

DS #: 4023

APN: 137-34-111-003

PROJECT: Summerlin V23B Phase 1 V(Carpis + rano)

SUBMITTAL: 1st

SCANNED BY/DATE: _____

CHECKED BY/DATE: _____





CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		September 12, 2013
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	COPIES TO:
	Summerlin V23B Parcel V (Capistrano)	VTN Nevada
Cross Streets:	NEQ of Sky Vista Drive & Alta Drive	Ryland Homes Nevada, LLC
File Number:	F:\Depot\DSMemos\DS4623A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-34-111-003	CCRFCD
Zoning Action:	TMP-50117	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES	NO X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	8/29/2013	9/12/2013	See Comments Below	\$400.00	331565: \$400
			TOTAL FEES (LDDRS):	\$400.00	----

REMARKS:

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

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

1. 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.
2. The existing contour lines on the grading plans have no label for elevations at all. The reviewer cannot determine the vertical difference in general between the existing grades and the proposed finished elevations. Provide existing contour elevations in the next submittal.
3. Comparing Page 7 of the study, **Table 2 (Street Flow Calculations Summary)** and a table in **Figure 5B**: The numbers in the two tables for *Hydraulic Section FM-1 (10-year and 100-year)* are not the same. Explain the discrepancies in the next submittal.
4. The Study stated that the property to the north of the subject development is going to be developed concurrently. However, the *City Flood Control* hasn't received a drainage study for that property concurrently with the subject drainage study. Therefore, the subject study and grading plans must address the impact of offsite drainage from the north in the interim condition. Provide offsite swale along the north boundary for flood protection in the next submittal. Revise all pertinent plans accordingly.
5. Obtain a notarized letter of permission from the adjacent property owner to the north for the offsite grading and swale prior to the final approval of the subject drainage study.

6. **Sheet GR1 & Sheet GR3:**

It appears that the finish floor elevations of the houses along *Sky Vista Drive* are lower than the adjacent street grades. The perimeter wall along *Sky Vista* must be a flood wall for protection. Revise **Details A/D1, B/D1 and C/D1** to indicate that the bottom three courses of the wall must be 8"-CMU and to be solid grouted.

7. **Sheet GR2 & Sheet GR4:**

Label the existing storm drain system and identify all the associated facilities such as drop inlets, laterals and manholes with *City of Las Vegas* recorded drawing number on the plans.

8. **Sheet GR3:**

- Lots 5, 6 and 9, 10 locate at the end of Tee-intersection of various streets. The velocity head from the incoming street will transform to hydraulic head before it can make a 90 degree turn, ie, impacting the downstream lots in a negative way. The finish floor elevation of Lots 5, 6 and 9, 10 must take into consideration of the additional hydraulic head from the incoming streets. Provide hydraulic calculations and address in the next submittal.
- Address in a worst case scenario that all drop inlets are completely clogged, are all the proposed finish floor elevations of the houses in the vicinity of the drop inlets still above the 100-year water surface in the streets?
- Revise all proposed drop inlets to modified Type CM inlets.

9. **Sheet GR4:**

- Two proposed storm drain inlets in *Port Reggio Street* are longer than 20' in length. Our experience is that a single more than 20'-long inlet is not hydraulically as efficient as two equivalent length inlets separated at a distance. Review and revise in the next submittal.
- Clearly identify, delineate and size of a public drainage easement (privately maintained by the HOA) between Lot 1 and Lot 48 on the grading plan. This easement must be granted as a "Common Lot" either in a Final Map or by separate document.

10. **Sheet DT1:**

- **Detail Sections H, I, J and K:** The bottom three courses of the wall adjacent to the street must be 8"-CMU and to be solid grouted.

11. Provide a note on the grading plans: "All onsite storm drains and the associated storm facilities are privately owned and to be privately maintained by the HOA".
12. Private streets must be public drainage easements. Provide a note on the grading plans "Note: All private streets are P.U.E., Public Drainage Easement and Public Sewer Easements to be privately maintained by HOA."
13. 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.
14. 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.
15. 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*).

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/34

AREA K-34

*** FAX TX REPORT ***

TRANSMISSION OK

JOB NO. 2237
 DESTINATION ADDRESS 3622597
 PSWD/SUBADDRESS
 DESTINATION ID
 ST. TIME 09/12 11:33
 USAGE T 01' 42
 PGS. 3
 RESULT OK

CITY OF LAS VEGAS		DATE:
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TECHNICAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 23B PARCEL V
CITY OF LAS VEGAS, NEVADA
W.O. #7534

Prepared for:

RYLAND HOMES

Submitted to:

**CITY OF LAS VEGAS
DEPT. OF PUBLIC WORKS**



HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: SUMMERLIN VILLAGE 23B PARCEL V (CAPISTRANO) Date: Aug 28, 2013
Location of Development: a) Descriptive (Cross Streets) North/South: FOX HILL DRIVE
East/West: ALTA DRIVE
b) Section: 34 Township: 20S Range: 59E
c) APN : 137-34-111-003

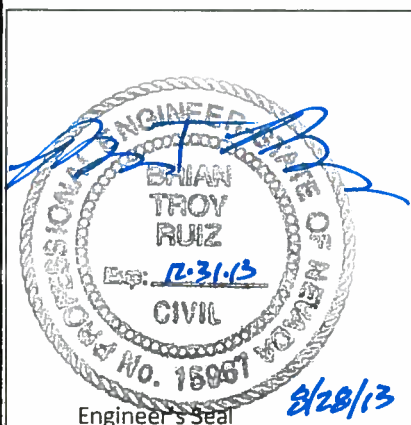
Name of Owner: RYLAND HOMES NEVADA LLC
Telephone No.: 702-360-7500 Fax No.: 702-360-7560 E-Mail Address: _____
Address: 8925 W RUSSELL ROAD STE 200 LAS VEGAS, NV 89148

Contact Person-Name: BRIAN RUIZ, P.E. Telephone No.: 873-7550
* E-Mail Address: brianr@vtnnv.com Fax No.: 362-2597
Firm: VTN
Address: 2727 S. Rainbow Blvd, LV, NV, 89146

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 25.38 ac Being Developed/Disturbed: 25.38 ac
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No
4. Proposed type of development (Residential, Commercial, Etc.): RESIDENTIAL
5. Approximate upstream land area which drains to the subject site: N/A
6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: TDS FOR SUMMERLIN 23B BY GC WALLACE
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: FOX HILL DRIVE (STORM DRAIN)
8. Briefly describe your proposed schedule for the subject project: ASAP



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

*New Required Field

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

	Revision	Date
Local Entity File No. _____		

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL																	
DRAINAGE SUBMITTAL CHECKLIST																	
Project Name: SUMMERLIN VILLAGE 23B PARCEL V (CAPISTRANO)	Map ID:																
Firm Name: VTN Nevada	Engineer: BRIAN RUIZ, P.E.																
Address: 2727 SOUTH RAINBOW BOULEVARD																	
City: LAS VEGAS	State: NEVADA	Zip: 89146															
Phone Number: (702) 873-7550	Fax Number: (702) 362-2597																
Property Owner: RYLAND HOMES NEVADA LLC																	
Address: 8925 W RUSSELL ROAD STE 200																	
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 <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> <th></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><u> X </u></td> <td style="text-align: center;"><u> </u></td> <td>Design Manual Standard Form 1 with the engineer's seal and signature.</td> </tr> <tr> <td style="text-align: center;"><u> X </u></td> <td style="text-align: center;"><u> </u></td> <td>Design Manual Standard Form 4.</td> </tr> <tr> <td style="text-align: center;"><u> X </u></td> <td style="text-align: center;"><u> </u></td> <td>2 copies of the 24" x 36" Drainage Plan.</td> </tr> <tr> <td style="text-align: center;"><u> </u></td> <td style="text-align: center;"><u> N/A </u></td> <td>A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge</td> </tr> </tbody> </table>			Yes	No		<u> X </u>	<u> </u>	Design Manual Standard Form 1 with the engineer's seal and signature.	<u> X </u>	<u> </u>	Design Manual Standard Form 4 .	<u> X </u>	<u> </u>	2 copies of the 24" x 36" Drainage Plan.	<u> </u>	<u> N/A </u>	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge
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<u> </u>	<u> N/A </u>	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge															
REFERENCE:		STANDARD FORM 2															

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS

Yes No

- | | | |
|--------------|---------------|--|
| <u> X </u> | <u> </u> | A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. |
| <u> X </u> | <u> </u> | A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated. |
| <u> X </u> | <u> </u> | Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs. |
| <u> X </u> | <u> </u> | On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs. |
| <u> X </u> | <u> </u> | Vicinity Map with local and major cross streets identified and a north arrow. |

III. DRAINAGE PLAN

Yes No

- | | | |
|--------------|---------------|---|
| <u> X </u> | <u> </u> | Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada. |
| <u> X </u> | <u> </u> | Minimum scale: 1" = 60'. |
| <u> X </u> | <u> </u> | Project Name. |
| <u> X </u> | <u> </u> | Vicinity Map with local and major cross streets. |
| <u> X </u> | <u> </u> | Revision box. |
| <u> X </u> | <u> </u> | North arrow and bar scale. |
| <u> X </u> | <u> </u> | Engineer's/consultant's address and phone number. |
| <u> X </u> | <u> </u> | Elevation datum and benchmark. |
| <u> X </u> | <u> </u> | Legend for symbols and abbreviations. |
| <u> X </u> | <u> </u> | Cut/fill scarps, where applicable. |
| <u> X </u> | <u> </u> | Street names, grades, widths. |
| <u> X </u> | <u> </u> | 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. |

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

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

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
<u>N/A</u>	☐	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
<u>X</u>	☐	Building and/or lot numbers.
<u>X</u>	☐	Alignment of all existing, proposed, or future Regional facilities adjacent to the site.
<u>X</u>	☐	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.
<u>N/A</u>	☐	For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
<u>N/A</u>	☐	Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows.
<u>X</u>	☐	Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

IV. HYDROLOGIC ANALYSIS

Yes	No	
<u>X</u>	☐	Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
<u>X</u>	☐	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.
<u>X</u>	☐	Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
<u>X</u>	☐	Use of correct precipitation values in and around the McCarran Airport rainfall area.
<u>X</u>	☐	A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
<u>X</u>	☐	A summary table of stormwater flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.
<u>X</u>	☐	Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
<u>X</u>	☐	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes No

<u>N/A</u>	_____	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
<u>X</u>	_____	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$, $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
<u>X</u>	_____	A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
<u>N/A</u>	_____	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged).
<u>N/A</u>	_____	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
<u>X</u>	_____	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, which ever is greater.
<u>N/A</u>	_____	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
<u>X</u>	_____	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
<u>X</u>	_____	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
<u>X</u>	_____	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.

REFERENCE:

STANDARD FORM 2

August 28, 2013
W.O. #7534

City of Las Vegas
Department of Public Works
333 N. Rancho drive
Las Vegas, Nevada 89106

**SUBJECT: TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE
23B PARCEL V**

Transmitted herewith for your review are two (2) copies of the *Technical Drainage Study for Summerlin Village 23B Parcel V*. The 25± acre development is located within Sections 33, Township 21 South, Range 60 East, M.D.M., Clark County, Nevada. Specifically the site is located north of Alta Drive, south of Far Hills Avenue, and is bounded to the west by Sky Vista Drive and the east by Fox Hill Drive.

If there are any questions concerning this study or additional information that is needed, please contact this office.

Respectfully Submitted,

VTN Nevada



Brian T. Ruiz, P.E.
Principal

I. INTRODUCTION

A. STUDY OVERVIEW AND PURPOSE

This technical drainage study will address the existing, interim, and developed drainage conditions for the +/- 25 acre Summerlin Village 23 B Parcel V (Parcel V) residential development. The site was evaluated in the Conceptual Drainage Study for Summerlin Village 23B and subsequent Updates and Technical Drainage Studies for Summerlin Village 23B by G.C. Wallace. This report references the analysis completed in those studies for offsite existing and developed conditions.

B. LOCATION

The Parcel V site is located within a portion of Section 33, Township 21 South, Range 60 East, M.D.M, Clark County, Nevada. Specifically the site is located north of Alta Drive, south of Far Hills Avenue, and is bounded to the west by Sky Vista Drive and the east by Fox Hill Drive (*Refer to Figure 1: Vicinity Map*).

C. DESCRIPTION

The site is currently undeveloped and consists of arid rangeland with desert shrub vegetative cover in poor hydrologic condition and slopes to the southeast at an average slope of 5 %. There is an existing berm within the site that may have served as a drainage facility in the past. The development of the Summerlin Village 23B drainage infrastructure and upstream CCRFCD Master Plan Update facilities have replaced the facility and rendered it unnecessary (*Refer to Figure 2, Site Description Map*).

D. FLOODPLAIN INFORMATION

According to the Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM) Community Panel Number 32003C2150, Clark County, Nevada and Incorporated Areas, revised September 27, 2002, the site is located within a Zone "X". A Zone "X" is described as an area determined to be outside of the 500-year floodplain (*refer to Figure 3: Flood Insurance Rate Map*).

E. MASTER PLANNING INFORMATION

The Capistrano development is delineated on Figures H-24 and F-24, which are referenced from the CCRFCD 2008 *Master Plan Update* and included in the Appendix. The site lies within a portion of the Master Plan Update Drainage

Basin SWAA-2 and is adjacent to the existing Regional Facility APAD0146, which is a 10' x 8' reinforced concrete box (RCB).

F. REFERENCE MATERIAL

The approved drainage studies utilized in the preparation of this study include:

- *Update #2 to the Technical Drainage Study for Summerlin Village 23B Fox Hill Drive Improvements Alta to Antelope Ridge Drive (Interior Road Improvements)*, dated November, 2012 by G.C. Wallace (CLV# DS3420E).

This study provides the technical analysis and design for the storm drain system within Fox Hill Drive and was referenced to show the established drainage patterns and the required discharge into the storm drain on Fox Hill Drive.

- *Update to the Conceptual Drainage Study for Summerlin Village 23B* dated July, 2012 by G.C. Wallace (CLV# DS4050D).

This study provides the technical analysis for the offsite drainage basin impacting the site and the routing patterns for offsite flows. According to this study Sky Vista Drive has been sufficiently graded to provide the routing patterns established in the ultimate conditions for the Summerlin Village 23B community.

- *Update #2 to the Conceptual Drainage Study for Summerlin Village 23B* dated January, 2013 by G.C. Wallace.

This study provides the technical analysis for the offsite drainage basin impacting the site and the routing patterns for offsite flows. According to this study the storm drain in Sky Vista Drive was reduced to a 54-inch RCP due to changes in flow routing patterns north of the proposed parcel.

- *Technical Drainage Study for Tevare* (Summerlin Village 23B Parcel U), by Smart Growth Engineering.

The Tevare parcel shares an entry way with Parcel V. The Tevare drainage study is currently under review at CLV. The drainage study was reviewed to coordinate the shared entrance and make sure that all flow patterns are consistent with the Tevare study. The entrance is being proposed with the Tevare study and is shown on the plans for that site. All flows from Parcel V are being discharged into the proposed storm drain prior to the entrance. Due

to this, there is no impact to flows in the entrance or any other portion of the Tevare site.

The referenced studies have been reviewed and the hydrologic and hydraulic calculations contained within them have been determined to be acceptable. Please note that the responsibility for all design, plans, information, etc. provided by other engineers for submission within this document remains with that engineer, VTN does not accept responsibility for any item prepared by others in this document.

II. HYDROLOGIC ANALYSIS

A. METHOD OF ANALYSIS

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

B. RAINFALL CRITERIA

(*Figure 513 and Table 505* were referenced from the *Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual* and are included in the *Rainfall Calculations* Section of this study.)

The site is not located within the McCarran Airport Rainfall Area as determined from *Figure 513*. The precipitation values of 1.45 inches for a 10-year, 6-hour rainfall depth-duration-frequency and 2.30 inches for a 100-year, 6-hour rainfall depth-duration-frequency were taken from the NOAA Atlas 2 and adjusted per *Table 501*. The final 100-year and 10-year, 6-hour rainfall depths were determined to be 3.29 inches and 1.80 inches respectively.

C. RUNOFF COMPUTATION

The Capistrano site consists predominantly of soil type 502 (Canutio-Cave gravelly fine sandy loams) and contains a sliver of soil type 155 (Cave gravelly fine sandy loam). The basin and soil boundaries are illustrated on *Figure 4: Soil Map*. Curve Numbers (CN) calculated for the soil group based on existing conditions were taken from Table 602, Sheet 4 of 4 referencing desert shrub. Curve Numbers (CN) calculated for the soil group based on developed conditions were taken from Table 602A, referencing Residential 8,000 square foot lots. Calculations for the CN values are included in the Appendix of this study.

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

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

Existing Conditions	Developed Conditions
$V_1 = 14.8*(S/100)^{1/2}$	$V_1 = 20.2*(S/100)^{1/2}$
$V_2 = 29.4*(S/100)^{1/2}$	$V_2 = 30.6*(S/100)^{1/2}$

D. PEAK FLOWS

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

TABLE 1. HEC-1 ANALYSIS PEAK FLOW SUMMARY

BASIN	10-YEAR FLOW	100-YEAR FLOW
	(CFS)	(CFS)
SUMMERLIN VILLAGE 23B PARCEL V		
EXISTING CONDITION		
ON1E	22	61
DEVELOPED CONDITION		
ON1D	17	46
ON2D	6	17

III. ONSITE & OFFSITE BASIN ANALYSIS**A. EXISTING CONDITION ANALYSIS**

(Refer to *Figure 5A: Existing Condition Basin Map*)

1. OFFSITE DRAINAGE BASIN DESCRIPTION

The existing condition for the site assumes that the offsite infrastructure and adjacent parcel to the north are completed. The Update #2 to the Conceptual Drainage Study for Summerlin Village 23B states that Sky Vista Drive has been sufficiently graded and or constructed to establish the drainage patterns for the ultimate conditions. Sky Vista Drive collects flows from the west and routes them as either surface flow or within the 54-inch storm drain into the existing storm drain in Alta Drive.

The proposed Parcel W located north of the site is moving concurrently with this study. Per the Master Drainage Study for Summerlin 23B, Parcel W will be graded to route all storm flows into the storm drain located in Fox Hill Drive and not impact the proposed site.

2. ONSITE DRAINAGE BASIN DESCRIPTION

In the existing condition the site the site was delineated into one drainage basin denoted as ON1E. Basin ON1E produces 22 cfs during the 10-yr storm event and 64 cfs during the 100-yr storm event respectively. Storm flows from the majority of the site are routed along the existing berm towards the northeast where they are discharged into a temporary sump pit inlet constructed with the Fox Hills roadway improvements. The sump pit inlet discharges into a 42" storm drain constructed with the Fox Hill roadway improvements. Storm flows from the remaining portion of the site are routed to the southeast and collected within a temporary

swale and sump pit inlet located at the southeast corner of Parcel V. The sump pit inlet discharges into a 42" storm drain constructed with the Fox Hill roadway improvements.

B. DEVELOPED CONDITION ANALYSIS

(Refer to *Figure 5B: Developed Condition Basin Map*)

1. OFFSITE DRAINAGE BASIN DESCRIPTION

In the ultimate condition, offsite drainage patterns follow the patterns shown on referenced *Figure 6U2, Ultimate Condition Drainage Basin Map from Update #2 to the Conceptual Drainage Study for Summerlin Village 23B*. According to that study Sky Vista Drive adjacent to the west perimeter of the site is impacted by offsite basin SWAA-1R which produces 64 cfs and 176 cfs during the 10-year and 100-year storm events respectively. The Flow produced on Sky Vista Drive is designated as basin ST-CR which produces 24 cfs and 48 cfs during the 10-year and 100-year storm events respectively. The flow from basin SWAA-1R and ST-CR are routed on Sky Vista Drive and the 54" storm drain under the roadway.

2. ONSITE DRAINAGE BASIN DESCRIPTION

In the Developed condition, the site consists of residential homes with an 8000 square foot average lot size. The site is delineated into two drainage basins denoted as ON1D and ON2D. ON1D encompasses the majority of the site routing flows to a low point in Messina Strait Street. ON2D includes the remainder of the site and routes the flows into the entrance street of Port Reggio Street. Flows from both basins are collected within a proposed storm drain that connects into the existing storm drain in Fox Hill Drive.

IV. FACILITY DESIGN CALCULATIONS

A. STREET FLOW

In order to determine the extent of flood protection needed to protect the site, the depth of flow within the adjacent streets needed to be determined. To quantify the flows in each street basin ON1D was broken into four sub-basins denoted as SUB1A, SUB2A, SUB3A, and SUB4A. The sub-basins are used to quantify the flow in the streets and determine street flow depths and velocities. Storm flows for each sub-basin were determined by area to flow proportion calculations included in the Appendix. The table below summarizes the flows in each street.

TABLE 3. STREET FLOW SUMMARY

SUMMERLIN VILLAGE 23B PARCEL V			
STREET FLOWS			
Street	Basin/Sub-basin	Q10 (cfs)	Q100 (cfs)
Valentia Hills	ON2D	6	17
Port Reggio	ON2D	6	17
Sfalassa View	SUB1A	4	12
Capistrano Vista	SUB2A	5	14
Calabria Ridge	SUB3A	4	12
Messina Strait Steet	SUB4A	3	8

The program FlowMaster, by Haestad Methods, has been utilized to determine the normal depth and velocity of the anticipated storm flows within the streets. Table 2 below shows the results of these street flow analyses. The product V x D shown in Table 3 has been calculated to show that the flow within the streets during the existing and interim conditions do not meet the 2002 Clark County Regional Flood Control District (CCRFC) Hydrologic Criteria and Drainage Design Manual requirement to be less than 6 in the 10-year storm event and less than 8 in the 100-year storm event. Construction of the perimeter streets of Fox Hill Drive and Sky Vista Drive are addressed by the referenced studies for Summerlin Village 23B. These streets have been designed to limit flows to top of curb which is the requirement for development within the Summerlin Community.

TABLE 2. STREET FLOW CALCULATIONS SUMMARY

FM SECTION	SLOPE (%)	Q (cfs)	Depth (ft)	Velocity (fps)	DxV
FM-1-10YR	4.81	16	0.34	5.18	1.76
FM-1-100YR	4.81	46	0.46	6.45	2.97
FM-2-10YR	2.03	5	0.27	2.84	0.77
FM-2-100YR	2.03	14	0.36	3.61	1.30
FM-3-10YR	1.46	4	0.29	2.38	0.69
FM-3-100YR	1.46	12	0.38	5.47	2.08
FM-4-10YR	1.16	4	0.28	2.18	0.61
FM-4-100YR	1.16	12	0.38	2.74	1.04
FM-5-10YR	4.32	6	0.26	3.97	1.03
FM-5-100YR	4.32	17	0.35	5.05	1.77
FM-6-10YR	4.00	6	0.30	3.90	1.17
FM-6-100YR	4.00	17	0.39	4.93	1.92

B. FLOOD CONTROL FACILITIES

The project extends the storm drain in Fox Hill to collect all flow produced onsite. The storm drain is extended from the stub location in Port Reggio through a proposed 20-foot drainage easement and onto Mount La Sla Avenue. Drop inlets are proposed in Port Reggio and at several locations along Mount La Sla to collect storm flows. A Standard Form 6 storm drain analysis is provided in the Appendix for the storm drain. Drop inlet calculations are also included in the Appendix.

V. CONCLUSIONS AND COMPLIANCES

This study has been submitted to serve as a *Technical Drainage Study for Capistrano*. The off-site and on-site flows impacting the site have been established in the existing, and developed conditions.

This study has been completed in compliance with the CCRFCD *Hydrologic Criteria and Drainage Design Manual*. The routing patterns established in this study should have no adverse effects on upstream or downstream properties.

REFERENCES

1. *Flood Control Master Plan Update Las Vegas Valley*, Clark County Regional Flood Control District, 2008.
2. *Flood Insurance Rate Map*, Community Panel Number 32003C2150F, Clark County, Nevada, revised November 16, 2011.
3. *Hydrologic Criteria and Drainage Design Manual*, Clark County Regional Flood Control District, 1999.
4. *Update #2 to the Technical Drainage Study for Summerlin Village 23B Fox Hill Drive Improvements Alta to Antelope Ridge Drive (Interior Road Improvements)*, dated November, 2012 by G.C. Wallace (CLV# DS3420E).
5. *Update #2 to the Conceptual Drainage Study for Summerlin Village 23B* dated January, 2013 by G.C. Wallace.
6. *Technical Drainage Study for Tevare* (Summerlin Village 23B Parcel U), by Smart Growth Engineering.

APPENDIX

ZONING CONDITIONS



LAS VEGAS
CITY COUNCIL

CAROLYN G. GOODMAN
MAYOR

STAVROS S. ANTHONY
MAYOR PRO TEM

LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

August 14, 2013

Ms. Julie Cleaver
The Howard Hughes Company, LLC
10801 West Charleston Boulevard, 3rd Floor
Las Vegas, Nevada 89135

**RE: TMP-50117 (PRJ-49891) – SUMMERLIN VILLAGE 23B PARCEL V
PLANNING COMMISSION MEETING OF AUGUST 13, 2013**

Dear Ms. Cleaver:

Your request for possible action on a request for a Tentative Map FOR A 112-LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION on 25.38 acres on the west side of Fox Hill Drive, approximately 1,200 feet north of Alta Drive (APN 137-34-111-003), P-C (Planned Community) Zone [SF3 (Single Family Detached) Summerlin Special Land Use Designation], Ward 2 (Beers) [PRJ-49891], was considered by the Planning Commission on August 13, 2013.

The Planning Commission voted to **APPROVE** your request, subject to the following:

Planning

1. Approval of the Tentative Map shall be for no more than four (4) years. If a Final Map is not recorded on all or a portion of the area embraced by the Tentative Map with four (4) years of the approval of the Tentative Map, this action is void.
2. All development shall conform to the Conditions of Approval of Rezoning (Z-0119-96), the Summerlin West Development Agreement and the Summerlin Development Standards.
3. Street names must be provided in accordance with the City's Street Naming Regulations.
4. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.

WO 7534
SUMMERLIN VILLAGE
23B PARCEL V

CC: AARON Y
SUE M.
FILE
Daryn O.

CITY OF LAS VEGAS
DEPARTMENT OF PLANNING
BUSINESS LICENSING DIVISION
DEVELOPMENT SERVICES CENTER
333 NORTH RANCHO DRIVE
6TH FLOOR
LAS VEGAS, NEVADA 89106

VOICE 702.229.6281

FAX 702.382.6642

TTY 702.386.9108

www.lasvegasnevada.gov

5. In conjunction with creation, declaration and recordation of the subject common-interest community, and prior to recordation of the Covenants, Codes and Restrictions ("CC&R"), or conveyance of any unit within the community, the Developer is required to record a Declaration of Private Maintenance Requirements ("DPMR") as a covenant on all associated properties, and on behalf of all current and future property owners. The DPMR is to include a listing of all privately owned and/or maintained infrastructure improvements, along with assignment of maintenance responsibility for each to the common interest community or the respective individual property owners, and is to provide a brief description of the required level of maintenance for privately maintained components. The DPMR must be reviewed and approved by the City of Las Vegas Department of Field Operations prior to recordation, and must include a statement that all properties within the community are subject to assessment for all associated costs should private maintenance obligations not be met, and the City of Las Vegas be required to provide for said maintenance. Also, the CC&R are to include a statement of obligation of compliance with the DPMR. Following recordation, the Developer is to submit copies of the recorded DPMR and CC&R documents to the City of Las Vegas Department of Field Operations.
6. All development is subject to the conditions of City Departments and State Subdivision Statutes.

Public Works

7. Unless already constructed or guaranteed by the adjacent developer to the south, construct the full width of the private entry street adjacent to this site concurrent with development of this site. If this site develops prior to the site to the south, appropriate easements outside the bounds of this Tentative Map for full construction of the entry street and for complete access from the entry street shall be granted by separate document prior to the approval of construction drawings for this site or the recordation of a map, whichever may occur first. Extend all required underground infrastructure past the limits of the fully constructed entry if this site develops before the site to the south.
8. Private streets must be granted and labeled on the Final Map for this site as Public Utility Easements (P.U.E.), Public Sewer Easements, and Public Drainage Easements with private surface maintenance by the Homeowner's Association.
9. The proposed non-standard knuckles on this site are hereby approved as a Deviation of Standards. Any further deviations, if any, will require separate approval from the City Engineer.

Ms. Julie Cleaver
The Howard Hughes Company, LLC
TMP-50117 - Page Three
August 14, 2013

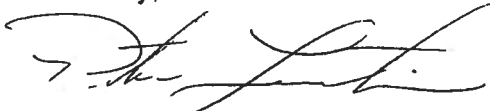
10. Appropriate public easements (Sewer, Drainage, Emergency Access, etc.) over the adjacent Common Lot 7 and Common Lot 17 of the Summerlin Village 23B Unit No. 1 Final Map (Book 145 Page 28) shall be granted to the City of Las Vegas by separate document as determined by the Department of Public Works prior to the recordation of a Final Map for this site requiring these easements. These easements are outside the boundary of this Tentative Map and are to be privately maintained.
11. A minimum 30-foot Public Sewer and Public Drainage Easement must be provided for on Common Element "C" and Common Element 1 on a Final Map for this site. Trees or landscaping over 3 feet tall are not allowed within this Public Sewer & Public Drainage Easement. The surface of Public Sewer Easements is to be privately maintained. This site may also provide the 30-foot Public Sewer and Public Drainage Easement completely on Common Element "C."
12. The proposed off-site sewer must be designed, bonded, and have all off-site easements in place, prior to the approval of construction drawings for this site. A working sanitary sewer connection shall be in place prior to final inspection of any units within this development. This development will be responsible for the completion of the off-site sewer and easements if it is not completed by others.
13. All landscaping shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and abutting street intersections.
14. Prior to the release of a Final Map for recordation on this site, the property owner must contact the Special Improvement District Section of the Department of Public Works (702.229.2136) and sign a notarized affidavit acknowledging and agreeing to a per lot assessment of all lots that will be created through a Final Map for this site. The City shall prepare an apportionment report following recordation of the Final Map and this apportionment report must be signed by the property owner prior to the release of any building permits for this site.
15. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits, submittal of any construction drawings or the submittal of a Map subdividing this site, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.

Ms. Julie Cleaver
The Howard Hughes Company, LLC
TMP-50117 - Page Four
August 14, 2013

16. Site development to comply with all applicable conditions of approval for Summerlin Village 23B, SV-0018-01, Z-0119-96 and all other applicable site-related actions.
17. The approval of all Public Works related improvements shown on this Tentative Map is in concept only. Specific design and construction details relating to size, type and/or alignment of improvements, including but not limited to street, sewer and drainage improvements, shall be resolved prior to approval of the construction plans by the City. No additional deviations from adopted City Standards shall be allowed unless specific written approval for such is received from the City Engineer prior to the recordation of a Final Map or the approval of subdivision related construction plans, whichever may occur first. Approval of this Tentative Map does not constitute approval of any deviations, unless specifically allowed herein. If such approval cannot be obtained, a revised Tentative Map must be submitted showing elimination of such deviations.

This action by the Planning Commission on **August 13, 2013** is final unless a written appeal is filed with the City Clerk within seven days of the date of the Planning Commission's decision as allowed by code or there is a review action filed by the City Council within the same time period. For additional information on appeals or review requests please access <http://www.lasvegasnevada.gov/CheckStatus/DevelopmentApp.htm>, or contact the Department of Planning and Development at 702.229.6301 after **August 20, 2013**. No building permits or business licenses related to these items shall be issued prior to the expiration of the required seven day waiting period, or until any filed appeal is resolved pursuant to LVMC Title 19.18.

Sincerely,



Peter Lowenstein, AICP
Planning Supervisor
Case Planning Division

PL:clb

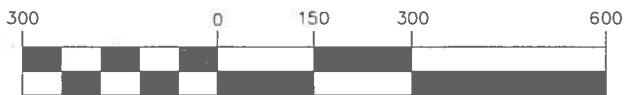
cc: Mr. Jeff Stevens
Ryland Homes
8925 West Russell Road, Suite #200
Las Vegas, Nevada 89148

Mr. Jason Kepple
VTN Nevada
2727 South Rainbow Boulevard
Las Vegas, Nevada 89146

FIGURES



GRAPHIC SCALE



1" = 300'



2727 S. RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148

PROJECT:

SUMMERLIN VILLAGE 23B
PARCEL V

FOR:

SITE DESCRIPTION MAP FIGURE 2

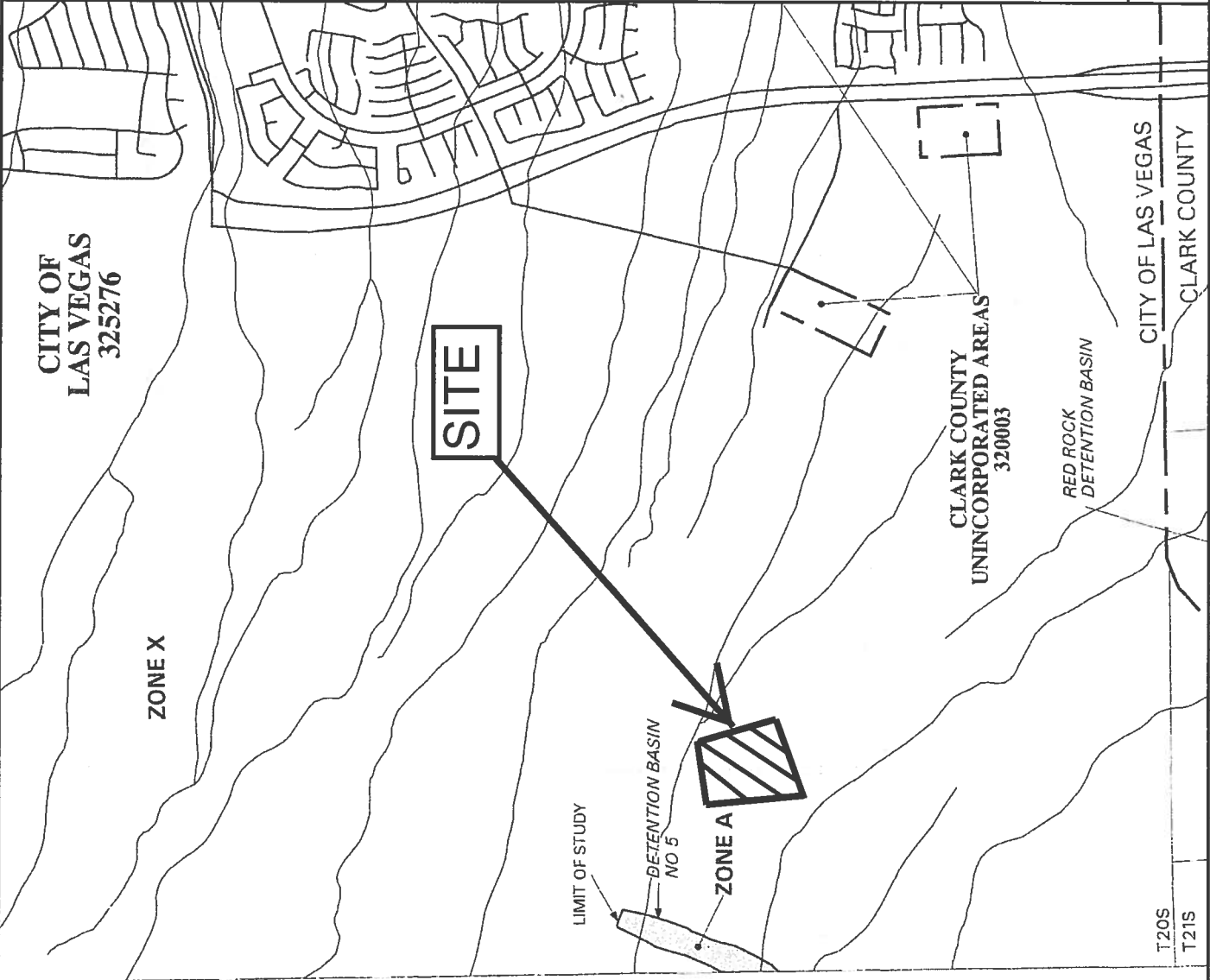
SCALE	HORZ. 1" = 300'
	VERT. N/A

W.O. NO.	7534
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DRAWN BY:	GJP
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DATE:	08/2013
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SHEET	X	OF	X
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MAP SCALE 1" = 2000'



PANEL 2150 E

FIRM **FLOOD INSURANCE RATE MAP** CLARK COUNTY, NEVADA AND UNINCORPORATED AREAS

PANEL 2150 OF 4090

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
LAS VEGAS CITY OF CLARK COUNTY UNINCORPORATED AREA	325276	2150	E	E
	320003	2150	E	E

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



MAP NUMBER
32003C2150 E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE F-24

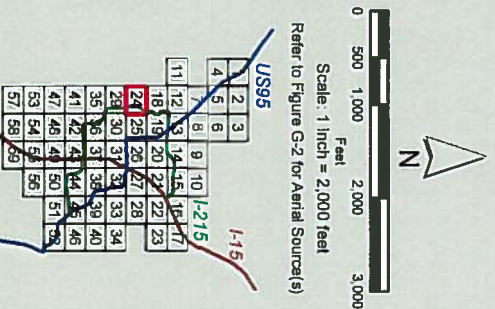
FLOOD CONTROL FACILITIES

LEGEND

-
- Ultimate Development Boundary
 Existing Facilities
 Category A Proposed Facilities
 Category B Proposed Facilities
 Local Existing Facilities
 Local Proposed Facilities
 Detention Basin
 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
 Stormdrain
 Stormdrain
 Crossing
 Crossing

Remove & Replace/Parallel Facilities

- | | | | |
|---|------------|---|------------|
|  | Channel |  | Channel |
|  | Stormdrain |  | Stormdrain |
|  | Crossing |  | Crossing |



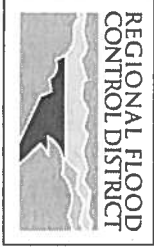
ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.m.)	Channel Slope (%)**
APAD 0004	E	ANGEL PARK - ALTA DRIVE BRANCH	1565	3140	CSMAA-3	ALLGOW3	8.26	4.24
0073	E	11' X 8' RCAP	2220	2917	CSMAA-2	ALLGOW3	7.88	3.50
0146	E	10' X 8' RCB	3010	2220	CSMAA-1	ALLGOW3	6.98	4.40
0203	E	2.7' X 5.5' RCB	1136	2220	CSMAA-1	ALLGOW3	6.98	5.28
0225	E	2.7' X 5.5' RCB Outlet	360	2149	SUM5DB	ALLGOW3	6.74	3.40
APBE 0013	E	ANGEL PARK - BELTWAY BRANCH	489	4060	CSWFH-9	ALLGOW3	2.65	6.50
0022	E	3.12' X 8' RCB	1556	4060	CSWFH-9	ALLGOW3	2.65	1.81
0051	E	Conc Chnl 20W 7D 2.1 SS	1583	4060	CSWFH-9	ALLGOW3	2.65	2.77
0081	E	Conc Chnl 20W 7D 2.1 SS	177	423	CSWFH-9	ALLGOW3	0.17	2.32
0084	E	8' X 8' RCBC @ Far Hills	1465	423	CSWFH-9	ALLGOW3	0.17	1.88
0122	E	Conc Chnl 10W 5D 2.1 SS	1409	423	CSWFH-9	ALLGOW3	0.17	0.80
APCH 0000	E	ANGEL PARK - CARRIAGE HILL BRANCH	152	585	SWFH-8	ALLGOW3	0.29	0.87
0003	P0	8' X 7' RCB	1461	585	SWFH-8	ALLGOW3	0.29	2.39
0031	P0	8' X 5' RCB	896	585	SWFH-8	ALLGOW3	0.29	0.80
APDZ 0002	P0	ANGEL PARK - DESERT FOOTHILLS 2 BRANCH	954	948	SMAA-2	ALLGOW3	0.70	2.00
0000	P0	7' X 7' RCB						
APD5 0000	P0	ANGEL PARK - DESERT FOOTHILLS 5 BRANCH	665	1701	CSWFH-2	ALLGOW3	1.09	1.89
0013	P0	8' X 6' RCB	1436	1701	CSWFH-2	ALLGOW3	1.09	4.18
APD6 0000	P0	ANGEL PARK - DESERT FOOTHILLS 6 BRANCH	2604	1076	CSWFH-6	ALLGOW3	0.56	6.15
APDF 0000	P0	ANGEL PARK - DESERT FOOTHILLS BRANCH	1356	2897	CSWFH-7	ALLGOW3	1.81	2.20
0026	P0	12' X 10' RCB	2463	1962	CSWFH-3	ALLGOW3	1.25	1.62
0073	P0	10' X 8' RCB	2679	1962	CSWFH-3	ALLGOW3	1.25	4.10
0123	P0	6' X 5' RCB	5355	1701	CSWFH-2	ALLGOW3	1.09	6.53
APF2 0000	P0	ANGEL PARK - FAR HILLS 2 BRANCH	1046	669	CSWFH-5	ALLGOW3	0.38	1.00
APFH 0000	E	ANGEL PARK - FAR HILLS BRANCH	995	3862	CSWFH-4	ALLGOW3	2.48	3.50
0019	E	2.8' X 8' RCB	250	3392	CCSWFH-7	ALLGOW3	2.18	4.19
0024	E	16' X 8' RCAP	1943	3392	CCSWFH-7	ALLGOW3	2.18	5.10
0061	E	8' X 7' RCB	1492	669	CSWFH-5	ALLGOW3	0.38	2.00
0089	P0	8' X 6' RCB	2802	669	CSWFH-5	ALLGOW3	0.38	2.00
0144	P0	7' X 6' RCB	1556	669	CSWFH-5	ALLGOW3	0.38	5.50
APM5 0000	E	ANGEL PARK - MIDDLE 5 BRANCH	7001		SUM5N	ALLGOW3	6.74	
0001	E	384 ac-ft Detention Basin #5	12153		SUM5N	ALLGOW3	6.74	
0008	P0	Conc Chnl 50W 4.5D 2.1 SS	2102	3725	CD854-6R	ALLGOW3	4.30	5.20
0009	P0	Conc Chnl 50W 4.5D 2.1 SS	4180	3624	CD855-8	ALLGOW3	2.45	5.80
0047	E	Diversion Basin with Gabion Bank Protection	1000	3725	CD854-6R	ALLGOW3	4.30	1.30
0056	P0	Conc Chnl 80W 4D 2.1 SS	264	3725	CD854-6R	ALLGOW3	4.30	1.30
0059	P0	Conc Chnl 50W 3D 2.1 SS	9922	1821	CD854-4	ALLGOW3	1.01	6.80
0212	P0	Conc Chnl 100W 3D 2.1 SS	8923	2358	CD854-5	ALLGOW3	2.45	7.00
0212	P0	Conc Chnl 30W 3.5D 2.1 SS	6695	1238	CD855-2	ALLGOW3	0.74	7.50
0213	P0	Conc Chnl 50W 2.5D 2.1 SS	6522	1125	CD855-5	ALLGOW3	0.62	7.30
APSP 0135	E	ANGEL PARK - SUMMERLIN PARKWAY	2030	1173	CR8-1	ALLGOW3	1.14	2.40
0177	E	Conc Chnl 10W 6D 2.1 SS	330	867	C11B-1	ALLGOW3	0.84	1.70
0183	E	9' X 8' RCBC at Anasazi	1680	867	C11B-1	ALLGOW3	0.84	1.70
G002 0257	E	Conc Chnl 10W 6D 2.1 SS	4293	2577	CCJ-C	ALLGOW3	2.87	4.10
G002 0000	E	CONC SOUTH FACILITIES (CHETENNE CHANNEL)						
G0B2 0000	P0	GOVAN LONE MOUNTAIN SYST. 2 BELTWAY	118	75	DET22	ALLGOW3	0.76	6.76
0001	P0	123 ac-ft Village 22 Detention Basin	1344		CSV22-DB	ALLGOW3	0.76	
0020	P0	8' X 7' RCB	657	1247	SV22-2	ALLGOW3	0.70	8.30
0033	P0	8' X 6' RCB	3359	1247	SV22-2	ALLGOW3	0.70	6.90
0096	P0	6' X 5' RCB	1332	1247	SV22-2	ALLGOW3	0.70	6.90

* The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of the 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).

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.m.)	Channel Slope (%)**
G0B3 0000	P0	GOVAN LONE MOUNTAIN SYST. 3 BELTWAY	1877	530	SV22-3	ALLGOW3	0.28	6.60
0035	P0	54' RCP	965	530	SV22-3	ALLGOW3	0.28	6.40
G0BE 0000	E	20' X 10' RCBC @ Access Rd	30	958	CSV22-3	GW3SC	0.28	5.67
0001	E	Conc Chnl 20W 5D 2.1 SS	3355	958	CSV22-3	GW3SC	0.28	6.50
0065	E	Conc Chnl 20W 6D 2.1 SS	1220	958	CSV22-3	GW3SC	0.28	1.90
0088	E	2.10' X 8' RCBC @ Lake Mead	400	471	CDE122	ALLGOW3	0.96	0.50
0096	E	Conc Chnl 20W 6D 2.1 SS	627	471	CDE122	ALLGOW3	0.96	0.50
0108	E	Conc Chnl 20W 6D 2.1 SS	1021	471	CDE122	ALLGOW3	0.96	0.50
0127	E	Conc Chnl 20W 6D 2.1 SS	638	442	SV22-1	ALLGOW3	0.20	0.50
0139	E	Conc Chnl 10W 5.5D 2.1 SS	1500	442	SV22-1	ALLGOW3	0.20	1.02
G0L3 0010	E	GOVAN LONE MOUNTAIN SYSTEM-BRANCH 3	3037	2946	CRCLMTIR	GW3SC	2.61	2.78
0088	E	Transition Structure	100	2946	CRCLMTIR	GW3SC	2.61	3.50
0070	E	20' X 6' RCBC @ Cliff Shadows	350	1182	CRCSV223	ALLGOW3	5.68	2.44
0077	E	Conc Chnl 20W 6D 0.1 SS	1229	1182	CRCSV223	ALLGOW3	5.68	6.11
0100	E	Conc Chnl 20W 10D 0.1 SS	200	1182	CRCSV223	ALLGOW3	5.68	5.67
0115	E	66' RCP Outlet	670	679	DET26	ALLGOW3	4.43	
0128	E	333 ac-ft Village 26 Detention Basin	4335	3767	VIL26N	ALLGOW3	4.43	0.50
0147	P0	14' X 14' RCB	3767	3767	VIL26N	ALLGOW3	4.43	6.08
0216	P0	Conc Chnl 50W 4.5D 2.1 SS	3761	3993	CSV26-1	ALLGOW3	4.15	7.95
0289	P0	Conc Chnl 50W 4.5D 2.1 SS	6215	2396	30	ALLGOW3	2.51	
0280	E	Natural Wash 353W	4850	1465	SV26-1	ALLGOW3	1.64	22.50
0370	E	Natural Wash 450W	7000	2396	30	ALLGOW3	2.51	8.50
G0L4 0000	E	GOVAN LONE MOUNTAIN SYSTEM-BRANCH 4	554	2257	CLMTIR	ALLGOW3	2.33	2.50
0010	E	14' X 8' RCB	820	2257	CLMTIR	ALLGOW3	2.33	4.74
0010	E	2.9' X 8' RCB	320	2257	CLMTIR	ALLGOW3	2.33	2.00
0025	E	Salt Cement Chnl 60W 6D 3.4 1 SS	320	2257	CLMTIR	ALLGOW3	2.33	
0026	E	Salt Cement Chnl 42W 6D 3.4 1 SS	700	2257	CLMTIR	ALLGOW3	2.33	1.00

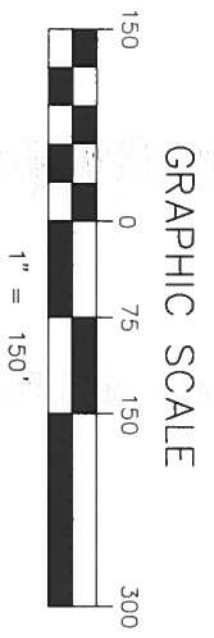


2008 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE FACILITY INVENTORY FIGURE F - 24

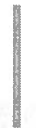
L E G E N D	ID (Facility Identifier) Parent Stream Name River Mile Distance Above Confluence with Parent Stream (Miles) Miles in Hundreds	AABB Existing Facility Proposed or Modified Facility Contingency Level Category B Master Plan Preliminary Design Design	E P P0 P1 P2 P3	Bottom Width Depth Side Slope, H:V SS	W D SS
----------------------------	--	--	--------------------------------	--	--------------

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





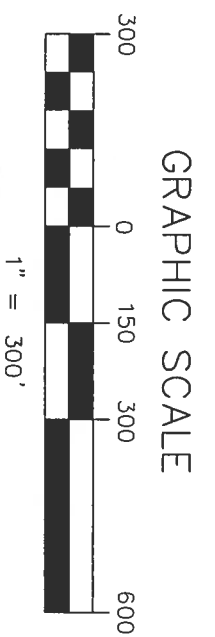
LEGEND

-  BASIN BOUNDARY
-  SOIL TYPE BOUNDARY
-  SOIL TYPE



SUMMERLIN VILLAGE 23B
 PARCEL V (CAPISTRANO)
 FIGURE 4 2013 MAP

W.O.#: 7534
 DATE: 8/19/2013
 BY: SMT
 SCALE: 1" = 150'

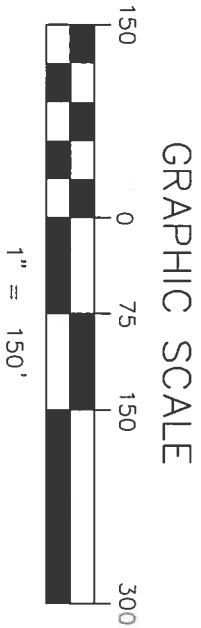
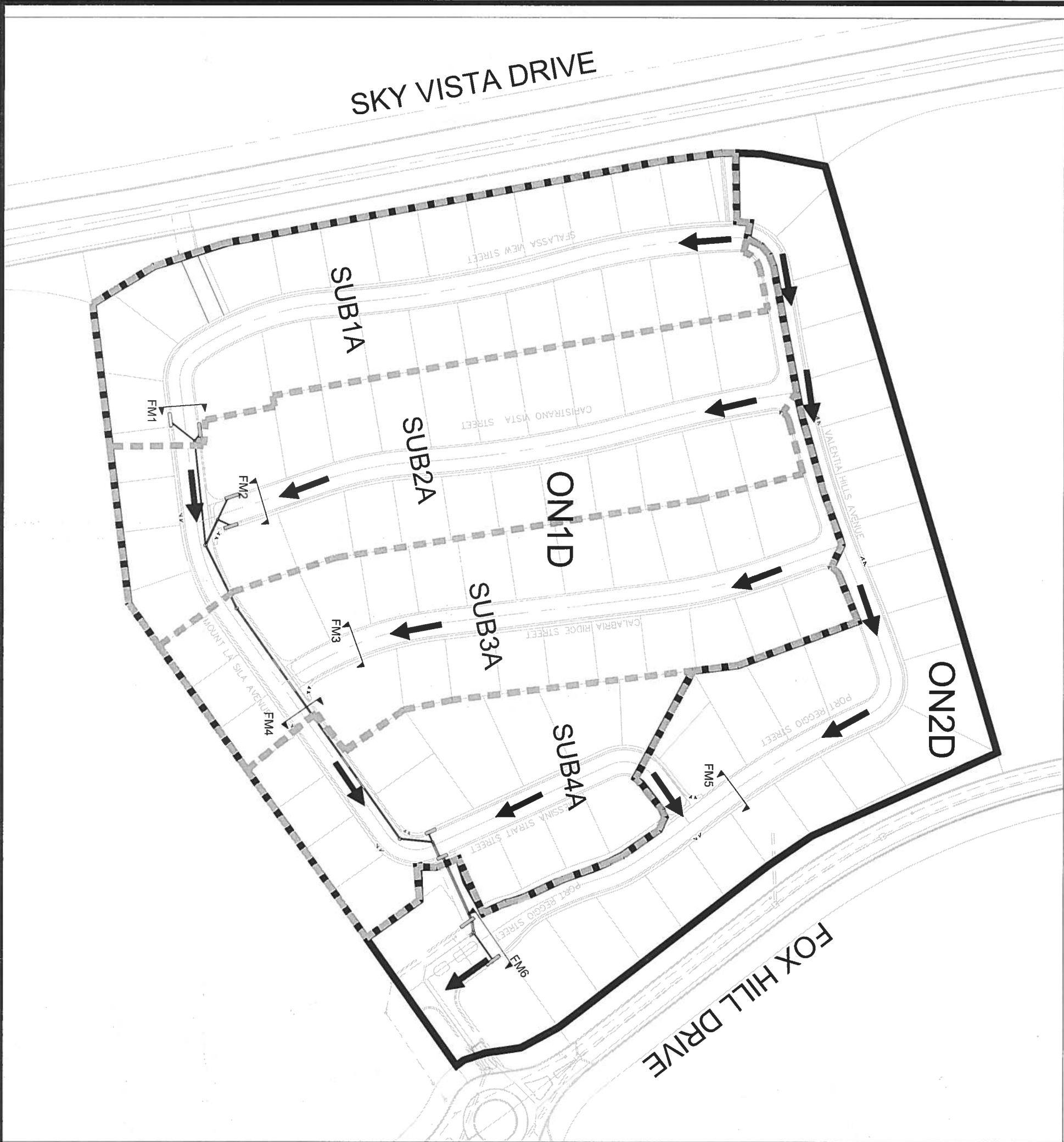


LEGEND

- BASIN BOUNDARY
- ON1D BASIN NAME
- FLOW ARROW
- ~ CONTOUR LINE

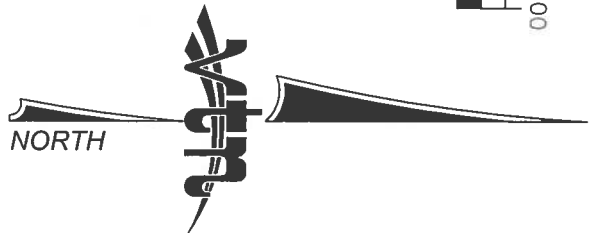
BASIN	10 YR (CFS)	100 YR (CFS)
ON1E	22	61





LEGEND

- BASIN BOUNDARY
- BASIN BOUNDARY
- ON1D BASIN NAME
- ON2D BASIN NAME
- FLOW ARROW
- FLOWMASTER CROSS-SECTION

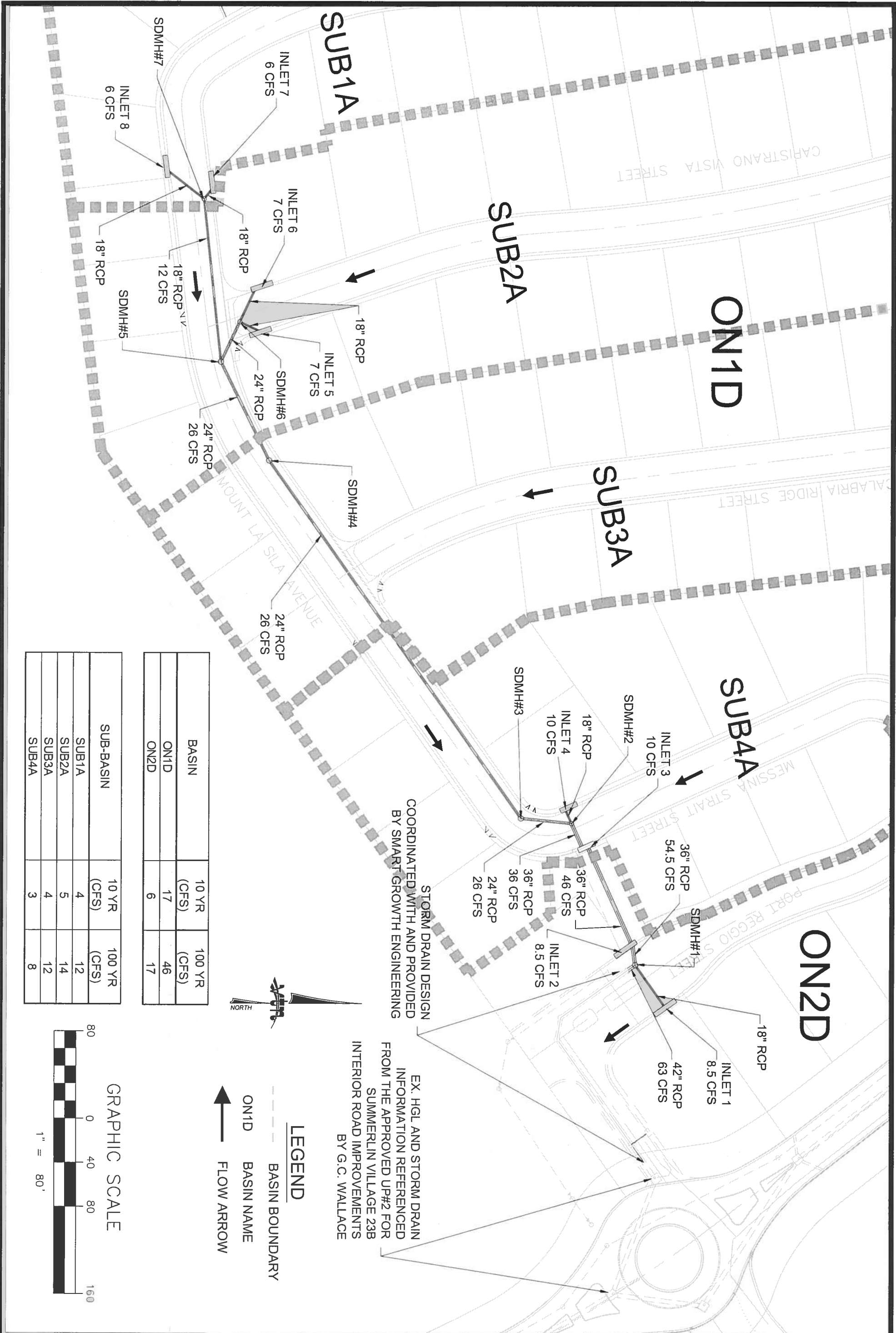


BASIN	10 YR (CFS)	100 YR (CFS)
ON1D	17	46
ON2D	6	17

SUB-BASIN	10 YR (CFS)	100 YR (CFS)
SUB1A	4	12
SUB2A	5	14
SUB3A	4	12
SUB4A	3	8

FMI SECTION	SLOPE (%)	Q (cfs)	Depth (ft)	Velocity (fps)	DxV
FM-1-10YR	4.81	4	0.23	3.79	0.87
FM-1-100YR	4.81	12	0.31	4.84	1.50
FM-2-10YR	2.03	5	0.27	2.84	0.77
FM-2-100YR	2.03	14	0.36	3.61	1.30
FM-3-10YR	1.46	4	0.29	2.38	0.69
FM-3-100YR	1.46	12	0.38	3.04	1.16
FM-4-10YR	1.16	4	0.28	2.18	0.61
FM-4-100YR	1.16	12	0.38	2.74	1.04
FM-5-10YR	4.32	6	0.26	3.97	1.03
FM-5-100YR	4.32	17	0.35	5.05	1.77
FM-6-10YR	4.00	6	0.30	3.90	1.17
FM-6-100YR	4.00	17	0.39	4.93	1.92





W.O.#: 7534
 DATE: 8/19/2013
 BY: SMT
 SCALE: 1" = 80'

**SUMMERLIN VILLAGE 23B
 PARCEL V (CAPISTRANO)**



HYDROLOGIC CALCULATIONS

RAINFALL CALCULATIONS

RAINFALL CALCULATIONS

DEVELOPMENT: Summerlin 23B Parcel V (Capistrano)

WO#: 7534

The project site is not included in the McCarran Airport Rainfall Area as shown by Figure 513 in the *Hydrologic Criteria and Drainage Design Manual*. Precipitation values are taken from the NOAA ATLAS 2, then adjusted per *Table 501* in the *Hydrologic Criteria and Drainage Design Manual*.

STREET INTERSECTION	TOWNSHIP	RANGE	SECTION
Major Avenue Fox Hills Drive	<i>T20 South</i>	<i>R59East</i>	<i>34</i>

STORM EVENT	RAINFALL DEPTH (IN)	RATIO TO NOAA ATLAS 2 ADJUSTMENT RATIO	DESIGN DEPTH (IN)
10-YEAR	1.45	1.24	1.80
100-YEAR	2.30	1.43	3.29

10-YEAR/100-YEAR DESIGN RAINFALL DEPTH RATIO:

0.55

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

PRECIPITATION ADJUSTMENT RATIOS

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

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

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

**WRC
ENGINEERING**

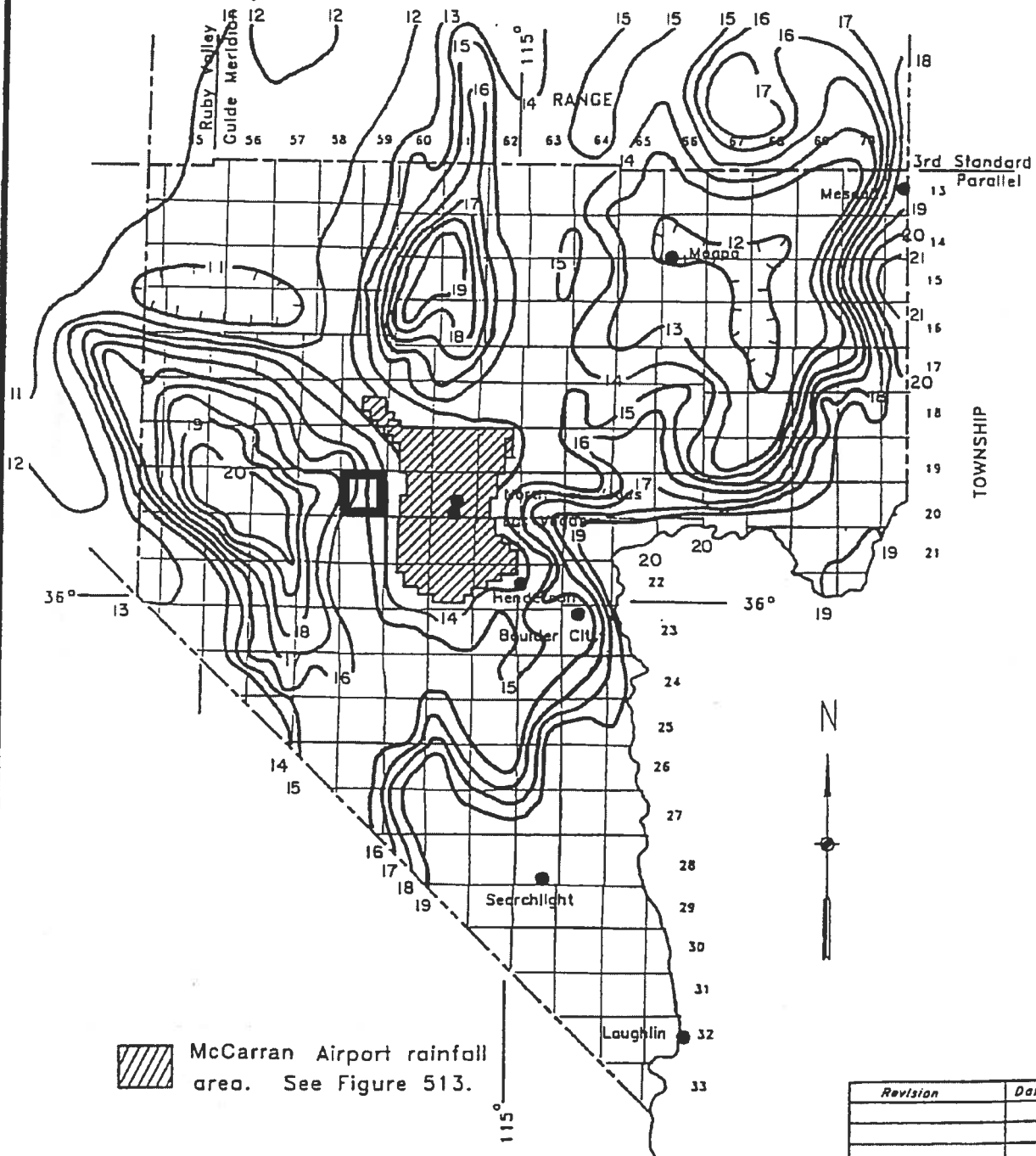
REFERENCE:

USACE, Los Angeles District, 1988

TABLE 501

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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



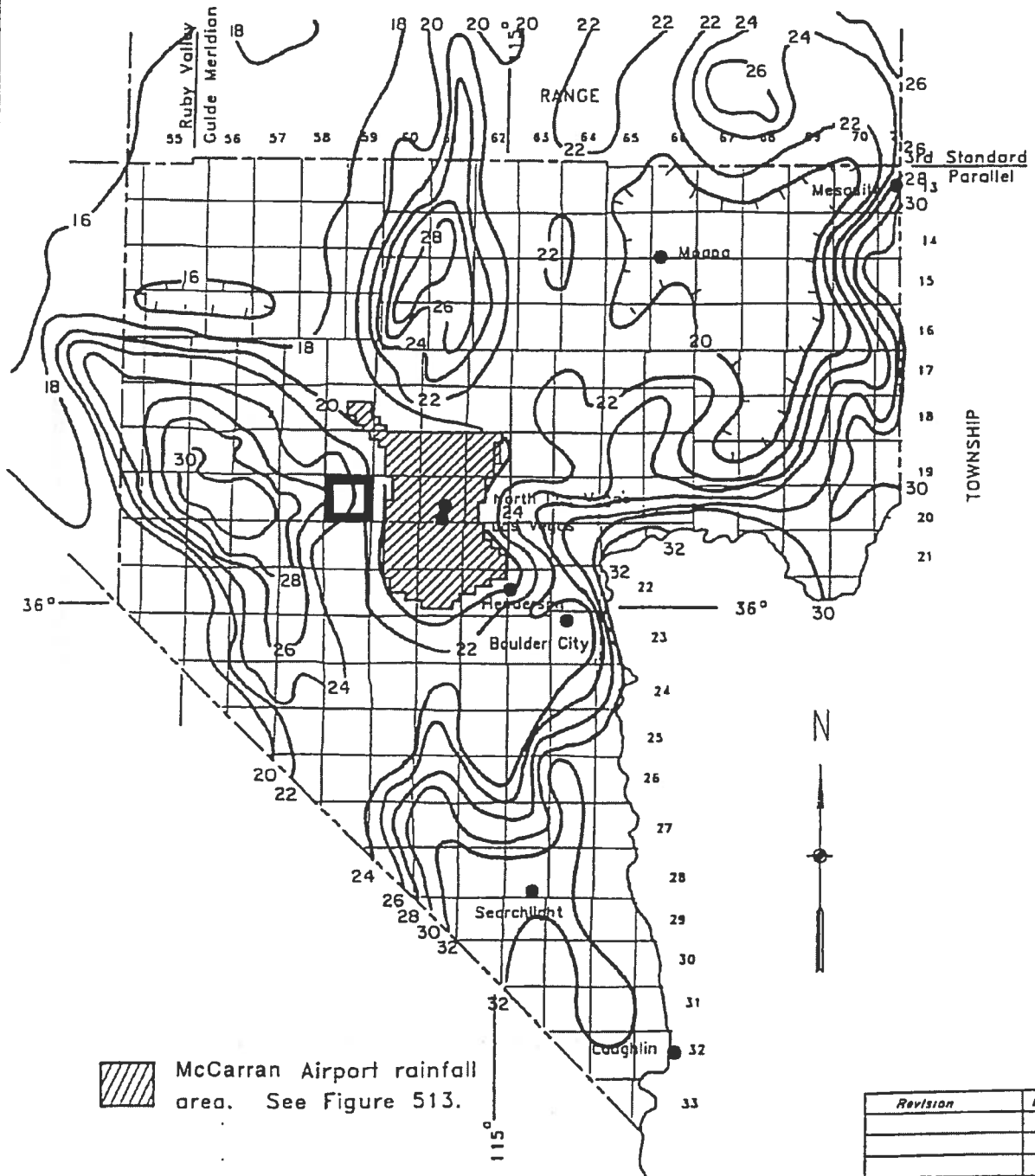
WRC
ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 503

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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



WRC
ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

SOIL AND CURVE NUMBER CALCULATIONS

Curve Numbers for Soils

Soil #155 Cave gravelly fine sandy loam				
Soil	Percent	Group	Existing ¹	Residential ²
Arizo	5%	A	63	73
Caliza	5%	B	77	82
Cave	90%	D	88	90
Total	100%		86	89

Soil #502 Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes				
Soil	Percent	Group	Existing ¹	Residential ²
Canutio	55%	B	77	82
Cave	40%	D	88	90
Arizo	5%	A	63	73
Total	100%		81	85

1-Referenced from the Clark County Drainage Manual, Table 602, page 4 for Desert shrub (poor condition)

2-Referenced from the Clark County Drainage Manual, Table 602A for 8,000 sq. ft. lots

Curve Number Calculations for Basins

Basin	Type	Soil #155	CN Value
ON1D	Residential	1%	1
ON2D	Residential	0%	0
ON1E	Existing	1%	0

Basin	Type	Soil #502	CN Value
ON1D	Residential	99%	84
ON2D	Residential	100%	85
ON1E	Existing	99%	84

Basin	CN Value (sum)
ON1D	85
ON2D	85
ON1E	84

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

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

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

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

Fair: 30 to 70% ground cover.

Good: >70% ground cover.

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

Revision	Date

**WRC
ENGINEERING**

REFERENCE:

SCS TR-55, USDA, June 1986.

**TABLE 602
4 of 4**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage ¹	Percent Impervious ²	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less ³	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

- 1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.
- 2 Actual percent impervious value should be compared to selected land use type.
- 3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

TABLE 602A

This unit is limited for roads because of the depth to the indurated hardpan. Roads should be designed to minimize cuts.

This map unit is in capability subclass VII_s, nonirrigated, and in horticultural group 6.

152—Cave gravelly fine sandy loam, 0 to 4 percent slopes. This shallow, well drained soil is on erosional fan remnants. It formed in alluvium derived from various kinds of rock.

Typically, about 80 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is pale brown gravelly fine sandy loam about 12 inches thick. The next layer to a depth of 36 inches is an indurated, lime-cemented hardpan. The underlying material to a depth of 60 inches or more is light brown very gravelly sandy loam. Depth to the hardpan ranges from 4 to 20 inches.

Included in this unit are about 5 percent Arizo soils, flooded, in channels, 5 percent Canutio soils on inset fans, and 5 percent Grapevine soils on side slopes of erosional fan remnants. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Cave soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed.

This unit is used mainly for urban development. It is also used as habitat for desert wildlife and for recreation.

This unit is poorly suited to urban development. The main limitation is the shallow depth to the hardpan. Excavation for building sites is limited by the hardpan, and heavy equipment is needed. Special design of septic tank absorption fields is needed.

Roads should be designed to minimize cuts because of the limited depth to the hardpan.

It is difficult to establish plants in areas where the pan is exposed. Mulching and fertilizing cut areas help to establish plants. Lawn grasses, shrubs, and trees that are not sensitive to lime-induced chlorosis are well suited to use in landscaping. Annual applications of iron chelates reduce the effects of chlorosis.

Intermittent streams form the drainageways in this unit. These drainageways are subject to rare or occasional periods of high-velocity flooding. Care should be taken during urbanization to accommodate the runoff from the drainageways. If drains become plugged during a major flood, accelerated erosion and damage to roads, buildings, and other structures can occur.

This map unit is in capability subclass VII_s, nonirrigated, and in horticultural group 6.

→ **155—Cave gravelly fine sandy loam, 4 to 15 percent slopes.** This shallow, well drained soil is on

erosional fan remnants. It formed in alluvium derived from various kinds of rock.

Typically, about 70 percent of the surface is covered with a desert pavement of rock fragments and pan fragments. The surface layer is light brown gravelly fine sandy loam about 5 inches thick. The underlying material to a depth of 15 inches is light brown gravelly fine sandy loam. The next layer to a depth of 60 inches or more is an indurated, lime-cemented hardpan. Depth to the hardpan ranges from 4 to 20 inches.

Included in this unit are about 5 percent Arizo soils, flooded, in channels and 5 percent Caliza soils on side slopes of erosional fan remnants. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Cave soil is moderate above the hardpan. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. Runoff is moderate, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed.

This unit is used as habitat for desert wildlife and for recreation.

This unit is limited for roads because of the depth to the indurated hardpan. Roads should be designed to minimize cuts. Cutting and filling can be reduced by building roads in the less sloping areas.

This map unit is in capability subclass VII_s, nonirrigated and in horticultural group 6.

160—Destazo cobbly fine sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on relict alluvial flats. It formed in alluvium derived dominantly from limestone and dolomite.

Typically, about 60 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is pink cobbly fine sandy loam about 11 inches thick. The upper 29 inches of the underlying material is light brown very gravelly sandy clay loam, and the lower part to a depth of 60 inches or more is pinkish white gravelly sandy loam containing some crystalline gypsum.

Included in this unit are about 5 percent Bracken very cobbly fine sandy loam, 2 to 8 percent slopes, on side slopes of slightly higher remnants of relict alluvial flats and 10 percent Las Vegas soils on summits of slightly higher remnants of alluvial flats. Included areas make up about 15 percent of the total acreage.

Permeability of this Destazo soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development. This unit is well suited to the construction of dwellings.

The main limitation for septic tank absorption fields is restricted permeability. The operation of septic tank

of 43 inches is stratified, light brown very cobbly sandy loam, brown very gravelly sandy loam, and brown extremely gravelly sandy loam, averaging extremely gravelly sandy loam. Bedrock is at a depth of about 43 inches. Depth to bedrock ranges from 40 to 60 inches or more.

Permeability of the Canutio soil is moderately rapid above the bedrock. Available water capacity is very low. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Akela soil is shallow and well drained. It formed in residuum derived dominantly from basalt and andesite. Typically, about 92 percent of the surface is covered with a desert pavement of pebbles, cobbles, and stones. The surface layer is pale brown very cobbly fine sandy loam about 3 inches thick. The underlying material to a depth of 11 inches is light brown very gravelly fine sandy loam. Basalt is at a depth of about 11 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Akela soil is moderate above the bedrock. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate if the surface is disturbed.

This unit is used as habitat for desert wildlife and for recreation.

This unit is limited for roads because of the depth to bedrock in the Akela soil. Roads should be designed to minimize cuts because of the limited depth to bedrock. Heavy equipment is needed for excavation.

This map unit is in capability subclass VIIc, nonirrigated. The Canutio soil is in horticultural group 1, and the Akela soil is in horticultural group 6.

501—Canutio gravelly fine sandy loam, 0 to 2 percent slopes. This very deep, well drained soil is on inset fans. It formed in mixed alluvium derived dominantly from limestone, quartzite, and sandstone.

Typically, about 60 percent of the surface is covered with a desert pavement of pebbles and cobbles. The surface layer is light brown gravelly fine sandy loam about 11 inches thick. The underlying material to a depth of 60 inches or more is light brown, stratified very gravelly sandy loam to very gravelly loam.

Included in this unit are about 5 percent Cave soils on erosional fan remnants and 5 percent Arizo soils, flooded, in channels. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Canutio soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the surface is disturbed.

This unit is used mainly as habitat for desert wildlife and for recreation. It is also used for urban development.

This unit is well suited to the construction of dwellings.

Unless the density of housing is too high, septic tank absorption fields normally function well on this unit.

Roads can easily be constructed and maintained on this unit.

The main limitations for lawns and landscaping are the desert pavement and the low available water capacity. Removing the desert pavement is necessary for best results when landscaping, particularly in areas used for lawns. Because the soil is droughty, applications of irrigation water should be light and frequent.

Intermittent streams form the drainageways in this unit. These drainageways are subject to rare or occasional periods of high-velocity flooding. Care should be taken during urbanization to accommodate the runoff from the drainageways. During major floods, plugging of the drains is likely to result in accelerated erosion and possible damage to roads, homesites, and structures.

This map unit is in capability subclasses IIIc, irrigated, and VIIc, nonirrigated. It is in horticultural group 1.

502—Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes. This map unit is on inset fans.

This unit is 55 percent Canutio gravelly fine sandy loam, 2 to 8 percent slopes, and 40 percent Cave gravelly fine sandy loam, 2 to 8 percent slopes. The Canutio soil is on inset fans, and the Cave soil is on nonburied fan remnants. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Arizo soils, flooded, in channels. The percentage varies from one area to another.

The Canutio soil is very deep and well drained. It formed in mixed alluvium derived dominantly from limestone, quartzite, and sandstone. Typically, about 35 percent of the surface is covered with pebbles and 5 percent is covered with cobbles. The surface layer is light brown gravelly fine sandy loam about 9 inches thick. The underlying material to a depth of 60 inches or more is light brown, stratified very gravelly sandy loam to very gravelly loam.

Permeability of the Canutio soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

The Cave soil is shallow and well drained. It formed in mixed alluvium derived dominantly from limestone, quartzite, and sandstone. Typically, about 30 percent of the surface is covered with pebbles and 5 percent is covered with cobbles. The surface layer is pale brown gravelly fine sandy loam about 16 inches thick. The upper 14 inches of the underlying material is an indurated, lime-cemented hardpan, and the lower part to a depth of 60 inches or more is light brown very gravelly sandy loam. Depth to the hardpan ranges from 4 to 20 inches.

TABLE 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare" and "occasional" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern.]

Soil name and map symbol	Hydro-logic group	Flooding		High water table		Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Months	Depth	Months	Depth	Thick-ness	Depth	Hard-ness	Uncoated steel	Concrete
				<u>Ft</u>		<u>In</u>		<u>In</u>			
105*: McCullough-----	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	High.
Jean-----	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Bluepoint-----	A	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
107*: Arizo-----	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
112*: Arizo-----	A	Occasional	Mar-Sep	>6.0	---	>60	---	---	---	High-----	Low.
113*: Arizo-----	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	High.
117*: Arizo-----	A	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
120*: Bluepoint-----	A	Rare-----	---	4.0-6.0	Jun-Sep	>60	---	---	---	High-----	Moderate.
127, 128, 129*: Bluepoint-----	A	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
130*: Bracken-----	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
Destazo-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	High.
132*: Bracken-----	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
133*: Bracken-----	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
Rock outcrop.											
134*: Bracken-----	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
140*: Casaga-----	D	None-----	---	>6.0	---	>60	---	---	---	High-----	High.
150*: Cave-----	D	None-----	---	>6.0	---	>60	---	4-20	Thick	High-----	Low.
151*: Cave-----	D	None-----	---	>6.0	---	>60	---	10-20	Thick	High-----	Low.
152, 153*: Cave-----	D	None-----	---	>6.0	---	>60	---	4-20	Thick	High-----	Low.
150*: Destazo-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	High.
181*: Celiza-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Pittman-----	C	None-----	---	>6.0	---	>60	---	20-30	Thick	High-----	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic symbol	Floodings		High water table		Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Months	Depth	Months	Depth	Thickness	Depth	Hardness	Uncoated steel	Concrete
				ft		ft		in			
515*: Artes--	F	None	---	>6.0	---	>60	---	---	---	High	High.
Brackish--	B	None	---	>6.0	---	40-60	Soft	---	---	High	High.
430-- Knob Hill	F	None	---	>6.0	---	>60	---	---	---	High	Low.
440-- Mekel	F	None	---	>6.0	---	40-60	Hard	---	---	High	Low.
450-- Cave Variant	F	None	---	>6.0	---	>60	---	5-10	Thick	High	High.
481, 484-- Rabbit	F	None	---	>6.0	---	6-20	Hard	---	---	High	Low.
500* Canalia	B	None	---	>6.0	---	40-60	Hard	---	---	High	Low.
Skala--	F	None	---	>6.0	---	10-20	Hard	---	---	High	Low.
501-- Canalia	B	None	---	>6.0	---	>60	---	---	---	High	Low.
502*: Canalia	B	None	---	>6.0	---	>60	---	---	---	High	Low.
Cave--	D	None	---	>6.0	---	>60	---	4-20	Thin	High	Low.
505* Canalia	B	None	---	>6.0	---	40-60	Hard	---	---	High	Low.
Skala--	D	None	---	>6.0	---	10-20	Hard	---	---	High	Low.
510*: Skala--	D	None	---	>6.0	---	10-20	Hard	---	---	High	Low.
Rock outcrop.											
520-- Weiser	B	None	---	>6.0	---	60	---	---	---	High	Low.
542*: Weiser	B	None	---	>6.0	---	>60	---	---	---	High	Low.
Artes--	F	None	---	>6.0	---	60	---	---	---	High	High.
545*: Weiser	B	None	---	>6.0	---	>60	---	---	---	High	Low.
Goodspings--	D	None	---	>6.0	---	60	---	0-20	Thick	High	Low.
500*: Slickens											
605*: Dupa											
610*: Pits											
615*: Mohar land											
630*: Badlands											
640*, 640*: Rock outcrop											
645*: Pits											

* See description of the map unit for composition and behavior characteristics of the map unit.

TRAVEL TIME CALCULATIONS

TRAVEL TIME CALCULATIONS

DEVELOPMENT: Summerlin 23B Parcel V (Capistrano)

W.O. # 7534

CALCULATED BY: SMT

$$Velocity = CS^{\frac{1}{2}}$$

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

Existing:		Developed	
C1=14.8	C2=29.4	C1=20.2	C2=30.6

Basin	Length (ft)	High Elev (ft)	Low Elev (ft)	Slope (ft/ft)	First 500 feet		Remaining Travel Distance	
					C1	V1 (fps)	C2	V2 (fps)
ON1D	1631	3504.84	3447.93	0.035	20.2	3.8	30.6	5.7
ON2D	1426	3504.84	3442.28	0.044	20.2	4.2	30.6	6.4
ON1E	1377	3517	3449	0.049	14.8	3.3	29.4	6.5

STANDARD FORM 4

ANALYSIS

STANDARD FORM 4

DEVELOPMENT: Summerlin 23B Parcel V (Capistrano)

W.O. # 7534 CALCULATED BY: SMT

V1 applies to the first 500 feet of travel distance V2 applies to the remaining travel distance	
Existing:	Developed
I'1 = 1.48 * S ^{1/3}	I'2 = 2.34 * S ^{1/3}
I'1 = 2.02 * S ^{1/3}	I'2 = 3.06 * S ^{1/3}

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

$$T_c = 0.0132C_n - 0.39$$

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

$$T_c = T_i + T_r$$

SUB-BASIN DATA				INITIAL/OVERLAND TIME (Ti)				TRAVEL TIME (Tt)				Tc CHECK (URBANIZED BASINS)		FINAL Tc	LAG TIME	REMARKS	
DESIG.	Cn	K	AREA Ac.	AREA MI ²	LENGTH Ft	SLOPE %	Ti Min.	LENGTH Ft	SLOPE %	V1 fps	V2 fps	Tt Min.	TOTAL LENGTH (11)	Tc Min.	TLAG Hr.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)	(11)	(12)					
ON1D	85	0.729	18.68	0.0292	151	0.9	8.49	1631	3.5	3.8	5.7	5.51	1782	19.90	14.00	0.140	
ON2D	85	0.729	6.75	0.0105	151	0.9	8.51	1426	4.4	4.2	6.4	4.38	1577	18.76	12.88	0.129	
ON1E	84	0.723	25.43	0.0397	356	5.1	7.43	1377	4.9	3.3	6.5	4.77	1732.52	19.63	12.20	0.122	
Minimum existing Tc is 10 minutes. Minimum developed TC is 5 minutes.																	

HYDROLOGIC ANALYSIS

EXISTING CONDITION
HEC-1 ANALYSIS

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 16AUG13 TIME 17:01:57
*
*****

```

```

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

```

```

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

```

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

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

1 HEC-1 INPUT PAGE 1

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*DIAGRAM
1 ID SUMMERLIN 23B PARCEL V CAPISTRANO - TECHNICAL DRAINAGE STUDY
2 ID EXISTING CONDITION
3 ID FILE: 7553-E.DAT
4 ID 10YR/100 YR STORM EVENT
5 IT 5 0 0 300
6 IN 5 0 0
7 IO 5 0 0
8 JR PREC .55 1.000
9 KK ON1E
10 KM ONSITE BASIN ON1E
11 BA .0397
12 PB 3.29
13 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
14 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
15 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
16 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
17 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
18 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
19 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
20 PC .998 .999 1.00
21 LS 84.0
22 UD .122
23 ZZ

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

9 ON1E

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 16AUG13 TIME 17:01:57
*
*****

```

```

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

```

SUMMERLIN 23B PARCEL V CAPISTRANO - TECHNICAL DRAINAGE STUDY
EXISTING CONDITION
FILE: 7553-E.DAT
10YR/100 YR STORM EVENT

*** ERROR *** SPECIFIED START AND END DATES RESULT IN TOO MANY TIME PERIODS

```

7 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 0 STARTING DATE
    ITIME 0000 STARTING TIME
    NQ 2000 NUMBER OF HYDROGRAPH ORDINATES
    NDDATE 7 0 ENDING DATE
    NDTIME 2235 ENDING TIME
    ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 166.58 HOURS

```

ENGLISH UNITS

7534-E.OUT

DRAINAGE AREA
PRECIPITATION DEPTH
LENGTH, ELEVATION
FLOW
STORAGE VOLUME
SURFACE AREA
TEMPERATURE

SQUARE MILES
INCHES
FEET
CUBIC FEET PER SECOND
ACRE-FEET
ACRES
DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.55 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	RATIO 2
				.55	1.00
HYDROGRAPH AT	ONIE	.04	1	22.	61.
+			FLOW TIME	3.58	3.58

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

DEVELOPED CONDITION

HEC-1 ANALYSIS


```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 15AUG13 TIME 08:06:09
*
*****
7534-D.OUT
*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

```

```

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

```

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

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

1 HEC-1 INPUT PAGE 1

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*DIAGRAM
1 ID SUMMERLIN 23B PARCEL V CAPISTRANO - TECHNICAL DRAINAGE STUDY
2 ID DEVELOPED CONDITION
3 ID FILE: 7553-D.DAT
4 ID 10YR/100 YR STORM EVENT
5 IT 5 0 0 300
6 IN 5 0 0
7 IO 5 0 0
8 JR PREC .55 1.000
9 KK ON1D
10 KM ONSITE BASIN ON1D
11 BA .0292
12 PB 3.29
13 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
14 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
15 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
16 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
17 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
18 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
19 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
20 PC .998 .999 1.00
21 LS 85.0
22 UD .140
23 KK ON2D
24 KM ONSITE BASIN ON2D
25 BA .0105
26 LS 85.0
27 UD .129
28 ZZ

```

```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
9 ON1D
.
23 ON2D
.

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 15AUG13 TIME 08:06:09
*
*****
*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
*****

```

SUMMERLIN 23B PARCEL V CAPISTRANO - TECHNICAL DRAINAGE STUDY
DEVELOPED CONDITION
FILE: 7553-D.DAT
10YR/100 YR STORM EVENT

*** ERROR *** SPECIFIED START AND END DATES RESULT IN TOO MANY TIME PERIODS

```

7 IO OUTPUT CONTROL VARIABLES
IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE
IT HYDROGRAPH TIME DATA
NMN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 0 STARTING DATE
ITIME 0000 STARTING TIME

```

NQ 2000 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 7 0 ENDING DATE
 NDTIME 2235 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 166.58 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
 .55 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 .55	RATIO 2 1.00
HYDROGRAPH AT					
+	ON1D	.03	1 FLOW TIME	17. 3.58	46. 3.58
HYDROGRAPH AT					
+	ON2D	.01	1 FLOW TIME	6. 3.58	17. 3.58

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

SUB-BASIN CALCULATIONS

Sub-Basin Calculations

Sub-Basin	Area (Ft ²)	Area (AC)	ON1D Area (AC)	Area Ratio	ON1D 100-YR	SUBBASIN 100-YR	ON1D 10-YR	SUBBASIN 10-YR
SUB1A	216103	4.96	18.67	0.266	46	12	16	4
SUB2A	240692	5.53	18.67	0.296	46	14	16	5
SUB3A	217865	5.00	18.67	0.268	46	12	16	4
SUB4A	138262	3.17	18.67	0.170	46	8	16	3

HYDRAULIC CALCULATIONS

STREET FLOW CALCULATIONS

Project Description

Manning Formula

Normal Depth

Channel Slope

4.81000 %

4.00 ft³/s

Station (ft)

Elevation (ft)

0+00.0	3465.66
0+00.2	3465.66
0+00.4	3465.66
0+00.9	3465.47
0+01.5	3465.28
0+02.0	3465.35
0+02.5	3465.41
0+10.9	3465.58
0+19.5	3465.75
0+27.9	3465.58
0+36.5	3465.41
0+37.0	3465.35
0+37.5	3465.28
0+38.1	3465.47
0+38.6	3465.66
0+38.8	3465.66
0+39.0	3465.66
0+41.0	3465.70
0+43.0	3465.74

Start Station

Ending Station

Roughness Coefficient

(0+00.0, 3465.66)	(0+02.5, 3465.41)	0.013
(0+02.5, 3465.41)	(0+36.5, 3465.41)	0.016

Worksheet for FM1-10-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+36.5, 3465.41)	(0+43.0, 3465.74)	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	0.23	ft
Elevation Range	3465.28 to 3465.75	ft
Flow Area	1.05	ft²
Wetted Perimeter	14.05	ft
Hydraulic Radius	0.08	ft
Top Width	13.96	ft
Normal Depth	0.23	ft
Critical Depth	0.30	ft
Critical Slope	0.00730	ft/ft
Velocity	3.79	ft/s
Velocity Head	0.22	ft
Specific Energy	0.45	ft
Froude Number	2.43	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.23	ft
Critical Depth	0.30	ft

Worksheet for FM1-10-YR

GVF Output Data

Channel Slope	4.81000	%
Critical Slope	0.00730	ft/ft

Cross Section for FM1-10-YR

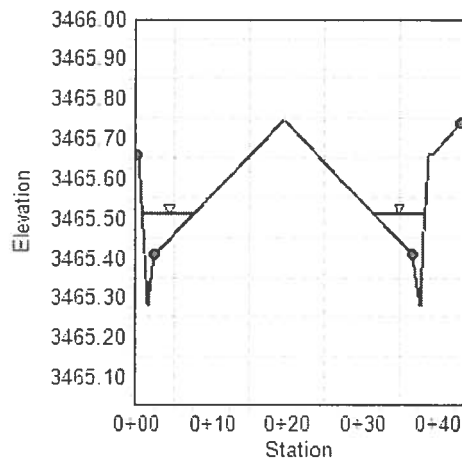
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope	4.81000	%
Normal Depth	0.23	ft
Discharge	4.00	ft ³ /s

Cross Section Image



Worksheet for FM1-100-YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 4.81000 %
Discharge 12.00 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3465.66
0+00.2	3465.66
0+00.4	3465.66
0+00.9	3465.47
0+01.5	3465.28
0+02.0	3465.35
0+02.5	3465.41
0+10.9	3465.58
0+19.5	3465.75
0+27.9	3465.58
0+36.5	3465.41
0+37.0	3465.35
0+37.5	3465.28
0+38.1	3465.47
0+38.6	3465.66
0+38.8	3465.66
0+39.0	3465.66
0+41.0	3465.70
0+43.0	3465.74

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3465.66)	(0+02.5, 3465.41)	0.013
(0+02.5, 3465.41)	(0+36.5, 3465.41)	0.016

Worksheet for FM1-100-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+36.5, 3465.41)	(0+43.0, 3465.74)	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	0.31	ft
Elevation Range	3465.28 to 3465.75	ft
Flow Area	2.48	ft ²
Wetted Perimeter	22.41	ft
Hydraulic Radius	0.11	ft
Top Width	22.29	ft
Normal Depth	0.31	ft
Critical Depth	0.41	ft
Critical Slope	0.00661	ft/ft
Velocity	4.84	ft/s
Velocity Head	0.36	ft
Specific Energy	0.67	ft
Froude Number	2.56	
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	0.31	ft
Critical Depth	0.41	ft

Worksheet for FM1-100-YR

GVF Output Data

Channel Slope	4.81000	%
Critical Slope	0.00661	ft/ft

Cross Section for FM1-100-YR

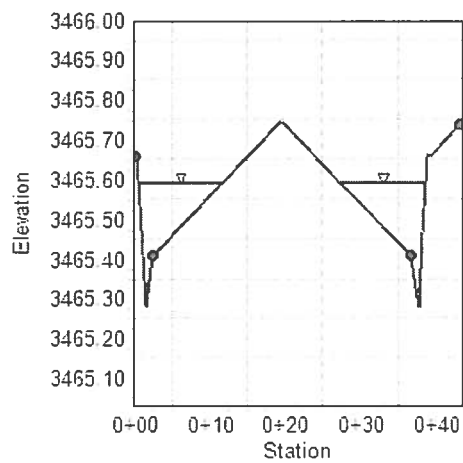
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.81000	%
Normal Depth	0.31	ft
Discharge	12.00	ft ³ /s

Cross Section Image



Project Description

Manning Formula

Normal Depth

Channel Slope

2.03000 %

Discharge

5.00 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3464.61
0+00.2	3464.61
0+00.4	3464.61
0+00.9	3464.43
0+01.5	3464.24
0+02.0	3464.30
0+02.5	3464.36
0+10.9	3464.53
0+19.5	3464.70
0+27.9	3464.53
0+36.5	3464.36
0+37.0	3464.30
0+37.5	3464.24
0+38.1	3464.42
0+38.6	3464.61
0+38.8	3464.61
0+39.0	3464.61
0+41.0	3464.65
0+43.0	3464.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3464.61)	(0+02.5, 3464.36)	0.013
(0+02.5, 3464.36)	(0+36.5, 3464.36)	0.016

Worksheet for FM2-10-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+36.5, 3464.36)	(0+43.0, 3464.69)	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	0.27	ft
Elevation Range	3464.24 to 3464.70	ft
Flow Area	1.76	ft²
Wetted Perimeter	18.67	ft
Hydraulic Radius	0.09	ft
Top Width	18.56	ft
Normal Depth	0.27	ft
Critical Depth	0.32	ft
Critical Slope	0.00722	ft/ft
Velocity	2.84	ft/s
Velocity Head	0.13	ft
Specific Energy	0.40	ft
Froude Number	1.62	
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	0.27	ft
Critical Depth	0.32	ft

Worksheet for FM2-10-YR

GVF Output Data

Channel Slope	2.03000	%
Critical Slope	0.00722	ft/ft

Cross Section for FM2-10-YR

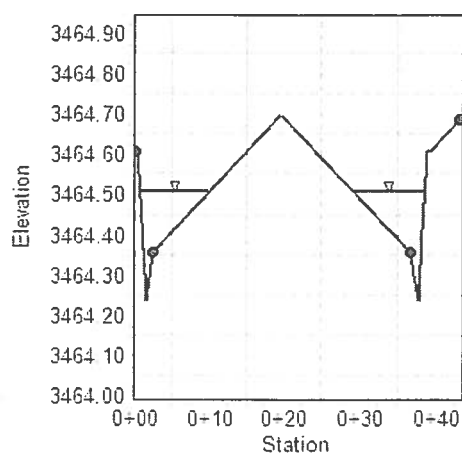
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.03000	%
Normal Depth	0.27	ft
Discharge	5.00	ft ³ /s

Cross Section Image



Worksheet for FM2-100-YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.03000 %
Discharge 14.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3464.61
0+00.2	3464.61
0+00.4	3464.61
0+00.9	3464.43
0+01.5	3464.24
0+02.0	3464.30
0+02.5	3464.36
0+10.9	3464.53
0+19.5	3464.70
0+27.9	3464.53
0+36.5	3464.36
0+37.0	3464.30
0+37.5	3464.24
0+38.1	3464.42
0+38.6	3464.61
0+38.8	3464.61
0+39.0	3464.61
0+41.0	3464.65
0+43.0	3464.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3464.61)	(0+02.5, 3464.36)	0.013
(0+02.5, 3464.36)	(0+36.5, 3464.36)	0.016

Worksheet for FM2-100-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+36.5, 3464.36)	(0+43.0, 3464.69)	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	0.36	ft
Elevation Range	3464.24 to 3464.70	ft
Flow Area	3.88	ft ²
Wetted Perimeter	28.31	ft
Hydraulic Radius	0.14	ft
Top Width	28.17	ft
Normal Depth	0.36	ft
Critical Depth	0.43	ft
Critical Slope	0.00657	ft/ft
Velocity	3.61	ft/s
Velocity Head	0.20	ft
Specific Energy	0.57	ft
Froude Number	1.71	
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	0.36	ft
Critical Depth	0.43	ft

Worksheet for FM2-100-YR

GVF Output Data

Channel Slope	2.03000	%
Critical Slope	0.00657	ft/ft

Cross Section for FM2-100-YR

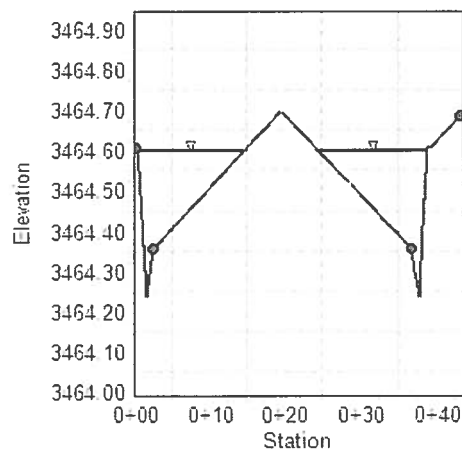
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.03000	%
Normal Depth	0.36	ft
Discharge	14.00	ft ³ /s

Cross Section Image



Project Description

Manning Formula

Normal Depth

Channel Slope

1.46000 %

4.00 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3459.71
0+00.0	3459.71
0+00.1	3459.70
0+00.4	3459.70
0+00.6	3459.63
0+01.5	3459.33
0+02.3	3459.43
0+02.5	3459.45
0+06.1	3459.52
0+19.5	3459.78
0+32.2	3459.51
0+36.5	3459.42
0+37.3	3459.33
0+37.5	3459.30
0+37.8	3459.40
0+38.7	3459.67
0+38.8	3459.67
0+39.0	3459.67
0+41.9	3459.72
0+43.0	3459.74

Start Station

(0+00.0, 3459.71)

Ending Station

(0+02.5, 3459.45)

Roughness Coefficient

0.013

Worksheet for FM3-10-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+02.5, 3459.45)	(0+36.5, 3459.42)	0.016
(0+36.5, 3459.42)	(0+43.0, 3459.74)	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	0.29	ft
Elevation Range	3459.30 to 3459.78 ft	
Flow Area	1.68	ft²
Wetted Perimeter	18.13	ft
Hydraulic Radius	0.09	ft
Top Width	18.03	ft
Normal Depth	0.29	ft
Critical Depth	0.31	ft
Critical Slope	0.00741	ft/ft
Velocity	2.38	ft/s
Velocity Head	0.09	ft
Specific Energy	0.37	ft
Froude Number	1.37	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.29	ft

Worksheet for FM3-10-YR

GVF Output Data

Critical Depth	0.31	ft
Channel Slope	1.46000	%
Critical Slope	0.00741	ft/ft

Project Description

Manning Formula

Normal Depth

1.46000 %

12.00 ft³/s

Station (ft)	Elevation (ft)
0+00.0	3459.70
0+00.0	3459.70
0+00.1	3459.70
0+00.4	3459.70
0+00.6	3459.65
0+01.5	3459.35
0+02.3	3459.45
0+02.5	3459.45
0+06.1	3459.55
0+19.5	3459.75
0+32.2	3459.55
0+36.5	3459.45
0+37.3	3459.35
0+37.5	3459.35
0+37.8	3459.45
0+38.7	3459.65
0+38.8	3459.65
0+39.0	3459.65
0+41.9	3459.75
0+43.0	3459.75

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3459.71)	(0+02.5, 3459.45)	0.013

Worksheet for FM3-100-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+02.5, 3459.45)	(0+36.5, 3459.42)	0.016
(0+36.5, 3459.42)	(0+43.0, 3459.74)	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	0.38	ft
Elevation Range	3459.30 to 3459.78 ft	
Flow Area	3.95	ft²
Wetted Perimeter	29.43	ft
Hydraulic Radius	0.13	ft
Top Width	29.29	ft
Normal Depth	0.38	ft
Critical Depth	0.43	ft
Critical Slope	0.00665	ft/ft
Velocity	3.04	ft/s
Velocity Head	0.14	ft
Specific Energy	0.53	ft
Froude Number	1.46	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.38	ft

Worksheet for FM3-100-YR

GVF Output Data

Critical Depth	0.43	ft
Channel Slope	1.46000	%
Critical Slope	0.00665	ft/ft

Cross Section for FM3-100-YR

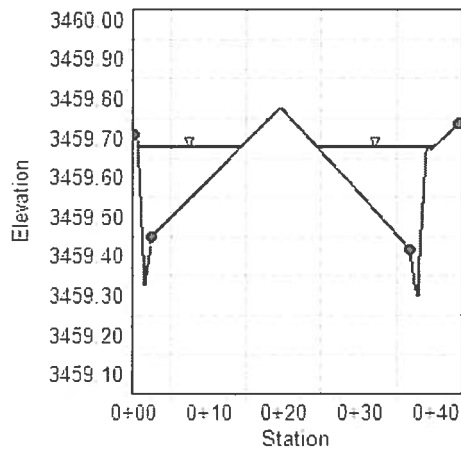
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 1.46000 %
Normal Depth 0.38 ft
Discharge 12.00 ft³/s

Cross Section Image



Project Description	Project Manager	Project Sponsor	Project Stakeholders	Project Risks	Project Budget	Project Timeline	Project Status
Project A	John Doe	Jane Smith	Stakeholder A, Stakeholder B	Risk A, Risk B	\$100,000	2023-01-01 to 2023-06-30	Completed
Project B	Jane Smith	John Doe	Stakeholder C, Stakeholder D	Risk C, Risk D	\$200,000	2023-07-01 to 2023-12-31	In Progress
Project C	John Doe	Jane Smith	Stakeholder E, Stakeholder F	Risk E, Risk F	\$150,000	2024-01-01 to 2024-06-30	On Hold
Project D	Jane Smith	John Doe	Stakeholder G, Stakeholder H	Risk G, Risk H	\$300,000	2024-07-01 to 2024-12-31	Planned

Friction Method Manning Formula

Manning Formula

Normal Depth

Channel Slope	1.16000	%
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1.16000 %

4.00 ft³/s

Roughness Segment Definitions

Worksheet for FM4-10-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+36.5, 3453.52)	(0+43.0, 3453.85)	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	0.28	ft
Elevation Range	3453.39 to 3453.86	ft
Flow Area	1.84	ft ²
Wetted Perimeter	19.09	ft
Hydraulic Radius	0.10	ft
Top Width	18.98	ft
Normal Depth	0.28	ft
Critical Depth	0.30	ft
Critical Slope	0.00744	ft/ft
Velocity	2.18	ft/s
Velocity Head	0.07	ft
Specific Energy	0.35	ft
Froude Number	1.24	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.28	ft
Critical Depth	0.30	ft

Worksheet for FM4-10-YR

GVF Output Data

Channel Slope	1.16000	%
Critical Slope	0.00744	ft/ft

Cross Section for FM4-10-YR

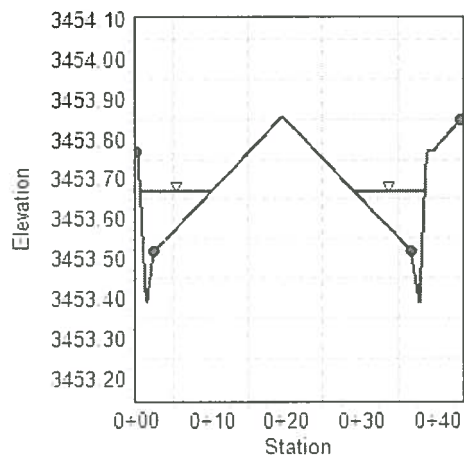
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 1.16000 %
Normal Depth 0.28 ft
Discharge 4.00 ft³/s

Cross Section Image



Worksheet for FM4-100-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+36.5, 3453.52)	(0+43.0, 3453.85)	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	3453.39 to 3453.86	ft
Flow Area	4.38	ft²
Wetted Perimeter	31.16	ft
Hydraulic Radius	0.14	ft
Top Width	31.01	ft
Normal Depth	0.38	ft
Critical Depth	0.41	ft
Critical Slope	0.00684	ft/ft
Velocity	2.74	ft/s
Velocity Head	0.12	ft
Specific Energy	0.50	ft
Froude Number	1.29	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.38	ft
Critical Depth	0.41	ft

Worksheet for FM4-100-YR

GVF Output Data

Channel Slope	1.16000	%
Critical Slope	0.00684	ft/ft

Cross Section for FM4-100-YR

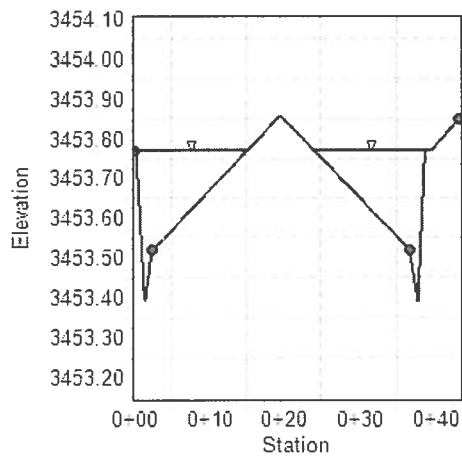
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.16000	%
Normal Depth	0.38	ft
Discharge	12.00	ft ³ /s

Cross Section Image



Project Description

Manning Formula

Normal Depth

Channel Slope

4.32000 %

Discharge

6.00 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3455.47
0+00.1	3455.47
0+00.4	3455.47
0+00.6	3455.39
0+01.5	3455.10
0+02.3	3455.20
0+02.5	3455.22
0+06.1	3455.30
0+19.5	3455.56
0+32.8	3455.30
0+36.5	3455.22
0+37.3	3455.13
0+37.5	3455.10
0+38.4	3455.39
0+38.6	3455.47
0+38.7	3455.47
0+39.0	3455.47
0+39.9	3455.49
0+43.0	3455.55
0+43.0	3455.55

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3455.47)	(0+02.5, 3455.22)	0.013

Worksheet for FM5-10-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+02.5, 3455.22)	(0+36.5, 3455.22)	0.016
(0+36.5, 3455.22)	(0+43.0, 3455.55)	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	0.26	ft
Elevation Range	3455.10 to 3455.56 ft	
Flow Area	1.51	ft ²
Wetted Perimeter	17.17	ft
Hydraulic Radius	0.09	ft
Top Width	17.06	ft
Normal Depth	0.26	ft
Critical Depth	0.33	ft
Critical Slope	0.00702	ft/ft
Velocity	3.97	ft/s
Velocity Head	0.24	ft
Specific Energy	0.51	ft
Froude Number	2.35	
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

Worksheet for FM5-10-YR

GVF Output Data

Critical Depth	0.33	ft
Channel Slope	4.32000	%
Critical Slope	0.00702	ft/ft

Cross Section for FM5-10-YR

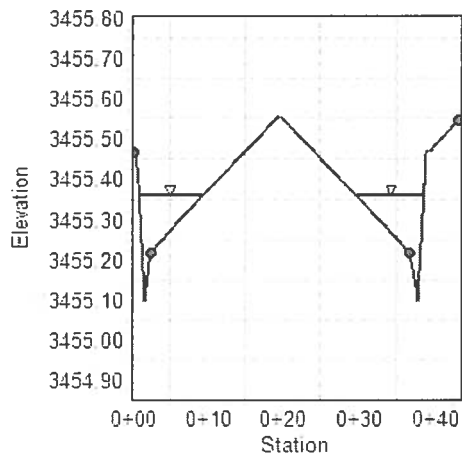
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.32000	%
Normal Depth	0.26	ft
Discharge	6.00	ft ³ /s

Cross Section Image



Worksheet for FM5-100-YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 4.32000 %
Discharge 17.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3455.47
0+00.1	3455.47
0+00.4	3455.47
0+00.6	3455.39
0+01.5	3455.10
0+02.3	3455.20
0+02.5	3455.22
0+06.1	3455.30
0+19.5	3455.56
0+32.8	3455.30
0+36.5	3455.22
0+37.3	3455.13
0+37.5	3455.10
0+38.4	3455.39
0+38.6	3455.47
0+38.7	3455.47
0+39.0	3455.47
0+39.9	3455.49
0+43.0	3455.55
0+43.0	3455.55

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3455.47)	(0+02.5, 3455.22)	0.013

Worksheet for FM5-100-YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+02.5, 3455.22)	(0+36.5, 3455.22)	0.016
(0+36.5, 3455.22)	(0+43.0, 3455.55)	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	0.35	ft
Elevation Range	3455.10 to 3455.56 ft	
Flow Area	3.37	ft²
Wetted Perimeter	26.30	ft
Hydraulic Radius	0.13	ft
Top Width	26.16	ft
Normal Depth	0.35	ft
Critical Depth	0.46	ft
Critical Slope	0.00640	ft/ft
Velocity	5.05	ft/s
Velocity Head	0.40	ft
Specific Energy	0.74	ft
Froude Number	2.48	
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	0.35	ft

Worksheet for FM5-100-YR

GVF Output Data

Critical Depth	0.46	ft
Channel Slope	4.32000	%
Critical Slope	0.00640	ft/ft

Cross Section for FM5-100-YR

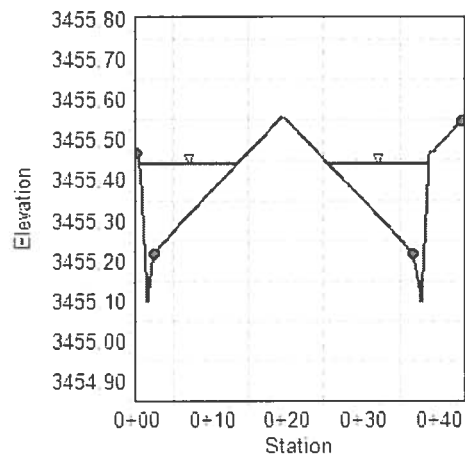
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.32000	%
Normal Depth	0.35	ft
Discharge	17.00	ft ³ /s

Cross Section Image



Worksheet for FM6-10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 4.00000 %
Discharge 6.00 ft³/s
Section Definitions

Station (ft)

Elevation (ft)

0+00.0	3443.05
0+00.0	3443.05
0+00.3	3443.05
0+00.4	3443.05
0+00.5	3442.89
0+00.5	3442.55
0+01.0	3442.60
0+02.0	3442.72
0+02.3	3442.72
0+12.6	3442.93
0+32.0	3443.32
0+51.5	3442.93
0+61.7	3442.72
0+62.0	3442.72
0+62.5	3442.67
0+63.5	3442.55
0+63.5	3442.71
0+63.6	3443.05
0+63.9	3443.05
0+64.0	3443.05
0+66.6	3443.06
0+67.0	3443.06
0+67.7	3443.06
0+68.0	3443.06
0+68.0	3443.07

Roughness Segment Definitions

Worksheet for FM6-10 YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3443.05)	(0+02.0, 3442.72)	0.013
(0+02.0, 3442.72)	(0+62.0, 3442.72)	0.016
(0+62.0, 3442.72)	(0+68.0, 3443.07)	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	0.30	ft
Elevation Range	3442.55 to 3443.32 ft	
Flow Area	1.54	ft²
Wetted Perimeter	16.85	ft
Hydraulic Radius	0.09	ft
Top Width	16.32	ft
Normal Depth	0.30	ft
Critical Depth	0.37	ft
Critical Slope	0.00715	ft/ft
Velocity	3.90	ft/s
Velocity Head	0.24	ft
Specific Energy	0.54	ft
Froude Number	2.24	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

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

Worksheet for FM6-10 YR

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.30	ft
Critical Depth	0.37	ft
Channel Slope	4.00000	%
Critical Slope	0.00715	ft/ft

Cross Section for FM6-10 YR

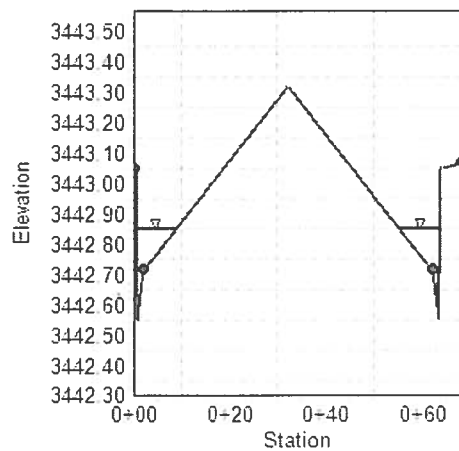
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 4.00000 %
Normal Depth 0.30 ft
Discharge 6.00 ft³/s

Cross Section Image



Project Description

Manning Formula

Normal Depth

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3443.05
0+00.0	3443.05
0+00.3	3443.05
0+00.4	3443.05
0+00.5	3442.85
0+00.5	3442.55
0+01.0	3442.60
0+02.0	3442.75
0+02.3	3442.75
0+12.6	3442.95
0+32.0	3443.35
0+51.5	3442.95
0+61.7	3442.75
0+62.0	3442.75
0+62.5	3442.65
0+63.5	3442.55
0+63.5	3442.75
0+63.6	3443.05
0+63.9	3443.05
0+64.0	3443.05
0+66.6	3443.05
0+67.0	3443.05
0+67.7	3443.05
0+68.0	3443.05
0+68.0	3443.05

Roughness Segment Definitions

Worksheet for FM6-100 YR

Input Data

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3443.05)	(0+02.0, 3442.72)	0.013
(0+02.0, 3442.72)	(0+62.0, 3442.72)	0.016
(0+62.0, 3442.72)	(0+68.0, 3443.07)	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	0.39	ft
Elevation Range	3442.55 to 3443.32 ft	
Flow Area	3.45	ft²
Wetted Perimeter	26.16	ft
Hydraulic Radius	0.13	ft
Top Width	25.47	ft
Normal Depth	0.39	ft
Critical Depth	0.51	ft
Critical Slope	0.00656	ft/ft
Velocity	4.93	ft/s
Velocity Head	0.38	ft
Specific Energy	0.77	ft
Froude Number	2.36	
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

Worksheet for FM6-100 YR

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.39	ft
Critical Depth	0.51	ft
Channel Slope	4.00000	%
Critical Slope	0.00656	ft/ft

Cross Section for FM6-100 YR

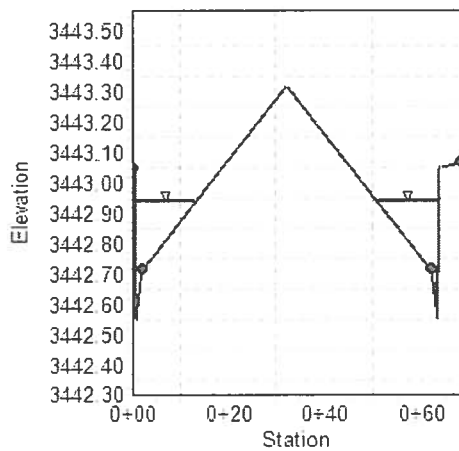
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 4.00000 %
Normal Depth 0.39 ft
Discharge 17.00 ft³/s

Cross Section Image



STANDARD FORM 6
ANALYSIS

Starting HGL and EGL

Tailwater Elevation *	Invert Elevation	Tailwater Depth (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)	
3434.06	3425.34	8.72	2.49	3.5	2.995	3434.06	0.67	3434.73

Phi Index

n Value	Phi
0.013	0.0049247

MAIN (23B PARCEL V ONSITE STORM DRAIN)
ULTIMATE CONDITION SHEET 1 OF 6

STATUS
CHECK

☆

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN 23B PARCEL V (CAPISTRANO)
CALCULATED BY: SDB WO# 7534

WO# 7534

Segment	Segment	Starting	Ending	Diameter	D/S	U/S	Length	Area	Pri	Flow	Slope	Velocity	Hv	Sf	Ave Sf	Hf	Hi	Hm	Hb	Hi	H _c	H Total	U/S EGL	U/S HGL	Pressure	D/S EGL of	Final	Final
Number	Type	Station	Station	(ft)			(ft)	(sq. ft)		(cfs)	(%)	(fps)	(ft)	(ft/s)	(ft/s)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	Elevation	Elevation	Flow ?	U/S Segment	U/S HGL	Final
1	EX PIPE	10+00.00	11+12.99	3.5	3425.34	3428.16	112.99	9.62	0.00492	63.00	2.50	6.55	0.67	0.00392	0.00392	0.44						0.44	3435.17	3434.50	Yes	3432.33	3435.17	3434.50
2	EX SDMH8	11+12.99	11+12.99	3.5	3428.16	3428.16	0.00	9.62	0.00492	63.00	N/A	6.55	0.67	0.00392	0.00392	0.00		0.37				0.37	3435.54	3434.88	Yes	3432.33	3435.54	3434.88
3	EX PIPE	11+12.99	11+51.38	3.5	3428.16	3428.60	38.39	9.62	0.00000	63.00	1.15	6.55	0.67	0.00000	0.00196	0.08					0.08	3435.62	3434.95	Yes	3432.77	3435.62	3434.95	
4	EX SDMH	11+51.38	11+51.38	3.5	3428.60	3428.60	0.00	9.62	0.00000	63.00	N/A	6.55	0.67	0.00000	0.00000	0.00	0.50	0.01			0.51	3436.13	3435.46	Yes	3432.77	3436.13	3435.46	
5	EX PIPE	11+51.38	12+69.07	3.5	3428.60	3429.95	117.69	9.62	0.00492	63.00	1.15	6.55	0.67	0.00392	0.00392	0.46					0.46	3436.59	3435.92	Yes	3434.12	3436.59	3435.92	
6	EX SDMH	12+69.07	12+69.07	3.5	3429.95	3429.95	0.00	9.62	0.00492	63.00	N/A	6.55	0.67	0.00392	0.00392	0.00		0.27			0.27	3436.86	3436.19	Yes	3434.12	3436.86	3436.19	
7	EX PIPE	12+69.07	12+89.07	3.5	3429.95	3431.02	20.00	9.62	0.00492	63.00	5.37	6.55	0.67	0.00392	0.00392	0.08		0.27			0.08	3436.93	3436.27	Yes	3435.19	3436.93	3436.27	
8	EX SDMH	12+89.07	12+89.07	3.5	3431.02	3431.02	0.00	9.62	0.00492	63.00	N/A	6.55	0.67	0.00392	0.00392	0.00		0.27			0.27	3437.20	3436.53	Yes	3435.19	3437.20	3436.53	
9	EX/DEV PIPE	12+89.07	13+72.39	3.5	3431.02	3435.50	83.32	9.62	0.00492	63.00	5.37	6.55	0.67	0.00392	0.00392	0.33					0.33	3437.53	3436.86	Yes	3435.73	3437.53	3436.86	
10	SDMH1	13+72.39	13+72.39	3.0	3435.50	3436.00	0.00	7.07	0.00492	63.00	N/A	8.91	1.23	0.00891	0.00641	0.00	0.44	0.64			1.07	3440.81	3439.57	Yes	3439.92	3440.81	3439.57	
11	PIPE	13+72.39	13+88.99	3.0	3436.00	3436.17	16.60	7.07	0.00492	54.50	1.00	7.71	0.92	0.00666	0.00779	0.13					0.43	3440.93	3440.01	Yes	3440.09	3440.93	3440.01	
12	INLET2	13+88.99	13+93.42	3.0	3436.17	3438.10	4.43	7.07	0.00492	46.00	2.06	6.51	0.86	0.00475	0.00571	0.54					0.49	3441.43	3440.50	Yes	3441.93	3441.43	3440.50	
13	PIPE	13+93.42	14+87.20	3.0	3436.17	3438.10	93.78	7.07	0.00492	46.00	2.06	6.51	0.86	0.00475	0.00571	0.02					0.54	3441.96	3441.30	Yes	3441.76	3441.96	3441.30	
14	INLET3	14+87.20	14+91.63	3.0	3438.10	3438.33	4.43	7.07	0.00492	46.00	1.00	5.09	0.40	0.00291	0.00383	0.09	0.03	0.25			0.35	3442.31	3441.65	Yes	3441.50	3442.31	3441.65	
15	PIPE	14+91.63	15+14.26	3.0	3438.10	3438.33	22.63	7.07	0.00492	36.00	N/A	5.09	0.40	0.002524	0.00345	0.00					0.09	3442.68	3441.64	No	3442.39	3442.68	3441.64	
16	SDMH2	15+14.26	15+14.26	2.0	3438.33	3439.33	0.00	3.14	0.00492	26.00	N/A	8.28	1.06	0.01317	0.01921	0.90					0.90	3443.58	3442.51	Yes	3444.06	3444.06	3443.00	
17	PIPE	15+14.26	15+60.87	2.0	3439.33	3441.00	46.61	3.14	0.00492	26.00	3.58	8.28	1.06	0.01317	0.01317	0.00					0.90	3443.58	3442.51	Yes	3444.06	3444.06	3443.00	
18	SDMH3	15+60.87	15+60.87	2.0	3441.00	3441.00	0.00	3.14	0.00492	26.00	N/A	8.28	1.06	0.01317	0.01317	0.00	0.47				0.47	3444.53	3443.47	Yes	3444.06	3444.53	3443.47	
19	PIPE	15+60.87	19+60.87	2.0	3441.00	3448.40	400.00	3.14	0.00492	26.00	1.85	8.28	1.06	0.01317	0.01317	5.27					5.27	3449.80	3448.74	Yes	3451.46	3451.46	3450.40	
20	SDMH4	19+60.87	19+60.87	2.0	3448.40	3448.40	0.00	3.14	0.00492	26.00	N/A	8.28	1.06	0.01317	0.01317	0.00		0.05			0.05	3451.52	3450.45	Yes	3451.46	3451.52	3450.45	
21	PIPE	19+60.87	20+61.07	2.0	3448.40	3450.40	100.20	3.14	0.00492	26.00	2.00	8.28	1.06	0.01317	0.01317	1.32					1.32	3452.84	3451.77	No	3455.26	3455.26	3451.90	
22	SDMH5	20+61.07	20+61.07	1.5	3450.40	3450.90	0.00	1.77	0.00492	26.00	N/A	14.71	3.38	0.06101	0.03709	0.00	0.75	0.11			0.86	3456.12	3452.75	Yes	3453.12	3456.12	3452.75	
23	PIPE	20+61.07	22+10.03	1.5	3450.90	3459.30	148.96	1.77	0.00492	12.00	5.64	6.79	0.72	0.01300	0.03701	5.51					5.51	3461.63	3460.91	Yes	3461.62	3461.63	3460.91	
24	SDMH7	22+10.03	22+10.03	1.5	3459.30	3459.30	0.00	1.77	0.00492	12.00	N/A	6.79	0.72	0.01300	0.01300	0.00	0.62	0.29			0.91	3462.54	3461.82	Yes	3460.98	3462.54	3461.82	
25	PIPE	22+10.03	22+49.98	1.5	3459.30	3459.70	39.95	1.77	0.00492	6.00	1.00	3.40	0.78	0.00325	0.00812	0.32					0.32	3462.86	3462.69	Yes	3461.38	3462.86	3462.69	
26	INLET8	22+49.98	22+49.98	1.5	3459.70	3459.70	0.00	1.77	0.00492	6.00	N/A	3.40	0.78	0.00325	0.00325	0.00	0.09				0.09	3462.95	3462.77	Yes		3462.95	3462.77	

Manholes/Transition Losses

Segment Number	Straight Through Manhole				Junction Manhole				Bend Losses				Inlet Losses		
	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1															
2	56	0.56	0.66579923	0.372848											
3															
4	0	0.02	0.66579923	0.013316	90	0.25	0.67	0.67	0.499349						
5															
6	45	0.4	0.66579923	0.26632											
7															
8	45	0.4	0.66579923	0.26632											
9															
10	63	0.69	0.92308641	0.63893	90	0.25	0.67	0.92	0.435028						
11															
12													0.5	0.923086	0.461543203
13															
14													0.5	0.657605	0.32880243
15															
16	60	0.63	0.40276744	0.253743	60	0.35	0.40	1.06	0.030622						
17															
18	49	0.44	1.06355777	0.467965											
19															
20	9	0.05	1.06355777	0.053178											
21															
22	20	0.1	1.06355777	0.106356	51	0.44	1.06	0.72	0.748504						
23															
24	46	0.4	0.716031	0.286412	44	0.51	0.72	0.18	0.624737						
25															
26													0.5	0.179008	0.089503675

Worksheet for EX. 42" Pipe

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	2.50000	%
Diameter	3.50	ft
Discharge	63.00	ft ³ /s

Results

Normal Depth	1.53	ft
Flow Area	4.05	ft ²
Wetted Perimeter	5.06	ft
Hydraulic Radius	0.80	ft
Top Width	3.47	ft
Critical Depth	2.49	ft
Percent Full	43.7	%
Critical Slope	0.00538	ft/ft
Velocity	15.57	ft/s
Velocity Head	3.77	ft
Specific Energy	5.30	ft
Froude Number	2.54	
Maximum Discharge	171.11	ft ³ /s
Discharge Full	159.07	ft ³ /s
Slope Full	0.00392	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	43.74	%
Downstream Velocity	Infinity	ft/s

Worksheet for EX. 42" Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.53	ft
Critical Depth	2.49	ft
Channel Slope	2.50000	%
Critical Slope	0.00538	ft/ft

Cross Section for EX. 42" Pipe

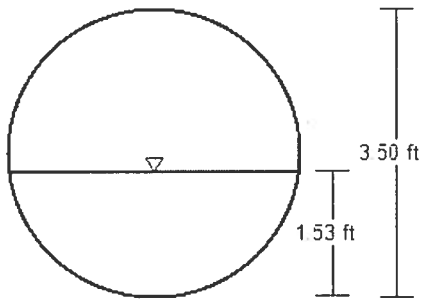
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	2.50000 %
Normal Depth	1.53 ft
Diameter	3.50 ft
Discharge	63.00 ft ³ /s

Cross Section Image



V 1 
H 1

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3461.82	3459.30	2.52	0.95	1.5	1.225	3461.824	0.179008	3462.00

Phi Index

n Value	Phi
0.013	0.0049247

18" LATERAL AT D.I.#7
ULTIMATE CONDITION

SHEET 2 OF 6

STATUS
CHECK ☆

STANDARD FORM 6
DEVELOPMENT: SUMMERLIN 23B PARCEL V (CAPISTRANO)
CALCULATED BY: SDB
WO# 7534

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq. ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H _u (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+09.55	1.5	3459.30	3460.40	9.55	1.77	0.00492	6.00	11.52	3.40	0.18	0.00325	0.00325	0.03						0.03	3462.03	3461.85	Yes	3462.08	3462.08	3461.90
2	INLET	10+09.55	10+09.55	1.5	3460.40	3460.40	0.00	1.77	0.00492	6.00	N/A	3.40	0.18	0.00325	0.00325	0.00						0.09	3462.17	3461.99				
9																												
10																												
11																												
12																												
13																												
14																												
15																												
16																												
17																												
18																												
19																												
20																												
21																												
22																												

Manholes/Transition Losses

Straight Through Manhole				Junction Manhole				Bend Losses				Inlet Losses			
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1													0.5	0.179008	0.089503875
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															

Worksheet for 18" Lateral for D.I.#7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	11.52000	%
Diameter	1.50	ft
Discharge	6.00	ft³/s

Results

Normal Depth	0.42	ft
Flow Area	0.40	ft²
Wetted Perimeter	1.66	ft
Hydraulic Radius	0.24	ft
Top Width	1.34	ft
Critical Depth	0.95	ft
Percent Full	27.8	%
Critical Slope	0.00622	ft/ft
Velocity	14.99	ft/s
Velocity Head	3.49	ft
Specific Energy	3.91	ft
Froude Number	4.84	
Maximum Discharge	38.35	ft³/s
Discharge Full	35.65	ft³/s
Slope Full	0.00326	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	27.76	%
Downstream Velocity	Infinity	ft/s

Worksheet for 18" Lateral for D.I.#7

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.42	ft
Critical Depth	0.95	ft
Channel Slope	11.52000	%
Critical Slope	0.00622	ft/ft

Cross Section for 18" Lateral for D.I.#7

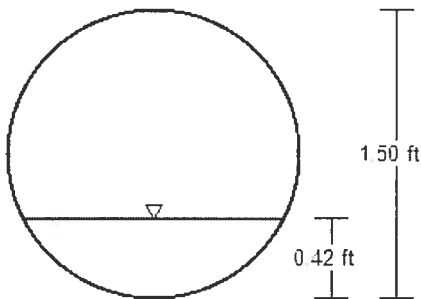
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	11.52000 %
Normal Depth	0.42 ft
Diameter	1.50 ft
Discharge	6.00 ft ³ /s

Cross Section Image



V 1
H 1

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3440.64	3439.83	0.81	1.22	1.5	1.36	3441.19	0.497244	3441.69

Phi Index

n Value	Phi
0.013	0.0049247

18" LATERAL AT D.I.#4
ULTIMATE CONDITION

SHEET 3 OF 6

STATUS
CHECK ☆

STANDARD FORM 6
DEVELOPMENT: SUMMERLIN 23B PARCEL V (CAPISTRANO)
CALCULATED BY: SDB
WO# 7534

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq. ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H_ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+12.37	1.5	3439.83	3439.95	12.37	1.77	0.00492	10.00	1.00	5.66	0.50	0.00903	0.00903	0.11						0.11	3441.80	3441.30	Yes	3441.95	3441.95	3441.45
2	INLET	10+12.37	10+12.37	1.5	3439.95	3439.95	0.00	1.77	0.00492	10.00	N/A	5.66	0.50	0.00903	0.00903	0.00					0.25		3442.20	3441.70				
9																												
10																												
11																												
12																												
13																												
14																												
15																												
16																												
17																												
18																												
19																												
20																												
21																												
22																												

Manholes/Transition Losses

Straight Through Manhole				Junction Manhole				Bend Losses				Inlet Losses				
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hi (ft)		Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2														0.5	0.497244	0.248621875
3																
4																
5																
6																
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Worksheet for 18" Lateral for D.I.#4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00000	%
Diameter	1.50	ft
Discharge	10.00	ft ³ /s

Results

Normal Depth	1.17	ft
Flow Area	1.48	ft ²
Wetted Perimeter	3.25	ft
Hydraulic Radius	0.46	ft
Top Width	1.24	ft
Critical Depth	1.22	ft
Percent Full	78.0	%
Critical Slope	0.00921	ft/ft
Velocity	6.77	ft/s
Velocity Head	0.71	ft
Specific Energy	1.88	ft
Froude Number	1.09	
Maximum Discharge	11.30	ft ³ /s
Discharge Full	10.50	ft ³ /s
Slope Full	0.00906	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	77.96	%
Downstream Velocity	Infinity	ft/s

Worksheet for 18" Lateral for D.I.#4

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.17	ft
Critical Depth	1.22	ft
Channel Slope	1.00000	%
Critical Slope	0.00921	ft/ft

Cross Section for 18" Lateral for D.I.#4

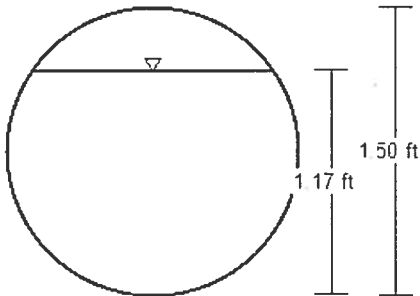
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.00000 %
Normal Depth	1.17 ft
Diameter	1.50 ft
Discharge	10.00 ft ³ /s

Cross Section Image



V 1
H 1

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3439.57	3437.50	2.07	1.13	1.5	1.315	3439.572	0.359259	3439.93

Phi Index

n Value	Phi
0.013	0.0049247

18" LATERAL AT D.I.#1
ULTIMATE CONDITION

SHEET 4 OF 6

STATUS
CHECK

✖

STANDARD FORM 6
DEVELOPMENT: SUMMERLIN 23B PARCEL V (CAPISTRANO)
CALCULATED BY: SDB
WO# 7534

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq. ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H ₁ (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL	
1	PIPE	10+00.00	10+45.26	1.5	3437.50	3437.95	45.26	1.77	0.00492	8.50	1.00	4.81	0.36	0.00652	0.00652	0.30							0.30	3440.23	3439.87	Yes	3439.81	3440.23	3439.87
2	INLET1	10+45.26	10+45.26	1.5	3437.95	3437.95	0.00	1.77	0.00492	8.50	N/A	4.81	0.36	0.00652	0.00652	0.00					0.18		0.18	3440.41	3440.05				
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Manholes/Transition Losses

Straight Through Manhole					Junction Manhole					Bend Losses					Inlet Losses				
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)				
1																			
2													0.5	0.359259	0.179629305				
3																			
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Worksheet for 18" Lateral for D.I.#1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00000	%
Diameter	1.50	ft
Discharge	8.50	ft ³ /s

Results

Normal Depth	1.02	ft
Flow Area	1.28	ft ²
Wetted Perimeter	2.92	ft
Hydraulic Radius	0.44	ft
Top Width	1.40	ft
Critical Depth	1.13	ft
Percent Full	68.2	%
Critical Slope	0.00781	ft/ft
Velocity	6.62	ft/s
Velocity Head	0.68	ft
Specific Energy	1.70	ft
Froude Number	1.22	
Maximum Discharge	11.30	ft ³ /s
Discharge Full	10.50	ft ³ /s
Slope Full	0.00655	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	68.23	%
Downstream Velocity	Infinity	ft/s

Worksheet for 18" Lateral for D.I.#1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.02	ft
Critical Depth	1.13	ft
Channel Slope	1.00000	%
Critical Slope	0.00781	ft/ft

Cross Section for 18" Lateral for D.I.#1

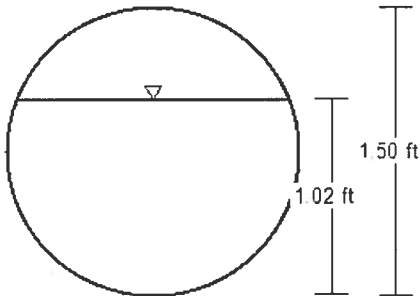
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.00000 %
Normal Depth	1.02 ft
Diameter	1.50 ft
Discharge	8.50 ft ³ /s

Cross Section Image



V 1 
H 1

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3452.75	3450.40	2.35	1.35	2.0	1.675	3452.755	0.308369	3453.06

Phi Index

n Value	Phi
0.013	0.0049247

24" LATERAL WITH MH6
ULTIMATE CONDITION

SHEET 5 OF 6

STATUS
CHECK

☆

STANDARD FORM 6
DEVELOPMENT: SUMMERLIN 23B PARCEL V (CAPISTRANO)
CALCULATED BY: SDB
WO# 7534

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq. ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv (ft)	Sf (ft/ft)	Ave. Sf (ft/ft)	Hf (ft)	Hj (ft)	Hm (ft)	Hb (ft)	Hi (ft)	H (ft)	H Total (ft)	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+40.36	2.0	3450.40	3453.89	40.36	3.14	0.00492	14.00	8.65	4.46	0.31	0.00382	0.00382	0.15						0.15	3453.22	3452.91	No	3456.36	3456.36	3455.39
2	SDMH6	10+40.36	10+40.36	1.5	3453.89	3454.39	0.00	1.77	0.00492	14.00	N/A	7.92	0.97	0.01769	0.01075	0.00	0.06	0.01				0.07	3456.44	3455.46	No	3456.13	3456.44	3455.46
9	PIPE	10+40.36	10+71.19	1.5	3454.39	3454.70	30.83	1.77	0.00492	7.00	1.00	3.96	0.24	0.00442	0.01106	0.34						0.34	3456.78	3456.53	Yes	3456.44	3456.78	3456.53
10	INLET6	10+71.19	10+71.19	1.5	3454.70	3454.70	0.00	1.77	0.00492	7.00	N/A	3.96	0.24	0.00442	0.00442	0.00				0.12		0.12	3456.90	3456.65				
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Manholes/Transition Losses

Straight Through Manhole				Junction Manhole				Bend Losses				Inlet Losses				
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)		Kb	Hv (ft)	Hb (ft)	Ki	Hv (ft)	Hi (ft)
1																
2	0	0.02	0.3083688	0.006167	90	0.25	0.31	0.97	0.064719							
3																
4														0.5	0.243649	0.121824719
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Worksheet for 24" Lateral with MH6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	8.65000	%
Diameter	2.00	ft
Discharge	14.00	ft³/s

Results

Normal Depth	0.62	ft
Flow Area	0.83	ft²
Wetted Perimeter	2.37	ft
Hydraulic Radius	0.35	ft
Top Width	1.85	ft
Critical Depth	1.35	ft
Percent Full	31.1	%
Critical Slope	0.00605	ft/ft
Velocity	16.77	ft/s
Velocity Head	4.37	ft
Specific Energy	5.00	ft
Froude Number	4.41	
Maximum Discharge	71.57	ft³/s
Discharge Full	66.53	ft³/s
Slope Full	0.00383	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	31.14	%
Downstream Velocity	Infinity	ft/s

Worksheet for 24" Lateral with MH6

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.62	ft
Critical Depth	1.35	ft
Channel Slope	8.65000	%
Critical Slope	0.00605	ft/ft

Cross Section for 24" Lateral with MH6

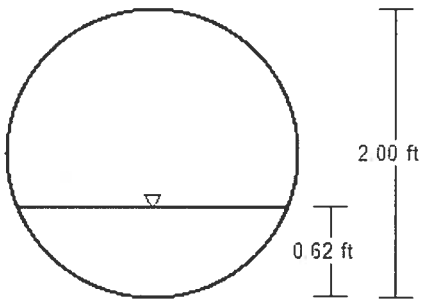
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	8.65000 %
Normal Depth	0.62 ft
Diameter	2.00 ft
Discharge	14.00 ft ³ /s

Cross Section Image



V 1 
H 1

Starting HGL and EGL

Tailwater Elevation	Outlet Invert Elevation	Tailwater Depth (ft)	Critical Depth- Dc (ft)	Pipe Diameter- D (ft)	(Dc+D)/2 (ft)	Starting HGL (ft)	Hv (ft)	Starting EGL (ft)
3455.46	3454.39	1.07	1.02	1.5	1.26	3455.65	0.243649	3455.89

Phi Index

n Value	Phi
0.013	0.0049247

18" LATERAL AT D.I.#5
ULTIMATE CONDITION

SHEET 6 OF 6

STATUS
CHECK

☆

STANDARD FORM 6

DEVELOPMENT: SUMMERLIN 23B PARCEL V (CAPISTRANO)
CALCULATED BY: SDB

WO# 7534

Segment Number	Segment Type	Starting Station	Ending Station	Diameter (ft)	D/S Invert	U/S Invert	Length (ft)	Area (sq. ft)	Phi	Flow (cfs)	Slope (%)	Velocity (fps)	Hv	Sf	Ave. Sf	Hf	Hj	Hm	Hb	Hi	H	H Total	U/S EGL Elevation	U/S HGL Elevation	Pressure Flow ?	D/S EGL of U/S Segment	Final U/S EGL	Final U/S HGL
1	PIPE	10+00.00	10+18.38	1.5	3454.39	3454.57	18.38	1.77	0.00492	7.00	1.00	3.96	0.24	0.00442	0.00442	0.08						0.08	3455.97	3455.73	Yes	3456.32	3456.32	3456.07
2	INLET5	10+18.38	10+18.38	1.5	3454.57	3454.57	0.00	1.77	0.00492	7.00	N/A	3.96	0.24	0.00442	0.00442	0.00				0.12		0.12	3456.44	3456.20				
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Manholes/Transition Losses

Straight Through Manhole		Junction Manhole				Bend Losses				Inlet Losses			
Segment Number	Deflection Angle	Km	Hv (ft)	Hm (ft)	Junction Angle	Kj	D/S Hv (ft)	U/S Hv (ft)	Hj (ft)	Ki	Hv (ft)	Hi (ft)	
1													
2										0.5	0.243649	0.121824719	
3													
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Worksheet for 18" Lateral for D.I.#5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	1.00000	%
Diameter	1.50	ft
Discharge	7.00	ft³/s

Results

Normal Depth	0.90	ft
Flow Area	1.10	ft²
Wetted Perimeter	2.65	ft
Hydraulic Radius	0.42	ft
Top Width	1.47	ft
Critical Depth	1.02	ft
Percent Full	59.7	%
Critical Slope	0.00676	ft/ft
Velocity	6.36	ft/s
Velocity Head	0.63	ft
Specific Energy	1.52	ft
Froude Number	1.30	
Maximum Discharge	11.30	ft³/s
Discharge Full	10.50	ft³/s
Slope Full	0.00444	ft/ft
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
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	59.69	%
Downstream Velocity	Infinity	ft/s

Worksheet for 18" Lateral for D.I.#5

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.90	ft
Critical Depth	1.02	ft
Channel Slope	1.00000	%
Critical Slope	0.00676	ft/ft

Cross Section for 18" Lateral for D.I.#5

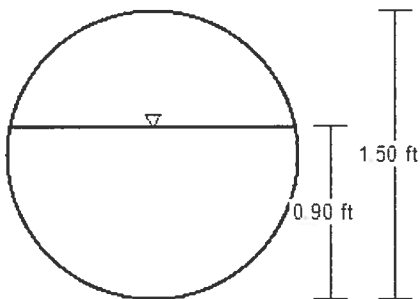
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	1.00000 %
Normal Depth	0.90 ft
Diameter	1.50 ft
Discharge	7.00 ft ³ /s

Cross Section Image



V 1 
H 1

DROP INLET CALCULATIONS

ROP INLET CALCULATIONS - ON GRADE

DEVELOPMENT SUMMERLIN 23B PARCEL V

LOCATION INLETS 7 AND 8

CALCULATED BY SDB

WORK ORDER # 7534

RESULTS

CURB OPENING LENGTH: 15.0 ft

GRATE LENGTH: 15.0 ft

TOTAL FLOW INTERCEPTED 6 cfs

CURB OPENING DROP INLET --- ON GRADE WITH LOCAL DEPRESSION

```

** *****
*
* Gutter flow, Q..... 6.0 cfs
* Flow depth, y..... 0.31 feet
* Street slope, S..... 4.81 %
* Cross slope, Sx..... 2.00 %
* Opening length, L..... 7.50 feet
* Gutter depr, a..... 1.68 in
* MANNING'S n..... 0.02
*
** *****

```

Note:

1. Equations from FHWA HEC-12 dated March, 1984.

RECTANGULAR GRATE DROP INLET --- ON GRADE

```

** *****
*
* Gutter flow, Q..... 6.0 cfs
* Flow velocity, V..... 4.8 fps
* Flow depth, Y..... 0.31 feet
* Grate length, L..... 7.50 feet
* Gutter width, W..... 1.5 feet
* Cross slope, Sx..... 2.00 %
*
** *****

```

Note:

1. Ratio of frontal flow intercepted to total frontal flow, $Rf=1.0$
2. Frontal to total gutter flow ratio is for composite cross slope.
3. Equations from FHWA HEC-12 dated March, 1984.

RESULTS

CURB OPENING LENGTH: 7.50 ft

NUMBER OF GRATES:

FLOW INTERCEPTED BY CURB: 5.2 cfs

FLOW INTERCEPTED BY GRATE: 5.6 cfs

11 cfs

RECTANGULAR GRATE DROP INLET --- SUMP CONDITION

[illegible]

Note:

1. Orifice condition depends on bar config., grate size, depth.
2. Equations from FHWA HEC-12 dated March, 1984.
3. Grate open area, A, based on Neenah R-4999-L9 grate(0.9 Sq.Ft Open Area)

DROP INLET CALCULATIONS - ON GRADE

DEVELOPMENT SUMMERLIN 23B PARCEL V

LOCATION INLETS 1 AND 2

CALCULATED BY SDB

WORK ORDER # 7534

RESULTS

CURB OPENING LENGTH: 17.5 ft

GRATE LENGTH: 17.5 ft

TOTAL FLOW INTERCEPTED 9 cfs

CURB OPENING DROP INLET		ON GRADE WITH LOCAL DEPRESSION		RECTANGULAR GRATE DROP INLET		ON GRADE	
*****		*****		*****		*****	
* Gutter flow, Q.....	8.5 cfs	* Frontal ratio, Eo.....	0.43	* Gutter flow, Q.....	8.5 cfs	* Efficiency:	*
* Flow depth, y.....	0.39 feet	* Eq cross-slope, Se.....	6.02 %	* Flow velocity, V.....	4.9 fps	* Frontal: total	* 24 %
* Street slope, S.....	4.00 %	*	*	* Flow depth, Y.....	0.39 feet	* Side flow, R.....	* 53 %
* Cross slope, Sx.....	2.00 %	*	*	* Grate length, L.....	8.75 feet	* Grate, E.....	* 64 %
* Opening length, L.....	8.75 feet	* 100% intercept.....	37.6 feet	* Gutter width, W.....	1.5 feet	* Top width, T....	* 19.5 feet
* Gutter depr, a.....	1.68 in	* Efficiency.....	37.9 %	* Cross slope, Sx.....	2.00 %	* Intercepted flow	* 5.4 cfs
* MANNING'S n.....	0.02	* Intercepted flow.....	3.2 cfs	*	*	*****	***
*	*	*	*	*	*	*****	***

Note:

1. Ratio of frontal flow intercepted to total frontal flow, Rf=1.0
2. Frontal to total gutter flow ratio is for composite cross slope.
3. Equations from FHWA HEC-12 dated March, 1984.

Note:
1. Equations from FHWA HEC-12 dated March, 1984.

REFERENCE MATERIAL

**UPDATE TO CONCEPTUAL DRAINAGE
STUDY FOR SUMMERLIN VILLAGE 23B**

**UPDATE TO THE
CONCEPTUAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 23B**

62023B-100

July 2012

Prepared for:

**The Howard Hughes Corporation
10000 W. Charleston Blvd., Suite 200
Las Vegas, Nevada 89135
Phone: (702) 791-4200
Fax: (702) 791-4450**

Prepared by:

**G. C. Wallace Companies
1555 S. Rainbow Blvd.
Las Vegas, Nevada 89146
Phone: (702) 804-2000
Fax: (702) 804-2299**



G.C. WALLACE, INC.
P.O. BOX 10000, LAS VEGAS, NV 89110

Writer's Contact Information:

702.804.2248

62023B-100

July 25, 2012

Albert Y. Sung, PE
Flood Control Project Manager
City of Las Vegas - Land Development Services
Department of Public Works
333 N. Rancho Drive
Las Vegas, Nevada 89106

Re: Conceptual Drainage Study for Summerlin Village 23B

Dear Mr. Sung:

The purpose of this letter is to serve as the update to the Conceptual Drainage Study for the subject project. The *Conceptual Drainage Study for Summerlin Village 23B* (hereinafter referred to as the Conceptual Study), was originally approved by the City of Las Vegas Public Works Department (CLV) on October 24, 2003, with concurrence from the Clark County Regional Flood Control District (CCRFCD) on November 20, 2003. The approved Conceptual Study presented ultimate conditions onsite drainage patterns and proposed major storm drain facilities within the exterior and interior roadways. Since approval of the study, the site plan and drainage design flow patterns for the parcels and proposed storm drain facilities have been revised. The calculations provided herewith serve to provide an ultimate condition for Village 23B and will supersede those of the Conceptual Study and serve to update the previously approved study. Pertinent reference materials from the Conceptual Study have been included in Appendix C. The methodologies and calculations presented in this report are in compliance with the *CCRFCD Hydrologic Criteria and Drainage Design Manual* (Manual). Copies of the approval letters have been included in Appendix C.

Since this is a conceptual study, all that is addressed is the existing and ultimate conditions. The interim conditions will be addressed in individual technical studies. It is not known at this time in what order the area will be developed. However, upon development, each area will be properly protected in the interim and ultimate conditions. It should be noted that several individual technical studies for roadways within Village 23B have been approved and will be updated according to this proposed Conceptual Study.

Existing conditions for the site were addressed in the *Technical Drainage Study for Summerlin Village 23B Rough Grading* (hereinafter referred to as the Rough Grade Study) and the *Technical Drainage Study for Summerlin Village 23A/23B/23B Alta Drive Street Improvements* (hereinafter referred to as the Alta Drive Street Study). A copy of Figure 6 from the Alta Drive Street Study showing the existing conditions drainage patterns has been included in Appendix C. Along the western boundary of the Village 23B site, the Sky Vista Collector Channel has been constructed as part of the Rough Grade Study and currently protects the site from offsite flows. Presently, onsite runoff from Village 23B is directed via existing berms to the existing graded channel in Desert Foothills Drive, discharging to the existing 7-foot wide by 7-foot high lateral off the 10-foot wide by 8-foot high RCB storm drain system in Alta Drive. Alta Drive has also been rough graded between the existing Sky Vista Drive Collector Channel and Desert Foothills Drive. The existing 10-foot wide by 8-foot high RCB storm drain facility was constructed within Alta Drive with the *Technical Drainage Study for Summerlin Villages 23A/23B, Alta Drive RCB Regional Drainage Improvements* (hereinafter referred to as the Alta Drive RCB Study). Per the Alta Drive Street Study, additional stubs were provided to collect existing conditions flows. As shown on the referenced Alta Drive Street Study Figure 6: 1) the exposed 60-inch RCP lateral at the intersection of Fox Hill Drive and Alta Drive collects existing conditions flows generated between the Sky Vista Drive collector channel and Fox Hill Drive; 2) the exposed 36-inch RCP lateral at the existing stockpile berm collects existing conditions flows generated between Fox Hill Drive and the stockpile berm; 3) the exposed 30-inch RCP lateral at the existing pedestrian underpass has not been designed to collect existing conditions flows; 4) an existing channel/berm west of Desert Foothills Drive conveys existing conditions flows generated east of the stockpile berm into the Desert Foothills Channel. Pertinent reference materials have been included in Appendix C.

The portion of the soils map containing Village 23B has been revised and has been included in Appendix A. The landuse and curve numbers for the onsite subbasins are consistent with the *2008 Las Vegas Valley Flood Control Master Plan Update* (hereinafter referred to as the 2008 MPU). The onsite ultimate conditions subbasins conservatively assume a landuse of Apartments/Condos/Commercial, Residential, Natural Desert Landscaping, Streets, and Open Space. Weighted curve numbers for ultimate conditions were calculated. Curve numbers ranging from 74 to 95.6 were determined for the ultimate conditions onsite subbasins. Curve number calculations for ultimate conditions as well as a curve number matrix of each soil type for each landuse is included in Appendix A.

The ultimate conditions for this project assumes fully developed parcels within Village 23B, full street improvements of the interior and exterior roadways, and offsites as fully developed. The 2008 MPU subbasins for the offsite drainage area west of Sky Vista Drive and north of Far Hills Avenue have been referenced; however the drainage patterns are generally consistent with the previously approved studies. Pertinent reference material has been included in Appendix C. Per the *2006 Summerlin West Planning Area Flood Control Master Plan* (hereinafter referred to as the 2006 Summerlin West MP), the area between the existing Detention Basin 5, Alta Drive and Sky Vista Drive will discharge into the Alta Drive storm drain system during ultimate conditions. The 2008 MPU references the 2006 Summerlin West MP subbasins, but did not include the area shown as Basin 5-9A1 on Figure 6U. Additionally, due to the site plan changes, concentration points have been relocated. Figure 6U depicts the overall subbasins and drainage patterns used in the ultimate conditions hydrologic analysis. Lag time calculations for the onsite drainage basin are included in Appendix A on Standard Form 4. The results of the HEC-1 model have been summarized in Table 1. A copy of the HEC-1 model has been included in Appendix A.

TABLE 1 SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL			
SB OR CP*	AREA (AC)	100 YR (CFS)	10 YR (CFS)
5-9A1	38.58	126	60
AA	18.52	63	31
BB	32.03	97	42
C-47	-	676	288
C-47A	-	2750	1699
CC	28.57	83	36
C-CR	-	2233	1602
CCSWFH-7	-	3477	1728
COS-5	8.79	13	3
CP-AL	-	2362	1630
CP-FH	-	765	339
CSWAA-1	-	2220	1593
CSWFH-5	-	679	290
ES-2	13.33	49	24
NP-2	12.54	21	5
P	24.03	67	29
PT0	-	139	61
PT1	-	211	93
PT10	-	409	176
PT11	-	169	70
PT12	-	578	244

TABLE 1 SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL			
SB OR CP*	AREA (AC)	100 YR (CFS)	10 YR (CFS)
PT13	-	645	273
PT2	-	282	123
PT3	-	309	136
PT3A	-	2298	1619
PT4	-	2328	1624
PT5	-	2334	1625
PT5A	-	2346	1627
PT6	-	149	66
PT7	-	166	73
PT9A	-	251	107
PT9B	-	107	47
PT9C	-	352	153
PT9D	-	393	170
Q1	14.87	45	19
Q2	13.34	40	17
R	25.54	77	33
S	19.69	60	26
ST1	8.00	26	13
ST2	4.25	17	8
ST3	4.12	17	9
ST4	5.98	21	10
ST-AL	13.03	43	21
ST-CR	16.43	48	24
ST-DF	12.14	33	16
ST-FH	13.14	44	22
SUM5OT	-	2149	1548
SWAA-1	-	326	134
T	29.70	87	38
U	25.15	75	33
V	25.45	77	33
W	23.78	74	32
X	23.31	70	30
Y	24.30	75	33
Z	25.01	80	36

*See Figure 6U.

All proposed flood control facilities have been shown on Figure 7U. Design of the proposed storm drain facilities have been based on normal depth calculations. All proposed facilities have been sized to convey ultimate conditions flowrates. Proposed mainline and lateral pipe sizes were calculated using normal depth and have been upsized by 6 inches in diameter to provide for losses and future design flexibility. Normal depth calculations for the recommended facilities have been included in Appendix B. Note that detailed hydraulic analysis for the proposed facilities will be provided in future technical drainage study submittals upon site development of this project. Drop inlets will be located and sized with individual technical studies for future roadway improvements. A total of six mainline systems

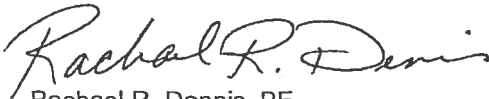
are existing or have been proposed with this project: 1) Proposed Sky Vista Drive System; 2) Proposed Far Hills System; 3) Proposed Fox Hill Drive System; 4) Existing Alta Drive System; 5) Proposed Antelope Ridge Drive System and 6) Proposed Desert Foothills Drive System. Please refer to Figure 7U for facility flows and sizes.

In general, the approved drainage patterns are consistent with the previously approved referenced drainage studies and the proposed site plan and storm drain facilities do not significantly alter existing peak flows or the character of flows downstream of the development and do not pose any negative impacts on downstream facilities and development.

If you have any questions or require additional information, please contact our office at 804-2000.

Cordially,

G. C. WALLACE, INC.



Rachael R. Dennis, PE
Project Manager
Flood Control Division

rrd/vlr

c: Jerry Pruitt, GCW
Josh Johnson, GCW
Derick Yoro, GCW
Ryan Belsick, GCW
Daniel Kelley, GCW

**UPDATE # 2 TO THE TECHNICAL
DRAINAGE STUDY FOR
SUMMERLIN VILLAGE 23B**

**UPDATE #2 TO THE
TECHNICAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 23B
FOX HILL DRIVE IMPROVEMENTS –
ALTA TO ANTELOPE RIDGE DRIVE
(INTERIOR ROAD IMPROVEMENTS)**

62023B-204

November 2012

Prepared for:

**The Howard Hughes Company, LLC
10000 W. Charleston Blvd., Suite 200
Las Vegas, Nevada 89135
Phone: (702) 791-4200
Fax: (702) 791-4450**



G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: December 6, 2012
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Technical Drainage Study for:	
Summerlin Village 23B – Interior Road Improvements Update #2 for Fox Hill Drive (From Alta to Antelope Ridge)		COPIES TO: G.C. Wallace, Inc.
Cross Streets:	Alta Drive & Desert Foothills Drive	Howard Hughes Corporation
File Number:	F:\Depot\DSMEMOS\DS4102F.doc	Bart Anderson, P.E., DevCo
Parcel Number:	137-22-000-015	
Zoning Action:	TMP - 14767	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES X	NO

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Trn. No.
1 st Submittal	11/22/2006	12/12/2006	Not Approved	\$400.00	58334: \$400
2 nd Submittal	1/26/2007	2/9/2007	Not Approved	\$400.00	61980: \$400
3 rd Submittal	3/23/2007	4/4/2007	Conditional Approval	\$400.00	65643: \$400
CCRCD	5/21/2007	6/4/2007	Concurrence	N/C	N/C
4 th Submittal & Supplement	10/11/2012 & 10/29/2012	10/30/2012	Approved	\$100.00	\$100.00
5 th Submittal & Supplement	11/14/2012 & 11/29/2012	12/6/2012	See Comments Below	\$100.00	301859: \$100
TOTAL FEES (LDDRS):				\$1,400.00	----

REMARKS:

5th Submittal & Supplement: Update #2 & Supplement for the street improvements of Fox Hill Drive from Alta Drive to Antelope Ridge Drive

4th Submittal & Supplement: Update #1 & Supplement for the street improvements of Antelope Ridge Drive

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

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

1. All interim berms / channels are owned and to be privately maintained by Howard Hughes Corporation.

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

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc.

REVISED (ULT) V23B Fox Hill Mainline (South) - Parcel X to Alta

DATE 12/09/12 FILE: SF6.xls

CONDUIT DATA										FLOW DATA										ENERGY LOSS DATA										EGL & HGL				COMMENTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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REFERENCE MATERIAL
UPDATE # 2 TO THE CONCEPTUAL
DRAINAGE STUDY FOR SUMMERLIN
VILLAGE 23B

**UPDATE #2 TO THE
CONCEPTUAL DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 23B**

62023B-100

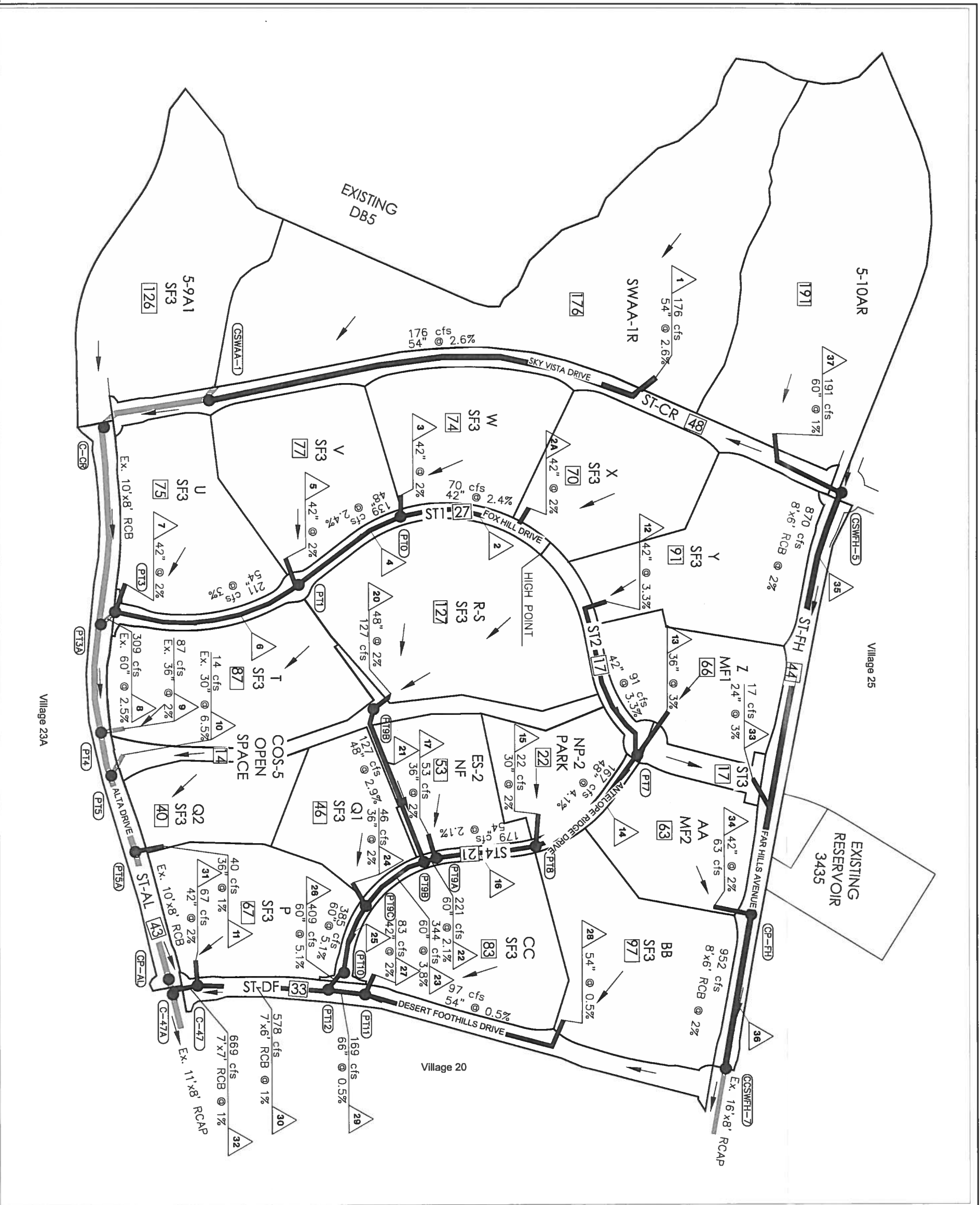
January 2013

Prepared for:

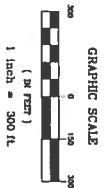
**The Howard Hughes Company, LLC
10000 W. Charleston Blvd., Suite 200
Las Vegas, Nevada 89135
Phone: (702) 791-4200
Fax: (702) 791-4450**

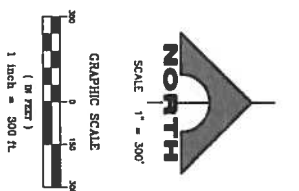
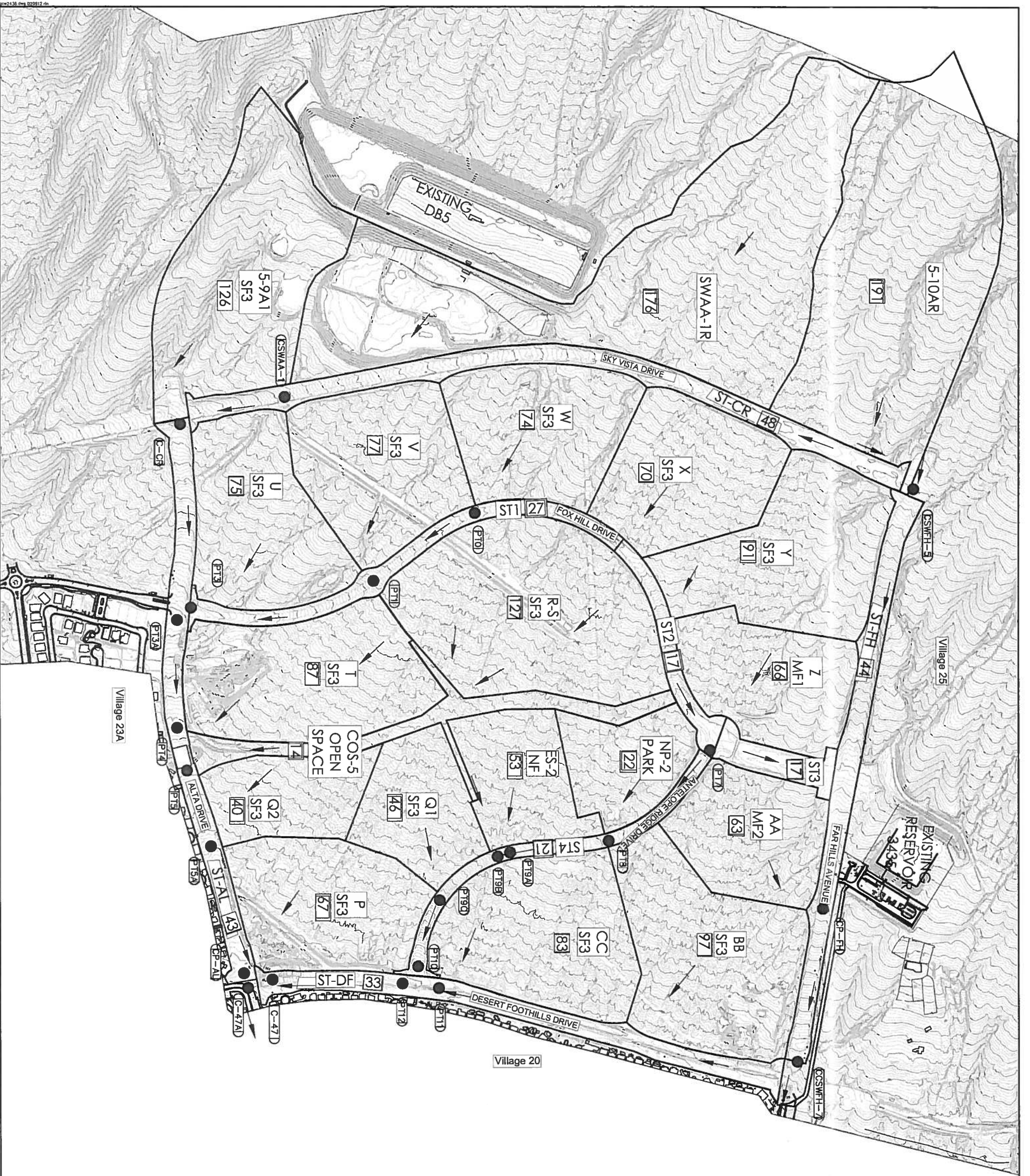


G. C. WALLACE COMPANIES
ENGINEERS | PLANNERS | SURVEYORS



- LEGEND**
- A PARCEL NAME
 - SF3 PARCEL DENSITIES
 - 13 MAXIMUM DISCHARGE FROM PARCEL
 - PROPOSED STORM DRAIN
 - CONCENTRATION POINT
 - EXISTING STORM DRAIN
 - SUBBASIN BOUNDARY
 - 8 FACILITY IDENTIFIER





LEGEND

- A PARCEL NAME
- SF3 PARCEL DENSITIES
- 13 MAXIMUM DISCHARGE FROM PARCEL
- PTD CONCENTRATION POINT
- SUBBASIN BOUNDARY

SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL				
SB OR CP	AREA (AC)	100 YR CFS	10 YR CFS	5 YR CFS
5-10AR	61.64	181	60	86
5-10AR	16.56	57	32	42
5-10AR	35.03	669	237	327
C-47A	-	2636	1650	1650
CC	28.57	83	38	38
C-CR	-	2212	1588	1588
CCSWFH-7	10.02	3855	1808	1808
CCSWFH-7	-	14	3	3
CCSWFH-7	-	2278	1598	1598
CCSWFH-7	-	312	156	156
CCSWFH-7	-	870	378	378
CCSWFH-7	-	14.69	53	28
ES-2	12.77	22	5	5
NP-2	24.03	67	29	29
P	-	139	61	61
P-10	-	211	93	93
P-11	-	409	178	178
P-12	-	169	70	70
P-13	-	212	93	93
P-14	-	282	123	123
P-15	-	309	138	138
P-16	-	2398	1619	1619
P-17	-	2328	1625	1625
P-18	-	2334	1625	1625
P-19	-	149	66	66
P-20	-	198	87	87
P-21	-	179	77	77
P-22	-	221	97	97
P-23	-	344	151	151
P-24	-	385	168	168
Q1	14.88	46	19	19
Q2	13.34	40	17	17
Q3	41.82	127	54	54
Q4	8.30	27	13	13
Q5	4.35	17	8	8
Q6	14.14	43	19	19
Q7	5.88	21	10	10
Q8	13.03	43	21	21
Q9	16.43	48	24	24
Q10	12.14	33	18	18
Q11	13.14	44	22	22
Q12	-	-	-	-
Q13	-	-	-	-
Q14	-	-	-	-
Q15	-	-	-	-
Q16	-	-	-	-
Q17	-	-	-	-
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Q91	-	-	-	-
Q92	-	-	-	-
Q93	-	-	-	-
Q94	-	-	-	-
Q95	-	-	-	-
Q96	-	-	-	-
Q97	-	-	-	-
Q98	-	-	-	-
Q99	-	-	-	-
Q100	-	-	-	-

SUMMERLIN VILLAGE 23B
CONCEPTUAL DRAINAGE STUDY UPDATE #2
ULTIMATE CONDITIONS DRAINAGE BASIN MAP

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 894-2000 FAX: (702) 894-2298
F:\Projects\600\620238-100\Division\Fct\Figures\Update #2\0602 dms02.dwg

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
PLOT DATE: 01-17-13
PLOT TIME: 14:42:00

REV	DATE	DESCRIPTION

DATE AGN APP DATE CCW APP DATE

SHEET
FIG 6U2
1 OF 1 SHEETS

REFERENCE MATERIAL
TECHNICAL DRAINAGE STUDY FOR
TEVARE (SUMMERLIN VILLAGE 23B
PARCEL U)



Basin	Area (acres)	10-YR (cfs)	Peak Flow	
			10-YR (cfs)	100-YR (cfs)
ORVX	26.49	20	60	9
ORVX	3.76	3		
CMVX	30.25	23	69	
UID	0.43	1	2	
U3AD	4.69	7	15	
U2BD	4.21	6	13	
CMID	8.90	12	28	
U2AD	6.58	9	21	
CM2D	15.48	21	49	
U3BD	5.81	9	20	
U2CD	3.71	5	12	
CM3D	9.52	14	32	
CM-5D	25.00	36	80	

ABBREVIATIONS

LEGEND

FLOW DIRECTION

SUB-BASIN BOUNDARIES

CM1

UNIT

SUB-BASIN NAME

3AD

SECTION

EXISTING AC REMOVAL AREA

100.0 PAD ELEVATION



SIDEWALK DRAIN

PROPOSED SINCE 1990

EXISTING STREET GRADE

EXISTING SIREL SLOPE

[0.00%] FUTURE STREET SLOPE

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SHEET:
FIG. 6
OF

SUMMERLIN VILLAGE 23B, PARCEL U
TEVARE

ON-SITE DRAINAGE MAP
DEVELOPED CONDITION
UNIT 3

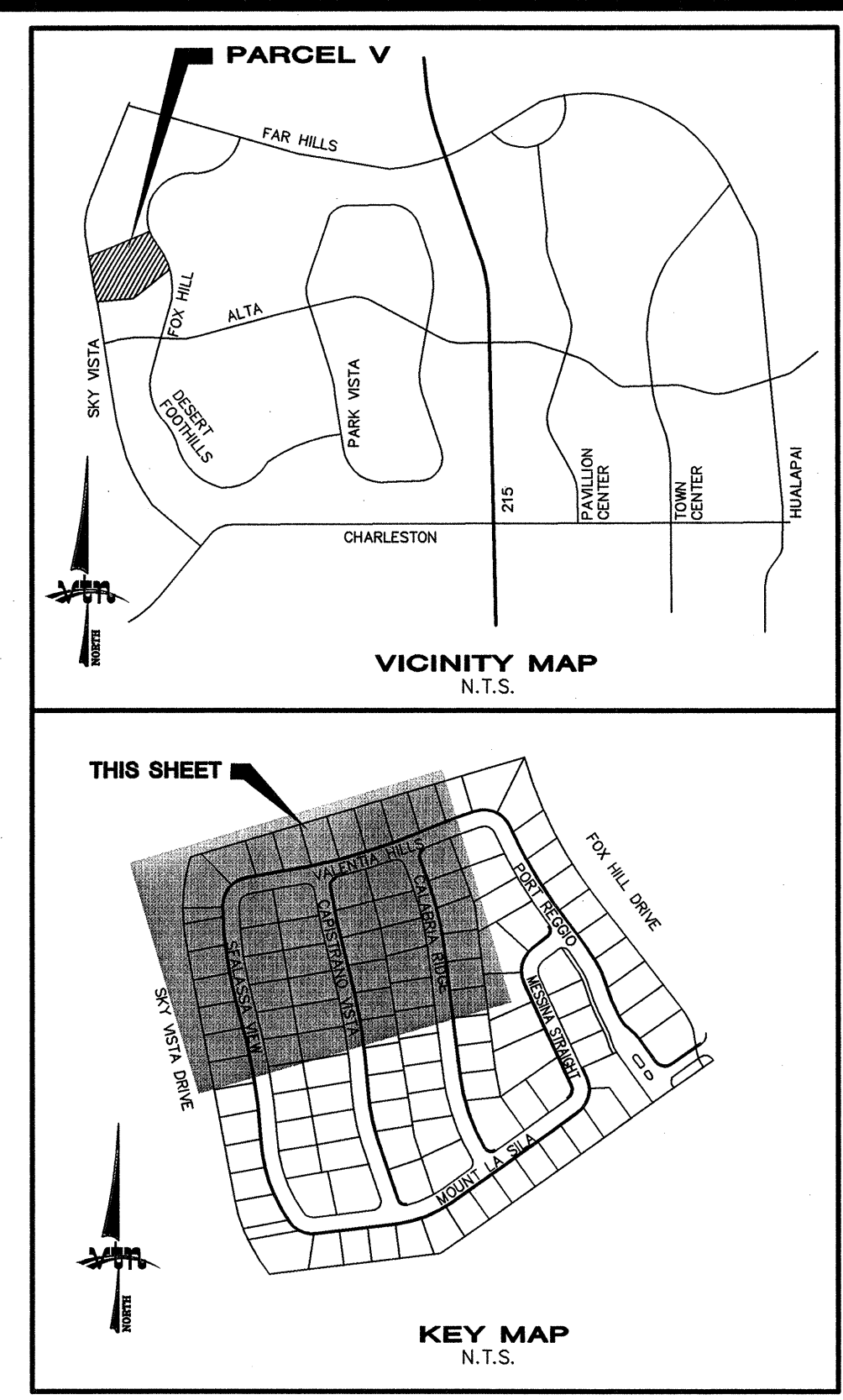
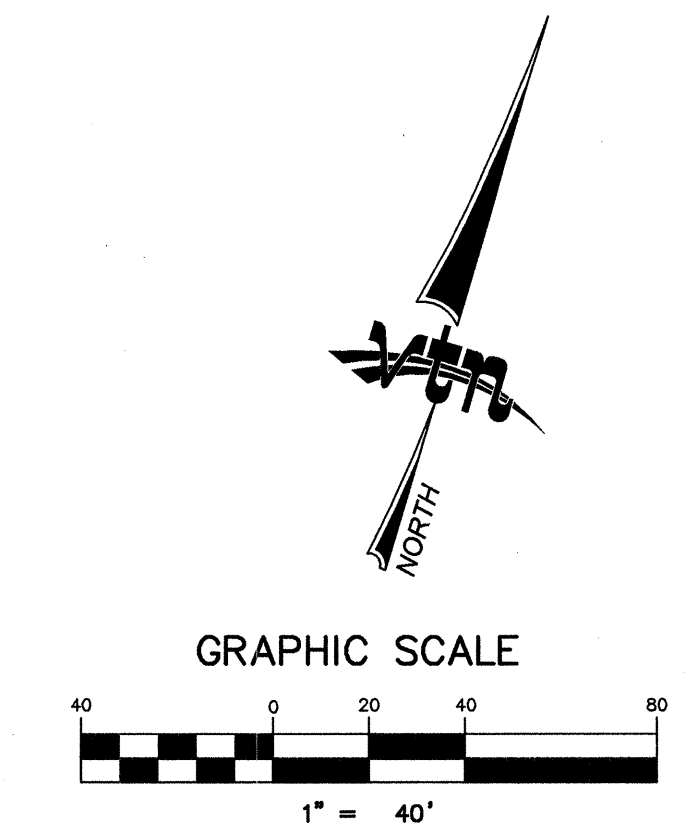


KBHOME SM
5655 BADURA AVENUE, LAS VEGAS, NEVADA 89118
PHONE: 702-266-8400, FAX: 702-266-8623

SMART  **GROWTH**
ENGINEERING
P.O. BOX 98274, LAS VEGAS, NEVADA 89193

DRAWN:
DESIGNED:
CHECKED:
DATE: JULY '13
SCALE: 1"=80' HORIZ VERT.
PROJECT NO: 100-001-003

[illegible]



LEGEND

- FG FINISH GRADE
- FL FLOW LINE
- TC TOP OF CURB
- TRC TOP OF ROLL CURB
- EAC EDGE OF ASPHALT PAVEMENT
- FUT. EXIST. VALLEY GUTTER
- VG VALLEY GUTTER
- NG NATURAL GROUND
- H.P. HIGH POINT
- L.P. LOW POINT
- C/L CENTER LINE
- O/C OFFSET CROWN
- BC BACK OF CURB
- BCR BEGIN CURB RETURN
- TF TOP OF FOOTING
- GB GRADE BREAK
- PC POINT OF CURVATURE
- PT POINT OF TANGENCY
- PRC POINT OF REVERSE CURVATURE
- PCC POINT OF COMPOUND CURVATURE
- BVC BEGIN VERTICAL CURVE
- MVC MID-POINT OF VERTICAL CURVE
- EVC END VERTICAL CURVE
- PRVC POINT OF REVERSE VERTICAL CURVE
- VPI VERTICAL POINT OF INTERSECTION
- TPW TOP OF PLANTER WALL
- TW TOP OF RETAINMENT WALL
- TOP TOP OF CHANNEL/SCARP
- TOE TOP OF CHANNEL/SCARP
- TOB TOP OF BOX
- PP POWER POLE
- TRANS. TRANSITION
- RET. RETAINMENT
- INT. INTERSECTION
- D.G. DESIGN GRADE
- TSW TOP OF SIDEWALK
- FF FINISH FLOOR
- OFF= GARAGE FINISH FLOOR
- EX BFE= EXISTING BASE FLOOD ELEVATION
- DEV BFE= BASE FLOOD ELEVATION PRIOR TO DEVELOPMENT
- R/W RIGHT-OF-WAY
- S/W SIDEWALK
- EX. CONTOUR(5' INTERVAL)
- EX. CONTOUR(1' INTERVAL)
- PROPOSED CONTOUR
- CUT AND FILL TRANSITION LINE
- PROPOSED PAD GRADE
- FUT./EXIST. PAD GRADE
- SLOPE AND FLOW DIRECTION
- EDGE OF EXIST. A.C.
- SAW CUT & MATCH A.C.
- SIDEWALK RAMP
- PAD SWALE SLOPES
- SCARP AREA
- LOT NUMBER
- BLOCK NUMBER
- RETAINING HEIGHT (42 = 4.2 FEET)
- SIGHT VISIBILITY ZONES
- PROJECT BOUNDARY LINE
- SETBACK LINE
- R/W OR P/L
- EXIST. IMPROVEMENTS
- FUTURE IMPROVEMENTS
- CENTER LINE
- RETAINING WALL
- EX. RETAINING WALL
- CONC. BLOCK WALL
- EXIST. CONC. BLOCK WALL
- EXIST. DIRT ROAD
- EXIST. AC
- CONSTRUCTION PHASE LINE OR UNIT BOUNDARY LINE
- MATCHLINE

PROJECT BENCHMARK
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CITY OF LAS VEGAS BENCHMARK: 5LV08-34NE6 2008 ADJUSTMENT (UPDATED 5/24/10) NAVD88 ELEVATION: 1007.197 METERS (3304.45 FEET)

RIVET AND PLATE IN TOP OF CURVE AT THE NORTHEAST CORNER OF DESERT FOOTHILLS AND ALTA.

BASIS OF BEARINGS
SOUTH 89°30'29" EAST-BEING THE BEARING OF THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 33, TOWNSHIP 21 SOUTH, RANGE 60 EAST M.D.M., AS SHOWN BY THAT PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN FILE 179 OF PLATS, AT PAGE 62.

- CONSTRUCTION NOTES**
- (A) CONSTRUCT 30" ROLL CURB & GUTTER PER SUMMERLIN STD. DWG. NO. S-48
 - (B) CONSTRUCT 4.0' CONCRETE SIDEWALK PER SUMMERLIN STD. DWG. NO. S-72
 - (C) CONSTRUCT CONCRETE CROSS GUTTER SUMMERLIN STD. DWG. NO. S-64
 - (D) CONSTRUCT WHEEL CHAIR RAMP CASE 1 PER STD. DWG. NO. 235
 - (E) CONSTRUCT "L" TYPE CURB & GUTTER PER SUMMERLIN STD. DWG. NO. S-47
 - (F) CONSTRUCT 5' CURB TRANSITION PER DETAIL ON SHEET DT1

HC RAMP DATA

NO.	"A"	"B"	CASE
1	8.0'	8.0'	1
2	9.5'	4.5'	1
3	4.5'	9.5'	1

FLOOD ZONE NOTE
FLOOD ZONE TYPE: ZONE X
PANEL# 2150 MAP# 32003C2150E
FEMA EFFECTIVE DATE: SEPTEMBER 27, 2002
(A ZONE "X" IS DESCRIBED AS AN AREA NOT WITHIN THE 100-YEAR STORM FLOODPLAIN.)

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DARYN M. OHTA, P.E. #15906 DATE
"I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT." (DS xxxxx)

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Call before you Overhead
1-702-227-2929

RYLAND HOMES
8925 W. RUSSELL ROAD, STE 200
LAS VEGAS, NEVADA 89148
(702) 360-7500

GRADING PLAN 1

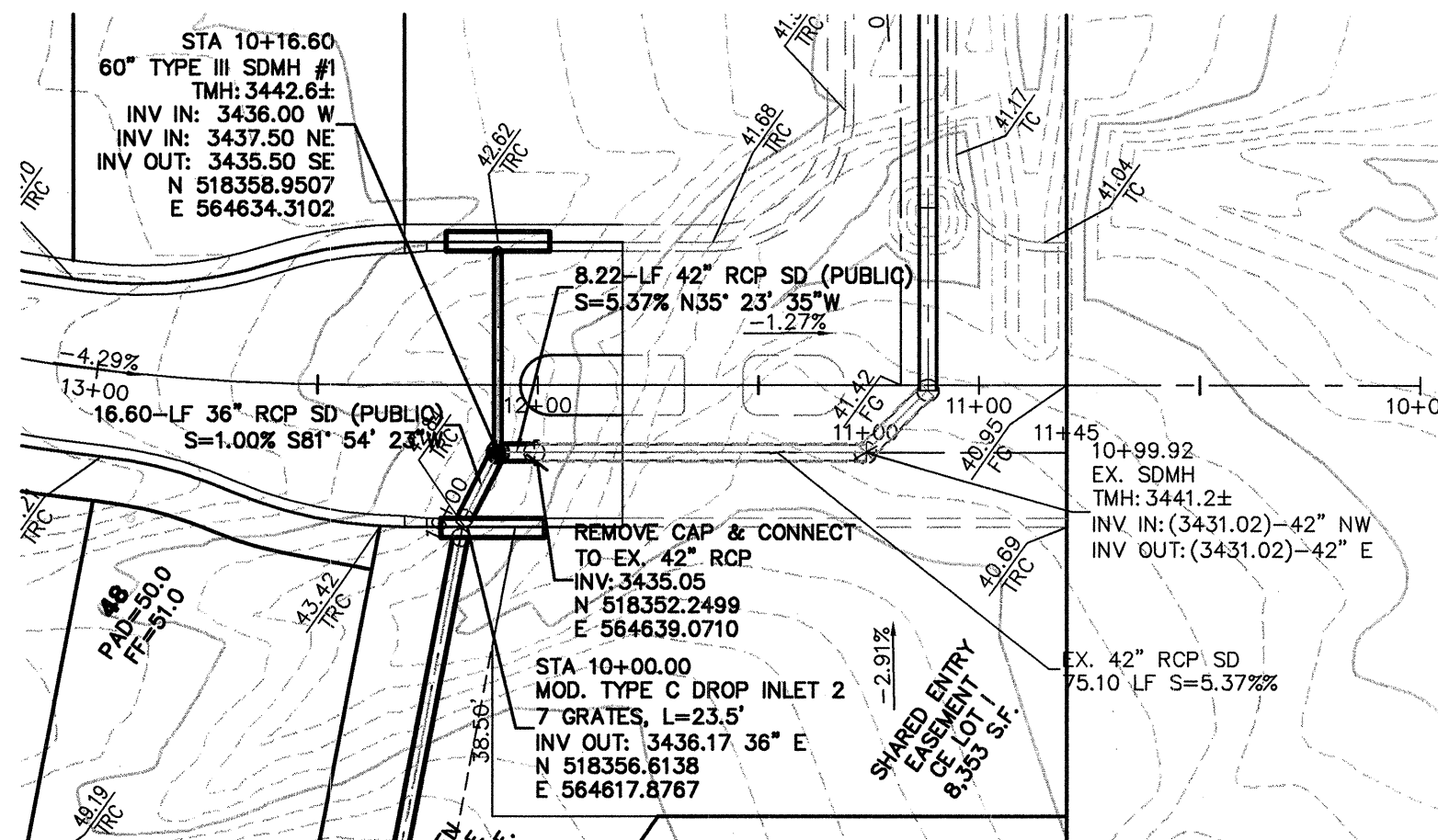
SUMMERLIN VILLAGE 23B
PARCEL V

DRAWN BY: DMO JULY 2013
DESIGNED BY: JULY 2013
CHECKED BY: AY
PROJECT NO: 7554
SCALE: 1"=40' HORIZ. NA VERT.

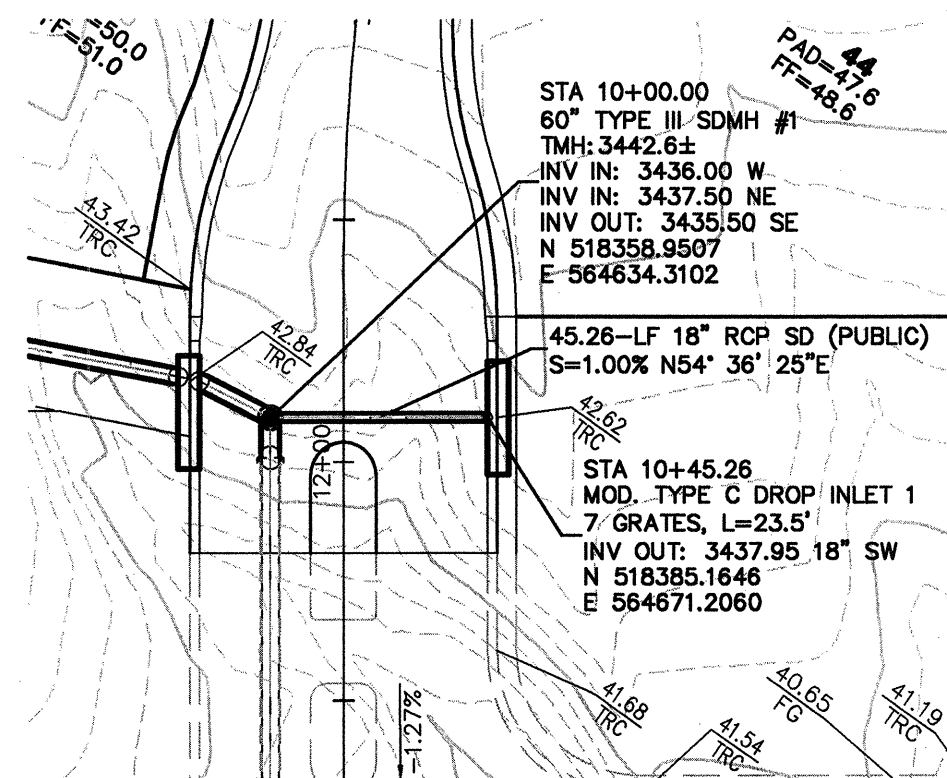
PROFESSIONAL ENGINEER
DARYN M. OHTA
CIVIL
NO. 15906
EXPIRES 12-31-13

SHEET
GR1
OF SHEETS
DRAWING NO.

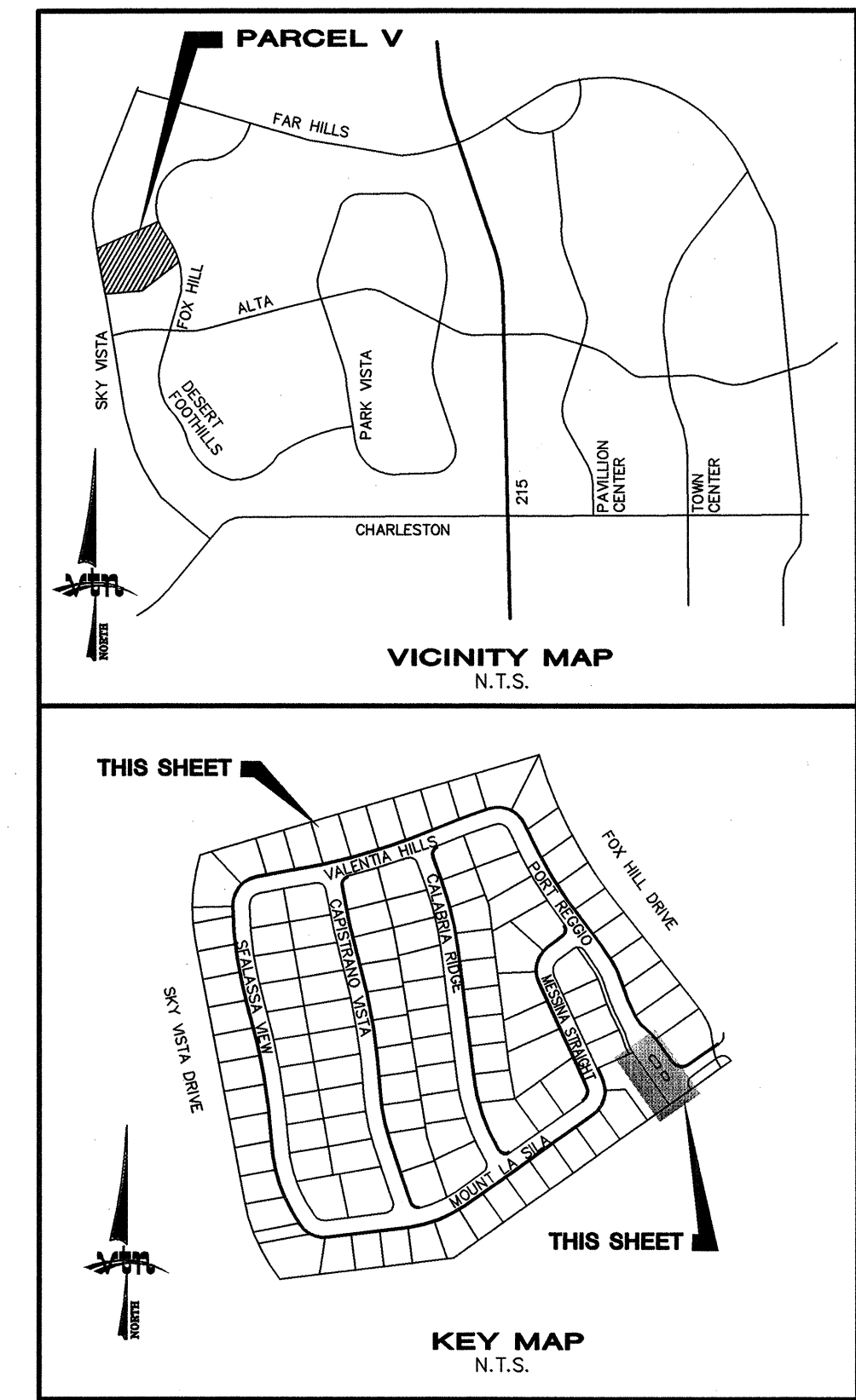
CITY OF LAS VEGAS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2587 WEB WWW.VTNV.COM
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PORT REGGIO STORM DRAIN



STORM DRAIN LATERAL 1



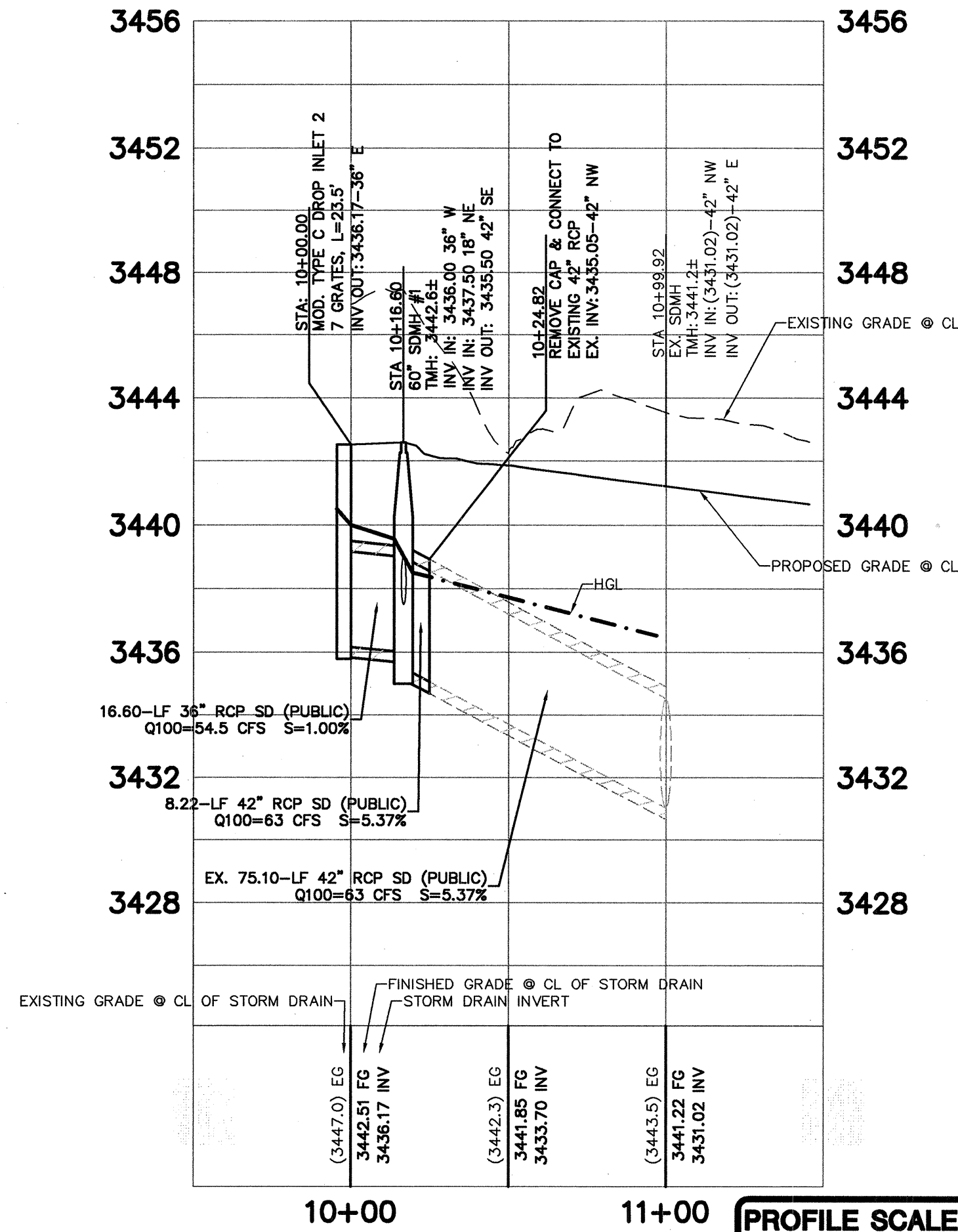
UTILITY CROSSING NOTE:
ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABLE WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

FLOOD ZONE NOTE
FLOOD ZONE TYPE: ZONE X
FLOOD ZONE MAP# 32003C2150E
FEMA EFFECTIVE DATE: SEPTEMBER 27, 2002
(A ZONE "X" IS DESCRIBED AS AN AREA NOT WITHIN THE 100-YEAR STORM FLOODPLAIN.)

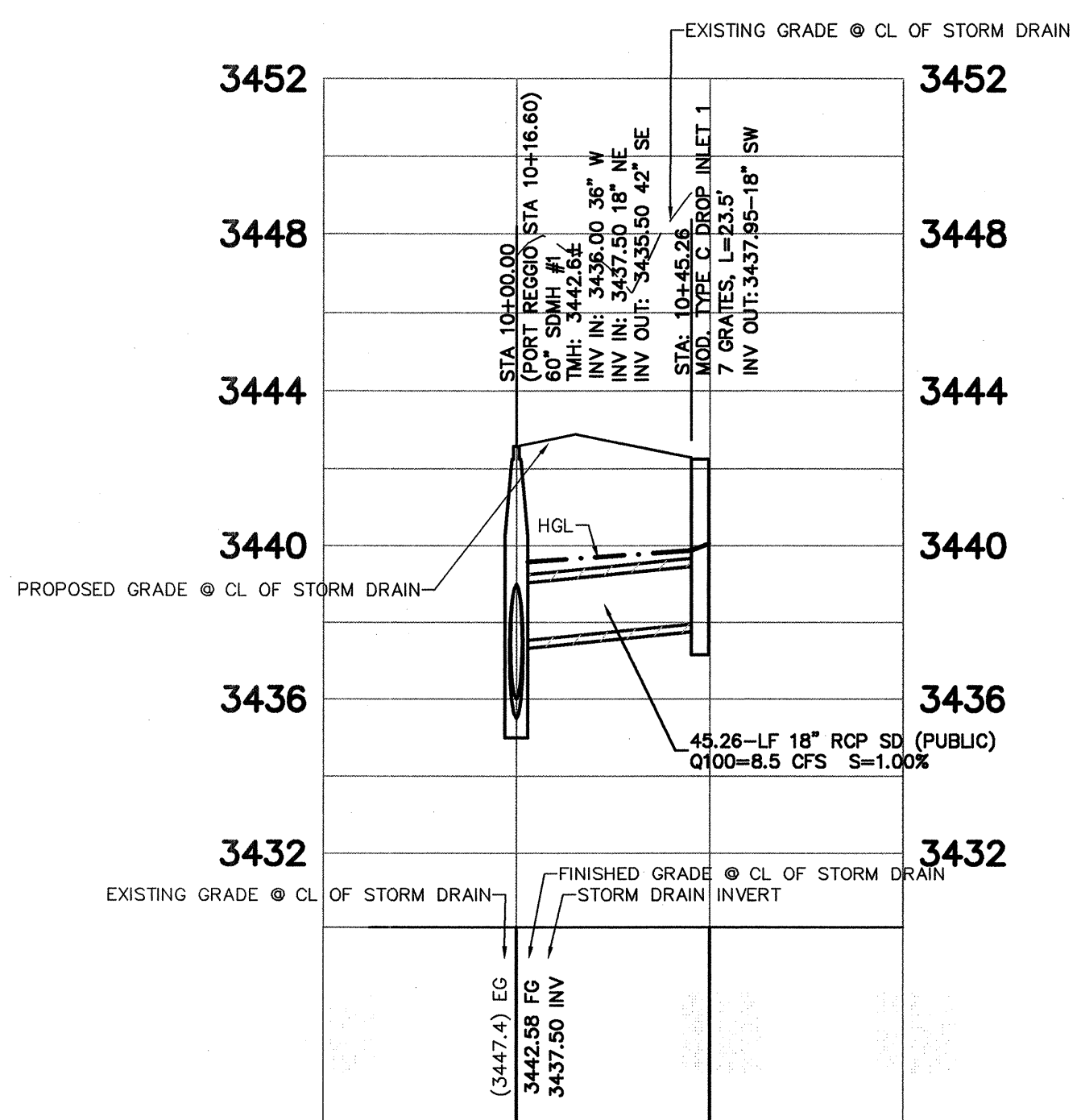
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PROFILE SCALES:
HORZ. = 1"=40'
VERT. = 1"=4'



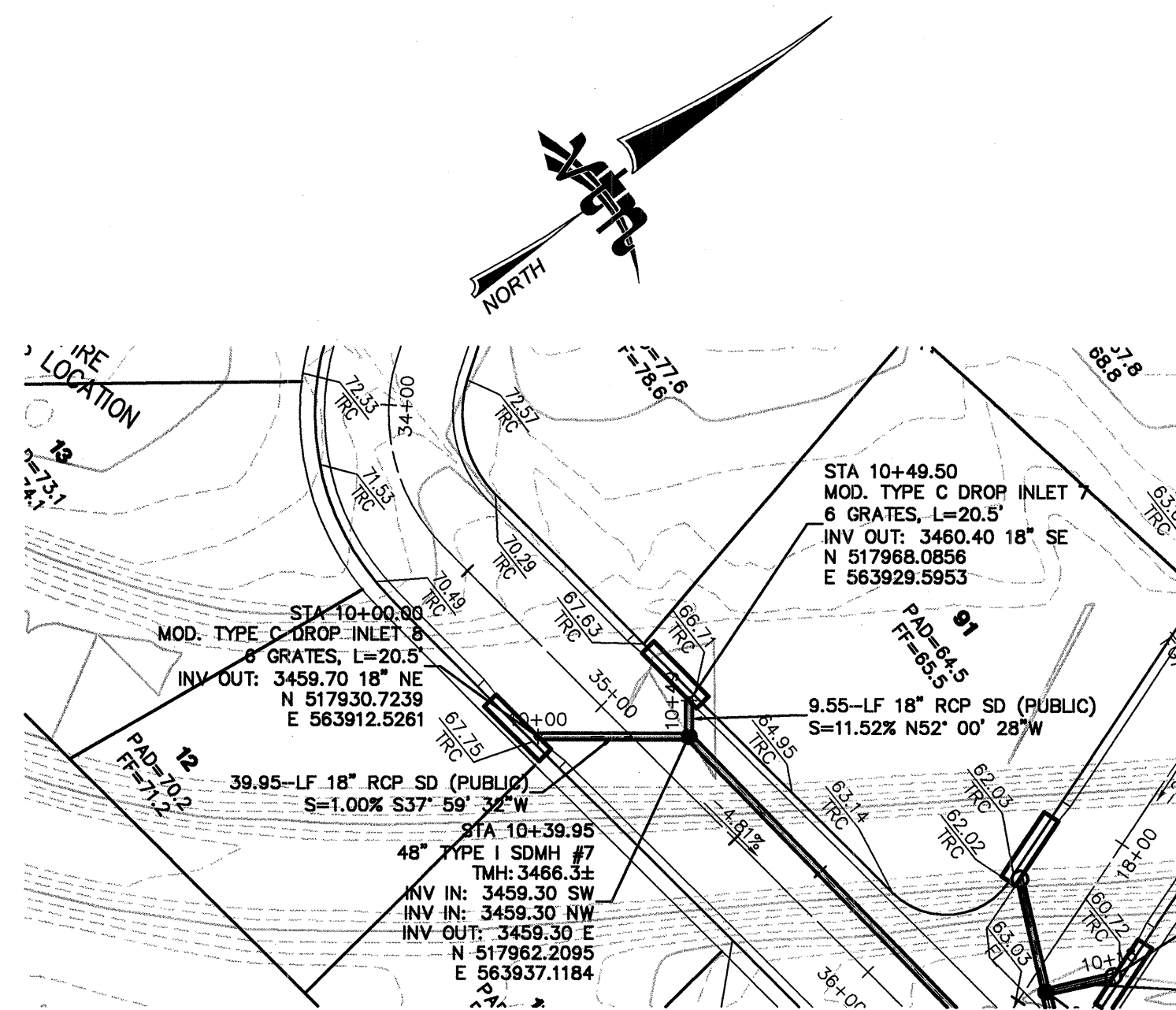
PROFILE SCALES:
HORZ. = 1"=40'
VERT. = 1"=4'

DARYN M. OHTA, P.E. #15906
DATE
"I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT." (DS xxxx)

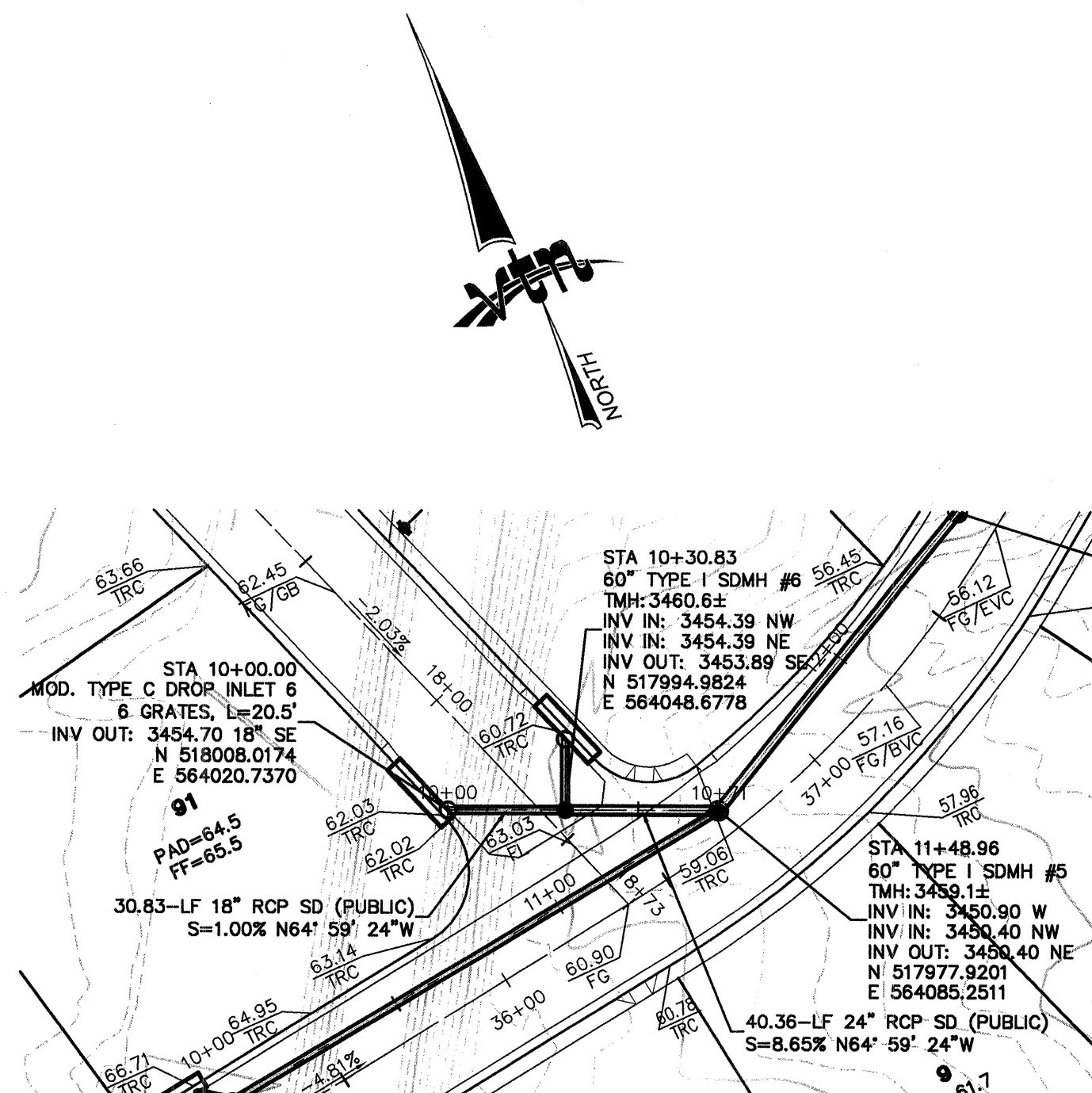


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1-702-227-2929

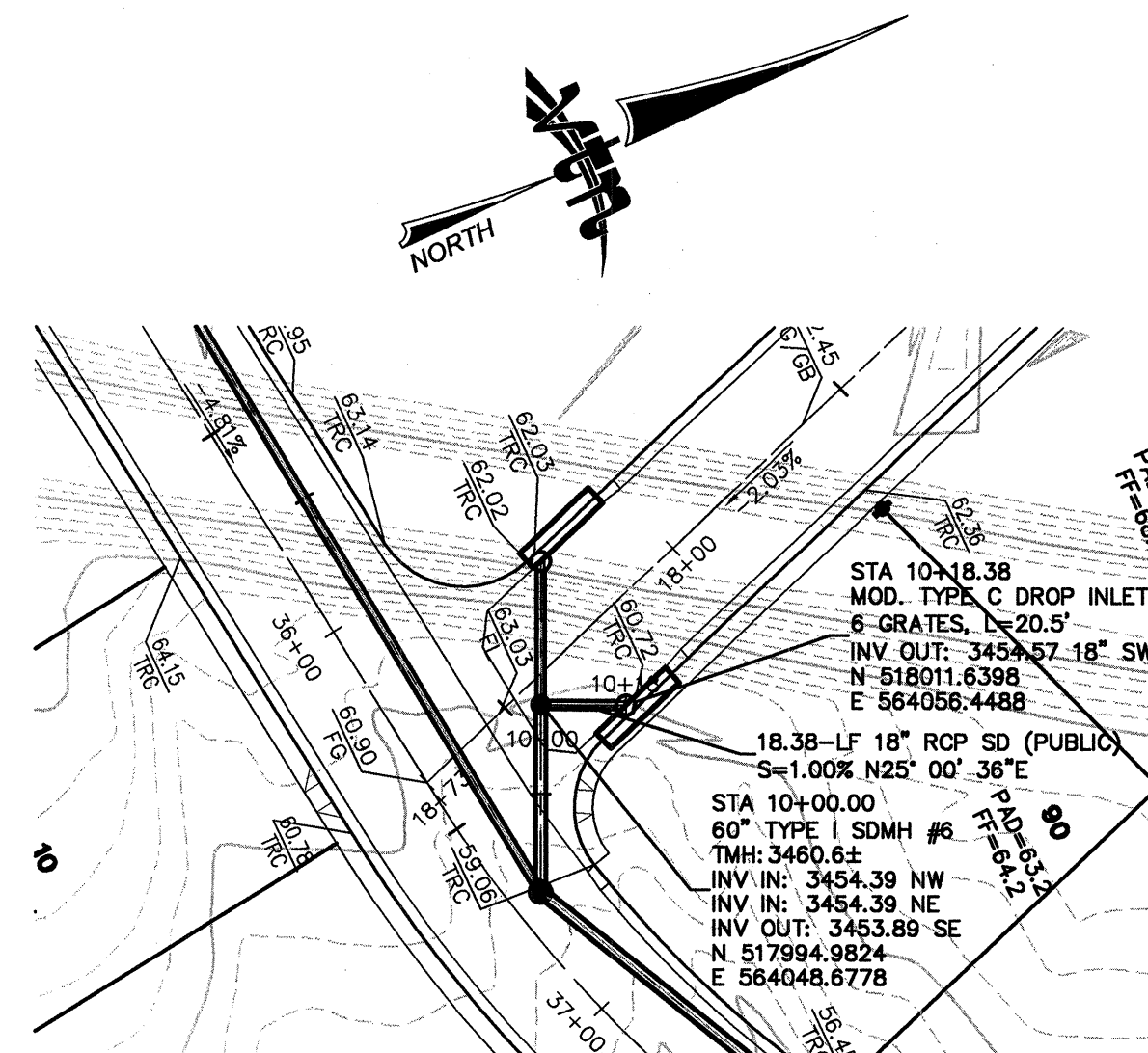
CITY OF LAS VEGAS		RYLAND HOMES		SUMMERLIN VILLAGE 23B	
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNV.COM		8825 W. RUSSELL ROAD, STE 200 LAS VEGAS, NEVADA 89148 (702) 360-7500		PARCEL V	
DESIGNED BY:	DARYN M. OHTA	CHECKED BY:	DARYN M. OHTA	PROJECT NO.:	7534
DRAWN BY:	DNO	DATE:	JULY 2013	SCALE:	1"=40' HORZ. 1"=4' VERT.
SHEET SD3		OF SHEETS		DRAWING NO.	



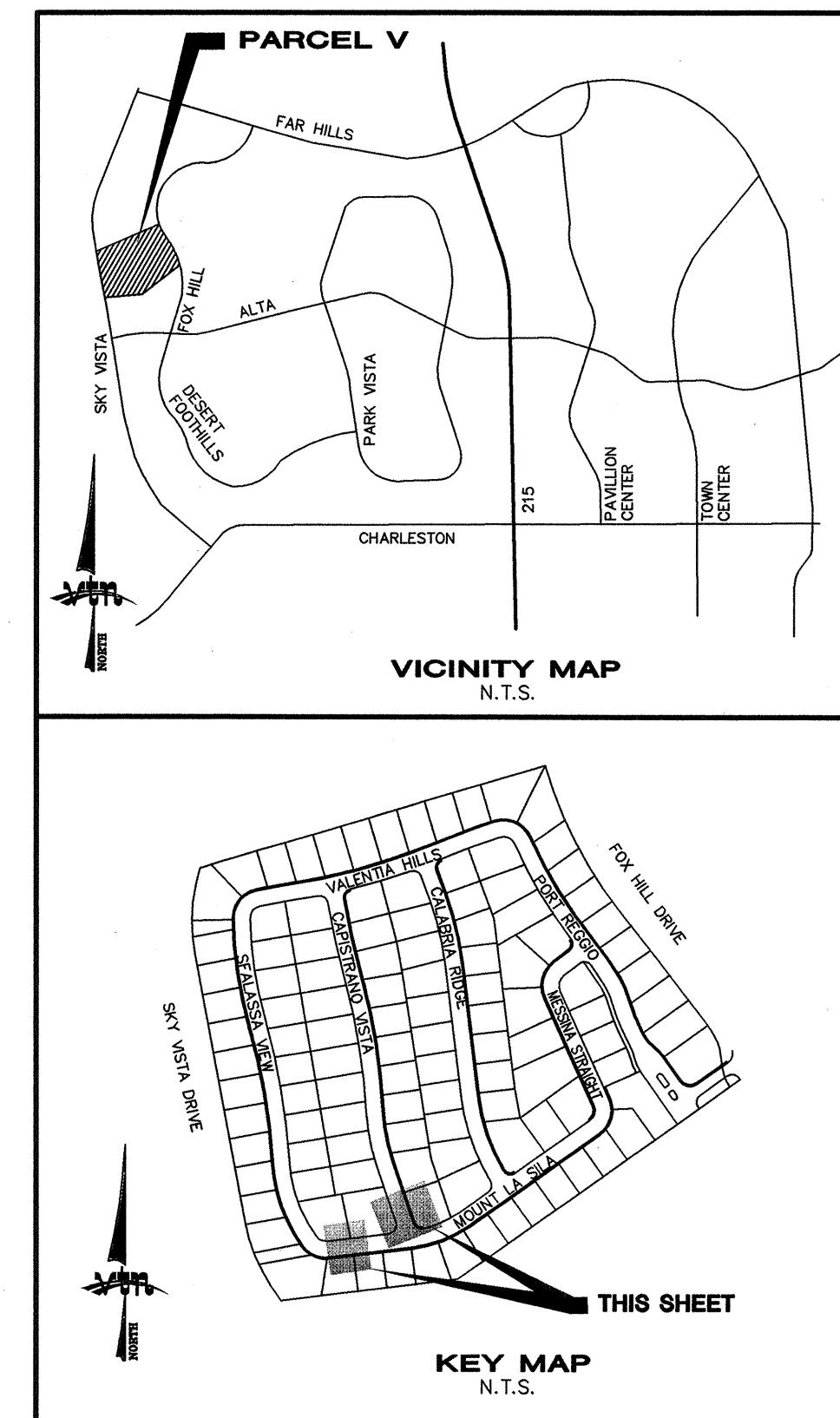
STORM DRAIN LATERAL 2



STORM DRAIN LATERAL 3



STORM DRAIN LATERAL 4



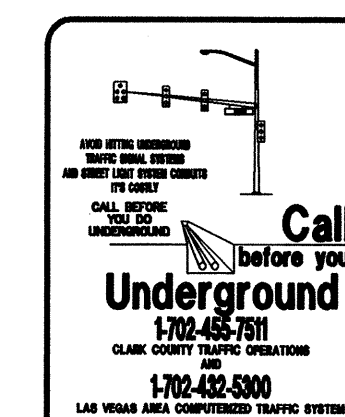
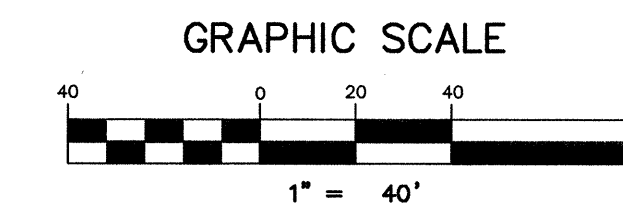
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FLOOD ZONE NOTE
FLOOD ZONE TYPE: ZONE X
FEMA EFFECTIVE DATE: SEPTEMBER 27, 2002
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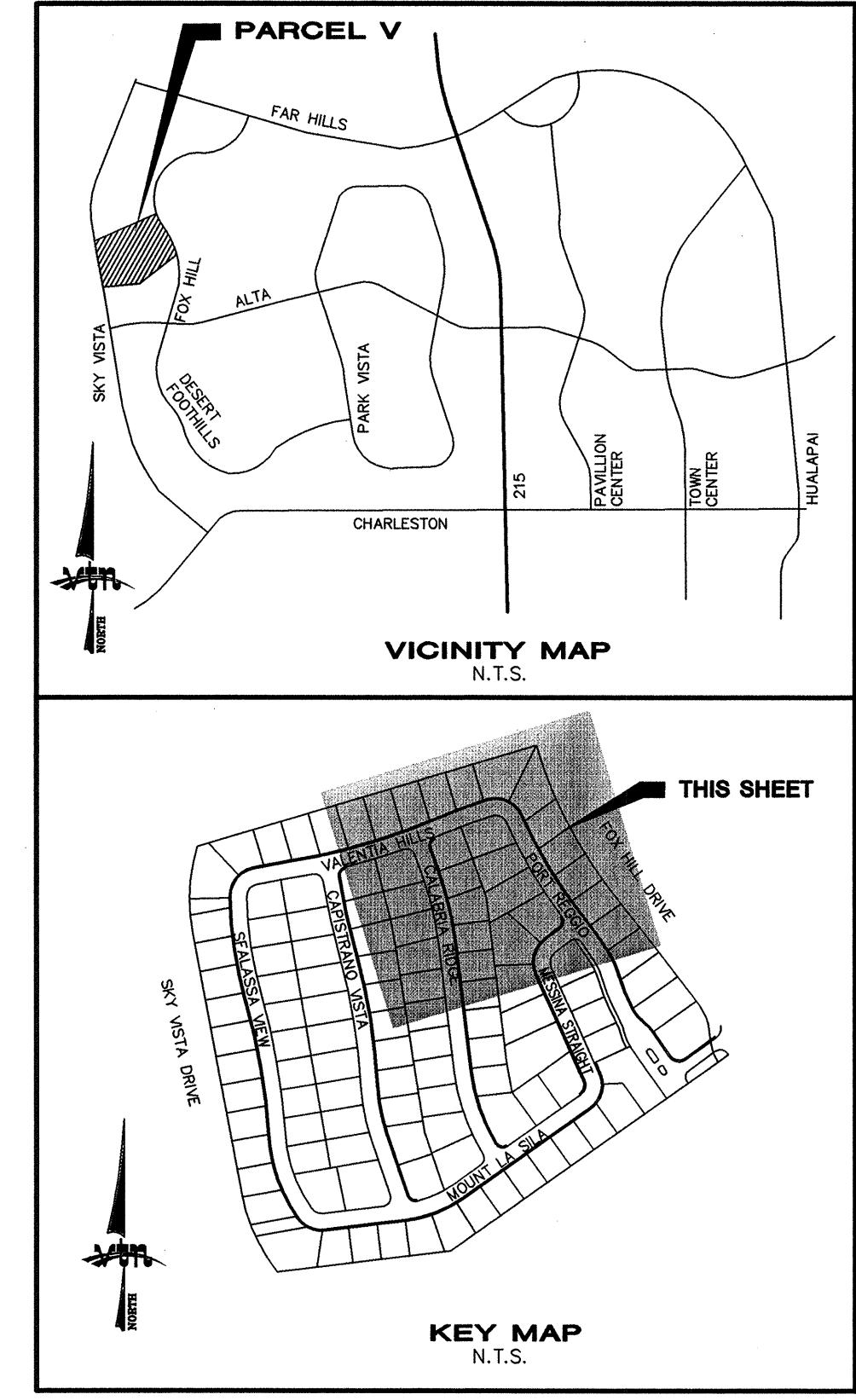
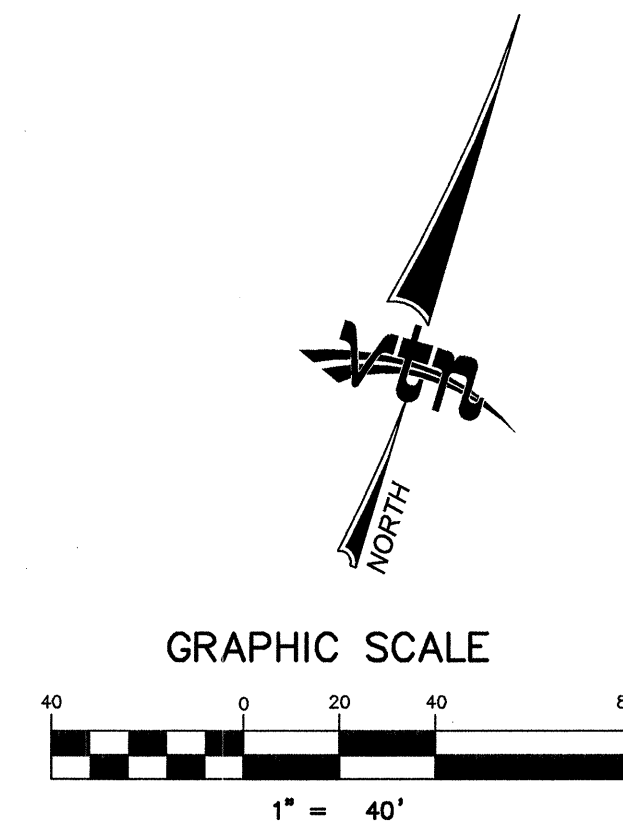
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DARYN M. OHTA, P.E. #15908
DATE
"I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT." (DS xxxx)

RYLAND HOMES 8925 W. RUSSELL ROAD, STE 200 LAS VEGAS, NEVADA 89148 (702) 360-7500		CITY OF LAS VEGAS 2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 673-7550 FAX (702) 362-2597 WEB WWW.VTNV.COM CONSULTING ENGINEERS • LAND SURVEYORS	
STORM DRAIN LATERAL PLAN & PROFILE		SUMMERLIN VILLAGE 23B PARCEL V	
DRAWN BY: DMD	DESIGNED BY: AY	CHECKED BY: AY	PROJECT NO.: 7534
JULY 2013		JULY 2013	
SCALE: 1"=40' HORIZ. 1"=4' VERT.		SCALE: 1"=40' HORIZ. 1"=4' VERT.	
EXPIRES 12-31-13		EXPIRES 12-31-13	
DARYN M. OHTA CIVIL No. 15908		DARYN M. OHTA CIVIL No. 15908	
SHEET SD4 OF SHEETS		SHEET SD4 OF SHEETS	
DRAWING NO.		DRAWING NO.	



LEGEND

- FG FINISH GRADE
- FL FLOW LINE
- TC TOP OF CURB
- TRC TOP OF ROLL CURB
- EAC EDGE OF ASPHALT PAVEMENT
- FUT. EXIST. VALLEY GUTTER
- VG VALLEY GUTTER
- NG NATURAL GROUND
- H.P. HIGH POINT
- L.P. LOW POINT
- C/L CENTER LINE
- O/C OFFSET CROWN
- BC BACK OF CURB
- BCR BEGIN CURB RETURN
- TF TOP OF FOOTING
- GB GRADE BREAK
- PC POINT OF CURVATURE
- PT POINT OF TANGENCY
- PRC POINT OF REVERSE CURVATURE
- PCC POINT OF COMPOUND CURVATURE
- BVC BEGIN VERTICAL CURVE
- MVC MID-POINT OF VERTICAL CURVE
- EVC END VERTICAL CURVE
- PRVC POINT OF REVERSE VERTICAL CURVE
- VPI VERTICAL POINT OF INTERSECTION
- TPW TOP OF PLANTER WALL
- TW TOP OF RETAINMENT WALL
- TSW TOP OF SIDEWALK
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- D.G. DESIGN GRADE
- TSW TOP OF SIDEWALK
- FF FINISH FLOOR
- GFF GARAGE FINISH FLOOR
- EX BFE EXISTING BASE FLOOD ELEVATION PRIOR TO DEVELOPMENT
- DEV BFE BASE FLOOD ELEVATION AFTER DEVELOPMENT
- R/W RIGHT-OF-WAY
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- PAD SWALE SLOPES
- SCARP AREA
- LOT NUMBER
- BLOCK NUMBER
- RETAINING HEIGHT (42 = 4.2 FEET)
- SIGHT VISIBILITY ZONES
- PROJECT BOUNDARY LINE
- R/W OR P/L
- EXIST. IMPROVEMENTS
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- CENTER LINE
- RETAINING WALL
- EX. RETAINING WALL
- CONC. BLOCK WALL
- EXIST. CONC. BLOCK WALL
- EXIST. DIRT ROAD
- EXIST. AC
- CONSTRUCTION PHASE LINE OR UNIT BOUNDARY LINE
- MATCHLINE

SEE SHEET GR4

FLOOD ZONE NOTE
FLOOD ZONE TYPE: ZONE X
PANEL # 2150 MAP# 32003C2150E
FEMA EFFECTIVE DATE: SEPTEMBER 27, 2002
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(E) CONSTRUCT "L" TYPE CURB & GUTTER PER SUMMERLIN STD. DWG. NO. S-47
(F) CONSTRUCT 5' CURB TRANSITION PER DETAIL ON SHEET DT1

DARYN M. OHTA, P.E. #15906 DATE
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8925 W. RUSSELL ROAD, STE 200
LAS VEGAS, NEVADA 89148
(702) 360-7500

GRADING PLAN 2

SUMMERLIN VILLAGE 23B
PARCEL V

DRAWN BY: DMO JULY 2013
DESIGNED BY: JULY 2013
CHECKED BY: AY
PROJECT NO: 7534
SCALE: 1"=40' HORIZ. VERT. NA
SHEET GR2 OF SHEETS
DRAWING NO.

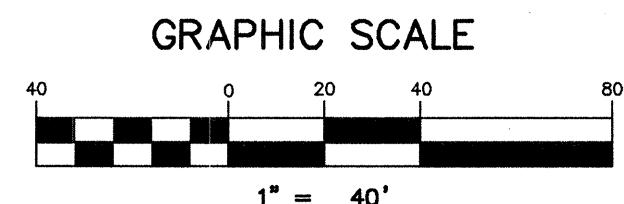
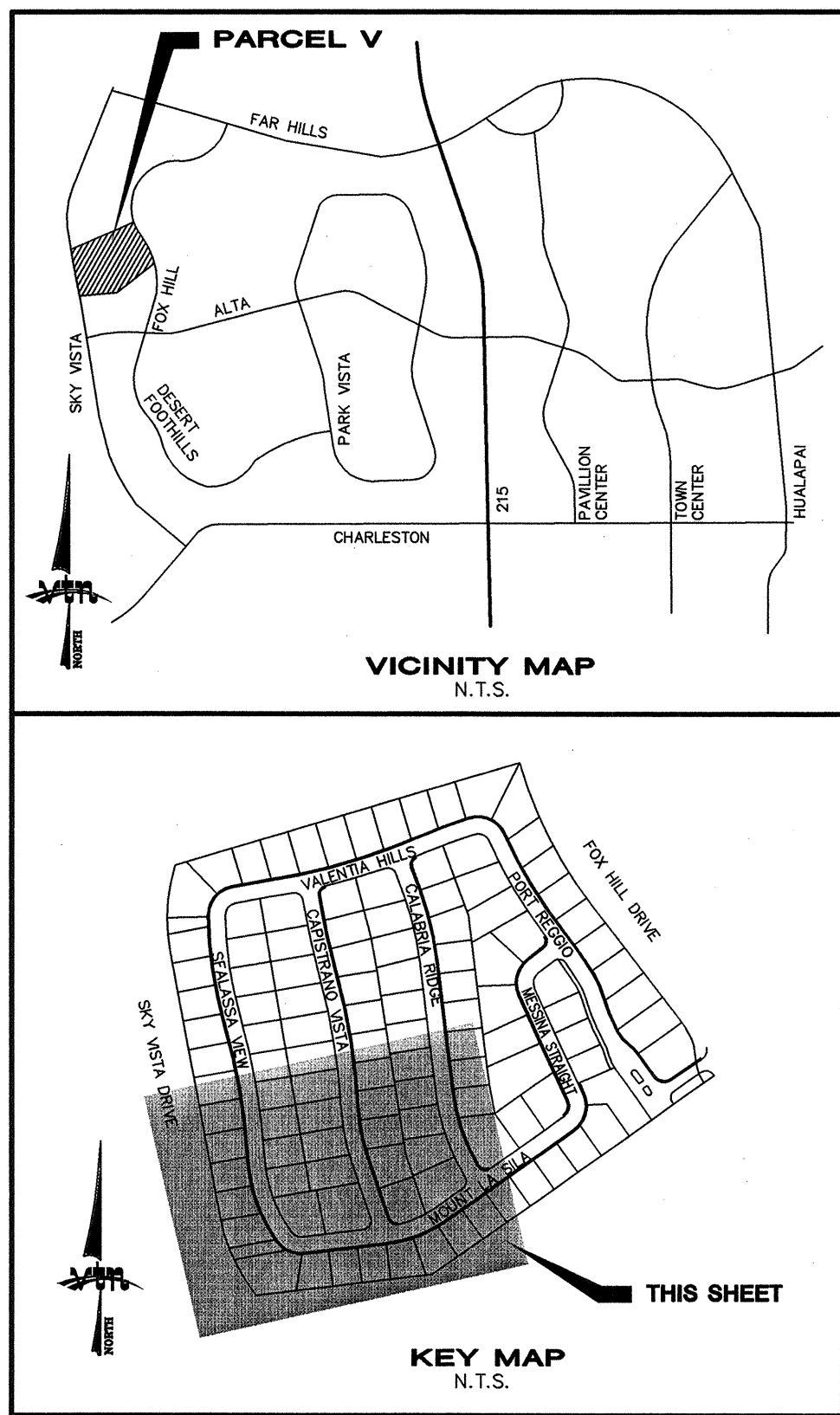
CITY OF LAS VEGAS
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNV.COM
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REVISION

EXPIRES 12-31-13
DARYN M. OHTA
PROFESSIONAL ENGINEER
CIVIL
9/28/13

SEE SHEET QR1

SEE SHEET QR4



LEGEND

- | | | | |
|---------|--------------------------------|--------|----------------------------------|
| FG | FINISH GRADE | (42.1) | PROPOSED PAD GRADE |
| FL | FLOW LINE | (42.1) | FUT./EXIST. PAD GRADE |
| TC | TOP OF CURB | 0.50% | SLOPE AND FLOW DIRECTION |
| TRC | TOP OF ROLL CURB | | EDGE OF EXIST. A.C. |
| EAC | EDGE OF ASPHALT PAVEMENT | | SAW CUT & MATCH A.C. |
| FUT. | FUTURE | | SIDEWALK RAMP |
| VG | VALLEY GUTTER | | PAD SWALE SLOPES |
| NG | NATURAL GROUND | | SCARP AREA |
| H.P. | HIGH POINT | 27 | LOT NUMBER |
| L.P. | LOW POINT | 4 | BLOCK NUMBER |
| C/L | CENTER LINE | | RETAINING HEIGHT (42 = 4.2 FEET) |
| O/C | OFFSET CROWN | | SIGHT VISIBILITY ZONES |
| BC | BACK OF CURB | | PROJECT BOUNDARY LINE |
| BCR | BEGIN CURB RETURN | | SETBACK LINE |
| TF | TOP OF FOOTING | | R/W OR P/L |
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| PCC | POINT OF COMPOUND CURVATURE | | EX. RETAINING WALL |
| BVC | BEGIN VERTICAL CURVE | | CONC. BLOCK WALL |
| MVC | MID-POINT OF VERTICAL CURVE | | EXIST. CONC. BLOCK WALL |
| EVC | END VERTICAL CURVE | | EXIST. DIRT ROAD |
| PVPC | POINT OF VERTICAL CURVE | | EXIST. ARC |
| VPI | VERTICAL POINT OF INTERSECTION | | CONSTRUCTION PHASE LINE |
| TPW | TOP OF PLANTER WALL | | OR UNIT BOUNDARY LINE |
| TW | TOP OF RETAINMENT WALL | | MATCHLINE |
| TOP | TOP OF CHANNEL/SCARP | | |
| TOE | TOE OF CHANNEL/SCARP | | |
| TOB | TOP OF BOX | | |
| PP | POWER POLE | | |
| TRANS. | TRANSITION | | |
| RET. | RETAINMENT | | |
| INT. | INTERSECTION | | |
| D.G. | DESIGN GRADE | | |
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| FF | FINISH FLOOR | | |
| GFF | GARAGE FINISH FLOOR | | |
| EX BFE | EXISTING BASE FLOOD ELEVATION | | |
| DEV BFE | BASE FLOOD ELEVATION | | |
| | PRIOR TO DEVELOPMENT | | |
| | AFTER DEVELOPMENT | | |
| R/W | RIGHT-OF-WAY | | |
| S/W | SIDEWALK | | |
| | EX. CONTOUR(5' INTERVAL) | | |
| | EX. CONTOUR(1' INTERVAL) | | |
| | PROPOSED CONTOUR | | |
| | CUT AND FILL TRANSITION LINE | | |

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FLOOD ZONE MAP: 32003C2150E
FEMA EFFECTIVE DATE: SEPTEMBER 27, 2002
(A ZONE "X" IS DESCRIBED AS AN AREA NOT WITHIN THE 100-YEAR STORM FLOODPLAIN.)

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SOUTH 89°30'29" EAST-BEING THE BEARING OF THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 33, TOWNSHIP 21 SOUTH, RANGE 60 EAST M.D.M., AS SHOWN BY THAT PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN FILE 179 OF PLATS, AT PAGE 62.

CONSTRUCTION NOTES

- CONSTRUCT 30" ROLL CURB & GUTTER PER SUMMERLIN STD. DWG. NO. S-48
- CONSTRUCT 4.0' CONCRETE SIDEWALK PER SUMMERLIN STD. DWG. NO. S-72
- CONSTRUCT CONCRETE CROSS GUTTER SUMMERLIN STD. DWG. NO. S-64
- CONSTRUCT WHEEL CHAIR RAMP CASE 1 PER STD. DWG. NO. 235
- CONSTRUCT "L" TYPE CURB & GUTTER PER SUMMERLIN STD. DWG. NO. S-47
- CONSTRUCT 5' CURB TRANSITION PER DETAIL ON SHEET DT1

CITY OF LAS VEGAS
8825 W. RUSSELL ROAD, STE. 200
LAS VEGAS, NEVADA 89148
(702) 360-7500

RYLAND HOMES

GRADING PLAN 1

SUMMERLIN VILLAGE 23B
PARCEL V

DRAWN BY: JULY 2013

DESIGNED BY:

CHECKED BY:

PROJECT NO: JULY 2013

SCALE: 1"=40'

HORIZ.

VERT.

DATE

REVISION

BY

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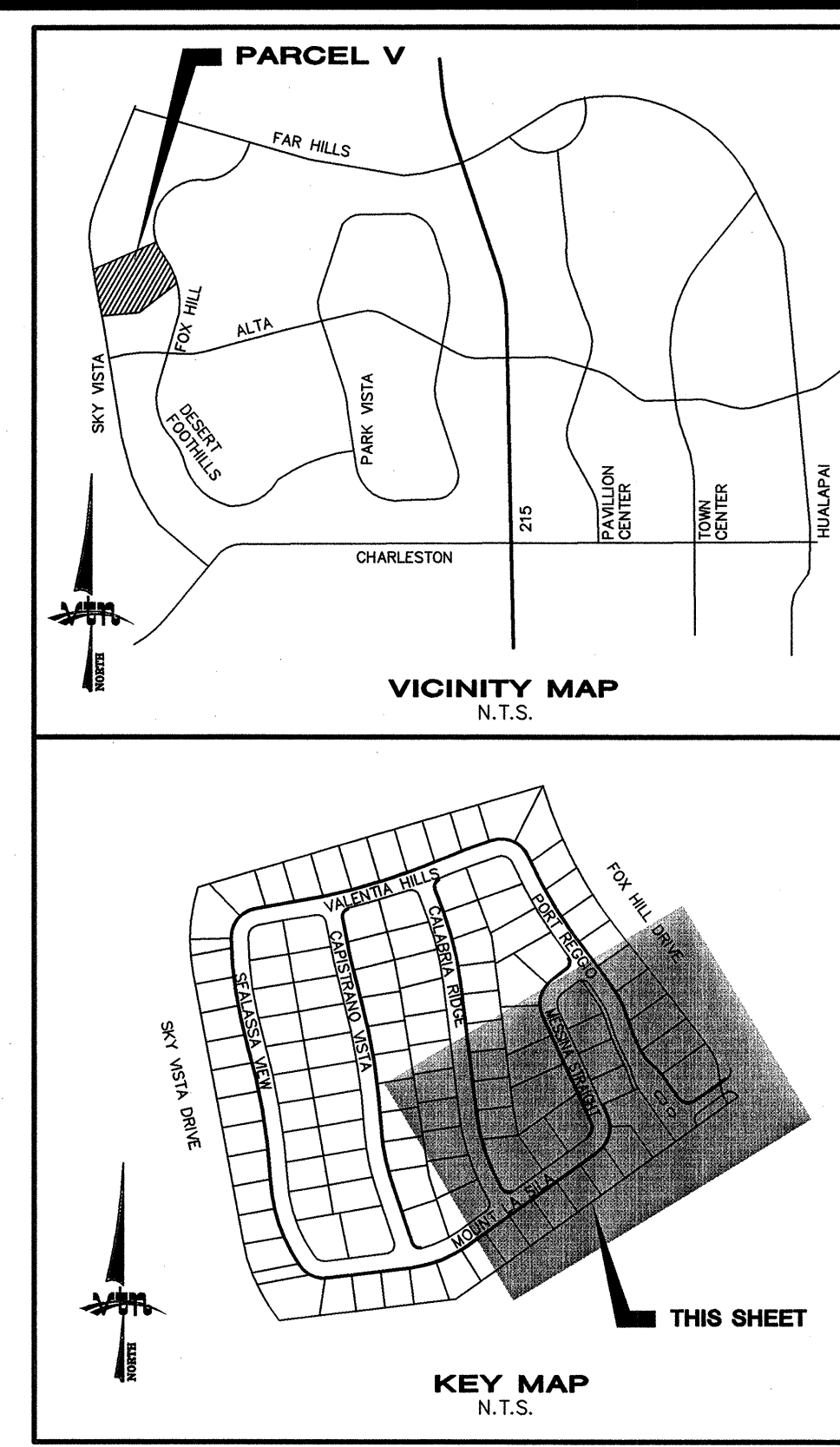
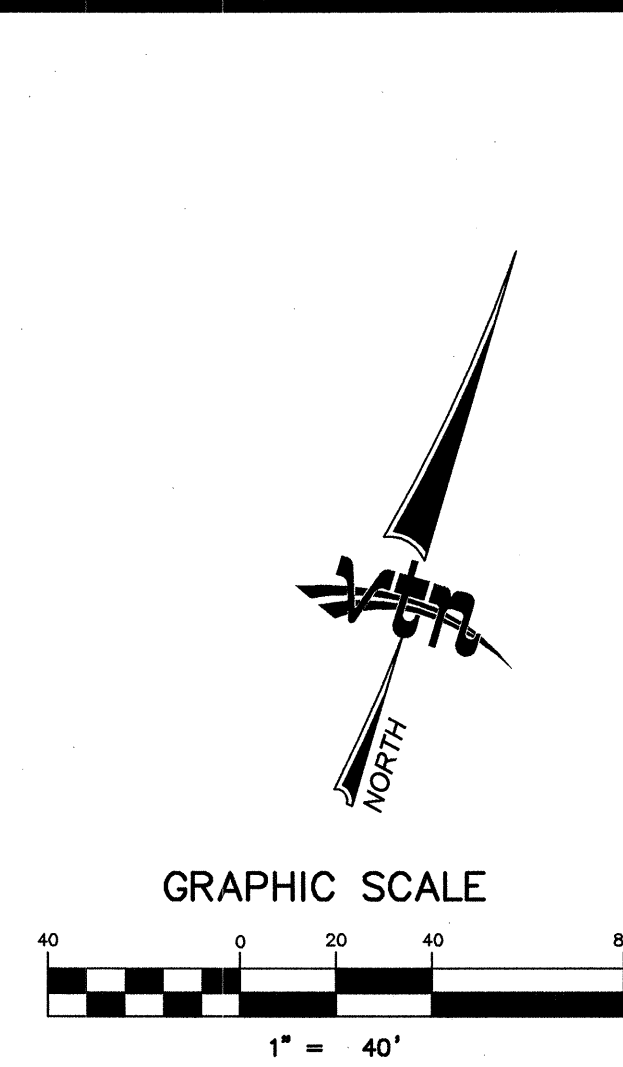
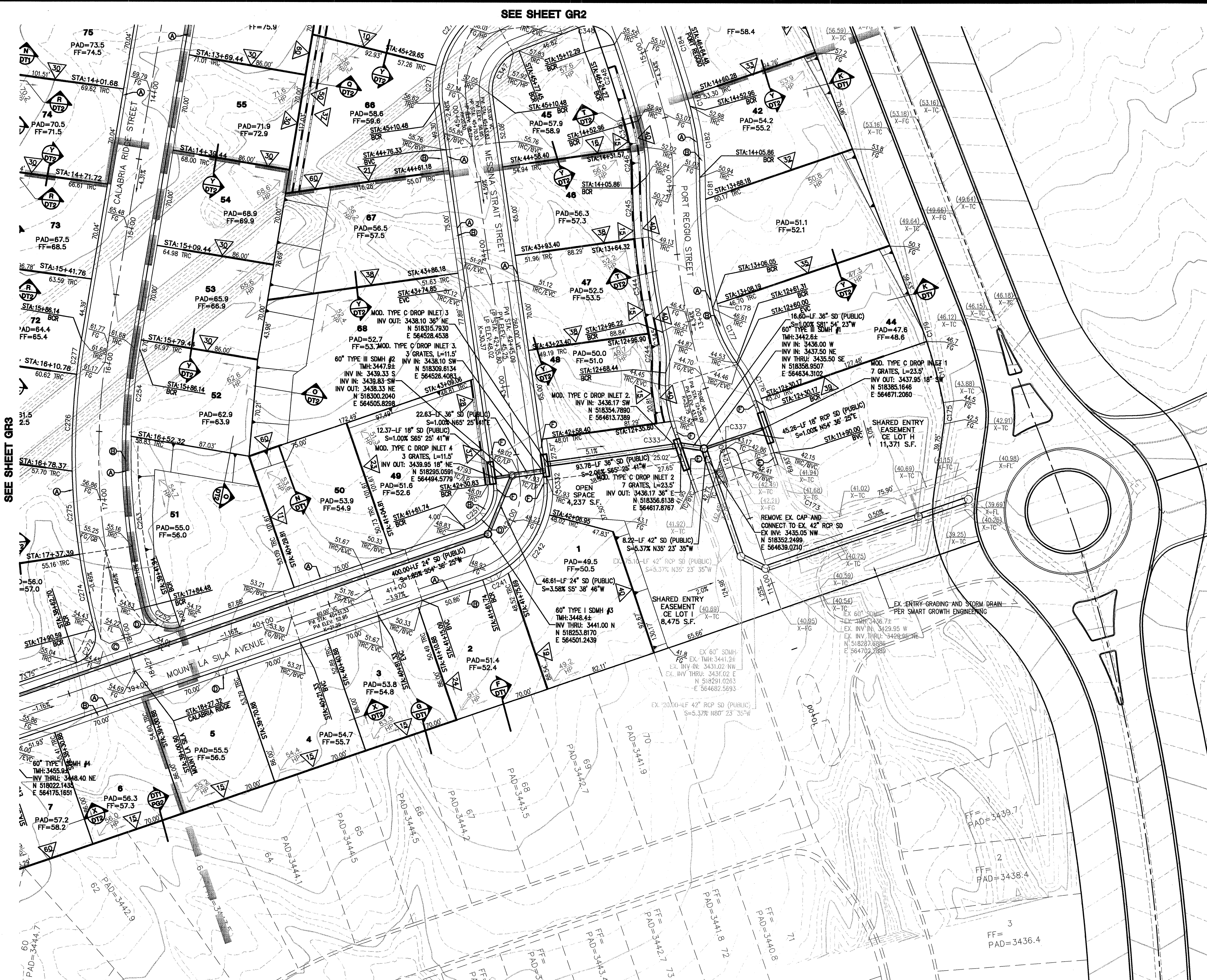
REV

DATE

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LEGEND

- | | | | |
|------------------------------|--|--------|----------------------------------|
| FG | FINISH GRADE | (42.1) | PROPOSED PAD GRADE |
| FL | FLOW LINE | (42.1) | FUT./EXIST. PAD GRADE |
| TC | TOP OF CURB | 0.50% | SLOPE AND FLOW DIRECTION |
| TRC | TOP OF ROLL CURB | | EDGE OF EXIST. A.C. |
| EAC | EDGE OF ASPHALT PAVEMENT | | SAW CUT & MATCH A.C. |
| FUT. | FUTURE | | SIDEWALK RAMP |
| VG | VALLEY GUTTER | | PAD SWALE SLOPES |
| NG | NATURAL GROUND | | SCARP AREA |
| H.P. | HIGH POINT | | LOT NUMBER |
| L.P. | LOW POINT | 27 | BLOCK NUMBER |
| C/L | CENTER LINE | | RETAINING HEIGHT (42 = 4.2 FEET) |
| O/C | OFFSET CROWN | | SIGHT VISIBILITY ZONES |
| BC | BACK OF CURB | | PROJECT BOUNDARY LINE |
| BCR | BEGIN CURB RETURN | | SETBACK LINE |
| TF | TOP OF FOOTING | | R/W OR P/L |
| GB | GRADE BREAK | | EXIST. IMPROVEMENTS |
| PC | POINT OF CURVATURE | | FUTURE IMPROVEMENTS |
| PT | POINT OF TANGENCY | | CENTER LINE |
| PRC | POINT OF REVERSE CURVATURE | | RETAINING WALL |
| PCC | POINT OF COMPOUND CURVATURE | | EX. RETAINING WALL |
| BVC | BEGIN VERTICAL CURVE | | CONC. BLOCK WALL |
| MVC | MID-POINT OF VERTICAL CURVE | | EXIST. CONC. BLOCK WALL |
| EVC | END VERTICAL CURVE | | EXIST. DIRT ROAD |
| PRVC | POINT OF REVERSE VERTICAL CURVE | | EXIST. AC |
| PTI | POINT OF INTERSECTION | | CONSTRUCTION PHASE LINE |
| VPI | VERTICAL POINT OF INTERSECTION | | OR UNIT BOUNDARY LINE |
| TPW | TOP OF PLANTER WALL | | MATCHLINE |
| TW | TOP OF RETAINMENT WALL | | |
| TOP | TOP OF CHANNEL/SCARP | | |
| TOE | TOE OF CHANNEL/SCARP | | |
| TOB | TOP OF BOX | | |
| PP | POWER POLE | | |
| TRANS. | TRANSITION | | |
| RET. | RETAINMENT | | |
| INT. | INTERSECTION | | |
| D.G. | DESIGN GRADE | | |
| TSW | TOP OF SIDEWALK | | |
| FT | FINISH FLOOR | | |
| OFF | GARAGE FINISH FLOOR | | |
| EX BFE | EXISTING BASE FLOOD ELEVATION | | |
| DEV BFE | BASE FLOOD ELEVATION AFTER DEVELOPMENT | | |
| R/W | RIGHT-OF-WAY | | |
| S/W | SIDEWALK | | |
| EX. CONTOUR(5' INTERVAL) | | | |
| EX. CONTOUR(1' INTERVAL) | | | |
| PROPOSED CONTOUR | | | |
| CUT AND FILL TRANSITION LINE | | | |

FLOOD ZONE NOTE

FLOOD ZONE TYPE: ZONE X
FLOOD ZONE MAP: 32003C2150E
FEMA EFFECTIVE DATE: SEPTEMBER 27, 2002
(A ZONE "X" IS DESCRIBED AS AN AREA NOT WITHIN THE 100-YEAR STORM FLOODPLAIN.)

ENGINEER DISCLAIMER NOTE

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

PROJECT BENCHMARK

PROJECT DATUM: NORTH AMERICAN DATUM
CITY OF LAS VEGAS BENCHMARK: 5LV09:34N6 2008
ADJUSTMENT (UPDATED 5/24/10) NAVD88 ELEVATION: 1007.197 METERS (3304.45 FEET)
RIVET AND PLATE IN TOP OF CURVE AT THE NORTHEAST CORNER OF DESERT FOOTHILLS AND ALTA.

BASIS OF BEARINGS

SOUTH 89°30'29" EAST-BEING THE BEARING OF THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 33, TOWNSHIP 21 SOUTH, RANGE 60 EAST M.D.M., AS SHOWN BY THAT PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN FILE 179 OF PLATS, AT PAGE 62.

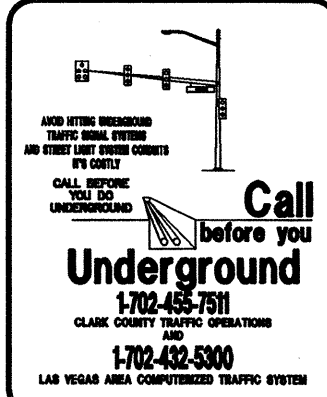
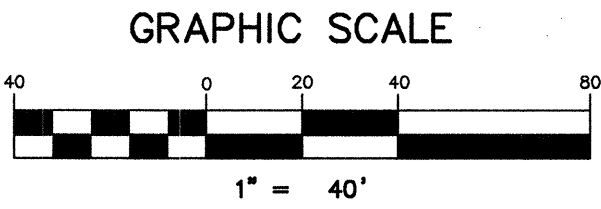
CONSTRUCTION NOTES

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- CONSTRUCT 5' CURB TRANSITION PER DETAIL ON SHEET DT1

RYLAND HOMES 8825 W. RUSSELL ROAD, STE 200 LAS VEGAS, NEVADA 89148 (702) 360-7500		CITY OF LAS VEGAS 2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 673-7550 FAX (702) 362-2597 WEB WWW.VTNV.COM CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS	
GRADING PLAN 4		SUMMERLIN VILLAGE 23B	
PARCEL V		PARCEL V	
DRAWN BY: DNO	DESIGNED BY: AY	CHECKED BY: AY	PROJECT NO: 7534
EXPIRES 12-31-13		SCALE: 1"=40' HORIZ. NA VERT.	
SHEET GR4		SHEETS	
DRAWING NO.			

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	TANGENT
C173	26.00'	90°00'00"	40.84'	26.00'
C174	370.00'	7°04'53"	45.73'	22.89'
C175	45.00'	19°51'11"	15.59'	7.88'
C176	104.00'	17°27'16"	31.68'	15.96'
C177	96.00'	25°00'05"	41.89'	21.28'
C178	476.50'	0°18'42"	2.59'	1.30'
C179	370.00'	2°25'44"	15.68'	7.84'
C181	476.50'	1°52'46"	15.63'	7.82'
C182	193.00'	15°55'19"	53.63'	26.99'
C183	1049.00'	0°25'09"	7.67'	3.84'
C184	1049.00'	4°05'51"	75.02'	37.53'
C185	1049.00'	1°39'03"	30.23'	15.11'
C186	1143.00'	2°14'50"	44.83'	22.42'
C187	1052.00'	1°22'00"	25.09'	12.55'
C188	1052.00'	4°05'11"	75.03'	37.53'
C189	1143.00'	3°45'39"	75.03'	37.53'
C190	1052.00'	4°06'09"	75.33'	37.68'
C191	1143.00'	3°46'24"	75.28'	37.65'
C192	1143.00'	3°48'10"	75.86'	37.95'
C193	1052.00'	4°08'25"	76.02'	38.03'
C194	1052.00'	7°29'50"	137.65'	68.92'
C195	1143.00'	0°42'14"	14.04'	7.02'
C196	73.00'	39°07'48"	49.86'	25.94'
C197	73.00'	44°35'41"	56.82'	29.94'
C198	1499.00'	0°17'07"	7.46'	3.73'
C199	1499.00'	2°40'47"	70.11'	35.06'
C200	1499.00'	2°09'29"	56.46'	28.23'
C201	1501.00'	0°31'48"	13.88'	6.94'
C202	1501.00'	2°40'52"	70.24'	35.13'
C203	1501.00'	2°40'26"	70.05'	35.03'
C204	1501.00'	2°40'21"	70.01'	35.01'
C205	1501.00'	2°40'36"	70.13'	35.07'
C206	1501.00'	2°41'13"	70.39'	35.20'
C207	1501.00'	0°22'51"	9.98'	4.99'
C208	1499.00'	2°18'47"	60.51'	30.26'
C209	1499.00'	1°00'53"	26.54'	13.27'
C210	73.00'	31°48'09"	40.52'	20.80'
C211	73.00'	47°10'45"	60.11'	31.88'
C212	999.00'	0°08'08"	2.37'	1.18'
C213	447.77'	16°29'38"	128.90'	64.90'
C214	999.00'	4°02'16"	70.40'	35.22'
C215	447.77'	5°37'21"	43.94'	21.99'
C216	999.00'	4°01'05"	70.06'	35.04'
C217	999.00'	4°01'05"	70.06'	35.04'
C218	1501.00'	1°47'25"	46.90'	23.45'
C219	999.00'	1°20'15"	23.32'	11.66'
C220	1039.02'	1°20'03"	24.19'	12.10'
C221	448.28'	5°08'24"	40.21'	20.12'
C222	1501.00'	2°40'27"	70.06'	35.04'
C223	1501.00'	2°40'20"	70.01'	35.01'
C224	1501.00'	2°40'34"	70.11'	35.06'
C225	1501.00'	2°41'10"	70.37'	35.19'
C226	399.00'	9°57'33"	69.35'	34.76'
C227	1501.00'	0°01'49"	0.79'	0.40'
C228	399.00'	11°16'15"	78.49'	39.37'
C229	438.54'	4°52'48"	37.35'	18.69'
C230	73.00'	10°29'41"	13.37'	6.70'
C231	438.54'	14°14'45"	109.04'	54.80'
C232	438.54'	4°35'53"	35.19'	17.61'
C233	399.00'	5°16'34"	36.74'	18.38'
C234	399.00'	5°02'14"	35.08'	17.55'
C235	436.54'	3°52'29"	29.66'	14.83'
C236	73.00'	45°52'57"	58.46'	30.90'
C237	73.00'	5°37'00"	7.16'	3.58'
C238	299.00'	12°05'44"	63.12'	31.68'
C239	299.00'	12°49'04"	66.89'	33.59'
C240	299.00'	3°28'18"	18.12'	9.06'
C241	73.50'	15°05'51"	19.37'	9.74'
C242	73.50'	41°28'35"	53.21'	27.83'
C244	90.00'	16°56'14"	26.60'	13.40'
C245	529.50'	4°49'27"	44.58'	22.30'
C246	140.00'	8°28'50"	20.72'	10.38'
C248	996.00'	4°18'58"	75.03'	37.53'
C251	26.50'	79°10'44"	36.62'	21.91'
C252	16.00'	94°47'35"	26.47'	17.40'
C253	457.00'	15°41'19"	125.13'	62.96'
C254	457.00'	7°57'40"	63.50'	31.80'
C255	793.00'	3°06'27"	43.01'	21.51'
C256	793.00'	4°47'19"	66.28'	33.16'
C257	793.00'	5°03'54"	70.10'	35.07'

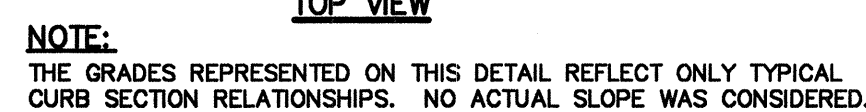
CORRECTIONS				
CORRECTION	RADIUS	DELTA	LENGTH	TANGENT
C258.9	793.00'	0°02'06.21"	24.98'	12.490'
C259.0	1670.50'	8°759'2.51"	2135.50'	15.81'
C260	1544.00'	0°46'09"	20.72'	10.36'
C261	1456.00'	1°58'15"	50.08'	25.04'
C262	1456.00'	3°09'08"	80.11'	40.06'
C263	30.00'	83°43'29"	43.84'	26.88'
C264	1186.00'	2°36'45"	54.08'	27.04'
C265	1186.00'	3°12'44"	66.49'	33.26'
C266	1186.00'	3°23'01"	70.04'	35.03'
C269	16.00'	89°14'23"	24.92'	15.79'
C270	73.50'	44°33'56"	57.17'	30.12'
C271	73.50'	21°57'37"	28.17'	14.26'
C272	20.00'	85°56'11"	30.00'	18.63'
C273	256.00'	5°34'03"	24.88'	12.45'
C274	500.00'	6°20'39"	55.36'	27.71'
C275	500.00'	7°02'15"	61.41'	30.75'
C276	500.00'	8°03'33"	70.33'	35.22'
C277	500.00'	2°56'19"	25.64'	12.82'
C278	750.00'	1°28'09"	19.23'	9.62'
C279	750.00'	5°21'27"	70.13'	35.09'
C280	750.00'	5°21'13"	70.08'	35.06'
C281	750.00'	0°59'47"	13.04'	6.52'
C282	1544.00'	2°46'25"	74.75'	37.38'
C283	20.00'	89°16'02"	31.16'	19.75'
C284	1957.00'	1°48'35"	61.81'	30.91'
C285	16.00'	85°44'38"	23.94'	14.85'
C286	1544.00'	2°52'12"	77.34'	38.68'
C287	1957.00'	2°03'02"	70.04'	35.03'
C288	1543.00'	0°10'27"	4.69'	2.35'
C289	1957.00'	1°51'36"	63.53'	31.77'
C290	1543.00'	2°36'32"	70.26'	35.14'
C291	1543.00'	2°36'05"	70.06'	35.04'
C292	1543.00'	2°35'58"	70.01'	35.01'
C293	1543.00'	2°36'11"	70.10'	35.06'
C294	457.00'	4°19'05"	34.44'	17.23'
C295	1543.00'	1°19'40"	35.76'	17.88'
C296	457.00'	8°47'53"	70.17'	35.16'
C297	457.00'	2°11'52"	17.53'	8.77'
C298	256.00'	16°07'40"	72.06'	36.27'
C299	16.00'	85°05'03"	23.76'	14.68'
C300	20.00'	101°36'21"	35.47'	24.53'
C301	500.00'	1°56'27"	16.94'	8.47'
C302	500.00'	8°02'18"	70.15'	35.13'
C303	500.00'	5°20'05"	46.55'	23.29'
C304	1500.00'	0°54'18"	23.69'	11.85'
C305	1500.00'	2°40'52"	70.19'	35.10'
C306	1500.00'	2°40'30"	70.03'	35.02'
C307	1500.00'	2°40'29"	70.02'	35.02'
C308	1500.00'	2°40'48"	70.16'	35.09'
C309	2000.00'	1°47'16"	62.41'	31.21'
C310	1500.00'	0°17'57"	7.83'	3.91'
C311	2000.00'	2°00'28"	70.08'	35.04'
C312	2000.00'	1°48'54"	63.35'	31.68'
C313	1456.00'	0°56'35"	23.97'	11.98'
C314	1544.00'	2°05'50"	56.51'	28.26'
C315	20.00'	91°14'55"	31.85'	20.44'
C316	956.00'	3°25'59"	57.28'	28.65'
C317	30.00'	78°58'55"	41.35'	24.72'
C318	1456.00'	2°23'04"	60.59'	30.30'
C319	956.00'	4°12'09"	70.12'	35.08'
C320	956.00'	4°11'49"	70.03'	35.03'
C321	1544.00'	0°41'15"	18.52'	9.26'
C322	956.00'	3°06'07"	51.76'	25.88'
C323	1544.00'	2°36'18"	70.20'	35.11'
C324	1544.00'	2°35'56"	70.04'	35.02'
C325	1544.00'	2°35'53"	70.02'	35.01'
C326	1544.00'	2°36'10"	70.14'	35.08'
C327	356.00'	5°04'30"	31.53'	15.78'
C328	1544.00'	1°26'14"	38.73'	19.36'
C329	356.00'	1°19'08"	70.33'	35.28'
C330	30.00'	61°59'39"	32.46'	18.02'
C331	356.00'	15°08'58"	94.13'	47.34'
C332	73.50'	22°36'17"	29.00'	14.69'
C333	100.00'	3°13'40"	5.63'	2.82'
C337	6.84'	180°00'00"	21.47'	INFINITY'
C344	529.50'	7°34'49"	70.05'	35.08'
C345	90.00'	16°56'14"	26.60'	13.40'
C346	140.00'	7°26'29"	18.18'	9.10'
C347	30.50'	76°44'04"	40.85'	24.15'
C348	20.00'	31°41'24"	11.06'	5.68'



Call before you Dig
1-800-227-2600

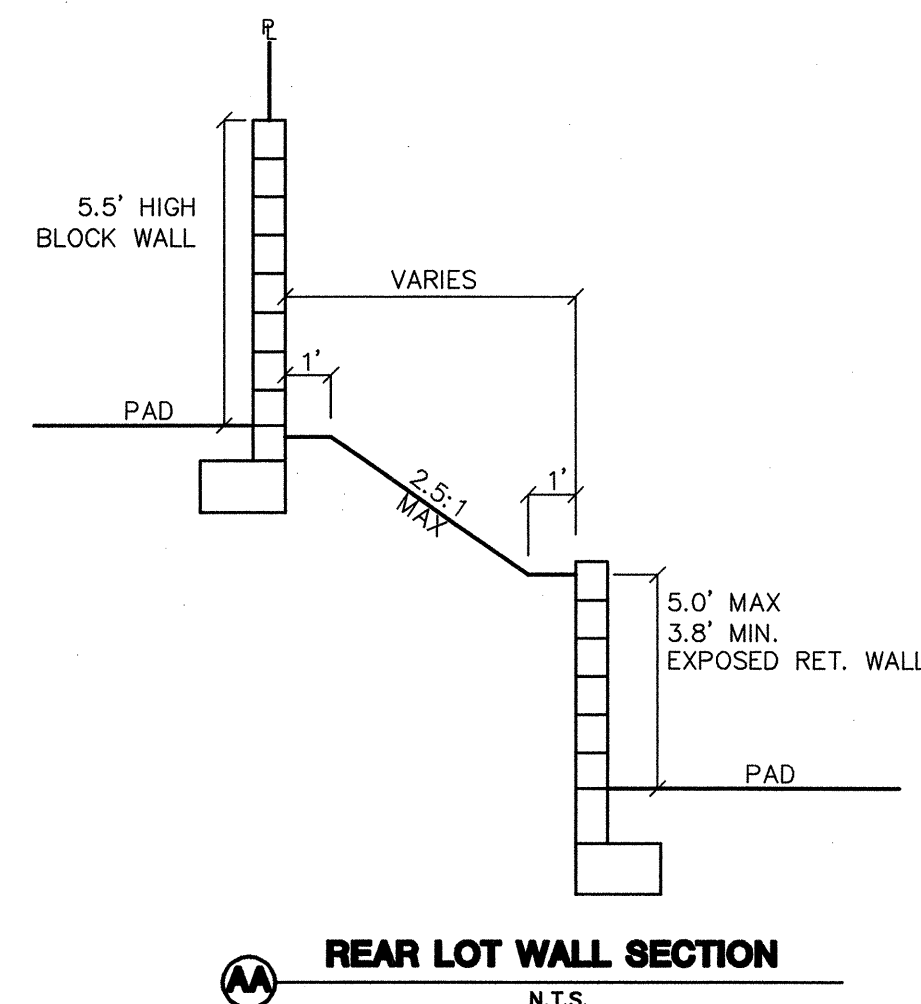
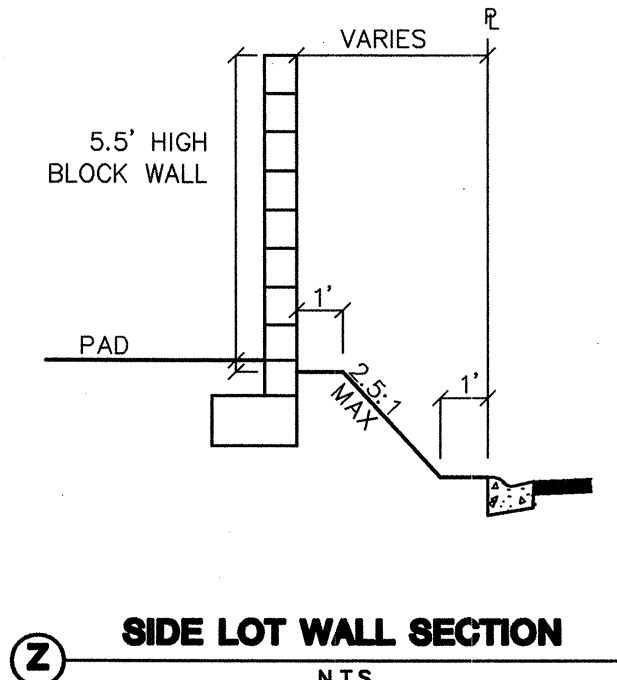
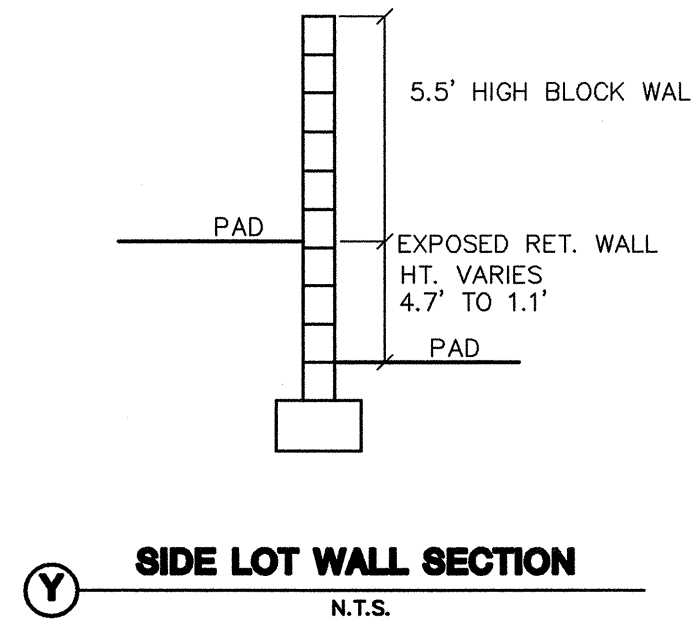
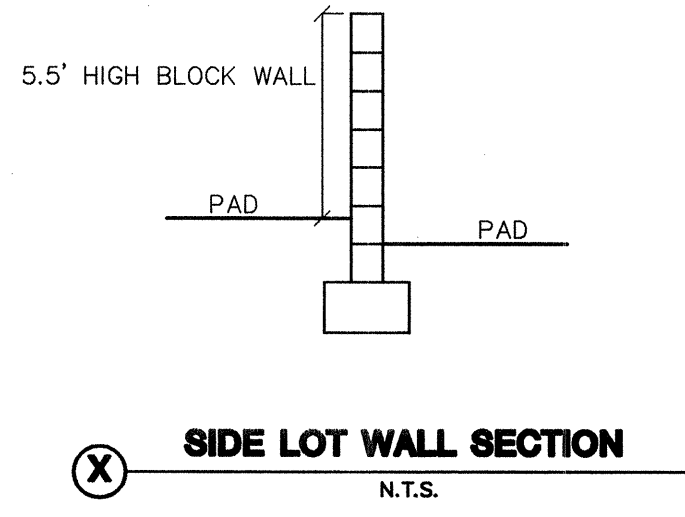
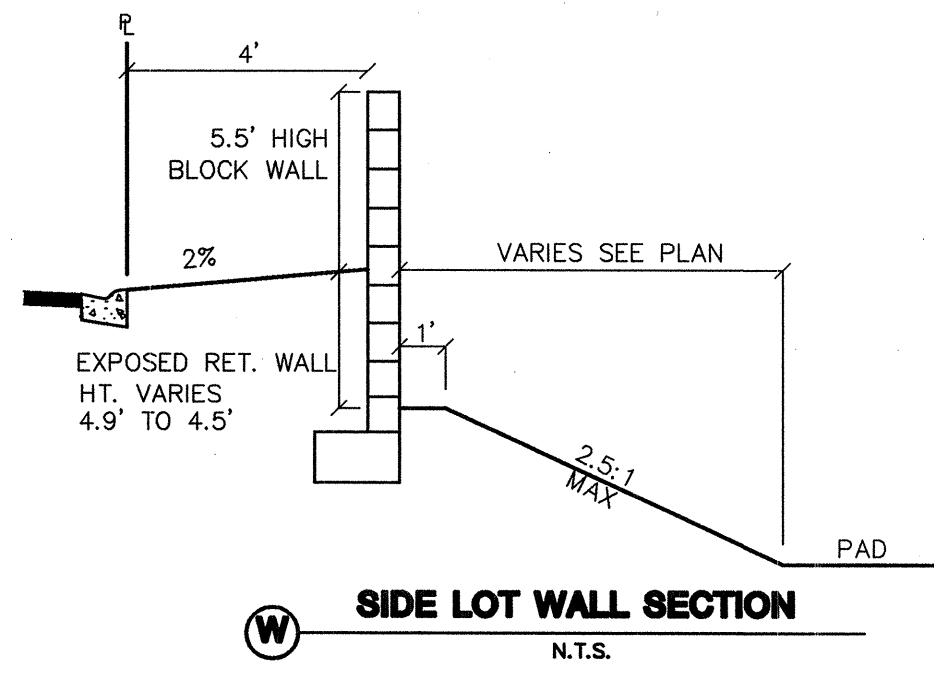
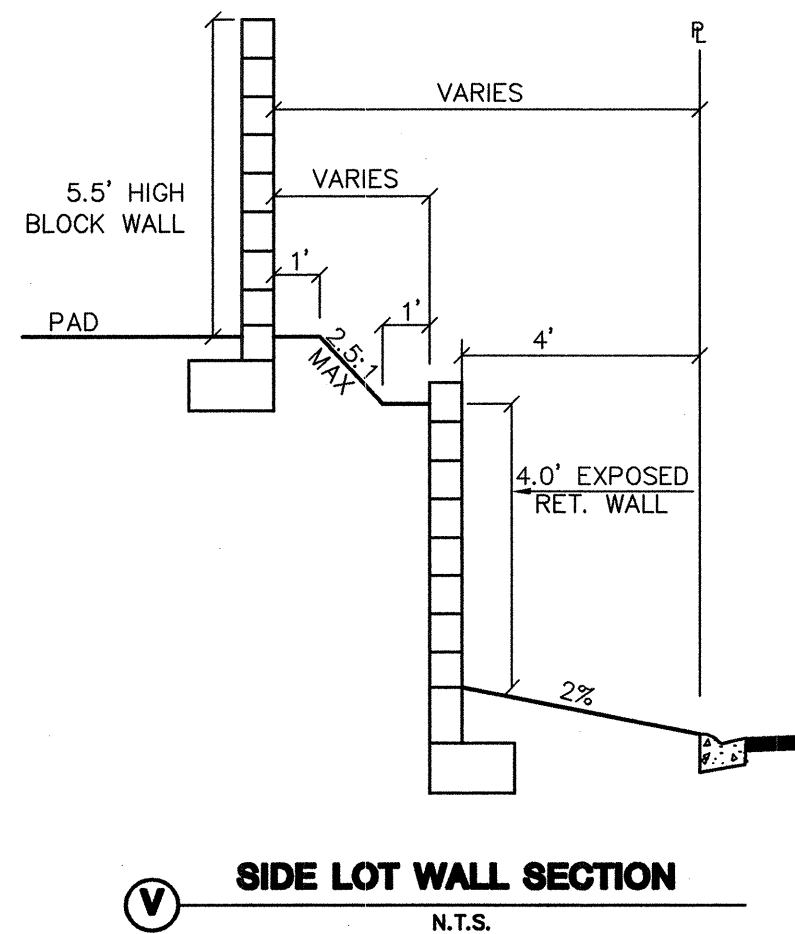
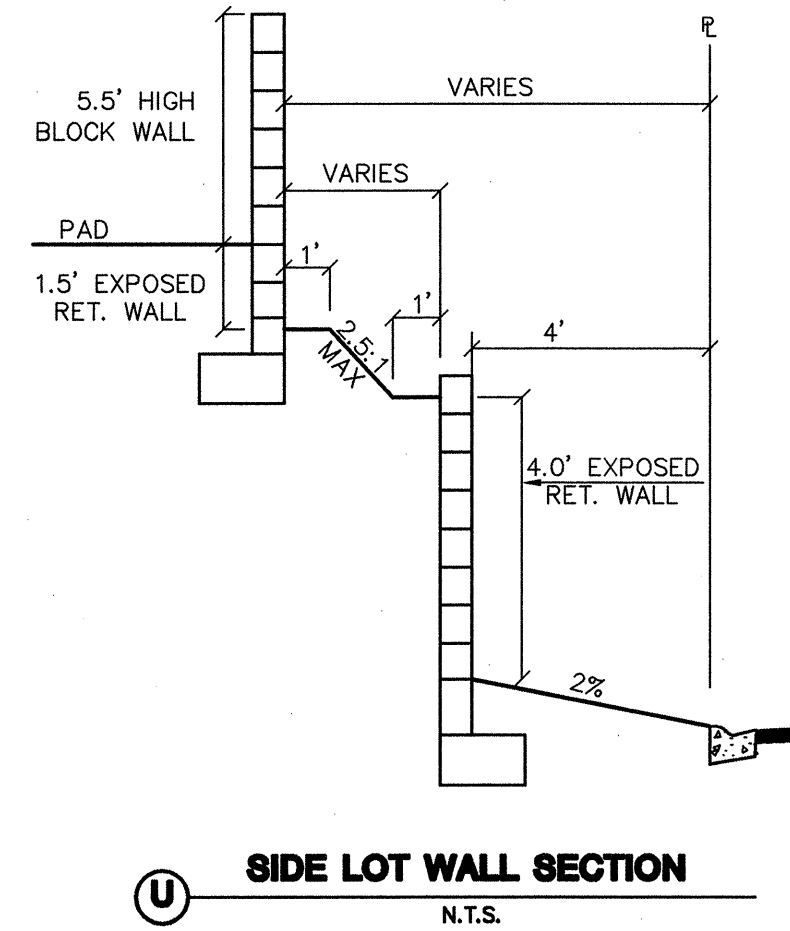
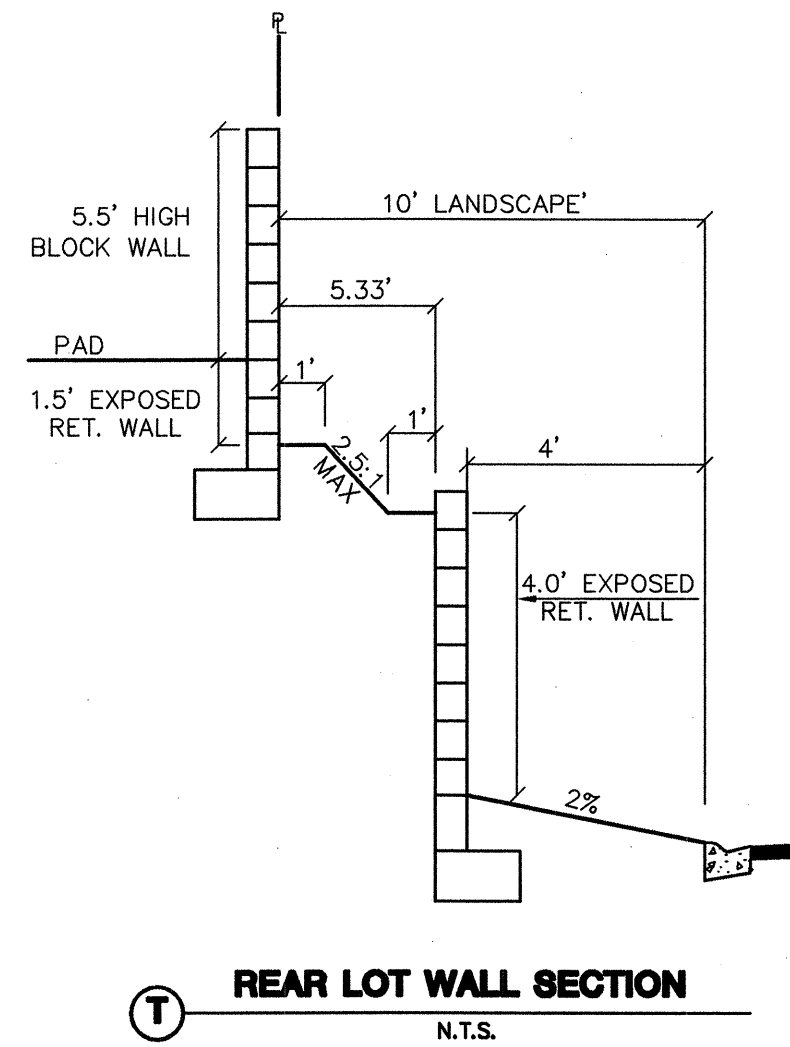
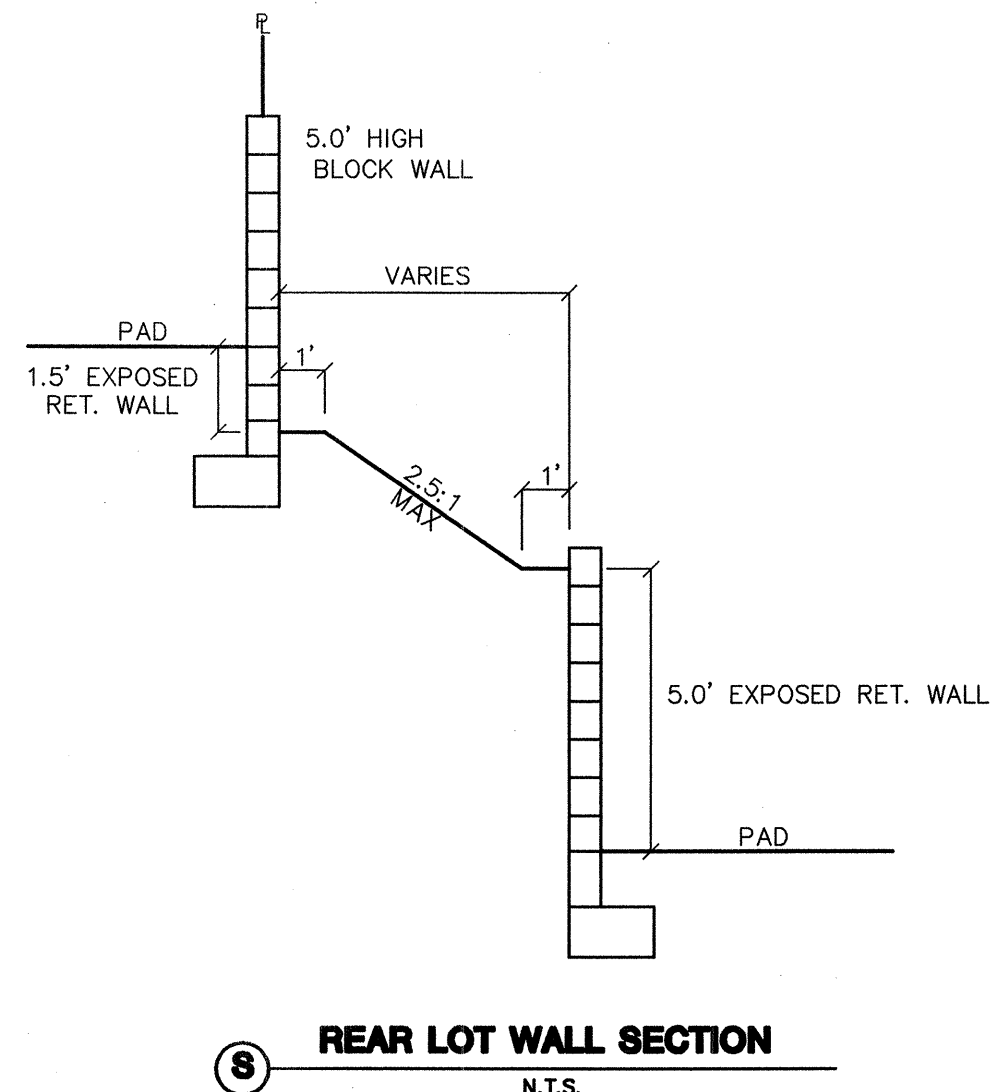
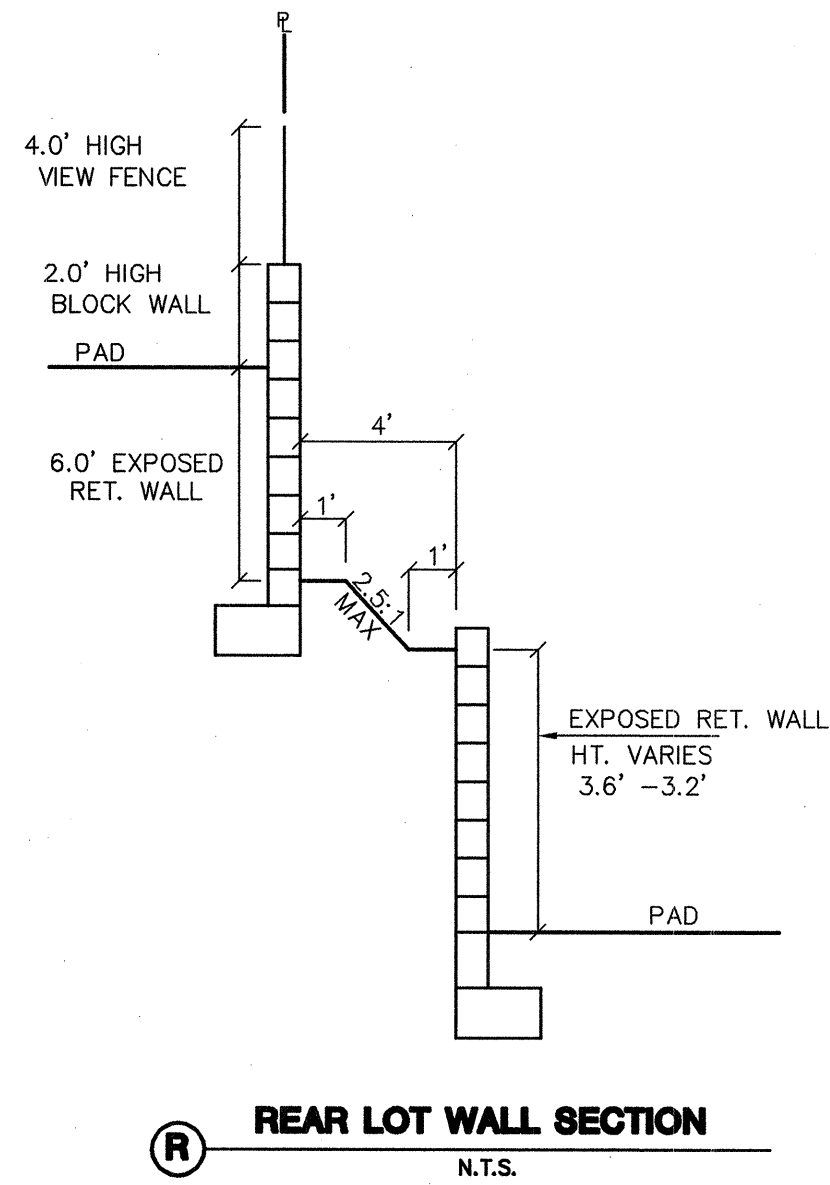
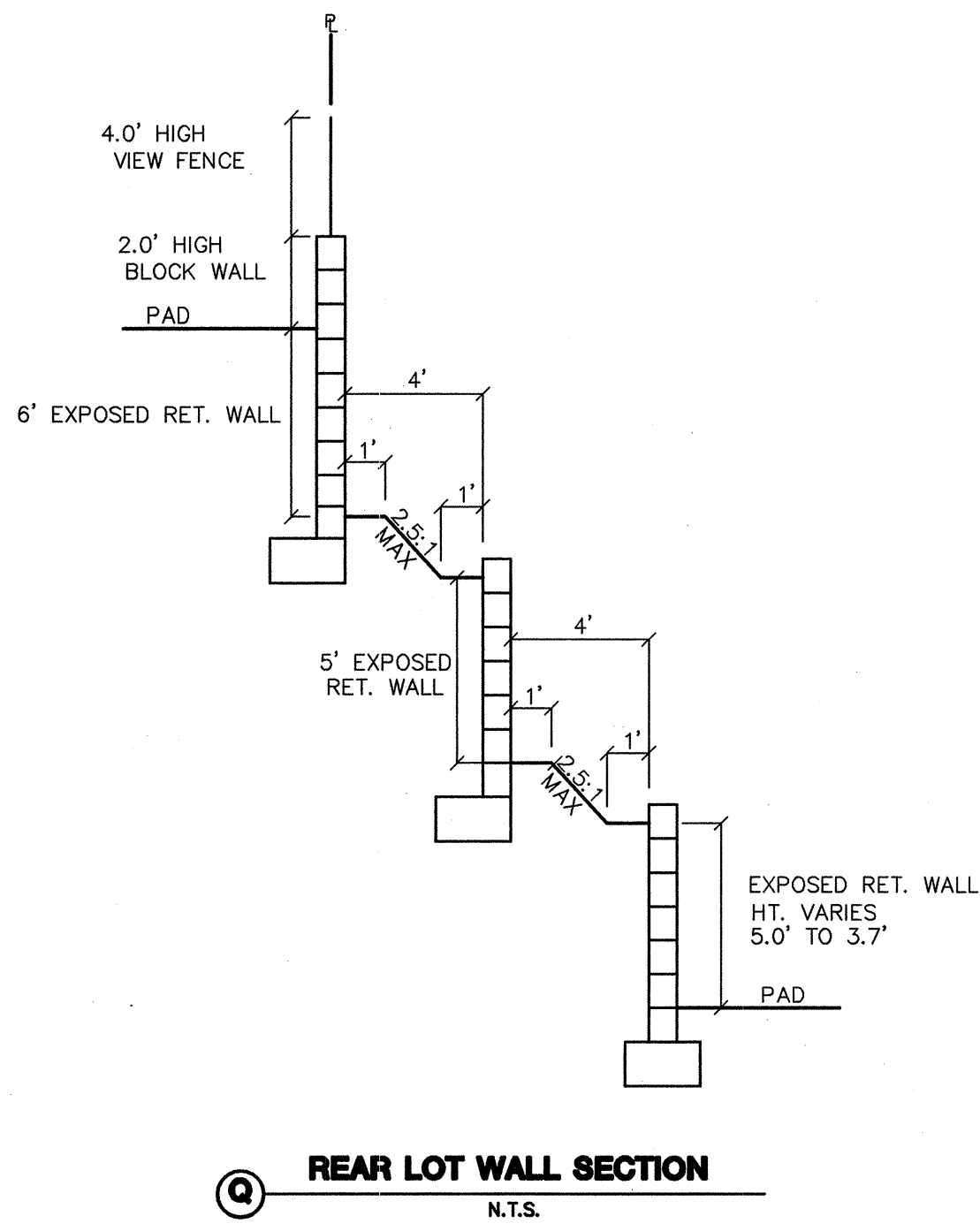
Call before you Overhead
1-702-432-5300

RYLAND HOMES 8925 W. RUSSELL ROAD, STE 200 LAS VEGAS, NEVADA 89148 (702) 360-7500		CITY OF LAS VEGAS 2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VTNV.COM CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS	
GRADING PLAN 5		SUMMERLIN VILLAGE 23B PARCEL V	
DRAWN BY: DNO	JULY 2013	DESIGNED BY: AY	JULY 2013
CHECKED BY: AY	JULY 2013	PROJECT NO: 7534	SCALE: 1"=40' HORIZ. VERT.
EXPIRES 12-31-13 DARYN M. OHTA CIVIL NO. 15906 RENEWED 8/28/13		SHEET GR5 OF SHEETS DRAWING NO.	

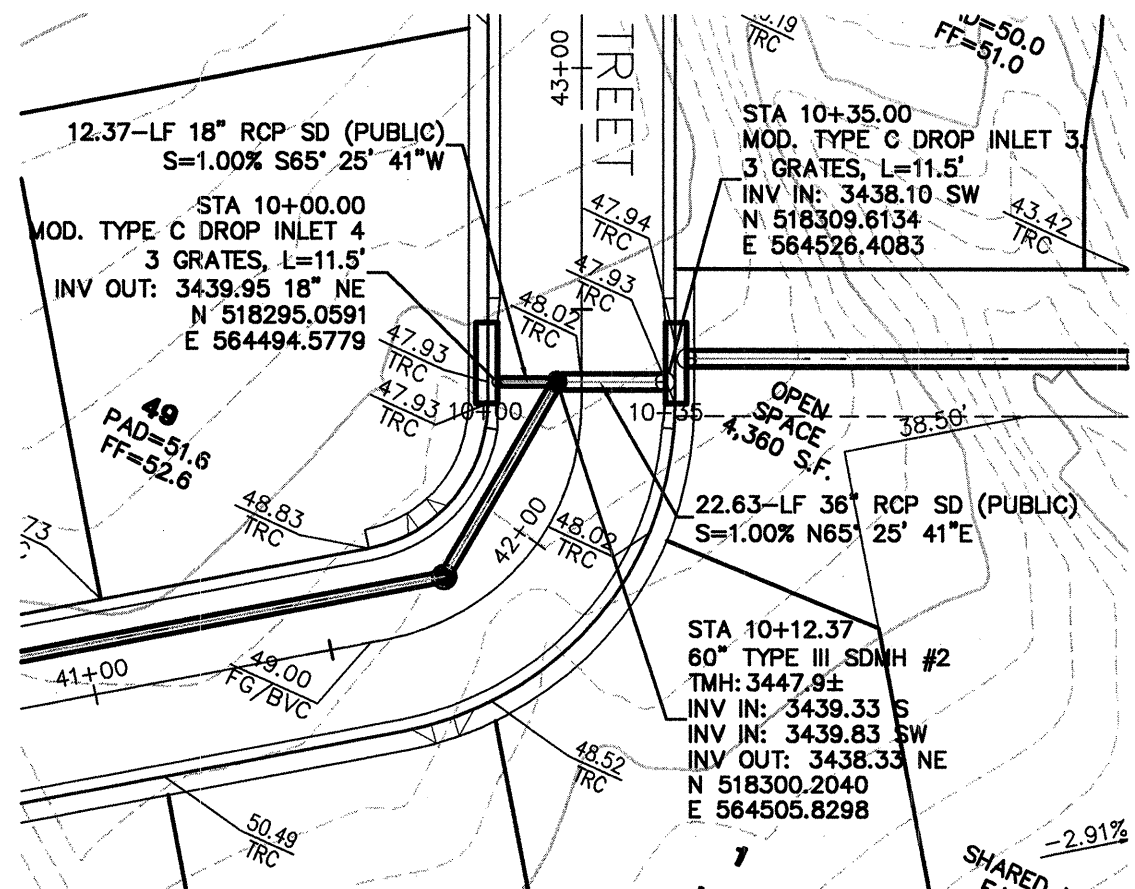


5' CURB TRANSITION

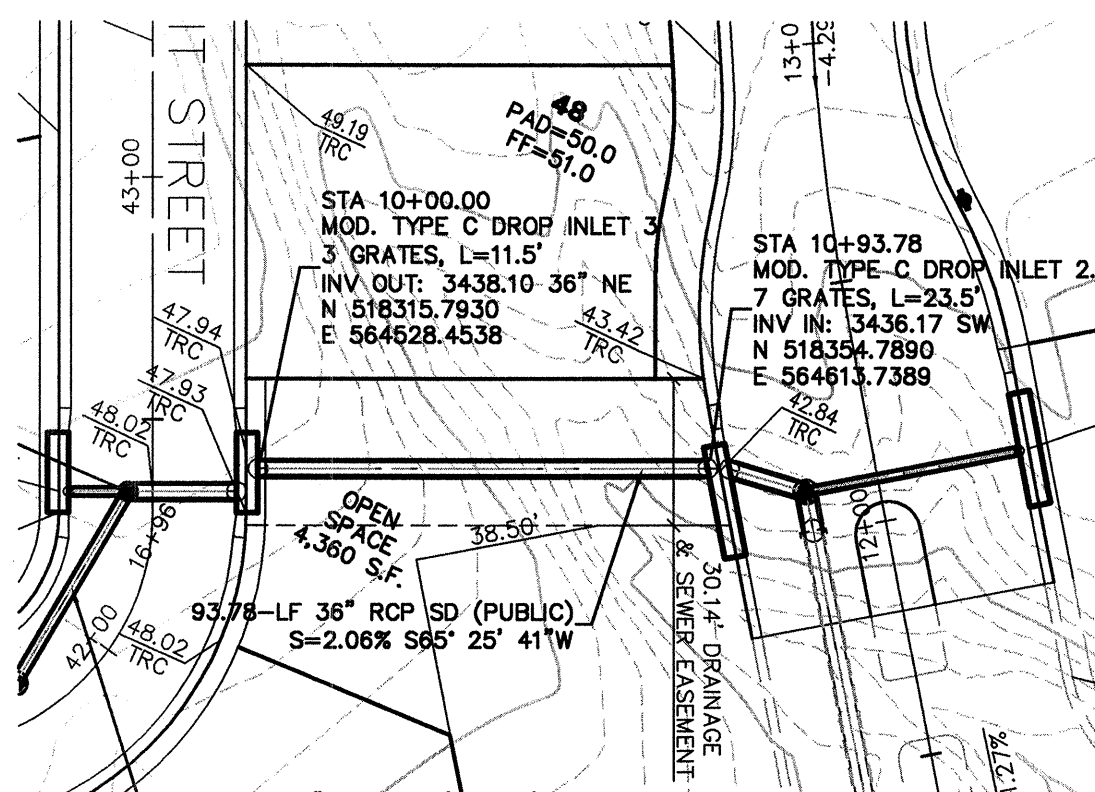




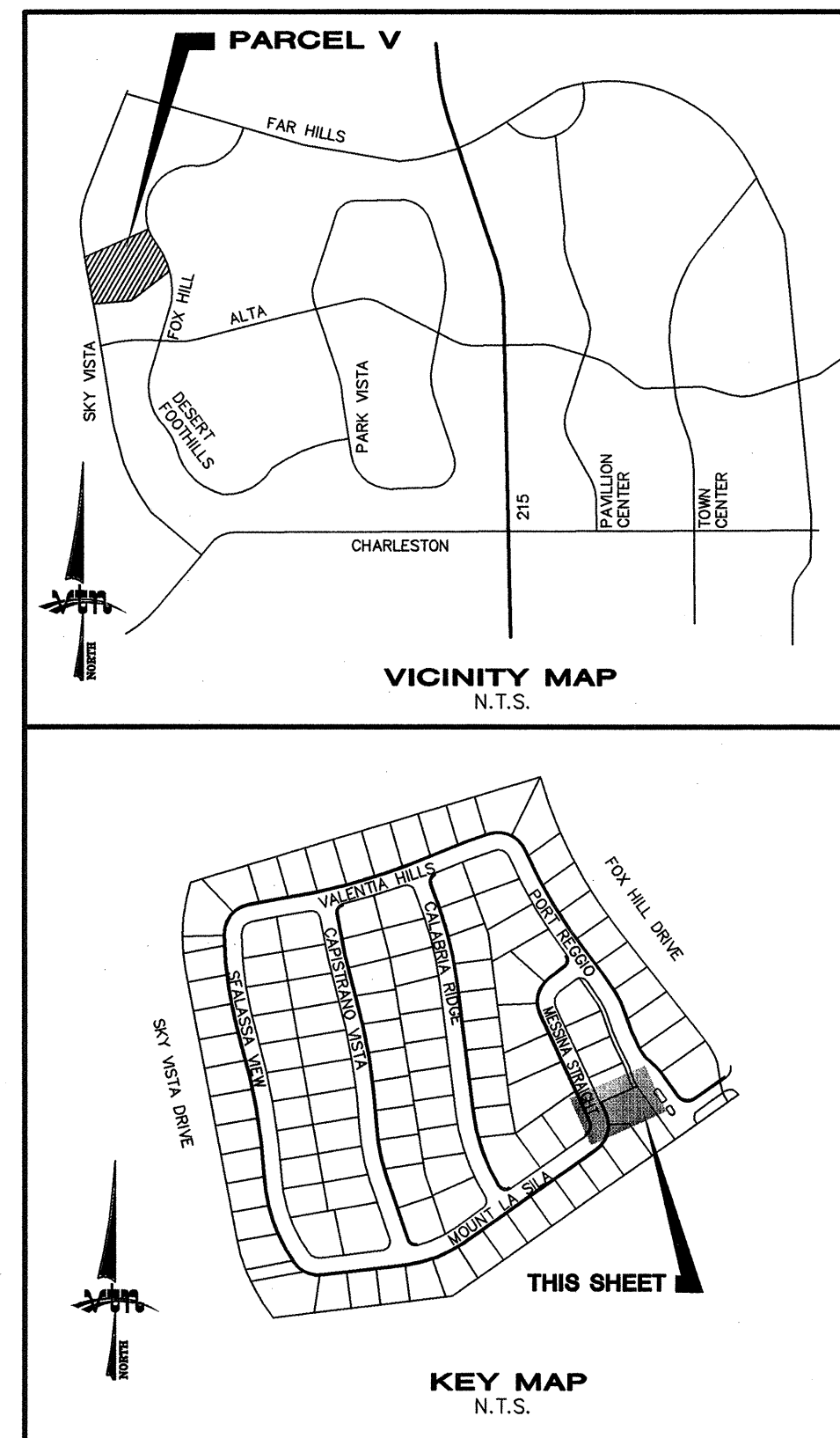
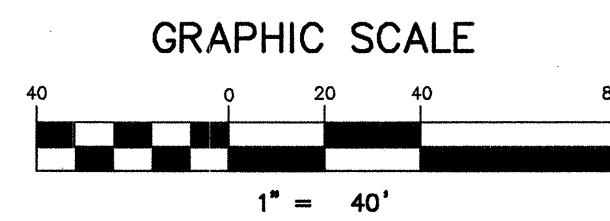
RYLAND HOMES 8825 W. RUSSELL ROAD, STE 200 LAS VEGAS, NEVADA 89148 (702) 360-7500		CITY OF LAS VEGAS 2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 873-7550 FAX (702) 362-2597 WEB WWW.VNIN.VCOM CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS	
GRADING DETAILS 2		SUMMERLIN VILLAGE 23B PARCEL V	
DRAWN BY: DMO	DESIGNED BY: AY	CHECKED BY: AY	PROJECT NO: 7532
JULY 2013	JULY 2013	SCALE: NA	HORIZ. VERT. NA
EXPIRES 12-31-13		8/28/13	
PROFESSIONAL ENGINEER DARYN M. OHTA CIVIL No. 15906		SHEET DT2 OF SHEETS DRAWING NO.	



MESSINA STRAIT STORM DRAIN



DRAINAGE EASEMENT STORM DRAIN



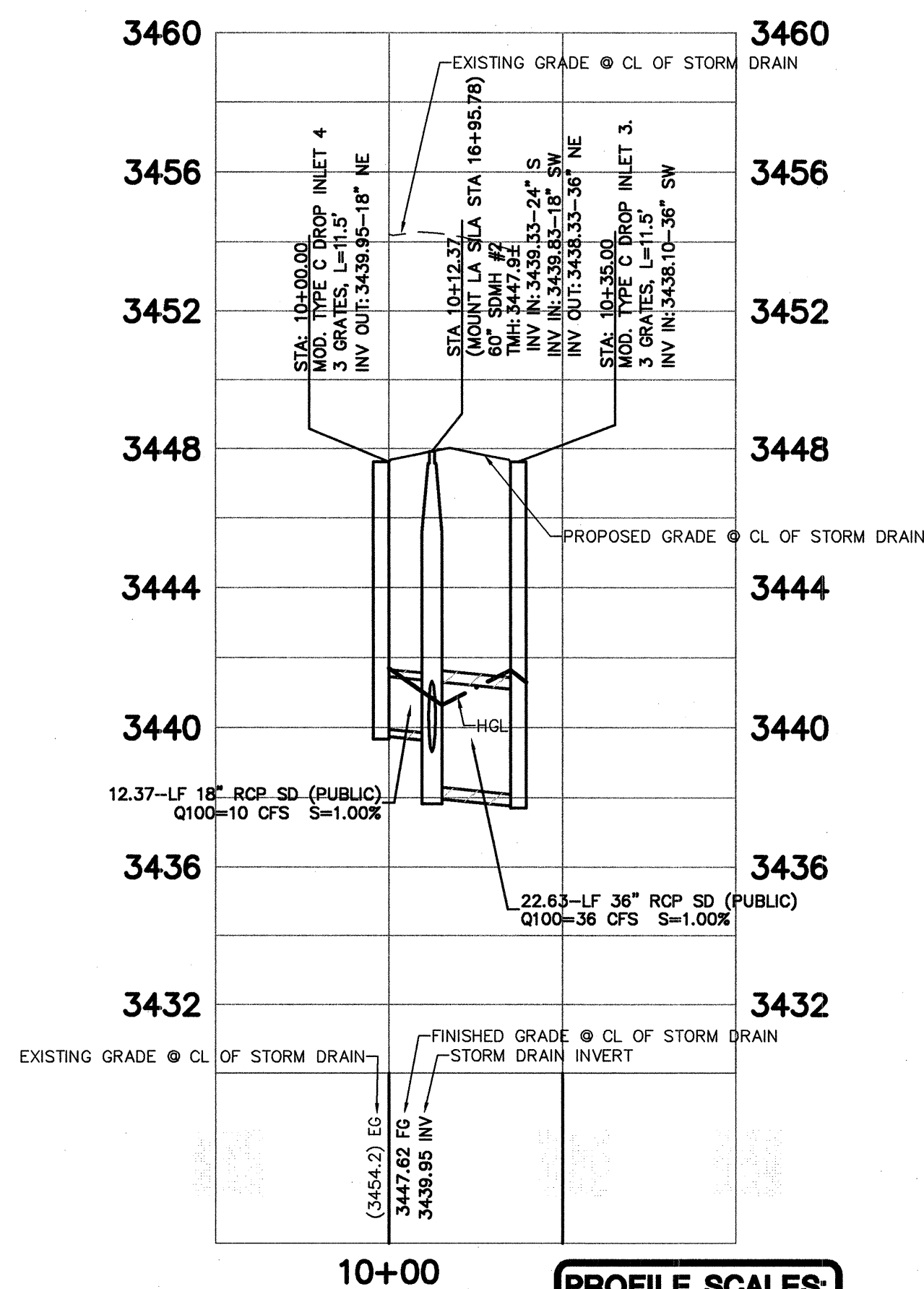
UTILITY CROSSING NOTE:
ALL SEWER/STORM DRAINS CROSSING WATER LINES MUST CONFORM TO SECTION 2.22 OF UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR PORTABLE WATER SYSTEMS (UDACS) FOR WATER AND STORM MAIN CROSSINGS AND CLEARANCES.

FLOOD ZONE NOTE
FLOOD ZONE TYPE: ZONE X
FLOOD ZONE MAP: 32003C2150E
FEMA EFFECTIVE DATE: SEPTEMBER 27, 2002
(A ZONE "X" IS DESCRIBED AS AN AREA NOT WITHIN THE 100-YEAR STORM FLOODPLAIN.)

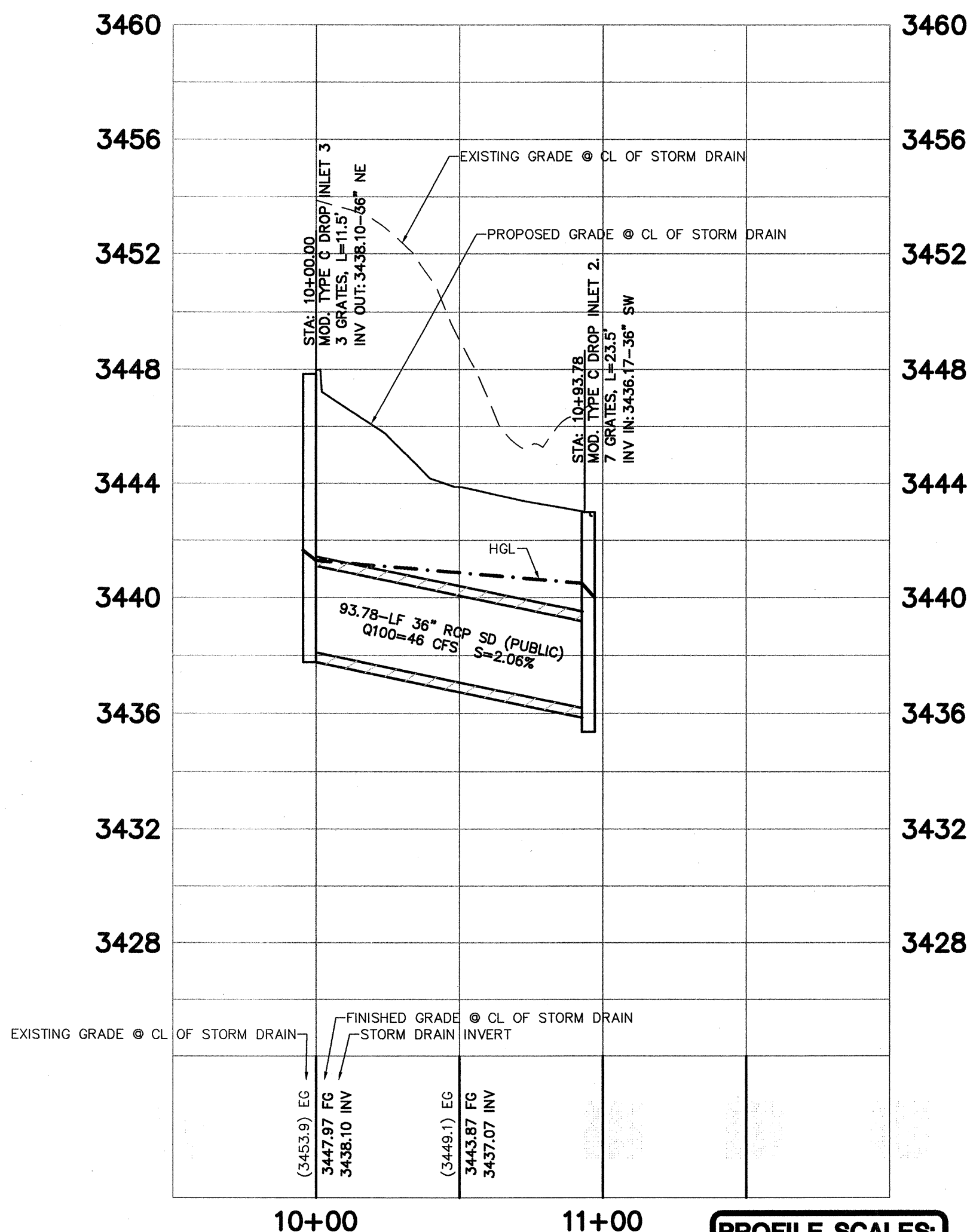
ENGINEER DISCLAIMER NOTE
UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO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

PROJECT BENCHMARK
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
CITY OF LAS VEGAS BENCHMARK: SLV09:34NE8 2008 ADJUSTMENT (UPDATED 5/24/10) NAVD88 ELEVATION: 1007.197 METERS (3304.45 FEET)
RIVET AND PLATE IN TOP OF CURVE AT THE NORTHEAST CORNER OF DESERT FOOTHILLS AND ALTA.

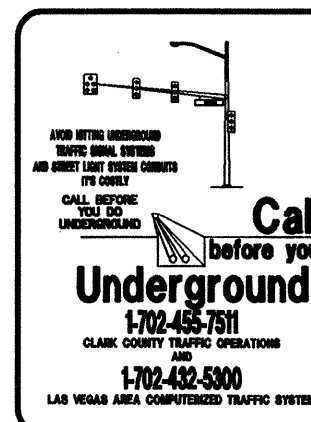
BASIS OF BEARINGS
SOUTH 89°30'28" EAST-BEING THE BEARING OF THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 33, TOWNSHIP 21 SOUTH, RANGE 60 EAST M.D.M., AS SHOWN BY THAT PARCEL MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN FILE 179 OF PLATS, AT PAGE 62.



PROFILE SCALES:
HORZ. = 1"=40'
VERT. = 1"=4'



PROFILE SCALES:
HORZ. = 1"=40'
VERT. = 1"=4'



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1-800-227-2800
Call before you Overhead
1-702-227-2929

DARYN M. OHTA, P.E. #15906 DATE
"I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT." (DS xxxxx)

CITY OF LAS VEGAS 2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148 PH. (702) 673-7550 FAX (702) 362-2597 WEB WWW.VTNV.COM CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS		REV	DATE	BY	REVISION
RYLAND HOMES 8925 W. RUSSELL ROAD, STE 200 LAS VEGAS, NEVADA 89148 (702) 360-7500					
MESSINA STRAIT & EASEMENT STORM DRAIN PLAN & PROFILE					
SUMMERLIN VILLAGE 23B PARCEL V					
DRAWN BY: DNO	JULY 2013	DESIGNED BY:		CHECKED BY:	AY
PROJECT NO:	7550	SCALE:	1"=40' HORZ. 1"=4' VERT.		
EXPIRES 12-31-13					
SHEET SD2 OF SHEETS		DRAWING NO.			