Golden Mesa North

Tentative Map
Application

Prepared For:

Moonlight Hills Estates, LLC
5390 Bellazza Court
Reno, NV 89519

Prepared By:

Axion
ENGINEERING
Civil Engineering • Land Development

681 Edison Way
Reno, NV 89502
775-771-5554

September, 2016

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Project Requests

This application is for a **Tentative Map Application** for:

A) 115 Single Family Residential lots on 119.76 acres.

Golden Mesa North is located north of Golden Valley Road, west off Estates Drive on two parcels. The project site is accessed from Estates Drive which connects to the Golden Valley Road. The project site includes two parcels, APN 552-050-01 and 552-092-19 and consists of 119.76± acres total, as shown in Figure 1 (below).

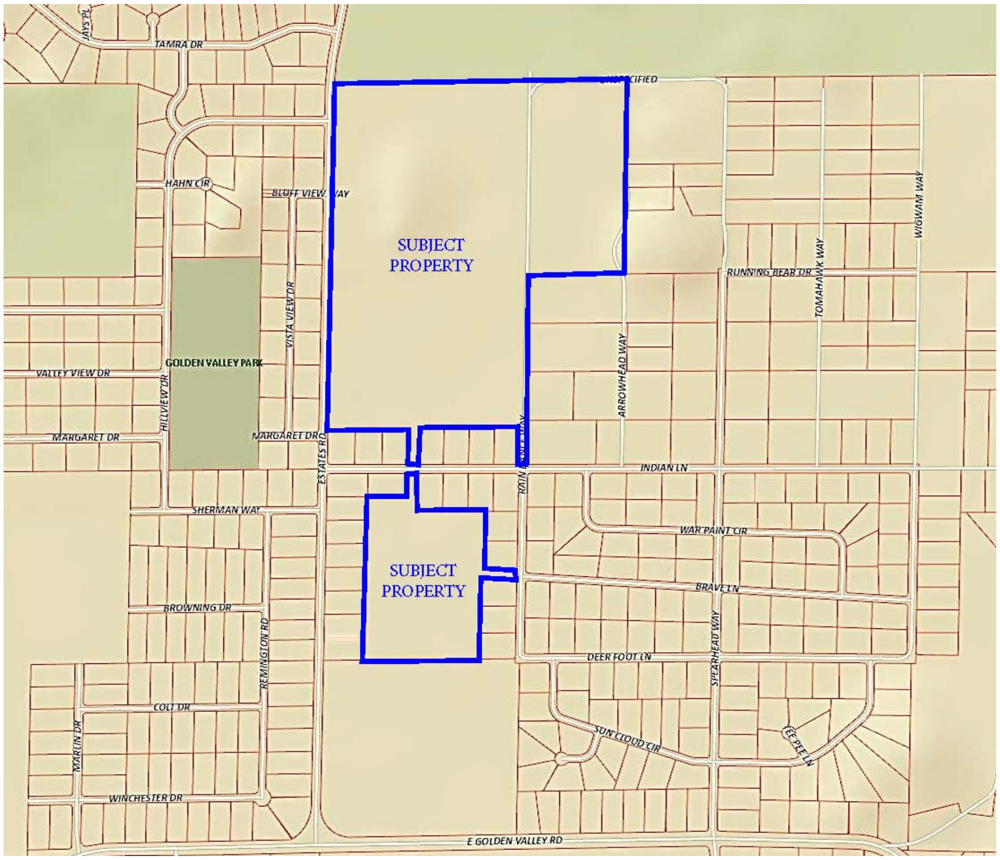


Figure 1 – Vicinity Map

Project History

R&K Homes requested and obtained approval for a Tentative Map, case number TM06-007 to develop a 94-lot single family common open space development on 99.54 acres. (APN 552-050.01). This submittal was subsequent to an expired Tentative Map approval on the subject property (TM04-008. The previous requests included a variance request for removal of curb, gutter and sidewalk requirements in order to use road side ditches. As mentioned above the previous request were for common open space developments allowing for reduced lot sizes while maintaining maximum allowed density. TM06-007 was approved on February 6th, 2007. The entitlement has since expired.

The southerly parcel of this project was included in a previous Tentative Map application titled Golden Mesa South. (TM05-015). In October of 2004 the Board of County Commissioners approved a Comprehensive Plan Amendment (CP04-011) that re-designated the above referenced parcels from LDS and GR to a mix of LDS and MDS. The entitlement for Golden Mesa South has expired.

Project Description

The proposed project is for a 115 unit single family residential development with lot sizes ranging from 35,000 square feet to 113,690 square feet. The average lot size is 39,984 square feet. The project will include 4.89 acres of open space, 9.31 acres of public right of way, and 105.56 acres of residential lots.

Proposed net density is 1.04 dwelling units per acre and the proposed gross density is 0.96 dwelling units per acre. The proposed layout is shown on the following page.

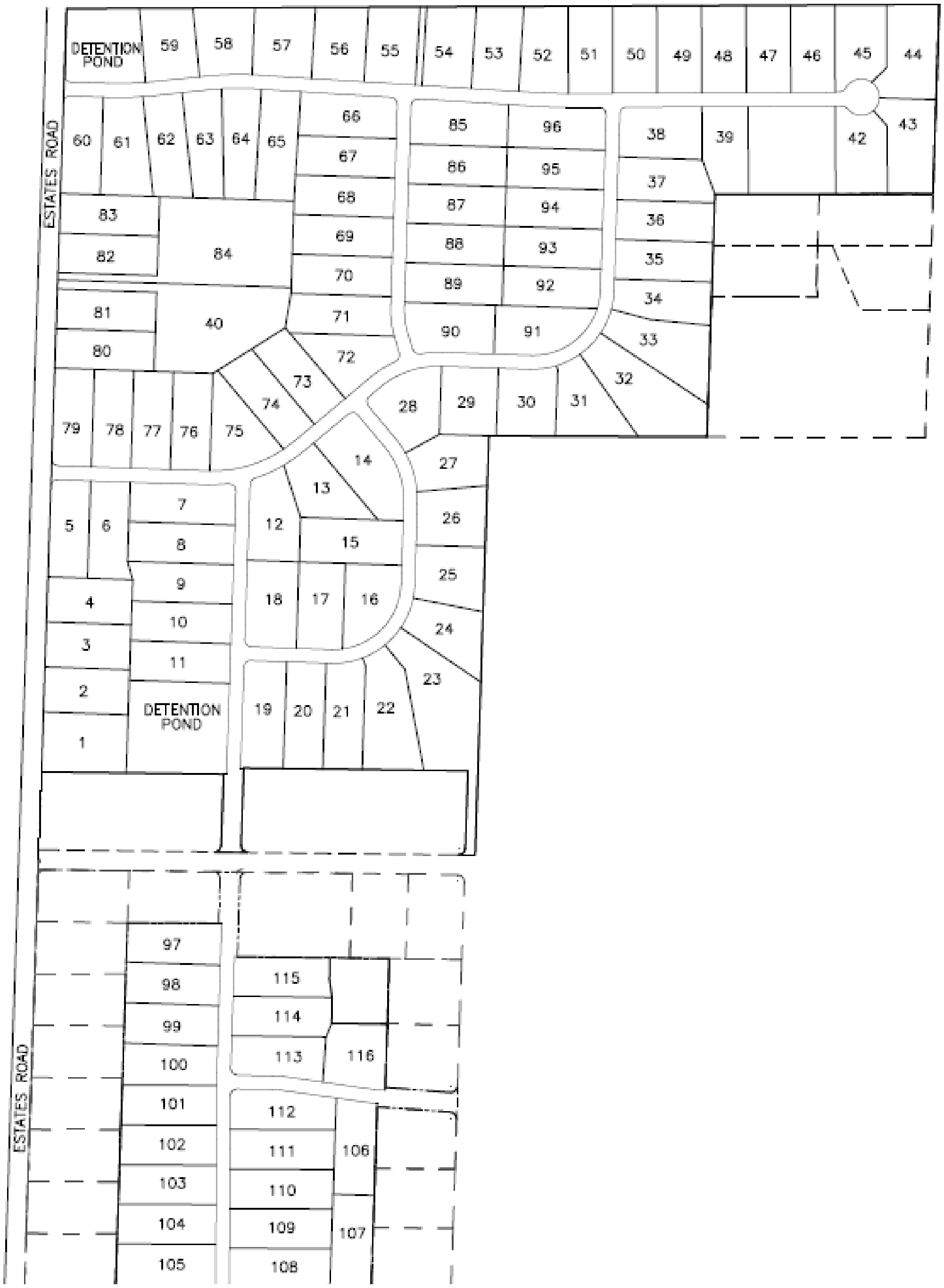


Figure 2 - Site Plan

Tentative Map Findings

When considering a Tentative Subdivision Map, the Washoe County development code requires that the Planning Commission determine if the proposal is in compliance with the required findings. The considered findings are as follows:

1) Plan Consistency – Determine that the proposed map is consistent with the Comprehensive Plan and the North Valleys Area Plan.

   Response: The proposed map is in conformance with all of the goals and policies of the North Valleys Area Plan. Proposed densities and subdivision design meet Plan requirements. There are no specific plans associated with this request.

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

   Response: The subdivision design complies with the policies of the North Valleys Area Plan and all the elements of the Washoe County Master Plan.

3) Type of Development – Determine that the project site is physically suited for the type of development proposed.

   Response: The proposed subdivision is located in an area with residential subdivisions to the east, west and south. Property to the north is vacant with an open space zoning, and the furthest south adjacent property is zoned MDS and LDS. The proposed project is a suitable fit.

4) Availability of Service – That the subdivision will meet the requirements of article 702, Adequate Public Facilities Management System.

   Response: Adequate facilities exist to accommodate the proposed development. Any determined deficiencies and/or required infrastructure to connect to existing facilities will be borne by the developer.

5) Fish or Wildlife – Determine 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.

   Response: There are no identified endangered plants or wildlife on the subject property.

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

   Response: The proposed subdivision is similar to other residential subdivisions in the surrounding area and the design is not likely to cause significant health problems.

7) Easements – Determine 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.

Response: The design of the subdivision takes into account all existing easements and will perpetuate access to existing residences.

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

Response: The proposed subdivision provides necessary access to surrounding, adjacent lands. Access points will be perpetuated and/or provided via new public roads.

9) Dedications – Determine that any land or improvements to be dedicated to Washoe County is consistent with the Master Plan.

Response: All lands to be dedicated to Washoe County are consistent with the Master Plan.

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

Response: Adequate opportunities shall be provided for future passive or natural heating or cooling to the extent feasible.

APPENDIX "A"

DEVELOPMENT APPLICATION

Axion
ENGINEERING
Civil Engineering • Land Development

Washoe County Development Application

Your entire application is a public record. If you have a concern about releasing personal information, please contact Planning and Development staff at 775.328.3600.

Project Information

Staff Assigned Case No.: ____________________

Project Name: Golden Mesa North

Project Description: 115 lot single family residential subdivision

Project Address: East of Estates Road, North of Indian Lane & 3160 Brave Lane

Project Area (acres or square feet): 119.76 acres

Project Location (with point of reference to major cross streets **AND** area locator):
Golden Valley. The parcels are north of Golden Valley Road & east of Estates Drive.

Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No(s):	Parcel Acreage:
552-050-01	99.546		
552-092-19	20.21		

Section(s)/Township/Range: Section 11 T. 20 E, R. 19 E.

Indicate any previous Washoe County approvals associated with this application:
Case No.(s). TM04-008 & TM06-007

Applicant Information (attach additional sheets if necessary)

Property Owner:		**Professional Consultant:**	
Name: Moonlight Hills Estates, LLC		Name: Axion Engineering	
Address: 5390 Bellazza Court		Address: 681 Edison Way	
Reno, NV	Zip: 89519	Reno, NV	Zip: 89503
Phone: 530-218-0065	Fax:	Phone: 775-771-5554	Fax: 775-856-3951
Email:		Email: gary@axionengineering.net	
Cell:	Other:	Cell:	Other:
Contact Person: Richard Nevis		Contact Person: Gary Guzelis	
Applicant/Developer:		**Other Persons to be Contacted:**	
Name: Same		Name: Mark Herrmann	
Address:		Address: P.O. Box 8817	
	Zip:	Reno, NV	Zip: 89511
Phone:	Fax:	Phone:	Fax:
Email:		Email: mvonherrman@sbcglobal.net	
Cell:	Other:	Cell: 775-720-8973	Other:
Contact Person:		Contact Person:	

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: MOONLIGHT HILLS ESTATES 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 t hat the application is deemed complete and will be processed.

STATE OF NEVADA)
)
COUNTY OF WASHOE)

I, MOONLIGHT HILLS ESTATES LLC,
(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 Development.

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

Assessor Parcel Number(s): 552-050-01

Printed Name

Signed Richard A Neve

Address

Subscribed and sworn to before me this 12 day of DEC. 2016.

Notary Public in and for said county and state

My commission expires: 10-13-2020

(Notary Stamp)

P. HANSON
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 96-3503-2 - Expires October 13, 2020

*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

Applicant Name: CRANDELL FAMILY TRUST

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 t hat the application is deemed complete and will be processed.

STATE OF NEVADA)
)
COUNTY OF WASHOE)

I, RAYMOND E. CRANDELL,
(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 Development.

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

Assessor Parcel Number(s): 552-092-19

Printed Name RAYMOND E. CRANDELL

Signed

Address 650 KRESGE LN.
SPARKS NV. 89431

Subscribed and sworn to before me this 2ND day of DEC, 2016

Notary Public in and for said county and state

My commission expires: 10-13-2020

(Notary Stamp)

P. HANSON
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 96-3503-2 - Expires October 13, 2020

*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

Applicant Name: CRANDELL Family TRUST

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 t hat the application is deemed complete and will be processed.

STATE OF NEVADA)
)
COUNTY OF WASHOE)

I, JUDITH M. CRANDELL,
(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 Development.

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

Assessor Parcel Number(s): 552-092-19

Printed Name Judith CRANDELL

Signed Judith Crandell

Address 650 KRESGE LN.

SPARKS NV. 89431

Subscribed and sworn to before me this 2nd day of DEC, 2016

Notary Public in and for said county and state

My commission expires: 10-13-2020

(Notary Stamp)

P. HANSON
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 98-3503-2 - Expires October 13, 2020

*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)

Chapter 110 of the Washoe County Code is commonly known as the Development Code. Specific references to tentative subdivision maps may be found in Article 608, Tentative Subdivision Maps.

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

The 20.21 acre property is located east of Estates Road, West of Rain Dance Way, South of Indian Lane approximately 1190 feet north of E. Golden Valley Road.

The 99.546 acre property is located east of Estates Drive approximately 2800 feet north of E. Golden Valley Road.

A legal description for both properties is included in the Preliminary Title Report which is part of this application.

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

Golden Mesa North

3. Density and lot design:

a. Acreage of project site	119.76 acres
b. Total number of lots	115
c. Dwelling units per acre	0.96
d. Minimum and maximum area of proposed lots	35,000 - 113,690
e. Minimum width of proposed lots	120 feet
f. Average lot size	39,984 square feet

4. Utilities:

a. Sewer Service	Washoe County Utilities
b. Electrical Service	NV Energy
c. Telephone Service	AT&T
d. LPG or Natural Gas Service	NV Energy
e. Solid Waste Disposal Service	Waste Management of Nevada
f. Cable Television Service	Charter
g. Water Service	TMWA

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

     4.89 acres

   - b. Development constraints within common open space (slope, wetlands, faults, springs, ridgelines):

     None

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

     35,000 sf min; 113,690 sf max.

   - d. Average lot size:

     39,984 square feet

   - e. Proposed yard setbacks if different from standard:

     Proposed setbacks shall conform to zoning requirements

   - f. Justification for setback reduction or increase, if requested:

     N/A

   - g. Identify all proposed non-residential uses:

     None

h. Improvements proposed for the common open space:

Open space improvements will included detention pond facilities and landscaping. The ponds will be maintained by a proposed maintenance association.

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

None

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

No trails are proposed with this development. Street side sidewalks will be constructed throughout the project.

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

Not applicable.

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

Fencing is anticipated to follow typical single family residential guidelines and Washoe County code.

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

A maintenance association will be created to take care of the common open space. Fees will be supported by homeowner dues.

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?

Adjacent property to the north is BLM land. Access to the property is provided via Estates road. Connectivity from the project site to Estates Road is provided via proposed public roads.

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? Reno

9. Will a special use permit be required for utility improvement? If so, what special use permits are required and are they submitted with the application package?

A Special Use Permit is required for a sewage lift station. The Special Use Permit will be applied for separately.

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

An archaeological survey was performed with the previous tentative map application (TM06-007). No significant archaeological sites were found.

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

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

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

Water rights will be purchased and dedicated prior to final map.

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

Energy conservation is typically improved by use of energy efficient building materials including windows, doors, insulation and structure wraps per current ICC's IECC energy codes. Energy efficient appliances and water efficient faucets, shower heads and toilets will be used.

13. Is the subject property in an area identified by Planning and Development 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:

The two properties are not identified by Washoe County Community Services Department as containing rare or endangered plants/animals, critical breeding habitat or migratory routes.

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

Not applicable.

15. Is the subject property located adjacent to an existing residential subdivision? If so, describe how the tentative map complies with each additional adopted policy and code requirement of Article 434, Regional Development Standards within Cooperative Planning Areas and all of Washoe County, in particular, grading within 50 and 200 feet of the adjacent developed properties under 5 acres and parcel matching criteria:

The proposed development is located adjacent to residential homes. The design of the project complies with applicable policies.

16. 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?

The project will comply with the applicable policies of the adopted Spanish Springs Area Plan.

17. 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?

No, there are no plan modifiers for this area.

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

At this time phasing is unknown and will depend on the developer. Phasing will be determined at the improvement plan preparation stage and discussed with Washoe County. It is anticipated that the phasing could be between one and three.

19. 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.

20. 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:

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

290,000 CY

22. 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?

Earthwork will be balanced on-site at approximately 290,000 cubic yards.

23. 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?

Disturbed areas are likely visible from all directions. Erosion control of disturbed areas will established per Best Management practices. Cut and fill slopes will be revegetated with approved seed mixes.

24. 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?

Slopes not to exceed 3:1 are proposed for cut and fill slopes. Slopes will be revegetated with an approved seed mix.

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

No berms are proposed.

26. 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?

One wall is proposed on the north side of the project adjacent to a proposed channel. The wall will be approximated three feet in height, 140' long and will likely be concrete stacked block or CMU. Visual impact should be minimal due to the wall location being within and at the rear of one of the proposed lots.

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

Tree removal is not anticipated.

28. 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?

The revegetation seed blend will be a native/naturalized blend applied at rate of 31 pounds per acre. A wood fiber mulch will be included in the hydroseed slurry.

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

Temporary irrigation will be provided through connection to installed water meters.

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

No

Request to Reserve New Street Name(s)

The Applicant is responsible for all sign costs.

Applicant Information

Name: Moonlight Hills Estates, LLC

Address: 5390 Bellazza Court

Reno, NV 89502

Phone : 775-771-5554 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.)

Caminto	
Sills Trail	Singing Wren
Palo Verde	Caprock
Kirwan	Lightening Ridge
Painite	Tripple Hills
Lazuli	Sho
Gainey Ranch	Sandia Heights
Saguaro Flor	

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 approval request.

Location

Project Name: Golden Mesa North

☐ Reno ☐ Sparks ☑ Washoe County

Parcel Numbers: 552-092-19 & 552-050-01

☑ 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 **CSD Engineering and Capital Projects Division**

Post Office Box 11130 - 1001 E. Ninth Street

Reno, NV 89520-0027

Phone: (775) 328-3667 - Fax: (775) 328-6133 Email: streetnames@washoecounty.us

PROPERTY TAX INFORMATION

Axion
ENGINEERING
Civil Engineering • Land Development

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
55209219	Active	12/9/2016 2:10:07 AM

Current Owner:
CRANDELL FAMILY TRUST, RAYMOND & JUDITH
650 KRESGE LN
SPARKS, NV 89431

SITUS:
3160 BRAVE LN
WCTY NV

Taxing District
4000

Geo CD:

Legal Description

Section 11 Township 20 Range 19 SubdivisionName _UNSPECIFIED

Installments

Period	Due Date	Tax Year	Tax	Penalty/Fee	Interest	Total Due
INST 1	8/15/2016	2016	$0.00	$0.00	$0.00	$0.00
INST 2	10/3/2016	2016	$0.00	$0.00	$0.00	$0.00
INST 3	1/2/2017	2016	$566.68	$0.00	$0.00	$566.68
INST 4	3/6/2017	2016	$566.68	$0.00	$0.00	$566.68
		Total Due:	**$1,133.36**	**$0.00**	**$0.00**	**$1,133.36**

Tax Detail

	Gross Tax	Credit	Net Tax
State of Nevada	$161.14	($42.22)	$118.92
Truckee Meadows Fire Dist	$511.86	($134.10)	$377.76
Washoe County	$1,319.19	($345.59)	$973.60
Washoe County Sc	$1,079.18	($282.73)	$796.45
Total Tax	**$3,071.37**	**($804.64)**	**$2,266.73**

Payment History

Tax Year	Bill Number	Receipt Number	Amount Paid	Last Paid
2016	2016122192	B16.41635	$566.69	8/11/2016
2016	2016122192	B16.88242	$566.68	9/13/2016

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) 328-2500

Address change requests may also mailed to: Washoe County Treasurer
P O Box 30039
Reno, NV 89520-3039

WASHOE COUNTY TREASURER

PO BOX 30039
RENO, NV 89520-3039
775-328-2510

Received By:	kbozman	**Receipt Number:**	U16.15477
Location:	Treasurer's Office	**Receipt Year:**	2016
Session:	kboz-0-12142016	**Date Received:**	12/14/2016

PAYMENT RECEIPT

Type	Description	Balance	Net Tax	Interest	Fees Penalties	Current Due	Current Paid	Balance Remaining
Real	Bill Number: 2016122757 Bill Year: 2016 PIN: 55205001 Primary Owner: MOONLIGHT HILLS ESTATES LLC Property Addr: ESTATES RD Property Desc: Section 11 Township 20 Range 19 SubdivisionName _UNSPECIFIED	3,905.34	2,845.89	0.00	136.10	2,981.99	2,981.99	923.35
Real	Bill Number: 297240 Bill Year: 2015 PIN: 55205001 Primary Owner: MOONLIGHT HILLS ESTATES LLC Property Addr: ESTATES RD Property Desc: Section 11 Township 20 Range 19 SubdivisionName _UNSPECIFIED	3,835.33	3,035.12	341.45	458.76	3,835.33	3,835.33	0.00
	Totals:	7,740.67	5,881.01	341.45	594.86	6,817.32	6,817.32	923.35

W. C. T. O. 37
DEC 13 2016
PAID

Tender Information:		Charge Summary:	
Check #1/1098	6,817.32	Real	6,817.32
Total Tendered	6,817.32	Total Charges	6,817.32

WASHOE COUNTY TREASURER PO BOX 30039 RENO, NV 89520-3039

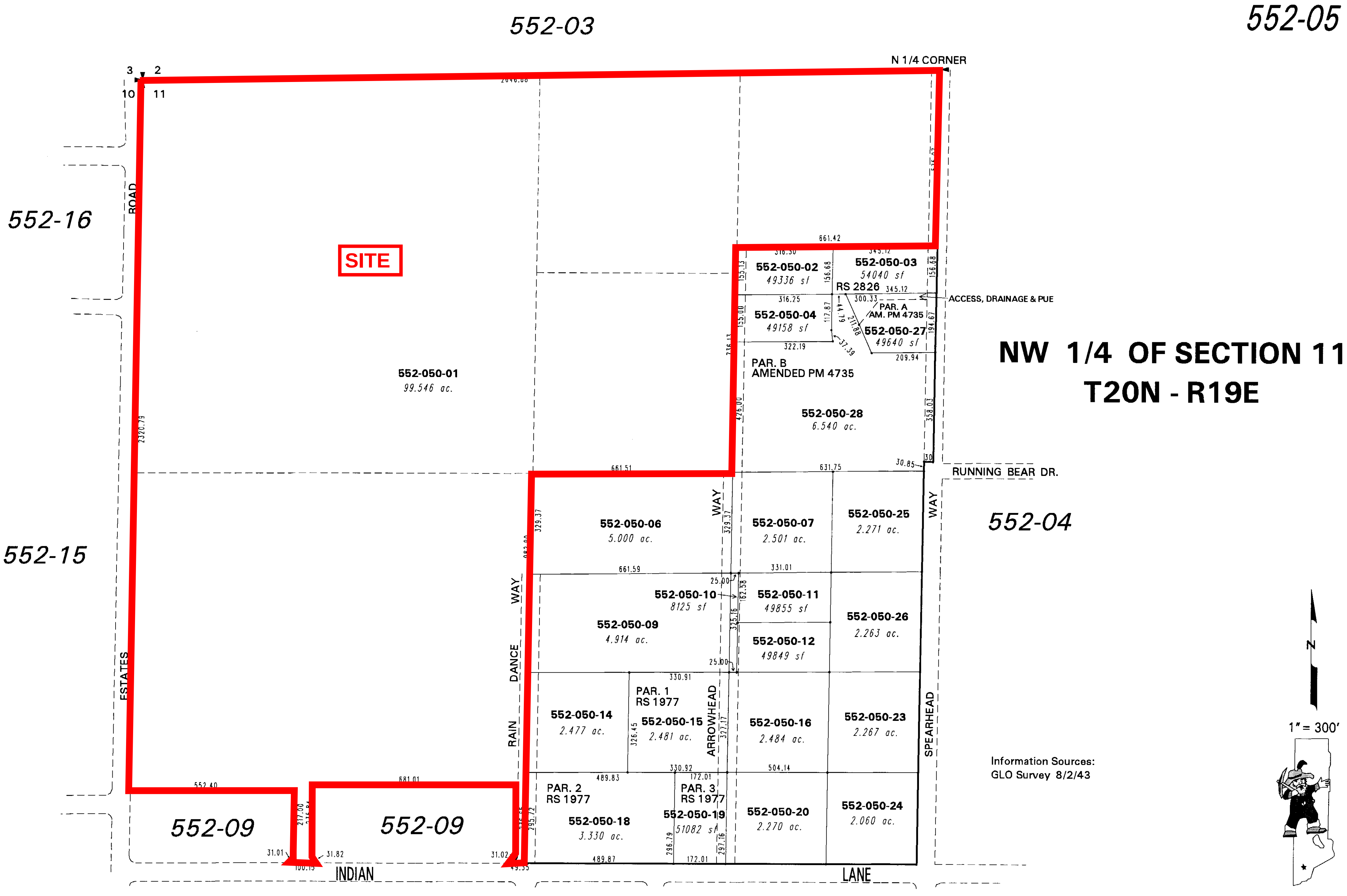
By Whom Paid:

MOONLIGHT HILLS ESTATES LLC
5390 BELLAZZA CT
RENO NV 89519

BALANCE REMAINING	923.35
CHARGES	6,817.32
PAID	6,817.32
CHANGE	0.00

ASSESSOR'S MAP

Axion
ENGINEERING
Civil Engineering • Land Development



552-07

NOTE: This map is prepared for the use of the Washoe County Assessor for assessment and illustrative purposes only. It does not represent a survey of the premises. No liability is assumed as to the sufficiency or the accuracy of the data delineated hereon.

Office of Washoe County Assessor, Nevada - Joshua G. Wilson

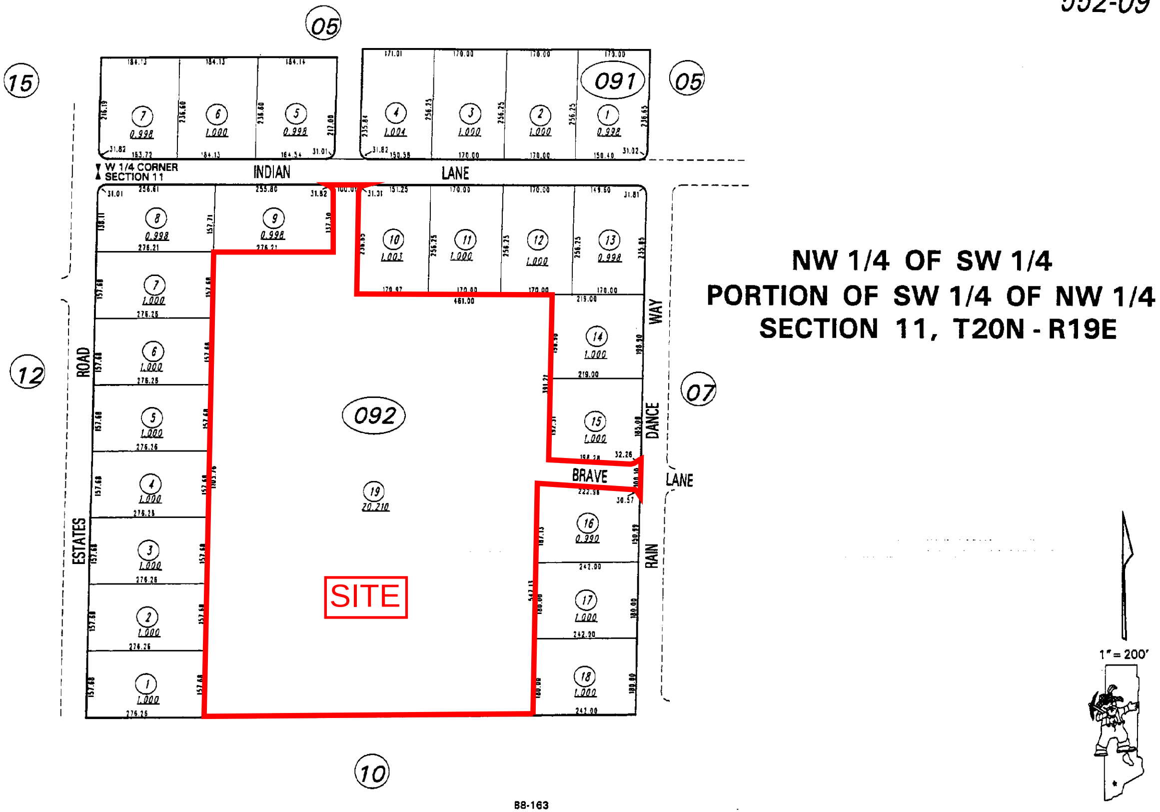
This area previously shown on 88-13

NOTE: Areas of parcels which are less than 2 acres are shown in square feet.

Drawn by TJF 2/97
Revised KSB 7/22/04 KSB 10/22/04
KSB 10/27/04 KSB 5/05/05 KSB 4/09/07

ARC INFO 9.1 WINDOWS 2000 5.0

552-09



NW 1/4 OF SW 1/4
PORTION OF SW 1/4 OF NW 1/4
SECTION 11, T20N - R19E

88-163

NOTE: This map is prepared for the use of the Washoe County Assessor for assessment and illustrative purposes only. It does not represent a survey of the premises. No liability is assumed as to the sufficiency or the accuracy of the data delineated hereon.

Office of Washoe County Assessor, Nevada - Robert W. McGowan

This area previously shown on 88-16

NOTE:
ASSESSOR'S BLOCK NUMBERS SHOWN IN ELLIPSES
ASSESSOR'S PARCEL NUMBERS SHOWN IN CIRCLES

Drawn by TJF 2/97
Revised

APPENDIX "B"

REPORTS and PLAN SETS

Axion
ENGINEERING
Civil Engineering • Land Development

TMWA DISCOVERY
and
WATER SERVICE ACKNOWLEDGEMENT

Axion
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AUTHORITY
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Ⓟ 775.834.8080 ● Ⓕ 775.834.8003

TO:	Karen Meyer	**DATE:**	July 6, 2016
THRU:	Scott Estes SJE		
FROM:	Brooke Long BL		

RE: Golden Valley Mesa Annexation/Discovery, TMWA WO# 16-4979

SUMMARY:

The Applicant has proposed a development consisting of 148 single family residential units on approximately 154.9 acres. TMWA can provide water service to the project, however, the project lies outside TMWA's service territory and will require annexation prior to a water service agreement. As part of this discovery, the off-site facility improvements have been identified. The cost opinion of the major off-site improvements for the project is $3,094,173.

Review of conceptual site plans or tentative maps by TMWA and/or agents of TMWA shall not constitute an application for service, nor implies a commitment by TMWA for planning, design or construction of the water facilities necessary for service. The extent of required off-site and on-site water infrastructure improvements will be determined by TMWA upon receiving a specific development proposal or complete application for service and upon review and approval of a water facilities plan by the local Health Authority. Because the NAC 445A Water System regulations are subject to interpretation, TMWA and/or agents of TMWA cannot guarantee that a subsequent water facility plan will be approved by the Health Authority or that a timely review and approval of the Project will be made. The Applicant should carefully consider the financial risk associated with committing resources to their Project prior to receiving all required approvals. After submittal of a complete Application for Service, the required facilities, the cost of these facilities, which could be significant, and associated fees will be estimated and will be included as part of the Water Service Agreement necessary for the Project. All fees must be paid to TMWA prior to water being delivered to the Project.

PURPOSE:

The purpose of this Discovery is to identify a planning level water service plan and an opinion of cost for the off-site facilities required to serve the proposed development in Lemmon Valley, Nevada.

ASSUMPTIONS:

1. The applicant shall be responsible for all application, review, inspection, storage, treatment, permits, easements, and other fees pertinent to the Project as adopted by the TMWA at the time of execution of a water service agreement.
2. The cost opinions contained herein do not include new business fees, cost of water rights and related fees, or contribution to the water meter retrofit fund.
3. Demand calculations, and fees based on demands, are estimates; actual fees will be determined at the time of application for service.
4. Project pressure criteria are:
    a. Maximum day pressure of at least 45 pounds per square inch (psi) at the ground surface elevation at the service connection with tank level at top of fire storage,
    b. Peak hour pressure of at least 40 psi at building pad elevation with tank level at top of emergency storage,
    c. Maximum day plus fire flow pressure of at least 20 psi at center of street elevation with tank level at bottom of fire storage, and
    d. TMWA does not calculate pressures for multi-story buildings. Confirmation that pressure will be adequate for upper stories is the responsibility of the Applicant.
5. Elevations used for this discovery were derived from existing site topographic information (not a grading plan).
6. Facility requirements for the Project are based on the assumed elevations, maximum day demand, and fire flow requirements. Changes in these parameters may affect the facility requirements.
7. Easements, permits and all pertinent Agency approvals are obtained for the design and construction of the water infrastructure necessary to serve the proposed Project.
8. All cost opinions are preliminary and subject to change. The costs presented in this study are planning level estimates based on the information available. Actual costs will be determined at the time of application for service. Cost opinions do not include on-site improvements made by the applicant.
9. This discovery is based on the current status of TMWA's system. Future development may alter the conclusions of this discovery. Capacity in TMWA's system is available on a first-come, first-served basis, and commitment to provide service is not established until a contract for service is executed and all fees are paid.
10. No water demands were included for the open space areas, public facilities or parks.

11. Project maximum day demands are calculated using the following equations:

Single-Family Units: Domestic *Maximum* Day Usage

$Y = 0.009 * \sqrt{x}$

Y = *maximum* day demand in gpm
x = lot size in square feet

Add irrigation for common areas as needed

Multi-Family Units: Domestic *Maximum* Day Usage

0.15 gpm per unit

Add irrigation for common areas as needed

Commercial/Industrial: Domestic *Maximum* Day Usage

Multiply water rights demand (in acre-feet) by 1.17

Add irrigation for common areas as needed

Potable Irrigation: *Maximum* Day Usage

Multiply water rights demand (in acre-feet) by 0.38

Note: TMWA plans to reevaluate the above maximum day demand equations for all customer usage types within the next 12 months, as part of a Water Facility Plan Update.

DISCUSSION:

The proposed Project is located in Golden Valley, NV and consists of 148 single family residential units with an average lot size of 38,000 square feet, on approximately 154.9 acres (see Figure 1).

Table 1. Project Parcel APNs and Acreage.

APN	ACREAGE
552-050-01	99.5
552-092-19	20.2
552-100-01	35.2
Total	**154.9**

The project can be served from TMWA's North Virginia water system. However, the project is not located within the Truckee Meadows Water Authority's (TMWA) retail service territory and will require annexation by TMWA.

Demands:

Applying TMWA's current maximum day demand formula, the demand for an average lot size of 38,000 ft^2 lot is 1.7 gpm. The total estimated project maximum day demand for the proposed 148 lots is 251.6 gpm.

Supply Capacity

TMWA's system currently has the available capacity to supply the Project's estimated max day demand.

Storage Capacity

TMWA's distribution system currently has adequate storage to accommodate the Project.

Tank Supply	Max Day Demand	Operating Storage (15% of MDD)	Emergency Storage (1 ADD)	Total Storage (gallons)
Raleigh Heights	251.6	54,346	138,814	193,159

Project Pressures:

Service pressures will range from 49 psi to115 psi. Where pressures exceed 80 psi, TMWA will require that all service connections have privately owned pressure regulators.

- Service elevations from 5090 to 5240.
- Project supply from the Raleigh Heights pressure zone.

Off-Site Improvements

Off-site improvements to serve the project for both developments are detailed below.

The project can be supplied from the existing 12" main in Golden Valley Rd. Planned off-site improvements are as follows:

- Two hot taps to the 12" main in Golden Valley Rd (see Figure 1 for locations).
- 4,850 LF of 8" pipe in Estates Rd from Golden Valley Rd to Hillview Dr.
- 500 LF connecting the north and south areas.

Dead Ends and Looping:

Nevada Administrative Code section 445A.6712 requires systems to be designed, to the extent possible, to eliminate dead ends. As planned, looping is achieved.

Project Fire Flows

Project Fire flow is assumed to be 1,500 gpm for a duration of 2 hours while maintaining a minimum residual service pressure of 20 psi.

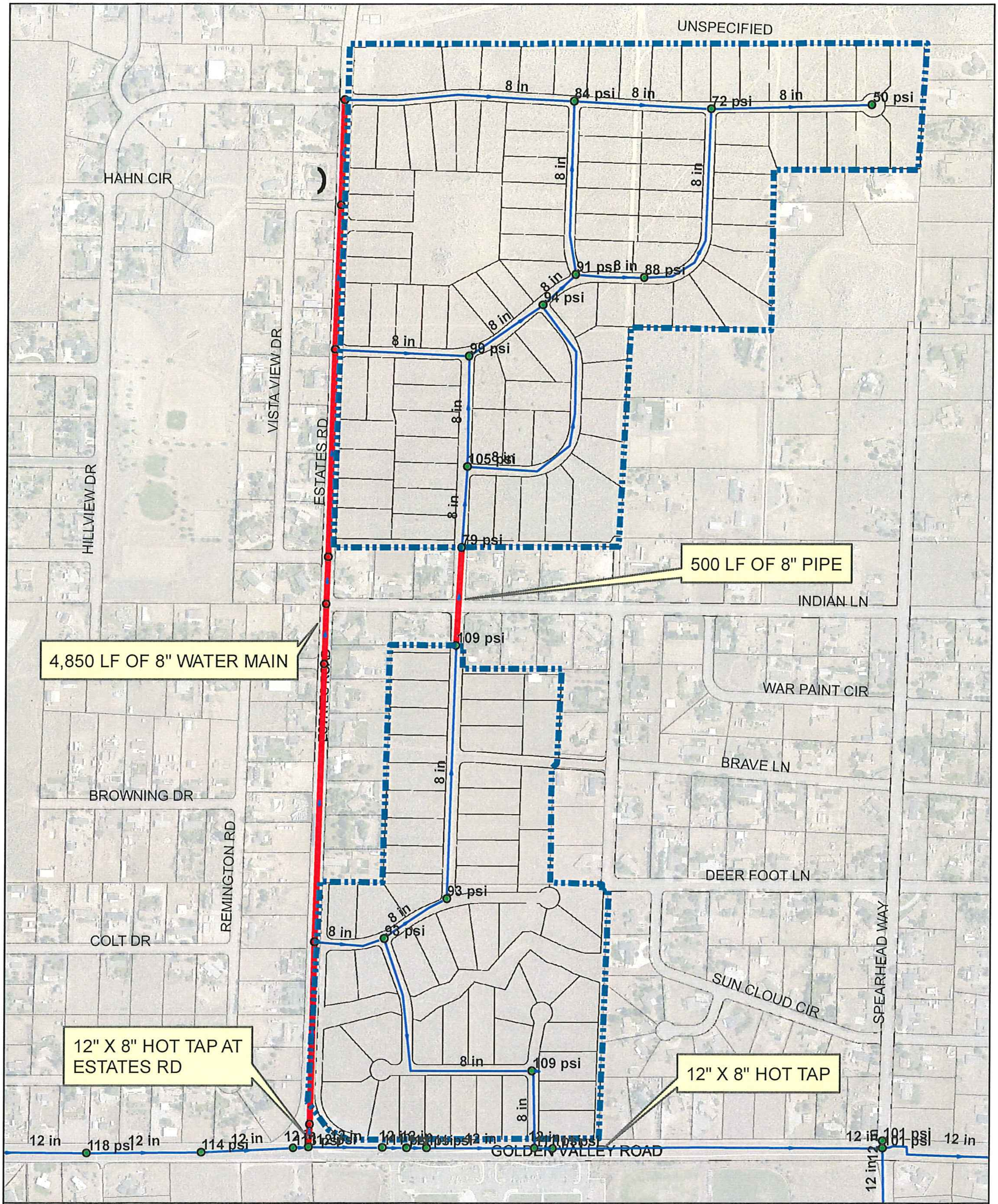
Major Water System Improvements and Cost Opinion

The major water system improvements to serve the project and a planning level cost opinion are listed in Table 2 and shown in Figure 1.

Table 2. Major Water System Improvements and Associated Costs

Description	Quantity	Unit	Unit Cost	Total Cost
Area 8 Facility Charge	251.6	MDD, gpm	$4,142	$1,042,127
Area 8 Storage Charge	251.6	MDD, gpm	$772	$194,235
Area 8 Supply and Treatment Charge	251.6	MDD, gpm	$4,163	$1,047,411
			subtotal	**$2,283,773**
Hot Tap	2	L.S.	$20,000	$40,000
8" main in Estates	4850	L.S.	$144	$698,400
8" main connecting the N and S Properties	500	L.F.	$144	$72,000
			subtotal	**$810,400**
			Total	**$3,094,173**

MDD = Maximum Day Demand, L.F. = Linear Feet, L.S. = Lump Sum



TRUCKEE MEADOWS WATER AUTHORITY

Quality. Delivered.

WATER FACILITY PLAN
16-4979 GOLDEN VALLEY MESA
ANNEXATION/DISCOVERY

DATE JULY 2016

MAP BY: BEL

MODEL: NV-STD_NAC 2016-02

SCALE: 1 inch = 600 feet

NORTH

NAD 83 NEVADA STATE PLANE WEST FEET

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Ⓟ 775.834.8080 ● Ⓕ 775.834.8003

Date: May 17, 2016

To: Karen Meyer

From: David Nelson DN

RE: 16-4979, Golden Valley Mesa North and South, +/- 148 SFR Lots (APN 552-050-01, 552-092-19 & 552-100-01)

The New Business/Water Resource team will answer the following assumptions on each new discovery:

- Is the property within Truckee Meadows Water Authority's water service territory?
- Does the property have Truckee River water rights appurtenant to the property, groundwater or resource credits associated with the property?
  - If yes, what is the status of the water right: Agricultural or Municipal and Domestic use?
- Estimated water demand for residential and or commercial projects.
- Any special conditions, or issues, that are a concern to TMWA or the customer.

The following information is provided to complete the Discovery as requested:

- These subject parcels (APN 552-050-01, 552-092-19 & 552-100-01) are within Truckee Meadows Water Authority's (TMWA's) service territory. An annexation is not required.

- There are no resource credits or Truckee River decreed water rights appurtenant to this property. The developer will be required to follow TMWA's current rules, specifically Rule 7, and pay all fees for water rights needed in order to obtain a will serve commitment letter.

- Based on the information provided by the applicant this project "Golden Valley Mesa North and South, +/- 148 SFR Lots" is estimated to require a domestic demand of **106.56 acre feet (AF)**. Landscaping plans were not provided to TMWA; therefore, a demand could not be determined. Please see the attached demand calculation sheet for the **estimated** demand and water resource fees. Once final plans are submitted a more accurate demand will be calculated. *Note: Water rights held or banked by the applicant must be dedicated to a project before any rule 7 water rights are purchased from TMWA. TMWA resources are first come, first serve and are limited. If applicant dedicates surface water for this project additional fees and dedications will apply.*

- Any existing right of ways and public easements would need to be reviewed, and if needed the property owner will need to grant TMWA the proper easements and/or land dedications to provide water service to the subject properties. Property owner will be required, at its sole expense, to provide TMWA with a current preliminary title report for all subject properties. Owner will represent and warrant such property offered for dedication or easements to TMWA shall be free and clear of all liens and encumbrances. Owner is solely responsible for obtaining all appropriate permits, licenses, construction easements, subordination agreements, consents from lenders, and other necessary rights from all necessary parties to dedicate property or easements with title acceptable to TMWA.

TRUCKEE MEADOWS WATER
AUTHORITY

WATER RIGHTS AND METER FUND CONTRIBUTION
CALCULATION WORKSHEET FOR MULTI-TENANT/COMMERCIAL APPLICATIONS

					Demand (Acre Feet)		
1	Existing demand (current usage) at Service Property				**0.00**		
2	No. of Lots: Average 35,000sf	**148**	x .72 AF per Lot	106.56			
3	Retail floor space:		x 0.0004 per sq.ft.	0.00			
4	Fixture units:		x 15x 365x 3.07/ 1 mil	0.00			
5	Landscaping: Turf		sq ft x 3.41/ 43,560	TBD			
6	Drip			TBD			
7	Other calculated demand			TBD			
8	New or additional demand at Service Property (lines 2+3+4+5+6)				**106.56**		
9	**Total Demand at Service Property (lines 1+8)**				**106.56**		
10	Less: Prior demand commitments at service property			**0.00**			
11	Less: Other resource credits			**0.00**			
12	**Total Credits (lines 10+11)**				**0.00**		
13	Subtotal: Required resource dedication/commitment (lines 9-12)				**106.56**		
14	Factor amount (0.11 x Line 13)				TBD		
15	Return flow required ([1-2.5/duty] x Line 13)				TBD		
16	**TOTAL RESOURCES REQUIRED (lines 13+14+15)**				**106.56**		
17	Price of Water Rights per AF	$7,500				$	799,200
18	Will Serve Commitment Letter Preparation Fee ($100 per letter)					$	100
19	Due Diligence Fee ($150.00 per parcel)					$	0
20	Document Preparation Fees ($100.00 per document)					$	0
21	Meter Contribution ($1,830 x 106.56 acre feet of demand)					$	TBD
22	**TOTAL FEES DUE (lines 17+18+19+20+21)**					**$**	**799,300**

Project: Golden Valley Mesa North and South, +/- 148 SFR Lots, Discovery

Applicant: Moonlight Hills Estates, LLC: Richard Nevis **Quote date:** 5/17/2016

Phone: Mark Herrmann, 720-8973 **Tech contact:** David 834-8021

APN: 552-050-01, 552-092-19, & 552-100-01 **Project No:** 16-4979

Remarks: **Fees quotes are valid only within 15 calendar days of Quote Date.**

The 106.56 acre feet may result in the assessment of facility fees pursuant to TMWA's Rules and Rates.

Estimate shows purchase/dedication of ground water, additional fees and dedication will apply if surface water is brought into TMWA. Resources are first come, first serve and are limited.

APN: 552-050-01, 552-100-01

<u>When Recorded, Return to:</u>
Truckee Meadows Water Authority
Attn: Amanda Duncan, ARWP, Land Agent
P O Box 30013
Reno, NV 89520-3013
TMWA WO: 16-4979

RETAIL WATER SERVICE AREA ANNEXATION AGREEMENT

THIS RETAIL WATER SERVICE AREA ANNEXATION AGREEMENT ("<u>Annexation Agreement</u>"), entered into this ______ day of ________________, 20__ ("<u>Effective Date</u>"), by and between **TRUCKEE MEADOWS WATER AUTHORITY** (the "<u>Authority</u>"), a Joint Powers Authority entity created pursuant to a cooperative agreement among the cities of Reno, Nevada, Sparks, Nevada and Washoe County, Nevada pursuant to N.R.S. Chapter 277, and **MOONLIGHT HILLS ESTATES, LLC,** a Nevada limited liability company, (referred to as "<u>Developer</u>" or "<u>Owner</u>" in this Agreement and exhibits attached hereto, and together with Authority collectively hereinafter referred to as "<u>Parties</u>");

WITNESSETH:

WHEREAS, Owner owns certain real property more particularly described on Exhibit "A" and depicted in Exhibit "A-1" attached hereto incorporated herein by this reference ("<u>Property</u>", or "<u>Owner's Project</u>"), located outside of Authority's current retail water service area.

WHEREAS, Owner desires the Authority to expand its retail water service area to provide water service to the Property.

WHEREAS, on December 31, 2014, Authority acquired the water utility system of the Washoe County Department of Water Resources and the South Truckee Meadows General Improvement District, and as a result, new customers may be eligible to annex into the Authority service area based upon their proximity to existing Authority facilities, availability of water resources, or cost-effectiveness.

WHEREAS, based upon these criteria, Authority has determined it is appropriate that Authority provide service to Owner and accordingly, Owner's property may be annexed into Authority's retain water service area.

WHEREAS, the expansion of Authority's retail water service area may require dedication of certain real property or water system facility improvements to facilitate the efficient management and operation of Authority's system to include the Property in its retail water service area.

WHEREAS, Authority is willing to expand its retail water service area to include water service to the Property and Owner agrees to the expansion of Authority's retail water service area upon the terms and conditions set forth in this Agreement, subject to and on the express condition that Owner fully and completely perform the terms and conditions set forth in this Agreement.

NOW, THEREFORE, in consideration of the mutual covenants and conditions herein contained, the Parties agree as follows:

1. Expansion of Water Service Area. Authority agrees to expand its retail water service area as set forth in Exhibits "A" and "A-1" attached hereto to provide water service for the Property; provided, however, that such expansion of the Authority's retail water service area is specifically conditioned upon execution of this Agreement by Owner and the Authority, and the complete and satisfactory performance of the terms and conditions in Section 2 herein by Owner and its permitted successors and assigns, to the extent applicable.

2. Conditions to Annexation. The following conditions must be satisfied within the time frames stipulated below or this Agreement shall automatically terminate, and the Property shall be deemed de-annexed from the Authority retail service area.

2.1 Construction/Dedication of Facility Improvements. The Authority has determined that additions, improvements and/or modifications to its Water System Facilities are required to expand its retail water service area to include the Property. Owner is responsible for all costs related to, and except as otherwise provided herein, shall install and construct the off-site additions, improvements and modifications to the Authority's Water System Facilities as delineated in Exhibit "B" attached hereto and incorporated herein by this reference. Owner shall submit a complete Application for New or Modified Water Service and enter a Water Service Agreement with Authority for the completion of the foregoing Water Facilities (or portions thereof, for phased development) no later than twenty-four (24) months from the Effective Date of this Annexation Agreement, or this Agreement shall automatically terminate, and the Property shall be deemed de-annexed from the Authority retail service area. For phased development, Owner shall continue to submit complete Applications for New or Modified Water Service and enter into Water Service Agreements for subsequent phases no later than twenty-four months from the Effective Date of the previous Water Service Agreement, or this Annexation Agreement shall automatically terminate and portions of the Property not actively receiving water service from Authority shall be deemed de-annexed from the Authority retail service area. Authority shall have no obligation to provide water service to any portion of the Property until required water system facilities are completed to the satisfaction of Authority. Upon completion of the facilities listed in Exhibit B, Owner shall dedicate the facilities to Authority pursuant to the terms of this Annexation Agreement and Authority's Rules, and Authority will own all capacity in the system including any excess capacity.

2.2 Dedication of Real Property. The Authority has determined that the dedication of certain real property in fee, or certain easements, rights of way or other interests in real property, is required to expand its retail water service area to include the Property. Owner shall, prior to the start of construction of any facilities required under this Annexation Agreement, grant and convey to Authority, all necessary easements, conveyances, deeds, rights-of-way, or other rights required by this Annexation Agreement. Such property shall be conveyed free and clear of all liens and encumbrances, and Owner shall obtain and provide Authority prior to dedication, at Owner's expense, a preliminary title report for any property offered for dedication showing all matters of record affecting such property. Owner is solely responsible for obtaining all appropriate permits, licenses, construction easements, subordination agreements, consents from lenders, and other necessary rights from all necessary parties to dedicate property with title acceptable to Authority. If any portion of the property required for dedication is located on property other than that owned by Owner, Owner shall be responsible for obtaining, at no cost to Authority, any necessary interests therein from such owners for conveyance to Authority free and clear of all liens and encumbrances. Owner may not apply for, nor shall Authority shall have any obligation to issue or enter, a Water Service Agreement for service to any portion of the Property until such real property required hereunder is granted to Authority in such form, location, scope and condition of title satisfactory to Authority. Furthermore, unless such real property is granted to Authority no later than twenty-four (24) months from the Effective Date of this Annexation Agreement, this Annexation Agreement shall automatically terminate, and the Property shall be deemed de-annexed from the Authority retail service area. In the event Owner has not conveyed the real property within the 24-month period, Owner may submit a written request for, and Authority in its sole discretion may grant, an extension up to one-year if Owner can show reasonable justification to Authority why the real property was not transferred.

3. Conditions of Water Service. Owner acknowledges and agrees that this Annexation Agreement merely addresses conditions required for the expansion of Authority's retail water service area, and that Owner must independently comply with all applicable requirements in Authority's Rules before the Authority has any obligation to provide water service to the Property, including without limitation (i) submitting and receiving approval from the Authority of appropriate applications for service; (ii) dedicating sufficient Water Resources to the Authority and receiving a Will Serve Commitment for service to the Property; (iii) in addition to any dedication requirements in Section 2 of this Annexation Agreement, dedicating appropriate easements and other real property required for service; (iv) in addition to any dedication requirements in Section 2 of this Annexation Agreement, installing, constructing and dedicating subdivision or on-site water system facility additions, improvements or modifications or further additions, improvements, extensions or

modifications to Authority's Water System Facilities as necessary to provide the requested new service(s) or modification of service(s) to the Property; and (v) satisfying such other terms and conditions pursuant to the Authority's Rules and any requirements of any local governmental entity with jurisdiction over the Property as necessary to obtain a Will-Serve Commitment letter from the Authority for the delivery of water to the Property. Owner shall submit such applications and execute such other documents required by Authority's Rules and procedures prior to being eligible for the delivery of water to the Property. All such conditions, dedications, additions, improvements, extensions and modifications shall be made in accordance with the Authority's Rules and regulations in effect at the time Authority and Owner enter into any agreement or agreements for the specific dedication, additions, improvements or modifications required to provide water service to the Property.

4. General Terms

4.1 Owner acknowledges and agrees that it is entering this Annexation Agreement voluntarily, that the expansion of Authority's service area is specifically conditioned on Owner's performance of all terms and conditions contained herein, and that if any of the provisions of this Annexation Agreement are deemed unenforceable or if Owner fails to perform any of its obligations hereunder, Authority is under no obligation to expand its service area to include any portion of the Property for which the Authority has not previously entered an agreement to provide water service. Nothing in this paragraph shall be construed to grant Owner a right, and Owner specifically waives any right, if any exists, to dispute any of the terms and conditions of this Annexation Agreement under Rule 8 in Authority's Rules, as such may be amended from time to time. Upon annexation of the Property, the Parties acknowledge and agree that both are bound by the terms and conditions of the rules and regulations adopted by Authority, as the rules and regulations may be amended from time to time, and as such rules may exist at the time service is applied for or requested for the Property or certain phases of the Property.

4.2. Any written notices or communications required hereunder shall be served by placing such notices in the U.S. Mail, postage prepaid, properly addressed to the following:

To: Authority

Truckee Meadows Water Authority
Attn. General Manager
P.O. Box 30013
Reno, NV 89520-3013

To: Owner

Attn: Richard Nevis
Moonlight Hills Estates, LLC
5390 Bellazza Court
Reno, NV 89519

4.3. This Annexation Agreement shall inure to and be binding upon the parties, their respective successors and assigns.

4.4. This Annexation Agreement shall not be modified except in writing, signed by all parties.

4.5. This Annexation Agreement represents the entire agreement between the Parties related to the expansion of the Authority's retail water service area and supersedes all prior representations and agreements whether written or oral with respect to the covenants and conditions provided herein; provided, however, that the obligations set forth in this Annexation Agreement shall be in addition to, and do not supersede or replace, any obligations that may be imposed upon Owner under Authority's Rules.

4.6 This Annexation Agreement and terms and conditions herein shall run with the land and be binding upon and inure to the benefit and burden of the parties to the agreement and their heirs, successors and assigns and any future owners of the Property.

4.7 Neither this Annexation Agreement nor any of the terms set forth herein shall be effective or binding on Authority until this Annexation Agreement is executed by Authority, and the Authority will be under no obligation to execute this Annexation Agreement if not executed and returned by Owners to the Authority by January 15, 2017.

IN WITNESS WHEREOF, the Parties hereto have executed this Annexation Agreement effective as of the Effective Date first written above.

TRUCKEE MEADOWS WATER AUTHORITY, a Joint Powers Authority

By:___________________________
Mark Foree, General Manager

MOONLIGHT HILLS ESTATES, LLC, A Nevada limited liability company

By: ___________________________

Name:_________________________

Title: _________________________

NOTARY PAGE FOLLOWS

STATE OF NEVADA)
) ss
COUNTY OF WASHOE)

This instrument was acknowledged before me on ______________________, 20__, by Mark Foree as General Manager, of the **TRUCKEE MEADOWS WATER AUTHORITY**, on behalf of said Joint Powers Authority therein named.

____
NOTARY PUBLIC

STATE OF _____________)
) ss
COUNTY OF ___________)

This instrument was acknowledged before me on ____________________, 20__, by ________________________________, as ______________________________________, of **MOONLIGHT HILLS ESTATES, LLC** on behalf of said Nevada limited liability company therein named.

____
NOTARY PUBLIC

EXHIBIT "A"

All that real property situate in the County of Washoe, State of Nevada, described as follows:

PARCEL 1:

ALL THAT PORTION OF THE NORTHWEST QUARTER (NW1/4) OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.& M., DESCRIBED AS FOLLOWS:

THE NORTHWEST QUARTER (NW ¼) OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.& M.

EXCEPTING THEREFROM THE SOUTHEAST QUARTER (SE ¼) THEREOF.

EXCEPTING THEREFROM THE FOLLOWING DESCRIBED PARCEL:

A PORTION OF THE EAST HALF (E ½) OF THE NORTHEAST QUARTER (NE 1/40 OF THE NORTHWEST QUARTER (NW ¼) OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.&M., WASHOE COUNTY, NEVADA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTH QUARTER CORNER OF SAID SECTION 11; THENCE SOUTH 01°02'02" WEST 575.07 FEET ALONG THE CENTER LINE OF SAID SECTION; THENCE SOUTH 89°08'30" WEST 345.12 FEET ALONG THE SOUTHERLY LINE OF THE NORTH HALF (N ½) OF THE SOUTH HALF (S ½) OF THE SOUTH HALF (S ½) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHWEST QUARTER (NW ¼) OF SAID SECTION 11, THE POINT OF BEGINNING; THENCE CONTINUING SOUTH 89°08'30" WEST 316.30 FEET ALONG SAID LINE TO THE WESTERLY LINE OF THE EAST HALF (E ½) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHWEST QUARTER (NW ¼) OF SAID SECTION 11; THENCE SOUTH 01°02'52" WEST ALONG SAID LINE 155.13 FEET; THENCE NORTH 89°25'22" EAST 316.25 FEET; THENCE NORTH 01°02'52" EAST 156.68 FEET TO THE POINT OF BEGINNING.

FURTHER EXCEPTING THEREFROM THE FOLLOWING DESCRIBED PARCEL:

THE SOUTHEAST QUARTER (SE ¼) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHWEST QUARTER (NW ¼) AND THE SOUTH HALF (S ½) OF THE SOUTH HALF (S ½) OF THE SOUTH HALF (S ½) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHWEST QUARTER (NW ¼) OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.&M.

FURTHER EXCEPTING THEREFROM ANY PORTION LYING WITH THE SOUTHEAST QUARTER (SE ¼) OF THE NORTHEAST QUARTER (NE ¼) OF SAID NORTHWEST QUARTER (NW ¼) OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.&M.

FURTHER EXCEPTING THEREFROM THE FOLLOWING DESCRIBED PARCEL:

COMMENCE AT THE WEST QUARTER CORNER OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.& M., WASHOE COUNTY, NEVADA, AND PROCEED NORTH 89°55'22" EAST 612.41 FEET ALONG THE CENTERLINE OF SAID SECTION; THENCE NORTH 1°05'22" EAST 286.25 FEET; THENCE NORTH 89°55'22" EAST 171.01 FEET TO THE POINT OF BEGINNING; THENCE CONTINUE NORTH 89°55'22" EAST 170.00 FEET; THENCE SOUTH 1°03'42" WEST 256.25 FEET OT A POINT ON THE NORTH LINE OF INDIAN LANE (60.00 FEET WIDE); THENCE ALONG SAID NORTH LINE SOUTH 89°55'22" WEST 170.00 FEET; THENCE NORTH 1°03'42" EAST 256.25 FEET TO THE POINT OF BEGINNING.

FURTHER EXCEPTING THEREFROM:

COMMENCING AT THE WEST QUARTER CORNER OF SAID SECTION 11 AND PROCEEDING THENCE NORTH 89°55'22" EAST ALONG THE CENTERLINE OF SAID SECTION 11, A DISTANCE OF 612.41 FEET; THENCE NORTH 01°05'22" EAST 50.41 FEET TO POINT OF BEGINNING, SAID POINT BEING ON THE EAST LINE OF A PROPOSED 60.00 FOOT WIDE ROADWAY; THENCE NORTH 01°55'22" EAST 235.84 FEET ALONG SAID EAST LINE; THENCE NORTH 89°55'22" EAST 171.01 FEET; THENCE SOUTH 01°03'42" WEST 256.25 FEET TO A POINT ON THE NORTH LINE OF INDIAN LANE (60.00 FEET WIDE); THENCE ALONG SAID NORTH LINE SOUTH 89°55'22" WEST 150.58 FEET TO BEGINNING OF A 20.00 FEET RADIUS CURVE TO THE RIGHT; THENCE ALONG SAID CURVE THROUGH AN ANGLE OF 91°10'00", AND AN ARC LENGTH OF 31.82 FEET TO THE POINT OF BEGINNING.

FURTHER EXCEPTING THEREFROM THE FOLLOWING DESCRIBED PARCEL:

COMMENCING AT THE WEST QUARTER CORNER OF SAID SECTION 11; THENCE NORTH 01°05'22" EAST 50.41 FEET ALONG THE WEST LINE OF SAID SECTION 11 TO THE POINT OF BEGINNING; THENCE CONTINUING NORTH 01°05'22" EAST 216.19 FEET; THENCE NORTH 89°55'22" EAST 184.13 FEET; THENCE SOUTH 01°05'22" WEST 236.60 FEET TO A POINT ON THE NORTH LINE OF INDIAN LANE (60.00 FEET WIDE); THENCE ALONG SAID NORTH LINE SOUTH 89°55'22" WEST 163.72 FEET TO THE BEGINNING OF A 20.00 FEET RADIUS CURVE TO THE RIGHT; THENCE ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 91°10'00", AND AN ARC LENGTH OF 31.82 FEET TO THE POINT OF BEGINNING.

FURTHER EXCEPTING THEREFROM THE FOLLOWING DESCRIBED PARCEL:

COMMENCING AT THE WEST QUARTER CORNER OF SAID SECTION 11; THENCE NORTH 89°55'22" EAST 612.41 FEET ALONG THE CENTERLINE OF SAID SECTION 11; THENCE NORTH 01°05'22" EAST 286.25 FEET; THENCE NORTH 89°55'22" EAST 511.01 FEET TO THE POINT OF BEGINNING; THENCE CONTINUING NORTH 89°55'22" EAST 170.00 FEET TO A POINT ON THE WEST LINE OF RAIN DANCE WAY EXTENDED; THENCE ALONG SAID WEST LINE SOUTH 01°03'42" WEST 236.65 FEET TO THE BEGINNING OF A 20.00 FEET RADIUS CURVE TO THE RIGHT; THENCE ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 88°51'40" FOR AN ARC LENGTH OF 31.02 FEET TO A POINT ON THE NORTH LINE OF INDIAN LANE (60.00 FEET WIDE); THENCE ALONG SAID NORTH LINE SOUTH 89°55'22" WEST 150.40 FEET; THENCE NORTH 01°03'42" EAST 256.25 FEET TO THE POINT OF BEGINNING.

FURTHER EXCEPTING THEREFROM THE FOLLOWING DESCRIBED PARCEL:

COMMENCING AT THE WEST QUARTER CORNER OF SAID SECTION 11; THENCE NORTH 89°55'22" EAST 612.41 FEET ALONG THE CENTERLINE OF SAID SECTION 11; THENCE NORTH 01°05'22" EAST 286.25 FEET THENCE NORTH 89°55'22" EAST 341.01 FEET TO THE POINT OF BEGINNING; THENCE CONTINUING NORTH 89°55'22" EAST 170.00 FEET; THENCE SOUTH 01°03'42" WEST 256.25 FEET TO THE POINT ON THE NORTH LINE OF INDIAN LANE (60.00 FEET WIDE); THENCE ALONG SAID NORTH LINE SOUTH 89°55'22" WEST 170.00 FEET; THENCE NORTH 01°03'42" EAST 256.25 FEET TO THE POINT OF BEGINNING.

FURTHER EXCEPTING THEREFROM THE FOLLOWING DESCRIBED PARCEL:

COMMENCE AT THE WEST QUARTER CORNER OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.&M., WASHOE COUNTY, NEVADA, AND PROCEED NORTH 1°05'22" EAST 266.60 FEET ALONG THE WEST LINE OF SAID SECTION 11; THENCE NORTH 89°55'22" EAST 184.13 FEET TO THE POINT OF BEGINNING; THENCE CONTINUE NORTH 89°55'22" EAST 184.13 FEET; THENCE SOUTH 105'22" WEST 236.60 FEET TO A POINT ON THE NORTH LINE OF INDIAN LANE (60.00 FEET WIDE); THENCE SOUTH 89°55'22" WEST 184.13 FEET ALONG SAID LINE; THENCE NORTH 1°05'22" EAST 236.60 FET TO THE POINT OF BEGINNING.

FURTHER EXCEPTING THEREFROM THE FOLLOWING DESCRIBED PARCEL:

COMMENCE AT THE WEST QUARTER CORNER OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.&M., WASHOE COUNTY, NEVADA, AND PROCEED NORTH 1°05'22" EAST 266.60 FEET ALONG THE WEST LINE OF SAID

SECTION 11; THENCE NORTH 89°55’22” EAST 368.26 FEET TO THE POINT OF BEGINNING; THENCE CONTINUE NORTH 89°55’22” EAST 184.14 FEET TO A POINT ON THE WEST LINE OF A PROPOSED 60.00 FEET WIDE ROADWAY; THENCE SOUTH 1°05’22” WEST 217.00 FEET ALONG THE SAID WEST LINE TO THE BEGINNING OF A 20.00 FEET RADIUS CURVE TO THE RIGHT; THENCE ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 88°50’00” AND AN ARC LENGTH OF 31.01 FEET TO A POINT ON THE NORTH LINE OF INDIAN LANE (60.00 FEET WIDE); THENCE ALONG SAID NORTH LINE SOUTH 89°55’22” WEST 164.54 FEET; THENCE NORTH 1°05’22” EAST 236.60 FEET TO THE POINT OF BEGINNING. EXCEPTING THEREFROM ANY PORTION THEREOF CONVEYED TO THE COUNTY OF WASHOE, STATE OF NEVADA, FOR ROAD AND INCIDENTAL PURPOSES.

PARCEL 1A:

AN EASEMENT 25.00 FEET IN WIDTH FOR ROADWAY AND UTILITY PURPOSES, SAID EASEMENT BEING THE WEST 25.0 FEET OF THE SOUTHEAST QUARTER (SE ¼) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHWEST QUARTER (NW ¼) AND THE SOUTH HALF (S ½) OF THE SOUTH HALF (S ½) OF THE SOUTH HALF (S ½) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHEAST QUARTER (NE ¼) OF THE NORTHWEST QUARTER (NW ¼) OF SAID SECTION 11, AS RECORDED APRIL 28, 1978 IN BOOK 1233, PAGE 442 AS INSTRUMENT NO. 528857 AND RECORDED JULY 2, 1996 IN BOOK 4613, PAGE 716 AS INSTRUMENT NO. 2009093 OF OFFICIAL RECORDS WASHOE COUNTY, NEVADA.

PARCEL 1B:

A NON-EXCLUSIVE EASEMENT FOR ROAD AND UTILITY PURPOSES 60 FEET IN WIDTH, THE CENTERLINE OF WHICH IS THE EAST LINE OF THE NORTHWEST QUARTER (NW ¼) OF SAID SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.D.B.&M, RECORDED JULY 2, 1996 IN BOOK 4613, PAGE 716 AS INSTRUMENT NO. 2009093, OF OFFICIAL RECORDS WASHOE COUNTY, NEVADA.

NOTE: THE ABOVE METES AND BOUNDS DESCRIPTION APPEARED PREVIOUSLY IN THAT CERTAIN DOCUMENT RECORDED JULY 2, 1996 IN BOOK 4613, PAGE 716 AS INSTRUMENT NO. 2009093, OF OFFICIAL RECORDS WASHOE COUNTY, NEVADA.

APN: 552-050-01

[Legal Description was referenced from that certain GRANT BARGAIN and SALE DEED, recorded as Document No. 4339670 on March 31, 2014, in the office of the County Recorder of Washoe County, State of Nevada.]

All that real property situate in the County of Washoe, State of Nevada, described as follows:

THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 11, TOWNSHIP 20 NORTH, RANGE 19 EAST, M.B.D.& M.

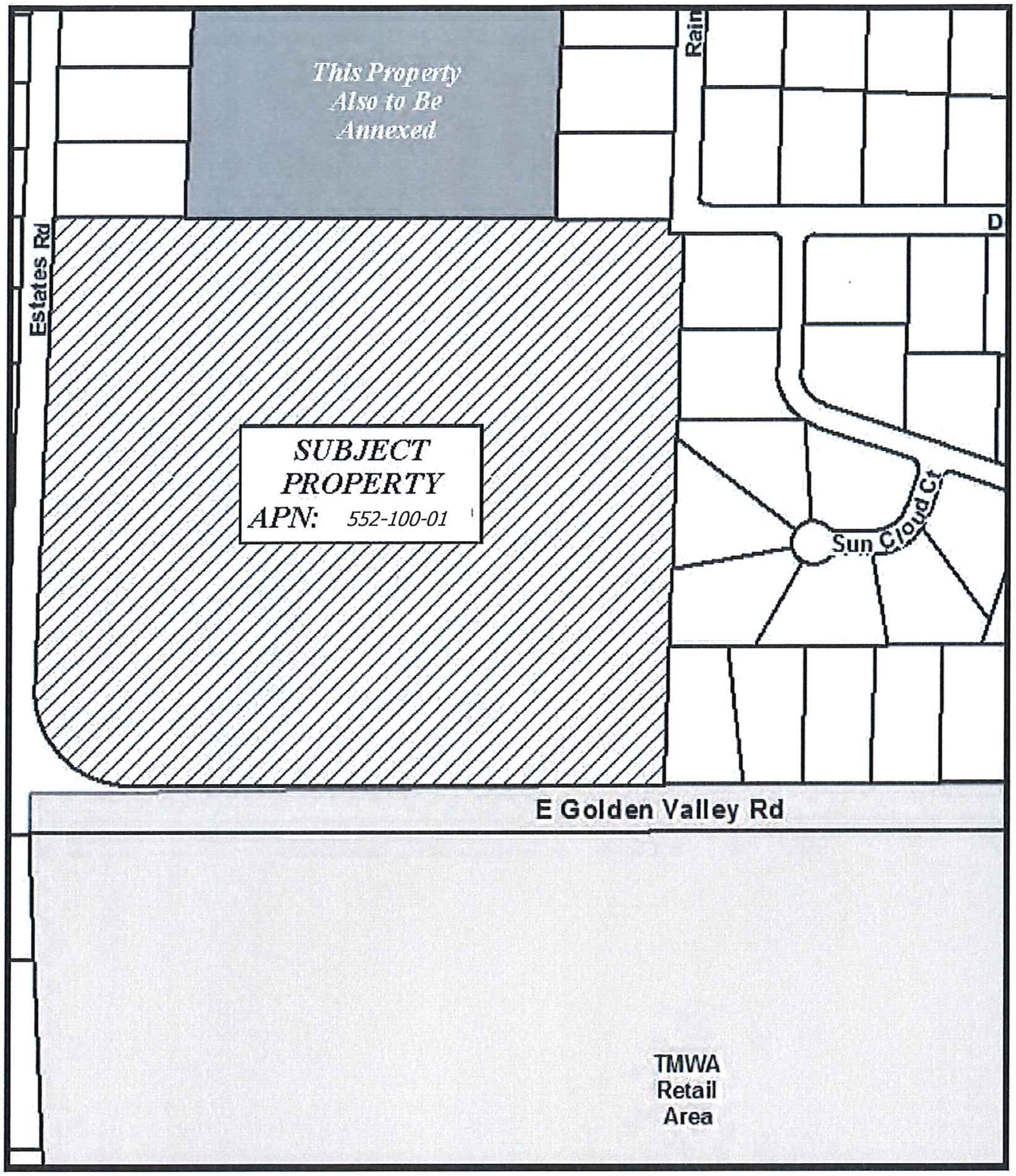
EXCEPTING THEREFROM THOSE PORTIONS THAT MAY LIE WITHIN THE FOLLOWING STREETS; RAIN DANCE WAY, DEER FOOT LANE, GOLDEN VALLEY ROAD AND ESTATES ROAD, AS IT MAY NOW EXIST.

NOTE; THE ABOVE SECTIONAL DESCRIPTION APPEARED PREVIOUSLY IN THAT CERTAIN DOCUMENT RECORDED JANUARY 13, 1997, IN BOOK 4764, PAGE 0132, AS INSTRUMENT NO. 2063449.

APN: 552-100-01

[Legal Description was referenced from that certain GRANT BARGAIN and SALE DEED, recorded as Document No. 4339697 on March 31, 2014, in the office of the County Recorder of Washoe County, State of Nevada.]

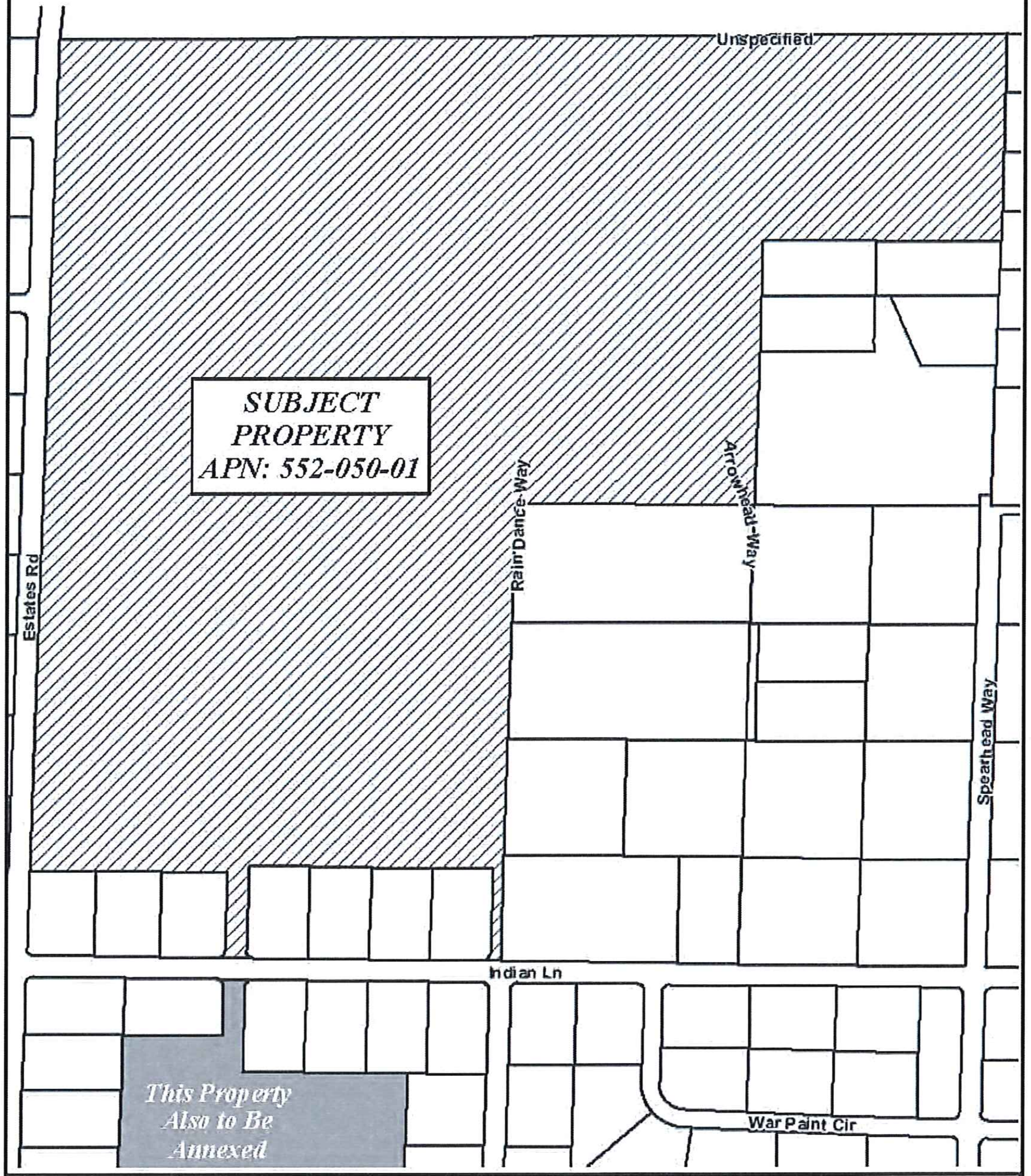
EXHIBIT A-1



TRUCKEE MEADOWS WATER AUTHORITY
www.tmwa.com

ANNEXATION EXHIBIT MAP A-1
(1 of 2) FOR
MOONLIGHT HILLS ESTATES, LLC
APN: 552-100-01

EXHIBIT A-1



TRUCKEE MEADOWS WATER AUTHORITY
www.tmwa.com

ANNEXATION EXHIBIT MAP A-1 (2 of 2) FOR MOONLIGHT HILLS ESTATES, LLC APN: 552-050-01

EXHIBIT B

GOLDEN VALLEY MESA
SUMMARY OF OFFSITE FACILITY REQUIREMENTS AND APPROXIMATE COSTS TO BE PAID BY DEVELOPER

Estimated Major Water Facility Costs

Description	Quantity	Unit	Unit Cost	Total Cost
Area 8 Facility Charge	251.6	MDD, gpm	$4,142	$1,042,127
Area 8 Storage Charge	251.6	MDD, gpm	$772	$194,235
Area 8 Supply and Treatment Charge	251.6	MDD, gpm	$4,163	$1,047,411
			subtotal	**$2,283,773**
Hot Tap	2	L.S.	$20,000	$40,000
8" main in Estates	4850	L.S.	$144	$698,400
8" main connecting the N and S Properties	500	L.F.	$144	$72,000
			subtotal	**$810,400**
			Total	**$3,094,173**

Notes:

1. Water System Facility Charges are determined based on the maximum day demand (MDD) of the development. The above MDD is estimated and will be determined at the time final development plans are submitted with a formal application for water service. All facility requirements listed above are preliminary and are subject to change during the final planning and design process.
2. Review of conceptual plans or tentative maps by TMWA does not constitute an application for service, nor implies a commitment by TMWA for planning, design or construction of the water facilities necessary for service. The extent of required off-site and on-site water infrastructure improvements will be determined by TMWA upon receiving a specific development proposal or complete application for service and upon review and approval of a water facilities plan by the local health authority. Because the NAC 445A Water System regulations are subject to interpretation, TMWA cannot guarantee that a subsequent water facility plan will be approved by the health authority or that a timely review and approval of the Project will be made. The Applicant should carefully consider the financial risk associated with committing resources to their project prior to receiving all required approvals. After submittal of a complete Application for Service, the required facilities, the cost of these facilities and associated fees will be estimated and will be included as part of the Water Service Agreement necessary for the Project. All fees must be paid to TMWA prior to water delivery to the Project.

TRUCKEE MEADOWS WATER
AUTHORITY
Quality. Delivered.

December 12, 2016

Mr. Richard Nevis
5390 Bellazza Ct
Reno, NV 89519

RE: **Golden Mesa North**
Acknowledgement of Water Service
TMWA Work Order 16-5294

Dear Mr. Nevis:

I have reviewed the plans for the above referenced development ("Project") as submitted to the Truckee Meadows Water Authority and have determined the Project is within the Truckee Meadows Water Authority's retail water service area. This letter constitutes an Acknowledgment of Water Service pursuant to NAC 445A.6666, and the Truckee Meadows Water Authority hereby acknowledges that Truckee Meadows Water Authority is agreeable to supplying water service to the Project, subject to applicant satisfying certain conditions precedent, including, without limitation, the dedication of water resources, approval of the water supply plan by the local health authority, the execution of a Water Service Agreement, payment of fees, and the construction and dedication of infrastructure in accordance with our rules and tariffs. This Acknowledgement does not constitute a legal obligation by Truckee Meadows Water Authority to supply water service to the Project, and is made subject to all applicable Truckee Meadows Water Authority Rules.

Review of conceptual site plans or tentative maps by Truckee Meadows Water Authority does not constitute an application for service, nor implies a commitment by Truckee Meadows Water Authority for planning, design or construction of the water facilities necessary for service. The extent of required off-site and on-site water infrastructure improvements will be determined by Truckee Meadows Water Authority upon receiving a specific development proposal or complete application for service and upon review and approval of a water facilities plan by the local health authority. Because the NAC 445A Water System regulations are subject to interpretation, Truckee Meadows Water Authority cannot guarantee that a subsequent water facility plan will be approved by the health authority or that a timely review and approval of the Project will be made. The Applicant should carefully consider the financial risk associated with committing resources to their project prior to receiving all required approvals. After submittal of a complete Application for Service, the required facilities, the cost of these facilities, which could be significant, and associated fees will be estimated and will be included as part of the Water Service Agreement necessary for the Project. All fees must be paid to Truckee Meadows Water Authority prior to water being delivered to the Project.

Please call me at 834-8104 at your convenience if you have any questions.

Sincerely,
Truckee Meadows Water Authority

Brooke Long, P.E.
Senior Engineer

TRAFFIC STUDY

Axion
ENGINEERING
Civil Engineering • Land Development

TRAFFIC IMPACT STUDY

FOR

GOLDEN MESA

June 27, 2016

PREPARED BY:

TRAFFIC WORKS LLC

PROFESSIONAL ENGINEER-STATE OF NEVADA
LOREN
EDWARD
CHILSON
Exp: 12·31·16
CIVIL
No. 15619

6·27·16

TRAFFIC WORKS, LLC
5482 Longley Lane, Suite B, Reno, NV 89511
775.322.4300
www.Traffic-Works.com

YOUR QUESTIONS ANSWERED QUICKLY

Why did you perform this study?

This Traffic Impact Study evaluates the potential traffic impacts associated with construction of the proposed Golden Mesa residential development.

What does the project consist of?

The proposed project consists of up to 158 single-family housing units.

How much traffic will the project generate?

The proposed project is anticipated to generate a total of 1,600 daily trips, 120 AM peak hour trips, and 159 PM peak hour trips.

Are there any traffic impacts?

The Golden Valley Road/North Hills Boulevard intersection and the southbound left-turn movement at the Golden Valley Road/Estates Road intersection currently operate below policy LOS standards (at LOS "E" or "F"). The additional project traffic worsens traffic operations at these locations causing increased delay compared to conditions without the project.

Are any traffic related improvements proposed?

The following two improvements are recommend to mitigate current deficiencies and project impacts:

- Golden Valley Road/N. Hills Boulevard – Optimize traffic signal timings.
- Golden Valley Road/Estates Road – Provide a receiving lane on Golden Valley Road enabling two-stage left-turn movements for southbound left-turning vehicles.

These improvements will accommodate 10-year horizon traffic volumes and the project traffic while maintaining policy LOS standards. No other mitigations are proposed at any other study intersections since the analysis showed the anticipated project traffic does not cause any other significant impacts. The project's contribution of Regional Road Impact Fees will mitigate the minor project effects on the overall roadway network.

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

This report presents the findings of a Traffic Impact Study completed to assess the potential traffic impacts on local intersections associated with construction of the Golden Mesa residential project. This traffic impact study has been prepared to document existing traffic conditions, quantify traffic volumes generated by the proposed project, identify potential impacts, document findings, and make recommendations to mitigate impacts, if any are found.

Study Area and Evaluated Scenarios

The project site is located east of Estates Road and north of Golden Valley Road in Washoe County, NV. The study intersections were identified based on scoping conversations with Washoe County staff. The project site location and the study intersections are shown in **Figure 1**. The following intersections are included in this study:

- Golden Valley Road/North Hills Boulevard
- Golden Valley Road/Estates Road
- Estates Road/Indian Lane
- Estates Road/Access 1
- Estates Road/Access 2
- Indian Lane/Access 3
- Estates Road/Access 4
- Golden Valley Road/Access 5

This study includes analysis of the both the weekday AM and PM peak hours as these are the periods of time in which peak traffic is anticipated to occur. The evaluated development scenarios are:

- Existing Conditions (no project)
- Existing Plus Project Conditions
- 10 year horizon Baseline Conditions (including growth per Washoe County’s travel demand model)
- 10 year horizon Plus Project Conditions

Analysis Methodology

Level of service (LOS) is a term commonly used by transportation practitioners to measure and describe the operational characteristics of intersections, roadway segments, and other facilities. This term equates seconds of delay per vehicle at intersections to letter grades “A” through “F” with “A” representing optimum conditions and “F” representing breakdown or over capacity flows. The complete methodology is established in the Highway Capacity Manual (HCM), 2010, published by the Transportation Research Board. **Table 1** presents the delay thresholds for each level of service grade at un-signalized and signalized intersections.

Table 1: Level of Service Definition for Intersections

Level of Service	Brief Description	Un-signalized Intersections (average delay/vehicle in seconds)	Signalized Intersections (average delay/vehicle in seconds)
A	Free flow conditions.	< 10	< 10
B	Stable conditions with some affect from other vehicles.	10 to 15	10 to 20
C	Stable conditions with significant affect from other vehicles.	15 to 25	20 to 35
D	High density traffic conditions still with stable flow.	25 to 35	35 to 55
E	At or near capacity flows.	35 to 50	55 to 80
F	Over capacity conditions.	> 50	> 80

Source: Highway Capacity Manual (2010), Chapters 16 and 17

Level of service calculations were performed for the study intersections using the Synchro 9 software suite, with analysis and results reported in accordance with HCM 2010 methodology.

Level of Service Policy

The 2035 Regional Transportation Plan (2035 RTP) establishes level of service criteria for regional roadway facilities within Washoe County, the City of Reno, and the City of Sparks. The current Level of Service policy is:

- "All regional roadway facilities projected to carry less than 27,000 ADT at the latest RTP horizon – LOS D or better."
- "All regional roadway facilities projected to carry 27,000 ADT or more at the latest RTP horizon – LOS E or better."
- "All intersections shall be designed to provide a level of service consistent with maintaining the policy level of service of the intersecting roadways".

According to the Nevada Department of Transportation's 2014 Annual Average Daily Traffic (AADT) data and Washoe County RTC's 2035 travel demand model data, the average daily volumes on the study roadways are anticipated to be less than 27,000 ADT. Hence, the level of service threshold specific to the study roadways and intersections is LOS "D".

EXISTING TRANSPORTATION FACILITIES

Roadway Facilities

A brief description of the key roadways in the study area is provided below:

Golden Valley Road within the study area is a four-lane roadway with two lanes in each direction and turn lanes at major intersections. It is classified as a "Medium Access Control Arterial" in the 2035 RTP. The posted speed limit is 40 mph in the study area.

Estates Road and Indian Lane are two-lane roadways with one lane in each direction. They are local roadways not classified in the 2035 RTP.

North Hills Boulevard is a three-lane roadway serving local commercial centers with one lane in each direction and a two-way left turn lane.

Alternate Travel Modes

There are currently sidewalks along the south side of Golden Valley Road throughout the study area. Sidewalks are also present on the north side of Golden Valley Road west of Estates Road, on the north side of North Hills Boulevard, and on the south side of North Hills Boulevard west of Golden Valley Road. Dedicated bike lanes exist in both directions on Golden Valley Road and North Hills Boulevard.

The Regional Transportation Commission (RTC) operates public transit service on Golden Valley Road and North Hills Boulevard (Route 7) as shown in Exhibit 1. While public transit is not operated on roadways immediately adjacent to the project site, Route 7 is within reasonable cycling distance from the project.

Exhibit 1. RTC Transit Routes

EXISTING CONDITIONS

Traffic Volumes

Existing traffic volumes were determined by conducting new video counts at the study intersections. The counts were conducted on an average mid-week day on May 17th, 2016 with schools in session. The existing AM and PM peak hour intersection traffic volumes in **Figure 2,** attached.

Intersection Level of Service

Level of service calculations were performed using the existing traffic volumes, lane configurations, and traffic controls. Current signal timing plans for the Golden Valley Road/North Hills Boulevard intersection was requested and obtained from the City of Reno and was incorporated into the model. The results are presented in **Table 2** and the calculation sheets are provided in **Appendix A**, attached.

Table 2: Existing Conditions Intersection Level of Service Summary

Intersection	Control	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
Golden Valley Rd/North Hills Blvd	Signal	D	46.8	**E**	**60.2**
Golden Valley Rd/Estates Rd	TWSC				
Southbound Approach		C	17.8	B	11.57
Southbound Left		**E**	**47.86**	C	22.03
Southbound Right		B	13.04	B	10.1
Estates Rd/Indian Ln	TWSC				
Westbound Approach		A	9.16	A	9.11
Westbound Left		A	9.2	A	9.11
Westbound Right		A	8.62	A	8.76

As shown in **Table 2**, the Golden Valley Road/North Hills Boulevard intersection is operating at LOS "C" and LOS "E" during the existing AM and PM peak hours respectively. The southbound left-turn movement at the Golden Valley Road/Estates Road intersection is operating at LOS "E" during the AM peak hour. The overall intersection and all other movements at this intersection operate at acceptable levels of service. All movements at the Estates Road/Indian Lane intersection operate at acceptable levels of service during both the AM and PM peak hours.

PROJECT GENERATED TRAFFIC

Project Description

The project site is generally located in the northeast quadrant of the Golden Valley Road/Estates Road intersection as shown in **Figure 1**. The proposed project consists of up to 158 single-family housing units. The site plan is shown in **Figure 3**.

Trip Generation

Trip generation rates for Golden Mesa were obtained from the Trip Generation Manual, 9th Edition, published by the Institute of Transportation Engineers. **Table 3** provides the Daily, AM peak hour, and PM peak hour trip generation calculation details for the proposed project.

Table 3: Trip Generation Estimates

ITE Land Use	Size	Daily	AM Peak			PM Peak		
			Total	In	Out	Total	In	Out
210 - Single-Family Detached Housing	158 Dwelling Units	1,600	120	30	90	159	100	59

As shown in **Table 3**, the proposed project is anticipated to generate up to 1,600 daily trips, 120 AM peak hour trips, and 159 PM peak hour trips.

Project Access

Access to the project site will be provided via multiple access points located on Estates Road, Indian Lane, and Golden Valley Road. All the access points are shown in the site plan in **Figure 3**. The access on Golden Valley Road (Access 5) is proposed as Right-In/Right-Out access only with STOP control on the driveway. All other access points will be full access stop-controlled driveways.

Trip Distribution and Assignment

Traffic generated by the project was distributed to the road network based on the location of the project site, the relative location of major activity centers, and access connection points to roadway network.

The following trip distribution percentages were used for distributing the project traffic:

- 80% to/from the west (accessing US 395)
- 10% to/from the north via North Hills Boulevard
- 10% to/from the east via Golden Valley Road

Project generated trips were assigned to the adjacent roadway system based on the distributions outlined above. The project trip assignment is shown on **Figure 4**, attached.

EXISTING PLUS PROJECT CONDITIONS

Traffic Volumes

Plus project traffic volumes were developed by adding the project generated trips (**Figure 4**) to the existing traffic volumes (**Figure 2**) and are shown on **Figure 5**, attached. The “Plus Project” condition Peak Hour Factors (PHF) and travel patterns were assumed to remain the same as were observed under existing conditions.

Intersection Level of Service Analysis

Table 9 presents the level of service analysis summary for the “Plus Project” scenario assuming the existing intersection configurations. Detailed calculation sheets are provided in **Appendix B**, attached.

As shown in **Table 9**, under the Plus Project conditions, the Golden Valley Road/North Hills Boulevard intersection continues to operate at acceptable LOS during the AM peak hour and continues to operate at LOS “E” during the PM peak hour. It should be noted that this intersection operates at LOS “E” even under existing conditions (without the addition of project traffic).

Table 9: Plus Project Intersection Level of Service Summary

Intersection	Control	AM Peak		PM Peak	
		LOS	**Delay**	**LOS**	**Delay**
Golden Valley Rd/North Hills Blvd	Signal	D	46.79	**E**	**58.36**
Golden Valley Rd/Estates Rd	TWSC				
Southbound Approach		C	22.46	B	13.22
Southbound Left		**F**	**70.8**	D	33.01
Southbound Right		C	15.26	B	10.46
Estates Rd/Indian Ln	TWSC				
Westbound Approach		A	9.84	A	9.7
Westbound Left		A	9.88	A	9.7
Westbound Right		A	8.96	A	9.16
Golden Valley Rd/Access 5	TWSC	B	11.62	A	9.82
Estates Rd/Access 4	TWSC				
Westbound Approach		B	10.39	B	10.34
Westbound Left		B	10.39	B	10.34
Westbound Right		A	8.9	A	9.45
Indian Ln/Access 3	TWSC				
Southbound Approach		A	8.59	A	8.44
Northbound Approach		A	9.17	A	9.15
Estates Rd/Access 2	TWSC				
Westbound Approach		A	9.2	A	9.22
Westbound Left		A	9.22	A	9.22
Westbound Right		A	8.57	A	8.8
Estates Rd/Access 1	TWSC				
Westbound Approach		A	9.01	A	9.02
Westbound Left		A	9.01	A	9.02
Westbound Right		A	8.5	A	8.68

During the AM peak hour, the southbound left-turn movement at the Golden Valley Road/Estates Road intersection deteriorates from LOS “E” under existing conditions to LOS “F” under Plus Project conditions. However, it should be noted that the overall southbound approach operates at LOS “C” during the same peak hour. It should also be noted that during the AM peak hour, the southbound left-turn volume is only 23 vehicles, which equates to less than one vehicle every two minutes. The intersection operates at acceptable LOS during the PM peak hour.

All other study intersections and approaches operate acceptably under Plus Project conditions, during both the AM and PM peak hours.

10-YEAR HORIZON BASELINE CONDITIONS

Traffic Volumes

Traffic volumes in the study area are anticipated to increase in the future as more development occurs in the North Valleys region. Traffic growth rates were obtained from Washoe County RTC's travel demand model. The latest iteration of the travel demand model, which included all the development incorporated in the North Valleys Region Multi-Modal Transportation Study (including this project) was used to determine future growth rates. The growth rates were then applied to the existing AM and PM peak hour traffic volumes to obtain future peak hour traffic volumes. The 10-Year horizon baseline peak hour traffic volumes are shown in **Figure 6**.

Growth rates were calculated based on the traffic volume increases at multiple points along Golden Valley Road. Other roadways in the study area, being minor roads, were not included in the RTC's travel demand model. Hence, a uniform growth rate obtained from the Golden Valley Road volume increase was applied to all the study intersections. The travel demand model outputs are attached in **Appendix C**. The growth rate calculations are shown in **Table 10**.

Table 10: Growth Rate Calculations

Golden Valley Road				
2015	3,800	6,775	9,723	15,509
2025	4,867	7,806	11,459	16,091
Difference	1,067	1,031	1,736	582
10 Years % Change	28%	15%	18%	4%
Annual Growth Rate	2.8%	1.5%	1.8%	0.4%
Adjusted 10 year Growth Factor	1.3	1.2	1.2	1.0
Average Growth Factor	**1.16**			

10-Year Baseline traffic volumes were calculated by applying the growth rate factor of 1.16 from **Table 10** to existing volumes.

Intersection Level of Service Analysis

Table 11 presents the level of service analysis summary for the "10-Year Horizon Baseline" scenario assuming the existing intersection configurations. Detailed calculation sheets are provided in **Appendix D**, attached.

Table 11: 10-Year Horizon Baseline Level of Service Summary

Intersection	Control	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
Golden Valley Rd/N Hills Blvd	Signal	D	49.58	**F**	**88.9**
Golden Valley Rd/Estates Rd	TWSC				
Southbound Approach		C	19.83	B	12.57
Southbound Left		**F**	**59.19**	C	27.56
Southbound Right		B	13.73	B	10.39
Estates Rd/Indian Ln	TWSC				
Westbound Approach		A	9.19	A	9.19
Westbound Left		A	9.23	A	9.19
Westbound Right		A	8.63	A	8.82

As shown in **Table 11**, the Golden Valley Road/North Hills Boulevard intersection and the southbound left-turn movement at the Golden Valley Road/Estates Road intersection operate at LOS "F" in the 10-year background conditions. All other intersections and movements operate at acceptable LOS conditions.

10-YEAR HORIZON PLUS PROJECT CONDITIONS

Traffic Volumes

10 year Horizon Plus Project traffic volumes were developed by adding the project generated trips (**Figure 4**) to the 10-Year Horizon Baseline traffic volumes (**Figure 6**) and are shown on **Figure 7**, attached.

Intersection Level of Service Analysis

Table 12 presents the level of service analysis summary for the "10-Year Horizon Plus Project" scenario. Detailed calculation sheets are provided in **Appendix E**, attached.

As shown in **Table 12**, with the addition of project traffic, the Golden Valley Road/North Hills Boulevard intersection and the southbound left-turn movement at Golden Valley Road/Estates Road intersection operate at LOS "F", with a slight increase in delay compared to 10-year horizon baseline conditions. It should be noted that these two intersections operate at LOS "F" in the 10-Year Horizon Background conditions (without addition of the project traffic). All other intersections and movements operate at acceptable levels of service.

Table 12: 10-Year Horizon Plus Project Intersection Level of Service Summary

Intersection	Control	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
Golden Valley Rd/N Hills Blvd	Signal	D	36.1	**F**	**>100**
Golden Valley Rd/Estates Rd	TWSC				
Southbound Approach		D	25.69	B	14.87
Southbound Left		**F**	**90.49**	**E**	**43.59**
Southbound Right		C	16.13	B	10.89
Estates Rd/Indian Ln	TWSC				
Westbound Approach		A	9.94	A	9.75
Westbound Left		A	9.98	A	9.75
Westbound Right		A	9.02	A	9.2
Golden Valley Rd/Access 5	TWSC	B	11.93	B	10.11
Estates Rd/Access 4	TWSC				
Westbound Approach		B	10.41	B	10.55
Westbound Left		B	10.41	B	10.55
Westbound Right		A	8.89	A	9.57
Indian Ln/Access 3	TWSC				
Southbound Approach		A	8.61	A	8.46
Northbound Approach		A	9.22	A	9.18
Estates Rd/Access 2	TWSC				
Westbound Approach		A	9.26	A	9.25
Westbound Left		A	9.26	A	9.25
Westbound Right		A	8.57	A	8.82
Estates Rd/Access 1	TWSC				
Westbound Approach		A	9.05	A	9.06
Westbound Left		A	9.05	A	9.06
Westbound Right		A	8.51	A	8.71

POTENTIAL MITIGATION MEASURES

Golden Valley Road/North Hills Boulevard

The Golden Valley Road/North Hills Boulevard intersection currently operates at LOS"E" during the PM peak hour even without addition of the project traffic. This intersection would continue to operate at LOS "E" with the addition of project traffic. It operates at LOS "F" during the 10-Year Horizon conditions. Operations at this intersection can be improved by optimizing the traffic signal timings. **Table 13** shows the LOS results with optimized signal timing.

Table 13: Golden Valley Rd/N. Hills Blvd Mitigated LOS Summary

Intersection	Scenario	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
Golden Valley Rd/N Hills Blvd	Existing	D	46.8	E	60.2
	Existing Plus Project	D	46.79	E	58.36
	Existing Plus Prj Mitigated	C	33.36	D	44.67
	10-Year Baseline	D	49.58	F	88.9
	10-Yr Plus Project	D	49.68	F	85.97
	10-Yr Plus Prj Mitigated	C	33.72	E	63.93

As shown in **Table 13**, during the Existing Plus Project PM peak hour conditions, optimizing signal timings would improve the level of service from LOS "E" to LOS "D". During the 10-year plus project conditions, optimizing signal timings would mitigate the project impacts and the intersection would operate at better than 10-year baseline (without the project) conditions. During the AM peak hour, the intersection would operate at acceptable LOS conditions with the project, both under existing and 10-year plus project conditions. Optimizing the signal timings would further improve traffic operations during the AM peak hour. Hence, optimizing the signal timings would mitigate the impacts of the project for both the existing and 10-year horizon conditions.

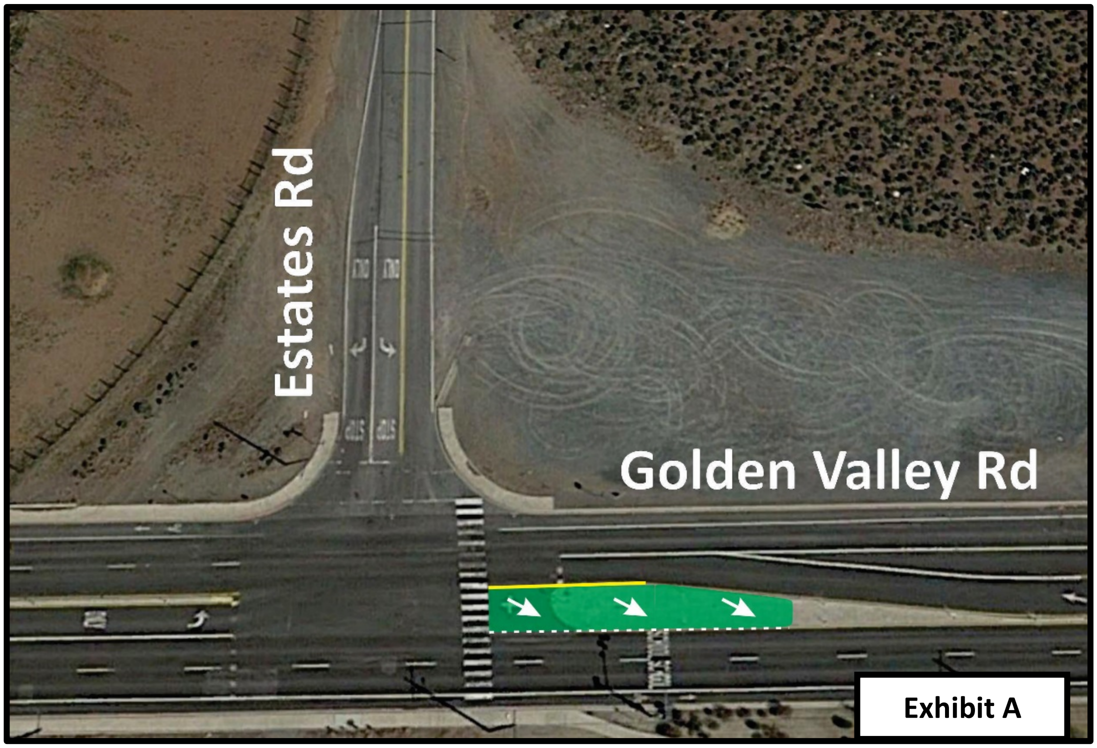
Golden Valley Road/Estates Road

The Golden Valley Road/Estates Road intersection is a two-way stop controlled intersection. The overall intersection LOS at a two-way stop control intersection is defined by the LOS of the worst approach/movement, which is typically a STOP-controlled movement. The southbound left-turn movement at this intersection currently operates at LOS "E" under existing AM peak hour conditions (without any project traffic). With the addition of project traffic, the southbound left-turn movement would deteriorate to LOS "F". All the other movements at this intersection operate at acceptable LOS conditions in the existing PM peak hour conditions (without and with project traffic).

In the 10-year horizon AM peak hour conditions, the southbound left-turn movement is expected to operate at LOS "F" with or without the project. During the 10-year horizon PM peak hour conditions, adding the project traffic would worsen the southbound left-turn level of service to LOS "E" (with project) from LOS "C" (without project). However, it should be noted that the overall southbound approach (combination of southbound left and right turn movements) operates at acceptable LOS conditions during both the existing and 10-year horizon conditions, even with the addition of project traffic.

It is important to recognize that LOS "F" conditions for only the left-turn movement from a side-street, during the peak hour, do not necessarily indicate an intersection failure or need for mitigation. Context of the volumes and intersection location are important in these cases. The subject southbound left-turn volume is only 14 vehicles per hour and there are other locations (i.e. Spearhead Way/Golden Valley Road intersection) where the desired traffic movement can more easily be made. This condition (side-street LOS "F" for a left-turn movement) commonly exists throughout the urban area and is acceptable in most cases so long as the project does not add significant traffic to the LOS "F" movement. Golden Mesa is expected to add about 9 peak hour trips to the southbound left-turn movement which is a small amount.

If mitigation were to be required, to most logical solution would be providing a two-stage left-turn receiving lane for southbound left-turning vehicles as shown in **Exhibit A**.



Providing a storage lane for two-stage left-turns would significantly reduce the delay on the Estates Road approach. **Table 14** summarizes the LOS results. As shown in **Table 14**, with a staging lane in place, all the southbound movements are anticipated to operate at acceptable LOS conditions during both the existing and 10-year horizon plus project conditions.

Table 14: Golden Valley Rd/Estates Rd Mitigated LOS Summary

Intersection		AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
Golden Valley Rd/Estates Rd					
Southbound Approach	Existing	C	17.8	B	11.57
Southbound Left		E	47.86	C	22.03
Southbound Right		B	13.04	B	10.1
Southbound Approach	Existing Plus Project	C	22.46	B	13.22
Southbound Left		F	70.8	D	33.01
Southbound Right		C	15.26	B	10.46
Southbound Approach	Existing Plus Prj Mitigated	C	16.69	B	11.67
Southbound Left		D	26.29	C	20.38
Southbound Right		C	15.26	B	10.46
Southbound Approach	10-Year Baseline	C	19.83	B	12.57
Southbound Left		F	59.19	C	27.56
Southbound Right		B	13.73	B	10.39
Southbound Approach	10-Yr Plus Project	D	25.69	B	14.87
Southbound Left		F	90.49	E	43.59
Southbound Right		C	16.13	B	10.89
Southbound Approach	10-Yr Plus Prj Mitigated	C	17.75	B	12.42
Southbound Left		D	28.76	C	23.48
Southbound Right		C	16.13	B	10.89

CONCLUSIONS & RECOMMENDATIONS

The following is a list of our key findings and recommendations to best manage the traffic generated by the proposed project:

Project Trips: The proposed project is anticipated to generate a total of 1,600 daily trips, 120 AM peak hour trips, and 159 PM peak hour trips.

Project Access: Access to the project site will be provided via multiple access points located on Estates Road, Indian Lane, and Golden Valley Road. The access on Golden Valley Road (Access 5) will be Right-In/Right-Out access only with STOP control on the driveway. All other access points will be full access STOP-controlled driveways.

Existing Level of Service: The Golden Valley Road/North Hills Boulevard intersection operates LOS “F” during the PM peak hour. The southbound left-turn movement at the Golden Valley Road/Estates Road intersection operates at LOS “E” during the AM peak hour. All other movements and intersections operate at acceptable level of service during both the AM and PM peak hours.

Plus Project Level of Service: With the addition of the project traffic, the Golden Valley Road/North Hills Boulevard intersection continues to operate at LOS "F" during the PM peak hour. The southbound left-turn movement at Golden Valley Road/Estates Road intersection would worsen from LOS "E" in existing conditions to LOS "F" during the AM peak hour, with the addition of project traffic. All other intersections and movements operate at acceptable LOS conditions.

10-Year Horizon Baseline Level of Service: 10-Year Horizon Baseline traffic volumes were calculated by applying the growth rates obtained from Washoe County RTC's travel demand model. The Golden Valley Road/North Hills Boulevard intersection and the southbound left-turn movement at the Golden Valley Road/Estates Road intersection operate at LOS "F". All other intersections and movements operate at acceptable LOS conditions.

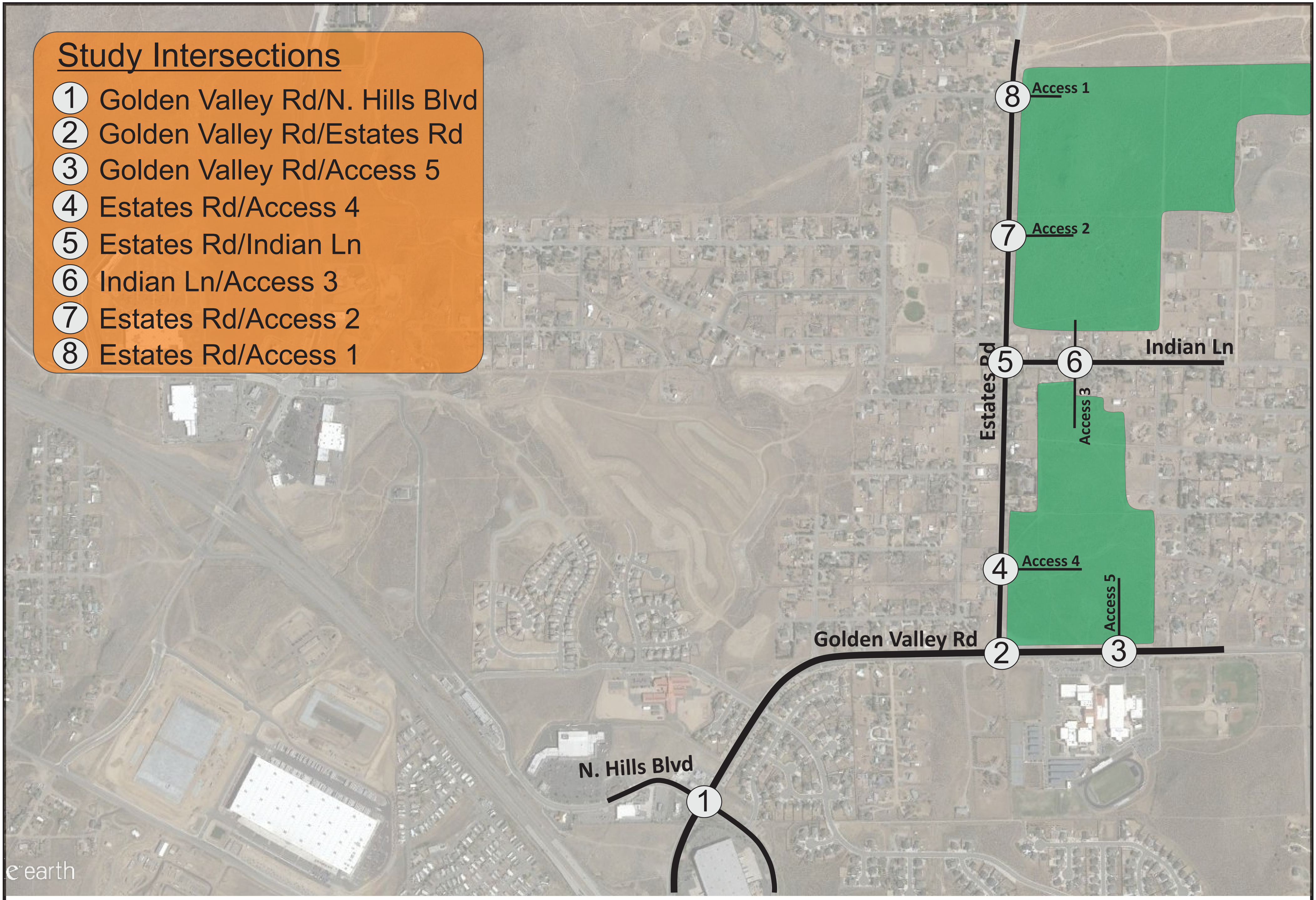
10-Year Horizon Plus Project Level of Service: With the addition of project traffic, the Golden Valley Road/North Hills Boulevard intersection and the southbound left-turn movement at Golden Valley Road/Estates Road intersection will operate at LOS "E/F", with a slight increase in delay compared to 10-year horizon baseline conditions. All other intersections and movements operate at acceptable level of service.

Mitigation Measures: The following improvements are recommend to mitigate the project impacts:

- Golden Valley Road/North Hills Boulevard – Optimize traffic signal timings.
- Golden Valley Road/Estates Road – Consider a two-stage left-turn receiving lane for southbound left-turning vehicles, as shown below

These mitigations can accommodate 10-year horizon traffic volumes while maintaining policy LOS standards. No other mitigations are proposed at any other study intersections since the analysis showed that the anticipated project traffic does not cause any other significant impacts requiring mitigation.

Regional Road Impact Fees: The project's contribution of standard Regional Road Impact Fees in the amount of approximately $609,000 will mitigate any other minor project effects on the overall roadway network.



Study Intersections

1. Golden Valley Rd/N. Hills Blvd
2. Golden Valley Rd/Estates Rd
3. Golden Valley Rd/Access 5
4. Estates Rd/Access 4
5. Estates Rd/Indian Ln
6. Indian Ln/Access 3
7. Estates Rd/Access 2
8. Estates Rd/Access 1

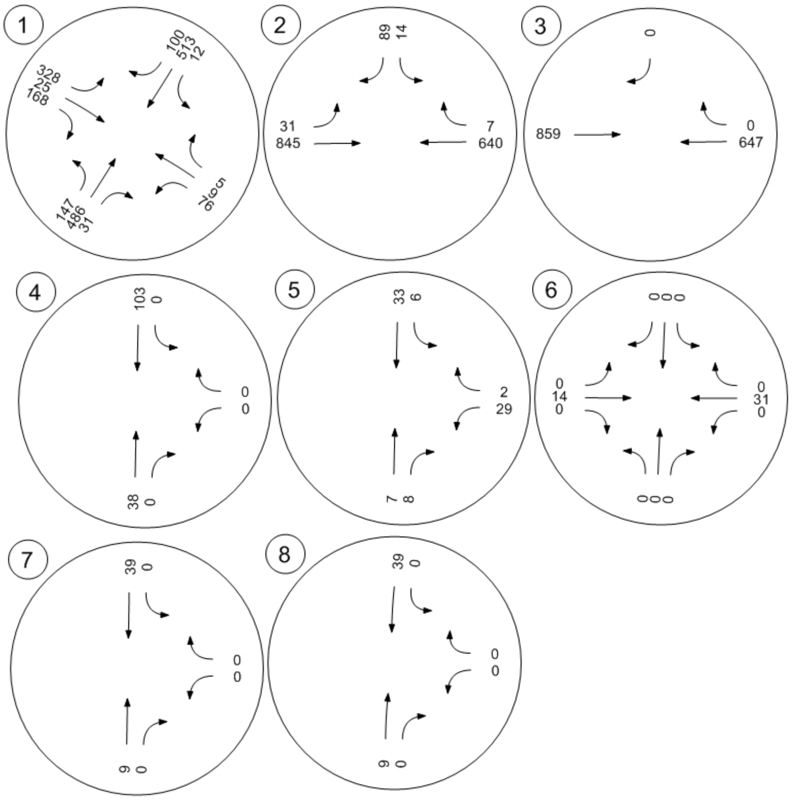
TRAFFIC WORKS LLC

NO SCALE

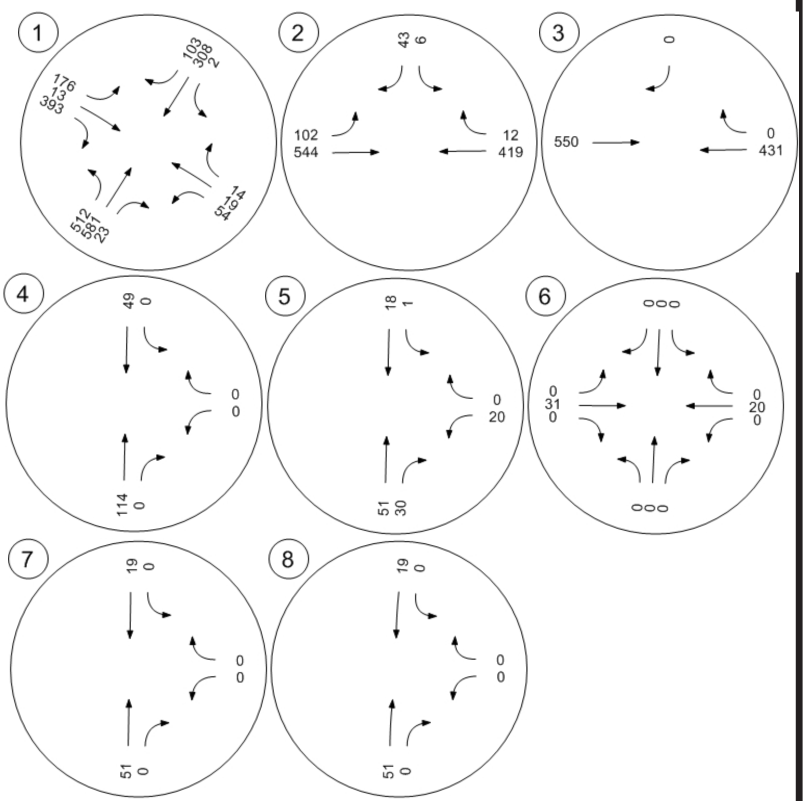
🟩 - **Golden Mesa Project**

Figure 1

Golden Mesa
Traffic Impact Study
Study Area



AM Peak



PM Peak

NO SCALE

Figure 2
Golden Mesa
Traffic Impact Study
Existing Traffic Volumes

TRAFFIC WORKS LLC

N

NO SCALE

Figure 3

Golden Mesa
Traffic Impact Study

Site Plan

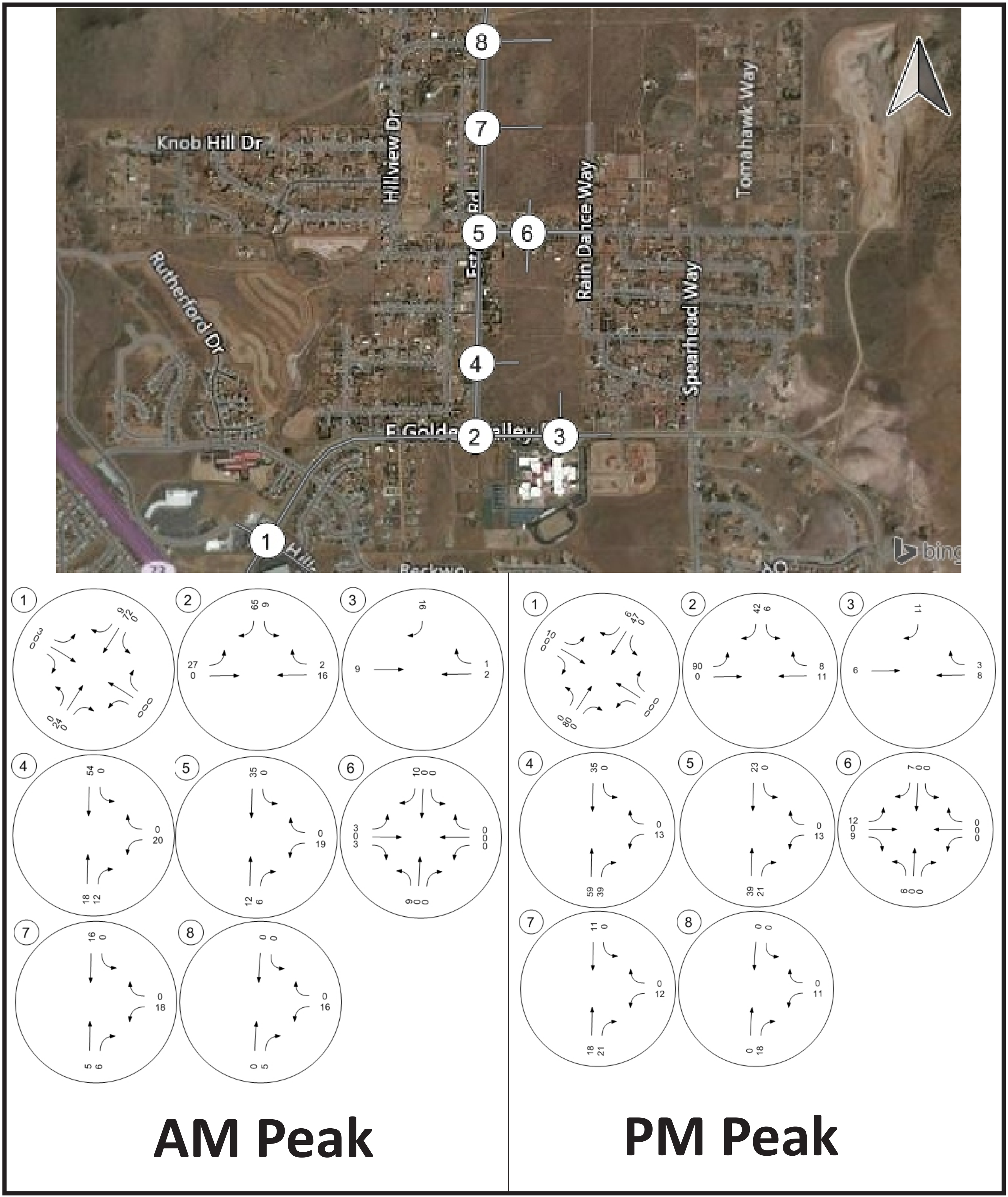


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Figure 4

Golden Mesa
Traffic Impact Study
Trip Assignment

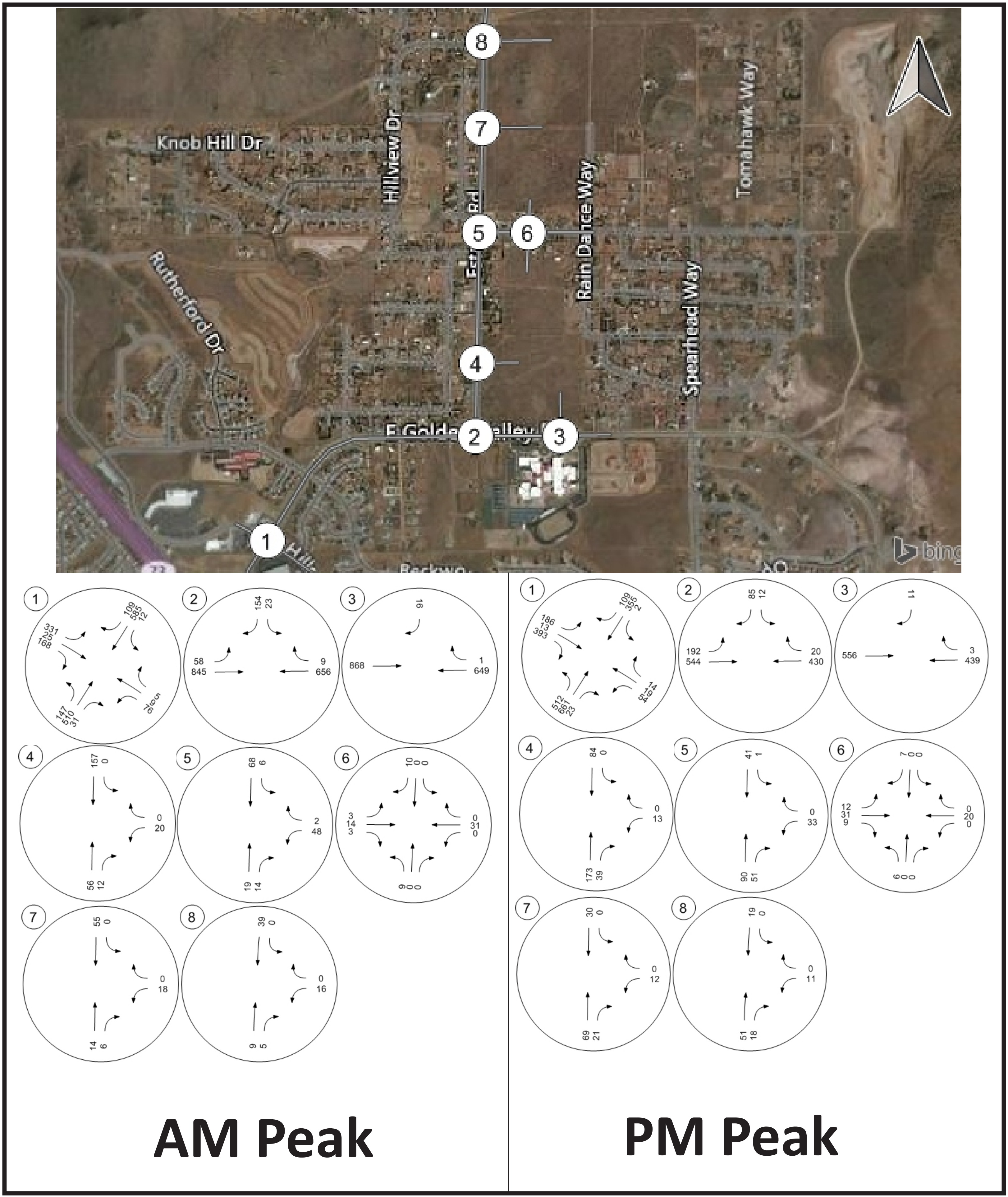

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Figure 5

Golden Mesa
Traffic Impact Study
Plus Project Traffic Volumes

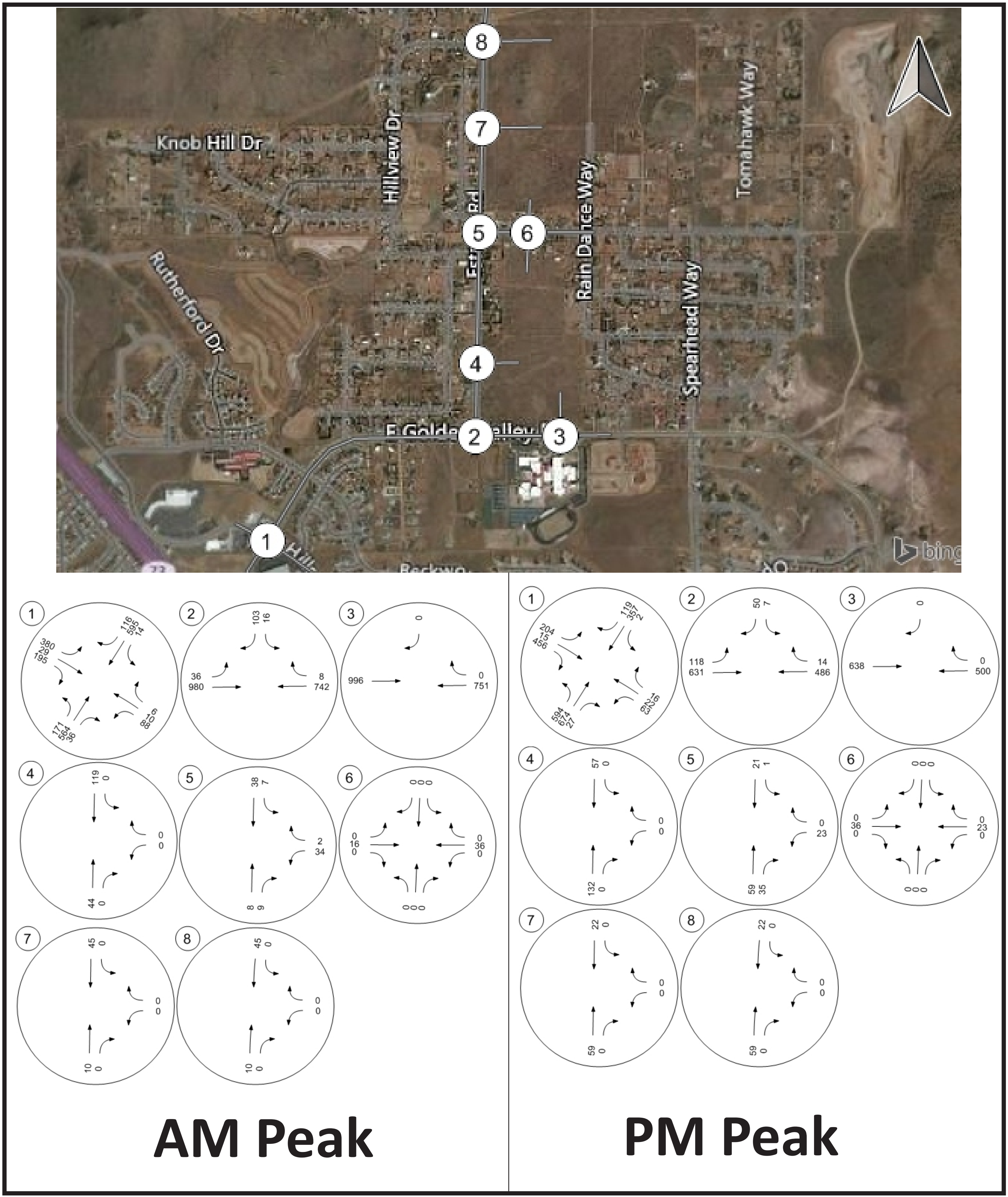

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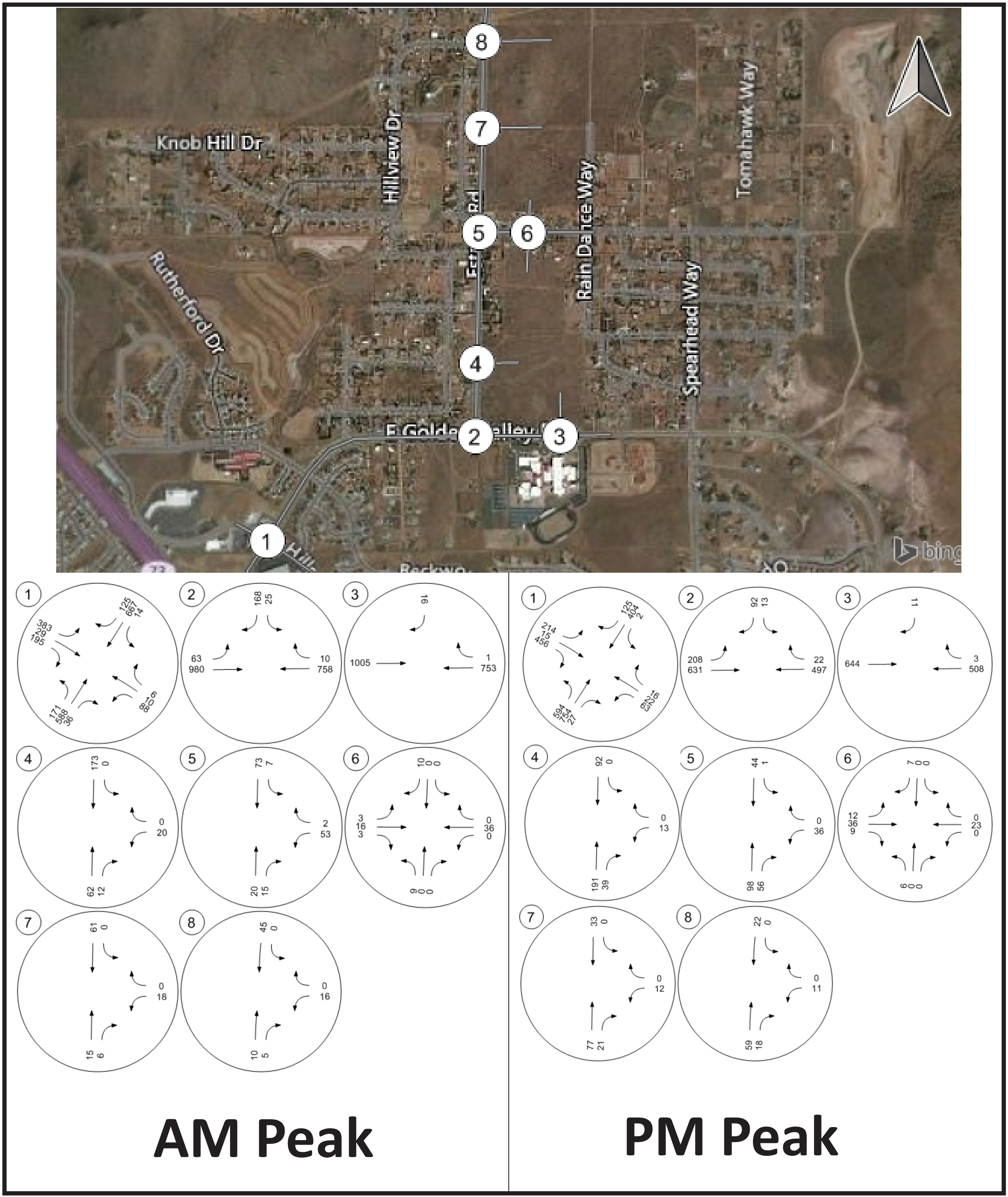
Figure 6

Golden Mesa
Traffic Impact Study

10-Year Horizon Baseline Volumes



AM Peak

PM Peak

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Figure 7

Golden Mesa
Traffic Impact Study
10-Year Horizon Plus Project Volumes

Appendix A

Existing Conditions LOS Calculations

Intersection Level Of Service Report
Intersection 1: Golden Valley Rd/N Hills Blvd

Control Type:	Signalized	Delay (sec / veh):	46.8
Analysis Method:	HCM 2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.678

Intersection Setup

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration	↰ ↑ ↑↱			↰ ↑ ↑↱			↰ ↑↱			↰ ↑↱		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Pocket Length [ft]	150.00	100.00	100.00	100.00	100.00	100.00	150.00	100.00	100.00	125.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Base Volume Input [veh/h]	147	486	31	12	513	100	76	9	5	328	25	168
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	147	486	31	12	513	100	76	9	5	328	25	168
Peak Hour Factor	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	46	152	10	4	160	31	24	3	2	103	8	53
Total Analysis Volume [veh/h]	184	608	39	15	641	125	95	11	6	410	31	210
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	114
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	3	8	0	7	4	0	0	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	5	10	0	0	6	0	0	6	0
Maximum Green [s]	35	35	0	35	35	0	0	30	0	0	30	0
Amber [s]	4.0	4.5	0.0	4.0	4.5	0.0	0.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Split [s]	40	40	0	40	40	0	0	34	0	0	34	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	13	0	0	21	0	0	21	0
l1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.5	3.5	0.0	2.5	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	L	C
L, Total Lost Time per Cycle [s]	4.50	5.50	5.50	4.50	5.50	5.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	3.50	3.50	2.50	3.50	3.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	15	68	68	2	55	55	30	30	30	30
g / C, Green / Cycle	0.13	0.60	0.60	0.02	0.48	0.48	0.26	0.26	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.12	0.19	0.20	0.01	0.23	0.24	0.09	0.01	0.33	0.17
s, saturation flow rate [veh/h]	1597	1676	1641	1597	1676	1583	1021	1578	1251	1453
c, Capacity [veh/h]	213	1000	979	28	806	760	159	408	355	376
d1, Uniform Delay [s]	48.36	11.54	11.54	55.52	20.10	20.12	51.59	31.66	46.07	37.54
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.50	0.18
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.89	0.87	0.89	14.48	2.12	2.25	3.55	0.04	97.04	3.01
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.86	0.33	0.33	0.53	0.49	0.49	0.60	0.04	1.16	0.64
d, Delay for Lane Group [s/veh]	58.25	12.41	12.43	70.00	22.22	22.37	55.15	31.70	143.11	40.55
Lane Group LOS	E	B	B	E	C	C	E	C	F	D
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh]	5.69	4.25	4.17	0.54	7.45	7.08	2.86	0.36	19.78	6.26
50th-Percentile Queue Length [ft]	142.32	106.36	104.31	13.54	186.25	177.01	71.51	8.96	494.53	156.56
95th-Percentile Queue Length [veh]	9.61	7.64	7.51	0.97	11.93	11.44	5.15	0.65	29.36	10.37
95th-Percentile Queue Length [ft]	240.15	190.93	187.75	24.37	298.15	286.10	128.71	16.13	733.97	259.16

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	58.25	12.42	12.43	70.00	22.28	22.37	55.15	31.70	31.70	143.11	40.55	40.55
Movement LOS	E	B	B	E	C	C	E	C	C	F	D	D
d_A, Approach Delay [s/veh]	22.57			23.21			51.59			105.15		
Approach LOS	C			C			D			F		
d_I, Intersection Delay [s/veh]	46.78											
Intersection LOS	D											
Intersection V/C	0.678											

Sequence

Ring 1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
Intersection 2: Golden Valley Rd/Estates Rd

Control Type:	Two-way stop	Delay (sec / veh):	47.9
Analysis Method:	HCM 2010	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.185

Intersection Setup

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↰↱		↰↑↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	1	0	0	0
Pocket Length [ft]	100.00	100.00	180.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

Volumes

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	14	89	31	845	640	7
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	14	89	31	845	640	7
Peak Hour Factor	0.7400	0.7400	0.7400	0.7400	0.7400	0.7400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	30	10	285	216	2
Total Analysis Volume [veh/h]	19	120	42	1142	865	9
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.19	0.21	0.05	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	47.86	13.04	9.96	0.00	0.00	0.00
Movement LOS	E	B	A	A	A	A
95th-Percentile Queue Length [veh]	0.64	0.79	0.17	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	16.05	19.84	4.33	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	17.80		0.35		0.00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	1.32					
Intersection LOS	E					

Intersection Level Of Service Report
Intersection 5: Estates Rd/Indian Ln

Control Type:	Two-way stop	Delay (sec / veh):	9.2
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.051

Intersection Setup

Name	Estates Rd		Estates Rd		Indian Ln	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	↱		↰		↔	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Indian Ln	
Base Volume Input [veh/h]	7	8	6	33	29	2
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	7	8	6	33	29	2
Peak Hour Factor	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	3	2	13	12	1
Total Analysis Volume [veh/h]	11	13	10	52	46	3
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.00	0.05	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.28	0.00	9.20	8.62
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.12	0.12	0.17	0.17
95th-Percentile Queue Length [ft]	0.00	0.00	3.04	3.04	4.24	4.24
d_A, Approach Delay [s/veh]	0.00		1.17		9.16	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3.87					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 1: Golden Valley Rd/N Hills Blvd

Control Type:	Signalized	Delay (sec / veh):	60.2
Analysis Method:	HCM 2010	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.748

Intersection Setup

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Pocket Length [ft]	150.00	100.00	100.00	100.00	100.00	100.00	150.00	100.00	100.00	125.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Base Volume Input [veh/h]	512	581	23	2	308	103	54	19	14	176	13	393
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	512	581	23	2	308	103	54	19	14	176	13	393
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	131	148	6	1	79	26	14	5	4	45	3	100
Total Analysis Volume [veh/h]	522	593	23	2	314	105	55	19	14	180	13	401
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	114
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	3	8	0	7	4	0	0	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	5	10	0	0	6	0	0	6	0
Maximum Green [s]	35	35	0	35	35	0	0	30	0	0	30	0
Amber [s]	4.0	4.5	0.0	4.0	4.5	0.0	0.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Split [s]	40	40	0	40	40	0	0	34	0	0	34	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	13	0	0	21	0	0	21	0
l1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.5	3.5	0.0	2.5	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	L	C
L, Total Lost Time per Cycle [s]	4.50	5.50	5.50	4.50	5.50	5.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	3.50	3.50	2.50	3.50	3.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	36	70	70	0	35	35	30	30	30	30
g / C, Green / Cycle	0.31	0.61	0.61	0.00	0.30	0.30	0.26	0.26	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.33	0.18	0.18	0.00	0.13	0.13	0.06	0.02	0.15	0.29
s, saturation flow rate [veh/h]	1597	1676	1655	1597	1676	1536	871	1560	1233	1432
c, Capacity [veh/h]	497	1023	1009	6	507	465	63	404	341	370
d1, Uniform Delay [s]	39.25	10.63	10.63	56.63	31.82	31.95	57.00	31.99	40.06	42.25
k, delay calibration	0.48	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.12	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	53.47	0.76	0.77	27.18	2.60	2.97	27.85	0.09	1.45	82.47
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.05	0.30	0.30	0.32	0.43	0.44	0.87	0.08	0.53	1.12
d, Delay for Lane Group [s/veh]	92.72	11.39	11.40	83.81	34.41	34.92	84.85	32.08	41.51	124.72
Lane Group LOS	F	B	B	F	C	C	F	C	D	F
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh]	21.05	3.81	3.76	0.10	5.12	4.88	2.07	0.70	4.70	18.78
50th-Percentile Queue Length [ft]	526.18	95.19	94.06	2.61	128.03	122.00	51.81	17.59	117.51	469.44
95th-Percentile Queue Length [veh]	29.49	6.85	6.77	0.19	8.83	8.50	3.73	1.27	8.26	27.58
95th-Percentile Queue Length [ft]	737.24	171.34	169.31	4.70	220.81	212.57	93.25	31.67	206.40	689.60

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	92.72	11.40	11.40	83.81	34.57	34.92	84.85	32.08	32.08	41.51	124.72	124.72
Movement LOS	F	B	B	F	C	C	F	C	C	D	F	F
d_A, Approach Delay [s/veh]	48.70			34.89			65.06			99.50		
Approach LOS	D			C			E			F		
d_I, Intersection Delay [s/veh]	60.21											
Intersection LOS	E											
Intersection V/C	0.748											

Sequence

Ring 1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
Intersection 2: Golden Valley Rd/Estates Rd

Control Type:	Two-way stop	Delay (sec / veh):	22.0
Analysis Method:	HCM 2010	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.032

Intersection Setup

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↰↱		↰↑↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	1	0	0	0
Pocket Length [ft]	100.00	100.00	180.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

Volumes

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	6	43	102	544	419	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	43	102	544	419	12
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	12	28	149	115	3
Total Analysis Volume [veh/h]	7	47	112	598	460	13
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.03	0.06	0.10	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	22.03	10.01	8.70	0.00	0.00	0.00
Movement LOS	C	B	A	A	A	A
95th-Percentile Queue Length [veh]	0.10	0.20	0.34	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	2.47	4.90	8.61	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	11.57		1.37		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	1.29					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 5: Estates Rd/Indian Ln

Control Type:	Two-way stop	Delay (sec / veh):	9.1
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.026

Intersection Setup

Name	Estates Rd		Estates Rd		Indian Ln	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	┣		┫		┳	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Indian Ln	
Base Volume Input [veh/h]	51	30	1	18	20	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	51	30	1	18	20	0
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	9	0	5	6	0
Total Analysis Volume [veh/h]	59	35	1	21	23	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.03	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.40	0.00	9.11	8.76
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.04	0.04	0.08	0.08
95th-Percentile Queue Length [ft]	0.00	0.00	1.12	1.12	1.97	1.97
d_A, Approach Delay [s/veh]	0.00		0.34		9.11	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.56					
Intersection LOS	A					

Appendix B

Plus Project Conditions LOS Calculations

Intersection Level Of Service Report
Intersection 1: Golden Valley Rd/N Hills Blvd

Control Type:	Signalized	Delay (sec / veh):	46.8
Analysis Method:	HCM 2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.712

Intersection Setup

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration	↰ ↑ ↑↱			↰ ↑ ↑↱			↰ ↑↱			↰ ↑↱		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Pocket Length [ft]	150.00	100.00	100.00	100.00	100.00	100.00	150.00	100.00	100.00	125.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Base Volume Input [veh/h]	147	486	31	12	513	100	76	9	5	328	25	168
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	24	0	0	72	9	0	0	0	3	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	147	510	31	12	585	109	76	9	5	331	25	168
Peak Hour Factor	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	46	159	10	4	183	34	24	3	2	103	8	53
Total Analysis Volume [veh/h]	184	638	39	15	731	136	95	11	6	414	31	210
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	114
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	3	8	0	7	4	0	0	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	5	10	0	0	6	0	0	6	0
Maximum Green [s]	35	35	0	35	35	0	0	30	0	0	30	0
Amber [s]	4.0	4.5	0.0	4.0	4.5	0.0	0.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Split [s]	40	40	0	40	40	0	0	34	0	0	34	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	13	0	0	21	0	0	21	0
l1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.5	3.5	0.0	2.5	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	L	C
L, Total Lost Time per Cycle [s]	4.50	5.50	5.50	4.50	5.50	5.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	3.50	3.50	2.50	3.50	3.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	15	68	68	2	55	55	30	30	30	30
g / C, Green / Cycle	0.13	0.60	0.60	0.02	0.48	0.48	0.26	0.26	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.12	0.20	0.20	0.01	0.27	0.27	0.09	0.01	0.33	0.17
s, saturation flow rate [veh/h]	1597	1676	1643	1597	1676	1586	1021	1578	1251	1453
c, Capacity [veh/h]	213	1000	980	28	806	762	159	408	355	376
d1, Uniform Delay [s]	48.36	11.67	11.67	55.52	20.95	20.95	51.59	31.66	46.07	37.54
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.50	0.18
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.89	0.93	0.95	14.48	2.73	2.88	3.55	0.04	101.24	3.01
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.86	0.34	0.34	0.53	0.55	0.55	0.60	0.04	1.17	0.64
d, Delay for Lane Group [s/veh]	58.25	12.60	12.62	70.00	23.68	23.84	55.15	31.70	147.31	40.55
Lane Group LOS	E	B	B	E	C	C	E	C	F	D
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh]	5.69	4.50	4.42	0.54	8.84	8.40	2.86	0.36	20.20	6.26
50th-Percentile Queue Length [ft]	142.32	112.57	110.48	13.54	220.92	209.97	71.51	8.96	504.88	156.56
95th-Percentile Queue Length [veh]	9.61	7.98	7.87	0.97	13.71	13.15	5.15	0.65	30.04	10.37
95th-Percentile Queue Length [ft]	240.15	199.58	196.66	24.37	342.80	328.79	128.71	16.13	750.98	259.16

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	58.25	12.61	12.62	70.00	23.74	23.84	55.15	31.70	31.70	147.31	40.55	40.55
Movement LOS	E	B	B	E	C	C	E	C	C	F	D	D
d_A, Approach Delay [s/veh]	22.37			24.54			51.59			108.03		
Approach LOS	C			C			D			F		
d_I, Intersection Delay [s/veh]	46.79											
Intersection LOS	D											
Intersection V/C	0.712											

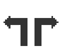
Sequence

Ring 1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
Intersection 2: Golden Valley Rd/Estates Rd

Control Type:	Two-way stop	Delay (sec / veh):	70.8
Analysis Method:	HCM 2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.368

Intersection Setup

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	1	0	0	0
Pocket Length [ft]	100.00	100.00	180.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

Volumes

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	14	89	31	845	640	7
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	9	65	27	0	16	2
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	23	154	58	845	656	9
Peak Hour Factor	0.7400	0.7400	0.7400	0.7400	0.7400	0.7400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	52	20	285	222	3
Total Analysis Volume [veh/h]	31	208	78	1142	886	12
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.37	0.37	0.10	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	70.80	15.26	10.34	0.00	0.00	0.00
Movement LOS	F	C	B	A	A	A
95th-Percentile Queue Length [veh]	1.44	1.72	0.35	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	35.94	42.97	8.65	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	22.46		0.66		0.00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	2.62					
Intersection LOS	F					

Intersection Level Of Service Report

Intersection 3: Golden Valley Rd/Access 5

Control Type:	Two-way stop	Delay (sec / veh):	11.6
Analysis Method:	HCM 2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.039

Intersection Setup

Name	Access 5		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↱		↑↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Access 5		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	0	0	0	859	647	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	16	0	9	2	1
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	16	0	868	649	1
Peak Hour Factor	1.0000	0.7400	1.0000	0.7400	0.7400	0.7400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	5	0	293	219	0
Total Analysis Volume [veh/h]	0	22	0	1173	877	1
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.04	0.00	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	11.62	0.00	0.00	0.00	0.00
Movement LOS		B		A	A	A
95th-Percentile Queue Length [veh]	0.00	0.12	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	3.03	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	11.62		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.12					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 4: Estates Rd/Access 4

Control Type:	Two-way stop	Delay (sec / veh):	10.4
Analysis Method:	HCM 2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.039

Intersection Setup

Name	Estates Rd		Estates Rd		Access 4	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access 4	
Base Volume Input [veh/h]	38	0	0	103	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	18	12	0	54	20	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	56	12	0	157	20	0
Peak Hour Factor	0.7400	0.7400	0.7400	0.7400	0.7400	0.7400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	4	0	53	7	0
Total Analysis Volume [veh/h]	76	16	0	212	27	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.04	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.40	0.00	10.39	8.90
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.12	0.12
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	3.03	3.03
d_A, Approach Delay [s/veh]	0.00		0.00		10.39	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.85					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 5: Estates Rd/Indian Ln

Control Type:	Two-way stop	Delay (sec / veh):	9.9
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.093

Intersection Setup

Name	Estates Rd		Estates Rd		Indian Ln	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	↑↱		↰↑		↰↱	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Indian Ln	
Base Volume Input [veh/h]	7	8	6	33	29	2
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	12	6	0	35	19	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	19	14	6	68	48	2
Peak Hour Factor	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	6	2	27	19	1
Total Analysis Volume [veh/h]	30	22	10	108	76	3
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.00	0.09	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.33	0.00	9.88	8.96
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.25	0.25	0.32	0.32
95th-Percentile Queue Length [ft]	0.00	0.00	6.15	6.15	7.95	7.95
d_A, Approach Delay [s/veh]	0.00		0.62		9.84	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3.42					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 6: Indian Ln/Access 3

Control Type:	Two-way stop	Delay (sec / veh):	9.5
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name	Access 3			Access 3			Indian Ln			Indian Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	✛			✛			✛			✛		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Access 3			Access 3			Indian Ln			Indian Ln		
Base Volume Input [veh/h]	0	0	0	0	0	0	0	14	0	0	31	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	9	0	0	0	0	10	3	0	3	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	0	0	0	0	10	3	14	3	0	31	0
Peak Hour Factor	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	0	0	0	0	4	1	6	1	0	12	0
Total Analysis Volume [veh/h]	14	0	0	0	0	16	5	22	5	0	49	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.17	9.54	8.49	9.05	9.55	8.59	7.32	0.00	0.00	7.27	0.00	0.00
Movement LOS	A	A	A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	1.22	1.22	1.22	1.20	1.20	1.20	1.57	1.57	1.57	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.17			8.59			1.14			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.72											
Intersection LOS	A											

Intersection Level Of Service Report

Intersection 7: Estates Rd/Access 2

Control Type:	Two-way stop	Delay (sec / veh):	9.2
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.033

Intersection Setup

Name	Estates Rd		Estates Rd		Access 2	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	├		┤		┬	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access 2	
Base Volume Input [veh/h]	9	0	0	39	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	6	0	16	18	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	14	6	0	55	18	0
Peak Hour Factor	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	2	0	22	7	0
Total Analysis Volume [veh/h]	22	10	0	87	29	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.03	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.28	0.00	9.22	8.57
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.10	0.10
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	2.55	2.55
d_A, Approach Delay [s/veh]	0.00		0.00		9.22	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.81					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 8: Estates Road/Access 1

Control Type:	Two-way stop	Delay (sec / veh):	9.0
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.027

Intersection Setup

Name	Estates Rd		Estates Rd		Access1	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	┣		┫		┳	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access1	
Base Volume Input [veh/h]	9	0	0	39	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	0	0	16	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	5	0	39	16	0
Peak Hour Factor	0.6300	0.6300	0.6300	0.6300	0.6300	0.6300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	2	0	15	6	0
Total Analysis Volume [veh/h]	14	8	0	62	25	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.03	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.26	0.00	9.01	8.50
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.08	0.08
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	2.09	2.09
d_A, Approach Delay [s/veh]	0.00		0.00		9.01	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.07					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 1: Golden Valley Rd/N Hills Blvd

Control Type:	Signalized	Delay (sec / veh):	58.4
Analysis Method:	HCM 2010	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.765

Intersection Setup

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration	↰ ↑ ↱			↰ ↑ ↱			↰ ↱			↰ ↱		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Pocket Length [ft]	150.00	100.00	100.00	100.00	100.00	100.00	150.00	100.00	100.00	125.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Base Volume Input [veh/h]	512	581	23	2	308	103	54	19	14	176	13	393
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	80	0	0	47	6	0	0	0	10	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	512	661	23	2	355	109	54	19	14	186	13	393
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	131	169	6	1	91	28	14	5	4	47	3	100
Total Analysis Volume [veh/h]	522	674	23	2	362	111	55	19	14	190	13	401
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	114
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	3	8	0	7	4	0	0	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	5	10	0	0	6	0	0	6	0
Maximum Green [s]	35	35	0	35	35	0	0	30	0	0	30	0
Amber [s]	4.0	4.5	0.0	4.0	4.5	0.0	0.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Split [s]	40	40	0	40	40	0	0	34	0	0	34	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	13	0	0	21	0	0	21	0
l1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.5	3.5	0.0	2.5	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	L	C
L, Total Lost Time per Cycle [s]	4.50	5.50	5.50	4.50	5.50	5.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	3.50	3.50	2.50	3.50	3.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	36	70	70	0	35	35	30	30	30	30
g / C, Green / Cycle	0.31	0.61	0.61	0.00	0.30	0.30	0.26	0.26	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.33	0.21	0.21	0.00	0.15	0.15	0.06	0.02	0.15	0.29
s, saturation flow rate [veh/h]	1597	1676	1657	1597	1676	1545	871	1560	1233	1432
c, Capacity [veh/h]	497	1023	1011	6	507	467	63	404	341	370
d1, Uniform Delay [s]	39.25	10.95	10.95	56.63	32.44	32.55	57.00	31.99	40.45	42.25
k, delay calibration	0.48	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.15	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	53.47	0.91	0.93	27.18	3.24	3.65	27.85	0.09	1.93	82.47
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.05	0.34	0.34	0.32	0.48	0.49	0.87	0.08	0.56	1.12
d, Delay for Lane Group [s/veh]	92.72	11.87	11.88	83.81	35.67	36.20	84.85	32.08	42.37	124.72
Lane Group LOS	F	B	B	F	D	D	F	C	D	F
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh]	21.05	4.44	4.40	0.10	5.93	5.64	2.07	0.70	5.05	18.78
50th-Percentile Queue Length [ft]	526.18	111.06	109.96	2.61	148.28	141.07	51.81	17.59	126.13	469.44
95th-Percentile Queue Length [veh]	29.49	7.90	7.84	0.19	9.93	9.54	3.73	1.27	8.73	27.58
95th-Percentile Queue Length [ft]	737.24	197.48	195.94	4.70	248.14	238.47	93.25	31.67	218.22	689.60

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	92.72	11.87	11.88	83.81	35.84	36.20	84.85	32.08	32.08	42.37	124.72	124.72
Movement LOS	F	B	B	F	D	D	F	C	C	D	F	F
d_A, Approach Delay [s/veh]	46.49			36.13			65.06			98.81		
Approach LOS	D			D			E			F		
d_I, Intersection Delay [s/veh]	58.36											
Intersection LOS	E											
Intersection V/C	0.765											

Sequence

Ring 1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report

Intersection 2: Golden Valley Rd/Estates Rd

Control Type:	Two-way stop	Delay (sec / veh):	33.0
Analysis Method:	HCM 2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.092

Intersection Setup

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↰↱		↰↑↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	1	0	0	0
Pocket Length [ft]	100.00	100.00	180.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

Volumes

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	6	43	102	544	419	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	6	42	90	0	11	8
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	12	85	192	544	430	20
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	23	53	149	118	5
Total Analysis Volume [veh/h]	13	93	211	598	473	22
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.09	0.12	0.20	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	33.01	10.46	9.21	0.00	0.00	0.00
Movement LOS	D	B	A	A	A	A
95th-Percentile Queue Length [veh]	0.30	0.42	0.74	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	7.45	10.52	18.40	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	13.22		2.40		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	2.37					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 3: Golden Valley Rd/Access 5

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.016

Intersection Setup

Name	Access 5		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↱		↑↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Access 5		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	0	0	0	550	431	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	11	0	6	8	3
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	11	0	556	439	3
Peak Hour Factor	1.0000	0.9100	1.0000	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	3	0	153	121	1
Total Analysis Volume [veh/h]	0	12	0	611	482	3
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.02	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	9.82	0.00	0.00	0.00	0.00
Movement LOS		A		A	A	A
95th-Percentile Queue Length [veh]	0.00	0.05	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	1.21	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.82		0.00		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.11					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 4: Estates Rd/Access 4

Control Type:	Two-way stop	Delay (sec / veh):	10.3
Analysis Method:	HCM 2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.020

Intersection Setup

Name	Estates Rd		Estates Rd		Access 4	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	├		┤		┬	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access 4	
Base Volume Input [veh/h]	114	0	0	49	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	59	39	0	35	13	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	173	39	0	84	13	0
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	48	11	0	23	4	0
Total Analysis Volume [veh/h]	190	43	0	92	14	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.02	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.70	0.00	10.34	9.45
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.06	0.06
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	1.56	1.56
d_A, Approach Delay [s/veh]	0.00		0.00		10.34	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.43					
Intersection LOS	B					

Intersection Level Of Service Report

Intersection 5: Estates Rd/Indian Ln

Control Type:	Two-way stop	Delay (sec / veh):	9.7
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.047

Intersection Setup

Name	Estates Rd		Estates Rd		Indian Ln	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	⊢		⊣		⊤	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Indian Ln	
Base Volume Input [veh/h]	51	30	1	18	20	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	39	21	0	23	13	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	90	51	1	41	33	0
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	15	0	12	10	0
Total Analysis Volume [veh/h]	105	59	1	48	38	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.05	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.55	0.00	9.70	9.16
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.11	0.11	0.15	0.15
95th-Percentile Queue Length [ft]	0.00	0.00	2.69	2.69	3.71	3.71
d_A, Approach Delay [s/veh]	0.00		0.15		9.70	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.50					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 6: Indian Ln/Access 3

Control Type:	Two-way stop	Delay (sec / veh):	9.6
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name	Access 3			Access 3			Indian Ln			Indian Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	✛			✛			✛			✛		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Access 3			Access 3			Indian Ln			Indian Ln		
Base Volume Input [veh/h]	0	0	0	0	0	0	0	31	0	0	20	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	6	0	0	0	0	7	12	0	9	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	0	0	0	0	7	12	31	9	0	20	0
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	0	0	0	2	3	9	3	0	6	0
Total Analysis Volume [veh/h]	7	0	0	0	0	8	14	36	10	0	23	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.15	9.59	8.53	9.09	9.61	8.44	7.28	0.00	0.00	7.31	0.00	0.00
Movement LOS	A	A	A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.02	0.02	0.02	0.02	0.02	0.02	0.12	0.12	0.12	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.61	0.61	0.61	0.57	0.57	0.57	2.94	2.94	2.94	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.15			8.44			1.70			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.38											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 7: Estates Rd/Access 2

Control Type:	Two-way stop	Delay (sec / veh):	9.2
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.016

Intersection Setup

Name	Estates Rd		Estates Rd		Access 2	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	↱		↰		↔	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access 2	
Base Volume Input [veh/h]	51	0	0	19	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	18	21	0	11	12	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	69	21	0	30	12	0
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	20	6	0	9	3	0
Total Analysis Volume [veh/h]	80	24	0	35	14	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.02	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.42	0.00	9.22	8.80
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.05	0.05
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	1.23	1.23
d_A, Approach Delay [s/veh]	0.00		0.00		9.22	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.84					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 8: Estates Road/Access 1

Control Type:	Two-way stop	Delay (sec / veh):	9.0
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.014

Intersection Setup

Name	Estates Rd		Estates Rd		Access1	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	┣		┫		┳	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access1	
Base Volume Input [veh/h]	51	0	0	19	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	18	0	0	11	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	51	18	0	19	11	0
Peak Hour Factor	0.8600	0.8600	0.8600	0.8600	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	5	0	6	3	0
Total Analysis Volume [veh/h]	59	21	0	22	13	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

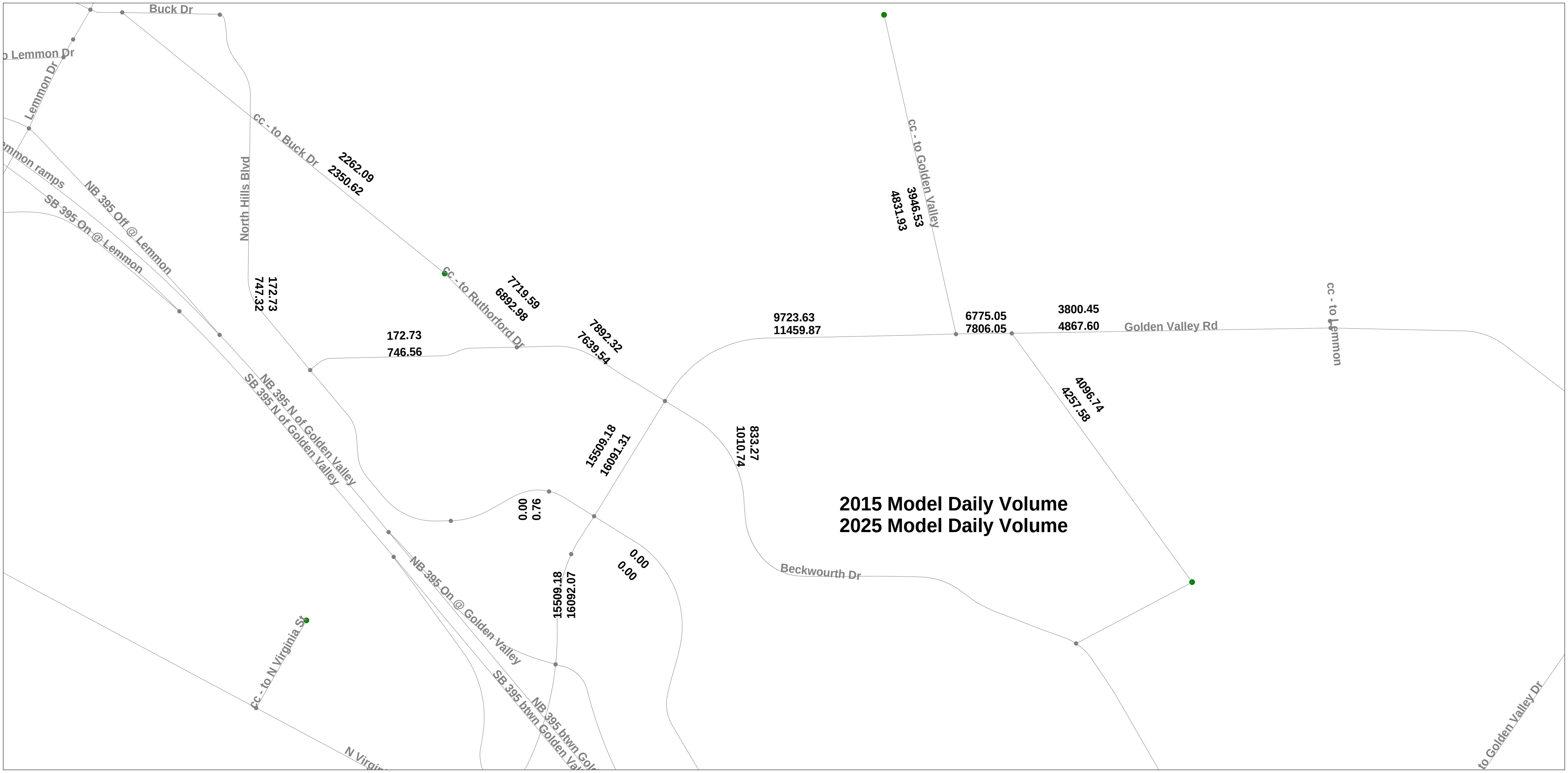
Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.37	0.00	9.02	8.68
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.04	0.04
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	1.09	1.09
d_A, Approach Delay [s/veh]	0.00		0.00		9.02	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.02					
Intersection LOS	A					

Appendix C

Demand Model Outputs


Buck Dr
o Lemmon Dr
Lemmon Dr
mmon ramps
NB 395 Off @ Lemmon
SB 395 On @ Lemmon
North Hills Blvd
cc - to Buck Dr
2262.09
2350.62
cc - to Golden Valley
3946.53
4831.93
172.73
747.32
cc - to Ruthorford Dr
7719.59
6892.98
172.73
746.56
7892.32
7639.54
9723.63
11459.87
6775.05
7806.05
3800.45
4867.60
Golden Valley Rd
cc - to Lemmon
4096.74
4257.58
NB 395 N of Golden Valley
SB 395 N of Golden Valley
15509.18
16091.31
833.27
1010.74
0.00
0.76
0.00
0.00
2015 Model Daily Volume
2025 Model Daily Volume
Beckwourth Dr
15509.18
16092.07
cc - to N Virginia St
NB 395 On @ Golden Valley
SB 395 btwn Golden Val
NB 395 btwn Gold
N Virgini
to Golden Valley Dr

Appendix D

10-Year Horizon Baseline Conditions LOS Calculations

Intersection Level Of Service Report
Intersection 1: Golden Valley Rd/N Hills Blvd

Control Type:	Signalized	Delay (sec / veh):	49.6
Analysis Method:	HCM 2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.699

Intersection Setup

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration	↰ ↑ ↑↱			↰ ↑ ↑↱			↰ ↑↱			↰ ↑↱		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Pocket Length [ft]	150.00	100.00	100.00	100.00	100.00	100.00	150.00	100.00	100.00	125.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Base Volume Input [veh/h]	147	486	31	12	513	100	76	9	5	328	25	168
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	171	564	36	14	595	116	88	10	6	380	29	195
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	48	157	10	4	165	32	24	3	2	106	8	54
Total Analysis Volume [veh/h]	190	627	40	16	661	129	98	11	7	422	32	217
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	114
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	3	8	0	7	4	0	0	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	5	10	0	0	6	0	0	6	0
Maximum Green [s]	35	35	0	35	35	0	0	30	0	0	30	0
Amber [s]	4.0	4.5	0.0	4.0	4.5	0.0	0.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Split [s]	40	40	0	40	40	0	0	34	0	0	34	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	13	0	0	21	0	0	21	0
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.5	3.5	0.0	2.5	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	L	C
L, Total Lost Time per Cycle [s]	4.50	5.50	5.50	4.50	5.50	5.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	3.50	3.50	2.50	3.50	3.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	16	68	68	2	54	54	30	30	30	30
g / C, Green / Cycle	0.14	0.60	0.60	0.02	0.48	0.48	0.26	0.26	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.12	0.20	0.20	0.01	0.24	0.24	0.10	0.01	0.34	0.17
s, saturation flow rate [veh/h]	1597	1676	1641	1597	1676	1583	1014	1569	1250	1453
c, Capacity [veh/h]	219	998	977	30	799	754	152	406	354	376
d1, Uniform Delay [s]	48.14	11.68	11.68	55.46	20.60	20.61	52.43	31.68	46.11	37.79
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.50	0.19
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.87	0.92	0.94	14.35	2.30	2.45	4.47	0.04	111.05	3.57
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.87	0.34	0.34	0.54	0.51	0.51	0.64	0.04	1.19	0.66
d, Delay for Lane Group [s/veh]	58.01	12.59	12.61	69.81	22.90	23.06	56.90	31.72	157.16	41.36
Lane Group LOS	E	B	B	E	C	C	E	C	F	D
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh]	5.87	4.43	4.35	0.57	7.84	7.45	3.01	0.38	21.11	6.56
50th-Percentile Queue Length [ft]	146.78	110.82	108.67	14.36	196.09	186.24	75.24	9.50	527.68	163.99
95th-Percentile Queue Length [veh]	9.84	7.89	7.77	1.03	12.44	11.93	5.42	0.68	31.56	10.76
95th-Percentile Queue Length [ft]	246.12	197.14	194.16	25.84	310.92	298.15	135.43	17.10	788.88	268.99

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	58.01	12.60	12.61	69.81	22.96	23.06	56.90	31.72	31.72	157.16	41.36	41.36
Movement LOS	E	B	B	E	C	C	E	C	C	F	D	D
d_A, Approach Delay [s/veh]	22.67			23.91			53.00			114.19		
Approach LOS	C			C			D			F		
d_I, Intersection Delay [s/veh]	49.58											
Intersection LOS	D											
Intersection V/C	0.699											

Sequence

Ring 1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
Intersection 2: Golden Valley Rd/Estates Rd

Control Type:	Two-way stop	Delay (sec / veh):	59.2
Analysis Method:	HCM 2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.233

Intersection Setup

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↰↱		↰↑↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	1	0	0	0
Pocket Length [ft]	100.00	100.00	180.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

Volumes

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	14	89	31	845	640	7
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	16	103	36	980	742	8
Peak Hour Factor	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	32	11	306	232	3
Total Analysis Volume [veh/h]	20	129	45	1225	928	10
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.23	0.24	0.06	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	59.19	13.73	10.28	0.00	0.00	0.00
Movement LOS	F	B	B	A	A	A
95th-Percentile Queue Length [veh]	0.83	0.92	0.20	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	20.68	23.08	4.94	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	19.83		0.36		0.00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	1.45					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 5: Estates Rd/Indian Ln

Control Type:	Two-way stop	Delay (sec / veh):	9.2
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.054

Intersection Setup

Name	Estates Rd		Estates Rd		Indian Ln	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	├		┤		┬	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Indian Ln	
Base Volume Input [veh/h]	7	8	6	33	29	2
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	8	9	7	38	34	2
Peak Hour Factor	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	3	3	14	12	1
Total Analysis Volume [veh/h]	11	13	10	54	49	3
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.00	0.05	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.28	0.00	9.23	8.63
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.13	0.13	0.18	0.18
95th-Percentile Queue Length [ft]	0.00	0.00	3.14	3.14	4.53	4.53
d_A, Approach Delay [s/veh]	0.00		1.14		9.19	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3.93					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 1: Golden Valley Rd/N Hills Blvd

Control Type:	Signalized	Delay (sec / veh):	88.9
Analysis Method:	HCM 2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.867

Intersection Setup

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration	↰ ↑ ↑↱			↰ ↑ ↑↱			↰ ↑↱			↰ ↑↱		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Pocket Length [ft]	150.00	100.00	100.00	100.00	100.00	100.00	150.00	100.00	100.00	125.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Base Volume Input [veh/h]	512	581	23	2	308	103	54	19	14	176	13	393
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	594	674	27	2	357	119	63	22	16	204	15	456
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	152	172	7	1	91	30	16	6	4	52	4	116
Total Analysis Volume [veh/h]	606	688	28	2	364	121	64	22	16	208	15	465
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	114
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	3	8	0	7	4	0	0	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	5	10	0	0	6	0	0	6	0
Maximum Green [s]	35	35	0	35	35	0	0	30	0	0	30	0
Amber [s]	4.0	4.5	0.0	4.0	4.5	0.0	0.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Split [s]	40	40	0	40	40	0	0	34	0	0	34	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	13	0	0	21	0	0	21	0
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.5	3.5	0.0	2.5	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	L	C
L, Total Lost Time per Cycle [s]	4.50	5.50	5.50	4.50	5.50	5.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	3.50	3.50	2.50	3.50	3.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	36	70	70	0	35	35	30	30	30	30
g / C, Green / Cycle	0.31	0.61	0.61	0.00	0.30	0.30	0.26	0.26	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.38	0.21	0.22	0.00	0.15	0.15	0.08	0.02	0.17	0.34
s, saturation flow rate [veh/h]	1597	1676	1654	1597	1676	1537	820	1561	1228	1432
c, Capacity [veh/h]	497	1023	1009	6	507	465	63	404	337	370
d1, Uniform Delay [s]	39.25	11.03	11.04	56.63	32.59	32.71	57.00	32.10	41.46	42.25
k, delay calibration	0.50	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.19	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	115.64	0.95	0.97	27.18	3.41	3.87	56.07	0.10	3.21	151.69
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.22	0.35	0.35	0.32	0.49	0.50	1.01	0.09	0.62	1.30
d, Delay for Lane Group [s/veh]	154.89	11.99	12.01	83.81	36.00	36.58	113.07	32.20	44.67	193.94
Lane Group LOS	F	B	B	F	D	D	F	C	D	F
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh]	29.63	4.60	4.55	0.10	6.14	5.81	2.80	0.81	5.74	25.90
50th-Percentile Queue Length [ft]	740.84	115.05	113.82	2.61	153.38	145.32	70.04	20.33	143.55	647.53
95th-Percentile Queue Length [veh]	43.39	8.12	8.05	0.19	10.20	9.77	5.04	1.46	9.67	39.25
95th-Percentile Queue Length [ft]	1084.76	203.00	201.31	4.70	254.93	244.16	126.07	36.59	241.79	981.19

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	154.89	12.00	12.01	83.81	36.18	36.58	113.07	32.20	32.20	44.67	193.94	193.94
Movement LOS	F	B	B	F	D	D	F	C	C	D	F	F
d_A, Approach Delay [s/veh]	77.50			36.48			82.94			148.81		
Approach LOS	E			D			F			F		
d_I, Intersection Delay [s/veh]	88.90											
Intersection LOS	F											
Intersection V/C	0.867											

Sequence

Ring 1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
Intersection 2: Golden Valley Rd/Estates Rd

Control Type:	Two-way stop	Delay (sec / veh):	27.6
Analysis Method:	HCM 2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.048

Intersection Setup

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↰↱		↰↑↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	1	0	0	0
Pocket Length [ft]	100.00	100.00	180.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

Volumes

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	6	43	102	544	419	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	7	50	118	631	486	14
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	14	32	173	134	4
Total Analysis Volume [veh/h]	8	55	130	693	534	15
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.08	0.13	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	27.56	10.39	9.06	0.00	0.00	0.00
Movement LOS	D	B	A	A	A	A
95th-Percentile Queue Length [veh]	0.15	0.25	0.44	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	3.73	6.16	10.95	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	12.57		1.43		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	1.37					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 5: Estates Rd/Indian Ln

Control Type:	Two-way stop	Delay (sec / veh):	9.2
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.029

Intersection Setup

Name	Estates Rd		Estates Rd		Indian Ln	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	↱		↰		↔	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Indian Ln	
Base Volume Input [veh/h]	51	30	1	18	20	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	59	35	1	21	23	0
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	10	0	6	6	0
Total Analysis Volume [veh/h]	66	39	1	23	26	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.03	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.42	0.00	9.19	8.82
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.05	0.05	0.09	0.09
95th-Percentile Queue Length [ft]	0.00	0.00	1.23	1.23	2.27	2.27
d_A, Approach Delay [s/veh]	0.00		0.31		9.19	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.59					
Intersection LOS	A					

Appendix E

10-Year Horizon Plus Project Conditions LOS Calculations

Intersection Level Of Service Report

Intersection 1: Golden Valley Rd/N Hills Blvd

Control Type:	Signalized	Delay (sec / veh):	49.7
Analysis Method:	HCM 2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.730

Intersection Setup

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration	↰ ↑ ↑↱			↰ ↑ ↑↱			↰ ↑↱			↰ ↑↱		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Pocket Length [ft]	150.00	100.00	100.00	100.00	100.00	100.00	150.00	100.00	100.00	125.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Base Volume Input [veh/h]	147	486	31	12	513	100	76	9	5	328	25	168
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	24	0	0	72	9	0	0	0	3	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	171	588	36	14	667	125	88	10	6	383	29	195
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	48	163	10	4	185	35	24	3	2	106	8	54
Total Analysis Volume [veh/h]	190	653	40	16	741	139	98	11	7	426	32	217
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	114
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	3	8	0	7	4	0	0	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	5	10	0	0	6	0	0	6	0
Maximum Green [s]	35	35	0	35	35	0	0	30	0	0	30	0
Amber [s]	4.0	4.5	0.0	4.0	4.5	0.0	0.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Split [s]	40	40	0	40	40	0	0	34	0	0	34	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	13	0	0	21	0	0	21	0
l1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.5	3.5	0.0	2.5	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	L	C
L, Total Lost Time per Cycle [s]	4.50	5.50	5.50	4.50	5.50	5.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	3.50	3.50	2.50	3.50	3.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	16	68	68	2	54	54	30	30	30	30
g / C, Green / Cycle	0.14	0.60	0.60	0.02	0.48	0.48	0.26	0.26	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.12	0.21	0.21	0.01	0.27	0.27	0.10	0.01	0.34	0.17
s, saturation flow rate [veh/h]	1597	1676	1643	1597	1676	1586	1014	1569	1250	1453
c, Capacity [veh/h]	219	998	978	30	799	756	152	406	354	376
d1, Uniform Delay [s]	48.14	11.79	11.79	55.46	21.38	21.38	52.43	31.68	46.11	37.79
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.50	0.19
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.87	0.97	0.99	14.35	2.89	3.06	4.47	0.04	115.43	3.57
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.87	0.35	0.35	0.54	0.57	0.57	0.64	0.04	1.20	0.66
d, Delay for Lane Group [s/veh]	58.01	12.76	12.78	69.81	24.27	24.44	56.90	31.72	161.53	41.36
Lane Group LOS	E	B	B	E	C	C	E	C	F	D
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh]	5.87	4.65	4.56	0.57	9.12	8.66	3.01	0.38	21.54	6.56
50th-Percentile Queue Length [ft]	146.78	116.30	114.11	14.36	227.89	216.50	75.24	9.50	538.44	163.99
95th-Percentile Queue Length [veh]	9.84	8.19	8.07	1.03	14.07	13.49	5.42	0.68	32.26	10.76
95th-Percentile Queue Length [ft]	246.12	204.73	201.71	25.84	351.68	337.15	135.43	17.10	806.58	268.99

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	58.01	12.77	12.78	69.81	24.34	24.44	56.90	31.72	31.72	161.53	41.36	41.36
Movement LOS	E	B	B	E	C	C	E	C	C	F	D	D
d_A, Approach Delay [s/veh]	22.50			25.16			53.00			117.20		
Approach LOS	C			C			D			F		
d_I, Intersection Delay [s/veh]	49.68											
Intersection LOS	D											
Intersection V/C	0.730											

Sequence

Ring 1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report

Intersection 2: Golden Valley Rd/Estates Rd

Control Type:	Two-way stop	Delay (sec / veh):	90.5
Analysis Method:	HCM 2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.437

Intersection Setup

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	1	0	0	0
Pocket Length [ft]	100.00	100.00	180.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

Volumes

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	14	89	31	845	640	7
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	9	65	27	0	16	2
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	25	168	63	980	758	10
Peak Hour Factor	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	53	20	306	237	3
Total Analysis Volume [veh/h]	31	210	79	1225	948	13
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.44	0.40	0.11	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	90.49	16.13	10.69	0.00	0.00	0.00
Movement LOS	F	C	B	A	A	A
95th-Percentile Queue Length [veh]	1.73	1.87	0.37	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	43.27	46.80	9.32	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	25.69		0.65		0.00	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	2.81					
Intersection LOS	F					

Intersection Level Of Service Report

Intersection 3: Golden Valley Rd/Access 5

Control Type:	Two-way stop	Delay (sec / veh):	11.9
Analysis Method:	HCM 2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.037

Intersection Setup

Name	Access 5		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↱		↑↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Access 5		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	0	0	0	859	647	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.16	1.00	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	16	0	9	2	1
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	16	0	1005	753	1
Peak Hour Factor	1.0000	0.8000	1.0000	0.8000	0.8000	0.8000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	5	0	314	235	0
Total Analysis Volume [veh/h]	0	20	0	1256	941	1
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.04	0.00	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	11.93	0.00	0.00	0.00	0.00
Movement LOS		B		A	A	A
95th-Percentile Queue Length [veh]	0.00	0.12	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	2.88	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	11.93		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.11					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 4: Estates Rd/Access 4

Control Type:	Two-way stop	Delay (sec / veh):	10.4
Analysis Method:	HCM 2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.036

Intersection Setup

Name	Estates Rd		Estates Rd		Access 4	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	┣		┫		┳	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access 4	
Base Volume Input [veh/h]	38	0	0	103	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	18	12	0	54	20	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	62	12	0	173	20	0
Peak Hour Factor	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	4	0	54	6	0
Total Analysis Volume [veh/h]	78	15	0	216	25	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.04	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.40	0.00	10.41	8.89
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.11	0.11
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	2.82	2.82
d_A, Approach Delay [s/veh]	0.00		0.00		10.41	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.78					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 5: Estates Rd/Indian Ln

Control Type: Two-way stop
Analysis Method: HCM 2010
Analysis Period: 15 minutes

Delay (sec / veh): 10.0
Level Of Service: A
Volume to Capacity (v/c): 0.102

Intersection Setup

Name	Estates Rd		Estates Rd		Indian Ln	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	├		┤		┬	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Indian Ln	
Base Volume Input [veh/h]	7	8	6	33	29	2
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	12	6	0	35	19	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	15	7	73	53	2
Peak Hour Factor	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	6	3	28	20	1
Total Analysis Volume [veh/h]	31	23	11	112	82	3
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.00	0.10	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.34	0.00	9.98	9.02
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.26	0.26	0.35	0.35
95th-Percentile Queue Length [ft]	0.00	0.00	6.45	6.45	8.72	8.72
d_A, Approach Delay [s/veh]	0.00		0.66		9.94	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3.53					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 6: Indian Ln/Access 3

Control Type:	Two-way stop	Delay (sec / veh):	9.6
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name	Access 3			Access 3			Indian Ln			Indian Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	✛			✛			✛			✛		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Access 3			Access 3			Indian Ln			Indian Ln		
Base Volume Input [veh/h]	0	0	0	0	0	0	0	14	0	0	31	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	9	0	0	0	0	10	3	0	3	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	0	0	0	0	10	3	16	3	0	36	0
Peak Hour Factor	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	0	0	0	0	4	1	6	1	0	14	0
Total Analysis Volume [veh/h]	14	0	0	0	0	15	5	25	5	0	55	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.22	9.60	8.50	9.10	9.60	8.61	7.33	0.00	0.00	7.27	0.00	0.00
Movement LOS	A	A	A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.05	0.05	0.05	0.05	0.05	0.05	0.07	0.07	0.07	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	1.23	1.23	1.23	1.13	1.13	1.13	1.73	1.73	1.73	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.22			8.61			1.05			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.48											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 7: Estates Rd/Access 2

Control Type: Two-way stop
Analysis Method: HCM 2010
Analysis Period: 15 minutes

Delay (sec / veh): 9.3
Level Of Service: A
Volume to Capacity (v/c): 0.032

Intersection Setup

Name	Estates Rd		Estates Rd		Access 2	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	┣		┫		┳	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access 2	
Base Volume Input [veh/h]	9	0	0	39	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	6	0	16	18	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	15	6	0	61	18	0
Peak Hour Factor	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	2	0	23	7	0
Total Analysis Volume [veh/h]	23	9	0	94	28	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.03	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.28	0.00	9.26	8.57
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.10	0.10
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	2.48	2.48
d_A, Approach Delay [s/veh]	0.00		0.00		9.26	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.68					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 8: Estates Road/Access 1

Control Type:	Two-way stop	Delay (sec / veh):	9.1
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.027

Intersection Setup

Name	Estates Rd		Estates Rd		Access1	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access1	
Base Volume Input [veh/h]	9	0	0	39	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	0	0	16	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	10	5	0	45	16	0
Peak Hour Factor	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	2	0	17	6	0
Total Analysis Volume [veh/h]	15	8	0	69	25	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.03	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.26	0.00	9.05	8.51
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.08	0.08
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	2.11	2.11
d_A, Approach Delay [s/veh]	0.00		0.00		9.05	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.93					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 1: Golden Valley Rd/N Hills Blvd

Control Type:	Signalized	Delay (sec / veh):	86.0
Analysis Method:	HCM 2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.884

Intersection Setup

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Lane Configuration	↰ ↑ ↑↱			↰ ↑ ↑↱			↰ ↑↱			↰ ↑↱		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Pocket Length [ft]	150.00	100.00	100.00	100.00	100.00	100.00	150.00	100.00	100.00	125.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Golden Valley Rd			Golden Valley Rd			N Hills Blvd			N Hills Blvd		
Base Volume Input [veh/h]	512	581	23	2	308	103	54	19	14	176	13	393
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	80	0	0	47	6	0	0	0	10	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	594	754	27	2	404	125	63	22	16	214	15	456
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	152	192	7	1	103	32	16	6	4	55	4	116
Total Analysis Volume [veh/h]	606	769	28	2	412	128	64	22	16	218	15	465
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	114
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal group	3	8	0	7	4	0	0	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	5	10	0	0	6	0	0	6	0
Maximum Green [s]	35	35	0	35	35	0	0	30	0	0	30	0
Amber [s]	4.0	4.5	0.0	4.0	4.5	0.0	0.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.5	1.0	0.0	0.5	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Split [s]	40	40	0	40	40	0	0	34	0	0	34	0
Vehicle Extension [s]	3.0	3.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	21	0	0	13	0	0	21	0	0	21	0
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.5	3.5	0.0	2.5	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	L	C
L, Total Lost Time per Cycle [s]	4.50	5.50	5.50	4.50	5.50	5.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	3.50	3.50	2.50	3.50	3.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	36	70	70	0	35	35	30	30	30	30
g / C, Green / Cycle	0.31	0.61	0.61	0.00	0.30	0.30	0.26	0.26	0.26	0.26
(v / s)_i Volume / Saturation Flow Rate	0.38	0.24	0.24	0.00	0.17	0.17	0.08	0.02	0.18	0.34
s, saturation flow rate [veh/h]	1597	1676	1656	1597	1676	1543	820	1561	1228	1432
c, Capacity [veh/h]	497	1023	1010	6	507	467	63	404	337	370
d1, Uniform Delay [s]	39.25	11.38	11.39	56.63	33.26	33.36	57.00	32.10	41.87	42.25
k, delay calibration	0.50	0.50	0.50	0.11	0.50	0.50	0.11	0.11	0.21	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	115.64	1.13	1.15	27.18	4.25	4.77	56.07	0.10	4.06	151.69
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.22	0.39	0.39	0.32	0.55	0.56	1.01	0.09	0.65	1.30
d, Delay for Lane Group [s/veh]	154.89	12.51	12.54	83.81	37.50	38.13	113.07	32.20	45.93	193.94
Lane Group LOS	F	B	B	F	D	D	F	C	D	F
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh]	29.63	5.29	5.24	0.10	7.03	6.65	2.80	0.81	6.14	25.90
50th-Percentile Queue Length [ft]	740.84	132.22	131.11	2.61	175.67	166.19	70.04	20.33	153.49	647.53
95th-Percentile Queue Length [veh]	43.39	9.06	9.00	0.19	11.37	10.88	5.04	1.46	10.20	39.25
95th-Percentile Queue Length [ft]	1084.76	226.51	225.01	4.70	284.36	271.90	126.07	36.59	255.08	981.19

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	154.89	12.52	12.54	83.81	37.71	38.13	113.07	32.20	32.20	45.93	193.94	193.94
Movement LOS	F	B	B	F	D	D	F	C	C	D	F	F
d_A, Approach Delay [s/veh]	74.02			37.98			82.94			147.71		
Approach LOS	E			D			F			F		
d_I, Intersection Delay [s/veh]	85.97											
Intersection LOS	F											
Intersection V/C	0.884											

Sequence

Ring 1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
Intersection 2: Golden Valley Rd/Estates Rd

Control Type:	Two-way stop	Delay (sec / veh):	43.6
Analysis Method:	HCM 2010	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.131

Intersection Setup

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	1	1	0	0	0
Pocket Length [ft]	100.00	100.00	180.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

Volumes

Name	Estates Rd		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	6	43	102	544	419	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	6	42	90	0	11	8
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	13	92	208	631	497	22
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	25	57	173	137	6
Total Analysis Volume [veh/h]	14	101	229	693	546	24
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.13	0.14	0.23	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	43.59	10.89	9.67	0.00	0.00	0.00
Movement LOS	E	B	A	A	A	A
95th-Percentile Queue Length [veh]	0.43	0.49	0.88	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	10.87	12.32	22.12	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	14.87		2.40		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	2.44					
Intersection LOS	E					

Intersection Level Of Service Report
Intersection 3: Golden Valley Rd/Access 5

Control Type:	Two-way stop	Delay (sec / veh):	10.1
Analysis Method:	HCM 2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.017

Intersection Setup

Name	Access 5		Golden Valley Rd		Golden Valley Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Access 5		Golden Valley Rd		Golden Valley Rd	
Base Volume Input [veh/h]	0	0	0	550	431	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.16	1.00	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	11	0	6	8	3
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	11	0	644	508	3
Peak Hour Factor	1.0000	0.9100	1.0000	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	3	0	177	140	1
Total Analysis Volume [veh/h]	0	12	0	708	558	3
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.02	0.00	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	10.11	0.00	0.00	0.00	0.00
Movement LOS		B		A	A	A
95th-Percentile Queue Length [veh]	0.00	0.05	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	1.28	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	10.11		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.09					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 4: Estates Rd/Access 4

Control Type:	Two-way stop	Delay (sec / veh):	10.6
Analysis Method:	HCM 2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.021

Intersection Setup

Name	Estates Rd		Estates Rd		Access 4	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	↱		↰		↔	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access 4	
Base Volume Input [veh/h]	114	0	0	49	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	59	39	0	35	13	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	191	39	0	92	13	0
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	52	11	0	25	4	0
Total Analysis Volume [veh/h]	210	43	0	101	14	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.02	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.74	0.00	10.55	9.57
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.06	0.06
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	1.62	1.62
d_A, Approach Delay [s/veh]	0.00		0.00		10.55	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.40					
Intersection LOS	B					

Intersection Level Of Service Report

Intersection 5: Estates Rd/Indian Ln

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.050

Intersection Setup

Name	Estates Rd		Estates Rd		Indian Ln	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	├		┤		┬	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Indian Ln	
Base Volume Input [veh/h]	51	30	1	18	20	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	39	21	0	23	13	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	98	56	1	44	36	0
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	16	0	12	10	0
Total Analysis Volume [veh/h]	109	62	1	49	40	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.05	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.56	0.00	9.75	9.20
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.11	0.11	0.16	0.16
95th-Percentile Queue Length [ft]	0.00	0.00	2.76	2.76	3.95	3.95
d_A, Approach Delay [s/veh]	0.00		0.15		9.75	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.52					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 6: Indian Ln/Access 3

Control Type:	Two-way stop	Delay (sec / veh):	9.6
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name	Access 3			Access 3			Indian Ln			Indian Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	✛			✛			✛			✛		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Access 3			Access 3			Indian Ln			Indian Ln		
Base Volume Input [veh/h]	0	0	0	0	0	0	0	31	0	0	20	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	6	0	0	0	0	7	12	0	9	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	0	0	0	0	7	12	36	9	0	23	0
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	0	0	0	2	3	10	3	0	6	0
Total Analysis Volume [veh/h]	7	0	0	0	0	8	13	40	10	0	26	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.18	9.61	8.55	9.12	9.63	8.46	7.29	0.00	0.00	7.31	0.00	0.00
Movement LOS	A	A	A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.02	0.02	0.02	0.02	0.02	0.02	0.12	0.12	0.12	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.61	0.61	0.61	0.58	0.58	0.58	3.10	3.10	3.10	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.18			8.46			1.50			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.18											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 7: Estates Rd/Access 2

Control Type:	Two-way stop	Delay (sec / veh):	9.3
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.015

Intersection Setup

Name	Estates Rd		Estates Rd		Access 2	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	↱		↰		↔	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access 2	
Base Volume Input [veh/h]	51	0	0	19	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	18	21	0	11	12	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	77	21	0	33	12	0
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	21	6	0	9	3	0
Total Analysis Volume [veh/h]	86	23	0	37	13	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.02	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.43	0.00	9.25	8.82
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.05	0.05
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	1.15	1.15
d_A, Approach Delay [s/veh]	0.00		0.00		9.25	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.76					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 8: Estates Road/Access 1

Control Type:	Two-way stop	Delay (sec / veh):	9.1
Analysis Method:	HCM 2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.013

Intersection Setup

Name	Estates Rd		Estates Rd		Access1	
Approach	Northbound		Southbound		Westbound	
Lane Configuration	↱		↰		↔	
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Estates Rd		Estates Rd		Access1	
Base Volume Input [veh/h]	51	0	0	19	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	18	0	0	11	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	59	18	0	22	11	0
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	5	0	6	3	0
Total Analysis Volume [veh/h]	66	20	0	24	12	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.38	0.00	9.06	8.71
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.04	0.04
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	1.01	1.01
d_A, Approach Delay [s/veh]	0.00		0.00		9.06	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.89					
Intersection LOS	A					

PRELIMINARY HYDROLOGY REPORT

Axion
ENGINEERING
Civil Engineering • Land Development

HYDROLOGY MASTER PLAN FOR
GOLDEN MESA NORTH PROJECT
GOLDEN VALLEY
WASHOE COUNTY, NEVADA

Prepared for:

Moonlight Hills Estates, LLC
5390 Belazza Court
Reno, NV 89519

Prepared by:

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10180 Grizzly Hill Court
Reno, NV 89521

December 5, 2016

PROFESSIONAL ENGINEER-STATE OF NEVADA
DAVID E. WESTHOFF
Exp: 6-30-18
CIVIL
No. 17601

Dec 5, 2016

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APPENDICES

LIST OF TABLES

1.0 INTRODUCTION

1.1 BACKGROUND

This report presents a Hydrology Master Plan for the proposed Golden Mesa North project. The project is in Golden Valley, about 4 miles north of Reno (Figure 1). The project consists of two parcels, parcel numbers 552-050-01 (GMN9 on Fig. 2) and 552-092-19 (GMN11 on Fig.2). Both parcels are in Section 11, T20N, R19E. The study was conducted to determine flow rates at key sites in Golden Valley, evaluate the impacts of the proposed development and estimate the size of proposed detention basins. Several previous hydrology studies of Golden Valley were reviewed and, where appropriate, data from those reports was included in the hydrologic models.

1.2 DESCRIPTION OF GOLDEN VALLEY

Golden Valley is located north of Reno and is in both the Washoe County and City of Reno spheres of influence. Development is proposed for two parcels within Washoe County's jurisdiction. The principal drainage feature of the area is Golden Valley Wash which flows northwesterly south of the parcels. The drainage area affecting the project area slopes southwest at a slope of about 3% in the flatter areas with slopes of up to 50% in the steeper hills. In undeveloped areas the vegetation consists of sagebrush and grasses. Developed areas consist of large residential parcels typically 1 acre in size.

1.3 EXISTING DRAINAGE PATTERN

The 2 parcels proposed for development, GMN9 and GMN11, receive storm water runoff from the north and east. Runoff flows generally southwest to the intersection of East Golden Valley Road and Estates Road where it combines with Golden Valley Wash. The flow exits the area through culverts under Estates Road to the west and then flows north. The ultimate destination of the runoff is Swan Lake (aka Lemmon Lake). The area is partially developed with lot sizes typically 1 acre in size. The developed areas around the subject parcels have numerous small drainage channels flowing either north-south or east-west parallel to the streets. The channels usually have small culverts under driveways that limit the channel's capacity. During significant storm events the capacity of these culverts is likely exceeded and shallow flow across lots and streets could occur. Estates Road, the western boundary of this study, also has channels on both sides of it that have several small culverts under driveways.

1.4 Proposed Project

The two parcels are planned to be developed with relatively large (35,000 sq. ft.) residential lots. Offsite flow from north of GMN-9 will be routed west to a detention basin near Estates Road, then discharged into a planned ditch. Onsite runoff from GMN-9 and GMN-11 will be routed to proposed detention basins and discharged to existing channels. Three detention basins are proposed (see Section 3.7.2).

1.5 FEMA Floodplains

The parcels are located on Flood Insurance Rate Map (FIRM) panel 32031C3027G (Figures 4A and 4B). The northern parcel (GMN-9) and most of the southern parcel (GMN-11) are in Zone

X, outside the 100-year floodplain. The extreme southwest corner of GMN-11 is in Zone AE with flood elevation of 5095 +/- feet. The effective FEMA 100-year flow rate in this area is 969 cfs in Golden Valley Wash.

2.0 PREVIOUS STUDIES

Nolte and Associates, Washoe County, Nevada, Flood Insurance Study Hydrologic Analysis – Final Project # SD0338 HO, 1998. This study calculated the flow rates and defined the flood plain that is the current effective flood plain shown on the Flood Insurance Rate Map (FIRM) for the subject parcels. Nolte used regression equations developed by the U.S. Geological Survey to calculate the flow rates at different locations within Golden Valley. (Nolte also used the equation for other valleys, including Sun Valley.) For the upstream section of Golden Valley Wash, the 100 year (or 1% chance) flow rate is 136 cubic feet per second (cfs). At Spearhead Way, the flow rate increases to 969 cfs (Figure 1). This is the flow rate through the southern parcel. Downstream of the parcel, at Browning Way, the flow rate increases to 1,904 cfs. These flow rates were used in a hydraulic model along with channel cross sections to determine the floodplain for Golden Valley Wash.

Stantec, Stead Drainage Master Plan, August, 2000. Stead and surrounding areas are part of the North Valleys, as is Golden Valley. Stead is near Swan Lake (also known as Lemmon Lake), which is the terminus of Golden Valley Wash. Swan Lake is a closed basin which means that discharge from the lake is by evaporation or infiltration only. Stantec's study was done to provide information on flow rates and runoff volumes for the region for existing and future conditions. They developed a hydrologic model (HEC-1) for this purpose. In their model, the two subject parcels and the area draining to them are included in a single watershed, labeled GV-1. This watershed also included additional area that doesn't discharge onto these parcels. The area of GV-1 is 3.13 square miles. In their model, the runoff rate from GV-1 was 497 cfs under existing conditions.

North Valleys Flood Control Hydrologic Analysis and Mitigation Options, Quad Knopf, March 30, 2007. This study was conducted to determine the regulatory water surface elevations in Swan Lake and another playa, Silver Lake, should be. They adopted the Stantec model with a few modifications. Watershed GV-1 has the same area in this model as in Stantec's, but the runoff coefficients, or runoff Curve Numbers (CN), were modified. Quad Knopf subcontracted a consultant to provide more precise information for calculating the curve numbers. In general, the curve numbers are lower than in Stantec's model, but include a percent impervious area that partially offsets the lower CN. This study did not include a 100-year, 24-hour storm event, so it provides helpful information (CN) but does not have model results to compare to other studies.

Hydrology Master Plan Tobler South Property, Nimbus Engineers, April, 2005. This report is a detailed hydrology report on parcel APN 552-100-01, south of GMN-11 and north of North Valleys High School. This study analyzed the hydrology of this parcel and the area draining to it using a HEC-1 hydrologic model. It divided the drainage area into 11 watersheds. It analyzed the subject parcel under existing and proposed (developed) conditions. The total drainage area was 2.24 square miles. It calculated a 100 year flow rate of 287 cfs at the northeast corner of Estates Road and Golden Valley Road. Currently, the water ponds here and then flows over

Estates Road. In the proposed conditions model, it included 2 detention basins to mitigate the impacts of developing the parcel.

Hydrology Master Plan Golden Mesa North Project Revised, Quad Knopf, October, 2006. This report is a detailed hydrology report for the northern subject property, APN 552-050-01. It revises the area modeled in the Nimbus report on Tobler South slightly to provide more detail on the northern parcel. It divides the total watershed area of 2.25 square miles into 14 watersheds. The model for this project calculated a 100-year, 24-hour flow rate of 358 cfs at the southwest corner of the southern parcel, at Estates Drive and Golden Valley Road. The reason for the increase in the flow rate is that the Tobler South report used a rainfall value of 2.664 inches while the Golden Mesa North report used 4.07 inches. Hence, this report in essence supersedes the Tobler South report. This report added a third detention basin to the two included in the Tobler South report.

Marlin and Lemmon Channels Floodplain Analysis & Improvement Alternatives Final Report, Manhard, Feb., 2010. Manhard conducted a hydrologic and hydraulic analysis to evaluate means of mitigating the flood problems in Golden and Lemmon Valley. They used the EPA's SWMM hydrologic model to evaluate flow rates and the Corps of Engineers' HEC-RAS model to do hydraulic analysis. It appears that both GMN 9 and GMN are in Manhard's Subbasin 14 which also includes additional area. The 100 year flow from Subbasin 14 is 91 cfs.

3.0 HYDROLOGIC ANALYSIS

3.1 Methodology

The U.S Army Corps of Engineers HEC-1 (v. 4.1R) computer program was used in this analysis. This program incorporates watershed area, time of concentration, curve number and precipitation data to compute peak flow rates and runoff volumes. These parameters and the values used in the model are discussed below. Procedures described in the Truckee Meadows Regional Drainage Manual (Manual) were followed in this analysis. A summary of the parameters is shown in Tables 1 and 2.

Models were developed for the 100-year and 5-year events for existing and proposed conditions. The models are presented in Appendix C

3.2 Rainfall Depth and Distribution

Rainfall data was obtained from National Weather Service Website http://dipper.nws.noaa.gov/hdsc/pfds/sa/nv_pfds.html.. This shows a 100-year, 24-hour value of 3.97 inches. The 5-year, 24-hour precipitation depth is 2.19 inches. A balanced storm distribution was used in this study.

3.3 Watershed Delineation

The Golden Mesa North watershed boundaries are based on existing topography as well as roads, ditches and other man-made features. The watershed affecting the proposed project area was divided into 12 watersheds designated GMN1 through GMN11 (Figure 2).

3.4 Runoff Curve Number

To calculate the runoff curve number (CN), the soil types within each watershed were identified by hydrologic soil groups. Soils have been classified by the U.S. National Resource Conservation Service (NRCS) into 4 hydrologic soil groups: A, B, C, and D. Infiltration rates decrease from soil groups A through D. Group A soils have a rapid infiltration rate and include very porous soils such as sands. Groups B and C have intermediate infiltration rates. Group D soils have a very slow infiltration rate which results in a larger percentage of the rainfall contributing to runoff. The hydrologic soil groups were obtained from the NRCS web soil survey found at http://websoilsurvey.nrcs.usda.gov/app. The soils map (Figure 3) shows that soils affecting the project fall mostly into soil groups C and D, with some A.

Relative soil moisture content is described in the NRCS methodology by the term “antecedent moisture condition” or AMC. Three different relative conditions are describe by the NRCS, AMC I, II and III. AMC I is an extremely dry condition where soil moisture has been depleted and infiltration rates for the soil are near their maximum. AMC III is a saturated condition with limited infiltration and AMC II is an average condition. As prescribed in the Manual, AMC II was used in this study. Vegetation also is a factor in evaluating curve number. An investigation of the site showed that the vegetation type in the study area is sagebrush and cheatgrass in fair condition. The developed areas around Golden Mesa North are developed with a typical lot size of 1 acre. Curve numbers were based on the characteristics described above and Table 702 of the Manual. Curve number calculations are shown in Appendix B.

3.5 Watershed Lag Time

Watershed time of concentration is the time it takes for water to reach the watershed outlet from the most hydraulic distant point in the watershed. The watershed lag time is used for the SCS methodology in the HEC-1 program. Using the SCS methodology, the lag time (TLAG) is equal to 0.6 times the time of concentration (T_c), or TLAG = 0.6 x T_c.

Table 703 and Figure 701 from the Regional Drainage Manual were used to calculate time of concentration for most watersheds. Calculations are presented in Appendix B.

3.6 Hydrograph Routing

Channel and overland flow routing were performed with the Muskingum-Cunge method. This method takes into account channel characteristics such as shape, slope, length and roughness.

TABLE 1. WATERSHED PARAMETERS FOR HEC-1 MODEL, PRE-PROJECT

WATERSHED	AREA, ACRES	AREA, SQ. MI.	CURVE NO.	LAG TIME, HR
GMN1	59.94	0.094	75	0.27
GMN2	20.47	0.032	79	0.29
GMN3	178.13	0.278	64	0.42
GMN4	149.18	0.233	64	0.36
GMN5A	44.46	0.069	74	0.24
GMN5B	49.07	0.077	64	0.23
GMN6	7.93	0.012	77	0.2
GMN7	40.02	0.063	54	0.21
GMN8	17.4	0.027	54	0.12
GMN9	97.45	0.152	65	0.31
GMN10	3.87	0.006	79	0.05
GMN11	34.05	0.053	70	0.19

TABLE 2. WATERSHED PARAMETERS FOR HEC-1 MODEL, POST-PROJECT

WATERSHED	AREA, ACRES	AREA, SQ. MI.	CURVE NO.	LAG TIME, HR
GMN9	97.45	0.152	76	0.32
GMN11	34.05	0.053	80	0.19

3.7 Results

3.7.1 EXISTING CONDITIONS

Five design points were established to evaluate the impacts of the proposed project. These points are shown on Figure 2 and described below.

- CP-1: First, at the northwest corner of GMN 9 where runoff from undeveloped areas north of GMN 9 collect along the east side of Estates Road.
- CP-2: The second is at the southwest corner of GMN-9, the outlet point from a parcel proposed for development.
- CP-3: The third is at the intersection of Indian Lane and Estates Road. The runoff from north of GMN-9, onsite runoff from GMN-9 and offsite runoff from the east (GMN-4, -7, and -2) combine at this intersection.
- CP-4: The fourth is where flow from GMN 11(the second parcel proposed for development) exits the parcel.
- CP-5: The fifth is the cumulative flow from the entire Golden Mesa North watershed area at the northeast intersection of East Golden Valley Road and Estates Road.

CP-2 and CP-4 are the key points, the discharge point from the parcels planned for development.

It is believed that all runoff from the study area will reach the ponding area northeast of the intersection of Golden Valley Road and Estates Road. Namely, it was assumed that no water spills over Estates Road north of the ponding area. The results of existing conditions model (file name GMN1E.dat) are shown in Table 4.

3.7.2 PROPOSED CONDITIONS

To simulate proposed conditions, it was assumed that GMN-9 and GMN-11 were developed with 35,000 sq ft (0.75 acre) lots. Then detention basins were inserted into the model at three locations:

- At DP-1, the northwest corner of GMN-9, where offsite watersheds GMN5A and 5B discharge into a channel parallel to Estates Road (Detention Basin A)
- At DP-2 where the onsite runoff from GMN9 plus offsite runoff from GMN6 and GMN8 exits from GMN9 (Detention Basin B) A
- At DP-4, the southern boundary of GMN11 where the planned development discharges to the ponding area northeast of the intersection of East Golden Valley Road and Estates Road.

The preliminary detention basin characteristics are summarized Table 3:

Table 3. Proposed Detention Basin Characteristics

Detention Basin	Area, ac.	Outlet Pipes (rcp)	Peak depth, ft
A	1	(1) 24"	3.8
B	1.2	Low flow (1) 30", high (3) 36" @ 1.6 ft	3.53
C	1.4	Low flow (2) 36", high (1) 36" @ 1.2 ft	4.32

The results of the pre- and post-development models are shown in Table 4. The locations are shown on Figure 2.

Table 4. Results of Existing and Proposed Conditions Models

Location	100-year Event		5-Year Event	
	Existing	**Proposed**	**Existing**	**Proposed**
DP-1	31	25	1	4
DP-2	143	90	12	11
DP-3	212	195	16	17
DP-4	158	129	16	16
DP-5	360	324	30	30

The models show that the 100-year flow rates from the two parcels proposed for development can be reduced to below existing conditions rates through the use of detention ponds. The flow rate from GMN-9 (CP-2) is reduced by 53 cfs, the flow from GMN-11 (CP-4) is reduced by 29 cfs, and the cumulative flow reaching the ponding area (CP-5) is reduced by 36 cfs.

The model shows that with the planned detention basins the 5-year flow rates are maintained at pre-development rates from the parcels planned for development and at the cumulative flow rate from the Golden Mesa North watershed (CP-5). Slight increases are shown at CP-1 and at CP-3. A A preliminary trapezoidal channel design with a 1 foot base and Z=2:1 can convey the 100-year flow of 25 cfs from CP-1 to CP-2. The existing channel starting at CP-3 can convey the 1 cfs increase in flow at that point.

4.0 FINDINGS

The findings of this study are:

- Stormwater from the watershed impacting the Golden Mesa North project currently collects in the northeast corner of the intersection of East Golden Valley Road and Estates Road then flows westward under Estates Road. In extreme events, it may overtop Estates Road. The stormwater eventually reaches Swan Lake.
- The capacity of the existing storm ditches north of Golden Valley Road is limited by the size of culverts under driveways, for example along Estates Road and Indian Lane
- The development of the two parcels, GMN-9 and GMN-11, will increase the peak runoff rates from the parcels.
- Construction of 3 detention basins from 1 to 1.5 acres in size will reduce the 100-year flow rates from the project area, more than mitigating the impacts of development.
- The planned detention basins will mitigate the increase in flow rates from the 5-year event from the parcels planned from development and the cumulative flow rate from the Golden Mesa North watershed..
- The flow rates from the 5-year storm event will increase by up to 3 cfs. Existing and planned channels will be able to accept these increases without adverse affects.

5.0 REFERENCES

Manhard, Marlin and Lemmon Channels Floodplain Analysis & Improvement Alternatives Final Report, Feb., 2010.

National Weather Service Website, http://dipper.nws.noaa.gov/hdsc/pfds/sa/nv_pfds.html.

Natural Resources Conservation Service Website, http://websoilsurvey.nrcs.usda.gov/app.

Nimbus Engineers, Hydrology Master Plan Tobler South Property, Nimbus Engineers, April, 2005

Nolte and Associates, Washoe County, Nevada, Flood Insurance Study Hydrologic Analysis – Final Project # SD0338 HO, 1998.

Odyssey Engingeers, Drainage Report for North Valleys High School, November, 1999.

Quad Knopf, North Valleys Flood Control Hydrologic Analysis and Mitigation Options, March 30, 2007.

Quad Knopf, Hydrology Master Plan Golden Mesa North Project Revised, October, 2006.

Stantec, Stead Drainage Master Plan, August, 2000.

Washoe County, City of Reno, City of Sparks, Truckee Meadows Regional Drainage Manual, April, 2009.

Wood Rodgers, Master Drainage Study for Northstar Ranch Phases 1-4, November 22, 2005.

APPENDIX A

FIGURES

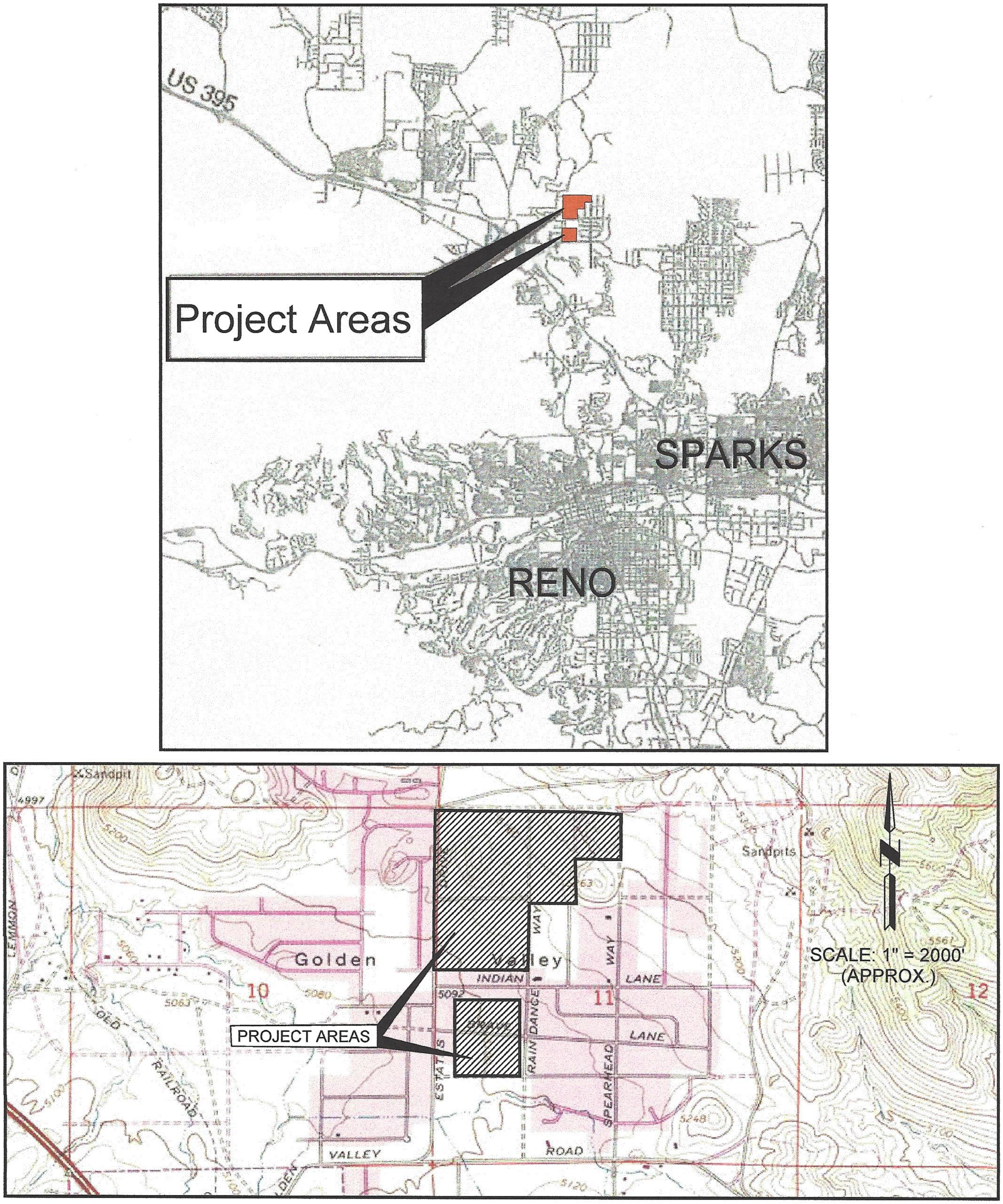
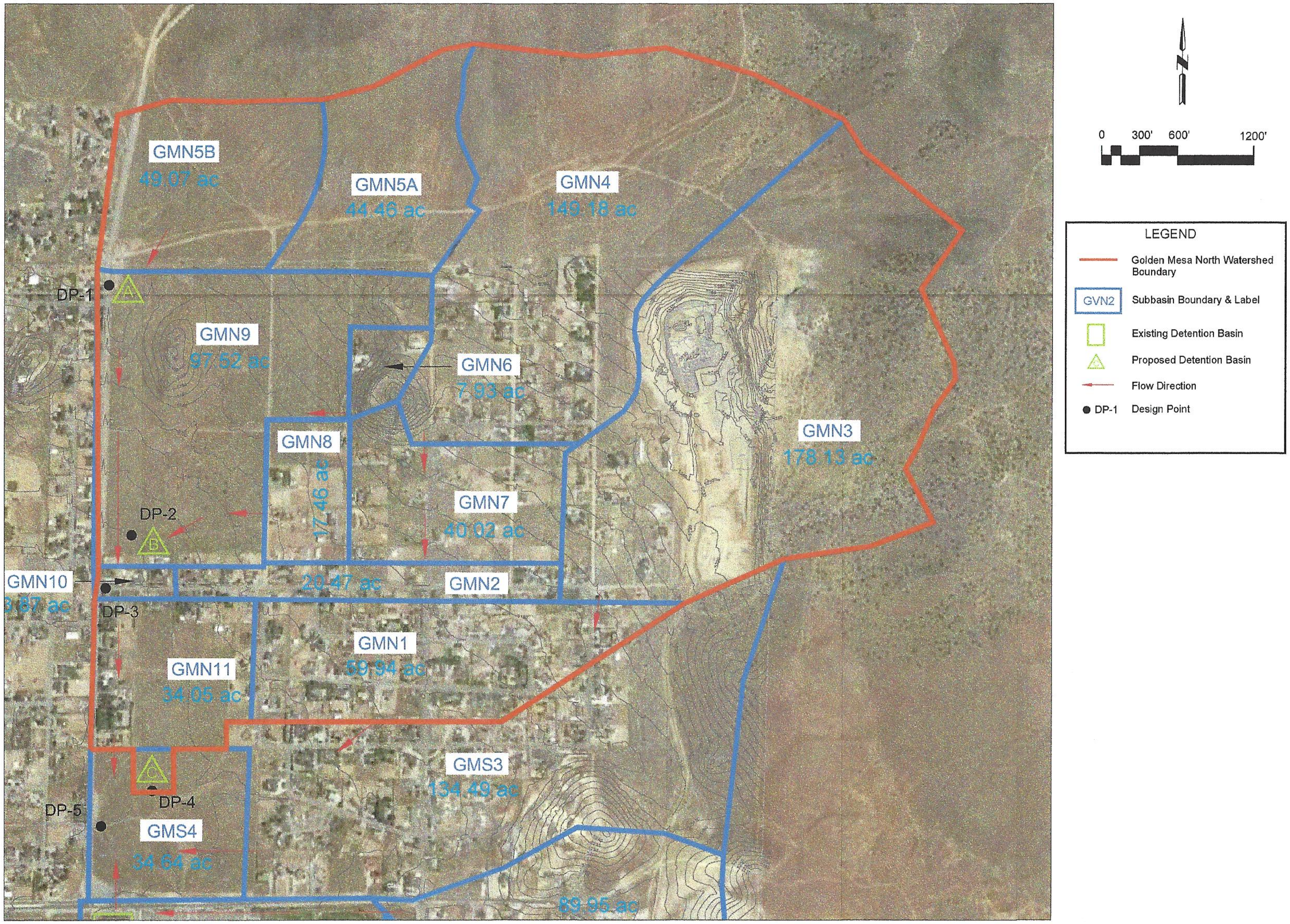


FIGURE 1
Vicinity Map
Golden Mesa North
Washoe County, Nevada
July, 2016

DEW Hydrology
10180 Grizzly Hill Court
Reno, Nevada 89521
Phone: (775) 815-2293



DEW Hydrology

10180 Grizzly Hill Court
Reno, nevada 89521
Phone: (775) 815-2293

WATERSHED MAP

GOLDEN MESA NORTH

RENO
WASHOE COUNTY
NEVADA

SHEET REVISIONS		
NO.	DESCRIPTION/DATE	BY

JOB NO.	
DESIGNED	D.W.
DRAWN	S.R.M.
CHECKED	
DATE	

FIGURE 2

OF SHEETS

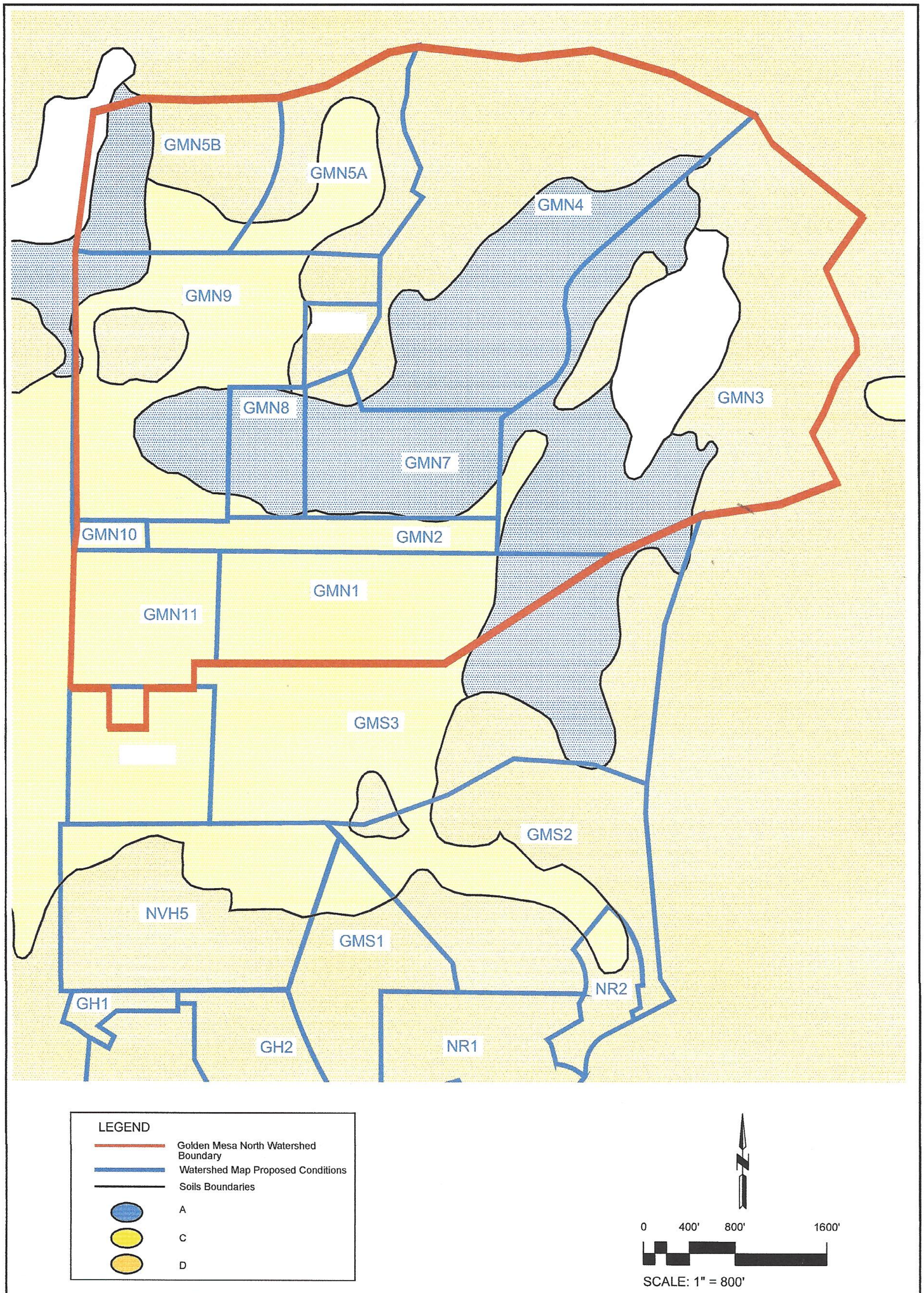


FIGURE 3
Soils Map
Golden Mesa North
Reno, Nevada
June 07, 2016

DEW Hydrology
10180 Grizzly Hill Court
Reno, Nevada 89521
Phone: (775) 815-2293

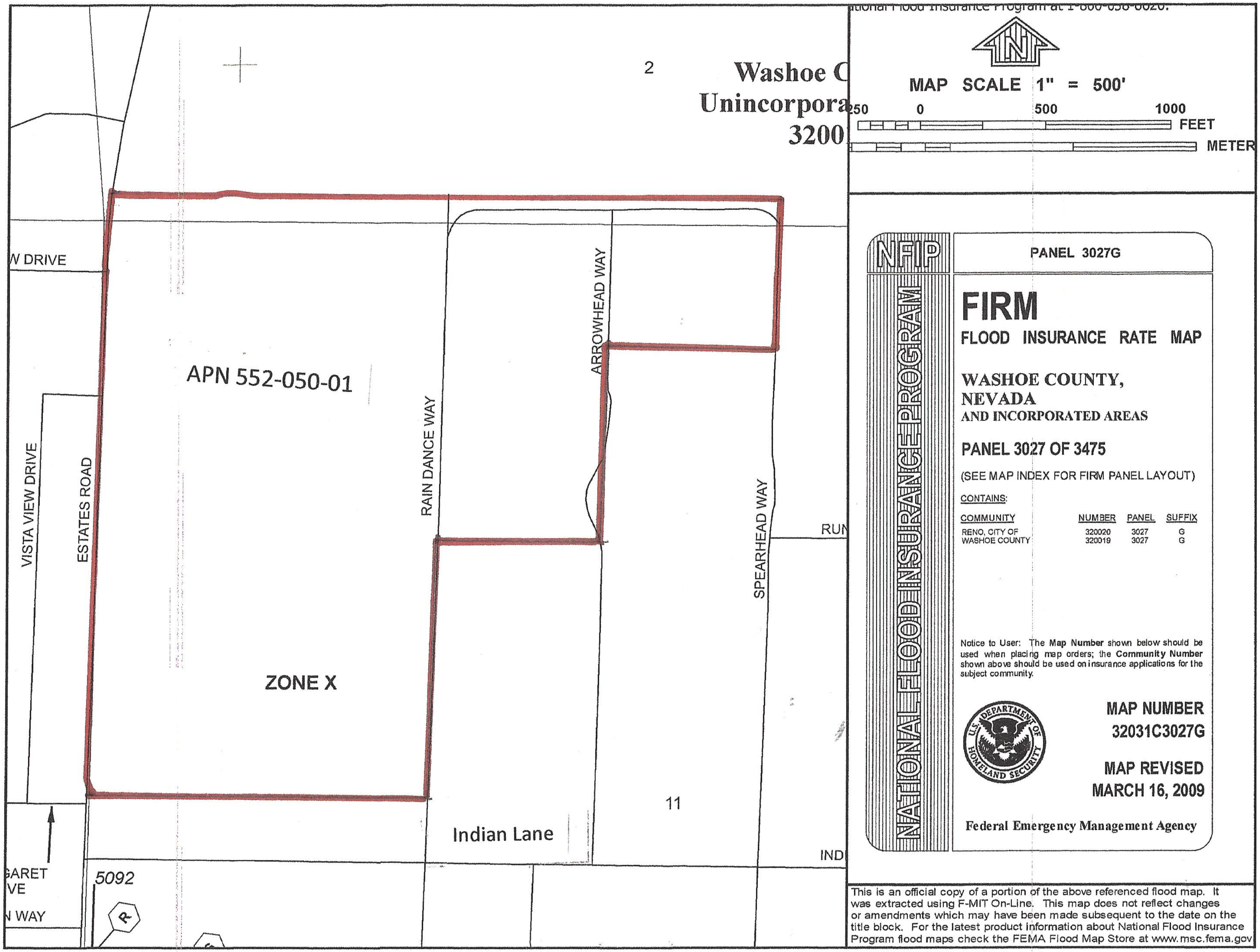
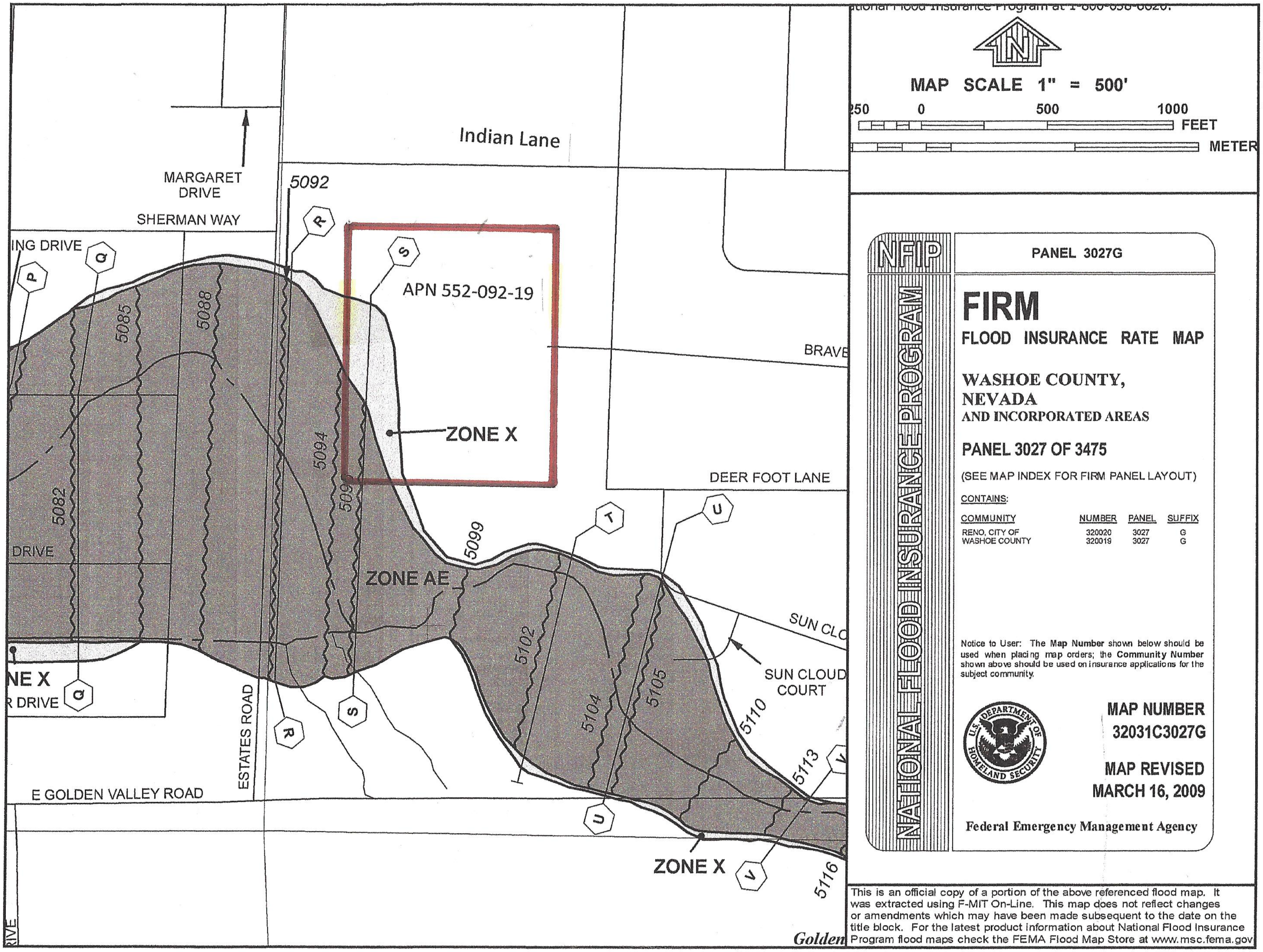

2
Washoe C
Unincorpora
3200
MAP SCALE 1" = 500'
250 0 500 1000
FEET
METER
W DRIVE
APN 552-050-01
RAIN DANCE WAY
ARROWHEAD WAY
SPEARHEAD WAY
RUN
VISTA VIEW DRIVE
ESTATES ROAD
ZONE X
11
Indian Lane
IND
GARET
VE
N WAY
5092
R
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 3027G
FIRM
FLOOD INSURANCE RATE MAP
WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS
PANEL 3027 OF 3475
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
RENO, CITY OF 320020 3027 G
WASHOE COUNTY 320019 3027 G
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
32031C3027G
MAP REVISED
MARCH 16, 2009
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

FIGURE 4A



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 3027G

FIRM
FLOOD INSURANCE RATE MAP

WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS

PANEL 3027 OF 3475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
RENO, CITY OF	320020	3027	G
WASHOE COUNTY	320019	3027	G

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

MAP NUMBER
32031C3027G

MAP REVISED
MARCH 16, 2009

Federal Emergency Management Agency

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FIGURE 4B

APPENDIX B

SUPPORTING CALCULATIONS

General Info
- Homepage
- Current Projects
- FAQ
- Glossary

Precipitation Frequency (PF)
- PF Data Server
- PF in GIS Format
- PF Maps
- Temporal Distr.
- Time Series Data
- PFDS Perform.
- PF Documents

Probable Maximum Precipitation (PMP)
- PMP Documents

Miscellaneous
- Publications
- AEP Storm Analysis
- Record Precipitation

Contact Us
- Inquiries
- List-server

USA.gov

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: NV

DATA DESCRIPTION

Data type: precipitation depth **Units:** english **Time series type:** partial duration

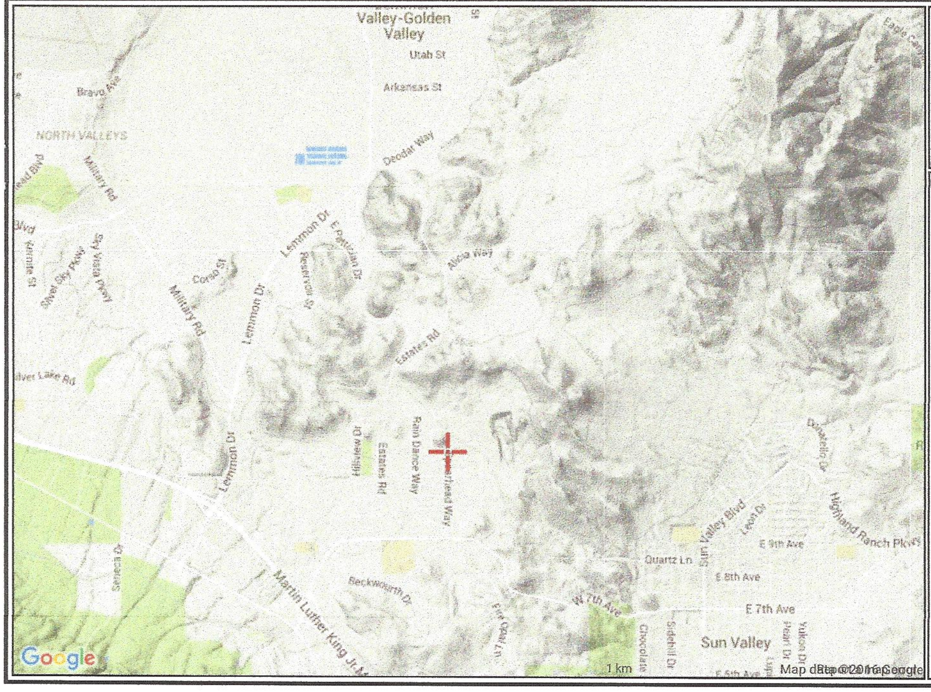
SELECT LOCATION

1. Manually:

a) **Enter location** (decimal degrees, use "-" for S and W): latitude: 39.617 longitude: "119.167" submit

b) **Select station** (click here for a list of stations used in frequency analysis for NV): select station

2. Use map:



a) Select location
(move crosshair or double click)

b) Click on station icon
(☐ show stations on map)

LOCATION INFORMATION:
Name: Reno, Nevada, US*
Latitude: 39.6174°
Longitude: -119.8174°
Elevation: 5171 ft*

* source: Google Maps

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 1, Version 5

PF tabular PF graphical Supplementary information Print Page

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.102** (0.086-0.118)	**0.127** (0.108-0.148)	**0.169** (0.145-0.199)	**0.210** (0.179-0.249)	**0.279** (0.232-0.336)	**0.344** (0.277-0.419)	**0.423** (0.330-0.523)	**0.518** (0.389-0.655)	**0.675** (0.478-0.883)	**0.821** (0.556-1.10)
10-min	**0.155** (0.132-0.179)	**0.193** (0.164-0.225)	**0.258** (0.220-0.303)	**0.320** (0.272-0.379)	**0.425** (0.353-0.511)	**0.524** (0.423-0.638)	**0.643** (0.502-0.796)	**0.789** (0.591-0.997)	**1.03** (0.728-1.35)	**1.25** (0.847-1.68)
15-min	**0.193** (0.163-0.221)	**0.239** (0.203-0.279)	**0.320** (0.272-0.376)	**0.397** (0.337-0.470)	**0.527** (0.438-0.633)	**0.650** (0.524-0.791)	**0.797** (0.622-0.986)	**0.978** (0.733-1.24)	**1.27** (0.902-1.67)	**1.55** (1.05-2.08)
30-min	**0.259** (0.219-0.298)	**0.322** (0.273-0.375)	**0.430** (0.367-0.507)	**0.535** (0.454-0.633)	**0.710** (0.589-0.853)	**0.875** (0.705-1.07)	**1.07** (0.838-1.33)	**1.32** (0.987-1.67)	**1.72** (1.21-2.25)	**2.09** (1.41-2.80)
60-min	**0.321** (0.271-0.369)	**0.399** (0.338-0.465)	**0.533** (0.454-0.627)	**0.662** (0.562-0.783)	**0.879** (0.729-1.06)	**1.08** (0.873-1.32)	**1.33** (1.04-1.64)	**1.63** (1.22-2.06)	**2.12** (1.50-2.78)	**2.58** (1.75-3.46)
2-hr	**0.424** (0.376-0.485)	**0.526** (0.469-0.604)	**0.675** (0.593-0.775)	**0.804** (0.698-0.925)	**1.01** (0.851-1.17)	**1.19** (0.981-1.40)	**1.40** (1.13-1.67)	**1.68** (1.31-2.08)	**2.21** (1.63-2.81)	**2.70** (1.92-3.50)
3-hr	**0.518** (0.465-0.584)	**0.643** (0.581-0.729)	**0.803** (0.721-0.909)	**0.935** (0.830-1.06)	**1.12** (0.980-1.28)	**1.29** (1.11-1.48)	**1.49** (1.25-1.74)	**1.77** (1.46-2.10)	**2.26** (1.81-2.83)	**2.72** (2.12-3.53)
6-hr	**0.755** (0.682-0.845)	**0.943** (0.850-1.06)	**1.16** (1.04-1.30)	**1.33** (1.19-1.49)	**1.55** (1.37-1.75)	**1.71** (1.49-1.95)	**1.88** (1.61-2.16)	**2.08** (1.76-2.42)	**2.49** (2.06-2.94)	**2.91** (2.37-3.57)
12-hr	**1.03** (0.930-1.15)	**1.29** (1.17-1.45)	**1.62** (1.46-1.82)	**1.88** (1.68-2.11)	**2.22** (1.96-2.51)	**2.49** (2.16-2.83)	**2.75** (2.36-3.17)	**3.02** (2.55-3.51)	**3.37** (2.77-4.01)	**3.68** (2.96-4.43)
24-hr	**1.37** (1.23-1.54)	**1.72** (1.54-1.93)	**2.19** (1.96-2.45)	**2.57** (2.30-2.88)	**3.10** (2.75-3.48)	**3.52** (3.10-3.97)	**3.97** (3.46-4.50)	**4.43** (3.83-5.06)	**5.08** (4.31-5.85)	**5.60** (4.67-6.51)
2-day	**1.68**	**2.12**	**2.74**	**3.25**	**3.97**	**4.56**	**5.18**	**5.84**	**6.77**	**7.53**

CURVE NUMBER CALCULATION WORKSHEET

PROJECT: Golden Mesa
SUBBASIN: GMN-1
AREA, AC.: 59.94
CALCULATED BY: DEW

HSG	LAND USE & CONDITION	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	1 acre lots	9.14	0.152	51	7.8	
C	1 acre lots	50.80	0.848	79	67.0	
			0.000		0.0	
			0.000		0.0	
		59.94	1.000			
			FINAL CN VALUE:		**74.7**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-2
AREA, AC.: 20.47
CALCULATED BY: DEW

HSG	LAND USE & CONDITION	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	1-acre lots	0.00	0.000	51	0.0	
C	1-acre lots	20.47	1.000	79	79.0	
D	1-acre lots	0.00	0.000	84	0.0	
			0.000		0.0	
			0.000		0.0	
		20.47	1.000			
			FINAL CN VALUE:		**79.0**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-3
AREA, AC.: 178.13
CALCULATED BY: DEW

HSG	LAND USE & CONDITION	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	Brush/fair cond.	52.13	0.293	35	10.2	
C	Brush/fair cond.	10.30	0.058	70	4.0	
D	Brush/fair cond.	86.80	0.487	77	37.5	
None	Brush/fair cond.	28.90	0.162	77	12.5	
			0.000		0.0	
			0.000		0.0	
		178.13	1.000			
			FINAL CN VALUE:		**64.3**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

CURVE NUMBER CALCULATION WORKSHEET

PROJECT: Golden Mesa
SUBBASIN: GMN-4
AREA, AC.: 149.18
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	1 acre lots	29.35	0.197	51	10.0	
D	1 acre lots	9.85	0.066	84	5.5	
A	Brush/fair	29.65	0.199	35	7.0	
D	Brush/fair	80.15	0.537	77	41.4	
			0.000			
		149.00	0.999			
		FINAL CN VALUE:			**63.9**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-5A
AREA, AC.: 44.5
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	Brush/fair	0.00	0.000	35	0.0	
C	Brush/fair	17.90	0.402	70	28.2	
D	Brush/fair	26.60	0.598	77	46.0	
		0.00	0.000	77	0.0	
			0.000		0.0	
		44.50	1.000			
		FINAL CN VALUE:			**74.2**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-6
AREA, AC.: 7.93
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	Brush/fair	0.00	0.000	35	0.0	
C	Brush/fair	0.21	0.026	70	1.9	
D	Brush/fair	7.71	0.972	77	74.9	
			0.000		0.0	
		7.92	0.999			
		FINAL CN VALUE:			**76.7**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

CURVE NUMBER CALCULATION WORKSHEET

PROJECT: Golden Mesa
SUBBASIN: GMN-7
AREA, AC.: 40.02
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	1 acre lots	35.60	0.890	51	45.4	
C	1 acre lots	4.42	0.110	79	8.7	
			0.000		0.0	
			0.000		0.0	
		40.02	1.000			

FINAL CN VALUE: **54.1**

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-8
AREA, AC.: 17.4
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	1-acre lots	15.79	0.907	51	46.3	
C	1-acre lots	1.43	0.082	79	6.5	
D	1-acre lots	0.18	0.010	84	0.9	
			0.000		0.0	
			0.000		0.0	
		17.40	1.000			

FINAL CN VALUE: **53.6**

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-9 Existing conditions
AREA, AC.: 97.45
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	Brush/fair	18.62	0.191	35	6.7	
C	Brush/fair	60.74	0.623	70	43.6	
D	Brush/fair	18.09	0.186	77	14.3	
			0.000		0.0	
			0.000		0.0	
		97.45	1.000			

FINAL CN VALUE: **64.6**

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

CURVE NUMBER CALCULATION WORKSHEET

PROJECT: Golden Mesa
SUBBASIN: GMN-10
AREA, AC.: 3.87
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	1 acre lots	0.00	0.000	51	0.0	
C	1 acre lots	3.87	1.000	79	79.0	
			0.000		0.0	
			0.000		0.0	
		3.87	1.000			
		FINAL CN VALUE:			**79.0**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-11 Existing conditions
AREA, AC.: 34.05
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	Brush/fair	0.00	0.000	51	0.0	
C	Brush/fair	34.05	1.000	70	70.0	
D	Brush/fair	0.00	0.000	84	0.0	
			0.000		0.0	
			0.000		0.0	
		34.05	1.000			
		FINAL CN VALUE:			**70.0**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN:
AREA, AC.: 1
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
		0.00	0.000	35	0.0	
		0.00	0.000	70	0.0	
		0.00	0.000	77	0.0	
		0.00	0.000	77	0.0	
			0.000		0.0	
			0.000		0.0	
		0.00	0.000			
		FINAL CN VALUE:			**0.0**	

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

CURVE NUMBER CALCULATION WORKSHEET

PROJECT: Golden Mesa
SUBBASIN: GMN-9 Proposed conditions
AREA, AC.: 97.45
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	.75 acre lot:	18.62	0.191	53	10.1	
C	.75 acre lot:	60.74	0.623	80	49.9	
D	.75 acre lot:	18.09	0.186	85	15.8	
			0.000		0.0	
		97.45	1.000			

FINAL CN VALUE: **75.8**

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-11 Proposed conditions
AREA, AC.: 34.05
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	.75 acre lot:	0.00	0.000	53	0.0	
C	.75 acre lot:	34.05	1.000	80	80.0	
D	.75 acre lot:	0.00	0.000	85	0.0	
			0.000		0.0	
			0.000		0.0	
		34.05	1.000			

FINAL CN VALUE: **80.0**

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

PROJECT: Golden Mesa
SUBBASIN: GMN-5B Existing conditions
AREA, AC.: 49.07
CALCULATED BY: DEW

HSG	LAND USE CONDITIO	AREA, ACRES	FRACTION OF AREA	CN*	WTD. CN	REMARKS
A	Brush/fair	14.00	0.285	35	10.0	
C	Brush/fair	9.48	0.193	70	13.5	
D	Brush/fair	22.68	0.462	77	35.6	
None		2.90	0.059	77	4.6	Bare rock
			0.000		0.0	
		49.06	1.000			

FINAL CN VALUE: **63.6**

*Curve number values based on Truckee Meadows Regional Drainage Manual (2009)

TIME OF CONCENTRATION CALCULATIONS

PROJECT:

SUB-BASIN			**INITIAL/OVERLAND TIME**			**TRAVEL TIME, t_t**					**URANIZED BASINS CHECK**		**FINAL**
DATA					t_i	**L,**	**S,**	**Vel,**	**TRAVEL TIME,**	t_c	**TOTAL**	t_c	t_c
NAME	**CN**	**R**	**L, FT**	**S, %**	**TIME, t_i**	**ft**	**%**	**ft/sec**	**tt , min**	t_i+t_t	**LENGTH, FT**		**min**
GMN-1	75	0.6	400	6	9.965121	2656	2.6	2.4	18.444	28.410	3056.000	26.978	27
GMN-2	79	0.65	122	2.5	6.571039	3374	1.8	2	28.117	34.688	3496.000	29.422	29
GMN-3*	62	0.43		>10%			>10%						*
GMN-4*	65	0.47		>10%			>10%				0.000		*
GMN-5*	69	0.52		>10%			>10%				0.000		*
GMN-6*	77	0.63		>10%			>10%				0.000		*
GMN-7	53	0.31	347	5.2	15.38166	1653	2.9	2.6	10.596	25.978	2000.000	21.111	21
GMN-8	54	0.32	65	3.1	7.764484	581	2.8	2.5	3.873	11.638	646.000	13.589	12
GMN-9	65	0.47	365	3.3	14.65637	3351	3.9	3	18.617	33.273	3716.000	30.644	31
GMN-10	79	0.65	0	1	0	640	1.7	2	5.333	5.333	640.000	13.556	5
GMN-11	70	0.53	287	2.8	12.28762	1632	7.7	4	6.800	19.088	1919.000	20.661	19
							DEVELOPED AREAS						
GMN-9	76	0.61	365	3.3	11.28912	3657	2	2.9	21.017	32.306	4022.000	32.344	32
GMN-11	80	0.67	339	3	10.00949	1508	2	2.9	8.667	18.676	1847.000	20.261	19
		-0.39			#DIV/0!								

$t_i = ((1.8)(1.1\text{-}R))(L^{\wedge}.5/S^{\wedge}.33)$

R= (.0132*CN)-0.39

Velocity for travel time calculations from Fig. 701 in TMRDM

Urbanized basins check: $t_c = (L/180)+10$

* See sheet for watersheds with slopes >10%.

LAG TIMES FOR WATERSHEDS WITH SLOPES GREATER THAN 10%

Watershed*	Watercourse Length (L), miles	Length to Centroid (L_c), miles	Upper Elev., ft	Lower Elev., ft	Elevation Change, ft	Average Slope (S), ft/mi	Roughness (Kn)	Lag Time (TLAG)hours	Urban Watershed Chec k (TLAG)hours
GMN-3	0.78	0.44	5760	5180	580	744	0.08	0.42	0.55
GMN-4	0.71	0.34	5840	5180	660	930	0.08	0.36	0.51
GMN-5A	0.45	0.23	5638	5180	458	1018	0.07	0.23	0.39
GMN-5B	0.41	0.23	5560	5160	400	976	0.07	0.23	0.37
GMN-6	0.21	0.11	5292	5262	30	143	0.07	0.20	0.27

$TLAG = 22.1(K_n)((L*(L_c/S^{.5}))^{.33}$ Equation 710 in Truckee Meadows Regional Drainage Manual

APPENDIX C

HEC-1 MODELS

5-YEAR EXISTING CONDITIONS

```
1*****************************************                                           ****************************************
 *                                       *                                           *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                           *   U.S. ARMY CORPS OF ENGINEERS       *
 *        JUN 1998 AND FEB 2010          *                                           *   HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1R               *                                           *         609 SECOND STREET            *
 *      RGMHEC2000 WWW.HEC-1.COM         *                                           *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   05DEC16  TIME  09:25:16   *                                           *          (916) 756-1104              *
 *                                       *                                           *                                      *
 *****************************************                                           ****************************************


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


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

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


1                                                HEC-1 INPUT                                                   PAGE  1

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

                        *DDIAGRAM
            1           ID  ========================================================================
            2           ID  MODEL TO DETERMINE FLOW RATES FOR GOLDEN MESA NORTH
            3           ID
            4           ID        EXISTING CONDITIONS MODEL
            5           ID
            6           ID       MODEL NAME GMN5E.DAT
            7           ID  5 YR24 HR PRECIP    WITH UPDATED AREAS
            8           ID  DATE:JUNE 2016 *********************************************
            9           ID    **********************************************************************
           10           ID
           11           ID
                        *      **********************************************************************
           12           IT      1                2880
           13           IN     15
           14           IO      5
           15           JR     PREC       1
                        *   *************************************************************************
                        *   *************************************************************************
                        *   *************************************************************************
                        *    JD CARDS WILL BE REPLACED WITH A JR CARD TO CORRECT THIS PR  OBLEM.
                        *    USERS OF THIS MODEL SHOULD CAREFULLY SELECT AN APPROPRIATE DARF FOR    EACH
                        *    CONCENTRATION POINTS. IT SHOULD BE NOTED THAT WHEN FLOW IS COMBINED    WITH
                        *    DIVERSION FLOWS, CALCULATED COMBINED TOTAL AREA MAY NOT BE APPROPRI     ATE
                        *    TO BE USED IN SELECTING DARF.
                        *   *************************************************************************
                        *   *************************************************************************
                        *        DARF         AREA (SQ.     MI.)
                        *        1.00            0 -  2
                        *        0.99          2.1 -  8
                        *        0.98          8.1 - 16
                        *        0.97         16.1 - 29
                        *        0.96         29.1 - 43
                        *        0.95         43.1 - 63
                        *        0.94         63.1 - 98
                        *   *************************************************************************
           16           JR     PREC     1.0     0.99     0.98     0.97
                        *   *************************************************************************
                        *   *************************************************************************
                        *     BEGIN NIMBUS 90 MODEL - SP  R1.705
                        *     NO MODIFICATIONS M      ADE
                        *   *************************************************************************

           17           KK   GMN5B    RUNOFF FROM WATERSHED GMN5B
           18           BA    .077
           19           PH       1       0     .169     .320     .533     .675     .803     1.16     1.62     2.19
           20           LS                64
           21           UD    0.23

           22           KK  ROUT-1ROUTE GMN5B  TO OUTLET OF GMN9
           23           RK    2300    .019    0.07            TRAP       4       3
1                                                HEC-1 INPUT                                                   PAGE  2

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


           24           KK   GMN5A    RUNOFF FROM WATERSHED GMN5A
           25           BA    .069
           26           LS                74
           27           UD     .24

           28           KK  ROUT-1ROUTE GMN5B  TO OUTLET OF GMN9
```

```
             29           RD    2300    .019    0.07            TRAP       4       3

             30           KK    CP-1        COMBINE GMN5A & GMN5B
             31           HC       2

             32           KK    GMN6 RUNOFF FROM GMN6
             33           BA    .012
             34           LS              77
             35           UD      .2

             36           KK    GMN8RUNOFF FROM GMN 8
             37           BA    .027
             38           LS              54
             39           UD     .12

             40           KK    CP-2        COMBINE GMN5, GMN6, & GMN8
             41           HC       3

             42           KK    GMN9        RUNOFF FROM GMN9 UNDEVELOPED
             43           BA    .152
             44           LS              65
             45           UD     .31

             46           KK    CP-3COMBINE FLOWS AT SW CORN OF GMN9
             47           KM   FLOW EXITING PROJECT SITE
             48           HC       2

             49           KK   GMN10        RUNOFF FROM GMN10
             50           BA    .006
             51           LS              79
             52           UD     .05

             53           KK    CP-4COMBINE RUNOFF FROM PROJECT SITE W/ GMN10
             54           HC       2

             55           KK    GMN4        RUNOFF FROM GMN4
             56           BA    .233
             57           LS              64
             58           UD     .36

             59           KK  ROUT-3        ROUTE GMN4 ACROSS GMN7
             60           RD     960    .008    0.07            TRAP       2       3
1                                                      HEC-1 INPUT                                             PAGE  3

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


             61           KK    GMN7        RUNOFF FROM GMN7
             62           BA    .063
             63           LS              54
             64           UD     .21

             65           KK    CP-5
             66           HC       2

             67           KK  ROUT-4        ROUTE FLOW THRU GMN2
             68           RD    1800    .004     .05            TRAP       2       1

             69           KK    GMN2        RUNOFF FROM GMN2
             70           BA    .032
             71           LS              79
             72           UD     .29

             73           KK    CP-6
             74           HC       2

             75           KK    CP-7        TOTAL FLOW AT INDIAN LANE & ESTATES ROAD
             76           HC       2

             77           KK    GMN3        RUNOFF FROM GMN3
             78           BA    .278
             79           LS              64
             80           UD     .42

             81           KK    GMN1        RUNOFF FROM GMN1
             82           BA    .094
             83           LS              75
             84           UD     .27

             85           KK    CP-8        COMBINE GMN3 & 1AT WEST BNDRY OF GMN11
             86           HC       2

             87           KK   GMN11        RUNOFF FROM GMN11
             88           KM  GMN UNDEVELOPED
             89           BA    .053
             90           LS              70
             91           UD     .19

             92           KK    CP-9        COMBINE GMN3 & 1WITH GMN11
             93           HC       2

             94           KK   CP-10        COMBINE ALL FLOWS AT BNDRY OF SOUTH PARCEL
             95           HC       2
             96           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE       (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

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

```
    17      GMN5B
                V
                V
    22     ROUT-1
                .
                .
    24          .       GMN5A
                .           V
                .           V
    28          .      ROUT-1
                .           .
                .           .
    30       CP-1............
                .
                .
    32          .        GMN6
                .           .
                .           .
    36          .           .        GMN8
                .           .           .
                .           .           .
    40       CP-2........................
                .
                .
    42          .        GMN9
                .           .
                .           .
    46       CP-3............
                .
                .
    49          .       GMN10
                .           .
                .           .
    53       CP-4............
                .
                .
    55          .        GMN4
                .           V
                .           V
    59          .      ROUT-3
                .           .
                .           .
    61          .           .        GMN7
                .           .           .
                .           .           .
    65          .        CP-5............
                .           V
                .           V
    67          .      ROUT-4
                .           .
                .           .
    69          .           .        GMN2
                .           .           .
                .           .           .
    73          .        CP-6............
                .           .
                .           .
    75       CP-7............
                .
                .
    77          .        GMN3
                .           .
                .           .
    81          .           .        GMN1
                .           .           .
                .           .           .
    85          .        CP-8............
                .           .
                .           .
    87          .           .       GMN11
                .           .           .
                .           .           .
    92          .        CP-9............
                .           .
                .           .
    94      CP-10............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                ****************************************
 *                                       *                                                *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                *   U.S. ARMY CORPS OF ENGINEERS       *
 *       JUN 1998 AND FEB 2010           *                                                *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1R                *                                                *         609 SECOND STREET            *
 *     RGMHEC2000 WWW.HEC-1.COM          *                                                *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05DEC16  TIME  09:25:16   *                                                *            (916) 756-1104            *
 *                                       *                                                *                                      *
 *****************************************                                                ****************************************



                          ======================================================================
                          MODEL TO DETERMINE FLOW RATES FOR GOLDEN MESA NORTH

                                EXISTING CONDITIONS MODEL

                               MODEL NAME GMN5E.DAT
                          5 YR24 HR PRECIP    WITH UPDATED AREAS
```

```
                           DATE:JUNE 2016 *********************************************
                             ************************************************************************



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

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

      IT          HYDROGRAPH TIME DATA
                         NMIN          1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     1    0  STARTING DATE
                        ITIME       0000  STARTING TIME
                           NQ       2000  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     2    0  ENDING DATE
                       NDTIME       0919  ENDING TIME
                        ICENT         19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   33.32 HOURS

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

      JP          MULTI-PLAN OPTION
                        NPLAN          1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00       .99       .98       .97

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000


          *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1




          *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1




          *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1




          *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1




          *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1




          *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1




          *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1



 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000
1
```

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


                                                                RATIOS APPLIED TO PRECIPITATION
 OPERATION        STATION       AREA    PLAN              RATIO 1  RATIO 2  RATIO 3  RATIO 4
                                                            1.00      .99      .98      .97

 HYDROGRAPH AT
+                   GMN5B       .077      1     FLOW         .89      .83      .80      .77
                                                TIME       12.43    14.95    15.00    15.02

 ROUTED TO
+                  ROUT-1       .077      1     FLOW         .89      .83      .80      .77
                                                TIME       12.88    15.40    15.40    15.42

 HYDROGRAPH AT
+                   GMN5A       .069      1     FLOW        8.38     8.10     7.83     7.55
                                                TIME       12.28    12.30    12.30    12.30

 ROUTED TO
+                  ROUT-1       .069      1     FLOW        8.32     8.04     7.77     7.49
                                                TIME       12.55    12.55    12.55    12.55

  2 COMBINED AT
+                    CP-1       .146      1     FLOW        8.32     8.04     7.77     7.49
                                                TIME       12.55    12.55    12.55    12.55

 HYDROGRAPH AT
+                    GMN6       .012      1     FLOW        2.23     2.17     2.11     2.05
                                                TIME       12.23    12.23    12.23    12.23

 HYDROGRAPH AT
+                    GMN8       .027      1     FLOW         .07      .07      .06      .06
                                                TIME       23.68    23.77    23.63    23.88

  3 COMBINED AT
+                    CP-2       .185      1     FLOW        9.26     8.94     8.63     8.34
                                                TIME       12.53    12.53    12.55    12.55

 HYDROGRAPH AT
+                    GMN9       .152      1     FLOW        2.32     2.11     1.92     1.73
                                                TIME       12.52    12.52    12.53    12.55

  2 COMBINED AT
+                    CP-3       .337      1     FLOW       11.57    11.06    10.55    10.07
                                                TIME       12.53    12.53    12.55    12.55

 HYDROGRAPH AT
+                   GMN10       .006      1     FLOW        2.26     2.20     2.15     2.09
                                                TIME       12.07    12.07    12.07    12.07

  2 COMBINED AT
+                    CP-4       .343      1     FLOW       11.87    11.35    10.84    10.35
                                                TIME       12.53    12.53    12.53    12.55

 HYDROGRAPH AT
+                    GMN4       .233      1     FLOW        2.61     2.51     2.41     2.31
                                                TIME       15.00    15.03    15.03    15.05

 ROUTED TO
+                  ROUT-3       .233      1     FLOW        2.61     2.51     2.41     2.31
                                                TIME       15.22    15.20    15.23    15.23

 HYDROGRAPH AT
+                    GMN7       .063      1     FLOW         .17      .16      .15      .14
                                                TIME       23.97    23.97    23.87    23.93

  2 COMBINED AT
+                    CP-5       .296      1     FLOW        2.61     2.51     2.41     2.31
                                                TIME       15.22    15.20    15.23    15.23

 ROUTED TO
+                  ROUT-4       .296      1     FLOW        2.61     2.51     2.41     2.31
                                                TIME       15.45    15.48    15.52    15.55

 HYDROGRAPH AT
+                    GMN2       .032      1     FLOW        5.85     5.71     5.56     5.42
                                                TIME       12.33    12.33    12.33    12.33

  2 COMBINED AT
+                    CP-6       .328      1     FLOW        5.85     5.71     5.56     5.42
                                                TIME       12.33    12.33    12.33    12.33

  2 COMBINED AT
+                    CP-7       .671      1     FLOW       16.16    15.49    14.83    14.21
                                                TIME       12.50    12.50    12.52    12.52

 HYDROGRAPH AT
+                    GMN3       .278      1     FLOW        3.11     2.99     2.87     2.75
                                                TIME       15.03    15.07    15.08    15.10

 HYDROGRAPH AT
+                    GMN1       .094      1     FLOW       12.03    11.65    11.28    10.91
                                                TIME       12.32    12.32    12.32    12.32

  2 COMBINED AT
+                    CP-8       .372      1     FLOW       12.88    12.36    11.86    11.38
                                                TIME       12.35    12.33    12.33    12.33
```

```
 HYDROGRAPH AT
+                  GMN11      .053     1   FLOW        3.99     3.79     3.60     3.40
                                           TIME       12.25    12.25    12.25    12.27

  2 COMBINED AT
+                   CP-9      .425     1   FLOW       16.47    15.80    15.14    14.51
                                           TIME       12.32    12.32    12.32    12.32

  2 COMBINED AT
+                  CP-10     1.096     1   FLOW       29.52    28.18    26.88    25.61
                                           TIME       12.47    12.47    12.47    12.47
1
                                           SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                               (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                   INTERPOLATED TO
                                                                                COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO      VOLUME      DT        PEAK    TIME TO     VOLUME
                                                      PEAK                                        PEAK

                                 (MIN)     (CFS)      (MIN)      (IN)      (MIN)     (CFS)     (MIN)       (IN)

           FOR PLAN = 1  RATIO= 1.00
             ROUT-1  MANE         1.00        .89   773.34       .17      1.00        .89   773.00          .17


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6960E+00 EXCESS= .0000E+00 OUTFLOW= .6996E+00 BASIN STORAGE= .6168E-05 PERCENT ERROR=   -.5


           FOR PLAN = 1  RATIO=  .99
             ROUT-1  MANE         1.00        .83   927.60       .16      1.00        .83   928.00          .16


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6698E+00 EXCESS= .0000E+00 OUTFLOW= .6743E+00 BASIN STORAGE= .6132E-05 PERCENT ERROR=   -.7


           FOR PLAN = 1  RATIO=  .98
             ROUT-1  MANE         1.00        .80   928.51       .16      1.00        .80   928.00          .16


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6441E+00 EXCESS= .0000E+00 OUTFLOW= .6483E+00 BASIN STORAGE= .6382E-05 PERCENT ERROR=   -.6


           FOR PLAN = 1  RATIO=  .97
             ROUT-1  MANE         1.00        .77   929.26       .15      1.00        .77   929.00          .15


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6188E+00 EXCESS= .0000E+00 OUTFLOW= .6227E+00 BASIN STORAGE= .6123E-05 PERCENT ERROR=   -.6


           FOR PLAN = 1  RATIO=  .00
             ROUT-1  MANE         1.00       8.32   753.00       .44      1.00       8.32   753.00          .44


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1627E+01 EXCESS= .0000E+00 OUTFLOW= .1627E+01 BASIN STORAGE= .1911E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
             ROUT-1  MANE         1.00       8.04   753.00       .43      1.00       8.04   753.00          .43


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1587E+01 EXCESS= .0000E+00 OUTFLOW= .1586E+01 BASIN STORAGE= .1859E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
             ROUT-1  MANE         1.00       7.77   753.00       .42      1.00       7.77   753.00          .42


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1547E+01 EXCESS= .0000E+00 OUTFLOW= .1546E+01 BASIN STORAGE= .1814E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
             ROUT-1  MANE         1.00       7.49   753.00       .41      1.00       7.49   753.00          .41


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1507E+01 EXCESS= .0000E+00 OUTFLOW= .1506E+01 BASIN STORAGE= .1747E-02 PERCENT ERROR=   -.1


           FOR PLAN = 1  RATIO=  .00
             ROUT-3  MANE         1.00       2.61   914.00       .17      1.00       2.61   914.00          .17


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2104E+01 EXCESS= .0000E+00 OUTFLOW= .2104E+01 BASIN STORAGE= .8810E-03 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
             ROUT-3  MANE         1.00       2.51   915.00       .16      1.00       2.51   915.00          .16


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2025E+01 EXCESS= .0000E+00 OUTFLOW= .2025E+01 BASIN STORAGE= .9657E-03 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
             ROUT-3  MANE         1.00       2.41   916.00       .16      1.00       2.41   916.00          .16


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1947E+01 EXCESS= .0000E+00 OUTFLOW= .1947E+01 BASIN STORAGE= .9363E-03 PERCENT ERROR=    .0


           FOR PLAN = 1  RATIO=  .00
```

100-YEAR EXISTING CONDITIONS

```
1*****************************************                              ***************************************** 
 *                                       *                              *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                              *   U.S. ARMY CORPS OF ENGINEERERS      *
 *        JUN 1998 AND FEB 2010          *                              *   HYDROLOGIC ENGINEERING CENTER       *
 *            VERSION 4.1R               *                              *          609 SECOND STREET            *
 *      RGMHEC2000 WWW.HEC-1.COM         *                              *      DAVIS, CALIFORNIA 95616          *
 *  RUN DATE   05DEC16  TIME  09:20:21   *                              *          (916) 756-1104               *
 *                                       *                              *                                       *
 *****************************************                              *****************************************



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


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

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

1                                      HEC-1 INPUT                                                   PAGE  1

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

                        *DDIAGRAM
             1          ID  ========================================================================
             2          ID  MODEL TO DETERMINE FLOW RATES FOR GOLDEN MESA NORTH
             3          ID
             4          ID        EXISTING CONDITIONS MODEL
             5          ID
             6          ID       MODEL NAME GMN1E.DAT
             7          ID  100 YR24 HR PRECIP    WITH UPDATED AREAS
             8          ID  DATE:JUNE 2016 ********************************************
             9          ID    ********************************************************************
            10          ID
            11          ID
                        *       ********************************************************************
            12          IT       1                  2880
            13          IN      15
            14          IO       5
            15          JR    PREC       1
                        *   ***********************************************************************
                        *   ***********************************************************************
                        *   ***********************************************************************
                        *    JD CARDS WILL BE REPLACED WITH A JR CARD TO CORRECT THIS PR  OBLEM.
                        *    USERS OF THIS MODEL SHOULD CAREFULLY SELECT AN APPROPRIATE DARF FOR    EACH
                        *    CONCENTRATION POINTS. IT SHOULD BE NOTED THAT WHEN FLOW IS COMBINED    WITH
                        *    DIVERSION FLOWS, CALCULATED COMBINED TOTAL AREA MAY NOT BE APPROPRI     ATE
                        *    TO BE USED IN SELECTING DARF.
                        *   ***********************************************************************
                        *   ***********************************************************************
                        *        DARF         AREA (SQ.     MI.)
                        *        1.00            0 -  2
                        *        0.99          2.1 -  8
                        *        0.98          8.1 - 16
                        *        0.97         16.1 - 29
                        *        0.96         29.1 - 43
                        *        0.95         43.1 - 63
                        *        0.94         63.1 - 98
                        *   ***********************************************************************
            16          JR    PREC     1.0     0.99     0.98     0.97
                        *   ***********************************************************************
                        *   ***********************************************************************
                        *     BEGIN NIMBUS 90 MODEL - SP  R1.705
                        *     NO MODIFICATIONS M      ADE
                        *   ***********************************************************************

            17          KK   GMN5B    RUNOFF FROM WATERSHED GMN5B
            18          BA    .077
            19          PH       1       0    .423    .797    1.33    1.40    1.49    1.88    2.75    3.97
            20          LS              64
            21          UD    0.23

            22          KK  ROUT-1ROUTE GMN5B  TO OUTLET OF GMN9
            23          RD    2300    .019    0.07            TRAP       4       3
1                                        HEC-1 INPUT                                                   PAGE  2

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


            24          KK   GMN5A    RUNOFF FROM WATERSHED GMN5A
            25          BA    .069
            26          LS              74
            27          UD     .24

            28          KK  ROUT-1ROUTE GMN5B  TO OUTLET OF GMN9
            29          RD    2337    .028    0.07            TRAP       4       3

            30          KK    CP-1        COMBINE GMN5A & GMN5B
            31          HC       2

            32          KK    GMN6 RUNOFF FROM GMN6
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             33          BA    .012
             34          LS              77
             35          UD      .2

             36          KK    GMN8RUNOFF FROM GMN 8
             37          BA    .027
             38          LS              54
             39          UD     .12

             40          KK    CP-2        COMBINE GMN5, GMN6, & GMN8
             41          HC       3

             42          KK    GMN9        RUNOFF FROM GMN9 UNDEVELOPED
             43          BA    .152
             44          LS              65
             45          UD     .31

             46          KK    CP-3COMBINE FLOWS AT SW CORN OF GMN9
             47          KM   FLOW EXITING PROJECT SITE
             48          HC       2

             49          KK   GMN10        RUNOFF FROM GMN10
             50          BA    .006
             51          LS              79
             52          UD     .05

             53          KK    CP-4COMBINE RUNOFF FROM PROJECT SITE W/ GMN10
             54          HC       2

             55          KK    GMN4        RUNOFF FROM GMN4
             56          BA    .233
             57          LS              64
             58          UD     .36

             59          KK  ROUT-3        ROUTE GMN4 ACROSS GMN7
             60          RD     960    .008    0.07           TRAP       2       3
1                                                     HEC-1 INPUT                                            PAGE  3

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

             61          KK    GMN7        RUNOFF FROM GMN7
             62          BA    .063
             63          LS              54
             64          UD     .21

             65          KK    CP-5
             66          HC       2

             67          KK  ROUT-4        ROUTE FLOW THRU GMN2
             68          RD    1800    .004     .05           TRAP       2       1

             69          KK    GMN2        RUNOFF FROM GMN2
             70          BA    .032
             71          LS              79
             72          UD     .29

             73          KK    CP-6
             74          HC       2

             75          KK    CP-7        TOTAL FLOW AT INDIAN LANE & ESTATES ROAD
             76          HC       2

             77          KK    GMN3        RUNOFF FROM GMN3
             78          BA    .278
             79          LS              64
             80          UD     .42

             81          KK    GMN1        RUNOFF FROM GMN1
             82          BA    .094
             83          LS              75
             84          UD     .27

             85          KK    CP-8        COMBINE GMN3 & 1AT WEST BNDRY OF GMN11
             86          HC       2

             87          KK   GMN11        RUNOFF FROM GMN11
             88          KM  GMN UNDEVELOPED
             89          BA    .053
             90          LS              70
             91          UD     .19

             92          KK    CP-9        COMBINE GMN3 & 1WITH GMN11
             93          HC       2

             94          KK   CP-10        COMBINE ALL FLOWS AT BNDRY OF SOUTH PARCEL
             95          HC       2
             96          ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

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

     17      GMN5B
                 V
                 V
     22     ROUT-1
                 .
                 .
     24          .      GMN5A
                 .          V
                 .          V
     28          .     ROUT-1
                 .          .
```

```
                 .           .
    30        CP-1............
                 .
                 .
    32           .        GMN6
                 .           .
                 .           .
    36           .           .        GMN8
                 .           .           .
                 .           .           .
    40        CP-2........................
                 .
                 .
    42           .        GMN9
                 .           .
                 .           .
    46        CP-3............
                 .
                 .
    49           .       GMN10
                 .           .
                 .           .
    53        CP-4............
                 .
                 .
    55           .        GMN4
                 .           V
                 .           V
    59           .      ROUT-3
                 .           .
                 .           .
    61           .           .        GMN7
                 .           .           .
                 .           .           .
    65           .        CP-5............
                 .           V
                 .           V
    67           .      ROUT-4
                 .           .
                 .           .
    69           .           .        GMN2
                 .           .           .
                 .           .           .
    73           .        CP-6............
                 .           .
                 .           .
    75        CP-7............
                 .
                 .
    77           .        GMN3
                 .           .
                 .           .
    81           .           .        GMN1
                 .           .           .
                 .           .           .
    85           .        CP-8............
                 .           .
                 .           .
    87           .           .       GMN11
                 .           .           .
                 .           .           .
    92           .        CP-9............
                 .           .
                 .           .
    94       CP-10............
 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                    ****************************************
 *                                       *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *        JUN 1998 AND FEB 2010          *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1R               *                                                    *          609 SECOND STREET           *
 *       RGMHEC2000 WWW.HEC-1.COM        *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   05DEC16  TIME  09:20:21   *                                                    *           (916) 756-1104             *
 *                                       *                                                    *                                      *
 *****************************************                                                    ****************************************



                           ========================================================================
                           MODEL TO DETERMINE FLOW RATES FOR GOLDEN MESA NORTH

                                 EXISTING CONDITIONS MODEL

                                MODEL NAME GMN1E.DAT
                           100 YR24 HR PRECIP    WITH UPDATED AREAS
                           DATE:JUNE 2016 **********************************************
                             *************************************************************************


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

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

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      2    0  ENDING DATE
```

```
                       NDTIME        0919  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   33.32 HOURS

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

      JP          MULTI-PLAN OPTION
                        NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00       .99       .98       .97

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000
1

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


                                                           RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA     PLAN            RATIO 1  RATIO 2  RATIO 3  RATIO 4
                                                        1.00      .99      .98      .97

 HYDROGRAPH AT
+                  GMN5B      .077      1    FLOW        30.89    30.02    29.15    28.29
                                             TIME        12.28    12.28    12.28    12.28

 ROUTED TO
+                 ROUT-1      .077      1    FLOW        30.63    29.77    28.92    28.06
                                             TIME        12.47    12.47    12.47    12.47

 HYDROGRAPH AT
+                  GMN5A      .069      1    FLOW        50.46    49.48    48.49    47.51
                                             TIME        12.28    12.28    12.28    12.28

 ROUTED TO
+                 ROUT-1      .069      1    FLOW        50.34    49.35    48.37    47.39
                                             TIME        12.42    12.42    12.42    12.42

  2 COMBINED AT
+                   CP-1      .146      1    FLOW        80.22    78.34    76.46    74.59
                                             TIME        12.43    12.43    12.43    12.43

 HYDROGRAPH AT
+                   GMN6      .012      1    FLOW        11.18    10.98    10.78    10.58
                                             TIME        12.23    12.23    12.23    12.23

 HYDROGRAPH AT
+                   GMN8      .027      1    FLOW         4.38     4.13     3.89     3.65
                                             TIME        12.20    12.20    12.20    12.20

  3 COMBINED AT
+                   CP-2      .185      1    FLOW        88.78    86.70    84.63    82.57
                                             TIME        12.43    12.43    12.43    12.43

 HYDROGRAPH AT
+                   GMN9      .152      1    FLOW        55.43    53.93    52.44    50.96
                                             TIME        12.37    12.37    12.37    12.37

  2 COMBINED AT
+                   CP-3      .337      1    FLOW       143.07   139.49   135.93   132.38
                                             TIME        12.42    12.42    12.42    12.42

 HYDROGRAPH AT
+                  GMN10      .006      1    FLOW        10.28    10.10     9.93     9.76
                                             TIME        12.07    12.07    12.07    12.07

  2 COMBINED AT
+                   CP-4      .343      1    FLOW       144.58   140.97   137.39   133.82
                                             TIME        12.42    12.42    12.42    12.42

 HYDROGRAPH AT
+                   GMN4      .233      1    FLOW        71.75    69.72    67.70    65.70
```

```
                                           TIME      12.43     12.43     12.43     12.43

 ROUTED TO
+                 ROUT-3      .233     1   FLOW      71.16     69.14     67.14     65.16
                                           TIME      12.52     12.52     12.52     12.52

 HYDROGRAPH AT
+                   GMN7      .063     1   FLOW       7.91      7.47      7.04      6.63
                                           TIME      12.32     12.32     12.32     12.32

  2 COMBINED AT
+                   CP-5      .296     1   FLOW      76.79     74.50     72.24     70.02
                                           TIME      12.50     12.50     12.52     12.52

 ROUTED TO
+                 ROUT-4      .296     1   FLOW      74.09     71.89     69.70     67.52
                                           TIME      12.65     12.65     12.65     12.65

 HYDROGRAPH AT
+                   GMN2      .032     1   FLOW      26.44     25.99     25.55     25.10
                                           TIME      12.33     12.33     12.33     12.33

  2 COMBINED AT
+                   CP-6      .328     1   FLOW      87.68     85.15     82.63     80.12
                                           TIME      12.62     12.62     12.62     12.62

  2 COMBINED AT
+                   CP-7      .671     1   FLOW     211.71    205.72    199.80    193.90
                                           TIME      12.47     12.48     12.48     12.48

 HYDROGRAPH AT
+                   GMN3      .278     1   FLOW      77.65     75.46     73.28     71.11
                                           TIME      12.50     12.50     12.50     12.50

 HYDROGRAPH AT
+                   GMN1      .094     1   FLOW      67.53     66.24     64.97     63.69
                                           TIME      12.32     12.32     12.32     12.32

  2 COMBINED AT
+                   CP-8      .372     1   FLOW     133.35    130.07    126.81    123.57
                                           TIME      12.38     12.38     12.38     12.38

 HYDROGRAPH AT
+                  GMN11      .053     1   FLOW      35.37     34.59     33.81     33.03
                                           TIME      12.23     12.23     12.23     12.23

  2 COMBINED AT
+                   CP-9      .425     1   FLOW     158.24    154.43    150.64    146.88
                                           TIME      12.35     12.35     12.35     12.35

  2 COMBINED AT
+                  CP-10     1.096     1   FLOW     359.77    349.86    340.02    330.30
                                           TIME      12.43     12.43     12.43     12.45
1
```

5-YEAR PROPOSED CONDITIONS

```
1****************************************                                        ***************************************
 *                                      *                                        *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                        *   U.S. ARMY CORPS OF ENGINEERS      *
 *        JUN 1998 AND FEB 2010         *                                        *   HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1R              *                                        *        609 SECOND STREET            *
 *        RGMHEC2000 WWW.HEC-1.COM      *                                        *     DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   05DEC16  TIME  09:37:09  *                                        *         (916) 756-1104              *
 *                                      *                                        *                                     *
 ****************************************                                        ***************************************



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



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

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


1                                                     HEC-1 INPUT                                                   PAGE  1

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

                        *DDIAGRAM
             1          ID  ==================================================================
             2          ID  MODEL TO DETERMINE FLOW RATES FOR GOLDEN MESA NORTH
             3          ID
             4          ID        PROPOSED CONDITIONS MODEL
             5          ID
             6          ID       MODEL NAME GMN5PL.DAT
             7          ID  100 YR24 HR PRECIP    WITH UPDATED AREAS
             8          ID  DATE:JUNE 2016 *******************************************
             9          ID    ********************************************************************
            10          ID
            11          ID
                        *      *********************************************************************
            12          IT      1                2880
            13          IN     15
            14          IO      5
            15          JR    PREC       1
                        *   **********************************************************************
                        *   **********************************************************************
                        *   **********************************************************************
                        *    JD CARDS WILL BE REPLACED WITH A JR CARD TO CORRECT THIS PR  OBLEM.
                        *    USERS OF THIS MODEL SHOULD CAREFULLY SELECT AN APPROPRIATE DARF FOR    EACH
                        *    CONCENTRATION POINTS. IT SHOULD BE NOTED THAT WHEN FLOW IS COMBINED    WITH
                        *    DIVERSION FLOWS, CALCULATED COMBINED TOTAL AREA MAY NOT BE APPROPRI     ATE
                        *    TO BE USED IN SELECTING DARF.
                        *   **********************************************************************
                        *   **********************************************************************
                        *       DARF         AREA (SQ.      MI.)
                        *       1.00             0 -  2
                        *       0.99           2.1 -  8
                        *       0.98           8.1 - 16
                        *       0.97          16.1 - 29
                        *       0.96          29.1 - 43
                        *       0.95          43.1 - 63
                        *       0.94          63.1 - 98
                        *   **********************************************************************
            16          JR    PREC     1.0    0.99
                        *   **********************************************************************
                        *   **********************************************************************
                        *     BEGIN NIMBUS 90 MODEL - SP  R1.705
                        *     NO MODIFICATIONS M      ADE
                        *   **********************************************************************

            17          KK   GMN5B    RUNOFF FROM WATERSHED GMN5B
            18          BA    .077
            19          PH       1       0    .167    .316    .527    .668    .795    1.15     1.6    2.19
            20          LS               64
            21          UD    0.23

            22          KK   GMN5A    RUNOFF FROM WATERSHED GMN5A
            23          BA    .069
            24          LS               74
            25          UD     .24
1                                                     HEC-1 INPUT                                                   PAGE  2

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


            26          KK  ROUT-1ROUTE GMN5A  TO DET BASIN A
            27          RD    1360    .015    .035            TRAP       2       3

            28          KK    CP-1         COMBINE GMN5A & GMN5B
            29          HC       2

            30          KK    DP-A         DET. POND A AT NW CORNER OF GMN9
            31          KM  OUTLET IS ONE 24" RCP
            32          RS       1    STOR       0
            33          SA      .1      .3      .4      .5      .6      .7      .8      .9     1.0
```

```
34           SQ       0       2       4       8      12      16      20      23      26
              35          SE       0      .5     1.0     1.5       2     2.5       3     3.5       4

              36          KK  ROUT-1ROUTE FLOW FROM DP-A TO SW CORNER OF GMN-9
              37          RD    2300    .019    0.07            TRAP       4       3

              38          KK    GMN6 RUNOFF FROM GMN6
              39          BA    .012
              40          LS                  77
              41          UD      .2

              42          KK    GMN8RUNOFF FROM GMN 8
              43          BA    .027
              44          LS                  54
              45          UD     .12

              46          KK    CP-2        COMBINE GMN5, GMN6, & GMN8
              47          HC       2

              48          KK    GMN9        RUNOFF FROM GMN9 UNDEVELOPED
              49          BA    .152
              50          LS                  76
              51          UD     .32

              52          KK    CP-3COMBINE FLOWS AT SW CORN OF GMN9
              53          KM   FLOW EXITING PROJECT SITE
              54          HC       2

              55          KK    DP-B        DET. POND AT SW CORNER OF GMN9
              56          KM  OUTLET IS  1-30" RCP  LOW FLOW & 2- 36" HIGH FLOW PIPES
              57          RS       1    STOR       0
              58          SA      .1      .3      .4      .5      .6      .7      .8      .9     1.0     1.2
              59          SE       0      .5       1     1.5       2     2.5     3.0     3.5       4       5
              60          SQ       0       6      11      28      59     117     165     215
              61          SE       0       1     1.6       2       3       4       5       6

              62          KK   GMN10        RUNOFF FROM GMN10
              63          BA    .006
              64          LS                  79
              65          UD     .05
1                                                       HEC-1 INPUT                                            PAGE  3

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


              66          KK    CP-4COMBINE RUNOFF FROM PROJECT SITE W/ GMN10
              67          HC       3

              68          KK    GMN4        RUNOFF FROM GMN4
              69          BA    .233
              70          LS                  64
              71          UD     .36

              72          KK  ROUT-3        ROUTE GMN4 ACROSS GMN7
              73          RD     960    .008    0.07            TRAP       2       3

              74          KK    GMN7        RUNOFF FROM GMN7
              75          BA    .063
              76          LS                  54
              77          UD     .21

              78          KK    CP-5
              79          HC       2

              80          KK  ROUT-4        ROUTE FLOW THRU GMN2
              81          RD    1800    .004     .05            TRAP       2       1

              82          KK    GMN2        RUNOFF FROM GMN2
              83          BA    .032
              84          LS                  79
              85          UD     .29

              86          KK    CP-6
              87          HC       2

              88          KK    CP-7        TOTAL FLOW AT INDIAN LANE & ESTATES ROAD
              89          HC       2

              90          KK    GMN3        RUNOFF FROM GMN3
              91          BA    .278
              92          LS                  64
              93          UD     .42

              94          KK    GMN1        RUNOFF FROM GMN1
              95          BA    .094
              96          LS                  75
              97          UD     .27

              98          KK    CP-8        COMBINE GMN3 & 1AT WEST BNDRY OF GMN11
              99          HC       2

             100          KK   GMN11        RUNOFF FROM GMN11
             101          KM  GMN 11DEVELOPED
             102          BA    .053
             103          LS                  80
             104          UD     .19
1                                                       HEC-1 INPUT                                            PAGE  4

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


             105          KK    CP-9        COMBINE GMN3 & 1WITH GMN11
             106          HC       2

             107          KK    DP-C        DET. POND  SOUTH OF GMN 11
             108          KM  OUTLET IS 2  36" RCP  LOW FLOW & 1-36" HIGH FLOW PIPES
```

```
            109           RS      1    STOR       0
            110           SA     .1      .4      .5      .6      .7      .8      .9     1.0     1.2     1.4
            111           SE      0      .5       1     1.5       2     2.5     3.0     3.5       4       5
            112           SQ      0       8      29      65     114     160     188
            113           SE      0      .2       2       3       4       5       6

            114           KK   CP-10        COMBINE ALL FLOWS AT BNDRY OF SOUTH PARCEL
            115           HC      2
            116           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   17        GMN5B
                 .
                 .
   22            .       GMN5A
                 .           V
                 .           V
   26            .      ROUT-1
                 .           .
                 .           .
   28         CP-1............
                 V
                 V
   30         DP-A
                 V
                 V
   36       ROUT-1
                 .
                 .
   38            .        GMN6
                 .           .
                 .           .
   42            .           .        GMN8
                 .           .           .
                 .           .           .
   46            .        CP-2............
                 .           .
                 .           .
   48            .           .        GMN9
                 .           .           .
                 .           .           .
   52            .        CP-3............
                 .           V
                 .           V
   55            .        DP-B
                 .           .
                 .           .
   62            .           .       GMN10
                 .           .           .
                 .           .           .
   66         CP-4........................
                 .
                 .
   68            .        GMN4
                 .           V
                 .           V
   72            .      ROUT-3
                 .           .
                 .           .
   74            .           .        GMN7
                 .           .           .
                 .           .           .
   78            .        CP-5............
                 .           V
                 .           V
   80            .      ROUT-4
                 .           .
                 .           .
   82            .           .        GMN2
                 .           .           .
                 .           .           .
   86            .        CP-6............
                 .           .
                 .           .
   88         CP-7............
                 .
                 .
   90            .        GMN3
                 .           .
                 .           .
   94            .           .        GMN1
                 .           .           .
                 .           .           .
   98            .        CP-8............
                 .           .
                 .           .
  100            .           .       GMN11
                 .           .           .
                 .           .           .
  105            .        CP-9............
                 .           V
                 .           V
  107            .        DP-C
                 .           .
                 .           .
  114        CP-10............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                   ****************************************
 *                                       *                                                   *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                   *    U.S. ARMY CORPS OF ENGINEERS      *
```

```
 *        JUN 1998 AND FEB 2010         *                                                   *    HYDROLOGIC ENGINEERING CENTER    *
 *             VERSION 4.1R             *                                                   *          609 SECOND STREET          *
 *       RGMHEC2000 WWW.HEC-1.COM       *                                                   *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   05DEC16  TIME  09:37:09  *                                                   *           (916) 756-1104            *
 *                                      *                                                   *                                     *
 ****************************************                                                   ***************************************




                           ========================================================================
                           MODEL TO DETERMINE FLOW RATES FOR GOLDEN MESA NORTH

                                 PROPOSED CONDITIONS MODEL

                                MODEL NAME GMN5PL.DAT
                           100 YR24 HR PRECIP    WITH UPDATED AREAS
                           DATE:JUNE 2016 *********************************************
                             **********************************************************************


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

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

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      2    0  ENDING DATE
                       NDTIME        0919  ENDING TIME
                        ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   33.32 HOURS

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

      JP          MULTI-PLAN OPTION
                        NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00       .99

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

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 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

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 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000

 VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667        24.00000
1

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


                                                           RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN              RATIO 1  RATIO 2
                                                          1.00      .99

 HYDROGRAPH AT
+                  GMN5B      .077     1   FLOW          .87      .82
                                           TIME        12.43    14.93

 HYDROGRAPH AT
+                  GMN5A      .069     1   FLOW         8.28     8.00
                                           TIME        12.28    12.28

 ROUTED TO
+                 ROUT-1      .069     1   FLOW         8.27     7.99
                                           TIME        12.38    12.38

  2 COMBINED AT
+                   CP-1      .146     1   FLOW         9.11     8.72
```

```
                                           TIME        12.38    12.40

 ROUTED TO
+                   DP-A      .146     1   FLOW         3.56     3.43
                                           TIME        12.87    12.87

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE         .89      .86
                                           TIME        12.88    12.88

 ROUTED TO
+                 ROUT-1      .146     1   FLOW         3.56     3.43
                                           TIME        13.18    13.20

 HYDROGRAPH AT
+                   GMN6      .012     1   FLOW         2.21     2.15
                                           TIME        12.23    12.23

 HYDROGRAPH AT
+                   GMN8      .027     1   FLOW          .07      .07
                                           TIME        23.73    23.98

  2 COMBINED AT
+                   CP-2      .039     1   FLOW         2.21     2.15
                                           TIME        12.23    12.23

 HYDROGRAPH AT
+                   GMN9      .152     1   FLOW        19.41    18.84
                                           TIME        12.37    12.37

  2 COMBINED AT
+                   CP-3      .191     1   FLOW        21.07    20.47
                                           TIME        12.37    12.37

 ROUTED TO
+                   DP-B      .191     1   FLOW        10.82    10.54
                                           TIME        12.72    12.72

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE        1.58     1.54
                                           TIME        12.73    12.73

 HYDROGRAPH AT
+                  GMN10      .006     1   FLOW         2.23     2.17
                                           TIME        12.07    12.07

  3 COMBINED AT
+                   CP-4      .343     1   FLOW        13.84    13.44
                                           TIME        12.90    12.90

 HYDROGRAPH AT
+                   GMN4      .233     1   FLOW         2.58     2.48
                                           TIME        15.05    15.07

 ROUTED TO
+                 ROUT-3      .233     1   FLOW         2.58     2.48
                                           TIME        15.20    15.20

 HYDROGRAPH AT
+                   GMN7      .063     1   FLOW          .17      .17
                                           TIME        23.98    23.88

  2 COMBINED AT
+                   CP-5      .296     1   FLOW         2.58     2.48
                                           TIME        15.20    15.20

 ROUTED TO
+                 ROUT-4      .296     1   FLOW         2.57     2.47
                                           TIME        15.50    15.50

 HYDROGRAPH AT
+                   GMN2      .032     1   FLOW         5.78     5.64
                                           TIME        12.33    12.33

  2 COMBINED AT
+                   CP-6      .328     1   FLOW         5.78     5.64
                                           TIME        12.33    12.33

  2 COMBINED AT
+                   CP-7      .671     1   FLOW        16.67    15.89
                                           TIME        13.10    13.12

 HYDROGRAPH AT
+                   GMN3      .278     1   FLOW         3.07     2.95
                                           TIME        15.03    15.07

 HYDROGRAPH AT
+                   GMN1      .094     1   FLOW        11.89    11.52
                                           TIME        12.32    12.32

  2 COMBINED AT
+                   CP-8      .372     1   FLOW        12.71    12.20
                                           TIME        12.35    12.33

 HYDROGRAPH AT
+                  GMN11      .053     1   FLOW        13.11    12.80
                                           TIME        12.22    12.22

  2 COMBINED AT
+                   CP-9      .425     1   FLOW        24.38    23.64
                                           TIME        12.27    12.27

 ROUTED TO
+                   DP-C      .425     1   FLOW        15.90    15.51
                                           TIME        12.50    12.50
```

```
                                              ** PEAK STAGES IN FEET **
                                              1   STAGE          .88       .84
                                                  TIME         12.50     12.50

  2 COMBINED AT
+                    CP-10      1.096         1   FLOW         30.43     29.61
                                                  TIME         12.52     12.50
```

100-YEAR PROPOSED CONDITIONS

```
1*****************************************                                             ****************************************
 *                                       *                                             *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                             *   U.S. ARMY CORPS OF ENGINEERS       *
 *       JUN 1998 AND FEB 2010           *                                             *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1R                *                                             *        609 SECOND STREET             *
 *      RGMHEC2000 WWW.HEC-1.COM         *                                             *     DAVIS, CALIFORNIA 95616          *
 * RUN DATE   05DEC16  TIME  09:34:20    *                                             *         (916) 756-1104               *
 *                                       *                                             *                                      *
*****************************************                                              ****************************************




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




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

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


1                                                 HEC-1 INPUT                                                  PAGE  1

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

                     *DDIAGRAM
        1            ID  =======================================================================
        2            ID  MODEL TO DETERMINE FLOW RATES FOR GOLDEN MESA NORTH
        3            ID
        4            ID       PROPOSED CONDITIONS MODEL
        5            ID       OUTLET FROM POND B NOW ONE 30" & 3 - 36"  PIPES
        6            ID  POND C HAS 2-36" LOW FLOW & 1-36" HIGH FLOW PIPES
        7            ID      MODEL NAME GMN1PL.DAT
        8            ID  100 YR24 HR PRECIP    WITH UPDATED AREAS
        9            ID  DATE:JUNE 2016 *******************************************
       10            ID    ******************************************************************
       11            ID
       12            ID
                     *     *******************************************************************
       13            IT      1                    2880
       14            IN     15
       15            IO      5
       16            JR    PREC       1
                     *   ********************************************************************
                     *   ********************************************************************
                     *   ********************************************************************
                     *    JD CARDS WILL BE REPLACED WITH A JR CARD TO CORRECT THIS PR  OBLEM.
                     *    USERS OF THIS MODEL SHOULD CAREFULLY SELECT AN APPROPRIATE DARF FOR    EACH
                     *    CONCENTRATION POINTS. IT SHOULD BE NOTED THAT WHEN FLOW IS COMBINED    WITH
                     *    DIVERSION FLOWS, CALCULATED COMBINED TOTAL AREA MAY NOT BE APPROPRI    ATE
                     *    TO BE USED IN SELECTING DARF.
                     *   ********************************************************************
                     *   ********************************************************************
                     *        DARF          AREA (SQ.     MI.)
                     *        1.00             0 -  2
                     *        0.99           2.1 -  8
                     *        0.98           8.1 - 16
                     *        0.97          16.1 - 29
                     *        0.96          29.1 - 43
                     *        0.95          43.1 - 63
                     *        0.94          63.1 - 98
                     *   ********************************************************************
       17            JR    PREC     1.0     0.99     0.98     0.97
                     *   ********************************************************************
                     *   ********************************************************************
                     *     BEGIN NIMBUS 90 MODEL - SP  R1.705
                     *     NO MODIFICATIONS M     ADE
                     *   ********************************************************************

       18            KK   GMN5B    RUNOFF FROM WATERSHED GMN5B
       19            BA    .077
       20            PH      1       0    .423    .797    1.33    1.40    1.49    1.88    2.75    3.97
       21            LS               64
       22            UD    0.23
1                                                 HEC-1 INPUT                                                  PAGE  2

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


       23            KK   GMN5A    RUNOFF FROM WATERSHED GMN5A
       24            BA    .069
       25            LS               74
       26            UD     .24

       27            KK  ROUT-1ROUTE GMN5A  TO DET BASIN A
       28            RD    1360    .015    .035           TRAP       2       3

       29            KK    CP-1        COMBINE GMN5A & GMN5B
       30            HC      2

       31            KK    DP-A        DET. POND A AT NW CORNER OF GMN9
       32            KM  OUTLET IS ONE 24" RCP
       33            RS      1    STOR       0
```

```
             34          SA      .1      .3      .4      .5      .6      .7      .8      .9     1.0       1
             35          SE      .1      .5       1     1.5       2     2.5       3     3.5       4     4.5
             36          SQ       0       2       4       8      12      16      20      23      26
             37          SE       0      .5       1     1.5       2     2.5       3     3.5       4

             38          KK  ROUT-1ROUTE FLOW FROM DP-A TO SW CORNER OF GMN-9
             39          RD    2300    .019    0.07            TRAP       4       3

             40          KK    GMN6 RUNOFF FROM GMN6
             41          BA    .012
             42          LS              77
             43          UD      .2

             44          KK    GMN8RUNOFF FROM GMN 8
             45          BA    .027
             46          LS              54
             47          UD     .12

             48          KK    CP-2        COMBINE GMN5, GMN6, & GMN8
             49          HC       2

             50          KK    GMN9        RUNOFF FROM GMN9 UNDEVELOPED
             51          BA    .152
             52          LS              76
             53          UD     .32

             54          KK    CP-3COMBINE FLOWS AT SW CORN OF GMN9
             55          KM   FLOW EXITING PROJECT SITE
             56          HC       2

             57          KK    DP-B        DET. POND AT SW CORNER OF GMN9
             58          KM  OUTLET IS 2 36" RCP   LOW FLOW & 1-36" HIGH FLOW PIPES
             59          RS       1    STOR       0
             60          SA      .1      .3      .4      .5      .6      .7      .8      .9     1.0     1.2
             61          SE       0      .5       1     1.5       2     2.5     3.0     3.5       4       5
             62          SQ       0       6      11      28      59     117     165     215
             63          SE       0       1     1.6       2       3       4       5       6
1                                                       HEC-1 INPUT                                             PAGE  3

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


             64          KK   GMN10        RUNOFF FROM GMN10
             65          BA    .006
             66          LS              79
             67          UD     .05

             68          KK    CP-4COMBINE RUNOFF FROM PROJECT SITE W/ GMN10
             69          HC       3

             70          KK    GMN4        RUNOFF FROM GMN4
             71          BA    .233
             72          LS              64
             73          UD     .36

             74          KK  ROUT-3        ROUTE GMN4 ACROSS GMN7
             75          RD     960    .008    0.07            TRAP       2       3

             76          KK    GMN7        RUNOFF FROM GMN7
             77          BA    .063
             78          LS              54
             79          UD     .21

             80          KK    CP-5
             81          HC       2

             82          KK  ROUT-4        ROUTE FLOW THRU GMN2
             83          RD    1800    .004     .05            TRAP       2       1

             84          KK    GMN2        RUNOFF FROM GMN2
             85          BA    .032
             86          LS              79
             87          UD     .29

             88          KK    CP-6
             89          HC       2

             90          KK    CP-7        TOTAL FLOW AT INDIAN LANE & ESTATES ROAD
             91          HC       2

             92          KK    GMN3        RUNOFF FROM GMN3
             93          BA    .278
             94          LS              64
             95          UD     .42

             96          KK    GMN1        RUNOFF FROM GMN1
             97          BA    .094
             98          LS              75
             99          UD     .27

            100          KK    CP-8        COMBINE GMN3 & 1AT WEST BNDRY OF GMN11
            101          HC       2
1                                                       HEC-1 INPUT                                             PAGE  4

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


            102          KK   GMN11        RUNOFF FROM GMN11
            103          KM  GMN 11DEVELOPED
            104          BA    .053
            105          LS              80
            106          UD     .19

            107          KK    CP-9        COMBINE GMN3 & 1WITH GMN11
            108          HC       2
```

```
            109           KK    DP-C        DET. POND  SOUTH OF GMN 11
            110           KM  OUTLET IS 3  36" RCP
            111           RS       1    STOR       0
            112           SA      .1      .4      .5      .6      .7      .8      .9     1.0     1.2     1.4
            113           SE       0      .5       1     1.5       2     2.5     3.0     3.5       4       5
            114           SQ       0       8      29      65     114     160     188
            115           SE       0     1.2       2       3       4       5       6

            116           KK   CP-10        COMBINE ALL FLOWS AT BNDRY OF SOUTH PARCEL
            117           HC       2
            118           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

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

    18       GMN5B
                 .
                 .
    23           .       GMN5A
                 .           V
                 .           V
    27           .      ROUT-1
                 .           .
                 .           .
    29        CP-1............
                 V
                 V
    31        DP-A
                 V
                 V
    38      ROUT-1
                 .
                 .
    40           .        GMN6
                 .           .
                 .           .
    44           .           .        GMN8
                 .           .           .
                 .           .           .
    48           .        CP-2............
                 .           .
                 .           .
    50           .           .        GMN9
                 .           .           .
                 .           .           .
    54           .        CP-3............
                 .           V
                 .           V
    57           .        DP-B
                 .           .
                 .           .
    64           .           .       GMN10
                 .           .           .
                 .           .           .
    68        CP-4........................
                 .
                 .
    70           .        GMN4
                 .           V
                 .           V
    74           .      ROUT-3
                 .           .
                 .           .
    76           .           .        GMN7
                 .           .           .
                 .           .           .
    80           .        CP-5............
                 .           V
                 .           V
    82           .      ROUT-4
                 .           .
                 .           .
    84           .           .        GMN2
                 .           .           .
                 .           .           .
    88           .        CP-6............
                 .           .
                 .           .
    90        CP-7............
                 .
                 .
    92           .        GMN3
                 .           .
                 .           .
    96           .           .        GMN1
                 .           .           .
                 .           .           .
   100           .        CP-8............
                 .           .
                 .           .
   102           .           .       GMN11
                 .           .           .
                 .           .           .
   107           .        CP-9............
                 .           V
                 .           V
   109           .        DP-C
                 .           .
                 .           .
   116       CP-10............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                   ****************************************
```

```
*                                        *                                                                                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                                                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
*        JUN 1998 AND FEB 2010           *                                                                                    *    HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.1R                *                                                                                    *         609 SECOND STREET            *
*       RGMHEC2000 WWW.HEC-1.COM         *                                                                                    *      DAVIS, CALIFORNIA 95616         *
*  RUN DATE   05DEC16  TIME  09:34:20    *                                                                                    *          (916) 756-1104              *
*                                        *                                                                                    *                                      *
******************************************                                                                                    ****************************************


                          ========================================================================
                          MODEL TO DETERMINE FLOW RATES FOR GOLDEN MESA NORTH

                                PROPOSED CONDITIONS MODEL
                                OUTLET FROM POND B NOW ONE 30" & 3 - 36"  PIPES
                          POND C HAS 2-36" LOW FLOW & 1-36" HIGH FLOW PIPES
                               MODEL NAME GMN1PL.DAT
                          100 YR24 HR PRECIP    WITH UPDATED AREAS
                          DATE:JUNE 2016 *******************************************
                            ***********************************************************************


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

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

     IT         HYDROGRAPH TIME DATA
                       NMIN           1  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME        0919  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   33.32 HOURS

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

     JP         MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR         MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                   1.00       .99       .98       .97

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000

VALUE EXCEEDS TABLE IN LOGLOG          .01667         .01667       24.00000
1

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


                                                                RATIOS APPLIED TO PRECIPITATION
OPERATION       STATION     AREA    PLAN              RATIO 1  RATIO 2  RATIO 3  RATIO 4
                                                         1.00      .99      .98      .97

HYDROGRAPH AT
+                 GMN5B      .077      1    FLOW       30.89    30.02    29.15    28.29
                                            TIME       12.28    12.28    12.28    12.28

HYDROGRAPH AT
+                 GMN5A      .069      1    FLOW       50.46    49.48    48.49    47.51
                                            TIME       12.28    12.28    12.28    12.28

ROUTED TO
+                 ROUT-1     .069      1    FLOW       50.40    49.41    48.42    47.44
                                            TIME       12.33    12.33    12.33    12.33
```

```
  2 COMBINED AT
+                   CP-1      .146    1   FLOW        80.35    78.51    76.68    74.87
                                          TIME        12.32    12.32    12.32    12.32

 ROUTED TO
+                   DP-A      .146    1   FLOW        24.95    24.58    24.22    23.85
                                          TIME        12.75    12.75    12.75    12.75

                                      ** PEAK STAGES IN FEET **
                                      1   STAGE        3.83     3.76     3.70     3.64
                                          TIME        12.75    12.75    12.75    12.75

 ROUTED TO
+                 ROUT-1      .146    1   FLOW        24.94    24.57    24.20    23.84
                                          TIME        12.93    12.93    12.93    12.93

 HYDROGRAPH AT
+                   GMN6      .012    1   FLOW        11.18    10.98    10.78    10.58
                                          TIME        12.23    12.23    12.23    12.23

 HYDROGRAPH AT
+                   GMN8      .027    1   FLOW         4.38     4.13     3.89     3.65
                                          TIME        12.20    12.20    12.20    12.20

  2 COMBINED AT
+                   CP-2      .039    1   FLOW        15.42    14.99    14.56    14.14
                                          TIME        12.22    12.22    12.22    12.22

 HYDROGRAPH AT
+                   GMN9      .152    1   FLOW       103.61   101.70    99.79    97.89
                                          TIME        12.37    12.37    12.37    12.37

  2 COMBINED AT
+                   CP-3      .191    1   FLOW       115.04   112.85   110.66   108.48
                                          TIME        12.35    12.35    12.35    12.35

 ROUTED TO
+                   DP-B      .191    1   FLOW        89.72    87.92    85.96    84.01
                                          TIME        12.52    12.52    12.52    12.53

                                      ** PEAK STAGES IN FEET **
                                      1   STAGE        3.53     3.50     3.46     3.43
                                          TIME        12.52    12.52    12.52    12.53

 HYDROGRAPH AT
+                  GMN10      .006    1   FLOW        10.28    10.10     9.93     9.76
                                          TIME        12.07    12.07    12.07    12.07

  3 COMBINED AT
+                   CP-4      .343    1   FLOW       108.39   106.10   103.79   101.45
                                          TIME        12.57    12.57    12.57    12.57

 HYDROGRAPH AT
+                   GMN4      .233    1   FLOW        71.75    69.72    67.70    65.70
                                          TIME        12.43    12.43    12.43    12.43

 ROUTED TO
+                 ROUT-3      .233    1   FLOW        71.16    69.14    67.14    65.16
                                          TIME        12.52    12.52    12.52    12.52

 HYDROGRAPH AT
+                   GMN7      .063    1   FLOW         7.91     7.47     7.04     6.63
                                          TIME        12.32    12.32    12.32    12.32

  2 COMBINED AT
+                   CP-5      .296    1   FLOW        76.79    74.50    72.24    70.02
                                          TIME        12.50    12.50    12.52    12.52

 ROUTED TO
+                 ROUT-4      .296    1   FLOW        74.09    71.89    69.70    67.52
                                          TIME        12.65    12.65    12.65    12.65

 HYDROGRAPH AT
+                   GMN2      .032    1   FLOW        26.44    25.99    25.55    25.10
                                          TIME        12.33    12.33    12.33    12.33

  2 COMBINED AT
+                   CP-6      .328    1   FLOW        87.68    85.15    82.63    80.12
                                          TIME        12.62    12.62    12.62    12.62

  2 COMBINED AT
+                   CP-7      .671    1   FLOW       195.40   190.45   185.67   180.89
                                          TIME        12.58    12.58    12.60    12.60

 HYDROGRAPH AT
+                   GMN3      .278    1   FLOW        77.65    75.46    73.28    71.11
                                          TIME        12.50    12.50    12.50    12.50

 HYDROGRAPH AT
+                   GMN1      .094    1   FLOW        67.53    66.24    64.97    63.69
                                          TIME        12.32    12.32    12.32    12.32

  2 COMBINED AT
+                   CP-8      .372    1   FLOW       133.35   130.07   126.81   123.57
                                          TIME        12.38    12.38    12.38    12.38

 HYDROGRAPH AT
+                  GMN11      .053    1   FLOW        57.65    56.69    55.74    54.80
                                          TIME        12.22    12.22    12.22    12.22

  2 COMBINED AT
+                   CP-9      .425    1   FLOW       174.01   170.11   166.23   162.37
                                          TIME        12.32    12.32    12.32    12.32

 ROUTED TO
```

```
+                  DP-C       .425     1   FLOW        128.52    125.88    123.27    120.70
                                           TIME         12.58     12.58     12.58     12.58

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE         4.32      4.26      4.20      4.15
                                           TIME         12.58     12.58     12.58     12.58

  2 COMBINED AT
+                 CP-10      1.096     1   FLOW        323.93    316.33    308.85    301.45
                                           TIME         12.58     12.58     12.58     12.60
```

PRELIMINARY SEWER REPORT

Axion
ENGINEERING
Civil Engineering • Land Development

Golden Mesa North
PRELIMINARY SEWERAGE REPORT

INTRODUCTION

Golden Mesa North is a proposed 116-unit single family residential subdivision located in Golden Valley on two parcels. APN 552-050-01 is approximately 99.5 acres and is located east of Estates Drive approximately 2800 feet north of E. Golden Valley Road. APN 552-092-19 is located east of Estates Road, West of Rain Dance Way, South of Indian Lane approximately 1190 feet north of E. Golden Valley Road. (Reference Figure 1 Vicinity Map). The proposed development is surrounded by undeveloped land to the North, single family homes to the east and west and undeveloped land to the south. This report will summarize proposed sewage flows and improvements.

The site slopes down from the north to the south toward Golden Valley Road. Currently no existing sewer facilities are immediately available adjacent to the proposed development with the exception of the existing sewer main within Golden Valley Road.

Proposed peak design flow requirements were determined using 350gpd/unit with a peaking factor of 3.0. Resulting peak flow is therefore 121,800gpd for the 116 proposed residences. In addition to this determined flow the proposed flows based on a previous Tentative Map submitted to Washoe County for Golden Mesa South, the 35 acre parcel located directly south of Golden Mesa North, have been added in resulting in an additional flow of 61,950 gpd. This is based on the unit count of the previously submitted Tentative Map of 59 units (TM05-015). Flow calculations can be found below.

FLOW CALCULATIONS

Average peak flows were determined to be 96,390 gallons per day based on the following Washoe County Department of Water Resources (WCDWR) design requirements:

Average Flow = 350 gallons/day

Peaking Factor = 3.0

Zoning = Single Family Residential

Minimum Velocity = 2.5 feet/second

Peak Flow Calculation:

Q_P = (avg flow) (peaking factor) (# of dwelling units)

$$Q_P = (350)\ (3.0)\ (175) = 183{,}750 \text{ gpd}$$

It is anticipated that the minimum pipe slope on the proposed sewer mains will be 0.5% which yields a half full velocity of 2.65 fps meeting the County minimum half full velocity of 2.5 fps.

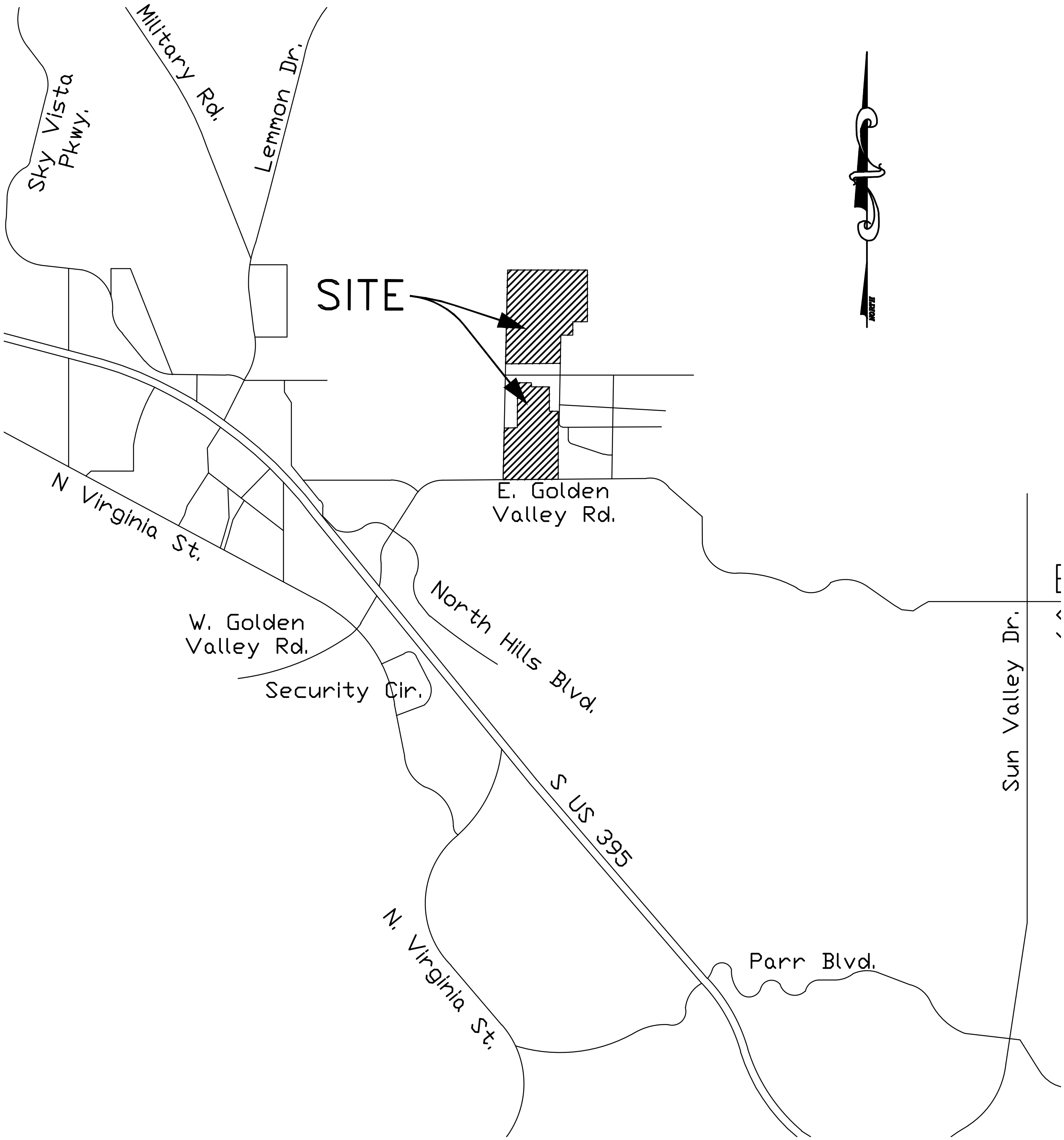
A sanitary sewage lift station will be required to get sewage into the existing sewer main in Golden Valley Road. The lift station will be located with the previously mentioned 35-acre parcel. (See Figure 2 – Sewer Map). Sewage flows, once leaving the lift station, will flow in the existing 12” sewer main in Golden Valley Road, westerly to the existing Golden Valley lift station owned and operated by the City of Reno. Attached to this report is the sewer summaries prepared by Summit Engineering as well as the preliminary design report provided to Washoe County DWR for the design of the previous lift station planned to be built with the prior Golden Mesa North Development.

GOLDEN MESA NORTH

SUBDIVISION

RENO NEVADA

SEPTEMBER 2016

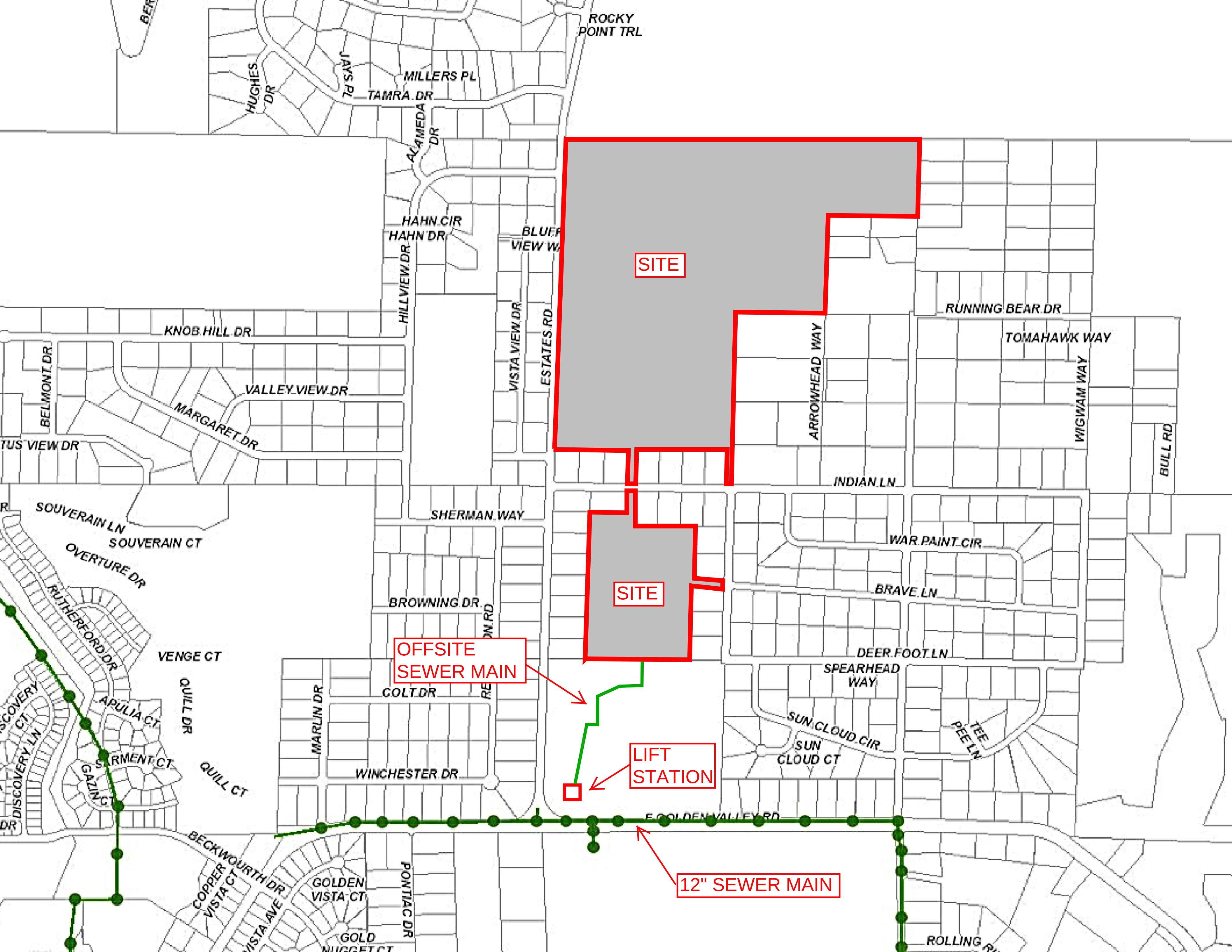


VICINITY MAP

Axion ENGINEERING

Civil Engineering • Land Development

681 EDISON WAY – RENO, NEVADA 89502
PH 775-771-5554 / FX 775-856-3951


SITE
SITE
OFFSITE SEWER MAIN
LIFT STATION
12" SEWER MAIN
ROCKY POINT TRL
JAYS PL
MILLERS PL
TAMRA DR
HUGHES DR
ALAMEDA DR
HAHN CIR
HAHN DR
BLUEF VIEW W
HILLVIEW DR
VISTA VIEW DR
ESTATES RD
KNOB HILL DR
BELMONT DR
VALLEY VIEW DR
MARGARET DR
TUS VIEW DR
RUNNING BEAR DR
TOMAHAWK WAY
ARROWHEAD WAY
WIGWAM WAY
BULL RD
INDIAN LN
SHERMAN WAY
WAR PAINT CIR
BRAVE LN
DEER FOOT LN
SPEARHEAD WAY
SUN CLOUD CIR
SUN CLOUD CT
TEE PEE LN
SOUVERAIN LN
SOUVERAIN CT
OVERTURE DR
RUTHERFORD DR
VENGE CT
QUILL DR
QUILL CT
APULIA CT
SARMENT CT
GAZIN CT
DISCOVERY LN
SCOVERY CT
BROWNING DR
COLT DR
MARLIN DR
WINCHESTER DR
E GOLDEN VALLEY RD
BECKWOURTH DR
COPPER VISTA CT
VISTA AVE
GOLDEN VISTA CT
GOLD NUGGET CT
PONTIAC DR
ROLLING

SEWER SUMMARY FOR GOLDEN MESA NORTH

Golden Mesa North will consist of 94 single family homes. The sewer system will consist of 4 inch laterals connecting to 8 inch mains within the streets and sewer easements. Peak flows are calculated using 280 gpd/unit and a peaking factor of 3, resulting in 280 x 94 x 3 = 78,960 gpd or 0.12 cfs.

All flows are carried to a proposed lift station at the corner of Golden Valley Road and Estates Road. Minimum slope on the proposed sewer is 0.5%. The lift station pumps flows to an existing manhole at the intersection of Golden Valley Road and Estates Road. From this manhole an existing 12 inch sewer main carries the flows westerly along Golden Valley Road to the existing Golden Valley lift station owned by the City of Reno.

Capacity calculations were performed on the proposed and existing sewer system. Results show the system has capacity for the 94 units proposed with Golden Mesa North, the 59 units approved in Golden Mesa South, and other nearby units currently utilizing septic systems that may wish to tie to the system in the future.

PROFESSIONAL ENGINEER - STATE OF NEVADA
CLINTON G. THIESSE
Exp. 6-30-08
CIVIL
No. 6159

11/1/06

SEWER SUMMARY

Golden Mesa South will consist of 59 single family homes. The sewer system will consist of 4" laterals connecting to 8" mains within the streets and sewer easements. Peak flows are calculated using 350 gpd/unit and a peaking factor of 3, resulting in 350 x 59 x 3 = 61,950 gpd or 0.10 cfs.

All flows are carried to a proposed lift station at the southwest corner of the development. Minimum slope on the proposed sewer is 0.4%. The lift station pumps flows to an existing manhole at the intersection of Golden Valley Road and Estates Road. From this manhole an existing 12" sewer main carries the flows westerly along Golden Valley Road to the existing Golden Valley lift station owned by the City of Reno.

Capacity calculations were performed on the proposed and existing sewer system. Results show the system has capacity for the 59 units proposed with Golden Mesa South, the 96 units approved in Golden Mesa North, and other nearby units currently utilizing septic systems that may wish to tie to the system in the future.

GOLDEN MESA – SEWER LIFT STATION

RE: Design Report

Date: July 27, 2006

To: Susan Hood, Washoe County Utilities
Ken Hendrix, R&K Homes
Clint Thiesse, P.E. Summit Engineering

From: Gary K. Guzelis, P.E.

This Design Report is being submitted for your review, comment and approval. This Design Report relates to the engineering for the sewer lift station for the Golden Mesa Development.

Design requirements:

1. *Peak hour flow rate of 162,750 gallons per day (113 gpm) was used for sizing the pumps and wet well. The peak flow was determined by using 350 gallons per day contribution from each dwelling unit per capita and 3 capita per dwelling unit. City of Reno*

2. *Based on the above peak flow rate, two 2.7 HP Gorman-Rupp pumps have been selected. The pumps were selected to operate at approximately 180 gpm @ 21' of head. One pump alone will be capable of pumping the peak flow rate with the second pump being on standby. The particular pumps selected come with impellors at full trim and are not upgradeable. The selected pumps will be capable of delivering capacity for 91 additional homes. Future upgrades beyond the additional 91 homes would require pump replacement which is estimated at $2500.00 per pump in today's dollars.*

3. *The wet well will consist of a 60" diameter manhole modified to accept the duplex pumps, level sensors and piping. The depth of the wet well will be approximately 24'. The interior of the wet well will be epoxy coated to help protect against deterioration of the concrete. Transducers will be used for level sensing with a redundant high water alarm float for emergency.*

4. *Emergency storage is required by the County and was sized to contain 2 hours of peak design flow estimated at a volume of 13,500 gallons. Emergency storage will be accomplished using 15,000 gallon precast*

concrete storage tank. Surface storage is not recommended due to the limited space and close proximity to the adjoining residences.

5. *The force main will be 4”HDPE, inside diameter of 3.95” and a dimension ratio of 17. The force main is approximately 218’ in length.*

6. *Back-up power will be required for the lift station and will be provided by a stand-by generator preliminarily sized at 50 KW. A 100 amp panel and 3 phase power will be required.*

7. *The site will need to be completely fenced to prevent unauthorized access to the lift station.*

8. *Pump cycle time @ peak flow with a 1.5’ on to off level will be 7.2 minutes. (Reference attached supporting data).*

GEOTECHNICAL INVESTIGATIONS

Axion ENGINEERING
Civil Engineering • Land Development

Axion
GEOTECHNICAL
Geotechnical Engineering & Construction Testing Services
681 Edison Way, Reno, NV 89502

GEOTECHNICAL INVESTIGATION

PROPOSED

GOLDEN MESA NORTH 20-ACRE PARCEL

Washoe County Assessor's Office Parcel Number 552-092-19

Estates Road, Golden Valley Area

RENO, NEVADA

Prepared for:

Moonlight Hills Estates, LLC
5390 Bellazza Court
Reno, Nevada 89519

Attention: Richard Nevis, Managing Member

October 2016

Project No. 16.161.01-G

Axion
GEOTECHNICAL
Geotechnical Engineering & Construction Testing Services
681 Edison Way, Reno, NV 89502

October 2016
Project No. 16.161.01-G

Moonlight Hills Estates, LLC
5390 Bellazza Court
Reno, Nevada 89519

Attn: Richard Nevis, Managing Member

Re: Geotechnical Investigation, Proposed Golden Mesa North 20-Acre Parcel, Washoe County Assessor's Office Parcel Number 552-092-19, Estates Road, Golden Valley area of Reno, Nevada.

Dear Mr. Nevis:

Axion Geotechnical is pleased to present results of a geotechnical investigation our firm conducted for the proposed project. Based on results of our investigation, experience in the area, and understanding of project development, we conclude that the site is suitable for development of single-family residences provided the recommendations included in our report are adhered to during design and construction. The primary geotechnical concerns identified are the **expansion potential** of portions of the native soil and location of the **floodplain** within the project site.

We appreciate being selected to perform this investigation and trust the results will fulfill your needs. If you or your consultants have questions, please contact us at (775) 771-2388.

Respectfully,

AXION GEOTECHNICAL, LLC
Chris D. Betts
Chris D. Betts, P.E.
President

PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER D. BETTS
Exp: 12-31-16
CIVIL
No. 21633
10-10-2016

CONTENTS

I INTRODUCTION

Axion Geotechnical is pleased to present results of a geotechnical investigation our firm conducted for the proposed Golden Mesa North 20-Acre Parcel project. The site is east of Estates Road and south of Indian Lane in the Golden Valley area in Reno, Nevada (Property). Proposed development includes construction of isolated pads for single-family residences serviced by community water, sewer and storm drain systems. The structures will have one to two levels, will be wood-framed with joist-supported floors, and will be supported with shallow conventional spread foundations. Dedicated service streets will be surfaced with asphaltic concrete.

We have not received information concerning foundation loads; however, we anticipate maximum wall loads will be on the order of one kip per foot (dead plus live plus snow load), and that maximum column loads will be less than two kips (dead plus live plus snow load). For frost protection, perimeter foundations will bottom at least 24 inches below lowest adjacent exterior ground surface. Structural design will follow criteria outlined in the 2012 *International Residential Code*.

We understand earthwork to attain proposed grades and for proper site drainage will include fills up to about ten feet. New slopes will be shallow and constructed at final inclinations of two horizontal to one vertical (2H:1V) or flatter. Site earth retaining walls are not anticipated. Depth of utility trenches should be less than eight feet. We assume underground utilities in proposed structural areas will be abandoned or relocated. Earthwork will be performed in accordance with the 2012 *Standard Specifications for Public Works Construction* by the Regional Transportation Commission (RTC).

The purpose of our investigation was to assess the subsurface soil conditions across the Property, and to provide opinions and recommendations concerning:

1. Potential geological hazards
2. Site preparation and grading, including shrinkage estimates
3. Soil engineering criteria for foundation design
4. Support of slabs-on-grade and exterior flatwork, and
5. Design and support of flexible pavement sections

This report is geotechnical in nature and not intended to identify other constraints such as environmental hazards, wetlands determinations or the potential presence of buried utilities.

Recommendations included in this report are specific to development at the Property, and are not intended for off-site development. Proposed development outside the limits of our investigation, or conceptual changes to the project such as use of alternative foundations or grade changes could require additional subsurface exploration, laboratory testing, and engineering analysis.

II FIELD EXPLORATION AND LABORATORY TESTS

To attain an overview of underlying soil conditions across the Property, five test pits were excavated using a Caterpillar 420 D rubber-tire backhoe. The pits extended to depths of seven to ten feet below ground surface. Test pit # 2 was terminated at seven feet due to backhoe refusal encountered on very dense soil. The pits were positioned in the field using pace and compass methods, and our understanding of project development. Pit locations are depicted on Plate 1 with respect to an aerial image using Google Earth. Locations are approximate. No greater accuracy is implied.

Our engineer logged visual descriptions of the earth materials. Representative soil samples were collected from the pits using a pick and shovel. Assessment of in-situ moisture content and dry-density was accomplished using a nuclear density gauge. The pits were loosely backfilled. Logs of the test pits are presented on Plates 2 through 4. The materials encountered were classified in accordance with the Unified Soil Classification System, which is explained on Plate 5.

The samples were returned to our office to confirm field classifications, and to select representative samples for laboratory testing. Results of in-situ moisture content and dry density, grain size analysis, Atterberg Limits, moisture-density relationships and Resistance R-Value determinations are presented on the logs and on Plates 6 through 8. Resistance R-Value test was performed by an independent laboratory.

III SITE AND SOIL CONDITIONS

The Property is undeveloped, vacant, and bordered by residences to the north, east and west, and undeveloped land to the south. The surface grades gently downward from the NE to the SW, and is covered by medium dense sagebrush and weeds. Dirt trails cross the Property. A well is present near the central area.

View of Property from north to south

Based on the United States Geological Survey 7.5-Minute topographic map of the Reno Quadrangle, the Property is in the SW ¼ of Section 11, Township 20 North, Range 19 East and elevation ranges from about 5,095 to 5,105 feet relative to mean sea level.

According to mapping by the U. S. Department of Agriculture, Soil Conservation Service (*Soil Survey of Washoe County, Nevada, South Part*, Sheet No. 22, 1980), the Property is underlain by Greenbrae sandy loam, clayey substratum, 0 to 2 percent slopes (# 131). This very deep, well-drained soil is on terraces and lower parts of alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,500 feet. Typically, the surface layer is grayish brown sandy loam about 10 inches thick. The subsoil is brown sandy clay loam or clay loam about 20 inches thick. The substratum to a depth of 63 inches or more is light yellowish brown gravelly fine sandy loam and loam. Permeability is slow. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Limitations to shallow excavations is severe. Limitations to local roads and streets is moderate. Limitations to septic tank absorption fields is severe. The shrink-swell potential is low-to-moderate. Frequency of flooding is none. Depth to high water table is greater than six feet. Depth to bedrock is greater than 60 inches. The corrosion potential to steel or concrete is moderate. Limitations associated with the use of this unit for urban development, as defined by the soil survey, are moderately high shrink-swell potential associated with the high clay content, slowly permeable subsoil, low strength and the susceptibility to frost heaving.

Based on mapping by H. F. Bonham, Jr. and E. C. Bingler (*Reno Folio, Geologic Map,* Nevada Bureau of Mines and Geology, dated 1973), material underlying the Property is Quaternary-age granitic alluvium (Qg) which consists of weathered granitic sand.

To aid in our investigation, we reviewed information included in a geotechnical investigation report dated July 21, 2015 prepared by Wood Rodgers for the Moonlight Hills Estates. According to the report, the underlying soils consist of loose to very dense silty sand (SM) that is moderately cemented in parts, medium dense to dense clayey sand (SC), loose to medium dense poorly-graded sand with silt (SP-SM), and weathered bedrock that grades to clayey sand (SC). One test pit revealed six feet of fill material consisting of medium dense silty sand with gravel (SM). The report indicates the native soils exhibit a very low to moderate potential for expansion, and negligible sulfate levels. At the time of the subsurface exploration (May 2015) no free water was encountered.

With exception of bedrock and loose soil, our subsurface exploration confirms, in general, the referenced soil and geologic mapping and referenced geotechnical report with the native soils consisting of loose (surface) to very dense silty sand (SM) and dense clayey sand (SC) to the depths explored.

At the time of our subsurface exploration (July 21, 2016), no free water was encountered to the depths explored. According to the *Reno Folio Hydrologic Map* (Cooley, Span and Scheibach, Nevada Bureau of Mines and Geology, 1974) the top of water table is estimated to be between 20 and 40 feet.

Overall, the native soils are in a compact density state and exhibit very low potential for expansion and high Resistance R-Value. The upper six inches of native soil are in a low-density state, and the clayey sand (SC) exhibit a low potential for expansion.

IV GEOLOGIC AND SEISMIC CONSIDERATIONS

To evaluate geological hazards at the site, our investigation included a site reconnaissance, trenching and review of available geological literature and maps.

A. Geology

The Property is in the northern foothills of the Truckee Meadows, a structural basin bounded by Peavine Mountain, Steamboat Hills, the Virginia Range and the Sierra Nevada to the north, south, east and west, respectively. The basin is transitional between the Basin and Range physiographic province to the east and the Sierra Nevada to the West. The geologic structure of the area is characterized by high-angle extensional normal faults trending in a north-northeast direction. The Truckee Meadows is a down-dropped graben with neighboring horsts to the east and west.

B. Faulting and Seismicity

Based on mapping by E. C. Bingler (*Earthquake Hazards Map, Reno Folio,* Nevada Bureau of Mines and Geology, dated 1974) no fault traces cross the Property. According to the United States Geological Survey Earthquakes Hazards Program, *Quaternary Faults in Google Earth*, no faults cross the Property. The website indicates that the nearest Holocene- to latest-Pleistocene-age fault is approximately 3 miles west of the Property. These faults are those that have moved or shifted in the last 15,000 years.

According to the Nevada Seismological Laboratory website (http://www.seismo.unr.edu), the nearest principal Quaternary-age faults are the north Reno and Spanish Springs Valley fault zones. The Nevada Seismological Laboratory indicates earthquakes of magnitude 6.6 and 6.9 are possible along these fault zones, respectively (*Reno/Carson Fault Information*, updated January 31, 2003).

Interpolated probabilistic ground motion values were obtained from the USGS Seismic Design Center web site using 2012 International Building Code, Site Class D and Risk Category I/II/III data. From the web site, the S_S value is 1.529g and the S_1 value is 0.507g (GPS: lat. 39.612575˚ N and long. 119.8241555˚ W).

In accordance with Section 1613.3.2 of the 2012 International Building Code (Chapter 20 of the ASCE 7-10), “where the soil properties are not known in sufficient detail a Site Class D shall be used”. In this case, results of investigation did not provide evidence that either a more or less restrictive Site Class could be assigned to the Property.

C. Liquefaction

Liquefaction is a loss of soil shear strength associated with loose saturated granular soils subjected to strong earthquake shaking. Liquefaction can result in unacceptable movement of foundations supported by such soils. According to the referenced earthquake hazards map the Property is not in an area of potential liquefaction.

D. Slope Stability

Based on the level nature of the site we do not believe the site is susceptible to rock falls, slumps, ground disturbances, or landslides.

E. Radon

Radon, a colorless, odorless, radioactive gas derived from the natural decay of uranium, is found in nearly all rocks and soils. The Environmental Protection Agency (EPA) suggests that remedial action be taken to reduce radon in any structure with average indoor radon of 4.0 picocuries per liter (pCi/L) or more. According to *Radon in Nevada* (Rigby *et al*., Nevada Bureau of Mines and Geology, Bulletin 108, 1994), the Property is in an area with an average indoor measurement equal to or greater than 2.0 pCi/L and less than 4.0 pCi/L.

F. Flooding

Flood hazard studies were completed by the Federal Emergency Management Agency (FEMA), and are dated March 16, 2009 are published on Community Panel Number 32031C3027G. The map indicates most the Property is in flood Zone X (unshaded). According to FEMA, “these are areas determined to be outside the 0.2% annual chance floodplain”. A small portion, however, of the Property is in the floodplain.

V CONCLUSIONS

Based on results of our investigation, experience in the area, and understanding of the proposed project, we conclude that the site is suitable for development of single-family residences provided the recommendations included in our report are adhered to during design and construction. The primary geotechnical concerns identified are the **expansion potential** of portions of the native soil and location of the **floodplain** within the project site.

Portions of the underlying soil, clayey sand (SC), exhibit a potential for expansion. Expansive soils are subject to substantial volume changes (shrink and swell) with changes in moisture content. Changes in moisture content can occur as a result of seasonal variations in precipitation, landscape irrigation, broken or leaking water pipes and sewer lines, and/or poor site drainage. These volume changes can cause differential movement such as settlement or heave of foundations, slabs-on-grade, exterior flatwork such as walkways, stoops and patios, and pavement sections.

One method to reduce potential for movement is to remove (over-excavate) the expansive material to a sufficient depth and replace it with approved compacted granular fill, thereby reducing the thickness of the expansive layer, providing surcharge, and maintaining moisture at a near constant level. In conjunction with over-excavation and filling, moisture conditioning of the exposed materials to a slightly over optimum moisture content will be needed during construction.

Studies and experience have shown that movement can be expected even if the recommended removal depth is followed, whenever underlying expansive material is allowed to remain. Therefore, the intent of our recommendations is to control potential movement without exceeding economic feasibility; however, the Owner or Developer should weigh the benefits of deeper removal.

In addition to their expansive characteristics, expansive materials also exhibit a lower Resistance R-Value and Modulus of Subgrade Reaction (k) than granular material. To reduce the thickness of aggregate base and minimize future maintenance in slab-on-grade, exterior flatwork and pavement areas, portions of these soils should be removed and replaced with approved compacted granular fill subbase.

According to FEMA, a portion of the Property is in an area of potential flooding. Consideration should be given to local and federal regulations which may impose construction constraints, such as requiring minimum finish floor elevations, or ordinances banning basements. Due to constant revisions associated with flood zoning, the Property delineation with respect to flood zoning should be verified with the most current map at the time of building permit application.

In addition to volume loss associated with removal of vegetation and roots, native soils excavated and recompacted in fill areas will experience a volume loss (e.g. shrinkage). Based on our investigation and anticipation of final compaction percentages, we estimate a shrinkage factor of 15 percent for the upper 12 inches of existing ground surface, and between 8 and 10 percent below a depth of 12 inches. As the amount of shrinkage is highly dependent on factors outside of our control, such as soil compaction, it may vary significantly from our estimation.

There are no apparent geologic hazards that would place unusual constraints on the project; however, strong ground shaking associated with earthquakes should be expected to occur during the life of the project.

VI RECOMMENDATIONS

A. Site Preparation and Grading

Test pits associated with our investigation were backfilled without compaction. Where these pits are in development areas, the backfill should be completely removed and replaced in a controlled manner as recommended, and under the supervision of the Geotechnical Engineer or his representative in the field.

In development areas vegetation should be cleared and removed from the site. The upper one to two inches of exposed soil containing root growth should be stripped or disked in-place as directed by the Geotechnical Engineer or his representative in the field. Stripped soils may be stockpiled for use in landscape or designated “non-structural” areas. Strippings should be evenly blended with soil, conditioned to suitable moisture content, placed in 12-inch loose lifts and compacted firm. Delineation of designated “non-structural” areas where roots or organics are placed should be illustrated on the “as-built” plans to facilitate future development.

In development areas, native clayey soil (SC) with a low potential for expansion should be over-excavated a sufficient depth to provide for at least 12 inches of approved compacted structural fill material below planned footing grade and garage, exterior flatwork and pavement subgrade. The amount of lateral removal (beyond footing, flatwork and pavement edges) should be at least 12 inches.

As previously mentioned, studies and experience have shown that movement of foundations, slabs-on-grade, exterior flatwork and pavement can be expected whenever underlying expansive materials are allowed to remain. The intent of our recommendations is to control this movement to tolerable limits without exceeding economic feasibility; however, the benefits of deeper removal should be weighed by the Owner or Developer.

The surfaces exposed by clearing, stripping, removal or over-excavation should be observed by the Geotechnical Engineer, or his representative in the field, to document the conditions are as anticipated and that no objectionable materials exist.

Approved surfaces should be scarified to a depth of six inches; conditioned to near optimum moisture content, and compacted to at least 90 percent relative compaction[1]. The Earthwork Contractor is responsible for obtaining approval for each prepared surface prior to proceeding with placement of structural components and/or any new fill and for maintaining the recommended moisture content during construction.

---

[1] Relative compaction refers to the in-place dry unit-weight of soil expressed as a percentage of the maximum dry unit weight of the same soil, as determined by the laboratory procedure ASTM Test Designation: D 1557.

B. Material Quality and Reuse

Where referred to in the text of this report, material with a low potential for expansion is defined as having a Plastic Index (PI) between 12 and 20 and an excess of 12 percent passing the No. 200 sieve. For on-site soils, mass zones are defined as areas outside the defined structural zones in Section A. In general, only approved structural fill may be utilized in structural zones. Typically, materials which do not meet the requirements for structural fill may be used in mass zones with the prior approval of the Geotechnical Engineer or governing agency.

Structural fill should be non-corrosive, free of organic matter and conform, in general, to the following requirements:

Sieve Size	% Passing (by dry weight)
4-inch	100
¾-inch	70 – 100
No. 40	15 – 65
No. 200	5 – 20

Maximum Liquid Limit: 35
Maximum Plasticity Index: 12
Maximum Expansion Index: 20
Minimum Resistance Value: 30

Our investigation indicates the native soil with exception to the clayey sand (SC) will be suitable for reuse as structural fill. Generally, materials which do not meet the requirements for structural fill may be reused as mass fill outside the defined structural zones with approval of the Geotechnical Engineer or his representative in the field. Materials proposed for use in public improvement areas must conform to specifications outlined in the 2012 edition of the *Standard Specifications for Public Works Construction*.

The Earthwork Contractor shall ensure that proposed fills are approved by the Geotechnical Engineer or his representative in the field. Fill sources shall be identified at least five working days prior to use to allow for sampling and testing.

Structural and mass fill shall be conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction. The thickness of all loose lifts will be restricted to a maximum of twelve inches and individually tested for every twelve inches placed.

If surfaces or layers becomes frozen, earthwork construction cannot proceed until it is allowed to thaw. The Earthwork Contractor shall obtain approval from the Geotechnical Engineer (or his representative in the field) of each lift prior to placement of subsequent fill and for maintaining the recommended moisture content during construction.

Recommendations for structural fill are intended as a guideline and define a readily attainable, acceptable material. Adjustments to the specified gradation limits to address use of other potentially acceptable materials, such as those containing over-size aggregate (typically material retained on the ¾-inch sieve), or which deviate from the classification requirements, may be made provided: 1) the Earthwork Contractor can demonstrate his ability to place and compact the material in substantial conformance with industry standards to achieve an equivalent finished product as that specified; 2) the Geotechnical Engineer gives his written approval; 3) the Geotechnical Engineer (or his representative in the field) directly observes and approves the placement method; and 4) all parties understand that ASTM standards governing compaction test procedures are invalid when the over-size fraction retained on the ¾-inch sieve is 30 percent or more, or the over-size fraction retained on the No. 4 sieve is 40 percent or more. Where structural fill containing over-size aggregate is allowed, compaction approval will be based on a performance specification with full-time on-site observation. This will result in an increase of technician time and cost of inspection services.

C. Site Drainage and Landscape

Ground surface adjacent to foundations and improvements shall be permanently sloped at least ½-percent for concrete, one percent for asphaltic concrete, and two to five percent for soil. The slope shall drain away from foundation or improvement for at least five feet so water is not allowed to pond and to restrict infiltration. Gutters with downspouts connected to solid pipe shall be used to contain storm water and direct it away from foundations. Landscaping adjacent to structures shall be limited and irrigation should be drip-type.

To mitigate potential for water to collect in structural sections and to prevent the potential buildup of hydrostatic pressure, a provision such as a gravity outlet, French drain or sump pump, which can convey collected water to a disposal area outside the building is recommended. The ground surface in crawl spaces shall be sloped toward a suitable point which will aid in conveying any collected water to a disposal area outside the building. Due to potential for lateral vapor migration to occur associated with seasonal moisture change and differences between the building interior and exterior ambient conditions, a vapor barrier should be placed throughout the crawlspace with at least a twelve-inch overlap and abut foundations.

Backfill around foundations and stem walls shall consist of fine-grain soil, moisture conditioned to near optimum, and be compacted to at least 90 percent relative compaction. To control water migration, an impermeable barrier such as 10-mil plastic sheeting is recommended between foundation backfill and excavation sidewalls. It should extend a sufficient distance to effectively cover all placed backfill or at least two feet (see Plate 9).

D. Foundation Support and Lateral Resistance

Shallow conventional spread foundations can gain adequate support on the previously specified minimum section of in-situ granular native soil and/or structural fill material (see Subsections A and B). In preparation for foundation construction, the Earthwork Contractor shall ensure field density tests have been performed to document relative compaction of the upper six inches of exposed materials and all new fill, and shall be responsible for maintaining recommended moisture content during construction. Preparation of these materials shall be documented prior to placement of structural components.

For frost protection, perimeter foundations shall bottom at least 24 inches below lowest adjacent exterior ground surface as required by the local governing agency. For foundations so supported, we recommend use of an allowable dead plus long-term live load bearing capacity of 2,000 pounds per square foot (psf). The allowable pressure can be increased by 1/3 for total load including wind or seismic forces. Resistance to lateral loads can be obtained from passive earth pressure and soil friction. We recommend a passive earth resistance of 300 pounds per cubic foot (equivalent fluid) per foot of depth and a friction factor of 0.35.

For shallow conventional spread foundations, we judge that total post-construction movement associated with foundation loads will be about 1-inch and total post-construction differential movement will be about ½-inch.

For corrosion potential mitigation we recommend using properly prepared and placed Type II portland cement concrete; maintaining at least three inches of concrete cover where reinforcing steel or other metal is near soil, and following Manufacturer’s directions for coating reinforcing steel and metal.

E. Garage Slab and Exterior Flatwork Support

Garage slabs and exterior flatwork can gain adequate support on the previously specified minimum section of in-situ native soils and/or approved and compacted structural fill material below subgrade (see Subsections A and B). In preparation for slab and flatwork construction, the Earthwork Contractor shall ensure that field density tests have been performed to document the relative compaction of the upper six inches of exposed materials and all new fill, and shall be responsible for maintaining the recommended moisture content during construction. Preparation of these materials shall be documented prior to placement of crushed gravel, aggregate base and/or structural components.

To provide uniform slab and flatwork section support all subbase surfaces below the aggregate base layer should be compacted to at least 90 percent relative compaction. The resulting surface should be smooth, firm and non-yielding. For slab-on-grade design we recommend a Modulus of Subgrade Reaction (k) of 150 pounds per square inch per inch.

Lightly loaded garage slabs should be underlain by at least four inches of clean, free draining, ¾-inch crushed gravel compacted with a vibratory plate or Type 2, Class B Aggregate Base material compacted to at least 95 percent relative compaction. Lightly loaded private exterior flatwork, such as walkways and patios, should be underlain by at least four inches of Type 2, Class B Aggregate Base material compacted to at least 95 percent relative compaction. Dedicated exterior flatwork shall conform to standards provided by the governing agency including section composition and supporting materials.

Materials proposed for use as crushed gravel and aggregate base must conform to Section 200.03.05, Table 200.03-.04-I (Class C Backfill) and Section 200.01.03, Table 200.01-.03-I (Crushed Aggregate Base), respectively, as outlined in the *Standard Specifications for Public Works Construction*, dated 2012.

Lightly loaded private exterior flatwork such as walkways should consist of at least 4 inches of Type II Portland cement concrete with a minimum 28-day compressive strength of 4,000 pounds per square inch (psi) with 4 to 7 percent entrained air. Reinforcing is recommended where heavier loads are proposed.

Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of the concrete and result in cracking and spalling of the slabs. We recommend that all placement and curing be performed in accordance with procedures outlined by the Portland Cement Association and American Concrete Institute. Concrete mix proportions and placement techniques particular to the Washoe County area should also be adhered to during construction. Special consideration should be given to concrete placed and cured during hot or cold weather conditions. Proper control joints and reinforcing steel should be provided to minimize any damage resulting from shrinkage.

F. Utilities, Trench Excavation, and Backfilling

The Earthwork Contractor must comply with the *Safety and Health Regulations for Construction* as directed by the Occupational Safety and Health Act (OSHA Standards, Volume 11, Part 1926, Subpart P) while excavating and backfilling. The Earthwork Contractor is also responsible for providing a competent person, as defined by the OSHA standards, to ensure excavation safety.

Bedding and backfill should conform to Section 200.03 of the *Standard Specifications for Public Works Construction*, dated 2012. In dedicated areas, trench backfill should consist of Class E Backfill per Section 200.03.06, and Tables 200.03.06-I and -II of the 2012 edition of the *Standard Specifications for Public Works Construction.* Bedding and backfill should be moisture conditioned to near optimum, placed in 8-inch maximum loose lifts, and compacted in accordance to the governing agency's requirements.

For corrosion potential mitigation we recommend using properly prepared and placed Type II portland cement concrete; maintaining at least three inches of concrete cover where reinforcing steel or other metal is near soil, and following Manufacturer's directions for coating reinforcing steel and metal.

G. Permanent Cut and Fill Slopes

All permanent cut and fill slopes should be constructed at maximum inclinations of two horizontal to one vertical (2H:1V), or flatter.

The Contractor shall overfill at least three feet and trim the face of all fill slopes. All slopes should be planted with dense-rooted, rapid growing vegetation or riprap material. Ground surfaces shall be sloped to drain away from top of slopes.

Slopes should be evaluated by the Geotechnical Engineer to document that conditions are as anticipated and that slope configuration are appropriate.

H. Pavement Sections

Pavement sections can gain adequate support on the previously specified section of approved granular native soils and/or structural fill material below subgrade (see Subsections A and B). In preparation for pavement construction, the Earthwork Contractor shall ensure that field density and material quality tests have been performed to document compaction of the upper six inches of exposed materials and all new fill, and shall be responsible for maintaining the recommended moisture content during construction. Preparation of these materials shall be documented prior to placement of aggregate base.

To provide uniform pavement section support, subbase surfaces shall exhibit a minimum Resistance Value of 30, shall be scarified, moisture conditioned to near optimum, and compacted to at least 90. The resulting surface should be smooth, firm and non-yielding.

All dedicated pavement should conform to standards provided by the governing agency including section composition, and supporting materials.

Based on our understanding of project development (20 or less lots) and design criteria included in the Asphalt Institute Manual Series No. 1 (MS-1), we recommend a minimum flexible pavement section of three inches of Type 3 bituminous course over at least six inches of Type 2, Class B Aggregate Base (see Section 337.00, less than 1,000,000 ESAL of the *Standard Specifications for Public Works Construction*, dated 2012). All pavement surfaces shall be sealed in accordance with Washoe County standards

Materials proposed for use as aggregate base must conform to Section 200.01.03, Table 200.01-.03-I (Crushed Aggregate Base), as outlined in the *Standard Specifications for Public Works Construction*, dated 2012.

Aggregate base materials should be placed in thin lifts and compacted to at least 95 percent relative compaction. All subgrades and final grades should be rolled to provide a uniform surface which is smooth, firm, and non-yielding.

A bituminous concrete mix design should be submitted for approval prior to paving. During paving, the bituminous mixture should be sampled and tested by the Geotechnical Engineer to ensure material quality and compaction. Annual crack and surface sealing must be implemented to achieve the service life of the pavement.

I. Additional Geotechnical Engineering Services

Consideration should be given to review of all plans and specifications for conformance with this geotechnical report and approval by the Geotechnical Engineer prior to submitting to the governing agency.

The recommendations presented in this report are based on our understanding of project development. Should conditions change from our understanding, we must be notified to determine if our recommendations are appropriate for design and construction. Recommendations included in this report are also based on the assumption that sufficient field inspection and construction review will be provided during all phases of construction. Prior to construction, a pre-job conference should be scheduled to include the Owner, Architect, Civil Engineer, General Contractor, Earthwork and Materials Sub-Contractors, Building Official and Geotechnical Engineer. The recommendations presented in this report should be reviewed by all parties to discuss applicable specifications and testing requirements. At this time, any applicable material quality and mix design reports should be submitted for approval by the Geotechnical Engineer.

Axion Geotechnical has prepared this report based on certain assumptions concerning subsurface conditions at the property. Axion Geotechnical should also provide on-site observations and testing during site preparation and grading, excavation, fill placement, foundation installation and paving. These observations would allow us to document that the soil conditions are as anticipated, and that the Contractor's work is in conformance with the intent of our recommendations and the approved plans and specifications. Our conclusions and recommendations may be invalidated, partially or in whole, by changes outside our control and by subsequent acts occurring on the site after field reconnaissance. This report may be subject to review and revision at any time. Opinions about the condition of the property do not constitute a warranty of any kind.

VII REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), *Guide for Design of Pavement Structures,* 1993.

American Concrete Institute, *Building Code Requirements for Reinforced Concrete* (ACI 318-83), revised 1986.

Asphalt Institute. *Thickness Design, Asphalt Pavements for Highways & Streets (MS-1).* Lexington, Kentucky. 1991.

Bingler, E.C. *Reno Folio Earthquake Hazards Map*. 1:24,000. Reno: Nevada Bureau of Mines & Geology, University of Nevada, Reno, 1974.

Bonham, Harold F. Jr. and E.C. Bingler. *Reno Folio Geologic Map*. 1:24,000. Reno: Nevada Bureau of Mines & Geology, University of Nevada, Reno, 1973.

Cooley, R. L., Spane Jr., F. A., and Scheibach, R. B. *Reno Folio Hydrologic Map.* Nevada Bureau of Mines and Geology, 1974.

International Residential Code Council *2012 International Building Code,* Whittier: International Code Council, Inc., 2012.

Lieberman, P. *Accelerated Corrosion Tests for Buried Metal Structures*. Pipeline and Gas Journal, October, 1996. Page. 51.

Rigby, James G., Jonathan G. Price, Lindsay G. Christensen, Daphne D. La Pointe, Alan R. Ramelli, Mario O. Desilets, Ronald H. Hess, and Stanley R. Marshall. *Radon in Nevada*. Reno: Nevada Bureau of Mines & Geology, Bulletin 108, University of Nevada, Reno, 1994.

Regional Transportation Commission of Washoe County. *Standard Specification for Public Works Construction.* Reno: Regional Transportation Commission of Washoe County, 2012.

United States Department of Agriculture, Soil Conservation Service. *Soil Survey of Washoe County, Nevada, South Part*. Washington: U.S. Government Printing Office, 1980.

United States Department of the Interior Geological Survey. *Reno Quadrangle*. 7.5-minute series map (topographic). 1:24,000. Denver: USGS, 1982.

VIII GLOSSARY OF TEST PROCEDURES

ASTM Test Designation: C 136: *Standard Test Methods for Sieve Analysis of Fine and Coarse Aggregates.*

ASTM Test Designation: D 420: *Standard Guide to Site Characterization for Engineering Design and Construction Purposes.*

ASTM Test Designation: D 1140: *Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-um) Sieve.*

ASTM Test Designation: D 1557: *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 KN-m/m^3)).*

ASTM Test Designation: D 2216: *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.*

ASTM Test Designation: D 2487: *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).*

ASTM Test Designation: D 2488: *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).*

ASTM Test Designation: D 2844: *Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils.*

ASTM Test Designation: D 4318: *Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.*

ASTM Test Designation: D 6938: *Standard Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)*

IX DISTRIBUTION

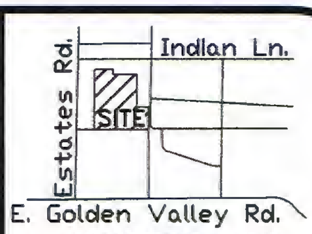
Unbound original and one .pdf to:

Moonlight Hills Estates, LLC
5390 Bellazza Court
Reno, Nevada 89519
Attention: Richard Nevis, Managing Member
Telephone: (775) 826-1390

Two wet-stamped bound copies and one .pdf to:

Axion Engineering, LLC
681 Edison Way
Reno, Nevada 90502
Attention: Gary Guzelis, P.E.
Telephone: (775) 771-5554
Facsimile: (775) 856-3951

X LIST OF ILLUSTRATIONS



VICINITY MAP

NOTE: Not to scale
Site Plan from Google Earth

📌 Approximate Test Pit Location

Job No. 16.161.01-G	SITE & EXPLORATION PLAN	reviewed: CDB
Axion GEOTECHNICAL 681 Edison Way Reno, NV 89502	GOLDEN MESA NORTH 20 ACRE PARCEL Reno, Nevada	Plate #1

Test Pit: TP 1

Equipment: Cat 420 D Rubber Tire Backhoe

Elevation: 5195.0 Date: 7/21/16

Laboratory Tests plate numbers and related information

*Percent Passing No. 200 sieve=12.5
Moisture-density relationship (see plate 7)

**Percent Passing No. 200 sieve=49.0
Liquid Limit=33
Plasticity Index=16

GPS: 39.61388°N
119.82537°W

Elevation Reference:
Washoe County GIS

Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Sample	Depth (ft)	Description
	1.1	99.8*	☒		Brown silty sand (SM) loose, dry with roots to one inch.
	2.3	101.5		1	Becoming medium dense below six inches.
		**	☒		Dark brown clayey sand (SC) dense, dry.
				2	
				3	Brown silty sand (SM) dense, dry.
				4	
				5	
				6	
				7	
				8	Becoming very dense below 8 feet.
				9	
				10	No Free Water Encountered.

Test Pit: TP 2

Equipment: Cat 420 D Rubber Tire Backhoe

Elevation: 5106 Date: 7/21/16

Laboratory Tests plate numbers and related information

GPS: 39.61363°N
119.82373°W

Elevation Reference:
See Log of TP 1

Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Sample	Depth (ft)	Description
					Brown silty sand (SM) loose, dry with roots to one inch, becoming medium dense belwo 6 inches.
				1	Dark brown clayey sand (SC) dense, dry.
				2	Brown silty sand (SM) very dense, dry
				3	
				4	
				5	
				6	Backhoe refusal at 7 feet
				7	No Free Water Encountered.
				8	

Job No. 16.161.01-G	TEST PIT LOG	reviewed: CDB
Axion GEOTECHNICAL Geotechnical Engineering & Construction Testing Services 681 Edison Way Reno, NV 89502	GOLDEN MESA NORTH 20 ACRE PARCEL Reno, Nevada	Plate #2

Test Pit: TP 3

Equipment: Cat 420 D Rubber Tire Backhoe

Elevation: 5098 Date: 7/21/16

Laboratory Tests plate numbers and related information	Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
				0–2	Brown silty sand (SM) loose, dry with roots to 1 inch. Becoming medium dense below 6 inches.
				2–3	Dark brown clayey sand (SC) dense, dry.
				3–9	Brown silty, sand (SM) very dense, dry.
* Grain size analysis (see plate 6)		4.7		*5 ☒	
				9–10	No Free Water Encountered.

GPS: 39.61262°N
119.82441°W

Elevation Reference:
See Log of TP 1

Test Pit: TP 4

Equipment: Cat 420 D Rubber Tire Backhoe

Elevation: 5102 Date: 7/21/16

Laboratory Tests plate numbers and related information	Driving Resistance Blows/Ft.	Moisture Content (%)	Dry Density (pcf)	Depth (ft) Sample	
* R-Value (see Plate 8)				* ☒ 0–1	Brown silty sand (SM) loose, dry with roots to 6 inches. Becoming medium dense below 8 inches.
				1–9	Color change to red-brown and becoming dense below 18 inches.
					Color change to brown and becoming very dense below 5 feet.
				9–10	No Free Water Encountered.

GPS: 39.61146°N
119.823190°W

Elevation Reference:
See Log of TP 1

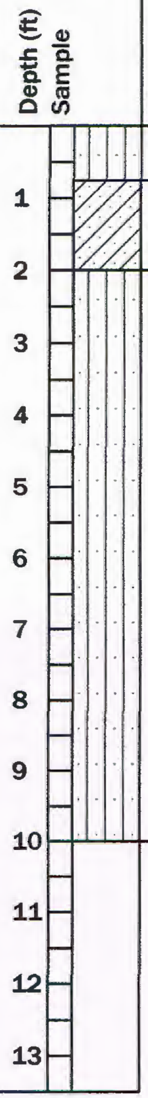
Job No. 16.161.01-G	TEST PIT LOG	reviewed: CDB
Axion GEOTECHNICAL Geotechnical Engineering & Construction Testing Services 681 Edison Way Reno, NV 89502	GOLDEN MESA NORTH 20 ACRE PARCEL Reno, Nevada	Plate #3

Test Pit: TP 5

Equipment: Cat 420 D Rubber Tire Backhoe

Elevation: 5094 Date: 7/21/16

Laboratory Tests plate numbers and related information



Brown silty sand (SM) loose dry with roots 2 inches

Dark brown clayey sand (SC) dense, dry.

Brown silty sand (SM) dense, dry.

No Free Water Encountered.

GPS: 39.61126°N
119.82516°W

Elevation Reference:
See Log of TP 1

Job No. 16.161.01-G	TEST PIT LOG	reviewed: CDB
Axion GEOTECHNICAL 681 Edison Way Reno, NV 89502	GOLDEN MESA NORTH 20 ACRE PARCEL Reno, Nevada	Plate #4

MAJOR DIVISIONS					TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN #200 SIEVE	**GRAVELS** MORE THAN HALF COURSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	⁙	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	⁙	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	▥	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND SILT MIXTURES
			GC	▨	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COURSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	⁙	WELL GRADED SANDS, GRAVELLY SANDS
			SP	⁙	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	▥	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	▨	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN #200 SIEVE	**SILTS AND CLAY** LIQUID LIMIT LESS THAN 50		ML	▥	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	▨	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS SILTY CLAYS, LEAN CLAYS
			OL	▥	INORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	▥	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	▨	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	▨	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	≈	PEAT AND OTHER HIGHLY ORGANIC SOILS

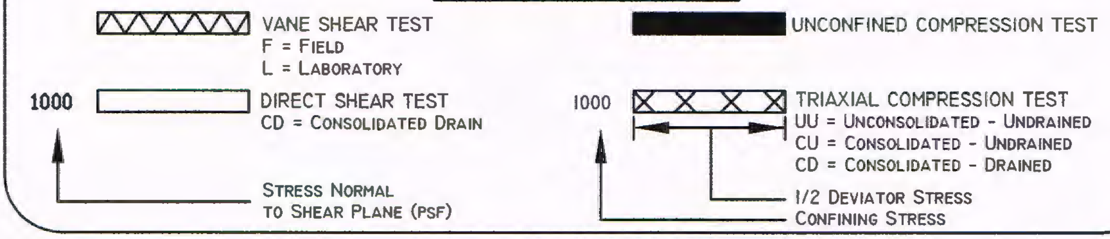
UNIFIED SOIL CLASSIFICATION SYSTEM

SAMPLE DESIGN

■ "UNDISTURBED" SAMPLE

☒ BULK OR CLASSIFICATION SAMPLE

STRENGTH TESTS



KEY TO TEST DATA

Job No. 16.161.01-G	**SOIL CLASSIFICATION CHART/KEY**	**reviewed: CDB**
Axion GEOTECHNICAL 681 Edison Way Reno, NV 89502	**GOLDEN MESA NORTH** **20 ACRE PARCEL** **Reno, Nevada**	**Plate #5**

SIEVE ANALYSIS
ASTM C136

Job Name: Moonlight Ranch Estates

Job Name: 16.161.01-G

Sample By: CDB   Date: 7/21/16   Tested by: CDB

Date: 7/25/16

Sample Source: T.P. 3 5.0'-5.5'

Classification: Brown Silty Sand (SM)

Lab No. GM-02

BEFORE WASHING

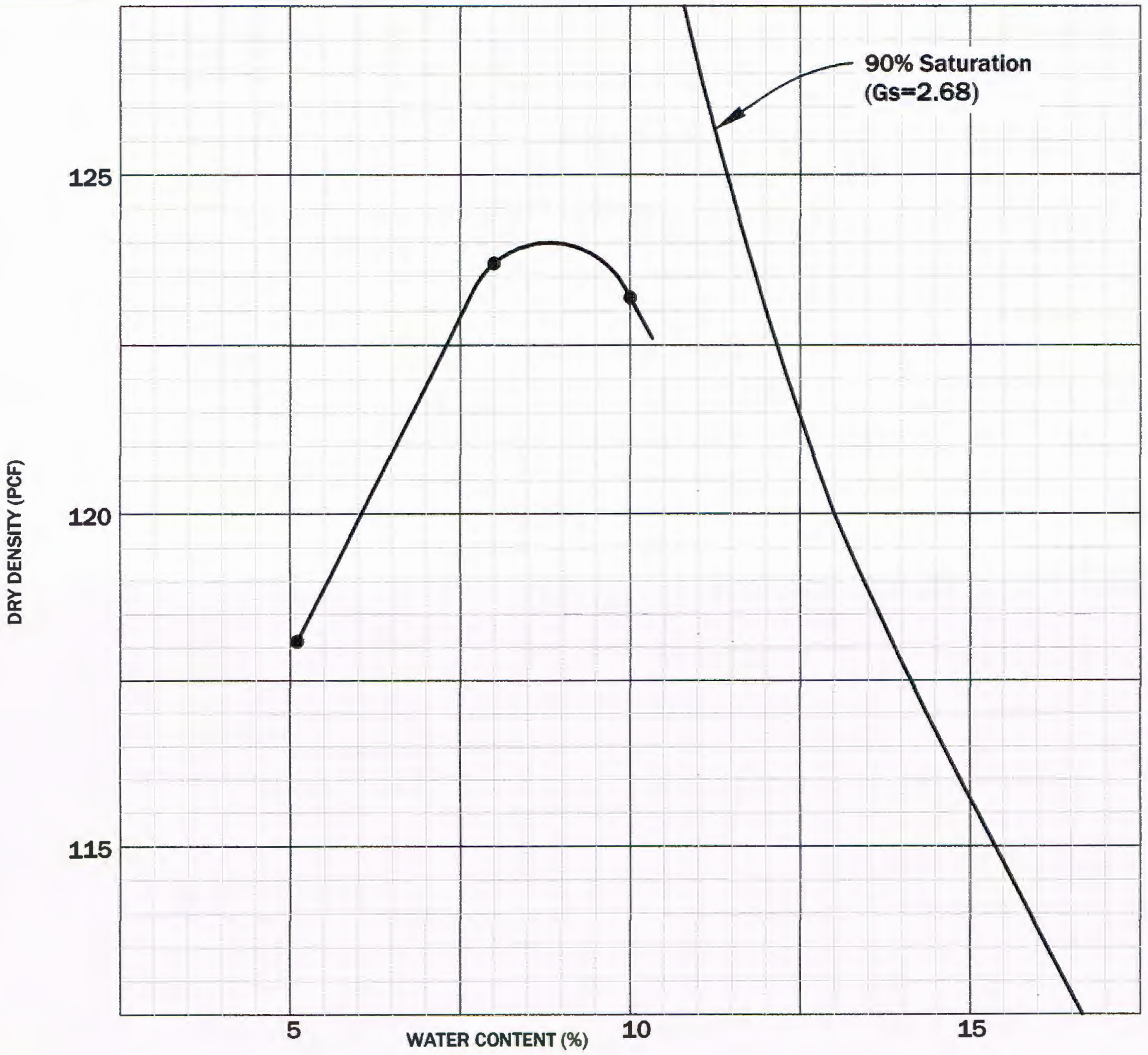
	Full Sample	Split Sample
Tare + Dry Wt.	2327.3	
Tare F	668.3	
Dry Wt.	1659.0	

AFTER WASH ON #200 SIEVE (ASTM D1140/C117)

Tare + Dry Wt.	3401.0
Tare A-3	2215.5
Dry Wt.	1185.5
Wt. -#200	473.5
Percent -#200	28.5

Sieve Size	Weight Retained	Percent Retained	Cumulative % Retained	Cumulative % Passing	Specifications
6"					
5 1/2"					
5"					
4 1/2"					
4"					
3 1/2"					
3"					
2 1/2"					
2"					
1 1/2"					
1"					
3/4"	0.0	0.0	0.0	100	
1/2"					
3/8"					
#4	104.3	6.3	6.3	93.7	
#8					
#10	218.0	13.1	19.4	80.6	
#20	200.0	12.0	31.4	68.6	
#30					
#40	336.5	20.3	51.7	48.3	
#50					
#60					
#100	241.3	14.5	66.2	33.8	
#200	81.3	4.9	71.1	28.9	
Pan	6.1	28.9			
Total					

Job No. 16.161.01-G	**GRAIN SIZE ANALYSIS**	reviewed: CDB
Axion GEOTECHNICAL Geotechnical Engineering & Construction Testing Serv 681 Edison Way Reno, NV 89502	**GOLDEN MESA NORTH 20 ACRE PARCEL Reno, Nevada**	**Plate #6**



TEST SPECIFICATION: ASTM D 1557-02 METHOD C MODIFIED

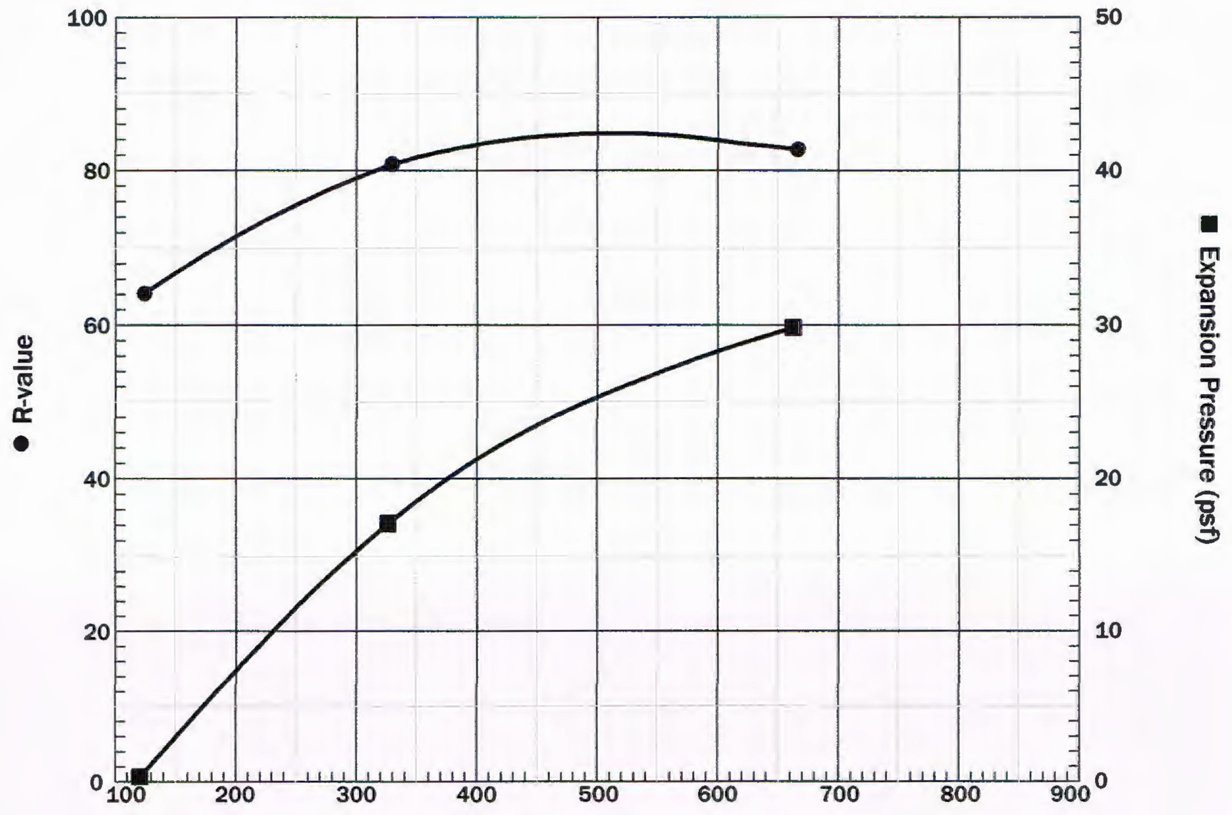
CLASSIFICATION		Sp. G.	LL	PI	% > 3/4"	% < No. 200
USCS	AASHTO					
(SM)				Non Plastic	Zero	12.5

TEST RESULTS	MATERIAL DESCRIPTION	COMMENTS
Maximum Dry density = 124 pcf Optimum Moisture = 8.5 %	Brown Silty Sand (SM)	

Sample Source: T.P. #1 0'-1' Depth: Sample No.: GM-01 Date: 7/25/16

Job No. 16.161.01-G	MOISTURE - DENSITY RELATIONSHIP	by: CDB
Axion GEOTECHNICAL 681 Edison Way Reno, NV 89502	GOLDEN MESA NORTH 20 ACRE PARCEL Reno, Nevada	Plate #7

R-VALUE TEST REPORT

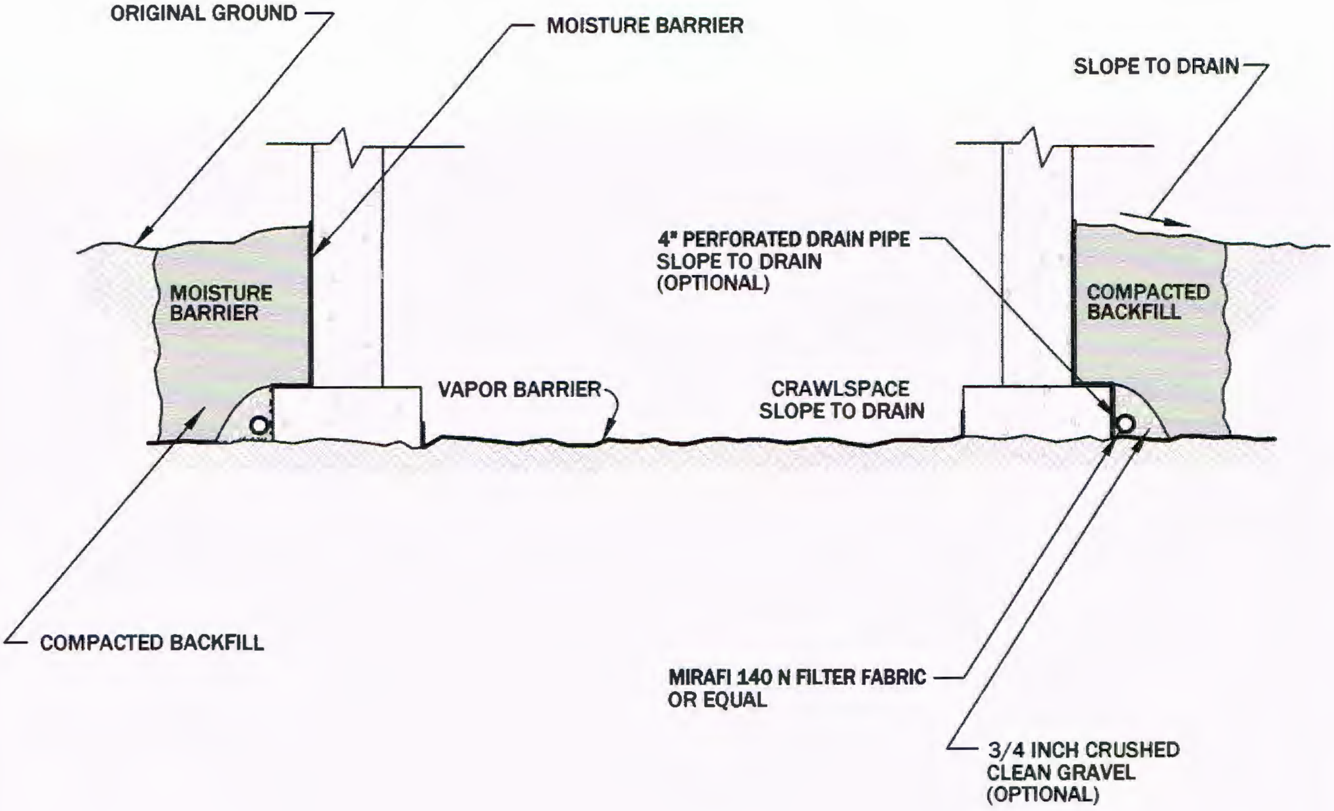


Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	300	126.7	8.1	31	16	2.55	581	84.1	84.1
2	300	124.4	9.9	0	36	2.59	119	62.9	65.0
3	300	125.8	8.7	17	17	2.45	294	82.3	82.3

Test Results	Material Description
R-Value at 300 psi exudation pressure= 82.7 Exp. pressure at 300 psi exudation pressure= 18 psf	Brown silty sand (SM)
Project No.: 6629.011 Project: Axion Geotechnical, LLC Location: Golden Mesa North 20 acre Parcel; T.P. 4 Sample Number: 16-235 Depth: 0.5-1.5' Date: 9/23/2016	Tested by: Checked by: Remarks:

Job No. 16.161.01-G	R-VALUE TEST REPORT	by: CDB
Axion GEOTECHNICAL 681 Edison Way Reno, NV 89502	GOLDEN MESA NORTH 20 ACRE PARCEL Reno, Nevada	Plate #8



Job No. 16.161.01-G	FOUNDATION & BACKFILL DETAIL	reviewed: CDB
Axion GEOTECHNICAL 681 Edison Way Reno, NV 89502	Golden Mesa North 20 Acre Parcel Reno, Nevada	Plate #9

Geotechnical Investigation
Moonlight Hills Estates
Washoe County, Nevada

Mr. Nevis
MOONLIGHT HILLS ESTATES, LLC
5390 Bellazza Court
Reno, Nevada 89519

Project No.: 3228.004
July 21, 2015

PROFESSIONAL ENGINEER - STATE OF NEVADA
BLAKE
DOUGLAS
CARTER
Exp. 12-31-16
CIVIL
No. 22331

Blake D. Carter, PE
PE Number – 22331

WOOD RODGERS
DEVELOPING INNOVATIVE DESIGN SOLUTIONS
5440 Reno Corporate Drive Tel: 775.823.4068
Reno, NV 89511 Fax: 775.823.4066

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Appendix A

EXECUTIVE SUMMARY

Presented herein are the results of Wood Rodgers' geotechnical exploration, laboratory testing, and associated geotechnical design recommendations for a proposed single-family residential development to be located in Washoe County, Nevada. The development will include two phases; the north and south parcels will be referred to as Phase 1 and Phase 2, respectively. The proposed home sites are anticipated to be half to one acre lots with wood-framed, raised foundation or slab-on-grade homes. Public improvements will include paved roads, underground utilities, and drainage features.

Phase 1 soils generally consist of a silty sand surface layer capping moderately cemented clayey sand of moderate plasticity. Shallow bedrock was encountered in the northwest quadrant and was relatively excavatable to the depths indicated on the test pit logs (Approximately four to ten feet). These soils should provide adequate structural support both in-situ and if placed as structural fill; and therefore, standard spread foundations have been recommended. No geologic hazards have been mapped or identified within immediate proximity to the project. Groundwater was not encountered in any of our explorations and is anticipated to lie at a depth that would not influence construction activities or foundation support.

Phase 2 soils mostly resemble the various blends of silty sands and moderately cemented clayey sands from Phase 1; however, near surface clayey sands encountered to a depth of approximately two feet exhibit high plasticity and meet standard definitions for expansive soil. Therefore, a selective grading program which includes removal of these clayey surface soils from structural zones and/or stabilization by means of moisture conditioning and compaction have been recommended to allow the use standard spread foundations. In addition, Phase 2 contains a mound of undocumented fill just south of the center of the parcel. The fill materials were encountered in test pit number 7 (TP-7) to a depth of about six feet, and included sand, gravel, concrete and asphalt debris. This existing fill material will have to be removed and reworked prior to constructing overlying improvements.

Structural pavement sections have been developed for both off-site and on-site improvements. The Washoe County minimum structural pavement sections have been presented based on the granular nature of native subgrade soils. However, traffic volumes may be higher than the minimum section would allow and the presented sections should be evaluated once anticipated traffic volumes have been quantified.

This report has been prepared in consideration of the applicable provisions set forth in the International Residential Code (2012 IRC) and the amendments and modifications adopted by Washoe County. Public improvements are to be construction to County standards, and per the requirements of the 2012 Standard Specifications for Public Works Construction (2012 SSPWC, Orange Book).

1.0 INTRODUCTION

Presented herein are the results of Wood Rodgers' geotechnical exploration, laboratory testing, and associated geotechnical design recommendations for the proposed Moonlight Hills Estates development to be located in Washoe County, Nevada. The assessments and recommendations presented in this geotechnical report have been framed, in part, around the surface and subsurface conditions identified by our exploration program which was developed to be consistent with locally accepted industry practices regarding exploratory methods and geotechnical investigations for similar type projects. The proposed structures, topography, grading design, soils, and bedrock are all unique and therefore the engineering judgment employed by those in responsible charge of geotechnical design considerations, as defined by the State of Nevada, is considered the established and accepted standard of care for evaluation and analyses associated with this report.

This report has been prepared in accordance with the applicable provisions set forth in the International Residential Code (IRC, 2012) and the amendments and modifications adopted by Washoe County. These documents establish the minimum level of structural integrity, life safety, fire safety and livability for inhabitants of dwelling units while considering affordability. Geotechnical considerations for public improvements have been formulated around the requirements of Washoe County's Public Works Design Guidelines and the Standard Specifications for Public Works Construction. Performance standards around which our primary recommendations have been framed are based solely upon the requirements of the referenced documents; supplementary recommendations have been formulated to allow the builder the opportunity to weigh the benefit of higher performance standards against costs to achieve. Any expectations of performance inconsistent with, outside the purview of, or exceeding the requirements of the referenced documents are subjective, a function of materials, design, workmanship, and ownership and unless specifically stipulated or quantified herein are considered in excess to the scope and design standards of this report.

The objectives of this study were to:

1. Explore, test, and assess general soil, bedrock, and ground water conditions pertaining to preliminary design and construction considerations for the residential units associated with the planned development.
2. Provide recommendations associated with the design and construction of the project, as related to the identified geotechnical conditions, the stipulated design levels, and performance standards established herein.

The area covered by this report is shown in Figure 1 and on Plate A-1 (Site Plan & Approximate Test Pit Locations) in Appendix A. Our study included field exploration, laboratory testing, and engineering analyses to identify the physical and mechanical properties of the various on-site materials. Results of our field exploration and testing programs are included in this report; and in consideration of the stated design levels and performance standards form the basis for all conclusions and recommendations.

2.0 PROJECT DESCRIPTION

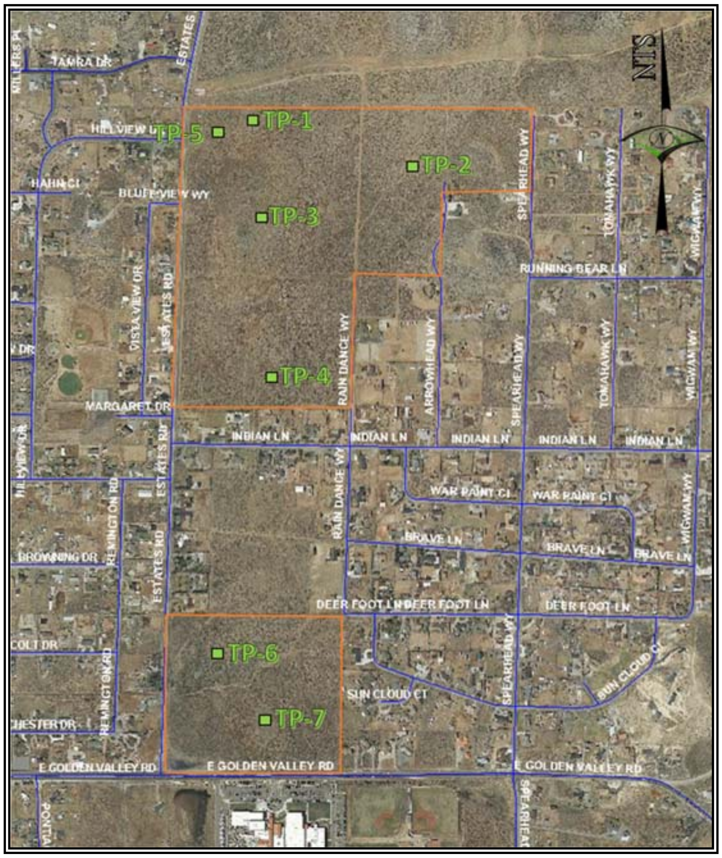

Figure 1 – Site Plan & Approximate Test Locations

The overall site is located in area known as Golden Valley, Washoe County, Nevada. The overall property encompasses an area of approximately 135 +/- acres, entirely contained in Section 11, Township 20N, Range 19E, M.D.M. As shown in Figure 1, the development is divided into two phases; Phase 1 to the north includes 100 acres and Phase 2 to the south including 35 acres. The overall site is bound by Estates Road to the west, East Golden Valley Road to the south, several residential properties to the east, and Bureau of Land Management land to the north. Many dirt trails exist across both phases and were used for site access.

It is our understanding that the proposed improvements consist of constructing half to one-acre home sites incorporating typical wood-framed, raised foundation or slab-on-grade homes, paved roads, underground utilities, and drainage features. Foundation loads have not been provided, but for the development of this report, are anticipated to be light to moderate (50 kips for column loads, 1 to 2 kips/foot for wall loads have been assumed).

The planning and engineering is currently in the conceptual phase; however, the development will be phased for a balance of cut and fills with little or no required import. Maximum cuts and fills are anticipated to be on the order of 10 feet. Depending on final grading, structures may be founded entirely in cut, entirely in fill, or in a cut/fill combination.

3.0 SITE CONDITIONS

3.1 Phase 1

Phase 1 consists of undeveloped land located along the southern foothills of the Hungry Mountain Range. Existing ground elevations across Phase 1 vary from approximately 5,105 feet in the southwest portion of the site to approximately 5,245 in the northeastern portion of the property, for a total relief of approximately 140 feet. The site exhibits an overall slope of approximately 3.5 percent to the south-southwest. A rock outcrop knob is present in the northwest quadrant. Drainage is accomplished by sheet flow to the southwest and a roadside ditch along Estates Drive. Vegetation consists of abundant sagebrush in excess of 3 feet in height and native grasses. Utilities were not encountered on-site, however an existing utility easement is present to the north of the property along Tamara Drive. This easement includes an underground gas main and overhead transmission lines. Several dirt trails traverse the site and were used by Wood Rodgers for site access.

3.2 Phase 2

Phase 2 is also composed of undeveloped land; however, the site offers a relatively flatter topography than Phase 1, is crossed by two small ephemeral creeks and presents a stockpile of undocumented fill soils in the south-central portion of the property. The northern creek was dry during our investigation, but appears to originate near the northeast quadrant of the property and flows toward the culvert near the midpoint of the western property boundary at Estates Drive. The other creek is a natural drainage fed from a storm drain culvert discharging onto the property about 420 feet east of Estates Drive. The two creeks meet near the inlet to the culvert crossing Estates Drive. The undocumented fill stockpile appears as a mound near the center of the property; however construction debris was encountered to a depth of six feet. Vegetation consists of sagebrush and native grasses. Underground utilities were not encountered.

4.0 FIELD EXPLORATION

The property was explored in May 2015 by excavating a series of seven test pits using a Deere 310SJ rubber-tire backhoe. The approximate locations of the test pits are shown on Plate A-1 – Site Plan and Approximate Exploration Locations. The maximum depth of test pit advance extended to 10 feet below the existing ground surface. Two percoloation tests were prepared in accordance with Washoe County Health Department standards within the northwest quadrant of Phase 1. Due to the soil-bedrock profile encountered within TP-1 and TP-5, the initial soak period did not percolate more than one inch in the first 30 mintues, therefore the test was discontinued.

Wood Rodgers' personnel examined and classified all soils in the field in general accordance with ASTM D 2488 (Description and Identification of Soils). Bulk samples for index testing were collected from the test pit trench walls at specific depths in various soil horizons, were placed in sealed plastic bags, and were returned to our Reno, Nevada laboratory for testing. Additional soil classifications, as well as verification of the field classifications, were subsequently performed in accordance with ASTM 2487 (Unified Soil Classification System [USCS]) upon completion of laboratory testing as described below in the Laboratory Testing section. Logs of the test pits are presented as Plate A-2a through Plate A-2f. A USCS chart has been included as Plate A-3 - Unified Soils Classification and Key to Soil Descriptions.

5.0 LABORATORY TESTING

All soil testing performed in the Wood Rodgers' laboratory is conducted in accordance with the standards and methods described in Volume 4.08 (Soil and Rock; Dimension Stone; Geosynthetics) of the ASTM Standards. Samples of significant soil types were analyzed to determine their in-situ moisture contents (ASTM D 2216), grain size distributions (ASTM D 6913), plasticity indices (ASTM D 4318), and R-value (ASTM D 2844). Results of laboratory testing are shown on Plate A-4a thru c – Summaries of Test Data. The test results were used to classify the soils according the USCS (ASTM D 2487) and to verify the field logs, which were then updated as appropriate. Classification in this manner provides an indication of the soil's mechanical behavior and can be correlated with published charts to evaluate bearing capacity, lateral earth pressures, and settlement potential.

Table 1 - Summary of Test Data

Test Hole	Depth (Ft.)	Moisture (%)	%Gravel (+ #4)*	% Sand (#4-#200)	%Fines (-#200)	Liquid Limit	Plasticity Index	USCS[1]
ASTM Standard		D2216	D6913			D4318		D2487
TP-1	0 - 1	6.8	2	79	18.5	NP	NP	SM
[2]TP-1	4 - 9	5.1	3	68	28.3	24	11	SC
[2]TP-3	2 - 8	2.5	42	45	12.8	24	10	SC
[2]TP-6	0.5 - 2	12.0	0	62	38.3	43	32	SC
TP-7	0 - 6	5.6	16	64	19.9	NP	NP	SM

[1] Since ASTM D2487 is limited by a maximum particle size of 3", the gradation test data presented is based on a maximum particle size of 3".
[2] Composite sample of subgrade material resulted in R-value of 44.

6.0 GEOLOGIC AND GENERAL SOIL AND GROUNDWATER CONDITIONS

Based on the Geologic Map of the Reno Area published by the Nevada Bureau of Mines and Geology (Figure 2), the site is mapped in an area of granitic alluvium (Qg) mainly consisting of weathered granitic sand and Granodiorite (Mzgd) which exhibits rock outcrops. The Golden Valley Pit is about 2,000 feet to the east of the northern project boundary; this Pit offers a commercial source for bedding sand and structural fill materials. The soil units encountered in our explorations are reasonably consistent with the mapped geologic deposits, and typically consisted of loose to medium dense sands locally capping a layer of moderately cemented clayey sands and weathered bedrock to the depth explored.

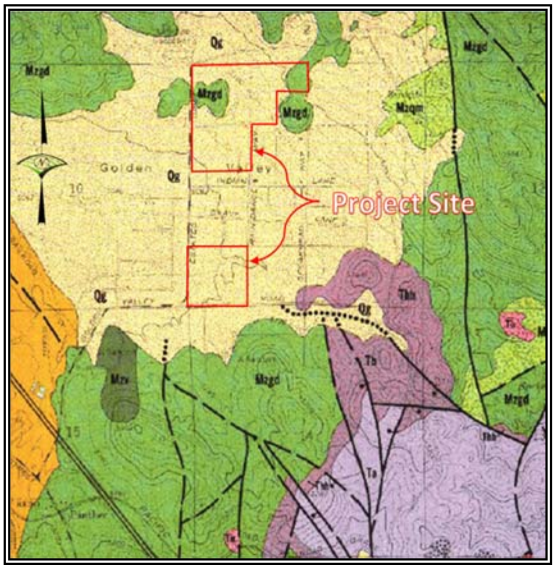

Figure 2 – Geologic Map of the Reno Area (NBMG, 1973)

Groundwater was not encountered in any of our explorations. Based on Nevada Division of Water Resources well data from 319 documented wells in the same Section, Township, and Range, an average groundwater depth near 90 feet was calculated.

7.0 DISCUSSION AND RECOMMENDATIONS

7.1 General Information

The following definitions characterize terms utilized in this report:

- Fine-grained soil possesses more than 40 percent by weight passing the number 200 sieve and exhibits a plasticity index lower than 15.
- Clay soil possesses more than 40 percent passing the number 200 sieve and exhibits a plasticity index greater than 15.
- Granular soil does not meeting the above criteria and has a maximum particle size less than 6-inches.

The recommendations provided herein, particularly under Site Preparation, Grading and Filling, Foundation Design, Site Drainage and Quality Control are intended to reduce risks of structural distress related to consolidation or expansion of native soils and/or structural fills. These recommendations, along with proper design and construction of the planned structure(s) and associated improvements, work together as a system to improve overall performance. If any aspect of this system is ignored or poorly implemented, the performance of the project will suffer. Any evaluation of the site for the presence of surface or subsurface hazardous substances is beyond the scope of this study. When suspected hazardous substances are encountered during routine geotechnical investigations, they are noted in the exploration logs and reported to the client. No such substances were identified during our exploration.

The exploratory test holes were advanced at the approximate locations shown on the exploration map. All excavations were backfilled upon completion of the field portion of our study. The backfill was compacted to the extent possible with the equipment on hand. However, the backfill was not compacted to the requirements presented herein under Grading and Filling. If structures, concrete flatwork, pavement, utilities or other improvements are to be located in the vicinity of any of the exploratory excavations, the backfill should be removed and re-compacted in accordance with the requirements contained in the soils report. Failure to properly compact backfill could result in excessive settlement of improvements located over test pits.

Structural areas referred to in this report include all areas of buildings, concrete slabs, asphalt pavements, as well as pads for any minor structures. All compaction requirements presented in this report are relative to ASTM D 1557[1].

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[1] • Relative compaction refers to the ratio (percentage of the in-place density of a soil divided by the same soil's maximum dry density) as determined by the ASTM D 1557 laboratory test procedure. Optimum moisture content is the corresponding moisture content of the same soil at its maximum dry density.

7.2 Seismic Design Category

Per the 2012 International Residential Code amendments adopted by Washoe County, the residential buildings located on-site shall be assigned a seismic design category D_2.

7.3 Site Preparation

All vegetation should be stripped and grubbed from structural areas. A stripping depth of 0.3 to 0.5 feet is anticipated. Localized deeper areas may be required in areas of large brush. Some vegetation could be placed in non-structural fill areas at least 5 feet away from any structure footprint. Concentration of the vegetation must be avoided and the vegetation must be blended with a sufficient amount of soil since placing large concentrated layers of vegetation could lead to excessive settlement and subsequent surface depressions.

Surficial clayey soils present within the upper two to three feet of Phase 2 will exhibit considerable shrink-swell with changes in moisture content. Such soils are common, but sporadically distributed and must be identified during grading. Failure to recognize and properly mitigate expansive clayey soils will result in damage to improvements. Clayey soils should be separated from improvements by structural fill in order to decrease potential shrink-swell movements. The minimum separation is 2.0 feet for footings and floor slabs and 1.5 feet for asphalt pavements and exterior concrete. This separation may include aggregate base section, as applicable. The required separation may be achieved by any combination of site filling or over-excavation and replacement. Over-excavation may cease if clayey soils are penetrated and presence of granular soils

Clayey soils to be left in place and covered with fill must be scarified and moisture-conditioned to 2 to 4 percent over optimum for a minimum depth of 12-inches. This requirement is in lieu of additional over-excavation and is critical to structure performance. This moisture level will significantly decrease the magnitude of shrink-swell movements in the upper foot of clayey soils. The high moisture content must be maintained by periodic surface wetting, or other methods, until the surface is covered by at least one lift of fill.

All areas to receive structural fill or structural loading should be densified for a minimum depth of 8-inches to at least 90 percent relative compaction in accordance with ASTM D 1557. Prior to densification, soils should be moisture conditioned to plus or minus 3 percent of optimum. Higher moisture contents will be acceptable if the soil horizon is stable and density can be achieved in subsequent structural fill lifts. Scarification and moisture conditioning may be required to achieve the required soil moisture content recommendations.

7.4 Grading and Filling

Structural fill is defined as any material placed below structural elements, including; foundations, concrete slabs-on-grade, pavements, or any structure that derives support from the underlying soil. Granular and fine-grained soil generated on-site and free of vegetation, organic matter, and other deleterious material can be used as structural fill. If imported structural fill is required, it should be reasonably free of vegetation, organic matter, and other deleterious material and meet the requirements of Table 2.

Table 2 - Guideline Specification for Imported Structural Fill

Sieve Size (ASTM D6913)	Percent by Weight Passing
6 Inch	100
4 Inch	90 - 100
¾ Inch	70 - 100
No. 40	15 - 70
No. 200	5 - 30
Maximum Liquid Limit (ASTM D4318)	40
Maximum Plasticity Index	10

Adjustments to the recommended limits presented in Table 2 can be provided to allow the use of other granular, non-expansive material, including rock fills. Any such adjustments must be made and approved by the geotechnical engineer, in writing, prior to importing fill to the site. Rock fills must consist of a 12-inch-minus, well-graded soil, placed and compacted in maximum 15-inch thick lifts. A soil fill or 3-inch minus rock fill is normally used for the final 12 inches of pad fills to facilitate fine grading, foundation excavations, and utility trenching.

Structural fill should be placed in maximum 12-inch thick (loose) level lifts or layers, moisture conditioned to within 3 percent of optimum, and densified to at least 90 percent relative compaction. Higher moisture contents are acceptable if the soil lifts are stable and required relative compaction can be attained in the soil lift and subsequent soil lifts. Where structural fills exceed 5 feet in thickness the minimum compaction requirement shall be increased to 95 percent.

The maximum fill differential beneath a building pad shall be limited to 5 feet; over-excavation and replacement of in-situ soils or extending foundations may be necessary to meet this requirement. Field density testing shall be performed at a rate of 1 test per 1,000 cubic yards of material placed, or 1 test per lift of fill, as a quality control measure during placement and compaction of fill soils.

7.5 Trenching and Excavation

All trenching should be performed and stabilized in accordance with local, state, and OSHA standards. Bank stability is the responsibility of the contractor, who is present at the site, able to observe changes in ground conditions, and has control over personnel and equipment. Based on the results of our exploration, it is our opinion that the bulk of the site soils appear to be predominately Type C, although variations exist. Deeper excavations in Phase 1 may encounter stable rock.

7.6 Foundations

Standard spread foundations are recommended for use on this project. Provided the foundation support soils have been prepared in accordance with the recommendations of this report, the bearing pressures presented in Table 3 can be utilized for design.

Table 3 - Allowable Foundation Bearing Pressures

Loading Condition	Maximum Net Allowable Bearing Pressure (PSF)[1]
Dead Load Plus Full Time Live Load	2,000
Dead Load Plus Live Loads, Plus Transient Wind or Seismic Loads	2,750

[1] Net allowable bearing pressure is that pressure at the base of the footing in excess of the adjacent overburden pressure.

For frost protection, footings should all be set at least twenty-four (24”) inches below adjacent outside or unheated interior finish grades, as required by code. Footings not located within frost prone areas should be placed at least 12 inches below surrounding ground or slab level for confinement. Regardless of loading, individual pad foundations and continuous spread foundations should be at least 18 and 12 inches wide, respectively, or as required by code.

Before placing reinforcement steel for foundations, the foundation subgrade should be inspected. If loose, soft, wet, or disturbed soils are encountered at the foundation subgrade, these soils should be removed to expose suitable foundation soils, and the resulting over-excavation backfilled with compacted structural fill. The base of all excavations should be dry and free of loose materials at the time of concrete placement.

Total settlement for structures designed in accordance with the assumptions and recommendations presented in this report is anticipated to be on the order of ¾ inch, or less. Differential settlement between foundations with similar loads and sizes is anticipated to be ½ of the total settlement. If larger footings or heavier column loads are planned, bearing capacity recommendations and anticipated settlements should be updated accordingly.

7.7 Lateral Loads and Retaining Structures

Lateral loads, such as wind or seismic, may be resisted by passive soil pressure and friction on the bottom of the footing. The recommended coefficient of base friction is 0.42 and has been reduced by a factor of 1.5 on the ultimate soil strength. Lateral earth pressures imposed on retaining walls are dependent on the relative rigidity and movement of the structure, soil type, and moisture conditions behind the wall. Recommended lateral earth pressures are presented in Table 4 – Lateral Earth Pressures.

Table 4 - Lateral Earth Pressures

Condition	Active (psf/f)		Passive (psf/f)		At Rest
	Static	Pseudo-Static	Static	Pseudo-Static	
Level	40	60	350	275	60

The values presented in Table 4 assume wall backfill will be structural fill. Excessive pressures can be developed due to heavy compaction equipment during backfill placement. Therefore, all backfill behind any retaining structures should be screened to 6” minus and shall be compacted to not less than 90 percent if only supporting slabs-on-grade. Due care must be exercised during compaction to avoid build-up of excessive pressures. The values presented in Table 4 do not take into account hydrostatic pressures or seismic forces. French drains, a drainage backfill geotextile such as Mirafi 140 N, or a pre-manufactured drain system such as Tensar® DC1200 may be used if hydrostatic pressure buildup is possible.

7.8 Slope Stability and Erosion Control

Stability of cut and filled surfaces involves two separate aspects. The first concerns true slope stability related to mass wasting, landslides or the enmasse downward movement of soil or rock. Cut and fill slopes, with gradients of 2H:1V (horizontal to vertical) or flatter, are suitable for the project soils.

The second aspect of stability involves erosion potential and is dependent on numerous factors involving grain size distribution, cohesion, moisture content, slope angle and the velocity of the water or wind on the ground surface. Erosion protection should be in accordance with Washoe County *Public Works Design Standards*.

Temporary (during construction) and permanent (after construction) erosion control will be required for all disturbed areas. The contractor shall prevent dust from being generated during construction in compliance with all applicable city, county, state and federal regulations, and shall submit an acceptable dust control plan to Washoe County prior to starting site preparation or earthwork. The project specifications should include an indemnification by the contractor of the owner and engineer for any dust generation during the construction period. The owner will be responsible for mitigation of dust after his acceptance of the project.

7.9 Site Drainage

Adequate surface drainage must be constructed and maintained away from the structures. The permanent finish slopes away from the structure should be sufficient to allow water to drain away quickly from and prevent any ponding of water adjacent to the structure. All runoff should be collected within permanent drainage paths that can convey water off the property. A system of roof gutters and downspouts is recommended to collect roof drainage and direct it away from the foundations.

Foundation and stem wall backfill should be densified to at least 90 percent relative compaction. Compacting the backfill material decreases permeability and reduces the amount of irrigation and storm water available to enter under floor areas.

7.10 Concrete Slabs

A 6-inch minimum thickness of compacted (95% minimum per ASTM D1557) Type 2, Class B aggregate base course should underlie concrete slabs-on-grade. All dedicated and public easement improvements shall be constructed in accordance with the Standard Specifications for Public Works Construction. The decision to incorporate a moisture vapor retarder or barrier is a function of the overlying floor treatments and/or equipment and should be based on a case by case basis. However, in no instance should concrete be placed directly on the barrier without additional consideration to curing practices.

Western Nevada is a region with absorptive aggregates and exceptionally low relative humidity. As a consequence, concrete flatwork will shrink and curl in a manner which is not typical of other US regions. Proper sub-grade preparation and placement of reinforcement are imperative. Typical joint spacing, regionally, is on 10 to 12 foot centers. Cracking that occurs within the slab on grade will often reflect through overlying improvements even if adequate substrate preparation has occurred.

All concrete placement and curing shall be performed in accordance with procedures outlined by the American Concrete Institute. Special considerations should be given to concrete placed and cured during hot or cold weather conditions. Proper control joints and reinforcing should be provided to minimize any damage resulting from shrinkage.

7.11 Concrete Sulfate Exposure Level

The native soils presented sodium sulfate levels in the negligible category. Therefore, it is our opinion sulfate exposure is not applicable, Class S0 (ACI 318, Table 4.2.1), should govern when considering concrete requirements. Soil corrosivity laboratory test results are presented on Plate A-5 in Appendix A.

7.12 Asphaltic Concrete

The minimum structural pavement section for local streets within Washoe County consists of 3 inches of Type II asphaltic concrete with a sand seal (or Type 3 asphaltic concrete with a fog seal) overlying 6 inches of Type II, Class B aggregate base. Based on the granular nature of subgrade soils and our composite R-Value tests, the minimum structural section can be used for the streets within the development providing roadbed has been prepared as discussed in the Site Preparation portion of this report. Roadway improvements specific to major roads should be addressed separately and based on projected traffic data.

All roadway construction shall be in accordance with the approved plans and the Standard Specifications for Public Works Construction. We recommend Type 3 plantmix bituminous pavement be used in the surface lift of all pavement sections. The Contractor should submit a pavement mix design to the Owner, for approval, at least 5 working days prior to paving. When pavement is placed directly adjacent to concrete flatwork, the finish compacted grade of the pavement be at least ½ of an inch higher than the edge of adjacent concrete surface to allow adequate compaction of the pavement without damaging the concrete.

7.13 Asphalt Design Life

Maintenance is *mandator*y to long-term pavement performance. Maintenance refers to any activity performed on the pavement that is intended to preserve its original service life or load-carrying capacity. Examples of maintenance activities include patching, crack or joint sealing, and seal coats. If these maintenance activities are ignored or deferred, premature failure of the pavement *will occur*.

The cost associated with proper maintenance is generally much less than the cost for reconstruction due to the premature failure of the pavement. Therefore, since pavement quality is an integral consideration in the formulation of our design recommendations, we strongly recommend the owner/project manager implement a pavement management program.

Premature failure of asphaltic concrete frequently occurs adjacent to poorly graded ponding areas and/or landscape areas. Failures may occur due to excessive precipitation, irrigation and landscaping water infiltrating into the subgrade soils causing subgrade failure. As such, in areas where saturation of the subgrade soils beneath asphaltic pavement may occur, we strongly recommend the owner/project manager install a subdrain system to eliminate the potential for saturation of subgrade soils. The subdrain system should discharge into a permanent drainage area that will not impede drainage flow to cause the system to back-up and/or clog. Appropriate maintenance procedures should be implemented to ensure the subdrain system does not plug and allow for proper drainage of surface and subsurface water beneath paved areas. Subdrain location and configuration should be evaluated once final grading and landscaping plans have been prepared. If the ultimate traffic exceeds the anticipated levels, it may be necessary to reevaluate and overlay the pavement at some time in the future.

8.0 CONSTRUCTION OBSERVATION AND TESTING SERVICES

The recommendations presented in this report are based on the assumption that the contractors perform their work as required by the project documents and that owner/project manager provides sufficient field-testing and construction review during all phases of construction. Prior to construction, the owner/project manager should schedule a pre-job conference including, but not limited to, the owner, architect, civil engineer, the general contractor, earthwork and materials subcontractors, building official, and geotechnical engineer. It is the owner's/project manager responsibility to set-up this meeting and contact all responsible parties. The conference will allow parties to review the project plans, specifications, and recommendations presented in this report, and discuss applicable material quality and mix design requirements. All quality control reports should be submitted to the owner/project manager for review and distributed to the appropriate parties.

During construction, Wood Rodgers Incorporated should have the opportunity to provide sufficient on-site observation of site preparation and grading, over-excavation, fill placement, foundation installation, and paving. Compaction testing and continuous observation of fill placement should be performed while placing fill and backfill. These observations would allow us to document that the geotechnical conditions are as anticipated and that the contractor's work meets with the criteria in the approved plans and specifications. Verification of horizontal and vertical control must be provided by whoever was responsible for establishing those boundaries and constructing associated improvements.

9.0 STANDARD LIMITATION CLAUSE

This report has been prepared in accordance with generally accepted local geotechnical practices. The analyses and recommendations submitted are based upon field exploration performed and the conditions encountered as discussed in our report. This report does not reflect soils variations that may become evident during the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to document compliance with our recommendations. The owner/project manager is responsible for distribution of this geotechnical report to all designers and contractors whose work is related to geotechnical factors.

It is the contractor’s responsibility for the grading and construction of the designed improvements. This responsibility includes the means, methods, techniques, sequence, and procedures of construction and safety of construction at the site. All construction shall conform to the requirements of the most recently adopted version of the Standard Specifications for Public Works Construction and the requirements of Washoe County. Failure to inspect the work shall not relieve the contractor from his obligation to perform sound and reliable work as described herein and as described in the Standard Specifications for Public Works Construction.

All plans and specifications should be reviewed by the design engineer responsible for this geotechnical report, to determine if they have been prepared in accordance with the recommendations contained in this report, prior to submitting to the building department for review. It is the owner's/project manager responsibility to provide the plans and specifications to the engineer.

This report has been prepared to provide information allowing the architect and engineer to design the project. The owner/project manager is responsible for distribution of this report to all designers and contractors whose work is affected by geotechnical aspects. In the event of changes in the design, location, or ownership of the project after presentation of this report, our recommendations should be reviewed and possibly modified by the geotechnical engineer. If the geotechnical engineer is not accorded the privilege of making this recommended review, we can assume no responsibility for misinterpretation or misapplication of our recommendations or their validity in the event changes have been made in the original design concept without our prior review. The engineer makes no other warranties, either expressed or implied, as to the professional advice provided under the terms of this agreement and included in this report.

This report was prepared by Wood Rodgers, Inc. for the benefit of Moonlight Hills Estates, LLC. The material in it reflects Wood Rodgers' best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Wood Rodgers' accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

10.0 REFERENCES

American Society of Civil Engineers (ASCE), 2013, *Minimum Design Loads for Buildings and Other Structures;* ASCE Standard ASCE/SEI 7-10.

American Concrete Institute (ACI), 2011, *Building Code Requirements for Structural Concrete and Commentary;* Volume ACI 318-11.

American Society for Testing and Materials (ASTM), 1993, *Soil and Rock; Dimension Stone; Geosynthetics,* Volume 4.08.

The Asphalt Institute, 1991, *Thickness Design - Asphalt Pavements for Highways and Streets*, Manual Series No. 1 (MS-1).

Bonham, Harold F., *Reno Folio Geologic Map*, Reno, Nevada (1973), Nevada Bureau of Mines and Geology, Environmental Series.

Bowles, J. E., 1996, *Foundation Analysis and Design,* McGraw Hill. 5th Edition.

International Building Code 2012.; *International Conference of Building Officials.*

Sowers, George, F., 1979, *Introductory Soil Mechanics and Foundations: Geotechnical Engineering.*

Standard Details for Public Works Construction, 2012 (Washoe County).

APPENDIX A

REFERENCE: CITY OF RENO GIS MAPSERVER, ACCESSED JUNE 2015.

WOOD RODGERS

5440 Reno Corporate Drive, Reno, NV 89511

Phone 775.823.4068 Fax 775.823.4066

SITE PLAN AND APPROXIMATE TEST LOCATIONS

Geotechnical Investigation

MOONLIGHT HILLS ESTATES
WASHOE COUNTY, NEVADA

Project No.: 3228.004
Date: 06/05/15

PLATE A-1

Wood Rodgers, Inc.
5440 Reno Corporate Drive
Reno, NV 89511
Telephone: 775-823-4068
Fax: 775-823-4066

TEST PIT NUMBER TP-1

PAGE 1 OF 1

CLIENT Moonlight Hills Estates

PROJECT NAME Golden Valley Estates

PROJECT NUMBER 3228.004

PROJECT LOCATION Golden Valley Nevada

DATE STARTED 5/19/15 **COMPLETED** 5/19/15

GROUND ELEVATION Original **TEST PIT SIZE** 36 inches

EXCAVATION CONTRACTOR Versa Grade Construction

GROUND WATER LEVELS:

EXCAVATION METHOD Deere 310SJ

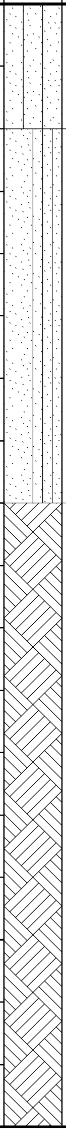
AT TIME OF EXCAVATION --- No Free Water Encountered

LOGGED BY Blake Carter **CHECKED BY** Blake Carter

AT END OF EXCAVATION --- No Free Water Encountered

NOTES: Percolation attempt at 4' BGS.

AFTER EXCAVATION --- No Free Water Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	R-VALUE	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
0.0		SILTY SAND, (SM) loose, moist, dark brown	GB 1A					6.8	NP	NP	NP	18.5
2.5		POORLY GRADED SAND TO SILTY SAND, (SP-SM) loose to medium dense, moist, yellow brown										
5.0		BEDROCK, very think-bedded, occasionally fractured, moderately hard, moderate strength, slightly weathered; Excavates as a moderately cemented Clayey Sand (SC), moist, light brown										
7.5		(Percolation test abandoned after <1 inch in 30 minutes during initial soak)	GB 1B					5.1	24	13	11	28.3

Practical Refusal at 9.0 feet.

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Fax: 775-823-4066

TEST PIT NUMBER TP-2

PAGE 1 OF 1

CLIENT Moonlight Hills Estates
PROJECT NAME Golden Valley Estates
PROJECT NUMBER 3228.004
PROJECT LOCATION Golden Valley Nevada
DATE STARTED 5/19/15 **COMPLETED** 5/19/15
GROUND ELEVATION Original **TEST PIT SIZE** 24 inches
EXCAVATION CONTRACTOR Versa Grade Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Deere 310SJ
AT TIME OF EXCAVATION --- No Free Water Encountered
LOGGED BY Blake Carter **CHECKED BY** Blake Carter
AT END OF EXCAVATION --- No Free Water Encountered
NOTES:
AFTER EXCAVATION --- No Free Water Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	R-VALUE	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		SILTY SAND, (SM) loose, moist, dark brown										
		SILTY SAND, (SM) dense, moist, yellow brown, moderately cemented										
2.5												
5.0			GB 2A									
7.5												

Bottom of Test Pit at 9.0 Feet.

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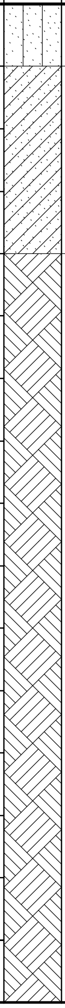
Fax: 775-823-4066

TEST PIT NUMBER TP-3

PAGE 1 OF 1

CLIENT Moonlight Hills Estates
PROJECT NAME Golden Valley Estates
PROJECT NUMBER 3228.004
PROJECT LOCATION Golden Valley Nevada
DATE STARTED 5/19/15 **COMPLETED** 5/19/15
GROUND ELEVATION Original **TEST PIT SIZE** 24 inches
EXCAVATION CONTRACTOR Versa Grade Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Deere 310SJ
AT TIME OF EXCAVATION --- No Free Water Encountered
LOGGED BY Blake Carter **CHECKED BY** Blake Carter
AT END OF EXCAVATION --- No Free Water Encountered
NOTES:
AFTER EXCAVATION --- No Free Water Encountered



DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	R-VALUE	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		SILTY SAND, (SM) loose, moist, dark brown										
		CLAYEY SAND, (SC) medium dense, moist, brown	✋ GB 3A									
2.5		BEDROCK, thick-bedded, closely fractured, moderately hard, moderate strength, moderate to slightly weathered; excavates as a Clayey Sand (SC) with gravel, dense to very dense, dry, light brown with oranges and grays.										
5.0			✋ GB 3B					2.5	24	14	10	12.8
7.5												

Practical Refusal at 8.0 feet.

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TEST PIT NUMBER TP-4

PAGE 1 OF 1

CLIENT Moonlight Hills Estates

PROJECT NAME Golden Valley Estates

PROJECT NUMBER 3228.004

PROJECT LOCATION Golden Valley Nevada

DATE STARTED 5/19/15 **COMPLETED** 5/19/15

GROUND ELEVATION Original **TEST PIT SIZE** 24 inches

EXCAVATION CONTRACTOR Versa Grade Construction

GROUND WATER LEVELS:

EXCAVATION METHOD Deere 310SJ

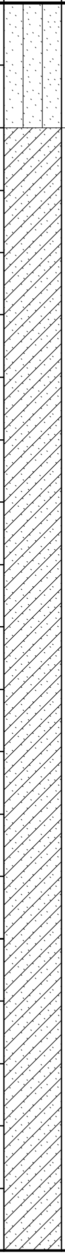
AT TIME OF EXCAVATION --- No Free Water Encountered

LOGGED BY Blake Carter **CHECKED BY** Blake Carter

AT END OF EXCAVATION --- No Free Water Encountered

NOTES:

AFTER EXCAVATION --- No Free Water Encountered



DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	R-VALUE	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0		SILTY SAND, (SM) loose, moist, dark brown										
		CLAYEY SAND, (SC) dense, moist, yellow brown, moderately cemented										
2.5												
5.0												
			GB 4A									
7.5												
10.0												

Bottom of Test Pit at 10.0 Feet.

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TEST PIT NUMBER TP-5

PAGE 1 OF 1

CLIENT Moonlight Hills Estates

PROJECT NAME Golden Valley Estates

PROJECT NUMBER 3228.004

PROJECT LOCATION Golden Valley Nevada

DATE STARTED 5/19/15 **COMPLETED** 5/19/15

GROUND ELEVATION Original **TEST PIT SIZE** 24 inches

EXCAVATION CONTRACTOR Versa Grade Construction

GROUND WATER LEVELS:

EXCAVATION METHOD Deere 310SJ

AT TIME OF EXCAVATION --- No Free Water Encountered

LOGGED BY Blake Carter **CHECKED BY** Blake Carter

AT END OF EXCAVATION --- No Free Water Encountered

NOTES:

AFTER EXCAVATION --- No Free Water Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	R-VALUE	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
0.0		SILTY SAND, (SM) loose, moist, yellow brown										
		Medium dense	✋ GB 5A									
2.5												
		BEDROCK, thick-bedded, closely fractured, moderately hard, moderate strength, moderate to slightly weathered; excavates as a Clayey Sand (SC) with gravel, dense to very dense, dry, light brown with oranges and grays.										
5.0												
7.5												
10.0												

Practical Refusal at 10.0 feet.

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Fax: 775-823-4066

TEST PIT NUMBER TP-6

PAGE 1 OF 1

CLIENT Moonlight Hills Estates
PROJECT NAME Golden Valley Estates
PROJECT NUMBER 3228.004
PROJECT LOCATION Golden Valley Nevada
DATE STARTED 5/19/15 **COMPLETED** 5/19/15
GROUND ELEVATION Original **TEST PIT SIZE** 24 inches
EXCAVATION CONTRACTOR Versa Grade Construction
GROUND WATER LEVELS:
EXCAVATION METHOD Deere 310SJ
AT TIME OF EXCAVATION --- No Free Water Encountered
LOGGED BY Blake Carter **CHECKED BY** Blake Carter
AT END OF EXCAVATION --- No Free Water Encountered
NOTES:
AFTER EXCAVATION --- No Free Water Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	R-VALUE	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		SILTY SAND, (SM) loose, moist, dark brown										
	▨	CLAYEY SAND, (SC) medium dense, moist, brown	GB 6A					12.0	43	11	32	38.3
2.5		SILTY SAND, (SM) dense to very dense, dry, light brown										
5.0			GB 6B									
7.5												
10.0												

Bottom of Test Pit at 10.0 Feet.

GEOTECH BH COLUMNS PLATE - GINT STD US LAB.GDT - 6/9/15 10:37 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\MOONLIGHT HILLS\GOLDEN VALLEY ESTATES.GPJ

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5440 Reno Corporate Drive
Reno, NV 89511
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TEST PIT NUMBER TP-7

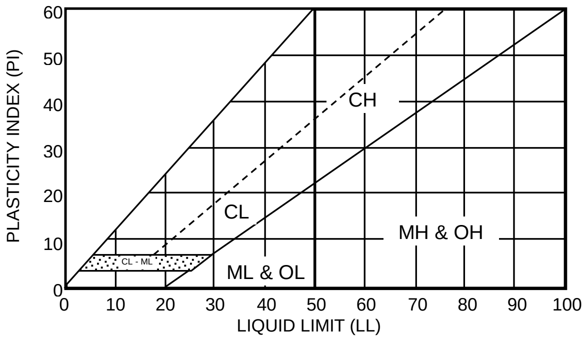
PAGE 1 OF 1

CLIENT	Moonlight Hills Estates	**PROJECT NAME**	Golden Valley Estates
PROJECT NUMBER	3228.004	**PROJECT LOCATION**	Golden Valley Nevada
DATE STARTED	5/19/15 **COMPLETED** 5/19/15	**GROUND ELEVATION**	Original **TEST PIT SIZE** 24 inches
EXCAVATION CONTRACTOR	Versa Grade Construction	**GROUND WATER LEVELS:**	
EXCAVATION METHOD	Deere 310SJ	**AT TIME OF EXCAVATION**	--- No Free Water Encountered
LOGGED BY	Blake Carter **CHECKED BY** Blake Carter	**AT END OF EXCAVATION**	--- No Free Water Encountered
NOTES:		**AFTER EXCAVATION**	--- No Free Water Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	R-VALUE	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0.0	▩	FILL - SILTY SAND WITH GRAVEL, (SM) medium dense, moist, brown, with asphalt particles up to 8-inch diameter and light debris. (Fill Mound with gravel, concrete and asphalt particles at surface)										
2.5												
			GB 7A					5.6	NP	NP	NP	19.9
5.0												
	▨	CLAYEY SAND, (SC) medium dense, moist, dark yellow brown										
7.5												
			GB 7B									
10.0												

Bottom of Test Pit at 10.0 Feet.

MAJOR DIVISION					TYPICAL NAMES
COARSED-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	**GRAVEL** MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	○	GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			●	GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	▨	GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			▨	GC	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SAND MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	○	SW	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			•	SP	POORLY GRADED SAND WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	▨	SM	SILTY SANDS WITH OR WITHOUT GRAVEL
			▨	SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	**SILT AND CLAY** LIQUID LIMIT 50% OR LESS		▥	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			▨	OL	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%		▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOLID, ELASTIC SILTS
			▨	CH	INORGANIC CLAYS OR HIGH PLASTICITY, FAT CLAYS
			▨	OH	ORGANIC SILTS OR CLAYS MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			■	Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS



CONSISTENCY		RELATIVE DENSITY	
SILTS & CLAYS	SPT BLOW* COUNTS (N)	SANDS & GRAVELS	SPT BLOW* COUNTS (N)
VERY SOFT	0 - 2	VERY LOOSE	0 - 4
SOFT	3 - 4	LOOSE	5 - 10
MEDIUM STIFF	5 - 8	MEDIUM DENSE	11 - 30
STIFF	9 - 15	DENSE	31 - 50
VERY STIFF	16 - 30	VERY DENSE	50 +
HARD	30 +		

* The Standard Penetration Resistance (N) In blows per foot is obtained by the ASTM D1585 procedure using 2" O.D., 1 3/8" I.D. samplers.

DESCRIPTION OF ESTIMATED PERCENTAGES OF GRAVEL, SAND, AND FINES	
TRACE	Particles are present but est. < 5%
FEW	5% - 10%
LITTLE	15% - 20%
SOME	30% - 45%
MOSTLY	50% - 100%

NOTE: Percentages are presented within soil description for soil horizon with laboratory tested soil samples.

DEFINITIONS OF SOIL FRACTIONS	
SOIL COMPONENT	PARTICLE SIZE RANGE
COBBLES	ABOVE 3 INCHES
GRAVEL	3 IN. TO NO. 4 SIEVE
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 SIEVE
SAND	NO. 4 TO NO. 200
COARSE SAND	NO. 4 TO NO. 10
MEDIUM SAND	NO. 10 TO NO. 40
FINE SAND	NO. 40 TO NO. 200
FINES (SILT OR CLAY)	MINUS NO. 200 SIEVE

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UNIFIED SOIL CLASSIFICATION AND KEY TO SOIL DESCRIPTIONS

Geotechnical Investigation

MOONLIGHT HILLS ESTATES
WASHOE COUNTY, NEVADA

Project No.: 3228.004
Date: 06/05/15

PLATE A-3a

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			FRACTURING	
Splitting Property	**Thickness**	**Stratification**	**Intensity**	**Size of Pieces in Feet**
Massive	Greater than 4.0 ft.	Very thick-bedded	Very little fractured	Greater than 4.0
Blocky	2.0 to 4.0 ft.	Thick-bedded	Occasionally fractured	1.0 to 4.0
Slabby	0.2 to 2.0 ft.	Thin-bedded	Moderately fractured	0.5 to 1.0
Flaggy	0.05 to 0.2 ft.	Very thin bedded	Closely fractured	0.1 to 0.5
Shaly or platy	0.01 to 0.05 ft.	Laminated	Intensely fractured	0.005 to 0.1
Papery	Less than 0.01 ft.	Thinly laminated	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

D. 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

M. Moderate - Slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected; Moderate to occasionally intense discoloration; Moderately coated features

S. Slightly - No megascopic decomposition of minerals; little or no effect on normal cementation; Slight and intermittent, or localized discoloration; Few stains on fracture surfaces

F. 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

MOONLIGHT HILLS ESTATES
WASHOE COUNTY, NEVADA

Project No.: 3228.004
Date: 06/05/15

PLATE A-3b

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Fax: 775-823-4066

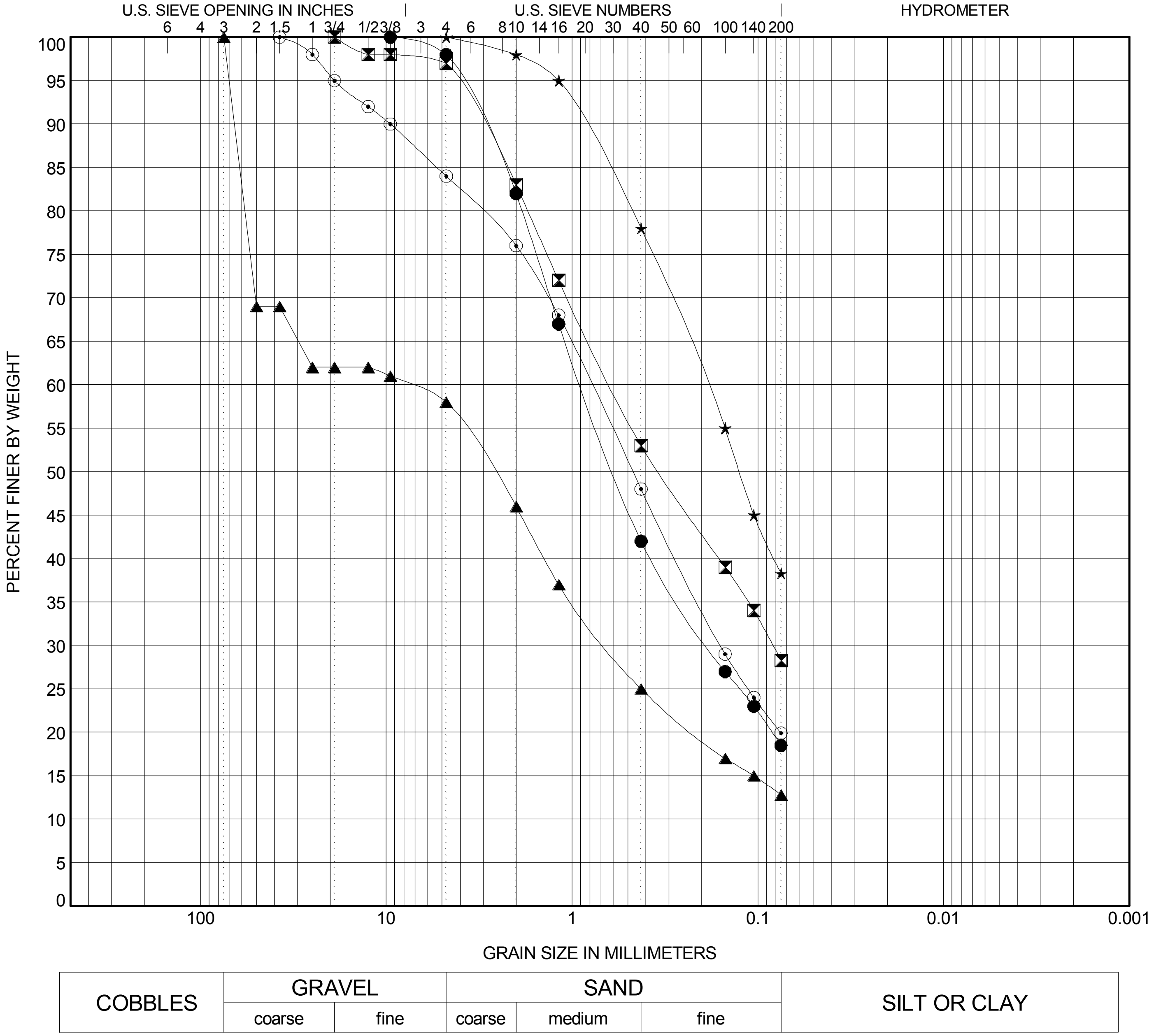
GRAIN SIZE DISTRIBUTION

CLIENT Moonlight Hills Estates

PROJECT NAME Golden Valley Estates

PROJECT NUMBER 3228.004

PROJECT LOCATION Golden Valley Nevada



	TEST PIT	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**TP-1**	**0.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**		
⧗	**TP-1**	**4.0**	**CLAYEY SAND(SC)**	**24**	**13**	**11**		
▲	**TP-3**	**2.0**	**CLAYEY SAND with GRAVEL(SC)**	**24**	**14**	**10**		
★	**TP-6**	**0.5**	**CLAYEY SAND(SC)**	**43**	**11**	**32**		
⊙	**TP-7**	**0.0**	**SILTY SAND with GRAVEL(SM)**	**NP**	**NP**	**NP**		

	TEST PIT	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-1**	**0.0**	**9.5**	**0.887**	**0.185**		**2.0**	**79.5**	**18.5**	
⧗	**TP-1**	**4.0**	**19**	**0.619**	**0.083**		**3.0**	**68.7**	**28.3**	
▲	**TP-3**	**2.0**	**75**	**7.54**	**0.65**		**42.0**	**45.2**	**12.8**	
★	**TP-6**	**0.5**	**4.75**	**0.188**			**0.0**	**61.7**	**38.3**	
⊙	**TP-7**	**0.0**	**37.5**	**0.784**	**0.158**		**16.0**	**64.1**	**19.9**	

GRAIN SIZE - GINT STD US LAB.GDT - 5/27/15 13:55 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\MOONLIGHT HILLS\GOLDEN VALLEY ESTATES.GPJ

Wood Rodgers, Inc.
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Reno, NV 89511
Telephone: 775-823-4068
Fax: 775-823-4066

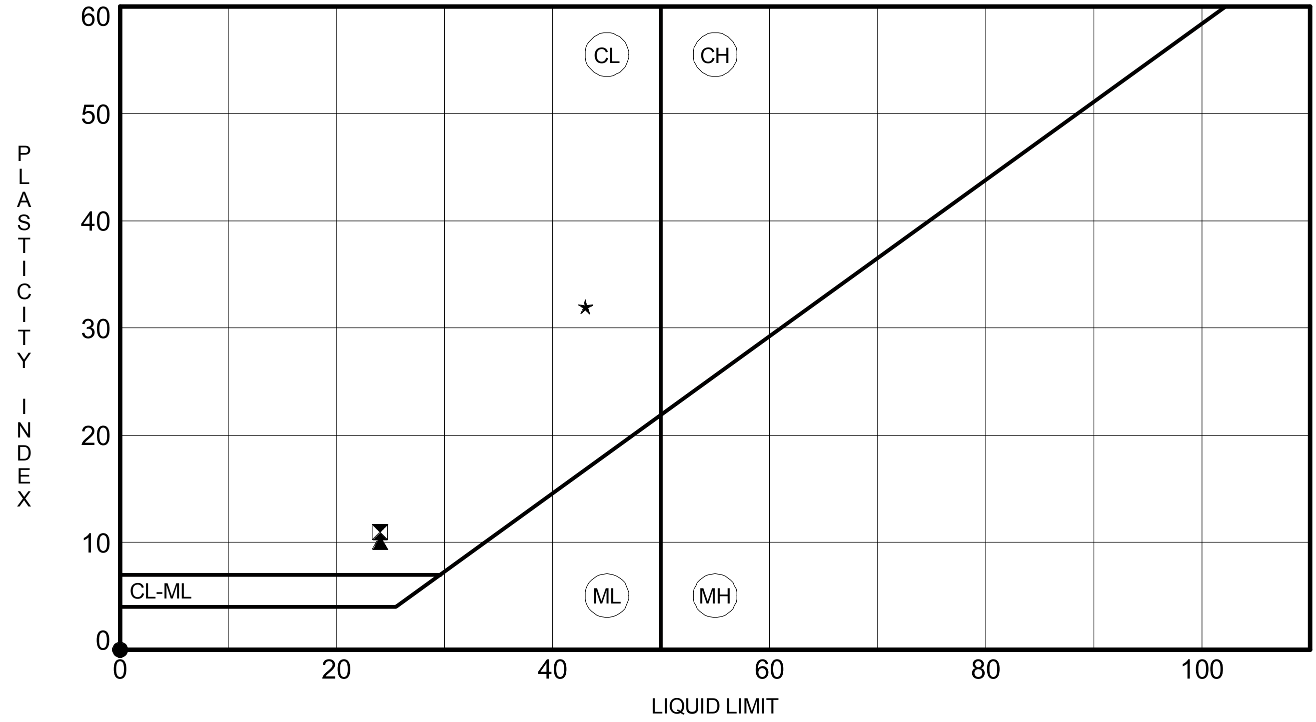
ATTERBERG LIMITS' RESULTS

CLIENT Moonlight Hills Estates

PROJECT NAME Golden Valley Estates

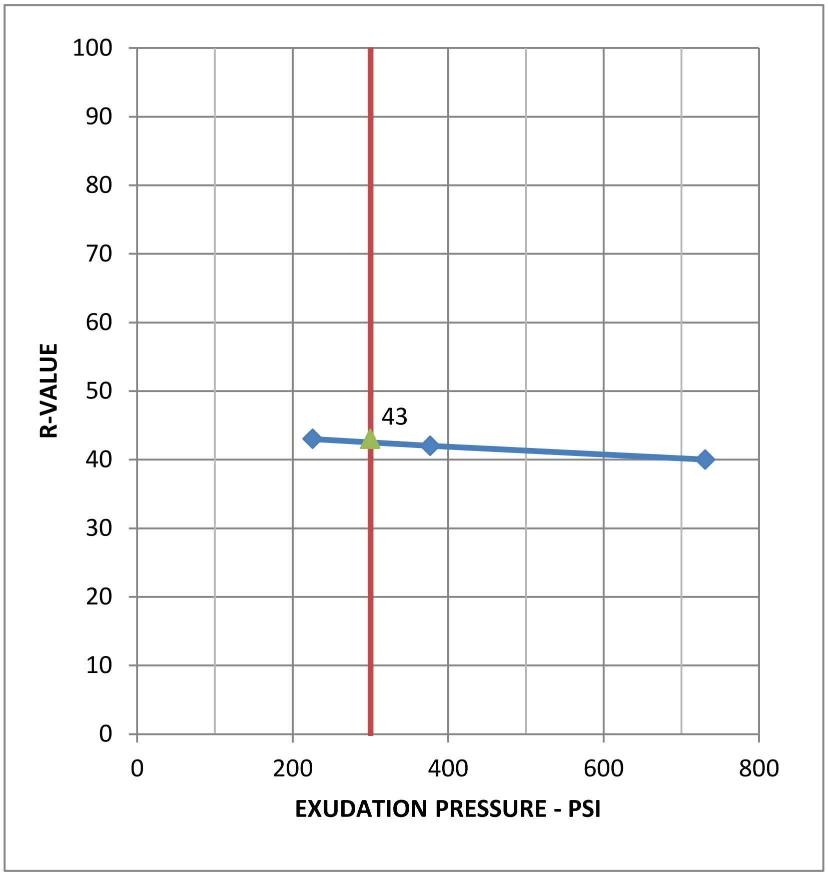
PROJECT NUMBER 3228.004

PROJECT LOCATION Golden Valley Nevada



	TEST PIT	DEPTH	LL	PL	PI	Fines	Classification
●	**TP-1**	**0.0**	**NP**	**NP**	**NP**	**19**	**SILTY SAND(SM)**
⧗	**TP-1**	**4.0**	**24**	**13**	**11**	**28**	**CLAYEY SAND(SC)**
▲	**TP-3**	**2.0**	**24**	**14**	**10**	**13**	**CLAYEY SAND with GRAVEL(SC)**
★	**TP-6**	**0.5**	**43**	**11**	**32**	**38**	**CLAYEY SAND(SC)**
⊙	**TP-7**	**0.0**	**NP**	**NP**	**NP**	**20**	**SILTY SAND with GRAVEL(SM)**

ATTERBERG LIMITS - GINT STD US LAB.GDT - 5/27/15 13:55 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\MOONLIGHT HILLS\GOLDEN VALLEY ESTATES.GPJ



Subgrade			
Unit Weight (pcf)	120.2	117.6	113.0
Moisture (%)	13.9	15.4	16.6
Foot Pressure (psi)	250	250	190
Exudation Pressure (psi)	731	377	226
Expansion Pressure (psf)	110	92	70
R-Value$_{\text{300psi Exudation}}$	40	42	43

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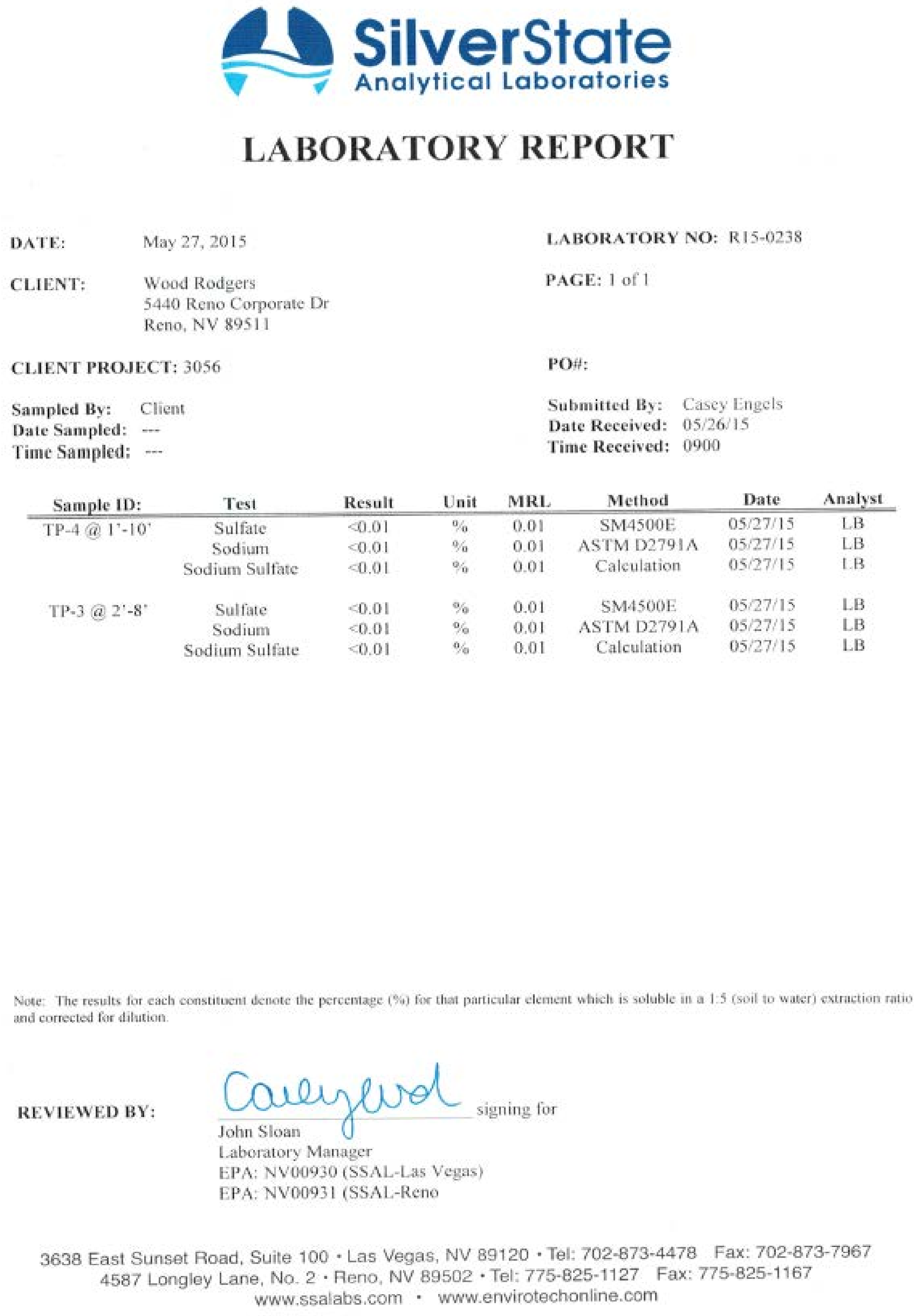
SUMMARY OF R-VALUE TEST DATA

Geotechnical Investigation

Moonlight Hills Estate

Project No.: 3228.004
Date: 05/19/15

PLATE A-4c



SilverState
Analytical Laboratories

LABORATORY REPORT

DATE:	May 27, 2015	**LABORATORY NO:**	R15-0238
CLIENT:	Wood Rodgers 5440 Reno Corporate Dr Reno, NV 89511	**PAGE:**	1 of 1
CLIENT PROJECT:	3056	**PO#:**	
Sampled By:	Client	**Submitted By:**	Casey Engels
Date Sampled:	---	**Date Received:**	05/26/15
Time Sampled:	---	**Time Received:**	0900

Sample ID:	Test	Result	Unit	MRL	Method	Date	Analyst
TP-4 @ 1'-10'	Sulfate	<0.01	%	0.01	SM4500E	05/27/15	LB
	Sodium	<0.01	%	0.01	ASTM D2791A	05/27/15	LB
	Sodium Sulfate	<0.01	%	0.01	Calculation	05/27/15	LB
TP-3 @ 2'-8'	Sulfate	<0.01	%	0.01	SM4500E	05/27/15	LB
	Sodium	<0.01	%	0.01	ASTM D2791A	05/27/15	LB
	Sodium Sulfate	<0.01	%	0.01	Calculation	05/27/15	LB

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY: signing for

John Sloan
Laboratory Manager
EPA: NV00930 (SSAL-Las Vegas)
EPA: NV00931 (SSAL-Reno

3638 East Sunset Road, Suite 100 • Las Vegas, NV 89120 • Tel: 702-873-4478 Fax: 702-873-7967
4587 Longley Lane, No. 2 • Reno, NV 89502 • Tel: 775-825-1127 Fax: 775-825-1167
www.ssalabs.com • www.envirotechonline.com

WOOD RODGERS 5440 Reno Corporate Drive, Reno, NV 89511 Phone 775.823.4068 Fax 775.823.4066	**CHEMICAL TEST RESULTS**	***Geotechnical Investigation*** ***MOONLIGHT HILLS ESTATES*** ***WASHOE COUNTY, NEVADA*** Project No.: 3228.004 Date: 06/05/15 **PLATE A-5**

TENTATIVE MAP APPLICATION
FOR
GOLDEN MESA NORTH
RENO WASHOE COUNTY NEVADA

ENGINEER

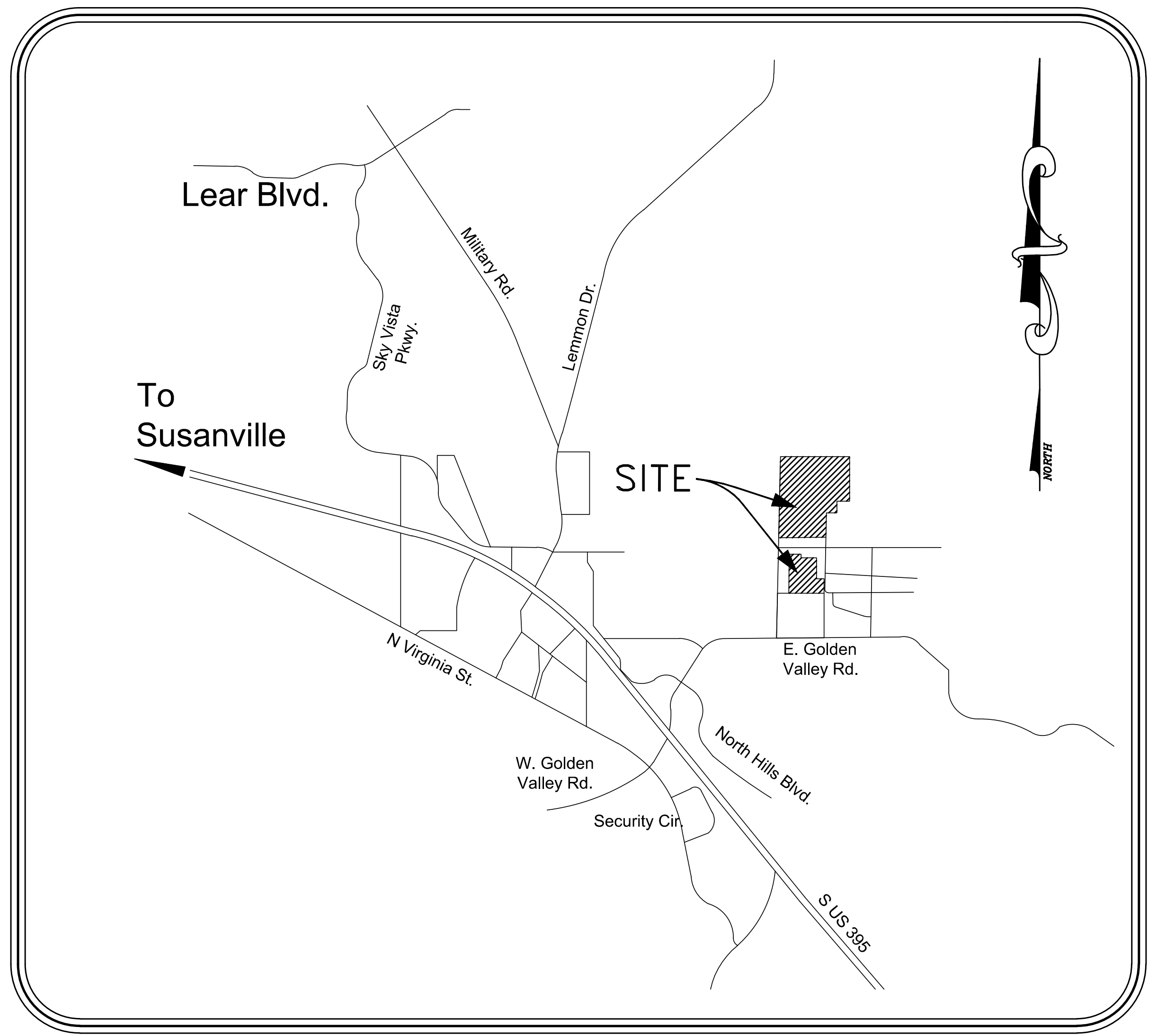
Axion ENGINEERING
Civil Engineering • Land Development
681 EDISON WAY - RENO, NEVADA 89502
PH 775-771-5554 / FX 775-856-3951

OWNER/DEVELOPER

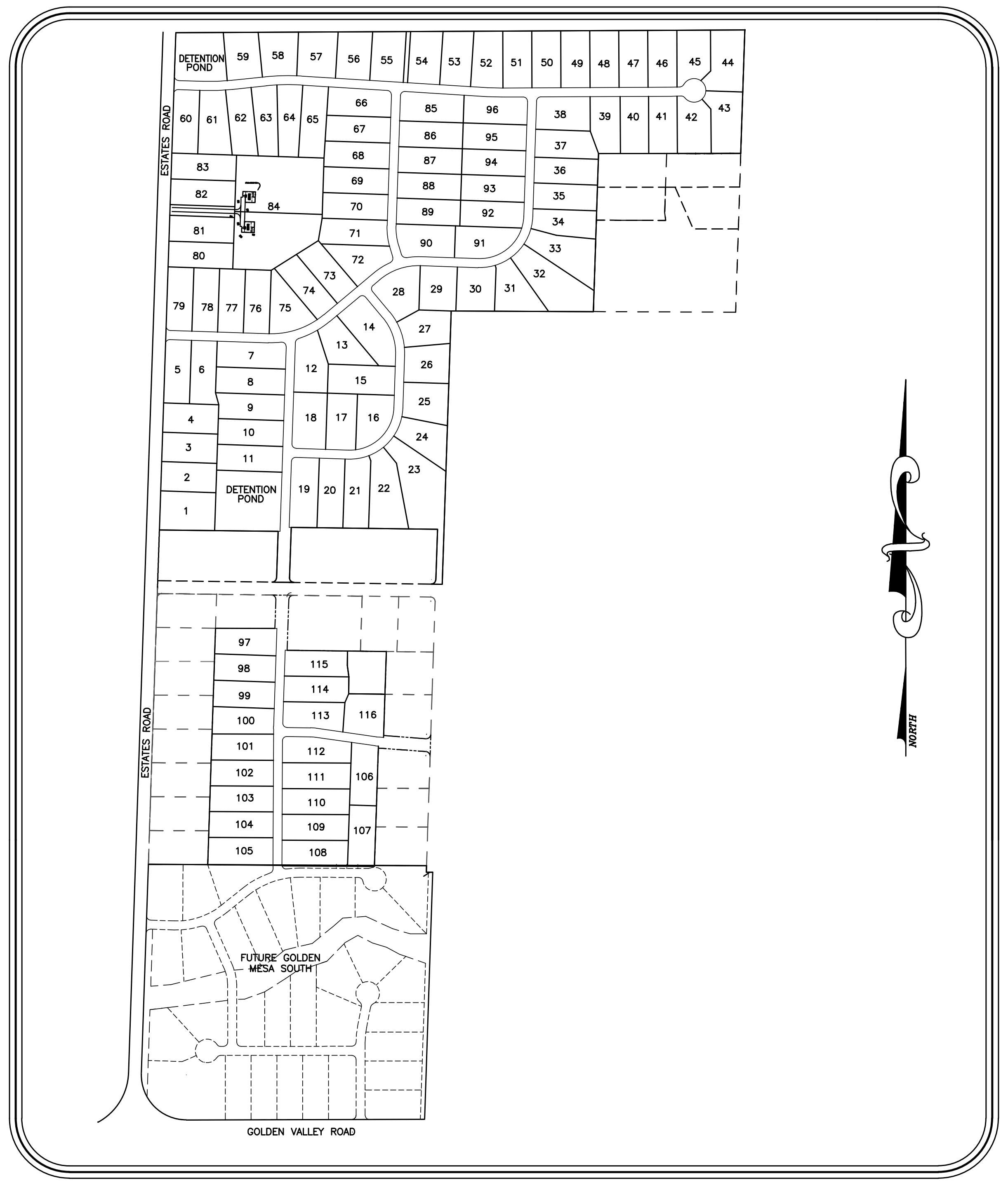
MOONLIGHT HILLS ESTATES, LLC
5390 BELLAZZA COURT
RENO, NV 89519
PHONE: (775) 826-0674

PUBLIC SERVICES

GAS & ELECTRICAL SERVICE: NV ENERGY
WATER SERVICE: TRUCKEE MEADOWS WATER AUTHORITY
SEWER SERVICE: WASHOE COUNTY & CITY OF RENO
TELEPHONE: AT&T
CABLE TV: CHARTER COMMUNICATIONS
FIRE PROTECTION: TRUCKEE MEADOWS FIRE DEPARTMENT
POLICE PROTECTION: WASHOE COUNTY SHERIFF DEPARTMENT



VICINITY MAP N.T.S.



SITE PLAN N.T.S.

SHEET INDEX

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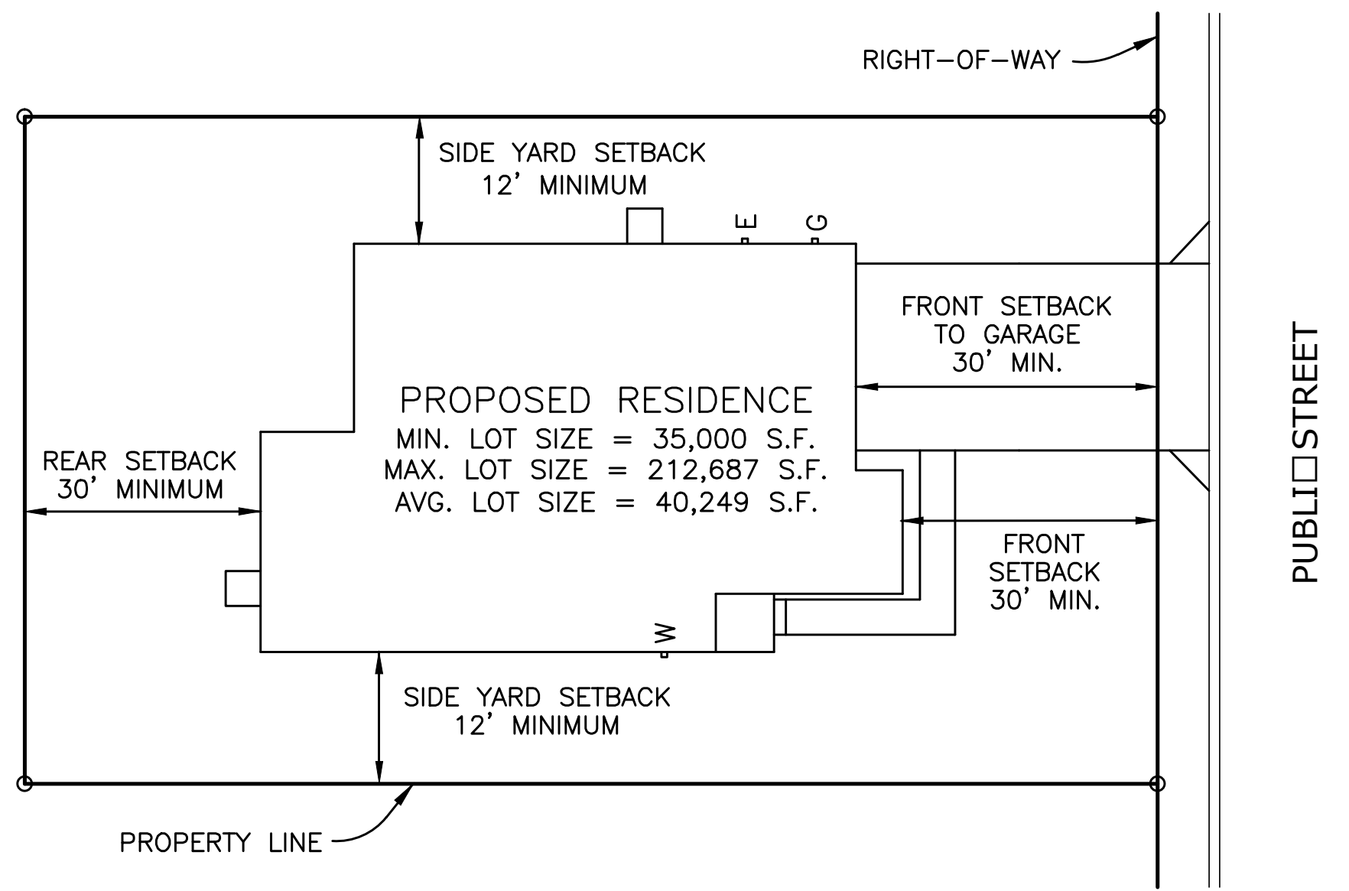
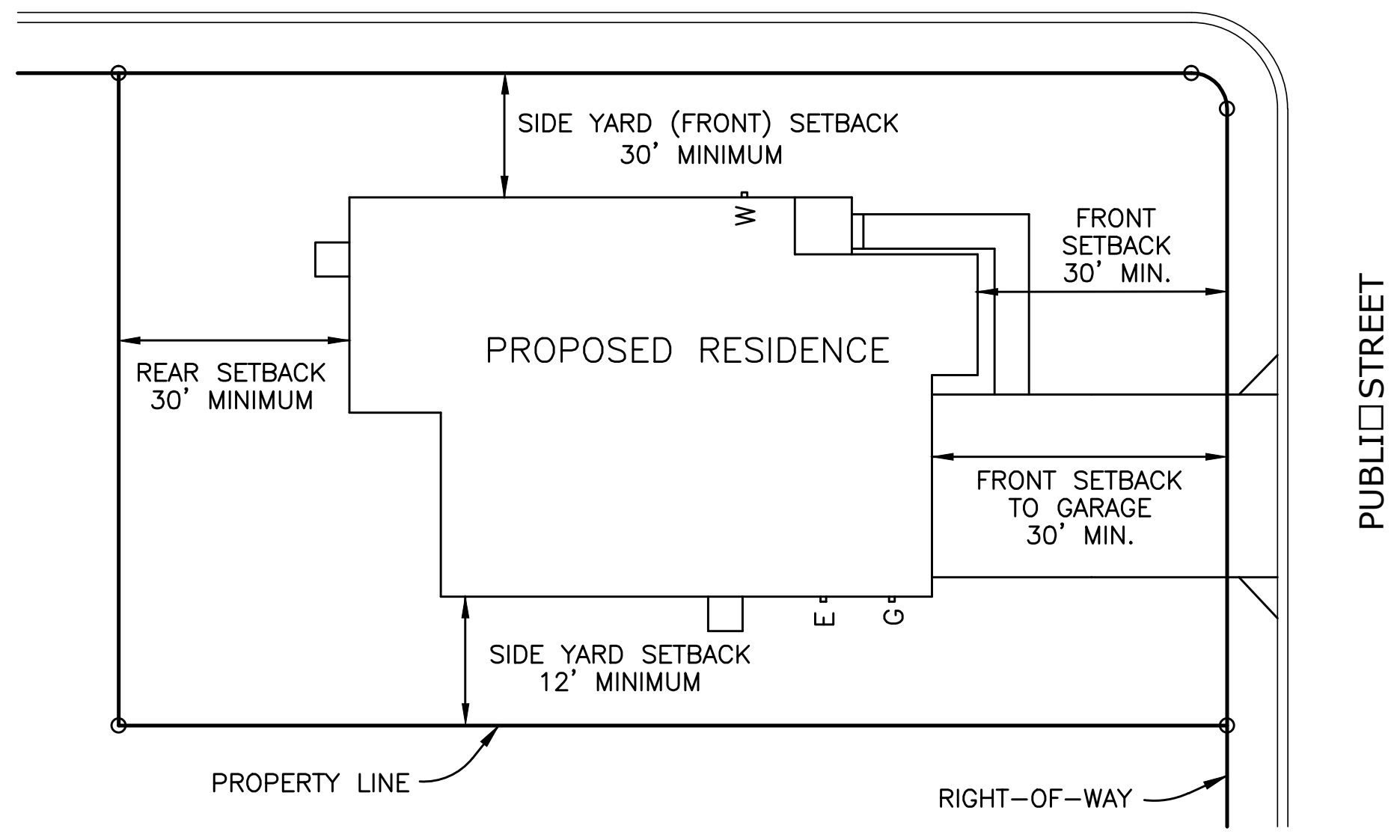
C-15	CROSS SECTIONS

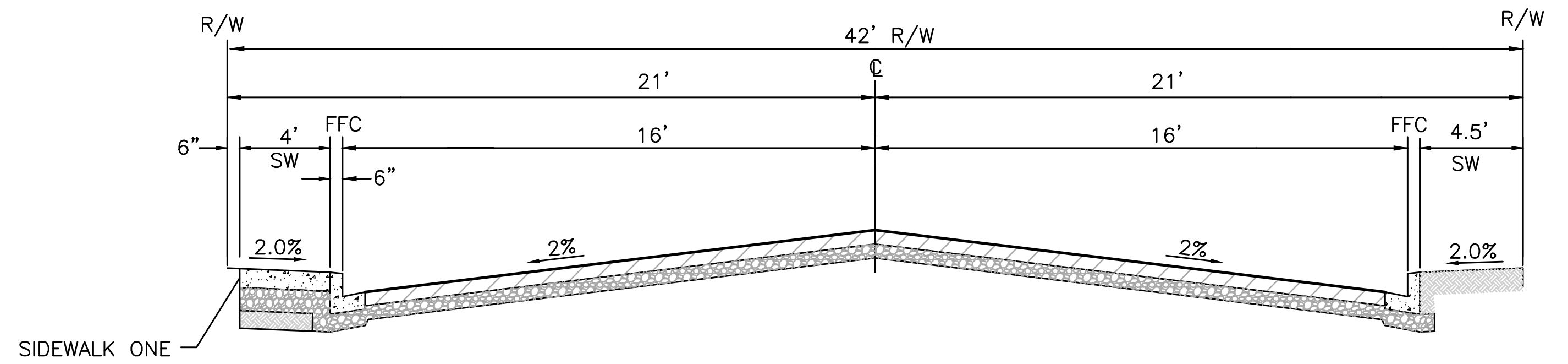
MINIMUM SETBACKS



TYPICAL LOT SETBACKS



CORNER LOT SETBACKS



RESIDENTIAL STREET SECTION

GOLDEN MESA NORTH

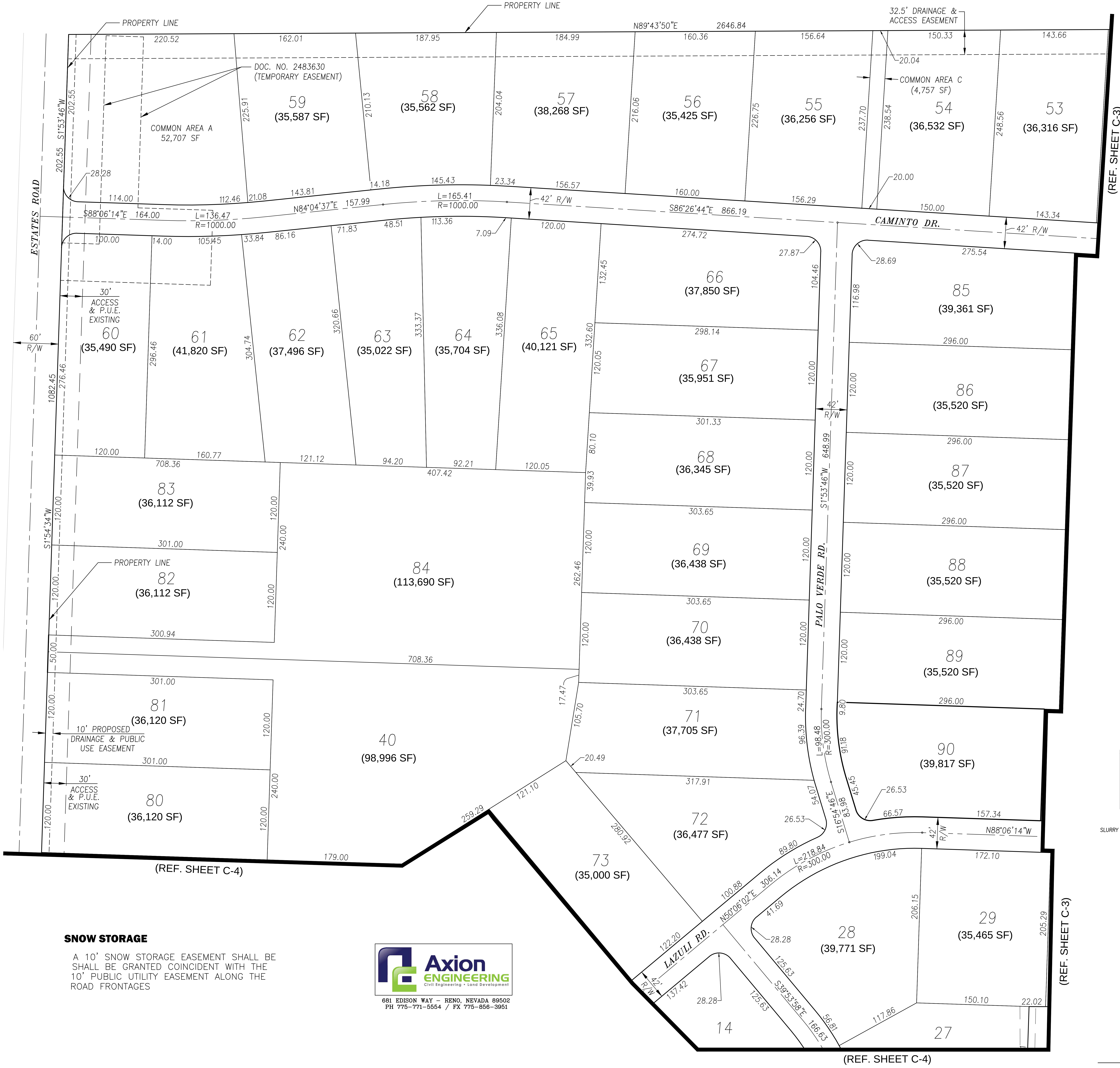
ENGINEERS STATEMENT

I, GARY K. GUZELIS, DO HEREBY CERTIFY THAT THIS MAP HAS BEEN PREPARED BY ME, OR UNDER MY SUPERVISION AND WAS COMPLETED ON THIS 12th DAY OF DECEMBER, 2016.

GARY K. GUZELIS P.E. #10372

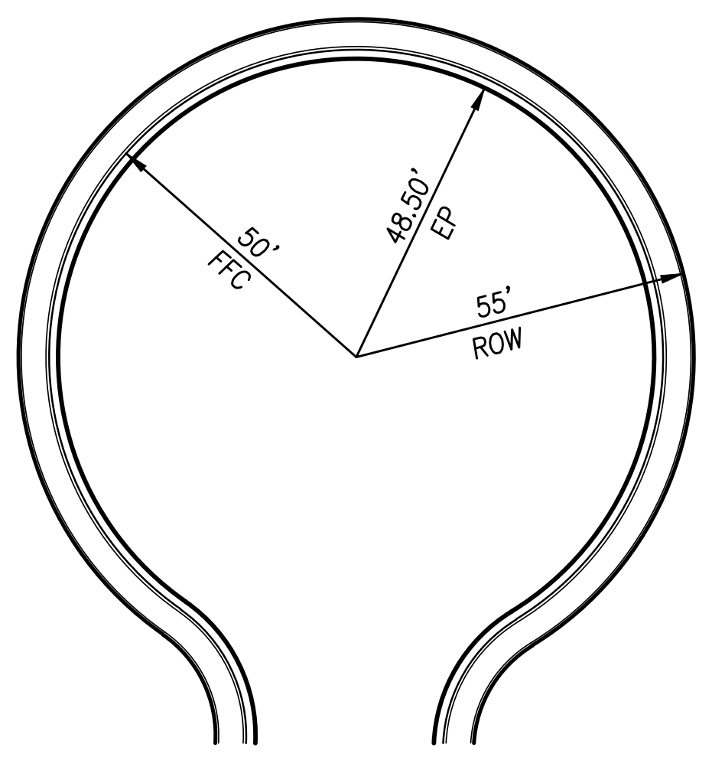
GOLDEN MESA NORTH TITLE SHEET

C1

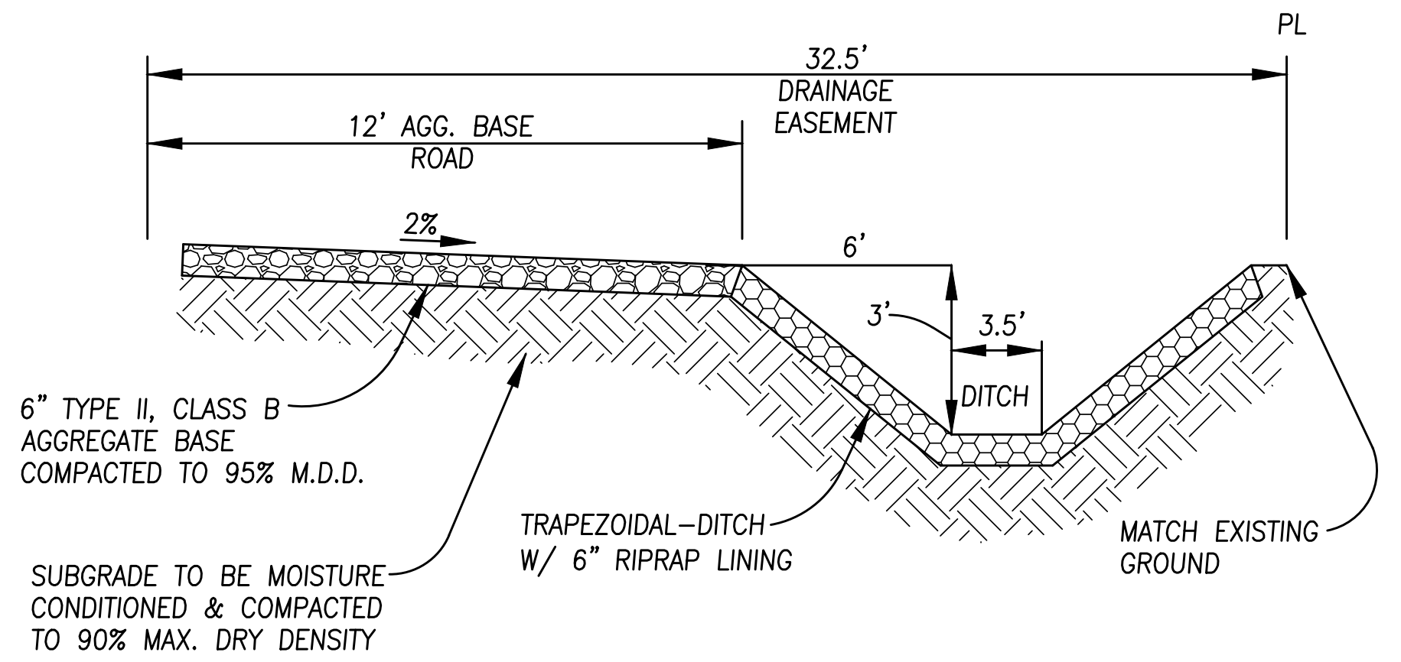


GOLDEN MESA NORTH PROJECT DEVELOPMENT SUMMARY

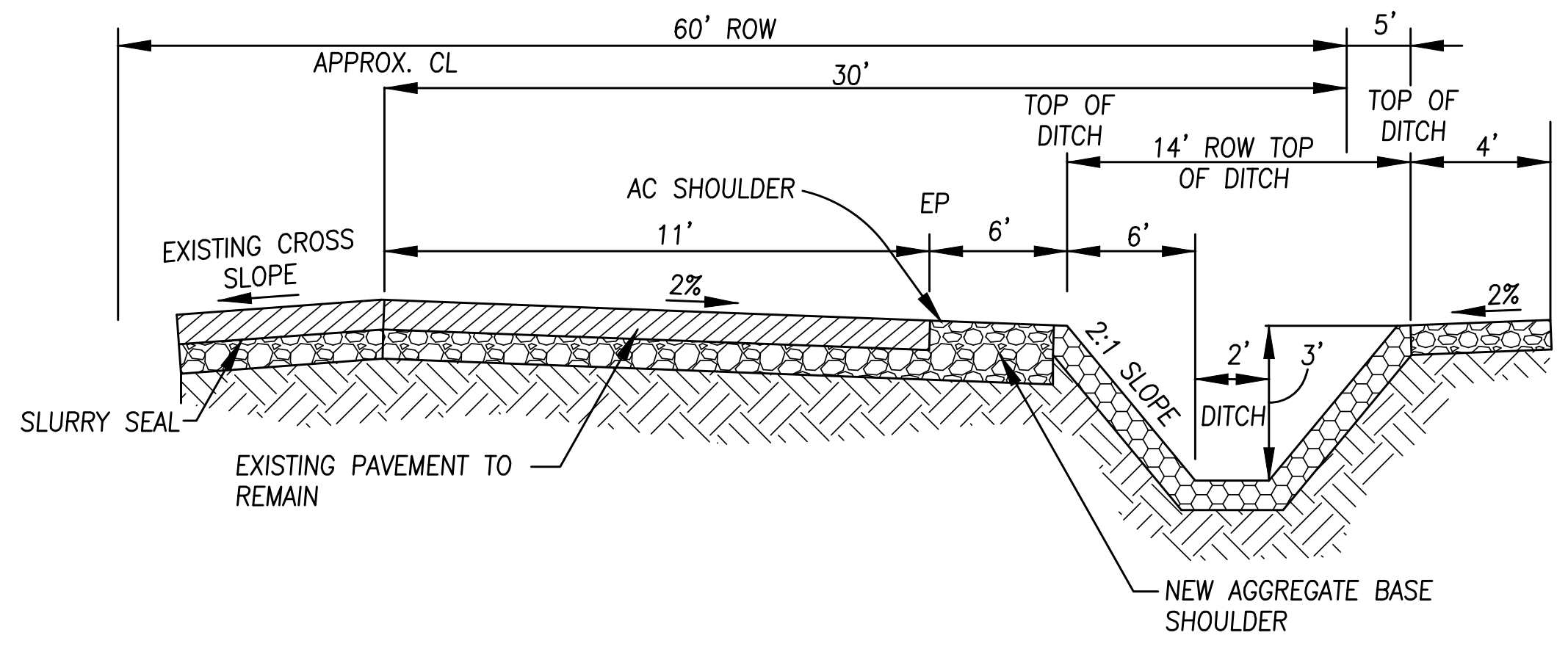
1.	TOTAL PROJECT SITE	119.76 ACRES
2.	LOT AREA	105.56 ACRES
3.	RIGHT OF WAY	9.31 ACRES
4.	COMMON AREA	4.89 ACRES
5.	GROSS DENSITY	0.96 DU/ACRE
6.	NET DENSITY	1.04 DU/ACRE
7.	AVERAGE LOT SIZE	39,984 SF
8.	MAXIMUM LOT SIZE	113,690 SF
9.	MINIMUM LOT SIZE	35,000 SF
10.	DWELLING UNITS	115 EA
11.	COMMON AREA LOTS	4 EA



TYPICAL CUL-DE-SAC DETAIL
NTS



NORTHERLY DRAINAGE CHANNEL
NTS



ESTATES ROAD (LOTS 1–5, 79–83, 60 & POND)
NTS

SCALE: 1"=50'

50 0 25 50 100

SNOW STORAGE

A 10' SNOW STORAGE EASEMENT SHALL BE SHALL BE GRANTED COINCIDENT WITH THE 10' PUBLIC UTILITY EASEMENT ALONG THE ROAD FRONTAGES

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SITE PLAN
1"=50'

2

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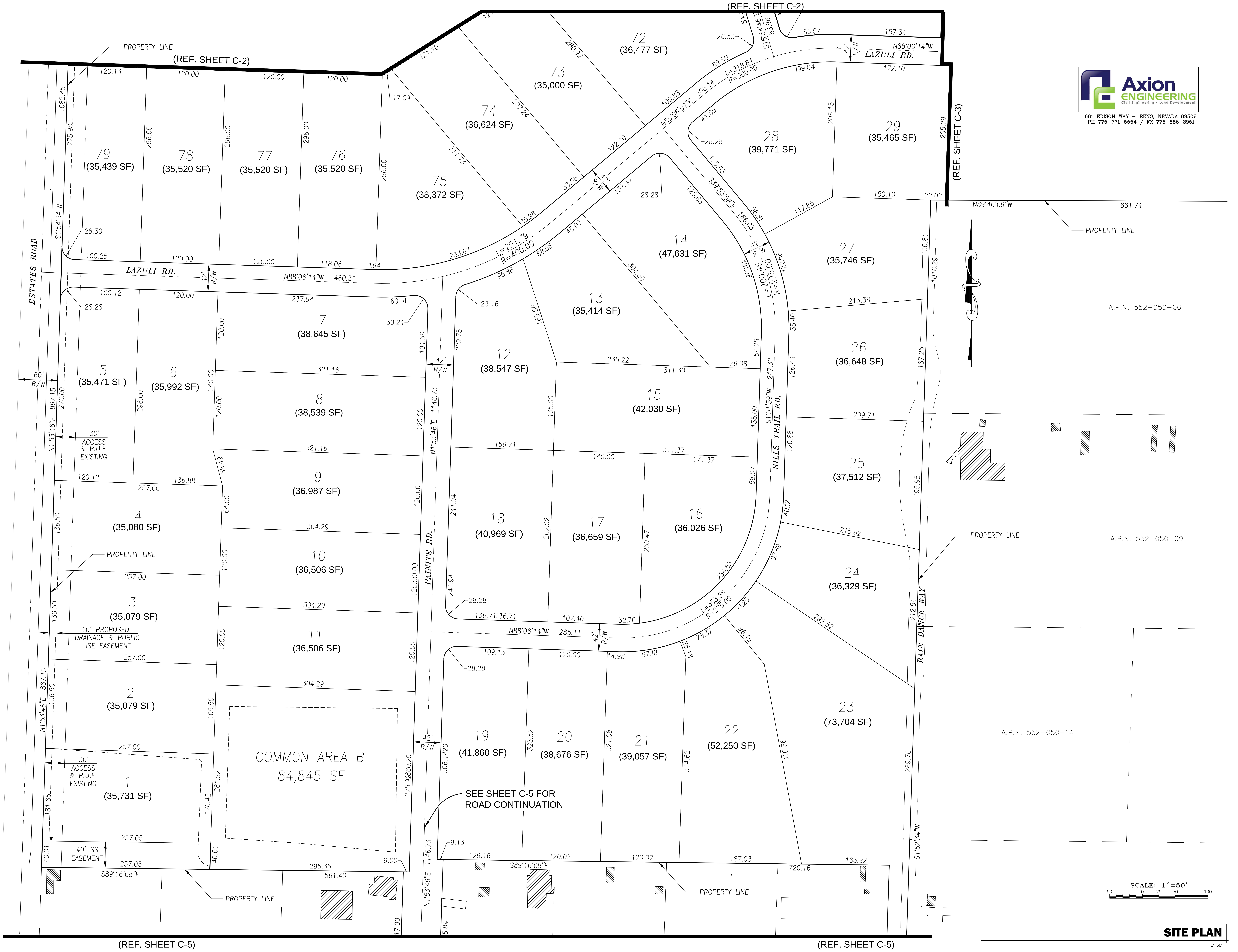
SCALE: 1"=50'
50 0 25 50 100

SITE PLAN

1"=50'



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SITE PLAN
1"=50'

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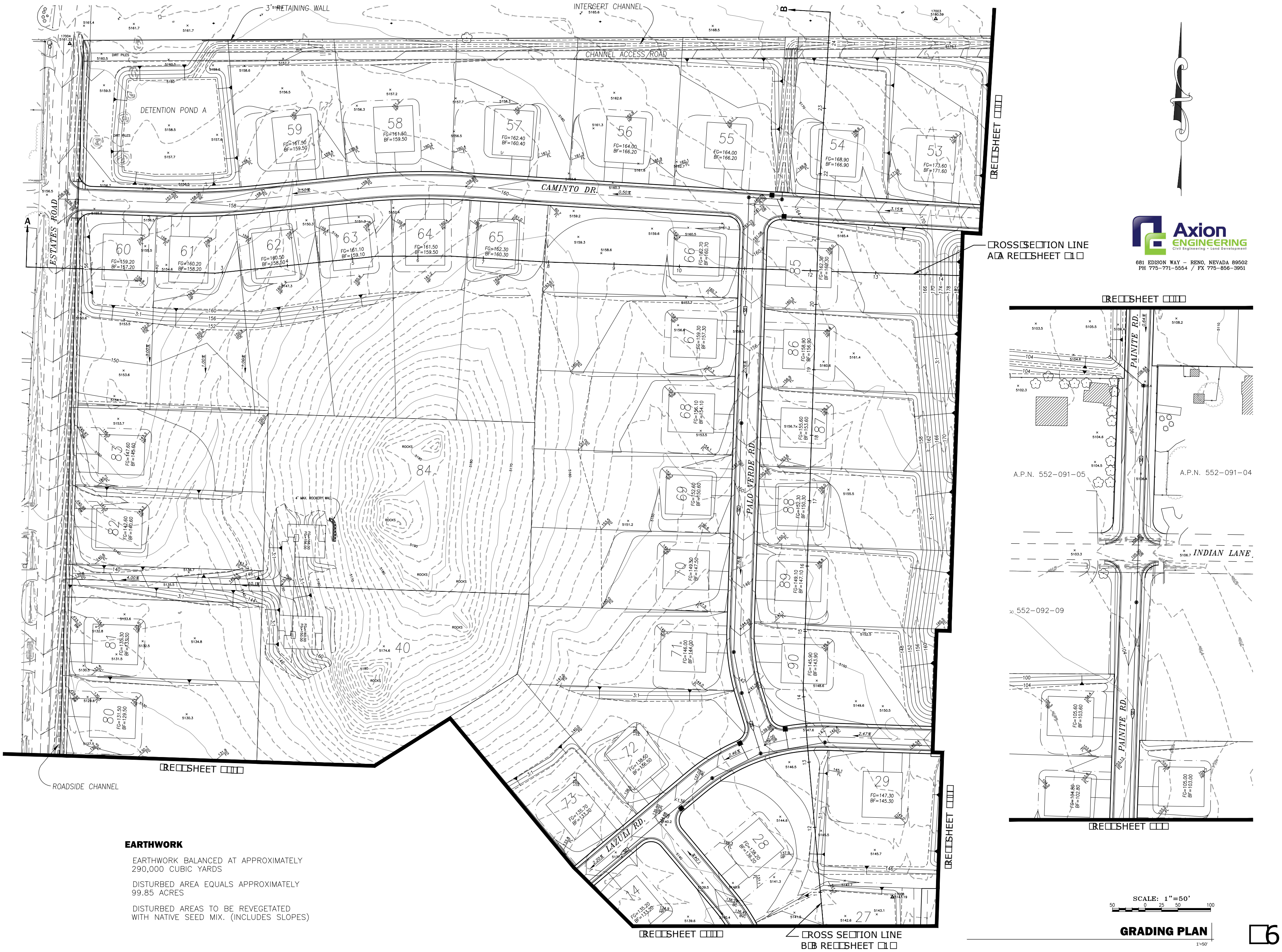
SITE PLAN
1"=50'



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EARTHWORK

EARTHWORK BALANCED AT APPROXIMATELY 290,000 CUBIC YARDS

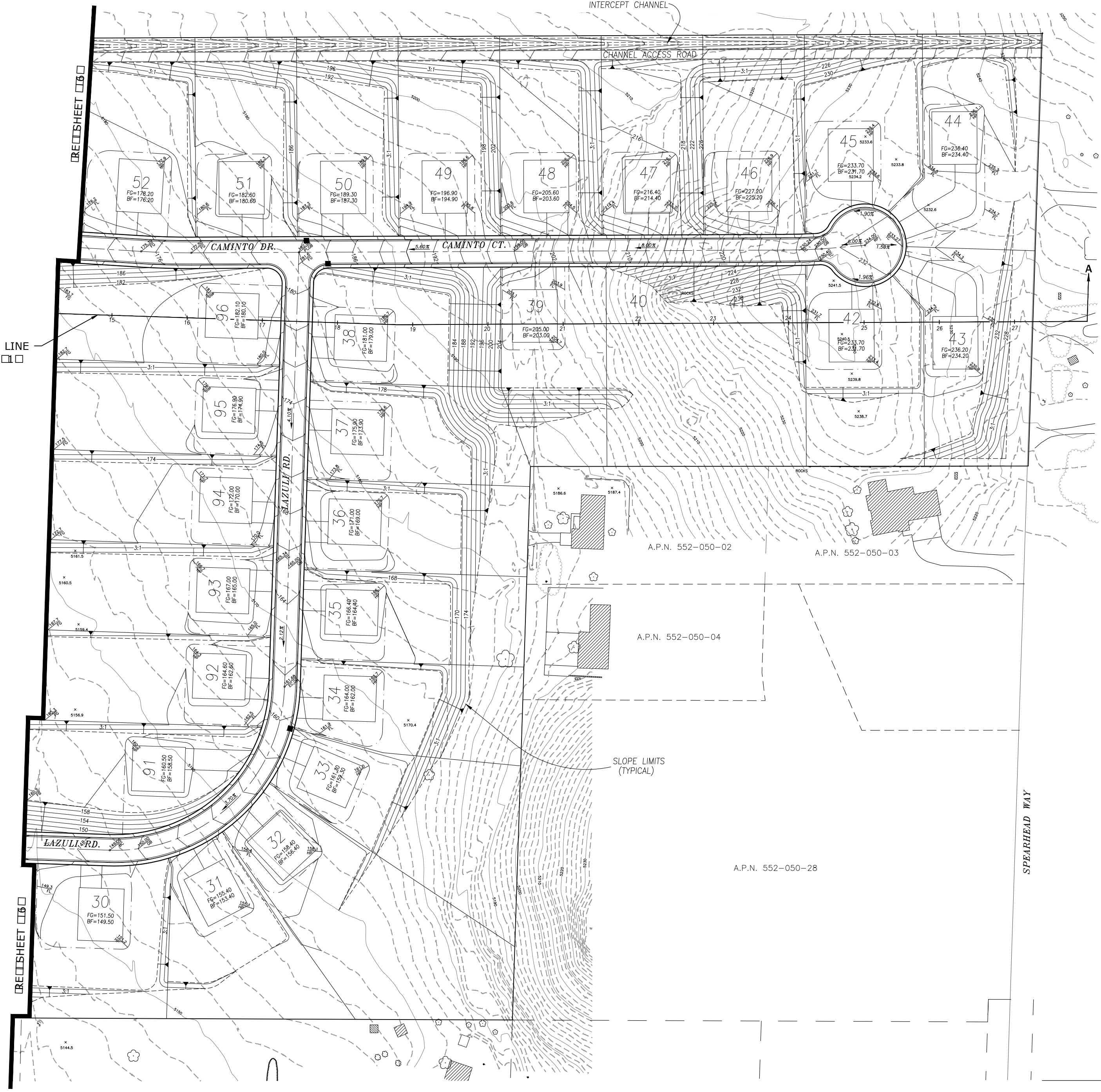
DISTURBED AREA EQUALS APPROXIMATELY 99.85 ACRES

DISTURBED AREAS TO BE REVEGETATED WITH NATIVE SEED MIX. (INCLUDES SLOPES)

GRADING PLAN

1'=50'

6



EARTHWORK

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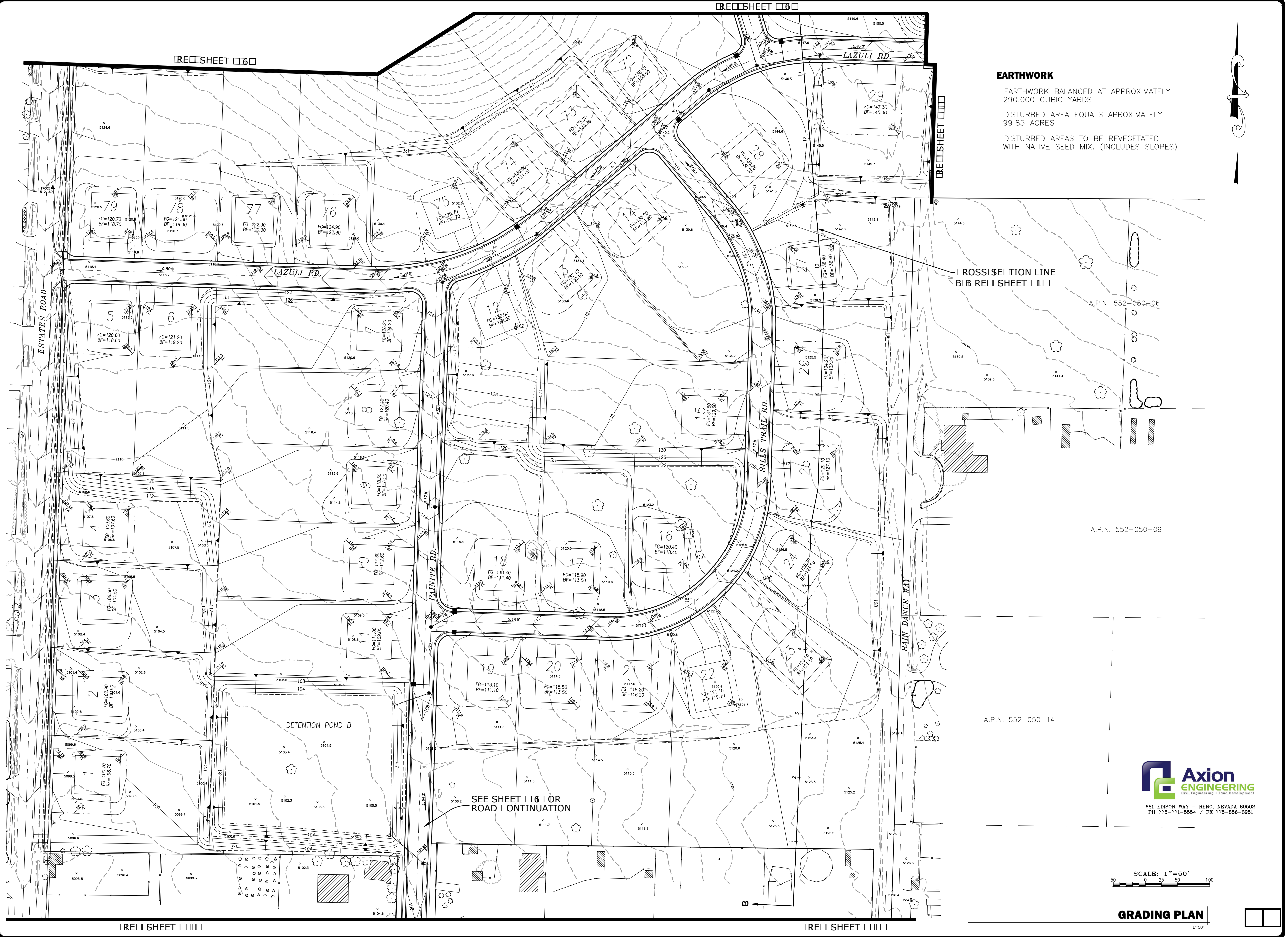
SCALE: 1"=50'
50 0 25 50 100

GRADING PLAN

1'=50'



EARTHWORK

EARTHWORK BALANCED AT APPROXIMATELY 290,000 CUBIC YARDS

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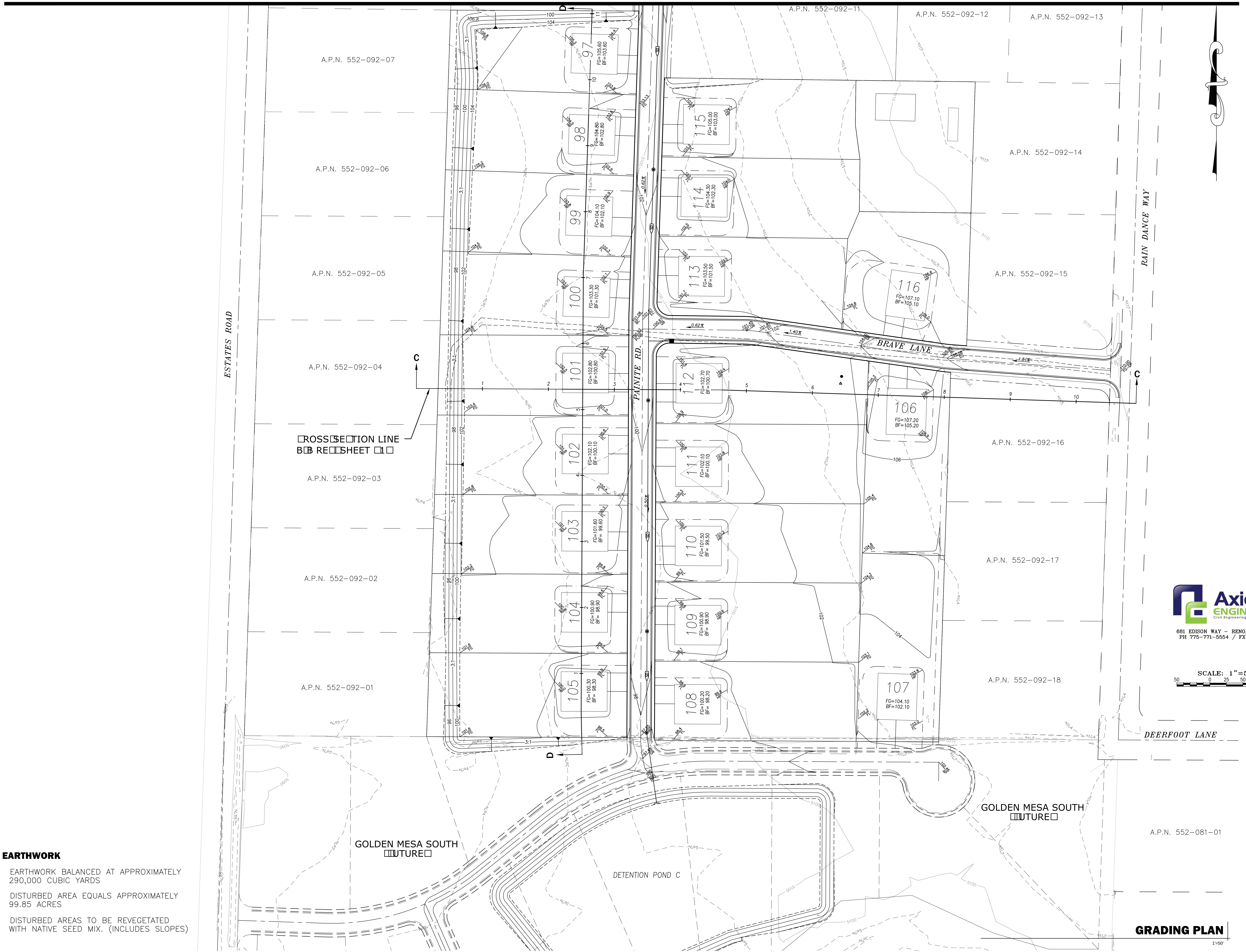
SCALE: 1"=50'

50 0 25 50 100

GRADING PLAN

1'=50'



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SCALE: 1"=50'
50 0 25 50 100

EARTHWORK

EARTHWORK BALANCED AT APPROXIMATELY 290,000 CUBIC YARDS

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GRADING PLAN
1"=50'

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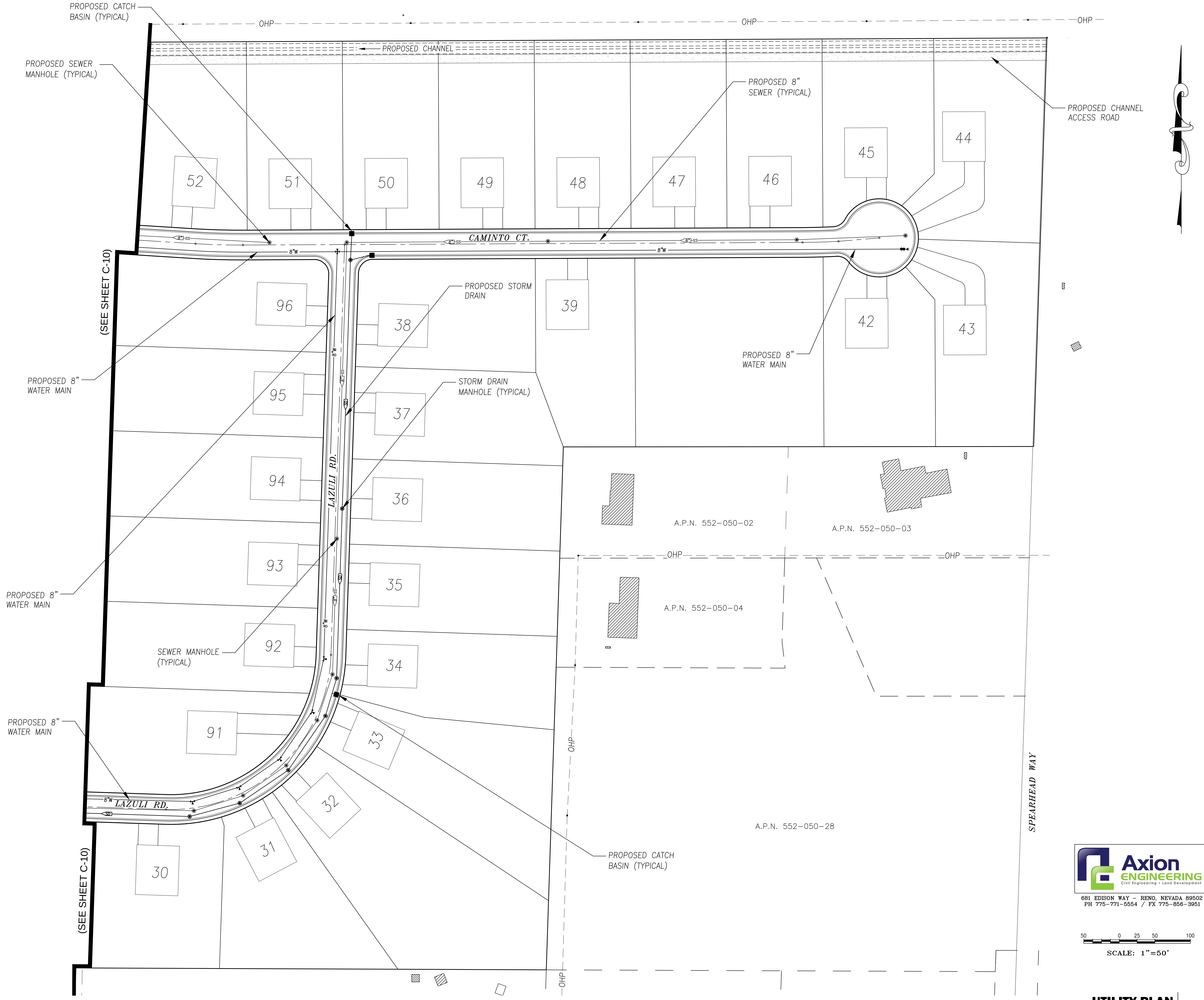
UTILITY PLAN
1'=50'

□10



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UTILITY PLAN
1"=50'

11

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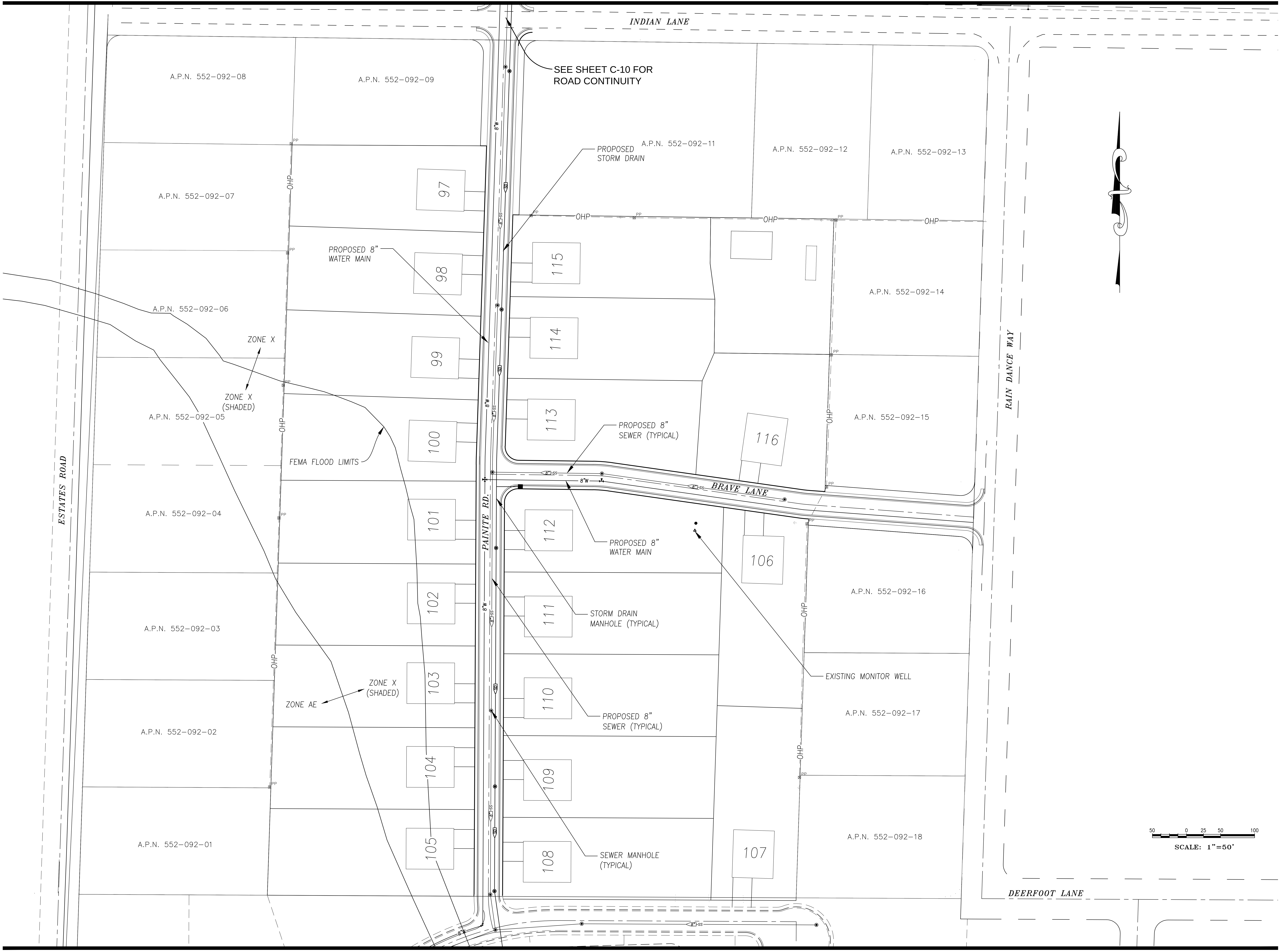
UTILITY PLAN
1"=50'

12

(SEE SHEET C-12)

(SEE SHEET C-12)



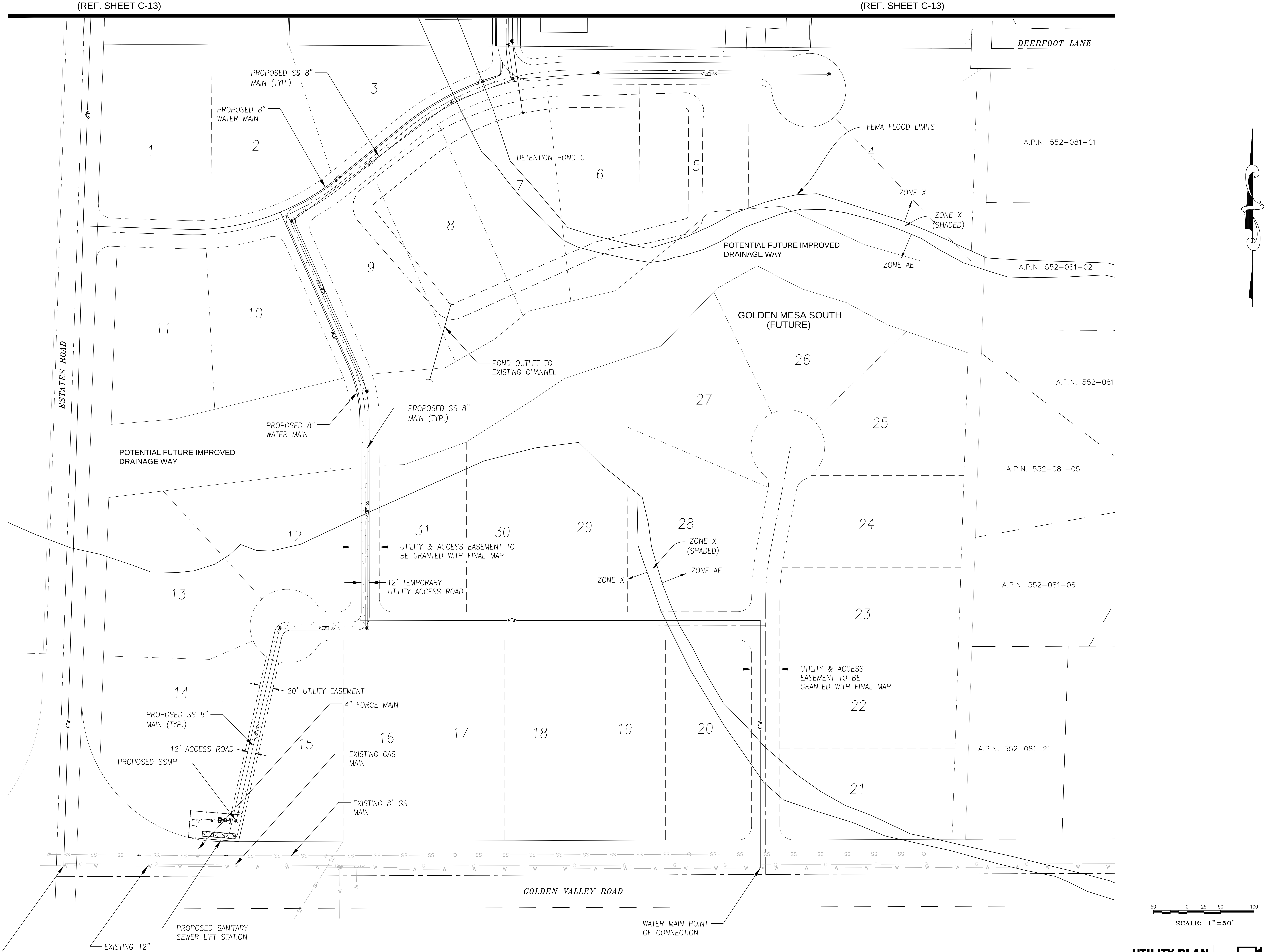
(SEE SHEET C-14)

(SEE SHEET C-14)

UTILITY PLAN

1'=50'

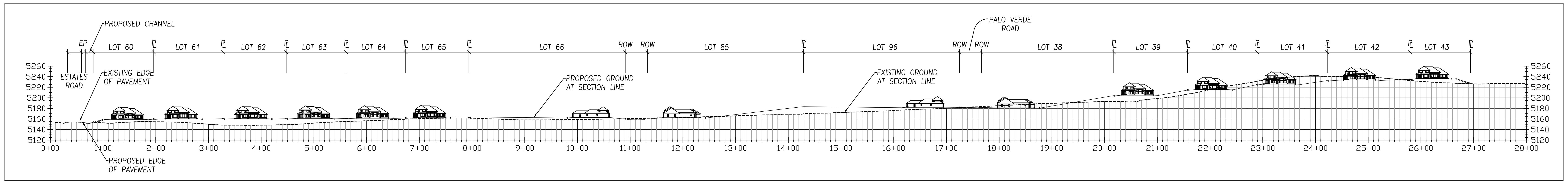
1



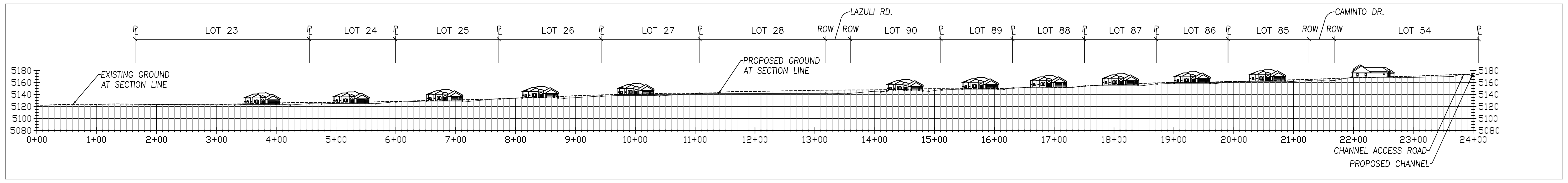
UTILITY PLAN

1'=50'

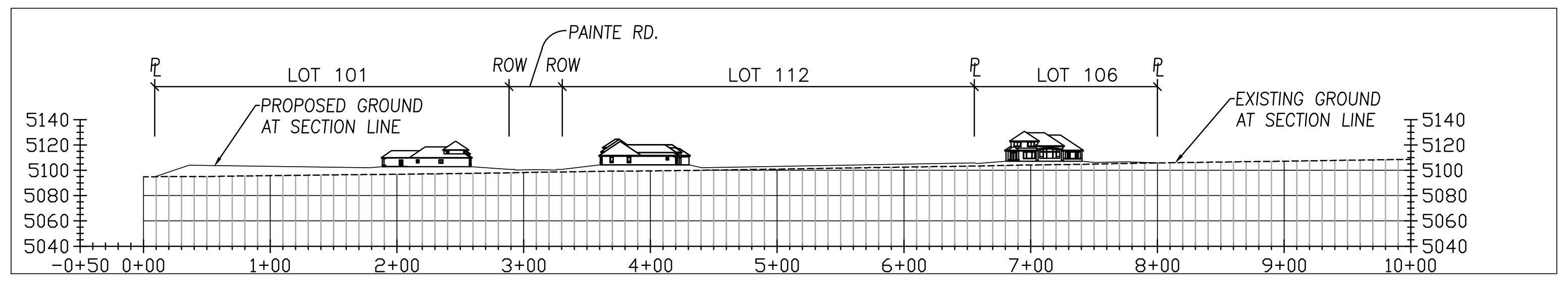
1



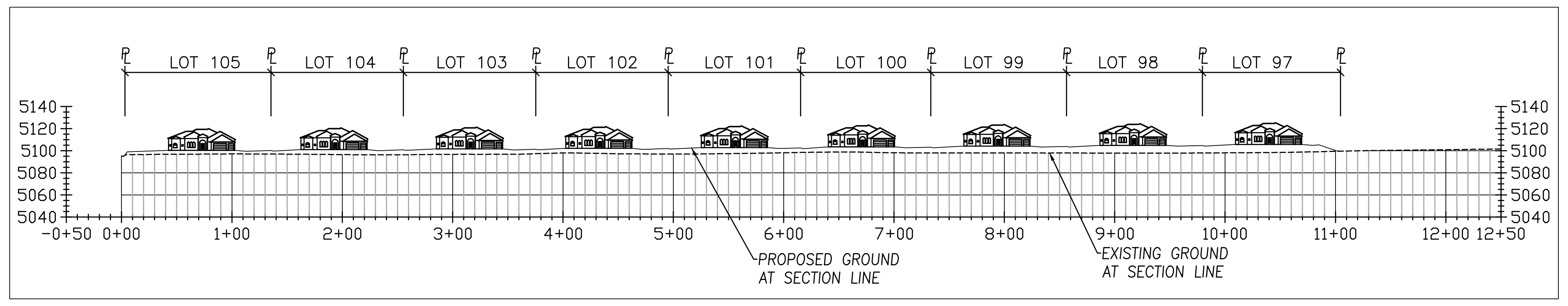
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

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1 0 .5 1 2

VERT. SCALE: 1"=100'

100 0 50 100 200

HORIZ. SCALE: 1"=100'

CROSS SECTIONS

1'=100'

1