GEOTECHNICAL INVESTIGATION REPORT

for

TAHOE VALLEY STORMWATER AND GREENBELT IMPROVEMENTS South Lake Tahoe, California

Prepared for:

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South Lake Tahoe, California

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GEOTECHNICAL INVESTIGATION REPORT for TAHOE VALLEY STORMWATER AND GREENBELT IMPROVEMENTS South Lake Tahoe, California

INTRODUCTION

Submitted herewith are the results of Lumos and Associates, Inc. (Lumos) geotechnical investigation for the Tahoe Valley Stormwater and Greenbelt Improvement project to be located in South Lake Tahoe, California (Plate 1). The project site boundaries are as far north as Council Rock Drive and as far south as F Street, west to Margaret Avenue, and east to Melba Drive.

It is our understanding that the proposed Tahoe Valley Stormwater and Greenbelt Improvement project will consist of stormwater diversion and collection upgrades that will consist of water quality treatment/infiltration basins and stormwater improvements.

The purpose of our investigation was to characterize the site geology and soil conditions, describe the native soils, and determine their engineering properties as they relate to the proposed construction. The investigation was also intended to identify possible adverse geologic, soil, and or water table conditions. However, this study did not include an environmental assessment, a fault study, or an evaluation for soil and/or groundwater contamination at the site.

This report concludes with recommendations for site grading, storm drain pipe construction, and Portland cement concrete. In addition, information such as logs of all exploratory test pits, laboratory test data, and percolation test results are provided in this report. The recommendations contained herein have been prepared based on our understanding of the proposed construction, as outlined above. Re-evaluation of the recommendations presented in this report should be conducted after the final site grading and construction plans are completed, if there are any variations from the assumptions described herein.

It is possible that subsurface discontinuities may exist between and beyond exploration points. Such discontinuities are beyond the evaluation of the Engineer at this time. No guarantee of the consistency of site geology and sub-surface conditions is implied or intended.

GEOLOGIC SETTING

South Lake Tahoe is located at the southern end of the Lake Tahoe Basin, a large faultbounded valley within the eastern portion of the Sierra Nevada geomorphic province. Lake Tahoe is one of the world's largest and deepest alpine lakes, approximately 22 miles long and at least 1,600 feet deep. The Sierra Nevada is geographically characterized by a steep eastern slope that separates the Sierra Nevada and Great Basin geomorphic provinces and a gentle western slope that eases down into the Great Valley.

The surface geology of the project has been mapped by George J. Saucedo (2005). The project encompasses a large area and the mapping indicates that alluvial soils (Q) from the Holocene and Pleistocene periods underlie the site, that flood plain deposits (Qfp) from the Holocene period underlie the site, and that Lacustrine terrace deposits (Qlt) from the Pleistocene period underlie the site. The map also indicated an inferred fault is located within the site boundary at the extreme southern end. The fault may be within 50 feet of the proposed improvements, the customary setback from a potentially active fault to a structure. Holocene faults (less than 12,000 years old) are considered active. This fault is not shown on the "Earthquake Hazard Map, South Lake Tahoe Quadrangle" by Dennis Trexler and John W. Bell (1979), therefore, we understand this fault to be older than a Holocene (Plate 5).

The geologic evolution of the Sierra Nevada province is extremely complex and involved a long sequence of events. First, subduction and abduction of oceanic plates below and across the continental plate began. This interaction between the two plates created different metamorphic rock complexes at the collision area known as a trench. Then, the deep continental crust began to melt into granite magma and volcanoes began to erupt above the granite batholiths. The basin and range to the east began to widen and open. Finally, the Sierra Nevada began to rise and tilt a few degrees to the west.

Glaciers have played an active roll in shaping the Sierra Nevada Mountains, particularly during the past two (2) million years. Alpine glaciers were present around Lake Tahoe during much of this period and extended below the current level of the Lake along the west shoreline (i.e., at Emerald Bay). The large U-shaped valleys surrounding the Lake were carved out by ice and display typical glacial features such as polished rock, lateral moraines and glacial lakes (tarns).

SEISMIC CONSIDERATIONS

South Lake Tahoe, similar to many areas of California, is located near active faults, which are capable of producing significant earthquakes. This area can be described as an area that may experience major damage due to earthquakes having intensities of VII or more when evaluated using the Modified Mercalli Intensity Scale of 1931 (Plate 3).

South Lake Tahoe is located within the Sierra Nevada-Great Basin seismic belt and at least two (2) major earthquakes, with magnitudes equal to or greater than 6.0 (Plate 4), have occurred historically within thirty miles of the site (DePolo and DePolo, 1999).

No evidence of Holocene faulting was found in the field or on published fault maps, which would indicate faulting on this site. However, the approximate location of the inferred fault (Saucedo, 2005) older than 1.6 million years (which is not considered active) is located along the southern border of the site. It is worth noting that the potential for surface rupture at or near these faults is inferred to be low. The largest active fault in the area, however, is the Genoa Fault with its surface trace, located approximately 7 miles east of the site. The Genoa Fault System is reported to have had activity within the past five hundred (500) years and be capable of producing earthquakes with a maximum moment magnitude of 6.9 (California Department of Conservation, 1996).

Ground shaking should be anticipated at the site and intensities should be governed by a design earthquake occurring within a few miles of the site on faults belonging to the Sierra Nevada – Great Basin seismic belt that crosses the Tahoe region. For design purposes, ground-shaking intensities should be based on a design earthquake occurring on the Genoa Fault Zone with a maximum credible earthquake of 7.5 in moment magnitude.

Liquefaction is the phenomena where more commonly loose saturated sands or silty sands lose their shear strength when subjected to cyclic loading, and become unstable.

Large earthquakes, as described above, may provide that type of cyclic loading. This condition was not encountered on this site during our field investigation. The native sands encountered were medium dense during our field exploration. Therefore, in our opinion, the potential for liquefaction to occur at the site is very low.

2012 IBC Design: The mapped maximum considered earthquake spectral response acceleration at short periods (S_5) is 1.791g corresponding to a 0.2 second spectral response acceleration at five percent (5%) of critical damping and for a Site Class B The mapped maximum considered earthquake spectral response (IBC 1613.3.1). acceleration at a 1-second period (S_1) is 0.611g corresponding to a 1.0 second spectral response acceleration at five percent (5%) of critical damping and for a Site Class B (IBC 1613.3.1). According to section 1613.3.2, when the soil properties are not known in sufficient detail to a depth of 100 feet, site Class D shall be assumed. Therefore, the spectral response accelerations must be adjusted for Site Class effects. The site coefficient for spectral response accelerations adjustment at short periods (Fa) is 1.0 (IBC Table 1613.3.3(1)). The site class effect for spectral response accelerations adjustment at 1-second periods (Fv) is 1.5 (IBC Table 1613.3.3(2)). The maximum considered earthquake spectral response acceleration parameter for short periods (SMs) is 1.791g and for 1-second periods (Sm1) is 0.917g. This corresponds to design spectral response acceleration parameters of 1.194g for short periods (S_{DS}) and of 0.611g for 1second periods (SD1).

It is emphasized that the above values are the minimum requirements intended to maintain public safety during strong ground shaking. These minimum requirements are meant to safeguard against loss of life and major structural failures, but are not intended to prevent damage or insure the functionality of the structure during and/or after a large seismic event. Additionally, they do not protect against damage to non-structural components or the contents of the structure.

SITE CONDITIONS AND FIELD EXPLORATION

At the time of our investigation, the site is currently developed with residences/businesses with associated roadways, paths, and utilities and generally slopes downwards towards Lake Tahoe from south to north. The proposed storm water treatment/infiltration locations are currently vacant, undeveloped lots within residential/commercial areas.

Field exploration included a site reconnaissance and subsurface soil-exploration. During the site reconnaissance, surface conditions were noted and the locations of the exploratory test pits were determined. They were located using existing features and a conceptual plan available to Lumos as a guide. Locations and elevations of the exploratory test pits should be considered accurate only to the degree implied by the method used.

Eleven (11) exploratory test pits were excavated within the proposed improvement area to a maximum depth of nine and a half (9.5) feet below-ground-surface (bgs). The approximate locations of the exploratory test pits within the site are shown on Plate 2. The subsurface soils were continuously logged and visually classified in the field by our Geotechnical Engineering Intern in accordance with the Unified Soil Classification System. Representative soil samples were collected at regular intervals within the exploratory test pits and subsequently transported to our Carson City geotechnical laboratory for testing and analysis.

The subsurface soils consisted generally of silty sands, silty sands with gravel, poorly graded sands with silts, and well graded sands with silts and gravel to the total depths explored for this project. Groundwater was encountered at the time of our field investigation. This occurred in Percolation Test Pit (Perc-6) at a depth of 9.2 feet. Mottling, which indicates previous ground water presence, was observed in Percolation Test Pit (Perc-6) at a depth of 4 feet. Seasonal groundwater (water table) fluctuations should be anticipated at the site.

FIELD AND LABORATORY TEST DATA

Field and laboratory data was developed from samples taken and tests conducted during the field exploration, field testing, and laboratory testing phases of this project. The test pits were excavated using a Mini Excavator (CAT 35D). Representative samples of each native soil type encountered were collected using bulk-sampling techniques. All samples were subsequently transported to our Carson City geotechnical laboratory for testing and analysis.

Laboratory tests performed on representative samples included sieve analysis, Atterberg limits, moisture-density curve, and direct shear. Much of this data is displayed on the "logs" of the exploratory test pits to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the exploratory test pits are included in Appendix A of this report as Plates A-1 through A-11. Plate A-12 describes the various symbols and nomenclature shown on the logs.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-5. Laboratory testing was performed per ASTM standards, except when test procedures are briefly described and no ASTM standard is specifically referenced in the report. Atterberg limits were determined using the dry method of preparation (Plate B-2). Special testing conducted for this project is described below.

Percolation tests were performed in test pits Perc 1 through Perc 6. The results are included in Appendix C

The soil samples obtained during this investigation will be held in our laboratory for 30 days from the date of this report. The samples may be retained longer at an additional cost to the client or obtained from this office upon request.

DISCUSSION AND RECOMMENDATIONS

General

From a geotechnical viewpoint, the site is considered suitable for the proposed improvements when prepared as recommended herein.

During earthwork, any existing improvements within the proposed improvements should be demolished and/or removed offsite, or salvaged if to remain. Demolition/ salvage activities, where applicable, should be conducted in general accordance with the specifications presented in Appendix E.

The following recommendations are based upon the construction and our understanding of this project, as outlined in the introduction of this report. If changes in the construction are proposed, they should be presented to the Lumos Geotechnical Department, so that these recommendations can be reviewed and modified in writing, as necessary. As a minimum, final construction drawings should be submitted to the Lumos Geotechnical Department for review prior to actual construction and verification that our geotechnical design recommendations have been implemented.

General Site Grading

Root- or organic-laden soils encountered during excavations, should be stockpiled in a designated area on site for later use in landscaping, or removed off site as directed by the owner. Excavated soils free from any organics, debris or otherwise unsuitable material and with particles no larger than three (3) inches in maximum dimension may be stockpiled and moisture conditioned for later use as compacted fill and backfill provided it meets the criteria for structural fill/ trench backfill soils. It is anticipated all site soils will be suitable for reuse as structural fill/trench backfill.

Existing fill and trench backfill shall be completely removed, replaced, moisture conditioned, and recompacted. Removals should extend horizontally beyond the

perimeter of the improvements equidistant to the depth of vertical removal. Exposed surfaces to receive fill shall be scarified to a depth of 12 inches, oversize particles (+3") removed, moisture conditioned to within two percent (2%) of optimum moisture content, and recompacted to a minimum of ninety percent (90%) of the ASTM D1557 standard. The overexcavated materials shall be replaced with structural fill and prepared as discussed later in the report. The removed material may be reused as structural fill provided the material meets the structural fill/trench backfill specifications.

All surfaces to receive fill, should be observed and approved by a Lumos representative prior to placement of the fill. The surfaces shall be scarified to a minimum depth of twelve (12) inches, particles over three (3) inches removed, moisture conditioned to within two percent (2%) of optimum, and re-compacted to at least ninety percent (90%) of the ASTM D1557 standard. Fill material should not be placed, spread or compacted while the ground is frozen or during unfavorable weather conditions. When site grading is interrupted by heavy rain or snow, grading or filling operations should not resume until a Lumos representative approves the moisture content and density conditions of the subgrade or previously placed fill.

Unstable conditions due to yielding and/or pumping soils may be encountered on site. If yielding or pumping conditions are encountered, the soils should be scarified in place, allowed to dry as necessary and re-compacted, where applicable. Alternatively, the unsuitable or saturated soil should be removed, the exposed surface leveled and compacted/tamped as much as practical without causing further pumping, and covered (including the sides) with geotextile stabilizing fabric (Mirafi HP370 or other equivalent). The fabric should then be covered with at least 12 inches of 4 to 8 inch **angular rock fill** with enough fines to fill the inter-rock pore spaces. Placement should be by end dumping. No traffic or other action should be allowed over the fabric, which may cause it to deflect/deform prior to cobble placement. Test sections should be used to determine the minimum thickness and/or number of layers required for stabilization. If there is water present at the bottom of the excavation de-watering may be necessary.

Stabilization should be evaluated by proof-rolling standards commensurate with the

equipment used, and approved by a Lumos representative. The placement of the stabilizing rock-fill may require additional over-excavation to maintain appropriate grading elevations. A filter fabric (Mirafi 180N or equal) should also be placed over the cobble rock fill to prevent piping of fines from covering soils into the stabilizing rock matrix.

Structural fill and trench backfill soils to be used for this project should consist of nonexpansive material (LL less than 35 and/or a PI less than 12, and/or an Expansion Index less than 20), and should be free of contaminants, organics (less than two percent (2%)), rubble, or natural rock larger than three (3) inches in largest dimension. The structural fill shall have a minimum "R-value" of 45, a soluble sulfate content of less that 0.1%, and meet the following gradation specifications (see Table 1). Any import soils should be tested and approved prior to being placed or delivered on-site (seven day advanced notice).

Sieve Size	% Passing
3″	100
3/4″	70-100
#40	15-65
#200	10-25

 TABLE 1

 STRUCTURAL FILL/TRENCH BACKFILL GRADATION SPECIFICATION

Compacted structural fill/trench backfill should be placed only on compacted sub-grade or on compacted structural fill in lifts not exceeding eight (8) inches in loose thickness, moisture conditioned to within two percent (2%) of optimum, and compacted to at least ninety percent (90%) relative compaction, as determined by the ASTM D1557 standard.

Landscaped areas should be cleared of all organic and objectionable material such as wood, root stumps, etc., if any. In landscape fill areas, fill should be placed in loose lifts not exceeding eight (8) inches, and compacted to at least ninety percent (90%) relative compaction to prevent erosion.

Percolation test results indicate that many of the site soils are relatively permeable (percolation <60 min/inch) (refer to Appendix C and following table). However, cemented soils were encountered in a few of the test pits (refer to logs), which increases the percolation rate. In order to decrease the percolation in the cemented soils, we recommend the scarification of the soils in the bottom of the infiltration basins to a depth of 12 inches. Percolation testing should be performed to insure the scarification of the cemented soils has been effective and to verify the design percolation rate for the pond.

Saturate	Percolation Rate		
cm/day	cm/hr	µm/sec	min/in
>864.0	>36.00	>100.08	<1
50.0 to 864.0	2.08 to 36.00	5.79 to 100.08	5
25.0 to 50.0	1.04 to 2.08	2.90 to 5.79	10
17.4 to 25.0	0.73 to 1.04	2.02 to 2.90	15
15.9 to 17.4	0.66 to 0.73	1.84 to 2.02	20
14.6 to 15.9	0.61 to 0.66	1.69 to 1.84	25
13.3 to 14.6	0.55 to 0.61	1.54 to 1.69	30
12.0 to 13.3	0.50 to 0.55	1.39 to 1.54	35
11.0 to 12.0	0.46 to 0.50	1.27 to 1.39	40
10.0 to 11.0	0.42 to 0.46	1.16 to 1.27	45
9.1 to 10.0	0.38 to 0.42	1.05 to 1.16	50
8.3 to 9.1	0.35 to 0.38	0.96 to 1.05	55
<8.3	< 0.35	< 0.96	>60

TABLE 2: SATURATED HYDRAULIC CONDUCTIVITY AND PERCOLATION RATES***

***Adapted from the State of Virginia, Virginia Department of Health, September 20, 2001, Footprint Committee Meeting. See References at the end of this document.

A representative of Lumos should be present during all site clearing, excavation removals, and grading operations to ensure that any unforeseen or concealed conditions within the site are identified and properly mitigated, and to test and observe earthwork construction. This testing and observation is an integral part of our services as acceptance of earthwork construction and is dependent upon compaction and stability of the subgrade soils. The Geotechnical Engineer may reject any material that does not meet acceptable fill, compaction, and stability requirements. Further, recommendations in this report are provided upon the assumption that earthwork construction will conform to recommendations set forth in this section of the report.

SLOPE STABILITY AND EROSION CONTROL

The results of our exploration, testing, and analysis confirm that 1.5:1 (H:V) maximum slopes will be stable for on-site materials both in cut and fill. Calculations are in Appendix F. All slopes shall incorporate a brow ditch to direct surface drainage away from the slope face. Slopes steeper than 1.5:1 will require stabilization, such as retaining walls.

The potential for dust generation is high at this project. Dust control will be mandatory on this project in order to comply with air quality standards. The contractor shall be responsible for submitting a dust control plan and securing any required permits.

Stabilization of all slopes and areas disturbed by construction will be required to prevent erosion and to control dust. Stabilization may consist of rip-rap, revegetation, or dust pallative, depending on the inclination of the slope.

In order to minimize storm water discharge from this site, best management practices should be implemented.

PORTLAND CEMENT CONCRETE

Portland cement concrete utilized on site (curbs, gutters, walkways, etc.) shall have a minimum compressive strength of 4,000 psi, a maximum water/cement ratio of 0.45, an entrained air content of between 5.5 and 8.0%, a slump of between 1-4 inches, a minimum of seven (7) sacks of cement per cubic yard and contain polypropylene fiber at a rate of 1.5 pounds per cubic yard. All Portland cement concrete shall be underlain by Class 2 aggregate base compacted to at least ninety-five percent (95%) (ASTM D1557). The underlying subgrade shall be prepared and compacted as discussed earlier in this report.

UTILITY EXCAVATIONS

On-site soils are anticipated to be excavatable with conventional construction equipment. Compliance with OSHA regulations should be enforced for Type C soils. Excavated soils may be suitable for backfill of utility trenches after screening any oversize (+3") material and debris, provided they meet the requirements of structural fill/trench backfill as provided earlier in the report. However, on-site soils will not meet the minimum requirements for trench bedding and should be imported, where required. If groundwater is encountered, 3/4 inch "Drain Rock" shall be utilized as bedding to a depth of 1 foot above the water level. The "Drain Rock" shall be encapsulated with a Geofilter Fabric (Mirafi 180N or equivalent).

MOISTURE PROTECTION, EROSION AND DRAINAGE

The finish surfaces around all structures should slope away from any foundations and toward appropriate drop inlets or other surface drainage devices. It is recommended that within ten (10) feet of the foundations a minimum slope of five percent (5%) be used for soil subgrades and two percent (2%) be used for pavements. These grades should be maintained for the life of the structures.

CONSTRUCTION SPECIFICATIONS

All work shall be governed by the City of South Lake Tahoe Public Improvements and Engineering Standards, except as modified herein.

LIMITATIONS

This report has been prepared in accordance with the currently accepted engineering practices in Northern Nevada. The analysis and recommendations in this report are based upon exploration performed at the locations shown on the site plan, the proposed improvements as described in the Introduction section of this report and upon the property in its condition as of the date of this report. Lumos makes no guarantee as to the continuity of conditions as subsurface variations may occur between or beyond exploration points and over time. Any subsurface variations encountered during construction should be immediately reported to Lumos so that, if necessary, Lumos' recommendations may be modified.

This report has been prepared for and provided directly to the Cardno, Inc. ("The Client"), and any and all use of this report is expressly limited to the exclusive use of the Client. The Client is responsible for determining who, if anyone, shall be provided this report, including any designers and subcontractors whose work is related to this project. Should the Client decide to provide this report to any other individual or entity, Lumos shall not be held liable for any use by those individuals or entities to whom this report is provided. The Client agrees to indemnify, defend and hold harmless Lumos, its agents and employees from any claims resulting from unauthorized users.

This report shall not be utilized to create a maximum cost estimate for the costs associated with construction as costs may vary depending upon any subsurface variations encountered. Further, this report is not intended for, nor should it be utilized for, bidding purposes. All additional plans and specifications should be submitted to Lumos for review, comment and approval, prior to submission of such plans or specifications to the building department or commencement of construction pursuant to such plans or specifications. A failure to submit to Lumos additional plans and specifications related to this report, thereafter relied upon by any person, shall be deemed an unauthorized use of this report. Any unauthorized use of this report, including bidding, releases Lumos from any and all liability related to the unauthorized use. The Client agrees to indemnify, defend and hold harmless Lumos, its agents and

employees from any and all claims, causes of action or liability arising from any claims resulting from an unauthorized use of this report.

As explained above, subsurface variations may exist and as such, beyond the express findings located in this report, no warranties express, or implied, are made by this report. No affirmation of fact, including but not limited to statements regarding suitability for use of performance shall be deemed to be a warranty or guaranty for any purpose.



Michael Hartley, E.I. Geotechnical Intern Lumos and Associates, Inc. Mitch Burns, P.E. Materials Engineering Manager Lumos and Associates, Inc.

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USGS 2012 Website, <u>www.eqdesign.cr.usgs.gov</u>





MODIFIED MERCALLI INTENSITY SCALE

INTENSITY	EFFECTS
- I	Not felt except by a very few under especially favorable circumstances.
11	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
- 111	Felt quite noticeable indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
ĪV	During the day felt indoors by many, outdoors by few. At night some awaken. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building; standing motor cars rock noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well- built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Disturbs persons driving motor cars.
ĪX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	Some well-built wooden structures destroyed; most masonry and frame structures with foundations destroyed; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (sloped) over banks.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipe lines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

From Wood and Newman, 1931, by U.S. Geological Survey, 1974, Earthquake Information Bulletin, v. 6, no. 5, p. 28

Richter Magnitude	Intensity (maximum expected Modified Mercalli)
3.0 - 3.9	1 -
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - VIII
7.0 - 7.9	IX - X
8.0 - 8.9	XI - XII



TAHOE VALLEY STORM WATER AND GREEN BELT IMPROVEMENTS **MODIFIED**

MERCALLI SCALE



CALIFORNIA





APPENDIX A



											TE	ST	PIT	⁻ No). 1
Logo	ged E	Зу:	B. Sexton			Total De	pth:	9.5	feet						
Date	e Log	ged	10-12-16			Water De	epth:	No	grou	Indw	ater	enco	unte	red	
Equi	pme	nt T	ype: Caterpiller	35D		Ground E	=lev.:	No	t Sur	veye	d				
Depth in Feet	Graphic Log	Sample Type	Percolation Test California Sampler	Solu DESCRIPTION	Ziplock Sample Static Water Table	Natural Moisture Content, %	Moisture Content, %	Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
			2" Asphalt Con			n 2	1								
			8" Decomposed	d Granite		9.2									
	· · · · · ·	R				0.8									
- 1 -			Munsell Color 1 (SM). Slightly Mo Cemented. Roo Silt	DYR 6/3. Pale Bro Dist, Medium Dens ts to 4', Estimated:	own, Silty SAND e, Weakly 70% Sand, 30%										
- 3 -															
- 4 -		B	Mottling at 4'												
- 5 -			Munsell Color 5	5YR 4/4. Reddish	Brown. Poorly	6.0									
US_LAB.GD1_10/28/16			Graded SAND (Estimated: 5% C	<u>SP),</u> Moist to Wet, Bravel, 90% Sand,	Medium Dense, 5% Silt										
- 8 6 - 8 6 - 9		В				9.0									
P_FULL_PAGE_TAHOE VA			Test pit terminated at 9.5 f	eet.											
			rest Pits backfilled withou	t compaction verification											
LUN		4	Lumos and 800 E. Collec Carson City,	Associates ge Parkway NB 89706	Tahoe Val	ey Storm	water	[•] and TOF	Gree RY T	enbeli EST	t Imp. F PI T	Г		PLA	TE
LU	M & A	09 550	775 883 707 Fax: 775 883 CIATES mhartley@lui	7 3 7114 mosinc.com	Job Number: 8937.0				<u>.</u>	Date:	Octo	- per 201	6	A-	7

TEST PIT												۲ Nc). 2			
Logo	jed E	By:	B. Sexton			То	Total Depth: 9 feet									
Date	Log	ged	10-12-16			Wa	ater De	epth:	No	grou	Indw	ater	enco	ounte	ered	
Equi	pme	nt Ty	pe: Caterpiller	35D		Gr	ound E	Elev.:	No	t Sur	veye	d			1	
Depth in Feet	Graphic Log	Sample Type	Percolation Test California Sampler	Split Spoon Bulk Sample	Ziplock Sample Static Wat Table	ter	atural Moisture Content, %	Moisture Content, %	ry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % 3" - #4 Sieve)	Sand, % t - #200 Sieve)	Fines, % < #200 Sieve)	R-Value	tpansion Index
		"		SOIL DESCRIPTIO	N		Na		ā				₩ <u> </u> <u> </u>	Ľ		Ш×
- 1 - - 2 - - 3 - - 4 - - 5 - - 6 - - 7 - - 8 - - 8 -		B	Munsell Color 5 with Gravel (SM Estimated: 10%	SOIL DESCRIPTION SYR 5/2. Reddish J. Dry, Medium E Gravel, 65% San	n Gray, Silty SA Dense, Roots to d, 25% Silt	<u>ND</u> 5', 9.0	2						(主)			
			Test pit terminated at 9 fee Test Pits backfilled without	t. compaction verification	_											
			Lumos and	Associates	Tahoe	/allev	Storm	water	and	Gree	enbel	t Imp				TF
LU	M		800 E. Colleg Carson City, 775 883 707 Fax: 775 883 mhartlev@lur	ge Parkway NB 89706 7 3 7114 mosinc.com	LOG	OF EX	XPLC	RA	TOF	RY T	ES	ΓΡΓ	г		A-	8
	αA	ออบ	UALES	-	Job Number: 893	7.000					Date:	Octo	ber 20	16		

LUMOS TP FULL PAGE TAHOE VALLEY SW AND GB.GPJ US LAB.GDT 10/28/16

									TE	EST	P۱٦	۲ Nc). 3	
Log	ged l	By:	B. Sexton		Total De	Total Depth: 9 feet								
Da	e Log	ged	10-12-16		Water De	epth:	No	grou	undw	ater	enco	unte	ered	
Equ	uipme	ent Ty	ype: Caterpiller 35D		Ground E	Elev.:	No	t Sur	veye	d				
Depth in Feet	Graphic Log	Sample Type	Percolation Split Test Spoon California Bluk Sampler Sample	Ziplock Sample Static Water Table	Vatural Moisture Content, %	Moisture Content, %	Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % #4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
_	_		SOIL DESCRIPT	ON	2						#)			ш
- 1 - 2 - 3 - 4 - 5 - 6 - 7 - 7 - 8 - 7 - 8 - 7 - 7 - 7 - 7 - 7		B	Munsell Color 5YR 4/6, Yellow (SM), Dry, Medium Dense, Wea Roots, Estimated: Trace Grave Silt	vish Red, Silty SAN akly Cemented, , 80% Sand, 20%	4.5									
- 9	<u>[·]·]</u>	1			9.0									
S IF FULL FAGE LAHUE VAL			Test pit terminated at 9 feet. Test Pits backfilled without compaction verification											
DMU D			Lumos and Associates	Tahoe Va	lley Storm	wate	r and	Gree	enbel	t Imp				TE
	JM		800 E. College Parkway Carson City, NB 89706 775 883 7077 Fax: 775 883 7114 mbartlev@lumosing.com	LOG OF	EXPLO	ORA	TOF	ΥΥ	ES	ΓΡΓ	Г		A-	9
	& A	SSO	CIATES maney@umosilic.com	Job Number: 8937.	000				Date:	Octo	ber 201	16		

											TE	EST	PIT	⁻ No). 4
Logo	ged E	By:	B. Sexton		Tota	Total Depth: 9 feet									
Date	e Log	ged	10-12-16		Wate	er De	pth:	No	grou	Indw	ater	enco	unte	red	
Equi	pme	nt ly	pe: Caterpiller 35D		Grou	und E	lev.:	NO	t Sur	veye	d				
Depth in Feet	Graphic Log	sample Type	Percolation Split Test Spoon California B Sampler Sample	Ziplock Sample Static Water Table		ttural Moisture Content, %	Moisture Content, %	y Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % 3" - #4 Sieve)	Sand, % - #200 Sieve)	Fines, % < #200 Sieve)	R-Value	pansion Index
		0	SOIL DESCRIPTION	N		Sa		ŋ			0	<u></u>	<u>v</u>		Ш
			Munsell Color 10YR 5/6. Yellow	ish Brown. Siltv											
- 1 -			<u>SAND (SM),</u> Dry, Medium Dense, Sand, 20% Silt	Estimated: 80%											
- 2 -															
- 3 ·		R													
- 4 -															
- 5 -															
- 6 ·					7.0										
- 7 -		В	Munsell Color 10YR 6/4, Light Y Poorly Graded SAND with Silt (Medium Dense	′ellowish Brown. SP-SM). Dry,		1.7	1.7		NP	NP	2.9	89.7	6.7		
- 9 -					9.0										
			Test pit terminated at 9 feet. Test Pits backfilled without compaction verification												
		_	Lumos and Associates	Tahoe Va	llev S	stormv	vater	and	Gree	enbel	t Imn			N IC	TE
		Ą	800 E. College Parkway Carson City, NB 89706 775 883 7077	LOG OF	EX	PLO	RA	TOF	RY T	EST	r Pl	Г	'		
	М & А	DS sso	Fax: 775 883 7114 CIATES mhartley@lumosinc.com	Job Number: 8937.0	000					Date:	Octo	ber 201	16	A- ′	10

TEST PIT										۲ Nc	b. 5					
Logo	ged E	By:	B. Sexton			То	tal Dep	oth:	9 fe	et						
Date	e Log	ged:	10-12-16			Wa	ater De	epth:	No	grou	ndw	ater	enco	unte	red	
Equi	ipme	nt I	pe: Caterpiller	35D		Gr	ound E	lev.:	No	t Sur	veye	d				
th in set	ic Log	e Type	Percolation Test	Split Spoon	Ziplock Sample		Moisture ent, %	sture ent, %	ısity, pcf	uid it, %	ticity x, %	el, % · Sieve)	d, % 00 Sieve)	s, %) Sieve)	alue	on Index
Dep Fe	Graph	Sampl	California Sampler	B Bulk Sample	Table ⊻ Static Water		Natural I Conte	Mois Conte	Dry Der	Lini	Plas Inde	Grav (3" - #4	San (#4 - #20	Fine (< #200	R-V	Expansi
	 7::1:1		Munaall Calar 7	SUIL DESCRIPTION	N Doorly Croded											
- 1 - - 2 - - 3 - - 5 -		B	SAND with Silt	<u>(SP-SM).</u> Dry, Me	edium Dense		0.9	0.9		NP	NP	9.0	78.2	11.0		
- 7 -																
- 8 -																
						9 0										
- 9 -	+ + + + + + + + + + + + + + + + + + + +															
			Test pit terminated at 9 fee Test Pits backfilled without	t. t compaction verification												
		_	Lumos and	Associates	Tahoe Va	llev	Storm	water	and	Gree	nbeli	t Imp				TE
, , ,			800 E. Colleg Carson City, 775 883 707 Fax: 775 883	je Parkway NB 89706 7 3 7114	LOG OF	E)	KPLC	RA	ΓOF	RY T	EST	r Pl	г		Δ_1	11
20	& A.	sso	CIATES mhartley@lur	mosinc.com	Job Number: 8937.0	000					Date:	Octo	ber 20 ⁻	16		

LUMOS_TP_FULL_PAGE_TAHOE VALLEY SW AND GB.GPJ_US_LAB.GDT_10/28/16

										ΓES	TP	IT N	lo.	Per	c-1
Log	ged I	By:	B. Harer			Total	Depth:	9 f	eet						
Date	e Log	gged	: 10-11-16			Water	Depth:	No	grou	Indw	ater	enco	unte	ered	
Equ	ipme	ent T	ype: Caterpiller	35D		Grour	nd Elev.:	No	t Sur	veye	d				
Depth in Feet	Graphic Log	Sample Type	Percolation Test California Sampler	Soli Description	Ziplock Sample Static Water Table	Natural Moisture	Content, % Moisture Content. %	Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
	<u></u>	4	Duff												
- 1 - 2 - 3 - 4 - 5 - - 6		B	Duff Munsell Color ' SAND (SM), Dry Cemented Percolation Test #1) Munsell Color 2 Medium Dense	10 YR 5/8, Yellov , Medium Dense t Result = 6.7 mir t Result = 16.0 m .5Y 5/6, Light Oliv	wish Brown, Silty , Slightly n//in (Test Hole #2) nin/in (Test Hole	0.5	2 2.2		NP	NP	7.9	71.1	15.1		
		B													
			Test pit terminated at 9 fee Test Pits backfilled withou Lumos and 800 E. Colleç Carson City, 775 883 707 Fax: 775 88	et. It compaction verification I Associates ge Parkway NB 89706 7 3 7114	Tahoe Va LOG OF	Illey Sto	ormwate	r and	Gree RY T	enbel ES	t Imp			PLA A-	TE 1
	& A	SSO	CIATES manuey@iu		Job Number: 8937.	000				Date:	Octo	ber 201	16		

TEST PIT No. Per												c-2		
Logged By: B. Sexton Total Depth: 9 feet														
Date	Log	ged	: 10-11-16		Water De	epth:	No	grou	Indw	ater	enco	unte	red	
Equi	pme	nt Ty	ype: Caterpiller 35D		Ground E	Elev.:	No	t Sur	veye	d				
Depth in Feet	Graphic Log	Sample Type	Percolation Split Test Spoon California Bulk Sampler Sample	Ziplock Sample Sattic Water Table	Natural Moisture Content, %	Moisture Content, %	Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % #4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
	1.42.5		SOIL DESCRIPTION											
	[<u>* '</u> , [/,		Duff		0.5									
- 1 -			Munsell Color 10 YR 7/4, Very Pa SAND with Gravel (SM), Dry, Rou Estimated: 10% Gravel, 65% Sand	ale Brown, Silty Inded, I, 35% Silt										
- 3 -		B	Percolation Test Result = 5.7 min/i	n (Test Hole #4)										
- 4 -		_	Munsell Color 2.5Y 5/4, Light Oli Graded SAND with Silt and Grav	ve Brown, Well el (SW-SM),	4.5									
- 5 -			Slightly Moist, Medium Dense, Rou Percolation Test Result = 4.0 min/i	inded n (Test Hole #3)										
- 7 -		В			3.5	3.5		NP	NP	9.7	71.9	9.0		
- 8 -					9.0									
			Test pit terminated at 9 feet. Test Pits backfilled without compaction verification											
		_	Lumos and Associates	Tahoe Val	ley Storm	water	and	Gree	enbel	t Imp				TF
LU	M		800 E. College Parkway Carson City, NB 89706 775 883 7077 Fax: 775 883 7114 mhartley@lumosinc.com	LOG OF	EXPLO	ORA	TOF	RY T	'EST		Γ		A-	2
	G A	550		JOD INUMDER: 8937.0	JU				Date:	UCto	uer 201	σ		

LUMOS_TP_FULL_PAGE_TAHOE VALLEY SW AND GB.GPJ_US_LAB.GDT_10/28/16

									٦	ΓES	ΤP	IT N	lo.	Per	c-3
Logo	ged E	By:	B. Sexton			Total De	epth:	9 fe	et						
Date	10-11-16		Water Depth: No groundwater encountered						red						
Equi	pme	nt Ty	/pe: Caterpiller 35D			Ground	Elev.:	No	t Sur	veye	d				
epth in Feet	phic Log	ple Type	Percolation Test	Split Spoon	Ziplock Sample	al Moisture ntent, %	oisture ntent, %	ensity, pcf	-iquid mit, %	asticity dex, %	avel, % #4 Sieve)	and, % 200 Sieve)	nes, % 00 Sieve)	-Value	ision Index
	Gra	Sam	Sampler	Sample	[–] Table	Col	≥ö	Dry D		르으	Gr (3" -	3 # - 1 * S	⊑¥ ∑	Υ Υ	Expar
			SOI	IL DESCRIPTION											ш
	1/ · <u>//</u> · //		<u>Duff</u>			0.5									
- 1 - - 2 -		B	Munsel Color 7.5 YI SAND (SM). Dry, Me	R 5/6, Strong dium Dense	<u>Brown, Silty</u>	1.9	1.9		NP	NP	13.3	73.2	13.5		
- 4 -			Percolation Test Res Percolation Test Res #5) Munsell Color 10YR Moist, Medium Dens Material	sult = 2.3 min/i sult = 30.0 min 5/6, Yellowish e, More Coars	in (Test Hole #6) n/in (Test Hole n Brown, Slightly se Than Above										
- 7 -		В				9.0									
			Test pit terminated at 9 feet. Test Pits backfilled without compa	action verification											
			Lumos and Asso	ociates	Tahoe Va	lley Storn	nwatei	and	Gree	enbel	t Imp			PLA	TE
LU			800 E. College Par Carson City, NB 89 775 883 7077 Fax: 775 883 711 mhartley@lumosin	rkway 9706 4 ic.com	LOG OF		ORA	TOF	RY T	ES1		Γ		A-	3
	X A	530	UIATED		Job Number: 8937.0	000				Date:	Octol	oer 201	6		

LUMOS TP FULL PAGE TAHOE VALLEY SW AND GB.GPJ US LAB.GDT 10/28/16

									Т	ES.	ΤP	IT N	lo. I	Pere	c-4
Logo	ged E	By:	B. Sexton			Total De	epth:	9 fe	eet						
Date	e Log	ged	10-11-16			Water D	epth:	No	grou	ndwa	ater	enco	unte	red	
Equi	pme	nt T	pe: Caterpiller 35	כ		Ground	Elev.:	No	t Surv	veye	d				
Depth in Feet	Graphic Log	Sample Type	Percolation Test [California Sampler S	Split Spoon Bulk Sample	Ziplock Sample Static Water Table	Natural Moisture Content, %	Moisture Content, %	Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
	<u></u>		Duff												
	<u> // . x. /,</u>		<u>Ban</u>			0.5									
- 1 -			Munsell Color 10Y Silty SAND with G Estimated: 10% Gra	′ R 4/6, Dark Ye <u>ravel (SM),</u> Dry avel, 70% Sand	Ilowish Brown, , Medium Dense, I, 20% Silt										
- 3 -		В	Percolation Test Re	esult = 1.7 min/i	n (Test Hole #8)										
- 4 -			Percolation Test Re Munsell Color 2.5Y												
- 6 -		В	Slightly Moist, Medi Above Material	um Dense, Mor	e Course Than										
0 GB.GPJ US_LAB.GDT 10/28															
SW AN						9.0									
5 TP_FULL_PAGE_TAHOE VALLEY 5	<u> </u>		Test pit terminated at 9 feet. Test Pits backfilled without con	npaction verification											
NMO			Lumos and As	sociates	Tahoe Va	ley Storr	nwate	r and	Gree	nbelt	Imp.			Ν	TF
	M & A		800 E. College P Carson City, NB 775 883 7077 Fax: 775 883 71 CIATES	arkway 89706 14 inc.com	LOG OF		ORA	TOF	RY T	EST		-		A-	4
					555 Harribol. 0007.0	~~				2010.			~		

									7	ΓES	T P	IT N	Io .	Per	c-5
Logo	ged E	By:	B. Sexton		Tota	l Dep	oth:	9 fe	et						
Date Logged: 10-11-16							Water Depth: No groundwater encountered								
Equi	pme	nt Ty	vpe: Caterpiller 35D		Grou	und E	lev.:	No	t Sur	veye	d			1	
Depth in Feet	Braphic Log	ample Type	Percolation Split Test Spoon California B Sampler Sample	Ziplock Sample Static Water Table	tural Moistura	tural Molsture Content, %	Moisture Content, %	y Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % " - #4 Sieve)	Sand, % - #200 Sieve)	Fines, % #200 Sieve)	R-Value	oansion Index
		S	SOIL DESCRIPTION	J		Za	-	D			() ()	<u></u>	Ľ	-	Ш. Ш.
	<u> </u>		Duff												
- 1 -			Munsell Color 10YR 6/3, Pale Br (SM), Dry, Medium Dense, Weakl	r <mark>own, Silty SAND</mark> y Cemented	0.5										
- 2 -		В													
- 4 -			Percolation Test Result = 80.0 mi #10)	n/in (Test Hole											
- 5 -			Munsell Color 2.5Y 6/2, Light Brow to Very Moist, Medium Dense Percolation Test Result = 26.7 min #9)	wnish Gray, Moist n/in (Test Hole											
- 7 -		B			1	16.6	16.6		NP	NP	1.6	80.9	16.5	,	
- 8 -			Gravel Below 8'		9.0										
			Test pit terminated at 9 feet. Test Pits backfilled without compaction verification												
Lumos and Associates Taboe Valley Stormwater and Greenbelt Imp									TF						
LU	M		800 E. College Parkway Carson City, NB 89706 775 883 7077 Fax: 775 883 7114 mhartlev@lumosinc.com	LOG OF	EXF	PLO	RA	ΓOF	RY T	ES	ΓΡΓ	Г		A-	5
	& A	550	LIAIES	Job Number: 8937.0	000					Date:	Octo	ber 20	16		

LUMOS_TP_FULL_PAGE_TAHOE VALLEY SW AND GB.GPJ_US_LAB.GDT_10/28/16

										7	ΓES	T P	N TI	lo.	Per	c-6
Log	ged E	By:	B. Sexton			Tota	al Dep	oth:	9.5	feet						
Date	e Log	ged	10-11-16			Wat	ter De	epth:	9.2	feet	±					
Equ	ipme	nt Ty	/pe: Caterpiller	35D		Gro	und E	lev.:	No	t Sur	veye	d				
pth in eet	hic Log	ole Type	Percolation Test	Split Spoon	Ziplock Sample		l Moisture tent, %	isture tent, %	ensity, pcf	quid nit, %	sticity ex, %	vel, % 4 Sieve)	nd, % 200 Sieve)	es, %)0 Sieve)	Value	sion Index
De	Grap	Samp	Sampler		Table		Natura Con	Con	Dry De	ביבי	Pla	Gra (3" - #	Sa (#4 - #2	Fin (< #2(Å	Expans
			Munsoll Color 1	SOIL DESCRIPTION	sh Brown Silty											
- 1			<u>SAND (SM),</u> Slig Cemented	ghtly Moist, Dense,	Moderately											
- 2		В					4.1	4.1		NP	NP	1.3	77.9	20.5		
- 3			Percolation Test #12)	t Result = 8.0 min/i	n (Test Hole											
- 4			Munsell Color 2	5X 6/2 Light Brow	unish Grav, Moist											
- 5 -			to Very Moist, M Cemented	edium Dense, Moc	derately											
- 6			Percolation Test #11)	t Result = 240.0 m	in/in (Test Hole											
8.GDT 10/28/16		B														
0 GB.GPJ US LAE - 8 8			Mottling at 8'													
E VALLEY SW AN			<u>.</u>			9.5										
-ULL_PAGE_TAHOI																
₽ E			Test pit terminated at 9.5 f Test Pits backfilled withou	eet. t compaction verification												
LUMOS			Lumos and	Associates	Tahoe Va	lley S	Storm	water	and	Gree	enbel	t Imp			PLA	TE
	I MI		800 E. Collec Carson City, 775 883 707 Fax: 775 883	ge Parkway NB 89706 7 3 7114 mosing com	LOG OF	EX	PLC	RA	TOF	RY T	ES	r pi	т		A-	6
	& A	SSO	CIATES minaney@iu		Job Number: 8937.0	000					Date:	Octo	ber 20´	16		

			SYM	BOLS	TYPICAL
N	IAJOR DIVISI	ONS	GRAPH	LETTER	DESCRIPTIONS
	GRAVEL AND	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	GRAVELLY SOILS	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
COARSE GRAINED	MORE THAN 50% OF	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
SOILS	RETAINED ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
		CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SANDY SOILS	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
	PASSING ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
				ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
FINE GRAINED	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
SOILS				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER				МН	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		СН	INORGANIC CLAYS OF HIGH PLASTICITY
				ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
н	IGHLY ORGANIC S	OILS		РТ	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

	Other Tests												
AN	ANALYTICAL TEST (pH, Soluble Sulfate, and Resistivity)												
С	CONSOLIDATION TEST												
DS	DIRECT SHEAR TEST												
MD	MOISTURE DENSITY CURVE												



Lumos and Associates 800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 bsexton@lumosinc.com

Tahoe Valley Stormwater and Greenbelt Improvements



PLATE A-12

Job Number: 8937.000

Date: October 2016
APPENDIX B











US_LAB.GDT GP.J AND GR MS: Ъ VALL TAHOE SIZE GRAIN







COMPACTION TAHOE VALLEY SW AND GB.GPJ US LAB.GDT 10/26/16

APPENDIX C

	F	PERCOL	ATION T	EST		
PROJECT:	- Tahoe Valley S.W. and Greer	belt Imp.	JOB #	8937.000 D	ATE: 10/1:	2/2016
TEST HOLE N	NO: <u>12</u> LOCATION:	Eloise Ave).		BY:	MH/PM
	LOCATION SKETCH			TES	T PIT LOG	
	× ×		DEPTH (FT)	SOIL DESCRI	PTION	
	x					
	Double Swing Gate		0	See Boring Lo	og for Soil Descri	<u>ption</u>
Т	rench	Ave.		Test		
		se /				
	● Test Hole #12 등 Â	Eloi	5			
	● Test Hole #11 <u></u> x					
	hain x					
			10			
	x		GWS ENCO	UNTERED?	NO	
			DEPTH TO	GWS	N/A	
DEPTH TO TE	EVATION Existing Ground					
TIME OF 1st S	ATURATION (12" WATER) (1) 5:02					
TIME WATER	DISAPPEARS 5:25				Dere Dere eine fein	4.11
TIME OF REFI	DISAPPEARS >10 min				(MIN) >10 min (4 Hours
IF 2 IS LESS	IF 2 IS LESS THAN 10 MIN. AND TEST IS IN SANDY SOIL, IMMEDIATELY PROCEED WITH PERCOLATION TEST USING					
10 MIN. READ	D/FILL INTERVALS. OTHERWISE, PRO	DCEED WITH	4-HOUR TEST E	BETWEEN 16 AND	30 HOURS AFTER	1
TIME	INTERVAL	DI	EPTH TO WA	TER	CHANGE	IN WATER
BEGIN TEST	in Minutes	INITIAL DEP	Ϋ́́Η	6 1/2	INCHES	MIN/IN
10:24	10			12	5.500	1.8
12:10	10	REFILL TO		6 1/8	2.375	4.2
12:20		REFILL TO		<u> </u>		
12:30	10			8 1/2	1.625	6.2
12:30	10	REFILL TO		8 1/2	0.625	16.0
12:40 12:40		REFILL TO		9 1/8		
12:50	10			8 7/8	1.750	5.7
12:50	10	REFILL TO		5 3/4	1.875	5.3
1:00		REFILL TO		6		
1:10	10			7 1/4	1.250	8.0
	3 10	REFILL TO			4 1.25	8.0
PERCOLAT	ION RATE = 3 / 4 =	8.0	MIN. / INCH			
-	Lumos and Associates	Tahoe	Valley Storm	water and Gr	eenbelt Imp.	PLATE
	800 E. College Parkway				-	
4	Carson City, NV 89706 (775) 883-7077		PERCOL	ATION TE	ST	
LUIVIUS & ASSO	DELATES bsexton@lumosinc.com					
		Job Numbe	er: 8973.000		Date:10/12/16	

	<u>F</u>	PERCOL	ATION T	EST			
PROJECT:	- Tahoe Valley S.W. and Green	belt Imp.	JOB #	8937.000 D	ATE: 10/1	2/2016	
			_		BV.		
		LIDISE AVE	·				
	LOCATION SKETCH' X	I.		TES	<u>T PIT LOG</u>		
	≺N ×		DEPTH (FT)	SOIL DESCRI	PTION		
- -	Double Swing Gate	.e	0	See Boring Lo	og for Soil Descri	<u>ption</u>	
		Eloise Av	5	<u>Test</u>			
	x x 2 x		10 GWS ENCO DEPTH TO	UNTERED? GWS	NO N/A		
SURFACE ELI	EVATION Existing Ground						
TIME OF 1st S	SATURATION (12" WATER) (1) 5:04						
TIME WATER	DISAPPEARS >10 min						
TIME OF REF	ILL >10 min				Run Presoak for	4 Hours	
IIME WATER	TIME WATER DISAPPEARS >10 min TIME TO DRAIN (MIN.) >10 min (2)						
10 MIN. READ	D/FILL INTERVALS. OTHERWISE, PRO		4-HOUR TEST E	BETWEEN 16 AND	30 HOURS AFTER	1	
ТІМЕ	INTERVAL	DI	EPTH TO WA	TER	CHANGE	IN WATER	
BEGIN TEST	in Minutes	INITIAL DEP	ТН		INCHES	MIN/IN	
10:22 10:52	30			5 1/2 5 3/4	0.250	120.0	
10:58 11:28	30	REFILL TO		5 3/4 5 7/8	0.125	240.0	
11:28	30	REFILL TO		5 7/8	0.125	240.0	
11:58	30	REFILL TO		6	0.125	240.0	
12:28	30	REFILL TO		6 1/8	0.125	240.0	
12:58		REFILL TO		6 1/4			
		REFILL TO					
	3 30	REFILL TO			4 0.125	240.0	
		FINAL					
PERCOLAT	PERCOLATION RATE = 3 / 4 =240.0MIN. / INCH						
	Lumos and Associates	Tahoe	Valley Storm	water and Gr	eenbelt Imp.	PLATE	
	800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 bsexton@lumosinc.com		PERCOL	ATION TE	ST	C-11	
		Job Numbe	r: 8973.000		Date:10/12/16		

		PERCOL	ATION T	EST			
PROJECT:	Tahoe Valley S.W. and Gre	enbelt Imp.	JOB #	8937.000 D	DATE: 10/12	2/2016	
TEST HOLE I	NO: <u>10</u> LOCATIO	N: Helen Ave).		BY:	MH/PM	
	LOCATION SKETCH			<u>TE</u> \$	<u>ST PIT LOG</u>		
	<u>←N</u>		DEPTH (FT)	SOIL DESCR	IPTION		
			0	See Boring L	og for Soil Descri	ption	
						<u></u>	
т	rench	Ave.		<u>Test</u>			
	Tost Hole #10	elen ,	F				
		Η	5				
	I est Hole #9						
	I	I					
			DEPTH TC	GWS	N/A		
SURFACE ELE	EVATION Existing Ground						
DEPTH TO TE	ST 3.5'	.11					
TIME WATER	DISAPPEARS >10 min	. 14					
TIME OF REF	ILL 4:24				Run Presoak for	4 Hours	
TIME WATER	DISAPPEARS >10 min			TIME TO DRAIN	(MIN.) >10 min (2	<u>2)</u>	
IF 2 IS LESS	S THAN 10 MIN. AND TEST IS IN S	ANDY SOIL, IMM			COLATION TEST US	3ING	
	INTERVAL	D	EPIHIOWA	IER	CHANGE		
BEGIN TEST	in Minutes	INITIAL DEF	PTH	3 1/8	INCHES	MIN/IN	
10:09	30			3 1/2	0.375	80.0	
10:09	30	REFILL TO		3 1/2	0.750	40.0	
10:39		REFILL TO		4 1/4			
11:09	30			4 7/8	0.625	48.0	
11:09	30	REFILL TO		4 7/8	0.625	48.0	
11:39	20	REFILL TO		5 1/2	0.500		
12:09	30			6	0.500	60.0	
12:09 12:39	30	REFILL TO		6 6 3/8	0.375	80.0	
12:39	30	REFILL TO		6 3/8	0.375	80.0	
1:09				6 3/4	0.010		
	3 30	FINAL			4 0.375	80.0	
Ī							
PERCOLATION RATE = 3 / 4 = 80.0 MIN. / INCH							
	Lumos and Associates	Tahoe	Valley Storm	nwater and Gr	eenbelt Imp.	PLATE	
	800 E. College Parkway Carson City, NV 89706						
UIMO	(775) 883-7077 Fax: (775) 883-7114		PERCOL	_ATION TE	EST	$ C_{-10} $	
& ASSC	DCIATES bsexton@lumosinc.com						
		Job Numbe	er: 8973.000		Date:10/12/16		

		PERCO	LATION T	EST		
PROJECT:	Tahoe Valley S.W. and Gree	enbelt Imp.	JOB #	8937.000 DA	ATE: 10/12	2/2016
TEST HOLE N	NO: 9 LOCATION	I: B St.	—		BY:	MH/PM
	LOCATION SKETCH			TES	T PIT LOG	
	≺ N-			JOIL DESCRI	TION	
			0	See Boring Lo	<u>g for Soil Descri</u>	<u>otion</u>
Ti	Test Hole #10 Test Hole #9	Helen Ave.	5	<u>Test</u>		
			10 GWS ENCC DEPTH TC	OUNTERED?	NO N/A	
SURFACE ELE	EVATION Existing Ground		-			
TIME OF 1st S	51 5.5 ATURATION (12" WATER) (1) 4:7	3				
TIME WATER	DISAPPEARS 4:24					
	LL 4:24				Run Presoak for	4 Hours
IF 2 IS LESS	IF 2 IS LESS THAN 10 MIN. AND TEST IS IN SANDY SOIL, IMMEDIATELY PROCEED WITH PERCOLATION TEST USING					
10 MIN. READ)/FILL INTERVALS. OTHERWISE, PI		H 4-HOUR TEST I	BETWEEN 16 AND	30 HOURS AFTER	1
ТІМЕ	INTERVAL	D	EPTH TO WA	TER	CHANGE I	N WATER
BEGIN TEST	in Minutes	INITIAL DEF	PTH		INCHES	MIN/IN
9:38	30			6 10	3.979	7.5
10:08 10:38	30	REFILL TO		10 10 3/4	0.750	40.0
10:41 11:11	30	REFILL TO		5	1.500	20.0
11:13 11:42	30	REFILL TO		6 1/2 8 1/4	1.750	17.1
11:43	30	REFILL TO		8 1/4 0 1/2	1.250	24.0
12:13 12:18 12:49	30	REFILL TO		<u>5 1/2</u> 7	1.500	20.0
12:48	30	REFILL TO		7	1.250	24.0
1:18 1:48	3 30	REFILL TO FINAL		8 1/4 9 3/8	4 1.125	26.7
PERCOLATI	ION RATE = 3 / 4 =	26.7				
	Lumos and Associates 800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 bsexton@lumosinc.com	Tahoe Job Numb	Valley Storm PERCOI er: 8973.000	ATION TE	eenbelt Imp. ST Date:10/12/16	PLATE C-9

	<u> </u>	PERCOL	ATION T	EST			
PROJECT:	Tahoe Valley S.W. and Greer	belt Imp.	JOB #	8937.000 D	ATE: <u>10/1</u>	1/2016	
TEST HOLE I	NO: <u>8</u> LOCATION:	Bike path i	near Helen Av	/e.	BY:	MH/PM	
	LOCATION SKETCH			TES	T PIT LOG		
	Ĩ	Ĩ	DEPTH (FT) SOIL DESCRIPTION				
			0	See Boring Lo	og for Soil Descri	otion	
	Bike Path		0				
	Trench			<u>Test</u>			
	Test Hole #8		5				
	Test Hole #7						
			10 GWS ENCO DEPTH TO	OUNTERED?	NO N/A		
SURFACE ELE	EVATION Existing Ground						
DEPTH TO TE	ST 3'						
TIME WATER	DISAPPEARS 2:32						
TIME OF REF	ILL 2:34						
TIME WATER	DISAPPEARS 2:43 S THAN 10 MIN AND TEST IS IN SAN				(MIN.) 9 (2)	NNG	
10 MIN. READ	D/FILL INTERVALS. OTHERWISE, PRO	DCEED WITH	4-HOUR TEST E	BETWEEN 16 AND	0 30 HOURS AFTER	1	
ТІМЕ	INTERVAL	DI	EPTH TO WA	TER	CHANGE	N WATER	
BEGIN TEST	in Minutes	INITIAL DEP	TH		INCHES	MIN/IN	
2:58	5			6 1/4 10 5/8	4.375	1.1	
3:03	5	REFILL TO		4 7/8	4 000	13	
3:08	5	 		8 7/8	4.000	1.5	
3:08 3:14	6	REFILL TO		6 5/8 11 1/2	4.875	1.2	
3:14	5	REFILL TO		6 3/4	3 000	1 7	
3:19	5			9 3/4	3.000	1.7	
3:19 3:24	5	REFILL TO		6 3/8 10 5/8	4.250	1.2	
3:24	5	REFILL TO		6	2 750	1.2	
3:29	5			9 3/4	3.750	1.5	
3:29	4	REFILL TO		6 8 7/8	2.875	1.4	
3:33	2 5	REFILL TO		6 1/4	1 2	1 7	
3:38	5 5	FINAL		9 1/4	4 5	1.7	
PERCOLAT	ION RATE = 3 / 4 =	1.7	MIN. / INCH				
	Lumos and Associates	Tahoe	Valley Storm	nwater and Gr	eenbelt Imp.	PLATE	
	800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 DCIATES bsexton@lumosinc.com		PERCOL	ATION TE	ST	C-8	
		Job Numbe	r: 8973.000		Date:10/11/16		

	PERCOLATION TEST									
PROJECT:	Tahoe Valley S.W. and Greer	nbelt Imp.	JOB #		ATE: <u>10/1</u> 2	2/2016				
TEST HOLE	NO: <u>7</u> LOCATION:	Bike path	near Helen Av	/e.	BY:	MH/PM				
	LOCATION SKETCH			TES	T PIT LOG					
	I	J	DEPTH (FT) SOIL DESCRIPTION							
			0	See Boring Lo	ng for Soil Descri	ntion				
	Bike Path		0	<u>See Doning Lo</u>		<u>piion</u>				
	Trench									
	Test Hole #8		5	<u>Test</u>						
	Test Hole #7									
			10 GWS ENCO DEPTH TO	OUNTERED?	NO N/A					
SURFACE EL	EVATION Existing Ground									
TIME OF 1st S	SATURATION (12" WATER) (1) 2:35	5								
TIME WATER	DISAPPEARS 2:54									
	ILL 2:54				Run Presoak for	4 Hours				
IF 2 IS LES	S THAN 10 MIN. AND TEST IS IN SAN	IDY SOIL, IMM	EDIATELY PRO	CEED WITH PER	COLATION TEST US	2) SING				
10 MIN. REAL	D/FILL INTERVALS. OTHERWISE, PR	OCEED WITH	4-HOUR TEST E	BETWEEN 16 AND	0 30 HOURS AFTER	1				
TIME	INTERVAL	DI	EPTH TO WA	TER	CHANGE	IN WATER				
BEGIN TEST	in Minutes	INITIAL DEP	TH	6 7/8	INCHES	MIN/IN				
11:00	10			10 1/4	3.375	3.0				
11:00 11:10	10	REFILL TO		6 1/2 9 3/4	3.250	3.1				
11:10 11:20	10	REFILL TO		6 5/8 9 1/2	2.875	3.5				
11:20 11:30	10	REFILL TO		6 1/4 9 1/8	2.875	3.5				
11:30 11:40	10	REFILL TO		6 1/2 9 1/4	2.750	3.6				
11:40 11:50	10	REFILL TO		6 1/8 8 3/4	2.625	3.8				
		REFILL TO								
	3 10	REFILL TO FINAL			4 2.625	3.8				
PERCOLAT	ION RATE = 3 / 4 =	3.8	MIN. / INCH							
-	Lumos and Associates	Tahoe	Valley Storm	nwater and Gr	eenbelt Imp.	PLATE				
	800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 DCIATES	Joh Numbe	PERCOL	ATION TE	ST	C-7				

	F	PERCOL	ATION T	EST			
PROJECT:	Tahoe Valley S.W. and Green	belt Imp.	JOB #	8937.000 D	ATE: 10/12	2/2016	
TEST HOLE	NO: <u>6</u> LOCATION:	B St.	-		BY:	MH/PM	
	LOCATION SKETCH			TES			
	\	_					
			0	See Boring Lo	og for Soil Descri	<u>otion</u>	
	B St.	`					
		\backslash		<u>Test</u>			
			5				
	Trench						
Test Ho	Le #5 Test Hole #6		10				
100(110			GWS ENCO	UNTERED?	NO		
			DEPTH TO	GWS	N/A		
SURFACE ELE	EVATION Existing Ground						
TIME OF 1st S	SATURATION (12" WATER) (1) 12:1	6					
TIME WATER	DISAPPEARS 12:22						
TIME OF REFI	ILL 12:26				Run Presoak for	4 Hours	
TIME WATER	DISAPPEARS >10 min			TIME TO DRAIN	(MIN.) >10 min (2)	
IF 2 IS LESS	S THAN 10 MIN. AND TEST IS IN SAN	DY SOIL, IMM	IEDIATELY PRO	CEED WITH PER	COLATION TEST US	SING	
10 MIN. REAL	D/FILL INTERVALS. OTHERWISE, PRO		4-HOUR TESTE	BETWEEN 16 ANL	30 HOURS AFTER	1	
TIME	INTERVAL	DI	EPTH TO WA	TER	CHANGE I	N WATER	
BEGIN TEST	in Minutes	INITIAL DEP	TH	- 4 (F	INCHES	MIN/IN	
7:59	10			6 1/5 12	5.800	1.7	
8:10	10	REFILL TO		6 3/4	5.75	1.7	
8:20					0.1.0		
8:31	10	REFILL TO		11 1/2	5.75	1.7	
8:32	10	REFILL TO		6 3/4	5.5	1.8	
8:42		REFILL TO		<u> </u>			
8:53	10			11	5.5	1.8	
8:54 9:04	10	REFILL TO		6 1/8 10 1/2	4.375	2.3	
		REFILL TO					
 				━━━━┝			
	3 10	FINAL			4 4.375	2.3	
PERCOLAI	PERCOLATION KATE = 3 / 4 = 2.3 MIN. / INCH						
1.	Lumos and Associates	lahoe	valley Storm	water and Gr	eenbelt Imp.	PLATE	
4	Carson City, NV 89706 (775) 883-7077		PERCOI		ST	\mathbf{O}	
LUMO	S Fax: (775) 883-7114 bsexton@lumosinc.com					U-6	
& ASS(JUIAIES	Job Numbe	r: 8973.000		Date:10/12/16		

r									
	<u>ר</u>	'ERCOL	ATION II	<u>ESI</u>					
PROJECT:	Tahoe Valley S.W. and Green	ibelt Imp.	JOB #	8937.000 D	DATE: <u>10/12</u>	2/2016			
TEST HOLE I	NO: <u>5</u> LOCATION:	B St.			BY:	MH/PM			
	LOCATION SKETCH		1	<u>TES</u>	<u>ST PIT LOG</u>				
	<u></u> ≺ №	_	DEPTH (FT)	SOIL DESCR					
	\backslash			_					
			0	See Boring Lo	<u>og for Soil Descri</u>	<u>otion</u>			
	В ЭГ.								
		\backslash	5	Test					
			, v	<u>1031</u>					
	Trench								
	\bullet \bullet								
Test Ho	ble #5 Test Hole #6		10						
			GWS ENCO	UNTERED?	NO				
	1		DEPTH TO	GWS	N/A				
SURFACE ELL DEPTH TO TE	SURFACE ELEVATION Existing Ground DEPTH TO TEST 4.5'								
TIME OF 1st S	SATURATION (12" WATER) (1) 12:1	5							
TIME WATER	DISAPPEARS >10 min								
TIME OF REF	ILL 12:50				Run Presoak for	4 Hours			
TIME WATER	TIME WATER DISAPPEARS >10 min TIME TO DRAIN (MIN.) >10 min (2)								
10 MIN REAL	S THAN 10 MIN. AND LEST IS IN SAM		A HOUR TEST F		COLATION LEST US	SING			
	J/FILL INTERVALO. OTHERWISE, TRE		4-HUUK ILSIL			1			
BEGIN IESI 7:58			IH	7		MIIN/IIN			
8:28	30			10	3.000	10.0			
8:29	30	REFILL TO		6 1/2	3.125	9.6			
8:59				9 3/8	0.120	0.0			
9:00	30	REFILL TO		/ 9 1/2	2.5	12.0			
9:31	20	REFILL TO		6 3/4	2 625	11 /			
10:01	JU			9 3/8	2.020	11.4			
10:02	30	REFILL TO		6 3/8 9 1/4	2.875	10.4			
10:32		REFILL TO		6 1/4					
11:03	30			9 3/8	3.125	9.6			
11:11	30	REFILL TO		6 1/4	2.75	10.9			
11:41				9					
12:11	3 30	FINAL		10	4 1	30.0			
		1							
PERCOLAT	ION RATE = 3 / 4 =	30.0	MIN. / INCH						
-	Lumos and Associates	Tahoe	Valley Storm	water and Gr	reenbelt Imp.	PLATE			
	800 E. College Parkway								
4	Carson City, NV 89706 (775) 883-7077		PERCOL		EST	$\frown E$			
LUMO	Fax: (775) 883-7114 bsexton@lumosinc.com		• =			し-つ			
& ASSL	JUATES		0070 000		D-1-10/40/40				

	<u>F</u>	PERCOL	ATION T	EST		
PROJECT:	Tahoe Valley S.W. and Green	belt Imp.	JOB #	8937.000 D	DATE: <u>10/12</u>	2/2016
TEST HOLE I	NO: 4 LOCATION:	Corner of I	Bonanza St. a	and 8th St.	BY:	MH/PM
	LOCATION SKETCH			TES	ST PIT LOG	
	<u></u>	_				
			DEPTH (FT)) SOIL DESCR	IPTION	
			0	See Boring Lo	og for Soil Descri	otion
Teet		\		<u>Test</u>		
1651						
	Test Hole #3 Path		5			
	'	I				
st.	Bonanza St.		10			
8t			GWS ENCO	OUNTERED?	NO	
SURFACE FLI	VATION Existing Ground		DEPTHIC) GWS	N/A	
DEPTH TO TE	ST 3'					
TIME OF 1st S	ATURATION (12" WATER) (1) 10:2 DISAPPEARS >10 min	7				
TIME OF REF	ILL N/A				Run Presoak for	4 Hours
TIME WATER	DISAPPEARS N/A				(MIN.) >10 min (2)
10 MIN. READ	D/FILL INTERVALS. OTHERWISE, PRO	DY SOIL, IMM	4-HOUR TEST	BETWEEN 16 AND	0 30 HOURS AFTER	1
ТІМЕ	INTERVAL	DE	EPTH TO WA	TER	CHANGE I	N WATER
BEGIN TEST	in Minutes	INITIAL DEP	TH		INCHES	MIN/IN
8:48 8:58	10			6 1/2 8 1/2	2.000	5.0
8:58	10	REFILL TO		5 3/4	2	5.0
9:08 9:08	40	REFILL TO		6 1/4	4.05	
9:18	10			8	1.25	8.0
9:18 9:28	10	REFILL TO		6 1/8 8	1.875	5.3
9:28	10	REFILL TO		6 1/8	1.875	5.3
9:38 9:38		REFILL TO		<u> </u>		
9:48	10			8 3/8	1.75	5.7
		REFILL TO				
	3 10	REFILL TO			4 1.75	5.7
		FINAL		F		
PERCOLAT	ION RATE = 3 / 4 =	5.7	MIN. / INCH			
	Lumos and Associates	Tahoe '	Valley Storn	nwater and Gr	eenbelt Imp.	PLATE
	800 E. College Parkway Carson City, NV 89706				07	
LUMO	S (775) 883-7077 Fax: (775) 883-7114		PERCO	LATION TE	51	C-4
& ASS(OCIATES USEXION@IUMOSINC.com	Job Numbe	r: 8973.000		Date:10/12/16	<u> </u>

PROJECT: Table Valley S.W. and Greenbelt Imp. JOB # B37.000_DATE: 10/11/2016 TEST HOLE NO:		F	PERCOL	ATION T	EST		
TEST HOLE NO:	PROJECT:	- Tahoe Valley S.W. and Greer	belt Imp.	JOB #	8937.000 D	ATE: 10/1 ⁻	1/2016
Interview Image: Second of Contract Output of Contract Output Output Itest Pit Log Image: Second of Contract Output Itest Pit Log	TEST HOLE N	NO: 3 LOCATION:	Corner of	- Bonanza St. a	and 8th St	BY	MH/PM
Image: Second System Image: Se				1	TES		
Image: Second		LOCATION SKETCH			<u>163</u>	<u>I PII LUG</u>	
Image: Supersonal State Image: Superso			_	DEPTH (FT)	SOIL DESCRI	PTION	
Image: Test Hole #4 Path 5 Isit Image: Test Hole #3 Path 10 Path Image: Test Hole #3 10 Stat Image: Path Note Image: Test Hole #3 10 Stat Image: Path Image: Path Image: Test Image: Test Is in SANDY SOL, IMMEDIATELY PROCEED WITH 4-PROCEED WITH 4-		Trench		0	See Boring Lo	og for Soil Descri	ption
Image: Solution of the second secon	Test	Hole #4 Test Hole #3 Path		5	Test	-	
5 GWS ENCOUNTERED? NO DEPTH TO GWS	ب ب ت	Bonanza St.		10			
SURFACE ELEVATION Existing Ground DEPTH TO TEST 4.5 TIME OF TEST 4.5 TIME WATER DISAPPEARS 10:33 TIME WATER DISAPPEARS 10:45 TIME TO DRAIN (MIN.) 9 mins (2) IF 2 IS LESS THAN 10 MIN. AND TEST IS IN SANDY SOIL, IMMEDIATELY PROCEED WITH PERCOLATION TEST USING 10 MIN. READ/FILL INTERVALS. OTHERWISE, PROCEED WITH 4-HOUR TEST BETWEEN 16 AND 30 HOURS AFTER 1 TIME TIME INTERVAL DEPTH TO WATER INTERVAL DEPTH TO WATER INTERVAL DEPTH TO WATER INCHES MIN/IN 10:50 10 5.34 4.875 2.1 TIME WATER 11:00 10 REFILL TO 5.1/8 3.5 2.9 11:10 10 REFILL TO 5.1/8 3.5 2.9 11:10 10 REFILL TO 5.3/4 2.5 4.0 TIME WATER TIME WATER TIME	84			GWS ENCC	OUNTERED?	NO N/A	
DEPTH TO TEST 4.5 TIME OF 1st SATURATION (12' WATER) (1) 10.25 TIME WATER DISAPPEARS 10.33 TIME WATER DISAPPEARS 10.45 TIME WATER DISAPPEARS TIME WATER INTERVAL DEPTH TO WATER CHANGE IN WATER 10.45 MIN. READFILL INTERVAL. DEPTH TO WATER CHANGE IN WATER 10.56 11:00 10 11:00 10 11:00 10 11:10 10 REFILL TO 5.16 3.5 2.9 11:10 10 REFILL TO 5.18 11:20 10 REFILL TO 5.34 2.375 4.2 11:30 10 REFILL TO 5.34 2.5 4.0 11:40 10 REFILL TO 5.34 3 10	SURFACE ELE	EVATION Existing Ground		I			
TIME WATER DISAPPEARS 10:33 TIME WATER DISAPPEARS 10:45 TISO 10 TISO 10 TISO 10 TISO 10 REFILL TO 5:3/4 TISO 10 REFILL TO 6:5/8 TISO 10 REFILL TO 6:5/8 TISO	DEPTH TO TE	ST 4.5' ATLIPATION (12" WATER) (1) 10:2	5				
TIME OF REFILL 10:36 TIME WATER DISAPPEARS 10:45 TIME TO DRAIN (MIN.) 9 mins (2) 10 F 2 IS LESS THAN 10 MIN. AND TEST IS IN SANDY SOIL, IMMEDIATELY PROCEED WITH PERCOLATION TEST USING 10 MIN. READ/FILL INTERVALS. OTHERWISE, PROCEED WITH 4-HOUR TEST BETWEEN 16 AND 30 HOURS AFTER 1 TIME INTERVAL DEPTH TO WATER CHANGE IN WATER BEGIN TEST in Minutes INITIAL DEPTH INCHES MIN/IN 10:50 10 10.5/8 4.875 2.1 11:00 10 REFILL TO 5.1/8 3.5 2.9 11:10 10 REFILL TO 5.1/8 3.5 2.9 11:10 10 REFILL TO 5.3/4 2.375 4.2 11:20 10 REFILL TO 5.3/4 2.375 4.2 11:30 10 REFILL TO 5.3/4 2.5 4.0 11:40 10 REFILL TO 6.5/8 2.5 4.0 11:40 10 REFILL TO 6.5/8 2.5 4.0 11:40 10 REFILL TO 6.5/8 2.5 4.0	TIME WATER	DISAPPEARS 10:33	.0				
Time water DISAPPEARS 10:45 Time to DRAIN (MIN.) 9 mins. (2) IF 2 ISLESSTHAN 10 MIN. AND TEST IS IN SANDY SOIL, IMMEDIATELY PROCEED WITH PERCOLATION TEST USING 10 MIN. READ/FILL INTERVALS. OTHERWISE, PROCEED WITH 4-HOUR TEST BETWEEN 16 AND 30 HOURS AFTER 1 TIME INTERVAL DEPTH TO WATER CHANGE IN WATER BEGIN TEST in Minutes INITIAL DEPTH INCHES MIN/IN 10:50 10 53/4 4.875 2.1 11:00 10 REFILL TO 51/8 3.5 2.9 11:10 10 REFILL TO 51/8 3.5 2.9 11:10 10 REFILL TO 51/4 3.25 3.1 11:20 10 REFILL TO 53/4 2.375 4.2 11:30 10 REFILL TO 53/4 2.5 4.0 11:30 10 REFILL TO 53/4 2.5 4.0 11:40 10 REFILL TO 53/4 2.5 4.0 11:40 10 REFILL TO 65/8 2.5 4.0 11:40 10 REFILL TO 65/8 2.5 4.0<	TIME OF REFI	LL 10:36					
Interval Interval Depth to water Change in water 10 Min READ/FILL INTERVALS, OTHERWISE, PROCEED WITH 4-HOUR TEST BETWEEN 16 AND 30 HOURS AFTER I TIME INTERVAL DEPTH TO WATER CHANGE IN WATER BEGIN TEST in Minutes INITIAL DEPTH INCHES MIN/IN 10:50 10 53/4 4.875 2.1 11:00 10 53/4 4.875 2.1 11:00 10 REFILL TO 5.1/8 3.5 2.9 11:10 10 REFILL TO 5.3/4 4.875 4.2 11:20 10 REFILL TO 5.3/4 2.375 4.2 11:30 10 REFILL TO 5.3/4 2.5 4.0 11:30 10 REFILL TO 6.5/6 2.5 4.0 11:40 10 REFILL TO 6.5/6 2.5 4.0 11:40 10 REFILL TO 6.5/6 2.5 4.0 11:40 10 REFILL TO 9.1/2 2.5	TIME WATER	DISAPPEARS 10:45 S THAN 10 MIN AND TEST IS IN SAN	DY SOIL IMM	IEDIATELY PRO	TIME TO DRAIN	(MIN.) 9 mins (2)	NNG
TIME INTERVAL DEPTH TO WATER CHANGE IN WATER BEGIN TEST in Minutes INITIAL DEPTH INCHES MIN/IN 11:00 10 53/4 4.875 2.1 11:00 10 10.5/8 4.875 2.1 11:00 10 REFILL TO 51/8 3.5 2.9 11:10 10 REFILL TO 31/4 3.25 3.1 11:20 10 REFILL TO 53/4 2.375 4.2 11:30 10 REFILL TO 53/4 2.5 4.0 11:30 10 REFILL TO 65/8 2.5 4.0 11:40 10 REFILL TO 91/2 2.5 4.0 2.5 10 REFILL TO 5.3/4 2.5	10 MIN. READ	FILL INTERVALS. OTHERWISE, PRO	OCEED WITH	4-HOUR TEST I	BETWEEN 16 AND	30 HOURS AFTER	1
BEGIN TEST in Minutes INTIAL DEPTH INCHES MIN/IN 10:50 10 53/4 4.875 2.1 11:00 10 65/8 3.5 2.9 11:10 10 REFILL TO 51/8 3.5 2.9 11:10 10 REFILL TO 31/4 3.25 3.1 11:20 10 REFILL TO 53/4 2.375 4.2 11:30 10 REFILL TO 53/4 2.5 4.0 11:30 10 REFILL TO 65/8 2.5 4.0 11:40 10 REFILL TO 65/8 2.5 4.0 11:40 10 REFILL TO 65/8 2.5 4.0 11:40 10 REFILL TO 4 2.5 4.0 11:50 10 REFILL TO 71/2 2.5 4.0 11:50 10 REFILL TO 71/2 2.5 4.0 PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH	ТІМЕ	INTERVAL	DI	EPTH TO WA	TER	CHANGE	N WATER
10:50 10 $10 \\ 105/8$ 4.875 2.1 11:00 10 REFILL TO 51/8 3.5 2.9 11:10 10 REFILL TO 31/4 3.25 3.1 11:20 10 REFILL TO 53/4 2.375 4.2 11:20 10 REFILL TO 53/4 2.375 4.2 11:20 10 REFILL TO 53/4 2.5 4.0 11:30 10 REFILL TO 53/4 2.5 4.0 11:40 10 REFILL TO 65/8 2.5 4.0 11:50 10 REFILL TO 65/8 2.5 4.0 11:50 10 REFILL TO 91/2 2.5 4.0 11:50 10 REFILL TO 4 2.5 4.0 PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH MIN. / INCH PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH PLATE 800 E. College Parkway Carson Civ, NV 89700 (775) 883-707 Tahoe Valley Stormwater and Greenbelt Imp. PLATE PERCOLATION TEST C3	BEGIN TEST	in Minutes	INITIAL DEP	TH	_	INCHES	MIN/IN
11:00 10 REFILL TO 5 1/8 3.5 2.9 11:10 10 REFILL TO 3 1/4 3.25 3.1 11:20 10 REFILL TO 3 1/4 3.25 3.1 11:20 10 REFILL TO 5 3/4 2.375 4.2 11:30 10 REFILL TO 5 3/4 2.5 4.0 11:30 10 REFILL TO 6 5/8 2.5 4.0 11:40 10 REFILL TO 6 5/8 2.5 4.0 11:40 10 REFILL TO 6 5/8 2.5 4.0 11:50 10 REFILL TO 6 5/8 2.5 4.0 11:50 10 REFILL TO 6 5/8 2.5 4.0 11:50 10 REFILL TO 4 2.5 4.0 11:50 10 REFILL TO 4 2.5 4.0 PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH MIN. / INCH Image: College Parkway Carson City, NV 89706 (775) 883-7077 Tahoe Valley Stormwater and Greenbelt Imp. PLATE Image:	10:50 11:00	10	<u> </u>		5 3/4 10 5/8	4.875	2.1
11:10 10 REFIL TO $3 / 1/4$ 3.25 3.1 11:20 10 REFILL TO $5 / 3/4$ 2.375 4.2 11:30 10 REFILL TO $5 / 3/4$ 2.375 4.2 11:30 10 REFILL TO $5 / 3/4$ 2.5 4.0 11:40 10 REFILL TO $6 / 5/8$ 2.5 4.0 11:50 10 REFILL TO $6 / 5/8$ 2.5 4.0 11:50 10 REFILL TO $6 / 5/8$ 2.5 4.0 11:50 10 REFILL TO $6 / 5/8$ 2.5 4.0 11:50 10 REFILL TO $4 / 2.5$ 4.0 PERCOLATION RATE = $3 / 4 =$ 4.0 MIN. / INCH $4 / 2.5$ 4.0 PERCOLATION RATE = $3 / 4 =$ Lumos and Associates 800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Tahoe Valley Stormwater and Greenbelt Imp. PLATE PERCOLATION TEST	11:00 11:10	10	REFILL TO		5 1/8 8 5/8	3.5	2.9
11:20 10 REFILL TO 5 3/4 2.375 4.2 11:30 10 REFILL TO 5 3/4 2.5 4.0 11:40 10 REFILL TO 6 5/8 2.5 4.0 11:40 10 REFILL TO 6 5/8 2.5 4.0 11:40 10 REFILL TO 6 5/8 2.5 4.0 11:50 10 REFILL TO 9 1/2 2.5 4.0 3 10 REFILL TO 4 2.5 4.0 PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH PERCOLATION RATE = 3 / 4 = 500 E. College Parkway Carson City, NV 89706 (775) 883-7017 Tahoe Valley Stormwater and Greenbelt Imp. PLATE 800 E. College Parkway Carson City, NV 89706 (775) 883-7017 PERCOLATION TEST C3	11:10 11:20	10	REFILL TO		3 1/4 7 1/2	3.25	3.1
11:30 10 REFILL TO 5 3/4 2.5 4.0 11:40 10 REFILL TO 6 5/8 2.5 4.0 11:40 10 REFILL TO 6 5/8 2.5 4.0 11:50 10 REFILL TO 6 5/8 2.5 4.0 3 10 REFILL TO 4 2.5 4.0 PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH 4 2.5 4.0 VINOS Lumos and Associates Tahoe Valley Stormwater and Greenbelt Imp. PLATE C3 VINOS S00 E. College Parkway Carson City, NV 89706 (775) 883-7077 PERCOLATION TEST C3	11:20 11:30	10	REFILL TO		5 3/4 8 1/8	2.375	4.2
Initial Initia Initial Initial	11:30 11:40	10	REFILL TO		5 3/4	2.5	4.0
Image: state stat	11:40	10	REFILL TO		<u>6 5/8</u> 0 1/2	2.5	4.0
3 10 REFILL TO FINAL 4 2.5 4.0 PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH Image: State of the state			REFILL TO				
PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH Image: State	┝╼╼╼╼┟	3 10	REFILL TO FINAL			4 2.5	4.0
PERCOLATION RATE = 3 / 4 = 4.0 MIN. / INCH Image: State	[_]				F		
Lumos and Associates 800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 Tahoe Valley Stormwater and Greenbelt Imp. PERCOLATION TEST	PERCOLATI	ION RATE = 3 / 4 =	4.0				
& ASSOCIATES bsexton@lumosinc.com		Lumos and Associates 800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 bsexton@lumosinc.com	Tahoe	Valley Storm PERCOI	nwater and Gr _ATION TE	eenbelt Imp.	PLATE C-3

	<u>F</u>	PERCOL	ATION T	EST				
PROJECT:	Tahoe Valley S.W. and Green	belt Imp.	JOB #	<u>8937.000</u>	DATE: 10/12	2/2016		
TEST HOLE	NO: <u>2</u> LOCATION:	Corner of	D St. and Ded	li St.	BY:	MH/PM		
	LOCATION SKETCH		[<u>TE</u> \$	ST PIT LOG			
	N		DEPTH (FT)	SOIL DESCR	IPTION			
			0	See Boring L	og for Soil Descri	ntion		
	- .		0	<u>See Doning L</u>	<u>og tot Soli Descri</u>	<u>pilon</u>		
	Irench			<u>Test</u>				
	Tost Hole #1 Test Hole #2	edi S	5					
		ă	5					
		I						
	D St.		10					
		-	GWS ENCO	UNTERED?	NO N/A			
SURFACE EL	EVATION Existing Ground				N/A			
DEPTH TO TE	ST 2.5'							
TIME OF 1st S	SATURATION (12" WATER) (1) 9:36							
TIME OF REF	ILL N/A				Run Presoak for	4 Hours		
TIME WATER	TIME WATER DISAPPEARS N/A TIME TO DRAIN (MIN.) >10 mins (2)							
IF 2 IS LES	IF 2 IS LESS THAN 10 MIN. AND TEST IS IN SANDY SOIL, IMMEDIATELY PROCEED WITH PERCOLATION TEST USING							
10 MIN. REAL	D/FILL INTERVALS. OTHERWISE, PRO	DCEED WITH	4-HOUR TEST E	BETWEEN 16 ANI	D 30 HOURS AFTER	1		
ТІМЕ	INTERVAL	DI	EPTH TO WA	TER	CHANGE	IN WATER		
BEGIN TEST	in Minutes	INITIAL DEP	TH	o //o	INCHES	MIN/IN		
8:32	10			6 1/8 8 3/4	3.625	2.8		
<u>8:42</u> 8:52	10	REFILL TO		6	2	5.0		
8:52	10	REFILL TO		5 1/2	2.25	4.4		
9:02	10	REFILL TO		6 1/2	1 625	6.2		
9:12 9:12		REFILL TO		8 1/8	1.020	0.2		
9:22	10			8 1/8	1.625	6.2		
9:22	10	REFILL TO		6 7 1/2	1.5	6.7		
		REFILL TO						
	3 10	REFILL TO			4 1.5	6.7		
		FINAL						
PERCOLAT	ION RATE = 3 / 4 =	6.7	MIN. / INCH					
	Lumos and Associates	Tahoe	Valley Storm	nwater and G	reenbelt Imp.	PLATE		
	800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 bsexton@lumosinc.com		PERCOL	ATION TE	EST	C-2		
a Abbi	a server a s	Job Numbe	r: 8973.000		Date:10/12/16			

	F	PERCOL	ATION T	EST		
PROJECT:	Tahoe Valley S.W. and Green	belt Imp.	JOB #	8937.000 D	DATE: 10/12	2/2016
TEST HOLE	NO: <u>1</u> LOCATION:	Corner of	D St. and Dec	li St.	BY:	MH/PM
	LOCATION SKETCH			<u>TE</u> \$	ST PIT LOG	
	Ň		DEPTH (FT)	SOIL DESCR	IPTION	
	I		0	See Boring L	og for Soil Descrir	otion
	Tranah		Ū			
		÷				
	Test Hole #1 Test Hole #2	edi S	5	<u>Test</u>		
	D St					
	5 01.		10			
			GWS ENCO	OUNTERED? GWS	NO N/A	
SURFACE EL	EVATION Existing Ground					
DEPTH TO TE	ST 4.5'					
TIME WATER	DISAPPEARS >10 mins					
TIME OF REF	ILL N/A				Run Presoak for	4 Hours
TIME WATER	DISAPPEARS N/A			TIME TO DRAIN	(MIN.) >10 mins (2	2)
IF 2 IS LES	S THAN 10 MIN. AND TEST IS IN SAN			CEED WITH PER	COLATION TEST US	ING
10 MIN. REAL	D/FILL INTERVALS. OTHERWISE, PRO		4-HOUR TEST	BETWEEN 16 ANL	0 30 HOURS AFTER	1
TIME	INTERVAL	DI	EPTH TO WA	TER	CHANGE I	N WATER
BEGIN TEST 8·32	in Minutes	INITIAL DEP	TH	3 5/8	INCHES	MIN/IN
9:02	30			6 3/8	2.75	10.9
9:02 9:32	30	REFILL TO		6 3/8 8 3/8	2	15.0
9:32	30	REFILL TO		5 1/4	1.875	16.0
10:02 10:02		REFILL TO		7 1/8 6 1/8	4.075	10.0
10:32	30			8	1.875	16.0
		REFILL TO				
		REFILL TO				
	3 30	REFILL TO			4 1.875	16.0
		FINAL				
PERCOLAT	ION RATE = 3 / 4 =	16.0	MIN. / INCH			
	Lumos and Associates	Tahoe	Valley Storm	water and Gr	eenbelt Imp.	PLATE
	800 E. College Parkway Carson City, NV 89706 (775) 883-7077 Fax: (775) 883-7114 DCIATES		PERCOL	ATION TE	ST	C-1
		Job Numbe	r: 8973.000		Date:10/12/16	

APPENDIX D

10/27/2016 EVALUATE: Design Maps S User-Specified Input Report Title	Design Maps Summary Report Summary Report Tahoe Valley Stormwater and Greenbelt Improvements Wed October 26, 2016 21:20:16 UTC
Building Code Reference Document	2012/2015 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	38.91045°N, 120.00089°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III
DESOLATION Z MOUNT F Toatio	South Lake Tahoe

50

S_{MS} = 1.473 g

S_{M1} = 0.760 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

3316 m

S_{DS} = 0.982 g

S_{D1} = 0.507 g

Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

file:///L:/LAProj/8937.000%20-%20Tahoe%20Valley%20Stormwater%20&%20Greenbelt%20Improv/Geotech/Design%20Maps%20Summary%20Report.html

Job Number: 8937.000

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3042 1

USGS-Provided Output

 $S_s = 1.473 \text{ g}$ $S_1 = 0.507 \text{ g}$

SPECTRUM

Tahoe Valley Stormwater and Greenbelt Improvements

DESIGN RESPONSE

Date: October 2016

1/1

PLATE

D-1

APPENDIX E

SPECIFICATIONS FOR DEMOLITION

Demolition shall include the removal of all designated structures/improvements to be removed, i.e. concrete structures, asphalt pavements, utilities, pipes and unsuitable material within the project area. Excavations caused by removal of existing improvements and utilities shall be cleared of all wastes, debris, and any loose/soft soils, and backfilled with properly compacted fill, as specified under the General Site Grading section of this report. All fill compaction should be performed under observation and testing by the Geotechnical Engineer.

Broken concrete, asphalt, and other materials shall be considered waste and shall be removed from the site.

Any existing drain lines, wires, utilities, etc., which are to remain on the site shall be protected from damage. Buried drain lines, pipe conduits, utilities, etc. which are necessarily cut shall be either carefully and permanently capped at the property line as specified by the City Engineer or re-routed as necessary. Utility lines not specifically noted for disposition, but which are encountered in the work area shall be capped, extended, protected or re-routed as necessary for completion of the work, as directed.

All work shall be performed in accordance with the Federal Occupational Safety and Health Administration, the local Division of Occupational Safety and Health requirements, and applicable ordinances of the governing municipality.

Care shall be taken not to damage adjoining utilities or structures to remain after completion of the work. Finished work damaged by operations during demolition and site preparation shall be repaired or replaced to the satisfaction of the Owner at no cost to the Owner.

All materials resulting from demolition and site preparation not designated by the Owner to be recovered or to be relocated by the Contractor shall be removed promptly and disposed of off the site.

Upon completion of demolition and site preparation, the site shall be "raked clean" – if applicable – and all waste, rubble, debris, etc. shall be removed and disposed of off the site.

APPENDIX F

SLOPE STABILITY CALCULATIONS (2:1) Lowest values from direct shear test:

C = 2,340 psf $\Phi = 31.9^0$

 $\gamma_{AVG} \approx 120 \ pcf \rightarrow From \ Proctor \ Test \ Results$

 $\frac{H_w}{H} = \frac{9}{10} = 0.9 \rightarrow assume \ 1 \ foot \ of \ freeboard \ for \ 10 \ feet \ deep \ basin \ \mu_w = 0.95$

$$\frac{H_w'}{H} = \frac{9}{10} = 0.9 \rightarrow assume \text{ no seepage } \mu_w' = 0.95$$

Assume no surcharge or tension cracks ($\mu_q = 1$ and $\mu_t = 1$)

$$P_{d} = \frac{\gamma * H + q - \gamma_{w} * H_{W}}{\mu_{q} * \mu_{w} * \mu_{t}} = \frac{120pcf * 10ft - 62.4pcf * 8ft}{1 * 0.95 * 1} = 737.7$$

$$P_e = \frac{\gamma * H + q - \gamma_w * H_W'}{\mu_q * \mu_w'} = \frac{120pcf * 10ft - 62.4pcf * 8ft}{1 * 0.95} = 737.7$$

$$\lambda_{C\Phi} = \frac{P_e * tan\Phi}{C} = \frac{737.7 * tan(31.9^0)}{2.340} = 0.2$$

$$X_0 = 1.1 \rightarrow \underline{X}_0 = 10 * 1.1 = 11$$

$$Y_0 = 1.6 \rightarrow \underline{Y}_0 = 10 * 1.6 = 16$$

Tahoe Valley Stormwater and Greenbelt Improvements

Slope Stability Calculations

F-1.1

PLATE

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Job Number: 8937.000

$$F = N_{cf} * \frac{C}{P_d} = 7.5 * \frac{2,340}{737.7} = 23.8 \rightarrow Try \text{ when Dry}$$

 $P_d = P_e = 1,200$

$$\lambda_{C\Phi} = \frac{1,200 * \tan(31.9^{\circ})}{2,340} = 0.3$$

$$F = 8 * \frac{2,340}{1,200} = 15.6 \to ok$$

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Tahoe Valley Stormwater and Greenbelt Improvements

Slope Stability Calculations

PLATE F-1.2

Job Number: 8937.000

SLOPE STABILITY CALCULATIONS (1.5:1) Lowest values from direct shear test:

C = 2,340 psf $\Phi = 31.9^0$

$$\gamma_{AVG} \approx 120 \ pcf \rightarrow From \ Proctor \ Test \ Results$$

 $\frac{H_w}{H} = \frac{9}{10} = 0.9 \rightarrow assume \ 1 \ foot \ of \ freeboard \ for \ 10 \ feet \ deep \ basin \ \mu_w = 0.93$

$$\frac{H_{w}'}{H} = \frac{9}{10} = 0.9 \rightarrow assume \text{ no seepage } \mu_{w}' = 0.93$$

Assume no surcharge or tension cracks ($\mu_q = 1$ and $\mu_t = 1$)

$$P_d = \frac{\gamma * H + q - \gamma_w * H_W}{\mu_q * \mu_w * \mu_t} = \frac{120pcf * 10ft - 62.4pcf * 8ft}{1 * 0.93 * 1} = 753.5$$

$$P_e = \frac{\gamma * H + q - \gamma_w * H_W'}{\mu_q * \mu_w'} = \frac{120pcf * 10ft - 62.4pcf * 8ft}{1 * 0.93} = 753.5$$

$$\lambda_{C\Phi} = \frac{P_e * tan\Phi}{C} = \frac{737.7 * tan(31.9^0)}{2,340} = 0.2$$

$$X_0 = 1.1 \rightarrow \underline{X}_0 = 10 * 1.1 = 11$$

$$Y_0 = 1.6 \rightarrow \underline{Y}_0 = 10 * 1.6 = 16$$

Tahoe Valley Stormwater and Greenbelt Improvements

Slope Stability Calculations

F-2.1

PLATE

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Lumos and Associates

$$F = N_{cf} * \frac{C}{P_d} = 7.5 * \frac{2,340}{753.5} = 21.7 \rightarrow Try \text{ when Dry}$$

$$P_d = P_e = 1,200$$

$$\lambda_{C\Phi} = \frac{1,200 * \tan(31.9^{\circ})}{2,340} = 0.3$$

$$F = 8 * \frac{2,340}{1,200} = 13.7 \to ok$$

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Tahoe Valley Stormwater and Greenbelt Improvements

Slope Stability Calculations

PLATE F-2.2

Job Number: 8937.000

