    93.0
          475          UD   0.096
                       *

          476          KK    CDC1
          477          KM   COMBINES IN EX BELTWAY CHANNEL
          478          HC       8
                       *

          479          KK    CFAR
          480          KM   EX FAR HILLS AVE SD
          481          HC       2
                       *
          482          ZZ
```

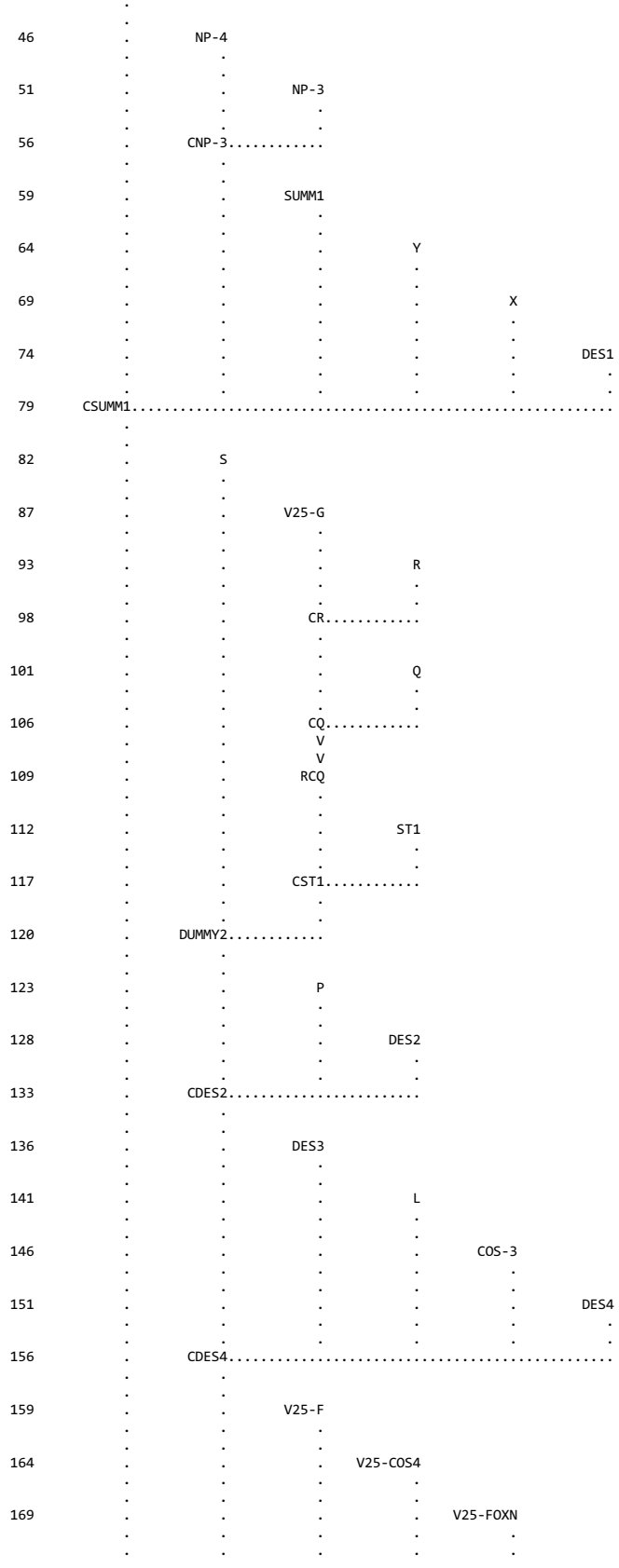
1

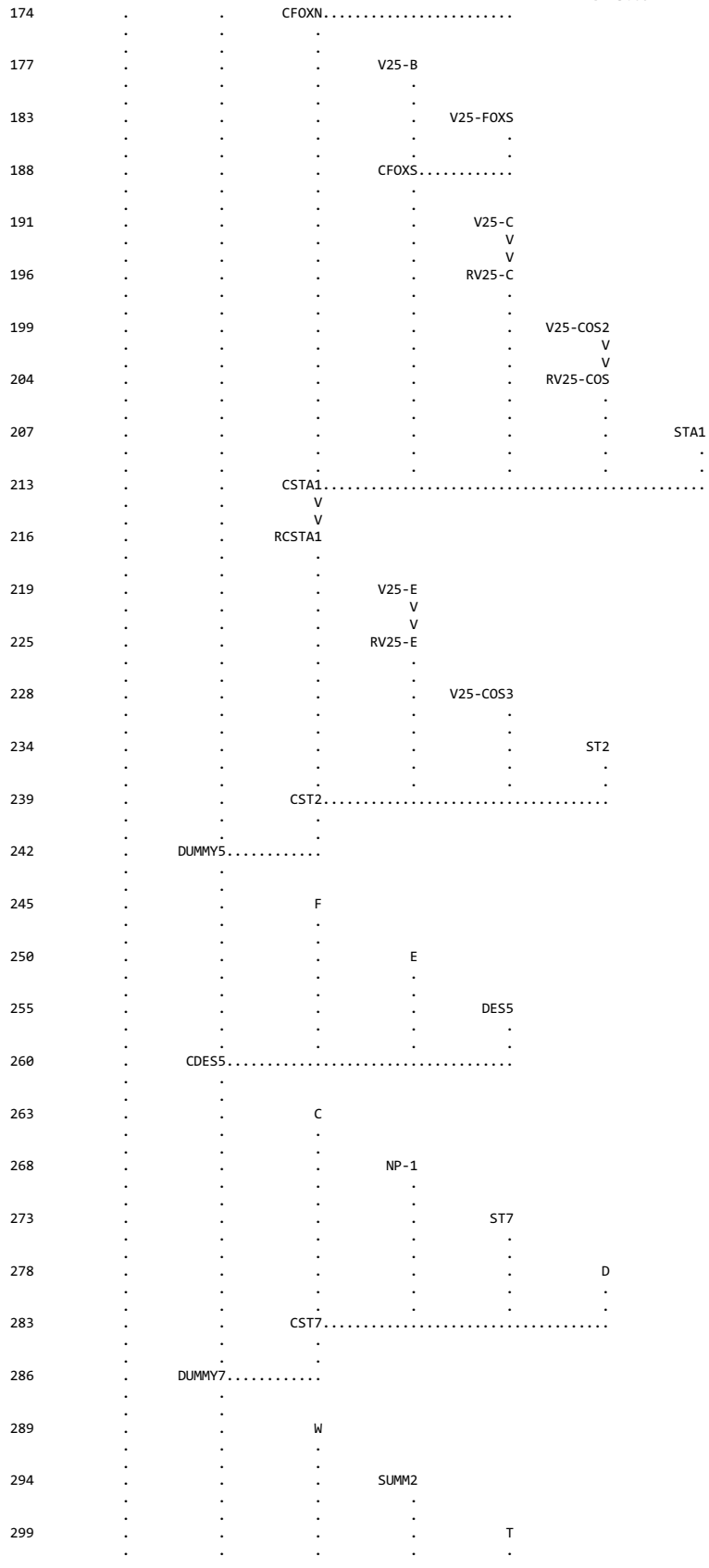
SCHEMATIC DIAGRAM OF STREAM NETWORK

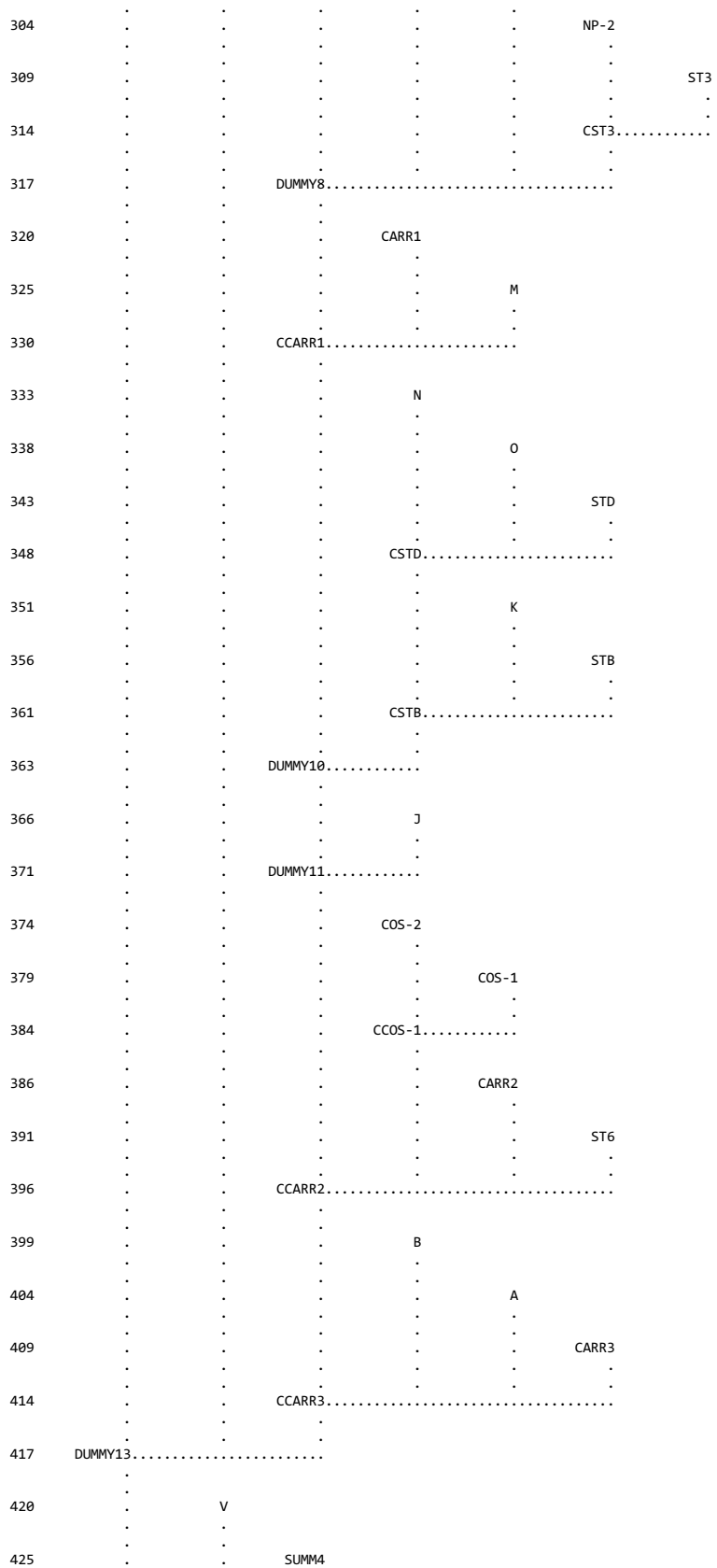
```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

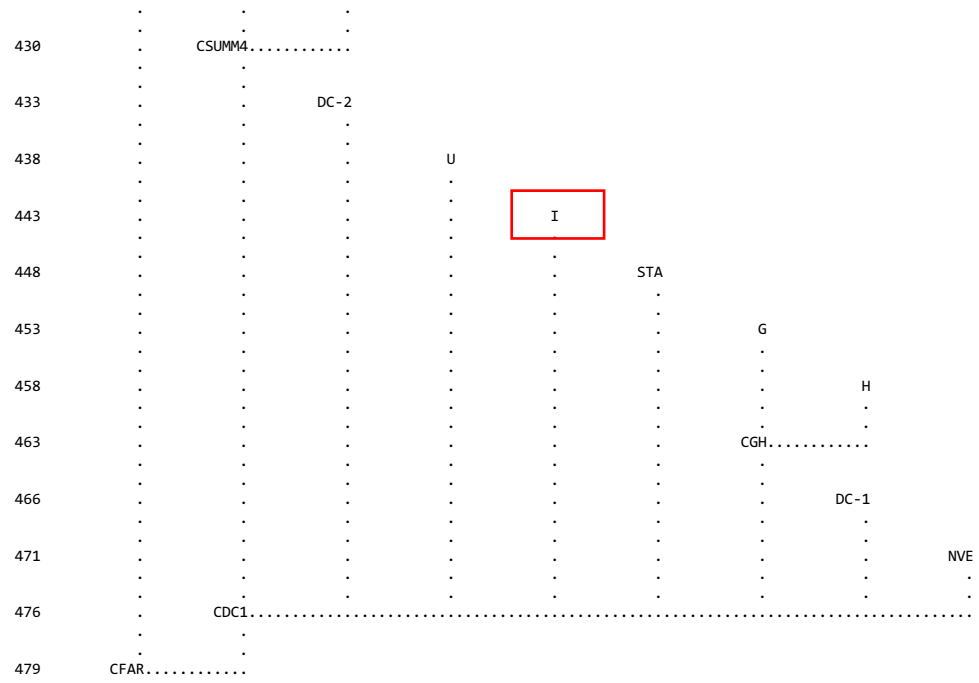
   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    20       SUMM3
                .
                .
    33          .           Z
                .           .
                .           .
    38          .           .          AA
                .           .           .
                .           .           .
    43        CAA.......................
```


NP-4
NP-3
CNP-3
SUMM1
Y
X
DES1
CSUMM1
S
V25-G
R
CR
Q
CQ
V
V
RCQ
ST1
CST1
DUMMY2
P
DES2
CDES2
DES3
L
COS-3
DES4
CDES4
V25-F
V25-COS4
V25-FOXN


CFOXN
V25-B
V25-FOXS
CFOXS
V25-C
RV25-C
V25-COS2
RV25-COS
STA1
CSTA1
RCSTA1
V25-E
RV25-E
V25-COS3
ST2
CST2
DUMMY5
F
E
DES5
CDES5
C
NP-1
ST7
D
CST7
DUMMY7
W
SUMM2
T


304 NP-2
309 ST3
314 CST3
317 DUMMY8
320 CARR1
325 M
330 CCARR1
333 N
338 O
343 STD
348 CSTD
351 K
356 STB
361 CSTB
363 DUMMY10
366 J
371 DUMMY11
374 COS-2
379 COS-1
384 CCOS-1
386 CARR2
391 ST6
396 CCARR2
399 B
404 A
409 CARR3
414 CCARR3
417 DUMMY13
420 V
425 SUMM4



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   27DEC18  TIME  16:51:33   *
 *                                       *
 *****************************************
```

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

INPUT FILE DATE = SEPTEMBER 12,2017
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (JYA)

```
*****************************************************************
* VILLAGE 21 (PREVIOUSLY AREA 1) HEC-1 MODE                     *
* REFER TO LAND USE EXHIBIT BY VTN FOR LOCATION OF AREAS 1      *
*                                                               *
*****************************************************************
```

100-YEAR, 6-HOUR STORM, SDN3

```
  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         100  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
                      NDTIME        0815  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE    8.25 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
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
HYDROGRAPH AT					
+	SUMM3	.00	1	FLOW	13.
				TIME	3.50
HYDROGRAPH AT					
+	Z	.01	1	FLOW	18.
				TIME	3.50
HYDROGRAPH AT					
+	AA	.01	1	FLOW	17.
				TIME	3.50
3 COMBINED AT					
+	CAA	.02	1	FLOW	48.
				TIME	3.50
HYDROGRAPH AT					
+	NP-4	.00	1	FLOW	3.
				TIME	3.50
HYDROGRAPH AT					
+	NP-3	.00	1	FLOW	3.
				TIME	3.50
2 COMBINED AT					
+	CNP-3	.00	1	FLOW	7.
				TIME	3.50
HYDROGRAPH AT					
+	SUMM1	.01	1	FLOW	20.
				TIME	3.50
HYDROGRAPH AT					
+	Y	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	X	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	DES1	.00	1	FLOW	8.
				TIME	3.50
6 COMBINED AT					
+	CSUMM1	.04	1	FLOW	113.
				TIME	3.50
HYDROGRAPH AT					
+	S	.01	1	FLOW	24.
				TIME	3.50
HYDROGRAPH AT					
+	V25-G	.02	1	FLOW	45.
				TIME	3.50
HYDROGRAPH AT					
+	R	.00	1	FLOW	12.
				TIME	3.50
2 COMBINED AT					
+	CR	.02	1	FLOW	56.
				TIME	3.50
HYDROGRAPH AT					
+	Q	.00	1	FLOW	12.
				TIME	3.50

```
  2 COMBINED AT
+                     CQ       .03     1   FLOW          68.
                                           TIME         3.50

 ROUTED TO
+                    RCQ       .03     1   FLOW          67.
                                           TIME         3.50

 HYDROGRAPH AT
+                     ST1       .00     1   FLOW           7.
                                           TIME         3.50

  2 COMBINED AT
+                    CST1       .03     1   FLOW          74.
                                           TIME         3.50

  2 COMBINED AT
+                  DUMMY2       .04     1   FLOW          98.
                                           TIME         3.50

 HYDROGRAPH AT
+                       P       .00     1   FLOW          11.
                                           TIME         3.50

 HYDROGRAPH AT
+                    DES2       .00     1   FLOW          10.
                                           TIME         3.50

  3 COMBINED AT
+                   CDES2       .05     1   FLOW         119.
                                           TIME         3.50

 HYDROGRAPH AT
+                    DES3       .01     1   FLOW          17.
                                           TIME         3.50

 HYDROGRAPH AT
+                       L       .01     1   FLOW          30.
                                           TIME         3.50

 HYDROGRAPH AT
+                   COS-3       .01     1   FLOW          17.
                                           TIME         3.50

 HYDROGRAPH AT
+                    DES4       .00     1   FLOW          12.
                                           TIME         3.50

  5 COMBINED AT
+                   CDES4       .08     1   FLOW         195.
                                           TIME         3.50

 HYDROGRAPH AT
+                   V25-F       .02     1   FLOW          43.
                                           TIME         3.50

 HYDROGRAPH AT
+                V25-COS4       .01     1   FLOW          15.
                                           TIME         3.50

 HYDROGRAPH AT
+                V25-FOXN       .00     1   FLOW          14.
                                           TIME         3.50

  3 COMBINED AT
+                   CFOXN       .03     1   FLOW          72.
                                           TIME         3.50

 HYDROGRAPH AT
+                   V25-B       .03     1   FLOW          67.
                                           TIME         3.50

 HYDROGRAPH AT
+                V25-FOXS       .00     1   FLOW          11.
                                           TIME         3.58

  2 COMBINED AT
+                   CFOXS       .04     1   FLOW          77.
                                           TIME         3.50

 HYDROGRAPH AT
+                   V25-C       .04     1   FLOW          86.
                                           TIME         3.50

 ROUTED TO
+                  RV25-C       .04     1   FLOW          84.
                                           TIME         3.58
```

```
 HYDROGRAPH AT
+              V25-COS2       .00     1   FLOW          5.
                                          TIME         3.58

 ROUTED TO
+              RV25-COS       .00     1   FLOW          5.
                                          TIME         3.67

 HYDROGRAPH AT
+                  STA1       .00     1   FLOW         13.
                                          TIME         3.50

  5 COMBINED AT
+                 CSTA1       .11     1   FLOW        238.
                                          TIME         3.50

 ROUTED TO
+                RCSTA1       .11     1   FLOW        217.
                                          TIME         3.58

 HYDROGRAPH AT
+                 V25-E       .03     1   FLOW         65.
                                          TIME         3.50

 ROUTED TO
+                RV25-E       .03     1   FLOW         59.
                                          TIME         3.58

 HYDROGRAPH AT
+              V25-COS3       .00     1   FLOW          8.
                                          TIME         3.50

 HYDROGRAPH AT
+                   ST2       .00     1   FLOW         12.
                                          TIME         3.50

  4 COMBINED AT
+                  CST2       .15     1   FLOW        291.
                                          TIME         3.58

  2 COMBINED AT
+                DUMMY5       .23     1   FLOW        461.
                                          TIME         3.50

 HYDROGRAPH AT
+                     F       .03     1   FLOW         65.
                                          TIME         3.50

 HYDROGRAPH AT
+                     E       .03     1   FLOW         78.
                                          TIME         3.50

 HYDROGRAPH AT
+                  DES5       .01     1   FLOW         22.
                                          TIME         3.50

  4 COMBINED AT
+                 CDES5       .29     1   FLOW        624.
                                          TIME         3.50

 HYDROGRAPH AT
+                     C       .02     1   FLOW         54.
                                          TIME         3.50

 HYDROGRAPH AT
+                  NP-1       .00     1   FLOW          4.
                                          TIME         3.50

 HYDROGRAPH AT
+                   ST7       .00     1   FLOW          9.
                                          TIME         3.50

 HYDROGRAPH AT
+                     D       .02     1   FLOW         56.
                                          TIME         3.50

  4 COMBINED AT
+                  CST7       .05     1   FLOW        124.
                                          TIME         3.50

  2 COMBINED AT
+                DUMMY7       .35     1   FLOW        748.
                                          TIME         3.50

 HYDROGRAPH AT
+                     W       .01     1   FLOW         31.
                                          TIME         3.50

 HYDROGRAPH AT
```

```
+                  SUMM2       .01     1   FLOW          16.
                                           TIME         3.50

 HYDROGRAPH AT
+                      T       .01     1   FLOW          23.
                                           TIME         3.50

 HYDROGRAPH AT
+                   NP-2       .00     1   FLOW           3.
                                           TIME         3.50

 HYDROGRAPH AT
+                    ST3       .00     1   FLOW           8.
                                           TIME         3.50

  2 COMBINED AT
+                   CST3       .00     1   FLOW          11.
                                           TIME         3.50

  4 COMBINED AT
+                  DUMMY8       .03     1   FLOW          81.
                                           TIME         3.50

 HYDROGRAPH AT
+                  CARR1       .01     1   FLOW          15.
                                           TIME         3.50

 HYDROGRAPH AT
+                      M       .01     1   FLOW          32.
                                           TIME         3.50

  3 COMBINED AT
+                 CCARR1       .05     1   FLOW         129.
                                           TIME         3.50

 HYDROGRAPH AT
+                      N       .00     1   FLOW          10.
                                           TIME         3.50

 HYDROGRAPH AT
+                      O       .01     1   FLOW          13.
                                           TIME         3.50

 HYDROGRAPH AT
+                    STD       .00     1   FLOW           4.
                                           TIME         3.50

  3 COMBINED AT
+                   CSTD       .01     1   FLOW          26.
                                           TIME         3.50

 HYDROGRAPH AT
+                      K       .01     1   FLOW          30.
                                           TIME         3.50

 HYDROGRAPH AT
+                    STB       .00     1   FLOW          12.
                                           TIME         3.50

  3 COMBINED AT
+                   CSTB       .03     1   FLOW          68.
                                           TIME         3.50

  2 COMBINED AT
+                 DUMMY10       .08     1   FLOW         197.
                                           TIME         3.50

 HYDROGRAPH AT
+                      J       .02     1   FLOW          42.
                                           TIME         3.50

  2 COMBINED AT
+                 DUMMY11       .10     1   FLOW         239.
                                           TIME         3.50

 HYDROGRAPH AT
+                  COS-2       .00     1   FLOW           2.
                                           TIME         3.58

 HYDROGRAPH AT
+                  COS-1       .01     1   FLOW          22.
                                           TIME         3.50

  2 COMBINED AT
+                 CCOS-1       .01     1   FLOW          24.
                                           TIME         3.50

 HYDROGRAPH AT
+                  CARR2       .00     1   FLOW          10.
```

				TIME	3.50
HYDROGRAPH AT					
+	ST6	.00	1	FLOW	13.
				TIME	3.50
4 COMBINED AT					
+	CCARR2	.12	1	FLOW	286.
				TIME	3.50
HYDROGRAPH AT					
+	B	.02	1	FLOW	54.
				TIME	3.50
HYDROGRAPH AT					
+	A	.02	1	FLOW	51.
				TIME	3.50
HYDROGRAPH AT					
+	CARR3	.01	1	FLOW	19.
				TIME	3.50
4 COMBINED AT					
+	CCARR3	.17	1	FLOW	410.
				TIME	3.50
3 COMBINED AT					
+	DUMMY13	.56	1	FLOW	1271.
				TIME	3.50
HYDROGRAPH AT					
+	V	.01	1	FLOW	29.
				TIME	3.50
HYDROGRAPH AT					
+	SUMM4	.01	1	FLOW	21.
				TIME	3.50
2 COMBINED AT					
+	CSUMM4	.02	1	FLOW	50.
				TIME	3.50
HYDROGRAPH AT					
+	DC-2	.00	1	FLOW	5.
				TIME	3.50
HYDROGRAPH AT					
+	U	.03	1	FLOW	73.
				TIME	3.50
HYDROGRAPH AT					
+	I	.03	1	FLOW	61.
				TIME	3.50
HYDROGRAPH AT					
+	STA	.00	1	FLOW	5.
				TIME	3.50
HYDROGRAPH AT					
+	G	.01	1	FLOW	19.
				TIME	3.50
HYDROGRAPH AT					
+	H	.01	1	FLOW	21.
				TIME	3.50
2 COMBINED AT					
+	CGH	.02	1	FLOW	39.
				TIME	3.50
HYDROGRAPH AT					
+	DC-1	.01	1	FLOW	23.
				TIME	3.58
HYDROGRAPH AT					
+	NVE	.03	1	FLOW	75.
				TIME	3.50
8 COMBINED AT					
+	CDC1	.15	1	FLOW	326.
				TIME	3.50
2 COMBINED AT					
+	CFAR	.71	1	FLOW	1598.
				TIME	3.50

1

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

Supplement to Addendum #1 to the Technical Drainage Study for

Summerlin West Village 21
Beltway Channel
(Far Hills Avenue to Sky Vista Drive)

Las Vegas, Nevada

W.O. # 7851

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: August 1, 2019
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Village 21 – Beltway Channel Revision (Far Hills Avenue to Sky Vista Drive)**			**COPIES TO:** VTN Nevada
Cross Streets:	Western Beltway 215 & Summerlin Parkway			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5139B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-26-101-001			CCRFCD
Zoning Action:	N/A			CCPW
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	5/15/2019	6/19/2019	Not Approved	$400.00	3133328: $400
2nd Submittal	7/11/2019	8/1/2019	See Comments Below	$400.00	3486271: $400
			TOTAL FEES (LDDRS):	**$800.00**	----

REMARKS:

***** The Conditional Approval of this Drainage Study is to allow the engineer/developer in submitting the Improvement Plans to Land Development Only**

***** Do not submit the Drainage Study to Clark County Regional Flood Control District (CCRFCD) prior to the Structural Design and Calculations being approved by the City Building & Safety Department**

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

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

1. **This drainage study is acceptable in concept;** however, *City of Las Vegas* will not formally accept the study until the *Clark County Regional Flood Control District (CCRFCD)* has issued a letter of concurrence. The engineer should contact the CCRFCD to confirm that they have begun their review.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

2. The proposed Beltway Channel modification segment is owned by the Clark County Public Works Department. The engineer must coordinate with *Clark County Public Works Department* (CCPW) and obtain approval from CCPW prior to final acceptance of the subject study.

3. Structural plans for the storm drain improvements must be submitted for review. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *Building Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study.

In an effort to increase administrative efficiency, for all original and re-submittal packages including updates and the addenda, the City of Las Vegas Public Works Department requires both a hardcopy and a digital copy (PDF) on CD for the drainage study.

A letter sealed and signed by a Nevada registered civil engineer must be included in every submittal certifying documents on the electronic CD matches 100% of the hardcopy submittal. The new submittal requirement is effective on May 1, 2019. If there are any questions regarding these new requirements, please contact Albert Sung in the City Flood Control Section at (702) 229-6541.

Sample Letter to certify CD.pdf

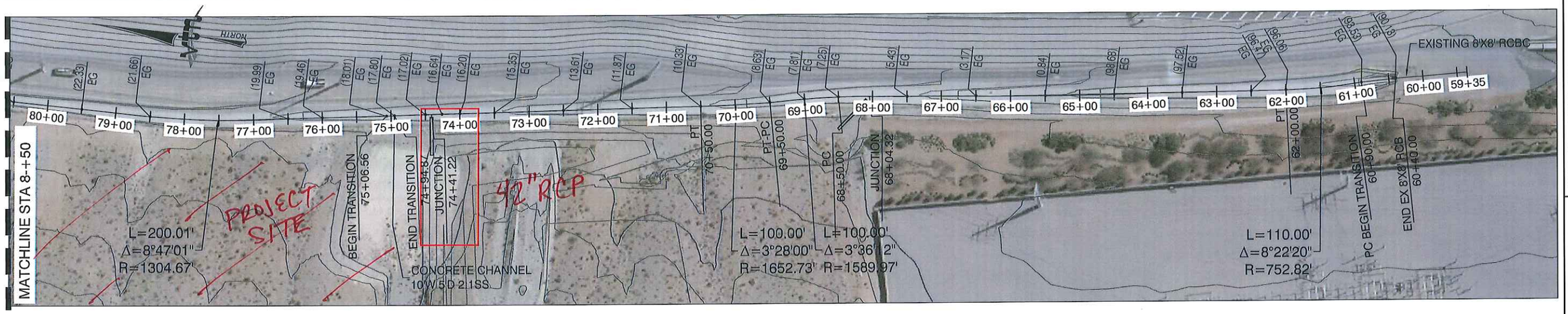
NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained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

END OF REMARKS

ays

T/R/S: T20S/R59E/26

AREA K-26



BELTWAY CHANNEL FREEBOARD CALCS (n=0.015) AND FLOW DEPTH ABOVE STEM WALL CALCS.

Facility Type	Station	Velocity (FPS)	Flow Depth (FT)	Freeboard Height (FT)	Flow Depth Above Stem Wall *	Prposed Stem Wall Height (ft)
4' Deep by 10' Wide (2:1 Side Slopes) Trapezoidal Channel	6090.000	20.59	2.919	1.736	-1.081	n/a
	6200.000	18.94	3.102	1.691	-0.898	n/a
	6250.000	19.56	3.031	1.708	-0.969	n/a
	6350.000	20.61	2.917	1.736	-1.083	n/a
	6450.000	21.86	2.793	1.770	-1.207	n/a
	6550.000	21.56	2.832	1.763	-1.168	n/a
	6650.000	20.67	2.911	1.738	-1.089	n/a
	6750.000	19.36	3.053	1.702	-0.947	n/a
	6850.000	19.48	2.948	1.698	-1.052	0.66
	6950.000	19.82	2.911	1.707	-1.089	0.66
	7050.000	19.54	2.941	1.700	-1.059	0.66
	7150.000	19.51	2.945	1.699	-1.055	0.66
	7250.000	18.92	3.011	1.683	-0.989	0.66
	7350.000	17.96	3.128	1.657	-0.872	0.66
	7400.000	17.30	3.213	1.638	-0.787	0.66
	7425.960	16.88	3.270	1.626	-0.73	0.66
	7450.000	17.81	2.993	1.642	-1.007	0.66
	7494.870	17.22	3.067	1.625	-0.933	0.66
5' Deep by 10' Wide (2:1 Side Slopes) Trapezoidal Channel	7506.560	17.05	3.089	1.621	-1.911	1.33
	7600.000	15.62	3.289	1.581	-1.711	1.33
	7650.000	15.29	3.341	1.571	-1.659	1.33
	7850.000	15.05	3.378	1.565	-1.622	1.33
	7950.000	15.51	3.307	1.578	-1.693	1.33
	8050.000	15.42	3.320	1.575	-1.68	1.33
	8150.000	16.02	3.231	1.592	-1.769	1.33
	8250.000	16.67	3.139	1.610	-1.861	1.33
	8350.000	18.00	2.970	1.647	-2.03	1.33
	8450.000	19.60	2.791	1.690	-2.209	0.66
	8550.000	21.91	2.569	1.750	-2.431	0.66
	8623.290	24.04	2.396	1.804	-2.604	0.66
6' Deep by 11' Wide Rectangular Channel	8670.030	24.37	3.178	1.896	-2.822	n/a
	8750.000	25.14	3.081	1.915	-2.919	n/a
	8800.000	26.23	2.953	1.941	-3.047	n/a
	9000.000	29.58	2.618	2.019	-3.382	n/a
	9050.000	27.81	2.785	1.978	-3.215	n/a
	9150.000	24.76	3.129	1.905	-2.871	n/a
	9246.540	20.83	3.719	1.807	-2.281	n/a

*Negative value indicates depth of flow is below the stem wall

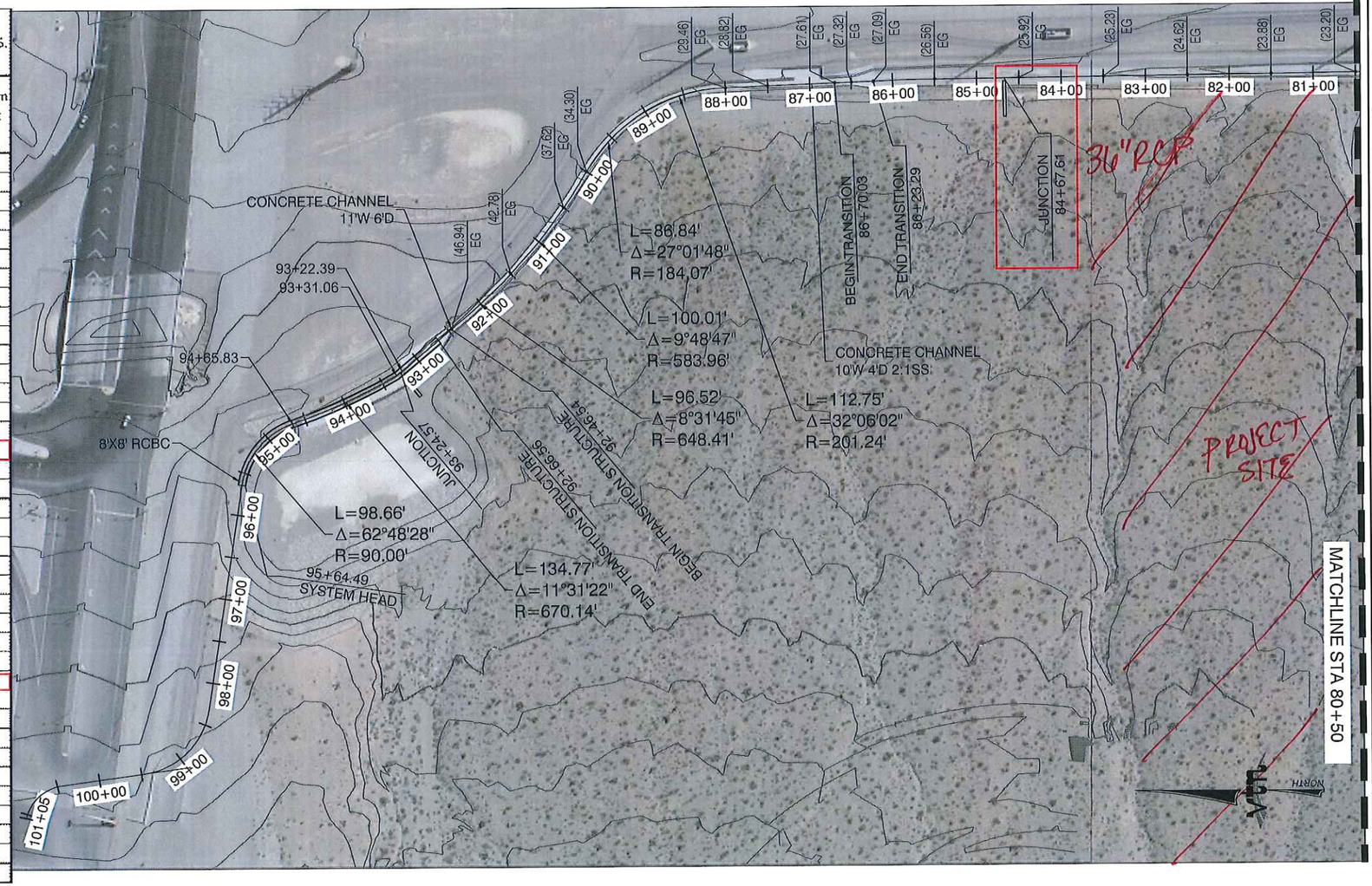


FIGURE 5:
WESTERN BELTWAY CHANNEL IMPROVEMENTS

W.O.#:	7851-5.8
DATE:	3/27/2019
BY:	RBR
SCALE:	1"=150'
SHEET	1 OF 1

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Beltway Channel\Drainage\2_ADD 1\A_Figures\Figure 10 - Western Beltway Improvements.dwg,rechelr, Jul 11, 2019 - 9:35am

```
T1 BELTWAY CHANNEL
T2 PTWA 0884   FILE NAME: BWC.WSW
T3 FILE: 8X8 RCB
SO   5267.99 3172.30   1      .015                 3180.3
R    5267.99 3172.30   1      .015                                    .000    .000 0
R    5655.59 3178.60   1      .015                                    .000    .000 0
R    6040.00 3190.13   1      .015                                    .000    .000 0
TS   6090.00 3193.53   3      .015
R    6200.00 3196.06   3      .015                                   8.372    .000 0
R    6250.00 3196.47   3      .015                                    .000    .000 0
R    6350.00 3197.52   3      .015                                    .000    .000 0
R    6450.00 3198.68   3      .015                                    .000    .000 0
R    6550.00 3200.84   3      .015                                    .000    .000 0
R    6650.00 3203.17   3      .015                                    .000    .000 0
R    6750.00 3205.43   3      .015                                    .000    .000 0
JX   6804.32 3206.37   3 36   .015   39.000         3207.19                45.0    .000
R    6850.00 3207.25   3      .015                                    .000    .000 0
R    6950.00 3208.63   3      .015                                  -3.603    .000 0
R    7050.00 3210.33   3      .015                                   3.467    .000 0
R    7150.00 3211.87   3      .015                                    .000    .000 0
R    7250.00 3213.61   3      .015                                    .000    .000 0
R    7350.00 3215.35   3      .015                                    .000    .000 0
R    7400.00 3216.20   3      .015                                    .000    .000 0
R    7425.96 3216.64   3      .015                                    .000    .000 0
JX   7441.22 3216.86   3 42   .015   61.000         3217.54                90.0    .000 PARCEL I
R    7450.00 3217.02   3      .015                                    .000    .000 0
R    7494.87 3217.80   3      .015                                    .000    .000 0
TS   7506.56 3218.01   2      .015
R    7600.00 3219.46   2      .015                                    .000    .000 0
R    7650.00 3219.99   2      .015                                    .000    .000 0
R    7850.00 3221.66   2      .015                                   8.750    .000 0
R    7950.00 3222.33   2      .015                                    .000    .000 0
R    8050.00 3223.20   2      .015                                    .000    .000 0
R    8150.00 3223.88   2      .015                                    .000     .000 0
R    8250.00 3224.62   2      .015                                    .000    .000 0
R    8350.00 3225.23   2      .015                                    .000    .000 0
R    8450.00 3225.92   2      .015                                    .000    .000 0
R    8467.69 3226.01   2      .015                                    .000    .000 0
R    8550.00 3226.56   2      .015                                    .000    .000 0
R    8623.29 3227.07   2      .015                                    .000    .000 0
TS   8670.03 3227.32   4      .015
R    8750.00 3228.82   4      .015                                    .000    .000 0
R    8800.00 3229.46   4      .015                                    .000    .000 0
R    8913.18 3231.10   4      .015                                 -32.101    .000 0
R    9000.00 3234.30   4      .015                                 -27.030    .000 0
R    9050.00 3237.62   4      .015                                    .000    .000 0
R    9150.00 3242.78   4      .015                                   9.913    .000 0
R    9246.54 3246.94   4      .015                                   8.529    .000 0

TS   9266.56 3247.34   1      .015
JX   9324.57 3247.92   1 36   .015   73.000         3248.92                90.0    .000
R    9331.06 3247.98   1      .015                                    .000  10.000 0
R    9465.83 3249.33   1      .015                                  11.523  00.000 0
R    9564.49 3250.32   1      .015                                 -62.808  00.000
SH   9564.49 3250.32   1
CD   1  3   0    .000   8.000    8.000  .000  .000   .00
CD   2  1   0    .000   4.000   10.000 2.000 2.000   .00
CD   3  1   0    .000   5.000   10.000 2.000 2.000   .00
CD   4  2   0    .000   6.000   11.000  .000  .000   .00
CD  24  4   0    .000   2.000    0.000  .000  .000   .00
CD  36  4   0    .000   3.000    0.000  .000  .000   .00
CD  42  4   0    .000   3.500    0.000  .000  .000   .00
Q           779.000   .0
```

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5267.991	3172.300	5.171	3177.471	952.00	23.01	8.22	3185.70	.00	7.61	8.00	8.000	8.000	.00	0 .0
179.793	.0163					.0194	3.49	5.17	1.78	5.41	.015	.00	.00	BOX
5447.784	3175.222	4.934	3180.156	952.00	24.12	9.03	3189.19	.00	7.61	8.00	8.000	8.000	.00	0 .0
117.970	.0163					.0220	2.59	4.93	1.91	5.41	.015	.00	.00	BOX
5565.754	3177.140	4.704	3181.844	952.00	25.30	9.94	3191.78	.00	7.61	8.00	8.000	8.000	.00	0 .0
89.836	.0163					.0249	2.23	4.70	2.06	5.41	.015	.00	.00	BOX
5655.590	3178.600	4.485	3183.085	952.00	26.53	10.93	3194.02	.00	7.61	8.00	8.000	8.000	.00	0 .0
57.944	.0300					.0260	1.50	4.49	2.21	4.28	.015	.00	.00	BOX
5713.535	3180.338	4.547	3184.885	952.00	26.17	10.64	3195.52	.00	7.61	8.00	8.000	8.000	.00	0 .0
124.369	.0300					.0240	2.99	4.55	2.16	4.28	.015	.00	.00	BOX
5837.903	3184.068	4.769	3188.837	952.00	24.95	9.67	3198.51	.00	7.61	8.00	8.000	8.000	.00	0 .0
73.468	.0300					.0212	1.56	4.77	2.01	4.28	.015	.00	.00	BOX
5911.372	3186.272	5.002	3191.273	952.00	23.79	8.79	3200.06	.00	7.61	8.00	8.000	8.000	.00	0 .0
49.286	.0300					.0187	.92	5.00	1.87	4.28	.015	.00	.00	BOX
5960.657	3187.750	5.246	3192.996	952.00	22.68	7.99	3200.99	.00	7.61	8.00	8.000	8.000	.00	0 .0
35.038	.0300					.0166	.58	5.25	1.75	4.28	.015	.00	.00	BOX
5995.695	3188.801	5.502	3194.303	952.00	21.63	7.26	3201.57	.00	7.61	8.00	8.000	8.000	.00	0 .0
25.563	.0300					.0147	.37	5.50	1.63	4.28	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6021.258	3189.568	5.770	3195.338	952.00	20.62	6.60	3201.94	.00	7.61	8.00	8.000	8.000	.00	0 .0
18.742	.0300					.0130	.24	5.77	1.51	4.28	.015	.00	.00	BOX
6040.000	3190.130	6.052	3196.182	952.00	19.66	6.00	3202.19	.00	7.61	8.00	8.000	8.000	.00	0 .0
TRANS STR	.0680					.0146	.73	6.05	1.41		.015	.00	.00	BOX
6090.000	3193.530	2.919	3196.449	952.00	20.59	6.59	3203.03	.49	4.78	21.68	5.000	10.000	2.00	0 .0
56.936	.0230					.0163	.93	3.41	2.49	2.70	.015	.00	2.00	TRAP
6146.936	3194.840	2.997	3197.837	952.00	19.86	6.12	3203.96	.47	4.78	21.99	5.000	10.000	2.00	0 .0
53.064	.0230					.0145	.77	3.46	2.37	2.70	.015	.00	2.00	TRAP
6200.000	3196.060	3.102	3199.163	952.00	18.94	5.57	3204.73	.00	4.78	22.41	5.000	10.000	2.00	0 .0
50.000	.0082					.0142	.71	3.10	2.23	3.53	.015	.00	2.00	TRAP
6250.000	3196.470	3.031	3199.501	952.00	19.56	5.94	3205.44	.00	4.78	22.12	5.000	10.000	2.00	0 .0
10.841	.0105					.0149	.16	3.03	2.32	3.31	.015	.00	2.00	TRAP
6260.841	3196.584	3.020	3199.604	952.00	19.65	6.00	3205.60	.00	4.78	22.08	5.000	10.000	2.00	0 .0
89.159	.0105					.0161	1.43	3.02	2.34	3.31	.015	.00	2.00	TRAP

6350.000	3197.520	2.917	3200.437	952.00	20.61	6.60	3207.03	.00	4.78	21.67	5.000	10.000	2.00	0	.0	
21.565	.0116					.0174	.38	2.92	2.49	3.23	.015	.00	2.00	TRAP		
6371.565	3197.770	2.893	3200.663	952.00	20.85	6.75	3207.41	.00	4.78	21.57	5.000	10.000	2.00	0	.0	
78.435	.0116					.0189	1.49	2.89	2.52	3.23	.015	.00	2.00	TRAP		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6450.000	3198.680	2.793	3201.473	952.00	21.86	7.42	3208.90	.00	4.78	21.17	5.000	10.000	2.00	0	.0	
100.000	.0216					.0198	1.98	2.79	2.69	2.74	.015	.00	2.00	TRAP		
6550.000	3200.840	2.823	3203.663	952.00	21.56	7.22	3210.88	.00	4.78	21.29	5.000	10.000	2.00	0	.0	
100.000	.0233					.0183	1.83	2.82	2.64	2.69	.015	.00	2.00	TRAP		
6650.000	3203.170	2.911	3206.081	952.00	20.67	6.63	3212.71	.00	4.78	21.64	5.000	10.000	2.00	0	.0	
33.396	.0226					.0168	.56	2.91	2.50	2.71	.015	.00	2.00	TRAP		
6683.396	3203.925	2.949	3206.874	952.00	20.31	6.40	3213.28	.00	4.78	21.79	5.000	10.000	2.00	0	.0	
66.604	.0226					.0154	1.03	2.95	2.44	2.71	.015	.00	2.00	TRAP		
6750.000	3205.430	3.053	3208.483	952.00	19.36	5.82	3214.30	.00	4.78	22.21	5.000	10.000	2.00	0	.0	
JUNCT STR	.0173					.0151	.82	3.05	2.29		.015	.00	2.00	TRAP		
6804.320	3206.370	2.911	3209.281	913.00	19.82	6.10	3215.38	.00	4.68	21.64	5.000	10.000	2.00	0	.0	
45.680	.0193					.0155	.71	2.91	2.39	2.77	.015	.00	2.00	TRAP		
6850.000	3207.250	2.948	3210.198	913.00	19.48	5.89	3216.09	.21	4.68	21.79	5.000	10.000	2.00	0	.0	
100.000	.0138					.0155	1.55	3.16	2.34	3.02	.015	.00	2.00	TRAP		
6950.000	3208.630	2.911	3211.541	913.00	19.82	6.10	3217.64	.21	4.68	21.64	5.000	10.000	2.00	0	.0	
100.000	.0170					.0156	1.56	3.12	2.39	2.86	.015	.00	2.00	TRAP		
7050.000	3210.330	2.941	3213.271	913.00	19.54	5.93	3219.20	.00	4.68	21.77	5.000	10.000	2.00	0	.0	
100.000	.0154					.0152	1.52	2.94	2.35	2.93	.015	.00	2.00	TRAP		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
7150.000	3211.870	2.945	3214.815	913.00	19.51	5.91	3220.72	.00	4.68	21.78	5.000	10.000	2.00	0	.0	
100.000	.0174					.0146	1.46	2.95	2.35	2.84	.015	.00	2.00	TRAP		
7250.000	3213.610	3.011	3216.621	913.00	18.92	5.56	3222.18	.00	4.68	22.04	5.000	10.000	2.00	0	.0	
11.805	.0174					.0139	.16	3.01	2.25	2.84	.015	.00	2.00	TRAP		
7261.805	3213.815	3.021	3216.837	913.00	18.84	5.51	3222.35	.00	4.68	22.09	5.000	10.000	2.00	0	.0	
88.195	.0174					.0129	1.14	3.02	2.24	2.84	.015	.00	2.00	TRAP		
7350.000	3215.350	3.128	3218.478	913.00	17.96	5.01	3223.49	.00	4.68	22.51	5.000	10.000	2.00	0	.0	
50.000	.0170					.0115	.57	3.13	2.11	2.86	.015	.00	2.00	TRAP		
7400.000	3216.200	3.213	3219.413	913.00	17.30	4.65	3224.06	.00	4.68	22.85	5.000	10.000	2.00	0	.0	
25.960	.0169					.0105	.27	3.21	2.01	2.86	.015	.00	2.00	TRAP		
7425.960	3216.640	3.270	3219.910	913.00	16.88	4.43	3224.34	.00	4.68	23.08	5.000	10.000	2.00	0	.0	

STARTING WSE FOR 42" RCP

JUNCT STR	.0144					.0114	.17	3.27	1.94			.015	.00	2.00	TRAP				
7441.220	3216.860	2.979	3219.839	852.00	17.92	4.99	3224.83	.00	4.51	21.92		5.000	10.000	2.00	0	.0			
8.780	.0182					.0125	.11	2.98	2.14	2.71		.015	.00	2.00	TRAP				
7450.000	3217.020	2.993	3220.013	852.00	17.81	4.92	3224.94	.00	4.51	21.97		5.000	10.000	2.00	0	.0			
44.870	.0174					.0119	.53	2.99	2.13	2.74		.015	.00	2.00	TRAP				
7494.870	3217.800	3.067	3220.867	852.00	17.22	4.60	3225.47	.00	4.51	22.27		5.000	10.000	2.00	0	.0			
TRANS STR	.0180					.0112	.13	3.07	2.04			.015	.00	2.00	TRAP				

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
7506.560	3218.010	3.089	3221.099	852.00	17.05	4.51	3225.61	.00	4.51	22.35		4.000	10.000	2.00	0	.0			
50.517	.0155					.0105	.53	3.09	2.01	2.82		.015	.00	2.00	TRAP				
7557.077	3218.794	3.179	3221.973	852.00	16.39	4.17	3226.14	.00	4.51	22.72		4.000	10.000	2.00	0	.0			
42.923	.0155					.0093	.40	3.18	1.91	2.82		.015	.00	2.00	TRAP				
7600.000	3219.460	3.289	3222.750	852.00	15.62	3.79	3226.54	.00	4.51	23.16		4.000	10.000	2.00	0	.0			
50.000	.0106					.0084	.42	3.29	1.79	3.12		.015	.00	2.00	TRAP				
7650.000	3219.990	3.341	3223.331	852.00	15.29	3.63	3226.96	.17	4.51	23.36		4.000	10.000	2.00	0	.0			
200.000	.0083					.0080	1.60	3.51	1.74	3.32		.015	.00	2.00	TRAP				
7850.000	3221.660	3.378	3225.038	852.00	15.05	3.52	3228.56	.00	4.51	23.51		4.000	10.000	2.00	0	.0			
100.000	.0067					.0081	.81	3.38	1.71	3.51		.015	.00	2.00	TRAP				
7950.000	3222.330	3.307	3225.637	852.00	15.51	3.73	3229.37	.00	4.51	23.23		4.000	10.000	2.00	0	.0			
100.000	.0087					.0084	.84	3.31	1.78	3.29		.015	.00	2.00	TRAP				
8050.000	3223.200	3.320	3226.520	852.00	15.42	3.69	3230.21	.00	4.51	23.28		4.000	10.000	2.00	0	.0			
100.000	.0068					.0088	.88	3.32	1.76	3.50		.015	.00	2.00	TRAP				
8150.000	3223.880	3.231	3227.111	852.00	16.02	3.98	3231.09	.00	4.51	22.93		4.000	10.000	2.00	0	.0			
100.000	.0074					.0098	.98	3.23	1.85	3.43		.015	.00	2.00	TRAP				
8250.000	3224.620	3.139	3227.759	852.00	16.67	4.32	3232.08	.00	4.51	22.56		4.000	10.000	2.00	0	.0			
40.426	.0061					.0108	.44	3.14	1.95	3.60		.015	.00	2.00	TRAP				

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
8290.426	3224.867	3.075	3227.941	852.00	17.16	4.57	3232.51	.00	4.51	22.30		4.000	10.000	2.00	0	.0			
59.574	.0061					.0120	.72	3.07	2.03	3.60		.015	.00	2.00	TRAP				
8350.000	3225.230	2.970	3228.200	852.00	18.00	5.03	3233.23	.00	4.51	21.88		4.000	10.000	2.00	0	.0			
46.837	.0069					.0135	.63	2.97	2.16	3.49		.015	.00	2.00	TRAP				
8396.837	3225.553	2.890	3228.443	852.00	18.68	5.42	3233.86	.00	4.51	21.56		4.000	10.000	2.00	0	.0			
53.163	.0069					.0152	.81	2.89	2.26	3.49		.015	.00	2.00	TRAP				
8450.000	3225.920	2.791	3228.710	852.00	19.60	5.96	3234.67	.00	4.51	21.16		4.000	10.000	2.00	0	.0			

17.690	.0051					.0167	.30	2.79	2.41	3.77	.015	.00	2.00	TRAP	
8467.690	3226.010	2.749	3228.759	852.00	20.00	6.21	3234.97	.00	4.51	21.00	4.000	10.000	2.00	0	.0
40.858	.0067					.0183	.75	2.75	2.47	3.52	.015	.00	2.00	TRAP	
8508.549	3226.283	2.662	3228.945	852.00	20.89	6.77	3235.72	.00	4.51	20.65	4.000	10.000	2.00	0	.0
41.451	.0067					.0208	.86	2.66	2.62	3.52	.015	.00	2.00	TRAP	
8550.000	3226.560	2.569	3229.129	852.00	21.91	7.45	3236.58	.00	4.51	20.28	4.000	10.000	2.00	0	.0
36.910	.0070					.0237	.87	2.57	2.79	3.48	.015	.00	2.00	TRAP	
8586.910	3226.817	2.483	3229.300	852.00	22.92	8.16	3237.46	.00	4.51	19.93	4.000	10.000	2.00	0	.0
36.380	.0070					.0270	.98	2.48	2.96	3.48	.015	.00	2.00	TRAP	
8623.290	3227.070	2.396	3229.466	852.00	24.04	8.98	3238.44	.00	4.51	19.58	4.000	10.000	2.00	0	.0
TRANS STR	.0053					.0263	1.23	2.40	3.15		.015	.00	2.00	TRAP	

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
8670.030	3227.320	3.178	3230.498	852.00	24.37	9.22	3239.72	.00	5.71	11.00	6.000	11.000	.00	0 .0
79.970	.0188					.0249	1.99	3.18	2.41	3.46	.015	.00	.00	RECTANG
8750.000	3228.820	3.081	3231.901	852.00	25.14	9.81	3241.71	.00	5.71	11.00	6.000	11.000	.00	0 .0
50.000	.0128					.0277	1.38	3.08	2.52	3.96	.015	.00	.00	RECTANG
8800.000	3229.460	2.953	3232.413	852.00	26.23	10.69	3243.10	1.16	5.71	11.00	6.000	11.000	.00	0 .0
13.185	.0145					.0298	.39	4.12	2.69	3.79	.015	.00	.00	RECTANG
8813.185	3229.651	2.920	3232.572	852.00	26.52	10.92	3243.49	1.19	5.71	11.00	6.000	11.000	.00	0 .0
53.036	.0145					.0325	1.72	4.11	2.73	3.79	.015	.00	.00	RECTANG
8866.221	3230.420	2.784	3233.204	852.00	27.82	12.01	3245.22	1.31	5.71	11.00	6.000	11.000	.00	0 .0
46.959	.0145					.0373	1.75	4.09	2.94	3.79	.015	.00	.00	RECTANG
8913.180	3231.100	2.655	3233.755	852.00	29.17	13.22	3246.97	1.58	5.71	11.00	6.000	11.000	.00	0 .0
86.820	.0369					.0407	3.53	4.23	3.16	2.73	.015	.00	.00	RECTANG
9000.000	3234.300	2.618	3236.918	852.00	29.58	13.59	3250.51	.00	5.71	11.00	6.000	11.000	.00	0 .0
13.187	.0664					.0407	.54	2.62	3.22	2.23	.015	.00	.00	RECTANG
9013.187	3235.176	2.655	3237.831	852.00	29.17	13.21	3251.04	.00	5.71	11.00	6.000	11.000	.00	0 .0
36.813	.0664					.0373	1.37	2.66	3.15	2.23	.015	.00	.00	RECTANG
9050.000	3237.620	2.785	3240.405	852.00	27.81	12.01	3252.42	.46	5.71	11.00	6.000	11.000	.00	0 .0
24.397	.0516					.0337	.82	3.24	2.94	2.43	.015	.00	.00	RECTANG

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
9074.397	3238.879	2.844	3241.723	852.00	27.23	11.52	3253.24	.44	5.71	11.00	6.000	11.000	.00	0 .0
43.237	.0516					.0306	1.32	3.28	2.85	2.43	.015	.00	.00	RECTANG
9117.635	3241.110	2.983	3244.093	852.00	25.96	10.47	3254.56	.40	5.71	11.00	6.000	11.000	.00	0 .0
32.365	.0516					.0267	.86	3.38	2.65	2.43	.015	.00	.00	RECTANG

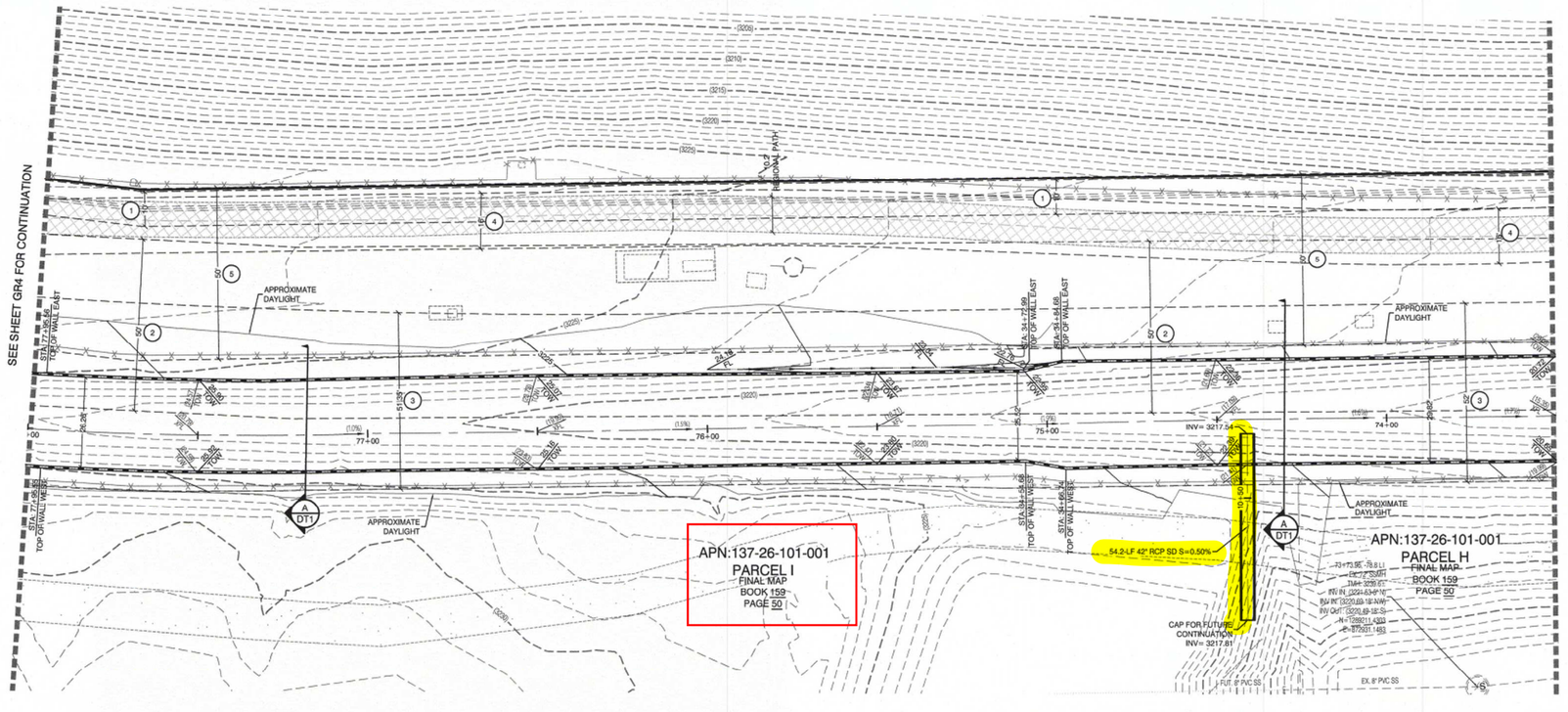
9150.000	3242.780	3.129	3245.909	852.00	24.76	9.52	3255.43	.32	5.71	11.00	6.000	11.000	.00	0	.0
23.893	.0431					.0239	.57	3.45	2.47	2.59	.015	.00	.00	RECTANG	
9173.893	3243.810	3.224	3247.033	852.00	24.03	8.96	3256.00	.30	5.71	11.00	6.000	11.000	.00	0	.0
30.317	.0431					.0214	.65	3.53	2.36	2.59	.015	.00	.00	RECTANG	
9204.210	3245.116	3.381	3248.497	852.00	22.91	8.15	3256.65	.28	5.71	11.00	6.000	11.000	.00	0	.0
23.611	.0431					.0187	.44	3.66	2.20	2.59	.015	.00	.00	RECTANG	
9227.821	3246.133	3.546	3249.679	852.00	21.84	7.41	3257.09	.25	5.71	11.00	6.000	11.000	.00	0	.0
18.719	.0431					.0164	.31	3.80	2.04	2.59	.015	.00	.00	RECTANG	
9246.540	3246.940	3.719	3250.659	852.00	20.83	6.73	3257.39	.00	5.71	11.00	6.000	11.000	.00	0	.0
TRANS STR	.0200					.0110	.22	3.72	1.90		.015	.00	.00	RECTANG	
9266.560	3247.340	7.063	3254.404	852.00	15.08	3.53	3257.93	.00	7.06	8.00	8.000	8.000	.00	0	.0
JUNCT STR	.0100					.0060	.35	7.06	1.00		.015	.00	.00	BOX	
9324.570	3247.920	8.195	3256.115	779.00	12.17	2.30	3258.42	.00	6.65	8.00	8.000	8.000	.00	0	.0
6.489	.0093					.0060	.04	8.20	.76	5.76	.015	.00	.00	BOX	

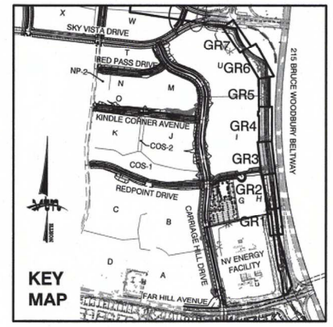
BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
9331.060	3247.980	8.250	3256.230	779.00	12.17	2.30	3258.53	.00	6.65	8.00	8.000	8.000	.00	0	.0
96.730	.0100					.0060	.58	.00	.76	5.59	.015	.00	.00	BOX	
9427.790	3248.949	8.000	3256.949	779.00	12.17	2.30	3259.25	8.00	6.65	8.00	8.000	8.000	.00	0	.0
25.020	.0100					.0041	.10	8.00	.76	5.59	.015	.00	.00	BOX	
9452.810	3249.200	7.627	3256.826	779.00	12.77	2.53	3259.36	.06	6.65	8.00	8.000	8.000	.00	0	.0
3.979	.0100					.0046	.02	7.69	.81	5.59	.015	.00	.00	BOX	
		---------- WARNING - Flow depth near top of box conduit ----------													
9456.788	3249.240	7.562	3256.802	779.00	12.88	2.57	3259.38	.06	6.65	8.00	8.000	8.000	.00	0	.0
HYDRAULIC JUMP															
		---------- WARNING - Flow depth near top of box conduit ----------													
9456.788	3249.240	5.818	3255.057	779.00	16.74	4.35	3259.41	.10	6.65	8.00	8.000	8.000	.00	0	.0
9.042	.0100					.0090	.08	5.92	1.22	5.59	.015	.00	.00	BOX	
9465.829	3249.330	5.831	3255.161	779.00	16.70	4.33	3259.49	.77	6.65	8.00	8.000	8.000	.00	0	.0
60.906	.0100					.0086	.52	6.60	1.22	5.58	.015	.00	.00	BOX	
9526.735	3249.941	6.048	3255.990	779.00	16.10	4.02	3260.01	.72	6.65	8.00	8.000	8.000	.00	0	.0
30.538	.0100					.0077	.24	6.76	1.15	5.58	.015	.00	.00	BOX	

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
9557.273	3250.248	6.344	3256.591	779.00	15.35	3.66	3260.25	.65	6.65	8.00	8.000	8.000	.00	0	.0
7.217	.0100					.0068	.05	6.99	1.07	5.58	.015	.00	.00	BOX	
9564.490	3250.320	6.654	3256.974	779.00	14.63	3.33	3260.30	.59	6.65	8.00	8.000	8.000	.00	0	.0





NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20 '

EASEMENT REFERENCE LEGEND

1	50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19990310:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19961001:0000671.
2	50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3	DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4	PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080527:0005041.
5	10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°10'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

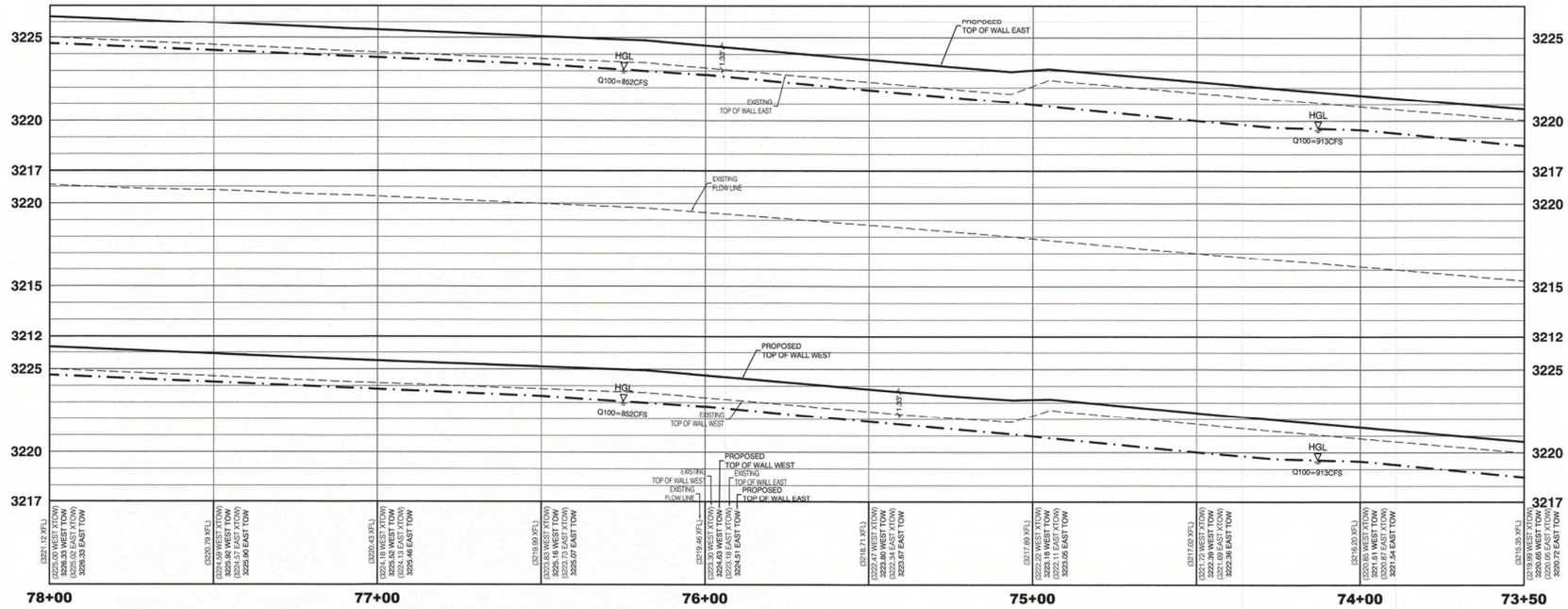
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

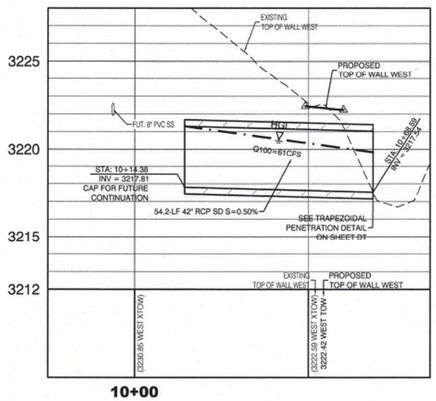
BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03





STORM DRAIN LATERAL
STA:74+41.22
(PUBLIC)

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.

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: NOVA GEOTECHNICAL PROJECT #----, DATED MARCH 5, 2018 HTE #----

Call before you Dig
Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-229-4811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

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

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD. SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2697 WEB WWW.VTNEV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 3

SUMMERLIN WEST V21
BELTWAY CHANNEL SKY VISTA DRIVE TO NV ENERGY FACILITY
A DELAWARE LIMITED LIABILITY COMPANY

DRAWN BY:	BCC 02/07/2019
DESIGNED BY:	BSC 02/07/2019
CHECKED BY:	WJM 07/09/2019
PROJECT NO:	7951 SCALE: 1"=20' HORIZ. NA VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
7/11/19

SHEET
GR3
11 OF 17 SHEETS

DRAWING NO.

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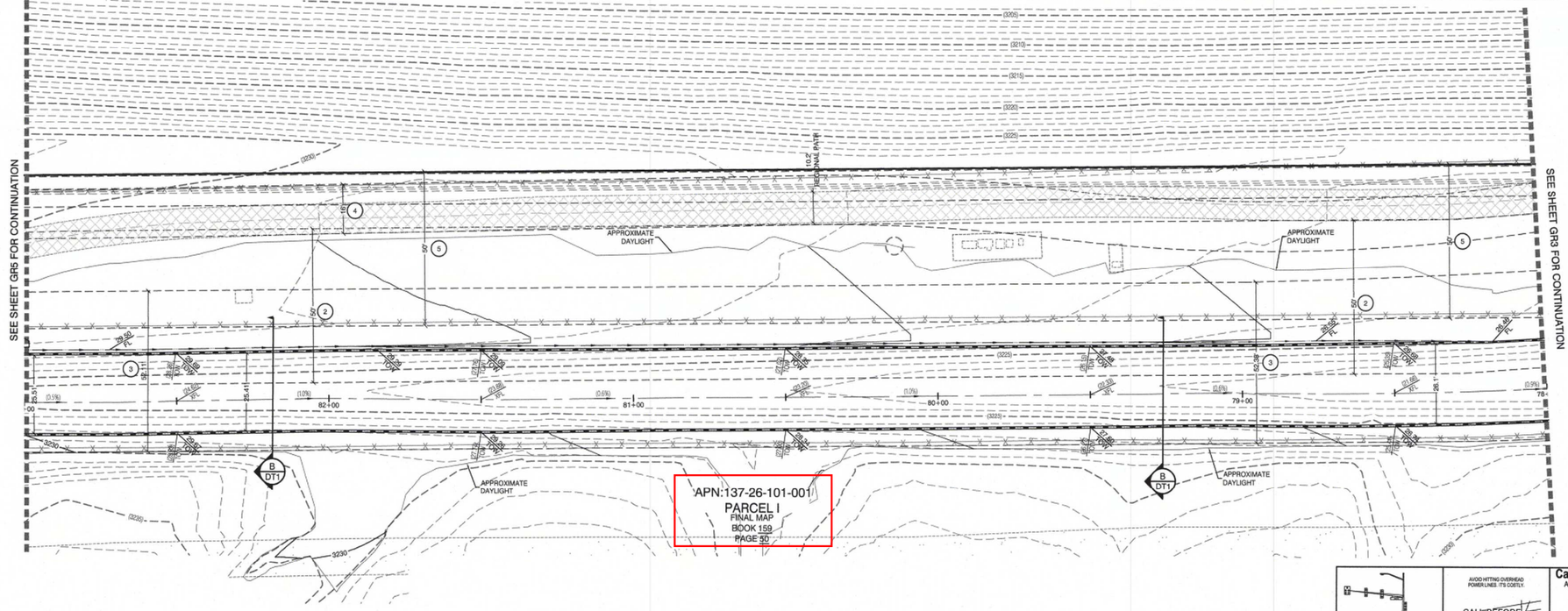

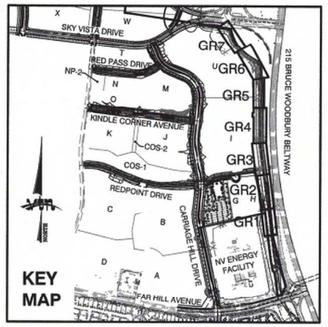

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20 '

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 969.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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: NOVA GEOTECHNICAL
PROJECT #----, DATED MARCH 5, 2018
HTE #----

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.

EASEMENT REFERENCE LEGEND

1. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 1996031:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 1996001:0000671.
2. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4. PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080527:0005041.
5. 10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

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
Avoid cutting underground utility lines. It's costly.
CALL 811 OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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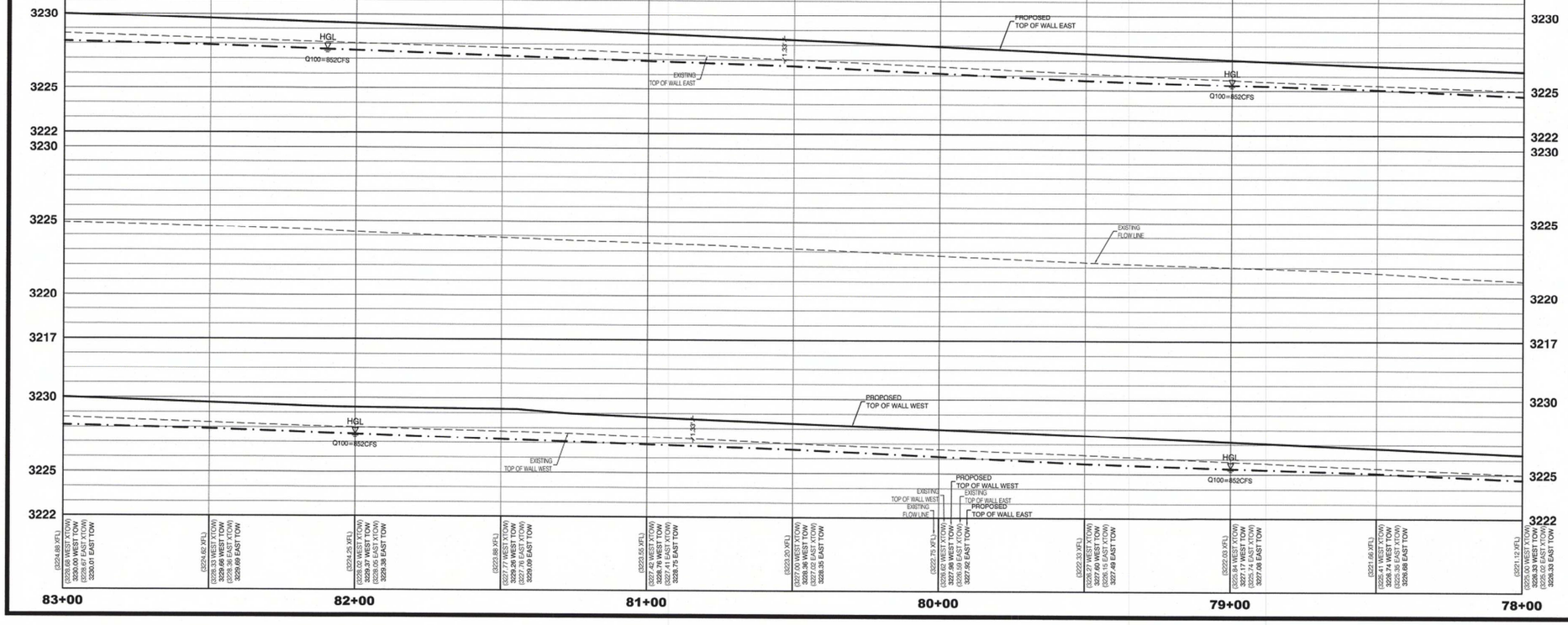
1-702-227-2929



REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10001 PARK RUN DRIVE LAS VEGAS, NEVADA 89145
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 4

SUMMERLIN WEST V21
BELTWAY CHANNEL SKY VISTA DRIVE TO NV ENERGY FACILITY
A DELAWARE LIMITED LIABILITY COMPANY

DRAWN BY: BCC	02/27/2019		
DESIGNED BY: BCC	02/27/2019		
CHECKED BY: WJM	07/09/2019	SCALE: 1"=20'	HORIZ.
PROJECT NO: 7851		N/A	VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
7/11/19

SHEET
GR4
12 OF 17 SHEETS

DRAWING NO.

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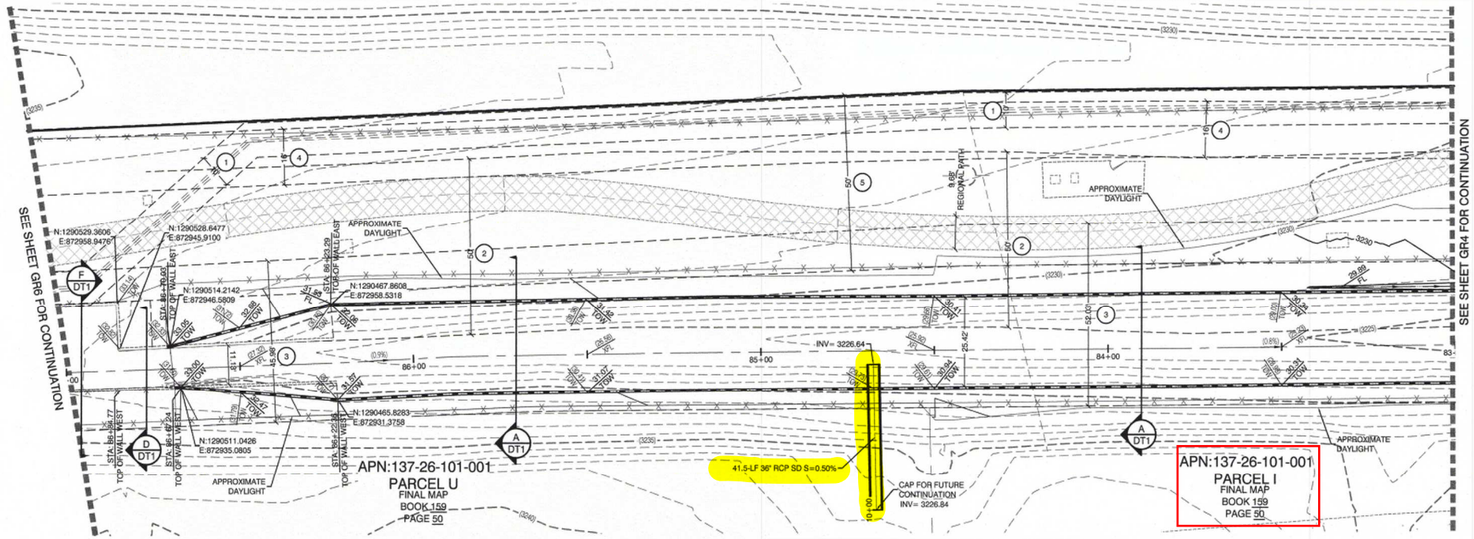

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

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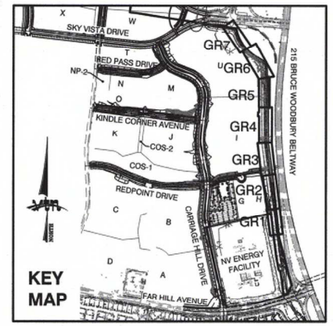
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.



BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

NORTH

GRAPHIC SCALE
-20 0 10 20 40
1" = 20 '

ENGINEER DISCLAIMER NOTE:

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EASEMENT REFERENCE LEGEND

1. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19990310:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19961001:0000671.
2. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4. PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080627:0005041.
5. 10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

GRADING PERMIT NOTE

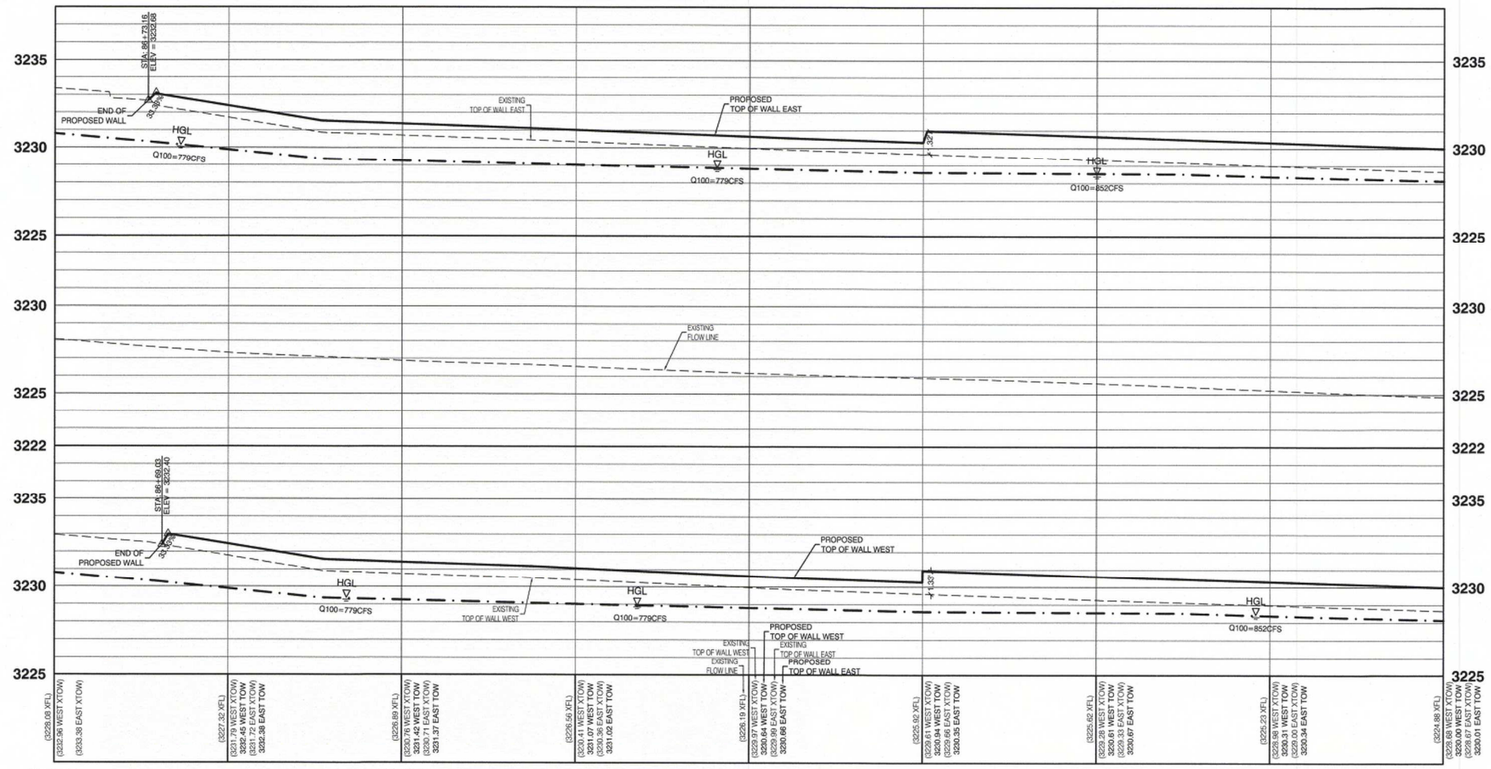
THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

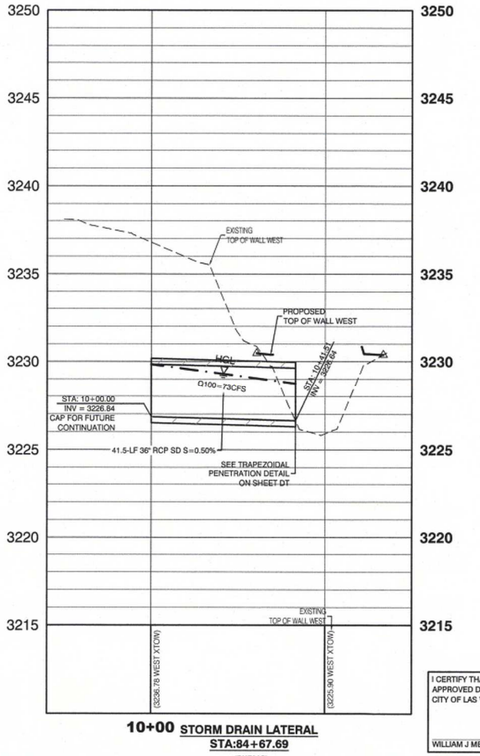
GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #----, DATED MARCH 5, 2018
HTE #----

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.





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

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

REV	DATE	BY	REVISION

VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2895 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 5

SUMMERLIN WEST V21
BELTWAY CHANNEL SKY VISTA DRIVE TO NV ENERGY FACILITY
A DELAWARE LIMITED LIABILITY COMPANY

DRAWN BY: BCC	02/07/2019	SCALE: 1"=20' HORIZ. N/A VERT.	
DESIGNED BY: BCC	02/07/2019		
CHECKED BY: WJM	07/08/2019		
PROJECT NO: 7851			

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
7/11/19

SHEET
GR5
13 OF 17 SHEETS

DRAWING NO.

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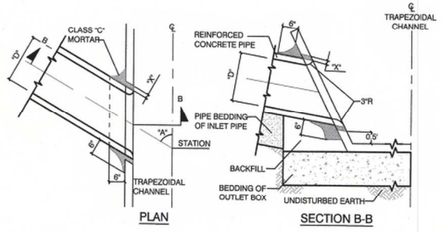
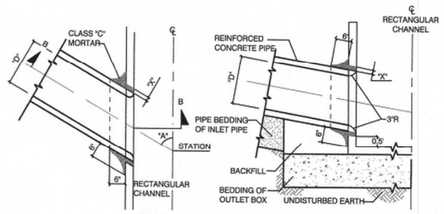


NOTES:

1. SEE PLAN FOR ANGLE 'A'
2. DIMENSION 'X' SHALL BE 2" MINIMUM AND 4" MAXIMUM
3. BURN OR CHIP END OF INLET PIPE FLUSH WITH INNER SURFACE OF MAINLINE. ROUND EDGES OF MAINLINE AND INLET PIPE.

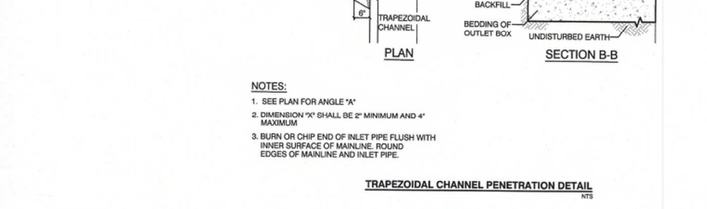
TRAPEZOIDAL CHANNEL PENETRATION DETAIL
NTS



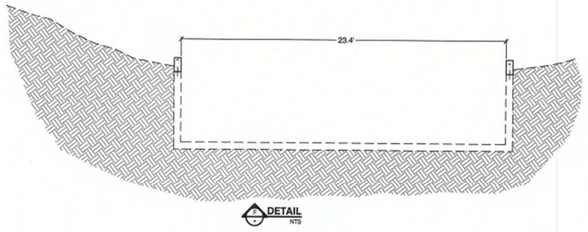
NOTES:

1. SEE PLAN FOR ANGLE 'A'
2. DIMENSION 'X' SHALL BE 2" MINIMUM AND 4" MAXIMUM
3. BURN OR CHIP END OF INLET PIPE FLUSH WITH INNER SURFACE OF MAINLINE. ROUND EDGES OF MAINLINE AND INLET PIPE.

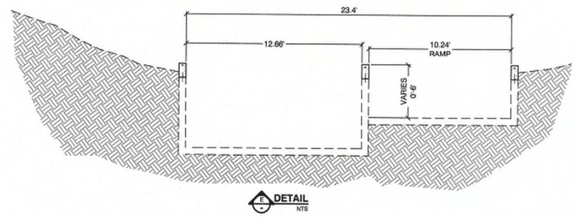
RECTANGULAR CHANNEL PENETRATION DETAIL
NTS



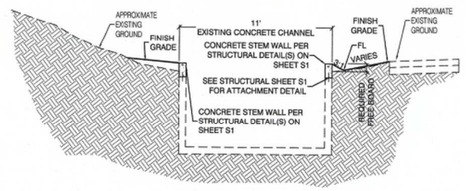
STA: 92+66.56 TO 95+64.49



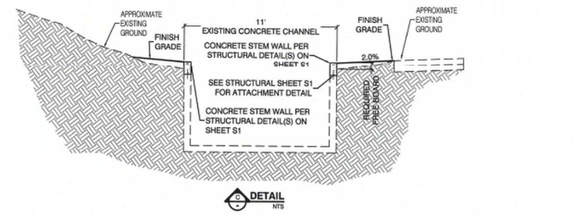
STA: 86+84.77 TO 87+18.46



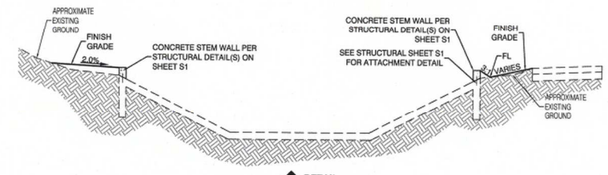
STA: 87+18.46 TO 87+77.36



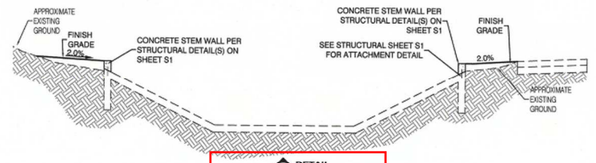
STA: 86+84.77 TO 86+70.87



STA: 87+77.36 TO 92+46.43



STA: 69+83.70 TO 71+75.06
STA: 74+95.17 TO 75+99.82
STA: 78+17.14 TO 83+41.85



STA: 67+90.88 TO 69+63.70
STA: 71+75.06 TO 74+95.17
STA: 75+99.82 TO 78+17.14
STA: 83+41.85 TO 86+70.88

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 N CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

CITY OF LAS VEGAS

REV	DATE	BY	REVISION

DETAIL SHEET

SUMMERLIN WEST V21
BELTWAY CHANNEL SKY VISTA DRIVE TO NV ENERGY FACILITY
A DELAWARE LIMITED LIABILITY COMPANY

DRAWN BY: BCC 02/07/2019
DESIGNED BY: BCC 02/07/2019
CHECKED BY: WJM 07/08/2019
PROJECT NO: 7951
SCALE: 1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/19
CIVIL
NO. 15745
7/11/19

SHEET
DT
16 OF 17 SHEETS

DRAWING NO.

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Update #2 to the Technical Drainage Study for

Summerlin West Village 21
Carriage Hill Drive
(Redpoint Drive to Summerlin Parkway)

Las Vegas, Nevada

Prepared for:

Howard Hughes Company, LLC

Submitted to:

City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: April 4, 2019
TO: **Land Development Services** Department of Building & Safety			FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Village 21 - Carriage Hill Drive – Update #1 (Redpoint Drive to Summerlin Parkway)**		**COPIES TO:** VTN Nevada
Cross Streets:	Carriage Hill Drive and Summerlin Parkway		The Howard Hughes Company LLC
File Number:	F:\Depot\DSMemos\DS5064C.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-26-101-001		CCRFCD
Zoning Action:			
FEMA Flood Zone	YES	NO **X**	
Proposed Storm Drain	YES **X**	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	11/13/2018 & 11/28/2018	12/6/2018	Not Approved	$400.00	500783: $400
2nd Submittal	1/31/2019	2/14/2019	Conditional Approval	$400.00	502868: $400
3rd Submittal & CCRFCD	3/14/2019 & 3/21/2019	4/4/2019	Concurrence Recv'd	$100.00	503994: $100
			TOTAL FEES (LDDRS):	**$900.00**	**----**

REMARKS:

3rd Submittal: Update #1 to upsize a 24"-lateral at Station 28+49.39 to a 30"-RCP

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

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

1. The project proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Carriage Hill Drive*. Prior to final plan approval the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City of Las Vegas Flood Control* for approval. Once the drainage study is conditionally approved, the engineer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update / letter will be required to justify that the offsite berms / channels are no longer necessary and can be removed.

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

LEGEND

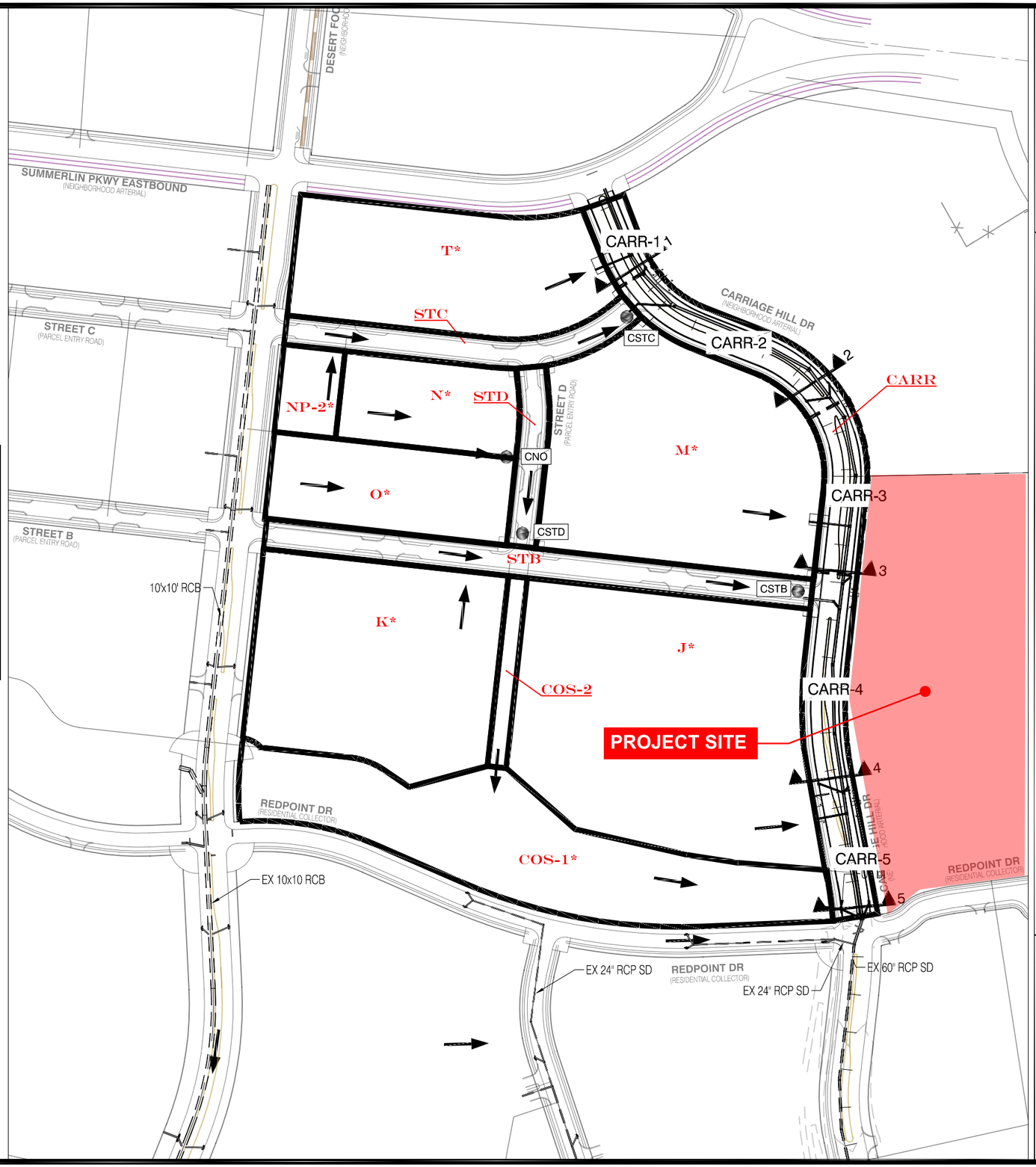
- CONCENTRATION POINT
- BASIN BOUNDARY
- ST7 — BASIN DESIGNATION
- PRORATED SUBBASIN BOUNDARY
- CARR-1 — PRORATED SUBBASIN DESIGNATION
- FLOW ARROW
- CROSS SECTION

ULTIMATE CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	**AREA (ac)**	**Q100 (CFS)**
T*	5.99	23
NP-2*	87	3
STC	1.68	7
CSTC	-	10
M*	9.11	32
N*	2.54	9
O*	3.43	13
CNO	-	22
STD	0.88	4
CSTD	-	26
K*	8.01	29
STB	2.68	12
CSTB	-	66
J*	11.83	42
COS-2	0.58	2
COS-1*	7.78	22
CCOS-1	-	24
CARR	5.78	22

*Referenced from the Master Study

ULTIMATE CONDITION OFFSITE PRORATED SUBBASINS		
BASIN ID	**AREA (ac)**	**Q100 (CFS)**
CARR	5.78	22
SUBBASIN	**AREA (ac)**	**Q100 (CFS)**
CARR-1	0.58	2
CARR-2	1.51	6
CARR-3	1.22	5
CARR-4	1.56	6
CARR-5	0.91	3

ULTIMATE CONDITION STREET FLOW ANALYSIS SUMMARY						
Street Section	**Q100 (cfs)**	**Slope**	**Velocity (ft/s)**	**Depth (ft)**	**V x D**	**Tributary Description**
1	2	5.31%	3.89	0.21	0.82	CARR-1
2	6	5.22%	4.38	0.29	1.27	CARR-2
3	5	1.65%	2.66	0.32	0.85	CARR-3
4	6	1.65%	2.77	0.33	0.91	CARR-4
5	4	1.66%	2.55	0.30	0.77	CARR-5, Section 4 Bypass



W.O.#:	7851-5.5
DATE:	09/2018
BY:	JYA
SCALE:	1" = 300'
SHEET	OF

FIGURE 8: ULTIMATE CONDITION BASIN MAP
SUMMERLIN VILLAGE 21 CARRIAGE HILL DRIVE
REDPOINT TO SUMMERLIN PARKWAY

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Carriage Hill Street A to Summerlin Pkwy\Drainage\A Figures\Figure 8 - Ultimate Basin Map.dwg;jayson; Sep 26, 2018 - 7:24pm

Worksheet for Section 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.65	%
Discharge	5.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+29.67	0.72
0+29.67	1.22
0+38.00	1.39
0+46.33	1.22
0+46.33	0.72
0+74.00	0.17
0+74.00	0.13
0+75.50	0.00
0+75.50	0.50
0+76.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.13)	0.013
(0+02.00, 0.13)	(0+29.67, 0.72)	0.016
(0+29.67, 0.72)	(0+46.33, 0.72)	0.013
(0+46.33, 0.72)	(0+74.00, 0.13)	0.016
(0+74.00, 0.13)	(0+76.00, 0.50)	0.013

Worksheet for Section 3

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 1.39 ft		
Flow Area		1.88	ft²
Wetted Perimeter		18.71	ft
Hydraulic Radius		0.10	ft
Top Width		17.98	ft
Normal Depth		0.32	ft
Critical Depth		0.35	ft
Critical Slope		0.00743	ft/ft
Velocity		2.66	ft/s
Velocity Head		0.11	ft
Specific Energy		0.43	ft
Froude Number		1.45	
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	0.35	ft
Channel Slope	1.65	%
Critical Slope	0.00743	ft/ft

Cross Section for Section 3

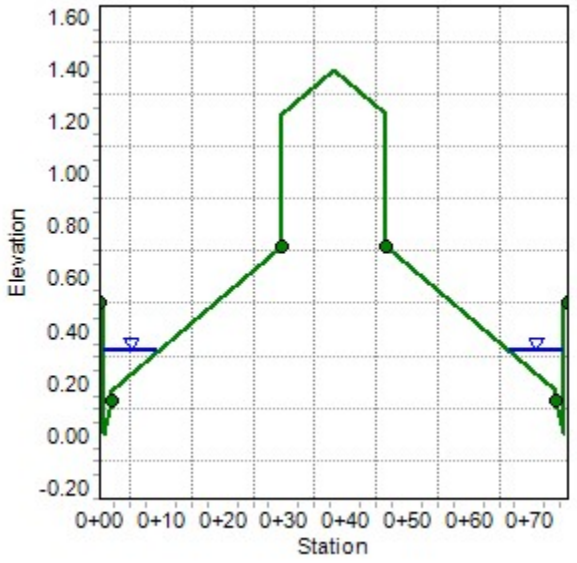
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.65	%
Normal Depth	0.32	ft
Discharge	5.00	ft³/s

Cross Section Image



Worksheet for Section 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.65	%
Discharge	6.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+29.67	0.72
0+29.67	1.22
0+38.00	1.39
0+46.33	1.22
0+46.33	0.72
0+74.00	0.17
0+74.00	0.13
0+75.50	0.00
0+75.50	0.50
0+76.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.13)	0.013
(0+02.00, 0.13)	(0+29.67, 0.72)	0.016
(0+29.67, 0.72)	(0+46.33, 0.72)	0.013
(0+46.33, 0.72)	(0+74.00, 0.13)	0.016
(0+74.00, 0.13)	(0+76.00, 0.50)	0.013

Worksheet for Section 4

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 1.39 ft		
Flow Area		2.16	ft²
Wetted Perimeter		20.29	ft
Hydraulic Radius		0.11	ft
Top Width		19.52	ft
Normal Depth		0.33	ft
Critical Depth		0.37	ft
Critical Slope		0.00729	ft/ft
Velocity		2.77	ft/s
Velocity Head		0.12	ft
Specific Energy		0.45	ft
Froude Number		1.47	
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	1.65	%
Critical Slope	0.00729	ft/ft

Cross Section for Section 4

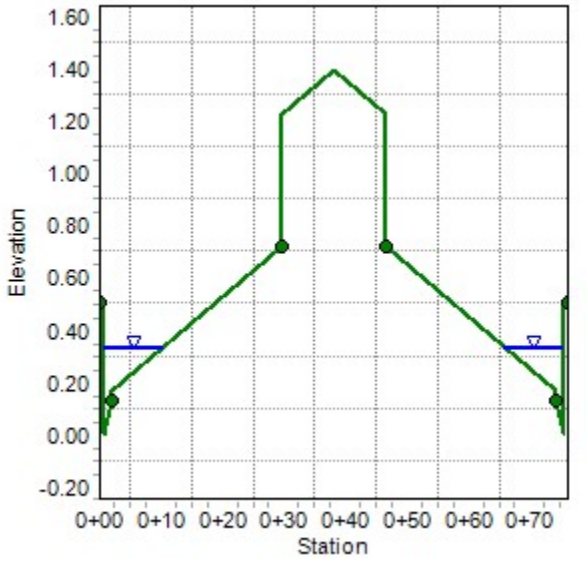
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.65	%
Normal Depth	0.33	ft
Discharge	6.00	ft³/s

Cross Section Image



Worksheet for Section 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.66	%
Discharge	4.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+29.67	0.72
0+29.67	1.22
0+38.00	1.39
0+46.33	1.22
0+46.33	0.72
0+74.00	0.17
0+74.00	0.13
0+75.50	0.00
0+75.50	0.50
0+76.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.13)	0.013
(0+02.00, 0.13)	(0+29.67, 0.72)	0.016
(0+29.67, 0.72)	(0+46.33, 0.72)	0.013
(0+46.33, 0.72)	(0+74.00, 0.13)	0.016
(0+74.00, 0.13)	(0+76.00, 0.50)	0.013

Worksheet for Section 5

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		0.30	ft
Elevation Range	0.00 to 1.39 ft		
Flow Area		1.57	ft²
Wetted Perimeter		16.85	ft
Hydraulic Radius		0.09	ft
Top Width		16.15	ft
Normal Depth		0.30	ft
Critical Depth		0.33	ft
Critical Slope		0.00760	ft/ft
Velocity		2.55	ft/s
Velocity Head		0.10	ft
Specific Energy		0.40	ft
Froude Number		1.45	
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	0.30	ft
Critical Depth	0.33	ft
Channel Slope	1.66	%
Critical Slope	0.00760	ft/ft

Cross Section for Section 5

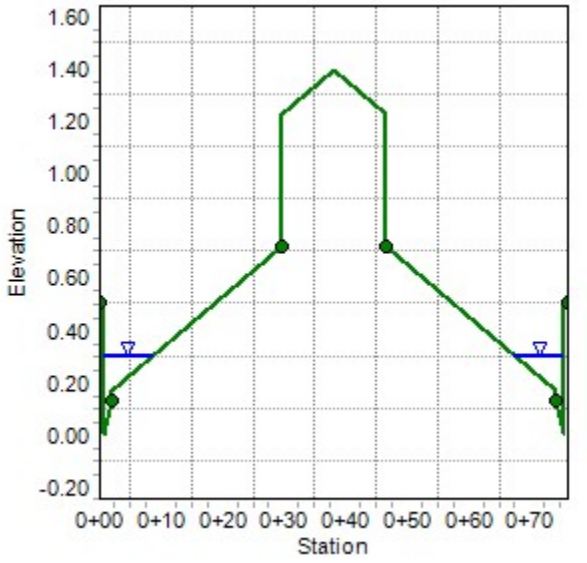
Project Description

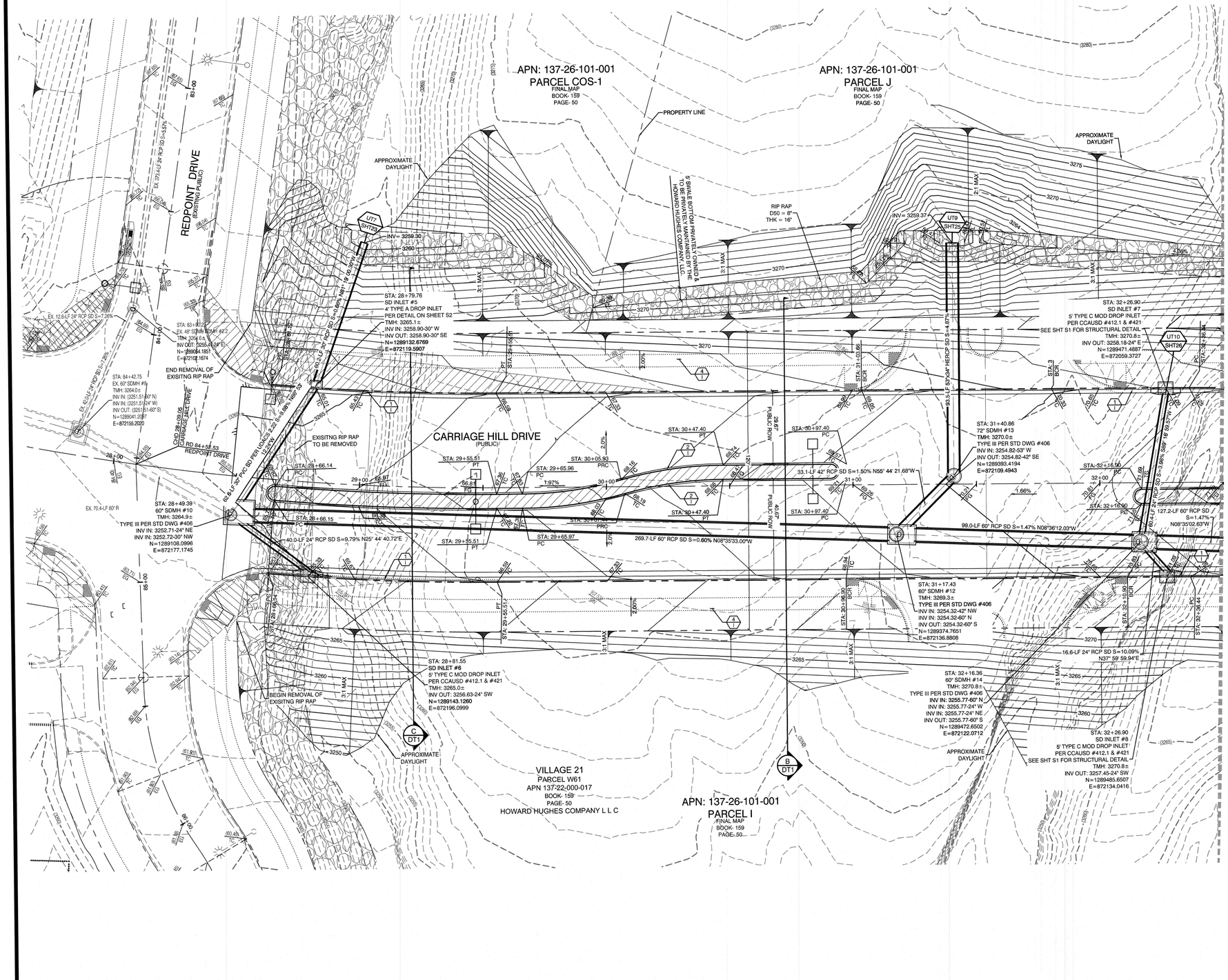
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

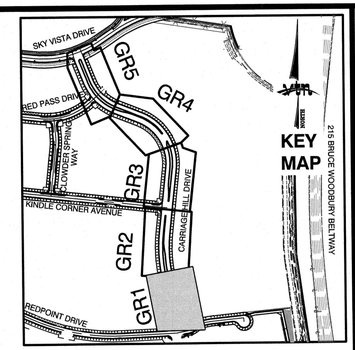
Channel Slope	1.66	%
Normal Depth	0.30	ft
Discharge	4.00	ft³/s

Cross Section Image





SEE SHEET GR2 STA 32+50 FOR CONTINUATION



NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. FUTURE SIDEWALK
4. CONSTRUCT HANDICAP RAMP PER STD. DWG. 225 CASE II
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT COMMERCIAL DRIVEWAY PER STD DWG #224

CONSTRUCTION NOTES

UT # / SHT #

UTILITY PROFILE REFERENCE LABEL
UT # = SHEET INDEX
SHT # = SHEET NUMBER

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-228-8611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO 'GROUND' DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D388 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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:

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

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DS5064A

WILLIAM J MEYER, P.E. No. 15745 DATE 7/31/19

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
No. 15745
CIVIL
7/31/19

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
(702) 791-4000

CITY OF LAS VEGAS

2772 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5146
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING DRAINAGE PLAN 1

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORZ.
BCC 10/22/2018	DEH 10/22/2018	WJM 05/06/2019	7851	1"=20'	VERT. N/A

SHEET
GR1
11 OF 44 SHEETS

DRAWING NO.
L19-00271
107V7673

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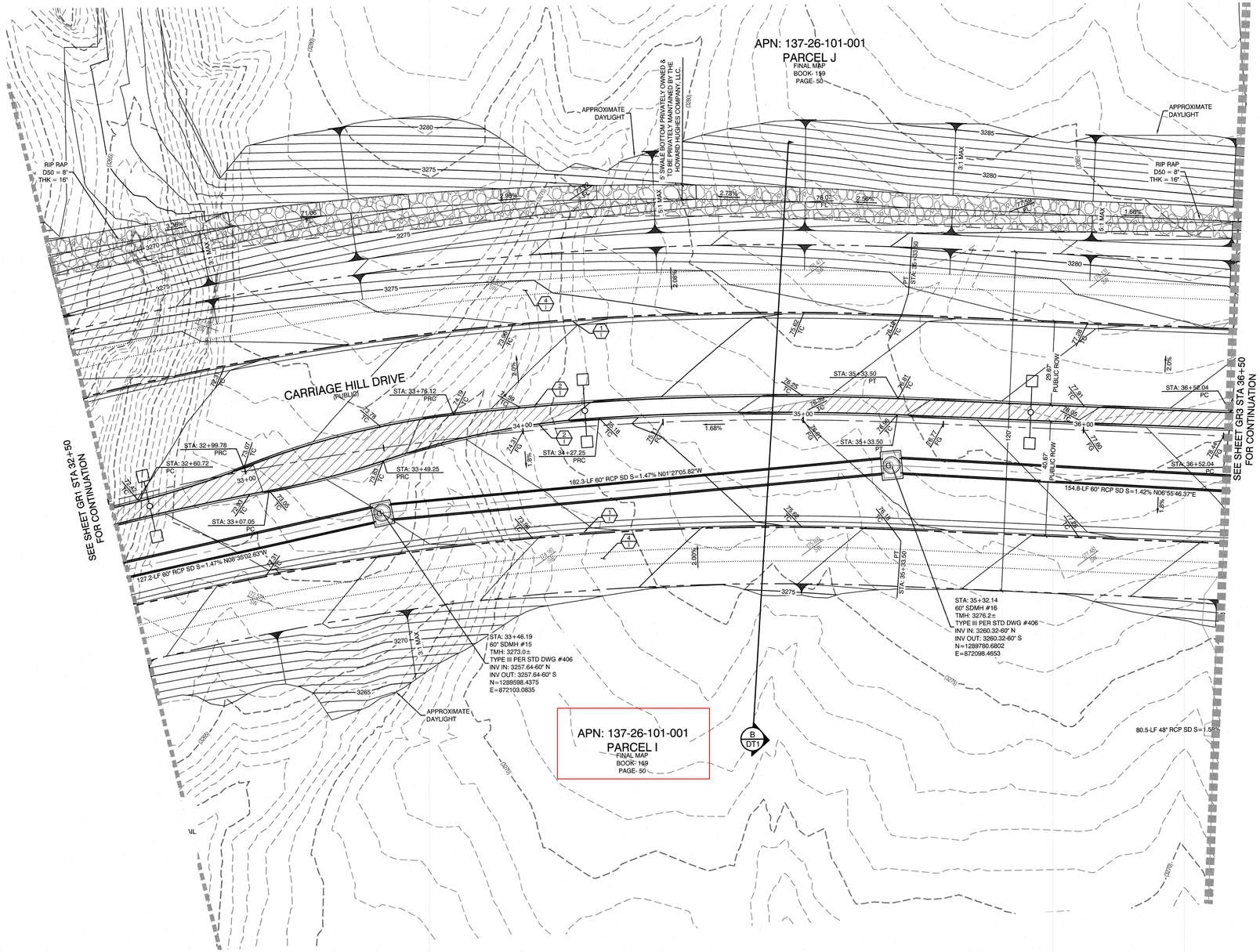

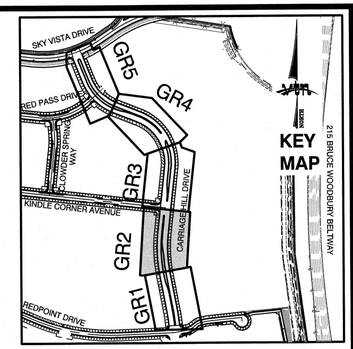

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

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Avoid cutting underground utility lines. It's costly.
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OR
1-800-227-2600
AND
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CLARK COUNTY TRAFFIC OPERATIONS

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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WILLIAM J MEYER , P.E. No. 15745 DATE 7/31/19

REV	DATE	BY	REVISION

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10801 W CHARLESTON BLVD SUITE 300
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702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7350 FAX (702) 362-2997 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING DRAINAGE PLAN 2

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

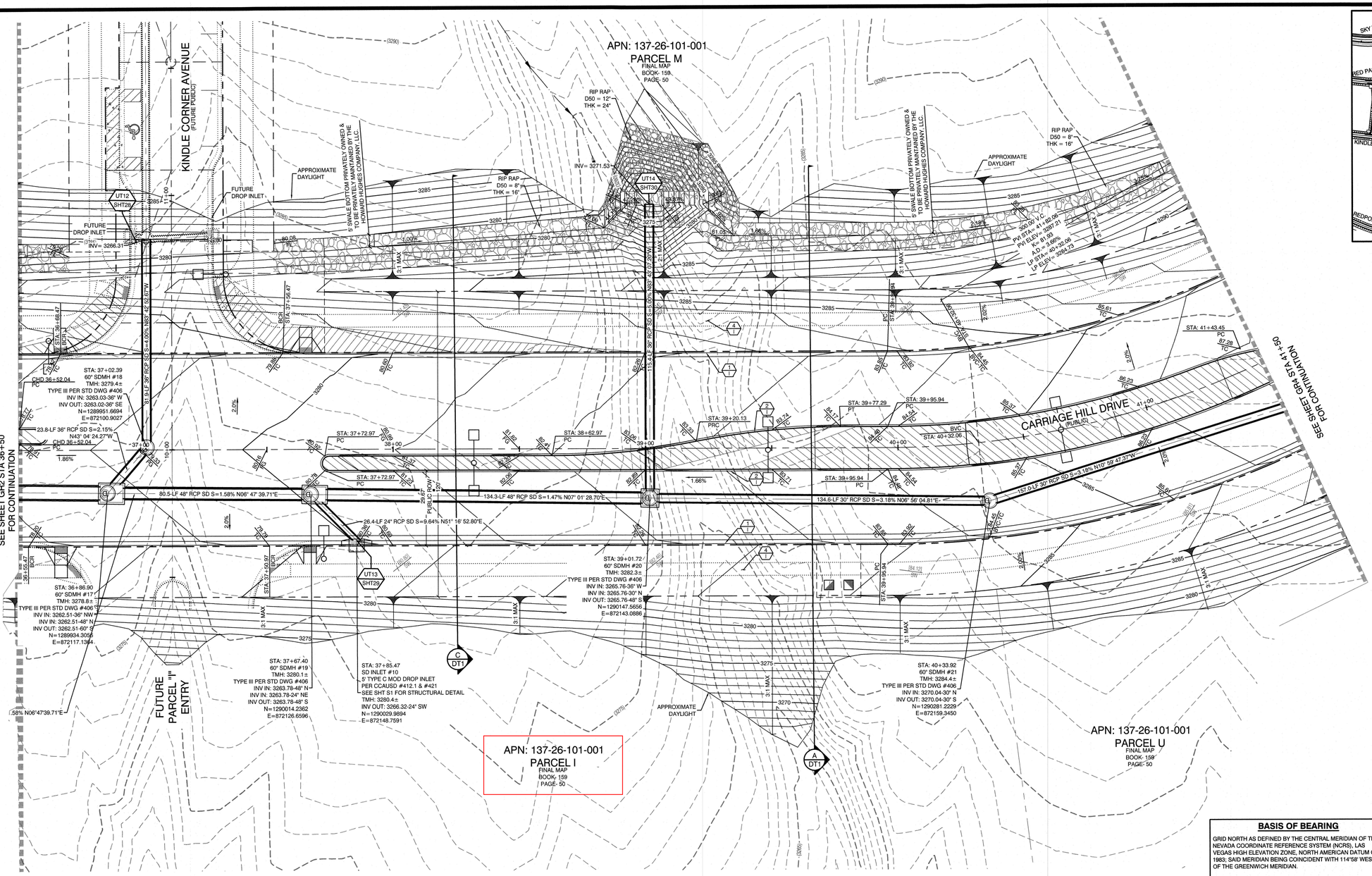
DRAWN BY: BSC	10/22/2018
DESIGNED BY: DEH	10/22/2018
CHECKED BY: WJM	05/06/2019
PROJECT NO: 7881	SCALE: HORIZ. 1"=20' VERT. N/A

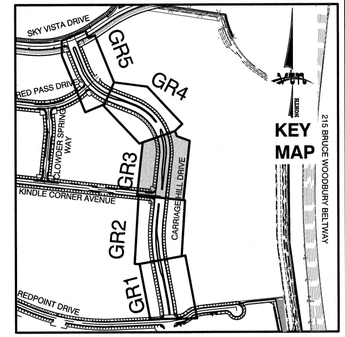
PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
No. 15745
EXP: 12/31/19
CIVIL
7/31/19

SHEET
GR2
12 OF 44 SHEETS

DRAWING NO.
L19-00271
107V7673

H:\7881\Carriage Hill Street A to Summerlin Pkwy\Sheet Set\DWG\7881-GRD.dwg,7/30/2019 9:34 AM,trevor





NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. FUTURE SIDEWALK
4. CONSTRUCT HANDICAP RAMP PER STD. DWG. 235 CASE II
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT COMMERCIAL DRIVEWAY PER STD DWG #224

CONSTRUCTION NOTES

UT # / SHT #

UTILITY PROFILE REFERENCE LABEL
UT # = SHEET INDEX
SHT# = SHEET NUMBER

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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:

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

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DSS064A

WILLIAM J MEYER , P.E. No. 15745 DATE 7/31/19

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE, SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2897 WEB WWW.LYNN1.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING DRAINAGE PLAN 3

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

DRAWN BY: BCC
DESIGNED BY: DEH
CHECKED BY: WJM
PROJECT NO: 7851

10/22/2018
10/22/2018
05/06/2019

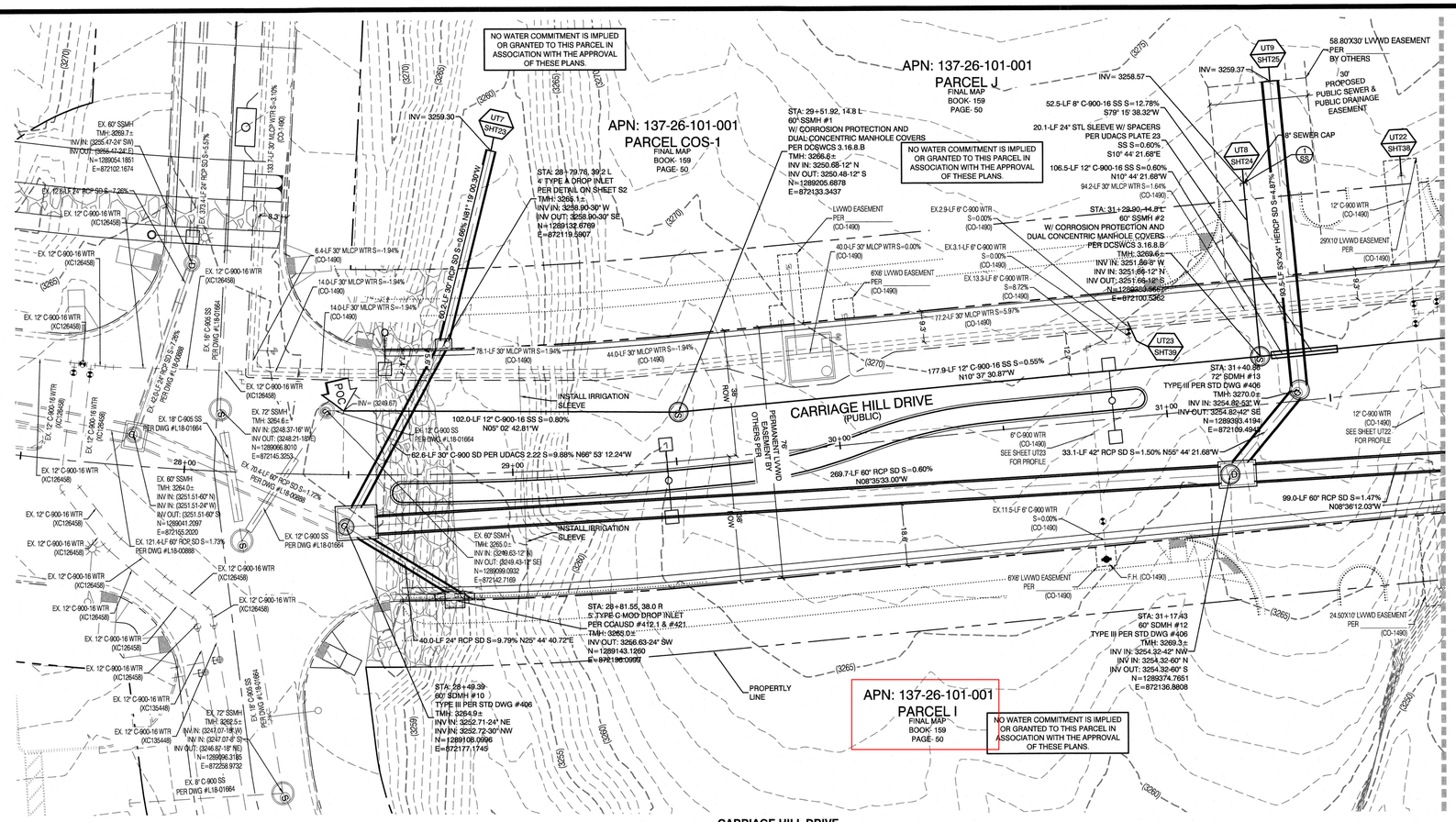
SCALE: 1"=20' HORIZ
N/A VERT:

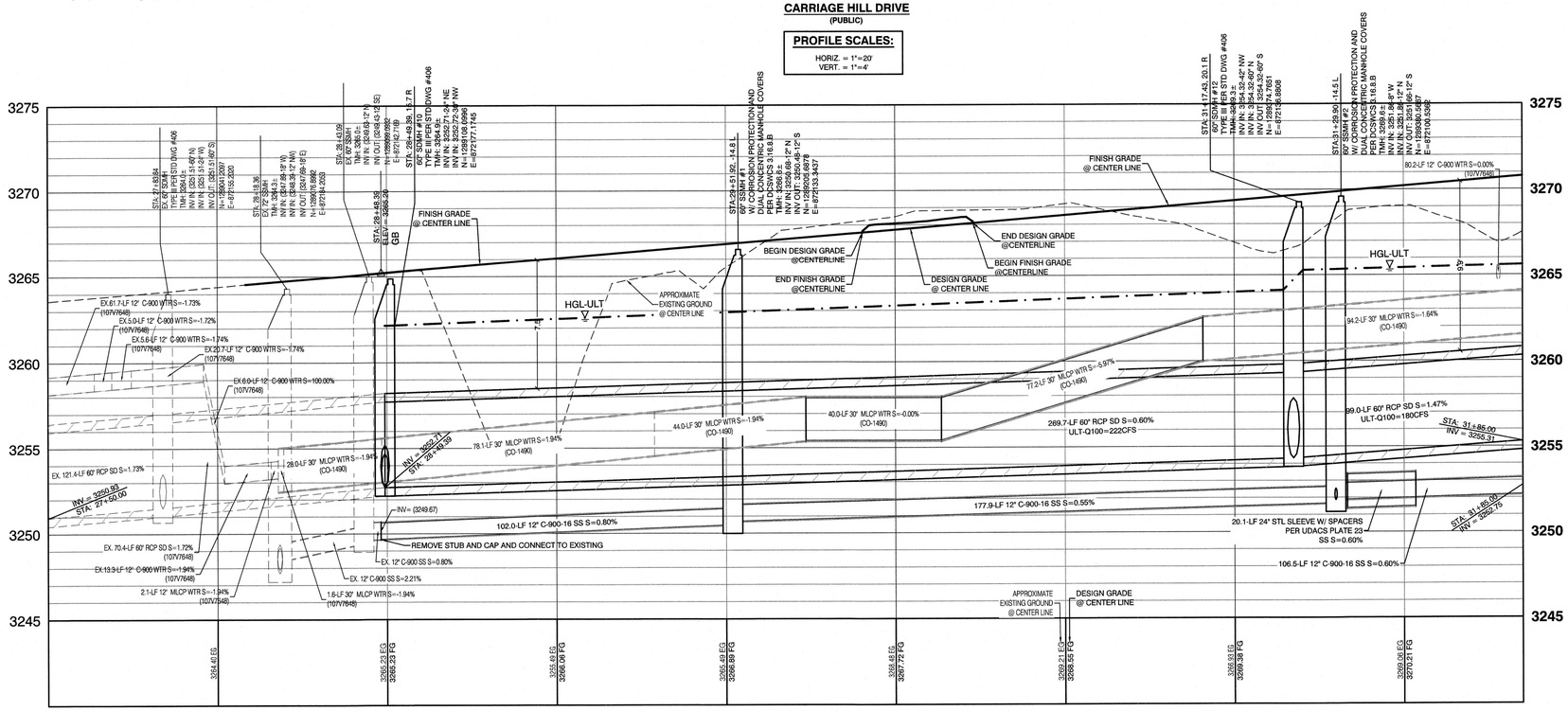
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
PROFESSIONAL ENGINEER-STATE OF NEVADA
No. 15745
7/31/19

SHEET
GR3
13 OF 44 SHEETS

DRAWING NO.
L19-00271
107V7673

H:\7851\Carriage Hill-Sheet A to Summerlin Pkwy\Sheet Set\DWG\7851-GRD.dwg;7/25/2019 9:34 AM;trevor





CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
S	STANDARD MANHOLE PER SD-1A & 1B	13 EA.	0 EA.
	8" C-900-16 SANITARY SEWER MAIN	210 LF.	0 LF.
	12" C-900-16 SANITARY SEWER MAIN	2,230 LF.	0 LF.
8SS	8" SEWER CAP (PER STD 4.6 & 4.11)	4 EA.	0 EA.
12SS	12" SEWER CAP (PER STD 4.6 & 4.11)	1 EA.	0 EA.
POC	SEWER POINT OF CONNECTION		

LVVWD NOTES:

PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES

DEPTH OF COVER DURING CONSTRUCTION

MAINTAIN MINIMUM TWENTY-FOUR (24) INCH COVER PER UDACS SECTION 2.08.04 GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP, (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN
TRENCH ABOVE EACH
HORIZONTAL ELBOW FITTING, PER UDACS
PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED
PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1500 GPM AT 20 P.S.I. RESIDUAL.

ENGINEER DISCLAIMER NOTE:

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UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

WATER MAIN JOINT DEFLECTION

PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02.

FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO:136311 FIRST APPROVED DATE: _____

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE, SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7540 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 1
27+50 TO 32+00

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

DRAWN BY: KTC	10/22/2018	
DESIGNED BY: DEH	10/22/2018	
CHECKED BY: WJM	05/06/2019	
PROJECT NO: 2501	SCALE:	1"=20' HORIZ. 1"=4' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
PROJECT NO. 19145
7/31/19

SHEET
UT1
17 OF 44 SHEETS

DRAWING NO.
L19-00271
107V7673

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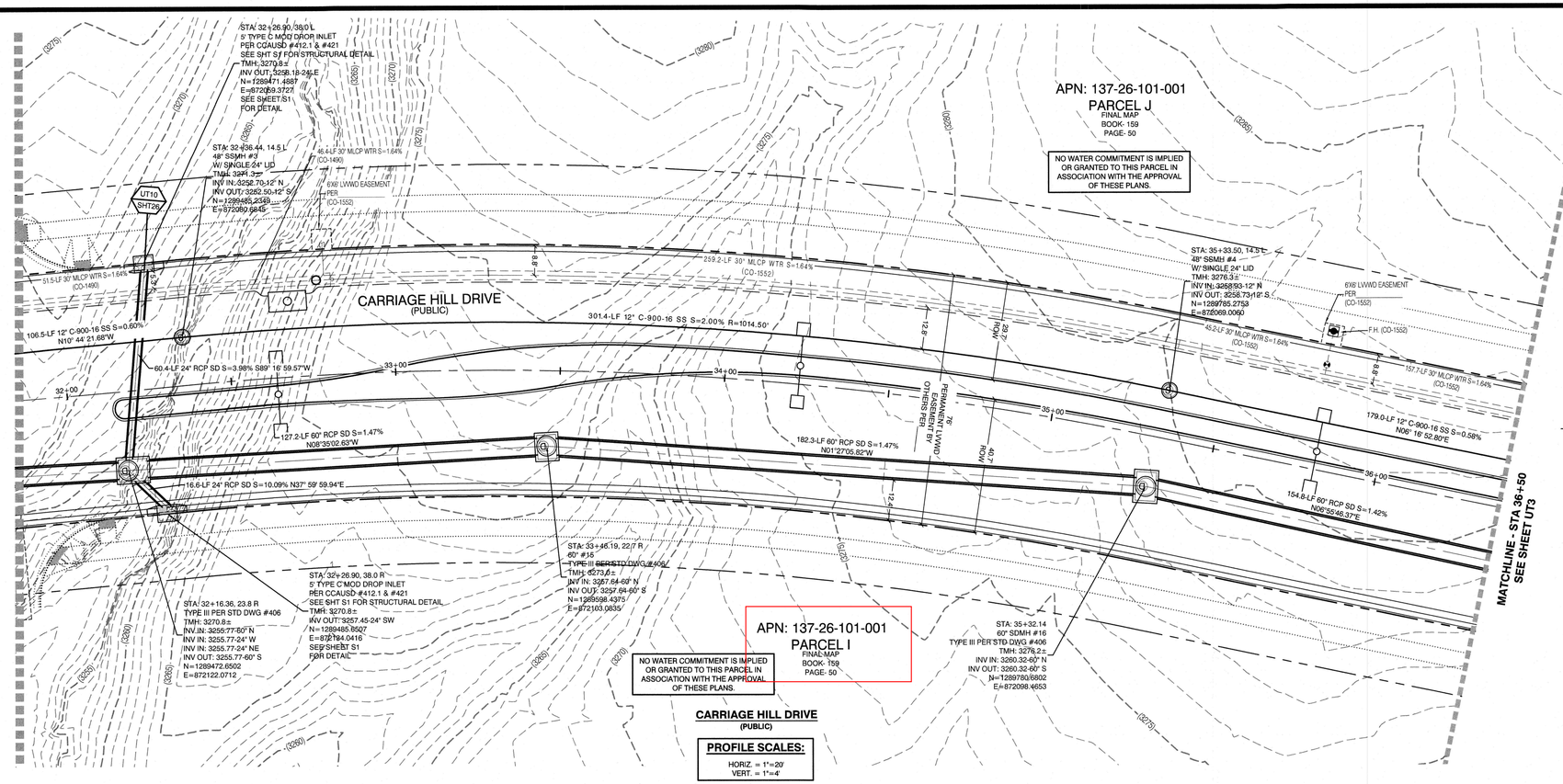

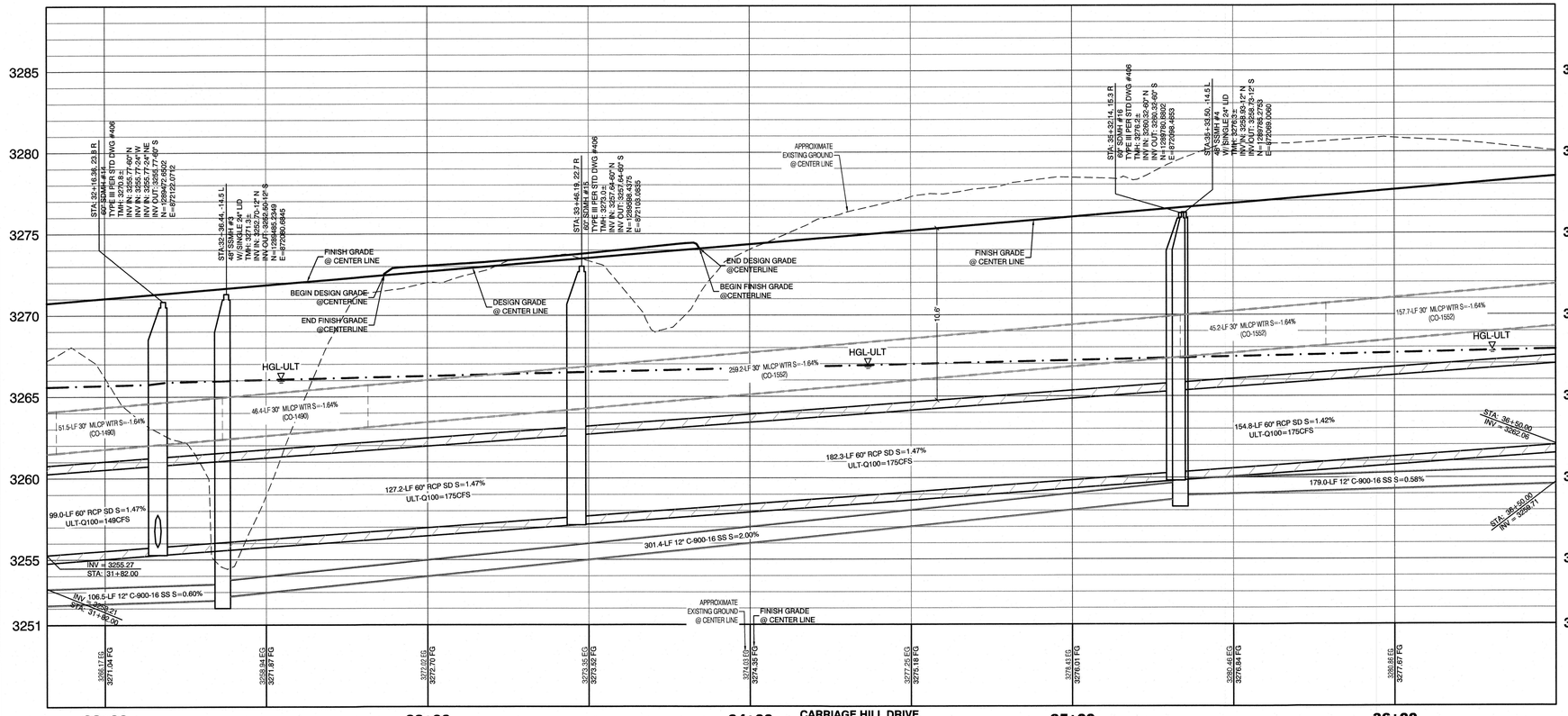

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
Ⓢ	STANDARD MANHOLE PER SD-1A & 1B	13 EA.	0 EA.
	8" C-900-16 SANITARY SEWER MAIN	210 LF.	0 LF.
	12" C-900-16 SANITARY SEWER MAIN	2,230 LF.	0 LF.
1 SS	6" SEWER CAP (PER STD 4.6 & 4.11)	4 EA.	0 EA.
2 SS	12" SEWER CAP (PER STD 4.6 & 4.11)	1 EA.	0 EA.
POC	SEWER POINT OF CONNECTION		

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

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WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LVVWD NOTES:

PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES

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Avoid cutting underground utility lines. It's costly.
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OR
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AND
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CLARK COUNTY TRAFFIC OPERATIONS

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CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEMS CONDUITS
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

DEPTH OF COVER DURING CONSTRUCTION

MAINTAIN MINIMUM TWENTY-FOUR (24) INCH COVER PER UDACS SECTION 2.08.04 GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN
TRENCH ABOVE EACH
HORIZONTAL ELBOW FITTING, PER UDACS
PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED
PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1500 GPM AT 20 P.S.I. RESIDUAL.

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO:136311 FIRST APPROVED DATE:_____

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W. CHARLESTON BLVD. SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7500 FAX (702) 362-2897 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 2
32+00 TO 36+50

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

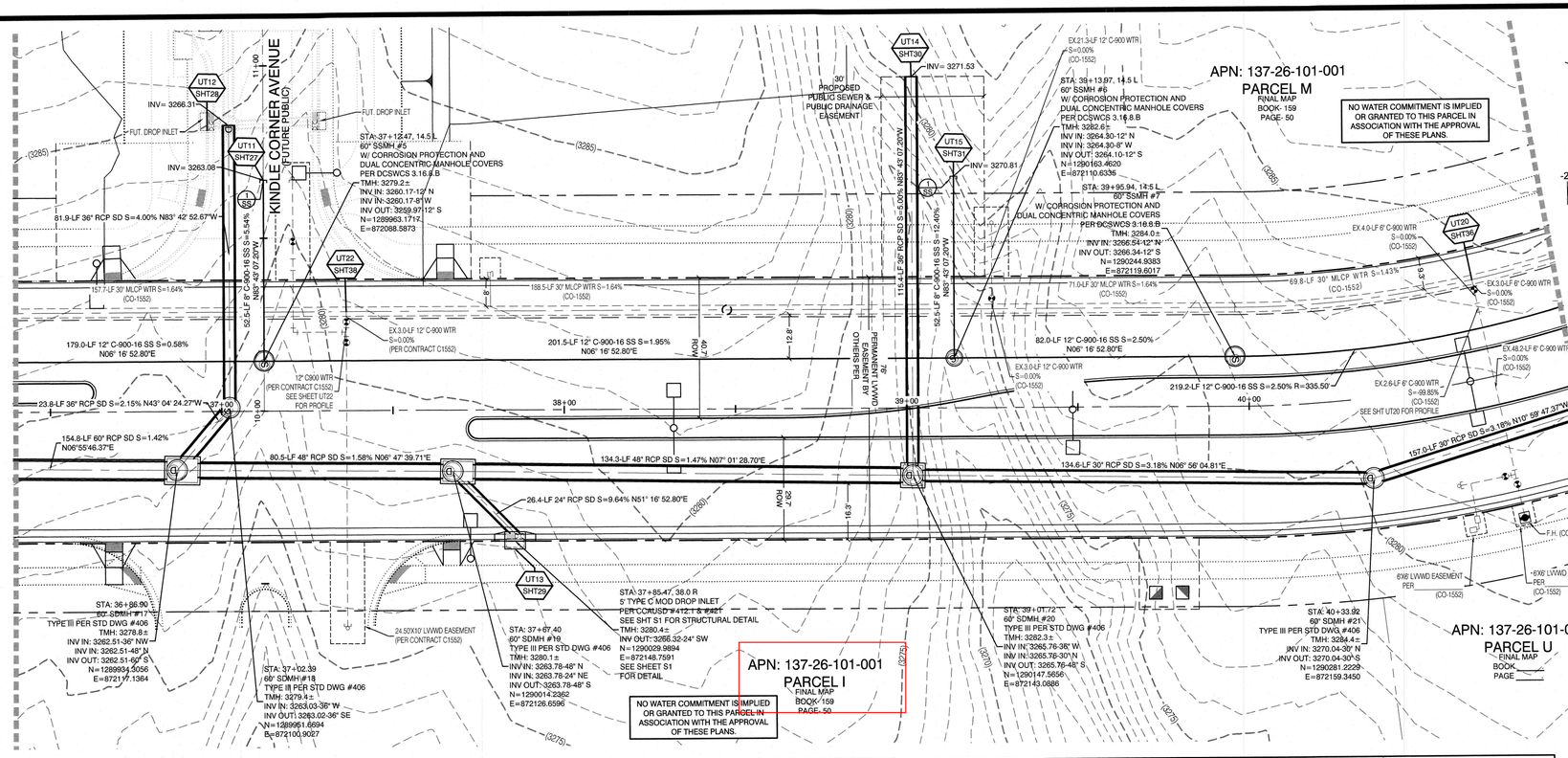
DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ:
KTC	DSH	W.M	7851	1"=20'	VERT: 1"=4'
10/22/2018	10/22/2018	06/06/2019			

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
STATE OF NEVADA
PROFESSIONAL ENGINEER
7/31/19

SHEET
UT2
18 OF **44** SHEETS

DRAWING NO.
L19-00271
107V7673

H:\7851\Carriage Hill-Sheet A to Summerlin Pkwy\Sheet Set\DWG\7851-UT.dwg,7/29/2019 5:12 PM,trevor


KINDLE CORNER AVENUE (FUTURE PUBLIC)
MATCHLINE - STA 36+50 SEE SHEET UT2
MATCHLINE - STA 41+00 SEE SHEET UT4
30' PROPOSED PUBLIC SEWER & PUBLIC DRAINAGE EASEMENT
APN: 137-26-101-001 PARCEL M FINAL MAP BOOK- 159 PAGE- 50
NO WATER COMMITMENT IS IMPLIED OR GRANTED TO THIS PARCEL IN ASSOCIATION WITH THE APPROVAL OF THESE PLANS.
APN: 137-26-101-001 PARCEL I FINAL MAP BOOK-159 PAGE- 50
NO WATER COMMITMENT IS IMPLIED OR GRANTED TO THIS PARCEL IN ASSOCIATION WITH THE APPROVAL OF THESE PLANS.
APN: 137-26-101-001 PARCEL U FINAL MAP BOOK_____ PAGE_____
CARRIAGE HILL DRIVE (PUBLIC)
NORTH
GRAPHIC SCALE
-20 0 10 20 40
1" = 20'
SKY VISTA DRIVE
RED PASS DRIVE
FLOWER SPRING WAY
KINDLE CORNER AVENUE
SUMMERLIN PARKWAY
215 BRUCE WOODBURY BELTWAY
REDPOINT DRIVE
UT6
UT5
UT4
UT3
UT2
UT1
KEY MAP
CONSTRUCTION NOTES
SEWER PUBLIC PRIVATE
STANDARD MANHOLE PER SD-1A & 1B 13 EA. 0 EA.
8" C-900-16 SANITARY SEWER MAIN 210 LF. 0 LF.
12" C-900-16 SANITARY SEWER MAIN 2,230 LF. 0 LF.
8" SEWER CAP (PER STD 4.6 & 4.11) 4 EA. 0 EA.
12" SEWER CAP (PER STD 4.6 & 4.11) 1 EA. 0 EA.
SEWER POINT OF CONNECTION
DEPTH OF COVER DURING CONSTRUCTION
MAINTAIN MINIMUM TWENTY-FOUR (24) INCH COVER PER UDACS SECTION 2.08.04 GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION
DROP INLET NOTE
WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).
WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.
WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08
WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.
WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15
FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.
LAS VEGAS FIRE & RESCUE APPROVAL
BY:_____ DATE:_____
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1500 GPM AT 20 P.S.I. RESIDUAL.
ENGINEER DISCLAIMER NOTE:
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Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR 1-800-227-2600 AND 1-702-455-5000 CLARK COUNTY TRAFFIC OPERATIONS
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929
AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS IT'S COSTLY
Call before you Dig Underground
1-702-455-7511 CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611 LAS VEGAS AREA COMPREHENSIVE TRAFFIC SYSTEM
PROFILE SCALES:
HORIZ = 1"=20'
VERT. = 1"=4'
WATER MAIN JOINT DEFLECTION
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02.
FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.
UTILITY CROSSING NOTE:
ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.
LVVWD NOTES:
PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES
APPROVED FOR CONSTRUCTION
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO:136311 FIRST APPROVED DATE:_____
LVVWD APPROVAL IS VALID FOR ONE (1) YEAR FROM SIGNATURE DATE. IF CONSTRUCTION IS NOT STARTED, PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL
3295 3290 3285 3280 3275 3270 3265 3260 3256
37+00 38+00 39+00 40+00
CARRIAGE HILL DRIVE (PUBLIC)
FINISH GRADE @ CENTER LINE
BEGIN DESIGN GRADE @CENTERLINE
END FINISH GRADE @CENTERLINE
DESIGN GRADE @ CENTER LINE
APPROXIMATE EXISTING GROUND @ CENTER LINE
HGL-ULT
1.65%
12.4'
300' V.C. PVI STA= 41+82.06 PVI ELEV= 3287.21 K= 81.93 A.D.= 3.66%
STA: 36+89.06 60" SDMH #17 TYPE III PER STD DWG #406 TMH: 3278.8± INV IN: 3262.51-36° NW INV OUT: 3262.51-69° S N=1289934.3056 E=872117.1364
STA: 37+12.39 60" SDMH #18 TYPE III PER STD DWG #406 TMH: 3279.4± INV IN: 3263.03-38° W INV OUT: 3263.02-36° SE N=1289951.6694 E=872100.9027
STA: 37+67.40 60" SDMH #19 TYPE III PER STD DWG #406 TMH: 3280.1± INV IN: 3263.78-48° N INV OUT: 3263.78-48° S N=1290014.2362 E=872126.6596
STA: 37+85.47, 38.0 R 5' TYPE C MOD DROP INLET PER CCRUSD 9412.1 & 9421 SEE SHT S1 FOR STRUCTURAL DETAIL TMH: 3280.4± INV OUT: 3265.32-24° SW N=1290029.9894 E=872148.7591 SEE SHEET S1 FOR DETAIL
STA: 39+01.72 60" SDMH #20 TYPE III PER STD DWG #406 TMH: 3282.3± INV IN: 3265.76-36° W INV IN: 3265.76-30°N INV OUT: 3265.76-48° S N=1290147.5656 E=872143.0886
STA: 40+33.92 60" SDMH #21 TYPE III PER STD DWG #406 TMH: 3284.4± INV IN: 3270.04-36° N INV OUT: 3270.04-30° S N=1290281.2229 E=872159.3450
STA: 39+69.94, 14.5 L 60" SSMH #7 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3284.0± INV IN: 3266.54-12° N INV OUT: 3266.34-12° S N=1290244.9383 E=872119.6017
STA: 39+95.94, 14.5 L 60" SSMH #7 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3284.0± INV IN: 3266.54-12° N INV OUT: 3266.34-12° S N=1290244.9383 E=872119.6017
STA: 37+42.47, 14.5 L 60" SSMH #5 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3279.2± INV IN: 3260.17-12° N INV IN: 3260.17-8° W INV OUT: 3259.97-12° S N=1289963.1717 E=872088.5873
STA: 39+13.97, 14.5 L 60" SSMH #6 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3282.6± INV IN: 3264.30-12° N INV IN: 3264.30-8° W INV OUT: 3264.10-12° S N=1290163.4620 E=872110.6335
STA: 37+57.15 GB STA = 37+57.15 ELEV = 3278.54
STA: 37+85.47 60" SDMH #19 TYPE III PER STD DWG #406 TMH: 3280.1± INV IN: 3263.78-48° N INV IN: 3263.78-24° NE INV OUT: 3263.78-48° S N=1290014.2362 E=872126.6596
STA: 39+01.72 60" SDMH #20 TYPE III PER STD DWG #406 TMH: 3282.3± INV IN: 3265.76-36° W INV IN: 3265.76-30°N INV OUT: 3265.76-48° S N=1290147.5656 E=872143.0886
STA: 39+69.94, 14.5 L 60" SSMH #7 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3284.0± INV IN: 3266.54-12° N INV OUT: 3266.34-12° S N=1290244.9383 E=872119.6017
STA: 40+33.92 60" SDMH #21 TYPE III PER STD DWG #406 TMH: 3284.4± INV IN: 3270.04-30° N INV OUT: 3270.04-30° S N=1290281.2229 E=872159.3450
STA: 40+33.92 BF/C ELEV= 3284.73 FG
STA: 41+33.92, 23.2 R 60" SDMH #21 TYPE III PER STD DWG #406 TMH: 3285.4± INV IN: 3270.04-30° N INV OUT: 3270.04-30° S N=1290281.2229 E=872199.3460
179.0-LF 12" C-900-16 SS S=0.58% N06° 16' 52.80"E
154.8-LF 60" RCP SD S=1.42% N06°55'46.37"E
23.8-LF 36" RCP SD S=2.15% N43° 04' 24.27"W
81.9-LF 36" RCP SD S=4.00% N83° 42' 52.67"W
157.7-LF 30" MLCP WTR S=1.64% (CO-1552)
32.5-LF 8" C-900-16 SS S=3.54% N85° 42' 07.20"W
188.5-LF 30" MLCP WTR S=1.64% (CO-1552)
201.5-LF 12" C-900-16 SS S=1.95% N06° 16' 52.80"E
12" C900 WTR (PER CONTRACT C1552) SEE SHEET UT22 FOR PROFILE
EX.3.0-LF 12" C-900 WTR S=0.00% (PER CONTRACT C1552)
80.5-LF 48" RCP SD S=1.58% N06° 47' 39.71"E
26.4-LF 24" RCP SD S=9.64% N51° 16' 52.80"E
STA: 37+02.39 60" SDMH #18 TYPE III PER STD DWG #406 TMH: 3279.4± INV IN: 3263.03-38° W INV OUT: 3263.02-36° SE N=1289951.6694 E=872100.9027
24.50X10' LVWD EASEMENT (PER CONTRACT C1552)
114.4-LF 54" RCP SD S=5.00% N83° 42' 07.20"W
52.5-LF 8" C-900-16 SS S=12.40% N85° 42' 07.20"W
82.0-LF 12" C-900-16 SS S=2.50% N06° 16' 52.80"E
EX.3.0-LF 12" C-900 WTR S=0.00% (CO-1552)
134.3-LF 48" RCP SD S=1.47% N07° 01' 28.70"E
134.6-LF 30" RCP SD S=3.18% N06° 56' 04.81"E
219.2-LF 12" C-900-16 SS S=2.50% R=335.50
EX.2.6-LF 8" C-900 WTR S=-99.83% (CO-1552)
SEE SHT UT20 FOR PROFILE
EX.48.2-LF 6" C-900 WTR S=0.00% (CO-1552)
157.0-LF 30" RCP SD S=3.18% N10° 59' 47.37"W
F.H. (CO-1552)
6X6' LVWD EASEMENT PER (CO-1552)
EX.4.0-LF 8" C-900 WTR S=0.00% (CO-1552)
EX.3.0-LF 8" C-900 WTR S=0.00% (CO-1552)
69.8-LF 30" MLCP WTR S=1.43% (CO-1552)
71.0-LF 30" MLCP WTR S=1.64% (CO-1552)
STA: 36+50.00 INV = 3259.63
179.0-LF 12" C-900-16 SS S=0.58%
154.8-LF 60" RCP SD S=1.42%
80.5-LF 48" RCP SD S=1.58% ULT-Q100=106.5CFS
201.5-LF 12" C-900-16 SS S=1.95%
134.3-LF 48" RCP SD S=1.47% ULT-Q100=104CFS
134.6-LF 30" RCP SD S=3.18% ULT-Q100=72CFS
82.0-LF 12" C-900-16 SS S=2.50%
157.0-LF 30" RCP SD S=3.18% ULT-Q100=72CFS
219.2-LF 12" C-900-16 SS S=2.50%
STA: 41+00.00 INV = 3268.64
60.5-LF 30" MLCP WTR S=-1.43% (CO-1552)
69.8-LF 30" MLCP WTR S=-1.43% (CO-1552)
71.0-LF 30" MLCP WTR S=-1.64% (CO-1552)
STA: 41+00.00 INV = 3275.99
3279.29 FG 3278.33 FG
3279.65 FG 3280.16 FG
3280.39 FG 3280.99 FG
3281.09 FG 3281.82 FG
3282.65 FG 3283.42 FG
3283.48 FG 3284.31 FG
3285.14 FG 3285.77 FG
HOWARD HUGHES COMPANY, LLC A DELAWARE LIMITED LIABILITY COMPANY
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 873-7560 FAX (702) 362-2597 WEB WWW.VTNW.COM
3 SUMMERLIN CENTRE 1980 FESTIVAL PLAZA DRIVE SUITE 300 LAS VEGAS, NEVADA 89135 (702) 255-4300
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
CITY OF LAS VEGAS
REV DATE BY REVISION
UTILITY PLAN & PROFILE 3 36+50 TO 41+00
SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE REDPOINT TO SKY VISTA
DRAWN BY: KTC 10/22/2018
DESIGNED BY: DEH 10/22/2018
CHECKED BY: WJM 06/06/2019
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7851
PROFESSIONAL ENGINEER STATE OF NEVADA WILLIAM J. MEYER EXP: 12/31/19 CIVIL No. 15749
7/31/19
SHEET UT3
19 OF 44 SHEETS
DRAWING NO. L19-00271 10V7673
H:\7851\Carriage Hill Street A to Summerlin Pkwy\Sheet Set\DWG\7851-UT.dwg;7/28/2019 5:12 PM;trevor

Addendum #1 to the Technical Drainage Study for

Summerlin West Village 21
Street A
Carriage Hill to Parcel H

Las Vegas, Nevada

W.O. # 7851

Prepared for:
Howard Hughes Co.

Submitted to:
Public Works Department
City of Las Vegas

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: August 14, 2018
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: Summerlin West Village 21 - Street A (from Carriage Hill Dr. to Parcel H)		COPIES TO: VTN Nevada
Cross Streets:	Street A - Desert Foothills to Carriage Hill		Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5007B.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017		
Zoning Action:	N/A		
FEMA Flood Zone	YES	NO X	
Proposed Storm Drain	YES X	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES Paid In Payment #
1st Submittal	6/13/2018	6/29/2018 & 7/3/2018	Not Approved	$400.00	496730 $400.00
2nd Submittal	7/31/2018	8/14/2018	See Comments Below	$400.00	497797 $400.00
			TOTAL FEES (LDDRS):	$800.00	

REMARKS:

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

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

1. The project proposed to construct temporary drainage facilities including drainage berms/swales along the north side of the proposed *Street A*. Prior to the final plans approval, the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control* for approval. Once the drainage study is conditionally approved the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to initiate the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berm/swale are no longer necessary and can be removed.

2. The proposed 30'-public drainage easement (privately maintained) from the cul-de-sac end of Street A to the Beltway channel must be dedicated prior to the final approval of the improvement plans.

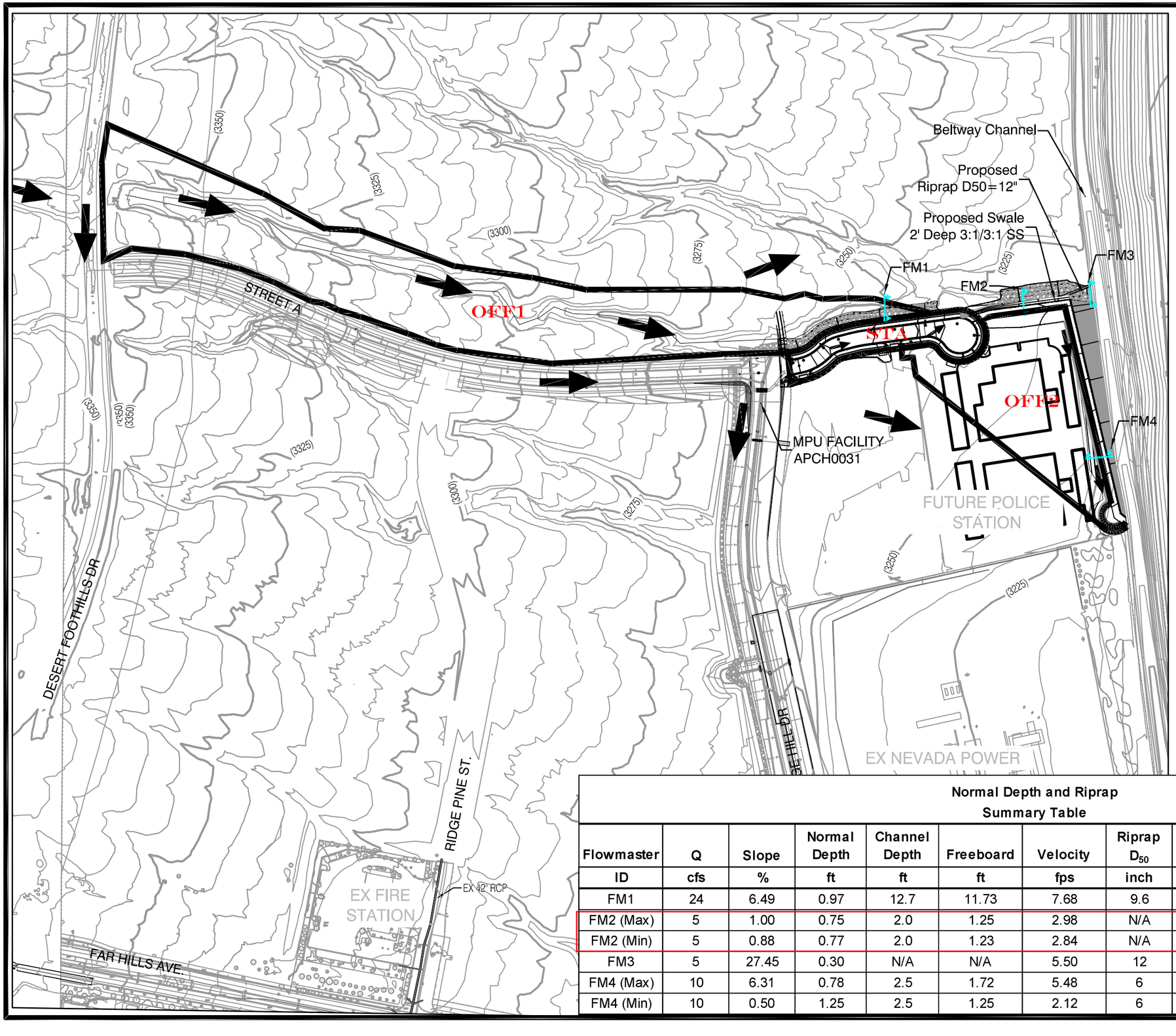
3. Upsize all riprap from d_{50} = 6" to d_{50} = 8" minimum.

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

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

END OF REMARKS
AYS

T/R/S: T20S/R59E/26
AREA K-26



GRAPHIC SCALE

250 0 125 250 500

1" = 250'

LEGEND

- BASIN BOUNDARY
- EX1 BASIN DESIGNATION
- FLOW ARROW
- FLOWMASTER CROSS SECTION

INTERIM CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
STA	1.00	5
OFF1	8.70	24
OFF2	3.03	10

Normal Depth and Riprap Summary Table

Flowmaster ID	Q cfs	Slope %	Normal Depth ft	Channel Depth ft	Freeboard ft	Velocity fps	Riprap D_{50} inch	Side Slope H:V	Description
FM1	24	6.49	0.97	12.7	11.73	7.68	9.6	2:1	Existing Wash/Roadway Embankment
FM2 (Max)	5	1.00	0.75	2.0	1.25	2.98	N/A	3:1	Earthen Swale
FM2 (Min)	5	0.88	0.77	2.0	1.23	2.84	N/A	3:1	Earthen Swale
FM3	5	27.45	0.30	N/A	N/A	5.50	12	10:1	Riprap Protection
FM4 (Max)	10	6.31	0.78	2.5	1.72	5.48	6	4:1/2:1	Riprap Channel
FM4 (Min)	10	0.50	1.25	2.5	1.25	2.12	6	4:1/2:1	Riprap Channel

W.O.#:	7851
DATE:	APRIL 2018
BY:	SVB
SCALE:	1" = 250'
SHEET	OF

FIGURE 7: INTERIM CONDITION BASIN MAP
SUMMERLIN WEST VILLAGE 21
STREET A CARRIAGE HILL TO PARCEL H

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Street A Police Substation Access\Drainage\2_ADD1\A Figures\Street A PSA Figure 7 - Interim Condition Map.dwg;jayson; Jul 31, 2018 - 10:46am

Worksheet for FM2 (Max S=1.00%)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	1.00	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Results

Normal Depth	0.75	ft
Flow Area	1.68	ft²
Wetted Perimeter	4.73	ft
Hydraulic Radius	0.35	ft
Top Width	4.49	ft
Critical Depth	0.70	ft
Critical Slope	0.01384	ft/ft
Velocity	2.98	ft/s
Velocity Head	0.14	ft
Specific Energy	0.89	ft
Froude Number	0.86	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.75	ft
Critical Depth	0.70	ft
Channel Slope	1.00	%
Critical Slope	0.01384	ft/ft

Cross Section for FM2 (Max S=1.00%)

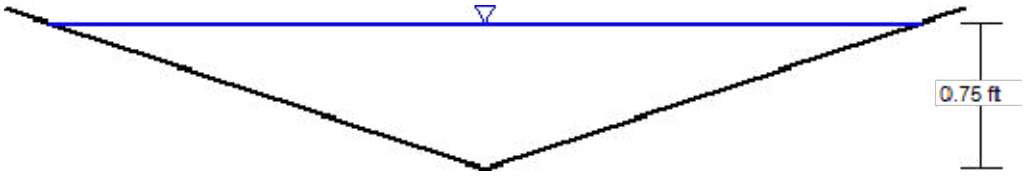
Project Description

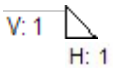
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	1.00	%
Normal Depth	0.75	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Cross Section Image





Worksheet for FM2 (Min S=0.88%)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.88	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Results

Normal Depth	0.77	ft
Flow Area	1.76	ft²
Wetted Perimeter	4.85	ft
Hydraulic Radius	0.36	ft
Top Width	4.60	ft
Critical Depth	0.70	ft
Critical Slope	0.01384	ft/ft
Velocity	2.84	ft/s
Velocity Head	0.13	ft
Specific Energy	0.89	ft
Froude Number	0.81	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.77	ft
Critical Depth	0.70	ft
Channel Slope	0.88	%
Critical Slope	0.01384	ft/ft

Cross Section for FM2 (Min S=0.88%)

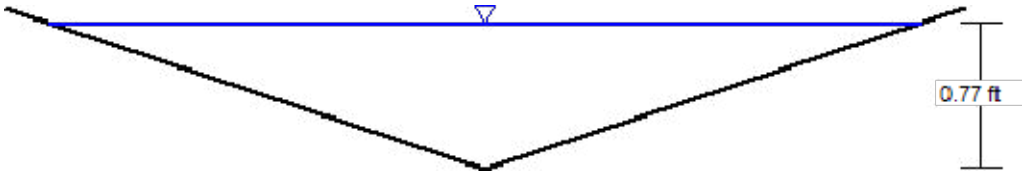
Project Description

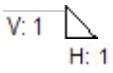
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.88	%
Normal Depth	0.77	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Cross Section Image





Worksheet for C.6 - MAX- Street Flow Analysis

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.07460	ft/ft
Discharge	5.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+10.00	0.50
0+10.50	0.50
0+10.50	0.00
0+12.00	0.13
0+12.00	0.17
0+28.50	0.50
0+45.00	0.17
0+45.00	0.13
0+46.50	0.00
0+46.50	0.50
0+47.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+10.00, 0.50)	(0+12.00, 0.13)	0.013
(0+12.00, 0.13)	(0+45.00, 0.13)	0.016
(0+45.00, 0.13)	(0+47.00, 0.50)	0.013

Options

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

Worksheet for C.6 - MAX- Street Flow Analysis

Results

Normal Depth		0.26	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		1.01	ft²
Wetted Perimeter		12.81	ft
Hydraulic Radius		0.08	ft
Top Width		12.19	ft
Normal Depth		0.26	ft
Critical Depth		0.35	ft
Critical Slope		0.00714	ft/ft
Velocity		4.94	ft/s
Velocity Head		0.38	ft
Specific Energy		0.64	ft
Froude Number		3.02	
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	0.26	ft
Critical Depth	0.35	ft
Channel Slope	0.07460	ft/ft
Critical Slope	0.00714	ft/ft

Cross Section for C.6 - MAX- Street Flow Analysis

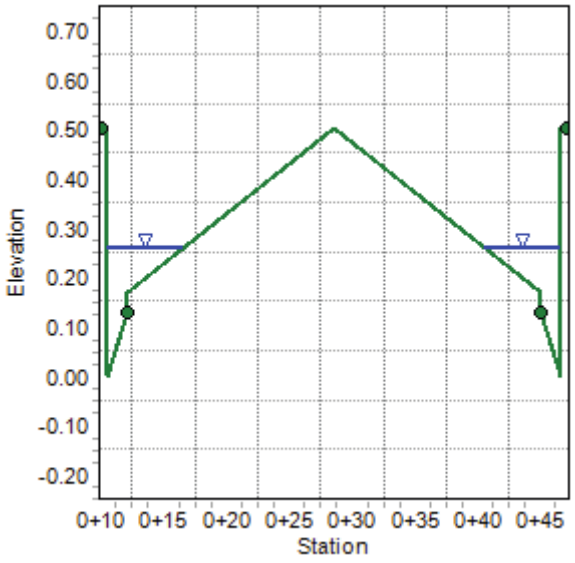
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.07460	ft/ft
Normal Depth	0.26	ft
Discharge	5.00	ft³/s

Cross Section Image



Worksheet for C.6 - MIN - Street Flow Analysis

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03340	ft/ft
Discharge	5.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+10.00	0.50
0+10.50	0.50
0+10.50	0.00
0+12.00	0.13
0+12.00	0.17
0+28.50	0.50
0+45.00	0.17
0+45.00	0.13
0+46.50	0.00
0+46.50	0.50
0+47.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+10.00, 0.50)	(0+12.00, 0.13)	0.013
(0+12.00, 0.13)	(0+45.00, 0.13)	0.016
(0+45.00, 0.13)	(0+47.00, 0.50)	0.013

Options

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

Worksheet for C.6 - MIN - Street Flow Analysis

Results

Normal Depth		0.29	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		1.41	ft²
Wetted Perimeter		15.76	ft
Hydraulic Radius		0.09	ft
Top Width		15.08	ft
Normal Depth		0.29	ft
Critical Depth		0.35	ft
Critical Slope		0.00726	ft/ft
Velocity		3.55	ft/s
Velocity Head		0.20	ft
Specific Energy		0.49	ft
Froude Number		2.05	
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	0.35	ft
Channel Slope	0.03340	ft/ft
Critical Slope	0.00726	ft/ft

Cross Section for C.6 - MIN - Street Flow Analysis

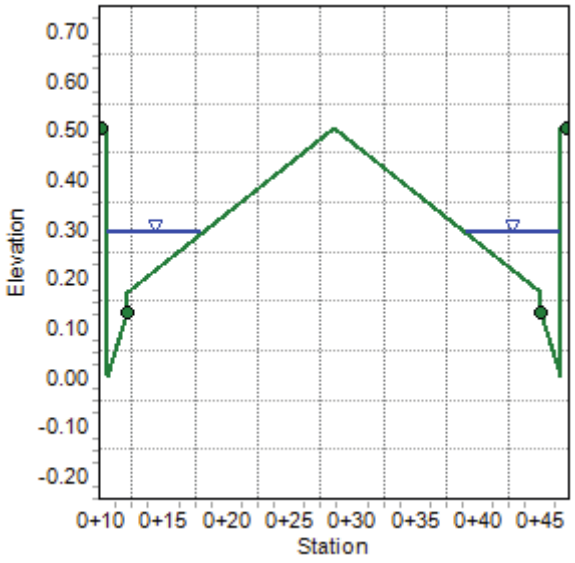
Project Description

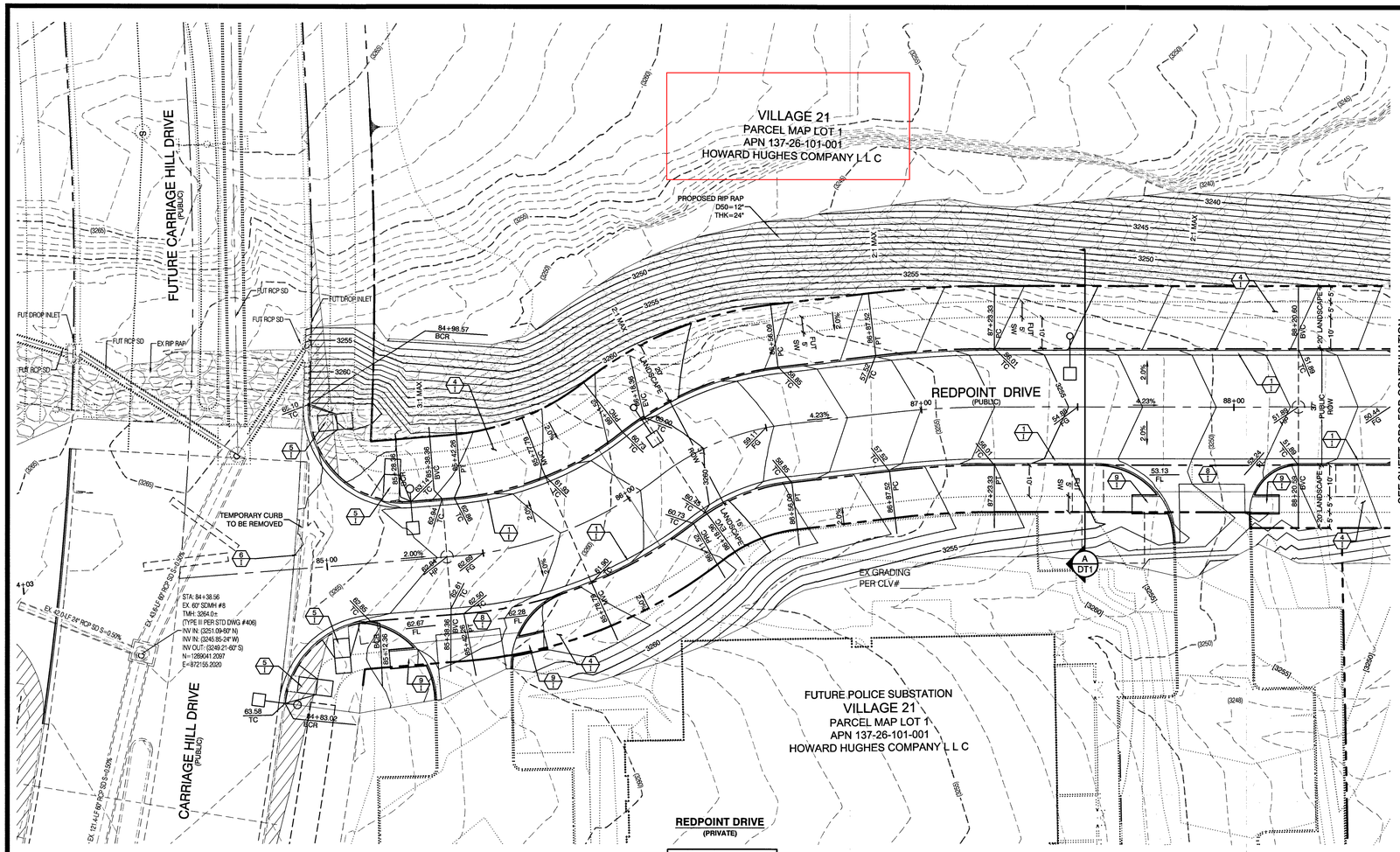
Friction Method	Manning Formula
Solve For	Normal Depth

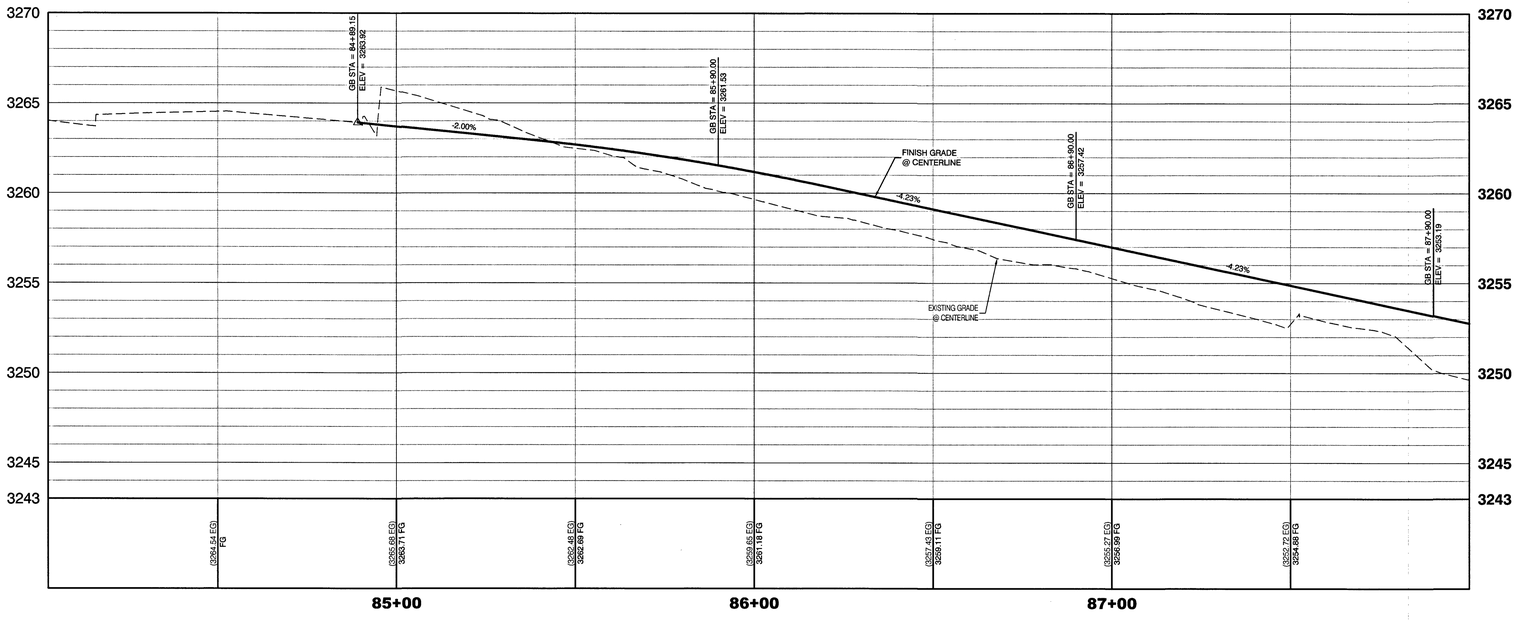
Input Data

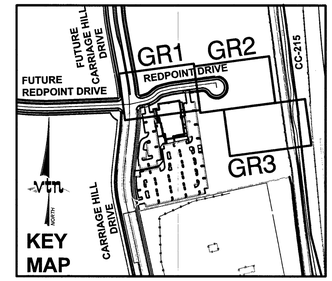
Channel Slope	0.03340	ft/ft
Normal Depth	0.29	ft
Discharge	5.00	ft³/s

Cross Section Image









GRAPHIC SCALE

-20 0 10 20 40

1" = 20 '

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. PROVIDE 2' WIDE OPENING IN PROPOSED "L"-TYPE CURB
3. EXISTING STREET LIGHT PROTECT IN PLACE
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7. FIELD VERIFY AND MATCH EXISTING
8. CONSTRUCT COMMERCIAL DRIVEWAY PER STD. DWG. #224
9. CONSTRUCT HANDICAP RAMP PER DETAIL ON SHEET DT3

GRADING PERMIT NOTE

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SIGHT VISIBILITY ZONES:

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018
CLV #L18-01664

ENGINEER DISCLAIMER NOTE:

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

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DS5007B

WILLIAM J MEYER, P.E. No. 15745 DATE 11/8/18

107V7424

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

CALL BEFORE YOU DO OVERHEAD

1-702-227-2929

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT CONDUIT AND CABLES (TS-102021)

Call before you Underground

1-702-455-1511
CLARK COUNTY TRAFFIC OPERATIONS

1-702-229-6811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 1

SUMMERLIN WEST VILLAGE 21
REDPOINT DRIVE
CARRIAGE HILL DRIVE TO PARCEL H

DRAWN BY: BCC
DESIGNED BY: BCC
CHECKED BY: WJM
PROJECT NO: 7951

04/23/2018
04/23/2018
11/07/2018

SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER — STATE OF NEVADA — No. 15745 — WILLIAM J MEYER — EXP: 12/31/19 — CIVIL

SHEET
GR1
6 OF 20 SHEETS

DRAWING NO.
L18-01664

H:\7951\Street A Police Substation Access\Sheet Set\7951 GR.dwg

VILLAGE 21
PARCEL MAP LOT 1
APN 137-26-101-001
HOWARD HUGHES COMPANY L L C

SEE SHEET GR1 FOR CONTINUATION

REDPOINT DRIVE
(PUBLIC)

FUTURE DEVELOPMENT
VILLAGE 21
PARCEL MAP LOT 1
APN 137-26-101-001
HOWARD HUGHES COMPANY L L C

SEE SHEET GR3 FOR CONTINUATION

PROPERTY LINE

30' PUBLIC DRAINAGE & SEWER EASEMENT TO BE PRIVATELY MAINTAINED

37' PUBLIC SEWER EASEMENT SURFACE TO BE PRIVATELY MAINTAINED

PROPOSED DRAINAGE ESMT (WIDTH VARIES 39.0' - 93') TO BE PRIVATELY MAINTAINED

31.21' EX. CHANNEL

4" STABALIZATION ROCK (THK=8")

16' PAVED ACCESS ROAD

EX GRADING PER CLV#

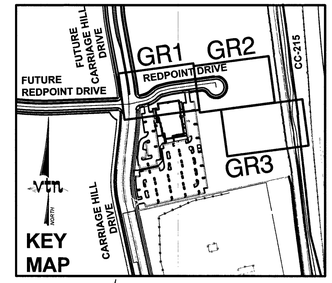
20' LANDSCAPE

PROPOSED RIP RAP D50=12" THK=24"

PROPOSED RIP RAP D50=8" THK=16"

PROPOSED RIP RAP D50 = 12" THK = 24"

PROPOSED RIP RAP D50=8" THK=16"



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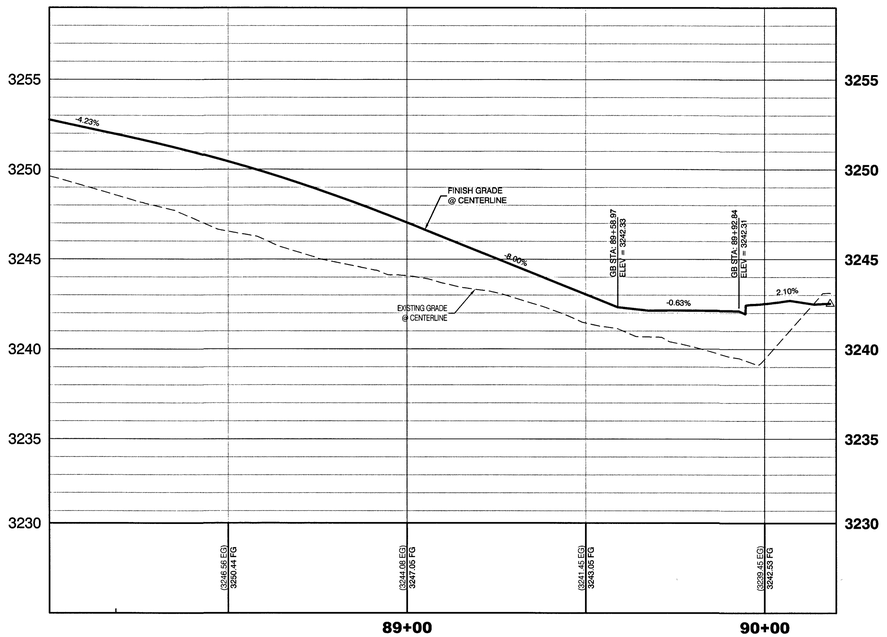

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FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

SIDEWALK RAMPS TABLE

(PER CCAUSD No. 235, CASE II)

NO.	DIM "A"	DIM "B"	CASE
1	4.5'	12'	II
2	4.5'	9.5'	II
3	8'	8'	II
4	9.5'	4.5'	II
5	15'	4.5'	II

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CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018
CLV #L18-01664

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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, #DS5007B

William J Meyer 10/2/18
WILLIAM J MEYER, P.E. No. 17745 DATE

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 17745

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE, SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 891146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 2

SUMMERLIN WEST VILLAGE 21
REDPOINT DRIVE
CARRIAGE HILL DRIVE TO PARCEL H

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
BCC	BCC	WJM	7951

04/23/2018	04/23/2018	11/07/2018	SCALE:	HORIZ.	VERT.
				1"=20'	1"=4'

SHEET
GR2
7 OF 20 SHEETS
DRAWING NO.
L18-01664

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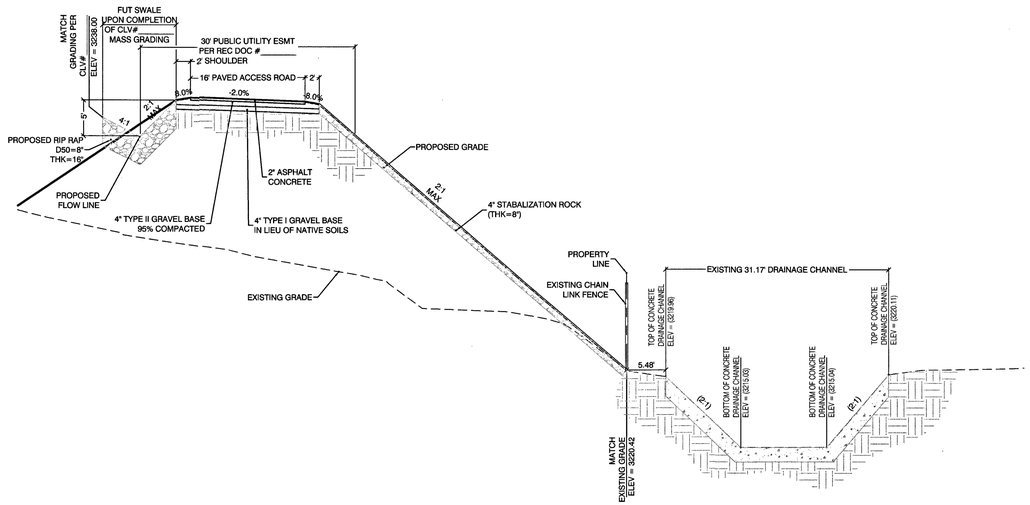
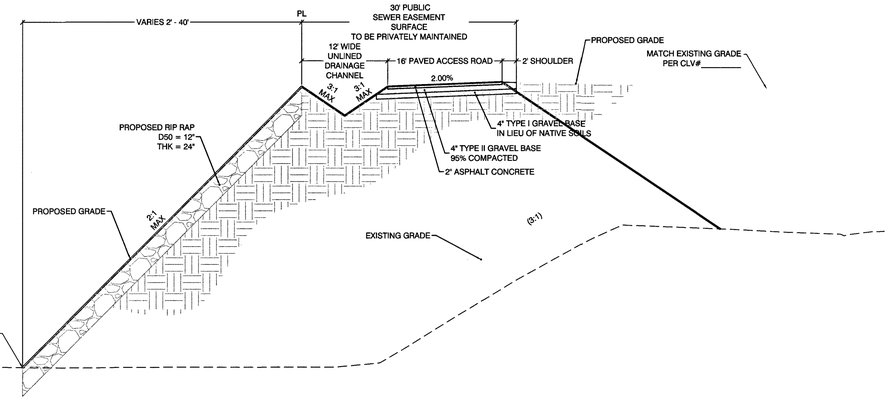
107V7424



C
BELTWAY PAVED ACCESS ROAD
NTS



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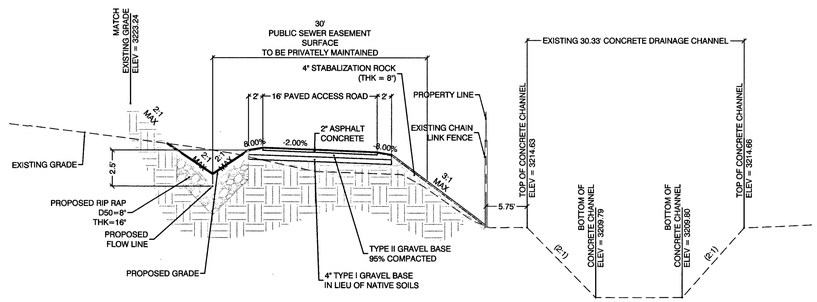
NORTH EAST DRAINAGE CHANNEL
NTS



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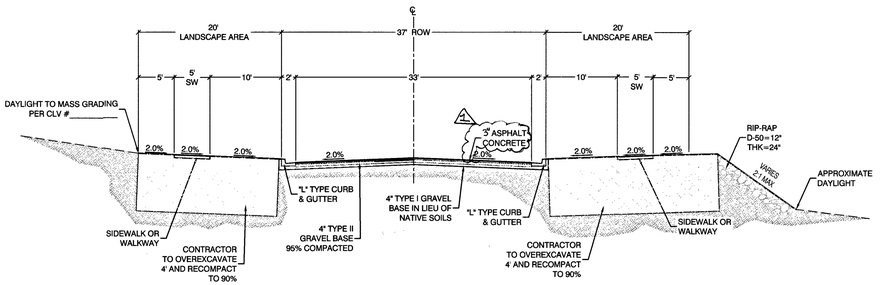
BELTWAY PAVED ACCESS ROAD
NTS



A
STREET A
NTS

107V7424

REV	DATE	BY	REVISION
1	09/29/2021	KTL	UPDATED SEWER STUB AND IMPROVED PAVEMENT THICKNESS TO 3"
			UPDATED 48" SSWR #2 10 60' 3/8/2019

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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DETAILS 1

SUMMERLIN WEST VILLAGE 21
REDPOINT DRIVE
CARRIAGE HILL DRIVE TO PARCEL H

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
BCC	CEH	WJM	7951
06/20/2018	04/23/2018	11/07/2018	

SCALE: HORIZ: —
VERT: N/A

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
STATE OF NEVADA
No. 17745
PROFESSIONAL ENGINEER
11/8/18

SHEET
DT1
9 OF **20** SHEETS

DRAWING NO.
L18-01664

H:\7951\Sheet A Police Substation Access\Sheet Set\7951 DT.dwg

Technical Drainage Study for

Summerlin West Village 21
Parcel U Stockpile

Las Vegas, Nevada

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: August 13, 2019
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Village 21 Parcel U – Stockpile Permit**			**COPIES TO:** VTN Nevada
Cross Streets:	Summerlin Parkway & Carriage Hill Drive			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5172A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-410-001			
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	8/5/2019	8/13/2019	See Comments Below	$400.00	3518614: $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:
	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
X	is conditionally approved subject to the following conditions:

1. The Dust Mitigation Plan/Permit must be obtained from the Clark County prior to the final approval of the grading/improvement plan.

2. Provide a note on the plan that states: "Stockpile to comply with the approved Dust Mitigation Plan #_____".

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

END OF REMARKS

ays

T/R/S: T20S/R59E/23

AREA K-23

representative assumption to where enough flow can be generated within the basin to warrant the use of the higher velocity coefficients. In summary,

Existing (Non-Urban) Conditions	Developed (Urban) Conditions
$V_1 = 14.8*(S/100)^{1/2}$ $V_2 = 29.4*(S/100)^{1/2}$	$V_1 = 20.2*(S/100)^{1/2}$ $V_2 = 30.6*(S/100)^{1/2}$

D. PEAK FLOWS

TABLE 1
PROPOSED CONDITION
HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
OFF1	0.58	2
OFF2	0.66	2
OFF3	0.72	2
ON1	9.47	40

III. ONSITE & OFFSITE BASIN ANALYSIS

A. EXISTING CONDITION

Presently, the offsite areas immediately the surrounding the site are undeveloped. The existing ground of the site and upstream areas fall easterly at toward the I-215 Western Beltway Channel. A majority of the flow generated to the west of the project is intercepted by the Carriage Hill Drive Improvements. The drainage impacts of the development of Parcel U has been addressed in the Master Study. The Master Study has determined that the development of Parcel U will not adversely impact existing downstream facilities. Therefore, a site-specific existing condition hydrologic analysis is not necessary for this study.

B. INTERIM CONDITION

(Refer to *Figure 6: Interim Condition Basin Map* in Appendix A.*)*

The offsite areas are consistent with those described in existing condition. No major washes impact the stockpile. Proposed condition is depicted on Figure 6.

Flow generated by the offsite basins OFF1, OFF2, AND OFF3 are diverted around the stockpile and will subsequently flow into the Beltway Channel as they do in existing condition. Flow generated on the top of the stockpile will be conveyed easterly as sheet flow. Therefore, the stockpile will not obstruct flows and flow patterns will be returned to their historic conditions.

C. ULTIMATE CONDITION

The proposed stockpile is temporary and will be removed with the development of Parcel U. An overall ultimate condition analysis assuming Parcel U and the Summerlin West Planning Area is fully developed was provided with the Master

Study. Therefore, a site-specific ultimate condition hydrologic analysis is not necessary for this study.

IV. HYDRAULIC ANALYSIS

Hydraulic cross sections have been taken along the perimeter of the stockpile to determine normal depth and velocity of the anticipated storm flows as they are conveyed around the stockpile. The results of the normal depth analysis are summarized in Table 5. Normal depth calculations have been included in Appendix C.

TABLE 2
PROPOSED CONDITION CHANNEL SUMMARY TABLE

Channel	Q100 (cfs)	Slope	Normal Depth (ft)	Velocity (ft/s)	Description
1	2	2.79%	0.10	1.32	OFF1
2	2	4.58%	0.17	2.41	OFF2
3	2	5.23%	0.21	3.00	OFF3

The normal depth analysis shows that the velocities of the flow along the slope of the stockpile are non-erosive. In addition, flow depths are contained below the top of the stockpile with additional freeboard.

V. CONCLUSIONS

This *Technical Drainage Study for Summerlin West Village 21 Parcel U Stockpile* has been developed in accordance with Criteria established in the Manual. The proposed development does not adversely impact any proposed or existing Clark County Regional Flood Control District Master Plan Update facilities.

The site has been designed to control storm water runoff for the 6-hour, 100-year floods as calculated in this study and the Master Study. There are no adverse effects on upstream or downstream properties due to the proposed drainage system or infrastructure improvements.

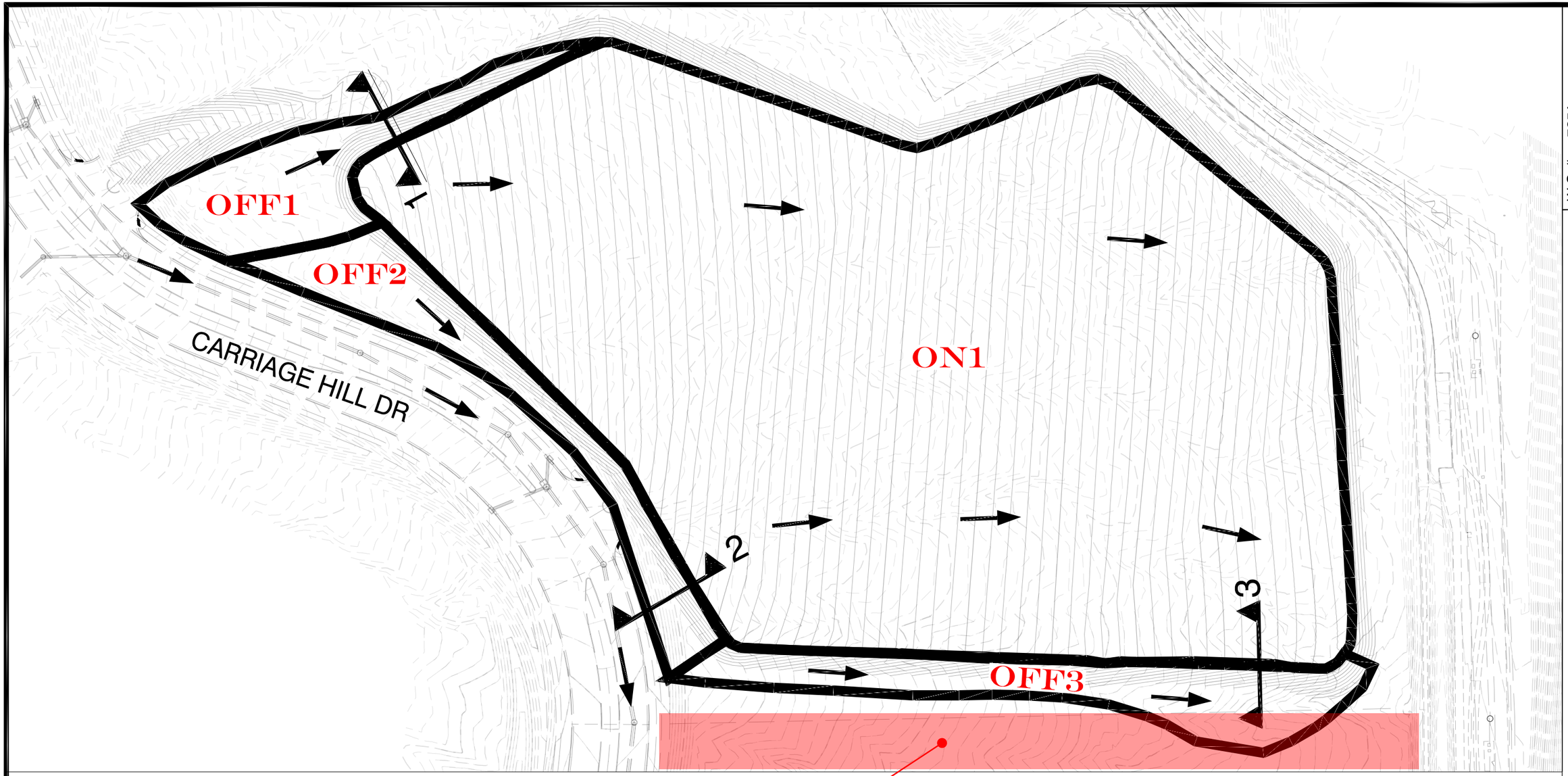

FIGURE 6 - PROPOSED CONDITION BASIN MAP
SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

W.O.#:	7851
DATE:	06/2019
BY:	ACY
SCALE:	1"=100'
SHEET	1 OF 1

PROPOSED CONDITION HEC-1 SUMMARY TABLE

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PROPOSED CONDITION CHANNEL SUMMARY TABLE

Channel	Q100 (cfs)	Slope	Normal Depth (ft)	Velocity (ft/s)	Description
1	2	6.70%	0.15	2.54	OFF1
2	2	5.30%	0.16	2.55	OFF2
3	2	6.20%	0.20	3.20	OFF3

GRAPHIC SCALE

100 0 50 100 200

1" = 100'

NORTH

LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- CROSS SECTION

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Parcel U Stock Pile\Drainage\A Figures & Exhibits\Figure 6 - Proposed Condition Basin Map.dwg,elidaby, Jun 18, 2019 - 10:23am

STANDARD FORM 4

DEVELOPMENT: Street U Stockpile

CONDITION: Proposed

W.O. # 7851 **CALCULATED BY:** ENB

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Non-Urban:		Urban	
$V1 = 1.48 * S^{1/2}$	$V2 = 2.94 * S^{1/2}$	$V1 = 2.02 * S^{1/2}$	$V2 = 3.06 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39 \qquad T_c = T_i + T_t$$

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.	
PROPOSED CONDITION																	
ON1	94.1	0.852	9.47	0.0148	100	5.7	2.50	870	6.3	5.1	7.7	2.44	970	15.39	4.94	0.049	Min TLAG=0.05
OFF1	86.7	0.754	0.58	0.0009	30	2.9	2.39	260	5.8	3.6	7.1	1.22	290	11.61	3.61	0.036	Min TLAG=0.10
OFF2	87.6	0.767	0.66	0.0010	25	4.6	1.80	480	4.6	3.2	6.3	2.52	505	12.81	4.33	0.043	Min TLAG=0.10
OFF3	86.7	0.754	0.72	0.0011	30	4.0	2.15	580	6.0	3.6	7.2	2.48	610	13.39	4.63	0.046	Min TLAG=0.10

```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                *                    *         609 SECOND STREET            *
 *                                      *                    *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   10JUN19  TIME  15:41:03  *                    *          (916) 756-1104              *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

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

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

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


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

                        *DIAGRAM
 *** FREE ***
             1          ID    PROPOSED CONDITION HYDROLOGIC MODEL
             2          ID    INPUT FILE DATE = MAY 3, 2019
             3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
             4          ID    STORM DISTRIBUTION = SDN #3
             5          ID    MODELED BY VTN (ACY)
             6          ID
             7          ID    ******************************************************
             8          ID    * SUMMERLIN WEST VILLAGE 21                          *
             9          ID    * PARCEL U STOCKPILE                                 *
            10          ID    ******************************************************
            11          ID
            12          ID  100-YEAR,  6-HOUR STORM,  SDN3
            13          ID
            14          IT       5       0       0     300
            15          IO       5       0       0
            16          IN       5       0       0
            17          JR    PREC    1.00
                        *

            18          KK    OFF1
            19          BA  0.0009
            20          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
            21          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            22          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            23          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            24          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            25          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            26          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            27          PC   0.998   0.999       1
            28          PB    3.36
            29          LS       0    86.7
            30          UD   0.100
                        *

            31          KK    OFF2
            32          BA  0.0010
            33          LS       0    87.6
            34          UD   0.100
                        *

            35          KK    OFF3
            36          BA  0.0011
            37          LS       0    86.7
            38          UD   0.100
                        *

            39          KK     ON1
            40          BA  0.0148
            41          LS       0    94.1
```

```
            42           UD   0.050
                         *
            43           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    18        OFF1
                 .
                 .
    31           .        OFF2
                 .           .
                 .           .
    35           .           .        OFF3
                 .           .           .
                 .           .           .
    39           .           .           .         ON1

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1**************************************                                  **************************************
 *                                    *                                  *                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                               *    U.S. ARMY CORPS OF ENGINEERS     *
 *               JUN   1998           *                                  *    HYDROLOGIC ENGINEERING CENTER    *
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 *                                    *                                  *                                    *
 **************************************                                  **************************************



                          PROPOSED CONDITION HYDROLOGIC MODEL
                          INPUT FILE DATE = MAY 3, 2019
                          DESIGN STORM = 100-YEAR 6-HR STORM
                          STORM DISTRIBUTION = SDN #3
                          MODELED BY VTN (ACY)

                          ********************************************************
                          * SUMMERLIN WEST VILLAGE 21                            *
                          * PARCEL U STOCKPILE                                   *
                          ********************************************************

                         100-YEAR,  6-HOUR STORM,  SDN3


   15 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
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
```

U-PRO

RATIOS APPLIED TO PRECIPITATION

OPERATION	STATION	AREA	PLAN		RATIO 1
					1.00
HYDROGRAPH AT					
+	OFF1	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	OFF2	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	OFF3	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	ON1	.01	1	FLOW	40.
				TIME	3.50

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

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

APN: 137-23-410-001
CITY OF LAS VEGAS
STATE OF NEVADA

DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY

10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

SHEET INDEX

SHEET #	SHEET	DESCRIPTION
CV	1	COVER SHEET
NT	2	GENERAL NOTES
GR1	3	GRADING PLAN
DT1	4	DETAILS

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°1'50"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

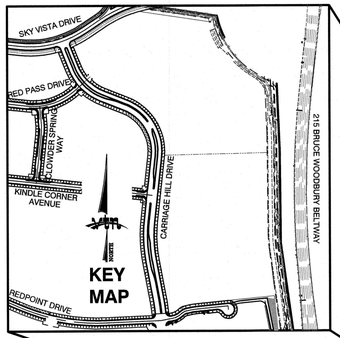
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

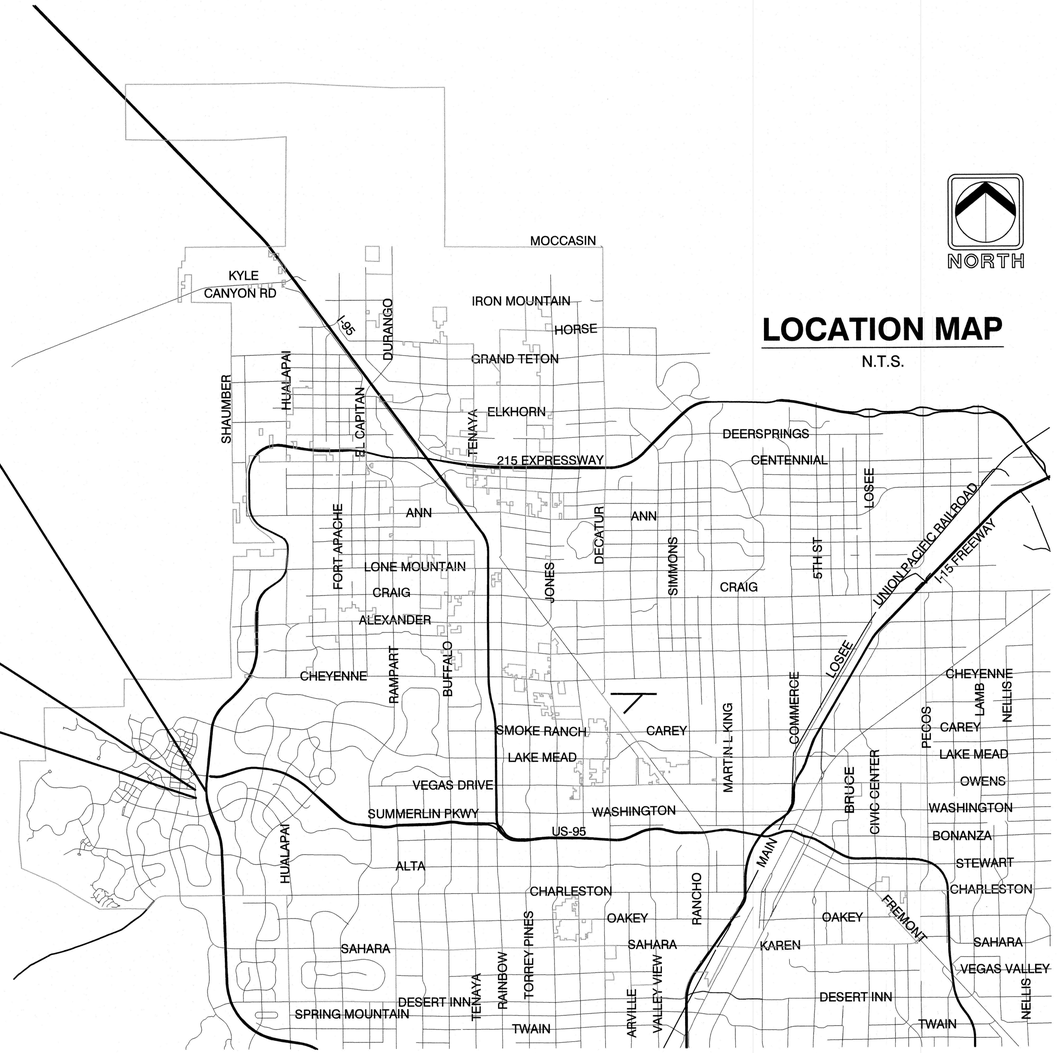
BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03





NORTH

LOCATION MAP

N.T.S.

PROJECT DESCRIPTION

THIS PROJECT PROPOSES AN APPROXIMATELY 125,343 CY STOCKPILE ON SUMMERLIN VILLAGE 21 PARCEL U TO BE USED IN THE CONSTRUCTION OF THE FOLLOWING PROJECTS:

- VILLAGE 21 DESERT FOOTHILLS DRIVE (REDPOINT TO SKY VISTA)
- VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT TO SKY VISTA)
- VILLAGE 21 KINDLE CORNER AVENUE (DESERT FOOTHILLS TO CARRIAGE HILL)
- VILLAGE 21 RED PASS DRIVE (CARRIAGE HILL TO DESERT FOOTHILLS)
- VILLAGE 21 CLOWDER SPRING WAY (KINDLE CORNER TO RED PASS)
- VILLAGE 21 SUMMERLIN PARKWAY EXTENSION

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER. 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 STATUES, 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

CITY ENGINEER ALLEN PAVELKA, P.E. # 9029

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

PLANNING DEPARTMENT, CITY OF LAS VEGAS DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

OWNER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

DEVELOPER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

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

REVISION | BY | DATE | REV

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

DRAWN BY: JDH 05/28/2019
DESIGNED BY: JDH 05/28/2019
CHECKED BY: WJM 05/28/2019
PROJECT NO: 7851
SCALE: N/A HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
8/5/19

SHEET
CV
1 OF 4 SHEETS

DRAWING NO.

H:\7851\Parcel U Stock Pile\Sheet Set\7851-CV.dwg,8/1/2019 4:58 PM,rynarc

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 DISTRICT'S - 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 THE REQUIRED FIRE FLOW. [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 FLUSH 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 § 106.3]
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC § 507.2.1, NFPA 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 30,000 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 2 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. [IFC § 503.1.1]
25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 200 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT. CLV REGULATION AND MOU
26 ALL DEAD-END FIRE APPARATUS ROADS AND/OR FIRE LANES, 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. CLV REGULATION
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
29. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS, OR HAVING FOUR OR MORE TRAVEL LANES AND A TRAFFIC COUNT OF MORE THAN 30,000 VEHICLES PER DAY, ALL HYDRANTS BEING UTILIZED TO DELIVER FIRE FLOW TO THE PROPOSED LOCATION SHALL BE LOCATED ON THE SAME SIDE OF THE STREET AS THE PROPOSED DEVELOPMENT. CLV REGULATION

EFFECTIVE DATE: FEBRUARY 4th, 2019

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLICWORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; 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 INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THERE WITH.
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 (½") 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. 12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: NOVA GEOTECHNICAL, PROJECT NO. G-18-003, DATED MARCH 5, 2018, APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLAN.
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. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

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

REVISED 06/04/2018

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'+	+0.0'to-0.1'	SEE SOILS REPORT
B.ENGINEERED FILL	0.5'+	+0.1'to-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

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

LEGEND

DESCRIPTION	PROPOSED	EXISTING	FUTURE
CONTOUR (5' INTERVAL)	2450	(2450)	(2450)
CONTOUR (1' INTERVAL)			
EDGE OF PAVEMENT			
SAW CUT			
RETAINING WALL			
SCREEN WALL			
RIGHT OF WAY			
CENTER LINE			
BACK OF CURB			
LIP OF GUTTER			
FACE OF CURB			
SIDEWALK			
UNIT BOUNDARY LINE			
UNIT BOUNDARY / ROW			
PROPERTY LINE			
SLOPE AND FLOW DIRECTION	1.00%	(1.00%)	(1.00%)
SCARP AREA			
MATCHLINE			
SIDEWALK RAMP			
SIGHT VISIBILITY ZONES			
PAVED ROAD			
PAVEMENT REMOVAL			
STREET LIGHT			
WATER UNDER 18"			
WATER 18" & OVER			
SANITARY SEWER UNDER 18"			
SANITARY SEWER 18" & OVER			
STORM SEWER			
FIRE HYDRANT			
SANITARY SEWER MAN HOLE	S	S	S
CLEAN OUT			
STORM DRAIN MAN HOLE	D	D	D

ABBREVIATIONS

FF	FINISH FLOOR	PT	POINT OF TANGENCY	O/C	OFFSET CROWN
FG	FINISH GRADE	PRC	POINT OF REVERSE CURVATURE	BC	BACK OF CURB
FL	FLOW LINE	PCC	POINT OF COMPOUND CURVATURE	BCR	BEGIN CURB RETURN
TC	TOP OF CURB	BVC	BEGIN VERTICAL CURVE	BCL	BACK OF CURB LENGTH
TRC	TOP OF ROLL CURB	MVC	MID-POINT OF VERTICAL CURVE	TF	TOP OF FOOTING
EOP	EDGE OF ASPHALT PAVEMENT	EVC	END VERTICAL CURVE	GB	GRADE BREAK
FUT.	FUTURE	PRVC	POINT OF REVERSE VERTICAL CURVE	PC	POINT OF CURVATURE
EX.	EXISTING	R/W	RIGHT-OF-WAY	TPW	TOP OF PLANTER WALL
VG	VALLEY GUTTER	DI	DROP INLET	TRW	TOP OF RETAINMENT WALL
NG	NATURAL GROUND	BFE	BASE FLOOD ELEVATION	TOP	TOP OF CHANNEL/SCARP
H.P.	HIGH POINT	CCUSD	CLARK COUNTY UNIFORM STANDARD DRAWINGS	TOE	TOE OF CHANNEL/SCARP
L.P.	LOW POINT	SW	SIDEWALK	TOB	TOP OF BOX
SSMH	SEWER MANHOLE	TSW	TOP OF SIDEWALK	PP	POWER POLE
WTR	WATER LINE	INT.	INTERSECTION	TRANS.	TRANSITION
SD	STORM DRAIN	D.G.	DESIGN GRADE	RET.	RETAINMENT
RCP	REINFORCED CONCRETE PIPE	C/L	CENTER LINE		

DEVIATION FROM CITY OF LAS VEGAS STANDARDS

- NONE

ESTIMATE OF QUANTITIES

ESTIMATED GRADING/SD/ROAD IMP. QUANTITIES	PUBLIC
TYPE II GRAVEL BASE	76 CY
EARTHWORKS CUT	2 CY
EARTHWORKS FILL	125,345 CY
EARTHWORKS TOTAL (FILL)	125,343 CY

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 NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5146
PH: (702) 873-7500 FAX: (702) 362-2597 WEB: WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GENERAL NOTES

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
JDH	JDH	W.M	7851	HORIZ. N/A VERT. N/A
05/29/2019	05/29/2019	05/29/2019		

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
PROFESSIONAL ENGINEER STATE OF NEVADA
No. 15745
6/5/19

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2 OF 4 SHEETS

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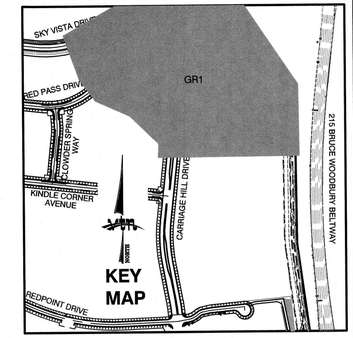
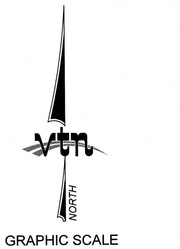
EARTHWORK QUANTITIES		
CUT	FILL	NET
2 CUBIC YARDS	125,345 CUBIC YARDS	125,343 CUBIC YARDS (FILL)





STOCKPILE NOTE:

STOCKPILES WITH HEIGHT OVER 4 FT MUST BE PROVIDED WITH A TEMPORARY FENCING.

STOCKPILE MATERIALS SHALL CONSIST OF CLEAN EARTH FILL UNLESS OTHERWISE APPROVED BY THE CITY OF LAS VEGAS.

STOCKPILE IS TO COMPLY WITH APPROVED CLARK COUNTY DUST MITIGATION PLAN #_____

FLOOD ZONE NOTE

SITE IS LOCATED IN A SHADED ZONE X AS SHOWN IN FIRM MAP 32003C2221SE, DATED SEPTEMBER 27, 2002. A SHADED ZONE X IS DETERMINED TO BE OUTSIDE THE 2.0% ANNUAL CHANCE FLOODPLAIN, ENTIRE SITE BOUNDARY IS WITHIN ZONE X.

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: NOVA GEOTECHNICAL PROJECT #G-18-003, DATED MARCH 5, 2018

GRADING NOTE:

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS / DITCHES AND A TEMPORARY LOCAL MINOR SEDIMENT BASIN ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY HOWARD HUGHES COMPANY.

EASEMENT REFERENCE LEGEND

1. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19990310:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19961001:0000671.
2. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4. PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080527:0005041.
5. 10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

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.

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

CALL BEFORE YOU DIG OVERHEAD

1-702-227-2929

Call before you Dig

Avoid cutting underground utility lines. It's costly.

CALL 811 OR 1-800-227-2600 AND 1-702-455-6000 CLARK COUNTY TRAFFIC OPERATIONS

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS. IT'S COSTLY.

Call before you Underground

1-702-455-7511 CLARK COUNTY TRAFFIC OPERATIONS AND 1-702-229-6811 LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
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CITY OF LAS VEGAS

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

DRAWN BY: JDH
DESIGNED BY: JDH
CHECKED BY: WJM
PROJECT NO: 7951

05/29/2019
05/29/2019
05/29/2019

SCALE: 1" = 50' HORIZ. 1" = 10' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
8/5/19

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GR1
3 OF 4 SHEETS

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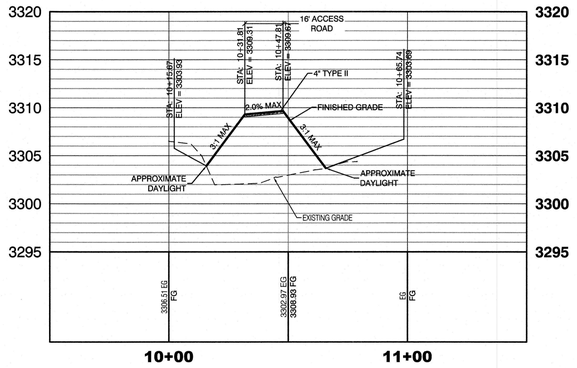

C
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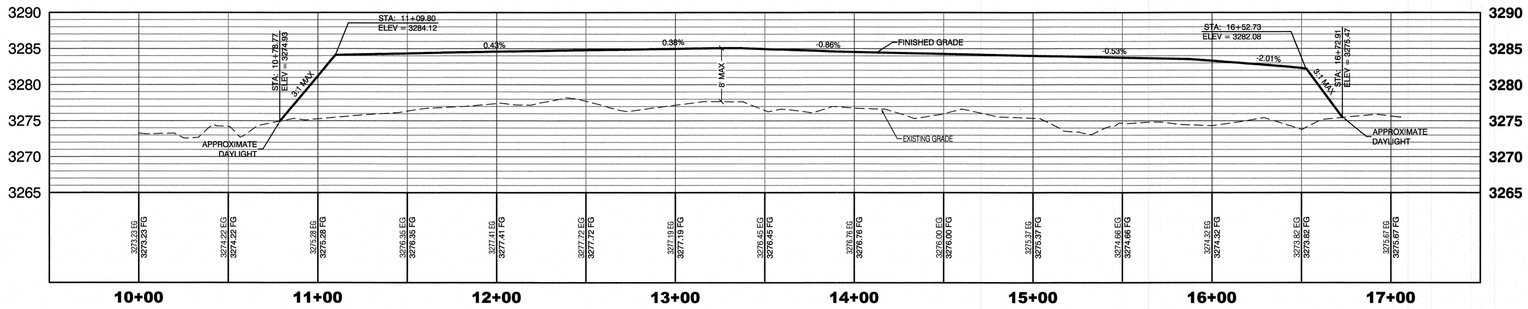
ACCESS ROAD TYPICAL SECTION

NTS



B
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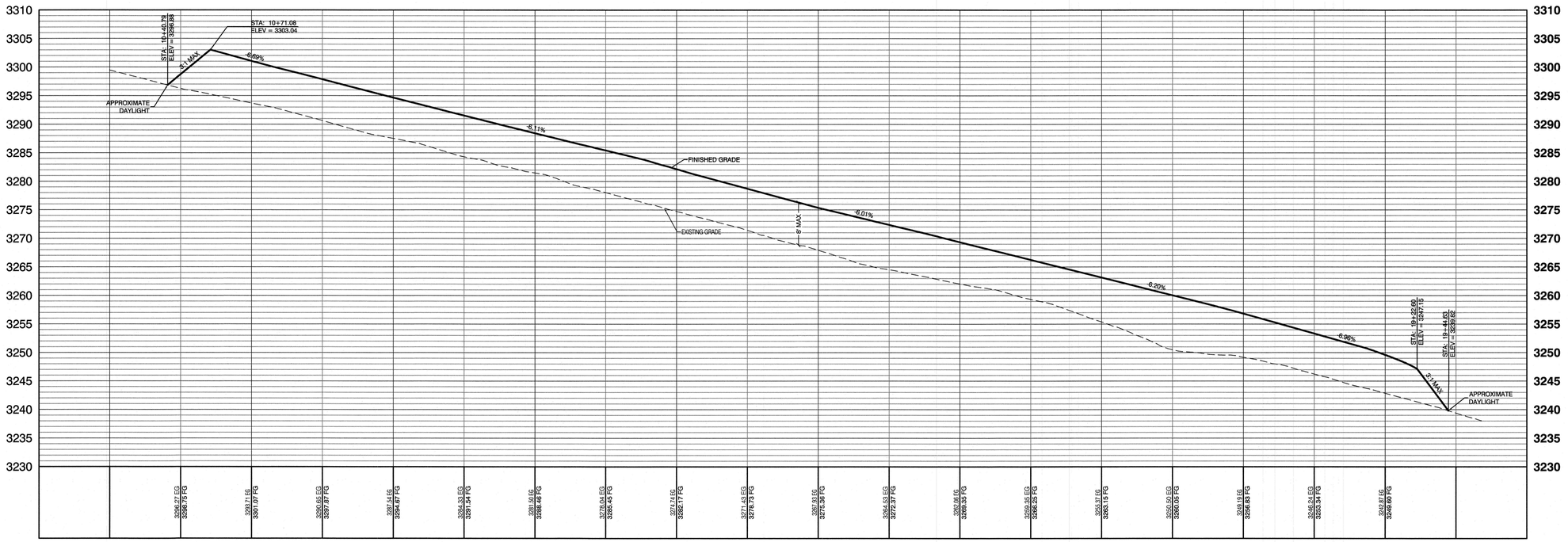
TYPICAL SECTION (LOOKING EAST)

NTS



A
-
TYPICAL SECTION (LOOKING NORTH)

NTS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

DETAILS

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

DRAWN BY: JDH — 05/29/2019
DESIGNED BY: JDH — 05/29/2019
CHECKED BY: WJM — 05/29/2019
PROJECT NO: 7951
SCALE: 1" = 50' HORIZ. 1" = 10' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/19
CIVIL
No. 15745
8/5/19

SHEET
DT1
4 OF 4 SHEETS

DRAWING NO.

H:\7951\Parcel U Stock Pile\Sheet Set\7951 - GR.dwg 8/5/2019 9:57 AM trevor

Technical Drainage Study for

Summerlin West Village 21
Parcel I Stockpile

Las Vegas, Nevada

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: June 21, 2019
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West V21 Parcel I – Stockpile Permit**			**COPIES TO:** VTN Nevada
Cross Streets:	NEC of Carriage Hill Drive & Redpoint Drive			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5137B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-26-101-001			
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	**X**	
Proposed Storm Drain	YES	NO	**X**	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	5/8/2019	5/28/2019	Not Approved	$400.00	3125925: $400
Supplement	6/13/2019	6/21/2019	See Comments Below	N/C	N/C
			TOTAL FEES (LDDRS):	**$400.00**	----

REMARKS:

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

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

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

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

END OF REMARKS

ays

T/R/S: T20S/R59E/26

AREA K-26

representative assumption to where enough flow can be generated within the basin to warrant the use of the higher velocity coefficients. In summary,

Existing (Non-Urban) Conditions	Developed (Urban) Conditions
$V_1 = 14.8*(S/100)^{1/2}$ $V_2 = 29.4*(S/100)^{1/2}$	$V_1 = 20.2*(S/100)^{1/2}$ $V_2 = 30.6*(S/100)^{1/2}$

D. PEAK FLOWS

TABLE 1
PROPOSED CONDITION
HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
OFF1	1.91	5
OFF2	1.09	3
OFF3	0.63	2
ON1	6.08	26

III. ONSITE & OFFSITE BASIN ANALYSIS

A. EXISTING CONDITION

Presently, the offsite areas immediately the surrounding the site are undeveloped. The existing ground of the site and upstream areas fall easterly at toward the I-215 Western Beltway Channel. A majority of the flow generated to the west of the project is intercepted by the Carriage Hill Drive Improvements. The drainage impacts of the development of Parcel I has been addressed in the Master Study. The Master Study has determined that the development of Parcel I will not adversely impact existing downstream facilities. Therefore, a site-specific existing condition hydrologic analysis is not necessary for this study.

B. INTERIM CONDITION

(Refer to *Figure 6: Interim Condition Basin Map* in Appendix A.*)*

The offsite areas are consistent with those described in existing condition. The proposed stockpile has been placed between two major washes so that no major washes impact the stockpile. Proposed condition is depicted on Figure 5.

Flow generated by the offsite basins OFF1, OFF2, AND OFF3 are diverted around the stockpile and will subsequently flow into the Beltway Channel as they do in existing condition. Flow generated on the top of the stockpile will be conveyed easterly as sheet flow. Therefore, the stockpile will not obstruct flows and flow patterns will be returned to their historic conditions.

C. ULTIMATE CONDITION

The proposed stockpile is temporary and will be removed with the development of Parcel I. An overall ultimate condition analysis assuming Parcel I and the Summerlin

West Planning Area is fully developed was provided with the Master Study. Therefore, a site-specific ultimate condition hydrologic analysis is not necessary for this study.

IV. HYDRAULIC ANALYSIS

Hydraulic cross sections have been taken along the perimeter of the stockpile to determine normal depth and velocity of the anticipated storm flows as they are conveyed around the stockpile. The results of the normal depth analysis are summarized in Table 5. Normal depth calculations have been included in Appendix C.

TABLE 2
PROPOSED CONDITION CHANNEL SUMMARY TABLE

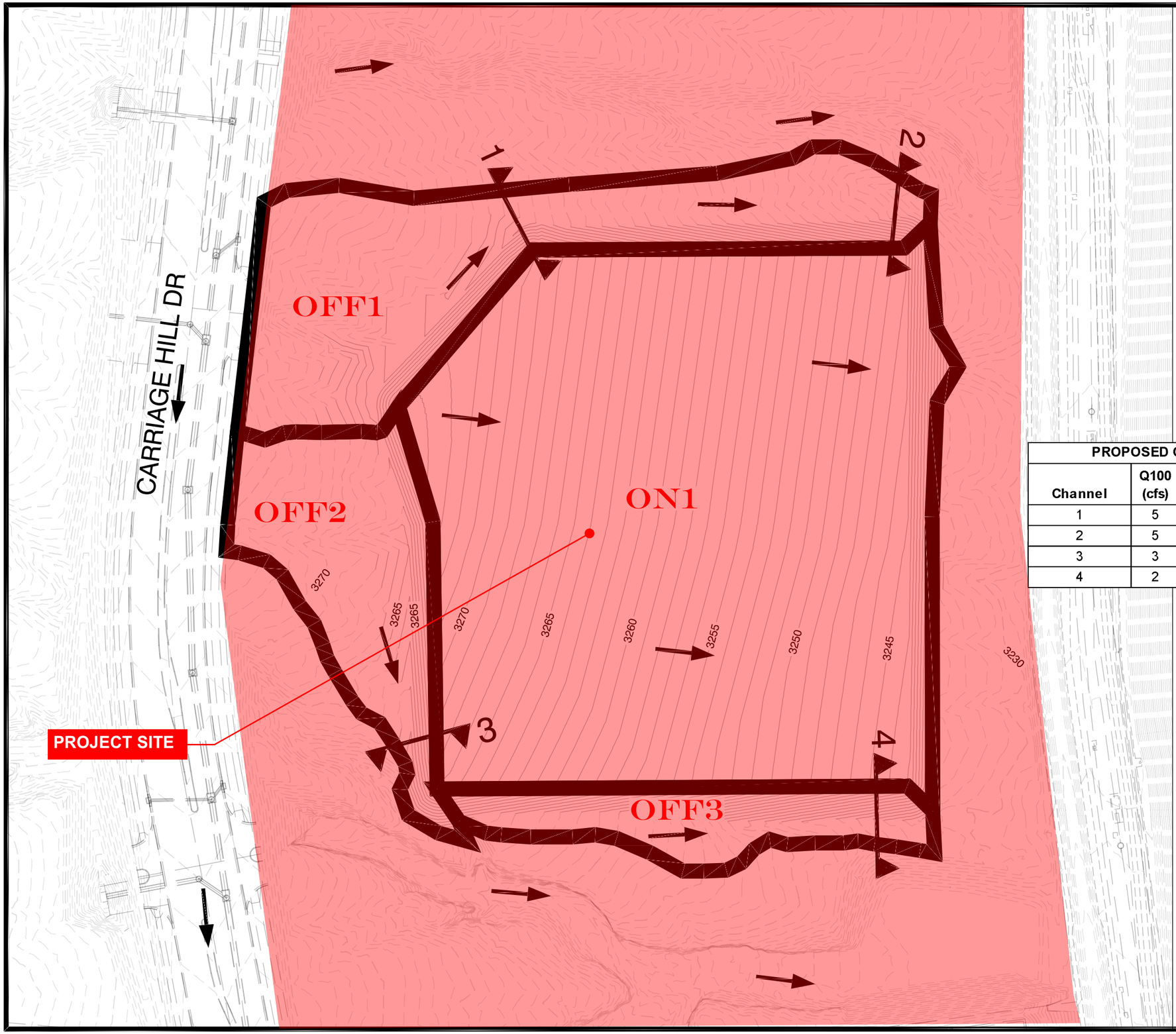
Channel	Q100 (cfs)	Slope	Normal Depth (ft)	Velocity (ft/s)	Description
1	5	1.60%	0.51	2.99	OFF1
2	5	6.71%	0.37	4.98	OFF1
3	3	2.22%	0.38	2.91	OFF2
4	2	6.24%	0.24	3.37	OFF3

The normal depth analysis shows that the velocities of the flow against the slope of the stockpile are non-erosive. In addition, flow depths are contained below the top of the stockpile with additional freeboard.

V. CONCLUSIONS

This *Technical Drainage Study for Summerlin West Village 21 Parcel I Stockpile* has been developed in accordance with Criteria established in the Manual. The proposed development does not adversely impact any proposed or existing Clark County Regional Flood Control District Master Plan Update facilities.

The site has been designed to control storm water runoff for the 6-hour, 100-year floods as calculated in this study and the Master Study. There are no adverse effects on upstream or downstream properties due to the proposed drainage system or infrastructure improvements.



PROPOSED CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	AREA (ac)	Q100 (CFS)
OFF1	1.91	5
OFF2	1.09	3
OFF3	0.63	2
ON1	6.08	26

PROPOSED CONDITION CHANNEL SUMMARY TABLE					
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4	2	6.24%	0.24	3.37	OFF3

NORTH

GRAPHIC SCALE

100 0 50 100 200

1" = 100'

LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- CROSS SECTION

FIGURE 6 - PROPOSED CONDITION BASIN MAP
SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

W.O.#:	7809
DATE:	05/2019
BY:	ACY
SCALE:	1"=100'
SHEET	1 OF 1

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Parcel I Stock Pile\Drainage\A Figures\Figure 6 - Proposed Condition Basin Map.dwg;ayup; May 03, 2019 - 11:38am

STANDARD FORM 4

DEVELOPMENT: Street I Stockpile

CONDITION: Proposed

W.O. # 7809 **CALCULATED BY:** ACY

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Non-Urban:		Urban	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132 C_n - 0.39 \qquad T_c = T_i + T_t$$

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.	
PROPOSED CONDITION																	
ON1	94.6	0.859	6.08	0.0095	100	5.7	2.43	440	7.6	5.6	8.4	1.31	540	13.00	3.74	0.037	Min TLAG=0.05
OFF1	86.7	0.754	1.91	0.0030	60	7.3	2.49	740	5.4	3.4	6.8	3.02	800	14.44	5.51	0.055	Min TLAG=0.10
OFF2	86.7	0.754	1.09	0.0017	80	3.8	3.57	450	4.3	3.1	6.1	2.46	530	12.94	6.03	0.060	Min TLAG=0.10
OFF3	86.7	0.754	0.63	0.0010	50	17.0	1.71	440	5.7	3.5	7.0	2.07	490	12.72	3.79	0.038	Min TLAG=0.10

```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                    *          609 SECOND STREET           *
 *                                      *                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   03MAY19  TIME  09:53:43  *                    *          (916) 756-1104              *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

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

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

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


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

                        *DIAGRAM
 *** FREE ***
             1          ID    PROPOSED CONDITION HYDROLOGIC MODEL
             2          ID    INPUT FILE DATE = MAY 3, 2019
             3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
             4          ID    STORM DISTRIBUTION = SDN #3
             5          ID    MODELED BY VTN (ACY)
             6          ID
             7          ID    ******************************************************
             8          ID    * SUMMERLIN WEST VILLAGE 21                          *
             9          ID    * PARCEL I STOCKPILE                                 *
            10          ID    ******************************************************
            11          ID
            12          ID  100-YEAR,  6-HOUR STORM,  SDN3
            13          ID
            14          IT       5       0       0     300
            15          IO       5       0       0
            16          IN       5       0       0
            17          JR    PREC    1.00
                        *

            18          KK    OFF1
            19          BA  0.0030
            20          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
            21          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            22          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            23          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            24          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            25          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            26          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            27          PC   0.998   0.999       1
            28          PB    3.35
            29          LS       0    86.7
            30          UD   0.100
                        *

            31          KK    OFF2
            32          BA  0.0017
            33          LS       0    86.7
            34          UD   0.100
                        *

            35          KK    OFF3
            36          BA  0.0010
            37          LS       0    86.7
            38          UD   0.100
                        *

            39          KK     ON1
            40          BA  0.0095
            41          LS       0    94.6
```

```
            42           UD   0.050
                         *
            43           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    18        OFF1
                 .
                 .
    31           .        OFF2
                 .          .
                 .          .
    35           .          .        OFF3
                 .          .          .
                 .          .          .
    39           .          .          .         ON1

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                    *    HYDROLOGIC ENGINEERING CENTER     *
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 *  RUN DATE   03MAY19  TIME  09:53:43  *                                    *          (916) 756-1104              *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************



                          PROPOSED CONDITION HYDROLOGIC MODEL
                          INPUT FILE DATE = MAY 3, 2019
                          DESIGN STORM = 100-YEAR 6-HR STORM
                          STORM DISTRIBUTION = SDN #3
                          MODELED BY VTN (ACY)

                          ******************************************************
                          * SUMMERLIN WEST VILLAGE 21                          *
                          * PARCEL I STOCKPILE                                 *
                          ******************************************************

                         100-YEAR,  6-HOUR STORM,  SDN3


   15 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
1

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

RATIOS APPLIED TO PRECIPITATION

OPERATION	STATION	AREA	PLAN		RATIO 1
					1.00
HYDROGRAPH AT					
+	OFF1	.00	1	FLOW	5.
				TIME	3.50
HYDROGRAPH AT					
+	OFF2	.00	1	FLOW	3.
				TIME	3.50
HYDROGRAPH AT					
+	OFF3	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	ON1	.01	1	FLOW	26.
				TIME	3.50

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

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

APN: 137-26-101-001
CITY OF LAS VEGAS
STATE OF NEVADA

DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY

10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

SHEET INDEX

SHEET #	SHEET	DESCRIPTION
CV	1	COVER SHEET
NT	2	NOTE SHEET
GR1	3	GRADING PLAN 1
DT1	4	DETAIL SHEET 1

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

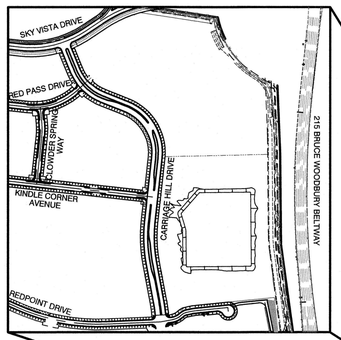
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

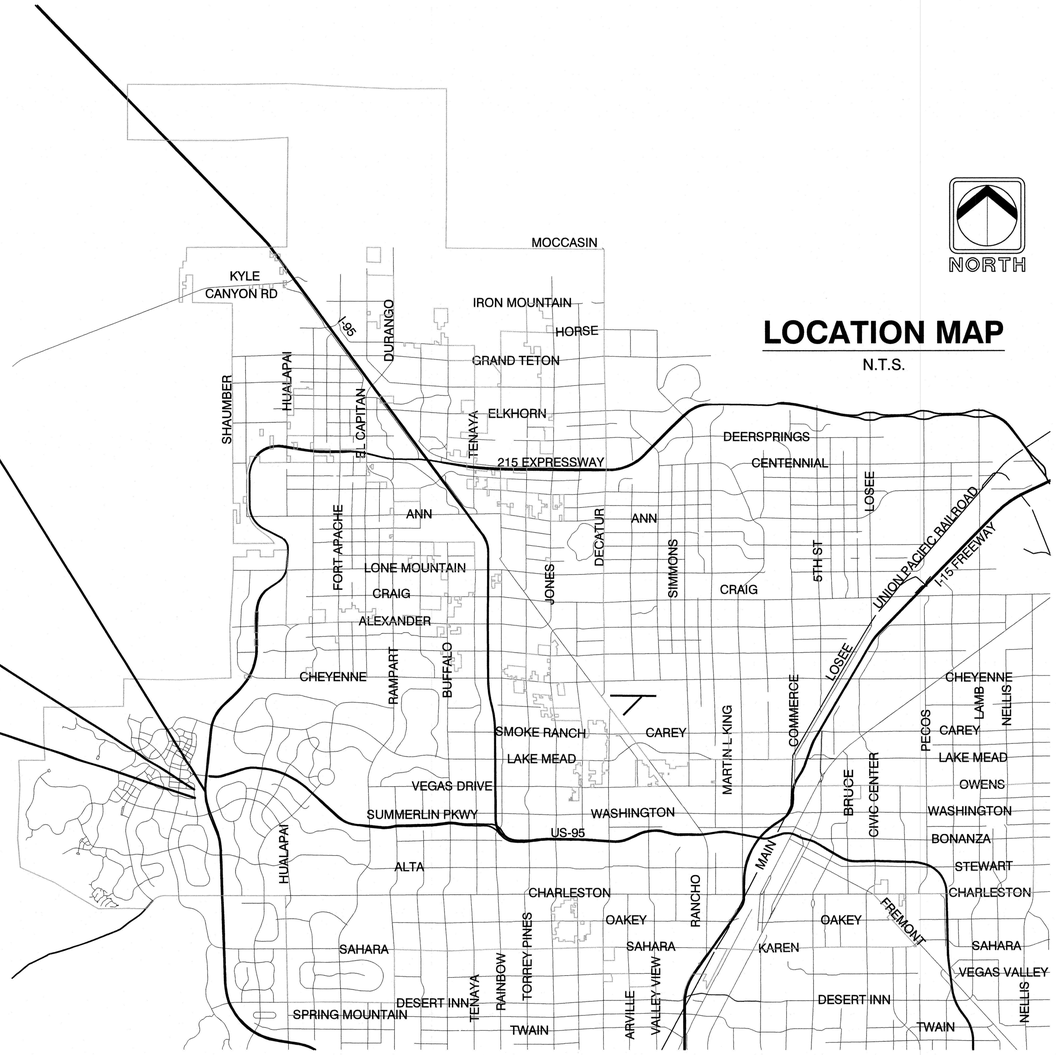
BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03





NORTH

LOCATION MAP

N.T.S.

OWNER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

DEVELOPER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

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

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

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CABLES! IT'S COSTLY
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-9611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

FIRE DEPARTMENT APPROVAL

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

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER. 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 STATUES, 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

CITY ENGINEER ALLEN PAVELKA, P.E. # 9029

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

PLANNING DEPARTMENT, CITY OF LAS VEGAS DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
(702) 791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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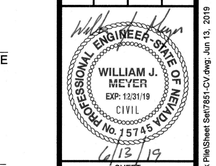
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
DEH	DEH	WJM	N/A	VERT.
04/30/2019	04/30/2019	04/30/2019	N/A	

PROJECT NO: 7851



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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 DISTRICT'S - 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 THE REQUIRED FIRE FLOW. [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 FLUSH 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 § 106.3]
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC § 507.2.1, NFPA 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 30,000 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 LANES, 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 GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLICWORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; 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 INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THERE WITH.
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 (½") 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. 12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: NOVA GEOTECHNICAL, PROJECT NO. G-18-003, DATED MARCH 5, 2018. APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLAN.
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. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

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

REVISED 06/04/2018

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'+	+0.0'to-0.1'	SEE SOILS REPORT
B.ENGINEERED FILL	0.5'+	+0.1'to-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

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

GENERAL CONSTRUCTION NOTE:

THE FOLLOWING SEPARATE VILLAGE 21 ROADWAY INFRASTRUCTURE PLANS ARE TO BE CONSTRUCTED GENERALLY ALL TOGETHER.
1. DESERT FOOTHILLS (REDPOINT DRIVE TO SUMMERLIN PARKWAY)
2. CARRIAGE HILL(REDPOINT DRIVE TO SUMMERLIN PARKWAY)
3. KINDLE CORNER AVENUE (CARRIAGE HILL TO DESERT FOOTHILLS)
4. RED PASS DRIVE (CARRIAGE HILL TO DESERT FOOTHILLS)
5. CLOWDER SPRING WAY (KINDLE CORNER AVENUE TO RED PASS DRIVE)

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):26°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

LEGEND

DESCRIPTION	PROPOSED	EXISTING	FUTURE
CONTOUR (5' INTERVAL)	2450	(2450)	(2450)
CONTOUR (1' INTERVAL)			
EDGE OF PAVEMENT			
SAW CUT			
RETAINING WALL			
SCREEN WALL			
RIGHT OF WAY			
CENTER LINE			
BACK OF CURB			
LIP OF GUTTER			
FACE OF CURB			
SIDEWALK			
UNIT BOUNDARY LINE			
UNIT BOUNDARY / ROW			
PROPERTY LINE			
SLOPE AND FLOW DIRECTION	1.00%	(1.00%)	(1.00%)
SCARP AREA			
MATCHLINE			
SIDEWALK RAMP			
SIGHT VISIBILITY ZONES			
PAVED ROAD			
PAVEMENT REMOVAL			
STREET LIGHT			
WATER UNDER 18"			
WATER 18" & OVER			
SANITARY SEWER UNDER 18"			
SANITARY SEWER 18" & OVER			
STORM SEWER			
FIRE HYDRANT			
SANITARY SEWER MAN HOLE	(S)	(S)	(S)
CLEAN OUT			
STORM DRAIN MAN HOLE	(D)	(D)	(D)

ABBREVIATIONS

FF	FINISH FLOOR	PT	POINT OF TANGENCY	O/C	OFFSET CROWN
FG	FINISH GRADE	PRC	POINT OF REVERSE CURVATURE	BC	BACK OF CURB
FL	FLOW LINE	PCC	POINT OF COMPOUND CURVATURE	BCR	BEGIN CURB RETURN
TC	TOP OF CURB	BVC	BEGIN VERTICAL CURVE	BCL	BACK OF CURB LENGTH
TRC	TOP OF ROLL CURB	MVC	MID-POINT OF VERTICAL CURVE	TF	TOP OF FOOTING
EOP	EDGE OF ASPHALT PAVEMENT	EVC	END VERTICAL CURVE	GB	GRADE BREAK
FUT.	FUTURE	RVPC	POINT OF REVERSE VERTICAL CURVE	PC	POINT OF CURVATURE
EX.	EXISTING	R/W	RIGHT-OF-WAY	TPW	TOP OF PLANTER WALL
VG	VALLEY GUTTER	DI	DROP INLET	TRW	TOP OF RETAINMENT WALL
NG	NATURAL GROUND	BFE	BASE FLOOD ELEVATION	TOP	TOP OF CHANNEL/SCARP
H.P.	HIGH POINT	CCUSD	CLARK COUNTY UNIFORM STANDARD DRAWINGS	TOE	TOE OF CHANNEL/SCARP
L.P.	LOW POINT	SW	SIDEWALK	TOB	TOP OF BOX
SSMH	SEWER MANHOLE	TSW	TOP OF SIDEWALK	PP	POWER POLE
WTR	WATER LINE	INT.	INTERSECTION	TRANS.	TRANSITION
SD	STORM DRAIN	D.G.	DESIGN GRADE	RET.	RETAINMENT
RCP	REINFORCED CONCRETE PIPE	G/L	CENTER LINE		

DEVIATION FROM CITY OF LAS VEGAS STANDARDS

- NONE

EARTHWORK QUANTITIES

CUT	FILL	NET
347 CUBIC YARDS	92,612 CUBIC YARDS	92,265 CUBIC YARDS (FILL)

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 NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
9755 SOUTH PECCOLE RANCH DRIVE SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS
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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

NOTE SHEET

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

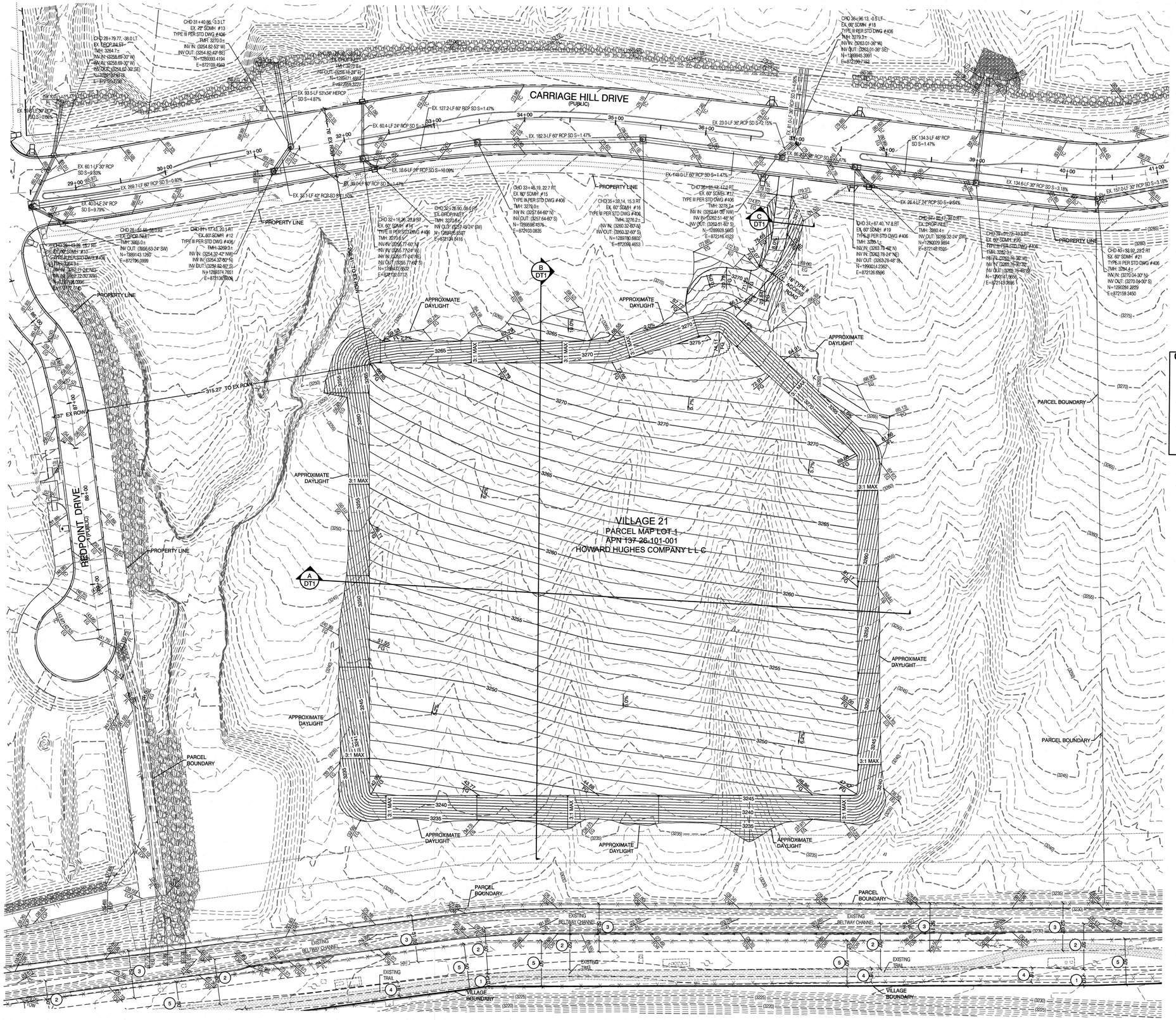
DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	PROJECT NO:
DEH 04/30/2019	DEH 04/30/2019	WJM 04/30/2019	HORIZ. N/A VERT. N/A	7851

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
6/13/19

SHEET
NT
2 OF 4 SHEETS

DRAWING NO.

H:\7851\Parcel I Stock Pile\Sheet Set\7851-NT.dwg, Jun 13, 2019



Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

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

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS. IT'S COSTLY.
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

EARTHWORK QUANTITIES

CUT	FILL	NET
347 CUBIC YARDS	92,612 CUBIC YARDS	92,265 CUBIC YARDS (FILL)

EASEMENT REFERENCE LEGEND

1. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19990310:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19961001:0000671.
2. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4. PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080527:0005041.
5. 10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

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.

STOCKPILE NOTE:

STOCKPILES WITH HEIGHT OVER 4 FT MUST BE PROVIDED WITH A TEMPORARY FENCING.

STOCKPILE MATERIALS SHALL CONSIST OF CLEAN EARTH FILL UNLESS OTHERWISE APPROVED BY THE CITY OF LAS VEGAS.

STOCKPILE IS TO COMPLY WITH APPROVED CLARK COUNTY DUST MITIGATION PLAN #49367

FLOOD ZONE NOTE

SITE IS LOCATED IN A SHADED ZONE X AS SHOWN IN FIRM MAP 32003C2215OE, DATED SEPTEMBER 27, 2002, A SHADED ZONE X IS DETERMINED TO BE OUTSIDE THE 0.0% ANNUAL CHANCE FLOODPLAIN, ENTIRE SITE BOUNDARY IS WITHIN ZONE X.

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: NOVA GEOTECHNICAL PROJECT #G-18-003, DATED MARCH 5, 2018

GRADING NOTE:

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS / DITCHES AND A TEMPORARY LOCAL MINOR SEDIMENT BASIN ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY HOWARD HUGHES COMPANY.

ENGINEER DISCLAIMER NOTE:

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

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 6/13/19

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702.791.4400

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (703) 873-7550 FAX (703) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 1

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
DBH	DBH	WJM	7651	N/A	N/A
04/30/2019	04/30/2019	04/30/2019			VERT.
				N/A	

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
6/13/19

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3 OF 4 SHEETS
DRAWING NO.

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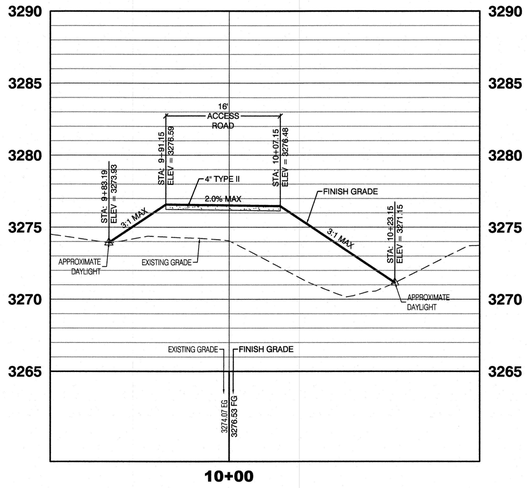
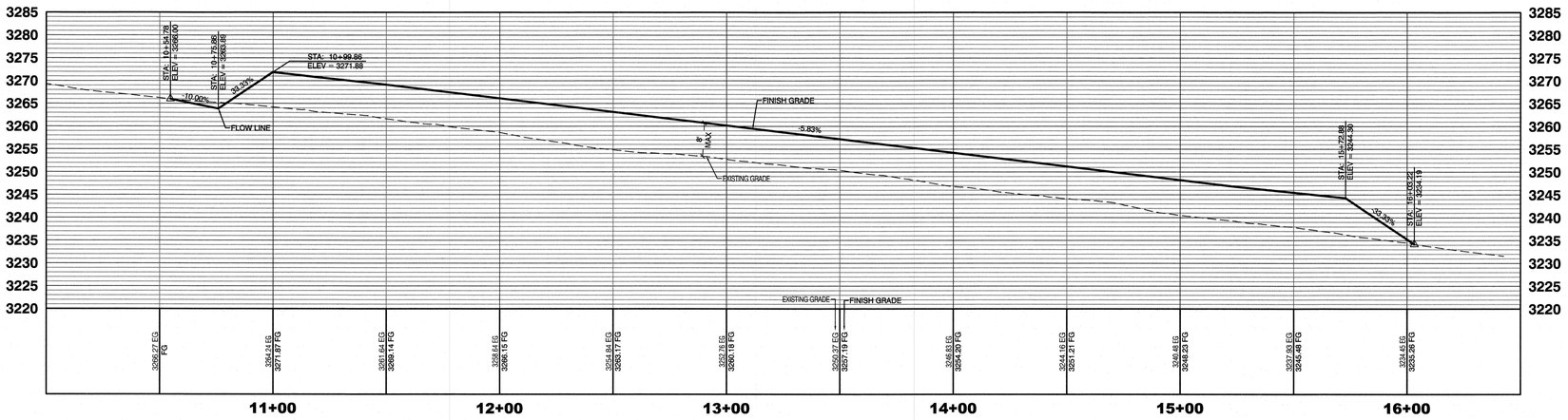


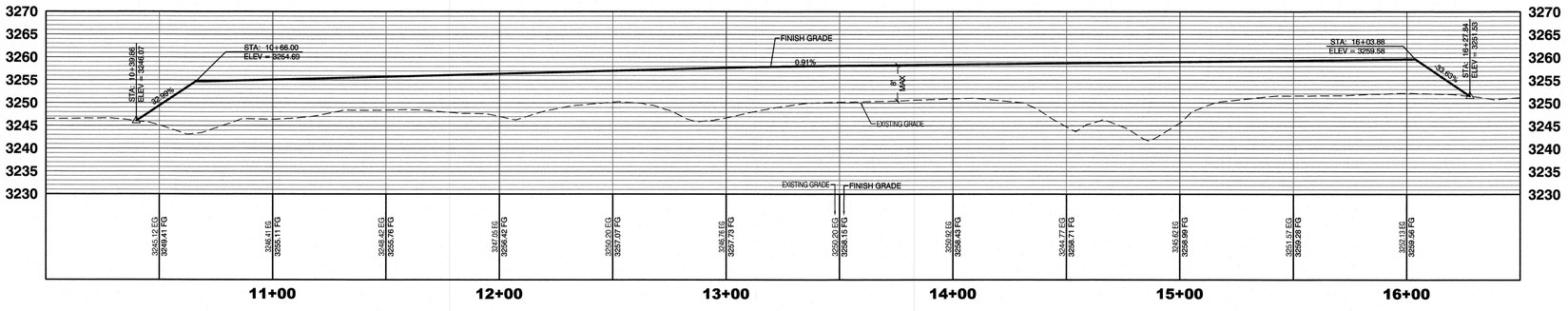
C - ACCESS ROAD TYPICAL SECTION

NTS



B - EAST WEST TYPICAL SECTION

NTS



A - NORTH SOUTH TYPICAL SECTION

NTS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

DETAIL SHEET 1

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

DRAWN BY: DEH 04/30/2019
DESIGNED BY: DEH 04/30/2019
CHECKED BY: WJM 04/30/2019
PROJECT NO: 7951
SCALE: N/A HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/19
CIVIL
No. 15745
6/13/19

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4 OF 4 SHEETS

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CIVIL IMPROVEMENT PLANS

FOR

HIGHLINE SUMMERLIN

VILLAGE 21 - PARCEL I

A PORTION OF APN: 137-26-112-001

CITY OF LAS VEGAS, NEVADA

PROJECT CONTACTS

DEVELOPER
LENNAR
9275 W RUSSELL RD, SUITE 400
LAS VEGAS, NEVADA 89148

CONTACT: ROBERT FLAXA
(702) 821-4651

OWNER
HUGHES HOWARD COMPANY, LLC
10801 W CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

CONTACT: CHRIS ANDERSON
(702) 791-4336

CIVIL ENGINEER
KIMLEY-HORN AND ASSOCIATES, INC.
6671 LAS VEGAS BOULEVARD SOUTH, SUITE 320
LAS VEGAS, NEVADA 89119

CONTACT: JODY WALKER BELSICK, PE
(702) 327-2567

PROJECT ARCHITECT
PERLMAN ARCHITECTS
450 FREMONT STREET, SUITE 233
LAS VEGAS, NEVADA 89101

CONTACT: MAY CADACIO
(702) 979-9900

PROJECT INFORMATION

A PORTION OF APN: 137-26-112-001

NUMBER OF LOTS: 1

ACREAGE: ±19.9 ACRES

ZONING: (P-C) PLANNED COMMUNITY DISTRICT

UTILITY PROVIDERS

WATER	LAS VEGAS VALLEY WATER DISTRICT
SEWER	CITY OF LAS VEGAS
ELECTRIC	NV ENERGY
SOLID WASTE DISPOSAL	REPUBLIC SERVICES
GAS	SOUTHWEST GAS
TELEPHONE	CENTURY LINK
COMMUNICATIONS	COX COMMUNICATIONS

LEGAL DESCRIPTION

A PORTION OF LOT 1 OF THAT CERTAIN FINAL MAP IN THE OFFICE OF SAID COUNTY RECORDER IN BOOK 123 OF PLATS, PAGE 36, RECORDED MAY 01, 2018, LOCATED WITHIN THE SECTIONS 14 THRU 17, 20 THRU 23, 26 THRU 29 AND 32 THRU 34, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AND SECTION 4, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M, CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

PARCEL I WILL BE ESTABLISHED AS A SEPARATE LEGAL PARCEL BY THHC WITH THE VILLAGE 21 UNIT 3 FINAL MAP.

FLOOD ZONE NOTE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAPS, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

GEOTECHNICAL NOTE

NO MAPPED FISSURES OR FAULTS. GROUNDWATER NOT ENCOUNTERED.

UTILITY NOTE

KIMLEY-HORN AND ASSOCIATES TAKES NO RESPONSIBILITY FOR EXISTING UTILITIES SHOWN HEREIN. THE EXISTING UTILITIES SHOWN ARE BASED ON INFORMATION PROVIDED BY-OTHER PARTIES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND VERIFY THE LOCATIONS AND INVERTS OF THE EXISTING WITHIN THE VICINITY OF CONSTRUCTION ACTIVITIES. IF A CONFLICT IS FOUND TO EXIST, THE CONTRACTOR SHALL COORDINATE THE PROJECT ENGINEER, PROJECT ARCHITECT, AND THE OWNER IMMEDIATELY.

GENERAL NOTES:

1. THIS SUBDIVISION IS A PART OF THE WEST SUMMERLIN VILLAGE 21 MASTER PLAN.
2. LANDSCAPING ON-SITE WILL BE MAINTAINED BY AN HOA
3. WATER POINT OF CONNECTION WILL COME OFF EXISTING WATER LINES FROM CARRIAGE HILL DRIVE
4. SEWER POINT OF CONNECTION WILL COME OFF EXISTING SEWER LINES AT THE SOUTHEAST CORNER OF THE PARCEL
5. ABOVE GROUND UTILITY BOXES SHALL NOT BE PLACED WITHIN TRAIL CORRIDORS
6. ONSITE STREETS, TRAILS, OPEN SPACES, AND DRAINAGE CORRIDORS ARE TO BE PRIVATE AND MAINTAINED BY THE HOA

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARING

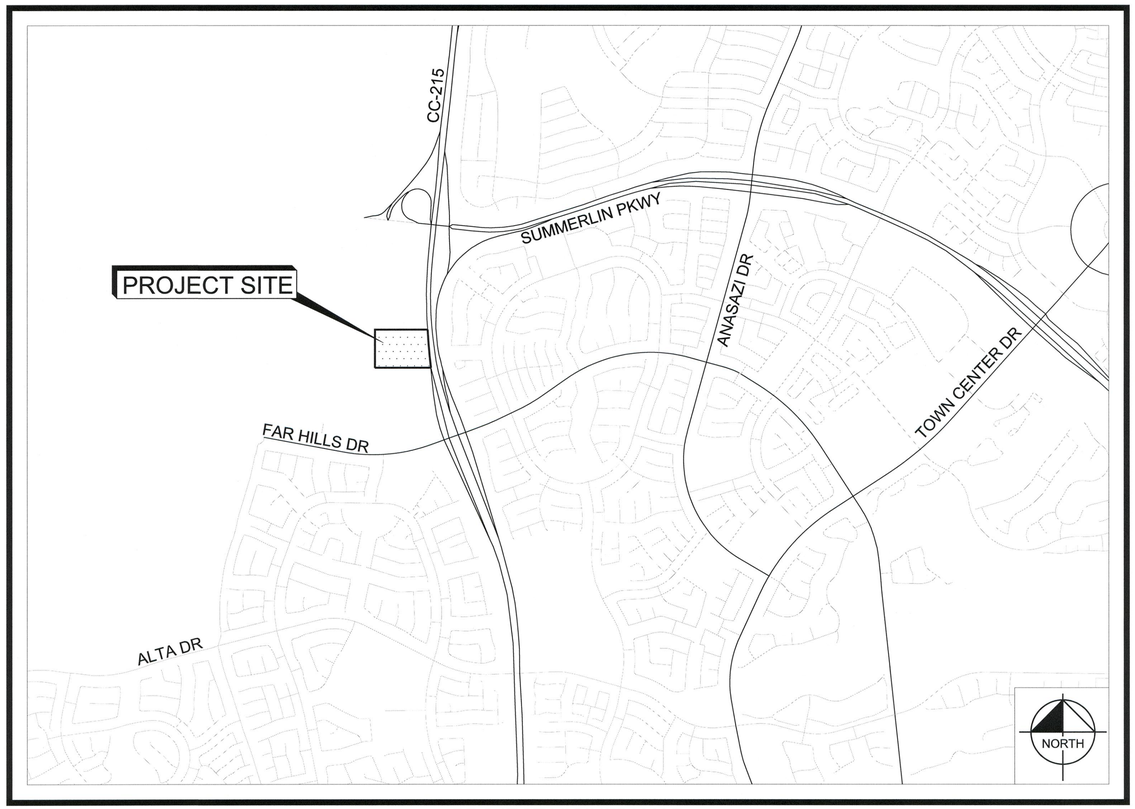
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE



PROJECT VICINITY MAP
NTS

SHEET INDEX:

SEE SHEET C0.3

REFERENCE INFORMATION:

TECHNICAL DRAINAGE STUDY:	XX-XXXXX
TRAFFIC STUDY:	XXXXXX
BUILDING PERMIT:	XXXXX-XXXXX
ENTITLEMENTS:	XXX-XXXXX

APPROVALS

CITY OF LAS VEGAS

"APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS" THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATION FROM STANDARDS" IN FAVOR OF THE SUMMERLIN IMPROVEMENT STANDARDS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA".

ALLEN PAVELKA, PE #09029 DATE
CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

CITY OF LAS VEGAS PLANNING DEPARTMENT DATE
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT

CITY OF LAS VEGAS FIRE DEPT. DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. XXXXX FIRST APPROVED DATE:
SHEETS: CX.X, CX.X, CX.X, CX.X, CX.X
PLAN APPROVAL CONTINGENT UPON APPROVAL OF PROJECT #XXXXXX & #XXXXXX

NV ENERGY* DATE

* NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY 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.

CENTRAL TELEPHONE COMPANY, d/b/a CENTURY LINK* DATE

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

COX COMMUNICATIONS LAS VEGAS, INC. DATE

SOUTHWEST GAS CORPORATION DATE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
© 2019 KIMLEY-HORN AND ASSOCIATES, INC.
6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

JODY WALKER BELSICK — STATE OF NEVADA — PROFESSIONAL ENGINEER — CIVIL — No. 15107 — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

COVER SHEET

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

1 OF 46 SHEETS
C0.1

Plotted By:Kirsten Nikol Sheet Set:Kha Layout:C0.1 October 13, 2019 01:57:34pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-cv.dwg
This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA"; LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA"; LATEST 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 INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") 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 220.
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 SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY TERRA SOUTHWEST CONSULTANTS INC. DATED DECEMBER 14, 2017 PROJECT NO. 64175087, 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. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

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

CITY OF LAS VEGAS STREETLIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION.
2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC/ELECTRICAL FIELD OPERATIONS DIVISION AND THE CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623.L0.03 (E) OF THE SPECIFICATIONS.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
4. ALL EMPTY CONDUIT SHALL HAVE PULL STRINGS INSTALLED PRIOR TO FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE OF EIGHTEEN INCHES (18") TO THE FACE OF STREET LIGHTING POLE ON ALL SIDES WHEN STREETLIGHT IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE ELECTRICAL SERVICES SECTION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINT SHALL BE COORDINATED WITH NEVADA POWER COMPANY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICE POINTS SHALL BE SHOWN ON THE PLANS.
8. IT SHALL BE ASSUMED THAT IN THE ABSENCE OF AN EXISTING, WORKABLE CIRCUIT TO ATTACH TO, ALL INSTALLATIONS SHALL REQUIRE A NEW SERVICE FOR OPERATION OF THE CIRCUIT.
9. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREET LIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BASES ARE INSTALLED AT NO EXPENSE TO THE CITY OF LAS VEGAS.
10. THE CONTRACTOR SHALL FURNISH COMPLETE SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON PLANS.
11. THE DEVELOPER/OWNER WILL BE REQUIRED TO SUPPLY POWER TO ALL NEW PUBLIC STREET LIGHTS INSTALLED UNDER THIS DESIGN PRIOR TO BOND RELEASE OR PROJECT COMPLETION. THE DEVELOPER/OWNER WILL BE RESPONSIBLE FOR ALL ITEMS ASSOCIATED WITH THE INSTALLATION, CONSTRUCTION, ENERGIZING, MAINTENANCE AND OPERATIONAL COST OF SAID STREETLIGHTS PRIOR TO PROJECT COMPLETION. REFER TO THE PLAN FOR ANY NEW SERVICE REQUIREMENTS. THE TRANSFER OF OWNERSHIP FROM THE DEVELOPER/OWNER TO THE THE CITY OF LAS VEGAS FOR ALL NEW PUBLIC STREET LIGHT/S AND/OR SERVICE/S INSTALLED UNDER THIS PLAN DESIGN WILL BE IN CONJUNCTION WITH THIS PROJECT COMPLETION. COORDINATE ALL MAINTENANCE AND OPERATIONAL TRANSFERS WITH THE CITY OF LAS VEGAS TRAFFIC ENGINEERING DEPARTMENT (TEFO) AT (702) 229-6331.

NOTE TO CONTRACTOR:

1. CONTRACTOR IS REQUIRED TO NOTIFY THE ARCHITECT, ENGINEER AND OWNER IN WRITING BY RFI OF ANY TYPED, HANDWRITTEN, STAMPED OR LABELLED PLAN CHECK COMMENTS ON THE PERMITTED PLANS WITHIN 7 DAYS OF RECEIPT OF THE PERMITTED PLANS. FAILURE TO PROVIDE WITHIN 7 DAYS INDICATES CONTRACTOR HAS INCLUDED ALL COSTS WITHIN HIS BASE BID TO COMPLY WITH FEDERAL, STATE AND LOCAL CODES AND SHALL PERFORM THE WORK AT NO ADDITIONAL COST.
2. GENERAL CONTRACTOR SHALL INCLUDE CONTACTING, COORDINATING PERMITS, SCHEDULING AND SUPERVISING ALL WORK TO BE PERFORMED BY NVE, SOUTHWEST GAS, CENTURYLINK, COX CABLE OR OTHER UTILITY PURVEYOR WORK PRIOR TO AND DURING CONSTRUCTION INCLUDING BARRICADING PLANS, BARRICADE DESIGNS, PERMITS AND BARRICADE WORK.
3. GENERAL CONTRACTOR SHALL CONTACT AND MEET ONSITE WITH ALL UTILITY PURVEYORS FOR SCHEDULING AND COORDINATION PURPOSES AT LEAST 30 DAYS PRIOR TO INSTALLATION OF UTILITY WORK.
4. GENERAL CONTRACTOR SHALL PROVIDE AND PAY FOR ALL BARRICADING PLANS, APPROVALS AND BARRICADING WITHIN THE RIGHT OF WAY AS WELL AS ANY CHANGES REQUIRED BY THE GOVERNING AUTHORITY IN THE PERFORMANCE OF CONTRACTOR'S WORK.
5. THE OWNER AND/OR HIS CONSULTANTS ARE NOT RESPONSIBLE FOR DELAYS CAUSED BY CONTRACTOR'S FAILURE TO PROVIDE NOTIFICATIONS IN A TIMELY MANNER.
6. PROJECT CONSULTANTS SHALL RESPOND TO RFIS OR OTHER CONTRACTOR QUERIES WITHIN 5 BUSINESS DAYS.

DEVIATION FROM STANDARDS

NONE

LAS VEGAS VALLEY WATER DISTRICT (LVVWD) STANDARD NOTES

LVVWD PROJECT # XX-XX

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 PM 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 THE UDACS SHALL SUPERCEDE 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 SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES OR 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 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 LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600.
14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK BY THE LVVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDED THE PLACEMENT OF APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

   ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNER'S ASSOCIATION IS IN EXISTENCE, OR THE ENTITY WHO ARRANGED FOR DECORATIVE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OR PRIVATE STREET, IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LVVWD WITH AN APPROPRIATELY SIZED PLAIN FINISH CONCRETE PATCH. THE LVVWD WILL NOT RESTORE DECORATIVE 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.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO._____XX-XX_____ FIRST APPROVED DATE:_____

SWPPP NOTES

1. CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVED 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 AND CLARK COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE CITY OF LAS VEGAS AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES 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 NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY ACTUAL 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 INSPECTION MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

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. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
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 FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.
10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C-900 PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

LAS VEGAS FIRE & RESCUE GENERAL NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6325 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALLEY 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 SYSTEMS SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. [IFC 105.7.12]
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 THE REQUIRED FIRE FLOW. [IFC 3310 & 3312]
5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF THE STREET ADJACENT TO FIRE HYDRANTS. [IFC 507.5.7.3]
6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH 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 106.3]
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC 507.2.1, NFPA 24]
8. PAINTING 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 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 FEET UNSPRINKLERED; 600 FEET SPRINKLERED
    COMMERCIAL-300 FEET UNSPRINKLERED; 400 FEET SPRINKLERED
12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FEET 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 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FEET 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 FEET OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FEET OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. [IFC C102.12]
15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE- OR TWO-FAMILY DWELLING SHALL NOT EXCEED 300 FEET, 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 FEET, 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 FEET. [IFC C102.6]
18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE ARE FOUR (4) OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN TWO (2) FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN. [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 FEET 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 FEET OUTSIDE AND 28 FEET INSIDE TURNING RADIUS. [IFC 503.2.4]
22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13 FEET 6 INCHES. [IFC 503.2.1]
23. FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 40 FEET FLOW LINE TO FLOW LINE WITH PARALLEL PARKING PERMITTED ON BOTH SIDES. NOT LESS THAN 32 FEET WIDE, FLOW-LINE TO FLOW-LINE, WHERE PARKING IS PERMITTED ONLY ON ONE SIDE OF THE FIRE APPARATUS ACCESS ROAD. NOT LESS THAN 24 FEET WIDE, FLOW-LINE TO FLOW-LINE, WHERE NO PARKING IS PERMITTED ON EITHER SIDE. FIRE LANES THROUGH PARKING LOTS SHALL BE NOT LESS THAN 24 FEET. [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 FEET FROM FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASED TO 250 FEET IF THE BUILDING IS SPRINKLERED. [IFC 501.1.1]
25. APPROVED SECONDARY FIRE APPARATUS SHALL BE PROVIDED FOR 100 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR WITH A SINGLE POINT OF ACCESS IN EXCESS OF 600 FEET. COMMERCIAL AND INDUSTRIAL DEVELOPMENTS WHERE BUILDINGS EXCEED 2 STORIES OR 30 FEET IN HEIGHT, OR EXCEEDING 62,000 SQUARE FEET IN

CONSTRUCTION NOTES

		UNIT	PUBLIC	PRIVATE
1	CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.	LF	–	–
2	CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.	LF	–	–
3	CONSTRUCT 6" CURB PER DETAIL	LF	–	–
4	CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.	LF	–	–
5	10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.	LF	–	–
6	CONSTRUCT 2' WIDE CURB CUT PER DETAIL 8 ON SHEET C9.3	EA	–	–
7	CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3	EA	–	–
8	CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3	SY	–	–
9	CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.	SF	–	–
10	CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236	EA	–	–
11	CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.	SF	–	–
12	CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.	SF	–	–
13	CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.	SY	–	–
14	INSTALL 4" PVC UNDER SIDEWALK	EA	–	–
15	CONSTRUCT STAIR RISER PER 2018 IBC, PROVIDE SUMMERLIN COMPLIANT HANDRAIL FOR 3 OR MORE STEPS.	SF	–	–
16	CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).	LF	–	–
17	CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).	LF	–	–
18	INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.	SF	–	–
19	INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.	EA	–	–
20	CONSTRUCT ACCESSIBLE RAMP CASE 1 PER DETAIL 11 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS	EA	–	–
21	CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS	EA	–	–
22	CONSTRUCT ACCESSIBLE RAMP CASE 3 PER DETAIL 13 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS	EA	–	–
23	CONSTRUCT ROCK RIP-RAP SWALE d50=X, T=X PER DETAIL x ON SHEET C9.3	SY	–	–
24	OUTLET 6" STORM DRAIN THROUGH WALL AND SPLASH TO GRADE PER DETAIL X ON SHEET C9.3	EA	–	–
25	INSTALL ROLL CURB DRAIN OUTLET	EA	–	–
26	INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR	EA	–	–

STORM DRAIN NOTES

		UNIT	PUBLIC	PRIVATE
1	INSTALL 18" RCP CLASS III STORM DRAIN PIPE	LF	–	–
2	INSTALL 24" RCP CLASS III STORM DRAIN PIPE	LF	–	–
3	INSTALL 42" RCP CLASS III STORM DRAIN PIPE	LF	–	–
4	INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403	LF	–	–
5	INSTALL 60" TYPE III SDMH PER CCAUSD NO. 403	EA	–	–
6	INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3	EA	–	–
7	INSTALL DROP INLET TYPE DM2 PER DETAILS 16 ON SHEET C9.3	EA	–	–
8	INSTALL NDS 18" X 18" CATCH BASIN	EA	–	–
9	INSTALL 6" PVC STORM DRAIN PIPE	LF	–	–
10	INSTALL 8" PVC STORM DRAIN PIPE	LF	–	–

MASTER LEGEND

- STREET CENTERLINE
- PROPERTY LINE
- ADJACENT PROPERTY LINE
- EXISTING LOT LINE
- EXISTING EASEMENT
- EXISTING PATENT EASEMENT
- EXISTING PROPERTY LINE TO BE VACATED
- EXISTING PATENT EASEMENT TO BE VACATED
- EXISTING WALL
- PROPOSED RETAINING & SCREEN WALL
- PROPOSED SCREEN WALL
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING BUILDING
- PROPOSED BUILDING
- PROPOSED CONCRETE BARRIER RAIL
- EXISTING CURB & GUTTER
- EXISTING CURB
- EXISTING SIDEWALK
- EXISTING VALLEY GUTTER
- PROPOSED CURB & GUTTER
- PROPOSED CURB
- PROPOSED SIDEWALK
- EXISTING EDGE OF PAVEMENT
- PROPOSED EDGE OF PAVEMENT
- EXISTING EDGE OF PAVEMENT TO BE REMOVED
- EXISTING ROAD STRIPING
- PROPOSED BOLLARD
- PROPOSED DOOR
- SCARP (35% / 0.40%)
- SLOPE
- EXISTING GRADE (32.27 AC)
- PROPOSED GRADE (30.50 TC)
- BACKWATER VALVE (BW)
- EXISTING PARKING STRIPING
- PROPOSED ROAD STRIPING
- PROPOSED PARKING STRIPING
- EXISTING CONTOUR (2375)
- PROPOSED CONTOUR 2376
- CUT FILL TRANSITION
- ADA ACCESS
- SAWCUT LIMITS
- RIDGE
- GRADE BREAK
- FLOW LINE
- EXISTING STORM DRAIN
- EXISTING STORM DRAIN TO BE REMOVED
- EXISTING SEWER LINE
- EXISTING WATER LINE
- EXISTING GAS LINE (G)
- PROPOSED SEWER (SS)
- PROPOSED SEWER LATERAL (SS)
- PROPOSED WATER LINE (W)
- PROPOSED STREET LIGHT CONDUIT
- PROPOSED TRAFFIC CONDUIT
- EXISTING SIGN
- PROPOSED SIGN
- PROPOSED SIGN
- EXISTING HANDICAP PARKING
- PROPOSED HANDICAP PARKING
- EXISTING STORM DRAIN MANHOLE
- PROPOSED SIDEWALK DRAIN
- EXISTING DROP INLET
- PROPOSED DROP INLET
- EXISTING SEWER MANHOLE
- PROPOSED SEWER MANHOLE
- EXISTING FIRE HYDRANT
- PROPOSED CLEAN OUT
- PROPOSED FIRE HYDRANT
- EXISTING WATER VALVE
- PROPOSED WATER VALVE
- PROPOSED BLUE REFLECTIVE PVMT MARKING
- EXISTING MISCELLANEOUS MANHOLE (MH)
- EXISTING POLE
- EXISTING STREET LIGHT
- EXISTING AREA LIGHT
- PROPOSED STREET LIGHT
- PROPOSED AREA LIGHT

INDEX

NUMBER	TITLE	NAME
1	COVER SHEET	C0.1
2	GENERAL NOTES	C0.2
3	MASTER LEGEND AND QUANTITIES	C0.3
4	OVERALL GRADING PLAN	C2.0
5	GRADING PLAN 1 OF 8	C2.1
6	GRADING PLAN 2 OF 8	C2.2
7	GRADING PLAN 3 OF 8	C2.3
8	GRADING PLAN 4 OF 8	C2.4
9	GRADING PLAN 5 OF 8	C2.5
10	GRADING PLAN 6 OF 8	C2.6
11	GRADING PLAN 7 OF 8	C2.7
12	GRADING PLAN 8 OF 8	C2.8
15	OVERALL UTILITY PLAN	C3.0
16	UTILITY SHEET 1 OF 8	C3.1
17	UTILITY SHEET 2 OF 8	C3.2
18	UTILITY SHEET 3 OF 8	C3.3
19	UTILITY SHEET 4 OF 8	C3.4
20	UTILITY SHEET 5 OF 8	C3.5
21	UTILITY SHEET 6 OF 8	C3.6
22	UTILITY SHEET 7 OF 8	C3.7
23	UTILITY SHEET 8 OF 8	C3.8
24	A & B DRIVE PLAN & PROFILE	C4.1
25	H & G DRIVE PLAN & PROFILE	C4.2
26	M DRIVE PLAN & PROFILE	C4.3
27	J DRIVE PLAN & PROFILE	C4.4
28	F DRIVE PLAN & PROFILE STA 10+20 – 16+00	C4.5
29	F DRIVE PLAN & PROFILE STA 10+00 – 16+00	C4.6
30	E DRIVE PLAN & PROFILE SHEET STA 10+81 – 16+50	C4.7
31	E DRIVE PLAN & PROFILE STA 16+50 – 21+73	C4.8
32	D DRIVE PLAN & PROFILE STA 10+00 – 15+50	C4.9
33	D DRIVE PLAN & PROFILE STA 15+50 – 20+54	C4.10
34	C DRIVE PLAN & PROFILE STA 10+89 – 75+00	C4.11
35	C DRIVE PLAN & PROFILE STA 15+00 – 21+22	C4.12
36	STORM DRAIN PLAN SHEET 1 OF 6	C5.1
37	STORM DRAIN PLAN SHEET 2 OF 6	C5.2
38	STORM DRAIN PLAN SHEET 3 OF 6	C5.3
39	STORM DRAIN PLAN SHEET 4 OF 6	C5.4
40	STORM DRAIN PLAN SHEET 5 OF 6	C5.5
41	STORM DRAIN PLAN SHEET 6 OF 6	C5.6
45	TYPICAL SECTIONS SHEET 1 OF 2	C9.1
46	TYPICAL SECTIONS SHEET 2 OF 2	C9.2
47	TYPICAL DETAILS SHEET	C9.3

ABBREVIATIONS

@	AT	E/W	EAST/WEST or EACH WAY	PT	POINT OF TANGENCY
AB	AGGREGATE BASE	F-F	FACE OF CURB TO FACE OF CURB	PVC	POLYVINYL CHLORIDE
AC	ASPHALTIC CONCRETE	FG	FINISHED GROUND	PVI	POINT OF VERTICAL INFLECTION
ADA	AMERICANS WITH DISABILITIES ACT	FH	FIRE HYDRANT	R	RADIUS
APN	ASSESSORS PARCEL NUMBER	FS	FINISHED SURFACE	RCB	REINFORCED CONCRETE BOX
AVE	AVENUE	FL	FLOWLINE	RCP	REINFORCED CONCRETE PIPE
BC	BACK OF CURB	FT	FOOT or FEET	RT	RIGHT
BCR	BEGIN CURB RETURN	GB	GRADE BREAK	R/W	RIGHT OF WAY
BLVD	BOULEVARD	H	HEIGHT	S	SOUTH
BM	BENCHMARK	HDPE	HIGH-DENSITY POLYETHYLENE	SD	STORM DRAIN
BVC	BEGIN VERTICAL CURVE	HP	HIGH POINT	SF	SQUARE FOOT OR FEET
BW	BOTTOM OF WALL	INT	INTERSECTION	SS	SANITARY SEWER
B/S	BACKSIDE	INV	INVERT	SSMH	SANITARY SEWER MANHOLE
CALC	CALCULATED	L	LENGTH	ST	STREET
CCAUSD	CLARK COUNTY AREA UNIFORM STANDARD DRAWING	LA	LANDSCAPE ARCHITECT	STL	STEEL
		LF	LINEAR FEET	STD	STANDARD
CCFD	CLARK COUNTY FIRE DEPARTMENT	L/S	LANDSCAPE	SY	SQUARE YARDS
CL	CENTERLINE	LT	LEFT	TC	TOP OF CURB
CLV	CITY OF LAS VEGAS	LVVWD	LAS VEGAS VALLEY WATER DISTRICT	TG	TOP OF GRATE
CO	CLEAN OUT	MAX	MAXIMUM	TYP	TYPICAL
CONN	CONNECTION	ME	MATCH EXISTING	TW	TOP OF WALL
CTV	CABLE TELEVISION	MEP	MECHANICAL, ELECTRICAL AND PLUMBING	UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS
CY	CUBIC YARD				
Δ	DELTA (DIFFERENCE) / ANGLE	MH	MANHOLE		
D	DEPTH	MIN	MINIMUM	VERT	VERTICAL
DG	DECOMPOSED GRANITE	N	NORTH	W	WEST OR WATER
DI	DUCTILE IRON	NAP	NOT A PART	WL	WATERLINE
E	EAST	NTS	NOT TO SCALE	WTR	WATER
EA	EACH	N/S	NORTH/SOUTH	XFF	EXISTING FINISHED FLOOR ELEVATION
ECR	END CURB RETURN	OC	ON CENTER	±	PLUS OR MINUS
ELEV	ELEVATION	P.A.E.	PUBLIC ACCESS EASEMENT		
ELEC	ELECTRICAL	PC	POINT OF CURVATURE		
EP	EDGE OF PAVEMENT	PCC	POINT OF COMPOUND CURVATURE		
EVC	END VERTICAL CURVE	PR	PROPOSED		
EX.	EXISTING	PRC	POINT OF REVERSE CURVATURE		

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XX-XX FIRST APPROVED DATE:

CLV#:

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

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

No.	REVISIONS	DATE	BY

Kimley»Horn

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

CONSTRUCTION MANAGER-IN-NEVADA STATE OF NEVADA JODY WALKER 15104 PROFESSIONAL ENGINEER CIVIL 12/31/20 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

MASTER LEGEND AND QUANTITIES

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

3 OF 46 SHEETS

C0.3

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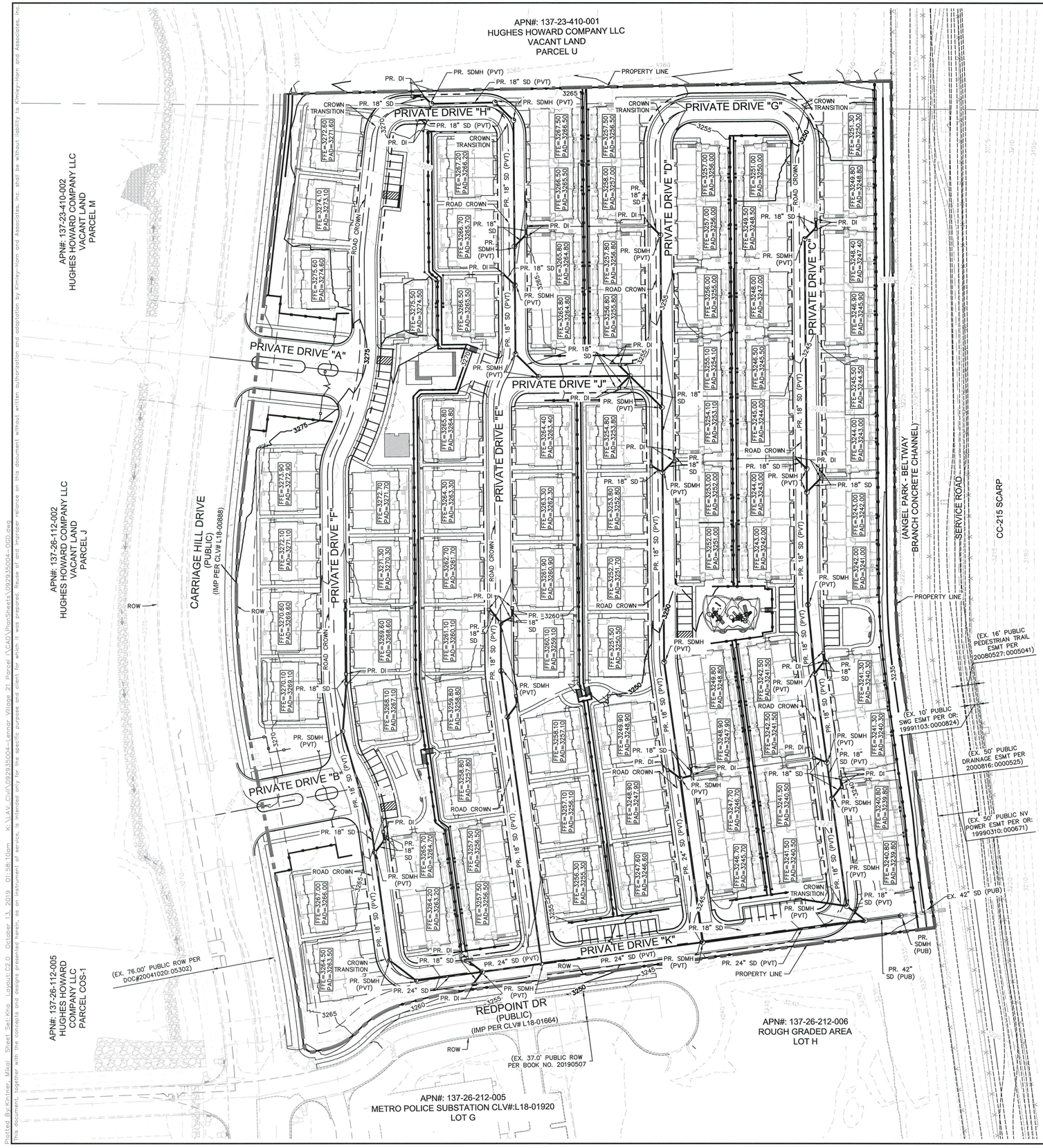
Plotted By:Kinther, Mikal Sheet Set:Kha Layout:C0.3 October 13, 2019 01:57:49pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-ML.dwg



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

EARTHWORK QUANTITIES		
CUT	FILL	NET
5,000 CY	200,000 CY	195,000 CY IMPORT

*NOTE: THESE QUANTITIES ARE APPROXIMATE AND ARE RAW VOLUMES ONLY. OVEREXCAVATION SUBSIDENCE, SHRINKAGE, & BULKING FACTORS ARE NOT TAKEN INTO ACCOUNT.

KEYMAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120
SCALE 1" = 60'

STORM DRAIN NOTE:

FOR STORM DRAIN DESIGN, REFER TO SHEETS C5.1 THROUGH C5.6

ENGINEER'S NOTES:

1. ALL WORK SHALL CONFORM TO THE SOILS REPORT PREPARED BY AMERICAN SOILS ENGINEERING, LLC DATED JULY 1, 2019 PROJECT NO. 1993-GEO
2. ALL OFF-SITE IMPROVEMENT CONSTRUCTION SHALL CONFORM TO THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST EDITION.
3. FINAL ASPHALTIC CONCRETE (AC) PAVEMENT SURFACES SHALL BE ONE-HALF INCH ABOVE THE TOP OF THE GUTTER (INCLUDING OPEN GRADE).
4. CONTRACTOR IS RESPONSIBLE FOR DUST AND EROSION CONTROL DURING CONSTRUCTION
5. THIS PLAN SHALL NOT, IN PART OR IN WHOLE, BE USED FOR CONSTRUCTION UNTIL APPROVED AND SIGNED BY ALL APPLICABLE GOVERNMENT AGENCIES.
6. ENGINEER TO BE NOTIFIED OF ANY DISCREPANCIES IMMEDIATELY.
7. MATCH ELEVATIONS SHOWN TO BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.
8. THIS PROJECT IS NOT PART OF AN EXISTING COMMERCIAL SUBDIVISION.
9. PROPERTY OWNER IS RESPONSIBLE TO MAINTAIN THE BEST MANAGEMENT PRACTICES SUCH AS BUT NOT LIMITED TO THE REMOVAL OF ACCUMULATED SEDIMENT AND DEBRIS AND CARE OF THE VEGETATION.
10. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS OTHERWISE NOTED.
11. OWNER RESPONSIBLE TO PROVIDE SURVEY MONUMENTATION AS SHOWN AND TO REPLACE ALL SURVEY MONUMENTATION DAMAGED, DISTURBED, DESTROYED, OR OBSCURED DURING CONSTRUCTION.
12. ALL ONSITE STORM DRAIN AND THE ASSOCIATED FACILITIES ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE PROPERTY OWNER.

STORMWATER MANAGEMENT NOTES:

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

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

SIGHT VISIBILITY ZONES NOTE

NO WALLS, FENCES, TREES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF CURB.

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

JODY WALKER BELSICK, PE No. 15107 DATE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — JODY WALKER BELSICK — No. 15107 — PROFESSIONAL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

OVERALL GRADING PLAN

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS — NEVADA

Plotted By:Kinhter Mikaj Sheet Set:Kha Layout:C2.0 October 13, 2019 01:58:10pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-OGD.dwg
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APN#: 137-23-410-001
HUGHES HOWARD COMPANY LLC
PARCEL U

APN#: 137-23-410-002
HUGHES HOWARD COMPANY LLC
VACANT LAND
PARCEL M

CARRIAGE HILL DRIVE
(PUBLIC)
(IMP PER CL\#I-18-00888)

PRIVATE DRIVE "H"

PRIVATE DRIVE "F"

PRIVATE DRIVE "E"

(EX. 76.00' PUBLIC ROW PER DOC#20041020:05302)
(EX. 38.00' PUBLIC ROW) (EX. 38.00' PUBLIC ROW)
(EX. 30" SD)
[EX. 60" SDMH-21]
[EX. 60" SDMH-20]
[EX. 60" SDMH-19]
[EX. 36" SD]
[EX. 48" SD]
[EX. 24" SD]
[EX. 5' DI]

PROPERTY LINE

DAYLIGHT

CROWN TRANSITION

ROAD CROWN

PROP SD

GB

ROW

20.00' C.E.

6.00' LS

8.00' SW

4.00' SW

15.50'

31.00' BC-BC

3.00' BC-BC

120.00' V.C.

80.00' V.C.

1% MIN.

FFE=3272.60
PAD=3271.60

FFE=3274.10
PAD=3273.10

FFE=3275.60
PAD=3274.60

FFE=3275.50
PAD=3274.50

FFE=3267.20
PAD=3266.20

FFE=3266.70
PAD=3265.70

FFE=3266.50
PAD=3265.50

FFE=3267.50
PAD=3266.50

FFE=3266.50
PAD=3265.50

FFE=3265.80
PAD=3264.80

FFE=3265.80
PAD=3264.80

STA:10+00.00
PC TC=69.02

STA:10+30.28
BVC TC=68.14

STA:10+94.08
PC TC=66.68

STA:10+51.12
PC,GB TC=70.13

STA:11+50.26
EVC PT TC=66.47

STA:11+34.85
EVC TC=66.60

STA:11+85.34
PC TC=72.79

STA:12+03.20
PT TC=73.13

STA:12+66.34
BVC TC=74.33

STA:12+85.42
BCR TC=75.32

STA:13+21.50
SIB FFG=75.79

STA:14+07.60
PC,BCR TC=64.24

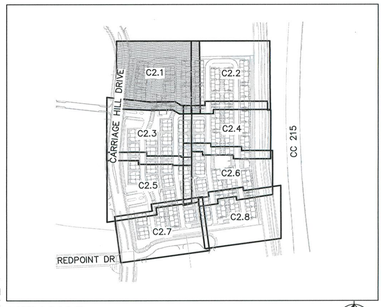
STA:10+60.00
EVC TC=60.67

STA:10+45.67
BCR,GB TC=61.83

STA:37+69.47
ECR TC,ME=80.09

MATCHLINE - SEE SHEET C2.3

MATCHLINE - SEE SHEET C2.2



KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
20. CONSTRUCT ACCESSIBLE RAMP CASE 1 PER DETAIL 11 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
21. CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN), AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S CHEAP! CALL 811 OR 1-800-227-2600

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

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

SIGHT VISIBILITY ZONES NOTE

NO WALLS, FENCES, TREES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF CURB.

No.	REVISIONS	DATE	BY

Kimley»Horn

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — JODY WALKER BELSICK — No. 15107 — PROFESSIONAL — CIVIL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
1 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

5 OF 46 SHEETS

C2.1

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Plotted By:Kintner, Mikol Sheet Set:Kha Layout:C2.1 October 13, 2019 01:59:17pm K:\LAV_Civil\092935004—Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg

APN#: 137-23-410-001
HUGHES HOWARD COMPANY LLC
PARCEL U

MATCHLINE - SEE SHEET C2.1

MATCHLINE - SEE SHEET C2.4

PRIVATE DRIVE "G"

PRIVATE DRIVE "D"

PRIVATE DRIVE "C"

DAYLIGHT

PROPERTY LINE

(ANGEL PARK - BELTWAY BRANCH CONCRETE CHANNEL)

SERVICE ROAD

REDPOINT DR.

CARRIAGE HILL DRIVE

CC 215

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

SIGHT VISIBILITY ZONES NOTE

NO WALLS, FENCES, TREES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF CURB.

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS–XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702–862–3600
WWW.KIMLEY–HORN.COM

STATE OF NEVADA — JODY WALKER BELSICK — No. 15107 — PROFESSIONAL ENGINEER — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

GRADING PLAN
2 OF 8

6 OF 46 SHEETS
C2.2

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C2.2 October 13, 2019 01:59:51pm K:\LAV_Civil\092935004–Lennar Village 21 Parcel I\CAD\PlanSheets\092935004–GD.dwg
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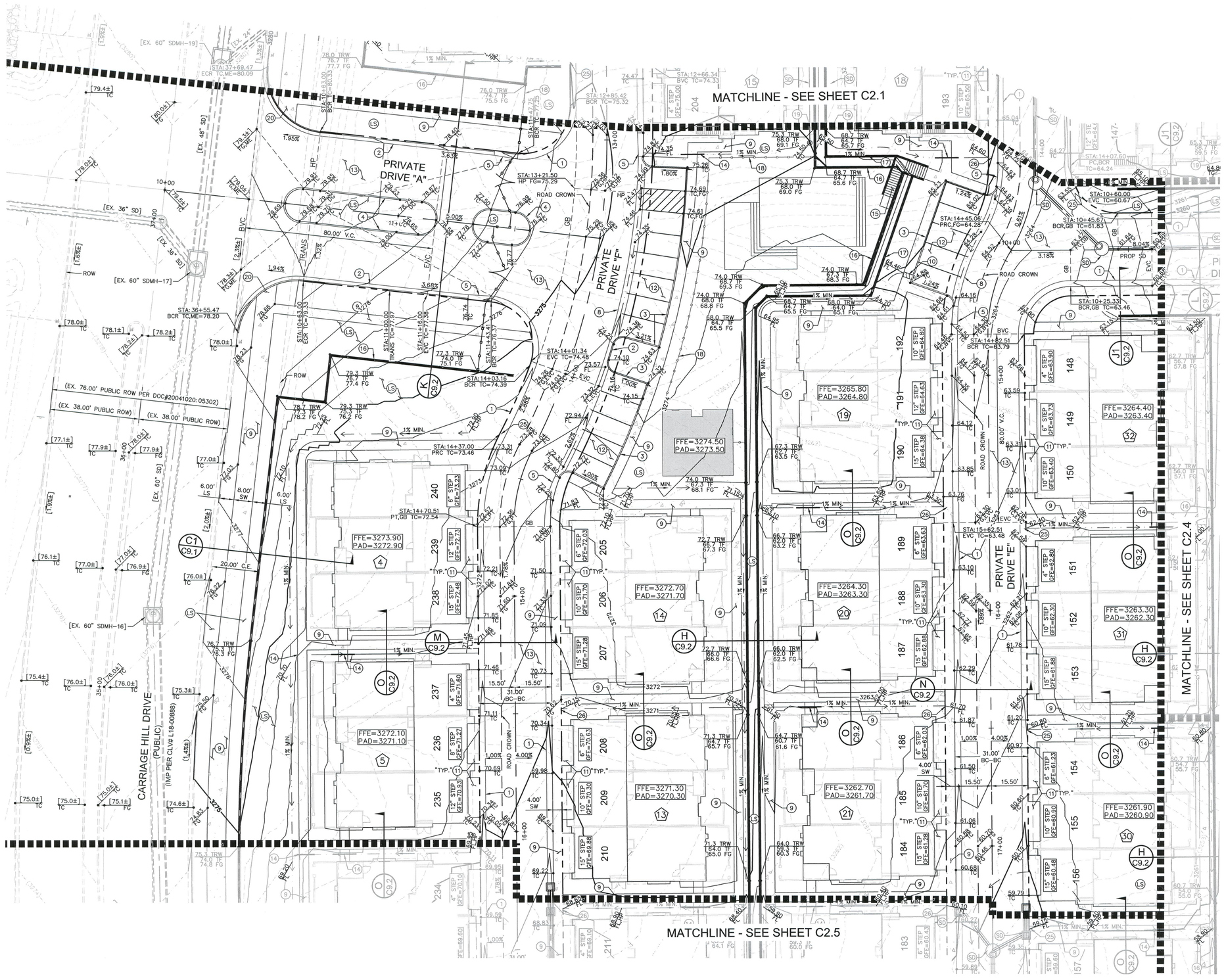

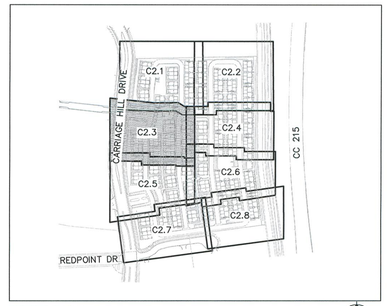

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
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18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
20. CONSTRUCT ACCESSIBLE RAMP CASE 1 PER DETAIL 11 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

10/13/2019
JODY WALKER BELSICK, PE No. 15107 — DATE

CLV#:

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No.	REVISIONS	DATE	BY

Kimley»Horn
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PHONE: 702-692-3000
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PROFESSIONAL ENGINEER – STATE OF NEVADA – JODY WALKER BELSICK – CIVIL – No. 15107 – 10/15/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
3 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

7 OF 46 SHEETS
C2.3

Plotted By:Kimberly Vikoi Sheet Set:Kho Layout:C2.3 October 13, 2019 02:00:42pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\
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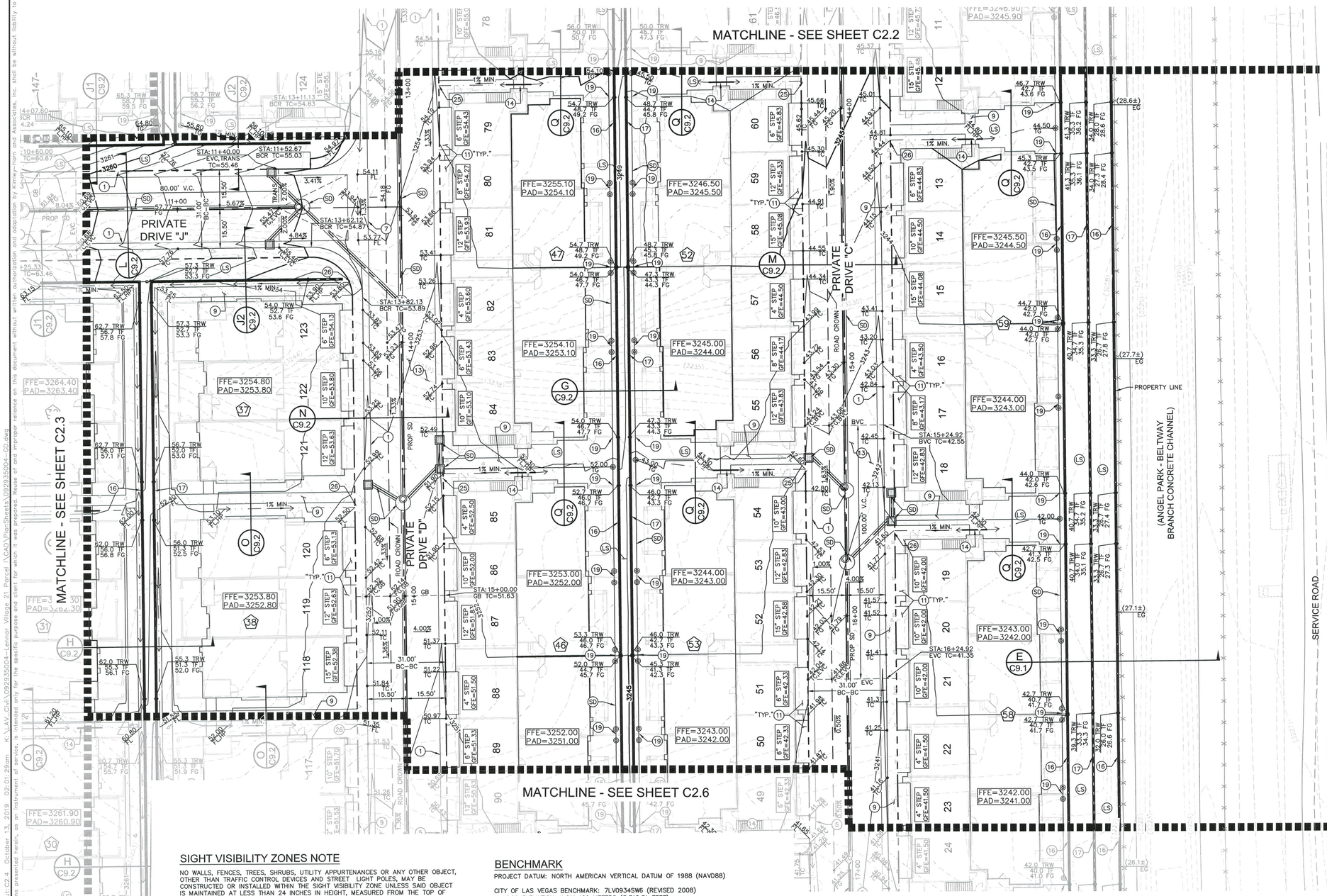

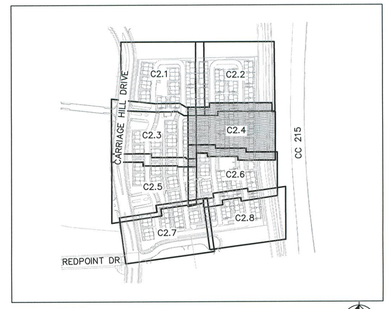

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
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(SD) REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

SIGHT VISIBILITY ZONES NOTE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

BENCHMARK

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

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No.	REVISIONS	DATE	BY

Kimley»Horn

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PROFESSIONAL ENGINEER — STATE OF NEVADA — JODY WALKER BELSICK — No. 15107 — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
4 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

8 OF 46 SHEETS
C2.4

Plotted By:Kintner, Mikol Sheet Set:Kha Layout:C2.4 October 13, 2019 02:01:29pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg
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EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

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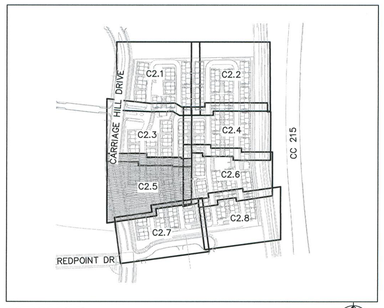
LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION



KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

MATCHLINE - SEE SHEET C2.3

MATCHLINE - SEE SHEET C2.6

MATCHLINE - SEE SHEET C2.7

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
4. CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.
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8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
10. CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
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25. INSTALL ROLL CURB DRAIN OUTLET
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BENCHMARK

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

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JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

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No.	REVISIONS	DATE	BY

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PHONE: 702-589-3507
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STATE OF NEVADA — JODY WALKER BELSICK — No. 15107 — CIVIL — PROFESSIONAL ENGINEER — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
5 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

9 OF 46 SHEETS

C2.5

Plotted By:Kristen Wiley Sheet Set:Kha Layout:C2.5 October 13, 2019 02:02:18pm K:\LAV-Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg
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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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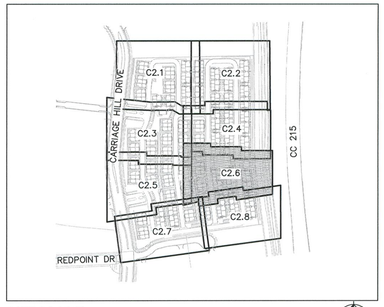
14. INSTALL 4" PVC UNDER SIDEWALK
15. CONSTRUCT STAIR RISER PER 2018 IBC, PROVIDE SUMMERLIN COMPLIANT HANDRAIL FOR 3 OR MORE STEPS.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN



KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

MATCHLINE - SEE SHEET C2.4

MATCHLINE - SEE SHEET C2.5

MATCHLINE - SEE SHEET C2.8

MATCHLINE - SEE SHEET C2.7

PRIVATE DRIVE "D"

PRIVATE DRIVE "C"

PROPERTY LINE

(ANGEL PARK - BELTWAY BRANCH CONCRETE CHANNEL)

(EX. 50' PUBLIC DRAINAGE ESMT PER 2000816: 0000525)

(EX. 10' PUBLIC SWG ESMT PER DR:

EARTHWORK QUANTITIES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS–XXX

10/13/2019

JODY WALKER BELSICK, PE No. 15107 — DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 (NEVADA AND ARIZONA SYSTEM OF ROAD/UTILITY)

Call before you Dig AVOID HITTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

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Plotted By:Kintner, Mikal Sheet Set:King Layout:C2.6 October 13, 2019 02:03:35pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702.589.3500
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER STATE OF NEVADA JODY WALKER BELSICK 15107 7/31/20 CIVIL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
6 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

10 OF 46 SHEETS
C2.6

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
10. CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
21. CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
22. CONSTRUCT ACCESSIBLE RAMP CASE 3 PER DETAIL 13 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
24. OUTLET 6" STORM DRAIN THROUGH WALL AND SPLASH TO GRADE
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
- (LS) LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
- (SD) REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN
- (WA) VILLAGE WALL BY MASTER DEVELOPER (PLAN/PERMIT BY OTHERS)

SIGHT VISIBILITY ZONES NOTE

NO WALLS, FENCES, TREES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF CURB.

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

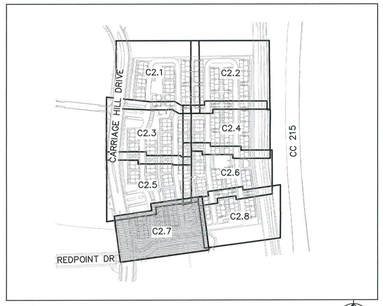
CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

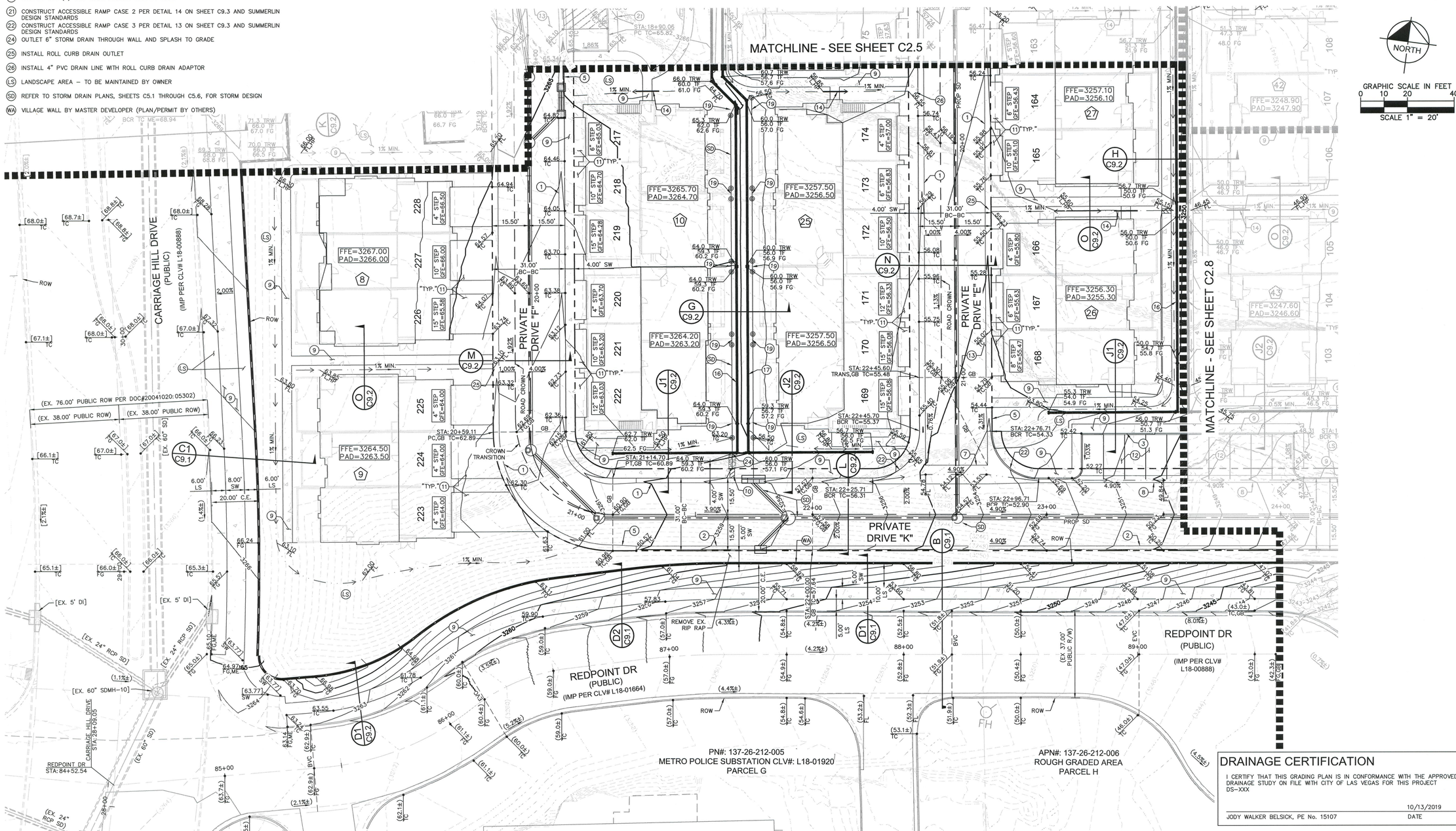
FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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



KEY MAP
NTS



NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS–XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-498-8040
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER – STATE OF NEVADA – 20079 – JODY WALKER BELSICK – 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
7 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

11 OF 46 SHEETS
C2.7

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C2.7 October 13, 2019 02:04:09pm K:\LAV_civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg
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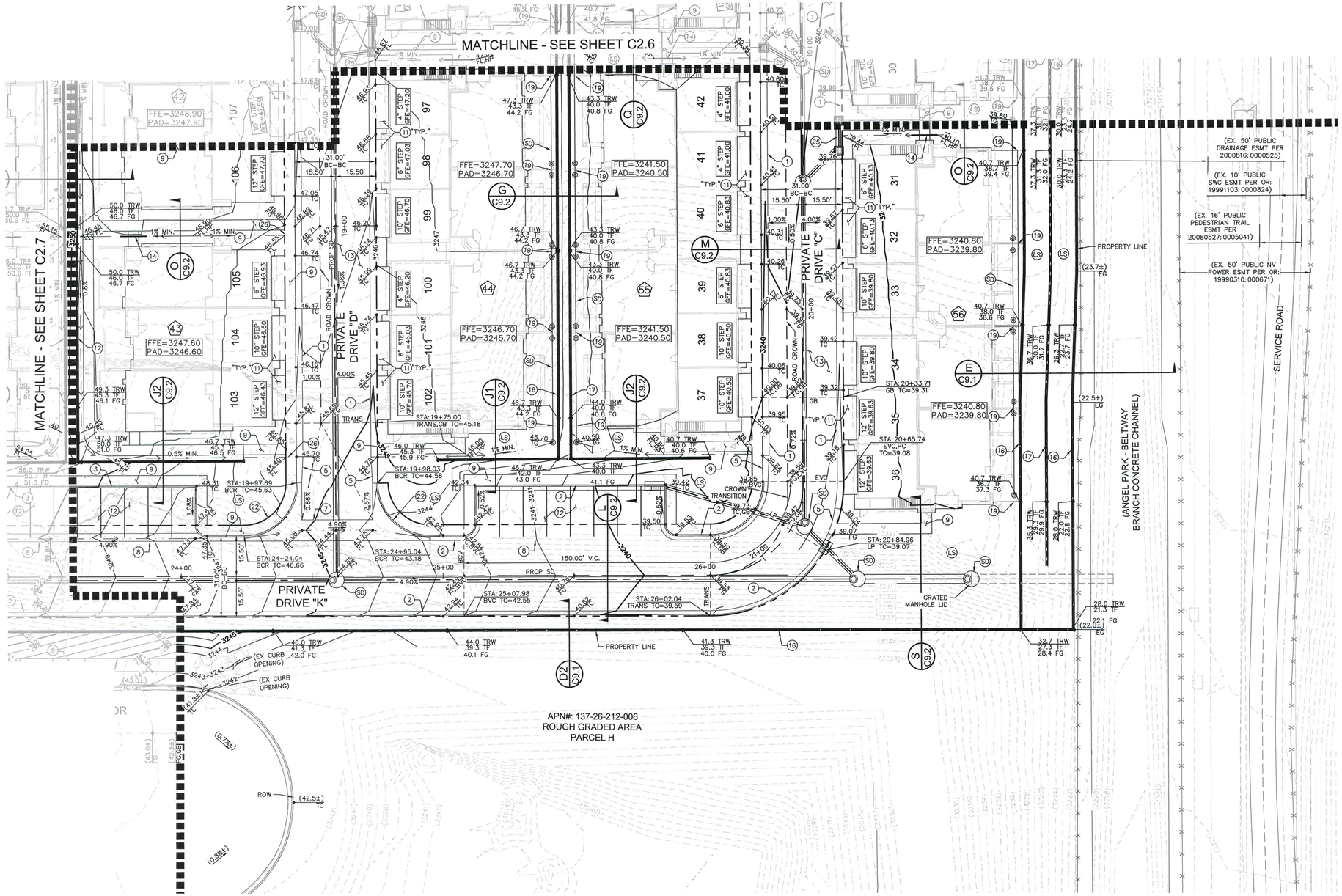

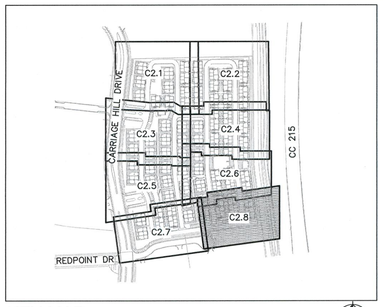

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
6. CONSTRUCT 2' WIDE CURB CUT PER DETAIL 8 ON SHEET C9.3
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
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19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
22. CONSTRUCT ACCESSIBLE RAMP CASE 3 PER DETAIL 13 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

SIGHT VISIBILITY ZONES NOTE

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FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

No.	REVISIONS	DATE	BY

Kimley»Horn

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PHONE: 702-862-3600
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STATE OF NEVADA — ENGINEER — JODY WALKER BELSICK — No. 15107 — PROFESSIONAL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
8 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

12 OF 46 SHEETS

C2.8

Plotted By:Kinner, Mikal Sheet Set:Kha Layout:C2.8 October 13, 2019 02:04:48pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg
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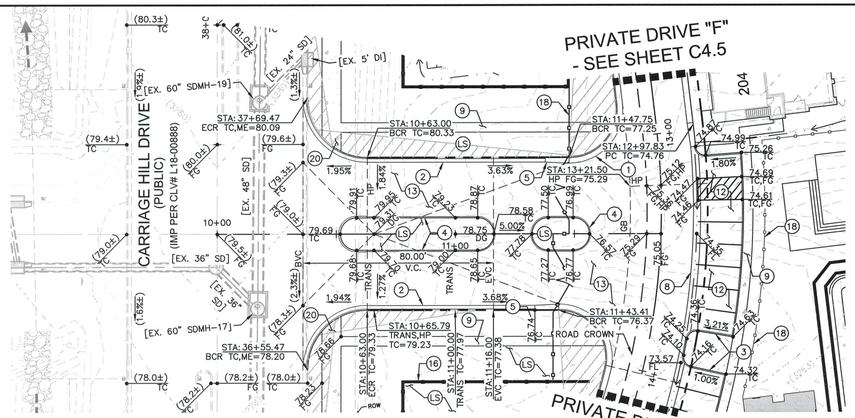
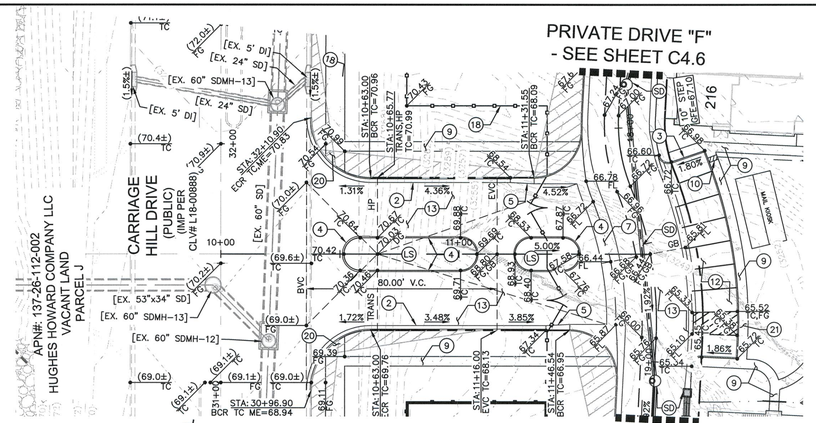


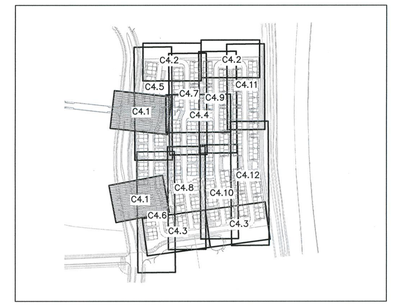
PRIVATE DRIVE "A" - PLAN VIEW

1" = 30'



PRIVATE DRIVE "B" - PLAN VIEW

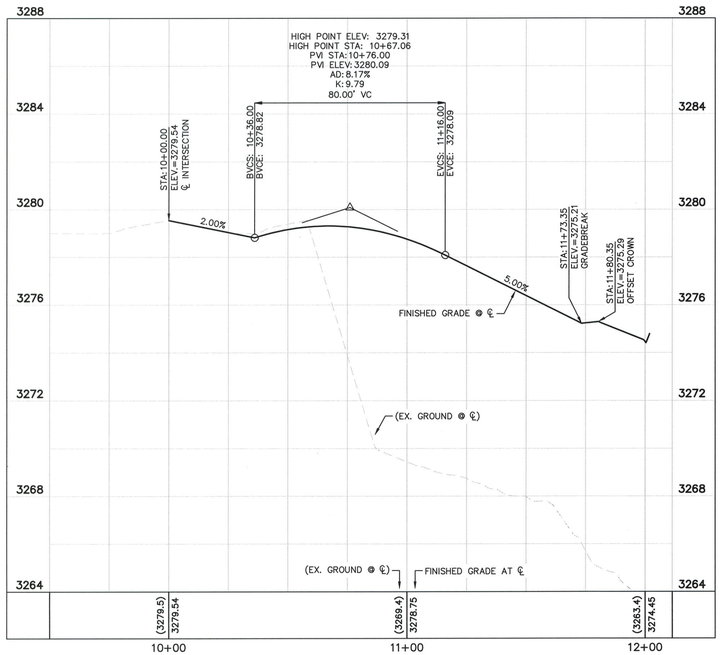
1" = 30'



KEYMAP

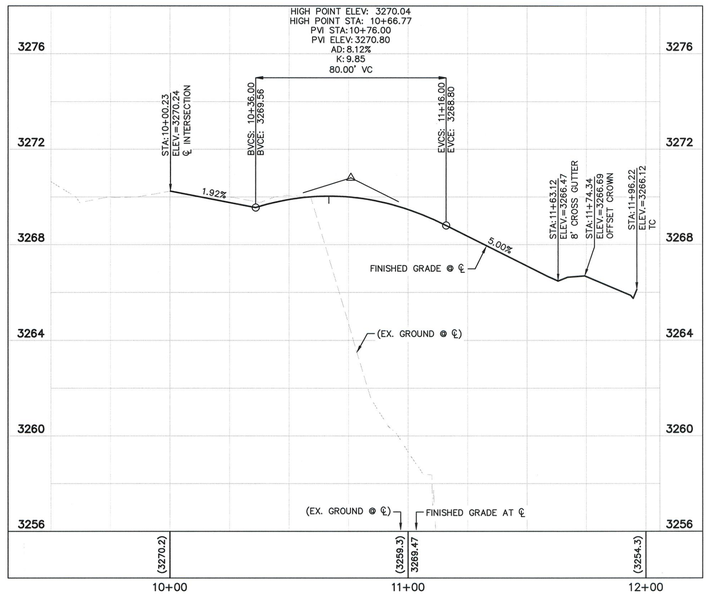
NTS

GRAPHIC SCALE IN FEET
0 15 30 60



PRIVATE DRIVE "A" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'



PRIVATE DRIVE "B" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
4. CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
10. CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
20. CONSTRUCT ACCESSIBLE RAMP CASE 1 PER DETAIL 11 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
21. CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
- (LS) LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
- (SD) REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

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

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-589-3500
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER STATE OF NEVADA JOHN WALKER 12570 CIVIL — 10/15/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

A & B DRIVE PLAN & PROFILE

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

24 OF 46 SHEETS

C4.1

Plotted By:Kintner, Mikol Sheet Set:Kha Layout:C4.1 October 13, 2019 02:16:30pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\
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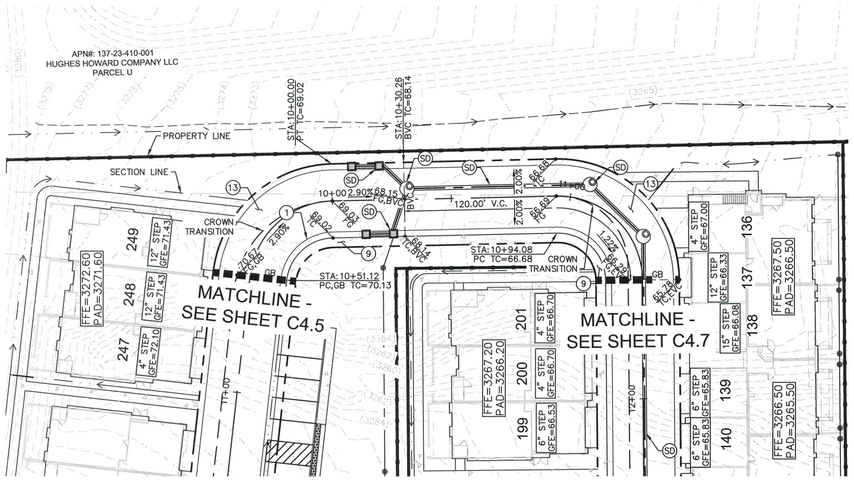
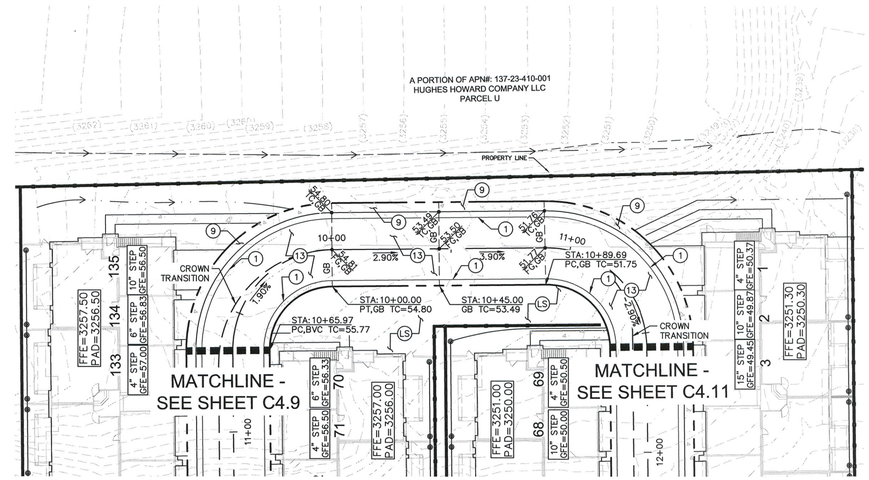


PRIVATE DRIVE "H" - PLAN VIEW

1" = 30'

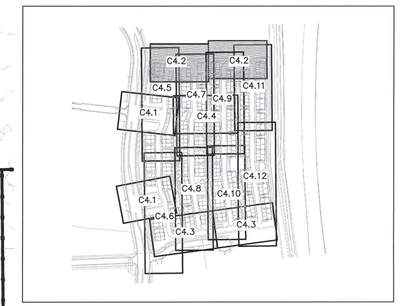
NORTH



PRIVATE DRIVE "G" - PLAN VIEW

1" = 30'

NORTH



KEYMAP

NTS

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

PRIVATE DRIVE "H" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'

PRIVATE DRIVE "G" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV09.34SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

No.	REVISIONS	DATE	BY

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-852-3600
WWW.KIMLEY-HORN.COM

REGISTERED PROFESSIONAL ENGINEER - STATE OF NEVADA - JOY WALKER OLSICK - 17078 - CIVIL - 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

H & G DRIVE PLAN & PROFILE

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

25 OF 46 SHEETS

C4.2

Plotted By:Kinter, Mikol Sheet Set:Kha Layout:C4.2 October 13, 2019 02:17:37am K:\LAV_Civil\092935004-Lennar Village 21 Parcel 1\CAD\PlanSheets\092935004-PP-EW.dwg
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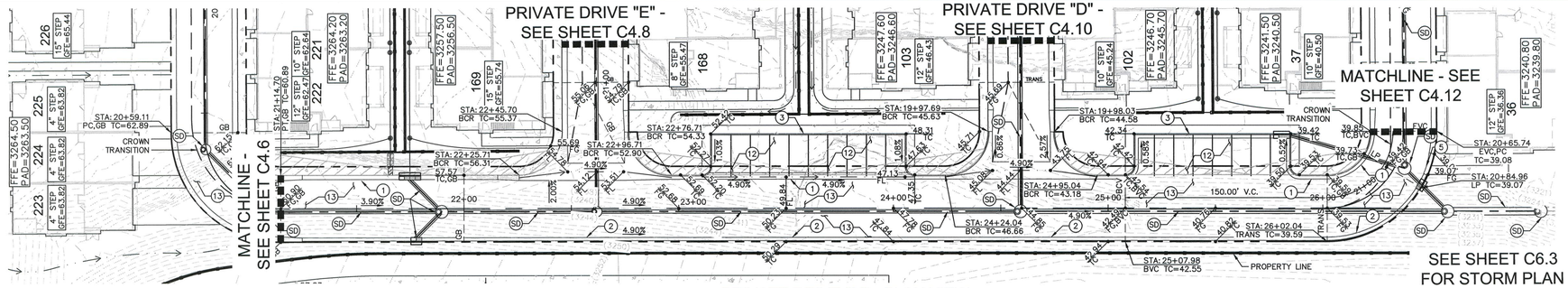
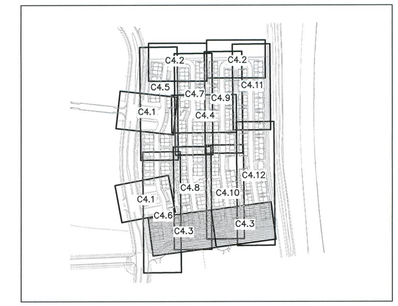


PRIVATE DRIVE "M" - PLAN VIEW

1" = 30'



KEYMAP

NTS

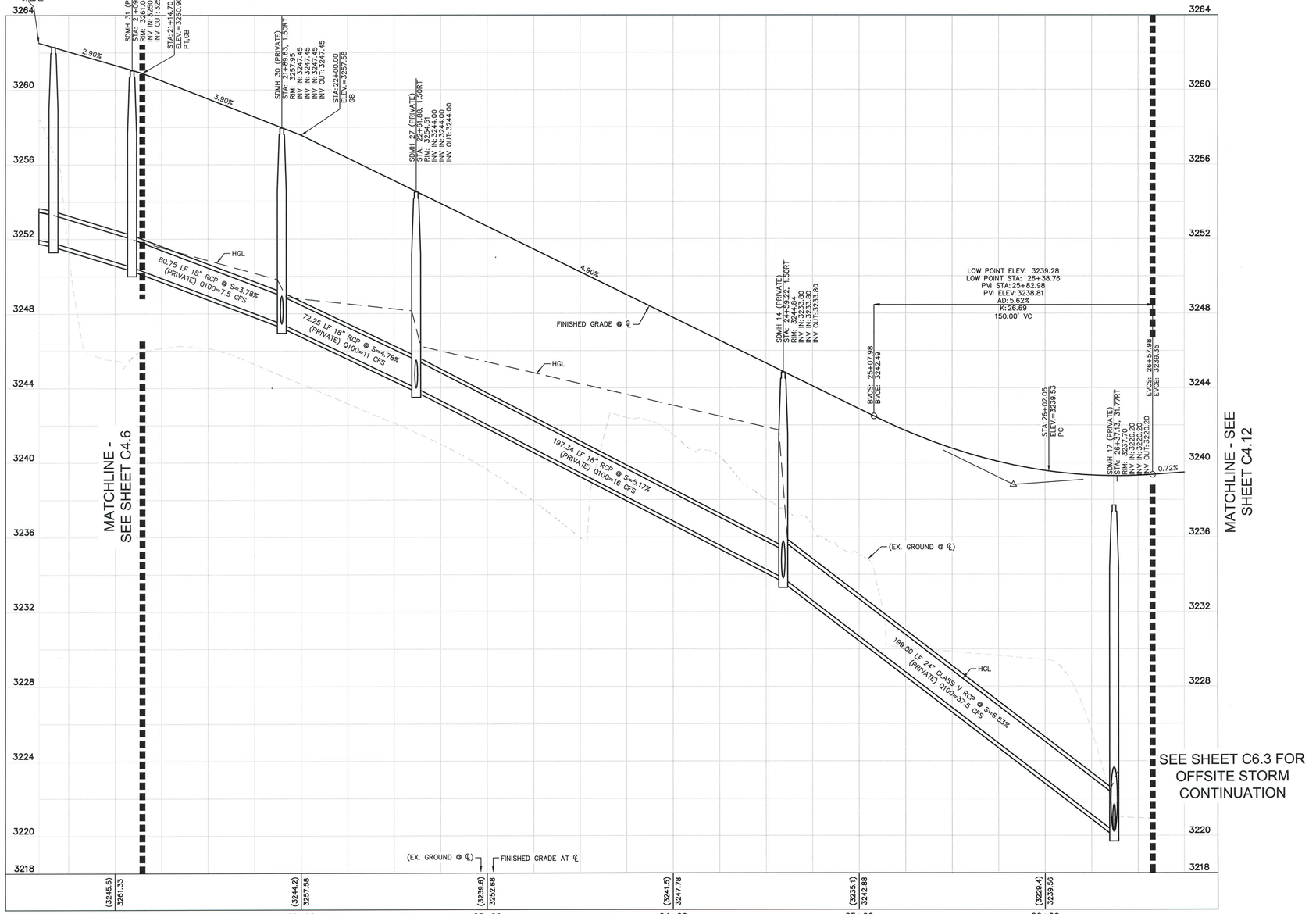
GRAPHIC SCALE IN FEET

0 15 30 60

NORTH

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
- SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN



PRIVATE DRIVE "M" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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

CLV#:

No.	REVISIONS	DATE	BY

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-852-3600
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER STATE OF NEVADA JEFFREY WALKER BELSICK 17576 CIVIL 10/13/2019

KHA PROJECT 092935004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

M DRIVE PLAN & PROFILE

26 OF 46 SHEETS

C4.3

Plotted By:Kinner, Mikol Sheet Set:Kha Layout:C4.3 October 13, 2019 02:17:54pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-PP-FW.dwg
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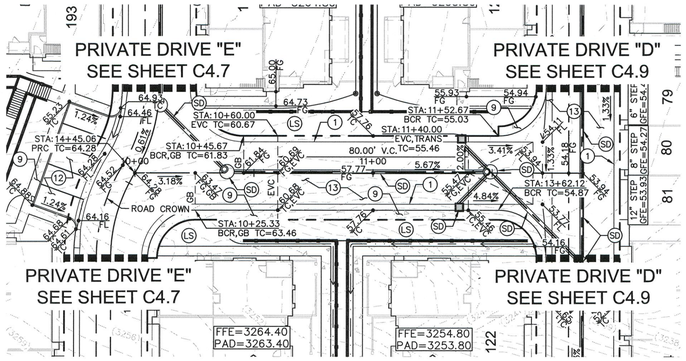
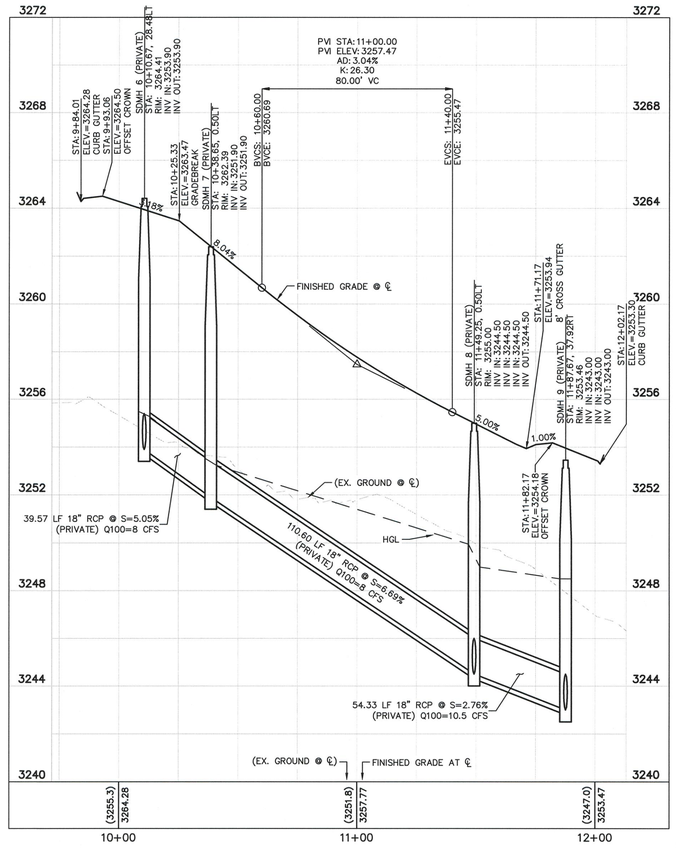


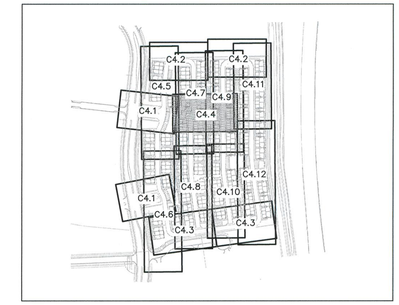
PRIVATE DRIVE "J" - PLAN VIEW

1" = 30'



PRIVATE DRIVE "J" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

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GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — No. 15101 — PROFESSIONAL
JODY WALKER BELSICK
12/31/20
CIVIL
10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

J DRIVE PLAN & PROFILE

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

27 OF 46 SHEETS
C4.4

FAST Call before you UnderGround 1-702-432-5300 (FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION)

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

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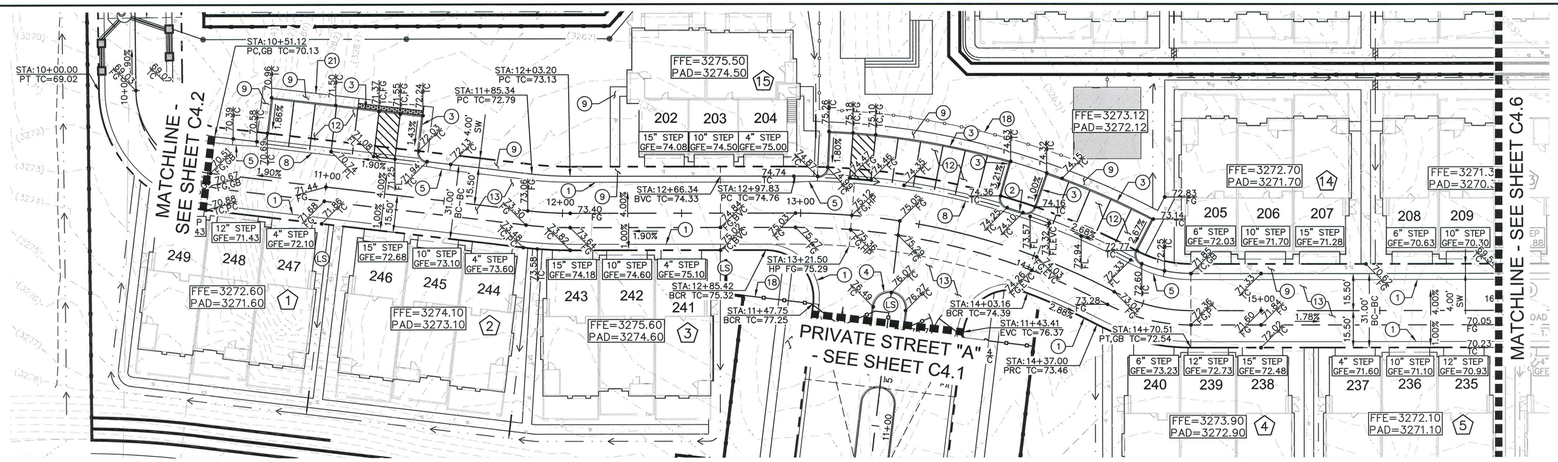
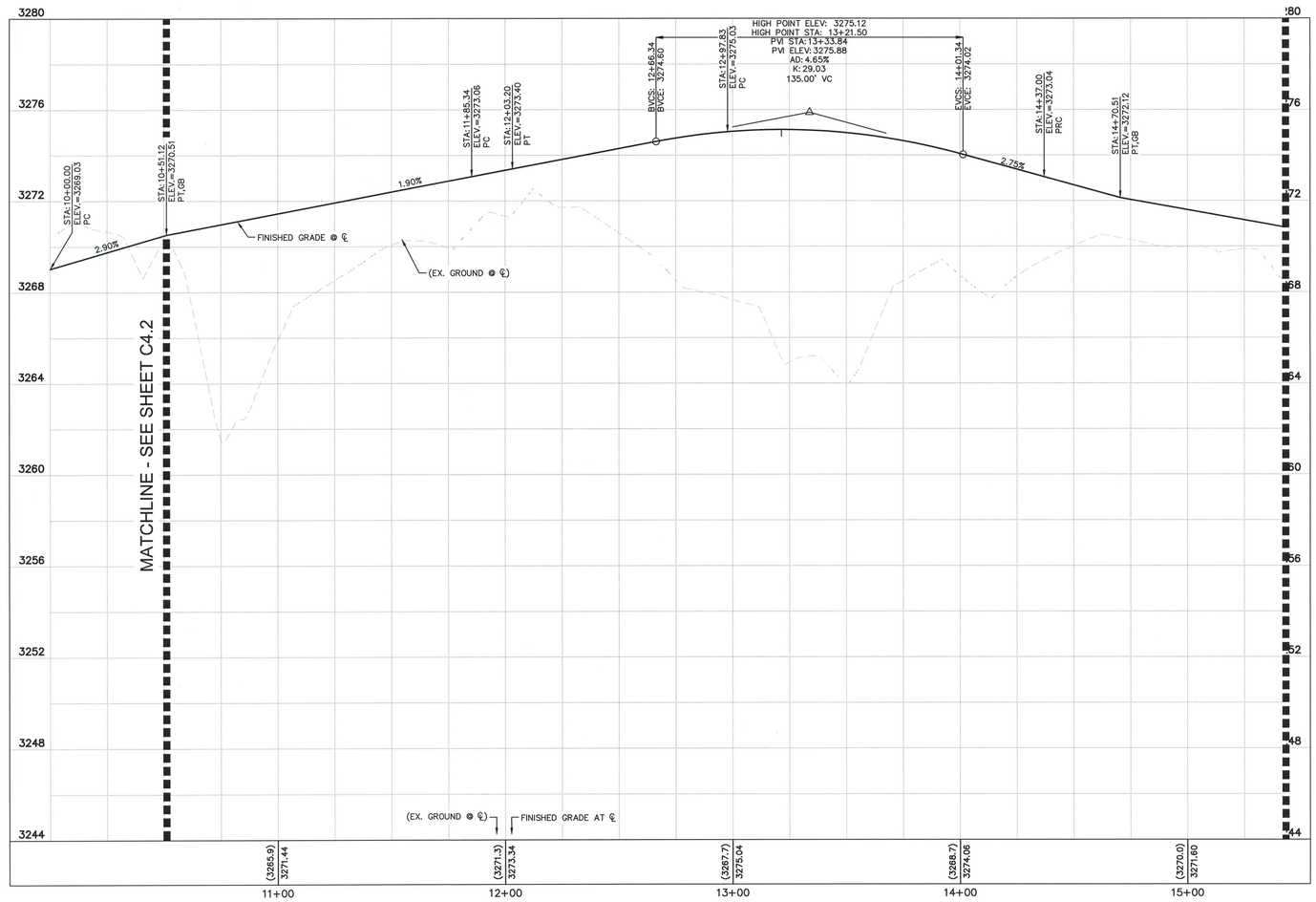


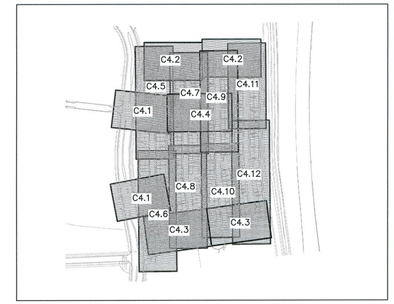
PRIVATE DRIVE "F" - PLAN VIEW - STA: 10+00 - 16+00

1" = 30'



PRIVATE DRIVE "F" - PROFILE VIEW - STA: 10+00 - 16+00

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
4. CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
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9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
21. CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
S0. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

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REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD, SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-498-8500
WWW.KIMLEY-HORN.COM

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

F DRIVE PLAN & PROFILE STA 10+20 - 16+00

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

28 OF 46 SHEETS

C4.5

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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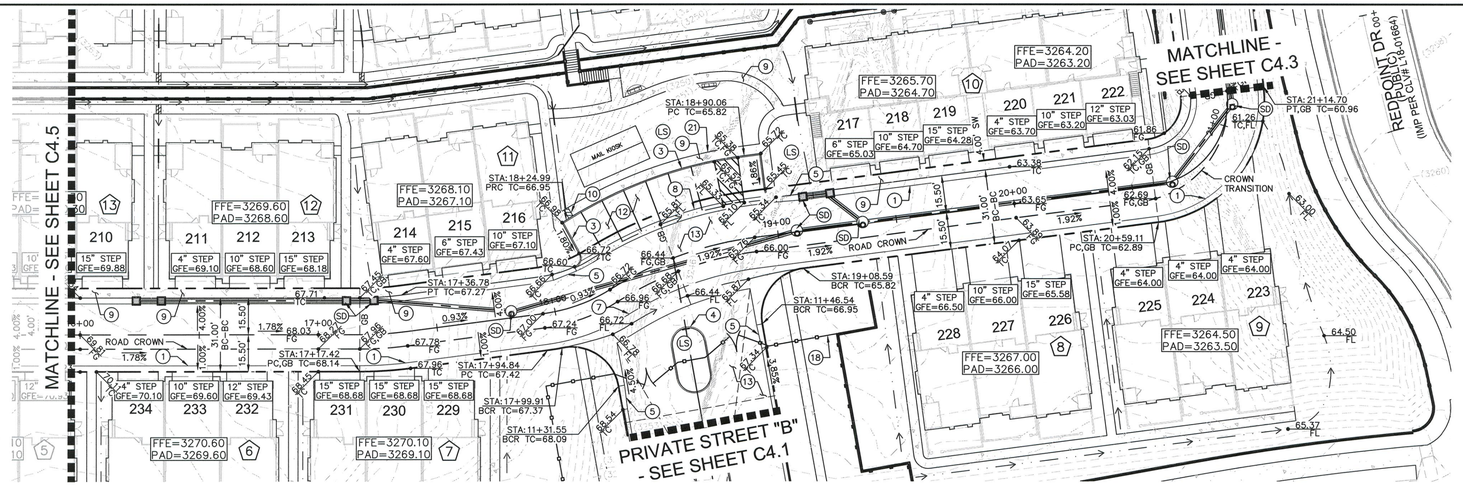
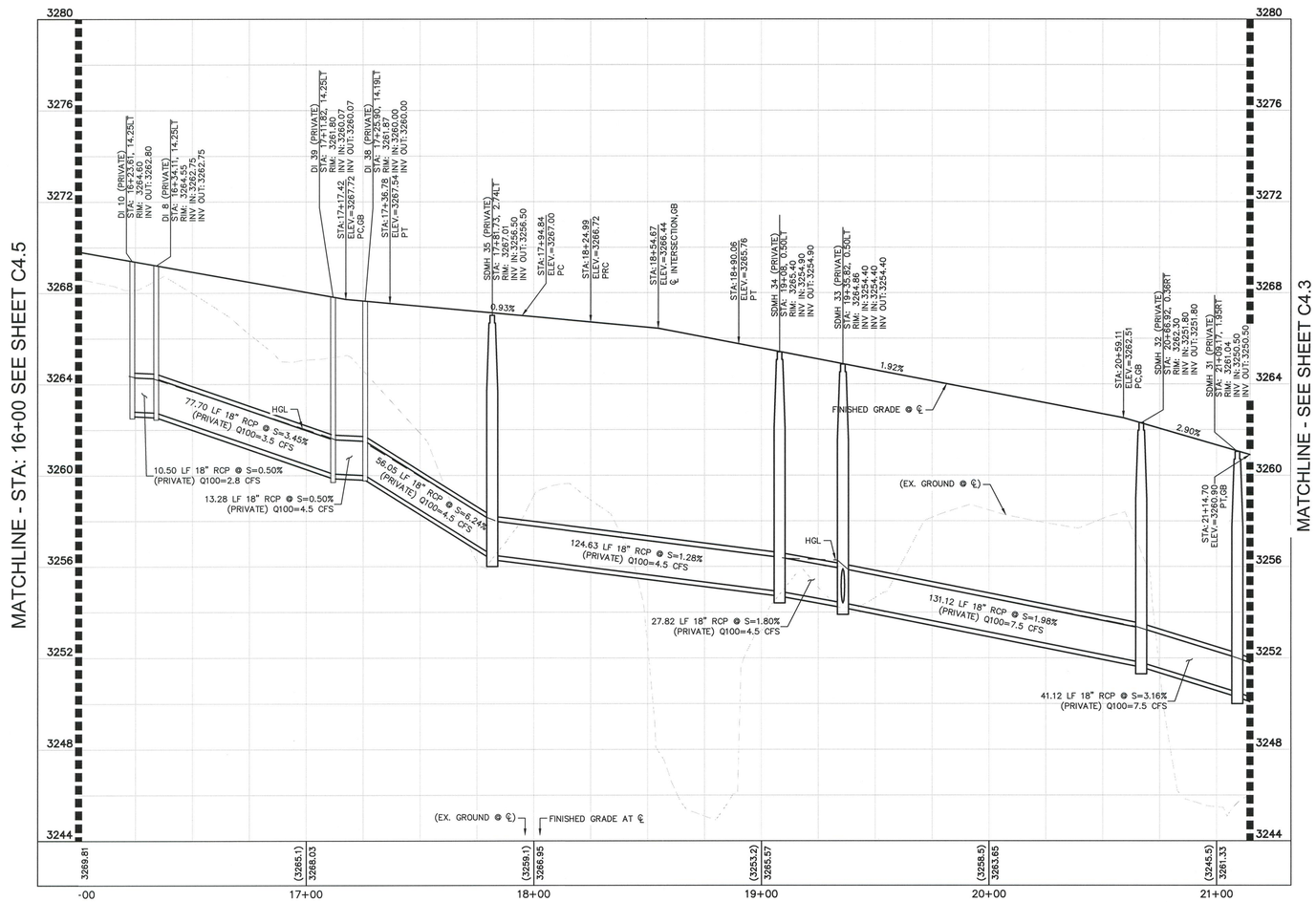


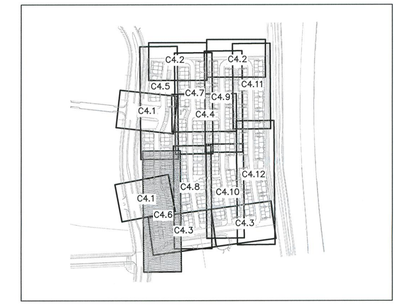
PRIVATE DRIVE "F" - PLAN VIEW - STA: 16+00 - 21+15

1" = 30'



PRIVATE DRIVE "F" - PROFILE VIEW - STA: 16+00 - 21+15

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
3. CONSTRUCT 6" CURB PER DETAIL
4. CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.
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7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
10. CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
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ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

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REPORT DATED: JULY 1, 2019
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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

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CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER - STATE OF NEVADA - JODY WALKER BELSICK - 17170 - CIVIL - 10/13/2019

KHA PROJECT 092935004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

F DRIVE PLAN & PROFILE STA 10+00 - 16+00

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

29 OF 46 SHEETS

C4.6

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

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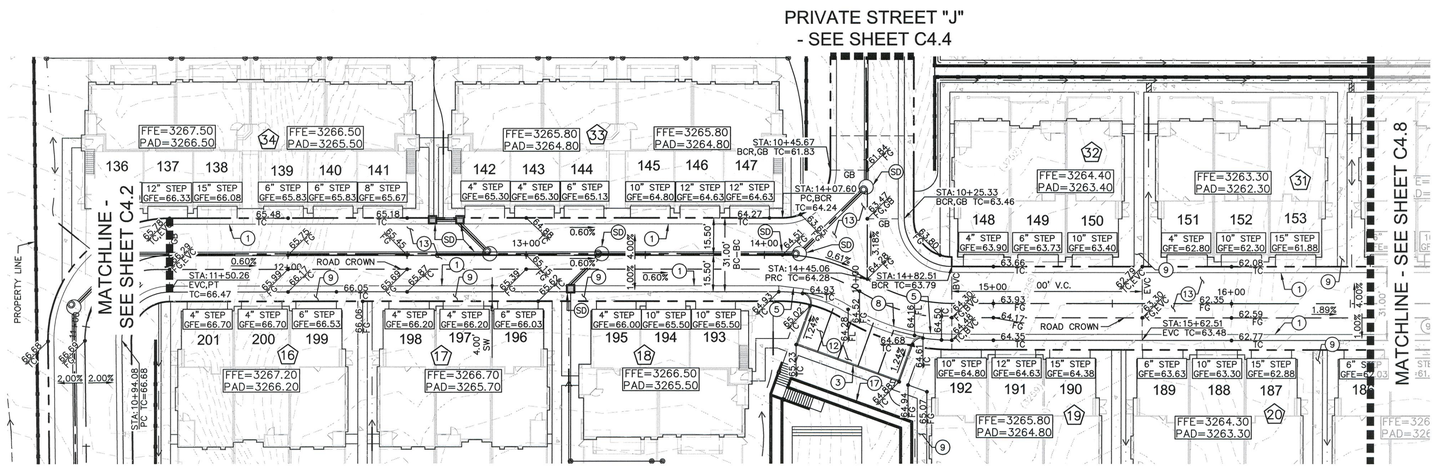
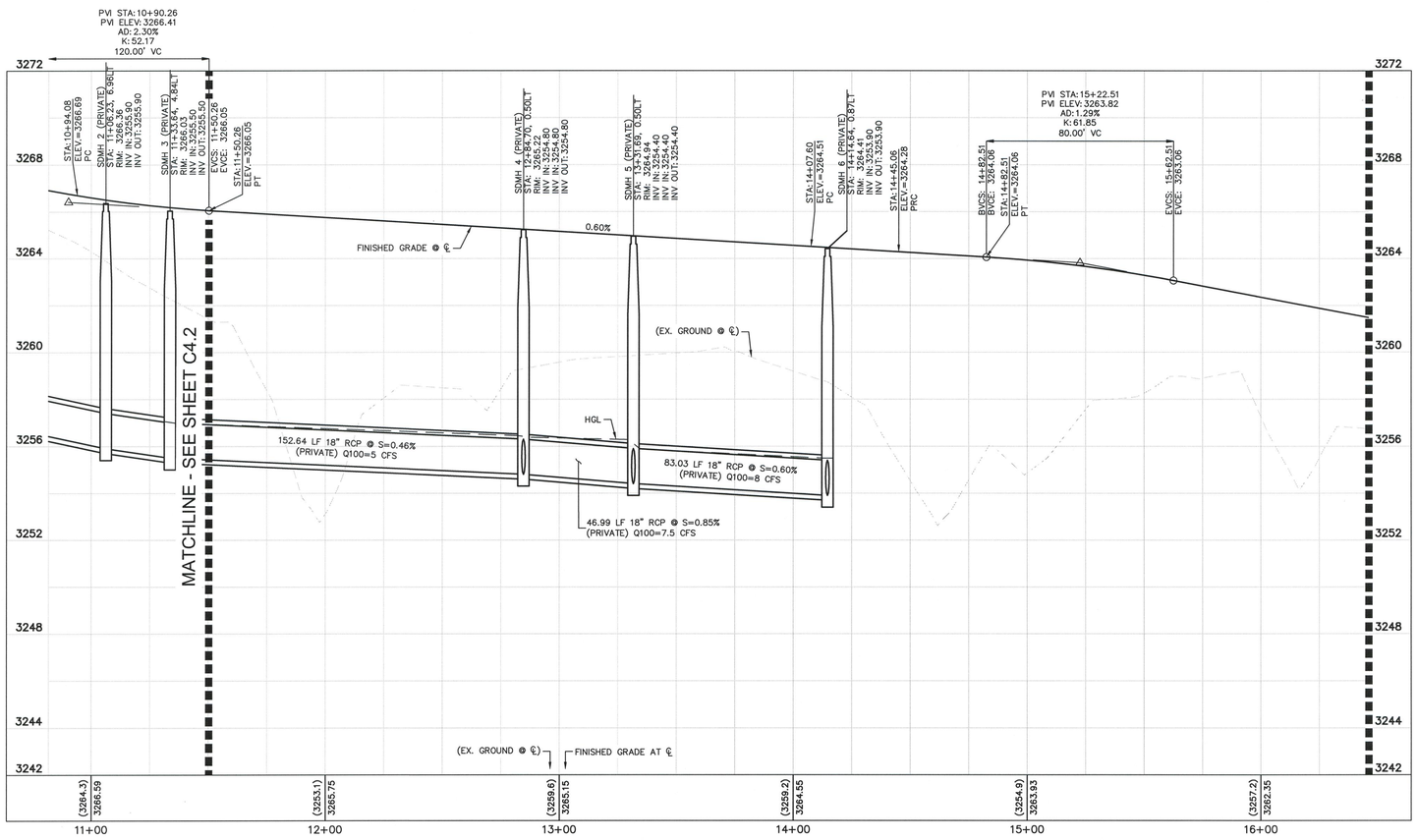


KEYMAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

PRIVATE DRIVE "E" - PLAN VIEW - STA: 10+81 - 16+50
1" = 30'



PRIVATE DRIVE "E" - PROFILE VIEW - STA: 10+81 - 16+50
HORIZ: 1" = 30'
VERT: 1" = 3'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
3. CONSTRUCT 6" CURB PER DETAIL
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE
ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE
ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION
SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV09345W6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS
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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM
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STATE OF NEVADA — JOY WALKER — 12/31/20 — CIVIL — PROFESSIONAL ENGINEER — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

E DRIVE PLAN & PROFILE SHEET STA 10+81 - 16+50

HIGHLINE VILLAGE 21 - PARCEL I
PREPARED FOR LENNAR HOMES
CITY OF LAS VEGAS NEVADA

30 OF 46 SHEETS
C4.7

FAST Call before you UnderGround 1-702-432-5300 PRIORITY AND ARTERIAL SYSTEM OF TRANSPORTATION

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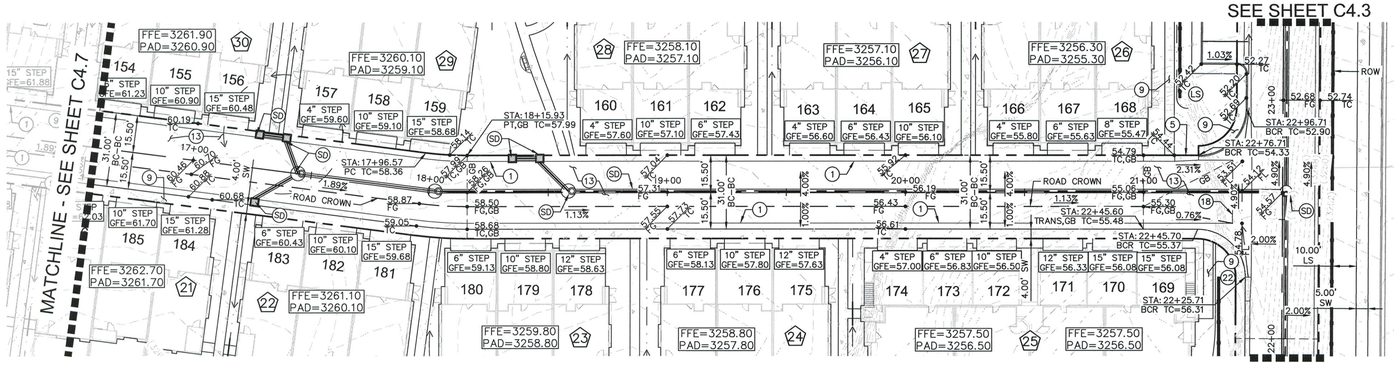
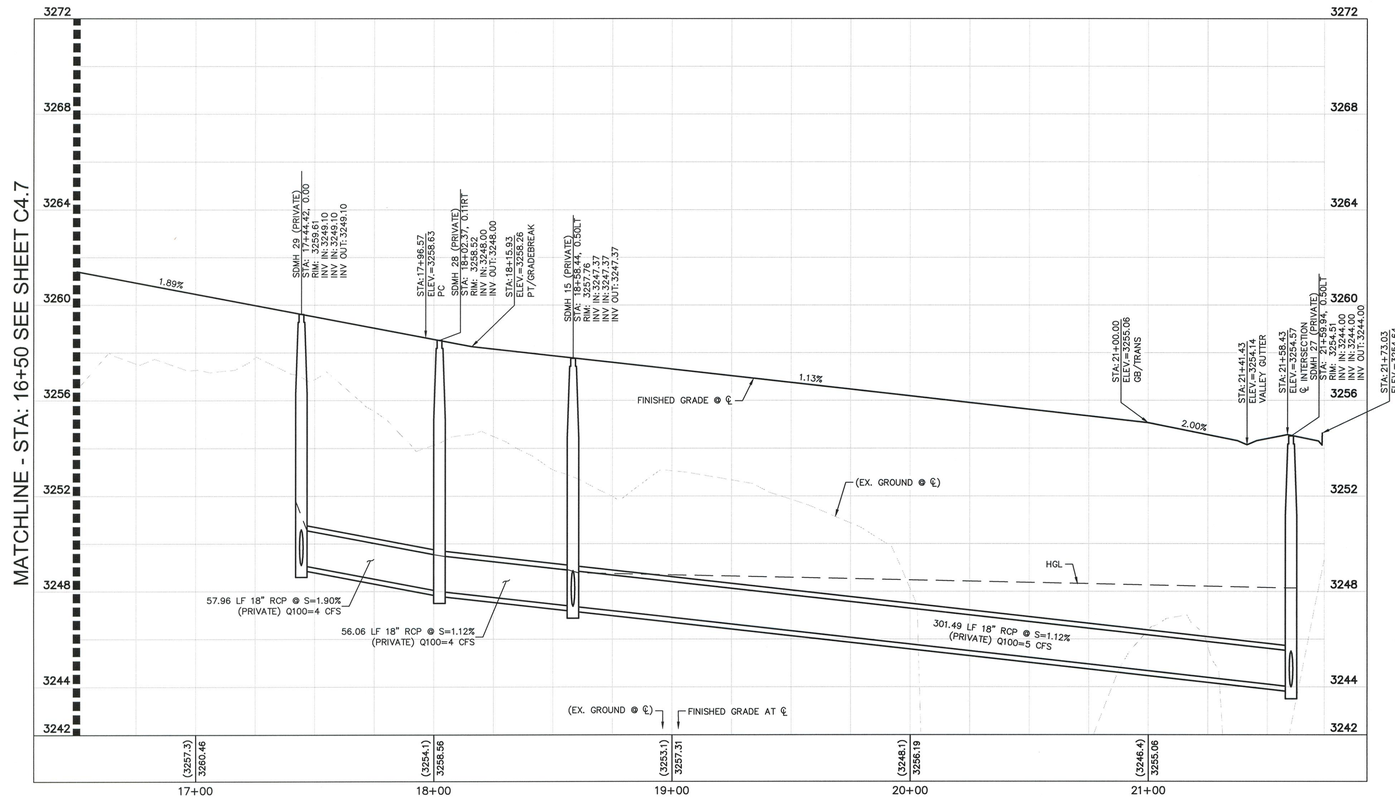


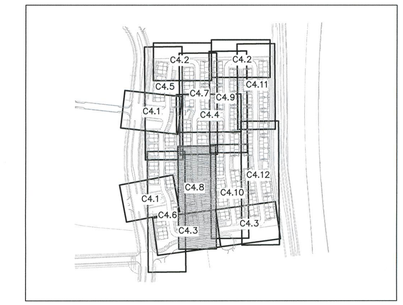
PRIVATE DRIVE "E" - PLAN VIEW - STA: 16+50 - 21+75

1" = 30'



PRIVATE DRIVE "E" - PROFILE VIEW - STA: 16+50 - 21+75

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
22. CONSTRUCT ACCESSIBLE RAMP CASE 3 PER DETAIL 13 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
S0. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS, POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV09.34SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
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KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

E DRIVE PLAN & PROFILE STA 16+50 - 21+73

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

31 OF 46 SHEETS

C4.8

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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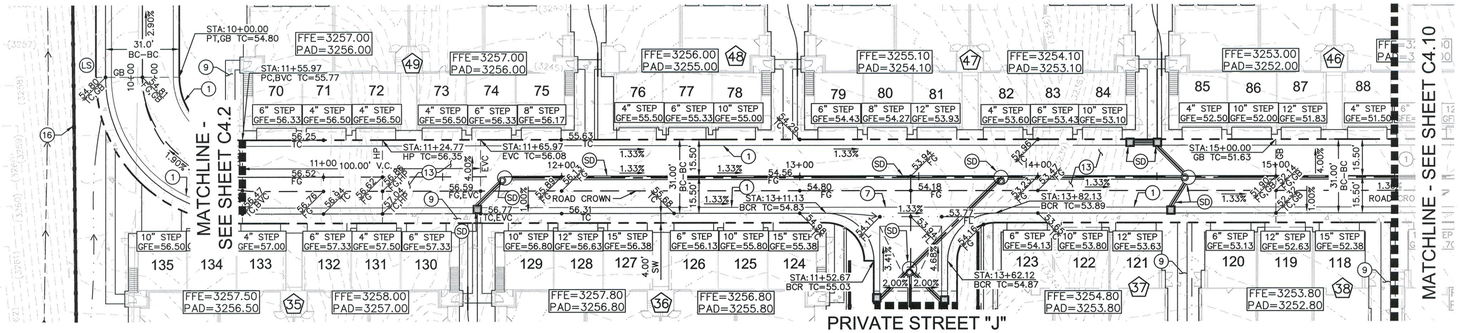
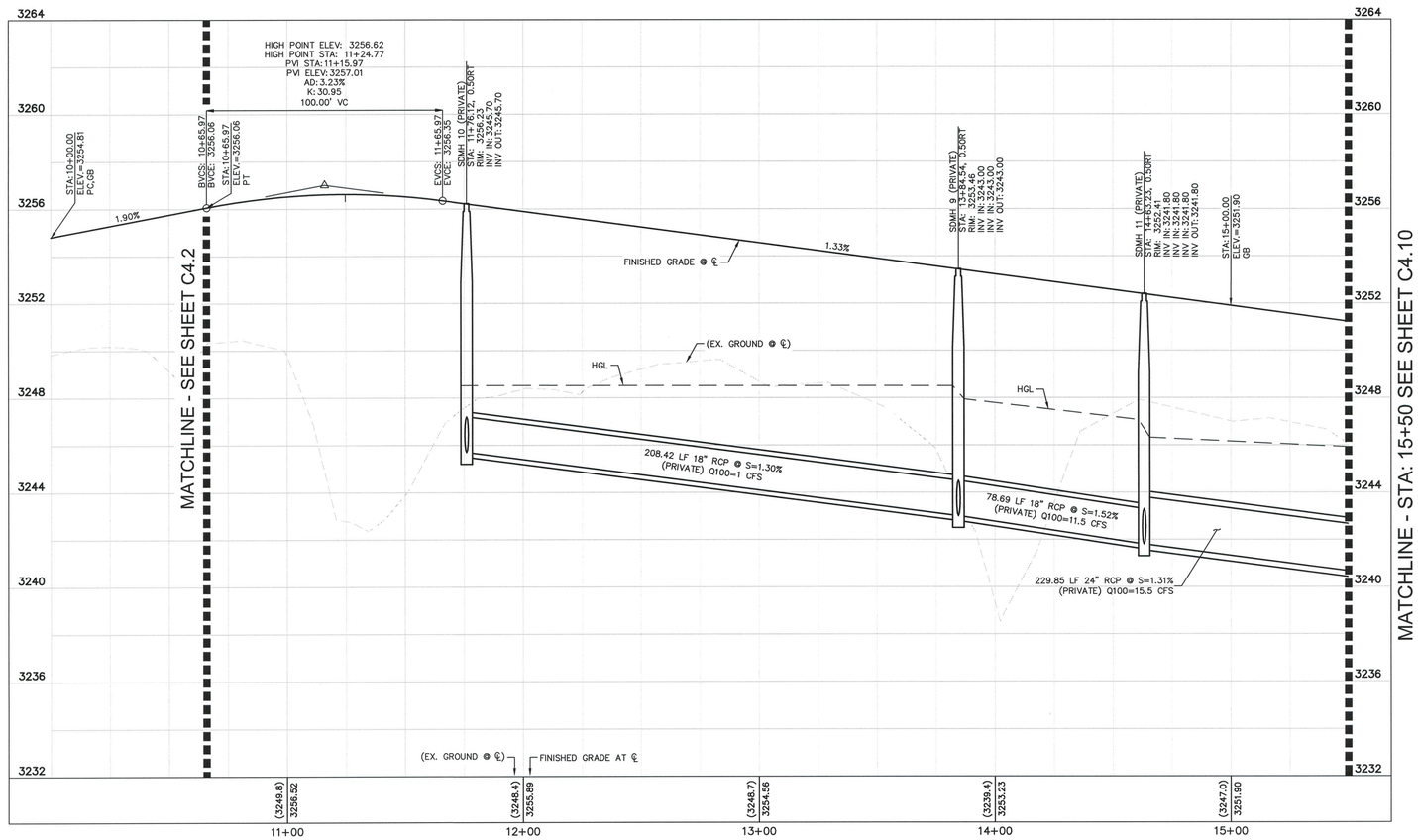


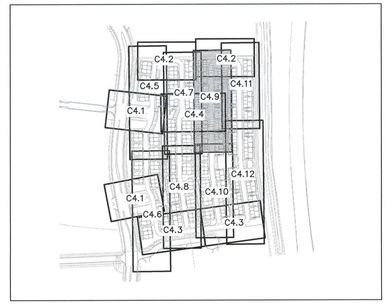
PRIVATE DRIVE "D" - PLAN VIEW - STA: 10+00 - 15+50

1" = 30'



PRIVATE DRIVE "D" - PROFILE VIEW - STA: 10+00 - 15+50

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

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REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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BASIS OF BEARINGS

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn

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PHONE: 702-852-3600
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PROFESSIONAL ENGINEER-STATE OF NEVADA
JODY WALKER
No. 15151
PROFESSIONAL
10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

D DRIVE PLAN & PROFILE STA 10+00 - 15+50

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

32 OF 46 SHEETS

C4.9

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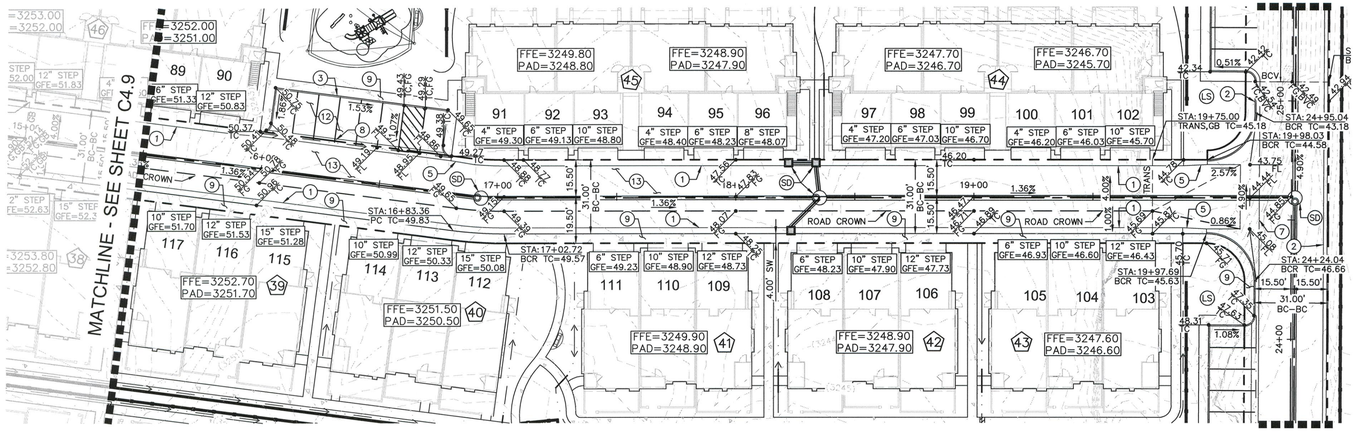
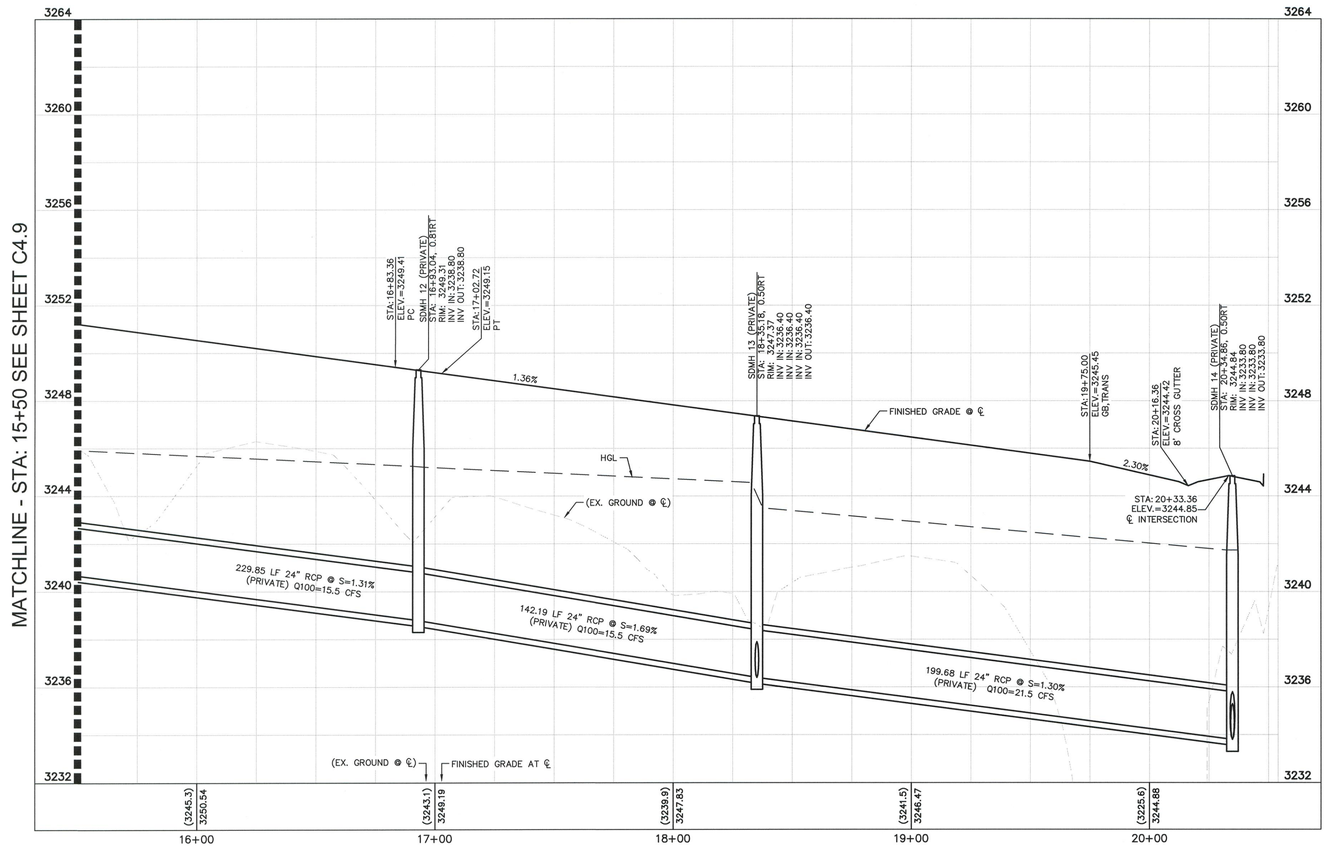


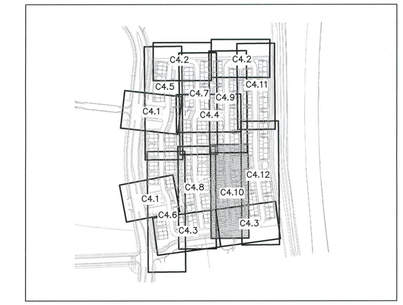
PRIVATE DRIVE "D" - PLAN VIEW - STA: 15+50 - 20+55

1" = 30'



PRIVATE DRIVE "D" - PROFILE VIEW - STA: 15+50 - 20+55

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
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13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

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ENGINEER'S NOTES

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV094SW6 (REVISED 2008)
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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

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

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702–862–3600
WWW.KIMLEY–HORN.COM

STATE OF NEVADA — PROFESSIONAL ENGINEER — 20171 — JOHN WALKER BELSICK — CIVIL — 10/13/2019

KHA PROJECT	092335004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

D DRIVE PLAN & PROFILE
STA 15+50 - 20+54

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

33 OF 46 SHEETS
C4.10

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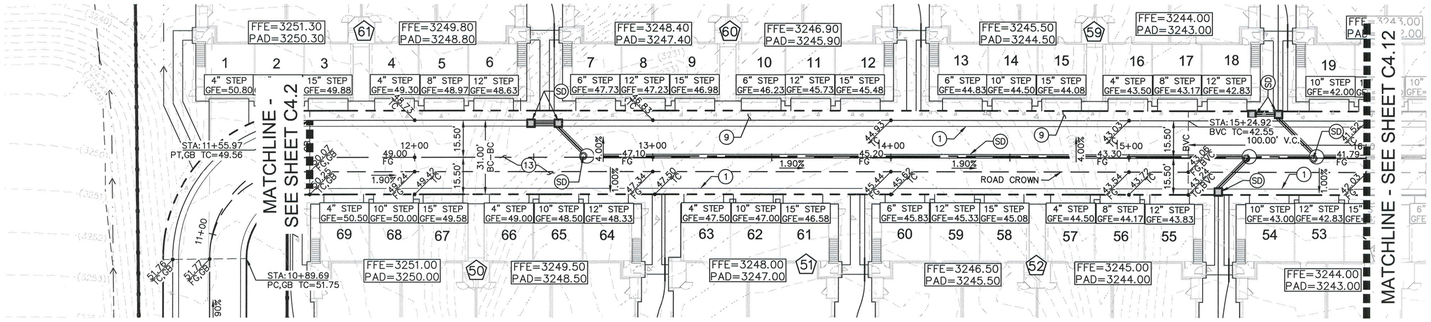
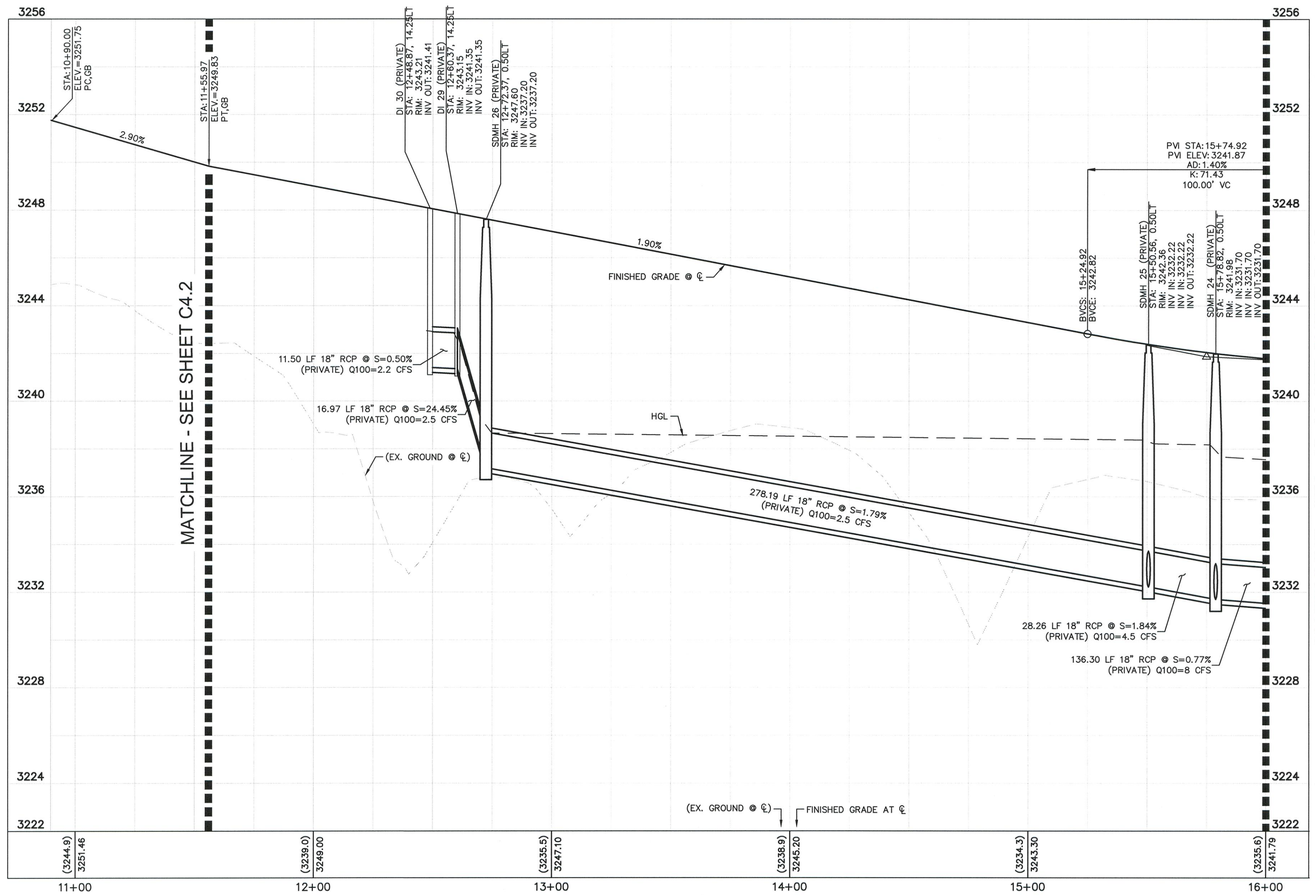


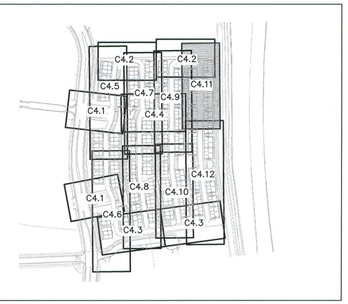
PRIVATE DRIVE "C" - PLAN VIEW - STA: 10+89 - 15+00

1" = 30'



PRIVATE DRIVE "C" - PROFILE VIEW - STA: 10+89 - 15+00

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

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ENGINEER-STATE OF NEVADA
JODY WALKER
RELSICK
CIVIL
No. 15101
PROFESSIONAL
10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

C DRIVE PLAN & PROFILE
STA 10+89 - 75+00

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

34 OF 46 SHEETS
C4.11

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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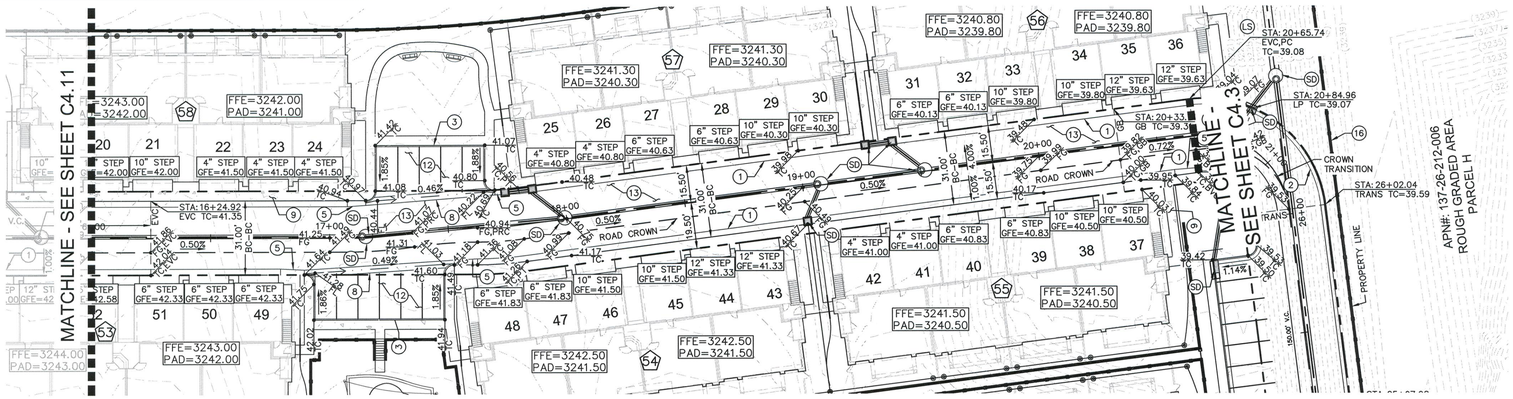
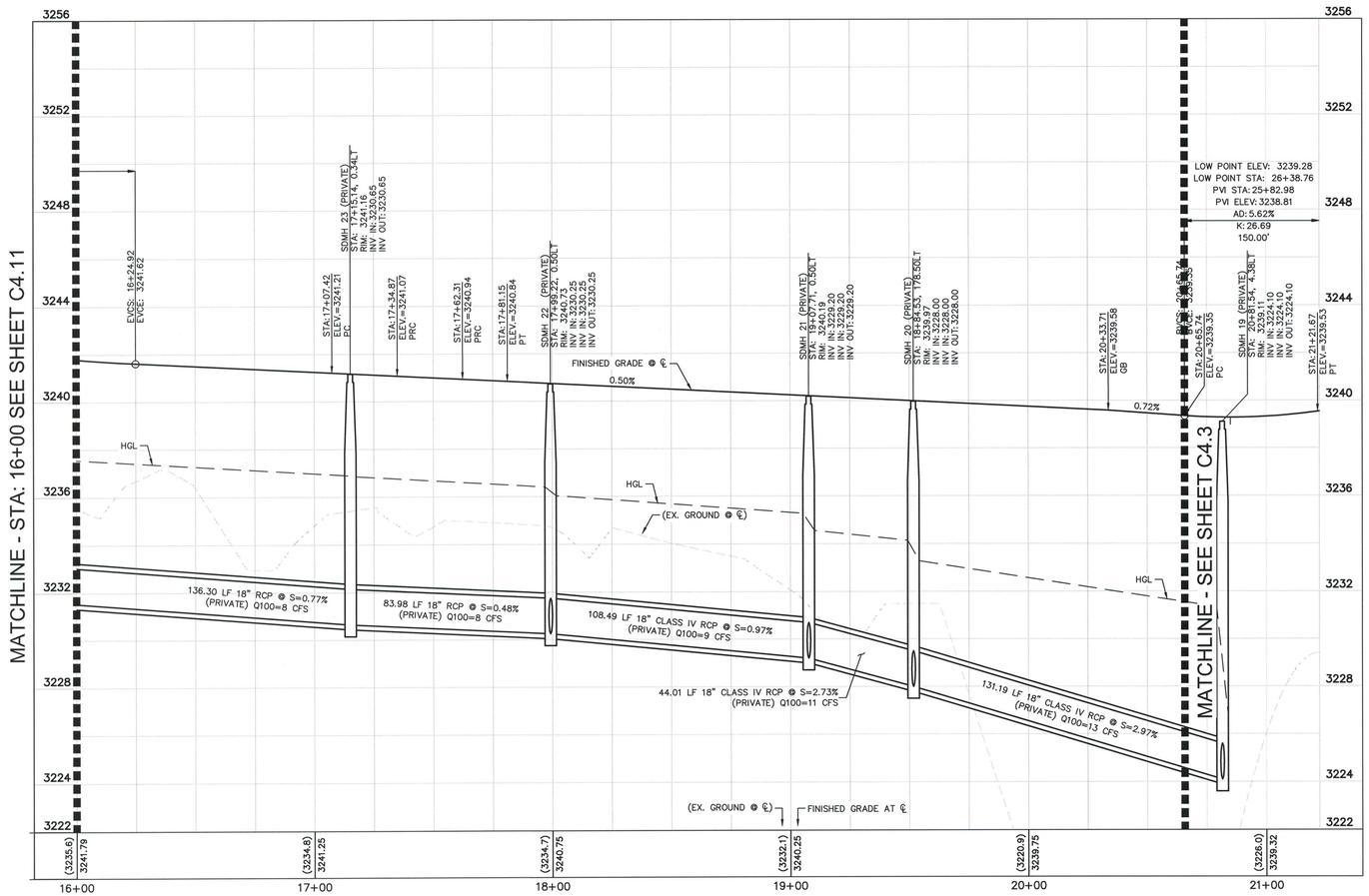


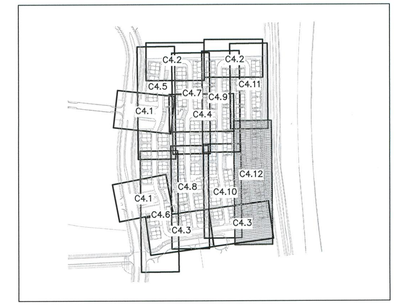
PRIVATE DRIVE "C" - PLAN VIEW

1" = 30'



PRIVATE DRIVE "C" - PROFILE VIEW - STA: 15+00 - 21+22

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

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

No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

ENGINEER-STATE OF NEVADA PROFESSIONAL
JODY WALKER BELSICK
No. 15107
CIVIL
12/31/20
10/13/2019

KHA PROJECT 092335004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

C DRIVE PLAN & PROFILE
STA 15+00 - 21+22

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

35 OF 46 SHEETS
C4.12

Plotted By: Kirstner, Mikol Sheet Set: Kha Layout: C4.12 October 13, 2019 02:22:43pm K:\LAV_Civil\092335004-Lennar Village 21 Parcel I\CAD\PlanSheets\092335004-PP-NS.dwg
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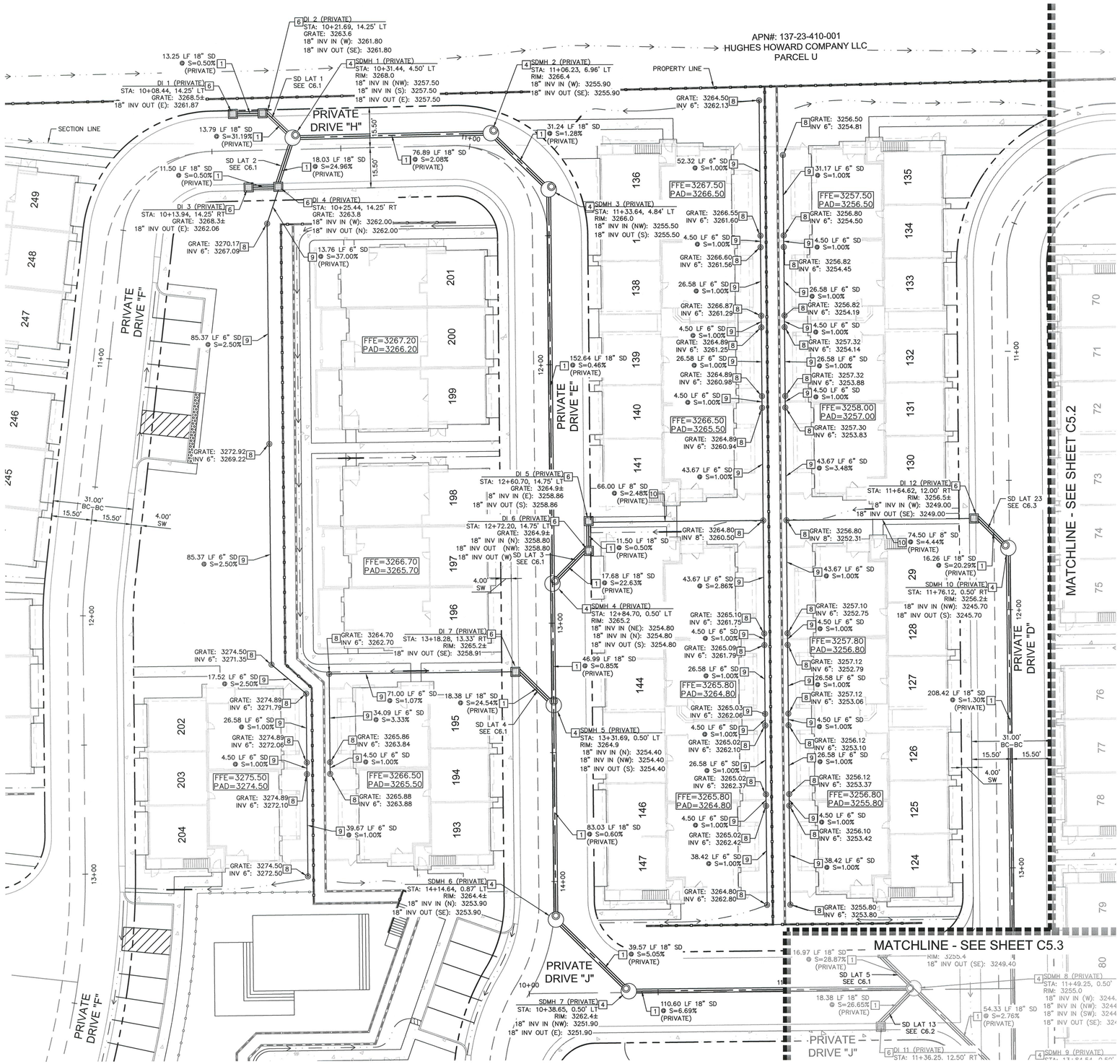

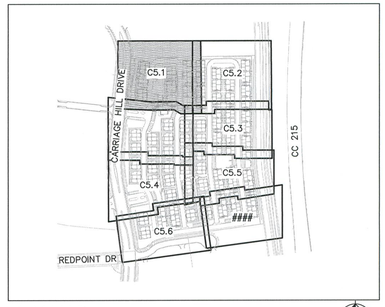

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

1. INSTALL 18" RCP CLASS III STORM DRAIN PIPE
4. INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403
6. INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3
8. INSTALL NDS 18" X 18" CATCH BASIN
9. INSTALL 6" PVC STORM DRAIN PIPE
10. INSTALL 8" PVC STORM DRAIN PIPE

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN), AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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BASIS OF BEARINGS

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

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PHONE: 702-862-3600
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NEVADA ENGINEER - STATE OF NEVADA - PROFESSIONAL - 20011 WALKER KELSICK CIVIL 10/13/2019

KHA PROJECT 092935004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

STORM DRAIN PLAN SHEET 1 OF 6

36 OF 46 SHEETS
C5.1

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C5.1 October 13, 2019 02:23:13pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-SD.dwg
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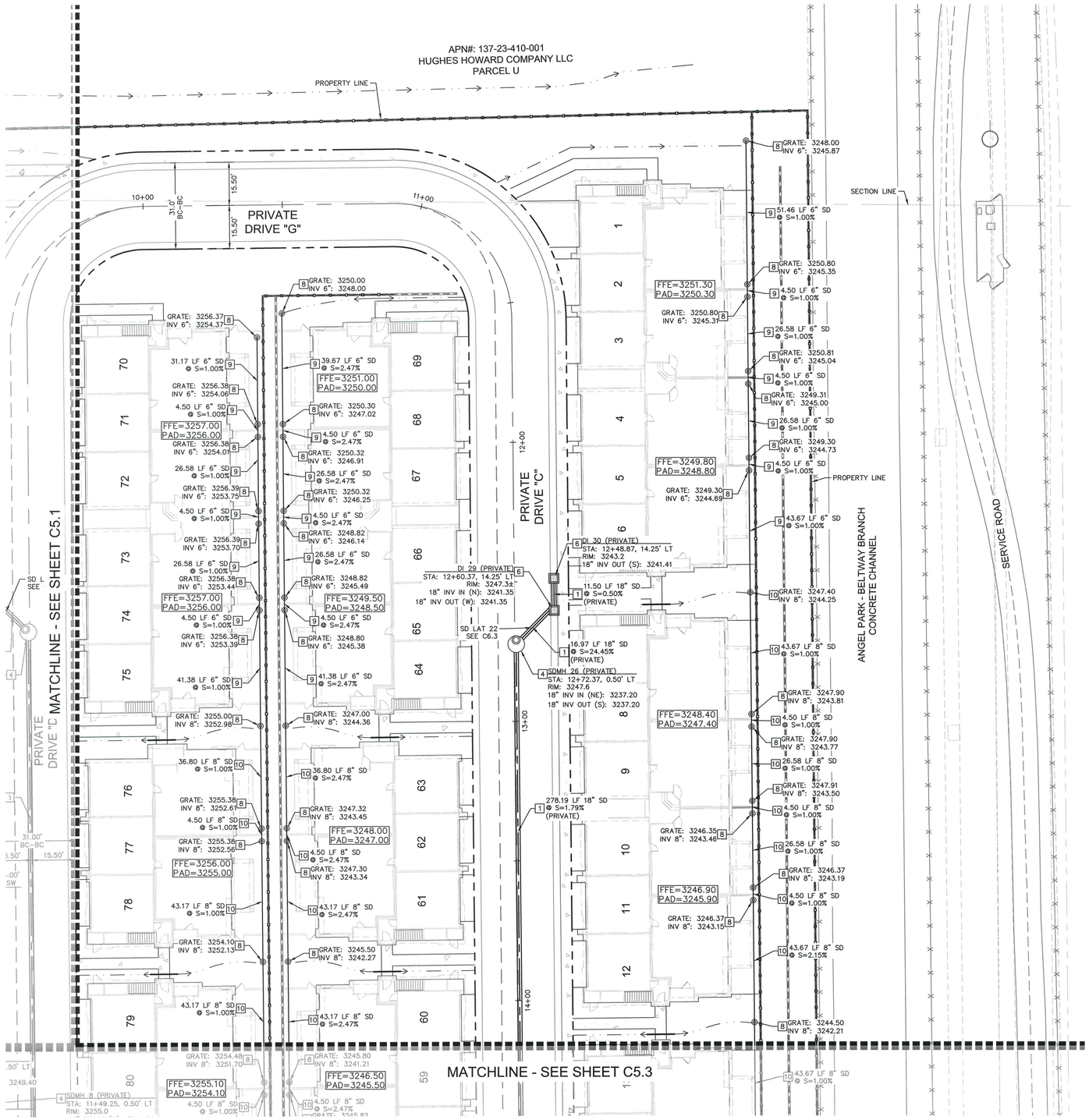

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

1. INSTALL 18" RCP CLASS III STORM DRAIN PIPE
4. INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403
6. INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3
8. INSTALL NDS 18" X 18" CATCH BASIN
9. INSTALL 6" PVC STORM DRAIN PIPE
10. INSTALL 8" PVC STORM DRAIN PIPE

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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ENGINEER-STATE OF NEVADA JOY WALKER BELSICK 17010 CIVIL PROFESSIONAL ENGINEER 10/13/2019

KHA PROJECT	092933504
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN PLAN SHEET 2 OF 6

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

37 OF 46 SHEETS
C5.2

Plotted By:Kistner, Mikel Sheet Set:Kha Layout:C5.2 October 13, 2019 02:23:23pm K:\LAV_Civil\092933504-Lennar Village 21 Parcel I\CAD\PlanSheets\092933504-SD.dwg
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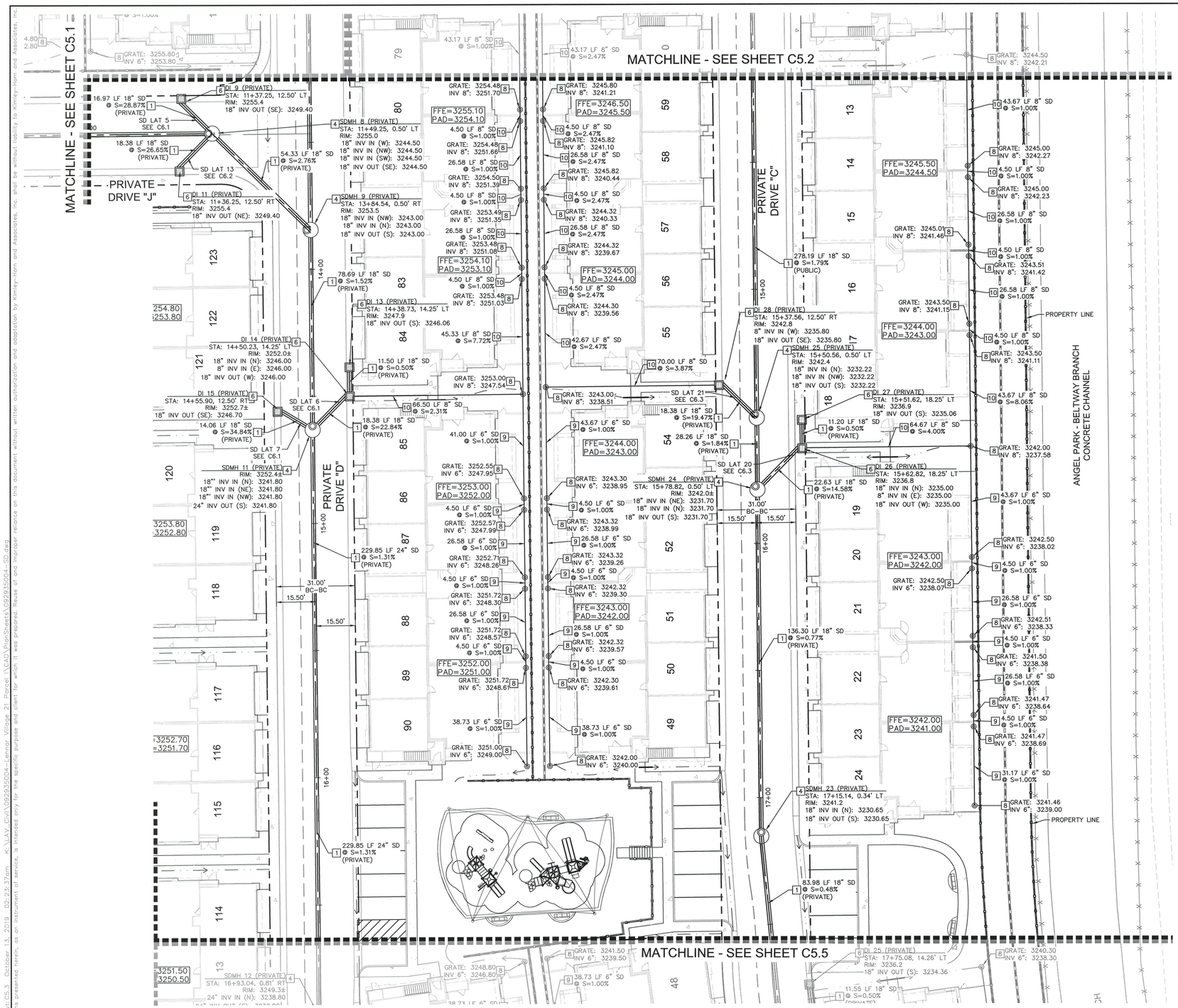

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

1. INSTALL 18" RCP CLASS III STORM DRAIN PIPE
4. INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403
6. INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3
8. INSTALL NDS 18" X 18" CATCH BASIN
9. INSTALL 6" PVC STORM DRAIN PIPE
10. INSTALL 8" PVC STORM DRAIN PIPE

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

CLV#:

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No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

ENGINEER - STATE OF NEVADA - JODY WALKER 015101 CIVIL 12/31/20 PROFESSIONAL 10/15/2019

TO SUBMIT

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN PLAN SHEET 3 OF 6

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

38 OF 46 SHEETS
C5.3

Plotted By:Kintner, Mikel Sheet Set:Kha Layout:C5.3 October 13, 2019 02:23:37pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel 1\CAD\PlanSheets\092935004-SD.dwg
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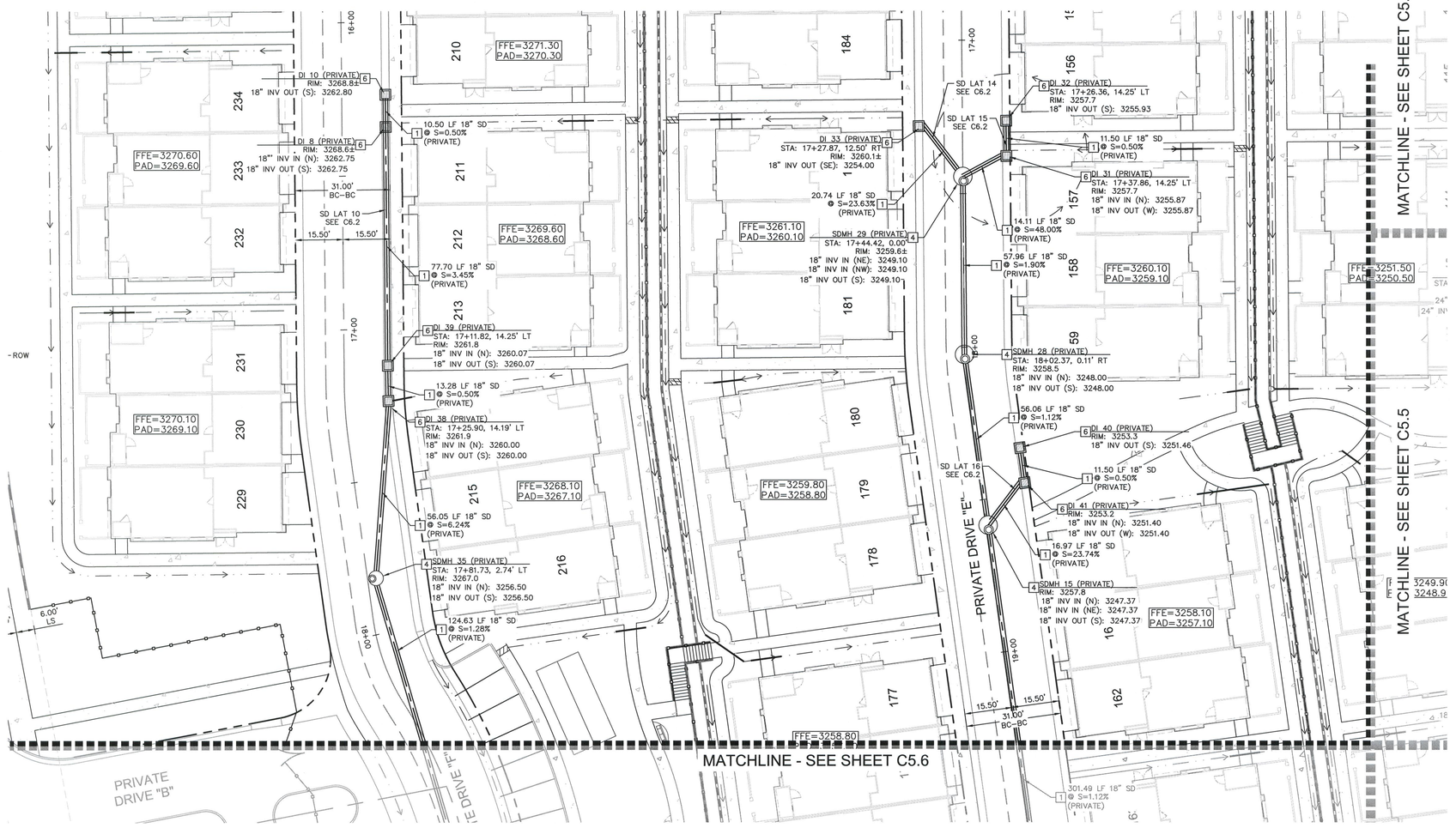

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

[1] INSTALL 18" RCP CLASS III STORM DRAIN PIPE

[4] INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403

[6] INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

CLV#:

No.	REVISIONS	DATE	BY

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — JOY WALKER DELSICK — 17747 — CIVIL — PROFESSIONAL ENGINEER — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN PLAN SHEET 4 OF 6

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

39 OF 46 SHEETS

C5.4

Plotted By:Kinner, Mikol Sheet Set:Kha Layout:C5.4 October 13, 2019 02:23:54pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-SD.dwg
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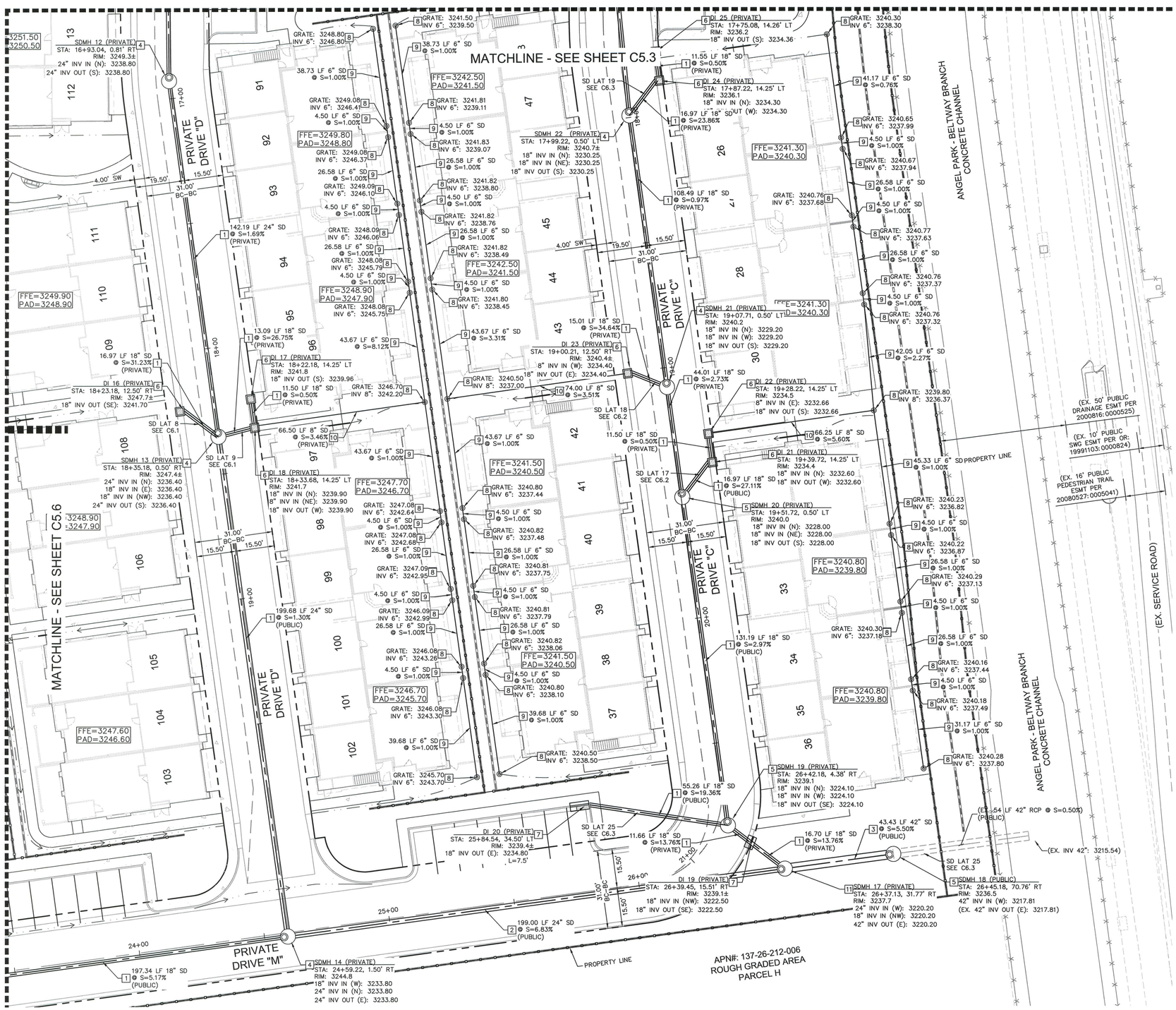

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

1. INSTALL 18" RCP CLASS III STORM DRAIN PIPE
2. INSTALL 24" RCP CLASS III STORM DRAIN PIPE
3. INSTALL 42" RCP CLASS III STORM DRAIN PIPE
4. INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403
5. INSTALL 60" TYPE III SDMH PER CCAUSD NO. 403
6. INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3
7. INSTALL DROP INLET TYPE DM2 PER DETAILS 16 ON SHEET C9.3
8. INSTALL NDS 18" X 18" CATCH BASIN
9. INSTALL 6" PVC STORM DRAIN PIPE
10. INSTALL 8" PVC STORM DRAIN PIPE
11. INSTALL 60" TYPE III SDMH WITH NEENAH GRATED LID PER CCAUSD NO. 403 AND NEENAH SPECIFICATIONS

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 (ITEMS) AND GENERAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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CLV#:

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

ENGINEER - STATE OF NEVADA - JEFFREY WALKER BELSICK - 12/31/20 - CIVIL - PROFESSIONAL - 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

STORM DRAIN PLAN SHEET 5 OF 6

40 OF 46 SHEETS

C5.5

Plotted By: Kinner, Mikol Sheet Set: Kha Layout: C5.5 October 13, 2019 02:24:04pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-SD.dwg
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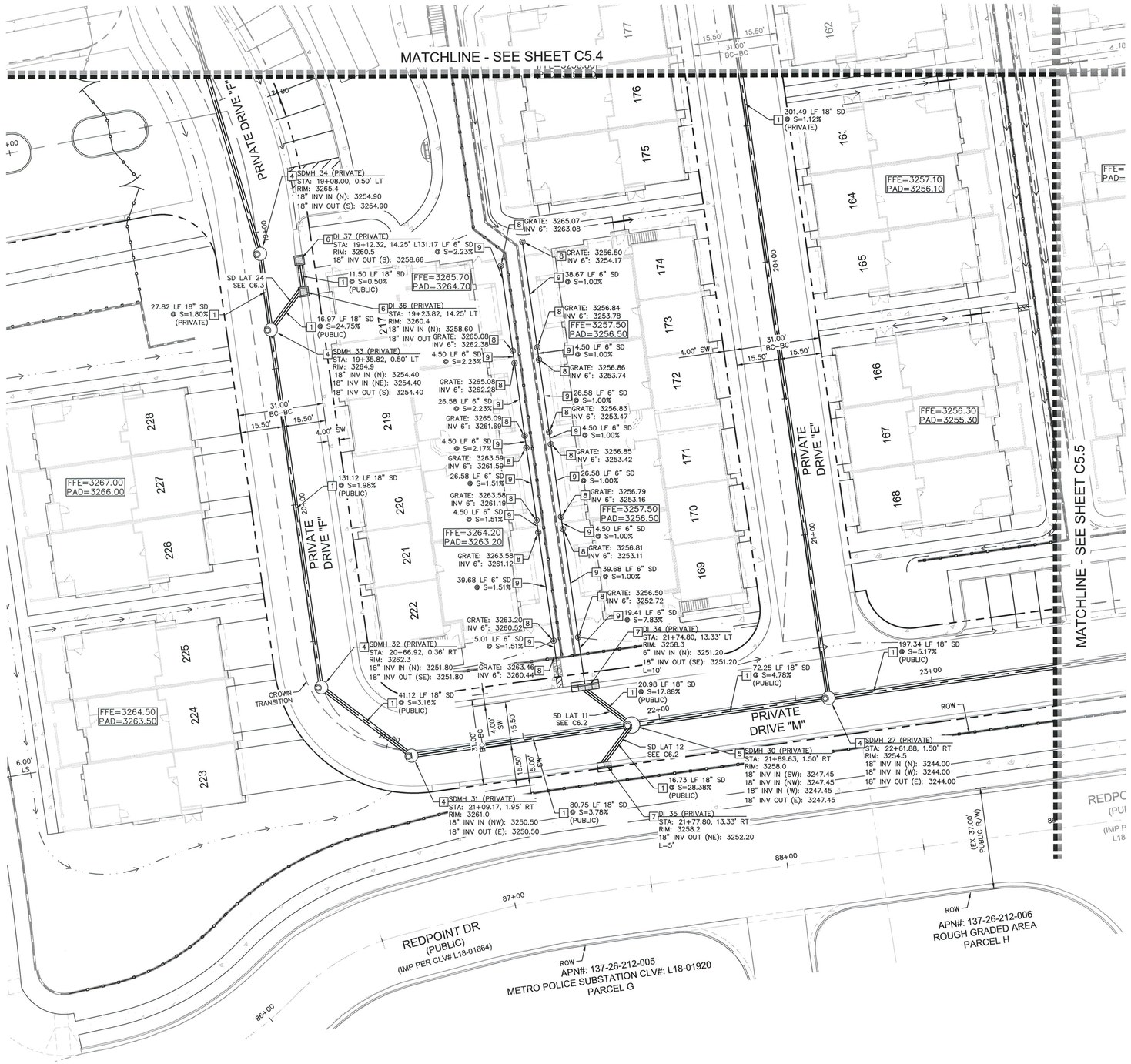

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

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STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

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LEGEND & ABBREVIATIONS

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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CLV#:

No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
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STATE OF NEVADA
ENGINEER
ROY WALKER BELSICK
12/31/20
CIVIL
15170
PROFESSIONAL
10/13/2019

TDJ 5-30-19

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

STORM DRAIN PLAN
SHEET 6 OF 6

41 OF 46 SHEETS
C5.6

Plotted By:Kinter, Mikol Sheet Set:Kha Layout:C5.6 October 13, 2019 02:24:17pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-SD.dwg
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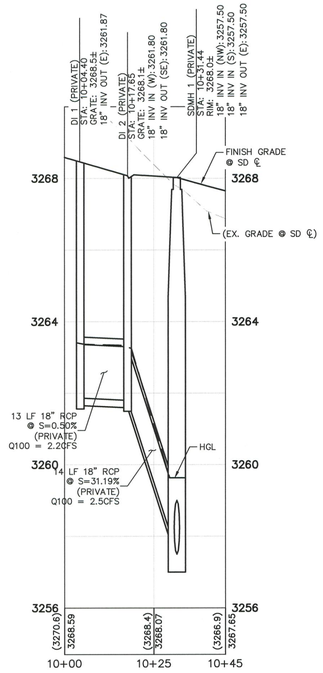
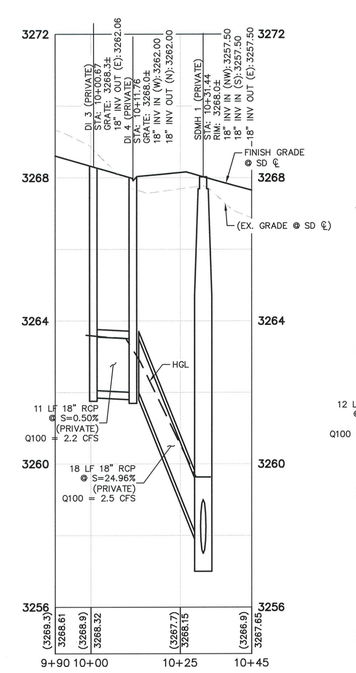


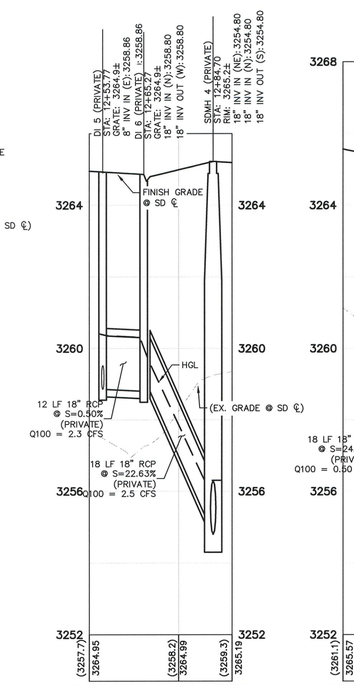
SD LAT 7

HORIZ: 1" = 20'
VERT: 1" = 2'



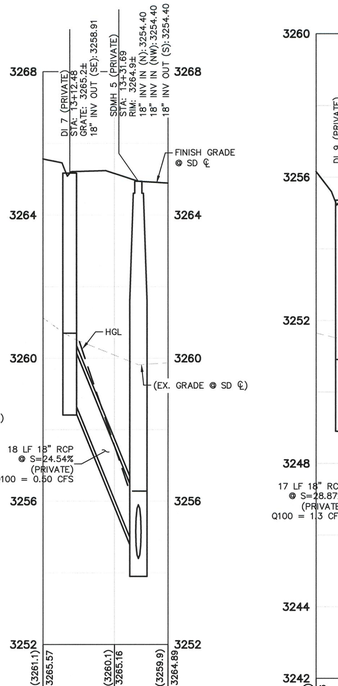
SD LAT 7

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 8

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 9

HORIZ: 1" = 20'
VERT: 1" = 2'

SD LAT 2

HORIZ: 1" = 20'
VERT: 1" = 2'

SD LAT 1

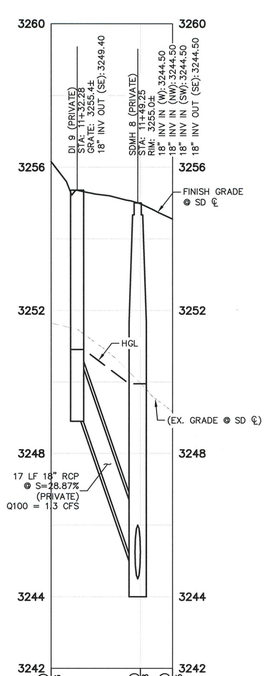
HORIZ: 1" = 20'
VERT: 1" = 2'

SD LAT 3

HORIZ: 1" = 20'
VERT: 1" = 2'

SD LAT 4

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 5

HORIZ: 1" = 20'
VERT: 1" = 2'

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

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BASIS OF BEARINGS

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

REGISTERED PROFESSIONAL ENGINEER - STATE OF NEVADA
JODY WALKER BELSICK
No. 15019
CIVIL
12/31/20
10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN LATERAL PROFILES SHEET 1 OF 3

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

42 OF 46 SHEETS
C6.1

TAS 10/15/19

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C6.1 October 13, 2019 02:24:43pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-PP-SD-LAT.dwg
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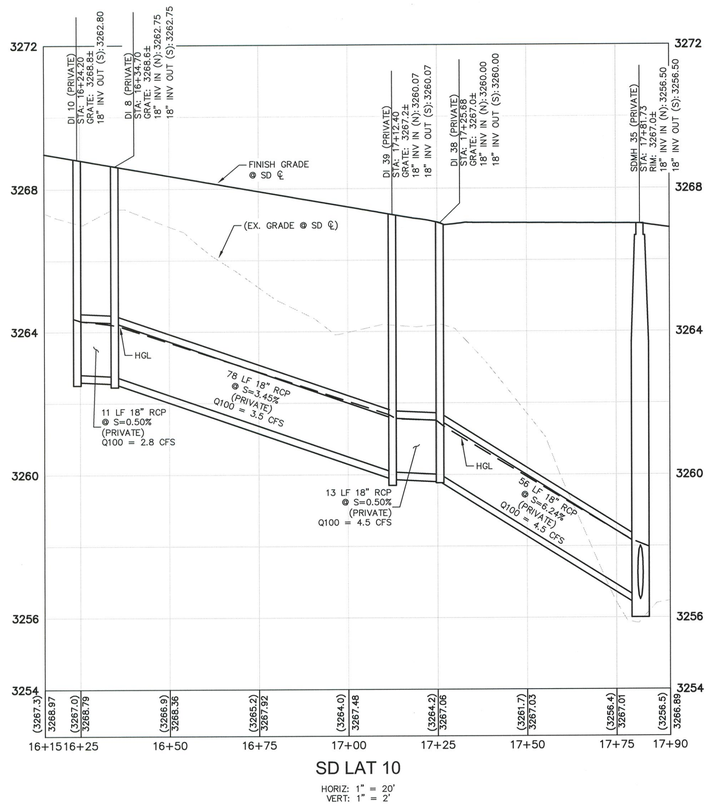
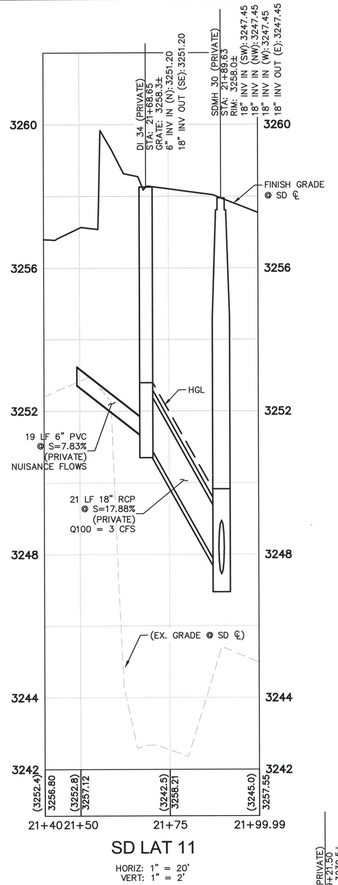


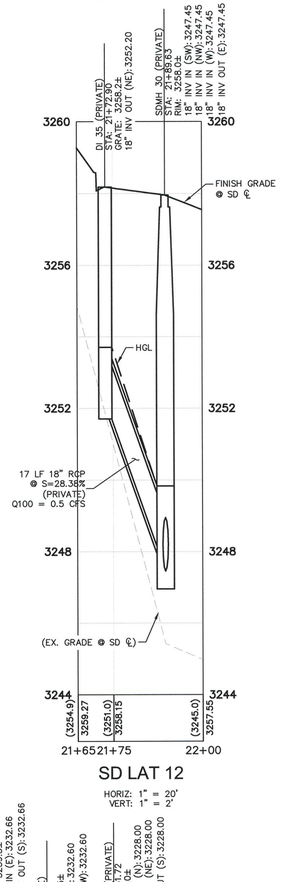
SD LAT 10

HORIZ: 1" = 20'
VERT: 1" = 2'



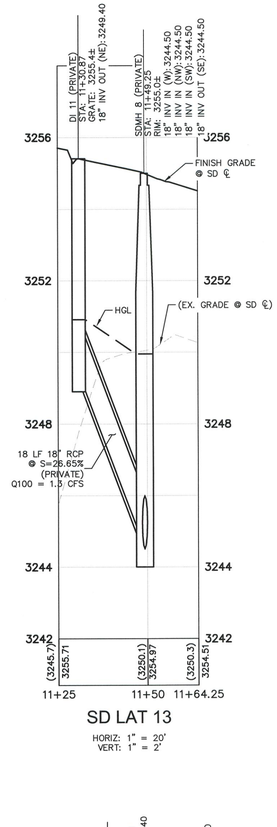
SD LAT 11

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 12

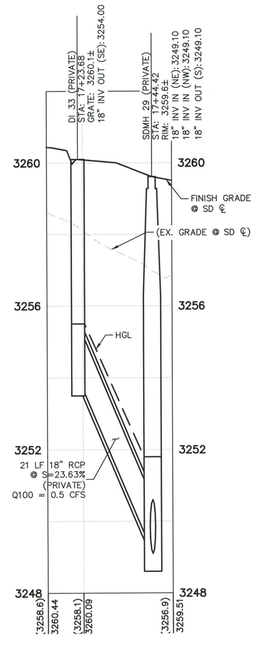
HORIZ: 1" = 20'
VERT: 1" = 2'

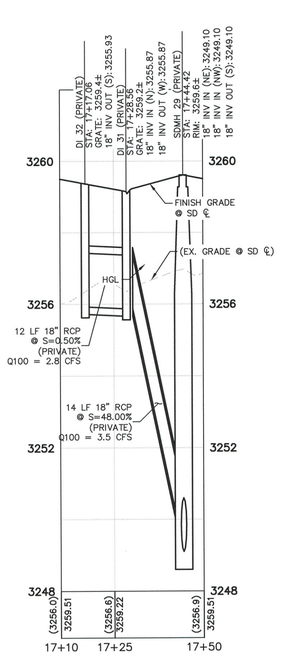


SD LAT 13

HORIZ: 1" = 20'
VERT: 1" = 2'

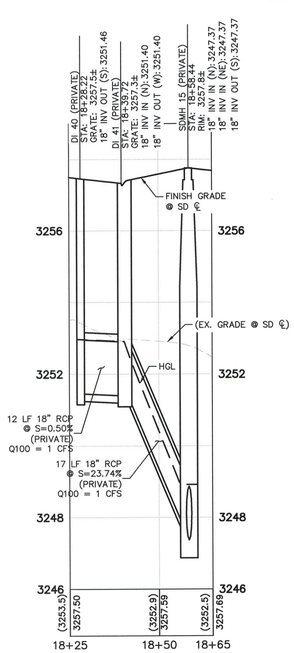
GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'





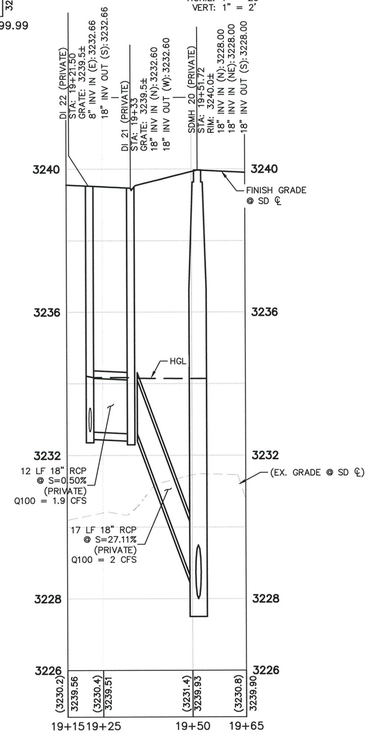
SD LAT 15

HORIZ: 1" = 20'
VERT: 1" = 2'



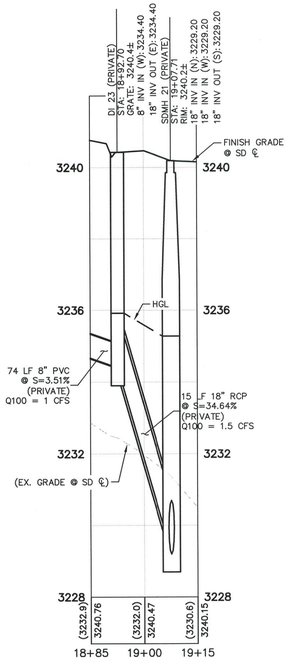
SD LAT 16

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 17

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 18

HORIZ: 1" = 20'
VERT: 1" = 2'

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

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LEGAL DESCRIPTION

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STATE OF NEVADA PROFESSIONAL ENGINEER — JODY WALKER BELSICK — 12/31/20 — CIVIL — 10/13/2019

KHA PROJECT 092935004	
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN LATERAL PROFILES SHEET 2 OF 3

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

43 OF 46 SHEETS

C6.2

TDS 5/6/20

Rotted Ryklner Mkel Sheet Set:Khe Layout:C6.2 October 13, 2019 02:24:51pm K:\LAV Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-PP-SD-LAT.dwg
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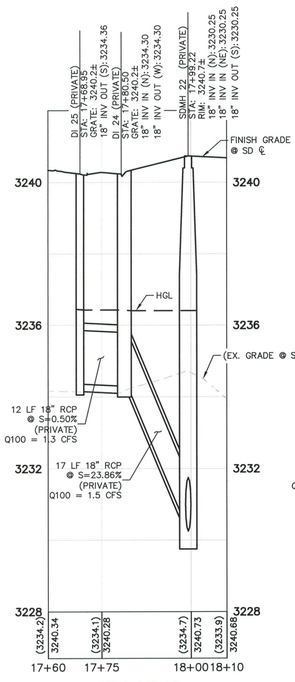

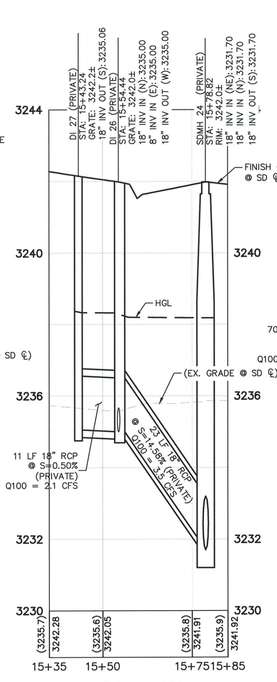

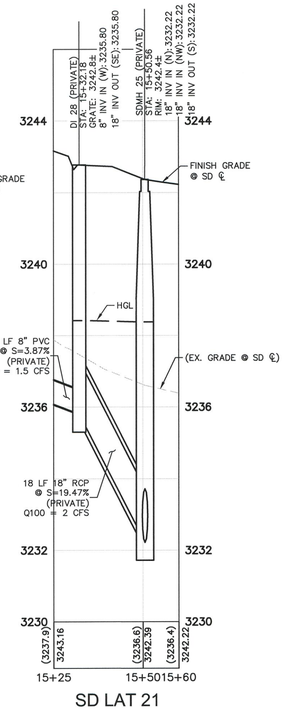

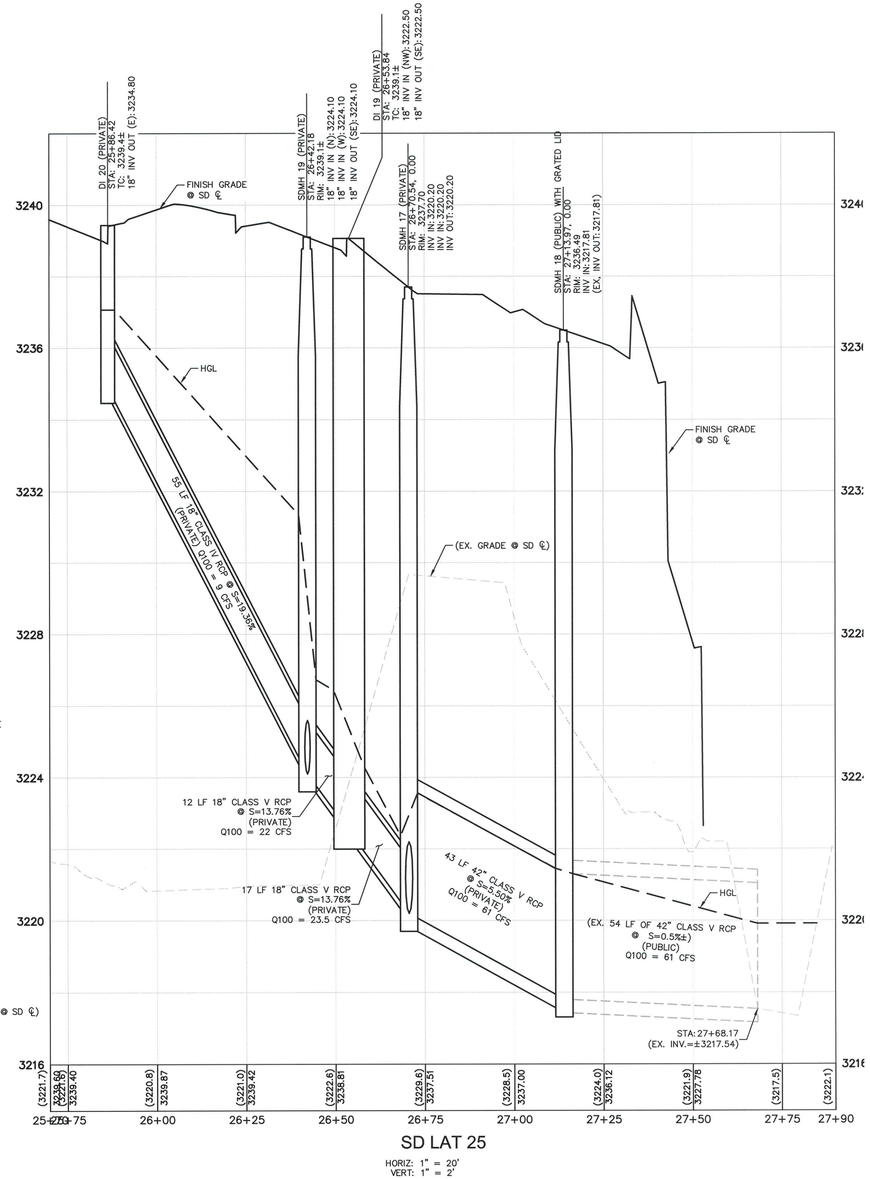

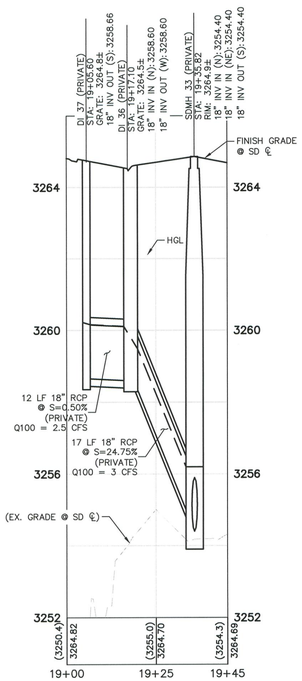

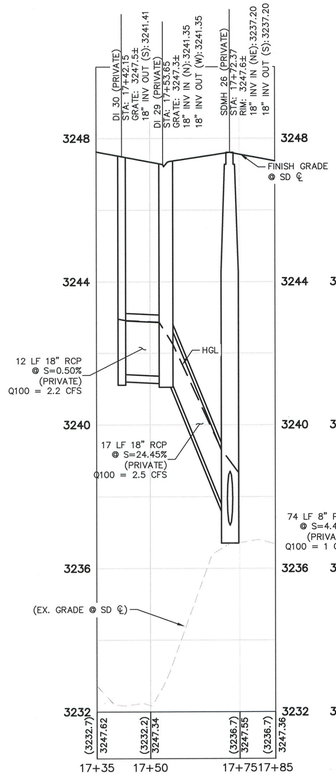

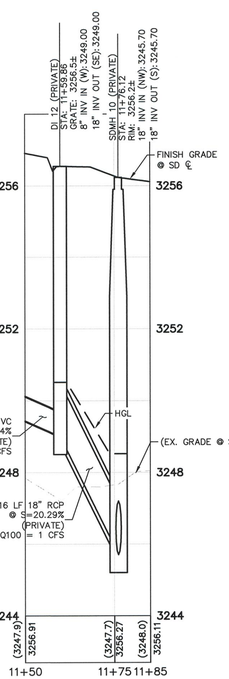

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — JODY WALKER 18153 — 12/31/20 — CIVIL — PROFESSIONAL — 10/13/2019

KHA PROJECT 092935004	
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN LATERAL PROFILES SHEET 3 OF 3

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

44 OF 46 SHEETS

C6.3

Plotted By: Kris Hoge, MKell, Sheet Set: Vlla, Layout: C6.3, October 13, 2019 - 02:26:01pm K:\LAN\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-PP-SD-LAT.dwg
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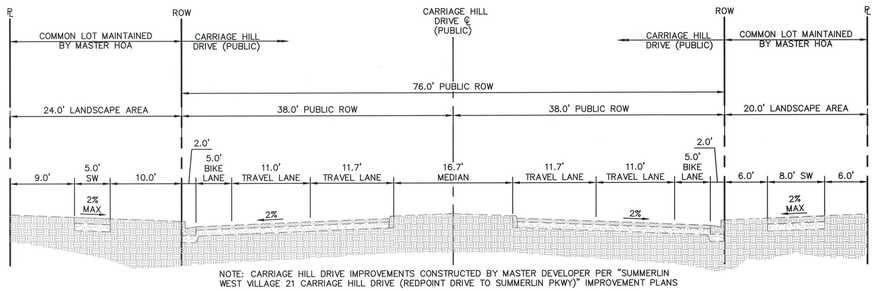
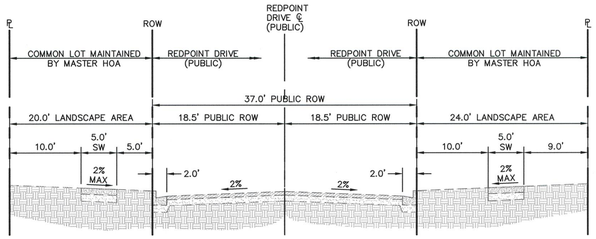


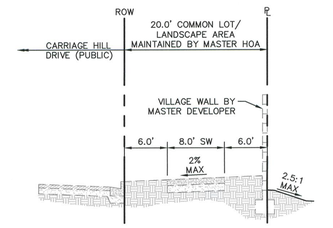
NOTE: CARRIAGE HILL DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT DRIVE TO SUMMERLIN PKWY)" IMPROVEMENT PLANS

A / C9.1 — TYPICAL STREET SECTION ALONG CARRIAGE HILL DRIVE (PER SUMMERLIN STD DWG S-5A) NTS



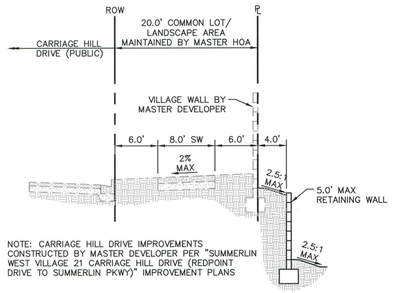
NOTE: REDPOINT DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 REDPOINT DRIVE (CARRIAGE HILL DRIVE TO PARCEL H)" IMPROVEMENT PLANS

B / C9.1 — TYPICAL STREET SECTION ALONG REDPOINT DRIVE (PER SUMMERLIN STD DWG S-7) NTS



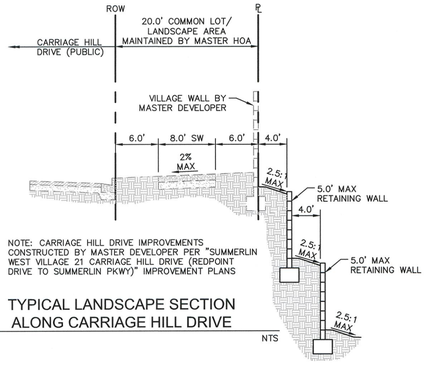
NOTE: CARRIAGE HILL DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT DRIVE TO SUMMERLIN PKWY)" IMPROVEMENT PLANS

C1 / C9.1 — TYPICAL LANDSCAPE SECTION ALONG CARRIAGE HILL DRIVE NTS



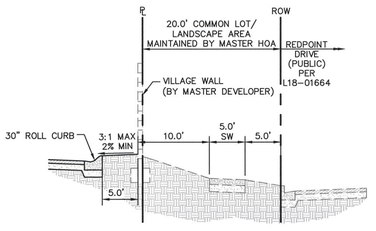
NOTE: CARRIAGE HILL DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT DRIVE TO SUMMERLIN PKWY)" IMPROVEMENT PLANS

C2 / C9.1 — TYPICAL LANDSCAPE SECTION ALONG CARRIAGE HILL DRIVE NTS

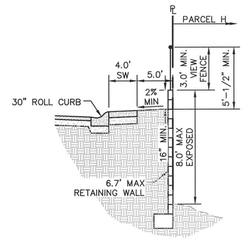


NOTE: CARRIAGE HILL DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT DRIVE TO SUMMERLIN PKWY)" IMPROVEMENT PLANS

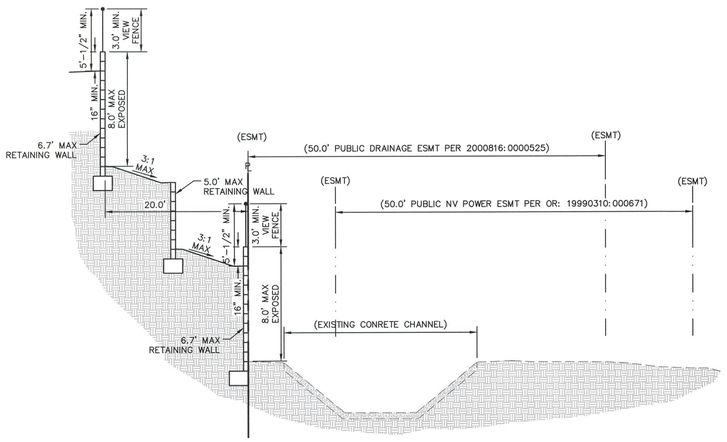
C3 / C9.1 — TYPICAL LANDSCAPE SECTION ALONG CARRIAGE HILL DRIVE NTS



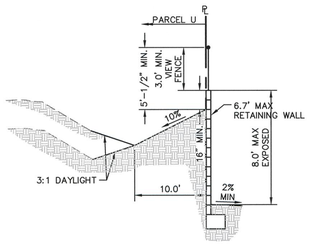
D1 / C9.1 — TYPICAL LANDSCAPE SECTION ALONG REDPOINT DRIVE NTS



D2 / C9.1 — TYPICAL SECTION SOUTHERN PL NTS



E / C9.1 — TYPICAL STREET SECTION ALONG EXISTING CHANNEL (PER SUMMERLIN STD DWG S-7) NTS



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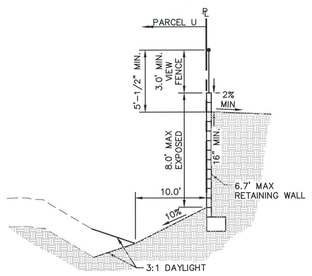

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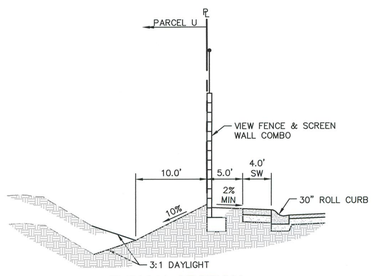

F3 / C9.1 — TYPICAL SECTION NORTHERN PL NTS

CLV#:

Plotted By: Kinter, Mikal Sheet Set: Kha Layout: C9.1 October 13, 2019 02:25:13pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-XS.dwg
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ENGINEER-STATE OF NEVADA — ANDY WALKER BELSICK — 12/31/20 — CIVIL — 15101 — PROFESSIONAL — 10/13/2019

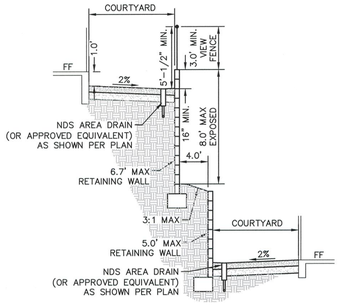
KHA PROJECT 092935004	DESIGNED BY MK
DATE 10/13/2019	DRAWN BY MK
SCALE AS SHOWN	CHECKED BY JB

TYPICAL SECTIONS SHEET 1 OF 2

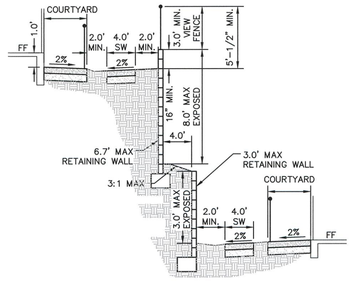
HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

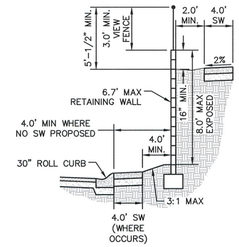
CITY OF LAS VEGAS NEVADA



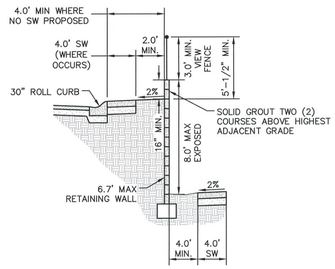
G C9.2 TYPICAL HUDSON COURTYARD SECTION NTS



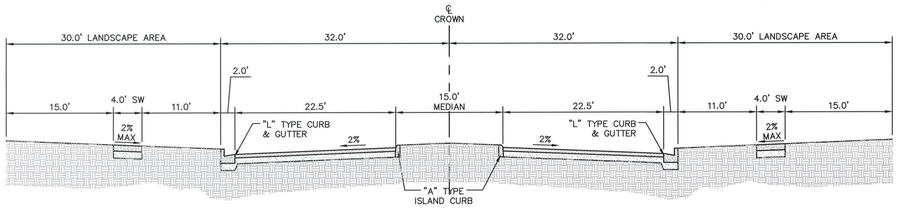
H C9.2 TYPICAL MORNING RIDGE COURTYARD SECTION NTS



J1 C9.2 TYPICAL CORNER LOT SECTION NTS



J2 C9.2 TYPICAL CORNER LOT SECTION NTS



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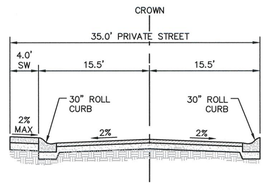

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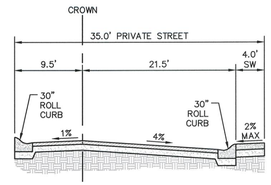

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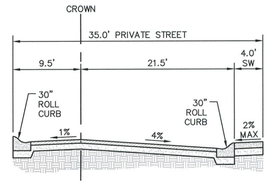
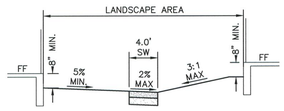
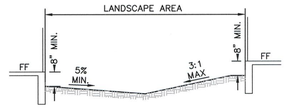


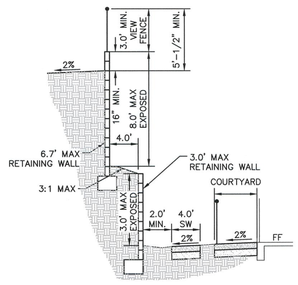
N C9.2 TYPICAL PRIVATE STREET SECTION NTS



O C9.2 TYPICAL BUILDING SECTION NTS



Q C9.2 TYPICAL BUILDING SECTION NTS



R C9.2 TYPICAL MORNING RIDGE COURTYARD SECTION NTS

CLV#:

No.	REVISIONS	DATE	BY

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PHONE: 702-862-3800
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STATE OF NEVADA — JOHN WALKER BELSICK — 12/31/20 — CIVIL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

TYPICAL SECTIONS SHEET 2 OF 2

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

46 OF 46 SHEETS
C9.2

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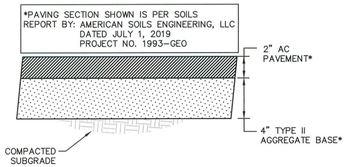

1 C9.3 LIGHT PAVEMENT SECTION
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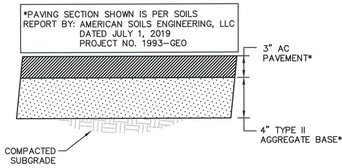

2 C9.3 HEAVY PAVEMENT SECTION
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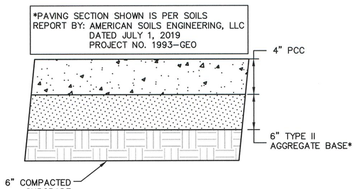

3 C9.3 PCC PAVEMENT
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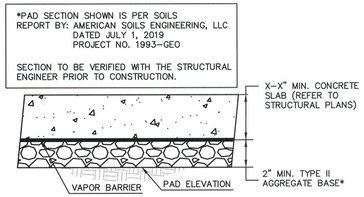

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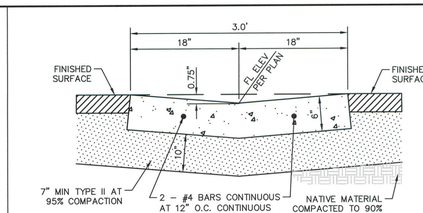
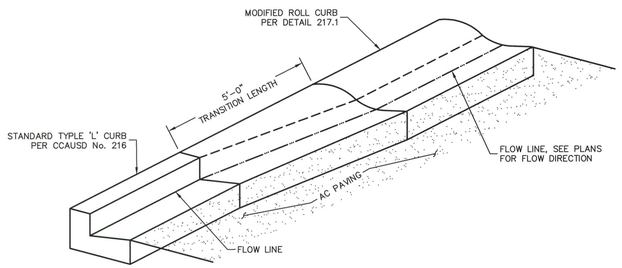


5 C9.3 3.0' VALLEY GUTTER
(NOT TO SCALE)



6 C9.3 MODIFIED ROLL CURB TRANSITION TO TYPE 'L' CURB
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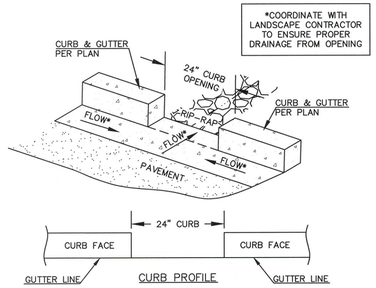
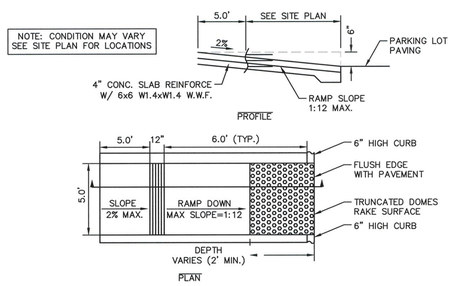
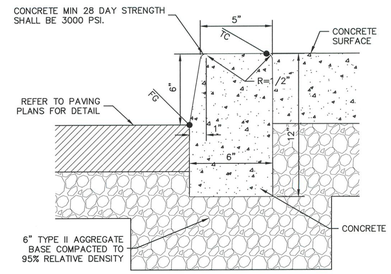


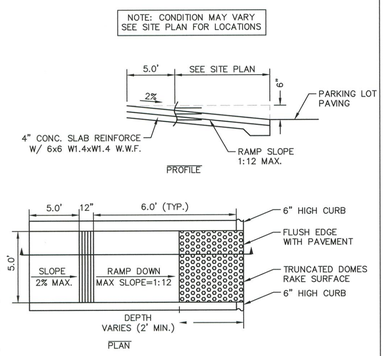
8 C9.3 2' CURB OPENING
(NOT TO SCALE)



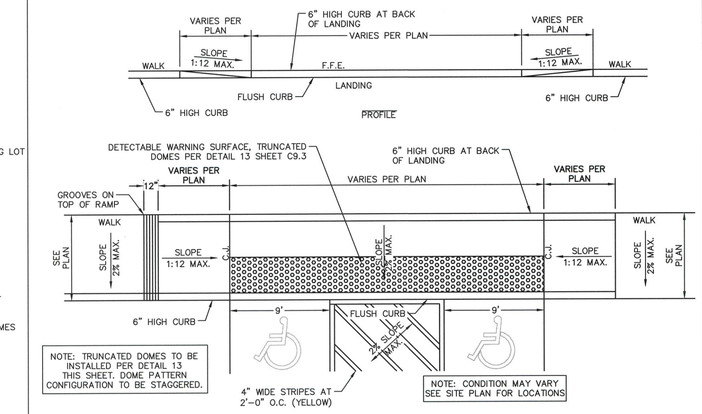
11 C9.3 ON-SITE SIDEWALK RAMP CASE I
(NOT TO SCALE)



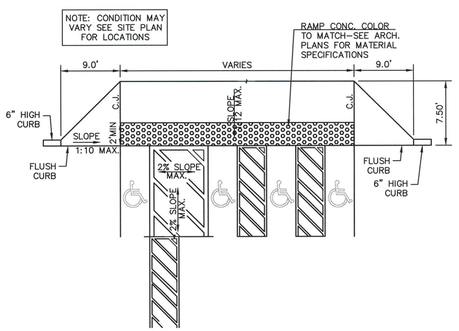
12 C9.3 6" CURB
(NOT TO SCALE)



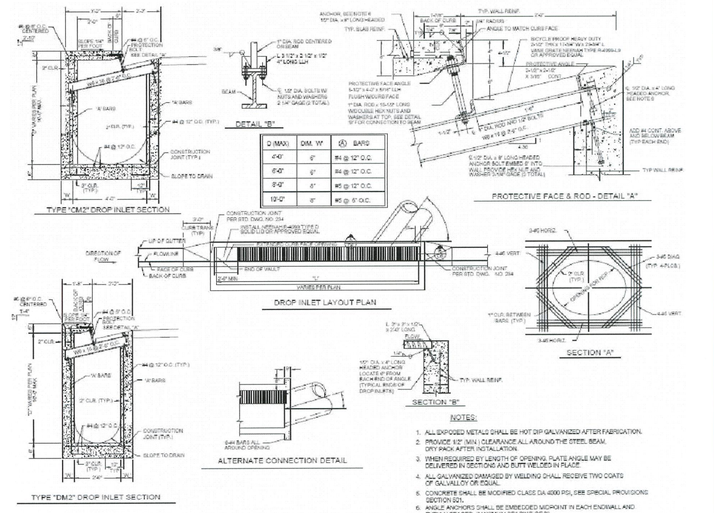
13 C9.3 ON-SITE SIDEWALK RAMP CASE I
(NOT TO SCALE)



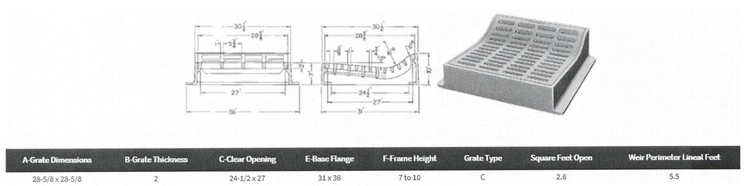
14 C9.3 ON-SITE SIDEWALK RAMP CASE II
(NOT TO SCALE)



15 C9.3 ONSITE SIDEWALK RAMP CASE III
(NOT TO SCALE)



16 C9.3 DM2 DROP INLET
(NOT TO SCALE)



A-Grate Dimensions	B-Grate Thickness	C-Clear Opening	E-Base Flange	F-Frame Height	Grate Type	Square Feet Open	Weir Perimeter Lineal Feet
28-5/8 x 28-5/8	2	24-1/2 x 27	31 x 36	7 to 10	C	2.6	5.5

17 C9.3 R-3501-R DROP INLET
(NOT TO SCALE)

CLV#:

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WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — JODY WALKER BELSICK — 15167 — CIVIL — 12/9/20 — 10/13/2019

No.	REVISIONS	DATE	BY

KHA PROJECT 092935004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

TYPICAL DETAILS SHEET

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS — NEVADA

47 OF 46 SHEETS
C9.3

Plotted By:Kintner, Mavi Sheet Set:Kha Layout:C9.3 October 13, 2019 02:25:32pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-DT.dwg
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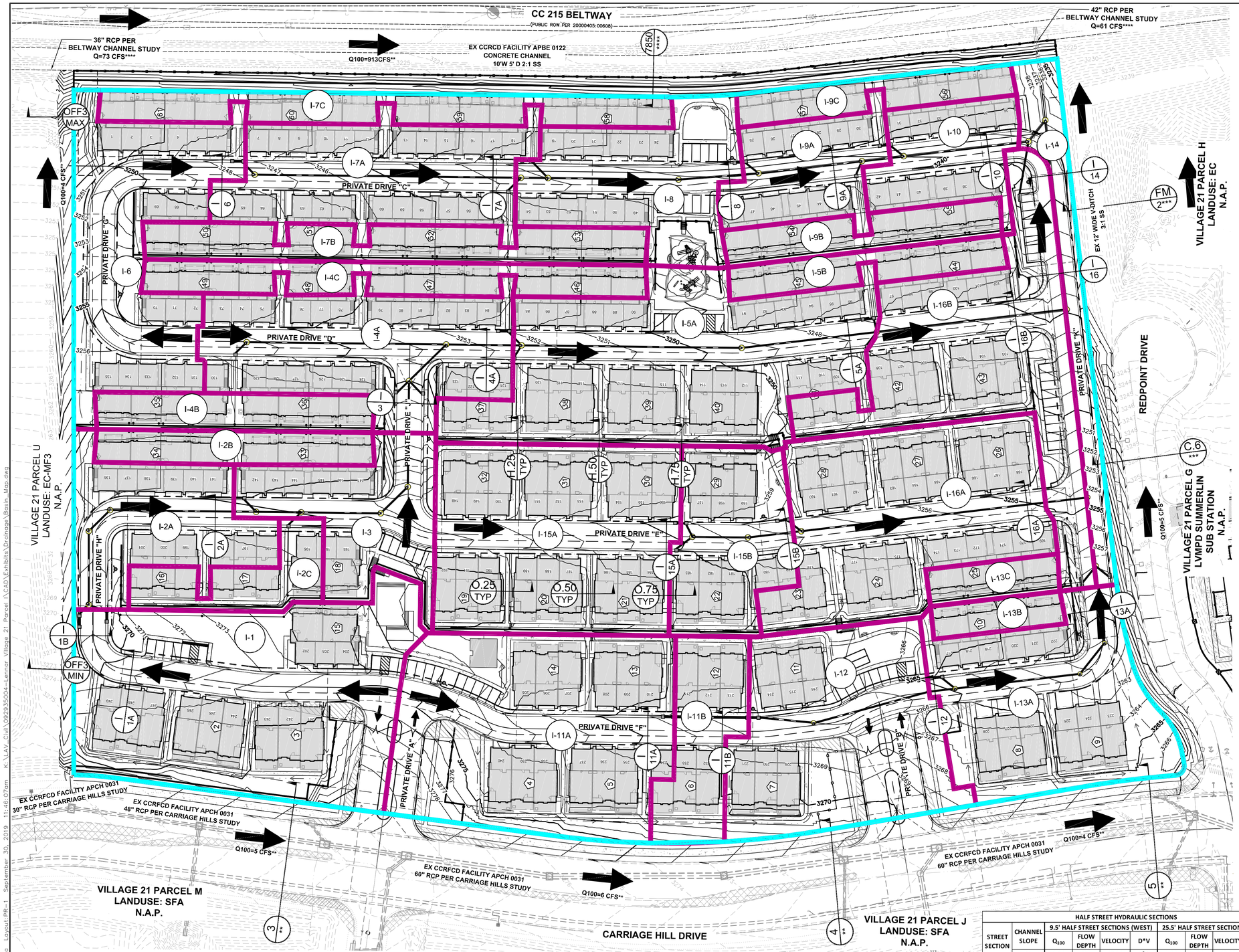

LEGEND

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100
SCALE 1" = 50'

- XXX — BASIN ID
- BASIN BOUNDARY
- PRORATED BASIN BOUNDARY
- FLOW ARROW
- X / XX — SECTION ID
- XX — BUILDING NUMBER

ULTIMATE CONDITION PRORATED FLOW SUMMARY

Ultimate Onsites			
SUBBASIN	Q_{100} (cfs)	AREA (ac)	CFS/ACRE
I*	61	18.69	3.26
Ultimate Onsite Prorated Basins			
SUBBASIN	Q_{100} (cfs)	AREA (ac)	CFS/ACRE
I-1	5	1.56	3.26
I-2A	2	0.56	3.26
I-2B	1	0.23	3.26
I-2C	1	0.25	3.26
I-3	1.5	0.53	3.26
I-4A	3	0.86	3.26
I-4B	1	0.26	3.26
I-4C	1	0.40	3.26
I-5A	5	1.41	3.26
I-5B	1	0.22	3.26
I-6	3	0.88	3.26
I-7A	2.5	0.78	3.26
I-7B	1.5	0.45	3.26
I-7C	1	0.42	3.26
I-8	2	0.65	3.26
I-9A	1	0.39	3.26
I-9B	1	0.25	3.26
I-9C	1	0.22	3.26
I-10	1	0.35	3.26
I-11A	4	1.34	3.26
I-11B	1	0.36	3.26
I-12	3	1.02	3.26
I-13A	3	0.93	3.26
I-13B	0	0.11	3.26
I-13C	0	0.12	3.26
I-14	1	0.26	3.26
I-15A	4	1.15	3.26
I-15B	1.5	0.51	3.26
I-16A	4	1.11	3.26
I-16B	4	1.11	3.26
TOTAL	61	18.69	NA

*Referenced from the Master Study

DROP INLET SUMMARY TABLE

DROP INLET ID	Q_{100} (cfs)	SLOPE (%)	FLOW DEPTH (ft)	Q_{INT} (cfs)	Q_{BYP} (cfs)	DI TYPE
I-1A	2.50	2.90	0.27	2.15	0.35	NEENAH R-3501-R
I-1B	0.35	2.90	0.13	0.35	0.00	NEENAH R-3501-R
I-2A	0.50	0.60	0.21	0.49	0.01	NEENAH R-3501-R
I-2A1	1.50	0.60	0.30	1.29	0.21	NEENAH R-3501-R
I-2A2	0.21	0.60	0.15	0.21	0.00	NEENAH R-3501-R
I-3	1.25	5.67	0.19	1.25	0.00	NEENAH R-3501-R
I-4A	0.50	1.33	0.18	0.50	0.00	NEENAH R-3501-R
I-4A1	2.50	1.33	0.32	2.08	0.42	NEENAH R-3501-R
I-4A2	0.42	1.33	0.17	0.42	0.00	NEENAH R-3501-R
I-5A	0.50	1.36	0.18	0.50	0.00	NEENAH R-3501-R
I-5A1	4.50	1.36	0.38	3.24	1.26	NEENAH R-3501-R
I-5A2	1.26	1.36	0.25	1.19	0.07	NEENAH R-3501-R
I-6A	2.50	1.90	0.30	2.15	0.35	NEENAH R-3501-R
I-6B	0.35	1.90	0.15	0.35	0.00	NEENAH R-3501-R
I-7A	0.50	1.63	0.17	0.50	0.00	NEENAH R-3501-R
I-7A1	2.50	1.63	0.31	2.12	0.38	NEENAH R-3501-R
I-7A2	0.38	1.63	0.15	0.38	0.00	NEENAH R-3501-R
I-8A	1.50	0.50	0.31	1.27	0.23	NEENAH R-3501-R
I-8B	0.23	0.50	0.16	0.23	0.00	NEENAH R-3501-R
I-9A	0.50	0.50	0.21	0.49	0.01	NEENAH R-3501-R
I-9A1	1.00	0.50	0.27	0.91	0.09	NEENAH R-3501-R
I-9A2	0.09	0.50	0.11	0.09	0.00	NEENAH R-3501-R
I-10 (SUMP)	1.50	N/A	0.20	1.50	0.00	5' TYPE DM2
I-11A1	3.50	1.78	0.34	2.77	0.73	NEENAH R-3501-R
I-11A2	0.73	1.78	0.19	0.73	0.00	NEENAH R-3501-R
I-11B1	1.00	1.78	0.22	0.98	0.02	NEENAH R-3501-R
I-11B2	0.02	1.78	0.05	0.02	0.00	NEENAH R-3501-R
I-12A	3.00	1.92	0.32	2.48	0.52	NEENAH R-3501-R
I-12B	0.52	1.92	0.17	0.52	0.00	NEENAH R-3501-R
I-13A N	3.00	3.90	0.25	2.94	0.06	10' TYPE DM2
I-13A S	0.50	3.90	0.15	0.50	0.00	5' TYPE DM2
I-15A	0.50	1.89	0.17	0.50	0.00	NEENAH R-3501-R
I-15A1	3.50	1.89	0.33	2.79	0.71	NEENAH R-3501-R
I-15A2	0.71	1.89	0.19	0.71	0.00	NEENAH R-3501-R
I-15B1	1.00	1.13	0.24	0.96	0.04	NEENAH R-3501-R
I-15B2	0.04	1.13	0.07	0.04	0.00	NEENAH R-3501-R
I-16 (SUMP)	9	N/A	0.47	9.00	0.00	7.5' TYPE DM2

STREET HYDRAULIC SECTIONS
35' STREET SECTIONS

STREET SECTION	CHANNEL SLOPE %	Q_{100} (cfs)	FLOW DEPTH (ft)	VELOCITY (ft/s)	D*V ft^2/s
I-1B	2.90	5.0	0.26	3.18	0.83
I-3	5.67	2.5	0.20	3.63	0.73
I-13A N	3.90	3.0	0.30	3.79	1.14
I-13A S	3.90	0.5	0.16	3.52	0.56
I-14	1.00	1.0	0.27	1.76	0.48
I-16	4.90	8.5	0.38	5.23	1.99

SWALE SECTIONS

SECTION	SLOPE (%)	Q_{100} (cfs)	FLOW DEPTH (ft)	TOTAL DEPTH (ft)	VELOCITY (ft/s)	TYPE	SIDE SLOPES		Req'd d_{50} (in)
OFF3 (MIN)	3.37	4*****	0.41	1	3.37	V	10:1	3:1	N/A
OFF3 (MAX)	25.00	4*****	0.34	1	5.17	V	10:1	3:1	24"
H.25 West	1.00	0.25	0.11	0.68	1.05	-	5%	5%	N/A
H.50 West	1.00	0.50	0.13	0.68	1.25	-	5%	5%	N/A
H.75 West	1.00	0.75	0.17	0.68	1.19	-	5%	5%	N/A
H.25 East	1.00	0.25	0.11	0.69	1.06	-	6%	6%	N/A
H.50 East	1.00	0.50	0.14	0.69	1.31	-	6%	6%	N/A
H.75 East	1.00	0.75	0.18	0.69	1.20	-	6%	6%	N/A
O.25	1.00	0.25	0.11	0.84	0.86	-	5%	5%	N/A
O.50	1.00	0.50	0.14	0.84	1.03	-	5%	5%	N/A
O.75	1.00	0.75	0.16	0.84	1.15	-	5%	5%	N/A

*****Referenced from the Parcel U Stockpile Study

REFERENCED HYDRAULIC SECTIONS

SECTION NAME	CHANNEL SLOPE %	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V
7850****	0.6	852	3.38	15.05	50.84
C.6***	3.3	5	0.29	3.55	1.03
FM2 MAX***	1.00	5	0.75	2.98	2.24
FM2 MIN***	0.88	5	0.77	2.84	2.19
3**	1.65	5	0.32	2.66	0.85
4**	1.65	6	0.33	2.77	0.91
5**	1.66	4	0.30	2.55	0.77

** Referenced from the Carriage Hill Study
*** Referenced from the Redpoint Study
****Referenced from the Beltway Study

HALF STREET HYDRAULIC SECTIONS

STREET SECTION	CHANNEL SLOPE	9.5' HALF STREET SECTIONS (WEST)				25.5' HALF STREET SECTIONS (EAST)			
		Q_{100}	FLOW DEPTH	VELOCITY	D*V	Q_{100}	FLOW DEPTH	VELOCITY	D*V
	%	(cfs)	(ft)	(ft/s)	ft^2/s	(cfs)	(ft)	(ft/s)	ft^2/s
I-1A	1.90	0.5	0.18	1.68	0.30	-	-	-	-
I-2	0.60	0.5	0.20	1.03	0.21	1.5	0.31	1.79	0.55
I-4A	1.33	0.5	0.18	1.44	0.26	4.0	0.37	3.06	1.13
I-5A	1.36	0.5	0.18	1.46	0.26	4.5	0.38	3.17	1.20
I-6	1.90	0.5	0.18	1.68	0.30	2.5	0.30	3.15	0.95
I-7A	1.63	0.5	0.18	1.57	0.28	2.5	0.31	2.96	0.92
I-8	0.50	0.5	0.20	0.98	0.20	1.5	0.31	1.68	0.52
I-9A	0.50	0.5	0.20	0.98	0.20	1.0	0.28	1.53	0.43
I-10	0.50	0.5	0.20	0.98	0.20	0.5	0.22	1.32	0.29
I-11A	1.78	0.5	0.18	1.63	0.29	3.5	0.34	3.33	1.13
I-11B	1.78	0.5	0.18	1.63	0.29	1.0	0.22	2.52	0.55
I-12	1.92	0.5	0.18	1.68	0.30	3.0	0.32	3.29	1.05
I-15A	1.89	0.5	0.18	1.67	0.30	3.5	0.33	3.40	1.12
I-15B	1.13	0.5	0.19	1.34	0.25	1.0	0.24	2.11	0.51
I-16A	1.13	0.5	0.19	1.34	0.25	4.0	0.38	2.88	1.09
I-16B	1.36	0.5	0.18	1.46	0.26	3.5	0.35	3.00	1.05

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
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No.	REVISIONS	DATE	BY

KHA PROJECT 092935004
DATE 09/30/19
SCALE AS SHOWN
DESIGNED BY AD
DRAWN BY AD
CHECKED BY RRD

ULTIMATE CONDITION BASIN MAP

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

ULT-1

Plotted By:Donovon_Autumlyn Sheet Set:Kha Layout:PR-1 September 30, 2019 11:46:07am K:\LAV_Civil\092935004_Lennar Village 21 Parcel I\CAD\Exhibits\Drainage\Basin_Map.dwg

CC 215 BELTWAY
(PUBLIC ROW PER 20000405:00608)

EX CCRCD FACILITY APBE 0122
CONCRETE CHANNEL
10'W 5' D 2:1 SS Q_{100}= 913 CFS

EXISTING 36" RCP
Q100=73 CFS

EXISTING 42" RCP
Q100=61 CFS

PROP. 42" RCP
Q100=61 CFS

EX 12' WIDE V-DITCH
3:1 SIDE SLOPES

PROP. 24" RCP
Q100=37.5 CFS

PRIVATE DRIVE "C"

PRIVATE DRIVE "G"

PRIVATE DRIVE "D"

PRIVATE DRIVE "J"

PRIVATE DRIVE "K"

REDPOINT DRIVE

PRIVATE DRIVE "E"

PRIVATE DRIVE "H"

PRIVATE DRIVE "F"

PRIVATE DRIVE "A"

PRIVATE DRIVE "B"

PROP. 18" RCP
Q100=16 CFS

PROP. TYPE DM2

EX CCRFCD FACILITY APCH 0031
30" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
48" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
60" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
60" RCP PER CARRIAGE HILLS STUDY

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100
SCALE 1" = 50'

LEGEND

- STORM DRAIN MAINLINE
- STORM DRAIN LATERAL DRIVE C
- STORM DRAIN LATERAL DRIVE D
- STORM DRAIN LATERAL DRIVE E
- STORM DRAIN LATERAL DRIVE F TO DRIVE K
- PVC STORM DRAIN
- EXISTING STORM DRAIN
- FLOW ARROW
- BUILDING NUMBER

No.	REVISIONS	DATE	BY

Kimley»Horn
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KHA PROJECT 092935004
DATE 09/30/19
SCALE AS SHOWN
DESIGNED BY AD
DRAWN BY AD
CHECKED BY RRD

FACILITY MAP

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

FAC-1

Plotted By:Donovan, Autumlyn Sheet Set:Kha Layout:FAC-1 September 30, 2019 11:49:08am K:\LAV_Civil\092935004 Lennar Village 21 Parcel I\CAD\Exhibits\Drainage\Facility_Map.dwg

NOTES

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

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

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

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

0 100 200 400 600 800

MAP LEGEND

PARCEL BOUNDARY
SUB BOUNDARY
PM/LD BOUNDARY
ROAD EASEMENT
MATCH / LEADER LINE
HISTORIC LOT LINE
HISTORIC SUB BOUNDARY
HISTORIC PM/LD BOUNDARY
SECTION LINE

CONDOMINIUM UNIT
AIR SPACE PCL
RIGHT OF WAY PCL
SUB-SURFACE PCL

001 ROAD PARCEL NUMBER
001 PARCEL NUMER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

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

BOOK T20S R59E

127	126	12512
136	137	13813
165	164	16316

Scale: 1" = 200'

SEC. 26

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Rev: 7/10/2019

MAP N 2 NW 4

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

137-26-1

CLARK COUNTY NEVADA

PT O
PT M
PT 137-23-410-002
CLOWDER SPRING WAY
KINDLE CORNER WAY
CARRIAGE HILL DR
DESERT FOOTHILLS DR
REDPOINT DR
112
SUMMERLIN VILLAGE 21 - UNIT 3
PB 159-50
110
SUMMERLIN VILLAGE 21 UNIT 1 -LARGE LOT FINAL MAP
PB 158-87
PT 137-26-212-003
PT 137-26-212-002
PT 137-26-212-005
PT 137-26-212-006
PT 137-23-410-001
COS-1
COS -2
PT B
PT C
PT G
PT H
PT 1
003 8.19
004 3.45
001 19.23
002 11.74
005 7.79
006 0.58
003 2.00

TAX DIST 200

NOTES TO USERS

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

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

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

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

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

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

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

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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

Base map information shown on this FIRM was provided in digital format by Clark County Regional Flood Control District. This information was converted using Orthophotography, dated 1999 or newer, and GBF/DIME data. Segments were digitized off of the orthophotography based on center of pavement.

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

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

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for infomation on all related products available from FEMA:

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

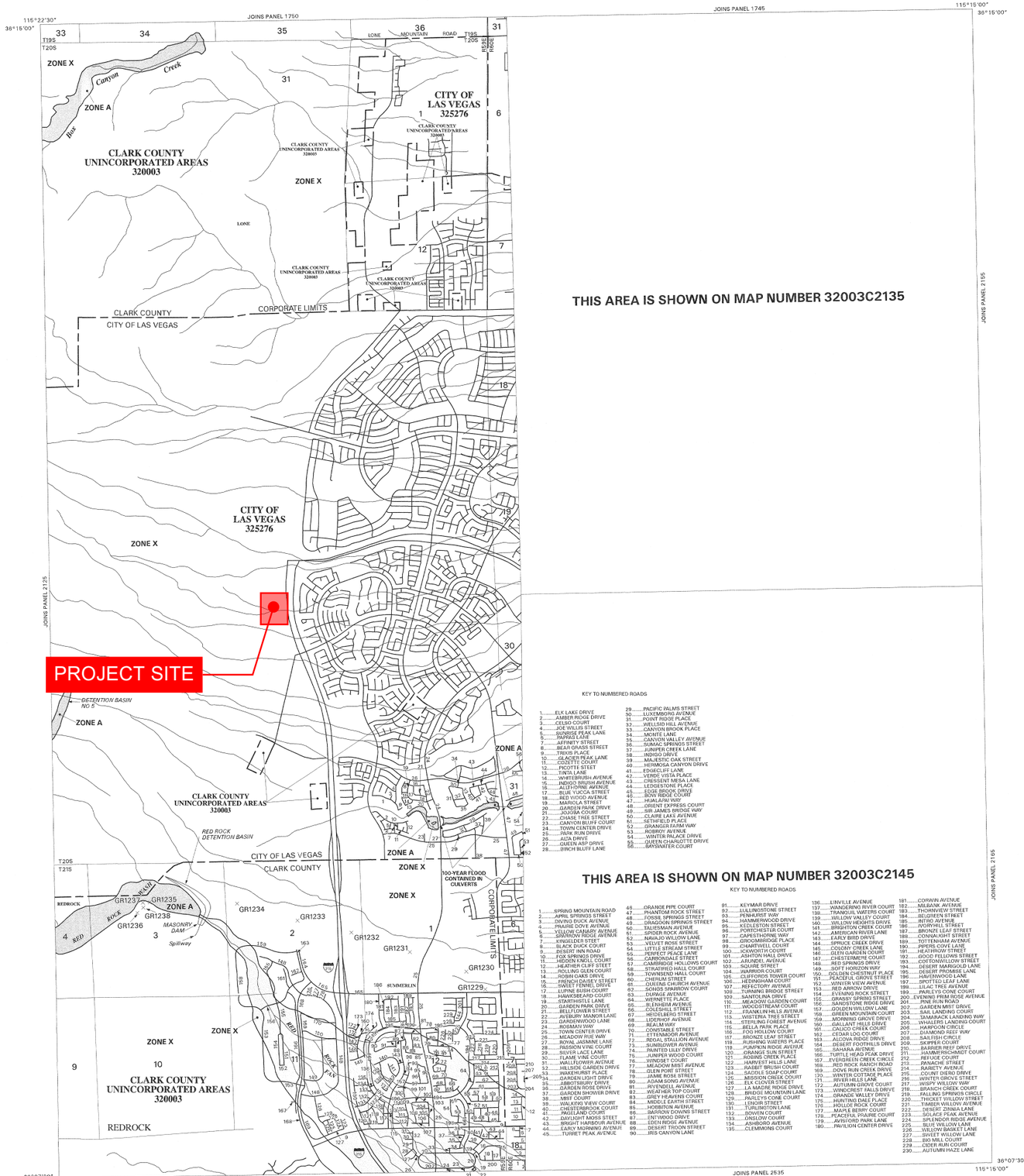
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result,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

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

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

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

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



KEY TO NUMBERED ROADS

1 ELK LAKE DRIVE
2 AMBER RIDGE DRIVE
3 CELSO COURT
4 JOE WILLIS STREET
5 SUNRISE PEAK LANE
6 PAPPAS LANE
7 AFFINITY STREET
8 BEAUTY BUSH STREET
9 IRIS PLACE
10 GLACIER PEAK LANE
11 COZETTE COURT
12 PICOTTE STEET
13 TINTIL LANE
14 WHITEBRUSH AVENUE
15 INDIGO BRUSH AVENUE
16 ALLITHORNE AVENUE
17 BLUE YUCCA STREET
18 RED WOOD AVENUE
19 MARIOLA STREET
20 GARDEN PARK DRIVE
21 BELLFLOWER STREET
22 CHANG TREE STREET
23 CANYON BLUFF COURT
24 TOWN CENTER DRIVE
25 PARK RUN DRIVE
26 AIZA DRIVE
27 QUEEN ASP DRIVE
28 BIRCH BLUFF LANE
29 PACIFIC PALMS STREET
30 LUXEMBORG AVENUE
31 POINT RIDGE PLACE
32 WELLSID HILL AVENUE
33 CANYON BROOK PLACE
34 MONTE LANE
35 CANYON VALLEY AVENUE
36 SUMAC SPRINGS STREET
37 JUNIPER CREEK LANE
38 INDIGO DRIVE
39 MAJESTIC OAK STREET
40 HERMOSA CANYON DRIVE
41 EDGECLIFF LANE
42 VERDE VISTA PLACE
43 CRESSENT MESA LANE
44 LEDGESTONE PLACE
45 TURRET PEAK AVENUE
46 ROSE RIDGE COURT
47 HUALAPAI WAY
48 ORIENT EXPRESS COURT
49 SIR JAMES BRIDGE WAY
50 CLAIRE LAKE AVENUE
51 SETHFIELD PLACE
52 GRANGER FARM WAY
53 ROBROY AVENUE
54 WINTER PALACE DRIVE
55 QUEEN CHARLOTTE DRIVE
56 BAYSWATER COURT
91 KEYMAR DRIVE
92 LILLINGSTONE STREET
93 PENHURST WAY
94 HAMMERWOOD DRIVE
95 KEDLESTON STREET
96 PORTCHESTER COURT
97 CAPESTHORNE WAY
98 GROOMBRIDGE PLACE
99 CHARTWELL COURT
100 ICKWORTH COURT
101 ASHTON HALL DRIVE
102 ARUNDEL AVENUE
103 SQUIRE STREET
104 WARRIOR COURT
105 CLIFFORDS MANOR COURT
106 HEDINGHAM COURT
107 ROSEMARY AVENUE
108 SPRING BRIDGE STREET
109 SANTOLINA DRIVE
110 MEADOW GARDEN COURT
111 WOODSTREAM COURT
112 FRANKLIN HILLS AVENUE
113 WISTERIA TREE STREET
114 STERLING FOREST AVENUE
115 BELLA PARK PLACE
116 FOG HOLLOW COURT
117 BRONZE LEAF STREET
118 RUNNING WATERS PLACE
119 PUMPKIN RIDGE AVENUE
120 ORANGE SUN STREET
121 ROBINS CREEK PLACE
122 HARVEST MOON LANE
123 RABBIT BRUSH COURT
124 SADDLE SOAP COURT
125 MISSION CREEK COURT
126 ELK CLOVER STREET
127 LA MADRE RIDGE DRIVE
128 BRIDGE MOUNTAIN LANE
129 PARLEYS CONE COURT
130 LEHOIR STREET
131 TURLINGTON LANE
132 BOWEN COURT
133 ONSLOW COURT
134 ASHBORO AVENUE
135 CLEMMONS COURT
136 LINVILLE AVENUE
137 WANDERING RIVER COURT
138 TRANQUIL WATERS COURT
139 WILLOW VALLEY COURT
140 WILLOW HEIGHTS DRIVE
141 BRIGHTON CREEK COURT
142 AMERICAN RIVER LANE
163 EARLY BIRD DRIVE
144 SPRUCE GROVE DRIVE
145 MISTY CREEK LANE
146 GLEN GARDEN COURT
147 CHESTERMERE COURT
148 RED SPRINGS DRIVE
149 SOFT HORIZON WAY
150 GOLDEN CHESTNUT PLACE
151 PEACEFUL GROVE STREET
152 WINTER VIEW AVENUE
153 RED ARROW DRIVE
154 EVENING ROCK STREET
155 GRASSY SPRING STREET
156 SANDSTONE RIDGE DRIVE
157 GOLDEN WILLOW LANE
158 GREEN MOUNTAIN COURT
159 MORNING MIST LANE
160 GALLO CREEK COURT
161 CEDAR LOG COURT
163 ALCOVA RIDGE DRIVE
164 DESERT FOOTHILLS DRIVE
165 SAHARA AVENUE
166 TURTLE HEAD PEAK DRIVE
167 EVERGREEN CREEK CIRCLE
168 RED ROCK RANCH ROAD
169 DOVE RUN CREEK DRIVE
170 WINTER COTTAGE PLACE
171 RIVER HILLS LANE
172 AUTUMN GROVE COURT
173 WINDCREST FALLS DRIVE
174 ORANDE VALLEY PLACE
176 HUNTINGDALE PLACE
177 MAPLE BERRY COURT
179 MAPLE BERRY COURT
178 PEACEFUL PRAIRIE COURT
179 AVISFORD PARK LANE
180 PAVILION CENTER DRIVE
181 CORWIN AVENUE
182 MILBANK AVENUE
183 THORNVIEW STREET
184 REGENTS STREET
185 ALLEN AVENUE
186 LARK WHEEL STREET
187 BRONZE LEAF STREET
188 CONNAUGHT STREET
189 TOTTENHAM AVENUE
190 PIPERS COVE LANE
191 HEATHROW STREET
192 GOOD FELLOWS STREET
193 COTTONWILLOW STREET
194 DESERT MARIGOLD LANE
195 DESERT PROMISE LANE
196 HAVERWOOD LANE
197 SPOTTED LEAF LANE
198 LILAC TREE POINT
199 PARLEYS CONE COURT
200 EVENING RIDGE AVENUE
205 PINE RUN ROAD
202 GARDEN MIST DRIVE
203 SAIL LANDING COURT
204 TAMARACK LANDING WAY
205 WHALERS LANDING COURT
208 HARPOON CIRCLE
207 DIAMOND REEF WAY
208 SAILFISH CIRCLE
209 SKIPPER COURT
210 BARRIER REEF DRIVE
211 HAMMERSCHMIDT COURT
212 REFUGE COURT
213 PINNACHE STREET
214 RARIETY AVENUE
215 COVE POINT DRIVE
216 WISTER DRIVE STREET
217 MISTY WILLOW WAY
218 BRANCH CREEK COURT
219 FALLING SPRINGS CIRCLE
220 THICKET WILLOW STREET
221 TIMBER WILLOW AVENUE
222 DESERT ZINNIA LANE
223 SOLACE PEAK AVENUE
224 SPLENDOR RIDGE AVENUE
225 BLUE WILLOW LANE
226 WILLOW BASKET LANE
227 SWEET WILLOW LANE
228 BIG MILL COURT
229 CIDER RUN COURT
230 AUTUMN HAZE LANE

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

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

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

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

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

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

*Referenced to the North American Vertical Datum of 1988

A — A Cross Section Line
23 — 23 Transect Line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276 mN Universal Transverse Mercator grid values, zone 11
600000 FT State Plane grid ticks
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
AUGUST 16, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 27, 2002: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to delete special flood hazard areas, to change zone designations, to add roads and road names, to incorporate previously issued letters of map revision, to incorporate previously issued letters of map amendment, and to change floodway.

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

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

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2150 E

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

PANEL 2150 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAS VEGAS, CITY OF	325276	2150	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	2150	E

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

MAP NUMBER 32003C2150 E

MAP REVISED: SEPTEMBER 27, 2002

Federal Emergency Management Agency

REGIONAL FLOOD CONTROL DISTRICT

2018
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-22
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

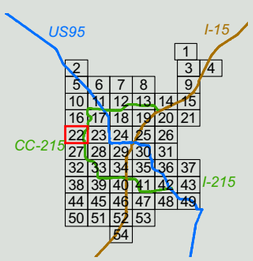
Category A	Category B
Channel	Channel
Stormdrain	Stormdrain
Crossing	Crossing

N

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

Scale: 1 inch = 2,000 feet

AerialSource:Esri World Imagery 2017



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Louis Berger

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APAD		**ANGEL PARK - ALTA DRIVE BRANCH**						
0203	E	2: 7' X 5.5' RCB	1104	2200	CSWAA-1	GOW3A	6.95	5.28
0225	E	2: 7' X 5.5' RCB OUTLET	360	2137	SUM5DB	GOW3A	6.73	3.40
APBE		**ANGEL PARK - BELTWAY BRANCH**						
0022	E	CONC CHNL 20'W 7'D 2:1 SS	1556	3366	CCSWFH15	GOW3A	3.39	1.81
0051	E	CONC CHNL 20'W 7'D 2:1 SS	1583	3366	CCSWFH15	GOW3A	3.39	2.77
0081	E	8' X 8' RCBC @ FAR HILLS	777	1048	CSWFH-15	GOW3A	0.59	2.32
0094	E	CONC CHNL 10'W 5'D 2:1 SS	1465	1048	CSWFH-15	GOW3A	0.59	1.88
0122	E	CONC CHNL 10'W 4'D 2:1 SS	1685	1048	CSWFH-15	GOW3A	0.59	0.80
0154	P0	8' X 6' RCB	5012	781	CSWFH-12	GOW3A	0.41	1.30
0249	P0	6' X 5' RCB	2858	606	CSWFH-11	GOW3A	0.31	3.00
APCH		**ANGEL PARK - CARRIAGE HILL BRANCH**						
0000	E	8' X 6' RCB	152	399	CSWFH-14	GOW3A	0.21	0.87
0003	P0	72" RCP	1685	399	CSWFH-14	GOW3A	0.21	2.00
0031	P0	60" RCP	2008	206	SWFH-13	GOW3A	0.10	1.38
APD2		**ANGEL PARK - DESERT FOOTHILLS 2 BRANCH**						
0002	E	7' X 6' RCB	883	674	SWAA-2	GOW3A	0.68	1.08
APDF		**ANGEL PARK - DESERT FOOTHILLS BRANCH**						
0000	P0	10' X 6' RCB	1788	1428	CSWFH-9	GOW3B	0.80	3.55
0026	P0	8' X 6' RCB	1813	968	CSWFH-8	GOW3A	1.80	2.00
0073	P0	6' X 4' RCB	1922	486	CSWFH-4	GOW3A	1.52	4.40
0123	P0	42" RCP	1076	141	GPDB	GOW3A	1.29	6.00
0125	P0	130 AC-FT GRAND PARK DETENTION BASIN		1543	CSWFH-3	GOW3A	1.29	
0127	P0	6' X 6' RCB	2977	853	SWFH-1	GOW3A	0.69	3.80
0128	P0	5' X 4' RCB	2197	509	SWFH-2	GOW3A	0.37	5.70
APFH		**ANGEL PARK - FAR HILLS BRANCH**						
0000	E	2: 8' X 8' RCB	1070	2494	CCSWFH14	GOW3B	1.51	3.50
0019	E	2: 8' X 8' RCB	250	2149	CCSWFH-9	GOW3B	1.30	4.19
0024	E	16' X 8' RCAP	1951	2149	CCSWFH-9	GOW3B	1.30	5.10
0061	E	8' X 6' RCB	1435	839	CSWFH-7	GOW3A	0.50	2.00
0089	E	8' X 6' RCB	2946	839	CSWFH-7	GOW3A	0.50	2.00
0144	P0	5' X 4' RCB	2497	456	SWFH-6	GOW3A	0.28	5.50
APM5		**DETENTION BASIN #5**						
0000	E	384 AC-FT DETENTION BASIN #5		6856	SUM5IN	GOW3A	6.73	
0008	P0	CONC CHNL 50'W 4.5'D 2:1 SS	2102	3634	CCDB54-7	GOW3A	4.13	5.20
0009	P0	CONC CHNL 50'W 4'D 2:1 SS	4180	3495	CDB55-7	GOW3A	2.60	5.80
0047	E	DIVERSION BERM WITH GABION BANK PROTECTION	1000	3634	CCDB54-7	GOW3A	4.13	1.30
0056	P0	CONC CHNL 80'W 4'D 2:1 SS	264	3634	CCDB54-7	GOW3A	4.13	1.30
0057	P0	CONC CHNL 50'W 3'D 2:1 SS	9922	1664	CDB54-4	GOW3A	0.81	6.80
0059	P0	CONC CHNL 100'W 3'D 2:1 SS	9075	2606	CDB54-7	GOW3A	3.31	7.00
0212	P0	CONC CHNL 30'W 3'D 2:1 SS	6695	1092	DB55-1	GOW3A	0.64	7.50
0213	P0	CONC CHNL 50'W 3'D 2:1 SS	6522	1729	CDB55-5	GOW3A	1.30	7.30
APSP		**ANGEL PARK - SUMMERLIN PARKWAY**						
0183	E	CONC CHNL 10'W 6'D 2:1 SS	1680	884	C11B-1	GOW3A	0.84	1.70
GOB3		**GOWAN LONE MOUNTAIN SYST. 3 BELTWAY**						
0000	E	66" RCP	1370	341	SV22-1	GOW3A	0.18	4.50
GOBE		**GOWAN LONE MOUNTAIN SYST. BELTWAY**						
0000	E	20' X 10' RCBC @ ACCESS RD	30	1044	CSV22	GOW3A	0.67	5.67
0001	E	CONC CHNL 20'W 5'D 2:1 SS	1100	1044	CSV22	GOW3A	0.67	6.50
0021	E	CONC CHNL 11'W 6.8'D 0:1 SS	2143	1044	CSV22	GOW3A	0.67	6.50
0058	E	CONC CHNL 15'W 7.5'D 0:1 SS	487	1044	CSV22	GOW3A	0.67	3.93
0065	E	CONC CHNL 17'W 7.5'D 0:1 SS	844	1044	CSV22	GOW3A	0.67	0.76
0088	E	2: 10' X 9' RCBC @ LAKE MEAD	400	782	SV22-2	GOW3A	0.49	0.50
0096	E	CONC CHNL 20'W 9'D 2:1 SS	627	782	SV22-2	GOW3A	0.49	0.50
0108	E	CONC CHNL 20'W 6'D 2:1 SS	1021	782	SV22-2	GOW3A	0.49	0.50
0127	E	CONC CHNL 20'W 6'D 2:1 SS	638	782	SV22-2	GOW3A	0.49	0.50
0139	E	CONC CHNL 10'W 5.5'D 2:1 SS	1500	782	SV22-2	GOW3A	0.49	1.02
GOL3		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3**						
0010	E	CONC CHNL 20'W 10'D 0:1 SS	3037	3277	CRCLMT1R	GOW3A	7.31	2.78
0068	E	TRANSITION STRUCTURE	100	3277	CRCLMT1R	GOW3A	7.31	3.50
0070	E	20' X 6' RCBC @ CLIFF SHADOWS	350	1271	CRCSV22	GOW3A	4.99	2.44
0077	E	CONC CHNL 20'W 6'D 0:1 SS	1229	1271	CRCSV22	GOW3A	4.99	6.11

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOL3		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3**						
0100	E	CONC CHNL 20'W 10'D 0:1 SS	200	1271	CRCSV22	GOW3A	4.99	5.67
0115	E	96" RCP OUTLET	670	666	DET26	GOW3A	4.31	0.29
0128	E	305 AC-FT VILLAGE 26 DETENTION BASIN		3615	VIL26IN	GOW3A	4.31	
0137	E	CONC CHNL 20'W 7.5'D 0:1 SS	2720	3615	VIL26IN	GOW3A	4.31	6.50
0188	E	CONC CHNL 20'W 8'D 0:1 SS	563	3615	VIL26IN	GOW3A	4.31	3.91
0197	E	14' X 14' RCB	890	3615	VIL26IN	GOW3A	4.31	0.88
0214	E	Dual 10' X 14' RCB	124	3615	VIL26IN	GOW3A	4.31	0.57
0216	P0	CONC CHNL 50'W 4'D 2:1 SS	4060	3524	CSV26-1	GOW3A	4.02	6.08
0289	P0	CONC CHNL 50'W 3.5'D 2:1 SS	6215	2281	30	GOW3A	2.44	7.95
0290	E	NATURAL WASH 363'W	4850	1410	SV26-1	GOW3A	1.59	22.50
0370	E	NATURAL WASH 450'W	7000	2281	30	GOW3A	2.44	8.50
GOL4		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4**						
0000	E	14' X 8' RCB	554	2243	CLMT1R	GOW3A	2.33	2.50
0010	E	2: 9' X 8' RCB	820	2243	CLMT1R	GOW3A	2.33	4.74
0025	E	SOIL CEMENT CHNL 60'W 8'D 3-4:1 SS	320	2243	CLMT1R	GOW3A	2.33	2.00
0026	E	SOIL CEMENT CHNL 42'W 6'D 3-4:1 SS	700	2243	CLMT1R	GOW3A	2.33	1.00

*The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.
**As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.
^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e. HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).

REGIONAL FLOOD CONTROL DISTRICT

2018 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F-22

LEGEND

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	CMAP	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

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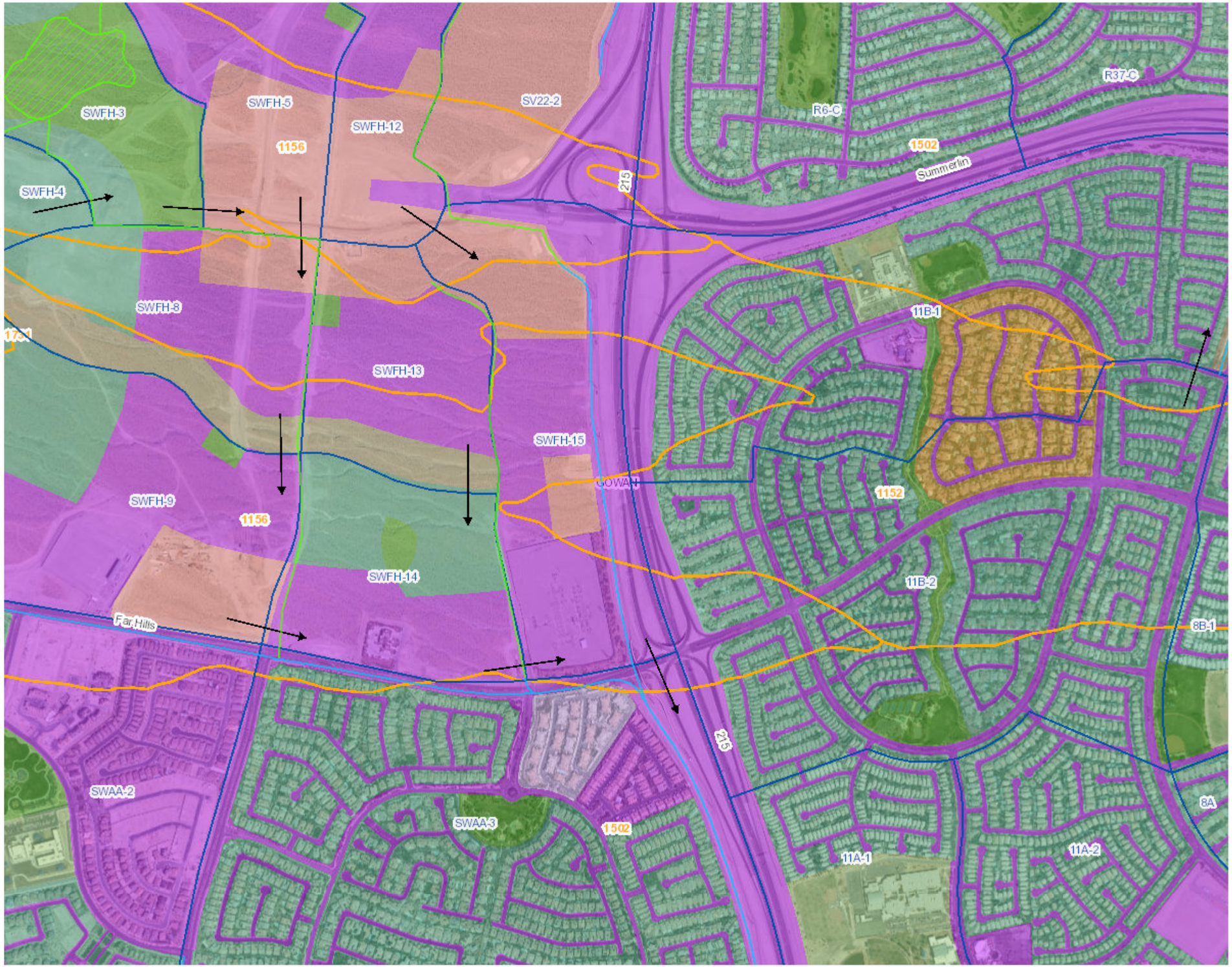
Louis Berger

Village 21 - Parcel I



Legend

- Flow Arrows
- NodeID flow(cfs) — Concentration Points
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Ultimate Development Boundary
- Watershed
- BasinID — Subbasins
- MUSYM — 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
- SFHA Zone AE
- SFHA Zone A
- SFHA Zone AO
- Zone X (Shaded)

1 inch = 833 feet

N

0 415 830 1,660 Feet

REGIONAL FLOOD CONTROL DISTRICT

Worksheet for I-1A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.29 ft
Hydraulic Radius	0.05 ft
Top Width	6.22 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.349
Flow Type	Supercritical

GVF Input Data

Worksheet for I-1A 9.5' Half Street

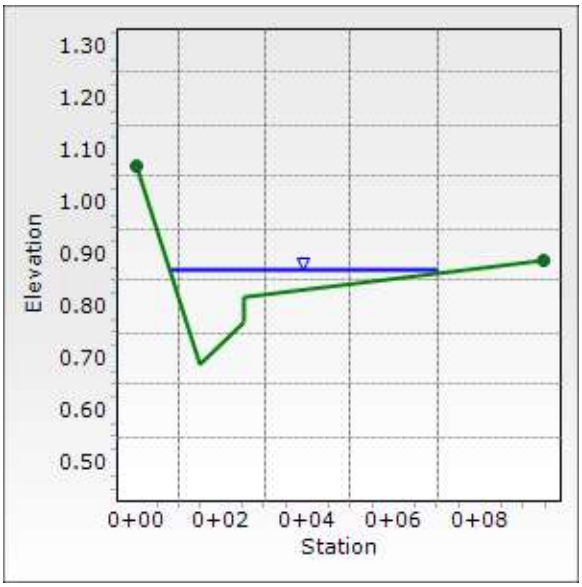
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.900 %
Critical Slope	1.018 %

Cross Section for I-1A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-1B 35' Typical (30" Roll Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.900 %
Discharge	5.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+15.50	0.39
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+35.00, 0.46)	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	0.26 ft
Elevation Range	0.00 to 0.46 ft
Flow Area	1.6 ft²
Wetted Perimeter	17.35 ft
Hydraulic Radius	0.09 ft
Top Width	17.17 ft
Normal Depth	0.26 ft
Critical Depth	0.31 ft
Critical Slope	0.777 %
Velocity	3.18 ft/s
Velocity Head	0.16 ft

Worksheet for I-1B 35' Typical (30" Roll Curb)

Results	
Specific Energy	0.42 ft
Froude Number	1.856
Flow Type	Supercritical

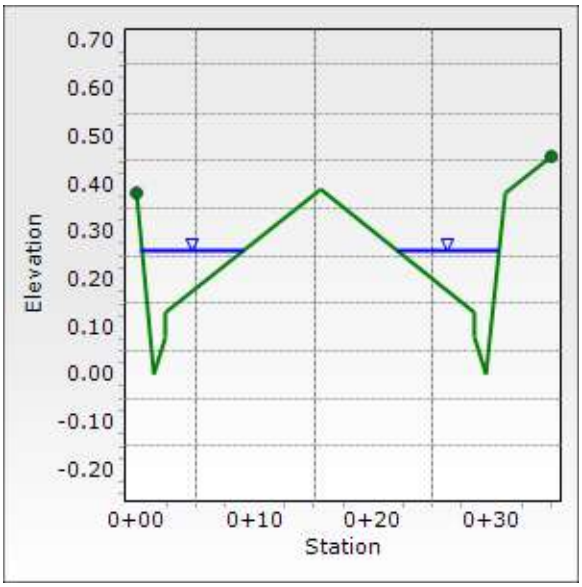
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.26 ft
Critical Depth	0.31 ft
Channel Slope	2.900 %
Critical Slope	0.777 %

Cross Section for I-1B 35' Typical (30" Roll Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.900 %
Normal Depth	0.26 ft
Discharge	5.00 cfs



Worksheet for I-2 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.600 %
Discharge	1.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.31 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.8 ft²
Wetted Perimeter	6.69 ft
Hydraulic Radius	0.12 ft
Top Width	6.60 ft
Normal Depth	0.31 ft
Critical Depth	0.29 ft
Critical Slope	0.768 %
Velocity	1.79 ft/s
Velocity Head	0.05 ft
Specific Energy	0.36 ft
Froude Number	0.889
Flow Type	Subcritical

Worksheet for I-2 25.5' Half Street

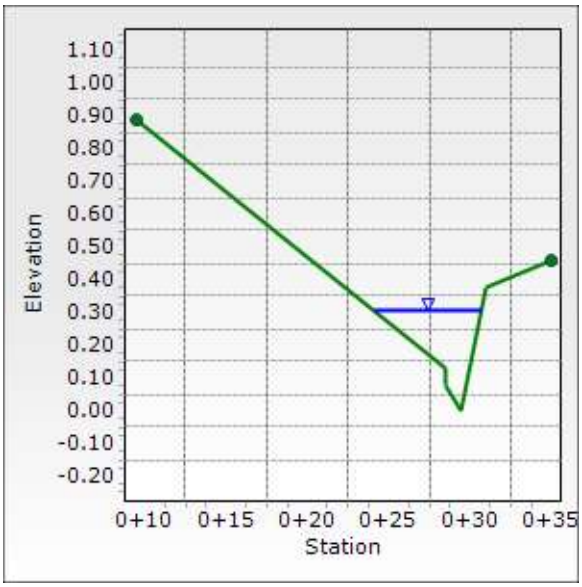
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.31 ft
Critical Depth	0.29 ft
Channel Slope	0.600 %
Critical Slope	0.768 %

Cross Section for I-2 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.600 %
Normal Depth	0.31 ft
Discharge	1.50 cfs



Worksheet for I-2 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	0.600	%
Discharge	0.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.20	ft
Elevation Range	0.69 to 1.07	ft
Flow Area	0.5	ft²
Wetted Perimeter	8.87	ft
Hydraulic Radius	0.05	ft
Top Width	8.79	ft
Normal Depth	0.20	ft
Critical Depth	0.19	ft
Critical Slope	1.018	%
Velocity	1.03	ft/s
Velocity Head	0.02	ft
Specific Energy	0.22	ft
Froude Number	0.775	
Flow Type	Subcritical	

GVF Input Data

Worksheet for I-2 9.5' Half Street

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

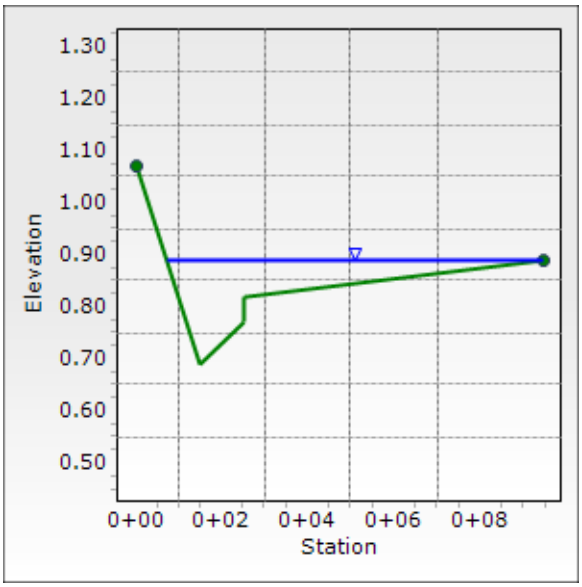
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Channel Slope	0.600 %
Critical Slope	1.018 %

Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.000103507975810935ft.

Cross Section for I-2 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.600 %
Normal Depth	0.20 ft
Discharge	0.50 cfs



Worksheet for I-3 35' Typical (30" Roll Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.670 %
Discharge	2.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+15.50	0.39
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+35.00, 0.46)	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	0.20 ft
Elevation Range	0.00 to 0.46 ft
Flow Area	0.7 ft²
Wetted Perimeter	10.38 ft
Hydraulic Radius	0.07 ft
Top Width	10.22 ft
Normal Depth	0.20 ft
Critical Depth	0.26 ft
Critical Slope	0.847 %
Velocity	3.63 ft/s
Velocity Head	0.20 ft

Worksheet for I-3 35' Typical (30" Roll Curb)

Results	
Specific Energy	0.40 ft
Froude Number	2.466
Flow Type	Supercritical

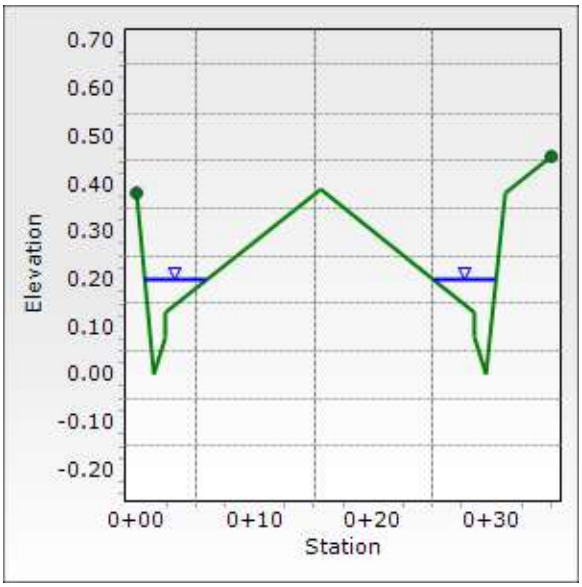
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.26 ft
Channel Slope	5.670 %
Critical Slope	0.847 %

Cross Section for I-3 35' Typical (30" Roll Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	5.670 %
Normal Depth	0.20 ft
Discharge	2.50 cfs



Worksheet for I-4A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.330	%
Discharge	4.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.37	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.3	ft²
Wetted Perimeter	8.51	ft
Hydraulic Radius	0.15	ft
Top Width	8.41	ft
Normal Depth	0.37	ft
Critical Depth	0.42	ft
Critical Slope	0.704	%
Velocity	3.06	ft/s
Velocity Head	0.15	ft
Specific Energy	0.51	ft
Froude Number	1.371	
Flow Type	Supercritical	

Worksheet for I-4A 25.5' Half Street

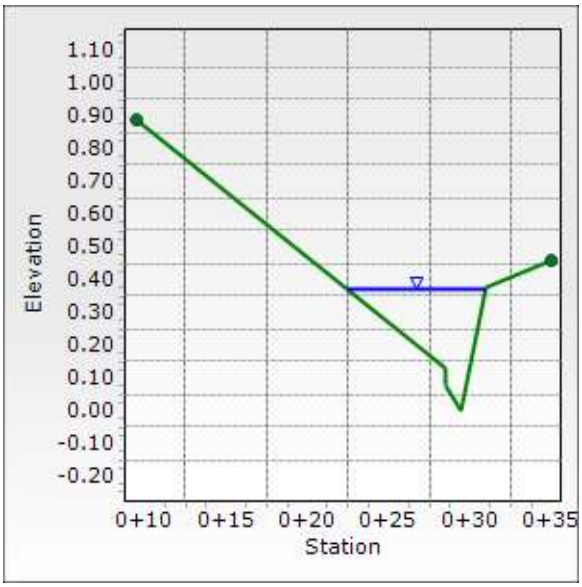
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.37 ft
Critical Depth	0.42 ft
Channel Slope	1.330 %
Critical Slope	0.704 %

Cross Section for I-4A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.330 %
Normal Depth	0.37 ft
Discharge	4.00 cfs



Worksheet for I-4A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.330 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	7.05 ft
Hydraulic Radius	0.05 ft
Top Width	6.98 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.44 ft/s
Velocity Head	0.03 ft
Specific Energy	0.21 ft
Froude Number	1.141
Flow Type	Supercritical

GVF Input Data

Worksheet for I-4A 9.5' Half Street

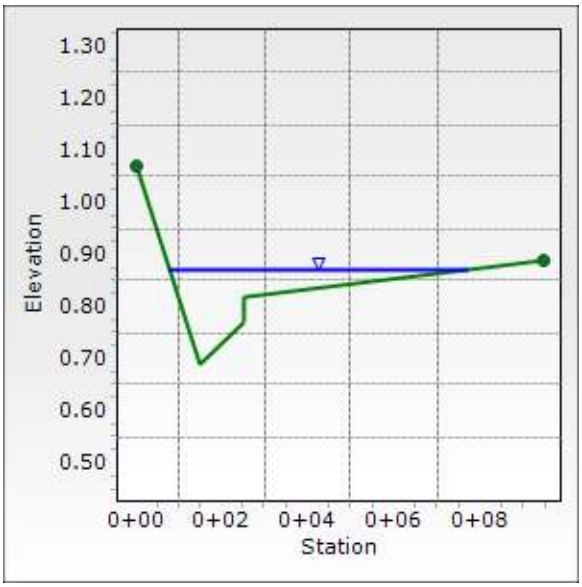
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.330 %
Critical Slope	1.018 %

Cross Section for I-4A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.330 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-5A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Discharge	4.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.38 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	1.4 ft²
Wetted Perimeter	8.97 ft
Hydraulic Radius	0.16 ft
Top Width	8.86 ft
Normal Depth	0.38 ft
Critical Depth	0.44 ft
Critical Slope	0.701 %
Velocity	3.17 ft/s
Velocity Head	0.16 ft
Specific Energy	0.54 ft
Froude Number	1.397
Flow Type	Supercritical

Worksheet for I-5A 25.5' Half Street

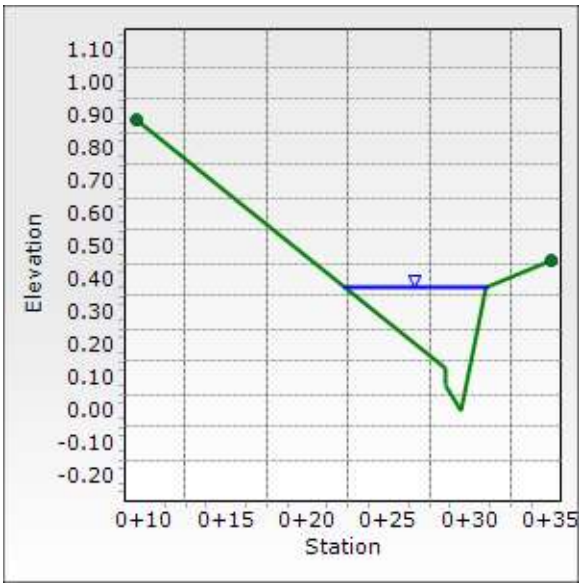
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.38 ft
Critical Depth	0.44 ft
Channel Slope	1.360 %
Critical Slope	0.701 %

Cross Section for I-5A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Normal Depth	0.38 ft
Discharge	4.50 cfs



Worksheet for I-5A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.360	%
Discharge	0.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	7.00 ft
Hydraulic Radius	0.05 ft
Top Width	6.93 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.46 ft/s
Velocity Head	0.03 ft
Specific Energy	0.22 ft
Froude Number	1.154
Flow Type	Supercritical

GVF Input Data

Worksheet for I-5A 9.5' Half Street

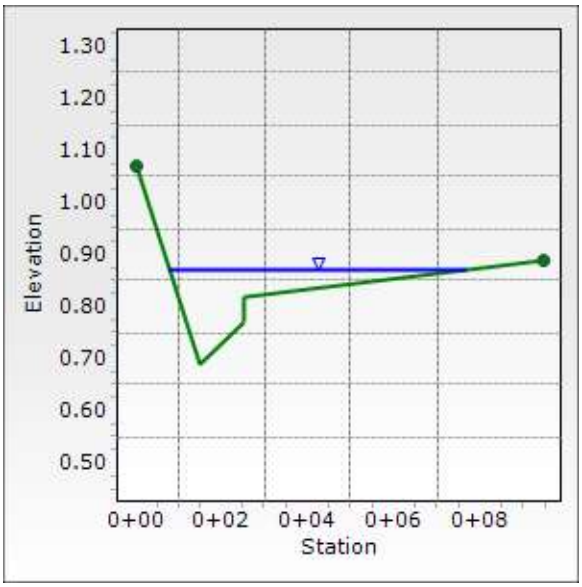
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.360 %
Critical Slope	1.018 %

Cross Section for I-5A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-6 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.900	%
Discharge	2.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.30	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	0.8	ft²
Wetted Perimeter	6.51	ft
Hydraulic Radius	0.12	ft
Top Width	6.41	ft
Normal Depth	0.30	ft
Critical Depth	0.35	ft
Critical Slope	0.720	%
Velocity	3.15	ft/s
Velocity Head	0.15	ft
Specific Energy	0.45	ft
Froude Number	1.577	
Flow Type	Supercritical	

Worksheet for I-6 25.5' Half Street

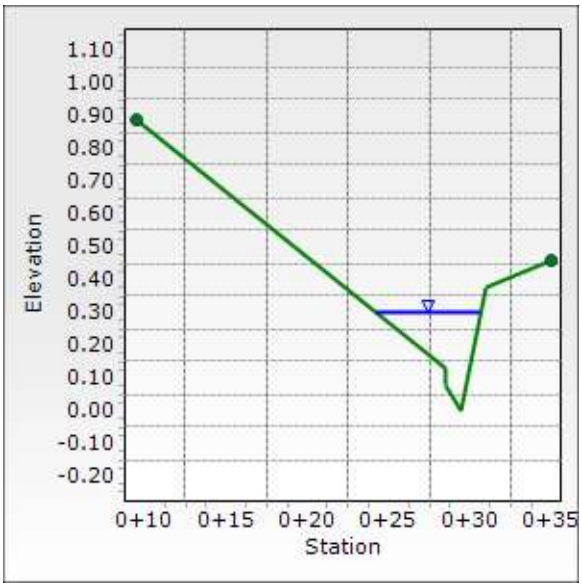
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.30 ft
Critical Depth	0.35 ft
Channel Slope	1.900 %
Critical Slope	0.720 %

Cross Section for I-6 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Normal Depth	0.30 ft
Discharge	2.50 cfs



Worksheet for I-6 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.29 ft
Hydraulic Radius	0.05 ft
Top Width	6.22 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.349
Flow Type	Supercritical

GVF Input Data

Worksheet for I-6 9.5' Half Street

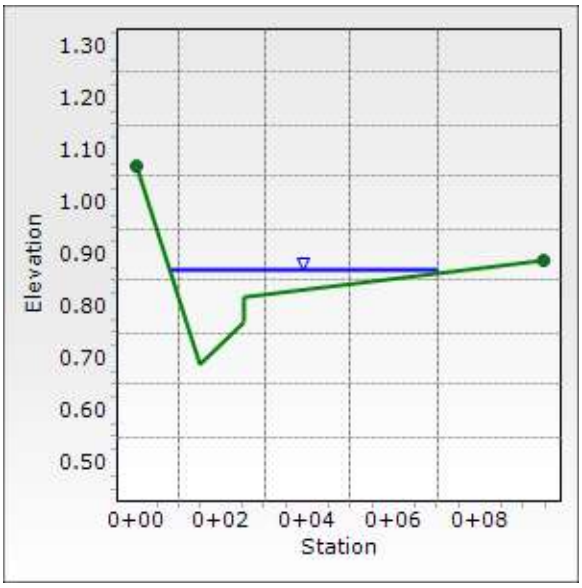
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.900 %
Critical Slope	1.018 %

Cross Section for I-6 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.900 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-7A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.630	%
Discharge	2.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.31	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	0.8	ft²
Wetted Perimeter	6.73	ft
Hydraulic Radius	0.13	ft
Top Width	6.63	ft
Normal Depth	0.31	ft
Critical Depth	0.35	ft
Critical Slope	0.720	%
Velocity	2.96	ft/s
Velocity Head	0.14	ft
Specific Energy	0.44	ft
Froude Number	1.465	
Flow Type	Supercritical	

Worksheet for I-7A 25.5' Half Street

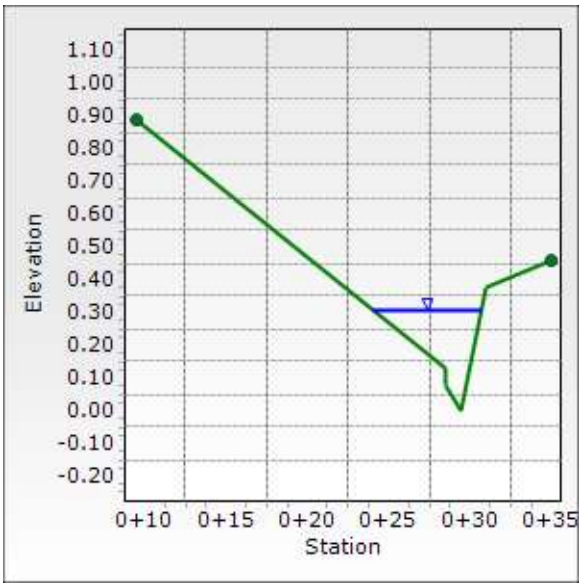
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.31 ft
Critical Depth	0.35 ft
Channel Slope	1.630 %
Critical Slope	0.720 %

Cross Section for I-7A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.630 %
Normal Depth	0.31 ft
Discharge	2.50 cfs



Worksheet for I-7A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.630 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.63 ft
Hydraulic Radius	0.05 ft
Top Width	6.55 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.57 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.253
Flow Type	Supercritical

GVF Input Data

Worksheet for I-7A 9.5' Half Street

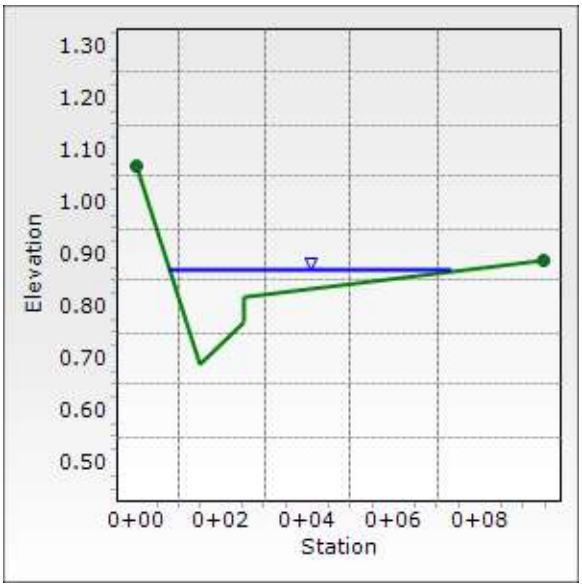
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.630 %
Critical Slope	1.018 %

Cross Section for I-7A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.630 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-8 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	1.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.31 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.9 ft²
Wetted Perimeter	6.95 ft
Hydraulic Radius	0.13 ft
Top Width	6.85 ft
Normal Depth	0.31 ft
Critical Depth	0.29 ft
Critical Slope	0.768 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.36 ft
Froude Number	0.819
Flow Type	Subcritical

Worksheet for I-8 25.5' Half Street

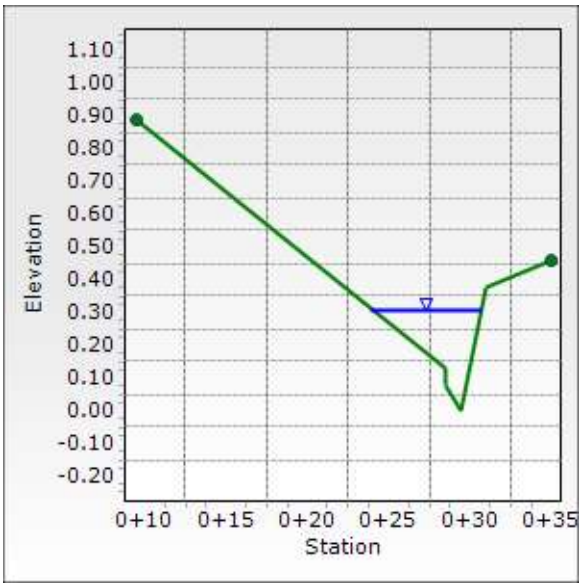
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.31 ft
Critical Depth	0.29 ft
Channel Slope	0.500 %
Critical Slope	0.768 %

Cross Section for I-8 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.31 ft
Discharge	1.50 cfs



Worksheet for I-8 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.20 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.5 ft²
Wetted Perimeter	8.88 ft
Hydraulic Radius	0.06 ft
Top Width	8.80 ft
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Critical Slope	1.017 %
Velocity	0.98 ft/s
Velocity Head	0.01 ft
Specific Energy	0.22 ft
Froude Number	0.717
Flow Type	Subcritical

GVF Input Data

Worksheet for I-8 9.5' Half Street

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	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Channel Slope	0.500 %
Critical Slope	1.017 %

Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.003067761 51974553ft.

Worksheet for I-9A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.28 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.7 ft²
Wetted Perimeter	5.84 ft
Hydraulic Radius	0.11 ft
Top Width	5.75 ft
Normal Depth	0.28 ft
Critical Depth	0.26 ft
Critical Slope	0.808 %
Velocity	1.53 ft/s
Velocity Head	0.04 ft
Specific Energy	0.31 ft
Froude Number	0.797
Flow Type	Subcritical

Worksheet for I-9A 25.5' Half Street

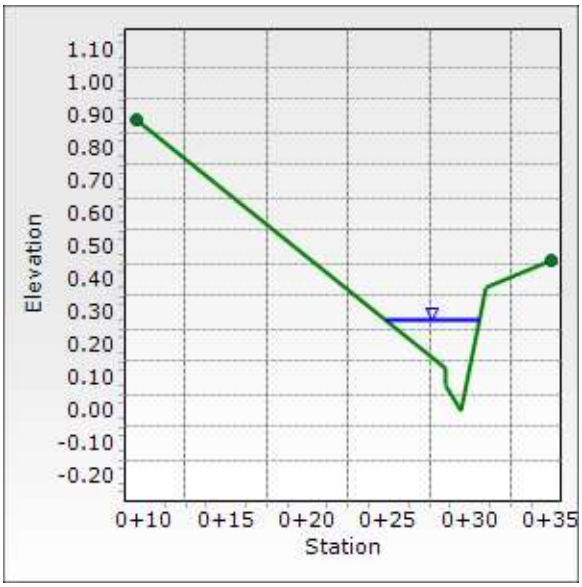
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.28 ft
Critical Depth	0.26 ft
Channel Slope	0.500 %
Critical Slope	0.808 %

Cross Section for I-9A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.28 ft
Discharge	1.00 cfs



Worksheet for I-9A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.20 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.5 ft²
Wetted Perimeter	8.88 ft
Hydraulic Radius	0.06 ft
Top Width	8.80 ft
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Critical Slope	1.017 %
Velocity	0.98 ft/s
Velocity Head	0.01 ft
Specific Energy	0.22 ft
Froude Number	0.717
Flow Type	Subcritical

GVF Input Data

Worksheet for I-9A 9.5' Half Street

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

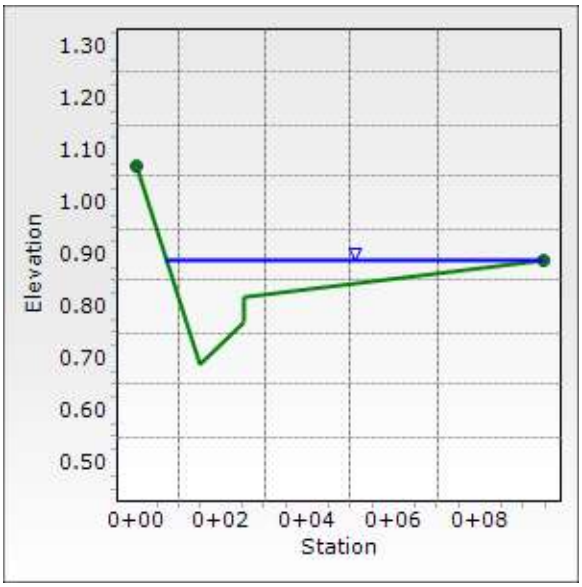
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Channel Slope	0.500 %
Critical Slope	1.017 %

Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.003067761 51974553ft.

Cross Section for I-9A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.20 ft
Discharge	0.50 cfs



Worksheet for I-10 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.22 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.4 ft²
Wetted Perimeter	4.21 ft
Hydraulic Radius	0.09 ft
Top Width	4.13 ft
Normal Depth	0.22 ft
Critical Depth	0.20 ft
Critical Slope	0.874 %
Velocity	1.32 ft/s
Velocity Head	0.03 ft
Specific Energy	0.25 ft
Froude Number	0.769
Flow Type	Subcritical

Worksheet for I-10 25.5' Half Street

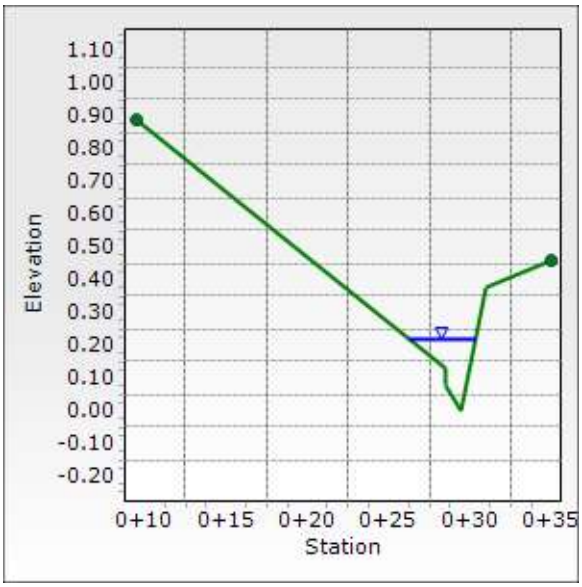
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.22 ft
Critical Depth	0.20 ft
Channel Slope	0.500 %
Critical Slope	0.874 %

Cross Section for I-10 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.22 ft
Discharge	0.50 cfs



Worksheet for I-10 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.20 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.5 ft²
Wetted Perimeter	8.88 ft
Hydraulic Radius	0.06 ft
Top Width	8.80 ft
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	0.98 ft/s
Velocity Head	0.01 ft
Specific Energy	0.22 ft
Froude Number	0.717
Flow Type	Subcritical

GVF Input Data

Worksheet for I-10 9.5' Half Street

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

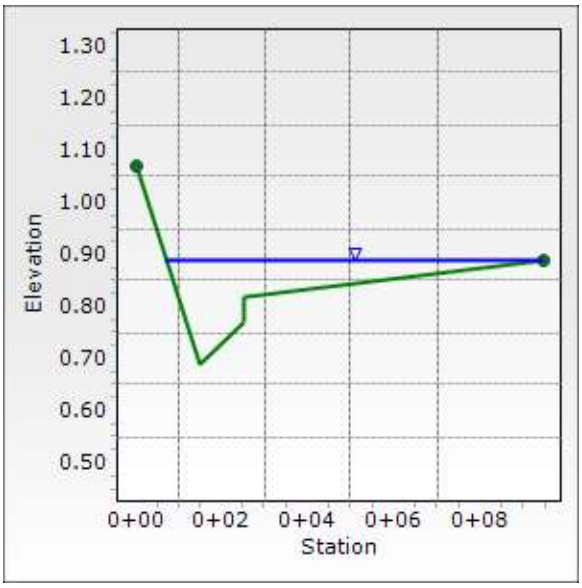
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.19 ft
Channel Slope	0.500 %
Critical Slope	1.018 %

Messages	
Messages	Water Surface Elevation exceeds lowest end station by 0.003002992 2372744ft.

Cross Section for I-10 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.20 ft
Discharge	0.50 cfs



Worksheet for I-11A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.780	%
Discharge	3.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.34	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.1	ft²
Wetted Perimeter	7.59	ft
Hydraulic Radius	0.14	ft
Top Width	7.49	ft
Normal Depth	0.34	ft
Critical Depth	0.40	ft
Critical Slope	0.702	%
Velocity	3.33	ft/s
Velocity Head	0.17	ft
Specific Energy	0.51	ft
Froude Number	1.564	
Flow Type	Supercritical	

Worksheet for I-11A 25.5' Half Street

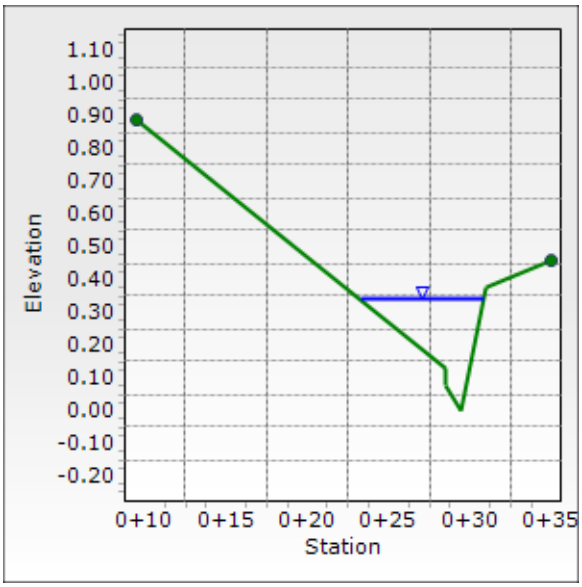
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.34 ft
Critical Depth	0.40 ft
Channel Slope	1.780 %
Critical Slope	0.702 %

Cross Section for I-11A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Normal Depth	0.34 ft
Discharge	3.50 cfs



Worksheet for I-11A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.780	%
Discharge	0.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18	ft
Elevation Range	0.69 to 1.07	ft
Flow Area	0.3	ft²
Wetted Perimeter	6.44	ft
Hydraulic Radius	0.05	ft
Top Width	6.36	ft
Normal Depth	0.18	ft
Critical Depth	0.19	ft
Critical Slope	1.018	%
Velocity	1.63	ft/s
Velocity Head	0.04	ft
Specific Energy	0.22	ft
Froude Number	1.307	
Flow Type	Supercritical	

GVF Input Data

Worksheet for I-11A 9.5' Half Street

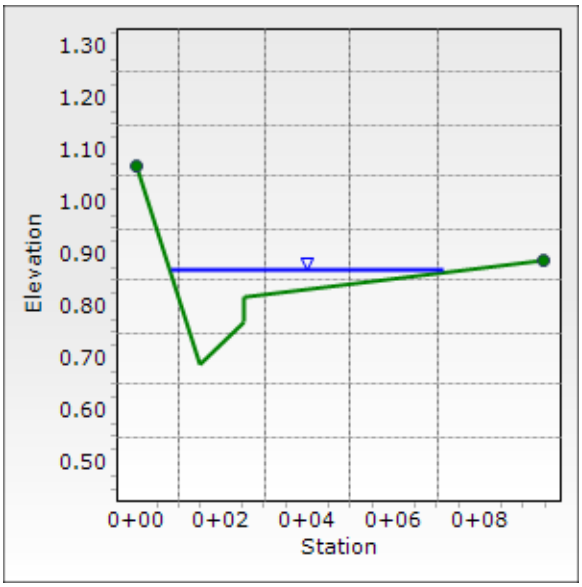
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.780 %
Critical Slope	1.018 %

Cross Section for I-11A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-11B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.22 ft
Elevation Range	0.00 to 0.89 ft
Flow Area	0.4 ft²
Wetted Perimeter	4.34 ft
Hydraulic Radius	0.09 ft
Top Width	4.25 ft
Normal Depth	0.22 ft
Critical Depth	0.26 ft
Critical Slope	0.808 %
Velocity	2.52 ft/s
Velocity Head	0.10 ft
Specific Energy	0.32 ft
Froude Number	1.457
Flow Type	Supercritical

Worksheet for I-11B 25.5' Half Street

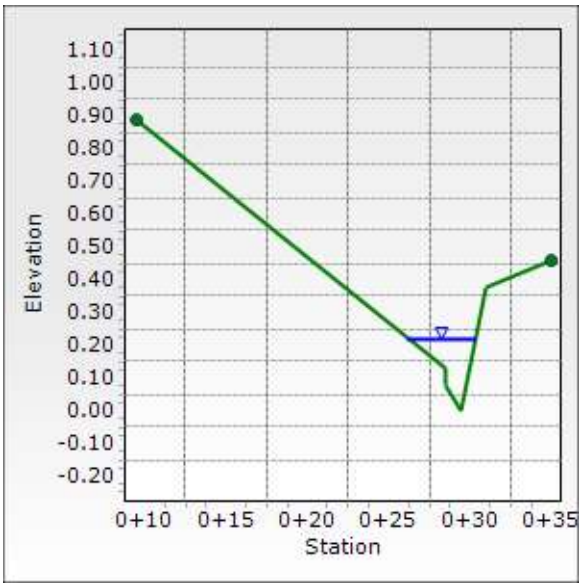
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.22 ft
Critical Depth	0.26 ft
Channel Slope	1.780 %
Critical Slope	0.808 %

Cross Section for I-11B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Normal Depth	0.22 ft
Discharge	1.00 cfs



Worksheet for I-11B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.44 ft
Hydraulic Radius	0.05 ft
Top Width	6.36 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.63 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.307
Flow Type	Supercritical

GVF Input Data

Worksheet for I-11B 9.5' Half Street

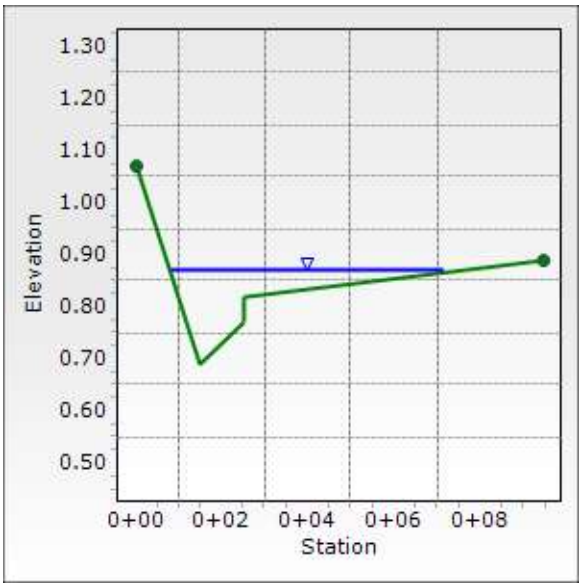
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.780 %
Critical Slope	1.018 %

Cross Section for I-11B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.780 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-12 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.920	%
Discharge	3.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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 0.89	ft
Flow Area	0.9	ft²
Wetted Perimeter	7.02	ft
Hydraulic Radius	0.13	ft
Top Width	6.92	ft
Normal Depth	0.32	ft
Critical Depth	0.37	ft
Critical Slope	0.703	%
Velocity	3.29	ft/s
Velocity Head	0.17	ft
Specific Energy	0.49	ft
Froude Number	1.600	
Flow Type	Supercritical	

Worksheet for I-12 25.5' Half Street

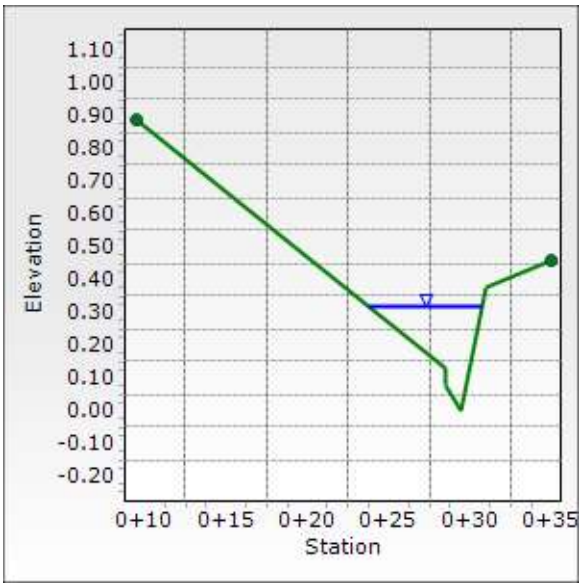
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
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	1.920 %
Critical Slope	0.703 %

Cross Section for I-12 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.920 %
Normal Depth	0.32 ft
Discharge	3.00 cfs



Worksheet for I-12 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.920 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.27 ft
Hydraulic Radius	0.05 ft
Top Width	6.19 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.017 %
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.356
Flow Type	Supercritical

GVF Input Data

Worksheet for I-12 9.5' Half Street

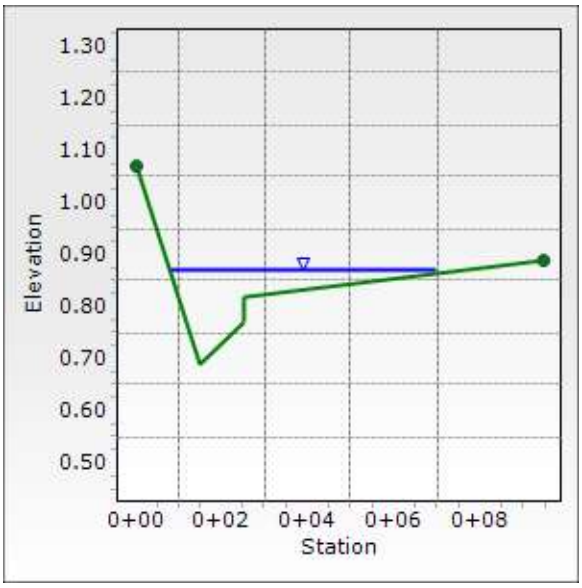
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.920 %
Critical Slope	1.017 %

Cross Section for I-12 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.920 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-13A North 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.900 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+15.50	0.44
0+29.00	0.17
0+29.00	0.13
0+30.50	0.00
0+30.50	0.48
0+31.00	0.50
0+35.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+15.50, 0.44)	(0+35.00, 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	0.30 ft
Elevation Range	0.00 to 0.60 ft
Flow Area	0.8 ft²
Wetted Perimeter	8.45 ft
Hydraulic Radius	0.09 ft
Top Width	8.10 ft
Normal Depth	0.30 ft
Critical Depth	0.37 ft
Critical Slope	0.777 %
Velocity	3.79 ft/s
Velocity Head	0.22 ft
Specific Energy	0.53 ft
Froude Number	2.139
Flow Type	Supercritical

Worksheet for I-13A North 35' Half Street (L Curb)

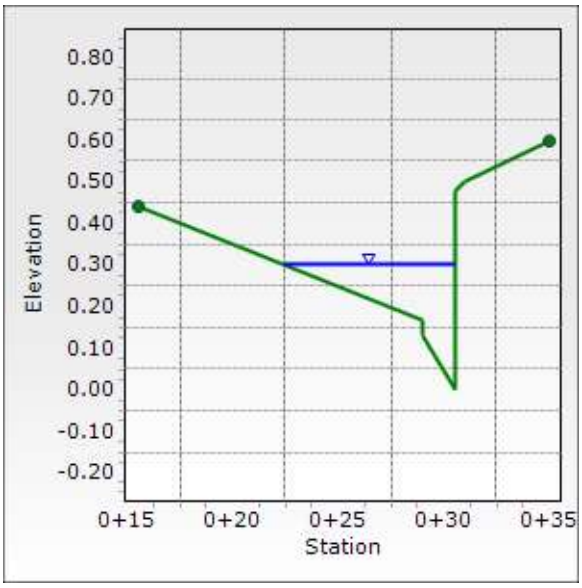
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.30 ft
Critical Depth	0.37 ft
Channel Slope	3.900 %
Critical Slope	0.777 %

Cross Section for I-13A North 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.900 %
Normal Depth	0.30 ft
Discharge	3.00 cfs



Worksheet for I-13A South 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.900 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+15.50	0.44

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+15.50, 0.44)	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	0.16 ft
Elevation Range	0.00 to 0.50 ft
Flow Area	0.1 ft²
Wetted Perimeter	1.70 ft
Hydraulic Radius	0.08 ft
Top Width	1.50 ft
Normal Depth	0.16 ft
Critical Depth	0.23 ft
Critical Slope	0.962 %
Velocity	3.52 ft/s
Velocity Head	0.19 ft
Specific Energy	0.35 ft
Froude Number	2.015
Flow Type	Supercritical

Worksheet for I-13A South 35' Half Street (L Curb)

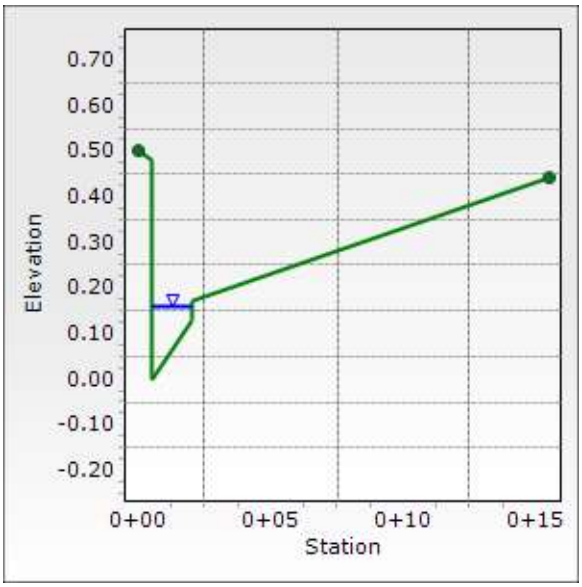
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.16 ft
Critical Depth	0.23 ft
Channel Slope	3.900 %
Critical Slope	0.962 %

Cross Section for I-13A South 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	3.900 %
Normal Depth	0.16 ft
Discharge	0.50 cfs



Worksheet for I-14 South 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+15.50	0.44

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+15.50, 0.44)	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	0.27 ft
Elevation Range	0.00 to 0.50 ft
Flow Area	0.6 ft²
Wetted Perimeter	6.90 ft
Hydraulic Radius	0.08 ft
Top Width	6.58 ft
Normal Depth	0.27 ft
Critical Depth	0.28 ft
Critical Slope	0.893 %
Velocity	1.76 ft/s
Velocity Head	0.05 ft
Specific Energy	0.32 ft
Froude Number	1.057
Flow Type	Supercritical

Worksheet for I-14 South 35' Half Street (L Curb)

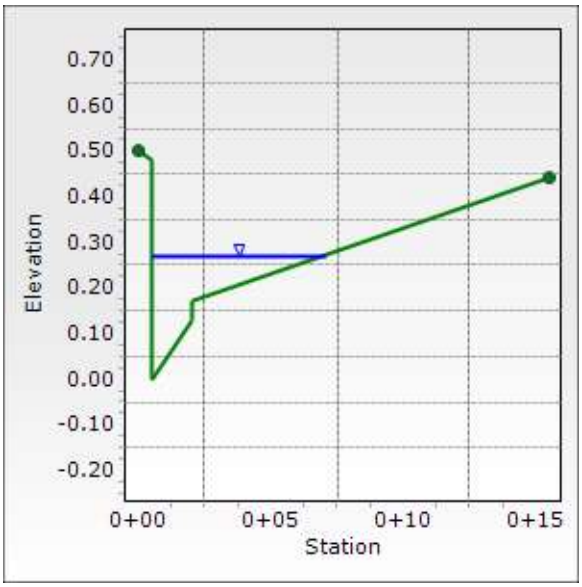
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.27 ft
Critical Depth	0.28 ft
Channel Slope	1.000 %
Critical Slope	0.893 %

Cross Section for I-14 South 35' Half Street (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.27 ft
Discharge	1.00 cfs



Worksheet for I-15A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.890	%
Discharge	3.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.33	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.0	ft²
Wetted Perimeter	7.50	ft
Hydraulic Radius	0.14	ft
Top Width	7.40	ft
Normal Depth	0.33	ft
Critical Depth	0.40	ft
Critical Slope	0.702	%
Velocity	3.40	ft/s
Velocity Head	0.18	ft
Specific Energy	0.51	ft
Froude Number	1.608	
Flow Type	Supercritical	

Worksheet for I-15A 25.5' Half Street

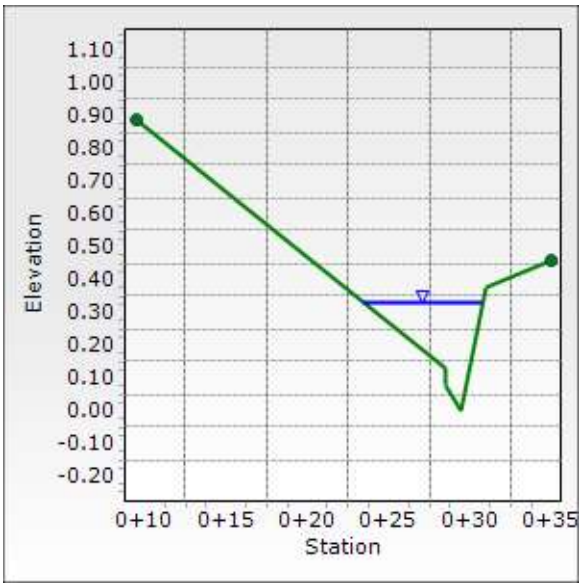
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.33 ft
Critical Depth	0.40 ft
Channel Slope	1.890 %
Critical Slope	0.702 %

Cross Section for I-15A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Normal Depth	0.33 ft
Discharge	3.50 cfs



Worksheet for I-15A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.30 ft
Hydraulic Radius	0.05 ft
Top Width	6.23 ft
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.67 ft/s
Velocity Head	0.04 ft
Specific Energy	0.22 ft
Froude Number	1.346
Flow Type	Supercritical

GVF Input Data

Worksheet for I-15A 9.5' Half Street

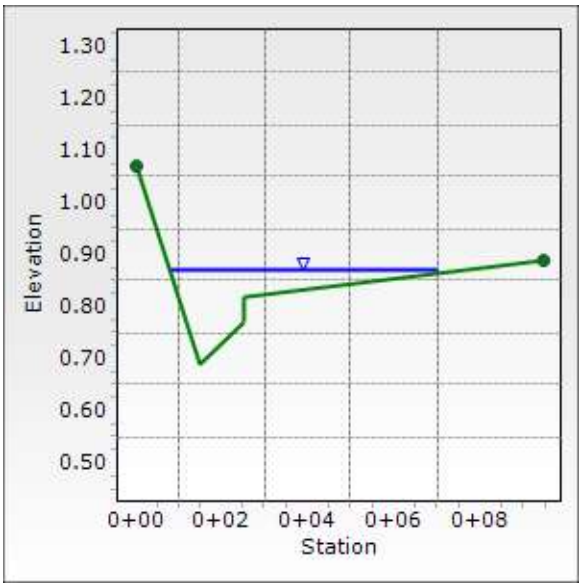
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.890 %
Critical Slope	1.018 %

Cross Section for I-15A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for I-15B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.130	%
Discharge	1.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.24	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	0.5	ft²
Wetted Perimeter	4.84	ft
Hydraulic Radius	0.10	ft
Top Width	4.76	ft
Normal Depth	0.24	ft
Critical Depth	0.26	ft
Critical Slope	0.808	%
Velocity	2.11	ft/s
Velocity Head	0.07	ft
Specific Energy	0.31	ft
Froude Number	1.175	
Flow Type	Supercritical	

Worksheet for I-15B 25.5' Half Street

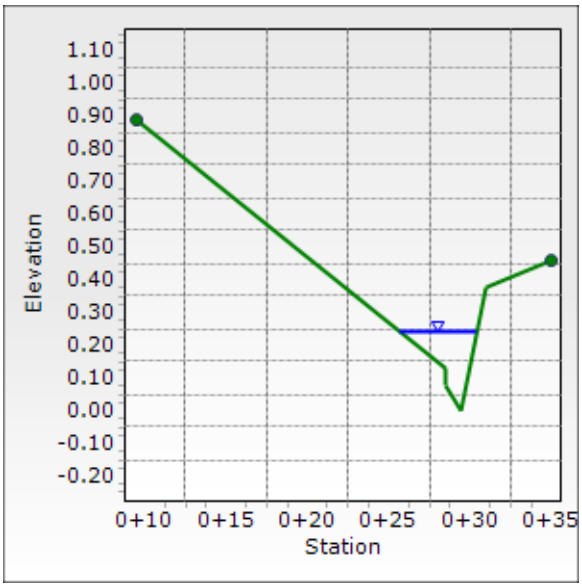
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.24 ft
Critical Depth	0.26 ft
Channel Slope	1.130 %
Critical Slope	0.808 %

Cross Section for I-15B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Normal Depth	0.24 ft
Discharge	1.00 cfs



Worksheet for I-15B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.19 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.4 ft²
Wetted Perimeter	7.44 ft
Hydraulic Radius	0.05 ft
Top Width	7.36 ft
Normal Depth	0.19 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.34 ft/s
Velocity Head	0.03 ft
Specific Energy	0.21 ft
Froude Number	1.052
Flow Type	Supercritical

GVF Input Data

Worksheet for I-15B 9.5' Half Street

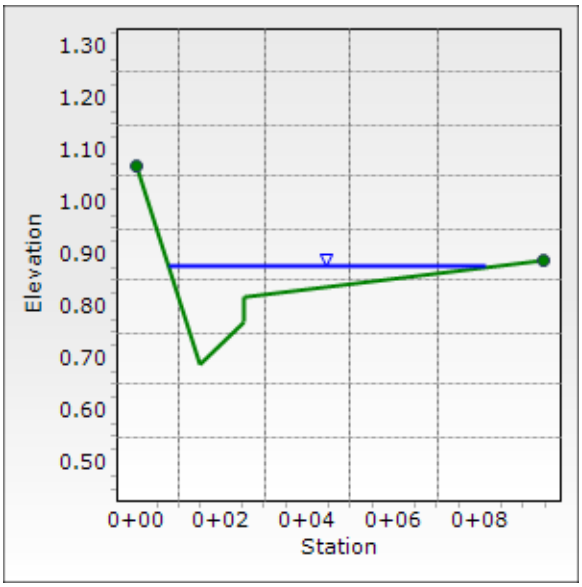
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.19 ft
Critical Depth	0.19 ft
Channel Slope	1.130 %
Critical Slope	1.018 %

Cross Section for I-15B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Normal Depth	0.19 ft
Discharge	0.50 cfs



Worksheet for I-16 North 35' Typical (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.900 %
Discharge	8.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+15.50	0.44
0+29.00	0.17
0+29.00	0.13
0+30.50	0.00
0+30.50	0.48
0+31.00	0.50
0+35.00	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+15.50, 0.44)	(0+35.00, 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	0.38 ft
Elevation Range	0.00 to 0.60 ft
Flow Area	1.6 ft²
Wetted Perimeter	12.63 ft
Hydraulic Radius	0.13 ft
Top Width	12.20 ft
Normal Depth	0.38 ft
Critical Depth	0.50 ft
Critical Slope	0.658 %
Velocity	5.23 ft/s
Velocity Head	0.43 ft
Specific Energy	0.81 ft
Froude Number	2.530
Flow Type	Supercritical

Worksheet for I-16 North 35' Typical (L Curb)

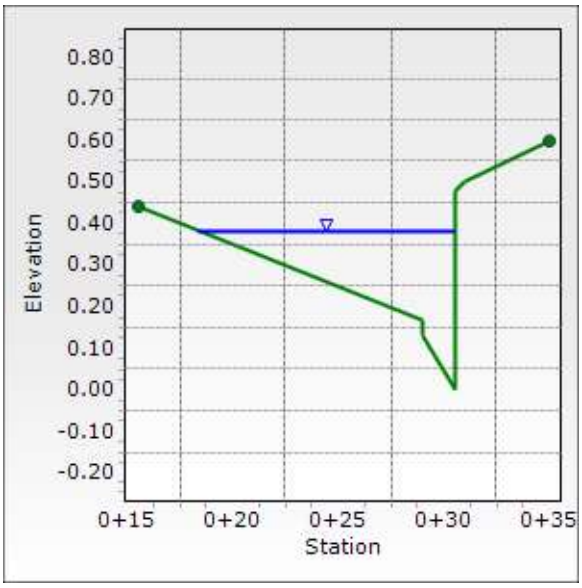
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.38 ft
Critical Depth	0.50 ft
Channel Slope	4.900 %
Critical Slope	0.658 %

Cross Section for I-16 North 35' Typical (L Curb)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.900 %
Normal Depth	0.38 ft
Discharge	8.50 cfs



Worksheet for I-16A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.130	%
Discharge	4.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.38	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.4	ft²
Wetted Perimeter	8.79	ft
Hydraulic Radius	0.16	ft
Top Width	8.68	ft
Normal Depth	0.38	ft
Critical Depth	0.42	ft
Critical Slope	0.704	%
Velocity	2.88	ft/s
Velocity Head	0.13	ft
Specific Energy	0.51	ft
Froude Number	1.273	
Flow Type	Supercritical	

Worksheet for I-16A 25.5' Half Street

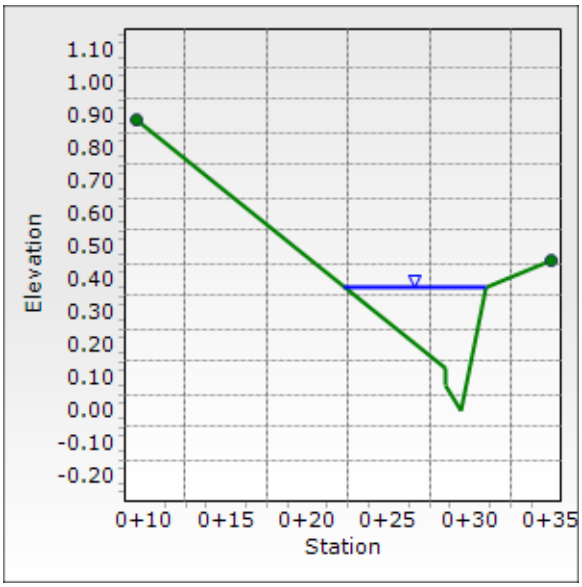
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.38 ft
Critical Depth	0.42 ft
Channel Slope	1.130 %
Critical Slope	0.704 %

Cross Section for I-16A 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Normal Depth	0.38 ft
Discharge	4.00 cfs



Worksheet for I-16A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.19 ft
Elevation Range	0.69 to 1.07 ft
Flow Area	0.4 ft²
Wetted Perimeter	7.44 ft
Hydraulic Radius	0.05 ft
Top Width	7.36 ft
Normal Depth	0.19 ft
Critical Depth	0.19 ft
Critical Slope	1.018 %
Velocity	1.34 ft/s
Velocity Head	0.03 ft
Specific Energy	0.21 ft
Froude Number	1.052
Flow Type	Supercritical

GVF Input Data

Worksheet for I-16A 9.5' Half Street

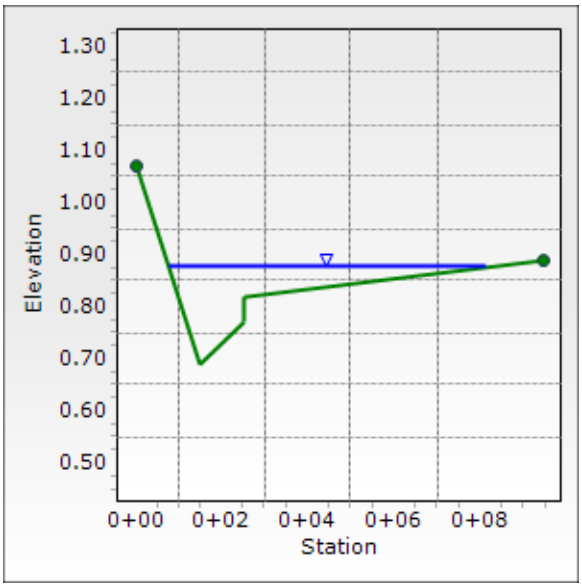
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.19 ft
Critical Depth	0.19 ft
Channel Slope	1.130 %
Critical Slope	1.018 %

Cross Section for I-16A 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.130 %
Normal Depth	0.19 ft
Discharge	0.50 cfs



Worksheet for I-16B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.360	%
Discharge	3.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+09.50	0.89
0+28.50	0.13
0+28.50	0.08
0+29.50	0.00
0+31.00	0.38
0+35.00	0.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+09.50, 0.89)	(0+35.00, 0.46)	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	0.35	ft
Elevation Range	0.00 to 0.89	ft
Flow Area	1.2	ft²
Wetted Perimeter	8.02	ft
Hydraulic Radius	0.15	ft
Top Width	7.92	ft
Normal Depth	0.35	ft
Critical Depth	0.40	ft
Critical Slope	0.702	%
Velocity	3.00	ft/s
Velocity Head	0.14	ft
Specific Energy	0.49	ft
Froude Number	1.379	
Flow Type	Supercritical	

Worksheet for I-16B 25.5' Half Street

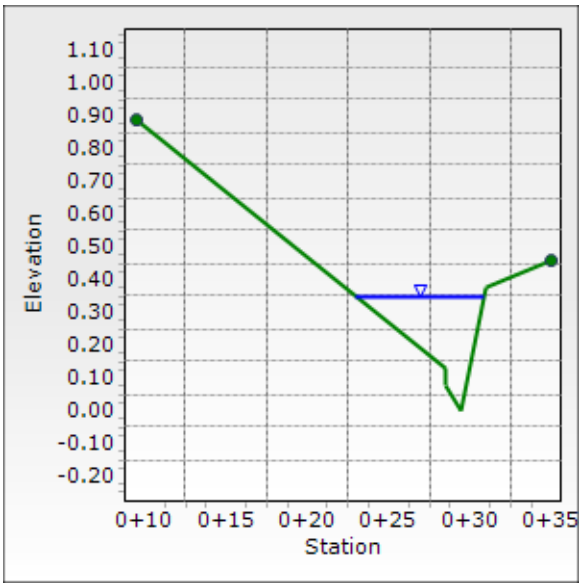
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.35 ft
Critical Depth	0.40 ft
Channel Slope	1.360 %
Critical Slope	0.702 %

Cross Section for I-16B 25.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Normal Depth	0.35 ft
Discharge	3.50 cfs



Worksheet for I-16B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Channel Slope	1.360	%
Discharge	0.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.07
0+01.50	0.69
0+02.50	0.77
0+02.50	0.82
0+09.50	0.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.07)	(0+09.50, 0.89)	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	0.18	ft
Elevation Range	0.69 to 1.07	ft
Flow Area	0.3	ft²
Wetted Perimeter	7.01	ft
Hydraulic Radius	0.05	ft
Top Width	6.93	ft
Normal Depth	0.18	ft
Critical Depth	0.19	ft
Critical Slope	1.017	%
Velocity	1.46	ft/s
Velocity Head	0.03	ft
Specific Energy	0.22	ft
Froude Number	1.154	
Flow Type	Supercritical	

GVF Input Data

Worksheet for I-16B 9.5' Half Street

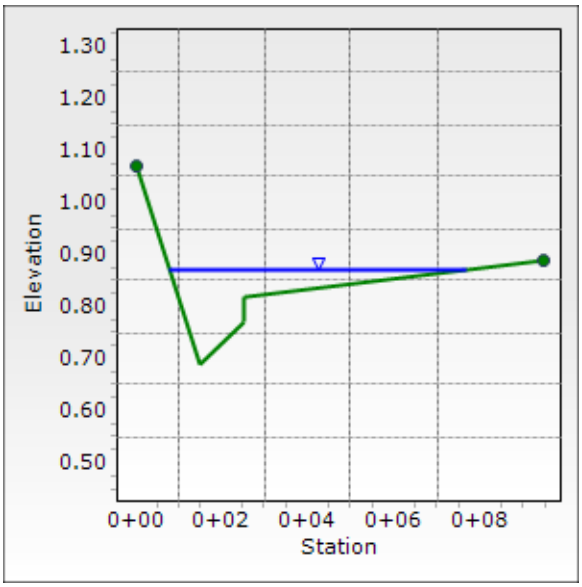
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.18 ft
Critical Depth	0.19 ft
Channel Slope	1.360 %
Critical Slope	1.017 %

Cross Section for I-16B 9.5' Half Street

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.360 %
Normal Depth	0.18 ft
Discharge	0.50 cfs



Worksheet for H.25 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.06
0+00.00	0.06
0+01.00	0.00
0+02.00	0.06
0+06.00	0.14
0+08.00	0.18
0+17.00	0.36
0+17.00	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.06)	(0+00.00, 0.06)	0.013
(0+00.00, 0.06)	(0+02.00, 0.06)	0.025
(0+02.00, 0.06)	(0+06.00, 0.14)	0.013
(0+06.00, 0.14)	(0+08.00, 0.18)	0.035
(0+08.00, 0.18)	(0+17.00, 0.69)	0.013

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

Results	
Normal Depth	0.11 ft
Elevation Range	0.00 to 3.06 ft
Flow Area	0.2 ft²
Wetted Perimeter	4.69 ft
Hydraulic Radius	0.05 ft
Top Width	4.63 ft
Normal Depth	0.11 ft
Critical Depth	0.11 ft
Critical Slope	1.486 %

Worksheet for H.25 (TYP) East - Irregular Section

Results	
Velocity	1.06 ft/s
Velocity Head	0.02 ft
Specific Energy	0.13 ft
Froude Number	0.834
Flow Type	Subcritical

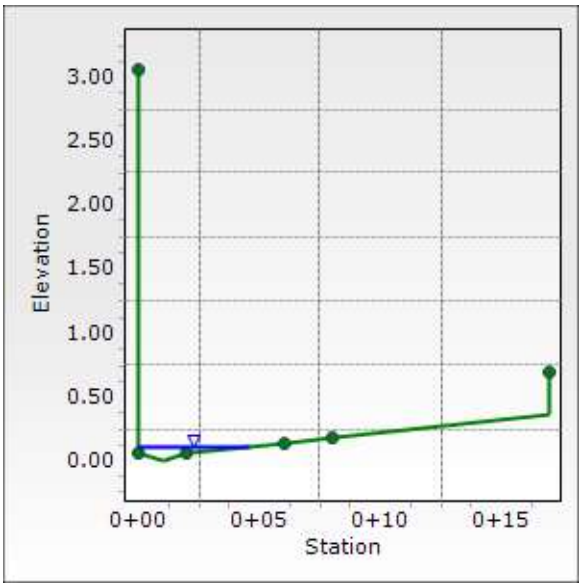
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.11 ft
Critical Depth	0.11 ft
Channel Slope	1.000 %
Critical Slope	1.486 %

Cross Section for H.25 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.11 ft
Discharge	0.25 cfs



Worksheet for H.25 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.68
0+00.00	0.35
0+09.00	0.17
0+11.00	0.13
0+15.00	0.05
0+16.00	0.00
0+17.00	0.05
0+17.00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.68)	(0+00.00, 0.35)	0.013
(0+00.00, 0.35)	(0+09.00, 0.17)	0.013
(0+09.00, 0.17)	(0+11.00, 0.13)	0.035
(0+11.00, 0.13)	(0+15.00, 0.05)	0.013
(0+15.00, 0.05)	(0+17.00, 0.05)	0.025
(0+17.00, 0.05)	(0+17.00, 2.50)	0.013

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

Results	
Normal Depth	0.11 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	0.2 ft²
Wetted Perimeter	4.83 ft
Hydraulic Radius	0.05 ft
Top Width	4.77 ft
Normal Depth	0.11 ft
Critical Depth	0.10 ft

Worksheet for H.25 (TYP) West - Irregular Section

Results	
Critical Slope	1.474 %
Velocity	1.05 ft/s
Velocity Head	0.02 ft
Specific Energy	0.12 ft
Froude Number	0.832
Flow Type	Subcritical

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

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.11 ft
Critical Depth	0.10 ft
Channel Slope	1.000 %
Critical Slope	1.474 %

Worksheet for H.25 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.68
0+00.00	0.35
0+09.00	0.17
0+11.00	0.13
0+15.00	0.05
0+16.00	0.00
0+17.00	0.05
0+17.00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.68)	(0+00.00, 0.35)	0.013
(0+00.00, 0.35)	(0+09.00, 0.17)	0.013
(0+09.00, 0.17)	(0+11.00, 0.13)	0.035
(0+11.00, 0.13)	(0+15.00, 0.05)	0.013
(0+15.00, 0.05)	(0+17.00, 0.05)	0.025
(0+17.00, 0.05)	(0+17.00, 2.50)	0.013

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

Results	
Normal Depth	0.11 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	0.2 ft²
Wetted Perimeter	4.83 ft
Hydraulic Radius	0.05 ft
Top Width	4.77 ft
Normal Depth	0.11 ft
Critical Depth	0.10 ft

Worksheet for H.25 (TYP) West - Irregular Section

Results	
Critical Slope	1.474 %
Velocity	1.05 ft/s
Velocity Head	0.02 ft
Specific Energy	0.12 ft
Froude Number	0.832
Flow Type	Subcritical

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

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.11 ft
Critical Depth	0.10 ft
Channel Slope	1.000 %
Critical Slope	1.474 %

Worksheet for H.50 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.06
0+00.00	0.06
0+01.00	0.00
0+02.00	0.06
0+06.00	0.14
0+08.00	0.18
0+17.00	0.36
0+17.00	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.06)	(0+00.00, 0.06)	0.013
(0+00.00, 0.06)	(0+02.00, 0.06)	0.025
(0+02.00, 0.06)	(0+06.00, 0.14)	0.013
(0+06.00, 0.14)	(0+08.00, 0.18)	0.035
(0+08.00, 0.18)	(0+17.00, 0.69)	0.013

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

Results	
Normal Depth	0.14 ft
Elevation Range	0.00 to 3.06 ft
Flow Area	0.4 ft²
Wetted Perimeter	6.10 ft
Hydraulic Radius	0.06 ft
Top Width	6.02 ft
Normal Depth	0.14 ft
Critical Depth	0.14 ft
Critical Slope	1.210 %

Worksheet for H.50 (TYP) East - Irregular Section

Results	
Velocity	1.31 ft/s
Velocity Head	0.03 ft
Specific Energy	0.17 ft
Froude Number	0.916
Flow Type	Subcritical

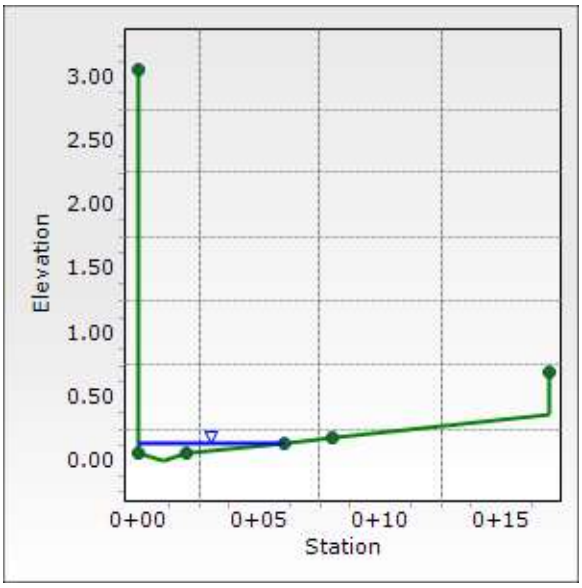
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.14 ft
Critical Depth	0.14 ft
Channel Slope	1.000 %
Critical Slope	1.210 %

Cross Section for H.50 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.14 ft
Discharge	0.50 cfs



Worksheet for H.50 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.68
0+00.00	0.35
0+09.00	0.17
0+11.00	0.13
0+15.00	0.05
0+16.00	0.00
0+17.00	0.05
0+17.00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.68)	(0+00.00, 0.35)	0.013
(0+00.00, 0.35)	(0+09.00, 0.17)	0.013
(0+09.00, 0.17)	(0+11.00, 0.13)	0.035
(0+11.00, 0.13)	(0+15.00, 0.05)	0.013
(0+15.00, 0.05)	(0+17.00, 0.05)	0.025
(0+17.00, 0.05)	(0+17.00, 2.50)	0.013

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

Results	
Normal Depth	0.13 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	0.4 ft²
Wetted Perimeter	6.32 ft
Hydraulic Radius	0.06 ft
Top Width	6.24 ft
Normal Depth	0.13 ft
Critical Depth	0.13 ft

Worksheet for H.50 (TYP) West - Irregular Section

Results	
Critical Slope	1.333 %
Velocity	1.25 ft/s
Velocity Head	0.02 ft
Specific Energy	0.16 ft
Froude Number	0.873
Flow Type	Subcritical

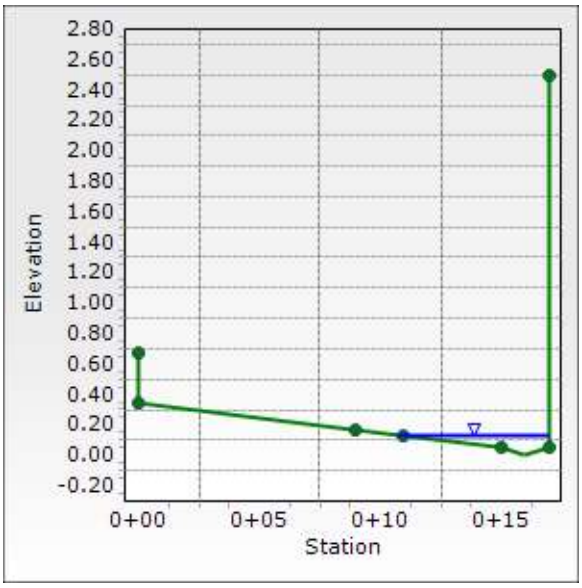
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.13 ft
Critical Depth	0.13 ft
Channel Slope	1.000 %
Critical Slope	1.333 %

Cross Section for H.50 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.13 ft
Discharge	0.50 cfs



Worksheet for H.75 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.75 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.06
0+00.00	0.06
0+01.00	0.00
0+02.00	0.06
0+06.00	0.14
0+08.00	0.18
0+17.00	0.36
0+17.00	0.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.06)	(0+00.00, 0.06)	0.013
(0+00.00, 0.06)	(0+02.00, 0.06)	0.025
(0+02.00, 0.06)	(0+06.00, 0.14)	0.013
(0+06.00, 0.14)	(0+08.00, 0.18)	0.035
(0+08.00, 0.18)	(0+17.00, 0.36)	0.013
(0+17.00, 0.36)	(0+17.00, 0.69)	0.013

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

Results	
Normal Depth	0.18 ft
Elevation Range	0.00 to 3.06 ft
Flow Area	0.6 ft²
Wetted Perimeter	7.90 ft
Hydraulic Radius	0.08 ft
Top Width	7.78 ft
Normal Depth	0.18 ft
Critical Depth	0.16 ft

Worksheet for H.75 (TYP) East - Irregular Section

Results	
Critical Slope	1.869 %
Velocity	1.20 ft/s
Velocity Head	0.02 ft
Specific Energy	0.20 ft
Froude Number	0.746
Flow Type	Subcritical

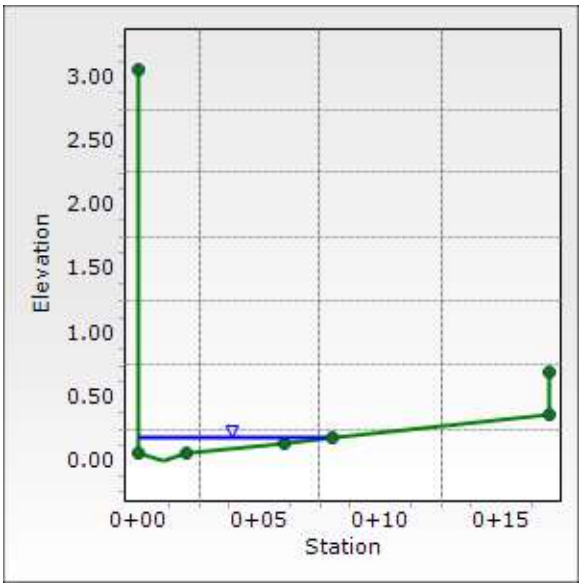
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.18 ft
Critical Depth	0.16 ft
Channel Slope	1.000 %
Critical Slope	1.869 %

Cross Section for H.75 (TYP) East - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.18 ft
Discharge	0.75 cfs



Worksheet for H.75 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.75 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.68
0+00.00	0.35
0+09.00	0.17
0+11.00	0.13
0+15.00	0.05
0+16.00	0.00
0+17.00	0.05
0+17.00	2.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.68)	(0+00.00, 0.35)	0.013
(0+00.00, 0.35)	(0+09.00, 0.17)	0.013
(0+09.00, 0.17)	(0+11.00, 0.13)	0.035
(0+11.00, 0.13)	(0+15.00, 0.05)	0.013
(0+15.00, 0.05)	(0+17.00, 0.05)	0.025
(0+17.00, 0.05)	(0+17.00, 2.50)	0.013

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

Results	
Normal Depth	0.17 ft
Elevation Range	0.00 to 2.50 ft
Flow Area	0.6 ft²
Wetted Perimeter	8.01 ft
Hydraulic Radius	0.08 ft
Top Width	7.89 ft
Normal Depth	0.17 ft
Critical Depth	0.15 ft

Worksheet for H.75 (TYP) West - Irregular Section

Results	
Critical Slope	1.906 %
Velocity	1.19 ft/s
Velocity Head	0.02 ft
Specific Energy	0.19 ft
Froude Number	0.739
Flow Type	Subcritical

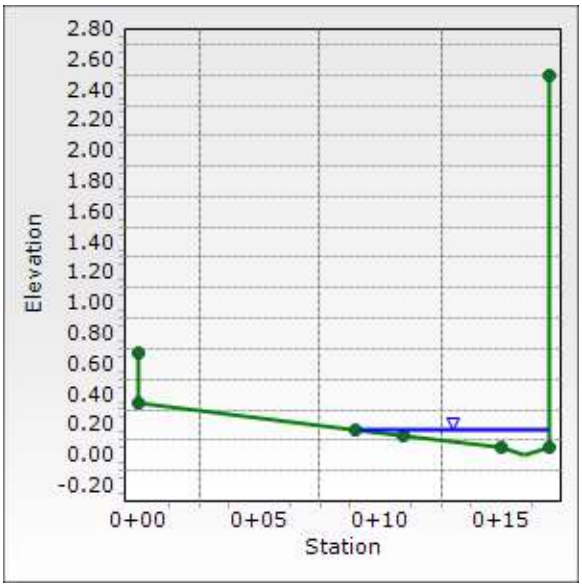
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.17 ft
Critical Depth	0.15 ft
Channel Slope	1.000 %
Critical Slope	1.906 %

Cross Section for H.75 (TYP) West - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.17 ft
Discharge	0.75 cfs



Worksheet for O.25 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.84
0+00.00	0.18
0+02.50	0.05
0+03.50	0.00
0+04.50	0.05
0+08.50	0.13
0+13.00	1.63
0+13.00	2.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.84)	(0+00.00, 0.18)	0.013
(0+00.00, 0.18)	(0+02.50, 0.05)	0.035
(0+02.50, 0.05)	(0+04.50, 0.05)	0.025
(0+04.50, 0.05)	(0+08.50, 0.13)	0.013
(0+08.50, 0.13)	(0+13.00, 1.63)	0.035
(0+13.00, 1.63)	(0+13.00, 2.30)	0.013

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

Results	
Normal Depth	0.11 ft
Elevation Range	0.00 to 2.30 ft
Flow Area	0.3 ft²
Wetted Perimeter	6.16 ft
Hydraulic Radius	0.05 ft
Top Width	6.15 ft
Normal Depth	0.11 ft
Critical Depth	0.10 ft

Worksheet for O.25 (TYP) - Irregular Section

Results	
Critical Slope	2.195 %
Velocity	0.86 ft/s
Velocity Head	0.01 ft
Specific Energy	0.12 ft
Froude Number	0.694
Flow Type	Subcritical

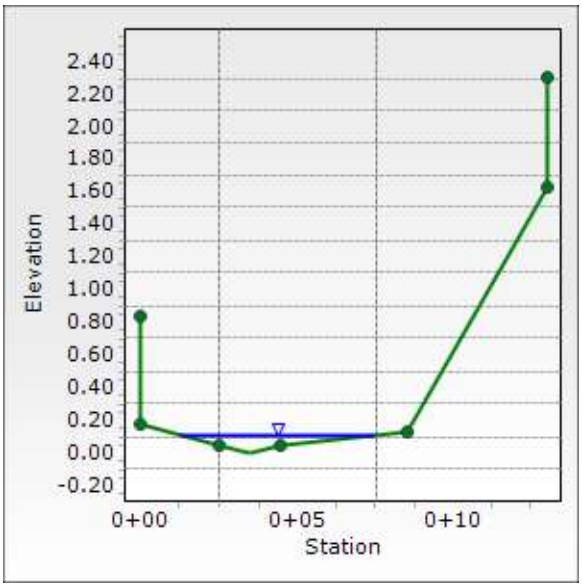
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.11 ft
Critical Depth	0.10 ft
Channel Slope	1.000 %
Critical Slope	2.195 %

Cross Section for O.25 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.11 ft
Discharge	0.25 cfs



Worksheet for O.50 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.84
0+00.00	0.18
0+02.50	0.05
0+03.50	0.00
0+04.50	0.05
0+08.50	0.13
0+13.00	1.63
0+13.00	2.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.84)	(0+00.00, 0.18)	0.013
(0+00.00, 0.18)	(0+02.50, 0.05)	0.035
(0+02.50, 0.05)	(0+04.50, 0.05)	0.025
(0+04.50, 0.05)	(0+08.50, 0.13)	0.013
(0+08.50, 0.13)	(0+13.00, 1.63)	0.035
(0+13.00, 1.63)	(0+13.00, 2.30)	0.013

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

Results	
Normal Depth	0.14 ft
Elevation Range	0.00 to 2.30 ft
Flow Area	0.5 ft²
Wetted Perimeter	7.77 ft
Hydraulic Radius	0.06 ft
Top Width	7.76 ft
Normal Depth	0.14 ft
Critical Depth	0.12 ft

Worksheet for O.50 (TYP) - Irregular Section

Results	
Critical Slope	2.035 %
Velocity	1.03 ft/s
Velocity Head	0.02 ft
Specific Energy	0.15 ft
Froude Number	0.721
Flow Type	Subcritical

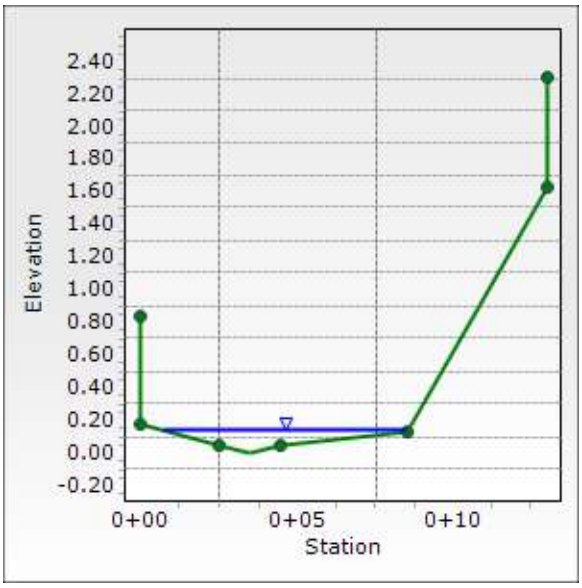
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.14 ft
Critical Depth	0.12 ft
Channel Slope	1.000 %
Critical Slope	2.035 %

Cross Section for O.50 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.14 ft
Discharge	0.50 cfs



Worksheet for O.75 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Discharge	0.75 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.84
0+00.00	0.18
0+02.50	0.05
0+03.50	0.00
0+04.50	0.05
0+08.50	0.13
0+13.00	1.63
0+13.00	2.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.84)	(0+00.00, 0.18)	0.013
(0+00.00, 0.18)	(0+02.50, 0.05)	0.035
(0+02.50, 0.05)	(0+04.50, 0.05)	0.025
(0+04.50, 0.05)	(0+08.50, 0.13)	0.013
(0+08.50, 0.13)	(0+13.00, 1.63)	0.035
(0+13.00, 1.63)	(0+13.00, 2.30)	0.013

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

Results	
Normal Depth	0.16 ft
Elevation Range	0.00 to 2.30 ft
Flow Area	0.7 ft²
Wetted Perimeter	8.24 ft
Hydraulic Radius	0.08 ft
Top Width	8.23 ft
Normal Depth	0.16 ft
Critical Depth	0.14 ft

Worksheet for O.75 (TYP) - Irregular Section

Results	
Critical Slope	2.046 %
Velocity	1.15 ft/s
Velocity Head	0.02 ft
Specific Energy	0.18 ft
Froude Number	0.722
Flow Type	Subcritical

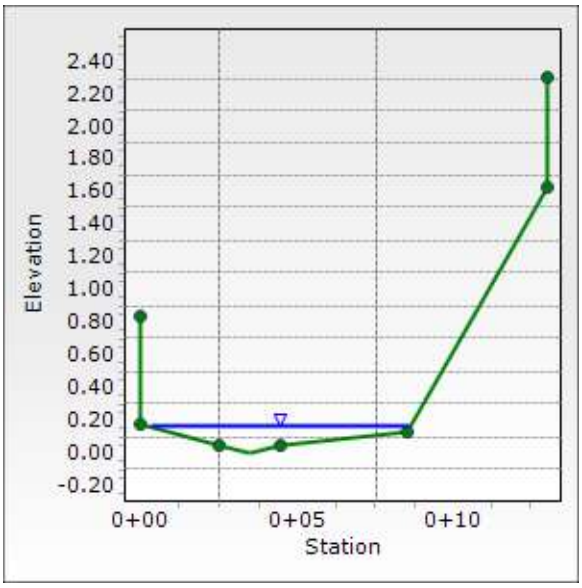
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.16 ft
Critical Depth	0.14 ft
Channel Slope	1.000 %
Critical Slope	2.046 %

Cross Section for O.75 (TYP) - Irregular Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.000 %
Normal Depth	0.16 ft
Discharge	0.75 cfs



Worksheet for (MIN) OFF3 - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.025
Channel Slope	3.370 %
Left Side Slope	10.000 H:V
Right Side Slope	3.000 H:V
Discharge	4.00 cfs

Results	
Normal Depth	0.41 ft
Flow Area	1.1 ft²
Wetted Perimeter	5.37 ft
Hydraulic Radius	0.20 ft
Top Width	5.28 ft
Critical Depth	0.47 ft
Critical Slope	1.505 %
Velocity	3.73 ft/s
Velocity Head	0.22 ft
Specific Energy	0.62 ft
Froude Number	1.459
Flow Type	Supercritical

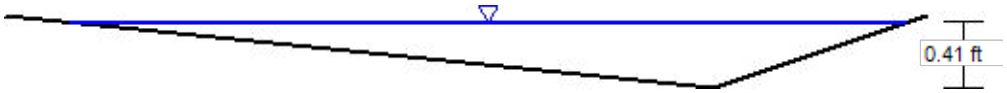
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

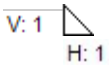
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.41 ft
Critical Depth	0.47 ft
Channel Slope	3.370 %
Critical Slope	1.505 %

Cross Section for (MIN) OFF3 - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.025
Channel Slope	3.370 %
Normal Depth	0.41 ft
Left Side Slope	10.000 H:V
Right Side Slope	3.000 H:V
Discharge	4.00 cfs





Worksheet for (MAX) OFF3 - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.044
Channel Slope	25.000 %
Left Side Slope	10.000 H:V
Right Side Slope	3.000 H:V
Discharge	4.00 cfs

Results	
Normal Depth	0.34 ft
Flow Area	0.8 ft²
Wetted Perimeter	4.56 ft
Hydraulic Radius	0.17 ft
Top Width	4.48 ft
Critical Depth	0.47 ft
Critical Slope	4.663 %
Velocity	5.17 ft/s
Velocity Head	0.42 ft
Specific Energy	0.76 ft
Froude Number	2.197
Flow Type	Supercritical

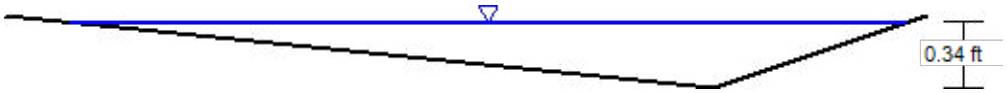
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

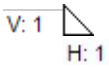
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.34 ft
Critical Depth	0.47 ft
Channel Slope	25.000 %
Critical Slope	4.663 %

Cross Section for (MAX) OFF3 - Triangular Channel

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.044
Channel Slope	25.000 %
Normal Depth	0.34 ft
Left Side Slope	10.000 H:V
Right Side Slope	3.000 H:V
Discharge	4.00 cfs





Date 09/24/19 Project 92935004

Calced by AD

Riprap Lining Calculation
Swale #1 - OFF3 (Max)

d_{50} = (3V* (S^0.17/S_s-1))^2

V = 7.9 ft/s

S = 0.25 ft/ft

S_S = 2.65 Specific Gravity

d_{50} = 1.5898 = 1.5898 x 12in/ft = 19.08-inches → Use d_{50} = 24-inches

Mannings N Calculator Using Equation 732 in the HCDDM			
Channel	d_{50} (in)	d_{50} (ft)	n
DITCH OFF3	24	2	0.044

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED MAINLINE - Connect to EX 42" RCP at Beltway Channel to Drive K to Drive D to Drive J to Drive E to Drive H

DATE: 09/26/19 FILE: SF6.xls

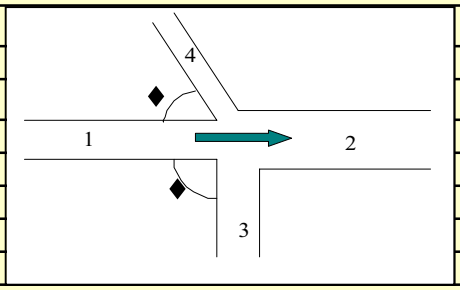
Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA								ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																			PIPE	TRANSITION																										
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S																																		
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(S_f) (ft/ft)	H_f (ft)	H_f (ft)	Θ (deg)	K_{mh}	H_{mh} (ft)	Θ (deg)	K_j	H_j (ft)	Inlet/ Cont	K_i	H_c (ft)	Θ (deg)	K_o	H_o (ft)	R_{bend} (ft)	Θ (deg)	K_b	H_b (ft)	H_m (ft)	Total (ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	PART FLOW	CRTL	
1		1000.00		42							17.54																				Outlet K_o=	1.0													CHAN
2	1000.00	1051.70	R	42					1	17.54	17.80	51.7	0.50%	9.62	0.0049	61.0	6.34	0.62	0.0037	0.0037	0.19																		0.00	21.92	21.30			PART	D/S	
3	1051.70	1056.70	T	42					1	17.80	17.95	5.0	3.00%	9.62	0.0049	61.0	6.34	0.62	0.0037	0.0037		0.02	0	0.02	0.01														0.03			22.07	21.45	FULL	D/S	SDMH18
4	1056.70	1095.14	R	42					1	17.95	20.06	38.4	5.50%	9.62	0.0049	61.0	6.34	0.62	0.0037	0.0037	0.14																		0.00	24.19	23.56			PART	D/S	
5	1095.14	1100.14	T	24					1	20.06	20.37	5.0	6.17%	3.14	0.0049	37.5	11.94	2.21	0.0274	0.0155		0.08	0	0.02	0.01														0.09			24.58	22.37	FULL	D/S	SDMH17
6	1100.14	1294.14	R	24					1	20.37	33.63	194.0	6.83%	3.14	0.0049	37.5	11.94	2.21	0.0274	0.0274	5.31																		0.00	37.84	35.63			PART	D/S	
7	1294.14	1299.14	T	24					1	33.63	33.83	5.0	4.06%	3.14	0.0049	21.5	6.84	0.73	0.0090	0.0182		0.09	90	1.33	2.94	0	0.85	1.59												4.63			42.47	41.74	FULL	U/S	SDMH14
8	1299.14	1493.82	R	24					1	33.83	36.37	194.7	1.30%	3.14	0.0049	21.5	6.84	0.73	0.0090	0.0090	1.75																		0.00	44.22	43.50			FULL	U/S	
9	1493.82	1498.82	T	24					1	36.37	36.44	5.0	1.50%	3.14	0.0049	15.5	4.93	0.38	0.0047	0.0068		0.03	0	0.02	0.01													0.68	0.73			44.95	44.57	FULL	U/S	SDMH13
10	1498.82	1636.01	R	24					1	36.44	38.76	137.2	1.69%	3.14	0.0049	15.5	4.93	0.38	0.0047	0.0047	0.64																		0.00	45.59	45.22			FULL	U/S	
11	1636.01	1641.01	T	24					1	38.76	38.83	5.0	1.50%	3.14	0.0049	15.5	4.93	0.38	0.0047	0.0047		0.02	8	0.05	0.02														0.04			45.64	45.26	FULL	U/S	SDMH12
12	1641.01	1867.03	R	24					1	38.83	41.77	226.0	1.30%	3.14	0.0049	15.5	4.93	0.38	0.0047	0.0047	1.06																		0.00	46.69	46.32			FULL	U/S	
13	1867.03	1872.03	T	18					1	41.77	41.84	5.0	1.42%	1.77	0.0049	11.5	6.51	0.66	0.0119	0.0083		0.04	0	0.02	0.01													0.99	1.04			47.73	47.07	FULL	U/S	SDMH11
14	1872.03	1944.56	R	18					1	41.84	42.96	72.5	1.55%	1.77	0.0049	11.5	6.51	0.66	0.0119	0.0119	0.87																		0.00	48.60	47.94			FULL	U/S	
15	1944.56	1949.56	T	18					1	42.96	43.07	5.0	2.16%	1.77	0.0049	10.5	5.94	0.55	0.0100	0.0109		0.05	0	0.02	0.01	45	0.50	0.38											0.45			49.05	48.50	FULL	U/S	SDMH9
16	1949.56	1998.89	R	18					1	43.07	44.43	49.3	2.76%	1.77	0.0049	10.5	5.94	0.55	0.0100	0.0100	0.49																		0.00	49.54	48.99			FULL	U/S	
17	1998.89	2003.89	T	18					1	44.43	44.67	5.0	4.73%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0079		0.04	45	0.46	0.25													0.44	0.73			50.27	49.95	FULL	U/S	SDMH8
18	2003.89	2109.49	R	18					1	44.67	51.73	105.6	6.69%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.61																		0.00	53.55	53.23			PART	D/S	
19	2109.49	2114.49	T	18					1	51.73	52.03	5.0	5.87%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058		0.03	45	0.46	0.15														0.18			53.84	53.53	FULL	D/S	SDMH7
20	2114.49	2149.06	R	18					1	52.03	53.77	34.6	5.05%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.20																		0.00	55.59	55.27			PART	D/S	
21	2149.06	2154.06	T	18					1	53.77	53.92	5.0	2.83%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0054		0.03	45	0.46	0.15														0.17			55.77	55.49	FULL	U/S	SDMH6
22	2154.06	2231.67	R	18					1	53.92	54.38	77.6	0.61%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.39																		0.00	56.16	55.88			FULL	D/S	
23	2231.67	2236.67	T	18					1	54.38	54.42	5.0	0.72%	1.77	0.0049	5	2.83	0.12	0.0023	0.0037		0.02	0	0.02	0.01	45	0.50	0.22											0.24			56.41	56.28	FULL	U/S	SDMH5
24	2236.67	2279.08	R	18					1	54.42	54.78	42.4	0.84%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023	0.10																		0.00	56.50	56.38			FULL	U/S	
25	2279.08	2284.08	T	18					1	54.78	54.81	5.0	0.65%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023		0.01	0	0.02	0.00	45	0.50	0.06											0.08			56.58	56.45	FULL	U/S	SDMH4
26	2284.08	2431.72	R	18					1	54.81	55.49	147.6	0.46%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023	0.33																		0.00	57.11	56.99			FULL	D/S	
27	2431.72	2436.72	T	18					1	55.49	55.53	5.0	0.87%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023		0.01	46	0.46	0.06														0.07			57.18	57.06	FULL	U/S	SDMH3
28	2436.72	2462.96	R	18					1	55.53	55.87	26.2	1.28%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023	0.06																		0.00	57.49	57.37			FULL	D/S	
29	2462.96	2467.96	T	18					1	55.87	55.95	5.0	1.67%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023		0.01	46	0.46	0.06														0.07			57.58	57.45	FULL	D/S	SDMH2
30	2467.96	2540.35	R	18					1	55.95	57.45	72.4	2.07%	1.77	0.0049	5	2.83	0.12	0.0023	0.0023	0.16																		0.00	59.07	58.95			PART	D/S	
31	2540.35	2545.35	T	18					1	57.45	58.13	5.0	13.63%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0014		0.01	71	0.85	0.11	45	0.50	0.11											0.22			59.66	59.63	PART	D/S	SDMH1
32	2545.35	2558.22	R	18					1	58.13	61.37	12.9	25.19%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																		0.00	62.90	62.87			PART	D/S	
33	2558.22	2563.22	T	18					1	61.37	62.01	5.0	12.85%	1.77	0.0049	2.2	1.22	0.02	0.0004	0.0005		0.00	71	0.85	0.03	45	0.50	0.02											0.05			63.54	63.51	PART	D/S	DI4
34	2563.22	2572.22	R	18					1	62.01	62.06	9.0	0.50%	1.77	0.0049	2.2	1.22	0.02	0.0004	0.0004	0.00																		0.00	63.58	63.56			FULL	D/S	
35	2572.22	2572.22	R	18					1	62.06	62.06	0.0		1.77	0.0049	2.2	1.22	0.02	0.0004	0.0004	0.00																		0.02			63.60	63.60	FULL	U/S	DI3
36																													Ki=	0.4	0.01												
37																																												
38																																												
39																																												

Junction Head Loss Calculation

Known

Diameter of Pipe 1 (in)	24.0
Diameter of Pipe 2 (in)	24.0
Diameter of Pipe 3 (in)	18.0
Diameter of Pipe 4 (in)*	18.0
Flow in Pipe 1 (cfs)	16
Flow in Pipe 2 (cfs)	22
Flow in Pipe 3 (cfs)	1
Flow in Pipe 4 (cfs)*	6
Angle of Pipe 3	45
Angle of Pipe 4*	84



*Optional

Headloss is applied at Entrance to Junction

Solve For

Insert Loss in Misc. Loss Column and leave Junction Loss Column Blank

Area of Pipe 1 (ft^2)	3.14
Area of Pipe 2 (ft^2)	3.14
Area of Pipe 3 (ft^2)	1.77
Area of Pipe 4 (ft^2)	1.77
Head Loss at Junction (ft)	**0.68**

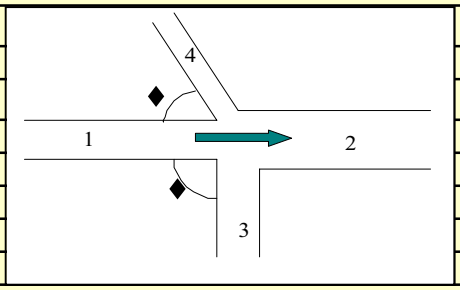
Equation Used:

Incorporates Pressure plus Momentum Laws

$$Hj=((Q_2^2/A_{2*g}-Q_1^2/A_{1*g}-Q_3^2*\cos(Ang3)/A_{3*g}-Q_4^2*\cos(Ang4)/A_{4*g})*2/(A_1+A_2)-D_1+D_2)$$

Junction Head Loss Calculation

Known		
Diameter of Pipe 1 (in)	18.0	
Diameter of Pipe 2 (in)	18.0	
Diameter of Pipe 3 (in)	18.0	
Diameter of Pipe 4 (in)*	18.0	
Flow in Pipe 1 (cfs)	12	
Flow in Pipe 2 (cfs)	16	
Flow in Pipe 3 (cfs)	1	
Flow in Pipe 4 (cfs)*	4	
Angle of Pipe 3	63	
Angle of Pipe 4*	45	



*Optional

Headloss is applied at Entrance to Junction

Solve For		
Area of Pipe 1 (ft^2)	1.77	Insert Loss in Misc. Loss Column and
Area of Pipe 2 (ft^2)	1.77	leave Junction Loss Column Blank
Area of Pipe 3 (ft^2)	1.77	
Area of Pipe 4 (ft^2)	1.77	
Head Loss at Junction (ft)	**0.99**	

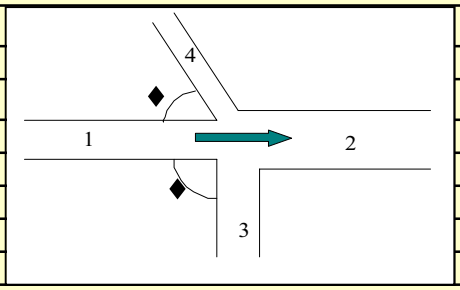
Equation Used:

Incorporates Pressure plus Momentum Laws

$$Hj=((Q_2^2/A_{2*g}-Q_1^2/A_{1*g}-Q_3^2*\cos(Ang3)/A_{3*g}-Q_4^2*\cos(Ang4)/A_{4*g})*2/(A_1+A_2)-D_1+D_2)$$

Junction Head Loss Calculation

Known		
Diameter of Pipe 1 (in)	18.0	
Diameter of Pipe 2 (in)	18.0	
Diameter of Pipe 3 (in)	18.0	
Diameter of Pipe 4 (in)*	18.0	
Flow in Pipe 1 (cfs)	8	
Flow in Pipe 2 (cfs)	11	
Flow in Pipe 3 (cfs)	1	
Flow in Pipe 4 (cfs)*	1	
Angle of Pipe 3	45	
Angle of Pipe 4*	45	



*Optional

Headloss is applied at Entrance to Junction

Insert Loss in Misc. Loss Column and leave Junction Loss Column Blank

Solve For	
Area of Pipe 1 (ft^2)	1.77
Area of Pipe 2 (ft^2)	1.77
Area of Pipe 3 (ft^2)	1.77
Area of Pipe 4 (ft^2)	1.77
Head Loss at Junction (ft)	**0.44**

Equation Used:

Incorporates Pressure plus Momentum Laws

$$Hj=((Q_2^2/A_{2*g}-Q_1^2/A_{1*g}-Q_3^2*\cos(Ang3)/A_{3*g}-Q_4^2*\cos(Ang4)/A_{4*g})*2/(A_1+A_2)-D_1+D_2)$$

Mainline - Summary of Results

						(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	17.54	21.04	20.53	19.91	21.41	CHAN		OK	NO
1051.70	17.80	21.30	21.92	21.30	36.73	SDMH18		OK	NO
1056.70	17.95	21.45	22.07	21.45	36.73			OK	NO
1095.14	20.06	23.56	24.19	23.56	38.16	SDMH17		OK	NO
1100.14	20.37	22.37	24.58	22.37	38.16			OK	NO
1294.14	33.63	35.63	37.84	35.63	44.84	SDMH14		OK	NO
1299.14	33.83	35.83	42.47	41.74	44.84			OK	YES
1493.82	36.37	38.37	44.22	43.50	47.37	SDMH13		OK	YES
1498.82	36.44	38.44	44.95	44.57	47.37			OK	YES
1636.01	38.76	40.76	45.59	45.22	49.31	SDMH12		OK	NO
1641.01	38.83	40.83	45.64	45.26	49.31			OK	NO
1867.03	41.77	43.77	46.69	46.32	52.42	SDMH11		OK	NO
1872.03	41.84	43.34	47.73	47.07	52.42			OK	NO
1944.56	42.96	44.46	48.60	47.94	53.46	SDMH9		OK	NO
1949.56	43.07	44.57	49.05	48.50	53.46			OK	NO
1998.89	44.43	45.93	49.54	48.99	55.00	SDMH8		OK	NO
2003.89	44.67	46.17	50.27	49.95	55.00			OK	NO
2109.49	51.73	53.23	53.55	53.23	62.39	SDMH7		OK	NO
2114.49	52.03	53.53	53.84	53.53	62.39			OK	NO
2149.06	53.77	55.27	55.59	55.27	64.41	SDMH6		OK	NO
2154.06	53.92	55.42	55.77	55.49	64.41			OK	NO
2231.67	54.38	55.88	56.16	55.88	64.94	SDMH5		OK	NO
2236.67	54.42	55.92	56.41	56.28	64.94			OK	NO
2279.08	54.78	56.28	56.50	56.38	65.22	SDMH4		OK	NO
2284.08	54.81	56.31	56.58	56.45	65.22			OK	NO
2431.72	55.49	56.99	57.11	56.99	66.03	SDMH3		OK	NO
2436.72	55.53	57.03	57.18	57.06	66.03			OK	NO
2462.96	55.87	57.37	57.49	57.37	66.36	SDMH2		OK	NO
2467.96	55.95	57.45	57.58	57.45	66.36			OK	NO
2540.35	57.45	58.95	59.07	58.95	68.04	SDMH1		OK	NO
2545.35	58.13	59.63	59.66	59.63	68.04			OK	NO
2558.22	61.37	62.87	62.90	62.87	67.97	DI4		OK	NO
2563.22	62.01	63.51	63.54	63.51	67.97			OK	NO
2572.22	62.06	63.56	63.58	63.56	68.30	DI3		OK	NO
2572.22	62.06	63.56	63.60	63.60	68.30			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH1 North

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							57.50																			Outlet K_o=		1.0															SDMH1
2	1000.00	1010.94	R	18					1	57.50	61.00	10.9	31.99%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																		0.00	62.53	62.50			PART	D/S	
3	1010.94	1015.94	T	18					1	61.00	61.81	5.0	16.25%	1.77	0.0049	2.2	1.24	0.02	0.0004	0.0005		0.00	47	0.46	0.01	45	0.50	0.02										0.04			63.34	63.31	PART	D/S	DI2
4	1015.94	1026.69	R	18					1	61.81	61.87	10.8	0.50%	1.77	0.0049	2.2	1.24	0.02	0.0004	0.0004	0.00																		0.00	63.39	63.37			FULL	D/S	
5	1026.69	1026.69	R	18					1	61.87	61.87	0.0		1.77	0.0049	2.2	1.24	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01							0.02			63.41	63.41	FULL	U/S	DI1
6																																													

SDMH 1 North - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	57.50	59.00	59.66	59.63	68.04	SDMH1		OK	NO
1010.94	61.00	62.50	62.53	62.50	68.08	DI2		OK	NO
1015.94	61.81	63.31	63.34	63.31	68.08			OK	NO
1026.69	61.87	63.37	63.39	63.37	68.46	DI1		OK	NO
1026.69	61.87	63.37	63.41	63.41	68.46			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH4

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							54.80																				Outlet K_o=	1.0												56.48	56.45			SDMH4
2	1000.00	1015.18	R	18					1	54.80	58.23	15.2	22.63%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																		0.00	59.77	59.73			PART	D/S	
3	1015.18	1020.18	T	18					1	58.23	58.81	5.0	11.57%	1.77	0.0049	2.3	1.30	0.03	0.0005	0.0005		0.00	45	0.46	0.01	45	0.50	0.02											0.03			60.34	60.31	PART	D/S	DI6
4	1020.18	1029.18	R	18					1	58.81	58.86	9.0	0.50%	1.77	0.0049	2.3	1.30	0.03	0.0005	0.0005	0.00																		0.00	60.38	60.36			FULL	D/S	
5	1029.18	1029.18	R	18					1	58.86	58.86	0.0		1.77	0.0049	2.3	1.30	0.03	0.0005	0.0005	0.00					45	0.50	0.01	Ki=	0.4	0.01								0.02			60.41	60.41	FULL	U/S	DI5
6																																													

SDMH 4 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	54.80	56.30	56.48	56.45	65.22	SDMH4		OK	NO
1015.18	58.23	59.73	59.77	59.73	64.86	DI6		OK	NO
1020.18	58.81	60.31	60.34	60.31	64.86			OK	NO
1029.18	58.86	60.36	60.38	60.36	64.93	DI5		OK	NO
1029.18	58.86	60.36	60.41	60.41	64.93			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH5

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont			(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							54.40																				Outlet K_o=	1.0											56.28	56.28			SDMH5
2	1000.00	1019.56	R	18					1	54.40	59.20	19.6	24.54%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	60.70	60.70			PART	D/S	
3	1019.56	1019.56	R	18					1	59.20	59.20	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00			45	0.50	0.00	Ki=	0.4	0.00									0.00			60.70	60.70	FULL	U/S	DI7
4																																													
5																																													
6																																													

SDMH 5 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	54.40	55.90	56.28	56.28	64.94	SDMH5		OK	NO
1019.56	59.20	60.70	60.70	60.70	65.17	DI7		OK	NO
1019.56	59.20	60.70	60.70	60.70	65.17			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH8 North

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA											FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																					PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							44.50																			Outlet K_o=		1.0												49.96	49.95			SDMH8
2	1000.00	1016.97	R	18					1	44.50	49.40	17.0	28.87%	1.77	0.0049	1.3	0.71	0.01	0.0001	0.0001	0.00																		0.00	50.91	50.90			PART	D/S
3	1016.97	1016.97	R	18					1	49.40	49.40	0.0		1.77	0.0049	1.3	0.71	0.01	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00								0.01			50.91	50.91	FULL	U/S	DI9
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SDMH 8 North - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	44.50	46.00	49.96	49.95	55.00	SDMH8		OK	NO
1016.97	49.40	50.90	50.91	50.90	55.29	DI9		OK	NO
1016.97	49.40	50.90	50.91	50.91	55.29			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH8 South

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							44.50																			Outlet K_o=		1.0												49.96	49.95			SDMH8
2	1000.00	1018.39	R	18					1	44.50	49.40	18.4	26.65%	1.77	0.0049	1.3	0.71	0.01	0.0001	0.0001	0.00																		0.00	50.91	50.90			PART	D/S	
3	1018.39	1018.39	R	18					1	49.40	49.40	0.0		1.77	0.0049	1.3	0.71	0.01	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00							0.01			50.91	50.91	FULL	U/S	DI11
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SDMH 8 South - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	44.50	46.00	49.96	49.95	55.00	SDMH8		OK	NO
1018.39	49.40	50.90	50.91	50.90	55.34	DI11		OK	NO
1018.39	49.40	50.90	50.91	50.91	55.34			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH9

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= D | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total					PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	H_f (ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)				(ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	FLOW	
1		1000.00		18							43.00																																				SDMH9
2	1000.00	1205.92	R	18					1	43.00	45.67	205.9	1.30%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.02																												
3	1205.92	1210.92	T	18					1	45.67	46.21	5.0	10.80%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001		0.00	45	0.46	0.00																									SDMH10
4	1210.92	1224.68	R	18					1	46.21	49.00	13.8	20.29%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00																												
5	1224.68	1224.68	R	18					1	49.00	49.00	0.0		1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00																DI12
6																																													

SDMH 9 - Summary of Results

						(Optional)			HGL with respect	Pressure Gasket
	STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1	1000.00	43.00	44.50	48.50	48.50	53.46	SDMH9		OK	NO
2	1205.92	45.67	47.17	48.52	48.52	56.23	SDMH10		OK	NO
3	1210.92	46.21	47.71	48.53	48.52	56.23			OK	NO
4	1224.68	49.00	50.50	50.50	50.50	56.50	DI12		OK	NO
5	1224.68	49.00	50.50	50.51	50.51	56.50			OK	NO
6										
7										
8										
9										
10										
11										
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Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH11 East

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(deg)		(ft)	(ft)	(deg)				EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							41.80																			Outlet K_o=	1.0											47.13	47.07			SDMH11
2	1000.00	1015.08	R	18					1	41.80	45.40	15.1	23.89%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0011	0.02																		0.00	47.15	47.09			FULL	U/S
3	1015.08	1020.08	T	18					1	45.40	46.01	5.0	12.20%	1.77	0.0049	2.1	1.19	0.02	0.0004	0.0008		0.00	48	0.46	0.03	45	0.50	0.05											0.08			47.53	47.51	PART	D/S	DI14
4	1020.08	1029.08	R	18					1	46.01	46.06	9.0	0.50%	1.77	0.0049	2.1	1.19	0.02	0.0004	0.0004	0.00																		0.00	47.58	47.56			FULL	D/S
5	1029.08	1029.08	R	18					1	46.06	46.06	0.0		1.77	0.0049	2.1	1.19	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01								0.02			47.60	47.60	FULL	U/S	DI13
6																																													

SDMH 11 East - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	41.80	43.30	47.13	47.07	52.42	SDMH11		OK	NO
1015.08	45.40	46.90	47.15	47.09	51.98	DI14		OK	NO
1020.08	46.01	47.51	47.53	47.51	51.98			OK	NO
1029.08	46.06	47.56	47.58	47.56	52.13	DI13		OK	NO
1029.08	46.06	47.56	47.60	47.60	52.13			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH11 West

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA											FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																					PIPE	TRANSITION																												
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend			Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(deg)		(ft)	(ft)	(deg)				(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							41.80																			Outlet K_o=		1.0												47.07	47.07			SDMH11
2	1000.00	1013.49	R	18					1	41.80	46.70	13.5	36.32%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	48.20	48.20			PART	D/S
3	1013.49	1013.49	R	18					1	46.70	46.70	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00					45	0.50	0.00	Ki=	0.4	0.00								0.00			48.20	48.20	FULL	U/S	DI15
4																																													
5																																													
6																																													

SDMH 11 West - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	41.80	43.30	47.07	47.07	52.42	SDMH11		OK	NO
1013.49	46.70	48.20	48.20	48.20	52.66	DI15		OK	NO
1013.49	46.70	48.20	48.20	48.20	52.66			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH13 East

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							36.40																			Outlet K_o=	1.0																SDMH13
2	1000.00	1010.59	R	18					1	36.40	39.23	10.6	26.75%	1.77	0.0049	5.5	3.11	0.15	0.0027	0.0027	0.03																		0.00	44.75	44.60		44.72	44.57	FULL	U/S	
3	1010.59	1015.59	T	18					1	39.23	39.91	5.0	13.63%	1.77	0.0049	3.2	1.81	0.05	0.0009	0.0018		0.01	83	1.06	0.16	45	0.50	0.12											0.29			45.04	44.99	FULL	U/S	DI18
4	1015.59	1024.59	R	18					1	39.91	39.96	9.0	0.50%	1.77	0.0049	3.2	1.81	0.05	0.0009	0.0009	0.01																		0.00	45.05	45.00			FULL	U/S	
5	1024.59	1024.59	R	18					1	39.96	39.96	0.0		1.77	0.0049	3.2	1.81	0.05	0.0009	0.0009	0.00					45	0.50	0.03	Ki=	0.4	0.02								0.05			45.10	45.10	FULL	U/S	DI17
6																																													

SDMH 13 East - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	36.40	37.90	44.72	44.57	47.37	SDMH13		OK	YES
1010.59	39.23	40.73	44.75	44.60	46.79	DI18		OK	NO
1015.59	39.91	41.41	45.04	44.99	46.79			OK	NO
1024.59	39.96	41.46	45.05	45.00	46.95	DI17		OK	NO
1024.59	39.96	41.46	45.10	45.10	46.95			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH13 West

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM (ft)	TO (ft)	T/R	D (in)	SPAN (ft)	RISE (ft)	AREA (ft^2)	HYD RAD (ft)		D/S (ft)	U/S (ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	S_f (ft/ft)	H_f (ft)	H_f (ft)	Θ (deg)	K_{mh}	H_{mh} (ft)	Θ (deg)	K_j	H_j (ft)	Inlet/ Cont	K_j	H_c (ft)	Θ (deg)	K_o	H_o (ft)	R_{bend} (ft)	Θ (deg)	K_b	H_b (ft)	H_m (ft)	Total (ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	PART FLOW	CRTL	
1		1000.00		18							36.40																																			SDMH13
																															Outlet K_o=	1.0														
2	1000.00	1016.97	R	18					1	36.40	41.70	17.0	31.23%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	44.57	44.57			FULL	U/S	
3	1016.97	1016.97	R	18					1	41.70	41.70	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00				45	0.50	0.00	Ki=	0.4	0.00									0.00			44.57	44.57	FULL	U/S	DI16
4																																												
5																																												
6																																												

SDMH 13 West - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	36.40	37.90	44.57	44.57	47.37	SDMH13		OK	YES
1016.97	41.70	43.20	44.57	44.57	47.69	DI16		OK	NO
1016.97	41.70	43.20	44.57	44.57	47.69			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH14 MAINLINE DRIVE F TO DRIVE K

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																					EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																									
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)			(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)				EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18						33.80																				Outlet K_o=	1.0											43.01	41.74			
2	1000.00	1194.84	R	18					1	33.80	43.87	194.8	5.17%	1.77	0.0049	16.0	9.05	1.27	0.0231	0.0231	4.50																		0.00	47.52	46.24			FULL	U/S	SDMH14
3	1194.84	1199.84	T	18					1	43.87	44.12	5.0	4.97%	1.77	0.0049	11.0	6.22	0.60	0.0109	0.0170		0.09	0	0.02	0.03	90	0.25	1.12										1.23			48.75	48.15	FULL	U/S	SDMH27
4	1199.84	1267.09	R	18					1	44.12	47.33	67.3	4.78%	1.77	0.0049	11.0	6.22	0.60	0.0109	0.0109	0.73																0.00	49.48	48.88			FULL	U/S	
5	1267.09	1272.09	T	18					1	47.33	47.54	5.0	4.28%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0080		0.04	0	0.02	0.01											0.58	0.63			50.11	49.83	FULL	U/S	SDMH30
6	1272.09	1347.84	R	18					1	47.54	50.41	75.8	3.78%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.38																0.00	52.19	51.91			PART	D/S	
7	1347.84	1352.84	T	18					1	50.41	50.58	5.0	3.47%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051		0.03	45	0.46	0.13											0.15			52.36	52.08	FULL	D/S	SDMH31
8	1352.84	1388.96	R	18					1	50.58	51.72	36.1	3.16%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.18																0.00	53.50	53.22			PART	D/S	
9	1388.96	1393.96	T	18					1	51.72	51.85	5.0	2.57%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051		0.03	45	0.46	0.13											0.15			53.65	53.38	FULL	U/S	SDMH32
10	1393.96	1520.08	R	18					1	51.85	54.35	126.1	1.98%	1.77	0.0049	7.5	4.24	0.28	0.0051	0.0051	0.64																0.00	56.13	55.85			PART	D/S	
11	1520.08	1525.08	T	18					1	54.35	54.45	5.0	1.89%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0035		0.02	0	0.02	0.01	45	0.50	0.23										0.25			56.38	56.28	FULL	U/S	SDMH33
12	1525.08	1547.90	R	18					1	54.45	54.86	22.8	1.80%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.04																0.00	56.46	56.36			FULL	D/S	
13	1547.90	1552.90	T	18					1	54.86	54.93	5.0	1.54%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018		0.01	9	0.05	0.01											0.01			56.53	56.43	FULL	D/S	SDMH34
14	1552.90	1672.53	R	18					1	54.93	56.47	119.6	1.28%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.22																0.00	58.07	57.97			PART	D/S	
15	1672.53	1677.53	T	18					1	56.47	56.66	5.0	3.76%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018		0.01	21	0.11	0.01											0.02			58.26	58.16	FULL	D/S	SDMH35
16	1677.53	1728.58	R	18					1	56.66	59.84	51.1	6.24%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.09																0.00	61.44	61.34			PART	D/S	
17	1728.58	1733.58	T	18					1	59.84	60.01	5.0	3.37%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018		0.01	6	0.05	0.01	45	0.50	0.05										0.06			61.61	61.51	FULL	D/S	DI38
18	1733.58	1741.86	R	18					1	60.01	60.05	8.3	0.50%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.02																0.00	61.65	61.55			FULL	D/S	
19	1741.86	1746.86	T	18					1	60.05	60.15	5.0	1.98%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0015		0.01	0	0.02	0.00	45	0.50	0.07										0.08			61.73	61.67	FULL	U/S	DI39
20	1746.86	1819.56	R	18					1	60.15	62.66	72.7	3.45%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0011	0.08																0.00	64.22	64.16			PART	D/S	
21	1819.56	1824.56	T	18					1	62.66	62.76	5.0	1.98%	1.77	0.0049	2.8	1.58	0.04	0.0007	0.0009		0.00	0	0.02	0.00	45	0.50	0.04										0.05			64.30	64.26	FULL	D/S	DI8
22	1824.56	1832.56	R	18					1	62.76	62.80	8.0	0.50%	1.77	0.0049	2.8	1.58	0.04	0.0007	0.0007	0.01																0.00	64.34	64.30			FULL	D/S	
23	1832.56	1832.56	R	18					1	62.80	62.80	0.0		1.77	0.0049	2.8	1.58	0.04	0.0007	0.0007	0.00						45	0.50	0.02	Ki=	0.4	0.02							0.04			64.37	64.37	FULL	U/S	DI10
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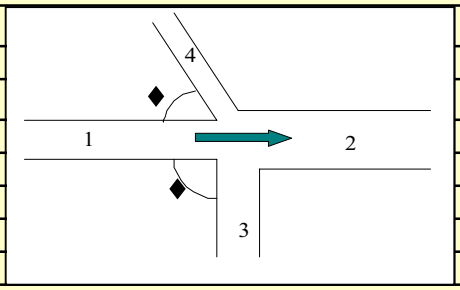
Junction Head Loss Calculation

Known		
Diameter of Pipe 1 (in)	18.0	
Diameter of Pipe 2 (in)	18.0	
Diameter of Pipe 3 (in)	18.0	
Diameter of Pipe 4 (in)*	18.0	
Flow in Pipe 1 (cfs)	8	
Flow in Pipe 2 (cfs)	11	
Flow in Pipe 3 (cfs)	1	
Flow in Pipe 4 (cfs)*	3	
Angle of Pipe 3	45	
Angle of Pipe 4*	45	



*Optional

Headloss is applied at Entrance to Junction

Solve For		
Area of Pipe 1 (ft^2)	1.77	Insert Loss in Misc. Loss Column and
Area of Pipe 2 (ft^2)	1.77	leave Junction Loss Column Blank
Area of Pipe 3 (ft^2)	1.77	
Area of Pipe 4 (ft^2)	1.77	

Head Loss at Junction (ft)	**0.58**

Equation Used:

Incorporates Pressure plus Momentum Laws

$$Hj=((Q_2^2/A_{2*g}-Q_1^2/A_{1*g}-Q_3^2*\cos(Ang3)/A_{3*g}-Q_4^2*\cos(Ang4)/A_{4*g})*2/(A_1+A_2)-D_1+D_2)$$

SDMH14 Mainline Drive F To Drive K - Summary of Results

						(Optional)			HGL with respect	Pressure Gasket
	STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1	1000.00	33.80	35.30	43.01	41.74	44.84	SDMH14		OK	YES
2	1194.84	43.87	45.37	47.52	46.24	54.51	SDMH27		OK	NO
3	1199.84	44.12	45.62	48.75	48.15	54.51			OK	NO
4	1267.09	47.33	48.83	49.48	48.88	57.95	SDMH30		OK	NO
5	1272.09	47.54	49.04	50.11	49.83	57.95			OK	NO
6	1347.84	50.41	51.91	52.19	51.91	61.04	SDMH31		OK	NO
7	1352.84	50.58	52.08	52.36	52.08	61.04			OK	NO
8	1388.96	51.72	53.22	53.50	53.22	62.30	SDMH32		OK	NO
9	1393.96	51.85	53.35	53.65	53.38	62.30			OK	NO
10	1520.08	54.35	55.85	56.13	55.85	64.86	SDMH33		OK	NO
11	1525.08	54.45	55.95	56.38	56.28	64.86			OK	NO
12	1547.90	54.86	56.36	56.46	56.36	65.40	SDMH34		OK	NO
13	1552.90	54.93	56.43	56.53	56.43	65.40			OK	NO
14	1672.53	56.47	57.97	58.07	57.97	67.01	SDMH35		OK	NO
15	1677.53	56.66	58.16	58.26	58.16	67.01			OK	NO
16	1728.58	59.84	61.34	61.44	61.34	67.04	DI38		OK	NO
17	1733.58	60.01	61.51	61.61	61.51	67.04			OK	NO
18	1741.86	60.05	61.55	61.65	61.55	67.23	DI39		OK	NO
19	1746.86	60.15	61.65	61.73	61.67	67.23			OK	NO
20	1819.56	62.66	64.16	64.22	64.16	68.62	DI8		OK	NO
21	1824.56	62.76	64.26	64.30	64.26	68.62			OK	NO
22	1832.56	62.80	64.30	64.34	64.30	68.81	DI10		OK	NO
23	1832.56	62.80	64.30	64.37	64.37	68.81			OK	NO
24										
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Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH15

DATE: 09/26/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	H_f (ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							47.37																			Outlet K_o=		1.0										48.92	48.92			SDMH15
2	1000.00	1014.47	R	18					1	47.37	50.81	14.5	23.74%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00																		0.00	52.31	52.31			PART	D/S	
3	1014.47	1019.47	T	18					1	50.81	51.41	5.0	12.12%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001		0.00	45	0.46	0.00	45	0.50	0.00											0.01			52.92	52.91	PART	D/S	DI41
4	1019.47	1028.47	R	18					1	51.41	51.46	9.0	0.50%	1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00																		0.00	52.96	52.96			FULL	D/S	
5	1028.47	1028.47	R	18					1	51.46	51.46	0.0		1.77	0.0049	1.0	0.57	0.00	0.0001	0.0001	0.00					45	0.50	0.00	Ki=	0.4	0.00								0.00			52.97	52.97	FULL	U/S	DI40
6																																													

SDMH 15 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	47.37	48.87	48.92	48.92	57.76	SDMH15		OK	NO
1014.47	50.81	52.31	52.31	52.31	57.33	DI41		OK	NO
1019.47	51.41	52.91	52.92	52.91	57.33			OK	NO
1028.47	51.46	52.96	52.96	52.96	57.46	DI40		OK	NO
1028.47	51.46	52.96	52.97	52.97	57.46			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH17 MAINLINE DRIVE C

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA								ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																			PIPE	TRANSITION																										
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend					Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)			(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							20.20																				Outlet K_o=	1.0														SDMH17
2	1000.00	1014.20	R	18					1	20.20	22.15	14.2	13.76%	1.77	0.0049	23.5	13.30	2.75	0.0498	0.0498	0.71																				0.00	27.01	24.27					
3	1014.20	1019.20	T	18					1	22.15	22.84	5.0	13.76%	1.77	0.0049	22.0	12.45	2.41	0.0437	0.0468		0.23	0	0.02	0.05	45	0.50	1.54												1.83			28.85	26.44	FULL	U/S	SDMH19
4	1019.20	1025.85	R	18					1	22.84	23.76	6.7	13.76%	1.77	0.0049	22.0	12.45	2.41	0.0437	0.0437	0.29																				0.00	29.14	26.73			FULL	U/S	
5	1025.85	1030.85	T	18					1	23.76	24.18	5.0	8.37%	1.77	0.0049	13.0	7.36	0.84	0.0153	0.0295		0.15	45	0.46	1.11	29	0.72	1.80												3.06			32.19	31.35	FULL	U/S	DI19
6	1030.85	1157.04	R	18					1	24.18	27.93	126.2	2.97%	1.77	0.0049	13.0	7.36	0.84	0.0153	0.0153	1.92																				0.00	34.12	33.28			FULL	U/S	
7	1157.04	1162.04	T	18					1	27.93	28.07	5.0	2.85%	1.77	0.0049	11.0	6.22	0.60	0.0109	0.0131		0.07	0	0.02	0.02	45	0.50	0.54												0.62			34.74	34.14	FULL	U/S	SDMH20
8	1162.04	1201.05	R	18					1	28.07	29.13	39.0	2.73%	1.77	0.0049	11.0	6.22	0.60	0.0109	0.0109	0.43																				0.00	35.17	34.56			FULL	U/S	
9	1201.05	1206.05	T	18					1	29.13	29.22	5.0	1.85%	1.77	0.0049	9.0	5.09	0.40	0.0073	0.0091		0.05	0	0.02	0.01	60	0.35	0.46												0.52			35.68	35.28	FULL	U/S	SDMH21
10	1206.05	1309.54	R	18					1	29.22	30.23	103.5	0.97%	1.77	0.0049	9.0	5.09	0.40	0.0073	0.0073	0.76																				0.00	36.44	36.04			FULL	U/S	
11	1309.54	1314.54	T	18					1	30.23	30.26	5.0	0.72%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0065		0.03	3	0.02	0.01	45	0.50	0.24												0.28			36.72	36.41	FULL	U/S	SDMH22
12	1314.54	1393.52	R	18					1	30.26	30.64	79.0	0.48%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.46																				0.00	37.18	36.86			FULL	U/S	
13	1393.52	1398.52	T	18					1	30.64	30.67	5.0	0.63%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058		0.03	6	0.05	0.02															0.04			37.23	36.91	FULL	U/S	SDMH23
14	1398.52	1529.82	R	18					1	30.67	31.68	131.3	0.77%	1.77	0.0049	8.0	4.53	0.32	0.0058	0.0058	0.76																				0.00	37.98	37.67			FULL	U/S	
15	1529.82	1534.82	T	18					1	31.68	31.75	5.0	1.30%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0038		0.02	0	0.02	0.01	45	0.50	0.27												0.29			38.28	38.18	FULL	U/S	SDMH24
16	1534.82	1558.08	R	18					1	31.75	32.17	23.3	1.84%	1.77	0.0049	4.5	2.55	0.10	0.0018	0.0018	0.04																				0.00	38.32	38.22			FULL	U/S	
17	1558.08	1563.08	T	18					1	32.17	32.26	5.0	1.82%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0012		0.01	0	0.02	0.00	45	0.50	0.09												0.09			38.41	38.38	FULL	U/S	SDMH25
18	1563.08	1836.27	R	18					1	32.26	37.16	273.2	1.79%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.15																				0.00	38.69	38.66			FULL	D/S	
19	1836.27	1841.27	T	18					1	37.16	37.81	5.0	13.12%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006		0.00	45	0.46	0.01													0.02			39.34	39.31	PART	D/S	SDMH26
20	1841.27	1853.24	R	18					1	37.81	40.74	12.0	24.45%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																				0.00	42.27	42.24			PART	D/S	
21	1853.24	1858.24	T	18					1	40.74	41.36	5.0	12.48%	1.77	0.0049	2.2	1.24	0.02	0.0004	0.0005		0.00	45	0.46	0.01	45	0.50	0.02												0.04			42.89	42.86	PART	D/S	DI29
22	1858.24	1867.24	R	18					1	41.36	41.41	9.0	0.50%	1.77	0.0049	2.2	1.24	0.02	0.0004	0.0004	0.00																				0.00	42.93	42.91			FULL	D/S	
23	1867.24	1867.24	R	18					1	41.41	41.41	0.0		1.77	0.0049	2.2	1.24	0.02	0.0004	0.0004	0.00						45	0.50	0.01	Ki=	0.4	0.01								0.02			42.95	42.95	FULL	U/S	DI30
24																																												

SDMH 17 Mainline Drive C - Summary of Results

						(Optional)			HGL with respect	Pressure Gasket
	STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1	1000.00	20.20	21.70	26.31	23.56	38.16	SDMH17		OK	NO
2	1014.20	22.15	23.65	27.01	24.27	39.11	DI19		OK	NO
3	1019.20	22.84	24.34	28.85	26.44	39.11			OK	NO
4	1025.85	23.76	25.26	29.14	26.73	39.11	SDMH19		OK	NO
5	1030.85	24.18	25.68	32.19	31.35	39.11			OK	YES
6	1157.04	27.93	29.43	34.12	33.28	39.99	SDMH20		OK	NO
7	1162.04	28.07	29.57	34.74	34.14	39.99			OK	NO
8	1201.05	29.13	30.63	35.17	34.56	40.19	SDMH21		OK	NO
9	1206.05	29.22	30.72	35.68	35.28	40.19			OK	NO
10	1309.54	30.23	31.73	36.44	36.04	40.73	SDMH22		OK	NO
11	1314.54	30.26	31.76	36.72	36.41	40.73			OK	NO
12	1393.52	30.64	32.14	37.18	36.86	41.16	SDMH23		OK	NO
13	1398.52	30.67	32.17	37.23	36.91	41.16			OK	NO
14	1529.82	31.68	33.18	37.98	37.67	41.98	SDMH24		OK	NO
15	1534.82	31.75	33.25	38.28	38.18	41.98			OK	NO
16	1558.08	32.17	33.67	38.32	38.22	42.36	SDMH25		OK	NO
17	1563.08	32.26	33.76	38.41	38.38	42.36			OK	NO
18	1836.27	37.16	38.66	38.69	38.66	47.60	SDMH26		OK	NO
19	1841.27	37.81	39.31	39.34	39.31	47.60			OK	NO
20	1853.24	40.74	42.24	42.27	42.24	47.27	DI29		OK	NO
21	1858.24	41.36	42.86	42.89	42.86	47.27			OK	NO
22	1867.24	41.41	42.91	42.93	42.91	47.49	DI30		OK	NO
23	1867.24	41.41	42.91	42.95	42.95	47.49			OK	NO
24										

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH19

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	(ft)	(deg)		(ft)	(deg)			Cont			(deg)		(ft)		(deg)				EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18						24.10																				Outlet K_o=	1.0													31.75	31.35			SDMH19
2	1000.00	1055.26	R	18					1	24.10	34.80	55.3	19.36%	1.77	0.0049	9.0	5.09	0.40	0.0073	0.0073	0.40																		0.00	36.70	36.30			PART	D/S	
3	1055.26	1055.26	R	18					1	34.80	34.80	0.0		1.77	0.0049	9.0	5.09	0.40	0.0073	0.0073	0.00			45	0.50	0.20	Ki=	0.4	0.16									0.36			37.07	37.07	FULL	U/S	DI20
4																																													
5																																													
6																																													

SDMH 19 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	24.10	25.60	31.75	31.35	39.11	SDMH19		OK	YES
1055.26	34.80	36.30	36.70	36.30	39.44	DI20		OK	NO
1055.26	34.80	36.30	37.07	37.07	39.44			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH20

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)				(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18						28.00																			Outlet K_o=		1.0															SDMH20
2	1000.00	1014.47	R	18					1	28.00	31.92	14.5	27.11%	1.77	0.0049	2.0	1.13	0.02	0.0004	0.0004	0.01																		0.00	34.17	34.15			34.16	34.14	FULL	U/S	
3	1014.47	1019.47	T	18					1	31.92	32.61	5.0	13.81%	1.77	0.0049	1.9	1.08	0.02	0.0003	0.0003		0.00	45	0.46	0.01	45	0.50	0.01											0.02			34.19	34.17	FULL	U/S	DI21
4	1019.47	1028.47	R	18					1	32.61	32.66	9.0	0.50%	1.77	0.0049	1.9	1.08	0.02	0.0003	0.0003	0.00																		0.00	34.19	34.17					FULL	U/S	
5	1028.47	1028.47	R	18					1	32.66	32.66	0.0		1.77	0.0049	1.9	1.08	0.02	0.0003	0.0003	0.00					45	0.50	0.01	Ki=	0.4	0.01								0.02			34.21	34.21	FULL	U/S	DI22
6																																													

SDMH 20 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	28.00	29.50	34.16	34.14	39.97	SDMH20		OK	NO
1014.47	31.92	33.42	34.17	34.15	39.47	DI21		OK	NO
1019.47	32.61	34.11	34.19	34.17	39.47			OK	NO
1028.47	32.66	34.16	34.19	34.17	39.53	DI22		OK	NO
1028.47	32.66	34.16	34.21	34.21	39.53			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH21

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							29.20																			Outlet K_o=		1.0												35.29	35.28			SDMH21
2	1000.00	1015.01	R	18					1	29.20	34.40	15.0	34.64%	1.77	0.0049	1.5	0.85	0.01	0.0002	0.0002	0.00																		0.00	35.91	35.90			PART	D/S
3	1015.01	1015.01	R	18					1	34.40	34.40	0.0		1.77	0.0049	1.5	0.85	0.01	0.0002	0.0002	0.00					45	0.50	0.01	Ki=	0.4	0.00							0.01			35.92	35.92	FULL	U/S	DI23
4																																												
5																																												
6																																												

SDMH 21 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	29.20	30.70	35.29	35.28	40.19	SDMH21		OK	NO
1015.01	34.40	35.90	35.91	35.90	40.42	DI23		OK	NO
1015.01	34.40	35.90	35.92	35.92	40.42			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH22

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																					EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																									
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							30.25																				Outlet K_o=	1.0														SDMH22
2	1000.00	1014.47	R	18					1	30.25	33.70	14.5	23.86%	1.77	0.0049	1.5	0.85	0.01	0.0002	0.0002	0.00																		0.00	36.42	36.41			FULL	U/S	
3	1014.47	1019.47	T	18					1	33.70	34.31	5.0	12.18%	1.77	0.0049	1.3	0.74	0.01	0.0002	0.0002		0.00	45	0.46	0.01	45	0.50	0.01											0.01			36.44	36.43	FULL	U/S	DI24
4	1019.47	1028.47	R	18					1	34.31	34.36	9.0	0.50%	1.77	0.0049	1.3	0.74	0.01	0.0002	0.0002	0.00																		0.00	36.44	36.43			FULL	U/S	
5	1028.47	1028.47	R	18					1	34.36	34.36	0.0		1.77	0.0049	1.3	0.74	0.01	0.0002	0.0002	0.00					45	0.50	0.00	Ki=	0.4	0.00							0.01			36.45	36.45	FULL	U/S	DI25
6																																												

SDMH 22 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	30.25	31.75	36.42	36.41	40.73	SDMH22		OK	NO
1014.47	33.70	35.20	36.42	36.41	40.23	DI24		OK	NO
1019.47	34.31	35.81	36.44	36.43	40.23			OK	NO
1028.47	34.36	35.86	36.44	36.43	40.24	DI25		OK	NO
1028.47	34.36	35.86	36.45	36.45	40.24			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH24

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																										
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						FLOW	
1		1000.00		18							31.70																			Outlet K_o=	1.0											38.24	38.18			SDMH24
2	1000.00	1020.13	R	18					1	31.70	34.64	20.1	14.58%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0011	0.02																	0.00	38.26	38.20			FULL	U/S	
3	1020.13	1025.13	T	18					1	34.64	35.01	5.0	7.54%	1.77	0.0049	2.1	1.19	0.02	0.0004	0.0008		0.00	45	0.46	0.03	45	0.50	0.05											0.08			38.34	38.32	FULL	U/S	DI26
4	1025.13	1033.83	R	18					1	35.01	35.06	8.7	0.50%	1.77	0.0049	2.1	1.19	0.02	0.0004	0.0004	0.00																	0.00	38.35	38.33			FULL	U/S	
5	1033.83	1033.83	R	18					1	35.06	35.06	0.0		1.77	0.0049	2.1	1.19	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01							0.02			38.37	38.37	FULL	U/S	DI27
6																																												

SDMH 24 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	31.70	33.20	38.24	38.18	41.98	SDMH24		OK	NO
1020.13	34.64	36.14	38.26	38.20	41.99	DI26		OK	NO
1025.13	35.01	36.51	38.34	38.32	41.99			OK	NO
1033.83	35.06	36.56	38.35	38.33	42.15	DI27		OK	NO
1033.83	35.06	36.56	38.37	38.37	42.15			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH25

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							32.22																			Outlet K_o=		1.0												38.40	38.38			SDMH25
2	1000.00	1018.39	R	18					1	32.22	35.80	18.4	19.47%	1.77	0.0049	2.0	1.13	0.02	0.0004	0.0004	0.01																	0.00	38.41	38.39			FULL	U/S	
3	1018.39	1018.39	R	18					1	35.80	35.80	0.0		1.77	0.0049	2.0	1.13	0.02	0.0004	0.0004	0.00					45	0.50	0.01	Ki=	0.4	0.01						0.02			38.42	38.42	FULL	U/S	DI28
4																																												
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SDMH 25 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	32.22	33.72	38.40	38.38	42.36	SDMH25		OK	NO
1018.39	35.80	37.30	38.41	38.39	42.77	DI28		OK	NO
1018.39	35.80	37.30	38.42	38.42	42.77			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH27 MAINLINE DRIVE E

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							44.00																			Outlet K_o=	1.0											48.27	48.15			SDMH27
2	1000.00	1279.10	R	18					1	44.00	47.12	279.1	1.12%	1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.63																		0.00	48.90	48.78			FULL	U/S	
3	1279.10	1284.10	T	18					1	47.12	47.18	5.0	1.12%	1.77	0.0049	4.0	2.26	0.08	0.0014	0.0019		0.01	0	0.02	0.00	45	0.50	0.08											0.10			49.00	48.92	FULL	U/S	SDMH15
4	1284.10	1355.06	R	18					1	47.18	47.97	71.0	1.12%	1.77	0.0049	4.0	2.26	0.08	0.0014	0.0014	0.10																		0.00	49.55	49.47			PART	D/S	
5	1355.06	1360.06	T	18					1	47.97	48.05	5.0	1.51%	1.77	0.0049	4.0	2.26	0.08	0.0014	0.0014		0.01	8	0.05	0.00													0.01			49.63	49.55	FULL	D/S	SDMH28
6	1360.06	1413.02	R	18					1	48.05	49.05	53.0	1.90%	1.77	0.0049	4.0	2.26	0.08	0.0014	0.0014	0.08																		0.00	50.63	50.55			PART	D/S	
7	1413.02	1418.02	T	18					1	49.05	50.30	5.0	24.95%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0013		0.01	63	0.63	0.05	37	0.60	0.04										0.10			51.86	51.80	PART	D/S	SDMH29
8	1418.02	1427.13	R	18					1	50.30	54.67	9.1	48.00%	1.77	0.0049	3.5	1.98	0.06	0.0011	0.0011	0.01																		0.00	56.23	56.17			PART	D/S	
9	1427.13	1432.13	T	18					1	54.67	55.88	5.0	24.17%	1.77	0.0049	2.7	1.53	0.04	0.0007	0.0009		0.00	63	0.63	0.04	45	0.50	0.04										0.09			57.42	57.38	PART	D/S	DI31
10	1432.13	1441.13	R	18					1	55.88	55.93	9.0	0.50%	1.77	0.0049	2.7	1.53	0.04	0.0007	0.0007	0.01																		0.00	57.46	57.43			FULL	D/S	
11	1441.13	1441.13	R	18					1	55.93	55.93	0.0		1.77	0.0049	2.7	1.53	0.04	0.0007	0.0007	0.00					45	0.50	0.02	Ki=	0.4	0.01									0.03			57.50	57.50	FULL	U/S	DI32
12																																													

SDMH 27 Mainline Drive E - Summary of Results

						(Optional)			HGL with respect	Pressure Gasket
	STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1	1000.00	44.00	45.50	48.27	48.15	54.51	SDMH27		OK	NO
2	1279.10	47.12	48.62	48.90	48.78	57.55	SDMH15		OK	NO
3	1284.10	47.18	48.68	49.00	48.92	57.55			OK	NO
4	1355.06	47.97	49.47	49.55	49.47	58.52	SDMH28		OK	NO
5	1360.06	48.05	49.55	49.63	49.55	58.52			OK	NO
6	1413.02	49.05	50.55	50.63	50.55	59.61	SDMH29		OK	NO
7	1418.02	50.30	51.80	51.86	51.80	59.61			OK	NO
8	1427.13	54.67	56.17	56.23	56.17	59.16	DI31		OK	NO
9	1432.13	55.88	57.38	57.42	57.38	59.16			OK	NO
10	1441.13	55.93	57.43	57.46	57.43	59.37	DI32		OK	NO
11	1441.13	55.93	57.43	57.50	57.50	59.37			OK	NO
12										
13										
14										
15										
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Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH29

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG			INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD	#	D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							49.10																				Outlet K_o=	1.0											51.80	51.80			SDMH29
2	1000.00	1020.74	R	18					1	49.10	54.00	20.7	23.63%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	55.50	55.50			PART	D/S
3	1020.74	1020.74	R	18					1	54.00	54.00	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00			45	0.50	0.00	Ki=	0.4	0.00									0.00			55.50	55.50	FULL	U/S	DI33
4																																												
5																																												
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SDMH 29 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	49.10	50.60	51.80	51.80	59.61	SDMH29		OK	NO
1020.74	54.00	55.50	55.50	55.50	60.10	DI33		OK	NO
1020.74	54.00	55.50	55.50	55.50	60.10			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH30 North

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	H_f (ft)	H_f (ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)				(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							47.45																			Outlet K_o=		1.0															SDMH30
2	1000.00	1020.98	R	18					1	47.45	51.20	21.0	17.88%	1.77	0.0049	3.0	1.70	0.04	0.0008	0.0008	0.02																		0.00	52.74	52.70			PART	D/S	
3	1020.98	1020.98	R	18					1	51.20	51.20	0.0		1.77	0.0049	3.0	1.70	0.04	0.0008	0.0008	0.00					45	0.50	0.02	Ki=	0.4	0.02							0.04			52.79	52.79	FULL	U/S	DI34
4																																												
5																																												
6																																												

SDMH30 North - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	47.45	48.95	49.87	49.83	57.95	SDMH30		OK	NO
1020.98	51.20	52.70	52.74	52.70	58.26	DI34		OK	NO
1020.98	51.20	52.70	52.79	52.79	58.26			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH30 South

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																												
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont			(deg)		(ft)	(ft)	(deg)						EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							47.45																			Outlet K_o=		1.0												49.83	49.83			SDMH30
2	1000.00	1016.73	R	18					1	47.45	52.20	16.7	28.38%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	53.70	53.70			PART	D/S	
3	1016.73	1016.73	R	18					1	52.20	52.20	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00			45	0.50	0.00	Ki=	0.4	0.00									0.00			53.70	53.70	FULL	U/S	DI35
4																																												
5																																												
6																																												

SDMH30 South - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	47.45	48.95	49.83	49.83	57.95	SDMH30		OK	NO
1016.73	52.20	53.70	53.70	53.70	58.18	DI35		OK	NO
1016.73	52.20	53.70	53.70	53.70	58.18			OK	NO

Storm Drain Hydraulics Calculations

Kimley»Horn

PROPOSED LATERAL - SDMH33

DATE: 09/27/19 FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 Inlet Structure Type or K_i= D Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																							EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																											
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		1000.00		18							54.40																			Outlet K_o=		1.0											56.32	56.28			SDMH33
2	1000.00	1014.47	R	18					1	54.40	57.98	14.5	24.75%	1.77	0.0049	3.0	1.70	0.04	0.0008	0.0008	0.01																		0.00	59.53	59.48			PART	D/S	
3	1014.47	1019.47	T	18					1	57.98	58.61	5.0	12.63%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0007		0.00	45	0.46	0.02	45	0.50	0.03											0.05			60.14	60.11	PART	D/S	DI36
4	1019.47	1028.47	R	18					1	58.61	58.66	9.0	0.50%	1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.01																		0.00	60.19	60.16			FULL	D/S	
5	1028.47	1028.47	R	18					1	58.66	58.66	0.0		1.77	0.0049	2.5	1.41	0.03	0.0006	0.0006	0.00					45	0.50	0.02	Ki=	0.4	0.01								0.03			60.22	60.22	FULL	U/S	DI37
6																																													

SDMH 33 - Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
1000.00	54.40	55.90	56.32	56.28	64.86	SDMH33		OK	NO
1014.47	57.98	59.48	59.53	59.48	64.53	DI36		OK	NO
1019.47	58.61	60.11	60.14	60.11	64.53			OK	NO
1028.47	58.66	60.16	60.19	60.16	64.75	DI37		OK	NO
1028.47	58.66	60.16	60.22	60.22	64.75			OK	NO

Worksheet for I-1A Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.50 cfs
Slope	2.900 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	2.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	85.80 %
Intercepted Flow	2.15 cfs
Bypass Flow	0.35 cfs
Spread	6.10 ft
Depth	0.27 ft
Flow Area	0.6 ft²
Gutter Depression	1.8 in
Total Depression	1.8 in
Velocity	4.47 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.045
Grate Flow Ratio	0.851
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-1B Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.35	cfs
Slope	2.900	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	2.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.35	cfs
Bypass Flow	0.00	cfs
Spread	1.68	ft
Depth	0.13	ft
Flow Area	0.1	ft^2
Gutter Depression	1.8	in
Total Depression	1.8	in
Velocity	3.11	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.083	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-2A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	1.50	cfs
Slope	0.600	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	86.20	%
Intercepted Flow	1.29	cfs
Bypass Flow	0.21	cfs
Spread	5.12	ft
Depth	0.30	ft
Flow Area	0.6	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.31	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.134	
Grate Flow Ratio	0.841	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-2A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.21	cfs
Slope	0.600	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.21	cfs
Bypass Flow	0.00	cfs
Spread	1.86	ft
Depth	0.15	ft
Flow Area	0.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.51	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.249	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-2A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	0.600	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	98.71	%
Intercepted Flow	0.49	cfs
Bypass Flow	0.01	cfs
Spread	3.11	ft
Depth	0.21	ft
Flow Area	0.3	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	1.87	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.185	
Grate Flow Ratio	0.984	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-3 Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.25 cfs
Slope	5.670 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	2.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	99.95 %
Intercepted Flow	1.25 cfs
Bypass Flow	0.00 cfs
Spread	2.38 ft
Depth	0.19 ft
Flow Area	0.2 ft²
Gutter Depression	1.8 in
Total Depression	1.8 in
Velocity	5.49 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.032
Grate Flow Ratio	1.000
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-4A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.50 cfs
Slope	1.330 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	83.14 %
Intercepted Flow	2.08 cfs
Bypass Flow	0.42 cfs
Spread	5.41 ft
Depth	0.32 ft
Flow Area	0.7 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	3.52 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.068
Grate Flow Ratio	0.819
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-4A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.42	cfs
Slope	1.330	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.42	cfs
Bypass Flow	0.00	cfs
Spread	2.08	ft
Depth	0.17	ft
Flow Area	0.2	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.43	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.124	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-4A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	1.330	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.22	ft
Depth	0.18	ft
Flow Area	0.2	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	2.54	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.116	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-5A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	4.50	cfs
Slope	1.360	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	71.91	%
Intercepted Flow	3.24	cfs
Bypass Flow	1.26	cfs
Spread	7.09	ft
Depth	0.38	ft
Flow Area	1.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	3.98	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.055	
Grate Flow Ratio	0.703	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-5A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	1.26	cfs
Slope	1.360	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	94.11	%
Intercepted Flow	1.19	cfs
Bypass Flow	0.07	cfs
Spread	3.72	ft
Depth	0.25	ft
Flow Area	0.4	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	3.14	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.082	
Grate Flow Ratio	0.936	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-5A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	1.360	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.21	ft
Depth	0.18	ft
Flow Area	0.2	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	2.56	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.114	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-6A Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.50 cfs
Slope	1.900 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	86.07 %
Intercepted Flow	2.15 cfs
Bypass Flow	0.35 cfs
Spread	4.95 ft
Depth	0.30 ft
Flow Area	0.6 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	4.07 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.053
Grate Flow Ratio	0.853
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-6B Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.35	cfs
Slope	1.900	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.35	cfs
Bypass Flow	0.00	cfs
Spread	1.82	ft
Depth	0.15	ft
Flow Area	0.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.65	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.108	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-7A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.50 cfs
Slope	1.630 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	84.81 %
Intercepted Flow	2.12 cfs
Bypass Flow	0.38 cfs
Spread	5.14 ft
Depth	0.31 ft
Flow Area	0.7 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	3.82 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.059
Grate Flow Ratio	0.839
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-7A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.38	cfs
Slope	1.630	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.38	cfs
Bypass Flow	0.00	cfs
Spread	1.93	ft
Depth	0.15	ft
Flow Area	0.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.55	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.114	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-7A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	1.630	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.14	ft
Depth	0.17	ft
Flow Area	0.2	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	2.74	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.102	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-8A Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	1.50	cfs
Slope	0.500	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	84.98	%
Intercepted Flow	1.27	cfs
Bypass Flow	0.23	cfs
Spread	5.35	ft
Depth	0.31	ft
Flow Area	0.7	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.15	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.150	
Grate Flow Ratio	0.823	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-8B Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.23	cfs
Slope	0.500	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.23	cfs
Bypass Flow	0.00	cfs
Spread	1.99	ft
Depth	0.16	ft
Flow Area	0.2	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.45	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.265	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-9A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.00 cfs
Slope	0.500 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	91.37 %
Intercepted Flow	0.91 cfs
Bypass Flow	0.09 cfs
Spread	4.34 ft
Depth	0.27 ft
Flow Area	0.5 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	1.99 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.168
Grate Flow Ratio	0.896
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-9A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.09	cfs
Slope	0.500	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.09	cfs
Bypass Flow	0.00	cfs
Spread	1.40	ft
Depth	0.11	ft
Flow Area	0.1	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.14	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.355	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-9A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.50 cfs
Slope	0.500 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	1.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	98.03 %
Intercepted Flow	0.49 cfs
Bypass Flow	0.01 cfs
Spread	3.80 ft
Depth	0.21 ft
Flow Area	0.3 ft²
Gutter Depression	2.1 in
Total Depression	2.1 in
Velocity	1.72 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.209
Grate Flow Ratio	0.975
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-10 Sump 5' Type DM2

Project Description	
Solve For	Spread

Input Data	
Discharge	1.50 cfs
Gutter Width	1.50 ft
Gutter Cross Slope	8.330 %
Road Cross Slope	2.000 %
Local Depression	5.0 in
Local Depression Width	18.0 in
Grate Width	1.50 ft
Grate Length	2.50 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %
Curb Opening Length	4.50 ft
Opening Height	0.50 ft
Curb Throat Type	Horizontal
Throat Incline Angle	90.00 degrees

Options	
Calculation Option	Use Both

Results	
Spread	5.11 ft
Depth	0.20 ft
Gutter Depression	1.1 in
Total Depression	6.1 in
Open Grate Area	1.7 ft²
Active Grate Weir Length	4.00 ft

Worksheet for I-11A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	3.50	cfs
Slope	1.780	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	79.22	%
Intercepted Flow	2.77	cfs
Bypass Flow	0.73	cfs
Spread	5.93	ft
Depth	0.34	ft
Flow Area	0.8	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	4.22	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.050	
Grate Flow Ratio	0.781	
Active Grate Length	1.13	ft

Worksheet for I-11A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.73 cfs
Slope	1.780 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	99.92 %
Intercepted Flow	0.73 cfs
Bypass Flow	0.00 cfs
Spread	2.42 ft
Depth	0.19 ft
Flow Area	0.2 ft^2
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	3.11 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.083
Grate Flow Ratio	0.999
Active Grate Length	1.13 ft

Worksheet for I-11B1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.00 cfs
Slope	1.780 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	97.58 %
Intercepted Flow	0.98 cfs
Bypass Flow	0.02 cfs
Spread	2.95 ft
Depth	0.22 ft
Flow Area	0.3 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	3.35 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.074
Grate Flow Ratio	0.974
Active Grate Length	1.13 ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-11B2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.02	cfs
Slope	1.780	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.02	cfs
Bypass Flow	0.00	cfs
Spread	0.63	ft
Depth	0.05	ft
Flow Area	0.0	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.26	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.315	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Messages	
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Worksheet for I-12A East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.00 cfs
Slope	1.920 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	82.83 %
Intercepted Flow	2.48 cfs
Bypass Flow	0.52 cfs
Spread	5.41 ft
Depth	0.32 ft
Flow Area	0.7 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	4.22 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.050
Grate Flow Ratio	0.819
Active Grate Length	1.13 ft

Worksheet for I-12B East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.52	cfs
Slope	1.920	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.52	cfs
Bypass Flow	0.00	cfs
Spread	2.10	ft
Depth	0.17	ft
Flow Area	0.2	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	2.94	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.091	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Worksheet for I-13A North 10' Type DM2

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.00 cfs
Slope	3.900 %
Gutter Width	1.50 ft
Gutter Cross Slope	8.330 %
Road Cross Slope	2.000 %
Roughness Coefficient	0.016
Local Depression	5.0 in
Local Depression Width	18.0 in
Grate Width	1.50 ft
Grate Length	7.50 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %
Curb Opening Length	9.50 ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results	
Efficiency	97.89 %
Intercepted Flow	2.94 cfs
Bypass Flow	0.06 cfs
Spread	7.67 ft
Depth	0.25 ft
Flow Area	0.7 ft²
Gutter Depression	1.1 in
Total Depression	6.1 in
Velocity	4.55 ft/s
Splash Over Velocity	11.14 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.154
Grate Flow Ratio	0.567
Equivalent Cross Slope	21.336 %
Active Grate Length	3.75 ft
Length Factor	0.529
Total Interception Length	10.86 ft

Messages

Worksheet for I-13A North 10' Type DM2

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

Worksheet for I-13A South 5' Type DM2

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	3.900	%
Gutter Width	1.50	ft
Gutter Cross Slope	8.330	%
Road Cross Slope	2.000	%
Roughness Coefficient	0.016	
Local Depression	5.0	in
Local Depression Width	18.0	in
Grate Width	1.50	ft
Grate Length	2.50	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%
Curb Opening Length	4.50	ft

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.57	ft
Depth	0.15	ft
Flow Area	0.1	ft^2
Gutter Depression	1.1	in
Total Depression	6.1	in
Velocity	3.64	ft/s
Splash Over Velocity	6.35	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.021	
Grate Flow Ratio	0.976	
Equivalent Cross Slope	35.277	%
Active Grate Length	1.25	ft
Length Factor	0.859	
Total Interception Length	3.79	ft

Messages

Worksheet for I-13A South 5' Type DM2

Messages		
Messages	Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).	

Worksheet for I-15A1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	3.50	cfs
Slope	1.890	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	79.75	%
Intercepted Flow	2.79	cfs
Bypass Flow	0.71	cfs
Spread	5.85	ft
Depth	0.33	ft
Flow Area	0.8	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	4.32	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.048	
Grate Flow Ratio	0.787	
Active Grate Length	1.13	ft

Worksheet for I-15A2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.71	cfs
Slope	1.890	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	99.97	%
Intercepted Flow	0.71	cfs
Bypass Flow	0.00	cfs
Spread	2.37	ft
Depth	0.19	ft
Flow Area	0.2	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	3.16	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.081	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Worksheet for I-15A West Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.50	cfs
Slope	1.890	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	1.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.50	cfs
Bypass Flow	0.00	cfs
Spread	2.08	ft
Depth	0.17	ft
Flow Area	0.2	ft^2
Gutter Depression	2.1	in
Total Depression	2.1	in
Velocity	2.89	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.094	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Worksheet for I-15B1 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.00 cfs
Slope	1.130 %
Gutter Width	2.50 ft
Gutter Cross Slope	8.000 %
Road Cross Slope	4.000 %
Roughness Coefficient	0.016
Grate Width	2.25 ft
Grate Length	2.25 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	95.72 %
Intercepted Flow	0.96 cfs
Bypass Flow	0.04 cfs
Spread	3.42 ft
Depth	0.24 ft
Flow Area	0.4 ft²
Gutter Depression	1.2 in
Total Depression	1.2 in
Velocity	2.79 ft/s
Splash Over Velocity	6.01 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.100
Grate Flow Ratio	0.952
Active Grate Length	1.13 ft

Worksheet for I-15B2 East Neenah R-3501-R

Project Description	
Solve For	Efficiency

Input Data		
Discharge	0.04	cfs
Slope	1.130	%
Gutter Width	2.50	ft
Gutter Cross Slope	8.000	%
Road Cross Slope	4.000	%
Roughness Coefficient	0.016	
Grate Width	2.25	ft
Grate Length	2.25	ft
Grate Type	P-50 mm (P-1 -7/8")	
Clogging	50.0	%

Options	
Grate Flow Option	Exclude None

Results		
Efficiency	100.00	%
Intercepted Flow	0.04	cfs
Bypass Flow	0.00	cfs
Spread	0.89	ft
Depth	0.07	ft
Flow Area	0.0	ft^2
Gutter Depression	1.2	in
Total Depression	1.2	in
Velocity	1.27	ft/s
Splash Over Velocity	6.01	ft/s
Frontal Flow Factor	1.000	
Side Flow Factor	0.314	
Grate Flow Ratio	1.000	
Active Grate Length	1.13	ft

Worksheet for I-16 Sump 7.5' Type DM2

Project Description	
Solve For	Spread

Input Data	
Discharge	9.00 cfs
Gutter Width	1.50 ft
Gutter Cross Slope	8.330 %
Road Cross Slope	2.000 %
Local Depression	5.0 in
Local Depression Width	18.0 in
Grate Width	1.50 ft
Grate Length	5.00 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %
Curb Opening Length	7.00 ft
Opening Height	0.50 ft
Curb Throat Type	Horizontal
Throat Incline Angle	90.00 degrees

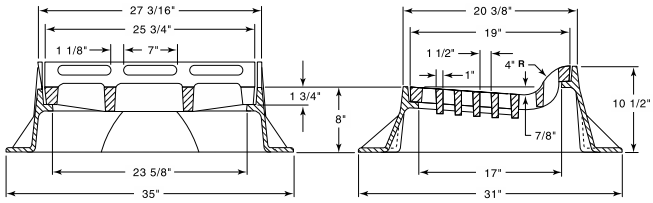
Options	
Calculation Option	Use Both

Results	
Spread	18.73 ft
Depth	0.47 ft
Gutter Depression	1.1 in
Total Depression	6.1 in
Open Grate Area	3.4 ft²
Active Grate Weir Length	6.50 ft

■ Note: When specifying/ordering grates, refer to "Choosing the Proper Inlet Grate" on pages 125-126.
For a complete listing of FREE OPEN AREAS and WEIR PERIMETERS of all NEENAH grates, refer to pages 327-332.

R-3501-P
Inlet for Roll Type Curb

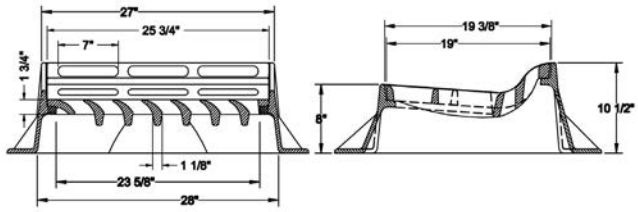
Heavy Duty



CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3501-P	C	1.5	4.3

R-3501-PR
Inlet for Roll Type Curb

Heavy Duty

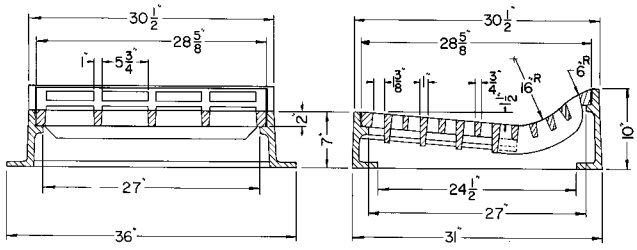


CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3501-PR	L	1.6	4.7
R-3501-PL	L	1.6	4.7

Illustrating **R-3501-PR** (flow right).
If flow left required, order **R-3501-PL**.

R-3501-R
Inlet for Roll Type Curb

Heavy Duty

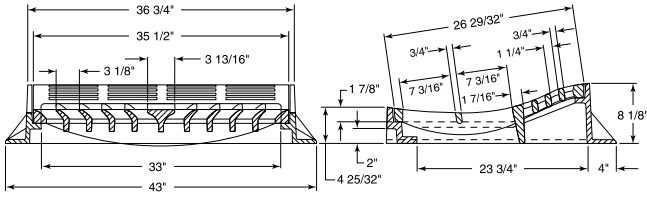


CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3501-R	C	2.6	5.5

Available with 4-flange frame, order **R-3501-RA.**

R-3501-TB
Inlet for Roll Type Curb

Heavy Duty



CATALOG NUMBER	GRATE TYPE	SQ. FT. OPEN	WEIR PERIMETER LINEAL FEET
R-3501-TB	L	3.1	5.7

Worksheet for 6" PVC Max Flow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.010	
Channel Slope	1.000	%
Diameter	6.0	in
Discharge	0.50	cfs

Results		
Normal Depth	0.30	ft
Flow Area	0.1	ft²
Wetted Perimeter	0.89	ft
Hydraulic Radius	0.14	ft
Top Width	0.49	ft
Critical Depth	0.36	ft
Percent Full	60.8	%
Critical Slope	0.621	%
Velocity	4.00	ft/s
Velocity Head	0.25	ft
Specific Energy	0.55	ft
Froude Number	1.394	
Maximum Discharge	0.78	cfs
Discharge Full	0.73	cfs
Slope Full	0.470	%
Flow Type	Supercritical	

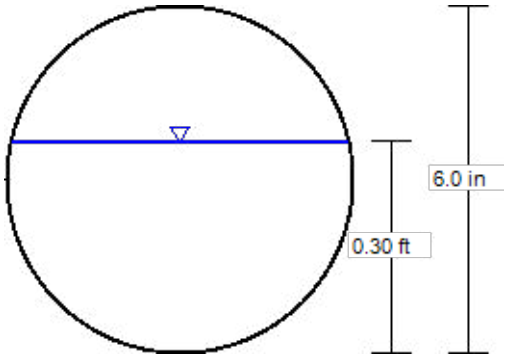
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

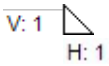
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	60.8	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.30	ft
Critical Depth	0.36	ft
Channel Slope	1.000	%
Critical Slope	0.621	%

Cross Section for 6" PVC Max Flow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	1.000 %
Normal Depth	0.30 ft
Diameter	6.0 in
Discharge	0.50 cfs





Worksheet for 8" PVC Max Flow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.010	
Channel Slope	1.000	%
Diameter	8.0	in
Discharge	1.50	cfs

Results		
Normal Depth	0.52	ft
Flow Area	0.3	ft²
Wetted Perimeter	1.45	ft
Hydraulic Radius	0.20	ft
Top Width	0.55	ft
Critical Depth	0.57	ft
Percent Full	78.2	%
Critical Slope	0.846	%
Velocity	5.12	ft/s
Velocity Head	0.41	ft
Specific Energy	0.93	ft
Froude Number	1.239	
Maximum Discharge	1.69	cfs
Discharge Full	1.57	cfs
Slope Full	0.912	%
Flow Type	Supercritical	

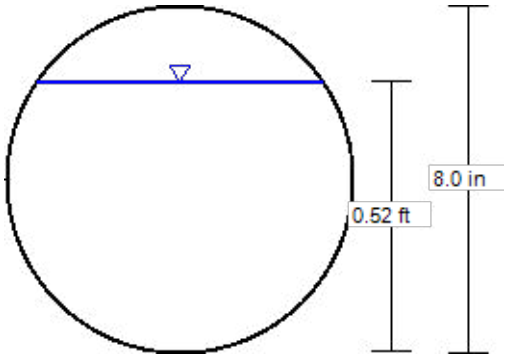
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

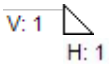
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	78.2	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.52	ft
Critical Depth	0.57	ft
Channel Slope	1.000	%
Critical Slope	0.846	%

Cross Section for 8" PVC Max Flow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.010
Channel Slope	1.000 %
Normal Depth	0.52 ft
Diameter	8.0 in
Discharge	1.50 cfs





WEIR CALCULATION

Emergency Overflow

GIVEN			CALCULATED		
Weir Length, L =	20	(ft)	**Flow[1], Q =**	**20.0**	(cfs)
Assumed Head, H1 =	0.48	(ft)	**Minimum FF[2]=**	**3239.58**	(ft)
Weir Coefficient, C=	3.0				
Weir Elev. =	3239.10	(ft)			
Freeboard =	0.00	(ft)			

[1] $Q = CL(H)^{3/2}$ (*HCDDM*)

[2] Minimum FF = Weir Elev. + H1 + Freeboard

Worksheet for Emergency Overflow

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.025
Channel Slope	1.000 %
Left Side Slope	6.500 H:V
Right Side Slope	6.500 H:V
Discharge	10.50 cfs

Results	
Normal Depth	0.73 ft
Flow Area	3.5 ft²
Wetted Perimeter	9.62 ft
Hydraulic Radius	0.36 ft
Top Width	9.51 ft
Critical Depth	0.70 ft
Critical Slope	1.316 %
Velocity	3.02 ft/s
Velocity Head	0.14 ft
Specific Energy	0.87 ft
Froude Number	0.879
Flow Type	Subcritical

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

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.73 ft
Critical Depth	0.70 ft
Channel Slope	1.000 %
Critical Slope	1.316 %

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design data 7

american concrete pipe association

CONCRETE PIPE SELECTION: Trench Installations

Trench conduits are usually installed in relatively narrow trenches excavated in undisturbed soil and backfilled to the original ground surface.

When a rigid conduit is installed in a narrow trench and backfilled, the backfill material will tend to settle. This downward movement generates frictional forces along the trench walls, which act upward to help support the weight of the backfill material. The magnitude of the frictional forces depends on the unit weight of the backfill material w, the value of Rankine's lateral pressure ratio K, and the coefficient of sliding friction μ' between the backfill material and the trench walls.

The backfill load on a conduit installed in a trench condition is equal to the weight of the mass of fill material within the trench less the summation of the frictional load transfers, and is expressed by the equation:

$$W_d = C_d \, w \, B_d^2$$

where

W_d=backfill load, pounds per linear foot
C_d=load coefficient for trench condition
w=unit weight of backfill material, pounds per cubic foot
B_d=width of trench at the top of the conduit, feet

Figures 2 through 5, based on the above equation, enable a direct determination of backfill load for a given trench width and depth of cover. As the trench width increases for a given depth of cover and pipe diameter, a point is reached at which an embankment condition develops. The curves showing pipe size indicate the limiting trench width for each pipe diameter beyond which greater trench widths will not affect the load. When this condition occurs, the load on the conduit remains constant. This load should be determined by the intersection of the vertical line representing the depth of cover and the dashed line representing the particular pipe diameter under consideration. For intermediate pipe sizes not shown in *Figures 2 through 5*, interpolation should be used.

The field supporting strength of a concrete pipe line is dependent on the inherent strength of the pipe, the type of foundation on which the pipe is installed and the compaction of the sidefill material adjacent to the pipe. A common method used to determine the inherent strength of a pipe is the three-edge bearing test, in which the pipe is subjected to concentrated loads at the crown and invert. The load that a pipe will support under this condition of loading is called the *three-edge bearing strength* and is expressed in pounds per linear foot.

ASTM Specification C14 covers three strength classes for non-reinforced concrete pipe — Class 1, 2 and 3. These three classes are specified to meet ultimate loads, expressed in terms of minimum strength in three-edge-bearing as listed in *Table I*.

TABLE I: Strength Requirements Non-reinforced Concrete Pipe ASTM C14

Pipe Diameter, Inches	Minimum Three-Edge Bearing Strengths, Pounds per Linear Foot		
	Class 1	Class 2	Class 3
4	1500	2000	2400
6	1500	2000	2400
8	1500	2000	2400
10	1600	2000	2400
12	1800	2250	2600
15	2000	2600	2900
18	2200	3000	3300
21	2400	3300	3850
24	2600	3600	4400
27	2800	3950	4600
30	3000	4300	4750
33	3150	4400	4875
36	3300	4500	5000

Another means of expressing pipe strength is in terms of D-load. The D-load of a pipe is the supporting strength of a pipe loaded under three-edge-bearing test conditions expressed in pounds per linear foot per foot of inside diameter. Thus the bearing strength may be converted to D-load by dividing by the inside diameter in feet.

ASTM Specification C76 specifies five strength classes reinforced concrete pipe. These strength classes are expressed in terms of D-load at 0.01-inch crack and for ultimate load. The D-load to produce the 0.01-inch crack $D_{0.01}$ is the maximum load applied to the concrete pipe before a crack occurs having a width of 0.01-inch measured at close intervals, throughout a length of at least 1-foot. The D-load to produce ultimate load D_u is the maximum three-edge-bearing test load carried by a pipe, expressed as D-load. *Table II* lists 0.01-inch crack and ultimate D-loads for the strength classes covered by ASTM Specification C76.

TABLE II: Strength Requirements Reinforced Concrete Pipe ASTM C76

Strength Class	Minimum D-Load in Three-Edge Bearing Pounds per Linear Foot per Foot of Internal Diameter	
	0.01 Inch Crack-$D_{0.01}$	Ultimate-D_u
I	800	1200
II	1000	1500
→ III	1350	2000
IV	2000	3000
V	3000	3750

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 18 IN. DIAMETER CIRCULAR PIPE

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P I P E D A T A

DIAMETER (in.)	18.00
WALL B, THICKNESS (in.)	2.500

I N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	5.90
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

R E S U L T S O F A N A L Y S I S

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SSSSSSSSS   AAAAAAAAA   MMM   MMM   MMM   MMM
SS          AA     AA   MM M M MM   MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM   MM  M  MM
       SS   AA     AA   MM     MM   MM     MM
SSSSSSSSS   AA     AA   MM     MM   MM     MM
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P R O G R A M S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT. (lb/ft/ft)
1.0	1.11	Y	297.	2603.	0.	2900.	1.90	1018.	1527.
1.5	1.17	Y	470.	1971.	0.	2440.	1.90	856.	1284.
2.0	1.23	Y	660.	1455.	0.	2115.	1.90	742.	1113.
2.5	1.30	Y	871.	1032.	0.	1903.	1.90	668.	1002.
3.0	1.37	Y	1104.	751.	0.	1855.	1.90	651.	976.
3.5	1.45	Y	1362.	616.	0.	1978.	1.90	694.	1041.
4.0	1.47	Y	1573.	516.	0.	2089.	1.90	733.	1100.
4.5	1.47	Y	1776.	439.	0.	2215.	1.90	777.	1166.
5.0	1.48	Y	1979.	378.	0.	2357.	1.90	827.	1241.
5.5	1.48	Y	2185.	329.	0.	2514.	1.90	882.	1323.
6.0	1.48	Y	2387.	290.	0.	2677.	1.90	939.	1409.
6.5	1.48	Y	2590.	257.	0.	2847.	1.90	999.	1498.
7.0	1.49	Y	2792.	229.	0.	3022.	1.90	1060.	1590.
7.5	1.49	Y	2995.	206.	0.	3201.	1.90	1123.	1685.
8.0	1.49	Y	3197.	186.	0.	3384.	1.90	1187.	1781.
8.5	1.49	Y	3400.	169.	0.	3569.	1.90	1252.	1879.
9.0	1.49	Y	3602.	155.	0.	3757.	1.90	1318.	1977.
9.5	1.49	Y	3805.	142.	0.	3947.	1.90	1385.	2077.
10.0	1.49	Y	4008.	130.	0.	4138.	1.90	1452.	2178.
10.5	1.49	Y	4210.	120.	0.	4330.	1.90	1519.	2279.
11.0	1.50	Y	4413.	111.	0.	4524.	1.90	1587.	2381.
11.5	1.50	Y	4616.	103.	0.	4719.	1.90	1656.	2484.
12.0	1.50	Y	4818.	96.	0.	4915.	1.90	1724.	2587.
12.5	1.49	Y	5014.	90.	0.	5103.	1.90	1791.	2686.
13.0	1.50	Y	5216.	84.	0.	5300.	1.90	1860.	2789.
13.5	1.50	Y	5418.	79.	0.	5497.	1.90	1929.	2893.

14.0	1.50	Y	5620.	74.	0.	5694.	1.90	1998.	2997.
14.5	1.50	Y	5823.	70.	0.	5892.	1.90	2067.	3066.
15.0	1.50	Y	6025.	66.	0.	6091.	1.90	2137.	3132.
15.5	1.50	Y	6227.	62.	0.	6289.	1.90	2207.	3196.
16.0	1.50	Y	6429.	59.	0.	6488.	1.90	2277.	3257.
16.5	1.50	Y	6632.	56.	0.	6687.	1.90	2346.	3316.
17.0	1.50	Y	6834.	53.	0.	6887.	1.90	2416.	3373.
17.5	1.50	Y	7036.	50.	0.	7087.	1.90	2487.	3427.
18.0	1.50	Y	7239.	48.	0.	7287.	1.90	2557.	3479.
18.5	1.50	Y	7441.	46.	0.	7487.	1.90	2627.	3529.
19.0	1.50	Y	7644.	43.	0.	7687.	1.90	2697.	3576.
19.5	1.50	Y	7846.	41.	0.	7887.	1.90	2768.	3620.
20.0	1.50	Y	8048.	40.	0.	8088.	1.90	2838.	3662.

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 24 IN. DIAMETER CIRCULAR PIPE

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P I P E D A T A

DIAMETER (in.)	24.00
WALL B, THICKNESS (in.)	3.000

I N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	6.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.0165
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

E S U L T S O F A N A L Y S I S

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SSSSSSSSS   AAAAAAAAA   MMM   MMM   MMM   MMM
SS          AA     AA   MM M M MM   MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM   MM  M  MM
      SS    AA     AA   MM     MM   MM     MM
SSSSSSSSS   AA     AA   MM     MM   MM     MM
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P R O G R A M S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT. (lb/ft/ft)
1.0	1.08	Y	378.	3008.	0.	3386.	1.90	891.	1337.
1.5	1.12	Y	591.	2400.	0.	2991.	1.90	787.	1181.
2.0	1.17	Y	820.	1781.	0.	2600.	1.90	684.	1026.
2.5	1.22	Y	1067.	1269.	0.	2336.	1.90	615.	922.
3.0	1.27	Y	1334.	927.	0.	2261.	1.90	595.	893.
3.5	1.33	Y	1623.	763.	0.	2386.	1.90	628.	942.
4.0	1.38	Y	1935.	641.	0.	2575.	1.90	678.	1017.
4.5	1.44	Y	2272.	546.	0.	2818.	1.90	742.	1112.
5.0	1.46	Y	2562.	472.	0.	3034.	1.90	798.	1197.
5.5	1.47	Y	2827.	412.	0.	3239.	1.90	852.	1278.
6.0	1.47	Y	3091.	363.	0.	3454.	1.90	909.	1363.
6.5	1.47	Y	3356.	322.	0.	3678.	1.90	968.	1452.
7.0	1.48	Y	3625.	288.	0.	3913.	1.90	1030.	1545.
7.5	1.48	Y	3889.	260.	0.	4149.	1.90	1092.	1638.
8.0	1.48	Y	4153.	235.	0.	4388.	1.90	1155.	1732.
8.5	1.48	Y	4417.	214.	0.	4631.	1.90	1219.	1828.
9.0	1.49	Y	4682.	195.	0.	4877.	1.90	1283.	1925.
9.5	1.49	Y	4946.	179.	0.	5125.	1.90	1349.	2023.
10.0	1.49	Y	5210.	165.	0.	5375.	1.90	1414.	2122.
10.5	1.49	Y	5474.	152.	0.	5627.	1.90	1481.	2221.
11.0	1.49	Y	5738.	141.	0.	5880.	1.90	1547.	2321.
1.5	1.49	Y	6003.	131.	0.	6134.	1.90	1614.	2421.
12.0	1.49	Y	6267.	122.	0.	6389.	1.90	1681.	2522.
12.5	1.49	Y	6531.	114.	0.	6645.	1.90	1749.	2623.
13.0	1.49	Y	6795.	107.	0.	6902.	1.90	1816.	2725.
13.5	1.49	Y	7060.	100.	0.	7160.	1.90	1884.	2826.

14.0	1.49	Y	7324.	94.	0.	7418.	1.90	1952.	2928.
14.5	1.50	Y	7588.	89.	0.	7677.	1.90	2020.	3020.
15.0	1.50	Y	7853.	84.	0.	7937.	1.90	2089.	3087.
15.5	1.50	Y	8117.	79.	0.	8196.	1.90	2157.	3151.
16.0	1.49	Y	8369.	75.	0.	8444.	1.90	2222.	3210.
16.5	1.49	Y	8633.	71.	0.	8704.	1.90	2291.	3269.
17.0	1.50	Y	8897.	68.	0.	8964.	1.90	2359.	3327.
17.5	1.50	Y	9160.	64.	0.	9225.	1.90	2428.	3382.
18.0	1.50	Y	9424.	61.	0.	9485.	1.90	2496.	3435.
18.5	1.50	Y	9688.	58.	0.	9746.	1.90	2565.	3485.
19.0	1.50	Y	9952.	56.	0.	10008.	1.90	2634.	3533.
19.5	1.50	Y	10216.	53.	0.	10269.	1.90	2702.	3579.
20.0	1.50	Y	10480.	51.	0.	10530.	1.90	2771.	3622.

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 42 IN. DIAMETER CIRCULAR PIPE

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? I P E D A T A

DIAMETER (in.)	42.00
WALL B, THICKNESS (in.)	4.500

I N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	0.50
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	8.83
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

R E S U L T S O F A N A L Y S I S

PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT.
0.5	1.02	Y	304.	2856.	0.	3160.	1.90	475.	713.
1.0	1.05	Y	623.	2550.	0.	3172.	1.90	477.	716.
1.5	1.07	Y	956.	2768.	0.	3724.	1.90	560.	840.
2.0	1.10	Y	1305.	2556.	0.	3860.	1.90	580.	871.
2.5	1.12	Y	1669.	1840.	0.	3509.	1.90	528.	792.
3.0	1.15	Y	2051.	1356.	0.	3407.	1.90	512.	768.
3.5	1.18	Y	2450.	1126.	0.	3576.	1.90	538.	807.
4.0	1.21	Y	2868.	952.	0.	3820.	1.90	574.	862.
4.5	1.23	Y	3305.	817.	0.	4122.	1.90	620.	930.
5.0	1.26	Y	3763.	710.	0.	4473.	1.90	673.	1009.
5.5	1.30	Y	4241.	623.	0.	4864.	1.90	731.	1097.
6.0	1.33	Y	4742.	552.	0.	5294.	1.90	796.	1194.
6.5	1.36	Y	5266.	493.	0.	5758.	1.90	866.	1299.
7.0	1.40	Y	5814.	442.	0.	6257.	1.90	941.	1411.
7.5	1.43	Y	6388.	400.	0.	6788.	1.90	1021.	1531.
8.0	1.46	Y	6946.	363.	0.	7309.	1.90	1099.	1649.
8.5	1.46	Y	7404.	331.	0.	7735.	1.90	1163.	1745.
9.0	1.47	Y	7854.	304.	0.	8158.	1.90	1227.	1840.
9.5	1.47	Y	8304.	280.	0.	8583.	1.90	1291.	1936.
10.0	1.47	Y	8754.	258.	0.	9012.	1.90	1355.	2033.
10.5	1.47	Y	9203.	239.	0.	9442.	1.90	1420.	2130.
11.0	1.47	Y	9653.	222.	0.	9875.	1.90	1485.	2227.
11.5	1.48	Y	10116.	207.	0.	10323.	1.90	1552.	2328.
12.0	1.48	Y	10565.	193.	0.	10758.	1.90	1618.	2427.
12.5	1.48	Y	11015.	181.	0.	11195.	1.90	1684.	2525.
13.0	1.48	Y	11464.	170.	0.	11633.	1.90	1749.	2624.
13.5	1.48	Y	11913.	159.	0.	12072.	1.90	1815.	2723.
14.0	1.48	Y	12362.	150.	0.	12512.	1.90	1882.	2822.
14.5	1.48	Y	12811.	142.	0.	12953.	1.90	1948.	2922.
15.0	1.49	Y	13260.	134.	0.	13394.	1.90	2014.	3014.
15.5	1.49	Y	13710.	127.	0.	13836.	1.90	2081.	3079.
16.0	1.49	Y	14159.	120.	0.	14279.	1.90	2147.	3142.
16.5	1.49	Y	14608.	114.	0.	14722.	1.90	2214.	3202.
17.0	1.49	Y	15057.	108.	0.	15165.	1.90	2281.	3261.
17.5	1.49	Y	15506.	103.	0.	15609.	1.90	2347.	3317.
18.0	1.49	Y	15955.	98.	0.	16054.	1.90	2414.	3371.
18.5	1.49	Y	16404.	94.	0.	16498.	1.90	2481.	3423.
19.0	1.49	N	16817.	90.	0.	16906.	1.90	2542.	3469.
19.5	1.48	N	17118.	86.	0.	17203.	1.90	2587.	3501.
20.0	1.46	N	17413.	82.	0.	17495.	1.90	2631.	3531.

BUILDING #	FF	High	Low	Criteria	Freeboard	Remarks
Sheet						
61N	51.30	50.70	49.26	0.88	0.10	
61S	49.80	49.05	47.94	0.88	0.25	
60N	48.40	47.44	46.32	0.88	0.46	
60S	46.90	46.17	45.01	0.88	0.23	
59N	45.50	44.52	43.41	0.88	0.48	
59S	44.00	43.20	42.09	0.88	0.30	
58N	43.00	41.77	41.31	0.88	0.73	
58S	42.00	41.25	40.94	0.88	0.25	
57N	41.30	40.53	40.24	0.88	0.27	
57S	41.30	40.19	39.90	0.88	0.61	
56N	40.80	39.76	39.47	0.88	0.54	
56S	40.80	39.42	39.04	0.88	0.88	
55S	41.50	40.26	39.95	0.88	0.74	
55S	41.50	39.82	39.62	0.88	1.18	
55N	41.50	40.60	40.31	0.88	0.40	
54S	42.50	41.03	40.73	0.88	0.97	
54N	42.50	41.38	41.08	0.88	0.62	
53S	43.00	42.08	41.78	0.88	0.42	
53N	44.00	42.80	42.14	0.88	0.70	
52S	45.00	44.34	43.24	0.88	0.16	
52N	46.50	45.66	44.55	0.88	0.34	
51	48.00	47.27	46.16	0.88	0.23	
50S	49.50	48.82	47.71	0.88	0.18	
50N	51.00	50.14	49.03	0.88	0.36	
50N	51.00	51.51	50.51	0.88	-1.01	Extend SG knee wall along Drive "G" to "TC" 51.51'
49N	57.00	55.77	56.35	0.88	0.73	
49N	57.00	55.60	54.80	0.88	0.90	
49S	57.00	56.30	55.62	0.88	0.20	
48	56.00	55.33	54.54	0.88	0.17	
47N	55.00	54.29	53.41	0.88	0.21	
47S	54.00	53.28	52.40	0.88	0.22	
46N	53.00	52.15	51.63	0.88	0.35	
46S	52.00	51.22	50.43	0.88	0.28	
45N	49.80	49.04	48.23	0.88	0.26	
45S	48.90	48.08	47.29	0.88	0.32	
44N	47.70	47.03	46.14	0.88	0.17	
44S	46.70	45.99	45.18	0.88	0.21	
43	47.60	46.74	45.87	0.88	0.36	
42	48.90	47.98	47.05	0.88	0.42	
41	49.90	49.06	48.21	0.88	0.34	
40	51.50	50.37	49.42	0.88	0.63	
39	52.70	51.53	50.68	0.88	0.67	
38	53.80	52.76	51.84	0.88	0.54	
37	54.80	53.89	52.91	0.88	0.41	
37	54.80	54.87	53.89	0.88	-0.57	Extend SG knee wall along to "TC" 54.30'
36S	56.80	55.76	54.83	0.88	0.54	
36N	57.80	56.77	55.91	0.88	0.53	
35S	58.00	57.00	56.88	0.88	0.50	
35N	57.50	56.74	55.52	0.88	0.26	
34N	67.50	66.14	65.61	0.88	0.86	

BUILDING #	FF	High	Low	Criteria	Freeboard	Remarks
34S	66.50	65.54	65.19	0.88	0.46	
33N	65.80	65.04	64.69	0.88	0.26	
33S	65.80	64.62	64.27	0.88	0.68	
32	64.40	63.79	63.01	0.88	0.11	
31	63.30	62.59	61.40	0.88	0.21	
30	61.70	60.97	59.79	0.88	0.23	
29	60.10	59.35	58.14	0.88	0.25	
28	58.10	57.51	56.72	0.88	0.09	
27	57.10	56.47	55.76	0.88	0.13	
26	56.10	55.50	54.79	0.88	0.10	
25S	57.50	55.96	55.40	0.88	1.04	
25N	57.50	56.74	56.08	0.88	0.26	
24	58.80	57.73	57.02	0.88	0.57	
23	59.80	58.80	58.05	0.88	0.50	
22	61.10	60.27	58.98	0.88	0.33	
21	62.70	61.87	60.68	0.88	0.33	
20	64.30	63.48	62.29	0.88	0.32	
19	65.80	64.50	63.85	0.88	0.80	
18	66.50	65.39	65.04	0.88	0.61	
17	66.70	65.92	65.62	0.88	0.28	
16	67.20	66.47	66.05	0.88	0.23	
16	67.20	66.66	66.66	0.88	0.04	
15	75.50	74.74	73.72	0.88	0.26	
14	72.70	71.85	70.73	0.88	0.35	
13	71.30	70.34	69.22	0.88	0.46	
12	69.60	68.83	67.71	0.88	0.27	
11	68.10	67.27	66.73	0.88	0.33	
10N	65.70	64.82	63.70	0.88	0.38	
10S	64.20	63.70	62.36	0.88	0.00	
9	64.50	63.32	61.63	0.88	0.68	
8	67.00	64.94	63.74	0.88	1.56	
8	67.00	66.90	66.90	0.88	-0.40	Extend SG knee wall to "TC" 66.50'
7	70.10	68.44	67.73	0.88	1.16	
6	70.60	69.95	68.83	0.88	0.15	
5	72.10	71.46	70.34	0.88	0.14	
4	73.90	73.09	71.85	0.88	0.31	
4	73.90	73.90	73.90	0.88	-0.50	Extend knee wall along Drive "F" south to "TC"
3	75.60	73.58	74.87	0.88	1.52	
3	75.60	75.32	75.32	0.88	-0.22	Extend SG knee wall to "TC" 75.10' along south
2	74.10	73.39	72.20	0.88	0.21	
1	72.60	71.86	70.23	0.88	0.24	

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
Sheet								
1	50.80	50.69	50.13	0.76	0.19	0.11	I6E	Prorated Flow
2	50.30	50.13	49.56	0.76	0.21	0.13	I6E	Prorated Flow
3	49.88	49.56	49.26	0.76	0.23	0.23	I6E	Prorated Flow
4	49.30	49.05	48.73	0.76	0.26	0.12	I6E	Prorated Flow
5	48.97	48.73	48.30	0.76	0.28	0.06	I6E	Prorated Flow
6	48.63	48.30	47.94	0.76	0.30	0.10	I6E	Prorated Flow
7	47.73	47.44	47.07	0.76	0.03	0.62	I7AE	Prorated Flow
8	47.23	47.07	46.68	0.76	0.05	0.44	I7AE	Prorated Flow
9	46.98	46.68	46.33	0.76	0.08	0.53	I7AE	Prorated Flow
10	46.23	46.12	45.77	0.76	0.10	0.28	I7AE	Prorated Flow
11	45.73	45.77	45.37	0.76	0.13	0.08	I7AE	Prorated Flow
12	45.48	45.37	45.01	0.76	0.15	0.18	I7AE	Prorated Flow
13	44.83	44.52	44.15	0.76	0.18	0.33	I7AE	Prorated Flow
14	44.50	44.15	43.72	0.76	0.21	0.32	I7AE	Prorated Flow
15	44.08	43.72	43.41	0.76	0.23	0.28	I7AE	Prorated Flow
16	43.50	43.20	42.84	0.76	0.26	0.16	I7AE	Prorated Flow
17	43.17	42.84	42.45	0.76	0.28	0.14	I7AE	Prorated Flow
18	42.83	42.45	42.13	0.76	0.31	0.14	I7AE	Prorated Flow
19	42.00	41.77	41.57	0.76	0.03	0.54	I8E	Prorated Flow
20	42.00	41.57	41.41	0.76	0.07	0.67	I8E	Prorated Flow
21	42.00	41.41	41.31	0.76	0.10	0.76	I8E	Prorated Flow
22	41.50	41.25	41.16	0.76	0.14	0.35	I8E	Prorated Flow
23	41.50	41.16	41.06	0.76	0.17	0.38	I8E	Prorated Flow
24	41.50	41.06	40.94	1.50	0.21	0.41	I8E	Prorated Flow
25	40.80	40.53	40.44	0.76	0.05	0.56	I9AE	Prorated Flow
26	40.80	40.44	40.34	0.76	0.09	0.55	I9AE	Prorated Flow
27	40.63	40.34	40.24	0.76	0.14	0.39	I9AE	Prorated Flow
28	40.63	40.19	40.09	0.76	0.19	0.45	I9AE	Prorated Flow
29	40.30	40.09	39.98	0.76	0.23	0.12	I9AE	Prorated Flow
30	40.30	39.98	39.90	0.76	0.28	0.14	I9AE	Prorated Flow
31	40.13	39.76	39.67	0.76	0.04	0.68	I0E	Prorated Flow
32	40.13	39.67	39.57	0.76	0.07	0.69	I0E	Prorated Flow
33	39.80	39.57	39.48	0.76	0.11	0.39	I0E	Prorated Flow
34	39.80	39.42	39.32	0.76	0.15	0.47	I0E	Prorated Flow
35	39.63	39.32	39.18	0.76	0.18	0.32	I0E	Prorated Flow
36	39.63	39.18	39.04	0.76	0.22	0.39	I0E	Prorated Flow
37	40.50	40.06	39.95	0.76	0.20	0.42	I10W	
38	40.50	40.17	40.06	0.76	0.20	0.31	I10W	
39	40.83	40.26	40.17	0.76	0.20	0.55	I10W	
40	40.83	40.41	40.31	0.76	0.20	0.40	I10W	
41	41.00	40.51	40.41	0.76	0.20	0.47	I10W	
42	41.00	40.60	40.51	0.76	0.20	0.38	I10W	
43	41.33	40.83	40.73	0.76	0.20	0.48	I9AW	
44	41.33	40.93	40.83	0.76	0.20	0.38	I9AW	
45	41.50	41.03	40.93	0.76	0.20	0.45	I9AW	
46	41.50	41.17	41.08	0.76	0.20	0.31	I9AW	
47	41.83	41.26	41.17	0.76	0.20	0.55	I9AW	
48	41.83	41.36	41.26	0.76	0.20	0.45	I9AW	
49	42.33	41.87	41.78	0.76	0.20	0.44	I8W	
50	42.33	41.98	41.87	0.76	0.20	0.33	I8W	

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
51	42.33	42.04	41.98	0.76	0.20	0.27	I8W	
52	42.58	42.30	42.14	0.76	0.20	0.26	I8W	
53	42.83	42.53	42.30	0.76	0.20	0.28	I8W	
54	43.00	42.80	42.53	0.76	0.20	0.18	I8W	
55	43.83	43.59	43.24	0.76	0.20	0.22	I7AW	
56	44.17	43.99	43.59	0.76	0.20	0.16	I7AW	
57	44.50	44.34	43.99	0.76	0.20	0.14	I7AW	
58	45.08	44.91	44.55	0.76	0.20	0.15	I7AW	
59	45.33	45.30	44.91	0.76	0.20	0.01	I7AW	
60	45.83	45.66	45.30	0.76	0.20	0.15	I7AW	
61	46.58	46.50	46.16	0.76	0.20	0.06	I7AW	
62	47.00	46.90	46.50	0.76	0.20	0.08	I7AW	
63	47.50	47.27	46.90	0.76	0.20	0.21	I7AW	
64	48.33	48.07	47.71	0.76	0.20	0.24	I7AW	
65	48.50	48.47	48.07	0.76	0.20	0.01	I7AW	
66	49.00	48.82	48.47	0.76	0.20	0.16	I7AW	
67	49.58	49.42	49.03	0.76	0.20	0.14	I6W	
68	50.00	49.78	49.42	0.76	0.20	0.20	I6W	
69	50.50	50.14	49.78	0.76	0.20	0.34	I6W	
70	56.33	56.16	55.90	0.76	0.00	0.55	I6E	Prorated Flow
71	56.50	56.32	56.16	0.76	0.02	0.53	I6E	Prorated Flow
72	56.50	56.35	56.32	0.76	0.03	0.47	I6E	Prorated Flow
73	56.50	56.30	56.15	0.76	0.03	0.52	I4AE	Prorated Flow
74	56.33	56.15	55.88	0.76	0.06	0.44	I4AE	Prorated Flow
75	56.17	55.88	55.63	0.76	0.09	0.49	I4AE	Prorated Flow
76	55.50	55.33	55.06	0.76	0.12	0.31	I4AE	Prorated Flow
77	55.33	55.06	54.78	0.76	0.15	0.34	I4AE	Prorated Flow
78	55.00	54.78	54.54	0.76	0.18	0.23	I4AE	Prorated Flow
79	54.43	54.19	53.94	0.76	0.21	0.19	I4AE	Prorated Flow
80	54.27	53.94	53.66	0.76	0.25	0.22	I4AE	Prorated Flow
81	53.93	53.66	53.41	0.76	0.28	0.10	I4AE	Prorated Flow
82	53.60	53.26	53.02	0.76	0.31	0.11	I4AE	Prorated Flow
83	53.43	53.02	52.74	0.76	0.34	0.11	I4AE	Prorated Flow
84	53.10	52.74	52.49	0.76	0.37	0.00	I4AE	Prorated Flow
85	52.50	52.15	51.90	0.76	0.03	0.68	I5AE	Prorated Flow
86	52.00	51.90	51.63	0.76	0.05	0.38	I5AE	Prorated Flow
87	51.83	51.63	51.37	0.76	0.08	0.43	I5AE	Prorated Flow
88	51.50	51.22	50.97	0.76	0.10	0.46	I5AE	Prorated Flow
89	51.33	50.97	50.69	0.76	0.13	0.49	I5AE	Prorated Flow
90	50.83	50.69	50.43	0.76	0.15	0.22	I5AE	Prorated Flow
91	49.30	49.04	48.77	0.76	0.25	0.13	I5AE	Prorated Flow
92	49.13	48.77	48.48	0.76	0.28	0.18	I5AE	Prorated Flow
93	48.80	48.48	48.23	0.76	0.30	0.09	I5AE	Prorated Flow
94	48.40	48.08	47.83	0.76	0.33	0.04	I5AE	Prorated Flow
95	48.23	47.83	47.56	0.76	0.35	0.07	I5AE	Prorated Flow
96	48.07	47.56	47.29	0.76	0.38	0.13	I5AE	Prorated Flow
97	47.20	46.93	46.68	0.76	0.05	0.54	I16BE	Prorated Flow
98	47.03	46.68	46.39	0.76	0.11	0.52	I16BE	Prorated Flow
99	46.70	46.39	46.14	0.76	0.16	0.37	I16BE	Prorated Flow

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
100	46.20	45.99	45.74	0.76	0.21	0.17	I16BE	Prorated Flow
101	46.03	45.74	45.45	0.76	0.27	0.14	I16BE	Prorated Flow
102	45.70	45.45	45.18	0.76	0.31	0.01	I16BE	Prorated Flow
103	46.43	46.16	45.87	0.76	0.18	0.29	I16BW	
104	46.60	46.47	46.16	0.76	0.18	0.15	I16BW	
105	46.93	46.74	46.47	0.76	0.18	0.21	I16BW	
106	47.73	47.33	47.05	0.76	0.18	0.42	I16BW	
107	47.90	47.63	47.33	0.76	0.18	0.29	I16BW	
108	48.23	47.90	47.63	0.76	0.18	0.35	I16BW	
109	48.73	48.48	48.21	0.76	0.20	0.23	I5AW	
110	48.90	48.80	48.48	0.76	0.20	0.08	I5AW	
111	49.23	49.06	48.80	0.76	0.20	0.15	I5AW	
112	50.08	49.83	49.61	0.76	0.20	0.23	I5AW	
113	50.33	50.10	49.83	0.76	0.20	0.21	I5AW	
114	50.96	50.37	50.10	0.76	0.20	0.57	I5AW	
115	51.28	50.96	50.68	0.76	0.20	0.30	I5AW	
116	51.53	51.26	50.96	0.76	0.20	0.25	I5AW	
117	51.70	51.53	51.26	0.76	0.20	0.15	I5AW	
118	52.38	52.11	51.84	0.76	0.20	0.25	I5AW	
119	52.63	52.42	52.11	0.76	0.20	0.19	I5AW	
120	53.13	52.68	52.42	0.76	0.20	0.43	I5AW	
121	53.63	53.25	52.99	0.76	0.20	0.36	I4AW	
122	53.80	53.56	53.25	0.76	0.20	0.22	I4AW	
123	54.13	53.82	53.56	0.76	0.20	0.29	I4AW	
124	55.38	55.16	54.98	0.76	0.20	0.20	I4AW	
125	55.80	55.44	55.16	0.76	0.20	0.34	I4AW	
126	56.13	55.68	55.44	0.76	0.20	0.43	I4AW	
127	56.38	56.08	55.83	0.76	0.20	0.28	I4AW	
128	56.63	56.31	56.08	0.76	0.20	0.30	I4AW	
129	56.80	56.61	56.31	0.76	0.20	0.17	I4AW	
130	57.33	57.03	56.92	0.76	0.20	0.28	I4AW	
131	57.50	57.01	57.04	0.76	0.18	0.51	I6W	
132	57.33	57.01	56.88	0.76	0.18	0.34	I6W	
133	57.00	56.74	56.47	0.76	0.18	0.28	I6W	
134	56.83	56.43	56.03	0.76	0.18	0.42	I6W	
135	56.50	56.03	55.67	0.76	0.18	0.49	I6W	
136	67.00	66.14	65.90	0.76	0.16	0.92	I2AE	Prorated Flow
137	66.33	65.90	65.72	0.76	0.19	0.43	I2AE	Prorated Flow
138	66.08	65.72	65.61	0.76	0.22	0.30	I2AE	Prorated Flow
139	65.83	65.54	65.43	0.76	0.25	0.17	I2AE	Prorated Flow
140	65.83	65.43	65.31	0.76	0.28	0.22	I2AE	Prorated Flow
141	65.67	65.31	65.19	0.76	0.31	0.12	I2AE	Prorated Flow
142	65.30	65.04	64.92	0.76	0.03	0.58	I2E	Prorated Flow
143	65.30	64.92	64.80	0.76	0.06	0.64	I2E	Prorated Flow
144	65.13	64.80	64.69	0.76	0.09	0.53	I2E	Prorated Flow
145	64.80	64.62	64.51	0.76	0.12	0.32	I2E	Prorated Flow
146	64.63	64.51	64.38	0.76	0.15	0.20	I2E	Prorated Flow
147	64.63	64.38	64.27	0.76	0.18	0.27	I2E	Prorated Flow
148	63.90	63.79	63.59	0.76	0.04	0.42	I15AE	Prorated Flow
149	63.73	63.59	63.31	0.76	0.07	0.37	I15AE	Prorated Flow
150	63.40	63.31	63.01	0.76	0.11	0.25	I15AE	Prorated Flow
151	62.80	62.59	62.21	0.76	0.15	0.30	I15AE	Prorated Flow
152	62.30	62.21	61.78	0.76	0.18	0.10	I15AE	Prorated Flow
153	61.88	61.78	61.40	0.76	0.22	0.04	I15AE	Prorated Flow

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
154	61.23	60.97	60.60	0.76	0.26	0.13	I15AE	Prorated Flow
155	60.90	60.60	60.19	0.76	0.29	0.09	I15AE	Prorated Flow
156	60.48	60.19	59.79	0.76	0.33	0.01	I15AE	Prorated Flow
157	59.60	59.35	58.98	0.76	0.06	0.50	I15BE	Prorated Flow
158	59.10	58.98	58.54	0.76	0.13	0.25	I15BE	Prorated Flow
159	58.68	58.54	58.14	0.76	0.19	0.14	I15BE	Prorated Flow
160	57.60	57.43	57.21	0.76	0.04	0.47	I16AE	Prorated Flow
161	57.10	57.21	56.94	0.76	0.08	0.10	I16AE	Prorated Flow
162	57.43	56.94	56.72	0.76	0.13	0.62	I16AE	Prorated Flow
163	56.60	56.47	56.24	0.76	0.17	0.17	I16AE	Prorated Flow
164	56.43	56.24	55.98	0.76	0.21	0.15	I16AE	Prorated Flow
165	56.10	55.98	55.76	0.76	0.25	0.00	I16AE	Prorated Flow
166	55.80	55.50	55.28	0.76	0.29	0.09	I16AE	Prorated Flow
167	55.63	55.28	55.02	0.76	0.34	0.06	I16AE	Prorated Flow
168	55.47	55.02	54.79	0.76	0.38	0.07	I16AE	Prorated Flow
169	56.08	55.48	55.40	0.76	0.19	0.60	I16AW	
170	56.08	55.75	55.48	0.76	0.19	0.33	I16AW	
171	56.33	55.96	55.75	0.76	0.19	0.37	I16AW	
172	56.50	56.29	56.08	0.76	0.19	0.21	I16AW	
173	56.83	56.61	56.29	0.76	0.19	0.22	I16AW	
174	57.00	56.74	56.61	0.76	0.19	0.26	I16AW	
175	57.63	57.24	57.02	0.76	0.19	0.39	I16AW	
176	57.80	57.50	57.24	0.76	0.19	0.30	I16AW	
177	58.13	57.73	57.50	0.76	0.19	0.40	I16AW	
178	58.63	58.27	58.05	0.76	0.19	0.36	I15BW	
179	58.80	58.53	58.27	0.76	0.19	0.27	I15BW	
180	59.13	58.80	58.53	0.76	0.19	0.33	I15BW	
181	59.68	59.45	48.98	0.76	0.19	0.23	I15BW	
182	60.10	59.89	59.45	0.76	0.19	0.21	I15BW	
183	60.43	60.27	59.89	0.76	0.19	0.16	I15BW	
184	61.28	61.06	60.68	0.76	0.20	0.20	I15AW	
185	61.70	61.50	61.06	0.76	0.20	0.18	I15AW	
186	62.03	61.87	61.50	0.76	0.20	0.14	I15AW	
187	62.88	62.65	62.29	0.76	0.20	0.21	I15AW	
188	63.30	63.10	62.65	0.76	0.20	0.18	I15AW	
189	63.63	63.48	63.10	0.76	0.20	0.13	I15AW	
190	64.38	64.12	63.85	0.76	0.20	0.24	I15AW	
191	64.63	64.35	64.12	0.76	0.20	0.26	I15AW	
192	64.80	64.50	64.35	0.76	0.20	0.28	I15AW	
193	65.50	65.16	65.04	0.76	0.20	0.32	I2AW	
194	65.50	65.28	65.16	0.76	0.20	0.20	I2AW	
195	66.00	65.39	65.28	0.76	0.20	0.59	I2AW	
196	66.03	65.66	65.62	0.76	0.20	0.35	I2AE	
197	66.20	65.80	65.66	0.76	0.20	0.38	I2AE	
198	66.20	65.92	65.80	0.76	0.20	0.26	I2AE	
199	66.53	66.17	66.05	0.76	0.20	0.34	I2AE	
200	66.70	66.31	66.17	0.76	0.20	0.37	I2AE	
201	66.70	66.47	66.31	0.76	0.20	0.21	I2AE	
202	74.08	74.07	73.72	0.76	0.02	0.36	I1E	Prorated Flow
203	74.50	74.47	74.07	0.76	0.03	0.35	I1E	Prorated Flow
204	75.00	74.74	74.47	0.76	0.05	0.54	I1E	Prorated Flow
205	72.03	71.85	71.50	0.76	0.22	0.12	I11AE	Prorated Flow
206	71.70	71.50	71.09	0.76	0.25	0.09	I11AE	Prorated Flow
207	71.28	71.09	70.73	0.76	0.27	0.03	I11AE	Prorated Flow

GARAGE #	FF	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
208	70.63	70.34	69.98	0.76	0.29	0.08	I11AE	Prorated Flow
209	70.30	69.98	69.54	0.76	0.32	0.07	I11AE	Prorated Flow
210	69.88	69.54	69.22	0.76	0.34	0.04	I11AE	Prorated Flow
211	69.10	68.83	68.48	0.76	0.07	0.50	I11BE	Prorated Flow
212	68.60	68.48	68.07	0.76	0.15	0.21	I11BE	Prorated Flow
213	68.18	68.07	67.71	0.76	0.22	0.05	I11BE	Prorated Flow
214	67.60	67.45	67.13	0.76	0.04	0.46	I12E	Prorated Flow
215	67.43	67.13	66.91	0.76	0.07	0.54	I12E	Prorated Flow
216	67.10	66.91	66.73	0.76	0.11	0.36	I12E	Prorated Flow
217	65.03	64.82	64.46	0.76	0.02	0.54	I13E	Prorated Flow
218	64.70	64.46	64.05	0.76	0.05	0.52	I13E	Prorated Flow
219	64.28	64.05	63.70	0.76	0.07	0.47	I13E	Prorated Flow
220	63.70	63.38	63.12	0.76	0.10	0.51	I13E	Prorated Flow
221	63.20	63.12	62.73	0.76	0.12	0.22	I13E	Prorated Flow
222	63.03	62.73	62.36	0.76	0.14	0.39	I13E	Prorated Flow
223	64.00	62.30	61.63	0.76	0.18	1.72	I13W	
224	64.00	62.89	62.30	0.76	0.18	1.13	I13W	
225	64.00	63.32	62.89	0.76	0.18	0.70	I13W	
226	65.58	64.07	63.74	0.76	0.18	1.53	I13W	
227	66.00	64.57	64.07	0.76	0.18	1.45	I13W	
228	66.50	64.94	64.57	0.76	0.18	1.58	I13W	
229	68.68	67.96	67.73	0.76	0.18	0.74	I12W	
230	68.68	68.14	67.96	0.76	0.18	0.56	I12W	
231	68.68	68.44	68.14	0.76	0.18	0.26	I12W	
232	69.43	69.19	68.83	0.76	0.18	0.26	I11BW	
233	69.60	69.59	69.19	0.76	0.18	0.03	I11BW	
234	70.10	69.95	69.59	0.76	0.20	0.13	I11AW	
235	70.93	70.69	70.34	0.76	0.20	0.22	I11AW	
236	71.27	71.11	70.69	0.76	0.20	0.14	I11AW	
237	71.60	71.46	71.11	0.76	0.20	0.12	I11AW	
238	72.48	72.21	71.85	0.76	0.20	0.25	I11AW	
239	72.73	72.57	72.21	0.76	0.20	0.14	I11AW	
240	73.23	73.09	72.57	0.76	0.20	0.12	I11AW	
241	75.10	74.87	74.49	0.76	0.20	0.21	I1	
242	74.60	74.49	74.06	0.76	0.20	0.09	I1	
243	74.18	74.06	73.76	0.76	0.20	0.10	I1	
244	73.60	73.39	73.01	0.76	0.20	0.19	I1	
245	73.10	73.01	72.57	0.76	0.20	0.07	I1	
246	72.68	72.57	72.20	0.76	0.20	0.09	I1	
247	72.10	71.86	71.41	0.76	0.20	0.22	I1	
248	71.43	71.41	70.88	0.76	0.20	0.00	I1	
249	71.43	70.88	70.42	0.76	0.20	0.53	I1	

Addendum #1 to Update #1 to the FLOOD CONTROL MASTER PLAN UPDATE

SUMMERLIN WEST PLANNING AREA

Las Vegas, Nevada

W.O. # 7809

Prepared for:
Howard Hughes Corp.

Submitted to:
Public Works Department
City of Las Vegas

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: April 17, 2019
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Planning Area Master Plan Update**			**COPIES TO:** VTN Nevada
Cross Streets:	West of I-215 between Lake Mead Boulevard and Charleston Boulevard			The Howard Hughes Corporation
File Number:	F:\Depot\DSMemos\DS4926H.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017			CCRFCD
Zoning Action:				CCPW
FEMA Flood Zone	YES **X**	NO		
Proposed Storm Drain	YES **X**	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	10/9/2017 & 10/25/2017	11/8/2017	Not Approved	$400.00	490518: $400
2nd Submittal	12/6/2017	12/20/2017 & 1/10/2018	Not Approved	$400.00	492005: $400
3rd Submittal	2/27/2018	3/24/2018	Not Approved	$400.00	493739: $400
4th Submittal & Supplement	4/23/2018 & 5/22/2018	5/22/2018	See Comments Below	$400.00	495223: $400
CCPW & CCRFCD	7/30/2018	7/30/2018	Concurrence Recv'd	N/C	N/C
5th Submittal	1/3/2019 (Paid on 1/7/2019)	1/30/2019	Not Approved	$100.00	502286: $100
6th Submittal	2/19/2019	3/13/2019	Conditional Approval	$400.00	503267: $400
CCPW & CCRFCD	4/15/2019	4/17/2019	Concurrence Recv'd	N/C	N/C
			TOTAL FEES (LDDRS):	**$2,100.00**	----

REMARKS:

5th & 6th Submittals: Update #1 & Addendum #1 to address Land Use Changes in the Summerlin West Planning Area

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

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

1. The proposed revision of the overall *Summerlin West Planning Area* (SWPA) will have impact to the various existing downstream regional facilities. All impacted downstream facilities must be modified and substantially completed prior to the onsite development of upstream Villages.

   With the exception of ***Summerlin West Villages 21 and 22***, no occupancy permits will be issued to the remaining villages prior to the pertinent downstream facility modifications being completed.

2. The *Study* states that ***Detention Basin 5*** (**DB5**) needs additional capacity to accommodate the increased flows from the proposed SWPA revision. An update to the **DB5** technical drainage study must be submitted and approved prior to any upstream Villages development with the exception of Villages 21 and 22.

3. The *Study* states that a portion of the existing *Beltway Channel* between *Far Hills Avenue* and *Summerlin Parkway* requires modification with heightened stem walls. An update to the Western Beltway Channel modification must be submitted and approved prior to any upstream Villages development with the exception of Villages 21 and 22.

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

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

END OF REMARKS
WSP/AYS

T/R/S: T21S/R69E/22
AREA K-22

REGIONAL FLOOD CONTROL DISTRICT

Rec'd: 4/15/19

Steven C. Parrish, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

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Isaac Barron
City of North Las Vegas

Mayor Pro Tem
Dr. Lois Tarkanian
City of Las Vegas

layor Rodney Woodbury
City of Boulder City

April 4, 2019

Mr. Oh Sang Kwon, P.E.
City of Las Vegas Department of Public Works
333 North Rancho Drive
Las Vegas, NV 89106

DISTRICT CONCURRENCE: **SUMMERLIN WEST PLANNING AREA MASTER PLAN UPDATE (DS4926G) (RFCD No. 19-11232)**

Dear Mr. Kwon:

Clark County Regional Flood Control District (District) reviewed Technical Drainage Study dated January 3, 2019, and Addendum No. 1 dated February 19, 2019 for above-mentioned project as submitted by VTN NEVADA. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas Department of Public Works dated March 13, 2019.

District concurs with acceptance of this Technical Drainage Study by City of Las Vegas Department of Public Works.

District's review of this project was limited to issues of Regional Flood Control Significance as defined in *Uniform Regulations for the Control of Drainage*.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, information submitted by VTN NEVADA may be superseded. Compliance with regulatory elements and design standards specified in *Uniform Regulations for the Control of Drainage* does not imply a guarantee that properties will be free from flooding or flood damage. The District, its officials, or employees assume no liability for information, data, or conclusions presented by consulting engineers. We, therefore, make no warranties, either expressed or implied, in conducting this review.

STEVEN C. PARRISH, P.E.
General Manager/Chief Engineer

BY: _____
Ching C. Wang, P.E.
Senior Civil Engineer

CCW:dd

c: Brian Troy Ruiz, P.E., VTN Nevada
P:\Letters and Memos\Local Drainage\Land Development & Drainage\2019\L-19-11232.doc

600 S. Grand Central Parkway, Suite 300 • Las Vegas, Nevada 89106-4511
(702) 685-0000 • FAX: (702) 685-0001
Website: http://www.regionalflood.org

Department of Public Works

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

Rec'd: 4/15/19

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

Drainage Study Concurrence Letter

Date: April 10, 2019
Firm: VTN Nevada
Engineer: Joanna Ayson / Brian Ruiz
Address: 2727 South Rainbow Boulevard, Las Vegas, NV 89146
Phone: (702) 873-7550
Fax: (702) 362-2597
E-mail: jayson@vtnnv.com; bruiz@vtnnv.com

Subject: Update for Summerlin West Planning Area Master Plan Update
Location: West of I-215 between Lake Mead Blvd and Charleston Blvd
APN: 137-21-000-002, 137-26-101-001 and others
Sec, Township, Range: S33 and others T20S, R59E
Flood Zone & Panel: Zone A and Zone X, 2125E and 2150E, Dated September 27, 2002
Application Number: PW19-12378

Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Update	03/21/2019	04/10/2019	CR	
Addendum 1	03/21/2019	04/10/2019	CR	

The above-referenced project is located within the **City of Las Vegas** adjacent to Clark County unincorporated areas. The drainage study was submitted to the County for concurrence on March 21, 2019. In addition, the County has received the City of Las Vegas acceptance letter dated March 13, 2019 for the Technical Drainage Study (DS4926G).

The County concurs with the acceptance of this Drainage Study by the City of Las Vegas. Please note that the County's review of this development is limited to drainage issues significant to Clark County unincorporated areas.

BOARD OF COUNTY COMMISSIONERS
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YOLANDA T. KING, County Manager

This update addresses; changes to land densities and parcel configurations; addition of drainage channels to Village 27; interim flood control berm to Village 21; revisions to existing washes to be designated as MPU facilities; upsizing Detention Basins DB5 and Grand Central Park to account for increased flow routing. The previously approved Technical Drainage Studies are: PW18-14248.

Additional Conditions:

1. The individual Technical Drainage Studies for the areas adjacent to the County to the west of the project site will need to be submitted for County review to verify acceptance of drainage flows.

2. Exhibits in future submittals need to show parcel lines and numbers; entity boundaries; ultimate development boundary; street names; etc.

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

Crissy Riland, P.E.
Senior Civil Engineer
Development Review
crissy@ClarkCountyNV.gov

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

LEGEND

- ONSITE BASIN BOUNDARY
- OFFSITE BASIN BOUNDARY
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- FLOW ARROW

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

NORTH

HEC-1 SUMMARY TABLE
VILLAGE 21
ULTIMATE CONDITION

Basin / Concentration Point	Area (Acre)			Q_{100} (cfs)			SDN
	Update	Previous	Difference	Update	Previous	Difference	
SUMM3	7.73	5.00	2.73	13	30	-17	SDN3
Z	4.50	4.50	0.00	18	17	1	SDN3
AA	4.02	3.71	0.31	17	14	3	SDN3
CAA	16.25	13.21	3.04	48	-	N/A	SDN3
NP-4	1.05	N/A	N/A	3	0	n/a	SDN3
NP-3	1.14	1.49	-0.35	3	4	-1	SDN3
CNP-3	2.18	1.49	0.69	7	-	N/A	SDN3
SUMM1	5.05	5.00	0.05	20	19	1	SDN3
Y	3.98	3.98	0.00	16	15	1	SDN3
X	3.94	3.63	0.31	16	14	2	SDN3
DES1	1.80	1.83	-0.03	8	7	1	SDN3
CSUMM1	33.20	N/A	N/A	113	-	N/A	SDN3
S	6.33	6.56	-0.23	24	25	-1	SDN3
V25-G	11.44	N/A	N/A	45	-	N/A	SDN3
R	3.07	3.10	-0.03	12	11	1	SDN3
CR	14.51	3.10	11.41	56	-	N/A	SDN3
Q	3.16	3.16	0.00	12	11	1	SDN3
CQ	17.67	6.26	11.41	68	-	N/A	SDN3
ST1	1.50	1.62	-0.12	7	6	1	SDN3
CST1	19.18	14.44	4.74	74	54	20	SDN3
P	3.00	3.17	-0.17	11	11	0	SDN3
DES2	2.39	2.27	0.12	10	9	1	SDN3
CDES2	30.89	N/A	N/A	119	-	N/A	SDN3
DES3	3.73	3.78	-0.05	17	15	2	SDN3
L	7.44	7.36	0.08	30	26	4	SDN3
COS-3	5.90	6.10	-0.20	17	18	-1	SDN3
DES4	2.79	2.88	-0.09	12	11	1	SDN3
V25-F	10.45	N/A	N/A	43	-	N/A	SDN3
V25-COS4	4.64	N/A	N/A	15	-	N/A	SDN3
V25-FOXN	3.23	N/A	N/A	14	-	N/A	SDN3
CFOXN	18.32	N/A	N/A	72	-	N/A	SDN3
V25-B	19.93	N/A	N/A	67	-	N/A	SDN3
V25-FOXS	3.19	N/A	N/A	11	-	N/A	SDN3
CFOXS	23.11	N/A	N/A	77	-	N/A	SDN3
V25-C	26.54	N/A	N/A	86	-	N/A	SDN3
V25-COS2	1.79	N/A	N/A	5	-	N/A	SDN3
STA1	2.98	N/A	N/A	13	-	N/A	SDN3
CSTA1	72.75	N/A	N/A	238	-	N/A	SDN3
V25-E	17.13	N/A	N/A	65	-	N/A	SDN3
V25-COS3	2.37	N/A	N/A	8	-	N/A	SDN3
ST2	2.88	2.93	-0.05	12	12	0	SDN3
CST2	95.12	2.93	92.19	291	-	N/A	SDN3
F	16.58	16.88	-0.30	65	59	6	SDN3
E	20.15	20.20	-0.05	78	77	1	SDN3
DES5	5.83	5.46	0.37	22	20	2	SDN3
CDES5	185.60	N/A	N/A	624	-	N/A	SDN3
C	14.83	14.05	0.78	54	44	10	SDN3
NP-1	1.27	1.35	-0.08	4	5	-1	SDN3
ST7	2.30	2.30	0.00	9	9	0	SDN3
D	14.73	15.42	-0.69	56	53	3	SDN3
CST7	33.13	33.12	0.01	124	108	16	SDN3
W	8.31	7.11	1.20	31	27	4	SDN3
SUMM2	3.63	3.28	0.35	16	13	3	SDN3
T	5.98	5.99	-0.01	23	23	0	SDN3
NP-2	0.93	0.87	0.06	3	3	0	SDN3
ST3	1.70	2.09	-0.39	8	8	0	SDN3
CST3	2.63	8.08	-5.45	11	43	-32	SDN3
CARR1	3.52	3.52	0.00	15	14	1	SDN3
M	9.11	9.11	0.00	32	32	0	SDN3
CCARR1	32.00	N/A	N/A	129	-	N/A	SDN3
N	2.54	2.54	0.00	10	9	1	SDN3
O	3.47	3.43	0.04	13	13	0	SDN3
STD	0.88	N/A	N/A	4	-	N/A	SDN3
CSTD	6.90	5.97	0.93	26	-	N/A	SDN3
K	8.20	8.01	0.19	30	29	1	SDN3
STB	2.65	N/A	N/A	12	-	N/A	SDN3
CSTB	17.75	8.01	9.74	68	-	N/A	SDN3
J	11.83	11.83	0.00	42	42	0	SDN3
COS-2	0.58	N/A	N/A	2	-	N/A	SDN3
COS-1	7.80	7.78	0.02	22	22	0	SDN3
CCOS-1	8.38	7.78	0.60	24	-	N/A	SDN3
CARR2	2.45	2.49	-0.04	10	10	0	SDN3
ST6	3.08	3.01	0.07	13	12	1	SDN3
CCARR2	76.80	N/A	N/A	286	-	N/A	SDN3
B	13.90	13.71	0.19	54	46	8	SDN3
A	14.15	14.36	-0.21	51	47	4	SDN3
CARR3	4.87	4.85	0.02	19	19	0	SDN3
CCARR3	109.72	N/A	N/A	410	-	N/A	SDN3
V	7.25	7.19	0.06	29	27	2	SDN3
SUMM4	4.87	N/A	N/A	21	-	N/A	SDN3
CSUMM4	12.12	7.19	N/A	50	-	N/A	SDN3
DC-2	1.19	1.40	-0.21	5	5	0	SDN3
U	20.17	20.42	-0.25	73	74	-1	SDN3
I	18.69	18.50	0.19	61	60	1	SDN3
STA	1.01	0.00	n/a	5	0	n/a	SDN3
G	5.01	5.71	-0.70	19	21	-2	SDN3
H	5.79	6.26	-0.47	21	22	-1	SDN3
CGH	10.80	11.97	-1.17	39	-	N/A	SDN3
DC-1	8.19	8.19	0.00	23	25	-2	SDN3
NVE	21.74	21.74	0.00	75	79	-4	SDN3
CDC1	104.69	101.38	3.31	326	-	N/A	SDN3
CFAR	454.4	N/A	N/A	1598	-	N/A	SDN3

THE HOWARD HUGHES CORPORATION
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5145
PH. (702) 873-7590 FAX (702) 365-2897 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

2018 UPDATE TO
SUMMERLIN WEST
PLANNING AREA

A.6.6
VILLAGE 21
DRAINAGE BASIN MAP

DRAWN BY: JYA/SS	NOV 2018		
DESIGNED BY: JYA/SS	NOV 2018		
CHECKED BY: WJM	FEB 2019	SCALE:	N/A HORZ. N/A VERT.
PROJECT NO: 7609			

SHEET
A.6.6
OF SHEETS
DRAWING NO.

H:\7609\Drainage\A_JP\A Figures\A.6.6 Village 21 Drainage Basin Map\A.6.6 Area 1 Drainage Basin Map.dwg

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

NORTH

LEGEND

- REGIONAL STORM DRAIN ALIGNMENT
- EXISTING STORM DRAIN ALIGNMENT
- INTERIM BERM/CHANNEL ALIGNMENT
- VILLAGE 21 LOCAL STORM DRAIN ALIGNMENT
- W51 BASIN DESIGNATION
- CONCENTRATION POINT
- (1) LOCAL FACILITY DESIGNATION
- DEVELOPED CONDITION FLOW ARROW

VILLAGE 21 LOCAL FLOOD PROTECTION FACILITIES

Facility Label	Design Slope (%)	Q100 ULT (cfs)		Tributary Basin/CP		Facility		Technical Drainage Study
		Previous	Updated	Previous	Updated	Previous	Updated	
1	9.0%	59	65	F	F	30" RCP	36" RCP	Reference 1
2	8.8%	77	78	E	E	30" RCP	36" RCP	Reference 1
3	4.2%	27	29	V	V	24" RCP	24" RCP	
5	4.8%	27	31	W	W	24" RCP	24" RCP	
6	1.3%	14	17	AA	AA	24" RCP	24" RCP	
7	1.0%	18	18	Z	Z	24" RCP	24" RCP	
8	4.2%	31	18	CZAA	Z	24" RCP	24" RCP	
9	4.2%	35	18	CNP-4A	CAA	24" RCP	24" RCP	
11	1.0%	15	16	Y	Y	24" 4CP	24" RCP	
13	3.3%	14	16	X	X	24" RCP	24" RCP	
15	0.5%	4	7	NP-3	CNP-3	24" 4CP	24" RCP	
20A	5.4%	n/a	45	n/a	V25-G	N/A	30" RCP	
20	2.1%	11	12	R	R	24" RCP	24" RCP	
21	5.4%	11	56	R	CR	24" RCP	30" RCP	
22	1.0%	11	12	Q	Q	24" RCP	24" RCP	
23	5.4%	23	68	CQR	CQ	24" RCP	36" RCP	
24	10.0%	25	24	S	S	24" RCP	30" RCP	Reference 6
25	8.0%	54	74	CST1	CST1	30" RCP	36" RCP	Reference 6
26	10.0%	11	11	P	P	24" RCP	30" RCP	Reference 6
27	10.0%	n/a	17	n/a	DES3	N/A	30" RCP	Reference 6
27A	10.0%	26	30	L	L	30" RCP	30" RCP	Reference 6
28	1.5%	3	3	NP-2	NP-2	24" RCP	24" RCP	
29	5.0%	3	11	NP-2	CST3	24" RCP	24" RCP	Reference 7
32	3.0%	23	23	T	T	24" RCP	24" RCP	Reference 7
33	3.0%	N/A	55	N/A	N/A	N/A	24" RCP	Reference 7
34	3.2%	N/A	66	N/A	N/A	N/A	36" RCP	Reference 7
35	5.0%	32	32	M	M	30" RCP	36" RCP	Reference 7
36	1.5%	N/A	104	N/A	N/A	N/A	48"	Reference 7
37	6.0%	N/A	22	CNO	CNO	N/A	24" RCP	
38	0.5%	29	30	K	K	30" RCP	36" RCP	
38B	4.0%	108	68	CST4	CSTB	36" RCP	36" RCP	Reference 7
39	6.1%	n/a	360	n/a	CST2	N/A	54" RCP	Reference 1
40	4.0%	42	42	J	J	24" RCP	42" RCP	Reference 7
41	6.3%	18	17	COS-3	COS-3	24" RCP	10'X10' RCB*	Reference 1
42	10.0%	22	24	COS-1	CCOS1	24" RCP	24" RCP	Reference 7
43A	1.5%	44	58	C	C, NP-1	36" RCP	42" RCP	Reference 3
43B	1.3%	58	58	C, NP-1, ST7	C, NP-1	36" RCP	42" RCP	Reference 3
44	5.6%	12	13	ST6	ST6	24" RCP	24" RCP	Reference 4
45	6.0%	46	54	B	B	30" RCP	36" RCP	Reference 2
46	6.0%	47	51	A	A	30" RCP	36" RCP	Reference 2
47A	N/A	N/A	N/A	N/A	For Flexibility	N/A	24" RCP	Reference 3
47	4.0%	53	56	D	D	30" RCP	36" RCP	Reference 3
48	1.3%	108	124	CST7	CST7	42" RCP	54" RCP	Reference 3
49	6.0%	74	73	U	U	30" RCP	36" RCP	
50	2.0%	60	61	I	I	36" RCP	42" RCP	
51	0.9%	43	39	G, H	CGH	24" RCP	Riprap Chnl	Reference 5
52	N/A	N/A	5	N/A	STA	N/A	24" RCP	

References:
1- Desert Foothills (Far Hills to Redpoint)
2- Carriage Hill (Far Hills to Street A)
3- Ridge Pine Street
4-Street A (Carriage Hill to Desert Foothills)
5-Street A (Carriage Hill to Parcel H)
6- Desert Foothills (Redpoint to Summerlin Parkway)
7- Carriage Hill (Redpoint to Summerlin Parkway)

REVISION | BY | DATE | REV

THE HOWARD HUGHES CORPORATION
10801 WEST CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2627 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

2018 UPDATE TO SUMMERLIN WEST PLANNING AREA

A.6.7
VILLAGE 21 LOCAL FLOOD CONTROL FACILITIES MAP

DRAWN BY: JYA/GSB — NOV 2018
DESIGNED BY: JVG/GSB — NOV 2018
CHECKED BY:
PROJECT NO.: 7929
SCALE: 1"=300' HORIZ. NA VERT.

SHEET A.6.
OF
DRAWI

...ments Facilities Maps\A.6.7 Village 21 Local Flood Control Facilities Map.dwg

STANDARD FORM 4

DEVELOPMENT: Village 21

W.O. # 7809 CALCULATED BY: GB

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Existing:		Developed:	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132 C_n - 0.39 \qquad T_c = T_i + T_t$$

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.	
DEVELOPED CONDITION ONSITE																	
A	94.9	0.863	14.15	0.0221	100	1.0	4.27	1614	3.7	3.9	5.9	5.33	1714	19.52	9.60	0.096	
B	95.0	0.864	13.90	0.0217	100	1.0	4.25	1039	4.1	4.1	6.2	3.47	1139	16.33	7.72	0.077	
C	95.0	0.864	14.83	0.0232	100	1.0	4.25	1596	3.3	3.7	5.6	5.54	1696	19.42	9.79	0.098	
D	95.0	0.864	14.73	0.0230	100	1.0	4.25	1240	4.4	4.3	6.4	3.87	1340	17.44	8.12	0.081	
E	95.0	0.864	20.15	0.0315	100	1.0	4.25	1545	6.5	5.2	7.8	3.84	1645	19.14	8.09	0.081	
F	95.0	0.864	16.58	0.0259	100	1.0	4.25	1350	5.8	4.9	7.4	3.64	1450	18.06	7.89	0.079	
G	95.0	0.864	5.01	0.0078	100	1.0	4.25	780	1.5	2.5	3.8	4.56	880	14.89	8.80	0.088	
H	95.0	0.864	5.79	0.0091	100	1.0	4.25	1078	1.5	2.5	3.7	5.97	1178	16.54	10.22	0.102	
I	92.0	0.824	18.69	0.0292	100	1.0	4.96	1599	3.2	3.6	5.5	5.66	1699	19.44	10.62	0.106	
J	92.0	0.824	11.83	0.0185	100	1.0	4.96	1010	4.8	4.4	6.7	3.17	1110	16.17	8.13	0.081	
K	92.0	0.824	8.20	0.0128	100	1.0	4.96	867	5.1	4.6	6.9	2.72	967	15.37	7.68	0.077	
L	95.0	0.864	7.44	0.0116	100	1.0	4.25	1027	5.5	4.7	7.1	3.00	1127	16.26	7.24	0.072	
M	92.0	0.824	9.11	0.0142	100	1.0	4.96	1027	5.5	4.7	7.1	3.00	1127	16.26	7.96	0.080	
N	92.2	0.827	2.54	0.0040	100	1.0	4.91	558	4.1	4.1	6.2	2.19	658	13.66	7.10	0.071	
O	92.1	0.826	3.47	0.0054	100	1.0	4.93	779	5.3	4.6	7.0	2.46	879	14.88	7.39	0.074	
P	92.1	0.826	3.00	0.0047	100	1.0	4.93	644	2.8	3.4	5.1	2.94	744	14.13	7.86	0.079	
Q	92.2	0.826	3.16	0.0049	100	1.0	4.93	587	2.1	2.9	4.4	3.17	687	13.82	8.10	0.081	
R	92.2	0.826	3.07	0.0048	100	1.0	4.93	555	4.0	4.0	6.1	2.22	655	13.64	7.15	0.071	
S	94.2	0.853	6.33	0.0099	100	1.0	4.44	1240	4.8	4.4	6.7	3.71	1340	17.44	8.15	0.081	
T	94.2	0.853	5.98	0.0093	100	1.0	4.44	1100	4.3	4.2	6.3	3.58	1200	16.67	8.01	0.080	
U	94.2	0.853	20.17	0.0315	100	1.0	4.44	1700	4.5	4.3	6.5	5.01	1800	20.00	9.45	0.094	
V	94.2	0.853	7.25	0.0113	100	1.0	4.44	1020	7.8	5.7	8.6	2.48	1120	16.22	6.92	0.069	
W	94.2	0.853	8.31	0.0130	100	1.0	4.44	1290	5.0	4.5	6.8	3.78	1390	17.72	8.22	0.082	
X	94.2	0.853	3.94	0.0061	100	1.0	4.44	636	4.1	4.1	6.2	2.41	736	14.09	6.84	0.068	
Y	94.2	0.853	3.98	0.0062	100	1.0	4.44	721	6.1	5.0	7.6	2.16	821	14.56	6.60	0.066	
Z	94.2	0.853	4.50	0.0070	100	1.0	4.44	785	7.6	5.6	8.5	2.05	885	14.92	6.49	0.065	
AA	94.2	0.853	4.02	0.0063	100	1.0	4.44	462	6.3	5.1	7.7	1.52	562	13.12	5.96	0.060	
COS-3	88.0	0.772	5.90	0.0092	100	1.0	5.91	1556	5.8	3.6	7.1	4.83	1656	19.20	10.74	0.107	
COS-2	88.3	0.776	0.58	0.0009	50	1.0	4.13	506	0.4	0.9	1.8	9.01	556	13.09	13.09	0.131	
COS-1	88.0	0.772	7.80	0.0122	100	1.0	5.91	1604	5.5	3.5	6.9	5.05	1704	19.47	10.96	0.110	
NP-4	88.0	0.772	1.05	0.0016	100	1.0	5.91	896	6.5	5.1	7.8	2.47	996	15.53	8.38	0.084	
NP-3	88.0	0.772	1.14	0.0018	100	1.0	5.91	750	1.7	2.7	4.0	4.17	850	14.72	10.08	0.101	
NP-2	89.0	0.785	0.93	0.0015	100	1.0	5.67	389	3.9	4.0	6.0	1.63	489	12.72	7.31	0.073	
NP-1	88.0	0.772	1.27	0.0020	100	1.0	5.91	218	4.1	4.1	6.2	0.89	318	11.77	6.80	0.068	
SUMM1	98.0	0.904	5.05	0.0079	40	2.0	1.77	2080	2.9	3.4	5.2	7.50	2120	21.78	9.27	0.093	
SUMM2	98.0	0.904	3.63	0.0057	40	2.0	1.77	1370	6.2	5.0	7.6	3.56	1410	17.83	5.33	0.053	
SUMM3	98.0	0.904	2.85	0.0045	40	2.0	1.77	1070	5.2	4.6	7.0	3.16	1110	16.17	4.93	0.049	

```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                *                    *         609 SECOND STREET            *
 *                                      *                    *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   27DEC18  TIME  16:51:33  *                    *          (916) 756-1104              *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

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

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

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


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

                        *DIAGRAM
 *** FREE ***
             1          ID    INPUT FILE DATE = SEPTEMBER 12,2017
             2          ID    DESIGN STORM = 100-YEAR 6-HR STORM
             3          ID    STORM DISTRIBUTION = SDN #3
             4          ID    MODELED BY VTN (JYA)
             5          ID
             6          ID    ****************************************************************
             7          ID    * VILLAGE 21 (PREVIOUSLY AREA 1) HEC-1 MODE                    *
             8          ID    * REFER TO LAND USE EXHIBIT BY VTN FOR LOCATION OF AREAS 1      *
             9          ID    *                                                              *
            10          ID    ****************************************************************
            11          ID
            12          ID
            13          ID
            14          ID  100-YEAR,  6-HOUR STORM,  SDN3
            15          ID
            16          IT       5       0       0     100
            17          IO       5       0       0
            18          IN       5       0       0
            19          JR    PREC    1.00
                        *

            20          KK   SUMM3
            21          BA  0.0045
            22          PB    3.40
            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      98
            32          UD   0.050
                        *

            33          KK       Z
            34          BA  0.0070
            35          PB    3.41
            36          LS       0    94.2
            37          UD   0.065
                        *

            38          KK      AA
            39          BA  0.0063
            40          PB    3.40
            41          LS       0    94.2
            42          UD   0.060
                        *
```

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

  43          KK     CAA
  44          KM   COMBINES SUMM3, Z, AND AA
  45          HC       3
              *

  46          KK    NP-4
  47          BA  0.0016
  48          PB    3.40
  49          LS       0    88.0
  50          UD   0.084
              *

  51          KK    NP-3
  52          BA  0.0018
  53          PB    3.38
  54          LS       0    88.0
  55          UD   0.101
              *

  56          KK   CNP-3
  57          KM   COMBINES NP-3 AND NP-4
  58          HC       2
              *

  59          KK   SUMM1
  60          PB    3.40
  61          BA  0.0079
  62          LS       0     98
  63          UD   0.093
              *

  64          KK       Y
  65          PB    3.40
  66          BA  0.0062
  67          LS       0    94.2
  68          UD   0.066
              *

  69          KK       X
  70          PB    3.40
  71          BA  0.0061
  72          LS       0    94.2
  73          UD   0.068
              *

  74          KK    DES1
  75          BA  0.0028
  76          PB    3.38
  77          LS       0     98
  78          UD   0.066
              *
```



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

  79          KK  CSUMM1
  80          KM   RFCD FACILITY IN DESERT FOOTHILLS DRIVE
  81          HC       6
              *

  82          KK       S
  83          BA  0.0099
  84          PB    3.40
  85          LS       0    94.2
  86          UD   0.081
              *

  87          KK   V25-G
  88          KM   OLD PARCEL NAME IS W48
  89          BA  0.0179
  90          PB    3.41
  91          LS       0    93.0
  92          UD   0.069
              *

  93          KK       R
  94          BA  0.0048
  95          PB    3.40
  96          LS       0    92.2
  97          UD   0.071
              *

  98          KK     CR
```

```
 99          KM   COMBINE Q AND R
100          HC       2
             *

101          KK       Q
102          BA  0.0049
103          PB    3.40
104          LS       0    92.2
105          UD   0.075
             *

106          KK      CQ
107          KM   COMBINE Q AND CR
108          HC       2
             *

109          KK     RCQ
110          KM   ROUTE CQR TO CST1
111          RD     330   0.055   0.013       0    CIRC       3
             *
1                                    HEC-1 INPUT                                        PAGE  4

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

112          KK     ST1
113          BA  0.0023
114          PB    3.40
115          LS       0      98
116          UD   0.050
             *

117          KK    CST1
118          KM   COMBINES CQ AND ST1
119          HC       2
             *

120          KK  DUMMY2
121          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
122          HC       2
             *

123          KK       P
124          BA  0.0047
125          PB    3.40
126          LS       0    92.1
127          UD   0.079
             *

128          KK    DES2
129          PB    3.40
130          BA  0.0037
131          LS       0      98
132          UD   0.062
             *

133          KK   CDES2
134          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
135          HC       3
             *

136          KK    DES3
137          BA  0.0058
138          PB    3.40
139          LS       0      98
140          UD   0.050
             *

141          KK       L
142          BA  0.0116
143          PB    3.40
144          LS       0    95.0
145          UD   0.072
             *
1                                    HEC-1 INPUT                                        PAGE  5

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

146          KK   COS-3
147          BA  0.0092
148          PB    3.39
149          LS       0    88.0
150          UD   0.107
             *

151          KK    DES4
152          BA  0.0044
153          PB    3.40
```

```
 154          LS       0    98.0
 155          UD   0.076
              *

 156          KK   CDES4
 157          KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 158          HC       5
              *

 159          KK   V25-F
 160          BA  0.0163
 161          PB    3.44
 162          LS       0    95.0
 163          UD   0.067
              *

 164          KKV25-COS4
 165          BA  0.0073
 166          PB    3.43
 167          LS       0    88.0
 168          UD   0.089
              *

 169          KKV25-FOXN
 170          BA  0.0050
 171          PB    3.41
 172          LS       0    98.0
 173          UD   0.062
              *

 174          KK   CFOXN
 175          KM   COMBINE V25-F, V25-COS4, V25-FOXN
 176          HC       3
              *

 177          KK   V25-B
 178          KM   OLD BASIN NAME GP20
 179          BA  0.0311
 180          PB    3.42
 181          LS       0    91.0
 182          UD   0.097
              *
```



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

 183          KKV25-FOXS
 184          BA  0.0050
 185          PB    3.40
 186          LS       0    98.0
 187          UD   0.179
              *

 188          KK   CFOXS
 189          KM   COMBINE V25-B, AND V25-FOXS
 190          HC       2
              *

 191          KK   V25-C
 192          BA  0.0415
 193          PB    3.45
 194          LS       0    90.7
 195          UD   0.109
              *

 196          KK  RV25-C
 197          KM   ROUTE V25-C TO CSTA1
 198          RD    2047   0.013   0.023       0    CIRC     3.5
              *

 199          KKV25-COS2
 200          BA  0.0028
 201          PB    3.43
 202          LS       0    88.0
 203          UD   0.128
              *

 204          KKRV25-COS2
 205          KM   ROUTE V25-COS2
 206          RD    1947   0.013   0.023       0    CIRC     3.5
              *

 207          KK    STA1
 208          KM   OLD PARCEL NAME IS SAME
 209          BA  0.0046
 210          PB    3.43
 211          LS       0    98.0
 212          UD   0.051
```

```
                *

 213            KK   CSTA1
 214            KM   COMBINE V25-FOXS, V25-C, CFOXS, V25-COS2, STA1, AND CFOXS
 215            HC       5
                *
1                                       HEC-1 INPUT                                             PAGE  7

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


 216            KK  RCSTA1
 217            KM   ROUTE STA1 TO CST2
 218            RD    1530   0.013   0.060       0    CIRC     3.5
                *

 219            KK   V25-E
 220            KM   OLD PARCEL NAME IS W63
 221            BA  0.0268
 222            PB    3.40
 223            LS       0    95.0
 224            UD   0.088
                *

 225            KK  RV25-E
 226            KM   ROUTE V25-E TO CST2
 227            RD     702   0.013   0.060       0    CIRC     3.5
                *

 228            KKV25-COS3
 229            KM   OLD PARCEL NAME IS GPPW3
 230            BA  0.0037
 231            PB    3.41
 232            LS       0    88.1
 233            UD   0.070
                *

 234            KK     ST2
 235            BA  0.0045
 236            PB    3.39
 237            LS       0      98
 238            UD   0.059

 239            KK    CST2
 240            KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 241            HC       4
                *

 242            KK  DUMMY5
 243            KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 244            HC       2
                *

 245            KK       F
 246            BA  0.0259
 247            PB    3.39
 248            LS       0    95.0
 249            UD   0.079
                *
1                                       HEC-1 INPUT                                             PAGE  8

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


 250            KK       E
 251            BA  0.0315
 252            PB    3.38
 253            LS       0    95.0
 254            UD   0.081
                *

 255            KK    DES5
 256            BA  0.0091
 257            PB    3.38
 258            LS       0    98.0
 259            UD   0.108
                *

 260            KK   CDES5
 261            KM   RFCD FACILITY IN DESERT FOOTHILLS DR
 262            HC       4
                *

 263            KK       C
 264            BA  0.0232
 265            PB    3.36
 266            LS       0    95.0
 267            UD   0.098
                *
```

```
 268          KK    NP-1
 269          BA  0.0020
 270          PB    3.36
 271          LS       0    88.0
 272          UD   0.068
              *

 273          KK     ST7
 274          BA  0.0036
 275          PB    3.36
 276          LS       0      98
 277          UD   0.089
              *

 278          KK       D
 279          BA  0.0230
 280          PB    3.36
 281          LS       0    95.0
 282          UD   0.081
              *

 283          KK    CST7
 284          KM   COMBINES IN RIDGE PINE ST
 285          HC       4
              *
1                                      HEC-1 INPUT                                      PAGE  9

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


 286          KK  DUMMY7
 287          KM   RFCD FACILITY IN FAR HILLS
 288          HC       2
              *

 289          KK       W
 290          BA  0.0130
 291          PB    3.38
 292          LS       0    94.2
 293          UD   0.082
              *

 294          KK   SUMM2
 295          BA  0.0057
 296          PB    3.38
 297          LS       0      98
 298          UD   0.053
              *

 299          KK       T
 300          PB    3.38
 301          BA  0.0093
 302          LS       0    94.2
 303          UD   0.080
              *

 304          KK    NP-2
 305          BA  0.0015
 306          PB    3.38
 307          LS       0    89.0
 308          UD   0.073
              *

 309          KK     ST3
 310          BA  0.0027
 311          PB    3.38
 312          LS       0    98.0
 313          UD   0.050
              *

 314          KK    CST3
 315          KM   COMBINE NP-2 AND ST3
 316          HC       2
              *

 317          KK  DUMMY8
 318          KM   COMBINE CT AND CST3
 319          HC       4
              *
1                                      HEC-1 INPUT                                      PAGE 10

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


 320          KK   CARR1
 321          BA  0.0055
 322          PB    3.36
 323          LS       0    98.0
```

```
 324          UD   0.060
              *

 325          KK       M
 326          BA  0.0142
 327          PB    3.36
 328          LS       0    92.0
 329          UD   0.083
              *

 330          KK  CCARR1
 331          KM   RFCD FACILITY IN CARRIAGE HILL DR
 332          HC       3
              *

 333          KK       N
 334          BA  0.0040
 335          PB    3.38
 336          LS       0    92.2
 337          UD   0.071
              *

 338          KK       O
 339          BA  0.0054
 340          PB    3.38
 341          LS       0    92.1
 342          UD   0.074
              *

 343          KK     STD
 344          BA  0.0014
 345          PB    3.38
 346          LS       0     98
 347          UD   0.050
              *

 348          KK    CSTD
 349          KM   COMBINE N, O, AND STD
 350          HC       3
              *

 351          KK       K
 352          BA  0.0128
 353          PB    3.37
 354          LS       0    92.0
 355          UD   0.077
              *
```



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

 356          KK     STB
 357          BA  0.0041
 358          PB    3.38
 359          LS       0     98
 360          UD   0.050
              *

 361          KK    CSTB
 362          HC       3
              *

 363          KK DUMMY10
 364          KM   RFCD FACILITY IN CARRIAGE HILL DR
 365          HC       2
              *

 366          KK       J
 367          BA  0.0185
 368          PB    3.35
 369          LS       0    92.0
 370          UD   0.081
              *

 371          KK DUMMY11
 372          KM   RFCD FACILITY IN CARRIAGE HILL DR
 373          HC       2
              *

 374          KK   COS-2
 375          BA  0.0009
 376          PB    3.37
 377          LS       0    88.3
 378          UD   0.131
              *

 379          KK   COS-1
 380          BA  0.0122
```

```
          381          PB    3.37
          382          LS       0    88.0
          383          UD   0.110
                       *

          384          KK  CCOS-1
          385          HC       2
                       *

          386          KK   CARR2
          387          BA  0.0038
          388          PB    3.35
          389          LS       0    98.0
          390          UD   0.068
                       *
1                                       HEC-1 INPUT                                          PAGE 12

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


          391          KK     ST6
          392          BA  0.0048
          393          PB    3.37
          394          LS       0      98
          395          UD   0.058
                       *

          396          KK  CCARR2
          397          KM   RFCD FACILITY IN CARRIAGE HILL DR
          398          HC       4
                       *

          399          KK       B
          400          BA  0.0217
          401          PB    3.34
          402          LS       0    95.0
          403          UD   0.077
                       *

          404          KK       A
          405          BA  0.0221
          406          PB    3.33
          407          LS       0    94.9
          408          UD   0.096
                       *

          409          KK   CARR3
          410          BA  0.0076
          411          PB    3.34
          412          LS       0      98
          413          UD   0.089
                       *

          414          KK  CCARR3
          415          KM   RFCD FACILITY IN CARRIAGE HILL DR
          416          HC       4
                       *

          417          KK DUMMY13
          418          KM   RFCD FACILITY IN FAR HILLS
          419          HC       3
                       *

          420          KK       V
          421          BA  0.0113
          422          PB    3.38
          423          LS       0    94.2
          424          UD   0.069
                       *
1                                       HEC-1 INPUT                                          PAGE 13

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


          425          KK   SUMM4
          426          BA  0.0076
          427          PB    3.38
          428          LS       0      98
          429          UD   0.055
                       *

          430          KK  CSUMM4
          431          KM   COMBINES IN EX BELTWAY CHANNEL
          432          HC       2
                       *

          433          KK    DC-2
          434          BA  0.0019
          435          PB    3.36
```

```
          436          LS       0    93.0
          437          UD   0.057
                       *

          438          KK       U
          439          BA  0.0315
          440          PB    3.36
          441          LS       0    94.2
          442          UD   0.094
                       *

          443          KK       I
          444          BA  0.0292
          445          PB    3.35
          446          LS       0    92.0
          447          UD   0.106
                       *

          448          KK     STA
          449          BA  0.0016
          450          PB    3.35
          451          LS       0    98.0
          452          UD   0.050
                       *

          453          KK       G
          454          BA  0.0078
          455          PB    3.35
          456          LS       0    95.0
          457          UD   0.088
                       *

          458          KK       H
          459          BA  0.0091
          460          PB    3.33
          461          LS       0    95.0
          462          UD   0.102
                       *
```



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

          463          KK     CGH
          464          KM   COMBINES G AND H
          465          HC       2
                       *

          466          KK    DC-1
          467          BA  0.0128
          468          PB    3.33
          469          LS       0    93.0
          470          UD   0.207
                       *

          471          KK     NVE
          472          BA  0.0340
          473          PB    3.32
          474          LS       0    93.0
          475          UD   0.096
                       *

          476          KK    CDC1
          477          KM   COMBINES IN EX BELTWAY CHANNEL
          478          HC       8
                       *

          479          KK    CFAR
          480          KM   EX FAR HILLS AVE SD
          481          HC       2
                       *
          482          ZZ
```

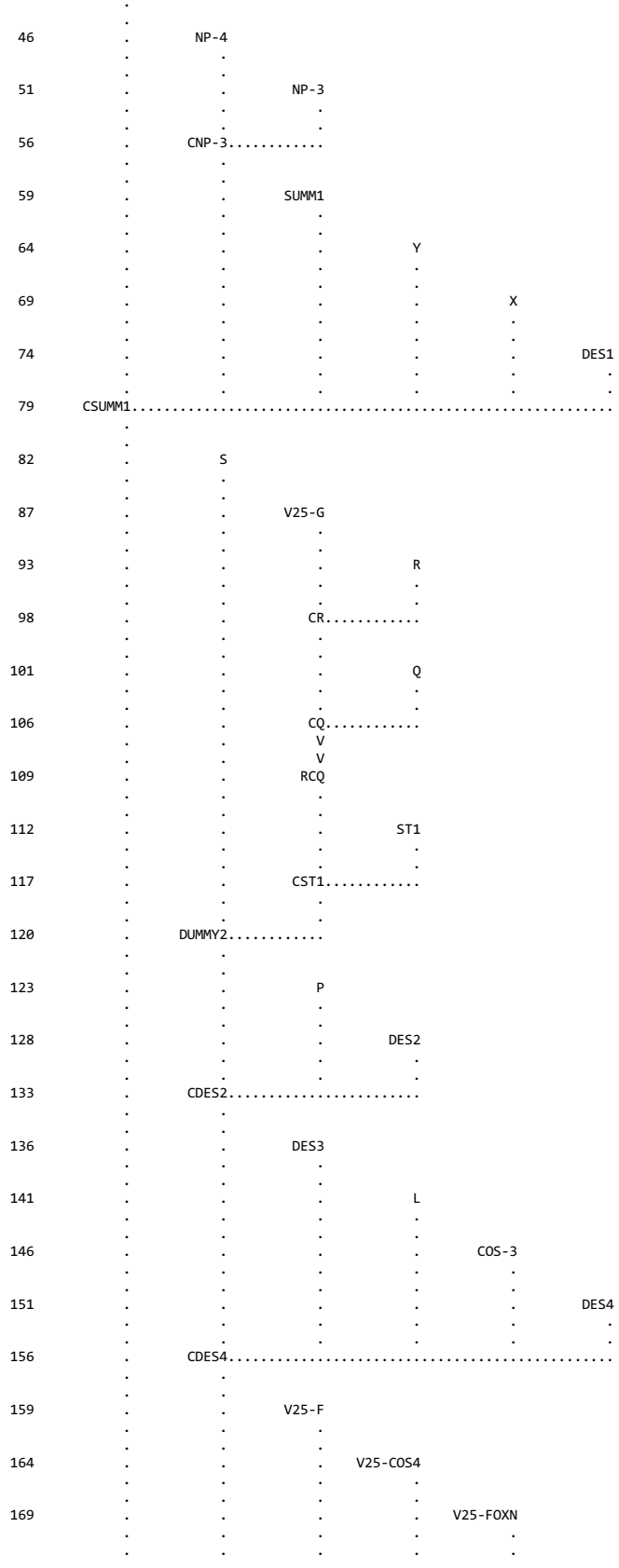
1

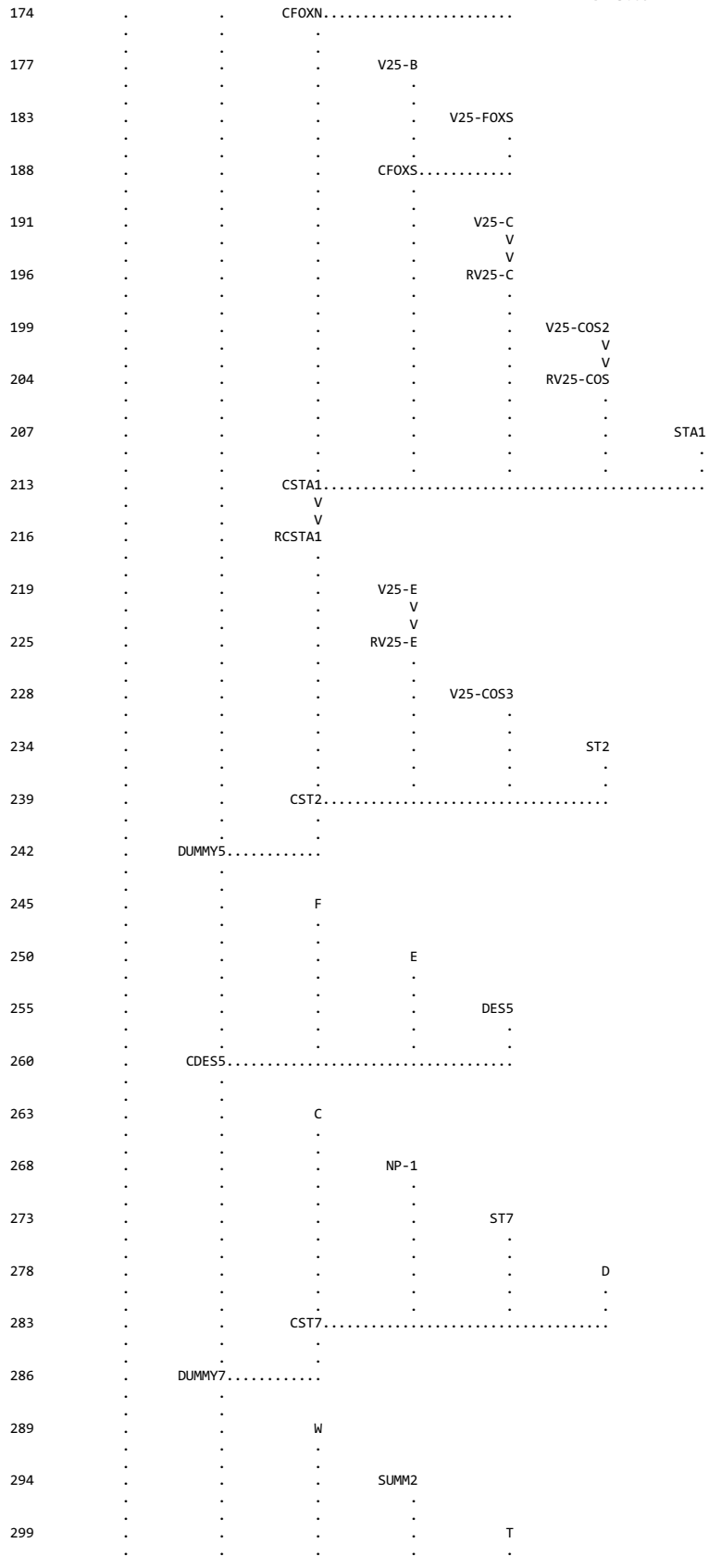
SCHEMATIC DIAGRAM OF STREAM NETWORK

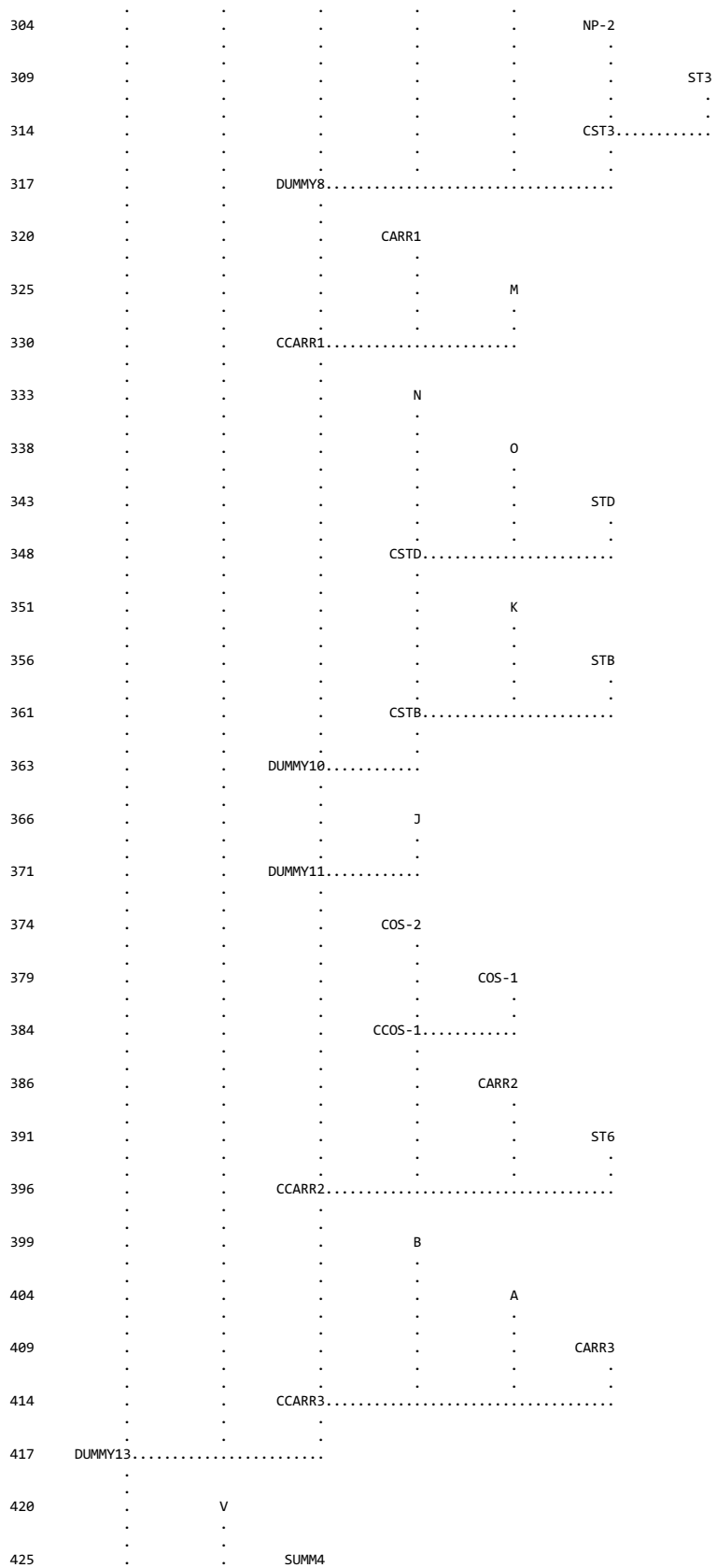
```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

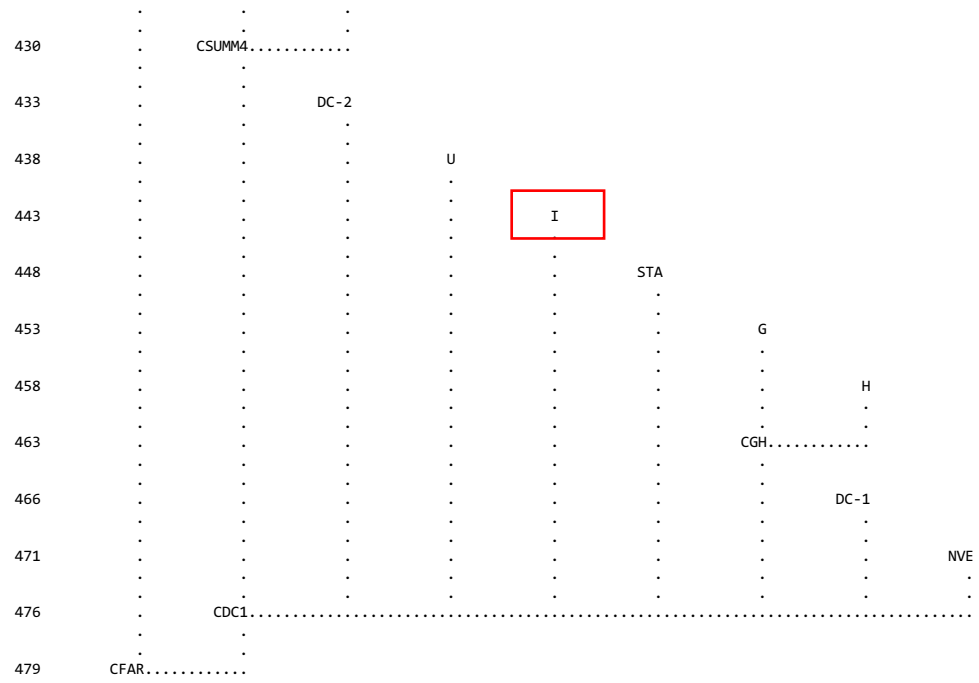
   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    20       SUMM3
                .
                .
    33          .           Z
                .           .
                .           .
    38          .           .          AA
                .           .           .
                .           .           .
    43        CAA.......................
```


NP-4
NP-3
CNP-3
SUMM1
Y
X
DES1
CSUMM1
S
V25-G
R
CR
Q
CQ
V
V
RCQ
ST1
CST1
DUMMY2
P
DES2
CDES2
DES3
L
COS-3
DES4
CDES4
V25-F
V25-COS4
V25-FOXN


CFOXN
V25-B
V25-FOXS
CFOXS
V25-C
RV25-C
V25-COS2
RV25-COS
STA1
CSTA1
RCSTA1
V25-E
RV25-E
V25-COS3
ST2
CST2
DUMMY5
F
E
DES5
CDES5
C
NP-1
ST7
D
CST7
DUMMY7
W
SUMM2
T


304 NP-2
309 ST3
314 CST3
317 DUMMY8
320 CARR1
325 M
330 CCARR1
333 N
338 O
343 STD
348 CSTD
351 K
356 STB
361 CSTB
363 DUMMY10
366 J
371 DUMMY11
374 COS-2
379 COS-1
384 CCOS-1
386 CARR2
391 ST6
396 CCARR2
399 B
404 A
409 CARR3
414 CCARR3
417 DUMMY13
420 V
425 SUMM4



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   27DEC18  TIME  16:51:33   *
 *                                       *
 *****************************************
```

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

INPUT FILE DATE = SEPTEMBER 12,2017
DESIGN STORM = 100-YEAR 6-HR STORM
STORM DISTRIBUTION = SDN #3
MODELED BY VTN (JYA)

```
*****************************************************************
* VILLAGE 21 (PREVIOUSLY AREA 1) HEC-1 MODE                     *
* REFER TO LAND USE EXHIBIT BY VTN FOR LOCATION OF AREAS 1      *
*                                                               *
*****************************************************************
```

100-YEAR, 6-HOUR STORM, SDN3

```
  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         100  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
                      NDTIME        0815  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE    8.25 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
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
HYDROGRAPH AT					
+	SUMM3	.00	1	FLOW	13.
				TIME	3.50
HYDROGRAPH AT					
+	Z	.01	1	FLOW	18.
				TIME	3.50
HYDROGRAPH AT					
+	AA	.01	1	FLOW	17.
				TIME	3.50
3 COMBINED AT					
+	CAA	.02	1	FLOW	48.
				TIME	3.50
HYDROGRAPH AT					
+	NP-4	.00	1	FLOW	3.
				TIME	3.50
HYDROGRAPH AT					
+	NP-3	.00	1	FLOW	3.
				TIME	3.50
2 COMBINED AT					
+	CNP-3	.00	1	FLOW	7.
				TIME	3.50
HYDROGRAPH AT					
+	SUMM1	.01	1	FLOW	20.
				TIME	3.50
HYDROGRAPH AT					
+	Y	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	X	.01	1	FLOW	16.
				TIME	3.50
HYDROGRAPH AT					
+	DES1	.00	1	FLOW	8.
				TIME	3.50
6 COMBINED AT					
+	CSUMM1	.04	1	FLOW	113.
				TIME	3.50
HYDROGRAPH AT					
+	S	.01	1	FLOW	24.
				TIME	3.50
HYDROGRAPH AT					
+	V25-G	.02	1	FLOW	45.
				TIME	3.50
HYDROGRAPH AT					
+	R	.00	1	FLOW	12.
				TIME	3.50
2 COMBINED AT					
+	CR	.02	1	FLOW	56.
				TIME	3.50
HYDROGRAPH AT					
+	Q	.00	1	FLOW	12.
				TIME	3.50

```
  2 COMBINED AT
+                     CQ       .03     1   FLOW          68.
                                           TIME         3.50

 ROUTED TO
+                    RCQ       .03     1   FLOW          67.
                                           TIME         3.50

 HYDROGRAPH AT
+                     ST1       .00     1   FLOW           7.
                                           TIME         3.50

  2 COMBINED AT
+                    CST1       .03     1   FLOW          74.
                                           TIME         3.50

  2 COMBINED AT
+                  DUMMY2       .04     1   FLOW          98.
                                           TIME         3.50

 HYDROGRAPH AT
+                       P       .00     1   FLOW          11.
                                           TIME         3.50

 HYDROGRAPH AT
+                    DES2       .00     1   FLOW          10.
                                           TIME         3.50

  3 COMBINED AT
+                   CDES2       .05     1   FLOW         119.
                                           TIME         3.50

 HYDROGRAPH AT
+                    DES3       .01     1   FLOW          17.
                                           TIME         3.50

 HYDROGRAPH AT
+                       L       .01     1   FLOW          30.
                                           TIME         3.50

 HYDROGRAPH AT
+                   COS-3       .01     1   FLOW          17.
                                           TIME         3.50

 HYDROGRAPH AT
+                    DES4       .00     1   FLOW          12.
                                           TIME         3.50

  5 COMBINED AT
+                   CDES4       .08     1   FLOW         195.
                                           TIME         3.50

 HYDROGRAPH AT
+                   V25-F       .02     1   FLOW          43.
                                           TIME         3.50

 HYDROGRAPH AT
+                V25-COS4       .01     1   FLOW          15.
                                           TIME         3.50

 HYDROGRAPH AT
+                V25-FOXN       .00     1   FLOW          14.
                                           TIME         3.50

  3 COMBINED AT
+                   CFOXN       .03     1   FLOW          72.
                                           TIME         3.50

 HYDROGRAPH AT
+                   V25-B       .03     1   FLOW          67.
                                           TIME         3.50

 HYDROGRAPH AT
+                V25-FOXS       .00     1   FLOW          11.
                                           TIME         3.58

  2 COMBINED AT
+                   CFOXS       .04     1   FLOW          77.
                                           TIME         3.50

 HYDROGRAPH AT
+                   V25-C       .04     1   FLOW          86.
                                           TIME         3.50

 ROUTED TO
+                  RV25-C       .04     1   FLOW          84.
                                           TIME         3.58
```

```
 HYDROGRAPH AT
+              V25-COS2       .00     1   FLOW          5.
                                          TIME         3.58

 ROUTED TO
+              RV25-COS       .00     1   FLOW          5.
                                          TIME         3.67

 HYDROGRAPH AT
+                  STA1       .00     1   FLOW         13.
                                          TIME         3.50

  5 COMBINED AT
+                 CSTA1       .11     1   FLOW        238.
                                          TIME         3.50

 ROUTED TO
+                RCSTA1       .11     1   FLOW        217.
                                          TIME         3.58

 HYDROGRAPH AT
+                 V25-E       .03     1   FLOW         65.
                                          TIME         3.50

 ROUTED TO
+                RV25-E       .03     1   FLOW         59.
                                          TIME         3.58

 HYDROGRAPH AT
+              V25-COS3       .00     1   FLOW          8.
                                          TIME         3.50

 HYDROGRAPH AT
+                   ST2       .00     1   FLOW         12.
                                          TIME         3.50

  4 COMBINED AT
+                  CST2       .15     1   FLOW        291.
                                          TIME         3.58

  2 COMBINED AT
+                DUMMY5       .23     1   FLOW        461.
                                          TIME         3.50

 HYDROGRAPH AT
+                     F       .03     1   FLOW         65.
                                          TIME         3.50

 HYDROGRAPH AT
+                     E       .03     1   FLOW         78.
                                          TIME         3.50

 HYDROGRAPH AT
+                  DES5       .01     1   FLOW         22.
                                          TIME         3.50

  4 COMBINED AT
+                 CDES5       .29     1   FLOW        624.
                                          TIME         3.50

 HYDROGRAPH AT
+                     C       .02     1   FLOW         54.
                                          TIME         3.50

 HYDROGRAPH AT
+                  NP-1       .00     1   FLOW          4.
                                          TIME         3.50

 HYDROGRAPH AT
+                   ST7       .00     1   FLOW          9.
                                          TIME         3.50

 HYDROGRAPH AT
+                     D       .02     1   FLOW         56.
                                          TIME         3.50

  4 COMBINED AT
+                  CST7       .05     1   FLOW        124.
                                          TIME         3.50

  2 COMBINED AT
+                DUMMY7       .35     1   FLOW        748.
                                          TIME         3.50

 HYDROGRAPH AT
+                     W       .01     1   FLOW         31.
                                          TIME         3.50

 HYDROGRAPH AT
```

```
+                  SUMM2       .01     1   FLOW          16.
                                           TIME         3.50

 HYDROGRAPH AT
+                      T       .01     1   FLOW          23.
                                           TIME         3.50

 HYDROGRAPH AT
+                   NP-2       .00     1   FLOW           3.
                                           TIME         3.50

 HYDROGRAPH AT
+                    ST3       .00     1   FLOW           8.
                                           TIME         3.50

  2 COMBINED AT
+                   CST3       .00     1   FLOW          11.
                                           TIME         3.50

  4 COMBINED AT
+                  DUMMY8       .03     1   FLOW          81.
                                           TIME         3.50

 HYDROGRAPH AT
+                  CARR1       .01     1   FLOW          15.
                                           TIME         3.50

 HYDROGRAPH AT
+                      M       .01     1   FLOW          32.
                                           TIME         3.50

  3 COMBINED AT
+                 CCARR1       .05     1   FLOW         129.
                                           TIME         3.50

 HYDROGRAPH AT
+                      N       .00     1   FLOW          10.
                                           TIME         3.50

 HYDROGRAPH AT
+                      O       .01     1   FLOW          13.
                                           TIME         3.50

 HYDROGRAPH AT
+                    STD       .00     1   FLOW           4.
                                           TIME         3.50

  3 COMBINED AT
+                   CSTD       .01     1   FLOW          26.
                                           TIME         3.50

 HYDROGRAPH AT
+                      K       .01     1   FLOW          30.
                                           TIME         3.50

 HYDROGRAPH AT
+                    STB       .00     1   FLOW          12.
                                           TIME         3.50

  3 COMBINED AT
+                   CSTB       .03     1   FLOW          68.
                                           TIME         3.50

  2 COMBINED AT
+                 DUMMY10       .08     1   FLOW         197.
                                           TIME         3.50

 HYDROGRAPH AT
+                      J       .02     1   FLOW          42.
                                           TIME         3.50

  2 COMBINED AT
+                 DUMMY11       .10     1   FLOW         239.
                                           TIME         3.50

 HYDROGRAPH AT
+                  COS-2       .00     1   FLOW           2.
                                           TIME         3.58

 HYDROGRAPH AT
+                  COS-1       .01     1   FLOW          22.
                                           TIME         3.50

  2 COMBINED AT
+                 CCOS-1       .01     1   FLOW          24.
                                           TIME         3.50

 HYDROGRAPH AT
+                  CARR2       .00     1   FLOW          10.
```

				TIME	3.50
HYDROGRAPH AT					
+	ST6	.00	1	FLOW	13.
				TIME	3.50
4 COMBINED AT					
+	CCARR2	.12	1	FLOW	286.
				TIME	3.50
HYDROGRAPH AT					
+	B	.02	1	FLOW	54.
				TIME	3.50
HYDROGRAPH AT					
+	A	.02	1	FLOW	51.
				TIME	3.50
HYDROGRAPH AT					
+	CARR3	.01	1	FLOW	19.
				TIME	3.50
4 COMBINED AT					
+	CCARR3	.17	1	FLOW	410.
				TIME	3.50
3 COMBINED AT					
+	DUMMY13	.56	1	FLOW	1271.
				TIME	3.50
HYDROGRAPH AT					
+	V	.01	1	FLOW	29.
				TIME	3.50
HYDROGRAPH AT					
+	SUMM4	.01	1	FLOW	21.
				TIME	3.50
2 COMBINED AT					
+	CSUMM4	.02	1	FLOW	50.
				TIME	3.50
HYDROGRAPH AT					
+	DC-2	.00	1	FLOW	5.
				TIME	3.50
HYDROGRAPH AT					
+	U	.03	1	FLOW	73.
				TIME	3.50
HYDROGRAPH AT					
+	I	.03	1	FLOW	61.
				TIME	3.50
HYDROGRAPH AT					
+	STA	.00	1	FLOW	5.
				TIME	3.50
HYDROGRAPH AT					
+	G	.01	1	FLOW	19.
				TIME	3.50
HYDROGRAPH AT					
+	H	.01	1	FLOW	21.
				TIME	3.50
2 COMBINED AT					
+	CGH	.02	1	FLOW	39.
				TIME	3.50
HYDROGRAPH AT					
+	DC-1	.01	1	FLOW	23.
				TIME	3.58
HYDROGRAPH AT					
+	NVE	.03	1	FLOW	75.
				TIME	3.50
8 COMBINED AT					
+	CDC1	.15	1	FLOW	326.
				TIME	3.50
2 COMBINED AT					
+	CFAR	.71	1	FLOW	1598.
				TIME	3.50

1

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

Supplement to Addendum #1 to the Technical Drainage Study for

Summerlin West Village 21
Beltway Channel
(Far Hills Avenue to Sky Vista Drive)

Las Vegas, Nevada

W.O. # 7851

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: August 1, 2019
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Village 21 – Beltway Channel Revision (Far Hills Avenue to Sky Vista Drive)**			**COPIES TO:** VTN Nevada
Cross Streets:	Western Beltway 215 & Summerlin Parkway			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5139B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-26-101-001			CCRFCD
Zoning Action:	N/A			CCPW
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	5/15/2019	6/19/2019	Not Approved	$400.00	3133328: $400
2nd Submittal	7/11/2019	8/1/2019	See Comments Below	$400.00	3486271: $400
			TOTAL FEES (LDDRS):	**$800.00**	----

REMARKS:

***** The Conditional Approval of this Drainage Study is to allow the engineer/developer in submitting the Improvement Plans to Land Development Only**

***** Do not submit the Drainage Study to Clark County Regional Flood Control District (CCRFCD) prior to the Structural Design and Calculations being approved by the City Building & Safety Department**

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

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

1. **This drainage study is acceptable in concept;** however, *City of Las Vegas* will not formally accept the study until the *Clark County Regional Flood Control District (CCRFCD)* has issued a letter of concurrence. The engineer should contact the CCRFCD to confirm that they have begun their review.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

2. The proposed Beltway Channel modification segment is owned by the Clark County Public Works Department. The engineer must coordinate with *Clark County Public Works Department* (CCPW) and obtain approval from CCPW prior to final acceptance of the subject study.

3. Structural plans for the storm drain improvements must be submitted for review. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the *Building Department* for processing. The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the drainage study.

In an effort to increase administrative efficiency, for all original and re-submittal packages including updates and the addenda, the City of Las Vegas Public Works Department requires both a hardcopy and a digital copy (PDF) on CD for the drainage study.

A letter sealed and signed by a Nevada registered civil engineer must be included in every submittal certifying documents on the electronic CD matches 100% of the hardcopy submittal. The new submittal requirement is effective on May 1, 2019. If there are any questions regarding these new requirements, please contact Albert Sung in the City Flood Control Section at (702) 229-6541.

Sample Letter to certify CD.pdf

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

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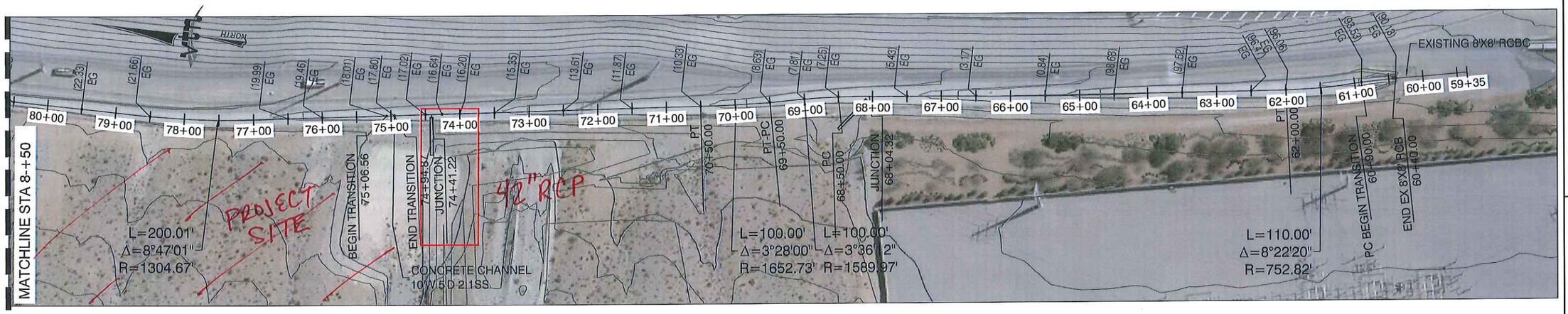
T/R/S: T20S/R59E/26

AREA K-26



BELTWAY CHANNEL FREEBOARD CALCS (n=0.015) AND FLOW DEPTH ABOVE STEM WALL CALCS.

Facility Type	Station	Velocity (FPS)	Flow Depth (FT)	Freeboard Height (FT)	Flow Depth Above Stem Wall *	Prposed Stem Wall Height (ft)
4' Deep by 10' Wide (2:1 Side Slopes) Trapezoidal Channel	6090.000	20.59	2.919	1.736	-1.081	n/a
	6200.000	18.94	3.102	1.691	-0.898	n/a
	6250.000	19.56	3.031	1.708	-0.969	n/a
	6350.000	20.61	2.917	1.736	-1.083	n/a
	6450.000	21.86	2.793	1.770	-1.207	n/a
	6550.000	21.56	2.832	1.763	-1.168	n/a
	6650.000	20.67	2.911	1.738	-1.089	n/a
	6750.000	19.36	3.053	1.702	-0.947	n/a
	6850.000	19.48	2.948	1.698	-1.052	0.66
	6950.000	19.82	2.911	1.707	-1.089	0.66
	7050.000	19.54	2.941	1.700	-1.059	0.66
	7150.000	19.51	2.945	1.699	-1.055	0.66
	7250.000	18.92	3.011	1.683	-0.989	0.66
	7350.000	17.96	3.128	1.657	-0.872	0.66
	7400.000	17.30	3.213	1.638	-0.787	0.66
	7425.960	16.88	3.270	1.626	-0.73	0.66
	7450.000	17.81	2.993	1.642	-1.007	0.66
	7494.870	17.22	3.067	1.625	-0.933	0.66
5' Deep by 10' Wide (2:1 Side Slopes) Trapezoidal Channel	7506.560	17.05	3.089	1.621	-1.911	1.33
	7600.000	15.62	3.289	1.581	-1.711	1.33
	7650.000	15.29	3.341	1.571	-1.659	1.33
	7850.000	15.05	3.378	1.565	-1.622	1.33
	7950.000	15.51	3.307	1.578	-1.693	1.33
	8050.000	15.42	3.320	1.575	-1.68	1.33
	8150.000	16.02	3.231	1.592	-1.769	1.33
	8250.000	16.67	3.139	1.610	-1.861	1.33
	8350.000	18.00	2.970	1.647	-2.03	1.33
	8450.000	19.60	2.791	1.690	-2.209	0.66
	8550.000	21.91	2.569	1.750	-2.431	0.66
	8623.290	24.04	2.396	1.804	-2.604	0.66
6' Deep by 11' Wide Rectangular Channel	8670.030	24.37	3.178	1.896	-2.822	n/a
	8750.000	25.14	3.081	1.915	-2.919	n/a
	8800.000	26.23	2.953	1.941	-3.047	n/a
	9000.000	29.58	2.618	2.019	-3.382	n/a
	9050.000	27.81	2.785	1.978	-3.215	n/a
	9150.000	24.76	3.129	1.905	-2.871	n/a
	9246.540	20.83	3.719	1.807	-2.281	n/a

*Negative value indicates depth of flow is below the stem wall

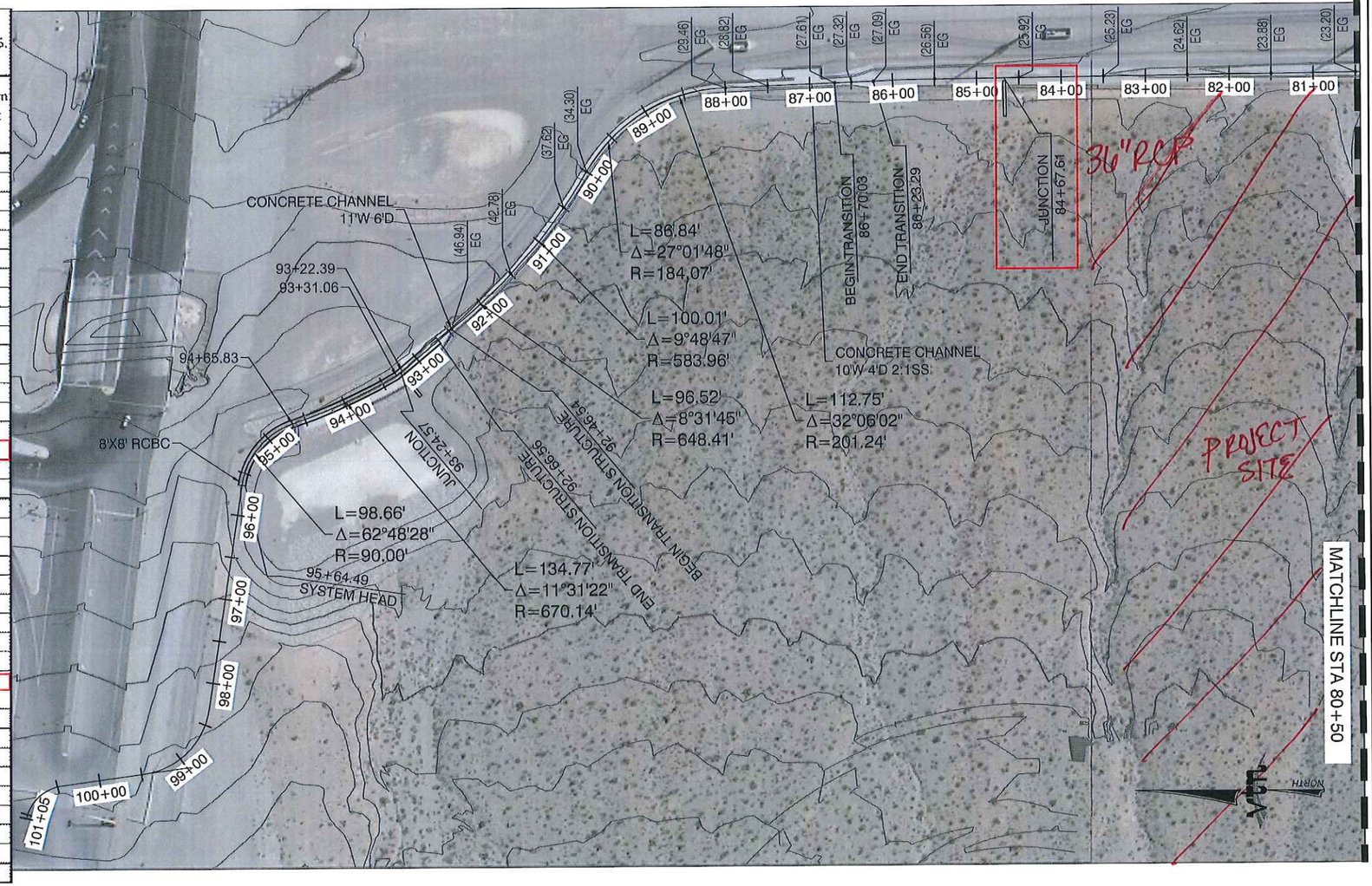


FIGURE 5:
WESTERN BELTWAY CHANNEL IMPROVEMENTS

W.O.#:	7851-5.8
DATE:	3/27/2019
BY:	RBR
SCALE:	1"=150'
SHEET	1 OF 1

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Beltway Channel\Drainage\2_ADD 1\A_Figures\Figure 10 - Western Beltway Improvements.dwg,rechelr, Jul 11, 2019 - 9:35am

```
T1 BELTWAY CHANNEL
T2 PTWA 0884   FILE NAME: BWC.WSW
T3 FILE: 8X8 RCB
SO   5267.99 3172.30   1      .015                 3180.3
R    5267.99 3172.30   1      .015                                    .000    .000 0
R    5655.59 3178.60   1      .015                                    .000    .000 0
R    6040.00 3190.13   1      .015                                    .000    .000 0
TS   6090.00 3193.53   3      .015
R    6200.00 3196.06   3      .015                                   8.372    .000 0
R    6250.00 3196.47   3      .015                                    .000    .000 0
R    6350.00 3197.52   3      .015                                    .000    .000 0
R    6450.00 3198.68   3      .015                                    .000    .000 0
R    6550.00 3200.84   3      .015                                    .000    .000 0
R    6650.00 3203.17   3      .015                                    .000    .000 0
R    6750.00 3205.43   3      .015                                    .000    .000 0
JX   6804.32 3206.37   3 36   .015   39.000         3207.19                45.0    .000
R    6850.00 3207.25   3      .015                                    .000    .000 0
R    6950.00 3208.63   3      .015                                  -3.603    .000 0
R    7050.00 3210.33   3      .015                                   3.467    .000 0
R    7150.00 3211.87   3      .015                                    .000    .000 0
R    7250.00 3213.61   3      .015                                    .000    .000 0
R    7350.00 3215.35   3      .015                                    .000    .000 0
R    7400.00 3216.20   3      .015                                    .000    .000 0
R    7425.96 3216.64   3      .015                                    .000    .000 0
JX   7441.22 3216.86   3 42   .015   61.000         3217.54                90.0    .000 PARCEL I
R    7450.00 3217.02   3      .015                                    .000    .000 0
R    7494.87 3217.80   3      .015                                    .000    .000 0
TS   7506.56 3218.01   2      .015
R    7600.00 3219.46   2      .015                                    .000    .000 0
R    7650.00 3219.99   2      .015                                    .000    .000 0
R    7850.00 3221.66   2      .015                                   8.750    .000 0
R    7950.00 3222.33   2      .015                                    .000    .000 0
R    8050.00 3223.20   2      .015                                    .000    .000 0
R    8150.00 3223.88   2      .015                                    .000     .000 0
R    8250.00 3224.62   2      .015                                    .000    .000 0
R    8350.00 3225.23   2      .015                                    .000    .000 0
R    8450.00 3225.92   2      .015                                    .000    .000 0
R    8467.69 3226.01   2      .015                                    .000    .000 0
R    8550.00 3226.56   2      .015                                    .000    .000 0
R    8623.29 3227.07   2      .015                                    .000    .000 0
TS   8670.03 3227.32   4      .015
R    8750.00 3228.82   4      .015                                    .000    .000 0
R    8800.00 3229.46   4      .015                                    .000    .000 0
R    8913.18 3231.10   4      .015                                 -32.101    .000 0
R    9000.00 3234.30   4      .015                                 -27.030    .000 0
R    9050.00 3237.62   4      .015                                    .000    .000 0
R    9150.00 3242.78   4      .015                                   9.913    .000 0
R    9246.54 3246.94   4      .015                                   8.529    .000 0

TS   9266.56 3247.34   1      .015
JX   9324.57 3247.92   1 36   .015   73.000         3248.92                90.0    .000
R    9331.06 3247.98   1      .015                                    .000  10.000 0
R    9465.83 3249.33   1      .015                                  11.523  00.000 0
R    9564.49 3250.32   1      .015                                 -62.808  00.000
SH   9564.49 3250.32   1
CD   1  3   0    .000   8.000    8.000  .000  .000   .00
CD   2  1   0    .000   4.000   10.000 2.000 2.000   .00
CD   3  1   0    .000   5.000   10.000 2.000 2.000   .00
CD   4  2   0    .000   6.000   11.000  .000  .000   .00
CD  24  4   0    .000   2.000    0.000  .000  .000   .00
CD  36  4   0    .000   3.000    0.000  .000  .000   .00
CD  42  4   0    .000   3.500    0.000  .000  .000   .00
Q           779.000   .0
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Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
5267.991	3172.300	5.171	3177.471	952.00	23.01	8.22	3185.70	.00	7.61	8.00	8.000	8.000	.00	0 .0
179.793	.0163					.0194	3.49	5.17	1.78	5.41	.015	.00	.00	BOX
5447.784	3175.222	4.934	3180.156	952.00	24.12	9.03	3189.19	.00	7.61	8.00	8.000	8.000	.00	0 .0
117.970	.0163					.0220	2.59	4.93	1.91	5.41	.015	.00	.00	BOX
5565.754	3177.140	4.704	3181.844	952.00	25.30	9.94	3191.78	.00	7.61	8.00	8.000	8.000	.00	0 .0
89.836	.0163					.0249	2.23	4.70	2.06	5.41	.015	.00	.00	BOX
5655.590	3178.600	4.485	3183.085	952.00	26.53	10.93	3194.02	.00	7.61	8.00	8.000	8.000	.00	0 .0
57.944	.0300					.0260	1.50	4.49	2.21	4.28	.015	.00	.00	BOX
5713.535	3180.338	4.547	3184.885	952.00	26.17	10.64	3195.52	.00	7.61	8.00	8.000	8.000	.00	0 .0
124.369	.0300					.0240	2.99	4.55	2.16	4.28	.015	.00	.00	BOX
5837.903	3184.068	4.769	3188.837	952.00	24.95	9.67	3198.51	.00	7.61	8.00	8.000	8.000	.00	0 .0
73.468	.0300					.0212	1.56	4.77	2.01	4.28	.015	.00	.00	BOX
5911.372	3186.272	5.002	3191.273	952.00	23.79	8.79	3200.06	.00	7.61	8.00	8.000	8.000	.00	0 .0
49.286	.0300					.0187	.92	5.00	1.87	4.28	.015	.00	.00	BOX
5960.657	3187.750	5.246	3192.996	952.00	22.68	7.99	3200.99	.00	7.61	8.00	8.000	8.000	.00	0 .0
35.038	.0300					.0166	.58	5.25	1.75	4.28	.015	.00	.00	BOX
5995.695	3188.801	5.502	3194.303	952.00	21.63	7.26	3201.57	.00	7.61	8.00	8.000	8.000	.00	0 .0
25.563	.0300					.0147	.37	5.50	1.63	4.28	.015	.00	.00	BOX

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6021.258	3189.568	5.770	3195.338	952.00	20.62	6.60	3201.94	.00	7.61	8.00	8.000	8.000	.00	0 .0
18.742	.0300					.0130	.24	5.77	1.51	4.28	.015	.00	.00	BOX
6040.000	3190.130	6.052	3196.182	952.00	19.66	6.00	3202.19	.00	7.61	8.00	8.000	8.000	.00	0 .0
TRANS STR	.0680					.0146	.73	6.05	1.41		.015	.00	.00	BOX
6090.000	3193.530	2.919	3196.449	952.00	20.59	6.59	3203.03	.49	4.78	21.68	5.000	10.000	2.00	0 .0
56.936	.0230					.0163	.93	3.41	2.49	2.70	.015	.00	2.00	TRAP
6146.936	3194.840	2.997	3197.837	952.00	19.86	6.12	3203.96	.47	4.78	21.99	5.000	10.000	2.00	0 .0
53.064	.0230					.0145	.77	3.46	2.37	2.70	.015	.00	2.00	TRAP
6200.000	3196.060	3.102	3199.163	952.00	18.94	5.57	3204.73	.00	4.78	22.41	5.000	10.000	2.00	0 .0
50.000	.0082					.0142	.71	3.10	2.23	3.53	.015	.00	2.00	TRAP
6250.000	3196.470	3.031	3199.501	952.00	19.56	5.94	3205.44	.00	4.78	22.12	5.000	10.000	2.00	0 .0
10.841	.0105					.0149	.16	3.03	2.32	3.31	.015	.00	2.00	TRAP
6260.841	3196.584	3.020	3199.604	952.00	19.65	6.00	3205.60	.00	4.78	22.08	5.000	10.000	2.00	0 .0
89.159	.0105					.0161	1.43	3.02	2.34	3.31	.015	.00	2.00	TRAP

6350.000	3197.520	2.917	3200.437	952.00	20.61	6.60	3207.03	.00	4.78	21.67	5.000	10.000	2.00	0	.0	
21.565	.0116					.0174	.38	2.92	2.49	3.23	.015	.00	2.00	TRAP		
6371.565	3197.770	2.893	3200.663	952.00	20.85	6.75	3207.41	.00	4.78	21.57	5.000	10.000	2.00	0	.0	
78.435	.0116					.0189	1.49	2.89	2.52	3.23	.015	.00	2.00	TRAP		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6450.000	3198.680	2.793	3201.473	952.00	21.86	7.42	3208.90	.00	4.78	21.17	5.000	10.000	2.00	0	.0	
100.000	.0216					.0198	1.98	2.79	2.69	2.74	.015	.00	2.00	TRAP		
6550.000	3200.840	2.823	3203.663	952.00	21.56	7.22	3210.88	.00	4.78	21.29	5.000	10.000	2.00	0	.0	
100.000	.0233					.0183	1.83	2.82	2.64	2.69	.015	.00	2.00	TRAP		
6650.000	3203.170	2.911	3206.081	952.00	20.67	6.63	3212.71	.00	4.78	21.64	5.000	10.000	2.00	0	.0	
33.396	.0226					.0168	.56	2.91	2.50	2.71	.015	.00	2.00	TRAP		
6683.396	3203.925	2.949	3206.874	952.00	20.31	6.40	3213.28	.00	4.78	21.79	5.000	10.000	2.00	0	.0	
66.604	.0226					.0154	1.03	2.95	2.44	2.71	.015	.00	2.00	TRAP		
6750.000	3205.430	3.053	3208.483	952.00	19.36	5.82	3214.30	.00	4.78	22.21	5.000	10.000	2.00	0	.0	
JUNCT STR	.0173					.0151	.82	3.05	2.29		.015	.00	2.00	TRAP		
6804.320	3206.370	2.911	3209.281	913.00	19.82	6.10	3215.38	.00	4.68	21.64	5.000	10.000	2.00	0	.0	
45.680	.0193					.0155	.71	2.91	2.39	2.77	.015	.00	2.00	TRAP		
6850.000	3207.250	2.948	3210.198	913.00	19.48	5.89	3216.09	.21	4.68	21.79	5.000	10.000	2.00	0	.0	
100.000	.0138					.0155	1.55	3.16	2.34	3.02	.015	.00	2.00	TRAP		
6950.000	3208.630	2.911	3211.541	913.00	19.82	6.10	3217.64	.21	4.68	21.64	5.000	10.000	2.00	0	.0	
100.000	.0170					.0156	1.56	3.12	2.39	2.86	.015	.00	2.00	TRAP		
7050.000	3210.330	2.941	3213.271	913.00	19.54	5.93	3219.20	.00	4.68	21.77	5.000	10.000	2.00	0	.0	
100.000	.0154					.0152	1.52	2.94	2.35	2.93	.015	.00	2.00	TRAP		

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
7150.000	3211.870	2.945	3214.815	913.00	19.51	5.91	3220.72	.00	4.68	21.78	5.000	10.000	2.00	0	.0	
100.000	.0174					.0146	1.46	2.95	2.35	2.84	.015	.00	2.00	TRAP		
7250.000	3213.610	3.011	3216.621	913.00	18.92	5.56	3222.18	.00	4.68	22.04	5.000	10.000	2.00	0	.0	
11.805	.0174					.0139	.16	3.01	2.25	2.84	.015	.00	2.00	TRAP		
7261.805	3213.815	3.021	3216.837	913.00	18.84	5.51	3222.35	.00	4.68	22.09	5.000	10.000	2.00	0	.0	
88.195	.0174					.0129	1.14	3.02	2.24	2.84	.015	.00	2.00	TRAP		
7350.000	3215.350	3.128	3218.478	913.00	17.96	5.01	3223.49	.00	4.68	22.51	5.000	10.000	2.00	0	.0	
50.000	.0170					.0115	.57	3.13	2.11	2.86	.015	.00	2.00	TRAP		
7400.000	3216.200	3.213	3219.413	913.00	17.30	4.65	3224.06	.00	4.68	22.85	5.000	10.000	2.00	0	.0	
25.960	.0169					.0105	.27	3.21	2.01	2.86	.015	.00	2.00	TRAP		
7425.960	3216.640	3.270	3219.910	913.00	16.88	4.43	3224.34	.00	4.68	23.08	5.000	10.000	2.00	0	.0	

STARTING WSE FOR 42" RCP

JUNCT STR	.0144					.0114	.17	3.27	1.94			.015	.00	2.00	TRAP				
7441.220	3216.860	2.979	3219.839	852.00	17.92	4.99	3224.83	.00	4.51	21.92		5.000	10.000	2.00	0	.0			
8.780	.0182					.0125	.11	2.98	2.14	2.71		.015	.00	2.00	TRAP				
7450.000	3217.020	2.993	3220.013	852.00	17.81	4.92	3224.94	.00	4.51	21.97		5.000	10.000	2.00	0	.0			
44.870	.0174					.0119	.53	2.99	2.13	2.74		.015	.00	2.00	TRAP				
7494.870	3217.800	3.067	3220.867	852.00	17.22	4.60	3225.47	.00	4.51	22.27		5.000	10.000	2.00	0	.0			
TRANS STR	.0180					.0112	.13	3.07	2.04			.015	.00	2.00	TRAP				

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
7506.560	3218.010	3.089	3221.099	852.00	17.05	4.51	3225.61	.00	4.51	22.35		4.000	10.000	2.00	0	.0			
50.517	.0155					.0105	.53	3.09	2.01	2.82		.015	.00	2.00	TRAP				
7557.077	3218.794	3.179	3221.973	852.00	16.39	4.17	3226.14	.00	4.51	22.72		4.000	10.000	2.00	0	.0			
42.923	.0155					.0093	.40	3.18	1.91	2.82		.015	.00	2.00	TRAP				
7600.000	3219.460	3.289	3222.750	852.00	15.62	3.79	3226.54	.00	4.51	23.16		4.000	10.000	2.00	0	.0			
50.000	.0106					.0084	.42	3.29	1.79	3.12		.015	.00	2.00	TRAP				
7650.000	3219.990	3.341	3223.331	852.00	15.29	3.63	3226.96	.17	4.51	23.36		4.000	10.000	2.00	0	.0			
200.000	.0083					.0080	1.60	3.51	1.74	3.32		.015	.00	2.00	TRAP				
7850.000	3221.660	3.378	3225.038	852.00	15.05	3.52	3228.56	.00	4.51	23.51		4.000	10.000	2.00	0	.0			
100.000	.0067					.0081	.81	3.38	1.71	3.51		.015	.00	2.00	TRAP				
7950.000	3222.330	3.307	3225.637	852.00	15.51	3.73	3229.37	.00	4.51	23.23		4.000	10.000	2.00	0	.0			
100.000	.0087					.0084	.84	3.31	1.78	3.29		.015	.00	2.00	TRAP				
8050.000	3223.200	3.320	3226.520	852.00	15.42	3.69	3230.21	.00	4.51	23.28		4.000	10.000	2.00	0	.0			
100.000	.0068					.0088	.88	3.32	1.76	3.50		.015	.00	2.00	TRAP				
8150.000	3223.880	3.231	3227.111	852.00	16.02	3.98	3231.09	.00	4.51	22.93		4.000	10.000	2.00	0	.0			
100.000	.0074					.0098	.98	3.23	1.85	3.43		.015	.00	2.00	TRAP				
8250.000	3224.620	3.139	3227.759	852.00	16.67	4.32	3232.08	.00	4.51	22.56		4.000	10.000	2.00	0	.0			
40.426	.0061					.0108	.44	3.14	1.95	3.60		.015	.00	2.00	TRAP				

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
8290.426	3224.867	3.075	3227.941	852.00	17.16	4.57	3232.51	.00	4.51	22.30		4.000	10.000	2.00	0	.0			
59.574	.0061					.0120	.72	3.07	2.03	3.60		.015	.00	2.00	TRAP				
8350.000	3225.230	2.970	3228.200	852.00	18.00	5.03	3233.23	.00	4.51	21.88		4.000	10.000	2.00	0	.0			
46.837	.0069					.0135	.63	2.97	2.16	3.49		.015	.00	2.00	TRAP				
8396.837	3225.553	2.890	3228.443	852.00	18.68	5.42	3233.86	.00	4.51	21.56		4.000	10.000	2.00	0	.0			
53.163	.0069					.0152	.81	2.89	2.26	3.49		.015	.00	2.00	TRAP				
8450.000	3225.920	2.791	3228.710	852.00	19.60	5.96	3234.67	.00	4.51	21.16		4.000	10.000	2.00	0	.0			

17.690	.0051					.0167	.30	2.79	2.41	3.77	.015	.00	2.00	TRAP	
8467.690	3226.010	2.749	3228.759	852.00	20.00	6.21	3234.97	.00	4.51	21.00	4.000	10.000	2.00	0	.0
40.858	.0067					.0183	.75	2.75	2.47	3.52	.015	.00	2.00	TRAP	
8508.549	3226.283	2.662	3228.945	852.00	20.89	6.77	3235.72	.00	4.51	20.65	4.000	10.000	2.00	0	.0
41.451	.0067					.0208	.86	2.66	2.62	3.52	.015	.00	2.00	TRAP	
8550.000	3226.560	2.569	3229.129	852.00	21.91	7.45	3236.58	.00	4.51	20.28	4.000	10.000	2.00	0	.0
36.910	.0070					.0237	.87	2.57	2.79	3.48	.015	.00	2.00	TRAP	
8586.910	3226.817	2.483	3229.300	852.00	22.92	8.16	3237.46	.00	4.51	19.93	4.000	10.000	2.00	0	.0
36.380	.0070					.0270	.98	2.48	2.96	3.48	.015	.00	2.00	TRAP	
8623.290	3227.070	2.396	3229.466	852.00	24.04	8.98	3238.44	.00	4.51	19.58	4.000	10.000	2.00	0	.0
TRANS STR	.0053					.0263	1.23	2.40	3.15		.015	.00	2.00	TRAP	

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WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
8670.030	3227.320	3.178	3230.498	852.00	24.37	9.22	3239.72	.00	5.71	11.00	6.000	11.000	.00	0 .0
79.970	.0188					.0249	1.99	3.18	2.41	3.46	.015	.00	.00	RECTANG
8750.000	3228.820	3.081	3231.901	852.00	25.14	9.81	3241.71	.00	5.71	11.00	6.000	11.000	.00	0 .0
50.000	.0128					.0277	1.38	3.08	2.52	3.96	.015	.00	.00	RECTANG
8800.000	3229.460	2.953	3232.413	852.00	26.23	10.69	3243.10	1.16	5.71	11.00	6.000	11.000	.00	0 .0
13.185	.0145					.0298	.39	4.12	2.69	3.79	.015	.00	.00	RECTANG
8813.185	3229.651	2.920	3232.572	852.00	26.52	10.92	3243.49	1.19	5.71	11.00	6.000	11.000	.00	0 .0
53.036	.0145					.0325	1.72	4.11	2.73	3.79	.015	.00	.00	RECTANG
8866.221	3230.420	2.784	3233.204	852.00	27.82	12.01	3245.22	1.31	5.71	11.00	6.000	11.000	.00	0 .0
46.959	.0145					.0373	1.75	4.09	2.94	3.79	.015	.00	.00	RECTANG
8913.180	3231.100	2.655	3233.755	852.00	29.17	13.22	3246.97	1.58	5.71	11.00	6.000	11.000	.00	0 .0
86.820	.0369					.0407	3.53	4.23	3.16	2.73	.015	.00	.00	RECTANG
9000.000	3234.300	2.618	3236.918	852.00	29.58	13.59	3250.51	.00	5.71	11.00	6.000	11.000	.00	0 .0
13.187	.0664					.0407	.54	2.62	3.22	2.23	.015	.00	.00	RECTANG
9013.187	3235.176	2.655	3237.831	852.00	29.17	13.21	3251.04	.00	5.71	11.00	6.000	11.000	.00	0 .0
36.813	.0664					.0373	1.37	2.66	3.15	2.23	.015	.00	.00	RECTANG
9050.000	3237.620	2.785	3240.405	852.00	27.81	12.01	3252.42	.46	5.71	11.00	6.000	11.000	.00	0 .0
24.397	.0516					.0337	.82	3.24	2.94	2.43	.015	.00	.00	RECTANG

Program Package Serial Number: 1513

WATER SURFACE PROFILE LISTING Date: 7-10-2019 Time:11:55:14

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
9074.397	3238.879	2.844	3241.723	852.00	27.23	11.52	3253.24	.44	5.71	11.00	6.000	11.000	.00	0 .0
43.237	.0516					.0306	1.32	3.28	2.85	2.43	.015	.00	.00	RECTANG
9117.635	3241.110	2.983	3244.093	852.00	25.96	10.47	3254.56	.40	5.71	11.00	6.000	11.000	.00	0 .0
32.365	.0516					.0267	.86	3.38	2.65	2.43	.015	.00	.00	RECTANG

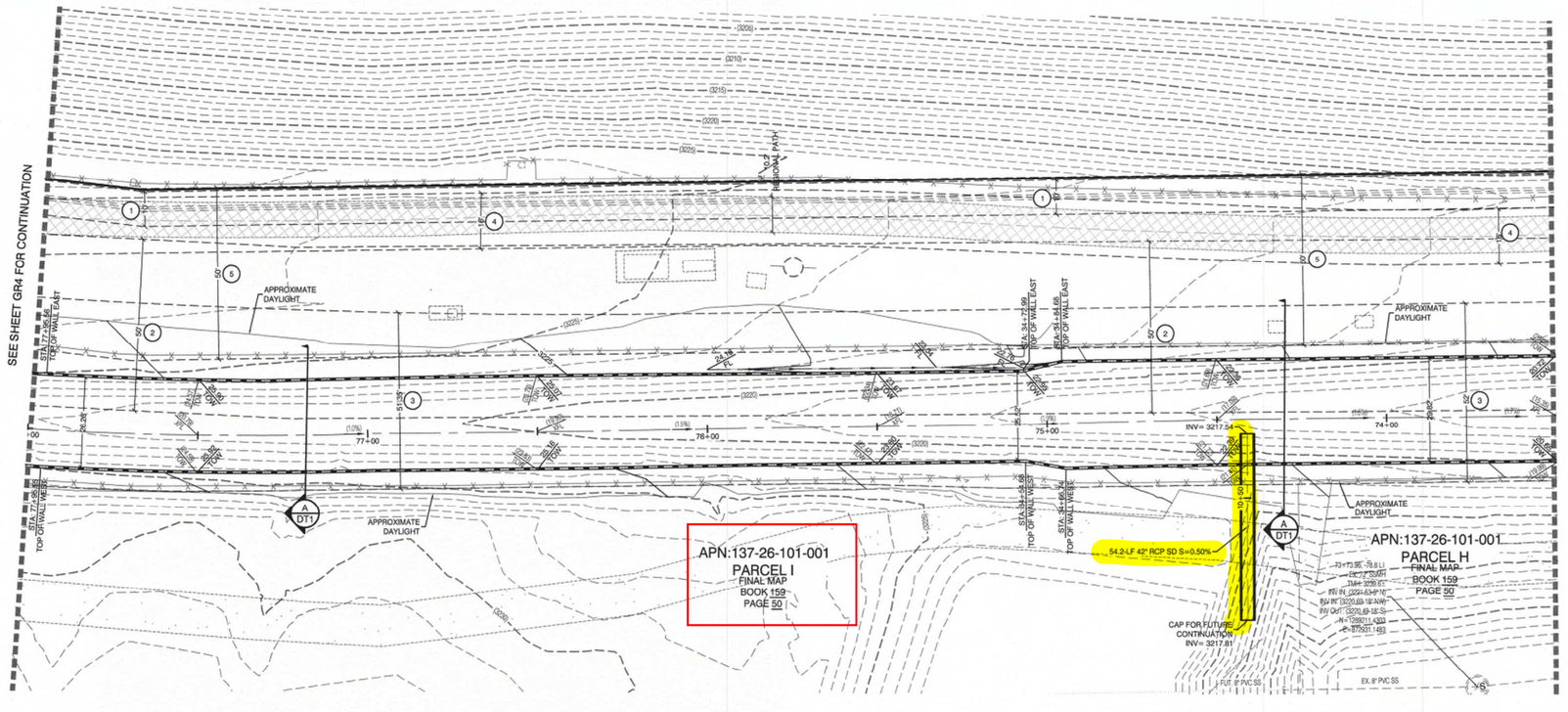
9150.000	3242.780	3.129	3245.909	852.00	24.76	9.52	3255.43	.32	5.71	11.00	6.000	11.000	.00	0	.0
23.893	.0431					.0239	.57	3.45	2.47	2.59	.015	.00	.00	RECTANG	
9173.893	3243.810	3.224	3247.033	852.00	24.03	8.96	3256.00	.30	5.71	11.00	6.000	11.000	.00	0	.0
30.317	.0431					.0214	.65	3.53	2.36	2.59	.015	.00	.00	RECTANG	
9204.210	3245.116	3.381	3248.497	852.00	22.91	8.15	3256.65	.28	5.71	11.00	6.000	11.000	.00	0	.0
23.611	.0431					.0187	.44	3.66	2.20	2.59	.015	.00	.00	RECTANG	
9227.821	3246.133	3.546	3249.679	852.00	21.84	7.41	3257.09	.25	5.71	11.00	6.000	11.000	.00	0	.0
18.719	.0431					.0164	.31	3.80	2.04	2.59	.015	.00	.00	RECTANG	
9246.540	3246.940	3.719	3250.659	852.00	20.83	6.73	3257.39	.00	5.71	11.00	6.000	11.000	.00	0	.0
TRANS STR	.0200					.0110	.22	3.72	1.90		.015	.00	.00	RECTANG	
9266.560	3247.340	7.063	3254.404	852.00	15.08	3.53	3257.93	.00	7.06	8.00	8.000	8.000	.00	0	.0
JUNCT STR	.0100					.0060	.35	7.06	1.00		.015	.00	.00	BOX	
9324.570	3247.920	8.195	3256.115	779.00	12.17	2.30	3258.42	.00	6.65	8.00	8.000	8.000	.00	0	.0
6.489	.0093					.0060	.04	8.20	.76	5.76	.015	.00	.00	BOX	

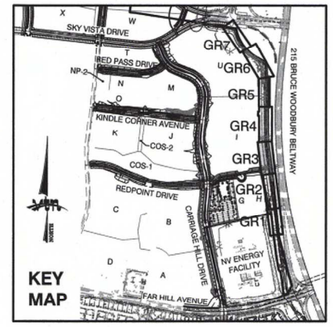
BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
9331.060	3247.980	8.250	3256.230	779.00	12.17	2.30	3258.53	.00	6.65	8.00	8.000	8.000	.00	0	.0
96.730	.0100					.0060	.58	.00	.76	5.59	.015	.00	.00	BOX	
9427.790	3248.949	8.000	3256.949	779.00	12.17	2.30	3259.25	8.00	6.65	8.00	8.000	8.000	.00	0	.0
25.020	.0100					.0041	.10	8.00	.76	5.59	.015	.00	.00	BOX	
9452.810	3249.200	7.627	3256.826	779.00	12.77	2.53	3259.36	.06	6.65	8.00	8.000	8.000	.00	0	.0
3.979	.0100					.0046	.02	7.69	.81	5.59	.015	.00	.00	BOX	
		---------- WARNING - Flow depth near top of box conduit ----------													
9456.788	3249.240	7.562	3256.802	779.00	12.88	2.57	3259.38	.06	6.65	8.00	8.000	8.000	.00	0	.0
HYDRAULIC JUMP															
		---------- WARNING - Flow depth near top of box conduit ----------													
9456.788	3249.240	5.818	3255.057	779.00	16.74	4.35	3259.41	.10	6.65	8.00	8.000	8.000	.00	0	.0
9.042	.0100					.0090	.08	5.92	1.22	5.59	.015	.00	.00	BOX	
9465.829	3249.330	5.831	3255.161	779.00	16.70	4.33	3259.49	.77	6.65	8.00	8.000	8.000	.00	0	.0
60.906	.0100					.0086	.52	6.60	1.22	5.58	.015	.00	.00	BOX	
9526.735	3249.941	6.048	3255.990	779.00	16.10	4.02	3260.01	.72	6.65	8.00	8.000	8.000	.00	0	.0
30.538	.0100					.0077	.24	6.76	1.15	5.58	.015	.00	.00	BOX	

BELTWAY CHANNEL
PTWA 0884 FILE NAME: BWC.WSW
FILE: 8X8 RCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
9557.273	3250.248	6.344	3256.591	779.00	15.35	3.66	3260.25	.65	6.65	8.00	8.000	8.000	.00	0	.0
7.217	.0100					.0068	.05	6.99	1.07	5.58	.015	.00	.00	BOX	
9564.490	3250.320	6.654	3256.974	779.00	14.63	3.33	3260.30	.59	6.65	8.00	8.000	8.000	.00	0	.0





NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20 '

EASEMENT REFERENCE LEGEND

1	50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19990310:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19961001:0000671.
2	50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3	DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4	PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080527:0005041.
5	10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°10'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

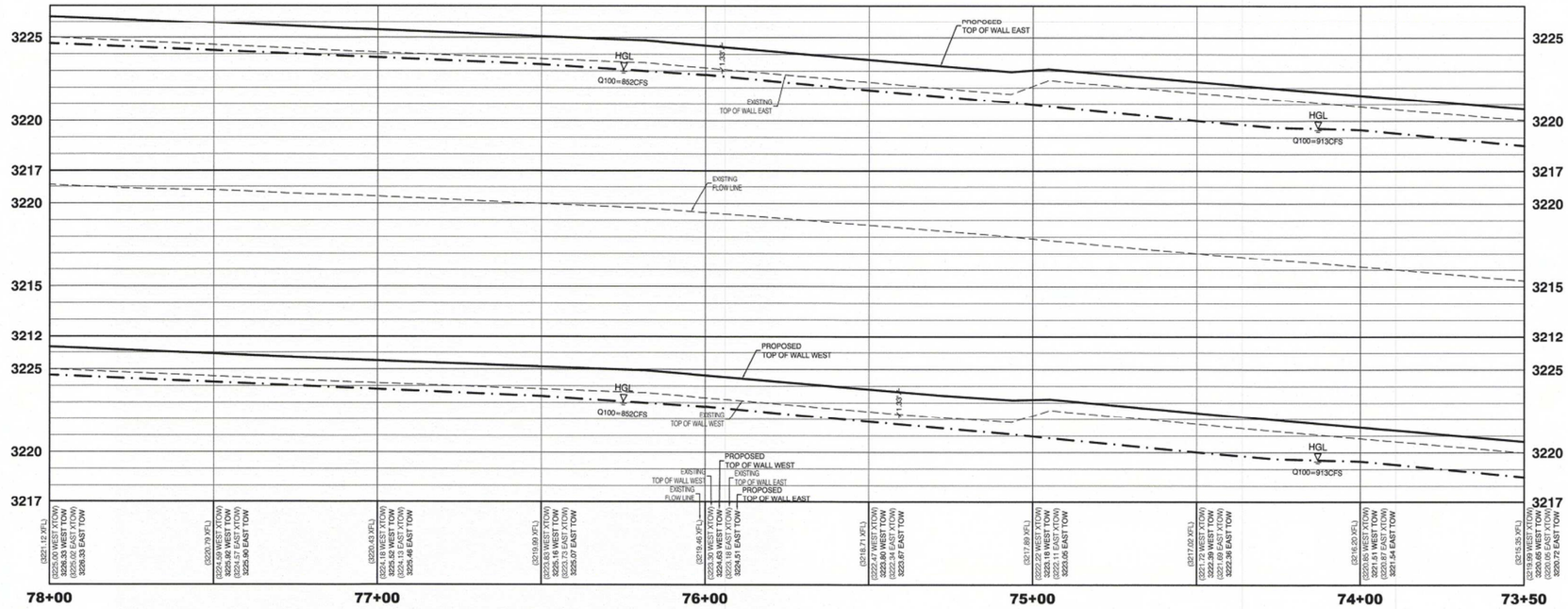
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

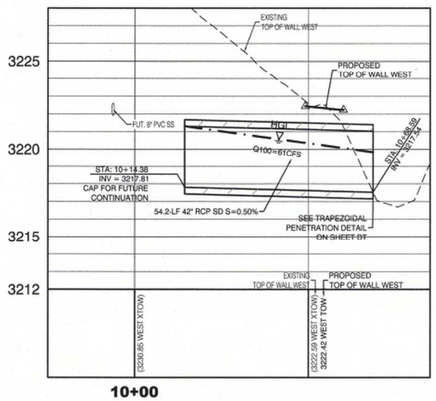
BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN. T21S,R59E,S03





STORM DRAIN LATERAL
STA:74+41.22
(PUBLIC)

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.

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: NOVA GEOTECHNICAL PROJECT #----, DATED MARCH 5, 2018 HTE #----

Call before you Dig
Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-229-4811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

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

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD. SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2697 WEB WWW.VTNEV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 3

SUMMERLIN WEST V21
BELTWAY CHANNEL SKY VISTA DRIVE TO NV ENERGY FACILITY
A DELAWARE LIMITED LIABILITY COMPANY

DRAWN BY:	BCC 02/07/2019
DESIGNED BY:	BSC 02/07/2019
CHECKED BY:	WJM 07/09/2019
PROJECT NO:	7951 SCALE: 1"=20' HORIZ. NA VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
7/11/19

SHEET
GR3
11 OF 17 SHEETS

DRAWING NO.

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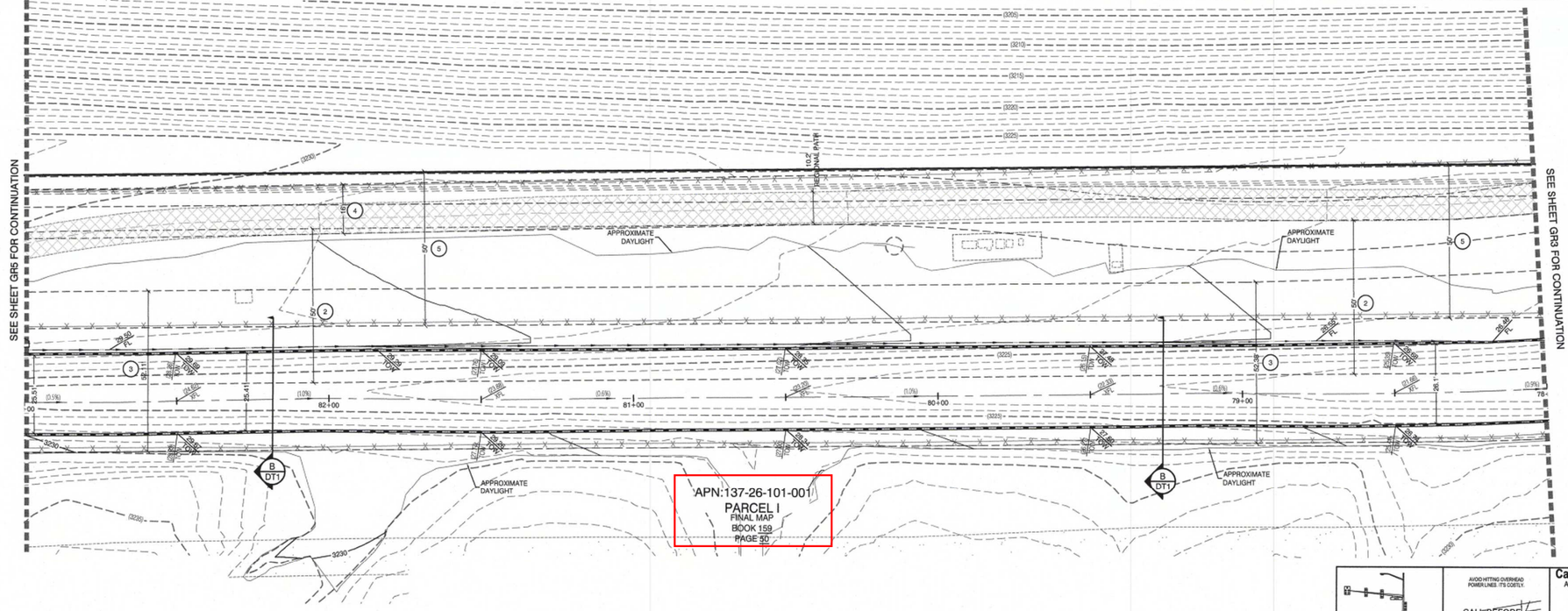

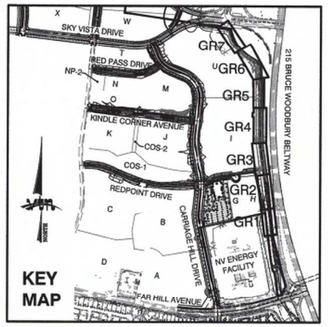

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20 '

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 969.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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: NOVA GEOTECHNICAL
PROJECT #----, DATED MARCH 5, 2018
HTE #----

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.

EASEMENT REFERENCE LEGEND

1. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 1996031:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 1996001:0000671.
2. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4. PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080527:0005041.
5. 10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

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
Avoid cutting underground utility lines. It's costly.
CALL 811 OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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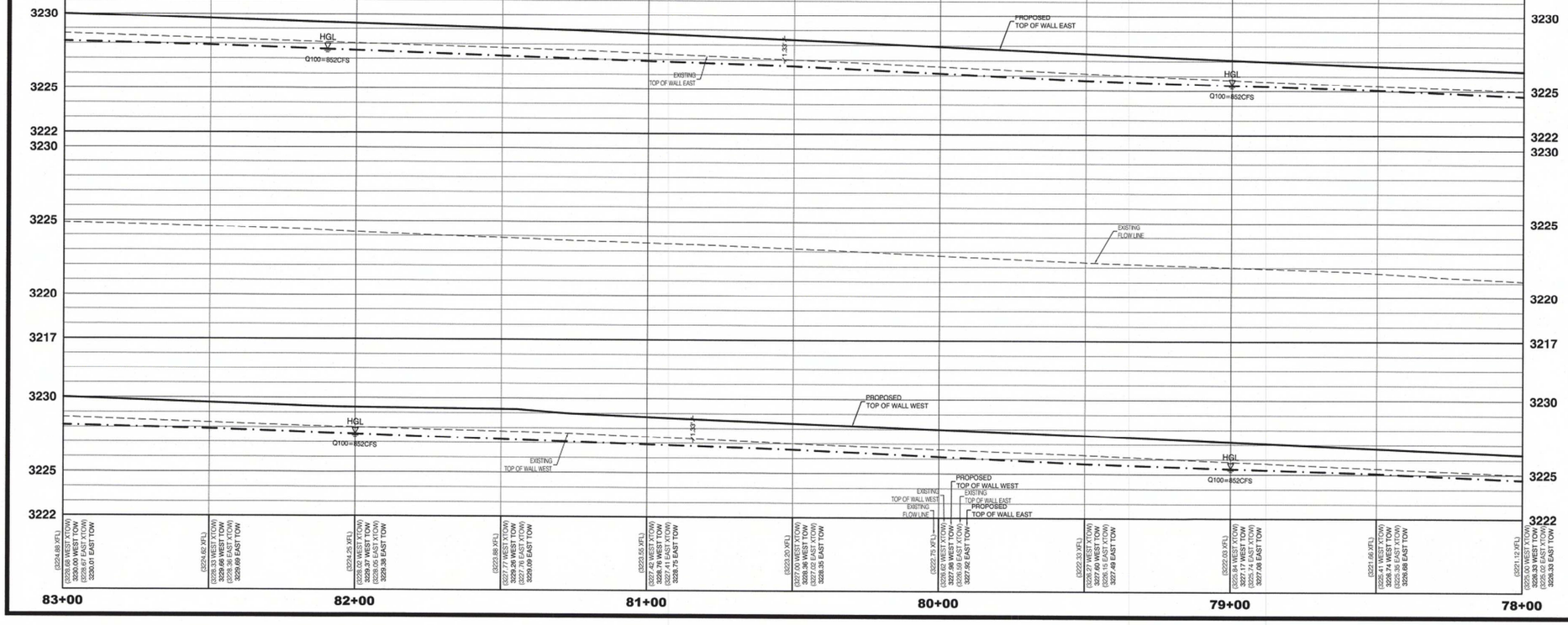
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929



REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10001 PARK RUN DRIVE LAS VEGAS, NEVADA 89145
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 4

SUMMERLIN WEST V21
BELTWAY CHANNEL SKY VISTA DRIVE TO NV ENERGY FACILITY
A DELAWARE LIMITED LIABILITY COMPANY

DRAWN BY: BCC	02/27/2019		
DESIGNED BY: BCC	02/27/2019		
CHECKED BY: WJM	07/09/2019	SCALE: 1"=20'	HORIZ.
PROJECT NO: 7851		N/A	VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
7/11/19

SHEET
GR4
12 OF 17 SHEETS

DRAWING NO.

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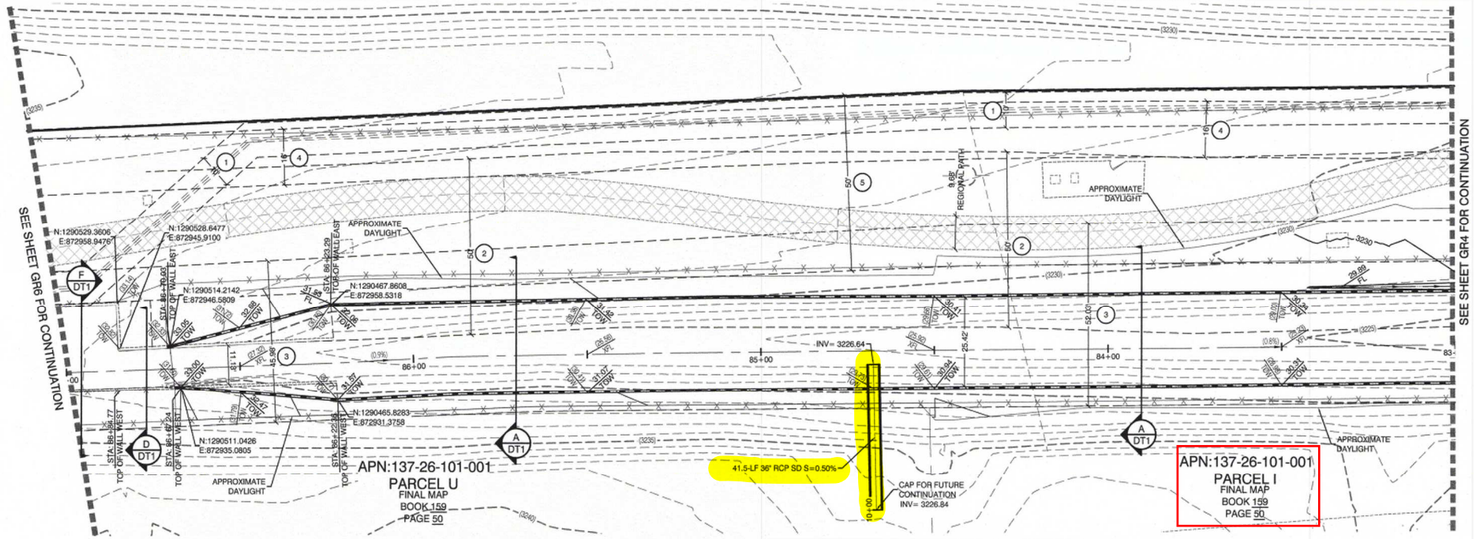


BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

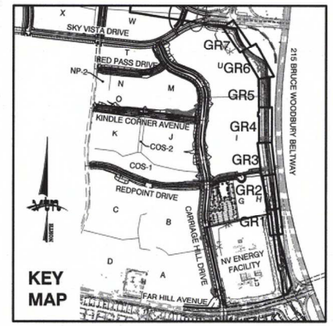
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.



BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

NORTH

GRAPHIC SCALE
-20 0 10 20 40
1" = 20 '

ENGINEER DISCLAIMER NOTE:

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EASEMENT REFERENCE LEGEND

1. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19990310:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19961001:0000671.
2. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4. PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080627:0005041.
5. 10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

GRADING PERMIT NOTE

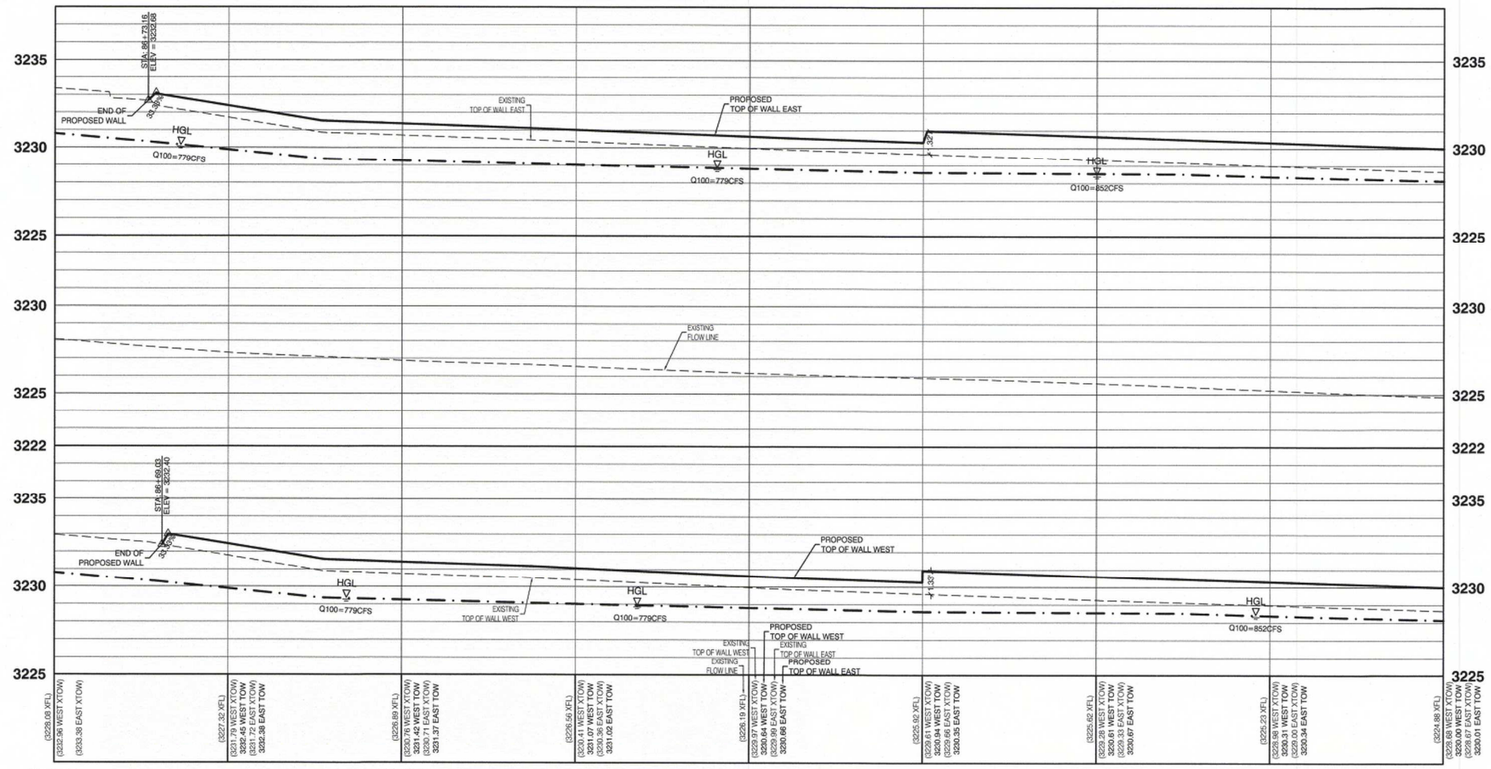
THIS GRADING PERMIT DOES NOT INCLUDE THE CONSTRUCTION OF RETAINING WALLS AND OTHERS STRUCTURES. SEPARATE PERMITS AND APPLICATIONS ARE REQUIRED FOR THESE.

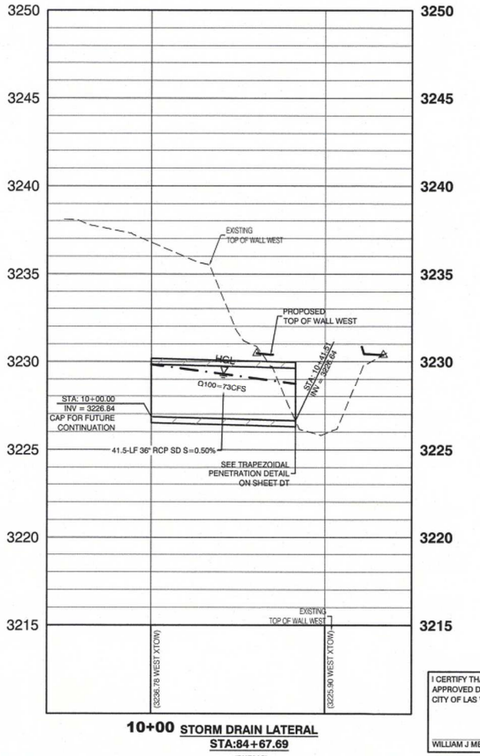
GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #----, DATED MARCH 5, 2018
HTE #----

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.





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

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

REV	DATE	BY	REVISION

VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2895 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 5

SUMMERLIN WEST V21
BELTWAY CHANNEL SKY VISTA DRIVE TO NV ENERGY FACILITY
A DELAWARE LIMITED LIABILITY COMPANY

DRAWN BY: BCC	02/07/2019	SCALE: 1"=20' HORIZ. N/A VERT.	
DESIGNED BY: BCC	02/07/2019		
CHECKED BY: WJM	07/08/2019		
PROJECT NO: 7851			

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
7/11/19

SHEET
GR5
13 OF 17 SHEETS

DRAWING NO.

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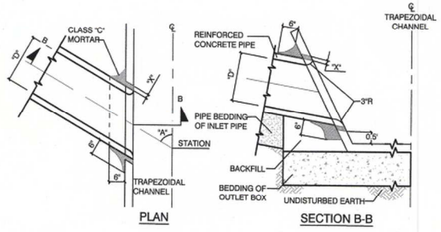
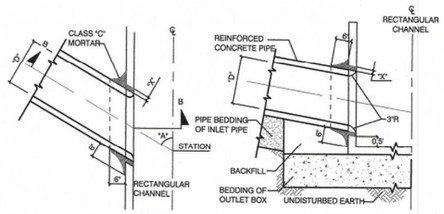


NOTES:

1. SEE PLAN FOR ANGLE 'A'
2. DIMENSION 'X' SHALL BE 2" MINIMUM AND 4" MAXIMUM
3. BURN OR CHIP END OF INLET PIPE FLUSH WITH INNER SURFACE OF MAINLINE. ROUND EDGES OF MAINLINE AND INLET PIPE.

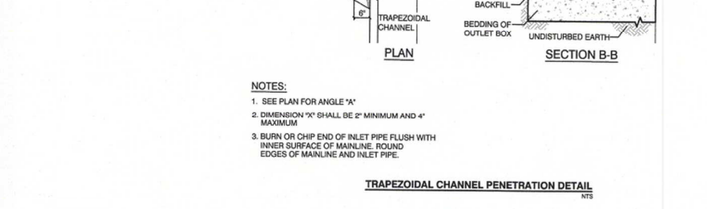
TRAPEZOIDAL CHANNEL PENETRATION DETAIL
NTS



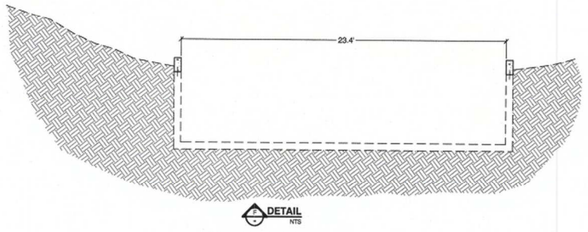
NOTES:

1. SEE PLAN FOR ANGLE 'A'
2. DIMENSION 'X' SHALL BE 2" MINIMUM AND 4" MAXIMUM
3. BURN OR CHIP END OF INLET PIPE FLUSH WITH INNER SURFACE OF MAINLINE. ROUND EDGES OF MAINLINE AND INLET PIPE.

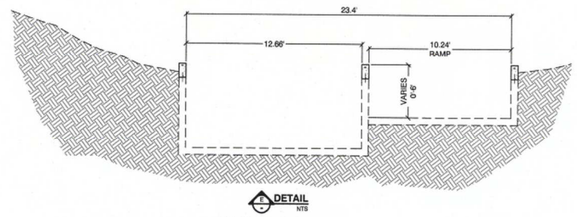
RECTANGULAR CHANNEL PENETRATION DETAIL
NTS



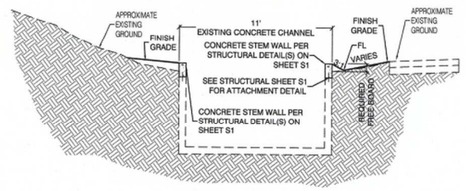
STA: 92+66.56 TO 95+64.49



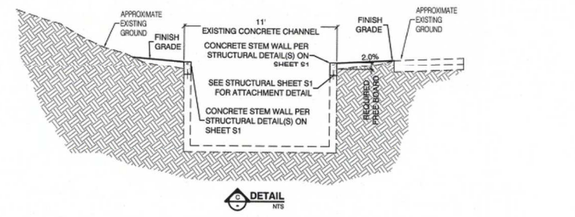
STA: 86+84.77 TO 87+18.46



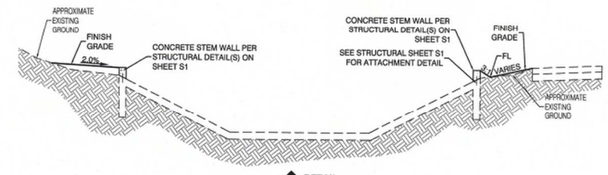
STA: 87+18.46 TO 87+77.36



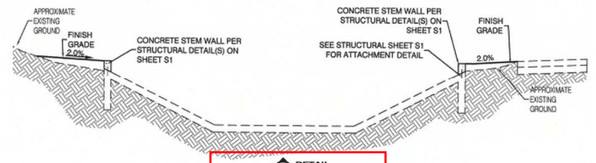
STA: 86+84.77 TO 86+70.87



STA: 87+77.36 TO 92+46.43



STA: 69+83.70 TO 71+75.06
STA: 74+95.17 TO 75+99.82
STA: 78+17.14 TO 83+41.85



STA: 67+90.88 TO 69+63.70
STA: 71+75.06 TO 74+95.17
STA: 75+99.82 TO 78+17.14
STA: 83+41.85 TO 86+70.88

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 N CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

CITY OF LAS VEGAS

REV	DATE	BY	REVISION

DETAIL SHEET

SUMMERLIN WEST V21
BELTWAY CHANNEL SKY VISTA DRIVE TO NV ENERGY FACILITY
A DELAWARE LIMITED LIABILITY COMPANY

DRAWN BY: BCC 02/07/2019
DESIGNED BY: BCC 02/07/2019
CHECKED BY: WJM 07/08/2019
PROJECT NO: 7951
SCALE: 1"=20' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/19
CIVIL
NO. 15745
7/11/19

SHEET
DT
16 OF 17 SHEETS

DRAWING NO.

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Update #2 to the Technical Drainage Study for

Summerlin West Village 21
Carriage Hill Drive
(Redpoint Drive to Summerlin Parkway)

Las Vegas, Nevada

Prepared for:

Howard Hughes Company, LLC

Submitted to:

City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: April 4, 2019
TO: **Land Development Services** Department of Building & Safety			FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Village 21 - Carriage Hill Drive – Update #1 (Redpoint Drive to Summerlin Parkway)**		**COPIES TO:** VTN Nevada
Cross Streets:	Carriage Hill Drive and Summerlin Parkway		The Howard Hughes Company LLC
File Number:	F:\Depot\DSMemos\DS5064C.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-26-101-001		CCRFCD
Zoning Action:			
FEMA Flood Zone	YES	NO **X**	
Proposed Storm Drain	YES **X**	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	11/13/2018 & 11/28/2018	12/6/2018	Not Approved	$400.00	500783: $400
2nd Submittal	1/31/2019	2/14/2019	Conditional Approval	$400.00	502868: $400
3rd Submittal & CCRFCD	3/14/2019 & 3/21/2019	4/4/2019	Concurrence Recv'd	$100.00	503994: $100
			TOTAL FEES (LDDRS):	**$900.00**	**----**

REMARKS:

3rd Submittal: Update #1 to upsize a 24"-lateral at Station 28+49.39 to a 30"-RCP

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

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

1. The project proposes to build temporary drainage facilities including drainage berms/swales along the west side of the proposed *Carriage Hill Drive*. Prior to final plan approval the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City of Las Vegas Flood Control* for approval. Once the drainage study is conditionally approved, the engineer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update / letter will be required to justify that the offsite berms / channels are no longer necessary and can be removed.

GRAPHIC SCALE

300 0 150 300 600

1" = 300'

LEGEND

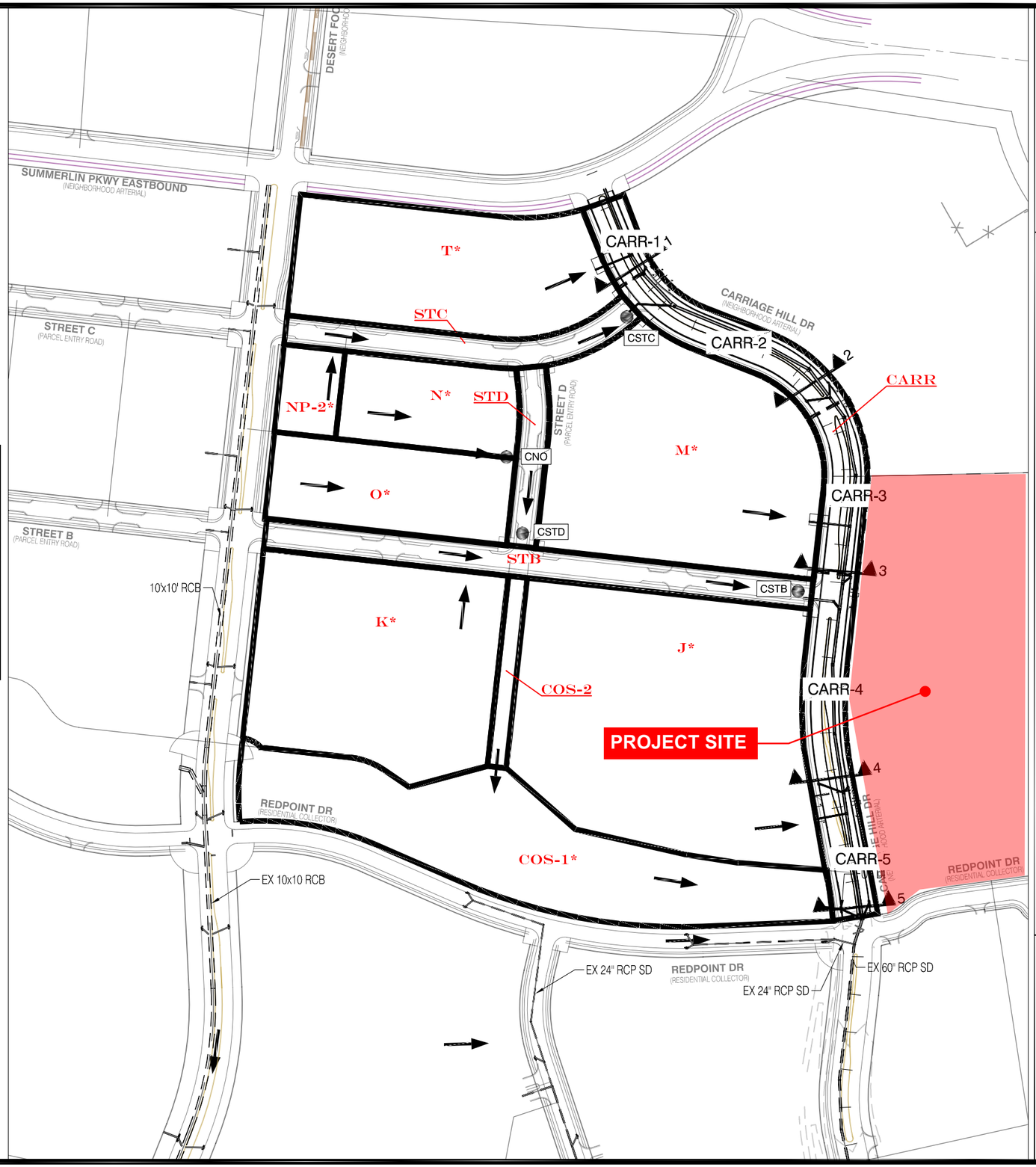
- CONCENTRATION POINT
- BASIN BOUNDARY
- ST7 — BASIN DESIGNATION
- PRORATED SUBBASIN BOUNDARY
- CARR-1 — PRORATED SUBBASIN DESIGNATION
- FLOW ARROW
- CROSS SECTION

ULTIMATE CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	**AREA (ac)**	**Q100 (CFS)**
T*	5.99	23
NP-2*	87	3
STC	1.68	7
CSTC	-	10
M*	9.11	32
N*	2.54	9
O*	3.43	13
CNO	-	22
STD	0.88	4
CSTD	-	26
K*	8.01	29
STB	2.68	12
CSTB	-	66
J*	11.83	42
COS-2	0.58	2
COS-1*	7.78	22
CCOS-1	-	24
CARR	5.78	22

*Referenced from the Master Study

ULTIMATE CONDITION OFFSITE PRORATED SUBBASINS		
BASIN ID	**AREA (ac)**	**Q100 (CFS)**
CARR	5.78	22
SUBBASIN	**AREA (ac)**	**Q100 (CFS)**
CARR-1	0.58	2
CARR-2	1.51	6
CARR-3	1.22	5
CARR-4	1.56	6
CARR-5	0.91	3

ULTIMATE CONDITION STREET FLOW ANALYSIS SUMMARY						
Street Section	**Q100 (cfs)**	**Slope**	**Velocity (ft/s)**	**Depth (ft)**	**V x D**	**Tributary Description**
1	2	5.31%	3.89	0.21	0.82	CARR-1
2	6	5.22%	4.38	0.29	1.27	CARR-2
3	5	1.65%	2.66	0.32	0.85	CARR-3
4	6	1.65%	2.77	0.33	0.91	CARR-4
5	4	1.66%	2.55	0.30	0.77	CARR-5, Section 4 Bypass



W.O.#:	7851-5.5
DATE:	09/2018
BY:	JYA
SCALE:	1" = 300'
SHEET	OF

FIGURE 8: ULTIMATE CONDITION BASIN MAP
SUMMERLIN VILLAGE 21 CARRIAGE HILL DRIVE
REDPOINT TO SUMMERLIN PARKWAY

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Carriage Hill Street A to Summerlin Pkwy\Drainage\A Figures\Figure 8 - Ultimate Basin Map.dwg;jayson; Sep 26, 2018 - 7:24pm

Worksheet for Section 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.65	%
Discharge	5.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+29.67	0.72
0+29.67	1.22
0+38.00	1.39
0+46.33	1.22
0+46.33	0.72
0+74.00	0.17
0+74.00	0.13
0+75.50	0.00
0+75.50	0.50
0+76.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.13)	0.013
(0+02.00, 0.13)	(0+29.67, 0.72)	0.016
(0+29.67, 0.72)	(0+46.33, 0.72)	0.013
(0+46.33, 0.72)	(0+74.00, 0.13)	0.016
(0+74.00, 0.13)	(0+76.00, 0.50)	0.013

Worksheet for Section 3

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 1.39 ft		
Flow Area		1.88	ft²
Wetted Perimeter		18.71	ft
Hydraulic Radius		0.10	ft
Top Width		17.98	ft
Normal Depth		0.32	ft
Critical Depth		0.35	ft
Critical Slope		0.00743	ft/ft
Velocity		2.66	ft/s
Velocity Head		0.11	ft
Specific Energy		0.43	ft
Froude Number		1.45	
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	0.35	ft
Channel Slope	1.65	%
Critical Slope	0.00743	ft/ft

Cross Section for Section 3

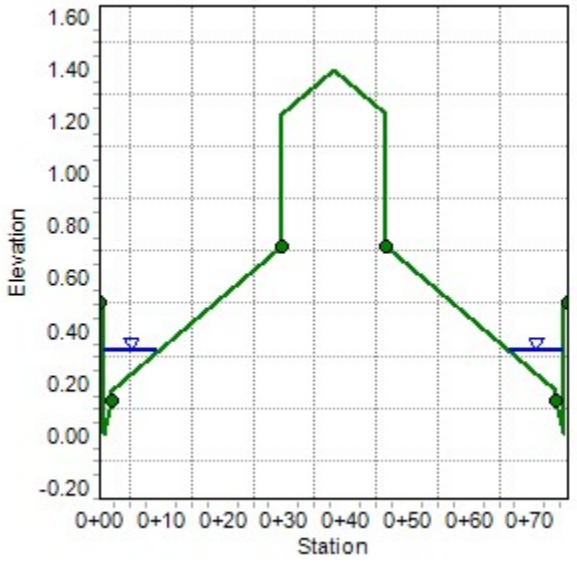
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.65	%
Normal Depth	0.32	ft
Discharge	5.00	ft³/s

Cross Section Image



Worksheet for Section 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.65	%
Discharge	6.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+29.67	0.72
0+29.67	1.22
0+38.00	1.39
0+46.33	1.22
0+46.33	0.72
0+74.00	0.17
0+74.00	0.13
0+75.50	0.00
0+75.50	0.50
0+76.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.13)	0.013
(0+02.00, 0.13)	(0+29.67, 0.72)	0.016
(0+29.67, 0.72)	(0+46.33, 0.72)	0.013
(0+46.33, 0.72)	(0+74.00, 0.13)	0.016
(0+74.00, 0.13)	(0+76.00, 0.50)	0.013

Worksheet for Section 4

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 1.39 ft		
Flow Area		2.16	ft²
Wetted Perimeter		20.29	ft
Hydraulic Radius		0.11	ft
Top Width		19.52	ft
Normal Depth		0.33	ft
Critical Depth		0.37	ft
Critical Slope		0.00729	ft/ft
Velocity		2.77	ft/s
Velocity Head		0.12	ft
Specific Energy		0.45	ft
Froude Number		1.47	
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	1.65	%
Critical Slope	0.00729	ft/ft

Cross Section for Section 4

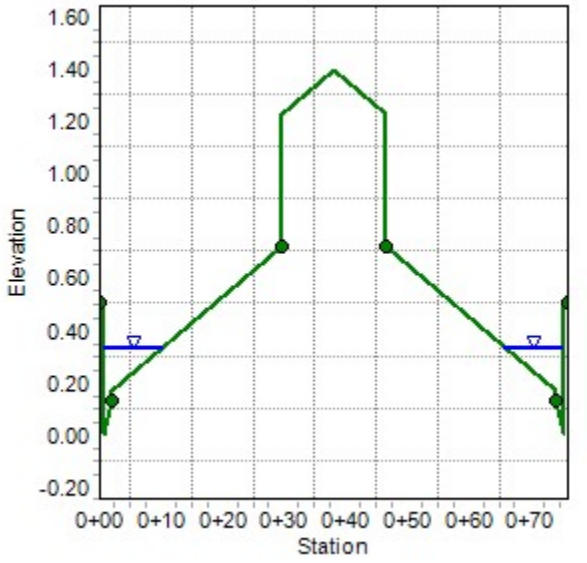
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.65	%
Normal Depth	0.33	ft
Discharge	6.00	ft³/s

Cross Section Image



Worksheet for Section 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.66	%
Discharge	4.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+29.67	0.72
0+29.67	1.22
0+38.00	1.39
0+46.33	1.22
0+46.33	0.72
0+74.00	0.17
0+74.00	0.13
0+75.50	0.00
0+75.50	0.50
0+76.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+02.00, 0.13)	0.013
(0+02.00, 0.13)	(0+29.67, 0.72)	0.016
(0+29.67, 0.72)	(0+46.33, 0.72)	0.013
(0+46.33, 0.72)	(0+74.00, 0.13)	0.016
(0+74.00, 0.13)	(0+76.00, 0.50)	0.013

Worksheet for Section 5

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		0.30	ft
Elevation Range	0.00 to 1.39 ft		
Flow Area		1.57	ft²
Wetted Perimeter		16.85	ft
Hydraulic Radius		0.09	ft
Top Width		16.15	ft
Normal Depth		0.30	ft
Critical Depth		0.33	ft
Critical Slope		0.00760	ft/ft
Velocity		2.55	ft/s
Velocity Head		0.10	ft
Specific Energy		0.40	ft
Froude Number		1.45	
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	0.30	ft
Critical Depth	0.33	ft
Channel Slope	1.66	%
Critical Slope	0.00760	ft/ft

Cross Section for Section 5

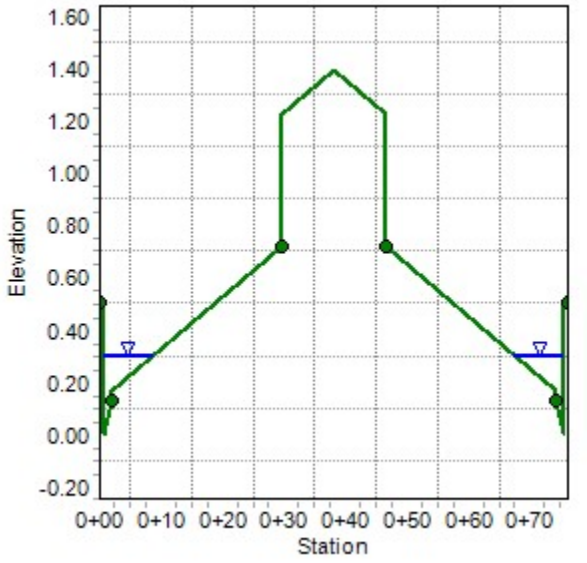
Project Description

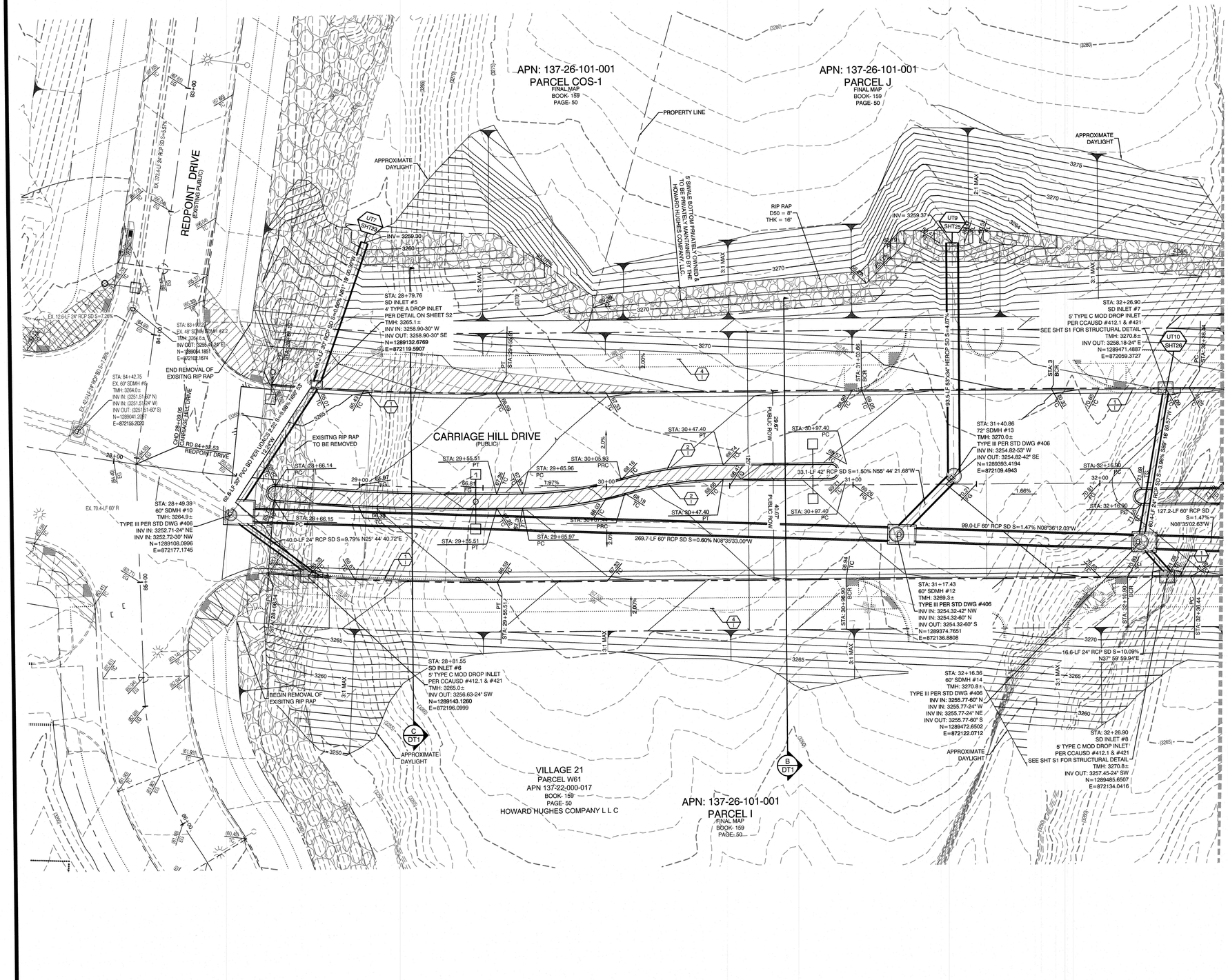
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

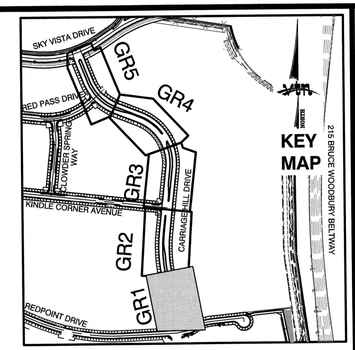
Channel Slope	1.66	%
Normal Depth	0.30	ft
Discharge	4.00	ft³/s

Cross Section Image





SEE SHEET GR2 STA 32+50 FOR CONTINUATION



NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. FUTURE SIDEWALK
4. CONSTRUCT HANDICAP RAMP PER STD. DWG. 225 CASE II
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT COMMERCIAL DRIVEWAY PER STD DWG #224

CONSTRUCTION NOTES

UT # / SHT #

UTILITY PROFILE REFERENCE LABEL
UT # = SHEET INDEX
SHT # = SHEET NUMBER

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-228-8611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO 'GROUND' DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D388 (REVISED 2008) NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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:

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

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DS5064A

WILLIAM J MEYER, P.E. No. 15745 DATE 7/31/19

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
No. 15745
CIVIL
7/31/19

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
(702) 791-4000

CITY OF LAS VEGAS

2772 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5146
PH. (702) 873-7500 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING DRAINAGE PLAN 1

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORZ.
BCC 10/22/2018	DEH 10/22/2018	WJM 05/06/2019	7851	1"=20'	VERT. N/A

SHEET
GR1
11 OF 44 SHEETS

DRAWING NO.
L19-00271
107V7673

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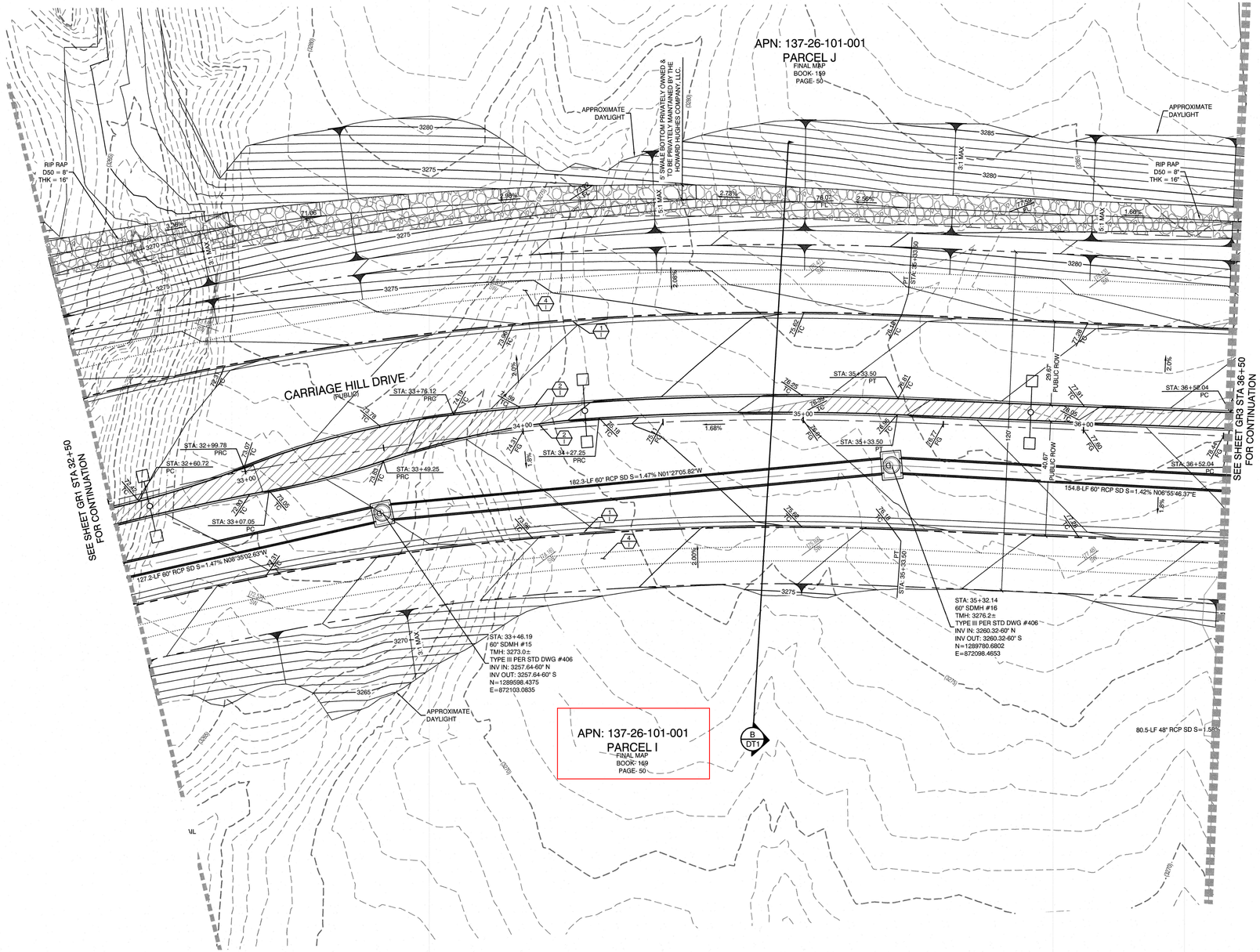

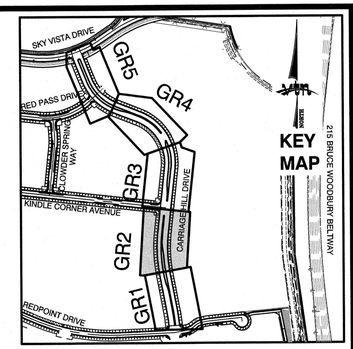

NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

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OR
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CLARK COUNTY TRAFFIC OPERATIONS

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
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BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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WILLIAM J MEYER , P.E. No. 15745 DATE 7/31/19

REV	DATE	BY	REVISION

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LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

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LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7350 FAX (702) 362-2997 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING DRAINAGE PLAN 2

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

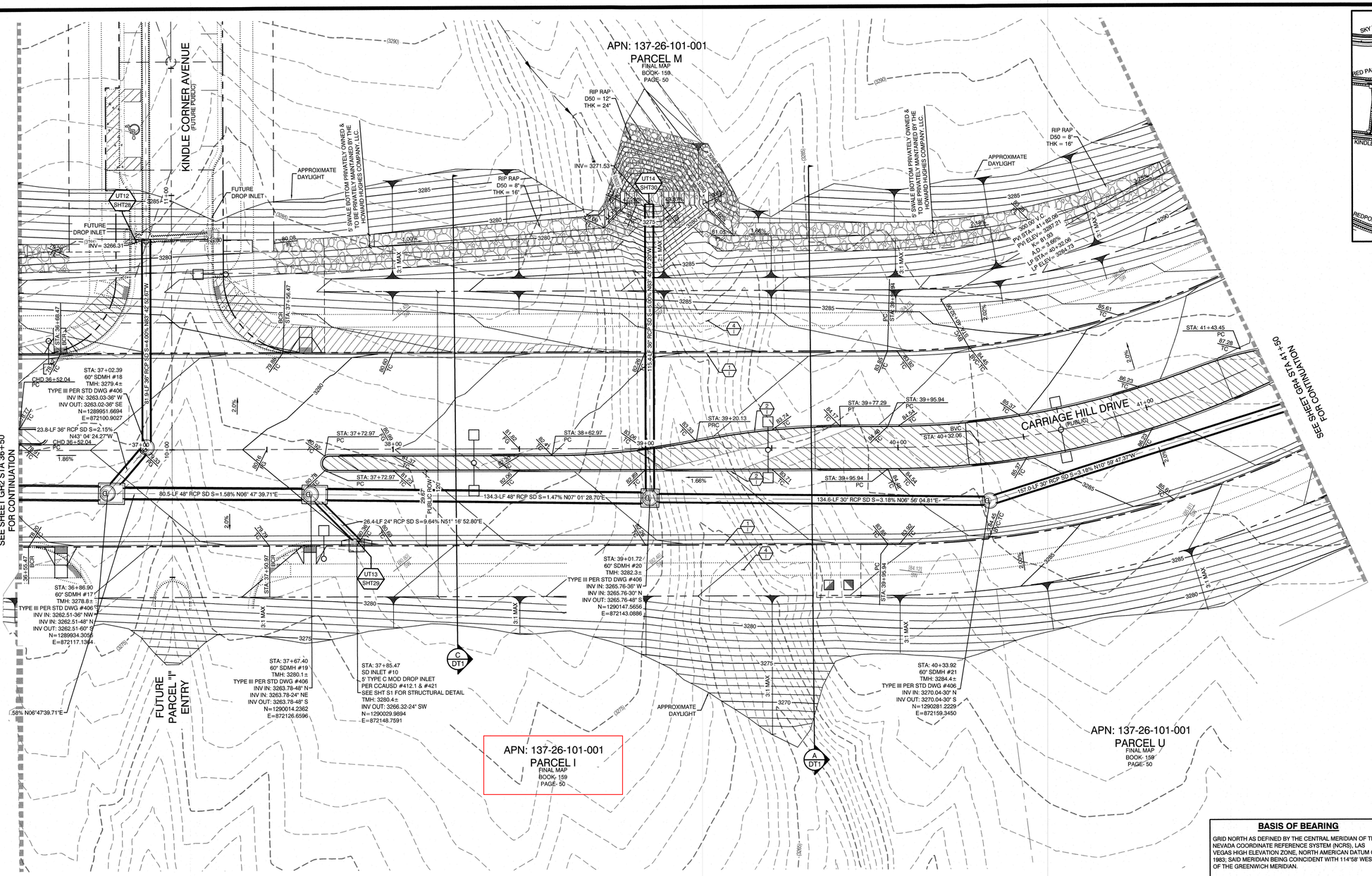
DRAWN BY: BSC	10/22/2018
DESIGNED BY: DEH	10/22/2018
CHECKED BY: WJM	05/06/2019
PROJECT NO: 7881	SCALE: HORIZ. 1"=20' VERT. N/A

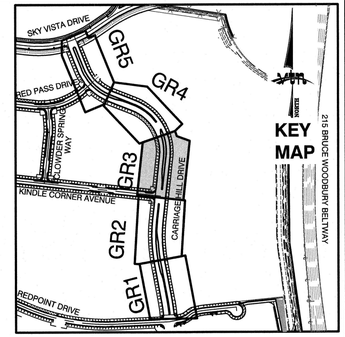
PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
No. 15745
EXP: 12/31/19
CIVIL
7/31/19

SHEET
GR2
12 OF 44 SHEETS

DRAWING NO.
L19-00271
107V7673

H:\7881\Carriage Hill Street A to Summerlin Pkwy\Sheet Set\DWG\7881-GRD.dwg,7/30/2019 9:34 AM,trevor





NORTH

GRAPHIC SCALE

-20 0 10 20 40

1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. CONSTRUCT TYPE "A" CURB PER STD. DWG. 219.
3. FUTURE SIDEWALK
4. CONSTRUCT HANDICAP RAMP PER STD. DWG. 235 CASE II
5. SAWCUT AND REMOVE ASPHALT PAVING AND MATCH WITH NEW CONSTRUCTION PER CCAUSD #500.5 & #503.
6. FIELD VERIFY AND MATCH EXISTING
7. CONSTRUCT COMMERCIAL DRIVEWAY PER STD DWG #224

CONSTRUCTION NOTES

UT # / SHT #

UTILITY PROFILE REFERENCE LABEL
UT # = SHEET INDEX
SHT# = SHEET NUMBER

Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

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:

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

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE WITH CITY OF LAS VEGAS, #DSS064A

WILLIAM J MEYER , P.E. No. 15745 DATE 7/31/19

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE, SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2897 WEB WWW.LYNN1.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING DRAINAGE PLAN 3

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

DRAWN BY: BCC
DESIGNED BY: DEH
CHECKED BY: WJM
PROJECT NO: 7851

10/22/2018
10/22/2018
05/06/2019

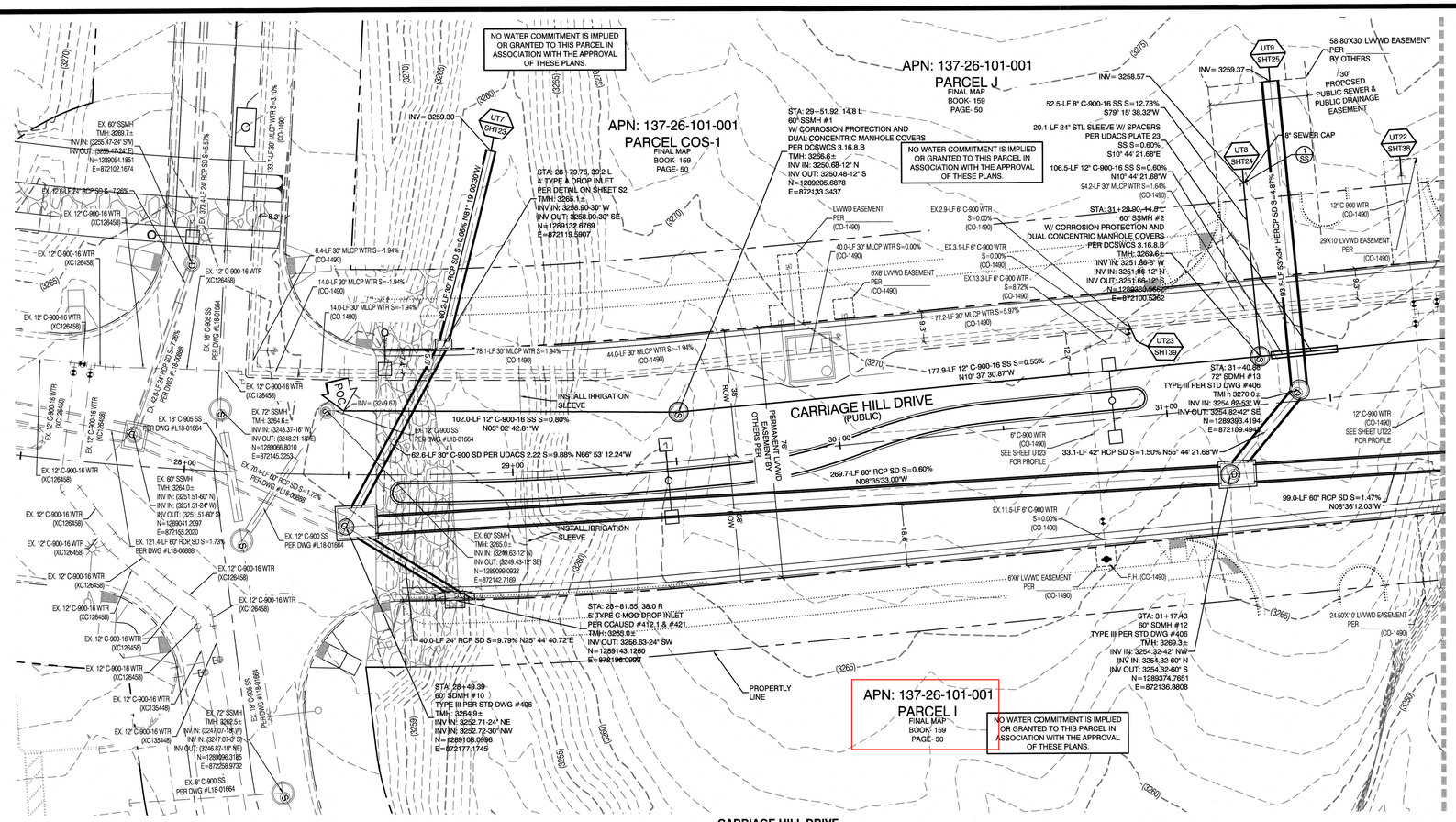
SCALE: 1"=20' HORIZ
N/A VERT:

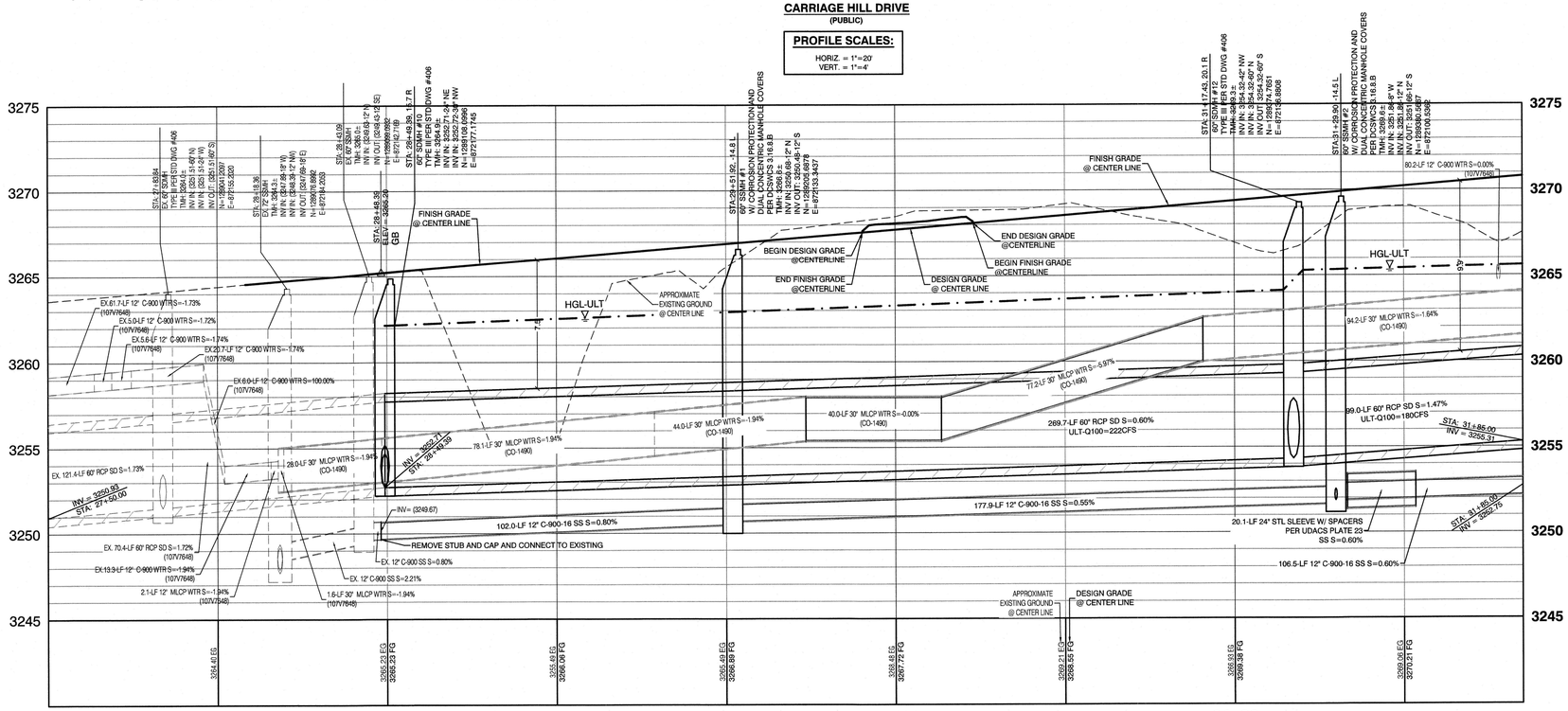
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
PROFESSIONAL ENGINEER-STATE OF NEVADA
No. 15745
7/31/19

SHEET
GR3
13 OF 44 SHEETS

DRAWING NO.
L19-00271
107V7673

H:\7851\Carriage Hill-Sheet A to Summerlin Pkwy\Sheet Set\DWG\7851-GRD.dwg;7/25/2019 9:34 AM;trevor





CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
S	STANDARD MANHOLE PER SD-1A & 1B	13 EA.	0 EA.
	8" C-900-16 SANITARY SEWER MAIN	210 LF.	0 LF.
	12" C-900-16 SANITARY SEWER MAIN	2,230 LF.	0 LF.
8SS	8" SEWER CAP (PER STD 4.6 & 4.11)	4 EA.	0 EA.
12SS	12" SEWER CAP (PER STD 4.6 & 4.11)	1 EA.	0 EA.
POC	SEWER POINT OF CONNECTION		

LVVWD NOTES:

PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES

DEPTH OF COVER DURING CONSTRUCTION

MAINTAIN MINIMUM TWENTY-FOUR (24) INCH COVER PER UDACS SECTION 2.08.04 GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP, (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN
TRENCH ABOVE EACH
HORIZONTAL ELBOW FITTING, PER UDACS
PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED
PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1500 GPM AT 20 P.S.I. RESIDUAL.

ENGINEER DISCLAIMER NOTE:

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UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

WATER MAIN JOINT DEFLECTION

PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02.

FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO:136311 FIRST APPROVED DATE: _____

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE, SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7540 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 1
27+50 TO 32+00

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

DRAWN BY: KTC	10/22/2018	
DESIGNED BY: DEH	10/22/2018	
CHECKED BY: WJM	05/06/2019	
PROJECT NO: 2501	SCALE:	1"=20' HORIZ. 1"=4' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
PROJECT NO. 19145
7/31/19

SHEET
UT1
17 OF 44 SHEETS

DRAWING NO.
L19-00271
107V7673

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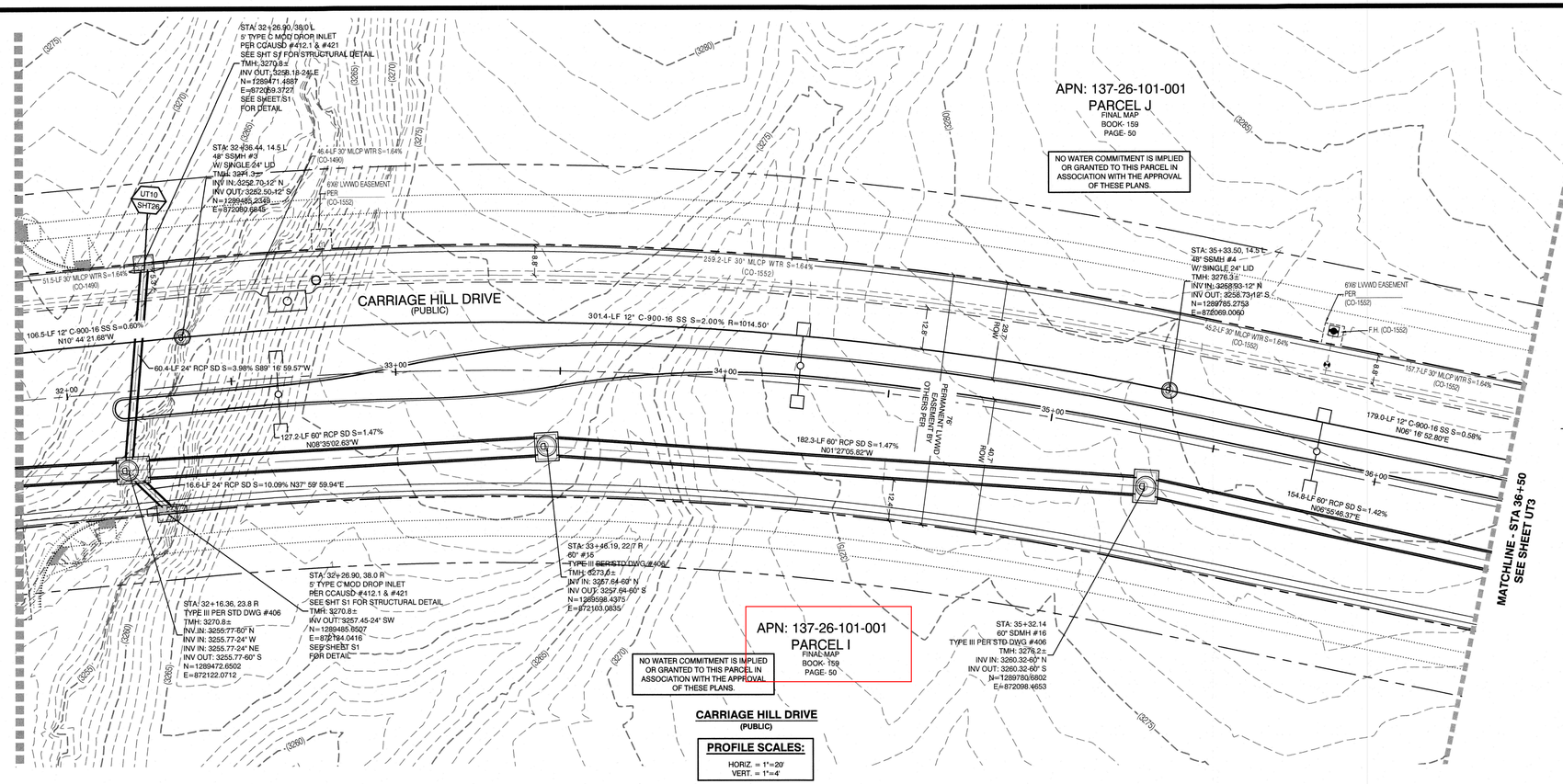

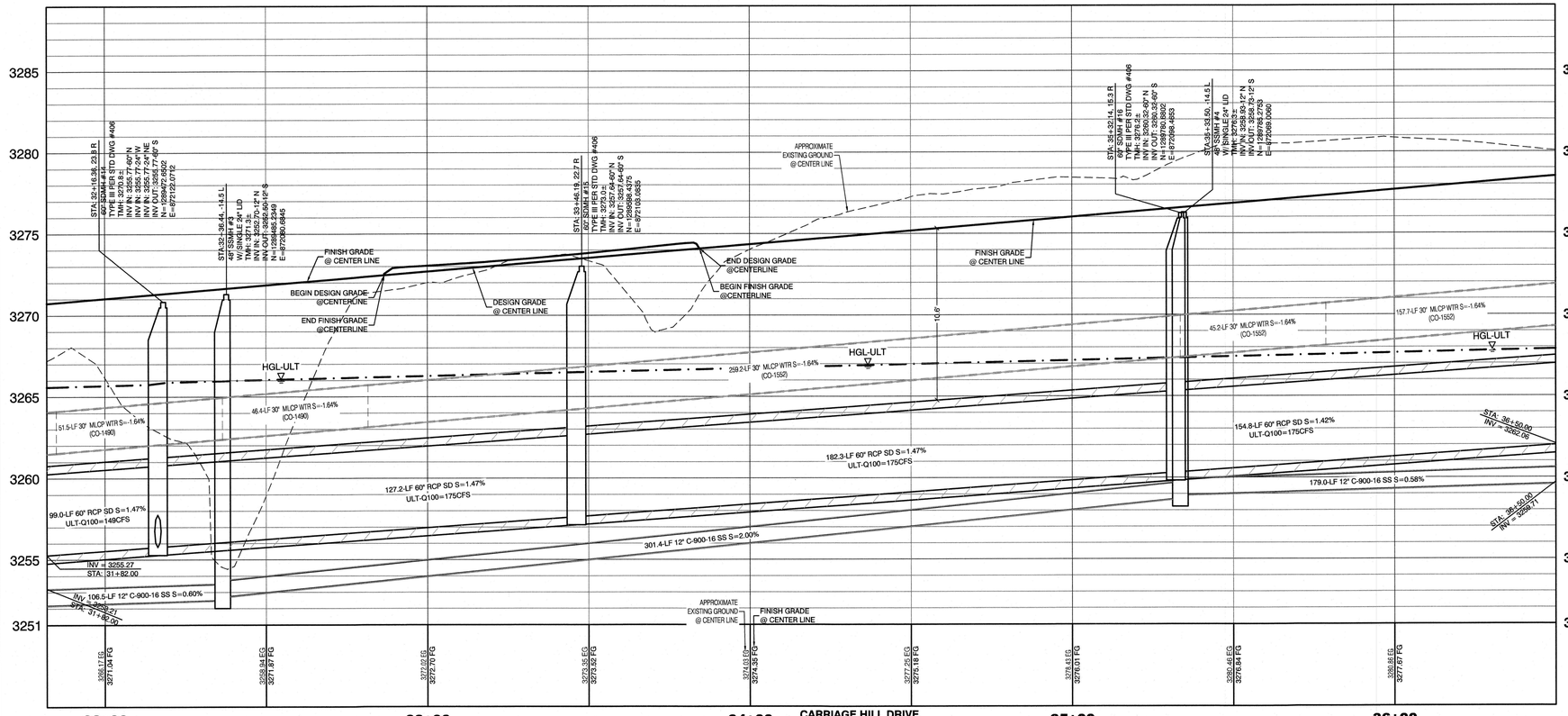

CONSTRUCTION NOTES

	SEWER	PUBLIC	PRIVATE
Ⓢ	STANDARD MANHOLE PER SD-1A & 1B	13 EA.	0 EA.
	8" C-900-16 SANITARY SEWER MAIN	210 LF.	0 LF.
	12" C-900-16 SANITARY SEWER MAIN	2,230 LF.	0 LF.
1 SS	6" SEWER CAP (PER STD 4.6 & 4.11)	4 EA.	0 EA.
2 SS	12" SEWER CAP (PER STD 4.6 & 4.11)	1 EA.	0 EA.
POC	SEWER POINT OF CONNECTION		

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

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WATER PRESSURE ZONE:

WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.

WATER MAIN COVER NOTE:

ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08

WATERLINE TRENCH NOTE:

CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.

LVVWD NOTES:

PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES

Call before you Dig
Avoid cutting underground utility lines. It's costly.
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OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

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CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEMS CONDUITS
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

DEPTH OF COVER DURING CONSTRUCTION

MAINTAIN MINIMUM TWENTY-FOUR (24) INCH COVER PER UDACS SECTION 2.08.04 GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION

WATER LINE MARKER BALLS NOTE

INSTALL PIPELINE MARKER BALLS IN
TRENCH ABOVE EACH
HORIZONTAL ELBOW FITTING, PER UDACS
PLATE No. 15

FIRE HYDRANT MARKER NOTES

BLUE COLORED REFLECTIVE RAISED
PAVEMENT MARKERS ARE TO BE INSTALLED:

1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.

LAS VEGAS FIRE & RESCUE APPROVAL

BY: _____ DATE: _____

APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1500 GPM AT 20 P.S.I. RESIDUAL.

UTILITY CROSSING NOTE:

ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO:136311 FIRST APPROVED DATE:_____

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W. CHARLESTON BLVD. SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH: (702) 873-7500 FAX (702) 362-2897 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

UTILITY PLAN & PROFILE 2
32+00 TO 36+50

SUMMERLIN WEST VILLAGE 21
CARRIAGE HILL DRIVE
REDPOINT TO SKY VISTA

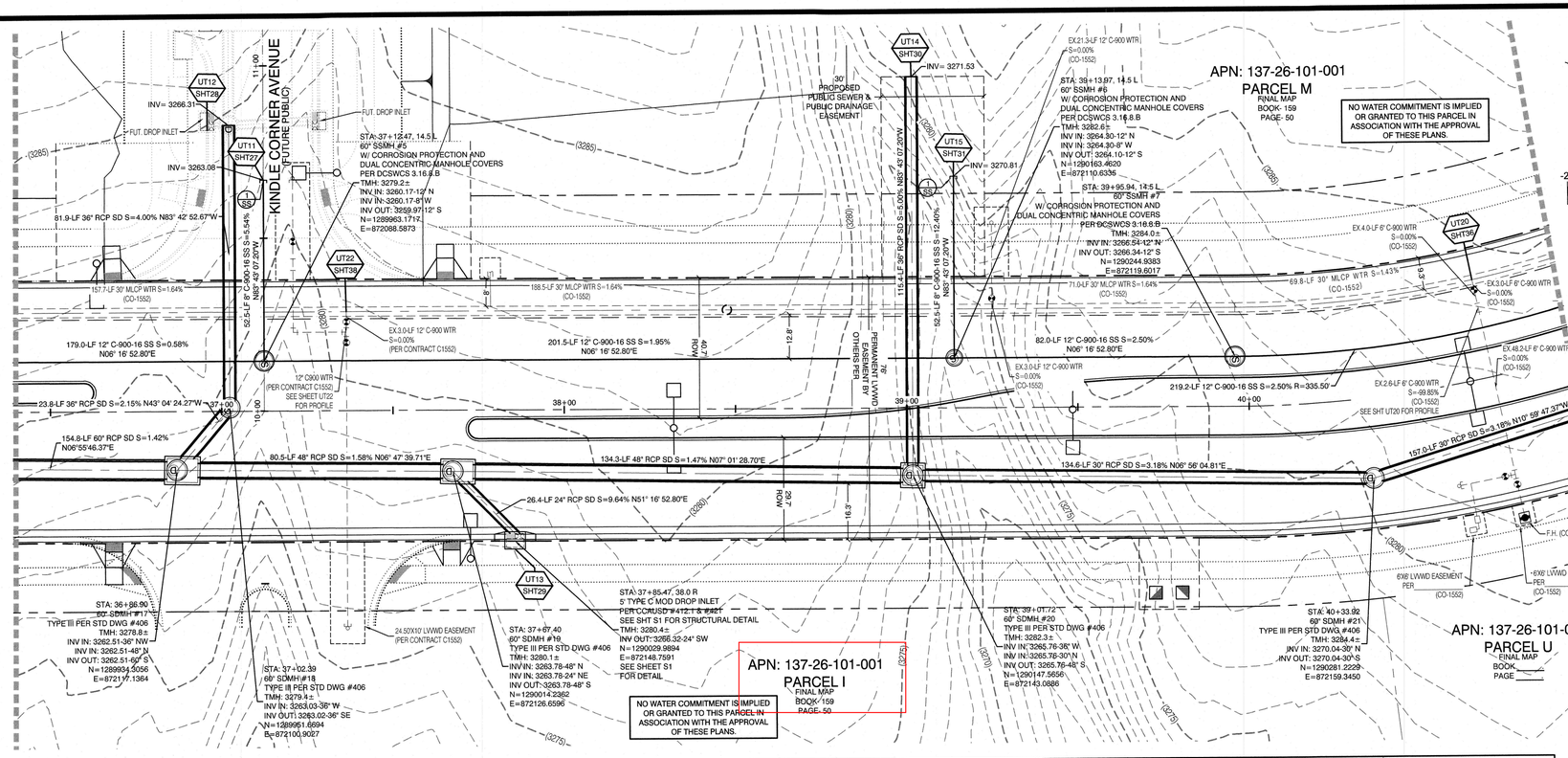
DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ:
KTC	DSH	W.M	7851	1"=20'	VERT: 1"=4'
10/22/2018	10/22/2018	06/06/2019			

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
STATE OF NEVADA
PROFESSIONAL ENGINEER
7/31/19

SHEET
UT2
18 OF **44** SHEETS

DRAWING NO.
L19-00271
107V7673

H:\7851\Carriage Hill-Sheet A to Summerlin Pkwy\Sheet Set\DWG\7851-UT.dwg,7/29/2019 5:12 PM,trevor


KINDLE CORNER AVENUE (FUTURE PUBLIC)
MATCHLINE - STA 36+50 SEE SHEET UT2
MATCHLINE - STA 41+00 SEE SHEET UT4
30' PROPOSED PUBLIC SEWER & PUBLIC DRAINAGE EASEMENT
APN: 137-26-101-001 PARCEL M FINAL MAP BOOK- 159 PAGE- 50
NO WATER COMMITMENT IS IMPLIED OR GRANTED TO THIS PARCEL IN ASSOCIATION WITH THE APPROVAL OF THESE PLANS.
APN: 137-26-101-001 PARCEL I FINAL MAP BOOK-159 PAGE- 50
NO WATER COMMITMENT IS IMPLIED OR GRANTED TO THIS PARCEL IN ASSOCIATION WITH THE APPROVAL OF THESE PLANS.
APN: 137-26-101-001 PARCEL U FINAL MAP BOOK_____ PAGE_____
CARRIAGE HILL DRIVE (PUBLIC)
NORTH
GRAPHIC SCALE
-20 0 10 20 40
1" = 20'
SKY VISTA DRIVE
RED PASS DRIVE
FLOWER SPRING WAY
KINDLE CORNER AVENUE
SUMMERLIN PARKWAY
215 BRUCE WOODBURY BELTWAY
REDPOINT DRIVE
UT6
UT5
UT4
UT3
UT2
UT1
KEY MAP
CONSTRUCTION NOTES
SEWER PUBLIC PRIVATE
STANDARD MANHOLE PER SD-1A & 1B 13 EA. 0 EA.
8" C-900-16 SANITARY SEWER MAIN 210 LF. 0 LF.
12" C-900-16 SANITARY SEWER MAIN 2,230 LF. 0 LF.
8" SEWER CAP (PER STD 4.6 & 4.11) 4 EA. 0 EA.
12" SEWER CAP (PER STD 4.6 & 4.11) 1 EA. 0 EA.
SEWER POINT OF CONNECTION
DEPTH OF COVER DURING CONSTRUCTION
MAINTAIN MINIMUM TWENTY-FOUR (24) INCH COVER PER UDACS SECTION 2.08.04 GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION
DROP INLET NOTE
WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE: CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).
WATER PRESSURE ZONE:
WATER SERVICE LOCATED IN THE 3435 PRESSURE ZONE.
WATER MAIN COVER NOTE:
ALL NEW WATER MAIN TO HAVE MINIMUM DEPTH OF COVER PER UDACS SECTION 2.08
WATERLINE TRENCH NOTE:
CONSTRUCT WATERLINE TRENCH SECTION AND BACKFILL PER UDACS PLATE NO. 17.
WATER LINE MARKER BALLS NOTE
INSTALL PIPELINE MARKER BALLS IN TRENCH ABOVE EACH HORIZONTAL ELBOW FITTING, PER UDACS PLATE No. 15
FIRE HYDRANT MARKER NOTES
BLUE COLORED REFLECTIVE RAISED PAVEMENT MARKERS ARE TO BE INSTALLED:
1. ON ROADWAYS WITH NO PARKING PERMITTED ON HYDRANT SIDE; LOCATE MAKER 8' FROM FACE OF CURB ON HYDRANT SIDE.
2. ON ROADWAYS WITH PARKING PERMITTED ON HYDRANT SIDE; LOCATE MARKER 16' FROM FACE OF CURB ON HYDRANT SIDE.
LAS VEGAS FIRE & RESCUE APPROVAL
BY:_____ DATE:_____
APPROVAL OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR, OR AN APPROVAL OF, ANY VIOLATION OF ANY OF THE PROVISIONS OF THE STATE OR COUNTY LAWS. FIRE FLOW 1500 GPM AT 20 P.S.I. RESIDUAL.
ENGINEER DISCLAIMER NOTE:
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Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR 1-800-227-2600 AND 1-702-455-5000 CLARK COUNTY TRAFFIC OPERATIONS
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929
AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS IT'S COSTLY
Call before you Dig Underground
1-702-455-7511 CLARK COUNTY TRAFFIC OPERATIONS
OR
1-702-229-6611 LAS VEGAS AREA COMPREHENSIVE TRAFFIC SYSTEM
PROFILE SCALES:
HORIZ = 1"=20'
VERT. = 1"=4'
WATER MAIN JOINT DEFLECTION
PVC PIPE SHALL BE DEFLECTED AT THE JOINT ONLY. THE MAXIMUM ALLOWABLE DEFLECTION SHALL BE ONE (1) DEGREE PER JOINT WITH A MINIMUM RADIUS OF CURVATURE OF 1,150 FEET, PER UDACS 2.07.01 AND 2.07.02.
FOR CHANGES IN DIRECTION EXCEEDING THE MAXIMUM ALLOWABLE JOINT DEFLECTION, FITTINGS SHALL BE USED.
UTILITY CROSSING NOTE:
ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABL WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.
LVVWD NOTES:
PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES
APPROVED FOR CONSTRUCTION
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO:136311 FIRST APPROVED DATE:_____
LVVWD APPROVAL IS VALID FOR ONE (1) YEAR FROM SIGNATURE DATE. IF CONSTRUCTION IS NOT STARTED, PLANS MUST BE RESUBMITTED FOR REVIEW AND APPROVAL
3295 3290 3285 3280 3275 3270 3265 3260 3256
37+00 38+00 39+00 40+00
CARRIAGE HILL DRIVE (PUBLIC)
FINISH GRADE @ CENTER LINE
BEGIN DESIGN GRADE @CENTERLINE
END FINISH GRADE @CENTERLINE
DESIGN GRADE @ CENTER LINE
APPROXIMATE EXISTING GROUND @ CENTER LINE
HGL-ULT
1.65%
12.4'
300' V.C. PVI STA= 41+82.06 PVI ELEV= 3287.21 K= 81.93 A.D.= 3.66%
STA: 36+89.06 60" SDMH #17 TYPE III PER STD DWG #406 TMH: 3278.8± INV IN: 3262.51-36° NW INV OUT: 3262.51-69° S N=1289934.3056 E=872117.1364
STA: 37+12.39 60" SDMH #18 TYPE III PER STD DWG #406 TMH: 3279.4± INV IN: 3263.03-38° W INV OUT: 3263.02-36° SE N=1289951.6694 E=872100.9027
STA: 37+67.40 60" SDMH #19 TYPE III PER STD DWG #406 TMH: 3280.1± INV IN: 3263.78-48° N INV OUT: 3263.78-48° S N=1290014.2362 E=872126.6596
STA: 37+85.47, 38.0 R 5' TYPE C MOD DROP INLET PER CCRUSD 9412.1 & 9421 SEE SHT S1 FOR STRUCTURAL DETAIL TMH: 3280.4± INV OUT: 3265.32-24° SW N=1290029.9894 E=872148.7591 SEE SHEET S1 FOR DETAIL
STA: 39+01.72 60" SDMH #20 TYPE III PER STD DWG #406 TMH: 3282.3± INV IN: 3265.76-36° W INV IN: 3265.76-30°N INV OUT: 3265.76-48° S N=1290147.5656 E=872143.0886
STA: 40+33.92 60" SDMH #21 TYPE III PER STD DWG #406 TMH: 3284.4± INV IN: 3270.04-36° N INV OUT: 3270.04-30° S N=1290281.2229 E=872159.3450
STA: 39+69.94, 14.5 L 60" SSMH #7 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3284.0± INV IN: 3266.54-12° N INV OUT: 3266.34-12° S N=1290244.9383 E=872119.6017
STA: 39+95.94, 14.5 L 60" SSMH #7 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3284.0± INV IN: 3266.54-12° N INV OUT: 3266.34-12° S N=1290244.9383 E=872119.6017
STA: 37+42.47, 14.5 L 60" SSMH #5 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3279.2± INV IN: 3260.17-12° N INV IN: 3260.17-8° W INV OUT: 3259.97-12° S N=1289963.1717 E=872088.5873
STA: 39+13.97, 14.5 L 60" SSMH #6 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3282.6± INV IN: 3264.30-12° N INV IN: 3264.30-8° W INV OUT: 3264.10-12° S N=1290163.4620 E=872110.6335
STA: 37+57.15 GB STA = 37+57.15 ELEV = 3278.54
STA: 37+85.47 60" SDMH #19 TYPE III PER STD DWG #406 TMH: 3280.1± INV IN: 3263.78-48° N INV IN: 3263.78-24° NE INV OUT: 3263.78-48° S N=1290014.2362 E=872126.6596
STA: 39+01.72 60" SDMH #20 TYPE III PER STD DWG #406 TMH: 3282.3± INV IN: 3265.76-36° W INV IN: 3265.76-30°N INV OUT: 3265.76-48° S N=1290147.5656 E=872143.0886
STA: 39+69.94, 14.5 L 60" SSMH #7 W/ CORROSION PROTECTION AND DUAL CONCENTRIC MANHOLE COVERS PER DCSWCS 3.16.8.B TMH: 3284.0± INV IN: 3266.54-12° N INV OUT: 3266.34-12° S N=1290244.9383 E=872119.6017
STA: 40+33.92 60" SDMH #21 TYPE III PER STD DWG #406 TMH: 3284.4± INV IN: 3270.04-30° N INV OUT: 3270.04-30° S N=1290281.2229 E=872159.3450
STA: 40+33.92 BF/C ELEV= 3284.73 FG
STA: 41+33.92, 23.2 R 60" SDMH #21 TYPE III PER STD DWG #406 TMH: 3285.4± INV IN: 3270.04-30° N INV OUT: 3270.04-30° S N=1290281.2229 E=872199.3460
179.0-LF 12" C-900-16 SS S=0.58% N06° 16' 52.80"E
154.8-LF 60" RCP SD S=1.42% N06°55'46.37"E
23.8-LF 36" RCP SD S=2.15% N43° 04' 24.27"W
81.9-LF 36" RCP SD S=4.00% N83° 42' 52.67"W
157.7-LF 30" MLCP WTR S=1.64% (CO-1552)
32.5-LF 8" C-900-16 SS S=3.54% N85° 42' 07.20"W
188.5-LF 30" MLCP WTR S=1.64% (CO-1552)
201.5-LF 12" C-900-16 SS S=1.95% N06° 16' 52.80"E
12" C900 WTR (PER CONTRACT C1552) SEE SHEET UT22 FOR PROFILE
EX.3.0-LF 12" C-900 WTR S=0.00% (PER CONTRACT C1552)
80.5-LF 48" RCP SD S=1.58% N06° 47' 39.71"E
26.4-LF 24" RCP SD S=9.64% N51° 16' 52.80"E
STA: 37+02.39 60" SDMH #18 TYPE III PER STD DWG #406 TMH: 3279.4± INV IN: 3263.03-38° W INV OUT: 3263.02-36° SE N=1289951.6694 E=872100.9027
24.50X10' LVWD EASEMENT (PER CONTRACT C1552)
114.4-LF 54" RCP SD S=5.00% N83° 42' 07.20"W
52.5-LF 8" C-900-16 SS S=12.40% N85° 42' 07.20"W
82.0-LF 12" C-900-16 SS S=2.50% N06° 16' 52.80"E
EX.3.0-LF 12" C-900 WTR S=0.00% (CO-1552)
134.3-LF 48" RCP SD S=1.47% N07° 01' 28.70"E
134.6-LF 30" RCP SD S=3.18% N06° 56' 04.81"E
219.2-LF 12" C-900-16 SS S=2.50% R=335.50
EX.2.6-LF 8" C-900 WTR S=-99.83% (CO-1552)
SEE SHT UT20 FOR PROFILE
EX.48.2-LF 6" C-900 WTR S=0.00% (CO-1552)
157.0-LF 30" RCP SD S=3.18% N10° 59' 47.37"W
F.H. (CO-1552)
6X6' LVWD EASEMENT PER (CO-1552)
EX.4.0-LF 8" C-900 WTR S=0.00% (CO-1552)
EX.3.0-LF 8" C-900 WTR S=0.00% (CO-1552)
69.8-LF 30" MLCP WTR S=1.43% (CO-1552)
71.0-LF 30" MLCP WTR S=1.64% (CO-1552)
STA: 36+50.00 INV = 3259.63
179.0-LF 12" C-900-16 SS S=0.58%
154.8-LF 60" RCP SD S=1.42%
80.5-LF 48" RCP SD S=1.58% ULT-Q100=106.5CFS
201.5-LF 12" C-900-16 SS S=1.95%
134.3-LF 48" RCP SD S=1.47% ULT-Q100=104CFS
134.6-LF 30" RCP SD S=3.18% ULT-Q100=72CFS
82.0-LF 12" C-900-16 SS S=2.50%
157.0-LF 30" RCP SD S=3.18% ULT-Q100=72CFS
219.2-LF 12" C-900-16 SS S=2.50%
STA: 41+00.00 INV = 3268.64
60.5-LF 30" MLCP WTR S=-1.43% (CO-1552)
69.8-LF 30" MLCP WTR S=-1.43% (CO-1552)
71.0-LF 30" MLCP WTR S=-1.64% (CO-1552)
STA: 41+00.00 INV = 3275.99
3279.29 FG 3278.33 FG
3279.65 FG 3280.16 FG
3280.39 FG 3280.99 FG
3281.09 FG 3281.82 FG
3282.65 FG 3283.42 FG
3283.48 FG 3284.31 FG
3285.14 FG 3285.77 FG
HOWARD HUGHES COMPANY, LLC A DELAWARE LIMITED LIABILITY COMPANY
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 873-7560 FAX (702) 362-2597 WEB WWW.VTNW.COM
3 SUMMERLIN CENTRE 1980 FESTIVAL PLAZA DRIVE SUITE 300 LAS VEGAS, NEVADA 89135 (702) 255-4300
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
CITY OF LAS VEGAS
REV DATE BY REVISION
UTILITY PLAN & PROFILE 3 36+50 TO 41+00
SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE REDPOINT TO SKY VISTA
DRAWN BY: KTC 10/22/2018
DESIGNED BY: DEH 10/22/2018
CHECKED BY: WJM 06/06/2019
SCALE: HORIZ. 1"=20' VERT. 1"=4'
PROJECT NO: 7851
PROFESSIONAL ENGINEER STATE OF NEVADA WILLIAM J. MEYER EXP: 12/31/19 CIVIL No. 15749
7/31/19
SHEET UT3
19 OF 44 SHEETS
DRAWING NO. L19-00271 10V7673
H:\7851\Carriage Hill Street A to Summerlin Pkwy\Sheet Set\DWG\7851-UT.dwg;7/28/2019 5:12 PM;trevor

Addendum #1 to the Technical Drainage Study for

Summerlin West Village 21
Street A
Carriage Hill to Parcel H

Las Vegas, Nevada

W.O. # 7851

Prepared for:
Howard Hughes Co.

Submitted to:
Public Works Department
City of Las Vegas

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: August 14, 2018
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: Summerlin West Village 21 - Street A (from Carriage Hill Dr. to Parcel H)		COPIES TO: VTN Nevada
Cross Streets:	Street A - Desert Foothills to Carriage Hill		Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5007B.doc		Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-017		
Zoning Action:	N/A		
FEMA Flood Zone	YES	NO X	
Proposed Storm Drain	YES X	NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES Paid In Payment #
1st Submittal	6/13/2018	6/29/2018 & 7/3/2018	Not Approved	$400.00	496730 $400.00
2nd Submittal	7/31/2018	8/14/2018	See Comments Below	$400.00	497797 $400.00
			TOTAL FEES (LDDRS):	$800.00	

REMARKS:

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

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

1. The project proposed to construct temporary drainage facilities including drainage berms/swales along the north side of the proposed *Street A*. Prior to the final plans approval, the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control* for approval. Once the drainage study is conditionally approved the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to initiate the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berm/swale are no longer necessary and can be removed.

2. The proposed 30'-public drainage easement (privately maintained) from the cul-de-sac end of Street A to the Beltway channel must be dedicated prior to the final approval of the improvement plans.

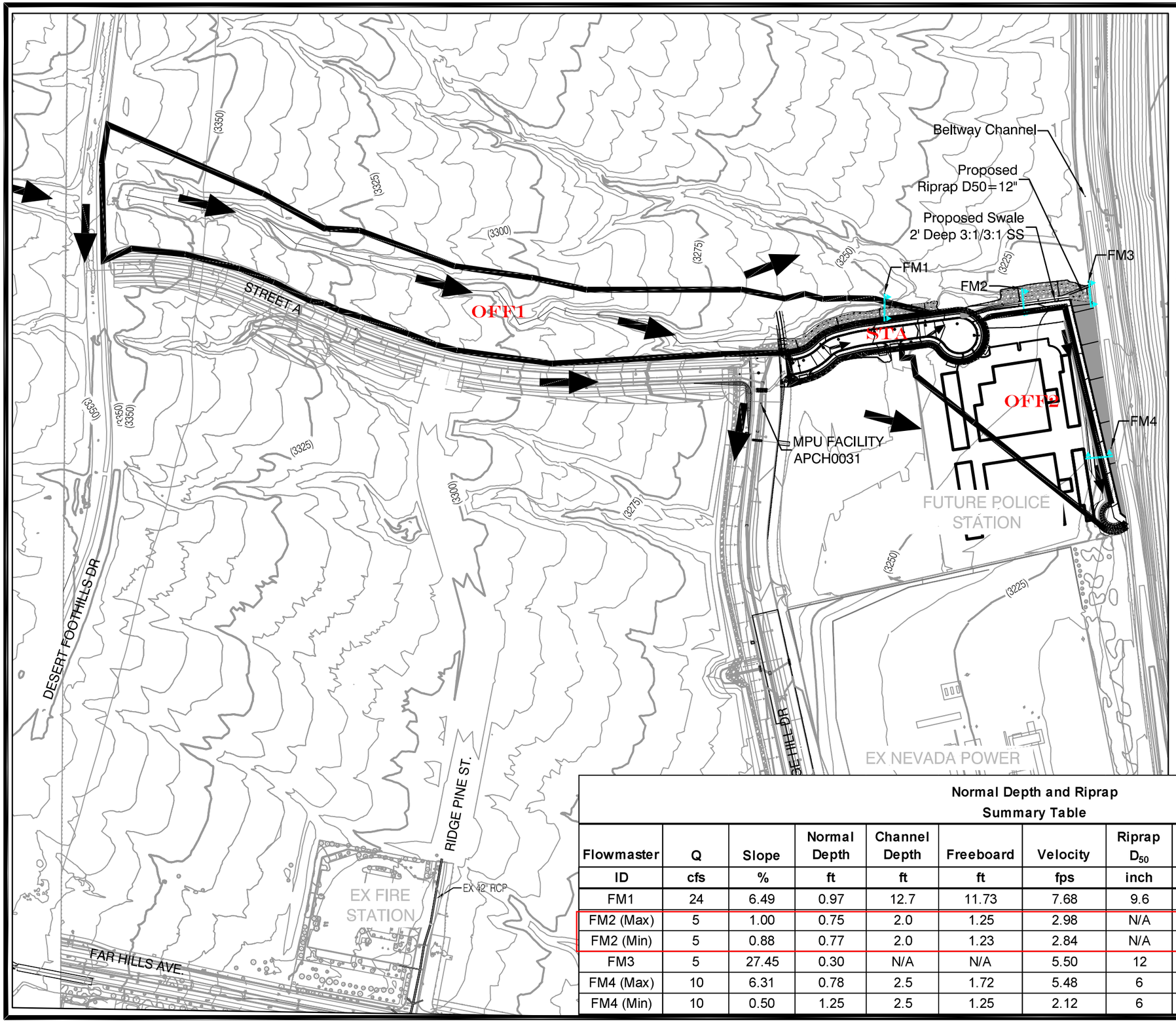
3. Upsize all riprap from d_{50} = 6" to d_{50} = 8" minimum.

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

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

END OF REMARKS
AYS

T/R/S: T20S/R59E/26
AREA K-26



GRAPHIC SCALE

250 0 125 250 500

1" = 250'

LEGEND

- BASIN BOUNDARY
- EX1 BASIN DESIGNATION
- FLOW ARROW
- FLOWMASTER CROSS SECTION

INTERIM CONDITION HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
STA	1.00	5
OFF1	8.70	24
OFF2	3.03	10

Normal Depth and Riprap Summary Table

Flowmaster ID	Q cfs	Slope %	Normal Depth ft	Channel Depth ft	Freeboard ft	Velocity fps	Riprap D_{50} inch	Side Slope H:V	Description
FM1	24	6.49	0.97	12.7	11.73	7.68	9.6	2:1	Existing Wash/Roadway Embankment
FM2 (Max)	5	1.00	0.75	2.0	1.25	2.98	N/A	3:1	Earthen Swale
FM2 (Min)	5	0.88	0.77	2.0	1.23	2.84	N/A	3:1	Earthen Swale
FM3	5	27.45	0.30	N/A	N/A	5.50	12	10:1	Riprap Protection
FM4 (Max)	10	6.31	0.78	2.5	1.72	5.48	6	4:1/2:1	Riprap Channel
FM4 (Min)	10	0.50	1.25	2.5	1.25	2.12	6	4:1/2:1	Riprap Channel

W.O.#:	7851
DATE:	APRIL 2018
BY:	SVB
SCALE:	1" = 250'
SHEET	OF

FIGURE 7: INTERIM CONDITION BASIN MAP
SUMMERLIN WEST VILLAGE 21
STREET A CARRIAGE HILL TO PARCEL H

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Street A Police Substation Access\Drainage\2_ADD1\A Figures\Street A PSA Figure 7 - Interim Condition Map.dwg;jayson; Jul 31, 2018 - 10:46am

Worksheet for FM2 (Max S=1.00%)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	1.00	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Results

Normal Depth	0.75	ft
Flow Area	1.68	ft²
Wetted Perimeter	4.73	ft
Hydraulic Radius	0.35	ft
Top Width	4.49	ft
Critical Depth	0.70	ft
Critical Slope	0.01384	ft/ft
Velocity	2.98	ft/s
Velocity Head	0.14	ft
Specific Energy	0.89	ft
Froude Number	0.86	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.75	ft
Critical Depth	0.70	ft
Channel Slope	1.00	%
Critical Slope	0.01384	ft/ft

Cross Section for FM2 (Max S=1.00%)

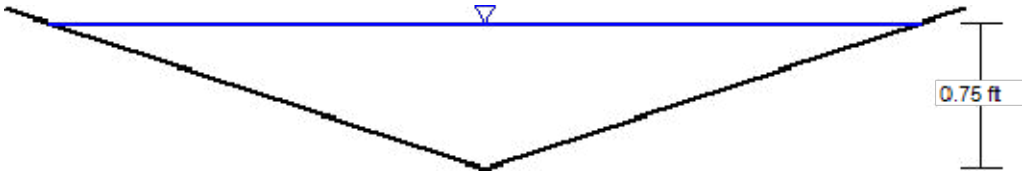
Project Description

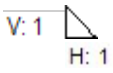
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	1.00	%
Normal Depth	0.75	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Cross Section Image





Worksheet for FM2 (Min S=0.88%)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.88	%
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Results

Normal Depth	0.77	ft
Flow Area	1.76	ft²
Wetted Perimeter	4.85	ft
Hydraulic Radius	0.36	ft
Top Width	4.60	ft
Critical Depth	0.70	ft
Critical Slope	0.01384	ft/ft
Velocity	2.84	ft/s
Velocity Head	0.13	ft
Specific Energy	0.89	ft
Froude Number	0.81	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.77	ft
Critical Depth	0.70	ft
Channel Slope	0.88	%
Critical Slope	0.01384	ft/ft

Cross Section for FM2 (Min S=0.88%)

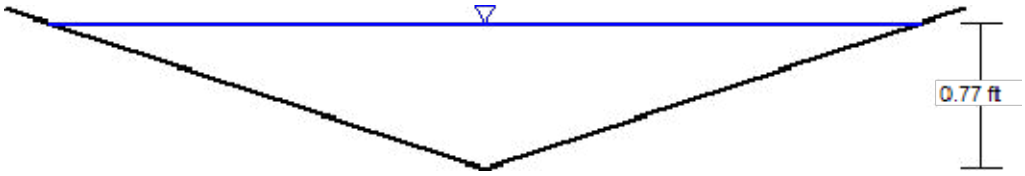
Project Description

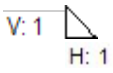
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.025	
Channel Slope	0.88	%
Normal Depth	0.77	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Discharge	5.00	ft³/s

Cross Section Image





Worksheet for C.6 - MAX- Street Flow Analysis

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.07460	ft/ft
Discharge	5.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+10.00	0.50
0+10.50	0.50
0+10.50	0.00
0+12.00	0.13
0+12.00	0.17
0+28.50	0.50
0+45.00	0.17
0+45.00	0.13
0+46.50	0.00
0+46.50	0.50
0+47.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+10.00, 0.50)	(0+12.00, 0.13)	0.013
(0+12.00, 0.13)	(0+45.00, 0.13)	0.016
(0+45.00, 0.13)	(0+47.00, 0.50)	0.013

Options

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

Worksheet for C.6 - MAX- Street Flow Analysis

Results

Normal Depth		0.26	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		1.01	ft²
Wetted Perimeter		12.81	ft
Hydraulic Radius		0.08	ft
Top Width		12.19	ft
Normal Depth		0.26	ft
Critical Depth		0.35	ft
Critical Slope		0.00714	ft/ft
Velocity		4.94	ft/s
Velocity Head		0.38	ft
Specific Energy		0.64	ft
Froude Number		3.02	
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	0.26	ft
Critical Depth	0.35	ft
Channel Slope	0.07460	ft/ft
Critical Slope	0.00714	ft/ft

Cross Section for C.6 - MAX- Street Flow Analysis

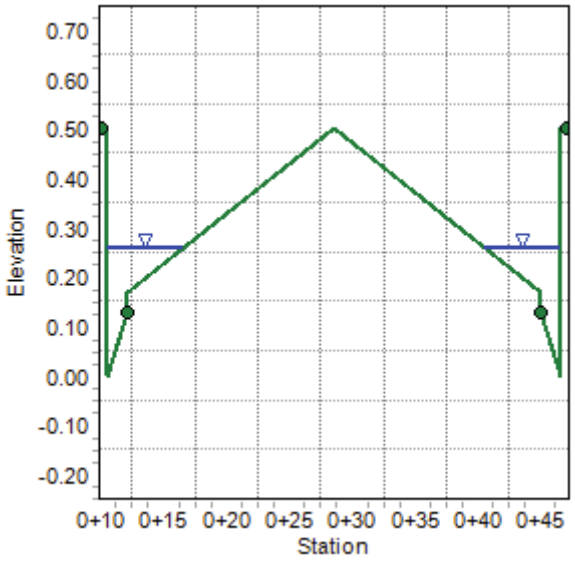
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.07460	ft/ft
Normal Depth	0.26	ft
Discharge	5.00	ft³/s

Cross Section Image



Worksheet for C.6 - MIN - Street Flow Analysis

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03340	ft/ft
Discharge	5.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+10.00	0.50
0+10.50	0.50
0+10.50	0.00
0+12.00	0.13
0+12.00	0.17
0+28.50	0.50
0+45.00	0.17
0+45.00	0.13
0+46.50	0.00
0+46.50	0.50
0+47.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+10.00, 0.50)	(0+12.00, 0.13)	0.013
(0+12.00, 0.13)	(0+45.00, 0.13)	0.016
(0+45.00, 0.13)	(0+47.00, 0.50)	0.013

Options

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

Worksheet for C.6 - MIN - Street Flow Analysis

Results

Normal Depth		0.29	ft
Elevation Range	0.00 to 0.50 ft		
Flow Area		1.41	ft²
Wetted Perimeter		15.76	ft
Hydraulic Radius		0.09	ft
Top Width		15.08	ft
Normal Depth		0.29	ft
Critical Depth		0.35	ft
Critical Slope		0.00726	ft/ft
Velocity		3.55	ft/s
Velocity Head		0.20	ft
Specific Energy		0.49	ft
Froude Number		2.05	
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	0.35	ft
Channel Slope	0.03340	ft/ft
Critical Slope	0.00726	ft/ft

Cross Section for C.6 - MIN - Street Flow Analysis

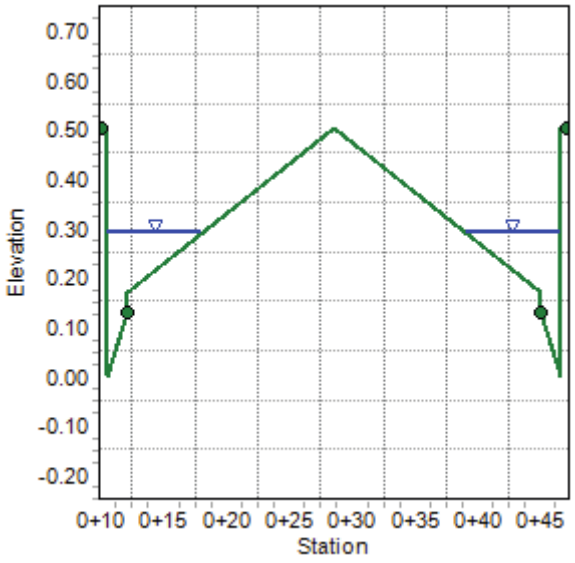
Project Description

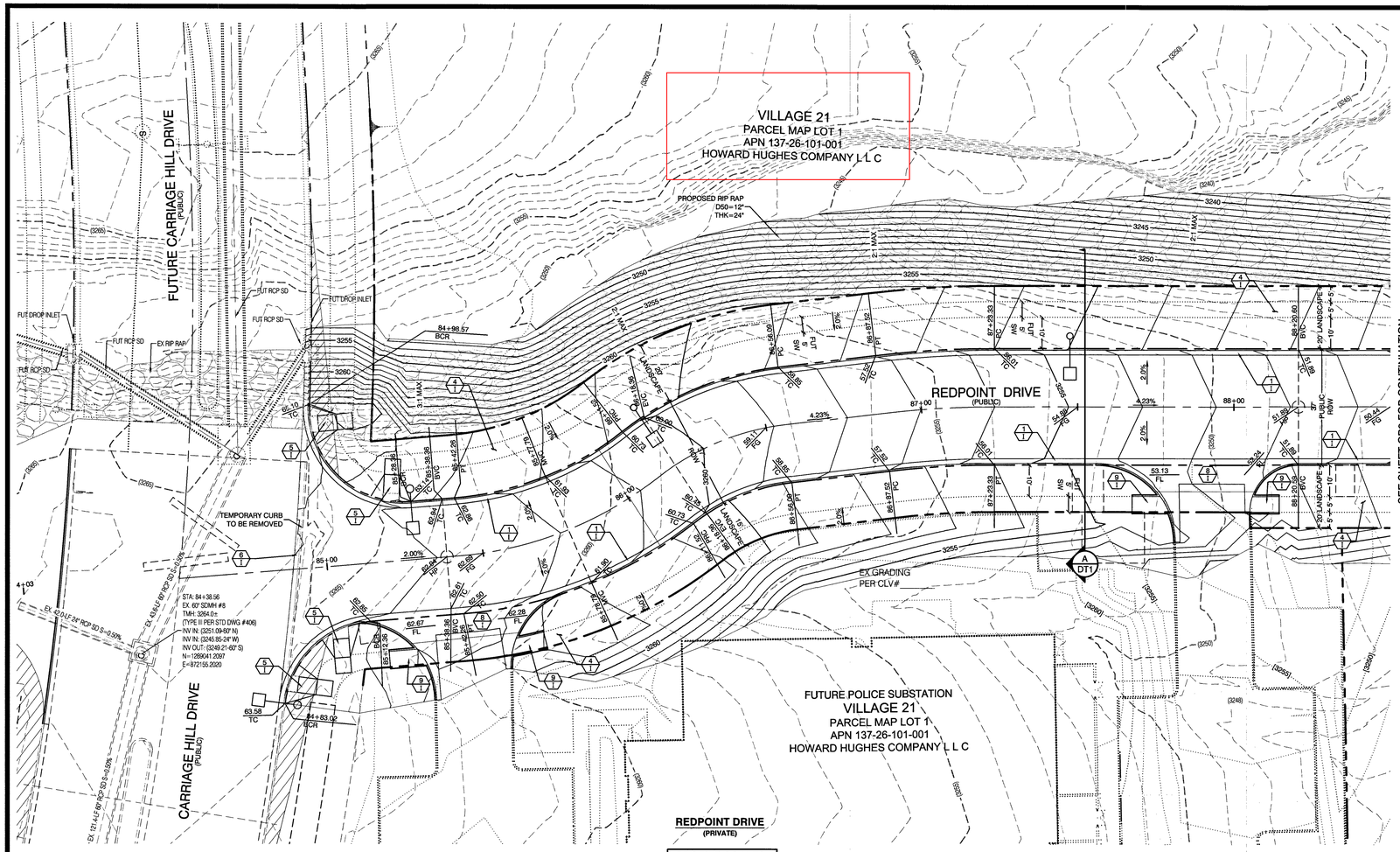
Friction Method	Manning Formula
Solve For	Normal Depth

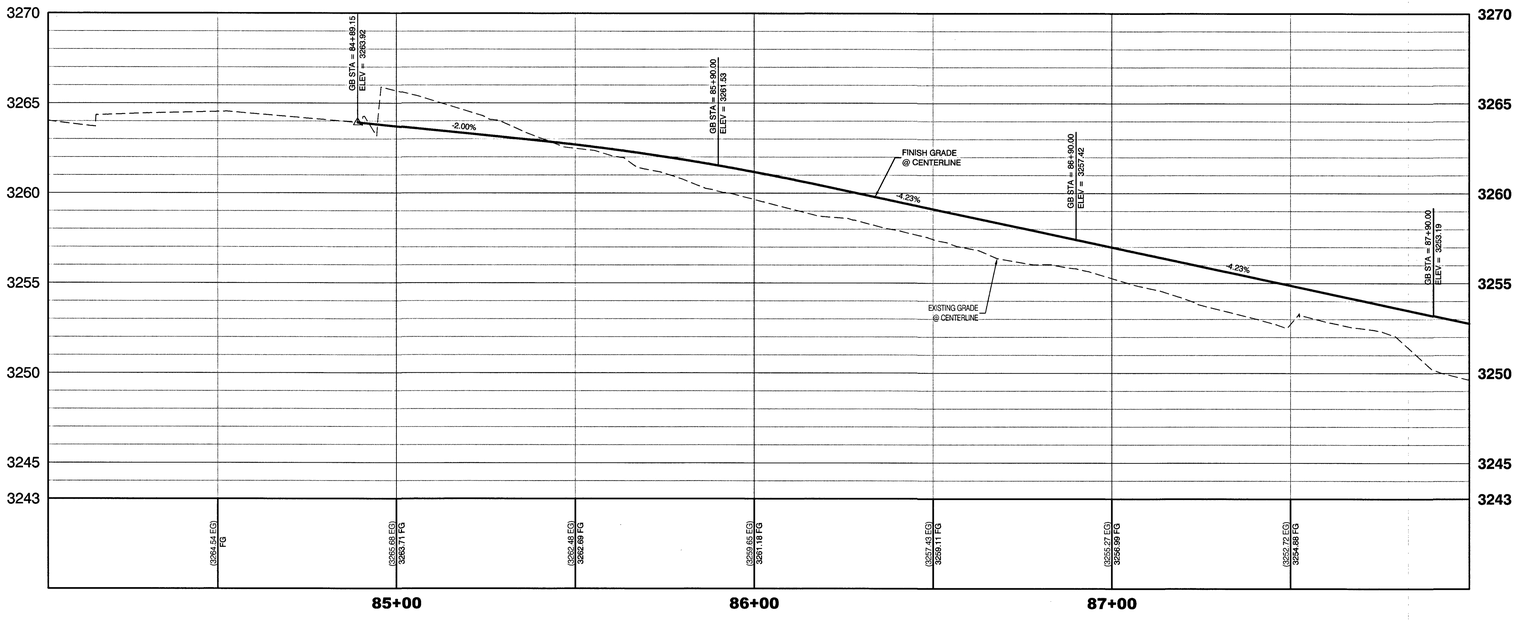
Input Data

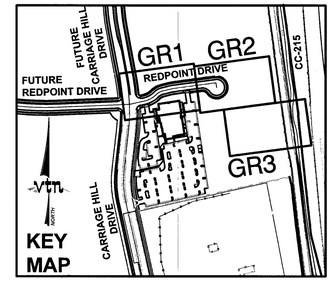
Channel Slope	0.03340	ft/ft
Normal Depth	0.29	ft
Discharge	5.00	ft³/s

Cross Section Image









GRAPHIC SCALE

-20 0 10 20 40

1" = 20 '

CONSTRUCTION NOTES

1. CONSTRUCT 24" TYPE "L" CURB & GUTTER PER STD. DWG. 216.
2. PROVIDE 2' WIDE OPENING IN PROPOSED "L"-TYPE CURB
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9. CONSTRUCT HANDICAP RAMP PER DETAIL ON SHEET DT3

GRADING PERMIT NOTE

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018
CLV #L18-01664

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, #DS5007B

WILLIAM J MEYER, P.E. No. 15745 DATE 11/8/18

107V7424

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

CALL BEFORE YOU DO OVERHEAD

1-702-227-2929

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT CONDUIT AND CABLES (TS-102021)

Call before you Underground

1-702-455-1511
CLARK COUNTY TRAFFIC OPERATIONS

1-702-229-6811
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

VTN
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2697 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 1

SUMMERLIN WEST VILLAGE 21
REDPOINT DRIVE
CARRIAGE HILL DRIVE TO PARCEL H

DRAWN BY: BCC
DESIGNED BY: BCC
CHECKED BY: WJM
PROJECT NO: 7951

04/23/2018
04/23/2018
11/07/2018

SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER — STATE OF NEVADA — No. 15745 — WILLIAM J MEYER — EXP: 12/31/19 — CIVIL

SHEET
GR1
6 OF 20 SHEETS

DRAWING NO.
L18-01664

H:\7951\Street A Police Substation Access\Sheet Set\7951 GR.dwg

VILLAGE 21
PARCEL MAP LOT 1
APN 137-26-101-001
HOWARD HUGHES COMPANY L L C

SEE SHEET GR1 FOR CONTINUATION

REDPOINT DRIVE
(PUBLIC)

FUTURE DEVELOPMENT
VILLAGE 21
PARCEL MAP LOT 1
APN 137-26-101-001
HOWARD HUGHES COMPANY L L C

SEE SHEET GR3 FOR CONTINUATION

PROPERTY LINE

30' PUBLIC DRAINAGE & SEWER EASEMENT TO BE PRIVATELY MAINTAINED

37' PUBLIC SEWER EASEMENT SURFACE TO BE PRIVATELY MAINTAINED

PROPOSED DRAINAGE ESMT (WIDTH VARIES 39.0' - 93') TO BE PRIVATELY MAINTAINED

31.21' EX. CHANNEL

4" STABALIZATION ROCK (THK=8")

16' PAVED ACCESS ROAD

EX GRADING PER CLV#

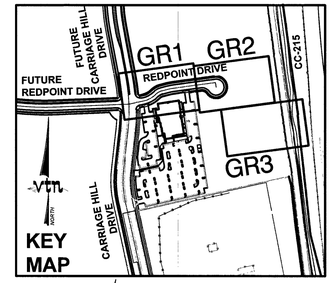
20' LANDSCAPE

PROPOSED RIP RAP D50=12" THK=24"

PROPOSED RIP RAP D50=8" THK=16"

PROPOSED RIP RAP D50 = 12" THK = 24"

PROPOSED RIP RAP D50=8" THK=16"



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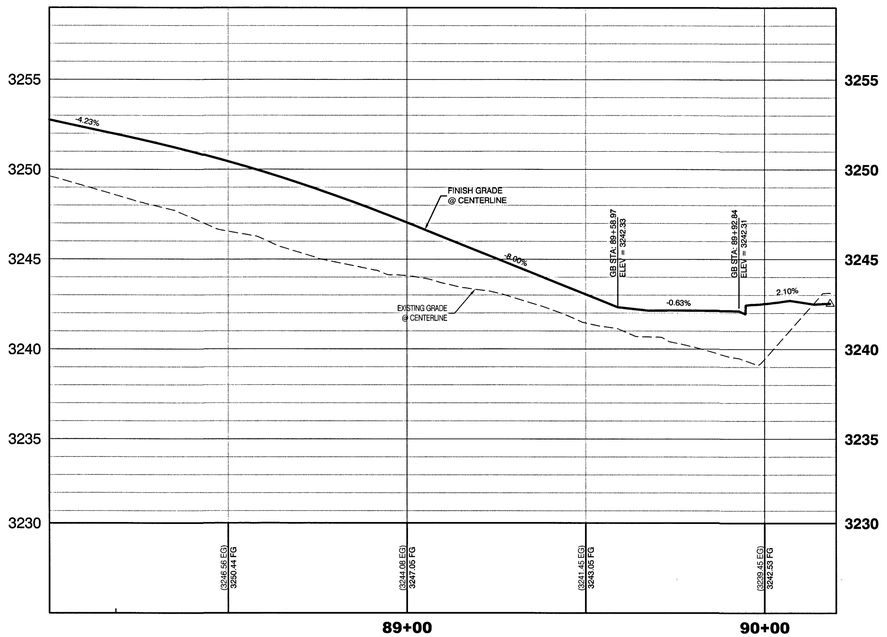

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FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

SIDEWALK RAMPS TABLE

(PER CCAUSD No. 235, CASE II)

NO.	DIM "A"	DIM "B"	CASE
1	4.5'	12'	II
2	4.5'	9.5'	II
3	8'	8'	II
4	9.5'	4.5'	II
5	15'	4.5'	II

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CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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GEOTECHNICAL NOTE:

REFER TO SOILS REPORT: NOVA GEOTECHNICAL
PROJECT #G-18-003, DATED MARCH 5, 2018
CLV #L18-01664

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William J Meyer 10/2/18
WILLIAM J MEYER, P.E. No. 17745 DATE

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 17745

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
1980 FESTIVAL PLAZA DRIVE, SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 891146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 2

SUMMERLIN WEST VILLAGE 21
REDPOINT DRIVE
CARRIAGE HILL DRIVE TO PARCEL H

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
BCC	BCC	WJM	7951

04/23/2018	04/23/2018	11/07/2018	SCALE:	HORIZ.	VERT.
				1"=20'	1"=4'

SHEET
GR2
7 OF 20 SHEETS
DRAWING NO.
L18-01664

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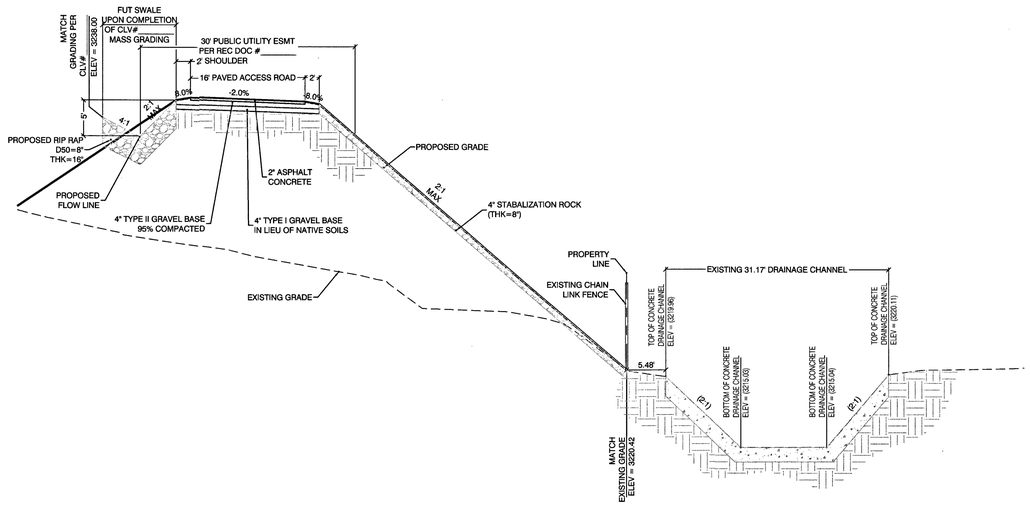
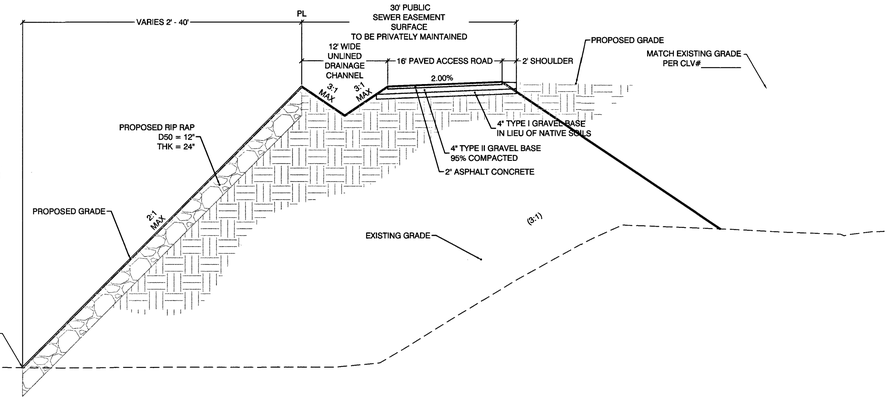
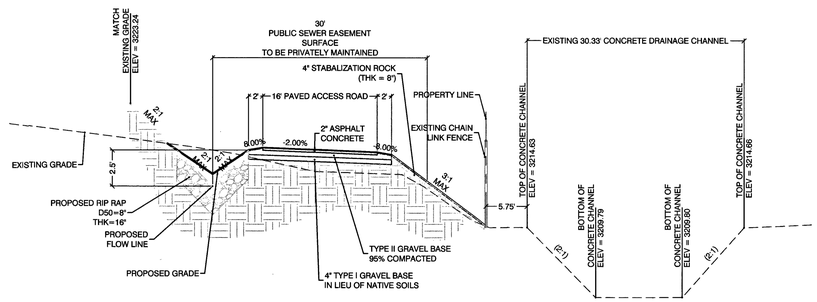
107V7424



C
BELTWAY PAVED ACCESS ROAD
NTS



B
NORTH EAST DRAINAGE CHANNEL
NTS



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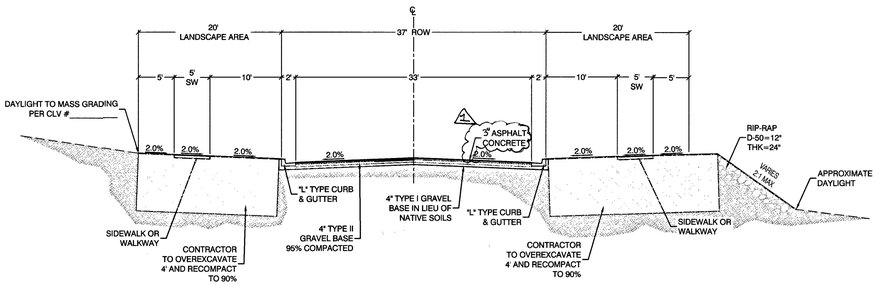
BELTWAY PAVED ACCESS ROAD
NTS



A
STREET A
NTS

107V7424

REV	DATE	BY	REVISION
1	09/29/2021	KTL	UPDATED SEWER STUB AND IMPROVED PAVEMENT THICKNESS TO 3"
			UPDATED 48" SSWR #2 10 60' 3/8/2019

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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DETAILS 1

SUMMERLIN WEST VILLAGE 21
REDPOINT DRIVE
CARRIAGE HILL DRIVE TO PARCEL H

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:
BCC	CEH	WJM	7951
06/20/2018	04/23/2018	11/07/2018	

SCALE: HORIZ: —
VERT: N/A

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
STATE OF NEVADA
No. 17745
PROFESSIONAL ENGINEER
11/8/18

SHEET
DT1
9 OF **20** SHEETS

DRAWING NO.
L18-01664

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Technical Drainage Study for

Summerlin West Village 21
Parcel U Stockpile

Las Vegas, Nevada

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: August 13, 2019
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West Village 21 Parcel U – Stockpile Permit**			**COPIES TO:** VTN Nevada
Cross Streets:	Summerlin Parkway & Carriage Hill Drive			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5172A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-23-410-001			
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	8/5/2019	8/13/2019	See Comments Below	$400.00	3518614: $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:
	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
X	is conditionally approved subject to the following conditions:

1. The Dust Mitigation Plan/Permit must be obtained from the Clark County prior to the final approval of the grading/improvement plan.

2. Provide a note on the plan that states: "Stockpile to comply with the approved Dust Mitigation Plan #_____".

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

END OF REMARKS

ays

T/R/S: T20S/R59E/23

AREA K-23

representative assumption to where enough flow can be generated within the basin to warrant the use of the higher velocity coefficients. In summary,

Existing (Non-Urban) Conditions	Developed (Urban) Conditions
$V_1 = 14.8*(S/100)^{1/2}$ $V_2 = 29.4*(S/100)^{1/2}$	$V_1 = 20.2*(S/100)^{1/2}$ $V_2 = 30.6*(S/100)^{1/2}$

D. PEAK FLOWS

TABLE 1
PROPOSED CONDITION
HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
OFF1	0.58	2
OFF2	0.66	2
OFF3	0.72	2
ON1	9.47	40

III. ONSITE & OFFSITE BASIN ANALYSIS

A. EXISTING CONDITION

Presently, the offsite areas immediately the surrounding the site are undeveloped. The existing ground of the site and upstream areas fall easterly at toward the I-215 Western Beltway Channel. A majority of the flow generated to the west of the project is intercepted by the Carriage Hill Drive Improvements. The drainage impacts of the development of Parcel U has been addressed in the Master Study. The Master Study has determined that the development of Parcel U will not adversely impact existing downstream facilities. Therefore, a site-specific existing condition hydrologic analysis is not necessary for this study.

B. INTERIM CONDITION

(Refer to *Figure 6: Interim Condition Basin Map* in Appendix A.*)*

The offsite areas are consistent with those described in existing condition. No major washes impact the stockpile. Proposed condition is depicted on Figure 6.

Flow generated by the offsite basins OFF1, OFF2, AND OFF3 are diverted around the stockpile and will subsequently flow into the Beltway Channel as they do in existing condition. Flow generated on the top of the stockpile will be conveyed easterly as sheet flow. Therefore, the stockpile will not obstruct flows and flow patterns will be returned to their historic conditions.

C. ULTIMATE CONDITION

The proposed stockpile is temporary and will be removed with the development of Parcel U. An overall ultimate condition analysis assuming Parcel U and the Summerlin West Planning Area is fully developed was provided with the Master

Study. Therefore, a site-specific ultimate condition hydrologic analysis is not necessary for this study.

IV. HYDRAULIC ANALYSIS

Hydraulic cross sections have been taken along the perimeter of the stockpile to determine normal depth and velocity of the anticipated storm flows as they are conveyed around the stockpile. The results of the normal depth analysis are summarized in Table 5. Normal depth calculations have been included in Appendix C.

TABLE 2
PROPOSED CONDITION CHANNEL SUMMARY TABLE

Channel	Q100 (cfs)	Slope	Normal Depth (ft)	Velocity (ft/s)	Description
1	2	2.79%	0.10	1.32	OFF1
2	2	4.58%	0.17	2.41	OFF2
3	2	5.23%	0.21	3.00	OFF3

The normal depth analysis shows that the velocities of the flow along the slope of the stockpile are non-erosive. In addition, flow depths are contained below the top of the stockpile with additional freeboard.

V. CONCLUSIONS

This *Technical Drainage Study for Summerlin West Village 21 Parcel U Stockpile* has been developed in accordance with Criteria established in the Manual. The proposed development does not adversely impact any proposed or existing Clark County Regional Flood Control District Master Plan Update facilities.

The site has been designed to control storm water runoff for the 6-hour, 100-year floods as calculated in this study and the Master Study. There are no adverse effects on upstream or downstream properties due to the proposed drainage system or infrastructure improvements.

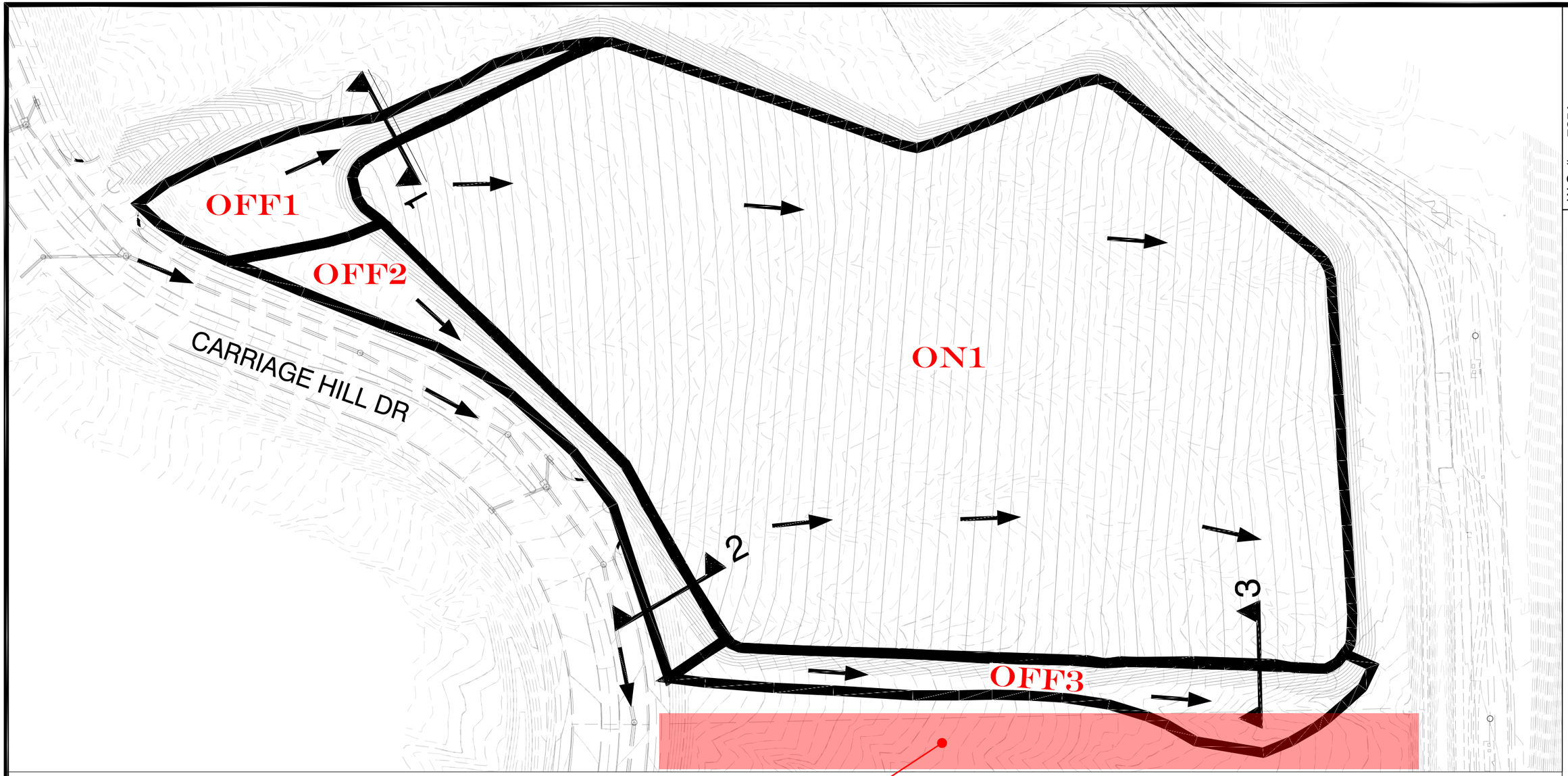

FIGURE 6 - PROPOSED CONDITION BASIN MAP
SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

W.O.#:	7851
DATE:	06/2019
BY:	ACY
SCALE:	1"=100'
SHEET	1 OF 1

PROPOSED CONDITION HEC-1 SUMMARY TABLE

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OFF1	0.58	2
OFF2	0.66	2
OFF3	0.72	2
ON1	9.47	40

PROPOSED CONDITION CHANNEL SUMMARY TABLE

Channel	Q100 (cfs)	Slope	Normal Depth (ft)	Velocity (ft/s)	Description
1	2	6.70%	0.15	2.54	OFF1
2	2	5.30%	0.16	2.55	OFF2
3	2	6.20%	0.20	3.20	OFF3

GRAPHIC SCALE

100 0 50 100 200

1" = 100'

NORTH

LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- CROSS SECTION

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Parcel U Stock Pile\Drainage\A Figures & Exhibits\Figure 6 - Proposed Condition Basin Map.dwg,elidaby, Jun 18, 2019 - 10:23am

STANDARD FORM 4

DEVELOPMENT: Street U Stockpile

CONDITION: Proposed

W.O. # 7851 **CALCULATED BY:** ENB

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Non-Urban:		Urban	
$V1 = 1.48 * S^{1/2}$	$V2 = 2.94 * S^{1/2}$	$V1 = 2.02 * S^{1/2}$	$V2 = 3.06 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132C_n - 0.39 \qquad T_c = T_i + T_t$$

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.	
PROPOSED CONDITION																	
ON1	94.1	0.852	9.47	0.0148	100	5.7	2.50	870	6.3	5.1	7.7	2.44	970	15.39	4.94	0.049	Min TLAG=0.05
OFF1	86.7	0.754	0.58	0.0009	30	2.9	2.39	260	5.8	3.6	7.1	1.22	290	11.61	3.61	0.036	Min TLAG=0.10
OFF2	87.6	0.767	0.66	0.0010	25	4.6	1.80	480	4.6	3.2	6.3	2.52	505	12.81	4.33	0.043	Min TLAG=0.10
OFF3	86.7	0.754	0.72	0.0011	30	4.0	2.15	580	6.0	3.6	7.2	2.48	610	13.39	4.63	0.046	Min TLAG=0.10

```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998               *                    *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                *                    *         609 SECOND STREET            *
 *                                      *                    *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   10JUN19  TIME  15:41:03  *                    *          (916) 756-1104              *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

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

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

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


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

                        *DIAGRAM
 *** FREE ***
             1          ID    PROPOSED CONDITION HYDROLOGIC MODEL
             2          ID    INPUT FILE DATE = MAY 3, 2019
             3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
             4          ID    STORM DISTRIBUTION = SDN #3
             5          ID    MODELED BY VTN (ACY)
             6          ID
             7          ID    ******************************************************
             8          ID    * SUMMERLIN WEST VILLAGE 21                          *
             9          ID    * PARCEL U STOCKPILE                                 *
            10          ID    ******************************************************
            11          ID
            12          ID  100-YEAR,  6-HOUR STORM,  SDN3
            13          ID
            14          IT       5       0       0     300
            15          IO       5       0       0
            16          IN       5       0       0
            17          JR    PREC    1.00
                        *

            18          KK    OFF1
            19          BA  0.0009
            20          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
            21          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            22          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            23          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            24          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            25          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            26          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            27          PC   0.998   0.999       1
            28          PB    3.36
            29          LS       0    86.7
            30          UD   0.100
                        *

            31          KK    OFF2
            32          BA  0.0010
            33          LS       0    87.6
            34          UD   0.100
                        *

            35          KK    OFF3
            36          BA  0.0011
            37          LS       0    86.7
            38          UD   0.100
                        *

            39          KK     ON1
            40          BA  0.0148
            41          LS       0    94.1
```

```
            42           UD   0.050
                         *
            43           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    18        OFF1
                 .
                 .
    31           .        OFF2
                 .           .
                 .           .
    35           .           .        OFF3
                 .           .           .
                 .           .           .
    39           .           .           .         ON1

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1**************************************                                  **************************************
 *                                    *                                  *                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                               *    U.S. ARMY CORPS OF ENGINEERS     *
 *               JUN   1998           *                                  *    HYDROLOGIC ENGINEERING CENTER    *
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 *  RUN DATE   10JUN19  TIME  15:41:03   *                               *          (916) 756-1104            *
 *                                    *                                  *                                    *
 **************************************                                  **************************************



                          PROPOSED CONDITION HYDROLOGIC MODEL
                          INPUT FILE DATE = MAY 3, 2019
                          DESIGN STORM = 100-YEAR 6-HR STORM
                          STORM DISTRIBUTION = SDN #3
                          MODELED BY VTN (ACY)

                          ********************************************************
                          * SUMMERLIN WEST VILLAGE 21                            *
                          * PARCEL U STOCKPILE                                   *
                          ********************************************************

                         100-YEAR,  6-HOUR STORM,  SDN3


   15 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
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
```

U-PRO

RATIOS APPLIED TO PRECIPITATION

OPERATION	STATION	AREA	PLAN		RATIO 1
					1.00
HYDROGRAPH AT					
+	OFF1	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	OFF2	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	OFF3	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	ON1	.01	1	FLOW	40.
				TIME	3.50

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

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

APN: 137-23-410-001
CITY OF LAS VEGAS
STATE OF NEVADA

DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY

10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

SHEET INDEX

SHEET #	SHEET	DESCRIPTION
CV	1	COVER SHEET
NT	2	GENERAL NOTES
GR1	3	GRADING PLAN
DT1	4	DETAILS

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°1'50"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

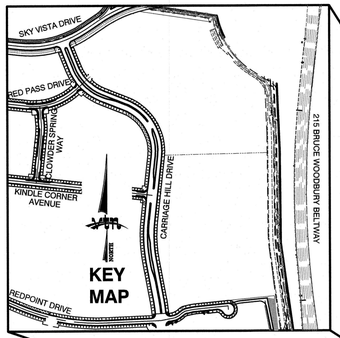
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

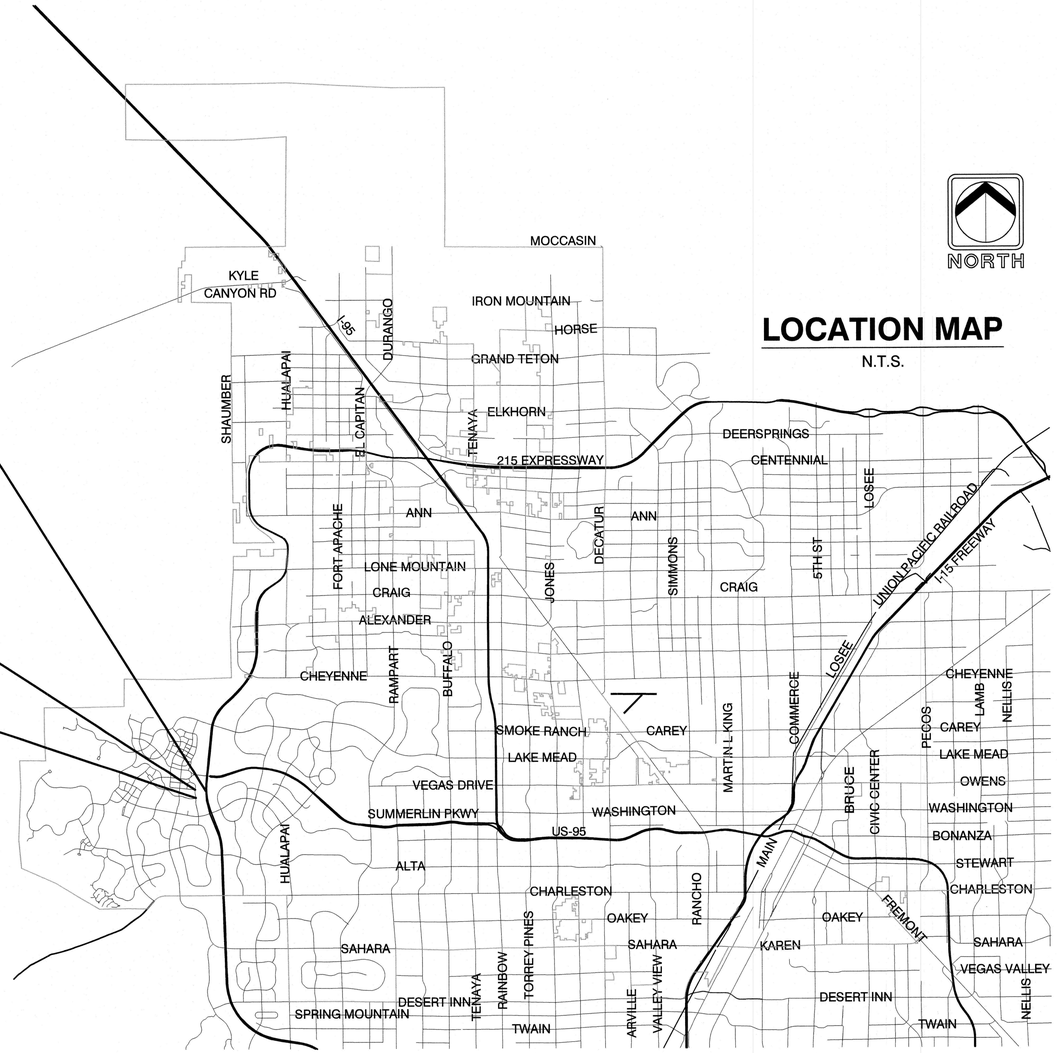
BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03





NORTH

LOCATION MAP

N.T.S.

PROJECT DESCRIPTION

THIS PROJECT PROPOSES AN APPROXIMATELY 125,343 CY STOCKPILE ON SUMMERLIN VILLAGE 21 PARCEL U TO BE USED IN THE CONSTRUCTION OF THE FOLLOWING PROJECTS:

- VILLAGE 21 DESERT FOOTHILLS DRIVE (REDPOINT TO SKY VISTA)
- VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT TO SKY VISTA)
- VILLAGE 21 KINDLE CORNER AVENUE (DESERT FOOTHILLS TO CARRIAGE HILL)
- VILLAGE 21 RED PASS DRIVE (CARRIAGE HILL TO DESERT FOOTHILLS)
- VILLAGE 21 CLOWDER SPRING WAY (KINDLE CORNER TO RED PASS)
- VILLAGE 21 SUMMERLIN PARKWAY EXTENSION

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER. 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 STATUES, 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

CITY ENGINEER ALLEN PAVELKA, P.E. # 9029

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

PLANNING DEPARTMENT, CITY OF LAS VEGAS DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

OWNER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

DEVELOPER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

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

REVISION | BY | DATE | REV

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

DRAWN BY: JDH 05/28/2019
DESIGNED BY: JDH 05/28/2019
CHECKED BY: WJM 05/28/2019
PROJECT NO: 7851
SCALE: N/A HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
8/5/19

SHEET
CV
1 OF 4 SHEETS

DRAWING NO.

H:\7851\Parcel U Stock Pile\Sheet Set\7851-CV.dwg,8/1/2019 4:58 PM,rynarc

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 DISTRICT'S - 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 THE REQUIRED FIRE FLOW. [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 FLUSH 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 § 106.3]
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC § 507.2.1, NFPA 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 30,000 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 2 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. [IFC § 503.1.1]
25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 200 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT. CLV REGULATION AND MOU
26 ALL DEAD-END FIRE APPARATUS ROADS AND/OR FIRE LANES, 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. CLV REGULATION
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
29. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS, OR HAVING FOUR OR MORE TRAVEL LANES AND A TRAFFIC COUNT OF MORE THAN 30,000 VEHICLES PER DAY, ALL HYDRANTS BEING UTILIZED TO DELIVER FIRE FLOW TO THE PROPOSED LOCATION SHALL BE LOCATED ON THE SAME SIDE OF THE STREET AS THE PROPOSED DEVELOPMENT. CLV REGULATION

EFFECTIVE DATE: FEBRUARY 4th, 2019

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLICWORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; 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 INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THERE WITH.
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 (½") 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. 12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: NOVA GEOTECHNICAL, PROJECT NO. G-18-003, DATED MARCH 5, 2018, APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLAN.
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. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

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

REVISED 06/04/2018

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'+	+0.0'to-0.1'	SEE SOILS REPORT
B.ENGINEERED FILL	0.5'+	+0.1'to-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

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

LEGEND

DESCRIPTION	PROPOSED	EXISTING	FUTURE
CONTOUR (5' INTERVAL)	2450	(2450)	(2450)
CONTOUR (1' INTERVAL)			
EDGE OF PAVEMENT			
SAW CUT			
RETAINING WALL			
SCREEN WALL			
RIGHT OF WAY			
CENTER LINE			
BACK OF CURB			
LIP OF GUTTER			
FACE OF CURB			
SIDEWALK			
UNIT BOUNDARY LINE			
UNIT BOUNDARY / ROW			
PROPERTY LINE			
SLOPE AND FLOW DIRECTION	1.00%	(1.00%)	(1.00%)
SCARP AREA			
MATCHLINE			
SIDEWALK RAMP			
SIGHT VISIBILITY ZONES			
PAVED ROAD			
PAVEMENT REMOVAL			
STREET LIGHT			
WATER UNDER 18"			
WATER 18" & OVER			
SANITARY SEWER UNDER 18"			
SANITARY SEWER 18" & OVER			
STORM SEWER			
FIRE HYDRANT			
SANITARY SEWER MAN HOLE	S	S	S
CLEAN OUT			
STORM DRAIN MAN HOLE	D	D	D

ABBREVIATIONS

FF	FINISH FLOOR	PT	POINT OF TANGENCY	O/C	OFFSET CROWN
FG	FINISH GRADE	PRC	POINT OF REVERSE CURVATURE	BC	BACK OF CURB
FL	FLOW LINE	PCC	POINT OF COMPOUND CURVATURE	BCR	BEGIN CURB RETURN
TC	TOP OF CURB	BVC	BEGIN VERTICAL CURVE	BCL	BACK OF CURB LENGTH
TRC	TOP OF ROLL CURB	MVC	MID-POINT OF VERTICAL CURVE	TF	TOP OF FOOTING
EOP	EDGE OF ASPHALT PAVEMENT	EVC	END VERTICAL CURVE	GB	GRADE BREAK
FUT.	FUTURE	PRVC	POINT OF REVERSE VERTICAL CURVE	PC	POINT OF CURVATURE
EX.	EXISTING	R/W	RIGHT-OF-WAY	TPW	TOP OF PLANTER WALL
VG	VALLEY GUTTER	DI	DROP INLET	TRW	TOP OF RETAINMENT WALL
NG	NATURAL GROUND	BFE	BASE FLOOD ELEVATION	TOP	TOP OF CHANNEL/SCARP
H.P.	HIGH POINT	CCUSD	CLARK COUNTY UNIFORM STANDARD DRAWINGS	TOE	TOE OF CHANNEL/SCARP
L.P.	LOW POINT	SW	SIDEWALK	TOB	TOP OF BOX
SSMH	SEWER MANHOLE	TSW	TOP OF SIDEWALK	PP	POWER POLE
WTR	WATER LINE	INT.	INTERSECTION	TRANS.	TRANSITION
SD	STORM DRAIN	D.G.	DESIGN GRADE	RET.	RETAINMENT
RCP	REINFORCED CONCRETE PIPE	C/L	CENTER LINE		

DEVIATION FROM CITY OF LAS VEGAS STANDARDS

- NONE

ESTIMATE OF QUANTITIES

ESTIMATED GRADING/SD/ROAD IMP. QUANTITIES	PUBLIC
TYPE II GRAVEL BASE	76 CY
EARTHWORKS CUT	2 CY
EARTHWORKS FILL	125,345 CY
EARTHWORKS TOTAL (FILL)	125,343 CY

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 NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5146
PH: (702) 873-7500 FAX: (702) 362-2597 WEB: WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GENERAL NOTES

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:
JDH	JDH	W.M	7851	HORIZ. N/A VERT. N/A
05/29/2019	05/29/2019	05/29/2019		

WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
PROFESSIONAL ENGINEER STATE OF NEVADA
No. 15745
6/5/19

SHEET
NT
2 OF 4 SHEETS

DRAWING NO.

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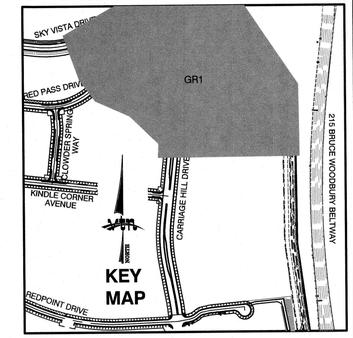
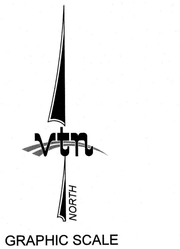
EARTHWORK QUANTITIES		
CUT	FILL	NET
2 CUBIC YARDS	125,345 CUBIC YARDS	125,343 CUBIC YARDS (FILL)





STOCKPILE NOTE:

STOCKPILES WITH HEIGHT OVER 4 FT MUST BE PROVIDED WITH A TEMPORARY FENCING.

STOCKPILE MATERIALS SHALL CONSIST OF CLEAN EARTH FILL UNLESS OTHERWISE APPROVED BY THE CITY OF LAS VEGAS.

STOCKPILE IS TO COMPLY WITH APPROVED CLARK COUNTY DUST MITIGATION PLAN #_____

FLOOD ZONE NOTE

SITE IS LOCATED IN A SHADED ZONE X AS SHOWN IN FIRM MAP 32003C2221SE, DATED SEPTEMBER 27, 2002. A SHADED ZONE X IS DETERMINED TO BE OUTSIDE THE 2.0% ANNUAL CHANCE FLOODPLAIN, ENTIRE SITE BOUNDARY IS WITHIN ZONE X.

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: NOVA GEOTECHNICAL PROJECT #G-18-003, DATED MARCH 5, 2018

GRADING NOTE:

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS / DITCHES AND A TEMPORARY LOCAL MINOR SEDIMENT BASIN ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY HOWARD HUGHES COMPANY.

EASEMENT REFERENCE LEGEND

1. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19990310:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19961001:0000671.
2. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4. PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080527:0005041.
5. 10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

ENGINEER DISCLAIMER NOTE:

UTILITY LOCATIONS SHOWN HERE ON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HERE ON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

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.

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

CALL BEFORE YOU DIG OVERHEAD

1-702-227-2929

Call before you Dig

Avoid cutting underground utility lines. It's costly.

CALL 811 OR 1-800-227-2600 AND 1-702-455-6000 CLARK COUNTY TRAFFIC OPERATIONS

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS. IT'S COSTLY.

Call before you Underground

1-702-455-7511 CLARK COUNTY TRAFFIC OPERATIONS AND 1-702-229-6811 LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

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

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
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CITY OF LAS VEGAS

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CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

DRAWN BY: JDH
DESIGNED BY: JDH
CHECKED BY: WJM
PROJECT NO: 7951

05/29/2019
05/29/2019
05/29/2019

SCALE: 1" = 50' HORIZ. 1" = 10' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
8/5/19

SHEET
GR1
3 OF 4 SHEETS

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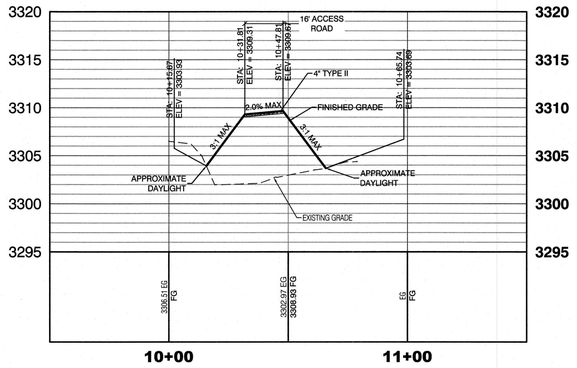

C
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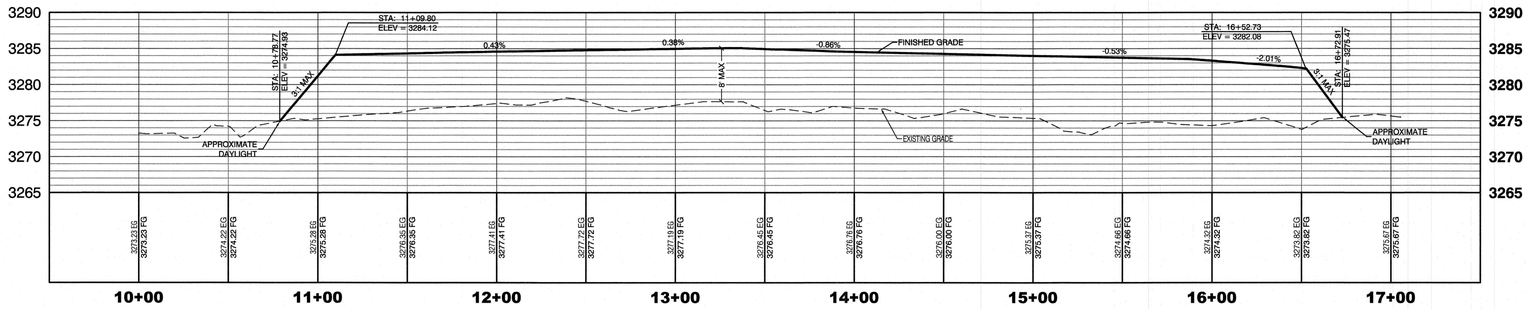
ACCESS ROAD TYPICAL SECTION

NTS



B
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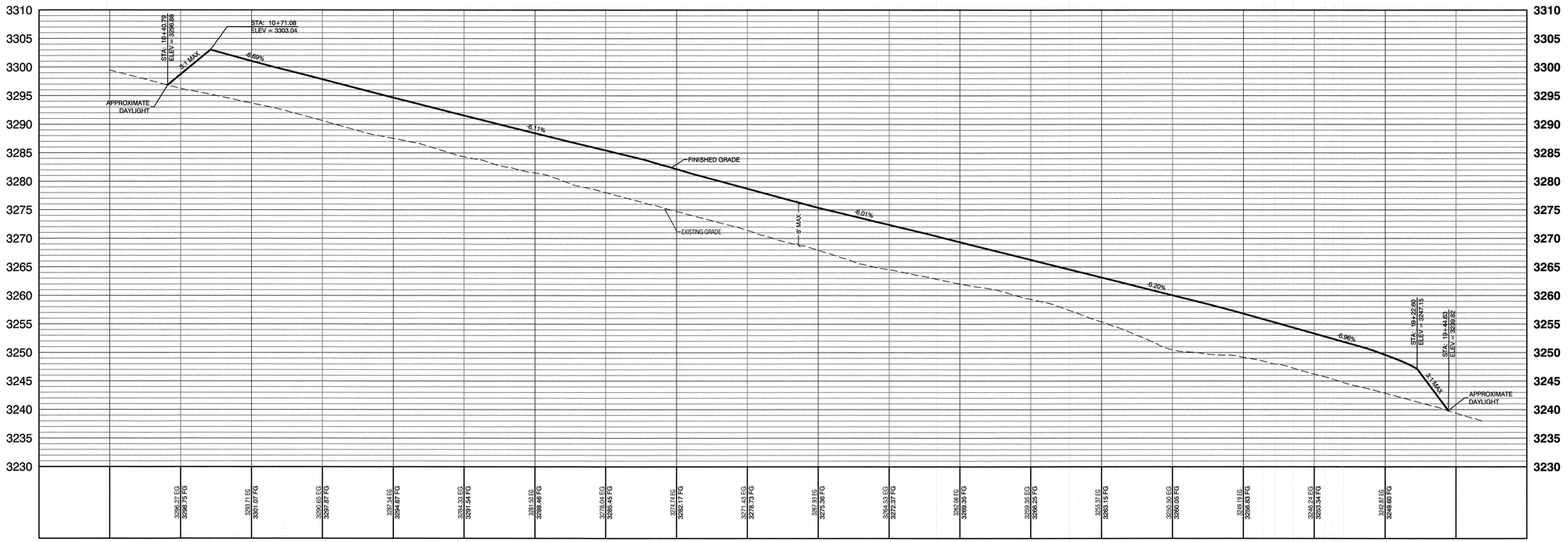
TYPICAL SECTION (LOOKING EAST)

NTS



A
-
TYPICAL SECTION (LOOKING NORTH)

NTS

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10845 GRIFFITH PEAK DRIVE, SUITE 160
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

DETAILS

SUMMERLIN WEST VILLAGE 21
PARCEL U STOCKPILE

DRAWN BY: JDH — 05/29/2019
DESIGNED BY: JDH — 05/29/2019
CHECKED BY: WJM — 05/29/2019
PROJECT NO: 7951
SCALE: 1" = 50' HORIZ. 1" = 10' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/19
CIVIL
No. 15745
8/5/19

SHEET
DT1
4 OF 4 SHEETS

DRAWING NO.

H:\7951\Parcel U Stock Pile\Sheet Set\7951 - GR.dwg 8/5/2019 9:57 AM trevor

Technical Drainage Study for

Summerlin West Village 21
Parcel I Stockpile

Las Vegas, Nevada

Prepared for:
Howard Hughes Company, LLC

Submitted to:
City of Las Vegas
Public Works

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: June 21, 2019
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Summerlin West V21 Parcel I – Stockpile Permit**			**COPIES TO:** VTN Nevada
Cross Streets:	NEC of Carriage Hill Drive & Redpoint Drive			Howard Hughes Company, LLC
File Number:	F:\Depot\DSMemos\DS5137B.doc			Bart Anderson, P.E., DevCo
Parcel Number:	137-26-101-001			
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	**X**	
Proposed Storm Drain	YES	NO	**X**	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	5/8/2019	5/28/2019	Not Approved	$400.00	3125925: $400
Supplement	6/13/2019	6/21/2019	See Comments Below	N/C	N/C
			TOTAL FEES (LDDRS):	**$400.00**	----

REMARKS:

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

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

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

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

END OF REMARKS

ays

T/R/S: T20S/R59E/26

AREA K-26

representative assumption to where enough flow can be generated within the basin to warrant the use of the higher velocity coefficients. In summary,

Existing (Non-Urban) Conditions	Developed (Urban) Conditions
$V_1 = 14.8*(S/100)^{1/2}$ $V_2 = 29.4*(S/100)^{1/2}$	$V_1 = 20.2*(S/100)^{1/2}$ $V_2 = 30.6*(S/100)^{1/2}$

D. PEAK FLOWS

TABLE 1
PROPOSED CONDITION
HEC-1 SUMMARY TABLE

BASIN ID	AREA (ac)	Q100 (CFS)
OFF1	1.91	5
OFF2	1.09	3
OFF3	0.63	2
ON1	6.08	26

III. ONSITE & OFFSITE BASIN ANALYSIS

A. EXISTING CONDITION

Presently, the offsite areas immediately the surrounding the site are undeveloped. The existing ground of the site and upstream areas fall easterly at toward the I-215 Western Beltway Channel. A majority of the flow generated to the west of the project is intercepted by the Carriage Hill Drive Improvements. The drainage impacts of the development of Parcel I has been addressed in the Master Study. The Master Study has determined that the development of Parcel I will not adversely impact existing downstream facilities. Therefore, a site-specific existing condition hydrologic analysis is not necessary for this study.

B. INTERIM CONDITION

(Refer to *Figure 6: Interim Condition Basin Map* in Appendix A.*)*

The offsite areas are consistent with those described in existing condition. The proposed stockpile has been placed between two major washes so that no major washes impact the stockpile. Proposed condition is depicted on Figure 5.

Flow generated by the offsite basins OFF1, OFF2, AND OFF3 are diverted around the stockpile and will subsequently flow into the Beltway Channel as they do in existing condition. Flow generated on the top of the stockpile will be conveyed easterly as sheet flow. Therefore, the stockpile will not obstruct flows and flow patterns will be returned to their historic conditions.

C. ULTIMATE CONDITION

The proposed stockpile is temporary and will be removed with the development of Parcel I. An overall ultimate condition analysis assuming Parcel I and the Summerlin

West Planning Area is fully developed was provided with the Master Study. Therefore, a site-specific ultimate condition hydrologic analysis is not necessary for this study.

IV. HYDRAULIC ANALYSIS

Hydraulic cross sections have been taken along the perimeter of the stockpile to determine normal depth and velocity of the anticipated storm flows as they are conveyed around the stockpile. The results of the normal depth analysis are summarized in Table 5. Normal depth calculations have been included in Appendix C.

TABLE 2
PROPOSED CONDITION CHANNEL SUMMARY TABLE

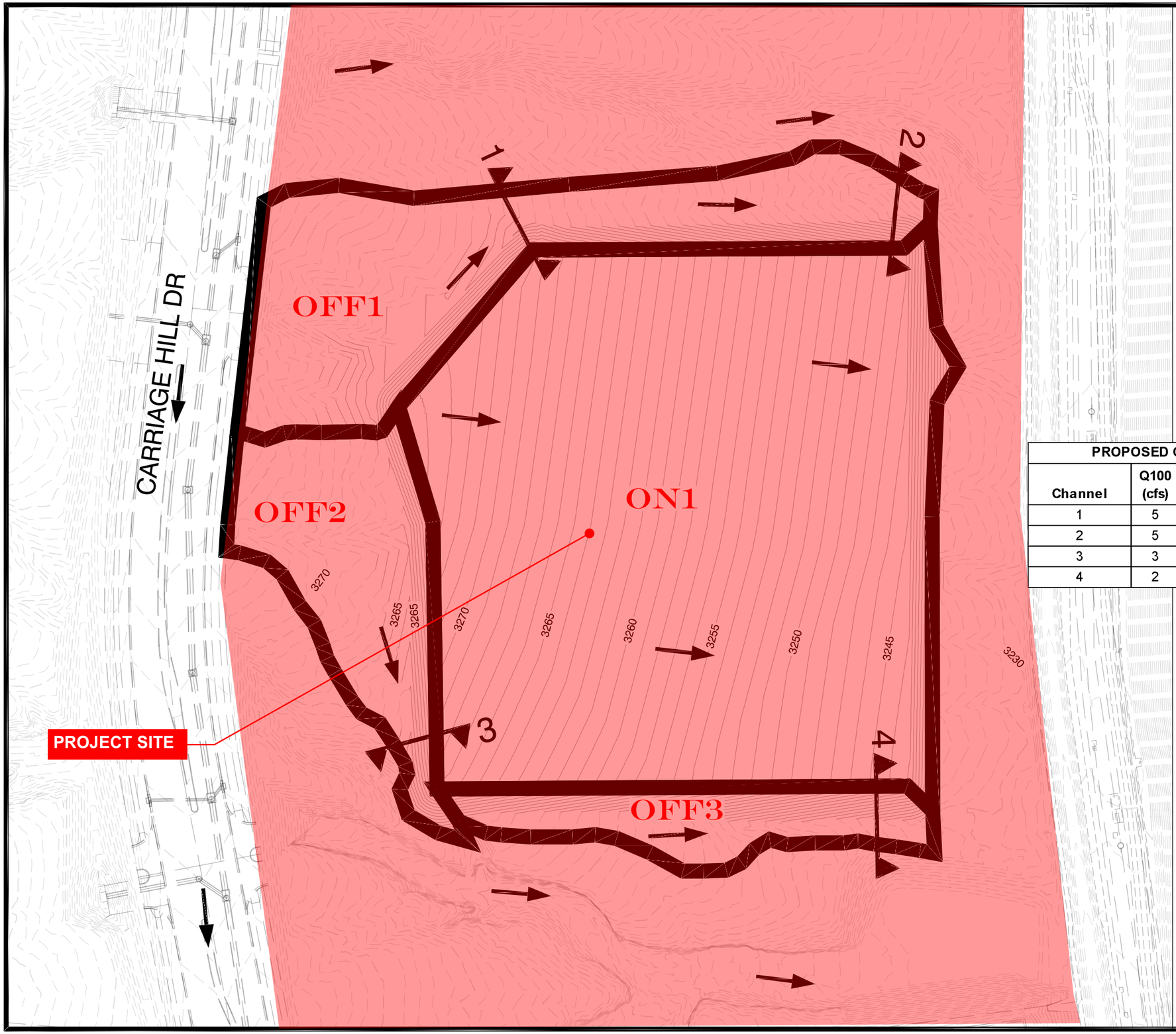
Channel	Q100 (cfs)	Slope	Normal Depth (ft)	Velocity (ft/s)	Description
1	5	1.60%	0.51	2.99	OFF1
2	5	6.71%	0.37	4.98	OFF1
3	3	2.22%	0.38	2.91	OFF2
4	2	6.24%	0.24	3.37	OFF3

The normal depth analysis shows that the velocities of the flow against the slope of the stockpile are non-erosive. In addition, flow depths are contained below the top of the stockpile with additional freeboard.

V. CONCLUSIONS

This *Technical Drainage Study for Summerlin West Village 21 Parcel I Stockpile* has been developed in accordance with Criteria established in the Manual. The proposed development does not adversely impact any proposed or existing Clark County Regional Flood Control District Master Plan Update facilities.

The site has been designed to control storm water runoff for the 6-hour, 100-year floods as calculated in this study and the Master Study. There are no adverse effects on upstream or downstream properties due to the proposed drainage system or infrastructure improvements.



PROPOSED CONDITION HEC-1 SUMMARY TABLE		
BASIN ID	AREA (ac)	Q100 (CFS)
OFF1	1.91	5
OFF2	1.09	3
OFF3	0.63	2
ON1	6.08	26

PROPOSED CONDITION CHANNEL SUMMARY TABLE					
Channel	Q100 (cfs)	Slope	Normal Depth (ft)	Velocity (ft/s)	Description
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3	3	2.22%	0.38	2.91	OFF2
4	2	6.24%	0.24	3.37	OFF3

NORTH

GRAPHIC SCALE

100 0 50 100 200

1" = 100'

LEGEND

- CONCENTRATION POINT
- BASIN BOUNDARY
- ST7 BASIN DESIGNATION
- FLOW ARROW
- CROSS SECTION

FIGURE 6 - PROPOSED CONDITION BASIN MAP
SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

W.O.#:	7809
DATE:	05/2019
BY:	ACY
SCALE:	1"=100'
SHEET	1 OF 1

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NV 89146-5148

H:\7851\Parcel I Stock Pile\Drainage\A Figures\Figure 6 - Proposed Condition Basin Map.dwg;ayup; May 03, 2019 - 11:38am

STANDARD FORM 4

DEVELOPMENT: Street I Stockpile

CONDITION: Proposed

W.O. # 7809 **CALCULATED BY:** ACY

V1 applies to the first 500 feet of travel distance
V2 applies to the remaining travel distance

Non-Urban:		Urban	
$V1 = 148 * S^{1/2}$	$V2 = 294 * S^{1/2}$	$V1 = 202 * S^{1/2}$	$V2 = 306 * S^{1/2}$

$$T_i = \frac{1.8(1.1-k)L^{1/2}}{S^{1/3}} \qquad T_t = \frac{L}{60V}$$

$$k = 0.0132 C_n - 0.39 \qquad T_c = T_i + T_t$$

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.	
PROPOSED CONDITION																	
ON1	94.6	0.859	6.08	0.0095	100	5.7	2.43	440	7.6	5.6	8.4	1.31	540	13.00	3.74	0.037	Min TLAG=0.05
OFF1	86.7	0.754	1.91	0.0030	60	7.3	2.49	740	5.4	3.4	6.8	3.02	800	14.44	5.51	0.055	Min TLAG=0.10
OFF2	86.7	0.754	1.09	0.0017	80	3.8	3.57	450	4.3	3.1	6.1	2.46	530	12.94	6.03	0.060	Min TLAG=0.10
OFF3	86.7	0.754	0.63	0.0010	50	17.0	1.71	440	5.7	3.5	7.0	2.07	490	12.72	3.79	0.038	Min TLAG=0.10

```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                    *          609 SECOND STREET           *
 *                                      *                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   03MAY19  TIME  09:53:43  *                    *          (916) 756-1104              *
 *                                      *                    *                                      *
 ****************************************                    ****************************************

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

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

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


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

                        *DIAGRAM
 *** FREE ***
             1          ID    PROPOSED CONDITION HYDROLOGIC MODEL
             2          ID    INPUT FILE DATE = MAY 3, 2019
             3          ID    DESIGN STORM = 100-YEAR 6-HR STORM
             4          ID    STORM DISTRIBUTION = SDN #3
             5          ID    MODELED BY VTN (ACY)
             6          ID
             7          ID    ******************************************************
             8          ID    * SUMMERLIN WEST VILLAGE 21                          *
             9          ID    * PARCEL I STOCKPILE                                 *
            10          ID    ******************************************************
            11          ID
            12          ID  100-YEAR,  6-HOUR STORM,  SDN3
            13          ID
            14          IT       5       0       0     300
            15          IO       5       0       0
            16          IN       5       0       0
            17          JR    PREC    1.00
                        *

            18          KK    OFF1
            19          BA  0.0030
            20          PC       0    0.02   0.057    0.07   0.087   0.108   0.124    0.13    0.13   0.130
            21          PC    0.13    0.13    0.13   0.133    0.14   0.142   0.148   0.158   0.172   0.181
            22          PC    0.19   0.197   0.199     0.2   0.201   0.204   0.214   0.229   0.241   0.249
            23          PC   0.251   0.256    0.27   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            24          PC   0.499    0.59    0.71   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            25          PC    0.86   0.868   0.876   0.888    0.91   0.926   0.937    0.95    0.97   0.976
            26          PC   0.982   0.985   0.987   0.989    0.99   0.993   0.993   0.994   0.995   0.998
            27          PC   0.998   0.999       1
            28          PB    3.35
            29          LS       0    86.7
            30          UD   0.100
                        *

            31          KK    OFF2
            32          BA  0.0017
            33          LS       0    86.7
            34          UD   0.100
                        *

            35          KK    OFF3
            36          BA  0.0010
            37          LS       0    86.7
            38          UD   0.100
                        *

            39          KK     ON1
            40          BA  0.0095
            41          LS       0    94.6
```

```
            42           UD   0.050
                         *
            43           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    18        OFF1
                 .
                 .
    31           .        OFF2
                 .          .
                 .          .
    35           .          .        OFF3
                 .          .          .
                 .          .          .
    39           .          .          .         ON1

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                    *    HYDROLOGIC ENGINEERING CENTER     *
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 *  RUN DATE   03MAY19  TIME  09:53:43  *                                    *          (916) 756-1104              *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************



                          PROPOSED CONDITION HYDROLOGIC MODEL
                          INPUT FILE DATE = MAY 3, 2019
                          DESIGN STORM = 100-YEAR 6-HR STORM
                          STORM DISTRIBUTION = SDN #3
                          MODELED BY VTN (ACY)

                          ******************************************************
                          * SUMMERLIN WEST VILLAGE 21                          *
                          * PARCEL I STOCKPILE                                 *
                          ******************************************************

                         100-YEAR,  6-HOUR STORM,  SDN3


   15 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
1

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

RATIOS APPLIED TO PRECIPITATION

OPERATION	STATION	AREA	PLAN		RATIO 1
					1.00
HYDROGRAPH AT					
+	OFF1	.00	1	FLOW	5.
				TIME	3.50
HYDROGRAPH AT					
+	OFF2	.00	1	FLOW	3.
				TIME	3.50
HYDROGRAPH AT					
+	OFF3	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	ON1	.01	1	FLOW	26.
				TIME	3.50

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

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

APN: 137-26-101-001
CITY OF LAS VEGAS
STATE OF NEVADA

DEVELOPED BY:

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY

10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

SHEET INDEX

SHEET #	SHEET	DESCRIPTION
CV	1	COVER SHEET
NT	2	NOTE SHEET
GR1	3	GRADING PLAN 1
DT1	4	DETAIL SHEET 1

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

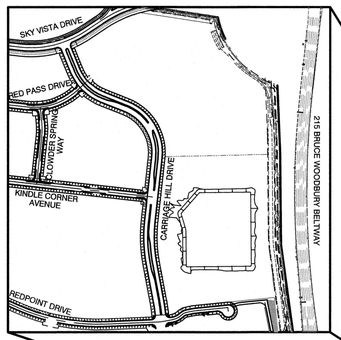
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

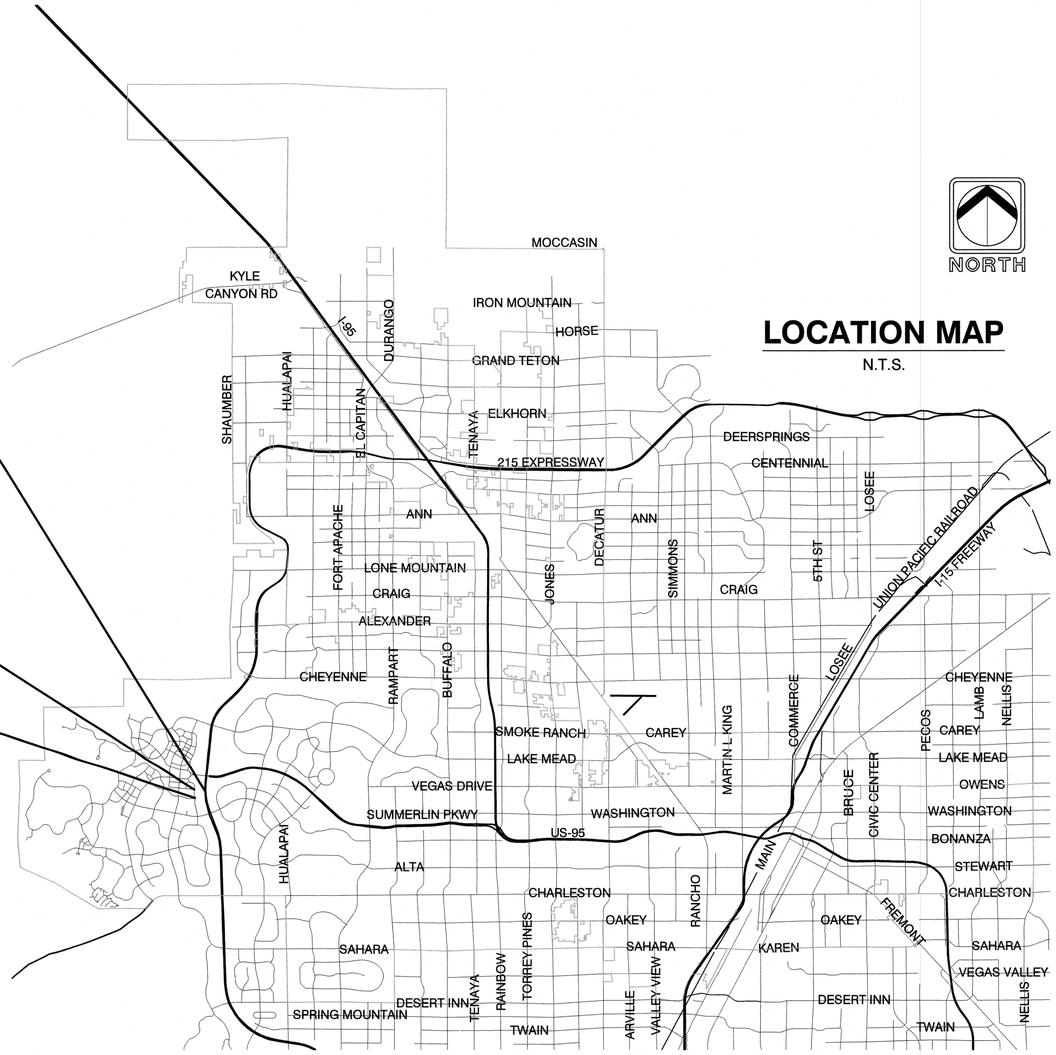
BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03





NORTH

LOCATION MAP

N.T.S.

OWNER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

DEVELOPER
HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

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

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

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CABLES! IT'S COSTLY
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
AND
1-702-229-9611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

FIRE DEPARTMENT APPROVAL

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

THESE PLANS AND THE DESIGN CRITERIA CONTAINED WITHIN THESE PLANS ARE BASED UPON THE INFORMATION PRESENTLY KNOWN BY THE ENGINEER. 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 STATUES, 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

CITY ENGINEER ALLEN PAVELKA, P.E. # 9029

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

PLANNING DEPARTMENT, CITY OF LAS VEGAS DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

KEVIN T. ORROCK, VICE PRESIDENT DATE

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY

REV	DATE	BY	REVISION

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILTY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
(702) 791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
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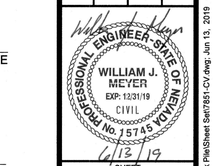
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	HORIZ.
DEH	DEH	WJM	N/A	VERT.
04/30/2019	04/30/2019	04/30/2019	N/A	

PROJECT NO: 7851



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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 DISTRICT'S - 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 THE REQUIRED FIRE FLOW. [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 FLUSH 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 § 106.3]
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC § 507.2.1, NFPA 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 30,000 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 LANES, 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 GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLICWORKS CONSTRUCTION OFFSITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; 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 INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THERE WITH.
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 (½") 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. 12. ALL GRADING WORK SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY: NOVA GEOTECHNICAL, PROJECT NO. G-18-003, DATED MARCH 5, 2018. APPROVED BY THE CITY ENGINEER, AND AS SHOWN ON THESE PLAN.
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. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

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

REVISED 06/04/2018

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'+	+0.0'to-0.1'	SEE SOILS REPORT
B.ENGINEERED FILL	0.5'+	+0.1'to-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

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: D368 (REVISED 2008)
NAVD88 ELEVATION: 989.574 METERS (3,246.63 FEET)

FND USC&GS DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD. & WEST OF DETENTION BASIN.
T21S,R59E,S03

GENERAL CONSTRUCTION NOTE:

THE FOLLOWING SEPARATE VILLAGE 21 ROADWAY INFRASTRUCTURE PLANS ARE TO BE CONSTRUCTED GENERALLY ALL TOGETHER.
1. DESERT FOOTHILLS (REDPOINT DRIVE TO SUMMERLIN PARKWAY)
2. CARRIAGE HILL(REDPOINT DRIVE TO SUMMERLIN PARKWAY)
3. KINDLE CORNER AVENUE (CARRIAGE HILL TO DESERT FOOTHILLS)
4. RED PASS DRIVE (CARRIAGE HILL TO DESERT FOOTHILLS)
5. CLOWDER SPRING WAY (KINDLE CORNER AVENUE TO RED PASS DRIVE)

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORGIN):26°15'00"N
LONGITUDE OF CENTRAL MERIDIAN:114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.

2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

LEGEND

DESCRIPTION	PROPOSED	EXISTING	FUTURE
CONTOUR (5' INTERVAL)	2450	(2450)	(2450)
CONTOUR (1' INTERVAL)			
EDGE OF PAVEMENT			
SAW CUT			
RETAINING WALL			
SCREEN WALL			
RIGHT OF WAY			
CENTER LINE			
BACK OF CURB			
LIP OF GUTTER			
FACE OF CURB			
SIDEWALK			
UNIT BOUNDARY LINE			
UNIT BOUNDARY / ROW			
PROPERTY LINE			
SLOPE AND FLOW DIRECTION	1.00%	(1.00%)	(1.00%)
SCARP AREA			
MATCHLINE			
SIDEWALK RAMP			
SIGHT VISIBILITY ZONES			
PAVED ROAD			
PAVEMENT REMOVAL			
STREET LIGHT			
WATER UNDER 18"			
WATER 18" & OVER			
SANITARY SEWER UNDER 18"			
SANITARY SEWER 18" & OVER			
STORM SEWER			
FIRE HYDRANT			
SANITARY SEWER MAN HOLE	(S)	(S)	(S)
CLEAN OUT			
STORM DRAIN MAN HOLE	(D)	(D)	(D)

ABBREVIATIONS

FF	FINISH FLOOR	PT	POINT OF TANGENCY	O/C	OFFSET CROWN
FG	FINISH GRADE	PRC	POINT OF REVERSE CURVATURE	BC	BACK OF CURB
FL	FLOW LINE	PCC	POINT OF COMPOUND CURVATURE	BCR	BEGIN CURB RETURN
TC	TOP OF CURB	BVC	BEGIN VERTICAL CURVE	BCL	BACK OF CURB LENGTH
TRC	TOP OF ROLL CURB	MVC	MID-POINT OF VERTICAL CURVE	TF	TOP OF FOOTING
EOP	EDGE OF ASPHALT PAVEMENT	EVC	END VERTICAL CURVE	GB	GRADE BREAK
FUT.	FUTURE	RVPC	POINT OF REVERSE VERTICAL CURVE	PC	POINT OF CURVATURE
EX.	EXISTING	R/W	RIGHT-OF-WAY	TPW	TOP OF PLANTER WALL
VG	VALLEY GUTTER	DI	DROP INLET	TRW	TOP OF RETAINMENT WALL
NG	NATURAL GROUND	BFE	BASE FLOOD ELEVATION	TOP	TOP OF CHANNEL/SCARP
H.P.	HIGH POINT	CCUSD	CLARK COUNTY UNIFORM STANDARD DRAWINGS	TOE	TOE OF CHANNEL/SCARP
L.P.	LOW POINT	SW	SIDEWALK	TOB	TOP OF BOX
SSMH	SEWER MANHOLE	TSW	TOP OF SIDEWALK	PP	POWER POLE
WTR	WATER LINE	INT.	INTERSECTION	TRANS.	TRANSITION
SD	STORM DRAIN	D.G.	DESIGN GRADE	RET.	RETAINMENT
RCP	REINFORCED CONCRETE PIPE	G/L	CENTER LINE		

DEVIATION FROM CITY OF LAS VEGAS STANDARDS

- NONE

EARTHWORK QUANTITIES

CUT	FILL	NET
347 CUBIC YARDS	92,612 CUBIC YARDS	92,265 CUBIC YARDS (FILL)

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 NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
9755 SOUTH PECCOLE RANCH DRIVE SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2697 WEB WWW.LTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

REV	DATE	BY	REVISION

NOTE SHEET

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

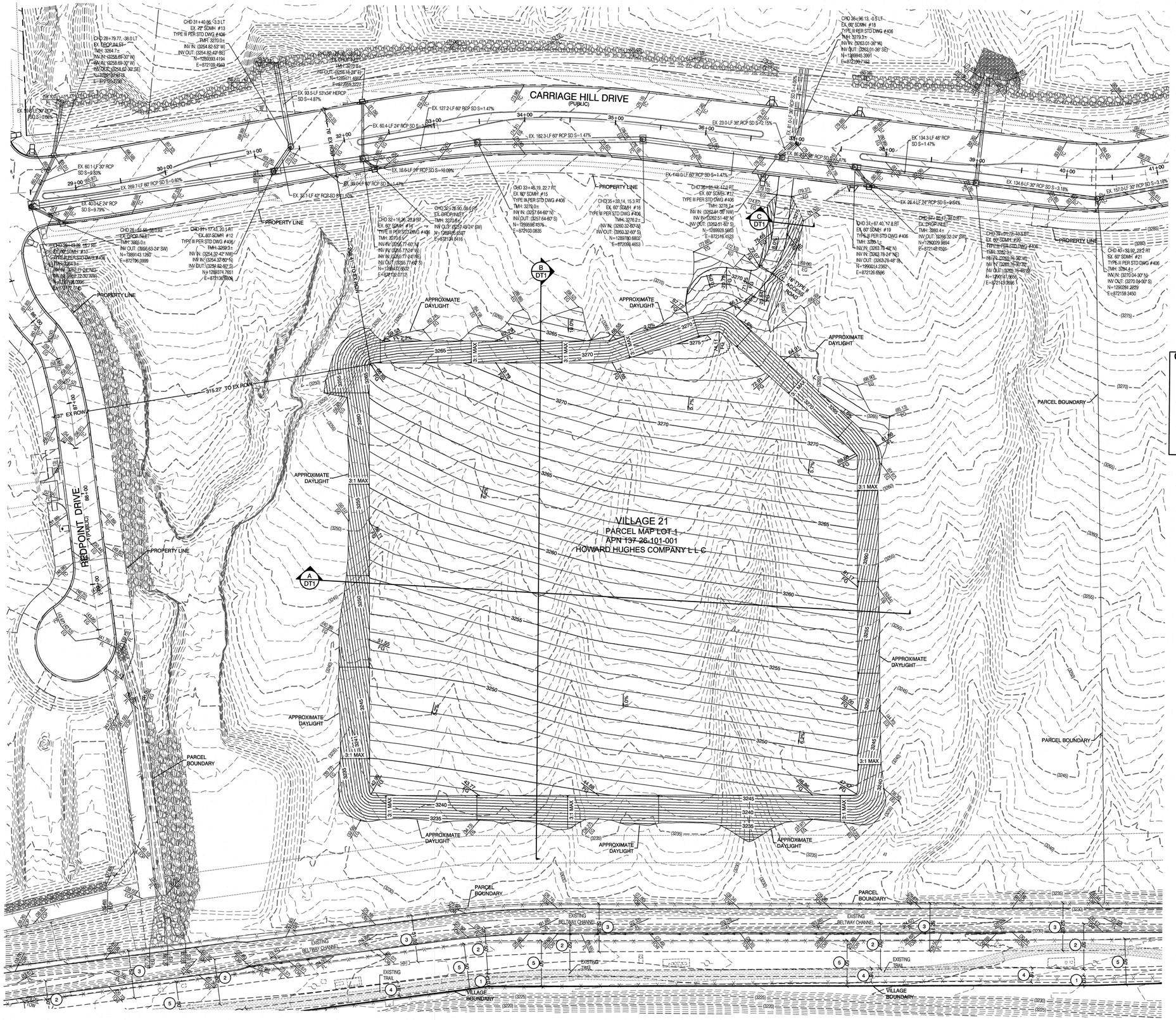
DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:	PROJECT NO:
DEH 04/30/2019	DEH 04/30/2019	WJM 04/30/2019	HORIZ. N/A VERT. N/A	7851

PROFESSIONAL ENGINEER - STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
No. 15745
6/13/19

SHEET
NT
2 OF 4 SHEETS

DRAWING NO.

H:\7851\Parcel I Stock Pile\Sheet Set\7851-NT.dwg, Jun 13, 2019



Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600
AND
1-702-455-6000
CLARK COUNTY TRAFFIC OPERATIONS

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

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL AND STREET LIGHT SYSTEM CONDUITS. IT'S COSTLY.
Call before you Underground
1-702-455-7511
CLARK COUNTY TRAFFIC OPERATIONS
1-702-229-6611
LAS VEGAS AREA COMPUTERIZED TRAFFIC SYSTEM

EARTHWORK QUANTITIES

CUT	FILL	NET
347 CUBIC YARDS	92,612 CUBIC YARDS	92,265 CUBIC YARDS (FILL)

EASEMENT REFERENCE LEGEND

1. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19990310:0001072. SUPERCEDES 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 19961001:0000671.
2. 50' WIDE NEVADA POWER COMPANY EASEMENT GRANTED PER OR: 20071119:0002005.
3. DRAINAGE EASEMENT GRANTED TO CLARK COUNTY PER OR: 20000816:0000525.
4. PEDESTRIAN TRAIL EASEMENT GRANTED TO CLARK COUNTY PER OR: 20080527:0005041.
5. 10' GAS EASEMENT GRANTED TO SOUTHWEST GAS COMPANY PER OR: 19991103:0000824.

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.

STOCKPILE NOTE:

STOCKPILES WITH HEIGHT OVER 4 FT MUST BE PROVIDED WITH A TEMPORARY FENCING.

STOCKPILE MATERIALS SHALL CONSIST OF CLEAN EARTH FILL UNLESS OTHERWISE APPROVED BY THE CITY OF LAS VEGAS.

STOCKPILE IS TO COMPLY WITH APPROVED CLARK COUNTY DUST MITIGATION PLAN #49367

FLOOD ZONE NOTE

SITE IS LOCATED IN A SHADED ZONE X AS SHOWN IN FIRM MAP 32003C2215OE, DATED SEPTEMBER 27, 2002, A SHADED ZONE X IS DETERMINED TO BE OUTSIDE THE 0.0% ANNUAL CHANCE FLOODPLAIN, ENTIRE SITE BOUNDARY IS WITHIN ZONE X.

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: NOVA GEOTECHNICAL PROJECT #G-18-003, DATED MARCH 5, 2018

GRADING NOTE:

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS / DITCHES AND A TEMPORARY LOCAL MINOR SEDIMENT BASIN ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY HOWARD HUGHES COMPANY.

ENGINEER DISCLAIMER NOTE:

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

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 6/13/19

REV	DATE	BY	REVISION

CITY OF LAS VEGAS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702.791.4400

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (703) 873-7550 FAX (703) 362-2597 WEB WWW.VTNNV.COM
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

GRADING PLAN 1

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

DRAWN BY:	DESIGNED BY:	CHECKED BY:	PROJECT NO:	SCALE:	HORIZ.
DBH	DBH	WJM	7651	N/A	N/A
04/30/2019	04/30/2019	04/30/2019			VERT.
				N/A	

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J. MEYER
EXP: 12/31/19
CIVIL
6/13/19

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GR1
3 OF 4 SHEETS
DRAWING NO.

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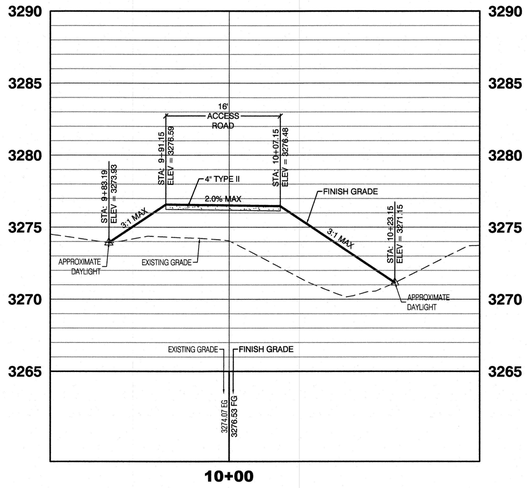
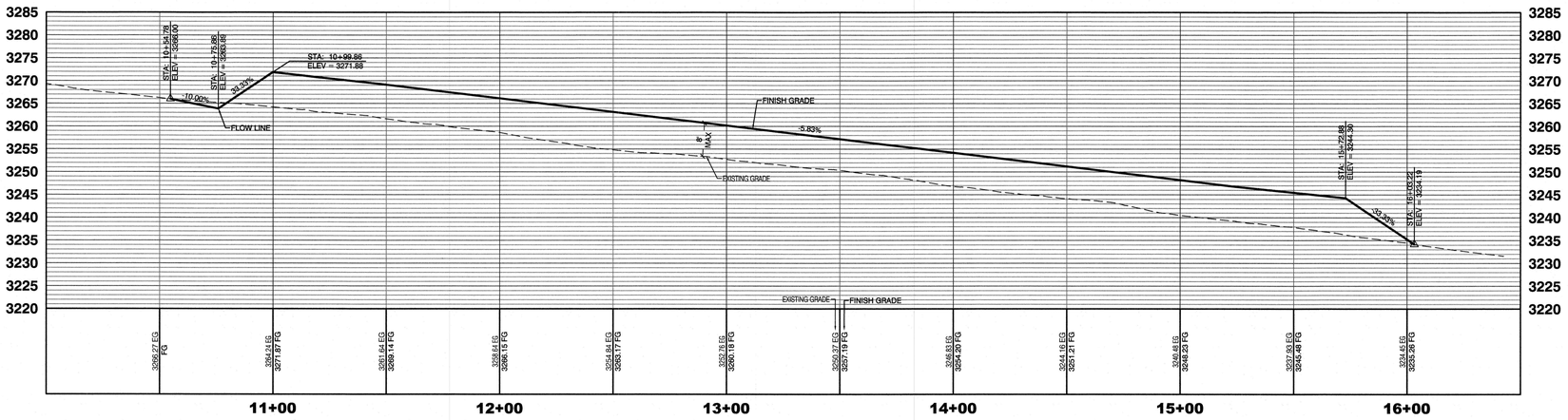


C - ACCESS ROAD TYPICAL SECTION

NTS



B - EAST WEST TYPICAL SECTION

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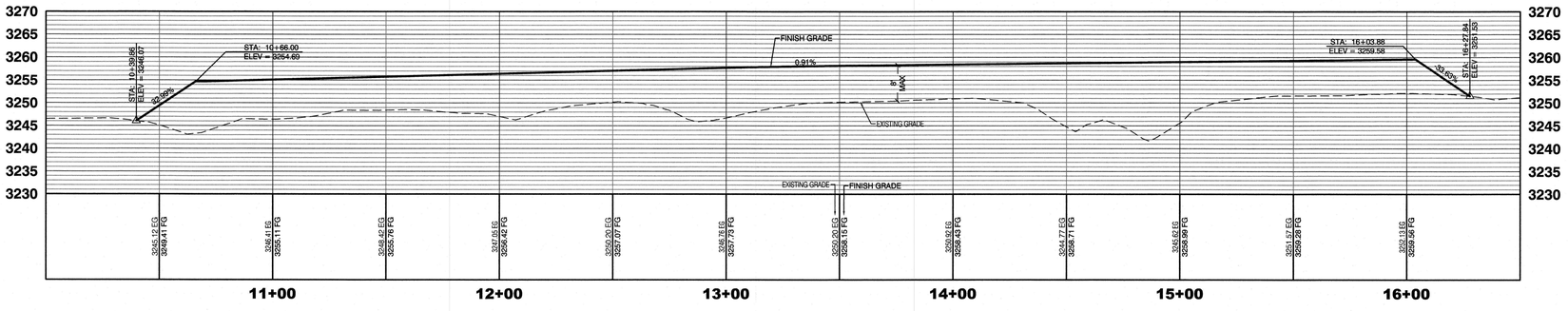

A - NORTH SOUTH TYPICAL SECTION

NTS

HOWARD HUGHES COMPANY, LLC
A DELAWARE LIMITED LIABILITY COMPANY
10801 W CHARLESTON BLVD SUITE 300
LAS VEGAS, NEVADA 89135
702-791-4000

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNNV.COM
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REV	DATE	BY	REVISION

DETAIL SHEET 1

SUMMERLIN WEST VILLAGE 21
PARCEL I STOCKPILE

DRAWN BY: DEH 04/30/2019
DESIGNED BY: DEH 04/30/2019
CHECKED BY: WJM 04/30/2019
PROJECT NO: 7951
SCALE: N/A HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
WILLIAM J MEYER
EXP: 12/31/19
CIVIL
No. 15745
6/13/19

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4 OF 4 SHEETS

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CIVIL IMPROVEMENT PLANS

FOR

HIGHLINE SUMMERLIN

VILLAGE 21 - PARCEL I

A PORTION OF APN: 137-26-112-001

CITY OF LAS VEGAS, NEVADA

PROJECT CONTACTS

DEVELOPER
LENNAR
9275 W RUSSELL RD, SUITE 400
LAS VEGAS, NEVADA 89148

CONTACT: ROBERT FLAXA
(702) 821-4651

OWNER
HUGHES HOWARD COMPANY, LLC
10801 W CHARLESTON BLVD, 3RD FLOOR
LAS VEGAS, NEVADA 89135

CONTACT: CHRIS ANDERSON
(702) 791-4336

CIVIL ENGINEER
KIMLEY-HORN AND ASSOCIATES, INC.
6671 LAS VEGAS BOULEVARD SOUTH, SUITE 320
LAS VEGAS, NEVADA 89119

CONTACT: JODY WALKER BELSICK, PE
(702) 327-2567

PROJECT ARCHITECT
PERLMAN ARCHITECTS
450 FREMONT STREET, SUITE 233
LAS VEGAS, NEVADA 89101

CONTACT: MAY CADACIO
(702) 979-9900

PROJECT INFORMATION

A PORTION OF APN: 137-26-112-001

NUMBER OF LOTS: 1

ACREAGE: ±19.9 ACRES

ZONING: (P-C) PLANNED COMMUNITY DISTRICT

UTILITY PROVIDERS

WATER	LAS VEGAS VALLEY WATER DISTRICT
SEWER	CITY OF LAS VEGAS
ELECTRIC	NV ENERGY
SOLID WASTE DISPOSAL	REPUBLIC SERVICES
GAS	SOUTHWEST GAS
TELEPHONE	CENTURY LINK
COMMUNICATIONS	COX COMMUNICATIONS

LEGAL DESCRIPTION

A PORTION OF LOT 1 OF THAT CERTAIN FINAL MAP IN THE OFFICE OF SAID COUNTY RECORDER IN BOOK 123 OF PLATS, PAGE 36, RECORDED MAY 01, 2018, LOCATED WITHIN THE SECTIONS 14 THRU 17, 20 THRU 23, 26 THRU 29 AND 32 THRU 34, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AND SECTION 4, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M, CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

PARCEL I WILL BE ESTABLISHED AS A SEPARATE LEGAL PARCEL BY THHC WITH THE VILLAGE 21 UNIT 3 FINAL MAP.

FLOOD ZONE NOTE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAPS, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

GEOTECHNICAL NOTE

NO MAPPED FISSURES OR FAULTS. GROUNDWATER NOT ENCOUNTERED.

UTILITY NOTE

KIMLEY-HORN AND ASSOCIATES TAKES NO RESPONSIBILITY FOR EXISTING UTILITIES SHOWN HEREIN. THE EXISTING UTILITIES SHOWN ARE BASED ON INFORMATION PROVIDED BY-OTHER PARTIES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND VERIFY THE LOCATIONS AND INVERTS OF THE EXISTING WITHIN THE VICINITY OF CONSTRUCTION ACTIVITIES. IF A CONFLICT IS FOUND TO EXIST, THE CONTRACTOR SHALL COORDINATE THE PROJECT ENGINEER, PROJECT ARCHITECT, AND THE OWNER IMMEDIATELY.

GENERAL NOTES:

1. THIS SUBDIVISION IS A PART OF THE WEST SUMMERLIN VILLAGE 21 MASTER PLAN.
2. LANDSCAPING ON-SITE WILL BE MAINTAINED BY AN HOA
3. WATER POINT OF CONNECTION WILL COME OFF EXISTING WATER LINES FROM CARRIAGE HILL DRIVE
4. SEWER POINT OF CONNECTION WILL COME OFF EXISTING SEWER LINES AT THE SOUTHEAST CORNER OF THE PARCEL
5. ABOVE GROUND UTILITY BOXES SHALL NOT BE PLACED WITHIN TRAIL CORRIDORS
6. ONSITE STREETS, TRAILS, OPEN SPACES, AND DRAINAGE CORRIDORS ARE TO BE PRIVATE AND MAINTAINED BY THE HOA

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARING

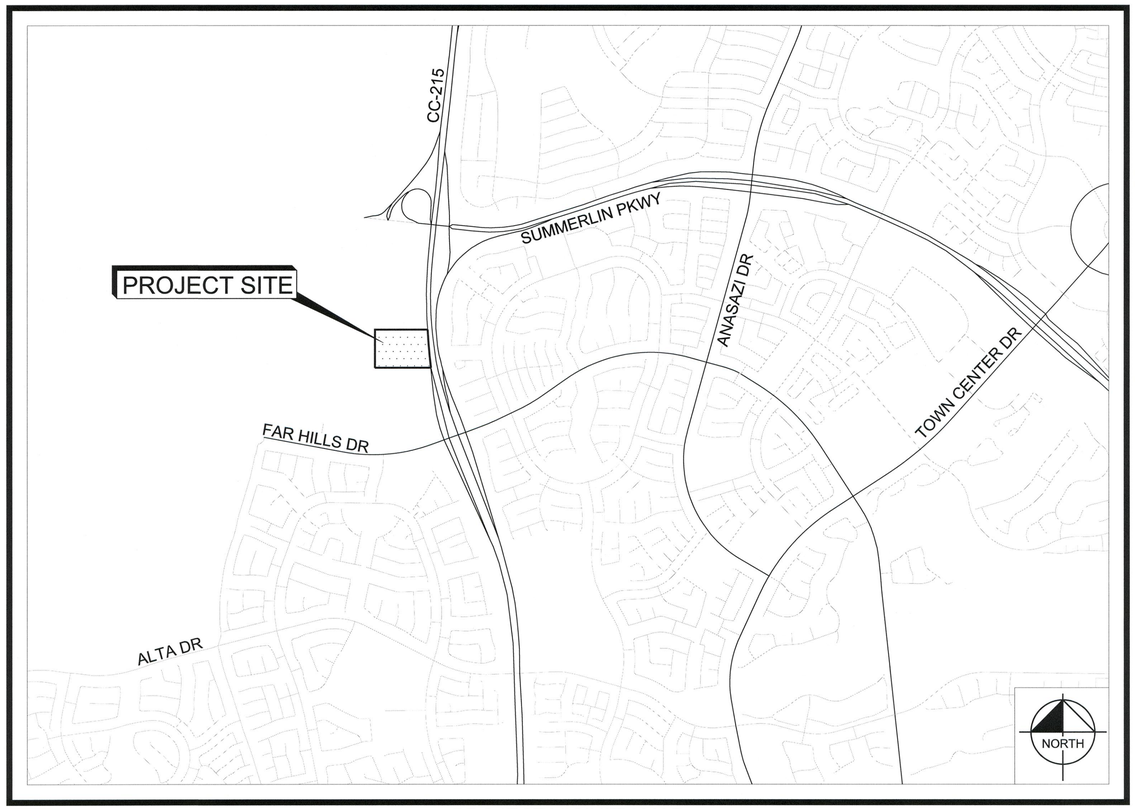
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE



PROJECT VICINITY MAP
NTS

SHEET INDEX:

SEE SHEET C0.3

REFERENCE INFORMATION:

TECHNICAL DRAINAGE STUDY:	XX-XXXXX
TRAFFIC STUDY:	XXXXXX
BUILDING PERMIT:	XXXXX-XXXXX
ENTITLEMENTS:	XXX-XXXXX

APPROVALS

CITY OF LAS VEGAS

"APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS" THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATION FROM STANDARDS" IN FAVOR OF THE SUMMERLIN IMPROVEMENT STANDARDS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA".

ALLEN PAVELKA, PE #09029 DATE
CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

CITY OF LAS VEGAS PLANNING DEPARTMENT DATE
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT

CITY OF LAS VEGAS FIRE DEPT. DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. XXXXX FIRST APPROVED DATE:
SHEETS: CX.X, CX.X, CX.X, CX.X, CX.X
PLAN APPROVAL CONTINGENT UPON APPROVAL OF PROJECT #XXXXXX & #XXXXXX

NV ENERGY* DATE

* NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY 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.

CENTRAL TELEPHONE COMPANY, d/b/a CENTURY LINK* DATE

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

COX COMMUNICATIONS LAS VEGAS, INC. DATE

SOUTHWEST GAS CORPORATION DATE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
© 2019 KIMLEY-HORN AND ASSOCIATES, INC.
6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

JODY WALKER BELSICK — STATE OF NEVADA — PROFESSIONAL ENGINEER — CIVIL — No. 15107 — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

COVER SHEET

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

1 OF 46 SHEETS
C0.1

Plotted By:Kirsten Nikol Sheet Set:Kha Layout:C0.1 October 13, 2019 01:57:34pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-cv.dwg
This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA"; LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA"; LATEST 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 INTERFERENCE'S WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.
3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER AND OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.
5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGNS TO BE APPROVED BY THE CITY, PRIOR TO THE USE ON THE PROJECT.
6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.
7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.
8. AC PAVEMENT TO BE ONE-HALF INCH (½") 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 220.
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 SHALL CONFORM TO THE SOILS REPORT AS PREPARED BY TERRA SOUTHWEST CONSULTANTS INC. DATED DECEMBER 14, 2017 PROJECT NO. 64175087, 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. 625.380 & CITY OF LAS VEGAS TITLE 18, APPENDIX D.
15. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE UTILITY COMPANY AND THE CITY ENGINEER.

WALL NOTES:

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

CITY OF LAS VEGAS STREETLIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION, AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION.
2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC/ELECTRICAL FIELD OPERATIONS DIVISION AND THE CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623.L0.03 (E) OF THE SPECIFICATIONS.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
4. ALL EMPTY CONDUIT SHALL HAVE PULL STRINGS INSTALLED PRIOR TO FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE OF EIGHTEEN INCHES (18") TO THE FACE OF STREET LIGHTING POLE ON ALL SIDES WHEN STREETLIGHT IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.
6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE ELECTRICAL SERVICES SECTION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.
7. SERVICE POINT SHALL BE COORDINATED WITH NEVADA POWER COMPANY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICE POINTS SHALL BE SHOWN ON THE PLANS.
8. IT SHALL BE ASSUMED THAT IN THE ABSENCE OF AN EXISTING, WORKABLE CIRCUIT TO ATTACH TO, ALL INSTALLATIONS SHALL REQUIRE A NEW SERVICE FOR OPERATION OF THE CIRCUIT.
9. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREET LIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BASES ARE INSTALLED AT NO EXPENSE TO THE CITY OF LAS VEGAS.
10. THE CONTRACTOR SHALL FURNISH COMPLETE SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON PLANS.
11. THE DEVELOPER/OWNER WILL BE REQUIRED TO SUPPLY POWER TO ALL NEW PUBLIC STREET LIGHTS INSTALLED UNDER THIS DESIGN PRIOR TO BOND RELEASE OR PROJECT COMPLETION. THE DEVELOPER/OWNER WILL BE RESPONSIBLE FOR ALL ITEMS ASSOCIATED WITH THE INSTALLATION, CONSTRUCTION, ENERGIZING, MAINTENANCE AND OPERATIONAL COST OF SAID STREETLIGHTS PRIOR TO PROJECT COMPLETION. REFER TO THE PLAN FOR ANY NEW SERVICE REQUIREMENTS. THE TRANSFER OF OWNERSHIP FROM THE DEVELOPER/OWNER TO THE THE CITY OF LAS VEGAS FOR ALL NEW PUBLIC STREET LIGHT/S AND/OR SERVICE/S INSTALLED UNDER THIS PLAN DESIGN WILL BE IN CONJUNCTION WITH THIS PROJECT COMPLETION. COORDINATE ALL MAINTENANCE AND OPERATIONAL TRANSFERS WITH THE CITY OF LAS VEGAS TRAFFIC ENGINEERING DEPARTMENT (TEFO) AT (702) 229-6331.

NOTE TO CONTRACTOR:

1. CONTRACTOR IS REQUIRED TO NOTIFY THE ARCHITECT, ENGINEER AND OWNER IN WRITING BY RFI OF ANY TYPED, HANDWRITTEN, STAMPED OR LABELLED PLAN CHECK COMMENTS ON THE PERMITTED PLANS WITHIN 7 DAYS OF RECEIPT OF THE PERMITTED PLANS. FAILURE TO PROVIDE WITHIN 7 DAYS INDICATES CONTRACTOR HAS INCLUDED ALL COSTS WITHIN HIS BASE BID TO COMPLY WITH FEDERAL, STATE AND LOCAL CODES AND SHALL PERFORM THE WORK AT NO ADDITIONAL COST.
2. GENERAL CONTRACTOR SHALL INCLUDE CONTACTING, COORDINATING PERMITS, SCHEDULING AND SUPERVISING ALL WORK TO BE PERFORMED BY NVE, SOUTHWEST GAS, CENTURYLINK, COX CABLE OR OTHER UTILITY PURVEYOR WORK PRIOR TO AND DURING CONSTRUCTION INCLUDING BARRICADING PLANS, BARRICADE DESIGNS, PERMITS AND BARRICADE WORK.
3. GENERAL CONTRACTOR SHALL CONTACT AND MEET ONSITE WITH ALL UTILITY PURVEYORS FOR SCHEDULING AND COORDINATION PURPOSES AT LEAST 30 DAYS PRIOR TO INSTALLATION OF UTILITY WORK.
4. GENERAL CONTRACTOR SHALL PROVIDE AND PAY FOR ALL BARRICADING PLANS, APPROVALS AND BARRICADING WITHIN THE RIGHT OF WAY AS WELL AS ANY CHANGES REQUIRED BY THE GOVERNING AUTHORITY IN THE PERFORMANCE OF CONTRACTOR'S WORK.
5. THE OWNER AND/OR HIS CONSULTANTS ARE NOT RESPONSIBLE FOR DELAYS CAUSED BY CONTRACTOR'S FAILURE TO PROVIDE NOTIFICATIONS IN A TIMELY MANNER.
6. PROJECT CONSULTANTS SHALL RESPOND TO RFIS OR OTHER CONTRACTOR QUERIES WITHIN 5 BUSINESS DAYS.

DEVIATION FROM STANDARDS

NONE

LAS VEGAS VALLEY WATER DISTRICT (LVVWD) STANDARD NOTES

LVVWD PROJECT # XX-XX

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 PM 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 THE UDACS SHALL SUPERCEDE 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 SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES OR 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 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 LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600.
14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK BY THE LVVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDED THE PLACEMENT OF APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

   ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNER'S ASSOCIATION IS IN EXISTENCE, OR THE ENTITY WHO ARRANGED FOR DECORATIVE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OR PRIVATE STREET, IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LVVWD WITH AN APPROPRIATELY SIZED PLAIN FINISH CONCRETE PATCH. THE LVVWD WILL NOT RESTORE DECORATIVE 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.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO._____XX-XX_____ FIRST APPROVED DATE:_____

SWPPP NOTES

1. CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVED 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 AND CLARK COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE CITY OF LAS VEGAS AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES 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 NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY ACTUAL 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 INSPECTION MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

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. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
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 FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.
10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C-900 PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

LAS VEGAS FIRE & RESCUE GENERAL NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6325 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALLEY 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 SYSTEMS SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. [IFC 105.7.12]
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 THE REQUIRED FIRE FLOW. [IFC 3310 & 3312]
5. TO IDENTIFY THE FIRE HYDRANT LOCATIONS, THE CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF THE STREET ADJACENT TO FIRE HYDRANTS. [IFC 507.5.7.3]
6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH 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 106.3]
7. ALL ON-SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC 507.2.1, NFPA 24]
8. PAINTING 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 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 FEET UNSPRINKLERED; 600 FEET SPRINKLERED
    COMMERCIAL-300 FEET UNSPRINKLERED; 400 FEET SPRINKLERED
12. WHERE THE WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM OF 1000 FEET 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 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FEET 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 FEET OF THE PERIMETER OF THE RADIUS OF THE CUL-DE-SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FEET OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. [IFC C102.12]
15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE- OR TWO-FAMILY DWELLING SHALL NOT EXCEED 300 FEET, 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 FEET, 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 FEET. [IFC C102.6]
18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE ARE FOUR (4) OR MORE FIRE HYDRANTS/SPRINKLER LEAD-INS ARE INSTALLED ON A SINGLE SYSTEM. SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN TWO (2) FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN. [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 FEET 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 FEET OUTSIDE AND 28 FEET INSIDE TURNING RADIUS. [IFC 503.2.4]
22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13 FEET 6 INCHES. [IFC 503.2.1]
23. FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 40 FEET FLOW LINE TO FLOW LINE WITH PARALLEL PARKING PERMITTED ON BOTH SIDES. NOT LESS THAN 32 FEET WIDE, FLOW-LINE TO FLOW-LINE, WHERE PARKING IS PERMITTED ONLY ON ONE SIDE OF THE FIRE APPARATUS ACCESS ROAD. NOT LESS THAN 24 FEET WIDE, FLOW-LINE TO FLOW-LINE, WHERE NO PARKING IS PERMITTED ON EITHER SIDE. FIRE LANES THROUGH PARKING LOTS SHALL BE NOT LESS THAN 24 FEET. [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 FEET FROM FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASED TO 250 FEET IF THE BUILDING IS SPRINKLERED. [IFC 501.1.1]
25. APPROVED SECONDARY FIRE APPARATUS SHALL BE PROVIDED FOR 100 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD-ENDS OR WITH A SINGLE POINT OF ACCESS IN EXCESS OF 600 FEET. COMMERCIAL AND INDUSTRIAL DEVELOPMENTS WHERE BUILDINGS EXCEED 2 STORIES OR 30 FEET IN HEIGHT, OR EXCEEDING 62,000 SQUARE FEET IN

CONSTRUCTION NOTES

		UNIT	PUBLIC	PRIVATE
1	CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.	LF	–	–
2	CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.	LF	–	–
3	CONSTRUCT 6" CURB PER DETAIL	LF	–	–
4	CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.	LF	–	–
5	10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.	LF	–	–
6	CONSTRUCT 2' WIDE CURB CUT PER DETAIL 8 ON SHEET C9.3	EA	–	–
7	CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3	EA	–	–
8	CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3	SY	–	–
9	CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.	SF	–	–
10	CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236	EA	–	–
11	CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.	SF	–	–
12	CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.	SF	–	–
13	CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.	SY	–	–
14	INSTALL 4" PVC UNDER SIDEWALK	EA	–	–
15	CONSTRUCT STAIR RISER PER 2018 IBC, PROVIDE SUMMERLIN COMPLIANT HANDRAIL FOR 3 OR MORE STEPS.	SF	–	–
16	CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).	LF	–	–
17	CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).	LF	–	–
18	INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.	SF	–	–
19	INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.	EA	–	–
20	CONSTRUCT ACCESSIBLE RAMP CASE 1 PER DETAIL 11 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS	EA	–	–
21	CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS	EA	–	–
22	CONSTRUCT ACCESSIBLE RAMP CASE 3 PER DETAIL 13 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS	EA	–	–
23	CONSTRUCT ROCK RIP-RAP SWALE d50=X, T=X PER DETAIL x ON SHEET C9.3	SY	–	–
24	OUTLET 6" STORM DRAIN THROUGH WALL AND SPLASH TO GRADE PER DETAIL X ON SHEET C9.3	EA	–	–
25	INSTALL ROLL CURB DRAIN OUTLET	EA	–	–
26	INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR	EA	–	–

STORM DRAIN NOTES

		UNIT	PUBLIC	PRIVATE
1	INSTALL 18" RCP CLASS III STORM DRAIN PIPE	LF	–	–
2	INSTALL 24" RCP CLASS III STORM DRAIN PIPE	LF	–	–
3	INSTALL 42" RCP CLASS III STORM DRAIN PIPE	LF	–	–
4	INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403	LF	–	–
5	INSTALL 60" TYPE III SDMH PER CCAUSD NO. 403	EA	–	–
6	INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3	EA	–	–
7	INSTALL DROP INLET TYPE DM2 PER DETAILS 16 ON SHEET C9.3	EA	–	–
8	INSTALL NDS 18" X 18" CATCH BASIN	EA	–	–
9	INSTALL 6" PVC STORM DRAIN PIPE	LF	–	–
10	INSTALL 8" PVC STORM DRAIN PIPE	LF	–	–

MASTER LEGEND

- STREET CENTERLINE
- PROPERTY LINE
- ADJACENT PROPERTY LINE
- EXISTING LOT LINE
- EXISTING EASEMENT
- EXISTING PATENT EASEMENT
- EXISTING PROPERTY LINE TO BE VACATED
- EXISTING PATENT EASEMENT TO BE VACATED
- EXISTING WALL
- PROPOSED RETAINING & SCREEN WALL
- PROPOSED SCREEN WALL
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING BUILDING
- PROPOSED BUILDING
- PROPOSED CONCRETE BARRIER RAIL
- EXISTING CURB & GUTTER
- EXISTING CURB
- EXISTING SIDEWALK
- EXISTING VALLEY GUTTER
- PROPOSED CURB & GUTTER
- PROPOSED CURB
- PROPOSED SIDEWALK
- EXISTING EDGE OF PAVEMENT
- PROPOSED EDGE OF PAVEMENT
- EXISTING EDGE OF PAVEMENT TO BE REMOVED
- EXISTING ROAD STRIPING
- PROPOSED BOLLARD
- PROPOSED DOOR
- SCARP (35% / 0.40%)
- SLOPE
- EXISTING GRADE (32.27 AC)
- PROPOSED GRADE (30.50 TC)
- BACKWATER VALVE (BW)
- EXISTING PARKING STRIPING
- PROPOSED ROAD STRIPING
- PROPOSED PARKING STRIPING
- EXISTING CONTOUR (2375)
- PROPOSED CONTOUR 2376
- CUT FILL TRANSITION
- ADA ACCESS
- SAWCUT LIMITS
- RIDGE
- GRADE BREAK
- FLOW LINE
- EXISTING STORM DRAIN
- EXISTING STORM DRAIN TO BE REMOVED
- EXISTING SEWER LINE
- EXISTING WATER LINE
- EXISTING GAS LINE (G)
- PROPOSED SEWER (SS)
- PROPOSED SEWER LATERAL (SS)
- PROPOSED WATER LINE (W)
- PROPOSED STREET LIGHT CONDUIT
- PROPOSED TRAFFIC CONDUIT
- EXISTING SIGN
- PROPOSED SIGN
- PROPOSED SIGN
- EXISTING HANDICAP PARKING
- PROPOSED HANDICAP PARKING
- EXISTING STORM DRAIN MANHOLE
- PROPOSED SIDEWALK DRAIN
- EXISTING DROP INLET
- PROPOSED DROP INLET
- EXISTING SEWER MANHOLE
- PROPOSED SEWER MANHOLE
- EXISTING FIRE HYDRANT
- PROPOSED CLEAN OUT
- PROPOSED FIRE HYDRANT
- EXISTING WATER VALVE
- PROPOSED WATER VALVE
- PROPOSED BLUE REFLECTIVE PVMT MARKING
- EXISTING MISCELLANEOUS MANHOLE (MH)
- EXISTING POLE
- EXISTING STREET LIGHT
- EXISTING AREA LIGHT
- PROPOSED STREET LIGHT
- PROPOSED AREA LIGHT

INDEX

NUMBER	TITLE	NAME
1	COVER SHEET	C0.1
2	GENERAL NOTES	C0.2
3	MASTER LEGEND AND QUANTITIES	C0.3
4	OVERALL GRADING PLAN	C2.0
5	GRADING PLAN 1 OF 8	C2.1
6	GRADING PLAN 2 OF 8	C2.2
7	GRADING PLAN 3 OF 8	C2.3
8	GRADING PLAN 4 OF 8	C2.4
9	GRADING PLAN 5 OF 8	C2.5
10	GRADING PLAN 6 OF 8	C2.6
11	GRADING PLAN 7 OF 8	C2.7
12	GRADING PLAN 8 OF 8	C2.8
15	OVERALL UTILITY PLAN	C3.0
16	UTILITY SHEET 1 OF 8	C3.1
17	UTILITY SHEET 2 OF 8	C3.2
18	UTILITY SHEET 3 OF 8	C3.3
19	UTILITY SHEET 4 OF 8	C3.4
20	UTILITY SHEET 5 OF 8	C3.5
21	UTILITY SHEET 6 OF 8	C3.6
22	UTILITY SHEET 7 OF 8	C3.7
23	UTILITY SHEET 8 OF 8	C3.8
24	A & B DRIVE PLAN & PROFILE	C4.1
25	H & G DRIVE PLAN & PROFILE	C4.2
26	M DRIVE PLAN & PROFILE	C4.3
27	J DRIVE PLAN & PROFILE	C4.4
28	F DRIVE PLAN & PROFILE STA 10+20 – 16+00	C4.5
29	F DRIVE PLAN & PROFILE STA 10+00 – 16+00	C4.6
30	E DRIVE PLAN & PROFILE SHEET STA 10+81 – 16+50	C4.7
31	E DRIVE PLAN & PROFILE STA 16+50 – 21+73	C4.8
32	D DRIVE PLAN & PROFILE STA 10+00 – 15+50	C4.9
33	D DRIVE PLAN & PROFILE STA 15+50 – 20+54	C4.10
34	C DRIVE PLAN & PROFILE STA 10+89 – 75+00	C4.11
35	C DRIVE PLAN & PROFILE STA 15+00 – 21+22	C4.12
36	STORM DRAIN PLAN SHEET 1 OF 6	C5.1
37	STORM DRAIN PLAN SHEET 2 OF 6	C5.2
38	STORM DRAIN PLAN SHEET 3 OF 6	C5.3
39	STORM DRAIN PLAN SHEET 4 OF 6	C5.4
40	STORM DRAIN PLAN SHEET 5 OF 6	C5.5
41	STORM DRAIN PLAN SHEET 6 OF 6	C5.6
45	TYPICAL SECTIONS SHEET 1 OF 2	C9.1
46	TYPICAL SECTIONS SHEET 2 OF 2	C9.2
47	TYPICAL DETAILS SHEET	C9.3

ABBREVIATIONS

@	AT	E/W	EAST/WEST or EACH WAY	PT	POINT OF TANGENCY
AB	AGGREGATE BASE	F-F	FACE OF CURB TO FACE OF CURB	PVC	POLYVINYL CHLORIDE
AC	ASPHALTIC CONCRETE	FG	FINISHED GROUND	PVI	POINT OF VERTICAL INFLECTION
ADA	AMERICANS WITH DISABILITIES ACT	FH	FIRE HYDRANT	R	RADIUS
APN	ASSESSORS PARCEL NUMBER	FS	FINISHED SURFACE	RCB	REINFORCED CONCRETE BOX
AVE	AVENUE	FL	FLOWLINE	RCP	REINFORCED CONCRETE PIPE
BC	BACK OF CURB	FT	FOOT or FEET	RT	RIGHT
BCR	BEGIN CURB RETURN	GB	GRADE BREAK	R/W	RIGHT OF WAY
BLVD	BOULEVARD	H	HEIGHT	S	SOUTH
BM	BENCHMARK	HDPE	HIGH-DENSITY POLYETHYLENE	SD	STORM DRAIN
BVC	BEGIN VERTICAL CURVE	HP	HIGH POINT	SF	SQUARE FOOT OR FEET
BW	BOTTOM OF WALL	INT	INTERSECTION	SS	SANITARY SEWER
B/S	BACKSIDE	INV	INVERT	SSMH	SANITARY SEWER MANHOLE
CALC	CALCULATED	L	LENGTH	ST	STREET
CCAUSD	CLARK COUNTY AREA UNIFORM STANDARD DRAWING	LA	LANDSCAPE ARCHITECT	STL	STEEL
		LF	LINEAR FEET	STD	STANDARD
CCFD	CLARK COUNTY FIRE DEPARTMENT	L/S	LANDSCAPE	SY	SQUARE YARDS
CL	CENTERLINE	LT	LEFT	TC	TOP OF CURB
CLV	CITY OF LAS VEGAS	LVVWD	LAS VEGAS VALLEY WATER DISTRICT	TG	TOP OF GRATE
CO	CLEAN OUT	MAX	MAXIMUM	TYP	TYPICAL
CONN	CONNECTION	ME	MATCH EXISTING	TW	TOP OF WALL
CTV	CABLE TELEVISION	MEP	MECHANICAL, ELECTRICAL AND PLUMBING	UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS
CY	CUBIC YARD				
Δ	DELTA (DIFFERENCE) / ANGLE	MH	MANHOLE		
D	DEPTH	MIN	MINIMUM	VERT	VERTICAL
DG	DECOMPOSED GRANITE	N	NORTH	W	WEST OR WATER
DI	DUCTILE IRON	NAP	NOT A PART	WL	WATERLINE
E	EAST	NTS	NOT TO SCALE	WTR	WATER
EA	EACH	N/S	NORTH/SOUTH	XFF	EXISTING FINISHED FLOOR ELEVATION
ECR	END CURB RETURN	OC	ON CENTER	±	PLUS OR MINUS
ELEV	ELEVATION	P.A.E.	PUBLIC ACCESS EASEMENT		
ELEC	ELECTRICAL	PC	POINT OF CURVATURE		
EP	EDGE OF PAVEMENT	PCC	POINT OF COMPOUND CURVATURE		
EVC	END VERTICAL CURVE	PR	PROPOSED		
EX.	EXISTING	PRC	POINT OF REVERSE CURVATURE		

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XX-XX FIRST APPROVED DATE:

CLV#:

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

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

No.	REVISIONS	DATE	BY

Kimley»Horn

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

CONSTRUCTION MANAGER-IN-NEVADA STATE OF NEVADA JODY WALKER 15104 PROFESSIONAL ENGINEER CIVIL 12/31/20 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

MASTER LEGEND AND QUANTITIES

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

3 OF 46 SHEETS

C0.3

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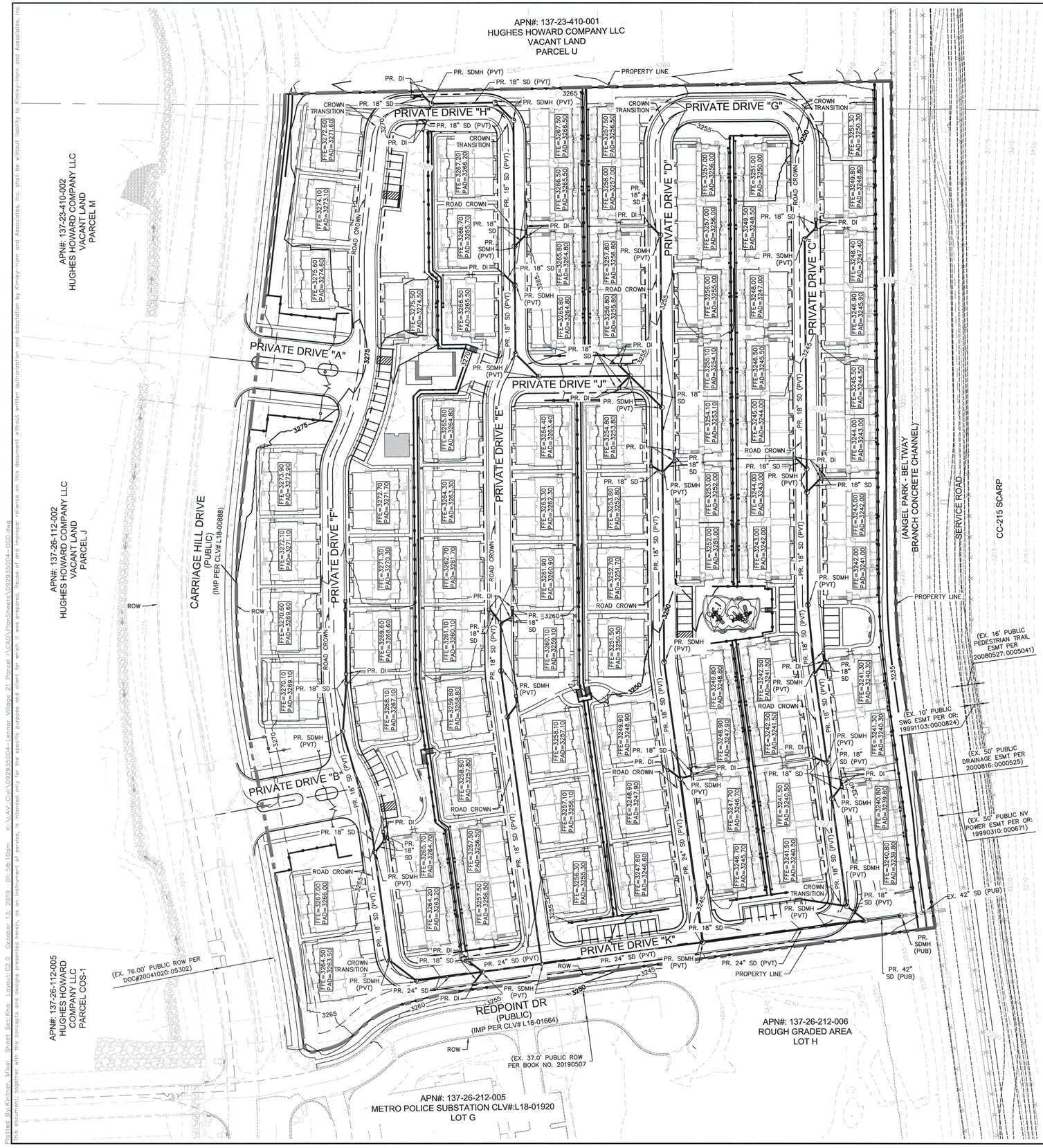
Plotted By:Kinther, Mikal Sheet Set:Kha Layout:C0.3 October 13, 2019 01:57:49pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-ML.dwg



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

EARTHWORK QUANTITIES		
CUT	FILL	NET
5,000 CY	200,000 CY	195,000 CY IMPORT

*NOTE: THESE QUANTITIES ARE APPROXIMATE AND ARE RAW VOLUMES ONLY. OVEREXCAVATION SUBSIDENCE, SHRINKAGE, & BULKING FACTORS ARE NOT TAKEN INTO ACCOUNT.

KEYMAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120
SCALE 1" = 60'

STORM DRAIN NOTE:

FOR STORM DRAIN DESIGN, REFER TO SHEETS C5.1 THROUGH C5.6

ENGINEER'S NOTES:

1. ALL WORK SHALL CONFORM TO THE SOILS REPORT PREPARED BY AMERICAN SOILS ENGINEERING, LLC DATED JULY 1, 2019 PROJECT NO. 1993-GEO
2. ALL OFF-SITE IMPROVEMENT CONSTRUCTION SHALL CONFORM TO THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST EDITION.
3. FINAL ASPHALTIC CONCRETE (AC) PAVEMENT SURFACES SHALL BE ONE-HALF INCH ABOVE THE TOP OF THE GUTTER (INCLUDING OPEN GRADE).
4. CONTRACTOR IS RESPONSIBLE FOR DUST AND EROSION CONTROL DURING CONSTRUCTION
5. THIS PLAN SHALL NOT, IN PART OR IN WHOLE, BE USED FOR CONSTRUCTION UNTIL APPROVED AND SIGNED BY ALL APPLICABLE GOVERNMENT AGENCIES.
6. ENGINEER TO BE NOTIFIED OF ANY DISCREPANCIES IMMEDIATELY.
7. MATCH ELEVATIONS SHOWN TO BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.
8. THIS PROJECT IS NOT PART OF AN EXISTING COMMERCIAL SUBDIVISION.
9. PROPERTY OWNER IS RESPONSIBLE TO MAINTAIN THE BEST MANAGEMENT PRACTICES SUCH AS BUT NOT LIMITED TO THE REMOVAL OF ACCUMULATED SEDIMENT AND DEBRIS AND CARE OF THE VEGETATION.
10. ALL DIMENSIONS ARE TO BACK OF CURB UNLESS OTHERWISE NOTED.
11. OWNER RESPONSIBLE TO PROVIDE SURVEY MONUMENTATION AS SHOWN AND TO REPLACE ALL SURVEY MONUMENTATION DAMAGED, DISTURBED, DESTROYED, OR OBSCURED DURING CONSTRUCTION.
12. ALL ONSITE STORM DRAIN AND THE ASSOCIATED FACILITIES ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE PROPERTY OWNER.

STORMWATER MANAGEMENT NOTES:

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

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

SIGHT VISIBILITY ZONES NOTE

NO WALLS, FENCES, TREES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF CURB.

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

JODY WALKER BELSICK, PE No. 15107 DATE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — JODY WALKER BELSICK — No. 15107 — PROFESSIONAL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

OVERALL GRADING PLAN

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS — NEVADA

Plotted By:Kinhter Mikaj Sheet Set:Kha Layout:C2.0 October 13, 2019 01:58:10pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-OGD.dwg
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APN#: 137-23-410-001
HUGHES HOWARD COMPANY LLC
PARCEL U

APN#: 137-23-410-002
HUGHES HOWARD COMPANY LLC
VACANT LAND
PARCEL M

CARRIAGE HILL DRIVE
(PUBLIC)
(IMP PER CL\#I-18-00888)

PRIVATE DRIVE "H"

PRIVATE DRIVE "F"

PRIVATE DRIVE "E"

(EX. 76.00' PUBLIC ROW PER DOC#20041020:05302)
(EX. 38.00' PUBLIC ROW) (EX. 38.00' PUBLIC ROW)
(EX. 30" SD)
[EX. 60" SDMH-21]
[EX. 60" SDMH-20]
[EX. 60" SDMH-19]
[EX. 36" SD]
[EX. 48" SD]
[EX. 24" SD]
[EX. 5' DI]

PROPERTY LINE

DAYLIGHT

CROWN TRANSITION

ROAD CROWN

PROP SD

GB

ROW

20.00' C.E.

6.00' LS

8.00' SW

4.00' SW

15.50'

31.00' BC-BC

3.00' BC-BC

120.00' V.C.

80.00' V.C.

1% MIN.

FFE=3272.60
PAD=3271.60

FFE=3274.10
PAD=3273.10

FFE=3275.60
PAD=3274.60

FFE=3275.50
PAD=3274.50

FFE=3267.20
PAD=3266.20

FFE=3266.70
PAD=3265.70

FFE=3266.50
PAD=3265.50

FFE=3267.50
PAD=3266.50

FFE=3266.50
PAD=3265.50

FFE=3265.80
PAD=3264.80

FFE=3265.80
PAD=3264.80

STA:10+00.00
PC TC=69.02

STA:10+30.28
BVC TC=68.14

STA:10+94.08
PC TC=66.68

STA:10+51.12
PC,GB TC=70.13

STA:11+50.26
EVC PT TC=66.47

STA:11+34.85
EVC TC=66.60

STA:11+85.34
PC TC=72.79

STA:12+03.20
PT TC=73.13

STA:12+66.34
BVC TC=74.33

STA:12+85.42
BCR TC=75.32

STA:13+21.50
SIB FFG=75.79

STA:14+07.60
PC,BCR TC=64.24

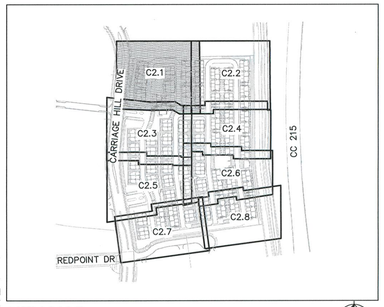
STA:10+60.00
EVC TC=60.67

STA:10+45.67
BCR,GB TC=61.83

STA:37+69.47
ECR TC,ME=80.09

MATCHLINE - SEE SHEET C2.3

MATCHLINE - SEE SHEET C2.2



KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
20. CONSTRUCT ACCESSIBLE RAMP CASE 1 PER DETAIL 11 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
21. CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN), AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S CHEAP! CALL 811 OR 1-800-227-2600

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

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

SIGHT VISIBILITY ZONES NOTE

NO WALLS, FENCES, TREES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF CURB.

No.	REVISIONS	DATE	BY

Kimley»Horn

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — JODY WALKER BELSICK — No. 15107 — PROFESSIONAL — CIVIL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
1 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

5 OF 46 SHEETS

C2.1

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Plotted By:Kintner, Mikol Sheet Set:Kha Layout:C2.1 October 13, 2019 01:59:17pm K:\LAV_Civil\092935004—Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg

APN#: 137-23-410-001
HUGHES HOWARD COMPANY LLC
PARCEL U

MATCHLINE - SEE SHEET C2.1

MATCHLINE - SEE SHEET C2.4

PRIVATE DRIVE "G"

PRIVATE DRIVE "D"

PRIVATE DRIVE "C"

DAYLIGHT

PROPERTY LINE

(ANGEL PARK - BELTWAY BRANCH CONCRETE CHANNEL)

SERVICE ROAD

REDPOINT DR.

CARRIAGE HILL DRIVE

CC 215

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

SIGHT VISIBILITY ZONES NOTE

NO WALLS, FENCES, TREES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF CURB.

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS–XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702–862–3600
WWW.KIMLEY–HORN.COM

STATE OF NEVADA — JODY WALKER BELSICK — No. 15107 — PROFESSIONAL ENGINEER — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

GRADING PLAN
2 OF 8

6 OF 46 SHEETS
C2.2

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C2.2 October 13, 2019 01:59:51pm K:\LAV_Civil\092935004–Lennar Village 21 Parcel I\CAD\PlanSheets\092935004–GD.dwg
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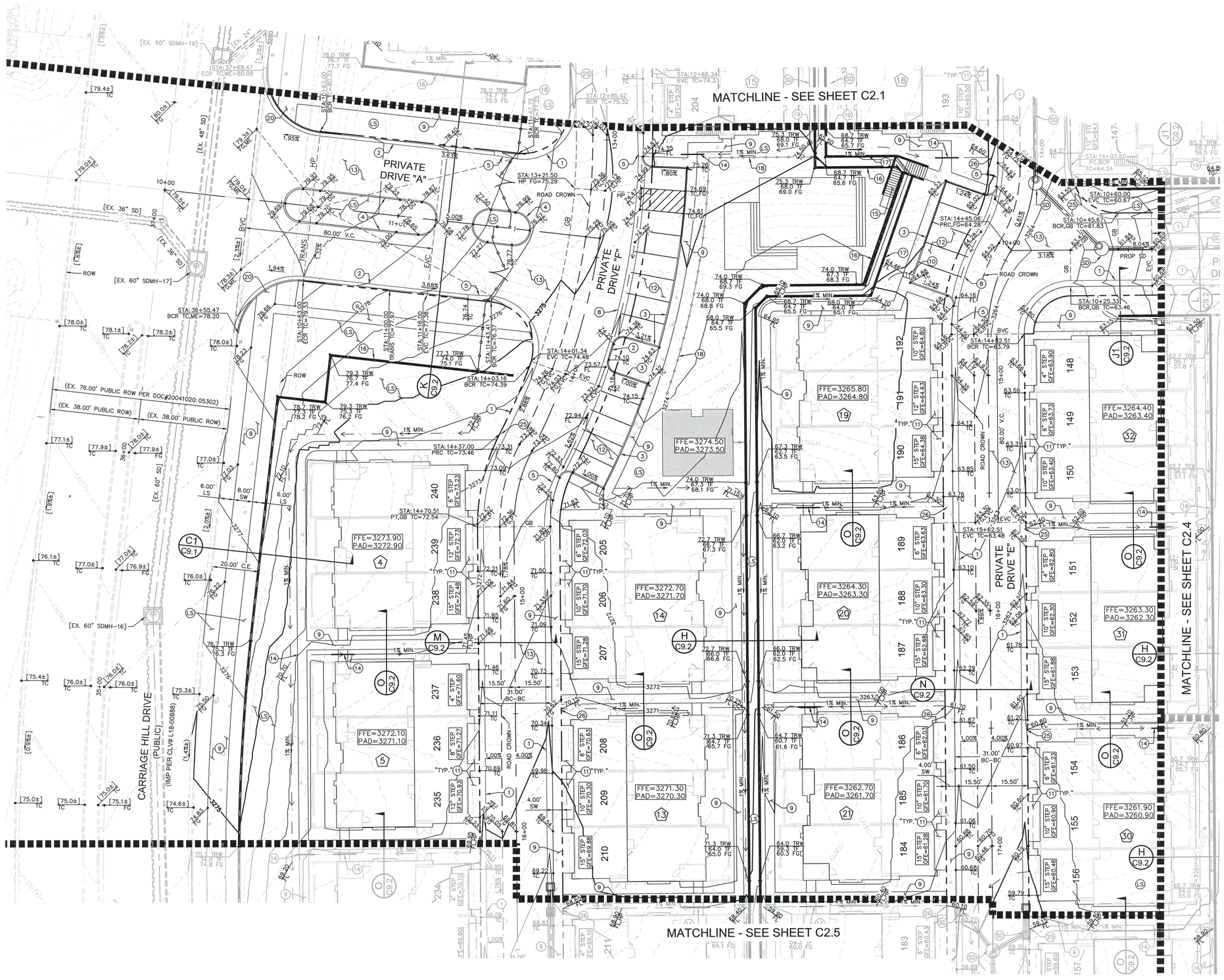

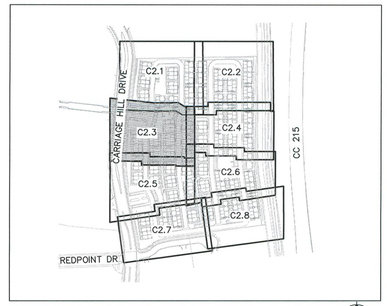

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
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14. INSTALL 4" PVC UNDER SIDEWALK
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18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
20. CONSTRUCT ACCESSIBLE RAMP CASE 1 PER DETAIL 11 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

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SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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BASIS OF BEARINGS

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

10/13/2019
JODY WALKER BELSICK, PE No. 15107 — DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 — FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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No.	REVISIONS	DATE	BY

Kimley»Horn
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PHONE: 702-692-3000
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PROFESSIONAL ENGINEER – STATE OF NEVADA – JODY WALKER BELSICK – CIVIL – No. 15107 – 10/15/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
3 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

7 OF 46 SHEETS
C2.3

Plotted By:Kimberly Vikoi Sheet Set:Kho Layout:C2.3 October 13, 2019 02:00:42pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\
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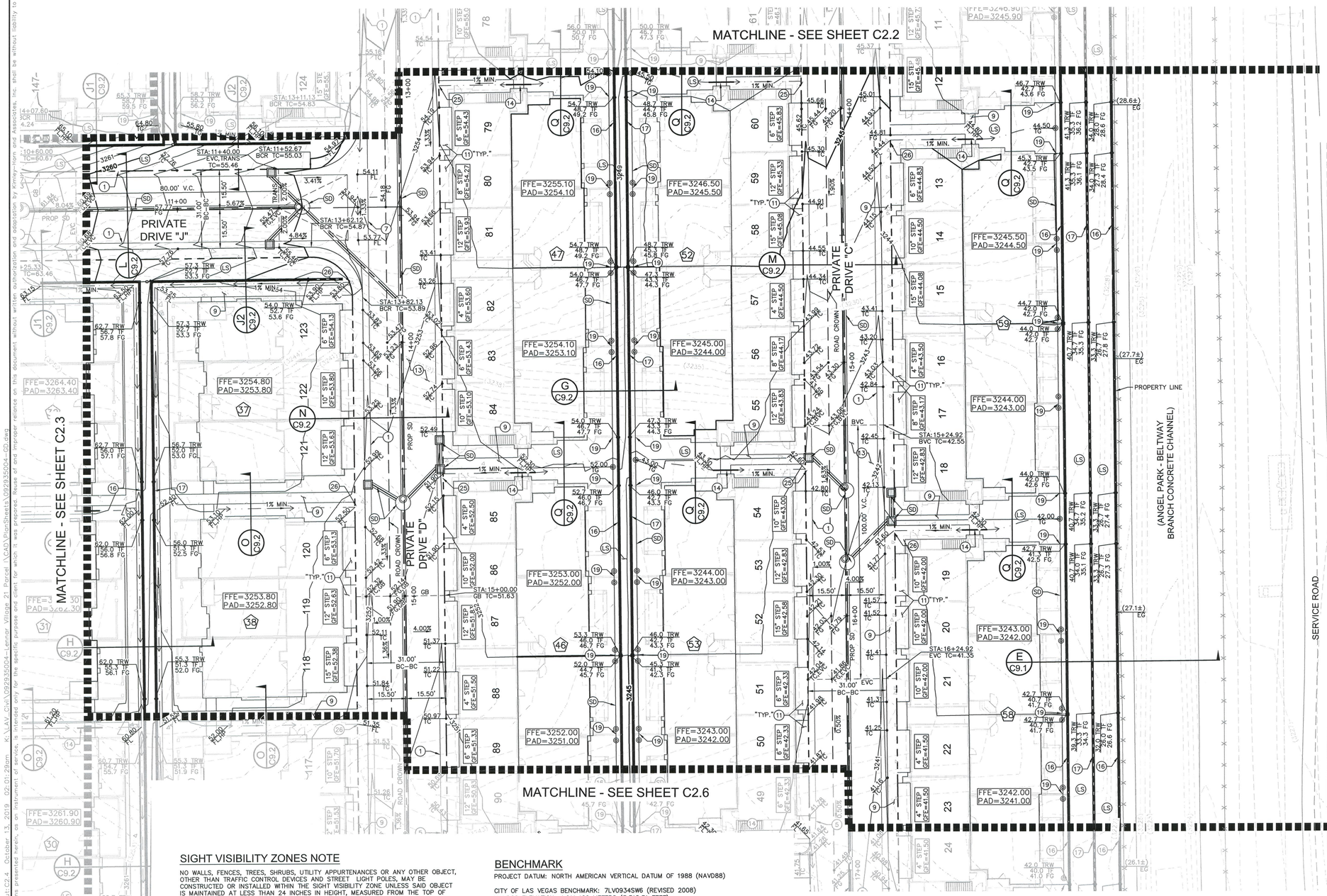

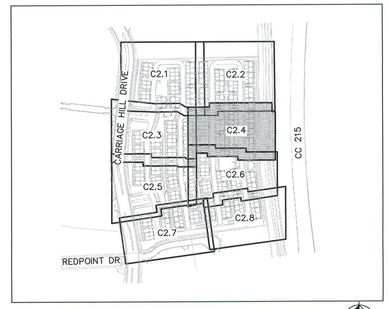

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
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(SD) REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

SIGHT VISIBILITY ZONES NOTE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

BENCHMARK

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

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No.	REVISIONS	DATE	BY

Kimley»Horn

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PROFESSIONAL ENGINEER — STATE OF NEVADA — JODY WALKER BELSICK — No. 15107 — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
4 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

8 OF 46 SHEETS
C2.4

Plotted By:Kintner, Mikol Sheet Set:Kha Layout:C2.4 October 13, 2019 02:01:29pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg
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EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

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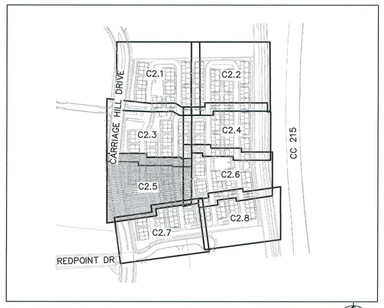
LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION



KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

MATCHLINE - SEE SHEET C2.3

MATCHLINE - SEE SHEET C2.6

MATCHLINE - SEE SHEET C2.7

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
4. CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.
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8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
10. CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
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25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
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BENCHMARK

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

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JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

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No.	REVISIONS	DATE	BY

Kimley»Horn
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PHONE: 702-589-3507
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STATE OF NEVADA — JODY WALKER BELSICK — No. 15107 — CIVIL — PROFESSIONAL ENGINEER — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
5 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

9 OF 46 SHEETS

C2.5

Plotted By:Kristen Wiley Sheet Set:Kha Layout:C2.5 October 13, 2019 02:02:18pm K:\LAV-Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg
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LEGEND & ABBREVIATIONS

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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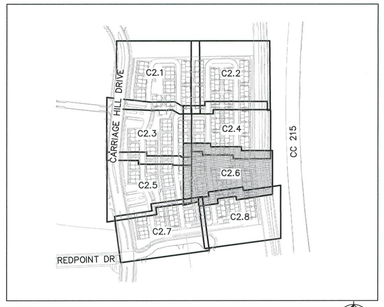
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
15. CONSTRUCT STAIR RISER PER 2018 IBC, PROVIDE SUMMERLIN COMPLIANT HANDRAIL FOR 3 OR MORE STEPS.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN



KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

MATCHLINE - SEE SHEET C2.4

MATCHLINE - SEE SHEET C2.5

MATCHLINE - SEE SHEET C2.8

MATCHLINE - SEE SHEET C2.7

PRIVATE DRIVE "D"

PRIVATE DRIVE "C"

PROPERTY LINE

(ANGEL PARK - BELTWAY BRANCH CONCRETE CHANNEL)

(EX. 50' PUBLIC DRAINAGE ESMT PER 2000816: 0000525)

(EX. 10' PUBLIC SWG ESMT PER DR:

EARTHWORK QUANTITIES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS–XXX

10/13/2019

JODY WALKER BELSICK, PE No. 15107 — DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 (NEVADA AND ARIZONA SYSTEM OF ROAD/UTILITY)

Call before you Dig AVOID HITTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

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Plotted By:Kintner, Mikal Sheet Set:King Layout:C2.6 October 13, 2019 02:03:35pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702.589.3500
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER STATE OF NEVADA JODY WALKER BELSICK 15107 7/31/20 CIVIL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
6 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

10 OF 46 SHEETS
C2.6

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
10. CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
14. INSTALL 4" PVC UNDER SIDEWALK
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
21. CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
22. CONSTRUCT ACCESSIBLE RAMP CASE 3 PER DETAIL 13 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
24. OUTLET 6" STORM DRAIN THROUGH WALL AND SPLASH TO GRADE
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
- (LS) LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
- (SD) REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN
- (WA) VILLAGE WALL BY MASTER DEVELOPER (PLAN/PERMIT BY OTHERS)

SIGHT VISIBILITY ZONES NOTE

NO WALLS, FENCES, TREES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBJECT, OTHER THAN TRAFFIC CONTROL DEVICES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR INSTALLED WITHIN THE SIGHT VISIBILITY ZONE UNLESS SAID OBJECT IS MAINTAINED AT LESS THAN 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF CURB.

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

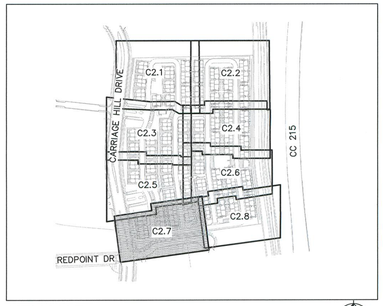
CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

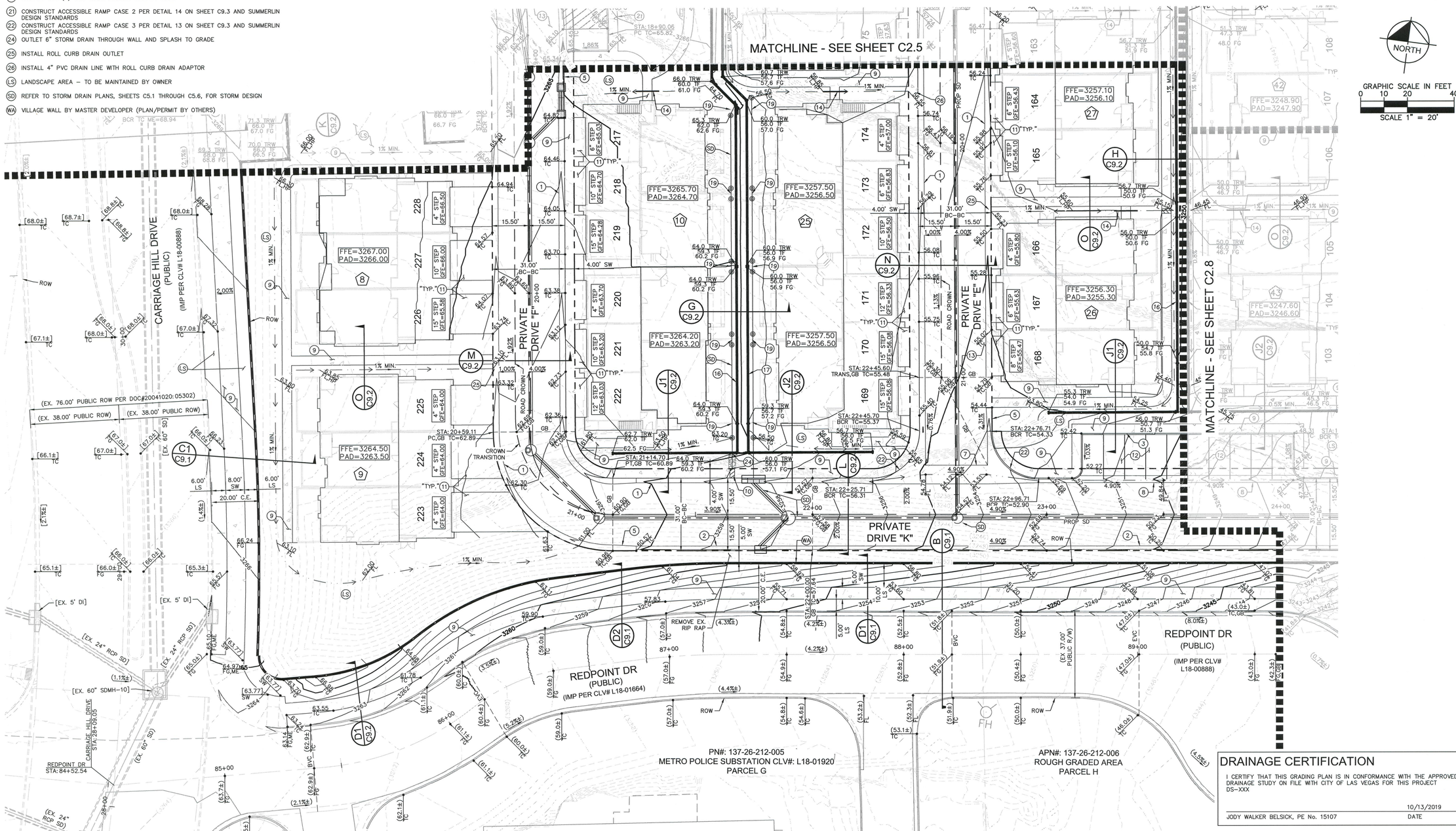
FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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



KEY MAP
NTS



NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS–XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-589-3040
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER – STATE OF NEVADA – 20079 – JODY WALKER BELSICK – 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
7 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

11 OF 46 SHEETS
C2.7

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C2.7 October 13, 2019 02:04:09pm K:\LAV_civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg
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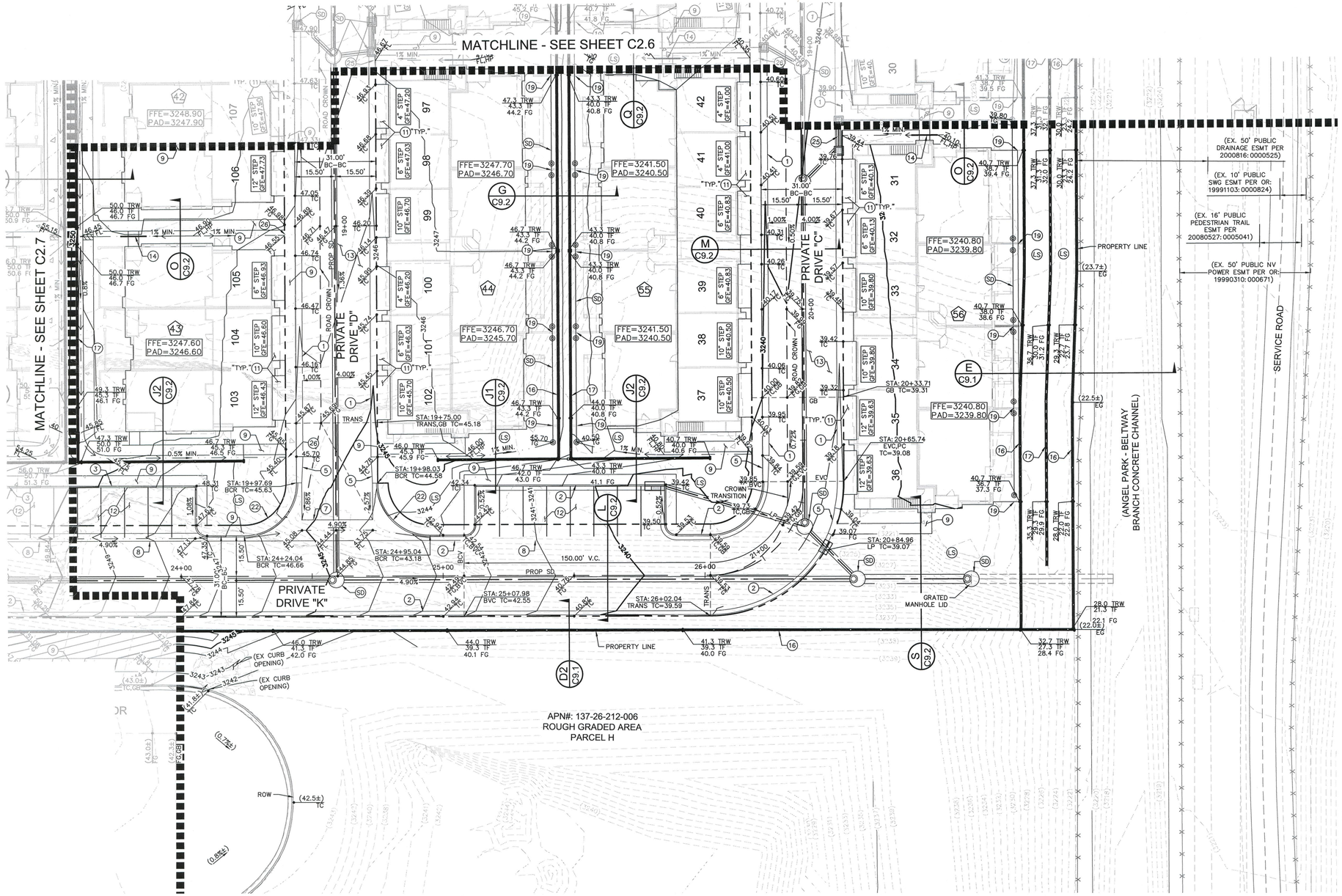

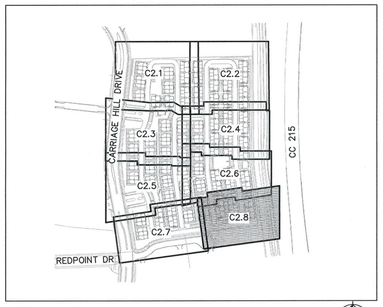

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL 12 ON SHEET C9.3.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
6. CONSTRUCT 2' WIDE CURB CUT PER DETAIL 8 ON SHEET C9.3
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
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19. INSTALL TWO (2) CMU DRAIN BLOCKS SIDE BY SIDE.
22. CONSTRUCT ACCESSIBLE RAMP CASE 3 PER DETAIL 13 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
25. INSTALL ROLL CURB DRAIN OUTLET
26. INSTALL 4" PVC DRAIN LINE WITH ROLL CURB DRAIN ADAPTOR
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

EARTHWORK QUANTITIES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

SIGHT VISIBILITY ZONES NOTE

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FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE WITH CITY OF LAS VEGAS FOR THIS PROJECT DS-XXX

JODY WALKER BELSICK, PE No. 15107 — 10/13/2019 DATE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

No.	REVISIONS	DATE	BY

Kimley»Horn

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PHONE: 702-862-3600
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STATE OF NEVADA — ENGINEER — JODY WALKER BELSICK — No. 15107 — PROFESSIONAL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

GRADING PLAN
8 OF 8

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

12 OF 46 SHEETS

C2.8

Plotted By:Kinner, Mikal Sheet Set:Kha Layout:C2.8 October 13, 2019 02:04:48pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-GD.dwg
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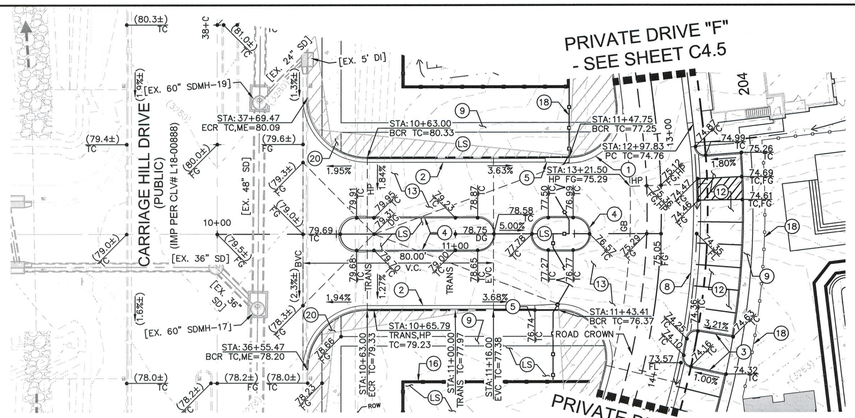
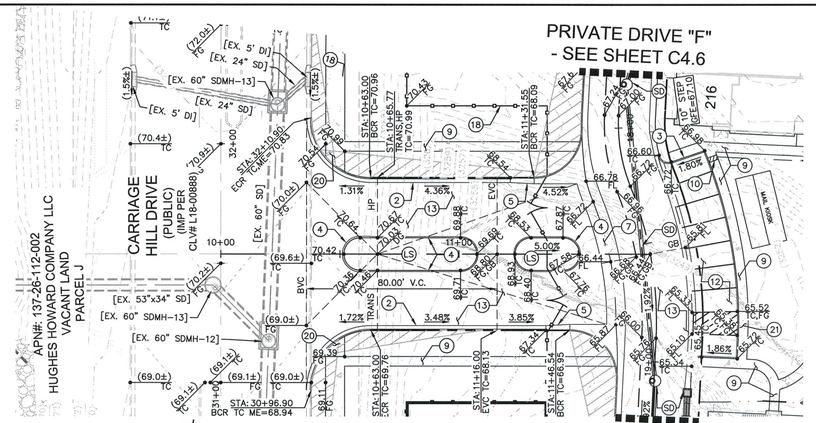


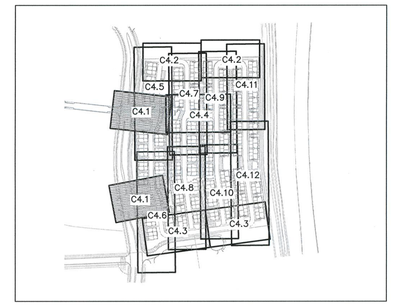
PRIVATE DRIVE "A" - PLAN VIEW

1" = 30'



PRIVATE DRIVE "B" - PLAN VIEW

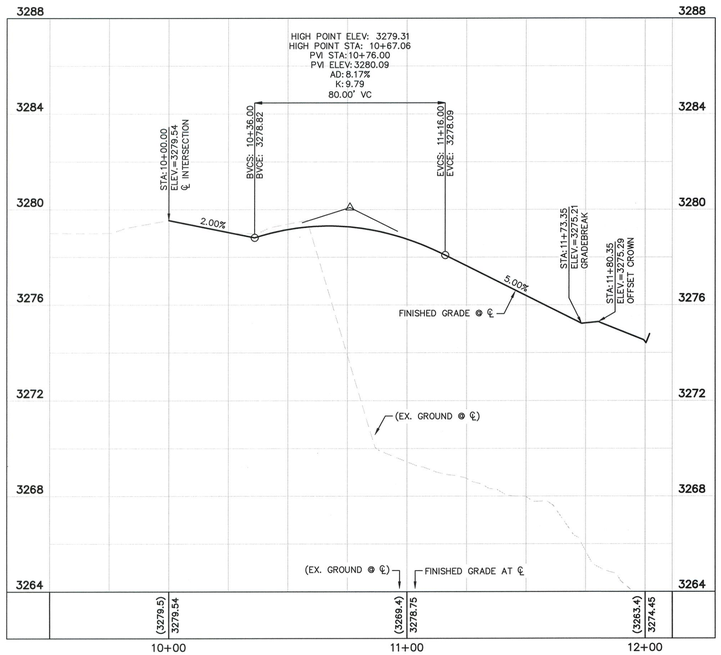
1" = 30'



KEYMAP

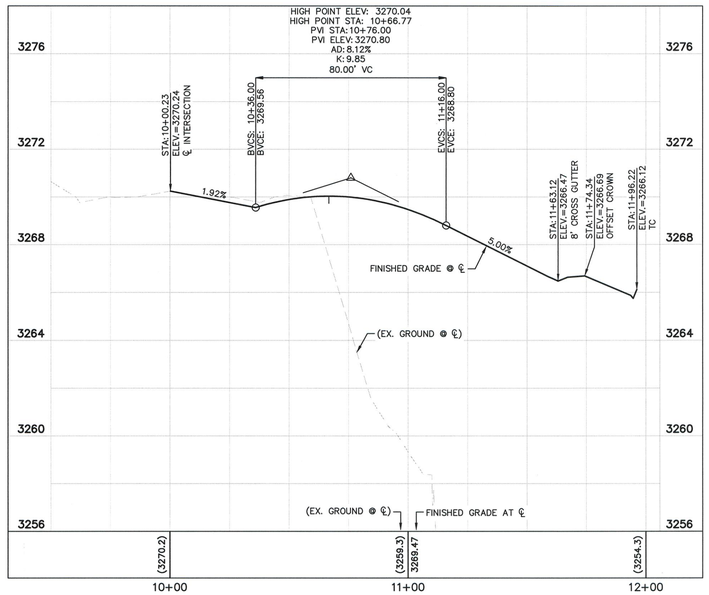
NTS

GRAPHIC SCALE IN FEET
0 15 30 60



PRIVATE DRIVE "A" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'



PRIVATE DRIVE "B" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
4. CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
10. CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
20. CONSTRUCT ACCESSIBLE RAMP CASE 1 PER DETAIL 11 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
21. CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
- (LS) LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
- (SD) REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

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

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-589-3500
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER STATE OF NEVADA JOHN WALKER 12570 CIVIL — 10/15/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

A & B DRIVE PLAN & PROFILE

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

24 OF 46 SHEETS

C4.1

Plotted By:Kintner, Mikol Sheet Set:Kha Layout:C4.1 October 13, 2019 02:16:30pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\
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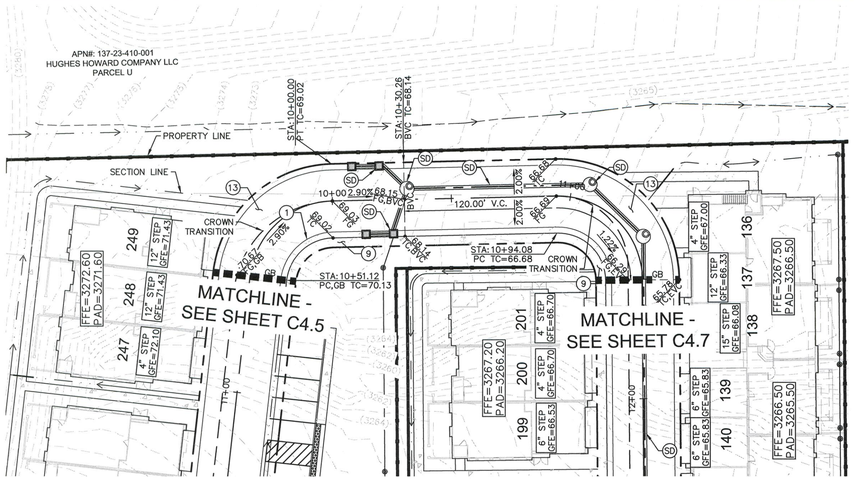
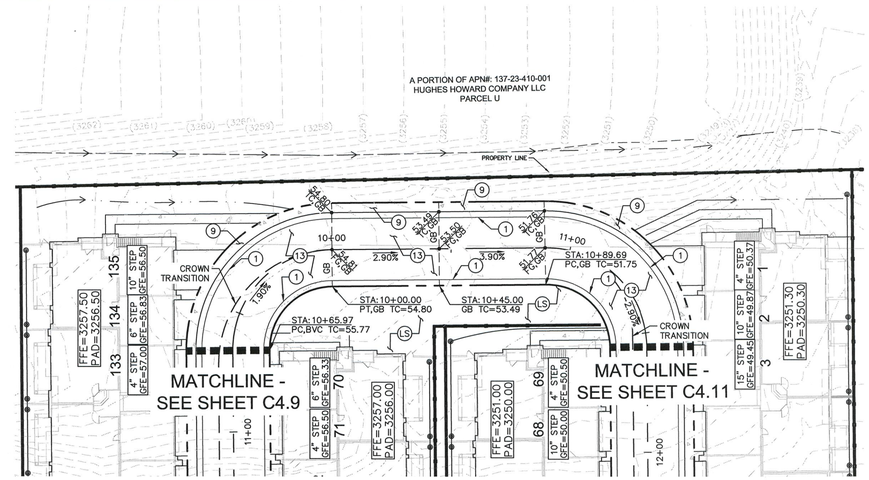


PRIVATE DRIVE "H" - PLAN VIEW

1" = 30'

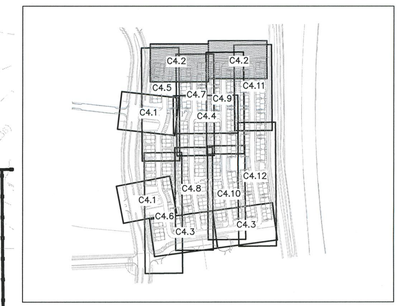
NORTH



PRIVATE DRIVE "G" - PLAN VIEW

1" = 30'

NORTH



KEYMAP

NTS

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

PRIVATE DRIVE "H" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'

PRIVATE DRIVE "G" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV09.34SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-852-3600
WWW.KIMLEY-HORN.COM

REGISTERED PROFESSIONAL ENGINEER - STATE OF NEVADA - JOY WALKER OLSICK - 17078 - CIVIL - 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

H & G DRIVE PLAN & PROFILE

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

25 OF 46 SHEETS

C4.2

Plotted By:Kinter, Mikol Sheet Set:Kha Layout:C4.2 October 13, 2019 02:17:37am K:\LAV_Civil\092935004-Lennar Village 21 Parcel 1\CAD\PlanSheets\092935004-PP-EW.dwg
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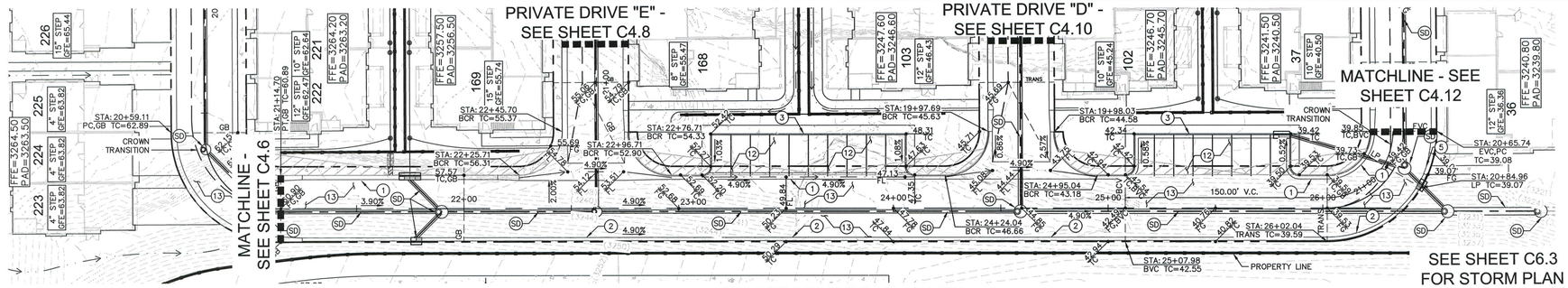
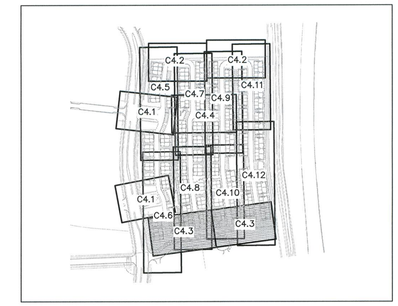


PRIVATE DRIVE "M" - PLAN VIEW

1" = 30'



KEYMAP

NTS

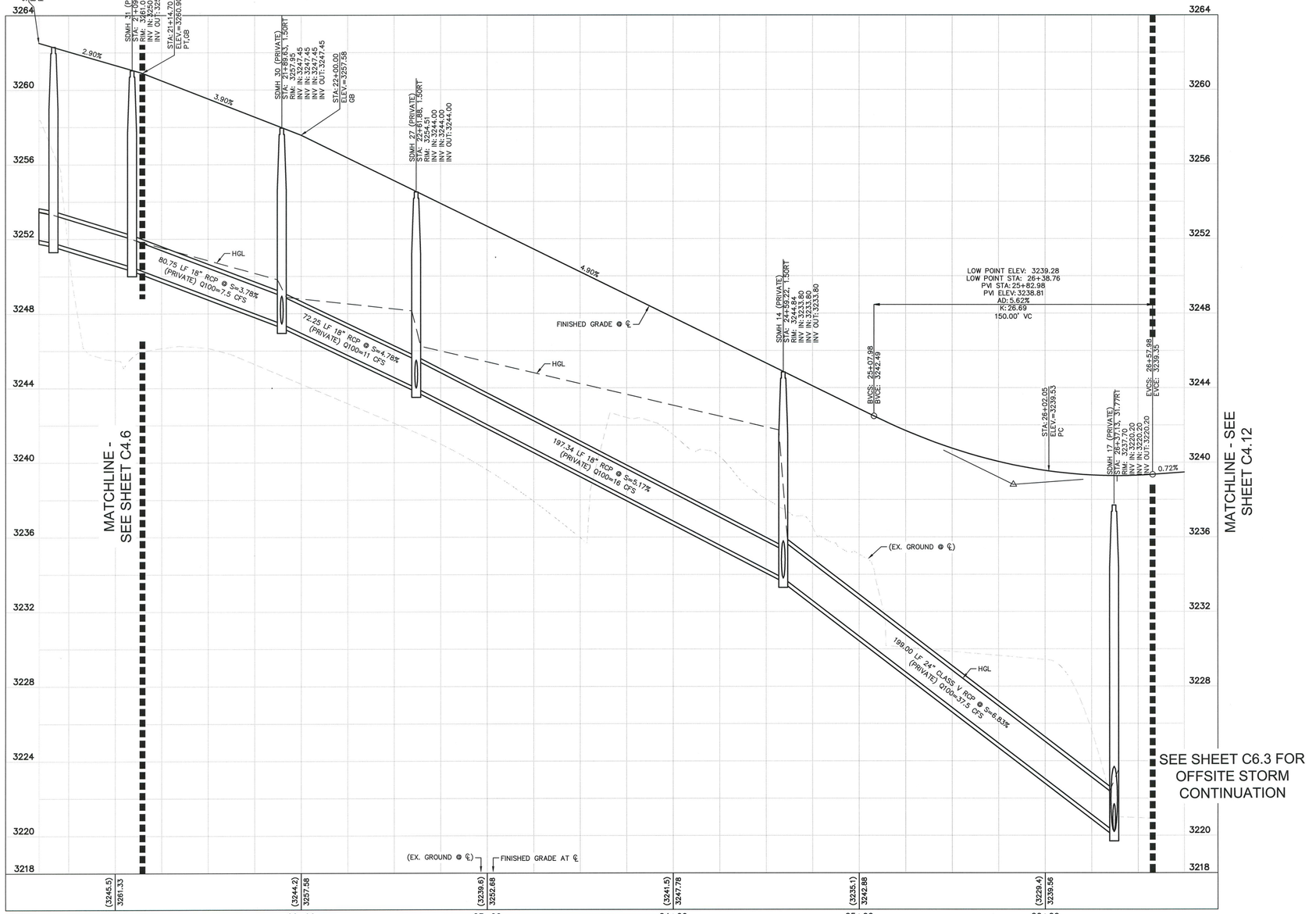
GRAPHIC SCALE IN FEET

0 15 30 60

NORTH

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
- SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN



PRIVATE DRIVE "M" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

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REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-852-3600
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER STATE OF NEVADA JEFFREY WALKER BELSICK 17576 CIVIL 10/13/2019

KHA PROJECT 092935004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

M DRIVE PLAN & PROFILE

26 OF 46 SHEETS

C4.3

Plotted By:Kinner, Mikol Sheet Set:Kha Layout:C4.3 October 13, 2019 02:17:54pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-PP-FW.dwg
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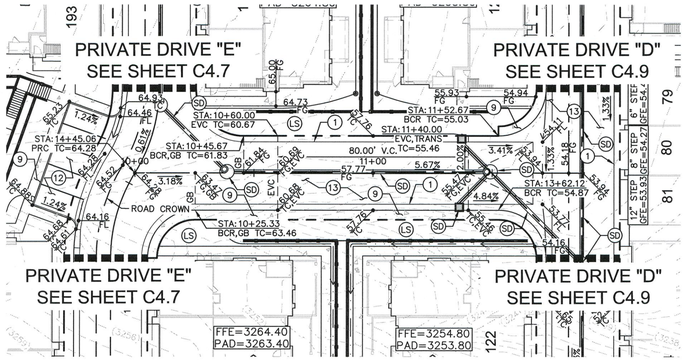
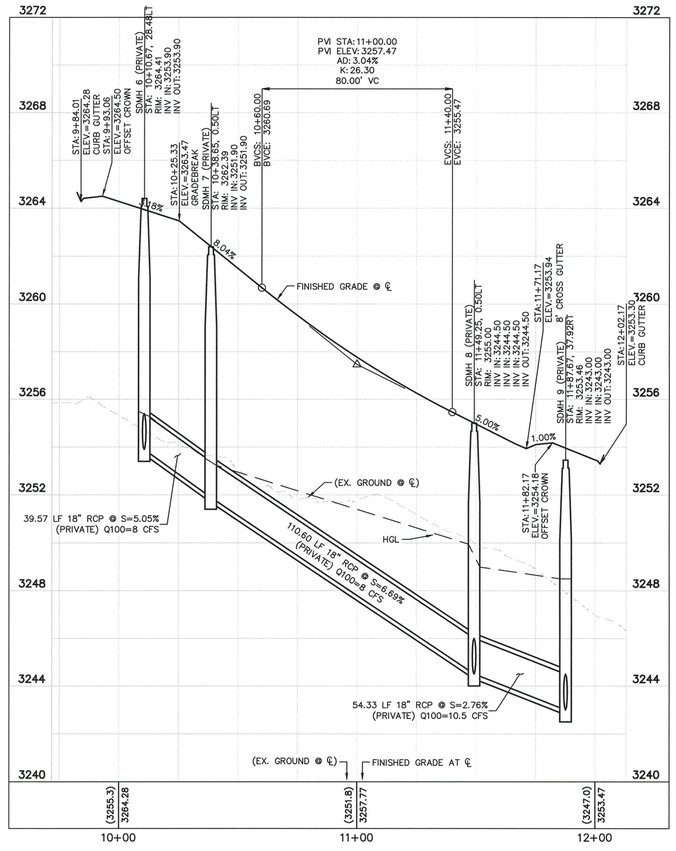


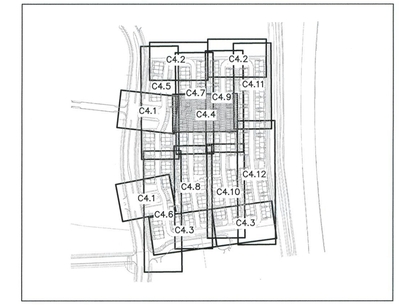
PRIVATE DRIVE "J" - PLAN VIEW

1" = 30'



PRIVATE DRIVE "J" - PROFILE VIEW

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
11. CONSTRUCT PCC DRIVEWAY PER DETAIL 3 ON SHEET C9.3.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — No. 15101 — PROFESSIONAL
JODY WALKER BELSICK
12/31/20
CIVIL
10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

J DRIVE PLAN & PROFILE

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

27 OF 46 SHEETS
C4.4

FAST Call before you UnderGround 1-702-432-5300 (FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION)

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

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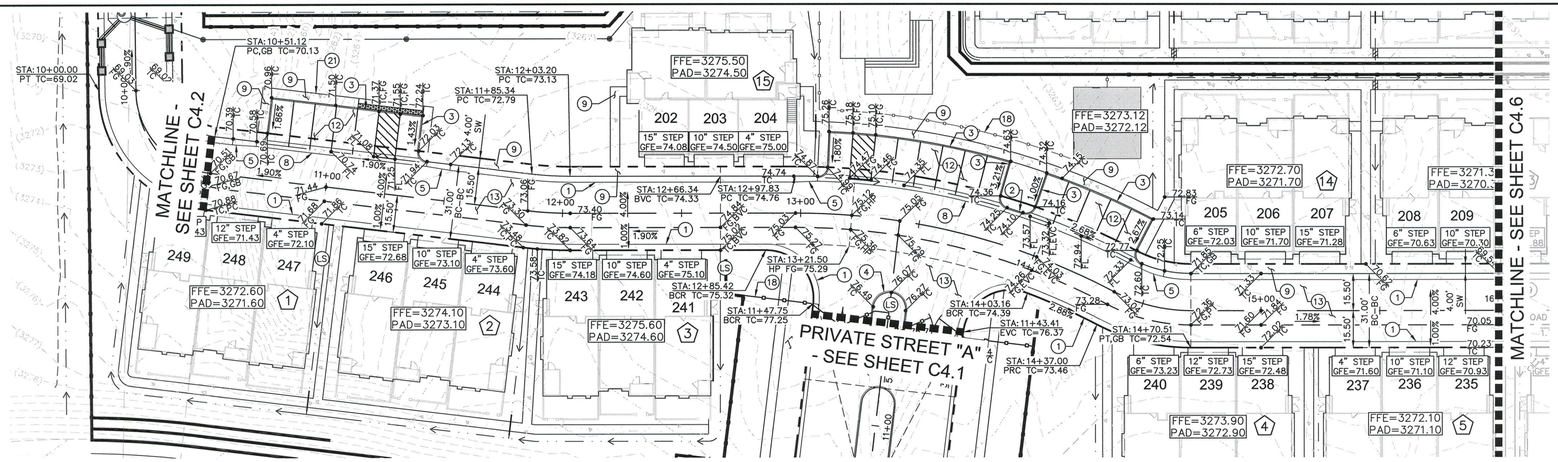
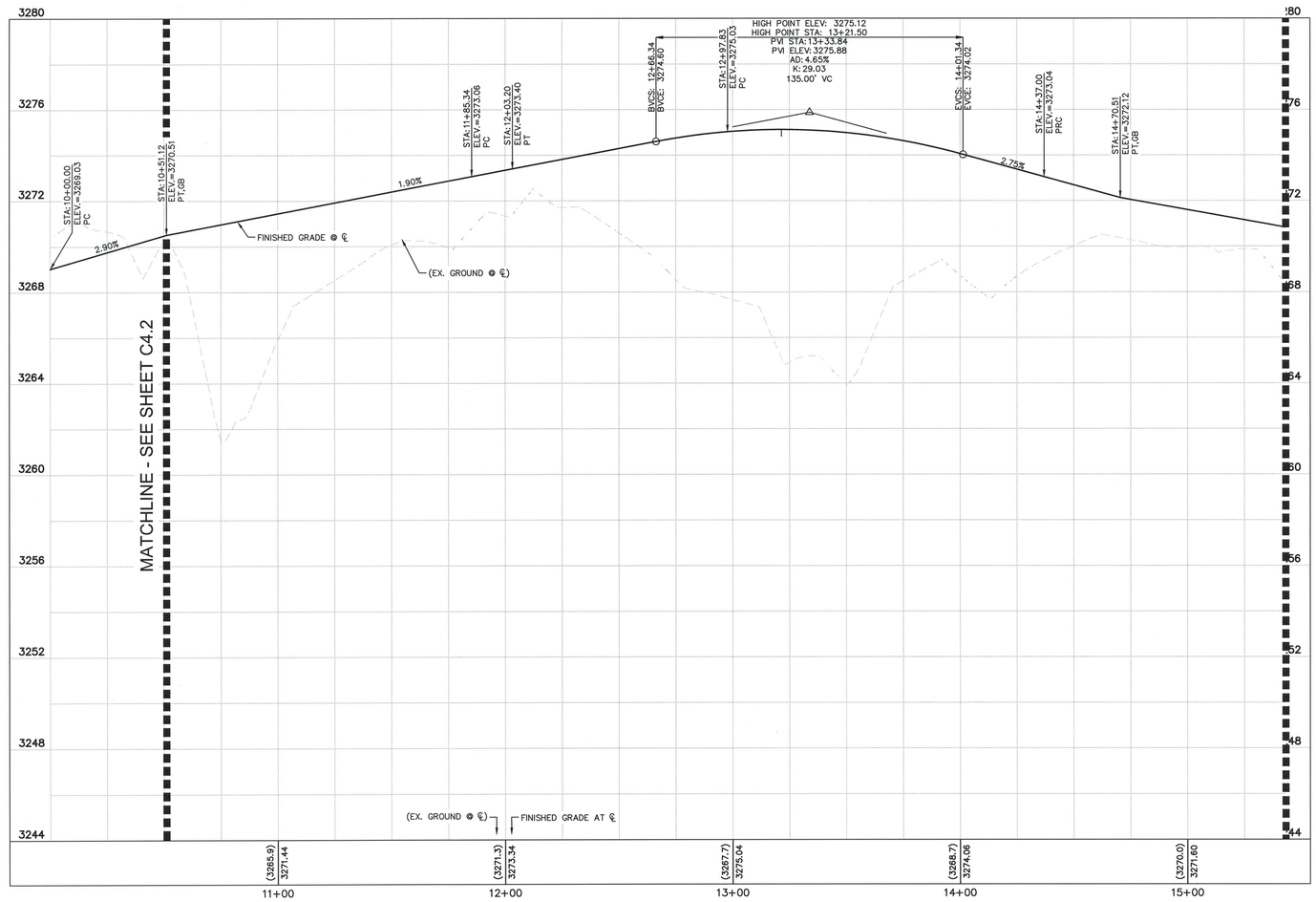


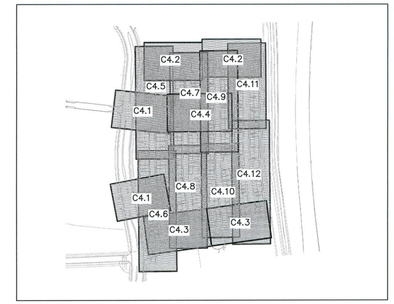
PRIVATE DRIVE "F" - PLAN VIEW - STA: 10+00 - 16+00

1" = 30'



PRIVATE DRIVE "F" - PROFILE VIEW - STA: 10+00 - 16+00

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
4. CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
21. CONSTRUCT ACCESSIBLE RAMP CASE 2 PER DETAIL 14 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
S0. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

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REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD, SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-498-8500
WWW.KIMLEY-HORN.COM

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

F DRIVE PLAN & PROFILE STA 10+20 - 16+00

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

28 OF 46 SHEETS

C4.5

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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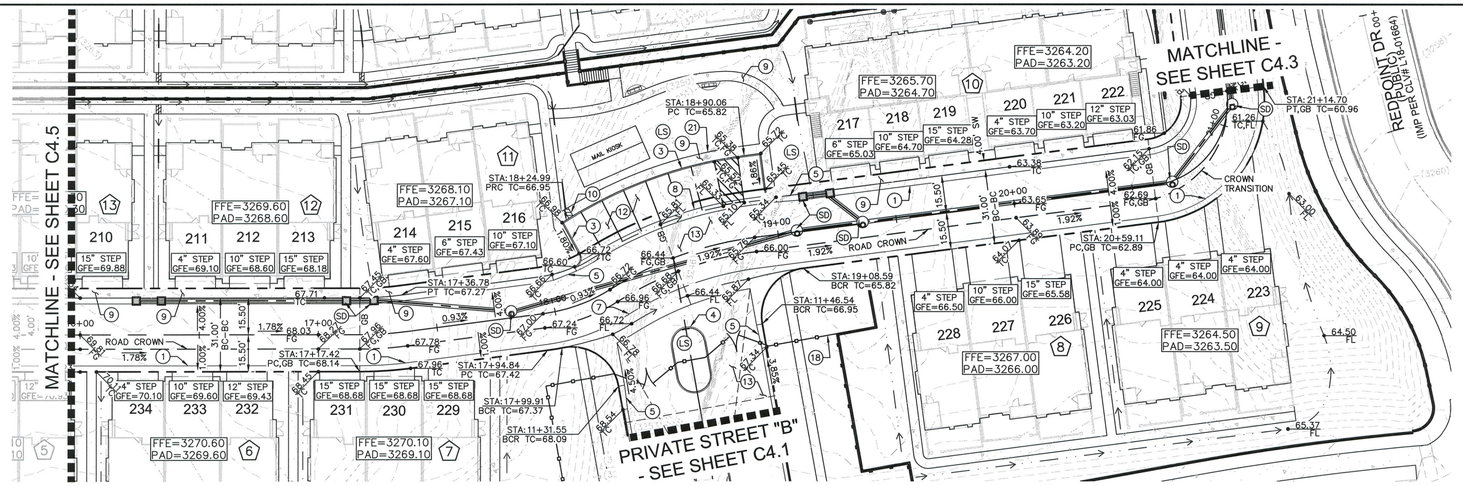
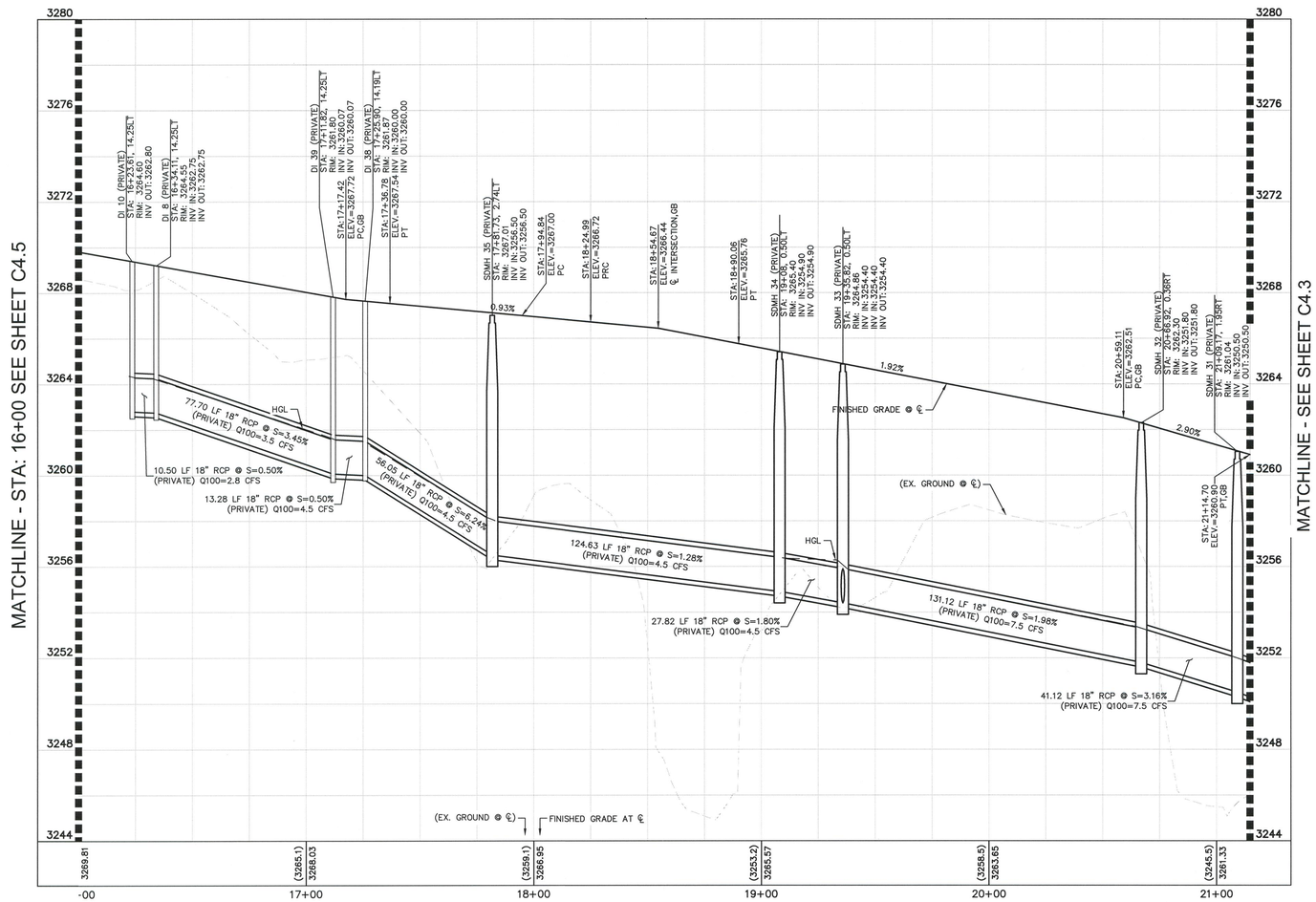


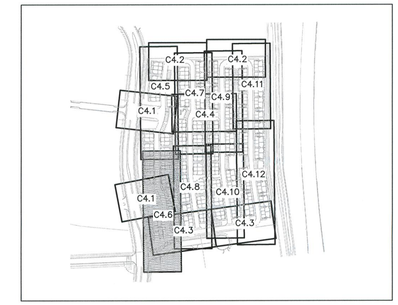
PRIVATE DRIVE "F" - PLAN VIEW - STA: 16+00 - 21+15

1" = 30'



PRIVATE DRIVE "F" - PROFILE VIEW - STA: 16+00 - 21+15

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
3. CONSTRUCT 6" CURB PER DETAIL
4. CONSTRUCT "A" TYPE CURB PER CCAUSD NO. 219.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
10. CONSTRUCT SIDEWALK UNDERDRAIN PER CCAUSD NO. 236
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
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ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

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REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER - STATE OF NEVADA - JODY WALKER BELSICK - 17170 - CIVIL - 10/13/2019

KHA PROJECT 092935004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

F DRIVE PLAN & PROFILE STA 10+00 - 16+00

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

29 OF 46 SHEETS

C4.6

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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

Plotted By:Kirtner, Mikel Sheet Set:Kha Layout:C4.6 October 13, 2019 02:19:59pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\
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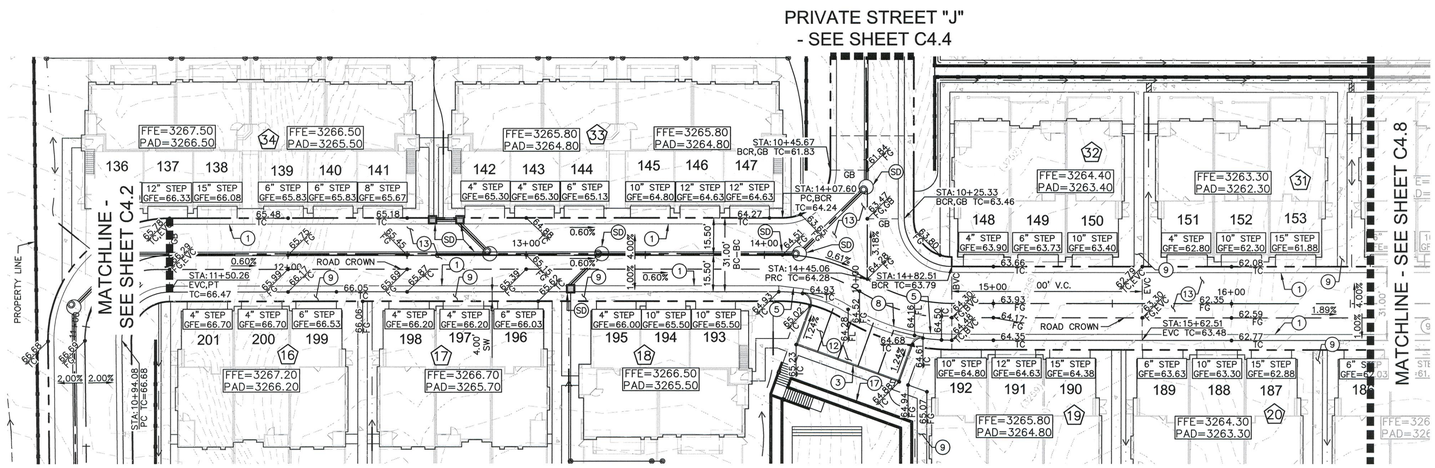
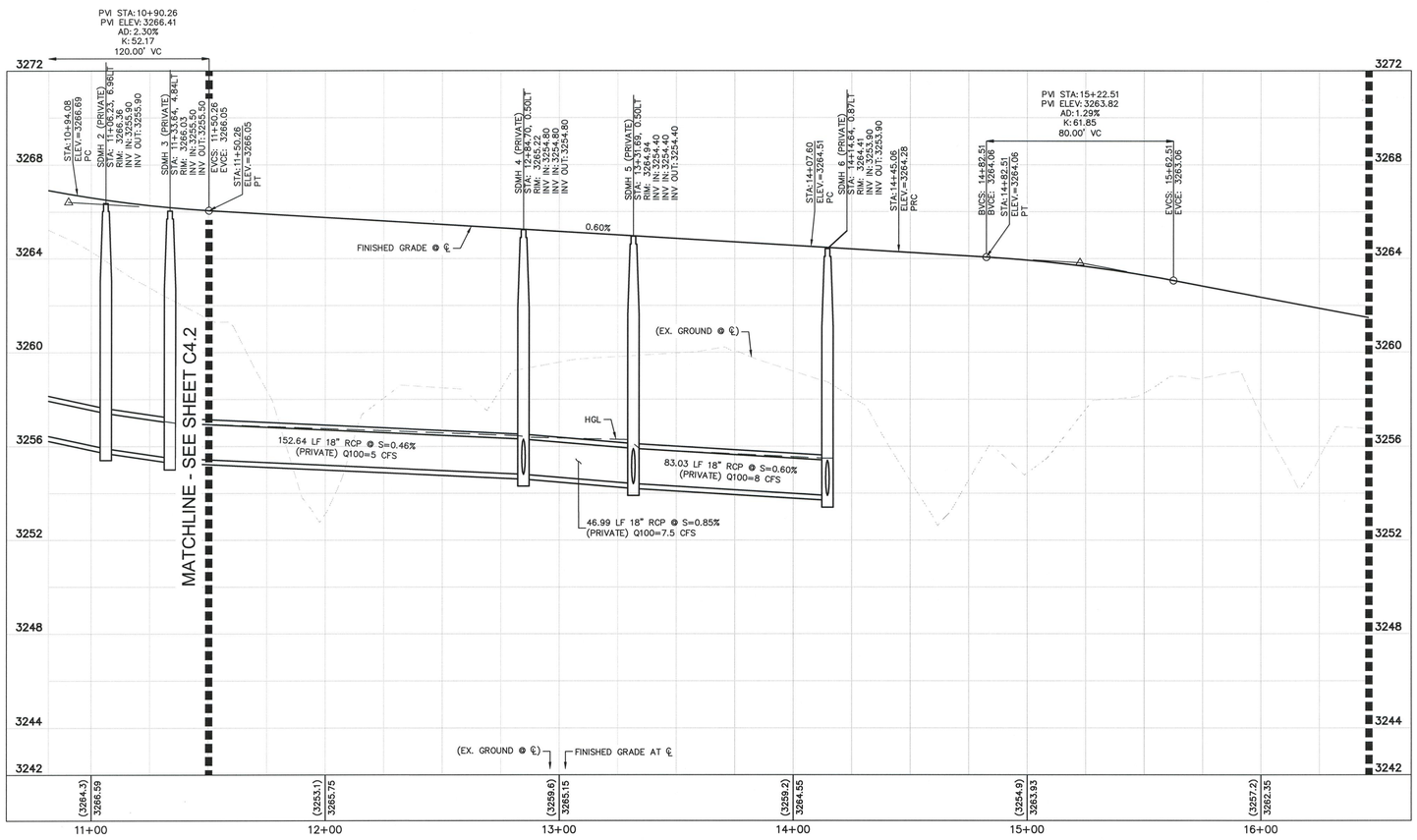


KEYMAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

PRIVATE DRIVE "E" - PLAN VIEW - STA: 10+81 - 16+50
1" = 30'



PRIVATE DRIVE "E" - PROFILE VIEW - STA: 10+81 - 16+50
HORIZ: 1" = 30'
VERT: 1" = 3'

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
3. CONSTRUCT 6" CURB PER DETAIL
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
17. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE
ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES
REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE
ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION
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BENCHMARK
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV09345W6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
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STATE OF NEVADA — JOY WALKER — 12/31/20 — CIVIL — PROFESSIONAL ENGINEER — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

E DRIVE PLAN & PROFILE SHEET STA 10+81 - 16+50

HIGHLINE VILLAGE 21 - PARCEL I
PREPARED FOR LENNAR HOMES
CITY OF LAS VEGAS NEVADA

30 OF 46 SHEETS
C4.7

FAST Call before you UnderGround 1-702-432-5300 PRIORITY AND ARTERIAL SYSTEM OF TRANSPORTATION

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Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C4.7 October 13, 2019 02:20:25pm K:\LAV_Civil\092935004--Lennar Village 21 Parcel I\CAD\PlanSheets\092935004--PP--NS.dwg
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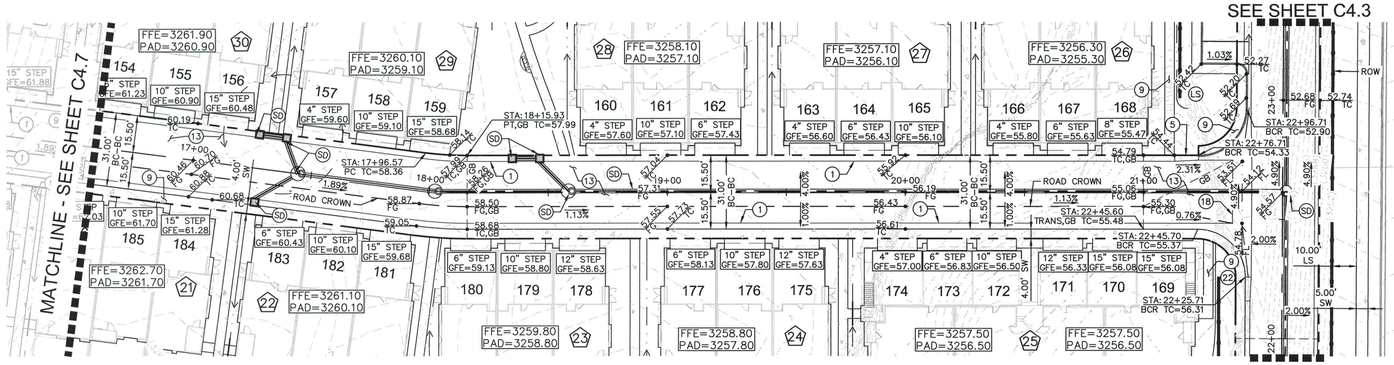
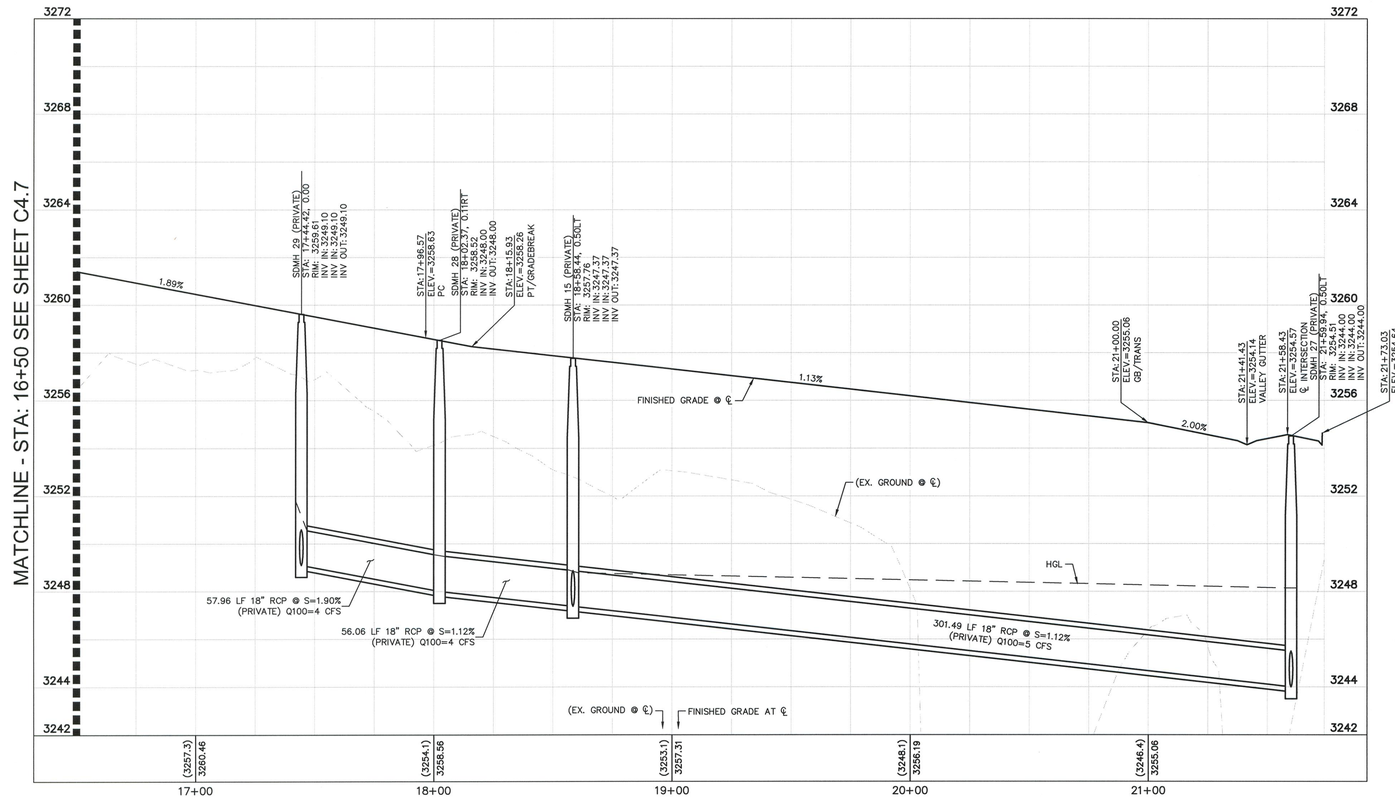


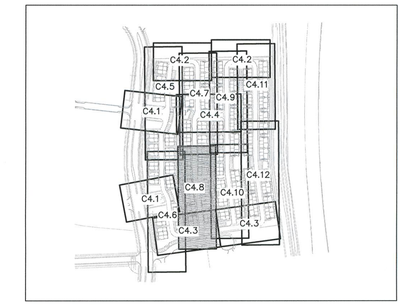
PRIVATE DRIVE "E" - PLAN VIEW - STA: 16+50 - 21+75

1" = 30'



PRIVATE DRIVE "E" - PROFILE VIEW - STA: 16+50 - 21+75

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
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13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
18. INSTALL DECORATIVE WROUGHT IRON FENCE COMPLIANT WITH SUMMERLIN DESIGN STANDARDS.
22. CONSTRUCT ACCESSIBLE RAMP CASE 3 PER DETAIL 13 ON SHEET C9.3 AND SUMMERLIN DESIGN STANDARDS
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
S0. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS, POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV09.34SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

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DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
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KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

E DRIVE PLAN & PROFILE STA 16+50 - 21+73

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

31 OF 46 SHEETS

C4.8

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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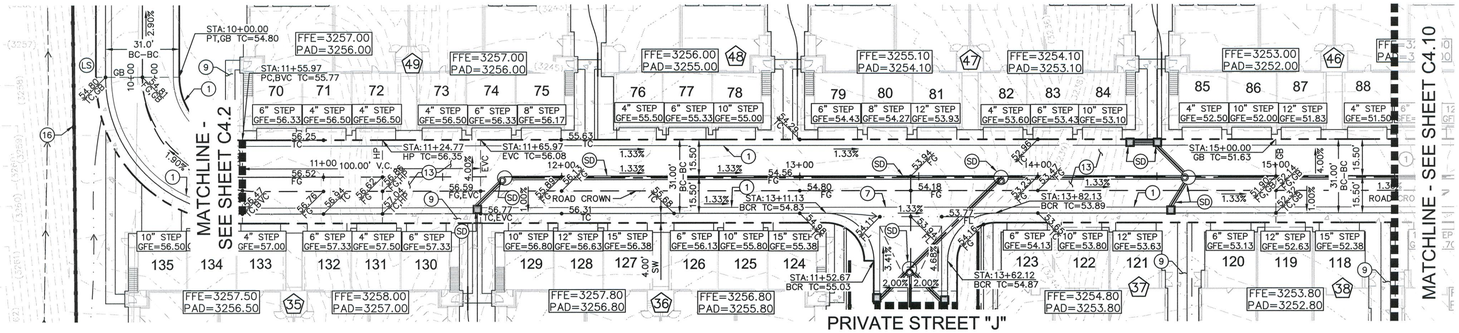
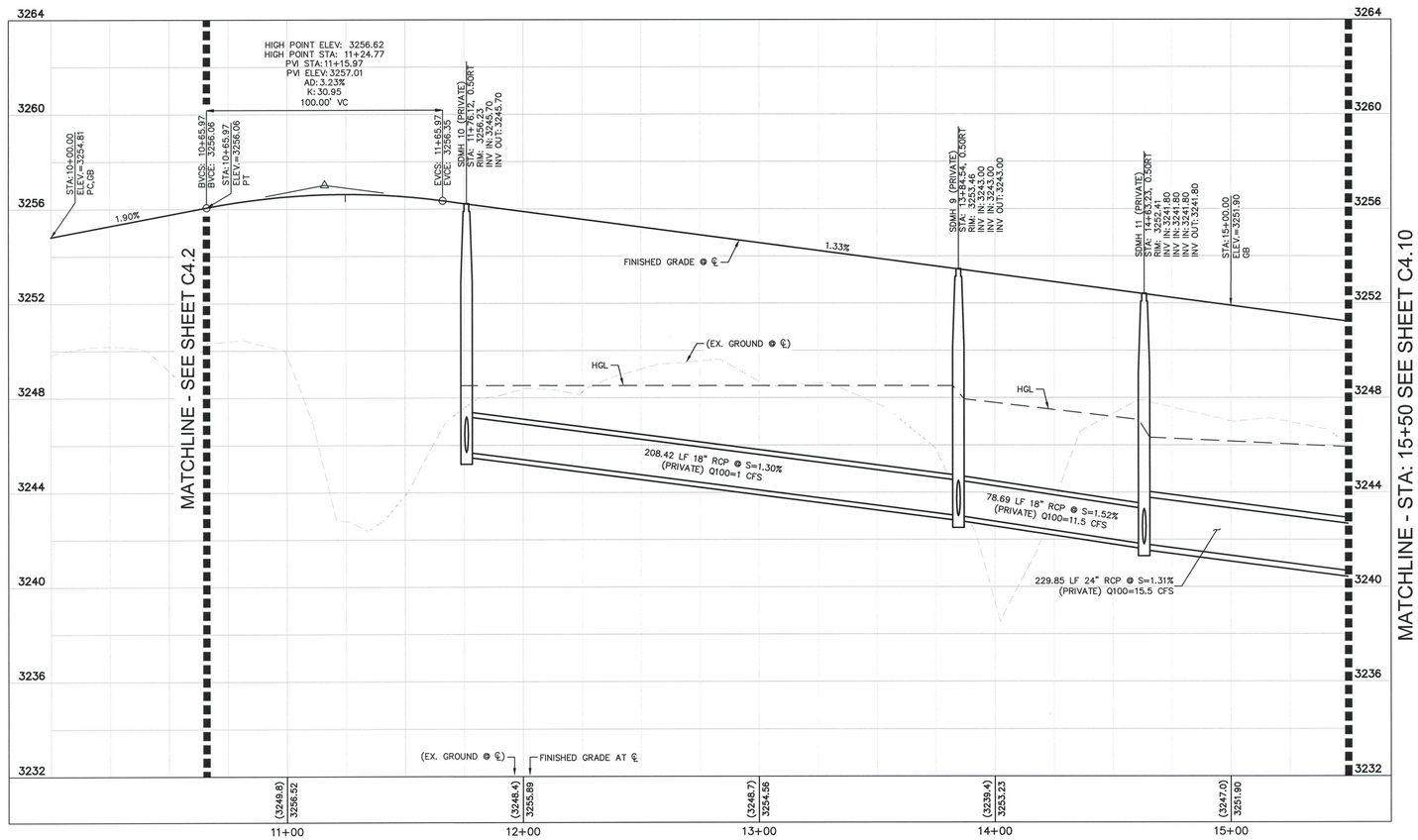


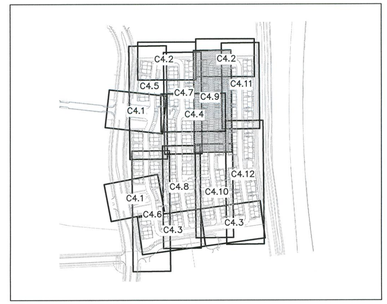
PRIVATE DRIVE "D" - PLAN VIEW - STA: 10+00 - 15+50

1" = 30'



PRIVATE DRIVE "D" - PROFILE VIEW - STA: 10+00 - 15+50

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
7. CONSTRUCT 8' WIDE VALLEY GUTTER PER DETAIL 9 ON SHEET C9.3
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SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

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ENGINEER'S NOTES

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn

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PROFESSIONAL ENGINEER-STATE OF NEVADA
JODY WALKER
No. 15151
PROFESSIONAL
10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

D DRIVE PLAN & PROFILE STA 10+00 - 15+50

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

32 OF 46 SHEETS

C4.9

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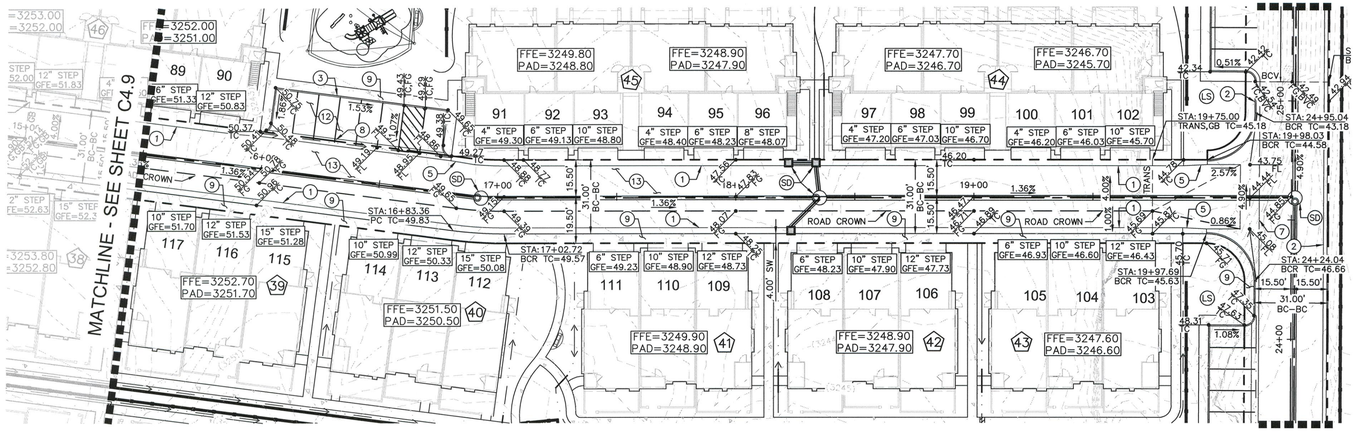
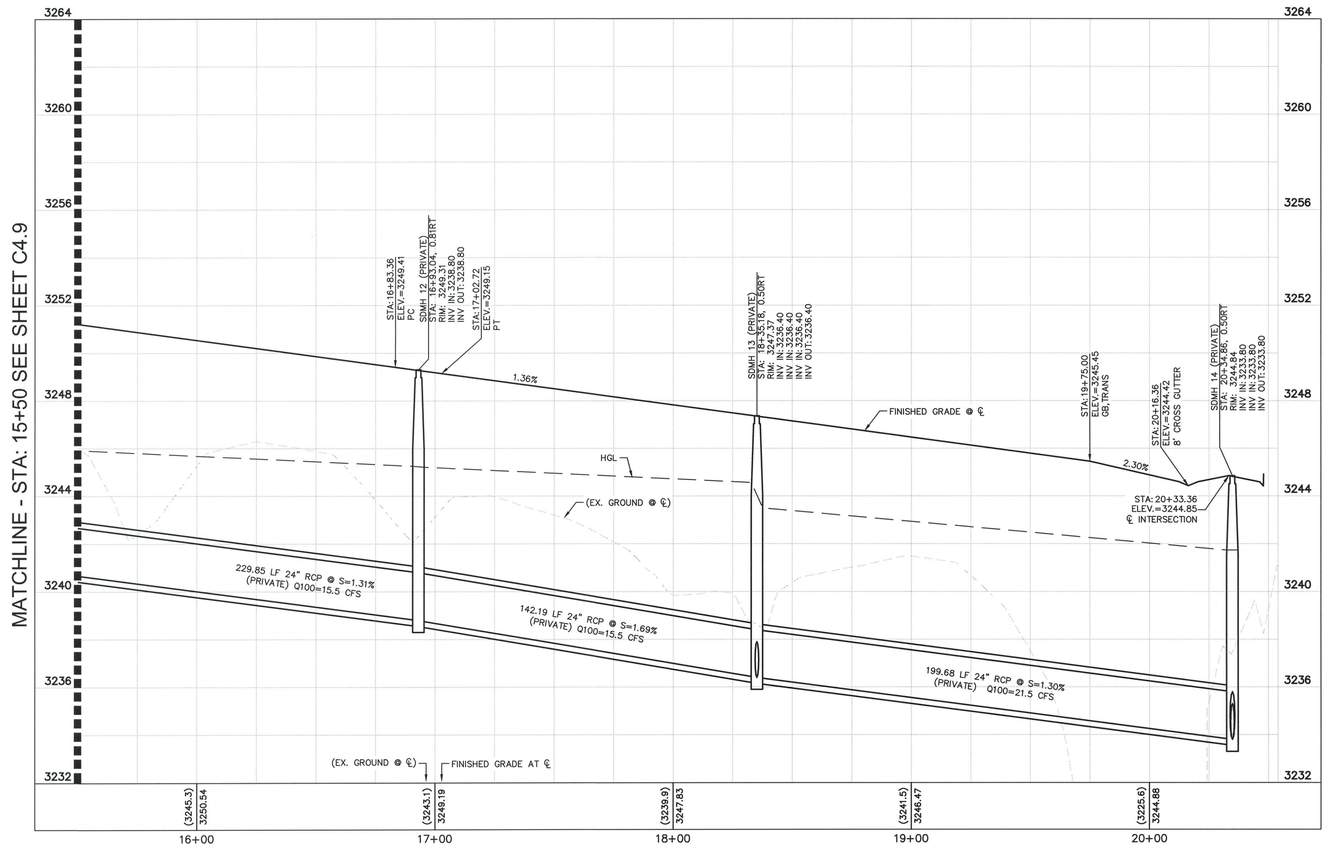


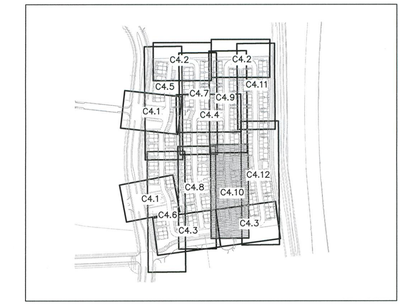
PRIVATE DRIVE "D" - PLAN VIEW - STA: 15+50 - 20+55

1" = 30'



PRIVATE DRIVE "D" - PROFILE VIEW - STA: 15+50 - 20+55

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
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5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
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REFER TO OVERALL GRADING PLAN, SHEET C2.0

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PROJECT No.: 1993–GEO

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DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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No.	REVISIONS	DATE	BY

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STATE OF NEVADA — PROFESSIONAL ENGINEER — 20171 — JOHN WALKER BELSICK — CIVIL — 10/13/2019

KHA PROJECT	092335004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

D DRIVE PLAN & PROFILE
STA 15+50 - 20+54

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

33 OF 46 SHEETS
C4.10

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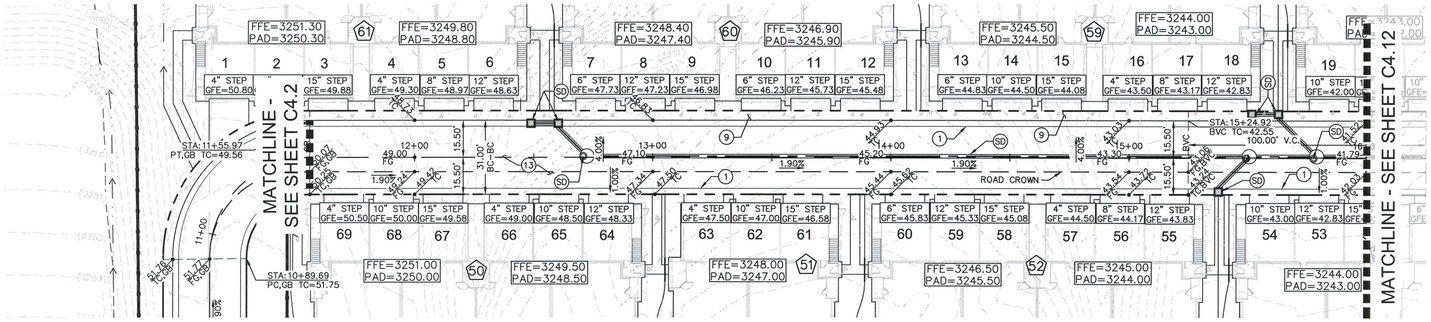
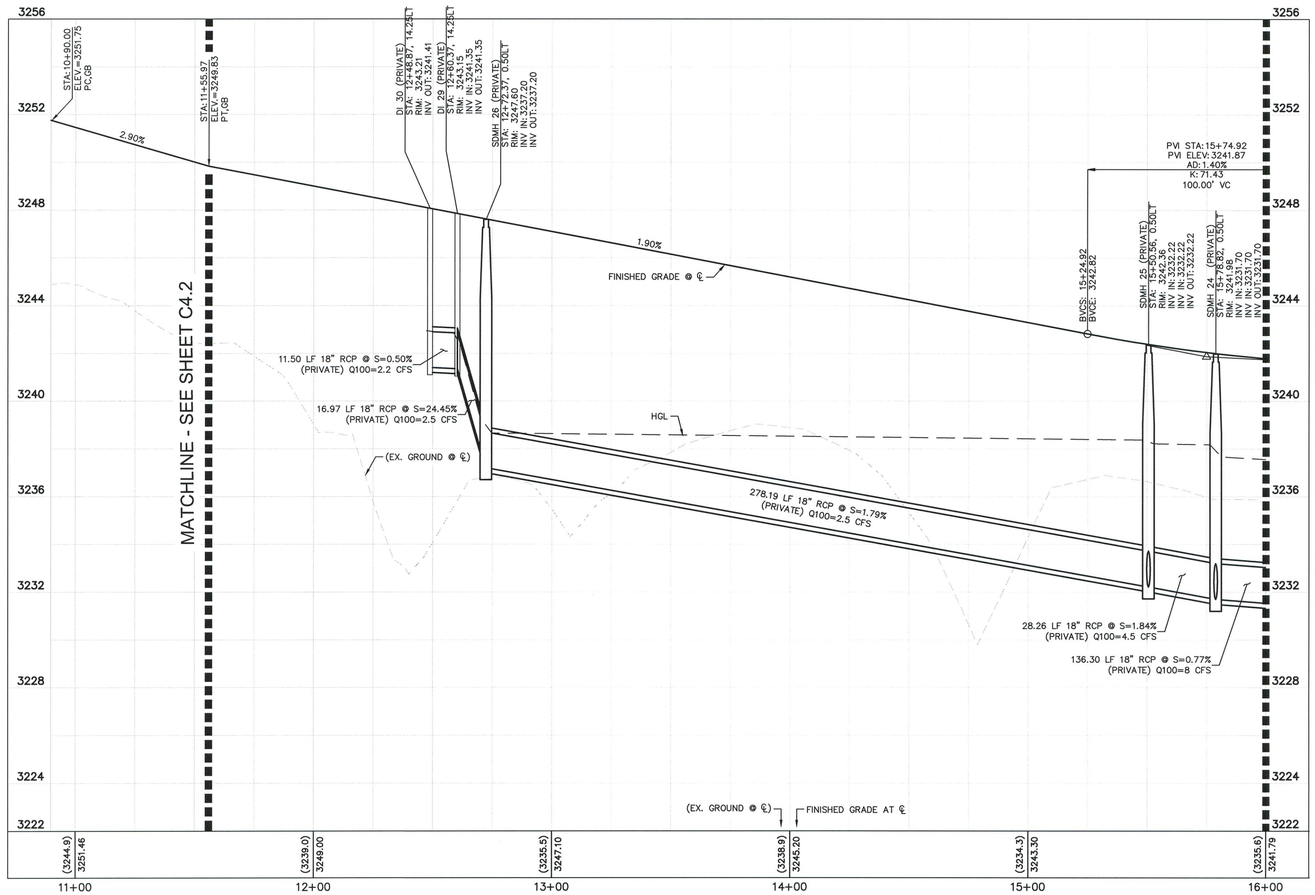


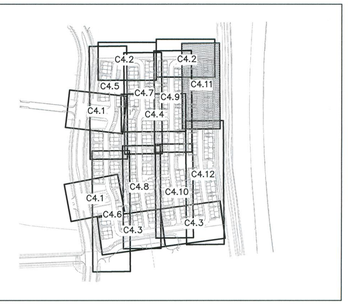
PRIVATE DRIVE "C" - PLAN VIEW - STA: 10+89 - 15+00

1" = 30'



PRIVATE DRIVE "C" - PROFILE VIEW - STA: 10+89 - 15+00

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

ALL GRADING AND PAVEMENT SECTIONS SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: AMERICAN SOILS ENGINEERING, LLC
REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

NOTE (ALL BUILDINGS): PER GEOTECHNICAL RECOMMENDATIONS. POSITIVE DRAINAGE OF 5% MINIMUM SHALL BE MAINTAINED FOR AREAS ADJACENT TO STRUCTURES THAT ARE NOT COVERED IN ASPHALT OR CONCRETE. THE 5% MINIMUM SLOPE SHALL BE MAINTAINED FOR A MINIMUM OF 10'.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

No.	REVISIONS	DATE	BY

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ENGINEER-STATE OF NEVADA
JODY WALKER
RELSICK
CIVIL
No. 15101
PROFESSIONAL
10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

C DRIVE PLAN & PROFILE
STA 10+89 - 75+00

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

34 OF 46 SHEETS
C4.11

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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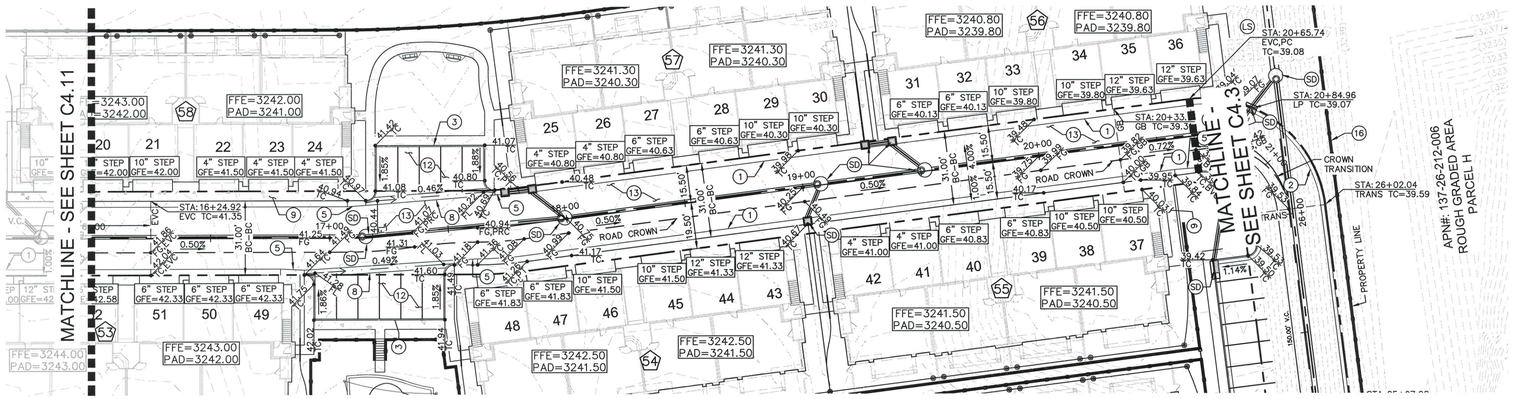
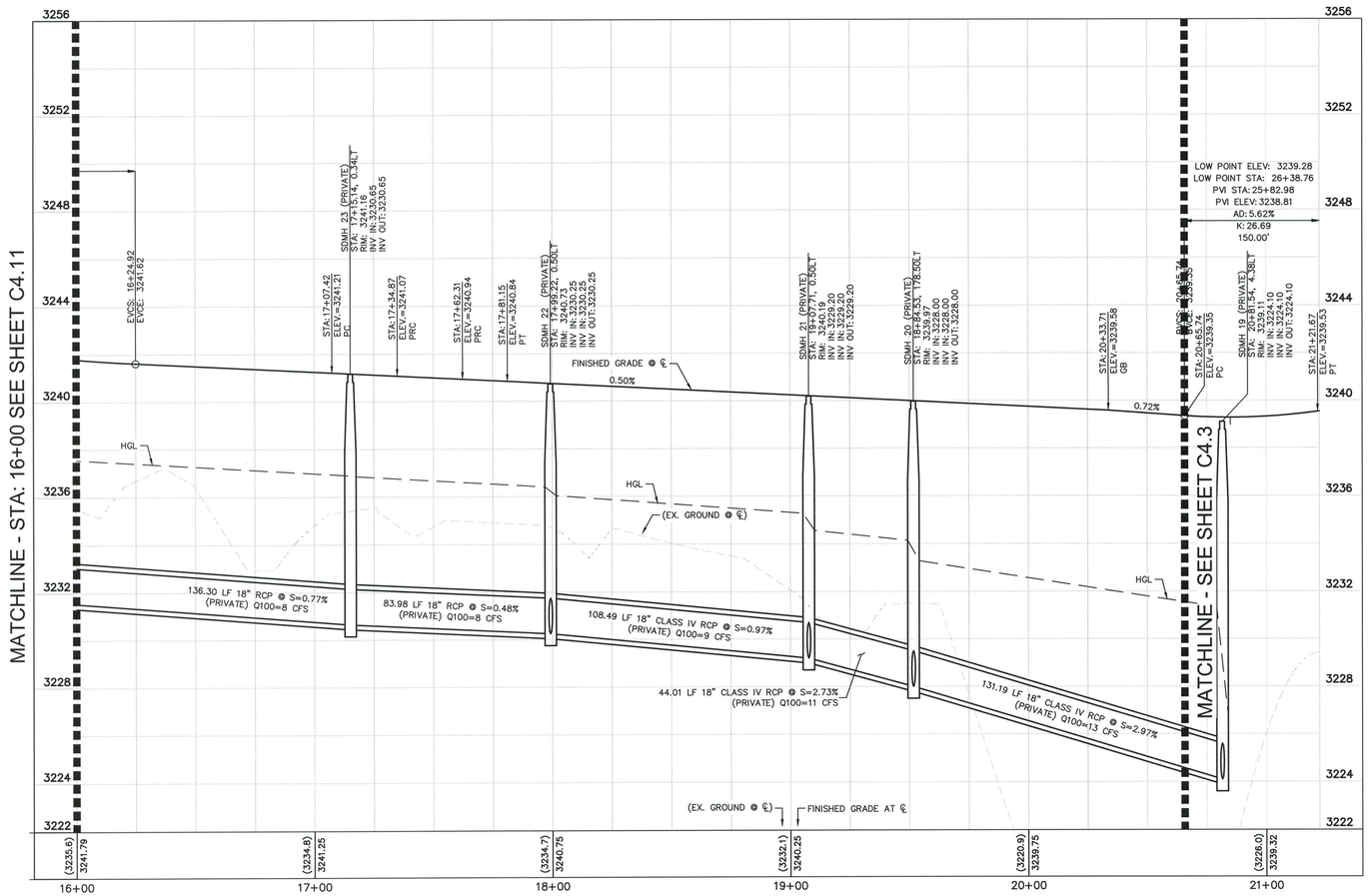


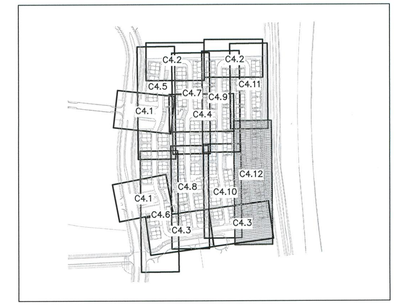
PRIVATE DRIVE "C" - PLAN VIEW

1" = 30'



PRIVATE DRIVE "C" - PROFILE VIEW - STA: 15+00 - 21+22

HORIZ: 1" = 30'
VERT: 1" = 3'



KEYMAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

CONSTRUCTION NOTES

1. CONSTRUCT 30" ROLL CURB PER CCAUSD NO. 217.1.
2. CONSTRUCT "L" TYPE CURB & GUTTER PER CCAUSD NO. 216.
3. CONSTRUCT 6" CURB PER DETAIL
5. 10 LF TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL 6 ON SHEET C9.3.
8. CONSTRUCT 3' WIDE VALLEY GUTTER PER DETAIL 5 ON SHEET C9.3
9. CONSTRUCT 5" THICK SIDEWALK (WIDTH PER PLAN) PER CCAUSD NO. 234.
12. CONSTRUCT LIGHT AC PAVEMENT PER DETAIL 1 ON SHEET C9.3.
13. CONSTRUCT HEAVY AC PAVEMENT PER DETAIL 2 ON SHEET C9.3.
16. CONSTRUCT CMU RETAINING WALL, HEIGHT PER PLAN, WITH DECORATIVE VIEW FENCE. PLANS & DETAILS BY OTHERS (PER SEPARATE PERMIT).
LS. LANDSCAPE AREA – TO BE MAINTAINED BY OWNER
SD. REFER TO STORM DRAIN PLANS, SHEETS C5.1 THROUGH C5.6, FOR STORM DESIGN

NOTE

ALL PIPES CLASS III UNLESS NOTED ON THE PLANS (TYP)

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

GEOTECHNICAL NOTE

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REPORT DATED: JULY 1, 2019
PROJECT No.: 1993-GEO

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

CLV#:

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No.	REVISIONS	DATE	BY

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WWW.KIMLEY-HORN.COM

ENGINEER-STATE OF NEVADA PROFESSIONAL
JODY WALKER BELSICK
No. 15107
CIVIL
12/31/20
10/13/2019

KHA PROJECT 092335004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

C DRIVE PLAN & PROFILE
STA 15+00 - 21+22

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

35 OF 46 SHEETS
C4.12

Plotted By: Kirstner, Mikol Sheet Set: Kha Layout: C4.12 October 13, 2019 02:22:43pm K:\LAV_Civil\092335004-Lennar Village 21 Parcel I\CAD\PlanSheets\092335004-PP-NS.dwg
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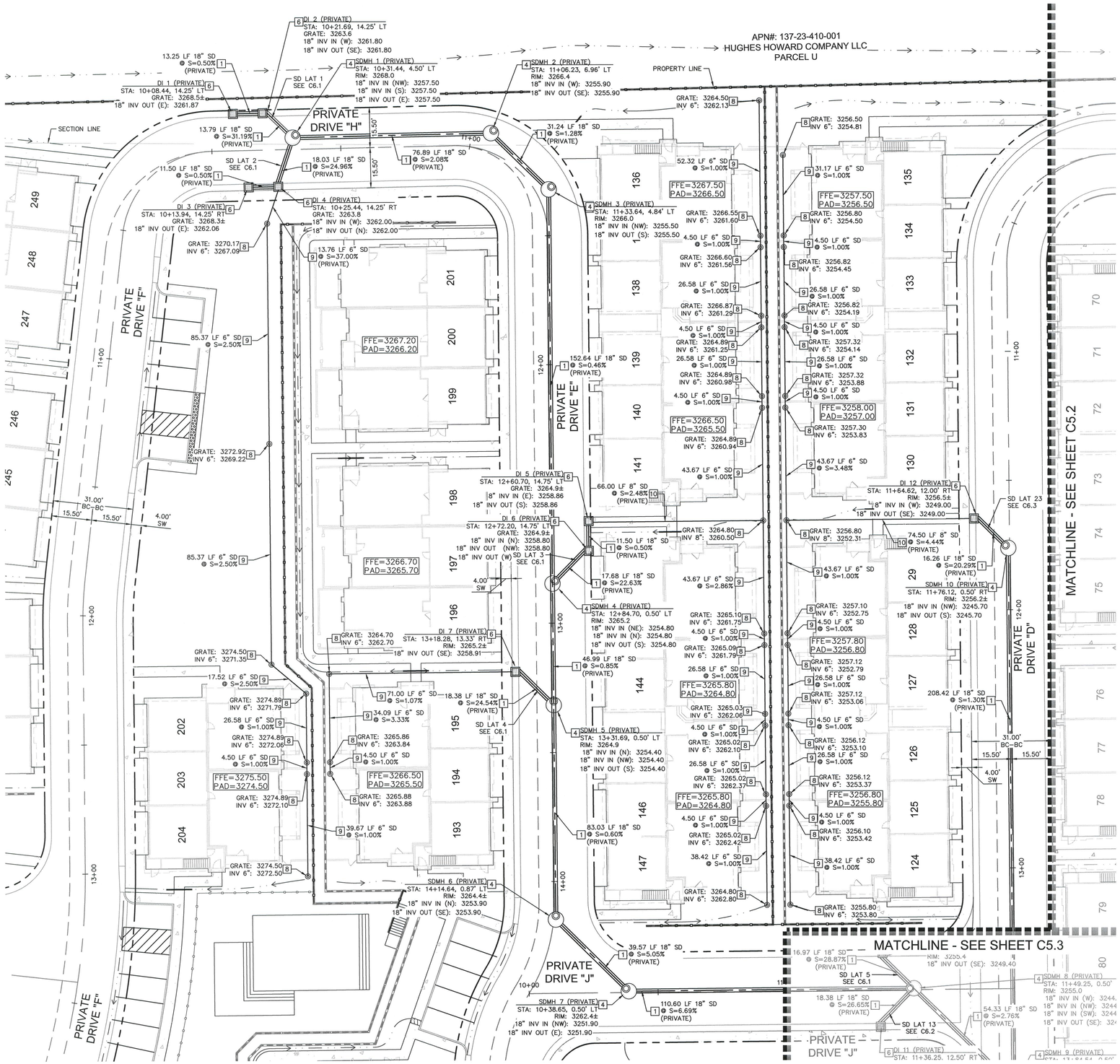

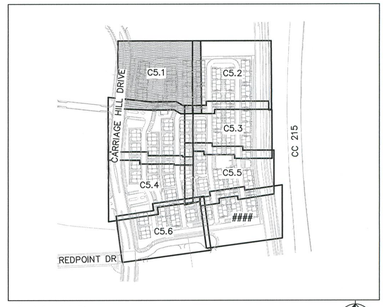

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

1. INSTALL 18" RCP CLASS III STORM DRAIN PIPE
4. INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403
6. INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3
8. INSTALL NDS 18" X 18" CATCH BASIN
9. INSTALL 6" PVC STORM DRAIN PIPE
10. INSTALL 8" PVC STORM DRAIN PIPE

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN), AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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

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PHONE: 702-862-3600
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NEVADA ENGINEER - STATE OF NEVADA - PROFESSIONAL - 20011 WALKER KELSICK CIVIL 10/13/2019

KHA PROJECT 092935004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

STORM DRAIN PLAN SHEET 1 OF 6

36 OF 46 SHEETS
C5.1

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C5.1 October 13, 2019 02:23:13pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-SD.dwg
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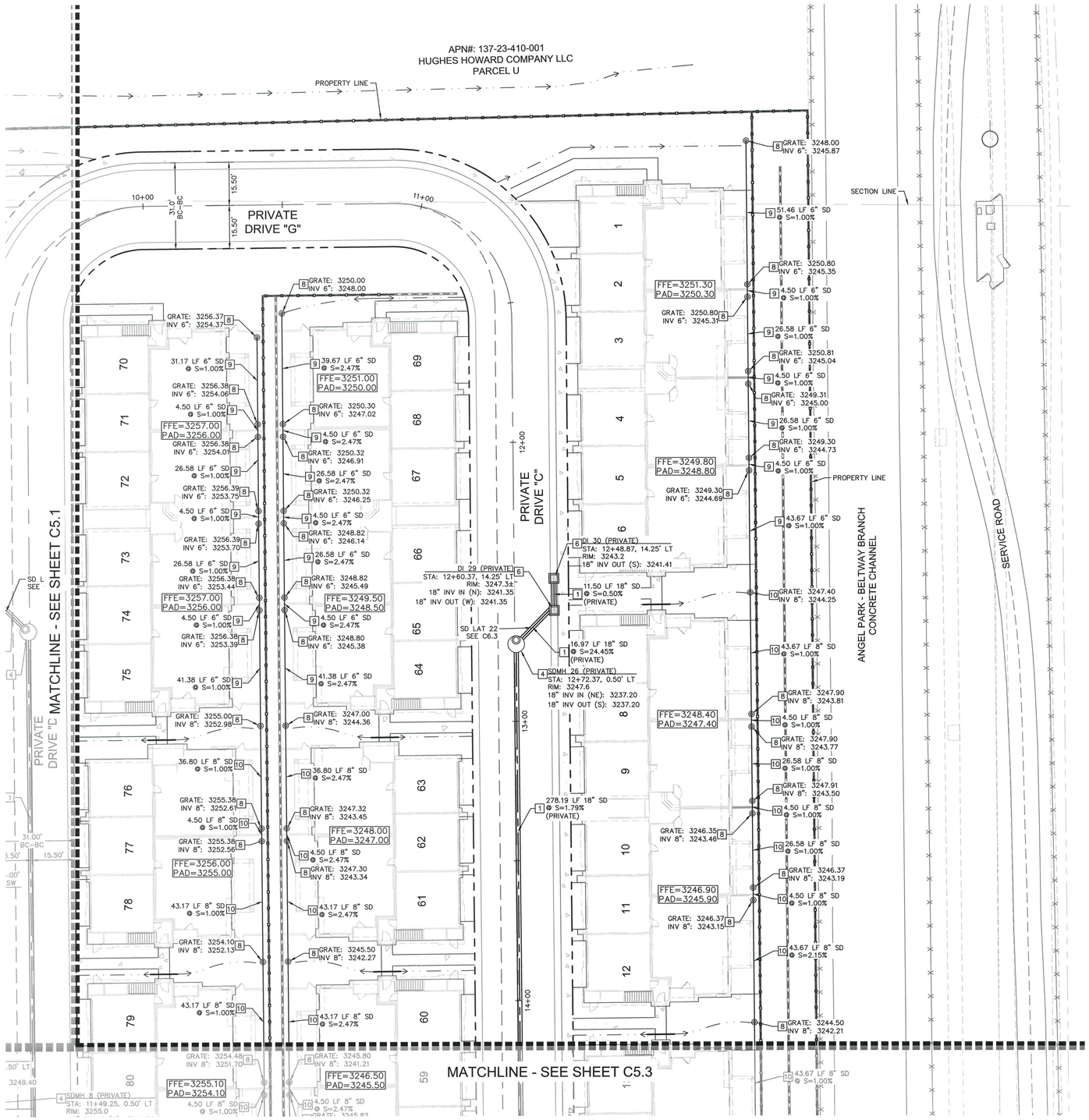

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

1. INSTALL 18" RCP CLASS III STORM DRAIN PIPE
4. INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403
6. INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3
8. INSTALL NDS 18" X 18" CATCH BASIN
9. INSTALL 6" PVC STORM DRAIN PIPE
10. INSTALL 8" PVC STORM DRAIN PIPE

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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ENGINEER-STATE OF NEVADA JOY WALKER BELSICK 17010 CIVIL PROFESSIONAL ENGINEER 10/13/2019

KHA PROJECT	092933504
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN PLAN SHEET 2 OF 6

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

37 OF 46 SHEETS
C5.2

Plotted By:Kistner, Mikel Sheet Set:Kha Layout:C5.2 October 13, 2019 02:23:23pm K:\LAV_Civil\092933504-Lennar Village 21 Parcel I\CAD\PlanSheets\092933504-SD.dwg
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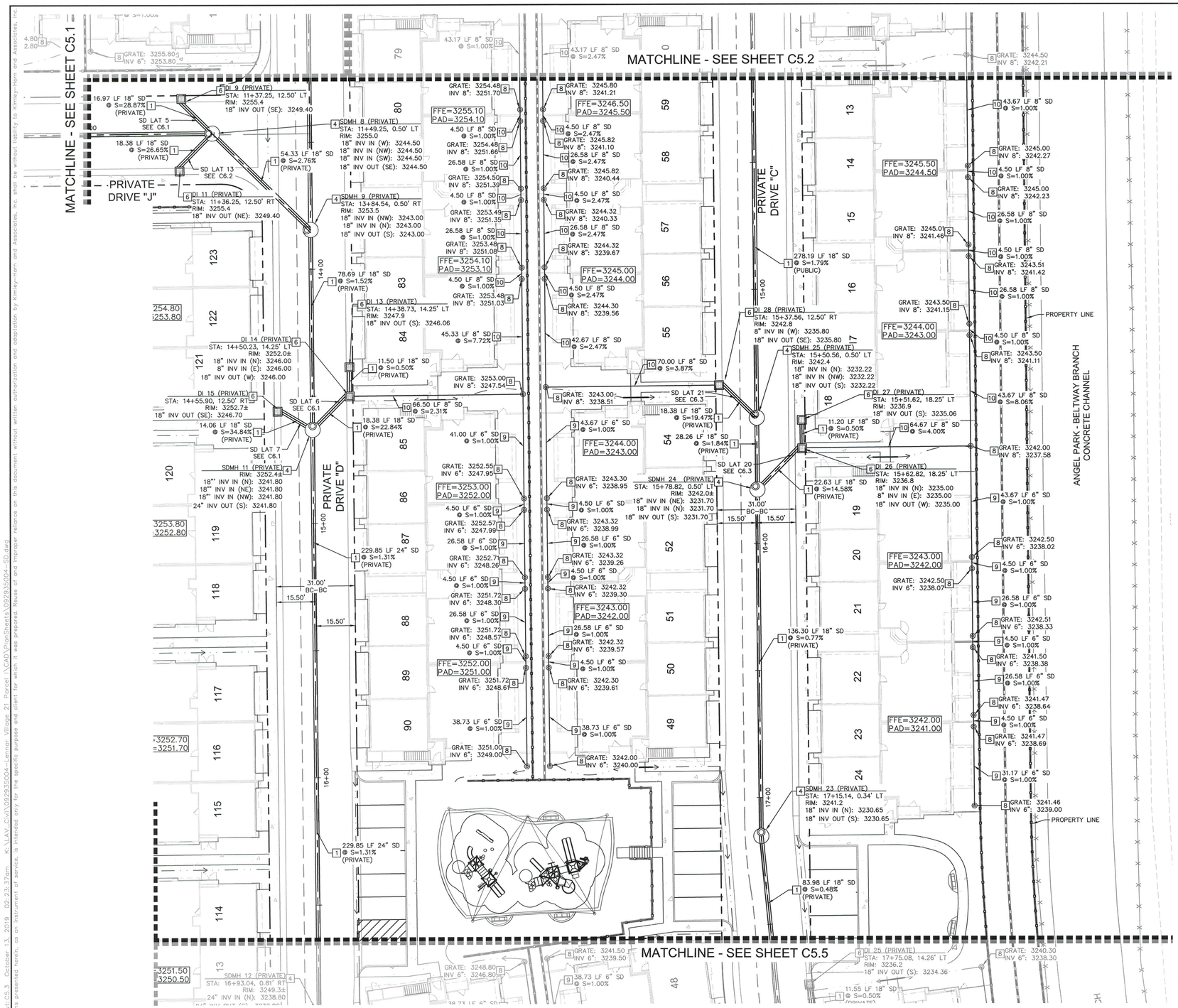

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

1. INSTALL 18" RCP CLASS III STORM DRAIN PIPE
4. INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403
6. INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3
8. INSTALL NDS 18" X 18" CATCH BASIN
9. INSTALL 6" PVC STORM DRAIN PIPE
10. INSTALL 8" PVC STORM DRAIN PIPE

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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CLV#:

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No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

ENGINEER - STATE OF NEVADA - JODY WALKER 015101 CIVIL 12/31/20 PROFESSIONAL 10/15/2019

TO SUBMIT

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN PLAN SHEET 3 OF 6

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

38 OF 46 SHEETS
C5.3

Plotted By:Kintner, Mikel Sheet Set:Kha Layout:C5.3 October 13, 2019 02:23:37pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel 1\CAD\PlanSheets\092935004-SD.dwg
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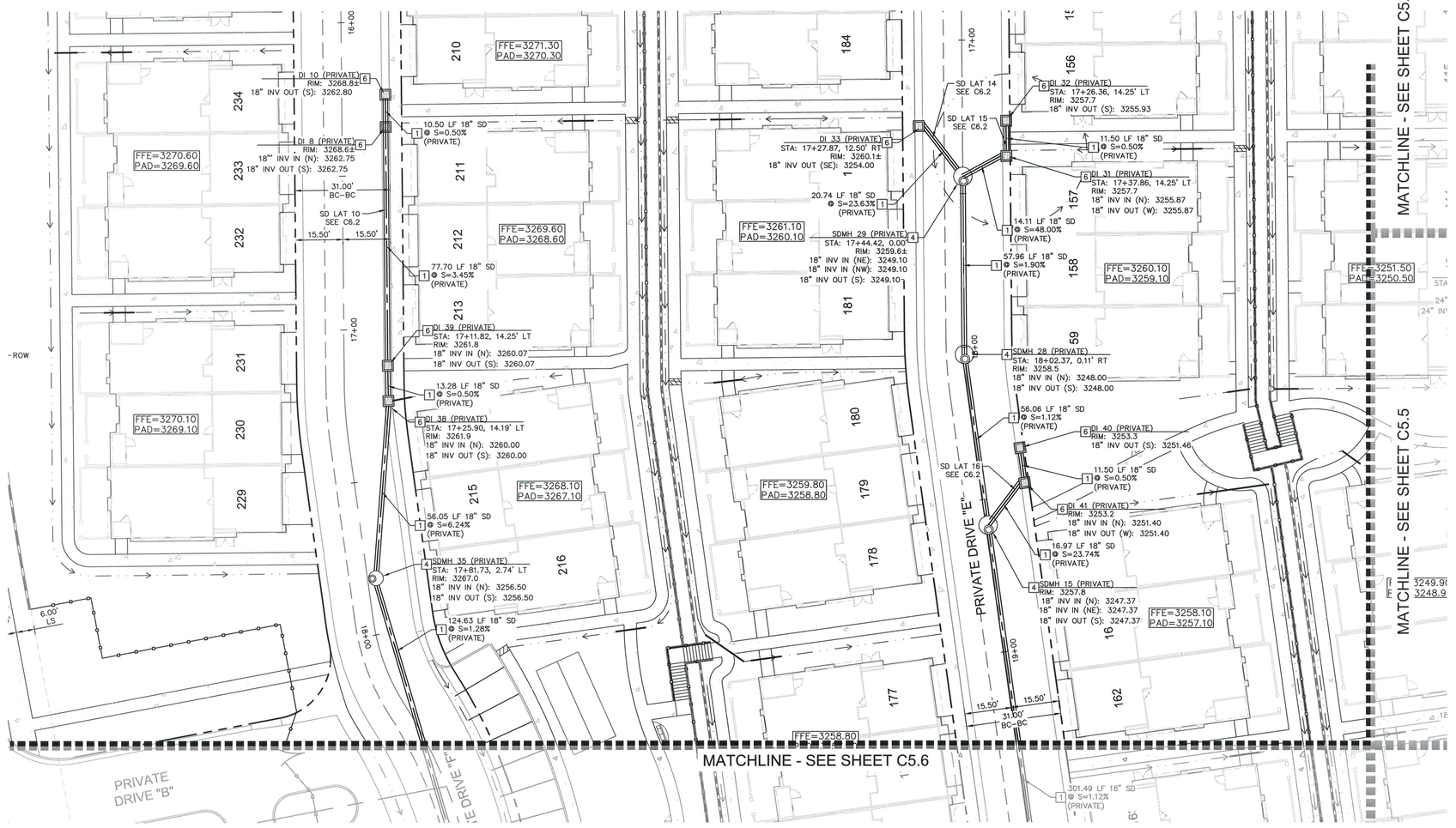

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

[1] INSTALL 18" RCP CLASS III STORM DRAIN PIPE

[4] INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403

[6] INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

CLV#:

No.	REVISIONS	DATE	BY

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — JOY WALKER DELSICK — 17747 — CIVIL — PROFESSIONAL ENGINEER — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN PLAN SHEET 4 OF 6

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

39 OF 46 SHEETS

C5.4

Plotted By:Kinner, Mikol Sheet Set:Kha Layout:C5.4 October 13, 2019 02:23:54pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-SD.dwg
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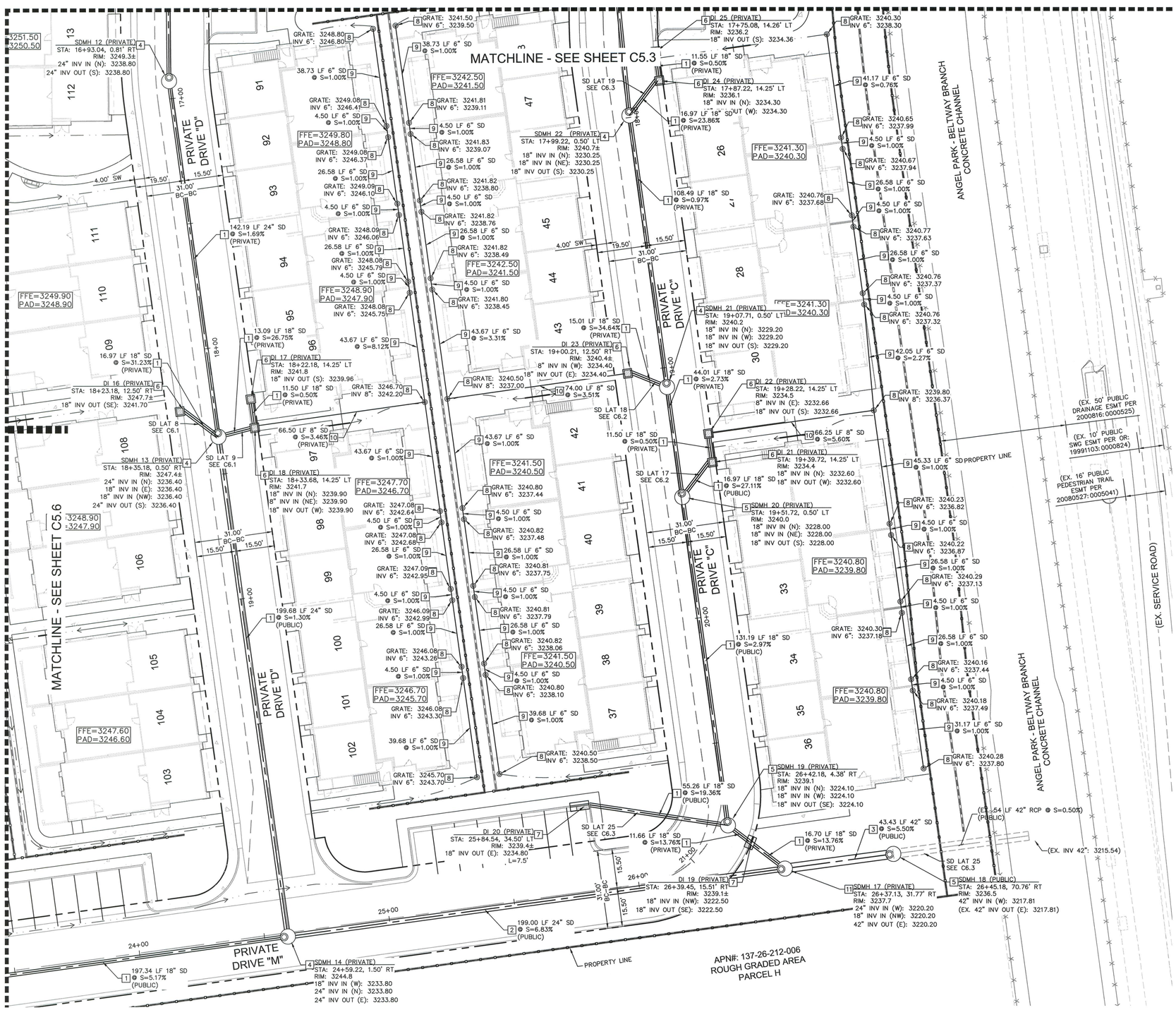

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

1. INSTALL 18" RCP CLASS III STORM DRAIN PIPE
2. INSTALL 24" RCP CLASS III STORM DRAIN PIPE
3. INSTALL 42" RCP CLASS III STORM DRAIN PIPE
4. INSTALL 48" TYPE I SDMH PER CCAUSD NO. 403
5. INSTALL 60" TYPE III SDMH PER CCAUSD NO. 403
6. INSTALL DROP INLET NEENAH TYPE R-3501 PER DETAIL 17 ON SHEET C9.3
7. INSTALL DROP INLET TYPE DM2 PER DETAILS 16 ON SHEET C9.3
8. INSTALL NDS 18" X 18" CATCH BASIN
9. INSTALL 6" PVC STORM DRAIN PIPE
10. INSTALL 8" PVC STORM DRAIN PIPE
11. INSTALL 60" TYPE III SDMH WITH NEENAH GRATED LID PER CCAUSD NO. 403 AND NEENAH SPECIFICATIONS

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 (ITEMS) AND GENERAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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CLV#:

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

ENGINEER - STATE OF NEVADA - JEFFREY WALKER BELSICK - 12/31/20 - CIVIL - PROFESSIONAL - 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

STORM DRAIN PLAN SHEET 5 OF 6

40 OF 46 SHEETS

C5.5

Plotted By: Kinner, Mikol Sheet Set: Kha Layout: C5.5 October 13, 2019 02:24:04pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-SD.dwg
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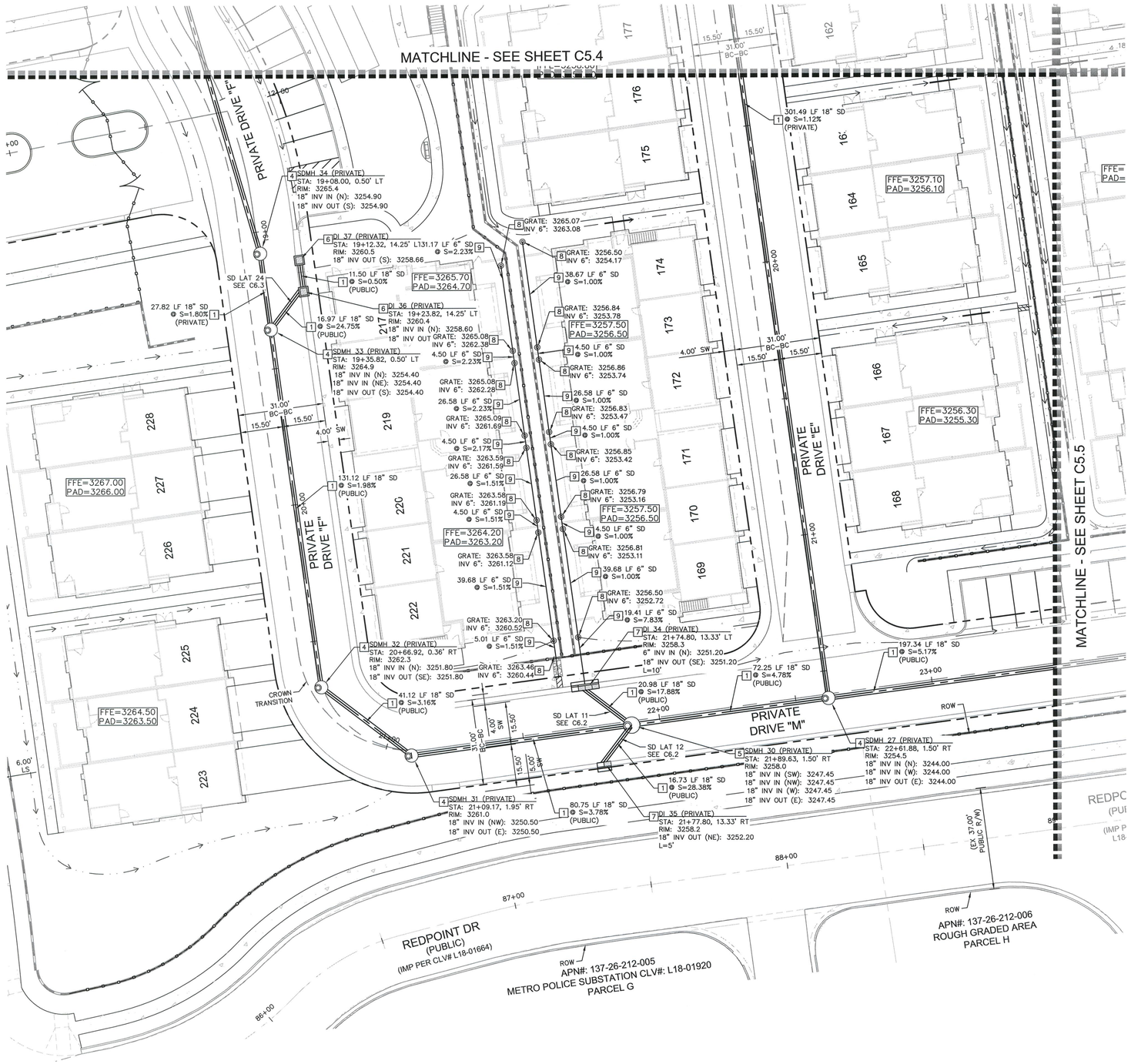

KEY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORM DRAIN NOTES

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STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

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LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

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CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

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SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
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STATE OF NEVADA
ENGINEER
ROY WALKER BELSICK
12/31/20
CIVIL
15170
PROFESSIONAL
10/13/2019

TDJ 5-30-19

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

STORM DRAIN PLAN
SHEET 6 OF 6

41 OF 46 SHEETS
C5.6

Plotted By:Kinter, Mikol Sheet Set:Kha Layout:C5.6 October 13, 2019 02:24:17pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-SD.dwg
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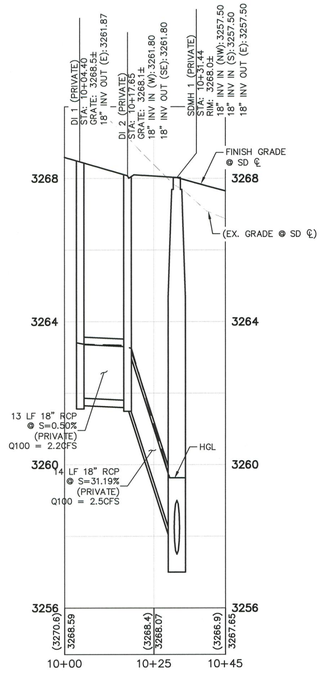
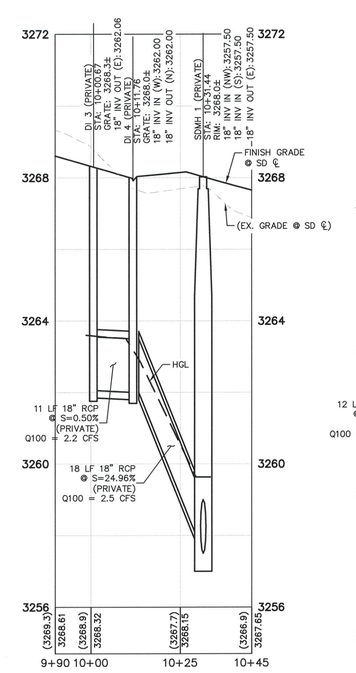


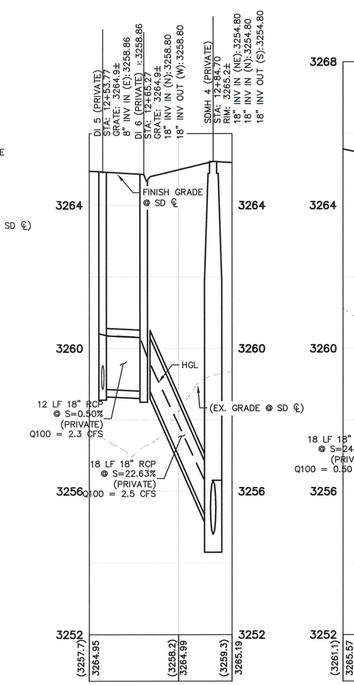
SD LAT 7

HORIZ: 1" = 20'
VERT: 1" = 2'



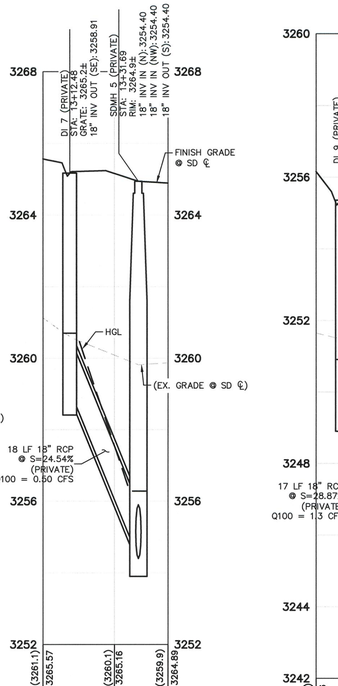
SD LAT 7

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 8

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 9

HORIZ: 1" = 20'
VERT: 1" = 2'

SD LAT 2

HORIZ: 1" = 20'
VERT: 1" = 2'

SD LAT 1

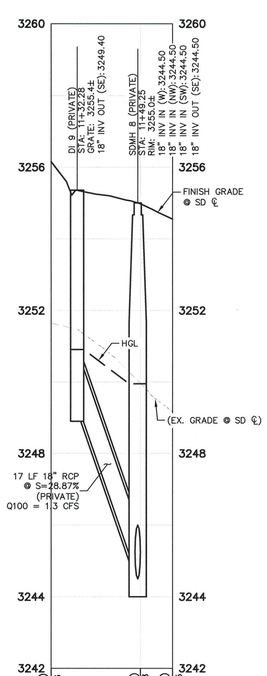
HORIZ: 1" = 20'
VERT: 1" = 2'

SD LAT 3

HORIZ: 1" = 20'
VERT: 1" = 2'

SD LAT 4

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 5

HORIZ: 1" = 20'
VERT: 1" = 2'

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

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LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

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BASIS OF BEARINGS

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LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

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CLV#:

No.	REVISIONS	DATE	BY

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PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

REGISTERED PROFESSIONAL ENGINEER - STATE OF NEVADA
JODY WALKER BELSICK
No. 15019
CIVIL
12/31/20
10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN LATERAL PROFILES SHEET 1 OF 3

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR
LENNAR HOMES

CITY OF LAS VEGAS NEVADA

42 OF 46 SHEETS
C6.1

TAS 10/15/19

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C6.1 October 13, 2019 02:24:43pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-PP-SD-LAT.dwg
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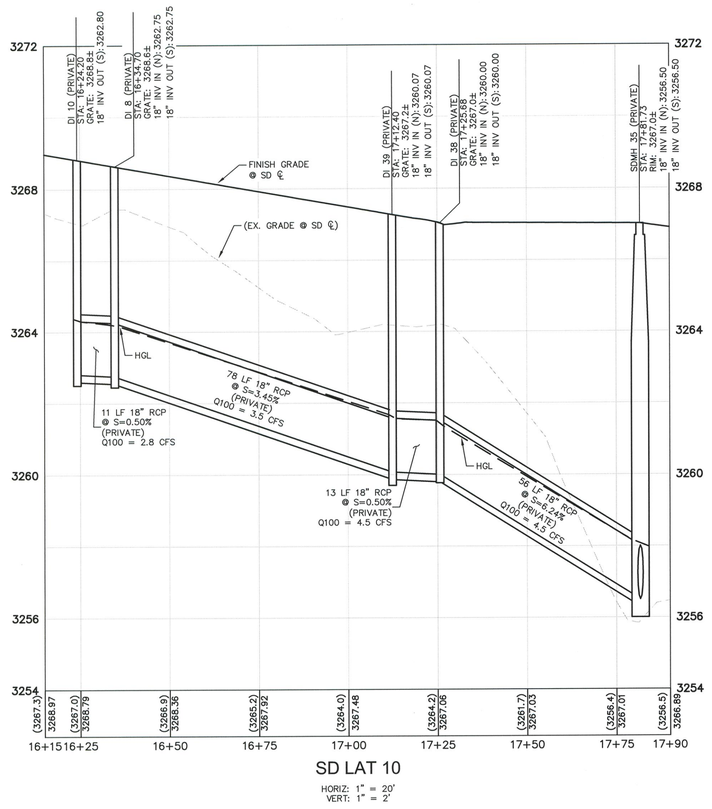
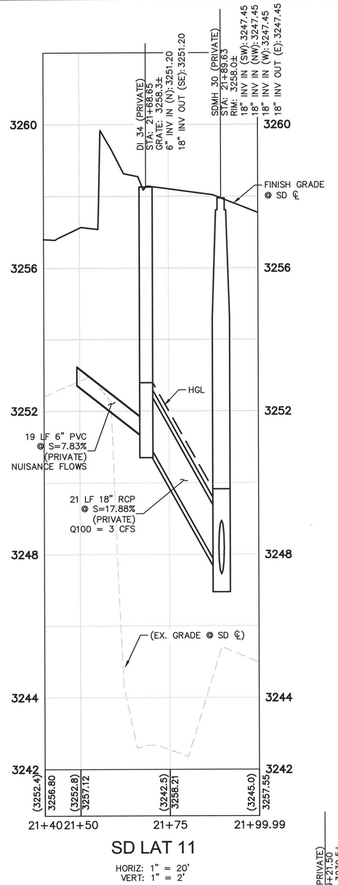


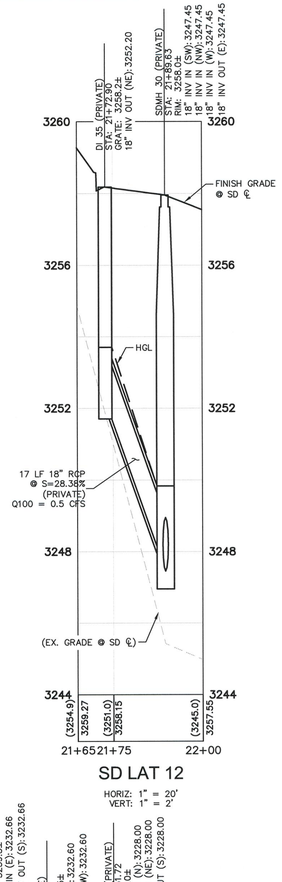
SD LAT 10

HORIZ: 1" = 20'
VERT: 1" = 2'



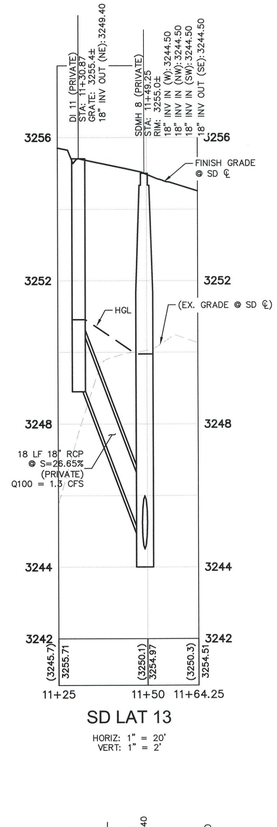
SD LAT 11

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 12

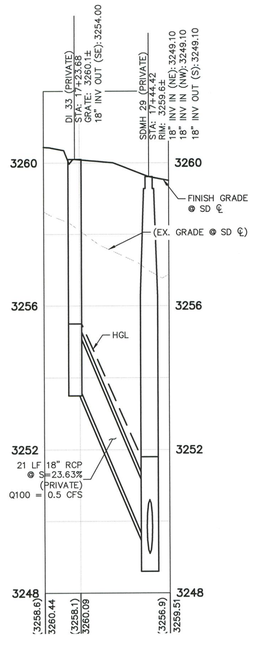
HORIZ: 1" = 20'
VERT: 1" = 2'

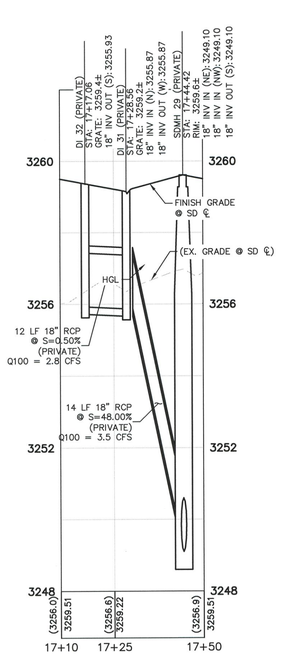


SD LAT 13

HORIZ: 1" = 20'
VERT: 1" = 2'

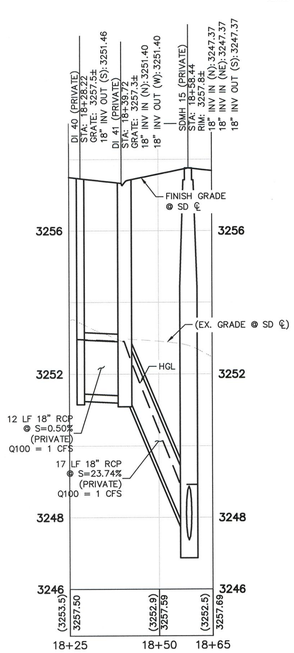
GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'





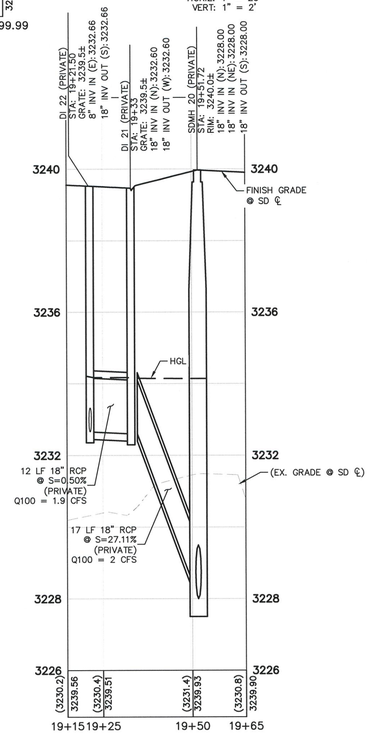
SD LAT 15

HORIZ: 1" = 20'
VERT: 1" = 2'



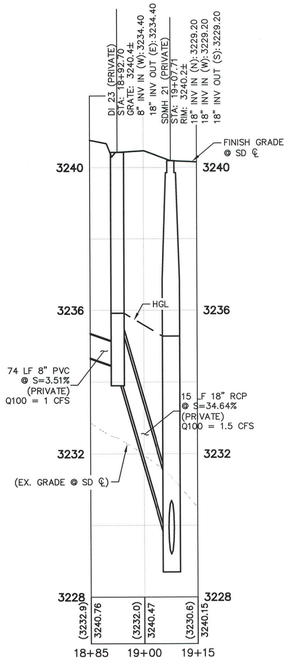
SD LAT 16

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 17

HORIZ: 1" = 20'
VERT: 1" = 2'



SD LAT 18

HORIZ: 1" = 20'
VERT: 1" = 2'

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

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LEGAL DESCRIPTION

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WWW.KIMLEY-HORN.COM

STATE OF NEVADA PROFESSIONAL ENGINEER — JODY WALKER BELSICK — CIVIL — 12/31/20 — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN LATERAL PROFILES SHEET 2 OF 3

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

43 OF 46 SHEETS

C6.2

Rotted Ryklner Mkel Sheet Set:Kha Layout:C6.2 October 13, 2019 02:24:51pm K:\LAV Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-PP-SD-LAT.dwg
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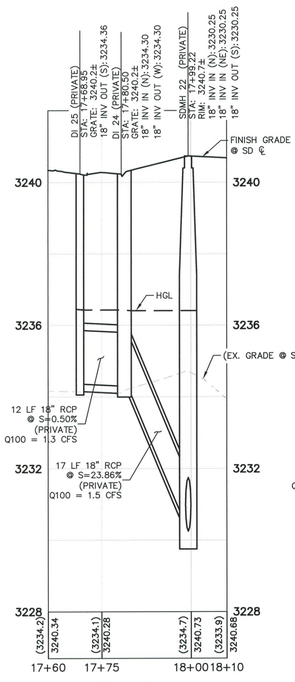

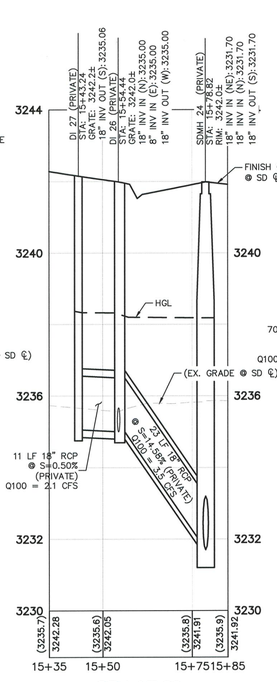

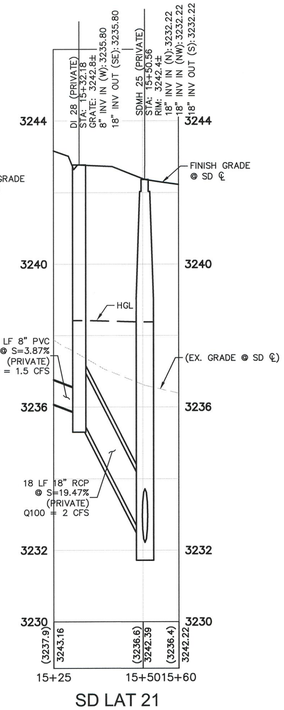

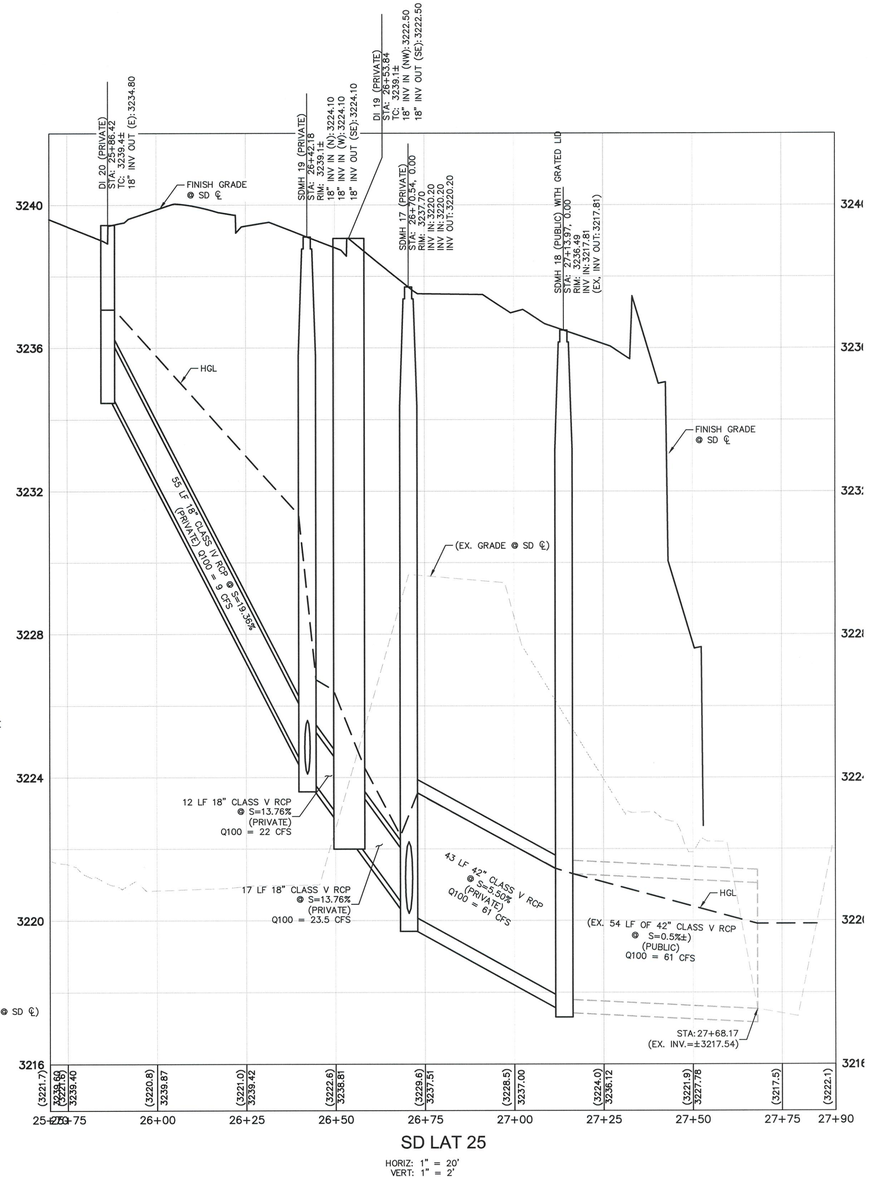

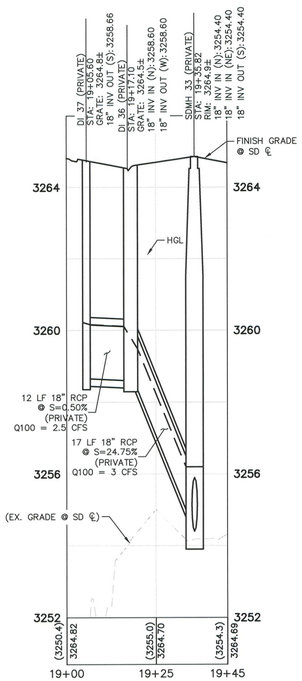

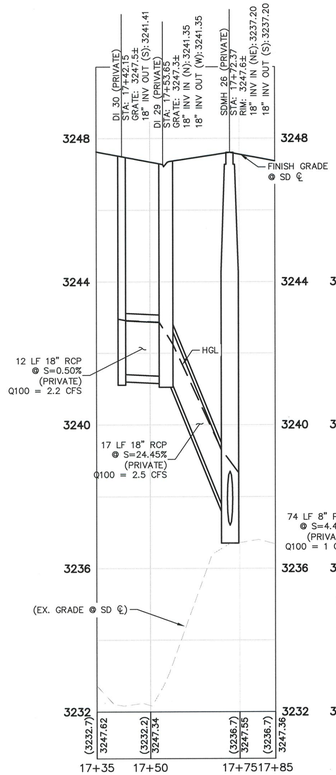

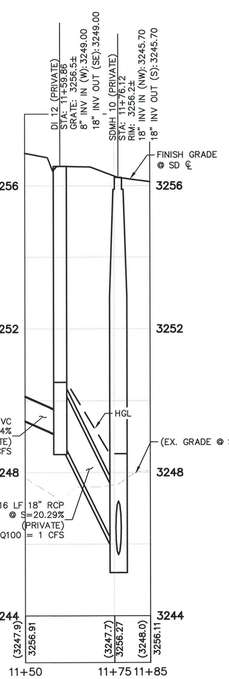

GRAPHIC SCALE IN FEET
0 10 20 40
SCALE 1" = 20'

STORMWATER MANAGEMENT NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

ENGINEER'S NOTES

REFER TO OVERALL GRADING PLAN, SHEET C2.0

FLOODZONE

THE PARCEL DESCRIBED HEREON LIES WITHIN THE FLOOD HAZARD ZONE HAVING A ZONE DESIGNATION OF "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN). AS SHOWN PER FEMA MAP, NO. 32003C2150 E DATED SEPTEMBER 27, 2002.

LEGEND & ABBREVIATIONS

SEE SHEET C0.3 FOR MASTER LEGEND AND ABBREVIATIONS.

LEGAL DESCRIPTION

SEE COVER SHEET FOR LEGAL DESCRIPTION

BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 7LV0934SW6 (REVISED 2008)
NAVD88 ELEVATION: 1,011.422 METERS (3,318.31 FEET)

FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34

BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)

DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00

SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

SYSTEM: LAS VEGAS HIGH ELEVATION ZONE

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. CALL 811 OR 1-800-227-2600

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

CLV#:

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — JODY WALKER 18153 — 12/31/20 — CIVIL — PROFESSIONAL — 10/13/2019

KHA PROJECT 092935004	
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

STORM DRAIN LATERAL PROFILES SHEET 3 OF 3

HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

CITY OF LAS VEGAS NEVADA

44 OF 46 SHEETS

C6.3

Plotted By: Kris Hoge, MKell, Sheet Set: Vlla, Layout: C6.3, October 13, 2019 - 02:26:01pm K:\LAN\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-PP-SD-LAT.dwg
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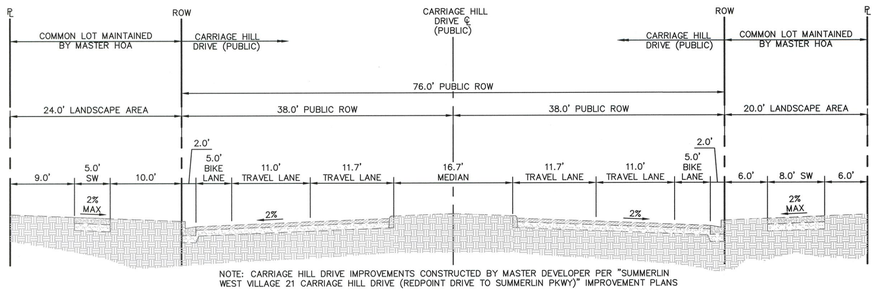
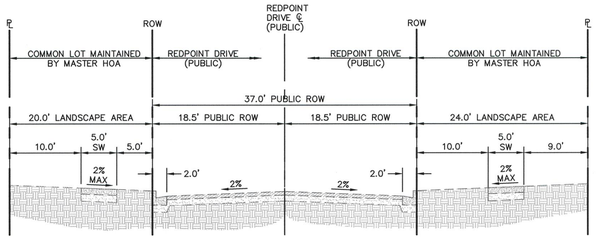


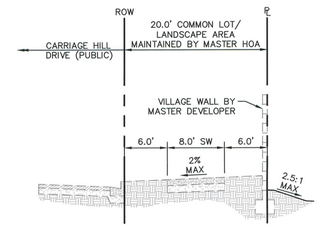
NOTE: CARRIAGE HILL DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT DRIVE TO SUMMERLIN PKWY)" IMPROVEMENT PLANS

A / C9.1 — TYPICAL STREET SECTION ALONG CARRIAGE HILL DRIVE (PER SUMMERLIN STD DWG S-5A) NTS



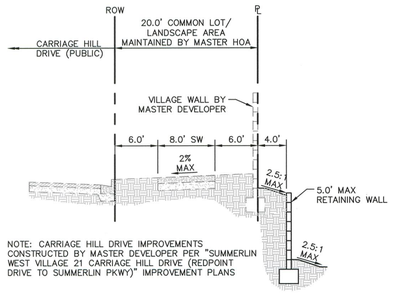
NOTE: REDPOINT DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 REDPOINT DRIVE (CARRIAGE HILL DRIVE TO PARCEL H)" IMPROVEMENT PLANS

B / C9.1 — TYPICAL STREET SECTION ALONG REDPOINT DRIVE (PER SUMMERLIN STD DWG S-7) NTS



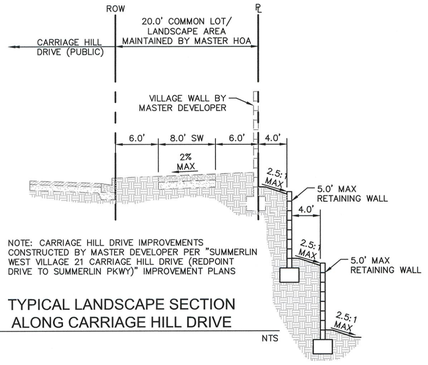
NOTE: CARRIAGE HILL DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT DRIVE TO SUMMERLIN PKWY)" IMPROVEMENT PLANS

C1 / C9.1 — TYPICAL LANDSCAPE SECTION ALONG CARRIAGE HILL DRIVE NTS



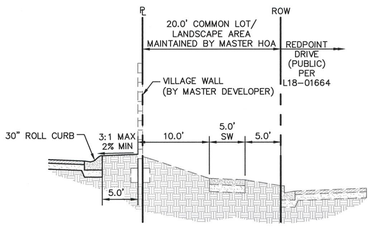
NOTE: CARRIAGE HILL DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT DRIVE TO SUMMERLIN PKWY)" IMPROVEMENT PLANS

C2 / C9.1 — TYPICAL LANDSCAPE SECTION ALONG CARRIAGE HILL DRIVE NTS

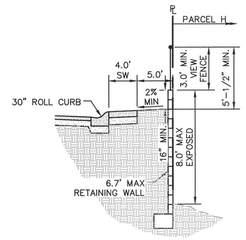


NOTE: CARRIAGE HILL DRIVE IMPROVEMENTS CONSTRUCTED BY MASTER DEVELOPER PER "SUMMERLIN WEST VILLAGE 21 CARRIAGE HILL DRIVE (REDPOINT DRIVE TO SUMMERLIN PKWY)" IMPROVEMENT PLANS

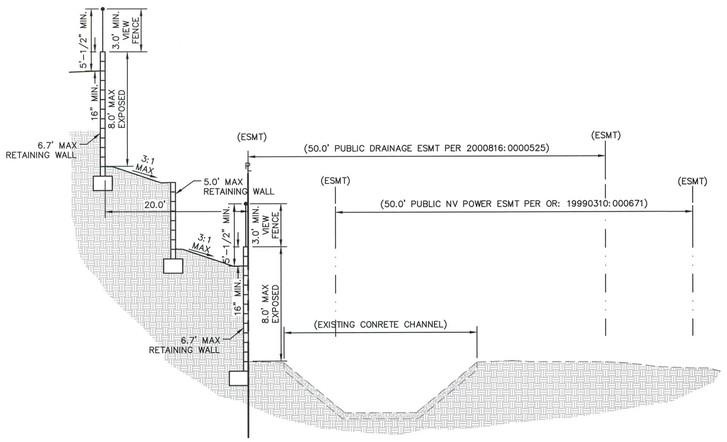
C3 / C9.1 — TYPICAL LANDSCAPE SECTION ALONG CARRIAGE HILL DRIVE NTS



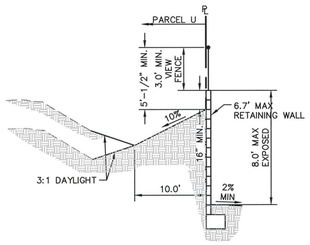
D1 / C9.1 — TYPICAL LANDSCAPE SECTION ALONG REDPOINT DRIVE NTS



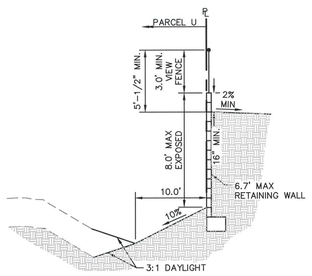
D2 / C9.1 — TYPICAL SECTION SOUTHERN PL NTS



E / C9.1 — TYPICAL STREET SECTION ALONG EXISTING CHANNEL (PER SUMMERLIN STD DWG S-7) NTS



F1 / C9.1 — TYPICAL SECTION NORTHERN PL NTS



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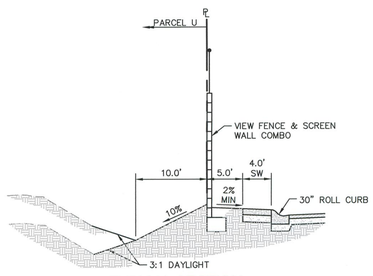

F3 / C9.1 — TYPICAL SECTION NORTHERN PL NTS

CLV#:

Plotted By: Kinter, Mikal Sheet Set: Kha Layout: C9.1 October 13, 2019 02:25:13pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-XS.dwg
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ENGINEER-STATE OF NEVADA — ANDY WALKER BELSICK — 12/31/20 — CIVIL — 15101 — PROFESSIONAL — 10/13/2019

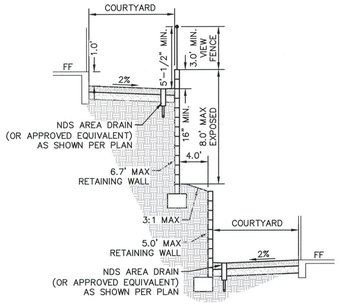
KHA PROJECT 092935004	DESIGNED BY MK
DATE 10/13/2019	DRAWN BY MK
SCALE AS SHOWN	CHECKED BY JB

TYPICAL SECTIONS SHEET 1 OF 2

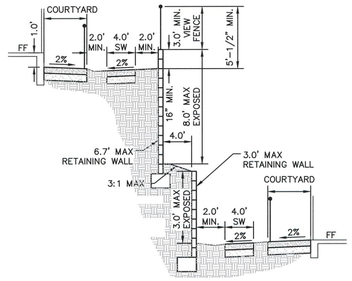
HIGHLINE VILLAGE 21 - PARCEL I

PREPARED FOR LENNAR HOMES

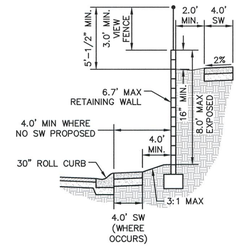
CITY OF LAS VEGAS NEVADA



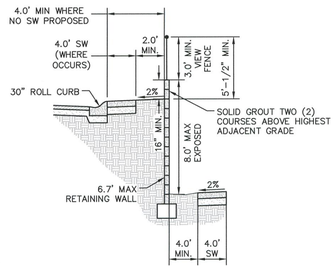
G C9.2 TYPICAL HUDSON COURTYARD SECTION NTS



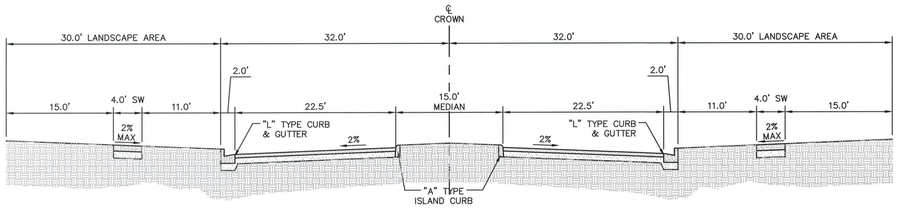
H C9.2 TYPICAL MORNING RIDGE COURTYARD SECTION NTS



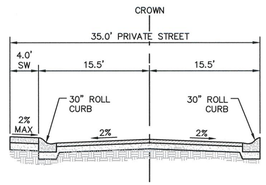
J1 C9.2 TYPICAL CORNER LOT SECTION NTS



J2 C9.2 TYPICAL CORNER LOT SECTION NTS



K C9.2 TYPICAL PRIVATE ENTRY STREET SECTION NTS



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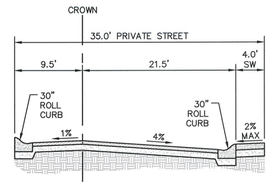
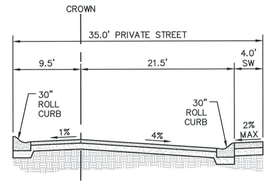
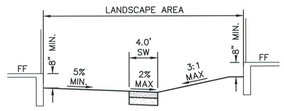


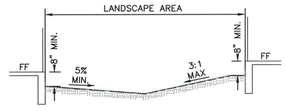
M C9.2 TYPICAL PRIVATE STREET SECTION NTS



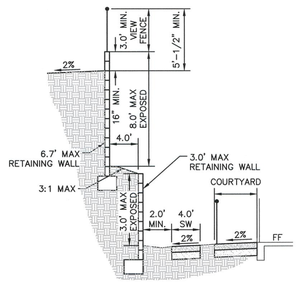
N C9.2 TYPICAL PRIVATE STREET SECTION NTS



O C9.2 TYPICAL BUILDING SECTION NTS



Q C9.2 TYPICAL BUILDING SECTION NTS



R C9.2 TYPICAL MORNING RIDGE COURTYARD SECTION NTS

CLV#:

No.	REVISIONS	DATE	BY

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STATE OF NEVADA — JOHN WALKER BELSICK — 12/31/20 — CIVIL — 10/13/2019

KHA PROJECT	092935004
DATE	10/13/2019
SCALE	AS SHOWN
DESIGNED BY	MK
DRAWN BY	MK
CHECKED BY	JB

TYPICAL SECTIONS SHEET 2 OF 2

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

46 OF 46 SHEETS
C9.2

Plotted By:Kintner, Mikal Sheet Set:Kha Layout:C9.2 October 13, 2019 02:25:13pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel 1\CAD\PlanSheets\092935004-XS.dwg
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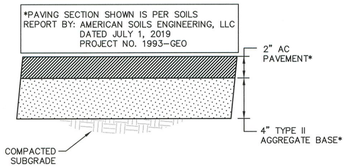

1 C9.3 LIGHT PAVEMENT SECTION
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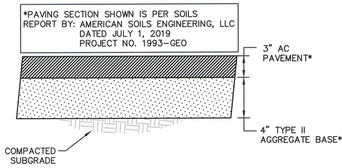

2 C9.3 HEAVY PAVEMENT SECTION
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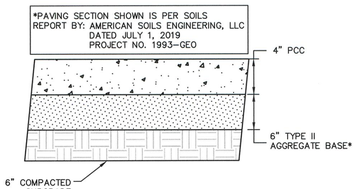

3 C9.3 PCC PAVEMENT
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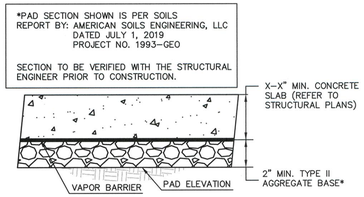

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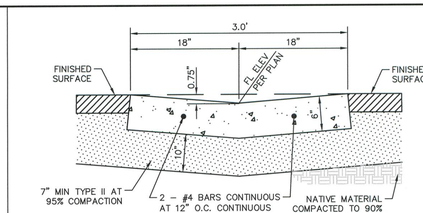

5 C9.3 3.0' VALLEY GUTTER
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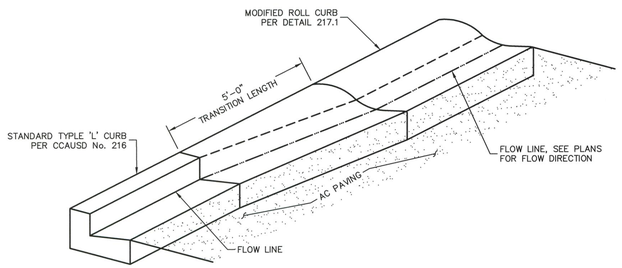
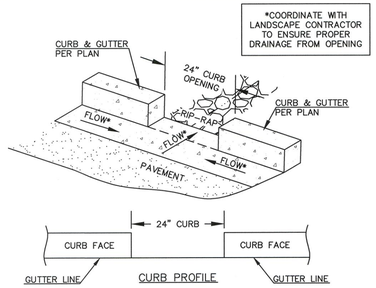
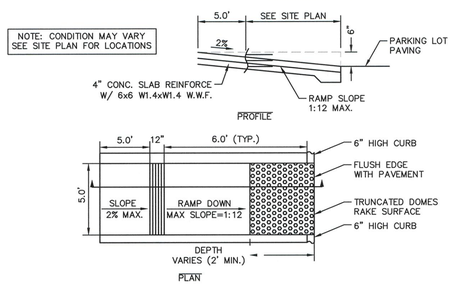


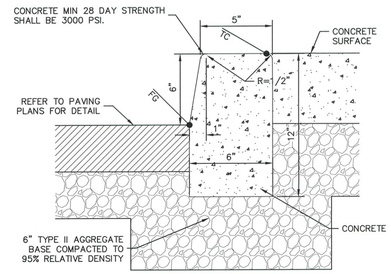
6 C9.3 MODIFIED ROLL CURB TRANSITION TO TYPE 'L' CURB
(NOT TO SCALE)



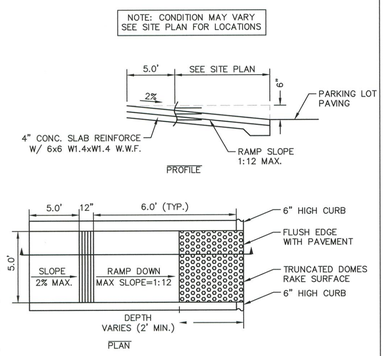
8 C9.3 2' CURB OPENING
(NOT TO SCALE)



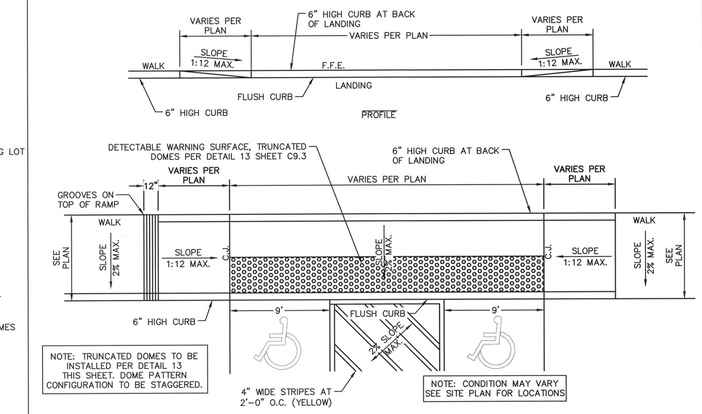
11 C9.3 ON-SITE SIDEWALK RAMP CASE I
(NOT TO SCALE)



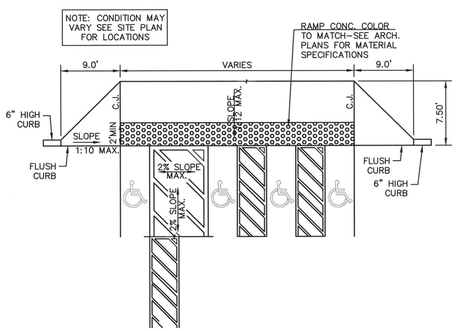
12 C9.3 6" CURB
(NOT TO SCALE)



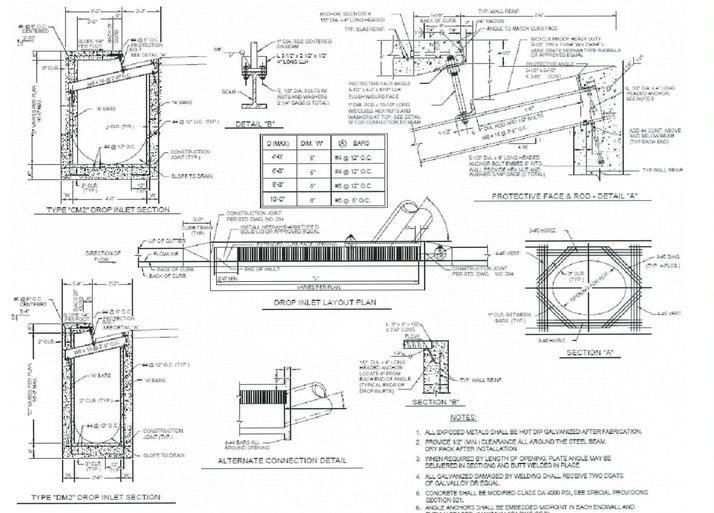
13 C9.3 ON-SITE SIDEWALK RAMP CASE I
(NOT TO SCALE)



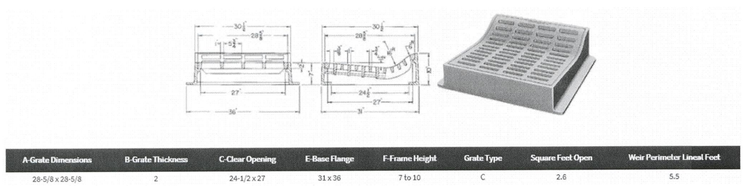
14 C9.3 ON-SITE SIDEWALK RAMP CASE II
(NOT TO SCALE)



15 C9.3 ONSITE SIDEWALK RAMP CASE III
(NOT TO SCALE)



16 C9.3 DM2 DROP INLET
(NOT TO SCALE)



A-Grate Dimensions	B-Grate Thickness	C-Clear Opening	E-Base Flange	F-Frame Height	Grate Type	Square Feet Open	Weir Perimeter Lineal Feet
28-5/8 x 28-5/8	2	24-1/2 x 27	31 x 36	7 to 10	C	2.6	5.5

17 C9.3 R-3501-R DROP INLET
(NOT TO SCALE)

CLV#:

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WWW.KIMLEY-HORN.COM

STATE OF NEVADA — ENGINEER — JODY WALKER BELSICK — 15167 — CIVIL — 12/9/20 — 10/13/2019

No.	REVISIONS	DATE	BY

KHA PROJECT 092935004
DATE 10/13/2019
SCALE AS SHOWN
DESIGNED BY MK
DRAWN BY MK
CHECKED BY JB

TYPICAL DETAILS SHEET

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS — NEVADA

47 OF 46 SHEETS
C9.3

Plotted By:Kintner, Mavi Sheet Set:Kha Layout:C9.3 October 13, 2019 02:25:32pm K:\LAV_Civil\092935004-Lennar Village 21 Parcel I\CAD\PlanSheets\092935004-DT.dwg
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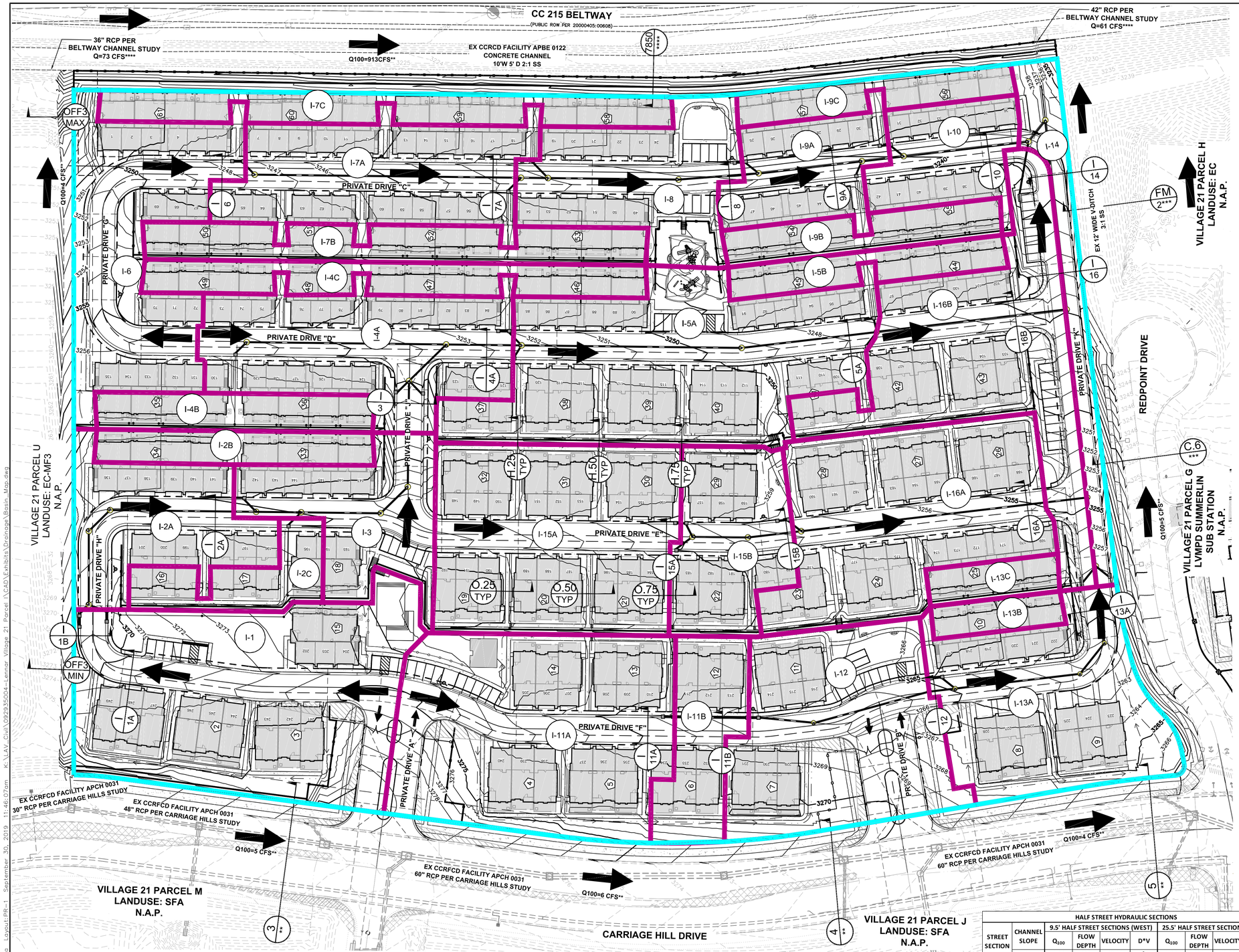

LEGEND

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100
SCALE 1" = 50'

- XXX — BASIN ID
- BASIN BOUNDARY
- PRORATED BASIN BOUNDARY
- FLOW ARROW
- X / XX — SECTION ID
- XX — BUILDING NUMBER

ULTIMATE CONDITION PRORATED FLOW SUMMARY

Ultimate Onsites			
SUBBASIN	Q_{100} (cfs)	AREA (ac)	CFS/ACRE
I*	61	18.69	3.26
Ultimate Onsite Prorated Basins			
SUBBASIN	Q_{100} (cfs)	AREA (ac)	CFS/ACRE
I-1	5	1.56	3.26
I-2A	2	0.56	3.26
I-2B	1	0.23	3.26
I-2C	1	0.25	3.26
I-3	1.5	0.53	3.26
I-4A	3	0.86	3.26
I-4B	1	0.26	3.26
I-4C	1	0.40	3.26
I-5A	5	1.41	3.26
I-5B	1	0.22	3.26
I-6	3	0.88	3.26
I-7A	2.5	0.78	3.26
I-7B	1.5	0.45	3.26
I-7C	1	0.42	3.26
I-8	2	0.65	3.26
I-9A	1	0.39	3.26
I-9B	1	0.25	3.26
I-9C	1	0.22	3.26
I-10	1	0.35	3.26
I-11A	4	1.34	3.26
I-11B	1	0.36	3.26
I-12	3	1.02	3.26
I-13A	3	0.93	3.26
I-13B	0	0.11	3.26
I-13C	0	0.12	3.26
I-14	1	0.26	3.26
I-15A	4	1.15	3.26
I-15B	1.5	0.51	3.26
I-16A	4	1.11	3.26
I-16B	4	1.11	3.26
TOTAL	61	18.69	NA

*Referenced from the Master Study

DROP INLET SUMMARY TABLE

DROP INLET ID	Q_{100} (cfs)	SLOPE (%)	FLOW DEPTH (ft)	Q_{INT} (cfs)	Q_{BYP} (cfs)	DI TYPE
I-1A	2.50	2.90	0.27	2.15	0.35	NEENAH R-3501-R
I-1B	0.35	2.90	0.13	0.35	0.00	NEENAH R-3501-R
I-2A	0.50	0.60	0.21	0.49	0.01	NEENAH R-3501-R
I-2A1	1.50	0.60	0.30	1.29	0.21	NEENAH R-3501-R
I-2A2	0.21	0.60	0.15	0.21	0.00	NEENAH R-3501-R
I-3	1.25	5.67	0.19	1.25	0.00	NEENAH R-3501-R
I-4A	0.50	1.33	0.18	0.50	0.00	NEENAH R-3501-R
I-4A1	2.50	1.33	0.32	2.08	0.42	NEENAH R-3501-R
I-4A2	0.42	1.33	0.17	0.42	0.00	NEENAH R-3501-R
I-5A	0.50	1.36	0.18	0.50	0.00	NEENAH R-3501-R
I-5A1	4.50	1.36	0.38	3.24	1.26	NEENAH R-3501-R
I-5A2	1.26	1.36	0.25	1.19	0.07	NEENAH R-3501-R
I-6A	2.50	1.90	0.30	2.15	0.35	NEENAH R-3501-R
I-6B	0.35	1.90	0.15	0.35	0.00	NEENAH R-3501-R
I-7A	0.50	1.63	0.17	0.50	0.00	NEENAH R-3501-R
I-7A1	2.50	1.63	0.31	2.12	0.38	NEENAH R-3501-R
I-7A2	0.38	1.63	0.15	0.38	0.00	NEENAH R-3501-R
I-8A	1.50	0.50	0.31	1.27	0.23	NEENAH R-3501-R
I-8B	0.23	0.50	0.16	0.23	0.00	NEENAH R-3501-R
I-9A	0.50	0.50	0.21	0.49	0.01	NEENAH R-3501-R
I-9A1	1.00	0.50	0.27	0.91	0.09	NEENAH R-3501-R
I-9A2	0.09	0.50	0.11	0.09	0.00	NEENAH R-3501-R
I-10 (SUMP)	1.50	N/A	0.20	1.50	0.00	5' TYPE DM2
I-11A1	3.50	1.78	0.34	2.77	0.73	NEENAH R-3501-R
I-11A2	0.73	1.78	0.19	0.73	0.00	NEENAH R-3501-R
I-11B1	1.00	1.78	0.22	0.98	0.02	NEENAH R-3501-R
I-11B2	0.02	1.78	0.05	0.02	0.00	NEENAH R-3501-R
I-12A	3.00	1.92	0.32	2.48	0.52	NEENAH R-3501-R
I-12B	0.52	1.92	0.17	0.52	0.00	NEENAH R-3501-R
I-13A N	3.00	3.90	0.25	2.94	0.06	10' TYPE DM2
I-13A S	0.50	3.90	0.15	0.50	0.00	5' TYPE DM2
I-15A	0.50	1.89	0.17	0.50	0.00	NEENAH R-3501-R
I-15A1	3.50	1.89	0.33	2.79	0.71	NEENAH R-3501-R
I-15A2	0.71	1.89	0.19	0.71	0.00	NEENAH R-3501-R
I-15B1	1.00	1.13	0.24	0.96	0.04	NEENAH R-3501-R
I-15B2	0.04	1.13	0.07	0.04	0.00	NEENAH R-3501-R
I-16 (SUMP)	9	N/A	0.47	9.00	0.00	7.5' TYPE DM2

STREET HYDRAULIC SECTIONS
35' STREET SECTIONS

STREET SECTION	CHANNEL SLOPE %	Q_{100} (cfs)	FLOW DEPTH (ft)	VELOCITY (ft/s)	D*V ft^2/s
I-1B	2.90	5.0	0.26	3.18	0.83
I-3	5.67	2.5	0.20	3.63	0.73
I-13A N	3.90	3.0	0.30	3.79	1.14
I-13A S	3.90	0.5	0.16	3.52	0.56
I-14	1.00	1.0	0.27	1.76	0.48
I-16	4.90	8.5	0.38	5.23	1.99

SWALE SECTIONS

SECTION	SLOPE (%)	Q_{100} (cfs)	FLOW DEPTH (ft)	TOTAL DEPTH (ft)	VELOCITY (ft/s)	TYPE	SIDE SLOPES		Req'd d_{50} (in)
OFF3 (MIN)	3.37	4*****	0.41	1	3.37	V	10:1	3:1	N/A
OFF3 (MAX)	25.00	4*****	0.34	1	5.17	V	10:1	3:1	24"
H.25 West	1.00	0.25	0.11	0.68	1.05	-	5%	5%	N/A
H.50 West	1.00	0.50	0.13	0.68	1.25	-	5%	5%	N/A
H.75 West	1.00	0.75	0.17	0.68	1.19	-	5%	5%	N/A
H.25 East	1.00	0.25	0.11	0.69	1.06	-	6%	6%	N/A
H.50 East	1.00	0.50	0.14	0.69	1.31	-	6%	6%	N/A
H.75 East	1.00	0.75	0.18	0.69	1.20	-	6%	6%	N/A
O.25	1.00	0.25	0.11	0.84	0.86	-	5%	5%	N/A
O.50	1.00	0.50	0.14	0.84	1.03	-	5%	5%	N/A
O.75	1.00	0.75	0.16	0.84	1.15	-	5%	5%	N/A

*****Referenced from the Parcel U Stockpile Study

REFERENCED HYDRAULIC SECTIONS

SECTION NAME	CHANNEL SLOPE %	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V
7850****	0.6	852	3.38	15.05	50.84
C.6***	3.3	5	0.29	3.55	1.03
FM2 MAX***	1.00	5	0.75	2.98	2.24
FM2 MIN***	0.88	5	0.77	2.84	2.19
3**	1.65	5	0.32	2.66	0.85
4**	1.65	6	0.33	2.77	0.91
5**	1.66	4	0.30	2.55	0.77

** Referenced from the Carriage Hill Study
*** Referenced from the Redpoint Study
****Referenced from the Beltway Study

HALF STREET HYDRAULIC SECTIONS

STREET SECTION	CHANNEL SLOPE	9.5' HALF STREET SECTIONS (WEST)				25.5' HALF STREET SECTIONS (EAST)			
		Q_{100}	FLOW DEPTH	VELOCITY	D*V	Q_{100}	FLOW DEPTH	VELOCITY	D*V
	%	(cfs)	(ft)	(ft/s)	ft^2/s	(cfs)	(ft)	(ft/s)	ft^2/s
I-1A	1.90	0.5	0.18	1.68	0.30	-	-	-	-
I-2	0.60	0.5	0.20	1.03	0.21	1.5	0.31	1.79	0.55
I-4A	1.33	0.5	0.18	1.44	0.26	4.0	0.37	3.06	1.13
I-5A	1.36	0.5	0.18	1.46	0.26	4.5	0.38	3.17	1.20
I-6	1.90	0.5	0.18	1.68	0.30	2.5	0.30	3.15	0.95
I-7A	1.63	0.5	0.18	1.57	0.28	2.5	0.31	2.96	0.92
I-8	0.50	0.5	0.20	0.98	0.20	1.5	0.31	1.68	0.52
I-9A	0.50	0.5	0.20	0.98	0.20	1.0	0.28	1.53	0.43
I-10	0.50	0.5	0.20	0.98	0.20	0.5	0.22	1.32	0.29
I-11A	1.78	0.5	0.18	1.63	0.29	3.5	0.34	3.33	1.13
I-11B	1.78	0.5	0.18	1.63	0.29	1.0	0.22	2.52	0.55
I-12	1.92	0.5	0.18	1.68	0.30	3.0	0.32	3.29	1.05
I-15A	1.89	0.5	0.18	1.67	0.30	3.5	0.33	3.40	1.12
I-15B	1.13	0.5	0.19	1.34	0.25	1.0	0.24	2.11	0.51
I-16A	1.13	0.5	0.19	1.34	0.25	4.0	0.38	2.88	1.09
I-16B	1.36	0.5	0.18	1.46	0.26	3.5	0.35	3.00	1.05

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No.	REVISIONS	DATE	BY

KHA PROJECT 092935004
DATE 09/30/19
SCALE AS SHOWN
DESIGNED BY AD
DRAWN BY AD
CHECKED BY RRD

ULTIMATE CONDITION BASIN MAP

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

ULT-1

Plotted By:Donovon_Autumlyn Sheet Set:Kha Layout:PR-1 September 30, 2019 11:46:07am K:\LAV_Civil\092935004_Lennar Village 21 Parcel I\CAD\Exhibits\Drainage\Basin_Map.dwg

CC 215 BELTWAY
(PUBLIC ROW PER 20000405:00608)

EX CCRCD FACILITY APBE 0122
CONCRETE CHANNEL
10'W 5' D 2:1 SS Q_{100}= 913 CFS

EXISTING 36" RCP
Q100=73 CFS

EXISTING 42" RCP
Q100=61 CFS

PROP. 42" RCP
Q100=61 CFS

EX 12' WIDE V-DITCH
3:1 SIDE SLOPES

PROP. 24" RCP
Q100=37.5 CFS

PRIVATE DRIVE "C"

PRIVATE DRIVE "G"

PRIVATE DRIVE "D"

PRIVATE DRIVE "J"

PRIVATE DRIVE "K"

REDPOINT DRIVE

PRIVATE DRIVE "E"

PRIVATE DRIVE "H"

PRIVATE DRIVE "F"

PRIVATE DRIVE "A"

PRIVATE DRIVE "B"

PROP. 18" RCP
Q100=16 CFS

PROP. TYPE DM2

EX CCRFCD FACILITY APCH 0031
30" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
48" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
60" RCP PER CARRIAGE HILLS STUDY

EX CCRFCD FACILITY APCH 0031
60" RCP PER CARRIAGE HILLS STUDY

NORTH

GRAPHIC SCALE IN FEET
0 25 50 100
SCALE 1" = 50'

LEGEND

- STORM DRAIN MAINLINE
- STORM DRAIN LATERAL DRIVE C
- STORM DRAIN LATERAL DRIVE D
- STORM DRAIN LATERAL DRIVE E
- STORM DRAIN LATERAL DRIVE F TO DRIVE K
- PVC STORM DRAIN
- EXISTING STORM DRAIN
- FLOW ARROW
- BUILDING NUMBER

No.	REVISIONS	DATE	BY

Kimley»Horn
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KHA PROJECT 092935004
DATE 09/30/19
SCALE AS SHOWN
DESIGNED BY AD
DRAWN BY AD
CHECKED BY RRD

FACILITY MAP

HIGHLINE
VILLAGE 21 - PARCEL I
PREPARED FOR
LENNAR HOMES
CITY OF LAS VEGAS NEVADA

FAC-1

Plotted By:Donovan, Autumlyn Sheet Set:Kha Layout:FAC-1 September 30, 2019 11:49:08am K:\LAV_Civil\092935004 Lennar Village 21 Parcel I\CAD\Exhibits\Drainage\Facility_Map.dwg

NOTES

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

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

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

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

0 100 200 400 600 800

MAP LEGEND

PARCEL BOUNDARY
SUB BOUNDARY
PM/LD BOUNDARY
ROAD EASEMENT
MATCH / LEADER LINE
HISTORIC LOT LINE
HISTORIC SUB BOUNDARY
HISTORIC PM/LD BOUNDARY
SECTION LINE

CONDOMINIUM UNIT
AIR SPACE PCL
RIGHT OF WAY PCL
SUB-SURFACE PCL

001 ROAD PARCEL NUMBER
001 PARCEL NUMER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

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

BOOK T20S R59E

127	126	12512
136	137	13813
165	164	16316

Scale: 1" = 200'

SEC. 26

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Rev: 7/10/2019

MAP N 2 NW 4

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

137-26-1

CLARK COUNTY NEVADA

PT O
PT M
PT 137-23-410-002
CLOWDER SPRING WAY
KINDLE CORNER WAY
CARRIAGE HILL DR
DESERT FOOTHILLS DR
REDPOINT DR
112
SUMMERLIN VILLAGE 21 - UNIT 3
PB 159-50
110
SUMMERLIN VILLAGE 21 UNIT 1 -LARGE LOT FINAL MAP
PB 158-87
PT 137-26-212-003
PT 137-26-212-002
PT 137-26-212-005
PT 137-26-212-006
PT 137-23-410-001
COS-1
COS -2
PT B
PT C
PT G
PT H
PT 1
003 8.19
004 3.45
001 19.23
002 11.74
005 7.79
006 0.58
003 2.00

TAX DIST 200

NOTES TO USERS

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

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

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

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

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

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

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

Vertical Network Branch, N/CG13
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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

Base map information shown on this FIRM was provided in digital format by Clark County Regional Flood Control District. This information was converted using Orthophotography, dated 1999 or newer, and GBF/DIME data. Segments were digitized off of the orthophotography based on center of pavement.

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

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

An accompanying Flood Insurance Study report, Letters of Map Revision or Letters of Map Amendment revising portions of this panel, and digital versions of this PANEL may be available. Contact the **FEMA Map Service Center** at the following phone numbers and Internet address for infomation on all related products available from FEMA:

Phone: 800-358-9616
FAX: 800-358-9620
www.fema.gov/msc

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

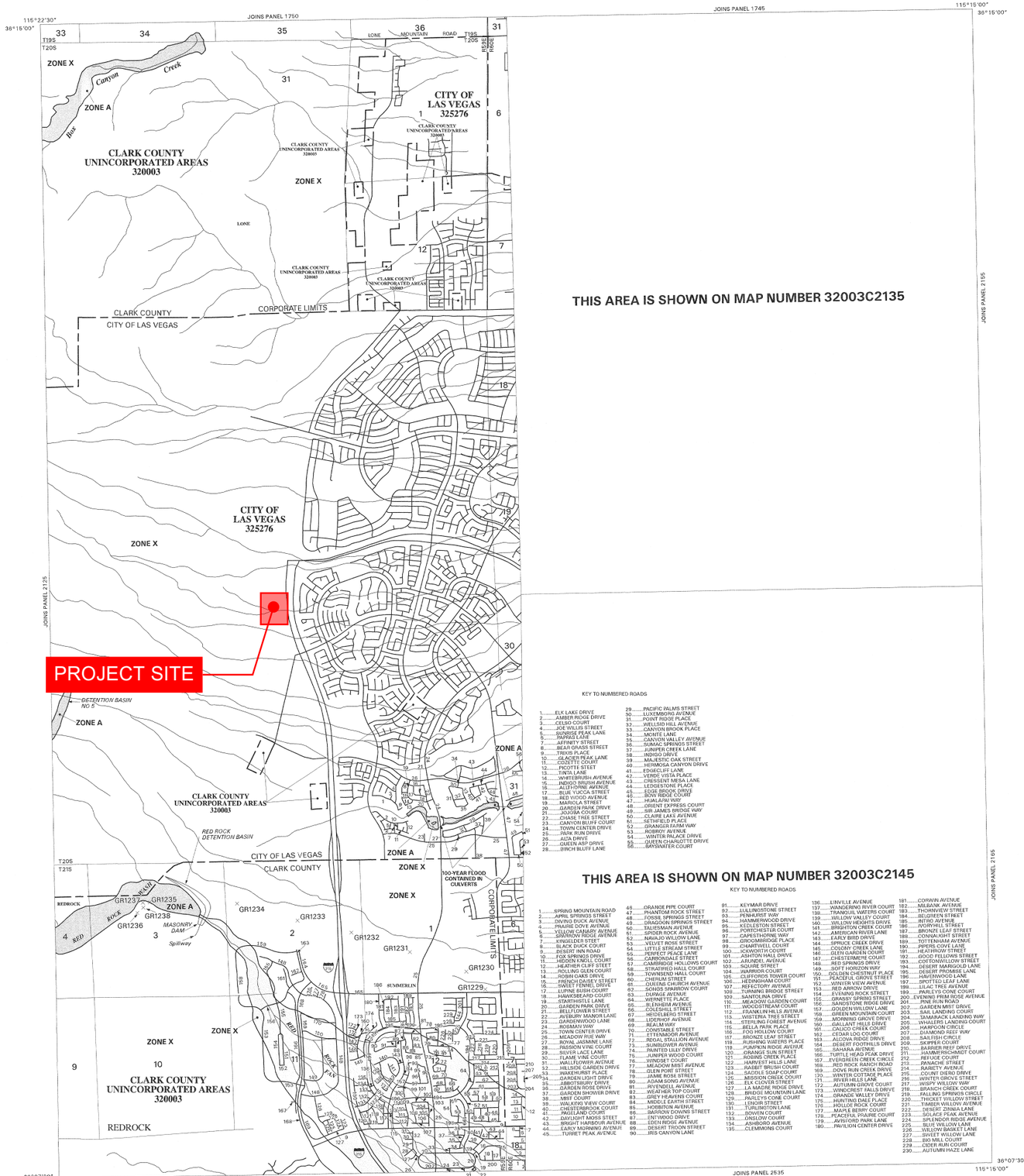
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result,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

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

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

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

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



KEY TO NUMBERED ROADS

1 ELK LAKE DRIVE
2 AMBER RIDGE DRIVE
3 CELSO COURT
4 JOE WILLIS STREET
5 SUNRISE PEAK LANE
6 PAPPAS LANE
7 AFFINITY STREET
8 BEAUTY BUSH STREET
9 IRIS PLACE
10 GLACIER PEAK LANE
11 COZETTE COURT
12 PICOTTE STEET
13 TINTIL LANE
14 WHITEBRUSH AVENUE
15 INDIGO BRUSH AVENUE
16 ALLITHORNE AVENUE
17 BLUE YUCCA STREET
18 RED WOOD AVENUE
19 MARIOLA STREET
20 GARDEN PARK DRIVE
21 BELLFLOWER STREET
22 CHANG TREE STREET
23 CANYON BLUFF COURT
24 TOWN CENTER DRIVE
25 PARK RUN DRIVE
26 AIZA DRIVE
27 QUEEN ASP DRIVE
28 BIRCH BLUFF LANE
29 PACIFIC PALMS STREET
30 LUXEMBORG AVENUE
31 POINT RIDGE PLACE
32 WELLSID HILL AVENUE
33 CANYON BROOK PLACE
34 MONTE LANE
35 CANYON VALLEY AVENUE
36 SUMAC SPRINGS STREET
37 JUNIPER CREEK LANE
38 INDIGO DRIVE
39 MAJESTIC OAK STREET
40 HERMOSA CANYON DRIVE
41 EDGECLIFF LANE
42 VERDE VISTA PLACE
43 CRESSENT MESA LANE
44 LEDGESTONE PLACE
45 TURRET PEAK AVENUE
46 ROSE RIDGE COURT
47 HUALAPAI WAY
48 ORIENT EXPRESS COURT
49 SIR JAMES BRIDGE WAY
50 CLAIRE LAKE AVENUE
51 SETHFIELD PLACE
52 GRANGER FARM WAY
53 ROBROY AVENUE
54 WINTER PALACE DRIVE
55 QUEEN CHARLOTTE DRIVE
56 BAYSWATER COURT
91 KEYMAR DRIVE
92 LILLINGSTONE STREET
93 PENHURST WAY
94 HAMMERWOOD DRIVE
95 KEDLESTON STREET
96 PORTCHESTER COURT
97 CAPESTHORNE WAY
98 GROOMBRIDGE PLACE
99 CHARTWELL COURT
100 ICKWORTH COURT
101 ASHTON HALL DRIVE
102 ARUNDEL AVENUE
103 SQUIRE STREET
104 WARRIOR COURT
105 CLIFFORDS MANOR COURT
106 HEDINGHAM COURT
107 ROSEMARY AVENUE
108 SPRING BRIDGE STREET
109 SANTOLINA DRIVE
110 MEADOW GARDEN COURT
111 WOODSTREAM COURT
112 FRANKLIN HILLS AVENUE
113 WISTERIA TREE STREET
114 STERLING FOREST AVENUE
115 BELLA PARK PLACE
116 FOG HOLLOW COURT
117 BRONZE LEAF STREET
118 RUNNING WATERS PLACE
119 PUMPKIN RIDGE AVENUE
120 ORANGE SUN STREET
121 ROBINS CREEK PLACE
122 HARVEST MOON LANE
123 RABBIT BRUSH COURT
124 SADDLE SOAP COURT
125 MISSION CREEK COURT
126 ELK CLOVER STREET
127 LA MADRE RIDGE DRIVE
128 BRIDGE MOUNTAIN LANE
129 PARLEYS CONE COURT
130 LEHOIR STREET
131 TURLINGTON LANE
132 BOWEN COURT
133 ONSLOW COURT
134 ASHBORO AVENUE
135 CLEMMONS COURT
136 LINVILLE AVENUE
137 WANDERING RIVER COURT
138 TRANQUIL WATERS COURT
139 WILLOW VALLEY COURT
140 WILLOW HEIGHTS DRIVE
141 BRIGHTON CREEK COURT
142 AMERICAN RIVER LANE
163 EARLY BIRD DRIVE
144 SPRUCE GROVE DRIVE
145 MISTY CREEK LANE
146 GLEN GARDEN COURT
147 CHESTERMERE COURT
148 RED SPRINGS DRIVE
149 SOFT HORIZON WAY
150 GOLDEN CHESTNUT PLACE
151 PEACEFUL GROVE STREET
152 WINTER VIEW AVENUE
153 RED ARROW DRIVE
154 EVENING ROCK STREET
155 GRASSY SPRING STREET
156 SANDSTONE RIDGE DRIVE
157 GOLDEN WILLOW LANE
158 GREEN MOUNTAIN COURT
159 MORNING MIST LANE
160 GALLO CREEK COURT
161 CEDAR LOG COURT
163 ALCOVA RIDGE DRIVE
164 DESERT FOOTHILLS DRIVE
165 SAHARA AVENUE
166 TURTLE HEAD PEAK DRIVE
167 EVERGREEN CREEK CIRCLE
168 RED ROCK RANCH ROAD
169 DOVE RUN CREEK DRIVE
170 WINTER COTTAGE PLACE
171 RIVER HILLS LANE
172 AUTUMN GROVE COURT
173 WINDCREST FALLS DRIVE
174 ORANDE VALLEY PLACE
176 HUNTINGDALE PLACE
177 MAPLE BERRY COURT
179 MAPLE BERRY COURT
178 PEACEFUL PRAIRIE COURT
179 AVISFORD PARK LANE
180 PAVILION CENTER DRIVE
181 CORWIN AVENUE
182 MILBANK AVENUE
183 THORNVIEW STREET
184 REGENTS STREET
185 ALLEN AVENUE
186 LARK WHEEL STREET
187 BRONZE LEAF STREET
188 CONNAUGHT STREET
189 TOTTENHAM AVENUE
190 PIPERS COVE LANE
191 HEATHROW STREET
192 GOOD FELLOWS STREET
193 COTTONWILLOW STREET
194 DESERT MARIGOLD LANE
195 DESERT PROMISE LANE
196 HAVERWOOD LANE
197 SPOTTED LEAF LANE
198 LILAC TREE POINT
199 PARLEYS CONE COURT
200 EVENING RIDGE AVENUE
205 PINE RUN ROAD
202 GARDEN MIST DRIVE
203 SAIL LANDING COURT
204 TAMARACK LANDING WAY
205 WHALERS LANDING COURT
208 HARPOON CIRCLE
207 DIAMOND REEF WAY
208 SAILFISH CIRCLE
209 SKIPPER COURT
210 BARRIER REEF DRIVE
211 HAMMERSCHMIDT COURT
212 REFUGE COURT
213 PINNACHE STREET
214 RARIETY AVENUE
215 COVE POINT DRIVE
216 WISTER DRIVE STREET
217 MISTY WILLOW WAY
218 BRANCH CREEK COURT
219 FALLING SPRINGS CIRCLE
220 THICKET WILLOW STREET
221 TIMBER WILLOW AVENUE
222 DESERT ZINNIA LANE
223 SOLACE PEAK AVENUE
224 SPLENDOR RIDGE AVENUE
225 BLUE WILLOW LANE
226 WILLOW BASKET LANE
227 SWEET WILLOW LANE
228 BIG MILL COURT
229 CIDER RUN COURT
230 AUTUMN HAZE LANE

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

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

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

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

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

ZONE A99 Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

*Referenced to the North American Vertical Datum of 1988

A — A Cross Section Line
23 — 23 Transect Line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4276 mN Universal Transverse Mercator grid values, zone 11
600000 FT State Plane grid ticks
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
AUGUST 16, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 27, 2002: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to delete special flood hazard areas, to change zone designations, to add roads and road names, to incorporate previously issued letters of map revision, to incorporate previously issued letters of map amendment, and to change floodway.

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

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

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2150 E

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

PANEL 2150 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAS VEGAS, CITY OF	325276	2150	E
CLARK COUNTY, UNINCORPORATED AREAS	320003	2150	E

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

MAP NUMBER 32003C2150 E

MAP REVISED: SEPTEMBER 27, 2002

Federal Emergency Management Agency

REGIONAL FLOOD CONTROL DISTRICT

2018
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-22
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

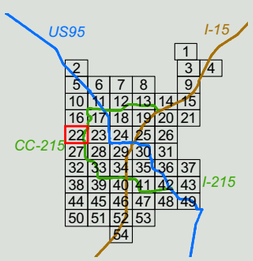
Category A	Category B
Channel	Channel
Stormdrain	Stormdrain
Crossing	Crossing

N

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

Scale: 1 inch = 2,000 feet

AerialSource:Esri World Imagery 2017



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Louis Berger

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APAD		**ANGEL PARK - ALTA DRIVE BRANCH**						
0203	E	2: 7' X 5.5' RCB	1104	2200	CSWAA-1	GOW3A	6.95	5.28
0225	E	2: 7' X 5.5' RCB OUTLET	360	2137	SUM5DB	GOW3A	6.73	3.40
APBE		**ANGEL PARK - BELTWAY BRANCH**						
0022	E	CONC CHNL 20'W 7'D 2:1 SS	1556	3366	CCSWFH15	GOW3A	3.39	1.81
0051	E	CONC CHNL 20'W 7'D 2:1 SS	1583	3366	CCSWFH15	GOW3A	3.39	2.77
0081	E	8' X 8' RCBC @ FAR HILLS	777	1048	CSWFH-15	GOW3A	0.59	2.32
0094	E	CONC CHNL 10'W 5'D 2:1 SS	1465	1048	CSWFH-15	GOW3A	0.59	1.88
0122	E	CONC CHNL 10'W 4'D 2:1 SS	1685	1048	CSWFH-15	GOW3A	0.59	0.80
0154	P0	8' X 6' RCB	5012	781	CSWFH-12	GOW3A	0.41	1.30
0249	P0	6' X 5' RCB	2858	606	CSWFH-11	GOW3A	0.31	3.00
APCH		**ANGEL PARK - CARRIAGE HILL BRANCH**						
0000	E	8' X 6' RCB	152	399	CSWFH-14	GOW3A	0.21	0.87
0003	P0	72" RCP	1685	399	CSWFH-14	GOW3A	0.21	2.00
0031	P0	60" RCP	2008	206	SWFH-13	GOW3A	0.10	1.38
APD2		**ANGEL PARK - DESERT FOOTHILLS 2 BRANCH**						
0002	E	7' X 6' RCB	883	674	SWAA-2	GOW3A	0.68	1.08
APDF		**ANGEL PARK - DESERT FOOTHILLS BRANCH**						
0000	P0	10' X 6' RCB	1788	1428	CSWFH-9	GOW3B	0.80	3.55
0026	P0	8' X 6' RCB	1813	968	CSWFH-8	GOW3A	1.80	2.00
0073	P0	6' X 4' RCB	1922	486	CSWFH-4	GOW3A	1.52	4.40
0123	P0	42" RCP	1076	141	GPDB	GOW3A	1.29	6.00
0125	P0	130 AC-FT GRAND PARK DETENTION BASIN		1543	CSWFH-3	GOW3A	1.29	
0127	P0	6' X 6' RCB	2977	853	SWFH-1	GOW3A	0.69	3.80
0128	P0	5' X 4' RCB	2197	509	SWFH-2	GOW3A	0.37	5.70
APFH		**ANGEL PARK - FAR HILLS BRANCH**						
0000	E	2: 8' X 8' RCB	1070	2494	CCSWFH14	GOW3B	1.51	3.50
0019	E	2: 8' X 8' RCB	250	2149	CCSWFH-9	GOW3B	1.30	4.19
0024	E	16' X 8' RCAP	1951	2149	CCSWFH-9	GOW3B	1.30	5.10
0061	E	8' X 6' RCB	1435	839	CSWFH-7	GOW3A	0.50	2.00
0089	E	8' X 6' RCB	2946	839	CSWFH-7	GOW3A	0.50	2.00
0144	P0	5' X 4' RCB	2497	456	SWFH-6	GOW3A	0.28	5.50
APM5		**DETENTION BASIN #5**						
0000	E	384 AC-FT DETENTION BASIN #5		6856	SUM5IN	GOW3A	6.73	
0008	P0	CONC CHNL 50'W 4.5'D 2:1 SS	2102	3634	CCDB54-7	GOW3A	4.13	5.20
0009	P0	CONC CHNL 50'W 4'D 2:1 SS	4180	3495	CDB55-7	GOW3A	2.60	5.80
0047	E	DIVERSION BERM WITH GABION BANK PROTECTION	1000	3634	CCDB54-7	GOW3A	4.13	1.30
0056	P0	CONC CHNL 80'W 4'D 2:1 SS	264	3634	CCDB54-7	GOW3A	4.13	1.30
0057	P0	CONC CHNL 50'W 3'D 2:1 SS	9922	1664	CDB54-4	GOW3A	0.81	6.80
0059	P0	CONC CHNL 100'W 3'D 2:1 SS	9075	2606	CDB54-7	GOW3A	3.31	7.00
0212	P0	CONC CHNL 30'W 3'D 2:1 SS	6695	1092	DB55-1	GOW3A	0.64	7.50
0213	P0	CONC CHNL 50'W 3'D 2:1 SS	6522	1729	CDB55-5	GOW3A	1.30	7.30
APSP		**ANGEL PARK - SUMMERLIN PARKWAY**						
0183	E	CONC CHNL 10'W 6'D 2:1 SS	1680	884	C11B-1	GOW3A	0.84	1.70
GOB3		**GOWAN LONE MOUNTAIN SYST. 3 BELTWAY**						
0000	E	66" RCP	1370	341	SV22-1	GOW3A	0.18	4.50
GOBE		**GOWAN LONE MOUNTAIN SYST. BELTWAY**						
0000	E	20' X 10' RCBC @ ACCESS RD	30	1044	CSV22	GOW3A	0.67	5.67
0001	E	CONC CHNL 20'W 5'D 2:1 SS	1100	1044	CSV22	GOW3A	0.67	6.50
0021	E	CONC CHNL 11'W 6.8'D 0:1 SS	2143	1044	CSV22	GOW3A	0.67	6.50
0058	E	CONC CHNL 15'W 7.5'D 0:1 SS	487	1044	CSV22	GOW3A	0.67	3.93
0065	E	CONC CHNL 17'W 7.5'D 0:1 SS	844	1044	CSV22	GOW3A	0.67	0.76
0088	E	2: 10' X 9' RCBC @ LAKE MEAD	400	782	SV22-2	GOW3A	0.49	0.50
0096	E	CONC CHNL 20'W 9'D 2:1 SS	627	782	SV22-2	GOW3A	0.49	0.50
0108	E	CONC CHNL 20'W 6'D 2:1 SS	1021	782	SV22-2	GOW3A	0.49	0.50
0127	E	CONC CHNL 20'W 6'D 2:1 SS	638	782	SV22-2	GOW3A	0.49	0.50
0139	E	CONC CHNL 10'W 5.5'D 2:1 SS	1500	782	SV22-2	GOW3A	0.49	1.02
GOL3		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3**						
0010	E	CONC CHNL 20'W 10'D 0:1 SS	3037	3277	CRCLMT1R	GOW3A	7.31	2.78
0068	E	TRANSITION STRUCTURE	100	3277	CRCLMT1R	GOW3A	7.31	3.50
0070	E	20' X 6' RCBC @ CLIFF SHADOWS	350	1271	CRCSV22	GOW3A	4.99	2.44
0077	E	CONC CHNL 20'W 6'D 0:1 SS	1229	1271	CRCSV22	GOW3A	4.99	6.11

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOL3		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3**						
0100	E	CONC CHNL 20'W 10'D 0:1 SS	200	1271	CRCSV22	GOW3A	4.99	5.67
0115	E	96" RCP OUTLET	670	666	DET26	GOW3A	4.31	0.29
0128	E	305 AC-FT VILLAGE 26 DETENTION BASIN		3615	VIL26IN	GOW3A	4.31	
0137	E	CONC CHNL 20'W 7.5'D 0:1 SS	2720	3615	VIL26IN	GOW3A	4.31	6.50
0188	E	CONC CHNL 20'W 8'D 0:1 SS	563	3615	VIL26IN	GOW3A	4.31	3.91
0197	E	14' X 14' RCB	890	3615	VIL26IN	GOW3A	4.31	0.88
0214	E	Dual 10' X 14' RCB	124	3615	VIL26IN	GOW3A	4.31	0.57
0216	P0	CONC CHNL 50'W 4'D 2:1 SS	4060	3524	CSV26-1	GOW3A	4.02	6.08
0289	P0	CONC CHNL 50'W 3.5'D 2:1 SS	6215	2281	30	GOW3A	2.44	7.95
0290	E	NATURAL WASH 363'W	4850	1410	SV26-1	GOW3A	1.59	22.50
0370	E	NATURAL WASH 450'W	7000	2281	30	GOW3A	2.44	8.50
GOL4		**GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4**						
0000	E	14' X 8' RCB	554	2243	CLMT1R	GOW3A	2.33	2.50
0010	E	2: 9' X 8' RCB	820	2243	CLMT1R	GOW3A	2.33	4.74
0025	E	SOIL CEMENT CHNL 60'W 8'D 3-4:1 SS	320	2243	CLMT1R	GOW3A	2.33	2.00
0026	E	SOIL CEMENT CHNL 42'W 6'D 3-4:1 SS	700	2243	CLMT1R	GOW3A	2.33	1.00

*The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.
**As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.
^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e. HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).

REGIONAL FLOOD CONTROL DISTRICT

2018 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F-22

LEGEND

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	CMAP	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

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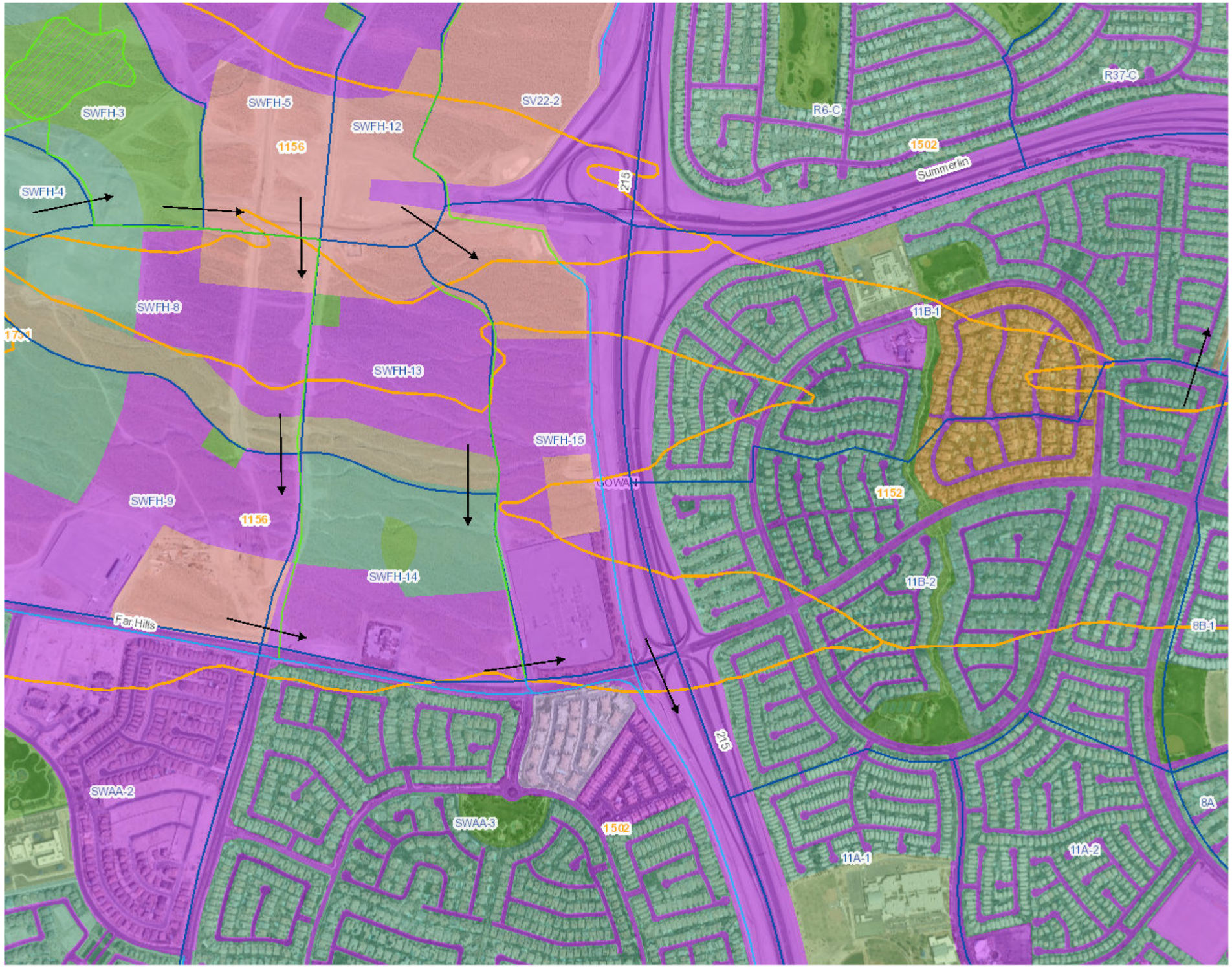
Louis Berger

Village 21 - Parcel I



Legend

- Flow Arrows
- NodeID flow(cfs) — Concentration Points
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Ultimate Development Boundary
- Watershed
- BasinID — Subbasins
- MUSYM — 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
- SFHA Zone AE
- SFHA Zone A
- SFHA Zone AO
- Zone X (Shaded)

1 inch = 833 feet

N

0 415 830 1,660 Feet

REGIONAL FLOOD CONTROL DISTRICT