Project No. 42949.00
December 7, 2021

Tahoe Donner Association
11509 Northwoods Boulevard
Truckee, California 96161

Attention: Jon Mitchell

Reference: **Tahoe Donner Association Downhill Ski Lodge**
Geotechnical Engineering Report, November 8, 2021
Truckee, California

Subject: **Preliminary Geotechnical Engineering Report Supplement No. 1**

This letter presents supplemental information requested for the Tahoe Donner Association (TDA) Downhill Ski Lodge project. NV5 previously prepared a geotechnical engineering report for the project, dated November 8, 2021. The purpose of this report supplement is to provide information requested following the completion of our geotechnical engineering report. This report supplement letter is a part of the geotechnical engineering report and should be bound to it.

This letter contains additional and/or updated recommendations that should be incorporated and/or will supersede the following sections of the geotechnical engineering report for the project

- 6.1.5 Temporary Unconfined Excavations;
- 6.2 Surface Water and Foundation Drainage;
- 6.3.1 Foundations; and
- 6.3.4 Retaining Wall Design Criteria

6.1.5 Temporary Unconfined Excavations

The following table should replace Table 6.1.5.1 in Section 6.1.5 of the Geotechnical Engineering Report for the project.

Table 6.1.5.1 – Unconfined Excavation Slopes

Temporary Slope Inclination (Horizontal to Vertical)	Depth Below Ground Surface (feet)
1H:1V (Soil)	0-12

6.2 Surface Water and Foundation Drainage

The following paragraphs should be added to Section 6.2 of the Geotechnical Engineering Report for the project.

Subsurface drains should be constructed on the upslope side of exterior foundations, behind retaining walls, on the upslope side of continuous interior wall foundations, and below slabs-on-grade where the slab is at or below the adjacent exterior grade. Subsurface drains should consist of a minimum 4-inch diameter perforated pipe (perforations facing down) placed in a minimum 12-inch wide trench. The top of drain pipes should be at least 12 inches below the lowest adjacent interior grade and sloped to drain via gravity to one or more infiltration facilities located below the structure. Drainage trenches should be backfilled with clean, free-draining gravel and burrito wrapped with geotextile filter fabric. We recommend using rigid PVC pipe (SDR35 or equal). Pipes should be bedded in drain rock to provide adequate support under pipe haunches and reduce pipe deformation. Perimeter foundation drain pipes should be positioned on the uphill side of footings, either at the same elevation as the footing or immediately above the footing with a thin bedding layer. Underslab drain trenches should be a minimum of 8 inches deep. All underslab areas enclosed by continuous interior footings should have at least one underslab drain. Drain pipes may need to go through stem walls or under footings (both interior and exterior) in some locations to facilitate positive drainage.

Infiltration facilities should be located on the downhill side of the structure, below all foundation elements so that water cannot seep back into foundation areas. We recommend annual maintenance to ensure that pipes remain functional.

6.3.1 Foundations

The following table should be added to Section 6.3.1 of the Geotechnical Engineering Report for the project.

Table 6.3.1.1 – Modulus of Subgrade Reaction

Native Soil	225 pci
Structural Fill	275 pci

6.3.4 Retaining Wall Design Criteria

The following paragraphs should replace the second paragraph in Section 6.3.4 of the Geotechnical Engineering Report for the project.

The values presented in Table 6.3.4.1 assume that the retained soil will not exceed approximately twelve feet in height and that no surcharge loads (e.g., footings, vehicles) are anticipated within a horizontal distance of approximately seven feet from the face of the wall.

We understand that retaining walls up to 16 feet in height will be required for the basement wall between Level 2 and Level 3 and will retain a combination of cut and fill soil. The values presented in Table 6.3.4.1 may be used for walls up to 16 feet in height, provided the retained soil below a depth of 10 feet from top of wall is compacted to a minimum of 95% relative compaction.

Fifty percent of any uniform surcharge placed at the top of a restrained wall (at-rest condition) may be assumed to act as a uniform horizontal pressure over the entire height of the wall. This may be reduced to 30 percent for unrestrained walls (active condition). Snow loads should be included as uniform surcharges. Snow removal equipment should also be included as uniform surcharges and can be modeled as a 250 psf surcharge load.

We can provide retaining wall and rockery wall design criteria for specific loading and backfill configurations, if requested.

Closing

The limitations outlined in the Geotechnical Engineering Report for the Tahoe Donner Association Downhill Ski Lodge dated November 8, 2021 are considered applicable to this supplement letter. Therefore, the recommendations presented in this letter should not be relied upon after a period of two years from the issue date without our review. We have prepared this letter for your exclusive use in accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our services. No warranty, express or implied, is intended.

We appreciate the opportunity to provide continuing assistance on this project. If you have any questions regarding this letter, please contact the undersigned.

Sincerely,
NV5

Prepared By:

Nicole McCurdy

REGISTERED PROFESSIONAL ENGINEER
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12/7/2021
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Nicole C. McCurdy, P.E.
Project Engineer

Reviewed By:

PROFESSIONAL GEOLOGIST
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12/7/2021
STATE OF CALIFORNIA

Pamela J. Raynak, P.G.
Senior Geologist

Attachment: *Geotechnical Engineering Report, Tahoe Donner Association Downhill Ski Lodge*, prepared by NV5 dated November 8, 2021.

GEOTECHNICAL ENGINEERING REPORT
TAHOE DONNER ASSOCIATION DOWNHILL SKI LODGE

11585 SNOWPEAK WAY
APN 046-250-009-000
TRUCKEE, CALIFORNIA

NOVEMBER 8, 2021

PREPARED FOR:

TAHOE DONNER ASSOCIATION
JON MITCHELL
11509 NORTHWOODS BOULEVARD
TRUCKEE, CALIFORNIA 96161

NV5
10775 PIONEER TRAIL, SUITE 213
TRUCKEE, CALIFORNIA 96161

PROJECT NO. 42949.00

Project No. 42949.00
November 8, 2021

Tahoe Donner Association
11509 Northwoods Boulevard
Truckee, California 96161

Attention: Jon Mitchell, P.E., Director of Capital Projects

Reference: **Tahoe Donner Association Downhill Ski Lodge**
11585 Snowpeak Way
APN 046-250-009-000
Truckee, California

Subject: **Geotechnical Engineering Report**

Dear Mr. Mitchell:

This report presents the results of our geotechnical engineering investigation for the proposed removal and replacement of the existing Tahoe Donner Association Downhill Ski Lodge located at 11585 Snowpeak Way in Truckee, California. The project will involve removal of the existing downhill ski lodge and replacement with a new 22,000 to 26,000 square-foot lodge. Following removal of the existing lodge, a temporary facility will be constructed for use prior to development of the new lodge facility. Appurtenant construction will include parking and access improvements, new hard surface patios, and new underground utilities.

Our professional opinion is that the site is suitable for the proposed development using conventional earthwork grading and foundation construction techniques. The near-surface soil is predominately granular soil that should provide suitable foundation support. No highly compressible or potentially expansive soil conditions were encountered during our subsurface exploration.

Loose granular soil was encountered in our borings at depth of approximately 0 to 10 feet bgs in Boring B-1; 10 to 20 feet bgs and 24 to 28.5 feet in Boring B-2; and 14 to 20 feet bgs in Boring B-4. Based on our understand of the project, excavations on the order of 10 to 12 feet will be needed for the new lodge structure. We understand that proposed unconfined excavation cut slopes will be inclined at 1:1 (horizontal to vertical). We anticipate that the soil encountered in our borings will be stable at the proposed inclinations, however, if groundwater is encountered, some sloughing of cut slopes may occur. Some ravelling of temporary unconfined excavations should be anticipated due to the granular nature of site soil. Temporary excavations should not be allowed to remain open over the winter.

Groundwater was encountered in three of our four borings at depths of approximately 6 to 10 feet bgs. during our field investigation. We anticipate that groundwater will be at relatively shallow depths shortly following snow melt. Depending on final site grades, rainfall, and/or irrigation practices, near-surface soil layers may become seasonally or temporarily saturated. Water in saturated soil could migrate through concrete slabs-on-grade, cause degradation of asphalt concrete pavements, and contribute to frost heave and other adverse conditions. Positive surface water drainage and foundation drainage will be important to help manage near-surface seasonal groundwater. Temporary dewatering during construction will likely be required. We have provided recommendations to reduce the potential for these adverse effects in the following report.

Existing fill was encountered in one soil boring and in each of our test pits at depths ranging from approximately 3 to 6 feet bgs across the site. Based on our visual observations, approximately 10 to 14 feet of existing fill is present on the slope between the existing lodge building and the Eagle Rock chair lift. Due to the developed nature of the site, it is likely that existing fill is present within areas of existing improvements at the site. Due to the potential for excessive settlement, existing fill will not be suitable for support of structures. Structures should be founded on underlying native soil, or the existing fill can be removed and replaced with compacted structural fill. Based on our understanding of the project as currently proposed, excavations on the order of 10 to 12 feet will be needed for the new lodge structure and the existing fill will likely be removed in these areas. We have provided recommendations for removal and replacement of existing fill in the following report.

The findings presented in this report are based on our subsurface exploration, laboratory test results, and experience in the project area. We recommend retaining our firm to provide construction monitoring services during earthwork and foundation excavation to observe subsurface conditions encountered with respect to our recommendations provided in this report. As plans develop, we should be consulted concerning the need for additional services.

Please contact us if you have any questions regarding this report or if we can be of additional service.

Sincerely,
NV5

Prepared by:

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11/8/2021

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11/8/2021

John K. Hudson
John K. Hudson, P.E.
Associate Engineer

TABLE OF CONTENTS

FIGURES

APPENDICES

1 INTRODUCTION

This report presents the results of our geotechnical engineering investigation for the proposed removal and replacement of the existing Tahoe Donner Association Downhill Ski Lodge located at 11585 Snowpeak Way in Truckee, California. We performed our investigation in general accordance with our July 9, 2021 proposal for the project.

1.1 PURPOSE

The purpose of our work was to explore and evaluate the subsurface conditions at the project site and to provide our geotechnical engineering conclusions and recommendations for project design and construction.

Our findings are based on our subsurface exploration, laboratory test results, and our experience in the project area. We recommend retaining our firm to provide construction monitoring services during earthwork and foundation excavation to observe subsurface conditions encountered with respect to our recommendations.

1.2 SCOPE OF SERVICES

To prepare this report we performed the following scope of services:

- We performed a site reconnaissance, literature review, and subsurface exploration involving borings drilled with a truck-mounted drill rig, test pits excavated with a track-mounted mini-excavator, completion of one infiltration test, and completion of a seismic refraction microtremor (ReMi) survey.
- We logged the subsurface conditions encountered in our borings and test pits and collected bulk soil samples for classification and laboratory testing.
- We performed laboratory tests on selected soil samples obtained during our subsurface investigation to evaluate material properties.
- Based on our subsurface exploration and the results of our laboratory testing, we performed engineering analyses to develop geotechnical engineering recommendations for project design and construction.

1.3 SITE DESCRIPTION

The project site is located near the northwest corner of the Tahoe Donner Subdivision at the bottom of the ski hill. The site consists of a single parcel that comprises approximately one acre of previously developed land. The Nevada County Assessor’s Parcel Number (APN) is 046-250-009-000 and the physical address for the site is 11585 Snowpeak Way.

The site contains an existing ski lodge that was constructed circa 1970s and is in need of replacement. The existing lodge facility is a two-story, wood-frame structure with a concrete deck. Much of the area surrounding the lodge consists of asphalt concrete pavement, with the exception of the area south of the lodge that consists of bare soil and a small lawn area. Access to the site is provided by a shared paved access road that extends off Snowpeak Way.

The site slopes gently down to the northeast. An existing drainage channel is located south of the existing lodge and concrete deck that provides drainage from the ski hill in a general northeast direction. Based on our subsurface exploration discussed in Section 3 of this report, existing fill is present throughout the majority of the site and varies in thickness from approximately 3 feet near the northeast corner of the site to approximately 6 feet near the southern edge of the existing lodge structure. Based on our visual observations, approximately 10 to 14 feet of existing fill is present on the slope between the existing lodge building and the Eagle Rock chair lift. Vegetation at the site consists of landscaping (small lawn area), a lone pine tree at the northwest corner of the site and dense willow bushes alone the southern drainage channel.

The site is bounded by condominiums associated with the Tahoe Donner Lodge Condominium Association to the north, west, and east, and ski runs and lifts associated with the downhill ski area to the south. The approximate location of the site is shown on Figure 1, Site Vicinity Map. A plan view of the project site are shown on Figures 2 and 3.

The site is located at 39.3551°N latitude and 120.2589°W longitude (WGS84 datum). Based on a preliminary building pad and mass grading plan prepared by Auerbach Engineering Corporation dated August 16, 2021, site elevations range from approximately 6,784 feet above mean sea level (MSL) near the southwest property corner to approximately 6,760 feet MSL near the north property corner. Surface water drainage consists of overland flow and is concentrated in the earthen drainage swales and culvert described above. The site slopes gently to moderately down in a general southwest to northeast direction.

1.4 PROPOSED IMPROVEMENTS

Information about the proposed project was obtained from our site visits, communication with Peter Williams of Bull Stockwell Allen Architecture + Planning + Interiors (BSA), and review of fifty-percent plans prepared by BSA dated August 16, 2021. The project will involve removal and replacement of the existing ski lodge. Appurtenant construction will include a new asphalt concrete paved driveway, new underground utilities, new hard surface patios, stormwater improvements, Americans with Disabilities Act (ADA) accessibility, and landscaping.

The new ski lodge will be a three-story wood and steel-frame building with concrete slab-on-grade and slab-on-deck floors. The lowest level will contain mechanical rooms, loading, and staff support offices. The middle level will contain guest services, including a rental area, locker rooms, and ski school services. The upper level will contain a dining and kitchen area. Structural loads were not available; assumed maximum wall and column loads will be about 6 kips per linear foot and about 190 to 450 kips, respectively. We anticipate cut and fill depths will be on the order of about 9 to 12 feet. No detailed grading plans were available for our review.

2 LITERATURE REVIEW

We reviewed available geologic and soil literature in our files to evaluate geologic and subsurface conditions at the project site.

2.1 PREVIOUS STUDIES

Nv5 (formerly Holdrege & Kull) prepared a geotechnical engineering report for the Tahoe Donner Downhill Ski Area Tier 4 Parking Lot dated August 23, 2011 (Project No. 41521-01) that is located approximately 600 feet northeast of the site. The purpose of the report was to evaluate subsurface conditions for a proposed new 48 stall asphalt concrete paved parking lot and widening of an access road that leads to Slalom Way. Three test pits were excavated as part of the study and subsurface conditions consisted of approximately 4 to 10 inches of silty Sand (SM) containing organic material (topsoil) overlying loose to very dense silty Sand (SM) with varying amounts of gravel, cobbles, and boulders. Groundwater was not encountered in the test pits.

2.2 SITE GEOLOGY

We reviewed a geologic map and report titled *Geologic Map of the North Lake Tahoe-Donner Pass Region, Northern Sierra Nevada, California*, by Arthur Gibbs Sylvester et al., California Geological Survey, 2012. The geologic map indicates that the site is underlain by Miocene aged volcanic rock that is comprised of andesite flows. The geologic map also shows the contact with Quaternary aged glacial drift along the north side of the existing lodge that is comprised of deeply weathered granitic silt, sand, gravel, cobbles, and boulders. Based on our subsurface investigation, described below, near-surface soil conditions are consistent with the mapped geology of glacial drift.

2.3 REGIONAL FAULTING

The project is located in a potentially active seismic area. To evaluate the location of mapped faults relative to the project site, we reviewed the following maps:

- *Fault Activity Map of California <http://maps.conservation.ca.gov/ cgs/fam/>;* by Charles W. Jennings and William A. Bryant, California Geological Survey, Geologic Data Map No. 6, 2010.
- Google Earth/KMZ files provided by USGS Earthquakes Hazards Program. Quaternary Faults & Folds in the U.S. Retrieved September 16, 2021. https://earthquake.usgs.gov/learn/kml.php
- *EQ Zapp: California Earthquake Hazards Zone Application*. *http://www.conservation.ca.gov/cgs/geohazards/eq-zapp;* California Geological Survey.

The potential risk of fault rupture is based on the concept of recency and recurrence. The more recently a particular fault has ruptured, the more likely it will rupture again. The California State Mining and Geology Board define an “active fault” as one that has had surface displacement within the past 11,000 years (Holocene). Potentially active faults are defined as those that have ruptured between 11,000 and 1.6 million years before the present (Quaternary). Faults are generally considered inactive if there is no evidence of displacement during the Quaternary period.

The referenced maps above show several active and potentially active faults located near the project site, including the Dog Valley Fault (potentially active, approximately 0.42 mile northwest), surface ruptures associated with the Dog Valley Fault and the 1966 Truckee Earthquake (active, approximately 5.5 miles northeast), the Polaris Fault (active, approximately 5.3 miles northeast), a group of unnamed faults southeast of Truckee (active and potentially active, approximately 4.5 and 5.8 miles southeast), the West Tahoe – Dollar Point Fault Zone (potentially active, approximately 8.4 miles southeast), that Tahoe Sierra Frontal Fault Zone (potentially active, approximately 8.2 miles south-southeast), the West Tahoe Fault (active, approximately 20 miles southeast), and the North Tahoe Fault (active, approximately 17.8 miles southeast). Earthquakes associated with these faults may cause strong ground shaking at the project site.

2.4 POTENTIAL SEISMIC HAZARDS

Primary hazards associated with earthquake faults include strong ground motion and surface rupture. No faults are mapped as crossing the site. Based on our review of the web-based interactive Fault Activity Map of California, the Dog Valley Fault is shown as trending towards the site and is shown terminating approximately 0.5 mile northeast of the site. The Fault Activity Map of California shows the Dog Valley Fault as potentially active. Based on our review of the Google Earth/KMZ files provided by USGS Earthquakes Hazards Program, Quaternary Faults & Folds in the U.S., the Dog Valley Fault is shown as terminating approximately 0.42 mile northeast of the site and is shown as potentially active (less than 1.6 million years). Since the fault is not shown as crossing the site, the potential for surface rupture at the site is considered low. It should also be understood that NV5 did not perform a site-specific surface reconnaissance investigation nor a subsurface investigation of the project site and vicinity for the purpose of identifying the exact locations of any faults that may negatively impact the project site. Earthquakes centered on regional faults in the area, such as the West Tahoe Fault, would likely result in higher ground motion at the site than earthquakes centered on smaller faults that are mapped closer to the site.

Based on our review of the *California Earthquake Hazards Zone Application (EQ Zapp – https://www.conservation.ca.gov/cgs/geohazards/eq-zapp),* the site is not located within an active Earthquake Hazards Zone (formerly referred to as the Alquist-Priolo fault zone).

Secondary seismic hazards include liquefaction, lateral spreading, seismically induced slope instability, and tsunami hazards. These potential hazards are discussed below.

2.4.1 Soil Liquefaction

Liquefaction is a phenomenon where loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup. Cyclic loading, such as that caused by an earthquake, typically causes an increase in pore water pressure and subsequent liquefaction. Based on the results of our subsurface exploration described in Section 3 below, soil underlying the site predominantly consists of loose to very dense silty Sand (SM) with varying amounts of gravel, cobbles, and boulders. Groundwater was encountered in Borings B-1, B-2, and B-4 at depths ranging from approximately 6 and 10 feet below the existing ground surface (bgs). The consistency of site soil increased with depth and the percentage of fines ranged from 10 to 44 percent. Based on our understanding of the subsurface conditions and our engineering analysis, this soil profile will have a low potential for liquefaction.

2.4.2 Lateral Spreading

Lateral spreading is the lateral movement of soil resulting from liquefaction of subadjacent materials. Since we anticipate that there is a low potential for liquefaction of soil at the site, the potential for lateral spreading to occur is also considered low.

2.4.3 Slope Instability

Slope instability includes landslides, debris flows, and rockfall. No landslides, debris flows or rockfall hazards were observed in the project area. Due to the previously graded nature of the site and general competent nature of site soil, the potential for slope instability is considered low.

2.5 RADON-222 GAS

Radon gas is a naturally occurring radioactive isotope that is formed from the decay of uranium and thorium commonly found in organic rich shale rock and granitic rocks. Because radon is a gas, it can easily move through soil and cracks in building slabs or basement walls and concentrate in a building's indoor air. Breathing air with elevated levels of radon gas results in increased risk of developing lung cancer. The Radon-222 isotope has the longest half-life of other radon isotopes and the Environmental Protection Agency (EPA) has established a long-term exposure limit of 4 picocuries per liter to protect human health.

The United States Environmental Protection Agency *Map of Radon Zones for California* (viewed at: www.epa.gov/radon/states/california.html) indicates that Nevada County is located in Radon Zone 2. This zone consists of counties with a predicted average indoor radon screening level between 2 pCi/L and 4 pCi/L.

CDHS published the *California Indoor Radon Levels Sorted by Zip Code* (https://www.cdph.ca.gov, last updated February 2016). This database summary indicated that, in the 96161 Zip Code for Truckee, radon concentrations exceeded the CDHS recommended action level (RAL) of 4 pCi/L in 27.7 percent indoor air tests.

The building ventilation system in the planned new lodge facility may exchange enough air each day to prevent the concentration of radon. If the planned ventilation system is not adequate to exchange air within the structure and prevent accumulation of radon gas, a passive ventilation system may be designed and constructed to help prevent the accumulation of radon in the structure.

3 SUBSURFACE EXPLORATION

We performed our subsurface exploration to help characterize subsurface conditions at the site.

3.1 FIELD EXPLORATION

We explored subsurface conditions at the site between July 15 and September 16, 2021, by drilling four exploratory borings, excavating four test pits, performing one infiltration rate test, and performing one seismic survey, as described below. Exploration locations were selected based on locations of proposed improvements and site access. Soil samples were packaged and sealed in the field to reduce moisture loss and returned to our laboratory for testing. The approximate locations for our borings, test pits, infiltration test, and seismic survey are shown on Figures 2 and 3. Copies of our boring and test pit logs are included in Appendix B.

Soil Borings

Four soil borings (B-1 through B-4) were drilled to depths ranging from approximately 21.5 to 31.5 feet below ground surface (bgs). The borings were advanced using a CME 75 truck-mounted drill rig equipped with 4-inch solid-stem augers.

An engineer from our firm logged the soil conditions encountered during drilling, visually classified soil, and collected soil samples for laboratory testing. Bulk and relatively undisturbed samples were obtained with an unlined SPT split-spoon sampler. Upon completion, the borings were backfilled with grout and soil cuttings.

Test Pits

Four test pits (TP-1 through TP-4) were excavated to depths ranging from approximately 4 to 10 feet bgs. The test pits were excavated using a Caterpillar 304 mini-excavator equipped with a 24-inch bucket.

A geologist from our firm logged the soil conditions exposed in the test pits, visually classified soil, and collected bulk soil samples for laboratory testing. Upon completion, test pits were backfilled with the excavated soil.

Seismic Survey

NV5 performed a seismic refraction microtremor (ReMi) survey at the site using the SeisOpt® ReMi™ Vs30 method to determine the in-situ weighted-average Rayleigh-wave (shear-wave) velocity profile of the upper 100-feet (30 meters) of soil beneath the site. This evaluation was selected to determine the 2019 California Building Code (CBC) Site Class.

The ReMi survey is performed at the surface using the same conventional seismograph and vertical P-wave geophones used for seismic refraction surveys. The seismic source consists of passive ambient seismic microtremors, which are constantly being generated by cultural activities and natural noise in the area, and active noise generated by walking up and down the line and striking a sledgehammer off the ends of the geophone spread. The data was acquired during a series of 12 recording periods, each consisting of one 30-second noise burst, using a Geometrics Model Geode 24-channel seismograph. The 4.5-hertz (Hz) geophones were positioned along a nominally straight line and spaced at 13-foot intervals. One approximately 300-foot seismic line was recorded at the approximate location shown on Figure 2.

Data quality for a ReMi survey is verified by observing the slowness-frequency plot of the Rayleigh-wave velocity spectrum. Good data quality is characterized by a well-defined energy envelope with a coherent dispersion curve that is continuous across all usable frequencies. Data quality for this ReMi survey was good, with a well-defined, coherent energy envelope.

ReMi analysis results are displayed as a 1-dimensional Vs model of shear-wave velocity versus depth below the existing ground surface at the center of the geophone spread. A plot of the ReMi dispersion curve showing picks and model fits and the velocity spectrum image with dispersion modeling picks are included in Appendix C. The resulting subsurface shear wave model for the site indicates that the weighted-average seismic shear wave velocity for the upper 100 feet of the subsurface (Vs100) is 1,736 feet per second (ft/s). This weighted shear wave velocity corresponds to a Site Class of C (Very Dense Soil and Soft Rock).

Infiltration Tests

Two infiltration tests were performed inside Test Pit TP-4 at a depth of approximately 4 feet bgs using a Turf Tech™ double ring infiltrometer (2 3/8-inch inner ring and 4 ¼-inch outer ring inside diameter). The test holes were filled with water and presoaked prior to collecting measurements. Successive readings of the drop in water level were made over several 15-minute periods until a stabilized drop was recorded. Measurements were referenced from the top of the infiltrometer. The test results indicate that the stabilized drop range varies between approximately 5 to 6 minutes per inch (mpi). We anticipate that permeability rate tests will be slower at depths greater than about 4 feet bgs due to increasing soil density. We recommend using 4 inches per hour for design of stormwater facilities.

3.2 SUBSURFACE SOIL CONDITIONS

Existing fill was encountered in Boring B-2 and in each of our test pits. The existing fill consisted of medium dense to dense silty Sand with gravel (SM) and stiff to very stiff sandy Silt with gravel (ML) and varying amounts of cobbles. Minor debris (trash and wood) was encountered in the exiting fill encountered in Test Pit TP-4. The depth of existing fill varied from approximately 3 feet near the northeast corner of the site to approximately 6 feet near the southern edge of the existing lodge structure.

Underlying the existing fill in our borings, soil conditions consisted of loose to very dense silty Sand (SM) with varying amounts of gravel and cobbles to the maximum depth explored of 31.25 feet below the ground surface (bgs). Loose soil was encountered in our borings at depths ranging from approximately 0 to 10 feet bgs in Boring B-1; 10 to 20 feet bgs and 24 to 28.5 feet in Boring B-2; and 14 to 20 feet bgs in Boring B-4.

Underlying the existing fill in our test pits, soil conditions consisted of medium dense poorly graded Gravel with silt and sand (GP-GM), medium dense to dense silty Sand (SM), medium dense clayey Sand (SC), and medium dense to dense poorly graded sand with clay and gravel

(SP-SC). Test pit TP-1 was terminated at a depth of approximately 9 feet bgs due to caving conditions in existing fill along the north wall. Test Pit TP-2 was terminated at a depth of approximately 10 feet bgs (maximum reach of excavating equipment). Test Pit TP-3 was terminated at a depth of approximately 4 feet bgs due to the presence of a metal pipe and Test Pit TP-4 was terminated at a depth of approximately 7 feet bgs due to the close proximity to an existing access driveway. More detailed descriptions of the subsurface conditions observed are presented in our Boring Logs in Appendix B.

3.3 GROUNDWATER CONDITIONS

We observed groundwater in three of the four borings (B-1, B-2, and B-4) at depths of approximately 6 and 10 feet bgs. We did not observe groundwater in our test pits. Based on our previous experience in the project area, we anticipate that the depth of groundwater will be relatively shallow shortly following snow melt. Fluctuations in soil moisture content and groundwater levels should be anticipated depending on precipitation, irrigation, runoff conditions, and other factors. Based on our experience in the project area, seasonal saturation of near-surface soil should be anticipated, especially during and immediately after large storm events and/or seasonal snowmelt.

Near-surface saturated soil may cause moisture intrusion through concrete slab-on-grade floors, degradation of asphalt concrete pavements, and other adverse conditions. Mitigation measures such as gravel underdrains, elevated building pads, trench drains, water barriers, or other methods may be required to intercept shallow groundwater or reduce potential adverse effects on project features.

4 LABORATORY TESTING

We performed laboratory tests on bulk soil samples collected from our exploratory borings and test pits to evaluate their engineering properties. We performed the following laboratory tests:

- Density (Unit Weight) (ASTM D2937)
- Atterberg Limits / Plasticity (ASTM D4318)
- Sieve Analysis (ASTM D422)

Sieve analysis and Atterberg limits data resulted in Unified Soil Classification System (USCS) classifications of silty Sand (SM), silty Sand with gravel (SM), poorly graded Gravel with silt and sand (GP-GM), and poorly graded Sand with clay and gravel (SP-SC). More specific soil classification and laboratory test data is included in Appendix D. USCS classifications and Atterberg indices are summarized below.

Table 4.1 – Summary of Laboratory Test Results

Boring/Test Pit Number	Depth (feet)	USCS Classification	Percent Passing #200 Sieve	Liquid Limit	Plasticity Index
B-1	10 – 11.5	Silty Sand (SM)	44	--	--
B-1	20 – 31.5	Silty Sand (SM)	41	Non-Plastic	Non-Plastic
B-2	5 – 6.5	Silty Sand with Gravel (SM)	19	Non-Plastic	Non-Plastic
B-4	3.5 – 4	Silty Sand (SM)	--	--	--
B-4	15 – 16.5	Silty Sand with Gravel (SM)	25	--	--
TP-1	7.5 – 8	Poorly Graded Gravel with Silt and Sand (GP-GM)	11	44	8
TP-2	5.5 – 6	Silty Sand (SM)	45	--	--
TP-4	5 – 5.5	Poorly Graded Sand with Clay and Gravel (SP-SC)	10	38	19

5 CONCLUSIONS

The following conclusions are based on our understanding of the subsurface conditions, laboratory test results, engineering analysis, and our experience in the area.

1. Soil conditions encountered during our field investigation consisted of loose to very dense coarse-grained soil types of low to medium plasticity. The soil should provide suitable foundation support for the proposed structures on conventional shallow spread foundations. No highly plastic, compressible, or potentially expansive soil was encountered.
2. Loose granular soil was encountered in our borings at depth of approximately 0 to 10 feet bgs in Boring B-1; 10 to 20 feet bgs and 24 to 28.5 feet in Boring B-2; and 14 to 20 feet bgs in Boring B-4. Based on our understand of the project, excavations on the order of 10 to 12 feet will be needed for the new lodge structure. We understand that proposed unconfined excavation cut slopes will be inclined at 1:1 (horizontal to vertical). We anticipate that the soil encountered in our borings will be stable at the proposed inclinations, however, if groundwater is encountered, some sloughing of cut slopes may occur. Some ravelling of temporary unconfined excavations should be anticipated due to the granular nature of site soil. Temporary excavations should not be allowed to remain open over the winter.
3. Groundwater was encountered in three of our four borings at depths of approximately 6 to 10 feet bgs. during our field investigation. We anticipate that groundwater will be at relatively shallow depths shortly following snow melt. Depending on final site grades, rainfall, and/or irrigation practices, near-surface soil layers may become seasonally or temporarily saturated. Water in saturated soil could migrate through concrete slabs-on-grade, cause degradation of asphalt concrete pavements, and contribute to frost heave and other adverse conditions. Positive surface water drainage and foundation drainage will be important to help manage near-surface seasonal groundwater. Temporary dewatering during construction will likely be required. We have provided recommendations to reduce the potential for these adverse effects in the *Recommendations* section of this report.
4. Existing fill was encountered in one soil boring and in each of our test pits at depths ranging up to approximately 3 to 6 feet bgs. Based on our visual observations, approximately 10 to 14 feet of existing fill is present on the slope between the existing lodge building and the Eagle Rock chair lift. Due to the potential for excessive settlement, existing fill will not be suitable for support of structures. Structures should be founded on underlying native soil, or the existing fill can be removed and replaced with compacted structural fill. Based on our understanding of the project as currently proposed, excavations on the order of 10 to 12 feet will be excavated for the new lodge structure and the existing fill will likely be removed in these areas. It is possible that utility lines may be present in the area of proposed improvements. If encountered, these items should be removed and disposed of off-site. Existing utility pipelines that extend

beyond the limits of the proposed construction that will be abandoned in place should be plugged with cement grout to prevent migration of soil and/or water. All excavations resulting from removal activities should be cleaned of loose or disturbed material, including all previously placed backfill.

5. Site soil is generally suitable for reuse as structural fill. Moisture conditioning to near-optimum moisture content, including drying, may be necessary prior to use as fill to reach the specified compaction. Moisture content, dry density, and relative compaction of structural fill should be evaluated by our firm at regular intervals during structural fill placement.
6. Site soil should provide adequate pavement support. However, seasonal saturation of near-surface soil should be considered in the design of pavement areas. Subdrains under pavement areas and/or v-ditches along the side of roads should be considered to reduce saturation.

6 RECOMMENDATIONS

The following geotechnical engineering recommendations are based on our understanding of the subsurface conditions and the project as currently proposed, our field observations, results of our laboratory tests, engineering analyses, and our experience in the area.

6.1 EARTHWORK

The following sections present our recommendations for site clearing and grubbing, preparation for and placement of fill material, cut/fill slope grading, temporary excavations, utility trench construction, and construction dewatering.

6.1.1 Clearing and Grubbing

Areas proposed for fill placement, road and driveway construction, and building areas should be cleared and grubbed of vegetation and other deleterious materials. Existing vegetation, organic topsoil, and any debris should be stripped and hauled offsite or stockpiled outside the construction limits. Due to the developed nature of the site and results from our subsurface exploration, we anticipate that the average depth of stripping will be minimal in areas of existing improvements and could be on the order of 6 inches in the area south of the existing lodge structure. Organic surface soil, if encountered, may be stockpiled for future use in landscape areas, but is not suitable for use as structural fill. We anticipate that the actual depth of stripping will vary across the site.

Man-made debris and backfill soil in our exploratory borings or any other onsite excavations should be over-excavated to underlying, competent material and replaced with compacted structural fill. Grubbing may be required where concentrations of organic soil or tree roots are encountered during site grading.

Existing fill should be removed in areas that will support foundation elements, earth retention structures, concrete slabs-on-grade, and pavement sections. Based on the results of our subsurface exploration, existing fill was encountered in one boring and in each of our test pits at depths ranging from approximately 3 to 6 feet across the site. In addition, we anticipate that existing fill may be encountered throughout the site due to the developed nature of the site. Existing fill should either be replaced with compacted structural fill or improvements may be founded directly on properly prepared underlying native soil. Existing fill material will be suitable for re-use as structural fill material provided any debris exceeding eight inches in maximum dimension and all organic or deleterious material are removed prior to placement. Preparation of the subgrade exposed by over-excavation and requirements for structural fill should be in accordance with recommendations provided below.

All rocks greater than 8 inches in greatest dimension (oversized rock) should be removed from the top 12 inches of soil, if encountered. Oversized rock may be used in landscape areas, rock faced slopes, or removed from the site. Oversized rock should not be placed in fill without prior approval by the project geotechnical engineer.

6.1.2 Preparation for Fill Placement

Prior to fill placement, all areas of existing fill material, man-made debris, or backfill soil should be removed to expose non-expansive native soil as discussed in the previous section.

Where fill placement is planned, the near-surface soil should be scarified to a depth of about 12 inches or to competent material and then uniformly moisture conditioned to within 2 percent of the optimum moisture content. Scarified and moisture conditioned soil should be recompacted with appropriate compaction equipment and proof rolled with a loaded, tandem-axle truck under the observation of an NV5 representative. Any areas that exhibit pumping or rutting should be over-excavated and replaced with compacted structural fill placed according to the recommendations below.

6.1.3 Fill Placement

All fill placed beneath structural improvements (e.g., foundation elements, pavements, and utility lines) and as part of a fill slope or retaining structure should be considered structural fill. Material used for structural fill should consist of uncontaminated, predominantly granular, non-expansive native soil or approved import soil. Structural fill should consist of granular material, nearly free of organic debris, with a liquid limit of less than 40, a plasticity index less than 15, 100 percent passing the 8-inch sieve, and less than 30 percent passing the No. 200 sieve. Based on our subsurface exploration, site soil generally meets these recommendations for structural fill; however, uniformly moisture conditioning the soil to within two percent of optimum moisture content and compacting it to meet project specifications may be difficult. Based on our previous experience in the area, site soil may be above optimum moisture content even in late summer and may require air drying or additional compaction effort to reach the specified compaction. Moisture content, dry density, and relative compaction of fill should be evaluated by our firm at regular intervals during fill placement. Rock used in fill should be broken into fragments no larger than eight inches in diameter. Rocks larger than eight inches are considered oversized material and should be stockpiled for offhaul, later use in rock-faced slopes, or placement in landscape areas.

Imported fill material should be predominantly granular, non-expansive, and free of deleterious or organic material. Import material that is proposed for use on site should be submitted to NV5 for approval and laboratory analysis at least 72 hours prior to import.

We anticipate near-surface site soil may be significantly above its optimum moisture content even if site grading is performed in late summer. These conditions could hamper equipment maneuverability and efforts to compact fill materials to the recommended compaction criteria. Fill material may require drying to facilitate placement and compaction, particularly during or following the wet season or spring snowmelt. Suitable compaction results may be difficult to obtain without processing the soil (e.g., discing during favorable weather, covering stockpiles during periods of precipitation, etc.).

Compaction requirements (maximum dry density and moisture content) specified in this report reference ASTM D1557 – *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort*. Structural fill should be uniformly moisture conditioned to within 3 percent of the optimum moisture content and placed in maximum 8-inch thick, loose lifts (layers) prior to compacting. Structural fill should be compacted to at least 90 percent of the maximum dry density. The upper 8 inches of structural fill in paved areas should be compacted to at least 95 percent of the maximum dry density. Moisture content, dry density, and relative compaction of fill should be evaluated by our firm at regular intervals during fill placement. The earthwork contractor should assist our representative by preparing test pads with the onsite earth moving equipment.

Structural fill material with more than 30 percent rock larger than ¾-inch cannot be reliably tested using conventional compaction testing equipment. We recommend that a procedural approach, or method specification, be used for quality assurance during rock fill placement rather than a specified relative compaction. The procedural requirements will depend on the equipment used, as well as the nature of the fill material, and will need to be determined by the geotechnical engineer on site. Based on our experience in the area, we anticipate that the procedural specification will require a minimum of six passes with a Cat 563 or similar, self-propelled vibratory compactor to compact a maximum 8-inch thick loose lift. Processing or screening of the fill may be required to remove rocks larger than 8-inches in maximum dimension. Continuous observation by an NV5 representative will be required during fill placement to confirm that procedural specifications have been met.

6.1.4 Cut/Fill Slope Grading

Permanent cut and fill slopes at the subject site should be stable at inclinations up to 2H:1V (horizontal to vertical); however, we recommend re-vegetating or armoring all cut/fill slopes to reduce the potential for erosion. Steeper slopes may be possible at the site provided slopes are protected from excessive erosion using rock slope protection or similar slope reinforcement. Slopes steeper than 2H:1V (horizontal to vertical) should be evaluated on a case-by-case basis.

Fill should be placed in horizontal lifts to the lines and grades shown on the project plans. Slopes should be constructed by overbuilding the slope face and then cutting it back to design slope grades. Fill slopes should not be constructed or extended horizontally by placing soil on an existing slope face and/or compacted by track walking.

Equipment width keyways and benches should be provided where fill is placed on side-slopes with gradients steeper than 5H:1V. The keyway should be excavated at the toe of the slope and extend into competent material. Benching must extend through loose surface soil into suitable material, and be performed at intervals such that no loose soil is left beneath the fill. NV5 should observe keyways and benches prior to fill placement.

The upper two to five feet of cut slopes should be rounded into the existing terrain above the slope to remove loose material and produce a contoured transition from cut face to natural ground. Scaling to remove unstable cobbles and boulders may be necessary. Fill slopes should be compacted as recommended for the placement of structural fill. The upper four to eight inches may be scarified to help promote revegetation.

6.1.5 Temporary Unconfined Excavations

Based on our understanding of the proposed project, temporary unconfined excavations deeper than five feet will be needed for the proposed new lodge structure. The following criteria may be used for construction of temporary cut slopes at the site.

Table 6.1.5.1 – Unconfined Excavation Slopes

Temporary Slope Inclination (Horizontal to Vertical)	Depth Below Ground Surface (feet)
0.1 H:1V (Soil)	0-12

These temporary slope inclinations may require modification in the field during construction or where loose soil, groundwater seepage, or existing fill is encountered. The slope should be scaled of loose cobbles and boulders. If groundwater seepage is encountered, minor sloughing of slopes may occur. Temporary drainage may be required during construction. Higher slopes should be covered with strong wire or fabric, firmly secured to prevent roll down of cobbles or other deleterious materials. The contractor is responsible for the safety of workers and should strictly observe federal and local Occupational Safety and Health Administration (OSHA) requirements for excavation shoring and safety. Some raveling of temporary cut slopes should be anticipated. During wet weather, surface water runoff should be prevented from entering excavations. To reduce the likelihood of sloughing or failure, temporary cut slopes must not remain over the winter.

6.1.6 Underground Utility Trenches

We anticipate that the contractor will be able to excavate underground utility trenches using conventional earthmoving equipment across the majority of the site. We expect that some caving and sloughing of utility trench sidewalls will occur. OSHA requires all utility trenches deeper than five feet bgs be shored with bracing equipment or sloped back prior to entry.

Shallow subsurface seepage may be encountered in trench excavations, particularly if utility trenches are excavated during the spring or early summer. The earthwork contractor may need to employ dewatering methods as discussed in the *Construction Dewatering* section below to excavate, place, and compact trench backfill materials.

Soil used as trench backfill should be non-expansive and should not contain rocks greater than 3 inches in maximum dimension. Trench backfill should consist of uniformly moisture conditioned soil and be placed in maximum 8-inch thick loose lifts prior to compacting. Unless otherwise specified by the applicable local utility district, pipe bedding and trench backfill should be compacted to at least 90 percent of the maximum dry density. Trench backfill placed within 8 inches of building subgrade and driveway areas should be compacted to at least 95 percent of the maximum dry density. The moisture content, density, and relative compaction of fill should be tested by NV5 at regular intervals during fill placement.

6.1.7 Construction Dewatering

During our subsurface exploration, we encountered groundwater at depths ranging from approximately 6 to 10 feet bgs. We anticipate that groundwater will be encountered at relatively shallow depths during site grading and underground utility construction, especially following snow melt. We should observe those conditions, if they are encountered, and provide site specific subsurface drainage recommendations. The following recommendations are preliminary and are not based on a groundwater flow analysis.

We anticipate that dewatering of excavations can be performed by gravity or by constructing sumps to depths below the excavation and removing water with pumps. A perimeter trench drain should be constructed at each planned building pad and water should be conveyed off site during construction. The temporary drainage system may be used for permanent drainage provided the system is protected and kept clean during construction. To maintain stability of the excavation when placing and compacting trench backfill, groundwater levels should be drawn down at least two feet below the lowest point of the excavation.

If seepage is encountered during trench excavation, it may be necessary to remove underlying saturated soil and replace it with free draining, open-graded, crushed rock (drain rock). Soil backfill may be placed after backfilling with drain rock to an elevation higher than encountered groundwater.

6.2 SURFACE WATER AND FOUNDATION DRAINAGE

This section of the report presents our recommendations to reduce the possibility of surface water and near-surface groundwater entering below grade areas. Care should be taken to reduce water and moisture introduced into the building interior during construction.

Based on our observations and past experience with geotechnical investigations in the project vicinity, there is a relatively high potential for seasonal saturation of near-surface soil and groundwater seepage into foundation areas. Depending on final site grades, rainfall, irrigation practices, and other factors beyond the scope of this study, water in near-surface saturated soil may migrate through concrete floor slabs, degrade asphalt concrete pavements, increase frost heave, and contribute to other adverse conditions.

Final site grading should be planned so that surface water is directed away from all foundations and pavements. Ponding of surface water should not be allowed near pavements or structures. Paved areas should be sloped away from structures a minimum of 2 percent and drainage gradients should be maintained to carry all surface water to a properly designed infiltration facility. The surface drainage system should generally be kept separate from the foundation (subsurface) drainage system. Surface water should not be infiltrated at elevations above the lowest foundation elements.

Drains should be considered on the upslope side of exterior foundations and should be placed along continuous interior wall foundations. Drains should extend to a properly designed infiltration facility. Recommended subsurface drain locations can be provided at the time of construction and when foundation elevations and configuration are known. Subsurface and foundation drain locations should be included on the project plans.

All foundation and slab-on-grade concrete should have a water to cement ratio of 0.45 or less. Underslab or blanket drains should be considered in slab-on-grade floor areas to reduce moisture transmission through the floor and help maintain subgrade support, particularly if the floor surface is lower than the adjacent exterior grade.

Where utility trenches slope toward structures, potential flow paths through utility trench backfill should be plugged with a less permeable material at the exterior of the foundation. All utility pipes should have sealed joints.

Roof drip-lines should be protected from erosion with a gravel layer and riprap. Roof downspouts should be directed to a closed collector pipe that discharges flow to positive drainage away from foundations. Backfill soil placed adjacent to building foundations should be placed and compacted such that water is not allowed to pond or infiltrate. Backfill should be free of deleterious material and placed and compacted in accordance with the above earthwork recommendations.

6.3 STRUCTURAL IMPROVEMENT DESIGN CRITERIA

The following sections provide design criteria for foundations, seismic design, slabs-on-grade, retaining walls, and pavement sections.

6.3.1 Foundations

Our opinion is that shallow spread foundations are suitable for support of the proposed structures. The following paragraphs discuss foundation design parameters and construction recommendations.

Exterior foundations should be embedded a minimum of 24 inches below the lowest adjacent exterior finish grade for frost protection and confinement. The bottom of interior footings should be at least 12 inches below lowest adjacent finish grade for confinement. Reinforcing steel requirements for foundations should be determined by the project structural engineer.

Foundations founded in competent, undisturbed native soil or compacted fill may be designed using an allowable bearing capacity of 3,000 psf for dead plus live loads. Allowable bearing pressures may be increased by 33 percent for transient loading such as wind or seismic loads.

Resistance to lateral loads (including transient loads) may be provided by frictional resistance between the bottom of concrete foundations and the underlying soil, and by passive soil pressure against the sides of foundations. Lateral resistance derived from passive earth pressure can be modeled as a triangular pressure distribution ranging from 0 psf at the ground surface to a maximum of 300d psf, where d equals the depth of the foundation in feet. A coefficient of friction of 0.32 may be used between poured-in-place concrete foundations and the underlying native soil. Lateral load resistance provided by passive soil pressure and friction may be used in combination without reduction.

Total settlement of individual foundations will vary depending on the plan dimensions of the foundation and actual structural loading. Based on anticipated foundation dimensions and loads, we estimate that total post-construction settlement of footings designed and constructed in accordance with our recommendations will be on the order of 1 inch. Differential settlement between similarly loaded, adjacent footings is expected to be less than ½ inch, provided footings are founded on similar materials (e.g., all on structural fill or native soil). Differential settlement between adjacent footings founded on dissimilar materials (e.g., one footing on soil and an adjacent footing on rock) may approach the maximum anticipated total settlement. Settlement of foundations is expected to occur rapidly and should be essentially complete shortly after initial application of loads.

Loose material remaining in footing excavations should be removed to expose firm, unyielding material or compacted to at least 90 percent relative compaction. Footing excavations should be moistened prior to placing concrete to reduce risk of problems caused by wicking of moisture from curing concrete. NV5 should observe footing excavations prior to reinforcing steel and concrete placement.

6.3.2 Seismic Design Criteria

In accordance with the 2019 California Building Code (CBC), the seismic design criteria shown in the table below should be used for the project site. The values were obtained for the site using the online Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps tool found at https://seismicmaps.org. Input values included the site’s approximate latitude and longitude obtained from Google Earth and the Site Class. The ReMi shear wave profile analysis resulted in Site Class C in accordance with definitions provided in Chapter 20 of ASCE 7-16.

Table 6.3.2.1 – 2019 CBC Seismic Design Parameters

Description	**Value**	**Reference**
Approximate Latitude/Longitude	39.3543°N/120.2593°W	Google Earth
Site Class	C	ReMi, Table 20.3-1, ASCE 7-16
Mapped Short-Period Spectral Response Acceleration Parameter	S_S = 1.296 g	Figure 1613.2.1(1), 2019 CBC
Mapped 1-Second Period Spectral Response Acceleration Parameter	S_1 = 0.425 g	Figure 1613.2.1(2), 2019 CBC
Short Period Site Coefficient	F_A = 1.2	Table 1613.2.3(1), 2010 CBC
1-Second Period Site Coefficient	F_V = 1.5	Table 1613.2.3(2), 2019 CBC
Site Adjusted Short-Period Spectral Response Acceleration Parameter	S_{MS} = 1.555 g	Equation 16-36, 2019 CBC
Site Adjusted 1-Second Period Spectral Response Acceleration Parameter	S_{M1} = 0.637 g	Equation 16-37, 2019 CBC
Design Short-Period Spectral Response Acceleration Parameter	S_{DS} = 1.036 g	Equation 16-38, 2019 CBC
Design 1-Second Period Spectral Response Acceleration Parameter	S_{D1} = 0.425 g	Equation 16-39, 2019 CBC
Peak Ground Acceleration	PGA = 0.564 g	Figure 22-9, ASCE 7-16
Risk Category	II	Table 1604.5, 2019 CBC
Seismic Design Category	D	Tables 1613.2.5 (1) & (2) 2019 CBC

6.3.3 Slab-on-Grade Construction

Concrete slabs-on-grade may be used in conjunction with perimeter concrete footings or shoulder backing. Slabs-on-grade should be a minimum of four inches thick. If floor loads higher than 250 psf, intermittent live loads, or vehicle loads are anticipated, the project structural engineer should provide slab thickness and steel reinforcing requirements.

Prior to constructing concrete slabs, the upper eight inches of slab subgrade should be scarified, uniformly moisture conditioned to within two percent of optimum moisture content and compacted to at least 90 percent of the maximum dry density. Scarification and compaction may not be required if floor slabs are placed directly on undisturbed compacted structural fill.

Slabs should be underlain by at least four inches of Class 2 aggregate base placed over the prepared subgrade. The aggregate base should be compacted to a minimum of 95 percent of the maximum dry density. If a subdrain is installed as described below, slabs may be constructed over the crushed gravel layer provided a moisture barrier will be placed over the gravel. All foundation and slab-on-grade concrete should have a water to cement ratio of 0.45 or less.

To reduce the potential for groundwater intrusion, the project architect and/or owner should consider constructing a drain beneath concrete slabs-on-grade in areas where groundwater and/or saturated soil may be present during wet periods. Subdrains should consist of a minimum of four inches of clean crushed gravel placed over native subgrade leveled or sloped at two percent towards a 4-inch diameter perforated drain pipe. The drain pipe should be placed with perforations faced down in a minimum 12-inch wide gravel-filled trench, wrapped in filter fabric. The depth of the trench may vary depending on cover requirements for the drain pipe and the slope required to drain water from beneath the slab to a properly constructed infiltration facility. A minimum of one pipe should be installed in each area of the slab surrounded by continuous perimeter foundation elements.

In slab-on-grade areas where moisture sensitive floor coverings are proposed, a vapor barrier (e.g., 15 mil Stego® Wrap) should be placed over the base course or gravel subdrain to reduce the migration of moisture vapor through the concrete slab. The vapor barrier should be installed in accordance with the manufacturer’s instructions. Concrete should be placed directly on the vapor barrier. All slab concrete should have a water-cement ratio of 0.45 or less. Alternatively, two inches of spray insulation may be placed between the gravel layer and slab-on-grade.

Regardless of the type of vapor barrier used, moisture can wick up through a concrete slab. Excessive moisture transmission through a slab can cause adhesion loss, warping, and peeling of resilient floor coverings, deterioration of adhesive, seam separation, formation of air pockets, mineral deposition beneath flooring, odor, and fungi growth. Slabs can be tested for water transmissivity in areas that are moisture sensitive. Commercial sealants, moisture retarding admixtures, fly ash, and a reduced water-to-cement ratio can be incorporated into the concrete to reduce slab permeability. To further reduce the chance of moisture transmission, a waterproofing consultant should be contacted.

Exterior slabs-on-grade such as sidewalks should be placed on a minimum 4-inch thick compacted aggregate base section to help reduce the potential for frost heave. Deleterious material should be removed from slab subgrades prior to concrete placement. For exterior slabs, the upper eight inches of native soil should be scarified, moisture conditioned, and compacted to at least 90 percent of the maximum dry density. We recommend a minimum concrete thickness of four inches. Where traffic loads are possible, we recommend a minimum concrete thickness of six inches. Concrete used for sidewalk construction should meet the durability requirements of Section 1904 of the 2019 CBC. The Exposure Class should be F2 unless the surface will be exposed to deicing chemicals, in which case the Exposure Class should be F3.

Concrete slabs impart a relatively small load on the subgrade (approximately 50 psf). Therefore, some vertical movement should be anticipated from possible expansion, freeze-thaw cycles, or differential loading. All exterior slabs should be constructed with a well compacted shoulder backing.

6.3.4 Retaining Wall Design Criteria

Retaining walls should be designed to resist lateral earth pressures exerted by retained soil plus additional lateral forces (i.e., surcharge loads) that will be applied to walls. Pressures exerted against retaining walls may be calculated by modeling soil as an equivalent fluid with unit weights presented in the following table. The equivalent fluid weights are for well-drained walls.

Table 6.3.4.1 – Equivalent Fluid Unit Weights*

Loading Condition	Retained Cut or Compacted Fill (Level Backfill)	Retained Cut or Compacted Fill (Backfill Slopes up to 2H:1V)
At-Rest Pressure (pcf)	55	70
Active Pressure (pcf)	40	55
Passive Pressure (pcf)	300	300
Coefficient of Friction	0.32	0.32

*Equivalent fluid unit weights presented are ultimate values and do not include a factor of safety. Passive pressures provided assume footings are founded in competent native soil or compacted and tested fill.

The values presented in Table 6.3.4.1 assume that the retained soil will not exceed approximately twelve feet in height and that no surcharge loads (e.g., footings, vehicles) are anticipated within a horizontal distance of approximately seven feet from the face of the wall. Fifty percent of any uniform areal surcharge placed at the top of a restrained wall (at-rest condition) may be assumed to act as a uniform horizontal pressure over the entire height of the wall. This may be reduced to 30 percent for unrestrained walls (active condition). In addition, we can provide retaining wall and rockery wall design criteria for specific loading and backfill configurations, if requested.

The use of the tabulated active pressure unit weight requires that the wall design accommodate sufficient deflection for mobilization of the retained soil to occur. Typically, a wall yield of at least 0.1 percent of the wall height is sufficient to mobilize active conditions in granular soil (*Caltrans Bridge Design Specifications*, August 2004). If the walls are rigid or restrained to prevent rotation, at-rest conditions should be used for design.

We recommend including additional lateral loading (ΔP_{ae}) on retaining structures due to seismic accelerations when designing walls greater than six feet in height. The USGS Seismic Design Maps tool was used to establish seismic design parameters and provides an estimated peak ground acceleration (PGA) corresponding to the maximum considered earthquake (MCE_R) ground motion.

For an earthquake producing a design PGA of 0.564g and a horizontal seismic coefficient (k_h) equal to one-third the PGA and following the Mononobe-Okabe procedure to evaluate seismic loading on retaining walls, we recommend that the resulting additional lateral force applied to retaining structures with drained level backfill be estimated as $\Delta P_{ae}=6.26H^2$ (pounds per foot), where H is the height of the wall in feet. The additional seismic force may be assumed to be applied at a height of H/3 above the base of the wall. This seismic loading is for standard retaining walls with drained, level backfill conditions only. NV5 should be consulted to provide seismic loading values for more critical walls or walls with non-level or non-drained backfill conditions. The use of reduced factors of safety is often appropriate when reviewing overturning and sliding resistance during seismic events.

Heavy compaction equipment or other loads should not be used in close proximity to retaining walls unless the wall is designed or braced to resist the additional lateral forces. If planned surface loads are closer to the top of the retaining wall than one-half of its height, NV5 should review the loads and loading configuration.

Retaining wall backfill should consist of granular material, nearly free of organic debris, with a liquid limit less than 40, a plasticity index less than 15, 100 percent passing the 8-inch sieve, and less than 30 percent passing the No. 200 sieve. Backfill should be uniformly moisture conditioned to within two percent of the optimum moisture content and compacted with appropriate compaction equipment to at least 90 percent of the maximum dry density. If the retaining wall backfill will support foundations or rigid pavements, the backfill should be compacted to at least 95 percent of the maximum dry density. An NV5 representative should review and provide specific backfill criteria for all retaining walls over 10 feet in height. Utilities that run through retaining wall backfill should allow for vertical movement where they pass through the wall.

Retaining wall design criteria presented in Table 6.3.4.1 assume that retaining walls are well-drained to reduce hydrostatic pressures. Back-of-wall drainage consisting of graded gravel drains and geosynthetic blankets should be installed to reduce hydrostatic pressures. Gravel drains should consist of at least 18 inches of open-graded, crushed rock placed directly behind the wall, wrapped in non-woven geotextile filter fabric such as Mirafi 140N or approved equivalent. Drains should have a minimum 4-inch diameter, perforated drain pipe placed at the base of the wall, inside the drain rock, with perforations placed down. The pipe should be sloped so that water is directed away from the wall by gravity. A geosynthetic drainage blanket such as Enkadrain™ or equivalent should also be placed against the back of the wall. Backfill must be compacted carefully so that equipment or soil does not tear or crush the drainage blanket.

We recommend that subsurface walls and slabs be treated to resist moisture migration. Moisture retarding material should consist of sheet membrane rubberized asphalt, polymer-modified asphalt, butyl rubber, or other approved material capable of bridging nonstructural cracks, applied in accordance with the manufacturers recommendations. A manufactured water-stop and/or key should be placed at all cold joints. The project architect or contractor may wish to consult with a waterproofing expert regarding additional options for reducing moisture migration into living areas.

6.3.5 Pavement Sections

Based on our experience in the Tahoe-Truckee area, environmental factors, such as freeze-thaw cycles and thermal cracking will usually govern the life of asphalt concrete (AC) pavements. Thermal cracking of asphalt pavement allows more water to enter the pavement section, which promotes deterioration and increases maintenance costs. In addition, snow removal activities on site may result in heavy traffic loads. For these reasons, we recommend a minimum parking area pavement section of three inches of AC on six inches of aggregate base (AB). For driveways and site access roads we recommend a minimum pavement section of four inches of AC on eight inches of aggregate base (AB).

We recommend that paving stones in non-traffic areas be supported by a minimum of six inches of Caltrans Class 2 AB. For light traffic areas, the AB section should be increased to at least eight inches. An underlying concrete slab is not necessary for light traffic and non-traffic areas. Prior to placing aggregate base, the subgrade should be prepared in accordance with the recommendations provided below.

Due to seasonal saturation of the underlying AB and freeze-thaw cycles, some vertical movement of paving stones over time should be anticipated. This movement can likely be reduced by constructing a drainage layer beneath paving stone pavements. The drainage layer should consist of at least 4 inches of compacted clean angular gravel under the AB layer. The drainage layer should contain a minimum 4-inch diameter perforated pipe, sloped to drain water from beneath the pavement towards an infiltration facility. All open-graded gravel should be consolidated using vibratory compaction equipment. A minimum 4-ounce non-woven filter fabric such as Mirafi 140N or approved equivalent should be placed between the compacted gravel subdrain and aggregate base course.

The upper six inches of native soil should be compacted to at least of 95 percent of the maximum dry density prior to placing AB. AB should also be compacted to a minimum of 95 percent of the maximum dry density. Subgrade and AB dry densities should be evaluated by NV5. In addition to field density tests, the subgrade should be proof rolled under NV5's observation prior to AB placement. If temporary pavement is used during construction, we recommend preparation of the subgrade and AB as outlined above prior to construction of the temporary pavement.

To improve pavement performance and lifespan, we recommend promoting drainage of the pavement subgrade. Drainage can be accomplished through roadway layout and design, subdrains, and/or roadside ditches. An NV5 representative should evaluate pavement subgrade at the time of construction and provide location-specific recommendations for subdrains. Typical subdrains consist of a shallow trench with a minimum 4-inch diameter perforated pipe encased in open-graded gravel wrapped in filter fabric. Pavement subgrade should be graded and prepared such that water drains from beneath the pavement section to a properly designed infiltration facility. Subdrains may be used in conjunction with roadside ditches located on one or both sides of the roadway. Roadside ditches should be constructed to a depth greater than the proposed pavement and subdrain section. Ditches should be rock-lined or vegetated to help reduce erosion and convey water to a properly designed infiltration facility.

We recommend installing cut-off curbs where paved areas abut landscaped areas to reduce migration of irrigation water into subgrade soil or baserock, promoting asphalt failure. Cut-off curbs should be a minimum of 4-inches wide, and extend through the aggregate base a minimum of four inches into subgrade soil.

6.4 PLAN REVIEW AND CONSTRUCTION MONITORING

Construction monitoring includes review of plans and specifications and observation of onsite activities during construction as described below. We should review final grading and foundation plans prior to construction to evaluate whether our recommendations have been implemented and to provide additional and/or modified recommendations, if necessary. We also recommend that our firm be retained to provide construction monitoring and testing services during site grading, foundation, retaining wall, underground utility, and road construction to observe subsurface conditions with respect to our engineering recommendations.

7 LIMITATIONS

Our professional services were performed consistent with generally accepted geotechnical engineering principles and practices employed in the site area at the time the report was prepared. No warranty, express or implied, is intended.

Our services were performed consistent with our agreement with our client. We are not responsible for the impacts of changes in environmental standards, practices, or regulations subsequent to performance of our services. We do not warrant the accuracy of information supplied by others or the use of segregated portions of this report. This report is solely for the use of our client. Reliance on this report by a third party is at the risk of that party.

If changes are made to the nature or design of the project as described in this report, then the conclusions and recommendations presented in the report should be reviewed by NV5 to assess the relevancy of our conclusions and recommendations. Additional field work and laboratory tests may be required to revise our recommendations. Costs to review project changes and perform additional field work and laboratory testing necessary to modify our recommendations are beyond the scope of services provided for this report. Additional work will be performed only after receipt of an approved scope of services, budget, and written authorization to proceed.

Analyses, conclusions, and recommendations presented in this report are based on site conditions as they existed at the time we performed our subsurface exploration. We assumed that subsurface soil conditions encountered at the locations of our subsurface explorations are generally representative of subsurface conditions across the project site. Actual subsurface conditions at locations between and beyond our explorations may differ. If subsurface conditions encountered during construction are different than those described in this report, we should be notified so that we can review and modify our recommendations as needed. Our scope of services did not include evaluating the project site for the presence of hazardous materials or petroleum products.

The elevation or depth to groundwater and soil moisture conditions underlying the project site may differ with time and location. The project site map shows approximate exploration locations as determined by pacing distances from identifiable site features. Therefore, exploration locations should not be relied upon as being exact.

The findings of this report are valid as of the present date. Changes in the conditions of the property can occur with the passage of time. These changes may be due to natural processes or human activity, at the project site or adjacent properties. In addition, changes in applicable or appropriate standards can occur, whether they result from legislation or a broadening of knowledge. Therefore, the recommendations presented in this report should not be relied upon after a period of two years from the issue date without our review.

8 REFERENCES

American Society of Civil Engineers. (2017). *ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.* Print.

California Building Standards Commission. (2019). *2019 California Building Code.* Print.

California Department of Transportation. (2012). *Highway Design Manual.* Print.

California Department of Transportation. (2008). *Bridge Design Specifications.*

California Geological Survey. (2005). *Geologic Map of the Lake Tahoe Basin, California and Nevada.* By George J. Saucedo. Print.

California Geological Survey. (2010). *Fault Activity Map of California.* Geologic Data Map No. 6, By Charles W. Jennings and William A. Bryant. *http://maps.conservation.ca.gov/cgs/fam/*

California Geological Survey. *EQ Zapp: California Earthquake Hazards Zone Application*. *http://www.conservation.ca.gov/cgs/geohazards/eq-zapp.*

Das, Braja M. *Principles of Foundation Engineering, 6th Edition.* 2007. Thomson. Print.

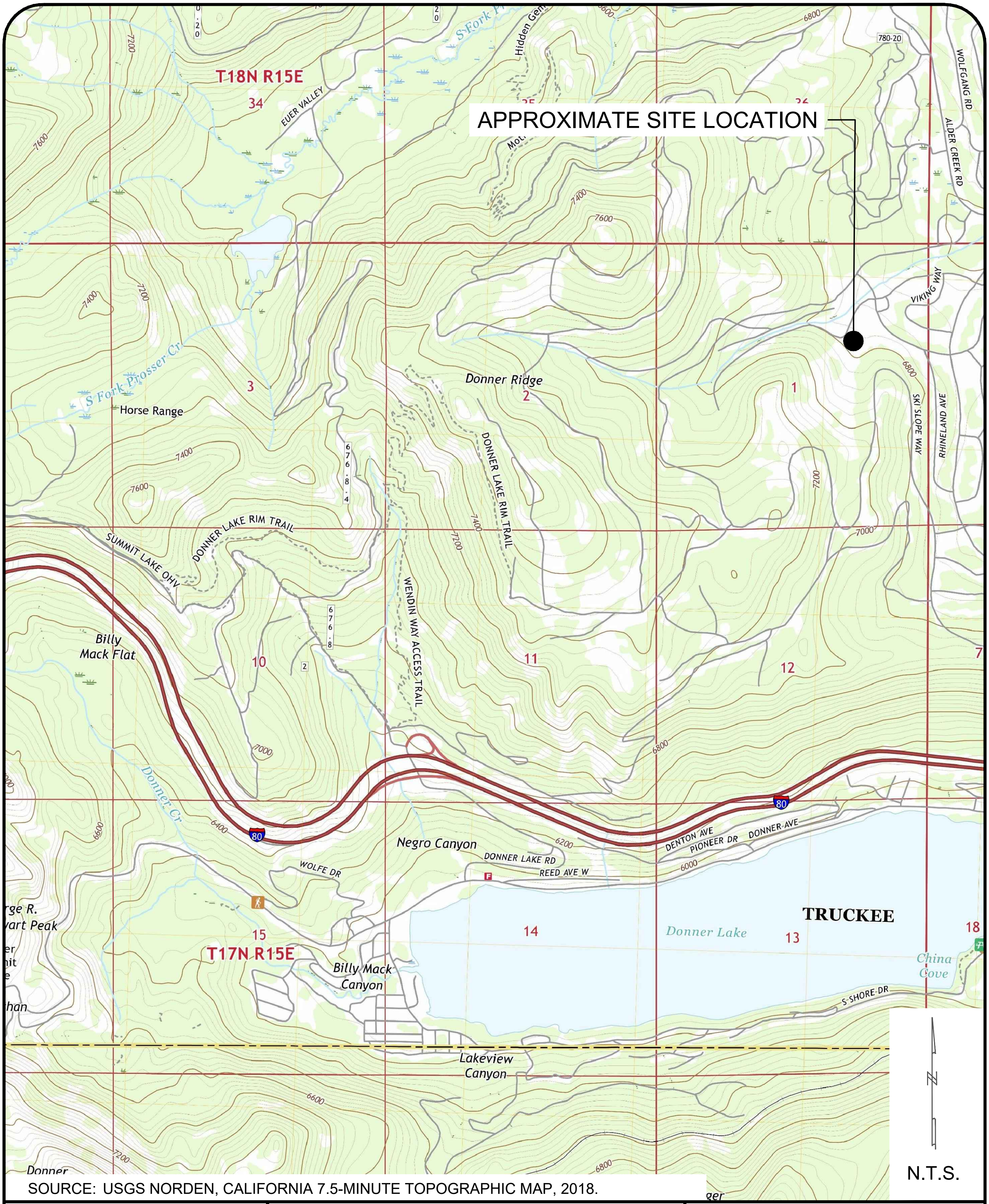
Kramer, Steven L. *Geotechnical Earthquake Engineering*. 2008. Pearson Education. Print.

Office of Statewide Health Planning and Development. (2019). Seismic Design Maps *<https://seismicmaps.org>.*

United States Geological Survey. (2018). *Kings Beach, California-Nevada Quadrangle*. Print.

United States Geological Survey and California Geological Survey, *Quaternary fault and fold database for the United States*, accessed September 16, 2021. *https://www.usgs.gov/natural-hazards/earthquake-hazards/faults.*

FIGURES



SOURCE: USGS NORDEN, CALIFORNIA 7.5-MINUTE TOPOGRAPHIC MAP, 2018.

NV5

SITE VICINITY MAP

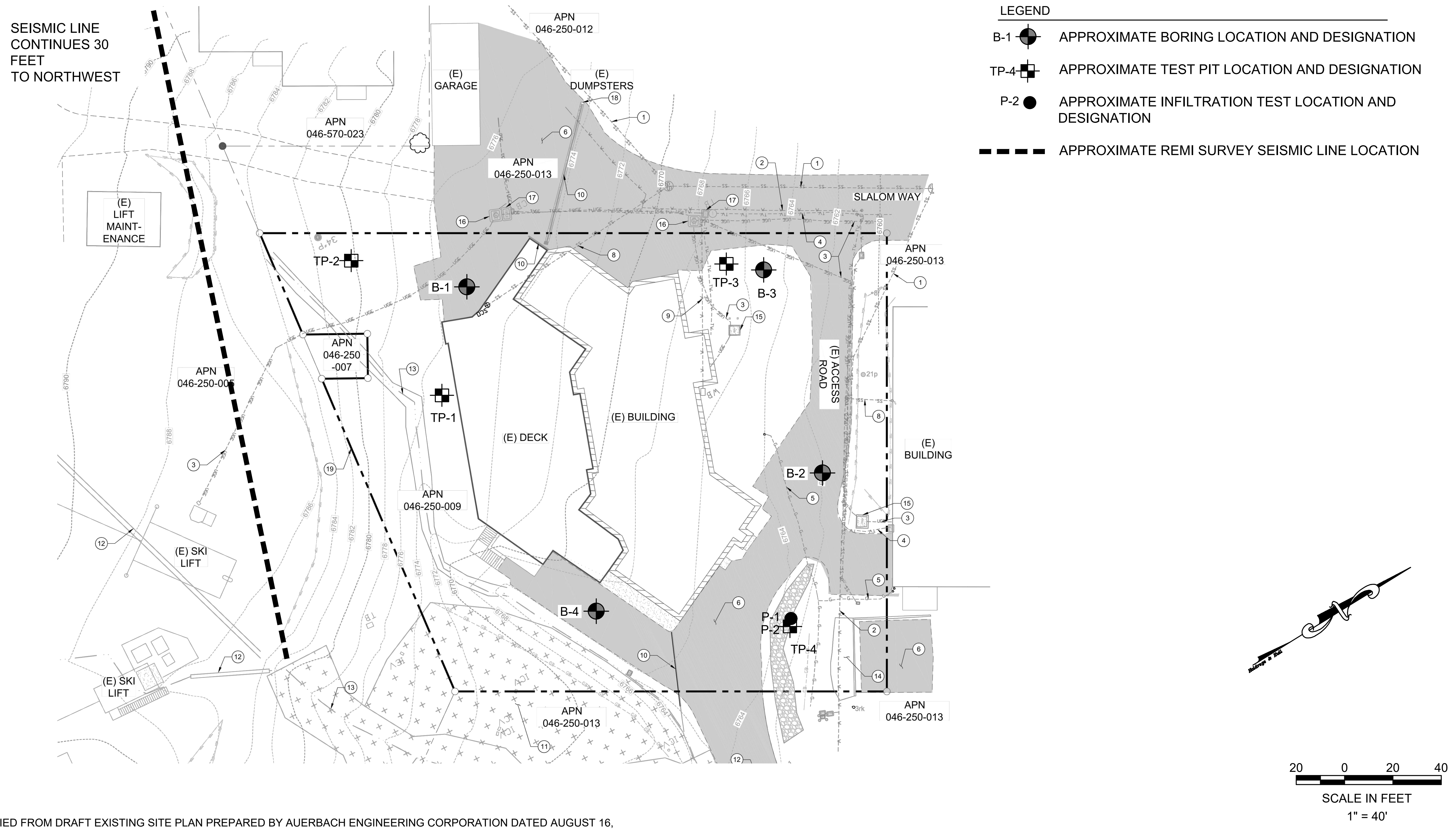
TAHOE DONNER ASSOCIATION DOWNHILL SKI LODGE

TRUCKEE, CALIFORNIA

PROJECT NO.: 42949.00

DATE: NOVEMBER 2021

FIGURE NO.: 1



MODIFIED FROM DRAFT EXISTING SITE PLAN PREPARED BY AUERBACH ENGINEERING CORPORATION DATED AUGUST 16, 2021.

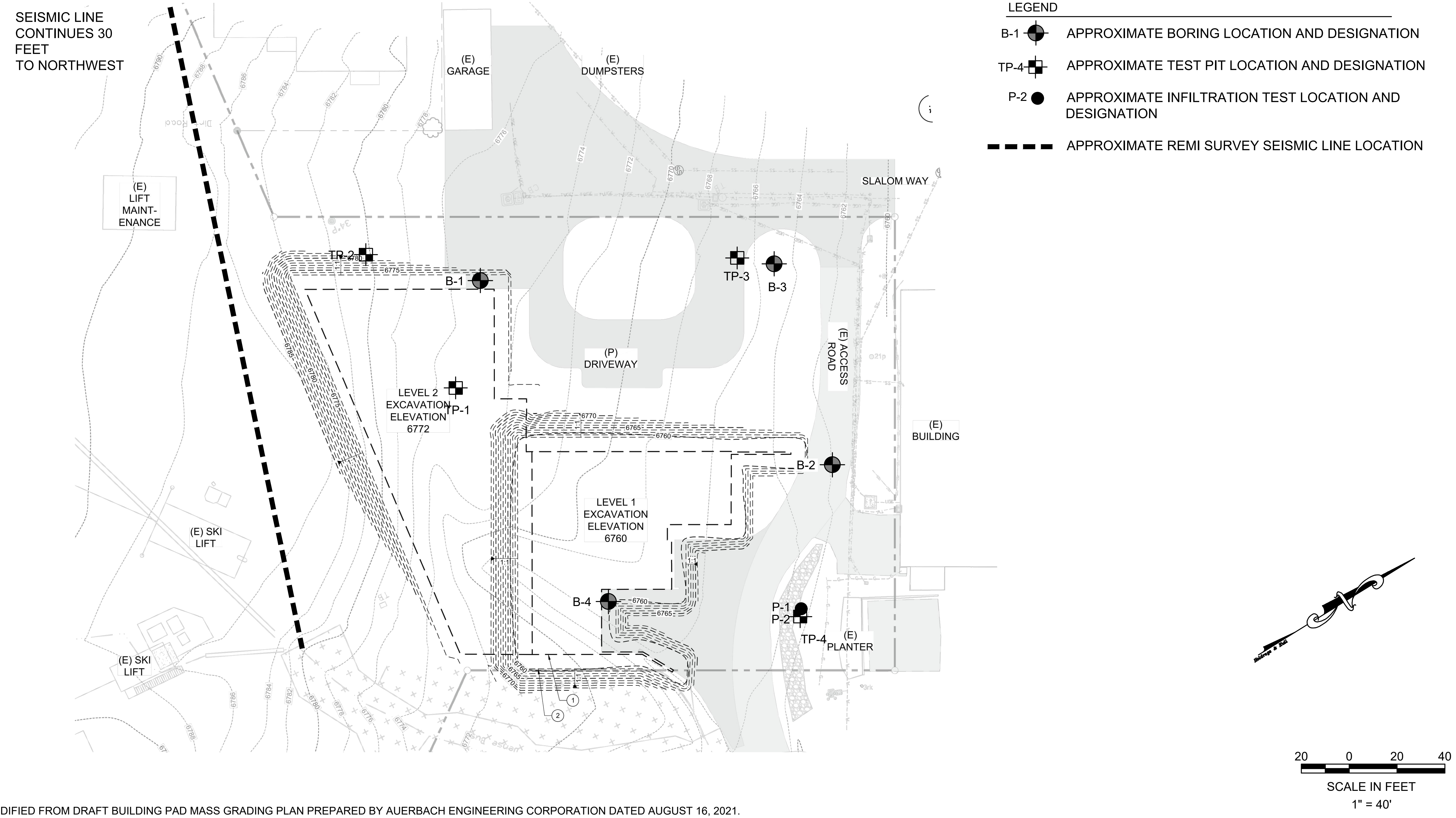
N|V|5

EXPLORATION LOCATION PLAN - EXISTING CONDITIONS

TAHOE DONNER ASSOCIATION DOWNHILL SKI LODGE

TRUCKEE, CALIFORNIA

DRAWN BY: PJR	CHECKED BY: JKH
PROJECT NO.: 42949.00	
DATE: NOVEMBER 2021	
FIGURE NO.: 2	



MODIFIED FROM DRAFT BUILDING PAD MASS GRADING PLAN PREPARED BY AUERBACH ENGINEERING CORPORATION DATED AUGUST 16, 2021.

N|V|5

EXPLORATION LOCATION PLAN - PROPOSED IMPROVEMENTS
TAHOE DONNER ASSOCIATION DOWNHILL SKI LODGE
TRUCKEE, CALIFORNIA

DRAWN BY: PJR	CHECKED BY: JKH
PROJECT NO.: 42949.00	
DATE: NOVEMBER 2021	
FIGURE NO.: 3	

APPENDIX A

Proposal

Proposal No. PT20328
July 9, 2021

Tahoe Donner Association
11509 Northwoods Boulevard
Truckee, California 96161

Attention: Jon Mitchell

Reference: **Tahoe Donner Association Downhill Ski Lodge**
11603 Snowpeak Way
Truckee, California

Subject: **Proposal for Geotechnical Engineering Report**

This letter presents our proposal to prepare a geotechnical engineering report for the proposed removal and replacement of the existing Tahoe Donner Association Downhill Ski Lodge located at 11603 Snowpeak Way in Truckee, California. The purpose of our services will be to explore and evaluate subsurface conditions at the project site and develop geotechnical engineering recommendations for project design and construction. Site subsurface conditions and specific recommendations regarding the geotechnical aspects of project design and construction can significantly affect project costs. NV5 will provide site-specific design recommendations to help reduce construction costs for your project. We have a reputation for responsive, innovative, yet practical approaches to geotechnical problems. Included in this proposal is a brief summary of our understanding of the project, the scope of services we intend to provide, and an estimate of our fees.

PROJECT DESCRIPTION

This proposal is based on a review of the Request for Qualification for Architectural & Engineering Services for Tahoe Donner Association Downhill Ski Lodge Replacement, October 27, 2020, the Tahoe Donner Downhill Ski Lodge Building Program Refinement Study, September 22, 2020 prepared by Ward Young Architecture & Planning, and recent conversations with the project team concerning project design and construction. The project will involve the planning and design of a multi-story lodge, on the order of 22,000 to 26,000 square feet to be built at the existing Downhill Ski Lodge site. We anticipate that the new structure will wood- and steel-frame structure with concrete slab-on-grade and concrete raised deck floors. For the purposes of this proposal, we have assumed that conventional shallow spread foundations will be used. Structural loads were assumed for the purposes of this proposal. Estimated vertical structural loads are not expected to exceed approximately 100 kips at isolated columns and 4 kips per linear foot along continuous wall foundations, for long-term loading conditions. The existing lodge building will be removed and a temporary facility will be constructed prior to the new lodge construction. We anticipate that cuts and fills for the proposed lodge will be on the order of 10 to 15 feet and are not expected to exceed about

18 feet. Appurtenant construction will likely include parking and access improvements, hard-surface patios, and underground utilities.

ANTICIPATED CONDITIONS

In preparation of this proposal, we made a site visit and reviewed geologic maps and reports in our files regarding subsurface conditions in the vicinity of the site. Based on this information and our experience in the area, we anticipate that subsurface soil conditions will consist of coarse grained soil types overlying near-surface volcanic rock. Due to the existing development at the site, we anticipate that fill is present in some areas.

We anticipate that groundwater may be seasonally present at relatively shallow depths and may affect the proposed construction. We anticipate that the site can be accessed by truck- and track-mounted equipment.

SCOPE OF SERVICES

Geotechnical Engineering Report

Review of Available Literature

Prior to our subsurface exploration, we will review regional geologic maps and reports in our files from other nearby sites.

Underground Utility Clearance

Prior to conducting our subsurface investigation, we will mark the site for Underground Service Alert (USA) and contact this agency to locate underground public utilities on and adjacent to the site. In addition, we will contract with an underground utility locator to clear utilities in the area of our proposed borings and test pits, described below. Our field exploration locations will be selected based on site access, existing underground utilities, and the anticipated project layout.

Field Exploration

We propose to explore the subsurface conditions at the project site using a combination of soil borings, test pits, and a seismic survey, as described below.

<u>Soil Borings</u>

We propose to also explore the subsurface conditions at the site by drilling 3 to 4 borings to depths of approximately 20 to 30 feet below the ground surface (bgs) to help evaluate depth of existing fill and depth to volcanic rock. The borings will be advanced with a truck-mounted drill rig equipped with hollow stem augers and diamond core bit barrels. The borings will be visually logged by an NV5 field representative who will obtain relatively undisturbed and bulk soil samples for classification and laboratory testing. Upon completion, the borings will be backfilled with soil cuttings and neat cement grout to the ground surface. The borings will be placed in areas of existing asphalt pavement and the surface will be capped with a quick setting cement grout. Soil cuttings generated during drilling activities that cannot be placed back into borings will be stockpiled onsite.

Test Pits/Infiltration Test

In addition to our borings described above, we propose to explore the subsurface conditions at the project site by excavating 4 to 6 test pits to depths up to approximately 12 feet below the existing ground surface or refusal. Exploration locations will be within or adjacent to the building envelope. The test pits will be excavated using a mini-excavator or backhoe. The test pits will be visually logged by a field representative who will obtain bulk soil samples for classification and laboratory testing. Upon completion, the test pits will be backfilled with excavated soil.

At the request of the project civil engineer, we will complete one infiltration rate test near the northeast corner of the site to help evaluate permeability of onsite soil for stormwater facility design. The infiltration test will be completed by using a hand operated double ring infiltrometer. At this time, we anticipate that the infiltration test will be completed inside or adjacent to one of our test pits at a depth of approximately 3 to 4 feet bgs.

Seismic Refraction Survey

In addition to our borings and test pits, we plan to use geophysical methods (seismic refraction and ReMi surveys) to help evaluate the depth to rock, rippability of rock for proposed excavations at the site, and to develop a shear wave velocity profile of soil in the upper 100 feet of the site. The in-situ shear wave velocity profiles at the site will be performed using the SeisOpt ReMi Refraction Microtremor method. The shear wave velocity data will be used to help address the Site Class in accordance with the California Building Code (CBC). The testing equipment is non-destructive and is set up on the ground surface.

Laboratory Testing

The purpose of laboratory testing is to evaluate the physical and engineering properties of the soil samples collected in the field. We anticipate the laboratory testing program will consist of tests for soil classification (gradations and plasticity) and expansion potential.

Analysis and Geotechnical Engineering Report

Based on the results of our field exploration and laboratory testing, we will provide our opinions and recommendations regarding the following:

- General soil and groundwater conditions at the project site, with emphasis on how the conditions are expected to affect the proposed construction;
- Discussion of our geophysical surveys and shear wave velocity profiles;
- Discussion of infiltration test and average soil permeability rate;
- Discussion of special geotechnical engineering constraints such as existing fill, highly expansive or compressible soil, near-surface groundwater, liquefaction potential, potential secondary seismic hazards, and/or near-surface rock;

- Recommendations for earthwork construction, including site preparation recommendations, a discussion of reuse of existing near-surface soil as structural fill, and a discussion of remedial earthwork recommendations, if warranted;
- Recommendations for temporary excavations, construction dewatering, and trench backfill;
- Recommendations for permanent cut and fill slopes;
- Surface and subsurface drainage recommendations;
- Recommendations for conventional shallow spread foundation design including soil bearing values, minimum footing depth, resistance to lateral loads and estimated settlements, and California Building Code Site Class and seismic coefficients for use in structural design;
- Lateral earth pressures and drainage recommendations for short retaining structures;
- Subgrade preparation for slab-on-grade concrete; and
- Asphalt concrete and paving stone pavement recommendations.

We will present our opinions and recommendations in a written report complete with a test pit and seismic line location plan, logs of our test pits, seismic survey results, and laboratory test results.

SCHEDULE AND FEES

At this time, we anticipate that we can begin our subsurface exploration within two to three weeks of receipt of your authorization to proceed, depending on availability of drilling and excavating equipment and operators. If weather, access, or site conditions restrict our field operations, we may need to revise our scope of services and fee estimate. We anticipate submitting our written report within three to four weeks after completion of our subsurface exploration. If requested, we can provide preliminary verbal information with respect to our anticipated conclusions and recommendations prior to completion of our final report. We will provide the scope of services described for an estimated fee of $ on a time-and-expense basis in accordance with our attached 2021 Fee Schedule and as detailed below:

Task	Estimated Cost
Geotechnical Engineering Services	
Underground Utility Clearance	
Field Investigation	
(Borings, Test Pits, Geophysical Survey, Permeability Test)	
Laboratory Testing	
Geotechnical Engineering Report	
Total Estimated Cost	

This cost includes the drilling and excavating equipment and operator required for our subsurface investigation, underground utility contractor, laboratory testing fees, and geophysical survey equipment and analysis. Progress billing will be on a monthly basis. Additional services beyond the scope of this proposal performed at the client's request will be billed on a time-and-expense basis using the fee schedule applicable at the time the services are provided.

Prior to initiating our subsurface exploration, all site utilities and utility easements must be accurately located in the field, on a scaled map, or both. This information must be made available to NV5 by the client before beginning our subsurface exploration. Our fee is not adequate to compensate for both the performance of the services and the assumption of risk of damage to such structures. NV5 will not accept responsibility for damage to existing utilities not accurately located in the manner described above. Services rendered by NV5 to repair them will be billed at cost.

In order to defray the initial mobilization costs of the drilling and excavating equipment, we are requesting a retainer in the amount of $ at the time of contract signing. All remittances should be sent to our Truckee office at the following address:

Accounts Receivable
NV5
10775 Pioneer Trail, Suite 213
Truckee, CA 96161

Remittances should reference this proposal number, PT20328.

CLOSING

NV5 will perform its services in a manner consistent with the standard of care and skill ordinarily exercised by members of the profession practicing under similar conditions in the geographic vicinity and at the time the services will be performed. No warranty or guarantee, express or implied, is part of the services offered by this proposal.

Enclosed with this proposal is our firm's Agreement for Geotechnical Engineering Services. Please sign and return one copy of the attached Agreement for Geotechnical Engineering Services to our attention if this proposal meets with your approval. This proposal is deemed to be incorporated into and made part of the Agreement for Geotechnical Engineering Services.

We appreciate the opportunity to submit this proposal and look forward to working with you on this project. If you have any questions or need additional information, please contact the undersigned.

Sincerely,
NV5

PJRaynak
Pamela J. Raynak, P.G.
Senior Geologist

Jake Hudson
John K. Hudson, P.E., C.E.G.
Associate Engineer

Enclosures: 2021 Fee Schedule
Agreement for Geotechnical Engineering Services

APPENDIX B

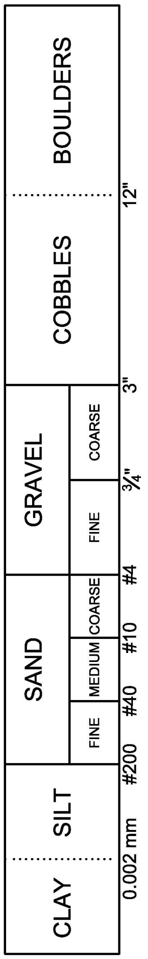
Boring and Test Pit Logs

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

COARSE GRAINED SOIL More than 50% of the soil is retained on the No. 200 sieve	GRAVEL More than 50% coarse fraction is larger than the No. 4 sieve size	Clean Gravel with less than 5% fines*	GW	WELL GRADED GRAVEL, GRAVEL SAND MIXTURES
			GP	POORLY GRADED GRAVEL, GRAVEL SAND MIXTURES
		Gravel with more than 12% fines*	GM	SILTY GRAVEL, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVEL, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
	SAND More than 50% coarse fraction is smaller than the No. 4 sieve size	Clean Sand with less than 5% fines*	SW	WELL GRADED SAND, GRAVELY SAND
			SP	POORLY GRADED SAND, GRAVELY SAND
		Sand with more than 12% fines*	SM	SILTY SAND, POORLY GRADED SAND-SILT MIXTURE
			SC	CLAYEY SAND, POORLY GRADED SAND-SILT MIXTURE
FINE GRAINED SOIL More than 50% of the soil passes the No. 200 sieve	SILT AND CLAY Liquid limit less than 50		ML	INORGANIC SILT & VERY FINE SAND, ROCK FLOUR, SILTY OR CLAYEY FINE SAND, OR CLAYEY SILT WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, GRAVELY CLAY, SANDY CLAY, SILTY CLAY, LEAN CLAY
			OL	ORGANIC CLAY AND ORGANIC SILTY CLAY OF LOW PLASTICITY
	SILT AND CLAY Liquid limit greater than 50		MH	INORGANIC SILT, MIMCACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOIL, ELASTIC SILT
			CH	INORGANIC CLAY OF HIGH PLASTICITY, FAT CLAY
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILT
HIGHLY ORGANIC SOIL			Pt	PEAT AND OTHER HIGHLY ORGANIC SOIL
ROCK			RX	ROCK

* Hybrid classifications are used when the fines content is between 5% and 12% (e.g, SP-SM, GP-GM, SW-SC, GW-GC, etc.)

PARTICLE SIZE LIMITS



SAMPLE DESIGNATION

◨	MODIFIED CALIFORNIA SAMPLER (3" OUTSIDE DIAMETER)
■	MODIFIED CALIFORNIA SAMPLER (2-1/2" OUTSIDE DIAMETER)
◩	STANDARD PENETRATION SPLIT SPOON SAMPLER (2" OUTSIDE DIAMETER)
☒	BULK OR CLASSIFICATION SAMPLE
▯	SHELBY TUBE (3" OUTSIDE DIAMETER)

KEY TO SYMBOLS

▽	OBSERVED GROUNDWATER
▼	STABILIZED GROUNDWATER LEVEL
LL	LIQUID LIMIT
PL	PLASTIC LIMIT
PI	PLASTICITY INDEX
Gs	SPECIFIC GRAVITY
PERM	PERMEABILITY
CONSOL	CONSOLIDATION
SA	SIEVE ANALYSIS
-200	PERCENT PASSING NO. 200 SIEVE

NON-COHESIVE (GRANULAR) SOIL

RELATIVE DENSITY	SPT BLOWS PER FOOT (N)
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	51 +

COHESIVE (CLAYEY) SOIL

COMPARATIVE CONSISTENCY	SPT BLOWS PER FOOT (N)	UNCONFINED COMPRESSIVE STRENGTH (TSF)
VERY SOFT	0 - 2	0 - 0.25
SOFT	3 - 4	0.25 - 0.50
MEDIUM STIFF	5 - 8	0.50 - 1.00
STIFF	9 - 15	1.00 - 2.00
VERY STIFF	16 - 30	2.00 - 4.00
HARD	31 +	4.00 +

BLOW COUNTS

BLOW COUNTS REPRESENT THE NUMBER OF BLOWS REQUIRED TO DRIVE THE SAMPLER EVERY 6 INCHES OF AN 18-INCH DRIVE OR FRACTION INDICATED. BLOW COUNTS PRESENTED ON LOGS HAVE NOT BEEN ADJUSTED.

SOIL CONTACTS

———	SOLID - WELL-DEFINED CHANGE
- - - - -	DASHED - GRADATIONAL OR APPROXIMATE CHANGE

MOISTURE CONTENT

CLASSIFICATION	DESCRIPTION
DRY	FREE OF MOISTURE, DUSTY, DRY TO THE TOUCH
SLIGHTLY MOIST	BELOW THE SOIL'S OPTIMUM MOISTURE CONTENT, BUT NOT DRY
MOIST	NEAR THE SOIL'S OPTIMUM MOISTURE CONTENT
VERY MOIST	ABOVE THE SOIL'S OPTIMUM MOISTURE CONTENT, BUT NOT WET
WET	VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

CEMENTATION

CLASSIFICATION	DESCRIPTION
WEAK	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATE	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONG	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

MINOR CONSTITUENT QUANTITIES

QUALIFIER	DESCRIPTION
TRACE	PARTICLES ARE PRESENT, BUT ESTIMATED TO BE LESS THAN 5%
SOME	5 to 12%
WITH	12 to 30%

N|V|5

SOIL CLASSIFICATION KEY
TAHOE DONNER ASSOCIATION
DOWNHILL SKI LODGE
TRUCKEE, CALIFORNIA

PROJECT NO.: 42949.00
DATE: NOVEMBER 2021
FIGURE NO.: B-1

NV5

EXPLORATORY BORING LOG

10775 PIONEER TRAIL, SUITE 213, TRUCKEE, CA 96161
PHONE: 530-587-5156

BORING NO.
B-1
SHEET 1 OF 2

PROJECT NAME: TAHOE DONNER DOWNHILL SKI LODGE
PROJECT NO: 42949.00
TASK: 1
START: 7/15/2021
LOCATION: SOUTHWEST CORNER OF EXISTING LODGE
GROUND SURFACE ELEV. (FEET MSL): ~6,775
FINISH: 7/15/2021
LOGGED BY: NCM
DRILLING COMPANY: TABER DRILLING
DRILL RIG TYPE: CME 75 TRUCK MOUNTED DRILL RIG
DRILLER: CHAD
DRILLING METHOD: HOLLOW STEM AUGER
HAMMER TYPE: AUTO HAMMER
BORING DIA. (INCHES): 4 INCHES
TOTAL DEPTH (FEET): 30 FT
BACKFILL: SOIL CUTTINGS AND CONCRETE CAP

GROUNDWATER INFORMATION

DATE	7/15/2021			
TIME	10:30 AM			
DEPTH (FT)	10 FEET BGS			

TIME	POCKET PEN. (TSF)	BLOW COUNTS (BLOWS/6 IN)	SAMPLER TYPE	SAMPLE RECOVERY	SAMPLE NO.	DEPTH (FEET)	SAMPLE INTERVAL AND SYMBOL	GRAPHIC LOG	USCS	SOIL AND/OR ROCK DESCRIPTIONS AND NOTES (Color USCS Classification, Density/Consistency, Moisture; Sand Size/Angularity, Gravel Size/Angularity, Estimated % Fines, Structure, Plasticity, Cementation, Organics, Oxidation Staining, Odor, etc.)
						1			SM	YELLOWISH BROWN SILTY SAND (SM); MOIST, LOOSE, FINE TO COARSE SAND, ESTIMATE 35% FINES
						2				
		3	SPT	18/18	1-1	3	◣			
		3 3				4	◣			
						5				
		5	SPT	17/18	1-2	6	◣			- ESTIMATE 45% FINES
		3 2				7	◣			
						8				
						9				
						10				∇
		3	SPT	18/18	1-3	11	◣			- GROUNDWATER ENCOUNTERED AT 10 FEET BGS, MEDIUM DENSE, FINE SAND, 44% FINES
		5 6				12	◣			
						13				
						14				
						15				
		39 50/5"	SPT	9/18	1-4	16	◣			- BECOMES VERY MOIST, VERY DENSE, FINE TO MEDIUM SAND, ESTIMATE 20% FINES
						17				
						18				
						19				DARK GRAY SILTY SAND (SM); VERY MOIST, VERY DENSE, FINE SAND
						20				

NOTES:

NV5

EXPLORATORY BORING LOG

10775 PIONEER TRAIL, SUITE 213, TRUCKEE, CA 96161
PHONE: 530-587-5156

BORING NO.
B-1

PROJECT NAME: TAHOE DONNER DOWNHILL SKI LODGE

PROJECT NO: 42949.00

TASK: 1

LOGGED BY: NCM

GROUNDWATER DEPTH (FT BGS): 10

TOTAL DEPTH (FT): 30

SHEET 2 OF 2

TIME	POCKET PEN. (TSF)	BLOW COUNTS (BLOWS/6 IN)	SAMPLER TYPE	SAMPLE RECOVERY	SAMPLE NO.	DEPTH (FEET)	SAMPLE INTERVAL AND SYMBOL	GRAPHIC LOG	USCS	SOIL AND/OR ROCK DESCRIPTIONS AND NOTES (Color USCS Classification, Density/Consistency, Moisture; Sand Size/Angularity, Gravel Size/Angularity, Estimated % Fines, Structure, Plasticity, Cementation, Organics, Oxidation Staining, Odor, etc.)
		50/4	SPT	3/18	1-5		◣		SM	DARK GRAY SILTY SAND (SM); VERY MOIST, VERY DENSE, FINE SAND, 41% FINES
						21				
						22				
						23				
						24				
						25				
		50/3	SPT	3/18	1-6		◣			
						26				
						27				
						28				
						29				
						30				
		50/1	SPT	3/18	1-6		◣			BORING TERMINATED AT 30 FEET BGS
						31				
						32				
						33				
						34				
						35				
						36				
						37				
						38				
						39				
						40				
						41				
						42				
						43				
						44				
						45				

NOTES:

N|V|5

EXPLORATORY BORING LOG

10775 PIONEER TRAIL, SUITE 213, TRUCKEE, CA 96161
PHONE: 530-587-5156

BORING NO.
B-2
SHEET 1 OF 2

PROJECT NAME: TAHOE DONNER DOWNHILL SKI LODGE
PROJECT NO: 42949.00
TASK: 2
START: 7/15/2021
LOCATION: NORTHEAST CORNER OF EXISTING LODGE
GROUND SURFACE ELEV. (FEET MSL): ~6,765
FINISH: 7/15/2021
LOGGED BY: NCM
DRILLING COMPANY: TABER DRILLING
DRILL RIG TYPE: CME 75 TRUCK MOUNTED DRILL RIG
DRILLER: CHAD
DRILLING METHOD: HOLLOW STEM AUGER
HAMMER TYPE: AUTO HAMMER
BORING DIA. (INCHES): 4 INCHES
TOTAL DEPTH (FEET): 31.25 FT
BACKFILL: SOIL CUTTINGS AND CONCRETE CAP

GROUNDWATER INFORMATION

DATE	7/15/2021			
TIME	12:00			
DEPTH (FT)	10			

TIME	POCKET PEN. (TSF)	BLOW COUNTS (BLOWS/6 IN)	SAMPLER TYPE	SAMPLE RECOVERY	SAMPLE NO.	DEPTH (FEET)	SAMPLE INTERVAL AND SYMBOL	GRAPHIC LOG	USCS	SOIL AND/OR ROCK DESCRIPTIONS AND NOTES (Color USCS Classification, Density/Consistency, Moisture; Sand Size/Angularity, Gravel Size/Angularity, Estimated % Fines, Structure, Plasticity, Cementation, Organics, Oxidation Staining, Odor, etc.)
						1			FILL (SM)	FILL: DARK BROWN SILTY SAND WITH GRAVEL (SM); SLIGHTLY MOIST, DENSE, FINE TO COARSE SAND, FINE TO COARSE GRAVEL, ESTIMATE 40% FINES
		6	SPT	11/18	2-1					
		50/5	↓			2				
						3				
						4				
						5				
		6	SPT	18/18	2-2				SM	BROWN SILTY SAND WITH GRAVEL (SM); SLIGHTLY MOIST, MEDIUM DENSE, FINE TO COARSE SAND, FINE TO COARSE GRAVEL, 19% FINES
		13	↓			6				
		10				7				
						8				
						9				
						10				▽
		1	SPT	18/18	2-3					
		1	↓			11			SM	BROWN SILTY SAND WITH GRAVEL (SM); SLIGHTLY MOIST, LOOSE, MEDIUM TO COARSE SAND, FINE TO COARSE GRAVEL, ESTIMATE 35% FINES
		5				12				- GROUNDWATER ENCOUNTERED AT 10 FEET BGS
						13				
						14				- BECOMES GRAY BROWN, MEDIUM SAND, SOME GRAVEL
						15				
		2	SPT	18/18	2-4					
		1	↓			16				
		2				17				
						18				
						19				
						20				

NOTES:

EXPLORATORY BORING LOG

10775 PIONEER TRAIL, SUITE 213, TRUCKEE, CA 96161
PHONE: 530-587-5156

BORING NO.

B-2

PROJECT NAME: TAHOE DONNER DOWNHILL SKI LODGE
PROJECT NO: 42949.00
TASK: 2
LOGGED BY: NCM

GROUNDWATER DEPTH (FT BGS): 10
TOTAL DEPTH (FT): 31.25
SHEET 2 OF 2

TIME	POCKET PEN. (TSF)	BLOW COUNTS (BLOWS/6 IN)	SAMPLER TYPE	SAMPLE RECOVERY	SAMPLE NO.	DEPTH (FEET)	SAMPLE INTERVAL AND SYMBOL	GRAPHIC LOG	USCS	SOIL AND/OR ROCK DESCRIPTIONS AND NOTES (Color USCS Classification, Density/Consistency, Moisture; Sand Size/Angularity, Gravel Size/Angularity, Estimated % Fines, Structure, Plasticity, Cementation, Organics, Oxidation Staining, Odor, etc.)
		2 3 11	SPT	18/18	2-5	21	◣		SM	GRAY BROWN SILTY SAND (SM); WET, MEDIUM DENSE, MEDIUM TO COARSE SAND, SOME FINE GRAVEL, ESTIMATE 35% FINES
						22				
						23				
						24				
						25			SM	BROWN SILTY SAND (SM); WET, LOOSE, MEDIUM TO COARSE SAND, SOME FINE GRAVEL, ESTIMATE 30% FINES
		3 1 1	SPT	18/18	2-6	26	◣			
						27				
						28				
						29			SM	GRAY BROWN SILTY SAND (SM); WET, VERY DENSE, FINE TO MEDIUM SAND, SOME FINE GRAVEL, ESTIMATE 25% FINES
						30				
		8 26 50/3	SPT	3/18	2-7	31	◣			
						32				BORING TERMINATED AT 31.25 FEET BGS
						33				
						34				
						35				
						36				
						37				
						38				
						39				
						40				
						41				
						42				
						43				
						44				
						45				

NOTES:

N|V|5

EXPLORATORY BORING LOG

10775 PIONEER TRAIL, SUITE 213, TRUCKEE, CA 96161
PHONE: 530-587-5156

BORING NO.
B-3
SHEET 1 OF 2

PROJECT NAME: TAHOE DONNER DOWNHILL SKI LODGE
PROJECT NO: 42949.00
TASK: 3
START: 7/15/2021
LOCATION: NORTHWEST CORNER OF EXISTING LODGE
GROUND SURFACE ELEV. (FEET MSL): ~6,762
FINISH: 7/15/2021
LOGGED BY: NCM
DRILLING COMPANY: TABER DRILLING
DRILL RIG TYPE: CME 75 TRUCK MOUNTED DRILL RIG
DRILLER: CHAD
DRILLING METHOD: HOLLOW STEM AUGER
HAMMER TYPE: AUTO HAMMER
BORING DIA. (INCHES): 4 INCHES
TOTAL DEPTH (FEET): 29 FT
BACKFILL: SOIL CUTTINGS

GROUNDWATER INFORMATION

DATE	N/A			
TIME	N/A			
DEPTH (FT)	N/A			

SOIL AND/OR ROCK DESCRIPTIONS AND NOTES
(Color USCS Classification, Density/Consistency, Moisture; Sand Size/Angularity, Gravel Size/Angularity, Estimated % Fines, Structure, Plasticity, Cementation, Organics, Oxidation Staining, Odor, etc.)

TIME	POCKET PEN. (TSF)	BLOW COUNTS (BLOWS/6 IN)	SAMPLER TYPE	SAMPLE RECOVERY	SAMPLE NO.	DEPTH (FEET)	SAMPLE INTERVAL AND SYMBOL	GRAPHIC LOG	USCS	SOIL AND/OR ROCK DESCRIPTIONS AND NOTES
						1			SM	BROWN SILTY SAND WITH GRAVEL (SM); MOIST, LOOSE, FINE TO COARSE GRAVEL, OCCASIONAL COBBLES TO 6 INCHES, ESTIMATE 30% FINES (DENSITY BASED ON DRILLING CONDITIONS)
						2				
						3				
						4				
						5				
		2 6	SPT	10/18	3-1	6	◣			- BECOMES MEDIUM DENSE
		5	↓			7				
						8				
						9				
						10				
						11				- BORE HOLE COLLAPSED ONCE AUGER WAS REMOVED. BLOW COUNTS NOT AVAILABLE
						12				
						13				
						14				
						15				- BECOMES DENSE
						16				- BECOMES MEDIUM DENSE
						17				
						18				
						19				
						20				

NOTES:

N|V|5

EXPLORATORY BORING LOG

10775 PIONEER TRAIL, SUITE 213, TRUCKEE, CA 96161
PHONE: 530-587-5156

BORING NO.
B-3

PROJECT NAME: TAHOE DONNER DOWNHILL SKI LODGE
PROJECT NO: 42949.00
TASK: 3
LOGGED BY: NCM

GROUNDWATER DEPTH (FT BGS): N/A
TOTAL DEPTH (FT): 29
SHEET 2 OF 2

TIME	POCKET PEN. (TSF)	BLOW COUNTS (BLOWS/6 IN)	SAMPLER TYPE	SAMPLE RECOVERY	SAMPLE NO.	DEPTH (FEET)	SAMPLE INTERVAL AND SYMBOL	GRAPHIC LOG	USCS	SOIL AND/OR ROCK DESCRIPTIONS AND NOTES (Color USCS Classification, Density/Consistency, Moisture; Sand Size/Angularity, Gravel Size/Angularity, Estimated % Fines, Structure, Plasticity, Cementation, Organics, Oxidation Staining, Odor, etc.)
						21		▨	SM	BROWN SILTY SAND WITH GRAVEL (SM); MOIST, MEDIUM DENSE, FINE TO COARSE GRAVEL, ESTIMATE 30% FINES
						22		▨		
						23		▨		
						24		▨		
						25		▨		
						26		▨		
						27		▨		- BECOMES VERY DENSE
						28		▨		
						29		▨		
						30				BORING TERMINATED AT 29 FEET BGS
						31				
						32				
						33				
						34				
						35				
						36				
						37				
						38				
						39				
						40				
						41				
						42				
						43				
						44				
						45				

NOTES:

N|V|5

EXPLORATORY BORING LOG

10775 PIONEER TRAIL, SUITE 213, TRUCKEE, CA 96161
PHONE: 530-587-5156

BORING NO.
B-4
SHEET 1 OF 2

PROJECT NAME: TAHOE DONNER DOWNHILL SKI LODGE
PROJECT NO: 42949.00
TASK: 4
START: 7/15/2021
LOCATION: SOUTHEAST CORNER OF EXISTING LODGE
GROUND SURFACE ELEV. (FEET MSL): ~6,767
FINISH: 7/15/2021
LOGGED BY: NCM
DRILLING COMPANY: TABER DRILLING
DRILL RIG TYPE: CME 75 TRUCK MOUNTED DRILL RIG
DRILLER: CHAD
DRILLING METHOD: HOLLOW STEM AUGER
HAMMER TYPE: AUTO HAMMER
BORING DIA. (INCHES): 4 INCHES
TOTAL DEPTH (FEET): 21.5 FT
BACKFILL: SOIL CUTTINGS AND CONCRETE CAP

GROUNDWATER INFORMATION

DATE	7/15			
TIME	15:30			
DEPTH (FT)	6			

SOIL AND/OR ROCK DESCRIPTIONS AND NOTES

(Color USCS Classification, Density/Consistency, Moisture; Sand Size/Angularity, Gravel Size/Angularity, Estimated % Fines, Structure, Plasticity, Cementation, Organics, Oxidation Staining, Odor, etc.)

TIME	POCKET PEN. (TSF)	BLOW COUNTS (BLOWS/6 IN)	SAMPLER TYPE	SAMPLE RECOVERY	SAMPLE NO.	DEPTH (FEET)	SAMPLE INTERVAL AND SYMBOL	GRAPHIC LOG	USCS	SOIL AND/OR ROCK DESCRIPTIONS AND NOTES
									SM	BROWN SILTY SAND (SM); MOIST, LOOSE, FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, ESTIMATE 40% FINES
						1				
						2				
						3				
		4	M.CAL	18/18						
		4	↓		4-1-1	4				
		5	↓		4-1-2					
						5				
						6				▽
										- GROUNDWATER ENCOUNTERED AT 6 FEET BGS
						7				
						8				
										- INCREASING GRAVEL, WET, MEDIUM TO COARSE SAND, ESTIMATE 30% FINES
						9				
									SM	BROWN SILTY SAND WITH GRAVEL (SM); WET, MEDIUM DENSE, FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, ESTIMATE 40% FINES
						10				
		3	SPT	12/18	4-2					
		4	↓			11				
		7	↓							
						12				
						13				
						14				
									SM	BROWN SILTY SAND WITH GRAVEL (SM); WET, LOOSE, FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, 25% FINES
						15				
		1	SPT	18/18	4-3					
		1	↓			16				
		2	↓							
						17				
						18				
						19				
						20				

NOTES:

NV5

EXPLORATORY BORING LOG

10775 PIONEER TRAIL, SUITE 213, TRUCKEE, CA 96161
PHONE: 530-587-5156

BORING NO.
B-4

PROJECT NAME: TAHOE DONNER DOWNHILL SKI LODGE
PROJECT NO: 42949.00
TASK: 4
LOGGED BY: NCM

GROUNDWATER DEPTH (FT BGS): 6
TOTAL DEPTH (FT): 21.5
SHEET 2 OF 2

TIME	POCKET PEN. (TSF)	BLOW COUNTS (BLOWS/6 IN)	SAMPLER TYPE	SAMPLE RECOVERY	SAMPLE NO.	DEPTH (FEET)	SAMPLE INTERVAL AND SYMBOL	GRAPHIC LOG	USCS	SOIL AND/OR ROCK DESCRIPTIONS AND NOTES (Color USCS Classification, Density/Consistency, Moisture; Sand Size/Angularity, Gravel Size/Angularity, Estimated % Fines, Structure, Plasticity, Cementation, Organics, Oxidation Staining, Odor, etc.)
		3 4 7	SPT ↓	18/18	4-4	21	◣	▨	SM	BROWN SILTY SAND (SM); WET, MEDIUM DENSE, FINE TO COARSE SAND, FINE TO COARSE GRAVEL, ESTIMATE 30% FINES
						22				BORING TERMINATED AT 21.5 FEET BGS
						23				
						24				
						25				
						26				
						27				
						28				
						29				
						30				
						31				
						32				
						33				
						34				
						35				
						36				
						37				
						38				
						39				
						40				
						41				
						42				
						43				
						44				
						45				

NOTES:

TEST PIT NO. TP-1

PROJECT NO.	PROJECT NAME	ELEVATION	DATE	PAGE
42949.00	TAHOE DONNER ASSOCIATION DOWNHILL SKI LODGE	~6,775 FT MSL	08/24/2021	1 OF 1

EXCAVATING CONTRACTOR	OPERATOR	EXCAVATING METHOD AND BUCKET SIZE
DAN GODDARD	DAN	CATERPILLAR 304 MINI-EXCAVATOR W/ 24 INCH BKT

LOGGED BY	SAMPLING METHOD	GROUNDWATER ENCOUNTERED	CAVED
PJR	BULK	NO	YES @ 6 FEET

SAMPLE NO.	POCKET PEN. (TSF)	PERCENT PASSING #200 SIEVE	DEPTH (FEET)	GRAPHIC LOG	USCS	DESCRIPTIONS/REMARKS
					FILL (SM)	FILL: DARK BROWN SILTY SAND WITH GRAVEL (SM); DRY, LOOSE, WITH ORGANICS (6 INCHES)
1-1	--	--	1 2 ☒ 3		FILL (SM)	FILL: DARK YELLOWISH BROWN SILTY SAND WITH GRAVEL (SM); DRY, DENSE, FINE SAND, FINE TO COARSE GRAVEL, EST. 20% FINES
1-2	--	--	4 5 ☒ 6		FILL (GM)	FILL: BROWN TO DARK BROWN SILTY GRAVEL WITH SAND (GM); MOIST, MEDIUM DENSE TO DENSE, FINE SAND, FINE TO COARSE GRAVEL, TRACE COBBLES TO 10 INCHES DIAMETER, EST. 20% TO 30% FINES FILTER FABRIC AT BASE
1-3	--	11	7 8 ☒ 9		GP-GM	DARK GRAYISH BROWN POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM); MOIST, MEDIUM DENSE, FINE SAND, FINE TO COARSE GRAVEL
			10 11 12 13 14 15 16 17 18 19 20			TEST PIT TERMINATED AT 9 FEET BGS - CAVING ON NORTH WALL DUE TO GRAVEL BACKFILL

TEST PIT NO. TP-2

PROJECT NO.	PROJECT NAME	ELEVATION	DATE	PAGE
42949.00	TAHOE DONNER ASSOCIATION DOWNHILL SKI LODGE	~6,780 FT MSL	08/24/2021	1 OF 1

EXCAVATING CONTRACTOR	OPERATOR	EXCAVATING METHOD AND BUCKET SIZE
DAN GODDARD	DAN	CATERPILLAR 304 MINI-EXCAVATOR W/ 24 INCH BKT

LOGGED BY	SAMPLING METHOD	GROUNDWATER ENCOUNTERED	CAVED
PJR	BULK	NO	YES @ 6 FEET

SAMPLE NO.	POCKET PEN. (TSF)	PERCENT PASSING #200 SIEVE	DEPTH (FEET)	GRAPHIC LOG	USCS	DESCRIPTIONS/REMARKS
					FILL (SM)	FILL: MOTTLED DARK BROWN AND DARK YELLOWISH BROWN SILTY SAND WITH GRAVEL (SM); DRY, DENSE, FINE SAND, FINE TO COARSE GRAVEL, OCCASIONAL COBBLES TO 10 INCHES DIAMETER, TRACE BOULDERS TO 18 INCHES DIAMETER, EST. 20% TO 30% FINES
			1			
			2			
			3			
			4		SM	LIGHT BROWN SILTY SAND (SM); DRY, MEDIUM DENSE, FINE SAND, EST. 30% TO 40% FINES
2-1	--	--	☒			
			5		SM	DARK YELLOWISH BROWN SILTY SAND (SM); DRY TO SLIGHTLY MOIST, DENSE, TRACE BOULDERS TO 18 INCHES DIAMETER
2-2	--	45	☒			
			6			
			7		SC	DARK YELLOWISH BROWN CLAYEY SAND (SC); MOIST TO VERY MOIST, MEDIUM DENSE, FINE TO MEDIUM SAND, EST. 20% TO 30% FINES
			8			
			9			
2-3	--	--	☒			
			10			TEST PIT TERMINATED AT 10 FEET BGS - MAXIMUM REACH OF EXCAVATING EQUIPMENT
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

TEST PIT NO. TP-3

PROJECT NO.: 42949.00
PROJECT NAME: TAHOE DONNER ASSOCIATION DOWNHILL SKI LODGE
ELEVATION: ~6,767 FT MSL
DATE: 08/24/2021
PAGE: 1 OF 1
EXCAVATING CONTRACTOR: DAN GODDARD
OPERATOR: DAN
EXCAVATING METHOD AND BUCKET SIZE: CATERPILLAR 304 MINI-EXCAVATOR W/ 24 INCH BKT
LOGGED BY: PJR
SAMPLING METHOD: BULK
GROUNDWATER ENCOUNTERED: NO
CAVED: NO

SAMPLE NO.	POCKET PEN. (TSF)	PERCENT PASSING #200 SIEVE	DEPTH (FEET)	GRAPHIC LOG	USCS	DESCRIPTIONS/REMARKS
				▥	FILL (SM)	FILL: DARK REDDISH BROWN SILTY SAND WITH GRAVEL (SM); DRY, DENSE, FINE TO MEDIUM SAND, FINE TO COARSE GRAVEL, EST. 30% FINES
			1	▥		
			2	▥		
			3	▒	FILL (SP)	FILL: GRAY POORLY GRADED SAND (SP); DRY, LOOSE TO MEDIUM DENSE (BEDDING SAND) 3-INCH DIAMETER METAL PIPE @ 4 FEET BGS
			4			TEST PIT TERMINATED AT 4 FEET BGS - METAL PIPE
			5			
			6			
			7			
			8			
			9			
			10			
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

TEST PIT NO. TP-4

PROJECT NO. 42949.00	PROJECT NAME TAHOE DONNER ASSOCIATION DOWNHILL SKI LODGE	ELEVATION ~6,775 FT MSL	DATE 08/24/2021	PAGE 1 OF 1

EXCAVATING CONTRACTOR DAN GODDARD	OPERATOR DAN	EXCAVATING METHOD AND BUCKET SIZE CATERPILLAR 304 MINI-EXCAVATOR W/ 24 INCH BKT

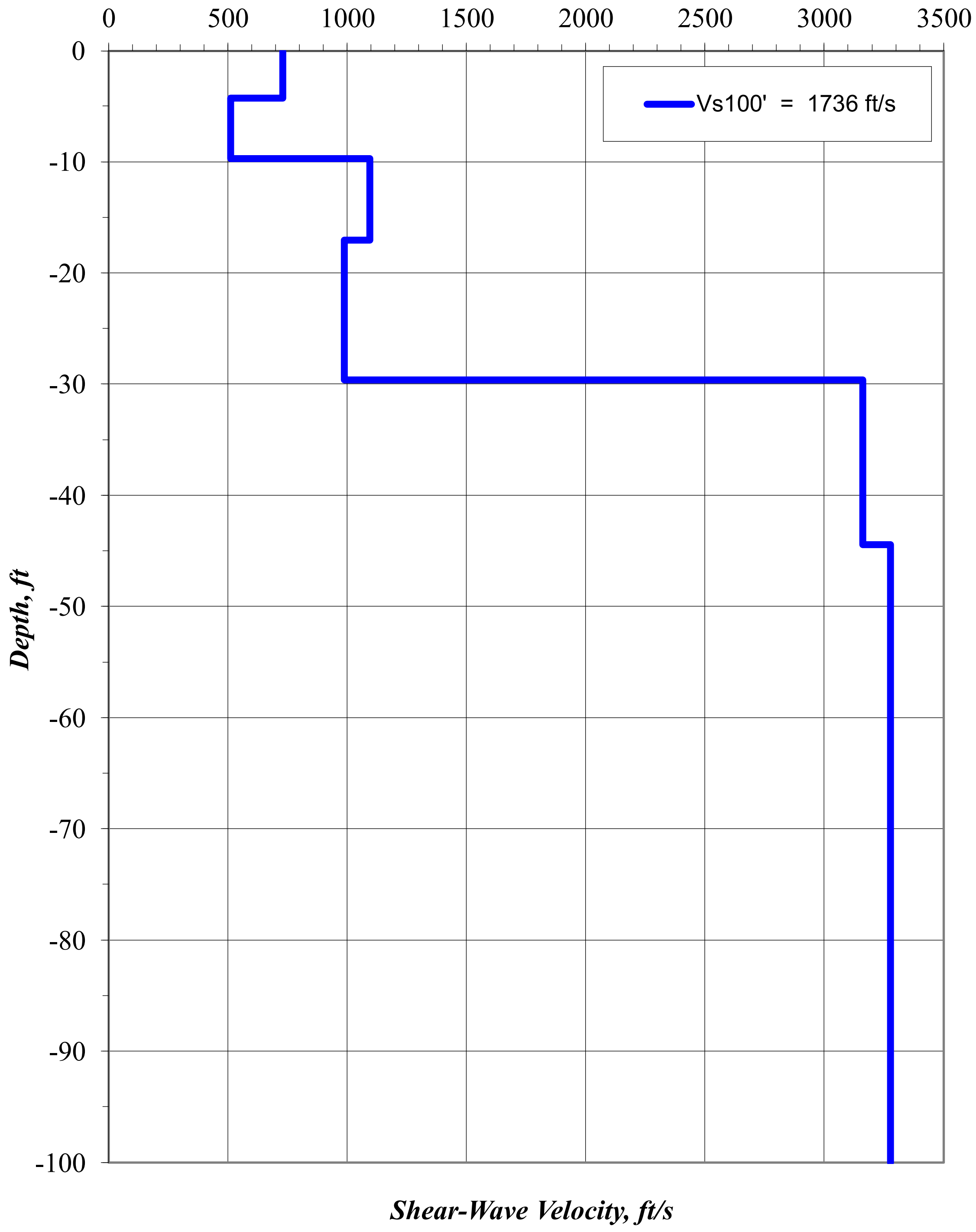
LOGGED BY PJR	SAMPLING METHOD BULK	GROUNDWATER ENCOUNTERED NO	CAVED NO

SAMPLE NO.	POCKET PEN. (TSF)	PERCENT PASSING #200 SIEVE	DEPTH (FEET)	GRAPHIC LOG	USCS	DESCRIPTIONS/REMARKS
					FILL (SM)	FILL: DARK BROWN SANDY SILT WITH GRAVEL (ML); DRY, LOOSE, WITH ORGANICS (2 INCHES)
			1		FILL (ML)	FILL: LIGHT GRAYISH BROWN SANDY SILT WITH GRAVEL (ML); DRY, STIFF TO VERY STIFF, FREQUENT COBBLES TO 6 INCHES DIAMETER, OCCASIONAL BOULDERS TO 18 INCHES DIAMETER, WITH DEBRIS (TRASH AND WOOD)
1-1	--	--	2			
			3		SP-SC	DARK REDDISH BROWN POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC); MOIST, MEDIUM DENSE TO DENSE, FREQUENT COBBLES TO 6 INCHES DIAMETER, OCCASIONAL BOULDERS TO 18 INCHES DIAMETER PERFORMED PERCOLATION RATE TESTS P-1 AND P-2 AT 4 FEET BGS 5.77 MIN/INCH (P-1) AND 2.16 MIN/INCH (P-2)
			4			
1-2	--	10	5			
			6			
			7			TEST PIT TERMINATED AT 7 FEET BGS
			8			
			9			
			10			
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

APPENDIX C

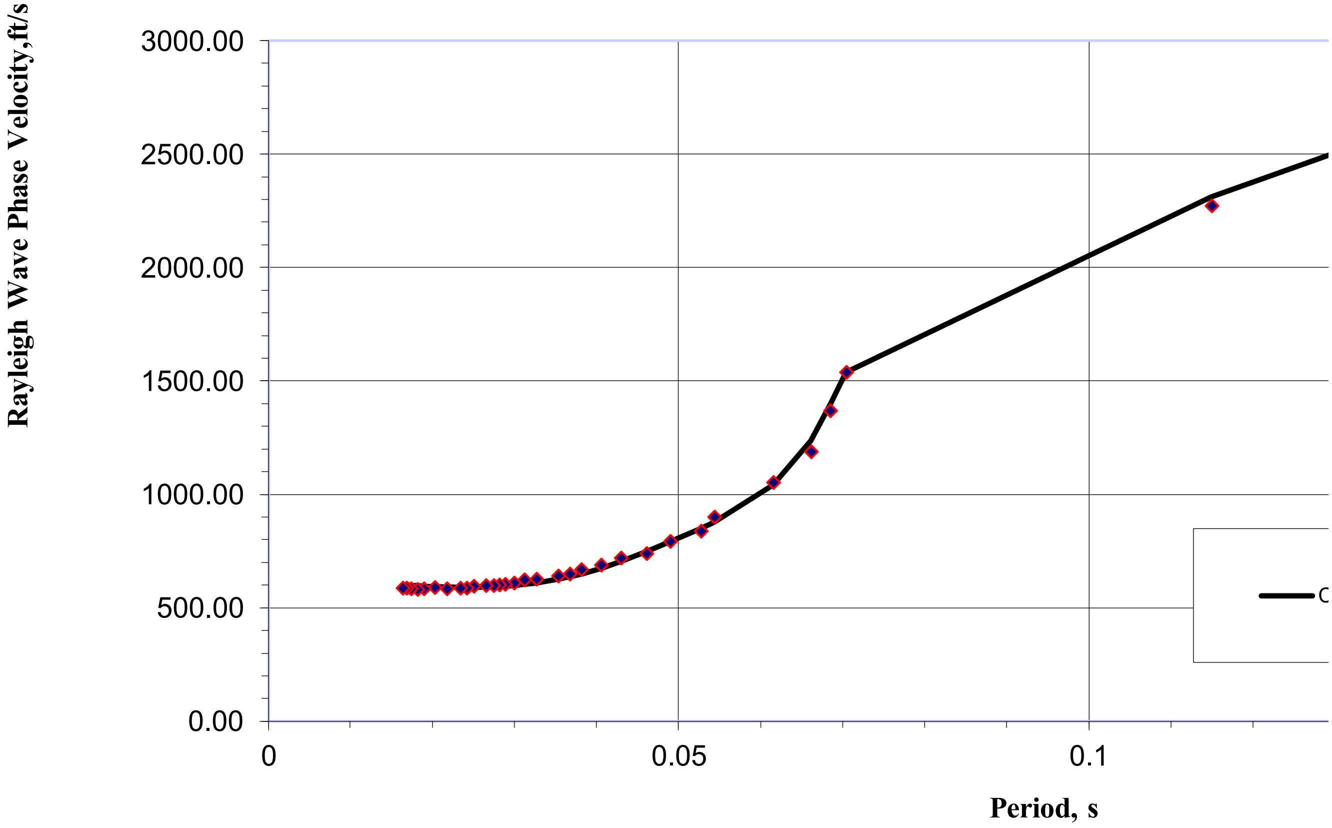
Refraction Microtremor (ReMi) Results

42949.00 Tahoe Donner Ski Lodge: Vs Model

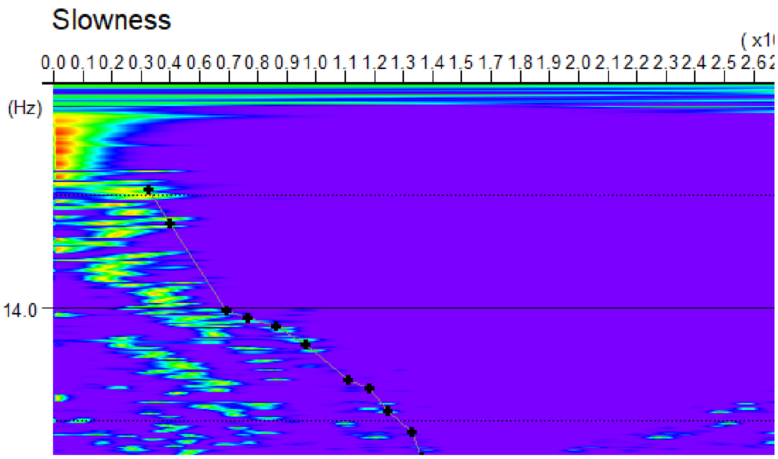


42949.00 Tahoe Donner Ski Lodge

Dispersion Curve Showing Picks and Fit



Dispersion image from p-f analysis with picks



APPENDIX D

Laboratory Test Data

PARTICLE SIZE DISTRIBUTION

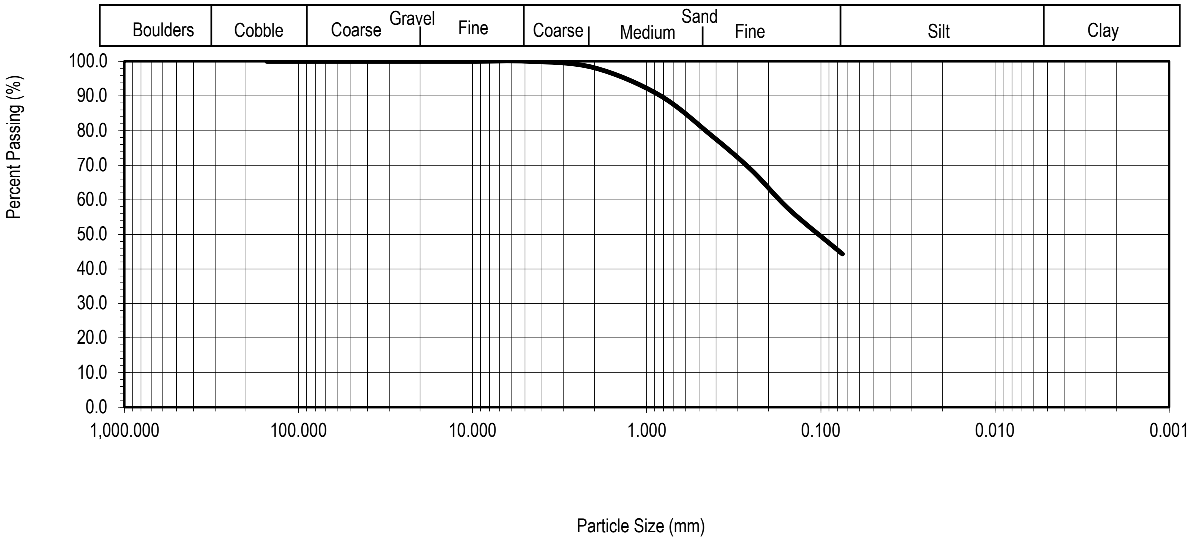
ASTM D422, C136

DSA LEA No.: 284

Project No.	**42949**	Project Name:	**Tahoe Dinner Lodge**	Date:	**8/17/2021**
Sample No.	**1-3**	Boring/Trench:	**B-1** Depth, (ft.): **10-11.5'**	Tested By:	**BJF**
Description:	**Yellowish Brown Silty Sand (SM)**			Checked By:	**DJP**
Sample Location:				Lab. No.	**C21-187**

Sieve Size	Particle Diameter		Dry Weight on Sieve			Percent Passing
(U.S. Standard)	Inches (in.)	Millimeter (mm)	Retained On Sieve (gm)	Accumulated On Sieve (gm)	Passing Sieve (gm)	(%)
6 Inch	6.0000	152.4	0.00	0.0	537.2	**100.0**
3 Inch	3.0000	76.2	0.00	0.0	537.2	**100.0**
2 Inch	2.0000	50.8	0.00	0.0	537.2	**100.0**
1.5 Inch	1.5000	38.1	0.00	0.0	537.2	**100.0**
1.0 Inch	1.0000	25.4	0.00	0.0	537.2	**100.0**
3/4 Inch	0.7500	19.1	0.00	0.0	537.2	**100.0**
1/2 Inch	0.5000	12.7	0.00	0.0	537.2	**100.0**
3/8 Inch	0.3750	9.5	0.00	0.0	537.2	**100.0**
#4	0.1870	4.7500	0.00	0.0	537.2	**100.0**
#10	0.0790	2.0066	9.96	10.0	527.2	**98.1**
#20	0.0335	0.8500	42.30	52.3	484.9	**90.3**
#40	0.0167	0.4250	62.80	115.1	422.1	**78.6**
#60	0.0098	0.2500	54.14	169.2	368.0	**68.5**
#100	0.0059	0.1500	62.22	231.4	305.8	**56.9**
#200	0.0030	0.0750	67.71	299.1	238.1	**44.3**

Particle Size Gradation



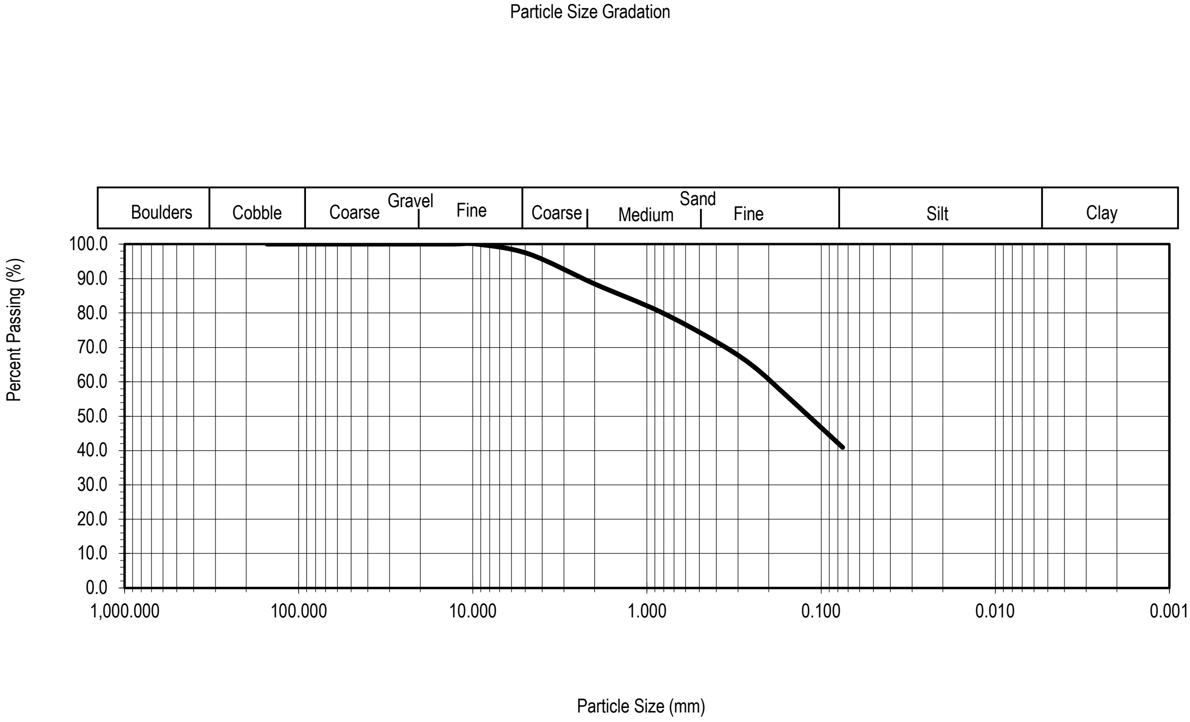
PARTICLE SIZE DISTRIBUTION

ASTM D422, C136

DSA LEA No.: **284**

Project No. **42949** Project Name: **Tahoe Dinner Lodge** Date: **8/17/2021**
Sample No. **1-5, 1-6, 1-7** Boring/Trench: **B-1** Depth, (ft.): **20-31.5'** Tested By: **BJF**
Description: **Dark Gray Silty Sand (SM)** Checked By: **DJP**
Sample Location: Lab. No. **C21-187**

Sieve Size	Particle Diameter		Dry Weight on Sieve			Percent Passing
(U.S. Standard)	Inches (in.)	Millimeter (mm)	Retained On Sieve (gm)	Accumulated On Sieve (gm)	Passing Sieve (gm)	(%)
6 Inch	6.0000	152.4	0.00	0.0	478.9	**100.0**
3 Inch	3.0000	76.2	0.00	0.0	478.9	**100.0**
2 Inch	2.0000	50.8	0.00	0.0	478.9	**100.0**
1.5 Inch	1.5000	38.1	0.00	0.0	478.9	**100.0**
1.0 Inch	1.0000	25.4	0.00	0.0	478.9	**100.0**
3/4 Inch	0.7500	19.1	0.00	0.0	478.9	**100.0**
1/2 Inch	0.5000	12.7	0.00	0.0	478.9	**100.0**
3/8 Inch	0.3750	9.5	0.00	0.0	478.9	**100.0**
#4	0.1870	4.7500	13.70	13.7	465.2	**97.1**
#10	0.0790	2.0066	41.62	55.3	423.6	**88.4**
#20	0.0335	0.8500	38.15	93.5	385.4	**80.5**
#40	0.0167	0.4250	38.87	132.3	346.6	**72.4**
#60	0.0098	0.2500	36.00	168.3	310.6	**64.9**
#100	0.0059	0.1500	47.96	216.3	262.6	**54.8**
#200	0.0030	0.0750	66.85	283.1	195.8	**40.9**



ATTERBERG INDICES

ASTM D4318

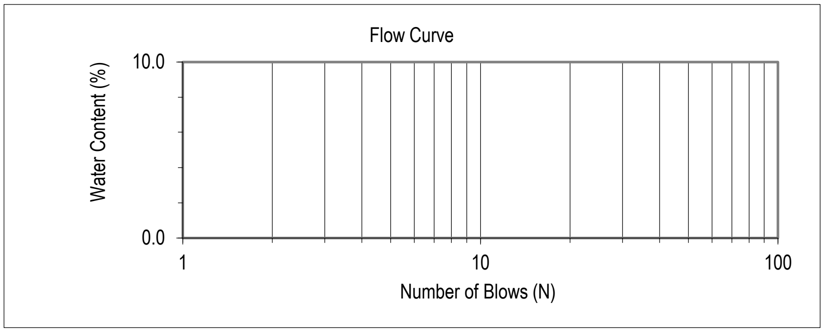
DSA LEA No. 284

DSA File No. 0
DSA App No. 0

Project No. 42949 Project Name Tahoe Dinner Lodge Date: 08/17/21
Sample No. 1-5, 1-6, 1-7 Boring/Trench B-1 Depth, (ft.): 20-31.5' Tested By: BJF
Description: Dark Gray Silty Sand (SM) Checked By: DJP
Sample Location: Lab. No. C21-187

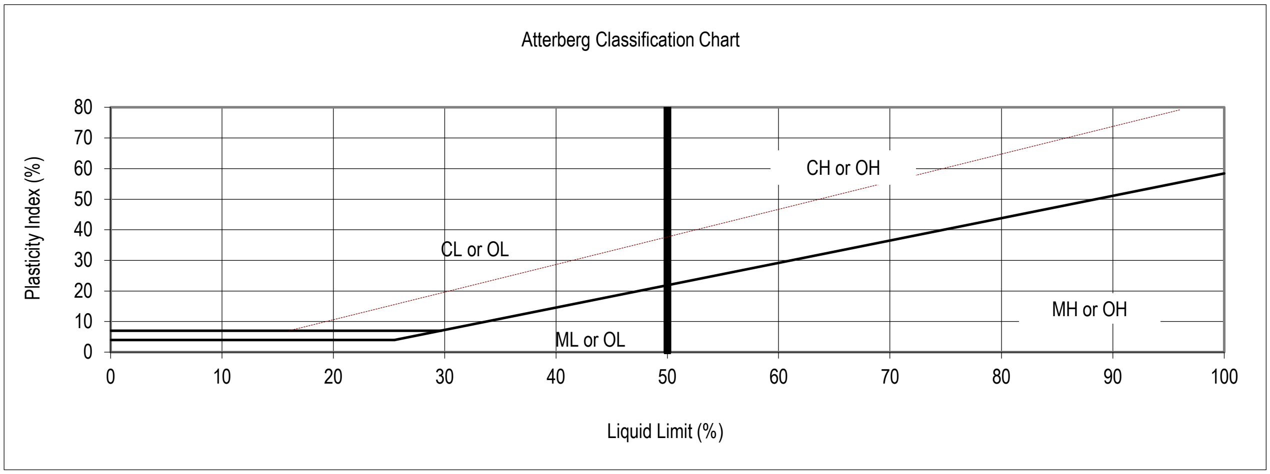
Estimated % of Sample Retained on No. 40 Sieve: Sample Air Dried: yes
Test Method A or B: A

	LIQUID LIMIT:					PLASTIC LIMIT:		
Sample No.:	1	2	3	4	5	1	2	3
Pan ID:								
Wt. Pan (gr)								
Wt. Wet Soil + Pan (gr)								
Wt. Dry Soil + Pan (gr)								
Wt. Water (gr)								
Wt. Dry Soil (gr)								
Water Content (%)								
Number of Blows, N								
				LIQUID LIMIT =			PLASTIC LIMIT =	



Plasticity Index =
Non-Plastic ☑

Group Symbol =



PARTICLE SIZE DISTRIBUTION

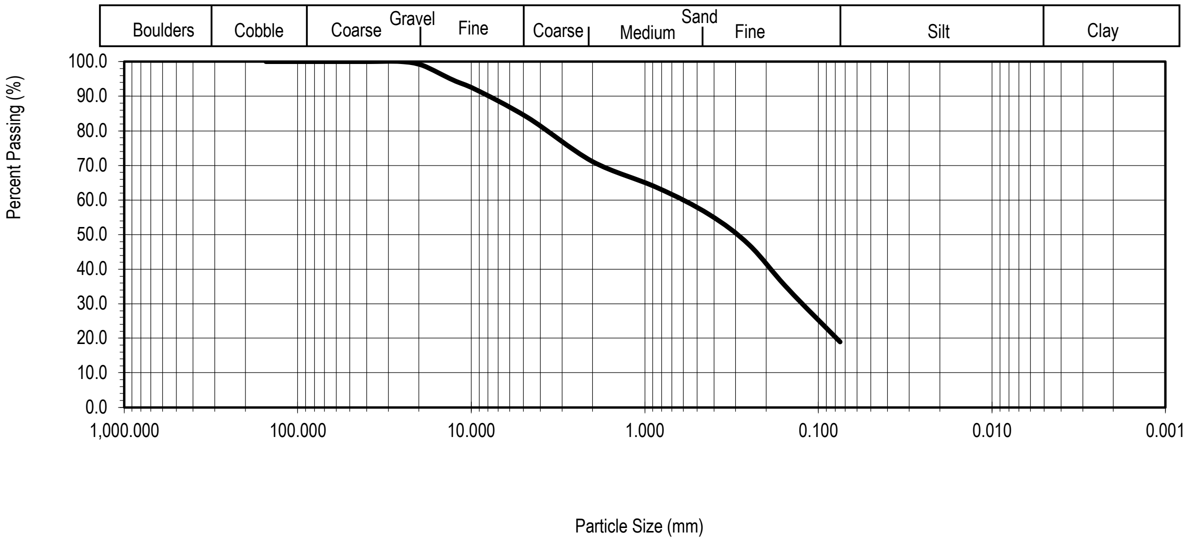
ASTM D422, C136

DSA LEA No.: **284**

Project No.	**42949**	Project Name:	**Tahoe Dinner Lodge**	Date:	**8/17/2021**
Sample No.	**2-2**	Boring/Trench:	**B-2** Depth, (ft.): **5-6.5'**	Tested By:	**BJF**
Description:	**Brown Silty Sand with Gravel (SM)**			Checked By:	**DJP**
Sample Location:				Lab. No.	**C21-187**

Sieve Size	Particle Diameter		Dry Weight on Sieve			Percent Passing
(U.S. Standard)	Inches (in.)	Millimeter (mm)	Retained On Sieve (gm)	Accumulated On Sieve (gm)	Passing Sieve (gm)	(%)
6 Inch	6.0000	152.4	0.00	0.0	915.6	**100.0**
3 Inch	3.0000	76.2	0.00	0.0	915.6	**100.0**
2 Inch	2.0000	50.8	0.00	0.0	915.6	**100.0**
1.5 Inch	1.5000	38.1	0.00	0.0	915.6	**100.0**
1.0 Inch	1.0000	25.4	0.00	0.0	915.6	**100.0**
3/4 Inch	0.7500	19.1	10.50	10.5	905.1	**98.9**
1/2 Inch	0.5000	12.7	39.00	49.5	866.1	**94.6**
3/8 Inch	0.3750	9.5	23.40	72.9	842.7	**92.0**
#4	0.1870	4.7500	74.90	147.8	767.8	**83.9**
#10	0.0790	2.0066	116.09	263.9	651.8	**71.2**
#20	0.0335	0.8500	69.47	333.4	582.3	**63.6**
#40	0.0167	0.4250	71.53	404.9	510.8	**55.8**
#60	0.0098	0.2500	80.51	485.4	430.3	**47.0**
#100	0.0059	0.1500	116.28	601.7	314.0	**34.3**
#200	0.0030	0.0750	140.06	741.7	173.9	**19.0**

Particle Size Gradation



ATTERBERG INDICES

ASTM D4318

DSA LEA No. 284

DSA File No. 0
DSA App No. 0

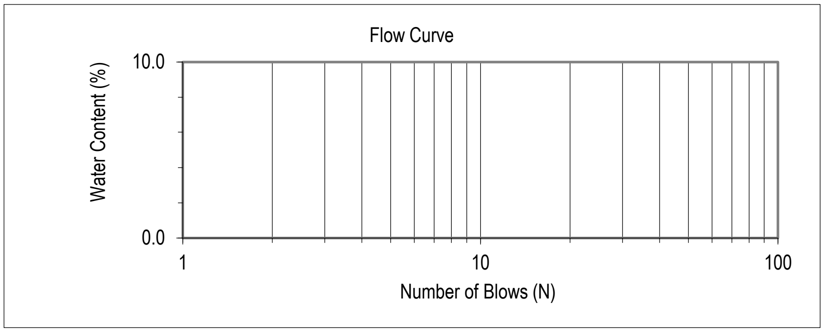
Project No. 42949 Project Name Tahoe Dinner Lodge Date: 08/17/21
Sample No. 2-2 Boring/Trench B-2 Depth, (ft.): 5-6.5' Tested By: BJF
Description: Brown Silty Sand with Gravel (SM) Checked By: DJP
Sample Location: 0 Lab. No. C21-187

Estimated % of Sample Retained on No. 40 Sieve: ____ Sample Air Dried: yes
Test Method A or B: A

	LIQUID LIMIT:					PLASTIC LIMIT:		
Sample No.:	1	2	3	4	5	1	2	3
Pan ID:								
Wt. Pan (gr)								
Wt. Wet Soil + Pan (gr)								
Wt. Dry Soil + Pan (gr)								
Wt. Water (gr)								
Wt. Dry Soil (gr)								
Water Content (%)								
Number of Blows, N								

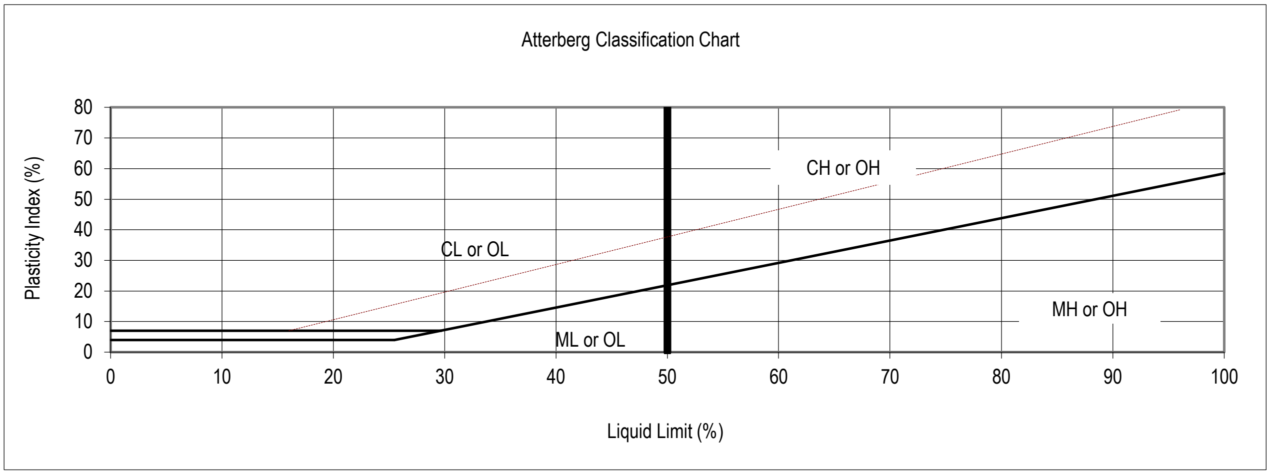
LIQUID LIMIT =

PLASTIC LIMIT =



Plasticity Index =
Non-Plastic ☑

Group Symbol =



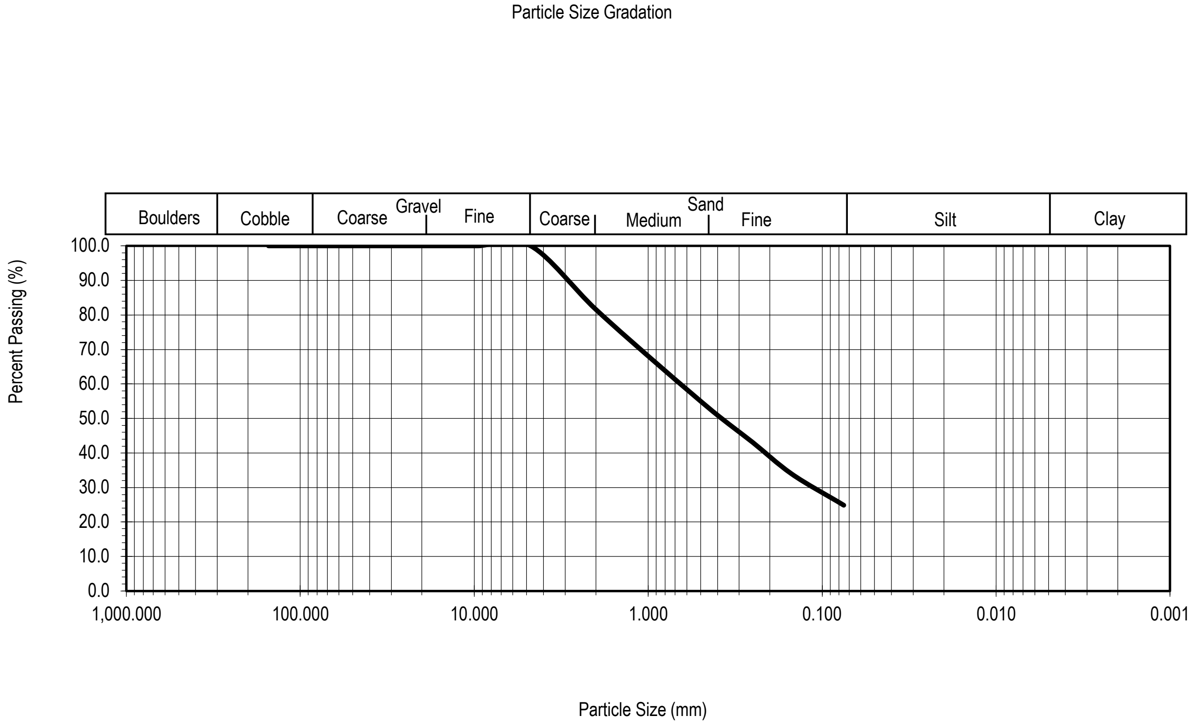
DSA LEA No.: **284**

PARTICLE SIZE DISTRIBUTION

ASTM D422, C136

Project No.	**42949**	Project Name:	**Tahoe Dinner Lodge**	Date:	**8/17/2021**
Sample No.	**4-3**	Boring/Trench:	**B-4** Depth, (ft.): **15-16.5'**	Tested By:	**BJF**
Description:	**Brown Silty Sand with Gravel (SM)**			Checked By:	**DJP**
Sample Location:				Lab. No.	**C21-187**

Sieve Size (U.S. Standard)	Particle Diameter Inches (in.)	Particle Diameter Millimeter (mm)	Dry Weight on Sieve Retained On Sieve (gm)	Dry Weight on Sieve Accumulated On Sieve (gm)	Dry Weight on Sieve Passing Sieve (gm)	Percent Passing (%)
6 Inch	6.0000	152.4	0.00	0.0	495.3	**100.0**
3 Inch	3.0000	76.2	0.00	0.0	495.3	**100.0**
2 Inch	2.0000	50.8	0.00	0.0	495.3	**100.0**
1.5 Inch	1.5000	38.1	0.00	0.0	495.3	**100.0**
1.0 Inch	1.0000	25.4	0.00	0.0	495.3	**100.0**
3/4 Inch	0.7500	19.1	0.00	0.0	495.3	**100.0**
1/2 Inch	0.5000	12.7	0.00	0.0	495.3	**100.0**
3/8 Inch	0.3750	9.5	0.00	0.0	495.3	**100.0**
#4	0.1870	4.7500	0.00	0.0	495.3	**100.0**
#10	0.0790	2.0066	90.90	90.9	404.4	**81.6**
#20	0.0335	0.8500	83.00	173.9	321.4	**64.9**
#40	0.0167	0.4250	63.50	237.4	257.9	**52.1**
#60	0.0098	0.2500	45.00	282.4	212.9	**43.0**
#100	0.0059	0.1500	44.80	327.2	168.1	**33.9**
#200	0.0030	0.0750	45.00	372.2	123.1	**24.9**



Moisture & Density

ASTM D2216, D2937, C566

DSA File No.: n/a
DSA App No.: n/a

Project No.: 42949
Project Name: Tahoe Dinner Lodge
Date: 08/17/21
Tested By: BJF
Checked By: DJP
Lab. No.: C21-187

SAMPLE LOCATION DATA

Boring/Trench No.	Units	B-4								
Sample No.		4-1-1								
Depth Interval	(ft.)	3.5-4								
Sample Description		Brown Silty Sand (SM)								
USCS Symbol										

SAMPLE DIMENSION AND WEIGHT DATA

Sample Length	(in)	5.280								
Sample Diameter	(in)	2.380								
Sample Volume	(cf)	0.0136								
Wet Soil + Tube Wt.	(gr)	931.80								
Tube Wt.	(gr)	253.60								
Wet Soil Wt.	(gr)	678.20								

MOISTURE CONTENT DATA

Tare No.		YY-47								
Tare Wt.	(gr)	129.10								
Wet Soil + Tare Wt.	(gr)	693.00								
Dry Soil + Tare Wt.	(gr)	502.40								
Water Wt.	(gr)	190.60								
Dry Soil Wt.	(gr)	373.30								
Moisture Content	(%)	51.1								

TEST RESULTS

Wet Unit Wt.	(pcf)	110.0								
Moisture Content	(%)	51.1								
Dry Unit Wt.	(pcf)	72.8								

MOISTURE CORRECTION DATA

Gauge Moisture	(%)									
K Value Correction Factor										

COMPACTION CURVE DATA (ASTM D698, ASTM D1557, or CAL216)

Test Method										
Curve No.										
Max Wet Unit Wt.	(pcf)									
Max Dry Unit Wt.	(pcf)									
Optimum Moisture	(%)									
Wet Relative Comp.	(%)									
Dry Relative Comp.	(%)									

PARTICLE SIZE DISTRIBUTION

ASTM D422, C136

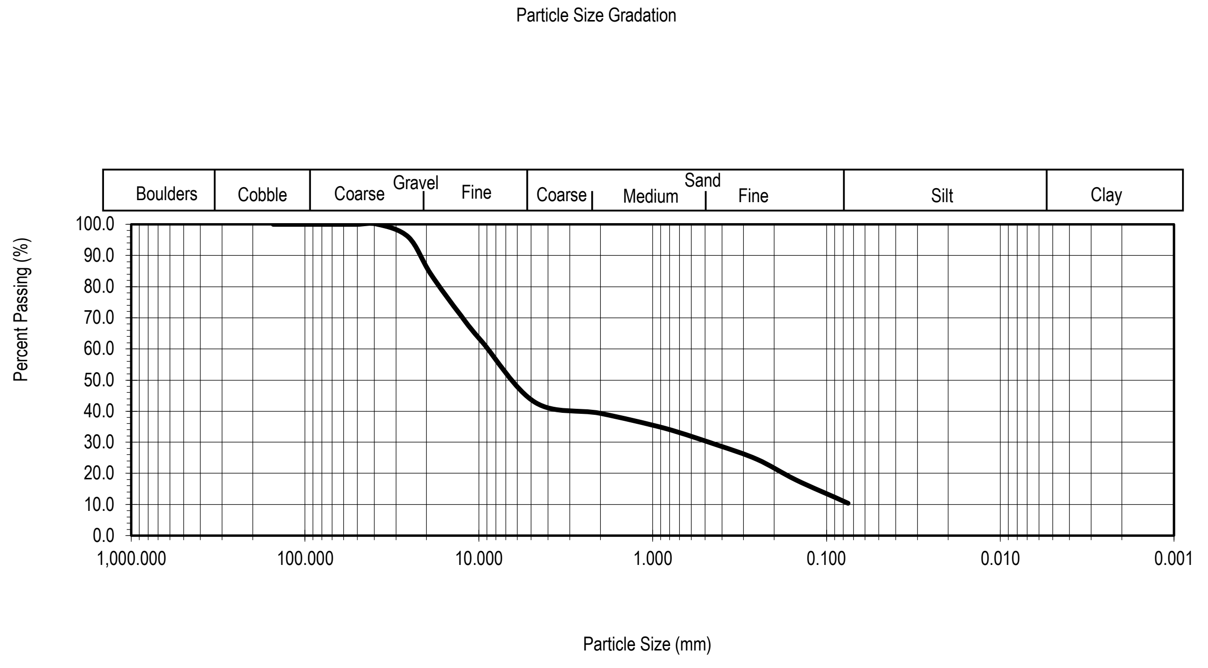
DSA LEA No.: **284**

Project No. **42949** Project Name: **Tahoe Donner Ski Lodge** Date: **9/3/2021**
Sample No. **1-3** Boring/Trench: **TP-1** Depth, (ft.): **7.5-8'** Tested By: **BJF**
Description: **Dark Grayish Brown Poorly Graded Gravel with Silt and Sand (GP-GM)** Checked By: **DJP**
Sample Location: Lab. No. **C21-207**

Sieve Size (U.S. Standard)	Particle Diameter		Dry Weight on Sieve			Percent Passing (%)
	Inches (in.)	Millimeter (mm)	Retained On Sieve (gm)	Accumulated On Sieve (gm)	Passing Sieve (gm)	
6 Inch	6.0000	152.4	0.00	0.0	2,445.7	**100.0**
3 Inch	3.0000	76.2	0.00	0.0	2,445.7	**100.0**
2 Inch	2.0000	50.8	0.00	0.0	2,445.7	**100.0**
1.5 Inch	1.5000	38.1	0.00	0.0	2,445.7	**100.0**
1.0 Inch	1.0000	25.4	101.90	101.9	2,343.8	**95.8**
3/4 Inch	0.7500	19.1	283.20	385.1	2,060.6	**84.3**
1/2 Inch	0.5000	12.7	332.60	717.7	1,728.0	**70.7**
3/8 Inch	0.3750	9.5	209.10	926.8	1,518.9	**62.1**
#4	0.1870	4.7500	470.80	1,397.6	1,048.1	**42.9**
#10	0.0790	2.0066	87.71	1,485.3	960.4	**39.3**
#20	0.0335	0.8500	117.44	1,602.7	842.9	**34.5**
#40	0.0167	0.4250	129.91	1,732.7	713.0	**29.2**
#60	0.0098	0.2500	113.03	1,845.7	600.0	**24.5**
#100	0.0059	0.1500	161.47	2,007.2	438.5	**17.9**
#200	0.0030	0.0750	182.39	2,189.6	256.1	**10.5**

Cc = 0.30

Cu = 131.26



ATTERBERG INDICES

ASTM D4318

DSA LEA No. 284

DSA File No. N/A

DSA App No. N/A

Project No.	42949	Project Name	Tahoe Donner Ski Lodge	Date:	09/03/21
Sample No.	1-3	Boring/Trench	TP-1 Depth, (ft.): 7.5-8'	Tested By:	BJF
Description:	Dark Grayish Brown Poorly Graded Gravel with Silt and Sand (GP-GM)			Checked By:	DJP
Sample Location:				Lab. No.	C21-207

Estimated % of Sample Retained on No. 40 Sieve: ____

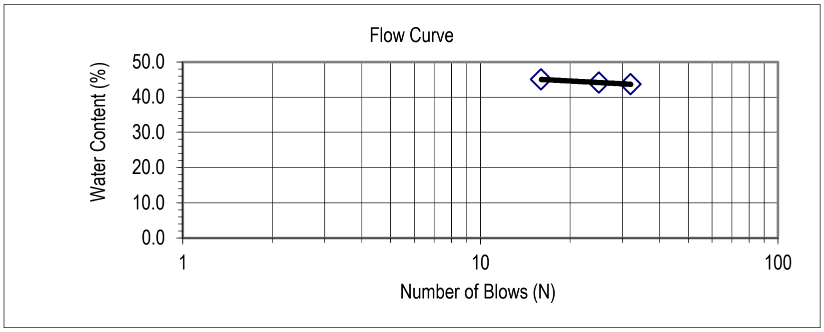
Sample Air Dried: yes

Test Method A or B: A

	LIQUID LIMIT:					PLASTIC LIMIT:		
Sample No.:	1	2	3	4	5	1	2	3
Pan ID:	A2	B2	C2			I	N1	K1
Wt. Pan (gr)	18.43	18.38	18.51			62.66	64.89	61.29
Wt. Wet Soil + Pan	37.25	37.68	40.38			71.19	72.66	68.34
Wt. Dry Soil + Pan (	31.53	31.77	33.59			68.93	70.65	66.48
Wt. Water (gr)	5.72	5.91	6.79			2.26	2.01	1.86
Wt. Dry Soil (gr)	13.10	13.39	15.08			6.27	5.76	5.19
Water Content (%)	43.7	44.1	45.0			36.0	34.9	35.8
Number of Blows, N	32	25	16					

LIQUID LIMIT = 44

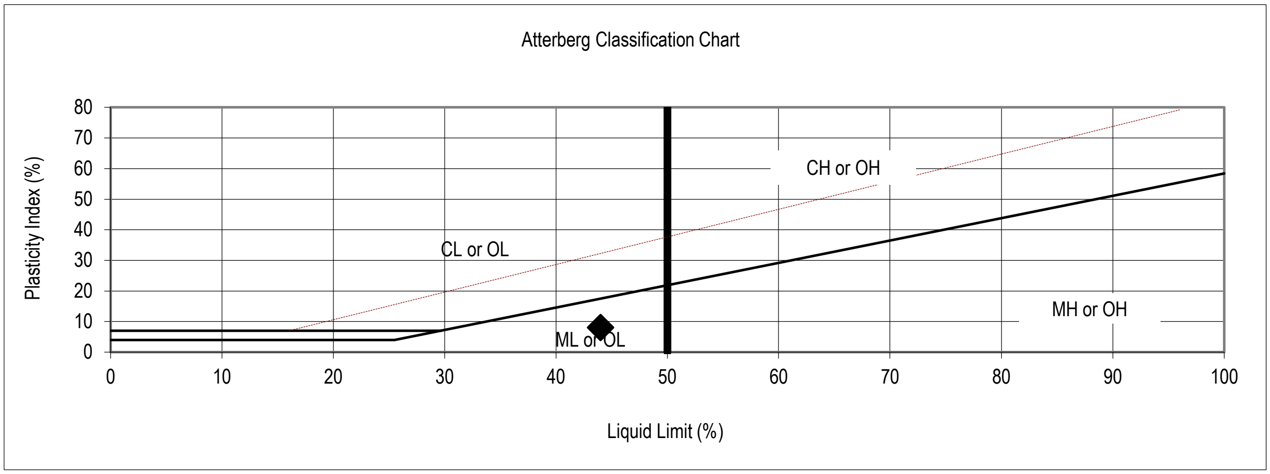
PLASTIC LIMIT = 36



Plasticity Index = 8

Non-Plastic ☐

Group Symbol = ML



PARTICLE SIZE DISTRIBUTION

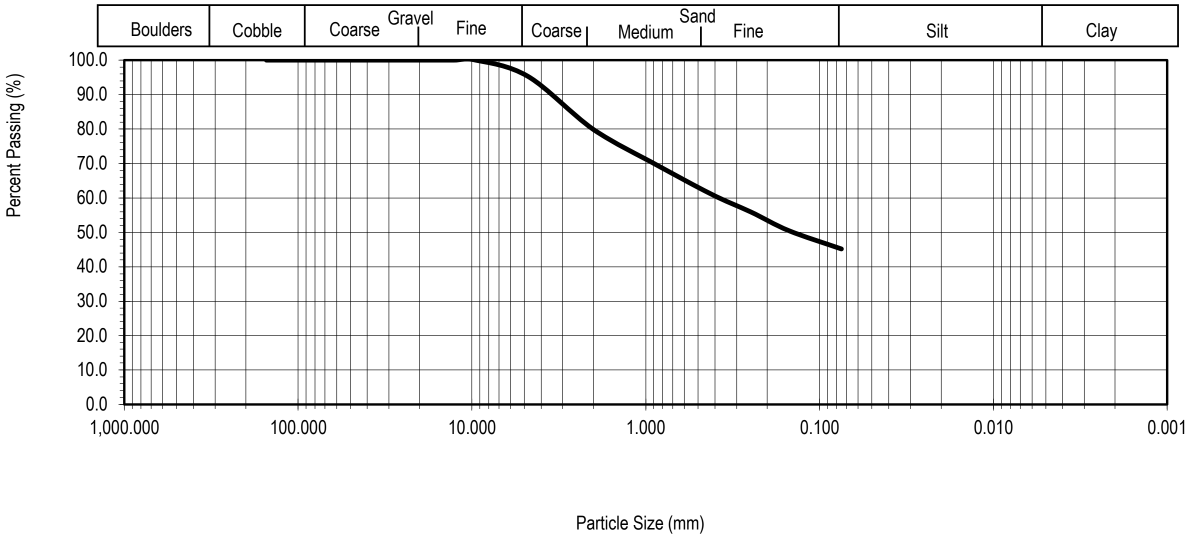
ASTM D422, C136

DSA LEA No.: **284**

Project No.	**42949**	Project Name:	**Tahoe Donner Ski Lodge**	Date:	**9/3/2021**
Sample No.	**2-2**	Boring/Trench:	**TP-2** Depth, (ft.): **5.5-6'**	Tested By:	**BJF**
Description:	**Dark Yellowish Brown Silty Sand (SM)**			Checked By:	**DJP**
Sample Location:				Lab. No.	**C21-207**

Sieve Size	Particle Diameter		Dry Weight on Sieve			Percent
	Inches	Millimeter	Retained On Sieve	Accumulated On Sieve	Passing Sieve	Passing
(U.S. Standard)	(in.)	(mm)	(gm)	(gm)	(gm)	(%)
6 Inch	6.0000	152.4	0.00	0.0	2,708.7	**100.0**
3 Inch	3.0000	76.2	0.00	0.0	2,708.7	**100.0**
2 Inch	2.0000	50.8	0.00	0.0	2,708.7	**100.0**
1.5 Inch	1.5000	38.1	0.00	0.0	2,708.7	**100.0**
1.0 Inch	1.0000	25.4	0.00	0.0	2,708.7	**100.0**
3/4 Inch	0.7500	19.1	0.00	0.0	2,708.7	**100.0**
1/2 Inch	0.5000	12.7	0.00	0.0	2,708.7	**100.0**
3/8 Inch	0.3750	9.5	0.00	0.0	2,708.7	**100.0**
#4	0.1870	4.7500	129.80	129.8	2,578.9	**95.2**
#10	0.0790	2.0066	413.73	543.5	2,165.2	**79.9**
#20	0.0335	0.8500	286.96	830.5	1,878.2	**69.3**
#40	0.0167	0.4250	220.74	1,051.2	1,657.5	**61.2**
#60	0.0098	0.2500	142.54	1,193.8	1,514.9	**55.9**
#100	0.0059	0.1500	148.21	1,342.0	1,366.7	**50.5**
#200	0.0030	0.0750	144.43	1,486.4	1,222.3	**45.1**

Particle Size Gradation



DSA LEA No.: **284**

PARTICLE SIZE DISTRIBUTION

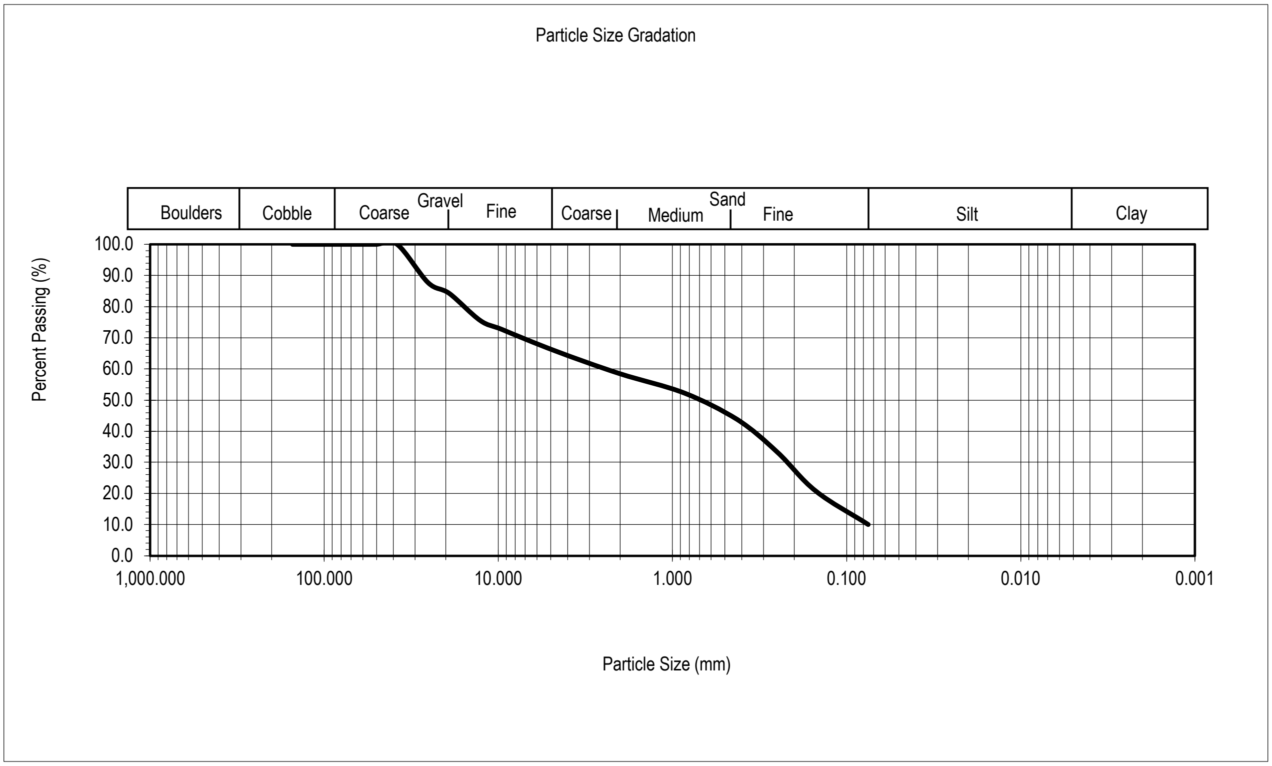
ASTM D422, C136

Project No.	**42949**	Project Name:	**Tahoe Donner Ski Lodge**	Date:	**9/3/2021**
Sample No.	**4-2**	Boring/Trench:	**TP-4** Depth, (ft.): **5-5.5'**	Tested By:	**BJF**
Description:	**Dark Reddish Brown Poorly Graded Sand with Clay and Gravel (SP-SC)**			Checked By:	**DJP**
Sample Location:				Lab. No.	**C21-207**

Sieve Size (U.S. Standard)	Particle Diameter Inches (in.)	Particle Diameter Millimeter (mm)	Dry Weight on Sieve Retained On Sieve (gm)	Dry Weight on Sieve Accumulated On Sieve (gm)	Dry Weight on Sieve Passing Sieve (gm)	Percent Passing (%)
6 Inch	6.0000	152.4	0.00	0.0	2,567.8	**100.0**
3 Inch	3.0000	76.2	0.00	0.0	2,567.8	**100.0**
2 Inch	2.0000	50.8	0.00	0.0	2,567.8	**100.0**
1.5 Inch	1.5000	38.1	0.00	0.0	2,567.8	**100.0**
1.0 Inch	1.0000	25.4	315.10	315.1	2,252.7	**87.7**
3/4 Inch	0.7500	19.1	92.40	407.5	2,160.3	**84.1**
1/2 Inch	0.5000	12.7	221.70	629.2	1,938.6	**75.5**
3/8 Inch	0.3750	9.5	74.30	703.5	1,864.3	**72.6**
#4	0.1870	4.7500	174.60	878.1	1,689.7	**65.8**
#10	0.0790	2.0066	189.73	1,067.8	1,500.0	**58.4**
#20	0.0335	0.8500	160.07	1,227.9	1,339.9	**52.2**
#40	0.0167	0.4250	217.16	1,445.1	1,122.7	**43.7**
#60	0.0098	0.2500	267.53	1,712.6	855.2	**33.3**
#100	0.0059	0.1500	324.06	2,036.7	531.1	**20.7**
#200	0.0030	0.0750	272.57	2,309.2	258.6	**10.1**

Cc = 0.25

Cu = 34.13



ATTERBERG INDICES

ASTM D4318

DSA LEA No. 284

DSA File No. N/A
DSA App No. N/A

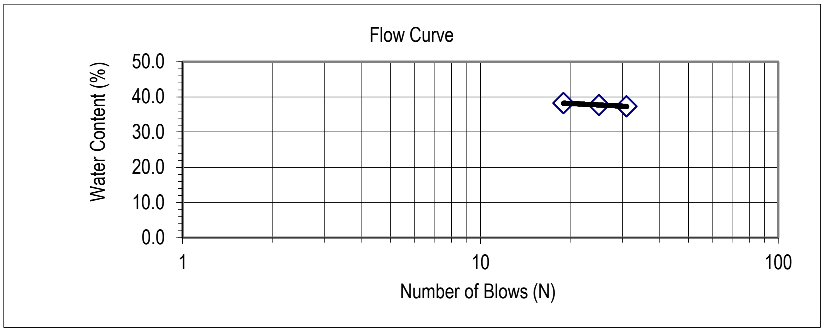
Project No.	42949	Project Name	Tahoe Donner Ski Lodge			Date:	09/03/21
Sample No.	4-2	Boring/Trenc	TP-4	Depth, (ft.):	5-5.5'	Tested By:	BJF
Description:	Dark Reddish Brown Poorly Graded Sand with Clay and Gravel (SP-SC)					Checked By:	DJP
Sample Location:						Lab. No.	C21-207

Estimated % of Sample Retained on No. 40 Sieve: ______
Sample Air Dried: yes
Test Method A or B: A

	LIQUID LIMIT:					PLASTIC LIMIT:		
Sample No.:	1	2	3	4	5	1	2	3
Pan ID:	B	X	E			A2	B2	C2
Wt. Pan (gr)	38.98	38.18	36.43			18.43	18.38	18.51
Wt. Wet Soil + Pan	56.43	64.77	58.78			20.40	20.72	20.81
Wt. Dry Soil + Pan (	51.69	57.49	52.60			20.07	20.48	20.36
Wt. Water (gr)	4.74	7.28	6.18			0.33	0.24	0.45
Wt. Dry Soil (gr)	12.71	19.31	16.17			1.64	2.10	1.85
Water Content (%)	37.3	37.7	38.2			20.1	11.4	24.3
Number of Blows, N	31	25	19					

LIQUID LIMIT = 38

PLASTIC LIMIT = 19



Plasticity Index = 19
Non-Plastic ☐

Group Symbol = CL