

**LEMMON DRIVE ESTATES  
TENTATIVE MAP  
& COMMON OPEN SPACE DEVELOPMENT**

PREPARED FOR

**LAKES AT LEMMON VALLEY, LLC**

PREPARED BY:  
**CFA, INC.**  
1150 CORPORATE BOULEVARD  
RENO, NV 89502  
(775) 856-1150



**MARCH 15, 2018**

**PROJECT: 16-013.00**

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## Project Description

### Project Request

This application is a request for a common open space tentative map on a 33.97+/- acre parcel located at on the east side of Lemmon Drive between Buck Drive and Military Road in Lemmon Valley. The Washoe County Assessor's office recognizes the property as APN 552-210-18.

In addition to this tentative map including a request for a common open space development, this request also includes the review of the site relative to the Hillside Ordinance (Article 424 of the Washoe County Development Code). It should be noted that the reason that a common open space development has been requested is to protect sensitive areas of the site (steep slopes and a drainageway). As such, there is not development proposed in the steep areas of the site, located in the northeast corner of the property, nor in the drainageway flow corridor.

As can be The property is made up of diverse terrain that is , inclusive of approximately 78% of the site in very developable slopes and approximately 22% of the site in moderate to steep slopes, which are predominately consolidated in the northeastern corner of the site. In addition to the slope constraints, a 100-year flood plain crosses the property and separates the most developable slopes from the steeper slope areas.

Requested with this application is a Common Open Space Development and Tentative Map for 98 single family lots parcels. The property is zoned MDS (Medium Density Suburban, which would allow for residential development at a density of up to 3 dwelling units per acre. The maximum number of units that would be allowed per the zoning designation is 101.91 lots residential lots. The proposed development plan contains 98 lots and has a gross density of 2.88+/- dwelling units per acre.

### Property Location

The subject property is locate on the west side of Lemmon Drive between Buck Drive and Military Road. The southern property line of the subject parcel is located approximately 1,200 feet north of Buck Drive and the north property line of the subject property is approximately 650 feet south of Military Road. A vicinity map is provided on page 2 of this project description.



# LEMMON DRIVE ESTATES

## COMMON OPEN SPACE TENTATIVE MAP

Figure 1 – Vicinity Map



### Master Plan and Zoning Conformance

Master Plan -- The subject property is designated Medium Density Suburban in the Reno Stead Corridor Joint Plan. This designation allows for 1 – 3 dwelling units per acre. The proposed Lemmon Drive Estates project has a gross density of 2.88+/- dwelling units per acre. As such, the project provides the type of development (single family) that is allowed within this master plan designation and presents a density that conforms to the master plan designation.

Zoning – The property is zoned MDS, allowing for up to 3 dwelling units per acre, conforming with the master plan designation for the property. The proposed Lemmon Drive Estates project has a gross density of 2.88+/- dwelling units per acre. As such, the project provides the type of development (single family) that is allowed within this master plan designation and presents a density that conforms to the zoning designation.

### Existing Site Conditions

The site is currently vacant and presents low to moderately sloped land on the western and southern ends of the site and possesses a floodplain and steep slopes that are located approximately in the northeast ¼ to 1/3 third of the property. Following are site photos showing the existing condition of the property. All of the photos were taken from the areas that are defined by Washoe County to be the most developable portions of the property via the Development Suitability Map from the North Valleys Area Plan



*View of subject property from Southwest corner, near Lemmon Drive and Silver State Kennels.*



# LEMMON DRIVE ESTATES

## COMMON OPEN SPACE TENTATIVE MAP



*View of property from current intersection of gas line and sewer line toward the northeast. Lower rock outcropping is on the subject property and will not be disturbed. Peak of hill is not part of subject property.*

*View of property from current northwest corner near Lemmon Drive and north property line. Dirt road to on left side of photo is the existing sewer line easement access road.*



**Project Summary**

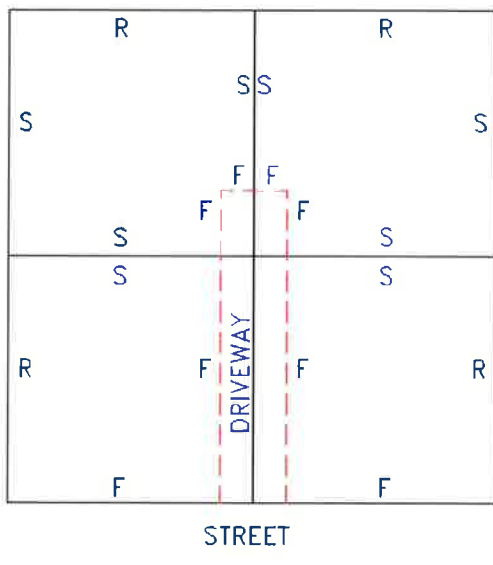
**Overview** - Lemmon Drive Estates is proposed to be a 98-lot single family subdivision that will incorporate common open space areas to preserve areas of steep slopes and existing drainage corridor that cross the property. The project is proposed to be developed in similar fashion and design to a recently developed project in the City of Sparks called The Preserve. The development design incorporates a clustered lot pattern, where four home sites are served off a common driveway.

**Setbacks** - Minimum setback requirements are proposed to be provided at 5 feet on all sides of the property with the exception of setbacks to garage faces where a 20-foot setback will be provided to accommodate a driveway to accommodate 2 cars of parking, in addition to the 2 parking spaces in within the garage of each home. Please see Figure 2 showing a typical setback exhibit of where each yard area (front, side and rear) would be considered for the Lemmon Drive Estates project. Figure 3 shows an aerial view of cluster court from The Preserves Subdivision in Sparks. This image shows the

Minimum Setbacks

- Front (home to public street) – 10 feet
- Front (garage to public street) – 20 feet
- Front (home to common driveway) – 5 feet
- Front (garage to common driveway) – 20 feet
- Side – 5 feet
- Rear – 5 feet

*Figures 2 & 3 – Yard Definition Exhibit & Product Example Aerial Image*



**Streets and Access** - All streets within the proposed Lemmon Drive Estates project will be designed and constructed to Washoe County standards. The streets are currently planned to be public streets, but through the review process the applicant will discuss with County staff about the potential of providing private streets with gated entries to the project.

The street sections will be designed with sidewalk on one side of each street except for entry roads with direct connection to Lemmon Drive, where sidewalks on both sides of the street will be provided.

**Common Area, Pedestrian Linkages Within and Outside the Community** – Lemmon Drive Estates is proposed to be a 98-lot single family residential community with 16.68+/- acres of common area that will be maintained by the Lemmon Drive Estates Homeowner’s Association. The project provides approximately 1.1+/- miles of path/sidewalk loops through the community. A Path Loop Exhibit map is provided in Appendix D that illustrates the location of the pedestrian loops around the community. The location of Lemmon Drive Estates provides the nearest shopping and retail level services within ¼ mile of the southern end of the project providing some limitation on typical automobile dependence for short or small shopping trips.

**Images of Similar Community** - Following are photo images of a similar project to what is proposed for Lemmon Drive Estates. These images were taken at The Preserve in Sparks, Nevada. The project is located on the north side of Disc Drive, between Sparks Boulevard and Galleria Parkway. These images should be helpful in illustrating entry signage, general character and feel of the court appearance of the lots, and the general street scene.



Community Sign General Character Example



LEMMON DRIVE ESTATES

COMMON OPEN SPACE TENTATIVE MAP

General Street Appearance Example



Rear Yard Fencing Concept, Abutting Street

Example Appearance of Court/Driveway with Housing



# LEMMON DRIVE ESTATES

## COMMON OPEN SPACE TENTATIVE MAP

### Development Statistics – Following are development statistics for the Lemmon Drive Estates.

Total Project Area:	33.97+/- AC
Maximum Dwelling Units Allowed (Per TMRPA constraint of 5 DU/AC):	101 Residential Lots
Total Dwellings Proposed:	98 Residential Lots
Gross Density Proposed:	2.88+/- DU/AC
Common Area Lots:	4 Parcel

### Areas of Use

Residential Lot Area:	13.52+/- AC
Common Area (Landscaped and Natural Areas):	16.68+/- AC
Streets (ROW)	3.77+/- AC

### Lot Sizes

Minimum Lot Size:	5,218+/- SF
Maximum Lot Size:	10,811+/- SF
Average Lot Size:	6,011+/- SF

### Proposed Setbacks

Front (home to street/ROW)	10 feet
Front (garage to street/ROW)	20 feet
Front (home to common driveway)	10 feet
Front (garage to common driveway)	20 feet
Side	5 feet
Rear	10 feet

### Landscape

Required Landscaping (20% of the site)	6.79+/- AC
Landscape Area Provided (Front Yard Landscape Not Included)	16.68+/- AC (49+/-%)

### Common Open Space Development Considerations

Article 408 of the Washoe County Development Code requires that Common Open Space Development requests review (at a minimum) 16 Site Analysis considerations, per 110.408.30 relative to the project location, design and area infrastructure and facility connectivity and availability. Following is a listing of the 16 considerations and a response relative to each item. A Site Analysis Map has been provided as part of this application submittal. Some of the responses to considerations reference that map, other maps in the tentative map package or other reports or documents contained within this application. This review of Common Open Space Development Considerations is duplicated on the Site Analysis Map provide with this application.

- a) Location Map – a location map is provided on the cover of the tentative map set and on page 2 of this project description.
- b) Land Use – Current land use is “vacant.” The planned land use is illustrated and defined and mapped in tentative form on the other sheets provided with this application.
- c) Existing Structures – there are no existing structures on the site.
- d) Existing Vegetation – The Washoe County Vegetative Communities/Landcover Map from the Washoe County Master Plan Conservation Element identifies that the area of the subject parcel is contained within the Sagebrush vegetative area
- e) Prevailing Winds – prevailing winds come from the west.
- f) Topography – A slope analysis map is provided in Appendix D of this application package. The site slope calculations on that map show that 6.7+/- acres of the site (19.7% of the site) is contained in 15% or steeper slopes. The steepest areas of the site (30% or greater) are held within the northeastern corner of the site across the drainageway the crosses the subject property. The steep slopes that exist on the site are not proposed for any development and will remain natural and be contained within the common area of the site.
- g) Soils – A geotechnical report is provided in the application package identifying the soil characteristics of the site. Please see Appendix C of this application.
- h) Natural Drainageways – A floodplain bisects the site from the southeast corner to the norther property line.
- i) Wetlands and Waterbodies – no wetlands or water bodies appear on the subject property.
- j) Flood Hazards – a 100-year floodplain is identified on the property through FEMA mapping. The flood plain location is shown on the Site Analysis Map provided on the following page.



- k) Seismic Hazards – No seismic hazards were identified on the site. This is evidenced in the preliminary geotechnical report, provided in Appendix C.
- l) Avalanche Hazards – There are not avalanche hazards on the site.
- m) Sensitive Habitat and Migration Routes – The Washoe County Master Plan Conservation Element Habitat and Migration Route Maps show that Mule Deer habitat may exist in the area of the site (as it also appears to exist in Lemmon Valley, Spanish Springs, Reno, the Sparks Indian Colony, Stead, and Antelope Valley). No Bighorn, Black Bear, Pronghorn Antelope, Raptors, Sage Grouse or Wild Horse and Burro Herd habitats are shown to exist in the area of the subject property, per the Washoe County Conservation Element Habitat and Migration Route Maps.
- n) Significant Views – The subject property sits in a moderately wide canyon between two hillsides that open to the north of the site and feed out to the expansive area of Lemmon Valley, where Swan Lake/Lemmon Lake is located. Due to this location, the best views from the property are located at the northeastern corner of the site, where the slopes on the property are the steepest and not proposed for development. No trail access is proposed into this area as there are no existing trails and the 120-acre federal land located to the east on (APN 552-210-19) contains no trails until you get to the western side of the hill that is contained within this federal parcel. No photos are provided as the views are (1) not significant and (2) not proposed to be accessible with the proposed development plan.
- o) Easements – Existing easements are shown on the Subdivision Map Sheet 1 of 5, provided with this application.
- p) Utilities – Utility connections are shown on the Site and Utilities Plan, Sheet 2 of 5 provided with this application package. Electric service is the only service identified in the requirements that is not shown on the Utilities Map. It is expected to enter the site at the project entrance(s) on Lemmon Drive or off the overhead power line that exists at the north end of the property. Electric, telephone and cable services will be run underground through the proposed subdivision.
- q) Appropriate Access Points – Access to the site must be served off Lemmon Drive. Two access points will be necessary to meet emergency access requirements.

## **Tentative Map Findings**

Article 821 of the Washoe County Development Code identifies findings that must be made in order to approve a common open space tentative map application. Following is an identification of each finding and the applicant's response as to how or why this finding is met with this request.

### **(a) Plan Consistency.**

*The requested Common Open Space Tentative Map request is consistent with the Washoe County Master Plan. The subject property is contained within the Reno Stead Corridor Joint Plan and holds a designation of Medium Density Suburban, which allows for single family residential development with a density range between 1 and 3 dwelling units per acre. The proposed project has a gross density of 2.88+/- dwelling units per acre and is consistent. Some of the specific policies noting consistency are identified below:*

*Adjacent properties to the southeast of the subject property are designated with a combination of GR (General Rural) and LDS (Low Density Suburban). Per the Washoe County Master Plan, Land Use and Transportation Element, the MDS is highly compatible with LDS and GR designations (see Table 3: Land Use Compatibility Matrix, p.55 of the Washoe County Master Plan).*

### **Reno Stead Corridor Joint Plan Policies**

#### **Conservation Policies**

C.2.1 The use of major drainageways as undeveloped buffers between areas of development is encouraged. Undeveloped drainageways should also be used for pedestrian, equestrian or bicycle access into the Peavine Mountain area and other open space areas where appropriate. Access routes along major drainageways should include sufficient width for a trail easement. Motorized vehicle access should be restricted where appropriate.

*The drainageway that crosses the property is incorporated into the eastern edge of the development area. Pedestrian accesses have been situated along or adjacent to the drainageway as a positive open space element within the subject property boundary. The drainageway offers a boundary to the steep slopes on the subject property that will be preserved in the development plan.*

C.3.1 Each development proposal shall be evaluated with the intent to preserve visually prominent ridges and rock outcroppings. Evaluation should address mitigation of the affects on visual appearance, scarring of hillsides, and the impact of increasing access in roadless areas.

*Rock outcroppings that are located in the northeastern portion of the property are to be left undisturbed as is the steeper sloped land surrounding the rock outcroppings.*

Land Use and Transportation Element Policies

LUT.3.1 Require timely, orderly, and fiscally responsible growth that is directed to existing suburban character management areas (SCMAs) within the Area Plans as well as to growth areas delineated within the Truckee Meadows Service Area (TMSA).

*The subject property situated near commercial development and is adjacent on both the north and south sides of the Lemmon Drive frontage with existing development (a dog kennel to the south and a church to the north).*

LUT.3.3 Single family detached residential development shall be limited to a maximum of five (5) dwelling units per acre.

*The proposed Lemmon Drive Estates project proposes a gross density of 2.88+/- DU/AC. This conforms with LUT 3.3.*

Housing Element Goals and Policies

Program 3.5: The County will promote residential development in areas where services and infrastructure already exist or are planned.

*Services and infrastructure already exist and the parcel is a vacant, infill site.*

(b) Design or Improvement.

*Finding b addresses consistency with master plan goals and policies, similar to finding a. As such, please see the address to finding a as the responses are the same.*

(c) Type of Development

*The areas of the subject property identified for development are categorized to be within the area "most suitable" for development per the Development Suitability Map within the North Valleys Area Plan. The steeper sloped portions of the property are to be retained as undisturbed open space.*

(d) Availability of Services.

*Based on preliminary discussion and review with utility purveyors that would serve the Lemmon Drive Estates project, utilities necessary to serve this in-fill site are generally adjacent to the site.*

(e) Fish or Wildlife.

*The Washoe County Master Plan Conservation Element Habitat and Migration Route Maps show that Mule Deer habitat may exist in the area of the site (as it also appears to exist in Lemmon Valley, Spanish Springs, Reno, the Sparks Indian Colony, Stead, and Antelope Valley). No Bighorn, Black Bear, Pronghorn Antelope, Raptors, Sage Grouse or Wild Horse and Burro Herd habitats are shown to exist in the area of the subject property, per the Washoe County Conservation Element Habitat and Migration Route Maps.*

(f) Public Health.

*A single-family manufactured home subdivision does not present any anticipated public health problems.*

(g) Easements

*There are only a few easements that currently encumber the property. A 16" natural gas line and sewer line are the primary easements and facilities that either dictate portions of the project design or will necessitate realignment through the subdivision with development of the site. Both easements can be accommodated or relocated appropriately within the proposed development plan.*

(h) Access

*Primary access is provided on E. Fourth Avenue, a collector status street as defined within the Sun Valley Area Plan Streets and Highways System Plan. Secondary/emergency access is provided to Pearl Drive as a gated emergency access.*

(i) Dedications

*The Valle Vista Community is proposed to contain private streets and private common area. No new dedications of roads or parks is expected. The existing flood plain at the northwest corner of the property is already contained within a protected drainage easement and no development is proposed for the storm water carrying feature.*

(j) Energy

*The proximity of the project to shopping and bus routes can have a positive impact on vehicle miles traveled. dependent upon the articulation of the roofline for each house that will be constructed (which will vary), substantial roof surface should be available for solar panels on the majority of the homes with smaller areas available for solar panels, if the home owner wishes to install them.*

# **APPENDIX A**

## Washoe County Development Application

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

<b>Project Information</b>		Staff Assigned Case No.: _____	
Project Name: Lemmon Drive Estates			
Project Description: A common open space tentative map is proposed for a 98 lot single family detached subdivision.			
Project Address: 0 Lemmon Drive			
Project Area (acres or square feet): 33.97 +/- Acres			
Project Location (with point of reference to major cross streets <b>AND</b> area locator): Located east of Lemmon Drive, north of Buck Drive, and south of the Church of Jesus Christ Latter Day Saints in Golden Valley.			
Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
552-210-18	33.97+/- acres		
Section(s)/Township/Range: Sec. 09, T. 20, R. 19			
<b>Indicate any previous Washoe County approvals associated with this application:</b>			
Case No.(s). CPA99-NV-1 (a comp plan amendment that provided MDS designation)			
<b>Applicant Information (attach additional sheets if necessary)</b>			
<b>Property Owner:</b>		<b>Professional Consultant:</b>	
Name: Lakes at Lemmon Valley LLC		Name: CFA, Inc.	
Address: 4655 Longley Lane, Suite 107 Reno, NV		Address: 1150 Corporate Blvd.	
Zip: 89502		Zip:	
Phone: 775-359-1191 Fax:		Phone: 775-856-7073 Fax:	
Email: cpbluth@aol.com		Email: dsnelgrove@cfareno.com	
Cell: 775-772-1641 Other:		Cell: 775-737-8910 Other:	
Contact Person: Chuck Bluth		Contact Person: Dave Snelgrove, AICP	
<b>Applicant/Developer:</b>		<b>Other Persons to be Contacted:</b>	
Name: Same as Owner		Name:	
Address:		Address:	
Zip:		Zip:	
Phone: Fax:		Phone: Fax:	
Email:		Email:	
Cell: Other:		Cell: Other:	
Contact Person:		Contact Person:	
<b>For Office Use Only</b>			
Date Received: Initial:		Planning Area:	
County Commission District:		Master Plan Designation(s):	
CAB(s):		Regulatory Zoning(s):	

# Property Owner Affidavit

**Applicant Name:** Lakes at Lemmon Valley LLC

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

STATE OF NEVADA        )  
  )  
COUNTY OF WASHOE    )

I, Charles Bluth, Owner of the Lakes at Lemmon Valley, 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 Building.

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

Assessor Parcel Number(s): 552-210-18

Printed Name CHARLES P. BLUTH  
Signed *Charles P. Bluth*

Address 4655 Longley Lane, Suite 107

Subscribed and sworn to before me this  
9<sup>th</sup> day of MARCH, 2018

*Kathleen Council*  
Notary Public in and for said county and state

My commission expires: 12-26-2018

(Notary Stamp)



\*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 subject property is located in Golden Valley to the east of Lemmon Dr., north of Buck Drive and APN 552-190-05 and APN 552-190-11, and south of APN 552-262-01. The subject parcel is recognized by the Washoe County Assessor's Office as APN 552-210-18.

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

Lemmon Drive Estates

3. Density and lot design:

a. Acreage of project site	33.97 acres
b. Total number of lots	98 residential lots - 1 common area lot
c. Dwelling units per acre	3 DU/AC
d. Minimum and maximum area of proposed lots	Minimum 5,218+/- s.f. Maximum 10,811+/- s.f.
e. Minimum width of proposed lots	75'
f. Average lot size	6,011+/- SF

4. Utilities:

a. Sewer Service	Washoe County
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
f. Cable Television Service	Charter
g. Water Service	Truckee Meadows Water Authority



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

a. Acreage of common open space:

16.68 acres of natural and landscaped common open space is provided, which equates to +/-49% of the total site.

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

The FEMA map shows that the site has a flood plain running through it from southeast to the northern parcel line. The flood plain area separates the area of the site that is most suitable for development from the street slopes that exist on the parcel. The slope analysis map, provided with this application shows that there is a total of 6.7+/- acres of slopes in excess of 15% on the subject site. These slope areas are not proposed for development and are shown to be in common open space on the tentative map sheets with this application. The preliminary geotechnical investigation, provided with this application did not find any information evidencing any faults on the subject property.

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

Minimum - 5,218+/- s.f., Maximum - 10,811+/- s.f.

d. Average lot size:

6,011+/- SF

e. Proposed yard setbacks if different from standard:

Front (home to street) - 10 feet  
Front (garage to street) - 20 feet  
Front (home to common driveway) - 10 feet  
Front (garage to common driveway) - 20 feet  
Side - 5 feet  
Rear - 10 feet

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

Smaller sized lots, which are allowed in common open space developments are meritorious having smaller setbacks, appropriate to their lot sizing, orientation and design. The proposed minimum setback distances are typical and provide flexibility for the home builder to provide a housing product that meets desires of many home buyers who do not want a yard area that creates considerable upkeep and maintenance. The trade-off for the compact lot and setback standards is the provision, protection and maintenance of common area that will not be scarred, developed or otherwise altered.

g. Identify all proposed non-residential uses:

There are not any non-residential uses proposed as part of the Lemmon Drive Estates project.

h. Improvements proposed for the common open space:

A pedestrian trail system is incorporated into appropriate sections of the common area to provide an interconnected series of loops with the sidewalks within the subdivision area. The total length of the path and sidewalk loops within the subdivision is 1.1+/- miles.

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

A pedestrian The sidewalk/pedestrian path system will be available and accessible to residents within the Lemmon Drive Estates housing development as well as the general public.

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

There are no existing trails near the subject property. As such, no connections have been proposed.

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

There are ridgelines on the property, only slopes heading toward ridgelines that exist off-property.

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

Fencing will be allowed on lot lines, typical with good neighbor fencing or enhanced wood fencing (photo example from The Preserve is provided in project description). Open fencing or combined solid and open fencing treatments may be incorporated along common areas where roads are not adjacent.

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

The Lemmon Drive Estates Homeowner's Association will be responsible for maintenance of the Common Open Space within the project.

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?

The Washoe County Engineering website and "Presumed Public Roads" map of the Reno Area does not show any "presumed public roads" that are not in paved road alignments. Lemmon Drive is shown on the map as the nearest "presumed public road" and that paved public right-of-way will provide access to the project.

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 through the Reno-Stead Joint Corridor Plan

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?

No. The subject property is an infill site along a major arterial roadway (Lemmon Drive) and utilities are available adjacent to the property.

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

Cultural Resources mapping provided in the Washoe County Master Plan indicates that SHPO has identified resources in the general area (within 1 mile of the project site), but it is unknown whether anything was identified, specific to the subject property.

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 is proposed to be served through TMWA. The applicant is fully aware that any necessary water rights to serve the project will have to be purchased by the applicant/project developer. A copy of the TMWA discovery report is provided with this application.

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

The proximity of the project to shopping and bus routes can have a positive impact on vehicle miles traveled. dependent upon the articulation of the roofline for each house that will be constructed (which will vary), substantial roof surface should be available for solar panels on the majority of the homes with smaller areas available for solar panels, if the home owner wishes to install them.

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

The Washoe County Master Plan Conservation Element Habitat and Migration Route Maps show that Mule Deer habitat may exist in the area of the site (as it also appears to exist in Lemmon Valley, Spanish Springs, Reno, the Sparks Indian Colony, Stead, and Antelope Valley). No Bighorn, Black Bear, Pronghorn Antelope, Raptors, Sage Grouse or Wild Horse and Burro Herd habitats are shown to exist in the area of the subject property, per the Washoe County Conservation Element Habitat and Migration Route Maps.

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

Streets are designed and proposed to be public, but the applicant will discuss with the County and the project design team the possibility of providing private streets through the review process.

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:

This section of code addresses policies from the 2002 Regional Plan, which are no longer valid.

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?

Please see the Tentative Map Legal Findings review section of the Project Description of this application.

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?

There are no applicable area plan modifiers in the Development Code that would apply to this project.

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

The project will be constructed in a total of three (3) Phases. The proposed phasing lines are shown on the tentative map sheets provided with this application package.

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?

41,500+/- 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?

500+/- CY are estimated to be exported from the site. The grading plan identifies that the export material will be taken to the Lockwood Landfill, but if there is a suitable site that can accept the material that is within the Lemmon Valley area, we will take the material there. This will be determined nearer to the actual time of earthwork and grading permit for the project.

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?

Most of the disturbed areas associated with site grading will be screened by the proposed development. Any portions that will remain visible will be revegetated, landscaped or left natural. Revegetation and landscaping are the primary mitigative treatments for such areas.

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?

3:1 maximum slope will be incorporated in the grading design. Fiber rolls, silt fences and/or other BMP's will be incorporated into the SWPPP for prevention of erosion escaping the site prior to revegetation or stabilization. BMP Notes are provided on the Grading Plan provided with this application.

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?

There are no retaining walls on the site.

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

There are no existing trees on the site.

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?

DAVE (Hansen)  
A revegetation seed mix will be used in areas where formal landscape is not proposed that have been graded. The total pounds per acre is expected to be 30+/- lbs/acre.

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

No temporary irrigation is proposed for revegetation areas. Hydroseeding is the anticipated method of treatment for revegetation.

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

No, the plan has not been reviewed with the Washoe Storey Conservation District.



# Request to Reserve New Street Name(s)

The Applicant is responsible for all sign costs.

## Applicant Information

Name: Lakes at Lemmon Valley LLC  
Address: 4655 Longley Lane, Suite 107  
Reno, NV 89502

Phone (Home): 775-359-1191 Phone (Work): \_\_\_\_\_  
 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.)

<u>sunset view drive</u>	<u>snowbrush drive/court</u>
<u>fire wheel drive</u>	<u>wild rye court</u>
<u>wolf willow court</u>	

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: Need name from client  
 Reno  Sparks  Washoe County

Parcel Numbers: 552-210-18  
 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 Department of Public Works

Post Office Box 11130 - 1001 E. Ninth Street  
Reno, NV 89520-0027

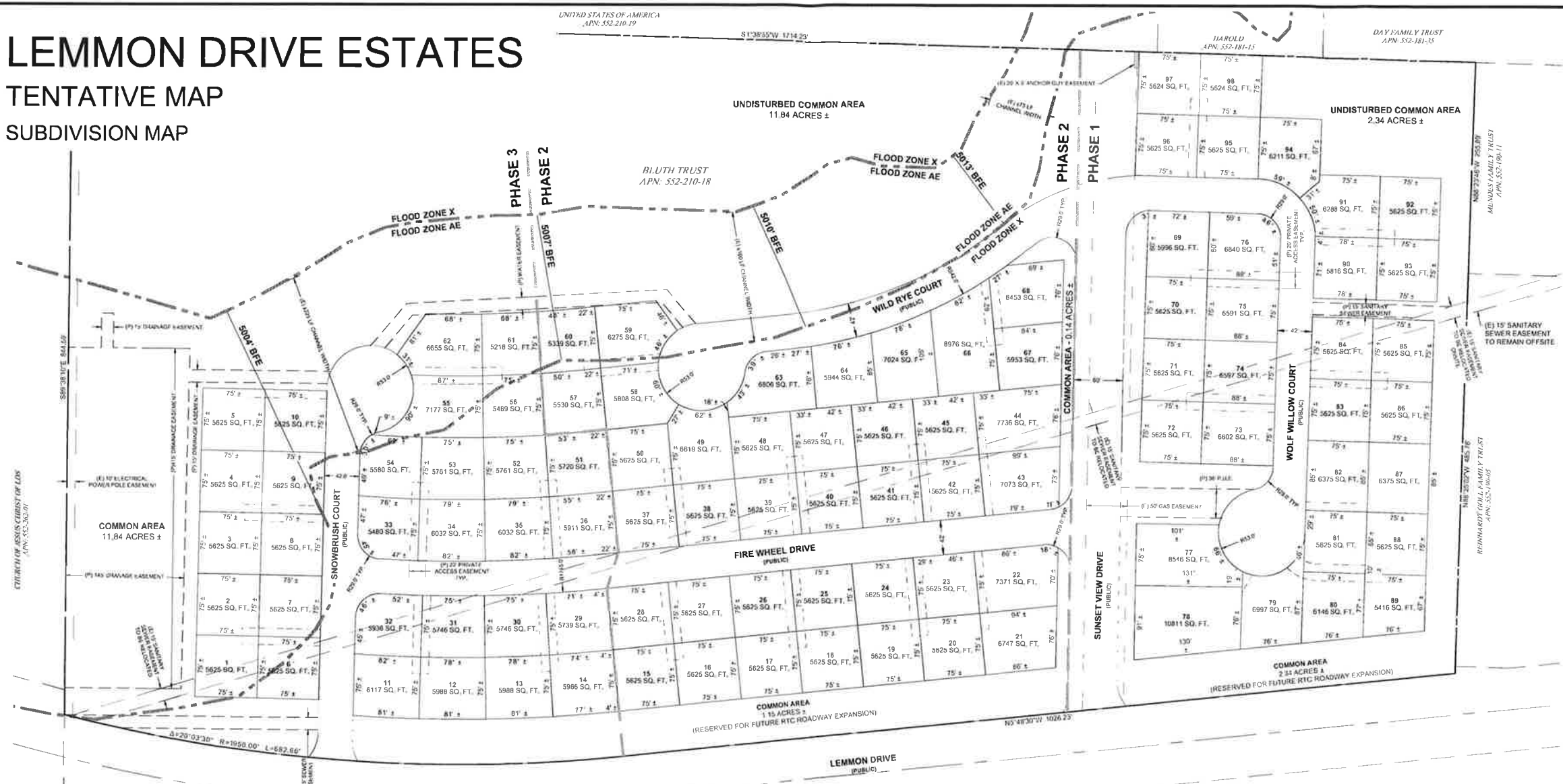
Phone: (775) 328-2344 Please email form to: [Addressing@washoecounty.us](mailto:Addressing@washoecounty.us)

# **APPENDIX B**

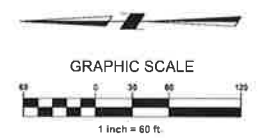
# LEMMON DRIVE ESTATES

## TENTATIVE MAP

### SUBDIVISION MAP



VICINITY MAP  
SCALE: NTS



#### ENGINEER'S STATEMENT:

TO THE BEST OF MY KNOWLEDGE, THE PLANS PREPARED ARE IN COMPLIANCE WITH APPLICABLE PROVISIONS OF THE WASHOE COUNTY DEVELOPMENT CODE.

JONATHAN LAU, P.E.  
CFA INC.



### LEMMON DRIVE ESTATES TENTATIVE MAP SUBDIVISION MAP

WASHOE COUNTY NEVADA

**CFA, INC.**  
LAND SURVEYORS  
CIVIL ENGINEERS  
LAND USE PLANNERS  
1150 CORPORATE BOULEVARD • RENO, NEVADA 89502  
775-856-1150 MAIN • 775-856-1160 FAX • CFARENO.COM

JOB NO: 16013.00 DATE: 03-15-2018

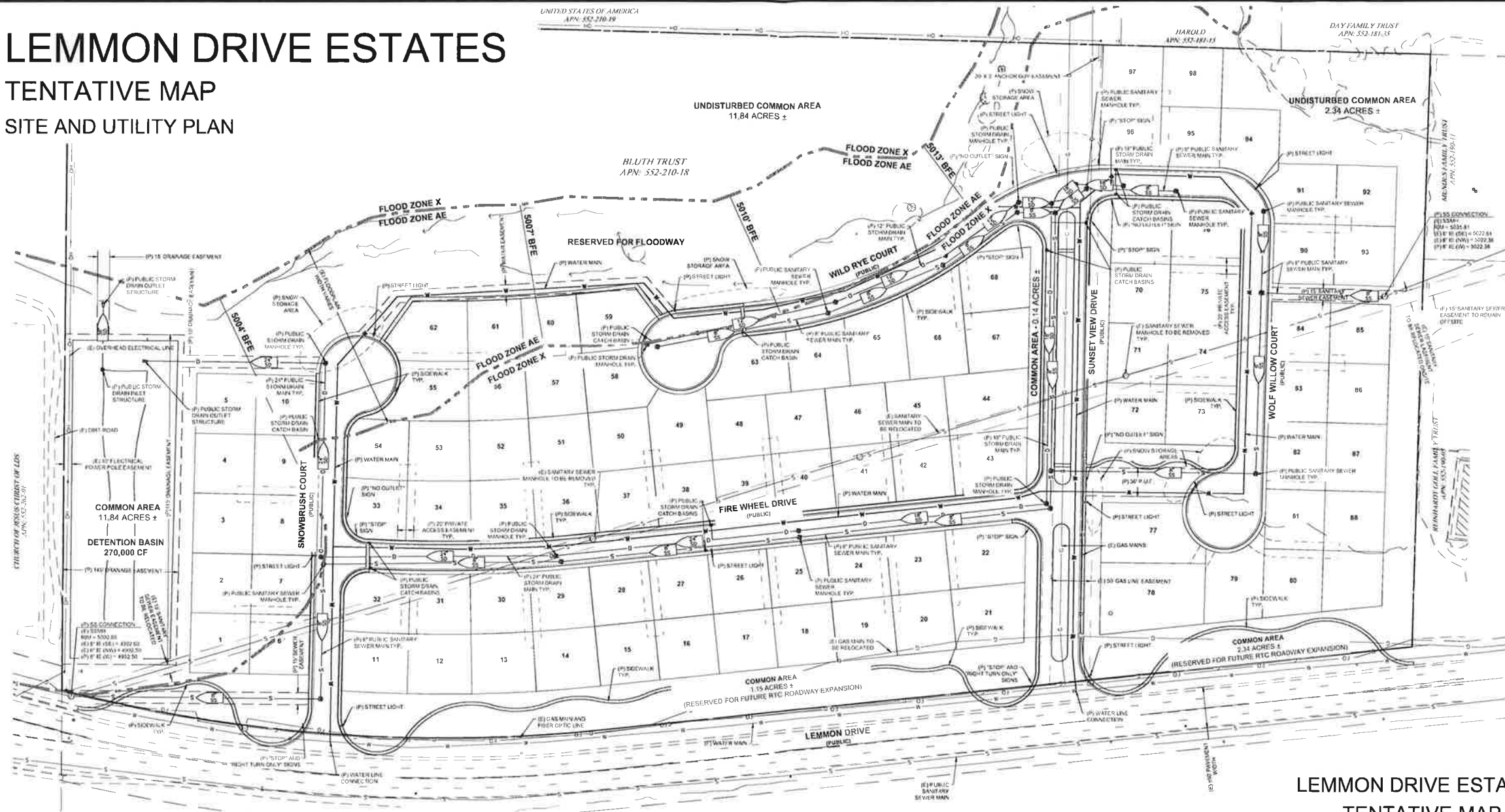
SHEET 1 OF 5

\S:\projects\16013\Drawings\Subdivision\16013-01.dwg 3/15/2018 10:47:29 AM

# LEMMON DRIVE ESTATES

## TENTATIVE MAP

### SITE AND UTILITY PLAN



#### SITE INFORMATION

##### SITE INFORMATION

SUBDIVISION NAME: LEMMON DRIVE ESTATES  
 APPLICANT: CHUCK BLUTH  
 PROPERTY OWNER: CHUCK BLUTH  
 ENGINEER: JONATHAN LAU, CFA INC.

ASSESSOR PARCEL NUMBER: 552-210-18  
 STREET ADDRESS: 0 LEMMON DRIVE  
 WASHOE COUNTY, NV 89508

##### SITE STATISTICS

TOTAL AREA: 33.97 AC  
 MAXIMUM TOTAL DWELLING UNITS ALLOWED: 101  
 TOTAL DWELLINGS: 98  
 COMMON AREAS: 4

##### AREA STATISTICS

TOTAL RESIDENTIAL LOT AREA:	989,098 ± SF	(13.52 AC)
TOTAL COMMON AREA:	673,873 ± SF	(16.88 AC)
TOTAL STREET AREA:	164,068 ± SF	(3.77 AC)
TOTAL:		33.97 AC

GROSS DENSITY: 2.88 DWELLINGS PER ACRE

##### COUNTY REGULATIONS

MINIMUM LOT SIZE:	5,218 SF
MAXIMUM LOT SIZE:	10,811 SF
AVERAGE LOT SIZE:	6,011 SF

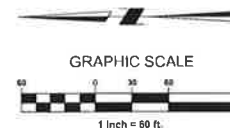
##### SETBACKS

FRONT (HOME TO STREET): 10 FEET  
 FRONT (GARAGE TO STREET): 20 FEET  
 FRONT (HOME TO COMMON DRIVEWAY): 10 FEET  
 FRONT (GARAGE TO COMMON DRIVEWAY): 20 FEET  
 SIDE: 5 FEET  
 REAR: 10 FEET

##### LANDSCAPE STATISTICS

TOTAL SITE AREA:	33.97 AC
UNDISTURBED AREA:	11.59 AC
TOTAL DEVELOPED AND GRADED AREA:	22.38 AC
REQUIRED LANDSCAPING (20%):	6.79 AC OR 295,772 SF
LANDSCAPE AREA PROVIDED:	16.88 AC OR 673,873 SF

(FRONT YARDS NOT INCLUDED)



# LEMMON DRIVE ESTATES

## TENTATIVE MAP

### SITE AND UTILITY PLAN

WASHOE COUNTY NEVADA

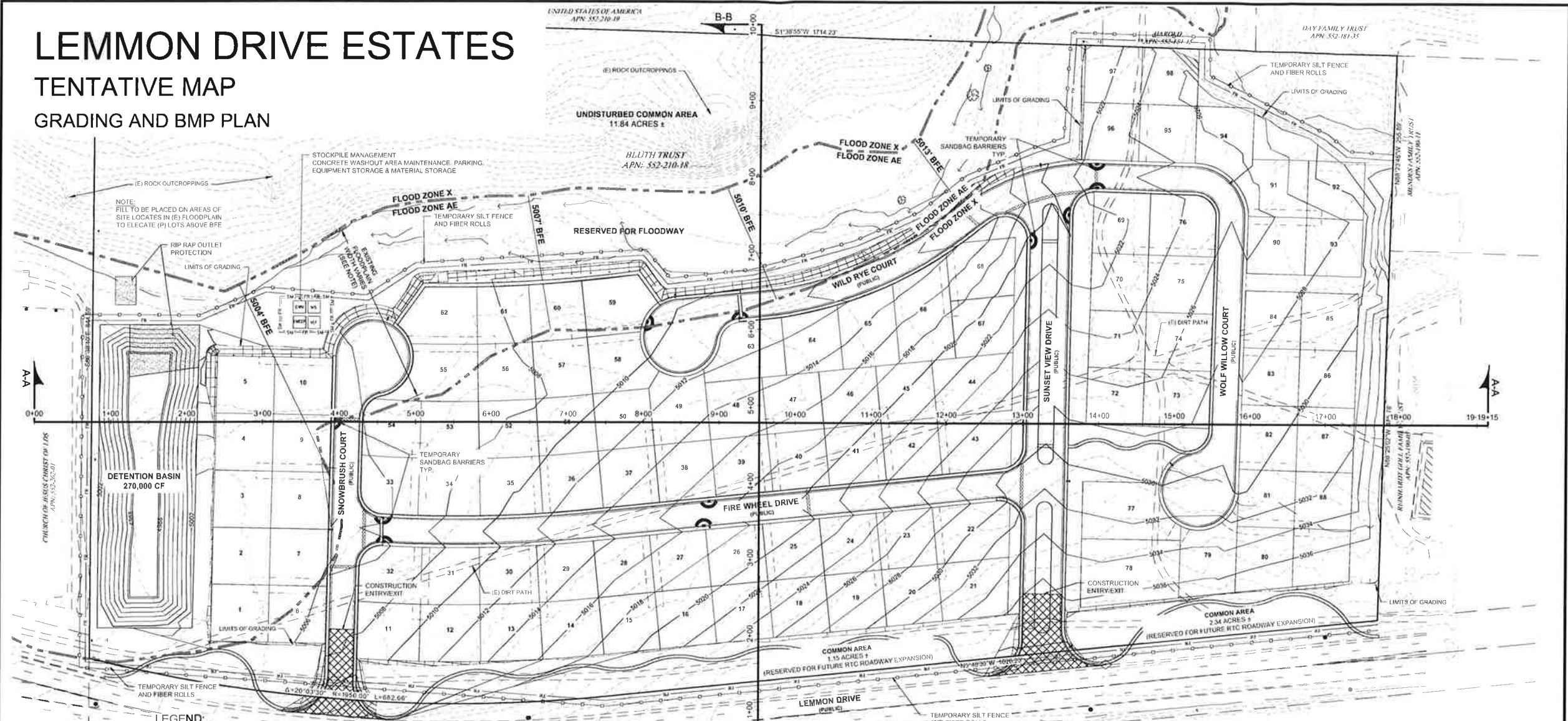
**CFA, INC.**  
**LAND SURVEYORS**  
**CIVIL ENGINEERS**  
**LAND USE PLANNERS**  
 1150 CORPORATE BOULEVARD • RENO, NEVADA 89502  
 775-856-1150 MAIN • 775-856-1160 FAX • CFARENO.COM

JOB NO: 16013.00 DATE: 03-15-2018

# LEMMON DRIVE ESTATES

## TENTATIVE MAP

### GRADING AND BMP PLAN



**LEGEND:**

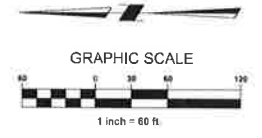
BMP NO.	BMP NAME	MAP SYMBOL
SC-8	CONSTRUCTION SITE ENTRANCES AND EXITS	[Grid pattern symbol]
EC-7	RIP RAP	[Stippled symbol]
DP-3	SAND BAG BARRIERS (STORM DRAIN INLET PROTECTION)	[Curved line symbol]
GM-2	STOCK PILE MANAGEMENT	[Swirled pattern symbol]
GM-5	STREET SWEEPING	[Rectangular symbol]
GM-6	VEHICLE AND EQUIPMENT MAINTENANCE AND FUELING	[Rectangular symbol]
GM-9	HANDLING AND DISPOSAL OF CONCRETE AND CEMENT	[Rectangular symbol]
GM-10	MATERIAL DELIVERY, HANDLING, STORAGE, AND USE	[Rectangular symbol]
SC-1	FIBER ROLLS (WATTLES)	[Rectangular symbol]
SC-5	SILT FENCE (MAY BE ATTACHED TO TEMP. CONSTRUCTION FENCE)	[Rectangular symbol]

- STORMWATER QUALITY NOTES**
1. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATE IN, THE PUBLIC RIGHTS OF WAYS OF THE CITY OF RENO OR WASHOE COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIAL SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
  2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESSEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN WASHOE COUNTY CODE AND THE TRUCKEE MEADOWS CONSTRUCTION SITE BEST MANAGEMENT PRACTICES HANDBOOK.
  3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO STORMWATER GENERAL PERMIT NW100000, SECTION 1.8.1.8-1.9.
  4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCES AND EXIT LOCATIONS AND ALL BMPs WEEKLY, PRIOR TO A FORECASTED RAIN EVENT AND WITHIN 24 HOURS AFTER ANY ACTUAL RAIN EVENT. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS FROZEN GROUND CONDITIONS OR SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO STORMWATER GENERAL PERMIT NW100000, SECTION 1.8.1.9.
  5. ACCUMULATED SEDIMENT IN BMPs SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.
  6. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL PERMANENTLY REVEGETATE ALL AREAS DISTURBED WHERE CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED.
  7. TEMPORARY BMPs SHALL BE REMOVED UPON COMPLETION OF CONSTRUCTION AND ACCEPTANCE OF MAINTENANCE BY WASHOE COUNTY.

**Cut/Fill Summary**

Name	Cut	Fill	Full	Partial	Adj. Area	Cut	Fill	Sum
Volume (Station)	3,000	1,000	2,000,000	50,000	50,000	41,500	40,000	81,500

EXTRA CUT MATERIAL SHALL BE STORED ON SITE IN accordance with local, state, and federal regulations.



## LEMMON DRIVE ESTATES

### TENTATIVE MAP

### GRADING AND BMP PLAN

WASHOE COUNTY NEVADA

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**LAND SURVEYORS**  
**CIVIL ENGINEERS**  
**LAND USE PLANNERS**  
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JOB NO: 16013.00 DATE: 03-15-2018

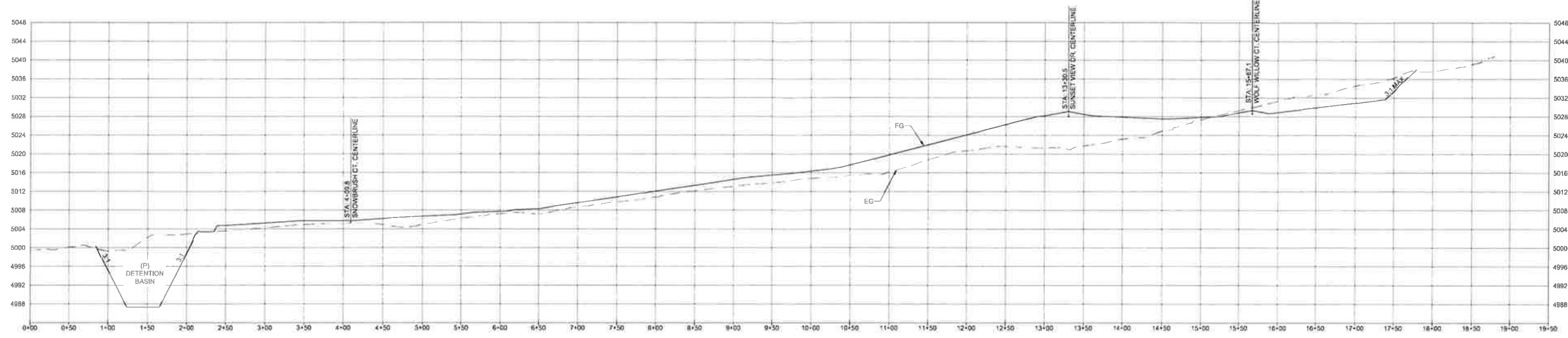
SHEET 3 OF 5



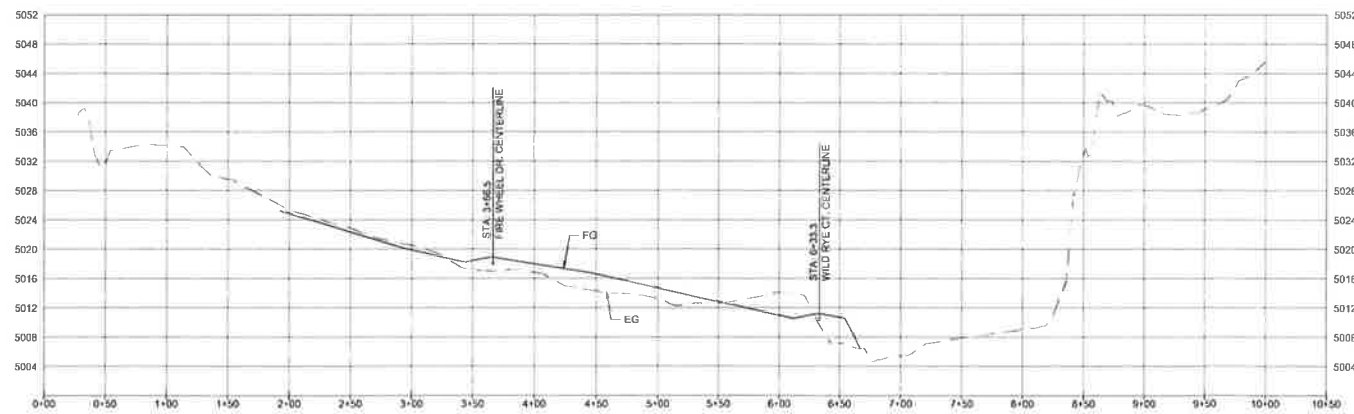
# LEMMON DRIVE ESTATES

## TENTATIVE MAP

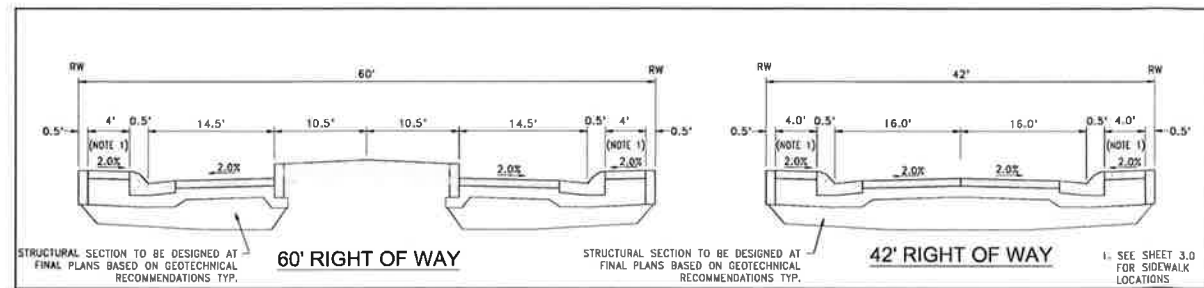
### CROSS SECTIONS



SECTION A-A  
H: 1"=60' V: 1"=10'



SECTION B-B  
H: 1"=60' V: 1"=10'



STREET CROSS SECTIONS  
NOT TO SCALE



### LEMMON DRIVE ESTATES TENTATIVE MAP CROSS SECTIONS

WASHOE COUNTY NEVADA

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JOB NO: 16013.00 DATE: 03-15-2018

SHEET 4 OF 5



# LEMMON DRIVE ESTATES

## TENTATIVE MAP

### PRELIMINARY LANDSCAPE PLAN



#### LANDSCAPE LEGEND/REQUIREMENTS

**REQUIRED YARDS ADJOINING STREETS** - ALL REQUIRED FRONT, REAR, AND SIDE YARDS WHICH ADJOIN A PUBLIC STREET SHALL BE LANDSCAPED AND SHALL INCLUDE AT LEAST ONE (1) TREE PER LOT PER STREET FRONTAGE WHERE LOT DIRECTLY ABUTS A STREET.

**SUBDIVISION PERIMETERS - NEW RESIDENTIAL SUBDIVISION**, REGARDLESS OF THE NUMBER OF DWELLING UNITS PER PARCEL, SHALL PROVIDE AT LEAST ONE (1) TREE FOR EVERY FIFTY (50) LINEAR FEET OF PERIMETER FRONTAGE ADJOINING AN ARTERIAL OR COLLECTOR IDENTIFIED IN THE WASHOE COUNTY COMPREHENSIVE PLAN STREETS AND HIGHWAYS SYSTEM PLAN MAP.

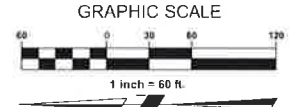
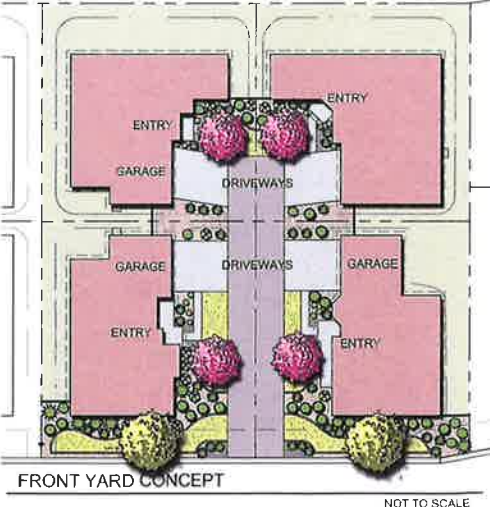
**COMMON AREA/SUNSET VIEW DRIVE** - ADDITIONAL TREES HAVE BEEN PROVIDED IN COMMON AREAS AND ALONG SUNSET VIEW DRIVE NOT REQUIRED BY CODE. FINAL TREE COUNTS IN THESE AREAS WILL BE DETERMINED BY OWNER DURING THE DEVELOPMENT OF FINAL DRAWINGS BASED ON DESIRED COMMUNITY AESTHETICS.

NATIVE/UNDISTURBED LANDSCAPE

- CANOPY SHADE TREES
- ORNAMENTAL/FLOWERING ACCENT TREES
- EVERGREEN TREES

NOTE: THE COMPOSITION OF TREES SHALL REPRESENT A MIXTURE OF DECIDUOUS AND CONIFEROUS VARIETIES AS FOLLOWS:

- AT LEAST ONE-HALF (1/2) OF ALL EVERGREEN TREES SHALL BE AT LEAST SEVEN (7) FEET IN HEIGHT, AND THE REMAINDER MUST BE AT LEAST FIVE (5) FEET IN HEIGHT AT THE TIME OF PLANTING.
- AT LEAST ONE-HALF (1/2) OF THE REQUIRED NUMBER OF DECIDUOUS TREES SHALL BE AT LEAST TWO (2) INCH CALIPER PER AMERICAN NURSERY STANDARDS AT THE TIME OF PLANTING. THE REMAINING NUMBER OF REQUIRED DECIDUOUS TREES SHALL BE AT LEAST ONE (1) INCH CALIPER AT THE TIME OF PLANTING.
- ALL PLANTING AND IRRIGATION SHALL BE INSTALLED PER LOCAL GOVERNING CODES.
- FINAL PLANT SELECTION AND LAYOUT WILL BE BASED ON SOUND HORTICULTURAL PRACTICES RELATING TO MICRO-CLIMATE, SOIL, AND WATER REGIMES. ALL TREES WILL BE STAKED SO AS TO REMAIN UPRIGHT AND PLUMB FOLLOWING INSTALLATION. PLANT SIZE AND QUALITY AT TIME OF PLANTING WILL BE PER CURRENT EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z60.1).
- ALL PLANTER BEDS WILL RECEIVE 3" MINIMUM DEPTH OF MULCH WITH WEED CONTROL.
- ALL LANDSCAPING WILL BE AUTOMATICALLY IRRIGATED UNLESS NOTED OTHERWISE ON THE PLAN. CONTAINER PLANTINGS WILL BE DRIP IRRIGATED. A REDUCED-PRESSURE-TYPE BACKFLOW PREVENTER WILL BE PROVIDED ON THE IRRIGATION SYSTEM AS REQUIRED PER CODE.



WASHOE COUNTY NEVADA

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JOB NO: 682-510-03-18 DATE: 3/15/18

SHEET 5 OF 5



# **APPENDIX C**





- 
5. Project pressure criteria are:
    - a. Maximum day pressure of 45 pounds per square inch (psi) at building pad elevation with tank level at top of fire storage,
    - b. Peak hour pressure of 40 psi at building pad elevation with tank level at top of emergency storage, and
    - c. Maximum day plus fire flow pressure of 20 psi at center of street elevation with tank level at bottom of fire storage.
  6. Facility requirements for the Project are based on the assumed maximum day demand and fire flow requirements. Changes in demand or fire flow requirements may affect 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. TMWA plans to reevaluate the maximum day demand equations for all customer usage types within the next 12 months, as part of a Water Facility Plan Update.
  9. 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. Project water resources and storage will be obtained from the Vidler Water Company. Vidler owns the Fish Springs Ranch water rights and the available storage capacity in the TMWA's Terminal Tank. TMWA owns the importation water infrastructure, originating at the Fish Springs Ranch and terminating in Lemmon Valley.

#### **DISCUSSION:**

This project includes the development of 100 single family residential units on a single 34 acre parcel in Lemmon Valley between Military Rd and Buck Dr. The project water service plan includes supply from the 24" high pressure main on the south side of Lemmon Dr, adjacent to the project. Two supply taps off of the 24" main will be required to provide supply redundancy. Two pressure reducing stations will be required that reduce the pressure from around 220 psi to normal service pressures.

#### Project Water maximum Day Demands (MDD)

Project maximum day demands were estimated based on an average lot size of 5,000 ft<sup>2</sup>.

$$\text{MDD} = 0.009 * \sqrt{5,000\text{ft}^2} = 0.6 \text{ gpm}$$

$$0.6 \text{ gpm} * 100 \text{ lots} = 60 \text{ gpm}$$

The actual project demand will be re-evaluated at the time of application for water service.

#### System Capacity

There is adequate water system capacity to accommodate the total estimated build-out project demand.

#### Storage Capacity

The estimated required storage for this project is 46,063 gallons.

---

Fire Flows

Assumed project fire flows are 1,500 gpm for 2 hours. The actual fire flow requirement will be set by the governing fire agency.

Project Service and Improvements

Service to the project will include the following:

- Two connections to the high pressure main in Lemmon Dr.
- Two pressure reducing stations.
- 8" diameter piping routed throughout the project (see the attached figure).

TMWA's Area 10 Facility Charge is applicable, based on the project's maximum day demand. The reduced Area 10 charge of \$3,575 per MDD gpm, reflects supply from Vidler's Fish Springs Ranch resource. Per an agreement between TMWA and the Vidler Water Company (VWC), development served directly from the terminal tank will pay a storage fee to VWC and as a result, will pay a reduced TMWA Area 10 Facility Charge.

Cost Opinion

A planning level cost estimate to provide water service to the project can be found in Table 2. A cost estimate for service connections and associated appurtenances was not conducted.

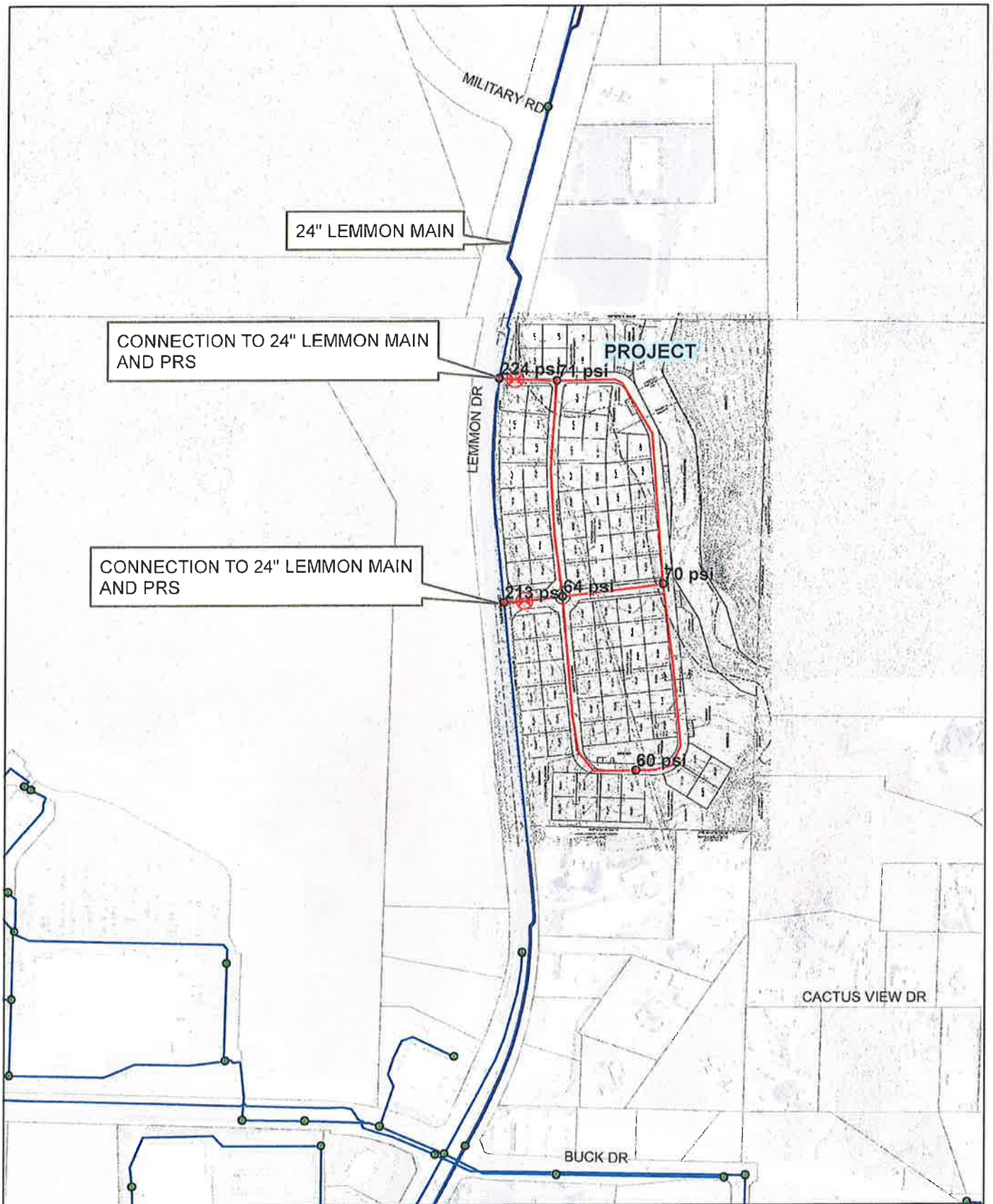
Table 2. Planning level cost estimate of the Project off-site improvements.

Description	Quantity	Unit	Unit Cost	Cost
Area 10 Facility Charge	60.0	MDD, gpm	\$3,575	\$214,500
Connection to the 24" Lemmon Main	2.0	L.S.	\$50,000	\$100,000
Pressure Reducing Station (non-SCADA)	2.0	L.S.	\$100,000	\$200,000
<b>Total</b>				<b>\$514,500</b>

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.

cc: File WO# 16-5019

Attachments: Figure 1: Project Water Service Plan



**WATER SERVICE PLAN  
LEMMON VALLEY DISCOVERY  
16-5019**

DATE	SEPT 2016
MAP BY:	BEL
MODEL:	NV-STD_NAC 2016-02
SCALE:	1 inch = 433 feet



1355 Capital Blvd. • P.O. Box 30013 • Reno, NV 89520-3013  
☎ 775.834.8080 • ☎ 775.834.8003

Date: June 16, 2016

To: Karen Meyer

From: David Nelson *DN*

RE: 16-5019, Lemmon Valley, +/- 123 SFR Lots, (APN 552-210-18)

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:

- This subject parcel (APN 552-210-18) is not within Truckee Meadows Water Authority's (TMWA's) service territory. An annexation is 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 "123 SFR Lots" is estimated to require a domestic demand of **39.36 acre feet (AF)**. Landscaping was not provided to TMWA; therefore, an additional 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. If applicant dedicates surface water for this project additional fees and dedications will apply. TMWA's resources are first come, first serve and are limited in this area.*
- 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.



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

	Demand (Acre Feet)
1 Existing demand (current usage) at Service Property	0.00
2 Office/Living units _____ x .12 (Apartments)	0.00
3 Average Lot Size: <u>123</u> x 0.32 per lot	39.36
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:	<u>TBD</u>
8 New or additional demand at Service Property (lines 2+3+4+5+6)	<b><u>39.36</u></b>
9 <b>Total Demand at Service Property (lines 1+8)</b>	<b>39.36</b>
10 Less: Prior demand commitments at service property	
11 Less: Other resource credits	<u>0.00</u>
12 <b>Total Credits (lines 10+11)</b>	<b><u>0.00</u></b>
13 Subtotal: Required resource dedication/commitment (lines 9-12)	<b>39.36</b>
14 Factor amount (0.11 x Line 13)	TBD
15 Return flow required ( [1-2.5/duty] x Line 13)	<u>TBD</u>
16 <b>TOTAL RESOURCES REQUIRED (lines 13+14+15)</b>	<b><u>39.36</u></b>
17 Price of Water Rights per AF <span style="border: 1px solid black; padding: 2px;">\$7,500</span>	\$ TBD
18 Will Serve Commitment Letter Preparation Fee (\$100 per letter)	\$ 100
19 Due Diligence Fee (\$150.00 per parcel)	\$ 0
20 Demand Calc Sheet Revision due to plan changes (\$100 per revised document)	\$ 0
21 Document Preparation Fees (\$100.00 per document)	\$ 0
22 Meter Contribution (\$1,830 x 39.36 acre feet of demand)	\$ <u>TBD</u>
23 <b>TOTAL FEES DUE (lines 17 through 22)</b>	<b>\$ <u>100</u></b>

**Project:** Lemmon Valley +/- 123 SFR Lots Discovery

**Applicant:** Chuck Bluth **Quote date:** 6/16/2016

**Phone:** CFA: Russ Applegate 856-1150 **Tech contact:** David 834-8021

**APN:** 552-210-18 **Project No:** 16-5019

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

Estimate shows dedication of groundwater. Additional fees and dedications will

apply if surface water is brought into TMWA. Property needs to be annexed.





Traffic Engineering, Transportation Planning, & Forensic Services

March 14, 2018

Charles P. Bluth  
 BLUTH DEVELOPMENT  
 4655 Longley Lane, Suite 107  
 Reno, NV 89502

**Trip Generation Letter for Lemmon Drive Residential Project – Bluth Development**

Dear Mr. Bluth,

This letter provides trip generation estimates for the development of 98 single family residential units on parcel APN 555-210-18 in Reno, NV. The project is located on the east side of Lemmon Drive between Buck Drive and Military Road, just south of the existing church property opposite Military Road.

***Trip Generation Estimates***

Trip generation rates for this analysis were obtained from the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 10<sup>th</sup> Edition*.

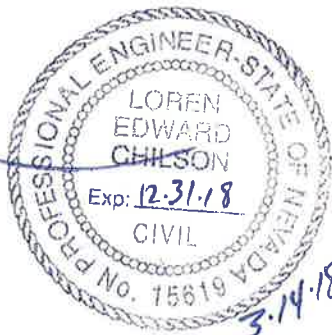
The table below shows the Daily, AM peak hour, and PM peak hour trip generation details for the planned development. The project would be expected to generate approximately 925 Daily Trips, 73 AM peak hour trips, and 97 PM peak hour trips.

Land Use	Size	Units	Rates							Trips						
			Daily	AM	AM In	AM Out	PM	PM In	PM Out	Daily	AM	AM In	AM Out	PM	PM In	PM Out
Single-Family Detached Housing (210)	98	du	9.44	0.74	0.19	0.56	0.99	0.62	0.37	925	73	18	54	97	61	36

Please do not hesitate to contact us with any questions.

Sincerely,  
 TRAFFIC WORKS, LLC

Loren E. Chilson, PE  
 Principal



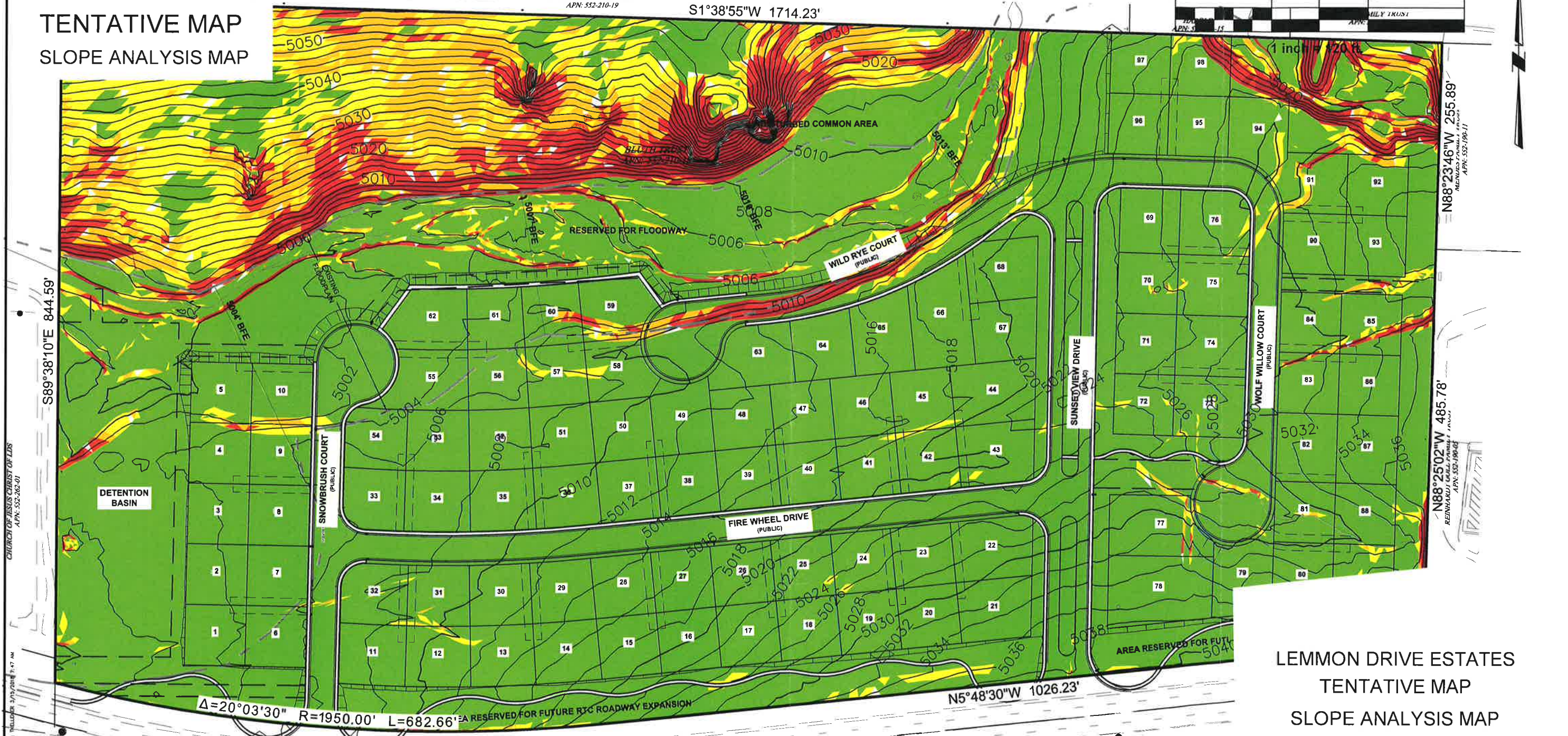
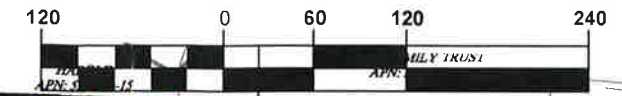
## **APPENDIX D**



# LEMMON DRIVE ESTATES

TENTATIVE MAP  
SLOPE ANALYSIS MAP

GRAPHIC SCALE



X:\Projects\16013.00\Map\LEMMON DRIVE ESTATES\Slope Analysis Map.dwg PLOT DATE: 3/15/2018 10:47 AM  
 CHURCH OF JESUS CHRIST OF LAS VEGAS APN: 552-262-01

Slopes Table

Number	Min. Slope	Max. Slope	Area	% Area	Color
1	0.00%	15.00%	1187696.73	80.3%	Green
2	15.10%	20.00%	109857.44	7.4%	Yellow
3	20.10%	25.00%	82965.84	5.6%	Orange
4	25.10%	30.00%	40641.72	2.7%	Light Red
5	30.10%	100.00%	58571.47	4.0%	Dark Red
Total Area			1479733.2 s.f.		

LEMMON DRIVE ESTATES  
TENTATIVE MAP  
SLOPE ANALYSIS MAP

WASHOE COUNTY, NEVADA  
**CFA, INC.**  
 LAND SURVEYORS  
 CIVIL ENGINEERS  
 LAND USE PLANNERS  
 1150 CORPORATE BOULEVARD • RENO, NEVADA 89502  
 775-856-1150 MAIN • 775-856-1160 FAX • CFARENO.COM

JOB NO: 16013.00 DATE: 03-15-2018



# LEGEND



SIDEWALK PATH  
(TOTAL DISTANCE:  
5918' = 1.1 MILE)



SCALE: NTS



X:\PROJECTS\16013.00\DWG\ENGR\SHEETS\PATH EXHIBIT.DWG <TKELLEHER> 3/15/2018 8:43 AM



1150 CORPORATE BLVD.  
RENO, NV 89502  
(775) 856-1150

## LEMMON DRIVE ESTATES TENATIVE MAP PATH LOOP LEMMON DRIVE WASHOE COUNTY, NV

SHEET  
1  
OF  
1

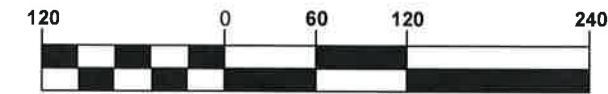


# LEMMON DRIVE ESTATES

## TENTATIVE MAP

### CUT & FILL EXHIBIT

### GRAPHIC SCALE



1 inch = 120 ft.

Elevations Table				
Number	Min. Elevation	Max. Elevation	Area (s.f.)	Color
1	-17	-13	12150.12	Red
2	-13	-9	12401.10	Red
3	-9	-5	28916.25	Yellow
4	-5	-1	215910.43	Yellow
5	-1	3	506411.34	Light Blue
6	3	7	124766.77	Blue
7	7	11	6673.35	Dark Blue

AREA OF STEEP SLOPES  
(UNDISTURBED)

BLUTH TRUST  
APN: 552-210-18

(E) DRAINAGE

HAROLD  
APN: 552-181-15

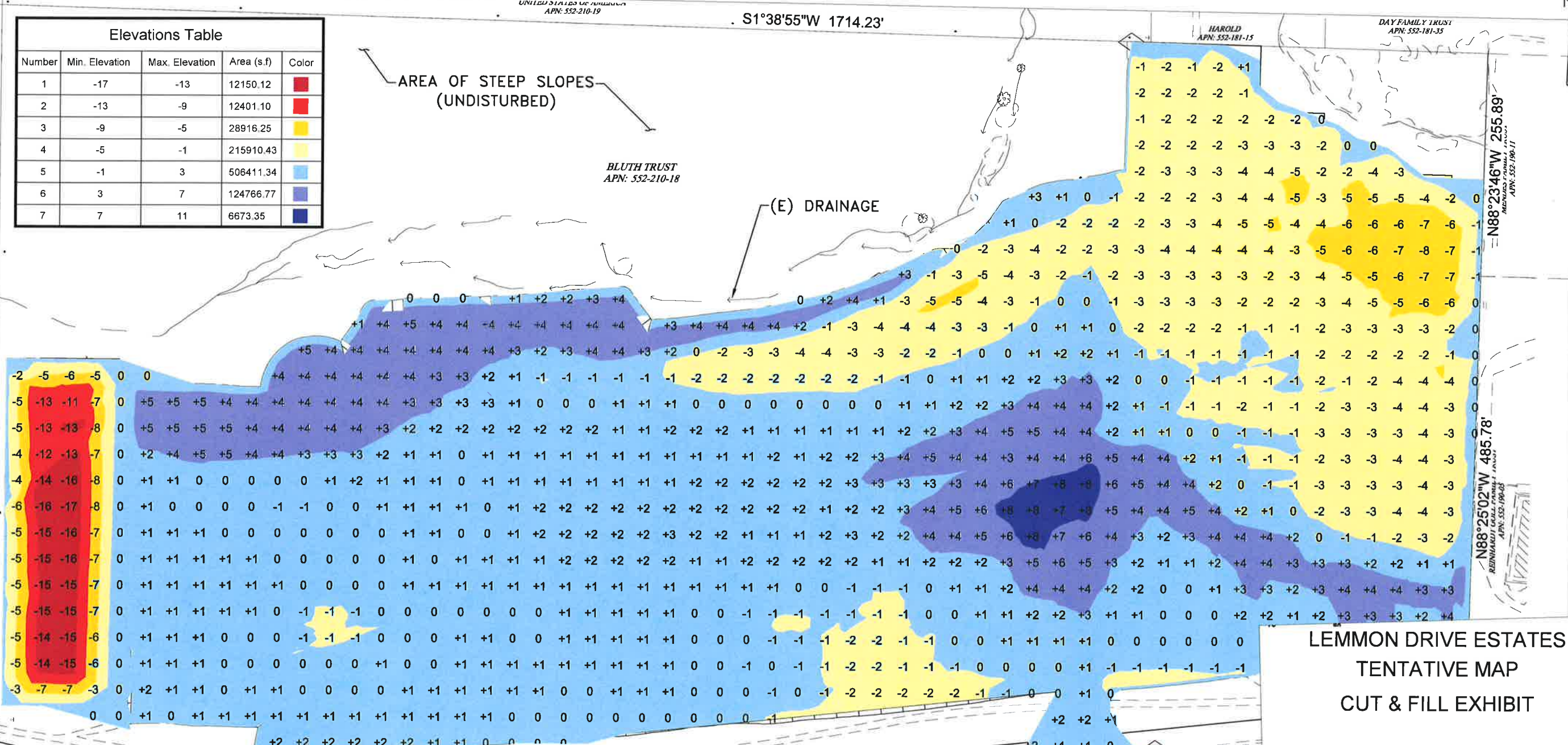
DAY FAMILY TRUST  
APN: 552-181-35

N88°23'46"W 255.89'  
REINHARDT GALLERIE TRUST  
APN: 552-190-11

N88°25'02"W 485.78'  
REINHARDT GALLERIE TRUST  
APN: 552-190-05

S89°38'10"E 844.59'

CHURCH OF JESUS CHRIST OF LDS  
 APN: 552-262-01  
 3/15/2018 10:14 AM



$\Delta=20^{\circ}03'30''$  P<sup>0</sup> L=682.66'

LEMMON DRIVE  
(PUBLIC)

N5°48'30"W

LEMMON DRIVE ESTATES  
TENTATIVE MAP  
CUT & FILL EXHIBIT

WASHOE COUNTY NEVADA

**cfa** INC.  
 LAND SURVEYORS  
 CIVIL ENGINEERS  
 LAND USE PLANNERS  
 1150 CORPORATE BOULEVARD • RENO, NEVADA 89502  
 775-856-1150 MAIN • 775-856-1160 FAX • CFARENO.COM

JOB NO: 16013.00 DATE: 03-15-2018





THE PRESERVE - PLAN 1A - 1,643 SF





THE PRESERVE - PLAN 2B - 1,683 SF





THE PRESERVE - PLAN 3B - 1,709 SF





THE PRESERVE - PLAN 4B - 1,900 SF





THE PRESERVE - PLAN 4A - 1,900 SF





**THE PRESERVE - PLAN 3A - 1,709 SF**





THE PRESERVE - PLAN 2A - 1,683 SF





**THE PRESERVE - PLAN 1B - 1,643 SF**

# **APPENDIX E**



STATE OF NEVADA  
**WASHOE COUNTY**  
**ASSESSOR'S OFFICE**  
Joshua G. Wilson, Assessor  
1001 East Ninth Street  
Building D  
Reno, Nevada, 89512  
(775) 328-2231



Scale: 0 200 400 600 800 Feet  
1 inch = 800 feet



created by CFB 09/08/2010  
last updated KSB 9/10/12 EMG 9/2/14

area previously shown on map(s)  
552-19

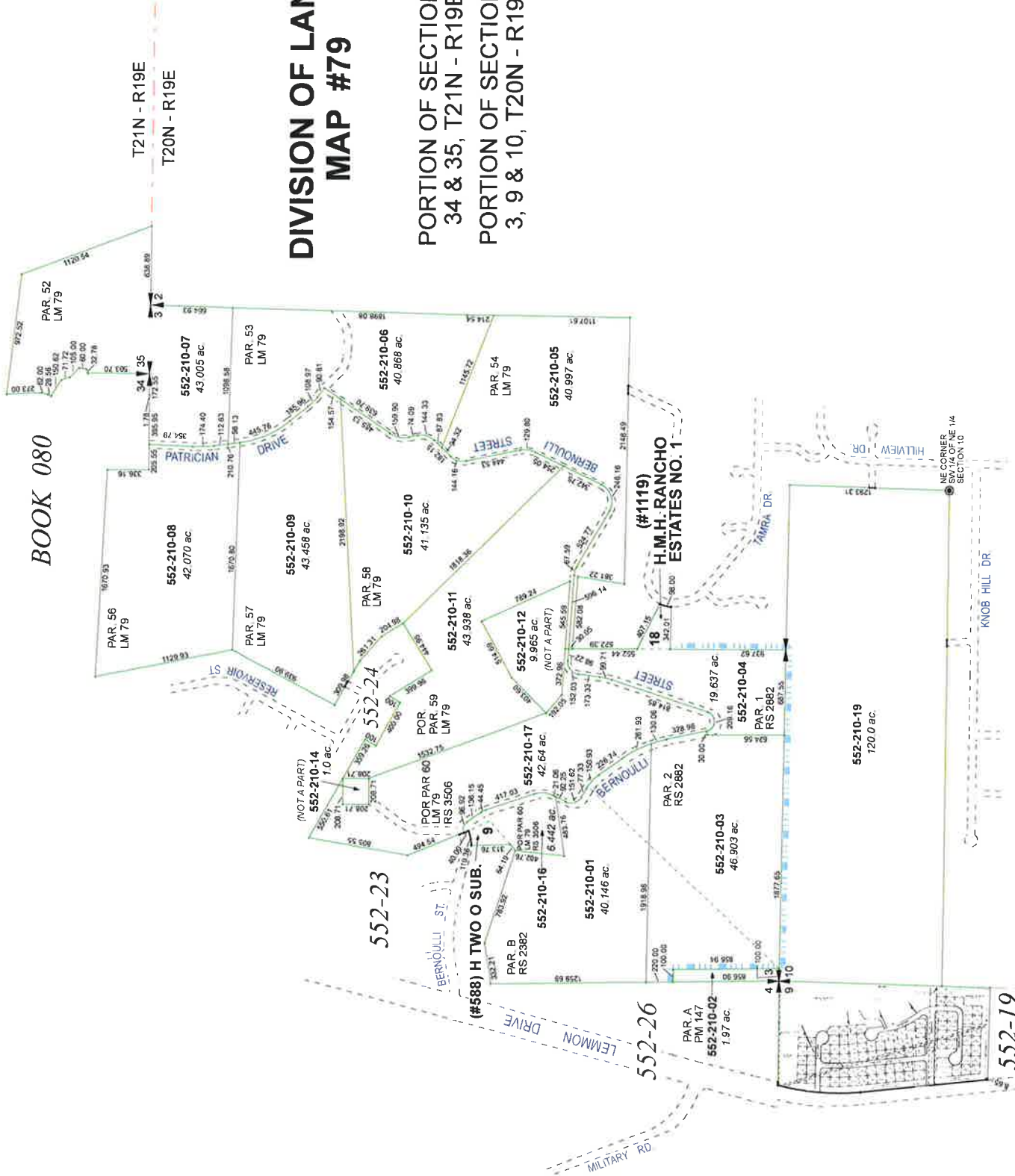
NOTE: This map was prepared for the use of the Assessor. The Assessor is not a professional surveyor. This map is for illustrative purposes only. It does not represent a survey of the premises. No liability is assumed as to the sufficiency or accuracy of the data obtained hereon.

**BOOK 080**

T21N - R19E  
T20N - R19E

**DIVISION OF LAND  
MAP #79**

**PORTION OF SECTIONS  
34 & 35, T21N - R19E  
PORTION OF SECTIONS  
3, 9 & 10, T20N - R19E**



**552-23**

**552-26**

**552-19**

**(#1119)  
H.M.H. RANCHO  
ESTATES NO. 1**

**(#588) H TWO O SUB.**

DOC #4670463

01/13/2017 11:02:30 AM  
Electronic Recording Requested By  
FIRST CENTENNIAL - RENO (MAIN OF  
Washoe County Recorder  
Lawrence R. Burtness  
Fee: \$18.00 RPTT: \$0  
Page 1 of 2

APN: 086-380-15 086-380-13  
552-210-18  
Escrow No. 00205870 - 001 - 06  
RPTT 0.00  
When Recorded Return to:  
**The Lakes at Lemmon Valley, LLC**  
**9550 Gateway Dr.**  
**Reno, NV 89521**  
Mail Tax Statements to:  
Grantee same as above

SPACE ABOVE FOR RECORDERS USE

**Grant, Bargain, Sale Deed**

THIS INDENTURE WITNESSETH: That  
Charles P. Bluth and Cynthia C. Bluth, trustees of The Bluth Trust UTD 4/19/93

In consideration of \$10.00, the receipt of which is hereby acknowledged, do(es) hereby  
Grant, Bargain, Sell and Convey to  
The Lakes at Lemmon Valley, LLC a Nevada Limited Liability Company

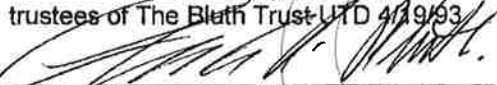
all that real property situate in the City of Reno, County of Washoe, State of Nevada,  
described as follows:

See Exhibit A attached hereto and made a part hereof.

Together with all and singular the tenements, hereditaments and appurtenances thereunto  
belonging or in anywise appertaining.

Witness my/our hand(s) this 30 day of January, 2017


Charles P. Bluth and Cynthia C. Bluth,  
trustees of The Bluth Trust UTD 4/19/93

  
Charles P. Bluth, trustee

  
Cynthia C. Bluth, trustee

STATE OF NEVADA  
COUNTY OF WASHOE

This instrument was acknowledged before me on January 3, 2017  
By Charles P. Bluth and Cynthia C. Bluth

  
NOTARY PUBLIC



SPACE BELOW FOR RECORDER

Exhibit A

PARCEL 1:

Parcel A of Parcel Map No. 4703, according to the map thereof, filed in the office of the County Recorder of Washoe County, State of Nevada, on January 10, 2007 as File No. 3485112, Official Records.

APN: 086-380-13

PARCEL 2:

Parcel A of Parcel Map No. 4704, for CAMINO VIEJO INVESTMENTS, according to the map thereof, filed in the office of the County Recorder of Washoe County, State of Nevada, on January 10, 2007, as File No. 3485113, Official Records.

APN: 086-380-15

PARCEL 3:

That portion of the Northeast Quarter (NE ¼) of Section 9, Township 20 North, Range 19 East, Mount Diablo Base and Meridian, lying East of the Easterly line of Lemmon Drive, as said Lemmon Drive currently exists.

EXCEPTING THEREFROM that portion thereof lying South of the most Northerly line of the land described in the deed to Silver State Kennel General Partnership, recorded March 23, 1999 as Document No. 2320002 of Official Records.

ALSO EXCEPTING THEREFROM that portion thereof lying South of the most Northerly line of the land described in the deed to Alan L. Mendes and Lilian A. Mendes recorded February 16, 1989 as Document No. 1305374 of Official Records.

APN: 552-210-18

SPACE BELOW FOR RECORDER

---

Bill Detail

[Back to Account Detail](#)    [Change of Address](#)    [Print this Page](#)

**Washoe County Parcel Information**

Parcel ID 55221018	Status Active	Last Update 3/13/2018 2:06:47 AM
<b>Current Owner:</b> LAKES AT LEMMON VALLEY LLC 4655 LONGLEY LN STE 107 RENO, NV 89502		<b>SITUS:</b> 0 LEMMON DR WCTY NV
<b>Taxing District</b>	<b>Geo CD:</b>	
Legal Description Section 9 Township 20 Range 19 SubdivisionName _UNSPECIFIED		

**Installments**

Period	Due Date	Tax Year	Tax	Penalty/Fee	Interest	Total Due
INST 1	8/21/2017	2017	\$0.00	\$0.00	\$0.00	\$0.00
INST 2	10/2/2017	2017	\$0.00	\$0.00	\$0.00	\$0.00
INST 3	1/1/2018	2017	\$0.00	\$0.00	\$0.00	\$0.00
INST 4	3/5/2018	2017	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Due:</b>			<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>

**Tax Detail**

	Gross Tax	Credit	Net Tax
State of Nevada	\$343.61	(\$258.60)	\$85.01
Truckee Meadows Fire Dist	\$1,091.46	(\$855.80)	\$235.66
Washoe County	\$2,812.93	(\$2,117.05)	\$695.88
Washoe County Sc	\$2,301.16	(\$1,731.87)	\$569.29
<b>Total Tax</b>	<b>\$6,549.16</b>	<b>(\$4,963.32)</b>	<b>\$1,585.84</b>

**Payment History**

Tax Year	Bill Number	Receipt Number	Amount Paid	Last Paid
2017	2017175096	B17.115237	\$396.46	9/29/2017
2017	2017175096	B17.167131	\$396.46	12/22/2017
2017	2017175096	B17.230091	\$396.46	3/2/2018
2017	2017175096	B17.61449	\$396.46	8/21/2017

**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 be mailed to:  
Washoe County  
Treasurer  
P O Box 30039  
Reno, NV 89520-3039

**LEMMON DRIVE ESTATES  
TENTATIVE MAP  
& COMMON OPEN SPACE DEVELOPMENT**

**(SPECIAL PACKET)**

PREPARED FOR

PREPARED BY:  
**CFA, INC.**  
1150 CORPORATE BOULEVARD  
RENO, NV 89502  
(775) 856-1150



**MARCH 15, 2018**

**PROJECT: 16-013.00**

**Table of Contents**

**(Special Package)**

**Appendices**

Preliminary Geotechnical Investigation (Axion Geotechnical) ..... A  
Preliminary Hydrology Report (CFA)..... B  
Flood Plain Analysis (Schaaf & Wheeler) ..... C

**Map Pocket**

- Preliminary Grading Plan
- Preliminary Landscape Plan



# **APPENDIX A**



# **PRELIMINARY GEOTECHNICAL INVESTIGATION**

**PROPOSED**

**LEMMON DRIVE ESTATES**

**Washoe County Assessor's Office Parcel Number 555-210-18**

**Lemmon Valley Area**

**RENO, NEVADA**

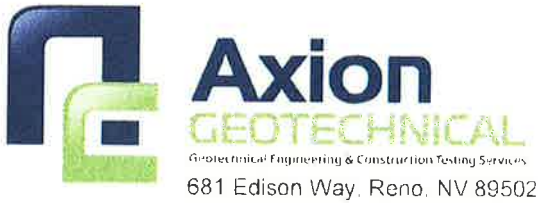
Prepared for:

Bluth Development, LLC  
9550 Gateway Drive  
Reno, Nevada 89521

Attention: Charles Bluth, President

March 13, 2018

Project No. 18.169.02-G



March 13, 2018  
Project No. 18.169.02-G

Bluth Development, LLC  
9550 Gateway Drive  
Reno, Nevada 89521

Attn: Charles Bluth, President

Re: Preliminary Geotechnical Investigation, Proposed Lemmon Drive Estates,  
Washoe County Assessor's Office Parcel Number 555-210-18,  
Lemmon Valley Area, Reno, Nevada.

Dear Bluth:

Axion Geotechnical is pleased to present results of a preliminary geotechnical investigation our firm conducted for the project. Based on results of our investigation, experience in the area, and understanding of project development, we conclude that the site is suitable for its intended use. The primary geotechnical concerns are the potential presence of **expansive soil** and **bedrock**, and the presence of **drainages**, **flood zone** and **utility easements**.

We appreciate being selected to perform this preliminary investigation and trust results fulfill your needs at this time. If you or your design consultants have questions, please contact us at (775) 771-2388 or at [chris@axionengineering.net](mailto:chris@axionengineering.net).

Respectfully,

AXION GEOTECHNICAL, LLC

*Chris D. Betts*

Chris D. Betts, P.E.  
President



# C O N T E N T S

---

I INTRODUCTION.....	1
II SITE, SOIL AND WATER CONDITIONS .....	2
III GEOLOGIC AND SEISMIC CONSIDERATIONS.....	6
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B. Faulting and Seismicity .....	6
C. Liquefaction .....	7
D. Slope Stability .....	7
E. Radon .....	7
F. Flooding.....	7
IV OPINIONS AND DISCUSSIONS.....	7
V REFERENCES .....	11
VI DISTRIBUTION.....	12

## I INTRODUCTION

Axion Geotechnical is pleased to present results of a preliminary geotechnical investigation our firm conducted for the proposed Lemmon Drive Estates. The 33.97-acre parcel is on the south side of Lemmon Drive, west of its intersection with Military Road and is Washoe County Assessor's Office parcel number 555-210-18 (Property). Proposed development includes construction of isolated pads for single-family residences serviced by community water and sewer system and on-site storm water retention. The structures will have one to two levels, will be wood-framed, and will be supported with shallow conventional spread foundations. Dedicated services 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 1.5 kips per foot (dead plus live plus snow load), and that maximum column loads will be less than 5 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 Building Code*.

We have not received civil design plans; however, we anticipate earthwork to attain proposed grades and for proper site drainage will include cuts and fill on the order of five feet. New slopes will be 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 preliminary geotechnical investigation was to perform a site reconnaissance and review available literature and maps to provide opinions and discussions concerning the geotechnical suitability of the Property for its intended use. Once design parameters, such as building locations, finish floor elevations, foundation loads and proposed grading are known; a design-level geotechnical investigation report with detailed information of the subsurface soil conditions and recommendations for design and construction must be performed.

This report is preliminary and geotechnical in nature and not intended to identify other potential site constraints such as environmental hazards, wetlands determinations or the potential presence of buried utilities. Opinions and discussions included in this report are specific to development at the Property and are not intended for off-site development.

## II SITE, SOIL AND WATER CONDITIONS

The Property is undeveloped, vacant, and bordered by undeveloped land to the east, Lemmon Drive to the west, a church to the north and dog kennels to the south. The surface grades gently downward from the south to the north, and moderately to steeply downward from the east to the west. The Property is covered by medium dense to dense sagebrush and weeds. Trees are present along the eastern drainage. Rock outcrops are present along the steep hillside to the east. Boulders are present in the central portion of the site. Two drainages cross the Property from south to north. Overhead utilities cross along the eastern portion of the Property, and underground utilities (sanitary sewer) crosses the central and eastern portions of the Property. Dirt roads are present.



View of Property from SW corner

Based on the United States Geological Survey 7.5-Minute topographic map of the Reno Quadrangle, the Property is in the NE  $\frac{1}{4}$  of Section 9, Township 19 North, Range 19 East and elevation ranges from about 5,040 to 5,060 feet relative to mean sea level.

Based on mapping by H. F. Bonham, Jr. and E. C. Bingler (*Reno Folio, Geologic Map*), the materials underlying the Property are predominantly Quaternary-age alluvial fan deposits of Peavine Mountain (Qpf), with Mesozoic-age granodiorite (Mzgd) along the eastern hillside. These units are described as follows:



Peavine Mountain (Qpf): Poorly sorted, pale yellowish to reddish brown, montmorillonitic, gravelly, to sandy and clayey silt, with white silicified andesite fragments common. In the Black Springs area, the unit contains pale orange brown clayey and gravelly sand.

Granodiorite (Mzgd): Gray hornblende-biotite granodiorite. Deuteric alteration has commonly formed actinolite and chlorite from hornblende and biotite; epidote calcite, and sericite partially replace plagioclase. It is not normally deeply weathered and usually forms numerous outcrops.

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 the following units:

Haybourne loamy sand, 2 to 4 percent slopes (# 140): This unit is along the larger drainage to the east. This very deep, well-drained soil on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,900 feet. Typically, the surface layer is pale brown loamy sand about 10 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum to a depth of 63 inches or more is brown, stratified fine sandy loam through coarse sand. Permeability is moderately rapid in the subsoil and moderately rapid to rapid in the substratum. Effective rooting depth is 60 inches or more. Runoff is slow, the hazard of water erosion is slight. The hazard for soil blowing is moderate. The soil is subject to flash flooding during storms of unusually high intensity and channeling. Deposition are common along streambanks. Limitations for shallow excavations are severe due to cutbanks caving. Limitations for dwellings with or without basements, small commercial buildings are severe due to flooding. Limitations for local roads and streets are severe due to flooding. Limitations for septic tank absorption fields are severe due to poor filter. The shrink-swell potential is low. The frequency of flooding is rare. Depth to high water table is greater than 6.0 feet. Depth to bedrock is greater than 60 inches. The potential frost action is moderate. The risk of corrosion to uncoated steel is moderate, and to concrete it is low. Limitations associated with the use of this unit for urban development, as defined by the soil survey, are flooding, rapid permeability and the susceptibility to frost heaving.

Northmore sandy loam, 2 to 4 percent slopes (# 201). This unit is along the central portion of the Property. This very deep, well-drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,500 to 5,500 feet. Typically, the surface layer is grayish brown sandy loam about 15 inches thick. The subsoil is brown sandy clay about 30 inches thick. The substratum to a depth of 60 inches or more is pale brown sandy loam. Permeability is slow. Effective rooting depth is 60 inches or more. runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Limitations for shallow excavations are slight. Limitations for dwellings with or without basements are severe due to shrink-swell. Limitations for roadways are severe due to low strength and shrink-swell.

Limitations for septic tank absorption fields are severe due to slow percolation rates. The shrink-swell potential is low to high. The frequency of flooding is none. Depth to high water table is greater than 6.0 feet. Depth to bedrock is greater than 60 inches. The potential frost action is low. The risk of corrosion to steel and concrete is moderate. The main limitations associated with the use of this unit for urban development, as described by the soil survey, are the high clay content, slow permeable subsoil, and low bearing strength.

Northmore sandy loam, 4 to 8 percent slopes (# 202). This unit is along the central and western portions of the Property. This very deep, well-drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. 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 about 35 inches thick. The substratum to a depth of 60 inches or more is a pale brown sandy loam. Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Limitations for shallow excavations are slight. Limitations for dwellings with or without basements and small commercial buildings are severe due to shrink-swell. Limitations for roadways are severe due to low strength and shrink-swell. Limitations for septic tank absorption fields are severe due to slow percolation rates. The shrink-swell potential is low to high. The frequency of flooding is none. Depth to high water table is greater than 6.0 feet. Depth to bedrock is greater than 60 inches. The potential frost action is low. The risk of corrosion to steel and concrete is moderate. The main limitations associated with the use of this unit for urban development, as described by the soil survey, are the high clay content, slow permeability, and low bearing strength.

Northmore sandy loam, 8 to 15 percent slopes (# 203). This unit is at the SE corner of the Property. This very deep, well-drained soil is on side slopes of alluvial fans. It formed in alluvium derived from mixed rock sources. 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 about 35 inches thick. The substratum to a depth of 60 inches or more is a pale brown sandy loam. Permeability is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Limitations for shallow excavations are moderate. Limitations for dwellings with or without basements are severe due to shrink-swell. Limitations for small commercial buildings are severe due to shrink-swell and slopes. Limitations for roadways are severe due to low strength and shrink-swell. Limitations for septic tank absorption fields are severe due to slow percolation rates. The shrink-swell potential is low to high. The frequency of flooding is none. Depth to high water table is greater than 6.0 feet. Depth to bedrock is greater than 60 inches. The potential frost action is low. The risk of corrosion to steel and concrete is moderate. The main limitations associated with the use of this unit for urban development, as described by the soil survey, are the high clay content, slow permeability, and low bearing strength.

Acrelane-Rock outcrop complex, 15 to 50 percent slopes (# 260): This unit is along the far eastern portions of the Property. This map unit is on uplands. Elevation is 4,500 to 6,000 feet. This unit is 65 percent Acrelane very stony sandy loam, 15 to 50 percent slopes, and 25 percent Rock outcrop. The Acrelane soil is on rolling uplands, and the Rock outcrop is on ridgetops and crests. Areas of the components of the unit are so intricately intermingled that it is not practical to map them separately at the scale used. Included in this unit are Verdico Variant soils on slightly concave slopes and in shallow depressions, Graufels soils at higher elevations near Rock outcrop, and Surgem soils on lower colluvial slopes. This unit is about 3 percent Verdico Variant soils, 4 percent Graufels soils, and 3 percent Surgem soils. Descriptions of the two main materials are as follows:

Acrelane soil: This soil is shallow and well-drained. It formed in residuum derived dominantly from granodiorite. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 6 inches thick. The subsoil is brown very gravelly sandy clay loam about 4 inches thick. Weathered granodiorite is at a depth of 10 inches. Depth to weathered bedrock ranges from 10 to 20 inches. Permeability is moderate. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight. Limitations for shallow excavations are severe due to depth to rock. Limitations for dwellings with or without basements and for small commercial buildings are severe due to depth to rock and slope. Limitations for local roads and streets are severe due to slope. Limitations for septic tank absorption fields are severe due to depth to rock and slope. Shrink-swell potential is low to moderate. Frequency of flooding is none. Depth to high water table is greater than 6.0 feet. Depth to bedrock is 10 to 20 inches. Hardness of bedrock is soft. Potential frost action is moderate. Risk of corrosion to uncoated steel and concrete is moderate.

Rock outcrop: This material consists of exposed areas of granodioritic rock.

The main limitations associated with the use of this complex for urban development, as defined by the soil survey, are steepness of the slopes, and the shallowness of soil over bedrock.

Acrelane very stony sandy loam, 8 to 15 percent slopes (# 262): This unit is along the far SE portion of the Property. This shallow, well-drained soil is on uplands. It formed in residuum derived dominantly granodiorite. Elevation is 4,500 to 6,000 feet. Typically, 3 to 10 percent of the surface is covered with stones. The surface layer is brown very stony sandy loam about 4 inches thick. The subsoil is brown very gravelly sandy clay loam about 6 inches thick. Weathered granodiorite is at a depth of 10 inches. Depth to weathered bedrock ranges from 10 to 20 inches. Permeability is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Limitations for shallow excavations are severe due to depth to

rock. Limitations for dwellings with or without basements and for small commercial buildings are severe due to depth to rock and slope. Limitations for roadways are moderate due to depth to rock, slope and frost action. Limitations for septic tank absorption fields are severe due to depth to rock. The shrink-swell potential is low to moderate. The frequency of flooding is none. Depth to high water table is greater than 6.0 feet. Depth to bedrock is 10 to 20 inches. The hardness of bedrock is soft. The potential frost action is moderate. The risk of corrosion to steel and concrete is moderate. The main limitations associated with the use of this unit for urban development, as described by the soil survey, are the steepness of slope, depth to bedrock and stones, shallowness of the soil over bedrock, and susceptibility of the soil to frost heaving.

According to the *Reno Folio Hydrologic Map* (Cooley, Span and Scheibach) the top of water table is estimated to be between 20 and 60 feet.

### **III GEOLOGIC AND SEISMIC CONSIDERATIONS**

To evaluate geological hazards at the site, our investigation included a site reconnaissance 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*) 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 1.9 mile southwest 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 fault is the north Reno fault zone. The Nevada Seismological Laboratory indicates earthquakes of magnitude 6.6 is possible along this fault zone (*Reno/Carson Fault Information*, updated January 31, 2003).



### 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 referenced Earthquake Hazards Map the subject property is in an area potentially underlain by moderately stable, semi-lithified alluvial fan deposits which may be subject to minor slumping and rock falls on vertical or near vertical cuts or natural embankments. Based on our understanding proposed slopes will be constructed at maximum inclinations of two horizontal to one vertical (2:1) or flatter, we do not believe the site is susceptible to slumps or ground disturbances.

### 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 32031C3026G. The map indicates much of the Property is in flood zone X; however, along the eastern drainage system it is in flood zone AE. According to FEMA, zone X are areas of minimal flood hazard, while zone AE are special flood hazard areas.

## IV OPINION AND DISCUSSION

Based on results of our preliminary investigation, experience in the area, and understanding of the proposed project, we conclude that the site is suitable for its intended use. The primary geotechnical concerns are the potential presence of **expansive soil** and **bedrock**, and the presence of **drainages**, **flood zone** and **utility easements**.

Expansive soils are subject to substantial volume changes (shrink and swell) with changes in moisture content. Changes in moisture content can occur because 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. To reduce potential for movement the expansive soil must be removed (over-excavated) a sufficient depth and replaced with approved compacted granular fill, thereby reducing the thickness of the expansive layer, providing surcharge, and maintaining moisture at a near constant level.

Alternatively, to mitigate potential movement, structures can be supported with pier and grade beams which penetrates the expansive soil and attain support by end-bearing on the lower firm native soils or by surface adhesion with the pier edges and native soil. Structural support may also be attained using post-tensioned slab-on-ground foundations, which mitigates movement by the rigid nature of the system.

Clay or fine-grain soils 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 must be removed and replaced with approved compacted granular fill subbase.

As clayey soil will also inhibit achieving uniform moisture content and impede compaction efforts, consideration should be given to time constraints associated with scarification, moisture conditioning, drying and compacting clayey soils. During periods of inclement weather, water may also become perched above the clayey soil, resulting in a saturated condition for prolonged periods and creating additional limitations on equipment mobility. Consideration should be given to the necessity for maintaining moisture content to prevent wind erosion and for controlling dust during earthwork operations.

Shallow bedrock is present across the Property. Consideration should be given to the difficulty of grading and trenching associated with bedrock. Although we do not believe that blasting will be necessary, as is inherent with bedrock, localized areas of resistant material may be encountered which will require the use of special equipment such as a hydraulic rock hammer.

In addition to potential difficulty of earthwork operations, consideration should be given to the fact that oversize aggregate such as gravel, cobbles and boulders, will be generated during earthwork operations. Consideration should be given to the subsequent reduction of the quantity of material available for use as fill, and that oversize aggregate could require off-hauling or that import material could be required to balance earthwork quantities to attain proposed grades. If oversize aggregate is proposed for use as fill, screening will be required, and sufficiently large equipment will be necessary to properly place and compact rock fills. Compaction approval during the placement of rock fills can only be achieved based on visual performance specifications established by the Geotechnical Engineer, which would increase on-site technician time and thus, in turn, increase the cost of inspection services. The removal of large cobbles or boulders will result in undercutting of excavation sidewalls and the resulting trench widths would be increased. The presence of

resistant bedrock could protrude into foundation areas, thereby requiring the drilling and epoxy of reinforcing steel. Footings may need to be formed and stepped.

Two natural drainages cross portions of the Property. Consideration should be given to potential seepage associated with these drainages and ditch and added construction costs associated with their abandonment, containment or realignment. Consideration should be given to the complete removal of organic material associated with these ditches and that proper benching and fill are provided prior to the construction of site improvements or the placement of new fill material. Consideration should also be given to the possibility that construction set-backs may be required.

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.

Overhead and underground utility easements cross the Property. Consideration should be given to the possibility that, prior to development, these utilities require relocation or abandonment in proposed structural areas. Consideration should also be given to the possibility that construction set-backs are required, and the subsequent potential reduction of property available for development.

The presence of steep drainages can lead to differential settlement as transition areas will occur where building pads are supported on a combination of in-situ soil and compacted fill material. To mitigate potential differential settlement in transition zones, native soils should be removed a sufficient depth to provide for a minimum section of compacted fill material below foundations, or foundations should be deepened to bottom uniformly on in-situ soil. The presence of slopes will require that construction off-sets be established.

The soil survey suggests that the slow percolation rates, frost action low load-bearing and corrosion to steel and concrete can be an additional constraint associated with the use of the underlying soils for urban development. Based on our understanding that project development will be serviced by community water, sewer and storm drain systems, we do not believe that slow permeability rates will impact the site. Consideration, however, should be given to performing infiltration tests if retention/detention basins are proposed. Based on our anticipation that structural fill will be provided below footing and roadways, we do not believe frost action or low load-bearing strength will impact site development. Based on our experience in the area, we believe adequate mitigation can be attained by using properly prepared and placed Type II portland cement concrete, by maintaining a minimum three-inch concrete cover where reinforcing steel or other metal is in proximity to native soils and, at the direction of the Manufacturer, by using special coating on reinforcing steel and metal. Consideration should also be given to chemical constituents which may inhibit establishment of landscaping, such as lawns, plants and other vegetation growth, not

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Proposed Lemmon Drive Estates  
Lemmon Valley Area - Reno, Nevada  
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**681 Edison Way**  
**Reno, Nevada 89502**  
**(775) 771-2388**

indigenous to the area. Laboratory testing to determine the agronomic characteristics of the native soils was not part of the scope of our work; however, it should be considered.

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.



## V REFERENCES

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**Axion Geotechnical, LLC**  
**681 Edison Way**  
**Reno, Nevada 89502**  
**(775) 771-2388**

## **VI DISTRIBUTION**

One wet-stamped .pdf to:

Bluth Development, LLC  
9550 Gateway Drive  
Reno, Nevada 89521  
Attn: Charles Bluth, President  
Telephone: (775) 749-1057

One unbound wet-stamped copy and one .pdf to:

CFA, Inc.  
1150 Corporate Boulevard  
Reno, Nevada 89502  
Attn: David Snelgrove, Planning and Right-of -Way Manager  
Telephone: (775) 856-1150  
Facsimile: (775) 856-1160

# **APPENDIX B**

**PRELIMINARY  
HYDROLOGY REPORT**

**LEMMON DRIVE ESTATES  
TENTATIVE MAP  
RENO, NV**





**PRELIMINARY  
HYDROLOGY REPORT**

**LEMMON DRIVE ESTATES  
TENTATIVE MAP  
RENO, NV**

PREPARED BY:  
CFA, Inc.  
1150 CORPORATE BOULEVARD  
RENO, NV 89502  
(775) 856-1150

**MARCH 2018**



## INTRODUCTION

This report presents the storm water drainage and management plan to support the tentative map for the Lemmon Drive Estates. This project is a proposed 98-lot subdivision located on approximately 32.76 acres of undeveloped range land in Section 4, Township 20 North, Range 19 East, M.D.M. in the Lemmon Valley area of Reno, Nevada (APN: 552-210-18).

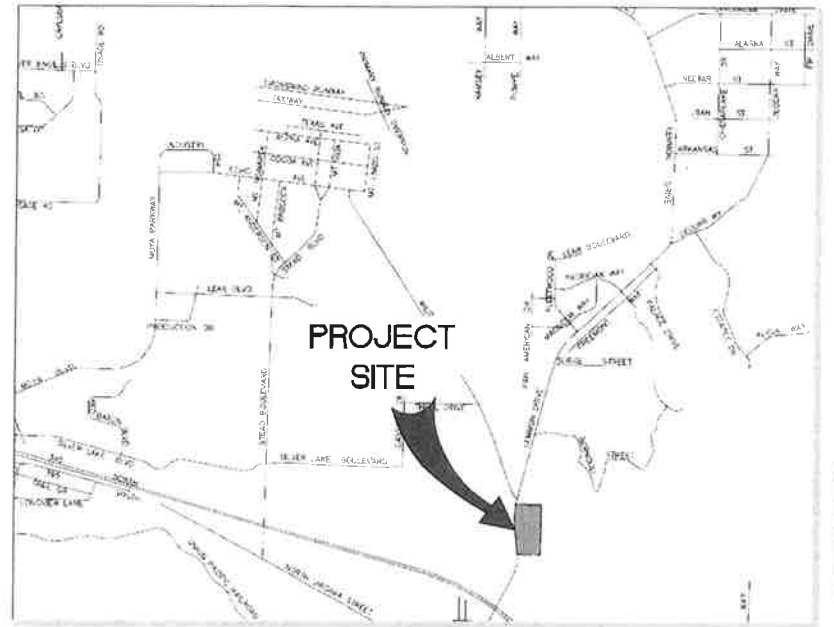
The purpose of this study is to compare the existing generated 5-year and 100-year flows to the proposed site development to mitigate any increase in flows for the 5-year and 100-year storms per Washoe County requirements.

An additional study of the onsite floodplain has been conducted by Schaff & Wheeler in their report *Floodplain Analysis for Lemmon Valley Drive Development Memorandum*, (March 2018) and is referenced in this report and included as appendix F.

## EXISTING SITE DESCRIPTION

The project is bordered on the north by baseball fields and a church, to the west by Lemmon Drive, on the south by two private homes, and on the east by undeveloped range land and another private home. This site and all the surrounding parcels are a part of Washoe County. An overall Vicinity Map follows in this report that depicts the area of the proposed project, and a site plan is located on Sheet 1 of the associated drawings.

The existing site is undeveloped with established native weeds sporadic throughout the area. The natural grade slopes from the south to north with a total change in elevation of 37 feet. The grades mostly vary across the site, with an average grade change of approximately 2.2 percent. The Golden Valley Wash exists on site and transfers storm flows from the south to the north on the east side of the proposed project. This wash connects to the Southwest Lemmon Valley Channel A in Lemmon Drive north of the project site.



VICINITY MAP

SCALE N18

## PROJECT DESCRIPTION

The Lemmon Drive Estates project is a proposed 98-lot subdivision, with each lot being approximately 0.17 acres. The site will have two entrances, located on Lemmon Drive. A portion of the site will be filled to remove lots from the floodplain. The existing on-site drainage will travel to concrete curb and gutters to capture sheet flows and transfer them to a proposed on-site storm drain infrastructure system. Flows from the storm drain infrastructure system will be carried into a detention basin located on the north end of the site to detain and control storm water flows. The basin will be constructed with an outlet pipe and outlet weir structure to meter the flow out of the basin to pre-development conditions. The pipe will outlet into the Golden Valley Wash that currently exits the site and flows north to the Southwest Lemmon Valley Channel A (and eventually Swan Lake Playa).

## FLOOD ZONE

According to FIRM Index Map #32031C2838G, dated March 16th, 2009, the site is located within two (2) flood zone areas:

- Zone X, Unshaded; flood zone areas determined to be outside the 0.2% annual chance floodplain
- Zone AE, Shaded, special flood hazard areas subject to inundation by the 1% annual chance flood, with base flood elevations determined

A copy of the FIRM Index Map is in Appendix A.

Portions of the development will be removed from the floodplain by filling the site to elevate structures above the effective base flood elevation (BFE). Reference *Floodplain Analysis for Lemmon Valley Drive Development Memorandum* (Schaaf & Wheeler 2018).

## EXISTING DRAINAGE

Off-site Drainage:

Off-site drainage enters the site at the southeast corner of the site and traverses the site through the Golden Valley Wash. This exits at the north end of the site and discharges eventually into the Southwest Lemmon Valley Channel A. This off-site drainage was analyzed by Schaaf & Wheeler, and the results are summarized in the *Floodplain Analysis for Lemmon Valley Drive Development Memorandum* (Schaaf & Wheeler 2018).

On-site Drainage:

Existing on-site drainage patterns generally flow south to north. The flows are caught in the existing wash on the east that is channeled away from the site (Ref. Existing Drainage Plan, Appendix D). Under the existing undeveloped range conditions, the site is calculated to generate 3.54 cfs and 21.20 cfs of runoff for the 5-year and 100-year storms, respectively (Ref. Rational Method Calculations, Drainage Channel Calculations, Appendix B, Table 1).

## PROPOSED DRAINAGE

Off-site Drainage:

The proposed off-site drainage network will remain unchanged from the existing off-site drainage network. The effects of filling the site to remove development from the flood plain on the effective BFE were



analyzed by Schaaf & Wheeler and summarized in the *Floodplain Analysis for Lemmon Valley Drive Development Memorandum* (Schaaf & Wheeler 2018).

#### On-site Drainage:

The site will develop new streets that will have their own drainage network with curb and gutter. Runoff from the lots will flow to the streets where it will be collected into the storm drainage network. The storm drainage network will be comprised of pipes, catch basins and curb and gutter. Flows from the storm drain infrastructure system will be carried into a detention basin located on the north end of the site to detain and control storm water flows (Ref. Proposed Drainage Plan, Appendix D). The proposed development was calculated to generate 11.45 cfs and 34.12 cfs of on-site peak runoff for the 5-year and 100-year storms, respectively (Ref. Rational Method Calculations, Appendix B, Table 2).

#### **RATIONAL METHOD – Washoe County**

The Rational Method is used to estimate the peak runoff resulting from a storm of given intensity and frequency falling on a specific watershed. The peak flow is expressed as:

$$Q = C i A$$

where

- Q = Peak rate of runoff, cubic feet per second
- C = Runoff coefficient
- i = Average rainfall intensity, inches per hour
- A = Watershed area, acres

Washoe County allows the use of the Rational Method for urban and small watersheds. Runoff computations are made using criteria provided by the Truckee Meadows Regional Drainage Manual. Rainfall intensities are determined from the rainfall intensity-duration-frequency (IDF) curves for Reno WSFO Airport. The initial time of concentration,  $T_{c(1)}$ , is calculated by the formula:

$$T_{c(1)} = 10 \text{ or } \frac{L}{60 \times V} \text{ (whichever is greater)}$$

where

- $T_{c(1)}$  = Initial time of concentration, minutes
- L = Length from uppermost point of watershed to design point, feet
- V = Channel or overland velocity, feet per second

The initial time of concentration models build-up and sheet flow conditions in the uppermost part of the watershed. Except for very small impervious watersheds, the minimum build-up time of 10 minutes is assumed. Therefore, for the first design point, the time of concentration is determined by adding travel time to the build-up time as follows:

$$T_{c(1)} = 10 + \frac{L}{60 \times V}$$

The time of concentration at successive points downstream is calculated by adding total travel time to the initial build-up time:

$$T_{c(n)} = 10 + \sum \frac{L}{60 \times V}$$

where  $T_{c(n)}$  = Time of concentration at design point, minutes  
 $\sum \frac{L}{60 \times V}$  = Total travel time to design point, minutes  
 $L$  = Length of flow path between design points, feet  
 $V$  = Velocity, feet per second

Velocities used are 2 - 3 fps for surface flow and 3 - 5 fps for channel and conduit flow.

Rational Method calculations are performed using a spreadsheet containing the appropriate IDF curves and routing parameters. The peak flow for each drainage area is determined based on the runoff coefficient, initial time of concentration, and area (Ref. Rational Method Calculations, Appendix B).

## HYDROLOGY

Peak flows for on-site watersheds were estimated for the 5-year and 100-year design storms using the Rational Method (Ref. Rational Method Calculations, Appendix B, Tables 1 and 2). Curb and gutter flows, along with the storm drain infrastructure piping were designed in accordance with the Truckee Meadows Regional Drainage Manual using the 5-year design storm event. Runoff from the 5-year design storm will increase from 3.54 cfs to 11.45 cfs, and from the 100-year design storm will increase from 21.20 cfs to 34.12 cfs. Once the runoff enters the proposed on-site storm drain system, it is conveyed through the system and into a detention basin located on the north end of the site to detain and control storm water

flows. The basin will be constructed with an outlet pipe and outlet weir structure. The pipe will outlet into the Golden Valley Wash that exits the site and flows north to the Southwest Lemmon Valley Channel A. The proposed detention basin will be public and maintained by Washoe County upon completion.

The increase in peak runoff generated by the proposed development of this project for the 100-year storm is 12.92 cfs. The increase in runoff volume generated because of the proposed development of the project will be mitigated for the 100-year, 10-day storm event per the Truckee Meadows Regional Drainage Manual for areas draining to the Swan Lake Playa. Flow generated from the proposed site development will be collected and diverted into the proposed detention basin located at the north end of the site. The volume required to mitigate 100-year, 10-day event is approximately 113,347 cubic feet (Ref. Detention Basin Volume Calculations, Appendix E). The proposed site development will provide 270,000 cubic feet of storm water storage.

A preliminary storm drain network was designed for this site and is shown on Sheet 2 of the associated drawings. Pipe sizing and hydraulic calculations for the storm drain network are presented in Appendix C. Proposed catch basins and storm drain piping for the site will have adequate inlet capacity to collect the peak runoff flows for the 5-year storm event. All storm drain pipes, catch basins and storm drain infrastructure are to be dedicated as public and maintained by Washoe County.

The velocities in the Golden Valley Wash through the site are highly erosive. The slope between the filled development and the wash will require rock placement for erosion protection. Reference *Floodplain Analysis for Lemmon Valley Drive Development Memorandum* (Schaaf & Wheeler 2018) for details.

## **CONCLUSION**

As demonstrated in this report, the proposed drainage concept will convey the 5-year and 100-year storm flows, meeting the Washoe County development code requirements. The detention basin has been designed to mitigate twice the volumetric increase for the 100-year, 10-day storm event, helping mitigate flooding of Swan Lake Playa and meeting Washoe County and Truckee Meadows Regional Drainage Manual Design requirements. Lastly, this report demonstrates that Lemmon Drive Estates as planned meets the requirements of Washoe County, and development will not negatively impact adjacent properties or downstream storm drain infrastructure.

**REFERENCE**

*Truckee Meadows Regional Drainage Manual*, (April 2009).

Washoe County, *Washoe County Development Code*. (April 2016).

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**APPENDIX A**  
**FIRM MAP**



**APPENDIX B**  
**RATIONAL METHOD CALCULATIONS**

**RATIONAL METHOD HYDROLOGY  
WASHOE COUNTY IDF CURVES**

**LEMMON DRIVE ESTATES - EXISTING DRAINAGE**

DESIGN POINT	DRAINAGE SUB-BASIN	AREA (acres)	C		WATERSHED LENGTH (ft)	VELOCITY (ft/sec)	T <sub>c</sub> (min)	INTENSITY (in/hr)		PEAK RUNOFF (cfs)	
			5-YR	100-YR				5-YR	100-YR	5-YR	100-YR
<b>PART B: EXISTING BASINS - ON-SITE</b>											
	E1	21.09	0.20	0.50	1800	2	25.0	0.84	2.01	3.54	21.20
<b>OVERALL TOTAL</b>		<b>21.09</b>								<b>3.54</b>	<b>21.20</b>

**RATIONAL METHOD HYDROLOGY  
WASHOE COUNTY IDF CURVES**

**LEMMON DRIVE ESTATES - PROPOSED SITE DRAINAGE**

DESIGN POINT	DRAINAGE SUB-BASIN	AREA (acres)	C		WATERSHED LENGTH (ft)	VELOCITY (ft/sec)	Tc (min)	INTENSITY (in/hr)		PEAK RUNOFF (cfs)	
			5-YR	100-YR				5-YR	100-YR	5-YR	100-YR
<b>PART B: PROPOSED BASINS - ON-SITE</b>											
	P1	4.88	0.64	0.80	1800	2	25.0	0.84	2.01	2.60	7.83
	P2	0.17	0.88	0.93	1800	2	25.0	0.84	2.01	0.12	0.31
	P3	2.32	0.62	0.79	1800	2	25.0	0.84	2.01	1.21	3.68
	P4	0.63	0.88	0.93	1800	2	25.0	0.84	2.01	0.46	1.17
	P5	3.17	0.63	0.79	1800	2	25.0	0.84	2.01	1.66	5.05
	P6	0.16	0.88	0.93	1800	2	25.0	0.84	2.01	0.12	0.30
	P7	2.18	0.62	0.79	1800	2	25.0	0.84	2.01	1.14	3.47
	P8	3.85	0.62	0.79	1800	2	25.0	0.84	2.01	1.99	6.10
	P9	1.38	0.68	0.82	1800	2	25.0	0.84	2.01	0.79	2.27
	P10	2.00	0.65	0.81	1800	2	25.0	0.84	2.01	1.09	3.25
	P11	0.36	0.88	0.93	1800	2	25.0	0.84	2.01	0.27	0.68
<b>ON-SITE TOTAL</b>		<b>21.09</b>								<b>11.45</b>	<b>34.12</b>
<b>OVERALL TOTAL</b>		<b>21.09</b>								<b>11.45</b>	<b>34.12</b>



**APPENDIX C**  
**PIPE SIZING AND HYDRAULIC CALCULATIONS**

**PIPE SIZING AND HYDRAULIC CALCULATIONS**

$$\text{LEG 1} = \text{P8} + \text{P9} = 1.99 + 0.79 = 2.78 \text{ cfs}$$

LEG 1 = 18" PIPE

$$\text{LEG 2} = \text{P4} + \text{P5} = 0.46 + 1.66 = 2.12 \text{ cfs}$$

LEG 2 = 12" PIPE

$$\text{LEG 3} = \text{LEG 1} + \text{LEG 2} + \text{P10} + \text{P11} = 2.78 + 2.12 + 1.09 + 0.27 = 6.26 \text{ cfs}$$

LEG 3 = 18" PIPE

$$\text{LEG 4} = \text{LEG 3} + \text{P6} + \text{P7} = 6.26 + 0.12 + 1.14 = 7.52 \text{ cfs}$$

LEG 4 = 24" PIPE

$$\text{LEG 5} = \text{LEG 4} + \text{P2} + \text{P3} = 7.52 + 0.12 + 1.21 = 8.85 \text{ cfs}$$

LEG 5 = 24" PIPE

$$\text{LEG 6} = \text{LEG 5} + \text{P1} = 8.85 + 2.60 = 11.45 \text{ cfs}$$

LEG 6 = 24" PIPE

---

## Worksheet for 24" Pipe at 0.5% Slope

---

### Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

### Input Data

Roughness Coefficient	0.014	
Channel Slope	0.50000	%
Normal Depth	24.00	in
Diameter	24.00	in
Discharge	14.85	ft <sup>3</sup> /s

### Results

Discharge	14.85	ft <sup>3</sup> /s
Normal Depth	24.00	in
Flow Area	3.14	ft <sup>2</sup>
Wetted Perimeter	6.28	ft
Hydraulic Radius	6.00	in
Top Width	0.00	ft
Critical Depth	1.39	ft
Percent Full	100.0	%
Critical Slope	0.00728	ft/ft
Velocity	4.73	ft/s
Velocity Head	0.35	ft
Specific Energy	2.35	ft
Froude Number	0.00	
Maximum Discharge	15.98	ft <sup>3</sup> /s
Discharge Full	14.85	ft <sup>3</sup> /s
Slope Full	0.00500	ft/ft
Flow Type	SubCritical	

### GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

## Worksheet for 18" Pipe at 0.5% Slope

### Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

### Input Data

Roughness Coefficient	0.014
Channel Slope	0.50000 %
Normal Depth	18.00 in
Diameter	18.00 in
Discharge	6.90 ft <sup>3</sup> /s

### Results

Discharge	6.90 ft <sup>3</sup> /s
Normal Depth	18.00 in
Flow Area	1.77 ft <sup>2</sup>
Wetted Perimeter	4.71 ft
Hydraulic Radius	4.50 in
Top Width	0.00 ft
Critical Depth	1.02 ft
Percent Full	100.0 %
Critical Slope	0.00778 ft/ft
Velocity	3.90 ft/s
Velocity Head	0.24 ft
Specific Energy	1.74 ft
Froude Number	0.00
Maximum Discharge	7.42 ft <sup>3</sup> /s
Discharge Full	6.90 ft <sup>3</sup> /s
Slope Full	0.00500 ft/ft
Flow Type	SubCritical

### GVF Input Data

Downstream Depth	0.00 in
Length	0.00 ft
Number Of Steps	0

### GVF Output Data

Upstream Depth	0.00 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.00 %

---

## Worksheet for 12" Pipe at 0.5% Slope

---

### Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

### Input Data

Roughness Coefficient	0.014
Channel Slope	0.50000 %
Normal Depth	12.00 in
Diameter	12.00 in
Discharge	2.34 ft <sup>3</sup> /s

### Results

Discharge	2.34 ft <sup>3</sup> /s
Normal Depth	12.00 in
Flow Area	0.79 ft <sup>2</sup>
Wetted Perimeter	3.14 ft
Hydraulic Radius	3.00 in
Top Width	0.00 ft
Critical Depth	0.65 ft
Percent Full	100.0 %
Critical Slope	0.00856 ft/ft
Velocity	2.98 ft/s
Velocity Head	0.14 ft
Specific Energy	1.14 ft
Froude Number	0.00
Maximum Discharge	2.52 ft <sup>3</sup> /s
Discharge Full	2.34 ft <sup>3</sup> /s
Slope Full	0.00500 ft/ft
Flow Type	SubCritical

### GVF Input Data

Downstream Depth	0.00 in
Length	0.00 ft
Number Of Steps	0

### GVF Output Data

Upstream Depth	0.00 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.00 %



**APPENDIX D**  
**PRE & POST DEVELOPMENT**  
**STORM WATER DRAINAGE PLAN**



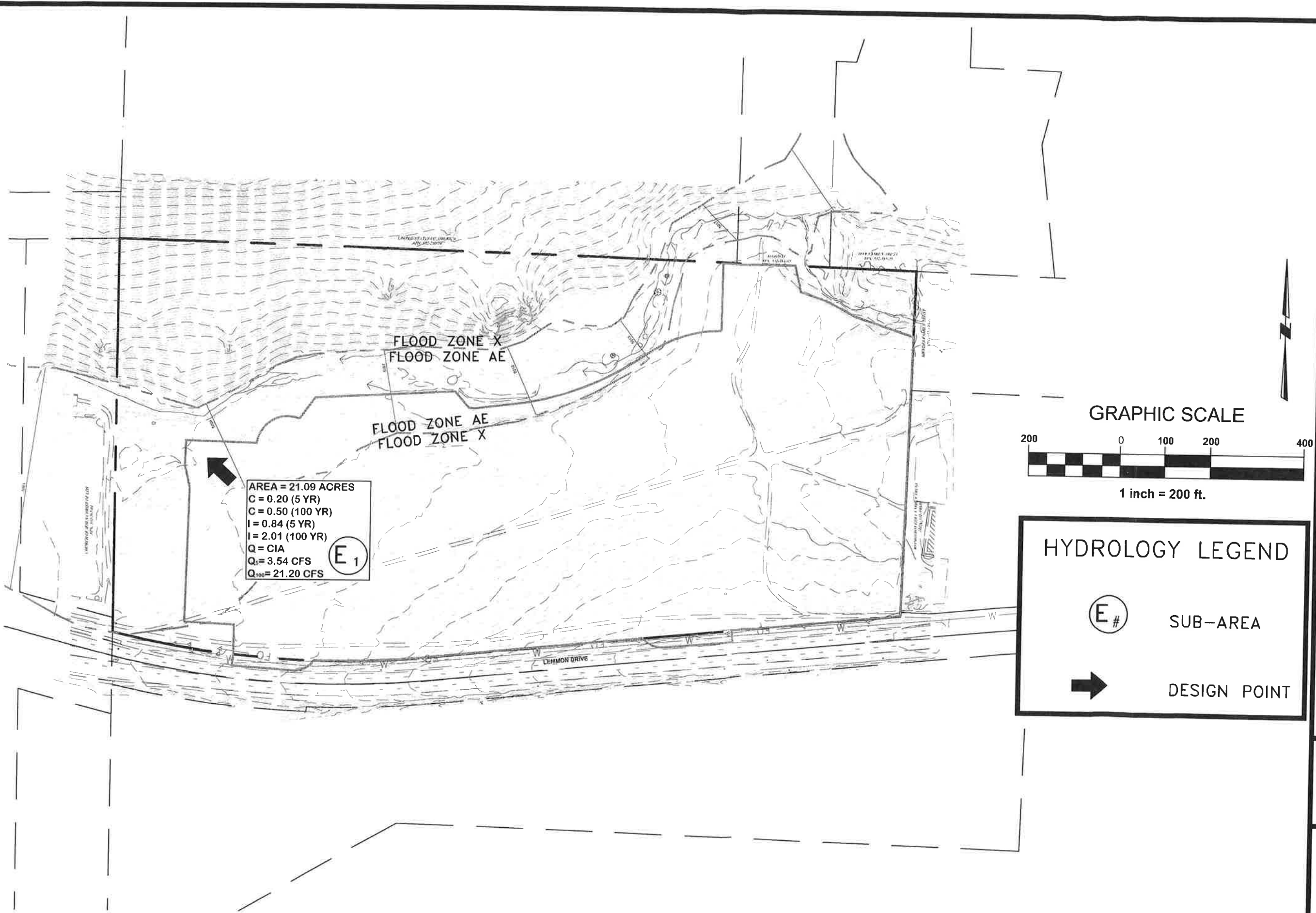
1150 CORPORATE BLVD.  
RENO, NV 89502  
(775) 856-1150  
FAX: (775) 856-1160

NEVADA

RENO

LEMMON DRIVE ESTATES  
TENTATIVE MAP

# EXISTING HYDROLOGY



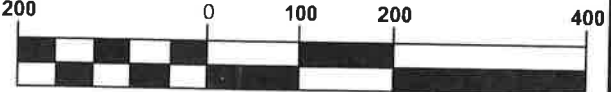
AREA = 21.09 ACRES  
C = 0.20 (5 YR)  
C = 0.50 (100 YR)  
I = 0.84 (5 YR)  
I = 2.01 (100 YR)  
Q = CIA  
Q<sub>5</sub> = 3.54 CFS  
Q<sub>100</sub> = 21.20 CFS

(E<sub>1</sub>)

FLOOD ZONE X  
FLOOD ZONE AE

FLOOD ZONE AE  
FLOOD ZONE X

GRAPHIC SCALE



1 inch = 200 ft.

## HYDROLOGY LEGEND



SUB-AREA



DESIGN POINT

JOB NO. 16013.00  
DESIGNED BY JL  
CHECKED BY MW  
DATE 03-15-2018

SHEET  
1  
OF  
2

AREA = 4.88 ACRES  
 C = 0.64 (5 YR)  
 C = 0.80 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 2.60 CFS  
 Q<sub>100</sub> = 7.83 CFS

AREA = 0.17 ACRES  
 C = 0.88 (5 YR)  
 C = 0.93 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 0.12 CFS  
 Q<sub>100</sub> = 0.31 CFS

AREA = 2.32 ACRES  
 C = 0.62 (5 YR)  
 C = 0.79 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 1.21 CFS  
 Q<sub>100</sub> = 3.68 CFS

AREA = 0.63 ACRES  
 C = 0.88 (5 YR)  
 C = 0.93 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 0.46 CFS  
 Q<sub>100</sub> = 1.17 CFS

AREA = 3.17 ACRES  
 C = 0.63 (5 YR)  
 C = 0.79 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 1.66 CFS  
 Q<sub>100</sub> = 5.05 CFS

AREA = 0.16 ACRES  
 C = 0.88 (5 YR)  
 C = 0.93 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 0.12 CFS  
 Q<sub>100</sub> = 0.30 CFS

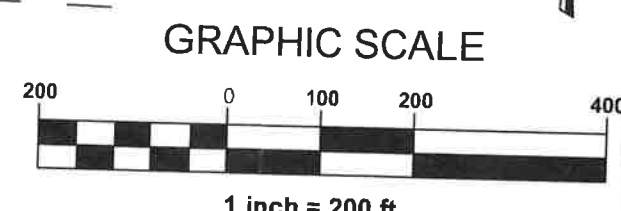
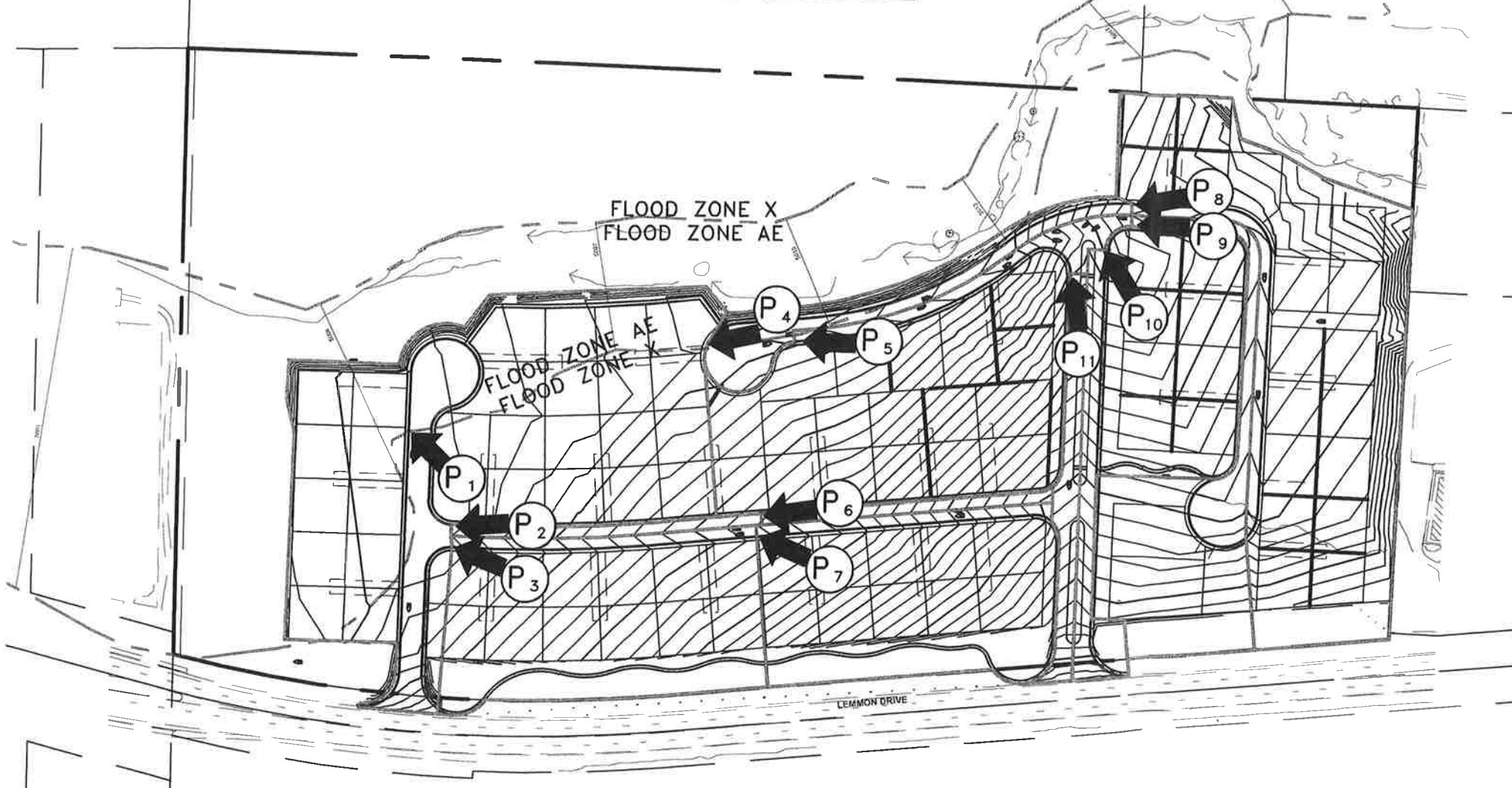
AREA = 2.16 ACRES  
 C = 0.62 (5 YR)  
 C = 0.79 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 1.14 CFS  
 Q<sub>100</sub> = 3.47 CFS

AREA = 3.85 ACRES  
 C = 0.62 (5 YR)  
 C = 0.79 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 1.99 CFS  
 Q<sub>100</sub> = 6.10 CFS

AREA = 1.38 ACRES  
 C = 0.68 (5 YR)  
 C = 0.82 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 0.79 CFS  
 Q<sub>100</sub> = 2.27 CFS

AREA = 2.00 ACRES  
 C = 0.65 (5 YR)  
 C = 0.81 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 1.09 CFS  
 Q<sub>100</sub> = 3.25 CFS

AREA = 0.36 ACRES  
 C = 0.88 (5 YR)  
 C = 0.93 (100 YR)  
 I = 0.84 (5 YR)  
 I = 2.01 (100 YR)  
 Q = CIA  
 Q<sub>5</sub> = 0.27 CFS  
 Q<sub>100</sub> = 0.68 CFS



**HYDROLOGY LEGEND**

(P#) SUB-AREA

➔ DESIGN POINT



1150 CORPORATE BLVD.  
 RENO, NV 89502  
 (775) 856-1150  
 FAX: (775) 856-1160

LEMMON DRIVE ESTATES  
 TENTATIVE MAP  
**PROPOSED HYDROLOGY**  
 NEVADA  
 RENO

JOB NO. 16013.00  
 DESIGNED BY JL  
 CHECKED BY MW  
 DATE 03-15-2018

SHEET  
 2  
 OF  
 2

**APPENDIX E**  
**NOAA ATLAS 14, VOLUME 1, VERSION 5**  
**PRECIPITATION FREQUENCY ESTIMATES;**  
**EXTENDED DETENTION CALCULATION FOR THE SWAN LAKE PLAYA**



NOAA Atlas 14, Volume 1, Version 5  
 Location name: Reno, Nevada, US\*  
 Latitude: 39.5000°, Longitude: -119.7833°  
 Elevation: 4413 ft\*  
 \* source: Google Maps



**POINT PRECIPITATION FREQUENCY ESTIMATES**

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

**PF tabular**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.086 (0.075-0.099)	0.106 (0.091-0.125)	0.142 (0.121-0.167)	0.176 (0.148-0.207)	0.231 (0.190-0.277)	0.281 (0.221-0.342)	0.341 (0.259-0.420)	0.411 (0.299-0.520)	0.527 (0.356-0.695)	0.631 (0.408-0.855)
10-min	0.130 (0.114-0.151)	0.161 (0.138-0.190)	0.217 (0.185-0.255)	0.267 (0.226-0.316)	0.351 (0.289-0.422)	0.428 (0.336-0.520)	0.518 (0.394-0.639)	0.627 (0.455-0.791)	0.802 (0.543-1.06)	0.961 (0.621-1.30)
15-min	0.161 (0.141-0.187)	0.200 (0.171-0.235)	0.269 (0.229-0.316)	0.331 (0.280-0.391)	0.436 (0.359-0.523)	0.531 (0.417-0.645)	0.643 (0.489-0.792)	0.777 (0.564-0.981)	0.995 (0.673-1.31)	1.19 (0.771-1.61)
30-min	0.217 (0.190-0.251)	0.269 (0.231-0.317)	0.362 (0.309-0.425)	0.447 (0.377-0.527)	0.587 (0.483-0.704)	0.715 (0.562-0.869)	0.866 (0.659-1.07)	1.05 (0.760-1.32)	1.34 (0.906-1.77)	1.60 (1.04-2.17)
60-min	0.269 (0.235-0.311)	0.333 (0.286-0.392)	0.448 (0.382-0.526)	0.553 (0.466-0.652)	0.727 (0.598-0.871)	0.885 (0.695-1.08)	1.07 (0.815-1.32)	1.29 (0.940-1.64)	1.66 (1.12-2.19)	1.99 (1.28-2.69)
2-hr	0.362 (0.320-0.414)	0.448 (0.400-0.517)	0.575 (0.502-0.661)	0.677 (0.584-0.783)	0.839 (0.696-0.982)	0.975 (0.789-1.17)	1.13 (0.886-1.37)	1.32 (0.985-1.65)	1.70 (1.20-2.21)	2.04 (1.39-2.72)
3-hr	0.427 (0.383-0.480)	0.532 (0.482-0.603)	0.666 (0.598-0.753)	0.767 (0.680-0.873)	0.909 (0.789-1.04)	1.03 (0.873-1.20)	1.17 (0.977-1.40)	1.35 (1.10-1.67)	1.71 (1.34-2.23)	2.06 (1.55-2.74)
6-hr	0.580 (0.525-0.645)	0.733 (0.661-0.817)	0.905 (0.816-1.01)	1.03 (0.925-1.15)	1.20 (1.05-1.35)	1.32 (1.14-1.50)	1.45 (1.23-1.67)	1.57 (1.31-1.84)	1.76 (1.41-2.25)	2.07 (1.62-2.77)
12-hr	0.737 (0.671-0.814)	0.924 (0.839-1.02)	1.17 (1.05-1.29)	1.35 (1.21-1.50)	1.59 (1.40-1.79)	1.77 (1.54-2.01)	1.95 (1.66-2.26)	2.13 (1.77-2.50)	2.36 (1.89-2.86)	2.55 (1.98-3.13)
24-hr	0.895 (0.813-0.996)	1.12 (1.02-1.25)	1.43 (1.29-1.58)	1.67 (1.52-1.86)	2.01 (1.81-2.24)	2.28 (2.04-2.54)	2.56 (2.27-2.88)	2.85 (2.50-3.22)	3.26 (2.81-3.70)	3.57 (3.05-4.10)
2-day	1.05 (0.956-1.17)	1.33 (1.21-1.47)	1.69 (1.53-1.87)	1.98 (1.79-2.19)	2.39 (2.14-2.65)	2.72 (2.42-3.03)	3.06 (2.69-3.43)	3.42 (2.97-3.86)	3.91 (3.34-4.47)	4.31 (3.61-4.97)
3-day	1.14 (1.04-1.27)	1.44 (1.31-1.60)	1.84 (1.67-2.04)	2.17 (1.96-2.41)	2.63 (2.35-2.92)	3.00 (2.66-3.35)	3.38 (2.96-3.80)	3.79 (3.28-4.29)	4.36 (3.70-4.99)	4.81 (4.02-5.56)
4-day	1.23 (1.12-1.37)	1.55 (1.41-1.73)	1.99 (1.80-2.21)	2.35 (2.12-2.62)	2.86 (2.56-3.19)	3.27 (2.90-3.66)	3.70 (3.24-4.17)	4.16 (3.59-4.71)	4.80 (4.07-5.50)	5.32 (4.43-6.16)
7-day	1.44 (1.30-1.62)	1.82 (1.64-2.04)	2.35 (2.10-2.63)	2.77 (2.48-3.12)	3.37 (2.99-3.79)	3.84 (3.38-4.34)	4.34 (3.79-4.94)	4.87 (4.20-5.57)	5.60 (4.73-6.48)	6.19 (5.16-7.23)
10-day	1.59 (1.43-1.78)	2.03 (1.82-2.26)	2.62 (2.36-2.93)	3.08 (2.77-3.45)	3.73 (3.32-4.18)	4.24 (3.74-4.76)	4.77 (4.17-5.38)	5.30 (4.60-6.03)	6.04 (5.14-6.93)	6.62 (5.57-7.65)
20-day	1.89 (1.71-2.10)	2.39 (2.16-2.66)	3.08 (2.79-3.42)	3.62 (3.26-4.01)	4.33 (3.88-4.80)	4.86 (4.33-5.42)	5.42 (4.78-6.08)	5.97 (5.21-6.72)	6.71 (5.79-7.65)	7.26 (6.20-8.33)
30-day	2.11 (1.91-2.35)	2.68 (2.44-2.98)	3.44 (3.12-3.81)	4.02 (3.63-4.46)	4.80 (4.30-5.33)	5.39 (4.80-6.02)	5.99 (5.28-6.71)	6.58 (5.76-7.43)	7.37 (6.37-8.38)	7.97 (6.81-9.14)
45-day	2.51 (2.28-2.75)	3.19 (2.90-3.49)	4.09 (3.71-4.47)	4.76 (4.30-5.20)	5.63 (5.08-6.16)	6.28 (5.63-6.88)	6.91 (6.16-7.60)	7.52 (6.67-8.31)	8.30 (7.27-9.25)	8.85 (7.71-9.95)
60-day	2.85 (2.60-3.13)	3.64 (3.31-3.97)	4.66 (4.23-5.08)	5.39 (4.89-5.87)	6.30 (5.70-6.88)	6.96 (6.27-7.63)	7.58 (6.81-8.32)	8.16 (7.28-8.97)	8.87 (7.86-9.83)	9.35 (8.23-10.4)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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**PRELIMINARY HYDRO REPORT – TENTATIVE MAP**  
**Extended Detention Calculation for Swan Lake Playa**

100-yr, 10-day precipitation depth = 4.77 inches  
= 0.398 feet

Volume of detention needed

$$\text{Volume (cf)} = C * \text{Depth} * \text{Area}$$

$$C = C_{\text{proposed}} - C_{\text{existing}}$$

$$C = 0.81 - 0.50 = 0.31$$

$$\text{Depth} = 0.398 \text{ feet}$$

$$\text{Area} = 21.09 \text{ acres} * 43560 \text{ ft}^2/\text{ac} = 918,680 \text{ ft}^2$$

$$\text{Volume needed} = (0.31) * (0.398 \text{ ft}) * (918,680 \text{ ft}^2)$$
$$= 113,347 \text{ cf}$$

$$\text{Volume provided} = 270,000 \text{ cf}$$

# **APPENDIX C**

## MEMORANDUM

TO: Catie Harrison, PE  
CFA

DATE: March 12, 2018

FROM: Sarah L. Rahimi, PE  
Charles D. Anderson, PE

JOB#: BDLC.01.17

SUBJECT: Floodplain Analysis for Lemmon Valley Drive Development

### Introduction

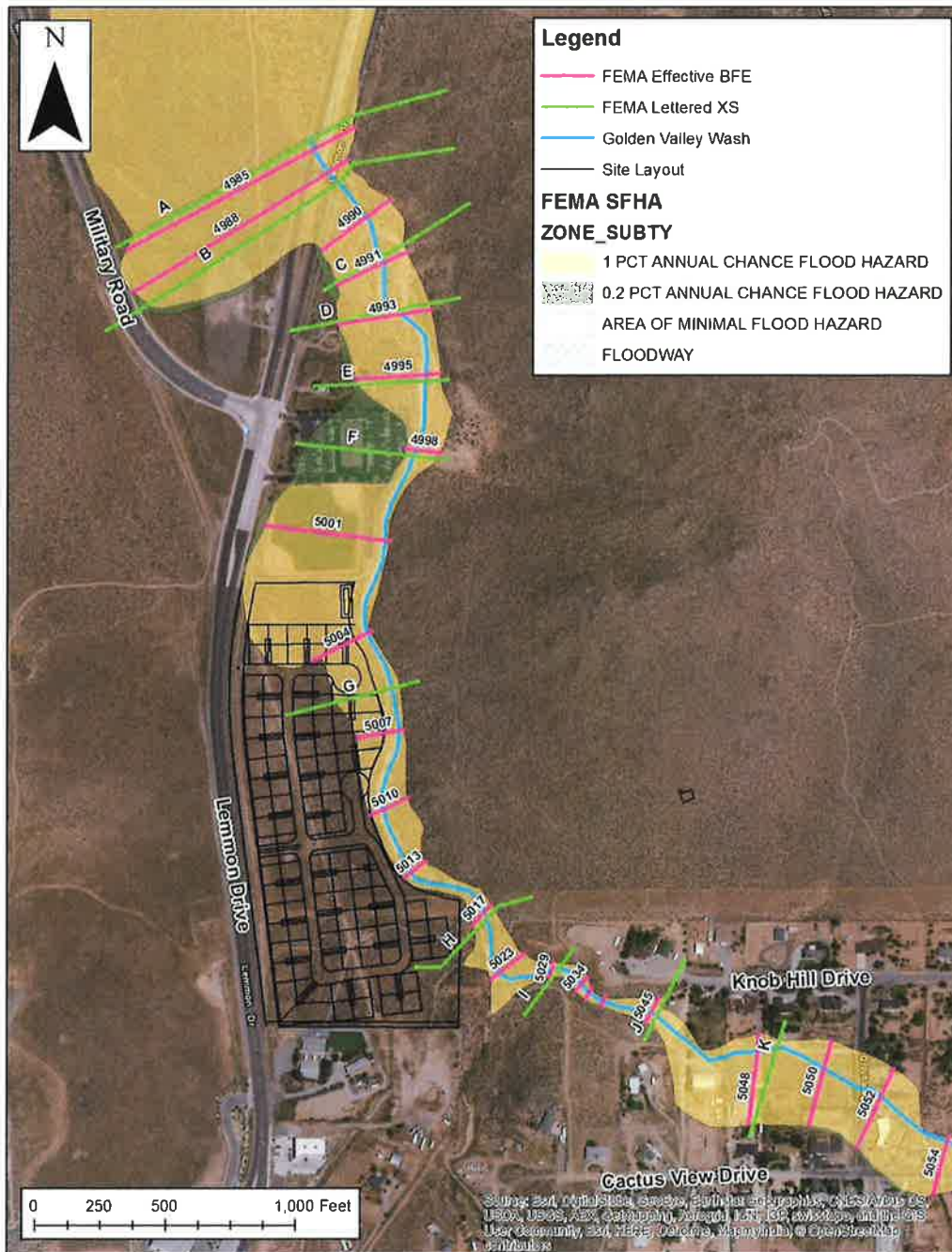
Schaaf & Wheeler has been contracted to coordinate hydrologic design and floodplain management for the proposed 32-acre single family home development (Project) off Lemmon Drive just south of the intersection with Military Road (Figure 1). Part of the development parcel is located within a Special Flood Hazard Area (SFHA) associated with the Golden Valley Wash. To develop the Project, the flood prone area needs to be pushed to the east so that to remove the flood hazard zone designation from the developable portion of the parcel. Based on requirements by the Federal Emergency Management Agency (FEMA) and Washoe County, the floodplain conditions were analyzed to establish the maximum development potential of the project site and to evaluate the hydraulic impact from the proposed development footprint.



**Figure 1. Location of the Proposed Lemmon Valley Drive Development**

### Existing Flood Hazards

A portion of the proposed development is partially located within a FEMA SFHA Zone AE, which is an area designated as having a one percent annual chance of flooding to the extent shown and has defined Base Flood Elevations (BFEs). Properties within in a SFHA Zone AE are considered to be at high risk of flooding under the National Flood Insurance Program (NFIP). The BFEs through the Project site range from 5017 feet to 5002 feet NAVD as shown in Figure 2.



**Figure 2. Effective FEMA Floodplain with Proposed Development Shown**

Just downstream of the Project site, FEMA approved a Conditional Letter of Map Revision (CLOMR: Case No. 15-09-2695R) in 2016 for the construction of the Southwest Lemmon Valley Channel A and the extension of the Southwest Lemmon Valley Channel B. This CLOMR, the application for which was prepared by Cardno, reflects a project that includes construction of 6,580 linear feet of Channel A to capture flow from an existing floodplain (Golden Valley Wash) and convey it to Channel B, and to extend Channel B by 2,030 linear feet, which ultimately drains directly to Swan Lake. The construction of Channel A will revise the floodplain boundaries currently classified as Zone A to be Zone AE contained within the channel. Channel A is proposed to begin where Golden Valley Wash intersects Lemmon Drive and terminate at its intersection with Channel B, where flow is also combined with that of Southwest Lemmon Valley Channel C.

Based on a thorough review of the CLOMR and the model, it is ascertained that the CLOMR does impact the floodplain hydraulics at the Lemmon Valley Drive development. Upstream of the development is another proposed development, Wild Stallion Estates, which is still in the planning stages. Additionally, this development is far enough upstream to have no hydraulic impact on the Lemmon Valley Drive development. Figure 3 shows the Lemmon Valley Development in relation to the referenced upstream and downstream hydraulic analyses.

### **County and FEMA Regulations**

The proposed development will need to meet Division Four – Development Standards, Article 416: Flood Hazards of the Washoe County Development Code along with NFIP and FEMA regulations. The degree of flood protection required by Article 416 is considered reasonable for purposes of complying with the minimum standards required by the Federal Insurance Administration for maintaining eligibility for Washoe County property owners who desire flood insurance. The applicable codes are as following:

- County Code Section 110.416.50: That the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one (1) foot at any point;
- County Code Section 110.416.65: In Zones AE and AH, new construction and substantial improvement of any structure shall have the top of the lowest floor (including basement floor) elevated to one (1) foot or more above the base flood elevation unless the construction of a crawlspace is in accordance with Section 110.416.60(h).
- FEMA 44 CFR 65. The proposed lowest adjacent grade to the structure or the lowest lot elevation must be at or above the BFE.

This memorandum evaluates the conceptual grading and site layout plans for the Project using these applicable codes.



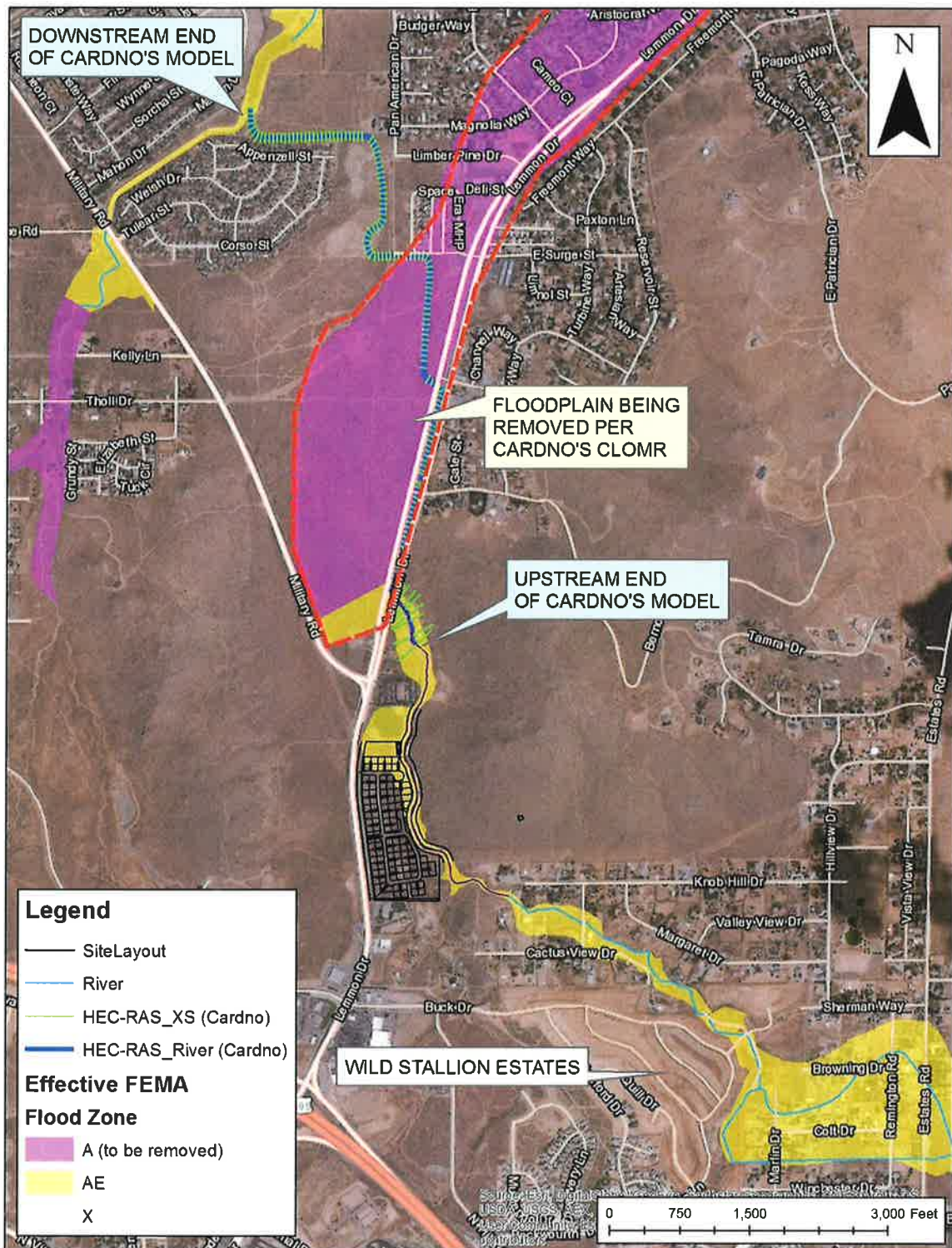


Figure 3. Study Area in Relation with CLOMR and Effective FEMA Floodplain

## Hydraulic Impact Analysis

Based on requirements by FEMA and the Washoe County, the floodplain conditions have been analyzed to determine the maximum development potential of the project site.

### Duplicate Effective Model

The existing effective model obtained from FEMA has been used to develop the duplicate effective model in HEC-RAS. The U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center's River Analysis System (HEC-RAS) effective model file was obtained from the FEMA Engineering Library. The duplicate effective model was then recreated in HEC-RAS 4.1.0 from cross sections XS 204 to XS 220 as shown in Figure 4. FEMA's published discharge for the Golden Valley Wash of 1,904 cfs is used. This duplicate effective model ties in with the FEMA lettered XS J at upstream XS 220 and at XS D at the downstream XS 204. As necessary the following conversion was used to convert the vertical datum from NGVD to NAVD:  $NAVD = NGVD + 3.74 \text{ feet.}^1$

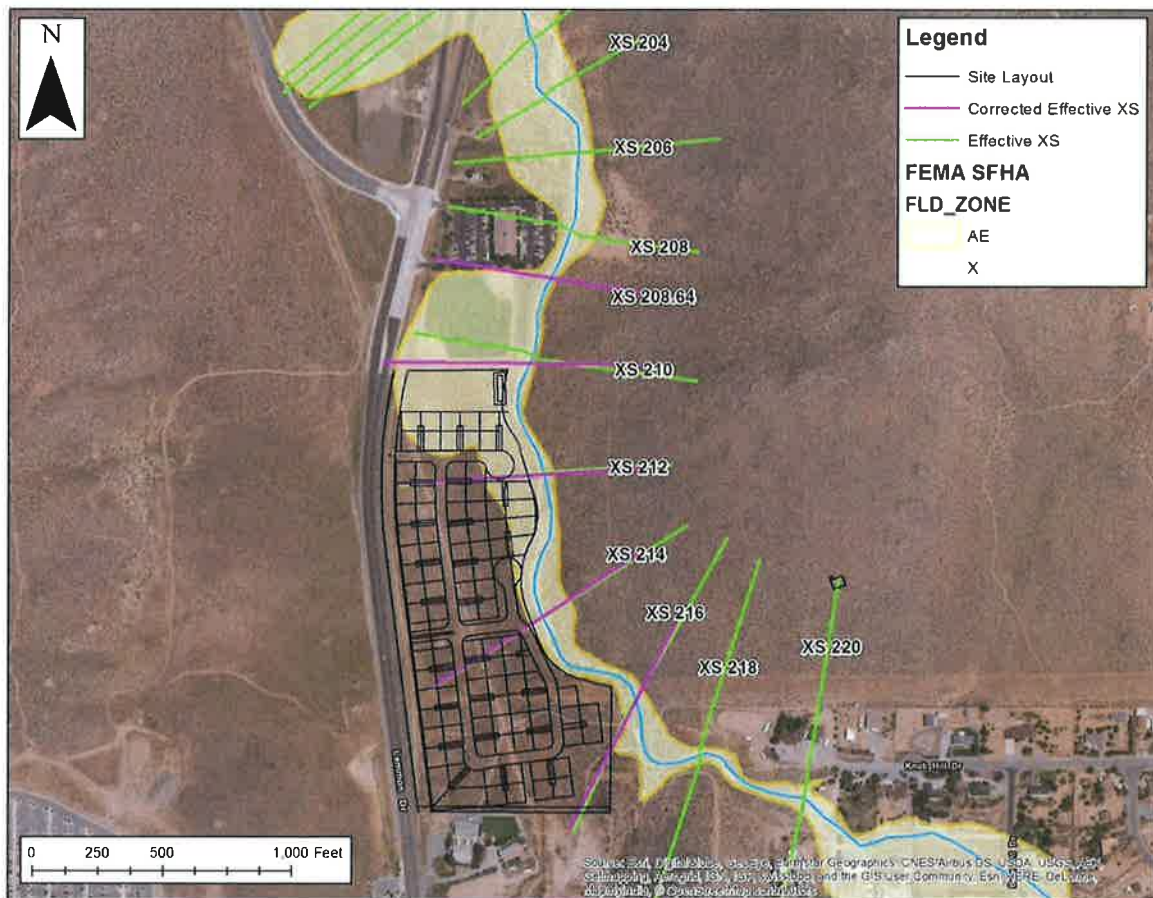


Figure 4. HEC-RAS Model Cross Sections

<sup>1</sup> NOAA National Geodetic Survey: VERTCON. [https://www.ngs.noaa.gov/cgi-bin/VERTCON/vert\\_con.pr1](https://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.pr1).



### Corrected Duplicate Effective Model (Existing Conditions)

The duplicate effective model was utilized to create the existing conditions model. The cross sections through the site, which include XS 216 – XS 210 were updated with existing site topography as provided by CFA. An additional cross section, XS 208.64, downstream of the site has been interpolated to take into account the flow expansion and contraction north of the development. Effective flows through the site have not been changed. The location of the existing corrected effective XS as compared to the effective XS are shown in Figure 4. The existing topography is at a slightly lower elevation than in the effective FEMA model, which drops the BFEs through the site. However, the corrected duplicate effective model still ties into the effective FEMA model at the upstream end and downstream end of the revised cross section reach.

### Project Model

The existing model of the Golden Valley Wash is utilized to determine the hydraulic impacts of development. This model has been modified based on the proposed development extents through the floodplain. The development area raised on engineered fill is modeled as normal blocked obstructions on the applicable cross sections to determine the potential hydraulic impacts from the development.

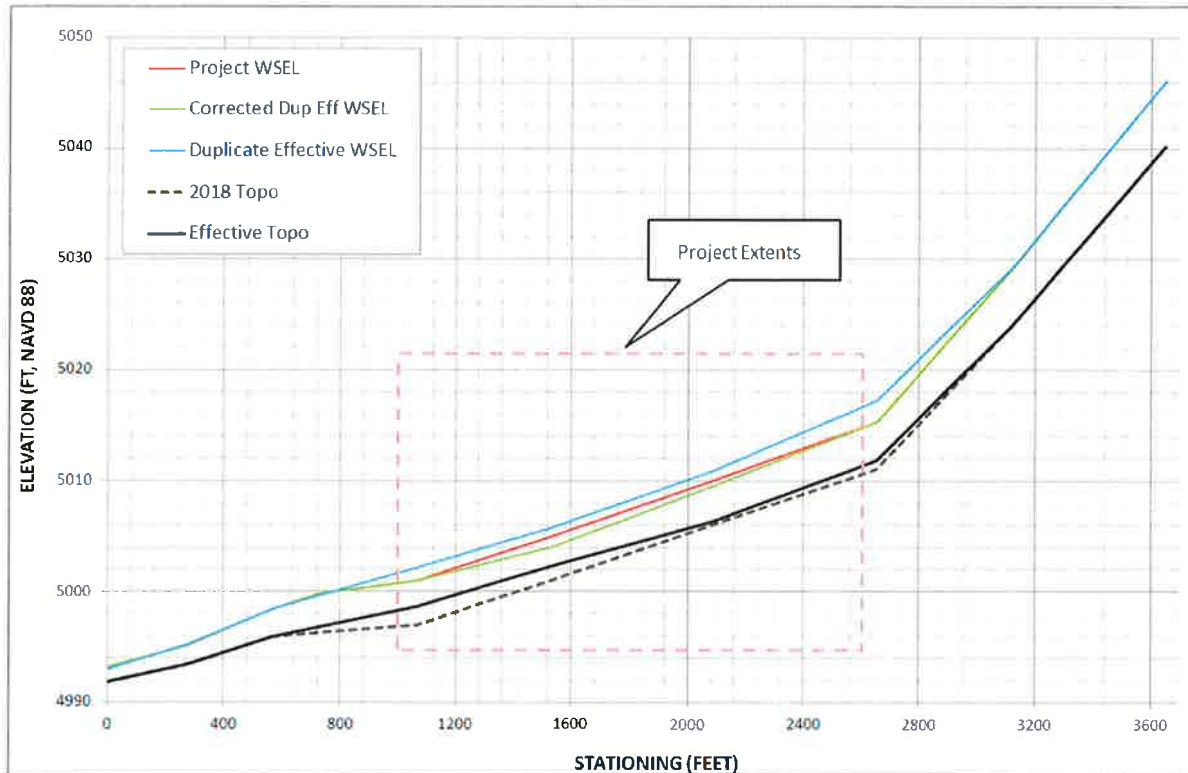
### Results

The results from the model runs are summarized in Table 1 and Figure 5. While the Project increases the BFEs through a portion of the development, the increased BFEs are contained without impact to neighboring properties and Project BFEs are equal to or lower than effective FEMA BFEs upstream and downstream of the Project. In comparison to the existing conditions model, the proposed development creates a maximum impact of 0.85 foot at XS 212 which is contained within the development site itself. This meets the Washoe's County Code since the development will not increase the water surface elevation of the base flood more than one (1) foot at any point. Furthermore, the Project model still ties in upstream and downstream with the duplicate effective FEMA BFEs.

**Table 1. 100-yr Water Surface Elevations through Golden Valley Wash**

River Station XS	FEMA Lettered XS	Duplicate Effective WSEL (feet NAVD)	Existing WSEL (feet NAVD)	Project WSEL (feet NAVD)	Difference <sup>2</sup>
220	5046.0 (J)	5046.1	5046.08	5046.08	0.00
218		5029.2	5029.14	5029.14	0.00
216 <sup>1</sup>	5017.4 (H)	5017.3	5015.33	5015.33	0.00
214 <sup>1</sup>		5010.9	5009.56	5010.03	0.47
212 <sup>1</sup>	5005.9 (G)	5005.8	5003.99	5004.84	0.85
210 <sup>1</sup>		5002.2	5000.92	5000.84	-0.08
208.64			4999.80	4999.79	-0.01
208		4998.4	4998.39	4998.39	0.00
206		4995.3	4995.14	4995.14	0.00
204	4993.2 (D)	4993.0	4993.20	4993.20	0.00

1. Cross sections through proposed development
2. Difference = Project WSEL – Existing WSEL



**Figure 5. 100-yr Water Surface Elevations through the Golden Valley Wash**

### Floodplain Removal

To remove the portions of the development from the floodplain, two options have been investigated: floodplain removal via fill (CLOMR-F/LOMR-F) and floodplain removal via letter of map revision (CLOMR/LOMR). The fill option has been chosen for floodplain removal.

#### Floodplain Removal via Fill (CLOMR-F/LOMR-F)

A CLOMR-F is a letter from FEMA stating that a parcel of land or proposed structure that will be elevated by fill would not be inundated by the base flood if fill is placed on the parcel as proposed or the structure is built as proposed. A LOMR-F would be filed once the existing structure or parcel of land has been physically elevated by fill, and the Letter of Map Revision would indicate that the structure or parcel of land is not subject to inundation by the base flood shown on the FIRM.

Thus, to remove the development from the floodplain, fill can be placed on site to elevate the portions of the site in the SFHA above the effective BFE. If structures are only being removed, the proposed lowest adjacent grade to the structures must be elevated to at least the effective BFE or higher. And if the entire area within the SFHA is being removed via fill, the lowest lot elevation must be elevated to at least the BFE or higher. A CLOMR-F followed by a LOMR-F will have to be filed with FEMA to officially remove the designation of the SFHA.

**Floodplain Removal via Letter of Map Revision (CLOMR/LOMR)**

A Conditional Letter of Map Revision (CLOMR) is FEMA's comment on a proposed project that would, upon construction, affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). Following a CLOMR, once the project has been completed, a LOMR is filed which is a letter from FEMA officially revising the current NFIP map to show changes to floodplains, floodways, or flood elevations.

To remap the floodplain so that the proposed development area is no longer in the SFHA, a floodwall could be constructed along the Golden Valley Wash at the limit of proposed site development to channelize the floodplain and prevent inundation on site. Assuming the floodwall is built in the same location as the limit of placed fill; Base Flood Elevations would be based on the new analysis, thus remapping the BFEs as well.

For the floodwall to be FEMA accredited, and thus remap the floodplain, the floodwall must meet the requirements outlined in Title 44 of the Code of Federal Regulations Section 65.10 (44 CFR 65.10). 44 CFR 65.10 provides the minimum design, operation, and maintenance standards levee systems must meet and continue to meet in order to be recognized as providing protection from the base flood on a Flood Insurance Rate Map. Per FEMA regulations, this floodwall must provide a minimum freeboard of three feet above the new channelized BFE. A tie-back floodwall would have to be constructed to the south of proposed detention basin to keep floodwaters from entering the site from the North. A CLOMR followed by a LOMR would have to be filed with FEMA which will remap the development as a Zone X protected by levee. Once the LOMR is approved, the development area would be officially removed from the SFHA, and fill would not need to be placed onsite to do so.

**Scour Protection**

In the project condition, the velocities in the Golden Valley Wash along the development range from 9.6 ft/s to 10.5 ft/s, which are considered highly erosive velocities. Thus the side of the development along the wash will require erosion protection. The fill option for floodplain removal will require that the fill slope exposed to the wash to be protected. And the floodwall option will require that the floodwall be protected against undermining due to channel scour. Both these options, will require placement of ¼ ton D(50) 23" to ½ ton D(50) 28" rock to protect against erosion in the wash.



# TRAFFIC IMPACT STUDY

for

# LEMMON DRIVE ESTATES

March 27, 2018

PREPARED FOR:  
**Bluth Development**

PREPARED BY:



## **YOUR QUESTIONS ANSWERED QUICKLY**

### **Why did you perform this study?**

This Traffic Impact Study evaluates the potential traffic impacts associated with the proposed Lemmon Drive Estates project. This study of potential transportation impacts was undertaken for planning purposes and to determine what traffic controls or other mitigations may be needed to reduce potential impacts, if any are identified.

### **What does the project consist of?**

For the purposes of this study, the project consists of 98 detached single-family residential homes. The project is located on the east side of Lemmon Drive between Sky Vista Parkway and Military Road in Washoe County, NV.

### **How much traffic will the project generate?**

The Lemmon Drive Estates project is anticipated to generate 926 Daily trips, 73 AM peak hour trips, and 97 PM peak hour trips.

### **Are there any traffic impacts?**

With the addition of project traffic, all study intersections are projected to operate at acceptable levels of service (LOS "C" or better) under "Existing Plus Project" conditions. No significant impacts are anticipated as a result of the project.

### **Are any improvements recommended?**

The following are proposed improvements for the project:

- The project access driveways should be constructed as right-in/right-out only.
- The proposed project should modify the channelizing island on the west side of Lemmon Drive at the Lemmon Drive / Military Road intersection to provide enough space for large passenger vehicles to make northbound to southbound U-turns.
- The project should dedicate right-of-way, if necessary, on Lemmon Drive along the project frontage, to accommodate the planned widening from 4 lanes to 6 lanes as stated in the 2040 RTP. See **Appendix C** for the typical regional roadway cross-section. Any right-of-way dedication and any widening improvements may be eligible for a Regional Road Impact Fee (RRIF) waiver/offset agreement.

The project's contribution of standard Regional Road Impact Fees will mitigate the minor project effects on the roadway network.

### LIST OF FIGURES

1. Study Area
2. Site Plan
3. Existing Traffic Volumes and Controls
4. Project Trips
5. Existing Plus Project Traffic Volumes and Controls

### LIST OF APPENDICES

- A. Existing Conditions LOS Calculations
- B. Existing Plus Project Conditions LOS Calculations
- C. Typical Regional Roadway Cross-Section

## 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 Lemmon Drive Estates project. This Transportation Impact Study has been prepared to describe existing traffic conditions, quantify traffic volumes generated by the proposed project, identify potential impacts on all modes of travel, document findings, and make recommendations to mitigate impacts, if any are found.

### *Study Area and Evaluated Scenarios*

The project is located on the east side of Lemmon Drive between Sky Vista Parkway and Military Road in Washoe County, NV. The project location and study intersections are shown in **Figure 1** and the site plan is provided in **Figure 2**. The following intersections were analyzed:

- Lemmon Drive / Military Road
- Lemmon Drive / Snowbrush Court
- Lemmon Drive / Sunset View Drive

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

- Existing Conditions (no project)
- Existing Plus Project Conditions

Future year scenarios have not been evaluated at this time due to the relatively small size and low trip generation of the project. Long-term plans for the Lemmon Drive corridor are outlined in the *North Valleys Multimodal Transportation Study* and the *2040 Regional Transportation Plan*.

### *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 average 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 LOS for a Two-Way STOP Control (TWSC) intersection is defined by the worst movement delay. 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.

Level of service calculations were performed for the study intersections using the Vistro 5.0 software package with analysis and results reported in accordance with the 2010 HCM methodology.

**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 Policy

The 2040 Regional Transportation Plan (2040 RTP) establishes level of service criteria for regional roadway facilities in Washoe County, the City of Reno, and 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”.

The 2040 traffic volume projections in the regional travel demand model exceed 27,000 ADT, therefore the policy LOS for intersections on Lemmon Drive in the study area is LOS E.



## EXISTING TRANSPORTATION FACILITIES

### *Roadway Facilities*

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

*Lemmon Drive* is a four-lane and six-lane north-south arterial roadway in the project area. There are four lanes fronting the project site with planned widening to six lanes in the 2040 RTP. It is classified as a “Moderate Access Control Arterial” in the 2040 RTP. The posted speed limit is 45 miles per hour (mph) within the project area.

*Military Road* is a two-lane arterial roadway in the project area. It is classified as a “Moderate Access Control Arterial” in the 2040 RTP. The posted speed limit is 45 mph within the project area.

### *Alternative Travel Modes*

Within the immediate project vicinity, sidewalks are only present around the Lemmon Drive / Military Road intersection. Dedicated bike lanes exist only on Military Road. Additional pedestrian and bicycle facilities are planned and outline in the *North Valleys Multimodal Transportation Study*.

RTC Route 17 currently operates immediately in front of the project site, as shown in **Exhibit 1**. Route 17 has an existing stop at the north end of the project site.



**Exhibit 1. Transit Routes**

## EXISTING CONDITIONS

### *Traffic Volumes*

Existing traffic volumes were determined by collecting new turning movement counts during the AM and PM peak periods at the study intersections on an average mid-week day in March 2018. The existing peak hour intersection traffic volumes and lane configurations are shown in **Figure 3**, attached.

### *Level of Service Analysis*

Level of service calculations were performed using the existing traffic volumes, lane configurations, and traffic controls. The results are presented in **Table 2** and the calculation sheets are provided in **Appendix A**, attached.

**Table 2: Existing Conditions Level of Service Summary**

Intersection	Control	Approach	Existing AM		Existing PM	
			LOS	Delay <sup>1</sup>	LOS	Delay
Lemmon Dr / Military Rd	Signal	Overall	C	23.4	C	20.3

Notes: <sup>1</sup> Delay is reported in seconds per vehicle for the overall intersection for signalized controlled intersections, and for the worst approach/movement for side-street stop controlled intersections.

## PROJECT GENERATED TRAFFIC

### *Project Description*

The project location is shown in **Figure 1** and the site plan is provided in **Figure 2**. The project consists of 98 detached single-family residential homes.

### *Trip Generation*

Trip generation rates for the proposed project were obtained from the *Trip Generation Manual, 10th Edition*, published by the Institute of Transportation Engineers. **Table 3** provides the Daily, AM Peak Hour, and PM Peak Hour trip generation calculations for the proposed project.

**Table 3: Trip Generation Estimates**

Land Use	Size	Weekday			AM Peak			PM Peak		
		Total	Entry	Exit	Total	Entry	Exit	Total	Entry	Exit
210 – Single-Family Detached Housing	98 Dwelling Units	926	463	463	73	18	55	97	61	36

Notes: ITE 10th Ed. Trip Generation Rates for Single Family Detached Housing (Per Dwelling Unit) – Daily: 9.44, AM: 0.74, PM: 0.99

As shown in **Table 3**, applying the ITE Trip Generation Manual trip rates, the proposed project is anticipated to generate 926 total Daily trips, 73 total AM peak hour trips, and 97 total PM peak hour trips.

### *Trip Distribution and Assignment*

Traffic generated by the project was distributed to the road network based on the location of the project, major activity centers, and local roadway connections. The following trip distribution percentages were used for distributing the project traffic:

- 90% travelling to/from the south on Lemmon Drive
- 5% travelling to/from the north on Lemmon Drive
- 5% travelling to/from the west on Military Road

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

***Project Access***

The project will access Lemmon Drive using two project driveways, as shown on **Figure 2**. Both access points are proposed to have right-in and right-out movements only with side-street STOP control. It is important to note that since there will be only right-in and right-out movements at Lemmon Drive, residents will have to make a U-turn at the Lemmon Drive / Military Road intersection to travel south on Lemmon Drive.

The Access Management Standards (Table E-2) in the 2040 RTP state that right deceleration lanes at driveways are required on a Moderate Access Control arterial roadway if there are more than 60 inbound, right-turn movements during the peak-hour. The proposed project is anticipated to generate 40 or less inbound right-turn movements at each driveway in the PM peak hour. This is below the threshold of 60 inbound right-turn movements, therefore a right-deceleration lane is not required at either driveway.

**EXISTING PLUS PROJECT CONDITIONS**

***Traffic Volumes***

Existing Plus Project traffic volumes were developed by adding the project generated trips (**Figure 4**) to the existing traffic volumes (**Figure 3**) and are shown on **Figure 5**, attached. The Existing Plus Project condition Peak Hour Factors (PHF) and travel patterns were assumed to remain the same as existing conditions.

***Intersection Level of Service Analysis***

**Table 4** presents the level of service analysis summary for the Existing Plus Project scenario. Detailed calculation sheets are provided in **Appendix B**, attached.

**Table 4: Existing Plus Project Conditions Level of Service Summary**

Intersection	Control	Approach	Plus Project AM		Plus Project PM	
			LOS	Delay	LOS	Delay
Lemmon Dr / Military Rd	Signal	Overall	C	24.4	C	23.7
Lemmon Dr / Snowbrush Ct	Side-Street STOP	Westbound Right	B	10.7	B	13.9
Lemmon Dr / Sunset View Dr	Side-Street STOP	Westbound Right	B	10.7	B	14.1

**Notes:** <sup>1</sup> Delay is reported in seconds per vehicle for the overall intersection for signalized controlled intersections, and for the worst approach/movement for side-street stop controlled intersections.

As shown in **Table 4**, all study intersections are anticipated to operate at acceptable level of service (LOS "C" or better) conditions under the Existing Plus Project scenario. The project does not have any notable impact on the study intersections.

## U-TURN AT LEMMON DRIVE / MILITARY ROAD

### *AutoTURN Analysis*

AutoTURN, a vehicle swept path analysis software was used to determine if large passenger vehicles are able to make a U-turn at the Lemmon Drive / Military Road intersection. **Exhibit B** shows the results of this analysis.



**Exhibit B. AutoTURN Snapshot**

As shown in **Exhibit B**, large passenger vehicles will not have quite enough space to make a U-turn under the existing configuration. It is worth noting that a small vehicle was observed making a U-turn during the video recording. The project should modify the island on the west side of Lemmon Drive to insure that large passenger vehicles can make the northbound to southbound U-turn.

## CONCLUSIONS & RECOMMENDATIONS

The following is a list of our key findings and recommendations:

**Proposed Project:** The project consists of 98 detached single-family residential homes. The project is located on the east side of Lemmon Drive between Sky Vista Parkway and Military Road in Washoe County, NV.

**Project Trips:** The Lemmon Drive Estates project is anticipated to generate 926 Daily trips, 73 AM peak hour trips, and 97 PM peak hour trips.

**Project Access:** The project will access Lemmon Drive using two project driveways. Both access points are proposed to have right-in and right-out movements only with side-street STOP control. It is important to note that since there will be only right-in and right-out movements at Lemmon Drive, residents will have to make a U-turn at the Lemmon Drive / Military Road intersection to travel south on Lemmon Drive.

The Access Management Standards (Table E-2) in the 2040 RTP state that right deceleration lanes at driveways are required on a Moderate Access Control arterial roadway if there are more than 60 inbound, right-turn movements during the peak-hour. The proposed project is anticipated to generate 40 or less inbound right-turn movements at each driveway in the PM peak hour. This is below the threshold of 60 inbound right-turn movements, therefore a right-deceleration lane is not required at either driveway.

**Existing Level of Service:** The Lemmon Drive / Military Road intersection currently operates at acceptable level of service conditions (LOS "C") during the AM and PM peak hours.

**Existing Plus Project Level of Service:** With the addition of project traffic, all study intersections are projected to operate at acceptable LOS conditions (LOS "C" or better) under "Existing Plus Project" conditions during both the AM and PM peak hours.

#### **Summary of Proposed Improvements:**

The following are proposed improvements for the project:

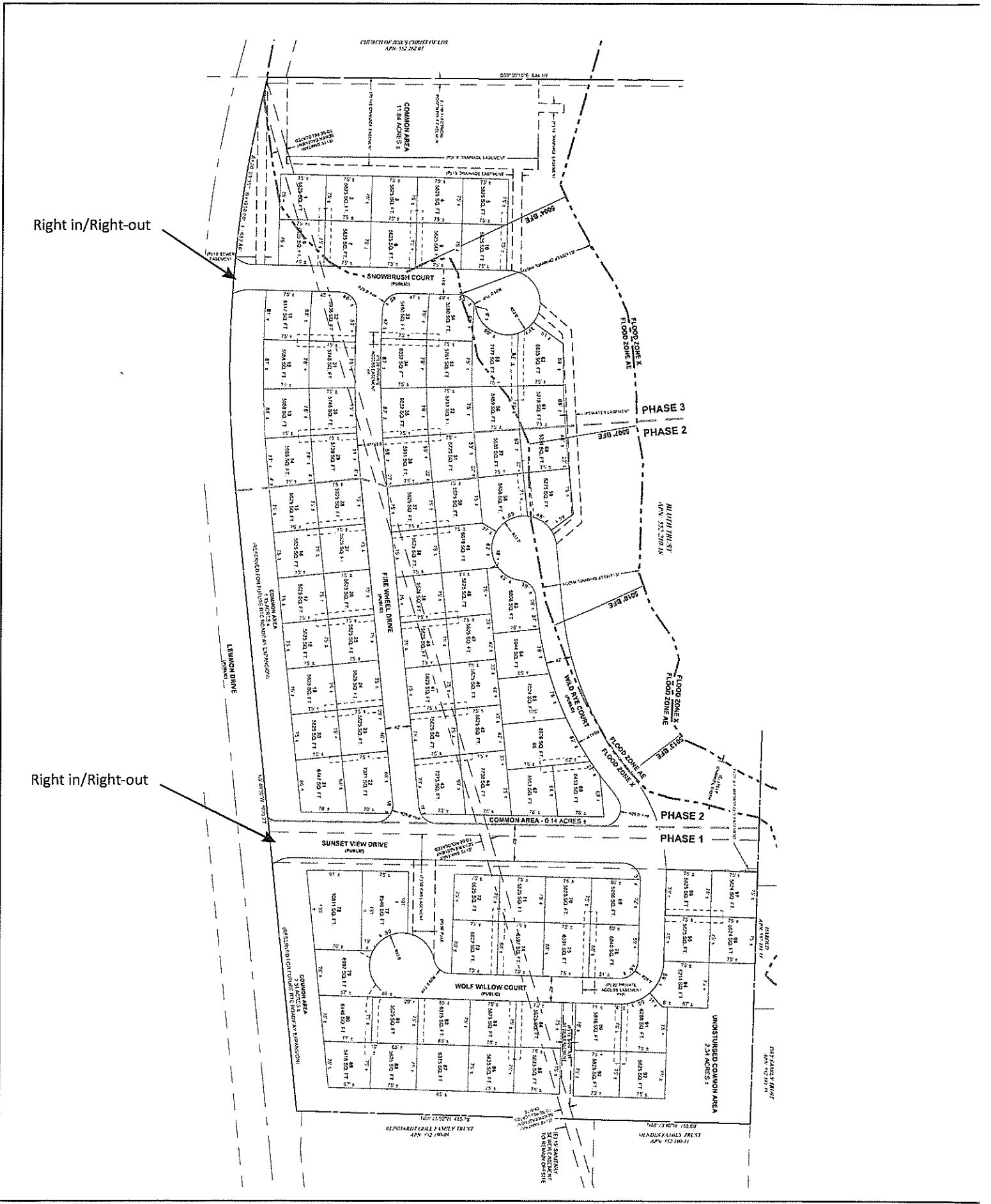
- The project access driveways should be constructed as right-in/right-out only.
- Right turn deceleration lanes are not required at the project driveways.
- The proposed project should modify the channelizing island on the west side of Lemmon Drive at the Lemmon Drive / Military Road intersection to provide enough space for large passenger vehicles to make northbound to southbound U-turns.
- The project should dedicate right-of-way, if necessary, on Lemmon Drive along the project frontage, to accommodate the planned widening from 4 lanes to 6 lanes as stated in the 2040 RTP. See **Appendix C** for the typical regional roadway cross-section. Any right-of-way dedication and any widening improvements may be eligible for a Regional Road Impact Fee (RRIF) waiver/offset agreement.

**Regional Road Impact Fees:** The project's contribution of standard Regional Road Impact Fees will mitigate the minor project effects on the roadway network.





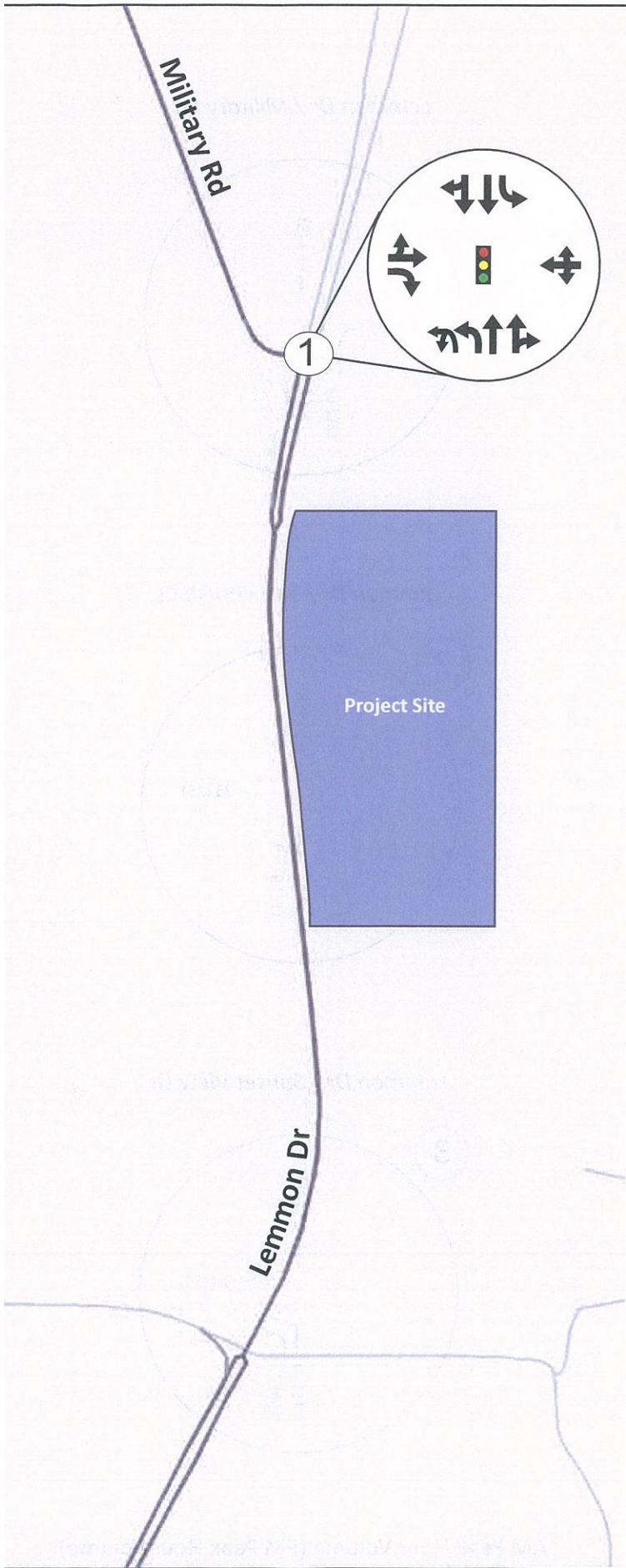
- Study Locations**
- ① Lemmon Dr / Military Rd
  - ② Lemmon Dr / Snowbrush Ct
  - ③ Lemmon Dr / Sunset View Dr



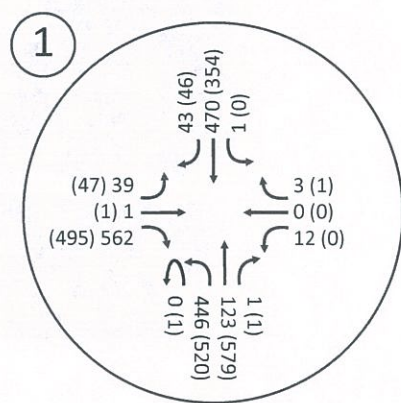
NO SCALE

Figure 2  
Lemmon Drive Estates  
TRAFFIC IMPACT STUDY  
Site Plan

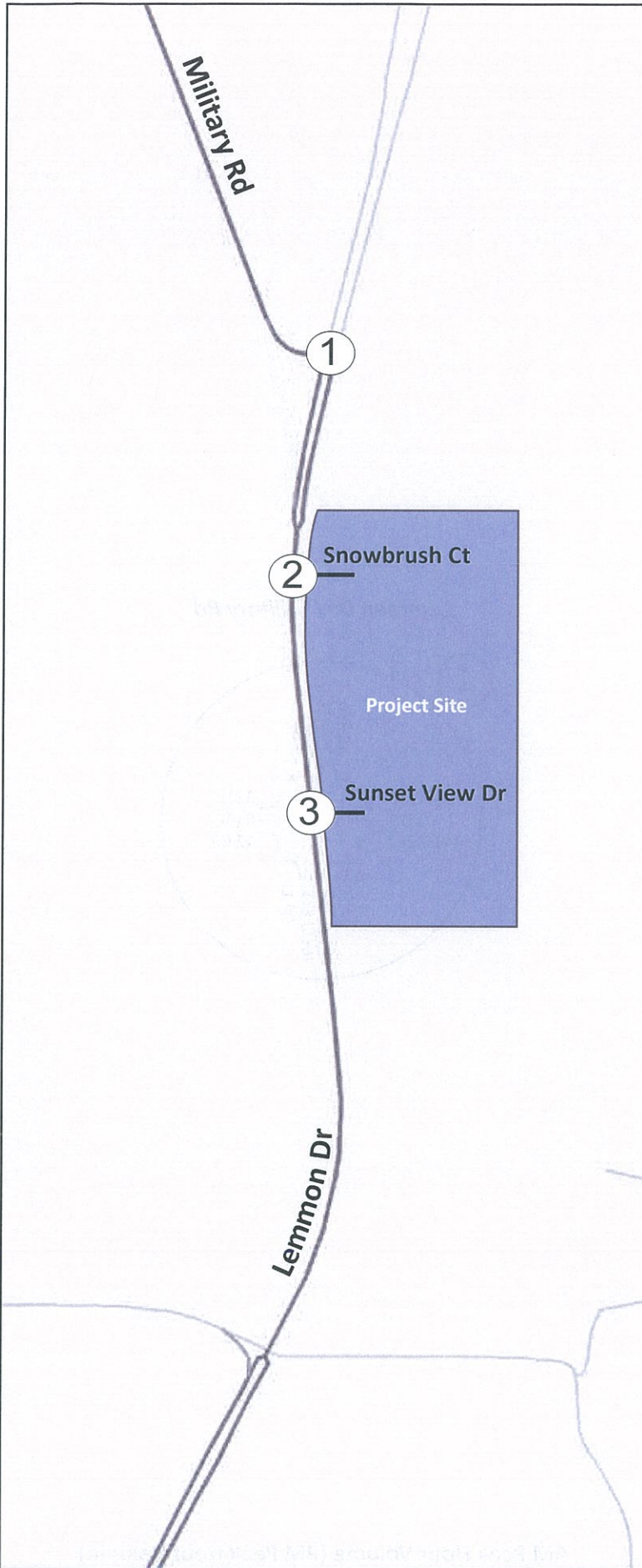




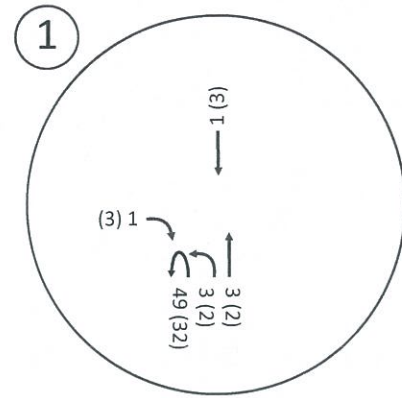
Lemmon Dr / Military Rd



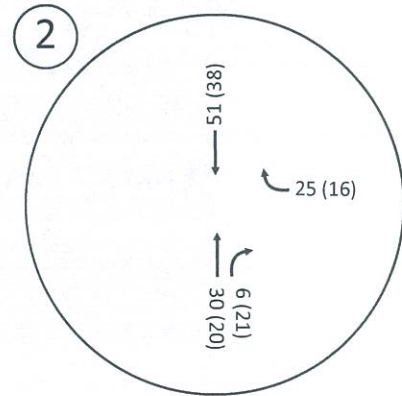
AM Peak Hour Volume (PM Peak Hour Volume)



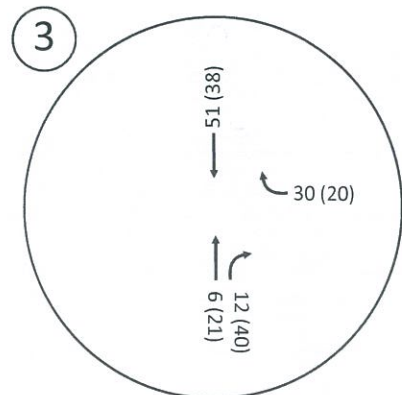
Lemmon Dr / Military Rd



Lemmon Dr / Snowbrush Ct

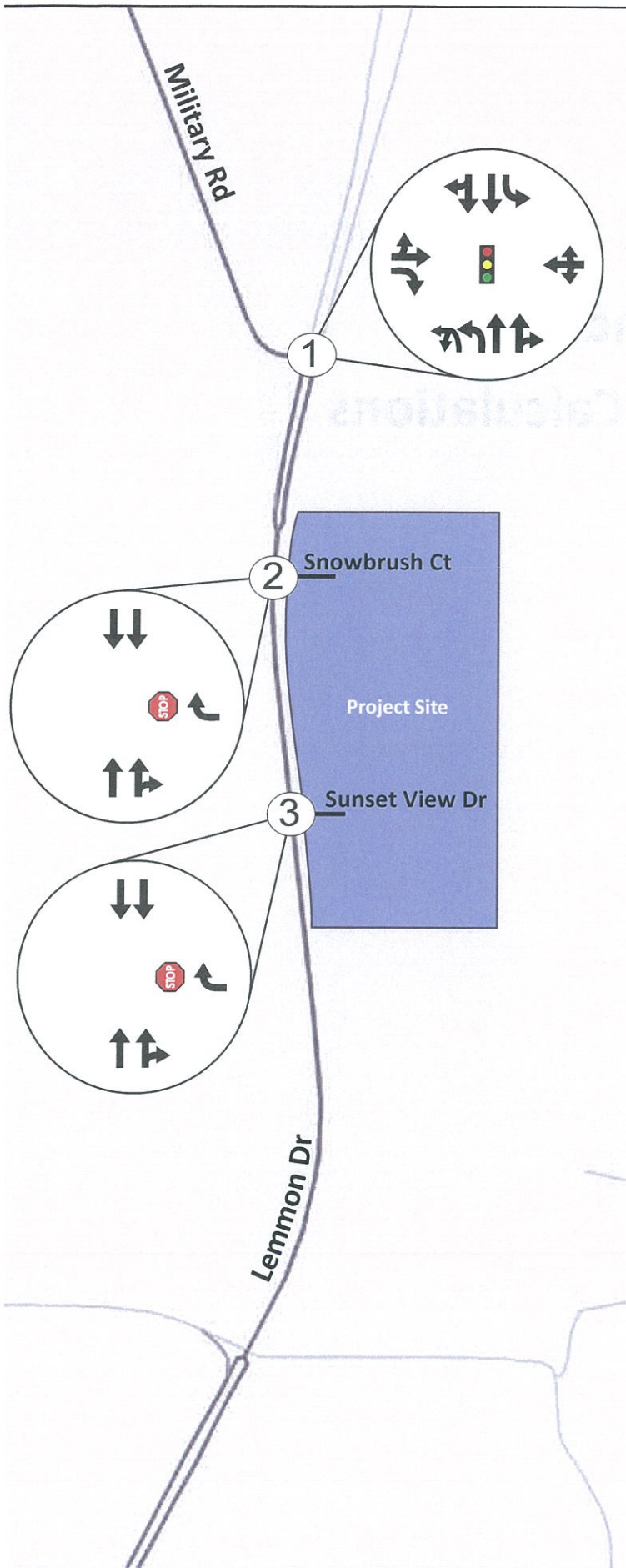


Lemmon Dr / Sunset View Dr

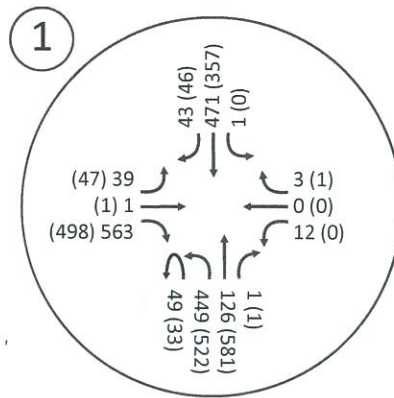


AM Peak Hour Volume (PM Peak Hour Volume)

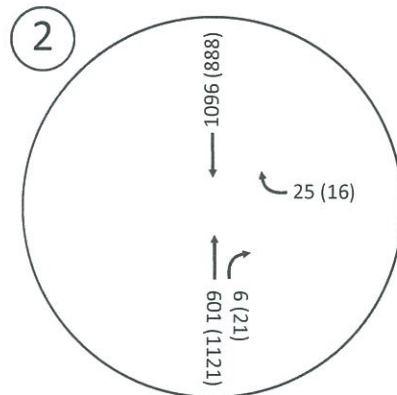




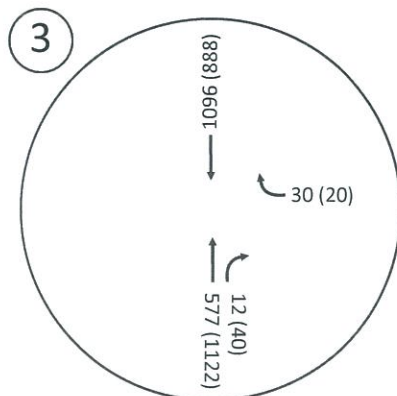
Lemmon Dr / Military Rd



Lemmon Dr / Snowbrush Ct



Lemmon Dr / Sunset View Dr



AM Peak Hour Volume (PM Peak Hour Volume)



# **Appendix A**

## **Existing LOS Calculations**

**Intersection Level Of Service Report**  
**Intersection 1: Lemmon Dr / Military Rd**

Control Type:	Signalized	Delay (sec / veh):	23.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.358

**Intersection Setup**

Name	Lemmon Dr				Lemmon Dr			Military Rd			Church Dwy		
Approach	Northbound				Southbound			Eastbound			Westbound		
Lane Configuration	↔↔↔↔				↔↔↔			↔↔			↔		
Turning Movement	U-tu	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	12.00
No. of Lanes in Pocket	2	0	0	0	1	0	0	0	0	1	0	0	0
Pocket Length [ft]	350.0	100.0	100.0	100.0	215.00	100.00	100.00	100.00	100.00	600.00	100.00	100.00	100.00
Speed [mph]	45.00				45.00			45.00			45.00		
Grade [%]	0.00				0.00			0.00			0.00		
Curb Present	No				No			No			No		
Crosswalk	Yes				Yes			Yes			Yes		

**Volumes**

Name	Lemmon Dr				Lemmon Dr			Military Rd			Church Dwy		
Base Volume Input [veh/h]	0	446	123	1	1	470	43	39	1	562	12	0	3
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
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	1.00
In-Process Volume [veh/h]	0	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	0
Diverted Trips [veh/h]	0	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	0
Existing Site Adjustment Volume [veh/h]	0	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	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	446	123	1	1	470	43	39	1	562	12	0	3
Peak Hour Factor	0.920	0.920	0.920	0.920	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	121	33	0	0	128	12	11	0	153	3	0	1
Total Analysis Volume [veh/h]	0	485	134	1	1	511	47	42	1	611	13	0	3
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	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0				0			0			0		
v_di, Inbound Pedestrian Volume crossing	0				0			0			0		
v_co, Outbound Pedestrian Volume crossing	0				0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0				0			0			0		
v_ab, Corner 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]	90
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

**Phasing & Timing**

Control Type	Permi	Prote	Permi	Permi	Protecte	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss
Signal group	0	5	2	0	1	6	0	0	4	0	0	8	0
Auxiliary Signal Groups													
Lead / Lag	-	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	4	6	0	4	6	0	0	4	0	0	4	0
Maximum Green [s]	0	20	35	0	15	35	0	0	20	0	0	15	0
Amber [s]	0.0	4.1	5.0	0.0	4.0	4.9	0.0	0.0	4.7	0.0	0.0	4.7	0.0
All red [s]	0.0	3.0	1.0	0.0	2.9	1.0	0.0	0.0	2.8	0.0	0.0	2.8	0.0
Split [s]	0	25	40	0	11	26	0	0	39	0	0	39	0
Vehicle Extension [s]	0.0	2.7	3.2	0.0	2.7	3.2	0.0	0.0	3.2	0.0	0.0	1.7	0.0
Walk [s]	0	0	7	0	0	10	0	0	9	0	0	10	0
Pedestrian Clearance [s]	0	0	8	0	0	10	0	0	20	0	0	19	0
Rest In Walk			No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	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]	0.0	5.1	4.0	0.0	4.9	3.9	0.0	0.0	5.5	0.0	0.0	5.5	0.0
Minimum Recall		No	Yes		No	Yes			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	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	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	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	C	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	7.10	6.00	6.00	6.90	5.90	5.90	7.50	7.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
l2, Clearance Lost Time [s]	5.10	4.00	4.00	4.90	3.90	3.90	5.50	5.50
g_i, Effective Green Time [s]	16	66	66	0	50	50	3	3
g / C, Green / Cycle	0.18	0.74	0.74	0.00	0.56	0.56	0.03	0.03
(v / s)_i Volume / Saturation Flow Rate	0.16	0.04	0.04	0.00	0.17	0.17	0.03	0.01
s, saturation flow rate [veh/h]	3063	1656	1652	1577	1656	1608	1527	1580
c, Capacity [veh/h]	552	1221	1218	3	924	897	131	127
d1, Uniform Delay [s]	35.95	3.24	3.24	44.88	10.61	10.62	43.15	42.40
k, delay calibration	0.09	0.50	0.50	0.09	0.50	0.50	0.12	0.04
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.08	0.09	0.09	57.42	0.86	0.89	1.55	0.16
d3, Initial Queue Delay [s]	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
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

**Lane Group Results**

X, volume / capacity	0.88	0.06	0.06	0.36	0.31	0.31	0.33	0.13
d, Delay for Lane Group [s/veh]	40.04	3.32	3.32	102.31	11.46	11.51	44.71	42.57
Lane Group LOS	D	A	A	F	B	B	D	D
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh]	5.19	0.24	0.24	0.07	2.76	2.71	0.97	0.34
50th-Percentile Queue Length [ft]	129.82	5.98	5.96	1.63	69.07	67.65	24.18	8.47
95th-Percentile Queue Length [veh]	8.93	0.43	0.43	0.12	4.97	4.87	1.74	0.61
95th-Percentile Queue Length [ft]	223.25	10.76	10.74	2.94	124.33	121.77	43.53	15.24

**Movement, Approach, & Intersection Results**

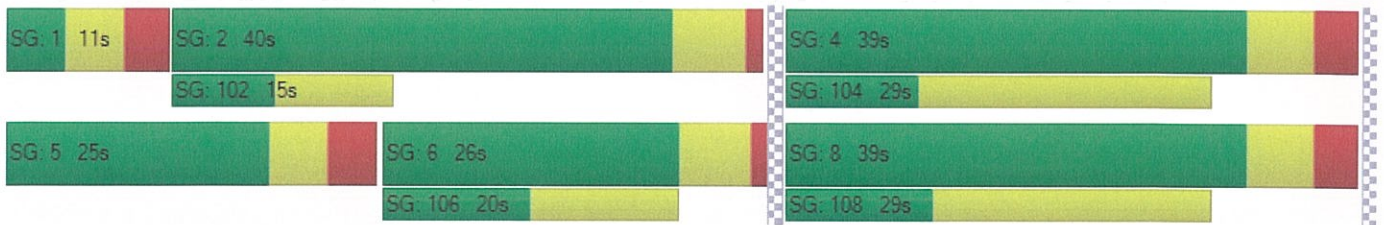
d_M, Delay for Movement [s/veh]	40.04	40.04	3.32	3.32	102.31	11.48	11.51	44.71	44.71	0.00	42.57	42.57	42.57
Movement LOS	D	D	A	A	F	B	B	D	D		D	D	D
d_A, Approach Delay [s/veh]	32.04				11.65			44.71			42.57		
Approach LOS	C				B			D			D		
d_I, Intersection Delay [s/veh]	23.41												
Intersection LOS	C												
Intersection V/C	0.358												

**Other Modes**

g_Walk,mi, Effective Walk Time [s]	13.0	14.0	14.0	11.0
M_corner, Corner Circulation Area [ft <sup>2</sup> /ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft <sup>2</sup> /ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	32.94	32.09	32.09	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.748	2.572	2.435	1.728
Crosswalk LOS	B	B	B	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	756	447	700	700
d_b, Bicycle Delay [s]	17.42	27.14	19.01	19.01
I_b,int, Bicycle LOS Score for Intersection	1.671	2.021	1.631	1.586
Bicycle LOS	A	B	A	A

**Sequence**

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-





**Intersection Level Of Service Report**  
**Intersection 1: Lemmon Dr / Military Rd**

Control Type:	Signalized	Delay (sec / veh):	20.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.358

**Intersection Setup**

Name	Lemmon Dr				Lemmon Dr			Military Rd			Church Dwy		
Approach	Northbound				Southbound			Eastbound			Westbound		
Lane Configuration	↔↔↔↔				↔↔↔			↔↔			+		
Turning Movement	U-tu	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	12.00
No. of Lanes in Pocket	2	0	0	0	1	0	0	0	0	1	0	0	0
Pocket Length [ft]	350.0	100.0	100.0	100.0	215.00	100.00	100.00	100.00	100.00	600.00	100.00	100.00	100.00
Speed [mph]	45.00				45.00			45.00			45.00		
Grade [%]	0.00				0.00			0.00			0.00		
Curb Present	No				No			No			No		
Crosswalk	Yes				Yes			Yes			Yes		

**Volumes**

Name	Lemmon Dr				Lemmon Dr			Military Rd			Church Dwy		
Base Volume Input [veh/h]	1	520	579	1	0	354	46	47	1	495	0	0	1
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
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	1.00
In-Process Volume [veh/h]	0	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	0
Diverted Trips [veh/h]	0	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	0
Existing Site Adjustment Volume [veh/h]	0	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	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	520	579	1	0	354	46	47	1	495	0	0	1
Peak Hour Factor	0.910	0.910	0.910	0.910	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	143	159	0	0	97	13	13	0	136	0	0	0
Total Analysis Volume [veh/h]	1	571	636	1	0	389	51	52	1	544	0	0	1
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	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0				0			0			0		
v_di, Inbound Pedestrian Volume crossing	0				0			0			0		
v_co, Outbound Pedestrian Volume crossing	1				0			0			1		
v_ci, Inbound Pedestrian Volume crossing	1				0			0			1		
v_ab, Corner 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]	90
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

**Phasing & Timing**

Control Type	Permi	Prote	Permi	Permi	Protecte	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss
Signal group	0	5	2	0	1	6	0	0	4	0	0	8	0
Auxiliary Signal Groups													
Lead / Lag	-	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	4	6	0	4	6	0	0	4	0	0	4	0
Maximum Green [s]	0	20	35	0	15	35	0	0	20	0	0	15	0
Amber [s]	0.0	4.1	5.0	0.0	4.0	4.9	0.0	0.0	4.7	0.0	0.0	4.7	0.0
All red [s]	0.0	3.0	1.0	0.0	2.9	1.0	0.0	0.0	2.8	0.0	0.0	2.8	0.0
Split [s]	0	25	40	0	11	26	0	0	39	0	0	39	0
Vehicle Extension [s]	0.0	2.7	3.2	0.0	2.7	3.2	0.0	0.0	3.2	0.0	0.0	1.7	0.0
Walk [s]	0	0	7	0	0	10	0	0	9	0	0	10	0
Pedestrian Clearance [s]	0	0	8	0	0	10	0	0	20	0	0	19	0
Rest In Walk			No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	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]	0.0	5.1	4.0	0.0	4.9	3.9	0.0	0.0	5.5	0.0	0.0	5.5	0.0
Minimum Recall		No	Yes		No	Yes			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	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	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	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	C	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	7.10	6.00	6.00	6.90	5.90	5.90	7.50	7.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
l2, Clearance Lost Time [s]	5.10	4.00	4.00	4.90	3.90	3.90	5.50	5.50
g_i, Effective Green Time [s]	18	66	66	0	48	48	4	4
g / C, Green / Cycle	0.20	0.73	0.73	0.00	0.53	0.53	0.04	0.04
(v / s)_i Volume / Saturation Flow Rate	0.19	0.19	0.19	0.00	0.13	0.14	0.04	0.00
s, saturation flow rate [veh/h]	3088	1669	1669	1590	1669	1603	1413	762
c, Capacity [veh/h]	614	1215	1214	1	882	847	143	74
d1, Uniform Delay [s]	35.45	4.13	4.13	0.00	11.57	11.59	42.50	41.06
k, delay calibration	0.09	0.50	0.50	0.09	0.50	0.50	0.12	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.12	0.53	0.53	0.00	0.69	0.73	1.73	0.03
d3, Initial Queue Delay [s]	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
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

**Lane Group Results**

X, volume / capacity	0.93	0.26	0.26	0.00	0.25	0.26	0.37	0.01
d, Delay for Lane Group [s/veh]	41.57	4.66	4.66	0.00	12.26	12.32	44.23	41.09
Lane Group LOS	D	A	A	A	B	B	D	D
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh]	6.30	1.45	1.45	0.00	2.28	2.23	1.19	0.02
50th-Percentile Queue Length [ft]	157.54	36.14	36.13	0.00	57.12	55.79	29.64	0.52
95th-Percentile Queue Length [veh]	10.42	2.60	2.60	0.00	4.11	4.02	2.13	0.04
95th-Percentile Queue Length [ft]	260.46	65.06	65.03	0.00	102.82	100.43	53.36	0.94

**Movement, Approach, & Intersection Results**

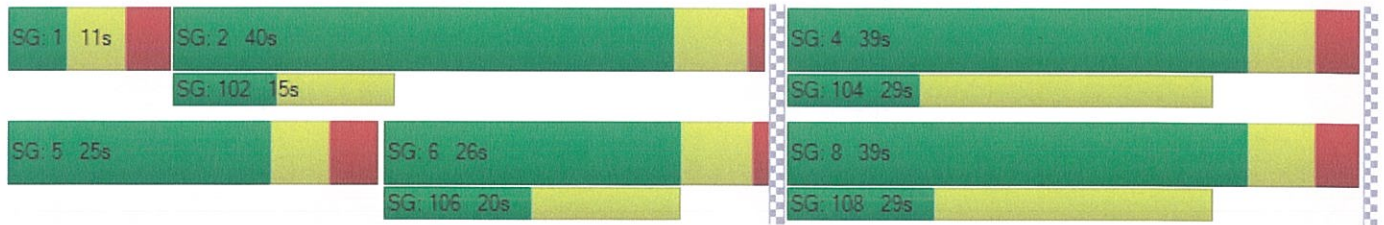
d_M, Delay for Movement [s/veh]	41.57	41.57	4.66	4.66	0.00	12.28	12.32	44.23	44.23	0.00	41.09	41.09	41.09
Movement LOS	D	D	A	A	A	B	B	D	D		D	D	D
d_A, Approach Delay [s/veh]	22.12				12.29			44.23			41.09		
Approach LOS	C				B			D			D		
d_I, Intersection Delay [s/veh]	20.28												
Intersection LOS	C												
Intersection V/C	0.358												

**Other Modes**

g_Walk,mi, Effective Walk Time [s]	13.0		14.0		14.0		11.0	
M_corner, Corner Circulation Area [ft <sup>2</sup> /ped]	-21.67		0.00		0.00		-21.67	
M_CW, Crosswalk Circulation Area [ft <sup>2</sup> /ped]	0.00		0.00		0.00		-49.91	
d_p, Pedestrian Delay [s]	32.94		32.09		32.09		34.67	
l_p,int, Pedestrian LOS Score for Intersection	2.841		2.700		2.455		1.717	
Crosswalk LOS	C		B		B		A	
s_b, Saturation Flow Rate of the bicycle lane	2000		2000		2000		2000	
c_b, Capacity of the bicycle lane [bicycles/h]	756		447		700		700	
d_b, Bicycle Delay [s]	17.42		27.14		19.01		19.01	
l_b,int, Bicycle LOS Score for Intersection	2.086		1.923		1.647		1.561	
Bicycle LOS	B		A		A		A	

**Sequence**

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



**Appendix B**  
**Existing Plus**  
**Project LOS Calculations**



**Intersection Level Of Service Report**  
**Intersection 1: Lemmon Dr / Military Rd**

Control Type:	Signalized	Delay (sec / veh):	24.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.377

**Intersection Setup**

Name	Lemmon Dr				Lemmon Dr			Military Rd			Church Dwy		
Approach	Northbound				Southbound			Eastbound			Westbound		
Lane Configuration													
Turning Movement	U-tu	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	12.00
No. of Lanes in Pocket	2	0	0	0	1	0	0	0	0	1	0	0	0
Pocket Length [ft]	350.0	100.0	100.0	100.0	215.00	100.00	100.00	100.00	100.00	600.00	100.00	100.00	100.00
Speed [mph]	45.00				45.00			45.00			45.00		
Grade [%]	0.00				0.00			0.00			0.00		
Curb Present	No				No			No			No		
Crosswalk	Yes				Yes			Yes			Yes		

**Volumes**

Name	Lemmon Dr				Lemmon Dr			Military Rd			Church Dwy		
Base Volume Input [veh/h]	0	446	123	1	1	470	43	39	1	562	12	0	3
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
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	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	49	3	3	0	0	1	0	0	0	1	0	0	0
Diverted Trips [veh/h]	0	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	0
Existing Site Adjustment Volume [veh/h]	0	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	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	49	449	126	1	1	471	43	39	1	563	12	0	3
Peak Hour Factor	0.920	0.920	0.920	0.920	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	122	34	0	0	128	12	11	0	153	3	0	1
Total Analysis Volume [veh/h]	53	488	137	1	1	512	47	42	1	612	13	0	3
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	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0				0			0			0		
v_di, Inbound Pedestrian Volume crossing	0				0			0			0		
v_co, Outbound Pedestrian Volume crossing	0				0			0			0		
v_ci, Inbound Pedestrian Volume crossing	0				0			0			0		
v_ab, Corner 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]	90
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

**Phasing & Timing**

Control Type	Permi	Prote	Permi	Permi	Protecte	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss
Signal group	0	5	2	0	1	6	0	0	4	0	0	8	0
Auxiliary Signal Groups													
Lead / Lag	-	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	4	6	0	4	6	0	0	4	0	0	4	0
Maximum Green [s]	0	20	35	0	15	35	0	0	20	0	0	15	0
Amber [s]	0.0	4.1	5.0	0.0	4.0	4.9	0.0	0.0	4.7	0.0	0.0	4.7	0.0
All red [s]	0.0	3.0	1.0	0.0	2.9	1.0	0.0	0.0	2.8	0.0	0.0	2.8	0.0
Split [s]	0	25	40	0	11	26	0	0	39	0	0	39	0
Vehicle Extension [s]	0.0	2.7	3.2	0.0	2.7	3.2	0.0	0.0	3.2	0.0	0.0	1.7	0.0
Walk [s]	0	0	7	0	0	10	0	0	9	0	0	10	0
Pedestrian Clearance [s]	0	0	8	0	0	10	0	0	20	0	0	19	0
Rest In Walk			No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	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]	0.0	5.1	4.0	0.0	4.9	3.9	0.0	0.0	5.5	0.0	0.0	5.5	0.0
Minimum Recall		No	Yes		No	Yes			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	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	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	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	C	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	7.10	6.00	6.00	6.90	5.90	5.90	7.50	7.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
l2, Clearance Lost Time [s]	5.10	4.00	4.00	4.90	3.90	3.90	5.50	5.50
g_i, Effective Green Time [s]	18	66	66	0	49	49	3	3
g / C, Green / Cycle	0.20	0.74	0.74	0.00	0.54	0.54	0.03	0.03
(v / s)_i Volume / Saturation Flow Rate	0.18	0.04	0.04	0.00	0.17	0.17	0.03	0.01
s, saturation flow rate [veh/h]	3063	1656	1652	1577	1656	1608	1527	1580
c, Capacity [veh/h]	600	1221	1218	3	898	872	131	127
d1, Uniform Delay [s]	35.36	3.24	3.24	44.88	11.38	11.39	43.15	42.40
k, delay calibration	0.09	0.50	0.50	0.09	0.50	0.50	0.12	0.04
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.64	0.09	0.09	57.42	0.92	0.95	1.55	0.16
d3, Initial Queue Delay [s]	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
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

**Lane Group Results**

X, volume / capacity	0.90	0.06	0.06	0.36	0.32	0.32	0.33	0.13
d, Delay for Lane Group [s/veh]	39.99	3.33	3.33	102.31	12.30	12.34	44.71	42.57
Lane Group LOS	D	A	A	F	B	B	D	D
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh]	5.82	0.24	0.24	0.07	2.91	2.85	0.97	0.34
50th-Percentile Queue Length [ft]	145.54	6.12	6.10	1.63	72.80	71.30	24.18	8.47
95th-Percentile Queue Length [veh]	9.78	0.44	0.44	0.12	5.24	5.13	1.74	0.61
95th-Percentile Queue Length [ft]	244.47	11.01	10.99	2.94	131.03	128.34	43.53	15.24

**Movement, Approach, & Intersection Results**

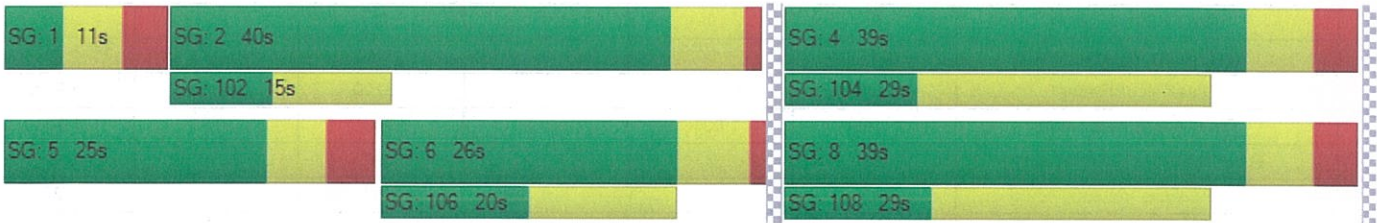
d_M, Delay for Movement [s/veh]	39.99	39.99	3.33	3.33	102.31	12.32	12.34	44.71	44.71	0.00	42.57	42.57	42.57
Movement LOS	D	D	A	A	F	B	B	D	D		D	D	D
d_A, Approach Delay [s/veh]	32.54			12.48			44.71			42.57			
Approach LOS	C			B			D			D			
d_I, Intersection Delay [s/veh]	24.41												
Intersection LOS	C												
Intersection V/C	0.377												

**Other Modes**

g_Walk,mi, Effective Walk Time [s]	13.0		14.0		14.0		11.0	
M_corner, Corner Circulation Area [ft <sup>2</sup> /ped]	0.00		0.00		0.00		0.00	
M_CW, Crosswalk Circulation Area [ft <sup>2</sup> /ped]	0.00		0.00		0.00		0.00	
d_p, Pedestrian Delay [s]	32.94		32.09		32.09		34.67	
I_p,int, Pedestrian LOS Score for Intersection	2.838		2.573		2.436		1.728	
Crosswalk LOS	C		B		B		A	
s_b, Saturation Flow Rate of the bicycle lane	2000		2000		2000		2000	
c_b, Capacity of the bicycle lane [bicycles/h]	756		447		700		700	
d_b, Bicycle Delay [s]	17.42		27.14		19.01		19.01	
I_b,int, Bicycle LOS Score for Intersection	1.717		2.022		1.631		1.586	
Bicycle LOS	A		B		A		A	

**Sequence**

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-





**Intersection Level Of Service Report**  
**Intersection 2: Lemmon Dr / Snowbrush Ct**

Control Type:	Two-way stop	Delay (sec / veh):	10.7
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.041

**Intersection Setup**

Name	Lemmon Dr		Lemmon Dr		Snowbrush Ct	
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]	45.00		45.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

**Volumes**

Name	Lemmon Dr		Lemmon Dr		Snowbrush Ct	
Base Volume Input [veh/h]	571	0	0	1045	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.00	4.00	2.00	4.00	2.00	4.00
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]	30	6	0	51	0	25
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]	601	6	0	1096	0	25
Peak Hour Factor	0.9200	0.9200	1.0000	0.9200	1.0000	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	163	2	0	298	0	7
Total Analysis Volume [veh/h]	653	7	0	1191	0	27
Pedestrian Volume [ped/h]	0		0		0	



**Intersection Settings**

Priority Scheme	Free	Free	Stop
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	0.01	0.00	0.00	0.01	0.00	0.04
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	0.00	0.00	10.69
Movement LOS	A	A		A		B
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.00	0.13
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	0.00	3.19
d_A, Approach Delay [s/veh]	0.00		0.00		10.69	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.15					
Intersection LOS	B					

**Intersection Level Of Service Report**  
**Intersection 3: Lemmon Dr / Sunset View Dr**

Control Type:	Two-way stop	Delay (sec / veh):	10.7
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.049

**Intersection Setup**

Name	Lemmon Dr		Lemmon Dr		Sunset View Dr	
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]	45.00		45.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

**Volumes**

Name	Lemmon Dr		Lemmon Dr		Sunset View Dr	
Base Volume Input [veh/h]	571	0	0	1045	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.00	4.00	2.00	4.00	2.00	4.00
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	12	0	51	0	30
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]	577	12	0	1096	0	30
Peak Hour Factor	0.9200	0.9200	1.0000	0.9200	1.0000	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	157	3	0	298	0	8
Total Analysis Volume [veh/h]	627	13	0	1191	0	33
Pedestrian Volume [ped/h]	0		0		0	

**Intersection Settings**

Priority Scheme	Free	Free	Stop
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	0.01	0.00	0.00	0.01	0.00	0.05
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	0.00	0.00	10.65
Movement LOS	A	A		A		B
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.00	0.16
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	0.00	3.88
d_A, Approach Delay [s/veh]	0.00		0.00		10.65	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.19					
Intersection LOS	B					



**Intersection Level Of Service Report**  
**Intersection 1: Lemmon Dr / Military Rd**

Control Type:	Signalized	Delay (sec / veh):	23.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.371

**Intersection Setup**

Name	Lemmon Dr				Lemmon Dr			Military Rd			Church Dwy		
Approach	Northbound				Southbound			Eastbound			Westbound		
Lane Configuration	↔↔↔↔				↔↔			↕↕			↕		
Turning Movement	U-tu	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	12.00
No. of Lanes in Pocket	2	0	0	0	1	0	0	0	0	1	0	0	0
Pocket Length [ft]	350.0	100.0	100.0	100.0	215.00	100.00	100.00	100.00	100.00	600.00	100.00	100.00	100.00
Speed [mph]	45.00				45.00			45.00			45.00		
Grade [%]	0.00				0.00			0.00			0.00		
Curb Present	No				No			No			No		
Crosswalk	Yes				Yes			Yes			Yes		

**Volumes**

Name	Lemmon Dr				Lemmon Dr			Military Rd			Church Dwy		
Base Volume Input [veh/h]	1	520	579	1	0	354	46	47	1	495	0	0	1
Base Volume Adjustment Factor	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
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	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	32	2	2	0	0	3	0	0	0	3	0	0	0
Diverted Trips [veh/h]	0	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	0
Existing Site Adjustment Volume [veh/h]	0	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	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	33	522	581	1	0	357	46	47	1	498	0	0	1
Peak Hour Factor	0.910	0.910	0.910	0.910	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.000	1.000	1.000	1.000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	9	143	160	0	0	98	13	13	0	137	0	0	0
Total Analysis Volume [veh/h]	36	574	638	1	0	392	51	52	1	547	0	0	1
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	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0				0			0			0		
v_di, Inbound Pedestrian Volume crossing	0				0			0			0		
v_co, Outbound Pedestrian Volume crossing	1				0			0			1		
v_ci, Inbound Pedestrian Volume crossing	1				0			0			1		
v_ab, Corner 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]	90
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

**Phasing & Timing**

Control Type	Permi	Prote	Permi	Permi	Protecte	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss
Signal group	0	5	2	0	1	6	0	0	4	0	0	8	0
Auxiliary Signal Groups													
Lead / Lag	-	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	0	4	6	0	4	6	0	0	4	0	0	4	0
Maximum Green [s]	0	20	35	0	15	35	0	0	20	0	0	15	0
Amber [s]	0.0	4.1	5.0	0.0	4.0	4.9	0.0	0.0	4.7	0.0	0.0	4.7	0.0
All red [s]	0.0	3.0	1.0	0.0	2.9	1.0	0.0	0.0	2.8	0.0	0.0	2.8	0.0
Split [s]	0	25	40	0	11	26	0	0	39	0	0	39	0
Vehicle Extension [s]	0.0	2.7	3.2	0.0	2.7	3.2	0.0	0.0	3.2	0.0	0.0	1.7	0.0
Walk [s]	0	0	7	0	0	10	0	0	9	0	0	10	0
Pedestrian Clearance [s]	0	0	8	0	0	10	0	0	20	0	0	19	0
Rest In Walk			No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	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]	0.0	5.1	4.0	0.0	4.9	3.9	0.0	0.0	5.5	0.0	0.0	5.5	0.0
Minimum Recall		No	Yes		No	Yes			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	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	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	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	C	C
C, Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	7.10	6.00	6.00	6.90	5.90	5.90	7.50	7.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
l2, Clearance Lost Time [s]	5.10	4.00	4.00	4.90	3.90	3.90	5.50	5.50
g_i, Effective Green Time [s]	18	66	66	0	48	48	4	4
g / C, Green / Cycle	0.20	0.73	0.73	0.00	0.53	0.53	0.04	0.04
(v / s)_i Volume / Saturation Flow Rate	0.20	0.19	0.19	0.00	0.13	0.14	0.04	0.00
s, saturation flow rate [veh/h]	3088	1669	1669	1590	1669	1603	1413	762
c, Capacity [veh/h]	614	1215	1214	1	882	847	143	74
d1, Uniform Delay [s]	35.99	4.13	4.13	0.00	11.58	11.60	42.50	41.06
k, delay calibration	0.09	0.50	0.50	0.09	0.50	0.50	0.12	0.04
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	14.08	0.53	0.53	0.00	0.70	0.74	1.73	0.03
d3, Initial Queue Delay [s]	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
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

**Lane Group Results**

X, volume / capacity	0.99	0.26	0.26	0.00	0.25	0.26	0.37	0.01
d, Delay for Lane Group [s/veh]	50.07	4.66	4.66	0.00	12.28	12.34	44.23	41.09
Lane Group LOS	D	A	A	A	B	B	D	D
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh]	7.46	1.45	1.45	0.00	2.30	2.25	1.19	0.02
50th-Percentile Queue Length [ft]	186.47	36.29	36.27	0.00	57.58	56.24	29.64	0.52
95th-Percentile Queue Length [veh]	11.94	2.61	2.61	0.00	4.15	4.05	2.13	0.04
95th-Percentile Queue Length [ft]	298.45	65.31	65.29	0.00	103.64	101.23	53.36	0.94



**Movement, Approach, & Intersection Results**

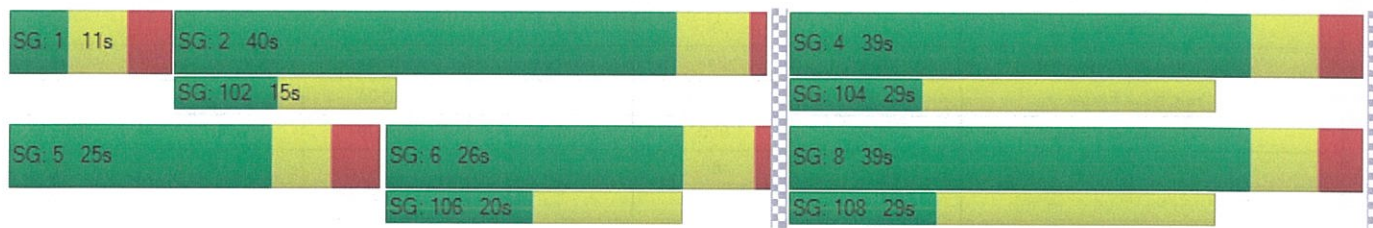
d_M, Delay for Movement [s/veh]	50.07	50.07	4.66	4.66	0.00	12.30	12.34	44.23	44.23	0.00	41.09	41.09	41.09
Movement LOS	D	D	A	A	A	B	B	D	D		D	D	D
d_A, Approach Delay [s/veh]	26.84				12.31			44.23			41.09		
Approach LOS	C				B			D			D		
d_I, Intersection Delay [s/veh]	23.69												
Intersection LOS	C												
Intersection V/C	0.371												

**Other Modes**

g_Walk,mi, Effective Walk Time [s]	13.0		14.0		14.0		11.0	
M_corner, Corner Circulation Area [ft <sup>2</sup> /ped]	-21.67		0.00		0.00		-21.67	
M_CW, Crosswalk Circulation Area [ft <sup>2</sup> /ped]	0.00		0.00		0.00		-49.91	
d_p, Pedestrian Delay [s]	32.94		32.09		32.09		34.67	
I_p,int, Pedestrian LOS Score for Intersection	2.902		2.702		2.456		1.717	
Crosswalk LOS	C		B		B		A	
s_b, Saturation Flow Rate of the bicycle lane	2000		2000		2000		2000	
c_b, Capacity of the bicycle lane [bicycles/h]	756		447		700		700	
d_b, Bicycle Delay [s]	17.42		27.14		19.01		19.01	
I_b,int, Bicycle LOS Score for Intersection	2.116		1.925		1.647		1.561	
Bicycle LOS	B		A		A		A	

**Sequence**

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



**Intersection Level Of Service Report**  
**Intersection 2: Lemmon Dr / Snowbrush Ct**

Control Type:	Two-way stop	Delay (sec / veh):	13.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.042

**Intersection Setup**

Name	Lemmon Dr		Lemmon Dr		Snowbrush Ct	
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]	45.00		45.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

**Volumes**

Name	Lemmon Dr		Lemmon Dr		Snowbrush Ct	
Base Volume Input [veh/h]	1101	0	0	850	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	3.00	2.00	3.00	2.00	3.00
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]	20	21	0	38	0	16
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]	1121	21	0	888	0	16
Peak Hour Factor	0.9100	0.9100	1.0000	0.9100	1.0000	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	308	6	0	244	0	4
Total Analysis Volume [veh/h]	1232	23	0	976	0	18
Pedestrian Volume [ped/h]	0		0		0	



**Intersection Settings**

Priority Scheme	Free	Free	Stop
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	0.01	0.00	0.00	0.01	0.00	0.04
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	0.00	0.00	13.88
Movement LOS	A	A		A		B
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.00	0.13
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	0.00	3.32
d_A, Approach Delay [s/veh]	0.00		0.00		13.88	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.11					
Intersection LOS	B					

**Intersection Level Of Service Report**  
**Intersection 3: Lemmon Dr / Sunset View Dr**

Control Type:	Two-way stop	Delay (sec / veh):	14.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.053

**Intersection Setup**

Name	Lemmon Dr		Lemmon Dr		Sunset View Dr	
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]	45.00		45.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		Yes	

**Volumes**

Name	Lemmon Dr		Lemmon Dr		Sunset View Dr	
Base Volume Input [veh/h]	1101	0	0	850	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	3.00	2.00	3.00	2.00	3.00
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]	21	40	0	38	0	20
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]	1122	40	0	888	0	20
Peak Hour Factor	0.9100	0.9100	1.0000	0.9100	1.0000	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	308	11	0	244	0	5
Total Analysis Volume [veh/h]	1233	44	0	976	0	22
Pedestrian Volume [ped/h]	0		0		0	

**Intersection Settings**

Priority Scheme	Free	Free	Stop
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	0.01	0.00	0.00	0.01	0.00	0.05
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	0.00	0.00	14.12
Movement LOS	A	A		A		B
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.00	0.17
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	0.00	4.17
d_A, Approach Delay [s/veh]	0.00		0.00		14.12	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	0.14					
Intersection LOS	B					

**Appendix C**  
**Typical Regional Roadway Cross-Section**



Appendix C. Typical Roadway Cross-Section

