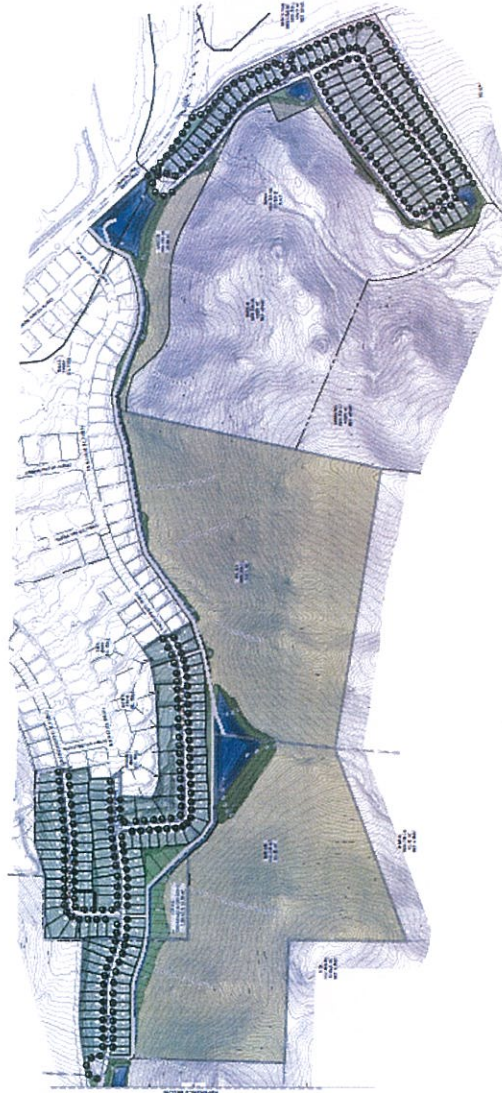


Lemmon Valley Heights

Tentative Map

January 2018



Prepared For:

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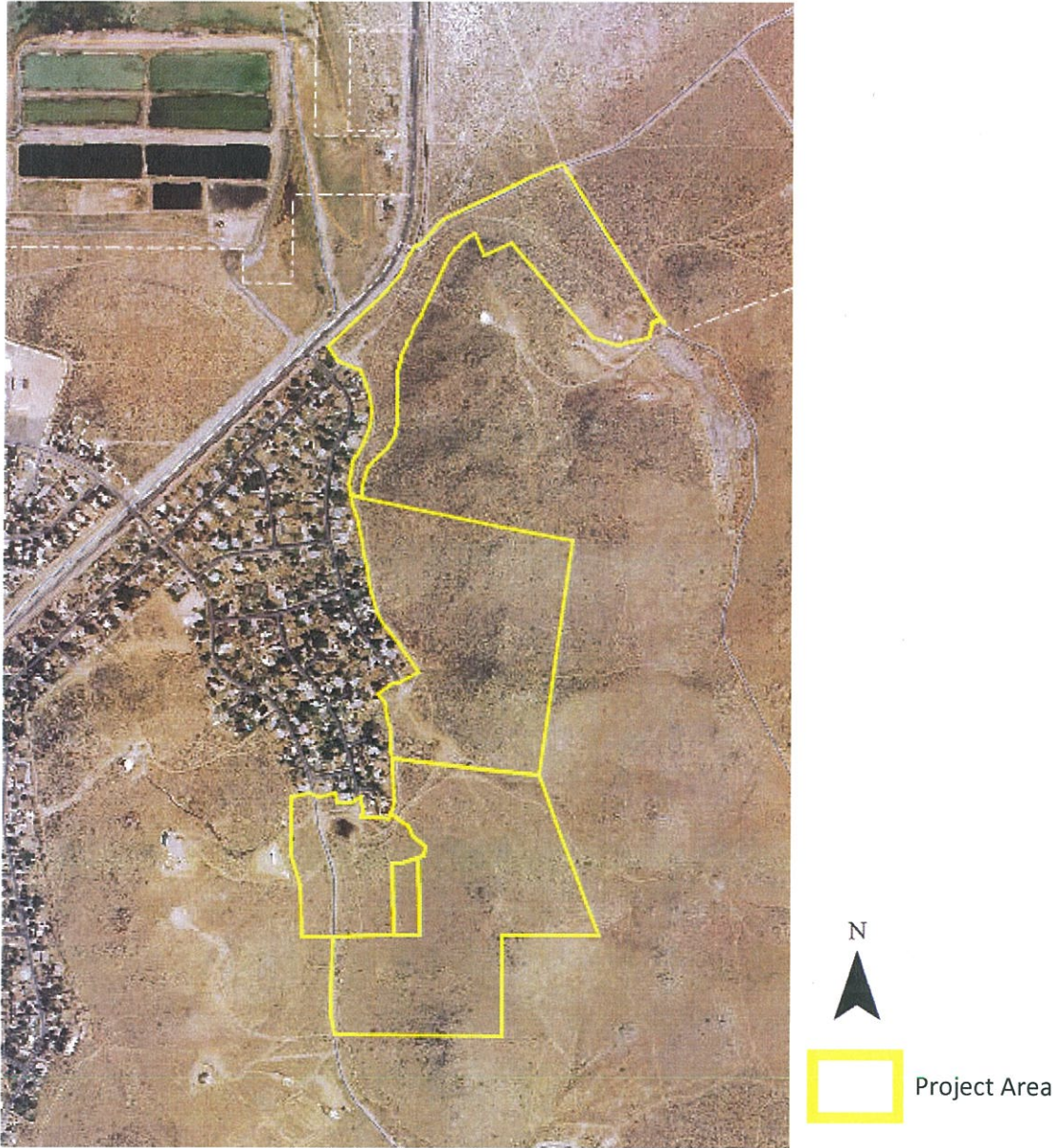
- Application & Supporting Information
- Preliminary Hydrology Report
- Preliminary Geotechnical Report
- Preliminary Sewer Report
- Traffic Study
- Maps for Hillside Development (Site Analysis Map, Developable Area Map) and Common Open Space Development (Site Analysis)
- Request to Reserve New Street Names
- TMWA Discovery
- Plan Set with Landscape Plan (submitted outside of packet)

PROJECT LOCATION

The project area is comprised of 5 parcels; APNs 080-635-01, 080-635-02, 080-730-21, 080-730-35, and 552-210-07; and is located in Lemmon Valley at the intersection of Lemmon Drive and Deodar Way, extending south to Bernoulli Street. The total project area is +/- 128.50 acres.

The project site is located within the eastern portion of Lemmon Valley, south of the Swan Lake playa, southeast of Swan Lake and northeast of the existing Lemmon Valley Heights Subdivision. The site is accessed via Lemmon Drive, with direct access to the northern portion of the project from Deodar Way and Estates Road and to the southern portion of the project from Palace Drive, Kess Way, and Patrician Drive.

Figure 1: Project Location



EXISTING CONDITIONS

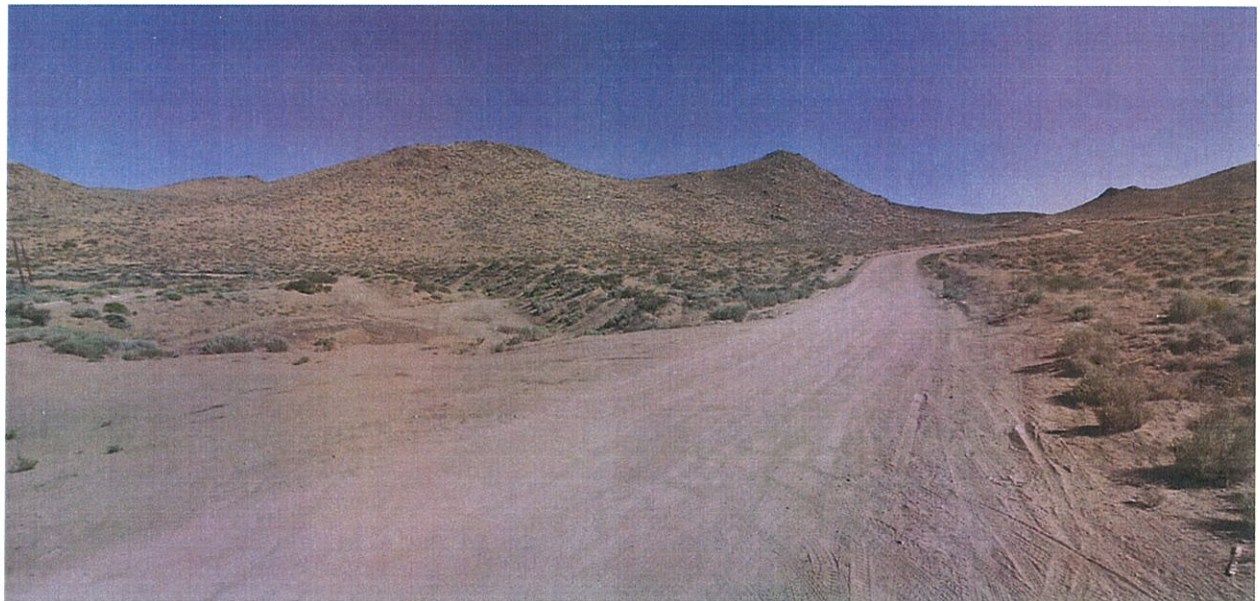
The +/-128.50 acre site is undeveloped. The area is bordered to the north by existing residential homes, and to the east, south, and west by undeveloped land. Swan lake is northwest of the site. The project area has two distinct areas of proposed development: a north subdivision area and a south subdivision area. The north portion of the site is undeveloped and generally slopes from southeast from northwest. The south portion of the site is an extension of the existing development. This portion of the site generally slopes down from south to north at approximately a 5 to 6 percent gradient.

The majority of the site is located outside of the FEMA 100-year floodplain; approximately 3 acres adjacent to Lemmon Drive is located within the 100-year floodplain. The majority of the vegetation throughout the undeveloped areas consists of brush and desert grasses. The NRSC soil classification for the proposed development area is primarily loamy sand.

Figure 2: Surrounding Property Designations

Direction	Current Zoning	Master Plan	Current Land Use
North	SF15 (City of Reno)/ Medium Density Suburban (Washoe County)	Suburban Residential	Undeveloped
East	General Rural	Rural	Undeveloped
South	Open Space General Rural	Open Space Rural	Open Space (USA) Undeveloped
West	Medium Density Suburban	Residential	Single Family Residential

Figure 3: Existing Conditions



PRIOR PROJECT APPROVALS

The Washoe County Planning Commission approved a Master Plan Amendment and Regulatory Zone Amendment (WMPA17-0002 and WRZA17-0001) on March 7, 2017, with the Washoe County Board of County Commissioners approval on April 25, 2017. This amendment reconfigured the master plan and zoning designations to conform more closely to the topography of the area. The Master Plan Amendment

was then determined to be in conformance with the Regional Plan by the Truckee Meadows Regional Planning Commission on June 28, 2017.

MASTER PLAN AND ZONING DESIGNATIONS

The parcels within the project area have Master Plan designations of Suburban Residential (SR) and Rural (R) and corresponding zoning designations of Medium Density Suburban (MDS) and General Rural (GR) as shown below:

Figure 4: Master Plan and Zoning Acreage

APN	Master Plan	Zoning	Acreage	Total Acreage
080-635-01	SR	MDS	13.59	13.59
080-635-02	SR	MDS	1.5	1.89
	R	GR	.39	
080-730-21	SR	MDS	8.59	43.21
	R	GR	34.62	
080-730-35	SR	MDS	26.89	26.89
552-210-07	SR	MDS	18.07	43.01
	R	GR	24.94	
TOTAL- Master Plan Designation	SR			68.64 acres
	R			59.95 acres
TOTAL- Zoning	MDS			68.64 acres
	GR			59.95 acres

Figure 5: Washoe County Master Plan Designation

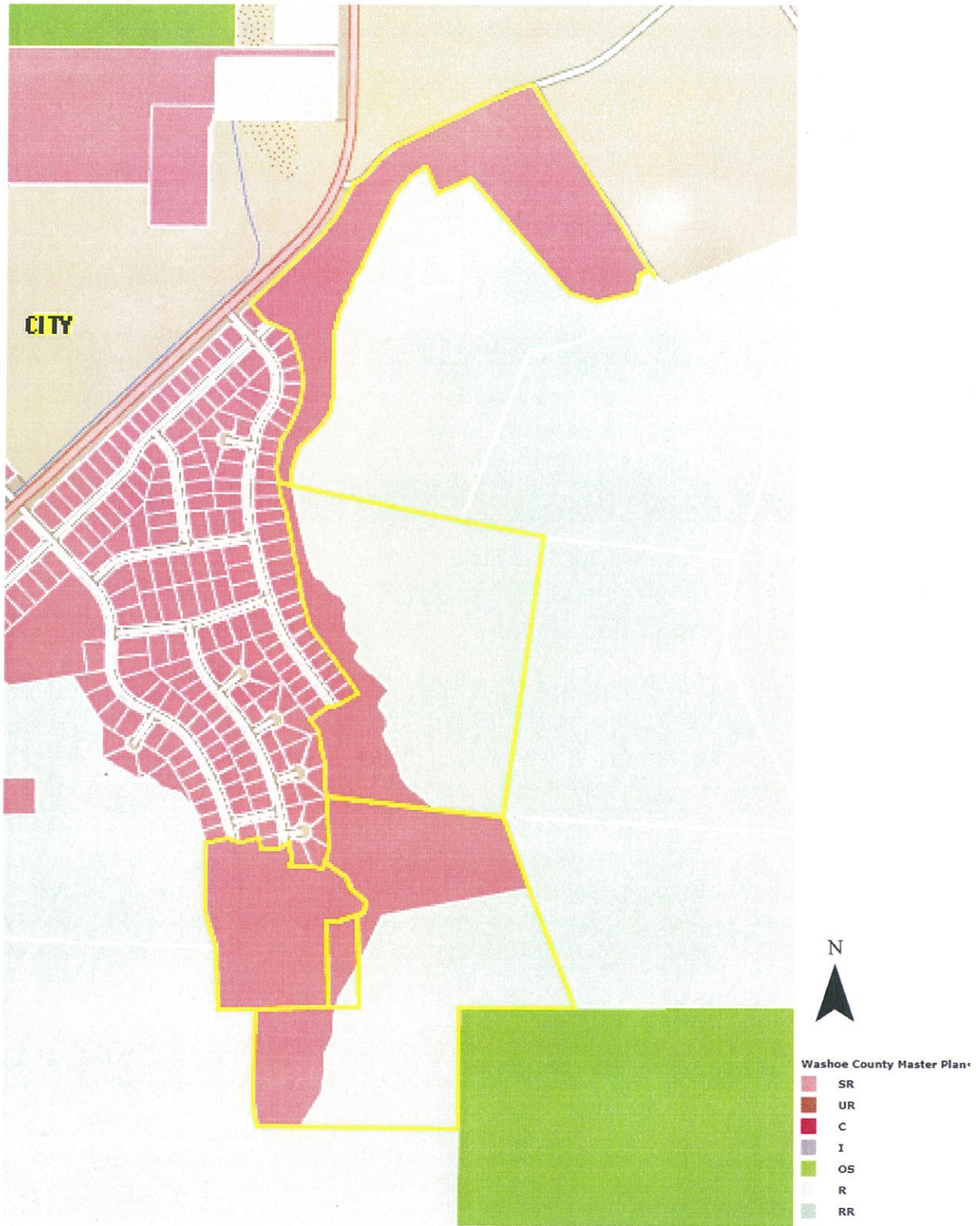
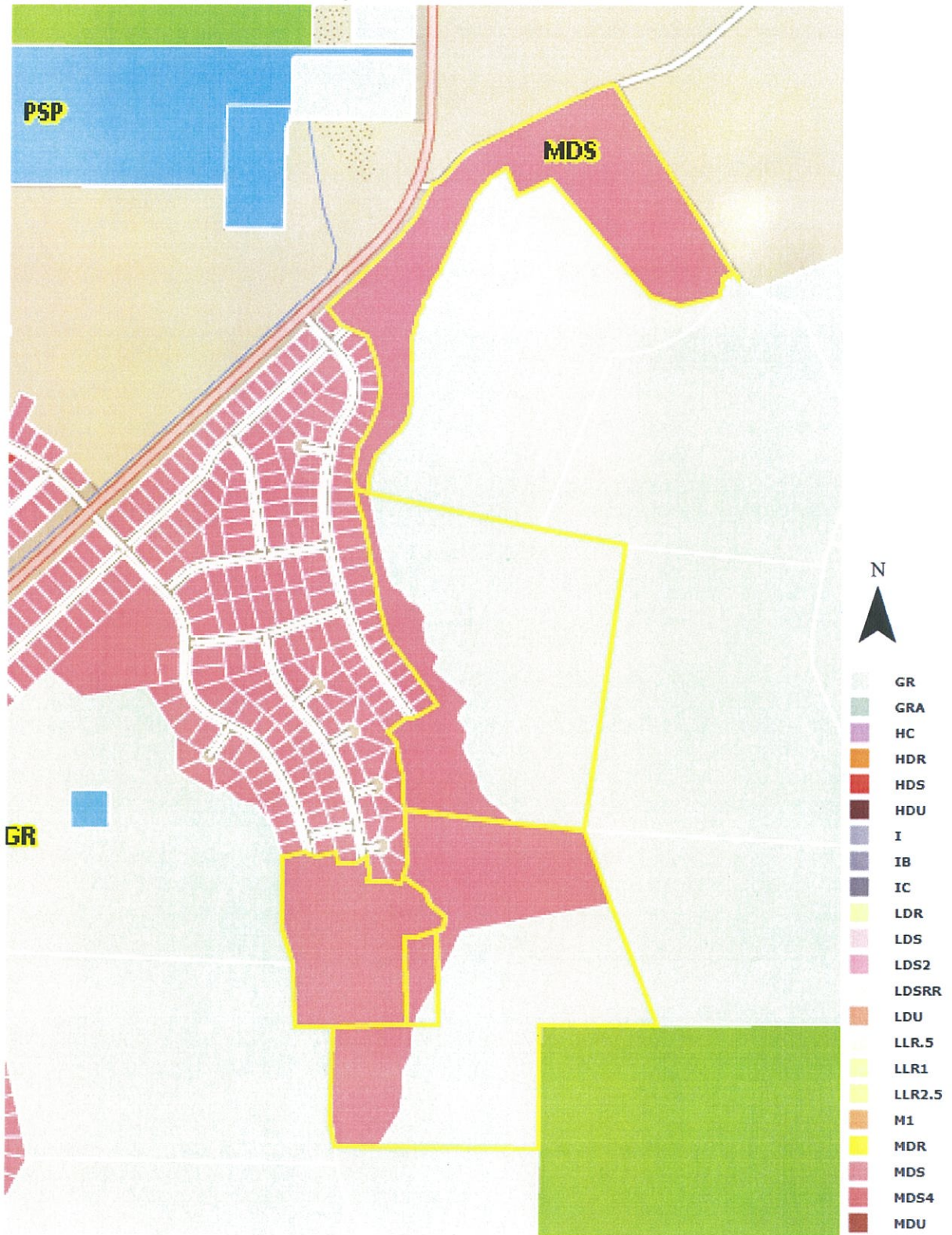


Figure 6: Washoe County Zoning Designation



PUBLIC OUTREACH

Following approval of the Master Plan and Regulatory Zoning Amendments on the project site, the applicant hosted community meetings on July 18 and November 6, 2017. Both meetings were held in Lemmon Valley at the Lemmon Valley Calvary Church of the Nazarene. The purpose of the first meeting was to request community input in development of the site. There was general discussion about hydrology and traffic concerns. These concerns were included in the development of the Tentative Map by proposing two distinct areas of development (north and south) and ensuring that the proposed drainage system reduces downstream flows. The conceptual land plan was presented at the second meeting (November 6, 2017).

Following application submittal, the project will be presented at the North Valleys Citizens Advisory Board meeting on February 12, 2018.

APPLICATION REQUEST

The enclosed application is a request for:

TENTATIVE SUBDIVISION MAP (WITH HILLSIDE DEVELOPMENT AND COMMON OPEN SPACE DEVELOPMENT) to create 206 single family residential lots on a +/-128.50 acre project site, including 88.47 acres of open space/common area.

PROJECT DESCRIPTION

The Lemmon Valley Heights is a proposed 206 lot residential community within a 128.50 acre project site. Of this total acreage, 30.93 acres (24.1%) are proposed to be developed for residential use. The remaining 186.04 acres will be used for open space/common area (88.47 acres, 68.8%) which will include detention and retention facilities and a trail, and right-of-way (9.11 acres, 7.1%). The gross density is 1.6 units per acre (206 units in the +/- 128.50 acre project area). Lots range in size from 4,500 sq. ft. to 17,206 sq. ft., with an average lot size of 6,540 sq. ft. There is no proposed residential development at this time so home designs are not available; future development will comply with the requirements of the Washoe County Development Code.

Common areas will be maintained by a Homeowners Association, Landscape Maintenance Association, or similar entity, as approved by Washoe County. Public water and sanitary sewer system will be provided for all units. The project includes +/- 88.47 acres of open space, which includes a detention/retention system and a trail that extends from the southern terminus of Kess Way, north along the pond/channel access maintenance road to Lemmon Drive, and provides for connection to the existing trail system.

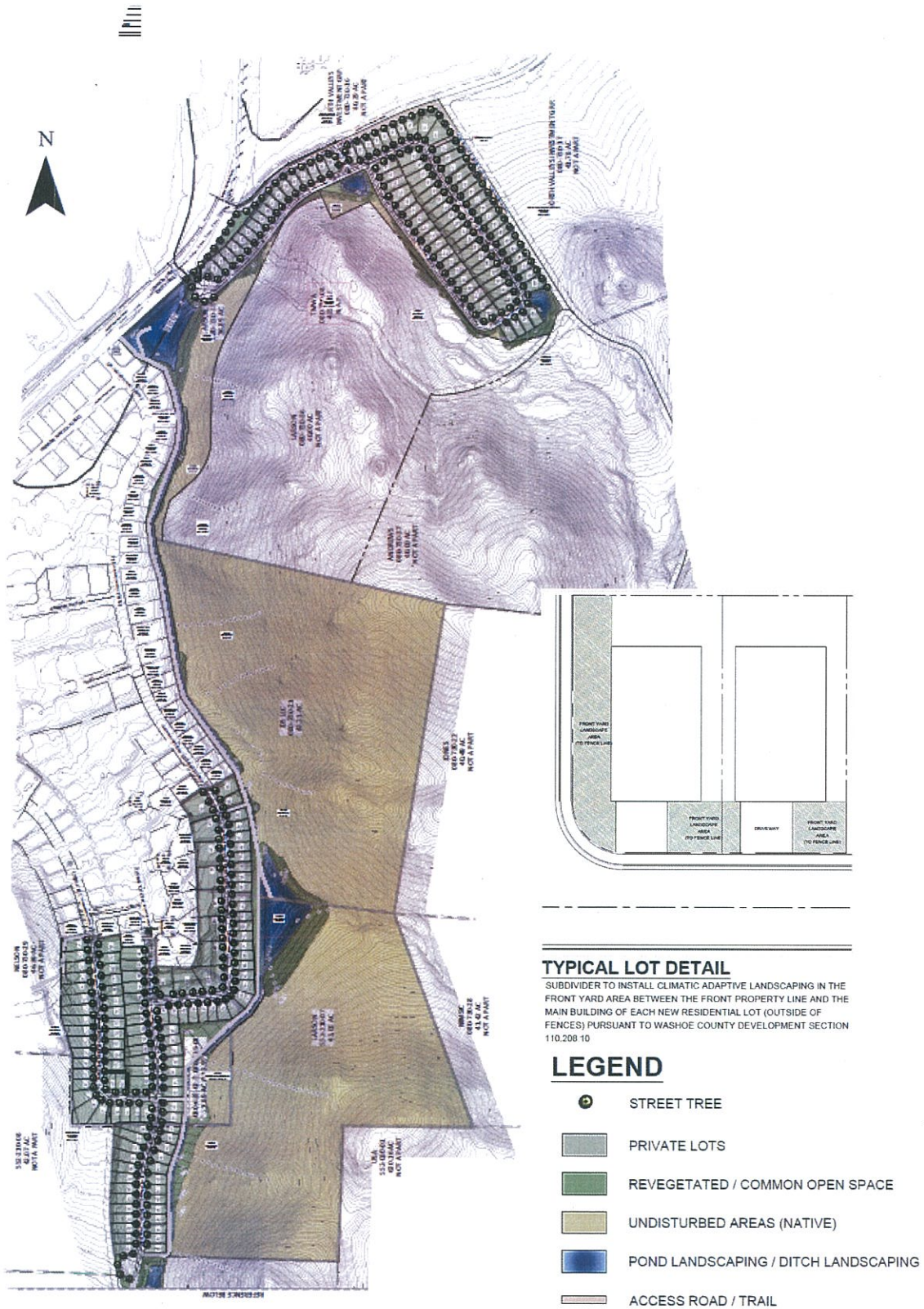
The lot pattern has been designed to accommodate site topography, meet hillside development standards, and be consistent with the approved master plan and zoning designations.

In accordance with the North Valleys Area Plan (Policy NV.6.1.b) homes will be limited to single story on the perimeter when adjacent to or across the street from existing residential development.

Figure 7: Project Summary

Project Summary	
Total Area	128.50 acres
Total Number of Lots	206
Smallest Lot	4,500 sq. ft.
Largest Lot	17,206 sq. ft.
Average Lot Size	6,540 sq. ft.
Overall Gross Density	1.6 units per acre
Total Common Area/Open Space	88.47 acres
Right-of-Way Area	9.11 acres

Figure 8: Preliminary Landscape Plan



COMMON OPEN SPACE DEVELOPMENT

A Common Open Space Development is proposed to provide open space, preserve the hillside, and achieve a more efficient use of land. The project has been designed to be in compliance with Washoe County Development Code Article 408 Common Open Space Development.

Density and Intensity

The Common Open Space Development standards state that the total number of dwelling units in the proposed development shall not exceed the total number of dwelling units allowed by the underlying regulatory zone(s) (WCDC Section 110.408.20). In the Medium Density Suburban (MDS) zoning designation, 3 dwelling units per acre are permitted; in the General Rural zoning designation, 1 unit per 40 acres is allowed. Under the existing zoning, a total of 206 units are permitted on the project site; there are 68.64 acres of MDS, permitting 205 units (68.64 acres x 3); and 59.95 acres of GR allows one additional unit.

Lot and Yard Standards

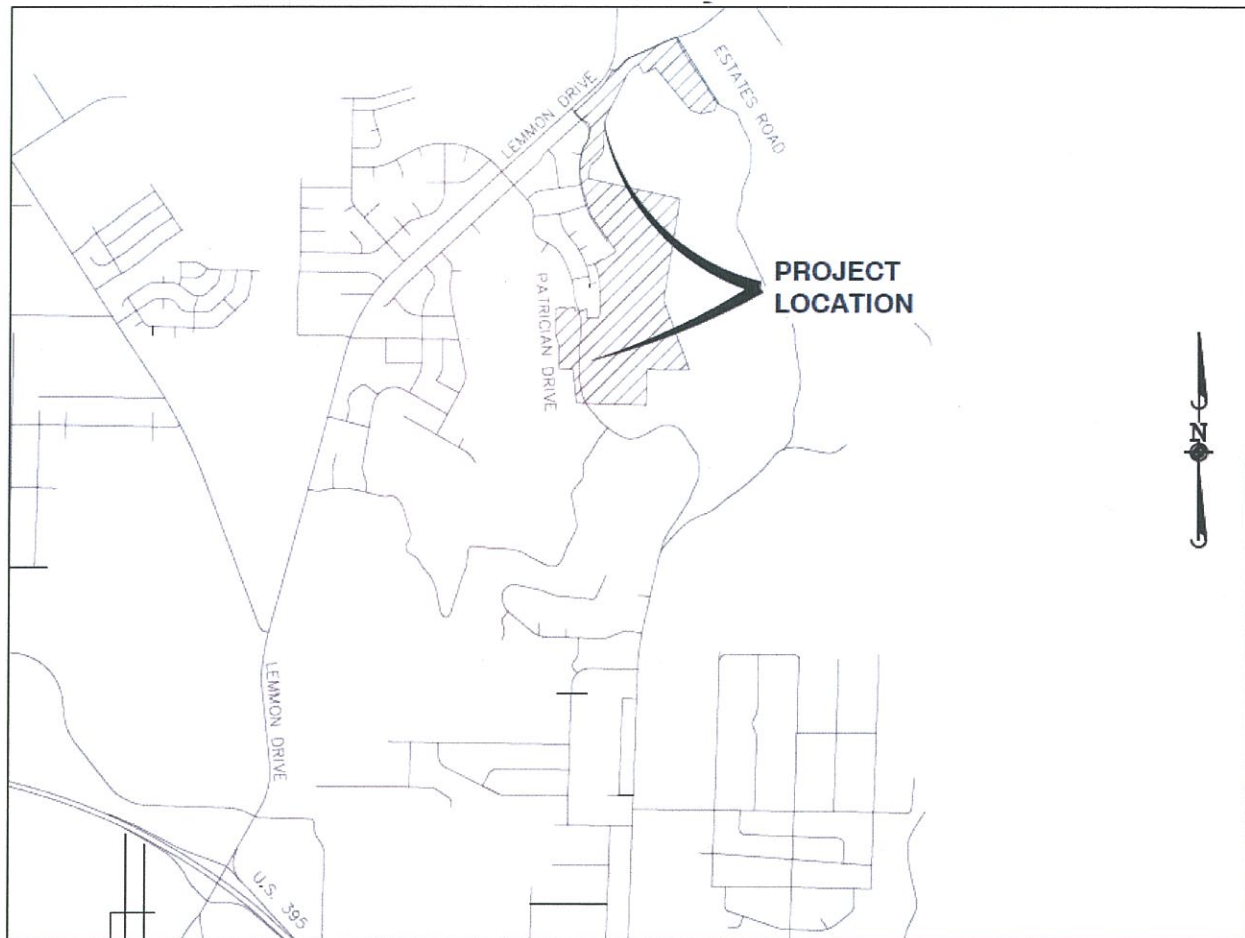
To accommodate the common open space development, and preserve 88.47 acres of open space, the minimum lot width and side yard setbacks are proposed to be varied. A typical building envelope is shown on the tentative subdivision map.

Minimum Lot Width:	45' (varied from Table 110.406.05.1 requirement of 80')
Front Yard Setback:	20'
Side Yard Setback:	5' (varied from Table 110.406.05.1 requirement of 8')
Rear Yard Setback:	20'

Site Analysis

A Site Analysis Map is included in this application package that contains the following information:

Location Map:



VICINITY MAP

Land Use: The site is currently undeveloped and has Master Plan designations of Suburban Residential (SR) and Rural (R) with corresponding zoning designations of Medium Density Suburban (MDS) and General Rural (GR). The proposed land use is single family residential, which meets the policies of the Master Plan and zoning designations. Surrounding property designations are shown in Figure 2. At the time of this application, there are no known development plans approved on unbuilt adjacent sites.

Existing Structures: There are no existing structures on the site.

Existing Vegetation: Brush and desert grasses. There are no trees on the site.

Prevailing Winds: Prevailing winds are from the south and southwest with high winds common especially during summer afternoons.

Topography: The project area has two distinct areas of proposed development: a north subdivision area and a south subdivision area. The north portion of the site is undeveloped and generally slopes from southeast from northwest, and contains off-road trails. The south portion of the site is an extension of the existing development and has some off-road trails, scattered rubble piles, and soil stockpiles. This portion of the site generally slopes down from south to north at approximately a 5 to 6 percent gradient.

Soil: The site is located within the eastern portion of Lemmon Valley south of the Lemmon Valley playa. The site lies in an area mapped by the Nevada Bureau of Mines and Geology (NBMG) as Quaternary Age Alluvial fan deposits that are made up of moderately well sorted to very poorly sorted granular coarse sand to sandy boulder gravel. The site periphery is mapped as granodiorite bedrock. A detailed discussion is in the attached Geotechnical Report.

Natural Drainageways: There are no natural drainageways on or adjacent to the site (Water Resources Master Plan Map).

Wetlands and Water Bodies: There are no existing or potential wetlands or water bodies on the site (Water Resources Master Plan Map).

Flood Hazards: FEMA flood zone designations are identified on the map.

Seismic Hazards: There are no known seismic hazards on or near the site.

Avalanche Hazards: There are no known avalanche or other landslide hazards on the site.

Sensitive Habitat and Migration Routes: There is no sensitive habitat area or migration routes on the site (Biodiversity Resources and Cultural Resources and Sensitive Landscapes Master Plan Maps).

Significant Views: Reference the Plan Set for cross sections throughout the project.

Easements: Easements are shown on the Site Plan.

Utilities: The Utility Plan shows the existing and available utilities and appropriate locations for water, power, sanitary sewer, and storm water sewer facilities.

Appropriate Access Points: The site is accessed via Lemmon Drive, with direct access to the northern portion of the project from Deodar Way and Estates Road (existing dirt public roads) and to the southern portion of the project from Palace Drive, Kess Way, and Patrician Drive (existing paved public roads).

Roads

The project has been designed to utilize the existing road system. It is accessed via Lemmon Drive, with direct access to the northern portion of the project from Deodar Way and Estates Road and to the southern portion of the project from Palace Drive, Kess Way, and Patrician Drive. Proposed roads are aligned to follow natural features and topography.

Parking

The project will meet the parking requirements of Article 410, Parking and Loading. Off-street parking for individual units will be provided through a combination garages and driveways, and will meet the Off-

Street Parking Space Requirements (Residential Use Types) in Table 110.410.10.1.; 2 off-street parking spaces per dwelling unit, 1 of which must be in an enclosed garage. Based on these requirements, a total of 412 (206 x 2) are required. Conceptual floor plans are not available so an exact amount of off-street parking spaces is not available, however it is expected that each unit will have a 2-car garage along with a driveway that will have 2 additional parking spaces, totaling 4 off-street parking spaces per residential unit. See Figure 14 for Parking Calculations.

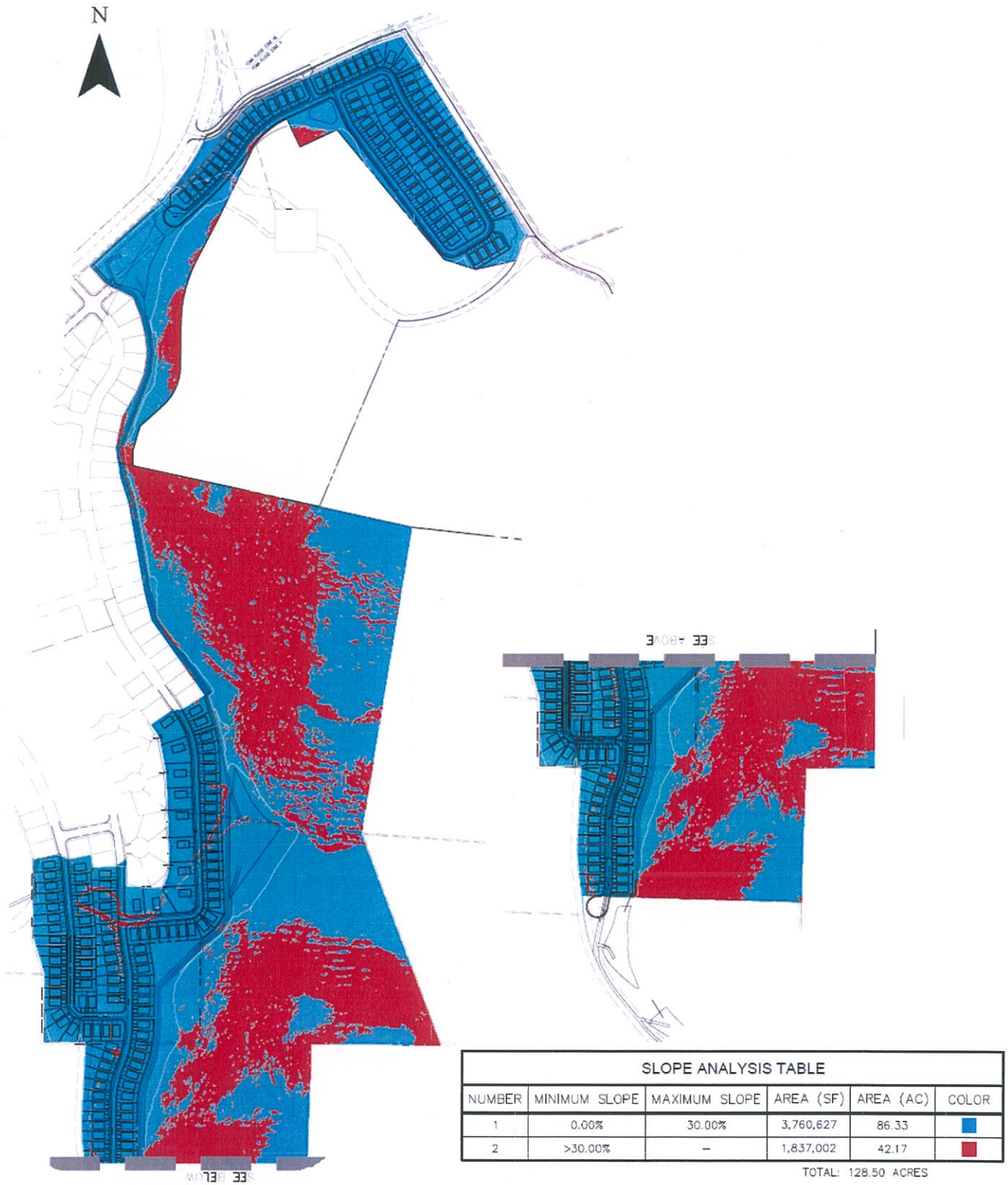
HILLSIDE DEVELOPMENT

The project has been designed in accordance with Article 424 Hillside Development to preserve and protect the hillside. As shown below, development will only occur in the developable area of the project site, primarily in areas where the slope is less than 15%, avoid areas with slope greater than 30%.

Because this Tentative Map is proposed as a Common Open Space Development, the housing units are distributed in a configuration that accommodates the natural slope of the site.

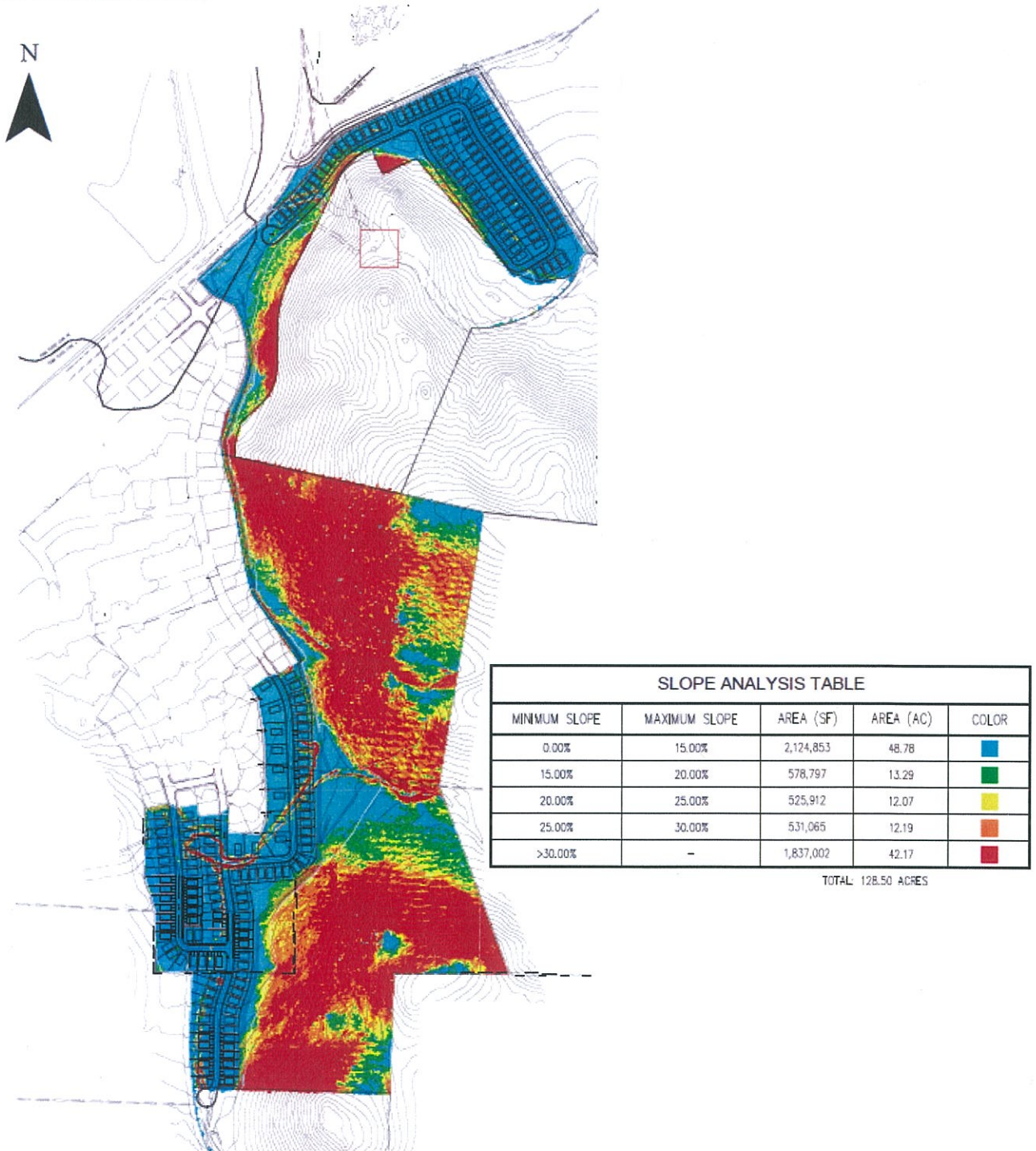
In accordance with Section 110.424.15, a Site Analysis and Developable Area Map have been prepared and are included in this application package.

Figure 9: Developable Area Map



The following exhibit provides a slope analysis and a breakdown of slope ranges within project area. Provisions will be incorporated to further site disturbance and provide consistency with Article 424 Hillside Development.

Figure 10: Slope Analysis



Site Analysis

As required by Section 110.424.15(a), a Site Analysis is included in this application, which includes the following information:

Topographical Conditions: There are no major topographical conditions (i.e. ridgelines, ravines, canyons, knolls, etc.) within the project area.

Geological Conditions: There are no major rock outcroppings, slide areas, or faults within the project area.

Soil: The site is located within the eastern portion of Lemmon Valley south of the Lemmon Valley playa. The site lies in an area mapped by the Nevada Bureau of Mines and Geology (NBMG) as Quaternary Age Alluvial fan deposits that are made up of moderately well sorted to very poorly sorted granular coarse sand to sandy boulder gravel. The site periphery is mapped as granodiorite bedrock. A detailed discussion is in the attached Geotechnical Report.

Surface Hydrological Conditions: There are no major natural drainageways on or adjacent to the site (Water Resources Master Plan Map). There are no existing or potential wetlands or water bodies on the site (Water Resources Master Plan Map). FEMA flood zone designations are identified on the map.

Existing Vegetation: Brush and desert grasses. There are no trees on the site.

Habitat areas: There are no sensitive habitat areas or migration routes on the site (Biodiversity Resources and Cultural Resources and Sensitive Landscapes Master Plan Maps).

Preliminary Viewshed Analysis: Reference the Plan Set for cross sections throughout the project.

Development Response to the Unique Conditions of the Hillside: The slope areas are a constraint within the project site. As shown in the Slope Analysis map, 79.72 acres have greater than 15 percent slope. The project has been designed so that the developed areas are located in the areas with less than 15 percent slope.

Slope Analysis: See Figure 10 Slope Analysis, above

Constraint and Mitigation Analysis

The slope areas are a constraint within the project site. As shown in the Slope Analysis map, 79.72 acres have greater than 15 percent slope. The project has been designed so that the developed areas are located in the areas with less than 15 percent slope.

LANDSCAPING/OPEN SPACE

A portion of the project site is adjacent to Lemmon Drive, an arterial roadway. Therefore, a Landscape Plan is included in this application package which meets the requirements of Article 412 Landscaping. Pursuant to Section 110.412.35:

- a) A minimum of 20% of the total developed land area shall be landscaped;
- b) All required front, rear, or side yards which adjoin a public street shall be landscaped and shall include at least one (1) tree for every fifty (50) linear feet of street frontage, or fraction thereof;
- c) New residential subdivisions 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 Master Plan Streets and Highways System Plan Map.

Additionally, the North Valleys Area Plan requires that all new residential subdivisions “shall include a requirement for the subdivider to install climatic adaptive landscaping in the front yard area between the front property line and the main building of each new residential lot.

As shown on the Landscape Plan, all areas disturbed by grading activities (revegetated/common open space) are to receive erosion control dryland native revegetation seed mix immediately after grading unless shown otherwise. Street trees are shown at 50’ spacing per Washoe County standards and are to be located 6’ from the ROW. All landscaped areas outside of lots are to be maintained by the HOA or LMA, as approved by Washoe County.

In addition to private yards, the project site also includes significant undeveloped native areas. These native areas will be left undisturbed except for any trail improvements, or necessary utility improvements which be returned as close as possible to their original state and revegetated. All slopes and grading outside of the individual lots shall be stabilized and revegetated per the recommendations of the geotechnical report and to the satisfaction of Washoe County.

The total Common Area/Open Space within the project area is 88.47 acres in size and contains a majority of the steeper slopes. These areas will be designated as open space to ensure that there is no development.

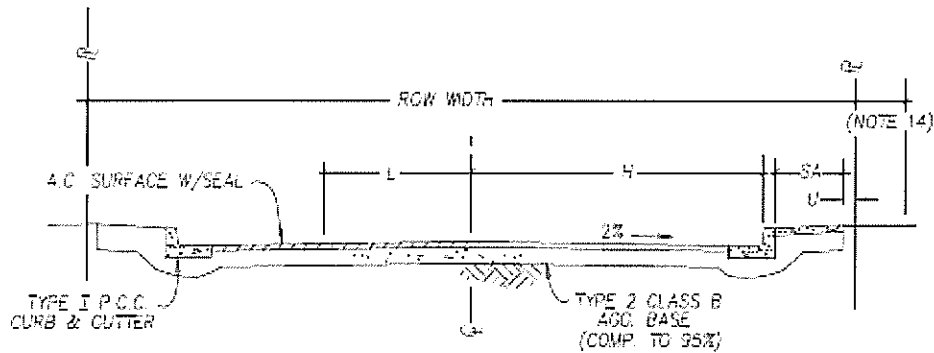
VEHICLE AND PEDESTRIAN ACCESS

Primary vehicular access to the site is provided from Lemmon Drive, with direct access to the northern portion of the project from Deodar Way and Estates Road and to the southern portion of the project from Palace Drive, Kess Way, and Patrician Drive. The proposed public roads will be constructed and dedicated to Washoe County. A permanent emergency access is provided along Deodar Way, extending from “Street A” and continuing on to Estates Road (existing public dirt road). Pedestrian access will be provided through a sidewalk network and pedestrian trail.

Streets and Sidewalks

Streets within the project area are proposed to be public and dedicated to Washoe County. Collector streets will have a 52' Right-of-Way width that includes two 12' travel lanes, two 4' bicycle lanes and a 5' sidewalk along one side of the street. Local streets will have a 42' right-of-way width that includes two 11' travel lanes and a 4' sidewalk along one side of the street. Deodar Way is the only collector street and will be completed with half-street improvements within the existing 60' ROW. The remaining proposed streets will be constructed as local streets in accordance with Washoe County standards. Typical Roadway and Cul-de-sac sections are below.

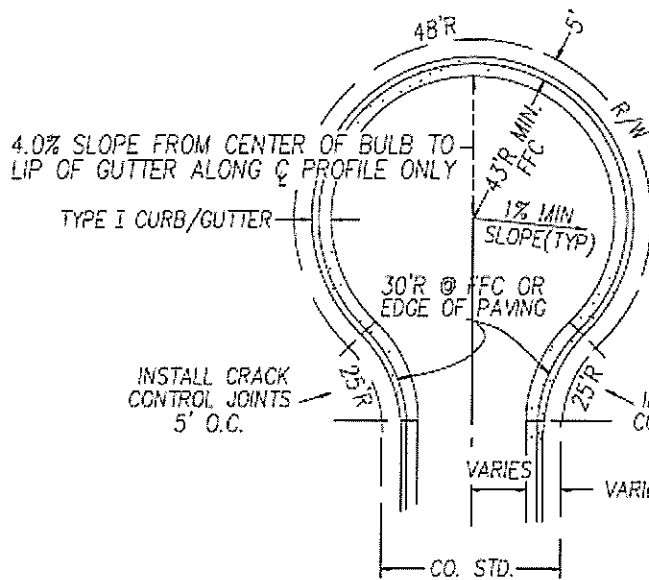
Figure 11: Typical Roadway and Cul-de-sac Sections



ROW	H	SA	U	L	B	PL	ADT MAX PER 2 TRAVEL LANES	REMARKS
52	20	5	0.5	12	4	0	7500	COLLECTOR
42	16	4	0.5	11	0	2	1000	LOCAL

NOTES

1. ALL WIDTHS ARE IN FEET.
2. H IS MEASURED TO THE FRONT FACE OF CURB.
3. L IS TRAVEL LANE; SA IS SIDEWALK AREA; B IS BICYCLE LANE; ROW IS RIGHT OF WAY PL IS MAX. NUMBER OF PARKING LANES; ADT IS AVERAGE DAILY TRAFFIC.
4. ADT REPRESENTS THE DESIGN VOLUME FOR A TWO LANE FACILITY.
5. BICYCLE LANES SHALL BE PROVIDED IN ACCORDANCE W/THE BICYCLE AND PEDESTRIAN ELEMENT OF THE REGIONAL TRANSPORTATION PLAN AND TO THE SATISFACTION OF THE COUNTY ENGINEER.
6. STRUCTURAL SECTIONS SHALL BE DETERMINED BY GEOTECHNICAL ENGINEERING DESIGN BUT IN NO CASE SHALL BE LESS THAN 4" A.C. OVER 6" GRAVEL BASE FOR COLLECTOR STREETS AND 3" A.C. OVER 6" GRAVEL BASE FOR LOCAL STREETS.
7. ALL CURB AND CUTTER IS MONOLITHIC CONCRETE AND L SHAPED PER STANDARD DETAIL.
8. SIDEWALK AREA SHALL BE @ 2% SLOPE TOWARD TOP OF CURB & COMPACTED 90% ASTM D-1557, BACKFILL SHALL BE EITHER TYPE 2 CLASS B BASE OR CLASS 4 BACKFILL.
9. ALL A.C. SURFACES SHALL BE SEALED IN ACCORDANCE WITH WASHOE CO. STANDARDS.
10. RESIDENTIAL ACCESS NOT ALLOWED TO STREETS ON WHICH 10YR. DESIGN ADT EXCEEDS 2000.
11. DESIGN OF IMPROVEMENTS TO BE DONE IN ACCORDANCE WITH ARTICLES 420 & 436 OF WASHOE COUNTY DEVELOPMENT STANDARDS AND DESIGN GUIDELINES.
12. ALL CONSTRUCTION IS TO BE DONE TO CURRENT WASHOE CO. STANDARDS & SPECIFICATIONS.
13. SLOPE EASEMENTS MAY BE REQ'D IN CERTAIN TERRAIN TO ACCOMMODATE ROADWAY SECTION.
14. MIN 7.5' PUBLIC UTILITY/TRAFFIC CONTROL SIGNAGE/PLOWED SNOW EASEMENT IS REQ'D ON BOTH SIDES OF ROW.



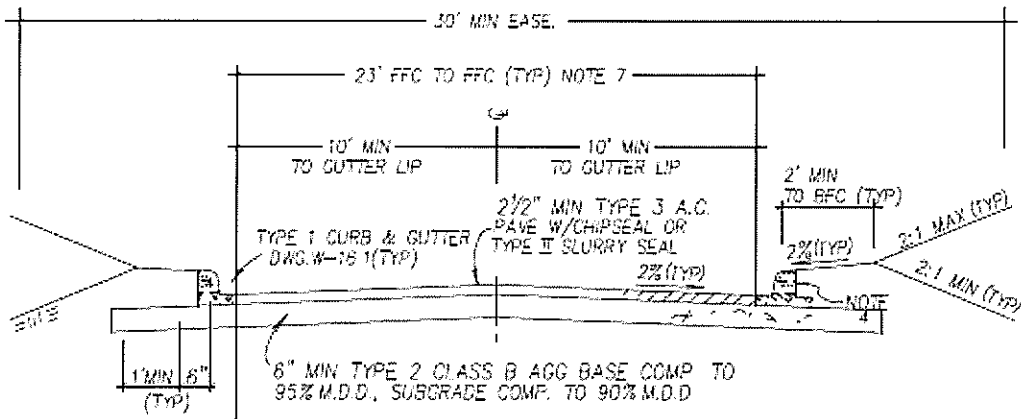
PAVED PERMANENT

N.T.S.

NOTES

1. TEMP TURNAROUND EASEMENT DOCUMENT REQ'D W/MIN 48' RADIUS TO BE ABANDONED W/STREET EXTENSION.
2. DRAINAGE OF UNPAVED TEMP CUL-DE-SAC SHALL BE CONSISTANT W/CO. STDS INCLUDING ARTICLE 420 STORM DRAINAGE & TO BE USED ONLY IF STREET IS TO BE EXTENDED WITHIN 1 YR.
3. PAVED TEMP TURNAROUND SHALL BE CONST WHEN AN OFF-SITE TEMP TURNAROUND EASE CAN'T BE OBTAINED & STREET IS TO BE EXTENDED IN THE FUTURE. STRUCTURAL SEC. OF TURNAROUND TO MATCH STREET SEC., REFER TO CODE 111 444 FOR CONSTRUCTION.
4. PAVED TEMPORARY TURNAROUND IS REQUIRED ON ALL FUTURE THROUGH-STREETS THAT FRONT S, OR EXTEND MORE THAN 150 FT BEYOND THE NEAREST INTERSECTING STREET.

Figure 12: Typical Permanent Emergency Access Road



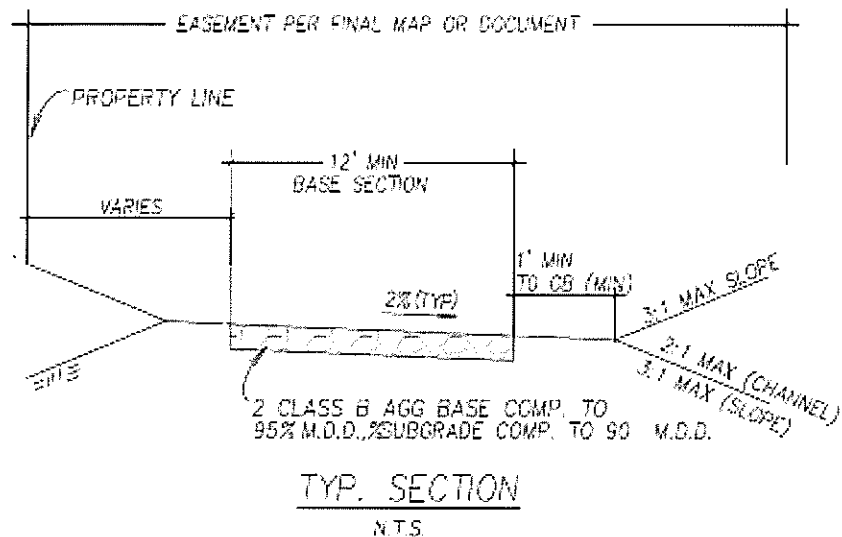
TYP. SECTION

N.T.S.

Trails

As shown on the Plan Set, this project includes a trail that extends from the southern terminus of Kess Way, north along the pond/channel access maintenance road to Lemmon Drive, and provides for connection to the existing trail system. There will be a 12' minimum base section along the maintenance access road. A sign will be placed at each end of the trail/road that indicates the road is for maintenance vehicles only and is not a public street.

Figure 13: Typical Section Aggregate Public Trail and Maintenance Access Road



UTILITIES AND PUBLIC SERVICES

Water

A public water system will be provided for all units. All necessary infrastructure to serve the project will be completed by the developer. TMWA completed a Discovery for this project area (included in this application package), for a proposed development consisting of 304 units. As this project is only for 206 residential lots, there will be a significant reduction in the amount of water demand anticipated to serve the development. For the northern portion of the site, there will be a tie to the existing water main in Lemmon Drive, and will extend through the street network. The southern portion of the project site will connect to the existing water main at Palace Drive, Kess Way, and Patrician Drive, and will extend through the street network. The project can be served from TMWA's Stead/Silver Lake/Lemmon water system. However, the project is not located within TMWA's retail service territory and will require annexation by TMWA.

Sewer

The proposed sanitary sewer collection system will consist of 8" diameter mains that will collect the flow throughout the project. These flows will be directed to the existing sanitary sewers in Patrician Drive, Kess Way, Palace Drive, and Lemmon Drive. Please reference the Utility Plan and the Sewer Report for detailed information.

Other Utilities

Existing and proposed overhead utility lines are identified on the Utility Plan. The gas distribution line is to be located with the water line.

Other Public Services

Truckee Meadows Fire Protection District (TMFRD) provides fire protection services in Washoe County. In addition, Lemmon Valley Volunteer Fire and Rescue serves the community of Lemmon Valley. The closest career fire station is located in Stead (Station 13, 10575 Silver Lake Blvd.) and is +/- 5 mile drive from the project area. The volunteer station is about 1½ miles (5 minute drive) from the project site. Washoe County Sheriff Department patrols already exist in the area and should not be significantly impact by this request. Washoe County School District provides educational services. Current zoned schools for the project area include Lemmon Valley Elementary School, O'Brien Middle School, and North Valleys High School. The Regional Transportation Commission (RTC) provides public transportation. The nearest bus stop is located at Lemmon Drive and Fleetwood Drive, approximately 1 mile southwest of the project site.

PARKING

Off-street parking for individual units will be provided through a combination garages and driveways, and will meet the Off-Street Parking Space Requirements (Residential Use Types) in Table 110.410.10.1.; 2 off-street parking spaces per dwelling unit, 1 of which must be in an enclosed garage. Based on these requirements, a total of 412 (206 x 2) are required. Conceptual floor plans are not available so an exact amount of off-street parking spaces is not available, however it is expected that each unit will have a 2 car garage along with a driveway that will park an additional 2 cars, totaling 4 off-street parking spaces per residential unit.

Figure 14: Parking Calculations

	# of Units	Spaces Required per Unit	Total Required Spaces	Total Spaces Provided
Single Family Detached	206	2 (one of which must be in an enclosed garage or carport)	412	Minimum: 412 as required by Washoe County Development Code Expected: 824 (2 garage + 2 driveway)

TRAFFIC

A traffic study was prepared in January 2017 that analyzed the proposed subdivision with 209 single family detached homes; 90 dwelling units in the northern portion of the site and 119 dwelling units in the southern portion of the site. As proposed in this Tentative Map request, there are 206 units total with 84 dwelling units in the northern portion of the site and 122 dwelling units in the southern portion of the site.

As shown in the Traffic Study, the project is anticipated to generate 1,990 average daily trips with 157 trips occurring during the AM peak hour and 209 trips occurring during the PM peak hour. Traffic generated by the proposed Lemmon Valley Subdivision will have some impact on the adjacent street network. The following recommendations are made to mitigate project traffic impacts:

- It is recommended that any required signing, striping, or traffic control improvements comply with Washoe County requirements.
- It is recommended that the segment of Deodar Way adjacent to the site and all internal subdivision streets be constructed per Washoe County standards.

Trip generation rates in the Traffic Study were obtained from the Ninth Edition of ITE Trip Generation (2012) for Land Use 210 “Single Family Detached Housing”.

Figure 15: Trip Generation

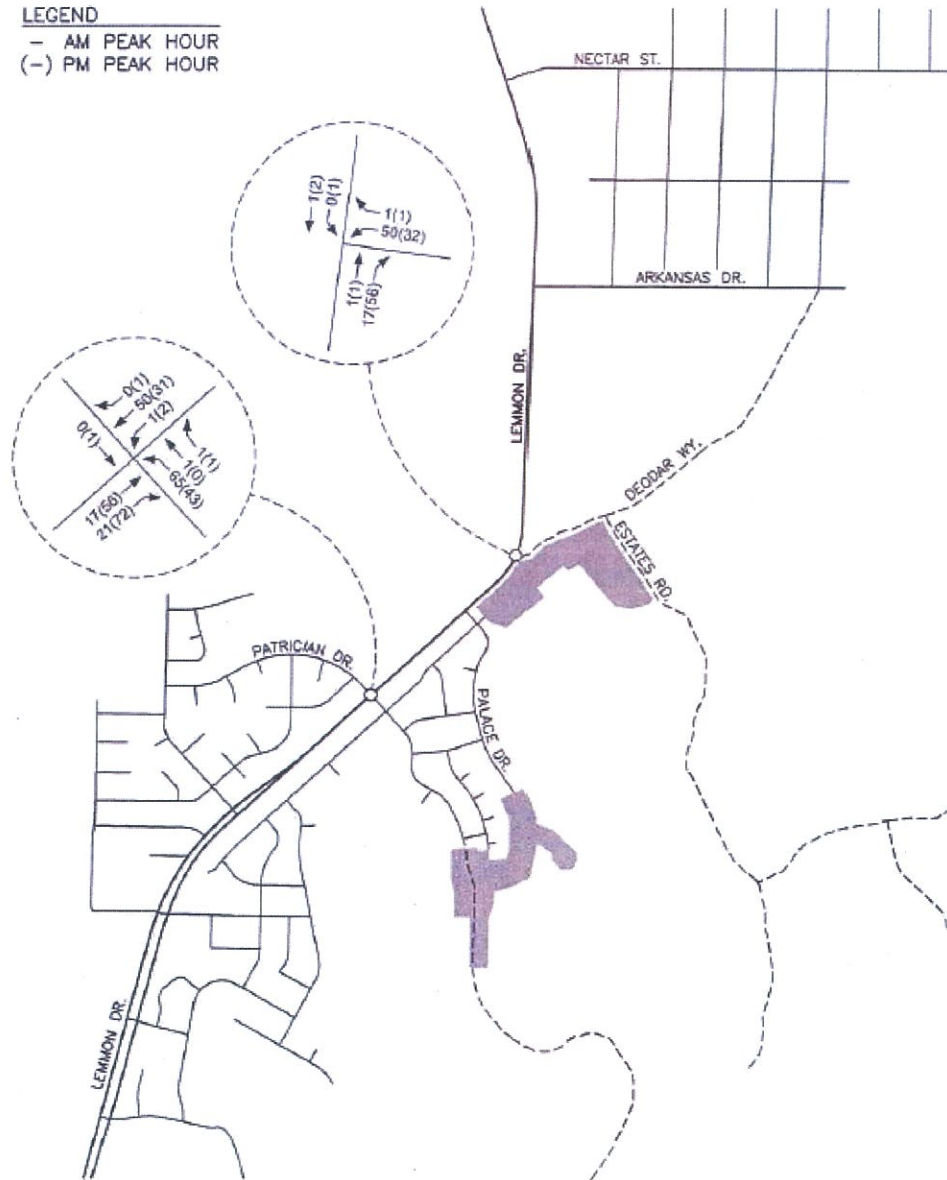
Land Use/Variable	ADT	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Family Homes (209 D.U.)	1,990	39	118	157	132	77	209

The distribution of project traffic to the key intersections was based on existing peak hour traffic patterns and locations of attractions and productions in the area; 97% of traffic heading south on Lemmon Drive, 2% of traffic heading north on Lemmon Drive, and 1% of traffic continuing west on Patrician Drive. The peak hour trips shown in Figure 15 were assigned to key intersections based on the trip distribution. Figure 16 shows the trip assignment at the key intersections for the AM and PM peak hours.

Figure 16: Trip Assignment



LEGEND
 - AM PEAK HOUR
 (-) PM PEAK HOUR



**LEMMON VALLEY SUBDIVISION
 TRIP ASSIGNMENT**

Along with traffic counts, this trip assignment was used to determine a level of service and delay results for the existing traffic levels, existing + project, 2026 base, and 2026 base + project.

Figure 17: Intersection Level of Service and Delay Results

INTERSECTION	Existing		Existing + Project		2026 Base		2026 Base + Project	
	AM	PM	AM	PM	AM	PM	AM	PM
Lemmon and Patrician								
Stop at East and West Legs								
EB Left-Thru-Right	B10.3	B11.0	B10.8	B12.0	B10.3	B11.4	B11.1	B12.4
WB Left-Thru-Right	B14.4	C16.7	C19.2	D27	C15.4	C18.4	C21.3	D31.9
NB Left	A8.0	A7.7	A8.1	A7.7	A8.1	A7.7	A8.3	A7.8
SB Left	A7.4	A8.1	A7.5	A8.5	A7.4	A8.2	A7.5	A8.6
Lemmon and Deodar								
Stop at East Leg								
WB Left-Right	A8.7	B12.1	B11.2	B13.0	A9.5	B12	B11.6	B13.7
SB Left	A0.0	A0.0	A0.0	A8.2	A7.4	A8.1	A7.4	A8.3

Both intersections will meet policy LOS D standards established by the Washoe County Regional Transportation Commission.

HYDROLOGY

The majority of the off-site flow entering the southern area will be routed through a series of detention ponds (Kess Way Ponds) and then conveyed through a channel to another detention basin (Palace Drive Pond). Outflow from the Palace Drive Pond will then be conveyed to a final retention basin (Lemmon Drive Pond). In the northern area, the majority of the off-site flow will be collected into two detention basins; Upper Deodar Pond and Lower Deodar Pond. The flow entering Upper Deodar Pond will be routed through the proposed development in two 24-inch concrete storm drain pipes that will outlet into Lower Deodar Pond. An additional 16.6 acer-foot retention basin will be located at the outlet of the project site along Lemmon Drive.

As shown in the attached Conceptual Hydrologic Analysis, drainage improvements associated with the proposed development will reduce flows at the Main Outlet (existing outlet and Lemmon Drive pond) from 255.2 cfs to 104.5 cfs and maintain flows at the WS3 Outlet (Lower Deodar Pond) at 125.8 cfs.

Figure 18: Peak Flow Rates and Total Volumes for Existing and Proposed Conditions

	Concentration Point	100-year 24-hour Peak Flow (cfs)
Existing Conditions	Main Outlet	255.2
	WS3 Outlet	125.9
Proposed Conditions	Main Outlet (existing outlet and Lemmon Drive Pond)	104.5
	WS3 Outlet (Lower Deodar Pond)	125.8

A complete Hydrology Report can be found in the Appendix.

TENTATIVE MAP FINDINGS

- (a) Plan Consistency. That the proposed map is consistent with the Master Plan and any specific plan;**

The proposed map is consistent with the current designation of Suburban Rural and Rural Master Plan designations, and meets applicable goals and policies of the Washoe County Master Plan and the North Valleys Area Plan.

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

The proposed subdivision is consistent with the Master Plan and the North Valleys Area Plan, particularly as related to the Lemmon Valley Suburban Character Management Area goals and policies (NV.6.1) regarding regulatory zones, parcel sizes, limiting dwellings to single story on the perimeter when adjacent to or across the street from existing residential development, landscape design, and lighting.

- (c) Type of Development. That the site is physically suited for the type of development proposed;**

The lots have been designed to specifically accommodate the terrain of the site. The site is physically suited for the residential development as designed. The proposed development is consistent with the lot sizes of the adjacent development.

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

In accordance with Article 702, Adequate Public Facilities Management System, public infrastructure is provided that is necessary to support this development project. It will be available concurrently with the impacts of the development that will not cause the level of service at which the infrastructure is provided to fall below adopted standards. Public facilities are available to each residential lot. All necessary utilities

are currently in place or will be in place to adequately serve the proposed project. Any new infrastructure improvements will be constructed to Washoe County standards and will be paid for by the developer.

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

The proposed subdivision is not located within an environmentally sensitive location. The proposed improvements will not cause substantial environmental damage or harm to endangered plants, wildlife, or their habitat.

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

The proposed project has been designed in accordance with the required environmental and health laws and regulations concerning water and air pollution, the disposal of solid waste, facilities to supply water, community or public sewage disposal. All necessary infrastructure to serve the project will be completed by the developer and adequate capacity exists to accommodate additional demands generated by the project. Refer to attached engineering reports for specific details.

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

Existing easements are incorporated into the subdivision design. There is no conflict with easements acquired by the public at large for access through or use of the property within the proposed subdivision. The design of the subdivision includes emergency access along Deodar Way, extending from "Street A" and continuing on to Estates Road (existing public dirt road). There are also pedestrian sidewalks, and trails that may be used by future residents of the subdivision as well as residents from neighboring developments.

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

The subdivision has been designed to provide access to the adjacent lands including easements that extend from the subdivision to the adjacent lands. A public trail is provided that extends from the southern terminus of Kess Way, north along the pond/channel access maintenance road to Lemmon Drive, and provides for connection to the existing trail system. Existing access will be perpetuated at the terminus of Kess Way along an existing access easement.

There is paved emergency access in the north section of the project designed in accordance with Washoe County standards, along Deodar Way, extending from "Street A" and continuing on to Estates Road (existing public dirt road).

- (i) Dedications. That any land or improvements to be dedicated to the County is consistent with the Master Plan; and**

Common areas will be maintained by a Homeowners Association, Landscape Maintenance Association, or similar entity, as approved by Washoe County.

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

To the extent feasible, future development will include building materials that allow for passive or natural heating and cooling opportunities. Specific building designs are not available at this time.

Community Services Department
Planning and Building
TENTATIVE SUBDIVISION MAP
APPLICATION



Community Services Department
Planning and Building
1001 E. Ninth St., Bldg. A
Reno, NV 89520

Telephone: 775.328.6100

Washoe County Development Application

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

Project Information		Staff Assigned Case No.: _____	
Project Name: Lemmon Valley Tentative Map			
Project Description: Tentative Subdivision Map (with Hillside Development and Common Open Space Development) to create 206 single family residential lots on +/- 128.5 acre project site.			
Project Address: 1200 Estates Road, Washoe County NV 89506			
Project Area (acres or square feet): +/-128.50 acres			
Project Location (with point of reference to major cross streets AND area locator): Lemmon Drive/ Deodar Way/ Estates Road; Lemmon Valley			
Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
080-635-01, -02	13.59/1.89	080-730-21	43.21
080-730-35	26.89	552-210-07	43.01
Section(s)/Township/Range:			
Indicate any previous Washoe County approvals associated with this application:			
Case No.(s).			
Applicant Information (attach additional sheets if necessary)			
Property Owner:		Professional Consultant:	
Name: JDS LLC/Derek Larson, Jennifer Jory, Surinder Preet		Name: Manhard Consulting	
Address: 7500 Rough Rock Road, Reno NV		Address: 9850 Double R Blvd., Suite 101 Reno NV	
Zip: 89502		Zip: 89521	
Phone: 775-544-5482	Fax:	Phone: 775-746-3500	Fax:
Email: dvlarson03@gmail.com		Email: kdowns@manhard.com	
Cell:	Other:	Cell:	Other:
Contact Person: Derek Larson		Contact Person: Karen Downs	
Applicant/Developer:		Other Persons to be Contacted:	
Name: Derek Larson; JDS LLC		Name:	
Address: 7500 Rough Rock Road, Reno NV		Address:	
Zip: 89502		Zip:	
Phone: 775-544-5482	Fax:	Phone:	Fax:
Email: dvlarson03@gmail.com		Email:	
Cell:	Other:	Cell:	Other:
Contact Person:		Contact Person:	
For Office Use Only			
Date Received:	Initial:	Planning Area:	
County Commission District:		Master Plan Designation(s):	
CAB(s):		Regulatory Zoning(s):	

Property Owner Affidavit

Applicant Name: _____

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, Derek V Larson
(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): 080-730-35, 080-730-21, 080-635-01, 080-635-02, 552-210-07

Printed Name Derek V Larson

Signed [Signature]

Address 7300 Rough Patch Rd
Reno NV 89502

State of Nevada
County of Washoe

Subscribed and sworn to before me this
12 day of December, 2017,
by Derek Larson.

(Notary Stamp)

Christina McFarlane
Notary Public in and for said county and state

My commission expires: Oct 20, 2021



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

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

Property Owner Affidavit

Applicant Name: Jennifer Jory / JDS Group

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, Jennifer M. Jory
(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): 080-730-35, 080-730-21, 080-635-01, 080-635-02, 552-210-07

Printed Name Jennifer M. Jory

Signed Jennifer Jory

Address 2597 Tuscan way
SPARKS, NV 89434

Subscribed and sworn to before me this 27 day of November, 2017.

(Notary Stamp)

[Signature]
Notary Public in and for said county and state

My commission expires: Mar. 6, 2021



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

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

Property Owner Affidavit

Applicant Name: SURINDER PREET

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, SURINDER PREET
(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): 080-730-35, 080-730-21, 080-635-01, 080-635-02, 552-210-07

Printed Name SURINDER PREET

Signed [Signature]

Address 4790 W. HIDDEN VALLEY DR
RENO NV 89502

State of Nevada
County of Washoe
Subscribed and sworn to before me this
12 day of December, 2017,
by Surinder Preet.

Christina McFarlane
Notary Public in and for said county and state

My commission expires: Oct. 20, 2021

(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

Property Owner Affidavit

Applicant Name: _____

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, Chris Flocchini
(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): 080-730-35, 080-730-21, 080-635-01, 080-635-02, 552-210-07

Printed Name Chris Flocchini

Signed [Signature]

Address 40 MACFARLANE RD
Reno NV 89511

Subscribed and sworn to before me this
11 day of December, 2017.

(Notary Stamp)

[Signature]
Notary Public in and for said county and state

My commission expires: July 9, 2021



*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)?

1200 Estates Road. The project is located in Lemmon Valley in the area around Lemmon Drive, Deodar Way, and Estates Road. The area continues in a southeast direction behind the existing residential subdivision to Vernoulli Street.

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

Lemmon Valley Estates

3. Density and lot design:

a. Acreage of project site	+/- 128.50 acres
b. Total number of lots	206 residential lots
c. Dwelling units per acre	1.6
d. Minimum and maximum area of proposed lots	4,500 sq. ft. to 17,206 sq. ft.
e. Minimum width of proposed lots	45 ft.
f. Average lot size	6,540 sq. ft.

4. Utilities:

a. Sewer Service	Washoe County
b. Electrical Service	NV Energy
c. Telephone Service	
d. LPG or Natural Gas Service	
e. Solid Waste Disposal Service	
f. Cable Television Service	
g. Water Service	TMWA

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

a. Acreage of common open space:

+/- 88.47 acres

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

Slope

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

4,500 sq. ft. to 17,206 sq. ft.

d. Average lot size:

6,540 sq. ft.

e. Proposed yard setbacks if different from standard:

Front- 20'
Side- 5' (varied from Table 110.406.05.1 requirement of 8')
Rear- 20'

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

To accommodate more narrow lots (minimum width of 45'), preserving the hillside, a side setback reduction from 8' to 5' is requested.

g. Identify all proposed non-residential uses:

Open space & detention/retention areas

- h. Improvements proposed for the common open space:

Common open space will be left as undeveloped open space, except for access and utility easements, a trail, and surface water retention and detention basins constructed to control runoff from the subdivision. As shown on the Plan Set, a trail is proposed that extends from the southern terminus of Kess Way, north along the pond/channel access maintenance road to Lemmon Drive, and provides for connection to the existing trail system.

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

The trail is shown on the Site Plan. It extends from the southern terminus of Kess Way, north along the pond/channel access maintenance road to Lemmon Drive, and provides for connection to the existing trail system.

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

The proposed trail is adjacent to the proposed open space and will allow for connectivity with the existing trails near the property.

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

N/A

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

Fencing will be allowed on lot lines.

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

Homeowners Association, Landscape Maintenance Association, or similar entity.

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 project is adjacent to public land, however circulation will not be disturbed through access to public lands. Project site is north of entrance to public land via Patrician Drive, and west of entrance via Estates Road. Project area that is directly adjacent will be utilized as open space.

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

<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No Annexation required
------------------------------	--

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

<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	If yes, within what city? City of Reno, Area of Interest 2002 - 2006
---	-----------------------------	--

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

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

No archaeological survey has been prepared. There are no known archaeological sites on the property. The area is not identified on the Cultural Resources and Sensitive Landscapes Master Plan Map.

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 #	TMWA as needed for development	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):

See attached TMWA Discovery letter. Water service to the site will be privately funded with development of the project. Water service is currently available to the west of the site, along Lemmon Drive in the existing residential development. Infrastructure will be connected to the site when a project is proposed. This property will need to be annexed into the TMWA service area.

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

The project has been designed to be efficient with small lots. Home design is not proposed at this time, however there is an opportunity to utilize model energy code aspects including property insulation, energy efficient appliances, energy efficient windows, and water saving shower heads, faucets, and toilets. Roadway widths will comply with minimum County standards for roadway with to reduce energy consumption associated with asphalt and aggregate production.

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:

No

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

Private roads are not proposed.

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

The proposed tentative map complies with Section 110.434.25(b)(1) Parcel Size Matching, maintaining consistent lot sizes for adjacent lots, particularly at the end of the existing Palace Drive, Kess Way, and Patrician Drive, and along proposed Palace Drive.

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

The property is within the North Valleys Area Plan and complies with Policies NV.1.7. (GR and MDS are permitted regulatory zones); NV.2.2 (minimize disruption to natural topography); NV.6.1 (perimeter parcel sizes match the existing residential parcels, limit dwellings to a single story on the perimeter when adjacent to across the street from residential development; include public review process; new residential parcels do not front on existing streets)

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

No

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

The project will likely be developed in several phases (in accordance with NRS 278) .

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?

387,500 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?

The project is proposed to balance on-site with final design.

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?

Some disturbed areas may be visible from Lemmon Drive. Other disturbed areas are behind proposed homes. All disturbed areas will be revegetated and use walls to limit impact. Much of the slope area will remain common open space and will not be disturbed.

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?

All cut and fill slopes are 3:1 minimum. Best management practices (i.e. silt fences, fiber rolls, revegetation, etc.) will be used to control erosion and allow revegetation to become established.

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?

Berms only occur in detention areas and the highest is approximately 16' in height. They are 3:1 slopes and will be stabilized with riprap where needed and revegetated.

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?

Walls range from small landscape walls on side lot lines to 10' max height walls outside of building setbacks. Where multiple walls are needed for slope mitigation, adequate benches between walls are provided.

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 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?

The specific type of revegetation seed mix will be determined at final design by a registered landscape architect to best suite the site and soil condition of exposed soils. Revegetation will meet Washoe County requirements.

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

N/A

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

The landscape plan incorporates recommended standards identified in the Washoe Storey Conservation District.

Tahoe Basin

Please complete the following additional questions if the project is within the Tahoe Basin:

31. Who is the Tahoe Regional Planning Agency (TRPA) project planner and what is his/her TRPA extension?

--

32. Is the project within a Community Plan (CP) area?

<input type="checkbox"/> Yes	<input type="checkbox"/> No	If yes, which CP?
------------------------------	-----------------------------	-------------------

33. State how you are addressing the goals and policies of the Community Plan for each of the following sections:

- a. Land Use:

--

- b. Transportation:

--

- c. Conservation:

--

d. Recreation:

--

e. Public Services:

--

34. Identify where the development rights for the proposed project will come from:

--

35. Will this project remove or replace existing housing?

<input type="checkbox"/> Yes	<input type="checkbox"/> No	If yes, how many units?
------------------------------	-----------------------------	-------------------------

36. How many residential allocations will the developer request from Washoe County?

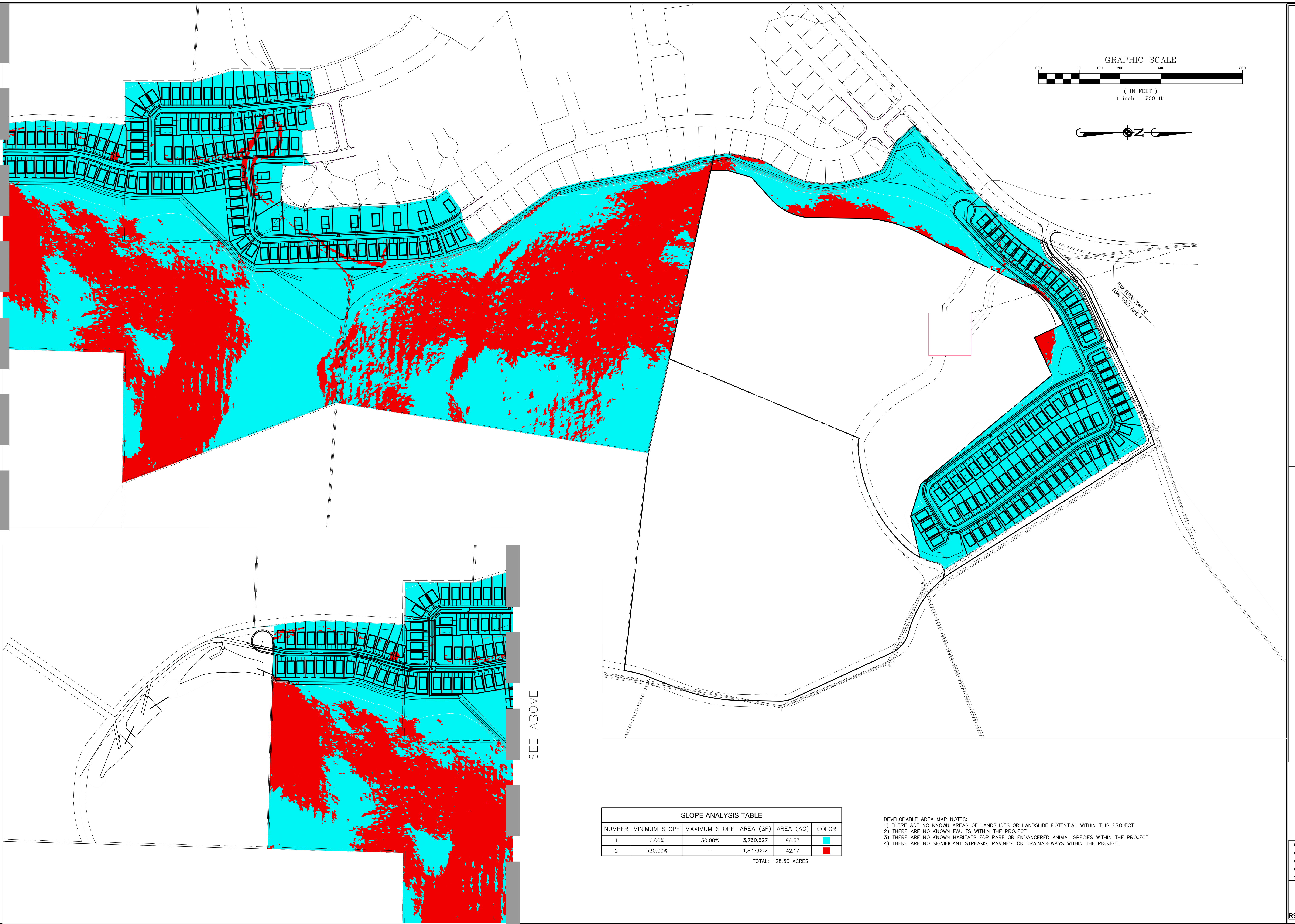
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37. Describe how the landscape plans conform to the Incline Village General Improvement District landscaping requirements:

--

December 20, 2017 - 11:24 Doc Name: P:\Revised\1\Drawings\LEH\LEH\DEVELOPABLE AREA MAP 121917.dwg Updated By: Sluoden

SEE BELOW

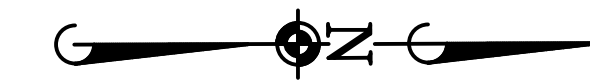
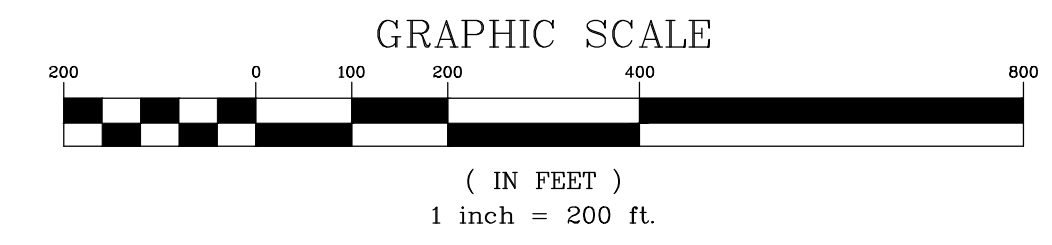


SEE ABOVE

SLOPE ANALYSIS TABLE					
NUMBER	MINIMUM SLOPE	MAXIMUM SLOPE	AREA (SF)	AREA (AC)	COLOR
1	0.00%	30.00%	3,760,627	86.33	Cyan
2	>30.00%	-	1,837,002	42.17	Red

TOTAL: 128.50 ACRES

- DEVELOPABLE AREA MAP NOTES:
- 1) THERE ARE NO KNOWN AREAS OF LANDSLIDES OR LANDSLIDE POTENTIAL WITHIN THIS PROJECT
 - 2) THERE ARE NO KNOWN FAULTS WITHIN THE PROJECT
 - 3) THERE ARE NO KNOWN HABITATS FOR RARE OR ENDANGERED ANIMAL SPECIES WITHIN THE PROJECT
 - 4) THERE ARE NO SIGNIFICANT STREAMS, RAVINES, OR DRAINAGEWAYS WITHIN THE PROJECT

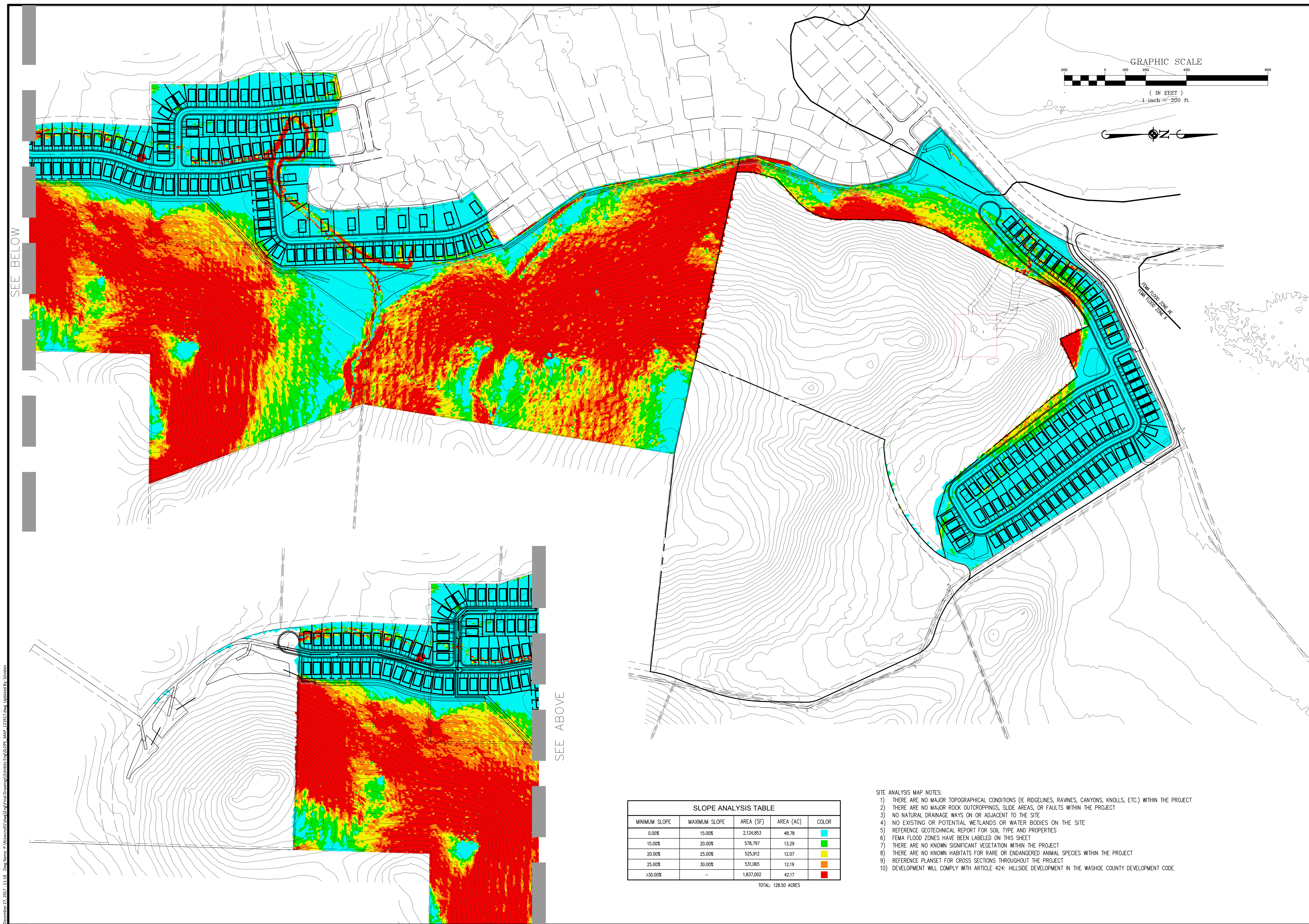


DATE	REVISIONS	DRAWN BY	CHECK BY

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CONSULTING LTD
8810 Double R Boulevard, Suite 101, Reno, NV 89521 ph: 775-748-3500 fx: 775-748-3500 manhard.com
Civil Engineers • Surveyors • Water Resources Engineers • Water & Wastewater Engineers
Construction Management • Environmental Scientists • Landscape Architects • Planners

LEMMON VALLEY ESTATES
WASHOE COUNTY, NEVADA
DEVELOPABLE AREA MAP

PROJ MGR: DMK
PROJ ASSOC: SWJ
DRAWN BY: SWJ
DATE: 12/20/17
SCALE: 1"=200'
SHEET
1 OF **1**
RSTWCNV01



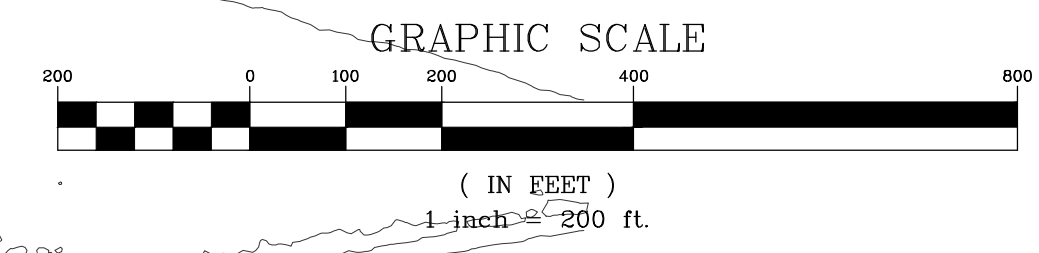
SLOPE ANALYSIS TABLE				
MINIMUM SLOPE	MAXIMUM SLOPE	AREA (SF)	AREA (AC)	COLOR
0.00%	15.00%	2,124,853	48.78	Blue
15.00%	20.00%	578,797	13.29	Green
20.00%	25.00%	525,912	12.07	Yellow
25.00%	30.00%	531,065	12.19	Orange
>30.00%	-	1,837,002	42.17	Red

TOTAL: 128.50 ACRES

- SITE ANALYSIS MAP NOTES:
- 1) THERE ARE NO MAJOR TOPOGRAPHICAL CONDITIONS (IE RIDGELINES, RAVINES, CANYONS, KNOLLS, ETC.) WITHIN THE PROJECT
 - 2) THERE ARE NO MAJOR ROCK OUTCROPPINGS, SLIDE AREAS, OR FAULTS WITHIN THE PROJECT
 - 3) NO NATURAL DRAINAGE WAYS ON OR ADJACENT TO THE SITE
 - 4) NO EXISTING OR POTENTIAL WETLANDS OR WATER BODIES ON THE SITE
 - 5) REFERENCE GEOTECHNICAL REPORT FOR SOIL TYPE AND PROPERTIES
 - 6) FEMA FLOOD ZONES HAVE BEEN LABELED ON THIS SHEET
 - 7) THERE ARE NO KNOWN SIGNIFICANT VEGETATION WITHIN THE PROJECT
 - 8) THERE ARE NO KNOWN HABITATS FOR RARE OR ENDANGERED ANIMAL SPECIES WITHIN THE PROJECT
 - 9) REFERENCE PLANSET FOR CROSS SECTIONS THROUGHOUT THE PROJECT
 - 10) DEVELOPMENT WILL COMPLY WITH ARTICLE 424: HILLSIDE DEVELOPMENT IN THE WASHOE COUNTY DEVELOPMENT CODE

SEE BELOW

SEE ABOVE



DATE	REVISIONS	DRAWN BY	CHECK BY

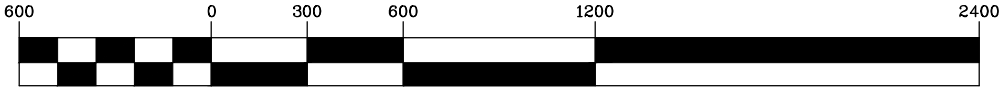
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CONSULTING LTD.
6810 Double R Boulevard, Suite 101, Reno, NV 89521, ph: 775-748-3500, mrenard@manhard.com
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LEMMON VALLEY ESTATES
WASHOE COUNTY, NEVADA
SITE ANALYSIS MAP

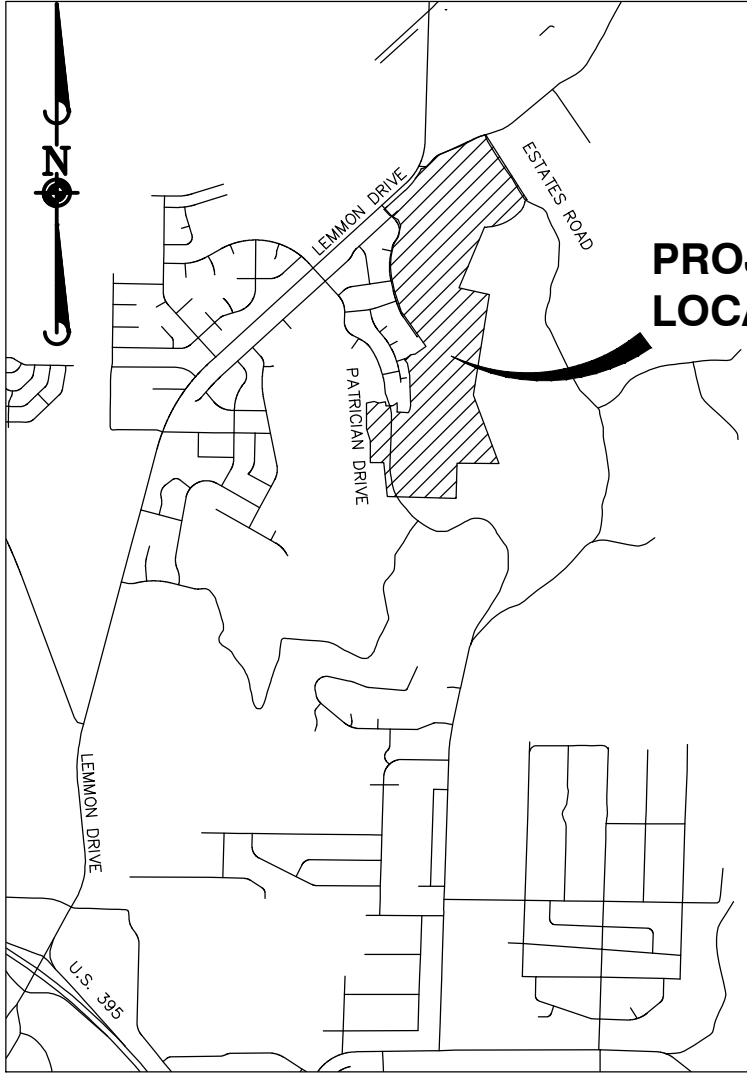
PROJ. MGR.: DMK
PROJ. ASSOC.: SWJ
DRAWN BY: SWJ
DATE: 12/20/17
SCALE: 1"=200'
SHEET
1 OF **1**
RSTWCNV01

December 27, 2017 - 11:18 Dog Name: P:\Rstwc001\Drawings\LEMMON VALLEY ESTATES\MAP_121917.dwg, Updated By: slivden

GRAPHIC SCALE

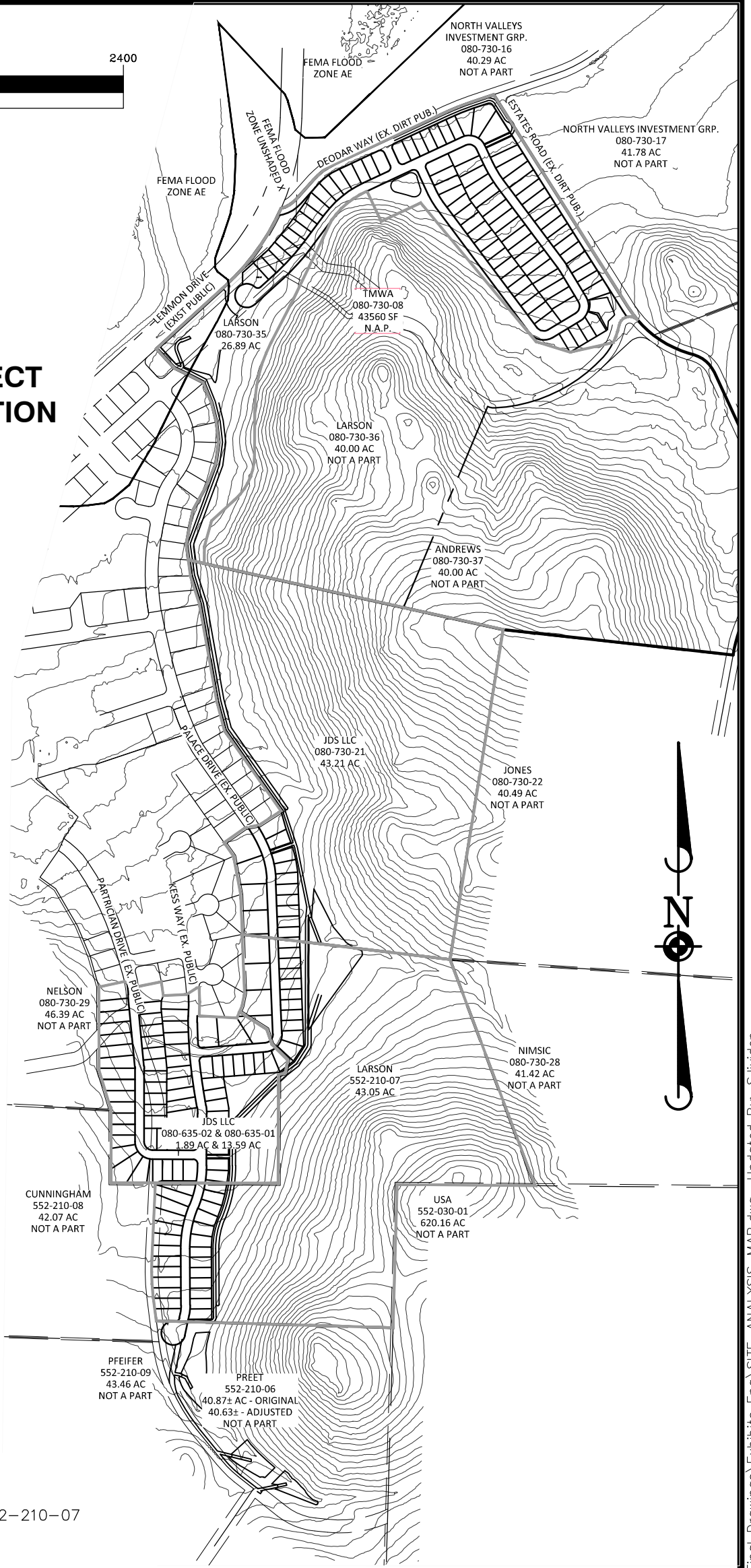


(IN FEET)
1 inch = 600 ft.



VICINITY MAP
NTS

PROJECT LOCATION



SITE ANALYSIS MAP NOTES:

- 1) THERE ARE NO MAJOR TOPOGRAPHICAL CONDITIONS (IE RIDGELINES, RAVINES, CANYONS, KNOLLS, ETC.) WITHIN THE PROJECT
- 2) NO NATURAL DRAINAGE WAYS ON OR ADJACENT TO THE SITE.
- 3) NO EXISTING OR POTENTIAL WETLANDS OR WATER BODIES ON THE SITE
- 4) THERE ARE NO AVALANCHE OR LANDSLIDE HAZARDS
- 5) THERE ARE NO FAULTS WITHIN THE PROJECT
- 6) REFERENCE GEOTECHNICAL REPORT FOR SOIL TYPE AND PROPERTIES
- 7) FEMA FLOOD ZONES HAVE BEEN LABELED ON THIS SHEET
- 8) THERE ARE NO KNOWN SIGNIFICANT VEGETATION WITHIN THE PROJECT
- 9) THERE ARE NO KNOWN HABITATS OR MIGRATION ROUTES FOR RARE OR ENDANGERED ANIMAL SPECIES WITHIN THE PROJECT
- 10) REFERENCE PLANSET FOR CROSS SECTIONS THROUGHOUT THE PROJECT
- 11) DEVELOPMENT WILL COMPLY WITH ARTICLE 424: HILLSIDE DEVELOPMENT IN THE WASHOE COUNTY DEVELOPMENT CODE
- 12) CONTOURS ARE AT 10' INTERVALS

LAND USE DATA:

LOCATION: LEMMON VALLEY, WASHOE COUNTY
ACCESS: 395 TO LEMMON DRIVE
APN: 080-730-21, 080-730-35, 080-635-01, 080-635-02, 552-210-07
LAND USE: PRESENT= MDS, PROPOSED= MDS (NO CHANGE)
NUMBER OF UNITS: PRESENT= 0, PROPOSED= 206

EX. VEGETATION (TREE PRESERVATION INFORMATION):

APPROXIMATE TREES WITHIN PROJECT AREA: 0
APPROXIMATE TREES TO BE REMOVED: 0
APPROXIMATE TO REMAIN: 0

PREVAILING WINDS: FROM THE SOUTH AND SOUTHWEST WITH HIGH WINDS COMMON ESPECIALLY DURING SUMMER AFTERNOONS

SOIL: PRIMARILY GRANULAR SAND SOILS

FLOOD ZONE: LOTS ARE IN ZONE UNSHADED X, PARTS OF PROJECT ARE IN ZONE AE

EX. UTILITY LOCATIONS:

SEWER: LEMMON DRIVE, PATRICIAN DRIVE, KESS WAY, PALACE DRIVE
WATER: LEMMON DRIVE, PATRICIAN DRIVE, KESS WAY, PALACE DRIVE
ELEC: LEMMON DRIVE, PATRICIAN DRIVE, KESS WAY, PALACE DRIVE
GAS: LEMMON DRIVE, PATRICIAN DRIVE, KESS WAY, PALACE DRIVE

DATE	REVISIONS	BY

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SLOPE ANALYSIS TABLE

MINIMUM SLOPE	MAXIMUM SLOPE	AREA (SF)	AREA (AC)
0.00%	15.00%	2,124,853	48.78
15.00%	20.00%	578,797	13.29
20.00%	25.00%	525,912	12.07
25.00%	30.00%	531,065	12.19
>30.00%	-	1,837,002	42.17

TOTAL: 128.50 ACRES

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LEMMON VALLEY PROJECT
WASHOE COUNTY, NEVADA
SITE ANALYSIS MAP

DRAWN BY: SWJ	RELEASE DATE: 12/21/17	SCALE: 1"=600'	CODE: RSTWCNV01
------------------	---------------------------	-------------------	--------------------

Washoe County Treasurer
Tammie Davis

Account Detail

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Washoe County Parcel Information

Parcel ID	Status	Last Update
08063501	Active	1/9/2018 2:06:23 AM

Current Owner:
JDS LLC

SITUS:
0 E PATRICIAN DR
WASHOE COUNTY NV

7500 ROUGH ROCK DR
RENO, NV 89502

Taxing District

Geo CD:

Legal Description

Township 21 Section 34 Lot Block Range 19 SubdivisionName _UNSPECIFIED

Tax Bill (Click on desired tax year for due dates and further details)

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2017	\$297.09	\$307.49	\$0.00	\$0.00	\$0.00
2016	\$289.56	\$303.80	\$0.00	\$0.00	\$0.00
2015	\$288.98	\$288.98	\$0.00	\$0.00	\$0.00
2014	\$288.98	\$288.98	\$0.00	\$0.00	\$0.00
2013	\$288.98	\$288.98	\$0.00	\$0.00	\$0.00
Total					\$0.00

Important Payment Information

- ALERTS:** If your real property taxes are delinquent, the search results displayed may not reflect the correct amount owing. Please contact our office for the current amount due.
- For your convenience, online payment is available on this site. E-check payments are accepted without a fee. However, a service fee does apply for online credit card payments. See [Payment Information](#) for details.

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No payment due for this account.

\$0.00

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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

 **Payment Information**

 **Special Assessment District**

 **Installment Date Information**

 **Assessment Information**

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Washoe County Treasurer
Tammi Davis

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\$0.00

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Reno, NV 89520-3039

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

Washoe County Parcel Information

Parcel ID	Status	Last Update
08063502	Active	1/9/2018 2:06:23 AM

Current Owner:
JDS LLC

SITUS:
0 E PATRICIAN DR
WASHOE COUNTY NV

7500 ROUGH ROCK DR
RENO, NV 89502

Taxing District

Geo CD:

Legal Description

Township 21 Section 34 Lot Block Range 19 SubdivisionName _UNSPECIFIED

Tax Bill (Click on desired tax year for due dates and further details)

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2017	\$146.90	\$152.05	\$0.00	\$0.00	\$0.00
2016	\$143.18	\$150.22	\$0.00	\$0.00	\$0.00
2015	\$142.89	\$142.89	\$0.00	\$0.00	\$0.00
2014	\$142.90	\$142.90	\$0.00	\$0.00	\$0.00
2013	\$142.90	\$142.90	\$0.00	\$0.00	\$0.00
Total					\$0.00

-  [Payment Information](#)
-  [Special Assessment District](#)
-  [Installment Date Information](#)
-  [Assessment Information](#)

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Washoe County Treasurer
Tammi Davis

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No payment due for this account.

\$0.00

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Reno, NV 89512-2845

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-  [Special Assessment District](#)
-  [Installment Date Information](#)
-  [Assessment Information](#)

Washoe County Parcel Information

Parcel ID	Status	Last Update
08073021	Active	1/9/2018 2:06:23 AM
Current Owner: JDS GROUP LLC 7500 ROUGH ROCK DR RENO, NV 89502		SITUS: 505 PALACE DR WCTY NV
Taxing District	Geo CD:	
Legal Description Range 19 Lot 51 SubdivisionName _UNSPECIFIED Township 21		

Tax Bill (Click on desired tax year for due dates and further details)

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2017	\$419.73	\$434.42	\$0.00	\$0.00	\$0.00
2016	\$409.09	\$423.41	\$0.00	\$0.00	\$0.00
2015	\$408.27	\$421.73	\$0.00	\$0.00	\$0.00
2014	\$408.28	\$447.37	\$0.00	\$0.00	\$0.00
2013	\$408.28	\$424.52	\$0.00	\$0.00	\$0.00
Total					\$0.00

Important Payment Information

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Washoe County Treasurer
Tammi Davis

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

Washoe County Parcel Information

Parcel ID	Status	Last Update
08073035	Active	1/9/2018 2:06:23 AM
Current Owner: LARSON, DEREK V		SITUS: 0 ESTATES RD WASHOE COUNTY NV
7500 ROUGH ROCK DR RENO, NV 89502		
Taxing District	Geo CD:	
Legal Description		
Range 19 SubdivisionName _UNSPECIFIED Township 21 Section 34,35 Lot A Block		

Tax Bill (Click on desired tax year for due dates and further details)

Important Payment Information

- ALERTS:** If your real property taxes are delinquent, the search results displayed may not reflect the correct amount owing. Please contact our office for the current amount due.
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-  [Payment Information](#)
-  [Special Assessment District](#)
-  [Installment Date Information](#)
-  [Assessment Information](#)

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Washoe County Treasurer
 Tammi Davis

Bill Detail

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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

Washoe County Parcel Information		
Parcel ID	Status	Last Update
55221007	Active	1/9/2018 2:06:23 AM
Current Owner: LARSON, DEREK 7500 ROUGH ROCK DR RENO, NV 89502		SITUS: 0 E PATRICIAN DR WASHOE COUNTY NV
Taxing District		Geo CD:
Legal Description Township 21 Section Lot 52 Block 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
Total Due:			\$0.00	\$0.00	\$0.00	\$0.00

Tax Detail			
	Gross Tax	Credit	Net Tax
State of Nevada	\$35.62	\$0.00	\$35.62
Truckee Meadows Fire Dist	\$113.16	\$0.00	\$113.16
Washoe County	\$291.63	\$0.00	\$291.63
Washoe County Sc	\$238.57	\$0.00	\$238.57
Total Tax	\$678.98	\$0.00	\$678.98

Payment History				
Tax Year	Bill Number	Receipt Number	Amount Paid	Last Paid
2017	2017122288	U17.14695	\$363.27	11/28/2017
2017	2017122288	U17.18299	\$339.48	1/8/2018

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Lemmon Valley Heights

Conceptual Hydrologic Analysis

November 13, 2017

Document Information

Prepared for Manhard Consulting, LTD.
Project Name Lemmon Valley Heights
Conceptual Hydrologic Analysis
Project Number E317104300
Project Manager Mark Gookin, PE, CFM
Date November 13, 2017



Mark Gookin, PE, CFM

Prepared for:



Manhard Consulting LTD
9850 Double R Boulevard, Suite 101, Reno, NV 89521 USA

Prepared by:



Cardno, Inc.
5496 Reno Corporate Drive, Reno, NV 89511 USA

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Appendices

Appendix A	Hydrologic Computations
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1 Introduction

1.1 Location/Description

The proposed Lemmon Valley Heights development project consists of a ± 48 acre residential development. The project site is located in Lemmon Valley, Nevada, Township 21N, Range 19E, Sections 34 and 35. The site is accessed via Lemmon Drive, East Patrician Drive and Estates Road and consists of Assessor's Parcel Numbers (APNs) 080-635-01, -02, 52-210-07, 080-730-21, -18, -08, -35. The general location of the project relative to other prominent areas in the Truckee Meadows is presented in Figure 1.

1.2 Existing Site Conditions

The proposed project site is surrounded by an existing residential development to the northwest and open space elsewhere. The majority of the site is located outside of the Federal Emergency Management Agency (FEMA) 100-year Swan Lake Floodplain, which has a reported water surface elevation of 4924 feet above NAVD88. A small portion of the proposed development, approximately 3 acres adjacent to Lemmon Drive, is located within the 100-year floodplain, however this area is designated as open space in the preliminary development layout.

The majority of the vegetation throughout the undeveloped areas consists of brush and desert grasses. The NRCS soil classification for the proposed development area is primarily loamy sand, which is classified as hydrologic soil group Type A, with a small area that is classified as Type D. The surrounding upland watersheds consist primarily of Type C and Type D soils.

The existing topography at the proposed project site consists of moderately steep slopes (2%-6%), with numerous washes and unmaintained dirt roads throughout the site and surrounding areas. The proposed site transitions into steeper terrain and ridgelines to the south and southeast, that ultimately make up the sub-catchments of the 1.2 mi² watershed that drains through the proposed project site.

1.3 Previous Studies and Relevant Master Plans

Schaaf and Wheeler conducted a comprehensive hydrologic study in 2005, titled Lemmon Valley Master Hydrology, which includes the project site and the entire surrounding watershed area. Similarly, the Stead Drainage Master Plan that was prepared for the City of Reno by Stantec in 2000 also includes the project site and surrounding watershed as a single basin. The 100-year peak runoff estimates from these studies were used to confirm the reasonableness of the results obtained in this study. This comparison is discussed further in the following Section 2.1.1.

2 Hydrologic Analysis

2.1 Existing and Proposed Drainage Basin Boundaries

The drainage basin boundaries were determined from 1-meter Light Detection and Ranging (LiDAR) point data collected by Washoe County in 2013. Two main concentration points for the drainage basin that contains the project site were identified; the Main Outlet where combined runoff from approximately 566 acres exits the existing development adjacent to the project site, and the WS3 Outlet, which drains 340 acres through the northeastern section of proposed development. Maintaining these distinct concentration points allowed for comparison of flows with the previous studies discussed in Section 1.3. The main watersheds were subdivided into smaller sub-basins, which were then kept the same, with respect to sub-basin boundaries, for both existing and proposed condition calculations, with the exception of WS-2H. In order to accurately represent the proposed drainage conditions, WS-2H was further subdivided into three separate basins for proposed conditions, based on the preliminary site plan. The other sub-basins that will undergo development with the proposed project were modified by increasing the percent of impervious area based on the density of development, as the flow routing through these sub-basins is not expected to significantly change as a result of the proposed development.

Peak flows through the existing development are detained by an approximate 6 acre-foot detention basin, which is located at the outlet of WS-2. The existing basin has a three-foot diameter corrugated metal pipe outlet, which connects to the existing trapezoidal channel draining the existing development. The existing basin is within the proposed development area, and will therefore be removed as part of the proposed project, thus requiring the offsite flows to be detained elsewhere.

The existing and proposed conditions sub-basins are shown in Figure 2 and the locations of these sub-basins relative to landmarks within the basin and the Main Outlet and WS3 concentration points are shown in Figure 3.

2.2 Storm Flow Calculations

Both existing and proposed storm flows were calculated using the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) Version 4.2.1. Runoff losses were computed using the Green and Ampt Infiltration method and transformation calculations were performed using the SCS Unit Hydrograph method. Infiltration losses in the Green and Ampt methodology were calculated using composite parameters that were developed for existing and proposed conditions based on soil classifications obtained from the NRCS database and land cover data obtained from USGS National Elevation Dataset. Where applicable, flows were routed through washes and other ephemeral stream channels within the sub basins using the Muskingham-Cunge method. Post-development flows were also routed through the developed areas using the Muskingham-Cunge method. Times of concentration for each sub-basin were calculated using the methodology for small watersheds with areas less than one square mile, as outlined in Section 702 of the Truckee Meadows Regional Drainage Manual (TMRDM). The final times of concentration are summarized in Appendix A.

Precipitation was applied based on depths obtained from the NOAA Atlas 14 frequency storms. In accordance with the TMRDM, the major storm (100-year 24-hour) was used for calculating peak runoff and sizing drainage facilities, while the 100-year 10-day storm was used to analyze runoff volume increase as a result of the proposed project. The area-weighted average soil characteristics, including porosity and hydraulic conductivity, were determined using the soils texture data obtained from the NRCS and the corresponding parameter for the Green and Ampt model provided in the HEC-HMS Technical Reference Manual (US Army Corps 2000). The final composite Green and Ampt parameters are provided in Appendix A. The percent of impervious surface area in each sub-basin was determined based on

residential density, field reconnaissance, and review of aerial imagery. The existing developed watershed areas were assigned an impervious area of 35%, which was determined based on the average proposed lot size and associated impervious area percentages outlined in the curve number table included in the TMRDM (Table 702). Under proposed conditions, the percent impervious area for each sub-basin to be partially developed was calculated by determining the total area within each sub-basin that would be developed and assigning this area an impervious percentage of 35% based on the average proposed lot size.

In order to simulate the effects of reduction in peak flows due to storage, all of the proposed retention and detention facilities were also modeled in HEC-HMS, assuming corrugated metal pipe outlets and emergency spillways. Emergency Spillways were preliminarily sized for each of the proposed basins, using peak flows that were obtained by doubling the precipitation depths for the 100-year 24-hour event, per the requirements in the TMRDM. In order to produce more conservative results, infiltration within the basins was not considered as part of this analysis, although it is expected that infiltration will contribute to a further reduction in runoff volume during large storm events. However, it was assumed that the soil characteristics in the proposed basin locations will comply with the minimum infiltration rate requirement of 1 inch/hr, and that the groundwater table will be a minimum of 5 feet below the bottom of the basins.

3 Existing Conditions Hydrology

Under existing conditions, the calculated peak runoff for the 100-year 24-hour storm at the Main Outlet was 255.3 cfs, with a total 100-year 10-day runoff volume of 40.2 ac-ft. The calculated peak runoff for the 100-year 24-hour storm at the WS3 Outlet was 125.9 cfs, with a total 100-year 10-day runoff volume of 5.8 ac-ft. Therefore, the 100-year 10-day runoff volume exiting the proposed project area under existing conditions is approximately 46 ac-ft.

3.1 Reasonableness of Results

The 24-hour peak flows were checked for reasonableness against peak flows presented in the Lemmon Valley Master Hydrology (Schaaf & Wheeler, 2005), and the Stead Master Drainage Plan (Stantec, 2000). It is important to note that both reports utilized 100-year, 24-hour precipitation depths that were less than those used in this study, which would suggest that the peak flow rates in the previous studies may be slightly lower. Also, both of the previous studies used larger, less-refined sub-basins, which may have been delineated differently. Therefore, the peak flows between studies may not be directly comparable.

The Stead Master plan modeled the entire project-site as a single watershed area, which is identified as Patrician Drive Basin, and the reported 100-year 24-hour peak flow is 338 cfs, which is slightly lower than the combined peak flow of 381 cfs identified in this study.

The Schaaf & Wheeler study includes the entire watershed area draining to the Main Outlet and a portion of WS3, which appears to be roughly equivalent to WS-3C. The basins that encompass the proposed project area are identified as Gold 6 and Gold 7 in the Schaaf and Wheeler report. The 24-hour peak flow for the project area (both Gold 6 and Gold 7) is 243 cfs. This peak flow is also lower than the calculated 24-hour peak of 381 cfs. The total watershed area included in the Schaaf & Wheeler report is approximately 1 mi², whereas the total watershed area in this study is 1.2 mi².

The higher precipitation depths, higher resolution drainage basin delineation, and expected differences in hydrograph peak timing, are expected to produce peak flows that would be higher than the aforementioned previous studies. Given these differences, along with the uncertainties in interpreting these older studies and dissimilarities between input parameters and computation methodology, the results were determined to be reasonably close to the previous studies and instill confidence in the results of the existing conditions model. A summary of these results is provided in Table 3-1.

Table 3-1 100-year 24-hour Peak Flows for Proposed Routing

Hydrologic Study	Basin Area (mi²)	100-year 24-hour Precipitation Depth (in)	100-year 24-hour Peak Flow (cfs)
Stead Master Drainage Plan (2000)	1.0	3.4	338
Lemmon Valley Master Hydrology (2005)	1.1	3.0	243
Cardno study (2017)	1.2	4.1	381

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4 Proposed Conditions Hydrology

Under proposed conditions, the calculated peak runoff for the 100-year 24-hour storm at the Main Outlet was reduced to 104.5 cfs from 255.2 cfs, while the peak flow at WS3 remains nearly constant at approximately 126 cfs. The large reduction in the peak flow at the the Main Outlet is primarily due to the re-routing of off-site flows through numerous detention basins and channels to the final retention basin located at Lemmon Drive. The 100-year 24-hour peak flow rates for both existing and proposed conditions are summarized in Table 4-1.

Table 4-1 Peak Flow Rates and Total Volumes for Existing and Proposed Conditions

	Concentration Point	100-year 24-hour Peak Flow (cfs)
Existing Conditions	Main Outlet	255.2
	WS3 Outlet	125.9
Proposed Conditions	Main Outlet (existing outlet and Lemmon Drive Pond)	104.5
	WS3 (Lower Deodar Pond)	125.8

4.1 Proposed Routing

The proposed development can be divided into two distinct areas. The first area (Area 1) consists of the proposed lots bordering Kess Way and Palace Drive, located to the southwest of the existing development. The second area of development (Area 2) contains the remaining proposed lots located along Deodar Way and Estates road, located to the northeast of the existing development.

The majority of the off-site flow entering Area 1 will be routed through a series of detention ponds (Kess Way Ponds), and then conveyed through a trapezoidal channel (Channel 1) with a 3-foot base width and 2:1 side slopes; Channel 1 then conveys the flow into another detention basin (Palace Drive Pond). The 24-hour peak flow in Channel 1 is 52.2 cfs, yielding a velocity of 3.47 fps and a flow depth of 2 feet. Therefore, it is recommended that the channel be lined with vegetation or small rock if further geotechnical investigation suggests that an unlined channel will be subject to erosion. The Palace Drive pond will also receive water from off-site basins WS1 and WS4. The outflow from the Palace Drive pond will then be conveyed to a final retention basin (Lemmon Drive Pond) via a second trapezoidal channel (Channel 2) with a 3-foot-base width and 2:1 side slopes. The 24-hour peak flow in Channel 2 is 43.7 cfs yielding a velocity of 3.3 fps and a flow depth of 1.9 feet. Similar to Channel 1, it is recommended that the channel be lined if the soils along the channel alignment are not cohesive enough to remain stable at these velocities and flow depths. A small portion of the off-site flows (WS2-i) and the on-site flows (WS-2H) in Area 1 will be routed through a storm drain system that will tie into the drainage system of the existing development.

The majority of the off-site flow entering Area 2 will be collected into two detention basins, Upper Deodar Pond and Lower Deodar Pond. The flow entering Upper Deodar Pond will be routed through the proposed development in two 24-inch concrete storm-drain pipes that will outlet into Lower Deodar Pond. The 24-hour peak flows in these pipes will be 55.6 and 31.4 cfs.

A summary of the proposed drainage channels and pipes in the proposed development and associated peak flow rates are shown in Table 4-2.

Table 4-2 100-year 24-hour Peak Flows for Proposed Routing

Proposed Routing Feature	100-year 24-hour Peak Flow (cfs)	Peak Velocity (fps)	Flow Depth (ft)
Channel 1	52.2	3.5	2
Channel 2	43.7	3.3	1.9
Pipe 1	55.6	19	N/A
Pipe 2	31.4	10	N/A

4.2 Detention and Retention Requirements

As discussed in Section 2.2, a volumetric comparison of existing and proposed conditions was conducted using the 100-year 10-day storm event. Under proposed conditions, the total 100-year 10-day runoff volumes for the Main Outlet and WS3 were 50.6 and 10.6 ac-ft, respectively. Therefore, under proposed conditions, the total calculated 100-year 10-day runoff volume exiting the project area is increased to 61.2 ac-ft, which results in a net volume increase of 15.2 ac-ft from existing conditions. Per the requirements outlined in Section 709.2 of the TMRDM, no additional volume may be discharged to Swan Lake due to new developments, and therefore 15.2 ac-ft of water must be retained on-site. A summary of the proposed conditions volume increase is presented in Table 4-3.

Table 4-3 Peak Flow Rates and Total Volumes for Existing and Proposed Conditions

	Concentration Point	100-year 10-day Total Volume (ac-ft)
Existing Conditions	Main Outlet	40.2
	WS3 Outlet	5.8
Proposed Conditions	Main Outlet (existing outlet and Lemmon Drive Pond)	50.6
	WS3 (Lower Deodar Pond)	10.6
	Volume Increase	15.2

To account for the 15.2 ac-ft volume increase, a 16.6 ac-ft retention basin, located at the outlet of the project site along Lemmon Drive is proposed. This basin will sufficiently store excess runoff, allowing for a foot of freeboard and allows for a 10% decrease in storage volume due to sedimentation. A total of six other detention/retention basins are proposed on-site in order to provide additional storage and mitigate flow rates such that major storm flows in the existing development area are substantially reduced and the final Lemmon Drive Pond will be able to adequately store all 15.2 ac-ft of excess volume. The layout of the proposed ponds is shown in Figure 4 and a summary of the detention facilities is presented in Table 4-4.

Table 4-4 Proposed Basin Volumes and 100-year 24-hour Peak Flows for Area 1

Proposed Basin	Basin Volume (ac-ft)	Peak Inflow (cfs)	Peak Outflow (cfs)
Kess Way 1	0.86	93.6	93.7
Kess Way 2	2.34	135.5	91.3
Kess Way 3	4.34	91.3	52.2
Palace Drive	16.9	114.6	14.3
Lemmon Drive	16.7	69.5	0
Upper Deodar	0.68	93	60.8
Lower Deodar	1.59	134	125.8

In order to further reduce the total volume being released to Swan Lake, the outlet inverts for the Palace Drive, Lemmon Drive, and Deodar Way ponds are recommended to be placed several feet above the bottom of the basins, such that excess water will be retained and percolate into the soil. Based on the soil types identified in the NRCS database, the soils at the proposed pond locations have percolation rates that are greater than the minimum requirement of 1 in/hr. However, geotechnical investigation at the proposed pond locations will be required to ensure that these facilities will drain within the allotted amount of time and that infiltration rates will be sufficient to provide the expected sub-surface storage. To provide a conservative approximation, the time for each pond to drain was calculated using the minimum percolation rate of 1 in/hr and all of the proposed basins will empty within the 7 day time-to-drain requirement set forth in the TMRDM.

5 Conclusions

5.1 Compliance with all Manual Policies and Requirements

The conceptual drainage design for the proposed developments complies with the policies and requirements outlined in the TMRDM. The calculations of storm flows were performed using the acceptable HEC-HMS methods and criteria outlined and provided in the TMRDM. As discussed in Section 3, the on-site facilities are designed with sufficient capacity to handle major storm peak flows, and the infrastructure meets applicable velocity and freeboard requirements. The increase in 100-year 10-day runoff volume of 15.2 ac-ft will be mitigated with on-site retention basins such that there will be no net increase in the 100-year water surface elevation of Swan Lake. The proposed retention/detention basins will comply with all design standards and criteria specified in the TMRDM for local minor detention facilities.

5.2 Effect of Development on Off-Site Flows and Impact to Adjacent Downstream Properties and Drainage ways

The proposed detention facilities located in Area 1 have been designed to capture the majority of the upland off-site flows that currently flow through the existing detention basin and channel. Therefore, the peak flow through the downstream existing channel will be reduced from 199 cfs to 48 cfs under proposed conditions and the total discharge at the Main Outlet will be reduced from 255.2 cfs to 104.5 cfs. The peak flow at the WS3 Outlet will remain approximately the same, at approximately 126cfs. Due to the elevation of the Palace Drive pond outlet pipe, the basin is able to retain an additional 6.5 ac-ft of runoff during the 100-year 24-hour event. This additional storage, combined with the 16.6 ac-ft of available storage in the downstream Lemmon Drive pond, allows for complete retention of runoff from the upland watersheds (WS-1, WS-2 and WS-3 through WS-6). This additional retention will result in a reduction in the overall volume of water being discharged from the Main Outlet from approximately 23 ac-ft under existing conditions to 14 ac-ft with the proposed development. Overall, the proposed drainage facilities will serve to mitigate any potential downstream impacts associated with the proposed development, as required by the local jurisdictions.

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6 Exhibits and Figures

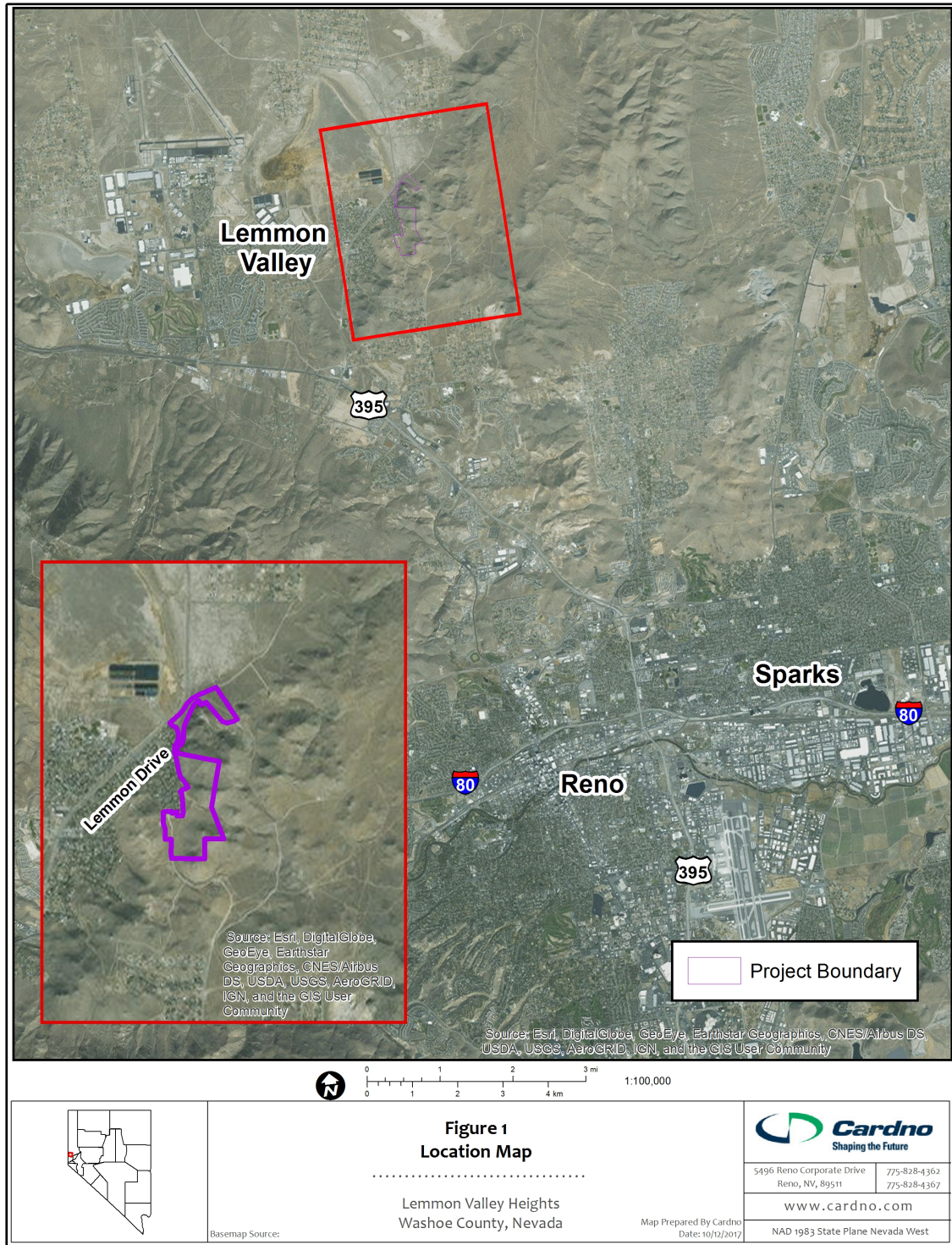


Figure 1: Project Location Map

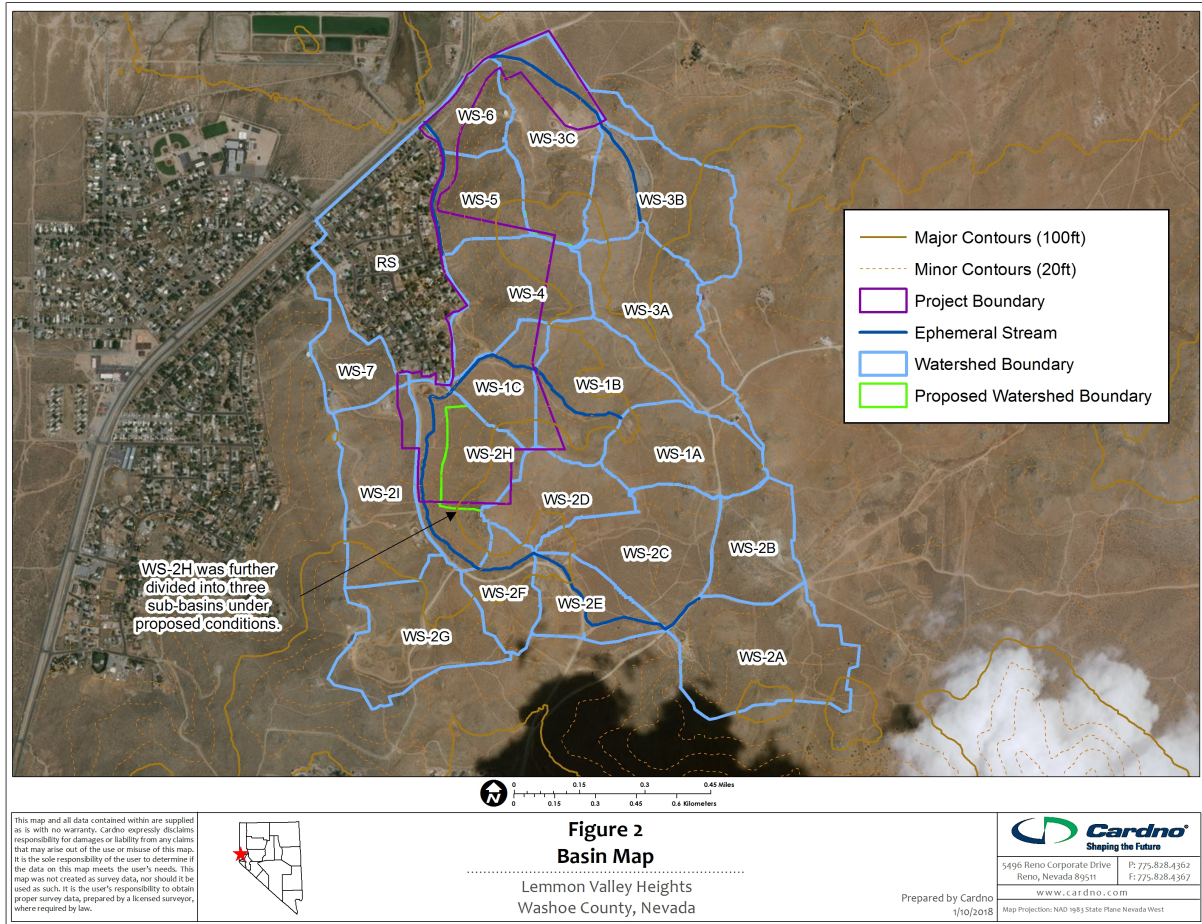


Figure 2: Project Watershed Sub-Basin Map

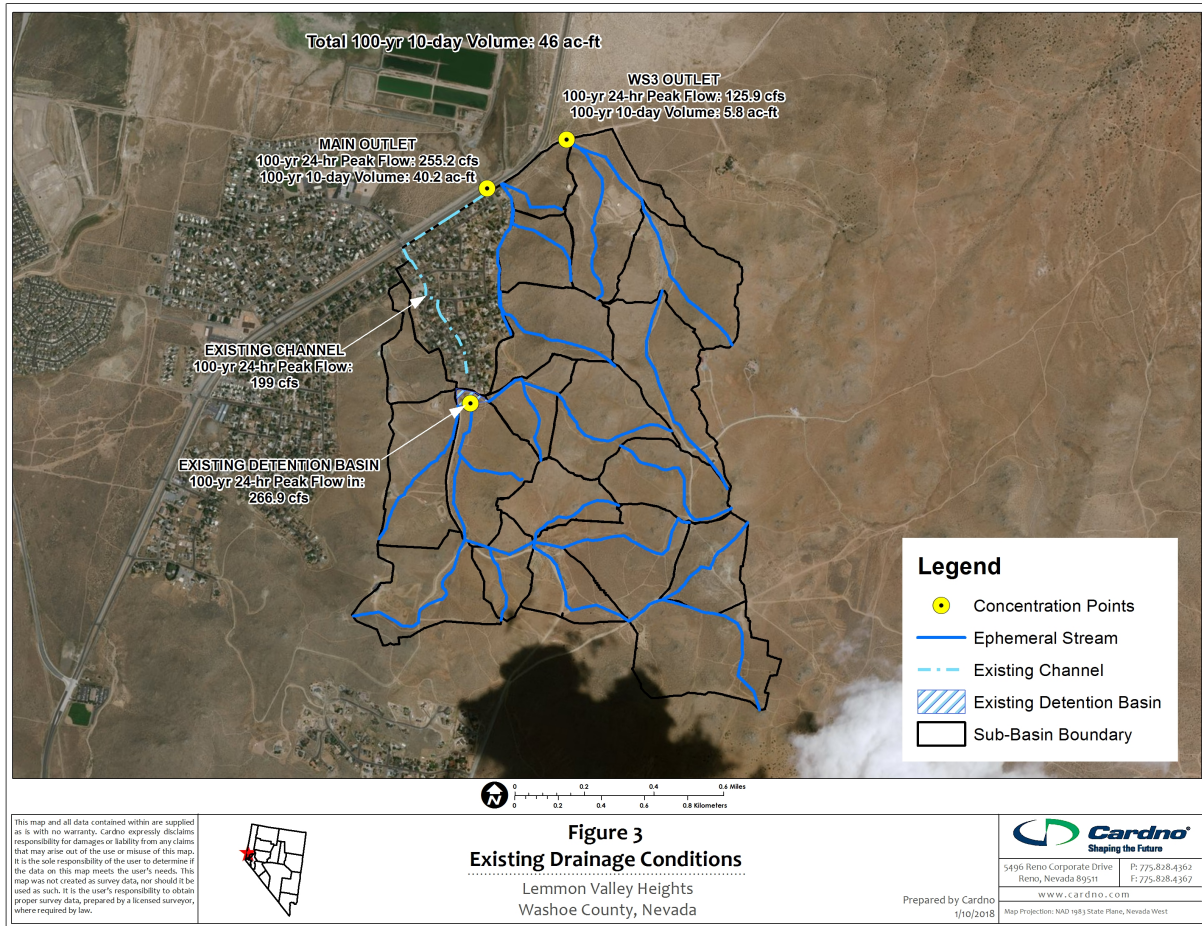


Figure 3: Existing Drainage Conditions

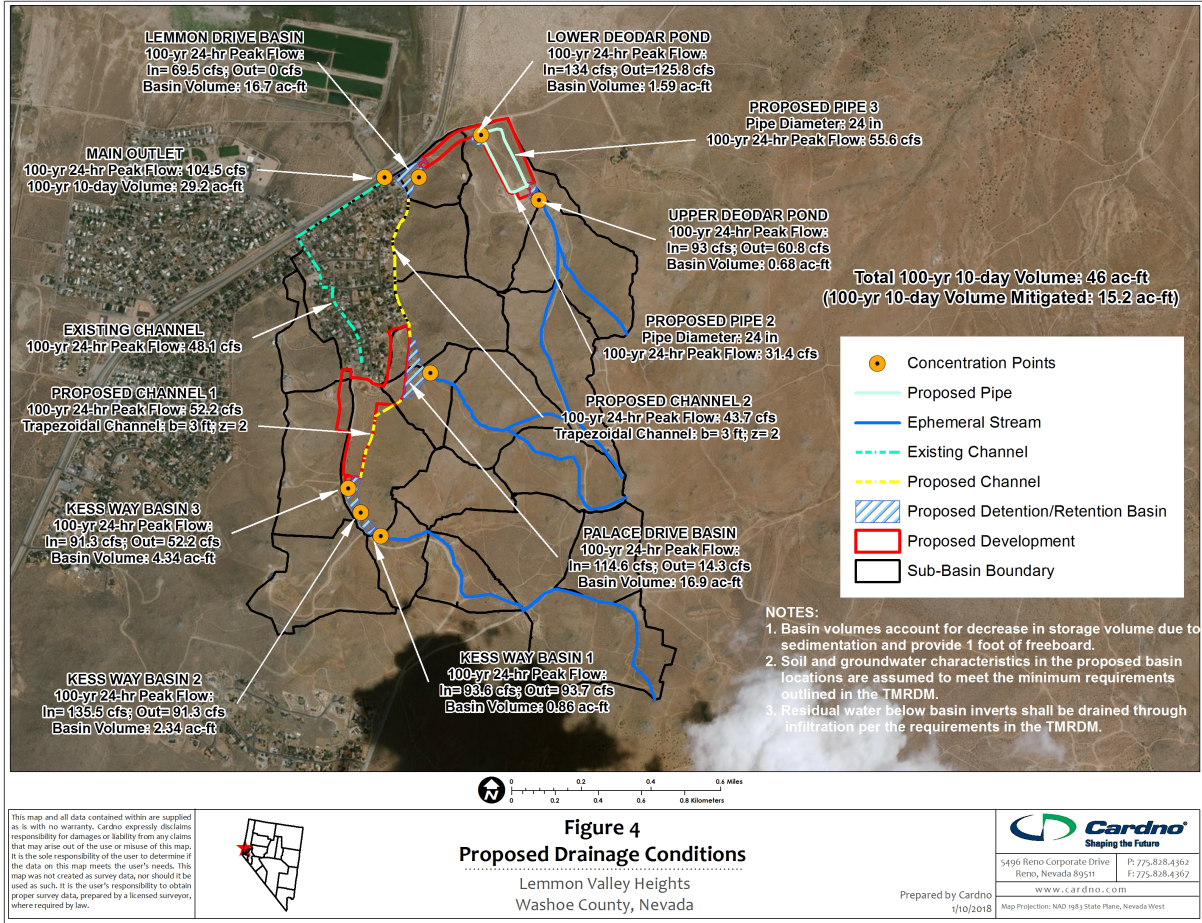


Figure 4: Proposed Drainage Conditions

7 References

- Federal Emergency Management Agency (FEMA). Flood Insurance Rate Map, Washoe County, Nevada. Map Number 32031C2850G, Panel 2850 of 3475 March 16, 2009.
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- Schaaf and Wheeler Consulting Civil Engineers, Lemmon Valley Master Hydrology. March, 2005.
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- United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Web Soil Survey. Website accessed October 2017. <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- United States Department of the Army, Corps of Engineers, Hydrologic Engineering Center Hydrologic Modeling System HEC-HMS, Technical Reference Manual. March 2000.
- United States Geologic Survey (USGS). National Elevation Data Set. Website accessed October 2017. <http://nationalmap.gov/elevation.html>

Lemmon Valley Heights
Conceptual Hydrologic Analysis

APPENDIX

A

HYDROLOGIC COMPUTATIONS

Appendix A Green & Ampt Parameter Tables

EXISTING CONDITION SUB-BASIN CHARACTERISTICS

WATERSHED #	AREA (AC)	AREA (MI ²)	POROSITY	EFFECTIVE POROSITY	INITIAL CONTENT (0.7θ _e)	WETTED FRONT SUCTION (IN)	HYDRAULIC CONDUCTIVITY (IN/HR)	IMPERVIOUS AREA (%)
WS-1A	38.3795	0.059967969	0.446	0.406	0.284	8.607	1.004	0
WS-1B	44.956	0.07024375	0.445	0.405	0.284	8.367	1.114	0
WS-1C	22.9457	0.035852656	0.442	0.403	0.282	7.253	1.628	0
WS-2A	58.6989	0.091717031	0.448	0.409	0.286	7.767	1.448	0
WS-2B	30.4107	0.047516719	0.443	0.405	0.284	6.820	1.865	0
WS-2C	47.7338	0.074584063	0.450	0.410	0.287	8.162	1.274	0
WS-2D	26.5466	0.041479063	0.453	0.412	0.288	8.740	1.020	0
WS-2E	25.03684	0.039120063	0.451	0.410	0.287	8.303	1.212	0
WS-2F	20.7036	0.032349375	0.453	0.412	0.288	8.740	1.020	0
WS-2G	48.2829	0.075442031	0.452	0.411	0.288	8.584	1.089	0
WS-2H	45.4367	0.070994844	0.446	0.407	0.285	7.427	1.597	0
WS-2I	48.4538	0.075709063	0.449	0.409	0.287	7.978	1.355	0
WS-3A	50.216	0.0784625	0.455	0.413	0.289	8.772	1.023	0
WS-3B	54.0743	0.084491094	0.456	0.414	0.290	8.663	1.032	0
WS-3C	57.905	0.090476563	0.430	0.393	0.275	7.231	1.502	0
WS-4	43.284	0.06763125	0.457	0.416	0.291	8.600	1.134	0
WS-5	25.2226	0.039410313	0.452	0.411	0.288	8.536	1.109	0
WS-6	17.773	0.027770313	0.446	0.407	0.285	7.424	1.599	0
WS-7	21.8239	0.034099844	0.377	0.343	0.240	7.212	0.875	0
RS	77.21854	0.120653969	0.442	0.404	0.283	6.544	1.986	35.000

PROPOSED CONDITION SUB-BASIN CHARACTERISTICS

WATERSHED #	AREA (AC)	AREA (MI²)	POROSITY	EFFECTIVE POROSITY	INITIAL CONTENT (0.7θ_e)	WETTED FRONT SUCTION (IN)	HYDRAULIC CONDUCTIVITY (IN/HR)	IMPERVIOUS AREA (AC)	IMPERVIOUS AREA (%)
WS-1A	38.3795	0.0600	0.4461	0.4057	0.2840	8.6073	1.0042	0.0000	0.0000
WS-1B	44.9560	0.0702	0.4452	0.4052	0.2836	8.3669	1.1136	0.0000	0.0000
WS-1C	22.9457	0.0359	0.4416	0.4032	0.2822	7.2529	1.6280	1.6740	7.2957
WS-2A	58.6989	0.0917	0.4481	0.4086	0.2860	7.7668	1.4479	0.0000	0.0000
WS-2B	30.4107	0.0475	0.4432	0.4053	0.2837	6.8196	1.8647	0.0000	0.0000
WS-2C	47.7338	0.0746	0.4501	0.4100	0.2870	8.1622	1.2740	0.0000	0.0000
WS-2D	26.5466	0.0415	0.4530	0.4120	0.2884	8.7402	1.0197	0.0000	0.0000
WS-2E	25.0368	0.0391	0.4508	0.4105	0.2873	8.3032	1.2119	0.0000	0.0000
WS-2F	20.7036	0.0323	0.4530	0.4120	0.2884	8.7401	1.0197	0.0000	0.0000
WS-2G	48.2829	0.0754	0.4522	0.4115	0.2880	8.5836	1.0886	0.0000	0.0000
WS-2H NEW	11.4583	0.0179	0.4466	0.4073	0.2851	7.7267	1.4512	0.0000	0.0000
WS-2H	33.9792	0.0531	0.4463	0.4074	0.2852	7.4271	1.5974	6.0332	17.7556
WS-2I	48.4538	0.0757	0.4491	0.4093	0.2865	7.9778	1.3551	1.6118	3.3266
WS-3A	50.2160	0.0785	0.4546	0.4135	0.2894	8.7719	1.0234	0.0000	0.0000
WS-3B	54.0743	0.0845	0.4556	0.4144	0.2901	8.6630	1.0316	0.0000	0.0000
WS-3C	57.9050	0.0905	0.4301	0.3925	0.2748	7.2308	1.5024	6.5139	11.2492
WS-4	43.2840	0.0676	0.4568	0.4157	0.2910	8.6002	1.1344	3.5932	8.3015
WS-5	25.2226	0.0394	0.4520	0.4113	0.2879	8.5360	1.1095	0.0000	0.0000
WS-6	17.7730	0.0278	0.4463	0.4074	0.2852	7.4235	1.5990	1.5759	8.8667
WS-7	21.8239	0.0341	0.3766	0.3426	0.2398	7.2116	0.8747	0.2418	1.1080
RS	77.2185	0.1207	0.4419	0.4043	0.2830	6.5436	1.9864	77.2185	35.0000

Time of Concentration Calculations

TIME OF CONCENTRATION CALCULATIONS												
BASIN #	A (MI ²)	SLOPE (%)	CN	LENGTH (FT)	L_CHAN (FT)	L_OVER (FT)	R	Ti (MIN)	Vapprox (FPS)	Tt (MIN)	Tc (MIN)	Tlag (MIN)
WS-1A	0.06	6.995	85.73	2415	1955	460	0.74	7.23	2.5	13.04	20.27	12.16
WS-1B	0.07	7.757	83.54	2121	1821	300	0.71	6.10	2.8	11.04	17.14	10.28
WS-1C	0.04	7.658	74.42	1076	716	360	0.59	8.80	2.8	4.34	13.14	7.88
WS-1C PRP	0.04	7.977	75.94	1076	721	355	0.61	8.28	2.8	4.37	12.65	7.59
WS-2A	0.09	5.913	77.31	3216	2716	500	0.63	10.45	2.3	20.12	30.57	18.34
WS-2B	0.05	4.003	70.25	1881	1531	350	0.54	11.93	2.0	12.76	24.70	14.82
WS-2C	0.07	3.604	81.72	2823	2623	200	0.69	6.83	2.0	21.86	28.69	17.21
WS-2D	0.04	4.643	87.48	1559	1219	340	0.76	6.67	2.3	9.03	15.70	9.42
WS-2E	0.04	3.462	82.65	2178	1948	230	0.70	7.20	2.0	16.23	23.43	14.06
WS-2F	0.03	7.557	87.60	1209	949	260	0.77	4.93	2.8	5.75	10.69	6.41
WS-2G	0.08	6.392	85.10	2655	2265	390	0.73	7.02	2.3	16.78	23.80	14.28
WS-2H	0.07	7.889	76.33	2312	1972	340	0.62	8.04	2.8	11.95	20.00	12.00
WS-2H PRP	0.03	9.951	76.33	1127	1012	115	0.62	4.33	3.0	5.62	9.95	5.97
WS-2H BASIN	0.02	10.162	76.33	646	468	178	0.62	5.35	3.2	2.44	7.79	4.67
WS-2H NEW	0.02	2.332	70.00	500	400	100	0.53	7.68	4.2	1.59	9.27	5.56
WS-2I	0.08	5.947	80.08	2411	1911	500	0.67	9.62	2.3	14.16	23.77	14.26
WS-2I PRP	0.08	4.267	80.61	2411	2010	401	0.67	9.47	2.0	16.75	26.22	15.73
WS-3A	0.08	8.589	86.54	3377	3157	220	0.75	4.53	2.8	18.79	23.32	13.99
WS-3B	0.08	8.572	86.43	2637	2157	480	0.75	6.73	2.8	12.84	19.57	11.74
WS-3C	0.09	7.428	73.09	2330	1830	500	0.57	10.83	2.8	11.09	21.93	13.16
WS-3C PRP	0.09	5.533	74.69	2330	1830	500	0.60	11.47	2.3	13.56	25.03	15.02
WS-4	0.07	7.988	84.72	2243	1793	450	0.73	7.10	2.8	10.68	17.78	10.67
WS-4 PRP	0.07	4.177	85.41	2168	1762	406	0.74	8.17	2.0	14.69	22.85	13.71
WS-5	0.04	10.599	83.55	1564	1244	320	0.71	5.68	3.2	6.48	12.16	7.29
WS-6	0.03	9.855	74.88	757	467	290	0.60	7.17	3.0	2.59	9.77	5.86
WS-6 PRP	0.03	10.813	76.21	757	574	183	0.62	5.33	3.2	2.99	8.32	4.99
WS-7	0.03	6.882	85.93	1583	1413	170	0.74	4.39	2.6	9.06	13.45	8.07
WS-7 PRP	0.03	3.233	86.11	1583	1322	261	0.75	6.95	1.8	12.24	19.19	11.52
RS	0.12	1.894	75.12	4152	3852	300	0.60	12.56	1.5	42.80	55.36	33.21

NOAA Atlas 14 Precipitation Frequency Data



NOAA Atlas 14, Volume 1, Version 5
Location name: Reno, Nevada, USA*
Latitude: 39.647°, Longitude: -119.8306°
Elevation: 4921.26 ft**
* source: EGRID Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

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

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.104 (0.087-0.120)	0.129 (0.107-0.150)	0.172 (0.145-0.203)	0.214 (0.180-0.254)	0.285 (0.235-0.344)	0.351 (0.283-0.431)	0.432 (0.339-0.539)	0.530 (0.401-0.676)	0.693 (0.497-0.912)	0.844 (0.581-1.14)
10-min	0.158 (0.132-0.182)	0.197 (0.164-0.229)	0.262 (0.221-0.309)	0.325 (0.274-0.387)	0.433 (0.358-0.523)	0.535 (0.431-0.656)	0.657 (0.515-0.820)	0.807 (0.611-1.03)	1.05 (0.757-1.39)	1.29 (0.885-1.73)
15-min	0.196 (0.164-0.226)	0.244 (0.203-0.284)	0.325 (0.274-0.383)	0.403 (0.340-0.479)	0.537 (0.444-0.649)	0.663 (0.535-0.814)	0.814 (0.639-1.02)	1.00 (0.757-1.28)	1.31 (0.938-1.72)	1.59 (1.10-2.15)
30-min	0.263 (0.221-0.304)	0.328 (0.274-0.382)	0.438 (0.369-0.516)	0.543 (0.458-0.646)	0.723 (0.598-0.874)	0.893 (0.720-1.10)	1.10 (0.861-1.37)	1.35 (1.02-1.72)	1.76 (1.26-2.32)	2.14 (1.48-2.89)
60-min	0.326 (0.273-0.376)	0.406 (0.339-0.473)	0.542 (0.456-0.639)	0.672 (0.567-0.799)	0.895 (0.740-1.08)	1.11 (0.891-1.36)	1.36 (1.07-1.70)	1.67 (1.26-2.13)	2.18 (1.56-2.87)	2.65 (1.83-3.58)
2-hr	0.430 (0.380-0.495)	0.534 (0.475-0.616)	0.685 (0.601-0.790)	0.817 (0.709-0.943)	1.03 (0.868-1.19)	1.21 (1.00-1.43)	1.44 (1.16-1.71)	1.73 (1.35-2.15)	2.29 (1.70-2.90)	2.81 (2.00-3.61)
3-hr	0.524 (0.470-0.593)	0.651 (0.587-0.742)	0.813 (0.728-0.923)	0.948 (0.842-1.08)	1.14 (0.998-1.31)	1.32 (1.13-1.52)	1.52 (1.29-1.78)	1.82 (1.50-2.15)	2.33 (1.87-2.93)	2.82 (2.20-3.65)
6-hr	0.769 (0.694-0.860)	0.958 (0.864-1.08)	1.18 (1.06-1.33)	1.35 (1.21-1.52)	1.58 (1.39-1.79)	1.75 (1.52-1.99)	1.92 (1.66-2.21)	2.14 (1.82-2.48)	2.58 (2.15-3.04)	3.03 (2.48-3.68)
12-hr	1.06 (0.953-1.18)	1.32 (1.19-1.48)	1.66 (1.49-1.86)	1.92 (1.72-2.15)	2.27 (2.01-2.56)	2.54 (2.22-2.88)	2.82 (2.43-3.23)	3.09 (2.63-3.59)	3.46 (2.87-4.09)	3.78 (3.08-4.53)
24-hr	1.39 (1.25-1.56)	1.75 (1.57-1.97)	2.24 (2.00-2.51)	2.63 (2.34-2.95)	3.18 (2.81-3.58)	3.62 (3.17-4.09)	4.08 (3.54-4.65)	4.57 (3.92-5.23)	5.24 (4.41-6.08)	5.77 (4.79-6.77)
2-day	1.71 (1.51-1.95)	2.17 (1.92-2.47)	2.81 (2.48-3.20)	3.34 (2.93-3.81)	4.09 (3.55-4.68)	4.70 (4.04-5.41)	5.34 (4.54-6.21)	6.03 (5.06-7.09)	7.01 (5.75-8.36)	7.80 (6.28-9.45)
3-day	1.88 (1.66-2.15)	2.40 (2.11-2.74)	3.15 (2.77-3.60)	3.77 (3.30-4.31)	4.66 (4.03-5.36)	5.39 (4.62-6.22)	6.17 (5.22-7.19)	7.01 (5.84-8.24)	8.21 (6.69-9.80)	9.20 (7.36-11.1)
4-day	2.05 (1.81-2.35)	2.63 (2.31-3.01)	3.49 (3.06-4.00)	4.20 (3.67-4.82)	5.23 (4.52-6.03)	6.08 (5.19-7.03)	7.00 (5.89-8.16)	7.99 (6.62-9.39)	9.42 (7.62-11.2)	10.6 (8.43-12.8)
7-day	2.44 (2.12-2.83)	3.14 (2.72-3.64)	4.21 (3.64-4.89)	5.09 (4.39-5.91)	6.34 (5.41-7.40)	7.37 (6.22-8.65)	8.48 (7.08-10.0)	9.67 (7.95-11.5)	11.4 (9.15-13.8)	12.8 (10.1-15.7)
10-day	2.78 (2.41-3.21)	3.58 (3.11-4.15)	4.81 (4.17-5.58)	5.80 (5.01-6.72)	7.19 (6.15-8.36)	8.30 (7.04-9.71)	9.49 (7.96-11.2)	10.7 (8.89-12.8)	12.5 (10.1-15.1)	13.9 (11.1-17.0)
20-day	3.57 (3.12-4.13)	4.61 (4.03-5.34)	6.18 (5.38-7.14)	7.39 (6.41-8.53)	9.03 (7.78-10.4)	10.3 (8.81-11.9)	11.6 (9.83-13.6)	13.0 (10.9-15.3)	15.0 (12.3-17.9)	16.5 (13.4-19.9)
30-day	4.23 (3.70-4.90)	5.48 (4.78-6.34)	7.33 (6.38-8.48)	8.74 (7.60-10.1)	10.7 (9.19-12.3)	12.1 (10.4-14.1)	13.6 (11.6-15.9)	15.2 (12.8-17.9)	17.4 (14.4-20.7)	19.2 (15.7-23.0)
45-day	5.12 (4.47-5.83)	6.63 (5.79-7.54)	8.84 (7.70-10.0)	10.5 (9.11-11.9)	12.6 (10.9-14.4)	14.3 (12.3-16.3)	15.9 (13.6-18.3)	17.6 (14.9-20.4)	20.0 (16.7-23.4)	21.9 (18.0-25.8)
60-day	5.89 (5.12-6.73)	7.66 (6.66-8.74)	10.2 (8.86-11.6)	12.0 (10.4-13.7)	14.3 (12.4-16.3)	16.0 (13.7-18.3)	17.7 (15.1-20.3)	19.3 (16.3-22.3)	21.5 (18.0-25.1)	23.2 (19.2-27.3)

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

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PF graphical

HEC-HMS Input: Basin Elevation-Storage Curves

KESS WAY PONDS

POND 1

ELEVATION	VOLUME (AC-FT)	30% SED VOL
5168.00	0	0
5170.00	0.239117998	0.167382599
5172.00	0.613024793	0.429117355
5173.00	0.857916208	0.600541345
5174.24	0.857916208	0.600541345

POND 2

ELEVATION	VOLUME (AC-FT)	10% SED VOL
5156.00	0	0
5158.00	0.161044766	0.144940289
5160.00	0.425897842	0.383308058
5162.00	0.808280762	0.727452686
5164.00	1.3215264	1.18937376
5166.00	1.978689164	1.780820248
5167.00	2.344849403	2.110364463
5168.24	2.344849403	2.110364463

POND 3

ELEVATION	VOLUME (AC-FT)	10% SED VOL
5132.00	0	0
5134.00	0.540816116	0.486734504
5136.00	1.307005739	1.176305165
5138.00	2.320230946	2.088207851
5140.00	3.597476354	3.237728719
5141.00	4.338985882	3.905087293
5142.24	4.338985882	3.905087293

PALACE DRIVE POND

ELEVATION	VOLUME (AC-FT)	30% SED VOL
5042.00	0	0
5044.00	1.345668503	0.941967952
5046.00	2.959365932	2.071556152
5048.00	4.864647842	3.405253489
5050.00	6.928379247	4.849865473
5052.00	9.321106749	6.524774725
5054.00	12.06665886	8.446661203
5056.00	15.18857163	10.63200014
5057.00	16.89763545	11.82834481
5058.24	16.89763545	11.82834481

LEMMON DRIVE POND

ELEVATION	VOLUME (AC-FT)	15% SED VOL
4902.00	0	0
4904.00	1.02626056	0.872321476
4906.00	2.253886364	1.915803409
4908.00	3.696953168	3.142410193
4910.00	5.373178375	4.567201618
4912.00	7.320757346	6.222643744
4914.00	9.575118687	8.138850884
4916.00	12.15222521	10.32939143
4918.00	15.07002916	12.80952478
4919.00	16.66203225	14.16272742
4920.00	16.66203225	14.16272742

DEODAR WAY PONDS

UPPER POND

ELEVATION	VOLUME (AC-FT)	30% SED VOL
5084.00	0	0
5086.00	0.095900367	0.067130257
5088.00	0.259631313	0.181741919
5090.00	0.516170799	0.361319559
5091.00	0.680894972	0.476626481
5092.00	0.680894972	0.476626481

DEODAR WAY PONDS

LOWER POND

ELEVATION	VOLUME (AC-FT)	15% SED VOL
4926.00	0	0
4928.00	0.16725023	0.142162695
4930.00	0.407136823	0.346066299
4932.00	0.73207966	0.622267711
4934.00	1.154205005	0.981074254
4936.00	1.587870523	1.349689945
4937.00	1.587870523	1.349689945

HEC-HMS Runoff Output

100-year 24-hour Existing Conditions

Hydrologic Element	Drainage Area (mi ²)	Peak Discharge (cfs)	Time of Peak	Volume (ac-ft)
Current Retention	0.7149767	176.7	01Jan2020, 12:35	10.4
Developed_Outlet	1.0045384	212.9	01Jan2020, 12:50	23.2
Existing Channel	0.7149767	165.6	01Jan2020, 12:50	10.4
Jcde	0.294417	92.2	01Jan2020, 12:25	4.3
Jf-g	0.4022084	141.3	01Jan2020, 12:20	6.3
J1a	0.059968	42.7	01Jan2020, 12:15	1.2
J1b	0.1302117	84.4	01Jan2020, 12:15	2.5
J1c	0.1660644	91.7	01Jan2020, 12:20	2.9
J2a	0.1392337	47	01Jan2020, 12:20	1.7
J2b	0.0475167	14.9	01Jan2020, 12:15	0.5
J2i	0.0757091	35.2	01Jan2020, 12:15	1.1
J3a	0.0784625	48.2	01Jan2020, 12:15	1.5
J3b	0.1629536	93	01Jan2020, 12:15	3.1
J4	0.0676313	43.8	01Jan2020, 12:15	1.2
J5	0.1070416	66.6	01Jan2020, 12:15	1.9
J7	0.0340998	33.1	01Jan2020, 12:10	0.9
Residential Area	0.12065	51.3	01Jan2020, 12:35	9.8
R1	0.0475167	14.8	01Jan2020, 12:20	0.5
R10	0.1629536	89.8	01Jan2020, 12:25	3.2
R11	0.0676313	42.7	01Jan2020, 12:20	1.2
R12	0.1070416	60.8	01Jan2020, 12:20	1.9
R13	0.0340998	29.3	01Jan2020, 12:20	0.9
R2	0.1392337	45.2	01Jan2020, 12:30	1.7
R3	0.294417	91.5	01Jan2020, 12:25	4.3
R4	0.4022084	141.1	01Jan2020, 12:25	6.3
R5	0.059968	41.5	01Jan2020, 12:20	1.2
R6	0.1302117	81.4	01Jan2020, 12:20	2.5
R7	0.1660644	88.3	01Jan2020, 12:20	2.9
R8	0.0757091	33.8	01Jan2020, 12:15	1.1
R9	0.0784625	47.3	01Jan2020, 12:20	1.5
WS 4-6 Outlet	0.1348119	67.2	01Jan2020, 12:15	2.2
WS1a	0.059968	42.7	01Jan2020, 12:15	1.2
WS1b	0.0702437	49.4	01Jan2020, 12:10	1.3
WS1c	0.0358527	17.1	01Jan2020, 12:10	0.4
WS2a	0.091717	32.2	01Jan2020, 12:20	1.2
WS2b	0.0475167	14.9	01Jan2020, 12:15	0.5
WS2c	0.0745841	31.6	01Jan2020, 12:20	1.2
WS2d	0.0414791	32.1	01Jan2020, 12:10	0.8
WS2e	0.0391201	20.5	01Jan2020, 12:15	0.6
WS2f	0.0323494	25.1	01Jan2020, 12:10	0.6
WS2g	0.075442	43.1	01Jan2020, 12:15	1.4
WS2h	0.0709948	31.5	01Jan2020, 12:15	0.8
WS2i	0.0757091	35.2	01Jan2020, 12:15	1.1
WS3a	0.0784625	48.2	01Jan2020, 12:15	1.5
WS3b	0.0844911	58.8	01Jan2020, 12:15	1.6
WS3c	0.0904766	42.6	01Jan2020, 12:15	1.2
WS3 Outlet	0.2534302	125.9	01Jan2020, 12:20	4.4
WS4	0.0676313	43.8	01Jan2020, 12:15	1.2
WS5	0.0394103	28.4	01Jan2020, 12:10	0.7
WS6	0.0277703	19.9	01Jan2020, 12:10	0.3
WS7	0.0340998	33.1	01Jan2020, 12:10	0.9

100-year 10-day Existing Conditions Volume Analysis

Hydrologic Element	Drainage Area (mi2)	Peak Discharge (cfs)	Time of Peak	Volume (ac-ft)
Current Retention	0.7149767	289.9	06Jan2020, 00:30	14.6
Developed_Outlet	1.0045384	329.6	06Jan2020, 00:45	40.2
Existing Channel	0.7149767	267.5	06Jan2020, 00:45	14.5
Jcde	0.294417	134	06Jan2020, 00:20	5.9
Jf-g	0.4022084	198.3	06Jan2020, 00:20	8.6
J1a	0.059968	54	06Jan2020, 00:15	1.6
J1b	0.1302117	109.1	06Jan2020, 00:15	3.2
J1c	0.1660644	118.5	06Jan2020, 00:20	3.8
J2a	0.1392337	65	06Jan2020, 00:20	2.4
J2b	0.0475167	21.1	06Jan2020, 00:15	0.7
J2i	0.0757091	47.9	06Jan2020, 00:15	1.5
J3a	0.0784625	62	06Jan2020, 00:15	2
J3b	0.1629536	121.6	06Jan2020, 00:15	4.1
J4	0.0676313	58.7	06Jan2020, 00:15	1.6
J5	0.1070416	89.5	06Jan2020, 00:15	2.6
J7	0.0340998	37.7	06Jan2020, 00:10	1
Residential Area	0.12065	55.7	06Jan2020, 00:35	21.7
R1	0.0475167	20.7	06Jan2020, 00:20	0.7
R10	0.1629536	118.1	06Jan2020, 00:20	4.1
R11	0.0676313	56.6	06Jan2020, 00:20	1.6
R12	0.1070416	81.4	06Jan2020, 00:20	2.6
R13	0.0340998	33.6	06Jan2020, 00:20	1
R2	0.1392337	61.3	06Jan2020, 00:25	2.4
R3	0.294417	131.2	06Jan2020, 00:25	5.9
R4	0.4022084	195.3	06Jan2020, 00:25	8.6
R5	0.059968	52.1	06Jan2020, 00:20	1.6
R6	0.1302117	104.9	06Jan2020, 00:20	3.2
R7	0.1660644	116.1	06Jan2020, 00:20	3.9
R8	0.0757091	46.3	06Jan2020, 00:15	1.5
R9	0.0784625	61.1	06Jan2020, 00:20	2
WS 4-6 Outlet	0.1348119	92	06Jan2020, 00:15	3
WS1a	0.059968	54	06Jan2020, 00:15	1.6
WS1b	0.0702437	63.1	06Jan2020, 00:10	1.7
WS1c	0.0358527	24.7	06Jan2020, 00:10	0.6
WS2a	0.091717	44.3	06Jan2020, 00:20	1.7
WS2b	0.0475167	21.1	06Jan2020, 00:15	0.7
WS2c	0.0745841	42.9	06Jan2020, 00:20	1.6
WS2d	0.0414791	40.3	06Jan2020, 00:10	1.1
WS2e	0.0391201	27.5	06Jan2020, 00:15	0.9
WS2f	0.0323494	31.5	06Jan2020, 00:10	0.8
WS2g	0.075442	56.4	06Jan2020, 00:15	1.8
WS2h	0.0709948	44	06Jan2020, 00:15	1.2
WS2i	0.0757091	47.9	06Jan2020, 00:15	1.5
WS3a	0.0784625	62	06Jan2020, 00:15	2
WS3b	0.0844911	75.8	06Jan2020, 00:15	2.1
WS3c	0.0904766	56.7	06Jan2020, 00:15	1.7
WS3 Outlet	0.2534302	165.6	06Jan2020, 00:20	5.8
WS4	0.0676313	58.7	06Jan2020, 00:15	1.6
WS5	0.0394103	36.6	06Jan2020, 00:10	0.9
WS6	0.0277703	26.1	06Jan2020, 00:10	0.5
WS7	0.0340998	37.7	06Jan2020, 00:10	1

100-year 24-hour Proposed Conditions

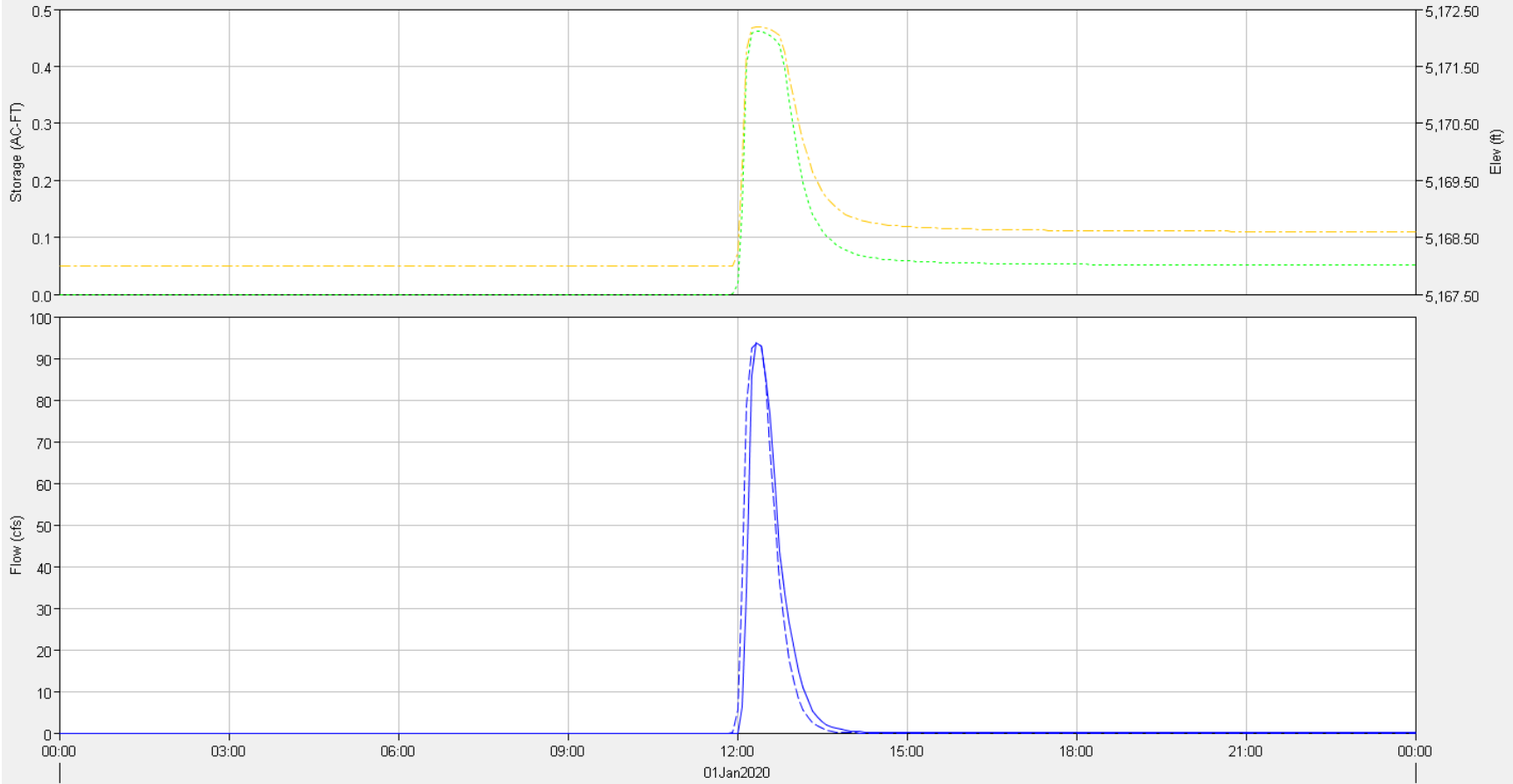
Hydrologic Element	Drainage Area (mi ²)	Peak Discharge (cfs)	Time of Peak	Volume (ac-ft)
Current Retention	0.7149767	289.9	06Jan2020, 00:30	14.6
Developed_Outlet	1.0045384	329.6	06Jan2020, 00:45	40.2
Existing Channel	0.7149767	267.5	06Jan2020, 00:45	14.5
Jcde	0.294417	134	06Jan2020, 00:20	5.9
Jf-g	0.4022084	198.3	06Jan2020, 00:20	8.6
J1a	0.059968	54	06Jan2020, 00:15	1.6
J1b	0.1302117	109.1	06Jan2020, 00:15	3.2
J1c	0.1660644	118.5	06Jan2020, 00:20	3.8
J2a	0.1392337	65	06Jan2020, 00:20	2.4
J2b	0.0475167	21.1	06Jan2020, 00:15	0.7
J2i	0.0757091	47.9	06Jan2020, 00:15	1.5
J3a	0.0784625	62	06Jan2020, 00:15	2
J3b	0.1629536	121.6	06Jan2020, 00:15	4.1
J4	0.0676313	58.7	06Jan2020, 00:15	1.6
J5	0.1070416	89.5	06Jan2020, 00:15	2.6
J7	0.0340998	37.7	06Jan2020, 00:10	1
Residential Area	0.12065	55.7	06Jan2020, 00:35	21.7
R1	0.0475167	20.7	06Jan2020, 00:20	0.7
R10	0.1629536	118.1	06Jan2020, 00:20	4.1
R11	0.0676313	56.6	06Jan2020, 00:20	1.6
R12	0.1070416	81.4	06Jan2020, 00:20	2.6
R13	0.0340998	33.6	06Jan2020, 00:20	1
R2	0.1392337	61.3	06Jan2020, 00:25	2.4
R3	0.294417	131.2	06Jan2020, 00:25	5.9
R4	0.4022084	195.3	06Jan2020, 00:25	8.6
R5	0.059968	52.1	06Jan2020, 00:20	1.6
R6	0.1302117	104.9	06Jan2020, 00:20	3.2
R7	0.1660644	116.1	06Jan2020, 00:20	3.9
R8	0.0757091	46.3	06Jan2020, 00:15	1.5
R9	0.0784625	61.1	06Jan2020, 00:20	2
WS 4-6 Outlet	0.1348119	92	06Jan2020, 00:15	3
WS1a	0.059968	54	06Jan2020, 00:15	1.6
WS1b	0.0702437	63.1	06Jan2020, 00:10	1.7
WS1c	0.0358527	24.7	06Jan2020, 00:10	0.6
WS2a	0.091717	44.3	06Jan2020, 00:20	1.7
WS2b	0.0475167	21.1	06Jan2020, 00:15	0.7
WS2c	0.0745841	42.9	06Jan2020, 00:20	1.6
WS2d	0.0414791	40.3	06Jan2020, 00:10	1.1
WS2e	0.0391201	27.5	06Jan2020, 00:15	0.9
WS2f	0.0323494	31.5	06Jan2020, 00:10	0.8
WS2g	0.075442	56.4	06Jan2020, 00:15	1.8
WS2h	0.0709948	44	06Jan2020, 00:15	1.2
WS2i	0.0757091	47.9	06Jan2020, 00:15	1.5
WS3a	0.0784625	62	06Jan2020, 00:15	2
WS3b	0.0844911	75.8	06Jan2020, 00:15	2.1
WS3c	0.0904766	56.7	06Jan2020, 00:15	1.7
WS3 Outlet	0.2534302	165.6	06Jan2020, 00:20	5.8
WS4	0.0676313	58.7	06Jan2020, 00:15	1.6
WS5	0.0394103	36.6	06Jan2020, 00:10	0.9
WS6	0.0277703	26.1	06Jan2020, 00:10	0.5
WS7	0.0340998	37.7	06Jan2020, 00:10	1

100-year 10-day Proposed Conditions Volume Analysis

Hydrologic Element	Drainage Area (mi ²)	Peak Discharge (cfs)	Time of Peak	Volume (ac-ft)
Ch1a	0.420112	193.6	06Jan2020, 00:25	8.9
Ch1b	0.4531519	193.5	06Jan2020, 00:25	9.5
Ch2a	0.6192163	274.9	06Jan2020, 00:25	14.6
Ch2b	0.6868476	314.6	06Jan2020, 00:25	18.8
Deodar_LowerPond	0.2534305	177.1	06Jan2020, 00:20	10.6
Deodar_UpperPond	0.1629536	121.6	06Jan2020, 00:15	4.1
Developed_Outlet	0.2501111	123.3	06Jan2020, 00:30	29.2
Ex_Channel	0.0954217	56.6	06Jan2020, 00:30	6.3
Jcde	0.294417	134	06Jan2020, 00:20	5.9
Jf-g	0.4022084	198.3	06Jan2020, 00:20	8.6
J1a	0.059968	54	06Jan2020, 00:15	1.6
J1b	0.1302117	109.1	06Jan2020, 00:15	3.2
J2a	0.1392337	65	06Jan2020, 00:20	2.4
J2b	0.0475167	21.1	06Jan2020, 00:15	0.7
J3a	0.0784625	62	06Jan2020, 00:15	2
J4	0.6868476	322	06Jan2020, 00:20	18.8
J5	0.7262579	325.9	06Jan2020, 00:25	19.8
J7	0.0340394	35.8	06Jan2020, 00:15	1.2
Kess_Ponds	0.420112	196.6	06Jan2020, 00:20	8.9
Lemmon_Pond	0.7540282	328.9	06Jan2020, 00:25	21.4
Palace_Pond	0.6192163	283.3	06Jan2020, 00:20	14.6
Pipes_2_3	0.1629536	119.5	06Jan2020, 00:20	4.1
Residential Area	0.12065	55.8	06Jan2020, 00:35	21.7
R1	0.0475167	20.7	06Jan2020, 00:20	0.7
R14	0.0340394	33.9	06Jan2020, 00:15	1.2
R2	0.1392337	61.3	06Jan2020, 00:25	2.4
R3	0.294417	131.2	06Jan2020, 00:25	5.9
R4	0.4022084	193.5	06Jan2020, 00:20	8.6
R6	0.059968	52.1	06Jan2020, 00:20	1.6
R7	0.1302117	101.5	06Jan2020, 00:15	3.3
R8	0.0784625	61.1	06Jan2020, 00:20	2
WS1a	0.059968	54	06Jan2020, 00:15	1.6
WS1b	0.0702437	63.1	06Jan2020, 00:10	1.7
WS1c_PRP	0.0358527	34.2	06Jan2020, 00:10	1.8
WS2a	0.091717	44.3	06Jan2020, 00:20	1.7
WS2b	0.0475167	21.1	06Jan2020, 00:15	0.7
WS2c	0.0745841	42.9	06Jan2020, 00:20	1.6
WS2d	0.0414791	40.3	06Jan2020, 00:10	1.1
WS2e	0.0391201	27.5	06Jan2020, 00:15	0.9
WS2f	0.0323494	31.5	06Jan2020, 00:10	0.8
WS2g	0.075442	56.4	06Jan2020, 00:15	1.8
WS2hOUT	0.4531519	195.6	06Jan2020, 00:25	9.5
WS2h_Developed	0.0197126	26.9	06Jan2020, 00:10	3.6
WS2h_new	0.0179036	18.1	06Jan2020, 00:10	0.3
WS2h_PRP	0.0330399	31.1	06Jan2020, 00:10	0.6
WS2i_OUT	0.0954217	60.6	06Jan2020, 00:15	6.3
WS2i_PRP	0.0757091	45.6	06Jan2020, 00:20	2.7
WS3a	0.0784625	62	06Jan2020, 00:15	2
WS3b	0.0844911	75.8	06Jan2020, 00:15	2.1
WS3c_PRP	0.0904769	59.5	06Jan2020, 00:15	6.5
WS4_PRP	0.0676313	55.4	06Jan2020, 00:15	4.2

WS5	0.0394103	36.6	06Jan2020, 00:10	0.9
WS6_PRP	0.0277703	29.1	06Jan2020, 00:10	1.6
WS7_PRP	0.0340394	35.8	06Jan2020, 00:15	1.2

Reservoir "Kess_Pond1" Results for Run "24hr_PRP_Sediment"



Legend (Compute Time: 13Nov2017, 15:26:06)

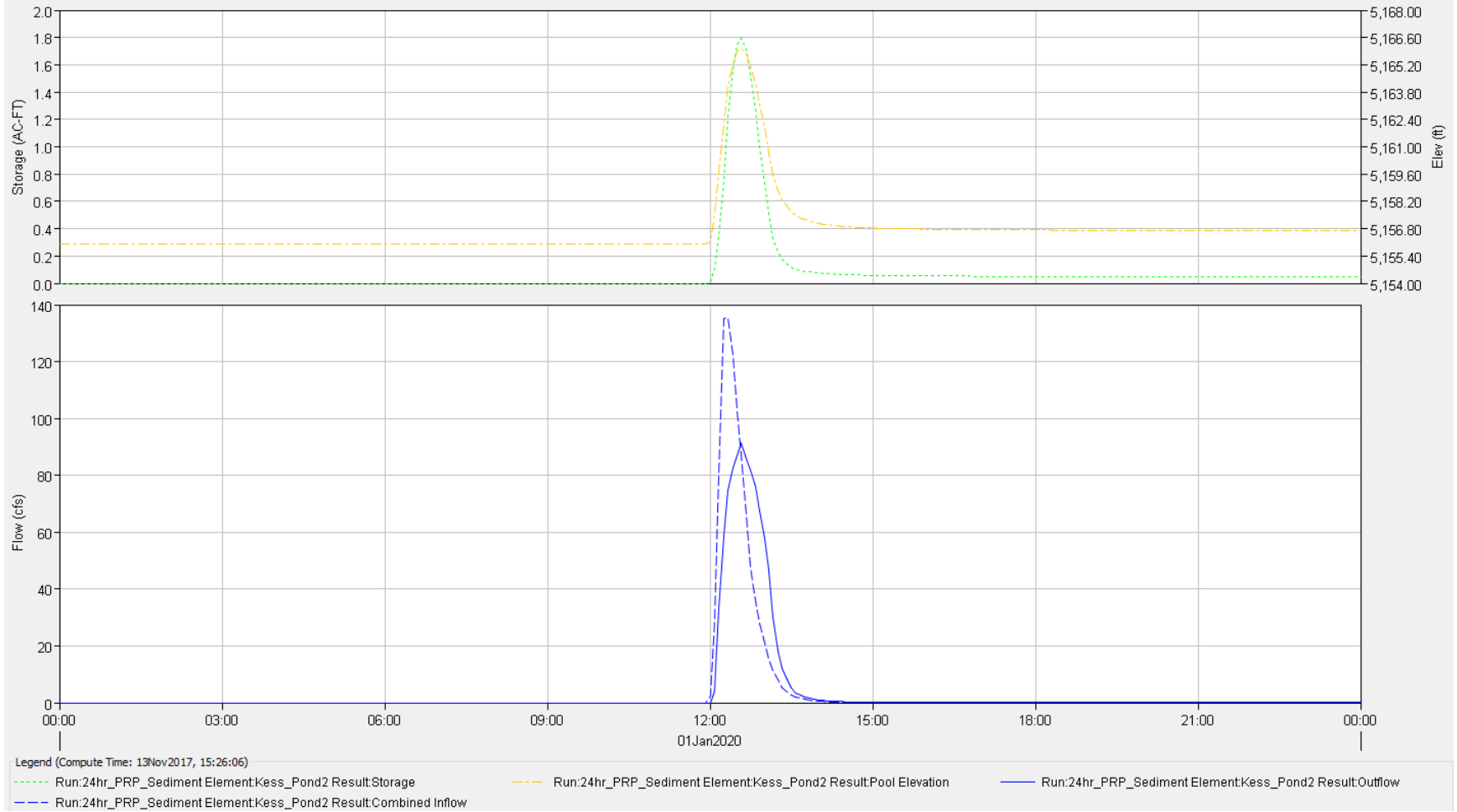
--- Run:24hr_PRP_Sediment Element:Kess_Pond1 Result:Storage

-.- Run:24hr_PRP_Sediment Element:Kess_Pond1 Result:Pool Elevation

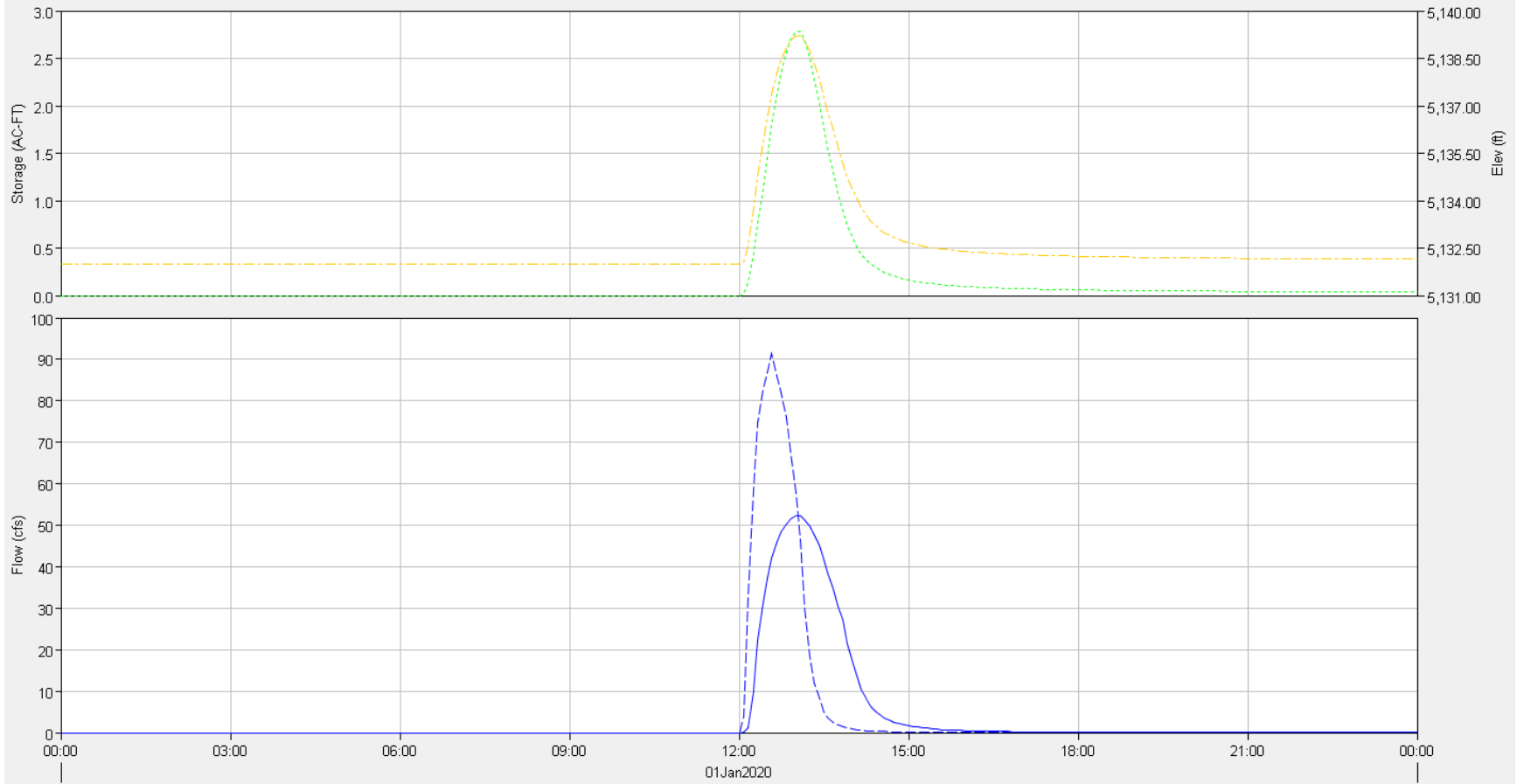
— Run:24hr_PRP_Sediment Element:Kess_Pond1 Result:Outflow

- - - Run:24hr_PRP_Sediment Element:Kess_Pond1 Result:Combined Inflow

Reservoir "Kess_Pond2" Results for Run "24hr_PRP_Sediment"



Reservoir "Kess_Pond3" Results for Run "24hr_PRP_Sediment"



Legend (Compute Time: 13Nov2017, 15:26:06)

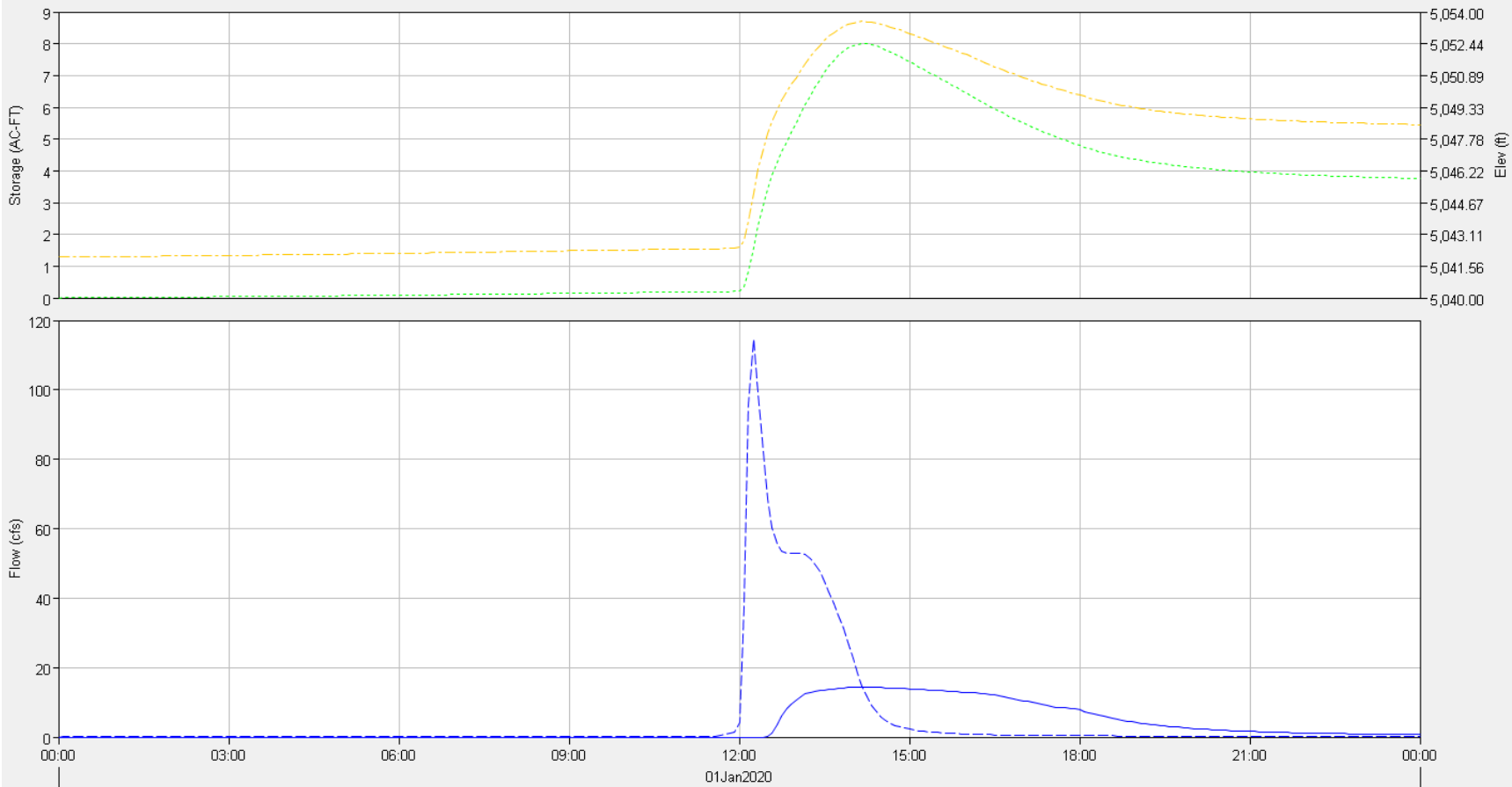
--- Run:24hr_PRP_Sediment Element:Kess_Pond3 Result:Storage

--- Run:24hr_PRP_Sediment Element:Kess_Pond3 Result:Pool Elevation

— Run:24hr_PRP_Sediment Element:Kess_Pond3 Result:Outflow

--- Run:24hr_PRP_Sediment Element:Kess_Pond3 Result:Combined Inflow

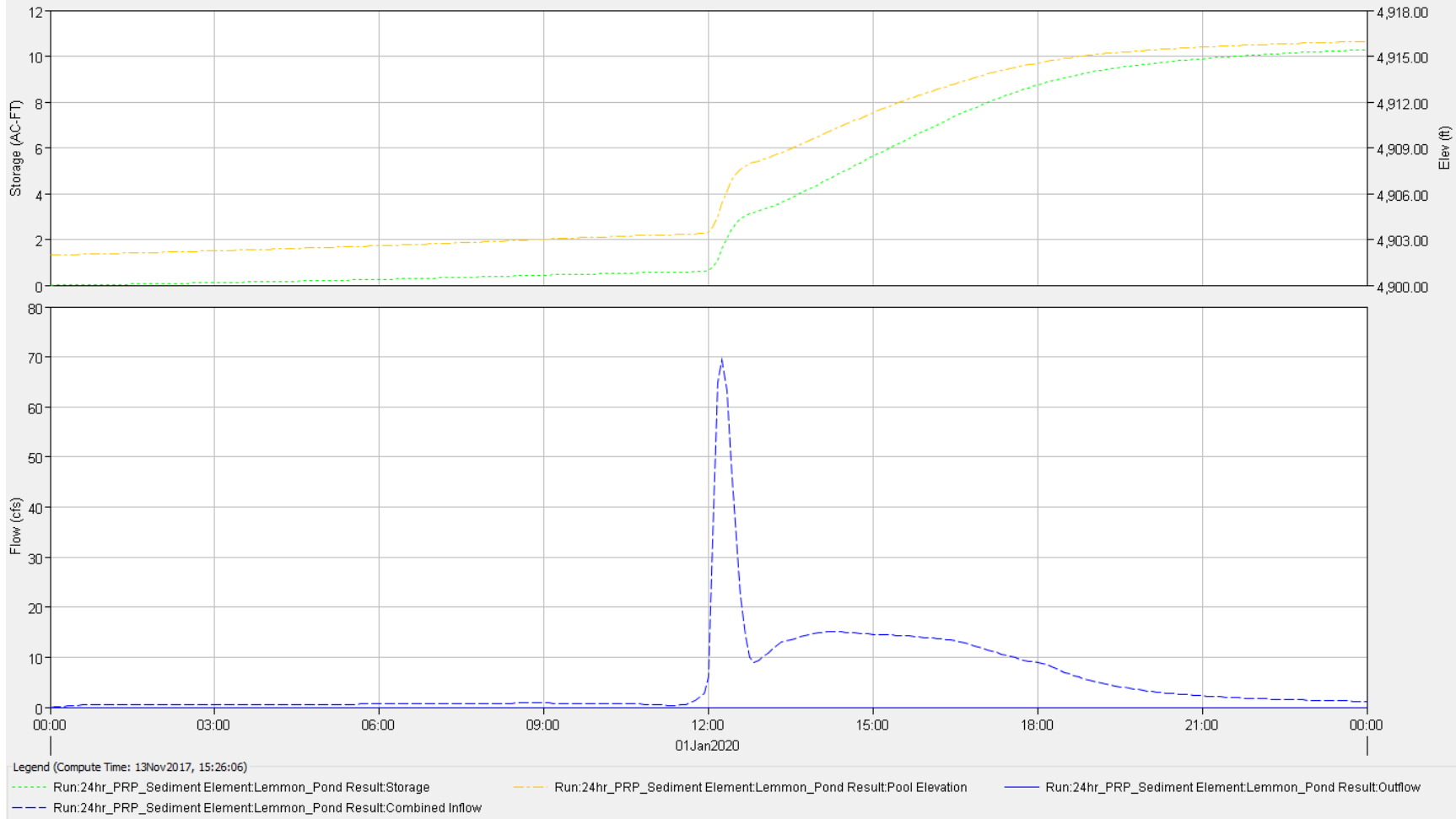
Reservoir "Palace_Pond" Results for Run "24hr_PRP_Sediment"



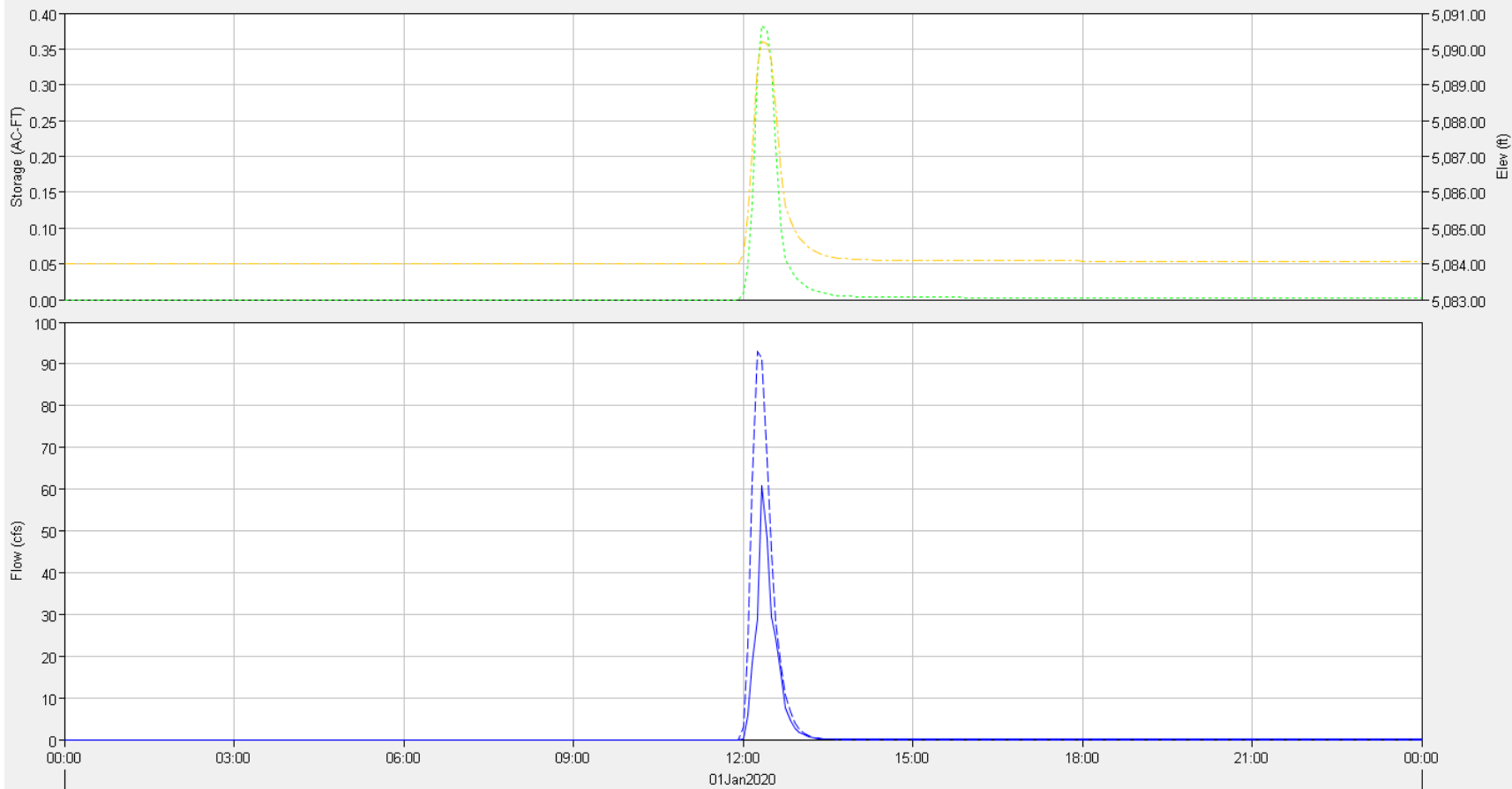
Legend (Compute Time: 13Nov2017, 15:26:06)

- -
 -
- Run:24hr_PRP_Sediment Element:Palace_Pond Result:Storage
 --- Run:24hr_PRP_Sediment Element:Palace_Pond Result:Pool Elevation
 --- Run:24hr_PRP_Sediment Element:Palace_Pond Result:Outflow
--- Run:24hr_PRP_Sediment Element:Palace_Pond Result:Combined Inflow

Reservoir "Lemmon_Pond" Results for Run "24hr_PRP_Sediment"



Reservoir "Deodar_UpperPond" Results for Run "24hr_PRP_Sediment"

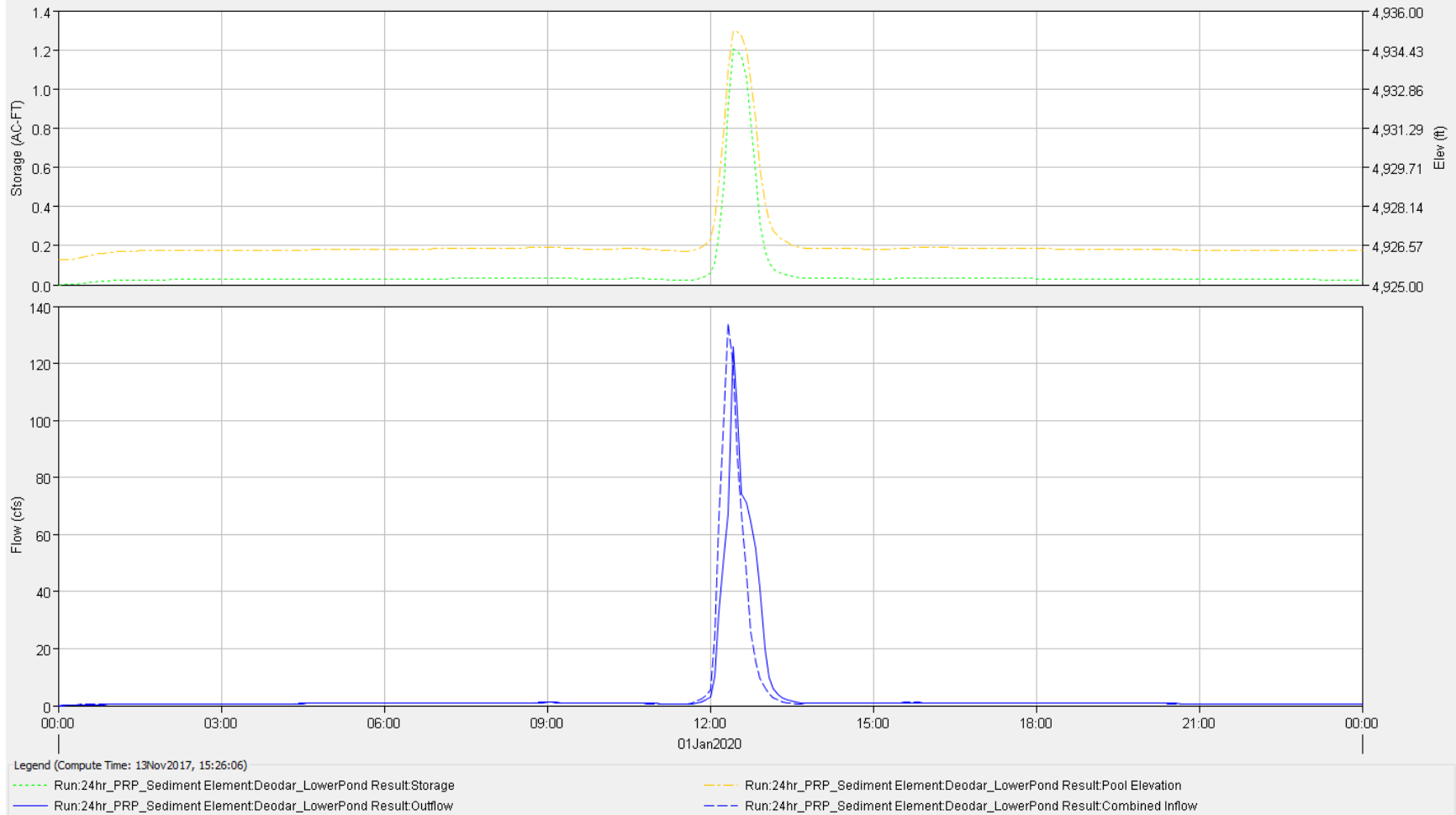


Legend (Compute Time: 13Nov2017, 15:26:06)

--- Run:24hr_PRP_Sediment Element:Deodar_UpperPond Result:Storage
--- Run:24hr_PRP_Sediment Element:Deodar_UpperPond Result:Outflow

--- Run:24hr_PRP_Sediment Element:Deodar_UpperPond Result:Pool Elevation
--- Run:24hr_PRP_Sediment Element:Deodar_UpperPond Result:Combined Inflow

Reservoir "Deodar_LowerPond" Results for Run "24hr_PRP_Sediment"



Black Eagle Consulting, Inc.

Preliminary Geotechnical
Investigation

Lemmon Drive Parcels

Washoe County, Nevada

August 25, 2017

Prepared for
JDS Group, LLC



Black Eagle Consulting, Inc.
Geotechnical & Construction Services

Mr. Derek Larson
JDS Group, LLC
7500 Rough Rock Drive
Reno, NV 89502

August 25, 2017
Project No.: 2047-01-1

L

**RE: Preliminary Geotechnical Investigation
Lemmon Drive Parcels
Washoe County, Nevada**

Dear Mr. Larson:

Black Eagle Consulting, Inc. is pleased to present the results of our preliminary geotechnical investigation for the above-referenced project. Our investigation consisted of research, field exploration, laboratory testing, and engineering analysis to allow formulation of geotechnical conclusions and recommendations for design and construction of the proposed project. Once project details and grading are finalized, we should be provided the opportunity to review and update the recommendations contained in this preliminary geotechnical investigation report as necessary.

The project will involve the design and construction of a residential development consisting of 207 single-family residential lots within 4 parcels located off of Lemmon Drive in Washoe County, Nevada. The total area of the parcels is approximately 129 acres. The proposed homes are expected to be one- or two-story, wood-framed structures supported by shallow concrete foundations. The homes will have either raised wood floors with a crawl space, PCC slab-on-grade floors, or a combination of both. Asphalt concrete residential roadways and underground utility infrastructure will be constructed as part of this project. The street improvements will be designed and constructed per Washoe County standards.

The subsurface materials within the site are primarily granular sand soils that will provide adequate support for the proposed residential project when properly prepared and can also be used as structural fill. Isolated areas of expansive clayey sand soils with excessive plastic fines were encountered and will require structural fill separation from project improvements.

We appreciate having the opportunity to work with you on this project. If you have any questions regarding the content of the attached report, please do not hesitate to contact us.

Sincerely,

Black Eagle Consulting, Inc.



Vimal P. Vimalaraj, P.E.
Engineering Division Manager

Jeffrey M. Jones, P.E.
Senior Geotechnical Engineer

Copies to: Addressee (3 copies)

JP:JM:LJ:PV:cjr



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Introduction

Presented herein are the results of Black Eagle Consulting, Inc.'s (BEC's) preliminary geotechnical investigation, laboratory testing, and associated geotechnical design recommendations for the proposed residential development to be located within parcels near Lemmon Drive in Washoe County, Nevada. These recommendations are based on surface and subsurface conditions encountered in our explorations and on details of the proposed project as described in this report. The objectives of this study were to:

1. Determine general soil and groundwater conditions pertaining to design and construction of the proposed residential development.
2. Provide recommendations for design and construction of the project as related to these geotechnical conditions.

The area covered by this report is shown on Plate 1 (Plot Plan). Our investigation included field exploration, laboratory testing, and engineering analysis to determine the physical and mechanical properties of the various on-site materials. Results of our field exploration and testing programs are included in this report and form the basis for all conclusions and recommendations.

The services described above were conducted in accordance with the BEC Professional Geotechnical Agreement dated July 14, 2017, which was signed by Mr. Derek Larson of JDS Group, LLC.



Project Description

The site of the proposed Lemmon Drive residential development consists of multiple parcels totaling approximately 129 acres located in Washoe County, Nevada. The site is entirely contained in Sections 34 and 35, Township 21N, Range 19E, Mount Diablo Meridian. The project will include 2 separate subdivisions.

Assessor's Parcel Number (APN) 080-730-18 is denoted as the north subdivision and is bordered to the north by Lemmon Drive and Deodar Way, to the east by Estates Road and undeveloped land, and to the south and west by existing homes. Access to the north subdivision will be from Estates Road. The APNs 080-635-01, 080-730-21, and 552-210-07 are denoted as the south subdivision. This area is bordered to the north by existing residential homes, and to the east, south, and west by undeveloped land. Access to the south subdivision can be obtained by either Patrician Drive or Kess Way.

The project will involve the design and construction of a residential development consisting of 207 single-family residential lots. The proposed homes are expected to be single- or two-story, wood-framed structures supported by shallow Portland cement concrete (PCC) foundations. The homes will have either raised wooden floors with a crawl space, PCC slab-on-grade floors, or a combination of both (e.g., garage portion with PCC slab-on-grade floor and elsewhere raised wood floor). Additional asphalt concrete roadways, either extending from existing roadways or as new construction, will be necessary. Underground utility infrastructure will be constructed to service the proposed residences. The new roadways will include associated PCC curbs, gutters, and sidewalks. The roadway improvements will be designed and constructed to Washoe County standards and will likely be dedicated to Washoe County.

A grading plan was not available for the project at the time of this report; however, we anticipate cuts and fills on the order of 10 feet or less. It is our understanding that the project will include multiple detention basins. With the project currently in the planning/preliminary design stage, no information on the locations of these basins or the proposed depths was available at the time of this report.



Site Conditions

The site of the north subdivision is located south of Lemmon Drive and Deodar Way, west of Estates Road, east of existing single-family residences, and north of a hill. This portion of the site is undeveloped, generally slopes from southeast to northwest, and contains off-road trails and a dense cover of sagebrush.

The site of the south subdivision contains an extension of Patrician Drive, which is currently unpaved, and is bordered to the north by existing single-family residences and to the east, south, and west by undeveloped land. The site exhibits off-road trails, some scattered rubble piles, and soil stockpiles. An ephemeral drainage extends across the site from south to north and flows into a large excavation. The excavation is approximately 175 feet by 115 feet by 10 feet deep and is located in the northern portion of the southern parcels between the proposed extension of Patrician Drive and Kess Way. We interpret the excavation to be a rudimentary infiltration basin that captures water flowing in the ephemeral drainage and prevents it from flowing into the existing subdivision to the north. The southern subdivision site generally slopes down from south to north at approximately a 5 to 6 percent gradient.



Overview of the North Parcel



Large Excavation in the South Parcel



Exploration

Test Pits

The residential development site was explored on July 31, 2017, by excavating 20 test pits using a Cat[®] 416 B rubber-tired backhoe. Locations of the test pits are shown on Plate 1. The test pits were generally excavated to depths ranging between 10 to 13 feet below the existing ground surface. Test pit TP-08 was terminated at 5.5 feet due to practical digging refusal. Samples for index testing were collected from the trench wall sides at specific depths in each soil horizon. Backfill was loosely placed and the area re-graded to the extent possible with equipment on hand.

Material Classification

A geotechnical engineering technician examined and identified all soils in the field in accordance with American Society for Testing and Materials (ASTM) D 2488. During test pit exploration, representative samples were placed in sealed plastic bags and returned to our Reno, Nevada laboratory for testing. Additional soil classification was subsequently performed in accordance with ASTM 2487 (Unified Soil Classification System [USCS]) upon completion of laboratory testing, as described in the **Laboratory Testing** section. Logs of the test pits are presented as Plate 2 (Test Pit Logs), and a USCS chart has been included as Plate 3 (USCS Soil Classification Chart).



Laboratory Testing

All soils testing performed in the BEC soils laboratory is conducted in general accordance with the standards and methodologies described in Volume 4.08 of the ASTM Standards.

Index Tests

Samples of each significant soil type were analyzed to determine their in-situ moisture content (ASTM D 2216), grain size distribution (ASTM D 422), and plasticity index (ASTM D 4318). The results of these tests are shown on Plate 4 (Index Test Results). Test results were used to classify the soils according to ASTM D 2487 and to verify field logs, which were then updated as appropriate. Classification in this manner provides an indication of the soil's mechanical properties and can be correlated with published charts (Bowles, 1996; Naval Facilities Engineering Command [NAVFAC], 1986a and b) to evaluate bearing capacity, lateral earth pressures, and settlement potential.



Grain Size Analysis

R-Value Test

A resistance value (R-value) test (ASTM D 2844) was performed on a representative sample of the native sand soils. Resistance value testing is a measure of subgrade strength and expansion potential and is used in design of flexible pavements. Results of the R-value test are shown on Plate 5 (R-Value Test Results).

Chemical Tests

Chemical testing was performed on a representative sample of site foundation soils to evaluate the site materials' potential to corrode steel and PCC in contact with the ground. The sample was tested for pH, resistivity, redox potential, soluble sulfates, and sulfides. The results of the chemical test are shown on Appendix A (Chemical Test Results). Chemical testing was performed by Silver State Analytical Laboratories of Reno, Nevada



Geologic and General Soil Conditions

The site is located within the eastern portion of Lemmon Valley south of the Lemmon Valley playa. The site lies in an area mapped by the Nevada Bureau of Mines and Geology (NBMG) as *Quaternary Age Alluvial fan deposits* that are made up of moderately well sorted to very poorly sorted granular coarse sand to sandy boulder gravel (Cordy, 1985a). The site periphery is mapped as granodiorite bedrock. The description provided by the NBMG is relatively consistent with the soils found during our site exploration.

Minor amounts of surficial fill soils (up to 1.5 feet thick) are present in localized areas of the southern subdivision. These fill soils include brown to dark brown clayey sand and clayey sand with gravel. These fill soils are slightly moist to moist, medium dense, and contain approximately 20 to 40 percent low to high plasticity fines, 55 to 60 percent fine to coarse sand, and up to 20 percent fine to coarse angular gravel.

The native soils in the southern subdivision include clayey sand, silty sand, poorly graded sand with silt, and silty, clayey sand. Sand soils with less than 25 percent non-plastic to medium plasticity fines dominate the subsurface soils profile through the maximum exploration depth of about 13 feet below existing ground surface. Localized areas exhibit near-surface, relatively thin layers of clayey sands with as much as 35 percent medium to high plasticity. The clayey sand is described as brown to dark brown, medium dense to dense, slightly moist to moist, and contains approximately 20 to 35 percent low to high plasticity fines, 65 to 80 percent fine to coarse sand, and trace amounts of subangular gravel up to ½ inch in diameter. The silty sand soils are reddish brown, light brown to dark brown, medium dense to dense, slightly moist to moist, and contain about 15 to 30 percent non-plastic to low plasticity fines, 70 to 80 percent fine to coarse sand, and trace amounts of subrounded gravel up to 3/8 inch in diameter. The poorly graded sand with silt soils are described as light brown to brown, slightly moist to moist, dense to very dense, and contain an estimated 10 percent non-plastic fines and 90 percent fine to coarse sand. The silty, clayey sand soils are brown, moist, medium dense to dense, and contain 25 percent low plasticity fines, 72 percent fine to coarse sand, and 3 percent subrounded fine gravel.

The native soils in the northern subdivision can be described as sandy silt, clayey sand, silty sand, poorly graded sand with clay, and poorly graded sand with silt. With the exception of localized areas of silt and clayey sands with up to 40 percent medium to high plasticity fines, subsurface soils within the northern subdivision site are predominantly sand soils with 35 percent or less non-plastic to low plasticity fines. The sandy silt is grayish green, moist, stiff to very stiff, and contains approximately 55 percent low plasticity fines and 45 percent fine to coarse sand. The clayey sand is brown to dark brown, dense, slightly moist to moist, and contains approximately 34 to 40 percent medium to high plasticity fines and 60 to 66 percent fine to coarse sand. The silty sand is white to reddish brown, white to light brown, brown, slightly moist to moist, loose to dense, and consists of about 20 to 35 percent non-plastic to low plasticity fines, 65 to 80 percent fine to coarse sand, and 5 percent angular to



subrounded gravel up to 1 inch in diameter. The poorly graded sand with clay is described as light brown, moist, dense, and contains approximately 10 percent low plasticity fines and 90 percent fine to coarse sand. The poorly graded sand with silt is light brown to dark brown, green to light brown, loose to dense, slightly moist to moist, and consists of 10 percent non-plastic fines, 85 to 90 percent fine to coarse sand, and 5 percent angular gravel up to 1 inch in diameter.

Groundwater was not encountered during exploration that extended to a maximum depth of 13 feet below existing ground surface and is expected to lie at a depth well below that which would affect design or construction.



Geologic Hazards

Seismicity and Faults

Lemmon Valley lies within an area with a high potential for strong earthquake shaking. Seismicity within the Lemmon Valley area is considered about average for the western Basin and Range Province (Ryall and Douglas, 1976). It is generally accepted that a maximum credible earthquake in this area would be in the range of magnitude 7 to 7.5 along the frontal fault system of the Eastern Sierra Nevada. Much of the western United States is a region of moderate to intense seismicity related to movement of crustal masses (plate tectonics). By far, the most seismically active regions, outside of Alaska, are in the vicinity of the San Andreas Fault system of western California. Other seismically active areas include the Wasatch Front in Salt Lake City, Utah, which forms the eastern boundary of the Basin and Range physiographic province, and the eastern front of the Sierra Nevada Mountains, which is the western margin of the province. The Lemmon Valley area lies along the eastern base of the Sierra Nevadas, within the western extreme of the Basin and Range. It must be recognized that there are probably few regions in the United States not underlain at some depth by older bedrock faults. Even areas within the interior of North America have a history of strong seismic activity.

The published earthquake hazards map (Cordy, 1985b) shows a fault about 1.5 miles west of the proposed site. Because no faults are mapped in the vicinity of the project site, and none were identified during our exploration, no further fault investigation or fault mitigation is considered necessary.

Ground Motion

Mapping by the United States Geological Survey (USGS, 2017) indicates that there is a 2 percent probability that a *bedrock* ground acceleration of 0.629 g will be exceeded in any 50-year interval. Only localized amplification of ground motion would be expected during an earthquake.

Flood Plains

The Federal Emergency Management Agency (FEMA) has identified the site as lying in unshaded Zone X, or outside the limits of a 500-year flood plain (FEMA, 2009), and Zone A, for which the base flood elevations have not been determined. Based on a conceptual site layout by Manhard Consulting, Ltd., the proposed pond will be in Zone A. The civil design for the project shall address all flood hazards associated with the project site.

Other Geologic Hazards

A moderate potential for dust generation is present if grading is performed in dry weather. No other geologic hazards were identified.



Discussion and Recommendations

General Information

The project will involve the design and construction of a residential development consisting of 207 single-family residential lots within approximately 129 acres on 4 parcels located near Lemmon Drive in Washoe County, Nevada. The proposed residential structures are expected to be one- to two-story, wood-framed buildings supported by shallow PCC foundations. The homes will have either raised wood floors with a crawl space, PCC slab-on-grade floors, or a combination of both. New asphalt concrete residential roadways will be constructed as part of the project. A grading plan is not available for the project; however, we anticipate cuts and fills on the order of 10 feet or less.

The site is geotechnically well-suited for the proposed residential development provided the following recommendations are implemented in project design and construction. While the majority of recommendations contained in this report could be considered design-level for the proposed residential project, we should be provided the opportunity to confirm this via an updated letter once final project details and the grading plan become available for our review. The site is underlain primarily by native sand soils that will provide adequate support for the proposed improvements. Uncontrolled fill materials up to approximately 1.5 feet thick were encountered at the eastern portion of the south subdivision. Uncontrolled fill will require removal and replacement with compacted structural fill, as detailed in the **Site Preparation** section. Additionally, we encountered isolated areas of clay soils with excessive plastic fines at the surface extending to depths of up to approximately 3 feet. In general, foundations and floor slabs can bear on compacted native soils or structural fill. In areas where clay soils are encountered, structure foundations, floor slabs, and pavements will require structural fill separation from potentially expansive clay soils. Native soils within the project site that classify as granular as defined below can be used as structural fill.

The recommendations provided herein, and particularly under **Site Preparation, Mass Grading, Foundations, and Quality Control**, are intended to minimize risks of structural distress related to consolidation or expansion of native soils and/or structural fills. These recommendations, along with proper design and construction of the structure and associated improvements, work together as a system to improve overall performance. If any aspect of this system is ignored or is poorly implemented, the performance of the project will suffer. Sufficient quality control should be performed to verify that the recommendations presented in this report are followed.

Structural areas referred to in this report include all areas of buildings, concrete slabs and asphalt pavements, as well as pads for any minor structures. The term engineer, as presented below, pertains to the civil or geological



engineer that has prepared the geotechnical engineering report for the project or who serves as a qualified geotechnical professional on behalf of the owner.

All compaction requirements presented in this report are relative to ASTM D 1557. For the purposes of this project:

- Fine-grained soils are defined as those with more than 40 percent by weight passing the number 200 sieve, and a plastic index lower than 15.
- Clay soils are defined as those with more than 30 percent passing the number 200 sieve, and a plastic index greater than 15.
- Granular soils are those not defined by the above criteria.

Any evaluation of the site for the presence of surface or subsurface hazardous substances is beyond the scope of this investigation. When suspected hazardous substances are encountered during routine geotechnical investigations, they are noted in the exploration logs and immediately reported to the client. No such substances were revealed during our exploration.

It is common practice in northern Nevada to place unsuitable soils, including expansive clays, oversized rock and organic strippings, in back, front and side yard areas. If the developer elects this alternate, as opposed to exporting such materials and importing/placing structural fills in yard areas, we recommend disclosure be included in the sales agreement. The buyer should be made aware that homeowner-added improvements, such as patios or swimming pools, will require geotechnical analysis.

Site Preparation

All vegetation shall be stripped and grubbed from structural areas and removed from the site. A stripping depth of 0.2 to 0.3 feet is anticipated. Roots greater than ½ inch in diameter shall be removed, where necessary, to a minimum depth of 12 inches below finished grade.

The test pits were excavated by backhoe at the approximate locations shown on Plate 1. Locations were determined in the field by approximate means. All test pits were backfilled upon completion of the field portion of our study, and the backfill was compacted to the extent possible with equipment on hand. However, the backfill was not compacted to the requirements presented herein under **Mass Grading**. If structures, concrete flatwork, pavement, utilities or other improvements are to be located in the vicinity of any of the test pits, the backfill should be removed and recompacted in accordance with the requirements contained in this report. Failure to properly compact backfill could result in excessive settlement of improvements located over test pits.

Clay soils as defined above were encountered at the surface in test pits TP-10, TP-18, and TP-19 to depths of up to 3 feet below the ground surface. Additional clay soils may be encountered between our test pit locations. The



clay soils were classified as slightly moist to moist, medium dense to dense, and as exhibiting low to high plasticity. Laboratory testing performed on these materials determined the clay soils exhibit plasticity indices on the order of 20, indicative of moderately expansive soils (Nelson and Miller, 1992).

Clay soils shall be removed or separated from improvements by at least 2 feet of structural fill beneath footings and 1.5 feet beneath slabs and pavements (including aggregate base sections) in order to decrease potential for shrink-swell movements. The required separation may be achieved by any combination of site filling or over-excavation and replacement. Over-excavation shall extend a minimum 12 inches from footings, slabs, and pavements on all sides. It is emphasized that unless clay soils are completely removed beneath improvements, some differential movement should be anticipated.

Clays to be left in place and covered with fill shall be moisture-conditioned to 2 to 4 percent over optimum for a minimum depth of 12 inches. This moisture level will significantly decrease the magnitude of shrink-swell movements in the upper foot of clay. The high moisture content must be maintained by periodic surface wetting, or other methods, until the surface is covered by at least 1 lift of fill. If allowed to dry out, subsequent expansion of clay soils beneath foundations and floor slabs could significantly exceed the design criteria set forth in this report.

All areas to receive structural fill or structural loading shall be scarified, moisture conditioned, and densified to at least 90 percent relative compaction.

If wet weather construction is anticipated, surface soils may be well above optimum moisture and impossible to compact. In some situations, moisture conditioning may be possible by scarifying the top 12 inches of subgrade and allowing it to air-dry to near-optimum moisture prior to compaction. Where this procedure is ineffective or where construction schedules preclude delays, mechanical stabilization will be necessary. Mechanical stabilization may be achieved by over-excavation and/or placement of an initial 12- to 18-inch-thick lift of 12-inch-minus, 3-inch-plus, well graded, angular rock fill. The more angular and well graded the rock is, the more effective it will be. This fill shall be densified with large equipment, such as a self-propelled sheeps-foot or a large loader, until no further deflection is noted. Additional lifts of rock may be necessary to achieve adequate stability. The use of a separator geotextile will prevent mud from pumping up between the rocks, thereby increasing rock-to-rock contact and decreasing the required thickness of stabilizing fill. The separator geotextile shall meet or exceed the following minimum properties presented in Table 1 (Minimum Required Properties for Separator Geotextile).

TABLE 1 - MINIMUM REQUIRED PROPERTIES FOR SEPARATOR GEOTEXTILE

Trapezoid Strength (ASTM D 4533)	80 x 80 lbs.
Puncture Strength (ASTM D 4833)	500 lbs.
Grab Tensile Strength/Elongation (ASTM D 4632)	200 x 200 @ 50 %



As an alternate to rock fill, a geotextile/gravel system may be used for stabilization. Aggregate base (*Standard Specifications for Public Works Construction [SSPWC], 2012*), Class C or D drain rock (*SSPWC, 2012*), or pit run gravels shall be placed above the geotextile. Regardless of which alternate is selected, a test section is recommended to determine the required thickness of stabilization.

Trenching, Excavation and Utility Backfill

Excavation and trenching can be performed using conventional medium to large construction equipment. The on-site materials may allow for neat-line trenching. It should be noted that we encountered practical digging refusal in test pit TP-08 at a depth of 5.5 feet. Excavations that encroach near the adjacent hillsides may encounter bedrock and require rock excavation techniques.

Temporary trenches with near-vertical sidewalls should be stable to a depth of approximately 4 feet. Temporary trenches are defined as those that will be open for less than 24 hours. Excavations to greater depths will require shoring or laying back of sidewalls to maintain adequate stability. Regulations contained in Part 1926, Subpart P, of Title 29 of the Code of Federal Regulations (CFR, 2010) require that temporary sidewall slopes be no greater than those presented in Table 2 (Maximum Allowable Temporary Slopes).

TABLE 2 - MAXIMUM ALLOWABLE TEMPORARY SLOPES	
Soil or Rock Type	Maximum Allowable Slopes ¹ for Deep Excavations less than 20 Feet Deep ²
Stable Rock	Vertical (90 degrees)
Type A ³	3H:4V (53 degrees)
Type B	1H:1V (45 degrees)
Type C	3H:2V (34 degrees)
<i>Notes:</i>	
¹ Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off. ² Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer. ³ A short-term (open 24 hours or less) maximum allowable slope of 1H:2V ([horizontal to vertical] 63 degrees) is allowed in excavation in Type A soils that are 12 feet or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet in depth shall be 3H:4V (53 degrees).	

The State of Nevada, Department of Industrial Relations, Division of Occupational Safety and Health Administration (OSHA) has adopted and strictly enforces these regulations, including the classification system and the maximum slopes. In general, Type A soils are cohesive, non-fissured soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Type B are cohesive soils with an unconfined compressive strength between 0.5 and 1.5 tsf. Type C soils have an unconfined compressive strength below 0.5 tsf. Numerous additional factors



and exclusions are included in the formal definitions. The client, owner, design engineer, and contractor shall refer to Appendix A and B of Subpart P of the previously referenced Federal Register for complete definitions and requirements on sloping and benching of trench sidewalls. Appendices C through F of Subpart P apply to requirements and methodologies for shoring.

On the basis of our exploration, the site soils are predominately Type C. All trenching shall be performed and stabilized in accordance with local, state, and OSHA standards.

Utility Trench Backfill

The maximum particle size in trench backfill shall be 4 inches. Bedding and initial backfill 12 inches over the pipe will require import and shall conform to the requirements of the utility having jurisdiction. Bedding and initial backfill shall be densified to at least 90 percent relative compaction. Native granular soils will provide adequate final backfill as long as oversized particles are excluded, and they shall be placed in maximum 8-inch-thick loose lifts that are compacted to a minimum of 90 percent relative compaction in all structural areas.

Mass Grading

The majority of the native materials encountered at the site classify as granular soils and are suitable for use as structural fill. Where encountered, excavated clay soils shall only be placed as fill in non-structural areas. If imported structural fill is required on this project, we recommend it satisfy the specifications presented in Table 3 (Guideline Specification for Imported Structural Fill).

TABLE 3 - GUIDELINE SPECIFICATION FOR IMPORTED STRUCTURAL FILL

Sieve Size	Percent by Weight Passing	
4 Inch	100	
3/4 Inch	70 – 100	
No. 40	15 – 70	
No. 200	5 – 30	
Percent Passing No. 200 Sieve	Maximum Liquid Limit	Maximum Plastic Index
5 – 10	50	20
11 – 20	40	15
21 – 30	35	10



These recommendations are intended as guidelines to specify a readily available, prequalified material. Adjustments to the recommended limits can be provided to allow the use of other granular, non-expansive material. Any such adjustments must be made and approved by the engineer, in writing, prior to importing fill to the site.

All structural fill shall be placed in maximum 8-inch-thick loose lifts, each densified to at least 90 percent relative compaction. Nonstructural fill shall be densified to at least 85 percent relative compaction to minimize consolidation and erosion. This is particularly important for yard areas because soil consolidation can cause water to pond in the drainage swales. Loose yard fill also allows water to infiltrate the backfill rather than flowing to the swale. Both of these conditions can contribute to excessive crawl space moisture (refer to **Site Drainage**).

Grading shall not be performed with or on frozen soils.

Seismic Design Parameters

Seismic design criteria for the 2012 *International Residential Code* ([*IRC*] International Code Council [*ICC*], 2012), adopted by Washoe County, are presented below in Table 4 (Seismic Design Criteria Using 2012 *International Residential Code*):

TABLE 4 - SEISMIC DESIGN CRITERIA USING 2012 <i>INTERNATIONAL RESIDENTIAL CODE</i>	
Latitude	39.6366
Longitude	-119.8294
Spectral Response at Short Periods, S_w , percent of gravity	157.2
Site Class	D
Soil Factor for Site Class D	1.00
Risk Category	II
Residential Site Value, percent of gravity	104.8
Residential Seismic Design Category	D ₂

Foundations

In general, the soils encountered at the site are granular and will provide adequate foundation support. However, isolated areas of clay soils were encountered; these materials are poor foundation soils, such that footings should not bear directly in these materials. The most economical method of foundation support lies in spread footings bearing on undisturbed native granular soils or structural fill.



Individual column footings and continuous wall footings underlain by undisturbed native soils or properly placed and compacted structural fill can be designed for a net maximum allowable bearing pressure of 2,500 pounds per square foot (psf) and should have minimum footing widths of 24 and 12 inches, respectively. The net allowable bearing pressure is the pressure at the base of the footing in excess of the adjacent overburden pressure. This allowable bearing value should be used for dead plus ordinary live loads. Ordinary live loads are that portion of the design live load that will be present during the majority of the life of the structure. Design live loads are loads that are produced by the use and occupancy of the building, such as by moveable objects, including people or equipment, as well as snow loads. This bearing value may be increased by one-third for total loads. Total loads are defined as the maximum load imposed by the required combinations of dead load, design live loads, snow loads, and wind or seismic loads.

With this allowable bearing pressure, total foundation movements of approximately $\frac{3}{4}$ inch should be anticipated. Differential movement between footings with similar loads, dimensions, and base elevations should not exceed two-thirds of the values provided above for total movements. The majority of the anticipated movement will occur during the construction period as loads are applied.

Lateral loads, such as wind or seismic, may be resisted by passive soil pressure and friction on the bottom of the footing. The recommended coefficient of base friction is 0.40 and has been reduced by a factor of 1.5 on the ultimate soil strength. Design values for active and passive equivalent fluid pressures are 40 and 390 psf per foot of depth, respectively. These design values are based on spread footings bearing on properly prepared native soils or compacted structural fill and backfilled with structural fill. All exterior footings should be placed a minimum 2 feet below adjacent finished grade for frost protection.

If loose, soft, wet, or disturbed soils are encountered at the foundation subgrade, these soils should be removed to expose competent soils and the resulting over-excavation backfilled with compacted structural fill. The base of all excavations should be dry and free of loose soils at the time of concrete placement.

Foundation Drainage Design Parameters

Subsurface foundation drainage must be installed along the exterior perimeter of the structure foundations of homes with raised floors. This may be accomplished by placing a non-woven geotextile/gravel system with a network of perforated drain pipes below and along the outside base of the exterior footings. The geotextile shall meet or exceed the minimum properties presented in Table 5 (Minimum Required Properties for Drainage Geotextile).



TABLE 5 - MINIMUM REQUIRED PROPERTIES FOR DRAINAGE GEOTEXTILE

Grab Tensile (ASTM D 4632)	90 lbs.
Puncture Strength (ASTM D 4833)	50 lbs.
Burst Strength (ASTM D 3786)	150 psi.
OR IF NATIVE SOILS HAVE SHARP, ANGULAR ROCKS:	
Grab Tensile (ASTM D 4632)	130 lbs.
Puncture Strength (ASTM D 4833)	75 lbs.
Burst Strength (ASTM D 3786)	250 psi.

A trench shall be excavated to a depth of at least 6 inches below the base and directly adjacent to the outside of the footings. A perforated, 4-inch-diameter drain pipe shall be placed in the bottom of the trench and graded to drain downslope of the residence. A minimum of 12 inches of Class C drain rock (*SSPWC*, 2012) shall be placed above the drain pipe and around the footing, then covered by the geotextile. The permeable material should extend up above the footing/stemwall cold joint.

Subsidence and Shrinkage

Granular alluvial soils excavated and recompactd in structural fills should experience quantity shrinkage of approximately 10 to 15 percent. In other words, 1 cubic yard of excavated granular alluvium will generate about 0.85 to 0.9 cubic yards of structural fill at 95 percent relative compaction.

Slope Stability and Erosion Control

Stability of cut and filled surfaces involves 2 separate aspects. The first concerns true slope stability related to mass wasting, landslides, or the en masse downward movement of soil or rock. Stability of cut and fill slopes is dependent upon shear strength, unit weight, moisture content, and slope angle. The *IRC* (ICC, 2012), adopted by Washoe County, allows cut and fill slopes up to 2H:1V (horizontal to vertical) in the type of soils present at this site. The exploration and testing program conducted during this investigation confirms 2H:1V slopes will be stable.

The second aspect of stability involves erosion potential and is dependent on numerous factors involving grain size distribution, cohesion, moisture content, slope angle, and the velocity of water or wind on the ground surface. Measures should be taken to control erosion. In general, slopes that are 5H:1V or steeper need to include erosion protection. Slopes at a 3H:1V ratio or flatter can be stabilized using hydroseeding. Slopes steeper than 3H:1V typically require stabilization such as rip-rap. Erosion protection is particularly important on slopes that are subject to significant water flow.



Dust potential at this site will be moderate during dry periods. Temporary (during construction) and permanent (after construction) erosion control will be required for all disturbed areas. The contractor shall prevent dust from being generated during construction in compliance with all applicable city, county, state, and federal regulations. The contractor shall submit an acceptable dust control plan to the controlling agency prior to starting site preparation or earthwork. Project specifications should include an indemnification by the contractor of the owner and engineer for any dust generation during the construction period. The owner will be responsible for mitigation of dust after accepting the project.

In order to minimize erosion and downstream impacts to sedimentation from this site, best management practices with respect to stormwater discharge shall be implemented.

Site Drainage

Surface Drainage

Adequate surface drainage shall be provided so moisture is directed away from structures. A system of roof gutters and downspouts is recommended to collect roof drainage and direct it away from the foundations. If roof runoff is allowed directly over paver stones, especially where they will be subjected to vehicle loading, saturation of the subgrade materials could result in rutting of the paver stone system.

Stemwall backfill shall be thoroughly compacted to decrease permeability and reduce the potential for irrigation and stormwater to migrate below the floor slab and/or enter the crawl space.

The ponding of water on finished grade or at the edge of pavements shall be prevented by grading the site in accordance with *IRC* (ICC, 2012) requirements.

Crawl Space Drainage

Positive crawl space drainage shall be provided. This is most easily accomplished by grading the crawl space to drain to 1 or more localized areas and providing 3-inch-diameter pipes to daylight beneath the footings and tie into the exterior foundation drain.

It is our opinion that the systems described above meet Washoe County and Federal Housing Authority requirements for positive crawl space drainage. These systems are sufficient to drain water within a few days that may occasionally occur from large snowmelt, major storms, or broken pipes. These systems may not, however, be entirely sufficient to prevent all homeowner complaints. It has been our experience that most problems with wet crawl spaces are directly related to changes in site drainage or poor irrigation practices by the homeowner; it is usually difficult to convince the homeowner of his or her responsibility in these matters, however, and the problem can often become time consuming, resulting in ill-will and even lawsuits between the homeowner and developer. For these reasons, some builders are using more positive drainage systems, such as pea gravel blankets, interior



perimeter drains, or exterior subdrains. It shall be noted that certain lots may be prone to collect upslope irrigation and storm drainage through subsurface flow that daylight in the crawl space.

Crawl space drainage systems cannot be expected to be 100 percent effective against sporadic wetting caused by plumbing leaks, large storms, or unusually large and/or rapid snowmelt. The purpose of all forms of positive crawl space drainage is to minimize the amount of moisture that enters the crawl space under normal conditions and to drain the increased moisture volume from unusual conditions in a few days or even weeks. Positive crawl space drainage does not require that soils are dry, only that freestanding water is not normally present. Moist to wet soils are normal in crawl spaces, particularly around the perimeter footings. Any perceived, undesirable effects from this moisture are usually prevented by installation of a polyethylene vapor barrier over the crawl space surface. Crawl space vents must be opened all year to help control moisture. The homeowner's obligation is to maintain proper drainage, away from the home, and to not overwater landscaping.

Concrete Slabs

All concrete slabs shall be directly underlain by imported Type 2, Class B aggregate base (*SSPWC*, 2012). The thickness of base material beneath PCC flatwork shall be 6 inches beneath curbs and gutters and 4 inches beneath sidewalks, floor slabs and private flatwork. Aggregate base courses shall be densified to at least 95 percent relative compaction.

Final design of the floor slab shall be performed by the project structural engineer. Any interior concrete slab-on-grade floors shall be a minimum of 4 inches thick. Floor slab reinforcement, as a minimum, shall consist of No. 3 reinforcing steel placed on 24-inch-centers in each direction, or flat sheets of 6x6, W4.0xW4.0 welded wire mesh (WWM). Rolls of WWM are not recommended for use because vertically centered placement of rolled WWM within a floor slab is difficult to achieve. All reinforcing steel and WWM shall be centered in the floor slab through the use of concrete dobies or an approved equivalent.

The Washoe County area is a region with exceptionally low relative humidity. As a consequence, concrete flatwork is prone to excessive shrinking and curling. Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of concrete and result in cracking, curling, and the spalling of slabs. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute (ACI, 2008) and this report. Special considerations shall be given to concrete placed and cured during hot or cold weather temperatures, low humidity conditions, and windy conditions such as are common in the Lemmon Valley area.

Proper control joints and reinforcement shall be provided to minimize any damage resulting from shrinkage, as discussed below. In particular, crack-control joints shall be installed on maximum 10-foot-centers and shall be installed to a minimum depth of 25 percent of the slab thickness. Saw-cuts, zip strips, and/or trowel joints are acceptable; however, saw-cut joints must be installed as soon as initial set allows and prior to the development of



internal stresses that will result in a random crack pattern. If trowel joints are used in the main living area floor slab, they will need to be grouted over prior to installation of floor coverings.

Concrete shall not be placed on frozen in-place soils.

Any interior concrete slab-on-grade floors will require a moisture barrier system. Installation shall conform to the specifications provided for a Class B vapor restraint (ASTM E 1745-97). The vapor barrier shall consist of placing a 10-mil-thick Stego® Wrap Vapor Barrier or an approved equal directly on a properly prepared subgrade surface. A 4-inch-thick layer of aggregate base shall be placed over the vapor barrier and compacted with a vibratory plate.

The base layer that overlies the moisture barrier membrane shall remain compacted and a uniform thickness maintained during the concrete pour, as its intended purpose is to facilitate even curing of the concrete and minimize curling of the slab. Extra attention shall be given during construction to ensure that rebar reinforcement and equipment do not damage the integrity of the vapor barrier. Care must be taken so that concrete discharge does not scour the base material from the vapor barrier. This can be accomplished by maintaining the discharge hose in the concrete and allowing the concrete to flow out over the base layer.

Asphalt Concrete

The residential streets within the proposed Lemmon Drive residential development will carry minimal traffic due to the limited number of lots involved. The Equivalent Single Axle Loading (ESAL) for the residential streets was estimated in a very conservative manner using the procedure summarized in Table 6 (Traffic Analysis for Residential Streets).

TABLE 6 - TRAFFIC ANALYSIS FOR RESIDENTIAL STREETS	
Design Life	20 Years (7,300 Days)
Maximum Lots	<125 per Subdivision
10 Two-Way Trips per Day per Lot (Institute of Transportation Engineers, 2003)	
2 Percent Trucks with Truck Factor (T.F.) of 0.52 (Assumed)	
Construction Traffic + 20 Trucks per Lot at T.F. = 1.0 (Assumed)	
$ESAL_{20} = (7,300)(125)(5)(.02)(.52) + (125)(20)(1.0)$	
$ESAL_{20} = 47,450 + 2,500 = 49,950$	

An R-value of 43 was measured in the laboratory testing for the on-site granular soils that will be exposed in the majority of cuts and will make up the bulk of the structural fill on this project. The minimum calculated structural section for residential streets in these subdivisions is 3 inches of asphalt concrete overlying 6 inches of Type 2,



Class B aggregate base (*SSPWC*, 2012). All aggregate base beneath pavements should be densified to at least 95 percent relative compaction.

If traffic ultimately exceeds the anticipated levels, it may be necessary to reevaluate and overlay the pavement at some time in the future. We should review any traffic projection reports if and when they become available to update our pavement design.

Asphalt concrete pavements have been designed for a standard 20-year life expectancy as detailed above. Due to the local climate and available construction aggregates, a 20-year performance life requires diligent maintenance. Between 15 and 20 years after initial construction (average 17 years), major rehabilitation (structural overlay or reconstruction) is often necessary if maintenance has been lax. To achieve maximum performance life, maintenance must include regular crack sealing, seal coats, and patching as needed. Crack filling is commonly necessary every year or at least every other year. Seal coats, typically with a Type II slurry seal, are generally needed every 3 to 6 years depending on surface wear. Failure to provide thorough maintenance will significantly reduce pavement design life and performance.

Corrosion Potential

Metal Pipe Design Parameters

Laboratory testing was performed to evaluate the corrosion potential of the soils with respect to metal pipe in contact with the ground. The results of the laboratory testing indicate that the site foundation soils are not corrosive to buried metal (American Water Works Association [AWWA], 1999). As a result, metal pipe in contact with the ground will not require corrosion protection.

Portland Cement Concrete Mix Design Parameters

Soluble sulfate content has been determined for representative samples of the site foundation soils. The sulfate was extracted from the soil at a 10:1 water to soil ratio in order to assure that all soluble sodium sulfate was dissolved. The results are reported in milligrams of sulfate per kilogram of soil and can be directly converted to percent by dividing by 10,000. The percent sulfate in the soil is used to determine the sulfate exposure Class (S) from the information presented in Table 7 (Sulfate Exposure Class).



TABLE 7 - SULFATE EXPOSURE CLASS*

S Sulfate			Water-Soluble Sulfate (SO₄) in Soil, Percent by Weight
	Not Applicable	S0	SO ₄ < 0.10
Moderate	S1	0.10 ≤ SO ₄ < 0.20	
Severe	S2	0.20 ≤ SO ₄ ≤ 2.00	
Very Severe	S3	SO ₄ > 2.00	

*From Table 4.2.1 Exposure Categories and Classes. ACI 318, *Buildings Code and Comments*.

The results of the testing (Appendix A) indicate that concrete in contact with the site foundation soils should be designed for Class S0 Sulfate exposure. Therefore, Type II cement can be used for all concrete work.



Anticipated Construction Problems

Depending on the season of construction, soft, wet surface soils may make it difficult for construction equipment to travel and operate. Native granular soils could slough and cave from trench sidewalls, particularly when they become dry. The site contains isolated areas of clay soils that will require careful inspection to identify and mitigate.



Quality Control

All plans and specifications should be reviewed for conformance with this geotechnical report and approved by the engineer prior to submitting them to the building department for review.

The recommendations presented in this report are based on the assumption that sufficient field testing and construction review will be provided during all phases of construction. We should review the final plans and specifications to check for conformance with the intent of our recommendations. Prior to construction, a pre-job conference should be scheduled to include, but not be limited to, the owner, architect, civil engineer, general contractor, earthwork and materials subcontractors, building official, and engineer. The conference will allow parties to review the project plans, specifications, and recommendations presented in this report and discuss applicable material quality and mix design requirements. All quality control reports should be submitted to and reviewed by the engineer.

During construction, we should have the opportunity to provide sufficient on-site observation of preparation and grading, over-excavation, fill placement, foundation installation, and paving. These observations would allow us to verify that the geotechnical conditions are as anticipated and that the contractor's work is in conformance with the approved plans and specifications.



Homeowner's Responsibilities

Backyards and side yards of the homes may include clays and other unsuitable soils. The developer of this project will mitigate potentially expansive soils in driveways and exterior concrete walkways during construction. The homeowner is responsible to mitigate potentially expansive clay soils below any addition flatwork installed by the homeowner (e.g., concrete and/or paver stone walkways, concrete patios, etc.). Such mitigation would include over-excavating clay soils to a minimum depth of 2 feet below the flatwork and backfilling the over-excavation with granular, non-expansive material.

The developer will finish grade the lot to prevent ponding of water adjacent to structural improvements and provide drainage away from the structure in accordance with local building codes. If the homeowner alters the drainage present at the time of sale, either by landscaping and/or making improvements on the lot, he/she must provide drainage away from the structure in accordance with local building codes. If positive drainage is not provided by the homeowner, differential movement of structural improvements could be experienced and result in cracking of interior walls and foundations. Wet crawl spaces with standing water could also occur with poor drainage.

The site is located in an area with active earthquakes in relatively close proximity. While the potential for ground rupture or liquefaction is minimal, the site does lie within a seismically active region with a high potential for ground shaking. The recurrence interval for earthquakes along the major active faults in the region is generally thought to be in the range of 1,000 years or more. The most recent earthquakes in northern Nevada, however, have occurred along lesser-known faults that seem to represent tectonic plate boundary motion. Approximately 85 percent of this motion is taken up along the San Andreas Fault in California, but as much as 15 percent of the plate motion appears to be occurring along numerous, smaller strike-slip faults in western Nevada. The realization that plate boundary faulting extends so far inland is relatively recent, such that the probable recurrence intervals and magnitudes of the consequent earthquakes are unknown. For this reason, and the general high potential for ground shaking in this area, homebuyers should be advised to consider purchasing earthquake insurance. Typically such insurance is of very low cost but has such a high deductible that it is only beneficial during a very large-scale seismic event.



Standard Limitations Clause

This report has been prepared in accordance with generally accepted geotechnical practices. The analyses and recommendations submitted are based on field exploration performed at the locations shown on Plate 1. This report does not reflect soils variations that may become evident during the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to ensure compliance with our recommendations.

Single-family residential construction results in a complex composite of steel, PCC, lumber and soils. Each element responds differently to loading and, as a consequence, minor cracking and distortion can occur. Such cracking and distortion is not in and of itself evidence of the structure failing to meet a reasonable standard or level of performance, but rather is typical of new residential construction. Repair of such conditions is considered aesthetic in nature and not a structural defect.

It is anticipated that the site will be graded cut to fill. As such, minor deviations from the recommendations and assessments presented in this report are anticipated. Fills are to be generated on site using cut-to-fill methods and will not be purchased from a commercial borrow source. Therefore, the potential exists for soils within the building pads to fall outside the material limits recommended in this report. Unless these deviations can be proven to be fundamental to any observed distress or performance issue, such deviations should not be considered a failure to adhere to the recommendations presented in this report or a design flaw, but should be considered an acceptable variation in mass grading when on-site materials are used as the fill source. Acceptable performance of such materials is formulated around the provisions and requirements of the *IRC*, as applicable.

This report has been produced to provide information allowing the architect or engineer to design the project. The owner is responsible for distributing this report to all designers and contractors whose work is affected by geotechnical aspects. In the event there are changes in the design, location, or ownership of the project from the time this report is issued, recommendations should be reviewed and possibly modified by the engineer. If the engineer is not granted the opportunity to make this recommended review, he or she can assume no responsibility for misinterpretation or misapplication of his or her recommendations or their validity in the event changes have been made in the original design concept without his or her prior review. The engineer makes no other warranties, either express or implied, as to the professional advice provided under the terms of this agreement and included in this report.

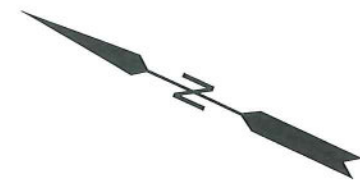


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PLATES



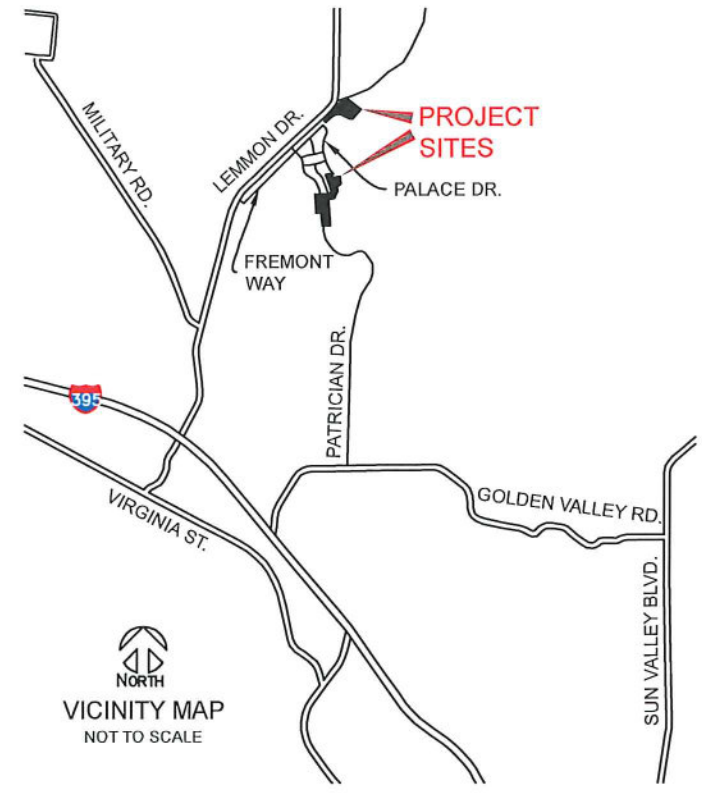
SCALE: 1"=500'

LEGEND

TP-01 APPROXIMATE TEST PIT LOCATION

NOTES

1. BASE MAP PROVIDED BY MANHARD CONSULTING LTD.



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JDS GROUP, LLC
PLOT PLAN
 LEMMON DRIVE PARCELS
 WASHOE COUNTY, NEVADA

Project No.
 2047-01-1
 Plate 1




LOG OF TEST PIT TP-01

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391376 E 257080 UTM NAD83							
A			6.4	7	1	SM	Silty Sand Light brown, slightly moist, medium dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand. Surface fill.
					2	SM	
B					3	SC-SM	Silty, Clayey Sand Brown, moist, dense, with 25% low plasticity fines, 72% fine to coarse sand, and 3% subrounded gravel up to 1/2 inch in diameter.
					4	SC-SM	
					5	SC-SM	
					6	SC-SM	
					7	SC-SM	
					8	SC-SM	Silty Sand Brown, moist, dense, with an estimated 30% non-plastic to low plasticity fines and 70% fine to coarse sand.
					9	SC-SM	
C					10	SM	
					11	SM	
					12	SM	
					13	SM	




LOG OF TEST PIT TP-02

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4397304 E 257134 UTM NAD83							
					1	SM	Silty Sand Light brown to brown, slightly moist, medium dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand.
A					2	SM	
					3	SM	
					4	SM	
					5	SM	Clayey Sand Brown, moist, dense, with an estimated 30% low to medium plasticity fines and 70% fine to coarse sand.
B					6	SC	
					7	SC	
					8	SC	
					9	SC	
					10	SC	Silty Sand Brown, moist, dense, with an estimated 30% non-plastic to low plasticity fines and 70% fine to coarse sand.
C					11	SM	
					12	SM	
					13	SM	

BEC-TP1 2047011.GPJ LAGNND7.GDT 8/24/2017


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Washoe County, Nevada 2047-01-1 Plate 2

LOG OF TEST PIT TP-03

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391424 E 257244 UTM NAD83							
			4.3	18	1	SC	Clayey Sand Brown, slightly moist to moist, medium dense to dense, with an estimated 25% low to medium plasticity fines and 75% fine to coarse sand.
A	↓				2		
					3		
B	↓				4		Clayey Sand Brown to dark brown, slightly moist to moist, dense, with 25% medium plasticity fines, 71% fine to coarse sand, and 4% subangular gravel up to 1/2 inch in diameter.
					5		
					6		
					7		
					8		
					9		
C	↓				10		Clayey Sand Brown, moist, dense, with an estimated 20% low to medium plasticity fines and 80% fine to coarse sand.
					11		
					12		
					13		

LOG OF TEST PIT TP-04

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391478 E 257256 UTM NAD83							
					1	SM	Silty Sand Brown, slightly moist to moist, medium dense to dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand.
A	↓		2				
			3				
			4	Silty Sand Light brown, moist, dense, with an estimated 15% non-plastic fines and 85% fine to coarse sand.			
			5				
			6				
			7				
B	↓		8				
			9				
			10				
			11				
			12				
			13				

BEC-TP1 2047011.GPJ LAGNN07.GDT 8/24/2017



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

LOG OF TEST PIT TP-05

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391635 E 257275 UTM NAD83							
A					1	SC	Clayey Sand with Gravel (Fill) Brown, slightly moist to moist, medium dense, with an estimated 20% low to medium plasticity fines, 60% fine to coarse sand, and 20% angular to subangular gravel up to 3 inches in diameter. Fill material.
					2	SC	
					3	SC	
B					4	SC	Clayey Sand Brown, moist, dense, with an estimated 35% medium to high plasticity fines and 65% fine to coarse sand.
					5		
					6		Silty Sand Brown, moist, dense, with an estimated 20% non-plastic to low plasticity fines and 80% fine to coarse sand.
					7		
					8		
C					9	SM	
					10		
					11		
					12		
					13		




LOG OF TEST PIT TP-06

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391544 E 257357 UTM NAD83							
A					1	SC	Clayey Sand (Fill) Brown to dark brown, slightly moist, dense, with an estimated 45% medium to high plasticity fines and 55% fine to coarse sand. Fill material.
					2	SC	
B					3		Silty Sand Brown, slightly moist to moist, dense, with an estimated 15% non-plastic fines and 85% fine to coarse sand.
					4		
					5	SM	
					6		
					7		
					8		
					9		
C					10	SM	Silty Sand Brown to dark brown, moist to very moist, dense, with an estimated 15% non-plastic fines and 85% fine to coarse sand.
					11	SM	
					12	SM	
					13		

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LOG OF TEST PIT TP-07

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391351 E 257288 UTM NAD83							
					1	SM	Silty Sand Brown, slightly moist to moist, medium dense to dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand.
					2		
					3		
A					4		
					5		
					6		
					7	SM	Silty Sand Brown, moist, dense, with an estimated 15% non-plastic to low plasticity fines and 85% fine to coarse sand.
					8		
					9		
B					10		
					11		
					12		
					13		



LOG OF TEST PIT TP-08

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391269 E 257233 UTM NAD83							
A					1	SC	Clayey Sand Brown to dark brown, slightly moist to moist, dense, with an estimated 25% medium to high plasticity fines and 75% fine to coarse sand.
					2		
B					3	SP-SM	Poorly Graded Sand with Silt Light brown to brown, moist, dense to very dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand.
					4		
					5		
					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		

Practical digging refusal.

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LOG OF TEST PIT TP-09

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391293 E 257191 UTM NAD83							
A			3.7	NP	1	SM	Silty Sand Brown, slightly moist to moist, medium dense to dense, with 23% non-plastic fines, 75% fine to coarse sand, and 2% subrounded gravel up to 3/8 inch in diameter.
					2		
					3		
					4		
					5		
B					6	SM	Silty Sand Reddish brown, moist, dense, with an estimated 30% non-plastic fines and 70% fine to coarse sand.
					7		
					8		
					9		
					10		
					11		
					12		
					13		




LOG OF TEST PIT TP-10

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391239 E 257180 UTM NAD83							
A					1	SC	Clayey Sand Brown to dark brown, slightly moist to moist, dense, with an estimated 35% medium to high plasticity fines and 65% fine to coarse sand.
					2		
B					3	SM	Silty Sand Brown, slightly moist to moist, dense, with an estimated 15% non-plastic fines and 85% fine to coarse sand.
					4		
					5		
					6		
					7		
C					8	SM	Silty Sand Light brown, moist, dense, with an estimated 25% non-plastic fines and 75% fine to coarse sand.
					9		
					10		
					11		
					12		
					13		

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LOG OF TEST PIT TP-11

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391430 E 257157 UTM NAD83							
					1	SM	Silty Sand Brown, slightly moist to moist, dense, with an estimated 30% non-plastic fines and 70% fine to coarse sand. Thin fill layer at the surface.
A					2		
					3		
					4		
					5		
					6	SC	Clayey Sand Brown, moist, dense, with an estimated 25% low to medium plasticity fines and 75% fine to coarse sand.
B					7		
					8		
					9		
					10		
					11		
					12		
					13		



LOG OF TEST PIT TP-12

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4391441 E 257722 UTM NAD83							
					1	SP-SM	Poorly Graded Sand with Silt Brown, slightly moist to moist, loose to dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand.
A					2		
					3		
					4		
					5	SM	Silty Sand Brown, moist, dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand.
B					6		
					7		
					8		
					9		
					10		
					11		
					12		
					13		

BEC-TP-1 2047011.GPJ LAGNN07.GDT 8/24/2017





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LOG OF TEST PIT TP-13

Date Excavated: 7/31/2017 Logged by: DEP
 Equipment: Cat 416 B Surface Elevation (ft) NA


SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4392432 E 257657 UTM NAD83							
A					1	SP-SM	Poorly Graded Sand with Silt Brown, slightly moist to moist, medium dense to dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand.
					2		
					3		Silty Sand Brown, moist, dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand.
					4		
B					5		
					6		
					7	SM	
					8		
					9		
					10		
					11		
					12		
					13		

LOG OF TEST PIT TP-14

Date Excavated: 7/31/2017 Logged by: DEP
 Equipment: Cat 416 B Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4392467 E 257649 UTM NAD83							
A			2.9	NP	1		Silty Sand Brown, slightly moist to moist, medium dense to dense, with 20% non-plastic fines, 75% fine to coarse sand, and 5% subangular to subrounded gravel up to 1/2 inch in diameter.
					2	SM	
					3		
					4		Poorly Graded Sand with Silt Brown, slightly moist to moist, medium dense to dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand.
					5		
B					6		
					7		
					8		
					9	SP-SM	
					10		
					11		
					12		
					13		

BEC-TP1 2047011.GPJ LAGNN07.GDT 8/24/2017

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LOG OF TEST PIT TP-15

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4392533 E 257608 UTM NAD83							
					1	SM	Silty Sand Brown, slightly moist to moist, loose to dense, with an estimated 25% non-plastic fines and 75% fine to coarse sand.
					2		
A	✎				3		
					4		
					5		
					6	SP-SM	Poorly Graded Sand with Silt Brown, moist, dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand.
					7		
					8		
					9		
B	✎				10		
					11		
					12		
					13		

LOG OF TEST PIT TP-16

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4392510 E 257603 UTM NAD83							
					1	SP-SM	Poorly Graded Sand with Silty Brown to dark brown, slightly moist to moist, medium dense to dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand.
A	✎				2		
					3		
					4		
					5	SP-SM	Poorly Graded Sand with Silt Light brown to green, moist, dense, with and estimated 10% non-plastic fines and 90% fine to coarse sand.
					6		
					7		
B	✎				8		
					9		
					10		
					11		
					12		
					13		

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LOG OF TEST PIT TP-17

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4392619 E 257441 UTM NAD83							
A					1	SM	Silty Sand Brown to dark brown, slightly moist to moist, medium dense to dense, with an estimated 25% non-plastic fines and 75% fine to coarse sand.
				2			
				3			
B					4	SM	Silty Sand White to light brown, moist, dense, with an estimated 35% non-plastic fines, 60% fine to coarse sand, and 5% angular gravel up to 1 inch in diameter.
				5			
				6			
C					7	SP-SM	Poorly Graded Sand with Silt Light brown, moist, dense, with an estimated 10% non-plastic fines, 85% fine to coarse sand, and 5% angular gravel up to 1 inch in diameter.
				8			
				9			
					10		
					11		
					12		
					13		



LOG OF TEST PIT TP-18

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4392639 E 257487 UTM NAD83							
A			8.4	20	1	SC	Clayey Sand Brown to dark brown, slightly moist to moist, dense, with 34% medium plasticity fines and 66% fine to coarse sand.
				2			
				3			
B					4	SP-SC	Poorly Graded Sand with Clay Light brown, moist, dense, with an estimated 10% low plasticity fines and 90% fine to coarse sand.
				5			
				6			
					7		
					8		
					9		
					10		
					11		
					12		
					13		

BEC-TP1 2047011.GPJ LAGNN07.GDT 8/24/2017



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LOG OF TEST PIT TP-19

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4392667 E 257550 UTM NAD83							
A					1	SC	Clayey Sand Brown to dark brown, slightly moist to moist, dense, with an estimated 40% medium to high plasticity fines and 60% fine to coarse sand.
				2			
					3	SM	Silty Sand Light brown, moist, dense, with an estimated 35% non-plastic to low plasticity fines and 65% fine to coarse sand.
				4			
				5			
				6			
B				7			
				8			
				9			
				10			
				11			
				12			
				13			




LOG OF TEST PIT TP-20

 Date Excavated: 7/31/2017

 Logged by: DEP

 Equipment: Cat 416 B

 Surface Elevation (ft) NA

SAMPLE NUMBER	SAMPLE	POCKET PEN. (tsf)	MOISTURE (%)	PI	DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION
Depth to Ground Water: NE Comments: N 4392638 E 257636 UTM NAD83							
					1	SM	Silty Sand Reddish brown, slightly moist to moist, medium dense to dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand.
				2			
A				3			
				4		SM	Silty Sand Brown, moist, dense, with an estimated 25% non-plastic fines and 75% fine to coarse sand.
				5			
				6			
B				7			
				8		ML	Sandy Silt Grayish green, moist, stiff to very stiff, with an estimated 55% low plasticity fines and 45% fine to coarse sand.
				9			
C				10			
				11			
				12			
				13			

BEC-TP1 2047011.GPJ LAGNIN07.GDT 8/24/2017



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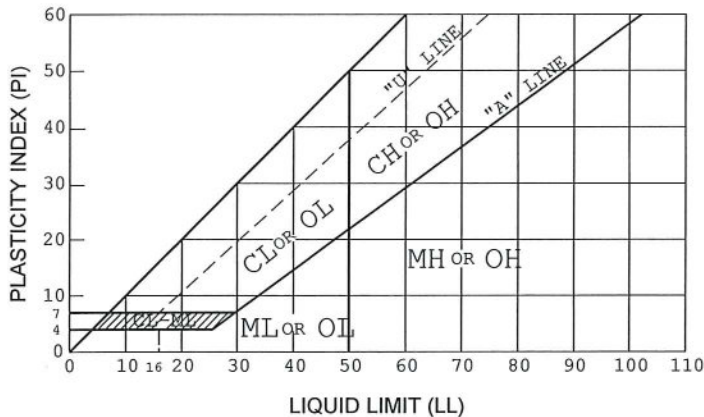
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SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL
			GRAPH	LETTER	DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
				SM	SILTY SANDS, SAND - SILT MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
		OH	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS
FILL MATERIAL				--	FILL MATERIAL, NON-NATIVE

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

PLASTICITY CHART



FOR CLASSIFICATION OF FINE-GRAINED SOILS AND FINE-GRAINED FRACTION OF COARSE-GRAINED SOILS

EXPLORATION SAMPLE TERMINOLOGY

Sample Type	Sample Symbol	Sample Code
Auger Cuttings		Auger
Bulk (Grab) Sample		Grab
Modified California Sampler		MC
Shelby Tube		SH or ST
Standard Penetration Test		SPT
Split Spoon		SS
No Sample		

GRAIN SIZE TERMINOLOGY

Component of Sample	Size Range
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	# 4 to #200 sieve (4.75mm to 0.074mm)
Silt or Clay	Passing #200 sieve (0.074mm)

RELATIVE DENSITY OF GRANULAR SOILS

N - Blows/ft	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
greater than 50	Very Dense

CONSISTENCY OF COHESIVE SOILS

Unconfined Compressive Strength, psf	N - Blows/ft	Consistency
less than 500	0 - 1	Very Soft
500 - 1,000	2 - 4	Soft
1,000 - 2,000	5 - 8	Firm
2,000 - 4,000	9 - 15	Stiff
4,000 - 8,000	16 - 30	Very Stiff
8,000 - 16,000	31 - 60	Hard
greater than 16,000	greater than 60	Very Hard

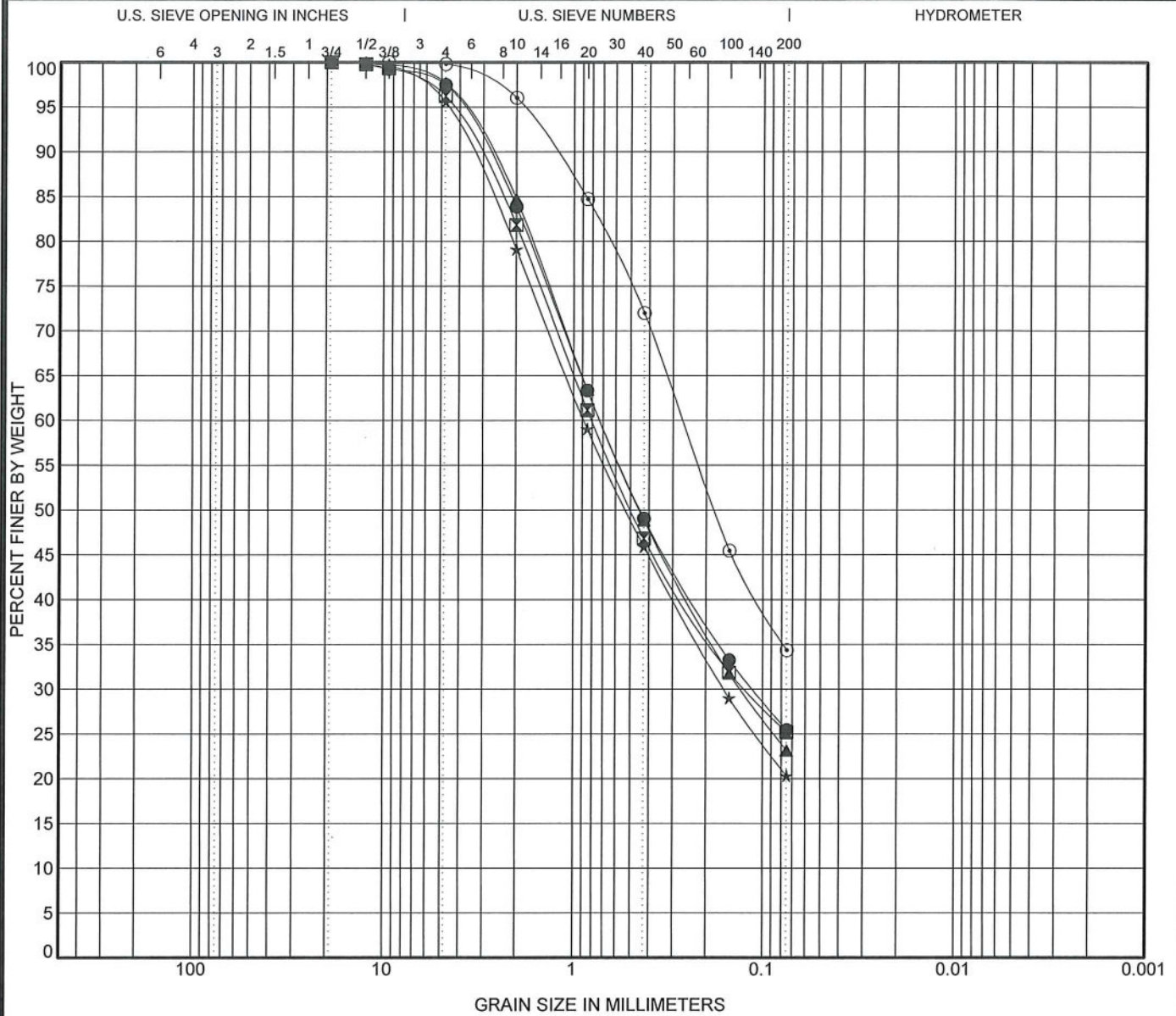
USCS CHART 2047011.GPJ US LAB.GDT 8/24/2017



Black Eagle Consulting, Inc.
1345 Capital Blvd., Suite A
Reno, Nevada 89502-7140
Telephone: (775) 359-6600
Fax: (775) 359-7766

USCS Soil Classification Chart

Project: Lemmon Drive Parcels
Location: Washoe County, Nevada
Project Number: 2047-01-1 Plate:



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	USCS Classification					LL	PL	PI	Cc	Cu
● TP-01 3.0'	SILTY, CLAYEY SAND (SC-SM)					21	14	7		
⊠ TP-03 4.0'	CLAYEY SAND (SC)					31	13	18		
▲ TP-09 2.0'	SILTY SAND (SM)					NP	NP	NP		
★ TP-14 0.5'	SILTY SAND (SM)					NP	NP	NP		
⊙ TP-18 1.0'	CLAYEY SAND (SC)					34	14	20		

Specimen Identification	D100	D60	D30	D10	MC %	%Gravel	%Sand	%Silt	%Clay
● TP-01 3.0'	19	0.722	0.112		6.4	2.5	72.1	25.4	
⊠ TP-03 4.0'	19	0.804	0.124		4.3	3.8	71.1	25.2	
▲ TP-09 2.0'	12.5	0.722	0.13		3.7	2.3	74.6	23.1	
★ TP-14 0.5'	19	0.885	0.16		2.9	4.4	75.3	20.3	
⊙ TP-18 1.0'	9.5	0.265			8.4	0.2	65.5	34.4	

GRAIN SIZE DISTRIBUTION

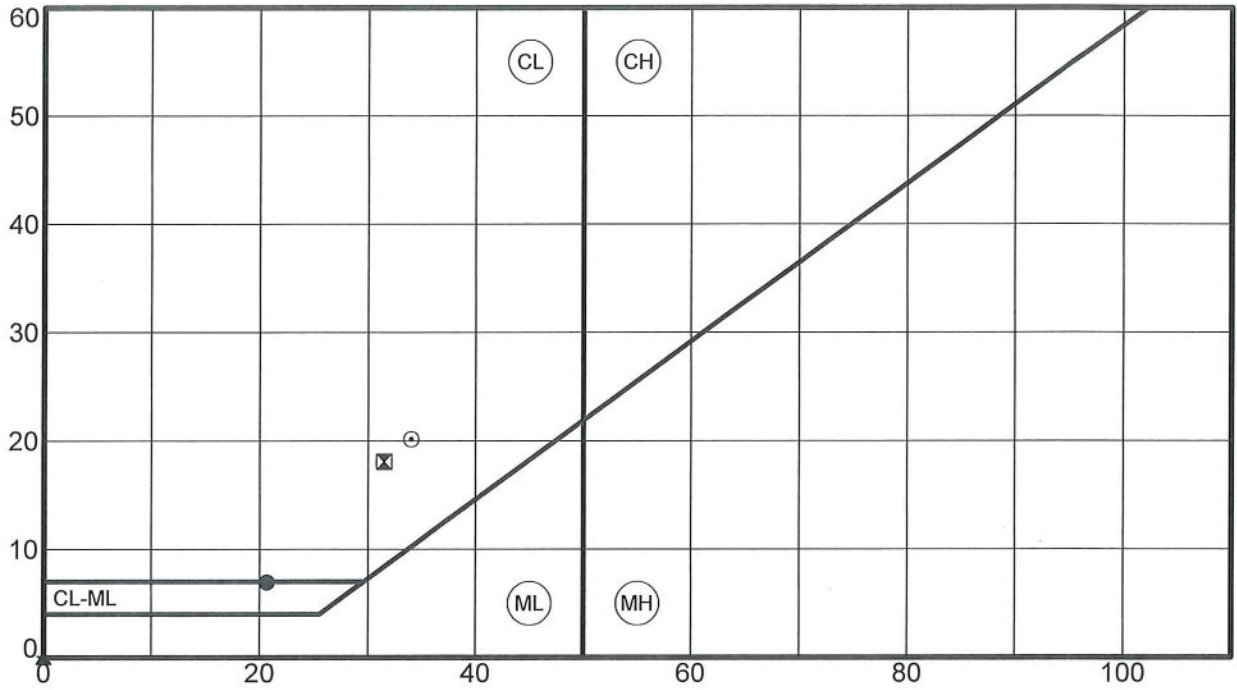
Black Eagle Consulting, Inc.
 1345 Capital Blvd., Suite A
 Reno, Nevada 89502-7140
 Telephone: (775) 359-6600
 Fax: (775) 359-7766

Project: Lemmon Drive Parcels
 Location: Washoe County, Nevada
 Project Number: 2047-01-1 Plate: 4a

US GRAIN SIZE 2047011.GPJ US LAB.GDT 8/24/2017



P L A S T I C I T Y
I N D E X



Specimen Depth in Feet.

LIQUID LIMIT

Specimen Identification	LL	PL	PI	Fines	USCS Classification
● TP-01 B 3.0'	21	14	7	25	SILTY, CLAYEY SAND (SC-SM)
☒ TP-03 B 4.0'	31	13	18	25	CLAYEY SAND (SC)
▲ TP-09 A 2.0'	NP	NP	NP	23	SILTY SAND (SM)
★ TP-14 A 0.5'	NP	NP	NP	20	SILTY SAND (SM)
⊙ TP-18 A 1.0'	34	14	20	34	CLAYEY SAND (SC)

US ATTERBERG LIMITS 2047011.GPJ US LAB.GDT 8/24/2017

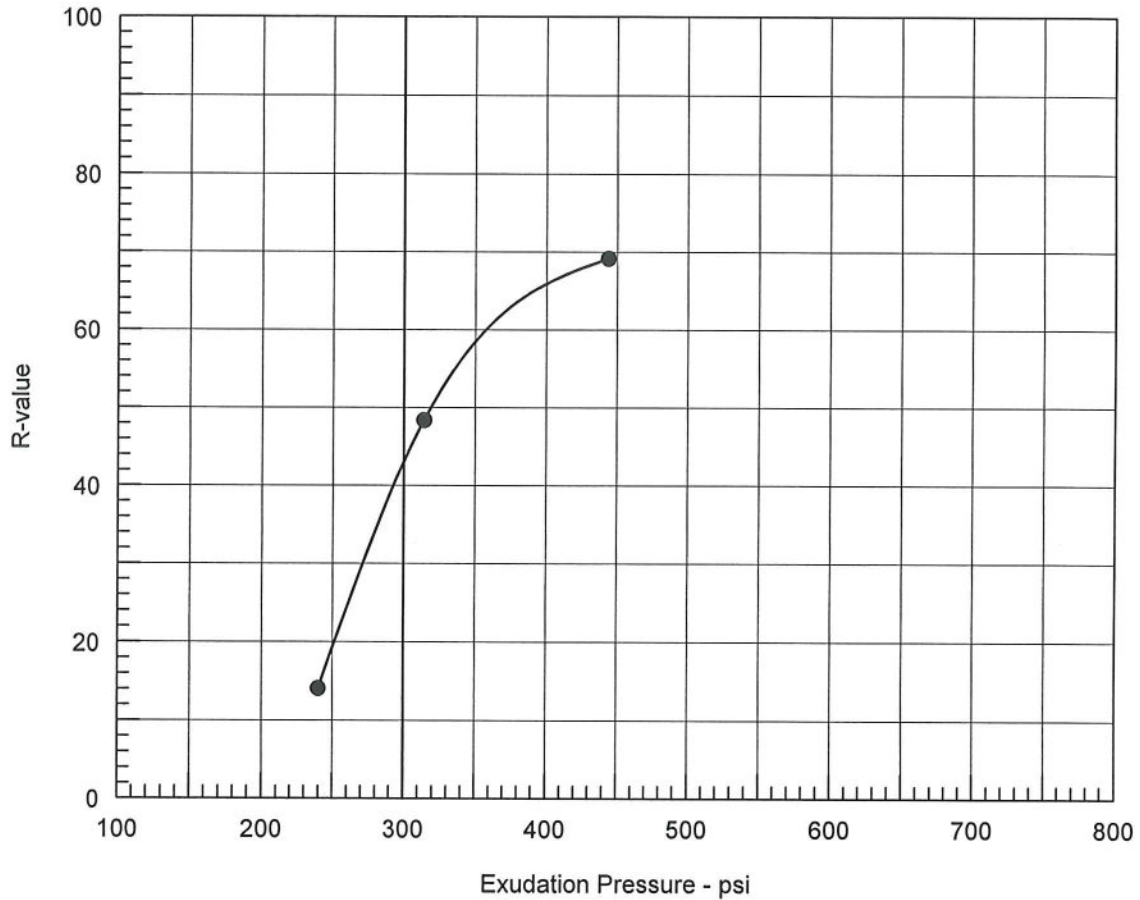


Black Eagle Consulting, Inc.
 1345 Capital Blvd., Suite A
 Reno, Nevada 89502-7140
 Telephone: (775) 359-6600
 Fax: (775) 359-7766

ATTERBERG LIMITS RESULTS

Project: Lemmon Drive Parcels
 Location: Washoe County, Nevada
 Project Number: 2047-01-1 Plate: 4b

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	220	129.3	10.2	0.00	124	2.53	240	14	14
2	350	132.8	8.8	0.00	32	2.48	444	69	69
3	350	132.4	9.6	0.00	61	2.46	314	48	48

Test Results	Material Description
R-value at 300 psi exudation pressure = 43	Silty Sand
Project No.: 2047-01-1 Project: Lemmon Drive Parcels Source of Sample: TP-09 Depth: 2-3' Sample Number: A Date: 8/14/2017	Tested by: GLO Checked by: ARD Remarks: Laboratory Log 5882
R-VALUE TEST REPORT BLACK EAGLE CONSULTING, INC.	Figure 5a

APPENDIX A
CHEMICAL TEST RESULTS



Silver State Labs-Reno
 1135 Financial Blvd
 Reno, NV 89502
 (775) 857-2400 FAX: (888) 398-7002
 www.ssalabs.com

Analytical Report

Workorder#: 17080221
 Date Reported: 8/9/2017

Client: BLACK EAGLE CONSULTING, INC
Project Name: 2047-01-1 TP-18A
PO #: 2047-01-1

Sampled By: D. Pelham

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
17080221-01	2047-01-1 TP-18A	07/31/2017 0:00	8/3/2017

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
Oxidation-Reduction Potential	SM 2580B	528	mV		LRB	08/04/2017 9:39	
pH	SW-846 9045D	6.43	pH Units		LRB	08/04/2017 14:59	
pH Temperature	SW-846 9045D	22.0	°C		LRB	08/04/2017 14:59	
Resistivity	EPA 120.1	59000	Ohms-cm		LRB	08/04/2017 9:14	
Sulfate	EPA 300.0	< 10	mg/Kg	10	JF	08/05/2017 3:35	
Sulfide	AWWA C105	Negative	POS/NEG		LRB	08/03/2017 16:55	



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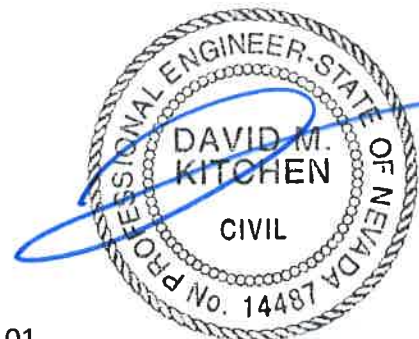
PRELIMINARY SANITARY SEWER REPORT FOR LEMMON VALLEY HEIGHTS TENTATIVE MAP

PREPARED FOR:

JDS LLC/DEREK LARSON
7500 Rough Rock Road
Reno, NV 89502

PREPARED BY:

Manhard Consulting Ltd.
9850 Double R Blvd, Suite 101
Reno, Nevada 89521
(775) 746 – 3500



247 6-30-19

1-10-18

DECEMBER 2017

Project No: RSTWCNV01

1 Introduction

1.1 Purpose of Analysis.

The purpose of this analysis is to investigate the expected sanitary sewer flows from the proposed residential subdivision tentative map for the Lemmon Valley Heights (LVH) project.

1.2 Project Location and Site Description.

The parcels for the LVH project total approximately 128.5 acres. The site is located on the ends of Patrician Drive, Kess Way, Palace Drive and the southwest corner of Deodar Way and Estates Road in Washoe County, Nevada. The project is situated within portions of Sections 34 and 35, Township 21 North, Range 19 East M. D. B. & M., and consists of Washoe County Assessor's Parcel Numbers (APNs) 080-635-01, 080-635-02, 080-730-21, 080-730-35 and 552-210-07. The project area is bound to the north by existing homes, Lemmon Drive and undeveloped private property, to the west by existing homes and large parcel tracts of 40+ acres, to the east and south by BLM land, the south by large parcel tracts of 40+ acres. Reference Exhibit 1 in Appendix A for a site vicinity map. The project parcels are currently vacant.

1.3 Project Description.

The proposed project for Lemmon Valley Heights is planned for 206 single family residential units. This project will have common open space areas and public streets. The open space common areas and associated drainage improvements will be maintained by a Homeowner's Association. All sanitary sewer and storm drain mains within the public right of way will be owned and maintained by Washoe County.

2 Proposed Alignment and Quantity of Service

2.1 Proposed Wastewater Collection System.

The proposed sanitary sewer collection system will consist of 8" dia. mains that will collect the flow throughout the project. These flows will be directed to the existing sanitary sewers in Patrician Drive, Kess Way, Palace Drive and Lemmon Drive. Please reference the Sewer Exhibit in Appendix A for a layout of the site and proposed sewer mains.

2.2 Estimated Peak Sewage Flows.

Calculations for the design of the sewer system were performed in accordance with the *Washoe County Community Services Department Gravity Sewer Collection Design Standards* dated March 2016. The average single family residential flow factors for Washoe County is 270 gallons per day with a minimum peaking factor of 3 for 8 inch mains.

The following table summarizes the methodology employed to calculate the peak daily flows for the residential subdivision.

Contributing Area	Units	Peaking Factor	Gallons/Day (gpd)	Peak Flow (gpd)	Peak Flow (cfs)
Total - SFR	206	3	270	166,860	0.2582

2.3 Existing Sewer Mains.

There are existing 8" sewer mains located at the existing ends of Palace Drive, Kess Way and Patrician Drive. These mains direct flow down grade to the existing truck main in Lemmon Drive. This truck main flows east along Lemmon Drive until the intersection of Palace and Lemmon Drive. From here the flow is directed north the Washoe County Treatment plant in Lemmon Valley.

The flows from the southwest portion of the Lemmon Valley Heights project will be routed through the existing gravity sewer mains to the Washoe County plant. The flows from the northeast portion of the project will be collect and routed through a new main in Deodar Way to Lemmon Drive. From here the flows will be carried in a new main that will connect to the existing system at the intersection of Palace and Lemmon Drives.

2.4 Proposed Sewer Analysis.

The proposed on-site sewer systems shall have a minimum pipe slope of 0.40%. The flows from the proposed project will be directed to the existing sanitary sewer in Lemmon

3 Conclusion

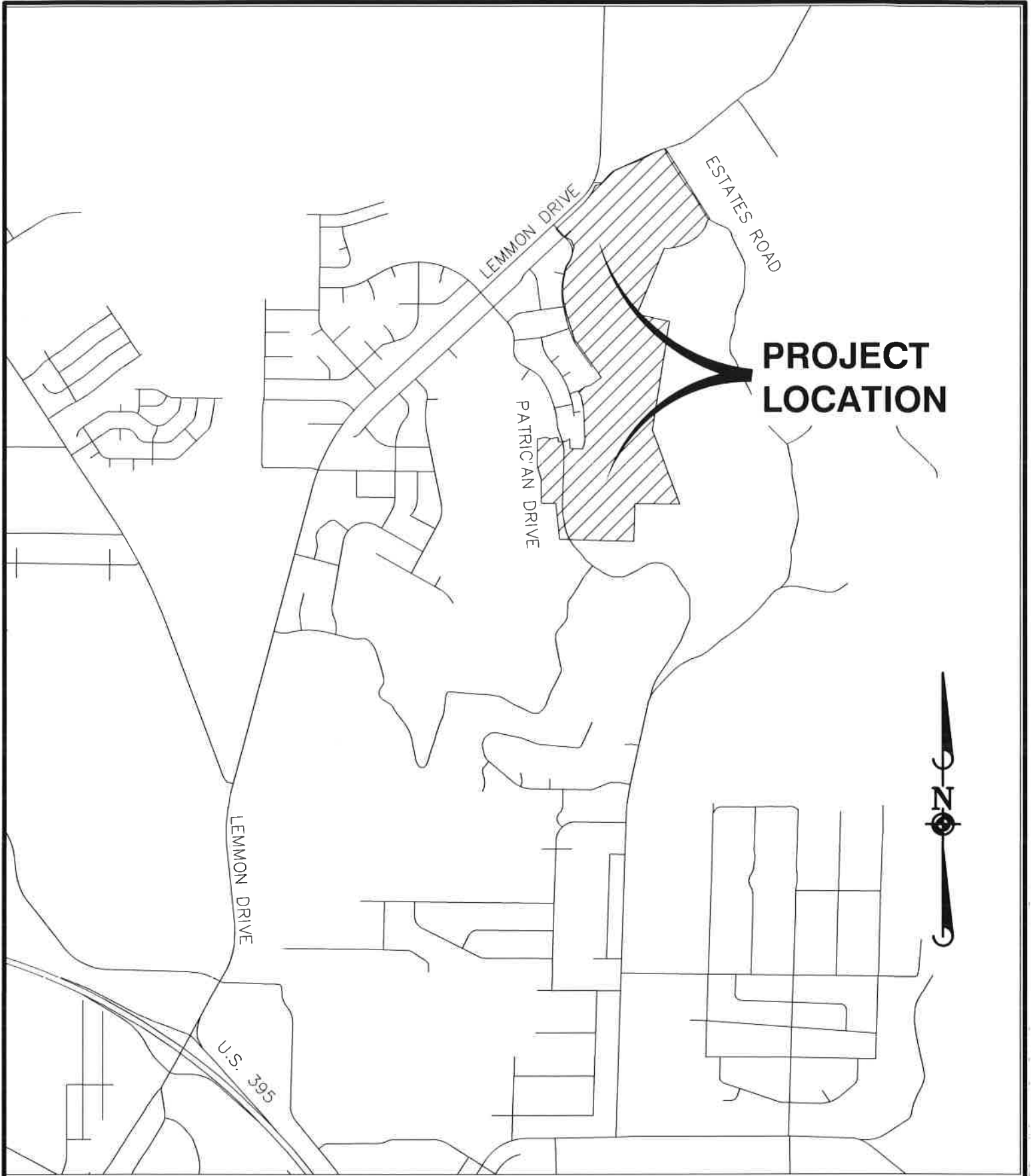
The proposed on-site sewer collection system shall be designed to have the capacity to handle the proposed developed sewage design flows. The existing downstream collection system has adequate capacity for the additional flows. However, there are some uncertainties to the amount of treatment capacity available, and the future of, the existing Washoe County Treatment Plant.

At this time, there is capacity at the existing treatment plant for some, if not all, of the proposed residences. This capacity depends on how fast this project moves through final design and construction. This capacity is also dependent upon any other developments that may be routed to the treatment plant now or in the future. In addition, there are a few other factors affecting final analysis and capacity calculations at the existing plant.

It is Manhard's understanding that addition capacity is going to be made available at the County plant with improvements to the adjacent City of Reno collection and pump station system at Buck Drive. However, we are told that this project is temporarily on hold for the time being. Therefore, we are confident that there is existing capacity now for this project and that additional capacity will be available at some point in the future for this project and others to be served. We also understand that the pace of development will be regulated by the availability of capacity and portions of this project may have to wait for the capacity to be available before proceeding to final construction of homes.

APPENDIX A

APPENDIX B



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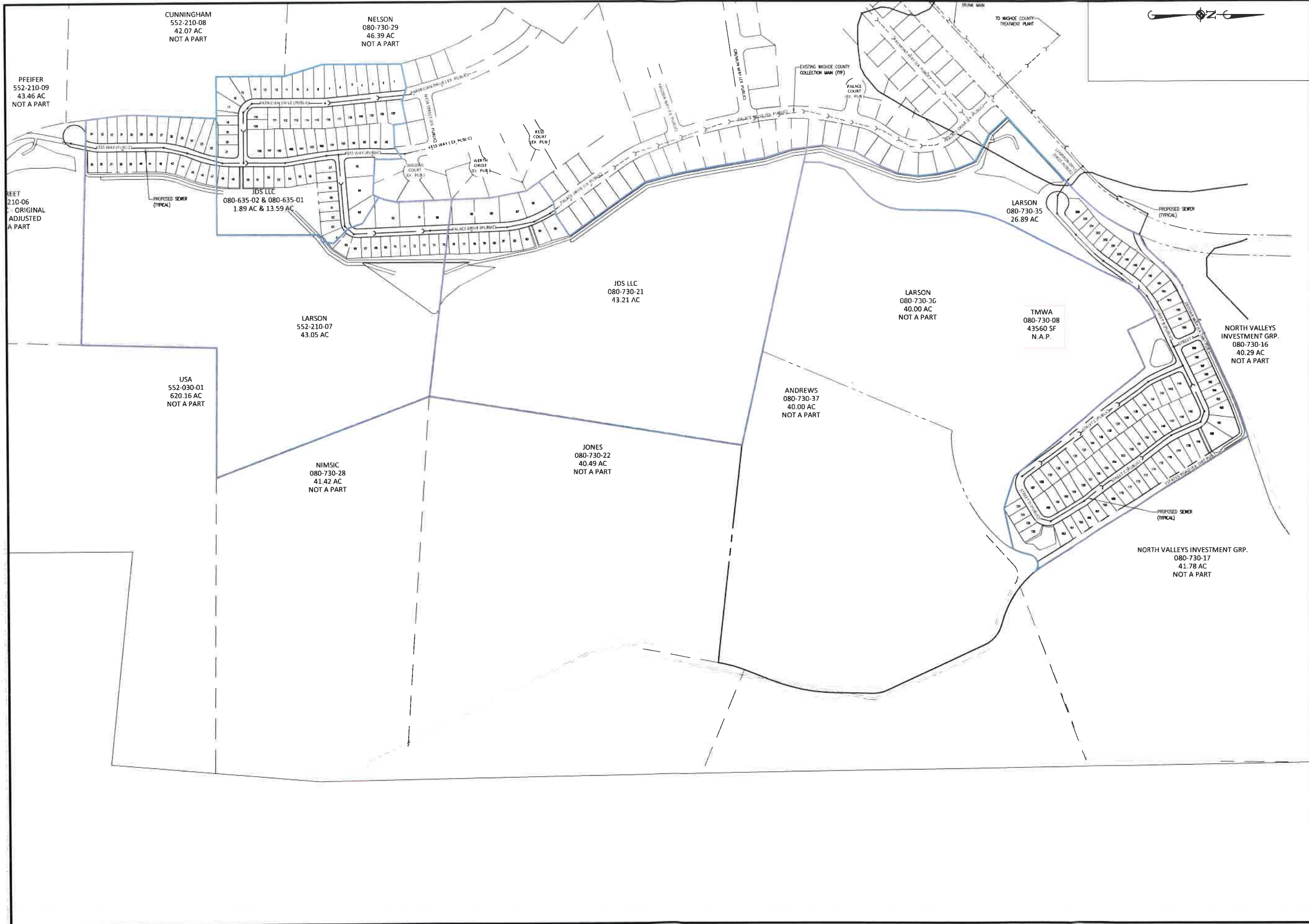


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 Civil Engineers · Surveyors · Water Resources Engineers · Water & Wastewater Engineers
 Construction Managers · Environmental Scientists · Landscape Architects · Planners

LEMMON VALLEY HEIGHTS
WASHOE COUNTY, NEVADA
VICINITY MAP

PROJ. MGR.: DMK
 DRAWN BY: DMK
 DATE: DMK
 SCALE: N.T.S.

SHEET
EXHIBIT 1
RSTWCNV01



CUNNINGHAM
552-210-08
42.07 AC
NOT A PART

NELSON
080-730-29
46.39 AC
NOT A PART

PFEIFER
552-210-09
43.46 AC
NOT A PART

REET
210-06
ORIGINAL
ADJUSTED
A PART

JDS LLC
080-635-02 & 080-635-01
1.89 AC & 13.59 AC

LARSON
552-210-07
43.05 AC

JDS LLC
080-730-21
43.21 AC

LARSON
080-730-36
40.00 AC
NOT A PART

USA
552-030-01
620.16 AC
NOT A PART

NIMSIC
080-730-28
41.42 AC
NOT A PART

JONES
080-730-22
40.49 AC
NOT A PART

ANDREWS
080-730-37
40.00 AC
NOT A PART

TMWA
080-730-08
43560 SF
N.A.P.

LARSON
080-730-35
26.89 AC

NORTH VALLEYS
INVESTMENT GRP.
080-730-16
40.29 AC
NOT A PART

NORTH VALLEYS INVESTMENT GRP.
080-730-17
41.78 AC
NOT A PART



PROJECT NO.	080-730-01
DATE	DEC 2017
SCALE	N.T.S.
SHEET	1 OF 1

Manhard CONSULTING LTD.

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LEMMON VALLEY HEIGHTS
WASHOE COUNTY, NEVADA
SEWER EXHIBIT

PROJ. MGR.: DMK
 PROJ. ENGR.: DMK
 DRAWN BY: DMK
 DATE: DEC 2017
 SCALE: N.T.S.

SHEET
1 OF **1**
 RSTWCHV01

TENTATIVE MAP

LEMMON VALLEY SUBDIVISION
TRAFFIC STUDY

JANUARY, 2017



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

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LEMMON VALLEY SUBDIVISION

TRAFFIC STUDY

EXECUTIVE SUMMARY

The proposed Lemmon Valley Subdivision will be located in Washoe County, Nevada. The project sites are generally located southeast of Lemmon Drive, south of Deodar Way and west of Estates Road. The project sites are currently undeveloped land. The purpose of this study is to address the project's impact upon the adjacent street network. The Lemmon Drive/Patrician Drive intersection and the Lemmon Drive/Deodar Way intersection have been identified for AM and PM peak hour capacity analysis for the existing, existing plus project, 2026 base and 2026 base plus project scenarios.

The proposed Lemmon Valley Subdivision will consist of the construction of a total of 209 single family detached homes. The northerly site will contain 90 dwelling units and the southerly site will contain 119 dwelling units. Access to the northerly site will be provided from accesses on Deodar Way and Estates Road via Lemmon Drive. Access to the southerly site will be provided from the extensions of Patrician Drive, Kess Way and Palace Way via Lemmon Drive. The project is anticipated to generate 1,990 average daily trips with 157 trips occurring during the AM peak hour and 209 trips occurring during the PM peak hour.

Traffic generated by the proposed Lemmon Valley Subdivision will have some impact on the adjacent street network. The following recommendations are made to mitigate project traffic impacts.

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

It is recommended that the segment of Deodar Way adjacent to the site and all internal subdivision streets be constructed per Washoe County standards.

INTRODUCTION

STUDY AREA

The proposed Lemmon Valley Subdivision will be located in Washoe County, Nevada. The project sites are generally located southeast of Lemmon Drive, south of Deodar Way and west of Estates Road. Figure 1 shows the approximate location of the sites. The purpose of this study is to address the project's impact upon the adjacent street network. The Lemmon Drive/Patrician Drive intersection and the Lemmon Drive/Deodar Way intersection have been identified for AM and PM peak hour capacity analysis for the existing, existing plus project, 2026 base and 2026 base plus project scenarios.

EXISTING AND PROPOSED LAND USES

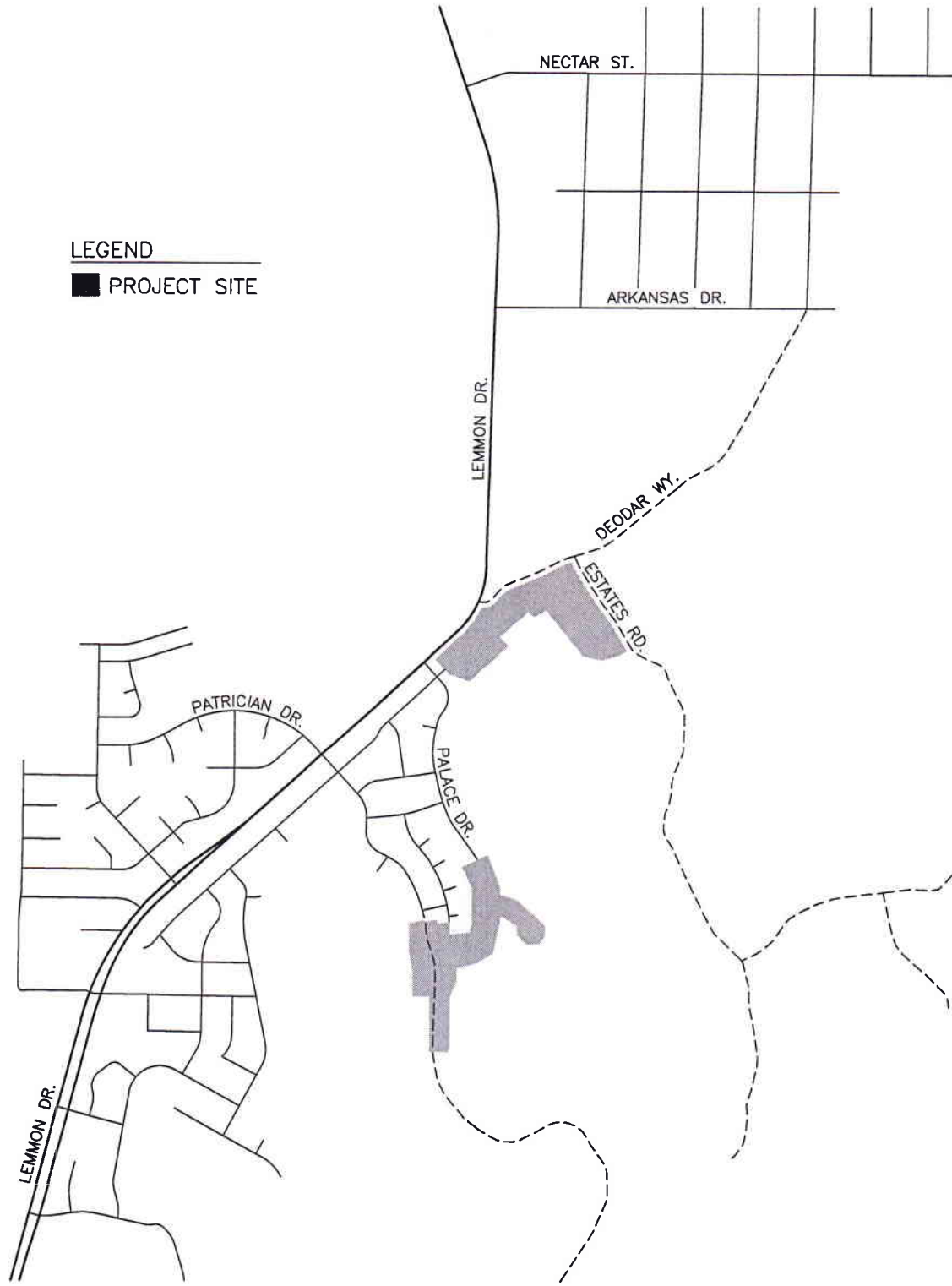
The project sites are currently undeveloped land. Adjacent properties generally include undeveloped land except for an existing subdivision located north of the southerly project site and west of the easterly project site. The Lemmon Valley Subdivision will consist of the construction of a total of 209 single family detached homes. The northerly site will contain 90 dwelling units and the southerly site will contain 119 dwelling units. Access to the northerly site will be provided from accesses on Deodar Way and Estates Road via Lemmon Drive. Access to the southerly site will be provided from the extensions of Patrician Drive, Kess Way and Palace Way via Lemmon Drive.

EXISTING AND PROPOSED ROADWAYS AND INTERSECTIONS

Lemmon Drive is a two-lane roadway with one through lane in each direction in the vicinity of the site. The posted speed limit changes from 45 miles per hour to the north and 35 miles per hour to the south approximately 1,000 feet north of Patrician Drive. Roadway improvements generally include graded shoulders with white edgelines and a yellow centerline. Asphalt pedestrian paths exist on both sides of the street south of Patrician Drive and on the east side of the street north of Patrician Drive. The Regional Transportation Commission's (RTC) *2035 Regional Transportation Plan* indicates that Lemmon Drive is planned to be widened to four lanes from Limber Pine Drive to Deodar Way in the 2023 to 2035 timeframe.

Patrician Drive is a two-lane roadway with one through lane in each direction east and west of Lemmon Drive. The speed limit is posted for 25 miles per hour. Roadway improvements generally include paved travel lanes with graded shoulders.

Deodar Way is a paved two-lane roadway with one lane in each direction from Lemmon Drive to approximately 65 feet to the east where it becomes a dirt roadway. The speed limit is not posted. It is anticipated that Deodar Way will be paved adjacent to the site with development of the project.



LEMMON VALLEY SUBDIVISION
VICINITY MAP
FIGURE 1

The Lemmon Drive/Patrician Drive intersection is an unsignalized four-leg intersection with stop sign control at the east and west Patrician Drive approaches. The north Lemmon Drive approach contains one left turn lane, one through lane, and one right turn lane. The south Lemmon Drive approach contains one left turn lane and one shared through-right turn lane. The east and west Patrician Drive approaches each contain one shared left turn-through-right turn lane. Pedestrian crosswalks exist at the north, east and west approaches. A pedestrian activated crossing flasher exists for the Lemmon Drive crossing.

The Lemmon Drive/Deodar Way intersection is an unsignalized three-leg intersection with stop sign control at the east approach. The north approach contains one shared left turn-through lane. The south approach contains one shared through-right turn lane. The east approach contains one shared left turn-right turn lane.

TRIP GENERATION

In order to assess the magnitude of traffic impacts of the proposed development on the adjacent street network, trip generation rates and peak hours had to be determined. Trip generation rates were obtained from the *Ninth Edition of ITE Trip Generation* (2012) for Land Use 210 “Single Family Detached Housing”.

The proposed Lemmon Valley Subdivision will consist of the construction of a total of 209 single family detached homes. The northerly site will contain 90 dwelling units and the southerly site will contain 119 dwelling units.

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

LAND USE/VARIABLE	ADT	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Single Family Homes (209 D.U.)	1,990	39	118	157	132	77	209

As shown in Table 1, the proposed Lemmon Valley Subdivision is anticipated to generate 1,990 average daily trips with 157 trips occurring during the AM peak hour and 209 trips occurring during the PM peak hour.

TRIP DISTRIBUTION AND ASSIGNMENT

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

EXISTING AND PROJECTED TRAFFIC VOLUMES

Figure 4 shows the existing traffic volumes at the key intersections during the AM and PM peak hours. The existing traffic volumes at the Lemmon Drive/Patrician Drive intersection were obtained from traffic counts conducted in May of 2016. The existing traffic volumes at the Lemmon Drive/Deodar Way intersection were obtained from traffic counts conducted in July of 2016.

Figure 5 shows the existing plus project traffic volumes at the key intersections during the AM and PM peak hours. The existing plus project volumes were obtained by adding the trip assignment volumes shown on Figure 3 to the existing volumes shown on Figure 4.

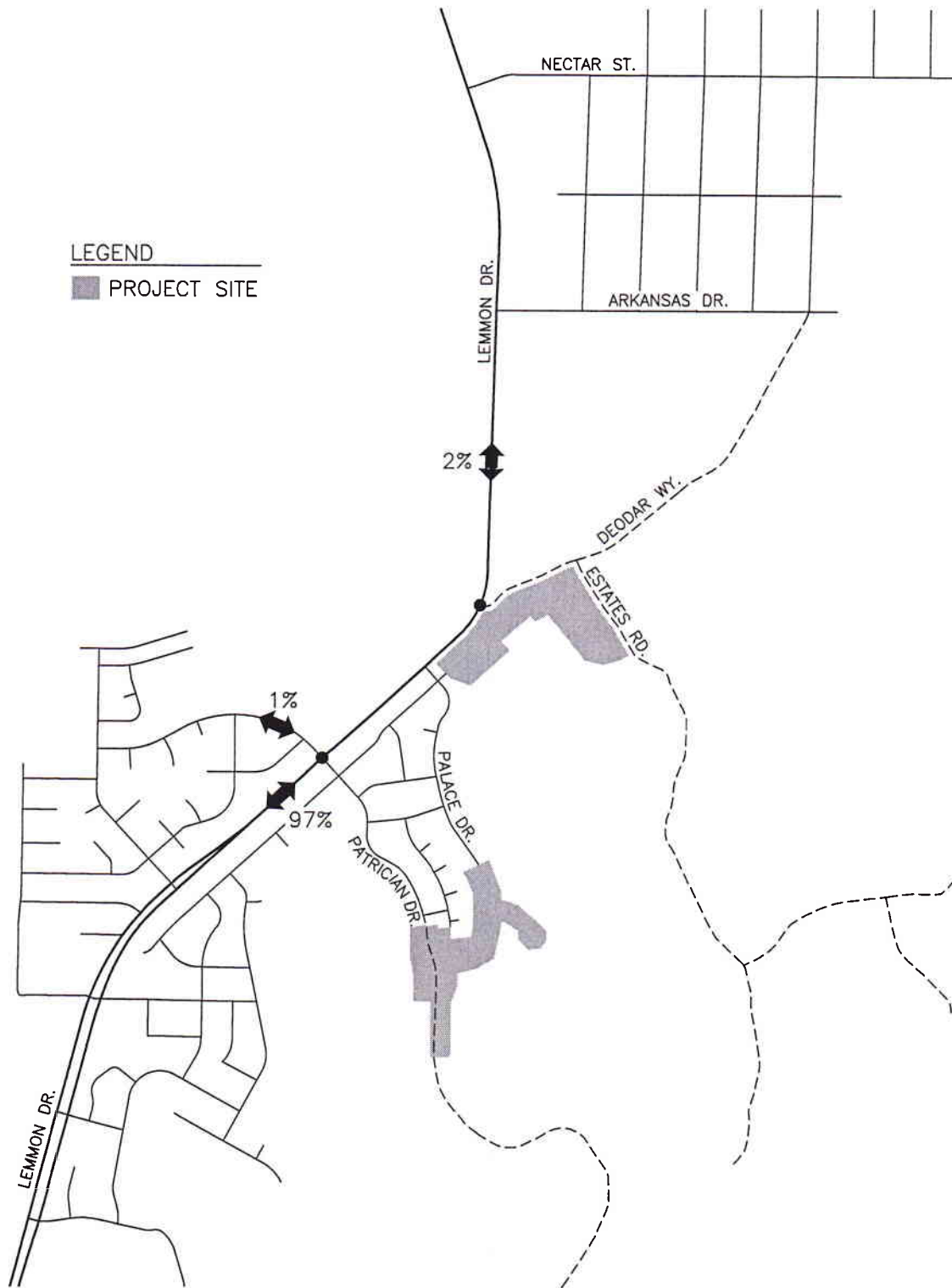
Figure 6 shows the 2026 base traffic volumes during the AM and PM peak hours. The 2026 base traffic volumes were estimated by applying a 1.0% average annual growth rate to the existing traffic volumes. A +0.5% average annual growth rate on Patrician Drive and a -0.9% growth rate on Lemmon Drive were derived from 10-year historic traffic count data obtained from the Nevada Department of Transportation's (NDOT) Annual Traffic Report. However, the 1.0% growth rate was used in order to ensure conservative results. The project is anticipated to account for all the growth in the Patrician Drive area and therefore the growth rate was not applied to traffic volumes on the southeast leg of the Lemmon Drive/Patrician Drive intersection.

Figure 7 shows the 2026 base plus project traffic volumes. The 2026 base plus project volumes were obtained by adding the trip assignment volumes shown on Figure 3 to the 2026 base volumes shown on Figure 6.

INTERSECTION CAPACITY ANALYSIS

The key intersections were analyzed for capacity based on procedures presented in the 2010 *Highway Capacity Manual (HCM)*, prepared by the Transportation Research Board, for unsignalized intersections using the latest version of the Highway Capacity computer software.

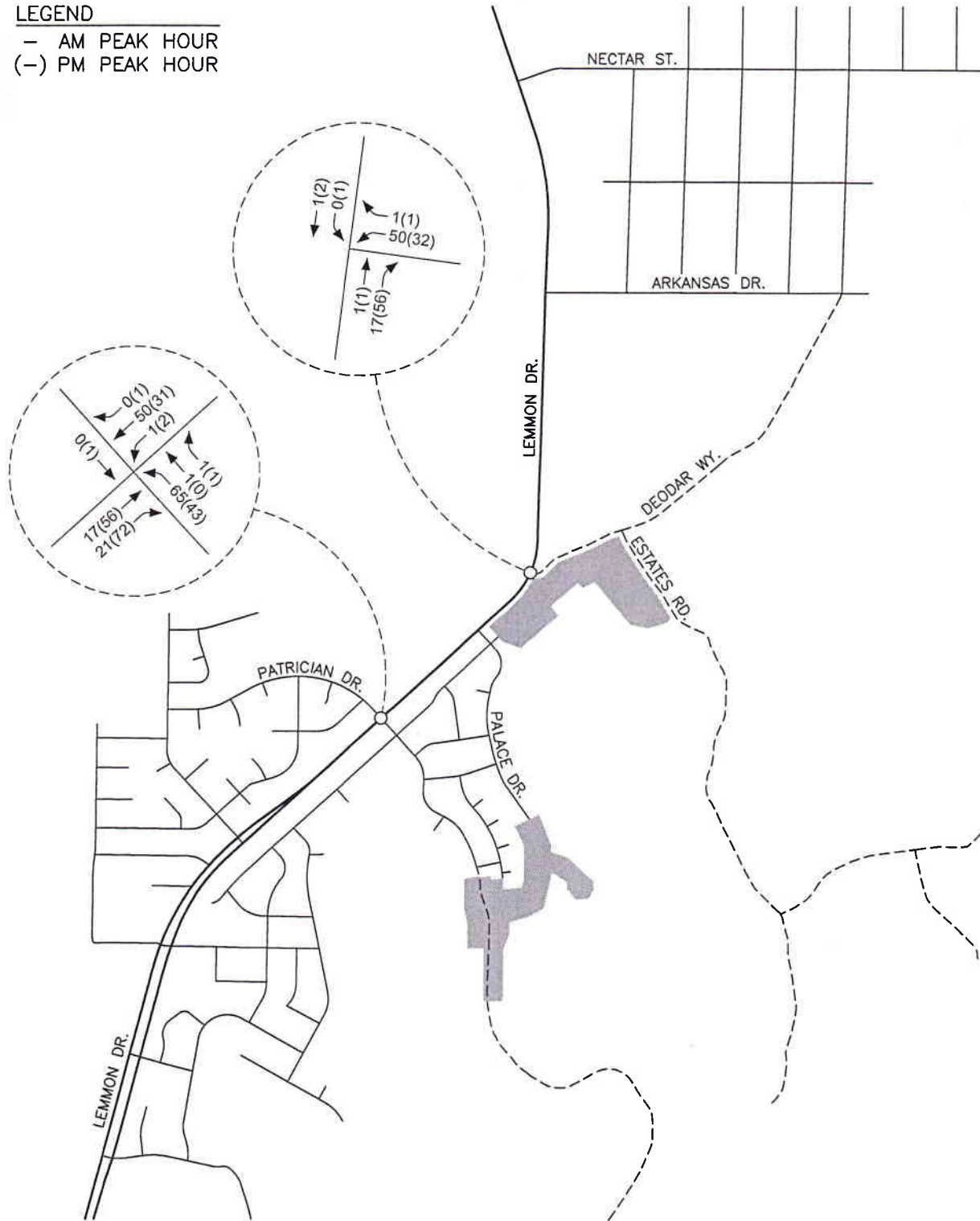
The result of capacity analysis is a level of service rating for each minor movement. Level of service is a qualitative measure of traffic operating conditions where a letter grade "A" through "F", corresponding to progressively worsening traffic operation, is assigned to the minor movement.



LEMMON VALLEY SUBDIVISION
TRIP DISTRIBUTION
FIGURE 2

LEGEND

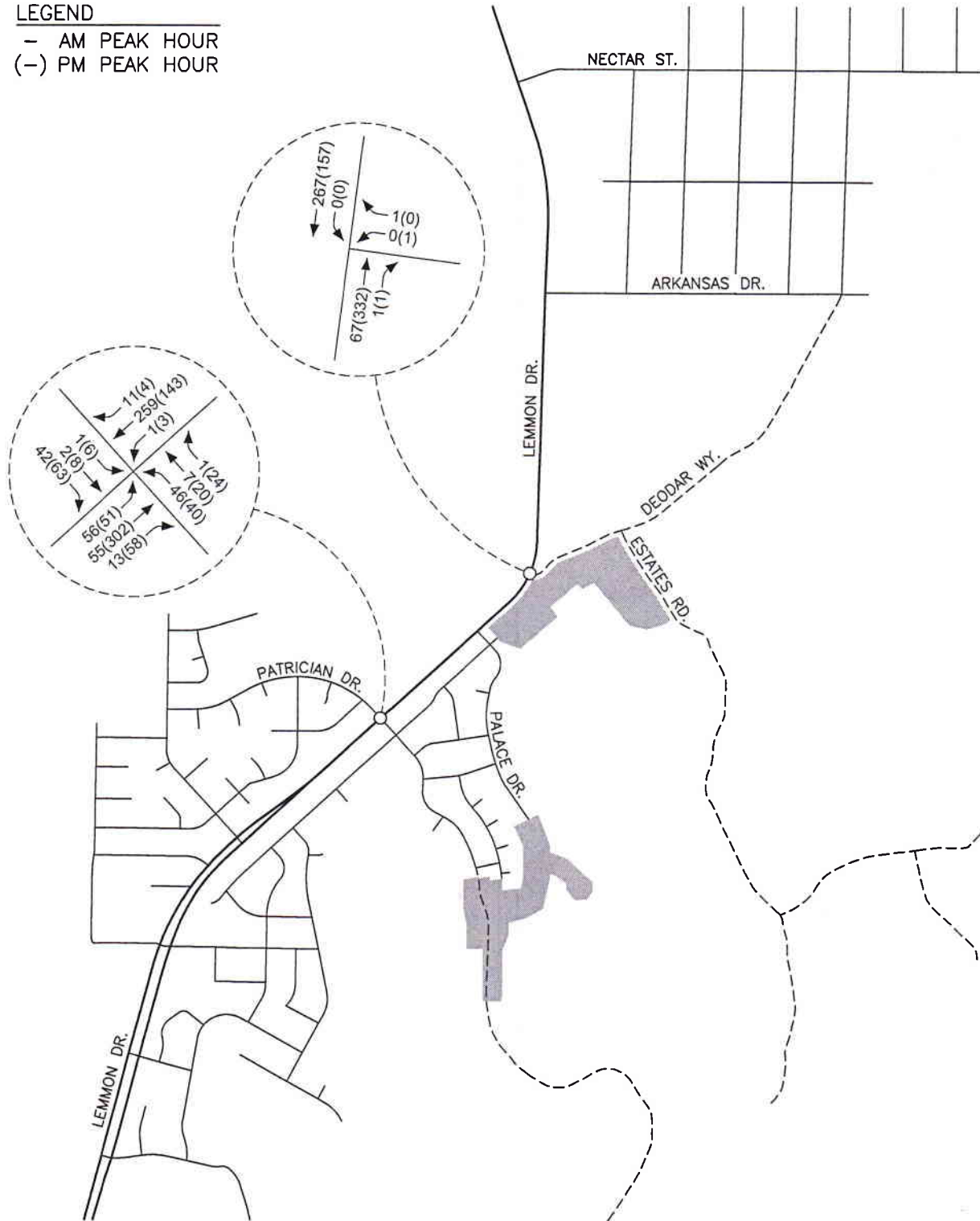
- AM PEAK HOUR
- (-) PM PEAK HOUR



LEMMON VALLEY SUBDIVISION
TRIP ASSIGNMENT
FIGURE 3

LEGEND

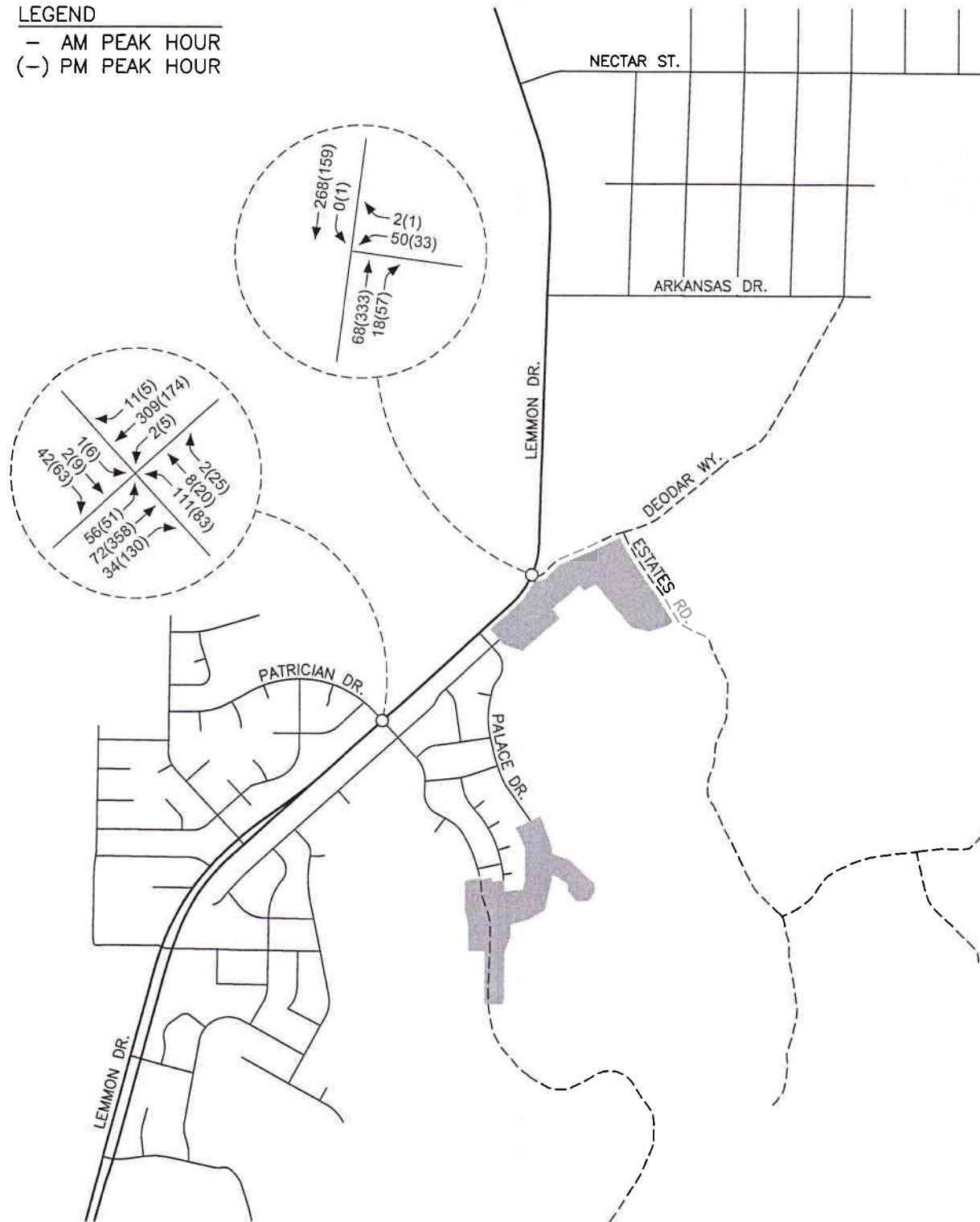
- AM PEAK HOUR
- (-) PM PEAK HOUR



LEMMON VALLEY SUBDIVISION
EXISTING TRAFFIC VOLUMES
FIGURE 4

LEGEND

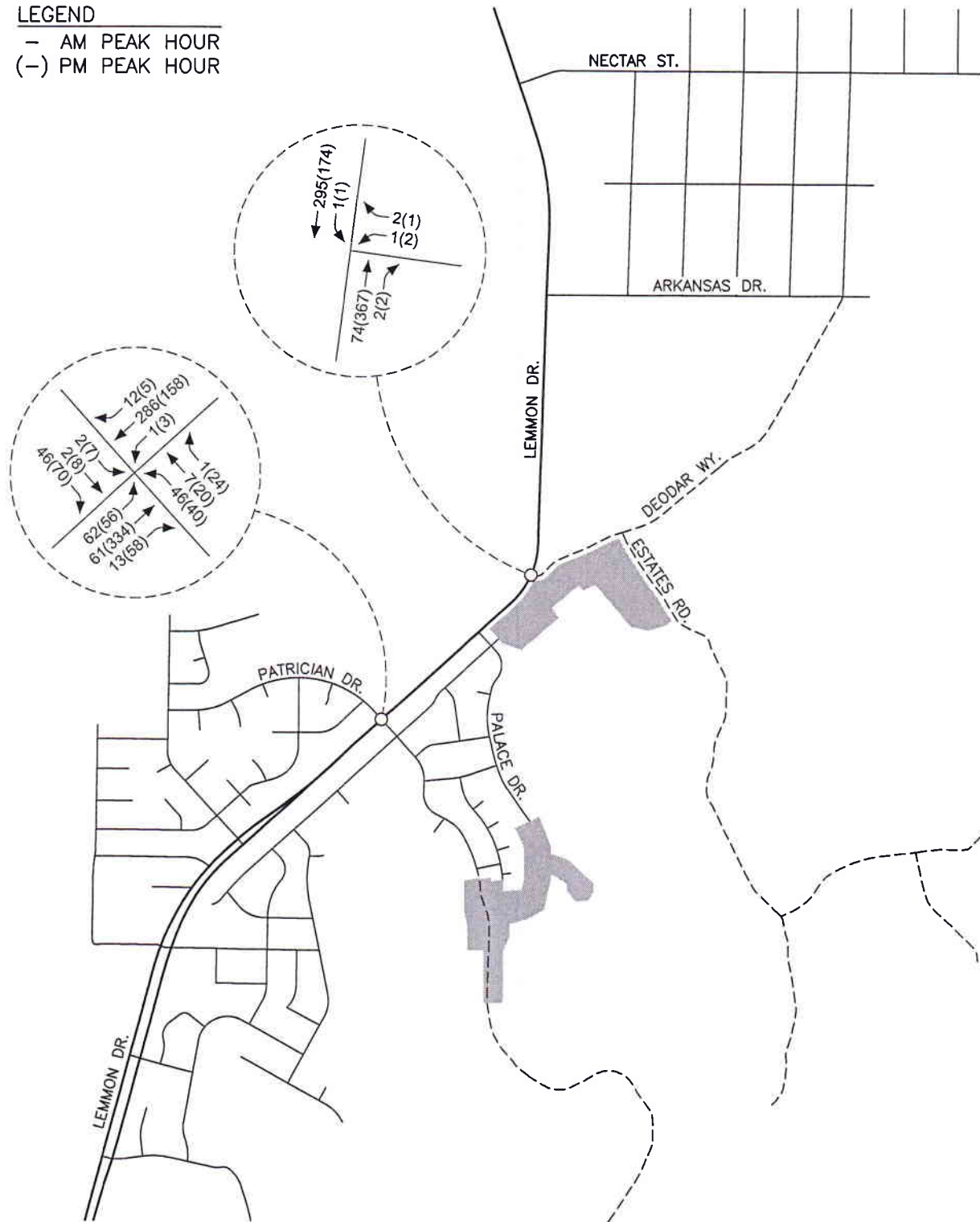
- AM PEAK HOUR
- (-) PM PEAK HOUR



LEMMON VALLEY SUBDIVISION
EXISTING PLUS PROJECT TRAFFIC VOLUMES
FIGURE 5

LEGEND

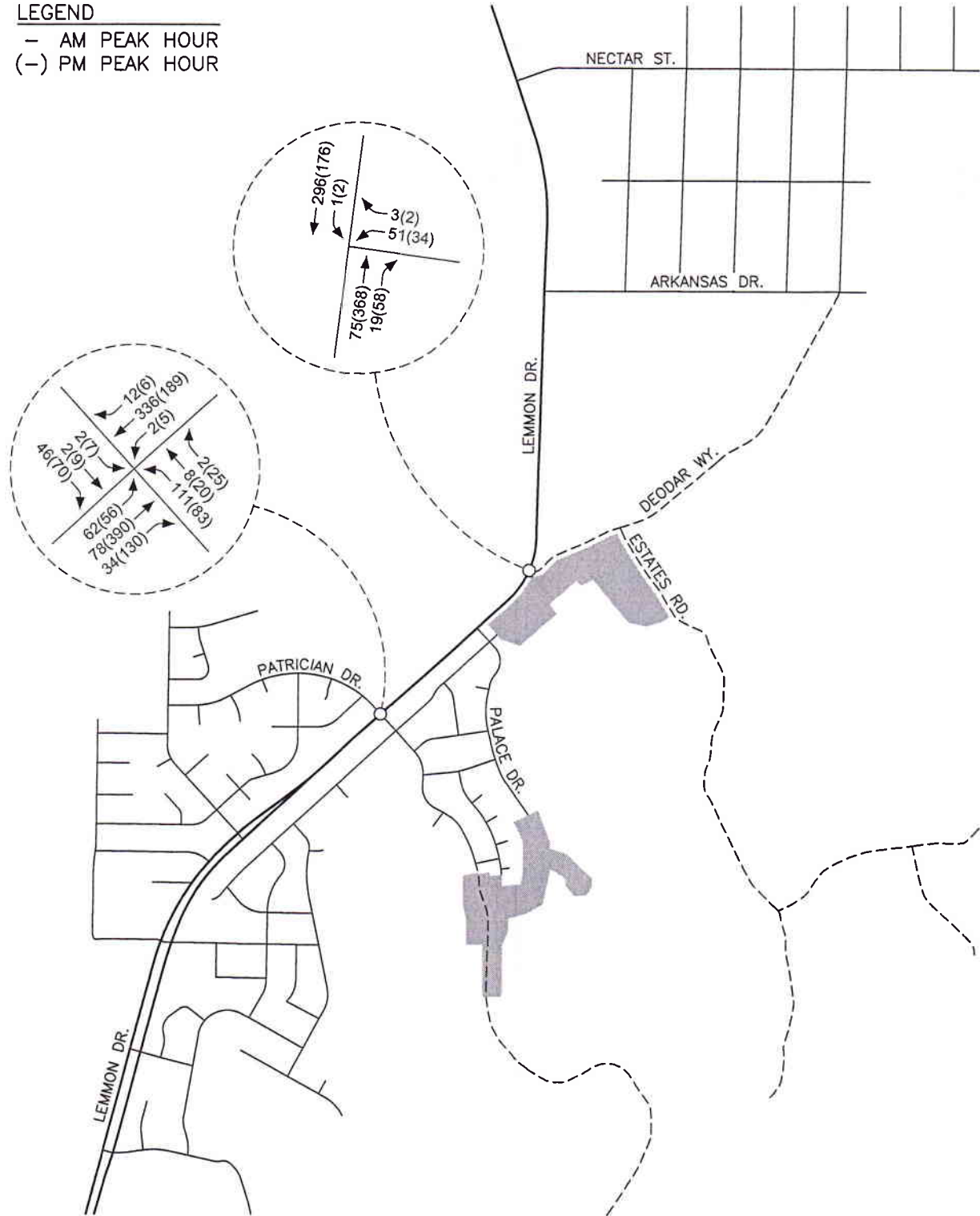
- AM PEAK HOUR
- (-) PM PEAK HOUR



LEMMON VALLEY SUBDIVISION
2026 BASE TRAFFIC VOLUMES
FIGURE 6

LEGEND

- AM PEAK HOUR
- (-) PM PEAK HOUR



LEMMON VALLEY SUBDIVISION
2026 BASE PLUS PROJECT TRAFFIC VOLUMES
FIGURE 7

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

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

The Regional Transportation Commission’s 2035 Regional Transportation Plan indicates that the level of service standard along this section of Lemmon Drive is LOS D based on the projected ADT for the 2035 planning scenario.

Table 3 shows a summary of the level of service and delay results for the existing, existing plus project, 2026 base, and 2026 base plus project scenarios. The capacity worksheets are included in the Appendix.

INTERSECTION	EXISTING		EXISTING + PROJECT		2026 BASE		2026 BASE + PROJECT	
	AM	PM	AM	PM	AM	PM	AM	PM
Lemmon & Patrician Stop at East and West Legs								
EB Left-Thru-Right	B10.3	B11.0	B10.8	B12.0	B10.6	B11.4	B11.1	B12.4
WB Left-Thru-Right	B14.4	C16.7	C19.2	D27.0	C15.4	C18.4	C21.3	D31.9
NB Left	A8.0	A7.7	A8.1	A7.7	A8.1	A7.7	A8.3	A7.8
SB Left	A7.4	A8.1	A7.5	A8.5	A7.4	A8.2	A7.5	A8.6
Lemmon & Deodar Stop at East Leg								
WB Left-Right	A8.7	B12.1	B11.2	B13.0	A9.5	B12.0	B11.6	B13.7
SB Left	A0.0	A0.0	A0.0	A8.2	A7.4	A8.1	A7.4	A8.3

Lemmon Drive/Patrician Drive Intersection

The Lemmon Drive/Patrician Drive intersection was analyzed as an unsignalized four-leg intersection with stop control at the east and west Patrician Drive approaches for all scenarios. The intersection minor movements currently operate at LOS B or better during the AM peak hour and LOS C or better during the PM peak hour. For the existing plus project traffic volumes the intersection minor movements are anticipated to operate at LOS C or better during the AM peak hour and LOS D or better during the PM peak hour. For the 2026 base traffic volumes the intersection minor movements are anticipated to operate at LOS C or better during the AM and PM peak hours. For the 2026 base plus project traffic volumes the intersection minor movements are anticipated to operate at LOS C or better during the AM peak hour and LOS D or better during the PM peak hour. The intersection was analyzed with the existing approach lanes for all scenarios. The intersection will meet policy LOS D standards established by the Washoe County Regional Transportation Commission.

The project is anticipated to add traffic to the southbound left turn movement at the Lemmon Drive/Patrician Drive intersection. Storage requirements were subsequently reviewed for this movement based on the unsignalized criteria of providing three minutes of storage during the peak hours. Less than 50 feet of storage length is required based on the 2026 base plus project traffic volumes. The existing left turn lane contains approximately 85 feet of storage length which will serve project traffic demands.

Lemmon Drive/Deodar Way Intersection

The Lemmon Drive/Deodar Way intersection was analyzed as an unsignalized three-leg intersection with stop control at the east approach for all scenarios. The intersection minor movements currently operate at LOS B or better during the AM and PM peak hours. For the existing plus project volumes the intersection minor movements will continue to operate at LOS B or better during the AM and PM peak hours. For the 2026 base traffic volumes the intersection minor movements are anticipated to operate at LOS B or better during the AM and PM peak hours. For the 2026 base plus project volumes the intersection minor movements will continue to operate at LOS B or better during the AM and PM peak hours. The intersection was analyzed with the existing approach lanes for all scenarios. The intersection will meet policy LOS D standards established by the Washoe County Regional Transportation Commission.

The project is anticipated to add traffic to the southbound left turn movement at the Lemmon Drive/Deodar Way intersection. The need for an exclusive lane for this movement was subsequently reviewed based on left turn lane guidelines presented in AASHTO's *A Policy on Geometric Design of Highways and Street*. The guidelines indicate that an exclusive left turn lane is not required for the southbound movement based on the 2026 base plus project traffic volumes.

SITE PLAN REVIEW

A copy of the site plan for the proposed Lemmon Valley Subdivision is included with this submittal. The site plan indicates that access to the northerly site will be provided from an access on Deodar Way and an access on Estates Road via Lemmon Drive. Access to the southerly site will be provided from the extensions of Patrician Drive, Kess Way and Palace Way via Lemmon Drive. The site plan indicates that that a cul-de-sac will be provided at the end of Fremont Street. Washoe County traffic engineering staff prefer that this be a regular street connection instead of a cul-de-sac. It is recommended that the segment of Deodar Way adjacent to the site and all internal subdivision streets be constructed per Washoe County standards.

RECOMMENDATIONS

Traffic generated by the proposed Lemmon Valley Subdivision will have some impact on the adjacent street network. The following recommendations are made to mitigate project traffic impacts.

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

It is recommended that the segment of Deodar Way adjacent to the site and all internal subdivision streets be constructed per Washoe County standards.

APPENDIX

Trip Generation Summary - Alternative 1

Project: New Project
 Alternative: Alternative 1

Open Date: 12/28/2016
 Analysis Date: 12/28/2016

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
210	SFHOUSE 1	995	995	1990	39	118	157	132	77	209
	209 Dwelling Units									

Unadjusted Volume	0	0	0	0	0	0	0	0	0	0
Internal Capture Trips	0	0	0	0	0	0	0	0	0	0
Pass-By Trips	0	0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets	0	0	0	0	0	0	0	0	0	0

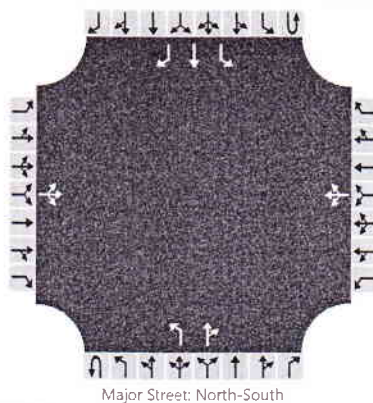
Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

HCS 2010 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	MSH			Intersection	Lemmon & Patrician		
Agency/Co.	Solaegui Engineers			Jurisdiction	Washoe County		
Date Performed	12/28/2016			East/West Street	Patrician Drive		
Analysis Year	2016			North/South Street	Lemmon Drive		
Time Analyzed	AM Existing			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description							

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1	
Configuration			LTR				LTR			L		TR		L	T	R	
Volume, V (veh/h)		1	2	42		46	7	1		56	55	13		1	259	11	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No				No				No				No			
Median Type/Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49				59					61					1
Capacity, c (veh/h)			726				442					1260					1517
v/c Ratio			0.07				0.13					0.05					0.00
95% Queue Length, Q ₉₅ (veh)			0.2				0.5					0.2					0.0
Control Delay (s/veh)			10.3				14.4					8.0					7.4
Level of Service, LOS			B				B					A					A
Approach Delay (s/veh)		10.3				14.4				3.6				0.0			
Approach LOS		B				B											

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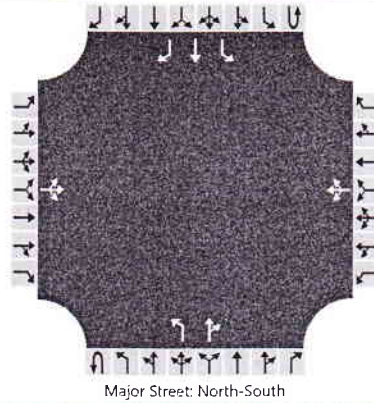
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2016
Time Analyzed	PM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Patrician
Jurisdiction	Washoe County
East/West Street	Patrician Drive
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1	
Configuration			LTR				LTR			L		TR		L	T	R	
Volume, V (veh/h)		6	8	63		40	20	24		51	302	58		3	143	4	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No				No				No							
Median Type/Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			84				91				55				3		
Capacity, c (veh/h)			688				398				1413				1161		
v/c Ratio			0.12				0.23				0.04				0.00		
95% Queue Length, Q ₉₅ (veh)			0.4				0.9				0.1				0.0		
Control Delay (s/veh)			11.0				16.7				7.7				8.1		
Level of Service, LOS			B				C				A				A		
Approach Delay (s/veh)		11.0				16.7				0.9				0.2			
Approach LOS		B				C											

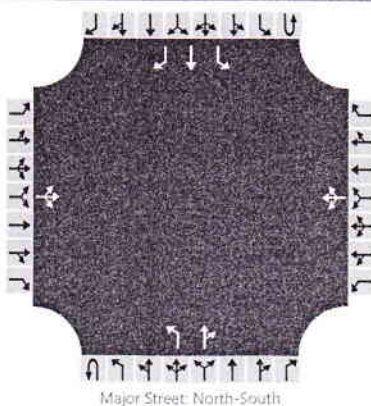
HCS 2010 Two-Way Stop-Control Report

General Information

Site Information

Analyst	MSH	Intersection	Lemmon & Patrician
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	12/28/2016	East/West Street	Patrician Drive
Analysis Year	2016	North/South Street	Lemmon Drive
Time Analyzed	AM Existing + Project	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0		0	1	1	0		0	1	1
Configuration			LTR				LTR			L		TR		L	T	R	
Volume, V (veh/h)		1	2	42		111	8	2		56	72	34		2	309	11	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No				No				No				No			
Median Type/Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49				132				61				2	
Capacity, c (veh/h)			673				384				1204				1466	
v/c Ratio			0.07				0.34				0.05				0.00	
95% Queue Length, Q ₉₅ (veh)			0.2				1.5				0.2				0.0	
Control Delay (s/veh)			10.8				19.2				8.1				7.5	
Level of Service, LOS			B				C				A				A	
Approach Delay (s/veh)		10.8				19.2				2.8				0.0		
Approach LOS		B				C										

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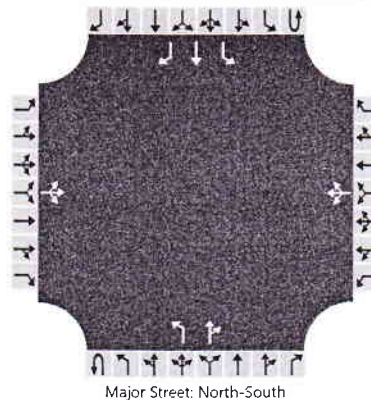
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2016
Time Analyzed	PM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Patrician
Jurisdiction	Washoe County
East/West Street	Patrician Drive
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1	
Configuration			LTR				LTR			L		TR		L	T	R	
Volume, V (veh/h)		6	9	63		83	20	25		51	358	130		5	174	5	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No				No					No						
Median Type/Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			85				139				55					5	
Capacity, c (veh/h)			602				300				1372					1031	
v/c Ratio			0.14				0.46				0.04					0.00	
95% Queue Length, Q ₉₅ (veh)			0.5				2.3				0.1					0.0	
Control Delay (s/veh)			12.0				27.0				7.7					8.5	
Level of Service, LOS			B				D				A					A	
Approach Delay (s/veh)		12.0				27.0				0.7				0.2			
Approach LOS		B				D											

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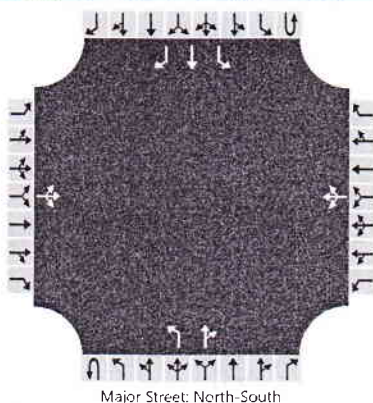
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2026
Time Analyzed	AM Base
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Patrician
Jurisdiction	Washoe County
East/West Street	Patrician Drive
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1
Configuration			LTR				LTR			L		TR		L	T	R
Volume, V (veh/h)		2	2	46		46	7	1		62	61	13		1	286	12
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			54				59				67				1	
Capacity, c (veh/h)			692				406				1229				1510	
v/c Ratio			0.08				0.15				0.05				0.00	
95% Queue Length, Q ₉₅ (veh)			0.3				0.5				0.2				0.0	
Control Delay (s/veh)			10.6				15.4				8.1				7.4	
Level of Service, LOS			B				C				A				A	
Approach Delay (s/veh)		10.6				15.4				3.7				0.0		
Approach LOS		B				C										

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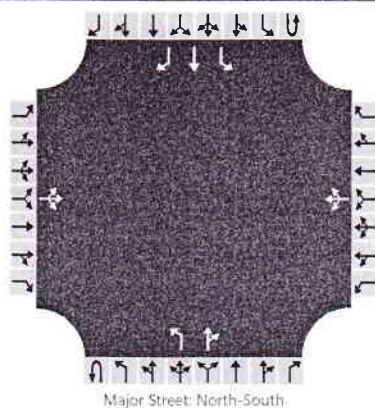
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2026
Time Analyzed	PM Base
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Patrician
Jurisdiction	Washoe County
East/West Street	Patrician Drive
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1	
Configuration			LTR				LTR			L		TR		L	T	R	
Volume, V (veh/h)		7	8	70		40	20	24		56	334	58		3	158	5	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No				No				No				No			
Median Type/Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			93				91				61					3	
Capacity, c (veh/h)			660				360				1391					1127	
v/c Ratio			0.14				0.25				0.04					0.00	
95% Queue Length, Q ₉₅ (veh)			0.5				1.0				0.1					0.0	
Control Delay (s/veh)			11.4				18.4				7.7					8.2	
Level of Service, LOS			B				C				A					A	
Approach Delay (s/veh)		11.4				18.4				1.0				0.1			
Approach LOS		B				C											

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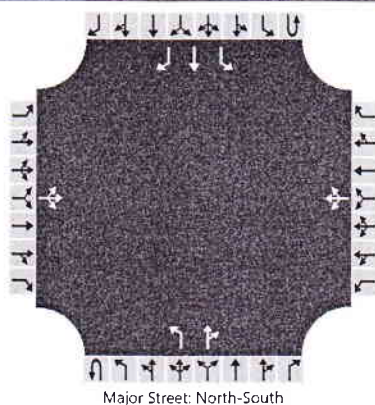
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2026
Time Analyzed	AM Base + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Patrician
Jurisdiction	Washoe County
East/West Street	Patrician Drive
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	1	
Configuration			LTR				LTR			L		TR		L	T	R	
Volume, V (veh/h)		2	2	46		111	8	2		62	78	34		2	336	12	
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3			
Proportion Time Blocked																	
Percent Grade (%)		0				0											
Right Turn Channelized		No				No				No							
Median Type/Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			54				132				67				2		
Capacity, c (veh/h)			640				351				1174				1457		
v/c Ratio			0.08				0.38				0.06				0.00		
95% Queue Length, Q ₉₅ (veh)			0.3				1.7				0.2				0.0		
Control Delay (s/veh)			11.1				21.3				8.3				7.5		
Level of Service, LOS			B				C				A				A		
Approach Delay (s/veh)		11.1				21.3				2.9				0.0			
Approach LOS		B				C											

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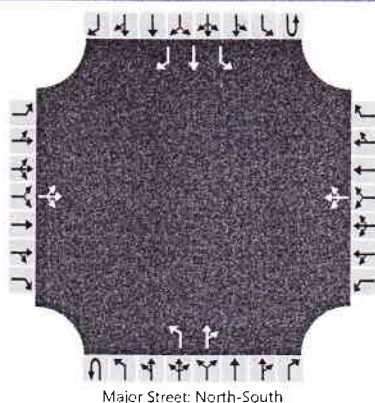
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2026
Time Analyzed	PM Base + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Patrician
Jurisdiction	Washoe County
East/West Street	Patrician Drive
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0		0	1	0		0	1	1
Configuration			LTR				LTR			L		TR		L	T	R
Volume, V (veh/h)		7	9	70		83	20	25		56	390	130		5	189	6
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No						
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			94				139				61				5	
Capacity, c (veh/h)			577				269				1351				1001	
v/c Ratio			0.16				0.52				0.05				0.00	
95% Queue Length, Q ₉₅ (veh)			0.6				2.8				0.1				0.0	
Control Delay (s/veh)			12.4				31.9				7.8				8.6	
Level of Service, LOS			B				D				A				A	
Approach Delay (s/veh)	12.4				31.9				0.8				0.2			
Approach LOS	B				D											

HCS 2010 Two-Way Stop-Control Report

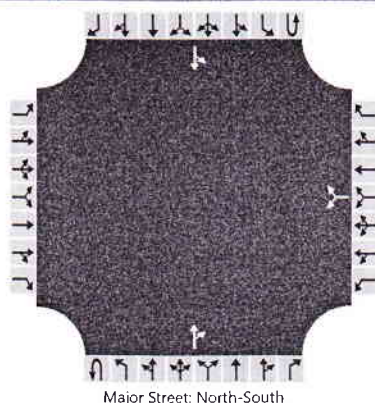
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2016
Time Analyzed	AM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Deodar
Jurisdiction	Washoe County
East/West Street	Deodar Way
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0		0	1	0		0	1	0
Configuration							LR					TR			LT	
Volume, V (veh/h)						0		1			67	1			0	267
Percent Heavy Vehicles (%)						3		3							3	
Proportion Time Blocked																
Percent Grade (%)							0									
Right Turn Channelized			No				No				No				No	
Median Type/Storage							Undivided									

Critical and Follow-up Headways

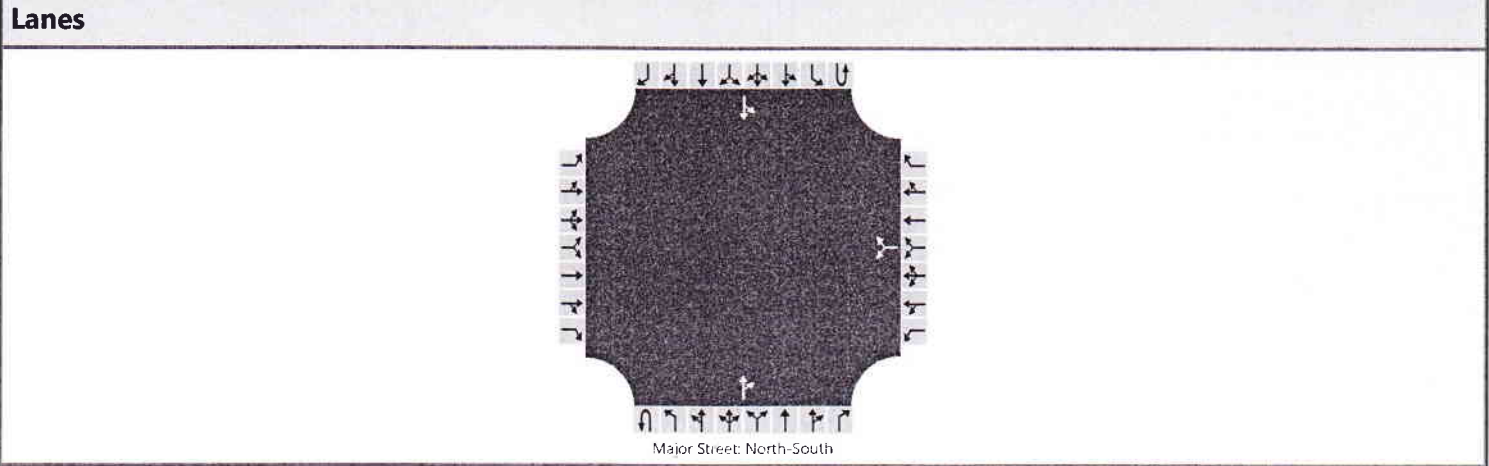
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							1								0	
Capacity, c (veh/h)							984								1517	
v/c Ratio							0.00								0.00	
95% Queue Length, Q ₉₅ (veh)							0.0								0.0	
Control Delay (s/veh)							8.7								7.4	
Level of Service, LOS							A								A	
Approach Delay (s/veh)							8.7								0.0	
Approach LOS							A									

HCS 2010 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Lemmon & Deodar
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	12/28/2016	East/West Street	Deodar Way
Analysis Year	2016	North/South Street	Lemmon Drive
Time Analyzed	PM Existing	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0	
Configuration							LR					TR		LT			
Volume, V (veh/h)						1		0			332	1		0	157		
Percent Heavy Vehicles (%)						3		3						3			
Proportion Time Blocked																	
Percent Grade (%)						0											
Right Turn Channelized		No				No				No				No			
Median Type/Storage		Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						1									0		
Capacity, c (veh/h)						506									1190		
v/c Ratio						0.00									0.00		
95% Queue Length, Q ₉₅ (veh)						0.0									0.0		
Control Delay (s/veh)						12.1									8.0		
Level of Service, LOS						B									A		
Approach Delay (s/veh)						12.1								0.0			
Approach LOS						B											

HCS 2010 Two-Way Stop-Control Report

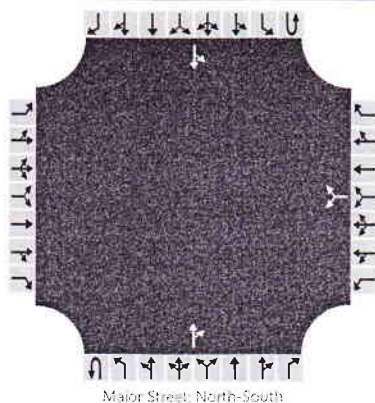
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2016
Time Analyzed	AM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Deodar
Jurisdiction	Washoe County
East/West Street	Deodar Way
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0		0	1	0		0	1	0
Configuration							LR					TR			LT	
Volume, V (veh/h)						50		2			68	18			0	268
Percent Heavy Vehicles (%)						3		3							3	
Proportion Time Blocked																
Percent Grade (%)							0									
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

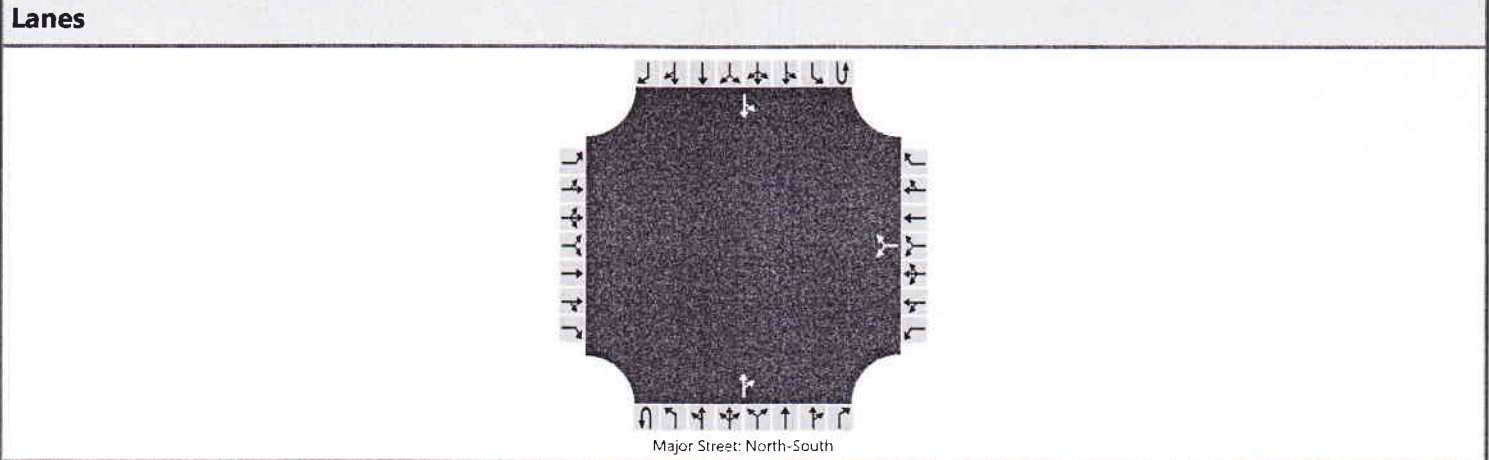
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)								56								0
Capacity, c (veh/h)								632								1492
v/c Ratio								0.09								0.00
95% Queue Length, Q ₉₅ (veh)								0.3								0.0
Control Delay (s/veh)								11.2								7.4
Level of Service, LOS								B								A
Approach Delay (s/veh)								11.2								0.0
Approach LOS								B								

HCS 2010 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	MSH	Intersection	Lemmon & Deodar				
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County				
Date Performed	12/28/2016	East/West Street	Deodar Way				
Analysis Year	2016	North/South Street	Lemmon Drive				
Time Analyzed	PM Existing + Project	Peak Hour Factor	0.92				
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25				
Project Description							



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0	
Configuration							LR					TR		LT			
Volume, V (veh/h)						33		1			333	57		1	159		
Percent Heavy Vehicles (%)						3		3						3			
Proportion Time Blocked																	
Percent Grade (%)							0										
Right Turn Channelized		No				No				No				No			
Median Type/Storage		Undivided															

Critical and Follow-up Headways

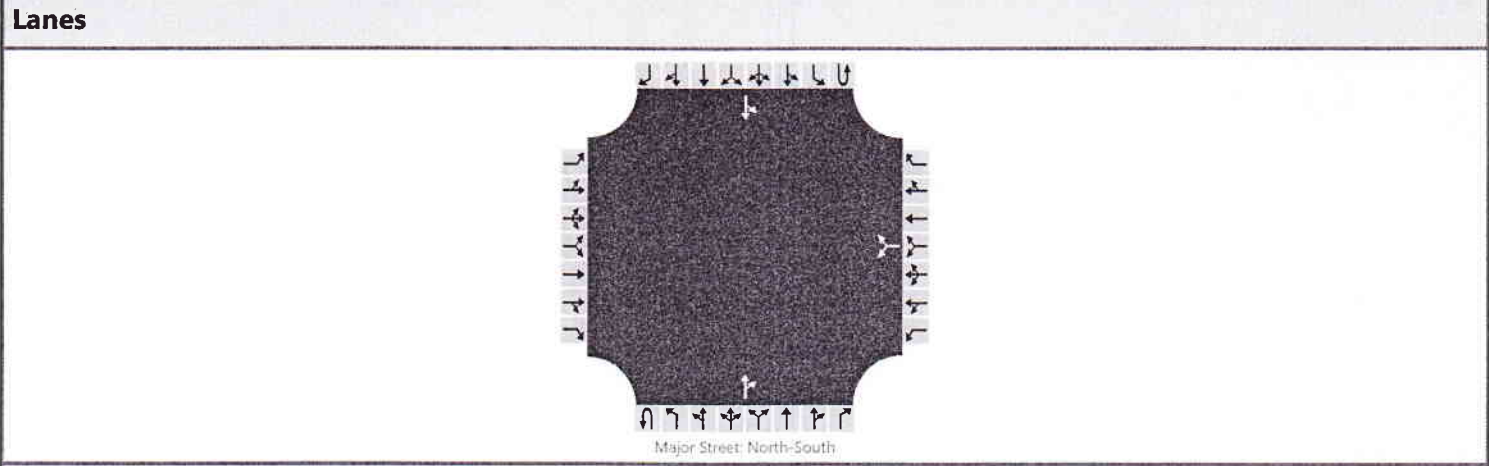
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						37								1			
Capacity, c (veh/h)						485								1129			
v/c Ratio						0.08								0.00			
95% Queue Length, Q ₉₅ (veh)						0.2								0.0			
Control Delay (s/veh)						13.0								8.2			
Level of Service, LOS						B								A			
Approach Delay (s/veh)						13.0								0.1			
Approach LOS						B											

HCS 2010 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Lemmon & Deodar
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	12/28/2016	East/West Street	Deodar Way
Analysis Year	2026	North/South Street	Lemmon Drive
Time Analyzed	AM Base	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0		0	1	0		0	1	0
Configuration							LR					TR			LT	
Volume, V (veh/h)						1		2			74	2			1	295
Percent Heavy Vehicles (%)						3		3							3	
Proportion Time Blocked																
Percent Grade (%)							0									
Right Turn Channelized		No				No				No				No		
Median Type/Storage				Undivided												

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							3								1	
Capacity, c (veh/h)							807								1507	
v/c Ratio							0.00								0.00	
95% Queue Length, Q ₉₅ (veh)							0.0								0.0	
Control Delay (s/veh)							9.5								7.4	
Level of Service, LOS							A								A	
Approach Delay (s/veh)							9.5								0.0	
Approach LOS							A									

HCS 2010 Two-Way Stop-Control Report

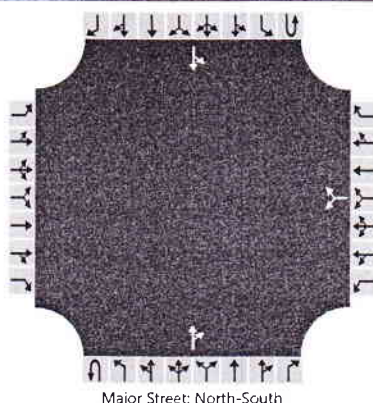
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2026
Time Analyzed	PM Base
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Deodar
Jurisdiction	Washoe County
East/West Street	Deodar Way
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0		0	1	0		0	1	0
Configuration							LR					TR			LT	
Volume, V (veh/h)						2		1			367	2			1	174
Percent Heavy Vehicles (%)						3		3							3	
Proportion Time Blocked																
Percent Grade (%)							0									
Right Turn Channelized			No				No				No				No	
Median Type/Storage							Undivided									

Critical and Follow-up Headways

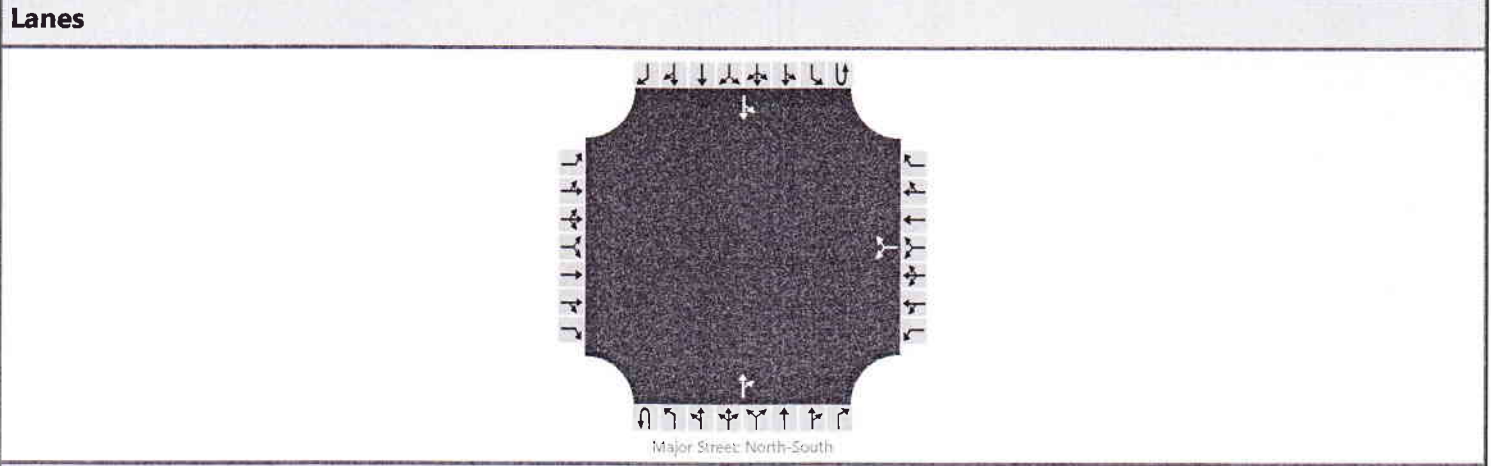
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							3								1	
Capacity, c (veh/h)							515								1151	
v/c Ratio							0.01								0.00	
95% Queue Length, Q ₉₅ (veh)							0.0								0.0	
Control Delay (s/veh)							12.0								8.1	
Level of Service, LOS							B								A	
Approach Delay (s/veh)							12.0								0.1	
Approach LOS							B									

HCS 2010 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	MSH	Intersection	Lemmon & Deodar
Agency/Co.	Solaegui Engineers	Jurisdiction	Washoe County
Date Performed	12/28/2016	East/West Street	Deodar Way
Analysis Year	2026	North/South Street	Lemmon Drive
Time Analyzed	AM Base + Project	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0		0	1	0		0	1	0
Configuration							LR					TR			LT	
Volume, V (veh/h)						51		3			75	19			1	296
Percent Heavy Vehicles (%)						3		3							3	
Proportion Time Blocked																
Percent Grade (%)							0									
Right Turn Channelized			No				No				No				No	
Median Type/Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							58								1	
Capacity, c (veh/h)							602								1481	
v/c Ratio							0.10								0.00	
95% Queue Length, Q ₉₅ (veh)							0.3								0.0	
Control Delay (s/veh)							11.6								7.4	
Level of Service, LOS							B								A	
Approach Delay (s/veh)							11.6								0.0	
Approach LOS							B									

HCS 2010 Two-Way Stop-Control Report

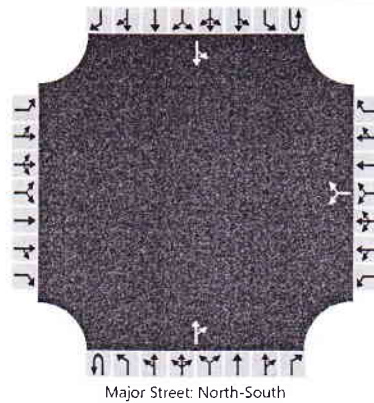
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	12/28/2016
Analysis Year	2026
Time Analyzed	PM Base + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Deodar
Jurisdiction	Washoe County
East/West Street	Deodar Way
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Movement																	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0	
Configuration							LR					TR		LT			
Volume, V (veh/h)						34		2			368	50		2	176		
Percent Heavy Vehicles (%)						3		3						3			
Proportion Time Blocked																	
Percent Grade (%)							0										
Right Turn Channelized		No				No				No				No			
Median Type/Storage		Undivided															

Critical and Follow-up Headways

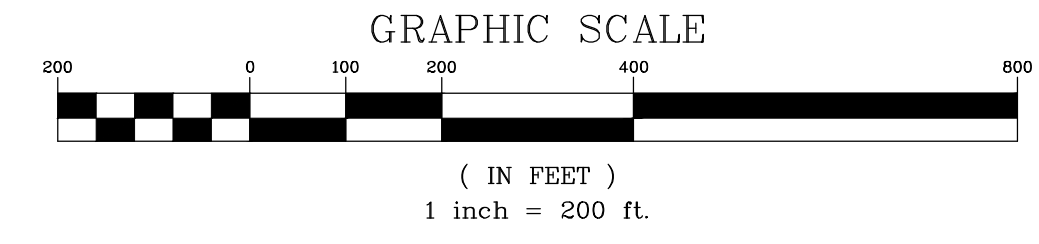
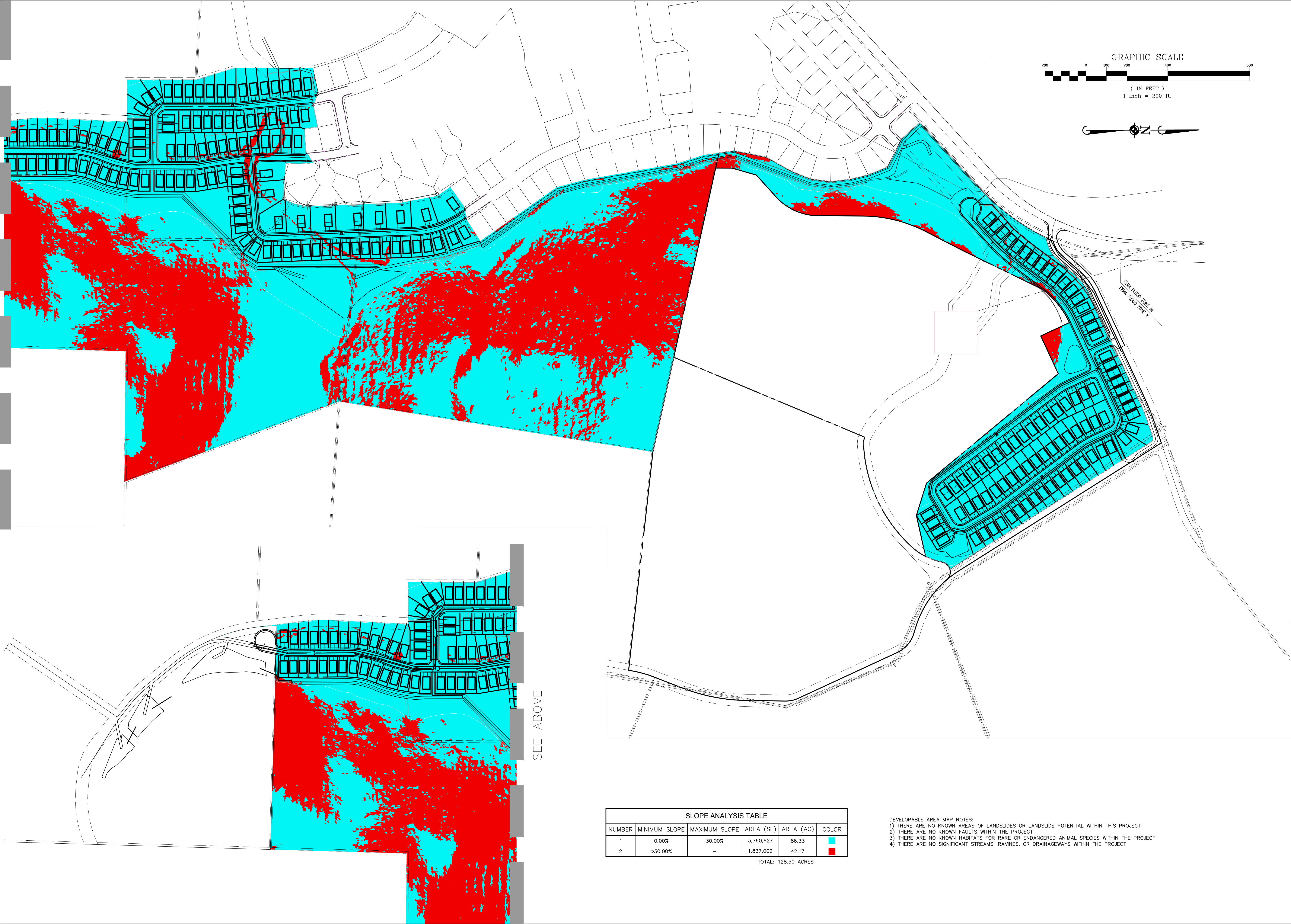
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							39								2		
Capacity, c (veh/h)							454								1100		
v/c Ratio							0.09								0.00		
95% Queue Length, Q ₉₅ (veh)							0.3								0.0		
Control Delay (s/veh)							13.7								8.3		
Level of Service, LOS							B								A		
Approach Delay (s/veh)							13.7								0.1		
Approach LOS							B										

December 20, 2017 - 11:24 Doc Name: P:\Resources\1\Drawings\LEMMON VALLEY\DEVELOPABLE AREA MAP 121917.dwg Updated By: Sladen

SEE BELOW



DATE	REVISIONS	DRAWN BY	CHECK BY

Manhard
CONSULTING LTD.
8810 Double R Boulevard, Suite 101, Reno, NV 89521 ph:775-749-3500 fx:775-749-3500 manhard.com
Civil Engineers • Surveyors • Water Resources Engineers • Water & Wastewater Engineers
Construction Management • Environmental Scientists • Landscape Architects • Planners

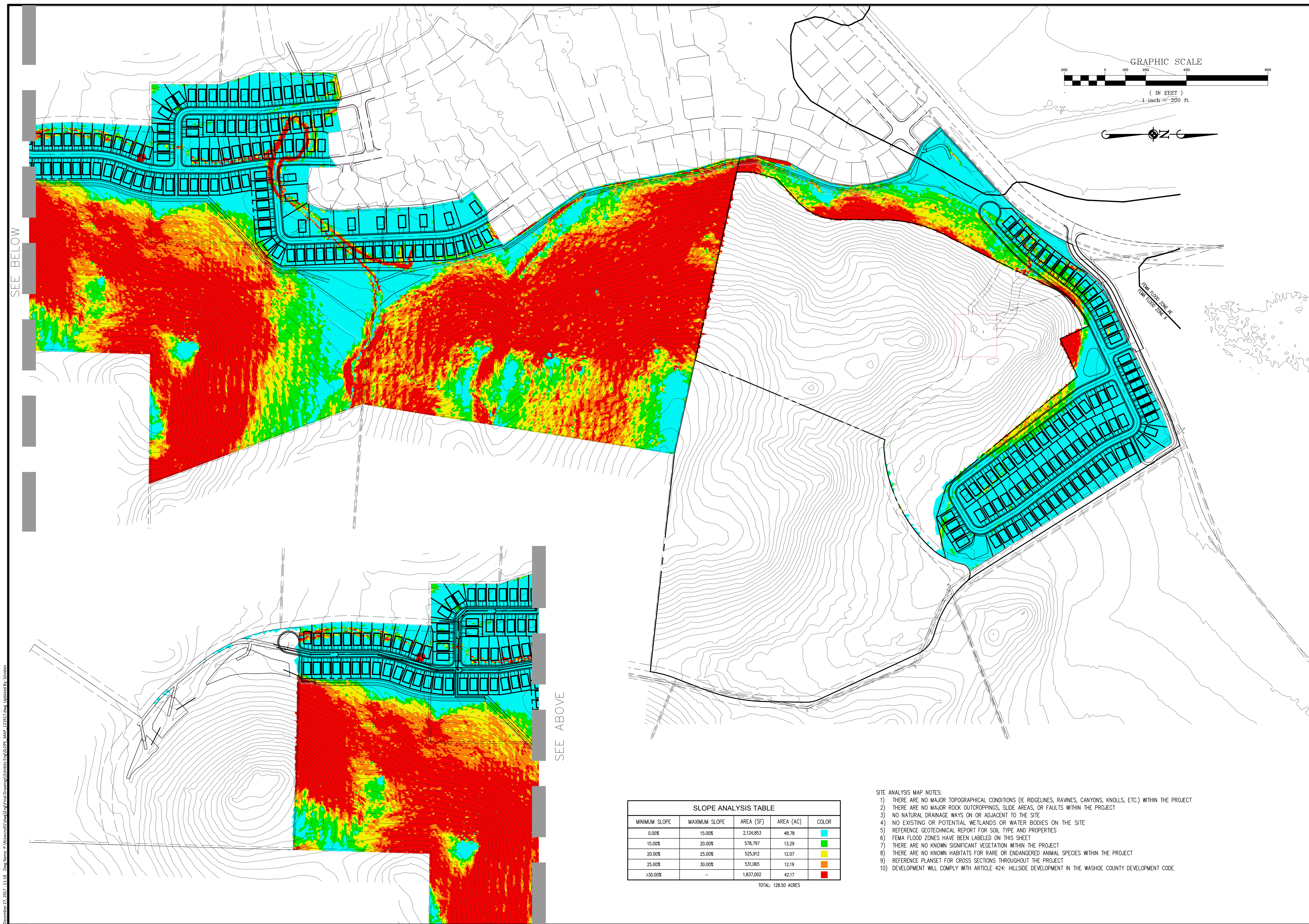
LEMMON VALLEY ESTATES
WASHOE COUNTY, NEVADA
DEVELOPABLE AREA MAP

SEE ABOVE

SLOPE ANALYSIS TABLE					
NUMBER	MINIMUM SLOPE	MAXIMUM SLOPE	AREA (SF)	AREA (AC)	COLOR
1	0.00%	30.00%	3,760,627	86.33	Cyan
2	>30.00%	-	1,837,002	42.17	Red
TOTAL:			128.50 ACRES		

- DEVELOPABLE AREA MAP NOTES:
- 1) THERE ARE NO KNOWN AREAS OF LANDSLIDES OR LANDSLIDE POTENTIAL WITHIN THIS PROJECT
 - 2) THERE ARE NO KNOWN FAULTS WITHIN THE PROJECT
 - 3) THERE ARE NO KNOWN HABITATS FOR RARE OR ENDANGERED ANIMAL SPECIES WITHIN THE PROJECT
 - 4) THERE ARE NO SIGNIFICANT STREAMS, RAVINES, OR DRAINAGEWAYS WITHIN THE PROJECT

PROJ. MGR.: DMK
PROJ. ASSOC.: SWJ
DRAWN BY: SWJ
DATE: 12/20/17
SCALE: 1"=200'
SHEET
1 OF **1**
RSTWCV01
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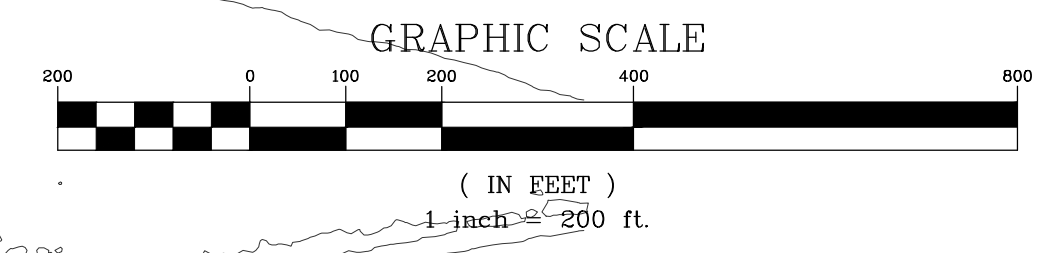


SLOPE ANALYSIS TABLE				
MINIMUM SLOPE	MAXIMUM SLOPE	AREA (SF)	AREA (AC)	COLOR
0.00%	15.00%	2,124,853	48.78	Blue
15.00%	20.00%	578,797	13.29	Green
20.00%	25.00%	525,912	12.07	Yellow
25.00%	30.00%	531,065	12.19	Orange
>30.00%	-	1,837,002	42.17	Red
		TOTAL: 128.50 ACRES		

- SITE ANALYSIS MAP NOTES:
- 1) THERE ARE NO MAJOR TOPOGRAPHICAL CONDITIONS (IE RIDGELINES, RAVINES, CANYONS, KNOLLS, ETC.) WITHIN THE PROJECT
 - 2) THERE ARE NO MAJOR ROCK OUTCROPPINGS, SLIDE AREAS, OR FAULTS WITHIN THE PROJECT
 - 3) NO NATURAL DRAINAGE WAYS ON OR ADJACENT TO THE SITE
 - 4) NO EXISTING OR POTENTIAL WETLANDS OR WATER BODIES ON THE SITE
 - 5) REFERENCE GEOTECHNICAL REPORT FOR SOIL TYPE AND PROPERTIES
 - 6) FEMA FLOOD ZONES HAVE BEEN LABELED ON THIS SHEET
 - 7) THERE ARE NO KNOWN SIGNIFICANT VEGETATION WITHIN THE PROJECT
 - 8) THERE ARE NO KNOWN HABITATS FOR RARE OR ENDANGERED ANIMAL SPECIES WITHIN THE PROJECT
 - 9) REFERENCE PLANSET FOR CROSS SECTIONS THROUGHOUT THE PROJECT
 - 10) DEVELOPMENT WILL COMPLY WITH ARTICLE 424: HILLSIDE DEVELOPMENT IN THE WASHOE COUNTY DEVELOPMENT CODE

SEE BELOW

SEE ABOVE



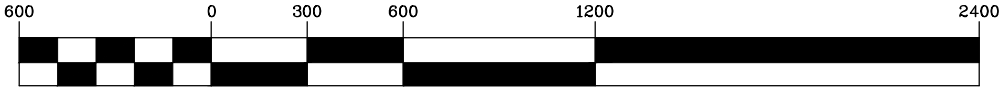
DATE	REVISIONS	DRAWN BY	CHECK BY

Manhard
CONSULTING LTD.
6810 Double R Boulevard, Suite 101, Reno, NV 89521, ph: 775-748-3500, mrenard@manhard.com
Civil Engineers • Surveyors • Water Resource Engineers • Water & Wastewater Engineers
Construction Managers • Environmental Scientists • Landscape Architects • Planners

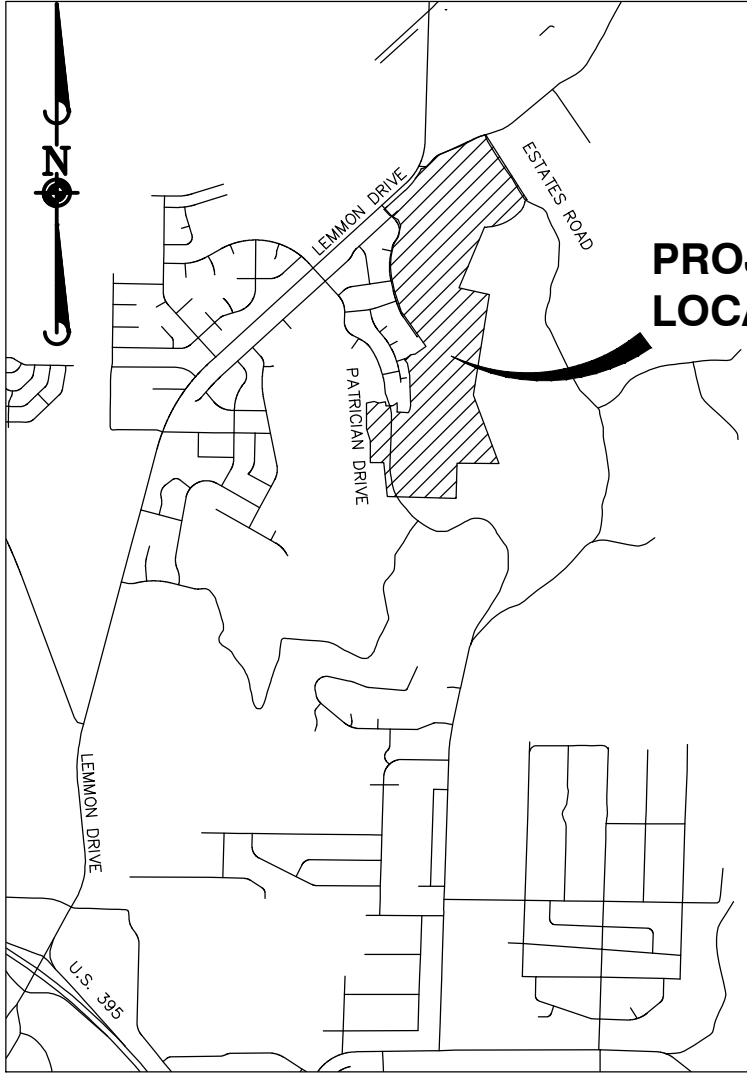
LEMMON VALLEY ESTATES
WASHOE COUNTY, NEVADA
SITE ANALYSIS MAP

PROJ. MGR.: DMK
PROJ. ASSOC.: SWJ
DRAWN BY: SWJ
DATE: 12/20/17
SCALE: 1"=200'
SHEET
1 OF **1**
RSTWCNV01

GRAPHIC SCALE

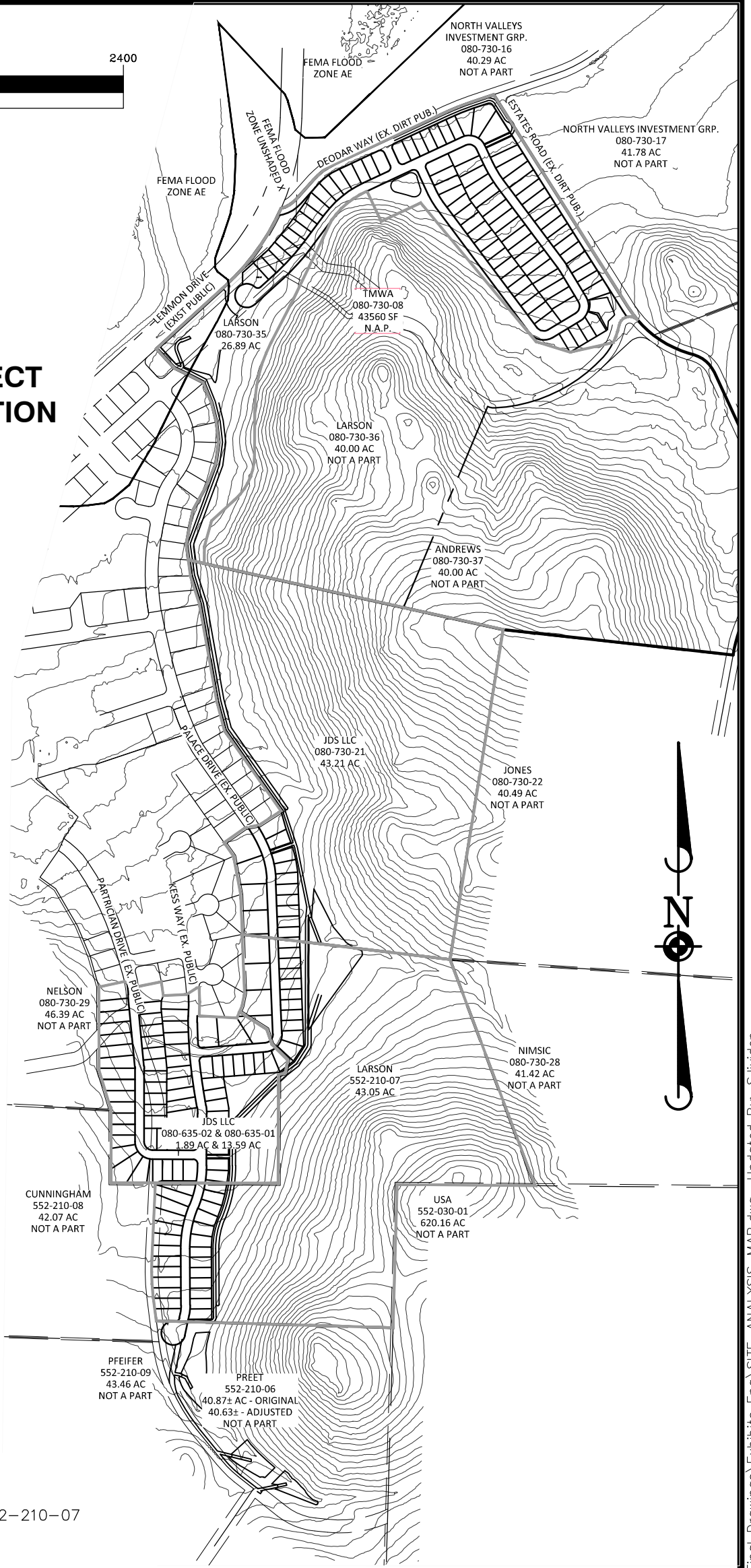


(IN FEET)
1 inch = 600 ft.



VICINITY MAP
NTS

PROJECT LOCATION



SITE ANALYSIS MAP NOTES:

- 1) THERE ARE NO MAJOR TOPOGRAPHICAL CONDITIONS (IE RIDGELINES, RAVINES, CANYONS, KNOLLS, ETC.) WITHIN THE PROJECT
- 2) NO NATURAL DRAINAGE WAYS ON OR ADJACENT TO THE SITE.
- 3) NO EXISTING OR POTENTIAL WETLANDS OR WATER BODIES ON THE SITE
- 4) THERE ARE NO AVALANCHE OR LANDSLIDE HAZARDS
- 5) THERE ARE NO FAULTS WITHIN THE PROJECT
- 6) REFERENCE GEOTECHNICAL REPORT FOR SOIL TYPE AND PROPERTIES
- 7) FEMA FLOOD ZONES HAVE BEEN LABELED ON THIS SHEET
- 8) THERE ARE NO KNOWN SIGNIFICANT VEGETATION WITHIN THE PROJECT
- 9) THERE ARE NO KNOWN HABITATS OR MIGRATION ROUTES FOR RARE OR ENDANGERED ANIMAL SPECIES WITHIN THE PROJECT
- 10) REFERENCE PLANSET FOR CROSS SECTIONS THROUGHOUT THE PROJECT
- 11) DEVELOPMENT WILL COMPLY WITH ARTICLE 424: HILLSIDE DEVELOPMENT IN THE WASHOE COUNTY DEVELOPMENT CODE
- 12) CONTOURS ARE AT 10' INTERVALS

LAND USE DATA:

LOCATION: LEMMON VALLEY, WASHOE COUNTY
ACCESS: 395 TO LEMMON DRIVE
APN: 080-730-21, 080-730-35, 080-635-01, 080-635-02, 552-210-07
LAND USE: PRESENT= MDS, PROPOSED= MDS (NO CHANGE)
NUMBER OF UNITS: PRESENT= 0, PROPOSED= 206

EX. VEGETATION (TREE PRESERVATION INFORMATION):

APPROXIMATE TREES WITHIN PROJECT AREA: 0
APPROXIMATE TREES TO BE REMOVED: 0
APPROXIMATE TO REMAIN: 0

PREVAILING WINDS: FROM THE SOUTH AND SOUTHWEST WITH HIGH WINDS COMMON ESPECIALLY DURING SUMMER AFTERNOONS

SOIL: PRIMARILY GRANULAR SAND SOILS

FLOOD ZONE: LOTS ARE IN ZONE UNSHADED X, PARTS OF PROJECT ARE IN ZONE AE

EX. UTILITY LOCATIONS:

SEWER: LEMMON DRIVE, PATRICIAN DRIVE, KESS WAY, PALACE DRIVE
WATER: LEMMON DRIVE, PATRICIAN DRIVE, KESS WAY, PALACE DRIVE
ELEC: LEMMON DRIVE, PATRICIAN DRIVE, KESS WAY, PALACE DRIVE
GAS: LEMMON DRIVE, PATRICIAN DRIVE, KESS WAY, PALACE DRIVE

DATE	REVISIONS	BY

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SLOPE ANALYSIS TABLE

MINIMUM SLOPE	MAXIMUM SLOPE	AREA (SF)	AREA (AC)
0.00%	15.00%	2,124,853	48.78
15.00%	20.00%	578,797	13.29
20.00%	25.00%	525,912	12.07
25.00%	30.00%	531,065	12.19
>30.00%	-	1,837,002	42.17

TOTAL: 128.50 ACRES

Manhard
CONSULTING LTD
2020 Diverse Road, Suite 101, Reno, NV 89521 tel: (775) 740-0000 fax: (775) 740-0000 www.manhard.com
Civil Engineers - Surveyors - Water Resources Engineers - Water & Wastewater Engineers
Construction Managers - Environmental Scientists - Landscape Architects - Planners

LEMMON VALLEY PROJECT
WASHOE COUNTY, NEVADA
SITE ANALYSIS MAP

DRAWN BY: SWJ	RELEASE DATE: 12/21/17	SCALE: 1"=600'	CODE: RSTWCNV01
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Request to Reserve New Street Name(s)

The Applicant is responsible for all sign costs.

Applicant Information

Name: JDS LLC Attn: Derek Larson
Address: 7500 Rough Rock Road
Reno NV 89502

Phone (Home) : _____ Phone (Work): 775-544-5482
 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.)

Walton Street (Street A)	
Kamino Way (Street B)	
Arctic Fox Way (Street C)	
Wicket Drive (Street D)	
Twin Suns Drive (Street E)	

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: Lemmon Valley Heights
 Reno Sparks Washoe County
Parcel Numbers: 080-635-01, 080-635-02, 080-730-21, 080-730-35, 552-210-07
 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



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June 29, 2016

Mr. Derek Larson
2265 Green Vista Drive #404
Reno, NV 89509

RE: 1200 Estates Road _DISC
TMWA PLL#: 16-4909

Dear Mr. Larson,

Pursuant to your request, Truckee Meadows Water Authority (TMWA) has completed its Discovery for the above referenced project, also referred to as 1200 Estates Road. Enclosed please find two internal memoranda from TMWA's Engineering and Water Rights Departments detailing their findings. Should you have any questions after reviewing the enclosures, please feel free to contact me at (775) 834-8037 or my email at pparenti@tmwa.com.

Thank you for the opportunity to serve your discovery and future project development needs.

Sincerely,


Pam Parenti
New Business Project Coordinator

Encl: Engineering, Water Rights memorandums
cc: Chris Baker, Manhard

TO: Pam Parenti
THRU: Scott Estes *SGE*
FROM: Brooke Long *BL*
DATE: June 28, 2016

RE: 1200 Estates Road Discovery, TMWA WO# 16-4909

SUMMARY:

The Applicant has proposed a development consisting of 304 single family residential units on approximately 335 acres. TMWA can provide water service to the project, however, the project lies outside TMWA's service territory and will require annexation prior to a water service agreement. As part of this discovery, the off-site facility improvements have been identified. The cost opinion of the major off-site improvements for the project is \$2,436,978.

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

PURPOSE:

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

ASSUMPTIONS:

1. The applicant shall be responsible for all application, review, inspection, storage, treatment, permits, easements, and other fees pertinent to the Project as adopted by the TMWA at the time of execution of a water service agreement.

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

Single-Family Units: Domestic Maximum Day Usage

$$Y = 0.009 \cdot \sqrt{x}$$

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

Add irrigation for common areas as needed

Multi-Family Units: Domestic Maximum Day Usage

0.15 gpm per unit

Add irrigation for common areas as needed

Commercial/Industrial: Domestic Maximum Day Usage

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

Add irrigation for common areas as needed

Potable Irrigation: Maximum Day Usage

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

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

DISCUSSION:

The proposed Project is located in Lemmon Valley and consists of 304 single family residential units with an average lot size of 6,000 square feet, on approximately 335 acres. Much of the land consists of steep terrain with the proposed developments concentrated on the less sloped areas. The project includes two separate developments, described as follows:

1. *The Southern Development* consists of an extension of the existing subdivision off E Patrician Dr, Kess Way and Palace Drive (see Figure 1).
2. *The Northern Development*, located off of Deodar Way and Estates Rd (see Figure 1).

Table 1. Project Parcel APNs and Acreage.

APN	ACREAGE
552-210-08	42.0
080-730-21	43.2
080-635-01	13.6
552-210-09	43.4
080-730-19	41.0
552-210-06	40.9
080-730-18	65.8
080-635-02	1.9
552-210-07	43.0
Total	334.9

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

Demands:

Applying TMWA's current maximum day demand formula, the demand for each 6,000 ft² lot is 0.7 gpm. The total estimated project maximum day demand for the proposed 304 lots is 212.8 gpm.

Supply Capacity

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

Storage Capacity

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

Storage Source	Max Day Demand	Operating Storage (15% of MDD)	Emergency Storage (1 ADD)	Total Storage (gallons)
Vidler storage.	152.6	13,003	33,214	46,217
Lemmon Tank 1 and Tank 2	60.2	32,962	84,193	117,155
			Total	163,372

Project Pressures:

Service pressures will range from 45 psi to 117 psi. Where pressures exceed 80 psi, TMWA will require that all service connections have privately owned pressure regulators.

Off-Site Improvements

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

Northern Development –

- Service elevations from 4922 to 5080.
- Two pressure Zones, upper and lower are planned.
- Lower pressure zone serving project elevations from 4922-ft to 5000-ft from the existing Lemmon 1 Tank zone.
- Upper pressure zone serves project elevations above 5000-ft to 5080-ft from a pressure regulated supply from TMWA's high pressure Lemmon Dr main.
- In order to loop this development, a water supply at one end and a tank at the other are planned.

The lower zone of the northern development can be supplied by the existing by the Lemmon 1 Tank zone up to a maximum service elevation of 5000-ft. Major water system facility improvements are as follows:

- A hot tap to TMWA's high pressure main in Lemmon Dr at Palace Dr.
- Pressure regulating station (PRS) at Palace and Fremont.
- 2,700 LF of 8" parallel main from the PRS through the lower pressure zone connecting to the upper pressure zone.
- A PRS from the upper to the lower pressure zone.
- A 350,000 gallon water storage tank at the top of the development.

In order to provide looping for the proposed linear development, a tank was placed at the top of the development. The location of the tank shown in Figure 1 is on the project property but is on a steep slope that likely would not be suitable. A more suitable tank site is located 1,100 feet further up Estates Rd on a neighboring parcel. Planning level costs for the proposed off-site water facilities are listed below and shown in Figure 1.

Southern Development -

The southern development can be supplied via two connections to TMWA's high pressure Lemmon main; one at Patrician Way and the other at Palace Dr. Each of these supplies will require pressure regulation and parallel mains to the development. No tank will is required for this development.

Service elevations for the southern development range from 5014-ft to 5165-ft. The development would consist of a single pressure zone with pressures ranging from 46 psi to 111 psi. The following off-site improvements are required:

- Two supply connections at Patrician Way and Palace Dr. An 8" stub-out to the south side of Lemmon Dr exists. A hot tap and a stub-out will need to be constructed at Palace Dr.
- Two pressure regulating stations. One at Patrician Way and one at Palace Dr. The PRS at Palace Dr will contain PRVs for both the northern and southern developments.
- 4,400 LF of 8" piping from the PRSs to the development.
- 8" on-site piping.

Dead Ends and Looping:

Nevada Administrative Code section 445A.6712 requires systems to be designed, to the extent possible, to eliminate dead ends. Looping can be achieved with two supply connections and by elimination of radial mains greater than a few hundred feet in length. As planned, looping is achieved.

Project Fire Flows

Project Fire flow is assumed to be 1,500 gpm for a duration of 2 hours.

Major Water System Improvements and Cost Opinion

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

\$ 298,652

Table 2. Major Water System Improvements and Associated Costs

Description	Quantity	Unit	Unit Cost	Total Cost
Area 10 Facility Charge for the portion of the development using Vidler storage.	152.6	MDD, gpm	\$3,575	\$771,698
Area 10 Facility Charge for the portion of the development using Lemmon Tank 1 storage.	60.2	MDD, gpm	\$5,057	\$215,215
subtotal				\$986,913
Northern Development				
Hot Tap to Lemmon Main at Palace Dr	1	L.S.	\$30,000	\$30,000
Tank	350,000	gallons	\$1.3	\$455,000
8" Pipe from Hot Tap to PRS	285	L.F.	\$128	\$36,480
Pressure Regulating Station at Palace Dr and Freemont Way (SCADA controlled)	1	L.S.	\$100,000	\$100,000
8" Pipe from PRS to upper pressure zone boundary	2700	L.F.	\$128	\$345,600
On-site PRS between upper and lower zones	1	L.S.	\$60,000	\$60,000
subtotal				\$1,027,080
Southern Development				
Pressure Regulating Station near intersection of Patrician Way and Freemont Way	1	L.S.	\$75,000	\$75,000
8" Parallel Piping in Patrician Way from PRS to development.	2200	L.F.	\$128	\$281,600
8" Parallel Piping in Palace Dr from PRS to development.	2200	L.F.	\$128	\$281,600
subtotal				\$638,200
Total				\$2,436,978

\$3246/lot

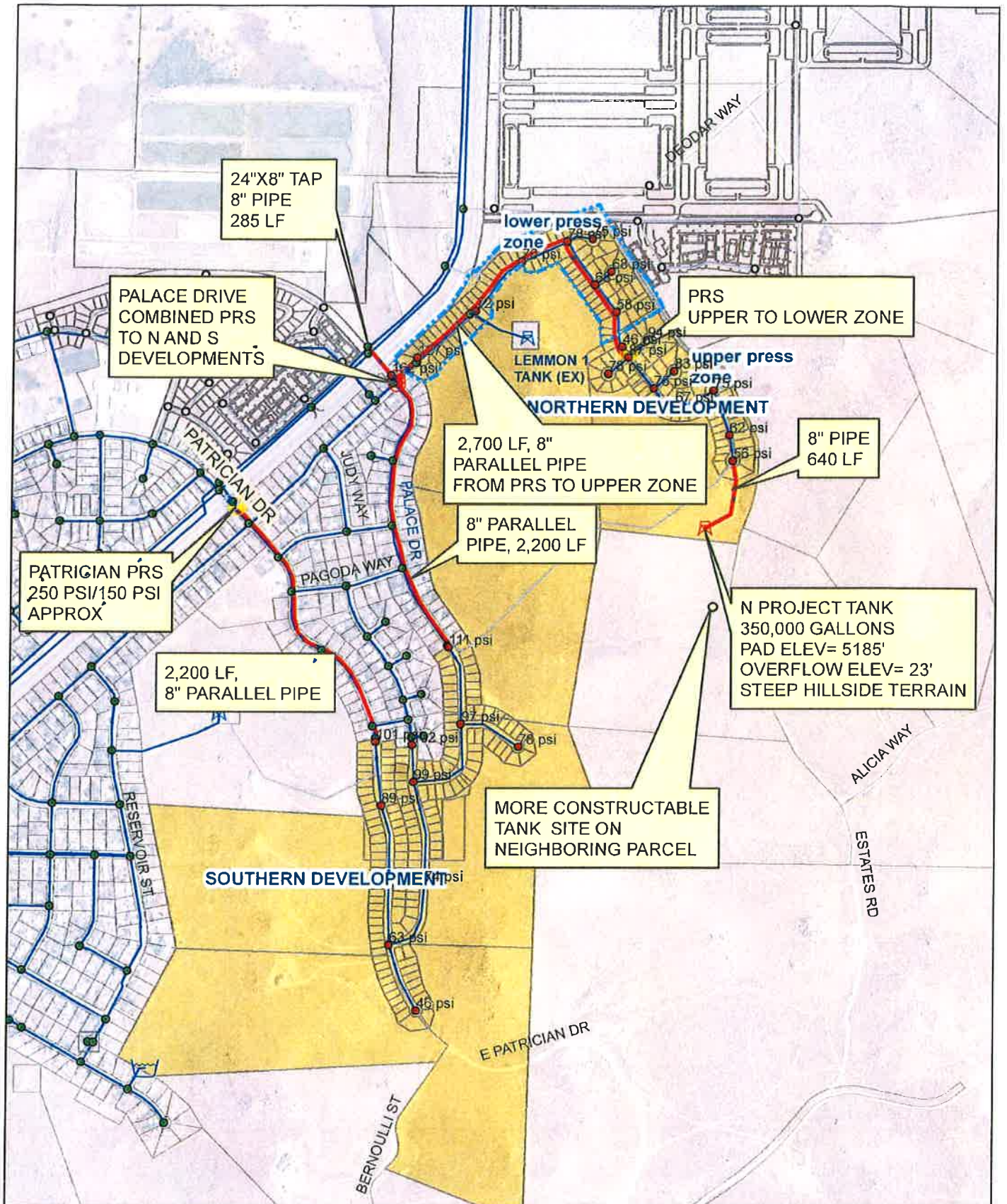
\$1,688,201

\$566,080

\$1,892,561

222
8927

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



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Date: April 4, 2016
To: Pam Parenti
From: David Nelson *DN*

RE: 16-4909, Estates Road, +/- 304 SFR Lots (080-730-18, -19, -21, 080-635-01, -02, 552-210-06 thru -09)

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

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

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

- These subject parcels (APN 080-730-18, -19, -21, 080-635-01, -02, 552-210-06 thru -09) are outside of Truckee Meadows Water Authority's (TMWA's) service territory. An annexation is required.
- There are no resource credits or Truckee River decreed surface water appurtenant to the 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 "Estates Road Discovery" is estimated to require a domestic demand of **109.44 acre feet (AF)**. Landscaping plans were not provided to TMWA; therefore, a demand could not be determined. Please see the attached demand calculation sheet for the **estimated** demand and water resource fees. Once final plans are submitted a more accurate demand will be calculated. *Note: TMWA resources are first come, first serve, and are limited in this area. Applicant needs to dedicate owned or banked resources before purchase of TMWA's Rule 7. If applicant dedicates surface water for this project additional fees and dedications will apply.*
- Any existing right of ways and public easements would need to be reviewed, and if needed the property owner will need to grant TMWA the proper easements and/or land dedications to provide water service to the subject properties. Property owner will be required, at its sole expense, to provide TMWA with a current preliminary title report for all subject properties. Owner will represent and warrant such property offered for dedication or easements to TMWA shall be free and clear of all liens and encumbrances. Owner is solely responsible for obtaining all appropriate permits, licenses, construction easements, subordination agreements, consents from lenders, and other necessary rights from all necessary parties to dedicate property or easements with title acceptable to TMWA.



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

		Demand (Acre Feet)
1 Existing demand (current usage) at Service Property		0.00
2 Number of units _____ x .12 (Apartments)	0.00	
3 Estimated Lot Demands <u>304</u> x 0.36AF per Lot	109.44	
4 Fixture units: _____ x 15x 365x 3.07/ 1 mil	0.00	
5 Landscaping: Turf _____ sq ft x 3.41/ 43,560	NA	
6 Drip	NA	
7 Other calculated demand	<u>NA</u>	
8 New or additional demand at Service Property (lines 2+3+4+5+6)		109.44
9 Total Demand at Service Property (lines 1+8)		109.44
10 Less: Prior demand commitments at service property	0.00	
11 Less: Other resource credits: on subject parcel	0.00	
12 Total Credits (lines 10+11)		0.00
13 Subtotal: Required resource dedication/commitment (lines 9-12)		109.44
14 Factor amount (0.11 x Line 13)		NA
15 Return flow required ([1-2.5/duty] x Line 13)		<u>NA</u>
16 TOTAL RESOURCES REQUIRED (lines 13+14+15)		109.44
17 Price of Water Rights per AF \$7,500		\$ NA
18 Will Serve Commitment Letter Preparation Fee (\$100 per letter)		\$ 100
19 Due Diligence Fee (\$150.00 per parcel)		\$ 0
20 Document Preparation Fees (\$100.00 per document)		\$ 0
21 Meter Contribution (\$1,830 x 109.44 acre feet of demand)		\$ <u>NA</u>
22 TOTAL FEES DUE (lines 17+18+19+20+21)		\$ 100

Project: Estate Road, Discovery, +/- 304 SFR Lots

Applicant: Derek Larson **Quote date:** 3/14/2016

Phone: Attn: Derek Larson 544-5482 **Tech contact:** David 834-8021

APN: 080-730-18, -19, -21, 080-635-01, -02, 552-210-06 thru -09 **Project No:** 16-4909

Remarks: Fees quotes are valid only within 15 calendar days of Quote Date, when annexed.

The 109.44 acre feet may result in the assessment of facility fees pursuant to TMWA's Rules and Rates.

This estimate does not display resource purchase from TMWA, resource dedication will be processed

at time of project submittal. A more accurate demand/fees will also be assessed at time of project submittal.