Ladera Ranch - Phase II

Application to Washoe County for a:

Tentative Subdivision Map and Variance

Prepared by:

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April 15, 2020

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Water Capacity Study

Plan Set (32 sheets)
T1 - Title Sheet
S0 to S6 - Preliminary Site Plan
G0 to G6 - Preliminary Grading Plan
C1 - Cut & Fill Map
U1 to U6 - Preliminary Utility Plan
EC1 to EC3 - Preliminary Erosion Control Plan
HY1 to HY4 - Preliminary Hydrology Plan
X1 to X2 - Cross Sections
L1 - Preliminary Landscape Plan & Tree Protection Plan

Project Request - This application includes the following request:

- A request for a Tentative Subdivision Map to allow development of 294 single family lots as a Common Open Space Development project on a 266-acre site known as Ladera Ranch –Phase II single family project.

Property Location

The site is located along and adjacent to Golden Valley Road and will be accessed from Dream Catcher Lane with several planned street connection to Dream Catcher. This is located on five parcels that total 266 acres for the site.

Project Description

Ladera Ranch is a common open space development which promotes the concept of clustering lots to the usable area and providing more open space in exchange for clustering of lots. In this case, 1/4th of the site is open space used primarily for the buffering areas. The 3/4ths majority of the site is development area to includes homes, yards, and streets for access.

Zoning Standards

Density: There are 4 zoning Districts on the site that lead to the following allowed density summary:

MDS = 69 acres x 3 du per acre = 205 lots proposed
LDS = 68 acres x 1 du per acre = 65 lots proposed
HDR = 61 acres x 1 du per 2.5 acres = 24 lots proposed
Opens Space = 68 acres and no lots
Zoning allows a total of 294 lots with the blended zoning designations.

Gross Density = 294 lots on 266 acres = 1.10 du per acre proposed

Following is the minimum lot size program designed for this community:

Minimum lot size = 48' width x 65' depth
Minimum Building setbacks are:
- Front Yards = 20' to the house or garage, 10' to the home
- Side yards = 13' on one side and Zero Lot Line on the other side
- Rear yards = 10'

Maximum Height: 2 stories allowed and all 2 story homes are being proposed
Minimum lot size is 3,120 sf, average lot size = 4,568 sf, the largest lot = 12096 sf

Figure 1 – Vicinity Map

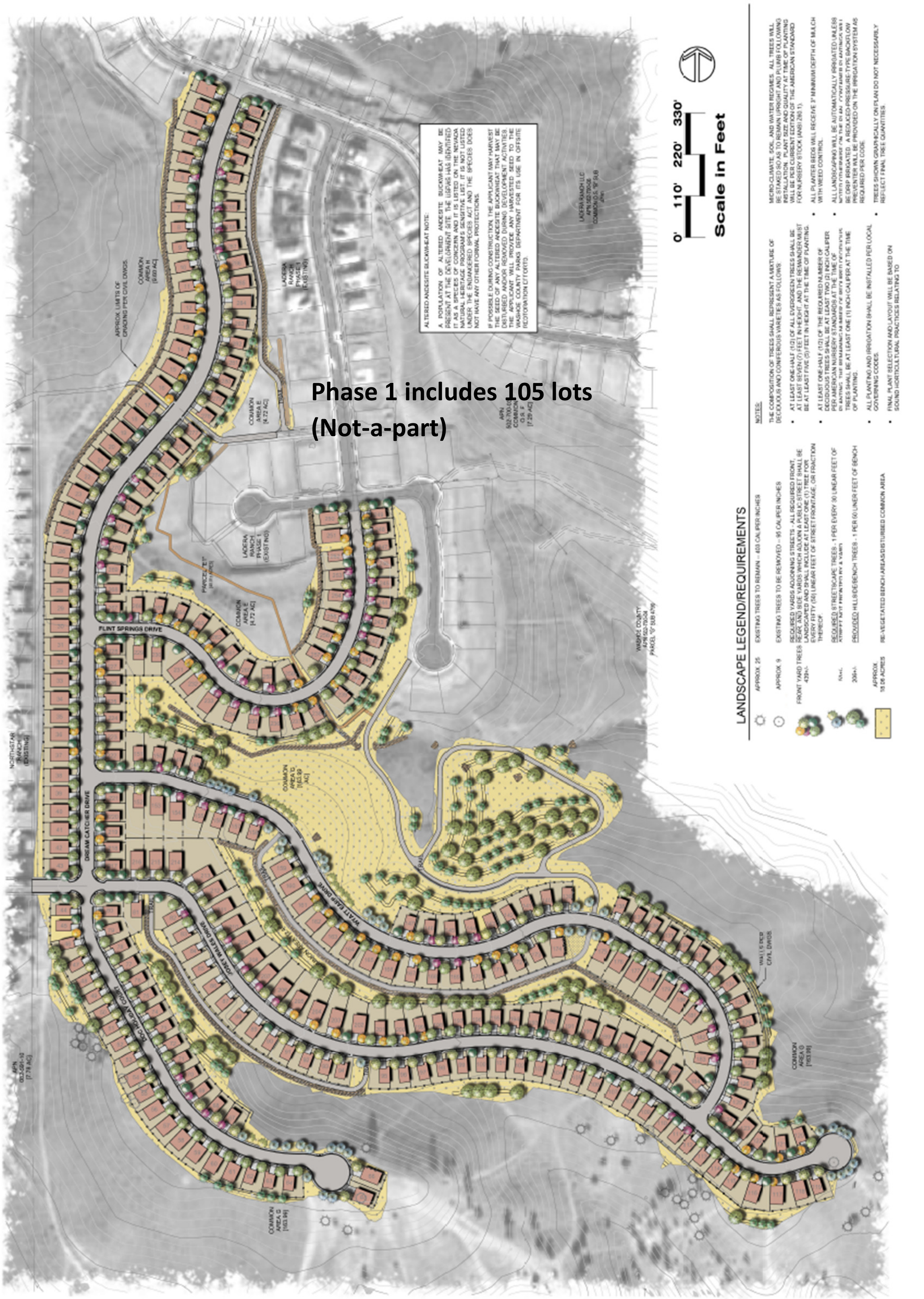

Figure 2 – Site Plan

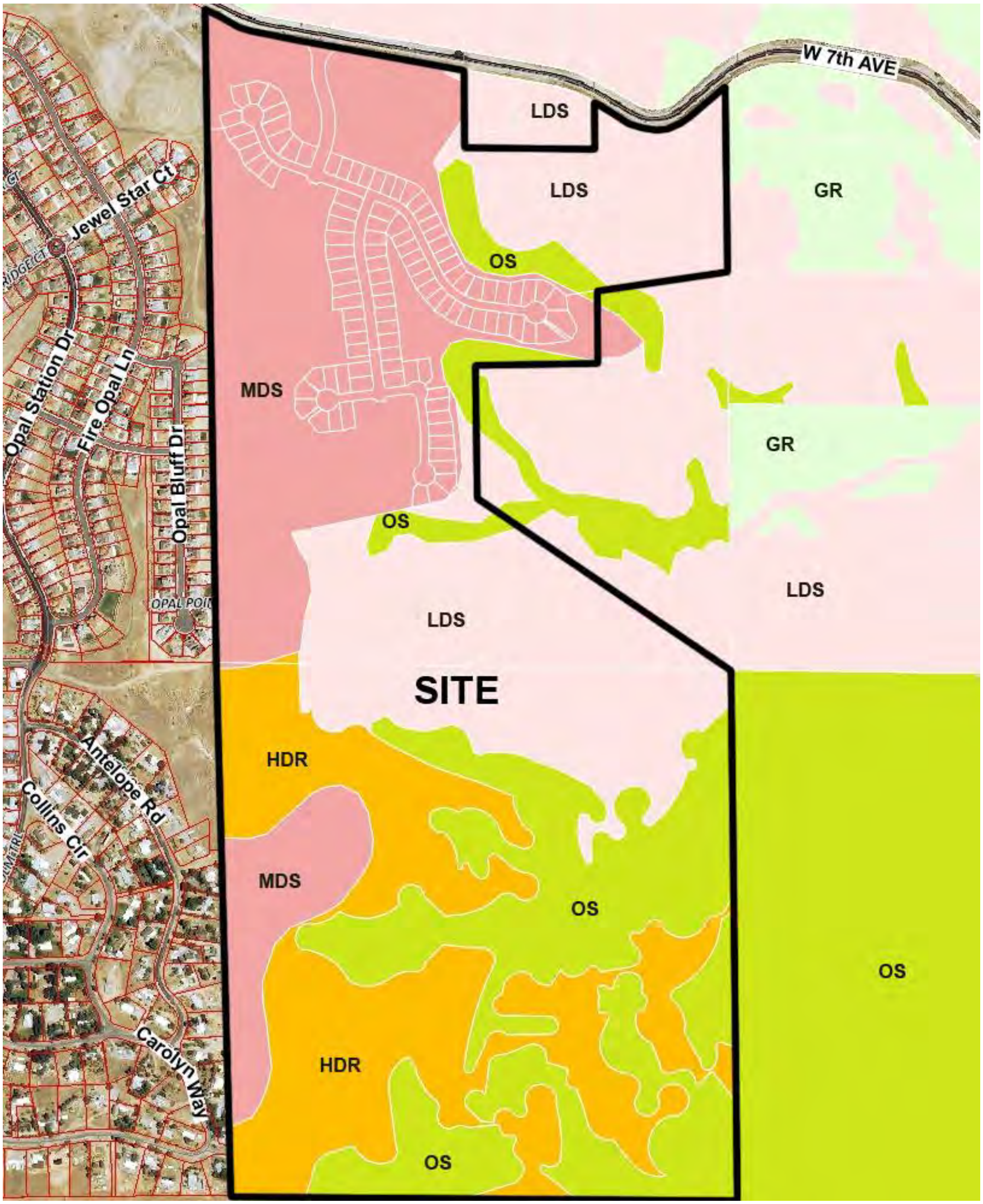

Figure 3 – WC Zoning

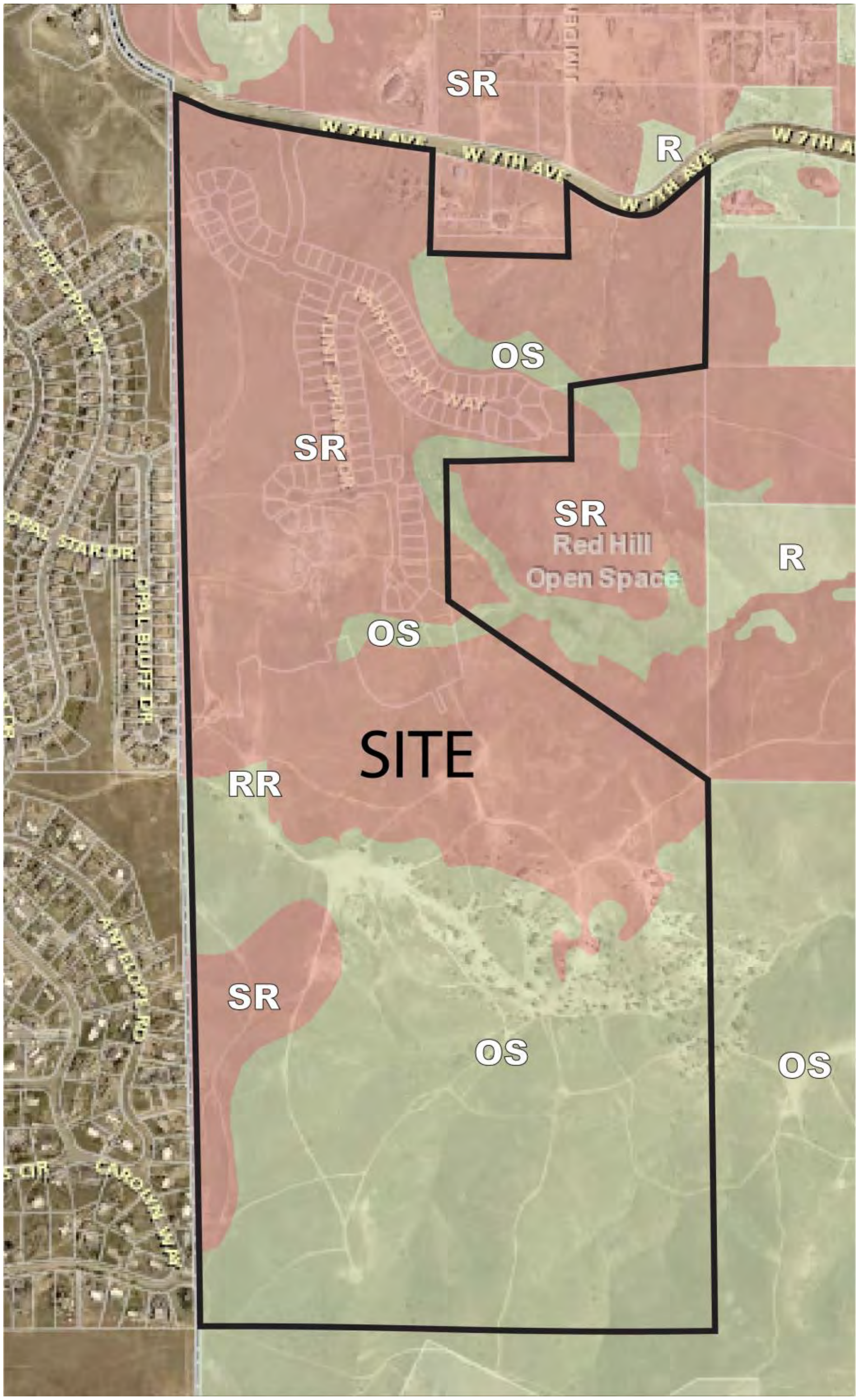

Figure 4 – WC Master Plan

Tentative Map Findings:
Washoe County Code Section 110.608.25 requires that all of the following findings be made to the satisfaction of the Washoe County Planning Commission before granting approval of the Tentative Map request.

1) **Plan Consistency. That the proposed map is consistent with the Master Plan and any specific plan.**

   The proposed subdivision map meets all of the pertinent goals and policies of the Master Plan, and the Sun Valley Area Plan. The project falls under the allowable density established in the Area Plan and complies with all known policies that allow the density du per acre for residential uses.

2) **Design or Improvement. That the design or improvement of the proposed subdivision is consistent with the Master Plan and any specific plan.**

   The proposed map meets all of the density, lot size and opens space criteria of the Master Plan, and the Sun Valley Area Plan. Specifically, the proposed development is within the allowable blended density of 3 units per acre of the MDS zoning, 1 unit per Acre for the LDS zoning, and 1 unit per 2.5 acres for the HDR zone and the Suburban Residential and Rural Residential master plan. Also, the proposed subdivision complies with the Common Open Space criteria for pedestrian access, open space, community amenities, etc.

3) **Type of Development. That the site is physically suited for the type of development proposed.**

   The proposed subdivision appears to be well suited to the site as reflected in all of the technical products including the lot sizes, access, and grading. The site appears to be physically suited for the type of development proposed.

4) **Availability of Services. That the subdivision will meet the requirements of Article 702, Adequate Public Facilities Management System.**

   The subdivision does meet all of the requirements of Article 702, Adequate Public Facilities Management System.

5) **Fish or Wildlife. That neither the design of the subdivision nor any proposed improvements is likely to cause substantial environmental damage, or substantial and avoidable injury to any endangered plant, wildlife or their habitat.**

   Most of the off-site infrastructure needs have been constructed. The improvements will not cause substantial environmental damage or substantial and avoidable injury to any endangered plant, wildlife or their habitat. There is no known habitat on the site. The site is covered with sagebrush and trees.

6) **Public Health. That the design of the subdivision or type of improvement is not likely to cause significant public health problems**.

The design of the subdivision and improvements will not cause significant public health problems because most of the infrastructure is already in place. Dust control related to grading will be the most obvious public health issue which is tightly regulated with dust control permitting. Additionally, the proposed amenities such as pedestrian trails, landscaping and common area will enhance the aesthetic and recreational value of the immediate neighborhood.

7) **Easements. That the design of the subdivision or the type of improvements will not conflict with easements acquired by the public at large for access through, or use of property within, the proposed subdivision.**

The subdivision as designed has taken into consideration and accommodated existing public easements for access through and use of the property.

8) **Access. That the design of the subdivision provides any necessary access to surrounding, adjacent lands and provides appropriate secondary access for emergency vehicles.**

The design of the subdivision will provide for good pedestrian and emergency vehicle access to these surrounding uses.

9) **Dedications. That any land or improvements to be dedicated to the County is consistent with the Master Plan.**

All of the roadways will be dedicated to the county. The paths and common area will remain under the ownership of the Homeowner's Association. All sewer improvements will be dedicated to Washoe County as well.

10) **Energy. That the design of the subdivision provides, to the extent feasible, for future passive or natural heating or cooling opportunities in the subdivision.**

To the extent possible, the design of the subdivision provides for future passive or natural heating or cooling opportunities. The layout is very much governed by the topographic conditions on the site which is the form of widely varied slopes across the site.

Appendices

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Washoe County Development Application

Your entire application is a public record. If you have a concern about releasing personal information, please contact Planning and Building staff at 775.328.6100.

Project Information **Staff Assigned Case No.:** ____________

Project Name: Ladera Ranch

Project Description: This project is a 294 lot subdivision that will serve as Phases 2 thru 6 as a continuation of Ladera Ranch subdivision.

Project Address: No Address Assigned: It is on W 7th Street (1/2 mile west of Sun Valley Boulevard)

Project Area (acres or square feet): ±266.07 Acres

Project Location (with point of reference to major cross streets **AND** area locator):

South of Ladera Ranch Phase 1. Near the intersection of E Golden Valley Rd (W 7th) & Dream Catcher

Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
Please see attached Parcel information Table			

Indicate any previous Washoe County approvals associated with this application:

Case No.(s).

Applicant Information (attach additional sheets if necessary)

Property Owner:		**Professional Consultant:**	
Name: Ladera Ranch LLC		Name: Summit Engineering	
Address: 5190 Neil Road, Suite 420		Address: 5405 Mae Anne Ave	
Reno, Nevada	Zip: 89502	Reno, Nevada	Zip: 89523
Phone: 775-825-4884	Fax: 825-8819	Phone: 775-747-8550	Fax: 747-8559
Email: wroberts@lansingcompanies.com		Email: Robert@summitnv.com	
Cell: (702)-305-8638	Other:	Cell: 775-787-4331	Other:
Contact Person: Will Roberts		Contact Person: Robert Gelu	
Applicant/Developer:		**Other Persons to be Contacted:**	
Name: Same as above		Name: KLS Planning & Design	
Address:		Address: 1 East 1st Street, Suite 1400	
	Zip:	Reno, NV	Zip: 89501
Phone:	Fax:	Phone: 775-857-7710	Fax: N/A
Email:		Email: Johnk@klsdesigngroup.com	
Cell:	Other:	Cell: 775-857-7710	Other: N/A
Contact Person:		Contact Person: John Krmpotic, AICP	

For Office Use Only

Date Received:	Initial:	Planning Area:
County Commission District:		Master Plan Designation(s):
CAB(s):		Regulatory Zoning(s):

Property Owner Affidavit

Applicant Name: Ladera Ranch, LLC ________________________________

The receipt of this application at the time of submittal does not guarantee the application complies with all requirements of the Washoe County Development Code, the Washoe County Master Plan or the applicable area plan, the applicable regulatory zoning, or that the application is deemed complete and will be processed.

STATE OF NEVADA)
)
COUNTY OF WASHOE)

I,____,
(please print name)

being duly sworn, depose and say that I am the owner* of the property or properties involved in this application as listed below and that the foregoing statements and answers herein contained and the information herewith submitted are in all respects complete, true, and correct to the best of my knowledge and belief. I understand that no assurance or guarantee can be given by members of Planning and Building.

(A separate Affidavit must be provided by each property owner named in the title report.)

Assessor Parcel Number(s): 502-700-01, 502-700-03, 502-700-06, 502-700-07, 502-250-32,

Printed Name________________________________

Signed________________________________

Address________________________________

____

Subscribed and sworn to before me this ______ day of ___________________, ______.

(Notary Stamp)

____
Notary Public in and for said county and state

My commission expires:___________________

*Owner refers to the following: (Please mark appropriate box.)

- ❑ Owner
- ❑ Corporate Officer/Partner (Provide copy of record document indicating authority to sign.)
- ❑ Power of Attorney (Provide copy of Power of Attorney.)
- ❑ Owner Agent (Provide notarized letter from property owner giving legal authority to agent.)
- ❑ Property Agent (Provide copy of record document indicating authority to sign.)
- ❑ Letter from Government Agency with Stewardship

Property Owner Affidavit

Applicant Name: Ladera Ranch, LLC

The receipt of this application at the time of submittal does not guarantee the application complies with all requirements of the Washoe County Development Code, the Washoe County Master Plan or the applicable area plan, the applicable regulatory zoning, or that the application is deemed complete and will be processed.

STATE OF ~~NEVADA~~ California KC)

COUNTY OF ~~WASHOE~~ San Diego KC)

I, Kelly D. Burt,

(please print name)

being duly sworn, depose and say that I am the owner* of the property or properties involved in this application as listed below and that the foregoing statements and answers herein contained and the information herewith submitted are in all respects complete, true, and correct to the best of my knowledge and belief. I understand that no assurance or guarantee can be given by members of Planning and Building.

(A separate Affidavit must be provided by each property owner named in the title report.)

Assessor Parcel Number(s): 502-700-07, 502-250-32

Printed Name Kelly D. Burt

Signed

Address 14385 Ciera Ct. Poway CA 92064

Subscribed and sworn to before me this 3rd day of December, 2019.

Lynn Chisnell San Diego CA

Notary Public in and for said county and state

My commission expires: 2/4/2023

(Notary Stamp)

LYNN CHISNELL
Notary Public - California
San Diego County
Commission # 2274681
My Comm. Expires Feb 4, 2023

*Owner refers to the following: (Please mark appropriate box.)

- ☑ Owner
- ☐ Corporate Officer/Partner (Provide copy of record document indicating authority to sign.)
- ☐ Power of Attorney (Provide copy of Power of Attorney.)
- ☐ Owner Agent (Provide notarized letter from property owner giving legal authority to agent.)
- ☐ Property Agent (Provide copy of record document indicating authority to sign.)
- ☐ Letter from Government Agency with Stewardship

Tentative Subdivision Map Application
Supplemental Information

(All required information may be separately attached)

1. What is the location (address or distance and direction from nearest intersection)?

The subject properties are located approximately 400+/- south of the intersection of 7th Avenue and Dream Catcher.

2. What is the subdivision name (proposed name must not duplicate the name of any existing subdivision)?

Ladera Ranch Phases 2 to 6

3. Density and lot design:

a. Acreage of project site	±266 Acres
b. Total number of lots	294
c. Dwelling units per acre	±1.10 du/ac
d. Minimum and maximum area of proposed lots	±3,120 ft² minimum, ±12096 ft² maximum
e. Minimum width of proposed lots	±48 ft minimum
f. Average lot size	4,568ft²

4. What utility company or organization will provide services to the development:

a. Sewer Service	SVGID
b. Electrical Service	NV Energy
c. Telephone Service	SBC
d. LPG or Natural Gas Service	NV Energy
e. Solid Waste Disposal Service	Waste Management
f. Cable Television Service	Charter Communications
g. Water Service	SVGID

5. For common open space subdivisions (Article 408), please answer the following:

   a. Acreage of common open space:

±225.7

   b. What development constraints are within the development and how many acres are designated slope, wetlands, faults, springs, and/or ridgelines:

Designated slopes: 67.66 AC

   c. Range of lot sizes (include minimum and maximum lot size):

±3,120 ft² minimum, ±12,096 ft² maximum

d. Proposed yard setbacks if different from standard:

Front=20' to garage, 10' to building; Side=0' or 5', Rear=10'

e. Justification for setback reduction or increase, if requested:

Common open space development

f. Identify all proposed non-residential uses:

Temporary home sales office and model homes

g. Improvements proposed for the common open space:

Grading, detention ponds, utility access, sanitary sewer, storm-drain landscaping around subdivision

h. Describe or show on the tentative map any public or private trail systems within common open space of the development:

Please see the attached trail map and tentative map grading plan.

i. Describe the connectivity of the proposed trail system with existing trails or open space adjacent to or near the property:

Existing trails will be perpetuated w/the tentative map, ref. trail map

j. If there are ridgelines on the property, how are they protected from development?

There are no ridgelines on the property.

k. Will fencing be allowed on lot lines or restricted? If so, how?

Rear fencing facing common areas will be restricted to open view fencing.

l. Identify the party responsible for maintenance of the common open space:

The Homeowner's Association

6. Is the project adjacent to public lands or impacted by "Presumed Public Roads" as shown on the adopted April 27, 1999 Presumed Public Roads (see Washoe County Engineering website at http://www.washoecounty.us/pubworks/engineering.htm). If so, how is access to those features provided?

No presumed public roads on site.

7. Is the parcel within the Truckee Meadows Service Area?

■ Yes	❑ No

8. Is the parcel within the Cooperative Planning Area as defined by the Regional Plan?

❑ Yes	■ No	If yes, within what city?

9. Has an archeological survey been reviewed and approved by SHPO on the property? If yes, what were the findings?

There is no need for such a study

10. Indicate the type and quantity of water rights the application has or proposes to have available:

a. Permit #	TBD	acre-feet per year	
b. Certificate #	TBD	acre-feet per year	
c. Surface Claim #	TBD	acre-feet per year	
d. Other #	TBD	acre-feet per year	

a. Title of those rights (as filed with the State Engineer in the Division of Water Resources of the Department of Conservation and Natural Resources):

TBD

11. Describe the aspects of the tentative subdivision that contribute to energy conservation:

The design of the proposed subdivision provides for passive or natural heating and cooling opportunities by orienting the homes to take advantage of prevailing breezes and southern exposure

12. Is the subject property in an area identified by Planning and Building as potentially containing rare or endangered plants and/or animals, critical breeding habitat, migration routes or winter range? If so, please list the species and describe what mitigation measures will be taken to prevent adverse impacts to the species:

There are no endangered species on the site (plants or animals), so, no mitigation is proposed.

13. If private roads are proposed, will the community be gated? If so, is a public trail system easement provided through the subdivision?

The community will not be gated and all proposed streets will be public.

14. Are there any applicable policies of the adopted area plan in which the project is located that require compliance? If so, which policies and how does the project comply?

Yes, the site is in the Sun Valley Area Plan. SV1.3, 1.7, 4.2, 4.5, 7.1, 10.1, and 12.1

15. Are there any applicable area plan modifiers in the Development Code in which the project is located that require compliance? If so, which modifiers and how does the project comply?

There are no plan modifiers in the Sun Valley Area Plan that apply to this project.

16. Will the project be completed in one phase or is phasing planned? If so, please provide that phasing plan:

There are five phases proposed. The phasing map can be found on Sheet 0 in the plan set.

17. Is the project subject to Article 424, Hillside Development? If yes, please address all requirements of the Hillside Ordinance in a separate set of attachments and maps.

■ Yes	☐ No	If yes, include a separate set of attachments and maps.

18. Is the project subject to Article 418, Significant Hydrologic Resources? If yes, please address Special Review Considerations within Section 110.418.30 in a separate attachment.

☐ Yes	■ No	If yes, include separate attachments.

Grading

Please complete the following additional questions if the project anticipates grading that involves: (1) Disturbed area exceeding twenty-five thousand (25,000) square feet not covered by streets, buildings and landscaping; (2) More than one thousand (1,000) cubic yards of earth to be imported and placed as fill in a special flood hazard area; (3) More than five thousand (5,000) cubic yards of earth to be imported and placed as fill; (4) More than one thousand (1,000) cubic yards to be excavated, whether or not the earth will be exported from the property; or (5) If a permanent earthen structure will be established over four and one-half (4.5) feet high:

19. How many cubic yards of material are you proposing to excavate on site?

±384,740 yd^3

20. How many cubic yards of material are you exporting or importing? If exporting of material is anticipated, where will the material be sent? If the disposal site is within unincorporated Washoe County, what measures will be taken for erosion control and revegetation at the site? If none, how are you balancing the work on-site?

There will be ±36980 yd^3 of import. With the required over ex, the site is expected to balance.

21. Can the disturbed area be seen from off-site? If yes, from which directions, and which properties or roadways? What measures will be taken to mitigate their impacts?

A portion of the disturbed area will be visible from one or two locations along Chocolate Dr. Dust control will be in during construction, landscaping and revegetation will be implemented.

22. What is the slope (Horizontal/Vertical) of the cut and fill areas proposed to be? What methods will be used to prevent erosion until the revegetation is established?

The cut and fill slopes will have a maximum of 3:1 slope. Landscaping and bmp's will be used to prevent erosion.

23. Are you planning any berms and, if so, how tall is the berm at its highest? How will it be stabilized and/or revegetated?

There are no berms planned for the site

24. Are retaining walls going to be required? If so, how high will the walls be, will there be multiple walls with intervening terracing, and what is the wall construction (i.e. rockery, concrete, timber, manufactured block)? How will the visual impacts be mitigated?

Retaining walls on the site will be a maximum of 6' tall. Multiple walls will have terraces in between walls. Multiple walls be composed of CMU.

25. Will the grading proposed require removal of any trees? If so, what species, how many, and of what size?

There are 9 pine trees from 6"-30" in diameter

26. What type of revegetation seed mix are you planning to use and how many pounds per acre do you intend to broadcast? Will you use mulch and, if so, what type?

Typical seed mix for revegetation at the rate prescribed by the landscape architect.

27. How are you providing temporary irrigation to the disturbed area?

Drip irrigation stubbed to the common area water meter

28. Have you reviewed the revegetation plan with the Washoe Storey Conservation District? If yes, have you incorporated their suggestions?

This is not necessary or applicable for this project.

Request to Reserve New Street Name(s)

The Applicant is responsible for all sign costs.

Applicant Information

Name: Ladera Ranch LLC

Address: 5190 Neil Road, Suite 420

The subject properties are located approximately 400+/- south of the intersection of 7th Avenue and Dream Catcher.

Phone : ____________ Fax: ____________

‰ Private Citizen ‰ Agency/Organization

Street Name Requests

(No more than 14 letters or 15 if there is an "i" in the name. Attach extra sheet if necessary.)

If final recordation has not occurred within one (1) year, it is necessary to submit a written request for extension to the coordinator prior to the expiration date of the original

Location

Project Name: Ladera Ranch

‰ Reno ‰ Sparks ‰ Washoe County

Parcel Numbers: ____________

‰ Subdivision ‰ Parcelization ‰ Private Street

Please attach maps, petitions and supplementary information.

Approved: ____________ Date: ____________

Regional Street Naming Coordinator

‰ Except where noted

Denied: ____________ Date: ____________

Regional Street Naming Coordinator

Washoe County Geographic Information Services

1001 E. Ninth Street

Reno, NV 89512-2845

Phone: (775) 328-2325 - Fax: (775) 328-6133

Community Services Department

Planning and Building

DIRECTOR'S MODIFICATION OF PARKING/LANDSCAPING MINOR DEVIATION STANDARDS APPLICATION

WASHOE COUNTY, NEVADA

1861

Community Services Department
Planning and Building
1001 E. Ninth St., Bldg. A
Reno, NV 89512-2845

Telephone: 775.328.6100

Washoe County Development Application

Your entire application is a public record. If you have a concern about releasing personal information, please contact Planning and Building staff at 775.328.6100.

Project Information		**Staff Assigned Case No.:**	
Project Name: Ladera Ranch			
Project Description: This project is a 294 lot subdivision that will serve as Phases 2 thru 6 as a continuation of Ladera Ranch subdivision.			
Project Address: No Address Assigned: It is on W 7th Street (1/2 mile west of Sun Valley Boulevard)			
Project Area (acres or square feet): ±266.07 Acres			
Project Location (with point of reference to major cross streets **AND** area locator): South of Ladera Ranch Phase 1. Near the intersection of E Golden Valley Rd (W 7th) & Dream Catcher			
Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
Please see attached Parcel information Table			
Indicate any previous Washoe County approvals associated with this application: Case No.(s).			

Applicant Information (attach additional sheets if necessary)			
Property Owner:		**Professional Consultant:**	
Name: Ladera Ranch LLC		Name: Summit Engineering	
Address: 5190 Neil Road, Suite 420		Address: 5405 Mae Anne Ave	
Reno, Nevada	Zip: 89502	Reno, Nevada	Zip: 89523
Phone: 775-825-4884	Fax: 825-8819	Phone: 775-747-8550	Fax: 747-8559
Email: wroberts@lansingcompanies.com		Email: Robert@summitnv.com	
Cell: (702)-305-8638	Other:	Cell: 775-787-4331	Other:
Contact Person: Will Roberts		Contact Person: Robert Gelu	
Applicant/Developer:		**Other Persons to be Contacted:**	
Name: Same as above		Name: KLS Planning & Design	
Address:		Address: 1 East 1st Street, Suite 1400	
	Zip:	Reno, NV	Zip: 89501
Phone:	Fax:	Phone: 775-857-7710	Fax: N/A
Email:		Email: Johnk@klsdesigngroup.com	
Cell:	Other:	Cell: 775-857-7710	Other: N/A
Contact Person:		Contact Person: John Krmpotic, AICP	

For Office Use Only			
Date Received:	Initial:	Planning Area:	
County Commission District:		Master Plan Designation(s):	
CAB(s):		Regulatory Zoning(s):	

Property Owner Affidavit

Applicant Name: Ladera Ranch, LLC

The receipt of this application at the time of submittal does not guarantee the application complies with all requirements of the Washoe County Development Code, the Washoe County Master Plan or the applicable area plan, the applicable regulatory zoning, or that the application is deemed complete and will be processed.

STATE OF NEVADA)
)
COUNTY OF WASHOE)

I,____,
(please print name)

being duly sworn, depose and say that I am the owner* of the property or properties involved in this application as listed below and that the foregoing statements and answers herein contained and the information herewith submitted are in all respects complete, true, and correct to the best of my knowledge and belief. I understand that no assurance or guarantee can be given by members of Planning and Building.

(A separate Affidavit must be provided by each property owner named in the title report.)

Assessor Parcel Number(s): 502-700-01, 502-700-03, 502-700-06, 502-700-07, 502-250-32,

Printed Name_________________________

Signed_________________________

Address_________________________

____

Subscribed and sworn to before me this ______ day of ________________, ______.

(Notary Stamp)

____
Notary Public in and for said county and state

My commission expires:_________________

*Owner refers to the following: (Please mark appropriate box.)

- ❑ Owner
- ❑ Corporate Officer/Partner (Provide copy of record document indicating authority to sign.)
- ❑ Power of Attorney (Provide copy of Power of Attorney.)
- ❑ Owner Agent (Provide notarized letter from property owner giving legal authority to agent.)
- ❑ Property Agent (Provide copy of record document indicating authority to sign.)
- ❑ Letter from Government Agency with Stewardship

Director's Modification of Standards
Supplemental Information

(All required information may be separately attached)

1. What modification or deviation are you requesting? **Be specific.**

The subject properties are located approximately 400+/- south of the intersection of 7th Avenue and Dream Catcher.

2. Why is the modification or deviation necessary to the success of the project/development? **Be specific.** Are there any extenuating circumstances or physical conditions on the proposed project/development site?

Yes, it helps to minimize disturbance, thus, leads toward success. Also, the earthwork will balance on-site for the areas within 100 feet of the property line with more than 10' of cut or fill from existing ground. Many areas where this modification occurs, is where the old tentative map tied in to the existing Ladera Ranch Phase 1. With this new project, modifications have been made to the plans that vary those plans but improve upon the old layout.

3. Are you proposing to mitigate the effect of the modification or reduction?

Slopes will be revegetated and grading benches will be landscaped to screen the slopes.

4. What section of code are you requesting to modify or deviate? **Be specific.** List the code section and if there are specific requirements for the modification, provide detailed information. For deviation, provide the percentage of the deviation.

Section 110.438.45(c). A modification allowing finish grade slopes, within 100 feet of the property line, to vary from the natural slope by more than 10' in elevation.

5. For Minor Deviation request; list what properties/parcels are affected by the deviation? Explain if there will be any impacts to the affected neighboring properties. (At a minimum, affected property owners are those owners of parcels that immediately abut the location of the proposed minor deviation.)

This is not applicable.

Community Services Department

Planning and Building

VARIANCE APPLICATION

Community Services Department
Planning and Building
1001 E. Ninth St., Bldg. A
Reno, NV 89512-2845

Telephone: 775.328.6100

Washoe County Development Application

Your entire application is a public record. If you have a concern about releasing personal information, please contact Planning and Building staff at 775.328.6100.

Project Information		**Staff Assigned Case No.:**	
Project Name: Ladera Ranch			
Project Description: This project is a 294 lot subdivision that will serve as Phases 2 thru 6 as a continuation of Ladera Ranch subdivision.			
Project Address: No Address Assigned: It is on W 7th Street (1/2 mile west of Sun Valley Boulevard)			
Project Area (acres or square feet): ±266.07 Acres			
Project Location (with point of reference to major cross streets **AND** area locator): South of Ladera Ranch Phase 1. Near the intersection of E Golden Valley Rd (W 7th) & Dream Catcher			
Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
Please see attached Parcel information Table			
Indicate any previous Washoe County approvals associated with this application: Case No.(s).			

Applicant Information (attach additional sheets if necessary)			
Property Owner:		**Professional Consultant:**	
Name: Ladera Ranch LLC		Name: Summit Engineering	
Address: 5190 Neil Road, Suite 420		Address: 5405 Mae Anne Ave	
Reno, Nevada	Zip: 89502	Reno, Nevada	Zip: 89523
Phone: 775-825-4884	Fax: 825-8819	Phone: 775-747-8550	Fax: 747-8559
Email: wroberts@lansingcompanies.com		Email: Robert@summitnv.com	
Cell: (702)-305-8638	Other:	Cell: 775-787-4331	Other:
Contact Person: Will Roberts		Contact Person: Robert Gelu	
Applicant/Developer:		**Other Persons to be Contacted:**	
Name: Same as above		Name: KLS Planning & Design	
Address:		Address: 1 East 1st Street, Suite 1400	
	Zip:	Reno, NV	Zip: 89501
Phone:	Fax:	Phone: 775-857-7710	Fax: N/A
Email:		Email: Johnk@klsdesigngroup.com	
Cell:	Other:	Cell: 775-857-7710	Other: N/A
Contact Person:		Contact Person: John Krmpotic, AICP	

For Office Use Only			
Date Received:	Initial:	Planning Area:	
County Commission District:		Master Plan Designation(s):	
CAB(s):		Regulatory Zoning(s):	

Variance Application
Supplemental Information

(All required information may be separately attached)

1. What provisions of the Development Code (e.g. front yard setback, height, etc.) must be waived or varied to permit your request?

   Modify Section 110.438.45(c) to allow finish grades to exceed more than 10 feet in height difference from existing ground where necessary

   You must answer the following questions in detail. Failure to provide complete and accurate information will result in denial of the application.

2. What are the topographic conditions, extraordinary or exceptional circumstances, shape of the property or location of surroundings that are unique to your property and, therefore, prevent you from complying with the Development Code requirements?

   The unique hillside and topo conditions are such that the proposed grading is a better solution to the built environment. The proposed grading solution is common practice in similar terrain.

3. What steps will be taken to prevent substantial negative impacts (e.g. blocking views, reducing privacy, decreasing pedestrian or traffic safety, etc.) to other properties or uses in the area?

   A 30' buffer along the western properly line is provided to separate from the existing North Star subdivision. The proposed grading will not have any adverse impacts to other properties.

4. How will this variance enhance the scenic or environmental character of the neighborhood (e.g. eliminate encroachment onto slopes or wetlands, provide enclosed parking, eliminate clutter in view of neighbors, etc.)?

   Most of this development is not visible to its neighbors. A trail system will be put in place to connect to the Red Hill Open Space. All houses will have 2 or 3 car garages.

5. What enjoyment or use of your property would be denied to you that is common to other properties in your neighborhood?

   This is a unique and challenging topographic condition that needs our proposed optimized approach to develop the property.

6. Are there any restrictive covenants, recorded conditions or deed restrictions (CC&Rs) that apply to the area subject to the variance request?

❑ Yes	❑ No	If yes, please attach a copy.

7. How is your current water provided?

   Water is provided by SVGID

8. How is your current sewer provided?

   Sewer is provided by SVGID

Variance Request

This variance request is made to allow for finish grade slopes to vary greater than 10 feet in height from the natural slope, specifically stated in Section 110.438.45(c) of the Washoe County Development Code.

Washoe County Development Code 110.804.25 requires that all of the following findings be made to the satisfaction of the Washoe County Planning Commission before granting approval of the Variance Request.

a) **Special Circumstances. Because of the special circumstances applicable to the property, by reason of exceptional topographic conditions.**

The Ladera Ranch subdivision, as a whole, has unique topographic features related to the need for the requested variance. In developing the land plan for Ladera Ranch, these topographic features were considered in defining development area. The specific areas in which the variance request is shown on the cut-fill map. The strict application of the regulation would result in peculiar design and exhibit practical difficulties in construction and to the property owners.

b) **No detriment. The relief will not create a substantial detriment to the public good, substantially impair affected natural resources or impair the intent and purpose of the Development Code or applicable policies under which the variance is granted.**

Granting the variance will not be detrimental to the public good, nor impair the intent and purpose of the Washoe County Development Code. Section 110.438.45(c)(1) requires that all of the following must be adhered to before an approval of a modification to the standards be allowed.

(i) The proposed cut and/or fill slopes include stepped-back structural containment (retaining walls) that form terraces,
The cut and fill slopes in areas that exceed 10 feet in height from the existing terrain are terraced with retaining walls to minimize disturbance from the natural slope. In areas where a wall addition causes more disturbance, or the integrity of the walls could be compromised by storm runoff, existing soil characteristics, cut and fill slopes with a maximum of 3:1 are added with wide landscaped and revegetated benches.

(ii) The proposed terraces include landscaping, are a minimum of six (6) feet in width, and have a slope flatter than three horizontal to one vertical (3:1),
The proposed terraces between retaining walls are 6' wide with landscaping. In addition, these terraces are designed to be at a maximum of 5% to prevent exposure of wall footings and to provide more stabilized ground for the retaining walls.

(iii) Retaining walls used to create terraces are limited to a maximum vertical height of ten (10) feet, when located outside any required yard setback
All proposed retaining walls used to create terraces have a maximum of 10 feet and are located outside of the yard setbacks. When a height of 12 feet is required, two 6-foot walls are proposed instead of having one 10-foot wall and one 2-foot wall. All proposed walls will be CMU walls and no dry stacked rockery walls will be used for this project.

(iv) *Terrace widths shall be at least sixty (60) percent of the height of the higher of the two (2) adjacent retaining walls.*
Terrace widths between adjacent retaining walls are 6 feet throughout the subdivision. In cases where walls are less than 10 feet, the terrace widths are still proposed at 6 feet to provide a unifying look on the neighborhood and to allow for adequate landscaping.

(v) *Bench widths shall be at least four (4) feet.*
The proposed bench widths on cut and fill slopes are 8 feet wide with landscaping and revegetation to provide a more scenic look and allow for planting of trees and maintenance access.

c) **<u>No special privileges. The granting of the variance will not constitute a grant of special privileges inconsistent with the limitations upon other properties in the vicinity and the identical regulatory zone in which the property is situated.</u>**

Grading the slopes 10' away from the natural terrain will not cause violation to these provisions and will be consistent with the limitations posed on other properties in the vicinity. It is important to note that there will be no proposed buildings placed in Open Space areas. The existing Ladera Phase 1 was constructed in a similar manner.

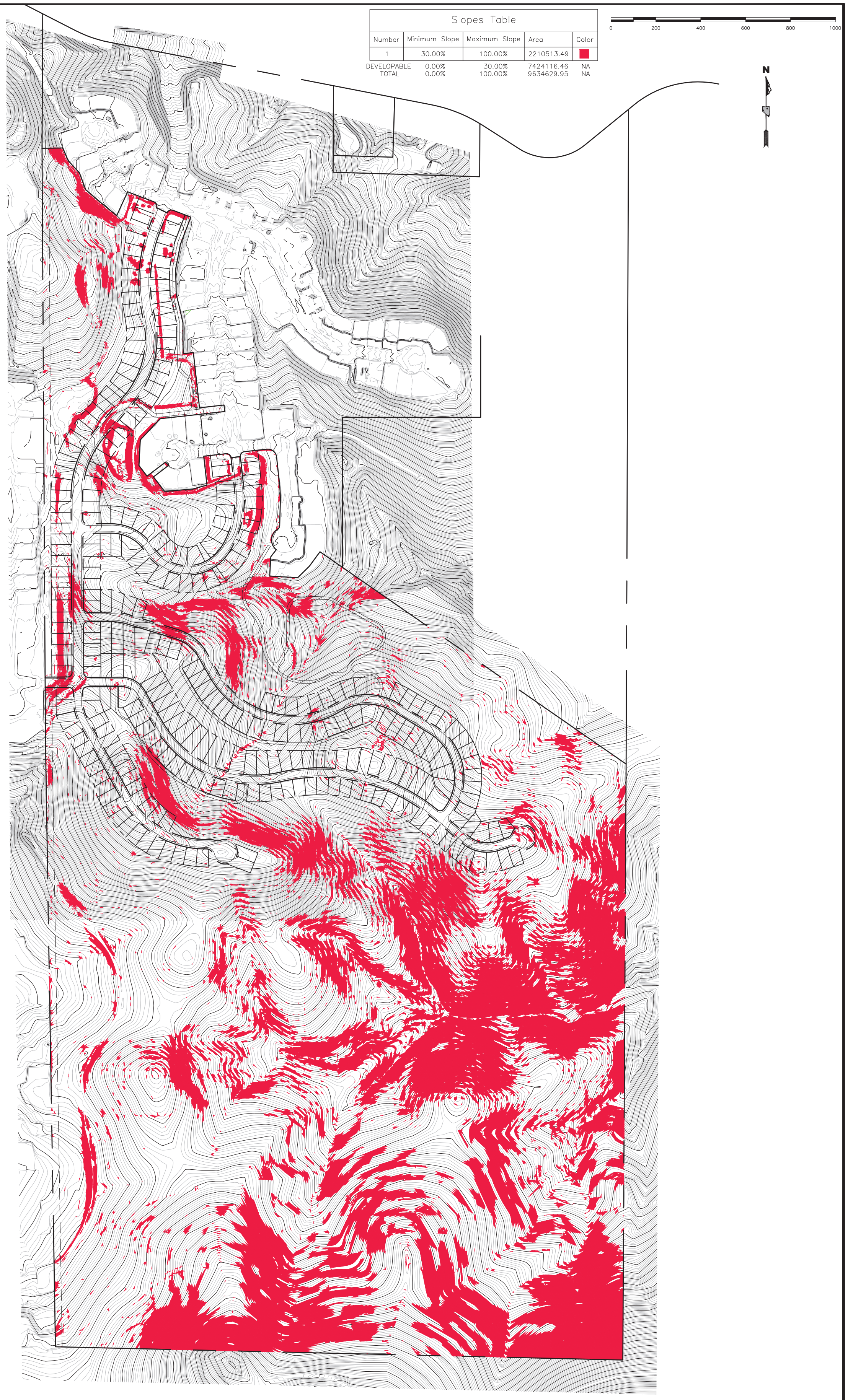
d) **<u>Use Authorized. The variance will not authorize a use or activity which is not otherwise expressly authorized by the regulation governing the parcel of property.</u>**

Ladera Ranch is a common open space development which promotes the concept of clustering lots to the useable area and providing more open space in exchange for clustering of lots. 197.94 acres of the site represents 74% of the allowable areas of development, while the rest is open space. The proposed development uses only 20% of the useable site which is established for residential purposes and will be used to construct homes, yards, and streets for access. Other land uses and activities are not promoted for this project.

e) **<u>Effect on Military Installation. The variance will not have a detrimental effect on the location, purpose and mission of the military installation.</u>**

There will be no effect on any military installation on this project.

Slopes Table				
Number	Minimum Slope	Maximum Slope	Area	Color
1	30.00%	100.00%	2210513.49	
DEVELOPABLE	0.00%	30.00%	7424116.46	NA
TOTAL	0.00%	100.00%	9634629.95	NA



TENTATIVE MAP PLANS FOR LADERA RANCH PHASES 2-6 DEVELOPABLE AREA MAP

WASHOE COUNTY NEVADA

SHEET 1 OF 1

JOB NO: 30884

SCALE
VERT:
HORIZ: 1"=200'

DESIGNED BY:
CHECKED BY: RG

REV.	DATE	DESCRIPTION	BY	APP'D

SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
PHONE:(775) 747-8550 FAX:(775) 747-8559

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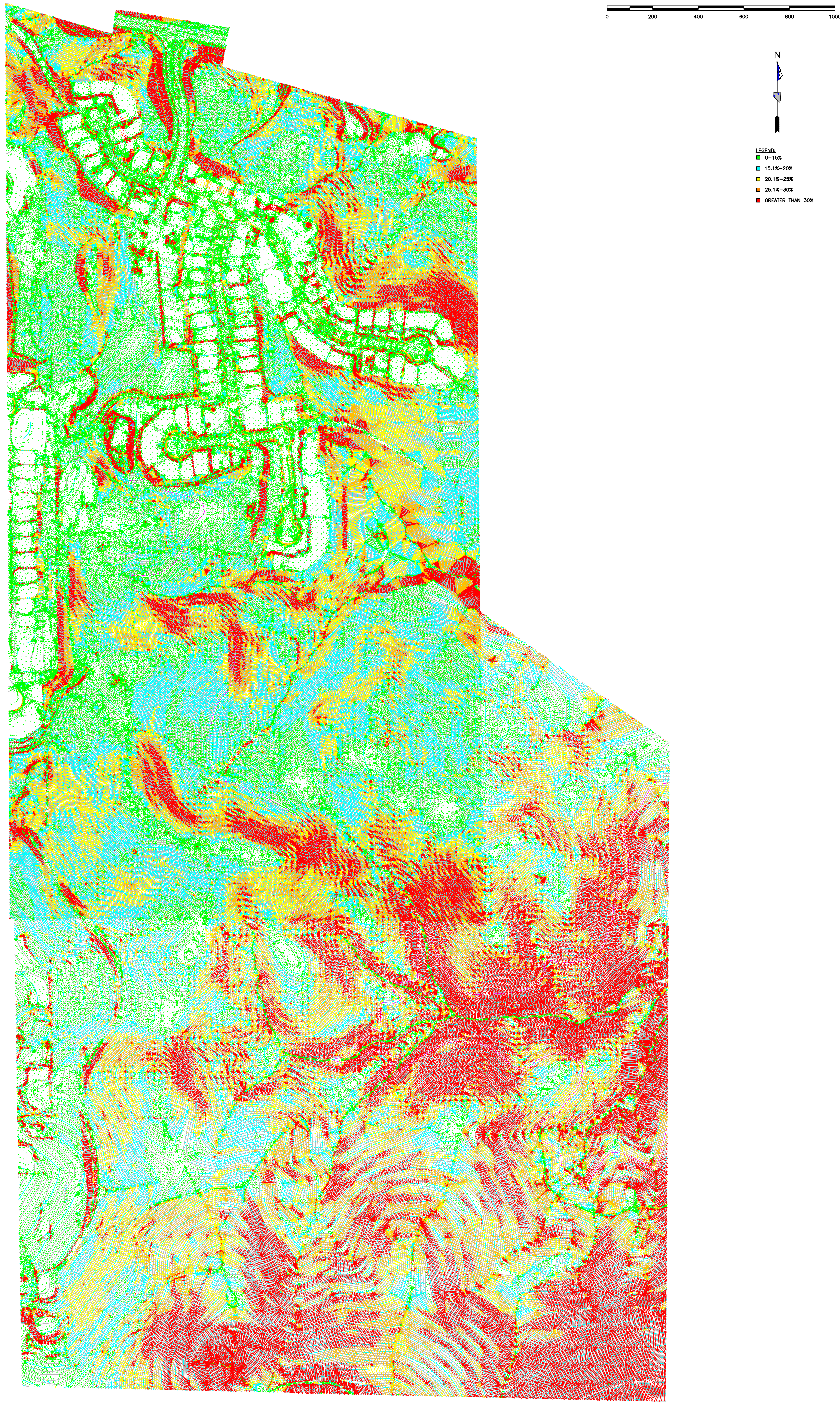

SHEET 1 OF 1

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HORIZ: 1"=200'
VERT:
JOB NO: 30884

TENTATIVE MAP PLANS FOR LADERA RANCH PHASE 2-6 SLOPE ANALYSIS

WASHOE COUNTY NEVADA

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PHONE:(775) 747-8550 FAX:(775) 747-8559

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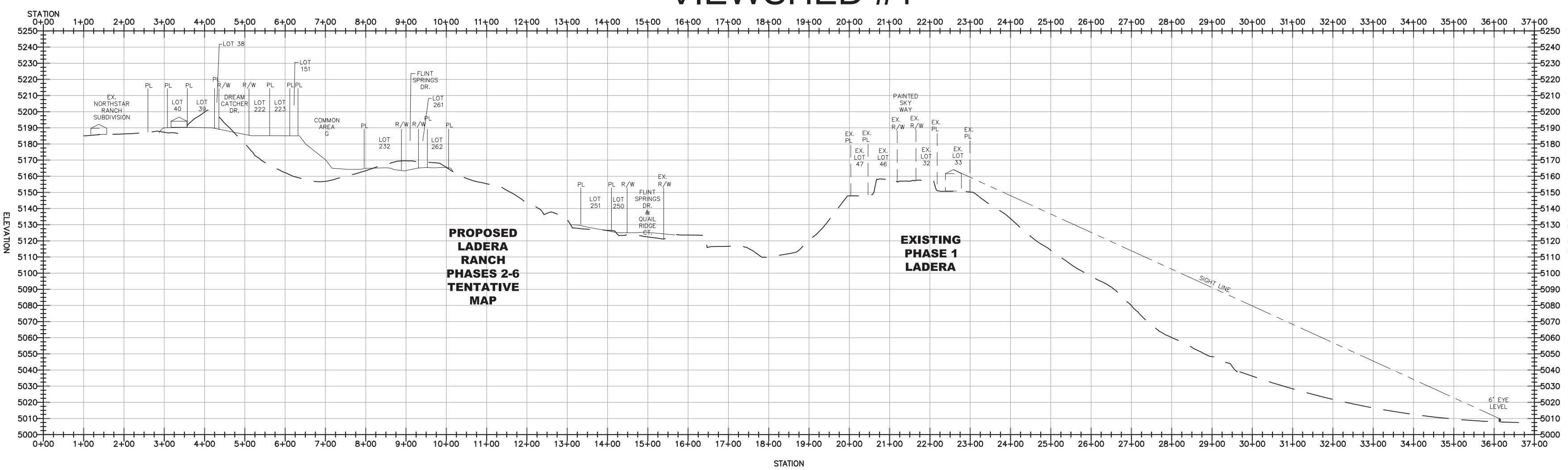

TENTATIVE MAP PLANS FOR
LADERA RANCH PHASES 2-6
VIEWSHED #1

WASHOE COUNTY NEVADA

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VERT: 1"=30'
JOB NO: 30884

SHEET VS-1 OF 5

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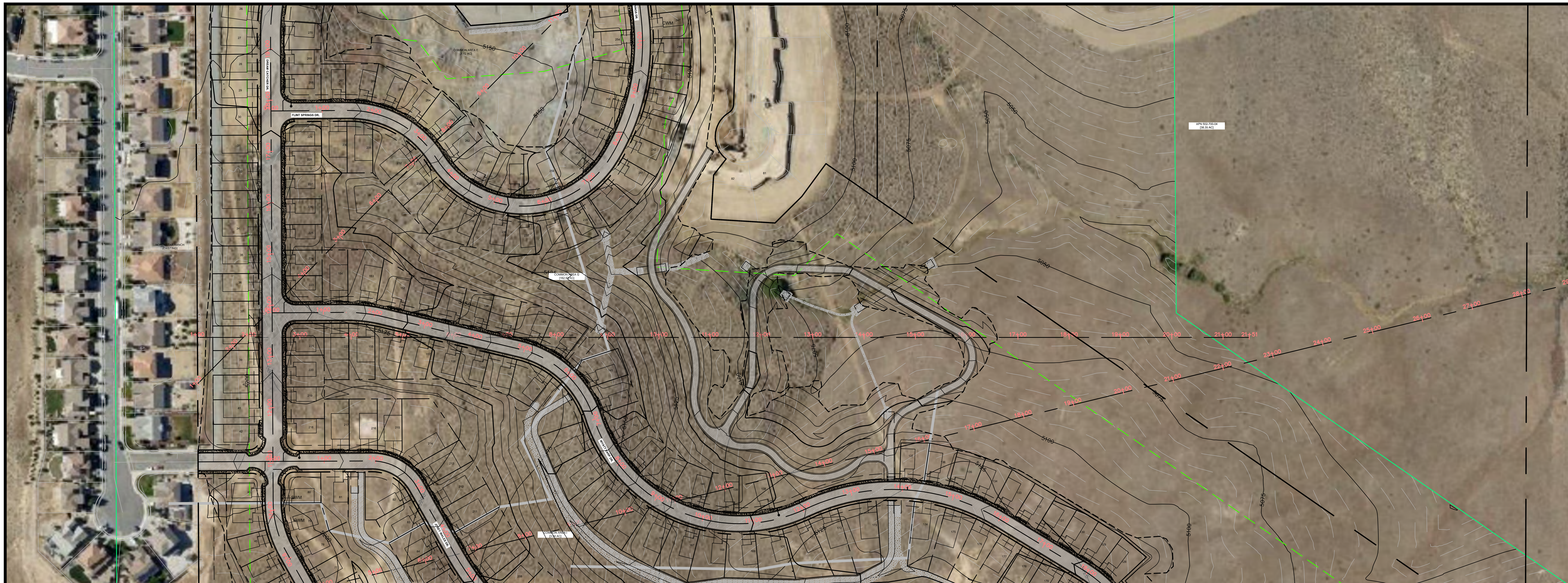

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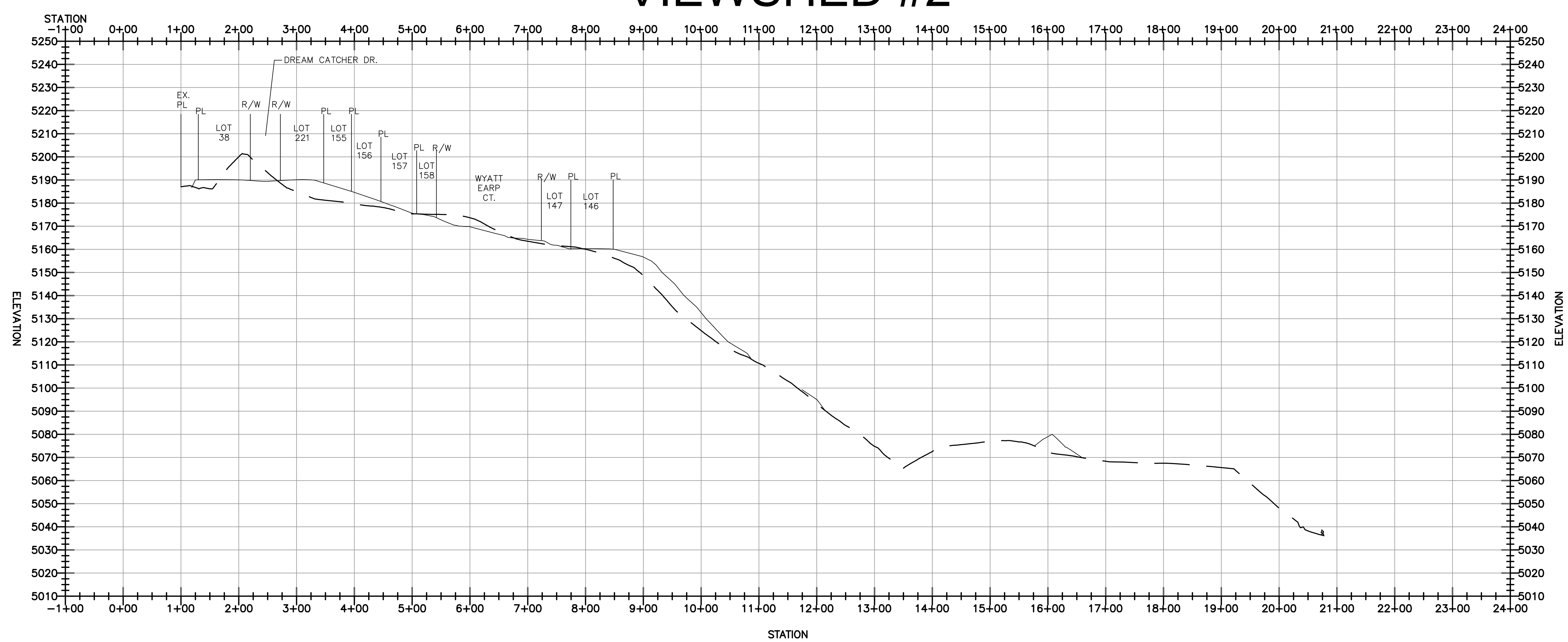

SUMMIT ENGINEERING CORPORATION
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PHONE:(775) 747-8550 FAX:(775) 747-8559

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TENTATIVE MAP PLANS FOR
LADERA RANCH PHASES 2-6
VIEWSHED #2

WASHOE COUNTY NEVADA

DESIGNED BY: MS
CHECKED BY: RG

SCALE
HORIZ: N.T.S.
VERT: N.T.S.

JOB NO: 30884

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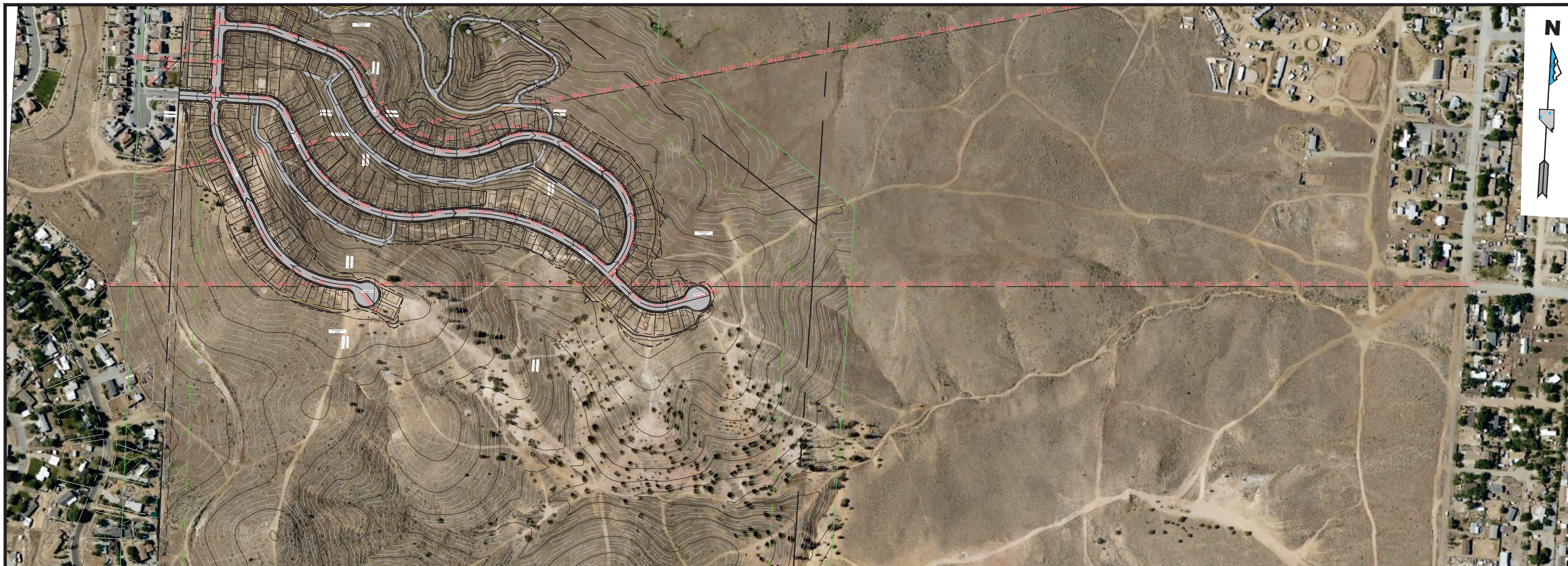

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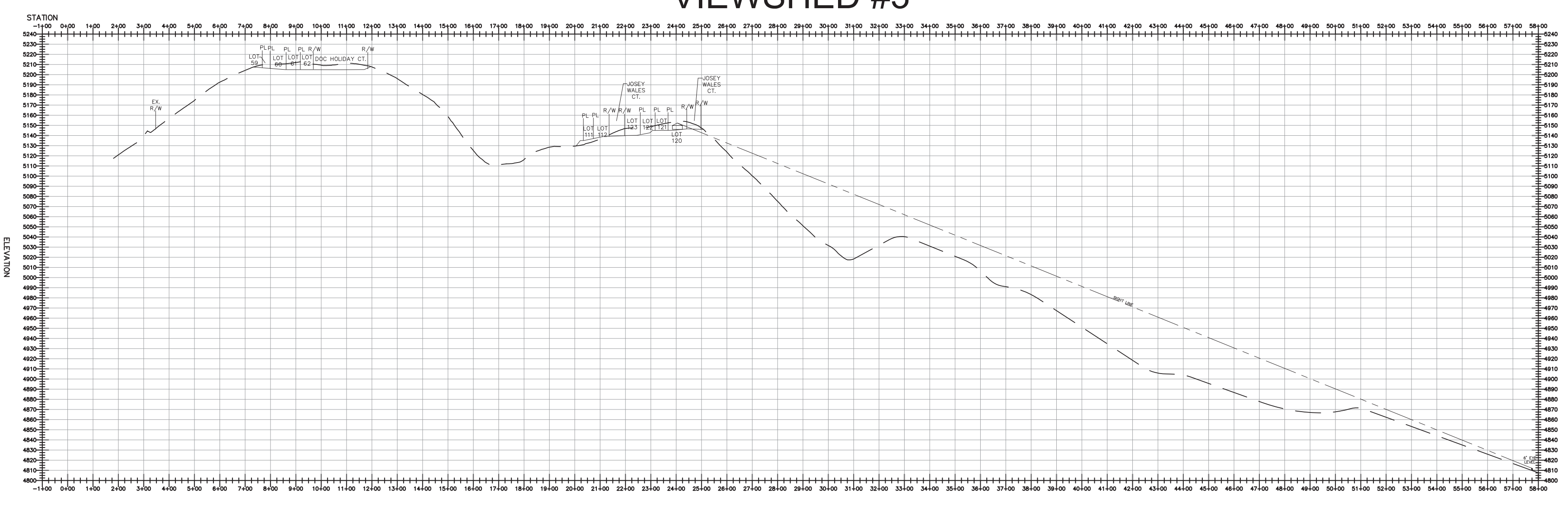

TENTATIVE MAP PLANS FOR
LADERA RANCH PHASES 2-6
VIEWSHED #3

WASHOE COUNTY NEVADA

REV.	DATE	DESCRIPTION	BY	APP'D

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SCALE
HORIZ: 1"=200'
VERT: 1"=50'
JOB NO: 30884

SHEET VS-3 OF 5

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5405 MAE ANNE AVENUE, RENO, NV. 89523
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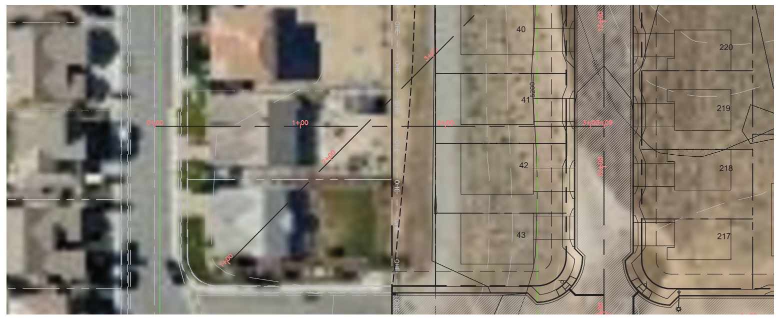

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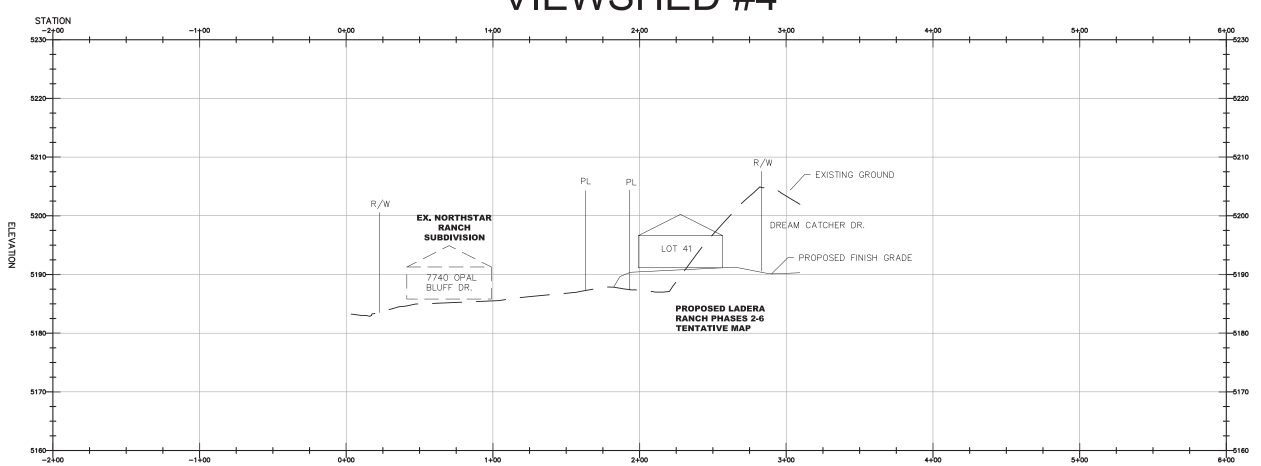

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TENTATIVE MAP PLANS FOR
LADERA RANCH PHASES 2-6
VIEWSHED #4

WASHOE COUNTY NEVADA

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SCALE
HORIZ: 1"=40'
VERT: 1"=10'
JOB NO: 30884

SHEET VS-4 OF 5

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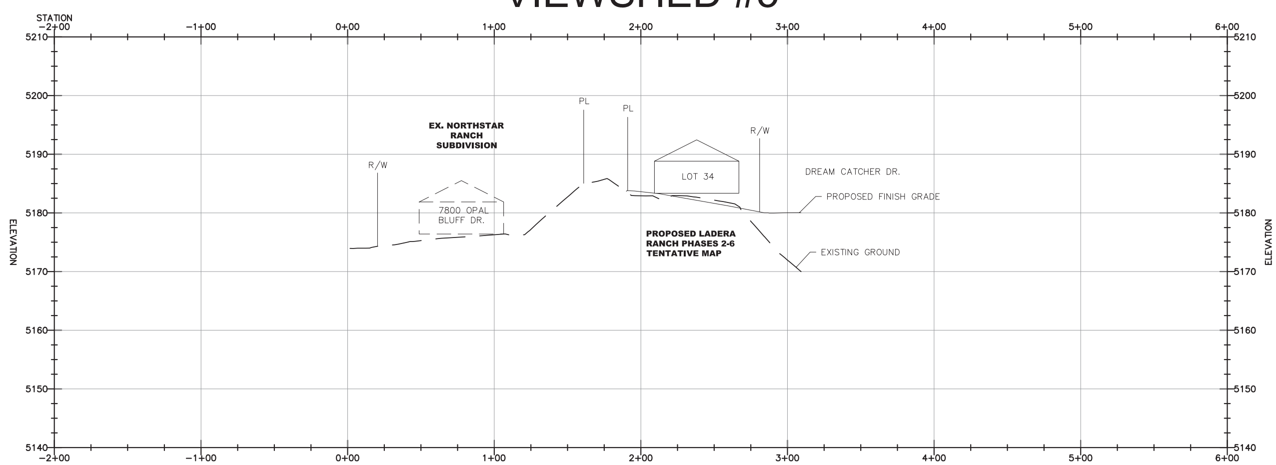

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SUMMIT ENGINEERING CORPORATION
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TENTATIVE MAP PLANS FOR
LADERA RANCH PHASES 2-6
VIEWSHED #5

WASHOE COUNTY NEVADA

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SCALE
HORIZ: 1"=40'
VERT: 1"=10'
JOB NO: 30884

SHEET VS-5 OF 5

N:\DWGS\J30884_Lansing_LaderaNewTM\Civil\LaderaTM-Base - VIEWSHEDS.DWG ~ 3:49 PM * 14-APR-2020

SHEET 1 OF 1	JOB NO: 30884 VERT: HORIZ: 1"=200' SCALE CHECKED BY: RG DESIGNED BY: SD	TENTATIVE MAP PLANS FOR LADERA RANCH PHASES 2-6 TRAIL MAP WASHOE COUNTY NEVADA

REV.	DATE	DESCRIPTION	BY	APP'D

SUMMIT ENGINEERING CORPORATION
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Washoe County Treasurer
P.O. Box 30039, Reno, NV 89520-3039
ph: (775) 328-2510 fax: (775) 328-2500
Email: tax@washoecounty.us

Washoe County Treasurer
Tammi Davis

Bill Detail

Back to Account Detail | Change of Address | Print this Page

Washoe County Parcel Information

Parcel ID	Status	Last Update
50225032	Active	2/14/2020 2:08:57 AM

Current Owner:
LADERA RANCH LLC
12671 HIGH BLUFF DR STE 150
SAN DIEGO, CA 92130

SITUS:
0 UNSPECIFIED
WASHOE COUNTY NV

Taxing District
4020

Geo CD:

Legal Description
Township 20 SubdivisionName _UNSPECIFIED Range 19 Lot E2 Block Section 13,24

Installments

Period	Due Date	Tax Year	Tax	Penalty/Fee	Interest	Total Due
INST 1	8/19/2019	2019	$0.00	$0.00	$0.00	$0.00
INST 2	10/7/2019	2019	$0.00	$0.00	$0.00	$0.00
INST 3	1/6/2020	2019	$0.00	$0.00	$0.00	$0.00
INST 4	3/2/2020	2019	$767.78	$0.00	$0.00	$767.78
		Total Due:	**$767.78**	**$0.00**	**$0.00**	**$767.78**

Tax Detail

	Gross Tax	Credit	Net Tax
State of Nevada	$754.97	($602.89)	$152.08
Sun Valley GID	$856.23	($683.75)	$172.48
Truckee Meadows Fire Dist	$2,398.15	($1,915.07)	$483.08
Washoe County	$6,180.55	($4,935.55)	$1,245.00
Washoe County Sc	$5,056.09	($4,037.60)	$1,018.49
TRUCKEE MDWS/SUN VALLEY WATER BASIN	$0.02	$0.00	$0.02
Total Tax	**$15,246.01**	**($12,174.86)**	**$3,071.15**

Payment History

Tax Year	Bill Number	Receipt Number	Amount Paid	Last Paid
2019	2019186266	B19.168473	$767.78	12/23/2019
2019	2019186266	B19.112984	$767.78	10/1/2019
2019	2019186266	B19.109937	$798.52	9/30/2019

Pay By Check

Please make checks payable to:
WASHOE COUNTY TREASURER

Mailing Address:
P.O. Box 30039
Reno, NV 89520-3039

Overnight Address:
1001 E. Ninth St., Ste D140
Reno, NV 89512-2845

Change of Address

All requests for a mailing address change must be submitted in writing, including a signature (unless using the online form).

To submit your address change online click here

Address change requests may also be faxed to: (775) 328-3642

Address change requests may also be mailed to:
Washoe County Assessor
1001 E 9th Street
Reno, NV 89512-2845

SHEET 1 OF 1	JOB NO: 30884	VERT:	HORIZ: 1"=200'	SCALE	CHECKED BY: RG	DESIGNED BY: MS

TENTATIVE MAP PLANS FOR
LADERA RANCH PHASES 2-6
ASSESSOR'S MAP OVERLAY

WASHOE COUNTY NEVADA

REV.	DATE	DESCRIPTION	BY	APP'D

SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
PHONE:(775) 747-8550 FAX:(775) 747-8559

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SOLAEGUI
ENGINEERS, LTD

LADERA RANCH

TRAFFIC STUDY

NOVEMBER 2019

REGISTERED PROFESSIONAL ENGINEER - STATE OF NEVADA
PAUL W.
SOLAEGUI
CIVIL
No. 7163

11-7-19
EXP 6-30-20

Prepared by:
Solaegui Engineers, Ltd.
715 H Street
Sparks, Nevada 89431
(775) 358-1004

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LADERA RANCH

TRAFFIC STUDY

EXECUTIVE SUMMARY

The proposed Ladera Ranch development will be located in Washoe County, Nevada. The project site is generally located south of Golden Valley Road and 7th Avenue, west of Chocolate Drive, and east of Spearhead Way. The project site is currently under construction with the first phase of Ladera Ranch. The purpose of this study is to address the project's impact upon the adjacent street network. The Golden Valley Road intersections with Estates Road and the US-395 northbound and southbound ramps and the 7th Avenue intersections with Sun Valley Boulevard and Dream Catcher Drive have been identified for AM and PM peak hour intersection capacity analysis for the existing, existing plus project, 2030 base, 2030 base plus project, 2040 base, and 2040 base plus project scenarios. Golden Valley Road and 7th Avenue have been identified for roadway capacity analysis for the 2030 and 2040 base plus project scenarios.

The proposed Ladera Ranch development will consist of the construction of a total of 399 single family detached homes. Phase 1 of Ladera Ranch is currently under construction with approximately 54 homes occupied or under construction. This traffic study will therefore provide analysis for 345 unbuilt homes. Project access will be provided from Dream Catcher Drive via Golden Valley Road and 7th Avenue. Buildout of the project is anticipated to generate 3,257 average daily trips with 255 trips occurring during the AM peak hour and 342 trips occurring during the PM peak hour.

Traffic generated by the Ladera Ranch development will have some impact on the adjacent street network. The following recommendations are made to mitigate project traffic impacts.

It is recommended that any required signing, striping, or traffic control improvements comply with Washoe County requirements.

It is recommended that the project developer contribute to possible future capacity improvements at the Golden Valley Road/Estates Road intersection with the payment of regional road impact fees.

INTRODUCTION

STUDY AREA

The proposed Ladera Ranch development will be located in Washoe County, Nevada. The project site is generally located south of Golden Valley Road and 7th Avenue, west of Chocolate Drive, and east of Spearhead Way. Figure 1 shows the approximate location of the project site. The purpose of this study is to address the project's impact upon the adjacent street network. The Golden Valley Road intersections with Estates Road and the US-395 northbound and southbound ramps and the 7th Avenue intersections with Sun Valley Boulevard and Dream Catcher Drive have been identified for AM and PM peak hour intersection capacity analysis for the existing, existing plus project, 2030 base, 2030 base plus project, 2040 base, and 2040 base plus project scenarios. Golden Valley Road and 7th Avenue have been identified for roadway capacity analysis for the 2030 and 2040 base plus project scenarios.

EXISTING AND PROPOSED LAND USES

The project site is currently under construction with the first phase of Ladera Ranch. Adjacent properties generally include residential dwelling units to the west and undeveloped land to the east and south. The proposed Ladera Ranch development will consist of the construction of a total of 399 single family detached homes. Phase 1 of Ladera Ranch is currently under construction with approximately 54 homes occupied or under construction. This traffic study therefore provides analysis for 345 unbuilt homes. Project access will be provided from Dream Catcher Drive via Golden Valley Road and 7th Avenue.

EXISTING AND PROPOSED ROADWAYS AND INTERSECTIONS

Golden Valley Road is a four-lane roadway with two through lanes in each direction from the US-395 northbound ramps to just east of Estates Road and a two-lane roadway with one through lane in each direction west of the US-395 northbound ramps and further east of Estates Road. The speed limit is posted for 35 miles per hour. Roadway improvements generally include curb, gutter and sidewalk on both sides of the street from North Virginia Street to Estates Road; curb, gutter and sidewalk on the south side of the street along the North Valley High School frontage; and graded shoulders with striped edgelines east of the high school. Raised center medians or center two-way left turn lanes exist between North Virginia Street and the high school and a striped centerline exists further east. Bike lanes exist on both sides of the street between Beckwourth Drive and Spearhead Way. Golden Valley Road becomes 7th Avenue east of Dream Catcher Drive.

7th Avenue is a two-lane roadway with one through lane in each direction from Dream Catcher Drive to east of Sun Valley Boulevard. The speed limit is posted for 25 miles per hour east of Sidehill Drive and 35 miles per hour west of Sidehill Drive. Roadway improvements generally include graded shoulders with striped edgelines and a striped centerline. A sidewalk exists on the south side of the street between Sun Valley Boulevard and Sidehill Drive.

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LADERA RANCH

VICINITY MAP
FIGURE 1

Estates Road is a two-lane roadway with one through lane in each direction north of Golden Valley Road. The speed limit is posted for 35 miles per hour. Roadway improvements generally include graded shoulders with striped edgelines and a striped centerline.

Sun Valley Boulevard is generally a four-lane roadway with two through lanes in each direction south of 7th Avenue and a two-lane roadway with one lane in each direction north of 7th Avenue. The speed limit is posted for 35 miles per hour. Roadway improvements generally include bike lanes and paved shoulders on both sides of the street with curb, gutter and sidewalk in some areas. A center two-way left turn lane exists on the four-lane section and a solid yellow centerline exists on the two-lane section.

Dream Catcher Drive is a two-lane roadway with one through lanes in each direction south of Golden Valley Road. The speed limit is posted for 25 miles per hour. Roadway improvements include curb, gutter and sidewalk on both sides of the street with a raised center median near 7th Avenue. Dream Catcher Drive will be extended southward with development of the project.

The Sun Valley Boulevard/7th Avenue intersection is a signalized four-leg intersection with protected/permissive phasing for the northbound and southbound left turn movements and permissive phasing for the eastbound and westbound left turn movements. The north approach contains one left turn lane, one through lane, and one shared through-right turn lane. The south approach contains one left turn lane, two through lanes, and one right turn lane. The east and west approaches each contain one shared left turn-through-right turn lane. Pedestrian crosswalks exist at the north, south, east, and west legs.

The Golden Valley Road/7th Avenue/Dream Catcher Drive intersection is an unsignalized three-leg intersection with stop sign control at the south approach. The east approach contains one left turn lane and one through lane. The west approach contains one through lane and one right turn lane. The south approach contains one left turn lane and one right turn lane.

The Golden Valley Road/Estates Road intersection is an unsignalized three-leg intersection with stop sign control at the north approach. The west approach contains one left turn lane and two through lanes. The east approach contains one through lane and one shared through-right turn lane. The north approach contains one left turn lane and one right turn lane. Pedestrian crosswalks exist on the north and east legs.

The Golden Valley Road/US-395 Northbound Ramp intersection is an unsignalized four-leg intersection with stop sign control at the northbound off-ramp approach. For analysis purposes it was assumed that Golden Valley Road runs in the east/west direction. The east Golden Valley Road approach contains one through lane and one right turn lane separated by a corner island. The west Golden Valley Road approach contains one left turn lane and one through lane. The south approach (US-395 northbound off-ramp) contains one shared left turn-through lane and one free-right turn lane separated by a corner island. The north approach is the on-ramp to northbound US-395. Pedestrian crosswalks exist on the north and south legs.

The Golden Valley Road/US-395 Southbound Ramp intersection is an unsignalized four-leg intersection with stop sign control at the north and west approaches. For analysis purposes it was assumed that Golden Valley Road runs in the east/west direction. The east Golden Valley Road approach contains one left turn lane and one through lane. The west Golden Valley Road approach contains one shared through-right turn lane with a corner island. The north approach (US-395 southbound off-ramp) contains one shared left turn-through lane and one right turn lane separated by a corner island. The south approach is the on-ramp to southbound US-395. Pedestrian crosswalks exist on the north and south legs.

TRIP GENERATION

In order to assess the magnitude of traffic impacts of the proposed project on the key roadways and intersections, trip generation rates and peak hours had to be determined. Trip generation rates were obtained from the 10th Edition of *ITE Trip Generation* (2018) for Land Uses 210: Single Family Detached Housing.

The proposed Ladera Ranch development will consist of the construction of a total of 399 single family detached homes. Phase 1 of Ladera Ranch is currently under construction with approximately 54 homes already occupied or under construction. This traffic study will therefore provide analysis for 345 unbuilt homes.

Trip generation was calculated for an average weekday and the weekday peak hours occurring between 7:00 and 9:00 AM and 4:00 and 6:00 PM, which correspond to the peak hours of adjacent street traffic. Table 1 shows a summary of the average daily traffic (ADT) and AM and PM peak hour volumes generated by the proposed project. The trip generation worksheets are included in the Appendix.

TABLE 1
TRIP GENERATION

		AM PEAK HOUR			PM PEAK HOUR		
LAND USE	ADT	IN	OUT	TOTAL	IN	OUT	TOTAL
Single Family Detached Housing (345 DU)	3,257	64	191	255	215	127	342

As shown in Table 1, buildout of the proposed project is anticipated to generate 3,257 average daily trips with 255 trips occurring during the AM peak hour and 342 trips occurring during the PM peak hour.

TRIP DISTRIBUTION AND ASSIGNMENT

The distribution of the project trips to the key intersections was based on existing peak hour traffic patterns and the locations of attractions and productions in the area. The anticipated trip distribution is shown on Figure 2. The peak hour trips shown in Table 1 were subsequently assigned to the key intersections based on the trip distribution percentages. Figure 3 shows the project trip assignment at the key intersections during the AM and PM peak hours.

EXISTING AND PROJECTED TRAFFIC VOLUMES

Figure 4 shows the existing traffic volumes at the key intersections during the AM and PM peak hours. The existing peak hour traffic volumes were obtained from weekday traffic counts conducted in October of 2019. Figure 5 shows the existing plus project traffic volumes at the key intersections during the AM and PM peak hours. The existing plus project traffic volumes were obtained by adding the trip assignment volumes shown on Figure 3 to the existing traffic volumes shown on Figure 4.

Figure 6 shows the 2030 base traffic volumes at the key intersections during the AM and PM peak hours. Figure 7 shows the 2030 base plus project traffic volumes at the key intersections during the AM and PM peak hours. The 2030 base plus project traffic volumes were obtained by adding the trip assignment volumes shown on Figure 3 to the 2030 base traffic volumes shown on Figure 6.

Figure 8 shows the 2040 base traffic volumes at the key intersections during the AM and PM peak hours. Figure 9 shows the 2040 base plus project traffic volumes at the key intersections during the AM and PM peak hours. The 2040 base plus project traffic volumes were obtained by adding the trip assignment volumes shown on Figure 3 to the 2040 base traffic volumes shown on Figure 8.

Figure 10 shows the average daily traffic volumes on Golden Valley Road and 7th Avenue for the 2030 and 2040 base plus project scenarios. These average daily traffic volumes were obtained directly the Regional Transportation Commission's traffic forecasting model. The Traffic Analysis Zone (TAZ) in which the project is located indicates household growth that represents full buildout Ladera Ranch.

The 2030 and 2040 base peak hour traffic volumes were estimated by either applying actual peak hour factors to average daily traffic volumes obtained directly from the Regional Transportation Commission's traffic forecasting model and then distributing the peak hour link volumes to the individual intersection movements or by applying growth rates obtained from the RTC traffic forecasting model to existing peak hour traffic volumes. The highest traffic volumes were utilized in order to ensure a conservative analysis. Again, it should be noted that the project dwelling units are included in the RTC traffic forecasting model.

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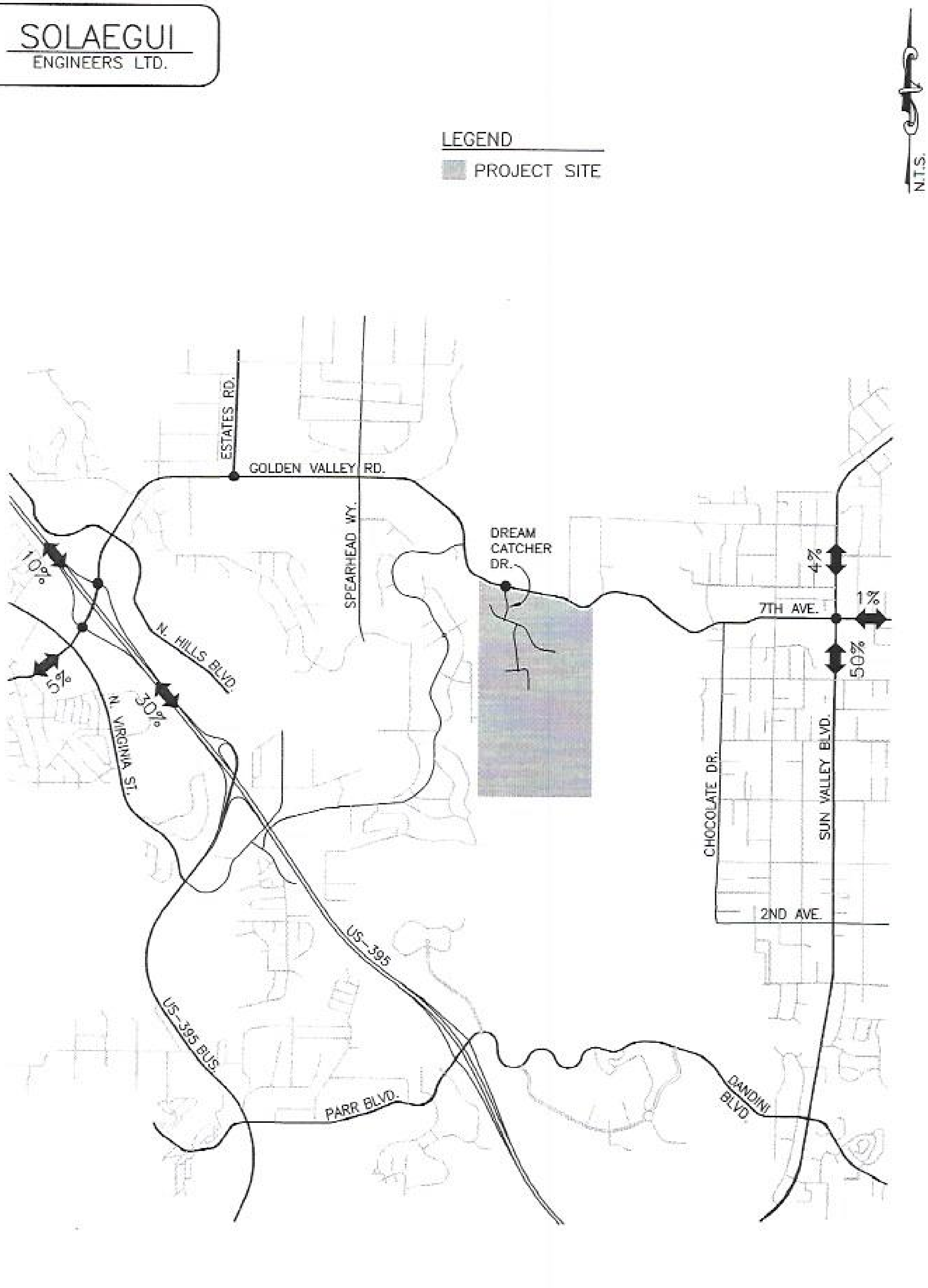
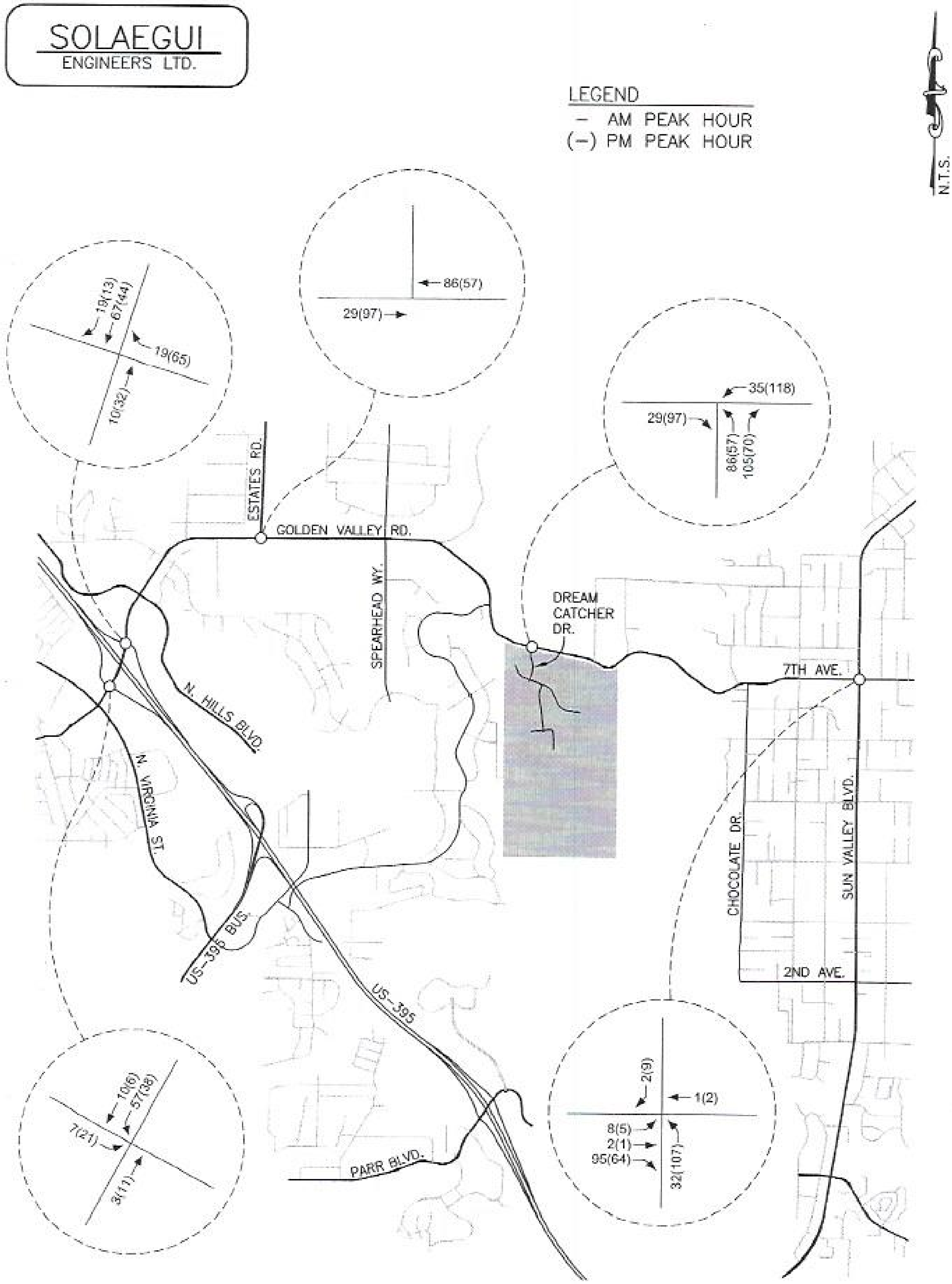


LADERA RANCH

TRIP DISTRIBUTION
FIGURE 2



LADERA RANCH

TRIP ASSIGNMENT
FIGURE 3

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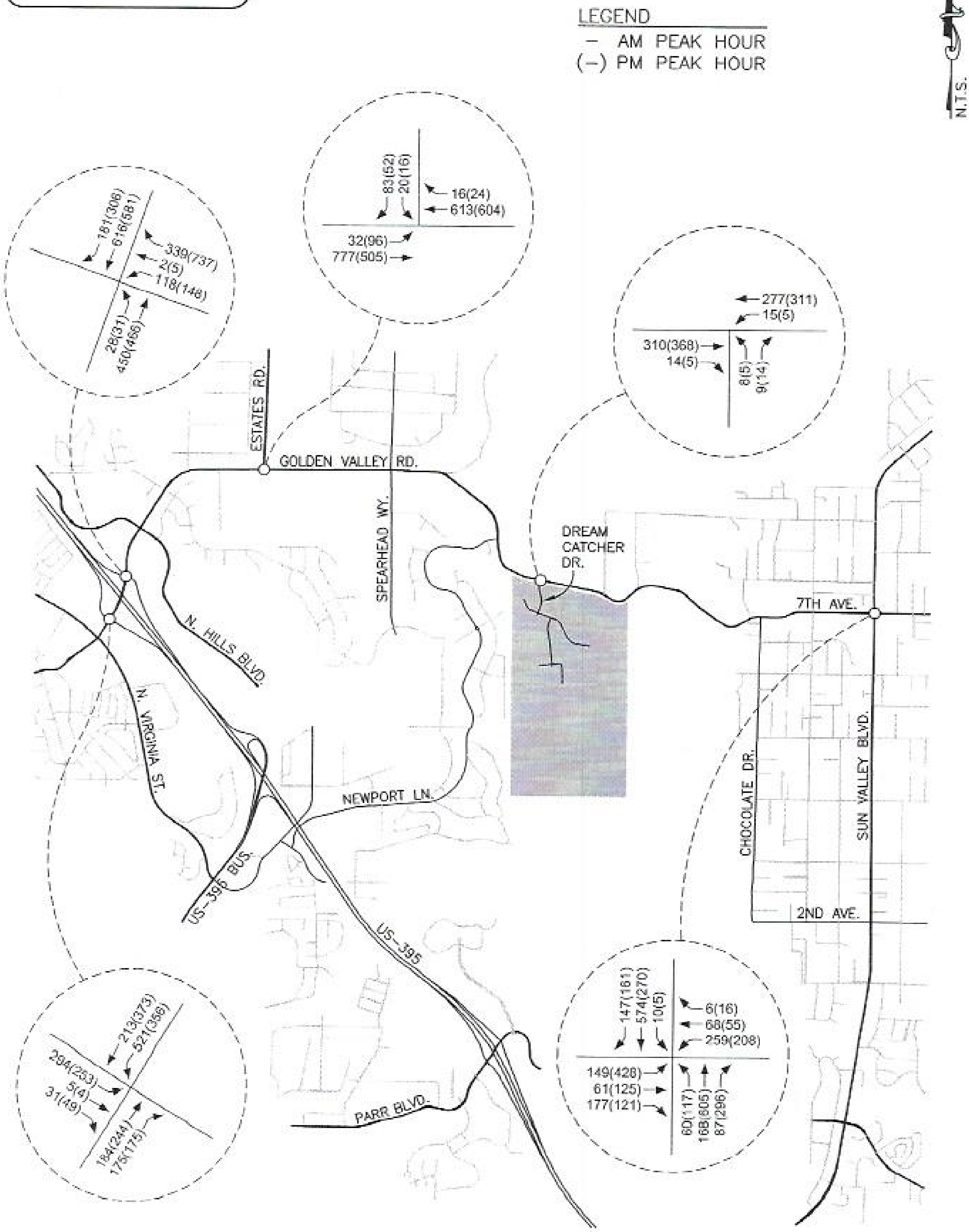

LADERA RANCH

EXISTING TRAFFIC VOLUMES
FIGURE 4

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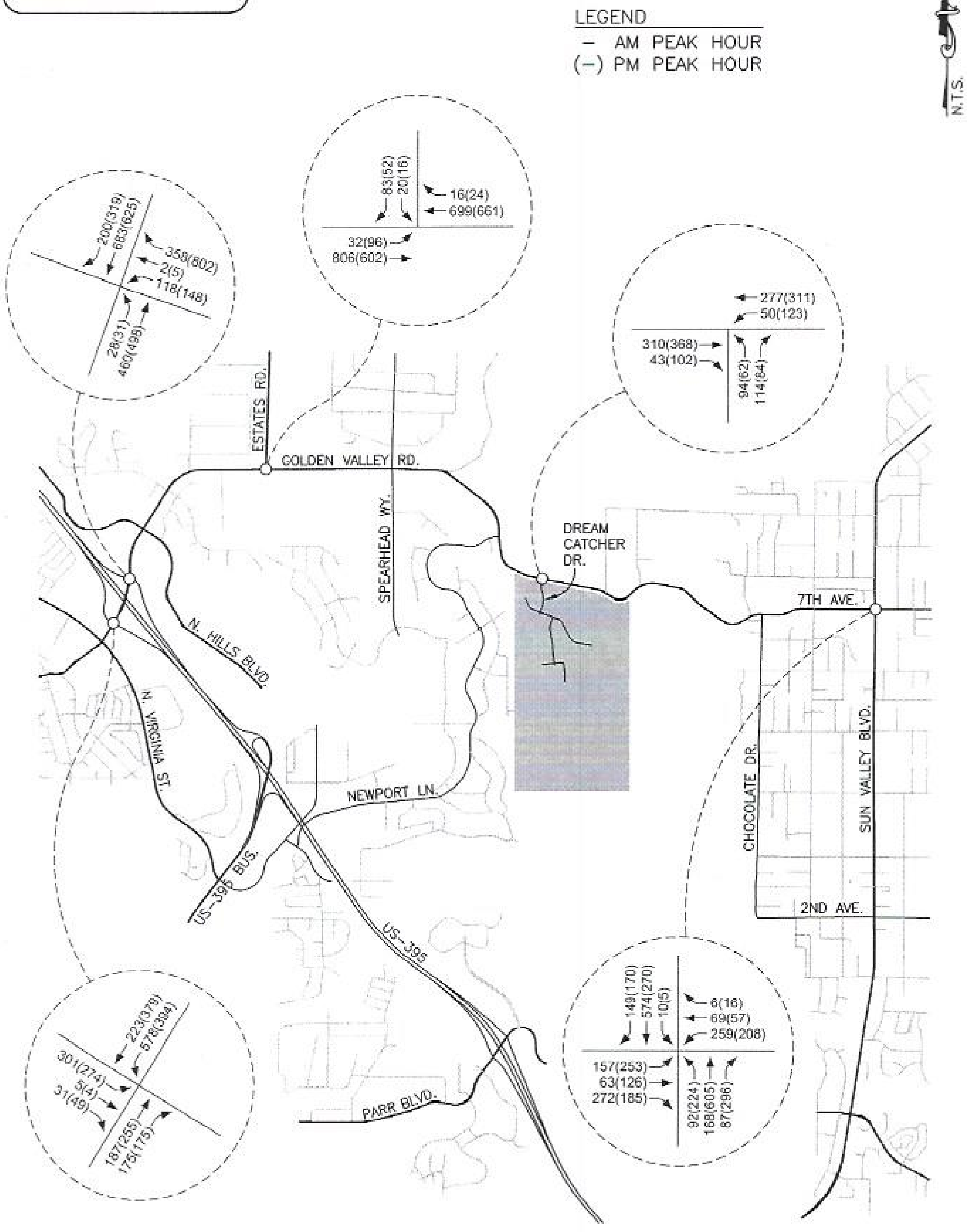

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EXISTING PLUS PROJECT TRAFFIC VOLUMES
FIGURE 5

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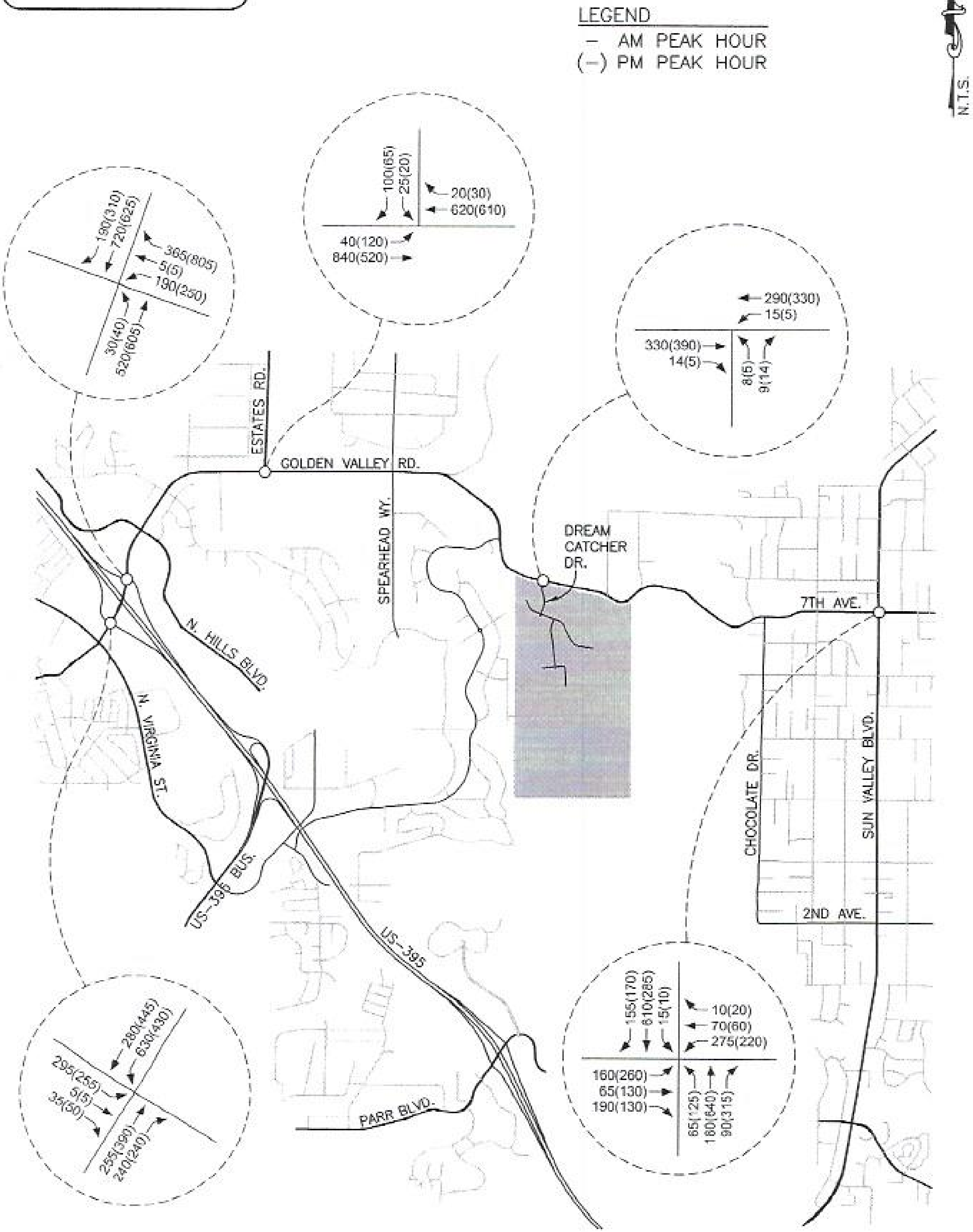

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2030 BASE TRAFFIC VOLUMES
FIGURE 6

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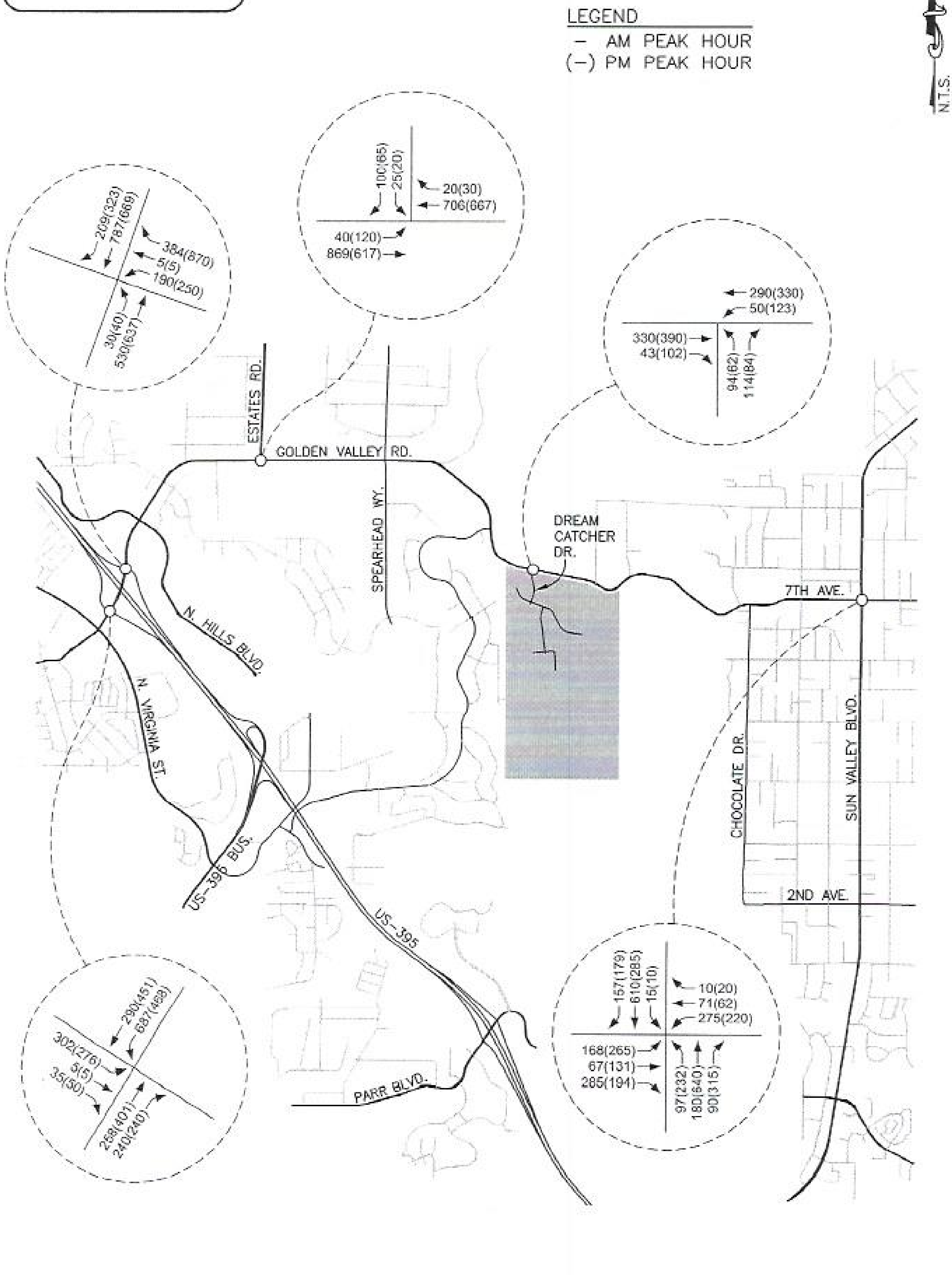

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2030 BASE PLUS PROJECT TRAFFIC VOLUMES
FIGURE 7

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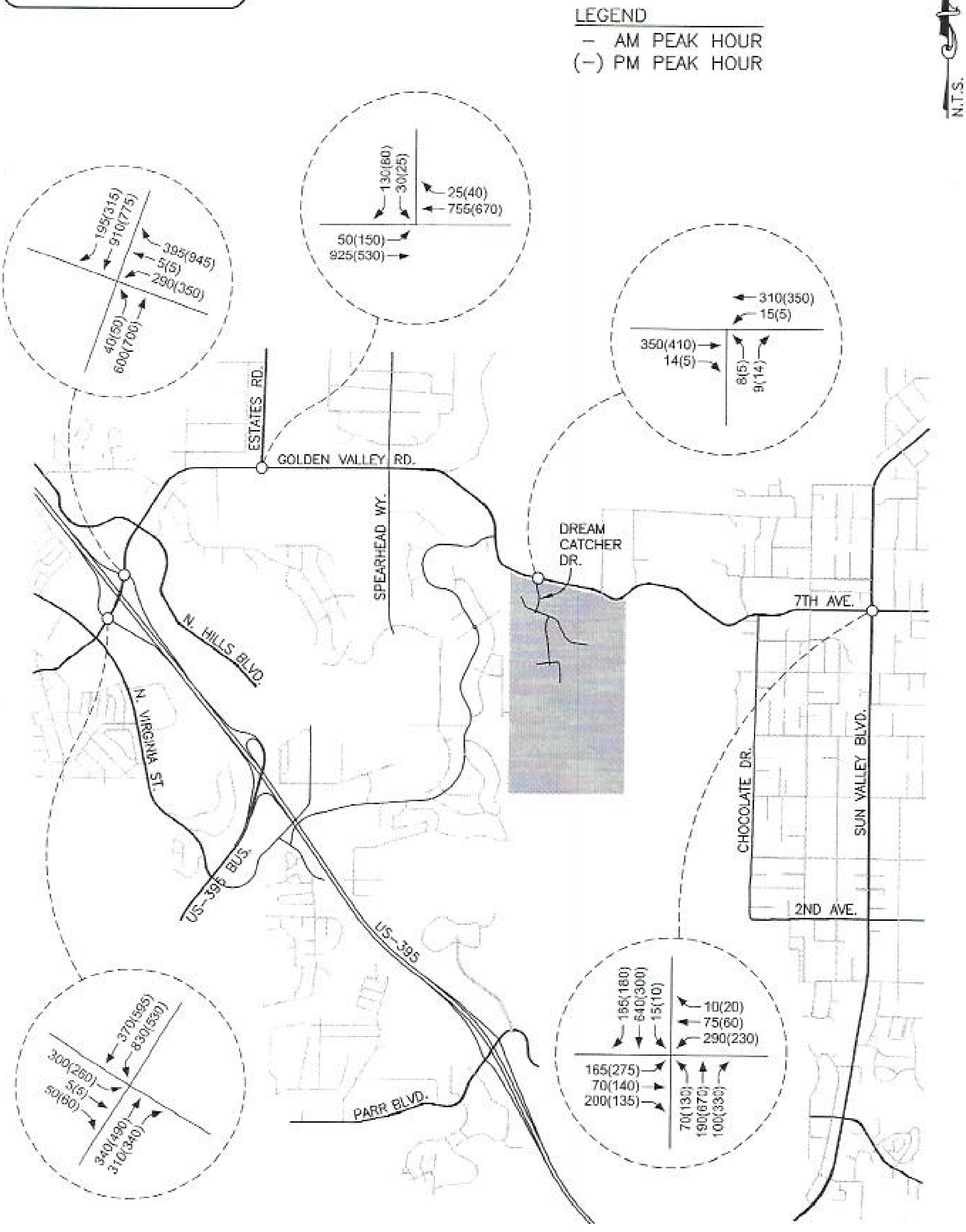

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2040 BASE TRAFFIC VOLUMES
FIGURE 8

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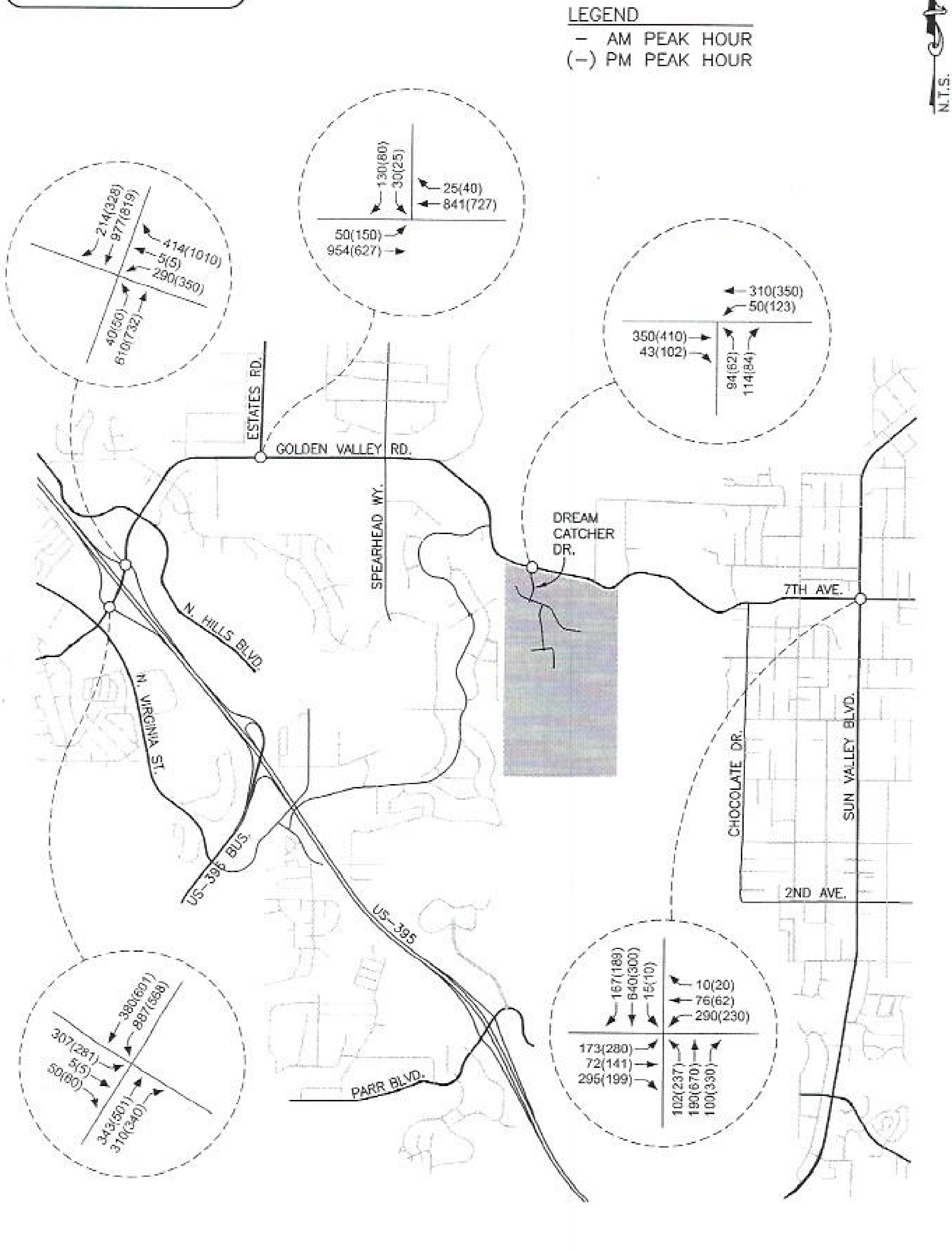

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2040 BASE PLUS PROJECT TRAFFIC VOLUMES
FIGURE 9

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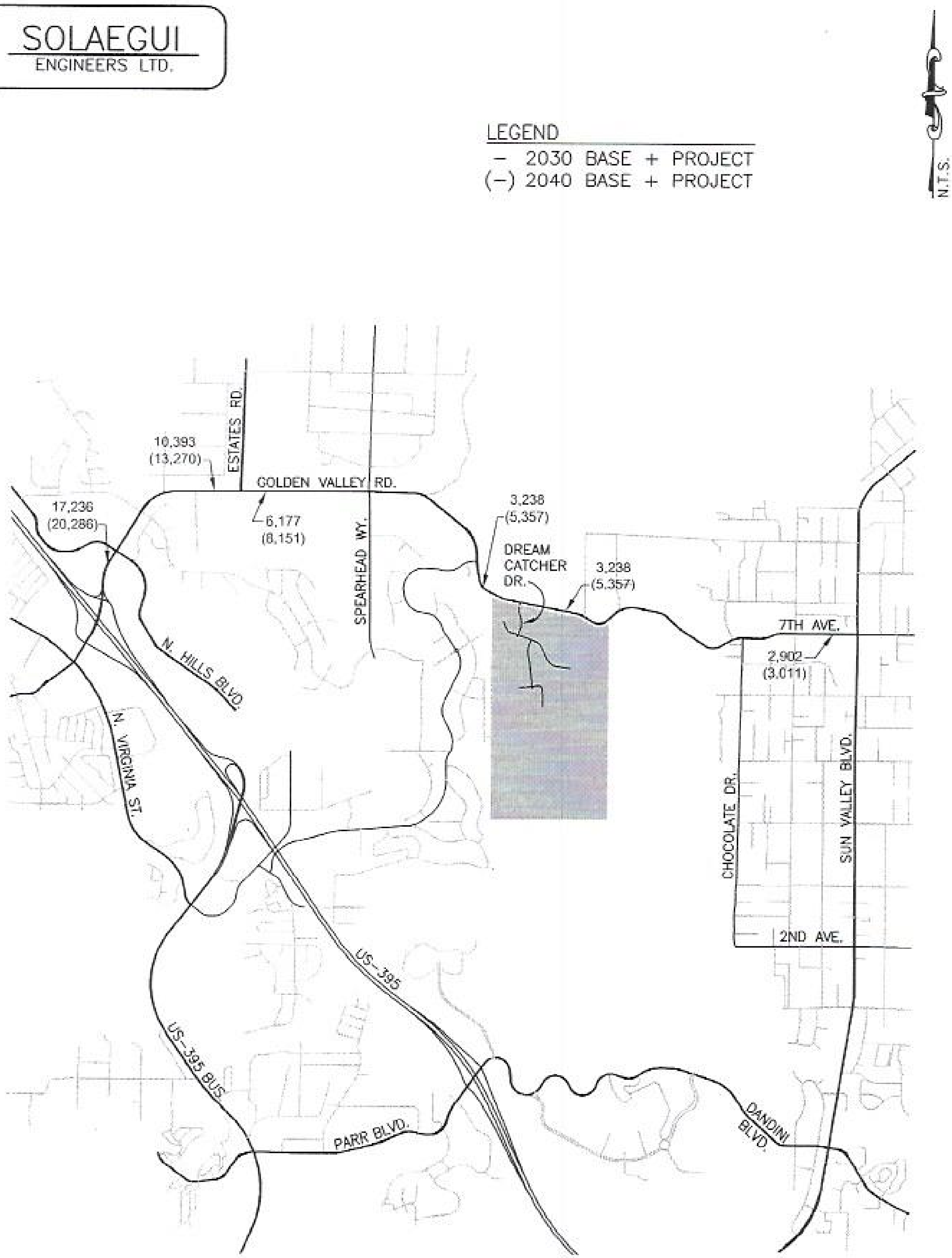


LADERA RANCH

AVERAGE DAILY TRAFFIC VOLUMES
FIGURE 10

INTERSECTION CAPACITY ANALYSIS

The key intersections were analyzed for capacity based on procedures presented in the *Highway Capacity Manual (6th Edition)*, prepared by the Transportation Research Board, for unsignalized and signalized intersections using the latest version of the Highway Capacity software.

The result of capacity analysis is a level of service (LOS) rating for signalized intersections and minor movements at a partial stop controlled intersection. Level of service is a qualitative measure of traffic operating conditions where a letter grade "A" through "F", corresponding to progressively worsening traffic operation, is assigned to the intersection or minor movement.

The *Highway Capacity Manual* defines level of service for stop controlled intersections in terms of computed or measured control delay for each minor movement. Level of service is not defined for the intersection as a whole. The level of service criteria for unsignalized intersections is shown in Table 2.

TABLE 2
LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DELAY RANGE (SEC/VEH)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Level of service for signalized intersections is stated in terms of the average control delay per vehicle for a peak 15 minute analysis period. The level of service criteria for signalized intersections is shown in Table 3.

TABLE 3
LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SEC)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

The Regional Transportation Commission's (RTC) 2040 Regional Transportation Plan indicates that level of service standards used for assessing the need for street and highway improvements at a planning level are LOS D for all regional roadway facilities projected to carry less than 27,000 ADT and LOS E for all regional roadway facilities projected to carry 27,000 or more ADT. RTC's traffic forecasting model indicates that all study intersection roadways will carry less than 27,000 ADT indicating that LOS D should be the level of service standard. However, Washoe County's Sun Valley Area Plan states that LOS C or above is the desired level for all regional roads in the Sun Valley planning area. In addition, the North Valleys Area Plan states that Washoe County's policy level of service for local transportation facilities in the North Valleys planning area is LOS C. LOS C is therefore the level of service standard for the key intersections in this analysis.

Table 4A shows a summary of the level of service and delay results at the key intersections for the existing and existing plus project scenarios. The intersection capacity worksheets are included in the Appendix.

TABLE 4A
INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS

INTERSECTION/MOVEMENT	EXISTING		EXISTING + PROJECT	
	AM	PM	AM	PM
Sun Valley/7th (Signal)	C23.1	C23.0	C24.6	C24.7
7th/Dream Catcher (Stop at South)				
Westbound Left	A8.0	A8.2	A8.2	A8.9
Northbound Left	B12.1	B12.5	B14.7	C17.5
Northbound Right	B10.2	B10.7	B11.2	B11.5
Golden Valley/Estates (Stop at North)				
Eastbound Left	A9.2	A9.5	A9.5	A9.8
Southbound Left	D28.0	D29.0	D32.9	D34.4
Southbound Right	B11.4	B11.0	B11.4	B11.4
Golden Valley/NB Ramps (Stop at South)				
Eastbound Left	A9.1	A8.9	A9.3	A9.1
Northbound Left-Right	F96.6	F149.1	F136.1	F209.4
Golden Valley/NB Ramps (Signal)	B15.2	B11.4	B16.1	B11.4
Golden Valley/SB Ramps (Stop at North)				
Southbound Left-Thru	F999+	F553.3	F999+	F815.1
Southbound Right	A9.7	B11.1	A9.7	B11.2
Golden Valley/SB Ramps (Signal)	C23.9	C21.7	C24.5	C22.8

Table 4B shows a summary of the level of service and delay results at the key intersections for the 2030 base, 2030 base plus project, 2040 base, and 2040 base plus project scenarios. The intersection capacity worksheets are included in the Appendix.

TABLE 4B
INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS

INTERSECTION	2030 BASE		2030 BASE + PROJECT		2040 BASE		2040 BASE + PROJECT	
	AM	PM	AM	PM	AM	PM	AM	PM
Sun Valley & 7th (Signal)	C24.5	C24.0	C26.9	C26.3	C26.3	C25.2	C29.8	C28.3
7th/Dream Catcher (Stop)								
Westbound Left	A8.1	A8.2	A8.3	A9.0	A8.2	A8.3	A8.4	A9.1
Northbound Left	B12.3	B12.8	C15.1	C18.1	B12.6	B13.0	C15.6	C18.7
Northbound Right	B10.3	B10.9	B11.4	B11.7	B10.5	B11.0	B11.7	B11.9
Golden Valley/Estates (Stop)								
Eastbound Left	A9.3	A9.7	A9.6	B10.1	B10.0	B10.4	B10.4	B10.7
Southbound Left	D31.9	D34.1	E38.1	E41.2	E49.3	E47.9	F61.6	F60.1
Southbound Right	B11.7	B11.3	B12.3	B11.6	B13.3	B11.9	B14.1	B12.3
Golden Valley/NB Ramp (Stop)								
Eastbound Left	A9.5	A9.2	A9.8	A9.3	B10.5	A9.9	B10.9	B10.1
Northbound Left-Right	F499.7	F782.8	F630.4	F954.7	F999+	F999+	F999+	F999+
Golden Valley/NB Ramp (Signal)	C20.1	B17.9	C21.1	B17.9	C30.0	C24.1	C32.5	C24.8
Golden Valley/SB Ramp (Stop)								
Southbound Left-Thru	F999+	F999+	F999+	F999+	F999+	F999+	F999+	F999+
Southbound Right	B10.2	B11.8	B10.3	B11.9	B11.1	B13.9	B11.2	B14.0
Golden Valley/SB Ramp (Signal)	C29.1	C26.7	C30.3	C28.3	D40.7	C29.9	D47.9	D35.8

Sun Valley Boulevard/7th Avenue Intersection

The Sun Valley Boulevard/7th Avenue intersection was analyzed as a signalized four-leg intersection for all scenarios. The intersection currently operates at LOS C during the AM and PM peak hours. For the existing plus project traffic volumes the intersection continues to operate at LOS C during the AM and PM peak hours with slight increases in delay. For the 2030 base traffic volumes the intersection operates at LOS C during the AM and PM peak hours. For the 2030 base plus project traffic volumes the intersection continues to operate at LOS C during the AM and PM peak hours with slight increases in delay. For the 2040 base traffic volumes the intersection operates at LOS C during the AM and PM peak hours. For the 2040 base plus project traffic volumes the intersection continues to operate at LOS C during the AM and PM peak hours with slight increases in delay. The intersection was analyzed with the existing approach lanes and phasing for all scenarios. The Sun Valley Boulevard/7th Avenue intersection meets Washoe County's policy LOS C standard for all scenarios.

The Golden Valley Road/7th Avenue/Dream Catcher Drive Intersection

The Golden Valley Road/7th Avenue/Dream Catcher Drive intersection was analyzed as an unsignalized three-leg intersection with stop sign control at the south approach for all scenarios. The intersection minor movements currently operate at LOS B or better during the AM and PM peak hours. For the existing plus project traffic volumes the intersection minor movements operate at LOS B or better during the AM peak hour and LOS C or better during the PM peak hour. For the 2030 base traffic volumes the intersection minor movements operate at LOS B or better during the AM and PM peak hours. For the 2030 base plus project traffic volumes the intersection minor movements operate at LOS C or better during the AM and PM peak hours. For the 2040 base traffic volumes the intersection minor movements operate at LOS B or better during the AM and PM peak hours. For the 2040 base plus project traffic volumes the intersection minor movements operate at LOS C or better during the AM and PM peak hours. The intersection was analyzed with the existing approach lanes for all scenarios. The Golden Valley Road/7th Avenue/Dream Catcher Drive intersection meets Washoe County's policy LOS C standard for all scenarios.

Queuing was subsequently reviewed for the westbound left turn movement at the Golden Valley Road/7th Avenue/Dream Catcher Drive intersection based on 95th percentile queue lengths obtained from the intersection operational analysis. The operational analysis indicates 95th percentile queue lengths of less than 50 feet for the westbound left turn movement for all scenarios. The existing left turn lane contains ±200 feet of storage length which exceeds the 50 foot queue length. The existing left turn storage lane is anticipated to accommodate project traffic volumes.

The Golden Valley Road/Estates Road Intersection

The Golden Valley Road/Estates Road intersection was analyzed as an unsignalized three-leg intersection with stop sign control at the north approach for all scenarios. The intersection minor movements currently operate at LOS B or better except for the southbound left turn movement which operates at LOS D during the AM and PM peak hours. For the existing plus project traffic volumes the intersection minor movements continue to operate at the same levels of service with increased delay during the AM and PM peak hours. For the 2030 base traffic volumes the intersection minor movements operate at LOS B or better except for the southbound left turn movement which operates at LOS D during the AM and PM peak hours. For the 2030 base plus project traffic volumes the intersection minor movements operate at LOS B or better except for the southbound left turn movement which operates at LOS E during the AM and PM peak hours. For the 2040 base traffic volumes the intersection minor movements operate at LOS B except for the southbound left turn movement which operates at LOS E during the AM and PM peak hours. For the 2040 base plus project traffic volumes the intersection minor movements operate at LOS B except for the southbound left turn movement which operates at LOS F during the AM and PM peak hours. The intersection was analyzed with the existing approach lanes for all scenarios. The Golden Valley Road/Estates Road intersection does not meet Washoe County's policy LOS C standard for existing conditions nor for the remaining scenarios.

Peak hour traffic signal warrant 3 per the latest edition of the *Manual on Uniform Traffic Control Devices* (MUTCD) was subsequently reviewed at the Golden Valley Road/Estates Road intersection due to the poor unsignalized intersection level of service operation. The traffic signal warrant is not met for any of the scenarios based on the southbound left turn volume. It should be noted that the MUTCD has eight additional warrants that should be evaluated when considering the need for the installation of a traffic signal. It is recommended that the project developer contribute to possible future capacity improvements at the Golden Valley Road/Estates Road intersection through the payment of regional road impact fees.

<u>Golden Valley Road/US-395 Northbound Ramp Intersection</u>

The Golden Valley Road/US-395 Northbound Ramp intersection was analyzed as an unsignalized four-leg intersection with stop sign control at the south off-ramp approach for all scenarios. The northbound left turn-through movement currently operates at LOS F during the AM and PM peak hours and will continue to do so for the existing plus project traffic volumes. The northbound left turn-through movement will continue to operate at LOS F during the AM and PM peak hours for the 2030 base, 2030 base plus project, 2040 base and 2040 base plus project scenarios. The intersection was analyzed with the existing approach lanes for all scenarios. The Golden Valley Road/US-395 Northbound Ramp intersection does not meet Washoe County's policy LOS C standard for any of the study scenarios nor does it meet the Nevada Department of Transportation's policy LOS D standard.

Peak hour traffic signal warrant 3 per the latest edition of the *Manual on Uniform Traffic Control Devices* (MUTCD) was subsequently reviewed at the Golden Valley Road/US-395 Northbound Ramp intersection due to the poor unsignalized intersection level of service operation. The traffic signal warrant is not met for the existing and existing plus project scenarios but is met for the 2030 base, 2030 base plus project, 2040 base and 2040 base plus project scenarios. The intersection will operate at LOS C or better for all scenarios based on Synchro signalized intersection analysis. It should be noted that the MUTCD has eight additional warrants that should be evaluated when considering the need for the installation of a traffic signal.

<u>Golden Valley Road/US-395 Southbound Ramp Intersection</u>

The Golden Valley Road/US-395 Southbound Ramp intersection was analyzed as an unsignalized four-leg intersection with stop sign control at the north off-ramp approach for all scenarios. Stop control also exists at the west approach but the Highway Capacity software does not model this non-standard intersection configuration. The southbound left turn-through movement currently operates at LOS F during the AM and PM peak hours and will continue to do so for the existing plus project traffic volumes. The southbound left turn-through movement will continue to operate at LOS F during the AM and PM peak hours for the 2030 base, 2030 base plus project, 2040 base and 2040 base plus project scenarios. The intersection was analyzed with the existing approach lanes for all scenarios. The Golden Valley Road/US-395 Southbound Ramp intersection does not meet Washoe County's policy LOS C standard for any of the study scenarios nor does it meet the Nevada Department of Transportation's policy LOS D standard.

Peak hour traffic signal warrant 3 per the latest edition of the *Manual on Uniform Traffic Control Devices* (MUTCD) was subsequently reviewed at the Golden Valley Road/US-395 Southbound Ramp intersection due to the poor unsignalized intersection level of service operation. The traffic signal warrant does not appear to be met for the existing and existing plus project scenarios but is met for the 2030 base, 2030 base plus project, 2040 base and 2040 base plus project scenarios. The intersection will operate at LOS D or better for all scenarios based on Synchro signalized intersection analysis which meets NDOT's LOS D standard. It should be noted that the MUTCD has eight additional warrants that should be evaluated when considering the need for the installation of a traffic signal.

ROADWAY CAPACITY ANALYSIS

The segment of Golden Valley Road from the US-395 Northbound Ramps to Dream Catcher Drive and the segment of 7th Avenue from Dream Catcher Drive to Sun Valley Boulevard were identified for roadway capacity analysis. Roadway capacity is based on average daily level of service thresholds established by the Regional Transportation Commission.

The 2040 Regional Transportation Plan indicates that the segment of Golden Valley Road from North Virginia Street to Dream Catcher Drive is classified as an arterial with moderate access control, the segment of 7th Avenue from Dream Catcher Drive to Chocolate Drive is classified as an arterial with moderate access control, and the segment of 7th Avenue between Chocolate Drive and Sun Valley Boulevard is classified as an arterial with low access control. Table 5 shows a summary of RTC's average daily traffic (ADT) level of service thresholds for low and moderate access control arterials.

TABLE 5
LEVEL OF SERVICE CRITERIA FOR ROADWAY SEGMENTS

FACILITY/LANES	AVERAGE DAILY TRAFFIC VOLUME			
	LOS B	LOS C	LOS D	LOS E
Arterial with Low Access Control				
2 Lanes	N/A	≤6,900	6,901-13,400	13,401-15,100
4 Lanes	N/A	≤15,700	15,701-28,400	28,401-30,200
Arterial with Moderate Access Control				
2 Lanes	≤5,500	5,501-14,800	14,801-17,500	17,501-18,600
4 Lanes	≤12,000	12,001-32,200	32,201-35,200	35,201-36,900

The segments of Golden Valley Road from the US-395 Northbound Ramps to Dream Catcher Drive and 7th Avenue from Dream Catcher Drive to Sun Valley Boulevard were reviewed for capacity based on the 2030 base plus project and 2040 base plus project traffic volumes shown on Figure 10 and the level of service threshold shown in Table 5. Table 6 shows a summary of the roadway segment level of service results.

TABLE 6
ROADWAY SEGMENT LEVEL OF SERVICE RESULTS

INTERSECTION/MOVEMENT	2030 BASE + PROJECT		2040 BASE + PROJECT	
	ADT	LOS	ADT	LOS
Golden Valley Road northeast of US-395 NB Ramps 4-Lane MAC Arterial (Existing)	17,236	LOS C	20,286	LOS C
Golden Valley Road west of Estates Road 4-Lane MAC Arterial (Existing)	10,393	LOS B	13,270	LOS C
Golden Valley Road east of Estates Road 4-Lane MAC Arterial (Existing)	6,177	LOS B	8,151	LOS B
Golden Valley Road west of Dream Catcher Drive 2-Lane MAC Arterial (Existing)	3,238	LOS B	5,357	LOS B
7th Avenue east of Dream Catcher Drive 2-Lane MAC Arterial (Existing)	3,238	LOS B	5,357	LOS B
7th Avenue west of Sun Valley Boulevard 2-Lane LAC Arterial (Existing)	2,902	LOS C	3,011	LOS C

As shown in Table 6, the existing four-lane segment of Golden Valley Road from the US-395 Northbound Ramps to east of Estates Road and the existing two-lane segment further east to Dream Catcher Drive operates at LOS C or better for the 2030 base plus project and 2040 base plus project traffic volumes. The existing two-lane segment of 7th Avenue from Dream Catcher Drive to Sun Valley Boulevard is also anticipated to operate at LOS C or better for the 2030 base plus project and 2040 base plus project traffic volumes. The entire segment of Golden Valley Road and 7th Avenue between the US-395 Northbound Ramps and Sun Valley Boulevard will meet Washoe County's policy LOS C standard. It should be noted that no improvements are scheduled for the segment of Golden Valley Road and 7th Avenue between the US-395 Northbound Ramps and Sun Valley Boulevard in RTC's 2040 Regional Transportation Plan.

TRAFFIC CRASH REVIEW

Traffic crash data at the key intersections was obtained from Nevada Department of Transportation Traffic Safety Engineering for the study period from July 1, 2015 to July 1, 2018. The crash data is included in the Appendix. The crash data at the key intersections is discussed below.

<u>Sun Valley Boulevard/7th Avenue Intersection</u>

A total of 29 crashes occurred at the Sun Valley Boulevard/7th Avenue intersection during the three-year period with no fatalities reported. The crash type included 14 angle collisions, 8 rear-end collisions, 5 non-collisions, 1 backing collision and 1 head-on collision. Following too close, driving too fast for conditions, failure to yield right of way, failure to keep in proper lane, object avoidance, disregard of traffic controls, hit and run, other improper driving, unsafe backing, exceeded speed limit, and unknown were the vehicle factors. Based on existing PM peak hour traffic volumes, the intersection currently experiences 1.4997 accidents per million vehicles entering the intersection. The project is anticipated to increase the occurrence of accidents by 1.0291 accidents per year.

<u>Golden Valley Road/7th Avenue/Dream Catcher Drive Intersection</u>

The Nevada Department of Transportation did not provide crash data at the Golden Valley Road/7th Avenue/Dream Catcher Drive intersection. The intersection was recently constructed with completion likely after the July 1, 2018 date of the traffic crash period.

<u>Golden Valley Road/Estates Road Intersection</u>

A total of 6 crashes occurred at the Golden Valley Road/Estates Road intersection during the three-year period with no fatalities reported. The crash type was 4 rear-end collisions and 2 angle collisions. Failure to yield the right of way, followed too closely, and unknown were the vehicle factors. Based on existing PM peak hour traffic volumes, the intersection currently experiences 0.4225 accidents per million vehicles entering the intersection. The project is anticipated to increase the occurrence of accidents by 0.2375 accidents per year.

<u>Golden Valley Road/US-395 Northbound Ramp Intersection</u>

A total of 5 crashes occurred at the Golden Valley Road/US-395 Northbound Ramp intersection during the three-year period with no fatalities reported. The crash type was 2 angle collisions, 2 non-collisions, and 1 head-on collision. Failure to keep in proper lane, failure to yield right of way, disregard of traffic controls, hit and run, and unknown were the vehicle factors. Based on existing PM peak hour traffic volumes, the intersection currently experiences 0.2008 accidents per million vehicles entering the intersection. The project is anticipated to increase the occurrence of accidents by 0.1129 accidents per year.

Golden Valley Road/US-395 Southbound Ramp Intersection

A total of 6 crashes occurred at the Golden Valley Road/US-395 Southbound Ramp intersection during the three-year period with no fatalities reported. The crash type was 4 angle collisions, 1 rear-end collision, and 1 unknown collision. Failure to yield right of way, mechanical defect, and other improper driving were the vehicle factors. Based on existing PM peak hour traffic volumes, the intersection currently experiences 0.3769 accidents per million vehicles entering the intersection. The project is anticipated to increase the occurrence of accidents by 0.1046 accidents per year.

RECOMMENDATIONS

Traffic generated by the Ladera Ranch development will have some impact on the adjacent street network. The following recommendations are made to mitigate project traffic impacts.

It is recommended that any required signing, striping, or traffic control improvements comply with Washoe County requirements.

It is recommended that the project developer contribute to possible future capacity improvements at the Golden Valley Road/Estates Road intersection with the payment of regional road impact fees.

APPENDIX

Single-Family Detached Housing
(210)

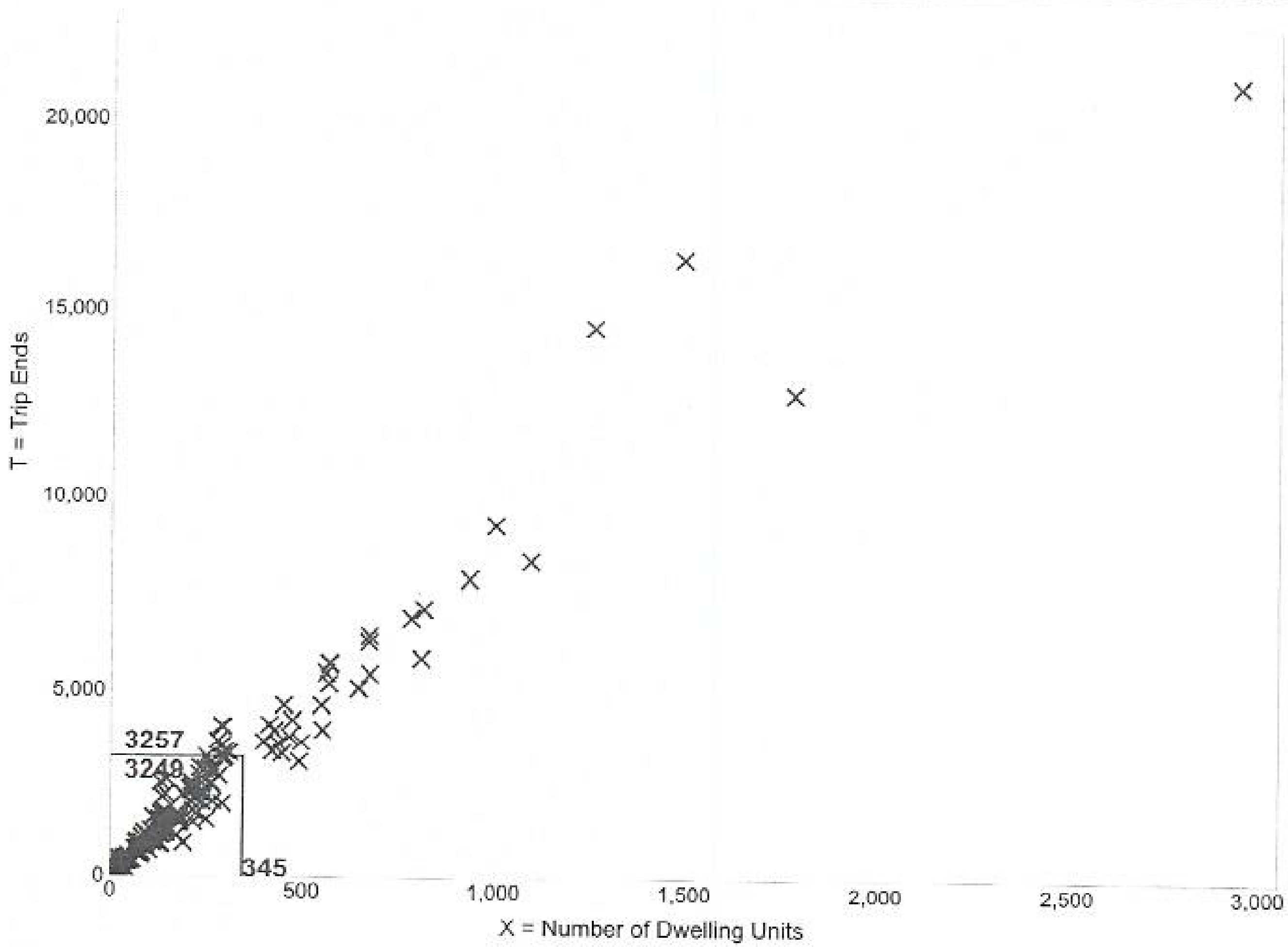
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



× **Study Site** ——— **Fitted Curve** **Average Rate**

Fitted Curve Equation: $\ln(T) = 0.92 \ln(X) + 2.71$ **$R^2 = 0.95$**

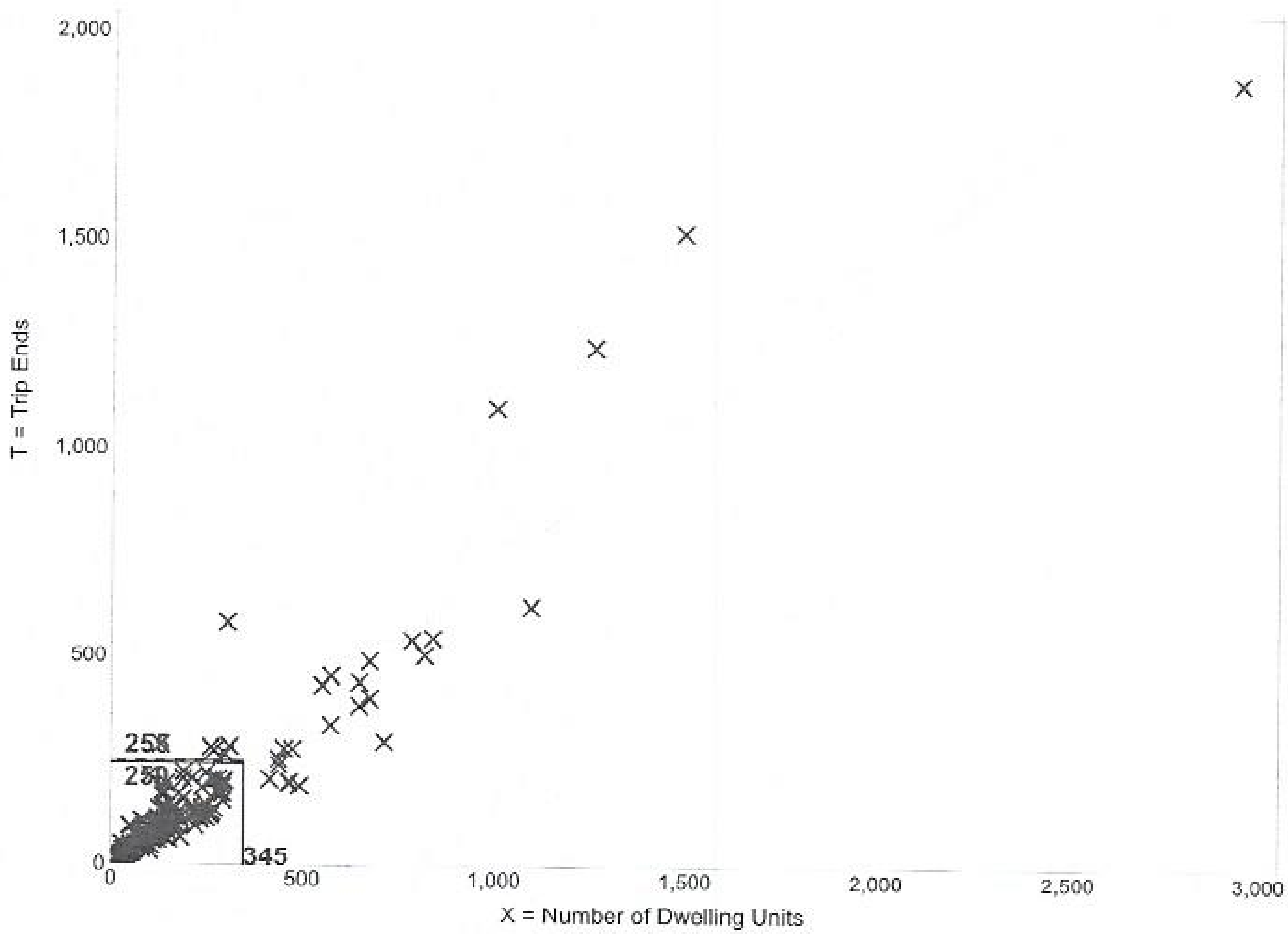
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



X **Study Site** ——— **Fitted Curve** **Average Rate**

Fitted Curve Equation: $T = 0.71(X) + 4.80$ **$R^2 = 0.89$**

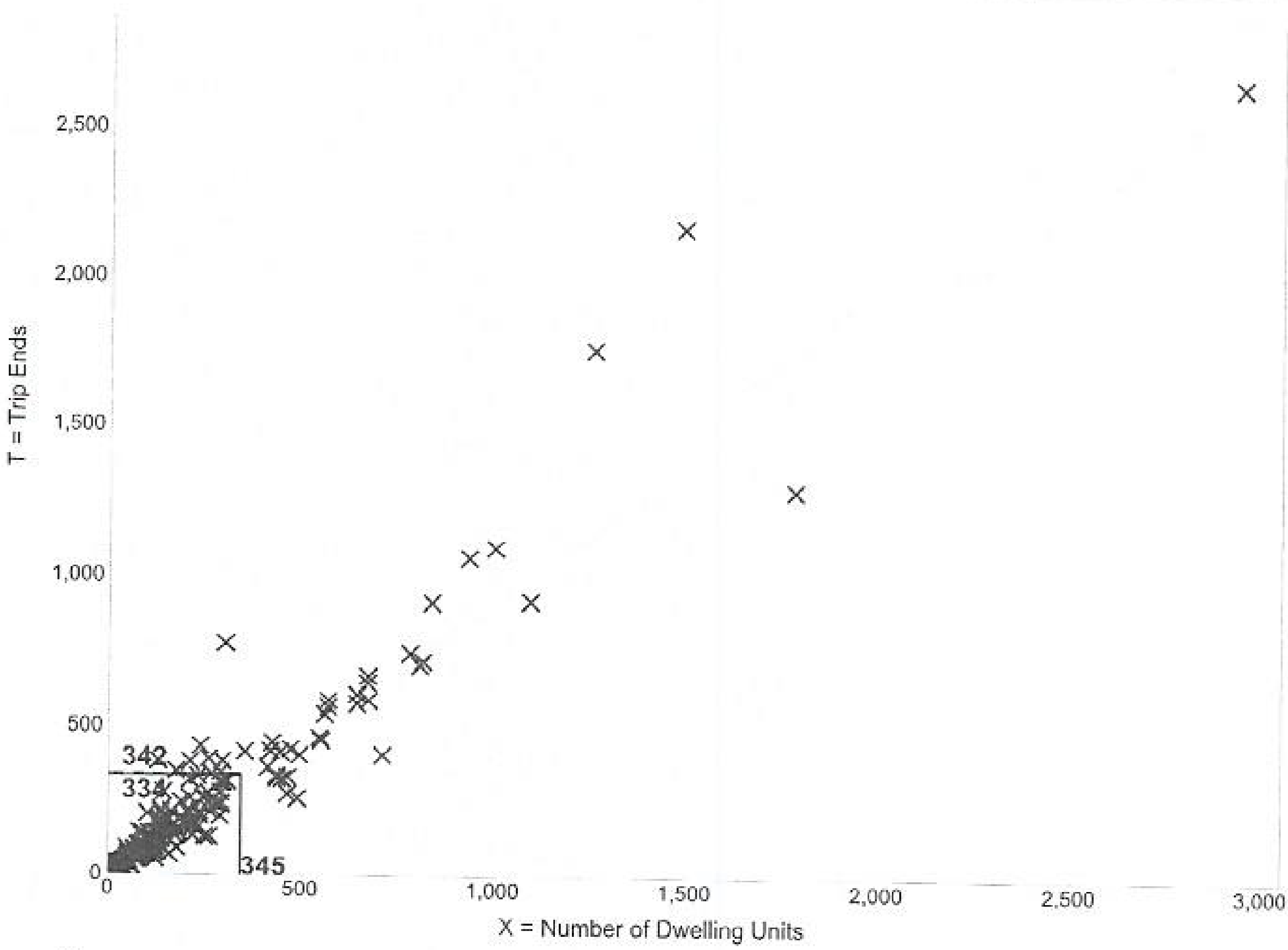
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation

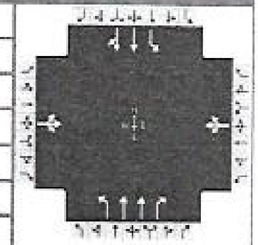


× **Study Site** ——— **Fitted Curve** **Average Rate**

Fitted Curve Equation: Ln(T) = 0.96 Ln(X) + 0.20 **R^2= 0.92**

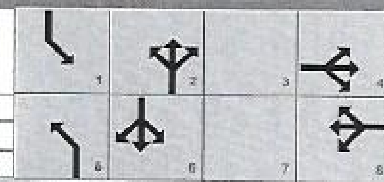
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe19ax.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	149	61	177	259	68	6	60	168	87	10	574	147

Signal Information										
Cycle, s	80.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.0	24.0	35.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
				Red	1.0	1.0	1.0	0.0	0.0	0.0



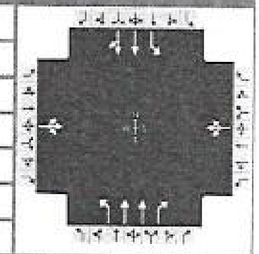
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, (Y+R c), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s		3.4		3.4	3.1	3.1	3.1	3.1
Queue Clearance Time (g s), s		17.2		25.2	3.9	5.3	2.3	17.0
Green Extension Time (g e), s		1.8		1.5	0.0	2.1	0.0	1.5
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		0.09	1.00	0.00	0.25	0.26

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		410			362		65	183	84	11	393	364
Adjusted Saturation Flow Rate (s), veh/h/ln		1570			1121		1781	1781	1518	1781	1870	1724
Queue Service Time (g s), s		0.0			8.0		1.9	3.0	3.3	0.3	14.9	15.0
Cycle Queue Clearance Time (g c), s		15.2			23.2		1.9	3.0	3.3	0.3	14.9	15.0
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		750			571		286	1068	455	509	561	517
Volume-to-Capacity Ratio (X)		0.546			0.634		0.228	0.171	0.184	0.021	0.700	0.703
Back of Queue (Q), ft/ln (95 th percentile)		228.2			238.7		33.8	54.9	50.8	5.4	278	258.7
Back of Queue (Q), veh/ln (95 th percentile)		9.0			9.4		1.3	2.2	2.0	0.2	10.9	10.3
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.17	0.00	0.00	0.03	0.00	0.00
Uniform Delay (d 1), s/veh		16.9			19.7		18.2	20.7	20.7	15.9	24.8	24.8
Incremental Delay (d 2), s/veh		0.5			1.8		0.1	0.0	0.1	0.0	3.3	3.6
Initial Queue Delay (d 3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		17.3			21.4		18.3	20.7	20.8	15.9	28.1	28.5
Level of Service (LOS)		B			C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	17.3		B	21.4		C	20.3		C	28.1		C
Intersection Delay, s/veh / LOS	23.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.16	A	1.08	A	0.76	A	1.12	A

HCS7 Signalized Intersection Results Summary

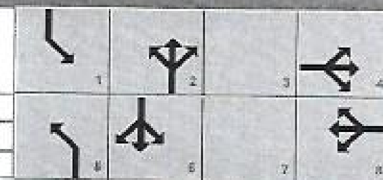
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe19px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	248	125	121	208	55	16	117	605	296	5	270	161

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	24.0	35.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, (Y+R c), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s		3.3		3.3	3.1	3.2	3.1	3.2
Queue Clearance Time (g s), s		25.8		18.5	5.8	16.4	2.2	10.4
Green Extension Time (g e), s		1.6		1.9	0.0	2.4	0.0	3.1
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.12		0.01	1.00	0.35	0.14	0.08

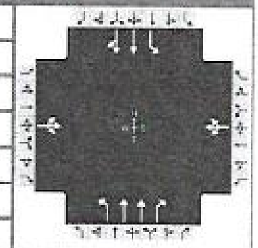
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		526			303		127	658	311	5	233	209
Adjusted Saturation Flow Rate (s), veh/h/ln		1509			1159		1781	1781	1518	1781	1870	1606
Queue Service Time (g s), s		7.3			0.0		3.8	12.7	14.4	0.2	8.0	8.4
Cycle Queue Clearance Time (g c), s		23.8			16.5		3.8	12.7	14.4	0.2	8.0	8.4
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		728			586		385	1068	455	314	561	482
Volume-to-Capacity Ratio (X)		0.722			0.518		0.330	0.616	0.683	0.017	0.415	0.433
Back of Queue (Q), ft/ln (95 th percentile)		324.9			179.9		68.1	224.7	230.5	2.7	152.3	135.4
Back of Queue (Q), veh/ln (95 th percentile)		12.8			7.1		2.7	8.8	9.1	0.1	6.0	5.4
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.34	0.00	0.00	0.01	0.00	0.00
Uniform Delay (d 1), s/veh		19.2			17.1		17.6	24.0	24.6	17.0	22.4	22.5
Incremental Delay (d 2), s/veh		3.1			0.4		0.2	0.8	3.5	0.0	0.2	0.2
Initial Queue Delay (d 3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		22.3			17.5		17.8	24.8	28.1	17.0	22.6	22.8
Level of Service (LOS)		C			B		B	C	C	B	C	C
Approach Delay, s/veh / LOS	22.3	C		17.5	B		24.9	C		22.6	C	
Intersection Delay, s/veh / LOS	23.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.36	A	0.99	A	1.39	A	0.86	A

 HCS™ Streets Version 7.8 Generated: 11/6/2019 8:08:18 AM

HCS7 Signalized Intersection Results Summary

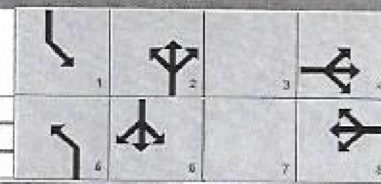
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe19aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	157	63	272	259	69	6	92	168	87	10	574	149

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	24.0	35.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



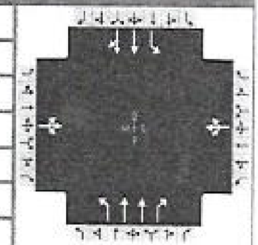
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.5		3.5	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		23.0		32.1	5.0	5.3	2.3	17.0
Green Extension Time (g_e), s		2.1		0.9	0.0	2.1	0.0	1.5
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.08		1.00	1.00	0.00	0.25	0.27

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		524			363		100	183	84	11	394	364
Adjusted Saturation Flow Rate (s), veh/h/ln		1623			939		1781	1781	1518	1781	1870	1722
Queue Service Time (g_s), s		0.0			9.1		3.0	3.0	3.3	0.3	15.0	15.0
Cycle Queue Clearance Time (g_c), s		21.0			30.1		3.0	3.0	3.3	0.3	15.0	15.0
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		770			491		285	1068	455	509	561	517
Volume-to-Capacity Ratio (X)		0.680			0.740		0.351	0.171	0.184	0.021	0.703	0.705
Back of Queue (Q), ft/ln (95 th percentile)		309.1			275.4		53.1	54.9	50.8	5.4	279.1	259.9
Back of Queue (Q), veh/ln (95 th percentile)		12.2			10.8		2.1	2.2	2.0	0.2	11.0	10.4
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.27	0.00	0.00	0.03	0.00	0.00
Uniform Delay (d_1), s/veh		18.5			22.1		18.7	20.7	20.7	15.9	24.8	24.9
Incremental Delay (d_2), s/veh		2.0			5.2		0.3	0.0	0.1	0.0	3.3	3.7
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		20.6			27.3		18.9	20.7	20.8	15.9	28.2	28.6
Level of Service (LOS)		C			C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	20.6	C		27.3	C		20.2	C		28.2	C	
Intersection Delay, s/veh / LOS	24.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.35	A	1.09	A	0.79	A	1.12	A

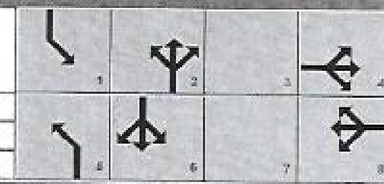
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe19pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	253	126	185	208	57	16	224	605	296	5	270	170

Signal Information										
Cycle, s	80.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.0	24.0	35.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
				Red	1.0	1.0	1.0	0.0	0.0	0.0



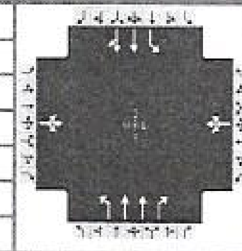
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		30.9		20.9	8.0	16.4	2.2	10.6
Green Extension Time (g_e), s		1.1		2.1	0.0	2.4	0.0	3.1
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.81		0.04	1.00	0.35	0.14	0.09

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		602			305		243	658	311	5	239	213
Adjusted Saturation Flow Rate (s), veh/h/ln		1530			1047		1781	1781	1518	1781	1870	1596
Queue Service Time (g_s), s		10.0			0.0		6.0	12.7	14.4	0.2	8.2	8.6
Cycle Queue Clearance Time (g_c), s		28.9			18.9		6.0	12.7	14.4	0.2	8.2	8.6
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		735			536		381	1068	455	314	561	479
Volume-to-Capacity Ratio (X)		0.819			0.569		0.639	0.616	0.683	0.017	0.425	0.444
Back of Queue (Q), ft/ln (95 th percentile)		404.8			190.9		61.6	224.7	230.5	2.7	156.8	138.5
Back of Queue (Q), veh/ln (95 th percentile)		15.9			7.5		2.4	8.8	9.1	0.1	6.2	5.5
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.31	0.00	0.00	0.01	0.00	0.00
Uniform Delay (d_1), s/veh		20.6			17.8		21.4	24.0	24.6	17.0	22.5	22.6
Incremental Delay (d_2), s/veh		6.8			0.9		2.8	0.8	3.5	0.0	0.2	0.2
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		27.5			18.7		24.2	24.8	28.1	17.0	22.7	22.9
Level of Service (LOS)		C			B		C	C	C	B	C	C
Approach Delay, s/veh / LOS	27.5	C		18.7	B		25.5	C		22.7	C	
Intersection Delay, s/veh / LOS	24.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.48	A	0.99	A	1.49	A	0.86	A

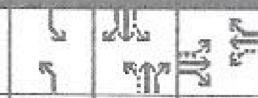
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2030 Base	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe30ax.xus		
Project Description					

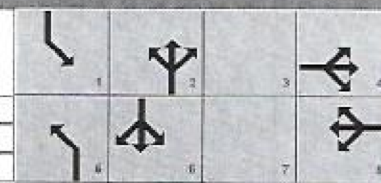


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	160	65	190	275	70	10	65	180	90	15	610	155

Signal Information				
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	6.0	24.0	35.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



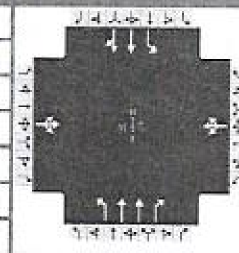
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		18.9		28.6	4.1	5.4	2.5	18.2
Green Extension Time (g_e), s		2.0		1.4	0.0	2.2	0.0	1.5
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.01		0.36	1.00	0.01	0.40	0.42

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		440			386		71	196	87	16	418	386
Adjusted Saturation Flow Rate (s), veh/h/ln		1576			1081		1781	1781	1518	1781	1870	1724
Queue Service Time (g_s), s		0.0			9.7		2.1	3.3	3.4	0.5	16.1	16.2
Cycle Queue Clearance Time (g_c), s		16.9			26.6		2.1	3.3	3.4	0.5	16.1	16.2
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		752			553		273	1068	455	502	561	517
Volume-to-Capacity Ratio (X)		0.585			0.698		0.259	0.183	0.191	0.032	0.745	0.747
Back of Queue (Q), ft/ln (95 th percentile)		249.4			267.8		36.7	59.1	52.9	8.1	302.4	281.7
Back of Queue (Q), veh/ln (95 th percentile)		9.8			10.5		1.4	2.3	2.1	0.3	11.9	11.3
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.18	0.00	0.00	0.04	0.00	0.00
Uniform Delay (d_1), s/veh		17.3			20.9		18.6	20.7	20.8	15.9	25.2	25.3
Incremental Delay (d_2), s/veh		0.8			3.3		0.2	0.0	0.1	0.0	4.8	5.2
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		18.1			24.1		18.8	20.8	20.9	16.0	30.0	30.5
Level of Service (LOS)		B			C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	18.1	B		24.1	C		20.4	C		30.0	C	
Intersection Delay, s/veh / LOS	24.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.21	A	1.12	A	0.78	A	1.16	A

HCS7 Signalized Intersection Results Summary

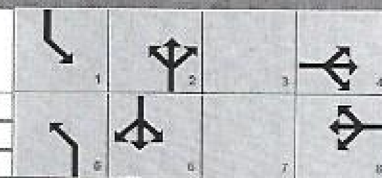
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2030 Base	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe30px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	260	130	130	220	60	20	125	640	315	10	285	170

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	24.0	35.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



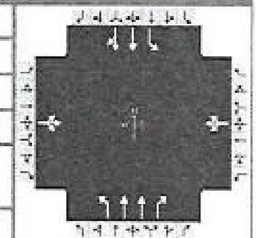
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		28.0		20.3	6.1	17.6	2.3	10.9
Green Extension Time (g_e), s		1.5		2.0	0.0	2.3	0.0	3.3
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.30		0.02	1.00	0.50	0.25	0.11

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		554			326		136	696	332	11	247	220
Adjusted Saturation Flow Rate (s), veh/h/ln		1504			1149		1781	1781	1518	1781	1870	1604
Queue Service Time (g_s), s		7.7			0.0		4.1	13.6	15.6	0.3	8.5	8.9
Cycle Queue Clearance Time (g_c), s		26.0			18.3		4.1	13.6	15.6	0.3	8.5	8.9
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		726			581		375	1068	455	302	561	481
Volume-to-Capacity Ratio (X)		0.764			0.562		0.362	0.651	0.728	0.036	0.440	0.458
Back of Queue (Q), ft/ln (95 th percentile)		354.9			199.1		73.2	238.7	251.7	5.4	163.3	144.5
Back of Queue (Q), veh/ln (95 th percentile)		14.0			7.8		2.9	9.4	9.9	0.2	6.4	5.8
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.37	0.00	0.00	0.03	0.00	0.00
Uniform Delay (d_1), s/veh		19.9			17.6		17.8	24.4	25.1	17.3	22.6	22.7
Incremental Delay (d_2), s/veh		4.4			0.8		0.2	1.1	5.1	0.0	0.2	0.3
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		24.2			18.4		18.0	25.5	30.2	17.3	22.8	23.0
Level of Service (LOS)		C			B		B	C	C	B	C	C
Approach Delay, s/veh / LOS	24.2	C		18.4	B		25.9	C		22.7	C	
Intersection Delay, s/veh / LOS	24.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.40	A	1.03	A	1.45	A	0.88	A

HCS7 Signalized Intersection Results Summary

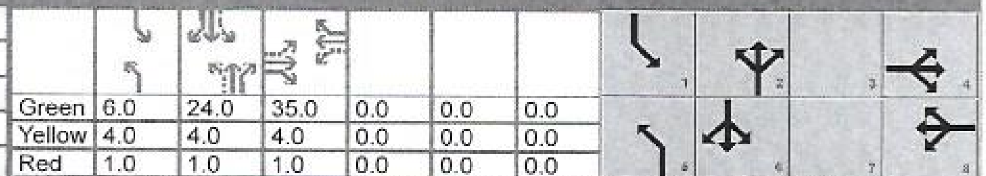
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2030 Base + Project	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe30aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	168	67	285	275	71	10	97	180	90	15	610	157

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	24.0	35.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, (Y+R c), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s		3.5		3.5	3.1	3.1	3.1	3.1
Queue Clearance Time (g s), s		25.0		36.3	5.1	5.4	2.5	18.2
Green Extension Time (g e), s		2.1		0.0	0.0	2.2	0.0	1.5
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.16		1.00	1.00	0.01	0.40	0.43

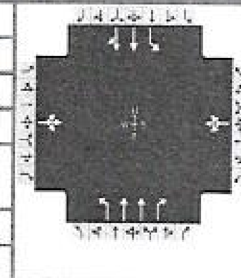
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		554			387		105	196	87	16	419	387
Adjusted Saturation Flow Rate (s), veh/h/ln		1635			900		1781	1781	1518	1781	1870	1722
Queue Service Time (g s), s		0.0			11.3		3.1	3.3	3.4	0.5	16.2	16.2
Cycle Queue Clearance Time (g c), s		23.0			34.3		3.1	3.3	3.4	0.5	16.2	16.2
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		775			474		272	1068	455	502	561	517
Volume-to-Capacity Ratio (X)		0.715			0.817		0.387	0.183	0.191	0.032	0.748	0.749
Back of Queue (Q), ft/ln (95 th percentile)		335.3			320.5		56.2	59.1	52.9	8.1	304	282.6
Back of Queue (Q), veh/ln (95 th percentile)		13.2			12.6		2.2	2.3	2.1	0.3	12.0	11.3
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.28	0.00	0.00	0.04	0.00	0.00
Uniform Delay (d 1), s/veh		19.1			23.7		19.1	20.7	20.8	15.9	25.3	25.3
Incremental Delay (d 2), s/veh		2.7			10.0		0.3	0.0	0.1	0.0	4.9	5.4
Initial Queue Delay (d 3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		21.8			33.7		19.4	20.8	20.9	16.0	30.1	30.6
Level of Service (LOS)		C			C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	21.8	C		33.7	C		20.4	C		30.1	C	
Intersection Delay, s/veh / LOS	26.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.40	A	1.13	A	0.81	A	1.17	A

 HCS™ Streets Version 7.8 Generated: 11/6/2019 8:10:15 AM

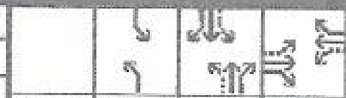
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2030 Base + Project	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe30pw.xus		
Project Description					

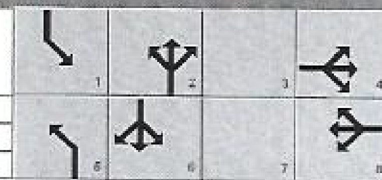


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	265	131	194	220	62	20	232	640	315	10	285	178

Signal Information				
Cycle, s	80.0	Reference Phase	2	
Offset, s	0	Reference Point	End	
Uncoordinated	Yes	Simult. Gap E/W	On	
Force Mode	Fixed	Simult. Gap N/S	On	



Green	6.0	24.0	35.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



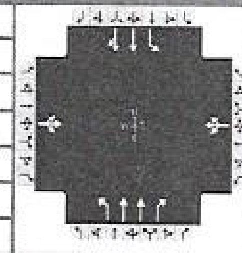
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s		3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		33.5		22.9	8.0	17.6	2.3	11.1
Green Extension Time (g_e), s		0.5		2.2	0.0	2.4	0.0	3.3
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		0.08	1.00	0.50	0.25	0.12

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		630			328		252	696	332	11	252	224
Adjusted Saturation Flow Rate (s), veh/h/ln		1526			1039		1781	1781	1518	1781	1870	1595
Queue Service Time (g_s), s		10.6			0.0		6.0	13.6	15.6	0.3	8.7	9.1
Cycle Queue Clearance Time (g_c), s		31.5			20.9		6.0	13.6	15.6	0.3	8.7	9.1
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		733			532		371	1068	455	302	561	479
Volume-to-Capacity Ratio (X)		0.860			0.616		0.679	0.651	0.728	0.036	0.450	0.468
Back of Queue (Q), ft/ln (95 th percentile)		447.1			210.4		79.3	238.7	251.7	5.4	167.2	147.3
Back of Queue (Q), veh/ln (95 th percentile)		17.6			8.3		3.1	9.4	9.9	0.2	6.6	5.9
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.40	0.00	0.00	0.03	0.00	0.00
Uniform Delay (d_1), s/veh		21.3			18.3		22.1	24.4	25.1	17.3	22.7	22.8
Incremental Delay (d_2), s/veh		9.7			1.6		4.1	1.1	5.1	0.0	0.2	0.3
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		31.0			19.9		26.2	25.5	30.2	17.3	22.9	23.1
Level of Service (LOS)		C			B		C	C	C	B	C	C
Approach Delay, s/veh / LOS	31.0		C	19.9		B	26.8		C	22.8		C
Intersection Delay, s/veh / LOS	26.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.53	B	1.03	A	1.54	B	0.89	A

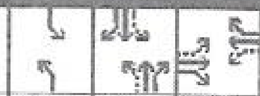
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2040 Base	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe40ax.xus		
Project Description					

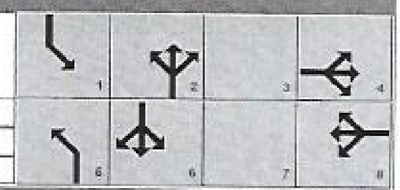


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	165	70	200	290	75	10	70	190	100	15	640	165

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	6.0	24.0	35.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



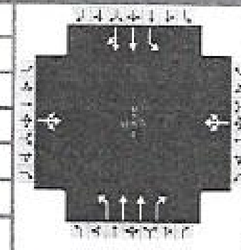
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, (*Y+R* c), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		20.1		31.7	4.2	5.9	2.5	19.3
Green Extension Time (g_e), s		2.1		0.9	0.0	2.4	0.0	1.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.03		1.00	1.00	0.01	0.40	0.63

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		462			408		76	207	98	16	441	407
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1586			1051		1781	1781	1518	1781	1870	1721
Queue Service Time (g_s), s		0.0			11.7		2.2	3.4	3.9	0.5	17.3	17.3
Cycle Queue Clearance Time (g_c), s		18.1			29.7		2.2	3.4	3.9	0.5	17.3	17.3
Green Ratio (*g/C*)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (*c*), veh/h		757			540		262	1068	455	496	561	516
Volume-to-Capacity Ratio (*X*)		0.611			0.755		0.291	0.193	0.215	0.033	0.786	0.787
Back of Queue (*Q*), ft/ln (95 th percentile)		264.3			299		39.8	62.5	59.9	8.1	328.5	305.2
Back of Queue (*Q*), veh/ln (95 th percentile)		10.4			11.8		1.6	2.5	2.4	0.3	12.9	12.2
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.20	0.00	0.00	0.04	0.00	0.00
Uniform Delay (d_1), s/veh		17.7			22.0		19.0	20.8	21.0	16.0	25.7	25.7
Incremental Delay (d_2), s/veh		1.1			5.4		0.2	0.0	0.1	0.0	6.7	7.3
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		18.7			27.4		19.2	20.8	21.0	16.0	32.4	33.0
Level of Service (LOS)		B			C		B	C	C	B	C	C
Approach Delay, s/veh / LOS	18.7	B		27.4	C		20.6	C		32.3	C	
Intersection Delay, s/veh / LOS	26.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.25	A	1.16	A	0.80	A	1.20	A

HCS7 Signalized Intersection Results Summary

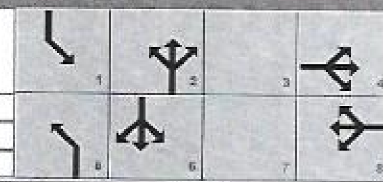
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2040 Base	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe40px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	275	140	135	230	60	20	130	670	330	10	300	180

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	24.0	35.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



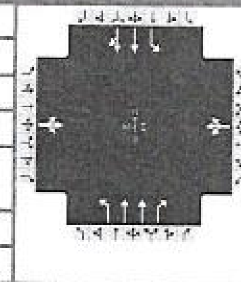
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		30.6		21.4	6.3	18.6	2.3	11.5
Green Extension Time (g_e), s		1.2		2.1	0.0	2.2	0.0	3.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.72		0.04	1.00	0.64	0.25	0.15

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		587			337		141	728	348	11	262	232
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1505			1128		1781	1781	1518	1781	1870	1601
Queue Service Time (g_s), s		9.2			0.0		4.3	14.4	16.6	0.3	9.1	9.5
Cycle Queue Clearance Time (g_c), s		28.6			19.4		4.3	14.4	16.6	0.3	9.1	9.5
Green Ratio (*g/C*)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (*c*), veh/h		726			572		364	1068	455	293	561	480
Volume-to-Capacity Ratio (*X*)		0.808			0.589		0.388	0.682	0.764	0.037	0.467	0.484
Back of Queue (*Q*), ft/ln (95 th percentile)		392.8			208.8		76.5	251.5	270.4	5.4	175	153.9
Back of Queue (*Q*), veh/ln (95 th percentile)		15.5			8.2		3.0	9.9	10.6	0.2	6.9	6.2
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.38	0.00	0.00	0.03	0.00	0.00
Uniform Delay (d_1), s/veh		20.6			17.9		18.0	24.6	25.4	17.4	22.8	22.9
Incremental Delay (d_2), s/veh		6.3			1.1		0.3	1.5	6.8	0.0	0.2	0.3
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		26.9			19.0		18.2	26.1	32.2	17.4	23.0	23.2
Level of Service (LOS)		C			B		B	C	C	B	C	C
Approach Delay, s/veh / LOS	26.9	C		19.0	B		26.9	C		23.0	C	
Intersection Delay, s/veh / LOS	25.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.46	A	1.04	A	1.49	A	0.90	A

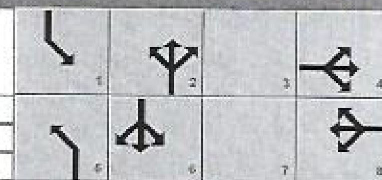
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2040 Base + Project	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe40aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	173	72	295	290	76	10	102	190	100	15	640	167

Signal Information										
Cycle, s	80.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.0	24.0	35.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
				Red	1.0	1.0	1.0	0.0	0.0	0.0



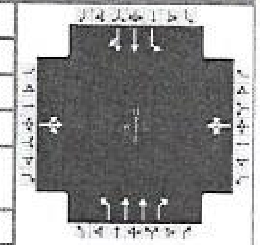
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.5		3.5	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		26.4		37.0	5.3	5.9	2.5	19.4
Green Extension Time (g_e), s		2.1		0.0	0.0	2.4	0.0	1.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.26		1.00	1.00	0.01	0.40	0.64

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		576			409		111	207	98	16	443	407
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1637			871		1781	1781	1518	1781	1870	1719
Queue Service Time (g_s), s		0.0			10.6		3.3	3.4	3.9	0.5	17.4	17.4
Cycle Queue Clearance Time (g_c), s		24.4			35.0		3.3	3.4	3.9	0.5	17.4	17.4
Green Ratio (*g/C*)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (*c*), veh/h		776			461		261	1068	455	496	561	516
Volume-to-Capacity Ratio (*X*)		0.743			0.887		0.425	0.193	0.215	0.033	0.789	0.790
Back of Queue (*Q*), ft/ln (95 th percentile)		356			376.5		59.4	62.5	59.9	8.1	329.9	306.6
Back of Queue (*Q*), veh/ln (95 th percentile)		14.0			14.8		2.3	2.5	2.4	0.3	13.0	12.3
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.30	0.00	0.00	0.04	0.00	0.00
Uniform Delay (d_1), s/veh		19.5			25.0		19.5	20.8	21.0	16.0	25.7	25.7
Incremental Delay (d_2), s/veh		3.4			17.9		0.4	0.0	0.1	0.0	6.8	7.5
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		22.9			43.0		19.9	20.8	21.0	16.0	32.5	33.1
Level of Service (LOS)		C			D		B	C	C	B	C	C
Approach Delay, s/veh / LOS	22.9	C		43.0	D		20.6	C		32.5	C	
Intersection Delay, s/veh / LOS	29.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.44	A	1.16	A	0.83	A	1.20	A

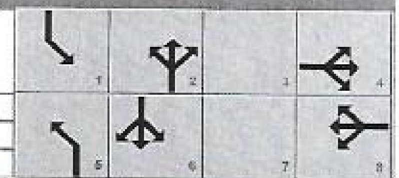
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Oct 31, 2019	Area Type	Other
Jurisdiction	Washoe County	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2040 Base + Project	Analysis Period	1> 7:00
Intersection	Sun Valley & 7th	File Name	SvSe40pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	280	141	199	230	62	20	237	670	330	10	300	189

Signal Information											
Cycle, s	80.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On	Green	6.0	24.0	35.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
				Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	1.1	3.0	1.1	4.0
Phase Duration, s		40.0		40.0	11.0	29.0	11.0	29.0
Change Period, (Y+R c), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (MAH), s		3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (g s), s		36.5		24.1	8.0	18.6	2.3	11.8
Green Extension Time (g e), s		0.0		2.3	0.0	2.2	0.0	3.4
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		0.13	1.00	0.64	0.25	0.16

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h		663			339		258	728	348	11	268	236
Adjusted Saturation Flow Rate (s), veh/h/ln		1527			1021		1781	1781	1518	1781	1870	1591
Queue Service Time (g s), s		12.4			0.0		6.0	14.4	16.6	0.3	9.4	9.8
Cycle Queue Clearance Time (g c), s		34.5			22.1		6.0	14.4	16.6	0.3	9.4	9.8
Green Ratio (g/C)		0.44			0.44		0.38	0.30	0.30	0.38	0.30	0.30
Capacity (c), veh/h		734			525		360	1068	455	293	561	477
Volume-to-Capacity Ratio (X)		0.904			0.646		0.715	0.682	0.764	0.037	0.478	0.495
Back of Queue (Q), ft/ln (95 th percentile)		504.9			222		95.5	251.5	270.4	5.4	179.4	157.1
Back of Queue (Q), veh/ln (95 th percentile)		19.9			8.7		3.8	9.9	10.6	0.2	7.1	6.3
Queue Storage Ratio (RQ) (95 th percentile)		0.00			0.00		0.48	0.00	0.00	0.03	0.00	0.00
Uniform Delay (d 1), s/veh		22.2			18.6		22.8	24.6	25.4	17.4	22.9	23.0
Incremental Delay (d 2), s/veh		14.2			2.2		5.7	1.5	6.8	0.0	0.2	0.3
Initial Queue Delay (d 3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh		36.4			20.8		28.5	26.1	32.2	17.4	23.1	23.3
Level of Service (LOS)		D			C		C	C	C	B	C	C
Approach Delay, s/veh / LOS	36.4	D		20.8	C		28.2	C		23.1	C	
Intersection Delay, s/veh / LOS	28.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.43	B	2.29	B	1.69	B	1.71	B
Bicycle LOS Score / LOS	1.58	B	1.05	A	1.59	B	0.91	A

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HCS7 Two-Way Stop-Control Report

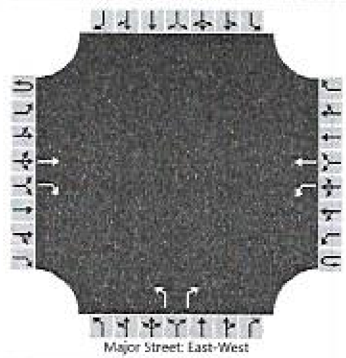
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2019
Time Analyzed	AM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	7th/Dream Catcher
Jurisdiction	Washoe County
East/West Street	7th Avenue
North/South Street	Dream Catcher Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			310	14		15	277			8		9				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						16				9		10				
Capacity, c (veh/h)						1201				517		703				
v/c Ratio						0.01				0.02		0.01				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.0				
Control Delay (s/veh)						8.0				12.1		10.2				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					0.4				11.1							
Approach LOS									B							

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HCS7 Two-Way Stop-Control Report

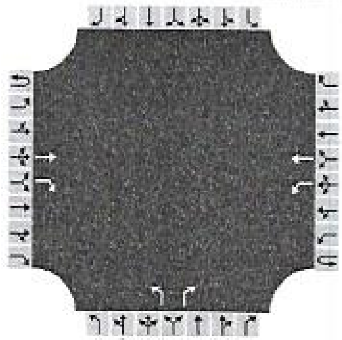
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2019
Time Analyzed	PM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	7th/Dream Catcher
Jurisdiction	Washoe County
East/West Street	7th Avenue
North/South Street	Dream Catcher Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			368	5		5	311			5		14				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						5				5		15				
Capacity, c (veh/h)						1148				487		648				
v/c Ratio						0.00				0.01		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.0		0.1				
Control Delay (s/veh)						8.2				12.5		10.7				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					0.1				11.2							
Approach LOS									B							

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HCS7 Two-Way Stop-Control Report

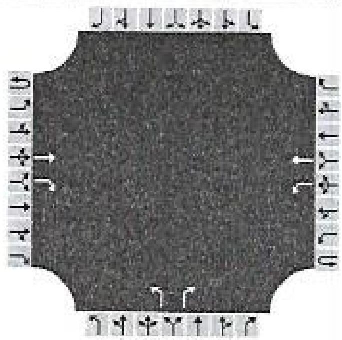
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2019
Time Analyzed	AM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	7th/Dream Catcher
Jurisdiction	Washoe County
East/West Street	7th Avenue
North/South Street	Dream Catcher Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			310	43		50	277			94		114				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

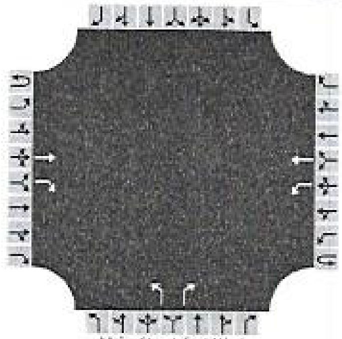
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						54				102		124				
Capacity, c (veh/h)						1169				472		703				
v/c Ratio						0.05				0.22		0.18				
95% Queue Length, Q_{95} (veh)						0.1				0.8		0.6				
Control Delay (s/veh)						8.2				14.7		11.2				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					1.3				12.8							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	7th/Dream Catcher
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	7th Avenue
Analysis Year	2019	North/South Street	Dream Catcher Drive
Time Analyzed	PM Existing + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			368	102		123	311			62		84				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Approach	Eastbound				Westbound				Northbound				Southbound			
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

Approach	Eastbound				Westbound				Northbound				Southbound			
Flow Rate, v (veh/h)						134				67		91				
Capacity, c (veh/h)						1049				355		648				
v/c Ratio						0.13				0.19		0.14				
95% Queue Length, Q_{95} (veh)						0.4				0.7		0.5				
Control Delay (s/veh)						8.9				17.5		11.5				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					2.5				14.0							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

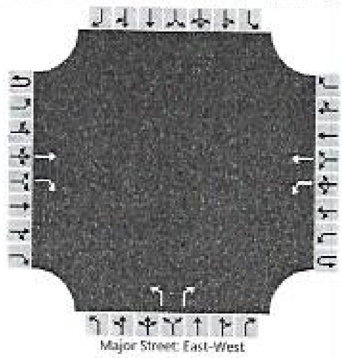
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2030
Time Analyzed	AM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	7th/Dream Catcher
Jurisdiction	Washoe County
East/West Street	7th Avenue
North/South Street	Dream Catcher Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			330	14		15	290			8		9				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

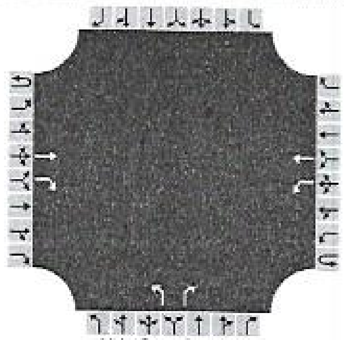
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						16				9		10				
Capacity, c (veh/h)						1179				501		683				
v/c Ratio						0.01				0.02		0.01				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.0				
Control Delay (s/veh)						8.1				12.3		10.3				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					0.4				11.3							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	7th/Dream Catcher
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	7th Avenue
Analysis Year	2030	North/South Street	Dream Catcher Drive
Time Analyzed	PM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			390	5		5	330			5		14				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

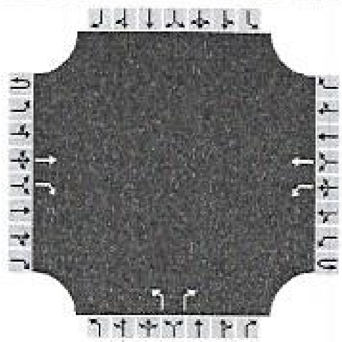
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						5				5		15				
Capacity, c (veh/h)						1125				470		628				
v/c Ratio						0.00				0.01		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.0		0.1				
Control Delay (s/veh)						8.2				12.8		10.9				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					0.1				11.4							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	7th/Dream Catcher
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	7th Avenue
Analysis Year	2030	North/South Street	Dream Catcher Drive
Time Analyzed	AM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			330	43		50	290			94		114				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)						54				102		124				
Capacity, c (veh/h)						1148				459		683				
v/c Ratio						0.05				0.22		0.18				
95% Queue Length, Q_{95} (veh)						0.1				0.8		0.7				
Control Delay (s/veh)						8.3				15.1		11.4				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					1.2				13.1							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

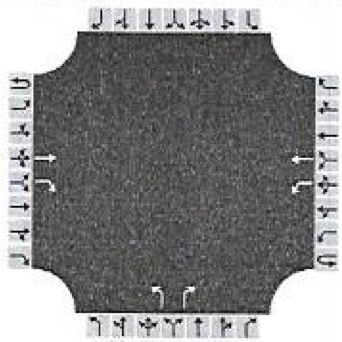
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2030
Time Analyzed	PM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	7th/Dream Catcher
Jurisdiction	Washoe County
East/West Street	7th Avenue
North/South Street	Dream Catcher Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			390	102		123	330			62		84				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

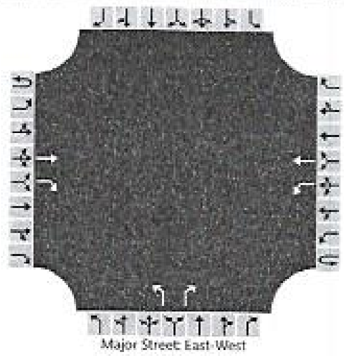
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						134				67		91				
Capacity, c (veh/h)						1028				342		628				
v/c Ratio						0.13				0.20		0.15				
95% Queue Length, Q_{95} (veh)						0.4				0.7		0.5				
Control Delay (s/veh)						9.0				18.1		11.7				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					2.5				14.4							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	7th/Dream Catcher
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	7th Avenue
Analysis Year	2040	North/South Street	Dream Catcher Drive
Time Analyzed	AM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			350	14		15	310			8		9				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						16				9		10				
Capacity, c (veh/h)						1157				484		664				
v/c Ratio						0.01				0.02		0.01				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.0				
Control Delay (s/veh)						8.2				12.6		10.5				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					0.4				11.5							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

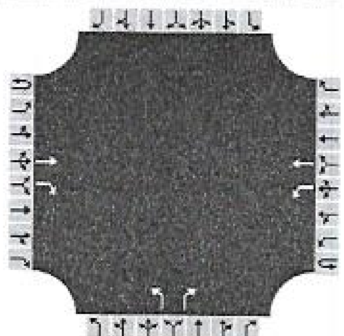
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2040
Time Analyzed	PM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	7th/Dream Catcher
Jurisdiction	Washoe County
East/West Street	7th Avenue
North/South Street	Dream Catcher Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			410	5		5	350			5		14				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

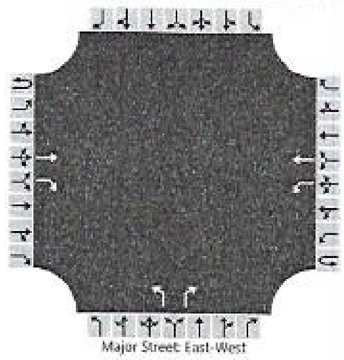
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						5				5		15				
Capacity, c (veh/h)						1104				453		610				
v/c Ratio						0.00				0.01		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.0		0.1				
Control Delay (s/veh)						8.3				13.0		11.0				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					0.1				11.6							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	7th/Dream Catcher
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	7th Avenue
Analysis Year	2040	North/South Street	Dream Catcher Drive
Time Analyzed	AM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			350	43		50	310			94		114				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Approach	Eastbound				Westbound				Northbound				Southbound			
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

Delay, Queue Length, and Level of Service

Approach	Eastbound				Westbound				Northbound				Southbound			
Flow Rate, v (veh/h)						54				102		124				
Capacity, c (veh/h)						1127				443		664				
v/c Ratio						0.05				0.23		0.19				
95% Queue Length, Q_{95} (veh)						0.2				0.9		0.7				
Control Delay (s/veh)						8.4				15.6		11.7				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					1.2				13.4							
Approach LOS									B							

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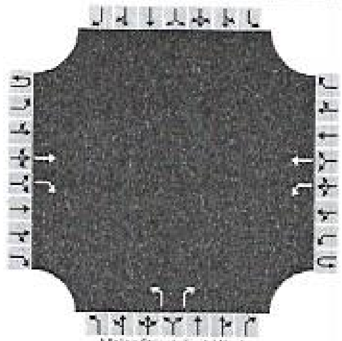
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	7th/Dream Catcher
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	7th Avenue
Analysis Year	2040	North/South Street	Dream Catcher Drive
Time Analyzed	PM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			410	102		123	350			62		84				
Percent Heavy Vehicles (%)						3				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No								No							
Median Type | Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.13				6.43		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.23				3.53		3.33				

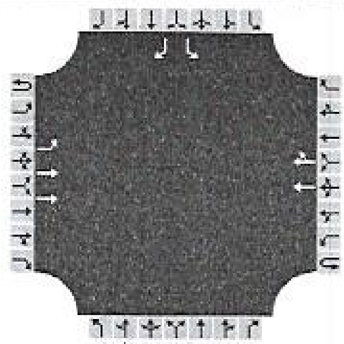
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						134				67		91				
Capacity, c (veh/h)						1009				330		610				
v/c Ratio						0.13				0.20		0.15				
95% Queue Length, Q_{95} (veh)						0.5				0.8		0.5				
Control Delay (s/veh)						9.1				18.7		11.9				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					2.4				14.8							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/Estates
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2019	North/South Street	Estates Road
Time Analyzed	AM Existing	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	32	777				613	16						20		83
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

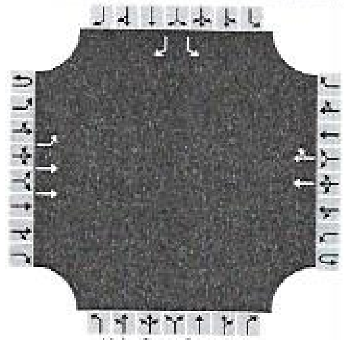
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		35												22		90
Capacity, c (veh/h)		899												178		651
v/c Ratio		0.04												0.12		0.14
95% Queue Length, Q_{95} (veh)		0.1												0.4		0.5
Control Delay (s/veh)		9.2												28.0		11.4
Level of Service (LOS)		A												D		B
Approach Delay (s/veh)	0.4												14.6			
Approach LOS													B			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/Estates
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2019	North/South Street	Estates Road
Time Analyzed	PM Existing	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	96	505				604	24						16		52
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

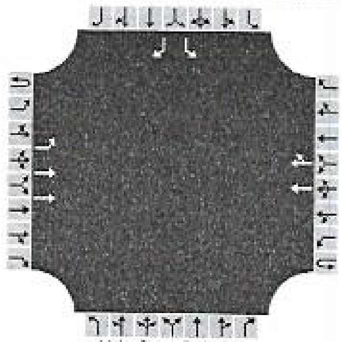
Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		104												17		57
Capacity, c (veh/h)		900												167		652
v/c Ratio		0.12												0.10		0.09
95% Queue Length, Q_{95} (veh)		0.4												0.3		0.3
Control Delay (s/veh)		9.5												29.0		11.0
Level of Service (LOS)		A												D		B
Approach Delay (s/veh)	1.5												15.3			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/Estates
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2019	North/South Street	Estates Road
Time Analyzed	AM Existing + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	32	806				699	16						20		83
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

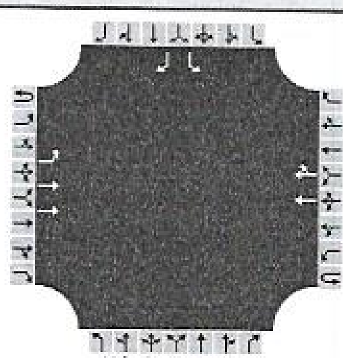
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		35												22		90
Capacity, c (veh/h)		829												151		607
v/c Ratio		0.04												0.14		0.15
95% Queue Length, Q_{95} (veh)		0.1												0.5		0.5
Control Delay (s/veh)		9.5												32.9		12.0
Level of Service (LOS)		A												D		B
Approach Delay (s/veh)	0.4												16.0			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/Estates
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2019	North/South Street	Estates Road
Time Analyzed	PM Existing + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	96	602				661	24						16		52
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		104												17		57
Capacity, c (veh/h)		852												140		622
v/c Ratio		0.12												0.12		0.09
95% Queue Length, Q_{95} (veh)		0.4												0.4		0.3
Control Delay (s/veh)		9.8												34.4		11.4
Level of Service (LOS)		A												D		B
Approach Delay (s/veh)	1.3												16.8			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

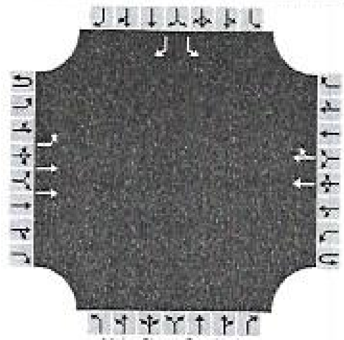
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2030
Time Analyzed	AM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/Estates
Jurisdiction	Washoe County
East/West Street	Golden Valley Road
North/South Street	Estates Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	40	840				620	20						25		100
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		43												27		109
Capacity, c (veh/h)		889												161		645
v/c Ratio		0.05												0.17		0.17
95% Queue Length, Q_{95} (veh)		0.2												0.6		0.6
Control Delay (s/veh)		9.3												31.9		11.7
Level of Service (LOS)		A												D		B
Approach Delay (s/veh)	0.4												15.7			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

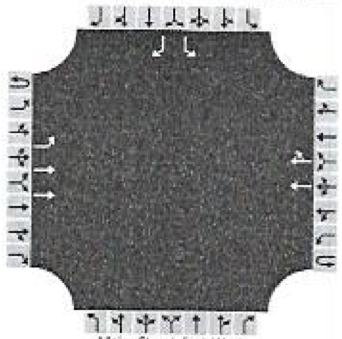
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2030
Time Analyzed	PM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/Estates
Jurisdiction	Washoe County
East/West Street	Golden Valley Road
North/South Street	Estates Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	120	520				610	30						20		65
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		130												22		71
Capacity, c (veh/h)		889												145		645
v/c Ratio		0.15												0.15		0.11
95% Queue Length, Q_{95} (veh)		0.5												0.5		0.4
Control Delay (s/veh)		9.7												34.1		11.3
Level of Service (LOS)		A												D		B
Approach Delay (s/veh)	1.8												16.6			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

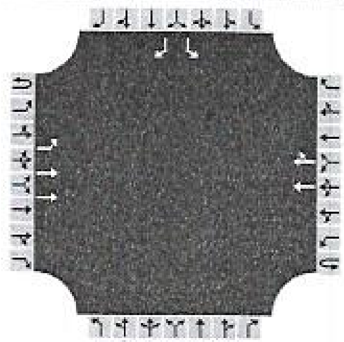
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2030
Time Analyzed	AM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/Estates
Jurisdiction	Washoe County
East/West Street	Golden Valley Road
North/South Street	Estates Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	40	869				706	20						25		100
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

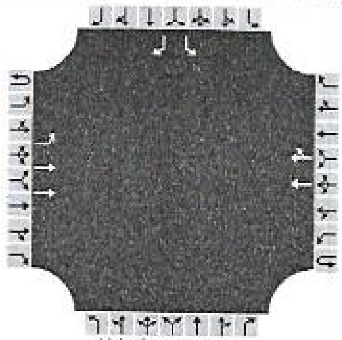
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		43												27		109
Capacity, c (veh/h)		820												136		602
v/c Ratio		0.05												0.20		0.18
95% Queue Length, Q_{95} (veh)		0.2												0.7		0.7
Control Delay (s/veh)		9.6												38.1		12.3
Level of Service (LOS)		A												E		B
Approach Delay (s/veh)	0.4												17.5			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/Estates
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2030	North/South Street	Estates Road
Time Analyzed	PM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	120	617				667	30						20		65
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		130												22		71
Capacity, c (veh/h)		843												121		616
v/c Ratio		0.15												0.18		0.11
95% Queue Length, Q_{95} (veh)		0.5												0.6		0.4
Control Delay (s/veh)		10.1												41.2		11.6
Level of Service (LOS)		B												E		B
Approach Delay (s/veh)	1.6												18.6			
Approach LOS													C			

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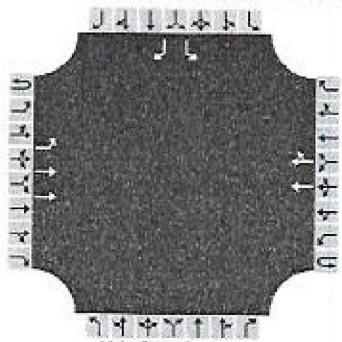
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/Estates
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	Estates Road
Time Analyzed	AM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	50	925				755	25						30		130
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

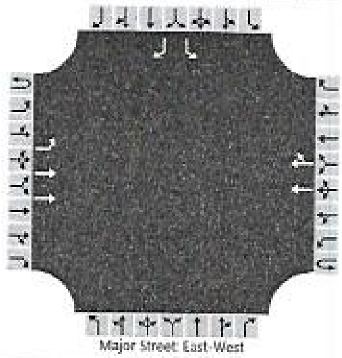
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		54												33		141
Capacity, c (veh/h)		779												113		576
v/c Ratio		0.07												0.29		0.25
95% Queue Length, Q_{95} (veh)		0.2												1.1		1.0
Control Delay (s/veh)		10.0												49.3		13.3
Level of Service (LOS)		A												E		B
Approach Delay (s/veh)	0.5												20.0			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

General Information		**Site Information**	
Analyst	MSH	Intersection	Golden Valley/Estates
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	Estates Road
Time Analyzed	PM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	150	530				670	40						25		80
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		163												27		87
Capacity, c (veh/h)		832												111		610
v/c Ratio		0.20												0.25		0.14
95% Queue Length, Q_{95} (veh)		0.7												0.9		0.5
Control Delay (s/veh)		10.4												47.9		11.9
Level of Service (LOS)		B												E		B
Approach Delay (s/veh)	2.3												20.5			
Approach LOS													C			

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HCS7 Two-Way Stop-Control Report

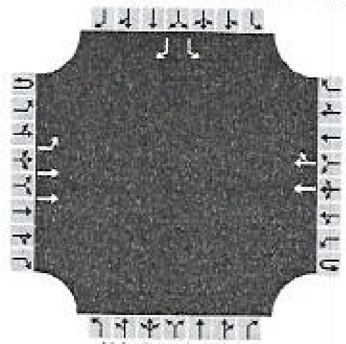
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2040
Time Analyzed	AM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/Estates
Jurisdiction	Washoe County
East/West Street	Golden Valley Road
North/South Street	Estates Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	50	954				841	25						30		130
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		54												33		141
Capacity, c (veh/h)		718												95		537
v/c Ratio		0.08												0.34		0.26
95% Queue Length, Q_{95} (veh)		0.2												1.3		1.0
Control Delay (s/veh)		10.4												61.6		14.1
Level of Service (LOS)		B												F		B
Approach Delay (s/veh)	0.5												23.0			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

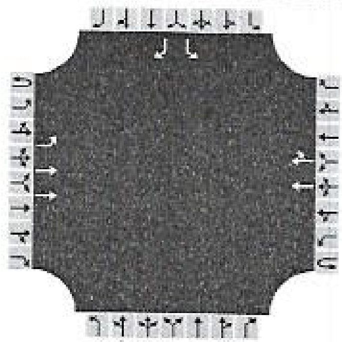
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2040
Time Analyzed	PM Base + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/Estates
Jurisdiction	Washoe County
East/West Street	Golden Valley Road
North/South Street	Estates Road
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	0	2	0		0	0	0		1	0	1
Configuration		L	T				T	TR						L		R
Volume (veh/h)	0	150	627				727	40						25		80
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		163												27		87
Capacity, c (veh/h)		789												92		582
v/c Ratio		0.21												0.30		0.15
95% Queue Length, Q_{95} (veh)		0.8												1.1		0.5
Control Delay (s/veh)		10.7												60.1		12.3
Level of Service (LOS)		B												F		B
Approach Delay (s/veh)	2.1												23.7			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report

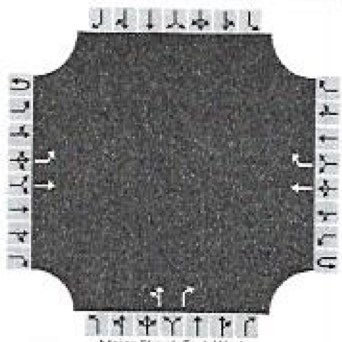
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2019
Time Analyzed	AM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/US-395 NB
Jurisdiction	NDOT
East/West Street	Golden Valley Road
North/South Street	US-395 NB Ramps
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		28	450				616	0		118	2	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		30								130		0				
Capacity, c (veh/h)		916								153		577				
v/c Ratio		0.03								0.85		0.00				
95% Queue Length, Q_{95} (veh)		0.1								5.7		0.0				
Control Delay (s/veh)		9.1								96.6		11.2				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.5								96.6							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

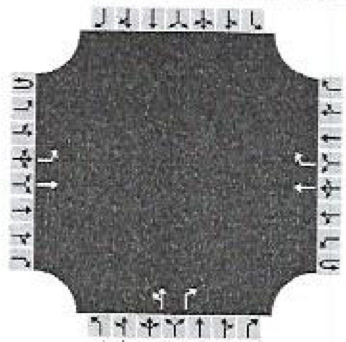
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2019
Time Analyzed	PM Existing
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/US-395 NB
Jurisdiction	NDOT
East/West Street	Golden Valley Road
North/South Street	US-395 NB Ramps
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		31	466				581	0		148	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		34								166		0				
Capacity, c (veh/h)		946								156		564				
v/c Ratio		0.04								1.07		0.00				
95% Queue Length, Q_{95} (veh)		0.1								8.6		0.0				
Control Delay (s/veh)		8.9								149.1		11.4				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.6								149.1							
Approach LOS									F							

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HCS7 Two-Way Stop-Control Report

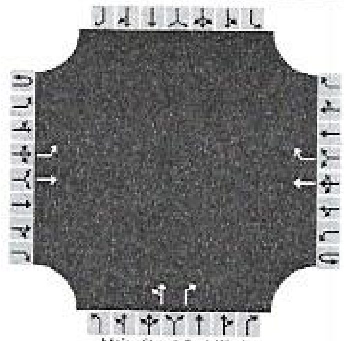
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2019
Time Analyzed	AM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/US-395 NB
Jurisdiction	NDOT
East/West Street	Golden Valley Road
North/South Street	US-395 NB Ramps
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		28	460				683	0		118	2	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

Delay, Queue Length, and Level of Service

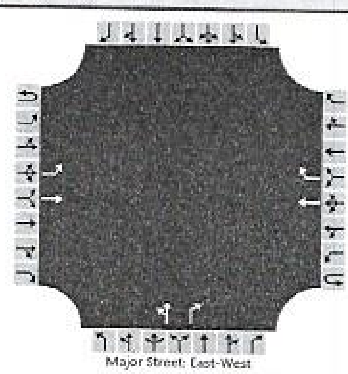
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		30								130		0				
Capacity, c (veh/h)		860								133		569				
v/c Ratio		0.04								0.98		0.00				
95% Queue Length, Q_{95} (veh)		0.1								6.8		0.0				
Control Delay (s/veh)		9.3								136.1		11.3				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.5								136.1							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

General Information	
Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2019
Time Analyzed	PM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information	
Intersection	Golden Valley/US-395 NB
Jurisdiction	NDOT
East/West Street	Golden Valley Road
North/South Street	US-395 NB Ramps
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		31	498				625	0		148	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		34								166		0				
Capacity, c (veh/h)		908								137		539				
v/c Ratio		0.04								1.22		0.00				
95% Queue Length, Q_{95} (veh)		0.1								10.0		0.0				
Control Delay (s/veh)		9.1								209.4		11.7				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.5								209.4							
Approach LOS									F							

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HCS7 Two-Way Stop-Control Report

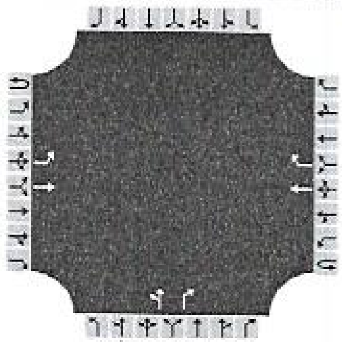
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2030
Time Analyzed	AM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/US-395 NB
Jurisdiction	NDOT
East/West Street	Golden Valley Road
North/South Street	US-395 NB Ramps
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		30	520				720	0		190	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

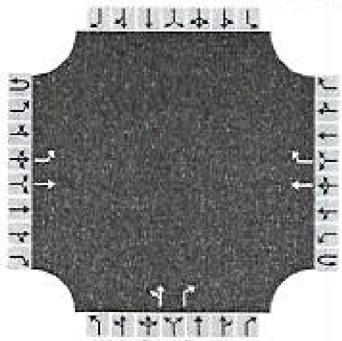
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		33								212		0				
Capacity, c (veh/h)		831								112		522				
v/c Ratio		0.04								1.90		0.00				
95% Queue Length, Q_{95} (veh)		0.1								17.2		0.0				
Control Delay (s/veh)		9.5								499.7		11.9				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.5								499.7							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 NB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2030	North/South Street	US-395 NB Ramps
Time Analyzed	PM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		40	605				625	0		250	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

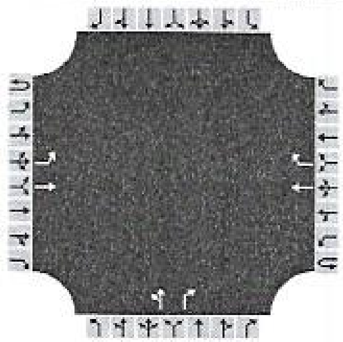
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		43								277		0				
Capacity, c (veh/h)		908								109		463				
v/c Ratio		0.05								2.54		0.00				
95% Queue Length, Q_{95} (veh)		0.2								25.2		0.0				
Control Delay (s/veh)		9.2								782.8		12.8				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.6								782.8							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 NB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2030	North/South Street	US-395 NB Ramps
Time Analyzed	AM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		30	530				787	0		190	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

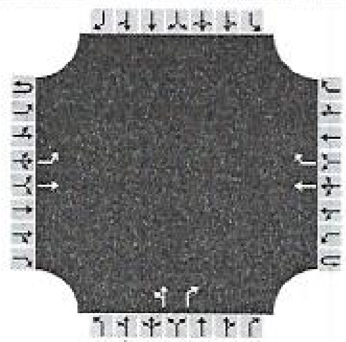
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		33								212		0				
Capacity, c (veh/h)		780								98		515				
v/c Ratio		0.04								2.17		0.00				
95% Queue Length, Q_{95} (veh)		0.1								18.6		0.0				
Control Delay (s/veh)		9.8								630.4		12.0				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.5								630.4							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 NB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2030	North/South Street	US-395 NB Ramps
Time Analyzed	PM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		40	637				669	0		250	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		43								277		0				
Capacity, c (veh/h)		872								95		442				
v/c Ratio		0.05								2.91		0.00				
95% Queue Length, Q_{95} (veh)		0.2								26.6		0.0				
Control Delay (s/veh)		9.3								954.7		13.1				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.6								954.7							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

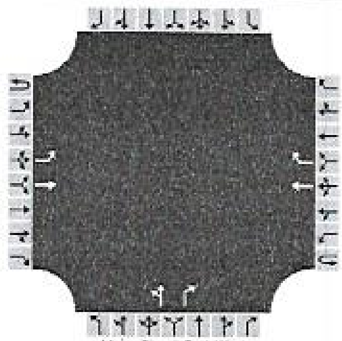
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2040
Time Analyzed	AM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/US-395 NB
Jurisdiction	NDOT
East/West Street	Golden Valley Road
North/South Street	US-395 NB Ramps
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		40	600				910	0		290	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

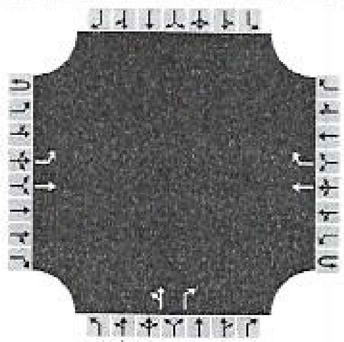
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		43								321		0				
Capacity, c (veh/h)		695								66		466				
v/c Ratio		0.06								4.86		0.00				
95% Queue Length, Q_{95} (veh)		0.2								35.2		0.0				
Control Delay (s/veh)		10.5								1862.0		12.7				
Level of Service (LOS)		B								F		B				
Approach Delay (s/veh)	0.7								1862.0							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 NB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	US-395 NB Ramps
Time Analyzed	PM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		50	700				775	0		350	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

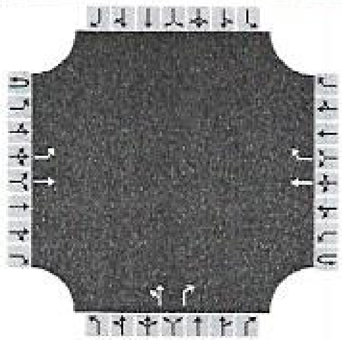
Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		54								386		0				
Capacity, c (veh/h)		789								67		404				
v/c Ratio		0.07								5.73		0.00				
95% Queue Length, Q_{95} (veh)		0.2								43.2		0.0				
Control Delay (s/veh)		9.9								2248.3		13.9				
Level of Service (LOS)		A								F		B				
Approach Delay (s/veh)	0.7								2248.3							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 NB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	US-395 NB Ramps
Time Analyzed	AM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		40	610				977	0		290	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

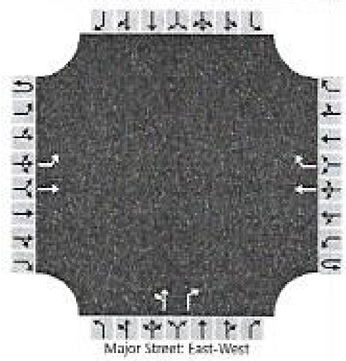
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		43								321		0				
Capacity, c (veh/h)		652								57		459				
v/c Ratio		0.07								5.58		0.00				
95% Queue Length, Q_{95} (veh)		0.2								36.2		0.0				
Control Delay (s/veh)		10.9								2204.2		12.8				
Level of Service (LOS)		B								F		B				
Approach Delay (s/veh)	0.7								2204.2							
Approach LOS									F							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 NB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	US-395 NB Ramps
Time Analyzed	PM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	1	1		0	0	0
Configuration		L	T				T	R		LT		R				
Volume (veh/h)		50	732				819	0		350	5	0				
Percent Heavy Vehicles (%)		3								3	3	3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized					Yes				Yes							
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		4.1								7.1	6.5	6.2				
Critical Headway (sec)		4.13								7.13	6.53	6.23				
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3				
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33				

Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)		54								386		0				
Capacity, c (veh/h)		757								59		386				
v/c Ratio		0.07								6.56		0.00				
95% Queue Length, Q_{95} (veh)		0.2								44.2		0.0				
Control Delay (s/veh)		10.1								2640.1		14.3				
Level of Service (LOS)		B								F		B				
Approach Delay (s/veh)	0.6								2640.1							
Approach LOS									F							

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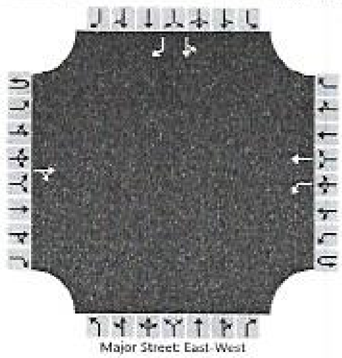
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2019	North/South Street	US-395 SB Ramps
Time Analyzed	AM Existing	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		521	213							294	5	31
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

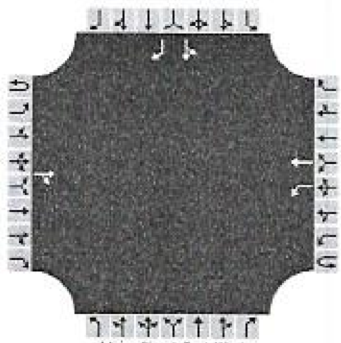
Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)						566								325		34
Capacity, c (veh/h)						1617								90		805
v/c Ratio						0.35								3.59		0.04
95% Queue Length, Q_{95} (veh)						1.6								33.0		0.1
Control Delay (s/veh)						8.4								1264.7		9.7
Level of Service (LOS)						A								F		A
Approach Delay (s/veh)					6.0								1146.8			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2019	North/South Street	US-395 SB Ramps
Time Analyzed	PM Existing	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		356	373							253	4	49
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

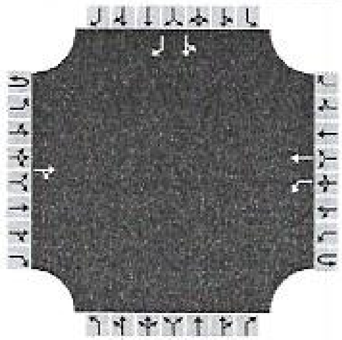
Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)						387								279		53
Capacity, c (veh/h)						1617								136		643
v/c Ratio						0.24								2.06		0.08
95% Queue Length, Q_{95} (veh)						0.9								22.6		0.3
Control Delay (s/veh)						7.9								553.3		11.1
Level of Service (LOS)						A								F		B
Approach Delay (s/veh)					3.9								466.5			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2019	North/South Street	US-395 SB Ramps
Time Analyzed	AM Existing + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		578	223							301	5	31
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						628								333		34
Capacity, c (veh/h)						1617								70		794
v/c Ratio						0.39								4.76		0.04
95% Queue Length, Q_{95} (veh)						1.9								36.3		0.1
Control Delay (s/veh)						8.6								1813.3		9.7
Level of Service (LOS)						A								F		A
Approach Delay (s/veh)					6.2								1647.4			
Approach LOS													F			

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HCS7 Two-Way Stop-Control Report

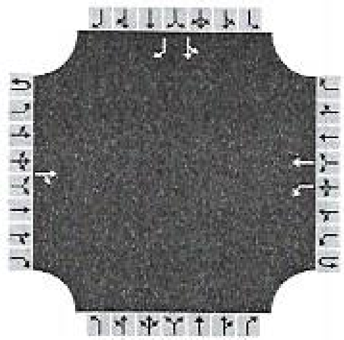
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2019
Time Analyzed	PM Existing + Project
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/US-395 SB
Jurisdiction	NDOT
East/West Street	Golden Valley Road
North/South Street	US-395 SB Ramps
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		394	379							274	4	49
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						428								302		53
Capacity, c (veh/h)						1617								115		638
v/c Ratio						0.26								2.63		0.08
95% Queue Length, Q_{95} (veh)						1.1								27.5		0.3
Control Delay (s/veh)						8.0								815.1		11.2
Level of Service (LOS)						A								F		B
Approach Delay (s/veh)					4.1								694.6			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

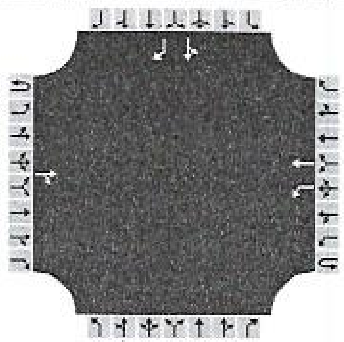
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	10/31/2019
Analysis Year	2030
Time Analyzed	AM Base
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Golden Valley/US-395 SB
Jurisdiction	NDOT
East/West Street	Golden Valley Road
North/South Street	US-395 SB Ramps
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		630	280							295	5	35
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						685								326		38
Capacity, c (veh/h)						1617								51		733
v/c Ratio						0.42								6.45		0.05
95% Queue Length, Q_{95} (veh)						2.2								37.7		0.2
Control Delay (s/veh)						8.9								2611.6		10.2
Level of Service (LOS)						A								F		B
Approach Delay (s/veh)					6.1								2339.8			
Approach LOS													F			

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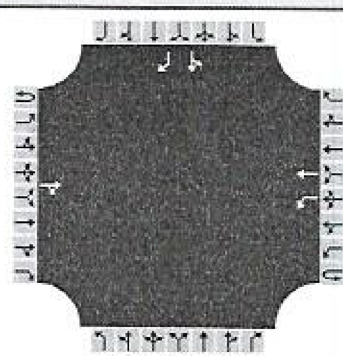
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2030	North/South Street	US-395 SB Ramps
Time Analyzed	PM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		430	445							255	5	50
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

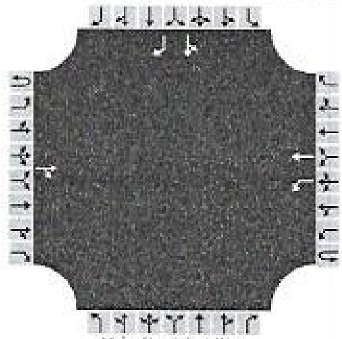
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						467								283		54
Capacity, c (veh/h)						1617								89		581
v/c Ratio						0.29								3.19		0.09
95% Queue Length, Q_{95} (veh)						1.2								28.0		0.3
Control Delay (s/veh)						8.1								1088.6		11.8
Level of Service (LOS)						A								F		B
Approach Delay (s/veh)					4.0								915.0			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2030	North/South Street	US-395 SB Ramps
Time Analyzed	AM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		687	290							302	5	35
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						747								334		38
Capacity, c (veh/h)						1617								39		723
v/c Ratio						0.46								8.62		0.05
95% Queue Length, Q_{95} (veh)						2.5								40.0		0.2
Control Delay (s/veh)						9.1								3629.6		10.3
Level of Service (LOS)						A								F		B
Approach Delay (s/veh)					6.4								3259.2			
Approach LOS													F			

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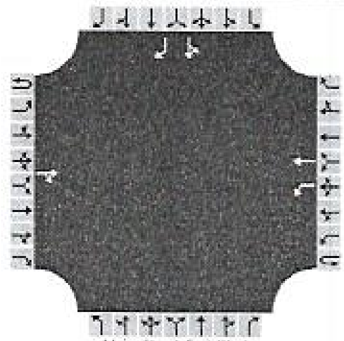
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2030	North/South Street	US-395 SB Ramps
Time Analyzed	PM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		468	451							276	5	50
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

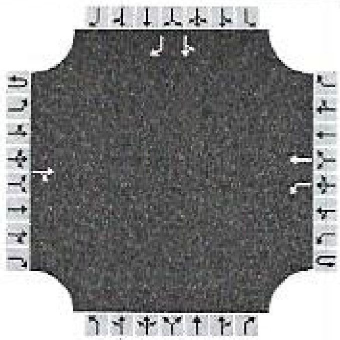
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						509								305		54
Capacity, c (veh/h)						1617								75		576
v/c Ratio						0.31								4.09		0.09
95% Queue Length, Q_{95} (veh)						1.4								32.4		0.3
Control Delay (s/veh)						8.2								1503.7		11.9
Level of Service (LOS)						A								F		B
Approach Delay (s/veh)					4.2								1278.4			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	US-395 SB Ramps
Time Analyzed	AM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		830	370							300	5	50
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

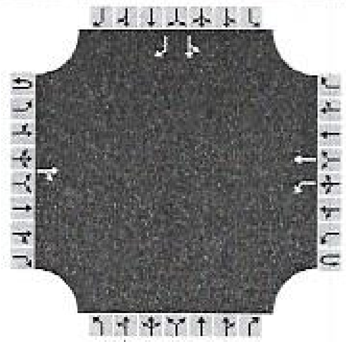
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						902								332		54
Capacity, c (veh/h)						1617								18		646
v/c Ratio						0.56								18.82		0.08
95% Queue Length, Q_{95} (veh)						3.6								42.2		0.3
Control Delay (s/veh)						10.0								8436.8		11.1
Level of Service (LOS)						B								F		B
Approach Delay (s/veh)					6.9								7250.0			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	US-395 SB Ramps
Time Analyzed	PM Base	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		530	595							260	5	60
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

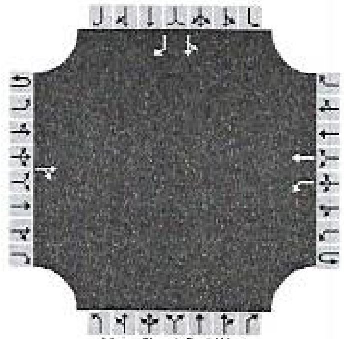
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						576								288		65
Capacity, c (veh/h)						1617								45		469
v/c Ratio						0.36								6.45		0.14
95% Queue Length, Q_{95} (veh)						1.6								33.6		0.5
Control Delay (s/veh)						8.5								2631.5		13.9
Level of Service (LOS)						A								F		B
Approach Delay (s/veh)					4.0								2148.2			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	US-395 SB Ramps
Time Analyzed	AM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		887	380							307	5	50
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

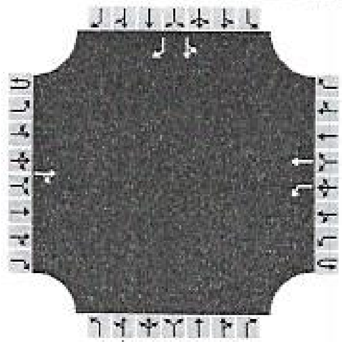
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)						964								339		54
Capacity, c (veh/h)						1617								13		637
v/c Ratio						0.60								25.58		0.09
95% Queue Length, Q_{95} (veh)						4.2								43.6		0.3
Control Delay (s/veh)						10.5								11611.9		11.2
Level of Service (LOS)						B								F		B
Approach Delay (s/veh)					7.3								10009.6			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Golden Valley/US-395 SB
Agency/Co.	Solaegui Engineers	Jurisdiction	NDOT
Date Performed	10/31/2019	East/West Street	Golden Valley Road
Analysis Year	2040	North/South Street	US-395 SB Ramps
Time Analyzed	PM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	0	0		0	1	1
Configuration				TR		L	T							LT		R
Volume (veh/h)			0	0		568	601							281	5	60
Percent Heavy Vehicles (%)						3								3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized													Yes			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.13								7.13	6.53	6.23
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.23								3.53	4.03	3.33

Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)						617								311		65
Capacity, c (veh/h)						1617								38		465
v/c Ratio						0.38								8.29		0.14
95% Queue Length, Q_{95} (veh)						1.8								37.3		0.5
Control Delay (s/veh)						8.6								3486.7		14.0
Level of Service (LOS)						A								F		B
Approach Delay (s/veh)					4.2								2884.5			
Approach LOS													F			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	184	175	521	213	0	0	0	0	294	5	31
Future Volume (veh/h)	0	184	175	521	213	0	0	0	0	294	5	31
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	200	0	566	232	0				320	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	349		816	1299	0				361	6	
Arrive On Green	0.00	0.19	0.00	0.77	1.00	0.00				0.21	0.21	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1755	27	1585
Grp Volume(v), veh/h	0	200	0	566	232	0				325	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	9.7	0.0	15.9	0.0	0.0				17.7	0.0	0.0
Cycle Q Clear(g_c), s	0.0	9.7	0.0	15.9	0.0	0.0				17.7	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	349		816	1299	0				366	0	
V/C Ratio(X)	0.00	0.57		0.69	0.18	0.00				0.89	0.00	
Avail Cap(c_a), veh/h	0	468		816	1299	0				446	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.85	0.85	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	37.1	0.0	8.2	0.0	0.0				38.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.5	0.0	2.2	0.3	0.0				16.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.5	0.0	3.9	0.1	0.0				9.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	38.6	0.0	10.4	0.3	0.0				55.3	0.0	0.0
LnGrp LOS	A	D		B	A	A				E	A	
Approach Vol, veh/h		200	A		798						325	A
Approach Delay, s/veh		38.6			7.5						55.3	
Approach LOS		D			A						E	
Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			50.8	23.6		25.6		74.4				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			35.0	25.0		25.0		65.0				
Max Q Clear Time (g_c+I1), s			17.9	11.7		19.7		2.0				
Green Ext Time (p_c), s			1.8	0.8		0.8		1.4				
Intersection Summary												
HCM 6th Ctrl Delay			23.9									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	450	0	0	616	181	118	2	339	0	0	0
Future Volume (veh/h)	28	450	0	0	616	181	118	2	339	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	30	489	0	0	670	0	128	2	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	311	1505	0	0	1085		168	3				
Arrive On Green	0.17	0.80	0.00	0.00	0.58	0.00	0.10	0.10	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1755	27	1585			
Grp Volume(v), veh/h	30	489	0	0	670	0	130	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1783	0	1585			
Q Serve(g_s), s	1.4	6.9	0.0	0.0	23.4	0.0	7.1	0.0	0.0			
Cycle Q Clear(g_c), s	1.4	6.9	0.0	0.0	23.4	0.0	7.1	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	311	1505	0	0	1085		170	0				
V/C Ratio(X)	0.10	0.32	0.00	0.00	0.62		0.76	0.00				
Avail Cap(c_a), veh/h	311	1505	0	0	1085		374	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.29	0.29	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	34.7	2.6	0.0	0.0	13.7	0.0	44.1	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	2.6	0.0	6.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.6	1.6	0.0	0.0	9.7	0.0	3.4	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.7	2.8	0.0	0.0	16.4	0.0	51.0	0.0	0.0			
LnGrp LOS	C	A	A	A	B		D	A				
Approach Vol, veh/h		519			670	A		130	A			
Approach Delay, s/veh		4.6			16.4			51.0				
Approach LOS		A			B			D				
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		14.6		85.4			22.4	63.0				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		21.0		69.0			6.0	58.0				
Max Q Clear Time (g_c+I1), s		9.1		8.9			3.4	25.4				
Green Ext Time (p_c), s		0.4		3.4			0.0	5.0				
Intersection Summary												
HCM 6th Ctrl Delay			15.2									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	244	175	356	373	0	0	0	0	253	4	49
Future Volume (veh/h)	0	244	175	356	373	0	0	0	0	253	4	49
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	265	0	387	405	0				275	4	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	909		844	1345	0				318	5	
Arrive On Green	0.00	0.49	0.00	0.06	0.24	0.00				0.18	0.18	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1757	26	1585
Grp Volume(v), veh/h	0	265	0	387	405	0				279	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	8.5	0.0	8.4	17.8	0.0				15.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	8.5	0.0	8.4	17.8	0.0				15.2	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	909		844	1345	0				323	0	
V/C Ratio(X)	0.00	0.29		0.46	0.30	0.00				0.86	0.00	
Avail Cap(c_a), veh/h	0	909		963	1345	0				446	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.49	0.49	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	15.4	0.0	8.1	17.5	0.0				39.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.2	0.3	0.0				12.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.5	0.0	3.3	8.9	0.0				7.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	15.6	0.0	8.3	17.8	0.0				52.0	0.0	0.0
LnGrp LOS	A	B		A	B	A				D	A	
Approach Vol, veh/h		265	A		792						279	A
Approach Delay, s/veh		15.6			13.2						52.0	
Approach LOS		B			B						D	

Timer - Assigned Phs			3	4		6		8
Phs Duration (G+Y+Rc), s			23.3	53.6		23.1		76.9
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0
Max Green Setting (Gmax), s			25.0	35.0		25.0		65.0
Max Q Clear Time (g_c+I1), s			10.4	10.5		17.2		19.8
Green Ext Time (p_c), s			1.0	1.5		0.9		2.7

Intersection Summary			
HCM 6th Ctrl Delay			21.7
HCM 6th LOS			C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	31	466	0	0	581	306	148	5	737	0	0	0
Future Volume (veh/h)	31	466	0	0	581	306	148	5	737	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	34	507	0	0	632	0	161	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	560	1459	0	0	1309		207	6				
Arrive On Green	0.03	0.78	0.00	0.00	0.70	0.00	0.12	0.12	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1730	54	1585			
Grp Volume(v), veh/h	34	507	0	0	632	0	166	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1784	0	1585			
Q Serve(g_s), s	0.5	8.2	0.0	0.0	15.3	0.0	9.0	0.0	0.0			
Cycle Q Clear(g_c), s	0.5	8.2	0.0	0.0	15.3	0.0	9.0	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.97		1.00			
Lane Grp Cap(c), veh/h	560	1459	0	0	1309		214	0				
V/C Ratio(X)	0.06	0.35	0.00	0.00	0.48		0.78	0.00				
Avail Cap(c_a), veh/h	595	1459	0	0	1309		767	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.58	0.58	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	4.7	3.3	0.0	0.0	6.8	0.0	42.7	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	1.3	0.0	6.0	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.1	2.2	0.0	0.0	5.5	0.0	4.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	4.8	3.7	0.0	0.0	8.1	0.0	48.7	0.0	0.0			
LnGrp LOS	A	A	A	A	A		D	A				
Approach Vol, veh/h		541			632	A		166	A			
Approach Delay, s/veh		3.8			8.1			48.7				
Approach LOS		A			A			D				
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		17.0		83.0			8.1	75.0				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		43.0		47.0			5.0	37.0				
Max Q Clear Time (g_c+I1), s		11.0		10.2			2.5	17.3				
Green Ext Time (p_c), s		0.9		3.5			0.0	4.1				
Intersection Summary												
HCM 6th Ctrl Delay			11.4									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	187	175	578	223	0	0	0	0	301	5	31
Future Volume (veh/h)	0	187	175	578	223	0	0	0	0	301	5	31
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	203	0	628	242	0				327	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	345		813	1292	0				367	6	
Arrive On Green	0.00	0.18	0.00	0.76	1.00	0.00				0.21	0.21	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1756	27	1585
Grp Volume(v), veh/h	0	203	0	628	242	0				332	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	9.9	0.0	20.4	0.0	0.0				18.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	9.9	0.0	20.4	0.0	0.0				18.1	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	345		813	1292	0				373	0	
V/C Ratio(X)	0.00	0.59		0.77	0.19	0.00				0.89	0.00	
Avail Cap(c_a), veh/h	0	468		813	1292	0				446	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.80	0.80	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	37.3	0.0	8.9	0.0	0.0				38.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.6	0.0	3.7	0.3	0.0				17.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.6	0.0	4.7	0.1	0.0				9.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	38.9	0.0	12.6	0.3	0.0				55.8	0.0	0.0
LnGrp LOS	A	D		B	A	A				E	A	
Approach Vol, veh/h		203	A		870						332	A
Approach Delay, s/veh		38.9			9.2						55.8	
Approach LOS		D			A						E	

Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			50.6	23.4		25.9		74.1				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			35.0	25.0		25.0		65.0				
Max Q Clear Time (g_c+I1), s			22.4	11.9		20.1		2.0				
Green Ext Time (p_c), s			1.8	0.8		0.8		1.5				

Intersection Summary		
HCM 6th Ctrl Delay		24.5
HCM 6th LOS		C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	28	460	0	0	683	200	118	2	358	0	0	0
Future Volume (veh/h)	28	460	0	0	683	200	118	2	358	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	30	500	0	0	742	0	128	2	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	311	1505	0	0	1085		168	3				
Arrive On Green	0.17	0.80	0.00	0.00	0.58	0.00	0.10	0.10	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1755	27	1585			
Grp Volume(v), veh/h	30	500	0	0	742	0	130	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1783	0	1585			
Q Serve(g_s), s	1.4	7.1	0.0	0.0	27.6	0.0	7.1	0.0	0.0			
Cycle Q Clear(g_c), s	1.4	7.1	0.0	0.0	27.6	0.0	7.1	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	311	1505	0	0	1085		170	0				
V/C Ratio(X)	0.10	0.33	0.00	0.00	0.68		0.76	0.00				
Avail Cap(c_a), veh/h	311	1505	0	0	1085		374	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.28	0.28	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	34.7	2.6	0.0	0.0	14.6	0.0	44.1	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	3.5	0.0	6.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.6	1.7	0.0	0.0	11.6	0.0	3.4	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.7	2.8	0.0	0.0	18.1	0.0	51.0	0.0	0.0			
LnGrp LOS	C	A	A	A	B		D	A				
Approach Vol, veh/h		530			742	A		130	A			
Approach Delay, s/veh		4.6			18.1			51.0				
Approach LOS		A			B			D				

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		14.6		85.4			22.4	63.0				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		21.0		69.0			6.0	58.0				
Max Q Clear Time (g_c+I1), s		9.1		9.1			3.4	29.6				
Green Ext Time (p_c), s		0.4		3.5			0.0	5.7				

Intersection Summary			
HCM 6th Ctrl Delay			16.1
HCM 6th LOS			B

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	255	175	394	379	0	0	0	0	274	4	49
Future Volume (veh/h)	0	255	175	394	379	0	0	0	0	274	4	49
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	277	0	428	412	0				298	4	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	882		819	1321	0				340	5	
Arrive On Green	0.00	0.47	0.00	0.06	0.23	0.00				0.19	0.19	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1759	24	1585
Grp Volume(v), veh/h	0	277	0	428	412	0				302	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1782	0	1585
Q Serve(g_s), s	0.0	9.2	0.0	9.7	18.2	0.0				16.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	9.2	0.0	9.7	18.2	0.0				16.5	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	882		819	1321	0				345	0	
V/C Ratio(X)	0.00	0.31		0.52	0.31	0.00				0.88	0.00	
Avail Cap(c_a), veh/h	0	882		935	1321	0				446	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.33	0.33	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	16.4	0.0	9.2	18.2	0.0				39.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.2	0.2	0.0				14.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.8	0.0	4.0	9.1	0.0				8.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	16.6	0.0	9.3	18.4	0.0				53.6	0.0	0.0
LnGrp LOS	A	B		A	B	A				D	A	
Approach Vol, veh/h		277	A		840						302	A
Approach Delay, s/veh		16.6			13.8						53.6	
Approach LOS		B			B						D	
Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			23.5	52.1		24.4		75.6				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			25.0	35.0		25.0		65.0				
Max Q Clear Time (g_c+I1), s			11.7	11.2		18.5		20.2				
Green Ext Time (p_c), s			1.1	1.5		0.9		2.7				
Intersection Summary												
HCM 6th Ctrl Delay			22.8									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	31	497	0	0	625	319	148	5	802	0	0	0
Future Volume (veh/h)	31	497	0	0	625	319	148	5	802	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	34	540	0	0	679	0	161	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	528	1459	0	0	1309		207	6				
Arrive On Green	0.03	0.78	0.00	0.00	0.70	0.00	0.12	0.12	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1730	54	1585			
Grp Volume(v), veh/h	34	540	0	0	679	0	166	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1784	0	1585			
Q Serve(g_s), s	0.5	8.9	0.0	0.0	17.1	0.0	9.0	0.0	0.0			
Cycle Q Clear(g_c), s	0.5	8.9	0.0	0.0	17.1	0.0	9.0	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.97		1.00			
Lane Grp Cap(c), veh/h	528	1459	0	0	1309		214	0				
V/C Ratio(X)	0.06	0.37	0.00	0.00	0.52		0.78	0.00				
Avail Cap(c_a), veh/h	563	1459	0	0	1309		767	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.55	0.55	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	5.1	3.4	0.0	0.0	7.1	0.0	42.7	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	1.5	0.0	6.0	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.1	2.4	0.0	0.0	6.1	0.0	4.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.1	3.8	0.0	0.0	8.5	0.0	48.7	0.0	0.0			
LnGrp LOS	A	A	A	A	A		D	A				
Approach Vol, veh/h		574			679	A		166	A			
Approach Delay, s/veh		3.9			8.5			48.7				
Approach LOS		A			A			D				
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		17.0		83.0			8.1	75.0				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		43.0		47.0			5.0	37.0				
Max Q Clear Time (g_c+I1), s		11.0		10.9			2.5	19.1				
Green Ext Time (p_c), s		0.9		3.8			0.0	4.3				
Intersection Summary												
HCM 6th Ctrl Delay			11.4									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	255	240	630	280	0	0	0	0	295	5	35
Future Volume (veh/h)	0	255	240	630	280	0	0	0	0	295	5	35
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	277	0	685	304	0				321	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	346		875	1343	0				348	5	
Arrive On Green	0.00	0.19	0.00	0.82	1.00	0.00				0.20	0.20	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1755	27	1585
Grp Volume(v), veh/h	0	277	0	685	304	0				326	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	17.0	0.0	23.1	0.0	0.0				21.5	0.0	0.0
Cycle Q Clear(g_c), s	0.0	17.0	0.0	23.1	0.0	0.0				21.5	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	346		875	1343	0				354	0	
V/C Ratio(X)	0.00	0.80		0.78	0.23	0.00				0.92	0.00	
Avail Cap(c_a), veh/h	0	530		875	1343	0				371	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.76	0.76	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	46.8	0.0	7.5	0.0	0.0				47.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	5.0	0.0	3.6	0.3	0.0				27.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	8.3	0.0	4.7	0.1	0.0				12.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	51.7	0.0	11.1	0.3	0.0				74.5	0.0	0.0
LnGrp LOS	A	D		B	A	A				E	A	
Approach Vol, veh/h		277	A		989						326	A
Approach Delay, s/veh		51.7			7.8						74.5	
Approach LOS		D			A						E	

Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			64.0	27.2		28.8		91.2				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			46.0	34.0		25.0		85.0				
Max Q Clear Time (g_c+I1), s			25.1	19.0		23.5		2.0				
Green Ext Time (p_c), s			2.4	1.3		0.3		1.9				

Intersection Summary			
HCM 6th Ctrl Delay			29.1
HCM 6th LOS			C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	30	520	0	0	720	190	190	5	365	0	0	0
Future Volume (veh/h)	30	520	0	0	720	190	190	5	365	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	33	565	0	0	783	0	207	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	227	1454	0	0	1138		242	6				
Arrive On Green	0.13	0.78	0.00	0.00	0.61	0.00	0.14	0.14	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1741	42	1585			
Grp Volume(v), veh/h	33	565	0	0	783	0	212	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1783	0	1585			
Q Serve(g_s), s	2.0	11.6	0.0	0.0	33.8	0.0	13.9	0.0	0.0			
Cycle Q Clear(g_c), s	2.0	11.6	0.0	0.0	33.8	0.0	13.9	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	227	1454	0	0	1138		248	0				
V/C Ratio(X)	0.15	0.39	0.00	0.00	0.69		0.85	0.00				
Avail Cap(c_a), veh/h	227	1454	0	0	1138		386	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	46.5	4.3	0.0	0.0	15.8	0.0	50.5	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	3.4	0.0	10.7	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.9	3.5	0.0	0.0	14.5	0.0	6.9	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.6	4.3	0.0	0.0	19.2	0.0	61.2	0.0	0.0			
LnGrp LOS	D	A	A	A	B		E	A				
Approach Vol, veh/h		598			783	A		212	A			
Approach Delay, s/veh		6.7			19.2			61.2				
Approach LOS		A			B			E				

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		21.7		98.3			20.3	78.0				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		26.0		84.0			6.0	73.0				
Max Q Clear Time (g_c+I1), s		15.9		13.6			4.0	35.8				
Green Ext Time (p_c), s		0.8		4.1			0.0	6.5				

Intersection Summary			
HCM 6th Ctrl Delay			20.1
HCM 6th LOS			C

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰	↑						↰	↱
Traffic Volume (veh/h)	0	390	240	430	445	0	0	0	0	255	5	50
Future Volume (veh/h)	0	390	240	430	445	0	0	0	0	255	5	50
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	424	0	467	484	0				277	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1068		732	1400	0				306	6	
Arrive On Green	0.00	0.57	0.00	0.05	0.25	0.00				0.17	0.17	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1751	32	1585
Grp Volume(v), veh/h	0	424	0	467	484	0				282	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	16.4	0.0	11.4	27.7	0.0				20.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	16.4	0.0	11.4	27.7	0.0				20.2	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	1068		732	1400	0				311	0	
V/C Ratio(X)	0.00	0.40		0.64	0.35	0.00				0.91	0.00	
Avail Cap(c_a), veh/h	0	1068		950	1400	0				357	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.21	0.21	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	15.5	0.0	10.3	22.7	0.0				52.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.2	0.1	0.0				23.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.9	0.0	5.0	13.9	0.0				11.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	15.7	0.0	10.5	22.9	0.0				76.5	0.0	0.0
LnGrp LOS	A	B		B	C	A				E	A	
Approach Vol, veh/h		424	A		951						282	A
Approach Delay, s/veh		15.7			16.8						76.5	
Approach LOS		B			B						E	
Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			23.1	79.2		27.7		102.3				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			34.0	55.0		26.0		94.0				
Max Q Clear Time (g_c+I1), s			13.4	18.4		22.2		29.7				
Green Ext Time (p_c), s			1.4	2.8		0.5		3.4				

Intersection Summary		
HCM 6th Ctrl Delay		26.7
HCM 6th LOS		C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	40	605	0	0	625	310	250	5	805	0	0	0
Future Volume (veh/h)	40	605	0	0	625	310	250	5	805	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	43	658	0	0	679	0	272	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	481	1390	0	0	1262		315	6				
Arrive On Green	0.03	0.74	0.00	0.00	0.67	0.00	0.18	0.18	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1751	32	1585			
Grp Volume(v), veh/h	43	658	0	0	679	0	277	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1783	0	1585			
Q Serve(g_s), s	0.9	18.1	0.0	0.0	24.1	0.0	19.6	0.0	0.0			
Cycle Q Clear(g_c), s	0.9	18.1	0.0	0.0	24.1	0.0	19.6	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	481	1390	0	0	1262		320	0				
V/C Ratio(X)	0.09	0.47	0.00	0.00	0.54		0.86	0.00				
Avail Cap(c_a), veh/h	496	1390	0	0	1262		850	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.25	0.25	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	8.0	6.6	0.0	0.0	10.8	0.0	51.8	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	1.6	0.0	6.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.3	6.4	0.0	0.0	9.8	0.0	9.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.0	6.9	0.0	0.0	12.5	0.0	58.7	0.0	0.0			
LnGrp LOS	A	A	A	A	B		E	A				
Approach Vol, veh/h		701			679	A		277	A			
Approach Delay, s/veh		7.0			12.5			58.7				
Approach LOS		A			B			E				

Timer - Assigned Phs		2		4			7	8
Phs Duration (G+Y+Rc), s		28.4		101.6			8.9	92.7
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0
Max Green Setting (Gmax), s		62.0		58.0			5.0	48.0
Max Q Clear Time (g_c+I1), s		21.6		20.1			2.9	26.1
Green Ext Time (p_c), s		1.8		5.0			0.0	4.7

Intersection Summary	
HCM 6th Ctrl Delay	17.9
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	258	240	687	290	0	0	0	0	302	5	35
Future Volume (veh/h)	0	258	240	687	290	0	0	0	0	302	5	35
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	280	0	747	315	0				328	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	343		872	1337	0				354	5	
Arrive On Green	0.00	0.18	0.00	0.82	1.00	0.00				0.20	0.20	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1756	27	1585
Grp Volume(v), veh/h	0	280	0	747	315	0				333	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	17.2	0.0	30.6	0.0	0.0				22.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	17.2	0.0	30.6	0.0	0.0				22.0	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	343		872	1337	0				360	0	
V/C Ratio(X)	0.00	0.82		0.86	0.24	0.00				0.93	0.00	
Avail Cap(c_a), veh/h	0	530		872	1337	0				371	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.70	0.70	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	47.0	0.0	8.4	0.0	0.0				47.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	5.6	0.0	6.1	0.3	0.0				28.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	8.5	0.0	5.8	0.1	0.0				12.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	52.7	0.0	14.5	0.3	0.0				75.4	0.0	0.0
LnGrp LOS	A	D		B	A	A				E	A	
Approach Vol, veh/h		280	A		1062						333	A
Approach Delay, s/veh		52.7			10.3						75.4	
Approach LOS		D			B						E	

Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			63.8	27.0		29.2		90.8				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			46.0	34.0		25.0		85.0				
Max Q Clear Time (g_c+I1), s			32.6	19.2		24.0		2.0				
Green Ext Time (p_c), s			2.4	1.3		0.2		2.0				

Intersection Summary		
HCM 6th Ctrl Delay		30.3
HCM 6th LOS		C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰	↱			
Traffic Volume (veh/h)	30	530	0	0	787	209	190	5	384	0	0	0
Future Volume (veh/h)	30	530	0	0	787	209	190	5	384	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	33	576	0	0	855	0	207	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	227	1454	0	0	1138		242	6				
Arrive On Green	0.13	0.78	0.00	0.00	0.61	0.00	0.14	0.14	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1741	42	1585			
Grp Volume(v), veh/h	33	576	0	0	855	0	212	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1783	0	1585			
Q Serve(g_s), s	2.0	11.9	0.0	0.0	39.6	0.0	13.9	0.0	0.0			
Cycle Q Clear(g_c), s	2.0	11.9	0.0	0.0	39.6	0.0	13.9	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	227	1454	0	0	1138		248	0				
V/C Ratio(X)	0.15	0.40	0.00	0.00	0.75		0.85	0.00				
Avail Cap(c_a), veh/h	227	1454	0	0	1138		386	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	46.5	4.3	0.0	0.0	17.0	0.0	50.5	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	4.6	0.0	10.7	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.9	3.6	0.0	0.0	17.1	0.0	6.9	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.6	4.4	0.0	0.0	21.5	0.0	61.2	0.0	0.0			
LnGrp LOS	D	A	A	A	C		E	A				
Approach Vol, veh/h		609			855	A		212	A			
Approach Delay, s/veh		6.7			21.5			61.2				
Approach LOS		A			C			E				

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		21.7		98.3			20.3	78.0				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		26.0		84.0			6.0	73.0				
Max Q Clear Time (g_c+I1), s		15.9		13.9			4.0	41.6				
Green Ext Time (p_c), s		0.8		4.2			0.0	7.3				

Intersection Summary			
HCM 6th Ctrl Delay			21.1
HCM 6th LOS			C

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰	↑						↰	↱
Traffic Volume (veh/h)	0	401	240	468	451	0	0	0	0	276	5	50
Future Volume (veh/h)	0	401	240	468	451	0	0	0	0	276	5	50
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	436	0	509	490	0				300	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1042		710	1378	0				326	5	
Arrive On Green	0.00	0.56	0.00	0.05	0.24	0.00				0.19	0.19	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1753	29	1585
Grp Volume(v), veh/h	0	436	0	509	490	0				305	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	17.5	0.0	13.0	28.2	0.0				21.8	0.0	0.0
Cycle Q Clear(g_c), s	0.0	17.5	0.0	13.0	28.2	0.0				21.8	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	1042		710	1378	0				332	0	
V/C Ratio(X)	0.00	0.42		0.72	0.36	0.00				0.92	0.00	
Avail Cap(c_a), veh/h	0	1042		923	1378	0				357	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	16.6	0.0	12.0	23.6	0.0				51.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.2	0.1	0.0				27.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	7.4	0.0	5.9	14.2	0.0				12.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	16.9	0.0	12.2	23.7	0.0				79.2	0.0	0.0
LnGrp LOS	A	B		B	C	A				E	A	
Approach Vol, veh/h		436	A		999						305	A
Approach Delay, s/veh		16.9			17.8						79.2	
Approach LOS		B			B						E	
Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			23.4	77.4		29.2		100.8				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			34.0	55.0		26.0		94.0				
Max Q Clear Time (g_c+I1), s			15.0	19.5		23.8		30.2				
Green Ext Time (p_c), s			1.6	2.9		0.4		3.4				
Intersection Summary												
HCM 6th Ctrl Delay			28.3									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	40	637	0	0	669	323	250	5	870	0	0	0
Future Volume (veh/h)	40	637	0	0	669	323	250	5	870	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	43	692	0	0	727	0	272	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	450	1390	0	0	1262		315	6				
Arrive On Green	0.03	0.74	0.00	0.00	0.67	0.00	0.18	0.18	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1751	32	1585			
Grp Volume(v), veh/h	43	692	0	0	727	0	277	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1783	0	1585			
Q Serve(g_s), s	0.9	19.6	0.0	0.0	26.9	0.0	19.6	0.0	0.0			
Cycle Q Clear(g_c), s	0.9	19.6	0.0	0.0	26.9	0.0	19.6	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	450	1390	0	0	1262		320	0				
V/C Ratio(X)	0.10	0.50	0.00	0.00	0.58		0.86	0.00				
Avail Cap(c_a), veh/h	464	1390	0	0	1262		850	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.22	0.22	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	8.6	6.8	0.0	0.0	11.3	0.0	51.8	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	1.9	0.0	6.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.3	6.9	0.0	0.0	11.0	0.0	9.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.6	7.1	0.0	0.0	13.2	0.0	58.7	0.0	0.0			
LnGrp LOS	A	A	A	A	B		E	A				
Approach Vol, veh/h		735			727	A		277	A			
Approach Delay, s/veh		7.2			13.2			58.7				
Approach LOS		A			B			E				
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		28.4		101.6			8.9	92.7				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		62.0		58.0			5.0	48.0				
Max Q Clear Time (g_c+I1), s		21.6		21.6			2.9	28.9				
Green Ext Time (p_c), s		1.8		5.4			0.0	4.9				
Intersection Summary												
HCM 6th Ctrl Delay			17.9									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰	↑						↰	↱
Traffic Volume (veh/h)	0	340	310	830	370	0	0	0	0	300	5	60
Future Volume (veh/h)	0	340	310	830	370	0	0	0	0	300	5	60
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	370	0	902	402	0				326	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	412		945	1403	0				314	5	
Arrive On Green	0.00	0.22	0.00	0.82	1.00	0.00				0.18	0.18	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1756	27	1585
Grp Volume(v), veh/h	0	370	0	902	402	0				331	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	26.9	0.0	47.1	0.0	0.0				25.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	26.9	0.0	47.1	0.0	0.0				25.0	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	412		945	1403	0				318	0	
V/C Ratio(X)	0.00	0.90		0.95	0.29	0.00				1.04	0.00	
Avail Cap(c_a), veh/h	0	615		945	1403	0				318	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.50	0.50	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	53.0	0.0	8.6	0.0	0.0				57.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	11.5	0.0	11.8	0.3	0.0				61.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	13.9	0.0	8.8	0.1	0.0				16.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	64.5	0.0	20.4	0.3	0.0				118.7	0.0	0.0
LnGrp LOS	A	E		C	A	A				F	A	
Approach Vol, veh/h		370	A		1304						331	A
Approach Delay, s/veh		64.5			14.2						118.7	
Approach LOS		E			B						F	
Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			74.1	35.9		30.0		110.0				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			54.0	46.0		25.0		105.0				
Max Q Clear Time (g_c+I1), s			49.1	28.9		27.0		2.0				
Green Ext Time (p_c), s			1.7	2.0		0.0		2.7				
Intersection Summary												
HCM 6th Ctrl Delay			40.7									
HCM 6th LOS			D									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	40	600	0	0	910	195	290	5	395	0	0	0
Future Volume (veh/h)	40	600	0	0	910	195	290	5	395	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	43	652	0	0	989	0	315	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	111	1373	0	0	1189		341	5				
Arrive On Green	0.06	0.73	0.00	0.00	0.64	0.00	0.19	0.19	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1755	28	1585			
Grp Volume(v), veh/h	43	652	0	0	989	0	320	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1783	0	1585			
Q Serve(g_s), s	3.2	19.9	0.0	0.0	57.2	0.0	24.7	0.0	0.0			
Cycle Q Clear(g_c), s	3.2	19.9	0.0	0.0	57.2	0.0	24.7	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	111	1373	0	0	1189		347	0				
V/C Ratio(X)	0.39	0.47	0.00	0.00	0.83		0.92	0.00				
Avail Cap(c_a), veh/h	111	1373	0	0	1189		382	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	63.0	7.6	0.0	0.0	19.7	0.0	55.3	0.0	0.0			
Incr Delay (d2), s/veh	0.2	0.1	0.0	0.0	6.9	0.0	26.3	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.5	7.3	0.0	0.0	25.5	0.0	13.5	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.2	7.7	0.0	0.0	26.6	0.0	81.6	0.0	0.0			
LnGrp LOS	E	A	A	A	C		F	A				
Approach Vol, veh/h		695			989	A		320	A			
Approach Delay, s/veh		11.1			26.6			81.6				
Approach LOS		B			C			F				
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		32.2		107.8			13.8	94.0				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		30.0		100.0			6.0	89.0				
Max Q Clear Time (g_c+I1), s		26.7		21.9			5.2	59.2				
Green Ext Time (p_c), s		0.6		5.1			0.0	9.3				
Intersection Summary												
HCM 6th Ctrl Delay			30.0									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	490	340	530	595	0	0	0	0	260	5	60
Future Volume (veh/h)	0	490	340	530	595	0	0	0	0	260	5	60
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	533	0	576	647	0				283	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1029		659	1396	0				310	5	
Arrive On Green	0.00	0.55	0.00	0.05	0.25	0.00				0.18	0.18	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1752	31	1585
Grp Volume(v), veh/h	0	533	0	576	647	0				288	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	23.3	0.0	14.7	38.3	0.0				20.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	23.3	0.0	14.7	38.3	0.0				20.6	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	1029		659	1396	0				315	0	
V/C Ratio(X)	0.00	0.52		0.87	0.46	0.00				0.91	0.00	
Avail Cap(c_a), veh/h	0	1029		844	1396	0				343	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	18.4	0.0	17.8	26.9	0.0				52.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.5	0.0	0.8	0.1	0.0				26.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.9	0.0	10.1	19.2	0.0				11.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	18.8	0.0	18.6	27.0	0.0				79.3	0.0	0.0
LnGrp LOS	A	B		B	C	A				E	A	
Approach Vol, veh/h		533	A		1223						288	A
Approach Delay, s/veh		18.8			23.0						79.3	
Approach LOS		B			C						E	

Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			25.5	76.5		28.0		102.0				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			34.0	56.0		25.0		95.0				
Max Q Clear Time (g_c+I1), s			16.7	25.3		22.6		40.3				
Green Ext Time (p_c), s			1.8	3.6		0.4		5.0				

Intersection Summary			
HCM 6th Ctrl Delay			29.9
HCM 6th LOS			C

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	50	700	0	0	775	315	350	5	945	0	0	0
Future Volume (veh/h)	50	700	0	0	775	315	350	5	945	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	54	761	0	0	842	0	380	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	302	1272	0	0	1138		428	6				
Arrive On Green	0.03	0.68	0.00	0.00	0.61	0.00	0.24	0.24	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1759	23	1585			
Grp Volume(v), veh/h	54	761	0	0	842	0	385	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1782	0	1585			
Q Serve(g_s), s	1.4	28.5	0.0	0.0	41.7	0.0	27.1	0.0	0.0			
Cycle Q Clear(g_c), s	1.4	28.5	0.0	0.0	41.7	0.0	27.1	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	302	1272	0	0	1138		433	0				
V/C Ratio(X)	0.18	0.60	0.00	0.00	0.74		0.89	0.00				
Avail Cap(c_a), veh/h	312	1272	0	0	1138		809	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	15.9	11.2	0.0	0.0	18.1	0.0	47.5	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	4.3	0.0	6.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.5	10.9	0.0	0.0	18.3	0.0	12.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.9	11.4	0.0	0.0	22.4	0.0	53.9	0.0	0.0			
LnGrp LOS	B	B	A	A	C		D	A				
Approach Vol, veh/h		815			842	A		385	A			
Approach Delay, s/veh		11.7			22.4			53.9				
Approach LOS		B			C			D				

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	36.6	93.4	9.3	84.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	59.0	61.0	5.0	51.0
Max Q Clear Time (g_c+I1), s	29.1	30.5	3.4	43.7
Green Ext Time (p_c), s	2.5	6.0	0.0	3.4

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	343	310	887	380	0	0	0	0	307	5	60
Future Volume (veh/h)	0	343	310	887	380	0	0	0	0	307	5	60
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	373	0	964	413	0				334	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	415		942	1403	0				314	5	
Arrive On Green	0.00	0.22	0.00	0.82	1.00	0.00				0.18	0.18	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1756	26	1585
Grp Volume(v), veh/h	0	373	0	964	413	0				339	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	27.1	0.0	68.9	0.0	0.0				25.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	27.1	0.0	68.9	0.0	0.0				25.0	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	415		942	1403	0				318	0	
V/C Ratio(X)	0.00	0.90		1.02	0.29	0.00				1.06	0.00	
Avail Cap(c_a), veh/h	0	615		942	1403	0				318	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.67	1.67	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.39	0.39	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	52.9	0.0	10.0	0.0	0.0				57.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	11.7	0.0	24.4	0.2	0.0				68.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	14.0	0.0	12.6	0.1	0.0				17.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	64.6	0.0	34.5	0.2	0.0				126.2	0.0	0.0
LnGrp LOS	A	E		F	A	A				F	A	
Approach Vol, veh/h		373	A		1377						339	A
Approach Delay, s/veh		64.6			24.2						126.2	
Approach LOS		E			C						F	
Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			73.9	36.1		30.0		110.0				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			54.0	46.0		25.0		105.0				
Max Q Clear Time (g_c+I1), s			70.9	29.1		27.0		2.0				
Green Ext Time (p_c), s			0.0	2.0		0.0		2.8				
Intersection Summary												
HCM 6th Ctrl Delay			47.9									
HCM 6th LOS			D									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	40	610	0	0	977	214	290	5	414	0	0	0
Future Volume (veh/h)	40	610	0	0	977	214	290	5	414	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	43	663	0	0	1062	0	315	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	111	1373	0	0	1189		341	5				
Arrive On Green	0.06	0.73	0.00	0.00	0.64	0.00	0.19	0.19	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1755	28	1585			
Grp Volume(v), veh/h	43	663	0	0	1062	0	320	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1783	0	1585			
Q Serve(g_s), s	3.2	20.4	0.0	0.0	67.0	0.0	24.7	0.0	0.0			
Cycle Q Clear(g_c), s	3.2	20.4	0.0	0.0	67.0	0.0	24.7	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.98		1.00			
Lane Grp Cap(c), veh/h	111	1373	0	0	1189		347	0				
V/C Ratio(X)	0.39	0.48	0.00	0.00	0.89		0.92	0.00				
Avail Cap(c_a), veh/h	111	1373	0	0	1189		382	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	63.0	7.7	0.0	0.0	21.5	0.0	55.3	0.0	0.0			
Incr Delay (d2), s/veh	0.2	0.1	0.0	0.0	10.4	0.0	26.3	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.5	7.5	0.0	0.0	30.6	0.0	13.5	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.2	7.8	0.0	0.0	31.9	0.0	81.6	0.0	0.0			
LnGrp LOS	E	A	A	A	C		F	A				
Approach Vol, veh/h		706			1062	A		320	A			
Approach Delay, s/veh		11.2			31.9			81.6				
Approach LOS		B			C			F				

Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		32.2		107.8			13.8	94.0				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		30.0		100.0			6.0	89.0				
Max Q Clear Time (g_c+I1), s		26.7		22.4			5.2	69.0				
Green Ext Time (p_c), s		0.6		5.2			0.0	8.9				

Intersection Summary			
HCM 6th Ctrl Delay			32.5
HCM 6th LOS			C

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	501	340	568	601	0	0	0	0	281	5	60
Future Volume (veh/h)	0	501	340	568	601	0	0	0	0	281	5	60
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	545	0	617	653	0				305	5	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	911		667	1376	0				329	5	
Arrive On Green	0.00	0.49	0.00	0.07	0.24	0.00				0.19	0.19	0.00
Sat Flow, veh/h	0	1870	0	1781	1870	0				1754	29	1585
Grp Volume(v), veh/h	0	545	0	617	653	0				310	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	0	1781	1870	0				1783	0	1585
Q Serve(g_s), s	0.0	27.4	0.0	23.1	38.8	0.0				22.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	27.4	0.0	23.1	38.8	0.0				22.2	0.0	0.0
Prop In Lane	0.00		0.00	1.00		0.00				0.98		1.00
Lane Grp Cap(c), veh/h	0	911		667	1376	0				334	0	
V/C Ratio(X)	0.00	0.60		0.92	0.47	0.00				0.93	0.00	
Avail Cap(c_a), veh/h	0	911		759	1376	0				343	0	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	24.1	0.0	28.4	27.7	0.0				51.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.1	0.0	2.0	0.1	0.0				30.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	12.1	0.0	21.7	19.5	0.0				12.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	25.2	0.0	30.3	27.8	0.0				82.3	0.0	0.0
LnGrp LOS	A	C		C	C	A				F	A	
Approach Vol, veh/h		545	A		1270						310	A
Approach Delay, s/veh		25.2			29.1						82.3	
Approach LOS		C			C						F	

Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			32.3	68.3		29.4		100.6				
Change Period (Y+Rc), s			5.0	5.0		5.0		5.0				
Max Green Setting (Gmax), s			34.0	56.0		25.0		95.0				
Max Q Clear Time (g_c+I1), s			25.1	29.4		24.2		40.8				
Green Ext Time (p_c), s			1.5	3.6		0.1		5.1				

Intersection Summary		
HCM 6th Ctrl Delay		35.8
HCM 6th LOS		D

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑			↑	↱		↰↑	↱			
Traffic Volume (veh/h)	50	732	0	0	819	328	350	5	1010	0	0	0
Future Volume (veh/h)	50	732	0	0	819	328	350	5	1010	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	54	796	0	0	890	0	380	5	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	272	1272	0	0	1138		428	6				
Arrive On Green	0.03	0.68	0.00	0.00	0.61	0.00	0.24	0.24	0.00			
Sat Flow, veh/h	1781	1870	0	0	1870	1585	1759	23	1585			
Grp Volume(v), veh/h	54	796	0	0	890	0	385	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1870	0	0	1870	1585	1782	0	1585			
Q Serve(g_s), s	1.4	30.8	0.0	0.0	46.2	0.0	27.1	0.0	0.0			
Cycle Q Clear(g_c), s	1.4	30.8	0.0	0.0	46.2	0.0	27.1	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	272	1272	0	0	1138		433	0				
V/C Ratio(X)	0.20	0.63	0.00	0.00	0.78		0.89	0.00				
Avail Cap(c_a), veh/h	282	1272	0	0	1138		809	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	17.7	11.6	0.0	0.0	19.0	0.0	47.5	0.0	0.0			
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	5.4	0.0	6.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.6	11.8	0.0	0.0	20.4	0.0	12.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.7	11.8	0.0	0.0	24.4	0.0	53.9	0.0	0.0			
LnGrp LOS	B	B	A	A	C		D	A				
Approach Vol, veh/h		850			890	A		385	A			
Approach Delay, s/veh		12.2			24.4			53.9				
Approach LOS		B			C			D				
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		36.6		93.4			9.3	84.1				
Change Period (Y+Rc), s		5.0		5.0			5.0	5.0				
Max Green Setting (Gmax), s		59.0		61.0			5.0	51.0				
Max Q Clear Time (g_c+I1), s		29.1		32.8			3.4	48.2				
Green Ext Time (p_c), s		2.5		6.3			0.0	1.6				
Intersection Summary												
HCM 6th Ctrl Delay			24.8									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

INTERSECTION DETAIL
GOLDEN VALLEY RD @ US395S RAMPS
01 JUL 15 - 01 JUL 18

COUNTY: WASHOE

Crash Severity	Crash Date	Crash Year	Crash Time
PROPERTY DAMAGE ONLY	21-Sep-2015	2015	12:28 PM
INJURY CRASH	14-Feb-2016	2016	07:50 AM
INJURY CRASH	14-Apr-2016	2016	09:02 AM
PROPERTY DAMAGE ONLY	20-Aug-2016	2016	04:50 PM
PROPERTY DAMAGE ONLY	16-May-2016	2016	11:14 AM
PROPERTY DAMAGE ONLY	27-Dec-2015	2015	05:15 PM

Primary Street	Distance	Dir
GOLDEN VALLEY RD		AT INT
GOLDEN VALLEY RD		AT INT
GOLDEN VALLEY RD		AT INT
GOLDEN VALLEY RD		AT INT
GOLDEN VALLEY RD TO US395S INT73	10	S
US395S TO GOLDEN VALLEY RD INT73	10	N

Secondary Street	Weather	Fatalities	Injured	Property Damage Only
GOLDEN VALLEY RD TO US395S INT73	CLEAR			PDO
GOLDEN VALLEY RD TO US395S INT73	CLOUDY		2	
US395S TO GOLDEN VALLEY RD INT73	CLOUDY		3	
US395S TO GOLDEN VALLEY RD INT73	CLEAR			PDO
GOLDEN VALLEY RD	CLEAR			PDO
GOLDEN VALLEY RD	CLOUDY			PDO
		Sum: 0	Sum: 5	Count: 4
		Count: 0	Count: 2	
		Total:	6	

Injury Type	Crash Type	Total Vehicles	V1 Type	V1 Dir	V1 Driver Age
	ANGLE	2	SEDAN, 4 DOOR	E	39
C	ANGLE	2	HATCHBACK, 4 DOOR	E	32
C	ANGLE	2	CARRY-ALL	S	28
	ANGLE	2	VAN	S	42
		2	TRACTOR TRUCK, DIESEL	S	68
	REAR-END	2		S	

V1 Lane Num	V1 Action	V1 Driver Factors	V1 Driver Distracted
	GOING STRAIGHT	APPARENTLY NORMAL	
	GOING STRAIGHT	APPARENTLY NORMAL	
	NOT REPORTED	APPARENTLY NORMAL	
1	GOING STRAIGHT	APPARENTLY NORMAL	
	GOING STRAIGHT	APPARENTLY NORMAL	
	UNKNOWN		

V1 Vehicle Factors	V1 Most Harmful Event
FAILED TO YIELD RIGHT OF WAY	
FAILED TO YIELD RIGHT OF WAY	
FAILED TO YIELD RIGHT OF WAY	
FAILED TO YIELD RIGHT OF WAY	
MECHANICAL DEFECTS: ROAD DEFECT	
HIT AND RUN: OTHER IMPROPER DRIVING	

V1 All Events	V2 Type	V2 Dir	V2 Driver Age	V2 Lane Num
	CARRY-ALL	W	18	
	SEDAN, 4 DOOR	W	61	
	HARDTOP, 4 DOOR	W	61	
	CARRY-ALL	W	49	1
CARGO/EQUIPMENT LOSS OR SHIFT	SEDAN, 4 DOOR	S	21	
SLOW/STOPPED VEHICLE	CARRY-ALL	S	58	

V2 Action	V2 Driver Factors	V2 Driver Distracted	V2 Vehicle Factors
TURNING LEFT	APPARENTLY NORMAL		
TURNING LEFT	APPARENTLY NORMAL		
GOING STRAIGHT	APPARENTLY NORMAL		
GOING STRAIGHT	APPARENTLY NORMAL		UNKNOWN
TURNING LEFT	APPARENTLY NORMAL		OBJECT AVOIDANCE
GOING STRAIGHT	APPARENTLY NORMAL		

V2 Most Harmful Event	V2 All Events	First Harmful Event
		MOTOR VEHICLE IN TRANSPORT
		MOTOR VEHICLE IN TRANSPORT
		MOTOR VEHICLE IN TRANSPORT
		MOTOR VEHICLE IN TRANSPORT
	OTHER MOVABLE OBJECT	

Nonmotorist Factors	Factors Roadway	Lighting	HWY Factors	Agency	Accident Rec Num
	DRY	DAYLIGHT	NONE	RPD	2191083
	DRY	DAYLIGHT	NONE	RPD	2315177
	DRY	DAYLIGHT	NONE	RPD	2315623
	DRY	DAYLIGHT	NONE	RPD	2370259
	DRY	DAYLIGHT	DEBRIS	NHP	2356796
	DRY	DARK - SPOT LIGHTING	NONE	NHP	2214682

INTERSECTION DETAIL
SUN VALLEY BLVD @ 7TH AVE
01 JUL 15 - 01 JUL 18

COUNTY: WASHOE				
Crash Severity	Crash Date	Crash Year	Crash Time	Primary Street
PROPERTY DAMAGE ONLY	16-Apr-2016	2016	05:14 PM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	20-Jul-2017	2017	11:47 AM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	12-Jan-2016	2016	04:33 PM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	28-Jul-2015	2015	05:48 PM	SUN VALLEY BLVD
INJURY CRASH	26-Sep-2015	2015	02:12 PM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	18-Nov-2015	2015	06:53 AM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	26-Dec-2015	2015	05:32 PM	SUN VALLEY BLVD
INJURY CRASH	19-Jul-2016	2016	06:33 PM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	26-Oct-2016	2016	03:50 PM	SUN VALLEY BLVD
INJURY CRASH	4-Apr-2017	2017	05:00 PM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	21-May-2017	2017	11:59 AM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	25-Jun-2017	2017	05:44 AM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	9-Sep-2017	2017	09:40 PM	SUN VALLEY BLVD
INJURY CRASH	2-Oct-2017	2017	07:32 PM	SUN VALLEY BLVD
INJURY CRASH	23-Jan-2018	2018	03:47 PM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	26-Jul-2016	2016	09:45 PM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	30-Dec-2015	2015	11:24 AM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	5-Dec-2015	2015	06:52 PM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	13-Apr-2016	2016	06:16 AM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	12-Nov-2016	2016	10:52 AM	SUN VALLEY BLVD
PROPERTY DAMAGE ONLY	12-Jul-2016	2016	05:08 PM	7TH AVE
PROPERTY DAMAGE ONLY	8-Oct-2017	2017	08:30 PM	7TH AVE
PROPERTY DAMAGE ONLY	20-Feb-2018	2018	07:25 AM	7TH AVE
INJURY CRASH	30-Jul-2015	2015	08:30 PM	7TH AVE
PROPERTY DAMAGE ONLY	7-Nov-2015	2015	04:15 PM	7TH AVE
INJURY CRASH	18-Nov-2015	2015	07:35 PM	7TH AVE
PROPERTY DAMAGE ONLY	5-Dec-2017	2017	04:04 PM	7TH AVE
INJURY CRASH	8-Oct-2017	2017	03:00 AM	7TH AVE
PROPERTY DAMAGE ONLY	1-Oct-2015	2015	04:55 PM	7TH AVE

Distance	Dir	Secondary Street	Weather	Fatalities	Injured
20	N	7TH AVE	CLEAR		
10	N	7TH AVE	CLEAR		
10	N	7TH AVE	CLEAR		
	AT INT	7TH AVE	CLEAR		
	AT INT	7TH AVE	UNKNOWN		1
	AT INT	7TH AVE	CLEAR		
	AT INT	7TH AVE	CLEAR		
	AT INT	7TH AVE	CLEAR		5
	AT INT	7TH AVE	CLEAR		
	AT INT	7TH AVE	CLEAR		1
	AT INT	7TH AVE	CLEAR		
	AT INT	7TH AVE	CLEAR		
	AT INT	7TH AVE	CLEAR		
	AT INT	7TH AVE	CLEAR		1
	AT INT	7TH AVE	CLEAR		1
2	S	7TH AVE	CLEAR		
20	S	7TH AVE	CLOUDY		
30	S	7TH AVE	CLOUDY		
40	S	7TH AVE	CLEAR		
100	S	7TH AVE	CLEAR		
100	E	SUN VALLEY BLVD	CLEAR		
50	E	SUN VALLEY BLVD	CLEAR		
40	E	SUN VALLEY BLVD	CLEAR		
	AT INT	SUN VALLEY BLVD	CLEAR		2
	AT INT	SUN VALLEY BLVD	CLEAR		
	AT INT	SUN VALLEY BLVD	CLEAR		1
	AT INT	SUN VALLEY BLVD	CLEAR		
35	W	SUN VALLEY BLVD	CLEAR		2
150	W	SUN VALLEY BLVD	RAIN		
				Sum: 0	Sum: 14
				Count: 0	Count: 8
				Total:	29

Property Damage Only	Injury Type	Crash Type	Total Vehicles	V1 Type	V1 Dir
PDO		REAR-END	2	SEDAN	S
PDO		NON-COLLISION	1	SEMI	S
PDO		REAR-END	2	HARDTOP, 2 DOOR	N
PDO		ANGLE	2	HATCHBACK, 4 DOOR	E
	C	NON-COLLISION	1	MOPED	S
PDO		HEAD-ON	2	SEDAN, 2 DOOR	N
PDO		ANGLE	2	PICKUP	N
	C	ANGLE	3	CARRY-ALL	S
PDO		ANGLE	2	CARRY-ALL	W
	C	NON-COLLISION	1	SEDAN, 4 DOOR	W
PDO		ANGLE	2	HARDTOP, 4 DOOR	W
PDO		ANGLE	2	VAN	E
PDO		ANGLE	2	PICKUP	E
	C	ANGLE	2	SEDAN, 4 DOOR	N
	C	REAR-END	2	SEDAN, 4 DOOR	N
PDO		ANGLE	2	PICKUP	S
PDO		REAR-END	2	CARRY-ALL	N
PDO		REAR-END	2	PICKUP	N
PDO		NON-COLLISION	1	HATCHBACK, 4 DOOR	N
PDO		REAR-END	2	HARDTOP, 4 DOOR	N
PDO		ANGLE	2	SEDAN, 4 DOOR	E
PDO		ANGLE	2	HARDTOP, 2 DOOR	W
PDO		BACKING	2	CARRY-ALL	W
	C	REAR-END	2	HATCHBACK, 2 DOOR	W
PDO		REAR-END	2	SEDAN, 4 DOOR	W
	B	ANGLE	2	CARRY-ALL	E
PDO		ANGLE	2	HARDTOP	S
	C	NON-COLLISION	1	CARRY-ALL	W
PDO		ANGLE	2	CARRY-ALL	E
Count: 21					

V1 Driver Age	V1 Lane Num	V1 Action	V1 Driver Factors
23	2	GOING STRAIGHT	APPARENTLY NORMAL
34		TURNING RIGHT	APPARENTLY NORMAL
		TURNING RIGHT	APPARENTLY NORMAL
		TURNING RIGHT	APPARENTLY NORMAL
32		GOING STRAIGHT	APPARENTLY NORMAL
		TURNING LEFT	OTHER IMPROPER DRIVING
73		TURNING LEFT	APPARENTLY NORMAL
41		GOING STRAIGHT	INATTENTION/DISTRACTED
71		TURNING RIGHT	APPARENTLY NORMAL
		TURNING LEFT	
		NOT REPORTED	APPARENTLY NORMAL
34		GOING STRAIGHT	APPARENTLY NORMAL
45		TURNING LEFT	APPARENTLY NORMAL
17		TURNING LEFT	APPARENTLY NORMAL
67		TURNING RIGHT	APPARENTLY NORMAL
50		TURNING LEFT	
18	1	GOING STRAIGHT	APPARENTLY NORMAL
58	1	GOING STRAIGHT	HAD BEEN DRINKING
60		NOT REPORTED	DRUG INVOLVEMENT
34	1	GOING STRAIGHT	APPARENTLY NORMAL
		NOT REPORTED	APPARENTLY NORMAL
		TURNING LEFT	HAD BEEN DRINKING
		BACKING UP	APPARENTLY NORMAL
41		STOPPED	APPARENTLY NORMAL
24		NOT REPORTED	APPARENTLY NORMAL
65		TURNING LEFT	APPARENTLY NORMAL
94		GOING STRAIGHT	APPARENTLY NORMAL
18		GOING STRAIGHT	INATTENTION/DISTRACTED: OTHER IMPROPER DRIVING
18		MAKING U-TURN	HAD BEEN DRINKING: OTHER IMPROPER DRIVING

V1 Driver Distracted
CHILDREN
OTHER

V1 Vehicle Factors
OTHER IMPROPER DRIVING
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHAN(
UNKNOWN
FAILED TO YIELD RIGHT OF WAY
OBJECT AVOIDANCE
FAILED TO YIELD RIGHT OF WAY
FAILED TO YIELD RIGHT OF WAY
FAILED TO YIELD RIGHT OF WAY
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS
FAILED TO YIELD RIGHT OF WAY: HIT AND RUN
UNKNOWN
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS
UNKNOWN
UNKNOWN
FOLLOWED TOO CLOSELY
HIT AND RUN
OTHER IMPROPER DRIVING
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHAN(
FAILED TO YIELD RIGHT OF WAY
FAILED TO YIELD RIGHT OF WAY
UNSAFE BACKING
HIT AND RUN
FAILED TO YIELD RIGHT OF WAY
UNKNOWN
EXCEEDED AUTHORIZED SPEED LIMIT: RAN OFF ROAD: OTHER IMPROPER DRIVING
DRIVING TOO FAST FOR CONDITIONS

V1 Most Harmful Event	V1 All Events
	SLOW/STOPPED VEHICLE
GE	NOT REPORTED
	OVERTURN/ROLLOVER
	PEDESTRIAN
	SEPARATION OF UNITS
	SLOW/STOPPED VEHICLE
	SLOW/STOPPED VEHICLE
	SLOW/STOPPED VEHICLE
	SLOW/STOPPED VEHICLE
GE	RAN OFF ROAD LEFT: TREE/SHRUB
	SLOW/STOPPED VEHICLE
	OTHER MOVABLE OBJECT
	SLOW/STOPPED VEHICLE
	SLOW/STOPPED VEHICLE
	SLOW/STOPPED VEHICLE: SEPARATION OF UNITS
	SLOW/STOPPED VEHICLE
	RAN OFF ROAD RIGHT: DITCH
	DITCH

V2 Type	V2 Dir	V2 Driver Age	V2 Lane Num	V2 Action
SEDAN, 4 DOOR	S	28	2	STOPPED
HARDTOP, 2 DOOR	N			TURNING RIGHT
CARRY-ALL	S			GOING STRAIGHT
SEDAN, 2 DOOR	W			GOING STRAIGHT
CARRY-ALL	S	38		GOING STRAIGHT
UTILITY	E	24		STOPPED
SEDAN, 4 DOOR	W	24		GOING STRAIGHT
HARDTOP, 4 DOOR	E			GOING STRAIGHT
UTILITY	S	38		GOING STRAIGHT
PICKUP	N	25		GOING STRAIGHT
CARRY-ALL	S	34		GOING STRAIGHT
SEDAN, 4 DOOR	N	18		TURNING RIGHT
SEDAN, 4 DOOR	N	28		STOPPED
CARRY-ALL	N	32	1	STOPPED
HATCHBACK, 2 DOOR	N	29	1	STOPPED
PICKUP	N	65	1	STOPPED
SEDAN, 4 DOOR	E			GOING STRAIGHT
PICKUP	E			GOING STRAIGHT
STATION WAGON	W			GOING STRAIGHT
PICKUP	W	39		GOING STRAIGHT
CARRY-ALL	W	50		STOPPED
CARRY-ALL	W	40		GOING STRAIGHT
HATCHBACK, 4 DOOR	W	85		TURNING LEFT
PICKUP	W	44		GOING STRAIGHT

V2 Driver Factors	V2 Driver Distracted	V2 Vehicle Factors	V2 Most Harmful Event
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL		UNKNOWN	
APPARENTLY NORMAL			
APPARENTLY NORMAL		UNKNOWN	
APPARENTLY NORMAL		UNKNOWN	
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL			
APPARENTLY NORMAL		UNKNOWN	
		UNKNOWN	
APPARENTLY NORMAL			
HAD BEEN DRINKING		FAILED TO YIELD RIGHT OF WAY	
APPARENTLY NORMAL			
APPARENTLY NORMAL		UNKNOWN	

V2 All Events	First Harmful Event	Nonmotorist Factors	Factors Roadway
SLOW/STOPPED VEHICLE			DRY
			DRY
			DRY
			DRY
SLOW/STOPPED VEHICLE			DRY
			DRY
		UNKNOWN	DRY
SEPARATION OF UNITS			
			DRY
			DRY
			DRY
			DRY
			DRY
			DRY
SLOW/STOPPED VEHICLE			DRY
			DRY
			DRY
OTHER MOVABLE OBJECT			
SLOW/STOPPED VEHICLE			DRY
SLOW/STOPPED VEHICLE			DRY
			DRY
			DRY
			DRY
DITCH			DRY

Lighting	HWY Factors	Agency	Accident Rec Num
DAYLIGHT	NONE	NHP	2236717
DAYLIGHT	NONE	NHP	2394457
		WASO	2310886
	NONE	NHP	2182512
DAYLIGHT	NONE	NHP	2210425
		WASO	2216303
DARK - SPOT LIGHTING	NONE	NHP	2214643
DAYLIGHT	NONE	NHP	2326588
DAYLIGHT	NONE	NHP	2339242
DAYLIGHT		NHP	2379305
		WASO	2386670
DAYLIGHT	NONE	NHP	2383904
DARK - SPOT LIGHTING	NONE	NHP	2397444
DARK - SPOT LIGHTING	NONE	NHP	2398711
DAYLIGHT	NONE	NHP	2419624
DARK - SPOT LIGHTING	NONE	NHP	2326982
DAYLIGHT	NONE	NHP	2214881
DARK - CONTINUOUS LIGHTING	NONE	NHP	2213463
DAWN	NONE	WASO	2310895
DAYLIGHT	NONE	NHP	2340245
		WASO	2331866
		WASO	2401507
		WASO	2423869
DUSK		WASO	2308338
DUSK	NONE	WASO	2310834
DARK - SPOT LIGHTING	NONE	NHP	2212568
DAYLIGHT	NONE	NHP	2416654
DARK - NO LIGHTING	NONE	WASO	2401505
DAYLIGHT	WEATHER	WASO	2308413

INTERSECTION DETAIL
E GOLDEN VALLEY RD @ ESTATES RD
01 JUL 15 - 01 JUL 18
COUNTY: WASHOE

Crash Severity	Crash Date	Crash Year	Crash Time	Primary Street
PROPERTY DAMAGE ONLY	2-Feb-2018	2018	07:29 AM	E GOLDEN VALLEY RD
PROPERTY DAMAGE ONLY	5-May-2017	2017	11:24 AM	E GOLDEN VALLEY RD
PROPERTY DAMAGE ONLY	2-Mar-2017	2017	07:26 AM	E GOLDEN VALLEY RD
PROPERTY DAMAGE ONLY	25-Aug-2017	2017	08:02 AM	E GOLDEN VALLEY RD
PROPERTY DAMAGE ONLY	3-May-2018	2018	08:17 PM	E GOLDEN VALLEY RD
PROPERTY DAMAGE ONLY	4-Jun-2016	2016	11:20 AM	ESTATES RD

Distance	Dir	Secondary Street	Weather	Fatalities	Injured
150	E	ESTATES RD	CLEAR		
150	E	ESTATES RD	CLEAR		
	AT INT	ESTATES RD	CLEAR		
	AT INT	ESTATES RD	CLEAR		
	AT INT	ESTATES RD	CLEAR		
	AT INT	E GOLDEN VALLEY RD	CLEAR		
				Sum: 0	Sum: 0
				Count: 0	Count: 0
				Total:	6

Property Damage Only	Injury Type	Crash Type	Total Vehicles	V1 Type	V1 Dir
PDO		REAR-END	3	CARRY-ALL	W
PDO		ANGLE	2	SEDAN, 4 DOOR	N
PDO		REAR-END	2	HATCHBACK, 4 DOOR	W
PDO		REAR-END	2	CARRY-ALL	E
PDO		ANGLE	2	HATCHBACK, 4 DOOR	
PDO		REAR-END	2	STATION WAGON	S
Count: 6					

V1 Driver Age	V1 Lane Num	V1 Action	V1 Driver Factors
		GOING STRAIGHT	INATTENTION/DISTRACTED
19	1	TURNING LEFT	INATTENTION/DISTRACTED
		GOING STRAIGHT	INATTENTION/DISTRACTED
		STOPPED	APPARENTLY NORMAL
		TURNING LEFT	
29		GOING STRAIGHT	APPARENTLY NORMAL

V1 Driver Distracted
ELECTRONIC EQUIPMENT (COMPUTERS, ON BOARD NAVIGATION SYSTEM, ETC
UNKNOWN
UNKNOWN

V1 Vehicle Factors	V1 Most Harmful Event
UNKNOWN	
FAILED TO YIELD RIGHT OF WAY	
FOLLOWED TOO CLOSELY	
UNKNOWN	
FAILED TO YIELD RIGHT OF WAY: HIT AND RUN	

V1 All Events	V2 Type	V2 Dir	V2 Driver Age	V2 Lane Num
SLOW/STOPPED VEHICLE	SEDAN, 4 DOOR	W		
	PICKUP	E	26	1
SLOW/STOPPED VEHICLE	PICKUP	W		
SLOW/STOPPED VEHICLE	SEDAN, 4 DOOR	E		
SLOW/STOPPED VEHICLE	HATCHBACK, 4 DOOR			
SLOW/STOPPED VEHICLE	PICKUP	S	57	

V2 Action	V2 Driver Factors	V2 Driver Distracted
GOING STRAIGHT		
GOING STRAIGHT	APPARENTLY NORMAL	
GOING STRAIGHT		
GOING STRAIGHT	OBSTRUCTED VIEW: OTHER IMPROPER DRIVING	
GOING STRAIGHT		
TURNING RIGHT	APPARENTLY NORMAL	

V2 Vehicle Factors	V2 Most Harmful Event
FOLLOWED TOO CLOSELY: VISIBILITY OBSTRUCTED	

V2 All Events	First Harmful Event	Nonmotorist Factors	Factors Roadway	Lighting	HWY Factors
SLOW/STOPPED VEHICLE					
			DRY	DAYLIGHT	NONE
SLOW/STOPPED VEHICLE					
SLOW/STOPPED VEHICLE					
SLOW/STOPPED VEHICLE			DRY	DAYLIGHT	NONE

Agency	Accident Rec Num
WASO	2423858
WASO	2386660
WASO	2368924
WASO	2401475
WASO	2517550
WASO	2331835

INTERSECTION DETAIL
GOLDEN VALLEY RD @ US395N RAMPS
01 JUL 15 - 01 JUL 18

COUNTY: WASHOE			
Crash Severity	Crash Date	Crash Year	Crash Time
PROPERTY DAMAGE ONLY	6-Apr-2016	2016	04:04 PM
PROPERTY DAMAGE ONLY	6-Jul-2016	2016	05:10 PM
PROPERTY DAMAGE ONLY	9-Dec-2017	2017	10:22 AM
PROPERTY DAMAGE ONLY	2-Sep-2015	2015	05:09 PM
PROPERTY DAMAGE ONLY	14-Sep-2017	2017	03:30 PM

Primary Street	Distance	Dir	Secondary Street
GOLDEN VALLEY RD		AT INT	US395N TO GOLDEN VALLEY RD INT73
GOLDEN VALLEY RD		AT INT	US395N TO GOLDEN VALLEY RD INT73
US395N TO GOLDEN VALLEY RD INT73	75	E	GOLDEN VALLEY RD
US395N TO GOLDEN VALLEY RD INT73	20	E	GOLDEN VALLEY RD
US395N TO GOLDEN VALLEY RD INT73		AT INT	GOLDEN VALLEY RD

Weather	Fatalities	Injured	Property Damage Only	Injury Type	Crash Type	Total Vehicles
UNKNOWN			PDO		ANGLE	2
CLEAR			PDO		ANGLE	2
CLEAR			PDO		NON-COLLISION	1
CLEAR			PDO		NON-COLLISION	1
CLEAR			PDO		HEAD-ON	2
	Sum: 0	Sum: 0	Count: 5			
	Count: 0	Count: 0				
	Total:	5				

V1 Type	V1 Dir	V1 Driver Age	V1 Lane Num	V1 Action	V1 Driver Factors
SEDAN, 4 DOOR	N			TURNING LEFT	
SEDAN, 4 DOOR	S		1	GOING STRAIGHT	
VAN	N	32	1	TURNING RIGHT	HAD BEEN DRINKING
SEDAN, 4 DOOR	N	26		GOING STRAIGHT	HAD BEEN DRINKING
SEDAN	N	31		TURNING LEFT	APPARENTLY NORMAL

V1 Driver Distracted

V1 Vehicle Factors
HIT AND RUN
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: RAN OFF ROAD: UNSAFE LANE CHA
FAILED TO YIELD RIGHT OF WAY

V1 Most Harmful Event	V1 All Events
NGE	RAN OFF ROAD LEFT: DITCH: OTHER POST, POLE OR SUPPORT

V2 Type	V2 Dir	V2 Driver Age	V2 Lane Num	V2 Action
SEDAN, 4 DOOR	S			GOING STRAIGHT
PICKUP	S	38	1	GOING STRAIGHT
BUS	N	64		GOING STRAIGHT

V2 Driver Factors	V2 Driver Distracted	V2 Vehicle Factors	V2 Most Harmful Event	V2 All Events
		UNKNOWN		
APPARENTLY NORMAL				

First Harmful Event	Nonmotorist Factors	Factors Roadway	Lighting	HWY Factors
MOTOR VEHICLE IN TRANSPORT		DRY	DAYLIGHT	NONE
		DRY	DAYLIGHT	NONE
		DRY	DAYLIGHT	NONE
		DRY	DAYLIGHT	

Agency	Accident Rec Num
RPD	2314095
RPD	2314512
RPD	2404067
NHP	2295953
WASD	2401391

PRELIMINARY HYDROLOGY REPORT
FOR
LADERA RANCH PHASES 2-6 TENTATIVE MAP

Prepared for:

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APRIL 2020

4-15-2020

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INTRODUCTION

The following report presents the results of the hydrologic analysis for the Ladera Ranch Phases 2-6 Tentative Map. The tentative Map is a proposed 294 lot single-family residential development located in Sun Valley, Nevada and within section 13, T20N, R19E. The site consists of approximately 267 acres (refer to Appendix A – Vicinity Map).

The property surrounding this project is as follows:

North: Ladera Ranch Phase 1 (Existing)
South: Open Space
East: Washoe County Parks (Existing)
West: Northstar Ranch Community (Existing)

The purpose of this report is to summarize the analysis of the pre- and post-development hydrologic conditions of the site and to determine possible impacts to the downstream drainage facilities.

HYDROLOGY METHODOLOGY

The hydrology was determined using the *Truckee Meadows Regional Drainage Manual* (TMRDM) and the "Rational Method". The parameters for the Rational Method of analysis are:

1. Area of the Sub-basin – A (acres)
2. Time of Concentration – Tc (minutes)
3. Runoff Coefficient - C
4. Rainfall Intensity – I (inches per hour)

The time of concentration is calculated using the TMRDM. The equations for determining the t_c are:

t_c = the lesser of $t_c = t_i + t_t$ where $t_i = \dfrac{1.8(1.1-R)L^{1/2}}{S^{1/3}}$ and $t_t = \dfrac{L}{60V}$

or for urbanized basins $t_c = \frac{L}{180} + 10$

$t_{c\ min.}$ = 10 min. for urbanized basins and 10 min. for non-urban watersheds

Where:

L = the travel distance (ft)

V = channel or overland velocity (fps) (obtained from *FlowMaster* –Appendix B)

R = 5-year runoff coefficient (C_5)

S = average overland basin slope (percent)

Reference 5-year and 100-year spreadsheets for the time of concentration determinations.

Rainfall intensities were obtained from the rainfall intensity-duration-frequency curves determined by NOAA Atlas 14, Volume1, Version 5. Peak runoff is calculated using the following equation:

$$Q = CIA$$

The runoff coefficients, C, were obtained from the TMRDM Table 701. The runoff coefficients, C, used for this analysis are:

Surface characteristics	5-year storm	100-year storm
Lot areas (1/4 Acre)	0.50	0.65
Pavement	0.88	0.93
Open areas – parc with access	0.20	0.50
Undeveloped areas - range	0.20	0.50

For Tc=10 minutes, the rainfall intensities are as follows:

I_5=1.46 inches per hour for the 5-year event

I_{100}=3.67 inches per hour for the 100-year event

EXISTING HYDROLOGY

The Ladera Phases 2-6 Tentative Map, in existing conditions, has been split up into 6 areas. X1 and X2 flow to the southeast and east of the site towards the existing Ladera Ranch Phase 1. X3 and X4 flow to the north and northeast of the site to an existing drainageway. X5 flows to an existing flared end section in Ladera Ranch Phase 1 that carries the flows into an existing detention pond and X6 flows to the west of the site. Reference Table 1 in Appendix B, and the Existing Hydrology Display (HY-1) in the map pocket for the hydrology information.

PROPOSED HYDROLOGY

The Ladera Phases 2 to 6 site was analyzed as 93 on-site sub-basins. A rational method analysis was performed on each sub-basin to determine peak runoff to size the storm drain improvements.

The developed condition analysis for single family residential used the following runoff coefficients C_5=0.50, and C_{100}=0.65. Rainfall intensities used for all on-site sub-basins for the 5- and 100-year storms were 1.46 inches per hour and 3.67 inches per hour, respectively. The rainfall intensities correspond to a time of concentration of 10 minutes.

The flow from areas A29-30, B-9, C13-14, and E17 will drain towards the back of the lots and be caught by the proposed and existing ditches on the site. Area C-13 will drain to the proposed detention basin. The catch basins collect the discharge and move it into the proposed detention basin and existing and proposed ditches. The development will discharge into the proposed pond to the east of the site and proposed and existing ditches to the west and southeast of the site.

The storm drain system was designed to accommodate the 100-year peak flow. The 100-year storm event will be carried by the on-site storm drain system, ditches on-site, and existing drainages. Reference displays HY-2 through HY-4 for proposed sub-basins. Table 2 summarizes the flows produced by the sub basins. A summary of the catch basin capacities can be referenced in Table 3. All proposed catch basins and laterals have the capacity to collect and convey the 5-year and 100-year peak flow.

The proposed Detention Pond on-site has a required volume of 134,716 cubic feet determined using the rational method with a safety factor. The proposed volume for the pond has a total volume of 244,781 cubic feet, which accommodates the required volume while having a minimum one foot of freeboard.

STREET CAPACITIES

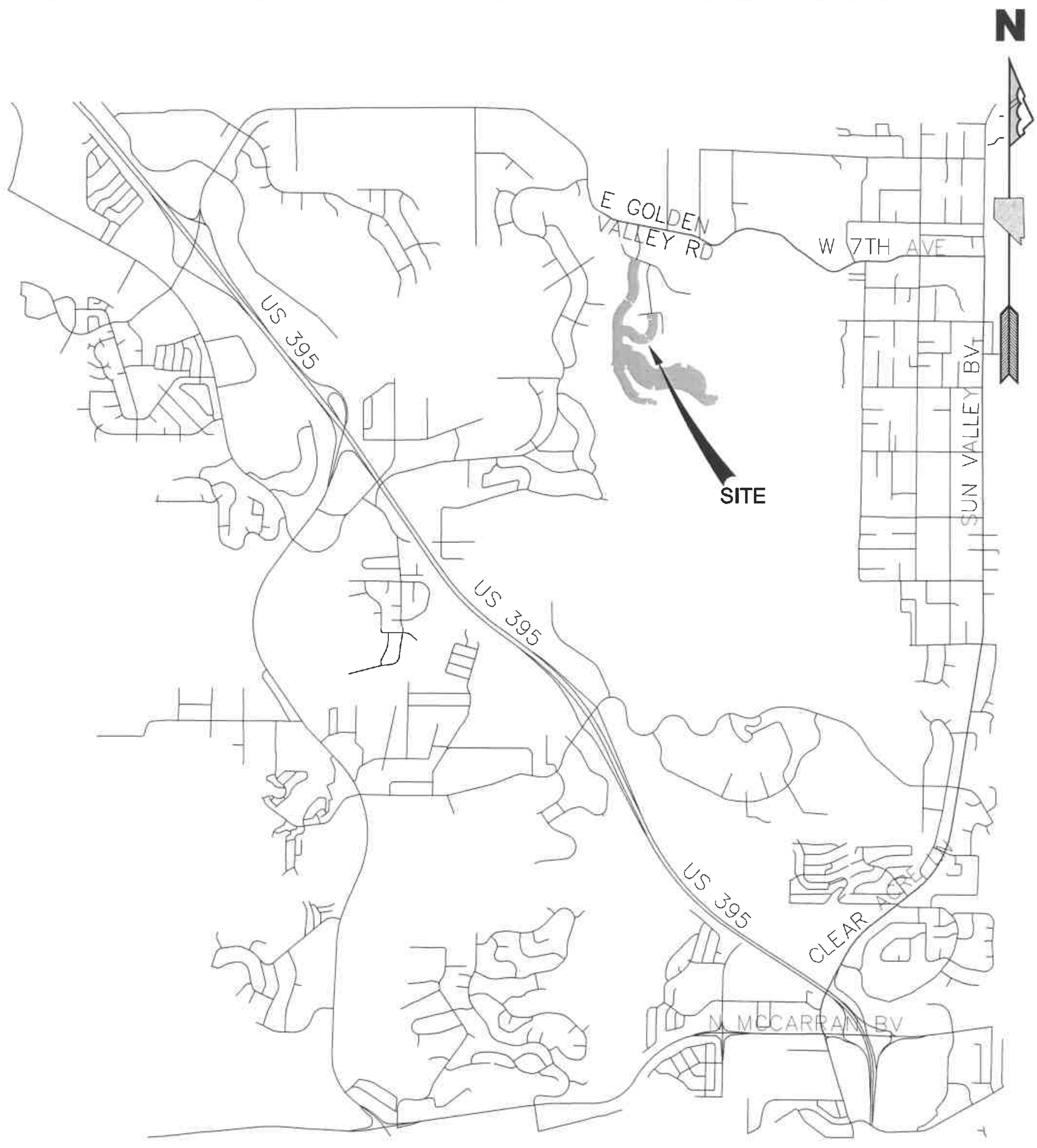
The developed condition analysis used for the following runoff coefficients C_5=0.88, C_{100}=0.93 for the street capacities. The one-half open travel width capacities and right of way capacities have been evaluated for the critical sections of Ladera Phases 2 to 6. The maximum 5-year flows (max. Q_5 ½ street) at the critical sections have been calculated using Flowmaster and compared with the one-half open travel width capacities (Q_{5cap} ½ open width. Similarly, the maximum 100-year flows (Max Q_{100} Whole Street) have been calculated and compared with the maximum right-of-way carrying capacities of the streets (Q_{100cap} R/W – R/W) at the critical sections. The minimum 1.56% collector street slope yielded a 5-year (18 foot width dry centered) half-street capacity of 1.87 cfs, while the 100-year storm yields a half-street capacity of 9.81 cfs. With the proposed on-site collection system, the maximum 5-year and 100-year peak flows will not exceed the capacity of the collector street. Local streets were analyzed with the same criteria. The minimum 1.0% local street slope yielded a 5-year (12-foot width dry centered) half-street capacity of 2.41 cfs, while the 100-year storm yields a half-street capacity of 10.86 cfs. The streets are able to carry the flows in the street without exceeding the street capacities.

CONCLUSION

The analysis of the Ladera Ranch Phases 2-6 Tentative Map on-site hydrology shows that the proposed collection system is able to collect and carry all of the runoff generated by the development. The catch basins in the site are designed to catch all the flows from the site. All flows caught on-site are directed to the proposed pond to the east of the development. The proposed pond is able to detain the required volume before discharging into the existing drainageway. The storm drain system in Ladera Ranch Phases 2-6 is designed to fully collect and detain all flows generated from the development. Any further developments, not discussed in this report, utilizing the existing system should be re-analyzed.

APPENDIX A

VICINITY MAP AND SUPPORTING DATA



LADERA RANCH PHASE 2-6
TENTATIVE MAP
VICINITY MAP

SCALE: N.T.S

SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
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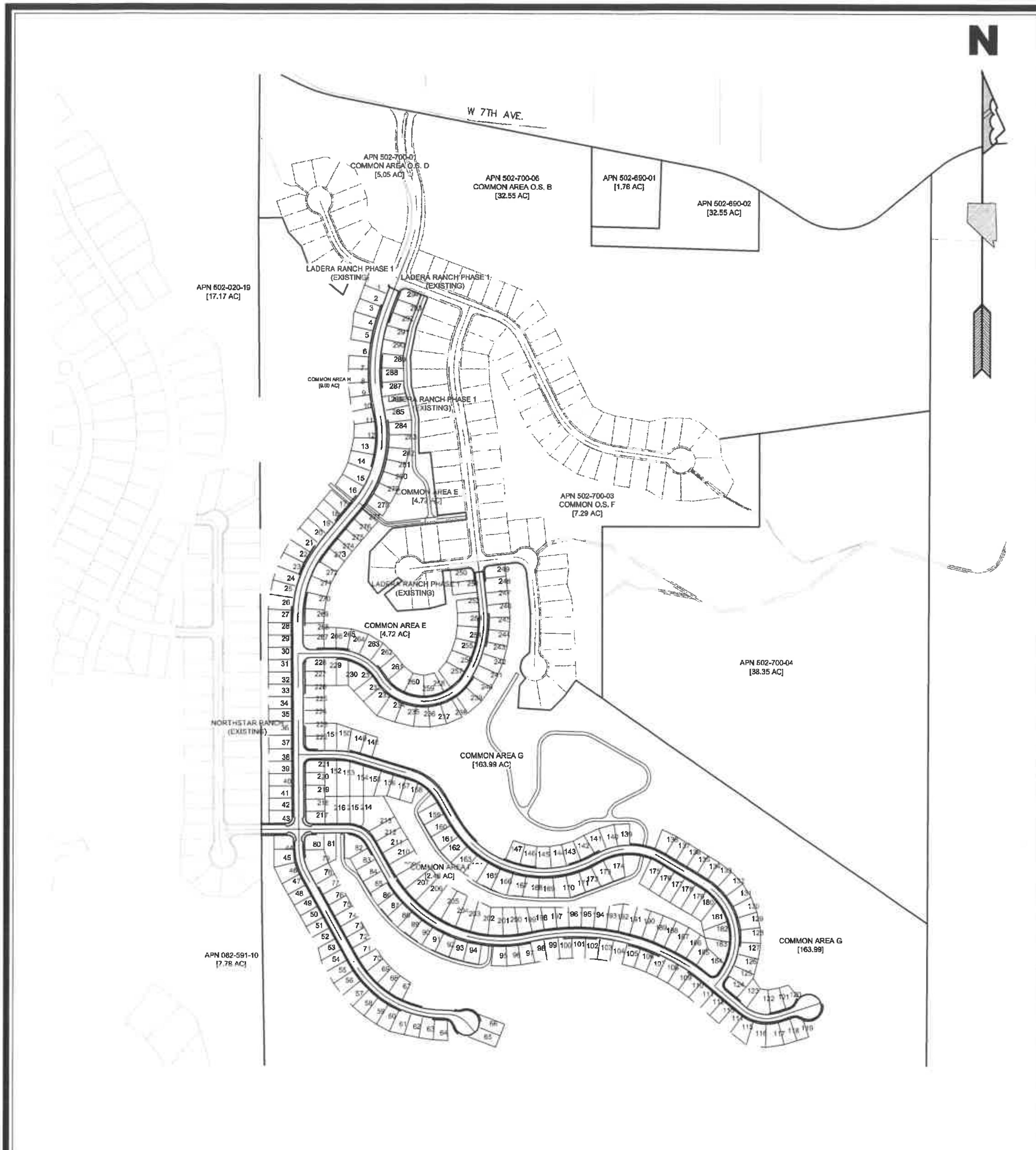
SHEET 1 OF 1

N: \DWGS\J30884_Lansing_LaderaNewTM\Civil\LaderaTM-T-1.DWG ~ 10:11 AM * 15-APR-2020



LADERA RANCH PHASE 2-6 TENTATIVE MAP SITE MAP	SCALE: N.T.S Copyright SUMMIT ENG 2020	SUMMIT ENGINEERING CORPORATION 5405 MAE ANNE AVENUE, RENO, NV. 89523 PHONE:(775) 747-8550 FAX:(775) 747-8559	SHEET 1 OF 1

N:\DWGS\J30884_Lansing_LaderaNewTM\Civil\LaderaTM-T-1.DWG ~ 10:11 AM * 15-APR-2020

NOAA Atlas 14, Volume 1, Version 5
Location name: Sun Valley, Nevada, USA*
Latitude: 39.5951°, Longitude: -119.8032°
Elevation: 5094.71 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.15 (0.972-1.32)	1.43 (1.21-1.67)	1.92 (1.63-2.26)	2.39 (2.02-2.83)	3.18 (2.64-3.82)	3.92 (3.14-4.78)	4.81 (3.74-5.95)	5.90 (4.40-7.45)	7.69 (5.41-10.0)	9.34 (6.28-12.5)
10-min	0.876 (0.744-1.01)	1.09 (0.924-1.27)	1.46 (1.24-1.72)	1.81 (1.54-2.15)	2.42 (2.00-2.90)	2.98 (2.40-3.63)	3.67 (2.85-4.52)	4.49 (3.35-5.67)	5.86 (4.12-7.64)	7.11 (4.78-9.49)
15-min	0.724 (0.616-0.832)	0.900 (0.764-1.05)	1.21 (1.03-1.42)	1.50 (1.27-1.78)	2.00 (1.66-2.40)	2.46 (1.98-3.00)	3.03 (2.36-3.74)	3.72 (2.77-4.69)	4.84 (3.40-6.31)	5.87 (3.95-7.85)
30-min	0.488 (0.414-0.562)	0.606 (0.514-0.708)	0.812 (0.692-0.958)	1.01 (0.856-1.20)	1.35 (1.12-1.62)	1.66 (1.33-2.02)	2.04 (1.59-2.52)	2.50 (1.87-3.16)	3.26 (2.29-4.25)	3.96 (2.66-5.28)
60-min	0.302 (0.256-0.347)	0.375 (0.318-0.438)	0.503 (0.428-0.592)	0.625 (0.530-0.741)	0.833 (0.691-1.00)	1.03 (0.826-1.25)	1.26 (0.981-1.56)	1.55 (1.16-1.95)	2.02 (1.42-2.63)	2.45 (1.65-3.27)
2-hr	0.201 (0.178-0.230)	0.249 (0.222-0.287)	0.320 (0.282-0.368)	0.382 (0.331-0.440)	0.478 (0.402-0.554)	0.564 (0.464-0.664)	0.664 (0.532-0.792)	0.794 (0.615-0.986)	1.04 (0.764-1.33)	1.27 (0.896-1.65)
3-hr	0.162 (0.145-0.183)	0.201 (0.182-0.228)	0.252 (0.226-0.285)	0.293 (0.260-0.332)	0.352 (0.307-0.401)	0.403 (0.346-0.466)	0.465 (0.391-0.545)	0.551 (0.453-0.662)	0.704 (0.561-0.893)	0.852 (0.657-1.11)
6-hr	0.116 (0.105-0.130)	0.146 (0.131-0.163)	0.180 (0.161-0.202)	0.206 (0.184-0.231)	0.240 (0.211-0.272)	0.265 (0.231-0.302)	0.291 (0.250-0.336)	0.323 (0.272-0.377)	0.384 (0.316-0.455)	0.448 (0.363-0.562)
12-hr	0.078 (0.070-0.087)	0.097 (0.088-0.109)	0.122 (0.110-0.137)	0.142 (0.126-0.158)	0.167 (0.147-0.189)	0.187 (0.163-0.212)	0.207 (0.177-0.238)	0.227 (0.191-0.264)	0.253 (0.207-0.301)	0.276 (0.221-0.333)
24-hr	0.050 (0.045-0.056)	0.063 (0.057-0.071)	0.080 (0.072-0.089)	0.094 (0.084-0.105)	0.113 (0.101-0.126)	0.128 (0.113-0.143)	0.144 (0.126-0.162)	0.161 (0.139-0.182)	0.184 (0.157-0.210)	0.202 (0.170-0.233)
2-day	0.030 (0.027-0.034)	0.038 (0.034-0.043)	0.049 (0.044-0.055)	0.058 (0.051-0.065)	0.070 (0.062-0.080)	0.080 (0.070-0.091)	0.091 (0.079-0.104)	0.102 (0.087-0.118)	0.118 (0.099-0.138)	0.131 (0.107-0.155)
3-day	0.022 (0.020-0.025)	0.028 (0.025-0.032)	0.036 (0.032-0.041)	0.043 (0.038-0.048)	0.052 (0.046-0.060)	0.060 (0.052-0.069)	0.069 (0.059-0.079)	0.078 (0.066-0.090)	0.090 (0.075-0.106)	0.101 (0.082-0.119)
4-day	0.018 (0.016-0.020)	0.023 (0.020-0.026)	0.030 (0.026-0.034)	0.035 (0.031-0.040)	0.044 (0.038-0.049)	0.050 (0.044-0.057)	0.057 (0.049-0.066)	0.065 (0.055-0.075)	0.076 (0.063-0.089)	0.086 (0.070-0.101)
7-day	0.012 (0.011-0.014)	0.015 (0.013-0.018)	0.020 (0.018-0.023)	0.024 (0.021-0.028)	0.030 (0.026-0.034)	0.034 (0.030-0.040)	0.039 (0.033-0.046)	0.045 (0.037-0.052)	0.052 (0.043-0.062)	0.058 (0.047-0.069)
10-day	0.009 (0.008-0.011)	0.012 (0.011-0.014)	0.016 (0.014-0.018)	0.019 (0.017-0.022)	0.024 (0.020-0.027)	0.027 (0.023-0.031)	0.031 (0.026-0.036)	0.034 (0.029-0.040)	0.040 (0.033-0.047)	0.044 (0.036-0.052)
20-day	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.010 (0.009-0.012)	0.012 (0.010-0.014)	0.015 (0.013-0.017)	0.017 (0.014-0.019)	0.019 (0.016-0.021)	0.021 (0.018-0.024)	0.024 (0.020-0.028)	0.026 (0.021-0.031)
30-day	0.005 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.009 (0.008-0.011)	0.011 (0.010-0.013)	0.013 (0.011-0.015)	0.014 (0.012-0.017)	0.016 (0.014-0.019)	0.018 (0.015-0.022)	0.020 (0.017-0.024)
45-day	0.004 (0.003-0.004)	0.005 (0.004-0.005)	0.006 (0.006-0.007)	0.007 (0.007-0.008)	0.009 (0.008-0.010)	0.010 (0.009-0.012)	0.011 (0.010-0.013)	0.012 (0.011-0.014)	0.014 (0.012-0.016)	0.015 (0.013-0.018)
60-day	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.008 (0.007-0.009)	0.009 (0.007-0.010)	0.009 (0.008-0.011)	0.010 (0.009-0.012)	0.011 (0.010-0.013)	0.012 (0.010-0.014)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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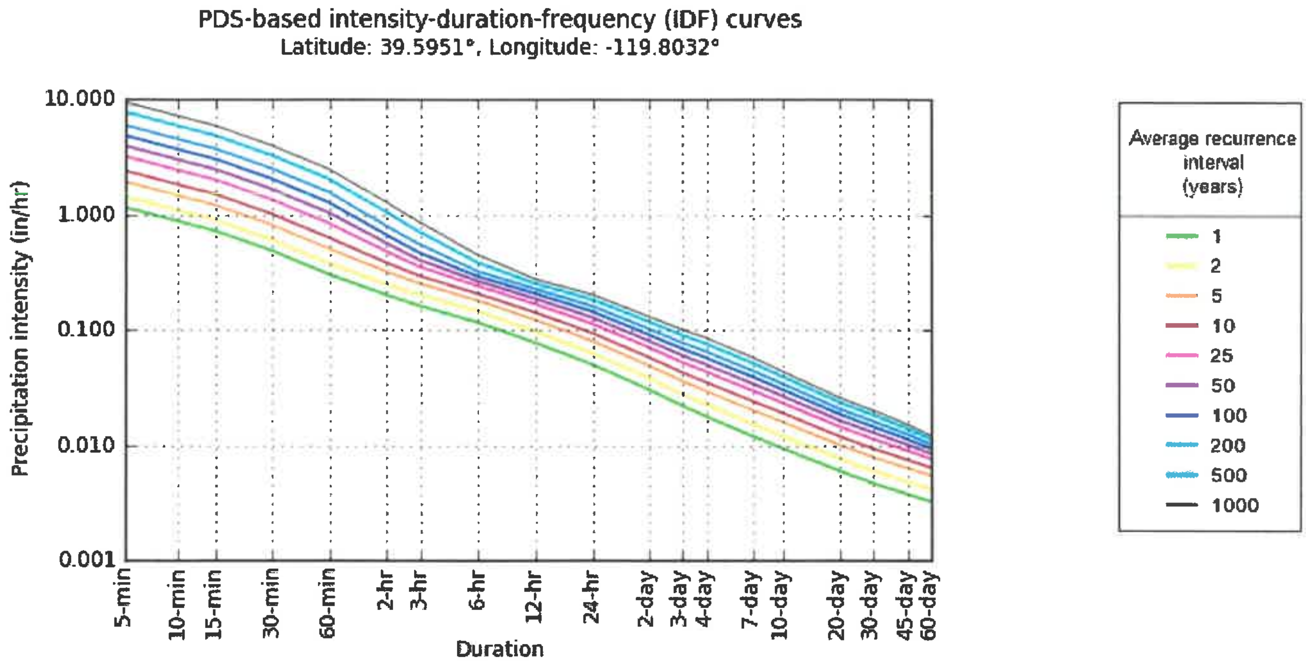
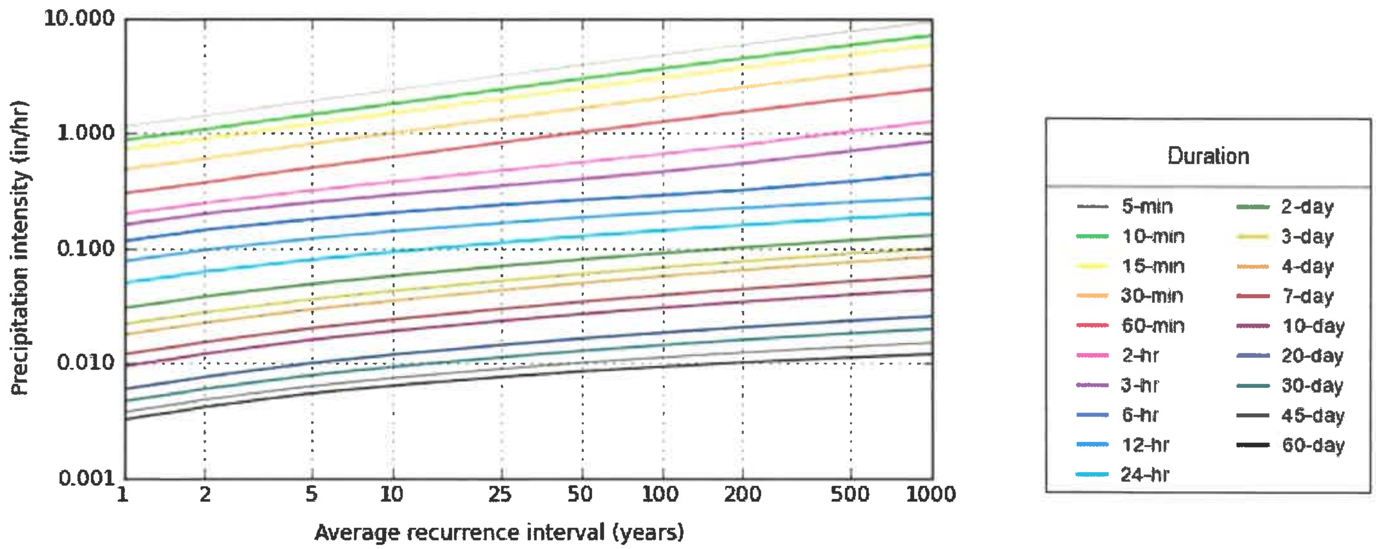
PF graphical





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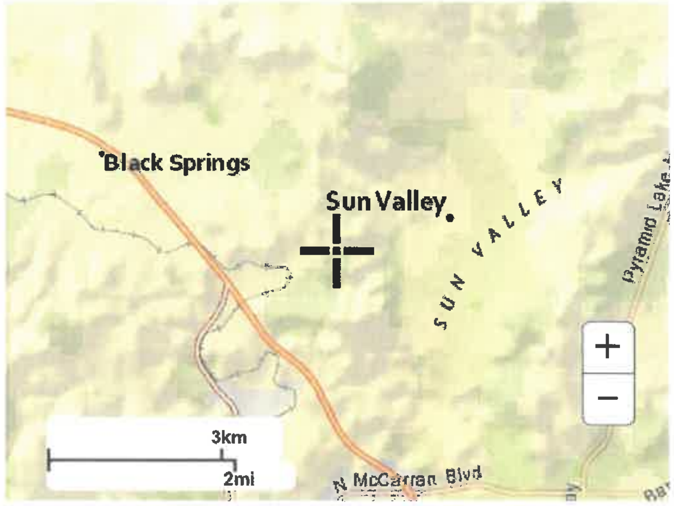
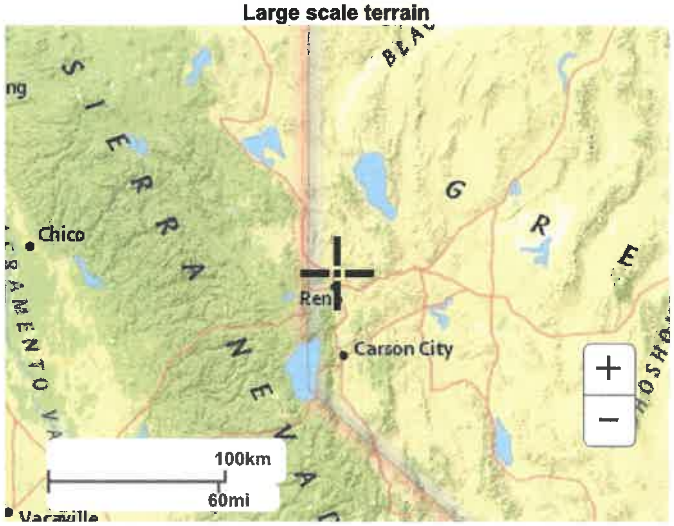
Maps & aerials

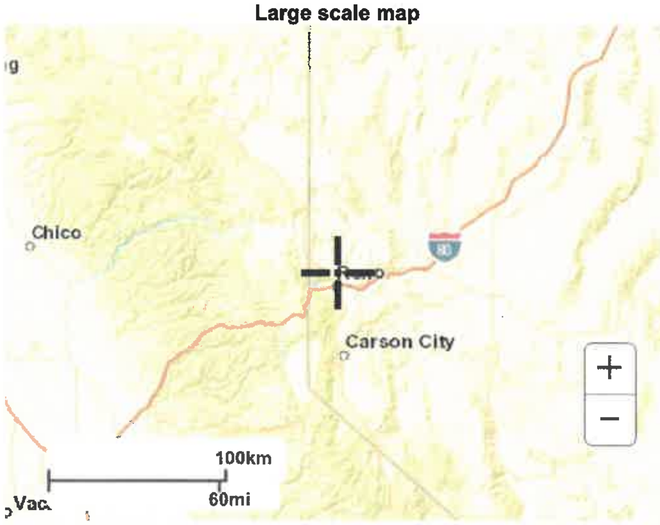
Small scale terrain



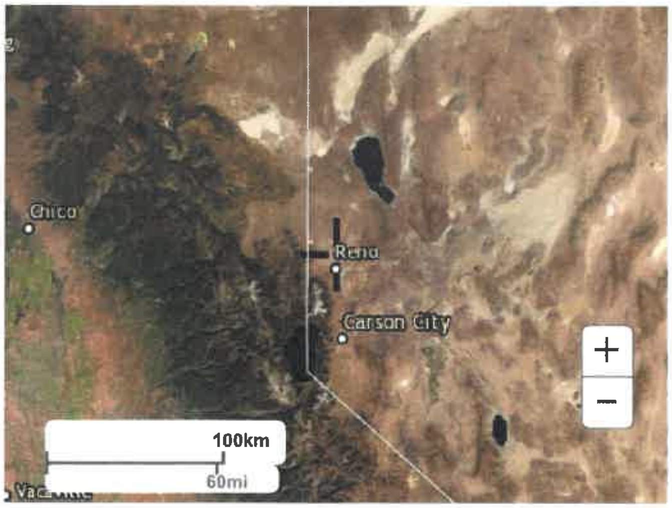
Large scale terrain



Large scale map



Large scale aerial



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Disclaimer

RATIONAL FORMULA METHOD
RUNOFF COEFFICIENTS

Land Use or Surface Characteristics	Aver. % Impervious Area	Runoff Coefficients 5-Year (C_5)	Runoff Coefficients 100-Year (C_{100})
Business/Commercial:			
Downtown Areas	85	.82	.85
Neighborhood Areas	70	.65	.80
Residential:			
(Average Lot Size)			
⅛ Acre or Less (Multi-Unit)	65	.60	.78
¼ Acre	38	.50	.65
⅓ Acre	30	.45	.60
½ Acre	25	.40	.55
1 Acre	20	.35	.50
Industrial:	72	.68	.82
Open Space:			
(Lawns, Parks, Golf Courses)	5	.05	.30
Undeveloped Areas:			
Range	0	.20	.50
Forest	0	.05	.30
Streets/Roads:			
Paved	100	.88	.93
Gravel	20	.25	.50
Drives/Walks:	95	.87	.90
Roof:	90	.85	.87

Notes:

1. Composite runoff coefficients shown for Residential, Industrial, and Business/Commercial Areas assume irrigated grass landscaping for all pervious areas. For development with landscaping other than irrigated grass, the designer must develop project specific composite runoff coefficients from the surface characteristics presented in this table.

VERSION: April 30, 2009	REFERENCE: USDCM, DROCOG, 1969 (with modifications)	TABLE 701
WRC ENGINEERING, INC.		

APPENDIX B

TABLES

TABLE 1. PEAK RUNOFF EXISTING CONDITION								
NAME	AREA [ac]	i5	i100	C5	C100	Q5 [cfs]	Q100 [cfs]	TO
X1	5.89	1.46	3.67	0.20	0.50	1.72	10.81	SOUTHEAST
X2	5.60	1.46	3.67	0.20	0.50	1.64	10.28	NORTHEAST
X3	4.32	1.46	3.67	0.20	0.50	1.26	7.93	EAST
X4	24.69	1.46	3.67	0.20	0.50	7.21	45.31	EAST
X5	0.55	1.46	3.67	0.20	0.50	0.16	1.01	NORTH
X6	3.90	1.46	3.67	0.20	0.50	1.14	7.16	WEST
							82.48	TOTAL FLOW

TABLE 2. PEAK RUNOFF PROPOSED CONDITION												
NAME	AREA [AC]	i5	i100	C5	C100	Q5 [cfs]	Q5 TOTAL [cfs]	Q5 str.cap [cfs]	Q100 [cfs]	Q100 TOTAL [cfs]	Q100 str.cap [cfs]	TO
A-1	0.30	1.46	3.67	0.50	0.65	0.22	0.42	1.87	0.71	1.25	9.81	EX.CB#5
A-2	0.16	1.46	3.67	0.88	0.93	0.21			0.55			
A-3	0.13	1.46	3.67	0.88	0.93	0.17	0.55	1.87	0.46	1.68	9.81	EX.CB#1
A-4	0.51	1.46	3.67	0.50	0.65	0.38			1.23			
A-5	0.41	1.46	3.67	0.50	0.65	0.30	0.59	1.87	0.98	1.75	9.81	CB#1
A-6	0.23	1.46	3.67	0.88	0.93	0.29			0.78			
A-7	0.26	1.46	3.67	0.88	0.93	0.34	0.92	1.87	0.89	2.80	9.81	CB#2
A-8	0.80	1.46	3.67	0.50	0.65	0.58			1.91			
A-9	0.19	1.46	3.67	0.50	0.65	0.14	0.32	1.87	0.45	0.93	9.81	CB#3
A-10	0.14	1.46	3.67	0.88	0.93	0.18			0.48			
A-11	0.12	1.46	3.67	0.88	0.93	0.16	0.42	1.87	0.41	1.27	9.81	CB#4
A-12	0.36	1.46	3.67	0.50	0.65	0.26			0.85			
A-13	0.22	1.46	3.67	0.50	0.65	0.16	0.37	1.87	0.54	1.07	9.81	CB#3
A-14	0.16	1.46	3.67	0.88	0.93	0.20			0.54			
A-15	0.11	1.46	3.67	0.88	0.93	0.14	0.35	1.87	0.36	1.07	9.81	CB#4
A-16	0.30	1.46	3.67	0.50	0.65	0.22			0.71			
A-17	0.38	1.46	3.67	0.50	0.65	0.28	0.60	3.41	0.91	1.76	13.61	CB#3A
A-18	0.25	1.46	3.67	0.88	0.93	0.32			0.84			
A-19	0.20	1.46	3.67	0.88	0.93	0.25	0.80	3.41	0.67	2.46	13.61	CB#4A
A-20	0.75	1.46	3.67	0.50	0.65	0.55			1.79			
A-21	0.48	1.46	3.67	0.50	0.65	0.35	0.62	2.12	1.15	1.87	11.11	CB#5
A-22	0.21	1.46	3.67	0.88	0.93	0.27			0.72			
A-23	0.42	1.46	3.67	0.50	0.65	0.31	0.55	2.12	1.01	1.64	11.11	CB#5A
A-24	0.19	1.46	3.67	0.88	0.93	0.24			0.63			
A-25	0.29	1.46	3.67	0.88	0.93	0.37	1.10	2.12	0.98	3.37	11.11	CB#6
A-26	1.00	1.46	3.67	0.50	0.65	0.73			2.39			
A-27	0.28	1.46	3.67	0.88	0.93	0.37	0.88	2.12	0.97	2.66	11.11	CB#6A
A-28	0.71	1.46	3.67	0.50	0.65	0.52			1.69			
A-29	2.28	1.46	3.67	0.50	0.65	1.67	1.67	N/A	5.44	5.44	N/A	DITCH
A-30	2.59	1.46	3.67	0.50	0.65	1.89	1.89	N/A	6.18	6.18	N/A	DITCH
B-1	0.51	1.46	3.67	0.50	0.65	0.37	0.68	2.96	1.21	2.02	13.3	CB#7
B-2	0.24	1.46	3.67	0.88	0.93	0.31			0.81			
B-3	0.31	1.46	3.67	0.88	0.93	0.40	1.06	2.96	1.07	3.23	13.3	CB#8
B-4	0.90	1.46	3.67	0.50	0.65	0.66			2.16			
B-5	0.31	1.46	3.67	0.50	0.65	0.23	0.72	2.41	0.74	2.06	10.86	CB#9
B-6	0.39	1.46	3.67	0.88	0.93	0.50			1.32			
B-7	0.37	1.46	3.67	0.88	0.93	0.47	1.31	2.41	1.25	3.98	10.86	CB#10
B-8	1.14	1.46	3.67	0.50	0.65	0.83			2.73			
B-9	4.11	1.46	3.67	0.50	0.65	3.00	3.00	N/A	9.80	9.80	N/A	DITCH
C-1	0.48	1.46	3.67	0.50	0.65	0.35	0.73	3.41	1.14	2.16	15.36	CB#11
C-2	0.30	1.46	3.67	0.88	0.93	0.38			1.02			
C-3	0.32	1.46	3.67	0.88	0.93	0.41	0.83	3.41	1.09	2.47	15.36	CB#12
C-4	0.58	1.46	3.67	0.50	0.65	0.42			1.39			
C-5	0.35	1.46	3.67	0.50	0.65	0.25	0.51	3.41	0.82	1.52	15.36	CB #13
C-6	0.20	1.46	3.67	0.88	0.93	0.26			0.69			
C-7	0.21	1.46	3.67	0.88	0.93	0.27	0.55	3.41	0.71	1.62	15.36	CB#14
C-8	0.38	1.46	3.67	0.50	0.65	0.28			0.91			
C-9	0.11	1.46	3.67	0.50	0.65	0.08	0.14	3.41	0.27	0.43	15.36	EX.CB#13
C-10	0.05	1.46	3.67	0.88	0.93	0.06			0.17			
C-11	0.04	1.46	3.67	0.88	0.93	0.05	0.12	3.41	0.14	0.37	15.36	EX.CB#14
C-12	0.09	1.46	3.67	0.50	0.65	0.07			0.23			
C-13	7.86	1.46	3.67	0.50	0.65	5.74	5.74	N/A	18.75	18.75	N/A	POND
C-14	2.36	1.46	3.67	0.50	0.65	1.72	1.72	N/A	5.63	5.63	N/A	DITCH
D-1	0.20	1.46	3.67	0.50	0.65	0.15	0.52	4.83	0.48	1.47	21.72	CB#15
D-2	0.29	1.46	3.67	0.88	0.93	0.37			0.99			
D-3	0.27	1.46	3.67	0.88	0.93	0.34	1.03	4.83	0.91	3.15	21.72	CB#16
D-4	0.94	1.46	3.67	0.50	0.65	0.69			2.24			
D-5	0.46	1.46	3.67	0.5	0.65	0.33	0.90	5.66	1.09	2.586988	25.47	CB#18A
D-6	0.44	1.46	3.67	0.88	0.93	0.56			1.50			
D-7	0.90	1.46	3.67	0.5	0.65	0.66	0.91	5.66	2.15	2.824052	25.47	CB#17
D-8	0.20	1.46	3.67	0.88	0.93	0.25			0.67			
D-9	0.87	1.46	3.67	0.5	0.65	0.64	0.96	5.66	2.08	2.932593	25.47	CB#18
D-10	0.25	1.46	3.67	0.88	0.93	0.32			0.85			
D-11	0.45	1.46	3.67	0.5	0.65	0.33	0.50	3.75	1.08	1.534761	16.9	CB#18A
D-12	0.13	1.46	3.67	0.88	0.93	0.17			0.45			
D-13	0.50	1.46	3.67	0.5	0.65	0.36	0.47	3.75	1.18	1.624972	16.9	CB#18
D-14	0.13	1.46	3.67	0.55	0.93	0.10			0.44			
D-15	0.90	1.46	3.67	0.5	0.65	0.65	0.80	3.75	2.14	2.619834	16.9	CB#19
D-16	0.20	1.46	3.67	0.5	0.65	0.15			0.48			
D-17	0.78	1.46	3.67	0.5	0.65	0.57	0.82	3.75	1.86	2.52262	16.9	CB#20
D-18	0.19	1.46	3.67	0.88	0.93	0.25			0.66			
E-1	1.02	1.46	3.67	0.50	0.65	0.74	1.22	3.41	2.43	3.70	15.36	CB#21
E-2	0.37	1.46	3.67	0.88	0.93	0.48			1.26			
E-3	0.41	1.46	3.67	0.88	0.93	0.53	1.47	3.41	1.41	4.48	15.36	CB#22
E-4	1.28	1.46	3.67	0.50	0.65	0.94			3.06			
E-5	0.58	1.46	3.67	0.50	0.65	0.42	0.79	3.41	1.38	2.36	15.36	CB#23
E-6	0.29	1.46	3.67	0.88	0.93	0.37			0.98			
E-7	0.33	1.46	3.67	0.88	0.93	0.42	1.23	3.41	1.12	3.78	15.36	CB#24
E-8	1.11	1.46	3.67	0.50	0.65	0.81			2.65			
E-9	0.48	1.46	3.67	0.50	0.65	0.35	0.67	3.41	1.14	1.98	10.86	CB#25
E-10	0.25	1.46	3.67	0.88	0.93	0.32			0.84			
E-11	0.14	1.46	3.67	0.88	0.93	0.17	0.53	3.41	0.46	1.61	10.86	CB#26
E-12	0.48	1.46	3.67	0.50	0.65	0.35			1.15			
E-13	0.52	1.46	3.67	0.50	0.65	0.38	0.77	2.41	1.25	2.28	10.86	CB#27
E-14.	0.30	1.46	3.67	0.88	0.93	0.39			1.03			
E-15	0.28	1.46	3.67	0.88	0.93	0.36	0.98	2.41	0.97	2.01	10.86	CB#26
E-16	0.84	1.46	3.67	0.50	0.65	0.61			2.01			
E-17	4.62	1.46	3.67	0.50	0.65	3.37	3.37	N/A	11.03	11.03	N/A	DITCH
F-1	0.05	1.46	3.67	0.50	0.65	0.04	0.04	N/A	0.13	0.13	N/A	DITCH
F-2	0.06	1.46	3.67	0.50	0.65	0.04	0.04	N/A	0.13	0.13	N/A	DITCH
OFF-1	5.64	1.46	3.67	0.20	0.50	1.65	1.65	N/A	10.34	10.34	N/A	DITCH
OFF-2	2.29	1.46	3.67	0.20	0.50	0.67	0.67	N/A	4.20	4.20	N/A	DITCH
OFF-3	0.62	1.46	3.67	0.20	0.50	0.18	0.18	N/A	1.14	1.14	N/A	CB#29
Total Peak Runoff Proposed Condition:									157.33			

TABLE 3. CATCH BASIN CAPACITIES									
CB#	TYPE	Q5 [cfs]	Q5cap [cfs]	Q100 [cfs]	Q100cap [cfs]	Overflow Q5 [cfs]	Overflow to	Overflow Q100 [cfs]	Overflow to
EX. CB#1	SUMP	2.07	3.58	6.68	4.89	0	N/A	1.80	N/A
EX. CB#5	SUMP	0.59	3.58	1.80	4.89	0	N/A	0	N/A
EX.CB#13	SUMP	0.86	3.58	3.99	4.89	0	N/A	0	N/A
EX. CB#14	SUMP	0.78	3.58	2.86	4.89	0	N/A	0	N/A
CB# 1	S=1.56%	0.59	0.53	1.75	1.17	0.06	CB#3	0.58	CB#3
CB# 2	S=1.56%	0.92	0.74	2.80	1.62	0.18	CB#4	1.18	CB#4
CB# 3	SUMP	0.78	3.58	2.03	4.89	0	N/A	0	N/A
CB# 4	SUMP	1.17	3.58	5.82	4.89	0	N/A	0.93	N/A
CB#3A	S=3%	0.60	0.56	1.76	1.24	0.04	CB#3	0.52	CB#3
CB#4A	S=3%	1.11	0.9	4.68	2.38	0.21	CB#4	2.30	CB#4
CB# 5	SUMP	0.62	3.58	1.87	4.89	0	N/A	0	N/A
CB# 5A	S=2%	0.55	0.51	1.64	1.14	0.04	CB#16	0.50	CB#16
CB# 6	S=2%	1.25	0.94	4.45	2.23	0.31	CB#4A	2.22	CB#4A
CB#6A	S=2%	0.88	0.73	2.66	1.59	0.15	CB#6	1.07	CB#6
CB# 7	SUMP	0.80	3.58	2.79	4.89	0	N/A	0	N/A
CB# 8	SUMP	1.44	3.58	5.16	4.89	0	N/A	0.28	N/A
CB# 9	S=1%	0.72	0.60	2.06	1.29	0.12	CB#7	0.77	CB#7
CB# 10	S=1%	1.31	0.93	3.98	2.04	0.38	CB#8	1.94	CB#8
CB# 11	S=2%	0.73	0.63	2.16	1.38	0.10	CB#13	0.78	CB#13
CB# 12	S=2%	0.83	0.70	2.47	1.51	0.13	CB#14	0.96	CB#14
CB#13	S=4%	0.51	0.50	1.52	1.16	0.01	N/A	0.36	EX.CB#13
CB#14	S=4%	0.55	0.53	1.62	1.21	0.02	N/A	0.41	EX.CB#14
CB#15	S=4%	0.52	0.51	1.47	1.13	0.01	CB#18	0.34	CB#18
CB#16	S=4%	1.07	0.90	3.65	2.08	0.17	CB#17	1.57	CB#17
CB#17	S=4%	1.08	0.91	4.40	2.35	0.17	CB#18	2.05	CB#18
CB#18	SUMP	1.77	3.58	9.07	4.89	0	N/A	4.18	POND
CB#18A	SUMP	1.56	3.58	5.66	4.89	0	N/A	0.77	POND
CB#19	S=2.42%	0.90	0.75	3.45	1.91	0.15	CB#18A	1.54	CB#18A
CB#20	S=2.42%	0.96	0.79	4.34	2.22	0.17	CB#18	2.12	CB#18
CB#21	S=4%	1.22	0.99	3.70	2.10	0.23	CB#23	1.60	CB#23
CB#22	S=4%	1.47	1.13	4.48	2.37	0.34	CB#24	2.11	CB#24
CB#23	S=2%	1.02	0.81	3.95	2.06	0.21	CB#25	1.89	CB#25
CB#24	S=2%	1.57	1.11	5.88	2.67	0.46	CB#26	3.21	CB#26
CB#25	S=2.42%	0.88	0.74	3.88	2.06	0.14	CB#20	1.82	CB#20
CB#26	SUMP	1.97	3.58	6.84	4.89	0	N/A	1.95	N/A
CB#27	S=2.42%	0.77	0.67	2.28	1.45	0.10	CB#19	0.83	CB#19
CB#28	SUMP	0.22	3.58	1.26	4.89	0	N/A	0	N/A
CB#29	SUMP	0.04	3.58	0.13	4.89	0	N/A	0	N/A

CB#1 5 YEAR CAPACITY S=1.56%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.59
Slope	0.0156
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	89.02
Intercepted Flow	0.53
Bypass Flow	0.06
Spread	4.2
Depth	2.1
Flow Area	0.2
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.42
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.254
Grate Flow Ratio	0.853
Active Grate Length	3.0

CB#1 100 YEAR CAPACITY S=1.56%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.75
Slope	0.1560
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	83.86
Intercepted Flow	1.47
Bypass Flow	0.28
Spread	4.0
Depth	2.1
Flow Area	0.2
Gutter Depression	0.09
Total Depression	0.09
Velocity	7.59
Splash Over Velocity	7.15
Frontal Flow Factor	0.960
Side Flow Factor	0.042
Grate Flow Ratio	0.868
Active Grate Length	3.0

CB#2 5 YEAR CAPACITY S=1.56%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.92
Slope	0.0156
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	80.20
Intercepted Flow	0.74
Bypass Flow	0.18
Spread	5.4
Depth	2.4
Flow Area	0.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.55
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.236
Grate Flow Ratio	0.741
Active Grate Length	3.0

CB#2 100 YEAR CAPACITY S=1.56%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.80
Slope	0.0156
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	57.79
Intercepted Flow	1.62
Bypass Flow	1.18
Spread	9.1
Depth	3.3
Flow Area	0.9
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.10
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.178
Grate Flow Ratio	0.486
Active Grate Length	3.0

CB#3 5 YEAR CAPACTIY S=3.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.57
Slope	0.0300
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	94.43
Intercepted Flow	0.54
Bypass Flow	0.03
Spread	3.2
Depth	1.9
Flow Area	0.2
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.25
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.167
Grate Flow Ratio	0.933
Active Grate Length	3.0

CB# 3A YEAR CAPACITY S=3.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.60
Slope	0.0300
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	93.57
Intercepted Flow	0.56
Bypass Flow	0.04
Spread	3.4
Depth	1.9
Flow Area	0.2
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.26
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.166
Grate Flow Ratio	0.923
Active Grate Length	3.0

CB#3A 100 YEAR CAPACITY S=3.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.76
Slope	0.0300
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	70.66
Intercepted Flow	1.24
Bypass Flow	0.52
Spread	6.3
Depth	2.7
Flow Area	0.5
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.71
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.136
Grate Flow Ratio	0.660
Active Grate Length	3.0

CB#4A 5 YEAR CAPACITY S=3.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.11
Slope	0.0300
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	81.00
Intercepted Flow	0.90
Bypass Flow	0.21
Spread	5.0
Depth	2.3
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.47
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.151
Grate Flow Ratio	0.776
Active Grate Length	3.0

CB#4A 100 YEAR CAPACITY S=3.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	4.70
Slope	0.0300
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	50.57
Intercepted Flow	2.38
Bypass Flow	2.32
Spread	9.9
Depth	3.5
Flow Area	1.0
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.48
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.101
Grate Flow Ratio	0.450
Active Grate Length	3.0

CB#5A 5 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.55
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	92.05
Intercepted Flow	0.51
Bypass Flow	0.04
Spread	3.7
Depth	2.0
Flow Area	0.2
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.69
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.220
Grate Flow Ratio	0.898
Active Grate Length	3.0

CB#5A 100 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.37
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	73.34
Intercepted Flow	1.00
Bypass Flow	0.37
Spread	6.2
Depth	2.6
Flow Area	0.5
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.01
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.187
Grate Flow Ratio	0.672
Active Grate Length	3.0

CB#6 5 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.24
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	75.48
Intercepted Flow	0.94
Bypass Flow	0.30
Spread	5.9
Depth	2.6
Flow Area	0.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.96
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.191
Grate Flow Ratio	0.697
Active Grate Length	3.0

CB#6 100 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	4.45
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	50.04
Intercepted Flow	2.23
Bypass Flow	2.22
Spread	10.5
Depth	3.7
Flow Area	1.2
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.77
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.132
Grate Flow Ratio	0.424
Active Grate Length	3.0

CB#6A 5 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.88
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	82.81
Intercepted Flow	0.73
Bypass Flow	0.15
Spread	4.9
Depth	2.3
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.82
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.205
Grate Flow Ratio	0.784
Active Grate Length	3.0

CB#6A 100 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.66
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	59.61
Intercepted Flow	1.59
Bypass Flow	1.07
Spread	8.4
Depth	3.2
Flow Area	0.8
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.39
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.156
Grate Flow Ratio	0.521
Active Grate Length	3.0

CB#9 5 YEAR CAPACITY S=1.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.72
Slope	0.0100
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	82.70
Intercepted Flow	0.60
Bypass Flow	0.12
Spread	5.3
Depth	2.4
Flow Area	0.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.03
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.317
Grate Flow Ratio	0.747
Active Grate Length	3.0

CB#9 100 YEAR CAPACITY S=1.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.06
Slope	0.0100
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	62.74
Intercepted Flow	1.29
Bypass Flow	0.77
Spread	8.8
Depth	3.2
Flow Area	0.8
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.44
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.251
Grate Flow Ratio	0.503
Active Grate Length	3.0

CB#10 5 YEAR CAPACITY S=1.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.31
Slope	0.0100
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	71.26
Intercepted Flow	0.93
Bypass Flow	0.38
Spread	7.2
Depth	2.9
Flow Area	0.6
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.24
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.281
Grate Flow Ratio	0.600
Active Grate Length	3.0

CB#10 100 YEAR CAPACITY S=1.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.98
Slope	0.0100
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	51.22
Intercepted Flow	2.04
Bypass Flow	1.94
Spread	11.6
Depth	3.9
Flow Area	1.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.81
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.206
Grate Flow Ratio	0.385
Active Grate Length	3.0

CB#11 5 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.73
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	86.66
Intercepted Flow	0.63
Bypass Flow	0.10
Spread	4.4
Depth	2.2
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.76
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.211
Grate Flow Ratio	0.831
Active Grate Length	3.0

CB#11 100 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.16
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	63.78
Intercepted Flow	1.38
Bypass Flow	0.78
Spread	7.7
Depth	3.0
Flow Area	0.7
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.26
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.166
Grate Flow Ratio	0.566
Active Grate Length	3.0

CB#12 5 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.84
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	83.78
Intercepted Flow	0.70
Bypass Flow	0.14
Spread	4.8
Depth	2.3
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.81
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.207
Grate Flow Ratio	0.796
Active Grate Length	3.0

CB#12 100 YEAR CAPACITY S=2.0%

Project Description

Solve For	Efficiency

Input Data

Discharge	2.47
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options

Grate Flow Option	Exclude None

Results

Efficiency	61.08
Intercepted Flow	1.51
Bypass Flow	0.96
Spread	8.2
Depth	3.1
Flow Area	0.7
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.34
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.160
Grate Flow Ratio	0.537
Active Grate Length	3.0

CB#13 5 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.51
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	97.82
Intercepted Flow	0.50
Bypass Flow	0.01
Spread	2.6
Depth	1.8
Flow Area	0.1
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.69
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.137
Grate Flow Ratio	0.975
Active Grate Length	3.0

CB#13 100 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.52
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	76.39
Intercepted Flow	1.16
Bypass Flow	0.36
Spread	5.5
Depth	2.5
Flow Area	0.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.10
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.116
Grate Flow Ratio	0.733
Active Grate Length	3.0

CB#14 5 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.55
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	96.91
Intercepted Flow	0.53
Bypass Flow	0.02
Spread	2.8
Depth	1.8
Flow Area	0.1
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.71
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.136
Grate Flow Ratio	0.964
Active Grate Length	3.0

CB#14 100 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.62
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	74.92
Intercepted Flow	1.21
Bypass Flow	0.41
Spread	5.7
Depth	2.5
Flow Area	0.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.14
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.115
Grate Flow Ratio	0.717
Active Grate Length	3.0

CB#15 5 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.52
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	97.60
Intercepted Flow	0.51
Bypass Flow	0.01
Spread	2.6
Depth	1.8
Flow Area	0.1
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.69
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.137
Grate Flow Ratio	0.972
Active Grate Length	3.0

CB#15 100 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.47
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	77.16
Intercepted Flow	1.13
Bypass Flow	0.34
Spread	5.4
Depth	2.4
Flow Area	0.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.08
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.117
Grate Flow Ratio	0.741
Active Grate Length	3.0

CB#16 5 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.07
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	84.42
Intercepted Flow	0.90
Bypass Flow	0.17
Spread	4.5
Depth	2.2
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.92
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.125
Grate Flow Ratio	0.822
Active Grate Length	3.0

CB#16 100 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.65
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	57.06
Intercepted Flow	2.08
Bypass Flow	1.57
Spread	8.3
Depth	3.1
Flow Area	0.8
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.77
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.091
Grate Flow Ratio	0.528
Active Grate Length	3.0

CB#17 5 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.08
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	84.21
Intercepted Flow	0.91
Bypass Flow	0.17
Spread	4.5
Depth	2.2
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.92
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.125
Grate Flow Ratio	0.820
Active Grate Length	3.0

CB#17 100 YEAR CAPACITY S=4.0%

Project Description

Solve For	Efficiency

Input Data

Discharge	4.40
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options

Grate Flow Option	Exclude None

Results

Efficiency	53.35
Intercepted Flow	2.35
Bypass Flow	2.05
Spread	9.0
Depth	3.3
Flow Area	0.9
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.95
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.086
Grate Flow Ratio	0.490
Active Grate Length	3.0

CB#19 5 YEAR CAPACITY S=2.42%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.90
Slope	0.0242
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	83.80
Intercepted Flow	0.75
Bypass Flow	0.15
Spread	4.7
Depth	2.3
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.08
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.181
Grate Flow Ratio	0.802
Active Grate Length	3.0

CB#19 100 YEAR CAPACITY S=2.42%

Project Description

Solve For	Efficiency

Input Data

Discharge	3.45
Slope	0.0242
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options

Grate Flow Option	Exclude None

Results

Efficiency	55.38
Intercepted Flow	1.91
Bypass Flow	1.54
Spread	9.1
Depth	3.3
Flow Area	0.9
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.86
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.128
Grate Flow Ratio	0.488
Active Grate Length	3.0

CB#20 5 YEAR CAPACITY S=2.42%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.96
Slope	0.0242
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	82.41
Intercepted Flow	0.79
Bypass Flow	0.17
Spread	4.9
Depth	2.3
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.10
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.179
Grate Flow Ratio	0.786
Active Grate Length	3.0

CB#20 100 YEAR CAPACITY S=2.42%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	4.34
Slope	0.0242
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	51.11
Intercepted Flow	2.22
Bypass Flow	2.12
Spread	10.0
Depth	3.5
Flow Area	1.1
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.05
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.119
Grate Flow Ratio	0.445
Active Grate Length	3.0

CB#21 5 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.22
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	81.45
Intercepted Flow	0.99
Bypass Flow	0.23
Spread	4.9
Depth	2.3
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.98
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.122
Grate Flow Ratio	0.789
Active Grate Length	3.0

CB#21 100 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	3.70
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	56.79
Intercepted Flow	2.10
Bypass Flow	1.60
Spread	8.4
Depth	3.2
Flow Area	0.8
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.78
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.091
Grate Flow Ratio	0.525
Active Grate Length	3.0

CB#22 5 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.47
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	77.16
Intercepted Flow	1.13
Bypass Flow	0.34
Spread	5.4
Depth	2.4
Flow Area	0.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.08
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.117
Grate Flow Ratio	0.741
Active Grate Length	3.0

CB#22 100 YEAR CAPACITY S=4.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	4.48
Slope	0.0400
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	53.01
Intercepted Flow	2.37
Bypass Flow	2.11
Spread	9.1
Depth	3.3
Flow Area	0.9
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.97
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.085
Grate Flow Ratio	0.486
Active Grate Length	3.0

CB#23 5 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.02
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	79.67
Intercepted Flow	0.81
Bypass Flow	0.21
Spread	5.3
Depth	2.4
Flow Area	0.4
Gutter Depression	0.09
Total Depression	0.09
Velocity	2.88
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.199
Grate Flow Ratio	0.746
Active Grate Length	3.0

CB#23 100 YEAR CAPACITY S=2.0%

Project Description

Solve For	Efficiency

Input Data

Discharge	3.95
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options

Grate Flow Option	Exclude None

Results

Efficiency	52.15
Intercepted Flow	2.06
Bypass Flow	1.89
Spread	10.0
Depth	3.5
Flow Area	1.1
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.68
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.138
Grate Flow Ratio	0.445
Active Grate Length	3.0

CB#24 5 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	1.57
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	70.43
Intercepted Flow	1.11
Bypass Flow	0.46
Spread	6.6
Depth	2.7
Flow Area	0.5
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.08
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.181
Grate Flow Ratio	0.639
Active Grate Length	3.0

CB#24 100 YEAR CAPACITY S=2.0%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	5.88
Slope	0.0200
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	45.34
Intercepted Flow	2.67
Bypass Flow	3.21
Spread	11.8
Depth	4.0
Flow Area	1.5
Gutter Depression	0.09
Total Depression	0.09
Velocity	4.01
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.120
Grate Flow Ratio	0.379
Active Grate Length	3.0

CB#25 5 YEAR CAPACITY S=2.42%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.88
Slope	0.0242
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	84.28
Intercepted Flow	0.74
Bypass Flow	0.14
Spread	4.6
Depth	2.3
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.07
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.182
Grate Flow Ratio	0.808
Active Grate Length	3.0

CB#25 100 YEAR CAPACITY S=2.42%

Project Description

Solve For	Efficiency

Input Data

Discharge	3.88
Slope	0.0242
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options

Grate Flow Option	Exclude None

Results

Efficiency	53.17
Intercepted Flow	2.06
Bypass Flow	1.82
Spread	9.5
Depth	3.4
Flow Area	1.0
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.95
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.123
Grate Flow Ratio	0.466
Active Grate Length	3.0

CB#27 5 YEAR CAPACITY S=2.42%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.77
Slope	0.0242
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	87.07
Intercepted Flow	0.67
Bypass Flow	0.10
Spread	4.3
Depth	2.2
Flow Area	0.3
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.02
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.185
Grate Flow Ratio	0.841
Active Grate Length	3.0

CB#27 100 YEAR CAPACITY S=2.42%

Project Description	
Solve For	Efficiency

Input Data	
Discharge	2.28
Slope	0.0242
Gutter Width	1.50
Gutter Cross Slope	0.0833
Road Cross Slope	0.0200
Roughness Coefficient	0.016
Grate Width	1.50
Grate Length	3.0
Grate Type	Curved Vaned
Clogging	0.0

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	63.66
Intercepted Flow	1.45
Bypass Flow	0.83
Spread	7.5
Depth	3.0
Flow Area	0.6
Gutter Depression	0.09
Total Depression	0.09
Velocity	3.56
Splash Over Velocity	7.15
Frontal Flow Factor	1.000
Side Flow Factor	0.145
Grate Flow Ratio	0.575
Active Grate Length	3.0

CB # 3,4,5,7,8,18,18A,26,28,29

5 YEAR GRATE

SUMP: Qi=Cw*Lw*d^1.5

WEIR

Qi=INLET CAPACITY IN CFS				Qi=	2.39
Cw=WEIR DISCHARGE COEFFICIENT				Cw=	3
Lw=WEIR LENGTH IN FT				Lw=	6
d=FLOW DEPTH IN FT				d=	0.26
Lw=L+2W		Lw=	6		
L=LENGTH OF GRATE		L=	3		
W=WIDTH OF GRATE		W=	1.5		
d<1.79(Ao/Lw)		d=	0.26		
	1.79(Ao/Lw)=		0.63	GOOD	
		Ao=	2.1		
5 YEAR WEIR=		3.58	CFS		

ORIFICE

d>1.79(Ao/Lw)					
Qi=INLET CAPACITY IN CFS				Qi=	5.76
Co=ORIFICE DISCHARGE COEFFICIENT				Co=	0.67
Ao=ORIFICE AREA IN FT^2				Ao=	2.1
d=FLOW DEPTH IN FT				d=	0.26
g=GRAVITY				g=	32.2
d=	0.26				
Ao=	2.1				
5 YEAR ORIFICE=		8.50	CFS		

Qi=	3.58	CFS

5 YEAR CURB OPENING

WEIR

Qi=INLET CAPACITY IN CFS				Qi=	1.19
Cw=WEIR DISCHARGE COEFFICIENT				Cw=	3
Lw=WEIR LENGTH IN FT				Lw=	3
d=FLOW DEPTH IN FT				d=	0.26
Lw=L+1.8W<12<=L		Lw=	3		
L=LENGTH OF CURB		L=	3		
W=WIDTH OF CURB		W=	1.5		
H=HEIGTH OF CURB		H=	0.33		
d<h		d=	0.26		
	h=		0.67	GOOD	
		Ao=	1		

ORIFICE

d>1.79(Ao/Lw)					
Qi=INLET CAPACITY IN CFS				Qi=	2.74
Co=ORIFICE DISCHARGE COEFFICIENT				Co=	0.67
Ao=ORIFICE AREA IN FT^2				Ao=	1
d=FLOW DEPTH IN FT				d=	0.26
g=GRAVITY				g=	32.2
d=	0.26				
Ao=	1				

CB # 3,4,5,7,8,18,18A,26,28,29

100 YEAR GRATE

SUMP: Qi=Cw*Lw*d^1.5

WEIR

Qi=INLET CAPACITY IN CFS				Qi=	3.26
Cw=WEIR DISCHARGE COEFFICIENT				Cw=	3
Lw=WEIR LENGTH IN FT				Lw=	6
d=FLOW DEPTH IN FT				d=	0.32
Lw=L+2W		Lw=	6		
L=LENGTH OF GRATE		L=	3		
W=WIDTH OF GRATE		W=	1.5		
d<1.79(Ao/Lw)		d=	0.32		
	1.79(Ao/Lw)=		0.63	GOOD	
		Ao=	2.1		

100 YEAR WEIR= 4.89 CFS

ORIFICE

d>1.79(Ao/Lw)					
Qi=INLET CAPACITY IN CFS				Qi=	6.39
Co=ORIFICE DISCHARGE COEFFICIENT				Co=	0.67
Ao=ORIFICE AREA IN FT^2				Ao=	2.1
d=FLOW DEPTH IN FT				d=	0.32
g=GRAVITY				g=	32.2
d=	0.32				
Ao=	2.1				
100 YEAR ORIFICE=		9.43	CFS		

Qi= 4.89 CFS

100 YEAR CURB OPENING

WEIR

Qi=INLET CAPACITY IN CFS				Qi=	1.63
Cw=WEIR DISCHARGE COEFFICIENT				Cw=	3
Lw=WEIR LENGTH IN FT				Lw=	3
d=FLOW DEPTH IN FT				d=	0.32
Lw=L+1.8W<12<=L		Lw=	3		
L=LENGTH OF CURB		L=	3		
W=WIDTH OF CURB		W=	1.5		
H=HEIGTH OF CURB		H=	0.33		
d<h		d=	0.32		
	h=		0.67	GOOD	
		Ao=	1		

ORIFICE

d>1.79(Ao/Lw)					
Qi=INLET CAPACITY IN CFS				Qi=	3.04
Co=ORIFICE DISCHARGE COEFFICIENT				Co=	0.67
Ao=ORIFICE AREA IN FT^2				Ao=	1
d=FLOW DEPTH IN FT				d=	0.32
g=GRAVITY				g=	32.2
d=	0.32				
Ao=	1				

<u>APPENDIX C</u>

5 YEAR AND 100 YEAR STREET CAPACITY CALCULATIONS

COLLECTOR STREET CAPACITY 5-YEAR STORM S=1.56%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.0156
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.17
0+02.00	0.22
0+20.50	0.54

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+20.50, 0.54)	0.016

Options

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

Results

Discharge	1.87
Elevation Range	0.00 to 0.54 ft
Flow Area	0.80
Wetted Perimeter	8.84
Hydraulic Radius	1.1
Top Width	8.44
Normal Depth	4.1
Critical Depth	4.4
Critical Slope	0.0084
Velocity	2.34
Velocity Head	0.09
Specific Energy	0.43
Froude Number	1.339
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0
Length	0.00
Number Of Steps	0

COLLECTOR STREET CAPACITY 5-YEAR STORM S=1.56%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.4
Channel Slope	0.0156
Critical Slope	0.0084

COLLECTOR STREET CAPACITY 100-YEAR STORM S=1.56%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0156
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.17
0+02.00	0.22
0+20.50	0.54
0+39.00	0.22
0+39.00	0.17
0+40.50	0.00
0+40.50	0.50
0+41.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+41.00, 0.50)	0.016

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

Results	
Discharge	19.62
Elevation Range	0.00 to 0.54 ft
Flow Area	5.78
Wetted Perimeter	36.50
Hydraulic Radius	1.9
Top Width	35.38
Normal Depth	6.0
Critical Depth	6.6
Critical Slope	0.0067
Velocity	3.39
Velocity Head	0.18
Specific Energy	0.68
Froude Number	1.481
Flow Type	Supercritical

COLLECTOR STREET CAPACITY 100-YEAR STORM S=1.56%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	6.6
Channel Slope	0.0156
Critical Slope	0.0067

COLLECTOR STREET CAPACITY 5-YEAR STORM S=2.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0200
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.17
0+02.00	0.22
0+20.50	0.54

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+20.50, 0.54)	0.016

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

Results	
Discharge	2.12
Elevation Range	0.00 to 0.54 ft
Flow Area	0.80
Wetted Perimeter	8.84
Hydraulic Radius	1.1
Top Width	8.44
Normal Depth	4.1
Critical Depth	4.5
Critical Slope	0.0083
Velocity	2.65
Velocity Head	0.11
Specific Energy	0.45
Froude Number	1.516
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

COLLECTOR STREET CAPACITY 5-YEAR STORM S=2.0%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.5
Channel Slope	0.0200
Critical Slope	0.0083

COLLECTOR STREET CAPACITY 100-YEAR STORM S=2.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0200
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.17
0+02.00	0.22
0+20.50	0.54
0+39.00	0.22
0+39.00	0.17
0+40.50	0.00
0+40.50	0.50
0+41.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+41.00, 0.50)	0.016

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

Results	
Discharge	22.22
Elevation Range	0.00 to 0.54 ft
Flow Area	5.78
Wetted Perimeter	36.50
Hydraulic Radius	1.9
Top Width	35.38
Normal Depth	6.0
Critical Depth	6.8
Critical Slope	0.0065
Velocity	3.84
Velocity Head	0.23
Specific Energy	0.73
Froude Number	1.677
Flow Type	Supercritical

COLLECTOR STREET CAPACITY 100-YEAR STORM S=2.0%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	6.8
Channel Slope	0.0200
Critical Slope	0.0065

COLLECTOR STREET CAPACITY 5-YEAR STORM S=3.0%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.0300
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.17
0+02.00	0.22
0+20.50	0.54

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+20.50, 0.54)	0.016

Options

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

Results

Discharge	2.60
Elevation Range	0.00 to 0.54 ft
Flow Area	0.80
Wetted Perimeter	8.84
Hydraulic Radius	1.1
Top Width	8.44
Normal Depth	4.1
Critical Depth	4.7
Critical Slope	0.0081
Velocity	3.24
Velocity Head	0.16
Specific Energy	0.50
Froude Number	1.857
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0
Length	0.00
Number Of Steps	0

COLLECTOR STREET CAPACITY 5-YEAR STORM S=3.0%

GVF Output Data

Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.7
Channel Slope	0.0300
Critical Slope	0.0081

COLLECTOR STREET CAPACITY 100-YEAR STORM S=3.0%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.0300
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.17
0+02.00	0.22
0+20.50	0.54
0+39.00	0.22
0+39.00	0.17
0+40.50	0.00
0+40.50	0.50
0+41.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+41.00, 0.50)	0.016

Options

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

Results

Discharge	27.21
Elevation Range	0.00 to 0.54 ft
Flow Area	5.78
Wetted Perimeter	36.50
Hydraulic Radius	1.9
Top Width	35.38
Normal Depth	6.0
Critical Depth	7.2
Critical Slope	0.0063
Velocity	4.71
Velocity Head	0.34
Specific Energy	0.84
Froude Number	2.053
Flow Type	Supercritical

COLLECTOR STREET CAPACITY 100-YEAR STORM S=3.0%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	7.2
Channel Slope	0.0300
Critical Slope	0.0063

COLLECTOR STREET CAPACITY 5-YEAR STORM S=3.57%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0357
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.17
0+02.00	0.22
0+20.50	0.54

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+20.50, 0.54)	0.016

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

Results	
Discharge	2.84
Elevation Range	0.00 to 0.54 ft
Flow Area	0.80
Wetted Perimeter	8.84
Hydraulic Radius	1.1
Top Width	8.44
Normal Depth	4.1
Critical Depth	4.8
Critical Slope	0.0080
Velocity	3.54
Velocity Head	0.19
Specific Energy	0.53
Froude Number	2.025
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

COLLECTOR STREET CAPACITY 5-YEAR STORM S=3.57%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.8
Channel Slope	0.0357
Critical Slope	0.0080

COLLECTOR STREET CAPACITY 100-YEAR STORM S=3.57%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.0357
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.17
0+02.00	0.22
0+20.50	0.54
0+39.00	0.22
0+39.00	0.17
0+40.50	0.00
0+40.50	0.50
0+41.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+41.00, 0.50)	0.016

Options

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

Results

Discharge	29.68
Elevation Range	0.00 to 0.54 ft
Flow Area	5.78
Wetted Perimeter	36.50
Hydraulic Radius	1.9
Top Width	35.38
Normal Depth	6.0
Critical Depth	7.4
Critical Slope	0.0062
Velocity	5.14
Velocity Head	0.41
Specific Energy	0.91
Froude Number	2.240
Flow Type	Supercritical

COLLECTOR STREET CAPACITY 100-YEAR STORM S=3.57%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	7.4
Channel Slope	0.0357
Critical Slope	0.0062

LOCAL STREET CAPACITY 5-YEAR STORM S=1.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0100
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+16.50, 0.42)	0.016

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

Results	
Discharge	2.41
Elevation Range	0.00 to 0.50 ft
Flow Area	1.19
Wetted Perimeter	11.56
Hydraulic Radius	1.2
Top Width	11.17
Normal Depth	4.1
Critical Depth	4.2
Critical Slope	0.0082
Velocity	2.03
Velocity Head	0.06
Specific Energy	0.40
Froude Number	1.101
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

LOCAL STREET CAPACITY 5-YEAR STORM S=1.0%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.2
Channel Slope	0.0100
Critical Slope	0.0082

LOCAL STREET CAPACITY 100-YEAR STORM S=1.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0100
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42
0+31.00	0.18
0+31.00	0.13
0+31.50	0.00
0+31.50	0.50
0+32.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+32.00, 0.50)	0.016

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

Results	
Discharge	21.72
Elevation Range	0.00 to 0.50 ft
Flow Area	6.67
Wetted Perimeter	32.13
Hydraulic Radius	2.5
Top Width	31.00
Normal Depth	6.0
Critical Depth	6.4
Critical Slope	0.0063
Velocity	3.26
Velocity Head	0.16
Specific Energy	0.66
Froude Number	1.238
Flow Type	Supercritical

LOCAL STREET CAPACITY 100-YEAR STORM S=1.0%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	6.4
Channel Slope	0.0100
Critical Slope	0.0063

LOCAL STREET CAPACITY 5-YEAR STORM S=1.5%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0150
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+16.50, 0.42)	0.016

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

Results	
Discharge	2.96
Elevation Range	0.00 to 0.50 ft
Flow Area	1.19
Wetted Perimeter	11.56
Hydraulic Radius	1.2
Top Width	11.17
Normal Depth	4.1
Critical Depth	4.4
Critical Slope	0.0079
Velocity	2.49
Velocity Head	0.10
Specific Energy	0.44
Froude Number	1.348
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

LOCAL STREET CAPACITY 5-YEAR STORM S=1.5%

GVF Output Data

Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.4
Channel Slope	0.0150
Critical Slope	0.0079

LOCAL STREET CAPACITY 100-YEAR STORM S=1.5%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0150
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42
0+31.00	0.18
0+31.00	0.13
0+31.50	0.00
0+31.50	0.50
0+32.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+32.00, 0.50)	0.016

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

Results	
Discharge	26.60
Elevation Range	0.00 to 0.50 ft
Flow Area	6.67
Wetted Perimeter	32.13
Hydraulic Radius	2.5
Top Width	31.00
Normal Depth	6.0
Critical Depth	6.8
Critical Slope	0.0060
Velocity	3.99
Velocity Head	0.25
Specific Energy	0.75
Froude Number	1.516
Flow Type	Supercritical

LOCAL STREET CAPACITY 100-YEAR STORM S=1.5%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	6.8
Channel Slope	0.0150
Critical Slope	0.0060

LOCAL STREET CAPACITY 5-YEAR STORM S=2.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0200
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+16.50, 0.42)	0.016

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

Results	
Discharge	3.41
Elevation Range	0.00 to 0.50 ft
Flow Area	1.19
Wetted Perimeter	11.56
Hydraulic Radius	1.2
Top Width	11.17
Normal Depth	4.1
Critical Depth	4.6
Critical Slope	0.0078
Velocity	2.88
Velocity Head	0.13
Specific Energy	0.47
Froude Number	1.557
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

LOCAL STREET CAPACITY 5-YEAR STORM S=2.0%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.6
Channel Slope	0.0200
Critical Slope	0.0078

LOCAL STREET CAPACITY 100-YEAR STORM S=2.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0200
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42
0+31.00	0.18
0+31.00	0.13
0+31.50	0.00
0+31.50	0.50
0+32.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+32.00, 0.50)	0.016

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

Results	
Discharge	30.72
Elevation Range	0.00 to 0.50 ft
Flow Area	6.67
Wetted Perimeter	32.13
Hydraulic Radius	2.5
Top Width	31.00
Normal Depth	6.0
Critical Depth	7.2
Critical Slope	0.0058
Velocity	4.61
Velocity Head	0.33
Specific Energy	0.83
Froude Number	1.750
Flow Type	Supercritical

LOCAL STREET CAPACITY 100-YEAR STORM S=2.0%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	7.2
Channel Slope	0.0200
Critical Slope	0.0058

LOCAL STREET CAPACITY 5-YEAR STORM S=2.42%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0242
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+16.50, 0.42)	0.016

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

Results	
Discharge	3.75
Elevation Range	0.00 to 0.50 ft
Flow Area	1.19
Wetted Perimeter	11.56
Hydraulic Radius	1.2
Top Width	11.17
Normal Depth	4.1
Critical Depth	4.7
Critical Slope	0.0077
Velocity	3.17
Velocity Head	0.16
Specific Energy	0.50
Froude Number	1.712
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

LOCAL STREET CAPACITY 5-YEAR STORM S=2.42%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.7
Channel Slope	0.0242
Critical Slope	0.0077

COLLECTOR STREET CAPACITY 100-YEAR STORM S=2.42%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0242
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42
0+31.00	0.18
0+31.00	0.13
0+31.50	0.00
0+31.50	0.50
0+32.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+32.00, 0.50)	0.016

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

Results	
Discharge	33.79
Elevation Range	0.00 to 0.50 ft
Flow Area	6.67
Wetted Perimeter	32.13
Hydraulic Radius	2.5
Top Width	31.00
Normal Depth	6.0
Critical Depth	7.4
Critical Slope	0.0057
Velocity	5.07
Velocity Head	0.40
Specific Energy	0.90
Froude Number	1.925
Flow Type	Supercritical

COLLECTOR STREET CAPACITY 100-YEAR STORM S=2.42%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	7.4
Channel Slope	0.0242
Critical Slope	0.0057

LOCAL STREET CAPACITY 5-YEAR STORM S=3.0%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.0300
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+16.50, 0.42)	0.016

Options

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

Results

Discharge	4.18
Elevation Range	0.00 to 0.50 ft
Flow Area	1.19
Wetted Perimeter	11.56
Hydraulic Radius	1.2
Top Width	11.17
Normal Depth	4.1
Critical Depth	4.8
Critical Slope	0.0076
Velocity	3.52
Velocity Head	0.19
Specific Energy	0.53
Froude Number	1.907
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0
Length	0.00
Number Of Steps	0

LOCAL STREET CAPACITY 5-YEAR STORM S=3.0%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	4.8
Channel Slope	0.0300
Critical Slope	0.0076

LOCAL STREET CAPACITY 100-YEAR STORM S=3.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0300
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42
0+31.00	0.18
0+31.00	0.13
0+31.50	0.00
0+31.50	0.50
0+32.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+32.00, 0.50)	0.016

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

Results	
Discharge	37.62
Elevation Range	0.00 to 0.50 ft
Flow Area	6.67
Wetted Perimeter	32.13
Hydraulic Radius	2.5
Top Width	31.00
Normal Depth	6.0
Critical Depth	7.7
Critical Slope	0.0056
Velocity	5.64
Velocity Head	0.49
Specific Energy	0.99
Froude Number	2.144
Flow Type	Supercritical

LOCAL STREET CAPACITY 100-YEAR STORM S=3.0%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	7.7
Channel Slope	0.0300
Critical Slope	0.0056

LOCAL STREET CAPACITY 100-YEAR STORM S=4.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0400
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42
0+31.00	0.18
0+31.00	0.13
0+31.50	0.00
0+31.50	0.50
0+32.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+32.00, 0.50)	0.016

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

Results	
Discharge	43.44
Elevation Range	0.00 to 0.50 ft
Flow Area	6.67
Wetted Perimeter	32.13
Hydraulic Radius	2.5
Top Width	31.00
Normal Depth	6.0
Critical Depth	8.1
Critical Slope	0.0054
Velocity	6.51
Velocity Head	0.66
Specific Energy	1.16
Froude Number	2.475
Flow Type	Supercritical

LOCAL STREET CAPACITY 100-YEAR STORM S=4.0%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	8.1
Channel Slope	0.0400
Critical Slope	0.0054

LOCAL STREET CAPACITY 5-YEAR STORM S=5.50%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0550
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+16.50, 0.42)	0.016

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

Results	
Discharge	5.66
Elevation Range	0.00 to 0.50 ft
Flow Area	1.19
Wetted Perimeter	11.56
Hydraulic Radius	1.2
Top Width	11.17
Normal Depth	4.1
Critical Depth	5.2
Critical Slope	0.0072
Velocity	4.77
Velocity Head	0.35
Specific Energy	0.69
Froude Number	2.582
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

LOCAL STREET CAPACITY 5-YEAR STORM S=5.50%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	5.2
Channel Slope	0.0550
Critical Slope	0.0072

LOCAL STREET CAPACITY 100-YEAR STORM S=5.50%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0550
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42
0+31.00	0.18
0+31.00	0.13
0+31.50	0.00
0+31.50	0.50
0+32.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+32.00, 0.50)	0.016

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

Results	
Discharge	50.94
Elevation Range	0.00 to 0.50 ft
Flow Area	6.67
Wetted Perimeter	32.13
Hydraulic Radius	2.5
Top Width	31.00
Normal Depth	6.0
Critical Depth	8.6
Critical Slope	0.0053
Velocity	7.64
Velocity Head	0.91
Specific Energy	1.41
Froude Number	2.902
Flow Type	Supercritical

LOCAL STREET CAPACITY 100-YEAR STORM S=5.50%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	8.6
Channel Slope	0.0550
Critical Slope	0.0053

LOCAL STREET CAPACITY 5-YEAR STORM S=6.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0600
Normal Depth	4.1

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+16.50, 0.42)	0.016

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

Results	
Discharge	5.91
Elevation Range	0.00 to 0.50 ft
Flow Area	1.19
Wetted Perimeter	11.56
Hydraulic Radius	1.2
Top Width	11.17
Normal Depth	4.1
Critical Depth	5.3
Critical Slope	0.0071
Velocity	4.98
Velocity Head	0.39
Specific Energy	0.73
Froude Number	2.696
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

LOCAL STREET CAPACITY 5-YEAR STORM S=6.0%

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.1
Critical Depth	5.3
Channel Slope	0.0600
Critical Slope	0.0071

LOCAL STREET CAPACITY 100-YEAR STORM S=6.0%

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.0600
Normal Depth	6.0

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.50
0+00.50	0.00
0+02.00	0.13
0+02.00	0.18
0+16.50	0.42
0+31.00	0.18
0+31.00	0.13
0+31.50	0.00
0+31.50	0.50
0+32.00	0.50

Roughness Segment Definitions

Start Station & Elevation	End Station & Elevation	Roughness Coefficient
(0+00.00, 0.50)	(0+32.00, 0.50)	0.016

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

Results	
Discharge	53.20
Elevation Range	0.00 to 0.50 ft
Flow Area	6.67
Wetted Perimeter	32.13
Hydraulic Radius	2.5
Top Width	31.00
Normal Depth	6.0
Critical Depth	8.8
Critical Slope	0.0052
Velocity	7.98
Velocity Head	0.99
Specific Energy	1.49
Froude Number	3.032
Flow Type	Supercritical

LOCAL STREET CAPACITY 100-YEAR STORM S=6.0%

GVF Input Data	
Downstream Depth	0.0
Length	0.00
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	6.0
Critical Depth	8.8
Channel Slope	0.0600
Critical Slope	0.0052

APPENDIX D

STORM DRAIN PIPE CALCULATIONS

12" SD MAIN CAPACITY S=1.56%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	1.56
Normal Depth	1.0
Diameter	12.0
Discharge	4.45

Results	
Discharge	4.45
Normal Depth	1.0
Flow Area	0.8
Wetted Perimeter	3.1
Hydraulic Radius	0.3
Top Width	0.00
Critical Depth	0.9
Percent Full	100.0
Critical Slope	1.40
Velocity	5.67
Velocity Head	0.50
Specific Energy	1.50
Froude Number	(N/A)
Maximum Discharge	4.79
Discharge Full	4.45
Slope Full	1.56
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.0
Critical Depth	0.9
Channel Slope	1.56
Critical Slope	1.40

12" SD MAIN CAPACITY S=2.0%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	2.00
Normal Depth	1.0
Diameter	12.0
Discharge	5.04

Results	
Discharge	5.04
Normal Depth	1.0
Flow Area	0.8
Wetted Perimeter	3.1
Hydraulic Radius	0.3
Top Width	0.00
Critical Depth	0.9
Percent Full	100.0
Critical Slope	1.74
Velocity	6.41
Velocity Head	0.64
Specific Energy	1.64
Froude Number	(N/A)
Maximum Discharge	5.42
Discharge Full	5.04
Slope Full	2.00
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.0
Critical Depth	0.9
Channel Slope	2.00
Critical Slope	1.74

12" SD MAIN CAPACITY S=2.32%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	2.32
Normal Depth	1.0
Diameter	12.0
Discharge	5.43

Results	
Discharge	5.43
Normal Depth	1.0
Flow Area	0.8
Wetted Perimeter	3.1
Hydraulic Radius	0.3
Top Width	0.00
Critical Depth	0.9
Percent Full	100.0
Critical Slope	2.01
Velocity	6.91
Velocity Head	0.74
Specific Energy	1.74
Froude Number	(N/A)
Maximum Discharge	5.84
Discharge Full	5.43
Slope Full	2.32
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.0
Critical Depth	0.9
Channel Slope	2.32
Critical Slope	2.01

12" SD MAIN CAPACITY S=3.0%

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013
Channel Slope	3.00
Normal Depth	1.0
Diameter	12.0
Discharge	6.17

Results

Discharge	6.17
Normal Depth	1.0
Flow Area	0.8
Wetted Perimeter	3.1
Hydraulic Radius	0.3
Top Width	0.00
Critical Depth	1.0
Percent Full	100.0
Critical Slope	2.61
Velocity	7.86
Velocity Head	0.96
Specific Energy	1.96
Froude Number	(N/A)
Maximum Discharge	6.64
Discharge Full	6.17
Slope Full	3.00
Flow Type	Critical

GVF Input Data

Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.0
Critical Depth	1.0
Channel Slope	3.00
Critical Slope	2.61

12" SD MAIN CAPACITY S=3.57%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	3.57
Normal Depth	1.0
Diameter	12.0
Discharge	6.73

Results	
Discharge	6.73
Normal Depth	1.0
Flow Area	0.8
Wetted Perimeter	3.1
Hydraulic Radius	0.3
Top Width	0.00
Critical Depth	1.0
Percent Full	100.0
Critical Slope	3.15
Velocity	8.57
Velocity Head	1.14
Specific Energy	2.14
Froude Number	(N/A)
Maximum Discharge	7.24
Discharge Full	6.73
Slope Full	3.57
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.0
Critical Depth	1.0
Channel Slope	3.57
Critical Slope	3.15

12" SD MAIN CAPACITY S=6.0%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	6.00
Normal Depth	1.0
Diameter	12.0
Discharge	8.73

Results	
Discharge	8.73
Normal Depth	1.0
Flow Area	0.8
Wetted Perimeter	3.1
Hydraulic Radius	0.3
Top Width	0.00
Critical Depth	1.0
Percent Full	100.0
Critical Slope	5.52
Velocity	11.11
Velocity Head	1.92
Specific Energy	2.92
Froude Number	(N/A)
Maximum Discharge	9.39
Discharge Full	8.73
Slope Full	6.00
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.0
Critical Depth	1.0
Channel Slope	6.00
Critical Slope	5.52

18" SD MAIN CAPACITY S=1.0%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	1.00
Normal Depth	1.5
Diameter	18.0
Discharge	10.50

Results	
Discharge	10.50
Normal Depth	1.5
Flow Area	1.8
Wetted Perimeter	4.7
Hydraulic Radius	0.4
Top Width	0.00
Critical Depth	1.2
Percent Full	100.0
Critical Slope	0.98
Velocity	5.94
Velocity Head	0.55
Specific Energy	2.05
Froude Number	(N/A)
Maximum Discharge	11.30
Discharge Full	10.50
Slope Full	1.00
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.5
Critical Depth	1.2
Channel Slope	1.00
Critical Slope	0.98

18" SD MAIN CAPACITY S=1.5%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	1.50
Normal Depth	1.5
Diameter	18.0
Discharge	12.86

Results	
Discharge	12.86
Normal Depth	1.5
Flow Area	1.8
Wetted Perimeter	4.7
Hydraulic Radius	0.4
Top Width	0.00
Critical Depth	1.3
Percent Full	100.0
Critical Slope	1.32
Velocity	7.28
Velocity Head	0.82
Specific Energy	2.32
Froude Number	(N/A)
Maximum Discharge	13.84
Discharge Full	12.86
Slope Full	1.50
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.5
Critical Depth	1.3
Channel Slope	1.50
Critical Slope	1.32

18" SD MAIN CAPACITY S=2.32%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	2.32
Normal Depth	1.5
Diameter	18.0
Discharge	16.00

Results	
Discharge	16.00
Normal Depth	1.5
Flow Area	1.8
Wetted Perimeter	4.7
Hydraulic Radius	0.4
Top Width	0.00
Critical Depth	1.4
Percent Full	100.0
Critical Slope	2.01
Velocity	9.05
Velocity Head	1.27
Specific Energy	2.77
Froude Number	(N/A)
Maximum Discharge	17.21
Discharge Full	16.00
Slope Full	2.32
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.5
Critical Depth	1.4
Channel Slope	2.32
Critical Slope	2.01

24" SD MAIN CAPACITY S=1.0%

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

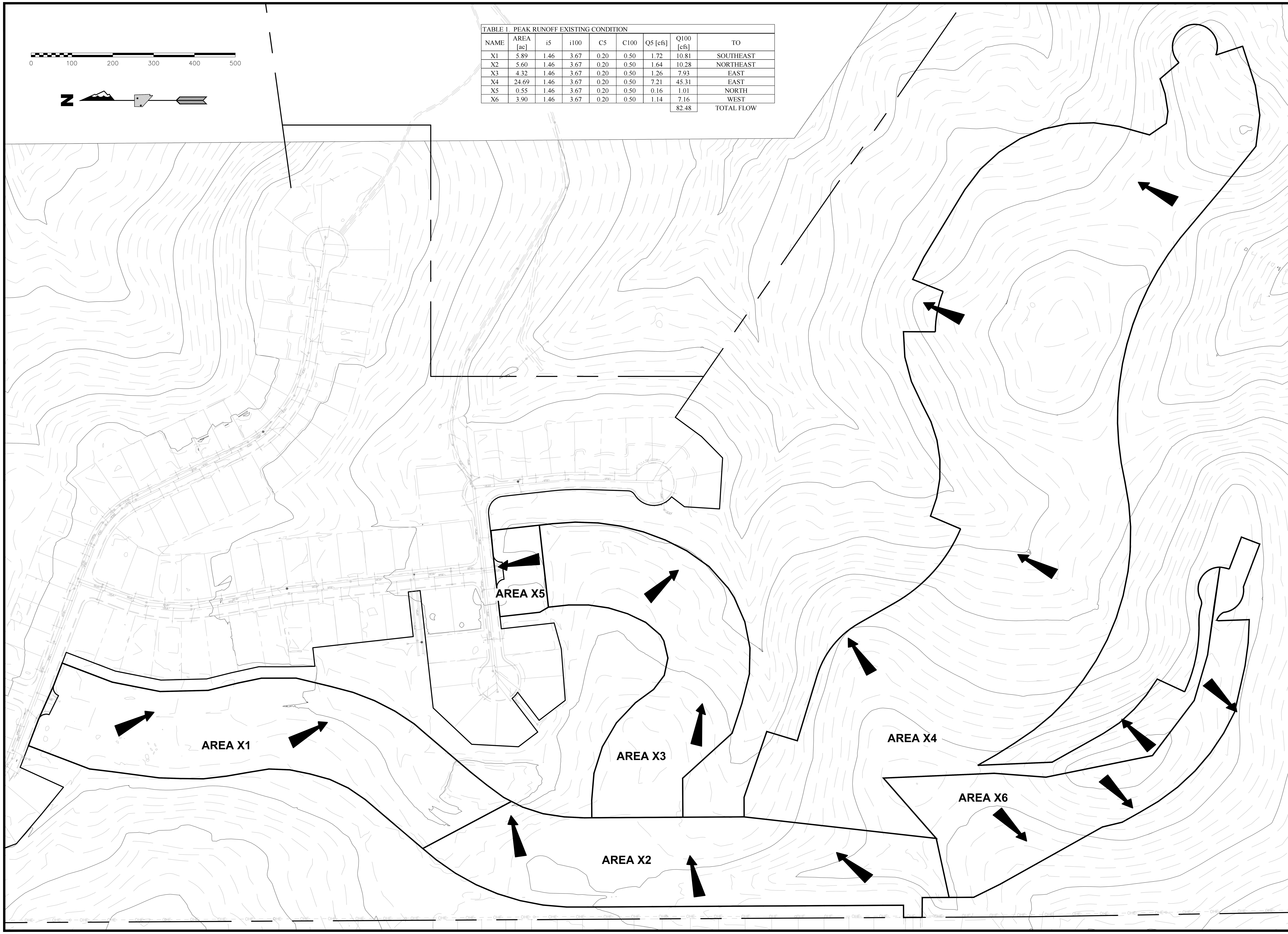
Input Data	
Roughness Coefficient	0.013
Channel Slope	1.00
Normal Depth	2.0
Diameter	24.0
Discharge	22.62

Results	
Discharge	22.62
Normal Depth	2.0
Flow Area	3.1
Wetted Perimeter	6.3
Hydraulic Radius	0.5
Top Width	0.00
Critical Depth	1.7
Percent Full	100.0
Critical Slope	0.95
Velocity	7.20
Velocity Head	0.81
Specific Energy	2.81
Froude Number	(N/A)
Maximum Discharge	24.33
Discharge Full	22.62
Slope Full	1.00
Flow Type	Critical

GVF Input Data	
Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0
Profile Description	
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	100.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	2.0
Critical Depth	1.7
Channel Slope	1.00
Critical Slope	0.95

TABLE 1. PEAK RUNOFF EXISTING CONDITION								
NAME	AREA [ac]	i5	i100	C5	C100	Q5 [cfs]	Q100 [cfs]	TO
X1	5.89	1.46	3.67	0.20	0.50	1.72	10.81	SOUTHEAST
X2	5.60	1.46	3.67	0.20	0.50	1.64	10.28	NORTHEAST
X3	4.32	1.46	3.67	0.20	0.50	1.26	7.93	EAST
X4	24.69	1.46	3.67	0.20	0.50	7.21	45.31	EAST
X5	0.55	1.46	3.67	0.20	0.50	0.16	1.01	NORTH
X6	3.90	1.46	3.67	0.20	0.50	1.14	7.16	WEST
							82.48	TOTAL FLOW



SUMMIT ENGINEERING CORPORATION
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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6

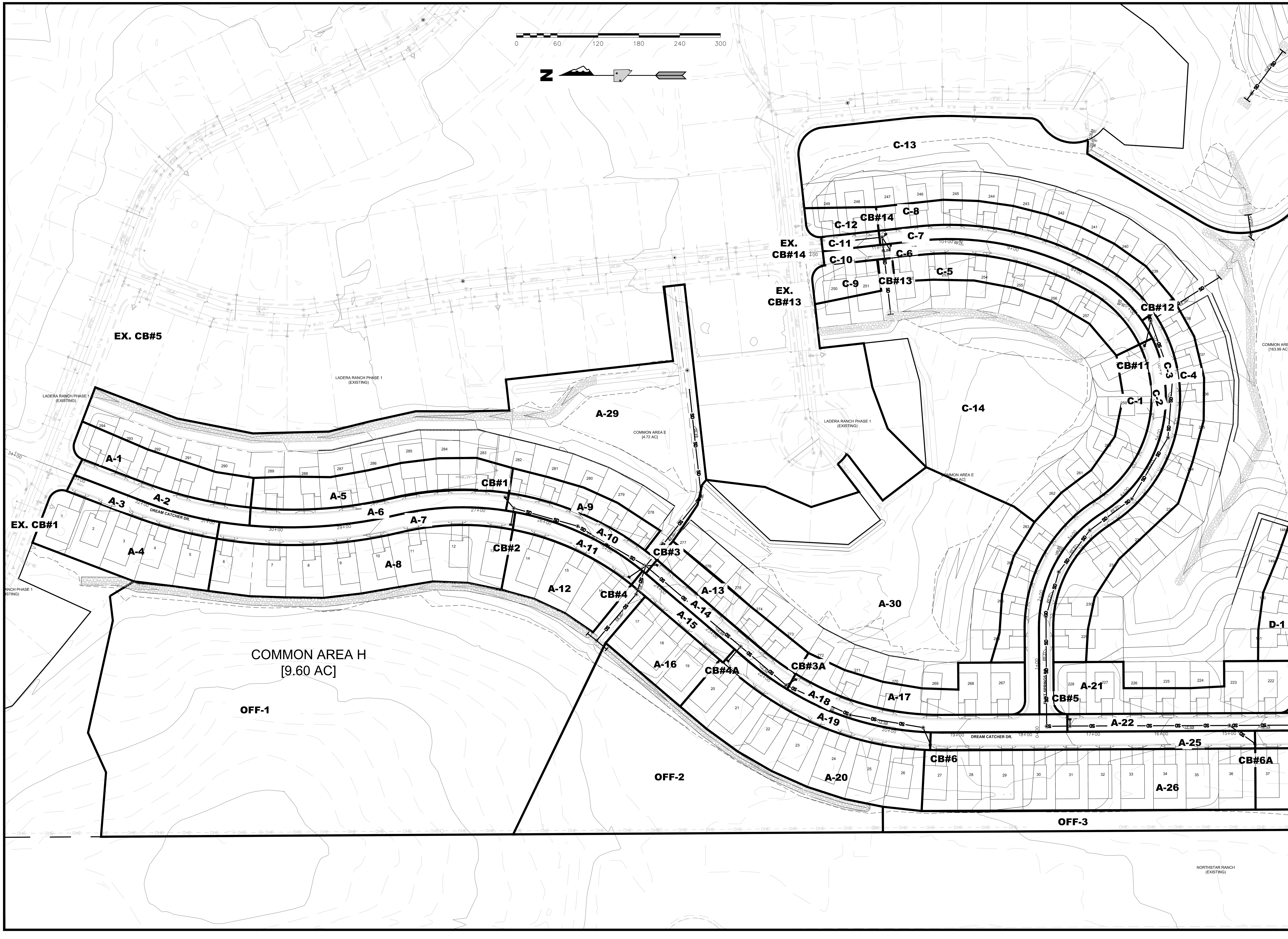
PRELIMINARY EXISTING HYDROLOGY DISPLAY

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=100'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

N:\DWGS\J30884_Lansing_Ladera\NewTM\Civil\LaderaTM-Base.DWG - 3:23 PM * 14-APR-2020



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PHONE:(775) 747-8550 FAX:(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PROPOSED HYDROLOGY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=60'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

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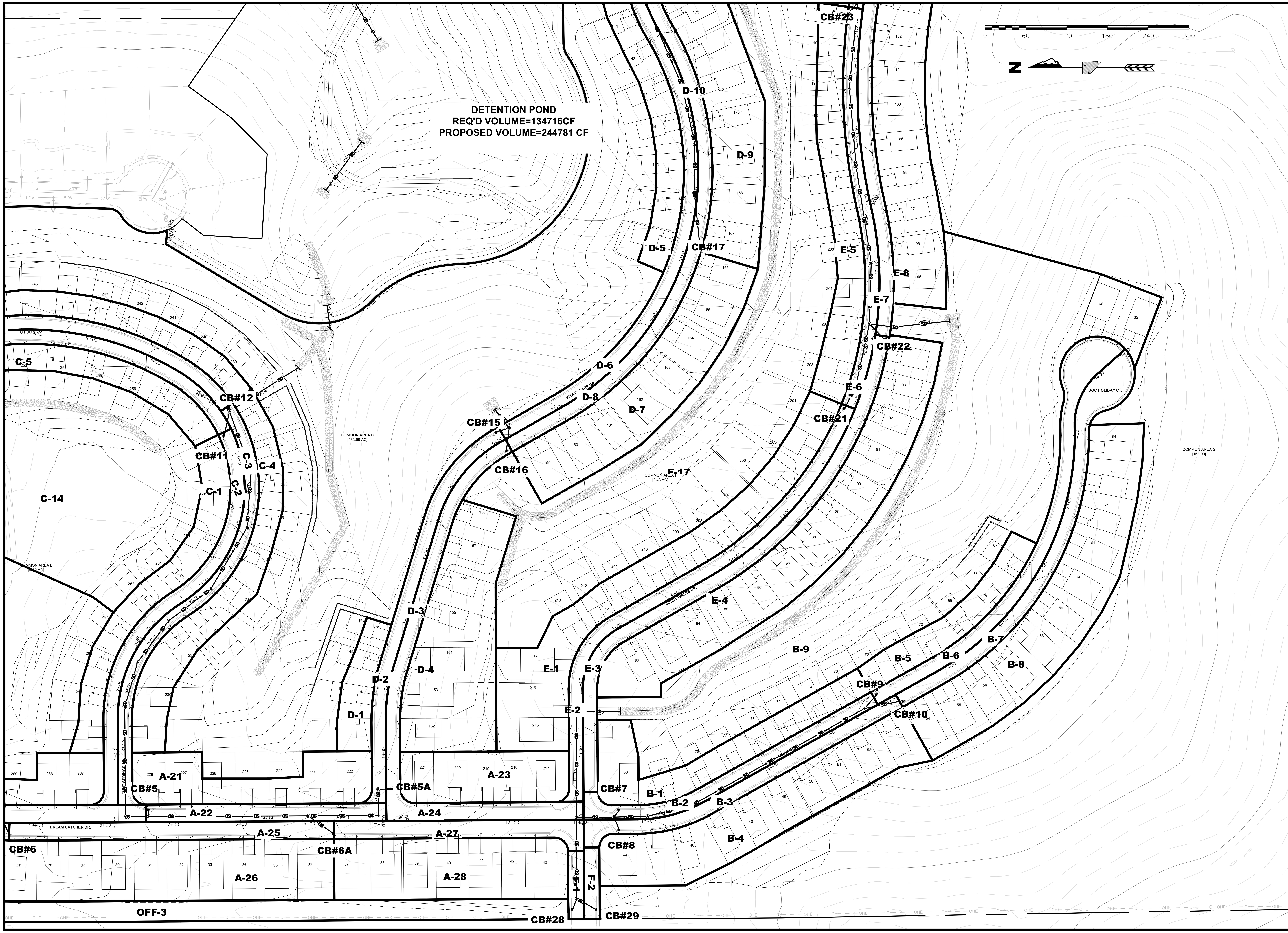

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TABLE 2. PEAK RUNOFF PROPOSED CONDITION

NAME	AREA [AC]	i5	i100	C5	C100	Q5 [cfs]	Q5 TOTAL [cfs]	Q5 str.cap [cfs]	Q100 [cfs]	Q100 TOTAL [cfs]	Q100 str.cap [cfs]	TO
A-1	0.30	1.46	3.67	0.50	0.65	0.22	0.42	1.87	0.71	1.25	9.81	EX.CB#5
A-2	0.16	1.46	3.67	0.88	0.93	0.21			0.55			
A-3	0.13	1.46	3.67	0.88	0.93	0.17	0.55	1.87	0.46	1.68	9.81	EX.CB#1
A-4	0.51	1.46	3.67	0.50	0.65	0.38			1.23			
A-5	0.41	1.46	3.67	0.50	0.65	0.30	0.59	1.87	0.98	1.75	9.81	CB#1
A-6	0.23	1.46	3.67	0.88	0.93	0.29			0.78			
A-7	0.26	1.46	3.67	0.88	0.93	0.34	0.92	1.87	0.89	2.80	9.81	CB#2
A-8	0.80	1.46	3.67	0.50	0.65	0.58			1.91			
A-9	0.19	1.46	3.67	0.50	0.65	0.14	0.32	1.87	0.45	0.93	9.81	CB#3
A-10	0.14	1.46	3.67	0.88	0.93	0.18			0.48			
A-11	0.12	1.46	3.67	0.88	0.93	0.16	0.42	1.87	0.41	1.27	9.81	CB#4
A-12	0.36	1.46	3.67	0.50	0.65	0.26			0.85			
A-13	0.22	1.46	3.67	0.50	0.65	0.16	0.37	1.87	0.54	1.07	9.81	CB#3
A-14	0.16	1.46	3.67	0.88	0.93	0.20			0.54			
A-15	0.11	1.46	3.67	0.88	0.93	0.14	0.35	1.87	0.36	1.07	9.81	CB#4
A-16	0.30	1.46	3.67	0.50	0.65	0.22			0.71			
A-17	0.38	1.46	3.67	0.50	0.65	0.28	0.60	3.41	0.91	1.76	13.61	CB#3A
A-18	0.25	1.46	3.67	0.88	0.93	0.32			0.84			
A-19	0.20	1.46	3.67	0.88	0.93	0.25	0.80	3.41	0.67	2.46	13.61	CB#4A
A-20	0.75	1.46	3.67	0.50	0.65	0.55			1.79			
A-21	0.48	1.46	3.67	0.50	0.65	0.35	0.62	2.12	1.15	1.87	11.11	CB#5
A-22	0.21	1.46	3.67	0.88	0.93	0.27			0.72			
A-23	0.42	1.46	3.67	0.50	0.65	0.31	0.55	2.12	1.01	1.64	11.11	CB#5A
A-24	0.19	1.46	3.67	0.88	0.93	0.24			0.63			
A-25	0.29	1.46	3.67	0.88	0.93	0.37	1.10	2.12	0.98	3.37	11.11	CB#6
A-26	1.00	1.46	3.67	0.50	0.65	0.73			2.39			
A-27	0.28	1.46	3.67	0.88	0.93	0.37	0.88	2.12	0.97	2.66	11.11	CB#6A
A-28	0.71	1.46	3.67	0.50	0.65	0.52			1.69			
A-29	2.28	1.46	3.67	0.50	0.65	1.67	1.67	N/A	5.44	5.44	N/A	DITCH
A-30	2.59	1.46	3.67	0.50	0.65	1.89	1.89	N/A	6.18	6.18	N/A	DITCH
B-1	0.51	1.46	3.67	0.50	0.65	0.37	0.68	2.96	1.21	2.02	13.3	CB#7
B-2	0.24	1.46	3.67	0.88	0.93	0.31			0.81			
B-3	0.31	1.46	3.67	0.88	0.93	0.40	1.06	2.96	1.07	3.23	13.3	CB#8
B-4	0.90	1.46	3.67	0.50	0.65	0.66			2.16			
B-5	0.31	1.46	3.67	0.50	0.65	0.23	0.72	2.41	0.74	2.06	10.86	CB#9
B-6	0.39	1.46	3.67	0.88	0.93	0.50			1.32			
B-7	0.37	1.46	3.67	0.88	0.93	0.47	1.31	2.41	1.25	3.98	10.86	CB#10
B-8	1.14	1.46	3.67	0.50	0.65	0.83			2.73			
B-9	4.11	1.46	3.67	0.50	0.65	3.00	3.00	N/A	9.80	9.80	N/A	DITCH
C-1	0.48	1.46	3.67	0.50	0.65	0.35	0.73	3.41	1.14	2.16	15.36	CB#11
C-2	0.30	1.46	3.67	0.88	0.93	0.38			1.02			
C-3	0.32	1.46	3.67	0.88	0.93	0.41	0.83	3.41	1.09	2.47	15.36	CB#12
C-4	0.58	1.46	3.67	0.50	0.65	0.42			1.39			
C-5	0.35	1.46	3.67	0.50	0.65	0.25	0.51	3.41	0.82	1.52	15.36	CB #13
C-6	0.20	1.46	3.67	0.88	0.93	0.26			0.69			
C-7	0.21	1.46	3.67	0.88	0.93	0.27	0.55	3.41	0.71	1.62	15.36	CB#14
C-8	0.38	1.46	3.67	0.50	0.65	0.28			0.91			
C-9	0.11	1.46	3.67	0.50	0.65	0.08	0.14	3.41	0.27	0.43	15.36	EX.CB#13
C-10	0.05	1.46	3.67	0.88	0.93	0.06			0.17			
C-11	0.04	1.46	3.67	0.88	0.93	0.05	0.12	3.41	0.14	0.37	15.36	EX.CB#14
C-12	0.09	1.46	3.67	0.50	0.65	0.07			0.23			
C-13	7.86	1.46	3.67	0.50	0.65	5.74	5.74	N/A	18.75	18.75	N/A	POND
C-14	2.36	1.46	3.67	0.50	0.65	1.72	1.72	N/A	5.63	5.63	N/A	DITCH
D-1	0.20	1.46	3.67	0.50	0.65	0.15	0.52	4.83	0.48	1.47	21.72	CB#15
D-2	0.29	1.46	3.67	0.88	0.93	0.37			0.99			
D-3	0.27	1.46	3.67	0.88	0.93	0.34	1.03	4.83	0.91	3.15	21.72	CB#16
D-4	0.94	1.46	3.67	0.50	0.65	0.69			2.24			
D-5	0.46	1.46	3.67	0.5	0.65	0.33	0.90	5.66	1.09	2.586988	25.47	CB#18A
D-6	0.44	1.46	3.67	0.88	0.93	0.56			1.50			
D-7	0.90	1.46	3.67	0.5	0.65	0.66	0.91	5.66	2.15	2.824052	25.47	CB#17
D-8	0.20	1.46	3.67	0.88	0.93	0.25			0.67			
D-9	0.87	1.46	3.67	0.5	0.65	0.64	0.96	5.66	2.08	2.932593	25.47	CB#18
D-10	0.25	1.46	3.67	0.88	0.93	0.32			0.85			
D-11	0.45	1.46	3.67	0.5	0.65	0.33	0.50	3.75	1.08	1.534761	16.9	CB#18A
D-12	0.13	1.46	3.67	0.88	0.93	0.17			0.45			
D-13	0.50	1.46	3.67	0.5	0.65	0.36	0.47	3.75	1.18	1.624972	16.9	CB#18
D-14	0.13	1.46	3.67	0.55	0.93	0.10			0.44			
D-15	0.90	1.46	3.67	0.5	0.65	0.65	0.80	3.75	2.14	2.619834	16.9	CB#19
D-16	0.20	1.46	3.67	0.5	0.65	0.15			0.48			
D-17	0.78	1.46	3.67	0.5	0.65	0.57	0.82	3.75	1.86	2.52262	16.9	CB#20
D-18	0.19	1.46	3.67	0.88	0.93	0.25			0.66			
E-1	1.02	1.46	3.67	0.50	0.65	0.74	1.22	3.41	2.43	3.70	15.36	CB#21
E-2	0.37	1.46	3.67	0.88	0.93	0.48			1.26			
E-3	0.41	1.46	3.67	0.88	0.93	0.53	1.47	3.41	1.41	4.48	15.36	CB#22
E-4	1.28	1.46	3.67	0.50	0.65	0.94			3.06			
E-5	0.58	1.46	3.67	0.50	0.65	0.42	0.79	3.41	1.38	2.36	15.36	CB#23
E-6	0.29	1.46	3.67	0.88	0.93	0.37			0.98			
E-7	0.33	1.46	3.67	0.88	0.93	0.42	1.23	3.41	1.12	3.78	15.36	CB#24
E-8	1.11	1.46	3.67	0.50	0.65	0.81			2.65			
E-9	0.48	1.46	3.67	0.50	0.65	0.35	0.67	3.41	1.14	1.98	10.86	CB#25
E-10	0.25	1.46	3.67	0.88	0.93	0.32			0.84			
E-11	0.14	1.46	3.67	0.88	0.93	0.17	0.53	3.41	0.46	1.61	10.86	CB#26
E-12	0.48	1.46	3.67	0.50	0.65	0.35			1.15			
E-13	0.52	1.46	3.67	0.50	0.65	0.38	0.77	2.41	1.25	2.28	10.86	CB#27
E-14.	0.30	1.46	3.67	0.88	0.93	0.39			1.03			
E-15	0.28	1.46	3.67	0.88	0.93	0.36	0.98	2.41	0.97	2.01	10.86	CB#26
E-16	0.84	1.46	3.67	0.50	0.65	0.61			2.01			
E-17	4.62	1.46	3.67	0.50	0.65	3.37	3.37	N/A	11.03	11.03	N/A	DITCH
F-1	0.05	1.46	3.67	0.50	0.65	0.04	0.04	N/A	0.13	0.13	N/A	DITCH
F-2	0.06	1.46	3.67	0.50	0.65	0.04	0.04	N/A	0.13	0.13	N/A	DITCH
OFF-1	5.64	1.46	3.67	0.20	0.50	1.65	1.65	N/A	10.34	10.34	N/A	DITCH
OFF-2	2.29	1.46	3.67	0.20	0.50	0.67	0.67	N/A	4.20	4.20	N/A	DITCH
OFF-3	0.62	1.46	3.67	0.20	0.50	0.18	0.18	N/A	1.14	1.14	N/A	CB#29
Total Peak Runoff Proposed Condition:									157.33			

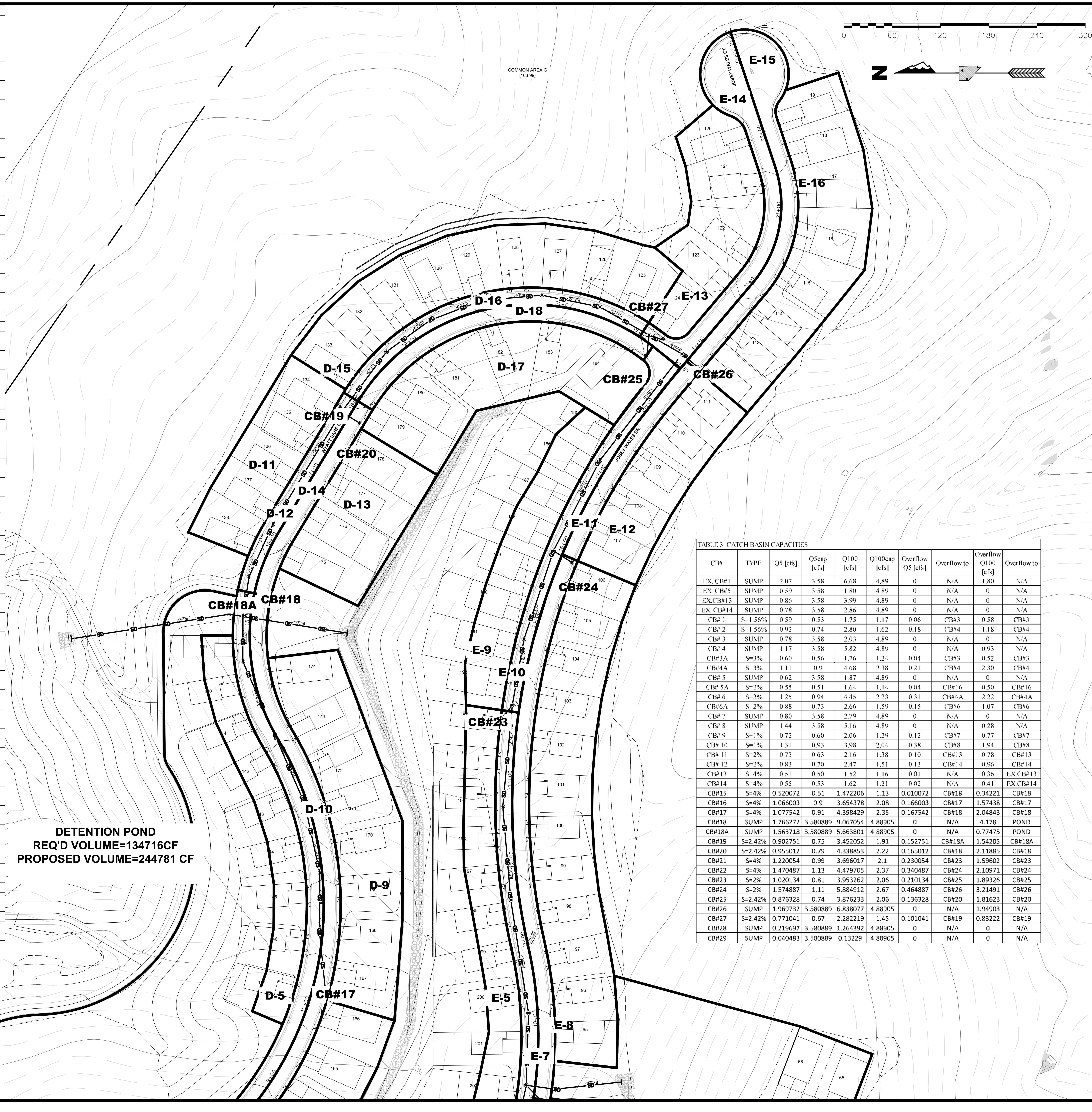

TABLE 3. CATCH BASIN CAPACITIES

CB#	TYPE	Q5 [cfs]	Q5cap [cfs]	Q100 [cfs]	Q100cap [cfs]	Overflow Q5 [cfs]	Overflow to	Overflow Q100 [cfs]	Overflow to
EX. CB#1	SUMP	2.07	3.58	6.68	4.89	0	N/A	1.80	N/A
EX. CB#5	SUMP	0.59	3.58	1.80	4.89	0	N/A	0	N/A
EX.CB#13	SUMP	0.86	3.58	3.99	4.89	0	N/A	0	N/A
EX. CB#14	SUMP	0.78	3.58	2.86	4.89	0	N/A	0	N/A
CB# 1	S=1.56%	0.59	0.53	1.75	1.17	0.06	CB#3	0.58	CB#3
CB# 2	S 1.56%	0.92	0.74	2.80	1.62	0.18	CB#4	1.18	CB#4
CB# 3	SUMP	0.78	3.58	2.03	4.89	0	N/A	0	N/A
CB# 4	SUMP	1.17	3.58	5.82	4.89	0	N/A	0.93	N/A
CB#3A	S=3%	0.60	0.56	1.76	1.24	0.04	CB#3	0.52	CB#3
CB#4A	S 3%	1.11	0.9	4.68	2.38	0.21	CB#4	2.30	CB#4
CB# 5	SUMP	0.62	3.58	1.87	4.89	0	N/A	0	N/A
CB# 5A	S=2%	0.55	0.51	1.64	1.14	0.04	CB#16	0.50	CB#16
CB# 6	S=2%	1.25	0.94	4.45	2.23	0.31	CB#4A	2.22	CB#4A
CB#6A	S 2%	0.88	0.73	2.66	1.59	0.15	CB#6	1.07	CB#6
CB# 7	SUMP	0.80	3.58	2.79	4.89	0	N/A	0	N/A
CB# 8	SUMP	1.44	3.58	5.16	4.89	0	N/A	0.28	N/A
CB# 9	S=1%	0.72	0.60	2.06	1.29	0.12	CB#7	0.77	CB#7
CB# 10	S=1%	1.31	0.93	3.98	2.04	0.38	CB#8	1.94	CB#8
CB# 11	S=2%	0.73	0.63	2.16	1.38	0.10	CB#13	0.78	CB#13
CB# 12	S=2%	0.83	0.70	2.47	1.51	0.13	CB#14	0.96	CB#14
CB#13	S 4%	0.51	0.50	1.52	1.16	0.01	N/A	0.36	EX.CB#13
CB#14	S=4%	0.55	0.53	1.62	1.21	0.02	N/A	0.41	EX.CB#14
CB#15	S=4%	0.520072	0.51	1.472206	1.13	0.010072	CB#18	0.34221	CB#18
CB#16	S=4%	1.066003	0.9	3.654378	2.08	0.166003	CB#17	1.57438	CB#17
CB#17	S=4%	1.077542	0.91	4.398429	2.35	0.167542	CB#18	2.04843	CB#18
CB#18	SUMP	1.766272	3.580889	9.067054	4.88905	0	N/A	4.178	POND
CB#18A	SUMP	1.563718	3.580889	5.663801	4.88905	0	N/A	0.77475	POND
CB#19	S=2.42%	0.902751	0.75	3.452052	1.91	0.152751	CB#18A	1.54205	CB#18A
CB#20	S=2.42%	0.955012	0.79	4.338853	2.22	0.165012	CB#18	2.11885	CB#18
CB#21	S=4%	1.220054	0.99	3.696017	2.1	0.230054	CB#23	1.59602	CB#23
CB#22	S=4%	1.470487	1.13	4.479705	2.37	0.340487	CB#24	2.10971	CB#24
CB#23	S=2%	1.020134	0.81	3.953262	2.06	0.210134	CB#25	1.89326	CB#25
CB#24	S=2%	1.574887	1.11	5.884912	2.67	0.464887	CB#26	3.21491	CB#26
CB#25	S=2.42%	0.876328	0.74	3.876233	2.06	0.136328	CB#20	1.81623	CB#20
CB#26	SUMP	1.969732	3.580889	6.838077	4.88905	0	N/A	1.94903	N/A
CB#27	S=2.42%	0.771041	0.67	2.282219	1.45	0.101041	CB#19	0.83222	CB#19
CB#28	SUMP	0.219697	3.580889	1.264392	4.88905	0	N/A	0	N/A
CB#29	SUMP	0.040483	3.580889	0.13229	4.88905	0	N/A	0	N/A

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SHEET HY-4 OF 32

PRELIMINARY SANITARY SEWER REPORT
FOR
LADERA RANCH PHASES 2-6
TENTATIVE MAP

Prepared for

LANSING COMPANIES
5190 NEIL ROAD ST 420
RENO, NV 89502

Prepared by

SUMMIT ENGINEERING CORPORATION

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FEBRUARY 2020

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APPENDIX A

VICINITY MAP

SANITARY SEWER DISPLAY

APPENDIX B

8 INCH 1/2 FULL CAPACITY CALCULATIONS

8 INCH DEMAND CALCULATIONS

INTRODUCTION

The following report presents the results of the sewer analysis for Ladera Ranch Phases 2-6 Tentative Map. The project is a proposed 294 lot single-family residential development located in Sun Valley, Nevada and within the section 13, T20N, R19E. The site consists of approximately 266 acres (Assessor Parcel Numbers (APN) 502-700-01, 502-700-03, 502-700-06, 502-700-07, and 502-250-32 (refer to Appendix A – Site Map). The purpose of this study is to estimate the peak sewer flows associated with this project, in accordance with the criteria set forth in the Washoe County Department of Water Resources.

The property surrounding this project is as follows:

North: Ladera Ranch Phase 1 (Existing)

South: Open Space

East: Washoe County Parks

West: Northstar Ranch Community (Existing)

EXISTING SANITARY SEWER TRIBUTARY AREAS

The existing mains that serve Ladera Ranch Phase 1 will also serve Ladera Ranch Phase 2. The sewer line comes from the Ladera Ranch development and will tie into an existing sanitary sewer line at the corner of 6th Avenue and Chocolate Drive. The sewer main consists of 8-inch SDR 35 PVC pipe that travels south on Chocolate Drive and then turns east on 5th Avenue to Leon Drive and then south to East Gepford Parkway, at which point it will connect to an interceptor consisting of a 15-inch diameter concrete pipe.

DESIGN STANDARDS

The following design standards were used in designing the mains within Ladera Ranch Phase 2, and in analyzing the effects of connecting the Ladera Ranch Phase 2 development to existing sewer facilities (reference Washoe County Department of Water Resources).

- Manning's roughness coefficient, n= 0.012
- Pipe capacity in terms of one-half full
- Peak discharge of 270 gallons per capita per day
- Peaking factor of 3
- Minimum mean velocity of 2.5 feet per second
- Maximum mean velocity of 10 feet per second

EXISITING SANITARY SEWER FACILITIES

The existing sanitary sewer system put in place with Ladera Ranch Phase 1 and the existing main on 6^{th} Avenue consist of an 8-inch diameter SDR 35 PVC. The flows from Ladera Ranch Phase 1 and Ladera Ranch Phase 2 will be carried east to the main on Chocolate Drive and 6^{th} Avenue.

PROPOSED SANITARY SEWER FACILITIES

Ladera Ranch Phases 2-6 will be served by proposed sanitary sewer mains comprised of 8-inch diameter SDR 35 PVC pipe, with a minimum slope of 1% constructed on-site. These sanitary sewer mains will convey sewage from the Ladera Ranch Phase 2 site to existing stubs within Ladera Ranch Phase 1 and will then connect to the outgoing main on 6^{th} Avenue.

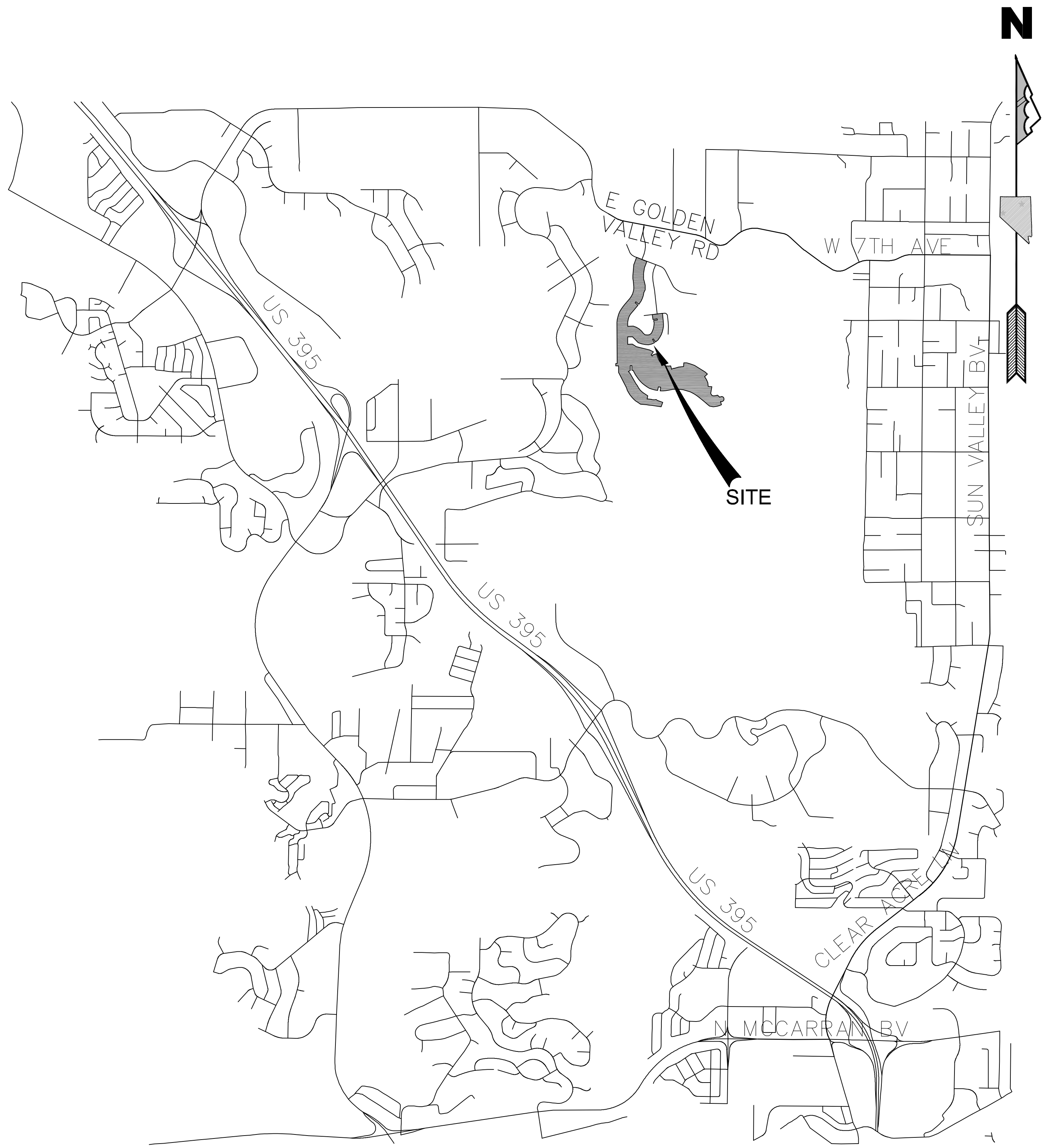
SEWER ANALYSIS

The approximate location of the proposed sanitary sewer system servicing Ladera Ranch Phase 2 is illustrated on the display map in the appendix of this report. Using the Washoe County Gravity Sewer Collection Design Standards, the proposed 294 lots will generate a peak flow of 238,140 gpd. The flattest section of the on-site gravity sanitary sewer is an 8-inch pipe with a slope of 1%, the half-full capacity of this pipe is 423,028 gpd at 3.75 ft/s and can serve approximately 522 single family units. At this slope (1.0%) and with peak flow of 238,140 gpd, the mains will flow at 36.3% full with a velocity of 3.22 ft/s. The highest slope in the development is in 7.49%. An 8-inch diameter SDR 35 PVC pipe with a slope of 7.49% has a half-full capacity of 1,157,738 gpd. At this slope (7.49%) and with peak flow of 238,140 gpd, the mains will flow at 21.7% full with a velocity of 6.62 ft/s. Phase 1 contributes 105 lots with a peak flow of 85,050 gpd. The mains from Ladera Ranch Phases 2-6 will connect to stubs at the cul-de-sac of Quail Ridge Ct. and at the intersections of Dream Catcher Road and Painted Sky Way, and Flint Springs Drive and Quail Ridge Ct all in Ladera Ranch phase 1.

CONCLUSION

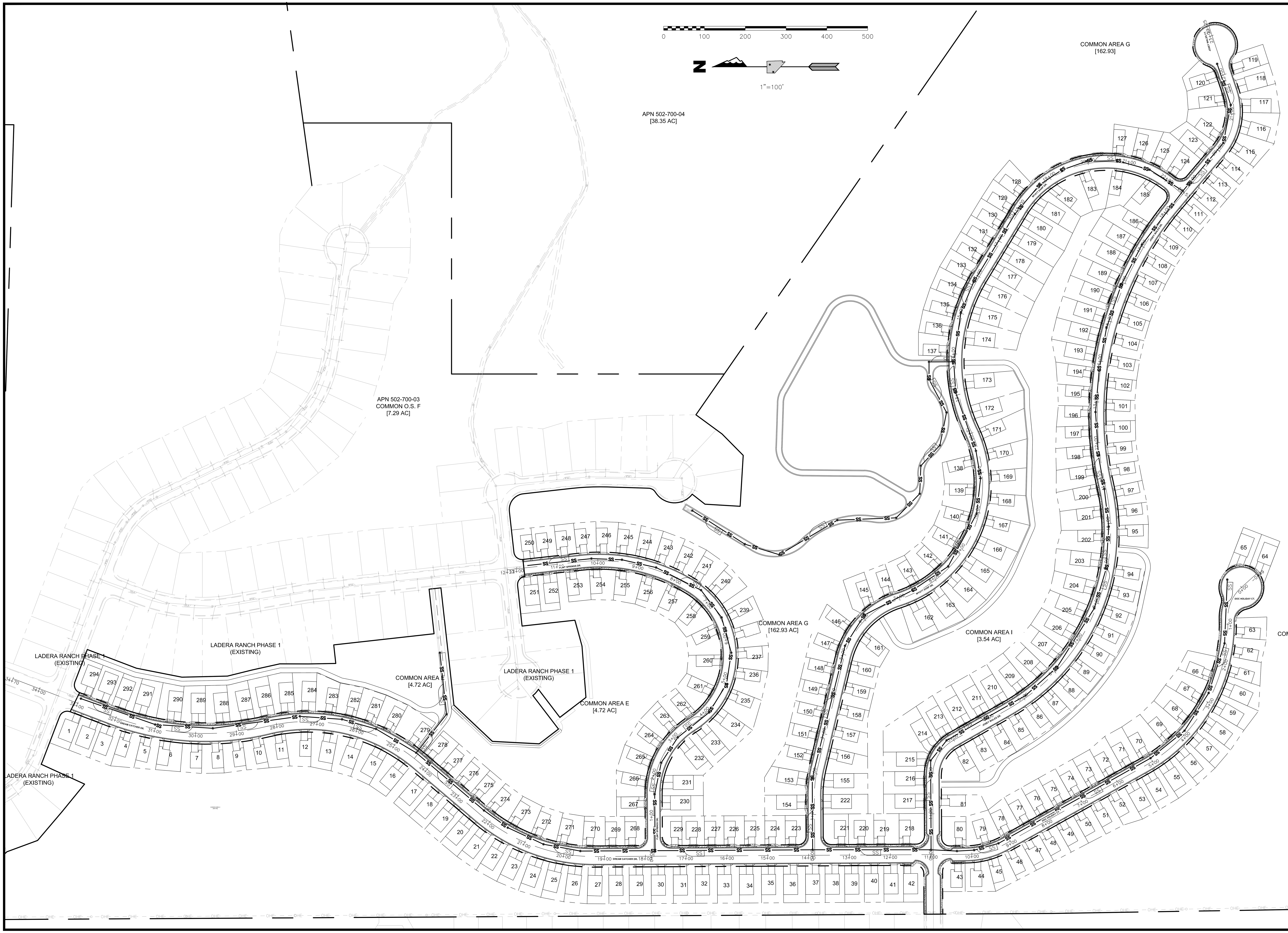
The Ladera Ranch Phases 2-6 Tentative Map will consist of 294 proposed single family units that will generate a proposed peak flow demand of 238,140 gpd. The proposed mains in the development have a minimum slope of 1% and a maximum slope of 7.49%. The proposed project will be served by proposed on-site mains that will connect to existing stubs in Ladera Ranch Phase 1, which will carry the flows off-site to existing mains in 6^{th} Avenue and Chocolate Drive. The existing off-site mains will have the capacity to accommodate the flows from the existing Ladera Ranch Phase 1 and the proposed Ladera Ranch Phases 2-6. All facilities are designed to handle the proposed flows at or below the half-full capacities of the mains. In the event of future developments not identified in this report utilizing the existing system, the downstream sanitary sewer system should be re-analyzed.

APPENDIX A



LADERA RANCH PHASE 2-6 TENTATIVE MAP VICINITY MAP	SCALE: N.T.S Copyright SUMMIT ENG 2020	SUMMIT ENGINEERING CORPORATION™ 5405 MAE ANNE AVENUE, RENO, NV. 89523 PHONE:(775) 747-8550 FAX:(775) 747-8559	SHEET 1 OF 1

N:\DWGS\J30884_Lansing_LaderaNewTM\Civil\LaderaTM-T-1.DWG ~ 9:32 AM * 28-JAN-2020



SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
PHONE(775) 747-8550 FAX(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP PLANS FOR LADERA RANCH PHASES 2-6 SANITARY SEWER DISPLAY

WASHOE COUNTY

NEVADA

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DESIGNED BY: SD

CHECKED BY: RG

SCALE

HORIZ: 1"=100'

VERT:

JOB NO: 30884

SHEET 1 OF 1

APPENDIX B

8" SS MAIN HALF-FULL CAPACITY S=1.0%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.012
Channel Slope	1.00
Normal Depth	4.0
Diameter	8.0

Results

Discharge	423,028.13
Flow Area	0.2
Wetted Perimeter	1.0
Hydraulic Radius	2.0
Top Width	0.67
Critical Depth	4.6
Percent Full	50.0
Critical Slope	0.64
Velocity	3.75
Velocity Head	0.22
Specific Energy	0.55
Froude Number	1.292
Maximum Discharge	910,107.69
Discharge Full	846,056.27
Slope Full	0.25
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	50.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.0
Critical Depth	4.6
Channel Slope	1.00
Critical Slope	0.64

8" SS MAIN HALF-FULL CAPACITY S=7.49%

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.012
Channel Slope	7.49
Normal Depth	4.0
Diameter	8.0

Results

Discharge	1,157,737.66
Flow Area	0.2
Wetted Perimeter	1.0
Hydraulic Radius	2.0
Top Width	0.67
Critical Depth	7.3
Percent Full	50.0
Critical Slope	1.63
Velocity	10.26
Velocity Head	1.64
Specific Energy	1.97
Froude Number	3.536
Maximum Discharge	2,490,770.38
Discharge Full	2,315,475.31
Slope Full	1.87
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	50.0
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	4.0
Critical Depth	7.3
Channel Slope	7.49
Critical Slope	1.63

8" SS MAIN PEAK FLOW DEMAND S=1.0%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012
Channel Slope	1.00
Diameter	8.0
Discharge	238,140.00

Results

Normal Depth	2.9
Flow Area	0.1
Wetted Perimeter	0.9
Hydraulic Radius	1.6
Top Width	0.64
Critical Depth	3.4
Percent Full	36.3
Critical Slope	0.57
Velocity	3.22
Velocity Head	0.16
Specific Energy	0.40
Froude Number	1.342
Maximum Discharge	910,107.69
Discharge Full	846,056.27
Slope Full	0.08
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	36.3
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	2.9
Critical Depth	3.4
Channel Slope	1.00
Critical Slope	0.57

8" SS MAIN PEAK FLOW DEMAND S=7.49%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012
Channel Slope	7.49
Diameter	8.0
Discharge	238,140.00

Results

Normal Depth	1.7
Flow Area	0.1
Wetted Perimeter	0.6
Hydraulic Radius	1.0
Top Width	0.55
Critical Depth	3.4
Percent Full	21.7
Critical Slope	0.57
Velocity	6.62
Velocity Head	0.68
Specific Energy	0.83
Froude Number	3.665
Maximum Discharge	2,490,770.38
Discharge Full	2,315,475.31
Slope Full	0.08
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0
Length	0.0
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0
Profile Description	N/A
Profile Headloss	0.00
Average End Depth Over Rise	0.0
Normal Depth Over Rise	21.7
Downstream Velocity	Infinity
Upstream Velocity	Infinity
Normal Depth	1.7
Critical Depth	3.4
Channel Slope	7.49
Critical Slope	0.57

February 12, 2020
Project No. 1404002

Mr. Will Roberts
LANSING COMPANIES
12671 High Bluff Dr., Suite #150
San Diego, CA 92130

RE: Geotechnical Code Update
Ladera Ranch
Washoe County, Nevada

REF: Geotechnical Investigation
Ladera Ranch
Reno, Washoe County, Nevada
Wood Rodgers, Inc. Project No. 1404002
January 28, 2005
Updated January 6, 2017
Addendum dated August 10, 2017

ASCE Design Loads Manual 7-16
2018 International Residential Code (IRC)
2018 Northern Nevada International Code Council Amendments

Dear Mr. Roberts:

Wood Rodgers is pleased to present this geotechnical code update for the Ladera Ranch project. Our assessments and recommendations are based on the findings presented in the 2005 report, the January, 2017 update report, and the August, 2017 addendum prepared by Wood Rodgers, Incorporated as well as the referenced codes and standards as they relate to geotechnical design considerations. This update has been developed to address relevant code changes to the ASCE Minimum Design Loads Manual and the 2018 IRC, both of which have been adopted as the applicable standards by Washoe County.

Unless specifically modified herein, the recommendations presented in the referenced 2005 Wood Rodgers report and subsequent update and addendum should be considered valid.

DISCUSSION AND RECOMMENDATIONS

Foundations

PT Slab Foundations

The January, 2017 update report recommends the soil moisture and soil suction profiles be investigated, tested, and re-evaluated as part of the process to develop design level recommendations.

Soil Profile Type Amplification Factors

In accordance with ASCE 7-16 and the Northern Nevada Amendments of the 2018 IRC, Site Class C and Seismic Design Category D2 have been assigned to the project. Seismic design values were determined based on a representative latitude and longitude of 39.596°N and -119.805°E, respectively. Per ASCE 7-16, the site's modified Peak Ground Acceleration to be used for engineering analyses is equal to 0.716g. The ASCE 7 Hazards Report is attached to this letter.

Retaining Walls

Clay soils or soils blended with organics shall not be placed in areas to be retained by or supporting retaining structures. Recommended lateral earth pressures for consideration in the design of retaining structures are presented in Table 1. Changes in earth pressures due to seismic influences were assessed via the Mononobe-Okabe protocol. In addition, we have assumed that some displacement is allowable during the design event, and our recommended values have therefore been based on 50% of ASCE 7-16's predicted PGA_M. The values presented in Table 1 do not consider hydrostatic pressures or surcharge loading. Traffic loading should be modeled by increasing the wall backfill load by an additional height of two feet. Unless confined by slab or pavement, the surface foot of soil should be ignored when considering passive resistance.

Table 1 - Lateral Earth Pressures

Condition	Active (psf/f)		Passive (psf/f)		At Rest
	Static	Pseudo-Static	Static	Pseudo-Static	
Level	37	74	350	275	56

Excessive retaining wall pressures can be developed due to heavy compaction equipment proximate to the wall during backfill placement. Therefore, due care during placement and compaction of backfill is required. Backfill behind retaining structures should be compacted to not less than 90 percent of the soils' maximum dry density. French drains, a drainage backfill geotextile such as Mirafi 140 N, or a pre-manufactured drain system such as Tensor ® DC1200 may be utilized if buildup of hydrostatic pressure is possible. Soil preparation for retaining wall foundations and allowable bearing capacities shall be consistent with the Site Preparation, Grading and Filling, and Foundations sections of this report.

CONCLUSION

We appreciate the opportunity to prepare this geotechnical update for the Ladera Ranch project. Please contact our office should you have any related questions or comments.

Sincerely,

WOOD RODGERS, INCORPORATED

PROFESSIONAL ENGINEER STATE OF NEVADA
JUSTIN M. MCDOUGAL
Exp. 12/31/21
CIVIL
No. 24474

02/12/20

Justin M. McDougal, PE	James G. Smith, PE
Associate	Principal
RE Number: 24474	
Expires: 12/31/2021	

Enclosures

1. ASCE 7-16 Seismic Design Hazards Report

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: C - Very Dense Soil and Soft Rock

Elevation: 5142.48 ft (NAVD 88)
Latitude: 39.596
Longitude: -119.805

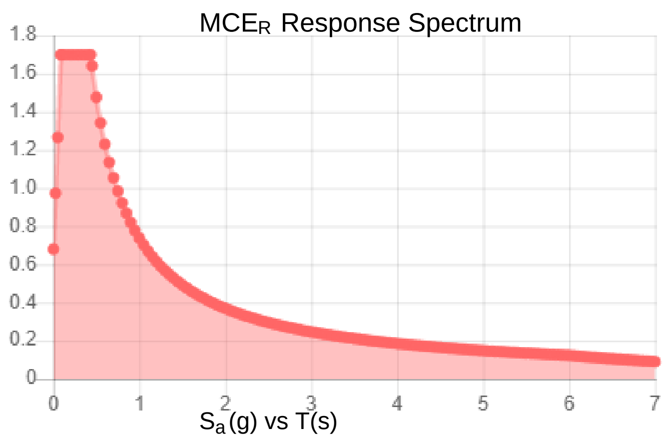
Seismic

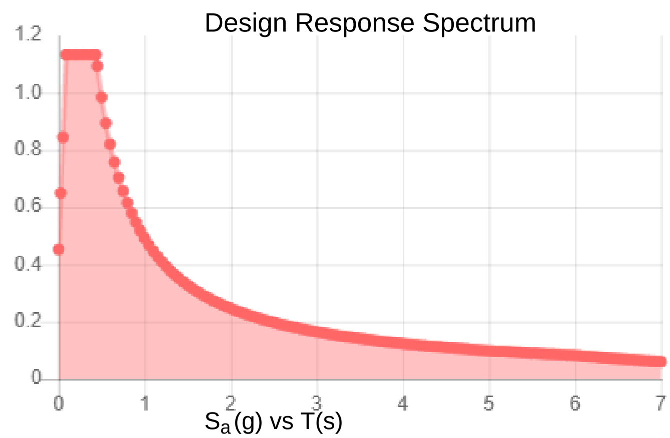
Site Soil Class: C - Very Dense Soil and Soft Rock

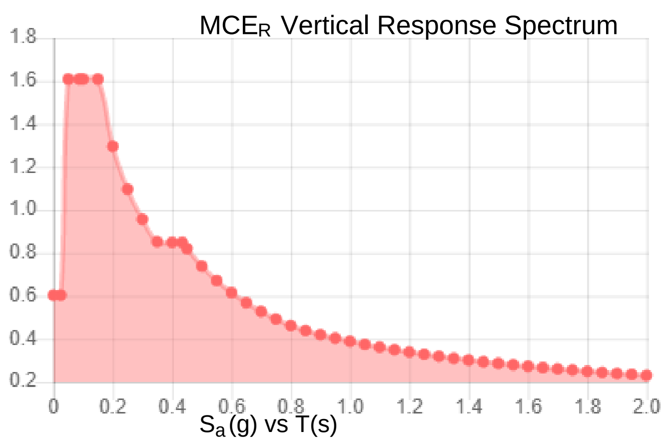
Results:

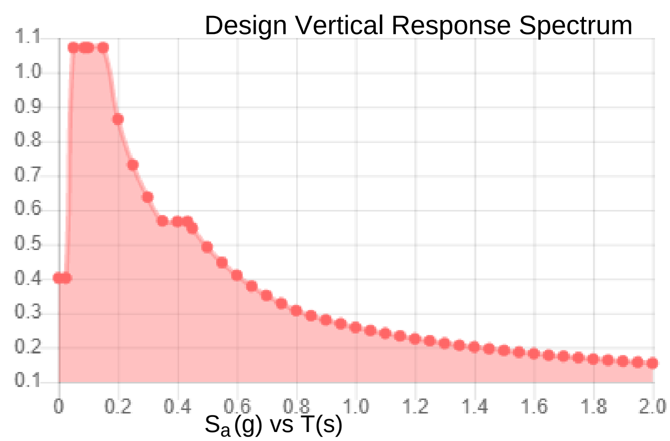
S_S :	1.416	S_{D1} :	0.492
S_1 :	0.492	T_L :	6
F_a :	1.2	PGA :	0.597
F_v :	1.5	PGA_M :	0.716
S_{MS} :	1.699	F_{PGA} :	1.2
S_{M1} :	0.738	I_e :	1
S_{DS} :	1.133	C_v :	1.183

Seismic Design Category D









Data Accessed: Wed Feb 05 2020

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

January 6, 2017
Project No. 1404003

Mr. Ted Brown
DR HORTON
1081 Whitney Ranch Drive, Suite 141
Henderson, NV 89014

Re: Geotechnical Update Report
Ladera Ranch
Single-Family Subdivision
Reno, Nevada

Dear Mr. Brown:

This letter transmits Wood Rodgers' geotechnical update report for Ladera Ranch subdivision in Reno, Nevada. The purpose of this update was to provide geotechnical recommendations related to construction of the planned single-family residences. In the preparation of this update report we reviewed the following documents:

- Geotechnical Investigation for Ladera Ranch; Washoe County, Nevada; January 28, 2005; Wood Rodgers, Inc.
- Results of Geophysical Measurements; Ladera Ranch; Washoe County, Nevada; April 26, 2016; Wood Rodgers Inc (enclosed).
- International Residential Code (IRC) 2012, International Code Council (ICC).
- International Building Code (IBC) 2012, ICC.
- 2012 Northern Nevada Code Amendments, ICC, City of Reno.
- NRCS Web Soil Survey; http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.
- USGS Interactive Fault Map; http://earthquake.usgs.gov/hazards/qfaults/map/.

Since the provisions of the International Residential Code (IRC) indicate that the Code applies to the design and construction of One- and Two-family Dwellings (R101.2 Scope) not more than three stories above grade plane in height, the IRC should be the design standard for planned single family residences. Unless specifically revised herein, the recommendations contained in the referenced geotechnical reports shall be considered valid.

SITE CONDITIONS

The site remains undeveloped since the referenced field explorations were completed. The site has been accessible from the Opal Station subdivision to the west and via dirt trails crossing the property. Localized dumping of random debris has occurred at various areas across the site. The ground surface is hilly and generally slopes to the east with changes in elevation greater than 20 feet. Ground coverage consists of moderately dense sagebrush up to about 3 feet in height, light grasses, and bare soil and rock.

PRIOR INVESTIGATIONS

Geotechnical Investigation, Wood Rodgers, 2005

The report covers approximately 400 acres for development of single family residences and related infrastructure. Site grading is anticipated to include maximum cuts and fills on the order of 25 and 30 feet, respectively. The scope included excavation of 25 test pits, fault investigation trenches, laboratory testing, engineering analysis, and report preparation including recommendations for design and construction of the project.

The field investigation encountered very difficult excavating conditions with a Komatsu 300LC excavator and refusal conditions before achieving several proposed cut depths. The site soils and rock are anticipated to be highly variable in quality and extent. Based on laboratory testing of sampled soils, the near surface soils range from low to highly expansive, and clayey soils and altered bedrock have the potential of extreme shrink/swell volume changes with changes in moisture content. The majority of native soil/rock material generated by mass grading operations are not anticipated to meet the criteria for engineered select fill. There are some areas onsite that have been identified as possible borrow sources for engineered select fill (TP-2, TP-11, TP-13, and TP-18). The materials will require crushing and screening in order to meet the criteria for engineered select fill. Recommendations for site preparation, grading, and select fill separation requirements are discussed within the original report, and should remain valid for the various grading opportunities. Design parameters for PT Slab Foundations were provided for highly expansive soils and moderately expansive altered-bedrock; these preliminary values will be modified herein as appropriate for contemporary design standards.

The fault investigation concluded that no evidence of Holocene faulting was found at the Ladera Ranch development site which was based on stereoscopic examination of aerial photographs, field reconnaissance, and exploratory test trenches. Recommendations include that no further investigation of the mapped faults be conducted, and that no fault setbacks are recommended because of the absence of Holocene-active faults.

No groundwater was encountered at the time of excavation in any of the test pits. Groundwater is not expected to affect construction activity; however groundwater elevation should be expected to seasonally fluctuate due to precipitation and snowmelt.

Results of Geophysical Measurements, Wood Rodgers, 2016 (enclosed)

A total of 15 geophysical alignments were measured at areas of proposed cut sections to aid in the assessment of excavatability of the proposed cut depths. Based on the Cut & Fill Map for Ladera Ranch Phase 1 & Phase 2 (Summit Engineering, 2015), the site plan and geophysical testing layout (Plate A-1) shows the proposed site layout, cut sections, and geophysical line designations. Each geophysical result has been accompanied by the existing topography, a photo of the test alignment, and a visual rock classification at the ground surface. The results show significant differences in P-wave velocity ranging from 2,000 feet per second (fps) to 6,000 fps at the ground surface. As the profiles indicate green to yellow velocities approaching 8,000 fps, the adverse curve on the production charts is approached (Caterpillar Handbook of Ripping, 12th Edition).

SEISMIC DESIGN

The City of Reno Northern Nevada Amendments to the IRC indicate residential structures should be placed in seismic design category D_2. Based on our review of the United States Geological Survey's interactive fault map, although there are Quaternary faults proximate to the property, none have been mapped as crossing the subject property. Previous studies have included fault investigations and concluded that fault offsets are not recommended. A summary of seismic design values are presented in Table 1, which utilized a Seismic Site Class C.

Table 1 – Summary of ASCE 7-10 Seismic Design Values

Lat.	Lon.	S_S	S_1	SDC	F_a	F_v	S_{MS}	S_{M1}	S_{DS}	S_{D1}	F_{PGA}	PGA_M
39.596	-119.805	1.487	0.496	D	1.0	1.304	1.487	0.647	0.992	0.431	1.000	0.548

FOUNDATIONS

Standard Spread Foundations

We recommend the use of standard spread foundations with the required over-excavation as outlined in the original report and mentioned below. Standard spread foundations may be utilized in areas that can be designated as medium dense to dense, undisturbed, native non-expansive soil, compacted non-expansive soil, compacted non-expansive rock fill, or a minimum of 3 feet of engineered select fill compacted at least 90 percent relative compaction. A maximum allowable soil bearing pressure of 2,000 pounds per square foot may be utilized for design, and can be increased by one-third for total loads including wind and seismic loads.

PT Slab Foundations

However, if the owner or structural engineer decide to proceed with post-tensioned slabs to avoid over-excavation beneath building pads, the following preliminary design values have been calculated following the Post Tension Institute, 3rd Edition. These design values have been established around the information developed from our review of prior documents and modeling soil suction at grade as a default suction value of 4.5 pF. We recommend the soil moisture and soil suction profiles be investigated, tested, and re-evaluated as part of the process to develop design level recommendations. Our post-tensioned slabs-on-grade analyses are presented in Appendix B. Note post-tension slabs are a flexible foundation system, and that movement is likely to occur.

Table 2 – Preliminary Post Tensioned Slab-on-Grade Design Recommendations

Condition	Center Lift	Edge Lift
Moderate to Highly Expansive Clay Soils		
Edge Moisture Variation - e_m (Ft.)	8.0	4.2
Differential Soil Movement - y_m (In.)	-1.6	2.4
Moderately Expansive Altered Bedrock		
Edge Moisture Variation - e_m (Ft.)	9.0	4.7
Differential Soil Movement - y_m (In.)	-1.0	1.5

An allowable bearing value of 2,000 pounds per square foot may be utilized for design. This value may be increased by a factor of 1.33 when considering wind or seismic loading.

Turn downs for post-tensioned slabs must extend to a depth of 2-feet below finished adjacent exterior grade or be designed to resist the effects of frost-heave (such as insulation as presented in ASCE 32). Local structural design practices have been modeling frost heave by designing an alternative edge-lift of 2.4 inches (10% of a 24 inch water column to model expansion during ice formation) within the perimeter 24 inches of the slab. It should be pointed out however, that this movement could potentially be in addition to edge-lift caused by clay activity and therefore the design edge-lift value should consider the cumulative effects of the two influences. In addition, the 2012 IRC Northern Nevada Amendments require that these deflection calculations "would need to show that the maximum combined frost and expansive soil heaving, as localized at slab edges, with resultant non-uniformly distributed deflections, as well as whole slab deflections would not result in super structure racking or excessive truss, roof, or wall frame movement."

Minimum slab thickness and recommended turn-down should be established by the structural engineer. Based on *Guidelines for the Evaluation and Repair of Residential Foundations*, the most realistic model for calculating elevation differences and maximum angular distortion for a slab-on-grade foundation is an elastic plate; slab-on-grade foundations exhibit two-way bending. When compared to deflection predicted via a beam model, the maximum slope of the deflection surface of a plate subjected to two-way bending is over 40-percent more than the maximum slope of a one-way beam deflected to the same deflection ratio. Therefore, if acceptable slab behavior is modeled via beam criteria, we recommend considering increasing the perimeter turn-down to such depth that an elastic plate response would be comparable to the one-way beam. As stated in the referenced document, *Deflection calculations predict future behavior of the foundation only in a very general and approximate sense*.[1]

For normal construction practices, the coefficient of friction μ should be taken as 1.0 for slabs cast directly on a sand or pea gravel base. Size No. 67 concrete aggregate is not recommended for the capillary break.

Excessive shrinkage cracking can precipitate the need for changes in design considerations. When considering non-post-tensioned slabs, crack control joint spacing is typically limited to 10 to 12 feet in our locale due to the combined effects of our local aggregates and environmental considerations. If this spacing seems aggressive when considering shrinkage, PTI suggests the designer consider increasing the minimum pre-stress force. Post-tensioned foundations are expected to deform. The flexibility of the slab distributes localized soil movement to a more uniform slab shape; however it is important that other consultants be cognizant of this behavior so that their products and design can be made compatible with a flexible foundation system. Typically, roof trusses, load concentrations, architectural features spanning between the active and non-active zones, non-flexible exterior siding, brittle floor coverings, and areas that slope to drain and utility connections warrant closer scrutiny.

Post-construction practices must be incorporated to help ensure the successful performance of the post-tensioned slabs. To help minimize movements in soils due to post-construction factors, not climate related, the following maintenance procedures are required:

- Uniform landscaping should be provided adjacent to the perimeter of the foundation, and excellent drainage provided and maintained away from the residence. Never allow water to pond adjacent to the structure

- Recommended positive drainage is a minimum of six inches of fall in ten feet, and impervious surfaces within ten feet of the building foundation should be sloped a minimum of two percent away from the foundation.

- Water should be applied in a uniform, systematic manner as equally as possible on all sides of the residence to keep the soil moist. Areas without ground cover may require more moisture due to the potential for increased evaporation.

- Soaker hoses, if used, should be placed 18" to 30" from foundation edge. Sprinklers should not be allowed to spray directly on foundation.

- Trees should not be planted within 10 feet of the structure.

---

[1] Guidelines for the Evaluation and Repair of Residential Foundations, Version 2, May 1, 2009, Texas Section American Society of Civil Engineers.

- Check gutters and downspouts to be sure they are clear and water discharges a minimum of five feet from foundation.

- The foundation perimeter should be observed during extreme hot and dry periods to help insure that adequate watering is being provided to prevent the soil from separating from the foundation.

It is recommended that all property owners conduct a yearly survey of their foundation and perform any maintenance necessary to improve drainage and prevent ponding of water adjacent to these structures. This is especially important during the first ten years after construction. This is usually when the most severe adjustment between the new foundation and supporting soil occurs. Following the above listed procedures should minimize detrimental foundation movement caused by expansive soils.

EXPECTATION OF PERFORMANCE

This section is intended to highlight the performance levels around which our analyses and recommendations have been based so that standards atypical to the project are not relied upon in assessing project performance. The assessments and recommendations presented in this geotechnical report have been formulated around locally accepted industry practices for investigations and analyses for similar type projects. Structural and civil design, topography, soils, and bedrock are all unique and the requirements of Code, information available, knowledge, and expertise of the geotechnical engineer *at the time this report was prepared* work together to establish the level for which performance shall be appraised.

There is no design or construction standard that can guarantee that cracking (wall board, flooring, concrete slabs-on-grade, etc.) will not occur. Disparate materials behave in dissimilar ways and it is the fundamental behavior of the individual components that govern overall response.

The International Building Code (IBC) and the International Residential Code (IRC), as amended and adopted by the City of Sparks, *establish minimum regulations for building systems using prescriptive and performance-related provisions*. They *are founded on broad-based principles that make possible the use of new materials and new building designs*. Effective use of the IBC provides minimum requirements to safeguard the public health, safety, and general welfare of the occupants of new and existing buildings and structures. Grading considerations presented in this report are consistent with the requirements and standards presented in the IBC (Chapter J).

The IRC was created to *serve as a complete, comprehensive code regulating the construction of single-family houses.* The IRC *presents coverage for what is conventional and common in residential construction practice* and the IRC is meant to be *all inclusive for typical residential construction*. Chapter 3 provides guidelines for *a minimum level of structural integrity, life* *safety, fire safety and livability for inhabitants of dwelling units* regulated by the IRC. Chapter 4 provides the *requirements for the design and construction of foundation systems for buildings* regulated by the IRC. Chapter 4 presents the provisions for seismic load, flood load, and frost protection. *Foundation systems are defined as consisting of two interdependent components: the foundation structure and the supporting soil.* Unless specifically modified in our technical discussions the IRC shall be considered the established standard around which all design assessments and recommendations are made.

Given the basic grading elements associated with the development, the ability to eliminate settlement associated with fills or heave due to wetting of the clay soils is impossible. Instead, to be consistent with the requirements of Code, settlement and heave must be limited to keep *structural integrity* from being compromised. This approaches 1” differential settlement in 12.5 feet. For the purposes of this report, the following design standards have been adopted for standard spread foundations:

Table 3 - Settlement Criteria for Building Damage[2]

Category	Description	*Maximum Radius of Curvature
Architectural	Cracking	1/300 (1”/25’)
Structural	Strength Reduction	1/150 (1”/12.5’)
Functional	Impaired Use	1/50 (1”/4.5’)
*Radius of Curvature = differential settlement/column spacing or differential settlement/adjacent supports. Differential settlement measurements for the purpose of assessing geotechnical performance shall subtract original construction variations and immediate settlements that occurred prior to sheet rocking and taping.		

To keep differential settlements below the Architectural Cracking threshold, allowable settlement limitations established with this report are for a maximum, post construction, radius of curvature of 1/360. Whether cracking actually occurs is a function of materials, structural design, geotechnical design, design loads, and construction practices, most of which are outside the purview of this report. Therefore, unless the post construction radius of curvature exceeds 1/360, any observed cracking should be considered a function of the materials, design loads, structural design, and/or construction practices, but within the intent of the IRC.

The recommendations presented in this report are also formulated around the consideration of the structural performance of concrete. Concrete can crack or curl and still perform within the structural framework intended and prescribed by Code. Primary limitations in the allowable magnitudes of concrete curl or cracking are driven by architectural concerns. These concerns

[2] Construction and Geotechnical Methods in Foundation Engineering, Koerner, Robert M., McGraw-Hill Book Company, 1984

are dependent upon the aesthetic performance desired by the builder and have been developed around the anticipated performance of his selected flooring products.

We appreciate the opportunity to perform our geotechnical services for you. Please contact our office should you have any related questions or comments.

Sincerely,

WOOD RODGERS, INCORPORATED

Blake D. Carter, PE
Associate
RE Number 22331
Expires 12/31/2018

PROFESSIONAL ENGINEER - STATE OF NEVADA
BLAKE DOUGLAS CARTER
Exp. 12-31-18
CIVIL
No. 22331

1/6/17

James G. Smith, PE
Principal

Appendix A:
USGS Design Maps Detailed Report

Appendix B:
Volflo PT Slab Calculations (PTI 3rd Edition)

Appendix C:
Results of Geophysical Measurements; Ladera Ranch; Washoe County, Nevada; April 26, 2016; Wood Rodgers Inc.

APPENDIX A
USGS DESIGN MAPS DETAILED REPORT

USGS Design Maps Detailed Report

ASCE 7-10 Standard (39.596°N, 119.805°W)

Site Class C – "Very Dense Soil and Soft Rock", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] S_S = 1.487 g

From Figure 22-2 [2] S_1 = 0.496 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 1.487 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.496 g, F_v = 1.304

Equation (11.4–1): $S_{MS} = F_aS_S = 1.000 \times 1.487 = 1.487$ g

Equation (11.4–2): $S_{M1} = F_vS_1 = 1.304 \times 0.496 = 0.647$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

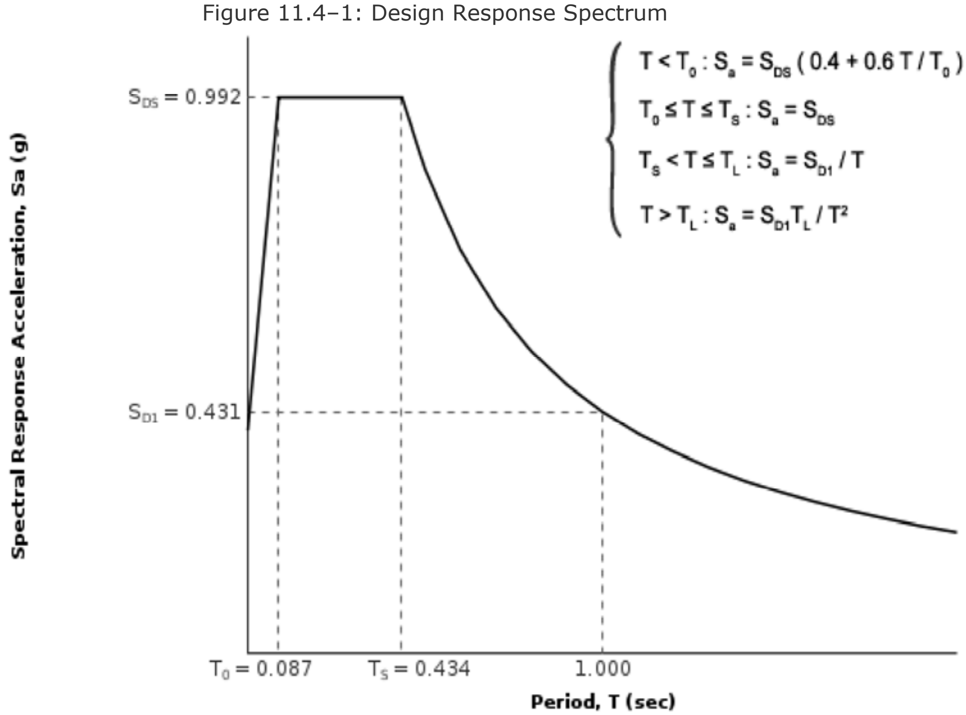
Equation (11.4–3): $S_{DS} = ⅔ S_{MS} = ⅔ \times 1.487 = 0.992$ g

Equation (11.4–4): $S_{D1} = ⅔ S_{M1} = ⅔ \times 0.647 = 0.431$ g

Section 11.4.5 — Design Response Spectrum

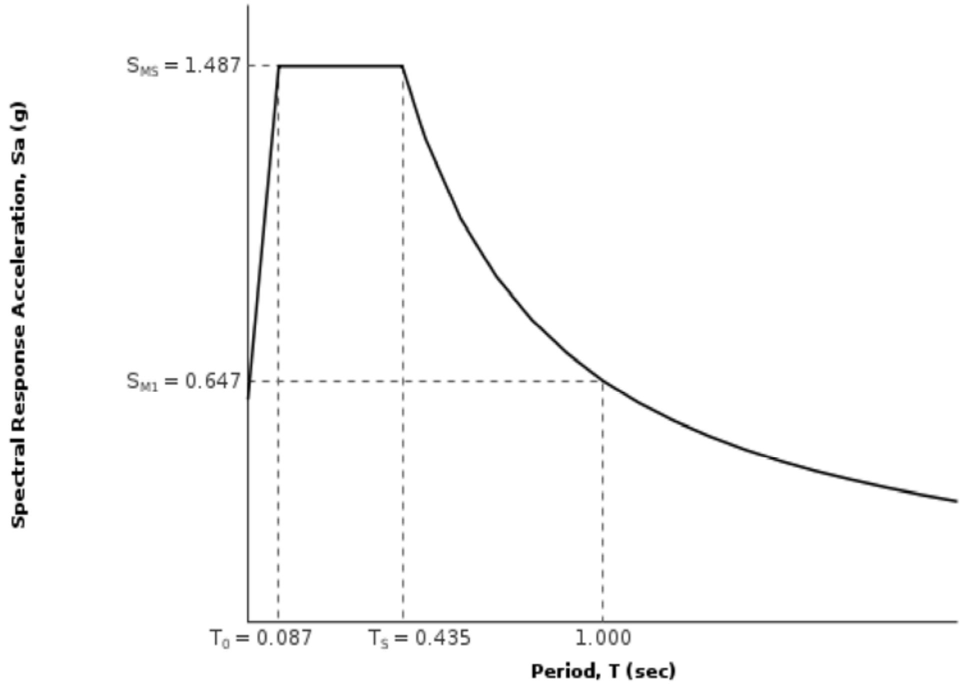
From Figure 22-12 [3] $T_L = 6$ seconds

Figure 11.4–1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] $PGA = 0.548$

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.548 = 0.548$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = C and PGA = 0.548 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] $C_{RS} = 0.955$

From Figure 22-18 [6] $C_{R1} = 0.953$

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.992 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.431 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

APPENDIX B

VOLFLO PT SLAB CALCULATIONS (PTI, 3RD EDITION)

VOLFLO 1.5

Geostructural Tool Kit, Inc.

Registered To : Wood Rodgers Serial Number : 200-100-086

Project Title : Ladera Ranch
Project Engineer : BC

Project Number : 1404003
Project Date : January 6, 2017

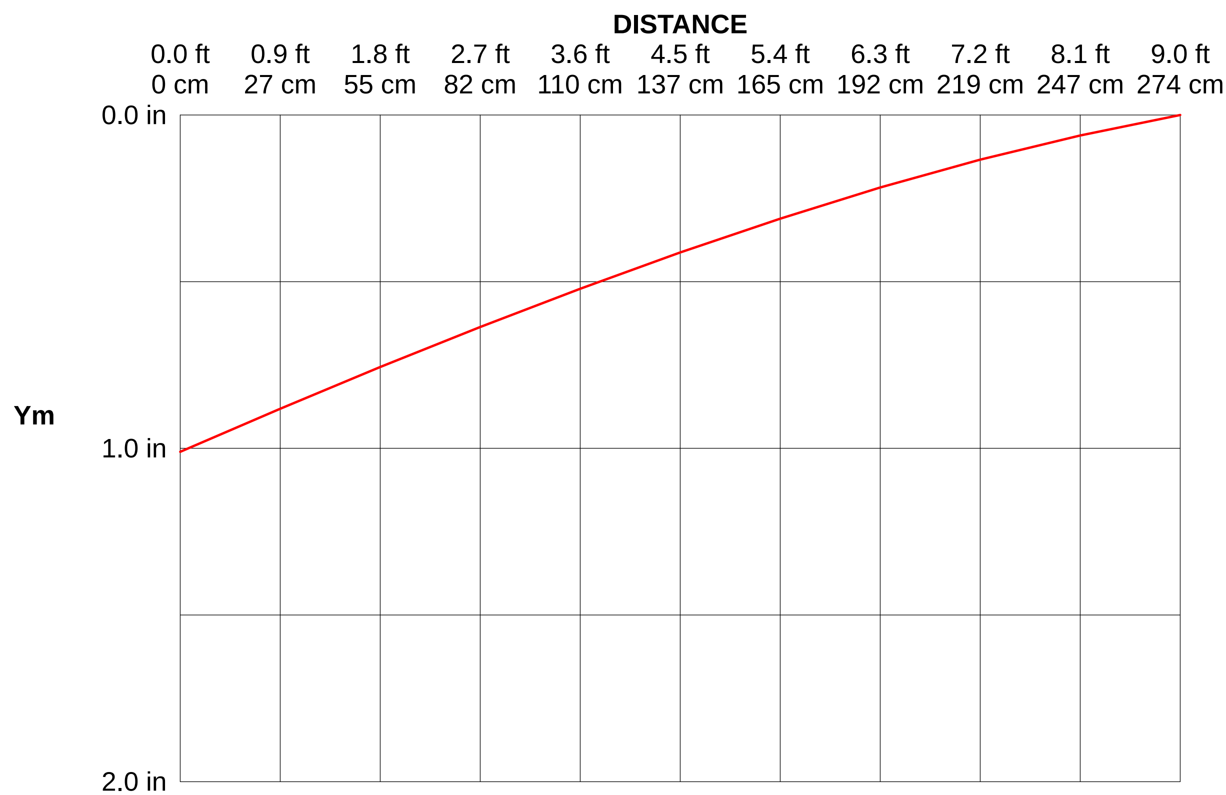
Geotechnical Report : Wood Rodgers

Report Date : 1/28/2005
Report Number : 1404.002

SHRINK CALCULATION

Ym Center (Shrink) = -1.01 inches (-2.57 centimeters)

Em Center = 9.00 feet (274.32 centimeters)



	Shrink at Slab Edge	Shrink at distance X from edge of slab									Shrink at Em
	0.0 ft	0.9 ft	1.8 ft	2.7 ft	3.6 ft	4.5 ft	5.4 ft	6.3 ft	7.2 ft	8.1 ft	9.0 ft
	0 cm	27 cm	55 cm	82 cm	110 cm	137 cm	165 cm	192 cm	219 cm	247 cm	274 cm
inches	-1.01	-0.88	-0.76	-0.64	-0.52	-0.41	-0.31	-0.22	-0.13	-0.06	0.00
cm	-2.57	-2.24	-1.92	-1.62	-1.32	-1.05	-0.79	-0.55	-0.34	-0.16	0.00

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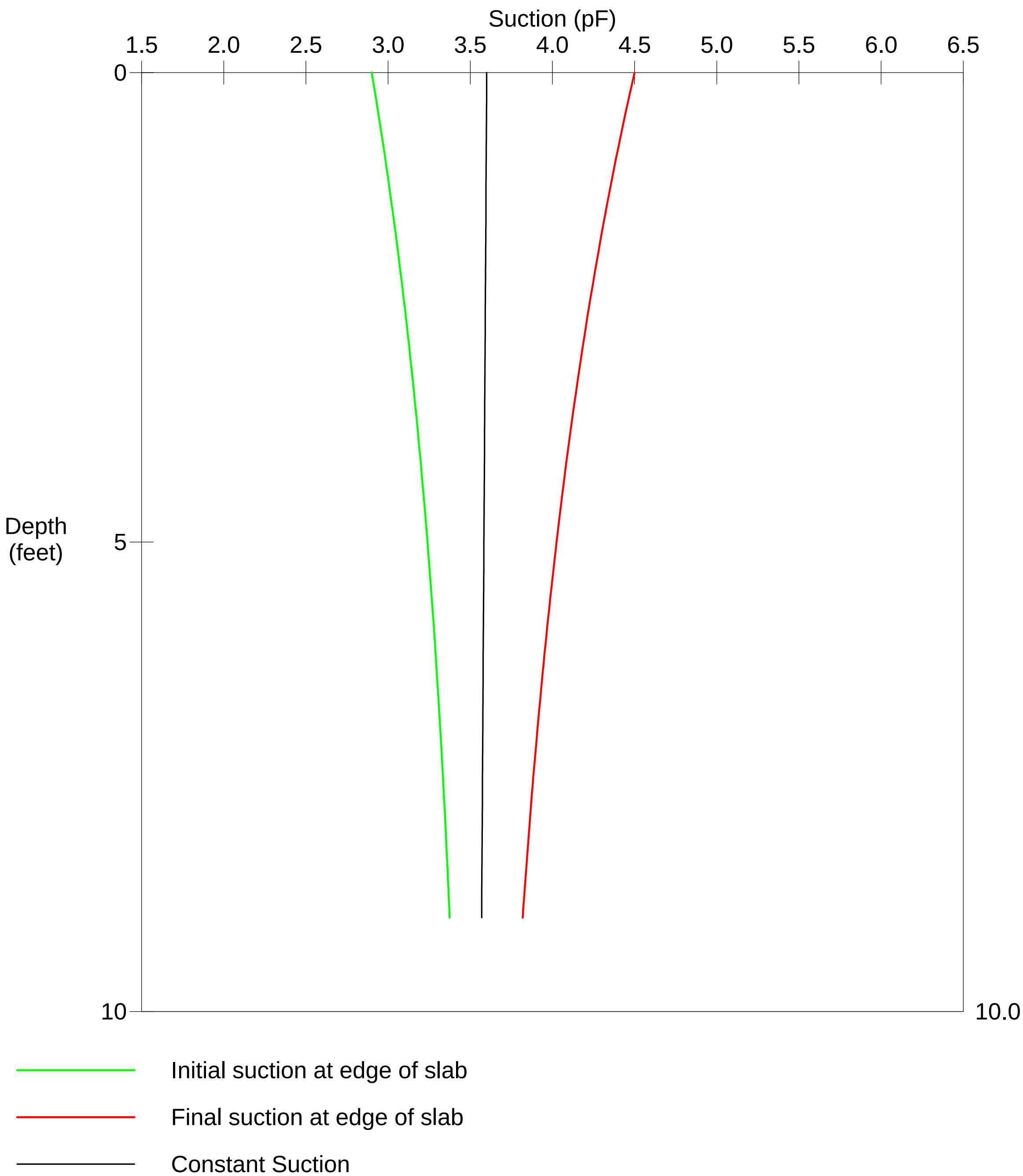
SUCTION PROFILES



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LAYER GEOTECHNICAL PROPERTIES

Layer	Gamma0 (Mean)	Fine Clay Cor. Fact.	Coarse-Grain Cor. Fact.	GammaH (Mean)	GammaH (Shrink)	GammaH (Swell)
1	0.050	0.600	1.000	0.030	0.029	0.031

Layer	Alpha (Mean)	Alpha (Shrink)	Alpha (Swell)	S	P	KoHo
1	0.004576	0.004587	0.004565	-12.605	0.000669	0.000290

Gamma0 Determination Per PTI 3rd Edition Manual

Layer	% Fine Clay	PI	PI/ %fc	LL	LL/ %fc	Zone Chart	Gamma0 (Mean)
1	60.00	30	0.50	50	0.83	2	0.050

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Geotechnical Report : Wood Rodgers

Report Date : 1/28/2005
Report Number : 1404.002

SUMMARY OF INPUT DATA - Soil Properties

Layer Thickness and description

Layer Number	Layer Thickness	Depth to Bottom	Layer Description
1	10.0 ft	10.0 ft	Expansive Rock

Layer Geotechnical Properties

Layer Number	Liquid Limit	Plastic Limit	% Pass. #200	% Finer 2 mic.	Dry Den. (lb/ft^3)	Gamma 100	Ko Drying	Ko Wetting	Fabric Factor
1	50	20	50.0	30.0	115.0	CALC	0.33	0.67	1.0

	Coarse-Grained Soil Correction		
Layer Number	% Pass. #10	(Gs) coarse	Wet Den. (lb/ft^3)
1	Not Calculated		

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Project Engineer : BC

Project Number : 1404003
Project Date : January 6, 2017

Geotechnical Report : Wood Rodgers

Report Date : 1/28/2005
Report Number : 1404.002

SUMMARY OF INPUT DATA - Suction at Edge of Slab

Initial Suction Profile ---- Default Wet Design Envelope

Suction value at surface : 2.9 pF

Final Suction Profile ---- Default Dry Design Envelope

Suction Value at Surface : 4.5 pF

Constant Suction

Constant suction : 3.6 pF
Depth to constant suction : 9.0 ft

Moisture Barriers

Vertical barrier depth : 0.0 ft
Apply vertical barrier to : Neither Profile

Horizontal barrier length : 0.0 ft

Project Title : Ladera Ranch
Project Engineer : BC
Project Number : 1404003
Project Date : January 6, 2017
Geotechnical Report : Wood Rodgers
Report Date : 1/28/2005
Report Number : 1404.002

SUMMARY OF INPUT DATA - Em

Em Distance

Determined per Modified PTI method
Thornthwaite Moisture Index -40

Suction Profile at Em ---- Constant Suction Profile

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Geostructural Tool Kit, Inc.

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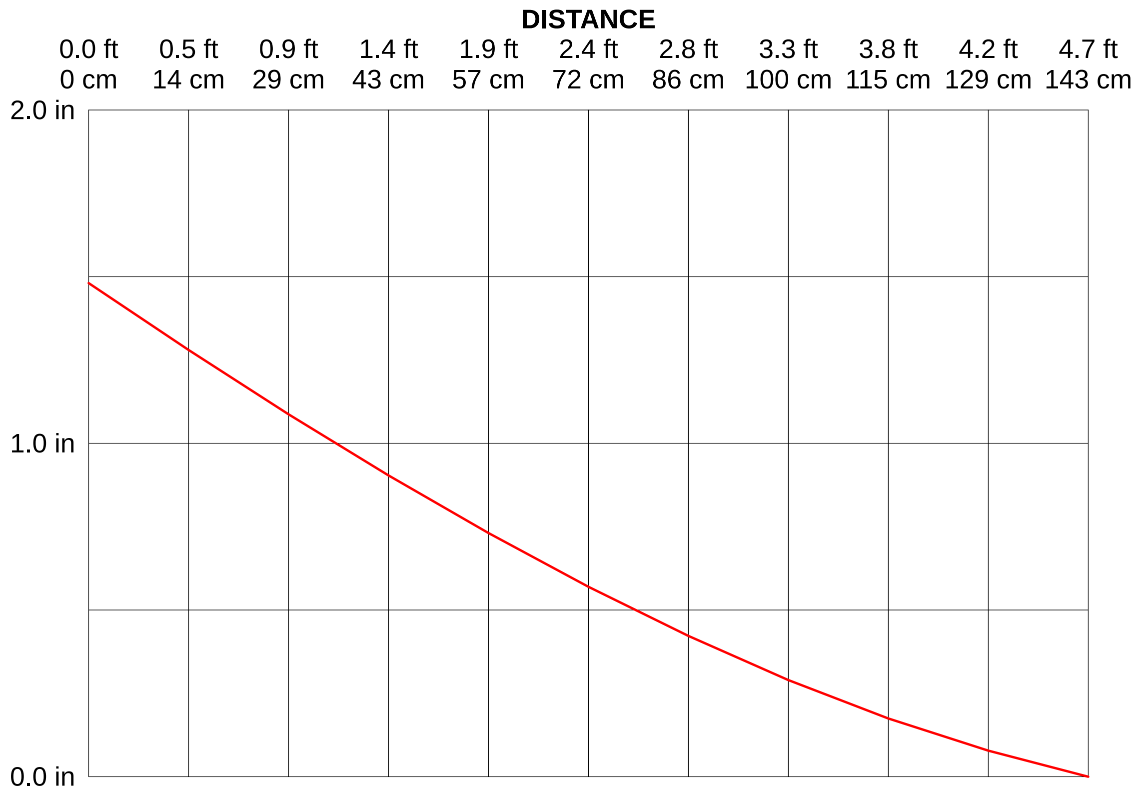
Report Date : 1/28/2005
Report Number : 1404.002

SWELL CALCULATION

Ym Edge (Swell) = 1.48 inches (3.76 centimeters)

Em Edge = 4.70 feet (143.26 centimeters)



	Swell at Slab Edge	Swell at distance X from edge of slab									Swell at Em
	0.0 ft	0.5 ft	0.9 ft	1.4 ft	1.9 ft	2.4 ft	2.8 ft	3.3 ft	3.8 ft	4.2 ft	4.7 ft
	0 cm	14 cm	29 cm	43 cm	57 cm	72 cm	86 cm	100 cm	115 cm	129 cm	143 cm
inches	1.48	1.28	1.09	0.90	0.73	0.57	0.42	0.29	0.17	0.08	0.00
cm	3.76	3.25	2.76	2.30	1.86	1.45	1.07	0.74	0.44	0.20	0.00

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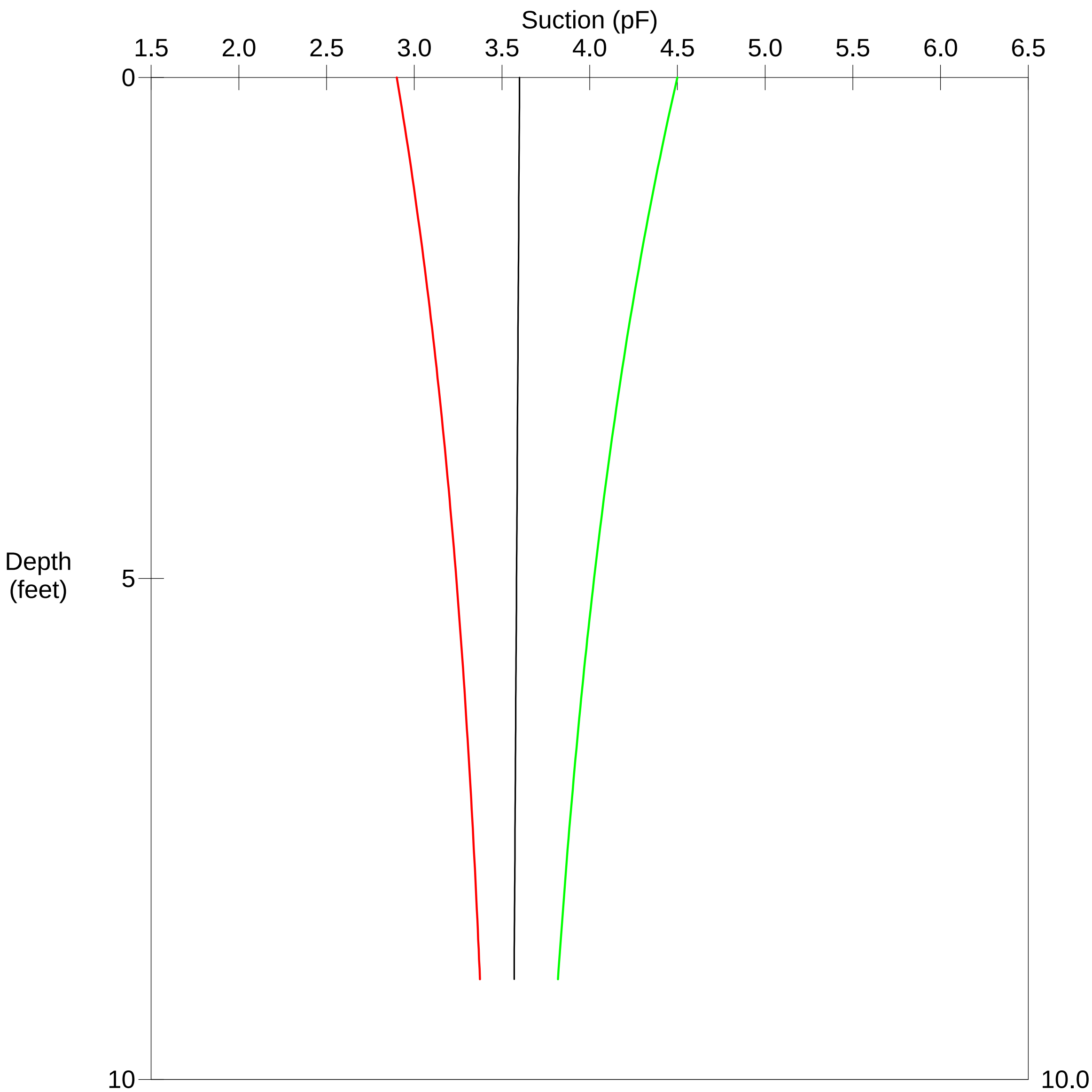
SUCTION PROFILES



Initial suction at edge of slab

Final suction at edge of slab

Constant Suction

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Layer	Gamma0 (Mean)	Fine Clay Cor. Fact.	Coarse-Grain Cor. Fact.	GammaH (Mean)	GammaH (Shrink)	GammaH (Swell)
1	0.050	0.600	1.000	0.030	0.029	0.031

Layer	Alpha (Mean)	Alpha (Shrink)	Alpha (Swell)	S	P	KoHo
1	0.004576	0.004587	0.004565	-12.605	0.000669	0.000290

Gamma0 Determination Per PTI 3rd Edition Manual

Layer	% Fine Clay	PI	PI/ %fc	LL	LL/ %fc	Zone Chart	Gamma0 (Mean)
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Layer Thickness and description

Layer Number	Layer Thickness	Depth to Bottom	Layer Description
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Layer Geotechnical Properties

Layer Number	Liquid Limit	Plastic Limit	% Pass. #200	% Finer 2 mic.	Dry Den. (lb/ft^3)	Gamma 100	Ko Drying	Ko Wetting	Fabric Factor
1	50	20	50.0	30.0	115.0	CALC	0.33	0.67	1.0

	Coarse-Grained Soil Correction		
Layer Number	% Pass. #10	(Gs) coarse	Wet Den. (lb/ft^3)
1	Not Calculated		

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SUMMARY OF INPUT DATA - Suction at Edge of Slab

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Suction value at surface : 4.5 pF

Final Suction Profile ---- Default Wet Design Envelope

Suction value at surface 2.9 pF

Constant Suction

Constant suction : 3.6 pF
Depth to constant suction : 9.0 ft

Moisture Barriers

Vertical barrier depth : 0.0 ft
Apply vertical barrier to : Neither Profile

Horizontal barrier length : 0.0 ft

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SUMMARY OF INPUT DATA - Em

Em Distance

Determined per Modified PTI method
Thornthwaite Moisture Index -40

Suction Profile at Em ---- Constant Suction Profile

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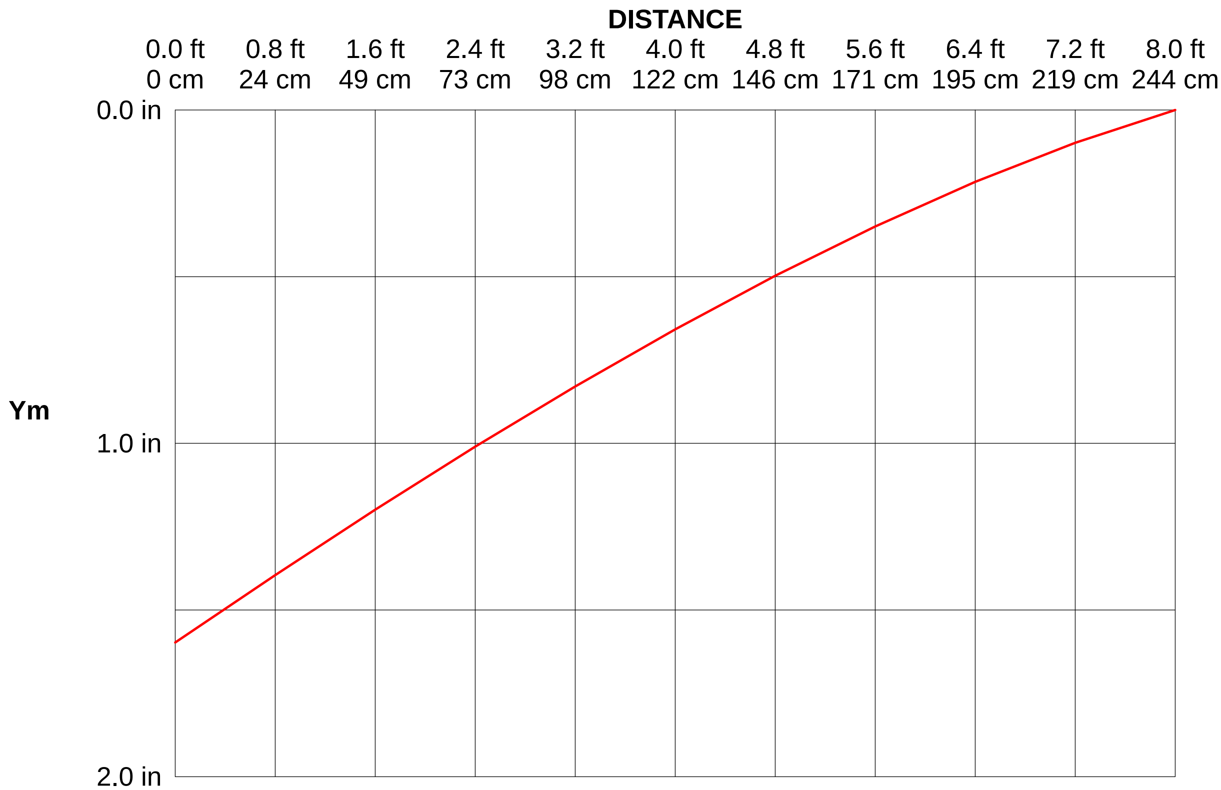
SHRINK CALCULATION

Ym Center (Shrink) = -1.60 inches (-4.06 centimeters)

Em Center = 8.00 feet (243.84 centimeters)



	Shrink at Slab Edge	Shrink at distance X from edge of slab									Shrink at Em
	0.0 ft	0.8 ft	1.6 ft	2.4 ft	3.2 ft	4.0 ft	4.8 ft	5.6 ft	6.4 ft	7.2 ft	8.0 ft
	0 cm	24 cm	49 cm	73 cm	98 cm	122 cm	146 cm	171 cm	195 cm	219 cm	244 cm
inches	-1.60	-1.40	-1.20	-1.01	-0.83	-0.66	-0.50	-0.35	-0.22	-0.10	0.00
cm	-4.06	-3.54	-3.05	-2.57	-2.11	-1.67	-1.26	-0.89	-0.55	-0.25	0.00

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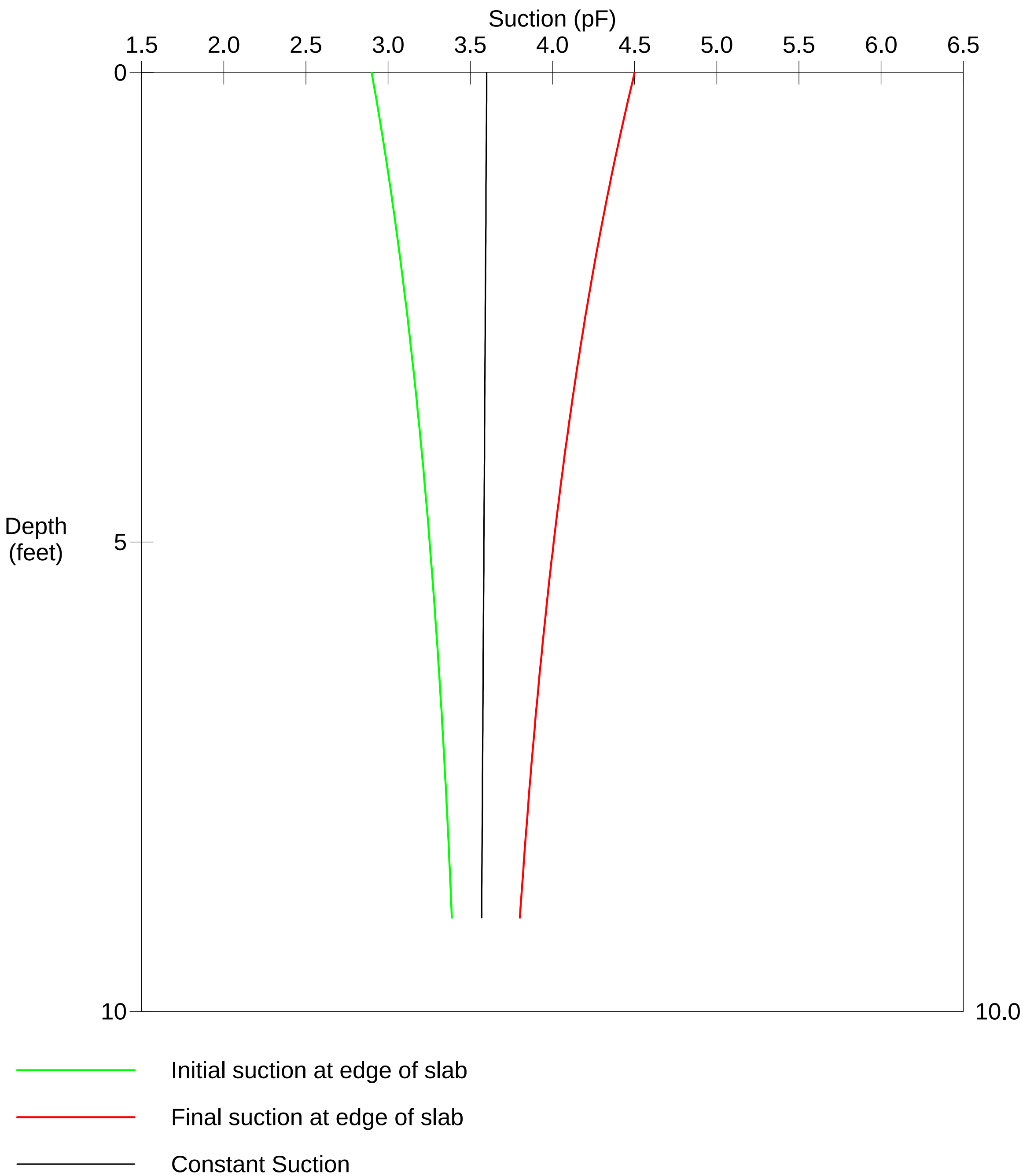
SUCTION PROFILES



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LAYER GEOTECHNICAL PROPERTIES

Layer	Gamma0 (Mean)	Fine Clay Cor. Fact.	Coarse-Grain Cor. Fact.	GammaH (Mean)	GammaH (Shrink)	GammaH (Swell)
1	0.100	0.500	1.000	0.050	0.048	0.053

Layer	Alpha (Mean)	Alpha (Shrink)	Alpha (Swell)	S	P	KoHo
1	0.004108	0.004138	0.004077	-11.222	0.000645	0.000280

Gamma0 Determination Per PTI 3rd Edition Manual

Layer	% Fine Clay	PI	PI/ %fc	LL	LL/ %fc	Zone Chart	Gamma0 (Mean)
1	50.00	32	0.64	56	1.12	3	0.100

VOLFLO 1.5

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Report Date : 1/28/2005
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SUMMARY OF INPUT DATA - Soil Properties

Layer Thickness and description

Layer Number	Layer Thickness	Depth to Bottom	Layer Description
1	10.0 ft	10.0 ft	High Expansive Soils

Layer Geotechnical Properties

Layer Number	Liquid Limit	Plastic Limit	% Pass. #200	% Finer 2 mic.	Dry Den. (lb/ft^3)	Gamma 100	Ko Drying	Ko Wetting	Fabric Factor
1	56	24	60.0	30.0	110.0	CALC	0.33	0.67	1.0

	Coarse-Grained Soil Correction		
Layer Number	% Pass. #10	(Gs) coarse	Wet Den. (lb/ft^3)
1	Not Calculated		

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Geostructural Tool Kit, Inc.

Registered To : Wood Rodgers Serial Number : 200-100-086

Project Title : Ladera Ranch
Project Engineer : BC

Project Number : 1404003
Project Date : January 6, 2017

Geotechnical Report : Wood Rodgers

Report Date : 1/28/2005
Report Number : 1404.002

SUMMARY OF INPUT DATA - Suction at Edge of Slab

Initial Suction Profile ---- Default Wet Design Envelope

Suction value at surface :	2.9 pF

Final Suction Profile ---- Default Dry Design Envelope

Suction Value at Surface :	4.5 pF

Constant Suction

Constant suction :	3.6 pF
Depth to constant suction :	9.0 ft

Moisture Barriers

Vertical barrier depth :	0.0 ft
Apply vertical barrier to :	Neither Profile
Horizontal barrier length :	0.0 ft

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Geostructural Tool Kit, Inc.

Registered To : Wood Rodgers

Serial Number : 200-100-086

Project Title : Ladera Ranch
Project Engineer : BC

Project Number : 1404003
Project Date : January 6, 2017

Geotechnical Report : Wood Rodgers

Report Date : 1/28/2005
Report Number : 1404.002

SUMMARY OF INPUT DATA - Em

Em Distance

Determined per Modified PTI method

Thornthwaite Moisture Index	-40

Suction Profile at Em ---- Constant Suction Profile

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Geostructural Tool Kit, Inc.

Registered To : Wood Rodgers

Serial Number : 200-100-086

Project Title : Ladera Ranch
Project Engineer : BC

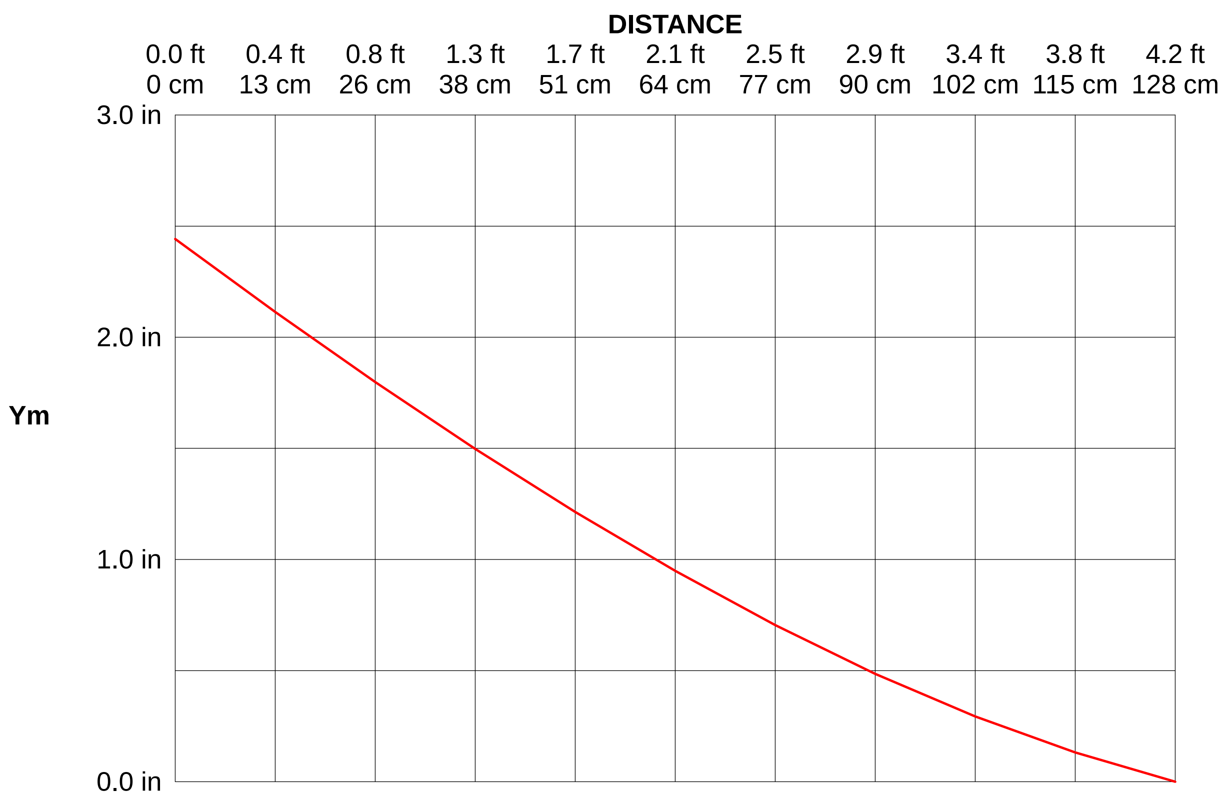
Project Number : 1404003
Project Date : January 6, 2017

Geotechnical Report : Wood Rodgers

Report Date : 1/28/2005
Report Number : 1404.002

SWELL CALCULATION

Ym Edge (Swell) =	**2.44 inches**	**(6.20 centimeters)**
Em Edge =	**4.20 feet**	**(128.02 centimeters)**



	Swell at Slab Edge	Swell at distance X from edge of slab									Swell at Em
	0.0 ft	0.4 ft	0.8 ft	1.3 ft	1.7 ft	2.1 ft	2.5 ft	2.9 ft	3.4 ft	3.8 ft	4.2 ft
	0 cm	13 cm	26 cm	38 cm	51 cm	64 cm	77 cm	90 cm	102 cm	115 cm	128 cm
inches	2.44	2.11	1.80	1.50	1.21	0.95	0.70	0.49	0.29	0.13	0.00
cm	6.20	5.37	4.57	3.80	3.08	2.41	1.79	1.23	0.75	0.33	0.00

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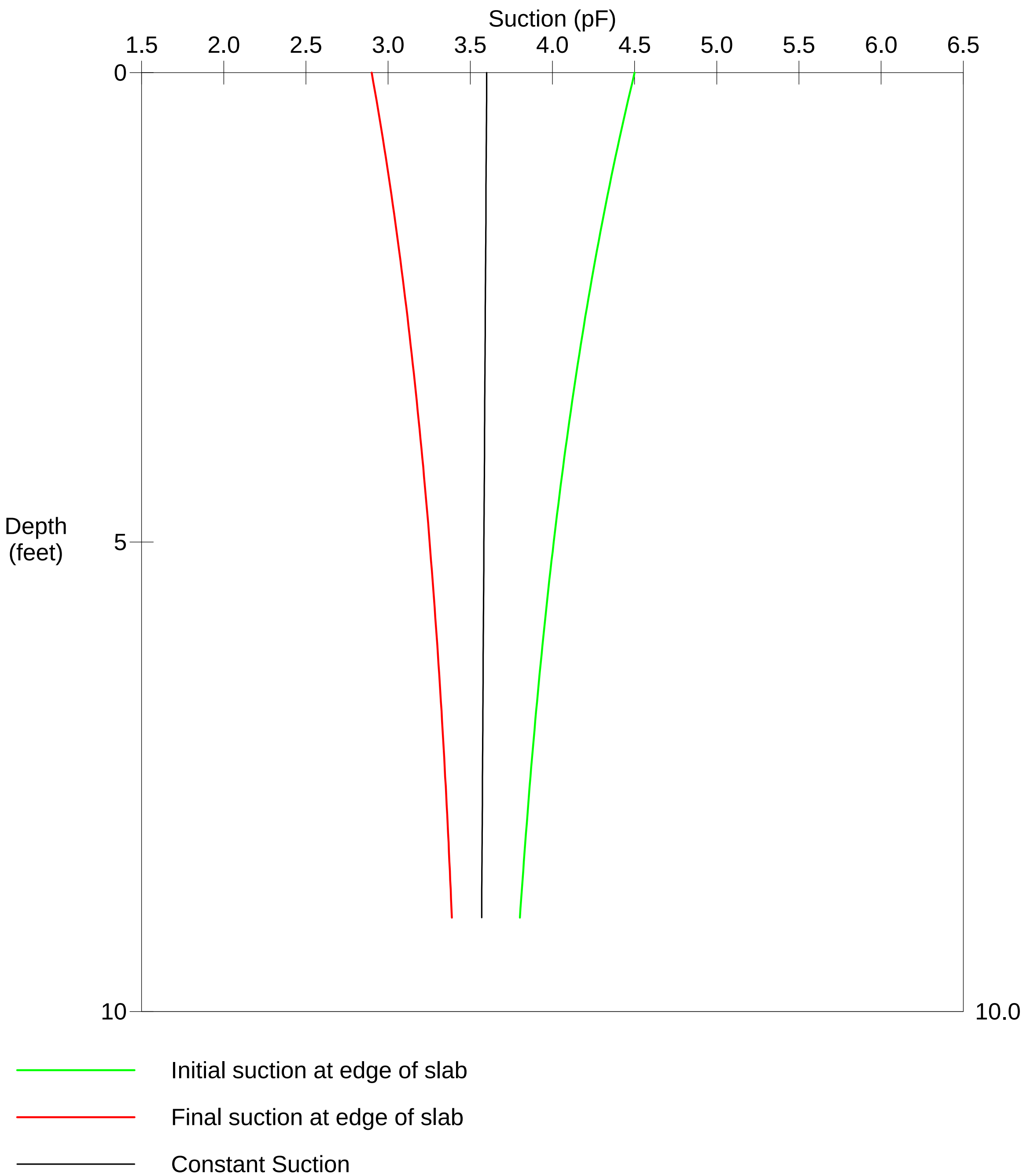
SUCTION PROFILES



Project Title : Ladera Ranch
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Project Date : January 6, 2017
Geotechnical Report : Wood Rodgers
Report Date : 1/28/2005
Report Number : 1404.002

LAYER GEOTECHNICAL PROPERTIES

Layer	Gamma0 (Mean)	Fine Clay Cor. Fact.	Coarse-Grain Cor. Fact.	GammaH (Mean)	GammaH (Shrink)	GammaH (Swell)
1	0.100	0.500	1.000	0.050	0.048	0.053

Layer	Alpha (Mean)	Alpha (Shrink)	Alpha (Swell)	S	P	KoHo
1	0.004108	0.004138	0.004077	-11.222	0.000645	0.000280

Gamma0 Determination Per PTI 3rd Edition Manual

Layer	% Fine Clay	PI	PI/ %fc	LL	LL/ %fc	Zone Chart	Gamma0 (Mean)
1	50.00	32	0.64	56	1.12	3	0.100

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Project Number : 1404003
Project Date : January 6, 2017

Geotechnical Report : Wood Rodgers

Report Date : 1/28/2005
Report Number : 1404.002

SUMMARY OF INPUT DATA - Soil Properties

Layer Thickness and description

Layer Number	Layer Thickness	Depth to Bottom	Layer Description
1	10.0 ft	10.0 ft	High Expansive Soils

Layer Geotechnical Properties

Layer Number	Liquid Limit	Plastic Limit	% Pass. #200	% Finer 2 mic.	Dry Den. (lb/ft^3)	Gamma 100	Ko Drying	Ko Wetting	Fabric Factor
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	Coarse-Grained Soil Correction		
Layer Number	% Pass. #10	(Gs) coarse	Wet Den. (lb/ft^3)
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Vertical barrier depth :	0.0 ft
Apply vertical barrier to :	Neither Profile
Horizontal barrier length :	0.0 ft

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SUMMARY OF INPUT DATA - Em

Em Distance

Determined per Modified PTI method

Thornthwaite Moisture Index	-40

Suction Profile at Em ---- Constant Suction Profile

APPENDIX C
RESULTS OF GEOPHYSICAL MEASUREMENTS
(WOOD RODGERS, 2016)

WOOD RODGERS

April 26, 2016

Mr. Mark Pekarek, PE
LANSING COMPANIES
12671 High Bluff Drive, Suite 150
San Diego, CA 92130

RE: **RESULTS OF GEOPHYSICAL MEASUREMENTS**
LADERA RANCH
WASHOE COUNTY, NEVADA

REF: **CUT & FILL MAP FOR LADERA RANCH PHASE 1 & PHASE 2, SUMMIT ENGINEERING, 2015**

GEOTECHNICAL INVESTIGATION FOR LADERA RANCH, WOOD RODGERS, 2005

Mr. Pekarek:
This letter transmits the results from our geophysical investigation performed at the referenced project site. Our investigation was limited to surface measurements and visual observations to complement the referenced Geotechnical Report and to target proposed cut sections shown on the referenced map.

The approximate locations of the geophysical alignments are included on Plate A-1 – Site Plan and Geophysical Testing Layout. Seismic refraction (ReMi®) measurements were performed in accordance with ASTM D5777, a reproduction of which has been attached, and include a two-dimensional seismic velocity profile (P-Wave) and a one-dimensional shear wave velocity profile for each geophysical alignment. A multi-channel seismograph using 12 geophones spaced at 14-feet was developed for each line creating a total geophone spread of 154-feet for each alignment. The locations were logged with GPS and projected over an aerial image with the proposed site and grading plan. The mapped topographic information shown was referenced from the grading map, and the geophysical elevation profiles represent a visual estimate of the field conditions.

A photo from each alignment was taken to reference the surface conditions for each geophysical profile. A visual estimate of the Rock Classification at the surface is included for each alignment, and references information provided on Plate A-2 – Criteria for Rock Descriptions. Rock characterization and other geologic information when used in tandem with seismic (P-Wave) velocity forms the basis for rippability prediction; however it should be noted that rock properties can change significantly within short distances. Caterpillar's *Handbook of Ripping*, Twelfth Edition, has been reproduced as an attachment to this letter for ease of reference. Therein, Caterpillar provides charts to predict various-sized ripper performance and production rates for a range of seismic (P-Wave) velocities and rock types. In our experience, where the seismic profiles indicate green to yellow velocities approaching 8,000 feet per second, the adverse curve on the production charts is approached.

Although the geophysical alignments target a subsurface representation of the proposed cut sections, the site is also known to encompass many rock outcrops whose subsurface extent and condition are difficult to discern. A variety of geologic units with variations in degree of weathering were noted at the surface across the site and on occasion within the measured alignments. Other geologic information that would affect ripping and excavation include subsurface in-place fracture, joint, and in-place rock mass characteristics. This information could be gathered by recovery and laboratory testing of rock core samples. Given the extent of the site and variability of geologic units on site, that style field exploration could be feasible if specific areas of concern were to be investigated.

We appreciate the opportunity to provide our geophysical services for you. If there are any questions with the contents of this report or figures, please contact the undersigned.

Sincerely,
WOOD RODGERS INCORPORATED

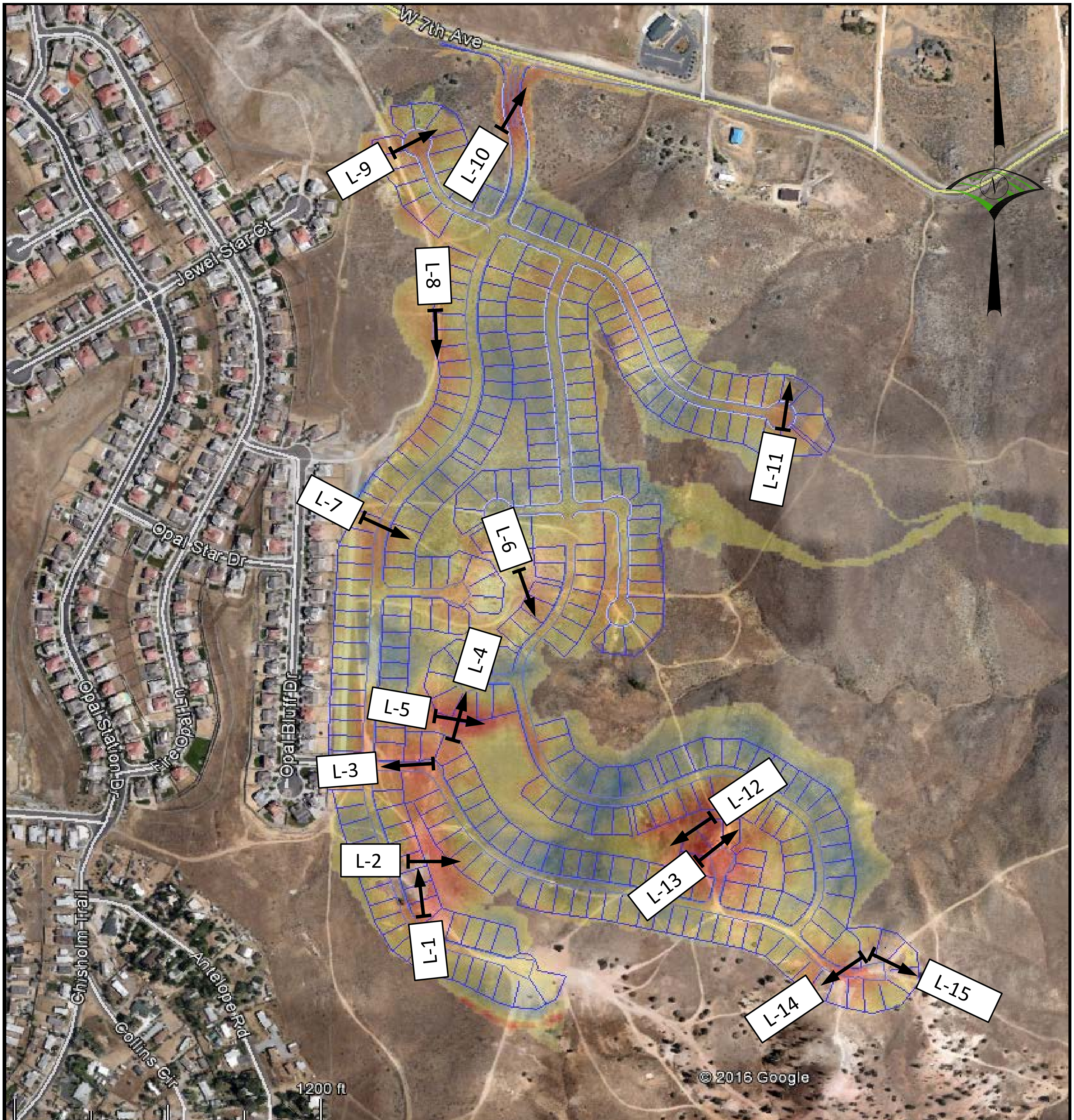
Blake D. Carter, PE
Associate
RE Number 22331
Expires 12/31/16

PROFESSIONAL ENGINEER - STATE OF NEVADA
BLAKE DOUGLAS CARTER
Exp: 12/31/16
CIVIL
No. 22331

4/26/16

James G. Smith, PE
Principal

Attachments:
Plate A-1 – Site Plan and Geophysical Testing Layout
Plate A-2 – Criteria for Rock Descriptions
Plate P-1 thru P-15 – Two-Dimensional Geophysical Profiles (P-Wave Velocity)
Plate VS-1 thru VS-15 – One-Dimensional Shear Wave Velocity Profile
ASTM D5777 – Standard Guide for Using the Seismic Refraction Method
Caterpillar Handbook of Ripping, Twelfth Edition



LEGEND

L-1 APPROXIMATE GEOPHYSICAL ALIGNMENT

REPRESENTS "0" ON 2-D P-WAVE VELOCITY PROFILE. EACH LINE WAS MEASURED AND IS SHOWN AT A LENGTH OF 154 FEET.

LINE DESIGNATION

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SITE PLAN AND GEOPHYSICAL TESTING LAYOUT

Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003

Date: 04/20/16

PLATE A-1

CONSOLIDATION OF SEDIMENTARY ROCKS

Usually determined from unweathered samples. Largley dependent on cementation.

U = unconsolidated   **M** = moderately consolidated

P = poorly consolidated   **W** = well consolidated

BEDDING OF SEDIMENTARY ROCKS

Splitting Property	Thickness	Stratification
Massive	Greater than 4.0 ft.	Very thick-bedded
Blocky	2.0 to 4.0 ft.	Thick-bedded
Slabby	0.2 to 2.0 ft.	Thin-bedded
Flaggy	0.05 to 0.2 ft.	Very thin bedded
Shaly or platy	0.01 to 0.05 ft.	Laminated
Papery	Less than 0.01 ft.	Thinly laminated

FRACTURING

	Intensity	Size of Pieces in Feet
1.	Very little fractured	Greater than 4.0
2.	Occasionally fractured	1.0 to 4.0
3.	Moderately fractured	0.5 to 1.0
4.	Closely fractured	0.1 to 0.5
5.	Intensely fractured	0.005 to 0.1
6.	Crushed	Less than 0.005

HARDNESS

1. Soft - Reserved for plastic material alone
2. Moderately soft - can be gouged deeply or carved easily with a knife blade
3. Moderately hard - can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away
4. Hard - can be scratched with difficulty; scratch produces little powder and is often faintly visible
5. Very Hard - cannont be scratched with a knife blade; leaves a metallic streak

STRENGTH

1. Plastic - very low strength
2. Friable - crumbles easily by rubbing with fingers
3. Weak - An unfractured specimen of such material will crumble under light hammer blows
4. Moderately Strong - Specimen will withstand a few heavy hammer blows before breaking
5. Strong - Specimen will withstand a few heavy hammer blows, and will yeild with difficulty only dust and small flying fragments
6. Very Strong - Specimen will resist heavy ringing hammer blows and will yeild with difficulty only dust and small flying fragments

WEATHERING

The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, freezing, and thawing

1. Deep - Moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration, many fractures, all extensively coated or filled with oxides, carbonates and/or clay silt
2. Moderate - Slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected; Moderate to occasionally intense discoloration; Moderately coated features
3. Slightly - No megascopic decomposition of minerals; little or no effect on normal cementation; Slight and intermittent, or localized discoloration; Few stains on fracture surfaces
4. Fresh - Unaffected by weathering agents; No disintegration or discoloration; Fractures usually less numerous than joints

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CRITERIA FOR ROCK DESCRIPTIONS

Geotechnical Investigation

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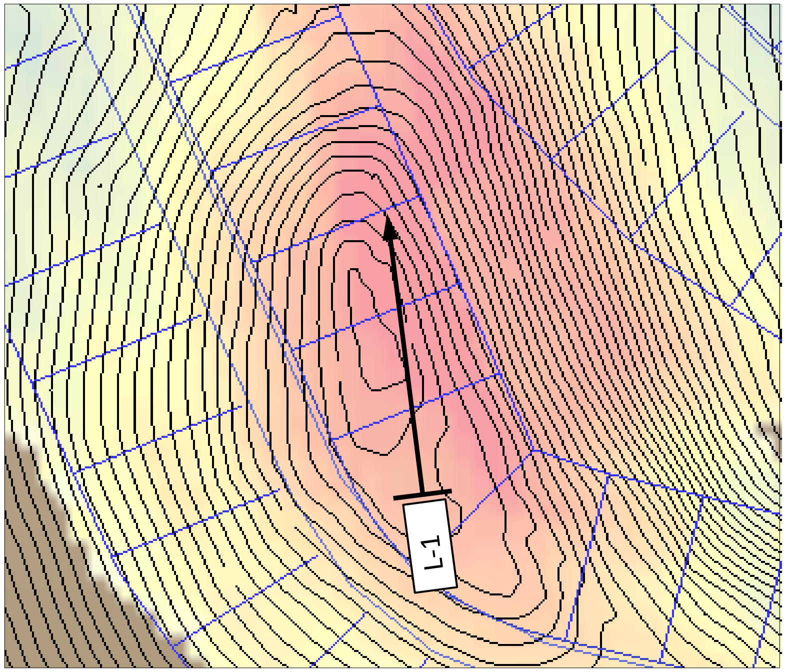
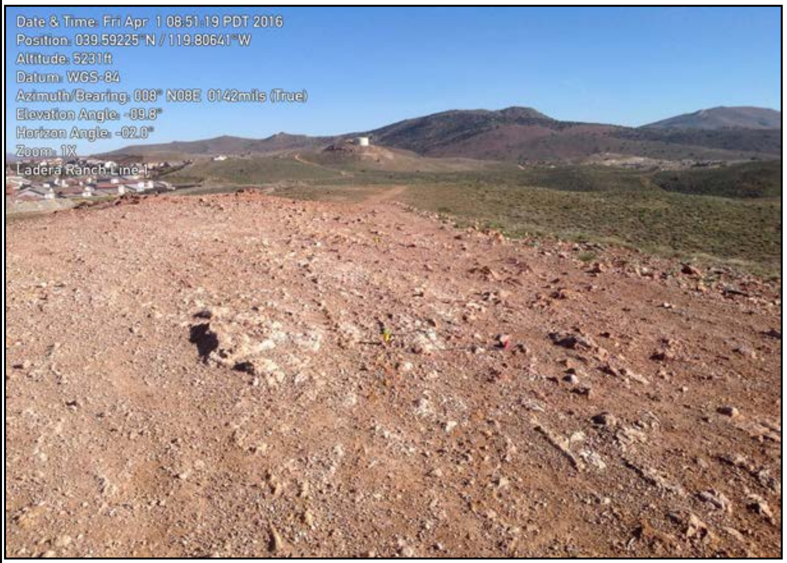
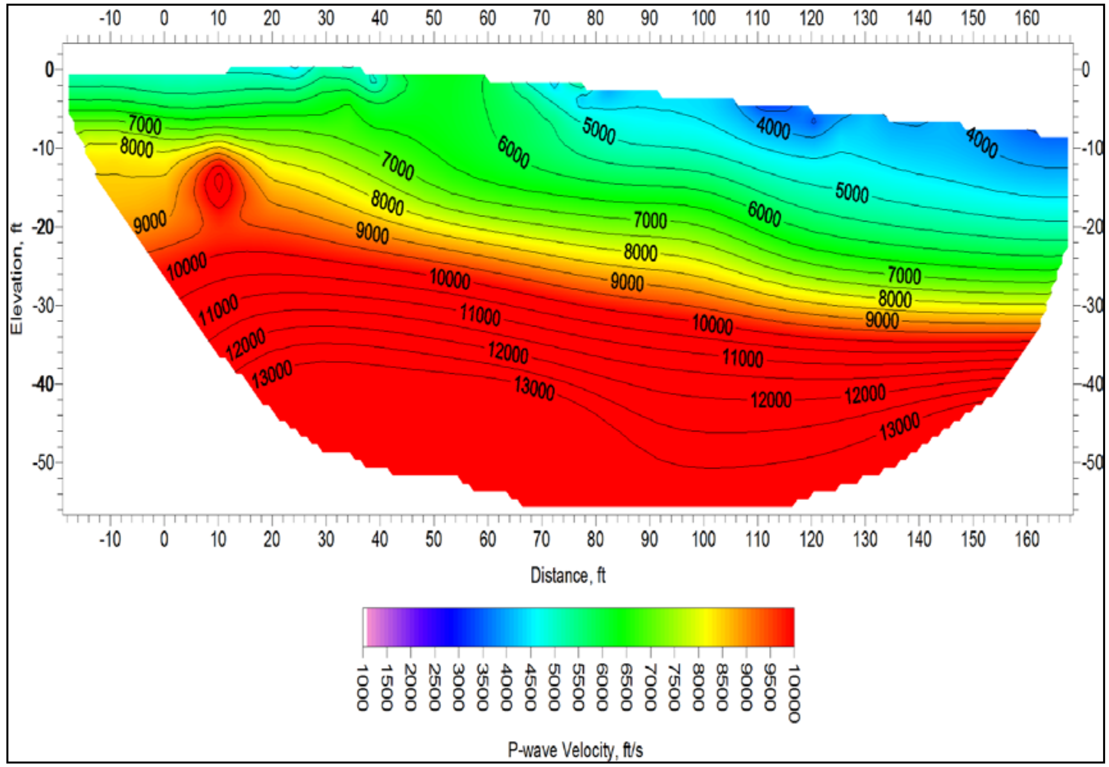
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE A-2







Visual Rock Classification at Surface	
Fracturing	1 - Very little fractured
Hardness	4 - Hard
Strength	4 - Moderately Strong
Weathering	2 - Moderate

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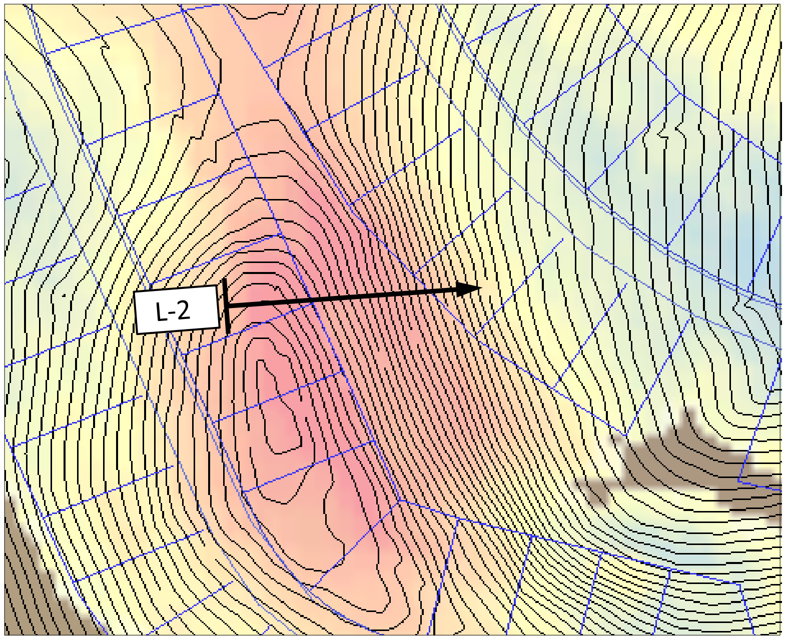
LINE 1
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

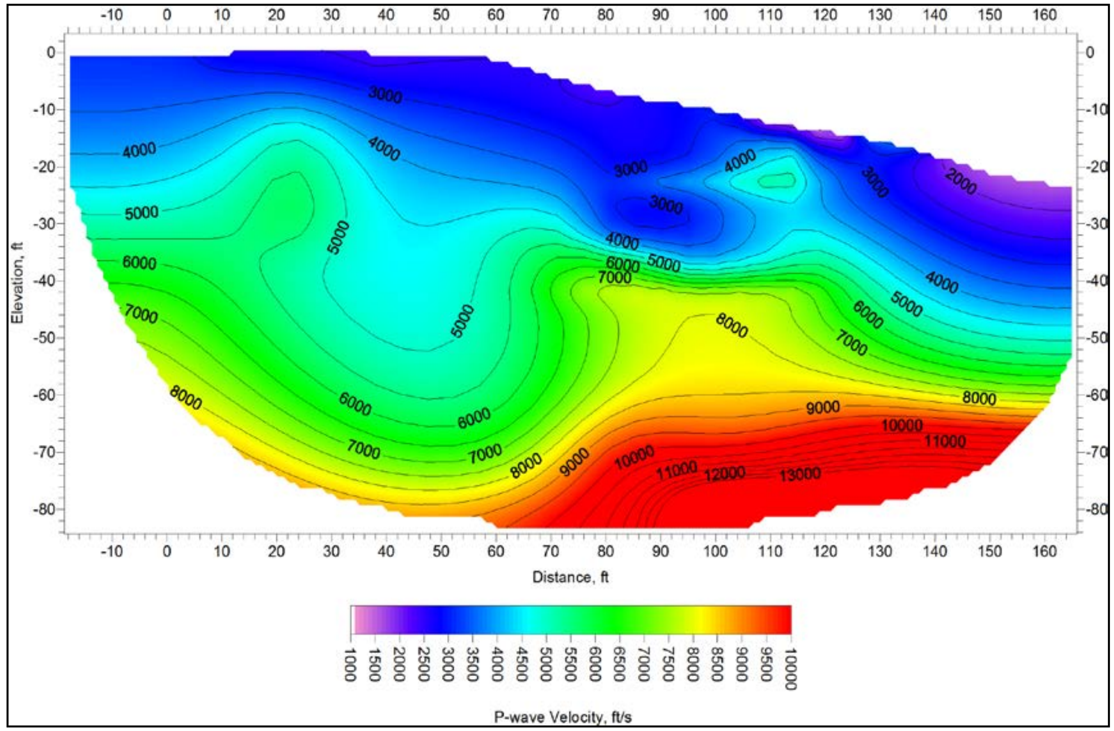
Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE
P-1





Visual Rock Classification at Surface	
Fracturing	4 - Closely fractured
Hardness	2 - Moderately Soft
Strength	4 - Moderately Strong
Weathering	1 - Deep

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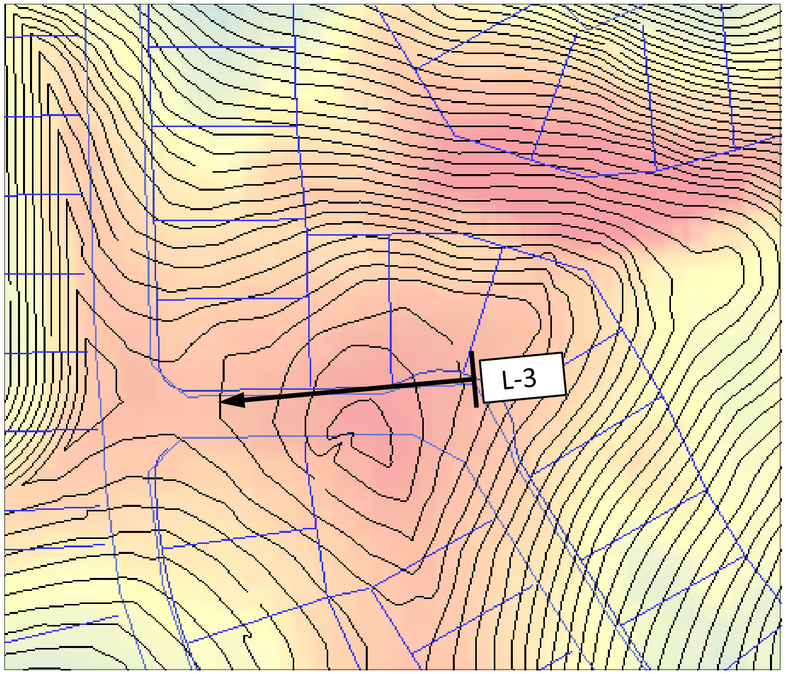
LINE 2
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

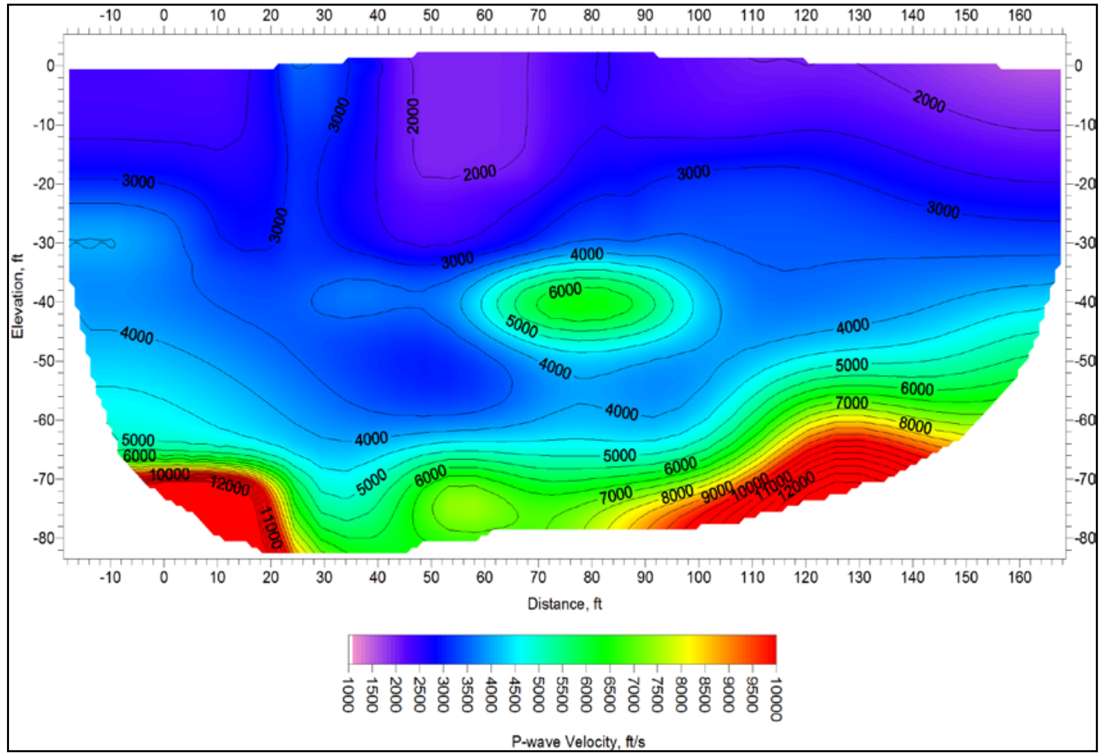
Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE
P-2





Visual Rock Classification at Surface	
Fracturing	N/A - Soil
Hardness	
Strength	
Weathering	

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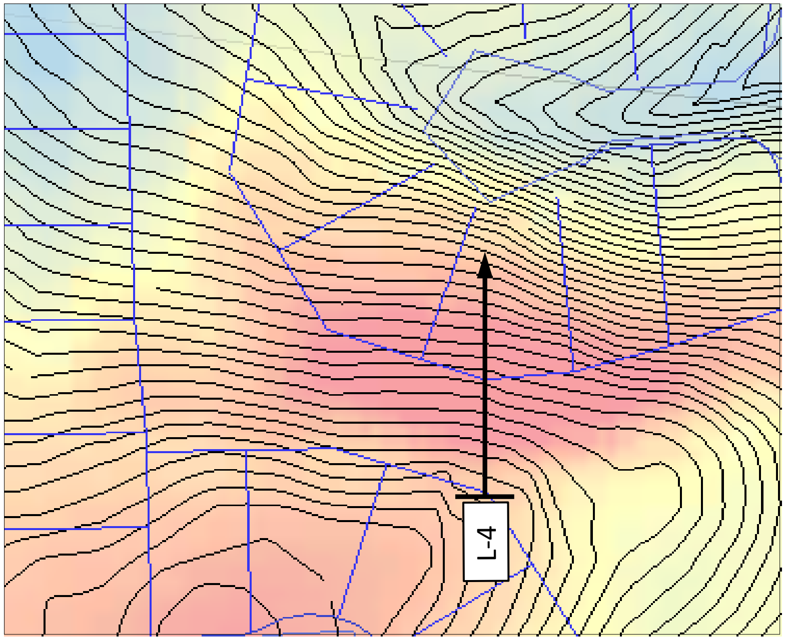
LINE 3
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

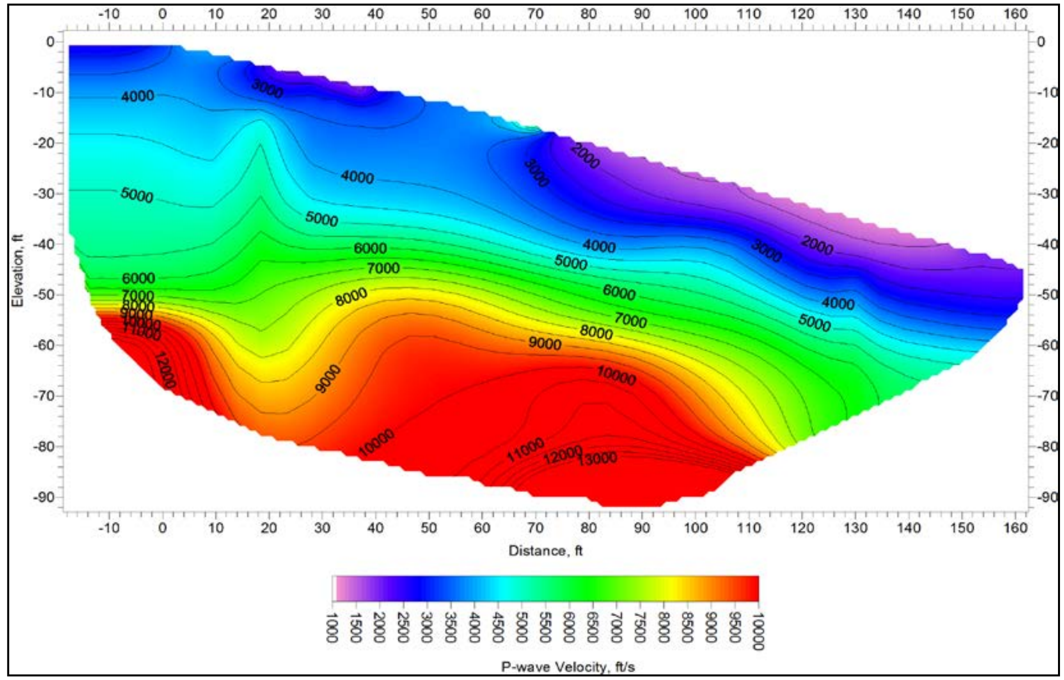
Geotechnical Investigation

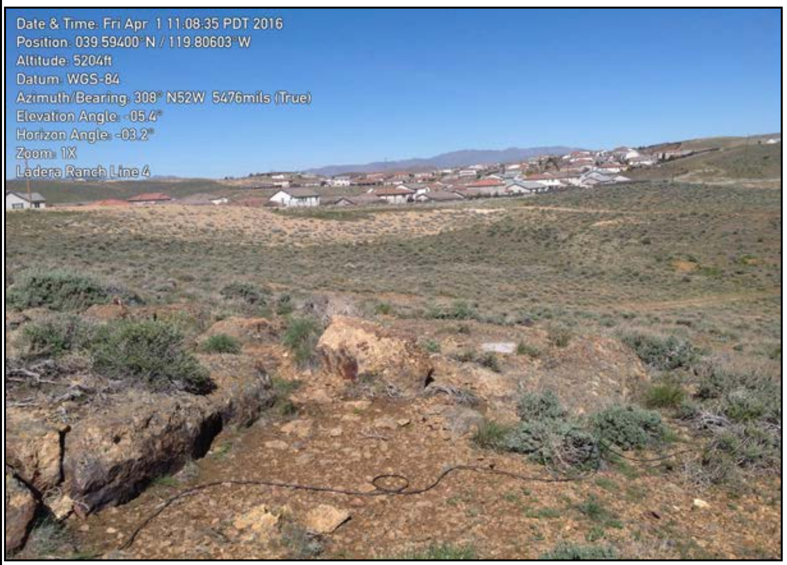
LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE
P-3







<-- Line 4 Upper

Line 4 Lower -->

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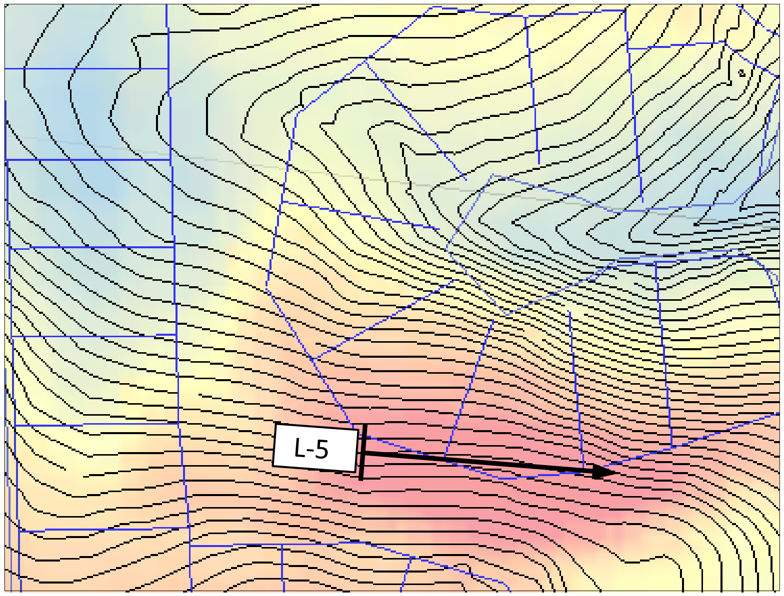
LINE 4
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

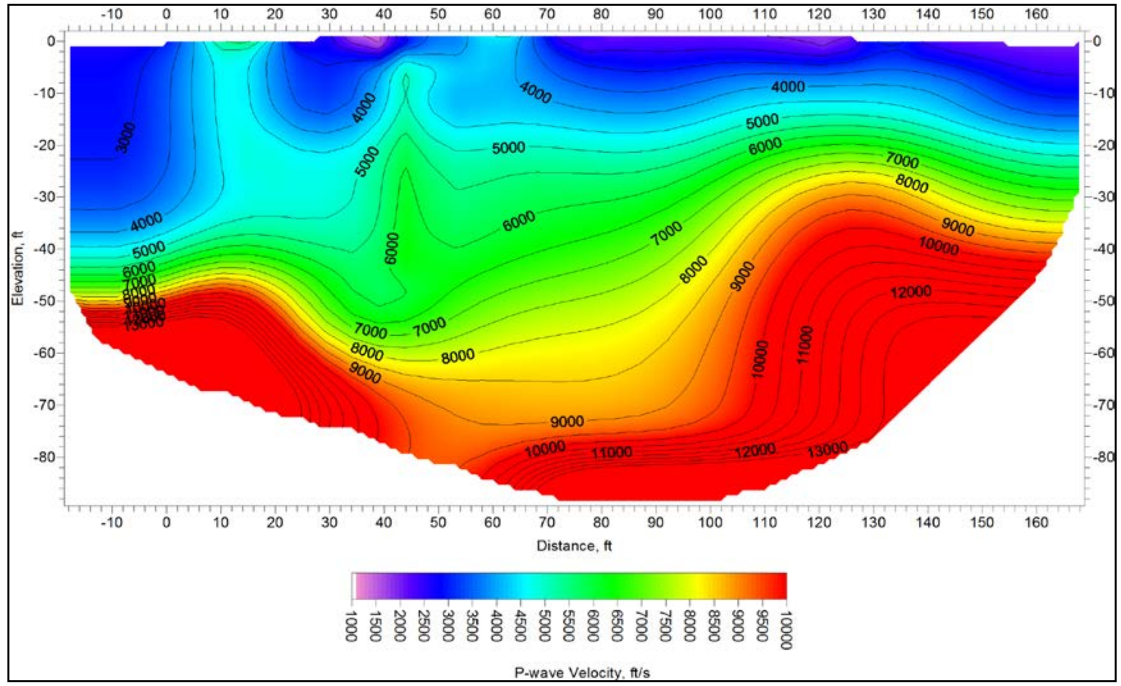
Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE
P-4





Visual Rock Classification at Surface	
Fracturing	N/A - Soil
Hardness	
Strength	
Weathering	

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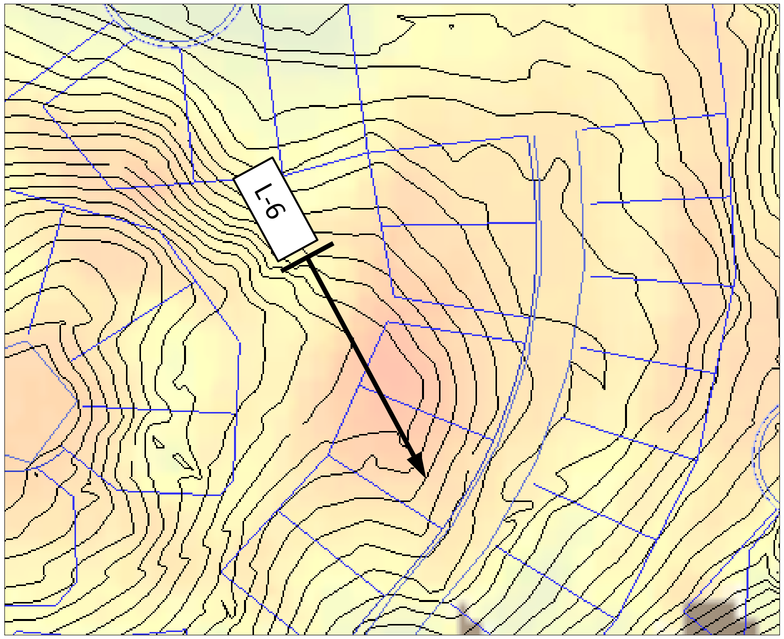
LINE 5
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

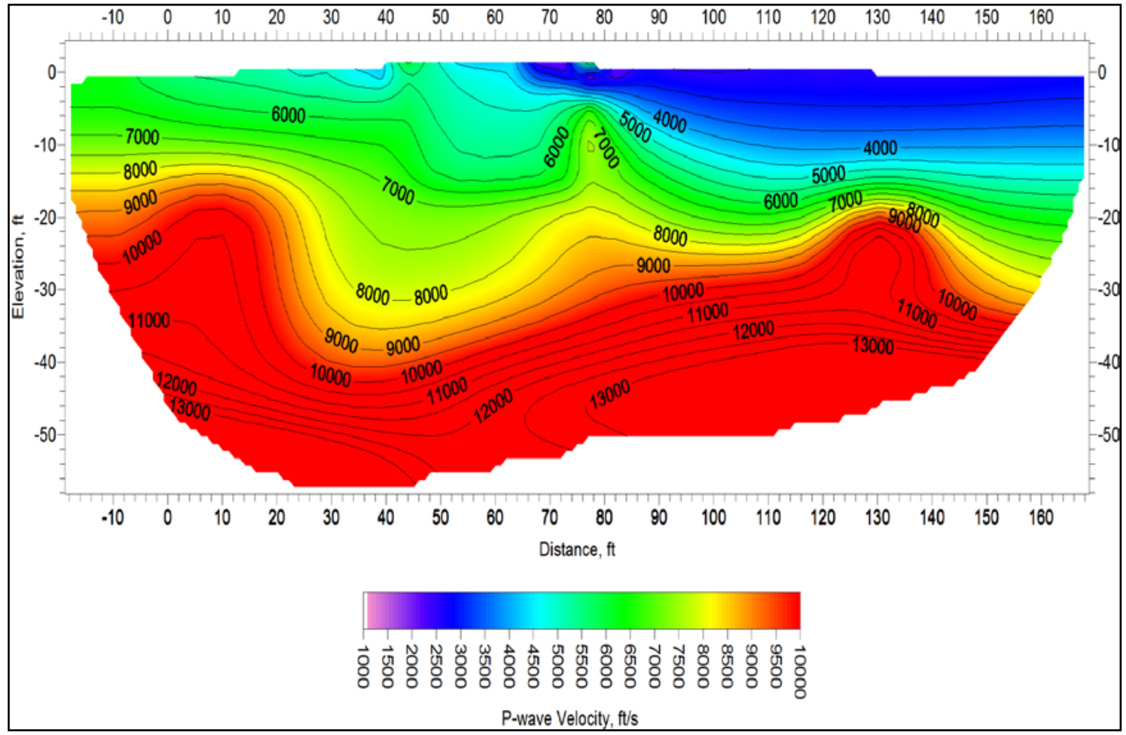
Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE
P-5





Visual Rock Classification at Surface	
Fracturing	Line End: N/A - Soil; Line Begin: 1 - Very little
Hardness	3 - Moderately Hard
Strength	4 - Moderately Strong
Weathering	2 - Moderate

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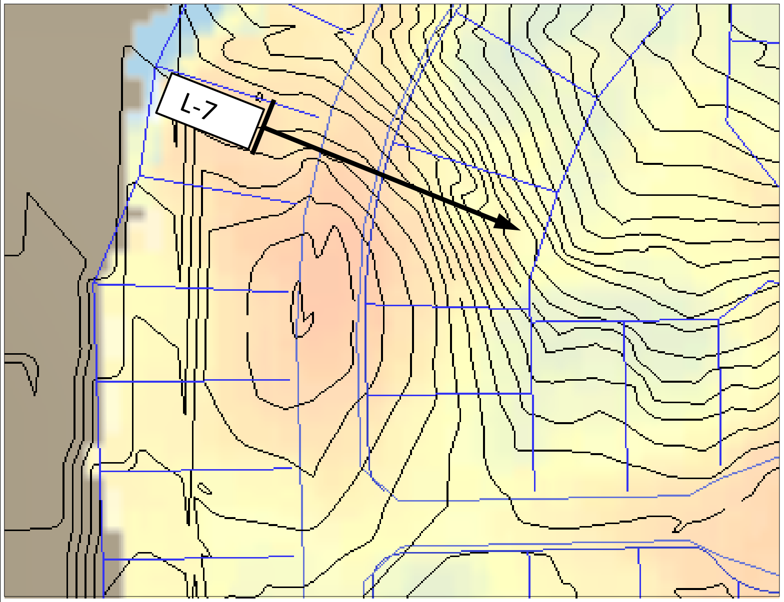
LINE 6
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

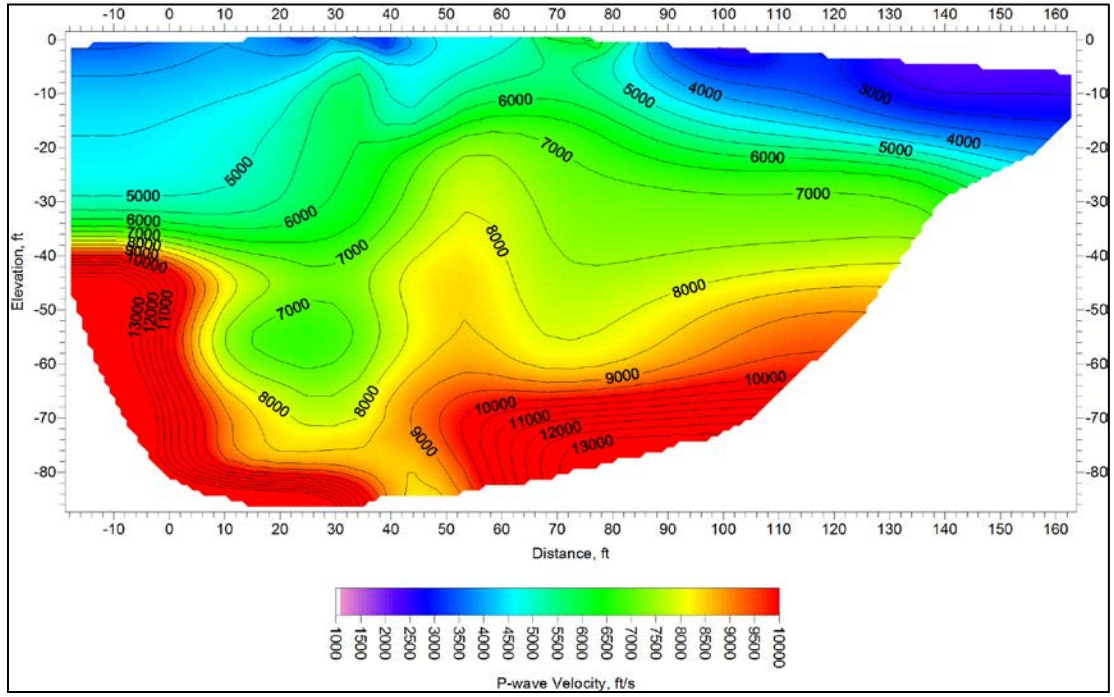
Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE
P-6





Visual Rock Classification at Surface	
Fracturing	N/A - Soil
Hardness	
Strength	
Weathering	

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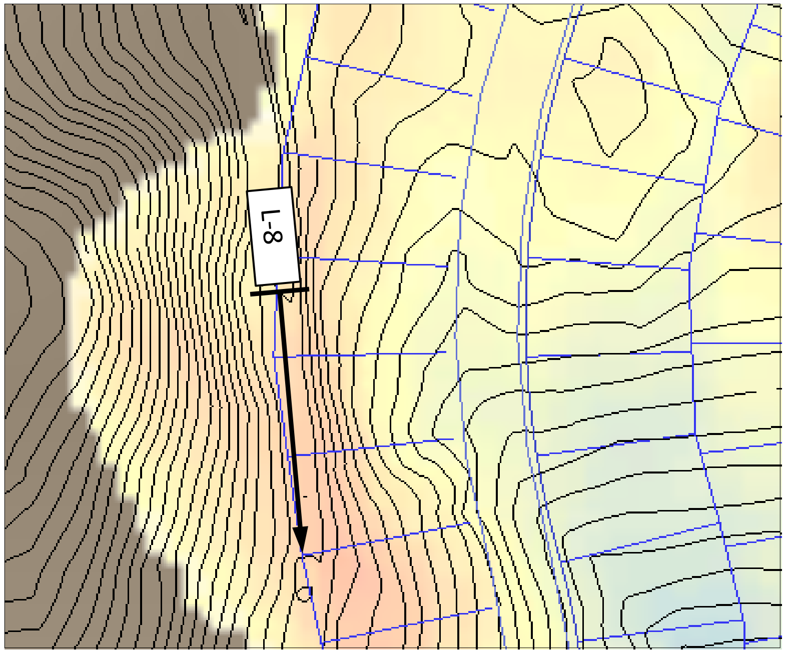
LINE 7
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

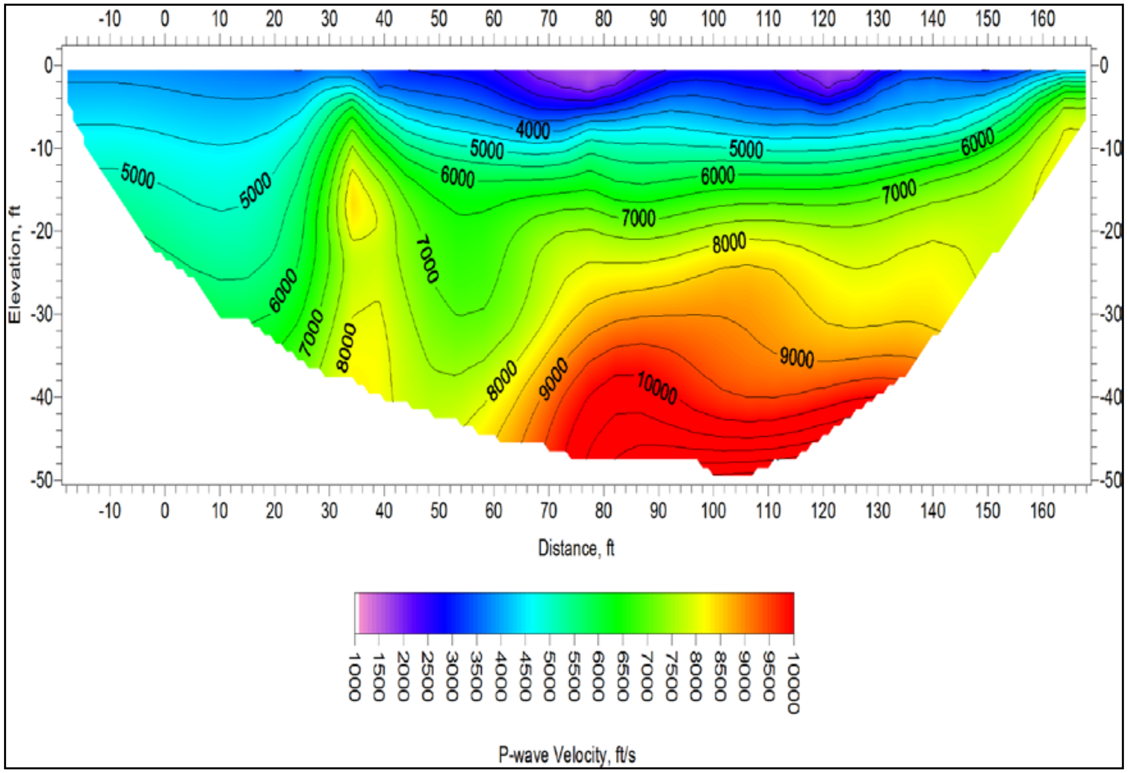
Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE P-7





Visual Rock Classification at Surface	
Fracturing	N/A - Soil
Hardness	
Strength	
Weathering	

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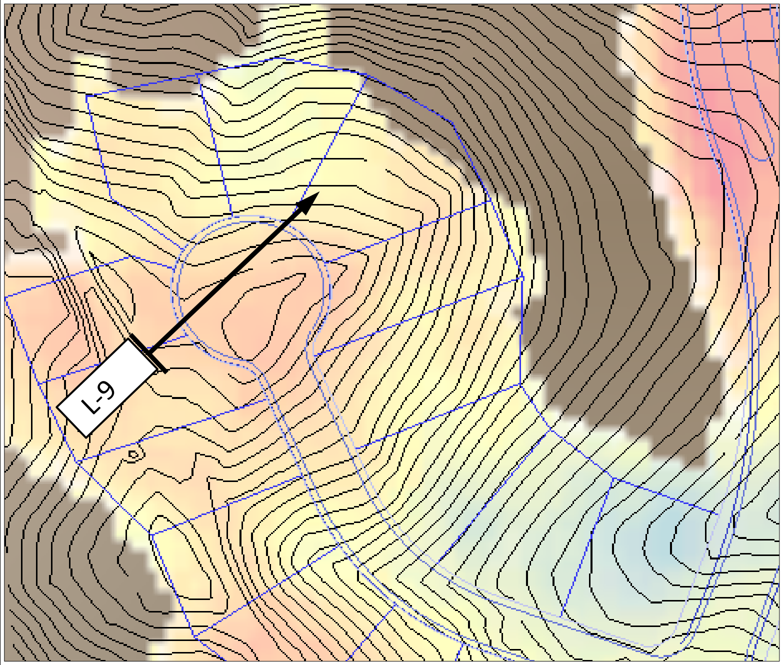
LINE 8
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

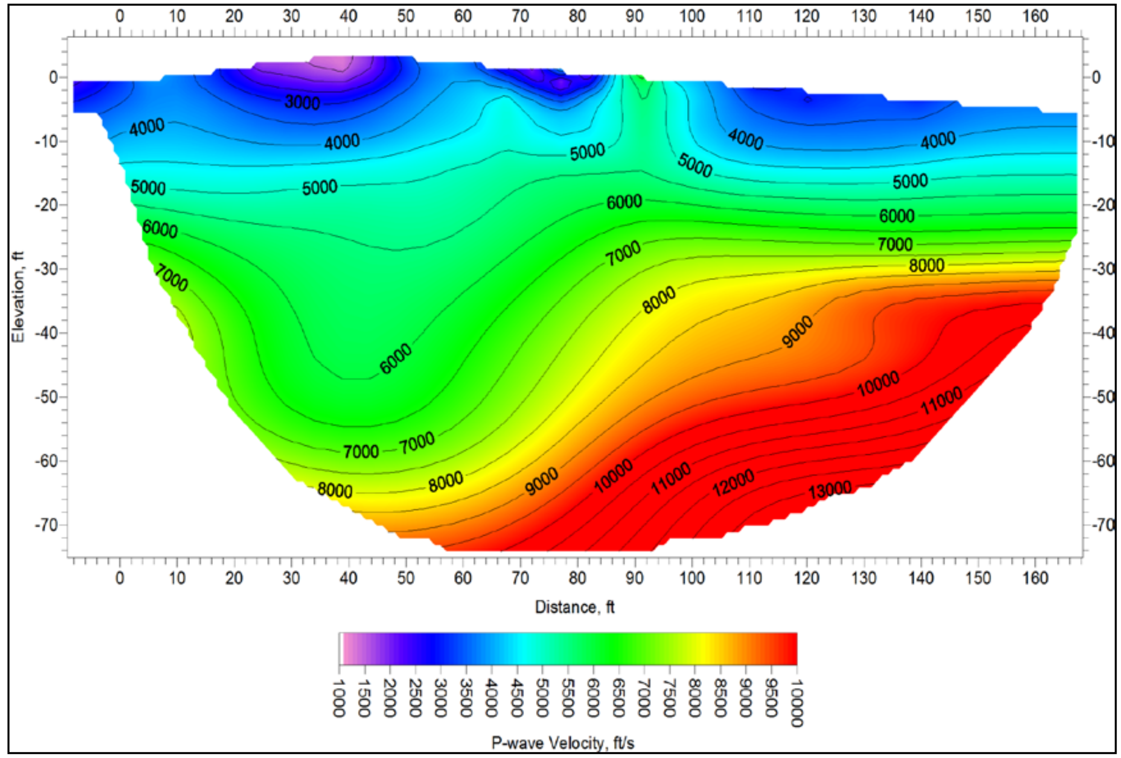
Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE P-8





Visual Rock Classification at Surface	
Fracturing	2 - Occasionally fractured
Hardness	5 - Very hard
Strength	6 - Very strong
Weathering	3 - Slightly

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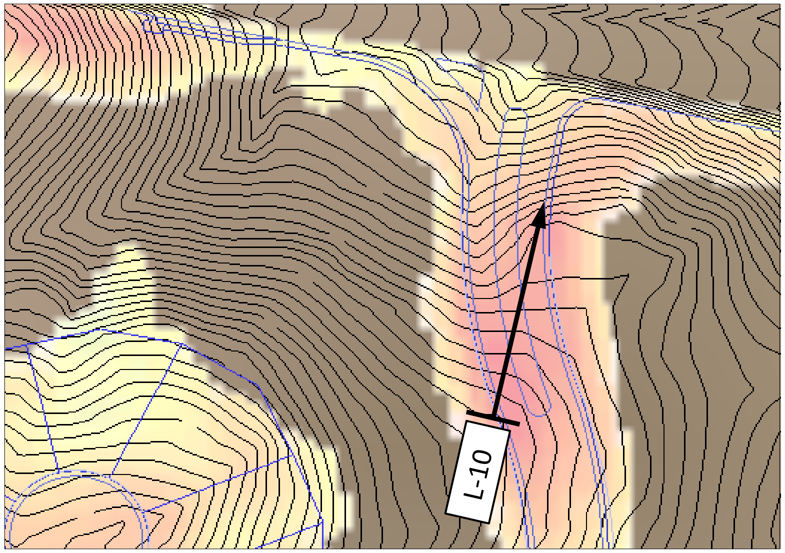
LINE 9
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

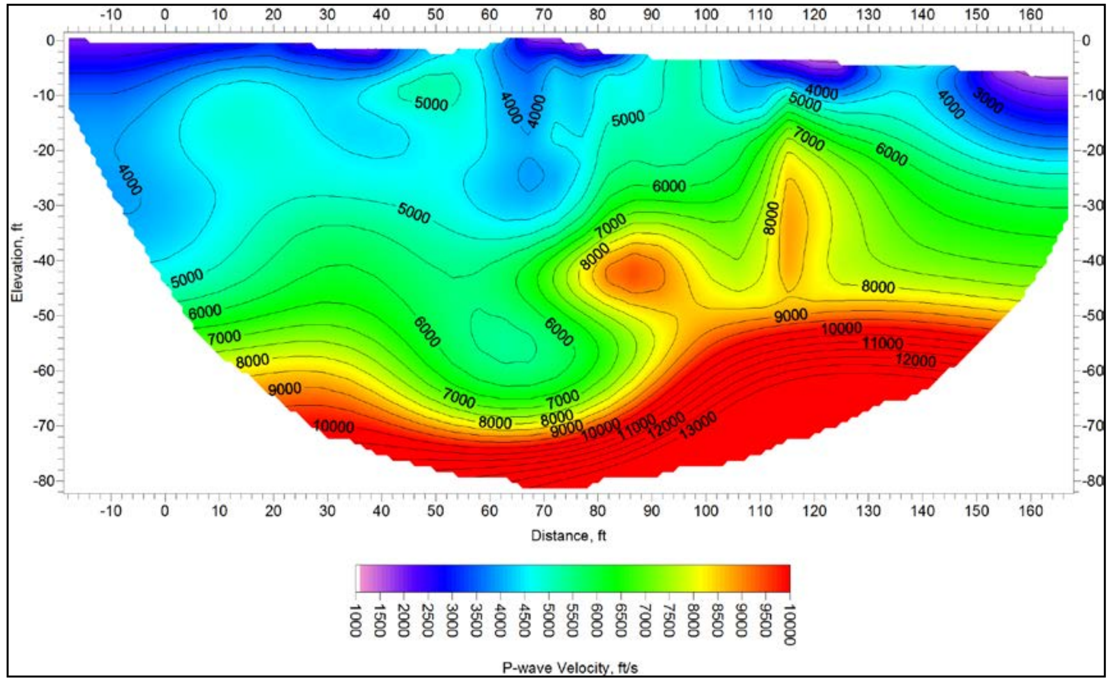
Geotechnical Investigation

LADERA RANCH
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE P-9





Visual Rock Classification at Surface	
Fracturing	N/A - Soil
Hardness	
Strength	
Weathering	

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LINE 10
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

Geotechnical Investigation

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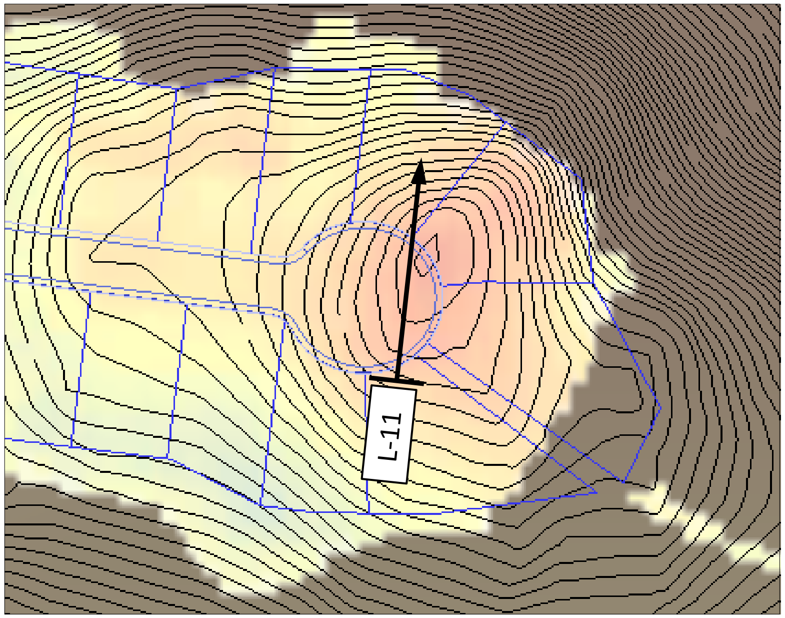
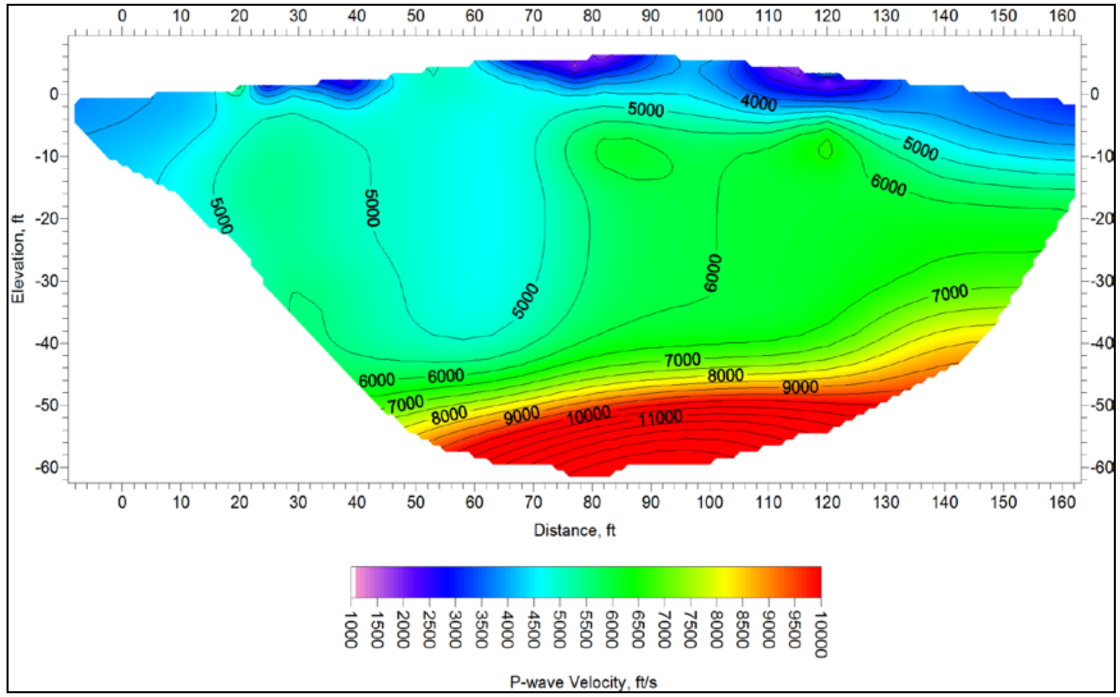
WASHOE COUNTY, NEVADA

Project No.: 3214.003
Date: 04/20/16

PLATE P-10





Visual Rock Classification at Surface	
Fracturing	3 - Moderately fractured
Hardness	4 - Hard
Strength	5 - Strong
Weathering	2 - Moderate

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LINE 11
2-D GEOPHYSICAL PROFILE
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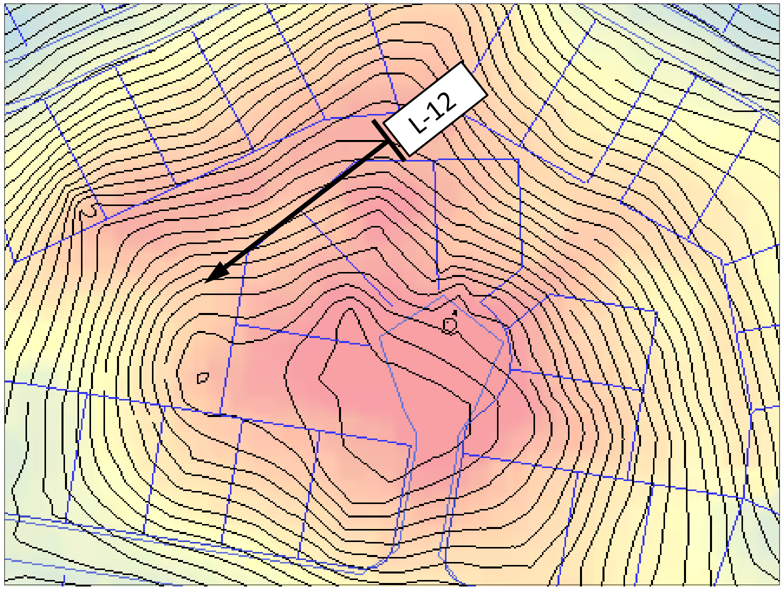
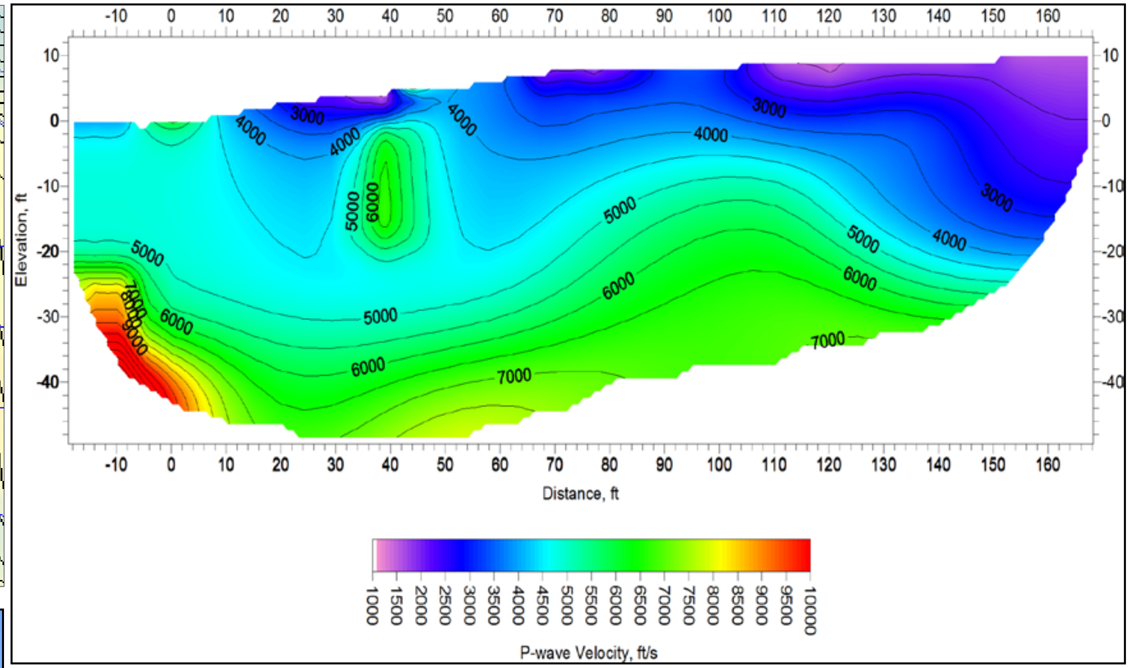
Project No.: 3214.003
Date: 04/20/16

PLATE
P-11





Visual Rock Classification at Surface	
Fracturing	2 - Occasionally fractured
Hardness	4 - Hard
Strength	5 - Strong
Weathering	2 - Moderate

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LINE 12
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

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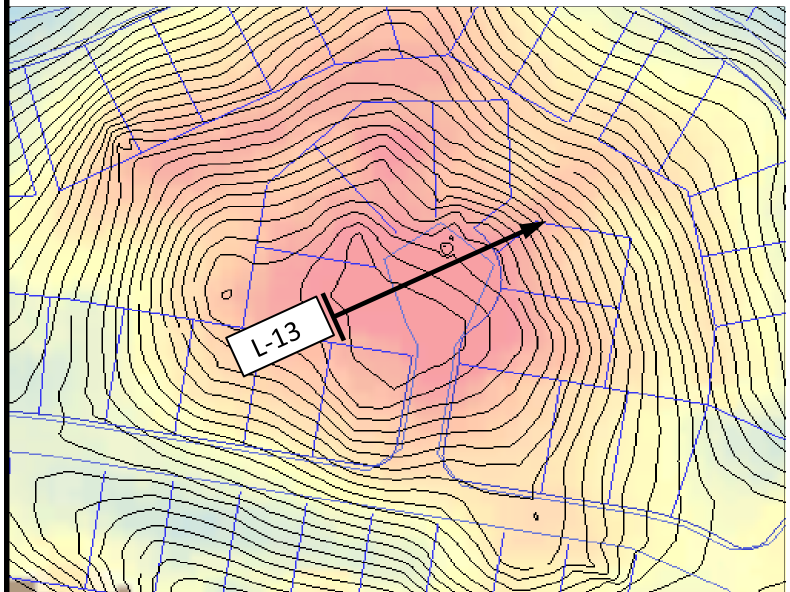
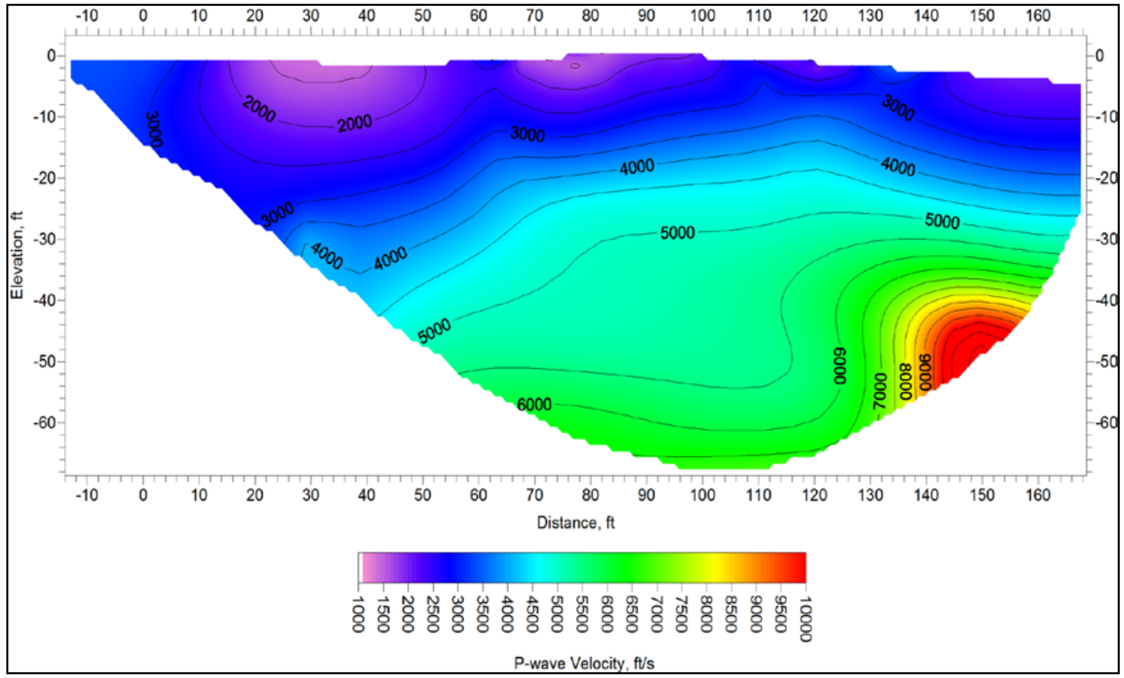
PLATE
P-12





Visual Rock Classification at Surface	
Fracturing	3 - Moderately fractured
Hardness	3 - Moderate
Strength	5 - Hard
Weathering	2 - Moderate

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LINE 13
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

Geotechnical Investigation

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Project No.: 3214.003
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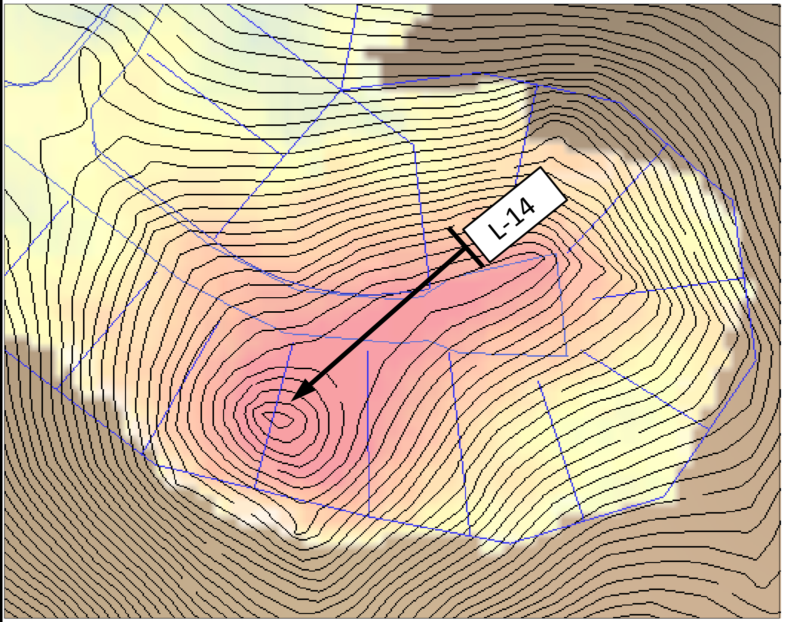
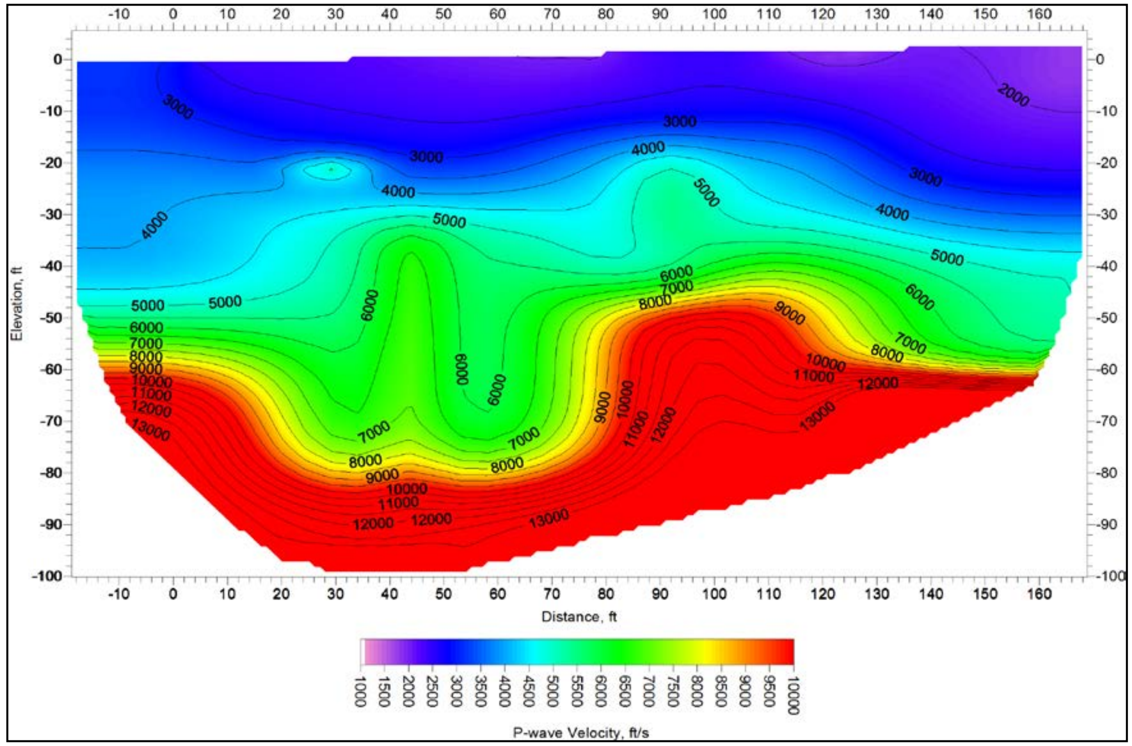
PLATE
P-13





Visual Rock Classification at Surface	
Fracturing	4 - Closely fractured
Hardness	4 - Hard
Strength	4 - Moderate
Weathering	2 - Moderate

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LINE 14
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

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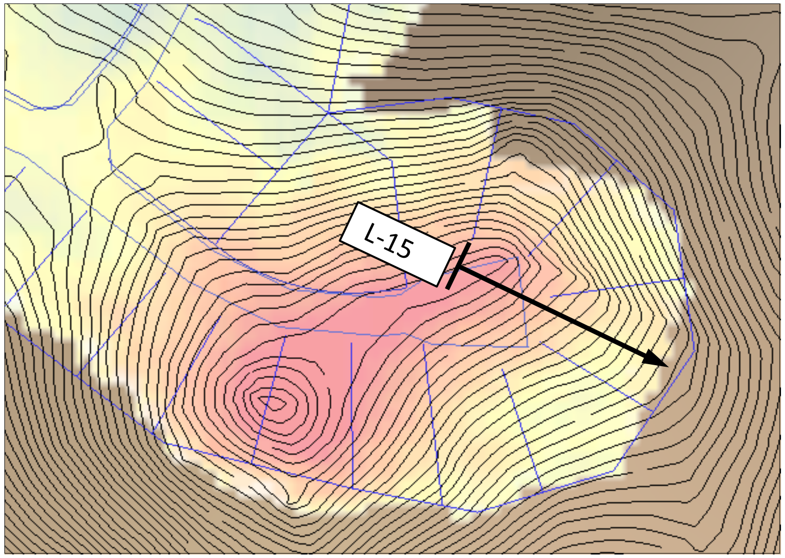
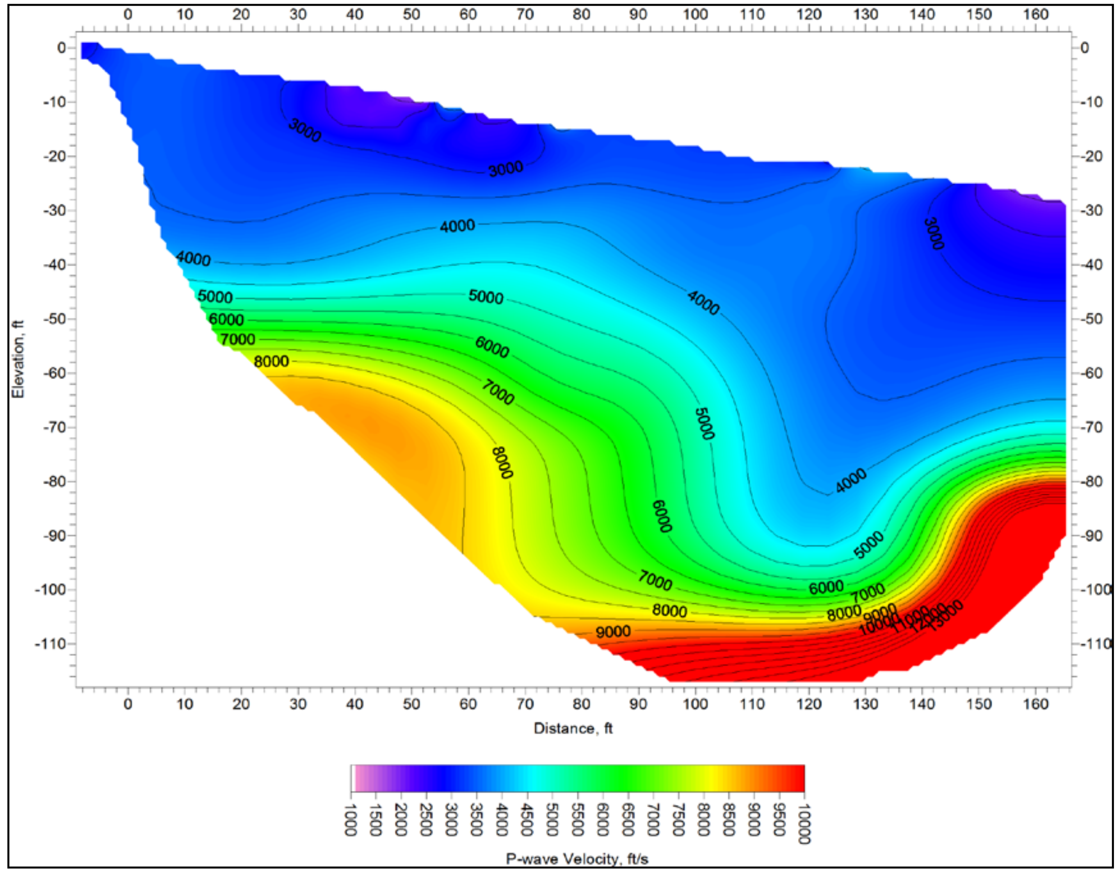
PLATE P-14





Visual Rock Classification at Surface	
Fracturing	3 - Moderately fractured
Hardness	4 - Hard
Strength	4 - Moderate
Weathering	2 - Moderate

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LINE 15
2-D GEOPHYSICAL PROFILE
SEISMIC (P-WAVE) VELOCITY

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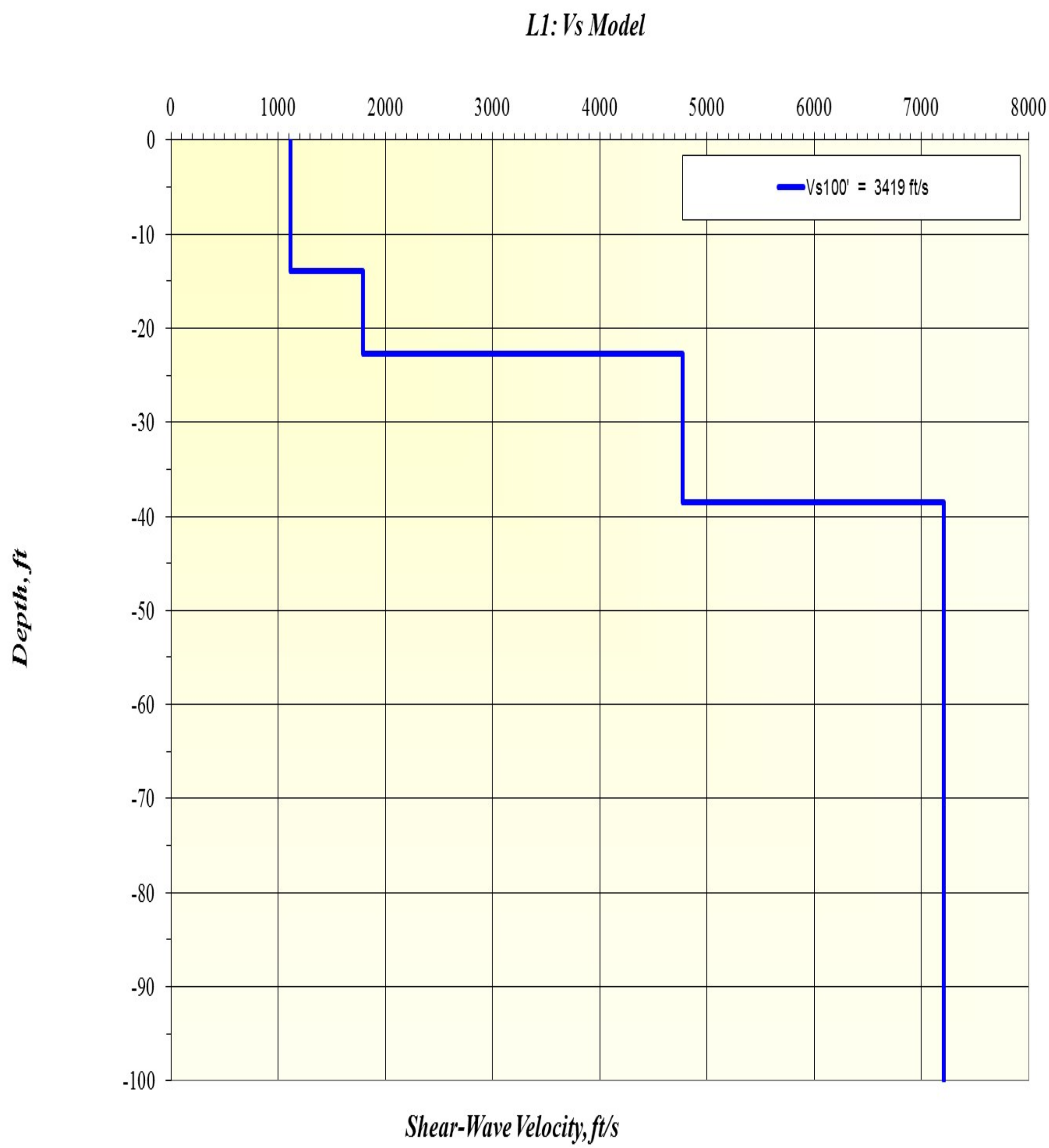
PLATE P-15



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1-D SHEAR WAVE VELOCITY PROFILE

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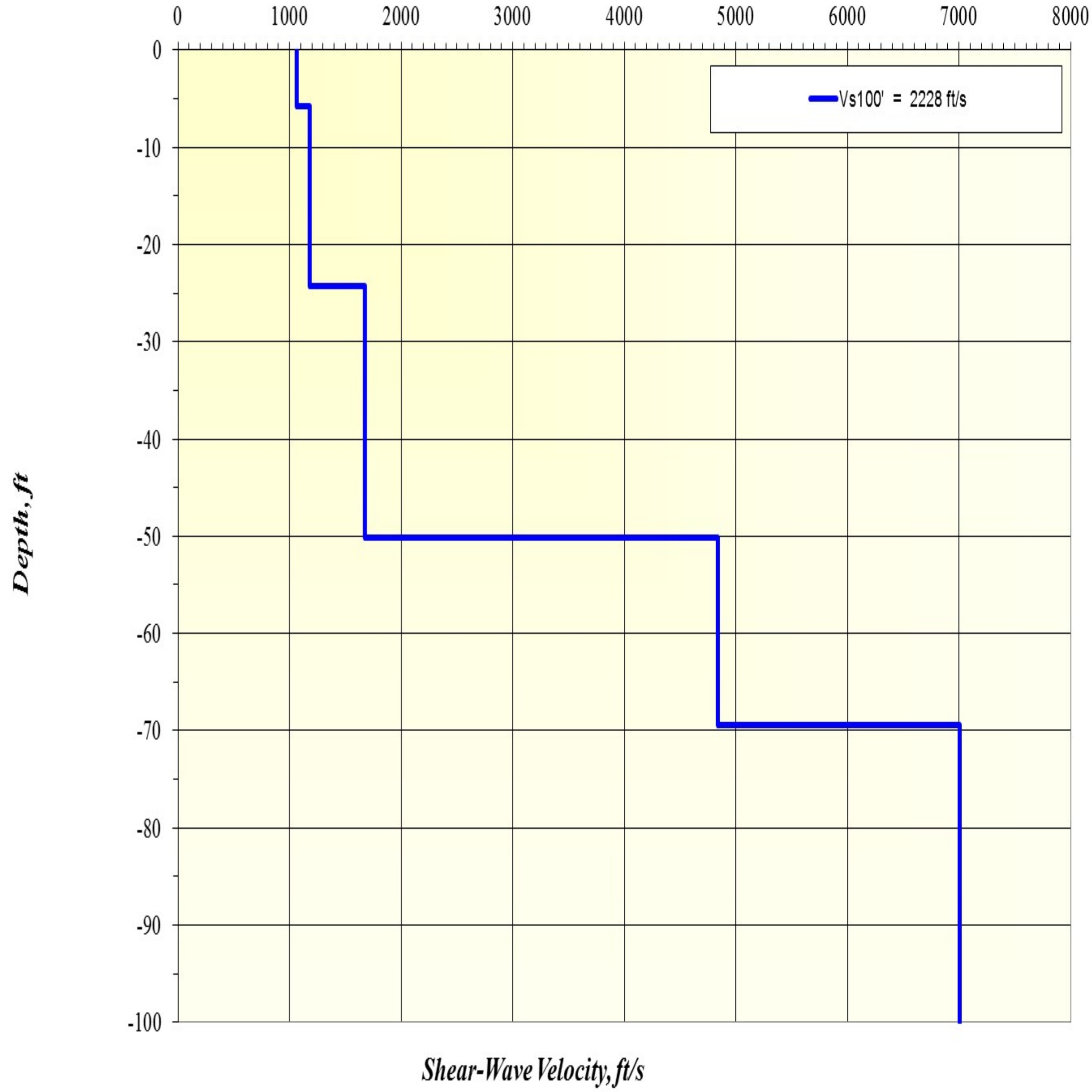
PLATE VS-1

L2: Vs Model



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1-D SHEAR WAVE VELOCITY PROFILE

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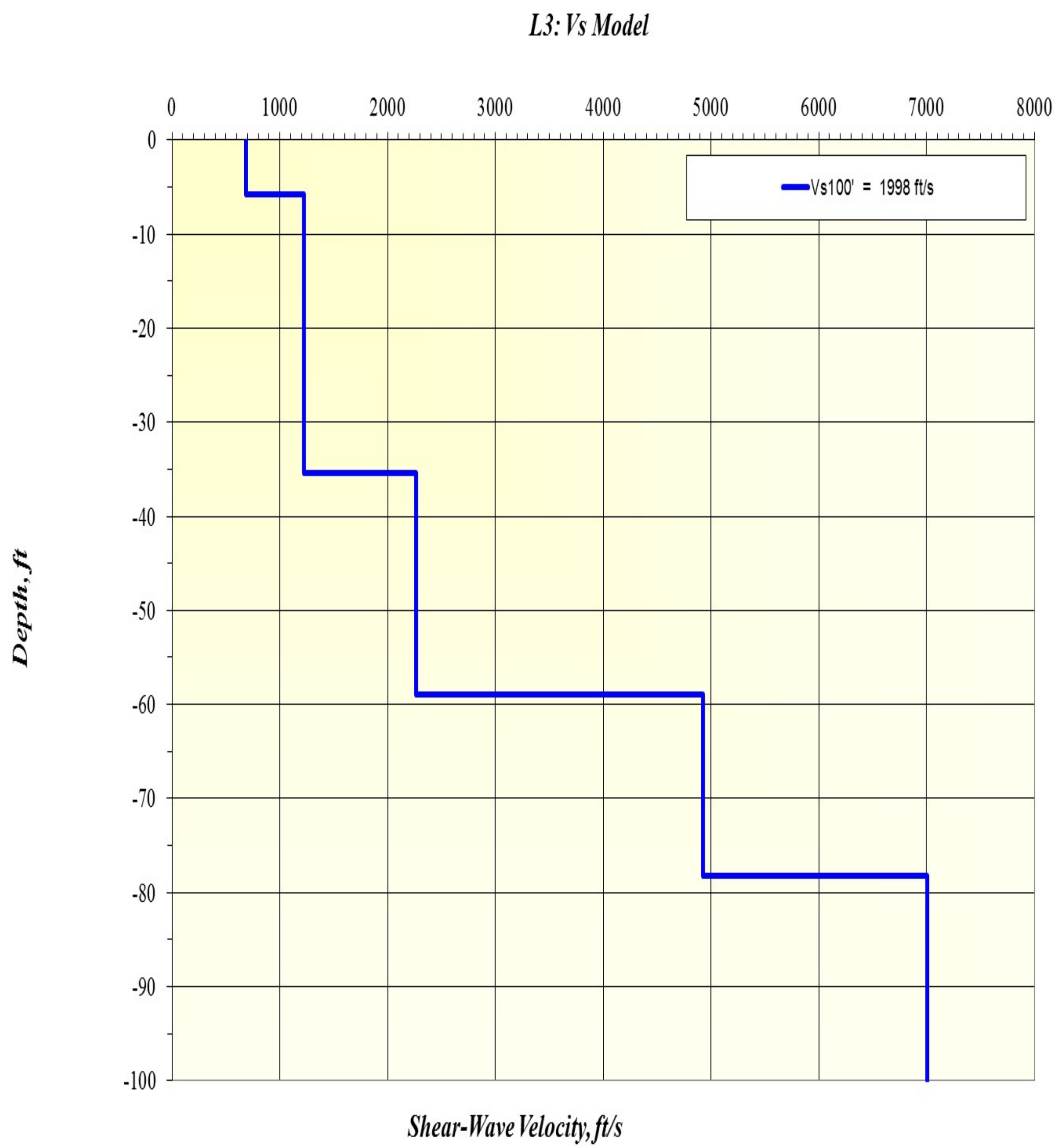
PLATE VS-2



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1-D SHEAR WAVE VELOCITY PROFILE

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PLATE VS-3

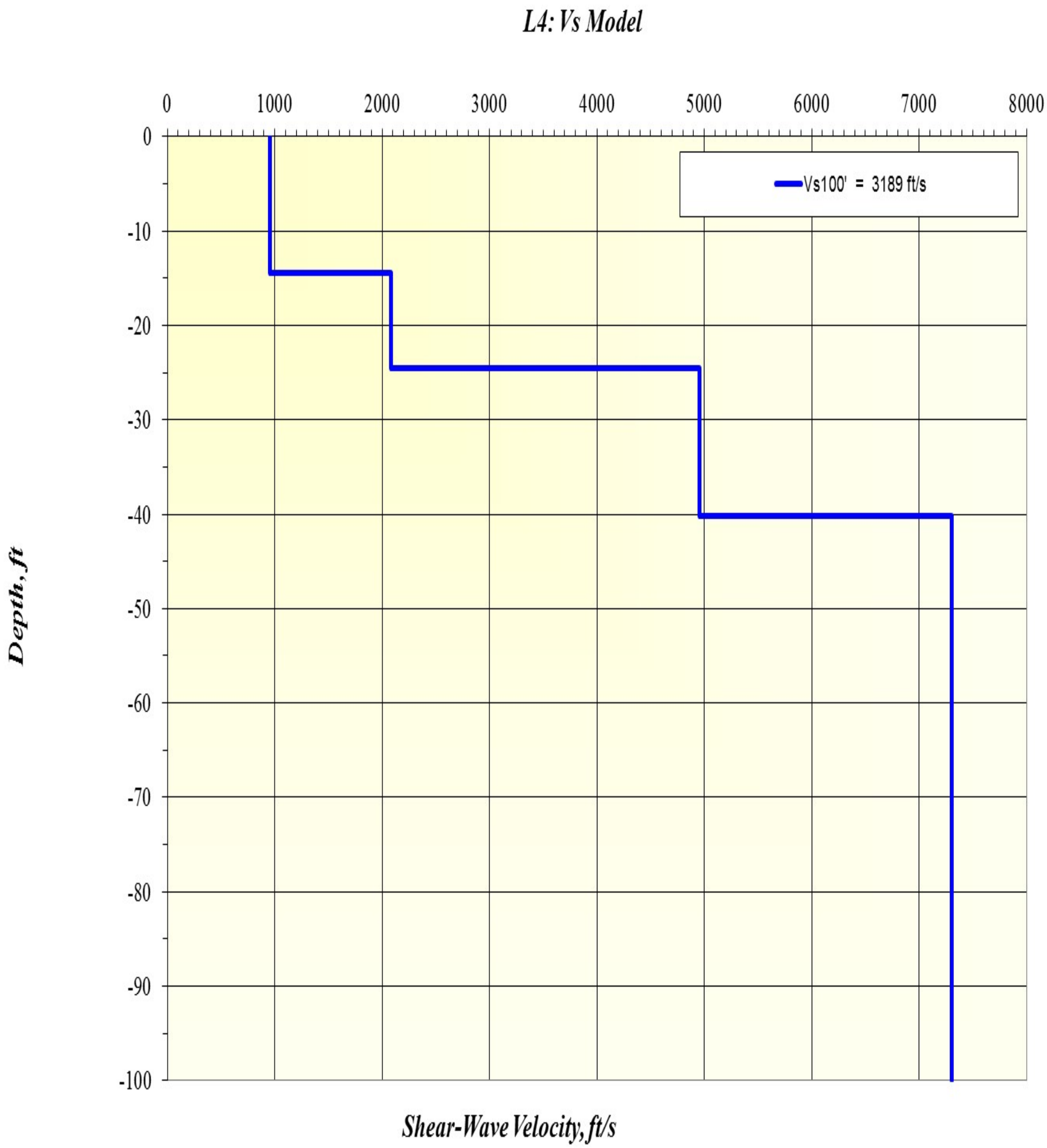

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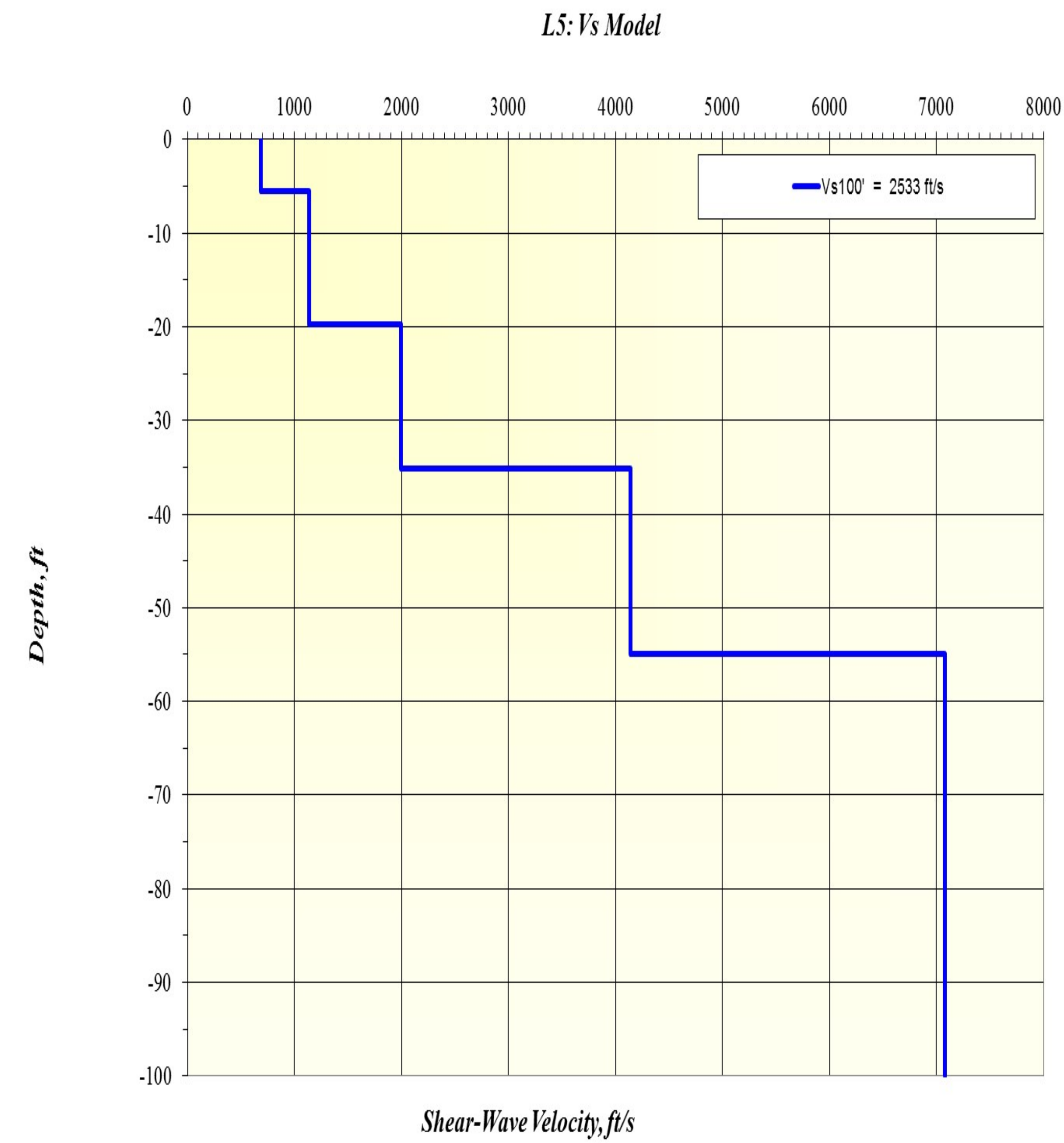
PLATE VS-4



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1-D SHEAR WAVE VELOCITY PROFILE

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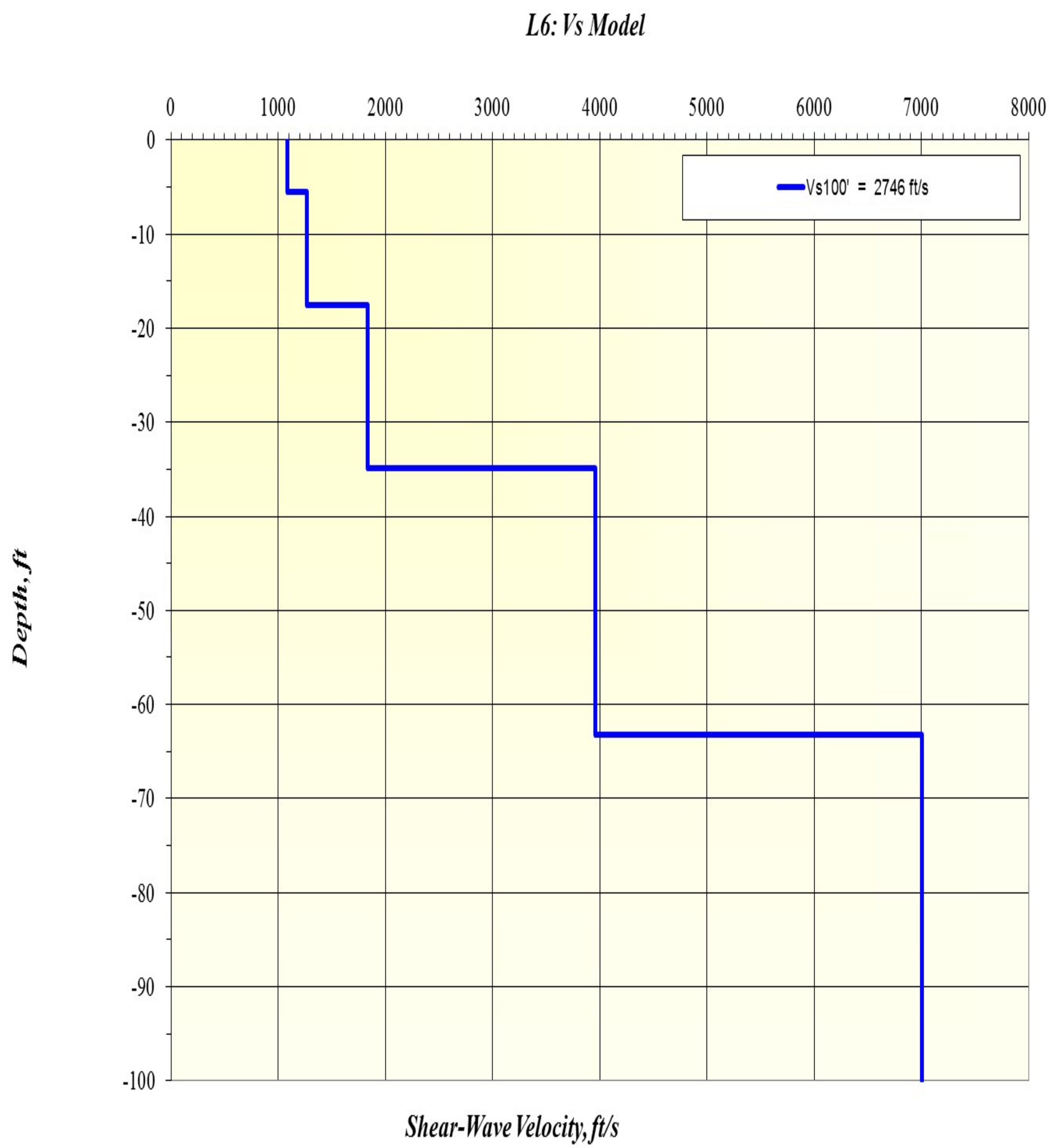
PLATE VS-5



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1-D SHEAR WAVE VELOCITY PROFILE

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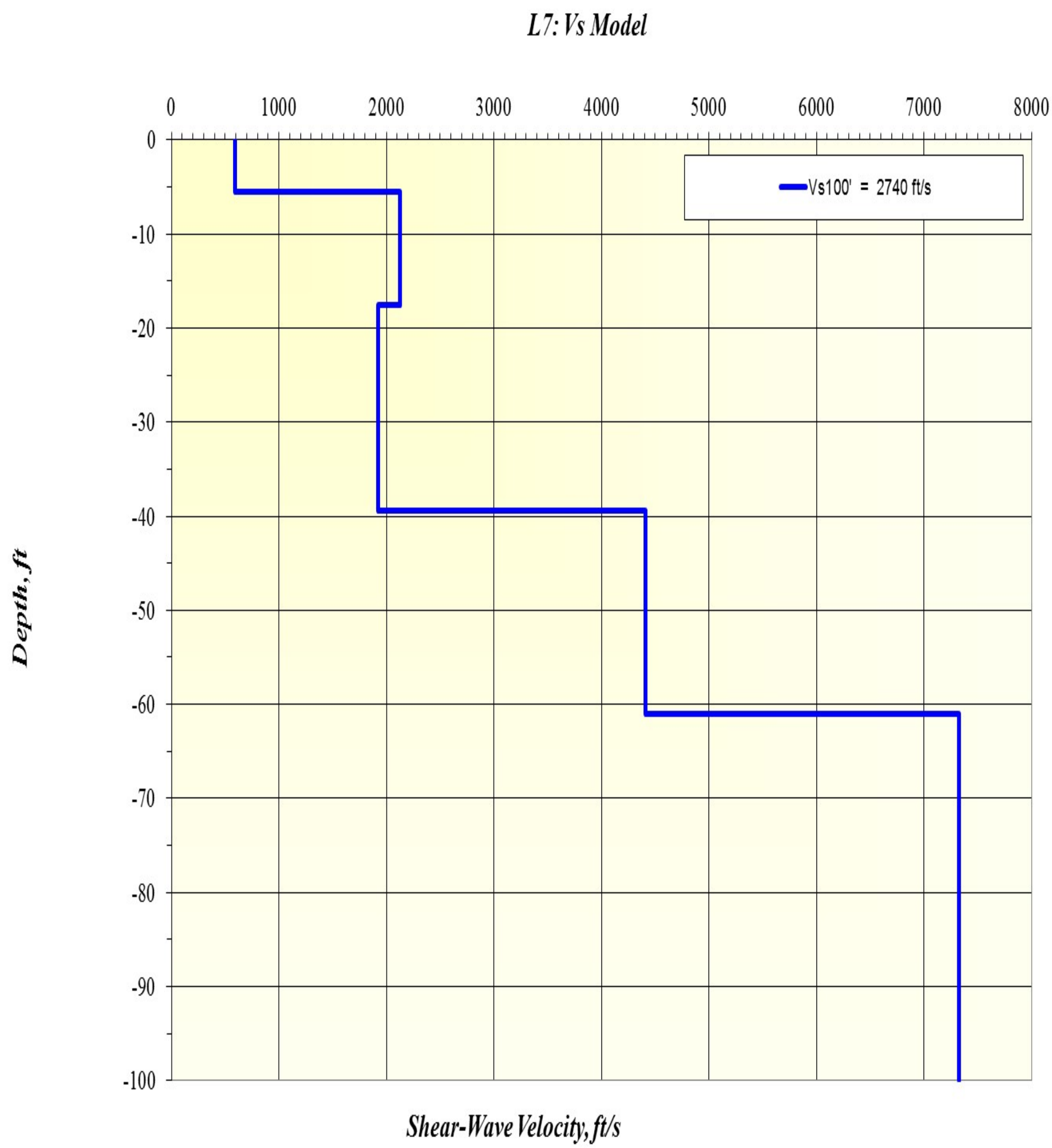
PLATE VS-6



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1-D SHEAR WAVE VELOCITY PROFILE

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PLATE VS-7

L8: Vs Model

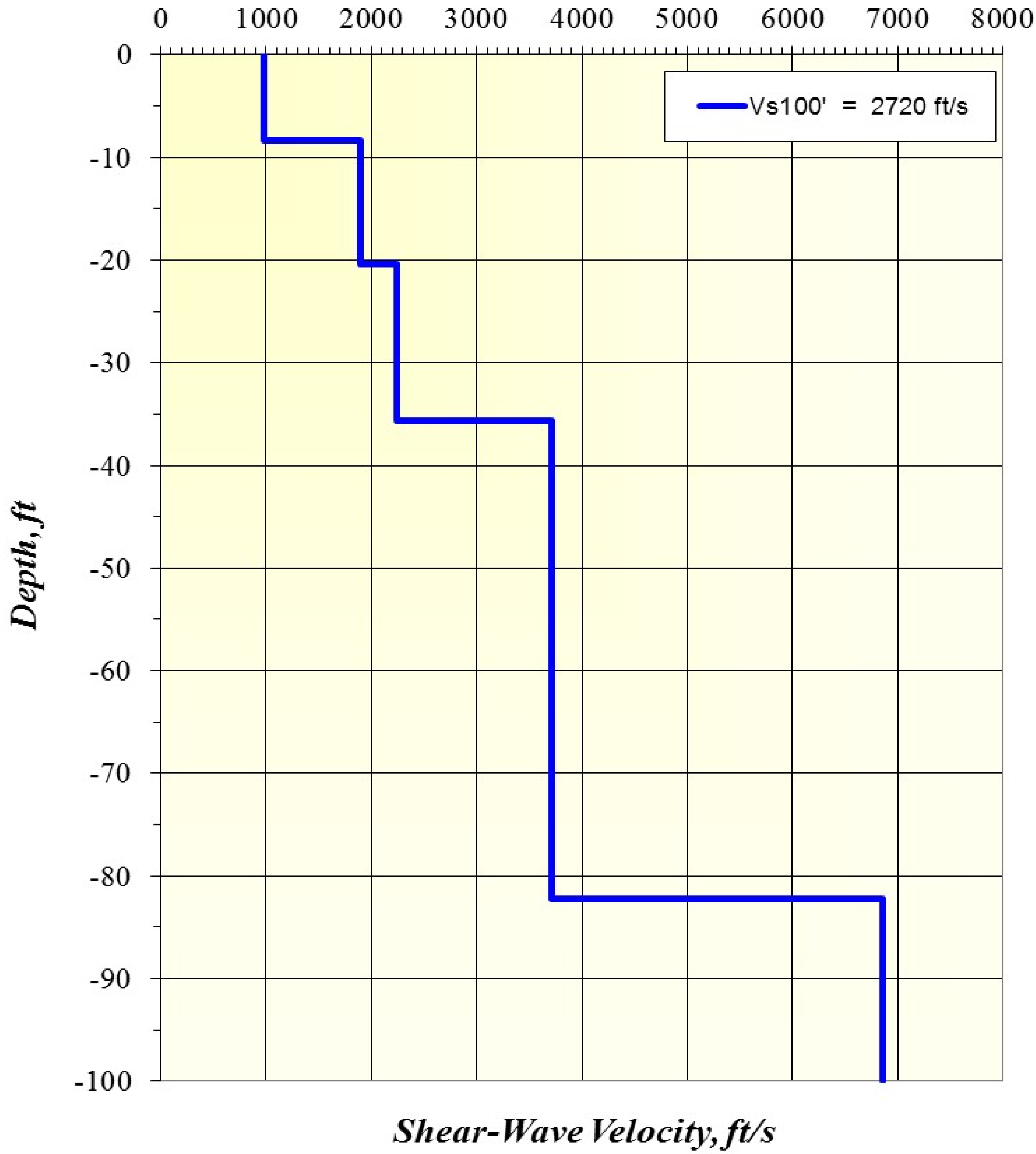

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PLATE VS-8

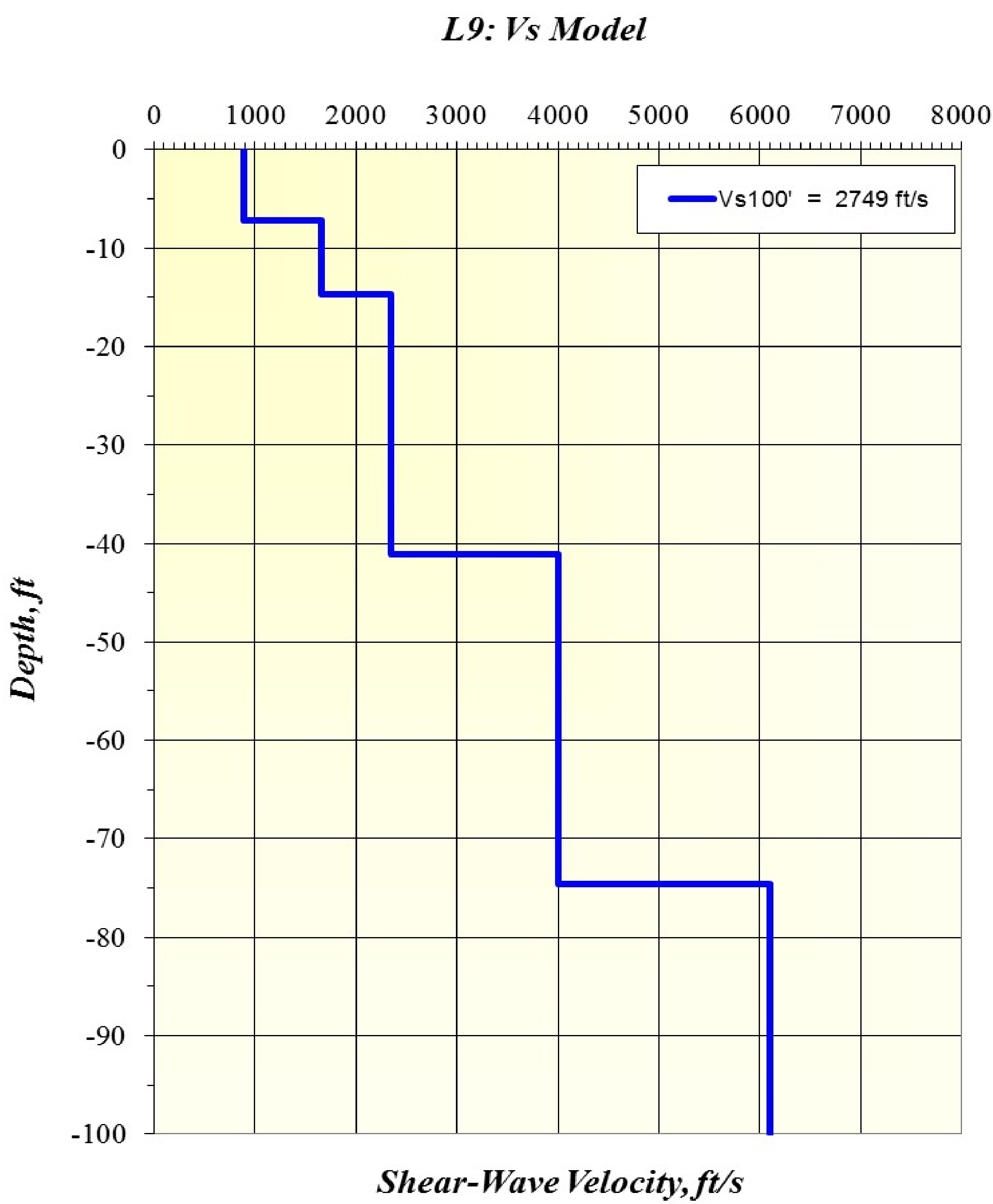

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PLATE VS-9

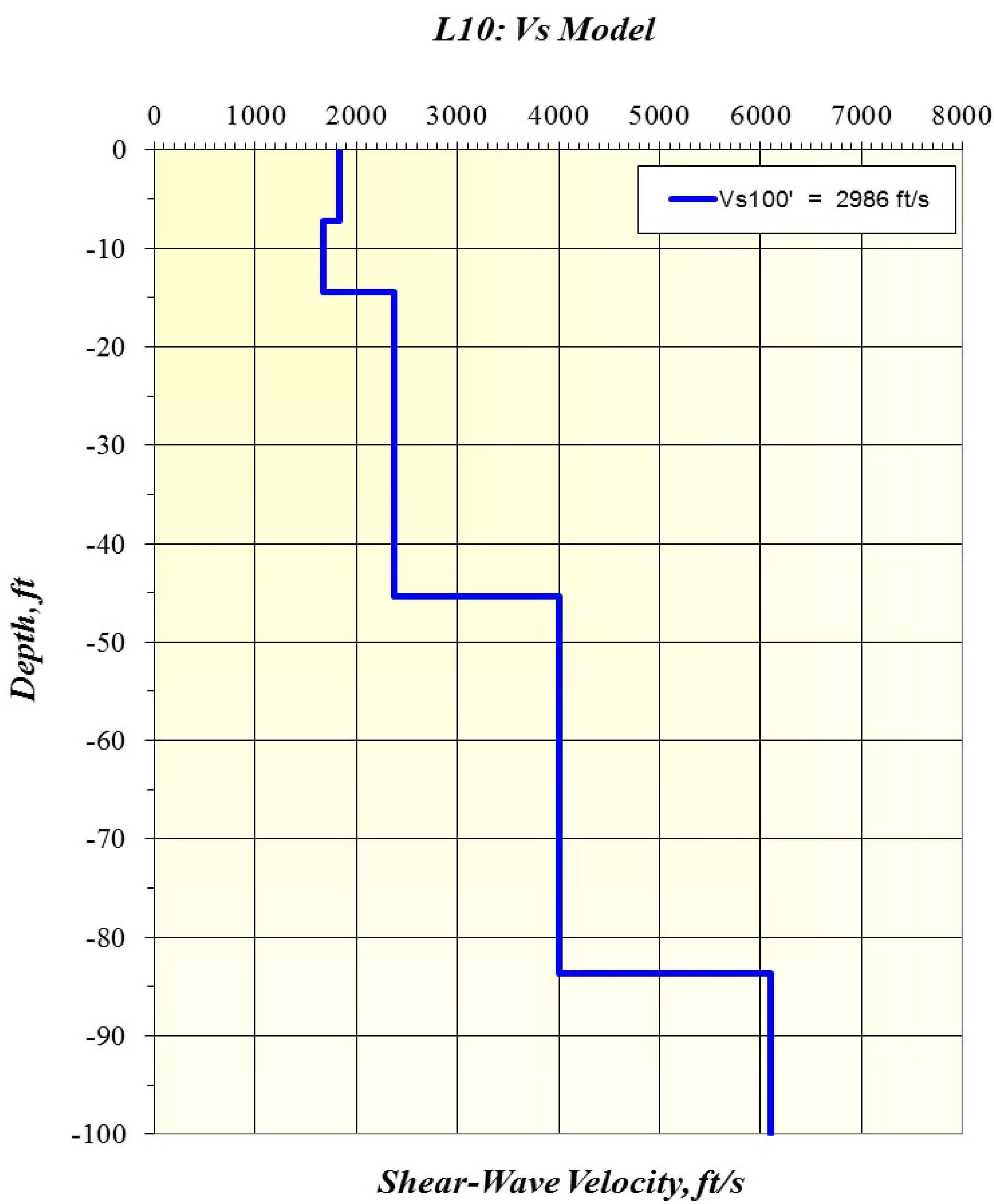

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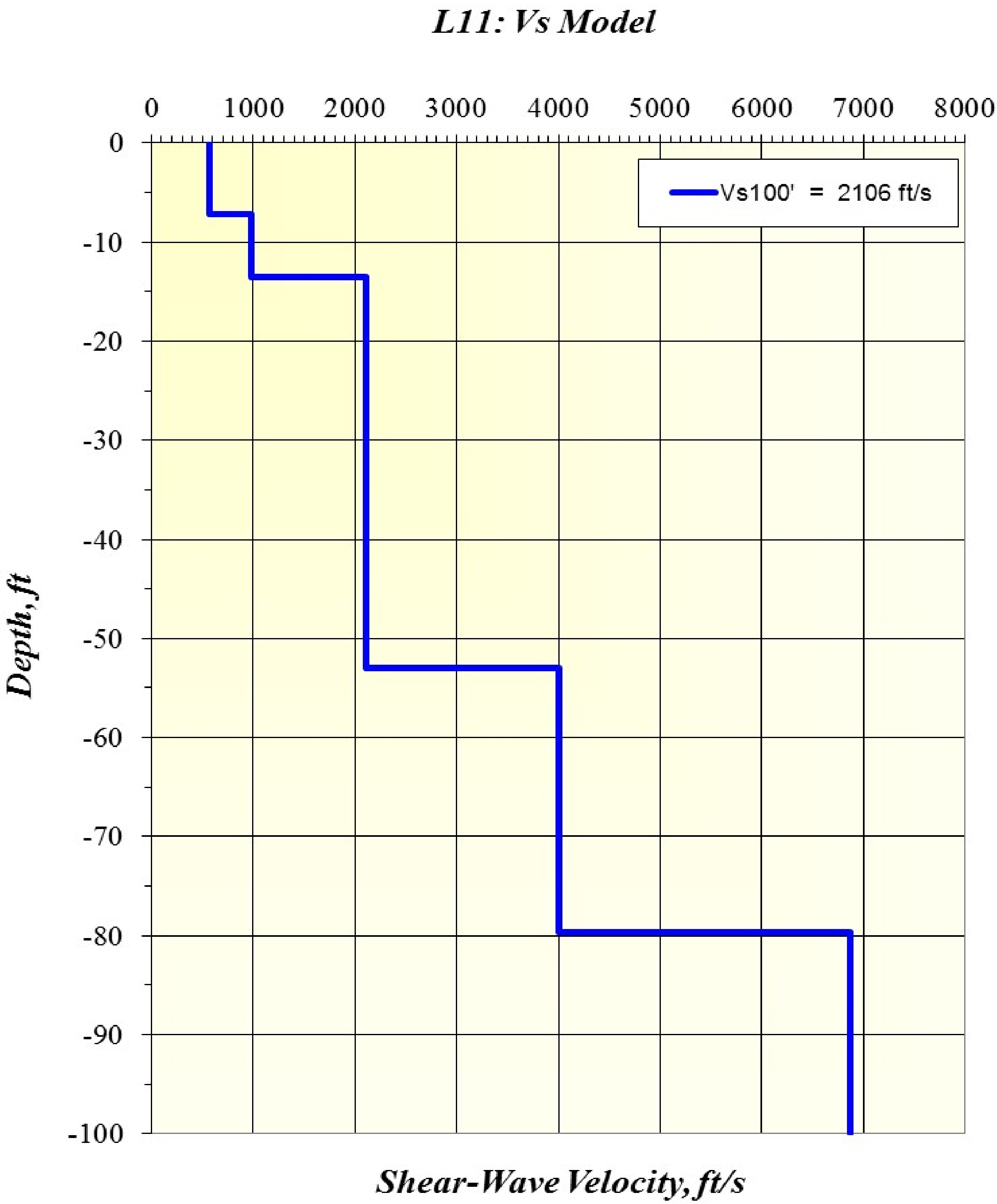
PLATE VS-10



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1-D SHEAR WAVE VELOCITY PROFILE

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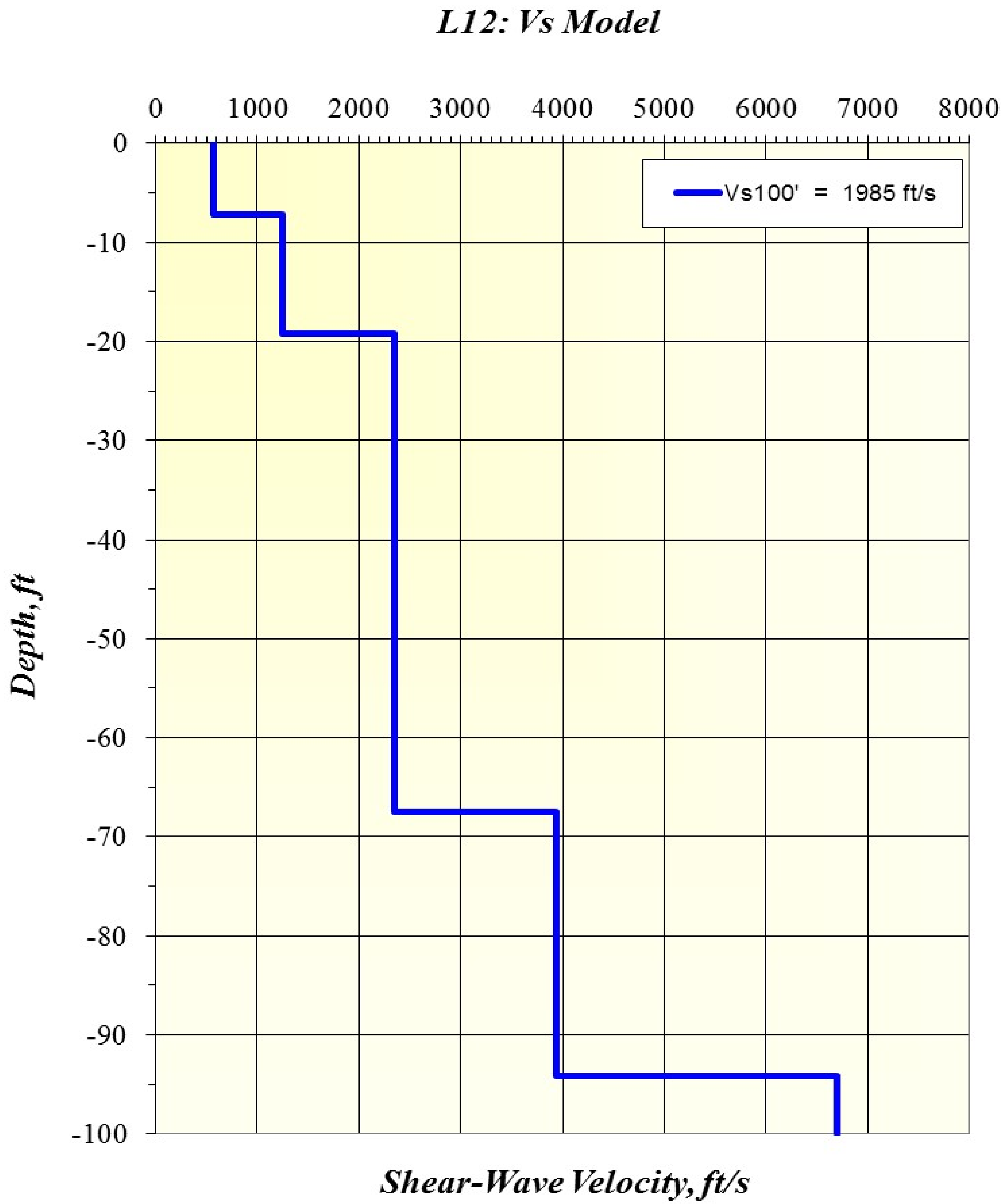
PLATE VS-11



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1-D SHEAR WAVE VELOCITY PROFILE

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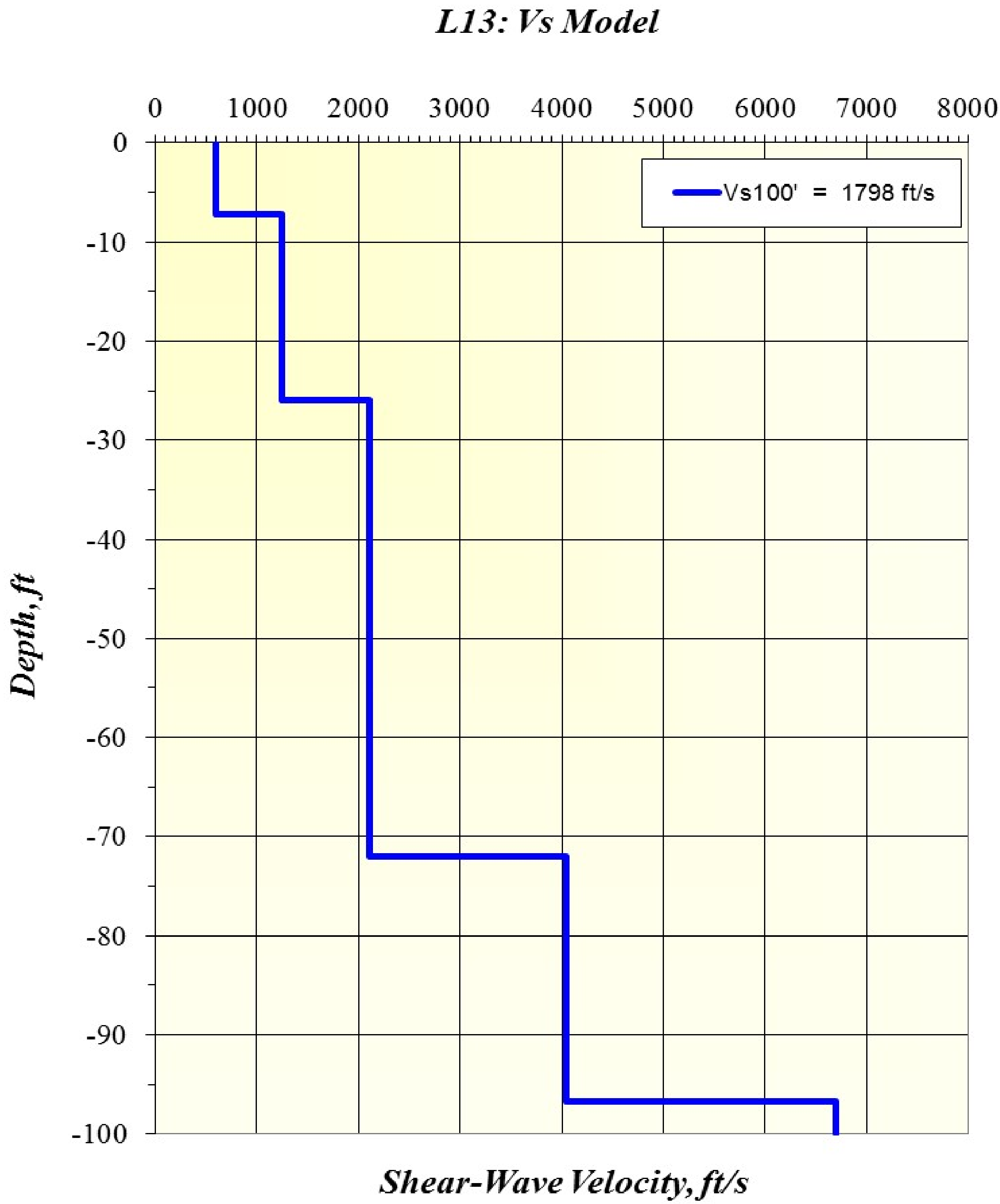
PLATE VS-12



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1-D SHEAR WAVE VELOCITY PROFILE

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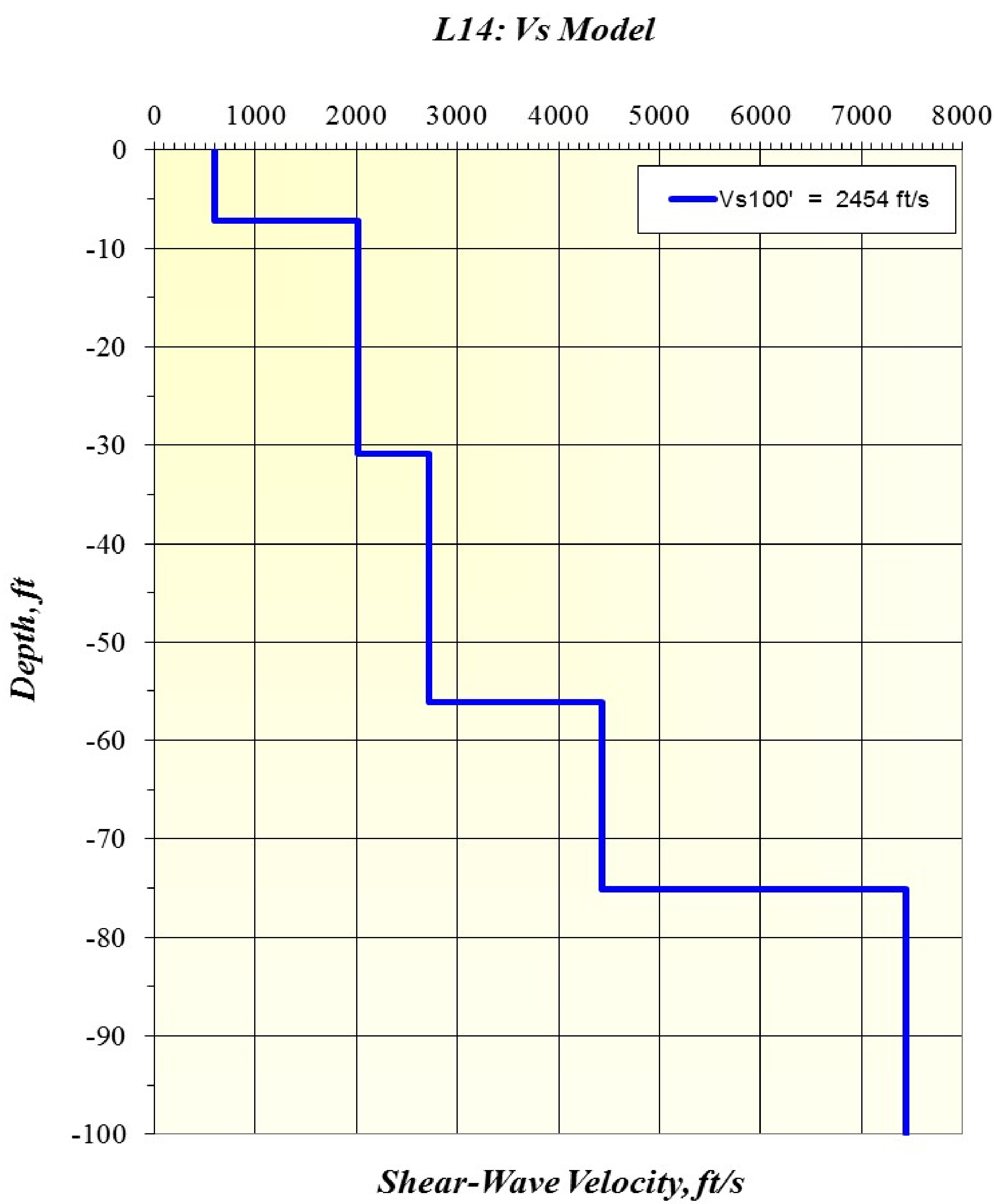
PLATE VS-13



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1-D SHEAR WAVE VELOCITY PROFILE

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PLATE VS-14

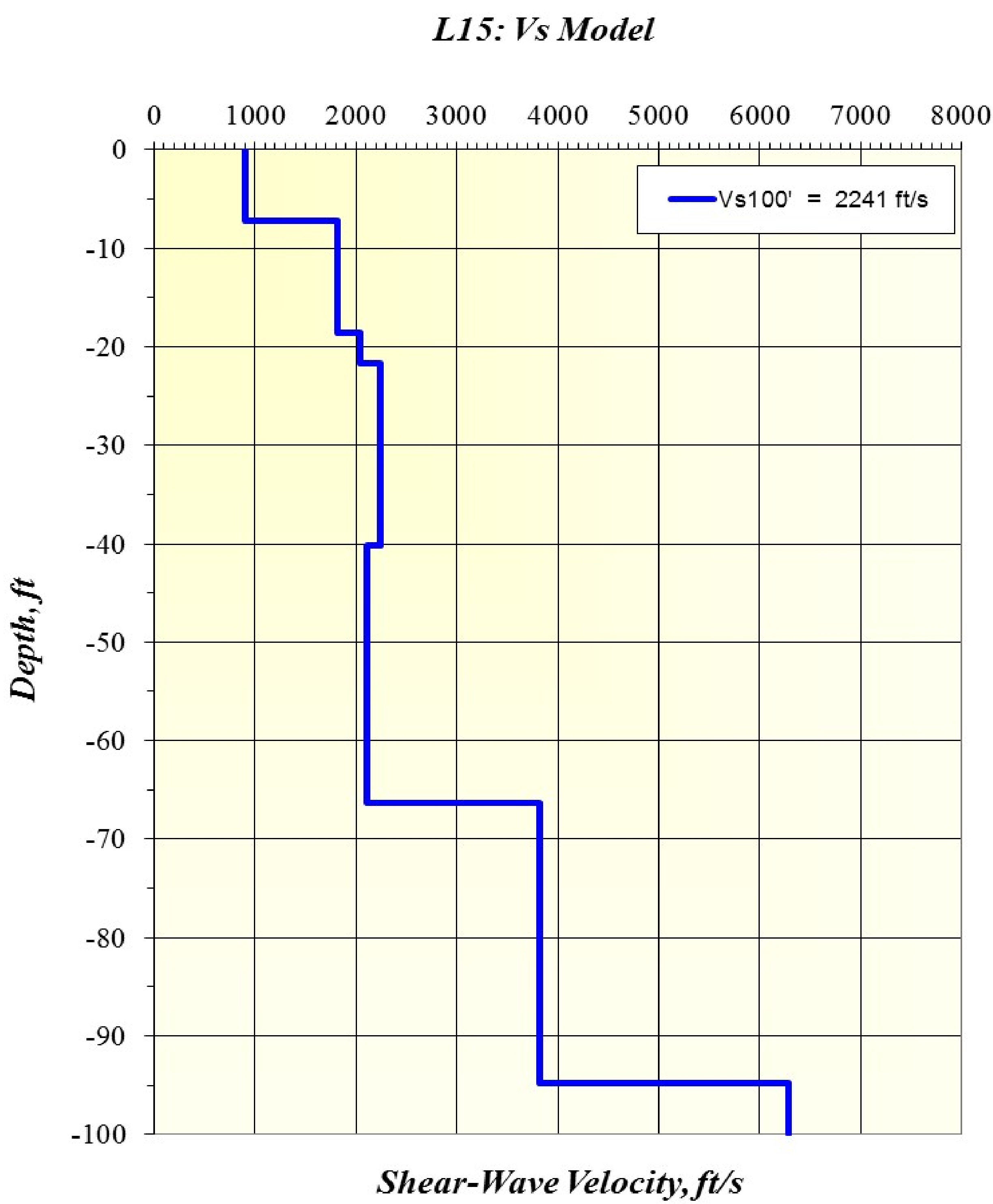

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PLATE VS-15

Designation: D5777 – 00 (Reapproved 2011)$^{\varepsilon 1}$

Standard Guide for Using the Seismic Refraction Method for Subsurface Investigation[1]

This standard is issued under the fixed designation D5777; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε^1 NOTE—Added a units statement as new 1.1.1 and revised Section 3 editorially in July 2011.

1. Scope

1.1 *Purpose and Application*—This guide covers the equipment, field procedures, and interpretation methods for the assessment of subsurface conditions using the seismic refraction method. Seismic refraction measurements as described in this guide are applicable in mapping subsurface conditions for various uses including geologic, geotechnical, hydrologic, environmental (**1**), mineral exploration, petroleum exploration, and archaeological investigations. The seismic refraction method is used to map geologic conditions including depth to bedrock, or to water table, stratigraphy, lithology, structure, and fractures or all of these. The calculated seismic wave velocity is related to mechanical material properties. Therefore, characterization of the material (type of rock, degree of weathering, and rippability) is made on the basis of seismic velocity and other geologic information.

1.1.1 The geotechnical industry uses English or SI units.

1.2 *Limitations:*

1.2.1 This guide provides an overview of the seismic refraction method using compressional (*P*) waves. It does not address the details of the seismic refraction theory, field procedures, or interpretation of the data. Numerous references are included for that purpose and are considered an essential part of this guide. It is recommended that the user of the seismic refraction method be familiar with the relevant material in this guide and the references cited in the text and with appropriate ASTM standards cited in 2.1.

1.2.2 This guide is limited to the commonly used approach to seismic refraction measurements made on land. The seismic refraction method can be adapted for a number of special uses, on land, within a borehole and on water. However, a discussion of these other adaptations of seismic refraction measurements is not included in this guide.

1.2.3 There are certain cases in which shear waves need to be measured to satisfy project requirements. The measurement of seismic shear waves is a subset of seismic refraction. This guide is not intended to include this topic and focuses only on *P* wave measurements.

1.2.4 The approaches suggested in this guide for the seismic refraction method are commonly used, widely accepted, and proven; however, other approaches or modifications to the seismic refraction method that are technically sound may be substituted.

1.2.5 Technical limitations and interferences of the seismic refraction method are discussed in D420, D653, D2845, D4428/D4428M, D5088, D5730, D5753, D6235, and D6429.

1.3 *Precautions:*

1.3.1 It is the responsibility of the user of this guide to follow any precautions within the equipment manufacturer's recommendations, establish appropriate health and safety practices, and consider the safety and regulatory implications when explosives are used.

1.3.2 If the method is applied at sites with hazardous materials, operations, or equipment, it is the responsibility of the user of this guide to establish appropriate safety and health practices and determine the applicability of any regulations prior to use.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this guide*

[1] This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.01 on Surface and Subsurface Characterization.

Current edition approved July 1, 2011. Published September 2011. Originally approved in 1995. Last previous edition approved in 2006 as D5777–00(2006). DOI: 10.1520/D5777-00R11e1.

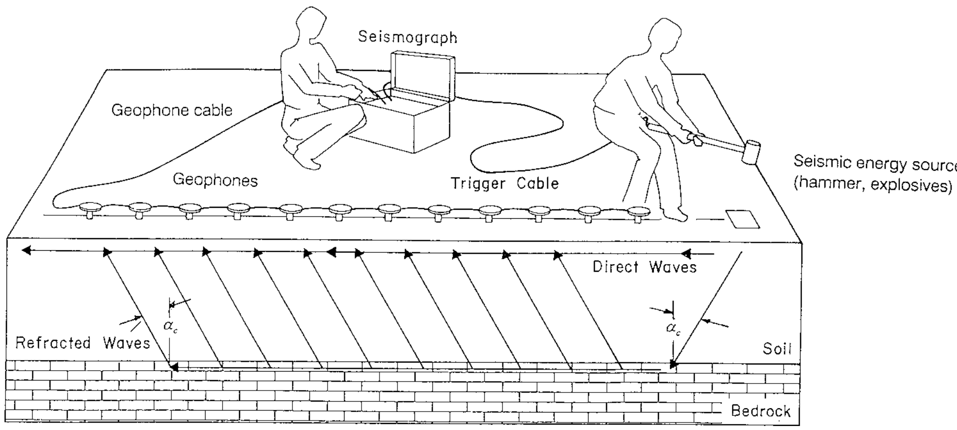


FIG. 1 Field Layout of a Twelve-Channel Seismograph Showing the Path of Direct and Refracted Seismic Waves in a Two-Layer Soil/Rock System (α_c = Critical Angle)

means only that the document has been approved through the ASTM consensus process.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D420 Guide to Site Characterization for Engineering Design and Construction Purposes (Withdrawn 2011)[3]

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D2845 Test Method for Laboratory Determination of Pulse Velocities and Ultrasonic Elastic Constants of Rock

D4428/D4428M Test Methods for Crosshole Seismic Testing

D5088 Practice for Decontamination of Field Equipment Used at Waste Sites

D5608 Practices for Decontamination of Field Equipment Used at Low Level Radioactive Waste Sites

D5730 Guide for Site Characterization for Environmental Purposes With Emphasis on Soil, Rock, the Vadose Zone and Ground Water

D5753 Guide for Planning and Conducting Borehole Geophysical Logging

D6235 Practice for Expedited Site Characterization of Vadose Zone and Groundwater Contamination at Hazardous Waste Contaminated Sites

D6429 Guide for Selecting Surface Geophysical Methods

3. Terminology

3.1 *Definitions:*

3.1.1 Definitions shall be in accordance with the terms and symbols given in Terminology D653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 The majority of the technical terms used in this guide are defined in Refs (**2**) and (**3**).[4]

4. Summary of Guide

4.1 *Summary of the Method*—Measurements of the travel time of a compressional (*P*) wave from a seismic source to a geophone(s) are made from the land surface and are used to interpret subsurface conditions and materials. This travel time, along with distance between the source and geophone(s), is interpreted to yield the depth to refractors refractors (refracting layers). The calculated seismic velocities of the layers are used to characterize some of the properties of natural or man-made man subsurface materials.

4.2 *Complementary Data*—Geologic and water table data obtained from borehole logs, geologic maps, data from outcrops or other complementary surface and borehole geophysical methods may be necessary to properly interpret subsurface conditions from seismic refraction data.

5. Significance and Use

5.1 *Concepts:*

5.1.1 This guide summarizes the equipment, field procedures, and interpretation methods used for the determination of the depth, thickness and the seismic velocity of subsurface soil and rock or engineered materials, using the seismic refraction method.

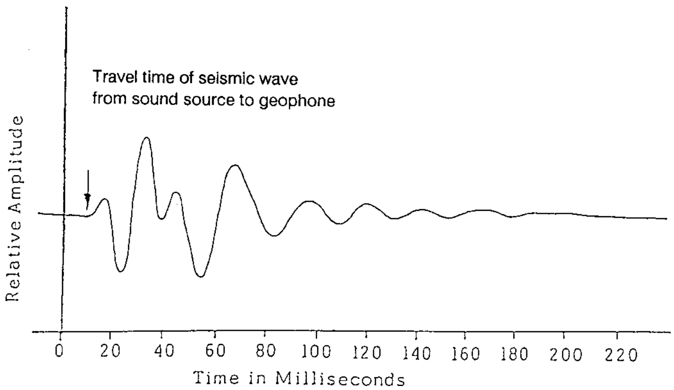
5.1.2 Measurement of subsurface conditions by the seismic refraction method requires a seismic energy source, trigger cable (or radio link), geophones, geophone cable, and a seismograph (see Fig. 1).

5.1.3 The geophone(s) and the seismic source must be placed in firm contact with the soil or rock. The geophones are usually located in a line, sometimes referred to as a geophone spread. The seismic source may be a sledge hammer, a mechanical device that strikes the ground, or some other type of impulse source. Explosives are used for deeper refractors or special conditions that require greater energy. Geophones

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] The boldface numbers given in parentheses refer to a list of references at the end of the text.



NOTE 1—Arrow marks arrival of first compressional wave.

FIG. 2 A Typical Seismic Waveform from a Single Geophone

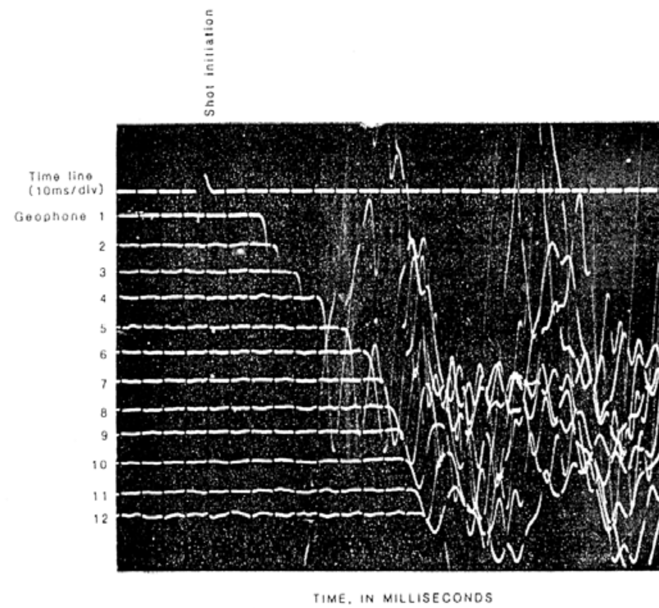


FIG. 3 Twelve-Channel Analog Seismograph Record Showing Good First Breaks Produced by an Explosive Sound Source (9)

convert the ground vibrations into an electrical signal. This electrical signal is recorded and processed by the seismograph. The travel time of the seismic wave (from the source to the geophone) is determined from the seismic wave form. Fig. 2 shows a seismograph record using a single geophone. Fig. 3 shows a seismograph record using twelve geophones.

5.1.4 The seismic energy source generates elastic waves that travel through the soil or rock from the source. When the seismic wave reaches the interface between two materials of different seismic velocities, the waves are refracted according to Snell's Law **(4, 8)**. When the angle of incidence equals the critical angle at the interface, the refracted wave moves along the interface between two materials, transmitting energy back to the surface (Fig. 1). This interface is referred to as a refractor.

5.1.5 A number of elastic waves are produced by a seismic energy source. Because the compressional *P* -wave has the highest seismic velocity, it is the first wave to arrive at each geophone (see Fig. 2 and Fig. 3).

5.1.6 The *P*-wave velocity V_p is dependent upon the bulk modulus, the shear modulus and the density in the following manner **(4)**:

$$V_p = \sqrt{[(K + 4/3\mu)/\rho]} \qquad (1)$$

where:

V_p = compressional wave velocity,
K = bulk modulus,
μ = shear modulus, and
ρ = density.

5.1.7 The arrival of energy from the seismic source at each geophone is recorded by the seismograph (Fig. 3). The travel time (the time it takes for the seismic *P*-wave to travel from the seismic energy source to the geophone(s)) is determined from each waveform. The unit of time is usually milliseconds (1 ms = 0.001 s).

5.1.8 The travel times are plotted against the distance between the source and the geophone to make a time distance plot. Fig. 4 shows the source and geophone layout and the resulting idealized time distance plot for a horizontal two-layered earth.

5.1.9 The travel time of the seismic wave between the seismic energy source and a geophone(s) is a function of the distance between them, the depth to the refractor and the seismic velocities of the materials through which the wave passes.

5.1.10 The depth to a refractor is calculated using the source to geophone geometry (spacing and elevation), determining the apparent seismic velocities (which are the reciprocals of the slopes of the plotted lines in the time distance plot), and the intercept time or crossover distances on the time distance plot (see Fig. 4). Intercept time and crossover distance-depth formulas have been derived in the literature **(6-8)**. These derivations are straightforward inasmuch as the travel time of the seismic wave is measured, the velocity in each layer is calculated from the time-distance plot, and the raypath geometry is known. These interpretation formulas are based on the following assumptions: (*1*) the boundaries between layers are planes that are either horizontal or dipping at a constant angle, (*2*) there is no land-surface relief, (*3*) each layer is homogeneous and isotropic, (*4*) the seismic velocity of the layers increases with depth, and (*5*) intermediate layers must be of sufficient velocity contrast, thickness and lateral extent to be detected. Reference **(9)** provides an excellent summary of these equations for two and three layer cases. The formulas for a two-layered case (see Fig. 4) are given below.

5.1.10.1 Intercept-time formula:

$$z = \frac{t_i}{2} \frac{V_2 V_1}{\sqrt{(V_2)^2 - (V_1)^2}} \qquad (2)$$

where:

z = depth to refractor two,
t_i = intercept time,
V_2 = seismic velocity in layer two, and
V_1 = seismic velocity in layer one.

5.1.10.2 Crossover distance formula:

V_1 = seismic velocity in layer 1

V_2 = seismic velocity in layer 2

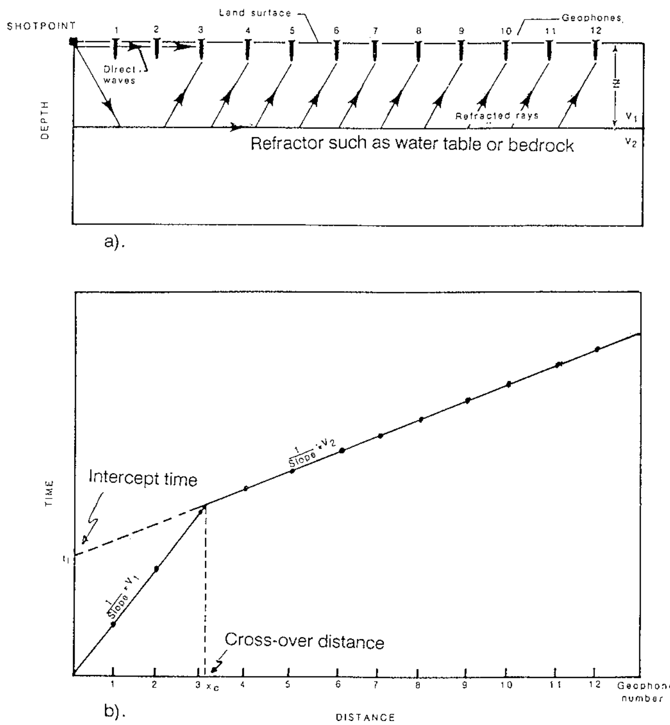


FIG. 4 (*a*) Seismic Raypaths and (*b*) Time-Distance Plot for a Two-Layer Earth With Parallel Boundaries (9)

$$z = \frac{x_c}{2} \sqrt{\frac{V_2 - V_1}{V_2 + V_1}} \quad (3)$$

where:

z, V_2 and V_1 are as defined above and x_c = crossover distance.

5.1.11 Three to four layers are usually the most that can be resolved by seismic refraction measurements. Fig. 5 shows the source and geophone layout and the resulting time distance plot for an idealized three-layer case.

5.1.12 The refraction method is used to define the depth to or profile of the top of one or more refractors, or both, for example, depth to water table or bedrock.

5.1.13 The source of energy is usually located at or near each end of the geophone spread; a refraction measurement is made in each direction. These are referred to as forward and reverse measurements, sometimes incorrectly called reciprocal measurements, from which separate time distance plots are made. Fig. 6 shows the source and geophone layout and the resulting time distance plot for a dipping refractor. The velocity obtained for the refractor from either of these two measurements alone is the apparent velocity of the refractor. Both measurements are necessary to resolve the true seismic velocity and the dip of layers (9) unless other data are available that indicate a horizontal layered earth. These two apparent velocity measurements and the intercept time or crossover distance are used to calculate the true velocity, depth and dip of the refractor. Note that only two depths of the planar refractor are obtained using this approach (see Fig. 7). Depth to the refractor is obtained under each geophone by using a more sophisticated data collection and interpretation approach.

V_1 = seismic velocity in layer 1

V_2 = seismic velocity in layer 2

V_3 = seismic velocity in layer 3

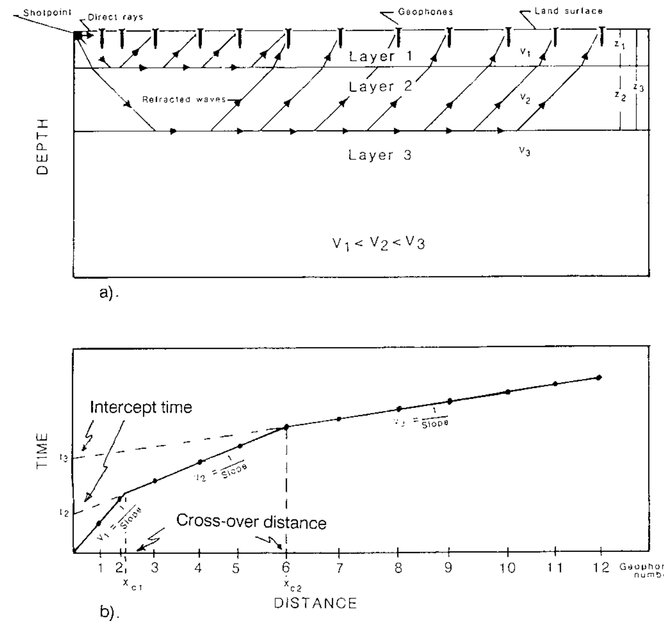


FIG. 5 (*a*) Seismic Raypaths and (*b*) Time-Distance Plot for a Three-Layer Model With Parallel Boundaries (9)

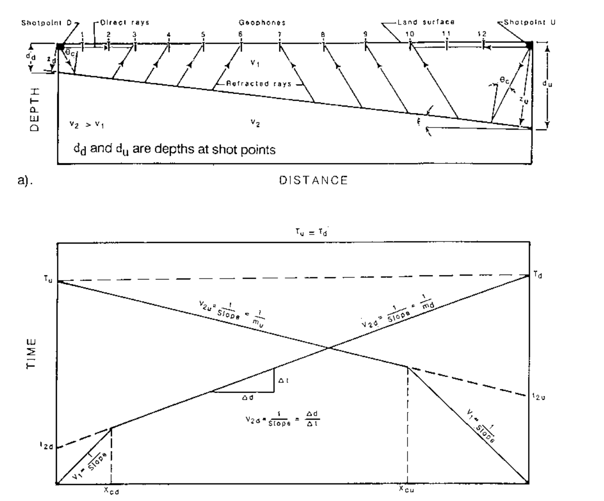


FIG. 6 (*a*) Seismic Raypaths and (*b*) Time-Distance Plot for a Two-Layer Model With A Dipping Boundary (9)

5.1.14 Most refraction surveys for geologic, engineering, hydrologic and environmental applications are carried out to determine depths of refractors that are less than 100 m (about 300 ft). However, with sufficient energy, refraction measurements can be made to depths of 300 m (1000 ft) and more (6).

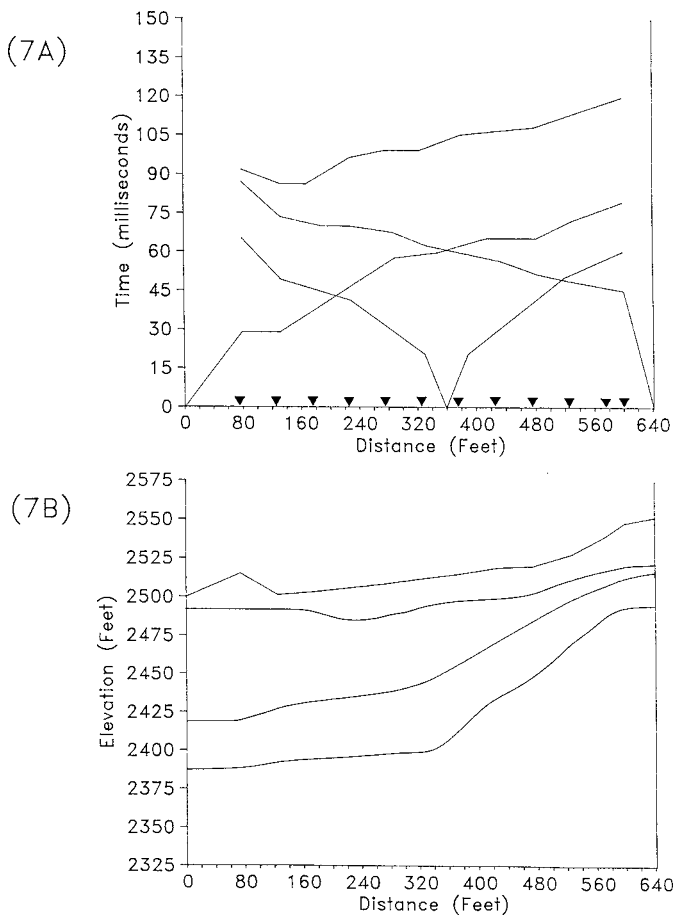


FIG. 7 Time Distance Plot (*a*) and Interpreted Seismic Section (*b*) (29)

TABLE 1 Range of Velocities For Compressional Waves in Soil and Rock (4)

Materials	Velocity	
Natural Soil and Rock	ft/s	m/s
Weathered surface material	800 to 2000	240 to 610
Gravel or dry sand	1500 to 3000	460 to 915
Sand (saturated)	4000 to 6000	1220 to 1830
Clay (saturated)	3000 to 9000	915 to 2750
Water[A]	4700 to 5500	1430 to 1665
Sea water[A]	4800 to 5000	1460 to 1525
Sandstone	6000 to 13 000	1830 to 3960
Shale	9000 to 14 000	2750 to 4270
Chalk	6000 to 13 000	1830 to 3960
Limestone	7000 to 20 000	2134 to 6100
Granite	15 000 to 19 000	4575 to 5800
Metamorphic rock	10 000 to 23 000	3050 to 7000

[A]Depending on temperature and salt content.

5.2 *Parameter Measured and Representative Values:*

5.2.1 The seismic refraction method provides the velocity of compressional *P*-waves in subsurface materials. Although the *P*-wave velocity is a good indicator of the type of soil or rock, it is not a unique indicator. Table 1 shows that each type of sediment or rock has a wide range of seismic velocities, and many of these ranges overlap. While the seismic refraction technique measures the seismic velocity of seismic waves in earth materials, it is the interpreter who, based on knowledge of the local conditions and other data, must interpret the seismic refraction data and arrive at a geologically feasible solution.

5.2.2 *P*-wave velocities are generally greater for:

5.2.2.1 Denser rocks than lighter rocks;

5.2.2.2 Older rocks than younger rocks;

5.2.2.3 Igneous rocks than sedimentary rocks;

5.2.2.4 Solid rocks than rocks with cracks or fractures;

5.2.2.5 Unweathered rocks than weathered rocks;

5.2.2.6 Consolidated sediments than unconsolidated sediments;

5.2.2.7 Water-saturated unconsolidated sediments than dry unconsolidated sediments; and

5.2.2.8 Wet soils than dry soils.

5.3 *Equipment*—Geophysical equipment used for surface seismic refraction measurement includes a seismograph, geophones, geophone cable, an energy source and a trigger cable or radio link. A wide variety of seismic geophysical equipment is available and the choice of equipment for a seismic refraction survey should be made in order to meet the objectives of the survey.

5.3.1 *Seismographs*—A wide variety of seismographs are available from different manufacturers. They range from relatively simple, single-channel units to very sophisticated multichannel units. Most engineering seismographs sample, record and display the seismic wave digitally.

5.3.1.1 *Single Channel Seismograph*—A single channel seismograph is the simplest seismic refraction instrument and is normally used with a single geophone. The geophone is usually placed at a fixed location and the ground is struck with the hammer at increasing distances from the geophone. First seismic wave arrival times (Fig. 2 and Fig. 3) are identified on the instrument display of the seismic waveform. For some simple geologic conditions and small projects a single-channel unit is satisfactory. Single channel systems are also used to measure the seismic velocity of rock samples or engineered materials.

5.3.1.2 *Multi-Channel Seismograph*—Multi-channel seismographs use 6, 12, 24, 48 or more geophones. With a multi-channel seismograph, the seismic wave forms are recorded simultaneously for all geophones (see Fig. 3).

5.3.1.3 The simultaneous display of waveforms enables the operator to observe trends in the data and helps in making reliable picks of first arrival times. This is useful in areas that are seismically noisy and in areas with complex geologic conditions. Computer programs are available that help the interpreter pick the first arrival time.

5.3.1.4 *Signal Enhancement*—Signal enhancement using filtering and stacking that improve the signal to noise ratio is available in most seismographs. It is an aid when working in noisy areas or with small energy sources. Signal stacking is accomplished by adding the refracted seismic signals for a number of impacts. This process increases the signal to noise ratio by summing the amplitude of the coherent seismic signals while reducing the amplitude of the random noise by averaging.

5.3.2 *Geophone and Cable:*

5.3.2.1 A geophone transforms the *P*-wave energy into a voltage that is recorded by the seismograph. For refraction work, the frequency of the geophones varies from 8 to 14 Hz. The geophones are connected to a geophone cable that is connected to the seismograph (see Fig. 1). The geophone cable has electrical connection points (take outs) for each geophone, usually located at uniform intervals along the cable. Geophone placements are spaced from about 1 m to hundreds of meters (2 or 3 ft to hundreds of feet) apart depending upon the level of detail needed to describe the surface of the refractor and the depth of the refractor(s). The geophone intervals may be adjusted at the shot end of a cable to provide additional seismic velocity information in the shallow subsurface.

5.3.2.2 If connections between geophones and cables are not waterproof, care must be taken to assure they will not be shorted out by wet grass, rain, etc. Special waterproof geophones (marsh geophones), geophone cables and connectors are required for areas covered with shallow water.

5.3.3 *Energy Sources:*

5.3.3.1 The selection of seismic refraction energy sources is dependent upon the depth of investigation and geologic conditions. Four types of energy sources are commonly used in seismic refraction surveys: sledge hammers, mechanical weight drop or impact devices, projectile (gun) sources, and explosives.

5.3.3.2 For shallow depths of investigation, 5 to 10 m (15 to 30 ft), a 4 to 7 kg (10 to 15 lb) sledge hammer may be used. Three to five hammer blows using signal enhancement capabilities of the seismograph will usually be sufficient. A strike plate on the ground is used to improve the coupling of energy from the hammer to the soil.

5.3.3.3 For deeper investigations in dry and loose materials, more seismic energy is required, and a mechanized or a projectile (gun) source may be selected. Projectile sources are discharged at or below the ground surface. Mechanical seismic sources use a large weight (of about 100 to 500 lb or 45 to 225 kg) that is dropped or driven downward under power. Mechanical weight drops are usually trailer mounted because of their size.

5.3.3.4 A small amount of explosives provides a substantial increase in energy levels. Explosive charges are usually buried to reduce energy losses and for safety reasons. Burial of small amounts of explosives (less than 1 lb or 0.5 kg) at 1 to 2 m (3 to 6 ft) is effective for shallow depths of investigation (less than 300 ft or 100 m) if backfilled and tamped. For greater depths of investigation (below 300 ft or 100 m), larger explosives charges (greater than 1 lb or 0.5 kg) are required and usually are buried 2 m (6 ft) deep or more. Use of explosives requires specially-trained personnel and special procedures.

5.3.4 *Timing*—A timing signal at the time of impact ($t = 0$) is sent to the seismograph (see Fig. 1). The time of impact ($t = 0$) is detected with mechanical switches, piezoelectric devices or a geophone (or accelerometer), or with a signal from a blasting unit. Special seismic blasting caps should be used for accurate timing.

5.4 *Limitations and Interferences :*

5.4.1 *General Limitations Inherent to Geophysical Methods:*

5.4.1.1 A fundamental limitation of all geophysical methods is that a given set of data cannot be associated with a unique set of subsurface conditions. In most situations, surface geophysical measurements alone cannot resolve all ambiguities, and some additional information, such as borehole data, is required. Because of this inherent limitation in the geophysical methods, a seismic refraction survey is not a complete assessment of subsurface conditions. Properly integrated with other geologic information, seismic refraction surveying is an effective, accurate, and cost-effective method of obtaining subsurface information.

5.4.1.2 All surface geophysical methods are inherently limited by decreasing resolution with depth.

5.4.2 *Limitations Specific to the Seismic Refraction Method:*

5.4.2.1 When refraction measurements are made over a layered earth, the seismic velocity of the layers are assumed to be uniform and isotropic. If actual conditions in the subsurface layers deviate significantly from this idealized model, then any interpretation also deviates from the ideal. An increasing error is introduced in the depth calculations as the angle of dip of the layer increases. The error is a function of dip angle and the velocity contrast between dipping layers (**10, 11**).

5.4.2.2 Another limitation inherent to seismic refraction surveys is referred to as a blind-zone problem (**4, 9, 12**). There must be a sufficient contrast between the seismic velocity of the overlying material and that of the refractor for the refractor to be detected. Some significant geologic or hydrogeologic boundaries have no field-measurable seismic velocity contrast across them and consequently cannot be detected with this technique.

5.4.2.3 A layer must also have a sufficient thickness in order to be detected (**12**).

5.4.2.4 If a layer has a seismic velocity lower than that of the layer above it (a velocity reversal), the low seismic velocity layer cannot be detected. As a result, the computed depths of deeper layers are greater than the actual depths (although the most common geologic condition is that of increasing seismic velocity with depth, there are situations in which seismic velocity reversals occur). Interpretation methods are available to address this problem in some instances (**13**).

5.4.3 *Interferences Caused by Natural and by Cultural Conditions:*

5.4.3.1 The seismic refraction method is sensitive to ground vibrations (time-variable noise) from a variety of sources. Geologic and cultural factors also produce unwanted noise.

5.4.3.2 *Ambient Sources*—Ambient sources of noise include any vibration of the ground due to wind, water movement (for example, waves breaking on a nearby beach), natural seismic activity, or by rainfall on the geophones.

5.4.3.3 *Geologic Sources*—Geologic sources of noise include unsuspected variations in travel time due to lateral and vertical variations in seismic velocity of subsurface layers (for example, the presence of large boulders within a soil).

5.4.3.4 *Cultural Sources*—Cultural sources of noise include vibration due to movement of the field crew, nearby vehicles, and construction equipment, aircraft, or blasting. Cultural factors such as buried structures under or near the survey line also may lead to unsuspected variations in travel time. Nearby powerlines may induce noise in long geophone cables.

5.4.3.5 During the course of designing and carrying out a refraction survey, sources of ambient, geologic, and cultural noise should be considered and its time of occurrence and location noted. The interference is not always predictable because it depends upon the magnitude of the noises and the geometry and spacing of the geophones and source.

5.5 *Alternative Methods*—The limitations discussed above may prevent the use of the seismic refraction method, and other geophysical or non-geophysical methods may be required to investigate subsurface conditions (see Guide D5753).

6. Procedure

6.1 This section includes a discussion of personnel qualification, planning and implementing the seismic refraction survey, and interpretation of seismic refraction data.

6.1.1 *Qualification of Personnel*—The success of a seismic refraction survey, as with most geophysical techniques, is dependent upon many factors. One of the most important factors is the competence of the person(s) responsible for planning, carrying out the survey, and interpreting the data. An understanding of the theory, field procedures, and methods for interpretation of seismic refraction data and an understanding of the site geology is necessary to complete a seismic refraction survey. Personnel not having specialized training and experience, should be cautious about using this technique and solicit assistance from qualified practitioners.

6.2 *Planning the Survey*—Successful use of the surface seismic refraction method depends to a great extent on careful and detailed planning.

6.2.1 *Objective(s) of the Seismic Refraction Survey:*

6.2.1.1 Planning and design of a seismic refraction survey should consider the objectives of the survey and the characteristics of the site. These factors determine the survey design, the equipment used, the level of effort, the interpretation method selected, and budget necessary to achieve the desired results. Important considerations include site geology, depth of investigation, topography, and access. The presence of noise-generating activities (for example, on-site utilities, man-made structures), and operational constraints (for example, restrictions on the use of explosives), must also be considered. It is good practice to obtain as much relevant information (for example, data from any previous seismic refraction work, boring, geologic and geophysical logs in the study area, topographic maps or aerial photos, or both) as possible about the site prior to designing a survey and mobilization to the field.

6.2.1.2 A geologic/hydrologic model of the subsurface conditions at the site should be developed early in the design phase and should include the thickness and type of soil cover, depth and type of rock, depth to water table and a stratigraphic section with the horizons to be mapped with the seismic refraction method.

6.2.1.3 The objective of the survey may be a reconnaissance of subsurface conditions or it may provide the most detailed subsurface information possible. In reconnaissance surveys, such as regional geologic or ground water studies and preliminary engineering studies, the spacing between the geophone spreads, or geophone spacing, is large, a few shot-points are used, and topographic maps or hand-level elevations are sufficient. Under these conditions, the cost of obtaining seismic refraction data is relatively low, but the resulting subsurface data are not very detailed. In a detailed survey, the spacing between the geophone spreads, or geophone spacing, is small, multiple shot-points are used, and elevations and locations of geophones and shot-points are more accurately determined. Under these conditions, the cost of obtaining seismic refraction data is higher, but can still be cost-effective because the resulting subsurface data is more detailed.

6.2.2 *Assess Seismic Velocity Contrast:*

6.2.2.1 One of the most critical elements in planning a seismic refraction survey is the determination of whether there is an adequate seismic velocity contrast between the two geologic or hydrologic units of interest.

6.2.2.2 Information from previous seismic refraction surveys in the area, knowledge of the geology, published references containing the seismic velocities of earth materials, and published reports of seismic refraction studies performed under similar conditions should be used.

6.2.2.3 When there is doubt that sufficient seismic velocity contrast exists, a pre-survey test is desirable at a control point, such as a borehole or well, where the stratigraphy is known and the seismic velocities can be determined. Three types of tests may be considered: a vertical seismic profile (VSP) (**8**) borehole log (such as a density log or sonic log, Guide D5753) that provide an indication of subsurface velocity layering, and a test refraction line near a known point of control. From this information, the feasibility of using the seismic refraction method at the site is assessed.

6.2.2.4 Forward modeling using mathematical equations (**7, 8, 9**) can be used to develop theoretical time distance plots. Given the thickness and the seismic velocity of the subsurface layers, these plots are used to assess the feasibility of conducting a seismic refraction survey and to determine the geometry of the field-survey. Sufficient information about layer thickness and seismic velocities may not be available to accurately model a site before field work is carried out. In this case, initial field measurements should be taken to assess whether an adequate seismic velocity contrast exists between the subsurface layers of interest.

6.2.3 *Selection of the Approach:*

6.2.3.1 The desired level of detail and geologic complexity will determine the interpretation method to be used for a refraction survey, which in turn will determine the field procedures to be followed (**4, 8, 9, 13-15**).

6.2.3.2 Numerous approaches are used to quantitatively interpret seismic refraction data; however, the most commonly used interpretation methods are classified into two general groups: methods that are used to define planar refractors and methods that are used to define nonplanar refractors.

6.2.4 *Methods Used To Define Planar Refractors:*

6.2.4.1 The intercept time method (ITM) and crossover distance method are the simplest and probably the best known of all the methods for the interpretation of seismic refraction data (**8, 11**). They can be described as the rigorous application of Snell's law to a subsurface model consisting of homogeneous layers and horizontal or dipping planar interfaces. The intercept time method requires that a constant seismic velocity exists in the overburden and in the refractor within a single geophone spread (between the shot points). The intercept time method uses simple field and interpretation procedures. Measurements are usually made from each end of the seismic refraction line (a minimum of one off-end shot-point on each end of the geophone spread). The results obtained using this method include the thickness of the overburden and the dip of the refractor at two points (see Fig. 6). It is also common to place one shot in the middle of the geophone spread. Shots off of each end of the spread may also be made to provide additional data. Additional shot-points increase the number of points along the refractor where depth can be determined.

6.2.4.2 The intercept time or crossover distance method can be used under the following conditions: where a limited number of refractor depth determinations are required within a single geophone spread; the surface of the refractor can be satisfactorily approximated by a plane (horizontal or dipping); lateral variations in seismic velocity of the subsurface layers (over the length of the geophone spread) can be neglected; and thin intermediate seismic velocity layers and seismic velocity inversions can be neglected.

6.2.4.3 Additional discussion of survey design and field considerations for the intercept-time method are given by Refs (**4** and **9**).

6.2.5 *Methods Used To Define Nonplanar Refractors*—A number of methods can be viewed as an extension of the intercept time method, whereby the depth to the refractor is calculated at the shot-points and at each geophone location. These methods require a greater level of effort in data acquisition, processing, and interpretation.

6.2.6 *Common Reciprocal Methods:*

6.2.6.1 A group of methods (referred to as the common reciprocal methods (CRM) by Palmer (**11**)). These methods can provide a more detailed interpretation of nonplanar refractors. Depths are obtained under each geophone, thereby accounting for irregular refracting surfaces (nonplanar refractors). The CRM has many variations including the plus-minus method, the ABC Method and Hagiwaras Method. Most, but not all, of the methods are based on the assumption that within a single geophone spread, seismic velocity in the overlying units and in the refractor do not vary laterally. Fig. 7 shows an interpreted seismic refraction section of an irregular rock surface using this approach. All these methods usually require that travel times be measured in both forward and reverse directions from three to seven shot-points per single geophone spread. The resolution of the surface of the refractor obtained by the survey is dependent on the spacing between the geophones and the number of shot-points. Additional discussion of survey design and field considerations for these methods are given in Refs (**4**) and (**10**).

6.2.6.2 These methods can be applied where depths to the refractor are required at each geophone; the surface of the refractor has some relief; lateral variations in seismic velocity of the subsurface layers (over the length of the spread) can be neglected; and thin intermediate seismic velocity layers and seismic velocity inversions can be neglected.

6.2.7 *Generalized Reciprocal Method:*

6.2.7.1 The generalized reciprocal method (GRM), as described by Palmer (**12, 17-19**) and Lankston (**14, 20**), can aid in resolving complex conditions including undetected layers, lateral changes in seismic velocity and anisotropy. The GRM includes as special cases the delay time method and Hales method (**11**). The GRM method requires a large data set (in time and space) to achieve the necessary resolution; therefore, a relatively small geophone spacing is required. This method usually requires that travel times be measured in both forward and reverse directions from five to seven shot-points per geophone spread. The generalized reciprocal method survey incorporates the strengths of most other seismic refraction methods and can provide the most detailed profile of a refractor, but requires considerably more effort in field data collection and interpretation. The full use of the generalized reciprocal method, which has been demonstrated by Palmer for model data and case histories, has still to achieve routine acceptance in engineering geophysics because it requires a greater field effort. The case histories in Palmer (**19**) demonstrate the application of the generalized reciprocal method to shallow targets of geotechnical significance.

6.2.7.2 The generalized reciprocal method can sometimes be used where lateral variations in seismic velocity within a single geophone spread, thin intermediate seismic velocity layers, and seismic velocity inversions cannot be neglected. Geophone spacing for this method is smaller to provide sufficient spatial data.

6.2.7.3 Additional discussions of survey design and field considerations for this method are given by Palmer (**17**); Lankston and Lankston (**20**); and Lankston (**14, 16**).

6.2.8 *Summary of Two Approaches:*

6.2.8.1 If it is acceptable to describe the surface of a refractor as a plane with a limited number of points, and lateral seismic velocity changes within a geophone spread can be neglected, then the intercept time or crossover distance methods may be sufficient.

6.2.8.2 If there is a need to define the depth and approximate shape of a non-planar refractor at each geophone location, and the lateral seismic velocity in subsurface layers within a geophone spread can be neglected, then one of the many common reciprocal methods that define nonplanar refractors can be used.

6.2.8.3 If there is a need to account for lateral seismic velocity changes in subsurface layers and account for intermediate seismic velocity layers and seismic velocity inversions, then the generalized reciprocal method can be used.

6.2.8.4 Table 2 summarizes the features and limitations of each of these methods. It is modified from Palmer (**11**).

6.2.8.5 The choice of interpretation method may vary from site to site and depends upon the detail required from the seismic refraction survey and the complexity of the geology at the site. The interpretation method in turn determines the approach and level of effort required in the field.

6.2.8.6 When selecting the approach for data acquisition the specific processing and interpretation method that is used must be considered since most processing and interpretation methods have specific requirements for data acquisition.

TABLE 2 Features and Limitations of Methods (Modified from Ref (11))

Methods Used For Defining Planar Refractors
Include the Time Intercept and Crossover Distance Methods
These methods require the least field and interpretation effort and are, therefore, the lowest cost. They can be applied where: • Depth computations are provided near shot-points; • The refractor is approximated by a plane (horizontal or dipping); • Lateral variations in seismic velocity within a single geophone spread are neglected; and • Thin intermediate velocity layers and velocity inversions are neglected.
Methods Used for Defining Non-Planar Refractors
The Common Reciprocal Method (CRM) Including Plus-Minus Method, the ABC Method, and the Hagiwaras Method
These CRM methods require additional field and interpretation effort and are intermediate in cost. They can be applied where: • Depth computations are provided at geophones; • The refractor has some relief; • Lateral variations in seismic velocity within a single geophone spread are neglected; and • Thin intermediate velocity layers and velocity inversions are neglected.
The Generalized Reciprocal Method (GRM)
The Delay Time Method and Hales Method are special cases of the GRM
In addition to all the features of the CRM methods, the Generalized Reciprocal Method (GRM) may account for: • Lateral variation in seismic velocity within a single geophone spread; • Thin intermediate velocity layers and velocity inversions. The GRM requires the greatest level of field and interpretation effort and is the most costly.

6.2.8.7 There are many field and interpretation methods that fall under the broad categories listed above. No attempt has been made to list all of the individual field and interpretation methods. Each one has strengths and weaknesses and must be selected to meet the project needs. The use of other field and interpretation methods not specifically mentioned are not precluded by this guide.

6.2.9 *Survey Design:*

6.2.9.1 *Location of Survey Lines*—Preliminary location of survey lines is usually done with the aid of topographic maps and aerial photos if an on-site visit is not possible. Consideration should be given to: the need for data at a given location; the accessibility of the area; the proximity of wells or test holes for control data; the extent and location of any asphalt or concrete surface, buried structures and utilities and other sources of cultural noise that will prevent measurements from being made, or introduce noise into the data (see section 5.7.3); and adequate space for the refraction line.

6.2.9.2 The geophone stations should lie along as straight a line as possible. Deviations from a straight path may result in inaccuracies unless the line is carefully surveyed and appropriate geometric corrections are applied to the data. Often the location of the line will be determined by topography. Line locations should be selected so that the ground surface along each geophone spread (cable) is as flat as possible or an interpretation method should be selected that accounts for topography.

6.2.9.3 *Coverage*—Survey coverage and orientation of survey lines should be designed to meet survey objectives. The area of survey should be larger than the area of interest so that measurements are taken in both "background" conditions and over any anomalous conditions. Consideration should be given to the orientation of lines with respect to geologic features of interest, such as, buried channels, faults, or fractures, etc. When mapping a buried channel, the refraction survey line should cross over the channel so that its boundaries can be determined. The number and locations of shot-points will depend upon the method chosen to collect and interpret the seismic refraction data. Geophone spacing is determined by two factors: the expected depth of the refractor(s) and desired degree of definition (lateral resolution) of the surface of the refractor. The geophone to shot-point separation will be larger for deeper refractors and smaller for shallow refractors. For reconnaissance measurements that do not require extensive detailed mapping of the top of the refractor, widely spaced geophones may be used. For detailed mapping of the top of a refractor, more closely-spaced geophones are required. To define the surface of a refractor in detail, the geophone spacing must be smaller than the size of the spatial changes in the refractor. Geophone spacing can be varied from less than 1 m (3 ft) to more than 100 m (300 ft) depending upon the depth to the refractor and lateral resolution needed to define the top of a refractor. Examples of geophone spacing and shot distance needed to define various geologic conditions are given by Haeni (**9**). A refraction survey line may require a source-to-geophone distance of up to three to five times the required depth of investigation. Therefore, adequate space for the refraction line is a consideration. If the length of the geophone spread and the source to geophone offset are not sufficient to reach the maximum depth of investigation, then the source to geophone offset distance must be increased until a sufficient depth is obtained. If the length of the line to be surveyed is longer than a single geophone spread, data can be obtained by using multiple geophone spreads.

6.2.9.4 Refraction surveys along a line with multiple geophone spreads may be reconnaissance or detailed. For reconnaissance surveys, a gap may be left between the ends of successive spreads. As more detailed data is required, the gap will decrease until the geophone spreads overlap and provide a continuous profile of the refractor being mapped. The geophone spacing and the amount of overlap of the geophones from each cable spread will depend upon the detail and continuity required to map the desired refractor. Since the common reciprocal method and generalized reciprocal method are used to obtain depth to a refractor under individual geophones, the geophone spreads must be overlapped if continuous coverage of the refractor is desired. The overlap will commonly range from one to two geophones for common reciprocal method and from two to five geophones for generalized reciprocal method. Greater overlaps may be necessary for deeper refractors. The time-distance plots for the seismic refraction measurements can be constructed by combining and plotting together the data from each geophone spread by a process called phantoming. Phantoming is discussed by Lankston and Lankston (**13**).

6.2.10 *Data Acquisition Format*—A recommended standard for Seismic data files used in the personal computer (PC) environment written under the guidance of the Society of Exploration Geophysicists (SEG)—Engineering and Ground Water Geophysics Committee given by Pullan (**20**).

6.3 *Implementation of Survey:*

6.3.1 *On Site Check of Survey Plan:*

6.3.1.1 A systematic visual inspection of the site should be made upon arrival to determine if the initial survey plan is feasible. Modifications to the survey plan may be required.

6.3.1.2 If a feasibility test has not been previously conducted, the results of initial measurements can be used to confirm the existence of an adequate seismic velocity contrast and can also be used to assess signal to noise ratio at the site. Results of these initial measurements may require that changes be made to the original survey plan.

6.3.2 *Layout the Survey Lines*—Locate the best position for the refraction lines based on the survey design described in 6.2.4 and the on-site visit in 6.3.1

6.3.3 *Conducting the Survey:*

6.3.3.1 Check for adequate space to lay out as straight a line as possible.

6.3.3.2 Locate the position of the first geophone.

6.3.3.3 Lay out the geophone cable.

6.3.3.4 Place geophones firmly in the ground and connect them to the cable. The geophone must be vertical and in contact with the soil or rock. Improper placement of geophones is a common problem resulting in poor detection of the seismic *P*-wave. Each geophone spike should be pushed firmly into the ground to make the contact between the soil and the geophone as tight as possible. Often the top few inches (10 cm) of soil is very loose and should be scraped off so that the geophone can be implanted into firm soil. Where rock is exposed at the surface the geophone spike may be replaced by a tripod base on the geophone. In both soil and rock, a good coupling between the ground and the geophones should be assured.

6.3.3.5 Test the geophones and geophone cable for short circuits and open circuits if possible (see seismograph instruction manual).

6.3.3.6 Set up the source at the first shot-point or a test point.

6.3.3.7 Test the seismic source and trigger cable.

6.3.3.8 Test for noise level and set gains and filters (see seismograph instruction manual).

6.3.3.9 The required degree of accuracy of the position and elevation of shot-points and geophones varies with the objectives of the project. If the ground is relatively flat or the accuracy of the refraction survey is not critical, the distance between source and geophone measured with a tape measure will be sufficient. Measurements (made by tape) to within 15- to 20-cm (about 0.5 ft) are adequate for most purposes. If there are considerable changes in surface elevation, shot-point and geophone elevations and their horizontal locations must be surveyed and referenced to the project datum.

6.3.3.10 Proceed with the refraction measurements, making sure that an adequate signal-to-noise ratio exists so that the first arrivals can be determined.

6.3.4 *Quality Control (QC)*—Quality control can be applied to seismic refraction measurements in the field. Quality-control procedures require that standard procedures be followed and documentation be made. The following items are recommended to provide QC of field operations and data acquisition:

6.3.4.1 Documentation of the field procedures and interpretation method that are planned to be used in the study. The method of interpretation will often dictate the field procedures, and the field procedures as well as site conditions used may limit the method of interpretation.

6.3.4.2 A field log in which field operational procedures used for the project are recorded.

6.3.4.3 Changes to the planned field procedures should be documented.

6.3.4.4 Conditions that could reduce the quality of the data (weather conditions, sources of natural and cultural noise, etc.) should be documented.

6.3.4.5 If data are being recorded (by a computer or digital-acquisition system) with no visible means of observing the data, it is recommended that the data be reviewed as soon as possible to check their quality.

6.3.4.6 Care should be taken to maintain accurate timing of the seismograph.

6.3.4.7 Ensure that a uniform method of picking first arrival time is employed.

6.3.4.8 During or after data acquisition, time-distance plots should be made to assure that the data are of adequate quality and quantity to support the method of interpretation and define the refractor of interest.

6.3.4.9 Both forward and reverse measurements are necessary to properly resolve dipping layers.

6.3.4.10 In addition to the time-distance curves, three additional tools can be used as a means of quality control for seismic refraction data: the irregularity test, the reciprocal time test, and the parallelism test.

6.3.4.11 The irregularity test checks for travel time consistency along the refraction profile. If there are deviations from the straight line slope, the time picks may be in error, time-distance curves may have an error in data entry or plotting, data may be noisy, or geologic conditions may be highly variable.

6.3.4.12 The reciprocal time test is used to check reciprocal time differences between forward and reverse profile curves. If differences between reciprocal times are excessive, then the time picks may be in error or the time distance curves may have an error in data entry or plotting.

6.3.4.13 The parallelism test is used to check the relative parallelism between selected forward or reverse time distance curves and another curve from the same refractor. If the slopes of the two curves are sufficiently different, then time picks for one of the sets of data may be in error or the time distance curves may have an error in data entry or plotting.

6.3.4.14 Finally, a check should be made to determine if the depths and seismic velocities obtained using the seismic refraction method make geologic sense.

6.3.5 *Calibration and Standardization*—In general, the manufacturer's recommendation should be followed for calibration and standardization. If no such recommendations are provided, a periodic check of equipment should be made. A check should also be made after each equipment problem and repair. An operational check of equipment should be carried out before each project and before starting field work each day.

6.4 *Interpretation of Seismic Refraction Data:*

6.4.1 *Method of Interpretation:*

6.4.1.1 In some limited cases, quantitative interpretation of the data may not be required and a simple qualitative interpretation may be sufficient. Examples of qualitative and semi-quantitative interpretation may include the lateral location of a buried channel without concern for its depth or minimum depth to rock calculations. In most cases, however, a quantitative interpretation will be necessary.

6.4.1.2 The level of effort involved in the interpretation will depend upon the objectives of the survey and the detail desired that in turn will determine the method of interpretation. A number of manual methods and computer programs are available for interpretation. While the solutions for these methods can be carried out manually, the process can be labor intensive for the more sophisticated methods.

6.4.1.3 A problem inherent in all geophysical studies is the non-unique correlation between possible geologic models and a single set of field data. This ambiguity can be resolved only through the use of geologic data and an experienced interpreter.

6.4.1.4 The first step in the interpretation process is to determine the time interval from the impact of the seismic source to the first arrival of energy at each geophone. When the first arrivals are sharp and there is no ambient noise, this procedure is straightforward (see Fig. 2 and Fig. 3). In many cases, noise in the data will make picking the first arrival times difficult. To minimize errors, a consistent approach to the picking of the arrival times must be used. Care should be taken to ensure that each trace is picked at the same point either at the first point of movement or the point of maximum curvature. This procedure will make the interpretation a more uniform process, as the data will be consistent from one trace to the next. In some cases, a first arrival pick from one or more geophones may be uncertain; then, one must rely upon the experience of the interpreter. If this is done, these picks should be noted. If a computer program is used to make first arrival picks, these picks must be checked (and re-adjusted as needed) by the individual(s) doing the processing and interpretation.

6.4.1.5 Corrections to travel time for elevation or other geometric factors are then made. The two main types of corrections are elevation corrections and weathering corrections. Both are used to adjust field-derived travel times to some selected datum, so that straight-line segments on the time-distance plot can be associated with subsurface refractors. These corrections can be applied manually (**7**) or by computer (**21**).

6.4.1.6 With the corrected travel-time data, a time-distance plot of arrival times versus shotpoint-to-geophone distance can be constructed. Lines are then fitted to these points to complete a time-distance plot. These time-distance plots are the foundation of seismic refraction interpretation. Examples of time-distance plots and their relationships to geologic models are shown by Zohdy (**6**) and Crice (**22**). Anyone undertaking seismic refraction measurements should be familiar with time-distance plots over a variety of geologic conditions and recognize the lack of a unique interpretation of these plots.

6.4.2 *Preliminary Interpretation*—Preliminary interpretation of field data should be labeled as draft or preliminary, and treated with caution because it is easy to make errors in an initial field interpretation and a preliminary analysis is never a complete and thorough interpretation. Analysis in the field is done mostly as a means of QC.

6.4.3 *Programs for Interpreting Planar Refractors:*

6.4.3.1 A wide variety of formulas, nomograms, and computer programs are available for solving seismic refraction problems using the intercept time (or the crossover distance method).

6.4.3.2 For manual interpretation techniques, see Palmer (**11**) and Haeni (**9**). Hand-held programmable calculator programs are available for solving the various seismic refraction equations (**23**). A number of computer programs are commercially available that are based on intercept time method.

6.4.4 *Programs for Interpreting Non-Planar Refractors:*

6.4.4.1 Manual interpretation techniques are given by Pakhiser and Black (**24**); Redpath (**4**); and Dobrin and Savit (**7**). Computer-assisted interpretation techniques are presented by Haeni, et al (**25**) and are discussed in Scott, et al (**21, 26**) and Haeni (**9**). A number of computer programs are commercially available that are based on the common reciprocal method.

6.4.4.2 Manual-interpretation techniques for the generalized reciprocal method are described by Palmer (**16**). However, due to the volume of data required for the method, interpretation is usually carried out on a computer. Computer programs are commercially available that are based on the generalized reciprocal method.

6.4.5 *Verification of Seismic Refraction Interpretation*—Seismic refraction interpretation can be verified by comparison with drilling data or other subsurface information. If such data is not available, this fact should be mentioned within the report.

6.4.6 *Presentation of Data:*

6.4.6.1 In some cases, there may be little need for a formal presentation of data or interpreted results.

6.4.6.2 The final seismic refraction interpretation is used to refine or confirm a geologic or hydrologic site model. Such a model is a simplified characterization of a site that incorporates all the essential features of the physical system under study. This model is usually represented as a cross-section, a contour map, or other drawings that illustrate the general geologic and hydrogeologic conditions and any anomalous conditions at a site.

6.4.6.3 If the original data are to be provided to the client, the data and related survey grid maps must be labeled.

7. Report

7.1 *Components of the Report*—The following is a list of the key items that should be contained within most reports. In some cases, there is no need for an extensive formal report:

7.1.1 The report should include a discussion of:

7.1.1.1 The purpose and scope of the seismic refraction survey;

7.1.1.2 The geologic setting;

7.1.1.3 Limitations of the seismic refraction survey;

7.1.1.4 Assumptions made;

7.1.1.5 The field approach, including a description of the equipment and the data acquisition parameters used;

7.1.1.6 The location of the seismic refraction line(s) on a site map;

7.1.1.7 The shot-point/geophone layout;

7.1.1.8 The approach used to pick first arrivals;

7.1.1.9 Corrections applied to field data, and justification for their use;

7.1.1.10 The results of field measurements, copies of typical raw records, and time-distance plots;

7.1.1.11 The method of interpretation used (intercept time method, common reciprocal method or generalized reciprocal method), and specifically what analytical method(s), or software program(s), were used;

7.1.1.12 The interpreted results and any qualifications and alternate interpretations;

7.1.1.13 The format of recording data (for example, notebook, hardcopy analog recorder, digital format, SEG, other);

7.1.1.14 If conditions occurred where a variance from this ASTM guide is necessary, the reason for the variance should be given;

7.1.1.15 Provide appropriate references for any supporting data used in the interpretation; and

7.1.1.16 Identify the person(s) responsible for the refraction survey and data interpretation.

7.2 *Quality Assurance of the Seismic Refraction Work and Report*—To provide quality assurance of the seismic refraction work, it is generally good practice to have the entire seismic refraction work, including the report, reviewed by a person knowledgeable with the seismic refraction method and the site geology but not directly involved with the project.

8. Precision and Bias

8.1 *Bias*—Bias is defined as a measure of the closeness to the truth.

8.1.1 The bias with which the depth and the shape of a refractor can be determined by seismic refraction methods depends on many factors. Some of these factors are:

8.1.1.1 Human errors in field procedures, record-keeping, picking of first arrivals, corrections to data, processing and interpretation;

8.1.1.2 Instrument errors in measuring, recording;

8.1.1.3 Geometry limitations, relating to geophone spacing, line location, topography, and noise;

8.1.1.4 Variation of the earth from simplifying assumptions used in the field and interpretation procedure;

8.1.1.5 Site-specific geologic limitations, such as dip, joints, fractures and highly weathered rock with gradual changes in seismic velocities with depth; and

8.1.1.6 Ability and experience of the field crew and interpreter.

8.1.2 Published references (**5**, **6**, **9**, **27**, **28**), indicate that the depth to a refractor can be determined to within ±10 % of the true depth. Larger errors are usually due to difficult field situations or improper interpretation due to blind zone problems.

8.1.3 Arrival times must be picked with an accuracy of a millisecond. This is done using what appears to be the onset of the pulse (see Fig. 2 and Fig. 3). A 1-ms error could translate to a depth error of 1 to 10 ft (0.3 to 3 m) depending upon geometry and seismic velocities of the subsurface layers.

8.2 *Differences Between Depths Determined Using Seismic Refraction and Those Determined by Drilling:*

8.2.1 The bias of a seismic refraction survey is commonly thought of as how well the refraction results agree with borehole data. In many cases, the depth obtained by refraction agrees with the borehole data. In other cases, there will be considerable disagreement between the refraction results and boring data. While a refraction measurement may be quite accurate, the interpreted results may disagree with a depth obtained from drilling for the reasons discussed in 8.2.2 through 8.2.4. It is important that the user of seismic refraction results be aware of these concepts and understand that the results of a seismic refraction survey will not always agree with drilling data.

8.2.2 *The Fundamental Differences Between Refraction and Drilling Measurements:*

8.2.2.1 The seismic refraction method is based upon a measure of travel time of the *P*-wave. In order to measure depth to a refractor, such as a soil-to-rock interface, a significant change in seismic velocity must exist between the two layers.

8.2.2.2 When the top of rock is defined by drilling it is often based upon refusal of the drill bit to continue to penetrate, the number of blow counts with a split-spoon sampler, or the first evidence of rock fragments. None of these necessarily agree with each other or the top of the rock surface measured by the seismic refraction method. The differences between seismic refraction and drilling interpretation can yield considerable differences in depth even when the top of rock is relatively flat.

8.2.3 *Lateral Geologic Variability*—Agreement between refraction and boring measurements may vary considerably along the seismic refraction line depending upon lateral geologic changes, such as dip as well as the degree of weathering and fracturing in the rock. Refraction measurements may not account for small lateral geologic changes and may only provide an average depth over them. In addition, the presence of a water table near the bedrock surface can in some cases lead to an error in interpretation. Therefore, it is not always possible to have exact agreement between refraction and boring data along a survey line.

8.2.4 *Positioning Differences*—The drilling location and the refraction measurement may not be made at exactly the same point. It is common to find that the boreholes are located on the basis of drill-rig access and may not be located along the seismic refraction line. Differences in position can easily account for up to 10 m (30 ft) of difference in depth where top of rock is highly variable (for example, karst).

8.3 *Precision*—For the purposes of this guide, precision is the repeatability between measurements, that is, the degree to which the travel times from two identical measurements in the same location with the same equipment match one another. Precision of a seismic refraction measurement will be affected by the sources used, the repeatability of the trigger signal timing, placement of geophones, soil conditions, the care involved in picking arrival times, and the level and variations of the noise impacting the measurements. If a refraction survey is repeated under identical conditions, the measurements would be expected to have a high level of precision.

8.4 *Resolution:*

8.4.1 *Lateral Resolution*—Lateral resolution of a seismic refraction survey is determined by geophone spacing and shot-point spacing. Close spacing of geophones will provide higher lateral resolution, for example, greater definition of the shape of the top of the refractor.

8.4.2 *Vertical Resolution:*

8.4.2.1 Vertical resolution can be thought of in three ways: how small a change in depth can be determined by the refraction method; how thin a layer can be detected by the seismic refraction method; and how much relief or dip can be accurately mapped without smoothing or errors in depth determination.

8.4.2.2 The answers to all three of these questions is a complex function of the geophone spacing, the depth to the refractors and the seismic velocity contrasts and near surface conditions such as freezing, changes in materials on which sources and receivers are placed and fluctuating of water tables.

9. Keywords

9.1 geophysics; refraction; seismic refraction; surface geophysics

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Sun Valley General Improvement District
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Phone: (775) 673-2220
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February 18, 2020

Summit Engineering Inc.
Attn: Robert Gelu, P.E.
5405 Mae Ann Avenue
Reno, Nevada 89523

Re: Ladera Ranch Subdivision Phase 2-6 (294 lots)

Dear Robert:

The Sun Valley G.I.D. is the owner/operator of the water and waste water facilities in the Sun Valley Hydro basin. This Hydro basin includes the site of Ladera Ranch subdivision (Phase 2-6 of 294 lots of a proposed 399 lot Subdivision).

Water:
At the writing of this letter, there is currently enough capacity to serve this proposed subdivision. This capacity is being utilized on a first come, first served basis. Sun Valley G.I.D. in 2007 had a 1.2 million gallon tank constructed and a booster pump station on West 7th Street to help supply water to this proposed subdivision.

Waste Water:
At the writing of this letter, there is currently enough capacity to serve this proposed subdivision. This capacity is being utilized on a first come first serve basis.

This proposed development is subject to Water Right dedication as well as Sun Valley G.I.D. Water and Sewer Facility Fees prior to issuance of Will Serve.

Should you have any further concerns or questions regarding this letter or require additional information, please feel free to contact me at your convenience.

Sincerely,
Sun Valley G.I.D.

Chris Melton
Public Works Director

Ladera
Phases 2-6

Water Capacity Study

February, 2020

SUN VALLEY GENERAL IMPROVEMENT DISTRICT

LADERA
PHASES 2-6

WATER CAPACITY STUDY

February, 2020

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL J. WINKELMAN
ENVIRONMENTAL
CIVIL
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Appendix A-Phase 2 through 6 Hydraulic Model Results

Maximum Day + Fire
Maximum Day
Peak Hour
Minim Month Demand (Static)

1.0 Summary

The purpose of this Study was to evaluate the ability of the Sun Valley General Improvement District (SVGID) to supply potable water service to the proposed Ladera Phases 2 through 6 residential development (hereinafter referred to as the "Development"). Determination of this ability was made in accordance with the minimum design standards established by SVGID and those contained in the Nevada Administrative Code (NAC).

This Study supersedes and replaces the following previous studies also prepared by Shaw Engineering;

Ladera Phases 2.1 and 2.2 Water Capacity Study dated November, 2017
Ladera Phases 3.1 and 3.2 Water Capacity Study dated November, 2017

Phase 1 of the Development, consisting of 105 lots, is currently under construction with 80 units completed and 25 units remaining. The lot count for Phases 2 through 6 is 294 distributed as follows;

Phase 2	80 Lots
Phase 3	38 Lots
Phase 4	126 Lots
Phase 5	12 Lots
Phase 6	38 Lots

The Development layout and location, as provided by Summit Enginering, is approximately shown in Figure 1, Page 2.

This Study demonstrates that the SVGID water system has the capacity to serve Phase 2 through 6 of the Development. An emergency intertie with TMWA system should be investigated and, if possible, implemented sufficiently in advance of Phase 4.

2.0 Water System Evaluation

2.1 Givens and General Assumptions

All of the existing water system information was obtained from the *SVGID Water System Master Plan Update*, dated September, 2016, (WMP) that was prepared by Shaw Engineering. As identified in the WMP, the following flows were utilized in this Study;

Average Day Demand, (ADD)	262 Gallons per Day/Customer (GPD/Customer)
Maximum Day Demand	603 GPD/Customer (PF=2.3)
Peak Hour Demand	1,025 GPD/Customer (PF=3.6)
Minimum Month Demand	140 GPD/Customer (PF=0.46)

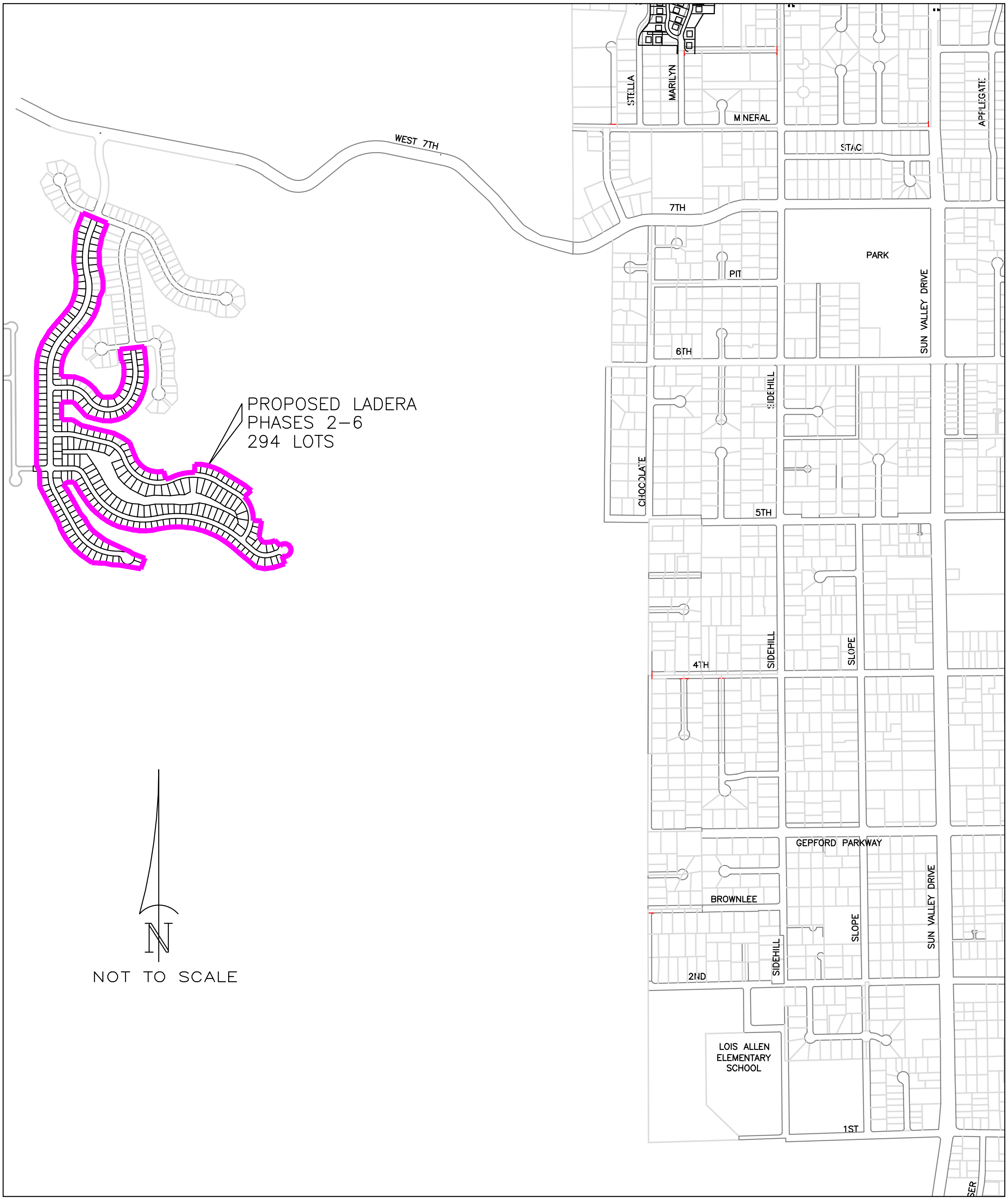

Figure □

Site Location Map

Within the Development Phase 2 through 6, a Residential Fire Flow of 1,500 GPM was utilized. Phase 1 utilized a fire flow rate of 2,000 GPM which will remain unaffected by the addition of Phases 2-6.

SVGID's current existing customers, active wills serves and planned future developments are summarized in Table 1 below;

Table 1
Existing and Future Anticipated Customers

Customer	**Existing Service Area**	**Expanded Service Area**
Existing Customers/Meters	6,100 (±)	
Infill Customers/Meters	354	
Active Will Serves		
Ladera Phase 1	25	
Planned Future Developments[1]		
Ladera Phases 2-6	294	
Sun Mesa Phase 3 and 4	102	
Valle Vista	75	
5 Ridges (Phases 1-2)		1,218
5 Ridges (Phase 3)		582
Sub Total	6,950[2]	1,800
Total	**8,750**	

Footnotes:
1. *Water capacity studies have been completed. Will serves are issued by SVGID on a first come first serve basis.*
2. *Total service area buildout projected in the 2016 Water Master Plan Update.*

System improvements completed and incorporated into the hydraulic modeling utilized for this Study includes the following;

a. New 12 inch transmission main loop constructed for the new Middle School.
b. New Juniper Terrace Pump Station.
c. Integration of the Sidehill and Chimney Hydraulic Pressure Zones.
d. Ladera Phase 1 distribution mains.

The SVGID has historically and successfully utilized the following planning and design criteria for their public water system which is consistent with the WMP and either meets or exceeds the minimum standards specified in the NAC;

<u>Source of Supply (via TMWA Wholesale)</u>

Sullivan + Raleigh Heights (via SVGID Main Pump Station and Boundary Tank respectively)	=Maximum Day Demand
Raleigh (via Boundary Tank)	=Minimum Month Demand

<u>Storage</u>

Operational	=17% of Maximum Day Demand (approximately equivalent to the peak hour demand minus what can be supplied into the zone via pumping considering the diurnal flow pattern)
Emergency	=2 Average Day Demand
Fire	=As dictated by Fire Authority

<u>Pumping (with adequate Zone Storage)</u>

With Largest Pump Offline	=Maximum Day Demand

<u>Pumping (with none or inadequate Zone Storage)</u>

With Largest Pump Offline (on dedicated standby power)	=Peak Hour Demand

<u>Distribution</u>

<u>Existing and New</u>

20 psi residual pressure @ Tank ½ Full at Maximum Day plus Fire
30 psi residual pressure @ Tank LWL at Peak Hour
40 psi residual pressure @ Tank LWL at Maximum Day

<u>New</u>

100 psi static pressure @ Tank HWL at Zero Demand.

Static pressures exceed 100 psi at various locations in the existing water distribution and transmission systems. All services that this poses a problem for have had individual pressure reducing valves installed on their services.

The Development surface elevations range from approximately 5120 to 5210 feet. The proposed Development site is therefore located in the Boundary Hydraulic Pressure Zone whose service elevation varies from approximately 5,100 to 5,210 feet. The West 7th hydraulic pressure zone is also served by the Boundary zone via a pressure reducing station.

Based upon all of the above presented information, the total flows utilized in this Study are summarized below in Tables 2 and 3.

Table 2
Total System Wide Demands, GPM/MGD

Customers	Average Day	Maximum Day	Peak Hour	Minimum Month
6,950 (Existing Service Area)	1,265/1.82	2,910/4.19	4,947/7.12	676/0.97
8,750 (Service Area Buildout)	1,592/2.29	3,664/5.28	6,228/8.97	851/1.23

Table 3
Total Boundary/West 7th Hydraulic Pressure Zone Demands, GPM/MGD

User	Average Day	Maximum Day	Peak Hour	Minimum Month
Existing SVGID (81 Customers)	15	34	58	8
Will Serves Ladera Phase 1 Remaining (25 Customers)	5	10	18	2
Planned Ladera Phases 2-6 (294 Customers)	53	123	209	29
Total	**73 (0.105)**	**168 (0.241)**	**285 (0.410)**	**39 (0.056)**

The water system was modeled utilizing Bentley WaterCAD V8i Cybernet V7.0 hydraulic modeling software.

2.2 Source Capacity

SVGID currently has a total source capacity available during all times of the year of up to 4,700 GPM from two TMWA wholesale points, Sullivan Lane (3,600 GPM) and Raleigh Heights (1,100 GPM) per the TMWA/SVGID Contract and Amendment. The Sullivan Lane wholesale point is pumped into the SVGID Chocolate Zone storage via SVGID's Main Pump Station. The Main Pump

Station capacity is 3,155 GPM (largest pump off line on dedicated standby power) (WMP, Table 3.1). The Raleigh Heights wholesale point gravity feeds into SVGID system via the Boundary Tank.

With the largest wholesale point (Sullivan) and/or the Main Pump Station completely off line (an emergency event), SVGID has the ability to provide a total gravity source capacity of 1,100 GPM (Raleigh Heights via Boundary Tank).

The proposed Maximum Day Demand is 3,664 GPM (Table 2) and the proposed Minimum Month Demand is 851 GPM (Table 2)

Since the existing source capacity (4,255 GPM maximum day and 1,100 GPM minimum month) exceeds the proposed Maximum Day Demand (3,664 GPM) and Minimum Month Demand (851 GPM), ***the SVGID system has the source capacity to meet the proposed Development Demands.***

2.3 Pumping Station Capacity

The Boundary Hydraulic Pressure Zone is normally served by gravity via the Boundary Tank which itself is gravity fed from the Raleigh Heights wholesale point.

The Boundary Zone can, however, also be fed by the West 7th Pump Station that provides full redundant service to the Boundary and West 7th hydraulic pressure zones from the lower Chocolate Zone. The West 7th Pump Station has a total redundant pumping capacity of 500 GPM (WMP, Table 3.4) with one pump off line on standby power.

The proposed Maximum Day Demand in the Boundary Zone is 168 GPM (Table 3).

Since the existing pumping station capacity (500 GPM) exceeds the proposed Maximum Day Demand (168 GPM), ***the SVGID system has the pumping capacity to meet the proposed Development Maximum Day Demands for a redundant service.***

2.4 Storage Capacity

The Boundary and West 7th hydraulic pressure zones are served by the Boundary Tank that provides a total storage volume of 1.35 MG (WMP, Table 3.5).

The estimated required storage volume to meet the proposed demands was calculated and is shown below.

Operational (241,200 GPD from Table 3)(0.17)	=0.041 MG
Emergency (104,800 GPD from Table 3)(2)	=0.210 MG
Fire (3,000 GPM for 3 Hours)[1]	=0.540 MG
Total	=0.791 MG

Footnote 1. The Boundary Tank was originally designed to provide for a commercial Fire Flow of 3,000 GPM for 3 hours therefore the Boundary Tank has adequate Fire Flow storage to supply the Development Fire Flow Demands of 1,500 GPM for 2 hours.

Since the existing storage volume (1.35 MG) exceeds the required storage volume (0.791 MG), ***the SVGID system has the storage volume capacity to meet the proposed Development demands.***

2.5 Distribution System Capacity

The existing water distribution system was modeled for the existing service area buildout condition to verify that the existing SVGID distribution/transmission system and the proposed Development distribution system, independently constructed for each Phase 2 through 6, could meet the minimum conditions while providing service to the proposed Development.

The hydraulic modeling was run first for Phase 2 distribution mains only to ensure all system conditions could be met without the benefit of looping that would be created in future phases. The model was then run for Phase 2+3, Phases 2-4, Phases 2-5 and finally Phase 2-6. The results of the hydraulic modeling for Phases 2-6 are contained in Appendix A.

The point of connection on West 7th Street can be fed by SVGID from two directions (via gravity from the Boundary Tank located to the north and via pumping from the West 7th Pump Station located to the east). The Development distribution system is currently only fed by a single ductile iron distribution main that lies along Dream Catcher Way between the point of connection at West 7th Street and Painted Sky Way. SVGID desires redundant mains when the customer count exceeds approximately 250 for redundancy. A redundant source main might be derived at Opal Point Drive with an emergency intertie to the existing TMWA system located in North Star Ranch. The capacity available from such an emergency intertie would have to be investigated further with TMWA with consideration given to the level of service desired during an emergency/abnormal event (i.e. the single main from West 7th becomes unavailable). The level of redundant service desired could range from only supplying minimal monthly demands (assuming water restriction would be enacted) all the way to supplying full redundancy to satisfy maximum day demands plus fire. The flows and pressures that would be required from an emergency intertie at Opal Point Drive for various levels of service are summarized in Table 4.

Table 4
Emergency Intertie with TMWA at Opal Point Drive
Minimum Flow and Pressure Delivery Requirements

Level of Service Desired (Phases 1-6)	Flow, GPM	Pressure, PSI
Minimum Month (@ 40 psi min.)	39	50
Average Day (@40 psi min.)	73	50
Maximum Day (@40 psi min.)	167	50
Maximum Day + 1500 GPM Fire (@20 psi min)	1,667	37
Maximum Day + 2000 GPM Fire (@20 psi min)	2,167	42

A TMWA discovery would have to be undertaken in order to determine what level of service could be supplied from TMWA's existing system via an emergency intertie.

Figure 2, page 9 illustrates the required proposed Development's water distribution system for Phases 2 through 6. It is important to note that the existing pressure sustaining/reducing valve located at the West 7th Pump Station pressure sustaining be set at 175 psi. This is only required during the higher summer time demands.

Based upon the hydraulic model, ***the SVGID distribution/transmission system and the proposed Development distribution system have the capacity to meet the Maximum Day Demand plus Fire Flow (at 20 psi minimum residual pressure), the Maximum Day Demand (at 40 psi minimum residual pressure), and the Peak Hour Demand (at 30 psi minimum residual pressure). The Distribution system within the Ladera Development does not exceed 100 psi static pressure. A redundant source main should be considered via an emergency intertie with TMWA's existing system located in Northstar Ranch Development providing that capacity exists for such an intertie.***

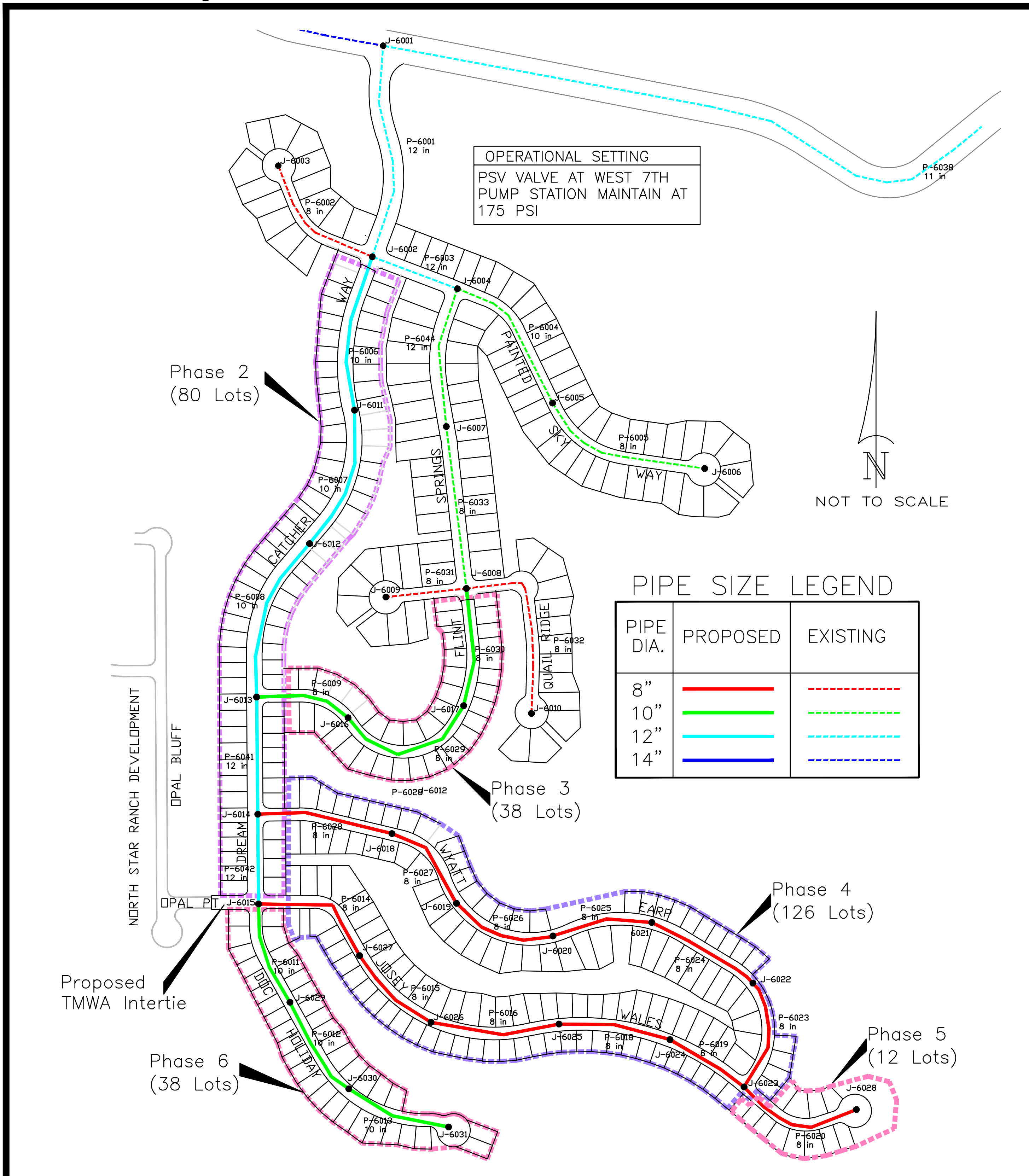

Figure 2
Water Distribution System

Appendix A-Phase 2
Hydraulic Model Results

Maximum Day + Fire

Maximum Day

Peak Hour

Minimum Month Demand (Static)

Maximum Day + Fire

Scenario Summary Report
Scenario: Existing SVGID System

Scenario Summary	
ID	64
Label	Existing SVGID System
Notes	
Active Topology	Base-Active Topology
Physical	Existing System
Demand	6950 Maximum Day
Initial Settings	Existing System Pumps OFF Tanks at 50%
Operational	Pumps OFF
Age	Base-Age Alternative
Constituent	Base-Constituent
Trace	Base-Trace Alternative
Fire Flow	500 GPM at all Nodes
Energy Cost	Base-Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base-User Data
Steady State/EPS Solver Calculation Options	Proposed SVGID System
Transient Solver Calculation Options	Base Calculation Options

Hydraulic Summary			
Time Analysis Type	Steady State	Use simple controls during steady state?	True
Friction Method	Hazen-Williams	Is EPS Snapshot?	False
Accuracy	0.001	Start Time	12:00:00 AM
Trials	40	Calculation Type	Fire Flow

Scenario: Existing SVGID System
Current Time Step: 0.000 h
FlexTable: Tank Table

Label	Zone	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Diameter (ft)	Volume Full (Calculated) (gal)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Eastside	Zone-1-2-3	4,963.00	4,963.00	4,978.00	4,992.92	90.00	1,423,863.12	779	4,978.00
Chocolate	Zone-1-2-3	4,964.25	4,964.25	4,978.00	4,992.92	74.00	922,386.13	394	4,978.00
Klondike	Zone-1-2-3	4,968.00	4,968.00	4,978.00	4,992.92	107.00	1,676,243.96	552	4,978.00
Juniper Terr. Tank	Zone-1-2-3	4,952.29	4,952.29	4,974.94	4,974.94	60.00	479,062.68	0	4,974.94
Sidehill	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,119.34	5,134.41	40.00	285,863.06	63	5,119.34
Chimney 1	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,119.34	5,135.09	40.00	292,255.26	128	5,119.34
Westside Tank	Zone-3 (Chocolate)	4,961.90	4,961.90	4,978.00	4,992.92	90.00	1,476,211.03	700	4,978.00
Boundary Tank	Zone 6 (Boundary)	5,279.50	5,279.50	5,297.50	5,315.50	80.00	1,353,642.89	168	5,297.50
Chimney 2	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,119.34	5,135.09	75.00	1,027,459.90	126	5,119.34

2910 GPM ✓

S:\Projects\STU\SVGID\SVGID, Ladera Revised Lot Count\Watercad\2020 SVGID Water MP Model for Ladera Phase 2-6.wtg

$$\frac{6950 \times 603}{1440} = 2910 \text{ GPM}$$ ✓

Scenario: Existing SVGID System
Current Time Step: 0.000 h
Fire Flow Node FlexTable: Fire Flow Report

Label	Zone	Satisfies Fire Flow Constraints?	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	Velocity of Maximum Pipe (ft/s)	Pipe w/ Maximum Velocity
J-1001	Zone-1 (Southern)	True	3,500	53	42	J-1015	38.79	P-1001
J-1002	Zone-1 (Southern)	True	781	21	20	J-1006	9.31	P-1001
J-1003	Zone-1 (Southern)	True	781	21	20	J-1006	9.31	P-1001
J-1004	Zone-1 (Southern)	True	711	21	20	J-1006	8.96	P-2196
J-1005	Zone-1 (Southern)	True	690	20	21	J-1006	8.95	P-2196
J-1006	Zone-1 (Southern)	True	574	20	21	J-1007	8.92	P-2196
J-1007	Zone-1 (Southern)	True	558	20	21	J-1006	8.91	P-2196
J-1008	Zone-1 (Southern)	True	2,298	31	20	J-1015	20.66	P-1001
J-1009	Zone-1 (Southern)	True	978	24	20	J-1014	10.79	P-2196
J-1010	Zone-1 (Southern)	False	469	20	40	J-1014	12.05	P-1014
J-1011	Zone-1 (Southern)	True	944	27	20	J-1014	10.78	P-2196
J-1012	Zone-1 (Southern)	True	939	26	20	J-1014	10.77	P-2196
J-1013	Zone-1 (Southern)	True	936	28	20	J-1014	10.77	P-2196
J-1014	Zone-1 (Southern)	True	893	20	28	J-1015	10.72	P-2196
J-1015	Zone-1 (Southern)	True	1,039	20	25	J-1014	10.83	P-2196
J-1016	Zone-1 (Southern)	True	1,727	32	20	J-1015	14.01	P-1001
J-1017	Zone-1 (Southern)	True	1,847	20	22	J-1015	13.32	P-1001
J-1018	Zone-1 (Southern)	True	1,683	21	20	J-1015	12.07	P-2053
J-1019	Zone-1 (Southern)	True	1,423	20	29	J-1015	16.16	P-1021
J-1020	Zone-1 (Southern)	True	1,731	24	20	J-1015	14.19	P-2053
J-1021	Zone-1 (Southern)	True	1,185	20	43	J-1015	13.46	P-1023
J-1022	Zone-1 (Southern)	True	1,232	20	41	J-1015	13.99	P-1024
J-2001	Zone-1 (Southern)	True	1,804	20	44	J-1015	21.19	P-3009
J-2002	Zone-2 (Central)	True	1,268	20	20	J-2043	15.10	P-2001
J-2003	Zone-2 (Central)	True	1,172	20	27	J-2043	14.02	P-2001
J-2004	Zone-2 (Central)	True	948	20	34	J-2043	11.47	P-2001
J-2005	Zone-2 (Central)	True	948	24	20	J-2043	11.47	P-2001
J-2006	Zone-2 (Central)	True	887	20	27	J-2043	10.79	P-2001
J-2007	Zone-2 (Central)	True	948	24	20	J-2043	11.47	P-2001
J-2008	Zone-2 (Central)	True	3,500	87	27	J-2043	30.20	P-3007
J-2009	Zone-2 (Central)	True	2,892	20	24	J-2043	73.99	P-2009
J-2010	Zone-2 (Central)	False	452	20	35	J-2043	11.68	P-2009
J-2011	Zone-2 (Central)	True	3,500	74	21	J-2043	26.67	P-3007
J-2012	Zone-2 (Central)	True	2,196	20	27	J-2043	13.75	P-3007
J-2013	Zone-2 (Central)	True	2,444	45	20	J-2043	12.06	P-2196
J-2014	Zone-2 (Central)	True	2,451	20	20	J-2043	11.58	P-2196
J-2015	Zone-2 (Central)	True	1,912	20	31	J-2043	14.36	P-2179
J-2016	Zone-2 (Central)	True	1,401	66	20	J-2043	11.09	P-2196
J-2017	Zone-2 (Central)	True	1,184	20	24	J-2043	13.52	P-2017
J-2018	Zone-2 (Central)	True	1,766	31	20	J-2043	11.31	P-2196
J-2019	Zone-2 (Central)	True	1,774	49	20	J-2043	11.35	P-2196
J-2020	Zone-2 (Central)	True	1,623	50	20	J-2043	11.23	P-2196
J-2021	Zone-2 (Central)	True	921	50	20	J-2025	10.77	P-2196
J-2022	Zone-2 (Central)	True	921	20	20	J-2025	10.77	P-2196
J-2023	Zone-2 (Central)	True	712	49	20	J-2025	10.62	P-2196
J-2024	Zone-2 (Central)	True	596	46	20	J-2025	10.55	P-2196
J-2025	Zone-2 (Central)	False	468	20	33	J-2043	10.48	P-2196
J-2026	Zone-2 (Central)	True	596	41	20	J-2025	10.55	P-2196
J-2027	Zone-2 (Central)	True	1,027	48	20	J-2025	10.88	P-2196
J-2028	Zone-2 (Central)	True	1,112	43	20	J-2025	10.96	P-2196
J-2029	Zone-2 (Central)	True	1,059	31	20	J-2025	10.91	P-2196
J-2030	Zone-2 (Central)	True	1,076	24	20	J-2025	10.93	P-2196
J-2031	Zone-2 (Central)	True	1,188	50	20	J-2043	10.98	P-2196
J-2032	Zone-2 (Central)	True	1,830	26	20	J-2043	11.30	P-2196
J-2033	Zone-2 (Central)	True	1,378	39	20	J-2043	11.04	P-2196
J-2034	Zone-2 (Central)	True	1,618	31	20	J-2043	11.24	P-2038
J-2035	Zone-2 (Central)	True	1,712	35	20	J-2043	11.09	P-2196
J-2036	Zone-2 (Central)	True	2,020	30	20	J-2043	11.36	P-2196
J-2037	Zone-2 (Central)	True	1,865	27	20	J-2043	11.31	P-2196
J-2038	Zone-2 (Central)	True	772	37	20	J-2042	10.64	P-2196
J-2039	Zone-2 (Central)	True	682	42	20	J-2043	10.63	P-2196
J-2040	Zone-2 (Central)	True	573	33	20	J-2043	10.56	P-2196
J-2041	Zone-2 (Central)	True	565	20	20	J-2043	10.56	P-2196
J-2042	Zone-2 (Central)	True	608	20	33	J-2043	10.54	P-2196
J-2043	Zone-2 (Central)	True	504	20	32	J-2041	10.52	P-2196
J-2044	Zone-2 (Central)	True	3,500	20	26	J-2043	19.72	P-3007
J-2045	Zone-2 (Central)	True	1,400	20	33	J-2043	15.90	P-2050
J-2046	Zone-2 (Central)	True	2,751	32	20	J-2043	17.32	P-2055
J-2047	Zone-2 (Central)	True	1,677	20	23	J-2043	19.17	P-2053
J-2048	Zone-2 (Central)	True	1,320	20	33	J-2043	15.12	P-2053
J-2049	Zone-2 (Central)	True	2,703	35	20	J-2043	15.89	P-2196
J-2050	Zone-2 (Central)	True	2,017	42	20	J-2043	14.57	P-2196
J-2051	Zone-2 (Central)	True	1,914	42	20	J-2043	22.00	P-2057
J-2052	Zone-2 (Central)	True	1,189	31	20	J-2043	13.78	P-2057
J-2053	Zone-2 (Central)	True	933	28	20	J-2043	11.96	P-2196
J-2054	Zone-2 (Central)	True	864	20	27	J-2043	11.82	P-2196

J-2055	Zone-2 (Central)	True	801	20	27	J-2043	11.69	P-2196
J-2056	Zone-2 (Central)	True	784	20	34	J-2043	11.65	P-2196
J-2057	Zone-2 (Central)	True	2,922	24	20	J-2043	16.76	P-2196
J-2058	Zone-2 (Central)	True	3,378	20	21	J-2043	17.65	P-2196
J-2059	Zone-2 (Central)	True	3,330	20	25	J-2043	18.20	P-2065
J-2060	Zone-2 (Central)	True	2,601	20	24	J-2043	19.57	P-2066
J-2061	Zone-2 (Central)	True	2,452	20	30	J-2043	17.09	P-2066
J-2062	Zone-2 (Central)	True	3,308	20	24	J-2043	25.21	P-2069
J-2063	Zone-2 (Central)	True	2,670	31	20	J-2043	16.33	P-2196
J-2064	Zone-2 (Central)	True	3,342	27	20	J-2043	19.46	P-2114
J-2065	Zone-2 (Central)	True	3,091	20	26	J-2043	14.62	P-2196
J-2066	Zone-2 (Central)	True	2,726	20	25	J-2043	17.17	P-2074
J-2067	Zone-2 (Central)	True	2,727	20	21	J-2043	18.07	P-2076
J-2068	Zone-2 (Central)	True	2,852	20	28	J-2043	20.34	P-2077
J-2069	Zone-2 (Central)	True	2,528	20	21	J-2043	14.69	P-2079
J-2070	Zone-2 (Central)	True	2,381	26	20	J-2043	13.92	P-2196
J-2071	Zone-2 (Central)	True	1,357	20	24	J-2043	12.26	P-2196
J-2072	Zone-2 (Central)	True	1,172	20	27	J-2043	13.03	P-2083
J-2073	Zone-2 (Central)	True	1,198	20	22	J-2043	14.24	P-2083
J-2074	Zone-2 (Central)	True	2,720	21	20	J-2043	15.06	P-2196
J-2075	Zone-2 (Central)	True	2,332	20	31	J-2043	15.34	P-2086
J-2076	Zone-2 (Central)	True	2,513	29	20	J-2043	14.42	P-2196
J-2077	Zone-2 (Central)	True	2,660	20	27	J-2043	15.59	P-2181
J-2078	Zone-2 (Central)	True	2,878	20	21	J-2043	16.32	P-2196
J-2079	Zone-2 (Central)	True	2,531	20	27	J-2043	15.84	P-2196
J-2080	Zone-2 (Central)	True	2,986	22	20	J-2043	16.91	P-2196
J-2081	Zone-2 (Central)	True	2,814	34	20	J-2043	16.37	P-2196
J-2082	Zone-2 (Central)	True	2,361	20	25	J-2043	15.31	P-2093
J-2083	Zone-2 (Central)	True	2,297	20	25	J-2043	14.97	P-2196
J-2084	Zone-2 (Central)	True	2,164	20	25	J-2043	15.01	P-2098
J-2085	Zone-2 (Central)	True	2,119	20	26	J-2043	14.03	P-2196
J-2086	Zone-2 (Central)	True	2,337	33	20	J-2043	14.84	P-2196
J-2087	Zone-2 (Central)	True	1,649	23	20	J-2043	13.11	P-2196
J-2088	Zone-2 (Central)	True	1,636	23	20	J-2043	13.09	P-2196
J-2089	Zone-2 (Central)	True	1,305	20	27	J-2043	12.49	P-2196
J-2090	Zone-2 (Central)	True	1,333	20	23	J-2043	12.56	P-2196
J-2091	Zone-2 (Central)	True	1,943	27	20	J-2043	13.87	P-2196
J-2092	Zone-2 (Central)	True	1,878	24	20	J-2043	13.76	P-2196
J-2093	Zone-2 (Central)	True	1,898	23	20	J-2043	13.82	P-2196
J-2094	Zone-2 (Central)	True	3,500	37	31	J-2043	27.36	P-2114
J-2095	Zone-2 (Central)	True	3,500	64	32	J-2043	26.43	P-2195
J-2096	Zone-2 (Central)	True	3,013	20	32	J-2043	19.73	P-2196
J-2097	Zone-2 (Central)	True	3,431	20	20	J-2043	18.94	P-2196
J-2098	Zone-2 (Central)	True	3,500	59	22	J-2043	25.00	P-2119
J-2099	Zone-2 (Central)	True	3,500	63	26	J-2043	21.44	P-2121
J-2100	Zone-2 (Central)	True	3,500	85	33	J-2043	22.55	P-2121
J-2101	Zone-2 (Central)	True	3,299	37	20	J-2043	18.37	P-2121
J-2102	Zone-2 (Central)	True	2,743	35	20	J-2043	16.39	P-2196
J-2103	Zone-2 (Central)	True	2,411	30	20	J-2043	15.33	P-2196
J-2104	Zone-2 (Central)	True	2,314	29	20	J-2043	14.93	P-2196
J-2105	Zone-2 (Central)	True	2,066	20	24	J-2043	14.41	P-2196
J-2106	Zone-2 (Central)	True	2,042	20	22	J-2043	14.27	P-2196
J-2107	Zone-2 (Central)	True	1,559	24	20	J-2043	17.90	P-2109
J-2108	Zone-2 (Central)	True	1,142	20	33	J-2043	13.16	P-2109
J-2109	Zone-2 (Central)	True	1,044	20	33	J-2043	11.99	P-2112
J-2110	Zone-2 (Central)	True	1,224	20	23	J-2043	14.03	P-2112
J-2111	Zone-2 (Central)	True	2,056	53	20	J-2043	17.58	P-2133
J-2112	Zone-2 (Central)	True	1,799	27	20	J-2043	16.68	P-2121
J-2113	Zone-2 (Central)	True	1,874	49	20	J-2043	16.70	P-2121
J-2114	Zone-2 (Central)	True	2,274	34	20	J-2043	16.77	P-2121
J-2115	Zone-2 (Central)	True	2,456	38	20	J-2043	18.28	P-2141
J-2116	Zone-2 (Central)	True	2,520	38	20	J-2043	16.93	P-2121
J-2117	Zone-2 (Central)	True	2,073	38	20	J-2043	15.42	P-2196
J-2118	Zone-2 (Central)	True	2,410	23	20	J-2043	16.12	P-2196
J-2119	Zone-2 (Central)	True	2,551	33	20	J-2043	16.16	P-2196
J-2120	Zone-2 (Central)	True	2,258	29	20	J-2043	15.13	P-2196
J-2121	Zone-2 (Central)	True	1,844	20	23	J-2043	14.01	P-2196
J-2122	Zone-2 (Central)	True	1,844	20	29	J-2043	13.95	P-2196
J-2123	Zone-2 (Central)	True	1,656	46	20	J-2043	16.08	P-2121
J-2124	Zone-2 (Central)	True	1,647	27	20	J-2043	16.12	P-2121
J-2125	Zone-2 (Central)	True	1,337	39	20	J-2043	14.87	P-2121
J-2126	Zone-2 (Central)	True	1,533	23	20	J-2043	15.65	P-2121
J-2127	Zone-2 (Central)	True	1,148	27	20	J-2043	14.20	P-2121
J-2128	Zone-2 (Central)	True	903	20	34	J-2043	13.45	P-2121
J-2129	Zone-2 (Central)	True	1,064	37	20	J-2043	13.93	P-2121
J-2130	Zone-2 (Central)	True	1,005	22	20	J-2043	13.76	P-2121
J-2131	Zone-2 (Central)	True	855	20	32	J-2043	13.31	P-2196
J-2132	Zone-2 (Central)	True	1,449	20	29	J-2043	14.12	P-2196
J-2133	Zone-2 (Central)	True	1,519	20	21	J-2043	14.28	P-2196
J-2134	Zone-2 (Central)	True	2,031	23	20	J-2043	17.08	P-2162
J-2135	Zone-2 (Central)	True	901	20	34	J-2043	12.56	P-2196
J-2136	Zone-2 (Central)	True	1,859	22	20	J-2043	14.31	P-2196
J-2137	Zone-2 (Central)	True	1,467	20	34	J-2043	13.30	P-2196
J-2138	Zone-2 (Central)	True	1,918	20	22	J-2043	14.36	P-2196
J-2139	Zone-2 (Central)	True	1,995	20	23	J-2043	14.52	P-2196
J-2140	Zone-2 (Central)	True	1,499	20	34	J-2043	13.41	P-2196
J-2141	Zone-2 (Central)	True	1,807	22	20	J-2043	14.10	P-2196
J-2142	Zone-2 (Central)	True	1,284	26	20	J-2043	12.81	P-2196
J-2143	Zone-2 (Central)	True	1,491	20	21	J-2043	13.24	P-2196
J-2144	Zone-2 (Central)	True	863	20	34	J-2043	12.01	P-2196

	Zone-2 (Central)	True	3,500	35	32	J-2043	34.49	P-2179
J-2146	Zone-2 (Central)	True	3,500	49	33	J-2043	18.55	P-2180
J-2147	Zone-1 (Southern)	True	998	20	44	J-1015	13.06	P-2196
J-2148	Zone-2 (Central)	True	1,188	29	20	J-2043	13.62	P-2183
J-2149	Zone-2 (Central)	True	1,311	20	33	J-2043	15.08	P-2109
J-2150	Zone-2 (Central)	True	573	26	20	J-2043	10.56	P-2196
J-2151	Zone-2 (Central)	True	2,137	20	30	J-2043	18.53	P-3022
J-2152	<None>	True	3,439	20	71	J-2156	39.74	P-3009
J-2153	Zone-3 (Chocolate)	True	2,184	20	33	J-3203	12.81	P-2187
J-2154	Zone-1 (Southern)	True	611	22	20	J-2155	15.60	P-2190
J-2155	Zone-1 (Southern)	False	449	20	39	J-2154	11.46	P-2191
J-2156	<None>	False	456	20	70	J-2152	11.63	P-2193
J-2157	<None>	True	3,500	80	56	J-2156	29.34	P-2196
J-3001	Zone-3 (Chocolate)	True	3,500	120	31	J-3203	8.80	P-2196
J-3002	Zone-3 (Chocolate)	True	3,500	120	31	J-3203	8.80	P-2196
J-3003	Zone-3 (Chocolate)	True	3,500	118	31	J-3203	8.80	P-2196
J-3004	Zone-3 (Chocolate)	True	3,500	120	31	J-3203	12.95	P-3005
J-3005	Zone-3 (Chocolate)	True	3,500	121	31	J-3203	8.80	P-2196
J-3006	Zone-3 (Chocolate)	True	3,500	120	31	J-3203	8.80	P-2196
J-3007	Zone-3 (Chocolate)	True	3,500	98	32	J-3203	10.49	P-3226
J-3008	Zone-3 (Chocolate)	True	3,500	54	34	J-3203	8.80	P-2196
J-3010	Zone-3 (Chocolate)	True	3,500	31	34	J-3203	18.91	P-3013
J-3011	Zone-3 (Chocolate)	True	3,378	20	34	J-3203	15.65	P-3013
J-3012	Zone-3 (Chocolate)	True	2,924	20	29	J-3203	10.41	P-3013
J-3013	Zone-3 (Chocolate)	True	2,990	20	20	J-3203	9.81	P-3013
J-3014	Zone-3 (Chocolate)	True	2,671	20	20	J-3203	9.64	P-3260
J-3015	Zone-3 (Chocolate)	True	2,674	20	20	J-3203	9.69	P-3260
J-3016	Zone-3 (Chocolate)	True	2,802	20	22	J-3203	11.40	P-3260
J-3017	Zone-3 (Chocolate)	True	2,774	20	26	J-3203	11.69	P-3260
J-3018	Zone-3 (Chocolate)	True	3,122	25	20	J-3203	13.93	P-3260
J-3019	Zone-3 (Chocolate)	True	3,500	51	33	J-3203	21.14	P-3269
J-3020	Zone-3 (Chocolate)	True	3,500	27	33	J-3203	22.38	P-3024
J-3021	Zone-3 (Chocolate)	True	3,210	20	22	J-3203	16.53	P-3269
J-3022	Zone-3 (Chocolate)	True	2,137	27	20	J-3203	16.35	P-3026
J-3023	Zone-3 (Chocolate)	True	1,702	31	20	J-3203	11.37	P-3026
J-3024	Zone-3 (Chocolate)	True	1,558	25	20	J-3203	12.15	P-3028
J-3025	Zone-3 (Chocolate)	True	1,558	25	20	J-3203	17.72	P-3029
J-3026	Zone Exempt	False	0	36	8	J-4050C	8.81	P-3034
J-3027	Zone-3 (Chocolate)	True	1,628	31	20	J-3203	11.06	P-3033
J-3028	Zone-3 (Chocolate)	True	1,607	36	20	J-3203	12.16	P-3033
J-3029	Zone-3 (Chocolate)	True	1,387	30	20	J-3203	8.80	P-2196
J-3030	Zone-3 (Chocolate)	True	1,286	38	20	J-3203	8.81	P-3034
J-3031	Zone-3 (Chocolate)	True	1,571	44	20	J-3203	9.68	P-3051
J-3032	Zone-3 (Chocolate)	True	1,481	41	20	J-3203	11.67	P-3051
J-3033	Zone-3 (Chocolate)	True	761	29	20	J-3165	8.86	P-3038
J-3034	Zone-3 (Chocolate)	True	614	20	20	J-3165	8.80	P-2196
J-3035	Zone-3 (Chocolate)	True	3,500	120	31	J-3203	8.80	P-2196
J-3036	Zone-3 (Chocolate)	True	3,500	123	31	J-3203	8.80	P-2196
J-3037	Zone Exempt	False	0	135	8	J-4050C	8.80	P-2196
J-3038	Zone Exempt	False	0	122	8	J-4050C	8.80	P-2196
J-3039	Zone-3 (Chocolate)	True	3,500	78	32	J-3203	8.80	P-2196
J-3040	Zone-3 (Chocolate)	True	3,500	83	32	J-3203	8.80	P-2196
J-3041	Zone-3 (Chocolate)	True	3,500	82	32	J-3203	8.80	P-2196
J-3042	Zone-3 (Chocolate)	True	3,500	59	28	J-3203	8.80	P-2196
J-3043	Zone-3 (Chocolate)	True	3,500	54	26	J-3203	29.14	P-3050
J-3044	Zone-3 (Chocolate)	True	2,503	20	31	J-3203	17.83	P-3055
J-3045	Zone-3 (Chocolate)	True	3,500	65	28	J-3203	8.80	P-2196
J-3046	Zone-3 (Chocolate)	True	3,500	47	26	J-3203	8.80	P-2196
J-3047	Zone-3 (Chocolate)	True	2,449	20	30	J-3203	15.67	P-3056
J-3048	Zone-3 (Chocolate)	True	3,500	40	26	J-3203	8.80	P-2196
J-3049	Zone-3 (Chocolate)	True	3,500	34	25	J-3203	8.80	P-2196
J-3050	Zone-3 (Chocolate)	True	3,500	25	25	J-3203	8.80	P-2196
J-3051	Zone Exempt	False	0	29	8	J-4050C	8.80	P-2196
J-3052	Zone Exempt	False	0	22	8	J-4050C	17.72	P-3029
J-3053	Zone Exempt	False	0	22	8	J-4050C	20.99	P-3086
J-3054	Zone Exempt	False	0	24	8	J-4050C	15.15	P-3086
J-3055	Zone Exempt	False	0	11	8	J-4050C	16.83	P-3086
J-3056	Zone Exempt	False	0	14	8	J-4050C	8.80	P-2196
J-3057	Zone-3 (Chocolate)	True	2,371	20	28	J-3203	17.43	P-3067
J-3058	Zone-3 (Chocolate)	True	3,017	29	20	J-3203	15.26	P-3068
J-3059	Zone-3 (Chocolate)	True	2,249	24	20	J-3203	8.90	P-3070
J-3060	Zone-3 (Chocolate)	True	1,749	27	20	J-3203	8.90	P-3070
J-3061	Zone-3 (Chocolate)	True	1,541	28	20	J-3203	8.80	P-2196
J-3062	Zone-3 (Chocolate)	True	1,471	20	20	J-3203	8.80	P-2196
J-3063	Zone-3 (Chocolate)	True	1,728	20	28	J-3203	13.56	P-3074
J-3064	Zone-3 (Chocolate)	True	1,096	26	20	J-3065	8.80	P-2196
J-3065	Zone-3 (Chocolate)	True	871	20	32	J-3203	9.91	P-3076
J-3066	Zone-3 (Chocolate)	True	1,368	29	20	J-3203	8.80	P-2196
J-3067	Zone-3 (Chocolate)	True	1,618	30	20	J-3203	11.45	P-3080
J-3068	Zone-3 (Chocolate)	True	1,746	32	20	J-3203	8.80	P-2196
J-3069	Zone-3 (Chocolate)	True	2,258	29	20	J-3203	16.15	P-3083
J-3070	Zone-3 (Chocolate)	True	2,664	40	20	J-3203	14.90	P-3084
J-3071	Zone-3 (Chocolate)	True	3,336	33	20	J-3203	13.77	P-3084
J-3072	Zone-3 (Chocolate)	True	3,384	30	20	J-3203	25.77	P-3085
J-3073	Zone-3 (Chocolate)	True	1,836	20	20	J-3203	21.21	P-3086
J-3074	Zone-3 (Chocolate)	True	1,816	20	21	J-3203	20.99	P-3086
J-3075	Zone-3 (Chocolate)	True	1,450	20	26	J-3203	16.83	P-3086
J-3076	Zone-3 (Chocolate)	True	1,302	20	23	J-3203	15.15	P-3086
J-3077	Zone-3 (Chocolate)	True	1,243	20	26	J-3203	14.49	P-3086
J-3078	Zone-3 (Chocolate)	True	3,500	26	29	J-3203	8.80	P-2196

	Zone-3 (Chocolate)	True	3,500	30	27	J-3203	8.80	P-2196
J-3080	Zone-3 (Chocolate)	True	3,500	33	27	J-3203	8.80	P-2196
J-3081	Zone-3 (Chocolate)	True	3,500	35	27	J-3203	8.80	P-2196
J-3082	Zone-3 (Chocolate)	True	3,500	39	28	J-3203	8.80	P-2196
J-3083	Zone-3 (Chocolate)	True	3,500	42	28	J-3203	8.80	P-2196
J-3084	Zone-3 (Chocolate)	True	3,500	46	28	J-3203	8.80	P-2196
J-3085	Zone-3 (Chocolate)	True	3,500	50	28	J-3203	8.80	P-2196
J-3086	Zone-3 (Chocolate)	True	3,500	55	28	J-3203	8.80	P-2196
J-3087	Zone-3 (Chocolate)	True	3,500	60	27	J-3203	8.80	P-2196
J-3088	Zone-3 (Chocolate)	True	3,500	60	27	J-3203	8.80	P-2196
J-3089	Zone-3 (Chocolate)	True	3,500	63	27	J-3203	8.80	P-2196
J-3090	Zone-3 (Chocolate)	True	3,500	63	27	J-3203	8.80	P-2196
J-3091	Zone-3 (Chocolate)	True	3,500	67	30	J-3203	28.17	P-3108
J-3092	Zone-3 (Chocolate)	True	3,500	69	30	J-3203	9.27	P-3108
J-3093	Zone-3 (Chocolate)	True	3,500	69	30	J-3203	8.80	P-2196
J-3094	Zone-3 (Chocolate)	True	3,500	67	30	J-3203	8.80	P-2196
J-3095	Zone-3 (Chocolate)	True	3,500	59	30	J-3203	8.80	P-2196
J-3096	Zone-3 (Chocolate)	True	3,500	53	30	J-3203	8.80	P-2196
J-3097	Zone-3 (Chocolate)	True	3,500	52	30	J-3203	8.97	P-3114
J-3098	Zone-3 (Chocolate)	True	3,500	51	29	J-3203	8.80	P-2196
J-3099	Zone-3 (Chocolate)	True	3,500	42	29	J-3203	8.80	P-2196
J-3100	Zone-3 (Chocolate)	True	3,500	38	29	J-3203	8.80	P-2196
J-3101	Zone-3 (Chocolate)	True	3,500	34	28	J-3203	8.80	P-2196
J-3102	Zone-3 (Chocolate)	True	3,500	32	28	J-3203	9.70	P-3119
J-3103	Zone-3 (Chocolate)	True	3,500	68	30	J-3203	8.80	P-2196
J-3104	Zone-3 (Chocolate)	True	3,500	67	30	J-3203	8.80	P-2196
J-3105	Zone-3 (Chocolate)	True	3,500	66	29	J-3203	8.80	P-2196
J-3106	Zone-3 (Chocolate)	True	3,500	63	30	J-3203	8.80	P-2196
J-3107	Zone-3 (Chocolate)	True	3,500	61	30	J-3203	8.80	P-2196
J-3108	Zone-3 (Chocolate)	True	3,500	59	30	J-3203	8.80	P-2196
J-3109	Zone-3 (Chocolate)	True	3,500	61	30	J-3203	10.74	P-3127
J-3110	Zone-3 (Chocolate)	True	3,500	61	30	J-3203	8.80	P-2196
J-3111	Zone-3 (Chocolate)	True	3,500	59	30	J-3203	9.37	P-3128
J-3112	Zone-3 (Chocolate)	True	3,500	56	30	J-3203	8.80	P-2196
J-3113	Zone-3 (Chocolate)	True	3,500	64	30	J-3203	33.60	P-3131
J-3114	Zone-3 (Chocolate)	True	2,125	20	26	J-3203	24.27	P-3132
J-3115	Zone-3 (Chocolate)	True	1,339	20	33	J-3203	15.36	P-3132
J-3116	Zone-3 (Chocolate)	True	3,500	106	29	J-3203	8.53	P-2196
J-3117	Zone-3 (Chocolate)	True	3,500	103	29	J-3203	13.39	P-3135
J-3118	Zone Exempt	False	0	126	8	J-4050C	8.80	P-2196
J-3119	Zone Exempt	False	0	126	8	J-4050C	33.60	P-3131
J-3120	Zone-3 (Chocolate)	True	3,500	98	28	J-3203	8.80	P-2196
J-3121	Zone-3 (Chocolate)	True	3,500	64	25	J-3203	8.80	P-2196
J-3122	Zone-3 (Chocolate)	True	3,435	81	20	J-3203	8.80	P-2196
J-3123	Zone-3 (Chocolate)	True	3,450	68	20	J-3203	8.80	P-2196
J-3124	Zone-3 (Chocolate)	True	3,500	68	20	J-3203	8.80	P-2196
J-3125	Zone-3 (Chocolate)	True	3,500	68	21	J-3203	8.80	P-2196
J-3126	Zone-3 (Chocolate)	True	3,500	66	21	J-3203	8.80	P-2196
J-3127	Zone-3 (Chocolate)	True	3,500	65	21	J-3203	8.80	P-2196
J-3128	Zone-3 (Chocolate)	True	3,500	63	22	J-3203	8.80	P-2196
J-3129	Zone-3 (Chocolate)	True	3,500	61	22	J-3203	8.80	P-2196
J-3130	Zone-3 (Chocolate)	True	3,500	67	23	J-3203	8.80	P-2196
J-3131	Zone-3 (Chocolate)	True	3,500	67	23	J-3203	8.80	P-2196
J-3132	Zone-3 (Chocolate)	True	3,500	69	24	J-3203	8.80	P-2196
J-3133	Zone-3 (Chocolate)	True	3,500	66	24	J-3203	8.80	P-2196
J-3134	Zone-3 (Chocolate)	True	3,500	65	24	J-3203	8.80	P-2196
J-3135	Zone-3 (Chocolate)	True	3,500	66	24	J-3203	8.80	P-2196
J-3136	Zone-3 (Chocolate)	True	3,500	68	25	J-3203	8.80	P-2196
J-3137	Zone-3 (Chocolate)	True	3,500	69	25	J-3203	8.80	P-2196
J-3138	Zone-3 (Chocolate)	True	3,500	71	25	J-3203	8.80	P-2196
J-3139	Zone-3 (Chocolate)	True	3,500	70	26	J-3203	8.80	P-2196
J-3140	Zone-3 (Chocolate)	True	3,500	67	26	J-3203	8.80	P-2196
J-3141	Zone-3 (Chocolate)	True	3,500	63	27	J-3203	8.80	P-2196
J-3142	Zone-3 (Chocolate)	True	3,500	70	28	J-3203	8.80	P-2196
J-3143	Zone-3 (Chocolate)	True	3,500	69	28	J-3203	17.13	P-3162
J-3144	Zone-3 (Chocolate)	True	2,489	20	30	J-3203	28.27	P-3194
J-3145	Zone-3 (Chocolate)	True	3,500	60	29	J-3203	13.93	P-3162
J-3146	Zone-3 (Chocolate)	True	3,500	57	29	J-3203	11.13	P-3162
J-3147	Zone-3 (Chocolate)	True	3,500	54	29	J-3203	28.64	P-3167
J-3148	Zone-3 (Chocolate)	True	3,500	69	28	J-3203	8.80	P-2196
J-3149	Zone-3 (Chocolate)	True	3,500	61	25	J-3203	14.57	P-3172
J-3150	Zone-3 (Chocolate)	True	3,500	51	25	J-3203	14.57	P-3172
J-3151	Zone-3 (Chocolate)	True	3,500	41	25	J-3203	14.57	P-3172
J-3152	Zone-3 (Chocolate)	True	3,500	30	25	J-3203	22.49	P-3175
J-3153	Zone-3 (Chocolate)	True	3,137	20	27	J-3203	20.17	P-3175
J-3154	Zone-3 (Chocolate)	True	3,500	62	25	J-3203	8.80	P-2196
J-3155	Zone-3 (Chocolate)	True	2,289	62	20	J-3203	9.50	P-3178
J-3156	Zone-3 (Chocolate)	True	2,288	27	20	J-3203	25.98	P-3179
J-3157	Zone-3 (Chocolate)	True	1,869	20	24	J-3203	21.22	P-3179
J-3158	Zone-3 (Chocolate)	True	3,500	28	28	J-3203	8.80	P-2196
J-3159	Zone-3 (Chocolate)	True	3,500	38	29	J-3203	8.80	P-2196
J-3160	Zone-3 (Chocolate)	True	2,694	20	32	J-3203	17.28	P-3184
J-3161	Zone-3 (Chocolate)	True	3,500	49	30	J-3203	8.80	P-2196
J-3162	Zone-3 (Chocolate)	True	3,500	52	30	J-3203	8.80	P-2196
J-3163	Zone-3 (Chocolate)	True	3,500	49	31	J-3203	8.80	P-2196
J-3164	Zone-3 (Chocolate)	True	2,583	32	20	J-3203	10.62	P-3084
J-3165	Zone-3 (Chocolate)	True	577	20	22	J-3034	8.80	P-2196
J-3167	Zone-3 (Chocolate)	True	2,350	20	25	J-3203	15.08	P-3196
J-3168	Zone-3 (Chocolate)	True	3,500	39	32	J-3203	8.80	P-2196
J-3169	Zone-3 (Chocolate)	True	2,637	32	20	J-3203	16.92	P-3196

	Zone-3 (Chocolate)	True	1,560	20	34	J-3203	10.04	P-3196
J-3171	Zone Exempt	False	0	12	8	J-4050C	16.92	P-3196
J-3172	Zone Exempt	False	0	141	8	J-4050C	8.80	P-2196
J-3173	Zone Exempt	False	0	40	8	J-4050C	8.80	P-2196
J-3174	Zone Exempt	False	0	141	8	J-4050C	8.80	P-2196
J-3175	Zone Exempt	False	0	141	8	J-4050C	10.62	P-3084
J-3176	Zone Exempt	False	0	40	8	J-4050C	8.80	P-2196
J-3177	Zone-3 (Chocolate)	True	3,500	74	33	J-3203	8.80	P-2196
J-3178	Zone-3 (Chocolate)	True	3,500	62	33	J-3203	14.30	P-3222
J-3180	Zone-3 (Chocolate)	True	3,500	58	33	J-3203	8.80	P-2196
J-3181	Zone-3 (Chocolate)	True	3,500	87	33	J-3203	8.80	P-2196
J-3182	Zone-3 (Chocolate)	True	3,500	64	33	J-3203	8.80	P-2196
J-3183	Zone-3 (Chocolate)	True	3,328	77	20	J-3203	8.80	P-2196
J-3184	Zone-3 (Chocolate)	True	2,270	54	20	J-3203	8.80	P-2196
J-3185	Zone-3 (Chocolate)	True	1,966	42	20	J-3203	8.80	P-2196
J-3186	Zone-3 (Chocolate)	True	1,790	31	20	J-3203	8.80	P-2196
J-3191	Zone-3 (Chocolate)	True	1,790	42	20	J-3203	8.80	P-2196
J-3192	Zone-3 (Chocolate)	True	1,955	48	20	J-3203	8.80	P-2196
J-3193	Zone-3 (Chocolate)	True	2,100	57	20	J-3203	8.80	P-2196
J-3194	Zone-3 (Chocolate)	True	2,082	57	20	J-3203	8.85	P-3249
J-3195	Zone-3 (Chocolate)	True	2,082	32	20	J-3203	13.30	P-3243
J-3198	Zone Exempt	False	0	34	8	J-4050C	8.80	P-2196
J-3199	Zone Exempt	False	0	34	8	J-4050C	15.60	P-2190
J-3200	Zone-3 (Chocolate)	True	554	20	23	J-3165	8.80	P-2196
J-3201	Zone-3 (Chocolate)	True	890	20	34	J-3203	10.10	P-3275
J-3202	Zone-3 (Chocolate)	True	1,610	21	20	J-3203	8.80	P-2196
J-3203	Zone-3 (Chocolate)	True	1,508	20	23	J-3202	8.80	P-2196
J-3204	Zone-3 (Chocolate)	True	1,617	33	20	J-3203	8.80	P-2196
J-3206	Zone-3 (Chocolate)	True	1,654	35	20	J-3203	8.80	P-2196
J-3207 (SM Ph4 Option 3)	Zone-3 (Chocolate)	True	1,540	20	21	J-3203	8.80	P-2196
J-3208 (SM Ph4 Option 3)	Zone-3 (Chocolate)	True	1,480	20	22	J-3203	8.80	P-2196
J-4001S	Zone-4 (Sidehill/Chimney)	True	1,015	52	20	J-4051C	12.16	P-4014
J-4002S	Zone-4 (Sidehill/Chimney)	True	1,003	58	20	J-4051C	12.03	P-4014
J-4003S	Zone-4 (Sidehill/Chimney)	True	961	57	20	J-4085S	11.55	P-4014
J-4004S	Zone-4 (Sidehill/Chimney)	True	958	47	20	J-4085S	11.51	P-4014
J-4005S	Zone-4 (Sidehill/Chimney)	True	957	44	20	J-4085S	11.50	P-4014
J-4006S	Zone-4 (Sidehill/Chimney)	True	957	38	20	J-4085S	11.50	P-4014
J-4007S	Zone-4 (Sidehill/Chimney)	True	956	49	20	J-4085S	11.49	P-4014
J-4008S	Zone-4 (Sidehill/Chimney)	True	955	26	20	J-4085S	11.48	P-4014
J-4009S	Zone-4 (Sidehill/Chimney)	True	932	20	22	J-4085S	11.22	P-4014
J-4010S	Zone-4 (Sidehill/Chimney)	True	1,054	52	20	J-4051C	12.60	P-4014
J-4011S	Zone-4 (Sidehill/Chimney)	True	1,518	44	20	J-4051C	17.87	P-4014
J-4012S	Zone-4 (Sidehill/Chimney)	True	2,501	39	20	J-4051C	10.47	P-4017
J-4013S	Zone-4 (Sidehill/Chimney)	True	1,099	20	47	J-4051C	12.49	P-4015
J-4014S	Zone Exempt	False	0	8	8	J-4050C	12.49	P-4015
J-4015S	Zone-4 (Sidehill/Chimney)	True	1,031	51	20	J-4051C	12.34	P-4014
J-4016S	Zone-4 (Sidehill/Chimney)	True	1,031	50	20	J-4051C	12.34	P-4014
J-4017S	Zone-4 (Sidehill/Chimney)	True	1,031	42	20	J-4051C	12.34	P-4014
J-4018	Zone-4 (Sidehill/Chimney)	True	1,031	36	20	J-4051C	12.34	P-4014
J-4019	Zone-4 (Sidehill/Chimney)	True	1,031	23	20	J-4051C	12.34	P-4014
J-4020S	Zone-4 (Sidehill/Chimney)	True	1,031	30	20	J-4051C	12.34	P-4014
J-4021S	Zone-4 (Sidehill/Chimney)	True	1,031	34	20	J-4051C	12.34	P-4014
J-4022C	Zone-4 (Sidehill/Chimney)	True	2,206	40	20	J-4051C	9.03	P-4025
J-4023C	Zone-4 (Sidehill/Chimney)	True	2,199	35	20	J-4051C	8.80	P-2196
J-4024C	Zone-4 (Sidehill/Chimney)	True	2,204	43	20	J-4051C	8.80	P-2196
J-4025C	Zone-4 (Sidehill/Chimney)	True	1,766	20	30	J-4051C	20.05	P-4027
J-4026C	Zone-4 (Sidehill/Chimney)	True	1,765	21	20	J-4051C	20.04	P-4027
J-4027C	Zone-4 (Sidehill/Chimney)	True	2,175	32	20	J-4051C	8.80	P-2196
J-4028C	Zone-4 (Sidehill/Chimney)	True	1,044	20	43	J-4051C	11.87	P-4030
J-4029C	Zone-4 (Sidehill/Chimney)	True	2,205	34	20	J-4051C	8.80	P-2196
J-4030C	Zone-4 (Sidehill/Chimney)	True	2,285	35	20	J-4051C	8.80	P-2196
J-4031C	Zone-4 (Sidehill/Chimney)	True	1,496	20	37	J-4051C	16.99	P-4033
J-4032C	Zone-4 (Sidehill/Chimney)	True	2,325	36	20	J-4051C	8.80	P-2196
J-4033C	Zone-4 (Sidehill/Chimney)	True	2,505	46	20	J-4051C	8.80	P-2196
J-4034C	Zone-4 (Sidehill/Chimney)	True	2,353	52	20	J-4051C	8.80	P-2196
J-4035C	Zone-4 (Sidehill/Chimney)	True	2,272	51	20	J-4051C	8.80	P-2196
J-4036C	Zone-4 (Sidehill/Chimney)	True	2,224	49	20	J-4051C	8.80	P-2196
J-4037C	Zone-4 (Sidehill/Chimney)	True	2,209	39	20	J-4051C	13.49	P-4041
J-4038C	Zone-4 (Sidehill/Chimney)	True	2,614	51	20	J-4051C	8.80	P-2196
J-4039C	Zone-4 (Sidehill/Chimney)	True	2,698	53	20	J-4051C	8.80	P-2196
J-4040C	Zone-4 (Sidehill/Chimney)	True	1,900	25	20	J-4051C	12.53	P-4045
J-4041C	Zone-4 (Sidehill/Chimney)	True	1,525	20	35	J-4051C	17.31	P-4046
J-4042C	Zone-4 (Sidehill/Chimney)	True	1,734	35	20	J-4051C	10.75	P-4049
J-4043C	Zone-4 (Sidehill/Chimney)	True	962	20	44	J-4051C	10.96	P-4048
J-4044C	Zone-4 (Sidehill/Chimney)	True	3,034	58	20	J-4051C	9.33	P-4103
J-4045C	Zone-4 (Sidehill/Chimney)	True	2,835	58	20	J-4051C	8.80	P-2196
J-4046C	Zone-4 (Sidehill/Chimney)	True	3,349	36	20	J-4051C	10.22	P-4103
J-4047C	Zone-4 (Sidehill/Chimney)	True	3,500	35	22	J-4051C	10.65	P-4103
J-4048C	Zone-4 (Sidehill/Chimney)	True	3,500	26	23	J-4051C	10.65	P-4103
J-4049C	Zone-4 (Sidehill/Chimney)	True	3,500	25	25	J-4051C	10.65	P-4103
J-4050C	Zone Exempt	False	0	8	8	J-4087C	10.65	P-4103
J-4051C	Zone-4 (Sidehill/Chimney)	True	2,806	20	30	J-4049C	15.51	P-4058
J-4052C	Zone-4 (Sidehill/Chimney)	True	2,100	20	33	J-4051C	15.97	P-4059
J-4053C	Zone-4 (Sidehill/Chimney)	True	1,083	20	42	J-4051C	12.34	P-4060
J-4054C	Zone-4 (Sidehill/Chimney)	True	2,272	20	27	J-4051C	13.48	P-4063
J-4055C	Zone-4 (Sidehill/Chimney)	True	2,717	20	26	J-4051C	20.36	P-4063
J-4056C	Zone-4 (Sidehill/Chimney)	True	3,338	53	20	J-4051C	10.19	P-4103
J-4057C	Zone-4 (Sidehill/Chimney)	True	3,178	20	24	J-4051C	9.74	P-4103
J-4058C	Zone-4 (Sidehill/Chimney)	True	3,178	50	20	J-4051C	20.39	P-4066
J-4059C	Zone-4 (Sidehill/Chimney)	True	1,854	20	21	J-4051C	21.18	P-4067

	Zone-4 (Sidehill/Chimney)	True	1,469	20	41	J-4051C	16.82	P-4067
J-4061C	Zone-4 (Sidehill/Chimney)	True	3,355	48	20	J-4051C	13.07	P-4069
J-4062C	Zone-4 (Sidehill/Chimney)	True	3,500	37	20	J-4051C	11.85	P-4069
J-4063C	Zone-4 (Sidehill/Chimney)	True	3,342	36	20	J-4051C	13.72	P-4071
J-4064C	Zone-4 (Sidehill/Chimney)	True	2,769	37	20	J-4051C	17.74	P-4072
J-4065C	Zone-4 (Sidehill/Chimney)	True	1,825	20	39	J-4051C	11.72	P-4073
J-4066C	Zone-4 (Sidehill/Chimney)	True	3,500	33	22	J-4051C	13.09	P-4074
J-4067C	Zone-4 (Sidehill/Chimney)	True	3,500	42	22	J-4051C	13.46	P-4080
J-4068C	Zone-4 (Sidehill/Chimney)	True	2,989	20	28	J-4051C	19.15	P-4076
J-4069C	Zone-4 (Sidehill/Chimney)	True	3,500	47	22	J-4051C	15.06	P-4080
J-4070C	Zone-4 (Sidehill/Chimney)	True	3,304	20	25	J-4051C	20.30	P-4079
J-4071C	Zone-4 (Sidehill/Chimney)	True	3,500	45	22	J-4051C	16.84	P-4080
J-4072C	Zone-4 (Sidehill/Chimney)	True	3,500	49	22	J-4051C	10.65	P-4103
J-4073C	Zone-4 (Sidehill/Chimney)	True	3,500	40	22	J-4051C	13.93	P-4081
J-4074C	Zone-4 (Sidehill/Chimney)	True	3,486	34	20	J-4051C	12.62	P-4071
J-4075C	Zone-4 (Sidehill/Chimney)	True	3,500	45	22	J-4051C	16.05	P-4080
J-4076C	Zone-4 (Sidehill/Chimney)	True	2,600	20	32	J-4051C	17.56	P-4085
J-4077C	Zone-4 (Sidehill/Chimney)	True	2,512	20	33	J-4051C	14.57	P-4087
J-4078C	Zone-4 (Sidehill/Chimney)	True	3,500	44	22	J-4051C	17.79	P-4089
J-4079S	Zone-4 (Sidehill/Chimney)	True	1,031	26	20	J-4051C	12.34	P-4014
J-4080S	Zone-4 (Sidehill/Chimney)	True	1,031	26	20	J-4051C	12.34	P-4014
J-4081S	Zone-4 (Sidehill/Chimney)	True	1,031	28	20	J-4051C	12.34	P-4014
J-4082S	Zone-4 (Sidehill/Chimney)	True	960	58	20	J-4085S	11.54	P-4014
J-4083S	Zone-4 (Sidehill/Chimney)	True	959	40	20	J-4085S	11.52	P-4014
J-4084S	Zone-4 (Sidehill/Chimney)	True	958	47	20	J-4085S	11.52	P-4014
J-4085S	Zone-4 (Sidehill/Chimney)	True	954	20	33	J-4051C	11.47	P-4014
J-4086S	Zone-4 (Sidehill/Chimney)	True	1,006	20	22	J-4051C	12.05	P-4014
J-4087C	Zone Exempt	False	0	8	8	J-4050C	8.80	P-2196
J-4106 School	Zone-4 (Sidehill/Chimney)	True	3,500	45	22	J-4051C	10.65	P-4103
J-4107 School	Zone-4 (Sidehill/Chimney)	True	3,500	45	22	J-4051C	10.65	P-4103
J-4108 School	<None>	True	3,500	26	70	J-2152	10.65	P-4103
J-5001	<None>	True	3,500	63	70	J-2152	9.93	P-6048
J-6001	Zone 6 (Boundary)	True	3,500	69	24	J-6031 Ph 6	8.80	P-2196
J-6002 Ph1	Zone 6 (Boundary)	True	3,011	44	20	J-6031 Ph 6	9.02	P-6001
J-6003 Ph1	Zone 6 (Boundary)	True	2,368	20	26	J-6031 Ph 6	15.13	P-6002
J-6004 Ph1	Zone 6 (Boundary)	True	2,953	44	20	J-6031 Ph 6	8.85	P-6001
J-6005 Ph1	Zone 6 (Boundary)	True	2,953	31	20	J-6031 Ph 6	12.11	P-6004
J-6006 Ph1	Zone 6 (Boundary)	True	2,082	20	28	J-6031 Ph 6	13.33	P-6005
J-6007 Ph 1	Zone 6 (Boundary)	True	2,830	45	20	J-6031 Ph 6	8.80	P-2196
J-6008 Ph1	Zone 6 (Boundary)	True	2,723	53	20	J-6031 Ph 6	8.80	P-2196
J-6009 Ph 1	Zone 6 (Boundary)	True	2,723	33	20	J-6031 Ph 6	17.40	P-6031
J-6010 Ph1	Zone 6 (Boundary)	True	2,723	23	20	J-6031 Ph 6	17.40	P-6032
J-6011 Ph2	Zone 6 (Boundary)	True	2,759	40	20	J-6031 Ph 6	8.80	P-2196
J-6012 Ph 2	Zone 6 (Boundary)	True	2,612	41	20	J-6031 Ph 6	8.80	P-2196
J-6013 Ph 2	Zone 6 (Boundary)	True	2,481	36	20	J-6031 Ph 6	8.80	P-2196
J-6014 Ph 2	Zone 6 (Boundary)	True	2,294	30	20	J-6031 Ph 6	8.80	P-2196
J-6015 Ph 2	Zone 6 (Boundary)	True	2,195	27	20	J-6031 Ph 6	8.80	P-2196
J-6016 Ph 3	Zone 6 (Boundary)	True	2,555	40	20	J-6031 Ph 6	8.80	P-2196
J-6017 Ph 3	Zone 6 (Boundary)	True	2,649	48	20	J-6031 Ph 6	8.80	P-2196
J-6018 Ph 4	Zone 6 (Boundary)	True	2,283	31	20	J-6031 Ph 6	11.00	P-6028
J-6019 Ph 4	Zone 6 (Boundary)	True	2,278	33	20	J-6031 Ph 6	9.96	P-6028
J-6020 Ph 4	Zone 6 (Boundary)	True	2,272	38	20	J-6031 Ph 6	9.05	P-6028
J-6021 Ph 4	Zone 6 (Boundary)	True	2,266	40	20	J-6031 Ph 6	8.80	P-2196
J-6022 Ph 4	Zone 6 (Boundary)	True	2,260	35	20	J-6031 Ph 6	8.80	P-2196
J-6023 Ph 4	Zone 6 (Boundary)	True	2,260	31	20	J-6031 Ph 6	8.80	P-2196
J-6024 Ph 4	Zone 6 (Boundary)	True	2,254	31	20	J-6031 Ph 6	8.80	P-2196
J-6025 Ph 4	Zone 6 (Boundary)	True	2,247	31	20	J-6031 Ph 6	8.80	P-2196
J-6026 Ph 4	Zone 6 (Boundary)	True	2,237	26	20	J-6031 Ph 6	9.74	P-6014
J-6027 Ph 4	Zone 6 (Boundary)	True	2,225	25	20	J-6031 Ph 6	10.72	P-6014
J-6028 Ph 5	Zone 6 (Boundary)	True	2,031	20	23	J-6031 Ph 6	13.00	P-6020
J-6029 Ph 6	Zone 6 (Boundary)	True	1,936	24	20	J-6031 Ph 6	8.80	P-2196
J-6030 Ph 6	Zone 6 (Boundary)	True	1,760	22	20	J-6031 Ph 6	8.80	P-2196
J-6031 Ph 6	Zone 6 (Boundary)	True	1,610	20	25	J-6030 Ph 6	8.80	P-2196
J-6034	Zone 5 (West7th)	True	3,500	39	166	J-6046	8.80	P-2196
J-6045	Zone 6 (Boundary)	True	3,500	73	24	J-6031 Ph 6	9.93	P-6048
J-6046	Zone 5 (West7th)	True	3,500	113	39	J-6034	9.93	P-6048
J-Section 5.3.2	<None>	False	0	88	70	J-2156	8.80	P-2196

>1500 OK

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Maximum Day

Scenario Summary Report
Scenario: Existing SVGID System

Scenario Summary

ID	64
Label	Existing SVGID System
Notes	
Active Topology	Base-Active Topology
Physical	Existing System
Demand	6950 Maximum Day
Initial Settings	Existing System Pumps OFF Tanks at LWL
Operational	Pumps OFF
Age	Base-Age Alternative
Constituent	Base-Constituent
Trace	Base-Trace Alternative
Fire Flow	500 GPM at all Nodes
Energy Cost	Base-Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base-User Data
Steady State/EPS Solver Calculation Options	Proposed SVGID System
Transient Solver Calculation Options	Base Calculation Options

Hydraulic Summary

Time Analysis Type	Steady State	Use simple controls during steady state?	True
Friction Method	Hazen-Williams	Is EPS Snapshot?	False
Accuracy	0.001	Start Time	12:00:00 AM
Trials	40	Calculation Type	Fire Flow

Scenario: Existing SVGID System
Current Time Step: 0.000 h
FlexTable: Tank Table

Label	Zone	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Diameter (ft)	Volume Full (Calculated) (gal)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Eastside	Zone-1-2-3	4,963.00	4,963.00	4,989.25	4,992.92	90.00	1,423,863.12	779	4,989.25
Chocolate	Zone-1-2-3	4,964.25	4,964.25	4,989.25	4,992.92	74.00	922,386.13	394	4,989.25
Klondike	Zone-1-2-3	4,968.00	4,968.00	4,989.25	4,992.92	107.00	1,676,243.96	552	4,989.25
Juniper Terr. Tank	Zone-1-2-3	4,952.29	4,952.29	4,974.94	4,974.94	60.00	479,062.68	0	4,974.94
Sidehill	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,123.59	5,134.41	40.00	285,863.06	69	5,123.59
Chimney 1	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,123.59	5,135.09	40.00	292,255.26	125	5,123.59
Westside Tank	Zone-3 (Chocolate)	4,961.90	4,961.90	4,989.25	4,992.92	90.00	1,476,211.03	700	4,989.25
Boundary Tank	Zone 6 (Boundary)	5,279.50	5,279.50	5,304.50	5,315.50	80.00	1,353,642.89	168	5,304.50
Chimney 2	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,123.59	5,135.09	75.00	1,027,459.90	123	5,123.59

2910 GPM ✓

S:\Projects\STU\SVGID\SVGID, Ladera Revised Lot Count\Watercad\2020 SVGID Water MP Model for Ladera Phase 2-6.wtg

$$\frac{6950 \times 603}{1440} = 2910 \text{ GPM} ✓$$

Scenario: Existing SVGID System
Current Time Step: 0.000 h
FlexTable: Junction Table

SORT

ID	Label	Elevation (ft)	Pressure (psi)	Demand (gpm)	Zone
483	J-4014S	5,100.00	10	0	Zone Exempt
518	J-4050C	5,100.00	10	0	Zone Exempt
619	J-4087C	5,100.00	10	0	Zone Exempt
373	J-3055	4,950.00	16	0	Zone Exempt
468	J-3171	4,949.00	17	0	Zone Exempt
374	J-3056	4,943.00	19	0	Zone Exempt
351	J-3052	4,925.00	27	0	Zone Exempt
371	J-3053	4,925.00	27	0	Zone Exempt
372	J-3054	4,921.00	29	0	Zone Exempt
350	J-3051	4,909.00	34	2	Zone Exempt
584	J-3198	4,900.00	39	0	Zone Exempt
585	J-3199	4,900.00	39	0	Zone Exempt
566	J-3203	4,895.00	40	6	Zone-3 (Chocolate)
461	J-3173	4,648.00	40	0	Zone Exempt
462	J-3176	4,648.00	40	0	Zone Exempt
193	J-2043	4,810.00	41	2	Zone-2 (Central)
557	J-2151	4,810.00	41	0	Zone-2 (Central)
616	J-6031 Ph 6	5,210.00	41	3	Zone 6 (Boundary)
565	J-3202	4,891.32	41	6	Zone-3 (Chocolate)
574	J-3208 (SM Ph4 Option 3)	4,891.00	41	6	Zone-3 (Chocolate)
567	J-3207 (SM Ph4 Option 3)	4,891.00	41	7	Zone-3 (Chocolate)
328	J-3026	4,892.00	41	0	Zone Exempt
174	J-2025	4,806.00	42	5	Zone-2 (Central)
359	J-3065	4,888.00	43	2	Zone-3 (Chocolate)
615	J-6030 Ph 6	5,205.00	43	4	Zone 6 (Boundary)
375	J-3078	4,887.00	43	0	Zone-3 (Chocolate)
141	J-1015	4,665.00	44	3	Zone-1 (Southern)
129	J-1006	4,664.00	44	4	Zone-1 (Southern)
614	J-6029 Ph 6	5,200.00	45	9	Zone 6 (Boundary)
128	J-1004	4,662.00	45	4	Zone-1 (Southern)
131	J-1002	4,662.00	45	5	Zone-1 (Southern)
148	J-1021	4,662.00	45	2	Zone-1 (Southern)
349	J-3050	4,882.00	46	3	Zone-3 (Chocolate)
456	J-3165	4,882.00	46	5	Zone-3 (Chocolate)
331	J-3034	4,882.00	46	7	Zone-3 (Chocolate)
130	J-1007	4,661.00	46	1	Zone-1 (Southern)
356	J-3062	4,881.00	46	6	Zone-3 (Chocolate)
185	J-2042	4,797.00	46	9	Zone-2 (Central)
376	J-3158	4,880.00	46	5	Zone-3 (Chocolate)
147	J-1022	4,659.00	47	1	Zone-1 (Southern)
140	J-1014	4,658.00	47	3	Zone-1 (Southern)
357	J-3063	4,877.00	48	7	Zone-3 (Chocolate)
604	J-6015 Ph 2	5,194.00	48	0	Zone 6 (Boundary)
588	J-6034	5,194.00	48	0	Zone 5 (West7th)
379	J-3079	4,876.00	48	4	Zone-3 (Chocolate)
358	J-3064	4,875.00	49	4	Zone-3 (Chocolate)
523	J-4051C	5,011.00	49	5	Zone-4 (Sidehill/Chimney)
1368	J-3200	4,875.00	49	0	Zone-3 (Chocolate)
517	J-4049C	5,010.00	49	0	Zone-4 (Sidehill/Chimney)
189	J-2041	4,790.00	49	4	Zone-2 (Central)
145	J-1019	4,653.00	49	1	Zone-1 (Southern)
133	J-1005	4,653.00	49	0	Zone-1 (Southern)
146	J-1020	4,653.00	49	5	Zone-1 (Southern)
144	J-1018	4,651.00	50	8	Zone-1 (Southern)
1396	J-6014 Ph 2	5,188.00	50	8	Zone 6 (Boundary)
132	J-1003	4,649.00	51	1	Zone-1 (Southern)
564	J-3186	4,868.30	51	7	Zone-3 (Chocolate)

<40 OK Exempt

>40 OK

380	J-3080	4,869.00	51	1	Zone-3 (Chocolate)
467	J-3170	4,870.00	51	3	Zone-3 (Chocolate)
464	J-3168	4,870.00	51	4	Zone-3 (Chocolate)
378	J-3160	4,869.00	51	13	Zone-3 (Chocolate)
560	J-2150	4,785.00	51	0	Zone-2 (Central)
516	J-4048C	5,004.00	52	4	Zone-4 (Sidehill/Chimney)
402	J-3102	4,867.00	52	7	Zone-3 (Chocolate)
482	J-4013S	5,002.00	53	2	Zone-4 (Sidehill/Chimney)
498	J-4028C	4,999.00	54	2	Zone-4 (Sidehill/Chimney)
360	J-3066	4,863.00	54	4	Zone-3 (Chocolate)
354	J-3060	4,863.00	54	3	Zone-3 (Chocolate)
355	J-3061	4,863.00	54	1	Zone-3 (Chocolate)
348	J-3049	4,863.00	54	10	Zone-3 (Chocolate)
1370	J-3201	4,863.00	54	0	Zone-3 (Chocolate)
188	J-2040	4,779.00	54	5	Zone-2 (Central)
240	J-2089	4,784.00	54	4	Zone-2 (Central)
608	J-6003 Ph1	5,179.37	54	3	Zone 6 (Boundary)
575	J-3204	4,861.21	54	6	Zone-3 (Chocolate)
330	J-3033	4,862.00	54	9	Zone-3 (Chocolate)
603	J-6027 Ph 4	5,178.00	55	8	Zone 6 (Boundary)
377	J-3159	4,861.00	55	7	Zone-3 (Chocolate)
381	J-3081	4,860.00	55	12	Zone-3 (Chocolate)
143	J-1017	4,639.00	55	13	Zone-1 (Southern)
127	J-1001	4,639.00	55	4	Zone-1 (Southern)
525	J-4057C	4,995.00	55	10	Zone-4 (Sidehill/Chimney)
568	J-3206	4,857.83	56	4	Zone-3 (Chocolate)
308	J-3010	4,860.00	56	5	Zone-3 (Chocolate)
401	J-3101	4,858.00	56	9	Zone-3 (Chocolate)
521	J-4052C	4,993.00	56	6	Zone-4 (Sidehill/Chimney)
605	J-6013 Ph 2	5,174.00	56	8	Zone 6 (Boundary)
165	J-2015	4,776.00	56	7	Zone-2 (Central)
142	J-1016	4,636.00	57	7	Zone-1 (Southern)
175	J-2022	4,773.00	57	4	Zone-2 (Central)
296	J-2131	4,790.00	57	14	Zone-2 (Central)
134	J-1008	4,635.00	57	5	Zone-1 (Southern)
241	J-2090	4,777.00	57	12	Zone-2 (Central)
353	J-3059	4,853.00	58	5	Zone-3 (Chocolate)
610	J-6006 Ph1	5,168.84	59	6	Zone 6 (Boundary)
511	J-4043C	4,987.00	59	3	Zone-4 (Sidehill/Chimney)
238	J-2087	4,770.00	60	9	Zone-2 (Central)
239	J-2088	4,770.00	60	7	Zone-2 (Central)
382	J-3082	4,848.00	60	12	Zone-3 (Chocolate)
400	J-3100	4,848.00	60	7	Zone-3 (Chocolate)
347	J-3048	4,848.00	60	1	Zone-3 (Chocolate)
361	J-3068	4,847.00	61	4	Zone-3 (Chocolate)
578	J-4085S	4,983.00	61	0	Zone-4 (Sidehill/Chimney)
602	J-6026 Ph 4	5,164.00	61	5	Zone 6 (Boundary)
466	J-3167	4,848.00	61	2	Zone-3 (Chocolate)
183	J-2035	4,763.00	61	13	Zone-2 (Central)
295	J-2130	4,780.00	61	7	Zone-2 (Central)
136	J-1011	4,625.00	61	3	Zone-1 (Southern)
137	J-1013	4,625.00	61	4	Zone-1 (Southern)
178	J-2030	4,762.00	61	9	Zone-2 (Central)
607	J-6011 Ph2	5,162.00	62	12	Zone 6 (Boundary)
569	J-3191	4,844.00	62	6	Zone-3 (Chocolate)
505	J-4031C	4,980.00	62	1	Zone-4 (Sidehill/Chimney)
563	J-3185	4,842.90	62	6	Zone-3 (Chocolate)
187	J-2039	4,760.00	62	11	Zone-2 (Central)
339	J-2145	4,763.00	62	0	Zone-2 (Central)
362	J-3067	4,843.00	62	6	Zone-3 (Chocolate)
338	J-2146	4,763.00	62	0	Zone-2 (Central)
594	J-6018 Ph 4	5,160.00	62	8	Zone 6 (Boundary)
617	J-6016 Ph 3	5,160.00	62	7	Zone 6 (Boundary)
606	J-6012 Ph 2	5,160.00	62	7	Zone 6 (Boundary)
454	J-3163	4,843.00	63	2	Zone-3 (Chocolate)
465	J-3169	4,843.00	63	7	Zone-3 (Chocolate)
135	J-1009	4,621.00	63	9	Zone-1 (Southern)

	J-2038	4,758.00	63	6	Zone-2 (Central)
452	J-3161	4,840.00	64	1	Zone-3 (Chocolate)
138	J-1012	4,619.00	64	7	Zone-1 (Southern)
559	J-2153	4,756.00	64	0	Zone-3 (Chocolate)
513	J-4041C	4,975.00	64	0	Zone-4 (Sidehill/Chimney)
399	J-3099	4,839.00	64	10	Zone-3 (Chocolate)
317	J-3020	4,840.00	64	6	Zone-3 (Chocolate)
139	J-1010	4,618.00	64	3	Zone-1 (Southern)
307	J-3008	4,840.00	64	4	Zone-3 (Chocolate)
609	J-6005 Ph1	5,155.32	64	6	Zone 6 (Boundary)
383	J-3083	4,838.00	65	12	Zone-3 (Chocolate)
250	J-2106	4,760.00	65	7	Zone-2 (Central)
582	J-2155	4,760.00	65	0	Zone-1 (Southern)
260	J-2144	4,760.00	65	4	Zone-2 (Central)
589	J-6002 Ph1	5,154.57	65	3	Zone 6 (Boundary)
242	J-2092	4,759.00	65	7	Zone-2 (Central)
243	J-2093	4,759.00	65	2	Zone-2 (Central)
182	J-2034	4,753.00	65	7	Zone-2 (Central)
293	J-2128	4,770.00	65	5	Zone-2 (Central)
342	J-3044	4,836.00	65	11	Zone-3 (Chocolate)
497	J-4027C	4,971.00	66	3	Zone-4 (Sidehill/Chimney)
590	J-6004 Ph1	5,152.08	66	7	Zone 6 (Boundary)
186	J-2036	4,751.00	66	12	Zone-2 (Central)
352	J-3058	4,834.00	66	5	Zone-3 (Chocolate)
343	J-3046	4,834.00	66	7	Zone-3 (Chocolate)
329	J-3032	4,834.00	66	8	Zone-3 (Chocolate)
316	J-3019	4,835.00	66	29	Zone-3 (Chocolate)
583	J-3180	4,835.00	66	0	Zone-3 (Chocolate)
315	J-3017	4,835.00	66	5	Zone-3 (Chocolate)
453	J-3162	4,834.00	66	11	Zone-3 (Chocolate)
581	J-2154	4,755.00	67	0	Zone-1 (Southern)
321	J-3024	4,833.00	67	1	Zone-3 (Chocolate)
322	J-3025	4,833.00	67	4	Zone-3 (Chocolate)
515	J-4047C	4,968.00	67	5	Zone-4 (Sidehill/Chimney)
613	J-6028 Ph 5	5,149.00	67	5	Zone 6 (Boundary)
172	J-2024	4,747.00	68	9	Zone-2 (Central)
177	J-2029	4,747.00	68	6	Zone-2 (Central)
499	J-4029C	4,966.00	68	3	Zone-4 (Sidehill/Chimney)
251	J-2105	4,752.00	68	9	Zone-2 (Central)
232	J-2077	4,750.00	68	8	Zone-2 (Central)
288	J-2126	4,763.00	68	9	Zone-2 (Central)
595	J-6019 Ph 4	5,146.00	68	4	Zone 6 (Boundary)
570	J-3192	4,828.00	69	4	Zone-3 (Chocolate)
573	J-3195	4,828.00	69	2	Zone-3 (Chocolate)
271	J-2132	4,758.00	69	6	Zone-2 (Central)
181	J-2033	4,745.00	69	10	Zone-2 (Central)
384	J-3084	4,828.00	69	11	Zone-3 (Chocolate)
256	J-2122	4,750.00	69	7	Zone-2 (Central)
164	J-2014	4,745.00	69	46	Zone-2 (Central)
173	J-2026	4,744.00	69	4	Zone-2 (Central)
500	J-4030C	4,963.00	69	2	Zone-4 (Sidehill/Chimney)
512	J-4040C	4,963.00	69	4	Zone-4 (Sidehill/Chimney)
514	J-4046C	4,963.00	69	2	Zone-4 (Sidehill/Chimney)
327	J-3029	4,827.00	69	7	Zone-3 (Chocolate)
1351	J-2152	4,729.75	70	0	<None>
398	J-3098	4,826.00	70	0	Zone-3 (Chocolate)
601	J-6025 Ph 4	5,143.00	70	6	Zone 6 (Boundary)
287	J-2124	4,760.00	70	7	Zone-2 (Central)
257	J-2121	4,748.00	70	9	Zone-2 (Central)
309	J-3011	4,827.00	70	7	Zone-3 (Chocolate)
591	J-6007 Ph 1	5,142.51	70	6	Zone 6 (Boundary)
501	J-4032C	4,961.00	70	4	Zone-4 (Sidehill/Chimney)
522	J-4053C	4,961.00	70	4	Zone-4 (Sidehill/Chimney)
318	J-3021	4,826.00	70	3	Zone-3 (Chocolate)
314	J-3016	4,826.00	70	5	Zone-3 (Chocolate)
231	J-2076	4,746.00	70	15	Zone-2 (Central)
259	J-2142	4,747.00	70	10	Zone-2 (Central)

	J-3023	4,825.00	70	7	Zone-3 (Chocolate)
180	J-2031	4,741.00	70	11	Zone-2 (Central)
171	J-2023	4,740.00	71	6	Zone-2 (Central)
191	J-2032	4,740.00	71	2	Zone-2 (Central)
496	J-4023C	4,959.00	71	3	Zone-4 (Sidehill/Chimney)
520	J-4054C	4,959.00	71	6	Zone-4 (Sidehill/Chimney)
600	J-6024 Ph 4	5,140.00	71	5	Zone 6 (Boundary)
481	J-4012S	4,959.00	71	5	Zone-4 (Sidehill/Chimney)
258	J-2143	4,745.00	71	20	Zone-2 (Central)
1327	J-2156	4,745.00	71	0	<None>
552	J-2147	4,751.00	71	0	Zone-1 (Southern)
326	J-3030	4,822.00	72	5	Zone-3 (Chocolate)
268	J-2135	4,748.00	72	12	Zone-2 (Central)
363	J-3069	4,821.00	72	6	Zone-3 (Chocolate)
244	J-2091	4,743.00	72	10	Zone-2 (Central)
170	J-2021	4,737.00	72	10	Zone-2 (Central)
455	J-3164	4,820.00	72	7	Zone-3 (Chocolate)
262	J-2140	4,743.00	72	7	Zone-2 (Central)
599	J-6023 Ph 4	5,137.00	72	5	Zone 6 (Boundary)
593	J-6017 Ph 3	5,137.00	72	9	Zone 6 (Boundary)
611	J-6009 Ph 1	5,136.51	73	3	Zone 6 (Boundary)
533	J-4065C	4,955.00	73	11	Zone-4 (Sidehill/Chimney)
292	J-2127	4,753.00	73	7	Zone-2 (Central)
1407	J-4108 School	4,955.00	73	0	<None>
272	J-2133	4,748.00	73	5	Zone-2 (Central)
313	J-3015	4,820.00	73	5	Zone-3 (Chocolate)
312	J-3014	4,820.00	73	2	Zone-3 (Chocolate)
233	J-2084	4,740.00	73	7	Zone-2 (Central)
192	J-2037	4,735.00	73	5	Zone-2 (Central)
562	J-3184	4,816.70	73	5	Zone-3 (Chocolate)
477	J-4008S	4,953.00	74	3	Zone-4 (Sidehill/Chimney)
397	J-3097	4,817.00	74	9	Zone-3 (Chocolate)
149	J-2001	4,720.00	74	5	Zone-1 (Southern)
194	J-3018	4,818.00	74	7	Zone-3 (Chocolate)
319	J-3022	4,817.00	74	10	Zone-3 (Chocolate)
510	J-4042C	4,952.00	74	7	Zone-4 (Sidehill/Chimney)
385	J-3085	4,816.00	74	12	Zone-3 (Chocolate)
294	J-2129	4,750.00	74	6	Zone-2 (Central)
223	J-2072	4,737.00	74	10	Zone-2 (Central)
549	J-3182	4,817.00	74	0	Zone-3 (Chocolate)
179	J-2028	4,732.00	74	15	Zone-2 (Central)
234	J-2085	4,736.00	75	8	Zone-2 (Central)
412	J-3112	4,814.00	75	6	Zone-3 (Chocolate)
190	J-2020	4,730.00	75	13	Zone-2 (Central)
346	J-3057	4,813.00	75	11	Zone-3 (Chocolate)
289	J-2125	4,746.00	76	6	Zone-2 (Central)
598	J-6022 Ph 4	5,129.00	76	5	Zone 6 (Boundary)
364	J-3070	4,811.00	76	2	Zone-3 (Chocolate)
341	J-3043	4,811.00	76	6	Zone-3 (Chocolate)
340	J-3042	4,811.00	76	7	Zone-3 (Chocolate)
176	J-2027	4,727.00	76	9	Zone-2 (Central)
418	J-3154	4,810.00	77	3	Zone-3 (Chocolate)
169	J-2019	4,727.00	77	12	Zone-2 (Central)
396	J-3096	4,810.00	77	9	Zone-3 (Chocolate)
222	J-2071	4,730.00	77	16	Zone-2 (Central)
596	J-6020 Ph 4	5,126.00	77	4	Zone 6 (Boundary)
235	J-2086	4,731.00	77	7	Zone-2 (Central)
519	J-4055C	4,944.00	78	3	Zone-4 (Sidehill/Chimney)
224	J-2073	4,729.00	78	8	Zone-2 (Central)
411	J-3111	4,808.00	78	6	Zone-3 (Chocolate)
571	J-3194	4,807.00	78	2	Zone-3 (Chocolate)
572	J-3193	4,807.00	78	3	Zone-3 (Chocolate)
249	J-2104	4,730.00	78	7	Zone-2 (Central)
366	J-3072	4,807.00	78	2	Zone-3 (Chocolate)
365	J-3071	4,807.00	78	0	Zone-3 (Chocolate)
469	J-4022C	4,943.00	78	2	Zone-4 (Sidehill/Chimney)
150	J-2002	4,710.00	78	7	Zone-2 (Central)

	J-2003	4,710.00	78	3	Zone-2 (Central)
592	J-6008 Ph1	5,123.20	78	6	Zone 6 (Boundary)
478	J-4009S	4,942.00	78	2	Zone-4 (Sidehill/Chimney)
410	J-3110	4,806.00	78	1	Zone-3 (Chocolate)
230	J-2075	4,727.00	79	19	Zone-2 (Central)
255	J-2141	4,728.00	79	11	Zone-2 (Central)
386	J-3086	4,804.00	79	12	Zone-3 (Chocolate)
286	J-2112	4,738.00	79	14	Zone-2 (Central)
254	J-2138	4,726.00	80	10	Zone-2 (Central)
263	J-2136	4,726.00	80	10	Zone-2 (Central)
417	J-3121	4,802.00	80	1	Zone-3 (Chocolate)
502	J-4033C	4,938.00	80	5	Zone-4 (Sidehill/Chimney)
248	J-2103	4,724.00	80	18	Zone-2 (Central)
253	J-2139	4,724.00	80	12	Zone-2 (Central)
597	J-6021 Ph 4	5,118.00	81	3	Zone 6 (Boundary)
409	J-3109	4,801.00	81	5	Zone-3 (Chocolate)
210	J-2056	4,721.00	81	4	Zone-2 (Central)
325	J-3031	4,801.00	81	4	Zone-3 (Chocolate)
323	J-3027	4,801.00	81	10	Zone-3 (Chocolate)
556	J-2148	4,727.00	81	0	Zone-2 (Central)
324	J-3028	4,800.00	81	0	Zone-3 (Chocolate)
236	J-2083	4,722.00	81	9	Zone-2 (Central)
554	J-4080S	4,935.00	81	0	Zone-4 (Sidehill/Chimney)
553	J-4079S	4,935.00	81	0	Zone-4 (Sidehill/Chimney)
163	J-2013	4,716.00	82	20	Zone-2 (Central)
252	J-2120	4,721.00	82	10	Zone-2 (Central)
408	J-3108	4,798.00	82	6	Zone-3 (Chocolate)
612	J-6010 Ph1	5,115.09	82	3	Zone 6 (Boundary)
310	J-3012	4,799.00	82	10	Zone-3 (Chocolate)
225	J-2074	4,719.00	82	7	Zone-2 (Central)
152	J-2004	4,700.00	82	3	Zone-2 (Central)
395	J-3095	4,797.00	82	6	Zone-3 (Chocolate)
579	J-4083S	4,932.80	82	3	Zone-4 (Sidehill/Chimney)
208	J-2054	4,717.00	82	3	Zone-2 (Central)
290	J-2123	4,729.00	83	3	Zone-2 (Central)
237	J-2082	4,718.00	83	11	Zone-2 (Central)
555	J-4081S	4,930.00	84	0	Zone-4 (Sidehill/Chimney)
489	J-4020S	4,930.00	84	2	Zone-4 (Sidehill/Chimney)
493	J-4024C	4,929.00	84	3	Zone-4 (Sidehill/Chimney)
264	J-2137	4,715.00	84	10	Zone-2 (Central)
388	J-3088	4,792.00	84	7	Zone-3 (Chocolate)
387	J-3087	4,792.00	84	4	Zone-3 (Chocolate)
506	J-4038C	4,928.00	84	5	Zone-4 (Sidehill/Chimney)
407	J-3107	4,792.00	84	5	Zone-3 (Chocolate)
344	J-3045	4,792.00	84	6	Zone-3 (Chocolate)
480	J-4011S	4,928.00	85	3	Zone-4 (Sidehill/Chimney)
273	J-2134	4,720.00	85	8	Zone-2 (Central)
494	J-4025C	4,927.00	85	1	Zone-4 (Sidehill/Chimney)
368	J-3074	4,790.00	85	5	Zone-3 (Chocolate)
367	J-3073	4,790.00	85	8	Zone-3 (Chocolate)
218	J-2067	4,708.00	85	13	Zone-2 (Central)
226	J-2078	4,713.00	86	5	Zone-2 (Central)
406	J-3106	4,789.00	86	11	Zone-3 (Chocolate)
492	J-4037C	4,925.00	86	0	Zone-4 (Sidehill/Chimney)
587	J-6001	5,106.13	86	0	Zone 6 (Boundary)
311	J-3013	4,790.00	86	5	Zone-3 (Chocolate)
405	J-3105	4,787.00	87	4	Zone-3 (Chocolate)
530	J-4062C	4,923.00	87	15	Zone-4 (Sidehill/Chimney)
507	J-4039C	4,923.00	87	3	Zone-4 (Sidehill/Chimney)
229	J-2081	4,710.00	87	7	Zone-2 (Central)
291	J-2113	4,720.00	87	7	Zone-2 (Central)
390	J-3090	4,785.00	87	2	Zone-3 (Chocolate)
389	J-3089	4,785.00	87	0	Zone-3 (Chocolate)
491	J-4036C	4,921.00	87	2	Zone-4 (Sidehill/Chimney)
221	J-2070	4,706.00	87	8	Zone-2 (Central)
394	J-3094	4,784.00	88	6	Zone-3 (Chocolate)
247	J-2102	4,708.00	88	20	Zone-2 (Central)

	J-Section 5.3.2	4,704.00	88	0	<None>
345	J-3047	4,784.00	88	4	Zone-3 (Chocolate)
270	J-2114	4,713.00	88	13	Zone-2 (Central)
167	J-2017	4,700.00	88	8	Zone-2 (Central)
577	J-4084S	4,919.00	88	2	Zone-4 (Sidehill/Chimney)
207	J-2053	4,703.00	88	5	Zone-2 (Central)
220	J-2069	4,703.00	89	6	Zone-2 (Central)
227	J-2079	4,706.00	89	6	Zone-2 (Central)
217	J-2066	4,701.00	89	8	Zone-2 (Central)
426	J-3129	4,781.00	89	5	Zone-3 (Chocolate)
261	J-2119	4,705.00	89	12	Zone-2 (Central)
404	J-3104	4,781.00	89	7	Zone-3 (Chocolate)
403	J-3103	4,781.00	89	3	Zone-3 (Chocolate)
503	J-4035C	4,917.00	89	1	Zone-4 (Sidehill/Chimney)
531	J-4063C	4,917.00	89	10	Zone-4 (Sidehill/Chimney)
524	J-4056C	4,917.00	89	6	Zone-4 (Sidehill/Chimney)
209	J-2055	4,701.00	89	3	Zone-2 (Central)
438	J-3141	4,780.00	89	4	Zone-3 (Chocolate)
450	J-3155	4,779.00	90	4	Zone-3 (Chocolate)
266	J-2117	4,706.00	90	12	Zone-2 (Central)
369	J-3075	4,779.00	90	14	Zone-3 (Chocolate)
166	J-2016	4,696.00	90	20	Zone-2 (Central)
168	J-2018	4,696.00	90	15	Zone-2 (Central)
532	J-4064C	4,915.00	90	0	Zone-4 (Sidehill/Chimney)
547	J-3177	4,780.00	90	0	Zone-3 (Chocolate)
548	J-3178	4,780.00	90	0	Zone-3 (Chocolate)
1404	J-4107 School	4,915.00	90	0	Zone-4 (Sidehill/Chimney)
1402	J-4106 School	4,915.00	90	0	Zone-4 (Sidehill/Chimney)
162	J-2012	4,696.00	90	18	Zone-2 (Central)
267	J-2116	4,707.00	90	5	Zone-2 (Central)
269	J-2115	4,707.00	90	5	Zone-2 (Central)
504	J-4034C	4,914.00	90	7	Zone-4 (Sidehill/Chimney)
425	J-3128	4,777.00	91	6	Zone-3 (Chocolate)
265	J-2118	4,703.00	91	22	Zone-2 (Central)
420	J-3123	4,777.00	91	9	Zone-3 (Chocolate)
298	J-2110	4,699.00	91	7	Zone-2 (Central)
216	J-2065	4,697.00	91	7	Zone-2 (Central)
228	J-2080	4,701.00	91	9	Zone-2 (Central)
393	J-3093	4,776.00	91	3	Zone-3 (Chocolate)
219	J-2068	4,696.00	91	4	Zone-2 (Central)
206	J-2052	4,696.00	91	5	Zone-2 (Central)
335	J-3039	4,776.00	91	7	Zone-3 (Chocolate)
424	J-3127	4,775.00	91	6	Zone-3 (Chocolate)
508	J-4045C	4,911.00	92	3	Zone-4 (Sidehill/Chimney)
509	J-4044C	4,911.00	92	8	Zone-4 (Sidehill/Chimney)
285	J-2111	4,710.00	92	10	Zone-2 (Central)
413	J-3113	4,774.00	92	2	Zone-3 (Chocolate)
392	J-3091	4,774.00	92	1	Zone-3 (Chocolate)
391	J-3092	4,774.00	92	0	Zone-3 (Chocolate)
536	J-4068C	4,910.00	92	12	Zone-4 (Sidehill/Chimney)
529	J-4061C	4,910.00	92	13	Zone-4 (Sidehill/Chimney)
423	J-3126	4,773.00	92	11	Zone-3 (Chocolate)
421	J-3124	4,773.00	92	12	Zone-3 (Chocolate)
422	J-3125	4,772.00	93	9	Zone-3 (Chocolate)
479	J-4010S	4,908.00	93	4	Zone-4 (Sidehill/Chimney)
299	J-2109	4,693.00	93	6	Zone-2 (Central)
300	J-2108	4,693.00	93	4	Zone-2 (Central)
441	J-3145	4,771.00	93	2	Zone-3 (Chocolate)
448	J-3148	4,771.00	93	3	Zone-3 (Chocolate)
274	J-3157	4,770.00	94	0	Zone-3 (Chocolate)
451	J-3156	4,770.00	94	1	Zone-3 (Chocolate)
439	J-3142	4,770.00	94	0	Zone-3 (Chocolate)
440	J-3143	4,770.00	94	1	Zone-3 (Chocolate)
442	J-3146	4,770.00	94	5	Zone-3 (Chocolate)
449	J-3147	4,770.00	94	0	Zone-3 (Chocolate)
542	J-4074C	4,906.00	94	4	Zone-4 (Sidehill/Chimney)
431	J-3134	4,768.00	95	9	Zone-3 (Chocolate)

	J-2061	4,687.00	95	9	Zone-2 (Central)
428	J-3131	4,766.00	95	17	Zone-3 (Chocolate)
430	J-3133	4,766.00	95	12	Zone-3 (Chocolate)
432	J-3135	4,766.00	95	19	Zone-3 (Chocolate)
437	J-3140	4,766.00	95	12	Zone-3 (Chocolate)
463	J-3144	4,766.00	96	2	Zone-3 (Chocolate)
540	J-4072C	4,902.00	96	0	Zone-4 (Sidehill/Chimney)
427	J-3130	4,765.00	96	6	Zone-3 (Chocolate)
370	J-3076	4,765.00	96	5	Zone-3 (Chocolate)
198	J-2060	4,685.00	96	8	Zone-2 (Central)
153	J-2005	4,667.00	96	5	Zone-2 (Central)
246	J-2101	4,693.00	96	17	Zone-2 (Central)
527	J-4059C	4,900.00	97	10	Zone-4 (Sidehill/Chimney)
490	J-4021S	4,900.00	97	0	Zone-4 (Sidehill/Chimney)
495	J-4026C	4,900.00	97	0	Zone-4 (Sidehill/Chimney)
245	J-2097	4,692.00	97	6	Zone-2 (Central)
414	J-3114	4,763.00	97	11	Zone-3 (Chocolate)
474	J-4005S	4,899.00	97	2	Zone-4 (Sidehill/Chimney)
475	J-4006S	4,899.00	97	1	Zone-4 (Sidehill/Chimney)
337	J-3041	4,763.00	97	11	Zone-3 (Chocolate)
336	J-3040	4,763.00	97	0	Zone-3 (Chocolate)
561	J-3183	4,762.00	97	3	Zone-3 (Chocolate)
433	J-3136	4,762.00	97	4	Zone-3 (Chocolate)
199	J-2059	4,682.00	98	7	Zone-2 (Central)
155	J-2006	4,664.00	98	5	Zone-2 (Central)
279	J-2098	4,700.00	98	2	Zone-2 (Central)
280	J-2099	4,700.00	98	9	Zone-2 (Central)
528	J-4060C	4,897.00	98	2	Zone-4 (Sidehill/Chimney)
473	J-4004S	4,897.00	98	6	Zone-4 (Sidehill/Chimney)
485	J-4016S	4,897.00	98	3	Zone-4 (Sidehill/Chimney)
484	J-4015S	4,897.00	98	2	Zone-4 (Sidehill/Chimney)
297	J-2107	4,683.00	98	14	Zone-2 (Central)
558	J-2149	4,683.00	98	0	Zone-2 (Central)
445	J-3151	4,760.00	98	11	Zone-3 (Chocolate)
436	J-3139	4,760.00	98	12	Zone-3 (Chocolate)
200	J-2058	4,681.00	98	5	Zone-2 (Central)
215	J-2062	4,681.00	98	2	Zone-2 (Central)
541	J-4073C	4,896.00	98	3	Zone-4 (Sidehill/Chimney)
429	J-3132	4,759.00	98	12	Zone-3 (Chocolate)
434	J-3137	4,759.00	98	17	Zone-3 (Chocolate)
301	J-3077	4,759.00	99	1	Zone-3 (Chocolate)
444	J-3150	4,758.00	99	10	Zone-3 (Chocolate)
443	J-3149	4,758.00	99	22	Zone-3 (Chocolate)
161	J-2011	4,675.00	99	54	Zone-2 (Central)
472	J-4003S	4,893.00	100	3	Zone-4 (Sidehill/Chimney)
576	J-4082S	4,893.00	100	3	Zone-4 (Sidehill/Chimney)
278	J-2096	4,687.00	100	12	Zone-2 (Central)
534	J-4066C	4,892.00	100	4	Zone-4 (Sidehill/Chimney)
544	J-4078C	4,892.00	100	6	Zone-4 (Sidehill/Chimney)
539	J-4071C	4,892.00	100	1	Zone-4 (Sidehill/Chimney)
447	J-3153	4,755.00	100	10	Zone-3 (Chocolate)
446	J-3152	4,755.00	100	13	Zone-3 (Chocolate)
435	J-3138	4,755.00	100	13	Zone-3 (Chocolate)
212	J-2064	4,678.00	100	7	Zone-2 (Central)
580	J-4086S	4,890.00	101	3	Zone-4 (Sidehill/Chimney)
476	J-4007S	4,890.00	101	2	Zone-4 (Sidehill/Chimney)
470	J-4001S	4,890.00	101	2	Zone-4 (Sidehill/Chimney)
211	J-2063	4,674.00	101	7	Zone-2 (Central)
538	J-4070C	4,889.00	101	2	Zone-4 (Sidehill/Chimney)
419	J-3122	4,751.00	102	0	Zone-3 (Chocolate)
201	J-2057	4,672.00	102	8	Zone-2 (Central)
205	J-2051	4,671.00	102	5	Zone-2 (Central)
214	J-2050	4,671.00	102	5	Zone-2 (Central)
276	J-2094	4,681.00	102	4	Zone-2 (Central)
550	J-3181	4,750.00	103	0	Zone-3 (Chocolate)
487	J-4018	4,885.00	103	3	Zone-4 (Sidehill/Chimney)
486	J-4017S	4,885.00	103	3	Zone-4 (Sidehill/Chimney)

	J-6045	5,066.00	103	0	Zone 6 (Boundary)
1313	J-5001	5,066.00	103	0	<None>
275	J-3115	4,748.00	103	3	Zone-3 (Chocolate)
526	J-4058C	4,884.00	103	2	Zone-4 (Sidehill/Chimney)
195	J-2044	4,667.00	104	13	Zone-2 (Central)
277	J-2095	4,681.00	104	7	Zone-2 (Central)
158	J-2009	4,664.00	104	2	Zone-2 (Central)
154	J-2007	4,649.00	104	35	Zone-2 (Central)
202	J-2046	4,664.00	105	4	Zone-2 (Central)
213	J-2049	4,664.00	105	5	Zone-2 (Central)
543	J-4075C	4,879.00	106	4	Zone-4 (Sidehill/Chimney)
203	J-2047	4,662.00	106	8	Zone-2 (Central)
157	J-2008	4,659.00	106	4	Zone-2 (Central)
1380	J-2157	4,681.00	106	0	<None>
471	J-4002S	4,877.00	106	5	Zone-4 (Sidehill/Chimney)
281	J-2100	4,681.00	107	2	Zone-2 (Central)
1331	J-4019	4,875.00	107	0	Zone-4 (Sidehill/Chimney)
159	J-2010	4,655.00	108	4	Zone-2 (Central)
535	J-4067C	4,873.00	108	9	Zone-4 (Sidehill/Chimney)
537	J-4069C	4,871.00	109	8	Zone-4 (Sidehill/Chimney)
204	J-2048	4,654.00	109	4	Zone-2 (Central)
196	J-2045	4,651.00	110	2	Zone-2 (Central)
156	J-3007	4,720.00	116	10	Zone-3 (Chocolate)
546	J-4077C	4,851.00	118	7	Zone-4 (Sidehill/Chimney)
545	J-4076C	4,851.00	118	4	Zone-4 (Sidehill/Chimney)
284	J-3120	4,700.00	123	0	Zone-3 (Chocolate)
334	J-3038	4,692.00	127	8	Zone Exempt
282	J-3117	4,681.00	131	2	Zone-3 (Chocolate)
415	J-3118	4,681.00	131	2	Zone Exempt
416	J-3119	4,681.00	131	2	Zone Exempt
283	J-3116	4,675.00	133	0	Zone-3 (Chocolate)
333	J-3037	4,662.00	140	3	Zone Exempt
160	J-3006	4,662.00	140	5	Zone-3 (Chocolate)
305	J-3004	4,660.00	141	0	Zone-3 (Chocolate)
306	J-3005	4,660.00	141	2	Zone-3 (Chocolate)
302	J-3035	4,648.00	146	0	Zone-3 (Chocolate)
303	J-3001	4,648.00	146	0	Zone-3 (Chocolate)
304	J-3002	4,648.00	146	0	Zone-3 (Chocolate)
458	J-3172	4,648.00	146	0	Zone Exempt
459	J-3175	4,648.00	146	0	Zone Exempt
460	J-3174	4,648.00	146	0	Zone Exempt
126	J-3003	4,645.00	148	0	Zone-3 (Chocolate)
332	J-3036	4,645.00	148	0	Zone-3 (Chocolate)
586	J-6046	4,900.00	175	0	Zone 5 (West7th)

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Peak Hour

Scenario Summary Report
Scenario: Existing SVGID System

Scenario Summary

ID	64
Label	Existing SVGID System
Notes	
Active Topology	Base-Active Topology
Physical	Existing System
Demand	6950 Peak Hour
Initial Settings	Existing System Pumps OFF Tanks at LWL
Operational	Pumps OFF
Age	Base-Age Alternative
Constituent	Base-Constituent
Trace	Base-Trace Alternative
Fire Flow	500 GPM at all Nodes
Energy Cost	Base-Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base-User Data
Steady State/EPS Solver Calculation Options	Proposed SVGID System
Transient Solver Calculation Options	Base Calculation Options

Hydraulic Summary

Time Analysis Type	Steady State	Use simple controls during steady state?	True
Friction Method	Hazen-Williams	Is EPS Snapshot?	False
Accuracy	0.001	Start Time	12:00:00 AM
Trials	40	Calculation Type	Fire Flow

Scenario: Existing SVGID System
Current Time Step: 0.000 h
FlexTable: Tank Table

Label	Zone	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Diameter (ft)	Volume Full (Calculated) (gal)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Eastside	Zone-1-2-3	4,963.00	4,963.00	4,989.25	4,992.92	90.00	1,423,863.12	1,238	4,989.25
Chocolate	Zone-1-2-3	4,964.25	4,964.25	4,989.25	4,992.92	74.00	922,386.13	699	4,989.25
Klondike	Zone-1-2-3	4,968.00	4,968.00	4,989.25	4,992.92	107.00	1,676,243.96	928	4,989.25
Juniper Terr. Tank	Zone-1-2-3	4,952.29	4,952.29	4,974.94	4,974.94	60.00	479,062.68	0	4,974.94
Sidehill	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,123.59	5,134.41	40.00	285,863.06	118	5,123.59
Chimney 1	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,123.59	5,135.09	40.00	292,255.26	212	5,123.59
Westside Tank	Zone-3 (Chocolate)	4,961.90	4,961.90	4,989.25	4,992.92	90.00	1,476,211.03	1,258	4,989.25
Boundary Tank	Zone 6 (Boundary)	5,279.50	5,279.50	5,304.50	5,315.50	80.00	1,353,642.89	285	5,304.50
Chimney 2	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,123.59	5,135.09	75.00	1,027,459.90	210	5,123.59

4948 gpm ✓

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$$\frac{6950 \times 1025}{1440} = 4947 \text{ gpm } ✓$$

Scenario: Existing SVGID System
Current Time Step: 0.000 h
FlexTable: Junction Table

SORT

<30 ok Exempt

>30 ok

ID	Label	Elevation (ft)	Pressure (psi)	Demand (gpm)	Zone
483	J-4014S	5,100.00	10	0	Zone Exempt
518	J-4050C	5,100.00	10	0	Zone Exempt
619	J-4087C	5,100.00	10	0	Zone Exempt
373	J-3055	4,950.00	15	0	Zone Exempt
468	J-3171	4,949.00	15	0	Zone Exempt
374	J-3056	4,943.00	18	0	Zone Exempt
351	J-3052	4,925.00	26	0	Zone Exempt
371	J-3053	4,925.00	26	1	Zone Exempt
372	J-3054	4,921.00	27	0	Zone Exempt
350	J-3051	4,909.00	32	3	Zone Exempt
193	J-2043	4,810.00	34	4	Zone-2 (Central)
557	J-2151	4,810.00	34	0	Zone-2 (Central)
174	J-2025	4,806.00	35	8	Zone-2 (Central)
566	J-3203	4,895.00	38	11	Zone-3 (Chocolate)
584	J-3198	4,900.00	38	0	Zone Exempt
585	J-3199	4,900.00	38	0	Zone Exempt
185	J-2042	4,797.00	39	15	Zone-2 (Central)
565	J-3202	4,891.32	39	11	Zone-3 (Chocolate)
574	J-3208 (SM Ph4 Option 3)	4,891.00	40	11	Zone-3 (Chocolate)
567	J-3207 (SM Ph4 Option 3)	4,891.00	40	12	Zone-3 (Chocolate)
461	J-3173	4,648.00	40	0	Zone Exempt
462	J-3176	4,648.00	40	0	Zone Exempt
328	J-3026	4,892.00	40	0	Zone Exempt
616	J-6031 Ph 6	5,210.00	41	5	Zone 6 (Boundary)
359	J-3065	4,888.00	41	4	Zone-3 (Chocolate)
375	J-3078	4,887.00	42	0	Zone-3 (Chocolate)
189	J-2041	4,790.00	42	7	Zone-2 (Central)
615	J-6030 Ph 6	5,205.00	43	7	Zone 6 (Boundary)
141	J-1015	4,665.00	44	6	Zone-1 (Southern)
456	J-3165	4,882.00	44	8	Zone-3 (Chocolate)
331	J-3034	4,882.00	44	11	Zone-3 (Chocolate)
349	J-3050	4,882.00	44	6	Zone-3 (Chocolate)
560	J-2150	4,785.00	44	0	Zone-2 (Central)
356	J-3062	4,881.00	44	10	Zone-3 (Chocolate)
129	J-1006	4,664.00	44	7	Zone-1 (Southern)
614	J-6029 Ph 6	5,200.00	45	15	Zone 6 (Boundary)
376	J-3158	4,880.00	45	9	Zone-3 (Chocolate)
128	J-1004	4,662.00	45	7	Zone-1 (Southern)
131	J-1002	4,662.00	45	9	Zone-1 (Southern)
148	J-1021	4,662.00	45	3	Zone-1 (Southern)
130	J-1007	4,661.00	46	2	Zone-1 (Southern)
357	J-3063	4,877.00	46	13	Zone-3 (Chocolate)
240	J-2089	4,784.00	47	7	Zone-2 (Central)
147	J-1022	4,659.00	47	1	Zone-1 (Southern)
379	J-3079	4,876.00	47	6	Zone-3 (Chocolate)
140	J-1014	4,658.00	47	6	Zone-1 (Southern)
188	J-2040	4,779.00	47	8	Zone-2 (Central)
358	J-3064	4,875.00	47	7	Zone-3 (Chocolate)
1368	J-3200	4,875.00	47	0	Zone-3 (Chocolate)
604	J-6015 Ph 2	5,194.00	48	0	Zone 6 (Boundary)
588	J-6034	5,194.00	48	0	Zone 5 (West7th)
523	J-4051C	5,011.00	48	8	Zone-4 (Sidehill/Chimney)
517	J-4049C	5,010.00	49	1	Zone-4 (Sidehill/Chimney)
145	J-1019	4,653.00	49	2	Zone-1 (Southern)
133	J-1005	4,653.00	49	1	Zone-1 (Southern)
146	J-1020	4,653.00	49	8	Zone-1 (Southern)
165	J-2015	4,776.00	49	11	Zone-2 (Central)

564	J-3186	4,868.30	49	13	Zone-3 (Chocolate)
175	J-2022	4,773.00	50	6	Zone-2 (Central)
241	J-2090	4,777.00	50	21	Zone-2 (Central)
380	J-3080	4,869.00	50	2	Zone-3 (Chocolate)
144	J-1018	4,651.00	50	14	Zone-1 (Southern)
378	J-3160	4,869.00	50	23	Zone-3 (Chocolate)
1396	J-6014 Ph 2	5,188.00	50	13	Zone 6 (Boundary)
402	J-3102	4,867.00	51	11	Zone-3 (Chocolate)
467	J-3170	4,870.00	51	6	Zone-3 (Chocolate)
464	J-3168	4,870.00	51	7	Zone-3 (Chocolate)
132	J-1003	4,649.00	51	2	Zone-1 (Southern)
516	J-4048C	5,004.00	51	6	Zone-4 (Sidehill/Chimney)
360	J-3066	4,863.00	52	6	Zone-3 (Chocolate)
354	J-3060	4,863.00	52	6	Zone-3 (Chocolate)
355	J-3061	4,863.00	52	2	Zone-3 (Chocolate)
348	J-3049	4,863.00	52	16	Zone-3 (Chocolate)
575	J-3204	4,861.21	52	10	Zone-3 (Chocolate)
482	J-4013S	5,002.00	53	4	Zone-4 (Sidehill/Chimney)
1370	J-3201	4,863.00	53	0	Zone-3 (Chocolate)
238	J-2087	4,770.00	53	16	Zone-2 (Central)
239	J-2088	4,770.00	53	13	Zone-2 (Central)
330	J-3033	4,862.00	53	15	Zone-3 (Chocolate)
296	J-2131	4,790.00	53	23	Zone-2 (Central)
498	J-4028C	4,999.00	53	4	Zone-4 (Sidehill/Chimney)
377	J-3159	4,861.00	54	11	Zone-3 (Chocolate)
381	J-3081	4,860.00	54	20	Zone-3 (Chocolate)
568	J-3206	4,857.83	54	7	Zone-3 (Chocolate)
608	J-6003 Ph1	5,179.37	54	6	Zone 6 (Boundary)
183	J-2035	4,763.00	54	23	Zone-2 (Central)
178	J-2030	4,762.00	54	15	Zone-2 (Central)
603	J-6027 Ph 4	5,178.00	54	13	Zone 6 (Boundary)
401	J-3101	4,858.00	54	16	Zone-3 (Chocolate)
525	J-4057C	4,995.00	55	18	Zone-4 (Sidehill/Chimney)
187	J-2039	4,760.00	55	18	Zone-2 (Central)
143	J-1017	4,639.00	55	23	Zone-1 (Southern)
339	J-2145	4,763.00	55	0	Zone-2 (Central)
338	J-2146	4,763.00	55	0	Zone-2 (Central)
127	J-1001	4,639.00	55	7	Zone-1 (Southern)
308	J-3010	4,860.00	55	9	Zone-3 (Chocolate)
521	J-4052C	4,993.00	56	11	Zone-4 (Sidehill/Chimney)
605	J-6013 Ph 2	5,174.00	56	13	Zone 6 (Boundary)
184	J-2038	4,758.00	56	11	Zone-2 (Central)
142	J-1016	4,636.00	57	13	Zone-1 (Southern)
353	J-3059	4,853.00	57	9	Zone-3 (Chocolate)
134	J-1008	4,635.00	57	8	Zone-1 (Southern)
559	J-2153	4,756.00	57	0	Zone-3 (Chocolate)
250	J-2106	4,760.00	57	13	Zone-2 (Central)
582	J-2155	4,760.00	57	0	Zone-1 (Southern)
260	J-2144	4,760.00	57	7	Zone-2 (Central)
295	J-2130	4,780.00	57	11	Zone-2 (Central)
242	J-2092	4,759.00	58	13	Zone-2 (Central)
243	J-2093	4,759.00	58	3	Zone-2 (Central)
182	J-2034	4,753.00	58	13	Zone-2 (Central)
610	J-6006 Ph1	5,168.84	58	11	Zone 6 (Boundary)
511	J-4043C	4,987.00	59	6	Zone-4 (Sidehill/Chimney)
382	J-3082	4,848.00	59	21	Zone-3 (Chocolate)
400	J-3100	4,848.00	59	12	Zone-3 (Chocolate)
347	J-3048	4,848.00	59	2	Zone-3 (Chocolate)
361	J-3068	4,847.00	59	7	Zone-3 (Chocolate)
186	J-2036	4,751.00	59	21	Zone-2 (Central)
581	J-2154	4,755.00	59	0	Zone-1 (Southern)
569	J-3191	4,844.00	60	10	Zone-3 (Chocolate)
466	J-3167	4,848.00	60	4	Zone-3 (Chocolate)
578	J-4085S	4,983.00	60	0	Zone-4 (Sidehill/Chimney)
563	J-3185	4,842.90	60	10	Zone-3 (Chocolate)
602	J-6026 Ph 4	5,164.00	61	9	Zone 6 (Boundary)
251	J-2105	4,752.00	61	15	Zone-2 (Central)

	J-2024	4,747.00	61	15	Zone-2 (Central)
177	J-2029	4,747.00	61	11	Zone-2 (Central)
362	J-3067	4,843.00	61	10	Zone-3 (Chocolate)
232	J-2077	4,750.00	61	13	Zone-2 (Central)
136	J-1011	4,625.00	61	5	Zone-1 (Southern)
137	J-1013	4,625.00	61	7	Zone-1 (Southern)
607	J-6011 Ph2	5,162.00	61	20	Zone 6 (Boundary)
256	J-2122	4,750.00	62	11	Zone-2 (Central)
293	J-2128	4,770.00	62	8	Zone-2 (Central)
505	J-4031C	4,980.00	62	2	Zone-4 (Sidehill/Chimney)
454	J-3163	4,843.00	62	3	Zone-3 (Chocolate)
181	J-2033	4,745.00	62	16	Zone-2 (Central)
164	J-2014	4,745.00	62	78	Zone-2 (Central)
173	J-2026	4,744.00	62	6	Zone-2 (Central)
594	J-6018 Ph 4	5,160.00	62	13	Zone 6 (Boundary)
617	J-6016 Ph 3	5,160.00	62	11	Zone 6 (Boundary)
606	J-6012 Ph 2	5,160.00	62	11	Zone 6 (Boundary)
465	J-3169	4,843.00	62	13	Zone-3 (Chocolate)
257	J-2121	4,748.00	62	16	Zone-2 (Central)
452	J-3161	4,840.00	63	1	Zone-3 (Chocolate)
399	J-3099	4,839.00	63	18	Zone-3 (Chocolate)
259	J-2142	4,747.00	63	18	Zone-2 (Central)
135	J-1009	4,621.00	63	15	Zone-1 (Southern)
231	J-2076	4,746.00	63	25	Zone-2 (Central)
383	J-3083	4,838.00	63	20	Zone-3 (Chocolate)
271	J-2132	4,758.00	63	11	Zone-2 (Central)
180	J-2031	4,741.00	63	19	Zone-2 (Central)
317	J-3020	4,840.00	64	11	Zone-3 (Chocolate)
258	J-2143	4,745.00	64	35	Zone-2 (Central)
1327	J-2156	4,745.00	64	0	<None>
513	J-4041C	4,975.00	64	1	Zone-4 (Sidehill/Chimney)
138	J-1012	4,619.00	64	11	Zone-1 (Southern)
171	J-2023	4,740.00	64	10	Zone-2 (Central)
342	J-3044	4,836.00	64	18	Zone-3 (Chocolate)
191	J-2032	4,740.00	64	3	Zone-2 (Central)
307	J-3008	4,840.00	64	6	Zone-3 (Chocolate)
139	J-1010	4,618.00	64	5	Zone-1 (Southern)
609	J-6005 Ph1	5,155.32	64	10	Zone 6 (Boundary)
244	J-2091	4,743.00	64	17	Zone-2 (Central)
589	J-6002 Ph1	5,154.57	65	6	Zone 6 (Boundary)
288	J-2126	4,763.00	65	16	Zone-2 (Central)
352	J-3058	4,834.00	65	8	Zone-3 (Chocolate)
343	J-3046	4,834.00	65	11	Zone-3 (Chocolate)
329	J-3032	4,834.00	65	14	Zone-3 (Chocolate)
262	J-2140	4,743.00	65	13	Zone-2 (Central)
170	J-2021	4,737.00	65	17	Zone-2 (Central)
453	J-3162	4,834.00	65	19	Zone-3 (Chocolate)
268	J-2135	4,748.00	65	21	Zone-2 (Central)
497	J-4027C	4,971.00	65	5	Zone-4 (Sidehill/Chimney)
233	J-2084	4,740.00	66	11	Zone-2 (Central)
321	J-3024	4,833.00	66	1	Zone-3 (Chocolate)
322	J-3025	4,833.00	66	6	Zone-3 (Chocolate)
590	J-6004 Ph1	5,152.08	66	12	Zone 6 (Boundary)
315	J-3017	4,835.00	66	8	Zone-3 (Chocolate)
316	J-3019	4,835.00	66	49	Zone-3 (Chocolate)
583	J-3180	4,835.00	66	0	Zone-3 (Chocolate)
552	J-2147	4,751.00	66	0	Zone-1 (Southern)
287	J-2124	4,760.00	66	11	Zone-2 (Central)
192	J-2037	4,735.00	66	9	Zone-2 (Central)
223	J-2072	4,737.00	67	18	Zone-2 (Central)
515	J-4047C	4,968.00	67	8	Zone-4 (Sidehill/Chimney)
570	J-3192	4,828.00	67	7	Zone-3 (Chocolate)
573	J-3195	4,828.00	67	4	Zone-3 (Chocolate)
613	J-6028 Ph 5	5,149.00	67	9	Zone 6 (Boundary)
179	J-2028	4,732.00	67	25	Zone-2 (Central)
384	J-3084	4,828.00	67	19	Zone-3 (Chocolate)
234	J-2085	4,736.00	67	13	Zone-2 (Central)

	J-2133	4,748.00	67	9	Zone-2 (Central)
499	J-4029C	4,966.00	68	6	Zone-4 (Sidehill/Chimney)
327	J-3029	4,827.00	68	11	Zone-3 (Chocolate)
595	J-6019 Ph 4	5,146.00	68	7	Zone 6 (Boundary)
398	J-3098	4,826.00	68	1	Zone-3 (Chocolate)
190	J-2020	4,730.00	68	23	Zone-2 (Central)
292	J-2127	4,753.00	69	13	Zone-2 (Central)
500	J-4030C	4,963.00	69	3	Zone-4 (Sidehill/Chimney)
512	J-4040C	4,963.00	69	6	Zone-4 (Sidehill/Chimney)
514	J-4046C	4,963.00	69	4	Zone-4 (Sidehill/Chimney)
320	J-3023	4,825.00	69	12	Zone-3 (Chocolate)
176	J-2027	4,727.00	69	16	Zone-2 (Central)
318	J-3021	4,826.00	69	5	Zone-3 (Chocolate)
309	J-3011	4,827.00	70	11	Zone-3 (Chocolate)
1351	J-2152	4,729.75	70	0	<None>
601	J-6025 Ph 4	5,143.00	70	11	Zone 6 (Boundary)
314	J-3016	4,826.00	70	8	Zone-3 (Chocolate)
169	J-2019	4,727.00	70	21	Zone-2 (Central)
235	J-2086	4,731.00	70	13	Zone-2 (Central)
501	J-4032C	4,961.00	70	6	Zone-4 (Sidehill/Chimney)
522	J-4053C	4,961.00	70	7	Zone-4 (Sidehill/Chimney)
222	J-2071	4,730.00	70	28	Zone-2 (Central)
591	J-6007 Ph 1	5,142.51	70	10	Zone 6 (Boundary)
294	J-2129	4,750.00	70	11	Zone-2 (Central)
249	J-2104	4,730.00	70	13	Zone-2 (Central)
224	J-2073	4,729.00	70	14	Zone-2 (Central)
326	J-3030	4,822.00	70	9	Zone-3 (Chocolate)
363	J-3069	4,821.00	70	10	Zone-3 (Chocolate)
496	J-4023C	4,959.00	71	5	Zone-4 (Sidehill/Chimney)
520	J-4054C	4,959.00	71	10	Zone-4 (Sidehill/Chimney)
455	J-3164	4,820.00	71	11	Zone-3 (Chocolate)
600	J-6024 Ph 4	5,140.00	71	9	Zone 6 (Boundary)
481	J-4012S	4,959.00	71	8	Zone-4 (Sidehill/Chimney)
255	J-2141	4,728.00	71	19	Zone-2 (Central)
230	J-2075	4,727.00	71	32	Zone-2 (Central)
562	J-3184	4,816.70	72	9	Zone-3 (Chocolate)
289	J-2125	4,746.00	72	11	Zone-2 (Central)
254	J-2138	4,726.00	72	16	Zone-2 (Central)
599	J-6023 Ph 4	5,137.00	72	8	Zone 6 (Boundary)
397	J-3097	4,817.00	72	16	Zone-3 (Chocolate)
593	J-6017 Ph 3	5,137.00	72	16	Zone 6 (Boundary)
313	J-3015	4,820.00	72	8	Zone-3 (Chocolate)
312	J-3014	4,820.00	72	4	Zone-3 (Chocolate)
533	J-4065C	4,955.00	72	18	Zone-4 (Sidehill/Chimney)
1407	J-4108 School	4,955.00	72	1	<None>
611	J-6009 Ph 1	5,136.51	72	6	Zone 6 (Boundary)
263	J-2136	4,726.00	72	18	Zone-2 (Central)
385	J-3085	4,816.00	73	20	Zone-3 (Chocolate)
248	J-2103	4,724.00	73	30	Zone-2 (Central)
253	J-2139	4,724.00	73	21	Zone-2 (Central)
319	J-3022	4,817.00	73	17	Zone-3 (Chocolate)
194	J-3018	4,818.00	73	12	Zone-3 (Chocolate)
549	J-3182	4,817.00	73	0	Zone-3 (Chocolate)
477	J-4008S	4,953.00	73	6	Zone-4 (Sidehill/Chimney)
149	J-2001	4,720.00	74	9	Zone-1 (Southern)
412	J-3112	4,814.00	74	10	Zone-3 (Chocolate)
510	J-4042C	4,952.00	74	11	Zone-4 (Sidehill/Chimney)
210	J-2056	4,721.00	74	6	Zone-2 (Central)
346	J-3057	4,813.00	74	19	Zone-3 (Chocolate)
236	J-2083	4,722.00	74	16	Zone-2 (Central)
252	J-2120	4,721.00	74	17	Zone-2 (Central)
556	J-2148	4,727.00	75	0	Zone-2 (Central)
364	J-3070	4,811.00	75	4	Zone-3 (Chocolate)
163	J-2013	4,716.00	75	34	Zone-2 (Central)
225	J-2074	4,719.00	75	13	Zone-2 (Central)
341	J-3043	4,811.00	75	10	Zone-3 (Chocolate)
340	J-3042	4,811.00	75	11	Zone-3 (Chocolate)

	J-3154	4,810.00	75	5	Zone-3 (Chocolate)
396	J-3096	4,810.00	75	15	Zone-3 (Chocolate)
208	J-2054	4,717.00	75	5	Zone-2 (Central)
598	J-6022 Ph 4	5,129.00	76	9	Zone 6 (Boundary)
237	J-2082	4,718.00	76	18	Zone-2 (Central)
286	J-2112	4,738.00	76	23	Zone-2 (Central)
571	J-3194	4,807.00	76	4	Zone-3 (Chocolate)
572	J-3193	4,807.00	76	5	Zone-3 (Chocolate)
411	J-3111	4,808.00	76	10	Zone-3 (Chocolate)
366	J-3072	4,807.00	76	4	Zone-3 (Chocolate)
365	J-3071	4,807.00	76	0	Zone-3 (Chocolate)
264	J-2137	4,715.00	77	17	Zone-2 (Central)
596	J-6020 Ph 4	5,126.00	77	6	Zone 6 (Boundary)
410	J-3110	4,806.00	77	1	Zone-3 (Chocolate)
519	J-4055C	4,944.00	77	6	Zone-4 (Sidehill/Chimney)
469	J-4022C	4,943.00	78	3	Zone-4 (Sidehill/Chimney)
151	J-2003	4,710.00	78	6	Zone-2 (Central)
150	J-2002	4,710.00	78	11	Zone-2 (Central)
386	J-3086	4,804.00	78	20	Zone-3 (Chocolate)
478	J-4009S	4,942.00	78	3	Zone-4 (Sidehill/Chimney)
417	J-3121	4,802.00	78	1	Zone-3 (Chocolate)
592	J-6008 Ph1	5,123.20	78	10	Zone 6 (Boundary)
218	J-2067	4,708.00	78	22	Zone-2 (Central)
226	J-2078	4,713.00	78	8	Zone-2 (Central)
409	J-3109	4,801.00	79	8	Zone-3 (Chocolate)
290	J-2123	4,729.00	79	6	Zone-2 (Central)
273	J-2134	4,720.00	79	13	Zone-2 (Central)
325	J-3031	4,801.00	79	6	Zone-3 (Chocolate)
323	J-3027	4,801.00	79	18	Zone-3 (Chocolate)
502	J-4033C	4,938.00	80	8	Zone-4 (Sidehill/Chimney)
324	J-3028	4,800.00	80	1	Zone-3 (Chocolate)
229	J-2081	4,710.00	80	13	Zone-2 (Central)
221	J-2070	4,706.00	80	14	Zone-2 (Central)
597	J-6021 Ph 4	5,118.00	80	6	Zone 6 (Boundary)
408	J-3108	4,798.00	80	10	Zone-3 (Chocolate)
395	J-3095	4,797.00	81	11	Zone-3 (Chocolate)
247	J-2102	4,708.00	81	33	Zone-2 (Central)
1321	J-Section 5.3.2	4,704.00	81	0	<None>
554	J-4080S	4,935.00	81	0	Zone-4 (Sidehill/Chimney)
553	J-4079S	4,935.00	81	0	Zone-4 (Sidehill/Chimney)
167	J-2017	4,700.00	81	13	Zone-2 (Central)
310	J-3012	4,799.00	81	17	Zone-3 (Chocolate)
207	J-2053	4,703.00	82	8	Zone-2 (Central)
220	J-2069	4,703.00	82	11	Zone-2 (Central)
152	J-2004	4,700.00	82	6	Zone-2 (Central)
612	J-6010 Ph1	5,115.09	82	5	Zone 6 (Boundary)
217	J-2066	4,701.00	82	13	Zone-2 (Central)
227	J-2079	4,706.00	82	10	Zone-2 (Central)
579	J-4083S	4,932.80	82	5	Zone-4 (Sidehill/Chimney)
261	J-2119	4,705.00	82	20	Zone-2 (Central)
209	J-2055	4,701.00	82	5	Zone-2 (Central)
388	J-3088	4,792.00	83	12	Zone-3 (Chocolate)
387	J-3087	4,792.00	83	7	Zone-3 (Chocolate)
407	J-3107	4,792.00	83	9	Zone-3 (Chocolate)
344	J-3045	4,792.00	83	11	Zone-3 (Chocolate)
168	J-2018	4,696.00	83	25	Zone-2 (Central)
270	J-2114	4,713.00	83	22	Zone-2 (Central)
166	J-2016	4,696.00	83	34	Zone-2 (Central)
555	J-4081S	4,930.00	83	0	Zone-4 (Sidehill/Chimney)
489	J-4020S	4,930.00	83	3	Zone-4 (Sidehill/Chimney)
291	J-2113	4,720.00	83	12	Zone-2 (Central)
162	J-2012	4,696.00	84	30	Zone-2 (Central)
266	J-2117	4,706.00	84	20	Zone-2 (Central)
298	J-2110	4,699.00	84	11	Zone-2 (Central)
493	J-4024C	4,929.00	84	5	Zone-4 (Sidehill/Chimney)
368	J-3074	4,790.00	84	9	Zone-3 (Chocolate)
367	J-3073	4,790.00	84	13	Zone-3 (Chocolate)

	J-2065	4,697.00	84	13	Zone-2 (Central)
265	J-2118	4,703.00	84	37	Zone-2 (Central)
506	J-4038C	4,928.00	84	9	Zone-4 (Sidehill/Chimney)
406	J-3106	4,789.00	84	18	Zone-3 (Chocolate)
480	J-4011S	4,928.00	84	5	Zone-4 (Sidehill/Chimney)
219	J-2068	4,696.00	84	6	Zone-2 (Central)
228	J-2080	4,701.00	84	16	Zone-2 (Central)
494	J-4025C	4,927.00	85	2	Zone-4 (Sidehill/Chimney)
206	J-2052	4,696.00	85	9	Zone-2 (Central)
267	J-2116	4,707.00	85	8	Zone-2 (Central)
269	J-2115	4,707.00	85	9	Zone-2 (Central)
405	J-3105	4,787.00	85	6	Zone-3 (Chocolate)
311	J-3013	4,790.00	85	8	Zone-3 (Chocolate)
492	J-4037C	4,925.00	85	1	Zone-4 (Sidehill/Chimney)
587	J-6001	5,106.13	86	1	Zone 6 (Boundary)
389	J-3089	4,785.00	86	0	Zone-3 (Chocolate)
390	J-3090	4,785.00	86	4	Zone-3 (Chocolate)
530	J-4062C	4,923.00	86	25	Zone-4 (Sidehill/Chimney)
507	J-4039C	4,923.00	86	6	Zone-4 (Sidehill/Chimney)
394	J-3094	4,784.00	86	10	Zone-3 (Chocolate)
299	J-2109	4,693.00	86	10	Zone-2 (Central)
345	J-3047	4,784.00	86	6	Zone-3 (Chocolate)
300	J-2108	4,693.00	87	7	Zone-2 (Central)
491	J-4036C	4,921.00	87	3	Zone-4 (Sidehill/Chimney)
426	J-3129	4,781.00	87	8	Zone-3 (Chocolate)
404	J-3104	4,781.00	88	13	Zone-3 (Chocolate)
403	J-3103	4,781.00	88	6	Zone-3 (Chocolate)
438	J-3141	4,780.00	88	7	Zone-3 (Chocolate)
577	J-4084S	4,919.00	88	3	Zone-4 (Sidehill/Chimney)
450	J-3155	4,779.00	88	7	Zone-3 (Chocolate)
197	J-2061	4,687.00	88	15	Zone-2 (Central)
369	J-3075	4,779.00	88	24	Zone-3 (Chocolate)
285	J-2111	4,710.00	89	16	Zone-2 (Central)
503	J-4035C	4,917.00	89	2	Zone-4 (Sidehill/Chimney)
531	J-4063C	4,917.00	89	18	Zone-4 (Sidehill/Chimney)
524	J-4056C	4,917.00	89	10	Zone-4 (Sidehill/Chimney)
425	J-3128	4,777.00	89	11	Zone-3 (Chocolate)
420	J-3123	4,777.00	89	16	Zone-3 (Chocolate)
547	J-3177	4,780.00	89	0	Zone-3 (Chocolate)
548	J-3178	4,780.00	89	0	Zone-3 (Chocolate)
198	J-2060	4,685.00	89	13	Zone-2 (Central)
532	J-4064C	4,915.00	90	0	Zone-4 (Sidehill/Chimney)
1404	J-4107 School	4,915.00	90	0	Zone-4 (Sidehill/Chimney)
1402	J-4106 School	4,915.00	90	0	Zone-4 (Sidehill/Chimney)
424	J-3127	4,775.00	90	10	Zone-3 (Chocolate)
393	J-3093	4,776.00	90	5	Zone-3 (Chocolate)
335	J-3039	4,776.00	90	12	Zone-3 (Chocolate)
504	J-4034C	4,914.00	90	12	Zone-4 (Sidehill/Chimney)
423	J-3126	4,773.00	91	19	Zone-3 (Chocolate)
421	J-3124	4,773.00	91	21	Zone-3 (Chocolate)
413	J-3113	4,774.00	91	3	Zone-3 (Chocolate)
392	J-3091	4,774.00	91	2	Zone-3 (Chocolate)
391	J-3092	4,774.00	91	0	Zone-3 (Chocolate)
199	J-2059	4,682.00	91	11	Zone-2 (Central)
246	J-2101	4,693.00	91	30	Zone-2 (Central)
422	J-3125	4,772.00	91	15	Zone-3 (Chocolate)
297	J-2107	4,683.00	91	23	Zone-2 (Central)
558	J-2149	4,683.00	91	0	Zone-2 (Central)
200	J-2058	4,681.00	91	8	Zone-2 (Central)
245	J-2097	4,692.00	91	10	Zone-2 (Central)
508	J-4045C	4,911.00	91	6	Zone-4 (Sidehill/Chimney)
509	J-4044C	4,911.00	91	13	Zone-4 (Sidehill/Chimney)
215	J-2062	4,681.00	91	3	Zone-2 (Central)
441	J-3145	4,771.00	92	4	Zone-3 (Chocolate)
448	J-3148	4,771.00	92	6	Zone-3 (Chocolate)
536	J-4068C	4,910.00	92	20	Zone-4 (Sidehill/Chimney)
529	J-4061C	4,910.00	92	22	Zone-4 (Sidehill/Chimney)

	J-3157	4,770.00	92	0	Zone-3 (Chocolate)
451	J-3156	4,770.00	92	1	Zone-3 (Chocolate)
439	J-3142	4,770.00	92	0	Zone-3 (Chocolate)
440	J-3143	4,770.00	92	1	Zone-3 (Chocolate)
442	J-3146	4,770.00	92	8	Zone-3 (Chocolate)
449	J-3147	4,770.00	92	0	Zone-3 (Chocolate)
479	J-4010S	4,908.00	93	6	Zone-4 (Sidehill/Chimney)
431	J-3134	4,768.00	93	16	Zone-3 (Chocolate)
161	J-2011	4,675.00	93	91	Zone-2 (Central)
542	J-4074C	4,906.00	94	7	Zone-4 (Sidehill/Chimney)
428	J-3131	4,766.00	94	28	Zone-3 (Chocolate)
430	J-3133	4,766.00	94	20	Zone-3 (Chocolate)
432	J-3135	4,766.00	94	32	Zone-3 (Chocolate)
437	J-3140	4,766.00	94	21	Zone-3 (Chocolate)
463	J-3144	4,766.00	94	4	Zone-3 (Chocolate)
212	J-2064	4,678.00	94	12	Zone-2 (Central)
427	J-3130	4,765.00	94	10	Zone-3 (Chocolate)
370	J-3076	4,765.00	94	8	Zone-3 (Chocolate)
211	J-2063	4,674.00	95	12	Zone-2 (Central)
201	J-2057	4,672.00	95	14	Zone-2 (Central)
278	J-2096	4,687.00	95	21	Zone-2 (Central)
540	J-4072C	4,902.00	95	0	Zone-4 (Sidehill/Chimney)
433	J-3136	4,762.00	95	6	Zone-3 (Chocolate)
414	J-3114	4,763.00	95	18	Zone-3 (Chocolate)
561	J-3183	4,762.00	95	6	Zone-3 (Chocolate)
205	J-2051	4,671.00	95	9	Zone-2 (Central)
214	J-2050	4,671.00	95	8	Zone-2 (Central)
337	J-3041	4,763.00	96	18	Zone-3 (Chocolate)
336	J-3040	4,763.00	96	0	Zone-3 (Chocolate)
153	J-2005	4,667.00	96	8	Zone-2 (Central)
279	J-2098	4,700.00	96	4	Zone-2 (Central)
280	J-2099	4,700.00	96	15	Zone-2 (Central)
527	J-4059C	4,900.00	96	18	Zone-4 (Sidehill/Chimney)
490	J-4021S	4,900.00	96	1	Zone-4 (Sidehill/Chimney)
495	J-4026C	4,900.00	96	0	Zone-4 (Sidehill/Chimney)
445	J-3151	4,760.00	96	19	Zone-3 (Chocolate)
436	J-3139	4,760.00	96	21	Zone-3 (Chocolate)
474	J-4005S	4,899.00	97	3	Zone-4 (Sidehill/Chimney)
475	J-4006S	4,899.00	97	1	Zone-4 (Sidehill/Chimney)
429	J-3132	4,759.00	97	21	Zone-3 (Chocolate)
434	J-3137	4,759.00	97	30	Zone-3 (Chocolate)
195	J-2044	4,667.00	97	23	Zone-2 (Central)
301	J-3077	4,759.00	97	1	Zone-3 (Chocolate)
444	J-3150	4,758.00	97	17	Zone-3 (Chocolate)
443	J-3149	4,758.00	97	37	Zone-3 (Chocolate)
155	J-2006	4,664.00	97	8	Zone-2 (Central)
528	J-4060C	4,897.00	97	4	Zone-4 (Sidehill/Chimney)
473	J-4004S	4,897.00	97	10	Zone-4 (Sidehill/Chimney)
485	J-4016S	4,897.00	97	5	Zone-4 (Sidehill/Chimney)
484	J-4015S	4,897.00	97	4	Zone-4 (Sidehill/Chimney)
541	J-4073C	4,896.00	98	6	Zone-4 (Sidehill/Chimney)
158	J-2009	4,664.00	98	3	Zone-2 (Central)
276	J-2094	4,681.00	98	7	Zone-2 (Central)
202	J-2046	4,664.00	98	7	Zone-2 (Central)
213	J-2049	4,664.00	98	9	Zone-2 (Central)
447	J-3153	4,755.00	98	17	Zone-3 (Chocolate)
446	J-3152	4,755.00	98	23	Zone-3 (Chocolate)
435	J-3138	4,755.00	98	22	Zone-3 (Chocolate)
203	J-2047	4,662.00	99	14	Zone-2 (Central)
472	J-4003S	4,893.00	99	6	Zone-4 (Sidehill/Chimney)
576	J-4082S	4,893.00	99	6	Zone-4 (Sidehill/Chimney)
534	J-4066C	4,892.00	100	7	Zone-4 (Sidehill/Chimney)
544	J-4078C	4,892.00	100	11	Zone-4 (Sidehill/Chimney)
539	J-4071C	4,892.00	100	2	Zone-4 (Sidehill/Chimney)
157	J-2008	4,659.00	100	7	Zone-2 (Central)
419	J-3122	4,751.00	100	0	Zone-3 (Chocolate)
580	J-4086S	4,890.00	101	5	Zone-4 (Sidehill/Chimney)

	J-4007S	4,890.00	101	3	Zone-4 (Sidehill/Chimney)
470	J-4001S	4,890.00	101	3	Zone-4 (Sidehill/Chimney)
538	J-4070C	4,889.00	101	4	Zone-4 (Sidehill/Chimney)
277	J-2095	4,681.00	101	11	Zone-2 (Central)
550	J-3181	4,750.00	102	0	Zone-3 (Chocolate)
159	J-2010	4,655.00	102	7	Zone-2 (Central)
275	J-3115	4,748.00	102	5	Zone-3 (Chocolate)
204	J-2048	4,654.00	102	7	Zone-2 (Central)
487	J-4018	4,885.00	103	6	Zone-4 (Sidehill/Chimney)
486	J-4017S	4,885.00	103	6	Zone-4 (Sidehill/Chimney)
1308	J-6045	5,066.00	103	0	Zone 6 (Boundary)
1313	J-5001	5,066.00	103	0	<None>
526	J-4058C	4,884.00	103	4	Zone-4 (Sidehill/Chimney)
154	J-2007	4,649.00	104	59	Zone-2 (Central)
196	J-2045	4,651.00	104	3	Zone-2 (Central)
1380	J-2157	4,681.00	105	0	<None>
543	J-4075C	4,879.00	105	7	Zone-4 (Sidehill/Chimney)
471	J-4002S	4,877.00	106	9	Zone-4 (Sidehill/Chimney)
281	J-2100	4,681.00	107	3	Zone-2 (Central)
1331	J-4019	4,875.00	107	0	Zone-4 (Sidehill/Chimney)
535	J-4067C	4,873.00	108	15	Zone-4 (Sidehill/Chimney)
537	J-4069C	4,871.00	109	13	Zone-4 (Sidehill/Chimney)
156	J-3007	4,720.00	114	17	Zone-3 (Chocolate)
545	J-4076C	4,851.00	117	7	Zone-4 (Sidehill/Chimney)
546	J-4077C	4,851.00	117	11	Zone-4 (Sidehill/Chimney)
284	J-3120	4,700.00	120	0	Zone-3 (Chocolate)
334	J-3038	4,692.00	125	14	Zone Exempt
282	J-3117	4,681.00	127	3	Zone-3 (Chocolate)
415	J-3118	4,681.00	128	3	Zone Exempt
416	J-3119	4,681.00	128	3	Zone Exempt
283	J-3116	4,675.00	130	0	Zone-3 (Chocolate)
333	J-3037	4,662.00	138	6	Zone Exempt
160	J-3006	4,662.00	138	9	Zone-3 (Chocolate)
305	J-3004	4,660.00	139	0	Zone-3 (Chocolate)
306	J-3005	4,660.00	139	4	Zone-3 (Chocolate)
302	J-3035	4,648.00	144	0	Zone-3 (Chocolate)
303	J-3001	4,648.00	144	0	Zone-3 (Chocolate)
304	J-3002	4,648.00	144	0	Zone-3 (Chocolate)
458	J-3172	4,648.00	144	0	Zone Exempt
459	J-3175	4,648.00	144	0	Zone Exempt
460	J-3174	4,648.00	144	0	Zone Exempt
126	J-3003	4,645.00	145	0	Zone-3 (Chocolate)
332	J-3036	4,645.00	145	0	Zone-3 (Chocolate)
586	J-6046	4,900.00	175	0	Zone 5 (West7th)

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Minimum Month Demand (Static)

Scenario Summary Report
Scenario: Existing SVGID System

Scenario Summary

ID	64
Label	Existing SVGID System
Notes	
Active Topology	Base-Active Topology
Physical	Existing System
Demand	6950 Minimum Month
Initial Settings	Existing System Pumps OFF Tanks at HWL
Operational	Pumps OFF
Age	Base-Age Alternative
Constituent	Base-Constituent
Trace	Base-Trace Alternative
Fire Flow	500 GPM at all Nodes
Energy Cost	Base-Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base-User Data
Steady State/EPS Solver Calculation Options	Proposed SVGID System
Transient Solver Calculation Options	Base Calculation Options

Run model at minimum month because PRV's crash model at 0 demand

Hydraulic Summary

Time Analysis Type	Steady State	Use simple controls during steady state?	True
Friction Method	Hazen-Williams	Is EPS Snapshot?	False
Accuracy	0.001	Start Time	12:00:00 AM
Trials	40	Calculation Type	Fire Flow

Scenario: Existing SVGID System
Current Time Step: 0.000 h
FlexTable: Tank Table

Label	Zone	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Diameter (ft)	Volume Full (Calculated) (gal)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
Eastside	Zone-1-2-3	4,963.00	4,963.00	4,992.92	4,992.92	90.00	1,423,863.12	184	4,992.92
Chocolate	Zone-1-2-3	4,964.25	4,964.25	4,992.92	4,992.92	74.00	922,386.13	88	4,992.92
Klondike	Zone-1-2-3	4,968.00	4,968.00	4,992.92	4,992.92	107.00	1,676,243.96	129	4,992.92
Juniper Terr. Tank	Zone-1-2-3	4,952.29	4,952.29	4,974.94	4,974.94	60.00	479,062.68	0	4,974.94
Sidehill	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,134.41	5,134.41	40.00	285,863.06	0	5,134.41
Chimney 1	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,135.09	5,135.09	40.00	292,255.26	37	5,135.09
Westside Tank	Zone-3 (Chocolate)	4,961.90	4,961.90	4,992.92	4,992.92	90.00	1,476,211.03	162	4,992.92
Boundary Tank	Zone 6 (Boundary)	5,279.50	5,279.50	5,315.50	5,315.50	80.00	1,353,642.89	39	5,315.50
Chimney 2	Zone-4 (Sidehill/Chimney)	5,104.00	5,104.00	5,135.09	5,135.09	75.00	1,027,459.90	37	5,135.09

676 ✓

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$$\frac{6950 \times 140}{1440} = 676 \text{ gpm} ✓$$

Scenario: Existing SVGID System
Current Time Step: 0.000 h
FlexTable: Junction Table

ID	Label	Elevation (ft)	Pressure (psi)	Demand (gpm)	Zone
127	J-1001	4,639.00	55	1	Zone-1 (Southern)
131	J-1002	4,662.00	45	1	Zone-1 (Southern)
132	J-1003	4,649.00	51	0	Zone-1 (Southern)
128	J-1004	4,662.00	45	1	Zone-1 (Southern)
133	J-1005	4,653.00	49	0	Zone-1 (Southern)
129	J-1006	4,664.00	45	1	Zone-1 (Southern)
130	J-1007	4,661.00	46	0	Zone-1 (Southern)
134	J-1008	4,635.00	57	1	Zone-1 (Southern)
135	J-1009	4,621.00	63	2	Zone-1 (Southern)
139	J-1010	4,618.00	64	1	Zone-1 (Southern)
136	J-1011	4,625.00	61	1	Zone-1 (Southern)
138	J-1012	4,619.00	64	2	Zone-1 (Southern)
137	J-1013	4,625.00	61	1	Zone-1 (Southern)
140	J-1014	4,658.00	47	1	Zone-1 (Southern)
141	J-1015	4,665.00	44	1	Zone-1 (Southern)
142	J-1016	4,636.00	57	2	Zone-1 (Southern)
143	J-1017	4,639.00	55	3	Zone-1 (Southern)
144	J-1018	4,651.00	50	2	Zone-1 (Southern)
145	J-1019	4,653.00	49	0	Zone-1 (Southern)
146	J-1020	4,653.00	49	1	Zone-1 (Southern)
148	J-1021	4,662.00	45	0	Zone-1 (Southern)
147	J-1022	4,659.00	47	0	Zone-1 (Southern)
149	J-2001	4,720.00	90	1	Zone-1 (Southern)
150	J-2002	4,710.00	94	2	Zone-2 (Central)
151	J-2003	4,710.00	94	1	Zone-2 (Central)
152	J-2004	4,700.00	99	1	Zone-2 (Central)
153	J-2005	4,667.00	113	1	Zone-2 (Central)
155	J-2006	4,664.00	114	1	Zone-2 (Central)
154	J-2007	4,649.00	121	8	Zone-2 (Central)
157	J-2008	4,659.00	117	1	Zone-2 (Central)
158	J-2009	4,664.00	114	0	Zone-2 (Central)
159	J-2010	4,655.00	118	1	Zone-2 (Central)
161	J-2011	4,675.00	110	12	Zone-2 (Central)
162	J-2012	4,696.00	101	4	Zone-2 (Central)
163	J-2013	4,716.00	92	5	Zone-2 (Central)
164	J-2014	4,745.00	79	11	Zone-2 (Central)
165	J-2015	4,776.00	66	2	Zone-2 (Central)
166	J-2016	4,696.00	101	5	Zone-2 (Central)
167	J-2017	4,700.00	99	2	Zone-2 (Central)
168	J-2018	4,696.00	101	3	Zone-2 (Central)
169	J-2019	4,727.00	87	3	Zone-2 (Central)
190	J-2020	4,730.00	86	3	Zone-2 (Central)
170	J-2021	4,737.00	83	2	Zone-2 (Central)
175	J-2022	4,773.00	67	1	Zone-2 (Central)
171	J-2023	4,740.00	82	1	Zone-2 (Central)
172	J-2024	4,747.00	78	2	Zone-2 (Central)
174	J-2025	4,806.00	53	1	Zone-2 (Central)
173	J-2026	4,744.00	80	1	Zone-2 (Central)
176	J-2027	4,727.00	87	2	Zone-2 (Central)
179	J-2028	4,732.00	85	3	Zone-2 (Central)
177	J-2029	4,747.00	78	1	Zone-2 (Central)
178	J-2030	4,762.00	72	2	Zone-2 (Central)
180	J-2031	4,741.00	81	3	Zone-2 (Central)
191	J-2032	4,740.00	82	0	Zone-2 (Central)
181	J-2033	4,745.00	79	2	Zone-2 (Central)
182	J-2034	4,753.00	76	2	Zone-2 (Central)
183	J-2035	4,763.00	72	3	Zone-2 (Central)

186	J-2036	4,751.00	77	3	Zone-2 (Central)
192	J-2037	4,735.00	84	1	Zone-2 (Central)
184	J-2038	4,758.00	74	1	Zone-2 (Central)
187	J-2039	4,760.00	73	3	Zone-2 (Central)
188	J-2040	4,779.00	65	1	Zone-2 (Central)
189	J-2041	4,790.00	60	1	Zone-2 (Central)
185	J-2042	4,797.00	57	2	Zone-2 (Central)
193	J-2043	4,810.00	51	1	Zone-2 (Central)
195	J-2044	4,667.00	113	3	Zone-2 (Central)
196	J-2045	4,651.00	120	0	Zone-2 (Central)
202	J-2046	4,664.00	115	1	Zone-2 (Central)
203	J-2047	4,662.00	115	2	Zone-2 (Central)
204	J-2048	4,654.00	119	1	Zone-2 (Central)
213	J-2049	4,664.00	115	1	Zone-2 (Central)
214	J-2050	4,671.00	111	1	Zone-2 (Central)
205	J-2051	4,671.00	111	1	Zone-2 (Central)
206	J-2052	4,696.00	101	1	Zone-2 (Central)
207	J-2053	4,703.00	98	1	Zone-2 (Central)
208	J-2054	4,717.00	92	1	Zone-2 (Central)
209	J-2055	4,701.00	99	1	Zone-2 (Central)
210	J-2056	4,721.00	90	1	Zone-2 (Central)
201	J-2057	4,672.00	111	2	Zone-2 (Central)
200	J-2058	4,681.00	107	1	Zone-2 (Central)
199	J-2059	4,682.00	107	2	Zone-2 (Central)
198	J-2060	4,685.00	105	2	Zone-2 (Central)
197	J-2061	4,687.00	105	2	Zone-2 (Central)
215	J-2062	4,681.00	107	0	Zone-2 (Central)
211	J-2063	4,674.00	110	2	Zone-2 (Central)
212	J-2064	4,678.00	109	2	Zone-2 (Central)
216	J-2065	4,697.00	100	2	Zone-2 (Central)
217	J-2066	4,701.00	98	2	Zone-2 (Central)
218	J-2067	4,708.00	95	3	Zone-2 (Central)
219	J-2068	4,696.00	101	1	Zone-2 (Central)
220	J-2069	4,703.00	98	1	Zone-2 (Central)
221	J-2070	4,706.00	96	2	Zone-2 (Central)
222	J-2071	4,730.00	86	4	Zone-2 (Central)
223	J-2072	4,737.00	83	2	Zone-2 (Central)
224	J-2073	4,729.00	86	2	Zone-2 (Central)
225	J-2074	4,719.00	91	2	Zone-2 (Central)
230	J-2075	4,727.00	87	4	Zone-2 (Central)
231	J-2076	4,746.00	79	3	Zone-2 (Central)
232	J-2077	4,750.00	77	2	Zone-2 (Central)
226	J-2078	4,713.00	93	1	Zone-2 (Central)
227	J-2079	4,706.00	96	1	Zone-2 (Central)
228	J-2080	4,701.00	99	2	Zone-2 (Central)
229	J-2081	4,710.00	95	2	Zone-2 (Central)
237	J-2082	4,718.00	91	3	Zone-2 (Central)
236	J-2083	4,722.00	90	2	Zone-2 (Central)
233	J-2084	4,740.00	82	2	Zone-2 (Central)
234	J-2085	4,736.00	83	2	Zone-2 (Central)
235	J-2086	4,731.00	86	2	Zone-2 (Central)
238	J-2087	4,770.00	69	2	Zone-2 (Central)
239	J-2088	4,770.00	69	2	Zone-2 (Central)
240	J-2089	4,784.00	63	1	Zone-2 (Central)
241	J-2090	4,777.00	66	3	Zone-2 (Central)
244	J-2091	4,743.00	80	2	Zone-2 (Central)
242	J-2092	4,759.00	73	2	Zone-2 (Central)
243	J-2093	4,759.00	73	0	Zone-2 (Central)
276	J-2094	4,681.00	107	1	Zone-2 (Central)
277	J-2095	4,681.00	108	2	Zone-2 (Central)
278	J-2096	4,687.00	105	3	Zone-2 (Central)
245	J-2097	4,692.00	103	1	Zone-2 (Central)
279	J-2098	4,700.00	100	1	Zone-2 (Central)
280	J-2099	4,700.00	100	2	Zone-2 (Central)
281	J-2100	4,681.00	108	0	Zone-2 (Central)
246	J-2101	4,693.00	102	4	Zone-2 (Central)
247	J-2102	4,708.00	96	5	Zone-2 (Central)

	J-2103	4,724.00	89	4	Zone-2 (Central)
249	J-2104	4,730.00	86	2	Zone-2 (Central)
251	J-2105	4,752.00	77	2	Zone-2 (Central)
250	J-2106	4,760.00	73	2	Zone-2 (Central)
297	J-2107	4,683.00	106	3	Zone-2 (Central)
300	J-2108	4,693.00	102	1	Zone-2 (Central)
299	J-2109	4,693.00	102	1	Zone-2 (Central)
298	J-2110	4,699.00	99	2	Zone-2 (Central)
285	J-2111	4,710.00	95	2	Zone-2 (Central)
286	J-2112	4,738.00	83	3	Zone-2 (Central)
291	J-2113	4,720.00	91	2	Zone-2 (Central)
270	J-2114	4,713.00	94	3	Zone-2 (Central)
269	J-2115	4,707.00	96	1	Zone-2 (Central)
267	J-2116	4,707.00	96	1	Zone-2 (Central)
266	J-2117	4,706.00	97	3	Zone-2 (Central)
265	J-2118	4,703.00	98	5	Zone-2 (Central)
261	J-2119	4,705.00	97	3	Zone-2 (Central)
252	J-2120	4,721.00	90	2	Zone-2 (Central)
257	J-2121	4,748.00	78	2	Zone-2 (Central)
256	J-2122	4,750.00	77	2	Zone-2 (Central)
290	J-2123	4,729.00	87	1	Zone-2 (Central)
287	J-2124	4,760.00	73	2	Zone-2 (Central)
289	J-2125	4,746.00	79	1	Zone-2 (Central)
288	J-2126	4,763.00	72	2	Zone-2 (Central)
292	J-2127	4,753.00	76	2	Zone-2 (Central)
293	J-2128	4,770.00	69	1	Zone-2 (Central)
294	J-2129	4,750.00	78	1	Zone-2 (Central)
295	J-2130	4,780.00	65	2	Zone-2 (Central)
296	J-2131	4,790.00	60	3	Zone-2 (Central)
271	J-2132	4,758.00	74	1	Zone-2 (Central)
272	J-2133	4,748.00	78	1	Zone-2 (Central)
273	J-2134	4,720.00	91	2	Zone-2 (Central)
268	J-2135	4,748.00	78	3	Zone-2 (Central)
263	J-2136	4,726.00	88	2	Zone-2 (Central)
264	J-2137	4,715.00	93	2	Zone-2 (Central)
254	J-2138	4,726.00	88	2	Zone-2 (Central)
253	J-2139	4,724.00	89	3	Zone-2 (Central)
262	J-2140	4,743.00	80	2	Zone-2 (Central)
255	J-2141	4,728.00	87	3	Zone-2 (Central)
259	J-2142	4,747.00	79	2	Zone-2 (Central)
258	J-2143	4,745.00	80	5	Zone-2 (Central)
260	J-2144	4,760.00	73	1	Zone-2 (Central)
339	J-2145	4,763.00	72	0	Zone-2 (Central)
338	J-2146	4,763.00	72	0	Zone-2 (Central)
552	J-2147	4,751.00	77	0	Zone-1 (Southern)
556	J-2148	4,727.00	87	0	Zone-2 (Central)
558	J-2149	4,683.00	106	0	Zone-2 (Central)
560	J-2150	4,785.00	62	0	Zone-2 (Central)
557	J-2151	4,810.00	51	0	Zone-2 (Central)
1351	J-2152	4,729.75	86	0	<None>
559	J-2153	4,756.00	75	0	Zone-3 (Chocolate)
581	J-2154	4,755.00	75	0	Zone-1 (Southern)
582	J-2155	4,760.00	73	0	Zone-1 (Southern)
1327	J-2156	4,745.00	80	0	<None>
1380	J-2157	4,681.00	108	0	<None>
303	J-3001	4,648.00	149	0	Zone-3 (Chocolate)
304	J-3002	4,648.00	149	0	Zone-3 (Chocolate)
126	J-3003	4,645.00	150	0	Zone-3 (Chocolate)
305	J-3004	4,660.00	144	0	Zone-3 (Chocolate)
306	J-3005	4,660.00	144	0	Zone-3 (Chocolate)
160	J-3006	4,662.00	143	1	Zone-3 (Chocolate)
156	J-3007	4,720.00	118	2	Zone-3 (Chocolate)
307	J-3008	4,840.00	66	1	Zone-3 (Chocolate)
308	J-3010	4,860.00	57	1	Zone-3 (Chocolate)
309	J-3011	4,827.00	72	2	Zone-3 (Chocolate)
310	J-3012	4,799.00	84	2	Zone-3 (Chocolate)
311	J-3013	4,790.00	88	1	Zone-3 (Chocolate)

	J-3014	4,820.00	75	0	Zone-3 (Chocolate)
313	J-3015	4,820.00	75	1	Zone-3 (Chocolate)
314	J-3016	4,826.00	72	1	Zone-3 (Chocolate)
315	J-3017	4,835.00	68	1	Zone-3 (Chocolate)
194	J-3018	4,818.00	76	2	Zone-3 (Chocolate)
316	J-3019	4,835.00	68	7	Zone-3 (Chocolate)
317	J-3020	4,840.00	66	1	Zone-3 (Chocolate)
318	J-3021	4,826.00	72	1	Zone-3 (Chocolate)
319	J-3022	4,817.00	76	2	Zone-3 (Chocolate)
320	J-3023	4,825.00	73	2	Zone-3 (Chocolate)
321	J-3024	4,833.00	69	0	Zone-3 (Chocolate)
322	J-3025	4,833.00	69	1	Zone-3 (Chocolate)
328	J-3026	4,892.00	44	0	Zone Exempt
323	J-3027	4,801.00	83	2	Zone-3 (Chocolate)
324	J-3028	4,800.00	83	0	Zone-3 (Chocolate)
327	J-3029	4,827.00	72	2	Zone-3 (Chocolate)
326	J-3030	4,822.00	74	1	Zone-3 (Chocolate)
325	J-3031	4,801.00	83	1	Zone-3 (Chocolate)
329	J-3032	4,834.00	69	2	Zone-3 (Chocolate)
330	J-3033	4,862.00	57	2	Zone-3 (Chocolate)
331	J-3034	4,882.00	48	2	Zone-3 (Chocolate)
302	J-3035	4,648.00	149	0	Zone-3 (Chocolate)
332	J-3036	4,645.00	150	0	Zone-3 (Chocolate)
333	J-3037	4,662.00	143	1	Zone Exempt
334	J-3038	4,692.00	130	2	Zone Exempt
335	J-3039	4,776.00	94	2	Zone-3 (Chocolate)
336	J-3040	4,763.00	99	0	Zone-3 (Chocolate)
337	J-3041	4,763.00	99	3	Zone-3 (Chocolate)
340	J-3042	4,811.00	79	2	Zone-3 (Chocolate)
341	J-3043	4,811.00	79	1	Zone-3 (Chocolate)
342	J-3044	4,836.00	68	3	Zone-3 (Chocolate)
344	J-3045	4,792.00	87	1	Zone-3 (Chocolate)
343	J-3046	4,834.00	69	2	Zone-3 (Chocolate)
345	J-3047	4,784.00	90	1	Zone-3 (Chocolate)
347	J-3048	4,848.00	63	0	Zone-3 (Chocolate)
348	J-3049	4,863.00	56	2	Zone-3 (Chocolate)
349	J-3050	4,882.00	48	1	Zone-3 (Chocolate)
350	J-3051	4,909.00	36	0	Zone Exempt
351	J-3052	4,925.00	29	0	Zone Exempt
371	J-3053	4,925.00	29	0	Zone Exempt
372	J-3054	4,921.00	31	0	Zone Exempt
373	J-3055	4,950.00	19	0	Zone Exempt
374	J-3056	4,943.00	22	0	Zone Exempt
346	J-3057	4,813.00	78	3	Zone-3 (Chocolate)
352	J-3058	4,834.00	69	1	Zone-3 (Chocolate)
353	J-3059	4,853.00	60	1	Zone-3 (Chocolate)
354	J-3060	4,863.00	56	1	Zone-3 (Chocolate)
355	J-3061	4,863.00	56	0	Zone-3 (Chocolate)
356	J-3062	4,881.00	48	1	Zone-3 (Chocolate)
357	J-3063	4,877.00	50	2	Zone-3 (Chocolate)
358	J-3064	4,875.00	51	1	Zone-3 (Chocolate)
359	J-3065	4,888.00	45	1	Zone-3 (Chocolate)
360	J-3066	4,863.00	56	1	Zone-3 (Chocolate)
362	J-3067	4,843.00	65	1	Zone-3 (Chocolate)
361	J-3068	4,847.00	63	1	Zone-3 (Chocolate)
363	J-3069	4,821.00	74	1	Zone-3 (Chocolate)
364	J-3070	4,811.00	79	0	Zone-3 (Chocolate)
365	J-3071	4,807.00	80	0	Zone-3 (Chocolate)
366	J-3072	4,807.00	80	1	Zone-3 (Chocolate)
367	J-3073	4,790.00	88	2	Zone-3 (Chocolate)
368	J-3074	4,790.00	88	1	Zone-3 (Chocolate)
369	J-3075	4,779.00	92	3	Zone-3 (Chocolate)
370	J-3076	4,765.00	99	1	Zone-3 (Chocolate)
301	J-3077	4,759.00	101	0	Zone-3 (Chocolate)
375	J-3078	4,887.00	46	0	Zone-3 (Chocolate)
379	J-3079	4,876.00	51	1	Zone-3 (Chocolate)
380	J-3080	4,869.00	54	0	Zone-3 (Chocolate)

	J-3081	4,860.00	57	3	Zone-3 (Chocolate)
382	J-3082	4,848.00	63	3	Zone-3 (Chocolate)
383	J-3083	4,838.00	67	3	Zone-3 (Chocolate)
384	J-3084	4,828.00	71	3	Zone-3 (Chocolate)
385	J-3085	4,816.00	76	3	Zone-3 (Chocolate)
386	J-3086	4,804.00	82	3	Zone-3 (Chocolate)
387	J-3087	4,792.00	87	1	Zone-3 (Chocolate)
388	J-3088	4,792.00	87	2	Zone-3 (Chocolate)
389	J-3089	4,785.00	90	0	Zone-3 (Chocolate)
390	J-3090	4,785.00	90	1	Zone-3 (Chocolate)
392	J-3091	4,774.00	95	0	Zone-3 (Chocolate)
391	J-3092	4,774.00	95	0	Zone-3 (Chocolate)
393	J-3093	4,776.00	94	1	Zone-3 (Chocolate)
394	J-3094	4,784.00	90	1	Zone-3 (Chocolate)
395	J-3095	4,797.00	85	1	Zone-3 (Chocolate)
396	J-3096	4,810.00	79	2	Zone-3 (Chocolate)
397	J-3097	4,817.00	76	2	Zone-3 (Chocolate)
398	J-3098	4,826.00	72	0	Zone-3 (Chocolate)
399	J-3099	4,839.00	67	2	Zone-3 (Chocolate)
400	J-3100	4,848.00	63	2	Zone-3 (Chocolate)
401	J-3101	4,858.00	58	2	Zone-3 (Chocolate)
402	J-3102	4,867.00	54	2	Zone-3 (Chocolate)
403	J-3103	4,781.00	92	1	Zone-3 (Chocolate)
404	J-3104	4,781.00	92	2	Zone-3 (Chocolate)
405	J-3105	4,787.00	89	1	Zone-3 (Chocolate)
406	J-3106	4,789.00	88	3	Zone-3 (Chocolate)
407	J-3107	4,792.00	87	1	Zone-3 (Chocolate)
408	J-3108	4,798.00	84	1	Zone-3 (Chocolate)
409	J-3109	4,801.00	83	1	Zone-3 (Chocolate)
410	J-3110	4,806.00	81	0	Zone-3 (Chocolate)
411	J-3111	4,808.00	80	1	Zone-3 (Chocolate)
412	J-3112	4,814.00	77	1	Zone-3 (Chocolate)
413	J-3113	4,774.00	95	0	Zone-3 (Chocolate)
414	J-3114	4,763.00	99	3	Zone-3 (Chocolate)
275	J-3115	4,748.00	106	1	Zone-3 (Chocolate)
283	J-3116	4,675.00	137	0	Zone-3 (Chocolate)
282	J-3117	4,681.00	135	0	Zone-3 (Chocolate)
415	J-3118	4,681.00	135	0	Zone Exempt
416	J-3119	4,681.00	135	0	Zone Exempt
284	J-3120	4,700.00	127	0	Zone-3 (Chocolate)
417	J-3121	4,802.00	83	0	Zone-3 (Chocolate)
419	J-3122	4,751.00	105	0	Zone-3 (Chocolate)
420	J-3123	4,777.00	93	2	Zone-3 (Chocolate)
421	J-3124	4,773.00	95	3	Zone-3 (Chocolate)
422	J-3125	4,772.00	95	2	Zone-3 (Chocolate)
423	J-3126	4,773.00	95	3	Zone-3 (Chocolate)
424	J-3127	4,775.00	94	1	Zone-3 (Chocolate)
425	J-3128	4,777.00	93	1	Zone-3 (Chocolate)
426	J-3129	4,781.00	92	1	Zone-3 (Chocolate)
427	J-3130	4,765.00	99	1	Zone-3 (Chocolate)
428	J-3131	4,766.00	98	4	Zone-3 (Chocolate)
429	J-3132	4,759.00	101	3	Zone-3 (Chocolate)
430	J-3133	4,766.00	98	3	Zone-3 (Chocolate)
431	J-3134	4,768.00	97	2	Zone-3 (Chocolate)
432	J-3135	4,766.00	98	4	Zone-3 (Chocolate)
433	J-3136	4,762.00	100	1	Zone-3 (Chocolate)
434	J-3137	4,759.00	101	4	Zone-3 (Chocolate)
435	J-3138	4,755.00	103	3	Zone-3 (Chocolate)
436	J-3139	4,760.00	101	3	Zone-3 (Chocolate)
437	J-3140	4,766.00	98	3	Zone-3 (Chocolate)
438	J-3141	4,780.00	92	1	Zone-3 (Chocolate)
439	J-3142	4,770.00	96	0	Zone-3 (Chocolate)
440	J-3143	4,770.00	96	0	Zone-3 (Chocolate)
463	J-3144	4,766.00	98	0	Zone-3 (Chocolate)
441	J-3145	4,771.00	96	0	Zone-3 (Chocolate)
442	J-3146	4,770.00	96	1	Zone-3 (Chocolate)
449	J-3147	4,770.00	96	0	Zone-3 (Chocolate)

	J-3148	4,771.00	96	1	Zone-3 (Chocolate)
443	J-3149	4,758.00	102	5	Zone-3 (Chocolate)
444	J-3150	4,758.00	102	2	Zone-3 (Chocolate)
445	J-3151	4,760.00	101	3	Zone-3 (Chocolate)
446	J-3152	4,755.00	103	3	Zone-3 (Chocolate)
447	J-3153	4,755.00	103	2	Zone-3 (Chocolate)
418	J-3154	4,810.00	79	1	Zone-3 (Chocolate)
450	J-3155	4,779.00	92	1	Zone-3 (Chocolate)
451	J-3156	4,770.00	96	0	Zone-3 (Chocolate)
274	J-3157	4,770.00	96	0	Zone-3 (Chocolate)
376	J-3158	4,880.00	49	1	Zone-3 (Chocolate)
377	J-3159	4,861.00	57	2	Zone-3 (Chocolate)
378	J-3160	4,869.00	54	3	Zone-3 (Chocolate)
452	J-3161	4,840.00	66	0	Zone-3 (Chocolate)
453	J-3162	4,834.00	69	3	Zone-3 (Chocolate)
454	J-3163	4,843.00	65	0	Zone-3 (Chocolate)
455	J-3164	4,820.00	75	2	Zone-3 (Chocolate)
456	J-3165	4,882.00	48	1	Zone-3 (Chocolate)
466	J-3167	4,848.00	63	1	Zone-3 (Chocolate)
464	J-3168	4,870.00	53	1	Zone-3 (Chocolate)
465	J-3169	4,843.00	65	2	Zone-3 (Chocolate)
467	J-3170	4,870.00	53	1	Zone-3 (Chocolate)
468	J-3171	4,949.00	19	0	Zone Exempt
458	J-3172	4,648.00	149	0	Zone Exempt
461	J-3173	4,648.00	40	0	Zone Exempt
460	J-3174	4,648.00	149	0	Zone Exempt
459	J-3175	4,648.00	149	0	Zone Exempt
462	J-3176	4,648.00	40	0	Zone Exempt
547	J-3177	4,780.00	92	0	Zone-3 (Chocolate)
548	J-3178	4,780.00	92	0	Zone-3 (Chocolate)
583	J-3180	4,835.00	68	0	Zone-3 (Chocolate)
550	J-3181	4,750.00	105	0	Zone-3 (Chocolate)
549	J-3182	4,817.00	76	0	Zone-3 (Chocolate)
561	J-3183	4,762.00	100	1	Zone-3 (Chocolate)
562	J-3184	4,816.70	76	1	Zone-3 (Chocolate)
563	J-3185	4,842.90	65	1	Zone-3 (Chocolate)
564	J-3186	4,868.30	54	2	Zone-3 (Chocolate)
569	J-3191	4,844.00	64	1	Zone-3 (Chocolate)
570	J-3192	4,828.00	71	1	Zone-3 (Chocolate)
572	J-3193	4,807.00	80	1	Zone-3 (Chocolate)
571	J-3194	4,807.00	80	1	Zone-3 (Chocolate)
573	J-3195	4,828.00	71	1	Zone-3 (Chocolate)
584	J-3198	4,900.00	40	0	Zone Exempt
585	J-3199	4,900.00	40	0	Zone Exempt
1368	J-3200	4,875.00	51	0	Zone-3 (Chocolate)
1370	J-3201	4,863.00	56	0	Zone-3 (Chocolate)
565	J-3202	4,891.32	44	1	Zone-3 (Chocolate)
566	J-3203	4,895.00	42	1	Zone-3 (Chocolate)
575	J-3204	4,861.21	57	1	Zone-3 (Chocolate)
568	J-3206	4,857.83	58	1	Zone-3 (Chocolate)
567	J-3207 (SM Ph4 Option 3)	4,891.00	44	2	Zone-3 (Chocolate)
574	J-3208 (SM Ph4 Option 3)	4,891.00	44	1	Zone-3 (Chocolate)
470	J-4001S	4,890.00	106	0	Zone-4 (Sidehill/Chimney)
471	J-4002S	4,877.00	112	1	Zone-4 (Sidehill/Chimney)
472	J-4003S	4,893.00	105	1	Zone-4 (Sidehill/Chimney)
473	J-4004S	4,897.00	103	1	Zone-4 (Sidehill/Chimney)
474	J-4005S	4,899.00	102	0	Zone-4 (Sidehill/Chimney)
475	J-4006S	4,899.00	102	0	Zone-4 (Sidehill/Chimney)
476	J-4007S	4,890.00	106	0	Zone-4 (Sidehill/Chimney)
477	J-4008S	4,953.00	79	1	Zone-4 (Sidehill/Chimney)
478	J-4009S	4,942.00	84	0	Zone-4 (Sidehill/Chimney)
479	J-4010S	4,908.00	98	1	Zone-4 (Sidehill/Chimney)
480	J-4011S	4,928.00	90	1	Zone-4 (Sidehill/Chimney)
481	J-4012S	4,959.00	76	1	Zone-4 (Sidehill/Chimney)
482	J-4013S	5,002.00	58	0	Zone-4 (Sidehill/Chimney)
483	J-4014S	5,100.00	15	0	Zone Exempt
484	J-4015S	4,897.00	103	0	Zone-4 (Sidehill/Chimney)

	J-4016S	4,897.00	103	1	Zone-4 (Sidehill/Chimney)
486	J-4017S	4,885.00	108	1	Zone-4 (Sidehill/Chimney)
487	J-4018	4,885.00	108	1	Zone-4 (Sidehill/Chimney)
1331	J-4019	4,875.00	112	0	Zone-4 (Sidehill/Chimney)
489	J-4020S	4,930.00	89	0	Zone-4 (Sidehill/Chimney)
490	J-4021S	4,900.00	102	0	Zone-4 (Sidehill/Chimney)
469	J-4022C	4,943.00	83	0	Zone-4 (Sidehill/Chimney)
496	J-4023C	4,959.00	76	1	Zone-4 (Sidehill/Chimney)
493	J-4024C	4,929.00	89	1	Zone-4 (Sidehill/Chimney)
494	J-4025C	4,927.00	90	0	Zone-4 (Sidehill/Chimney)
495	J-4026C	4,900.00	102	0	Zone-4 (Sidehill/Chimney)
497	J-4027C	4,971.00	71	1	Zone-4 (Sidehill/Chimney)
498	J-4028C	4,999.00	59	0	Zone-4 (Sidehill/Chimney)
499	J-4029C	4,966.00	73	1	Zone-4 (Sidehill/Chimney)
500	J-4030C	4,963.00	74	0	Zone-4 (Sidehill/Chimney)
505	J-4031C	4,980.00	67	0	Zone-4 (Sidehill/Chimney)
501	J-4032C	4,961.00	75	1	Zone-4 (Sidehill/Chimney)
502	J-4033C	4,938.00	85	1	Zone-4 (Sidehill/Chimney)
504	J-4034C	4,914.00	96	2	Zone-4 (Sidehill/Chimney)
503	J-4035C	4,917.00	94	0	Zone-4 (Sidehill/Chimney)
491	J-4036C	4,921.00	93	0	Zone-4 (Sidehill/Chimney)
492	J-4037C	4,925.00	91	0	Zone-4 (Sidehill/Chimney)
506	J-4038C	4,928.00	90	1	Zone-4 (Sidehill/Chimney)
507	J-4039C	4,923.00	92	1	Zone-4 (Sidehill/Chimney)
512	J-4040C	4,963.00	74	1	Zone-4 (Sidehill/Chimney)
513	J-4041C	4,975.00	69	0	Zone-4 (Sidehill/Chimney)
510	J-4042C	4,952.00	79	2	Zone-4 (Sidehill/Chimney)
511	J-4043C	4,987.00	64	1	Zone-4 (Sidehill/Chimney)
509	J-4044C	4,911.00	97	2	Zone-4 (Sidehill/Chimney)
508	J-4045C	4,911.00	97	1	Zone-4 (Sidehill/Chimney)
514	J-4046C	4,963.00	74	0	Zone-4 (Sidehill/Chimney)
515	J-4047C	4,968.00	72	1	Zone-4 (Sidehill/Chimney)
516	J-4048C	5,004.00	57	1	Zone-4 (Sidehill/Chimney)
517	J-4049C	5,010.00	54	0	Zone-4 (Sidehill/Chimney)
518	J-4050C	5,100.00	15	0	Zone Exempt
523	J-4051C	5,011.00	54	1	Zone-4 (Sidehill/Chimney)
521	J-4052C	4,993.00	61	1	Zone-4 (Sidehill/Chimney)
522	J-4053C	4,961.00	75	1	Zone-4 (Sidehill/Chimney)
520	J-4054C	4,959.00	76	1	Zone-4 (Sidehill/Chimney)
519	J-4055C	4,944.00	83	1	Zone-4 (Sidehill/Chimney)
524	J-4056C	4,917.00	94	1	Zone-4 (Sidehill/Chimney)
525	J-4057C	4,995.00	61	2	Zone-4 (Sidehill/Chimney)
526	J-4058C	4,884.00	109	1	Zone-4 (Sidehill/Chimney)
527	J-4059C	4,900.00	102	2	Zone-4 (Sidehill/Chimney)
528	J-4060C	4,897.00	103	1	Zone-4 (Sidehill/Chimney)
529	J-4061C	4,910.00	97	3	Zone-4 (Sidehill/Chimney)
530	J-4062C	4,923.00	92	3	Zone-4 (Sidehill/Chimney)
531	J-4063C	4,917.00	94	2	Zone-4 (Sidehill/Chimney)
532	J-4064C	4,915.00	95	0	Zone-4 (Sidehill/Chimney)
533	J-4065C	4,955.00	78	3	Zone-4 (Sidehill/Chimney)
534	J-4066C	4,892.00	105	1	Zone-4 (Sidehill/Chimney)
535	J-4067C	4,873.00	113	2	Zone-4 (Sidehill/Chimney)
536	J-4068C	4,910.00	97	3	Zone-4 (Sidehill/Chimney)
537	J-4069C	4,871.00	114	2	Zone-4 (Sidehill/Chimney)
538	J-4070C	4,889.00	106	1	Zone-4 (Sidehill/Chimney)
539	J-4071C	4,892.00	105	0	Zone-4 (Sidehill/Chimney)
540	J-4072C	4,902.00	101	0	Zone-4 (Sidehill/Chimney)
541	J-4073C	4,896.00	103	1	Zone-4 (Sidehill/Chimney)
542	J-4074C	4,906.00	99	1	Zone-4 (Sidehill/Chimney)
543	J-4075C	4,879.00	111	1	Zone-4 (Sidehill/Chimney)
545	J-4076C	4,851.00	123	1	Zone-4 (Sidehill/Chimney)
546	J-4077C	4,851.00	123	2	Zone-4 (Sidehill/Chimney)
544	J-4078C	4,892.00	105	1	Zone-4 (Sidehill/Chimney)
553	J-4079S	4,935.00	87	0	Zone-4 (Sidehill/Chimney)
554	J-4080S	4,935.00	87	0	Zone-4 (Sidehill/Chimney)
555	J-4081S	4,930.00	89	0	Zone-4 (Sidehill/Chimney)
576	J-4082S	4,893.00	105	1	Zone-4 (Sidehill/Chimney)

	J-4083S	4,932.80	87	1	Zone-4 (Sidehill/Chimney)
577	J-4084S	4,919.00	93	0	Zone-4 (Sidehill/Chimney)
578	J-4085S	4,983.00	66	0	Zone-4 (Sidehill/Chimney)
580	J-4086S	4,890.00	106	1	Zone-4 (Sidehill/Chimney)
619	J-4087C	5,100.00	15	0	Zone Exempt
1402	J-4106 School	4,915.00	95	0	Zone-4 (Sidehill/Chimney)
1404	J-4107 School	4,915.00	95	0	Zone-4 (Sidehill/Chimney)
1407	J-4108 School	4,955.00	78	0	<None>
1313	J-5001	5,066.00	108	0	<None>
587	J-6001	5,106.13	91	0	Zone 6 (Boundary)
589	J-6002 Ph1	5,154.57	70	1	Zone 6 (Boundary)
608	J-6003 Ph1	5,179.37	59	1	Zone 6 (Boundary)
590	J-6004 Ph1	5,152.08	71	2	Zone 6 (Boundary)
609	J-6005 Ph1	5,155.32	69	1	Zone 6 (Boundary)
610	J-6006 Ph1	5,168.84	63	1	Zone 6 (Boundary)
591	J-6007 Ph 1	5,142.51	75	1	Zone 6 (Boundary)
592	J-6008 Ph1	5,123.20	83	1	Zone 6 (Boundary)
611	J-6009 Ph 1	5,136.51	77	1	Zone 6 (Boundary)
612	J-6010 Ph1	5,115.09	87	1	Zone 6 (Boundary)
607	J-6011 Ph2	5,162.00	66	3	Zone 6 (Boundary)
606	J-6012 Ph 2	5,160.00	67	2	Zone 6 (Boundary)
605	J-6013 Ph 2	5,174.00	61	2	Zone 6 (Boundary)
1396	J-6014 Ph 2	5,188.00	55	2	Zone 6 (Boundary)
604	J-6015 Ph 2	5,194.00	53	0	Zone 6 (Boundary)
617	J-6016 Ph 3	5,160.00	67	2	Zone 6 (Boundary)
593	J-6017 Ph 3	5,137.00	77	2	Zone 6 (Boundary)
594	J-6018 Ph 4	5,160.00	<100 67	2	Zone 6 (Boundary)
595	J-6019 Ph 4	5,146.00	73	1	Zone 6 (Boundary)
596	J-6020 Ph 4	5,126.00	ok 82	1	Zone 6 (Boundary)
597	J-6021 Ph 4	5,118.00	85	1	Zone 6 (Boundary)
598	J-6022 Ph 4	5,129.00	81	1	Zone 6 (Boundary)
599	J-6023 Ph 4	5,137.00	77	1	Zone 6 (Boundary)
600	J-6024 Ph 4	5,140.00	76	1	Zone 6 (Boundary)
601	J-6025 Ph 4	5,143.00	75	1	Zone 6 (Boundary)
602	J-6026 Ph 4	5,164.00	66	1	Zone 6 (Boundary)
603	J-6027 Ph 4	5,178.00	59	2	Zone 6 (Boundary)
613	J-6028 Ph 5	5,149.00	72	1	Zone 6 (Boundary)
614	J-6029 Ph 6	5,200.00	50	2	Zone 6 (Boundary)
615	J-6030 Ph 6	5,205.00	48	1	Zone 6 (Boundary)
616	J-6031 Ph 6	5,210.00	46	1	Zone 6 (Boundary)
588	J-6034	5,194.00	53	0	Zone 5 (West7th)
1308	J-6045	5,066.00	108	0	Zone 6 (Boundary)
586	J-6046	4,900.00	180	0	Zone 5 (West7th)
1321	J-Section 5.3.2	4,704.00	97	0	<None>

S:\Projects\STU\SVGID\SVGID, Ladera Revised Lot Count\Watercad\2020 SVGID Water MP Model for Ladera Phase 2-6.wtg

TENTATIVE MAP AND VARIANCE PLANS
FOR
LADERA RANCH

SUN VALLEY — WASHOE CO. — NEVADA

OWNER / DEVELOPER

LANSING COMPANIES
5190 NEIL ROAD ST 420
RENO, NV 89502
(775) 800-1459

ENGINEER

SUMMIT ENGINEERING CORPORATION

GENERAL NOTES

1. THESE NOTES REPRESENT GENERAL INFORMATION NECESSARY FOR THE PROPER EXECUTION OF THE WORK CONTAINED ON THESE IMPROVEMENT PLANS. THESE NOTES APPLY TO ALL PLAN SHEETS. THE CONTRACTOR IS RESPONSIBLE TO READ AND COMPLY WITH ALL NOTES.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE SAFETY OF ALL CONSTRUCTION PERSONNEL IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, COUNTY AND CITY CODES AND ORDINANCES GOVERNING CONSTRUCTION SAFETY.

3. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE ALL NECESSARY TRAFFIC AND PEDESTRIAN CONTROL DURING CONSTRUCTION AND TO PROVIDE ALL NECESSARY WARNING SIGNS AND CONSTRUCTION FENCING.

4. THE DEVELOPER IS RESPONSIBLE TO OBTAIN THE SERVICES OF A TESTING AND INSPECTION FIRM FOR INSPECTION AND TESTING OF ALL IMPROVEMENTS. WASHOE COUNTY IS RESPONSIBLE FOR INSPECTION AND TESTING OF PUBLIC IMPROVEMENTS. THE CONTRACTOR IS RESPONSIBLE TO NOTIFY ANY AFFECTED PARTY 48 HOURS IN ADVANCE OF ANY REQUIRED TESTING AND/OR INSPECTION.

5. ALL CONSTRUCTION SHALL BE DONE IN ACCORDANCE WITH THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (SSPWC) AND THE LATEST DETAILS FOR (SSPWC) ADOPTED BY WASHOE COUNTY.

6. THE CONTRACTOR SHALL MAINTAIN A 24–HOUR DUST CONTROL PROGRAM TO INCLUDE WATERING OF OPEN AREAS AND SHALL MAINTAIN CONFORMITY WITH SECTION 40.030 OF THE WASHOE COUNTY AIR POLLUTION REGULATIONS AND THE APPROVED DUST CONTROL PERMIT FOR THE PROJECT.

7. THE EXISTING UTILITIES SHOWN ON THESE IMPROVEMENT PLANS WERE OBTAINED FROM VARIOUS SOURCES AND ARE FOR THE CONTRACTOR'S GENERAL INFORMATION ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY LOCATION, SIZE, TYPE. ETC. THIS ENGINEER ASSUMES NO RESPONSIBILITY FOR THE UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN ON THESE PLANS. THE CONTRACTOR IS DIRECTED TO NOTIFY THE ENGINEER IN CASE OF ANY CONFLICT BETWEEN NEW AND EXISTING UTILITIES.

8. IT IS THE INTENT OF THESE SPECIFICATIONS AND IMPROVEMENT PLANS THAT THE WORK PERFORMED UNDER THE CONTRACT SHALL RESULT IN A COMPLETE OPERATING SYSTEM IN SATISFACTORY WORKING CONDITION WITH RESPECT TO THE FUNCTIONAL PURPOSES OF THE INSTALLATION. IF THERE ARE ANY QUESTIONS REGARDING THE STATED OR IMPLIED MEANING OF THESE PLANS, THE CONTRACTOR IS DIRECTED TO CONTACT THE CONSULTING ENGINEER IMMEDIATELY.

9. IN ORDER TO EXPEDITE THE INSPECTION AND TESTING OF MATERIALS, THE CONTRACTOR SHALL FURNISH COMPLETE STATEMENTS TO THE ENGINEER AS TO THE ORIGIN, COMPOSITION AND MANUFACTURE OF ALL MATERIALS TO BE USED IN THE WORK. SUCH STATEMENTS SHALL BE FURNISHED PROMPTLY AFTER EXECUTION OF THE CONTRACT, BUT IN ALL CASES PRIOR TO DELIVERY OF SUCH MATERIALS.

10. SHOULD ANY PREHISTORIC OR HISTORIC REMAINS OR ARTIFACTS BE DISCOVERED DURING SITE DEVELOPMENT, WORK SHALL TEMPORARILY BE HALTED AT THE SPECIFIC SITE AND THE STATE HISTORIC PRESERVATION OFFICE OF THE DEPARTMENT OF MUSEUMS, LIBRARY AND ARTS, SHALL BE NOTIFIED TO RECORD AND PHOTOGRAPH THE SITE. THE PERIOD OF TEMPORARY DELAY SHALL BE LIMITED TO A MAXIMUM OF TWO WORKING DAYS FROM THE DATE OF NOTIFICATION.

11. ALL EXCAVATION AND EMBANKMENT SHALL BE IN ACCORDANCE WITH WASHOE COUNTY STANDARDS AND THE GEOTECHNICAL INVESTIGATIONS BY WOOD ROGERS DATED JANUARY 28, 2005 AND THE "GEOTECHNICAL UPDATE REPORT LADERA RANCH" BY WOOD RODGERS, DATED JANUARY 6, 2017

12. NO MATERIALS OF ANY KIND SHALL BE STOCKPILED OR CONSTRUCTION EQUIPMENT PARKED ON CONCRETE OR ASPHALT SURFACES TO BE DEDICATED TO WASHOE COUNTY.

13. A CONSTRUCTION HAUL ROUTE SHALL BE DESIGNATED TO THE SATISFACTION OF THE ENGINEERING DIVISION AND SHALL BE USED BY ALL CONTRACTORS. ALL CONSTRUCTION TRAFFIC SHALL USE WEST 7TH AND SUN VALLEY BLVD TO THE SITE.

14. EXCESS OR UNSUITABLE MATERIAL SHALL BE DISPOSED OF IN CONFORMANCE WITH WASHOE COUNTY REGULATIONS OR IN APPROVED AREAS AS SHOWN ON THE APPROVED GRADING PLANS.

15. DRAINAGE:
    A) THE CONTRACTOR SHALL MAINTAIN ALL EXISTING DRAINAGE FACILITIES WITHIN THE CONSTRUCTION AREA UNTIL NEW DRAINAGE IMPROVEMENTS ARE IN PLACE AND FUNCTIONING.
    B) NO FENCE OR OTHER OBSTRUCTION WHICH INTERFERES WITH DRAINAGE SHALL BE ALLOWED WITHIN THE DRAINAGE OR STORM DRAIN EASEMENTS.

16. ALL DIMENSIONS NOTED ON THESE PLANS ARE TO FRONT FACE OF CURB UNLESS OTHERWISE NOTED.

17. CONSTRUCTION OF STREET IMPROVEMENTS MUST ALLOW FOR THE PERPETUATION OF ALL EXISTING LEGAL ACCESSES AND EXISTING DRIVEWAYS. THE LOCATION AND WIDTH OF ALL LEGAL ACCESSES AND DRIVEWAYS SHALL BE IN ACCORDANCE WITH DRAWING W–16.4 OF THE STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION. AS REQUIRED, A DEPRESSED CURB AND CONCRETE APRON SHALL BE PROVIDED IN ACCORDANCE WITH STANDARD DETAIL DRAWING W–5.11. ADDITIONALLY, ALL IMPROVEMENTS NECESSARY TO PERPETUATE THE EXISTING ACCESS OR DRIVEWAY, INCLUDING ASPHALT PAVING, GRADING, PIPING, ETC., SHALL BE CONSTRUCTED TO THE SATISFACTION OF THE COUNTY ENGINEER. ALL COSTS FOR IMPROVING THE LEGAL ACCESSES AND DRIVEWAYS SHALL BE THE RESPONSIBILITY OF THE DEVELOPER.

18. A P.C.C. DRIVEWAY APRON OR TEMPORARY HEADER SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD DETAIL DRAWING W–5.11 AND W–16.4 AT ALL DEPRESSED CURBS AND ALL UNUSED DEPRESSED CURBS SHALL BE REPLACED WITH FULL HEIGHT CURBS.

19. CONSTRUCTION OF WEAKENED PLANE JOINTS IN ALL CURBS, GUTTERS AND SIDEWALKS SHALL BE INSTALLED IN ACCORDANCE WITH STANDARD DETAIL DRAWING W–16.1, W–16.2, AND W–16.3.

20. STORM DRAIN LARGER THAN 36" SHALL BE RCP CL IV. IT IS THE CONTRACTORS RESPONSIBILITY TO MAINTAIN COVER OVER STORM DRAINS DURING CONSTRUCTION TO PROTECT THE INTEGRITY OF THE STORM DRAIN.

21. ALL SANITARY SEWER LINES SHALL BE SDR CLASS 35 PVC. IN ADDITION, ALL SANITARY SEWER LATERALS SHALL BE 6" DIAMETER AND SHALL BE STUBBED, PLUGGED AND MARKED TO EVERY LOT WITH CLEAN OUT. ALL SEWERS SHALL BE "TV" INSPECTED. ALL SEWER SHALL BE BALL, FLUSH, MANDRELL AND PRESSURE TESTED.

22. ALL SANITARY SEWER MANHOLES SHALL BE VACUUM TESTED.

23. AT ALL POINTS WHERE SEWER AND WATER LINES CROSS, A MINIMUM VERTICAL CLEARANCE OF 18" SHALL BE MAINTAINED, ELSE THE WATER PIPE SHALL HAVE RESTRAINED JOINTS FOR 10 FEET ON EACH SIDE OF THE CROSSING POINT. A MINIMUM OF 10' HORIZONTAL SEPARATION SHALL BE MAINTAINED FOR ALL SEWER AND WATER LINES RUNNING PARALLEL. REFER TO THE DETAIL ON SHEET D–1 FOR FURTHER INFORMATION.

24. ALL SIGN LOCATIONS AND MATERIALS SHALL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (M.U.T.C.D.)

25. A PRECONSTRUCTION CONFERENCE SHALL BE HELD WITH WASHOE COUNTY, SVGID, & PUBLIC UTILITIES PRIOR TO ANY CONSTRUCTION.

26. THE CONTRACTOR IS RESPONSIBLE TO INSURE THAT ALL IMPROVEMENTS ARE CONSTRUCTED ACCORDING TO THESE PLANS AND SPECIFICATIONS. ANY CHANGES TO THE LOCATION (HORIZONTAL OR VERTICAL), OR ANY OTHER PLAN DESIGNATION, SHALL BE APPROVED BY THE ENGINEER PRIOR TO PROCEEDING WITH THE WORK. THE CONTRACTOR IS RESPONSIBLE TO KEEP THE NECESSARY RECORDS TO ENABLE THE ENGINEER TO PREPARE AS–BUILT DRAWINGS OF THE FINAL CONSTRUCTED IMPROVEMENTS.

27. THE CONTRACTOR SHALL COORDINATE ALL UTILITY CONNECTIONS WITH THE APPROPRIATE UTILITY COMPANY.

28. THE CONTRACTOR SHALL SUPPLY THE WASHOE COUNTY COMMUNITY SERVICES DEPARTMENT WITH A REPRODUCIBLE (I.E. MYLARS, SEPIAS) SET OF AS–BUILT DRAWINGS PRIOR TO ACCEPTANCE. THE AS–BUILT DRAWINGS SHALL IDENTIFY THE FOLLOWING:

    GENERAL:
    A. ANY CHANGES IN SLOPE OR ALIGNMENT.
    B. DIMENSIONS FROM CURB TO SEWER AND WATER LINES.
    C. SIZE AND TYPE OF SEWER AND WATER PIPE.
    D. DIMENSIONS TO END CAPS.

    SEWER:
    A. DIMENSIONS TO WYES FROM DOWN STREAM SANITARY SEWER MANHOLES.
    B. DIMENSIONS BETWEEN SANITARY SEWER MANHOLES.
    C. DIMENSIONS TO END OF LATERALS FROM SANITARY SEWER MAIN.

29. ALL GAS AND ELECTRIC IMPROVEMENTS NOTED ON THESE PLANS ARE FOR REFERENCE ONLY. THE CONTRACTOR IS RESPONSIBLE TO OBTAIN DESIGN PLANS FROM NV ENERGY FOR ALL GAS AND ELECTRIC CONSTRUCTION INFORMATION.

30. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING CONFORMANCE WITH ALL PERMITS, INCLUDING GRADING, BUILDING, DUST CONTROL, SWPPP AND THE N.D.P.E.S. PERMIT ISSUED BY THE STATE OF NEVADA DIVISION OF ENVIRONMENTAL PROTECTION.

31. ALL PARCELS WITHIN AN APPROVED SUBDIVISION SHALL REQUIRE THAT THE INDIVIDUAL SITE AND DRAINAGE PLANS SUBMITTED FOR BUILDING PERMITS SHALL SHOW ALL FINISHED GRADE ELEVATIONS, HIGH POINT LOCATIONS, AND DRAINAGE SWALE LOCATIONS WITH A MINIMUM SLOPE OF ONE PERCENT (1%) ON THE SWALE. THIS INFORMATION SHALL BE SHOWN ON BOTH THE SITE AND DRAINAGE PLAN AND THE APPROVED CONSTRUCTION GRADING PLANS. ALL INDIVIDUAL SITE AND DRAINAGE PLANS SUBMITTED TO THE BUILDING AND SAFETY DIVISION AND APPROVED CONSTRUCTION DRAWINGS SHALL BE STAMPED BY A NEVADA REGISTERED CIVIL ENGINEER.

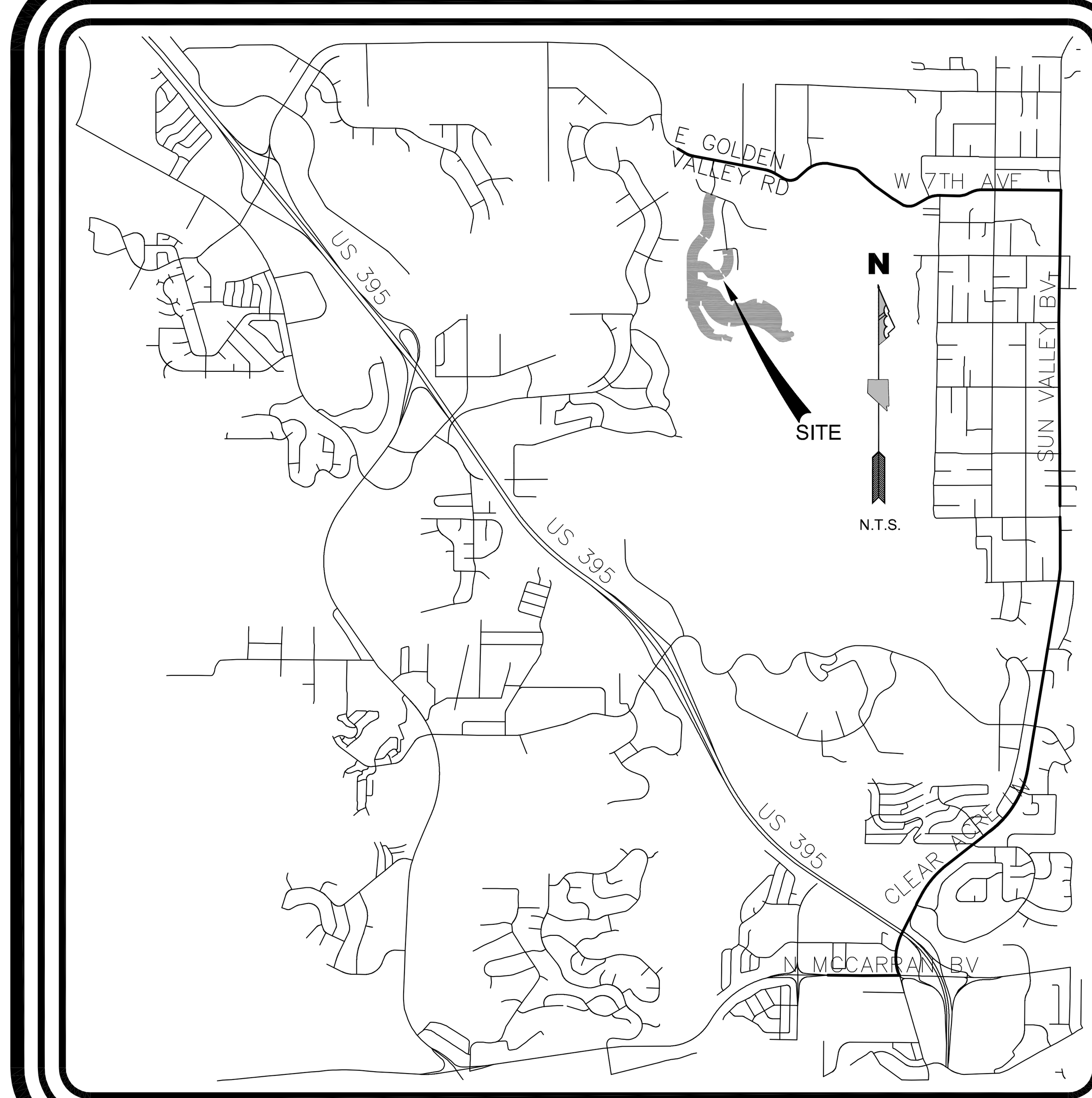
32. ALL PARCELS WITHIN ANY APPROVED SUBDIVISION SHALL REQUIRE THAT A NEVADA REGISTERED CIVIL ENGINEER OR A NEVADA REGISTERED LAND SURVEYOR SUBMIT A CERTIFICATION LETTER TO THE BUILDING OFFICIAL PRIOR TO THE SCHEDULING OF INSPECTIONS FOR THE FOLLOWING;

    1. NEVADA REGISTERED CIVIL ENGINEER TO CERTIFY THAT:

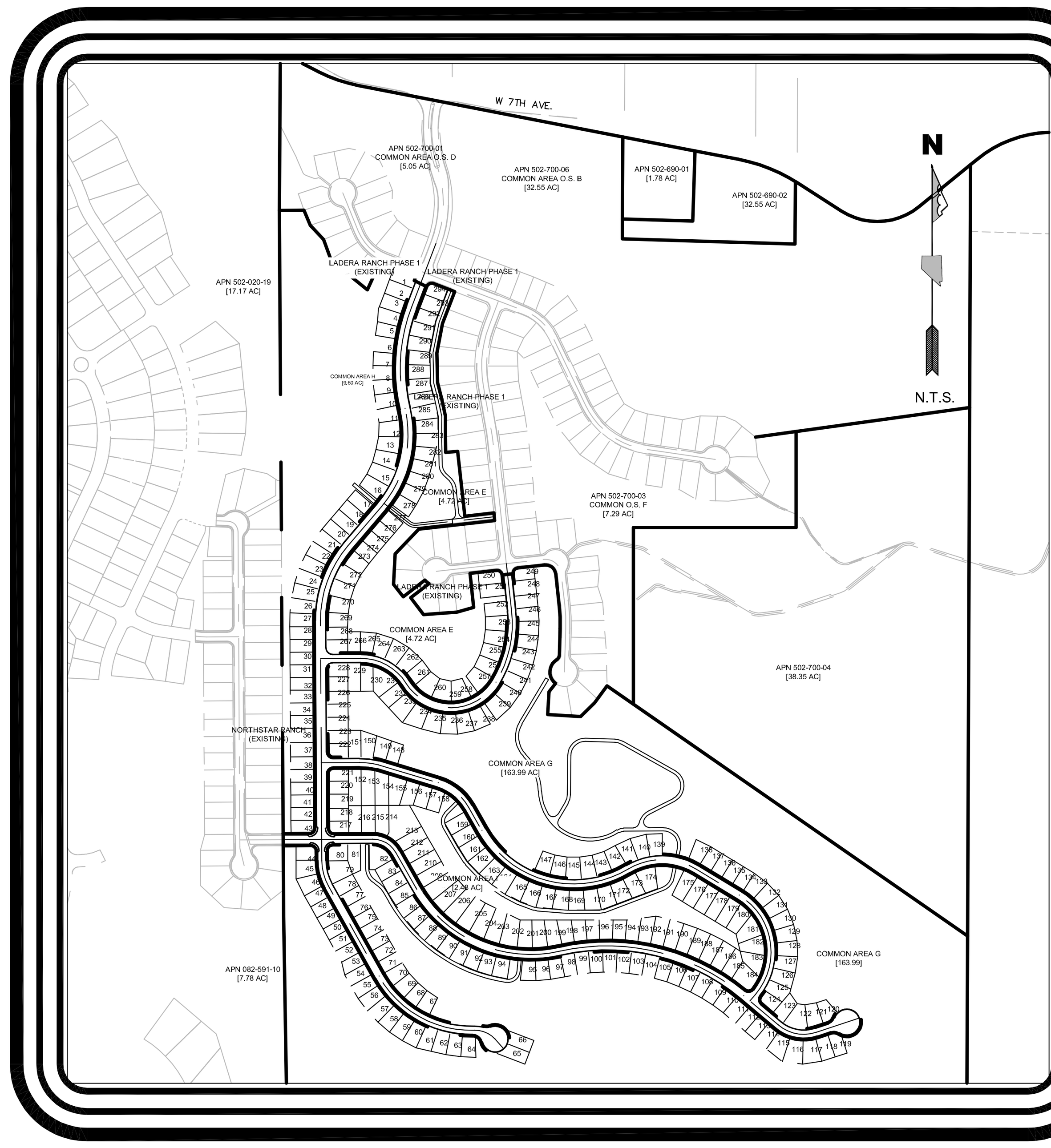
       1.1 SOILS INVESTIGATION REPORT INDICATING SOILS CLASSIFICATION AND DESIGN PRIOR TO THE FOUNDATION INSPECTION.
       1.2 ELEVATION, GRADING AND DRAINAGE CERTIFICATION PER THE APPROVED CONSTRUCTION PLANS PRIOR TO THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY.

    2. NEVADA REGISTERED CIVIL ENGINEER OR A NEVADA REGISTERED LAND SURVEYOR TO CERTIFY:

       2.1 FOUNDATION ELEVATION AND BUILDING SETBACK CERTIFICATION AS PER THE APPROVED PLOT PLAN PRIOR TO THE FOUNDATION INSPECTION.



VICINITY MAP



SITE PLAN

SHEET INDEX

T-1	TITLE SHEET
S-0 TO S-6	PRELIMINARY SITE PLAN
G-0 TO G-6	PRELIMINARY GRADING PLAN
C-1	CUT/FILL MAP
U-1 TO U-6	PRELIMINARY UTILITY PLAN
EC-1 TO EC-3..	PRELIMINARY EROSION CONTROL
HY-1 TO HY-4..	PRELIMINARY HYDROLOGY
X-1 TO X-2	CROSS SECTIONS
L-1	PRELIMINARY LANDSCAPE AND TREE PROTECTION PLAN

PROJECT DATA

NUMBER OF LOTS	294
TOTAL AREA	266.07 AC
COMMON AREA	225.37± AC
TOTAL LOT AREA	31.09±AC
RIGHT OF WAY	9.61± AC
GROSS DENSITY	1.10± DU/AC
AVERAGE LOT SIZE	4568± SF
LARGEST LOT	12096 SF
SMALLEST LOT	3120 SF

ABBREVIATIONS

AC	ASPHALTIC CONCRETE
AGG.	AGGREGATE
BC	BEGIN CURVE
BF	BOTTOM OF FOOTING
BVC	BEGIN VERTICAL CURVE
BVCE	BEGIN VERTICAL CURVE ELEVATION
BVCS	BEGIN VERTICAL CURVE STATION
BW	BACK OF SIDEWALK
CB	CATCH BASIN
CBU	CLUSTER BOX UNIT
℄	CENTERLINE
CONC.	CONCRETE
CONST.	CONSTRUCT
ELEV.	ELEVATION
EC	END OF CURVE
EVC	END OF VERTICAL CURVE
EVCE	END OF VERTICAL CURVE ELEVATION
EVCS	END OF VERTICAL CURVE STATION
EXIST.	EXISTING
(e)	EXISTING
FF	FINISHED FLOOR
FFC	FRONT FACE OF CURB
FG	FINISHED GRADE
FHA	FIRE HYDRANT
FL	FLOW LINE
FLG	FLANGE
G	GAS
GB	GRADE BREAK
HP	HIGH POINT
IE	INVERT ELEVATION
LF	LINEAL FEET
LP	LOW POINT
LT.	LEFT
LVC	LENGTH OF VERTICAL CURVE
MH	MANHOLE
P	PAD ELEVATION
PI	POINT OF INTERSECTION
PRC	POINT OF REVERSE CURVATURE
PVC	POLYVINYL CHLORIDE PIPE
PO	PUSH ON
P.U.E.	PUBLIC UTILITY EASEMENT
PL	PROPERTY LINE
Q10	10–YEAR STORM FLOW
Q100	100–YEAR STORM FLOW
(R)	RADIAL
R	RADIUS
REF.	REFERENCE
RCP	REINFORCED CONCRETE PIPE
RP	RADIUS POINT
RT.	RIGHT
R/W	RIGHT OF WAY
S	SLOPE
SS	SANITARY SEWER
SW	SIDEWALK
STA.	STATION
SD	STORM DRAIN
TC	TOP OF CURB
TYP	TYPICAL
VC	VERTICAL CURVE
VPI	VERTICAL POINT OF INTERSECTION
W	WATER
Δ	CURVE DELTA

BASIS OF BEARINGS

NEVADA STATE PLANE COORDINATE SYSTEM, WEST ZONE GRID, NAD83/94. COORDINATES SHOWN ARE MODIFIED BY A COMBINATION FACTOR OF 1.000197939 AND CONVERTED TO THE U.S. SURVEY FOOT. ALL DIMENSIONS ARE GROUND DISTANCES.

BASIS OF ELEVATION

NORTH AMERICAN VERTICAL DATUM OF 1988 DETERMINDED WITH REAL TIME KINEMATIC (RTK) GPS OBSERVATIONS WITH CORRECTIONS TRANSMITTED BY WASHOE COUNTY CONTINUOUSLY OPERATING REFERENCE STATION (CORS) "STEAD" USING THE CONTINENTAL UNITED STATES GEOID MODEL OF 1999 (CONUS99).

SPECIFICATIONS

ALL CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION SPONSORED AND DISTRIBUTED BY RENO, SPARKS, AND WASHOE COUNTY, AS WELL AS TO THE RECOMMENDATIONS ESTABLISHED BY THE SOILS INVESTIGATION OF THIS SITE DATED JANUARY 28, 2005, THE GEOTECHNICAL UPDATE REPORT LADERA RANCH DATED JANUARY6, 2017, THE GEOTECHNICAL ADDENDUM DATED AUGUST 10, 2017, AND THE GEOTECHNICAL CODE UPDATE DATED FEBRUARY 12, 2020 ALL PREPARED BY WOOD RODGERS.

ENGINEER'S STATEMENT

THESE PLANS (SHEETS T-1 THROUGH L-1 OF 32) HAVE BEEN PREPARED IN ACCORDANCE WITH THE APPROVED TENTATIVE MAP, COUNTY COMMISSION CONDITIONS OF APPROVAL, WITH ACCEPTED ENGINEERING PROCEDURES AND GUIDELINES,AND ARE IN SUBSTANTIAL COMPLIANCE WITH APPLICABLE STATUTES, COUNTY ORDINANCES, AND CODES. IN THE EVENT OF CONFLICT BETWEEN ANY PORTION OF THESE PLANS AND COUNTY CODES, THE COUNTY CODES SHALL PREVAIL.

ROBERT GELU   P.E. #17741

SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
PHONE:(775) 747-8550 FAX:(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

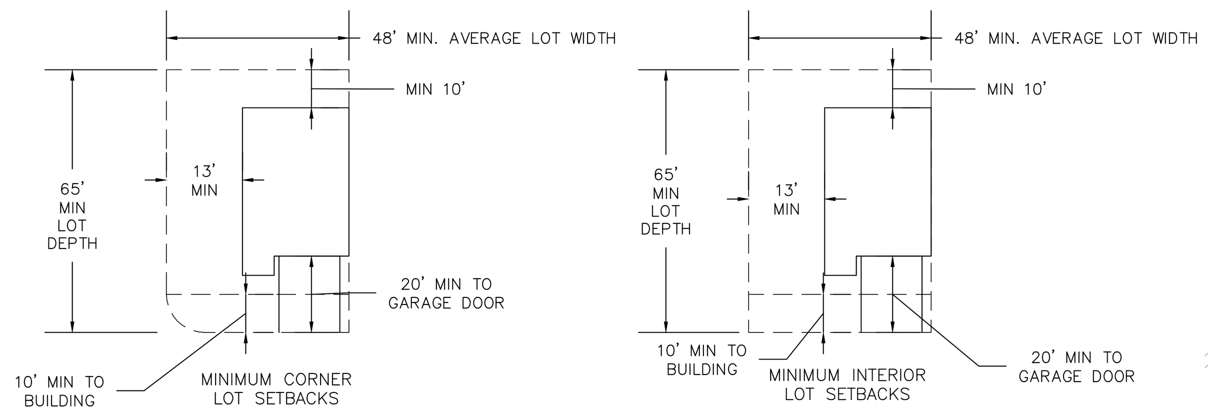
TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
TITLE SHEET
WASHOE COUNTY — NEVADA

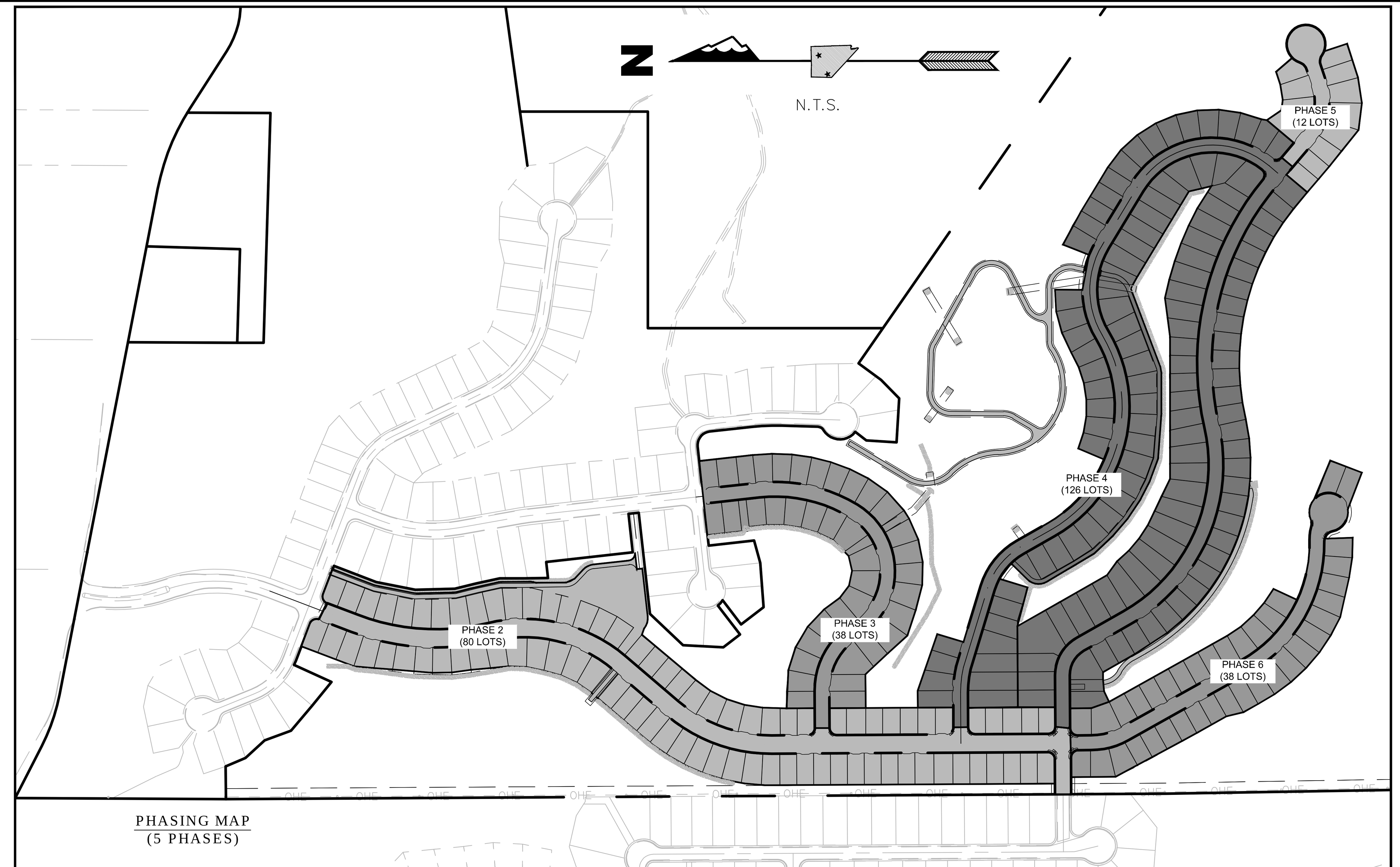
DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ:
VERT:
JOB NO: 30884

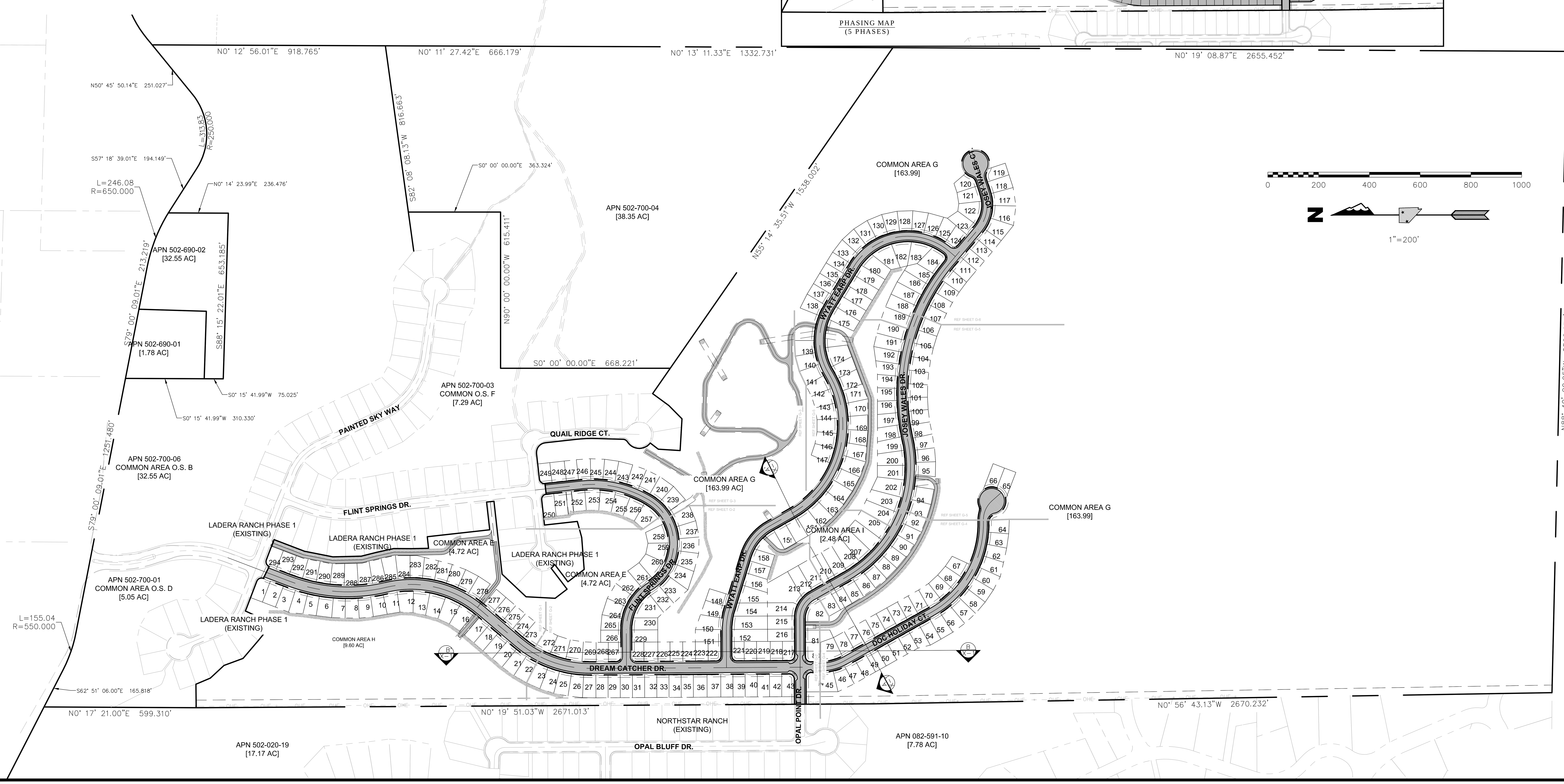
PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

REF SHEET X-1 FOR STREET CROSS SECTIONS

REF SHEET T-1 FOR PROJECT DATA







TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6

OVERALL SITE PLAN

WASHOE COUNTY NEVADA

REV.	DATE	DESCRIPTION	BY	APP'D

SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
PHONE:(775) 747-8550 FAX:(775) 747-8559

DESIGNED BY: SD

CHECKED BY: RG

SCALE

HORIZ: 1"=200'

VERT:

JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET S-0 OF 32

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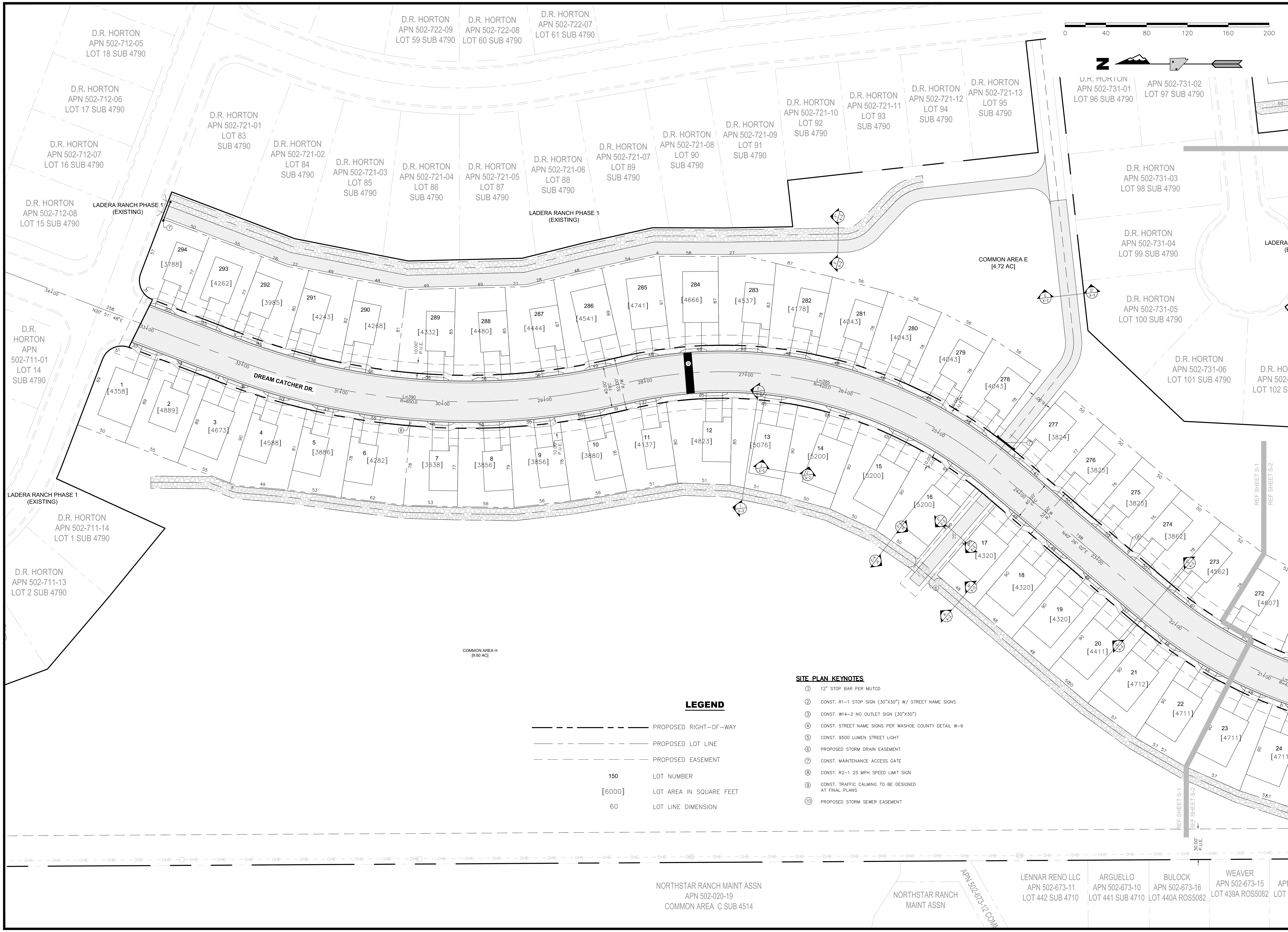

LEGEND

	PROPOSED RIGHT-OF-WAY
	PROPOSED LOT LINE
	PROPOSED EASEMENT
150	LOT NUMBER
[6000]	LOT AREA IN SQUARE FEET
60	LOT LINE DIMENSION

SITE PLAN KEYNOTES

1. 12" STOP BAR PER MUTCD
2. CONST. R1-1 STOP SIGN (30"X30") W/ STREET NAME SIGNS
3. CONST. W14-2 NO OUTLET SIGN (30"X30")
4. CONST. STREET NAME SIGNS PER WASHOE COUNTY DETAIL W-6
5. CONST. 9500 LUMEN STREET LIGHT
6. PROPOSED STORM DRAIN EASEMENT
7. CONST. MAINTENANCE ACCESS GATE
8. CONST. R2-1 25 MPH SPEED LIMIT SIGN
9. CONST. TRAFFIC CALMING TO BE DESIGNED AT FINAL PLANS
10. PROPOSED STORM SEWER EASEMENT

SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
PHONE:(775) 747-8550 FAX:(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY SITE PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=40'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER STATE OF NEVADA ROBERT GELU Exp. 6-30-21 CIVIL No. 17741

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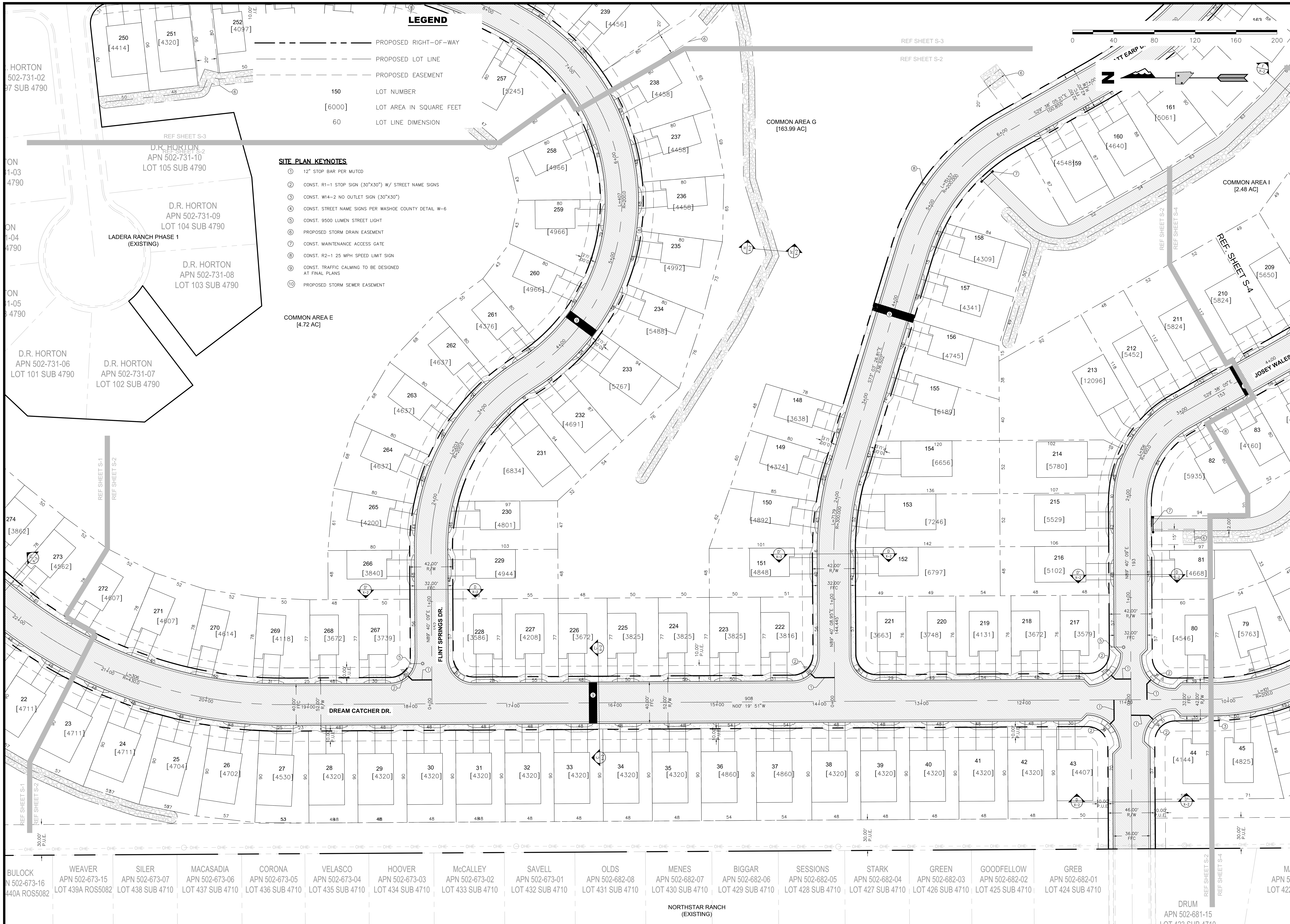

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PRELIMINARY SITE PLAN

WASHOE COUNTY NEVADA

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PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET S-2 OF 32

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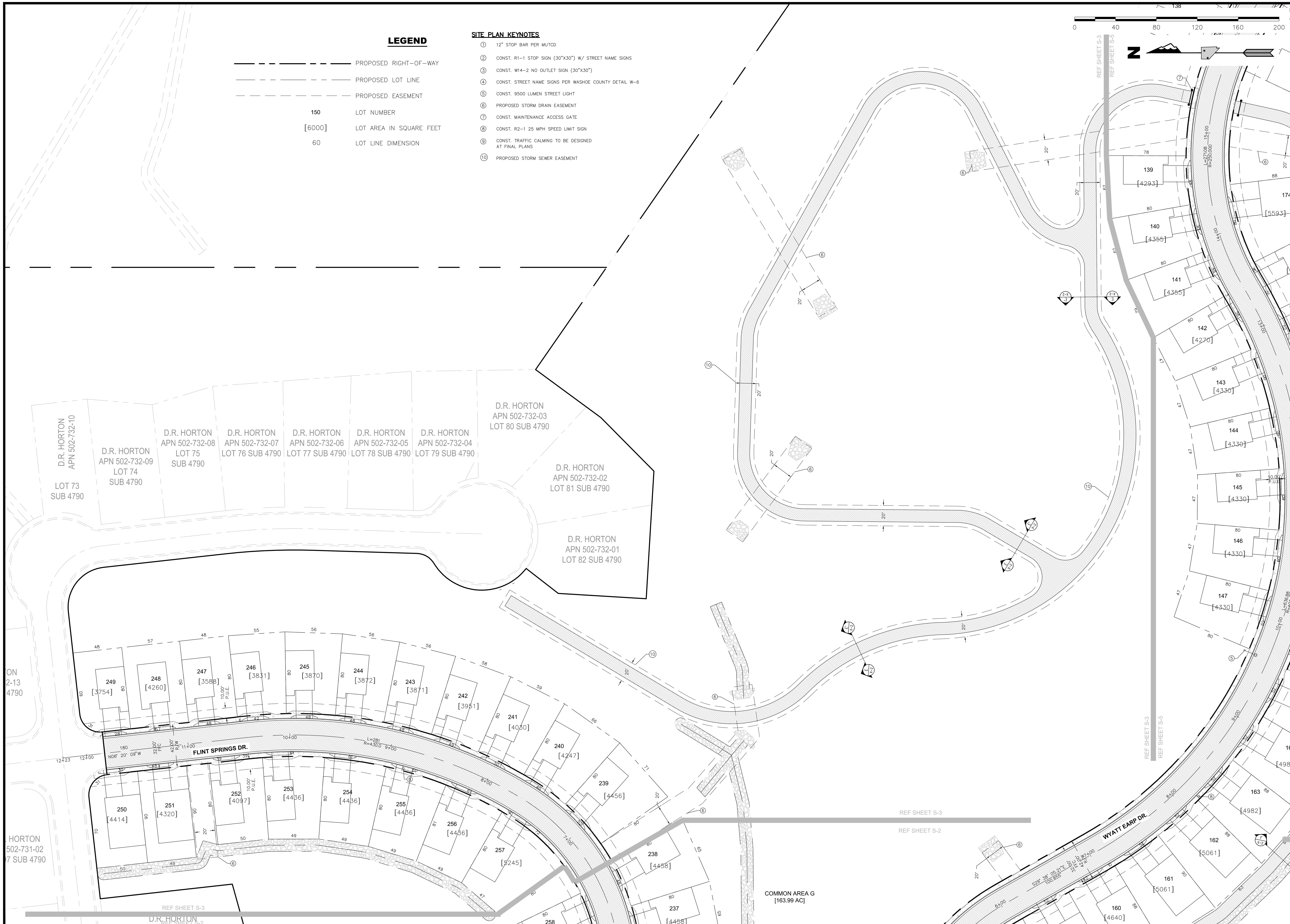
LEGEND

— — —	PROPOSED RIGHT-OF-WAY
— — —	PROPOSED LOT LINE
— — —	PROPOSED EASEMENT
150	LOT NUMBER
[6000]	LOT AREA IN SQUARE FEET
60	LOT LINE DIMENSION

SITE PLAN KEYNOTES

1. 12" STOP BAR PER MUTCD
2. CONST. R1-1 STOP SIGN (30"X30") W/ STREET NAME SIGNS
3. CONST. W14-2 NO OUTLET SIGN (30"X30")
4. CONST. STREET NAME SIGNS PER WASHOE COUNTY DETAIL W-6
5. CONST. 9500 LUMEN STREET LIGHT
6. PROPOSED STORM DRAIN EASEMENT
7. CONST. MAINTENANCE ACCESS GATE
8. CONST. R2-1 25 MPH SPEED LIMIT SIGN
9. CONST. TRAFFIC CALMING TO BE DESIGNED AT FINAL PLANS
10. PROPOSED STORM SEWER EASEMENT



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TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6 PRELIMINARY SITE PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
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SCALE
HORIZ: 1"=40'
VERT:
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PROFESSIONAL ENGINEER · STATE OF NEVADA · ROBERT GELU · Exp. 6-30-21 · CIVIL · No. 17741

SHEET S-3 OF 32

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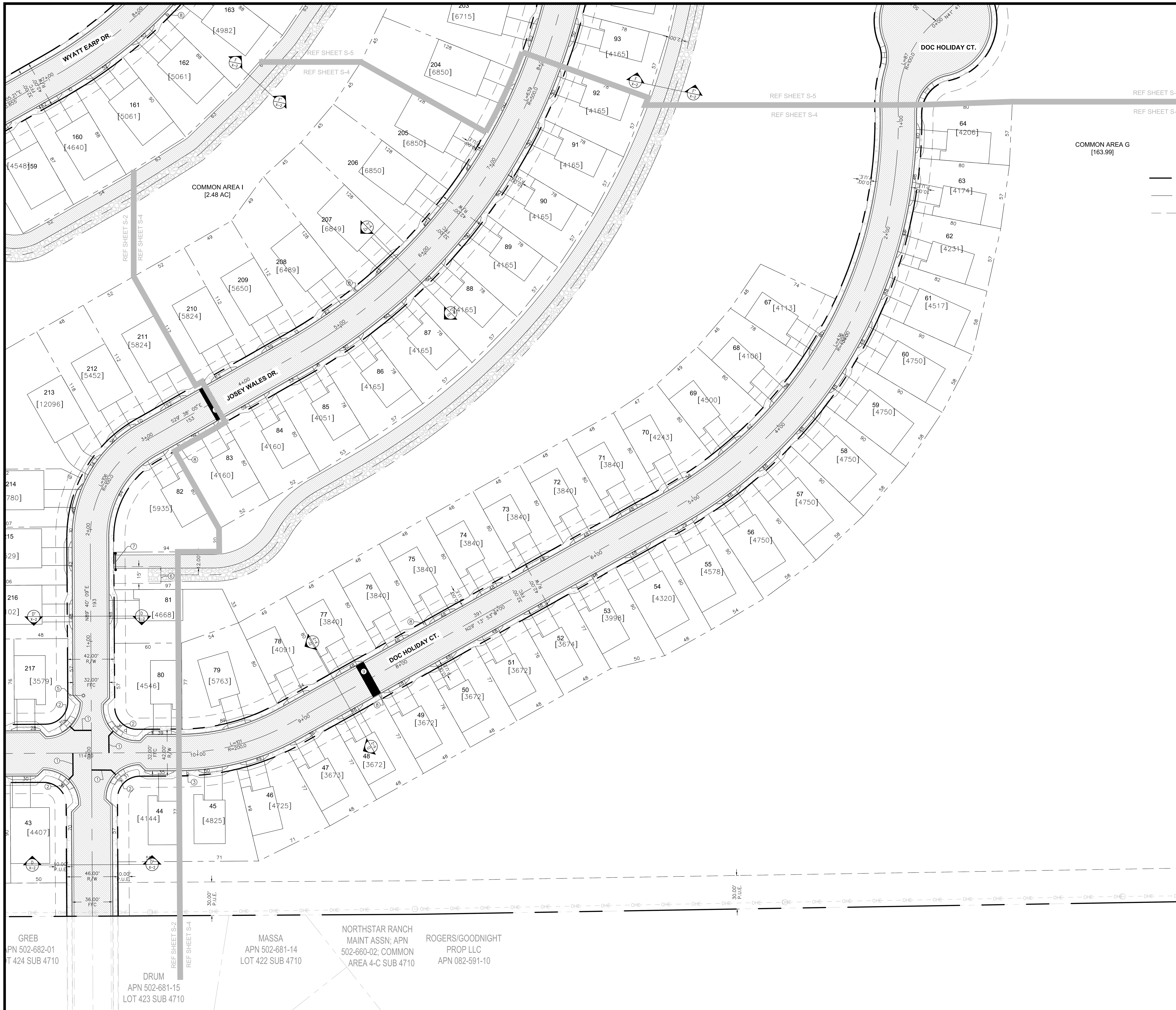

0 40 80 120 160 200

LEGEND

PROPOSED RIGHT-OF-WAY

PROPOSED LOT LINE

PROPOSED EASEMENT

150 LOT NUMBER

[6000] LOT AREA IN SQUARE FEET

60 LOT LINE DIMENSION

SITE PLAN KEYNOTES

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TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6 PRELIMINARY SITE PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD

CHECKED BY: RG

SCALE

HORIZ: 1"=40'

VERT:

JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET S-4 OF 32

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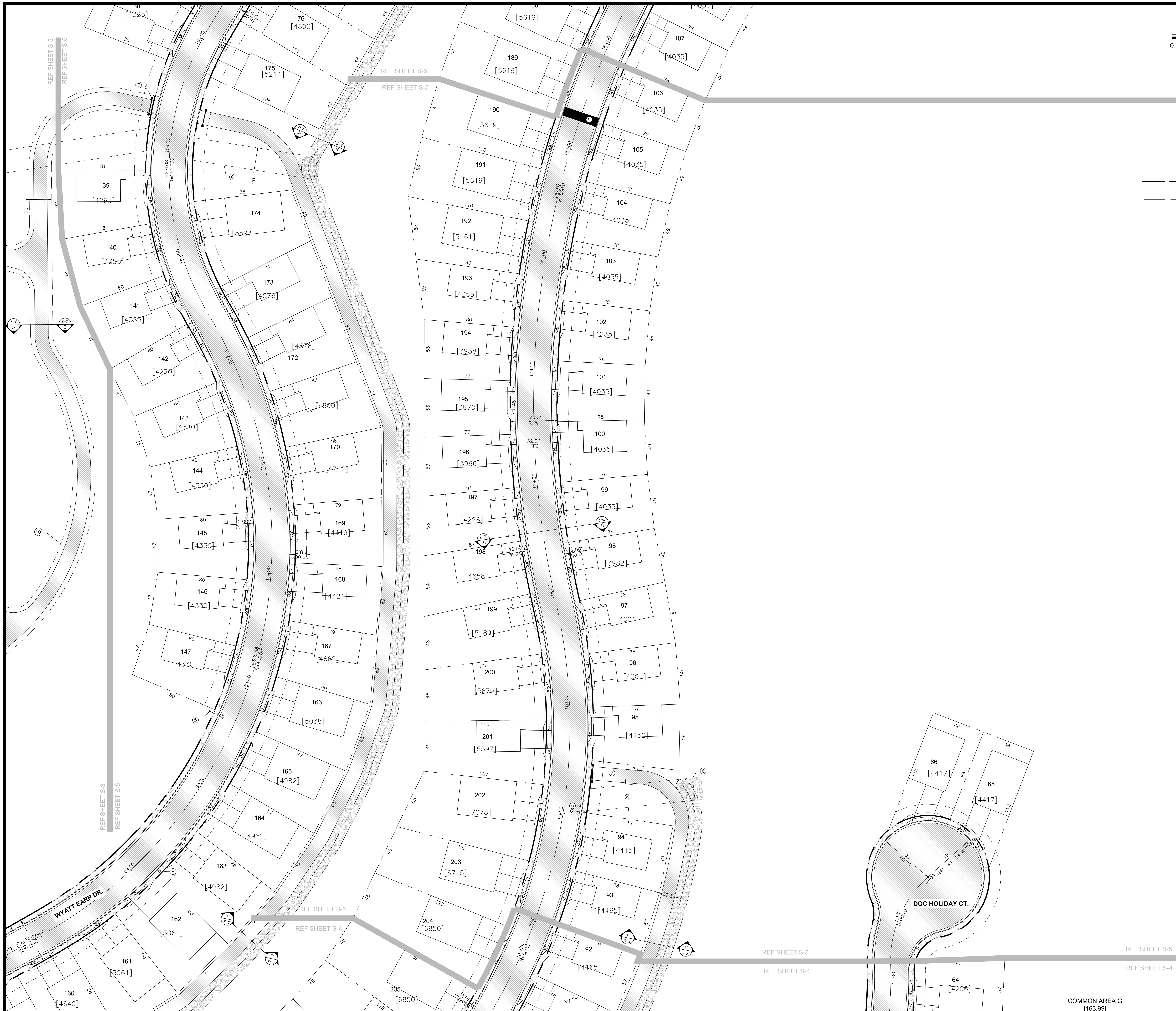

LEGEND

PROPOSED RIGHT-OF-WAY

PROPOSED LOT LINE

PROPOSED EASEMENT

150 LOT NUMBER

[6000] LOT AREA IN SQUARE FEET

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TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6

PRELIMINARY SITE PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD

CHECKED BY: RG

SCALE

HORIZ: 1"=40'

VERT:

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PROFESSIONAL ENGINEER - STATE OF NEVADA
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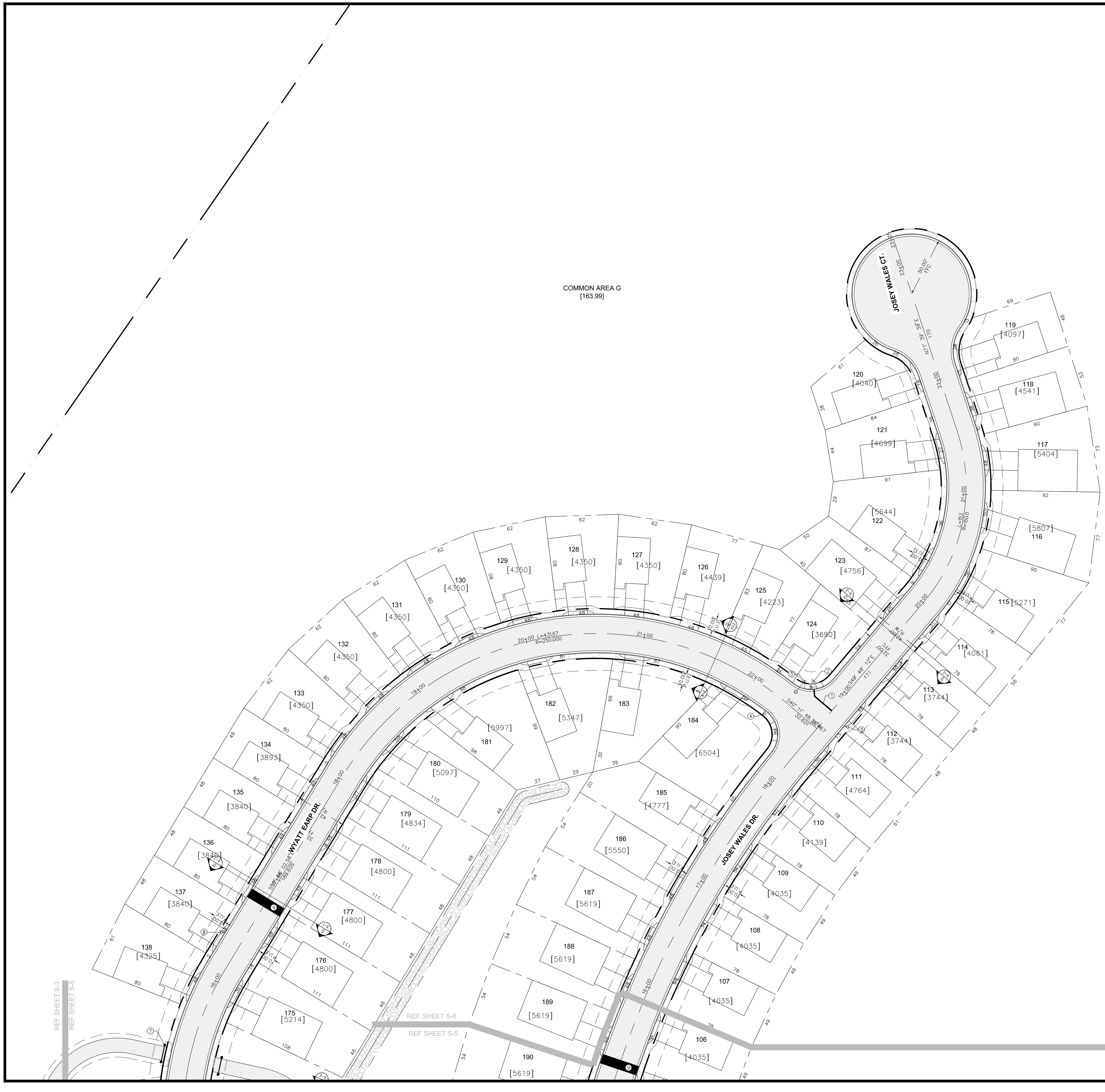

REF SHEET S-6
REF SHEET S-5

0 40 80 120 160 200

N

SITE PLAN KEYNOTES

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LEGEND

	PROPOSED RIGHT-OF-WAY
	PROPOSED LOT LINE
	PROPOSED EASEMENT
150	LOT NUMBER
[6000]	LOT AREA IN SQUARE FEET
60	LOT LINE DIMENSION

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TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY SITE PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=40'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

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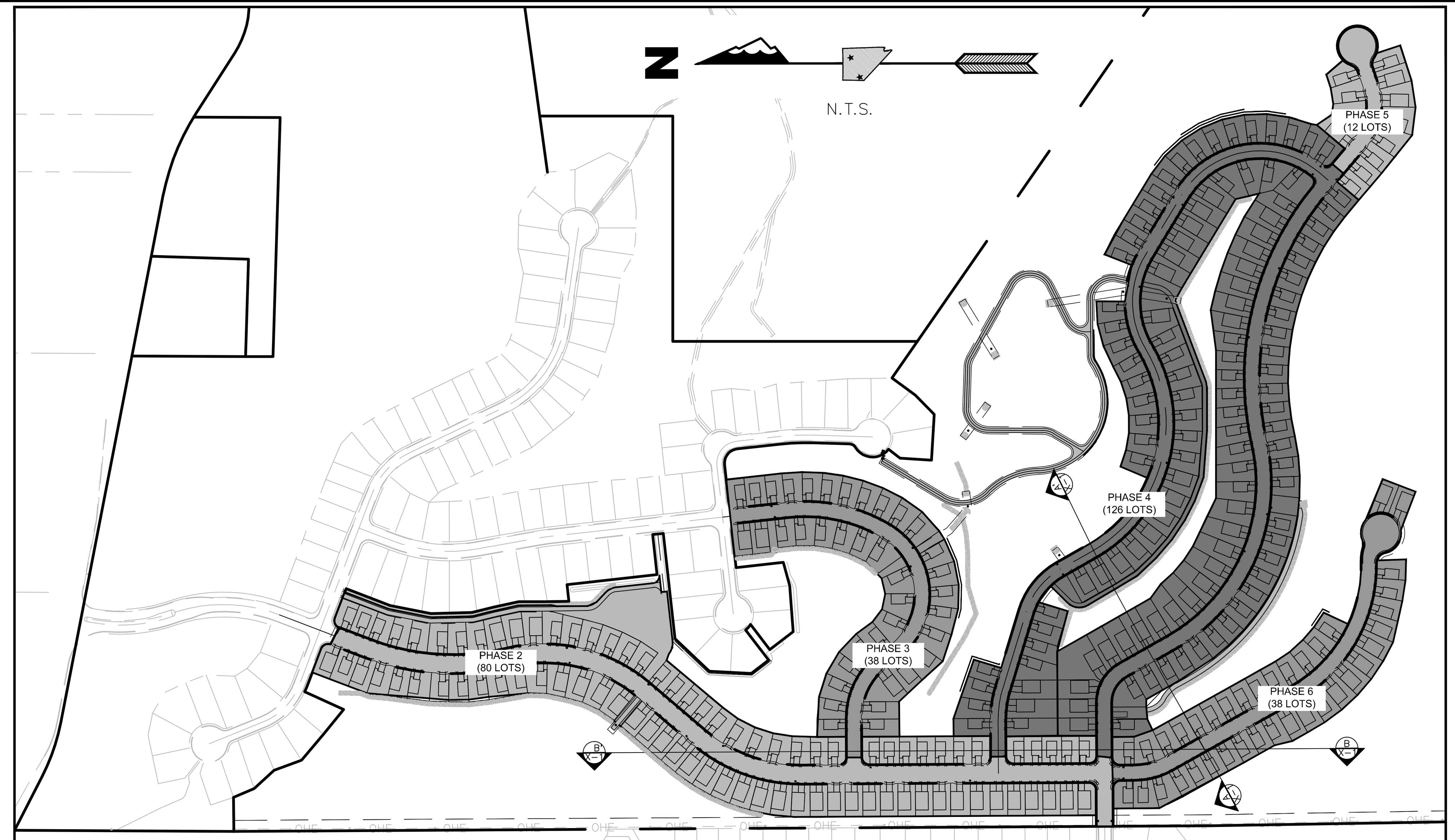
GRADING NOTES

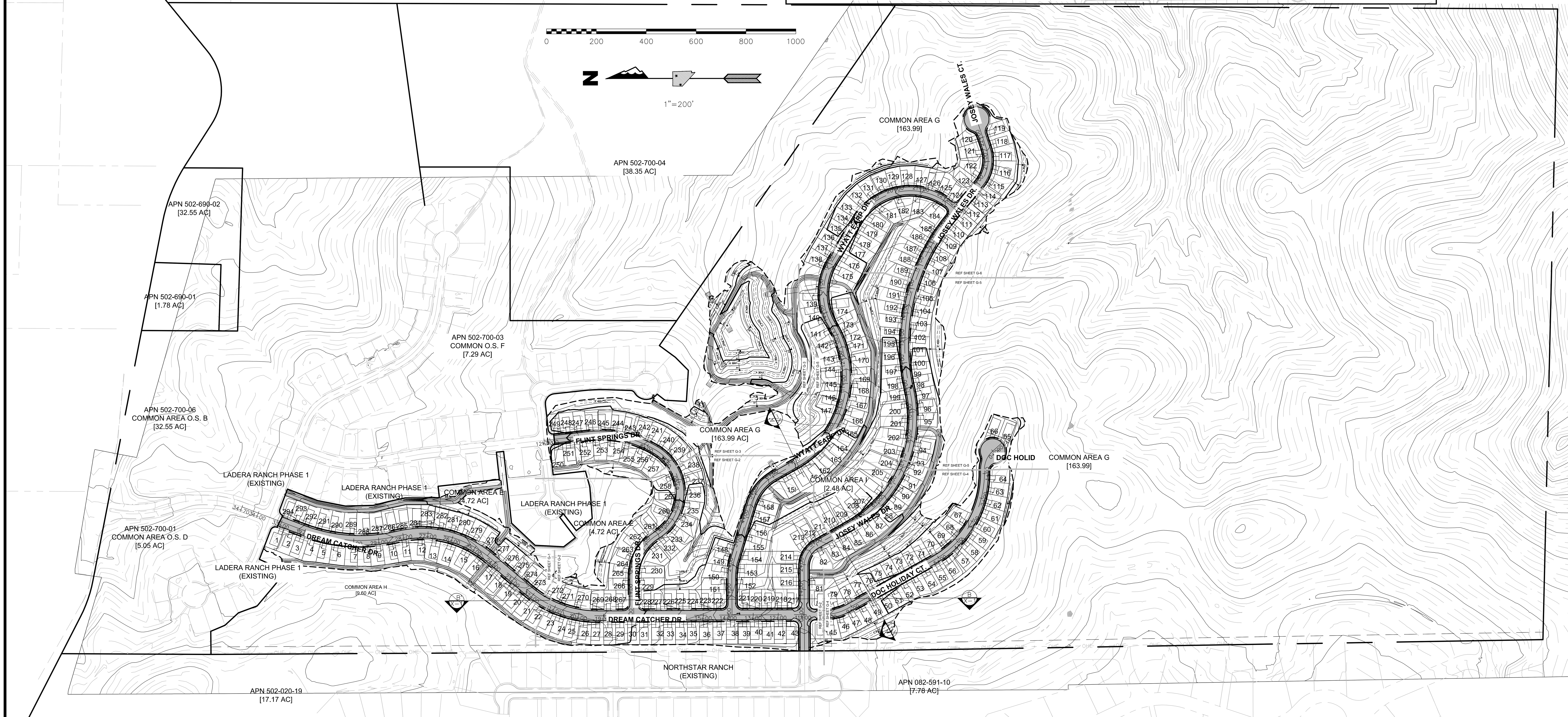
1. THE CONTRACTOR SHALL MAINTAIN A DUST CONTROL PROGRAM, INCLUDING WATERING OF OPEN AREAS. THE CONTRACTOR SHALL ALSO MAINTAIN CONFORMITY WITH SECTION 040.030 OF THE WASHOE COUNTY AIR POLLUTION REGULATIONS.
2. THE CONTRACTOR SHALL MAINTAIN AN ON–GOING PROCESS OF REMOVAL OF ALL SPILLAGE OF EXCAVATION MATERIAL ON ALL PAVED STREETS.
3. THE INSPECTION AND TESTING OF SOILS SHALL BE TO THE WASHOE COUNTY SPECIFICATIONS.
4. ALL AREAS DISTURBED AND LEFT UNDEVELOPED FOR A PERIOD OF MORE THAN 30 DAYS SHALL BE STABILIZED BY THE APPLICATION OF A DUST PALLIATIVE. ALL AREAS LEFT UNDEVELOPED FOR MORE THAN 90 DAYS SHALL BE HYDRO–SEEDED WITH AN APPROVED SEED MIX AND TACKIFIER SHALL BE IRRIGATED UNTIL FIRMLY ESTABLISHED AS APPROVED BY THE COUNTY ENGINEER.
5. LAND GRADING SHALL BE DONE IN A METHOD TO PREVENT DUST FROM TRAVERSING THE PROPERTY LINE.
6. THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND FEES REQUIRED FOR CONSTRUCTION.
7. THE CONTRACTOR SHALL NOTIFY ALL AFFECTED PUBLIC OR PRIVATE ENTITIES 48 HOURS PRIOR TO BEGINNING CONSTRUCTION.
8. THE CONTRACTOR SHALL VERIFY IN FIELD, ALL ELEVATIONS, DIMENSIONS, FLOW LINES, EXISTING CONDITIONS, AND POINTS OF CONNECTIONS WITH ADJOINING PROPERTY (PUBLIC OR PRIVATE), ANY DISCREPANCIES SHALL BE CALLED TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
9. THE CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER, THE SOILS ENGINEER, WASHOE COUNTY, AND NV ENERGY 48 HOURS PRIOR TO COMMENCEMENT OF WORK.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY AND ALL DAMAGE TO EXISTING UTILITIES ENCOUNTERED DURING CONSTRUCTION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE UTILITY COMPANIES FOR LOCATIONS OR POTHOLING PRIOR TO CONSTRUCTION.
11. TC GRADES ON DRIVEWAY APRONS REFLECT THE FULL CURB DESIGN GRADES, NOT THE DEPRESSED APRON GRADES
12. SEPARATE BUILDING PERMIT REQUIRED FOR RETAINING WALLS PRIOR TO CONSTRUCTION.
13. MAXIMUM WALL HEIGHT FOR ROCKERY WALLS IS 6'.
14. MAXIMUM WALL HEIGHT FOR REINFORCED CONCRETE OR MASONRY WALLS IS 6'.
15. MORE REINFORCED CONCRETE OR MASONRY WALLS MAY BE CONSTRUCTED BETWEEN LOTS WITH FINAL PLANS TO ACCOUNT FOR FINISH GRADING.

PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL:
a: ALL FILL DIRT IMPORTED AS PART OF THE PROJECT IS REQUIRED TO BE "CERTIFIED WEED FREE".
b: BEST MANAGEMENT PRACTICES WILL BE USED TO PREVENT THE SPREAD OF NOXIOUS AND INVASIVE WEEDS DURING CONSTRUCTION ACTIVITIES.
- IDENTIFY AND MAP ALL NOXIOUS AND INVASIVE WEED POPULATIONS PRESENT IN THE PROJECT AREA,
- TREAT OR CONTAIN ANY WEED POPULATIONS THAT MAY BE IMPACTED OR DISTURBED BY CONSTRUCTION ACTIVITY,
- FLAG ALL WEED POPULATIONS TO BE AVOIDED,
- PROVIDE TRAINING TO CONSTRUCTION WORKERS AND EQUIPMENT OPERATORS ON THE IDENTIFICATION OF WEEDS TO BE AVOIDED,
- CERTIFY THAT ALL CONSTRUCTION MATERIAL SOURCES USED FOR SUPPLIES OF SAND, GRAVEL, ROCK AND MULCH ARE WEED–FREE PRIOR TO OBTAINING OR TRANSPORTING ANY MATERIAL FROM THEM,
- OBTAIN AND USE ONLY CERTIFIED WEED–FREE STRAW OR USE FIBER ROLL LOGS FOR SEDIMENT CONTAINMENT,
- WASH AND INSPECT ALL VEHICLES FOR WEED SEEDS AND PLANT PARTS PRIOR TO BRINGING THEM ONTO THE JOB SITE,
- INSTALL STORMWATER BEST MANAGEMENT PRACTICES TO PREVENT EROSION OF THE JOB SITE AND THE POTENTIAL TRANSPORT OFF WEEDY MATERIAL ONTO OR OFF OF THE JOB SITE.

DURING CONSTRUCTION THE CONTRACTOR SHALL:
- MINIMIZE GROUND DISTURBANCE AND VEGETATION REMOVAL AS MUCH AS POSSIBLE AND PRACTICAL.
- WASH, OR USING AN AIR COMPRESSOR, BLOW CLEAN ALL VEHICLES (INCLUDING TIRES AND UNDERCARRIAGE) THAT MAY HAVE ENTERED WEED INFESTED AREAS PRIOR TO ENTERING UNINFESTED AREAS OF THE JOB SITE.
- RESTRICT VEHICLES OR OTHER TRAFFIC THAT MAY TRANSPORT WEED SEEDS OR PLANT MATERIAL FROM ENTERING THE JOB SITE UNLESS THEY ARE FIRST WASHED AND INSPECTED.



PHASING MAP
(5 PHASES)



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SUMMIT ENGINEERING CORPORATION
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TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
OVERALL GRADING PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=200'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER – STATE OF NEVADA
ROBERT GELU
Exp. 6–30–21
CIVIL
No. 17741

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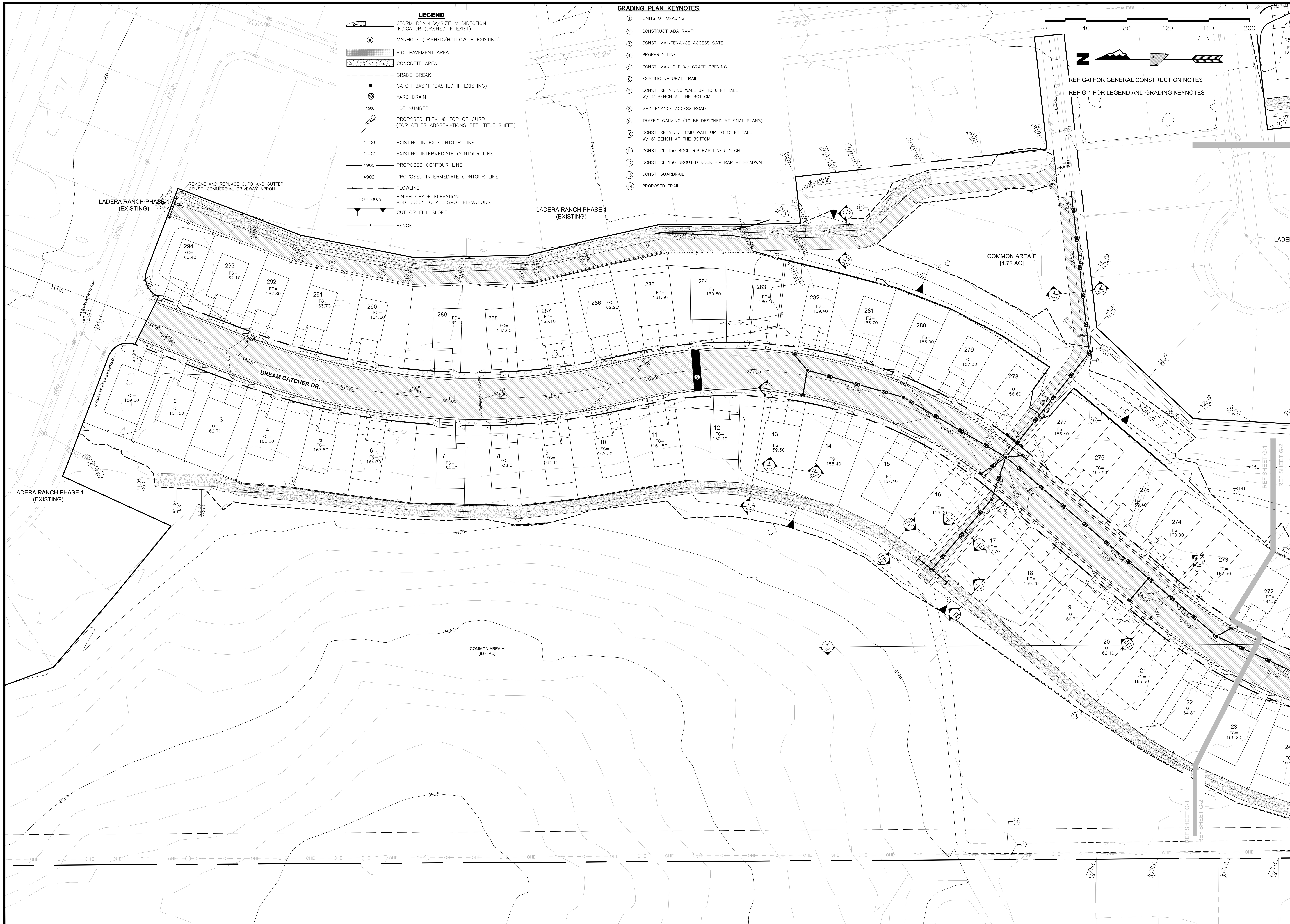
SHEET G-0 OF 32



LEGEND

- STORM DRAIN W/SIZE & DIRECTION INDICATOR (DASHED IF EXIST)
- MANHOLE (DASHED/HOLLOW IF EXISTING)
- A.C. PAVEMENT AREA
- CONCRETE AREA
- GRADE BREAK
- CATCH BASIN (DASHED IF EXISTING)
- YARD DRAIN
- 1500 LOT NUMBER
- PROPOSED ELEV. @ TOP OF CURB (FOR OTHER ABBREVIATIONS REF. TITLE SHEET)
- 5000 EXISTING INDEX CONTOUR LINE
- 5002 EXISTING INTERMEDIATE CONTOUR LINE
- 4900 PROPOSED CONTOUR LINE
- 4902 PROPOSED INTERMEDIATE CONTOUR LINE
- FLOWLINE
- FG=100.5 FINISH GRADE ELEVATION ADD 5000' TO ALL SPOT ELEVATIONS
- CUT OR FILL SLOPE
- FENCE

GRADING PLAN KEYNOTES

1. LIMITS OF GRADING
2. CONSTRUCT ADA RAMP
3. CONST. MAINTENANCE ACCESS GATE
4. PROPERTY LINE
5. CONST. MANHOLE W/ GRATE OPENING
6. EXISTING NATURAL TRAIL
7. CONST. RETAINING WALL UP TO 6 FT TALL W/ 4' BENCH AT THE BOTTOM
8. MAINTENANCE ACCESS ROAD
9. TRAFFIC CALMING (TO BE DESIGNED AT FINAL PLANS)
10. CONST. RETAINING CMU WALL UP TO 10 FT TALL W/ 6' BENCH AT THE BOTTOM
11. CONST. CL 150 ROCK RIP RAP LINED DITCH
12. CONST. CL 150 GROUTED ROCK RIP RAP AT HEADWALL
13. CONST. GUARDRAIL
14. PROPOSED TRAIL

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6 PRELIMINARY GRADING PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG

SCALE
HORIZ: 1"=40'
VERT:

JOB NO: 30884

PROFESSIONAL ENGINEER STATE OF NEVADA ROBERT GELU Exp. 6-30-21 CIVIL No. 17741

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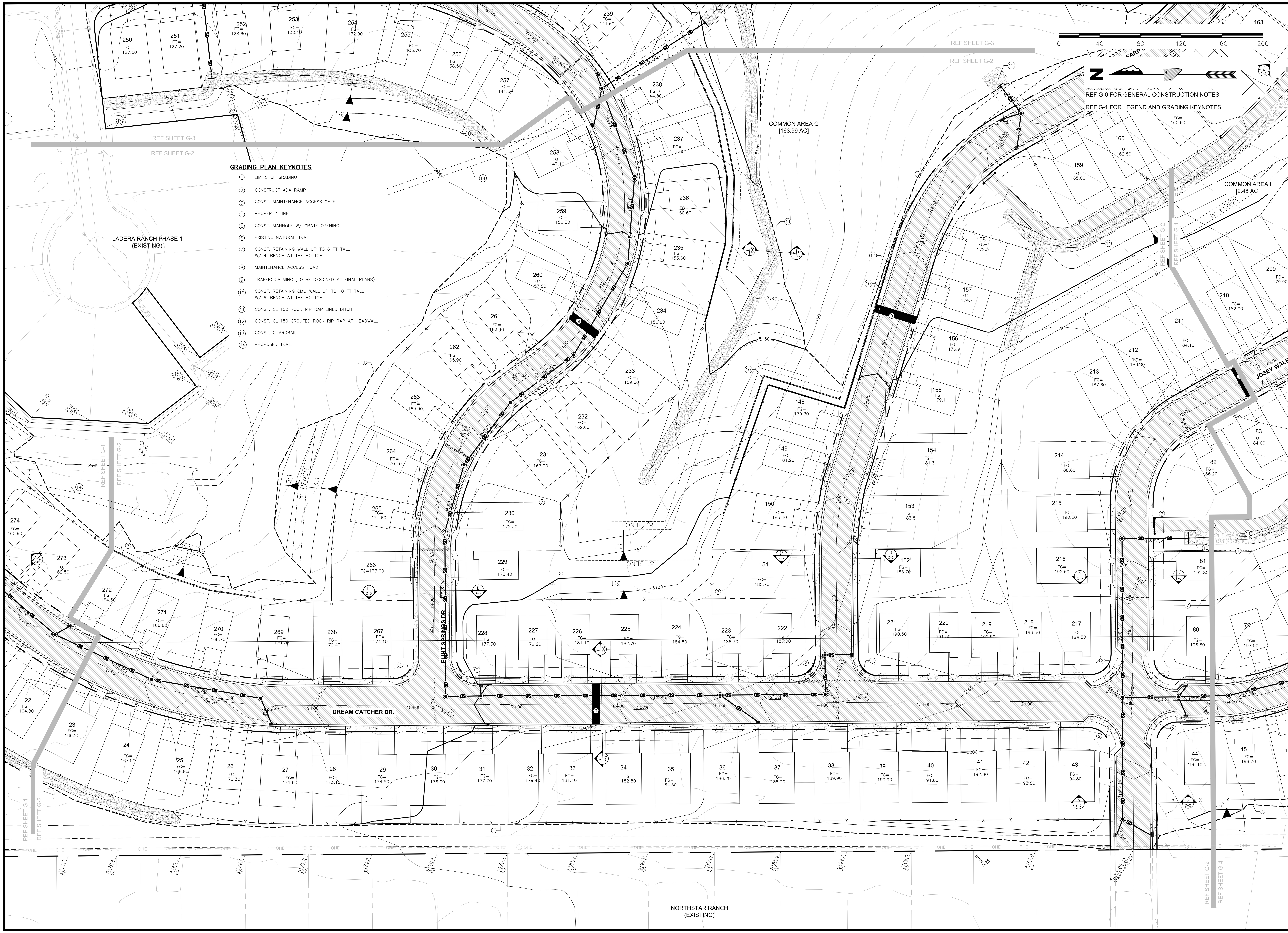
SHEET G-1 OF 32



TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6

PRELIMINARY GRADING PLAN

WASHOE COUNTY NEVADA

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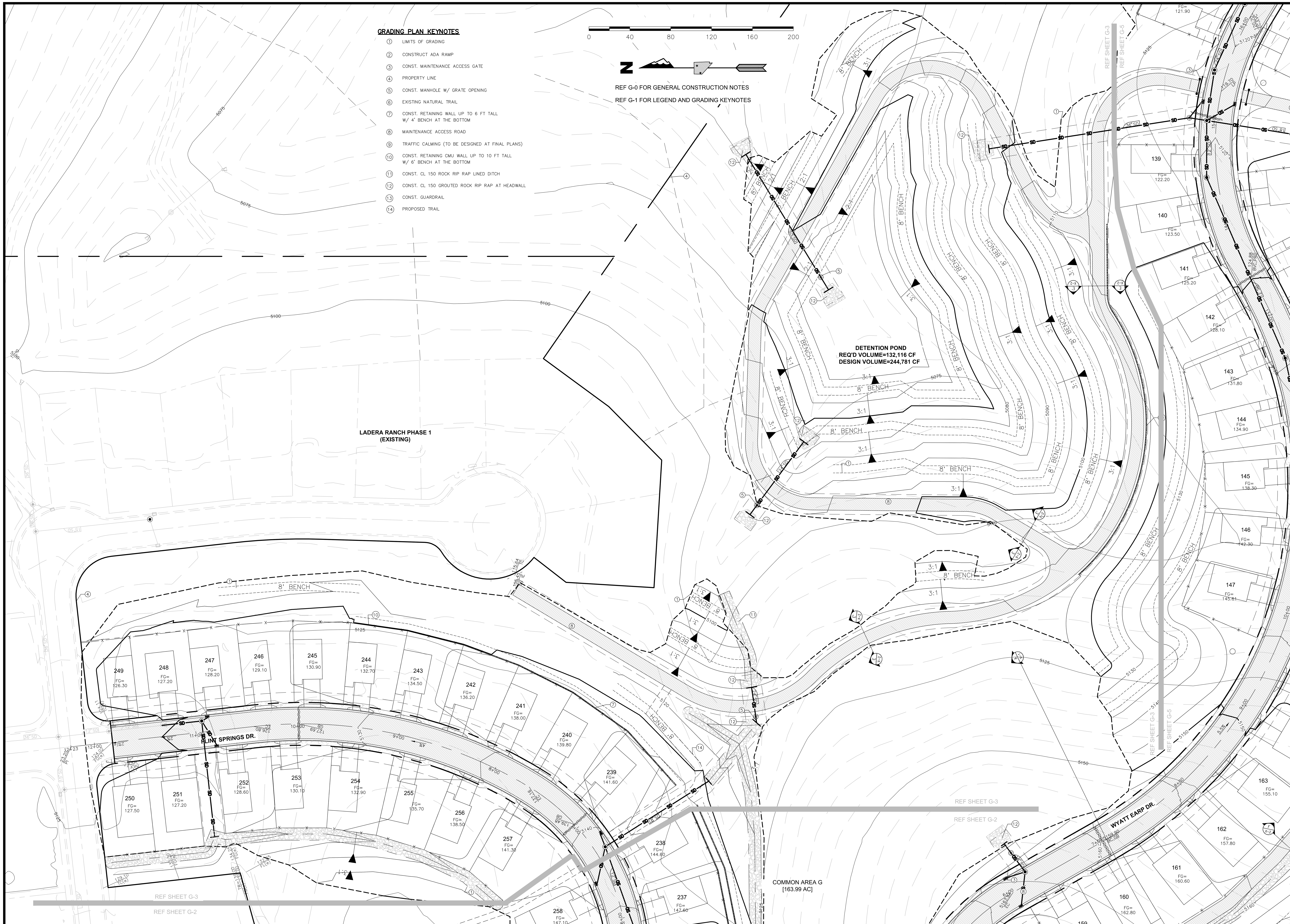

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SHEET G-3 OF 32

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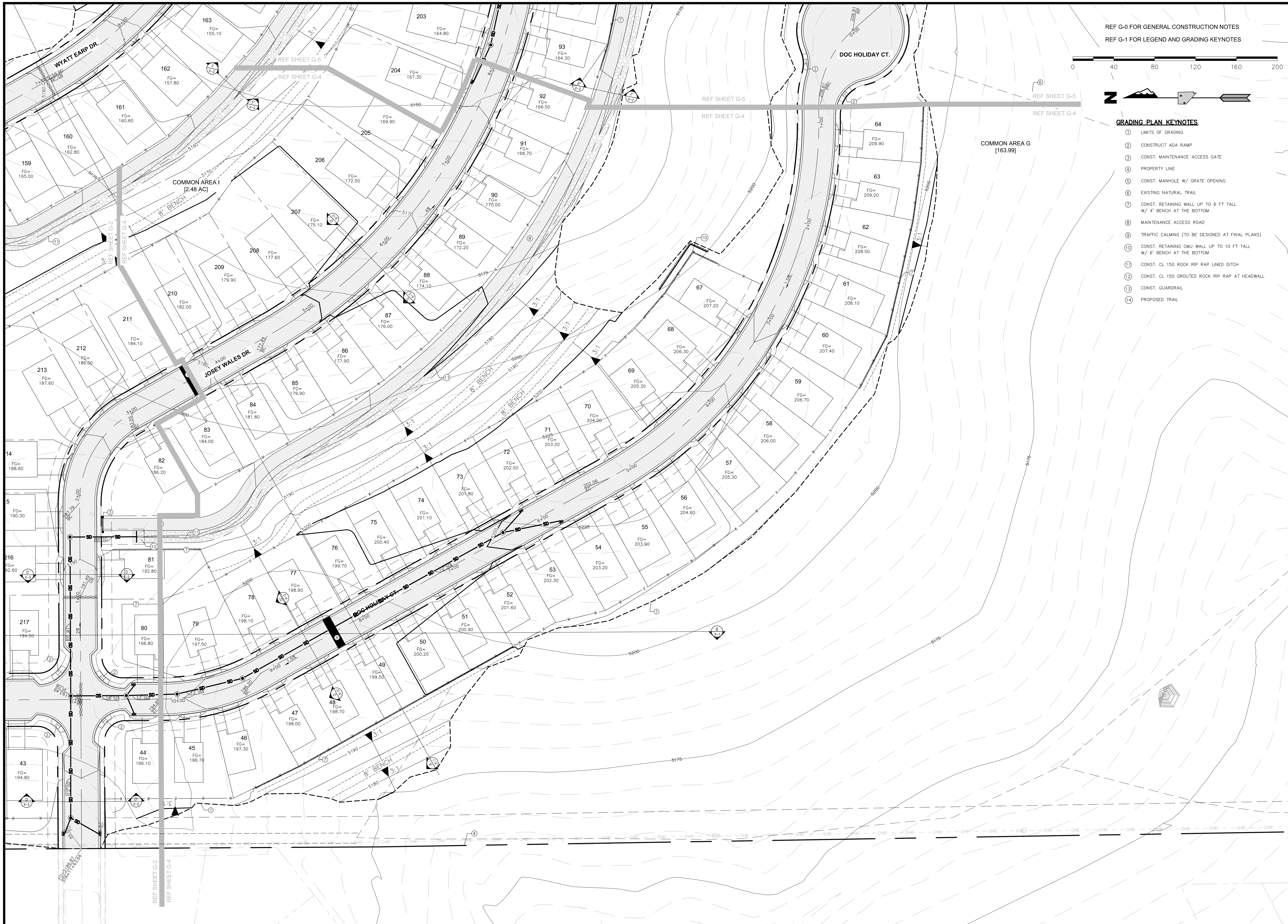
REF G-0 FOR GENERAL CONSTRUCTION NOTES

REF G-1 FOR LEGEND AND GRADING KEYNOTES



GRADING PLAN KEYNOTES

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WASHOE COUNTY NEVADA

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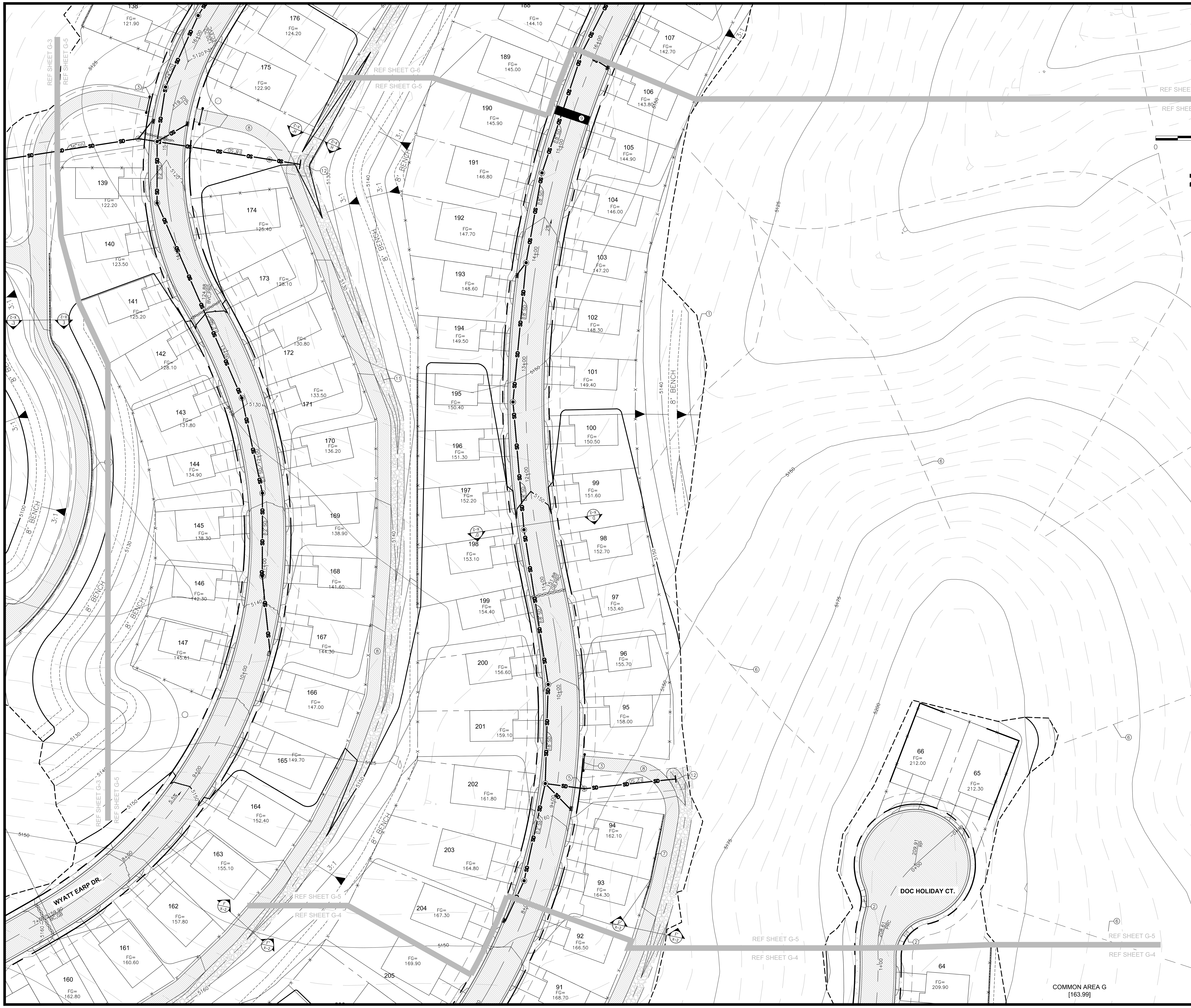
SHEET G-4 OF 32



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REF G-0 FOR GENERAL CONSTRUCTION NOTES

REF G-1 FOR LEGEND AND GRADING KEYNOTES

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PRELIMINARY GRADING PLAN

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SHEET G-5 OF 32

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REF G-0 FOR GENERAL CONSTRUCTION NOTES

REF G-1 FOR LEGEND AND GRADING KEYNOTES

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PRELIMINARY GRADING PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD

CHECKED BY: RG

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HORIZ: 1"=40'

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SHEET G-6 OF 32

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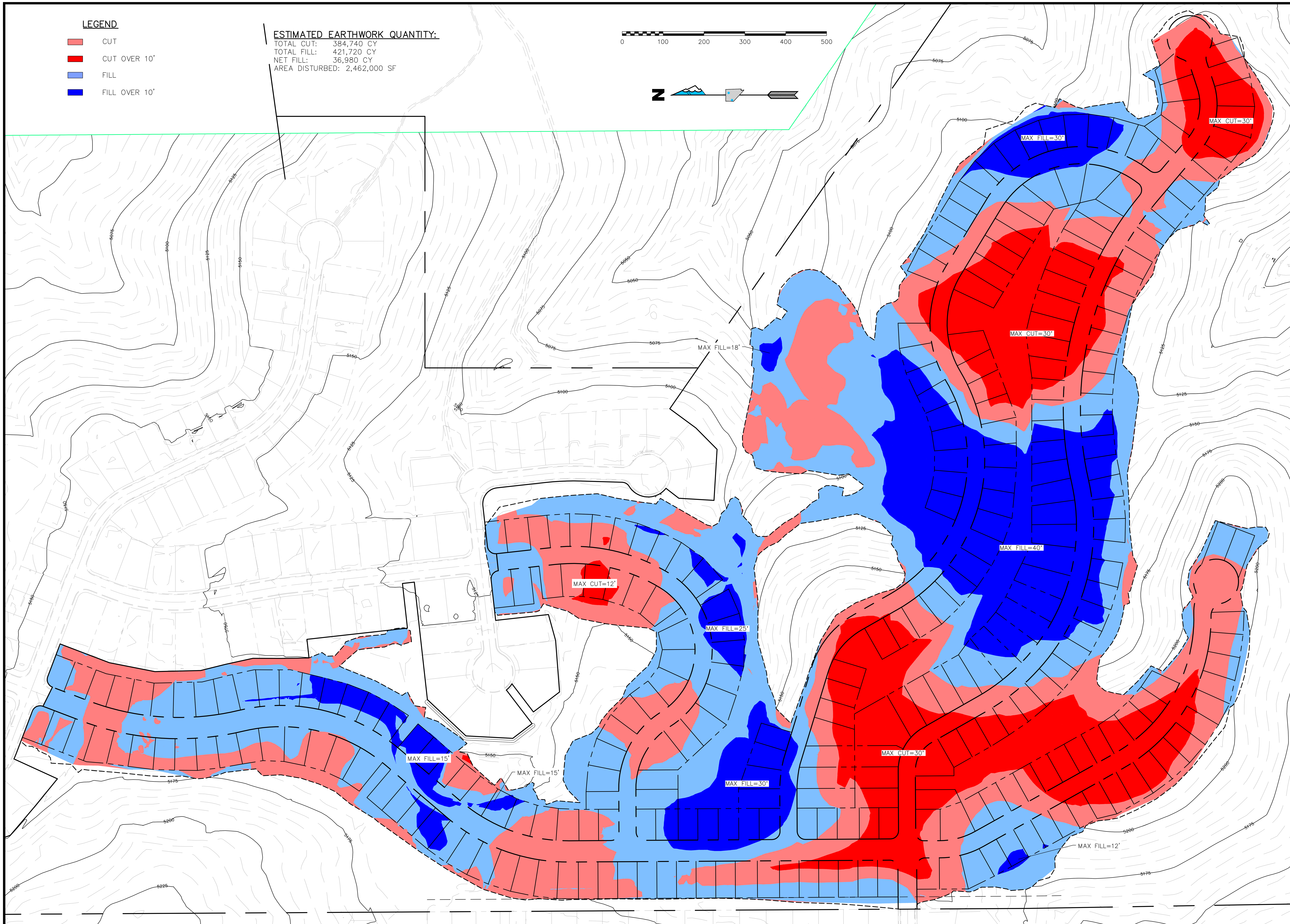

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
CUT/FILL MAP

WASHOE COUNTY
NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=100'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET C-0 OF 32

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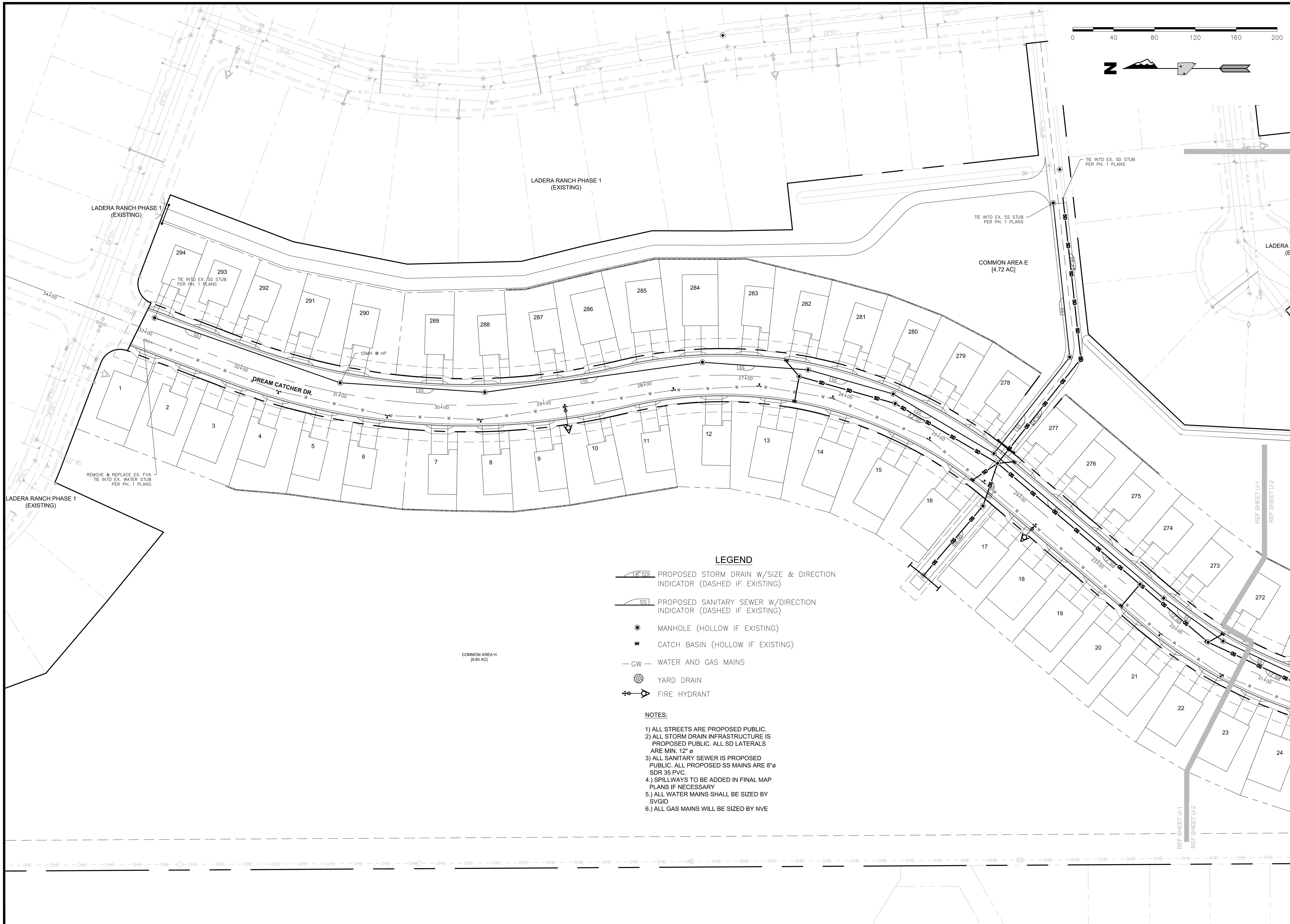

LEGEND

18" SD	PROPOSED STORM DRAIN W/SIZE & DIRECTION INDICATOR (DASHED IF EXISTING)
SS	PROPOSED SANITARY SEWER W/DIRECTION INDICATOR (DASHED IF EXISTING)
	MANHOLE (HOLLOW IF EXISTING)
	CATCH BASIN (HOLLOW IF EXISTING)
— GW —	WATER AND GAS MAINS
	YARD DRAIN
	FIRE HYDRANT

NOTES:

1) ALL STREETS ARE PROPOSED PUBLIC.
2) ALL STORM DRAIN INFRASTRUCTURE IS PROPOSED PUBLIC. ALL SD LATERALS ARE MIN. 12" ø
3) ALL SANITARY SEWER IS PROPOSED PUBLIC. ALL PROPOSED SS MAINS ARE 8"ø SDR 35 PVC.
4.) SPILLWAYS TO BE ADDED IN FINAL MAP PLANS IF NECESSARY
5.) ALL WATER MAINS SHALL BE SIZED BY SVGID
6.) ALL GAS MAINS WILL BE SIZED BY NVE

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY UTILITY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG

SCALE	
HORIZ:	1"=40'
VERT:	

JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

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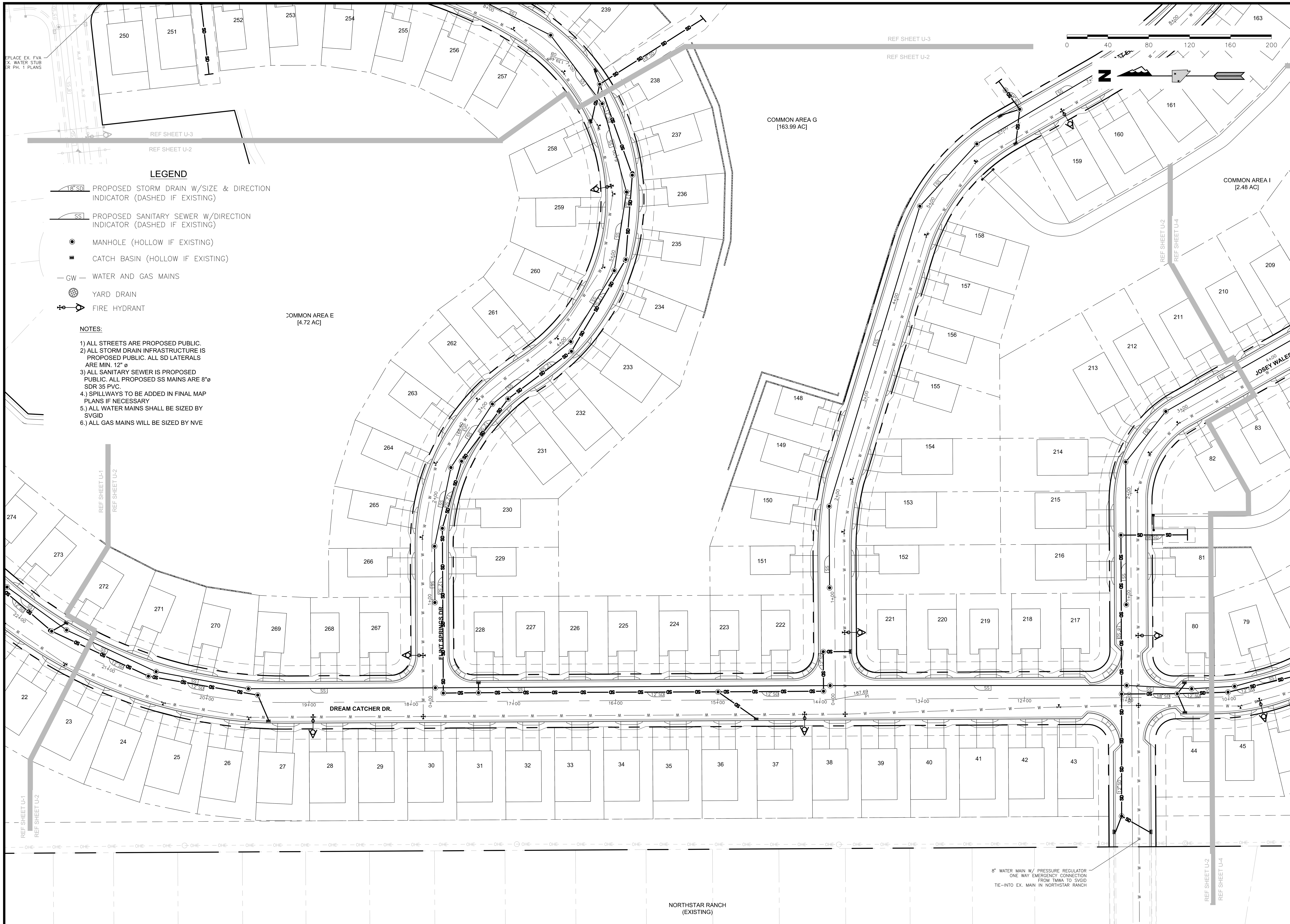

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY UTILITY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=40'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET U-2 OF 32

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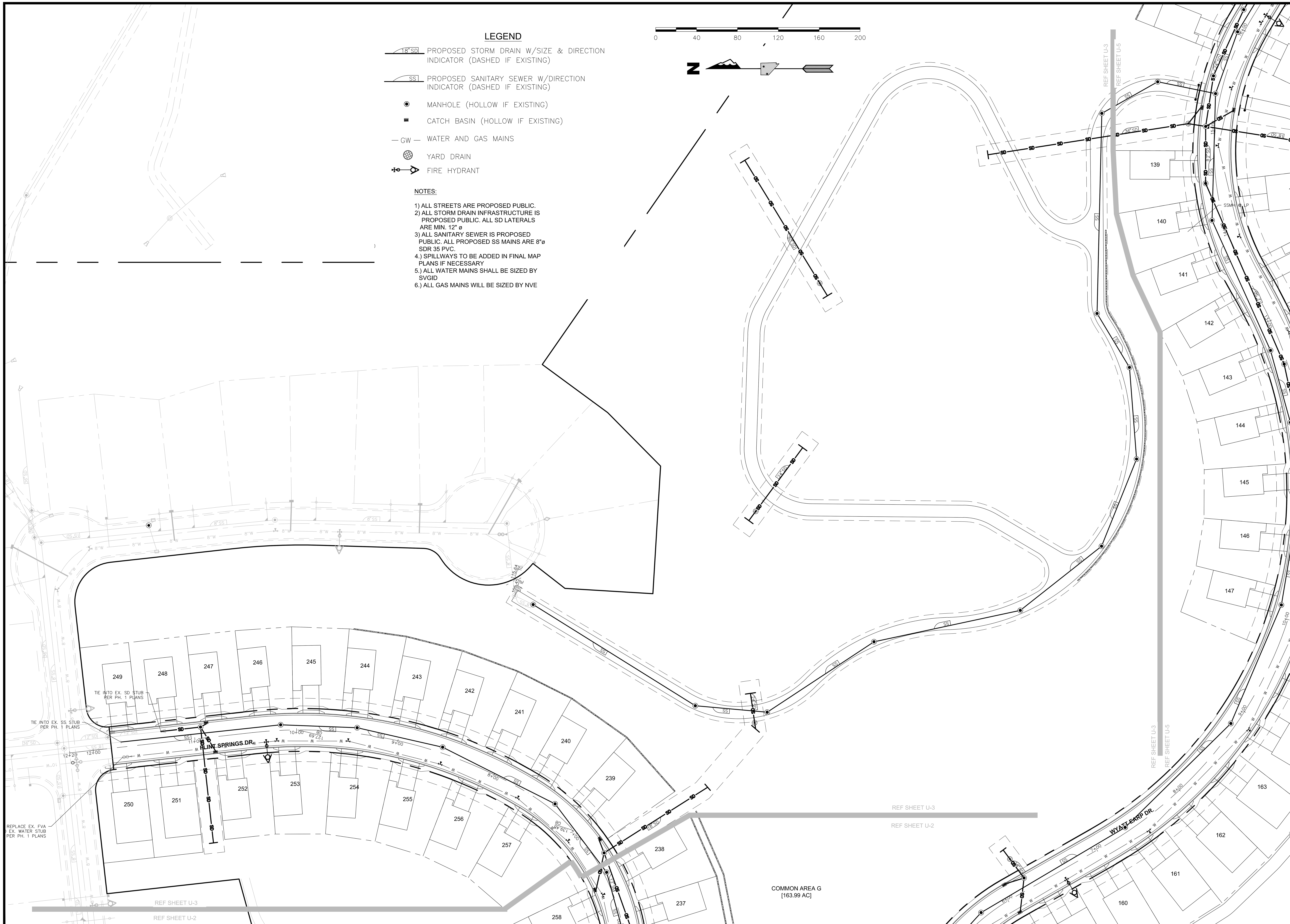

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY UTILITY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=40'
VERT:
JOB NO: 30884

ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741
PROFESSIONAL ENGINEER - STATE OF NEVADA

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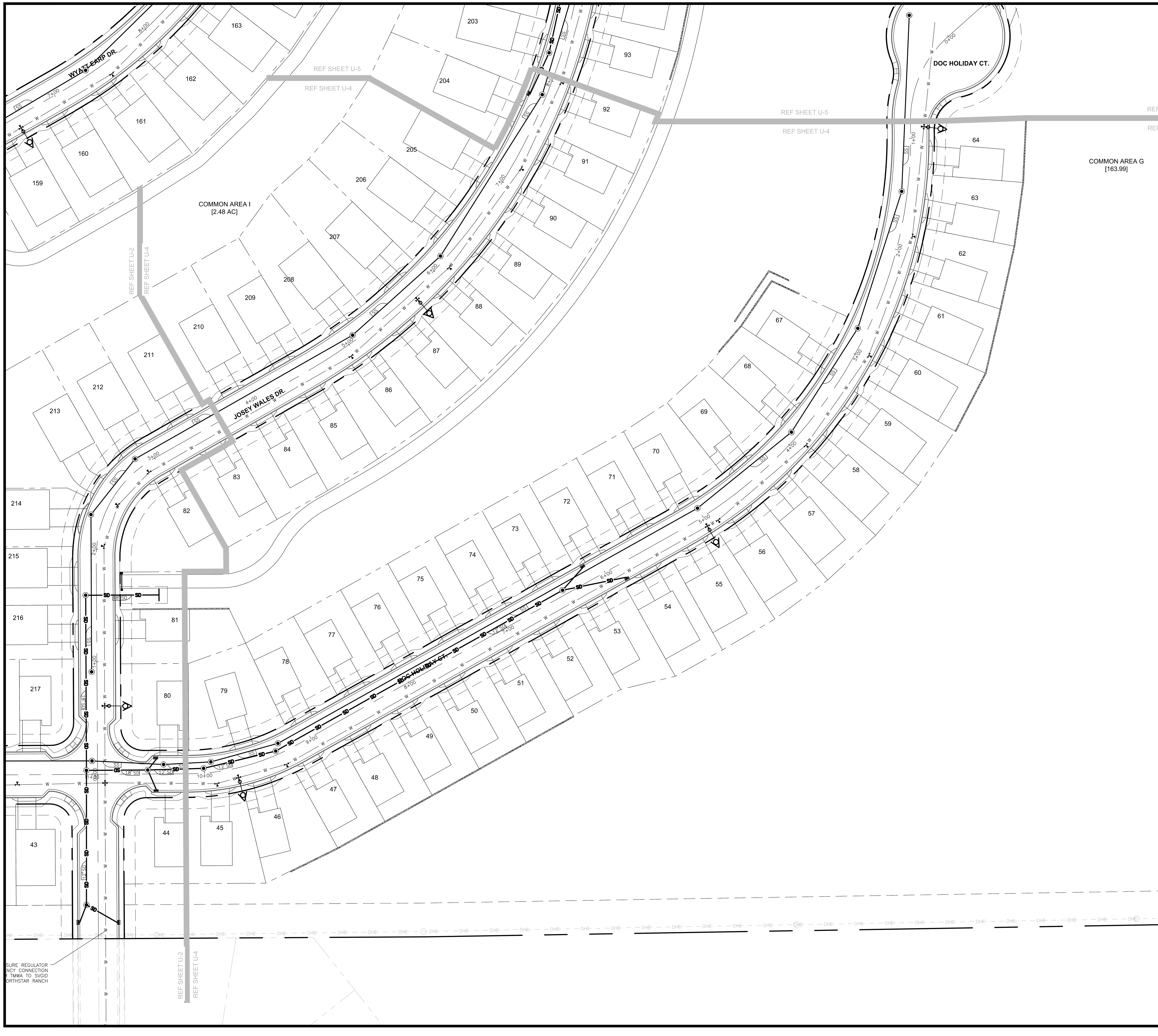

0 40 80 120 160 200

N

LEGEND

- 18" SD — PROPOSED STORM DRAIN W/SIZE & DIRECTION INDICATOR (DASHED IF EXISTING)
- SS — PROPOSED SANITARY SEWER W/DIRECTION INDICATOR (DASHED IF EXISTING)
- MANHOLE (HOLLOW IF EXISTING)
- CATCH BASIN (HOLLOW IF EXISTING)
- — GW — WATER AND GAS MAINS
- YARD DRAIN
- FIRE HYDRANT

NOTES:

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2) ALL STORM DRAIN INFRASTRUCTURE IS PROPOSED PUBLIC. ALL SD LATERALS ARE MIN. 12" ø
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5.) ALL WATER MAINS SHALL BE SIZED BY SVGID
6.) ALL GAS MAINS WILL BE SIZED BY NVE

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY UTILITY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=40'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER – STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET U-4 OF 32

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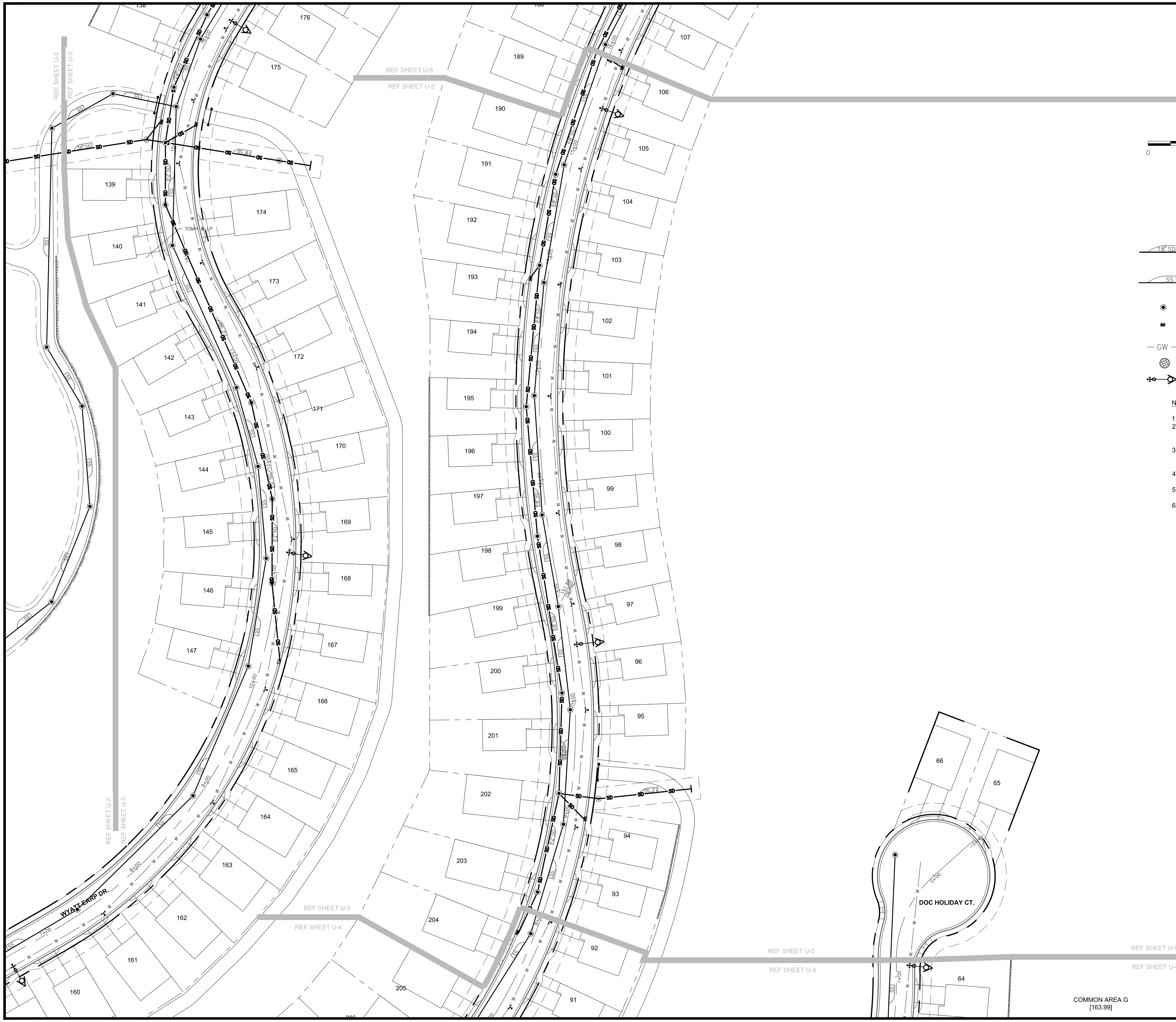

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LEGEND

18" SD — PROPOSED STORM DRAIN W/SIZE & DIRECTION INDICATOR (DASHED IF EXISTING)

SS — PROPOSED SANITARY SEWER W/DIRECTION INDICATOR (DASHED IF EXISTING)

MANHOLE (HOLLOW IF EXISTING)

CATCH BASIN (HOLLOW IF EXISTING)

— GW — WATER AND GAS MAINS

YARD DRAIN

FIRE HYDRANT

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY UTILITY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=40'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET U-5 OF 32

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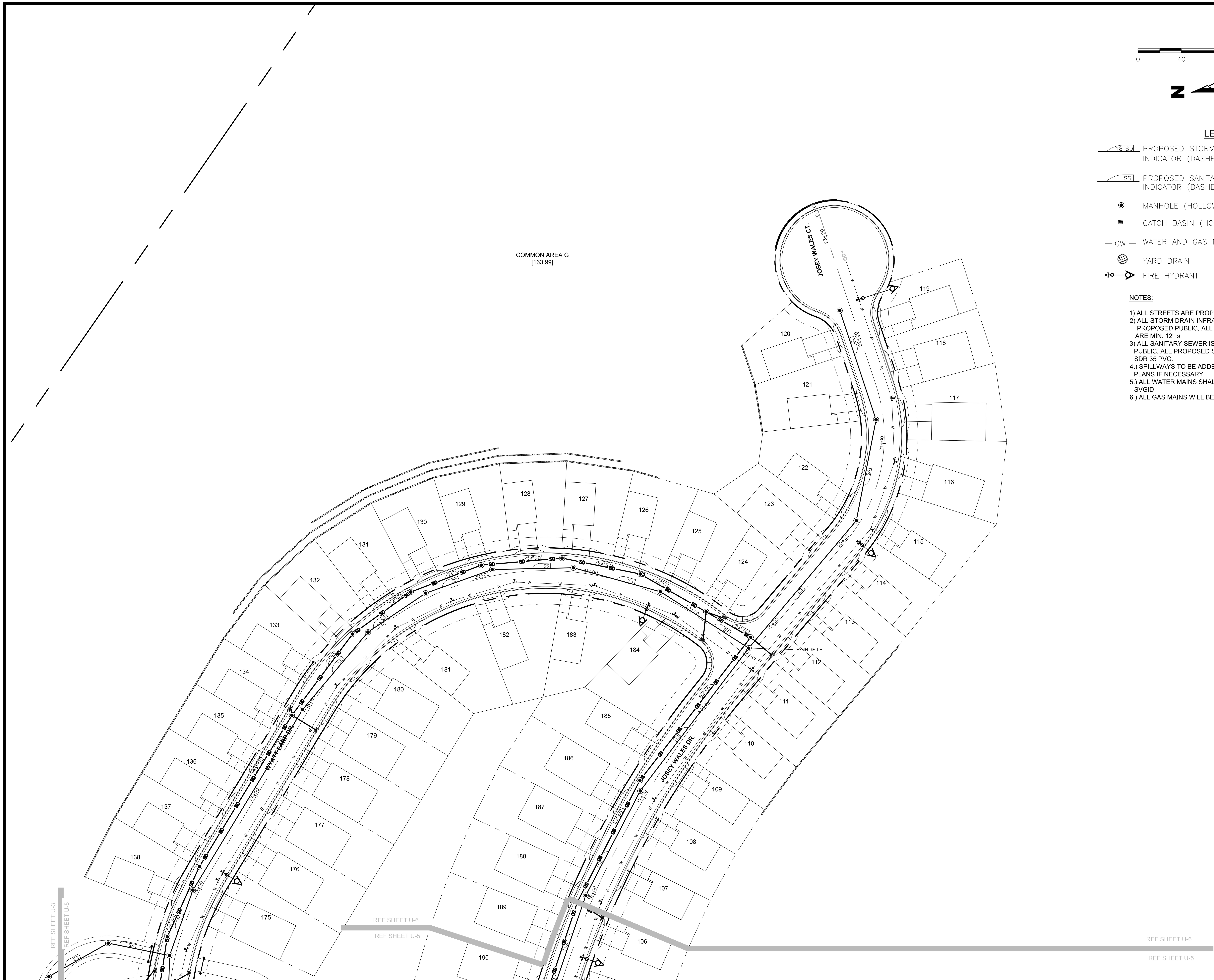

0 40 80 120 160 200

LEGEND

18" SD — PROPOSED STORM DRAIN W/SIZE & DIRECTION INDICATOR (DASHED IF EXISTING)

SS — PROPOSED SANITARY SEWER W/DIRECTION INDICATOR (DASHED IF EXISTING)

MANHOLE (HOLLOW IF EXISTING)

CATCH BASIN (HOLLOW IF EXISTING)

— GW — WATER AND GAS MAINS

YARD DRAIN

FIRE HYDRANT

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY UTILITY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=40'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

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LEGEND

INSTALL CONSTRUCTION SITE ENTRANCE & EXIT (BMP SC-8)

RIPRAP AREA (BMP EC-7)

INSTALL FIBER ROLLS (BMP SC-1)

INSTALL REVEGETATION (BMP EC-8)

SWM — SOLID AND DEMOLITION WASTE MANAGEMENT (BMP GM-3)

STORM DRAIN INLET PROTECTION (BMP DP-3)

SAND AND GRAVEL BAG BARRIERS (BMP SC-3)

CWM — HANDLING AND DISPOSAL OF CONCRETE AND CEMENT (BMP GM-9)

SS — SANITARY/SEPTIC WASTE MANAGEMENT (BMP GM-14)

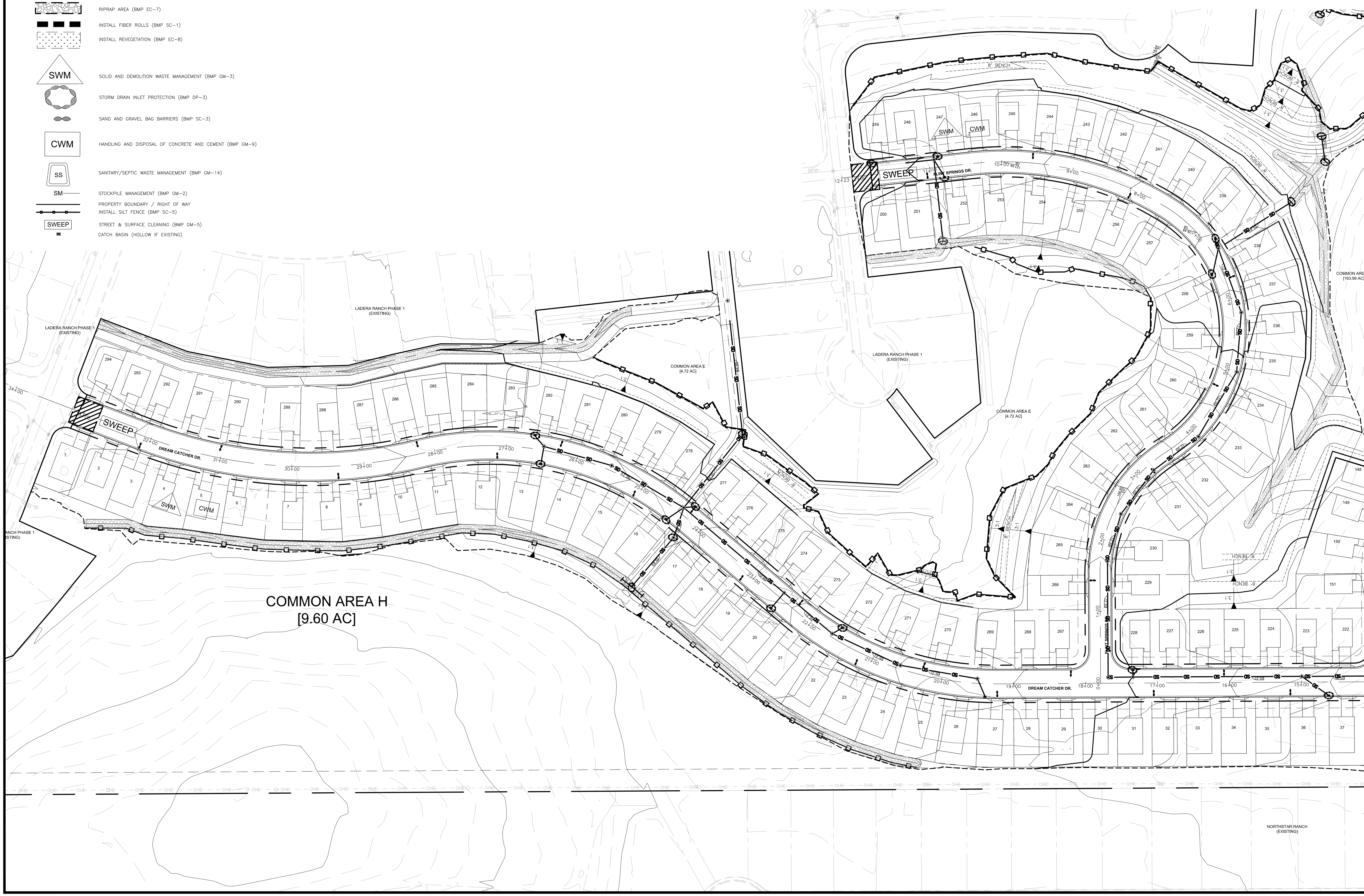
SM — STOCKPILE MANAGEMENT (BMP GM-2)

PROPERTY BOUNDARY / RIGHT OF WAY

INSTALL SILT FENCE (BMP SC-5)

SWEEP — STREET & SURFACE CLEANING (BMP GM-5)

CATCH BASIN (HOLLOW IF EXISTING)



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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PRELIMINARY EROSION CONTROL PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD

CHECKED BY: RG

SCALE

HORIZ: 1"=60'

VERT:

JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET EC-1 OF 32

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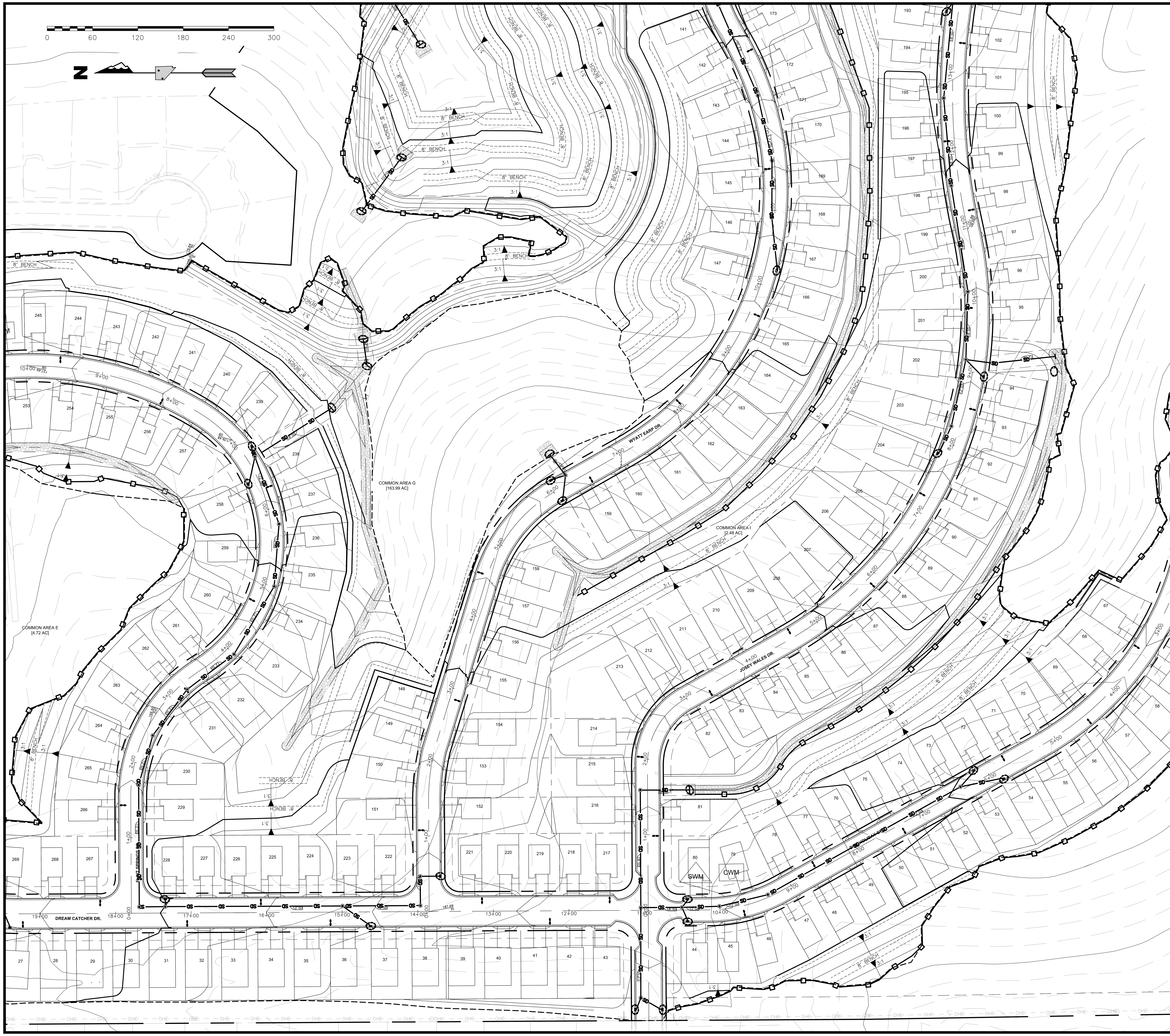

LEGEND

- INSTALL CONSTRUCTION SITE ENTRANCE & EXIT (BMP SC-8)
- RIPRAP AREA (BMP EC-7)
- INSTALL FIBER ROLLS (BMP SC-1)
- INSTALL REVEGETATION (BMP EC-8)
- SWM — SOLID AND DEMOLITION WASTE MANAGEMENT (BMP GM-3)
- STORM DRAIN INLET PROTECTION (BMP DP-3)
- SAND AND GRAVEL BAG BARRIERS (BMP SC-3)
- CWM — HANDLING AND DISPOSAL OF CONCRETE AND CEMENT (BMP GM-9)
- SS — SANITARY/SEPTIC WASTE MANAGEMENT (BMP GM-14)
- SM — STOCKPILE MANAGEMENT (BMP GM-2)
- PROPERTY BOUNDARY / RIGHT OF WAY
- INSTALL SILT FENCE (BMP SC-5)
- SWEEP — STREET & SURFACE CLEANING (BMP GM-5)
- CATCH BASIN (HOLLOW IF EXISTING)

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PHONE (775) 747-8550 FAX (775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6

PRELIMINARY EROSION CONTROL PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=60'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET EC-2 OF 32

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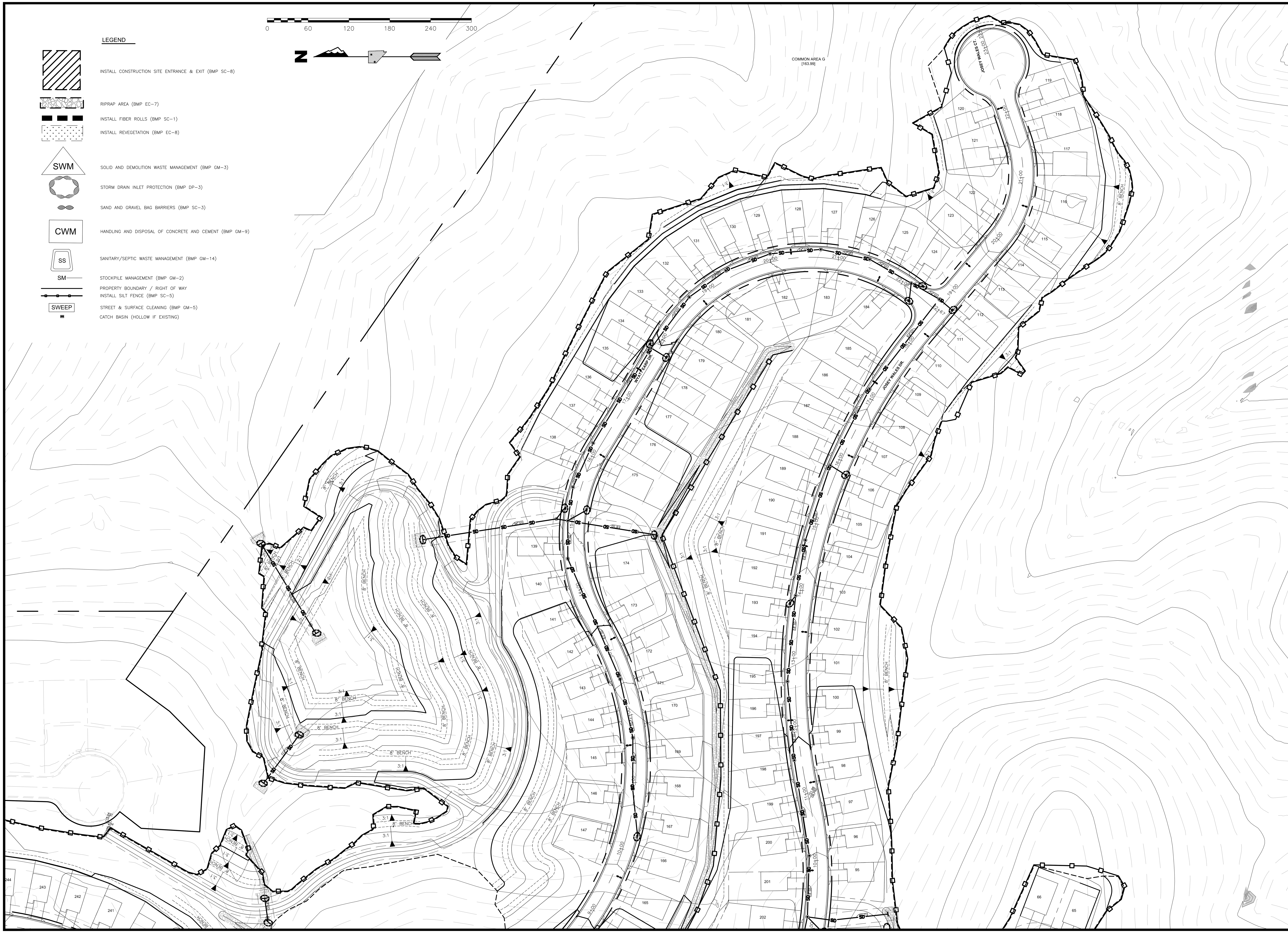
LEGEND

- INSTALL CONSTRUCTION SITE ENTRANCE & EXIT (BMP SC-8)
- RIPRAP AREA (BMP EC-7)
- INSTALL FIBER ROLLS (BMP SC-1)
- INSTALL REVEGETATION (BMP EC-8)
- SWM — SOLID AND DEMOLITION WASTE MANAGEMENT (BMP GM-3)
- STORM DRAIN INLET PROTECTION (BMP DP-3)
- SAND AND GRAVEL BAG BARRIERS (BMP SC-3)
- CWM — HANDLING AND DISPOSAL OF CONCRETE AND CEMENT (BMP GM-9)
- SS — SANITARY/SEPTIC WASTE MANAGEMENT (BMP GM-14)
- SM — STOCKPILE MANAGEMENT (BMP GM-2)
- PROPERTY BOUNDARY / RIGHT OF WAY
- INSTALL SILT FENCE (BMP SC-5)
- SWEEP — STREET & SURFACE CLEANING (BMP GM-5)
- CATCH BASIN (HOLLOW IF EXISTING)



TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6

PRELIMINARY EROSION CONTROL PLAN

WASHOE COUNTY NEVADA

SUMMIT ENGINEERING CORPORATION
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REV.	DATE	DESCRIPTION	BY	APP'D

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=60'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

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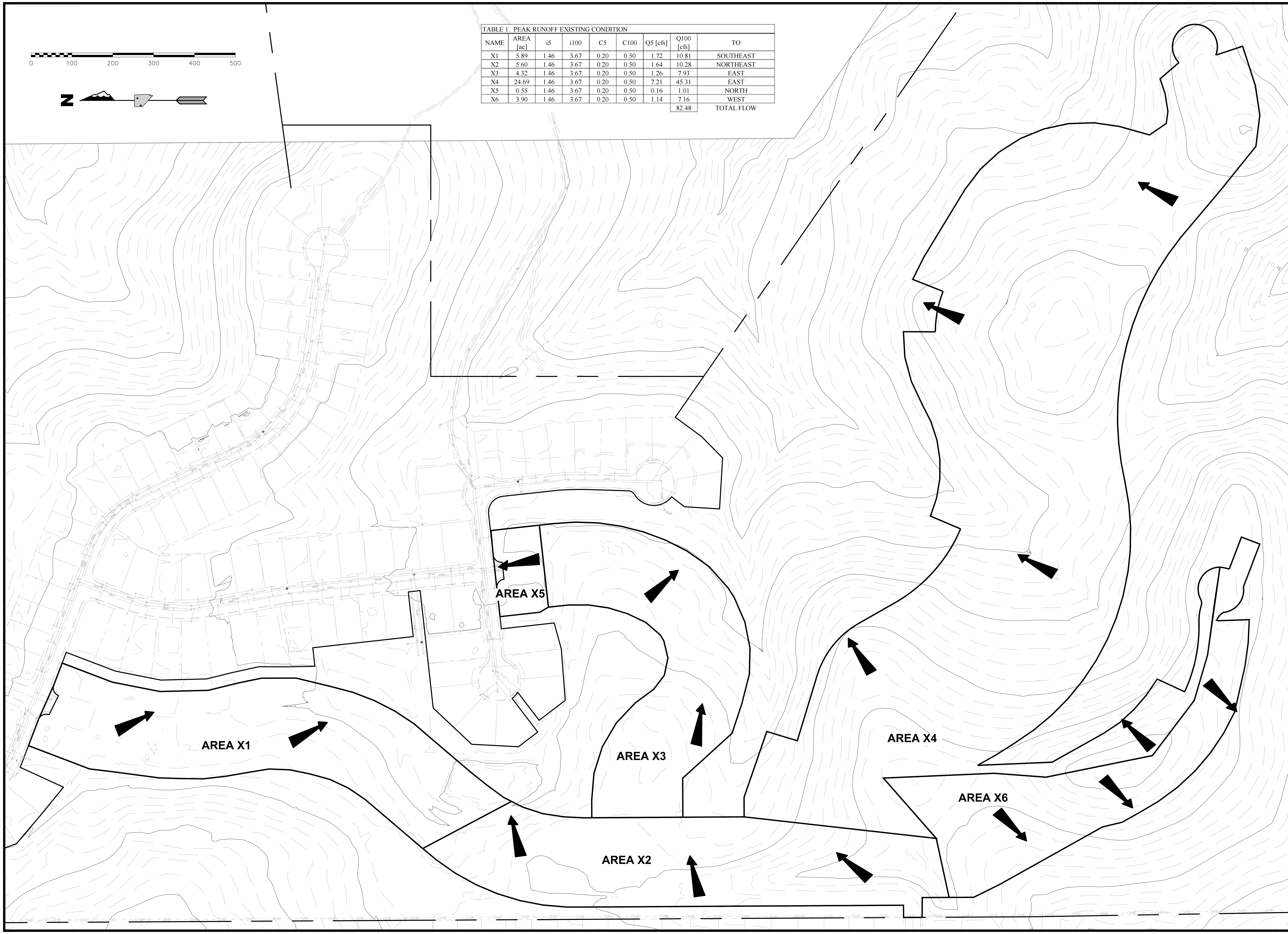

TABLE 1. PEAK RUNOFF EXISTING CONDITION

NAME	AREA [ac]	i5	i100	C5	C100	Q5 [cfs]	Q100 [cfs]	TO
X1	5.89	1.46	3.67	0.20	0.50	1.72	10.81	SOUTHEAST
X2	5.60	1.46	3.67	0.20	0.50	1.64	10.28	NORTHEAST
X3	4.32	1.46	3.67	0.20	0.50	1.26	7.93	EAST
X4	24.69	1.46	3.67	0.20	0.50	7.21	45.31	EAST
X5	0.55	1.46	3.67	0.20	0.50	0.16	1.01	NORTH
X6	3.90	1.46	3.67	0.20	0.50	1.14	7.16	WEST
							82.48	TOTAL FLOW

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REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6

PRELIMINARY EXISTING HYDROLOGY DISPLAY

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG

SCALE
HORIZ: 1"=100'
VERT:

JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET HY-1 OF 32

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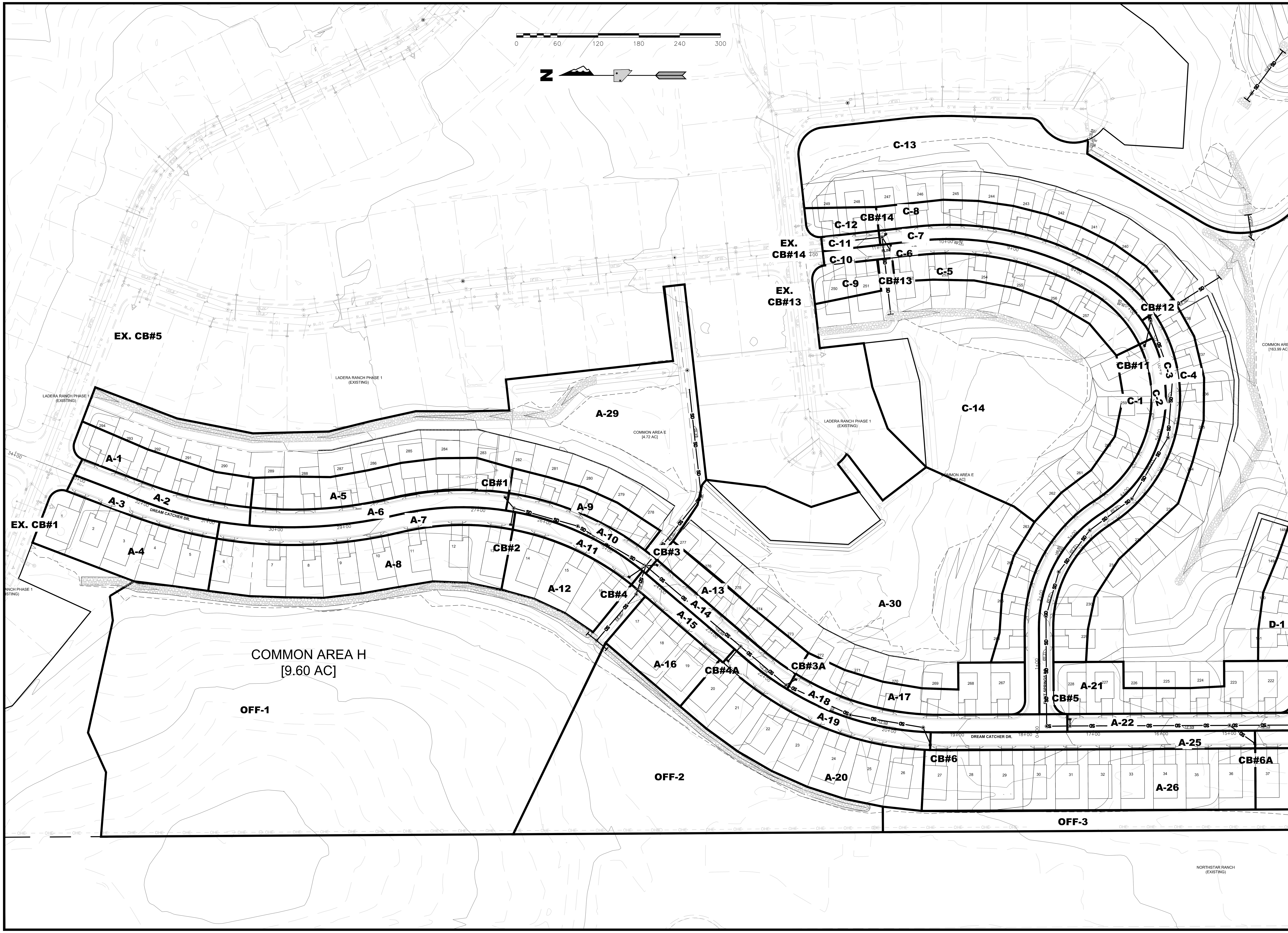

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PHONE:(775) 747-8550 FAX:(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PROPOSED HYDROLOGY PLAN

WASHOE COUNTY NEVADA

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DESIGNED BY: SD
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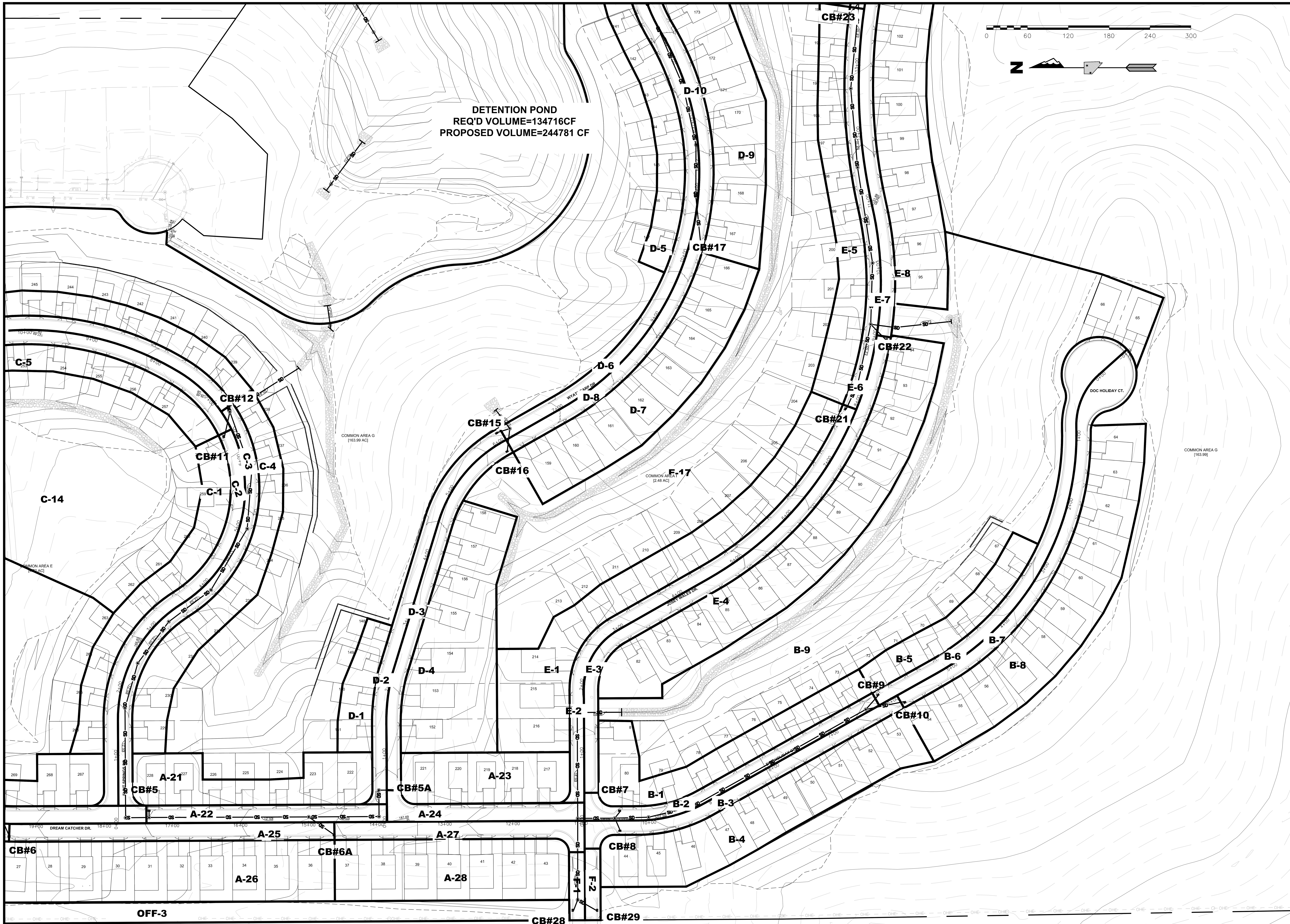
PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET
HY-2 OF 32



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PHONE:(775) 747-8550 FAX:(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6 PROPOSED HYDROLOGY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=60'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET HY-3 OF 32

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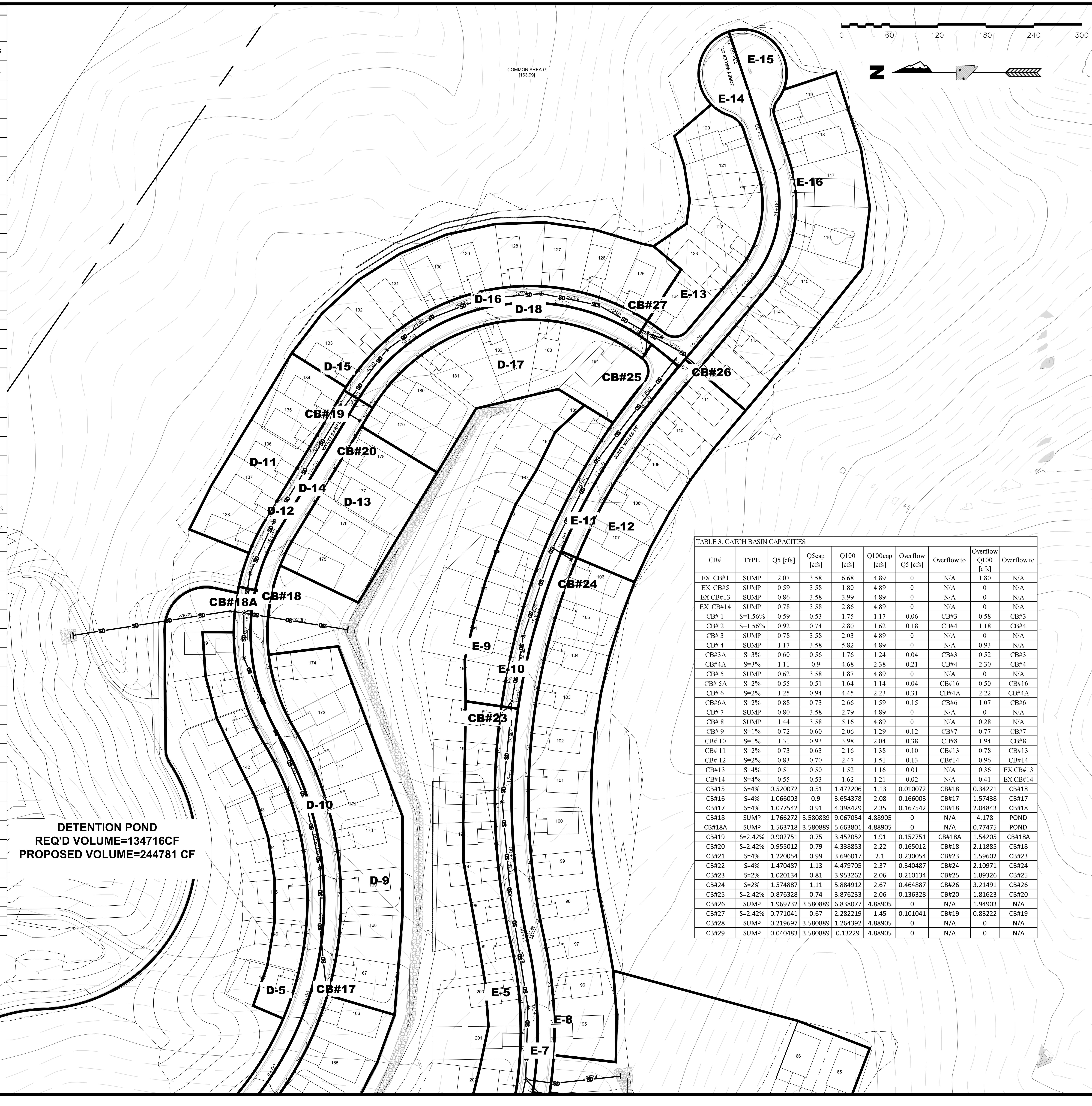
TABLE 2. PEAK RUNOFF PROPOSED CONDITION

NAME	AREA [AC]	i5	i100	C5	C100	Q5 [cfs]	Q5 TOTAL [cfs]	Q5 str.cap [cfs]	Q100 [cfs]	Q100 TOTAL [cfs]	Q100 str.cap [cfs]	TO
A-1	0.30	1.46	3.67	0.50	0.65	0.22	0.42	1.87	0.71	1.25	9.81	EX.CB#5
A-2	0.16	1.46	3.67	0.88	0.93	0.21			0.55			
A-3	0.13	1.46	3.67	0.88	0.93	0.17	0.55	1.87	0.46	1.68	9.81	EX.CB#1
A-4	0.51	1.46	3.67	0.50	0.65	0.38			1.23			
A-5	0.41	1.46	3.67	0.50	0.65	0.30	0.59	1.87	0.98	1.75	9.81	CB#1
A-6	0.23	1.46	3.67	0.88	0.93	0.29			0.78			
A-7	0.26	1.46	3.67	0.88	0.93	0.34	0.92	1.87	0.89	2.80	9.81	CB#2
A-8	0.80	1.46	3.67	0.50	0.65	0.58			1.91			
A-9	0.19	1.46	3.67	0.50	0.65	0.14	0.32	1.87	0.45	0.93	9.81	CB#3
A-10	0.14	1.46	3.67	0.88	0.93	0.18			0.48			
A-11	0.12	1.46	3.67	0.88	0.93	0.16	0.42	1.87	0.41	1.27	9.81	CB#4
A-12	0.36	1.46	3.67	0.50	0.65	0.26			0.85			
A-13	0.22	1.46	3.67	0.50	0.65	0.16	0.37	1.87	0.54	1.07	9.81	CB#3
A-14	0.16	1.46	3.67	0.88	0.93	0.20			0.54			
A-15	0.11	1.46	3.67	0.88	0.93	0.14	0.35	1.87	0.36	1.07	9.81	CB#4
A-16	0.30	1.46	3.67	0.50	0.65	0.22			0.71			
A-17	0.38	1.46	3.67	0.50	0.65	0.28	0.60	3.41	0.91	1.76	13.61	CB#3A
A-18	0.25	1.46	3.67	0.88	0.93	0.32			0.84			
A-19	0.20	1.46	3.67	0.88	0.93	0.25	0.80	3.41	0.67	2.46	13.61	CB#4A
A-20	0.75	1.46	3.67	0.50	0.65	0.55			1.79			
A-21	0.48	1.46	3.67	0.50	0.65	0.35	0.62	2.12	1.15	1.87	11.11	CB#5
A-22	0.21	1.46	3.67	0.88	0.93	0.27			0.72			
A-23	0.42	1.46	3.67	0.50	0.65	0.31	0.55	2.12	1.01	1.64	11.11	CB#5A
A-24	0.19	1.46	3.67	0.88	0.93	0.24			0.63			
A-25	0.29	1.46	3.67	0.88	0.93	0.37	1.10	2.12	0.98	3.37	11.11	CB#6
A-26	1.00	1.46	3.67	0.50	0.65	0.73			2.39			
A-27	0.28	1.46	3.67	0.88	0.93	0.37	0.88	2.12	0.97	2.66	11.11	CB#6A
A-28	0.71	1.46	3.67	0.50	0.65	0.52			1.69			
A-29	2.28	1.46	3.67	0.50	0.65	1.67	1.67	N/A	5.44	5.44	N/A	DITCH
A-30	2.59	1.46	3.67	0.50	0.65	1.89	1.89	N/A	6.18	6.18	N/A	DITCH
B-1	0.51	1.46	3.67	0.50	0.65	0.37	0.68	2.96	1.21	2.02	13.3	
B-2	0.24	1.46	3.67	0.88	0.93	0.31			0.81			CB#7
B-3	0.31	1.46	3.67	0.88	0.93	0.40	1.06	2.96	1.07	3.23	13.3	
B-4	0.90	1.46	3.67	0.50	0.65	0.66			2.16			CB#8
B-5	0.31	1.46	3.67	0.50	0.65	0.23	0.72	2.41	0.74	2.06	10.86	
B-6	0.39	1.46	3.67	0.88	0.93	0.50			1.32			CB#9
B-7	0.37	1.46	3.67	0.88	0.93	0.47	1.31	2.41	1.25	3.98	10.86	
B-8	1.14	1.46	3.67	0.50	0.65	0.83			2.73			CB#10
B-9	4.11	1.46	3.67	0.50	0.65	3.00	3.00	N/A	9.80	9.80	N/A	DITCH
C-1	0.48	1.46	3.67	0.50	0.65	0.35	0.73	3.41	1.14	2.16	15.36	CB#11
C-2	0.30	1.46	3.67	0.88	0.93	0.38			1.02			
C-3	0.32	1.46	3.67	0.88	0.93	0.41	0.83	3.41	1.09	2.47	15.36	CB#12
C-4	0.58	1.46	3.67	0.50	0.65	0.42			1.39			
C-5	0.35	1.46	3.67	0.50	0.65	0.25	0.51	3.41	0.82	1.52	15.36	
C-6	0.20	1.46	3.67	0.88	0.93	0.26			0.69			CB #13
C-7	0.21	1.46	3.67	0.88	0.93	0.27	0.55	3.41	0.71	1.62	15.36	
C-8	0.38	1.46	3.67	0.50	0.65	0.28			0.91			CB#14
C-9	0.11	1.46	3.67	0.50	0.65	0.08	0.14	3.41	0.27	0.43	15.36	
C-10	0.05	1.46	3.67	0.88	0.93	0.06			0.17			EX.CB#13
C-11	0.04	1.46	3.67	0.88	0.93	0.05	0.12	3.41	0.14	0.37	15.36	
C-12	0.09	1.46	3.67	0.50	0.65	0.07			0.23			EX.CB#14
C-13	7.86	1.46	3.67	0.50	0.65	5.74	5.74	N/A	18.75	18.75	N/A	POND
C-14	2.36	1.46	3.67	0.50	0.65	1.72	1.72	N/A	5.63	5.63	N/A	DITCH
D-1	0.20	1.46	3.67	0.50	0.65	0.15	0.52	4.83	0.48	1.47	21.72	CB#15
D-2	0.29	1.46	3.67	0.88	0.93	0.37			0.99			
D-3	0.27	1.46	3.67	0.88	0.93	0.34	1.03	4.83	0.91	3.15	21.72	CB#16
D-4	0.94	1.46	3.67	0.50	0.65	0.69			2.24			
D-5	0.46	1.46	3.67	0.5	0.65	0.33	0.90	5.66	1.09	2.586988	25.47	CB#18A
D-6	0.44	1.46	3.67	0.88	0.93	0.56			1.50			
D-7	0.90	1.46	3.67	0.5	0.65	0.66	0.91	5.66	2.15	2.824052	25.47	CB#17
D-8	0.20	1.46	3.67	0.88	0.93	0.25			0.67			
D-9	0.87	1.46	3.67	0.5	0.65	0.64	0.96	5.66	2.08	2.932593	25.47	CB#18
D-10	0.25	1.46	3.67	0.88	0.93	0.32			0.85			
D-11	0.45	1.46	3.67	0.5	0.65	0.33	0.50	3.75	1.08	1.534761	16.9	CB#18A
D-12	0.13	1.46	3.67	0.88	0.93	0.17			0.45			
D-13	0.50	1.46	3.67	0.5	0.65	0.36	0.47	3.75	1.18	1.624972	16.9	CB#18
D-14	0.13	1.46	3.67	0.55	0.93	0.10			0.44			
D-15	0.90	1.46	3.67	0.5	0.65	0.65	0.80	3.75	2.14	2.619834	16.9	CB#19
D-16	0.20	1.46	3.67	0.5	0.65	0.15			0.48			
D-17	0.78	1.46	3.67	0.5	0.65	0.57	0.82	3.75	1.86	2.52262	16.9	CB#20
D-18	0.19	1.46	3.67	0.88	0.93	0.25			0.66			
E-1	1.02	1.46	3.67	0.50	0.65	0.74	1.22	3.41	2.43	3.70	15.36	CB#21
E-2	0.37	1.46	3.67	0.88	0.93	0.48			1.26			
E-3	0.41	1.46	3.67	0.88	0.93	0.53	1.47	3.41	1.41	4.48	15.36	CB#22
E-4	1.28	1.46	3.67	0.50	0.65	0.94			3.06			
E-5	0.58	1.46	3.67	0.50	0.65	0.42	0.79	3.41	1.38	2.36	15.36	CB#23
E-6	0.29	1.46	3.67	0.88	0.93	0.37			0.98			
E-7	0.33	1.46	3.67	0.88	0.93	0.42	1.23	3.41	1.12	3.78	15.36	CB#24
E-8	1.11	1.46	3.67	0.50	0.65	0.81			2.65			
E-9	0.48	1.46	3.67	0.50	0.65	0.35	0.67	3.41	1.14	1.98	10.86	CB#25
E-10	0.25	1.46	3.67	0.88	0.93	0.32			0.84			
E-11	0.14	1.46	3.67	0.88	0.93	0.17	0.53	3.41	0.46	1.61	10.86	CB#26
E-12	0.48	1.46	3.67	0.50	0.65	0.35			1.15			
E-13	0.52	1.46	3.67	0.50	0.65	0.38	0.77	2.41	1.25	2.28	10.86	CB#27
E-14.	0.30	1.46	3.67	0.88	0.93	0.39			1.03			
E-15	0.28	1.46	3.67	0.88	0.93	0.36	0.98	2.41	0.97	2.01	10.86	CB#26
E-16	0.84	1.46	3.67	0.50	0.65	0.61			2.01			
E-17	4.62	1.46	3.67	0.50	0.65	3.37	3.37	N/A	11.03	11.03	N/A	DITCH
F-1	0.05	1.46	3.67	0.50	0.65	0.04	0.04	N/A	0.13	0.13	N/A	DITCH
F-2	0.06	1.46	3.67	0.50	0.65	0.04	0.04	N/A	0.13	0.13	N/A	DITCH
OFF-1	5.64	1.46	3.67	0.20	0.50	1.65	1.65	N/A	10.34	10.34	N/A	DITCH
OFF-2	2.29	1.46	3.67	0.20	0.50	0.67	0.67	N/A	4.20	4.20	N/A	DITCH
OFF-3	0.62	1.46	3.67	0.20	0.50	0.18	0.18	N/A	1.14	1.14	N/A	CB#29
Total Peak Runoff Proposed Condition:									157.33			



DETENTION POND
REQ'D VOLUME=134716CF
PROPOSED VOLUME=244781 CF

TABLE 3. CATCH BASIN CAPACITIES

CB#	TYPE	Q5 [cfs]	Q5cap [cfs]	Q100 [cfs]	Q100cap [cfs]	Overflow Q5 [cfs]	Overflow to	Overflow Q100 [cfs]	Overflow to
EX. CB#1	SUMP	2.07	3.58	6.68	4.89	0	N/A	1.80	N/A
EX. CB#5	SUMP	0.59	3.58	1.80	4.89	0	N/A	0	N/A
EX.CB#13	SUMP	0.86	3.58	3.99	4.89	0	N/A	0	N/A
EX. CB#14	SUMP	0.78	3.58	2.86	4.89	0	N/A	0	N/A
CB# 1	S=1.56%	0.59	0.53	1.75	1.17	0.06	CB#3	0.58	CB#3
CB# 2	S=1.56%	0.92	0.74	2.80	1.62	0.18	CB#4	1.18	CB#4
CB# 3	SUMP	0.78	3.58	2.03	4.89	0	N/A	0	N/A
CB# 4	SUMP	1.17	3.58	5.82	4.89	0	N/A	0.93	N/A
CB#3A	S=3%	0.60	0.56	1.76	1.24	0.04	CB#3	0.52	CB#3
CB#4A	S=3%	1.11	0.9	4.68	2.38	0.21	CB#4	2.30	CB#4
CB# 5	SUMP	0.62	3.58	1.87	4.89	0	N/A	0	N/A
CB# 5A	S=2%	0.55	0.51	1.64	1.14	0.04	CB#16	0.50	CB#16
CB# 6	S=2%	1.25	0.94	4.45	2.23	0.31	CB#4A	2.22	CB#4A
CB#6A	S=2%	0.88	0.73	2.66	1.59	0.15	CB#6	1.07	CB#6
CB# 7	SUMP	0.80	3.58	2.79	4.89	0	N/A	0	N/A
CB# 8	SUMP	1.44	3.58	5.16	4.89	0	N/A	0.28	N/A
CB# 9	S=1%	0.72	0.60	2.06	1.29	0.12	CB#7	0.77	CB#7
CB# 10	S=1%	1.31	0.93	3.98	2.04	0.38	CB#8	1.94	CB#8
CB# 11	S=2%	0.73	0.63	2.16	1.38	0.10	CB#13	0.78	CB#13
CB# 12	S=2%	0.83	0.70	2.47	1.51	0.13	CB#14	0.96	CB#14
CB#13	S=4%	0.51	0.50	1.52	1.16	0.01	N/A	0.36	EX.CB#13
CB#14	S=4%	0.55	0.53	1.62	1.21	0.02	N/A	0.41	EX.CB#14
CB#15	S=4%	0.520072	0.51	1.472206	1.13	0.010072	CB#18	0.34221	CB#18
CB#16	S=4%	1.066003	0.9	3.654378	2.08	0.166003	CB#17	1.57438	CB#17
CB#17	S=4%	1.077542	0.91	4.398429	2.35	0.167542	CB#18	2.04843	CB#18
CB#18	SUMP	1.766272	3.580889	9.067054	4.88905	0	N/A	4.178	POND
CB#18A	SUMP	1.563718	3.580889	5.663801	4.88905	0	N/A	0.77475	POND
CB#19	S=2.42%	0.902751	0.75	3.452052	1.91	0.152751	CB#18A	1.54205	CB#18A
CB#20	S=2.42%	0.955012	0.79	4.338853	2.22	0.165012	CB#18	2.11885	CB#18
CB#21	S=4%	1.220054	0.99	3.696017	2.1	0.230054	CB#23	1.59602	CB#23
CB#22	S=4%	1.470487	1.13	4.479705	2.37	0.340487	CB#24	2.10971	CB#24
CB#23	S=2%	1.020134	0.81	3.953262	2.06	0.210134	CB#25	1.89326	CB#25
CB#24	S=2%	1.574887	1.11	5.884912	2.67	0.464887	CB#26	3.21491	CB#26
CB#25	S=2.42%	0.876328	0.74	3.876233	2.06	0.136328	CB#20	1.81623	CB#20
CB#26	SUMP	1.969732	3.580889	6.838077	4.88905	0	N/A	1.94903	N/A
CB#27	S=2.42%	0.771041	0.67	2.282219	1.45	0.101041	CB#19	0.83222	CB#19
CB#28	SUMP	0.219697	3.580889	1.264392	4.88905	0	N/A	0	N/A
CB#29	SUMP	0.040483	3.580889	0.13229	4.88905	0	N/A	0	N/A

SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
PHONE:(775) 747-8550 FAX:(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6
PROPOSED HYDROLOGY PLAN

WASHOE COUNTY NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ: 1"=60'
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET HY-4 OF 32

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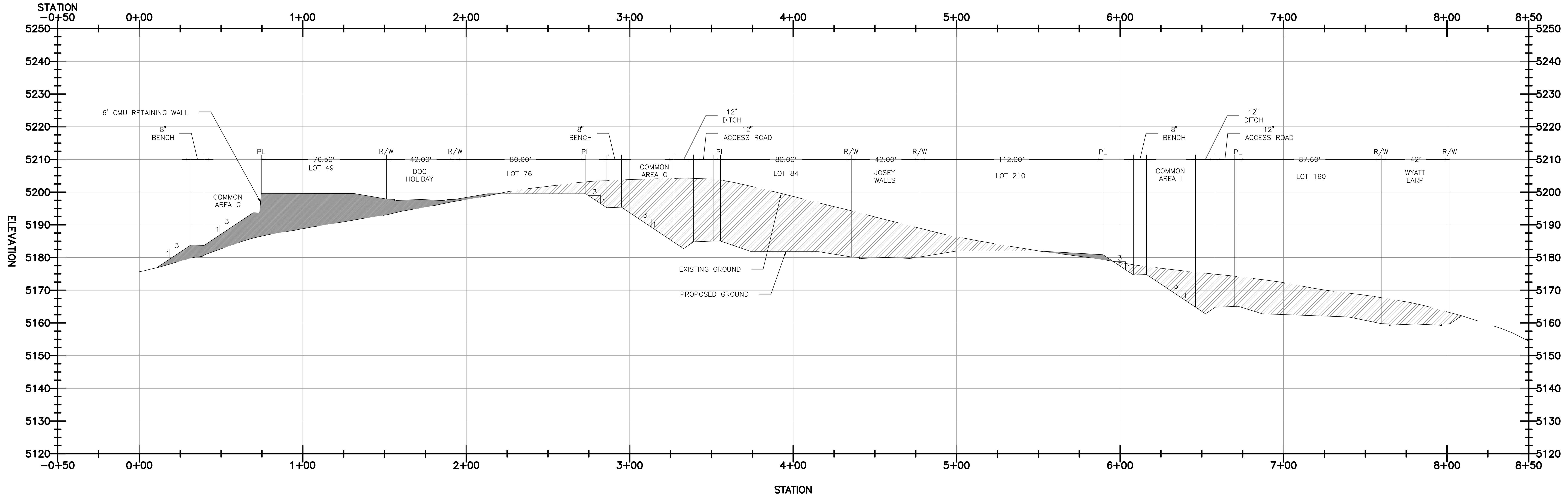
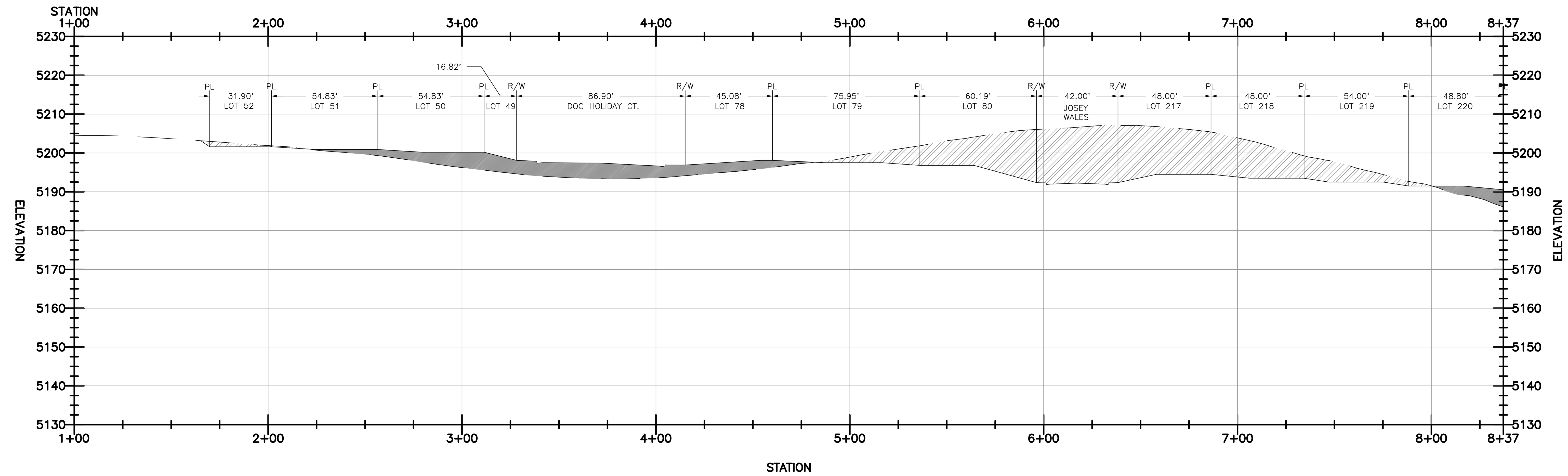
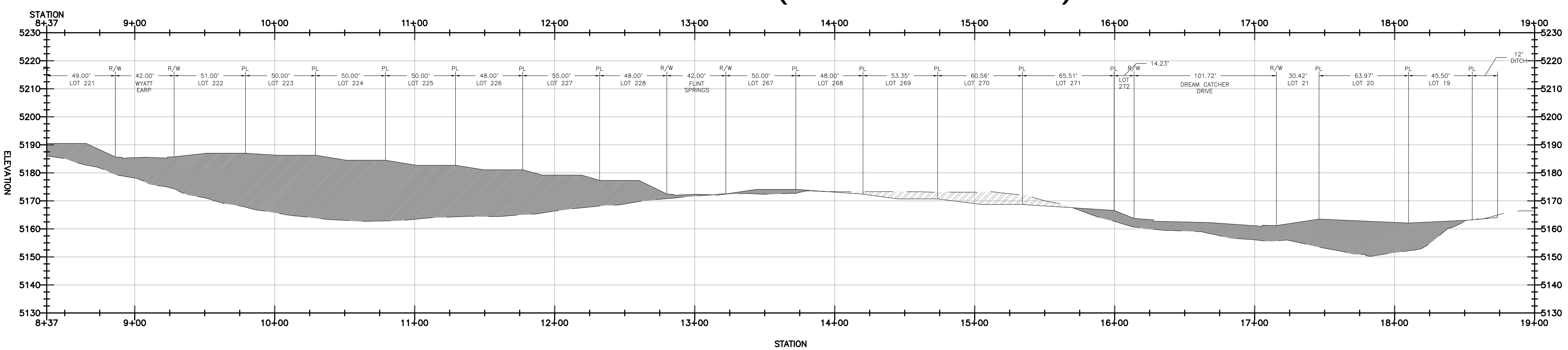
SECTION A-A'



SECTION B-B' (STA 1+00 TO 8+37)



SECTION B-B' (8+37 TO 19+00)



SUMMIT ENGINEERING CORPORATION
5405 MAE ANNE AVENUE, RENO, NV. 89523
PHONE:(775) 747-8550 FAX:(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR LADERA RANCH PHASES 2-6

CROSS SECTIONS

WASHOE COUNTY

NEVADA

DESIGNED BY: SD
CHECKED BY: RG

SCALE
HORIZ:
VERT:

JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

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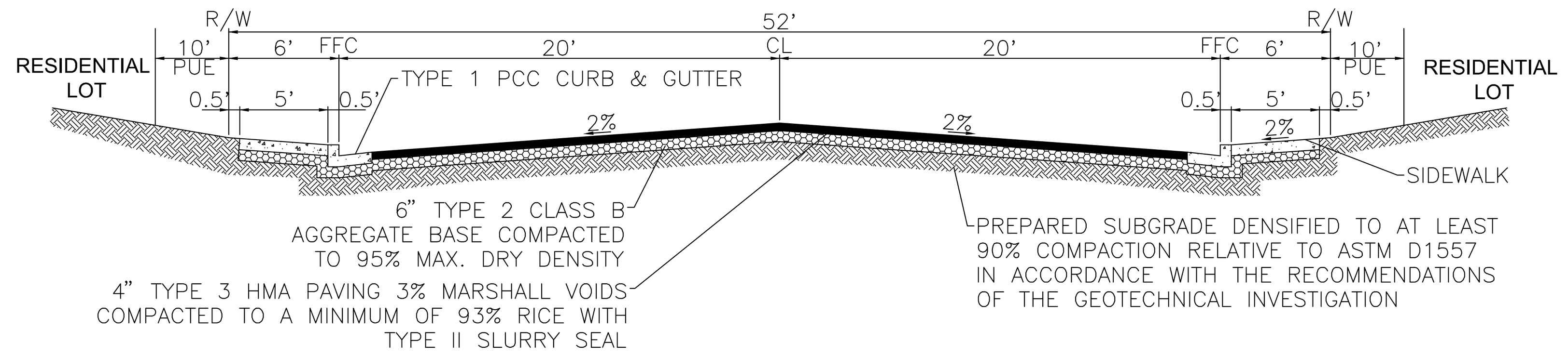
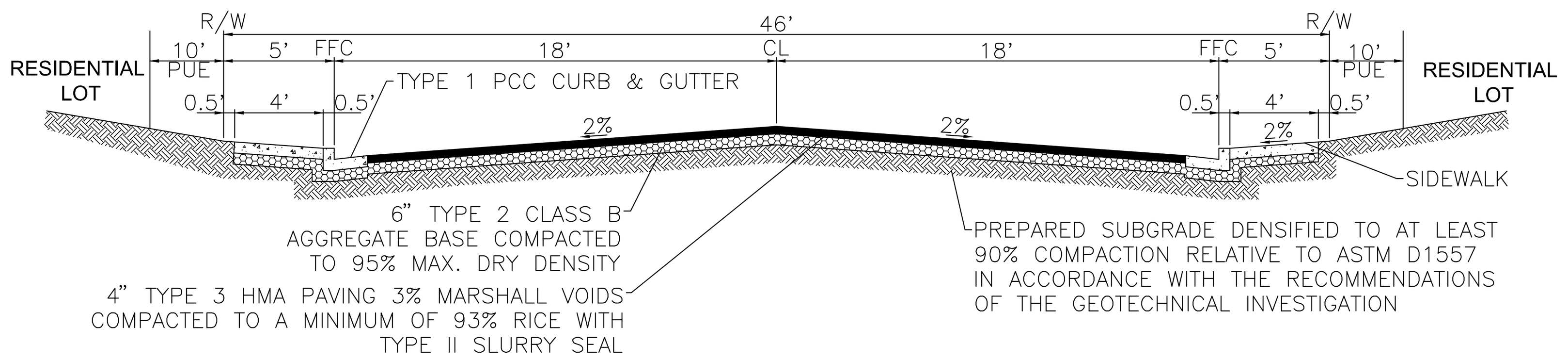
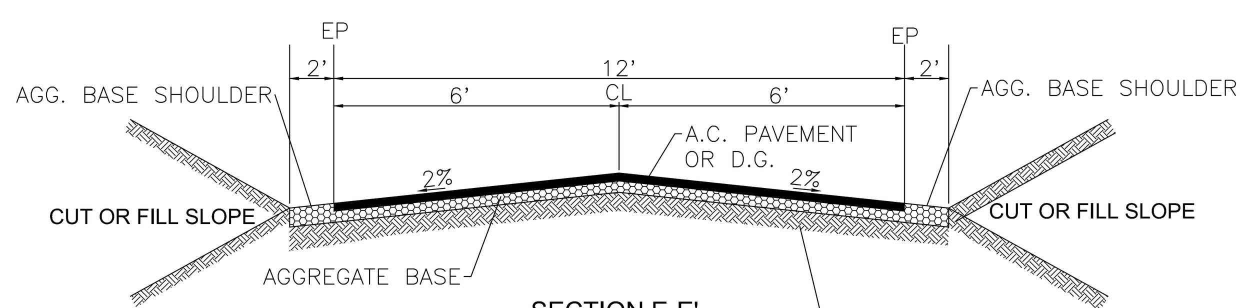
SHEET X-1 OF 32



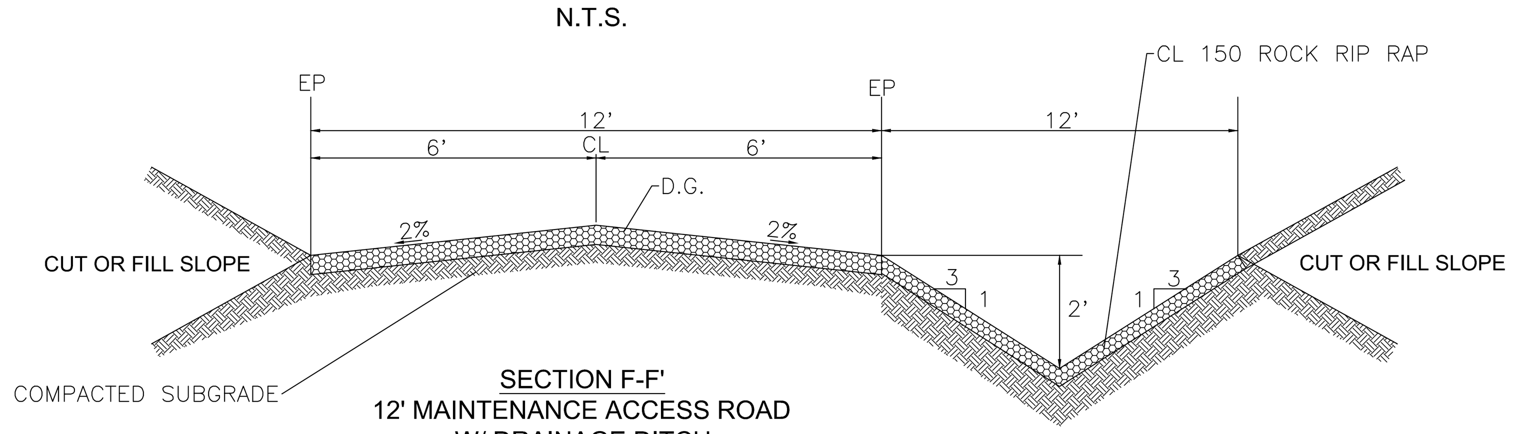
SECTION C-C'
COLLECTOR STREET WITH SIDEWALK ON BOTH SIDES
N.T.S
DREAM CATCHER DR. (MATCHING EXISTING)



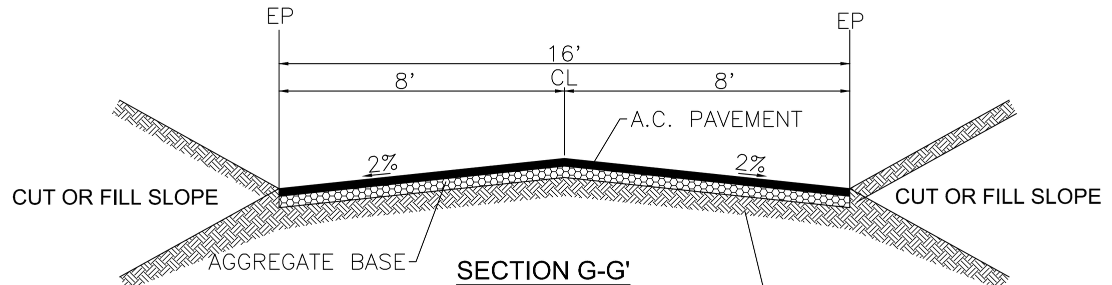
SECTION D-D'
LOCAL STREET WITH SIDEWALK ON BOTH SIDES
N.T.S.
WYATT EARP CT., FLINT SPRINGS DR., DOC HOLIDAY CT., JOSEY WALES CT., OPAL POINT DR.



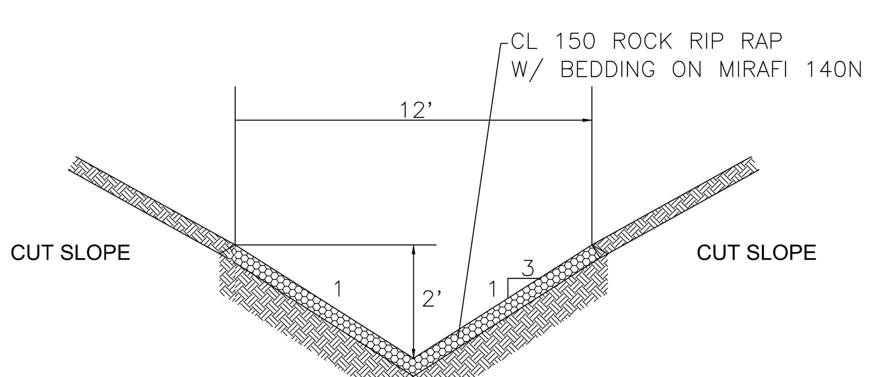
SECTION E-E'
12' MAINTENANCE ACCESS ROAD
WITH SHOULDER
N.T.S.



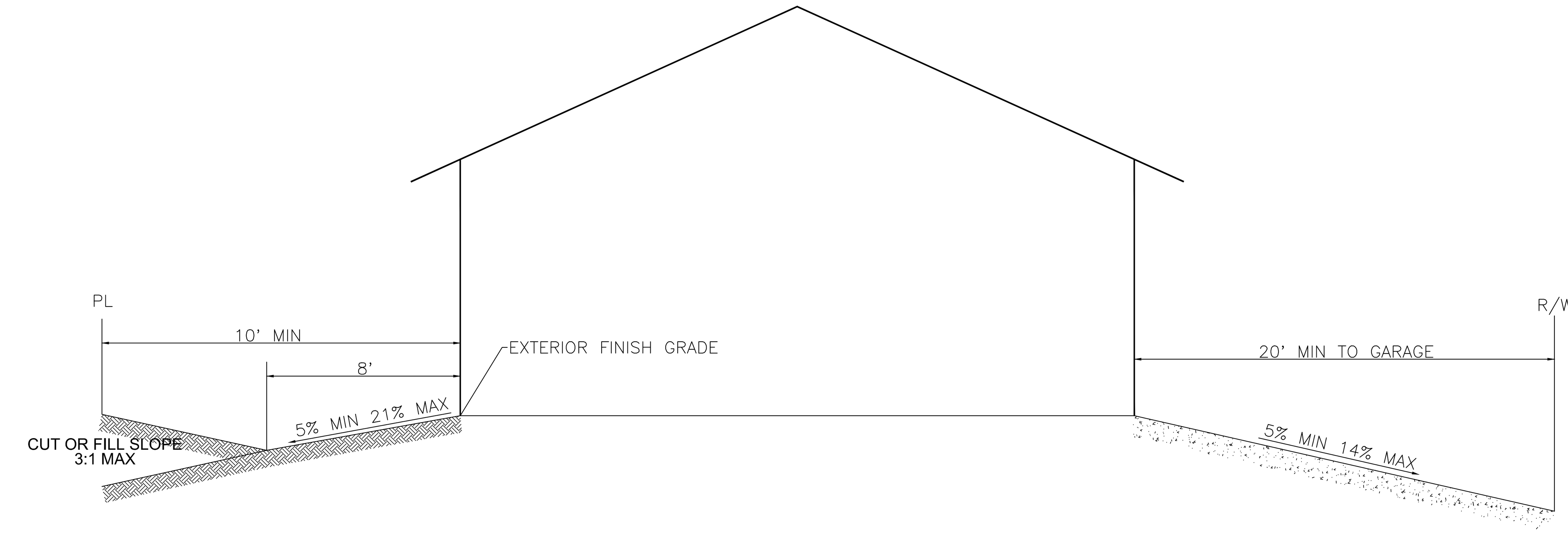
SECTION F-F'
12' MAINTENANCE ACCESS ROAD
W/ DRAINAGE DITCH
N.T.S.



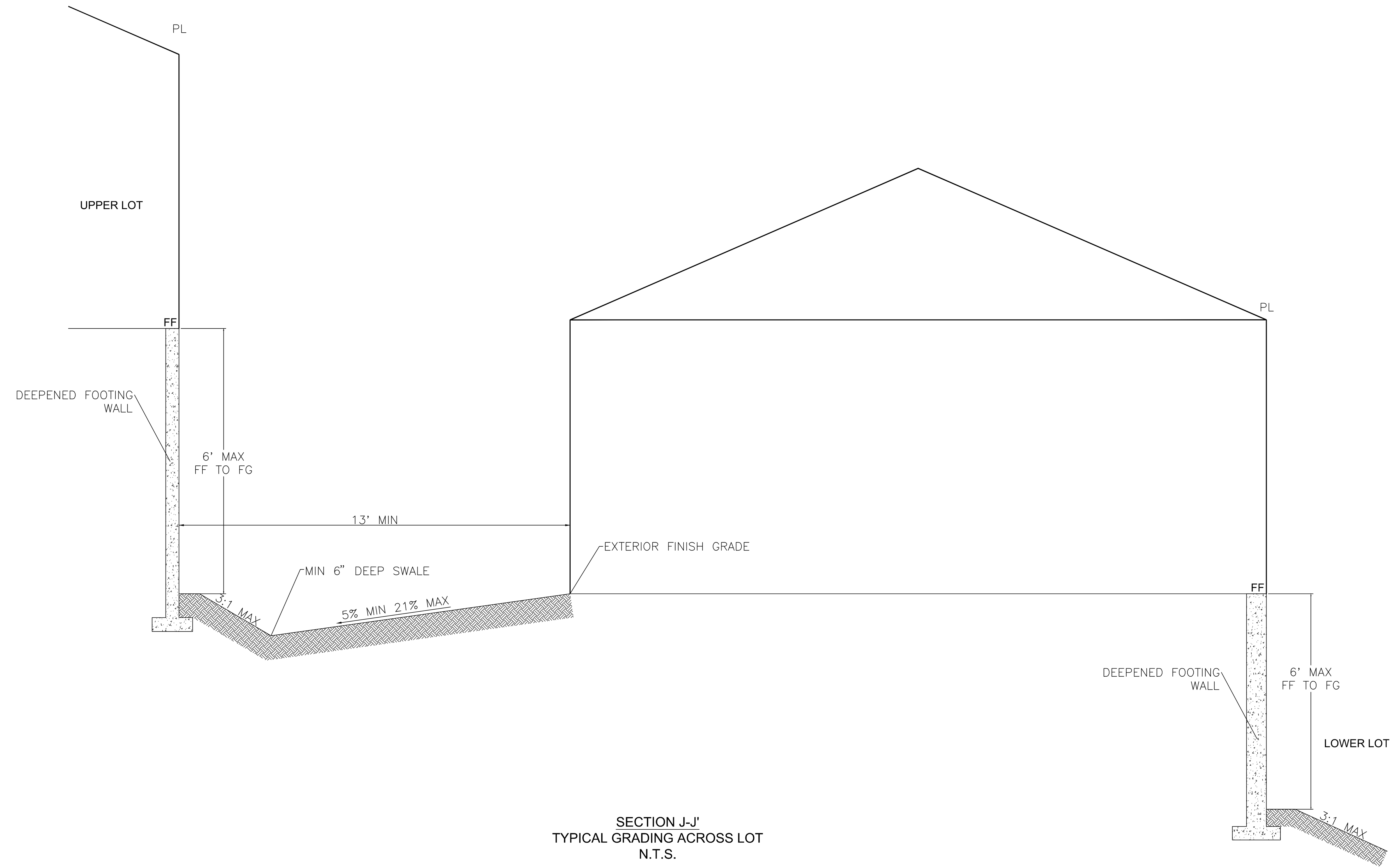
SECTION G-G'
16' MAINTENANCE ACCESS ROAD
N.T.S.



SECTION H-H'
12' DRAINAGE DITCH
N.T.S.



SECTION I-I'
TYPICAL GRADING ALONG LOT
N.T.S.



SECTION J-J'
TYPICAL GRADING ACROSS LOT
N.T.S.

SUMMIT ENGINEERING CORPORATION
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PHONE:(775) 747-8550 FAX:(775) 747-8559

REV.	DATE	DESCRIPTION	BY	APP'D

TENTATIVE MAP AND VARIANCE PLANS FOR
LADERA RANCH PHASES 2-6
CROSS SECTIONS

WASHOE COUNTY
NEVADA

DESIGNED BY: SD
CHECKED BY: RG
SCALE
HORIZ:
VERT:
JOB NO: 30884

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT GELU
Exp. 6-30-21
CIVIL
No. 17741

SHEET X-2 OF 32

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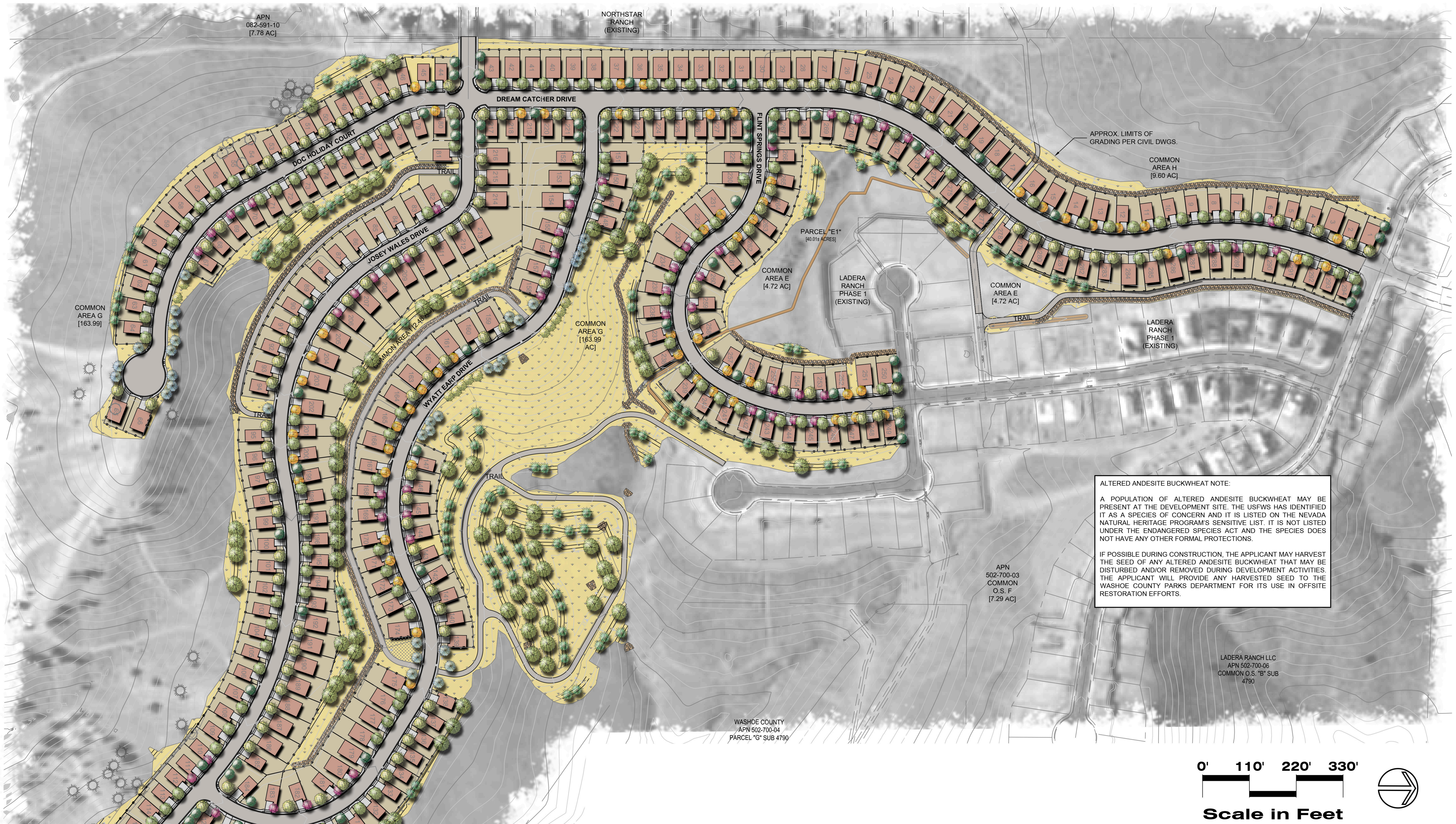

ALTERED ANDESITE BUCKWHEAT NOTE:

A POPULATION OF ALTERED ANDESITE BUCKWHEAT MAY BE PRESENT AT THE DEVELOPMENT SITE. THE USFWS HAS IDENTIFIED IT AS A SPECIES OF CONCERN AND IT IS LISTED ON THE NEVADA NATURAL HERITAGE PROGRAM'S SENSITIVE LIST. IT IS NOT LISTED UNDER THE ENDANGERED SPECIES ACT AND THE SPECIES DOES NOT HAVE ANY OTHER FORMAL PROTECTIONS.

IF POSSIBLE DURING CONSTRUCTION, THE APPLICANT MAY HARVEST THE SEED OF ANY ALTERED ANDESITE BUCKWHEAT THAT MAY BE DISTURBED AND/OR REMOVED DURING DEVELOPMENT ACTIVITIES. THE APPLICANT WILL PROVIDE ANY HARVESTED SEED TO THE WASHOE COUNTY PARKS DEPARTMENT FOR ITS USE IN OFFSITE RESTORATION EFFORTS.

LANDSCAPE LEGEND/REQUIREMENTS

APPROX. 25	EXISTING TREES TO REMAIN -- 403 CALIPER INCHES
APPROX. 9	EXISTING TREES TO BE REMOVED -- 95 CALIPER INCHES
FRONT YARD TREES 439+/-	REQUIRED YARDS ADJOINING STREETS - ALL REQUIRED FRONT, REAR, AND SIDE YARDS WHICH ADJOIN A PUBLIC STREET SHALL BE LANDSCAPED AND SHALL INCLUDE AT LEAST ONE (1) TREE FOR EVERY FIFTY (50) LINEAR FEET OF STREET FRONTAGE, OR FRACTION THEREOF.
53+/-	REQUIRED STREETSCAPE TREES - 1 PER EVERY 30 LINEAR FEET OF STREET NOT FRONTED BY A YARD.
206+/-	PROVIDED HILLSIDE/BENCH TREES - 1 PER 50 LINER FEET OF BENCH
APPROX. 18.06 ACRES	RE-VEGETATED BENCH AREAS/DISTURBED COMMON AREA

NOTES:

THE COMPOSITION OF TREES SHALL REPRESENT A MIXTURE OF DECIDUOUS AND CONIFEROUS VARIETIES AS FOLLOWS:

- AT LEAST ONE-HALF (1/2) OF ALL EVERGREEN TREES SHALL BE AT LEAST SEVEN (7) FEET IN HEIGHT, AND THE REMAINDER MUST BE AT LEAST FIVE (5) FEET IN HEIGHT AT THE TIME OF PLANTING.
- AT LEAST ONE-HALF (1/2) OF THE REQUIRED NUMBER OF DECIDUOUS TREES SHALL BE AT LEAST TWO (2) INCH CALIPER PER AMERICAN NURSERY STANDARDS AT THE TIME OF PLANTING. THE REMAINING NUMBER OF REQUIRED DECIDUOUS TREES SHALL BE AT LEAST ONE (1) INCH CALIPER AT THE TIME OF PLANTING.
- ALL PLANTING AND IRRIGATION SHALL BE INSTALLED PER LOCAL GOVERNING CODES.
- FINAL PLANT SELECTION AND LAYOUT WILL BE BASED ON SOUND HORTICULTURAL PRACTICES RELATING TO MICRO-CLIMATE, SOIL, AND WATER REGIMES. ALL TREES WILL BE STAKED SO AS TO REMAIN UPRIGHT AND PLUMB FOLLOWING INSTALLATION. PLANT SIZE AND QUALITY AT TIME OF PLANTING WILL BE PER CURRENT EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z60.1).
- ALL PLANTER BEDS WILL RECEIVE 3" MINIMUM DEPTH OF MULCH WITH WEED CONTROL.
- ALL LANDSCAPING WILL BE AUTOMATICALLY IRRIGATED UNLESS NOTED OTHERWISE ON THE PLAN. CONTAINER PLANTINGS WILL BE DRIP IRRIGATED. A REDUCED-PRESSURE-TYPE BACKFLOW PREVENTER WILL BE PROVIDED ON THE IRRIGATION SYSTEM AS REQUIRED PER CODE.
- TREES SHOWN GRAPHICALLY ON PLAN DO NOT NECESSARILY REFLECT FINAL TREE QUANTITIES.

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Preliminary Landscape & Tree Protection Plan
LADERA RANCH -294 LOTS
Ladera Ranch, LLC

Reno Washoe Co. Nevada

No.	Revision Date

LA No: 747-502-11-19
Designed: KRD
Drawn: KRD
Checked: RWH
Date: 4/15/2020

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