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FEASIBILITY GEOTECHNICAL REPORT

GENESEE PROPERTIES, INC.
SOCIETY TURN PARCEL
HIGHWAY 145
SAN MIGUEL COUNTY, COLORADO

August 21, 2020

Prepared for:

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1.0 INTRODUCTION

DOWL conducted a feasibility geotechnical evaluation on July 15-16, 2019 at the proposed Society Turn Parcel near Telluride, Colorado (see Vicinity Map, Map 1, Appendix A). Our services were performed at the request of Thomas Kennedy, PC, on behalf of Genesee Properties, to evaluate the general geotechnical characteristics of the property to determine the feasibility and potential geotechnical constraints for the intended construction of roads, a medical center, and a variety of commercial and residential structures. The evaluation consisted of a site evaluation, drilling of ten (10) boreholes, logging and testing of representative materials found, pavement design, and analysis of available data. This report presents the findings of our evaluation and our feasibility-level geotechnical engineering recommendations for site development.

2.0 CONSTRUCTION PLANS

As seen on Map 2 (Development Plan), the Society Turn Parcel is proposed to have potentially five (5) Planning Areas (although these Society Turn Parcels may be further divided or aggregated as part of the County review process); two (2) Open Space areas; a proposed WWTP expansion area on the west side of the existing WWTP; and two (2) access roads.

At this point in the planning development review process, the Society Turn Parcel has initially been separated out into five (5) Planning Areas that would accommodate the differing uses contemplated in the development plan. The Society Turn Parcel will be developed in multiple phases. The Planning Areas are likely to be further divided into small development tracts as part of the development review process. Some underground parking areas are contemplated for the various buildings on the Society Turn Parcel (as will be determined with site-specific reviews of the proposed buildings and uses which would occur in the future). Paved surface parking is also planned for the property.

Along the northern edge of the Parcel, a low (approximately 4-foot tall) retaining wall is planned to retain the slope for a recreational trail and a taller (roughly 9 to 10-foot tall) wall is planned below the trail to accommodate parking spaces. A pedestrian bridge will be constructed across Remine Creek to allow access to the Open Space on the western end of the Parcel. A water tank, augmentation pond, and surface and subsurface detention basins are also planned.

The PUD (Planned Unit Development)/Subdivision review process which the landowner is pursuing with the County will largely focus on evaluations of lot/parcel placement, uses/densities, infrastructure, general building siting along with maximum mass/scale/height, parking requirements and other supporting site improvements. Site-specific design plans for the buildings proposed for each parcel will be generated after final platting as each building is contemplated for development, therefore, construction plans/drawings for building are not available at this time. As such, specific recommendations for foundations are not provided, and we recommend site-specific geotechnical testing be performed within each planning area once building details are known. Similarly, the depth of excavations and cut/fill information is not known. However, we have assumed that below grade parking and possible basements in at least some of the buildings will be constructed and that the medical center and other structures will have multiple levels above grade, as determined by the PUD process and County requirements.

3.0 SITE CONDITIONS

As seen on the Vicinity Map (Map 1, Appendix A), the Society Turn Parcel (19.9 acres) is in the San Miguel River valley, roughly 3 miles west of the Town of Telluride. It is southwest of the Society Turn intersection (round-about), with Highway 145 on the north and east sides, and Society Drive to the south. The Parcel is the mostly gently sloping terrain that sits on the north side of the San Miguel Valley at the base of a steep slope, which is the toe of Deep Creek Mesa, seen on the Vicinity Map (Map 1). The Conceptual Plan (Map 2) shows the Parcel has a long and narrow shape that comes to a point on the west end and is approximately 2,390 feet long (east-west) and 630 feet wide (north-south) at its' widest. The San Miguel River flows westerly through the southeast portion of the property and touches a small portion of the property near its western end. Remine Creek flows south through a narrow, steep gorge near the western tip of the Parcel. The attached Conceptual Plan (Map 2) shows the five (5) Planning Areas, the proposed Road A and Road B, two Open Space parcels, site topography, the approximate locations of our boreholes, and other local features. There is an existing, unimproved dirt trail that enters the Parcel in the southeastern corner, crosses the San Miguel River on a pedestrian bridge, and then crosses Road B and continues to the northern edge of the property. It currently continues to the entrance road on the east side of Remine Creek and then crosses Highway 145 to the north to ascend Deep Creek Mesa. Improvements to the trail will include an elevated path along the northern edge of the Parcel that will continue west and cross Remine Creek with a new pedestrian bridge.

Elevations range from 8,632 feet along the San Miguel River to 8,698 feet in the northeast corner of the Parcel. Due to the unknown exact locations of possible buildings, we and the development team consisting of Tom Kennedy (project attorney and owner representative), Dave Bulson (PLS with Foley Associates), and Chris Touchette (planner with CCY Architects), selected borehole locations to be representative of the areas to be developed, especially those with specific design concerns. Table 1 below summarizes the location (Map 2) and purpose of each of the ten (10) boreholes drilled as part of this feasibility-level study of the property.

Table 1. Borehole Locations & Purpose

Borehole #	Location	Purpose
1	Western Open Space	East abutment of proposed pedestrian bridge (west abutment was inaccessible)
2	Planning Area 1	Pavement design in medical center area and buried detention structure site
3-5	Planning Area 2	Determine the quality and extent of known fill material in this area and suitability for underground parking
6	Planning Area 3	Irrigation water tank site
7	Planning Area 3	Determine general soil conditions for building construction and underground parking
8	Road B	Evaluate pavement design
9	Planning Area 4	Determine general soil conditions for building construction and underground parking
10	Eastern Open Space	Determine general soil conditions for commercial building construction and possible extent of mill tailings or other fill material in the area

Each of these borehole locations were staked by Foley Associates in the field prior to our drilling to aid in proper location of boreholes. The following photographs were taken of the site at the time of our field evaluation.

Photo 1 (left) view west at Borehole #2 (BH#2) and Photo 2 (right) view east at BH#3, show the vegetative cover, the local topography, and the conditions at the time of our drilling.

The ten (10) boreholes are shown on Map 2 (Conceptual Plan, Appendix A), while the borehole logs are presented in Appendix B, and the laboratory results are in Appendix C. The results of our field and laboratory testing are discussed in the *Soil Characteristics* Section of this report.

4.0 GEOLOGY

The San Juan Mountains in the vicinity of Telluride, consist of uplifted Paleozoic and Mesozoic sedimentary formations intruded by Tertiary volcanics. Uplifting that accompanied the volcanic eruptions caused warping and alteration of older sedimentary bedrock. As magma rose towards the surface, some was injected into fractures in the sedimentary strata forming a network of dikes and sills. The magma was rich in mineralized fluids, forming the gold and silver veins that made the area a rich mining district. In the millions of years since the intrusives were formed and the region was uplifted, much of the overlying sedimentary rock has been weathered and stripped away by erosion, landslides, and glaciation to create the current dramatic landscape.

The Parcel lies within a deep valley near the headwaters of the San Miguel River located east of Telluride. The valley has cut through the surrounding volcanic and sedimentary formations by a combination of glacial and fluvial scouring and deposition. Since the end of the last glacial period, the scoured valley floor has been filled to a depth of over 200 feet with alluvial and fluvial materials deposited by the San Miguel River and its' tributaries like Cornet Creek, Bear Creek, Butcher Creek, Mill Creek, Eider Creek, Remine Creek, as well as with glacial moraine deposits and colluvium from the steep valley walls. In the vicinity of the Society Turn Parcel, the bedrock in the canyon walls is Jurassic Morrison and Cretaceous Dakota Sandstone (*Preliminary Geologic Map of the Gray Head Quadrangle San Miguel County, Colorado*, Bush et at *1961*; *Geologic Map of the Telluride Quadrangle*, Burbank and Luedke, 1966). The Morrison Formation consists of variegated mudstone with some interbedded sandstone in the upper member and gray to yellow lenticular sandstone beds with some interbedded mudstone and limestone beds in the lower member. The Dakota Sandstone is a gray to yellow quartzitic sandstone and conglomeratic sandstone with gray to black carbonaceous shale and some thin coal seams. The distinctive dipping sandstone cliff above Airport Road to the north of the Parcel is the Dakota Sandstone. No bedrock outcrops on or adjacent to the Parcel and bedrock is expected to be quite deep under the site due to glacial scouring of the San Miguel River canyon during the Pleistocene and significant valley in-filling over that past roughly 10,000 years.

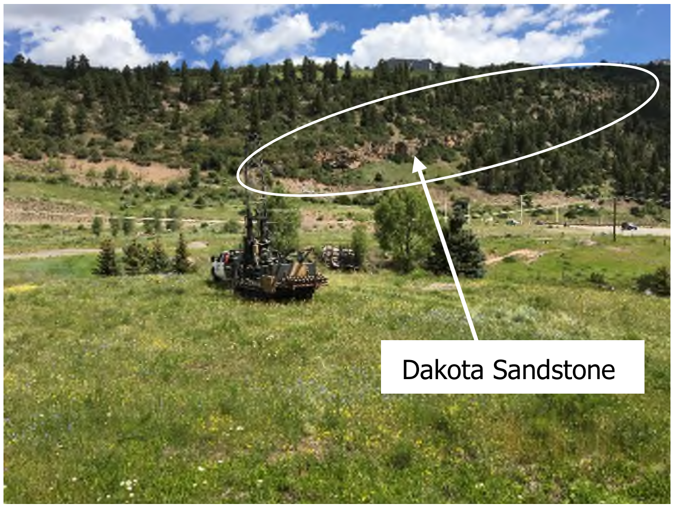


Photo 3. View north as BH#10 was being drilled, shows the dipping outcrop of Dakota Sandstone on the north side of the valley adjacent to the Parcel. Due to deep valley fill, no bedrock was found during our drilling and none is anticipated at any reasonable depth underlying the Parcel.

The Society Turn Parcel is mapped as containing Quaternary river alluvium (*Qal*), Quaternary alluvial cone or fan (*Qac*) deposits, and Quaternary young glacial drift or moraine (*Qd*) deposits. The entire Parcel contains geologically recent, Quaternary (less than 1.8 million-year-old), unconsolidated deposits. The deposit that dominates the western half of the Parcel is the Remine Creek alluvial fan (cone) deposits (*Qac*) where it enters the valley floor, while the eastern half is primarily river alluvium (*Qal*) associated with fluvial deposits of the San Miguel River. There are also two remnant glacial drift/moraines (*Qd*) deposits at the northeast and southeast corners of the Parcel, and one small area on the western tip of the Parcel. There is no bedrock mapped on this Parcel, as it is covered by thick sequences of geologically recent glacial, colluvial, and alluvial deposits. Due to deep glacial scouring and later infilling, bedrock is anticipated to be deep below the Parcel. A review of water wells constructed on the property, available on the Colorado Division of Water Resources (CDWR) website, revealed that no bedrock was found in any of the three wells to depths of 70, 130 and 177 feet. According to the well logs, the valley fill consists of glaciofluvial silt, sand, gravel, cobbles and boulders. Our July 2019 geotechnical drilling also found no bedrock, although the depths of exploration in that study were much shallower than the drilling performed for the construction of wells.

Alluvial deposits (Qal) typically consist of sand and gravel with cobbles and some boulders, but some areas of silt and clay can accumulate during flood events in areas of overbank flow. These unconsolidated deposits were spread throughout the valley floor by the migrating river channel. Alluvial fan deposits are similar in composition to river alluvium, but the landform is more conical in shape, with the apex of the fan at the mouth of the canyon. Coarser material (boulders and cobbles) are typically found near the mouth of the canyon, while finer material (silt, clay, sand, and gravel) are carried to the mid- and distal fan areas. In the central portion of the Society Turn Parcel, the Remine Creek fan deposits have pushed the San Miguel River to the south side of the valley.

Glacial moraine (Qd) deposits on the Parcel were pushed by glacial ice moving down valley from the head of the valley in the box canyon east of Telluride. The San Miguel River canyon served as a trunk glacier fed by smaller glaciers in tributary basins. A terminal moraine was located on the Parcel, but subsequent erosion has left only remnant fragments of these deposits at the east and west margins of the property. The moraine in the northeast corner of the Parcel and one in the southeast corner were originally connected and were later breached by the San Miguel River. Remnants of a terminal moraine are also found at the top of Keystone Hill on the west side of the Parcel. Glacial debris in the valley caused temporary damming of the San Miguel River resulting in the deposition of silt and clay, so the valley fill contains sequences of finer-grained materials within beds of coarser alluvium, colluvium and glacial deposits. Glacial material typically consists of a jumble of cobbles and boulders in a sand and gravel matrix with variable amounts of fines. The soils found during our investigation are consistent with the mapped geology of the region and are discussed in the Soil Characteristics section 6.0. Refer to the DOWL Geologic Hazards report for specific maps of the geology of the Parcel.

5.0 GEOLOGIC HAZARDS

A detailed geologic hazard assessment was performed for the Society Turn Parcel by DOWL and is presented in a June 15, 2020 Geologic Hazards report. Refer to that report for a discussion of geologic hazards relevant to this property and associated recommended mitigation.

6.0 SOIL CHARACTERISTICS

6.1 Field Evaluation

As outlined in Table 1, each of the ten (10) boreholes (BH#1 - BH#10) were located with the purpose of determining soil conditions for specific development purposes. The boreholes were drilled to depths of 7.5 to 26.5 feet using a CME 55 tracked drill rig at the locations noted on the attached Conceptual Plan (Map 2, Appendix A). The locations of the borings were selected by Genesee and DOWL staff, surveyed by Foley Associates and staked prior to the field evaluation. The boreholes were drilled with an 8-inch hollow stem continuous flight auger. Soil samples were obtained at discrete depths using a standard 1.375-inch inside diameter (I.D.) split-spoon sampler without liners to perform in-situ Standard Penetration Tests (SPTs) in general accordance with ASTM Standard D-1586. The number of blows required to drive the sampler 12 inches in 6-inch increments were recorded (SPT "N" penetration resistance values) and indicate the relative density or consistency of the soils.

The soil, bedrock, and groundwater conditions were logged and the borehole logs are presented in Appendix B. Representative samples of soil and rock materials were tested in our laboratory with the results presented in Appendix C. Laboratory results are also summarized on the borehole logs. Our findings and recommendations are based on materials found within our boreholes which we drilled to depths ranging from 7.5 to 26.5 feet below the existing ground surface. Soil conditions may change between boreholes and below these depths. Since this is a feasibility study, site-specific geotechnical evaluations must be performed at building sites once building footprints, loads and design features are known.

The soils across the site typically consist of silty to clayey sand and gravel with variable amounts of cobbles and occasional small boulders, typical of alluvial, alluvial fan, and glacial moraine deposits. No groundwater or bedrock was found in any of the boreholes. The following photographs were taken of the native soil and rock from two of the boreholes.

Photo 4 (left) shows the native soils from BH#7 at 5-6.5 feet and Photo 5 (right) shows the soil from BH#10 at 5-6.5 feet. Soils range from light brown to red-brown and are generally silty/clayey sand and gravel.

The following is a summary of the soils found in the Open Space and Planning Areas tested (refer to Table 1, Map 2 - Appendix A, Borehole Logs – Appendix B):

1. **Pedestrian Bridge (Western Open Space)** – In BH#1, located at the eastern abutment of a possible pedestrian bridge site that will cross Remine Creek, we found brown, dense, silty sand with gravel and cobbles with some small boulders to 7.5 feet underlain by brown, moderately dense to dense, silty/clayey sand and gravel with some larger rocks to 21.5 feet. SPT N-values of 32, 26, 30 and 35 blows per foot (bpf) were recorded at 5-foot increments starting at 5 feet. Although the drilling was noted to be easier from 10-15 feet, this was due to fewer large rocks in this zone. The N-values indicate consistently medium dense to dense conditions. This site is located on the Remine Creek fan at the crest of the slope of the current channel. The west side of the bridge could not be accessed; however, soil conditions are likely similar to those found at BH#1 due to a similar position on the Remine Creek fan. No bedrock was found or is anticipated to any reasonable depth, and the soils are dry (6-9% moisture content) due to the high position of the bridge above the existing Remine Creek water level and the presence of granular, well-drained soils.
2. **Buried Detention Structure on Planning Area 1** – Borehole BH#2 was placed in the location of a proposed buried detention structure to capture and store runoff events in the western portion of the Parcel. No boreholes were evaluated in the medical center footprint of Planning Area 1, as we understand that development will be directed by an entity other than Genesee Properties. In BH#2, we found roughly 1-foot of topsoil underlain by brown, moist, moderately dense, silty/clayey sand and gravel with some cobbles to 9 feet. A 2-foot zone of reddish-brown silty/clayey sand with small gravel was found from 9-11 feet and beneath this was dense to very dense, silty/clayey sand and gravel, cobbles and small boulders. N-values of 20 bpf at 5 feet and 33 bpf at 10 feet were recorded. The deeper soil below 11 feet was very rocky and dense and auger refusal was reached at 14 feet on a boulder. No groundwater or bedrock was found to 14 feet.
3. **Subgrade Development on Planning Area 2** – Three boreholes (BH#3-BH#5) were drilled in this planning area to determine the depth of fill known to have been placed and re-seeded in the past as well as the suitability of the site for underground parking and basements. We found 3 feet of fill at BH#3, 4.5 feet of fill at BH#4, and 1 foot of fill at BH#5. The fill appears to be sandy gravel from a local alluvial source, while the underlying native material is a silty to clayey sand with gravel and some lenses of larger cobbly material. N-values of 16 and 22 bpf were recorded in BH#3 at 15 and 25 feet, N-values of 33 and 12 bpf were recorded in BH#4 at 10 and 20 feet, and N-values of 7, 10 and 33 bpf were recorded at BH#5 at 5, 15 and 20 feet. The wide-ranging blow counts are due to softer areas which are dominated by silty/clayey sand with gravel, and denser areas with larger rocks. This variability is to be expected for alluvial fans with migrating channels, sources, and types of events over time. No groundwater or bedrock were encountered in this deep alluvial fill.
4. **Water Tank in Planning Area 3** – Borehole BH#6 was located along the northern edge of Planning Area 3 to evaluate the site for a subgrade water tank to hold and distribute irrigation water for the project landscaping. In the upper 14 feet at this site the soils were moist to dry, loose to medium dense, silty/clayey sand with gravel. N-values of 9 and 4 bpf were recorded at 5 and 10 feet, respectively, and this material appears to be mostly loosely consolidated slopewash material. From 14 to 21.5 feet, the soil was denser, with N-values of 37 and 22 bpf at 15 and 20 feet, respectively, and it was composed of silty/clayey sand and gravel with some cobbles and lenses of clay. No groundwater or bedrock was found at this site.

5. **General Development Soil Conditions for Planning Area 3** – Borehole BH#7 was placed in the western portion of Planning Area 3 to determine soil conditions for general development. The soils at this site consisted of moist, loose, silty/clayey sand with gravel to 4 feet, a lens of dense sandy gravels and cobbles from 4 to 6 feet, and moist to dry, loose to medium dense, silty/clayey sand and gravel to 16.5 feet. N-values at 5, 10 and 15 feet were 41, 21, and 41 bpf, respectively. No groundwater or bedrock was found at this site. These soils are generally denser than those encountered at BH#6 to the north and BH#5 to the south. This may be due to the position of this borehole closer to the mouth of Remine Creek Canyon where the rockier material was deposited, while the other two sites are further out on the fan (BH#5) and near the base of the hillside (BH#6) where finer materials from mudflows are more likely in the geologic past.
6. **Road B** – Borehole BH#8 was chosen in the central portion of the Road B corridor, which is the main east-west access road within the development. Results from this borehole are used for pavement design. Soils at this site consist of moist to dry, dense to very dense, silty/clayey sand and gravel from the surface to a depth of 7.5 feet, where auger refusal was reached on a boulder. An N-value of 72 bpf was recorded at 5 feet. These soils are granular and well-drained with no groundwater or bedrock encountered.
7. **General Development Soil Conditions for Planning Area 4** - Borehole BH#9 was placed in the western portion of Planning Area 4 (on the west side of the glacial moraine) to determine soil conditions for general development. In this borehole, we found moist to dry, dense to very dense and rocky, silty/clayey sand and gravel throughout the soil column to a depth of 16.5 feet. N-values at 5, 10 and 15 feet were 29, 38 and 24 bpf, respectively. These soils are granular and well-drained with no groundwater or bedrock encountered.
8. **Eastern Open Space** – Borehole BH#10 was placed within the building site of a possible commercial building to assess the suitability of the native soils and to determine if any mill tailings or other mine-related waste materials are present. In this borehole we found red-brown, dry to moist, loose, silty sand with some gravel to 4 feet underlain by red-brown, dense to very dense, silty/clayey sand with gravel to 16.5 feet. N-values at 5, 10 and 15 feet were 54, 31 and 26 bpf, respectively. These soils are granular and well-drained with no groundwater or bedrock encountered. These red-brown soils are typical of the region as native soils and there was no evidence in this borehole of mill tailings or other mine waste material, which are more typically various shades of gray (due to the predominately igneous rock that was processed) and are poorly graded (or gap graded), meaning they are dominated by a sand of one size. This was not the case for any of the soil in BH#10, which contained sand and gravel of various sizes and it was all red-brown in color.

6.2 Laboratory testing

Laboratory tests were performed on the predominant native soil types to evaluate the range of plasticity and particle size characteristics (Appendix C). Atterberg limits (ASTM D4318 and gradation analyses (ASTM D1140) were performed on samples collected in five of the boreholes. Soil samples tested were DS1 (BH#1), DS6 (BH#2), DS12 (BH#5), DS15 (BH#6), and DS25 (BH#10). These soils are composed of 20-34% fines (silt/clay), 30-48% sand, and 27-36% gravel. Two samples were found to be non-plastic, while three samples have Plasticity

Indices (PI) of 2, 6 and 7. A soil with a PI of less than 15 is considered to have a low potential for swelling when wetted and shrinking when dried, and a non-plastic soil has very low potential for swelling or shrinking and it has little or no cohesion. These soils classify in the Unified Soil Classification System (USCS) as clayey to silty sands (SC-SM) and clayey to silty gravels (GC-GM). Moisture contents at various depths ranged from 5.6-13.1% which is dry to moist. These soils are dominated by granular materials (sand and gravel) and are permeable and well-drained.

Standard Proctor (ASTM D698) and California Bearing Ratio (CBR) (ASTM D1883) tests were performed on two bulk samples obtained during drilling. The testing of sample BS1 from 2-5 feet deep in BH#2 resulted in a Standard Proctor of 120.7 pcf at 12.1% optimum moisture content and a CBR of 3.3 for this silty/clayey sand with gravel. The testing of sample BS2 from 2-5 feet deep in BH#8 resulted in a Standard Proctor of 132.4 pcf at 8.3% optimum moisture content and a CBR of 19.0 for this silty/clayey sand with gravel.

A series of geochemical tests were conducted on soil sample DS5, obtained from a depth of 5 to 6.5 feet in BH#2. The soil sample had a water-soluble sulfate concentration of 0.00%, a chloride content of 0.053%, resistivity of 0.002 µS/cm, and a pH of 7.6. Although none of these results are indicative of moderately or highly corrosive soil, the chlorides and electro-conductivity values are elevated. Recommendations for addressing the corrosive nature of the soil are presented in the *Recommendations* Section of this report.

6.3 Soils Summary

In summary, the field observations and laboratory testing indicate that the soils to the depths explored have low plasticity, low swell potential, moderately low to high density (depending on the presence of larger rocks) and are dominated by granular material (sand and gravel). Due to the nature of the alluvial fan, colluvium, glacial material, and alluvial deposits, they are generally composed of suitable bearing material, but they are variably loose and not consistently consolidated at all depths tested. Ensuring uniformly dense bearing conditions during construction and management of surface and subsurface water will be important to the long-term performance of the foundation soils.

7.0 ENGINEERING ANALYSIS

7.1 Pavement Design

It is our understanding that Roads A and B will be paved with asphalt for their entire lengths and the right-of-way will vary from 40 to 52.5-feet wide. Paving for Road B will be constructed in phases as development occurs. There will also an extension from Road A connecting to the access roadway to the existing SMPA yard and numerous parking lots for the development.

7.1.1 Traffic Analysis

A traffic impact study, dated July 3, 2020, prepared by SGM Consultants, estimated daily trips for the mixed-use development between residential, retail, office, restaurant and medical center traffic. Using that study as a basis for design we estimated 1,000,000 ESAL's for the 20-year design of asphalt roads in the development.

7.1.3 Soil Sample Classification

Individual laboratory testing results on representative soil samples obtained from the boreholes are attached (Appendices B and C). As discussed above in Section 6.0 of this report, the silty/clayey sand (SM/SC) soil found at this site has a California Bearing Ratio (CBR) of 3.3. This value was used to calculate the Resilient Modulus (M_R) of the site soils. Equation 3-1 from the *CAPA Guideline for the Design and Use of Asphalt Pavements for Colorado Roadways* states:

M_R (psi) = 1500 x CBR, so the average M_R = 1500 x 3.3 = 4,950 psi

Table 2 shows the Structural Number (SN) calculations given for the M_R above.

TABLE 2. PAVEMENT THICKNESS DESIGN FACTORS

Parameter	Subgrade
Resilient Modulus (psi)	4,950
Drainage coefficient	1.0
Reliability (%)	75
Standard Normal Deviate (Z_R)	-0.674
Standard Deviation	0.44
Serviceability Loss	2.0
Strength coefficients:	
HMA	0.44
ABC	0.12

7.1.4 Subgrade Support Characteristics

Table 2 (above) summarizes the typical subgrade support characteristics for the soils encountered. Assumptions for choosing the subgrade characteristics listed in Table 2 are:

(a) The pavement structures on site will be exposed to moisture levels approaching saturation more than 25% of the time and that these areas of potential saturation will be have a "good" quality of drainage. No typical drainage information was available for the soils encountered on the site at the time of this report, therefore a CDOT recommended drainage coefficient of m_1 = 1.0 was used.

(b) From CDOT's Table 5.6 Drainage Quality (2014 Edition), it was assumed that water would be removed from all pavement structures within one day and so an overall drainage quality of "good" was used.

(c) A reliability factor of 75% was assumed due to the conservative ESAL count in Section (1) above. CDOT's Table 1.3 – Reliability (Risk) recommends a range of reliability of 50-85 % for roads. However, 75% reliability was used to represent an acceptable long-term service life.

(d) A standard normal deviate (Z_R) of -0.674 and a standard deviation of 0.44, as required by CDOT for all designs, was used.

(e) Per CDOT 2019 Pavement Design Manual recommendations, initial and terminal Serviceability Indexes were assumed to be 4.5 and 2.5 respectively, thus a Design Serviceability Loss (ΔPSI) of 2.0 was calculated by subtracting the terminal serviceability index from the initial serviceability index.

CDOT Equation 3.2 was used to calculate the required pavement section for flexible (asphalt) pavement. Equation 3.2 states:

$$SN = a_1D_1 + a_2D_2m_2 + a_3D_3m_3$$

Where:

a_1, a_2, a_3 = structural layer coefficients
D_1 = thickness of bituminous surface course (inches)
D_2 = thickness of base course (inches)
D_3 = thickness of sub-base (inches)
m_2 = drainage coefficient of base course
m_3 = drainage coefficient of sub-base

The minimum recommended structural number (SN) was calculated to be = 3.56.

7.1.5 Road Section Selection

Based on the design criteria and calculations presented above, we identified two options for the structural section for the project roadways and parking lots (Table 3). Alternative #1 is for all roadway pavement sections and consists of 4 inches of Hot Mix Asphalt (HMA) on 9 inches of compacted Class 6 aggregate base course (A.B.C.) and 6 inches of compacted CDOT Class 1 aggregate sub-base course Alternative #2 is for the asphalt parking lot pavement. This section consists of 4-inches of hot mix asphalt on 13-inches of CDOT Class 6 A.B.C. for a total thickness of 17 inches.

Table 3. Pavement Section Alternatives

Pavement Section Alternatives	SN	HMA Thickness (in.)	Class 6 Base Course Thickness (in.)	Class 1 Sub-base Course (ABC) Thickness (in.)	Total Section Thickness (in.)
Alternative #1	3.62	4	9	6	19
Alternative #2	3.58	4	13	0	17

Pavement design recommendations are presented in the *Recommendations* section below.

8.0 CONCLUSIONS & RECOMMENDATIONS

Based upon our feasibility level geotechnical evaluation and the results of our subsurface and laboratory testing, it appears that all sites evaluated are suitable for the typical intended construction of structures associated with mixed commercial and residential/commercial development with special attention to foundation subgrade preparation, foundation design, general site preparation and drainage design. The soils evaluated on the Society Turn Parcel are granular alluvial and colluvial deposits with variable density, ranging from loose to very dense, but they are generally well-drained sands and gravels that have low potential for swelling or shrinking. However, due to the variable density of these materials laterally and vertically, there is some potential for consolidation. For most types of small to moderate sized commercial and commercial/residential structures anticipated for this site, the native soils are suitable for conventional spread footings with soil preparation needed to ensure uniformly dense conditions.

The following preliminary recommendations are offered to enhance the long-term performance of the foundation soils, foundations and site improvements. It should be noted that the measures offered herein are intended for preliminary site evaluation and they do not address specific construction at potential building sites. Site-specific geotechnical investigations should be performed for each building site once building characteristics and other improvements are known. Also, these recommendations cannot and will not arrest or prevent large-scale geologic processes that may be on-going elsewhere on the property and within San Miguel County.

8.1 General Design Criteria

1. Conduct site-specific geotechnical investigations at each building site when specific design parameters and loads are known. This will ensure that foundation design will be based on site-specific soils information.

2. Reference the DOWL Society Turn Parcel Geologic Hazard Report (June 15, 2020) to determine any site constraints and recommended mitigation for geologic hazards that may be relevant to a site.

3. Extend shallow components of foundation systems into the soil a minimum depth below finished grade of 48 inches per San Miguel County building regulations for sites above 7,500 feet in elevation to reduce the negative effects of frost heave.

8.2 Seismic Design Criteria

Based on the ASCE7-16 guidelines and our knowledge of the site, we conservatively recommend that this site be designated as Site Class D (stiff soil with $15 \leq N \leq 50$). This classification is based on limited shallow exploratory data, is based on the predominant soil condition near the surface and assumes similar conditions for a depth of 100 feet. For most structures to be constructed for this parcel, Risk Category III is used and for essential facilities such as hospitals, Risk Category IV is used. For Site Class D and Risk Category III structures, the maximum spectral response acceleration at short periods (0.2 second, $\mathbf{S_{MS}}$) is 0.495g and at one second ($\mathbf{S_{M1}}$) is 0.185g. The acceleration values are the same for Risk Category IV structures. If IBC 2015 codes are followed, the maximum spectral response acceleration at short periods (0.2 second, $\mathbf{S_{MS}}$) is 0.488g and at one second ($\mathbf{S_{M1}}$) is 0.198g for Site Class D soils and Risk Category III and IV structures. These values are taken from the Applied Technology Council (ATC) website (*www.hazards.atccouncil.org*) that relies on the U.S. Geological Survey Seismic Design Web Services and is based on the latitude and longitude coordinates for the site. See ATC seismic parameter output for both ASCE7-16 and IBC 2015 codes in Appendix D.

8.3 Building Foundations

In three of the borings we encountered undocumented fill. There is a high risk of settlement when constructing on fill because if the inherent variability and the possibility of deleterious material in the fill. We recommend removing the fill below buildings, slabs, and pavement. Based on our field investigation and laboratory testing, it is our opinion that planned structures at the site can be constructed on conventional spread footings and have slab-on-grade floors. However, in some places we encountered loose soil near the foundation elevations. Depending on final building loads, site grading, and soil conditions it may be necessary to over-excavate and recompact one to three feet of soil below the foundations.

For most types of small to moderate sized commercial and commercial/residential structures anticipated for this site, the native soils are suitable for support of conventional spread footings if the soil immediately beneath the footings is densified with removal and re-compaction or replacement with compacted structural fill due to the potential for differential settlement of the native soils. The amount of over-excavation will depend on site-specific geotechnical testing and actual characteristics of the proposed structure such as loading patterns and tolerance for movement. Bearing capacity of the prepared surface should be determined by the site-specific geotechnical investigation, but it will likely be on the order of 2,000 to 2,500 psf. This soil preparation is needed to ensure uniformly dense conditions for both structures constructed at grade as well as those below grade such as underground parking and basements. Slabs on grade and suspended floor systems are appropriate for buildings at this site.

Similarly, the pedestrian bridge over Remine Creek can be founded on spread footings if the hydrology and hydraulics analysis of the bridge site determines that the footings will be above potential scour depth. Similar preparation of the soil as suggested above (i.e. removal and re-compaction or replacement with structural fill) will be necessary to ensure uniformly dense conditions.

1. Observation and testing during construction is essential to ensure that the geotechnical recommendations are consistent with conditions and that the project is constructed in general conformance with project design and specifications.

2. If the ground surface on the hillside below the foundation slopes at 2H:1V or steeper, the base of the foundations must be deepened to create a minimum setback distance of at least 10 feet, measured horizontally from the bottom outside edge of the footings to the face of the slope.

3. All concrete used in foundation components at this site in contact with native soil should comply with the recommendations in the *Concrete* Section of these recommendations.

8.4 Water Tank Foundation

At the proposed water irrigation tank location there is about 14 feet of loose clayey sand. Assuming a 15-foot diameter tank with a bearing pressure of about 1,500 pounds per square foot, we calculated about one-inch of settlement. Note that the settlement will increase with increasing diameter and increasing bearing pressure. Until details of the proposed irrigation water tank are known, specific foundation recommendations are not warranted. However, assuming a subgrade concrete water tank is placed in the vicinity of BH#7, the soils at this site are suitable for a ring-type, slab or spread footing type foundation system with a similar soil preparation (e.g., removal and re-compaction or removal and replacement with compacted structural fill) as recommended above for building foundations. A settlement analysis should be performed to evaluate the bearing capacity for the tank site once tank loads and characteristics are known. At that time, the amount of over-excavation and other relevant design and construction geotechnical recommendations cannot be made.

8.5 Retaining Structures

For this feasibility level geotechnical study, areas that need retaining walls were not specifically analyzed. However, based on the range of site conditions encountered, the recommendations offered below are general and should be verified on a site-specific basis.

1. The design of retaining walls should rely on site-specific geotechnical investigations. General design parameters are given below as a reference. The lateral earth pressures given in Table 4 below assume a level backslope (slope behind the walls) or outboard slope (slope below the toe of wall), no hydraulic pressures behind the wall, the use of "free-draining" native granular (sandy gravel) soil or structural fill, and no surcharge loads applied within the backslope zone (as defined on Figure 1, Foundation Excavation Sketch below). We should be contacted to recommend modified lateral earth pressure values for increased backslope angles, decreased outboard slope angles or loading within the backslope zone.

Table 4. Lateral Earth Pressures

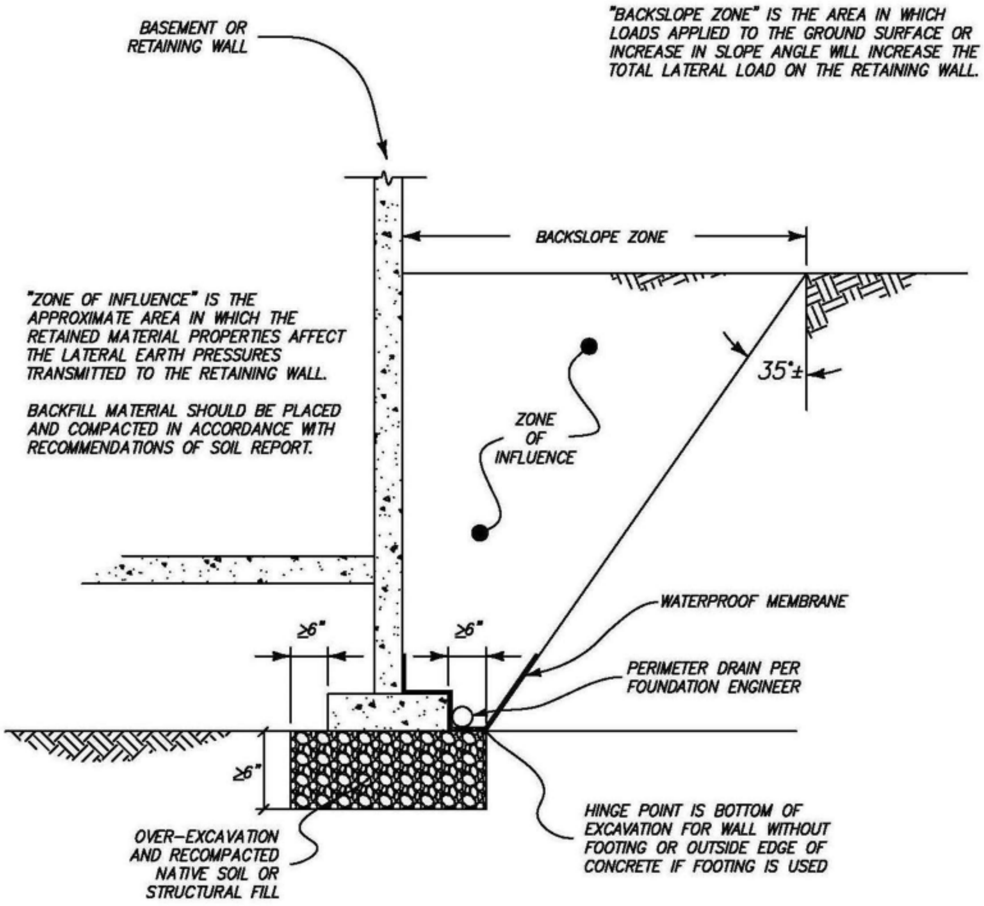
	Native Sandy Gravel or Structural Fill	
Active Earth Pressure	34	pcf*
Passive Earth Pressure	400	pcf*
At-Rest Earth Pressure	54	pcf*
Unit weight of soil	120	pcf**
Coefficient of Friction	0.32	***

* pounds per cubic foot (fluid equivalent)
** pounds per cubic foot
*** concrete on dry soil conditions

2. Retaining walls should have provisions for drainage so that hydrostatic pressures are relieved. This is usually accomplished by providing free-draining granular backfill between the wall and retained soil, with a collection drain provided at the bottom of this granular zone (shown in Figure 1), and/or the use of weep holes through the face of the

wall. The drain system should be continuous and have a positive outfall which releases the collected water well away from the wall in a manner that minimizes the erosive energy of concentrated flow. The design engineer should ensure that drainage design is compatible with design assumptions.

3. Please note that the Foundation Excavation Sketch (Figure 1) is schematic only, is not to scale and site-specific details are to be provided by the foundation design engineer.



"BACKSLOPE ZONE" IS THE AREA IN WHICH LOADS APPLIED TO THE GROUND SURFACE OR INCREASE IN SLOPE ANGLE WILL INCREASE THE TOTAL LATERAL LOAD ON THE RETAINING WALL.

"ZONE OF INFLUENCE" IS THE APPROXIMATE AREA IN WHICH THE RETAINED MATERIAL PROPERTIES AFFECT THE LATERAL EARTH PRESSURES TRANSMITTED TO THE RETAINING WALL.

BACKFILL MATERIAL SHOULD BE PLACED AND COMPACTED IN ACCORDANCE WITH RECOMMENDATIONS OF SOIL REPORT.

Figure 1. Foundation Excavation Sketch

4. Excavations for retaining and foundation walls should be laid back a minimum of 35° from the vertical prior to backfilling against retaining structures (Figure 1). For safety, excavations should also be in accordance with OSHA Regulations 29 CFR 1926. Consequently, gentler excavation faces may be required.

5. Fill material placed behind the walls should consist of free-draining granular material (specified below) compacted as per the design engineer's specifications. Clean native soil material (less than 10% passing the #200 sieve and rocks larger than 6-inches removed) can be used for this purpose if approved by the design engineer. Compaction to 90 to 95% of Standard Proctor maximum dry density is typically used to minimize post-construction settlement of the backfill. Over-compaction of the backfill immediately

adjacent to the wall should be avoided so that excessive pressures are not placed against the retaining wall. Unless expressly approved by the design engineer, only hand-operated light-duty compaction equipment should be used within three feet of the wall. The upper one foot of backfill should consist of clayey (i.e., less permeable) soil to create a barrier against infiltration of surface runoff. Flatwork and other improvements supported on the lightly compacted backfill will likely settle over time. Such improvements should be designed to accommodate such settlement or be founded through the backfill on native undisturbed soils.

6. All concrete used for retaining structures at this site in contact with native soil should comply with the recommendations in the *Concrete* Section of these recommendations.

8.6 Foundation Drainage and Ventilation

It is important to minimize moisture penetration into the soil beneath or adjacent to structures. Moisture can accumulate because of poor surface drainage, drywell and infiltration systems, over-irrigation of landscaped areas, waterline leaks, melting snow, subsurface seepage, or condensation from vapor transport.

1. Provisions should be made to direct water away from foundations and under slabs. This may be accomplished using conventional footing drains in tandem with a positively-vented moisture and radon control system.
2. Perimeter foundation drains should be constructed as soon as the foundation excavation is completed that discharge to daylight, if possible. This will minimize the accumulation of standing water in the excavation which can soften and weaken foundation soils.
3. If roof gutters are used, they should be fitted with gates and/or heat traces are used for snowpack.
4. All foundation drains should be integrated into the site drainage plan as discussed below for final disposal from the building site. In no case should surface or roof drainage be introduced into foundation drains.
5. Crawl spaces, the gravel lenses beneath floor slabs, and confined areas above concrete floor slabs should be well ventilated to allow for the release of radon gas, a known carcinogen. Recommendations for design and construction techniques found effective in the reduction of radon gas can be found in the pamphlet entitled, *Building Radon Out: A Step-by-Step Guide on How to Build Radon-Resistant Homes* (USEPA Office of Air and Radiation EPA/402-K-01-002, April 2001). This publication can be obtained from the CDPHE in Denver by calling (303) 692-3420. Other recommendations for passive and active design and construction techniques for reducing radon gas can be found on the websites *www.epa.gov/radon/* or *www.cdphe.state.co.us/hm/rad/radon*.

8.7 Site Preparation and Grading

1. The site drainage plan for each site, in tandem with the landscape and grading plans, should ensure that the construction does not impede natural drainage patterns. Surface water should be directed away from the building foundations either during or after completion of construction. This includes water from landscaped areas, flatwork, drywell systems, infiltration galleries and roofs. Drainage plans should ensure that precipitation, snowmelt, and runoff are conveyed around and away from buildings as well as roads. This runoff should be dispersed (not concentrated) in a manner consistent with the natural, pre-construction drainage pattern.

2. Per the 2018 IBC, slope the ground surface within 10 feet of the structure downward a minimum of 5% away from the structure as shown in the detail below. Slope the ground surface beyond 10 feet of structures downward at least 2% away from the structure.

3. Development should utilize "best practices" for design and construction so that on-site erosion is minimized. This may include selective thinning of vegetation, construction of temporary diversion ditches, silt fencing, and/or dust suppression. The local building official will be able to provide specific details regarding these requirements.

4. Grading of all permanent cut and fill slopes should not exceed 2H:1V. Existing or created permanent slopes greater than 2H:1V and over 3 feet in vertical height upon which permanent improvements are constructed and/or where retention or enhancement of current slope stability is desired, should be restrained by an engineered retaining structure/system.

5. Irrigation of lawn and landscaped areas should be kept at a distance of at least 5 feet from the perimeter of the building and sprinkler heads should be set to spray away from and not towards the foundations.

6. Backfill placed in utility trenches leading to the structure should be densely compacted in accordance with project specifications to inhibit surface water infiltration and migration towards the foundation, as well as minimize post-construction settlement of the trench backfill. We recommend low-permeability check-dams be installed in the trenches at the lot line and the structure to inhibit water flow along any utility trenches.

7. Disturbed areas should be revegetated as soon as practical to reduce soil erosion.

8. Fill used at this site should meet the gradational and compaction requirements listed in Tables 5 and 6 below. Fill should be placed and compacted in **maximum 6-inch lifts**, unless otherwise directed by the design engineer. Structural fill should not be placed on frozen or wet existing soil or fill material. Clean native soil material with all deleterious material and over-size rock removed may be used as structural fill if approved by the design engineer.

Table 5. Gradation Requirements for Fill Material

Type	Sieve	%Passing, by weight
Structural Fill (CDOT Class 6 roadbase)	3/4" (19.0 mm)	100
	#4 (4.75 mm)	30-65
	#8 (2.36 mm)	25-55
	#200 (0.075 mm)	3-12
Structural Fill (CDOT Class 1)	2.5" (63.5 mm)	100
	2" (50 mm)	95-100
	#4 (4.75 mm)	30-65
	#200 (0.075 mm)	3-15
Fill under exterior concrete flatwork	3" (75 mm)	100
	#200 (0.075 mm)	0-5
Free-draining fill	3" (75 mm)	100
	¾" (19 mm)	20-90
	#4 (4.75 mm)	0-20
	#200 (0.075 mm)	0-3

Note: The Plasticity Index for all fill soils should be less than 6.

Table 6. Compaction Requirements for Fill Material

Application	Compaction Requirement	Proctor	Moisture
Under footings and slabs	95% max. dry density	Modified	±2% of optimum
Under exterior flatwork	90% max. dry density	Modified	±2% of optimum
Road Subgrade	95% max. dry density	Standard	0-4% above optimum
Road Subbase	95% max. dry density	Modified	±2% of optimum
Road base course	95% max. dry density	Modified	±2% of optimum
Behind retaining walls	Per project specifications*		
Utility Trenches	Per project specifications*		
General landscaping	Per project specifications*		

*As specified by the design engineer on project documents or in accordance with local municipal requirements.

9. Any soils containing organics, debris, topsoil, frozen soil, snow, ice, and other deleterious materials shall not be used for anything other than landscaping.

10. A representative of DOWL should be called out to the site to observe placement of structural fill and verify the compacted density for components constructed for the PUD. The owner should contact DOWL in advance of the excavations to discuss the specific testing requirements, budget, and scheduling needed for these services.

8.8 Concrete

Although laboratory results indicated 0.00% sulfates in the samples tested, because of the potential of corrosive soils, we recommend that the cementitious material requirements for

Class 2 sulfate exposure in Section 601.04 of CDOT's *Standard Specifications for Road and Bridge Construction* be consulted and followed.

8.9 Exterior Concrete Flatwork

1. Flatwork may be placed on undisturbed native soil with the topsoil and organic material removed. If fill is needed, it should consist of washed rock or structural fill (see Tables 5 and 6), placed and compacted in accordance with project specifications. As previously discussed, flatwork and other improvements supported on the lightly compacted backfill will likely settle over time. Such improvements should be designed to accommodate such settlement or be founded through the backfill on native undisturbed soils.

2. Flatwork adjacent to buildings should be placed on properly compacted fill. To minimize future settlement and damage to the flatwork and/or adjacent foundations, the fill should consist of approved material placed and compacted per project specifications.

3. Flatwork adjacent to exterior doorways should be dowelled into the foundation to reduce long-term differential movement between the flatwork and structure.

4. Exterior concrete flatwork should be designed and constructed so that it drains freely away from the structure. Concrete flatwork adjacent to the foundation should slope away at a grade of at least ¼-inch per foot.

5. All concrete used at this site in contact with native soil should comply with the recommendations in the *Concrete* Section of these recommendations.

8.10 Excavation and Shoring

1. Temporary excavations should be in accordance with Occupational Safety and Health Administration (OSHA) regulations and with worker safety in mind.

2. Construction equipment, materials, and soil stockpiles should be located a minimum horizontal distance equal to the height of the excavation from the crest of the excavation unless otherwise approved by the design engineer. The additional weight could create a driving force and cause unstable excavation conditions due to the low cohesion of the native soils.

3. An excavation bracing plan is recommended for all temporary excavations of 10 feet or more. There are numerous methods of providing support for the excavation walls. DOWL should be contacted to provide geotechnical input into the design of the excavation support once the foundation plan is available.

4. The contractor's "competent person" (defined by OSHA as "an individual capable of identifying existing and predictable hazards…and who has the authorization to take prompt corrective measures to eliminate or manage these hazards and conditions) should evaluate the soil materials exposed during excavation based on composition,

structure, and environmental conditions per 29 CFR 1926 and recommend appropriate slope laybacks or shoring, as required. Refer to OSHA's Technical Manual Section V: Chapter 2 on *Excavations: Hazard Recognition in Trenching and Shoring* (available on-line at: *www.osha.gov*) for further excavation guidelines. We can provide these services, as requested.

5. If the excavations will be made or remain open during wet weather, it is recommended that polyethylene sheeting be secured over the excavation face to minimize sediment runoff and deterioration of the foundation soils. Surface runoff above the cuts should be directed away from the excavation using berms or diversion ditches. **Water should not be allowed to accumulate and/or pond anywhere upon the soils in the construction area. It must be removed by gravity or pumped to avoid this condition until permanent drainage systems are operational.**

6. We anticipate that the excavation of the site soils can be accomplished by conventional excavating equipment.

7. An effort should be made to reduce the potential impacts of "runaway" rocks that are dislodged during excavation and construction activities when such activities occur near the crests of slopes. This includes rocks that may roll downhill onto other property due to the activities on the subject lot. Careful excavation and temporary retaining walls, berms, or fencing may be necessary.

8.11 Pavement Section Design

The following recommendations are offered for pavement design based on the analysis presented in Section 7.0 of this report.

1. To provide a stable base for construction of the recommended project roadway pavement sections presented above, we recommend that the upper 12 inches of the existing native subgrade soil be scarified and re-compacted to 95% of Standard Proctor (AASHTO T-99) maximum density, at +/- 2% of optimum moisture content. We then recommend the installation of CDOT Class 6 aggregate base course (ABC) before placement of HMA. The ABC should be compacted to a minimum of 95% of a Modified Proctor maximum density (AASHTO T-180) at +/- 2% of optimum moisture content.

2. Based on material and construction costs and overall section thickness, we recommend that **Alternative #1** (See Section 6.4), 4 inches of Hot Mix Asphalt on 9 inches of Class 6 ABC, on 6 inches of Class 1be used for the project roadway sections and that **Alternative #2** (see Section 6.4), 4 inches of HMA on 13 inches of CDOT Class 6 base course, be used on the parking lot pavement areas.

3. Design and construction of the roadway should promote drainage away from the paved areas. Where needed, roadside ditches should either be constructed or modified to accept road drainage.

4. All paving construction activities should be monitored and tested by a competent civil/geotechnical engineering firm for compliance with the recommendations contained in this report and with the specifications in the latest edition of the *San Miguel County Standards and Specifications for Roads and Bridges.*

9.0 CLOSING CONSIDERATIONS

The recommendations herein are subject to revision based on review of final site grading and structural plans for walls and other infrastructure. Site-specific geotechnical evaluations should be performed on a per building or Planning Area basis.

9.1 Standard of Care and Interpretation of Subsurface Data

We prepared this report in a manner consistent with local standards of professional geotechnical engineering practice. As previously noted, we did not perform an evaluation of deep subsurface conditions. Evaluation of environmental contaminants was not part of our scope of services performed at this site. The classification of soils and interpretation of subsurface conditions is based on our training and years of experience but is necessarily based on limited subsurface observation and testing. As such, inferred ground conditions cannot be guaranteed to be exact. No other warranty, express or implied, is made.

Observations of the excavation(s) subgrade by DOWL prior to erection of the foundation system are integral to our recommendations. Also, if subsurface conditions differing from those described herein are discovered during excavation, construction should be stopped until the situation has been assessed by a representative of DOWL. Construction should be resumed only when remedies or design adjustments, as necessary, have been prescribed.

9.2 Use of This Report

This report is intended for use by the design team specifically to address the site and subsurface conditions as they relate to the proposed structure(s) described in the *Construction Plans* Section. Changes to the site or proposed development plans may alter or invalidate the recommendations contained herein.

DOWL retains an ownership and property interest in this report. Consistent with the industry, copies of this document that may be relied upon by the design team are limited to those that are signed and sealed by the Geotechnical Engineer (*Standard Form of Agreement Between Owner and Geotechnical Engineer for Professional Services*, Engineer's Joint Contract Documents Committee, 1996). This report together with ancillary data, analyses, test results, and other components and/or supporting parts are not intended or represented to be suitable for reuse by the design team or others on extensions to this project or on any other project. Any such reuse or modification invalidates all aspects of the report and excuses the Geotechnical Engineer for all responsibility and liability or legal exposure.

This report is considered valid for a period of two years from the date of issue provided the site conditions and development plans have not changed from what is referenced in this report.

Changes to the site may occur due to development or natural processes. Additionally, technological advances made in construction and changes in legislation may alter the recommendations made herein. Depending upon the site and proposed development changes, DOWL may require additional evaluation (at additional cost) to update the recommendations contained herein.

9.3 Retention of Samples

Samples of soil and rock collected during the course of our geotechnical evaluation(s) are routinely held in our laboratory for a period of three months from the date of the evaluation and then are discarded. A written request by the client or design team is required for samples to be stored for a longer period.

10.0 ADDITIONAL SERVICES

To provide continuity and consistency from project start to finish, we should be retained to make observations and carry out material testing as a service to the owner. As noted above, we recommend the owner contact us to discuss required services and scheduling in advance of the construction phase.

DOWL is a full-service engineering firm providing foundation, site drainage, structural and retaining structure design services, as well as surveying, construction materials testing, and inspections. Please visit **www.dowl.com** for a full description of our services.

Thank you for the opportunity to perform this geotechnical evaluation for you. If you require any of the above services or have any questions regarding this report, please contact us.

Respectfully Submitted,
DOWL, LLC

8-21-20

FOR LAURIE J. BRANDT.

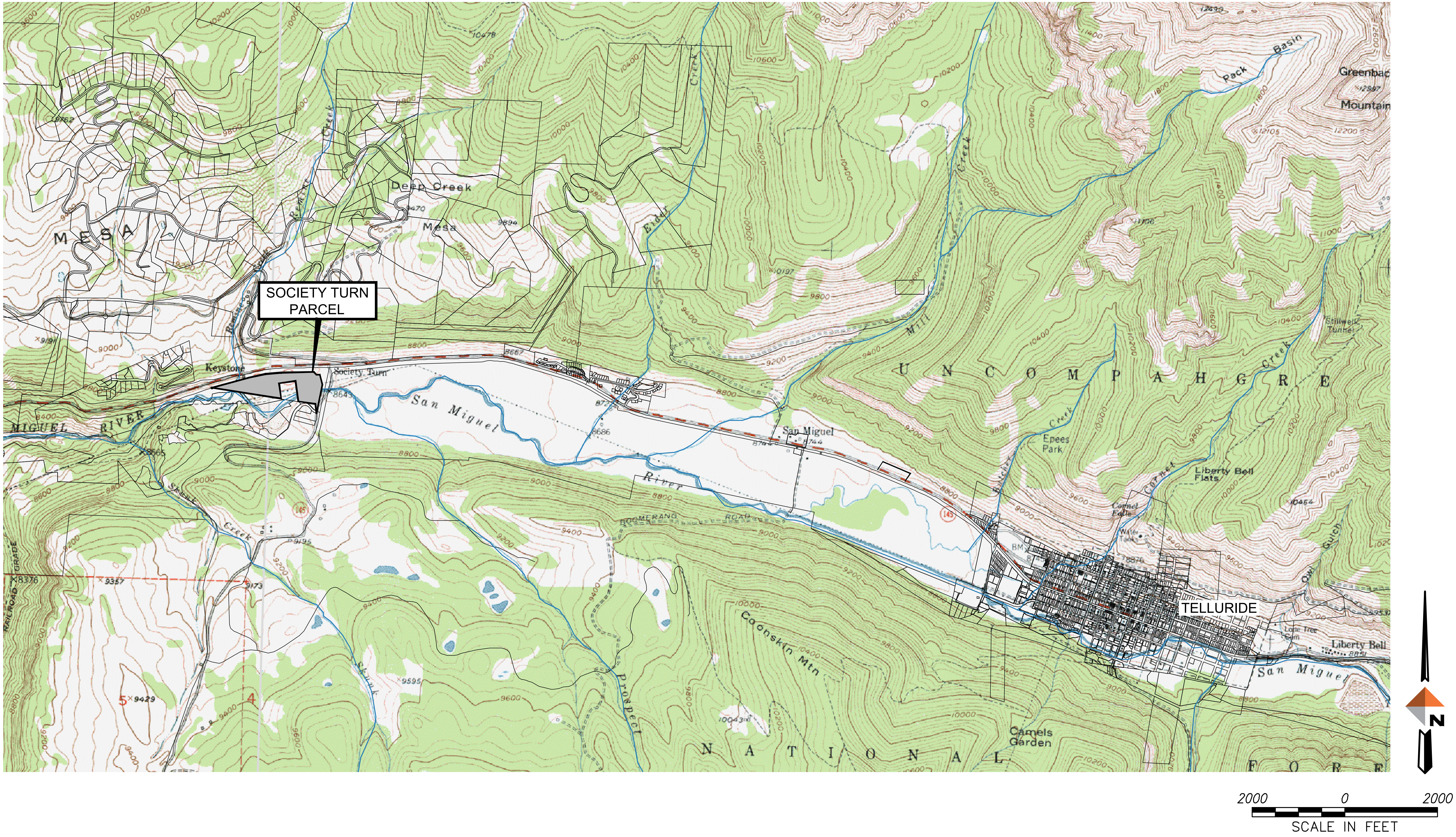
10967
LAURIE J. BRANDT

Laurie J. Brandt, C.P.G.
Certified Professional Geologist

PE.0056538
1-31-20

Dennis A. Russell, P.E.
Senior Geotechnical Engineer

APPENDIX A - PROJECT MAPS



Source: Gray Head Topographic Quadrangle (USGS: 1953) and Telluride Topographic Quadrangle (USGS: 1955) https://ngmdb.usgs.gov/topoview/viewer/#14/37.9438/-107.8579

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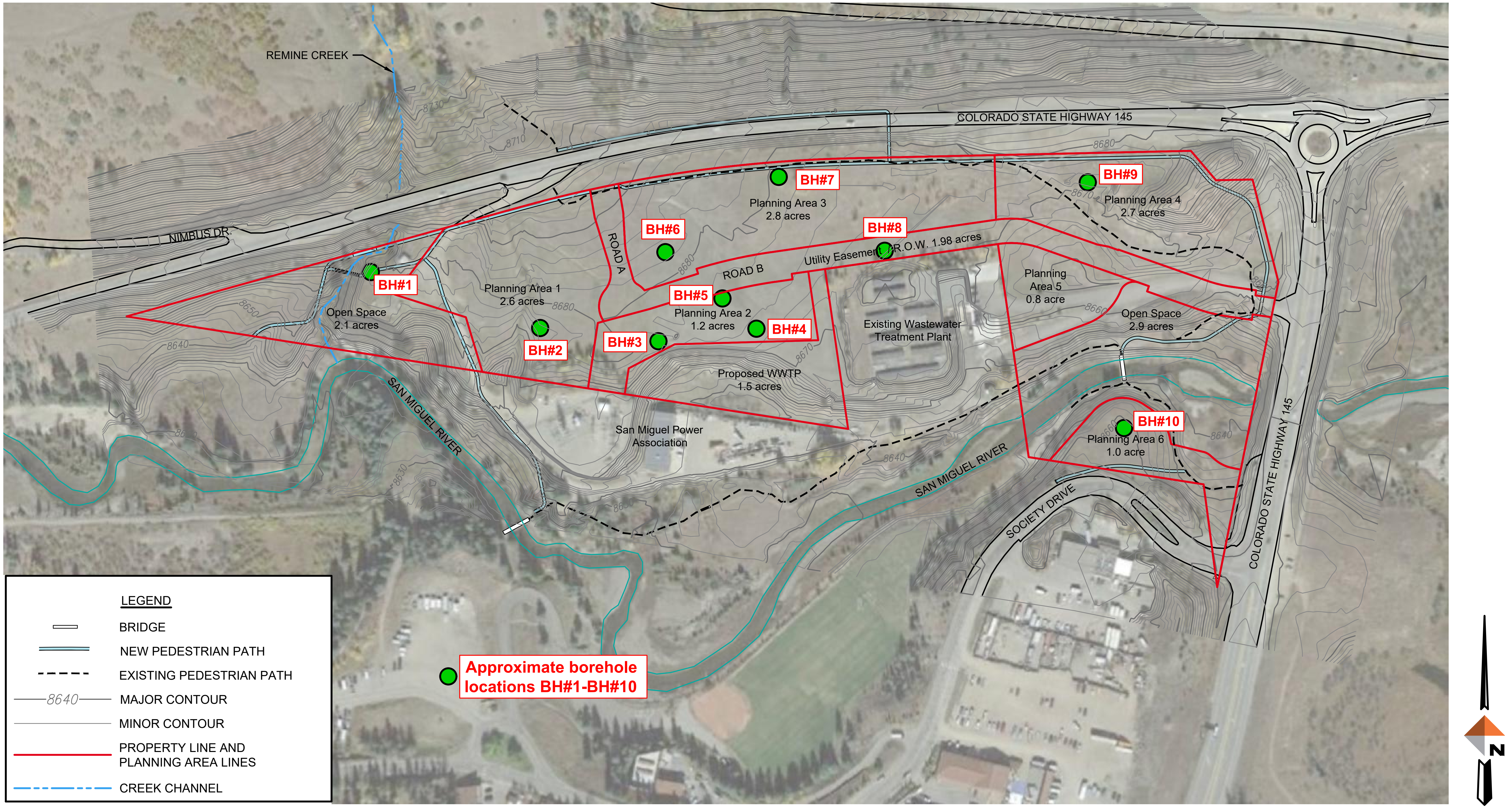
Montrose, Colorado 81401
970-249-6828

SOCIETY TURN PARCEL
SAN MIGUEL COUNTY, COLORADO
VICINITY MAP

PROJECT	7122.74614.01
DATE	01/31/2020

MAP 1

Q:\22\74614-01\45Geohazard Evaluation\Geo CAD\Society Turn GEO-Vicinity_Map1.dwg PLOT DATE 2020-1-31 11:18 SAVED DATE 2020-01-31 10:59 USER: dcastillo



Property lines shown hereon, produced by Foley Associates Inc. in conjunction with Olympus Aerial Surveys, June & July 2008

200 0 200
SCALE IN FEET

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SOCIETY TURN PARCEL
SAN MIGUEL COUNTY, COLORADO
CONCEPTUAL PLAN

PROJECT 7122.74614.01
DATE 01/31/2020

MAP 2

APPENDIX B - BOREHOLE LOGS

Log of Borehole #1 (BH#1)

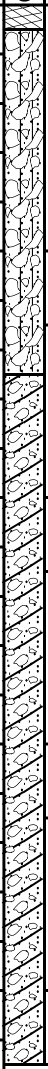
BOREHOLE LOCATION: east bridge abutment

DRILLING COMPANY: Kelly / HRL (Mike)

DRILL RIG: CME 55

SAMPLER: Std SSS

DRILL STEM: 8" HSA



DEPTH (ft)	WATER LEVEL ▽	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
							gravel FILL (0-0.5')	
							brown, moist to dry, dense, silty SAND with gravel and cobbles, some small boulders (0.5-7.5')	
5		STD	DS1	13, 12, 20	32	18"		DS1 @5-6.5' (SM) LL=NP PL=NP PI=NP gravel=35.7% sand=43.5% silt/clay=20.8% MC=8.8%
10		STD	DS2	27, 16, 10	26	13"	easier drilling from 10-15'	DS2 @10-11.5' MC=5.7%
							brown, dry, moderately dense to dense, silty/clayey SAND and GRAVEL, some larger rocks (7.5-21.5')	
15		STD	DS3	20, 17, 13	30	13"		DS3 @15-16.5' MC=6.8%
20		STD	DS4	28, 18, 17	35	13"	end of hole at 21.5' no groundwater or bedrock encountered	DS4 @20-11.5' MC=5.9%
25								

Borehole Log 1 of 10		
Field Staff	LB	Society Turn Parcel San Miguel County, Colorado
Drafting Staff	SJ	
Field Date	7/15/2019	
Project #	7122.74614.01	

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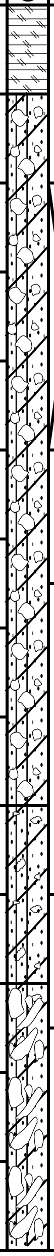
Log of Borehole #2 (BH#2)

BOREHOLE LOCATION: Planning Area 1 - pavement and detention structure

DRILLING COMPANY: Kelly / HRL
DRILL RIG: CME 55

SAMPLER: STD SSS
DRILL STEM: 8" HSA

DEPTH (ft)	WATER LEVEL	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
								dark brown cobbly TOPSOIL (0-1')	
2									
				BS1					BS1 @2-5' MDD= 120.7pcf OMC= 12.1% CBR= 3.3
4									
								brown, moist, moderately dense, silty/clayey SAND and GRAVEL, some cobbles (1-9')	
			STD	DS5	10, 9, 11	20	18"		DS5 @5-6.5' water soluble sulfates=0.00% chlorides=0.053% Electro-conductivity=479 µS/cm pH=7.6 MC=10.2%
6									
8									
10								red-brown, moist, moderately dense, silty/clayey SAND and GRAVEL; gravel is mostly small (9-11')	DS6 @10-11.5' (GC-GM) LL=23 PL=17 PI=6 gravel=36.0% sand=30.1% silt/clay=33.9% MC=12.7%
			STD	DS6	7, 16, 17	33	18"		
12								brown to red-brown, dense to very dense, silty/clayey SAND and gravel, cobbles and small boulders; very rocky and dense (11-14')	
								refusal at 14' on boulder	
14								no groundwater or bedrock encountered	

Borehole Log 2 of 10		
Field Staff	LB	Society Turn Parcel San Miguel County, Colorado
Drafting Staff	SJ	
Field Date	7/25/2019	
Project #	7122.74614.01	

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Log of Borehole #3 (BH#3)

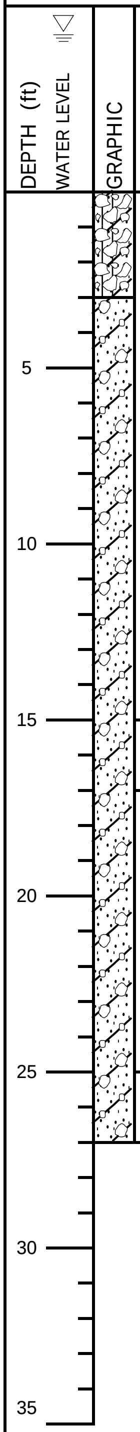
BOREHOLE LOCATION: west side of Planning Area 2 fill

DRILLING COMPANY: Kelly / HRL

DRILL RIG: CME 55

SAMPLER: STD SSS

DRILL STEM: 4.5" SSA



SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
					dark brown to brown, sandy GRAVEL (FILL) (0-3')	
					brown to red-brown, moist, loose to medium dense, clayey SAND with GRAVEL; few rocks; relatively easy drilling (3-26.5')	
STD	DS7	13, 8, 8	16	18"		
					cluster of rocks at 18-20'	
STD	DS8	18, 11, 11	22	18"	end of hole at 26.5' no groundwater or bedrock encountered	
					Note: Rocky fill only in upper 3' of surface	

Borehole Log		
3	Field Staff	LB
	Drafting Staff	SJ
	Field Date	7/25/2019
of 10	Project #	7122.74614.01

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Log of Borehole #4 (BH#4)

BOREHOLE LOCATION: east side of Planning Area 2 fill

DRILLING COMPANY: Kelly / HRL (Mike)

DRILL RIG: CME 55

SAMPLER: Std SSS

DRILL STEM: 4.5" SSA

DEPTH (ft)	WATER LEVEL ▽	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
								moist, dense, sandy GRAVEL (FILL) (0-4.5')	
5									
								loose at 8-9'	
10									
			STD	DS9	13, 13, 20	33	13"	brown to red-brown, moist to dry, medium dense, clayey SAND with gravel; some larger rocks (4.5-20')	
15								relatively easy drilling at 15-20' (loose)	
20								red-brown, moist, loose to moderately dense, fine SAND; no gravel (20-21.5')	
			STD	DS10	9, 6, 6	12	15"	end of hole at 21.5' no groundwater or bedrock encountered	
								Note: Rocky fill is only in upper 4.5'	
25									

Borehole Log 4 of 10	Field Staff	LB	Society Turn Parcel San Miguel County, Colorado
	Drafting Staff	SJ	
	Field Date	7/15/2019	
	Project #	7122.74614.01	

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Log of Borehole #5 (BH#5)

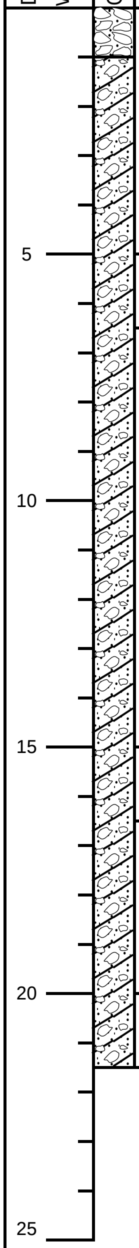
BOREHOLE LOCATION: north side of Planning Area 2 fill

DRILLING COMPANY: Kelly / HRL (Mike)

DRILL RIG: CME 55

SAMPLER: STD SSS

DRILL STEM: 4.5" HSA



DEPTH (ft)	WATER LEVEL	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
								moist, dense, sandy GRAVEL (FILL) (0-1')	
5			STD	DS11	4, 3, 4	7	10"		
								relatively easy drilling at 5-20' (loose)	
10								brown to red-brown, moist to dry, loose to medium dense, silty/clayey SAND with gravel (1-21.5')	
15			STD	DS12	7, 6, 4	10	16"		DS12 @15-16.5' (SM) LL=NP PL=NP PI=NP gravel=33.5% sand=46.3% silt/clay=20.2% MC=8.3%
20			STD	DS13	17, 7, 6	33	15"	denser clayey sand and gravel end of hole at 21.5' no groundwater or bedrock encountered	
								Note: Rocky fill is only in upper 1 foot	
25									

Borehole Log	Field Staff	LB
1	Drafting Staff	SJ
	Field Date	7/15/2019
of 10	Project #	7122.74614.01

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Log of Borehole #6 (BH#6)

BOREHOLE LOCATION: water tank in Planning Area 3

DRILLING COMPANY: Kelly / HRL (Mike)　　DRILL RIG: CME 55

SAMPLER: Std SSS　　DRILL STEM: 4.5" SSA

DEPTH (ft)	WATER LEVEL	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
5									
			STD	DS14	8, 6, 3	9	16"	brown to red-brown, moist to dry, loose to medium dense, clayey SAND and gravel (loose slopewash) (0-14')	
10									
			STD	DS15	3, 2, 2	4	18"		DS15 @10-1.5' (SC-SM) LL=23 PL=16 PI=7 gravel=27.1% sand=48.4% silt/clay=24.5% MC=13.1%
15									
			STD	DS16	16, 17, 20	37	15"		
								brown to red-brown, moist to dry, dense, clayey/silty SAND and gravel, some larger rocks and lenses of clay (14-21.5')	
20									
			STD	DS17	19, 11, 11	22	18"	end of hole at 21.5' no groundwater or bedrock encountered	
25									

Borehole Log 6 of 10		
Field Staff	LB	Society Turn Parcel San Miguel County, Colorado
Drafting Staff	SJ	
Field Date	7/15/2019	
Project #	7122.74614.01	

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Log of Borehole #7 (BH#7)

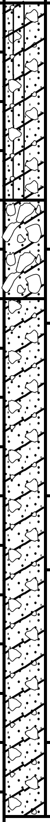
BOREHOLE LOCATION: Planning Area 3

DRILLING COMPANY: Kelly / HRL (Mike)

DRILL RIG: CME 55

SAMPLER: Std SSS

DRILL STEM: 4.5" SSA

DEPTH (ft)	WATER LEVEL ▽	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
								no topsoil	
								dark brown to brown, moist, loose, silty/clayey SAND with gravel (0-4')	
5								gray-brown, dry, dense, sandy GRAVEL and COBBLES (4-6')	
			STD	DS18	20, 29, 12	41	15"		
10									
			STD	DS19	11, 11, 10	21	18"	brown to red-brown, moist to dry, loose to moderately dense, silty/clayey SAND and gravel (6-16.5')	
15									
			STD	DS20	17, 21, 20	41	14"	rock plug in DS20 end of hole at 16.5' no groundwater or bedrock encountered	
20									
25									

Borehole Log 7 of 10		
	Field Staff	LB
	Drafting Staff	SJ
	Field Date	7/16/2019
	Project #	7122.74614.01

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Log of Borehole #8 (BH#8)

BOREHOLE LOCATION: east end pavement - road ROW

DRILLING COMPANY: Kelly / HRL

DRILL RIG: CME 55

SAMPLER: STD SSS

DRILL STEM: 8" HSA

DEPTH (ft) WATER LEVEL	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
							no topsoil	
2								
			BS2				brown to red-brown, moist to dry, very dense, silty/clayey SAND and gravel (0-6')	BS2 @2-5' MDD= 132.4pcf OMC= 8.3% CBR= 19.0
4								
6		STD	DS21	24, 30, 42	72	18"		
							refusal at 7.5' on boulder	
8							no groundwater or bedrock encountered	
10								
12								
14								

Borehole
Log
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of 10

Field Staff	LB
Drafting Staff	SJ
Field Date	7/16/2019
Project #	7122.74614.01

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Log of Borehole #9 (BH#9)

BOREHOLE LOCATION: Planning Area 4

DRILLING COMPANY: Kelly / HRL (Mike)

DRILL RIG: CME 55

SAMPLER: Std SSS

DRILL STEM: 4.5" SSA

DEPTH (ft)	WATER LEVEL ▽	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
								no topsoil	
5			STD	DS22	16, 13, 16	29	18"	brown to red-brown, moist to dry, dense to very dense and rocky, silty/clayey SAND and GRAVEL (0-16.5')	
10			STD	DS23	18, 15, 23	38	18"		
15			STD	DS24	8, 10, 14	24	15"	end of hole at 16.5' no groundwater or bedrock encountered	
20									
25									

Borehole
Log
9
of 10

Field Staff	LB
Drafting Staff	SJ
Field Date	7/16/2019
Project #	7122.74614.01

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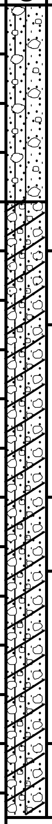
Log of Borehole #10 (BH#10)

BOREHOLE LOCATION: Planning Area 6

DRILLING COMPANY: Kelly / HRL (Mike)
DRILL RIG: CME 55

SAMPLER: Std SSS
DRILL STEM: 4.5" SSA



DEPTH (ft)	WATER LEVEL ▽	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS
								no topsoil	
								red-brown, dry to moist, loose, silty SAND with some gravel (0-4')	
5			STD	DS25	22, 19, 35	54	18"	dense and rocky at 5-10'	DS25 @5-6.5' (SM) LL=17 PL=15 PI=2 gravel=28.9% sand=41.5% silt/clay=29.6% MC=8.7%
10			STD	DS26	18, 15, 16	31	18"	red-brown, moist to dry, dense to very dense, silty/clayey SAND with GRAVEL (4-16.5')	DS26 @10-11.5' MC=5.6%
								slightly less dense/loose at 13-15'	
15			STD	DS27	14, 11, 15	26	18"	end of hole at 16.5' no groundwater or bedrock encountered	
								Note: all soil was red-brown, native material. No evidence of mill tailings or other fill/non-native material.	
20									
25									

Borehole Log 10 of 10		
Field Staff	LB	
Drafting Staff	SJ	
Field Date	7/16/2019	
Project #	7122.74614.01	

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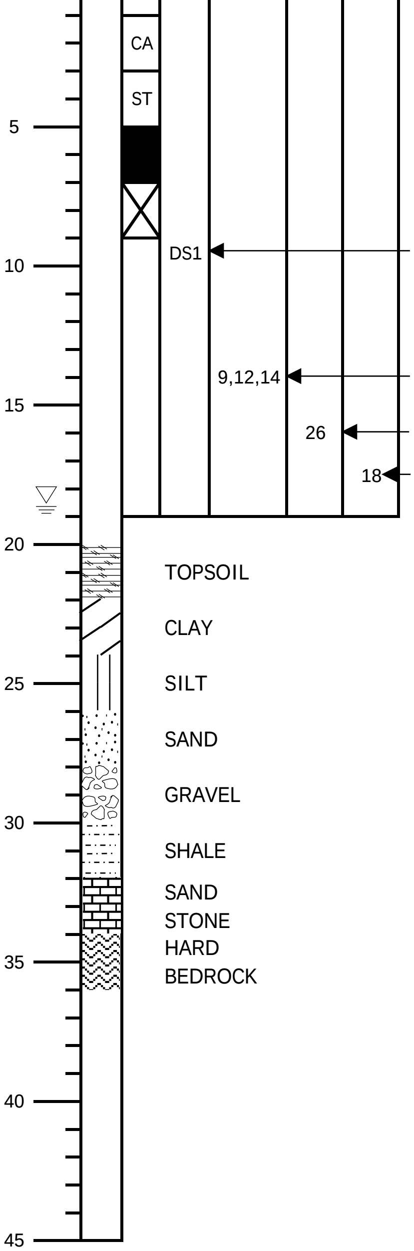
BOREHOLE LOG KEY

BOREHOLE LOCATION:

DRILLING COMPANY: DRILL RIG:

SAMPLER DRILL STEM:

DEPTH (ft) WATER LEVEL	GRAPHIC	SAMPLE	SAMPLE #	FIELD BLOW COUNTS	FIELD "N" VALUE (BPF)	RECOVERY (INCHES)	SUBSURFACE DESCRIPTION	FIELD & LABORATORY TEST RESULTS



drive sample, California sampler

drive sample, standard sampler

core sample

bulk sample, obtained from augers

Sample identifier:
DS = Drive sample
BS = Bulk sample from augers
CS = Core sample
GS = Grab sample

Blows required to drive sampler 6" three times; first 6" is considered to be the "seating" drive

Indicates 26 blows required to drive the sampler 12 inches

Indicates blows/foot (BPF) using a 140-lb hammer falling 30"

free water depth at time of drilling

Unified Soil Classification System (ASTM D-2487)

CL = lean clay to sandy/gravelly lean clay
ML = silt to sandy/gravelly silt
CH = high plasticity clay to sandy/gravelly high plasticity clay
MH = high elasticity silt to sandy/gravelly high elasticity silt
SW = well-graded sand or well-graded sand with gravel
SP = poorly graded sand or poorly graded sand with gravel
SM = silty sand to silty sand with gravel
SC = clayey sand to clayey sand with gravel
GW = well-graded gravel or well-gravel with sand
GP = poorly graded gravel or poorly graded gravel with sand
GM = silty gravel or silty gravel with sand
GC = clayey gravel or clayey gravel with sand

Notes in this column indicate tests performed and test results:

DD: dry density, pcf
MC: moisture content, %
LL: liquid limit
PL: plastic limit
PI: plasticity index
GF: gravel fraction, %
SF: sand fraction, %
Fines: silt/clay, %
Sh: Shear resistance
P: Penetration resistance
CBR: California Bearing Ratio
SP: swelling pressure
TM: total movement
UCS: unconfined compressive strength
psf: pounds per square foot
pcf: pounds per cubic foot
psi: pounds per square inch

N value	**Relative density**
sands (non-cohesive soils)	
0-4	very loose
4-10	loose
10-30	medium
30-50	dense
>50	very dense
clays (cohesive soils)	
<2	very soft
2-4	soft
4-8	medium
8-15	stiff
15-30	very stiff
>30	hard

Rock Weathering Classification

W1 = Fresh
W2 = Slightly weathered
W3 = Moderately weathered
W4 = Highly weathered
W5 = Completely weathered
W6 = Residual soil, no structure
RQD = Rock Quality Designation

Intact Rock Strength Classification

R0 = Extremely weak rock, 35-150 psi
R1 = Very weak rock, 150-725 psi
R2 = Weak rock, 725-3,625 psi
R3 = Medium strong rock, 3,625-7,250 psi
R4 = Strong rock, 7,250-14,500 psi
R5 = Very strong rock, 14,500-36,000 psi
R6 = Extremely strong rock, >36,000 psi

Borehole Log	Field Staff	Borehole Log Key
	Drafting Staff	
	Field Date	
of	Project #	

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FIELD SOIL IDENTIFICATION TERMS

Relative Density of Cohesionless Soils

Description	Field Identification	N Value
Very Loose	Easily penetrated with hand shovel	0-4
Loose	Easily penetrated with 1/2" rebar pushed by hand; easily excavated with hand shovel	4-10
Moderately Dense	Easily penetrated with 1/2" rebar driven with 5 lb. hammer; difficult to excavate with hand shovel	10-30
Dense	Penetrated 1 ft. with driven rebar; must be loosened with pick to excavate	30-50
Very Dense	Penetrated only a few inches with driven rebar; very difficult to excavate even with pick	>50

Consistency & Relative Density of Cohesive Soils

Description	Field Identification	Undrained Shear Strength (psf)	N Value (Approx.)
Very Soft	Extrudes between fingers when squeezed	<250	0-2
Soft	Molded by light finger pressure	250-500	2-4
Firm	Molded by strong finger pressure	500-1,000	4-8
Stiff	Indented by thumb	1,000-2,000	8-15
Very Stiff	Indented by thumbnail	2,000-4,000	15-30
Hard	Difficult to indent with thumbnail	>4,000	>30

Soil Constituents

Modifier	trace	little	some	-ey or -y	and
% (by weight)	0 - 5	5 - 12	12 - 20	20 - 30	>30

Sheet	Field Staff	Field Soil Identification Terms
1	Drafting Staff	
	Field Date	
of 1	Project #	

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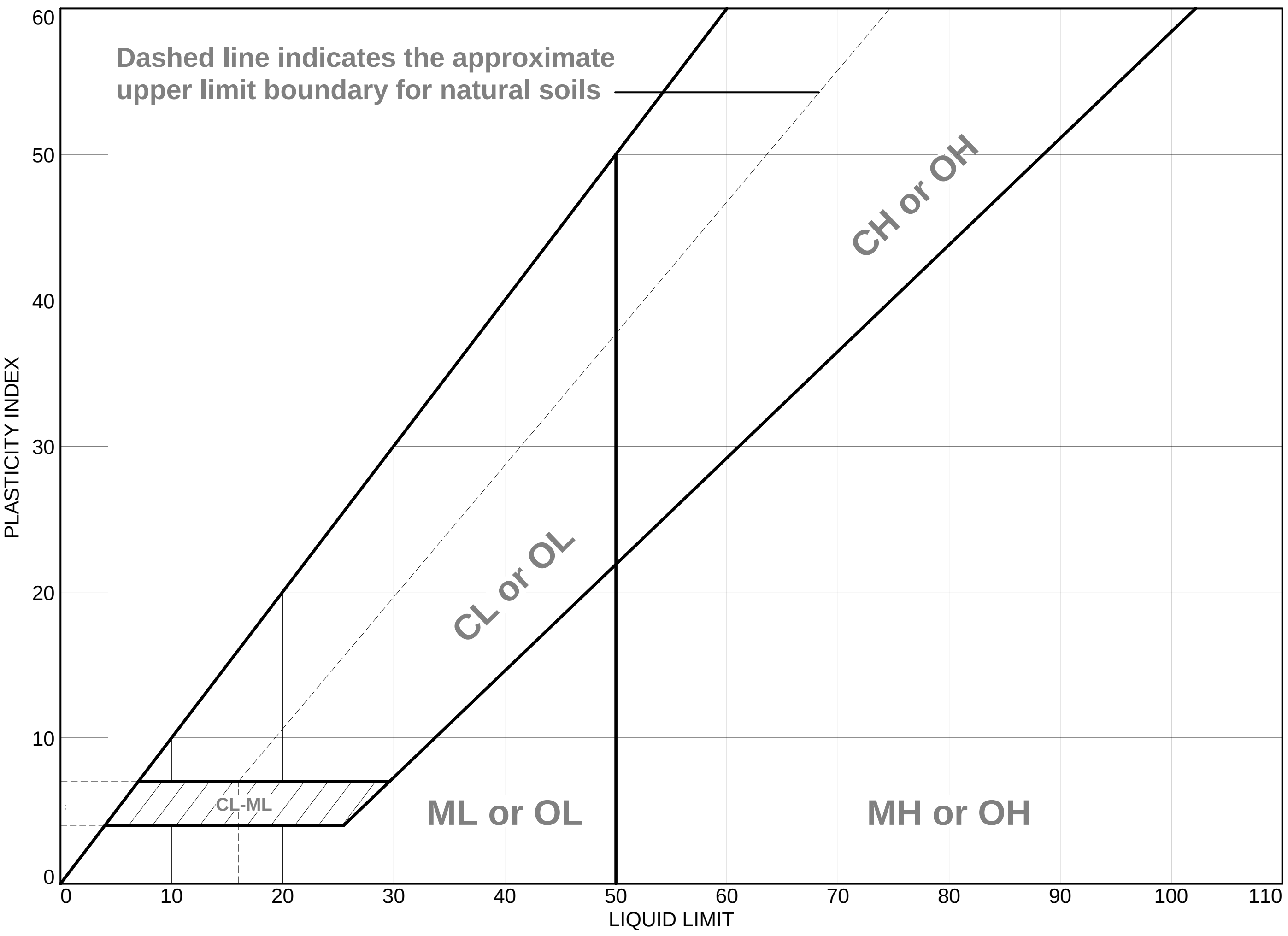
APPENDIX C - LABORATORY RESULTS

ATTERBERG LIMITS



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown silty SAND with gravel	NP	NP	NP	30.6	20.8	SM

Project No. 7122.74614.01 **Client:** Genessee

Project: Society Turn Parcel

Telluride, CO

●**Source of Sample:** BH#1 **Depth:** 5-6.5' **Sample Number:** DS1

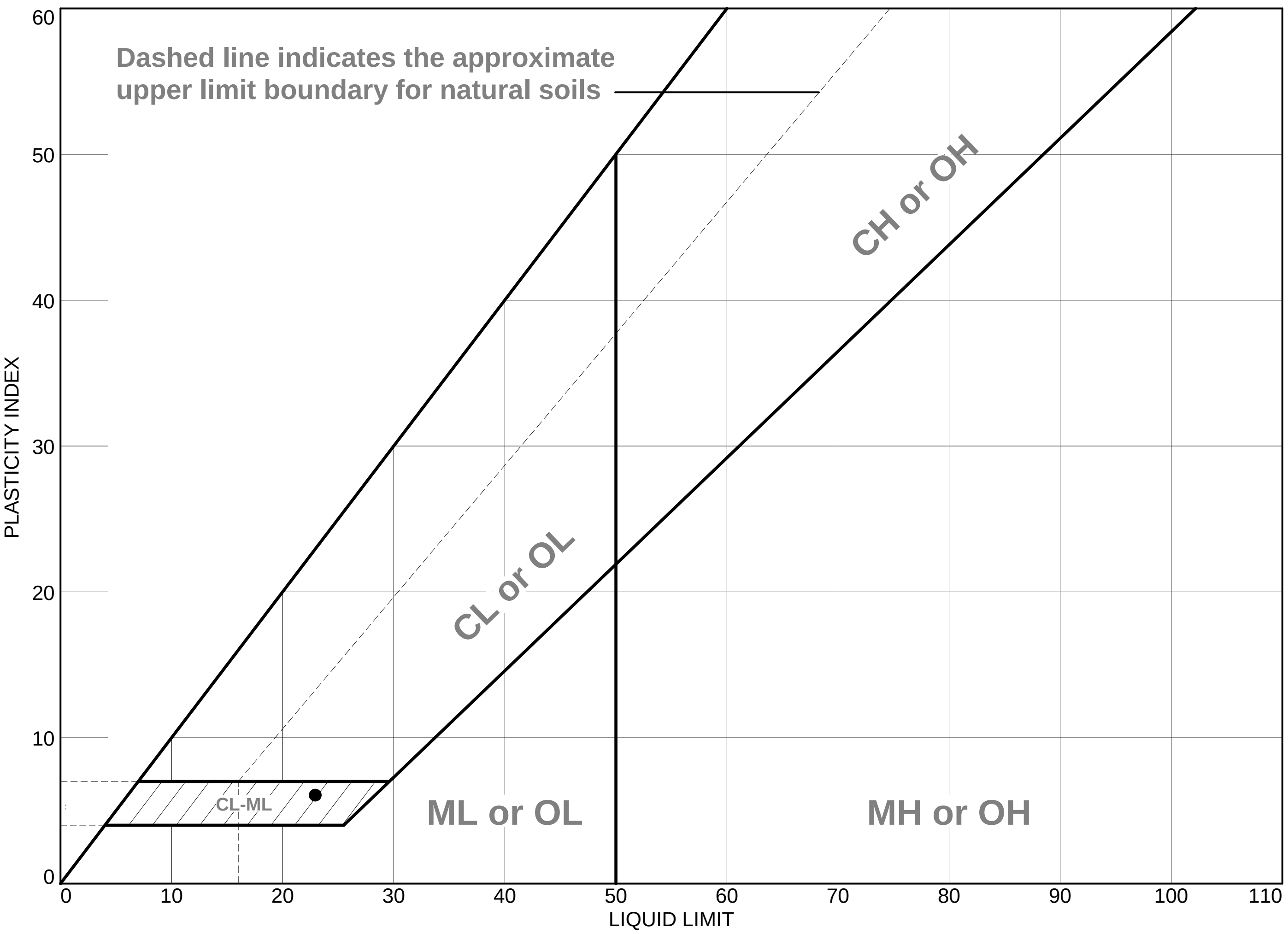
Remarks:

.

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Tested By: SJ

ATTERBERG LIMITS



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	reddish-brown silty clayey GRAVEL with sand	23	17	6	43.9	33.9	GC-GM

Project No. 7122.74614.01 **Client:** Genessee

Project: Society Turn Parcel

Telluride, CO

● **Source of Sample:** BH#2 **Depth:** 10-11.5' **Sample Number:** DS6

Remarks:

DOWL

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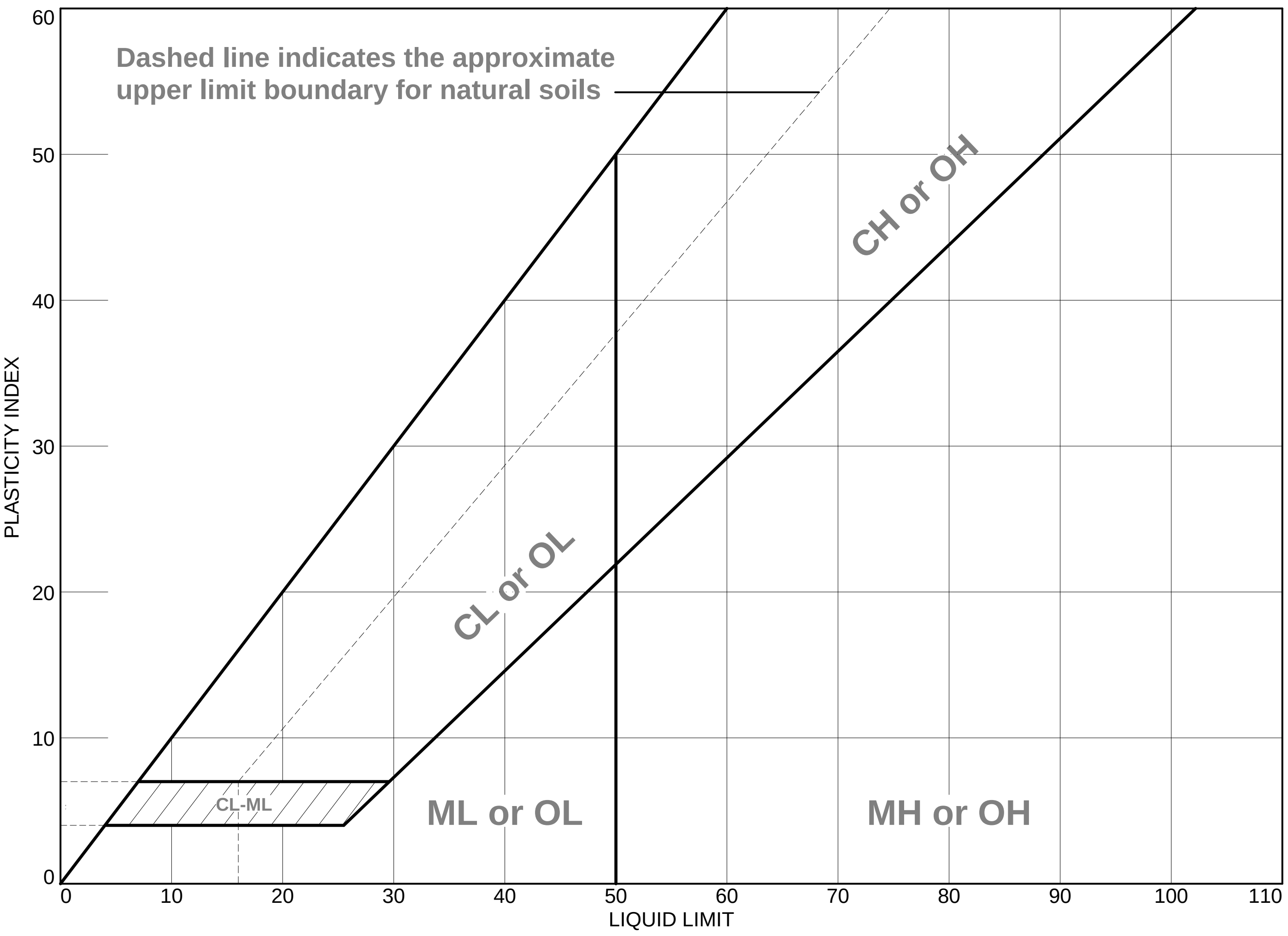
Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Tested By: BK **Checked By:** SJ

ATTERBERG LIMITS



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown silty SAND with gravel	NP	NP	NP	36.9	20.2	SM

Project No. 7122.74614.01 **Client:** Genessee

Project: Society Turn Parcel

Telluride, CO

●**Source of Sample:** BH#5 **Depth:** 15-16.5' **Sample Number:** DS12

Remarks:

DOWL

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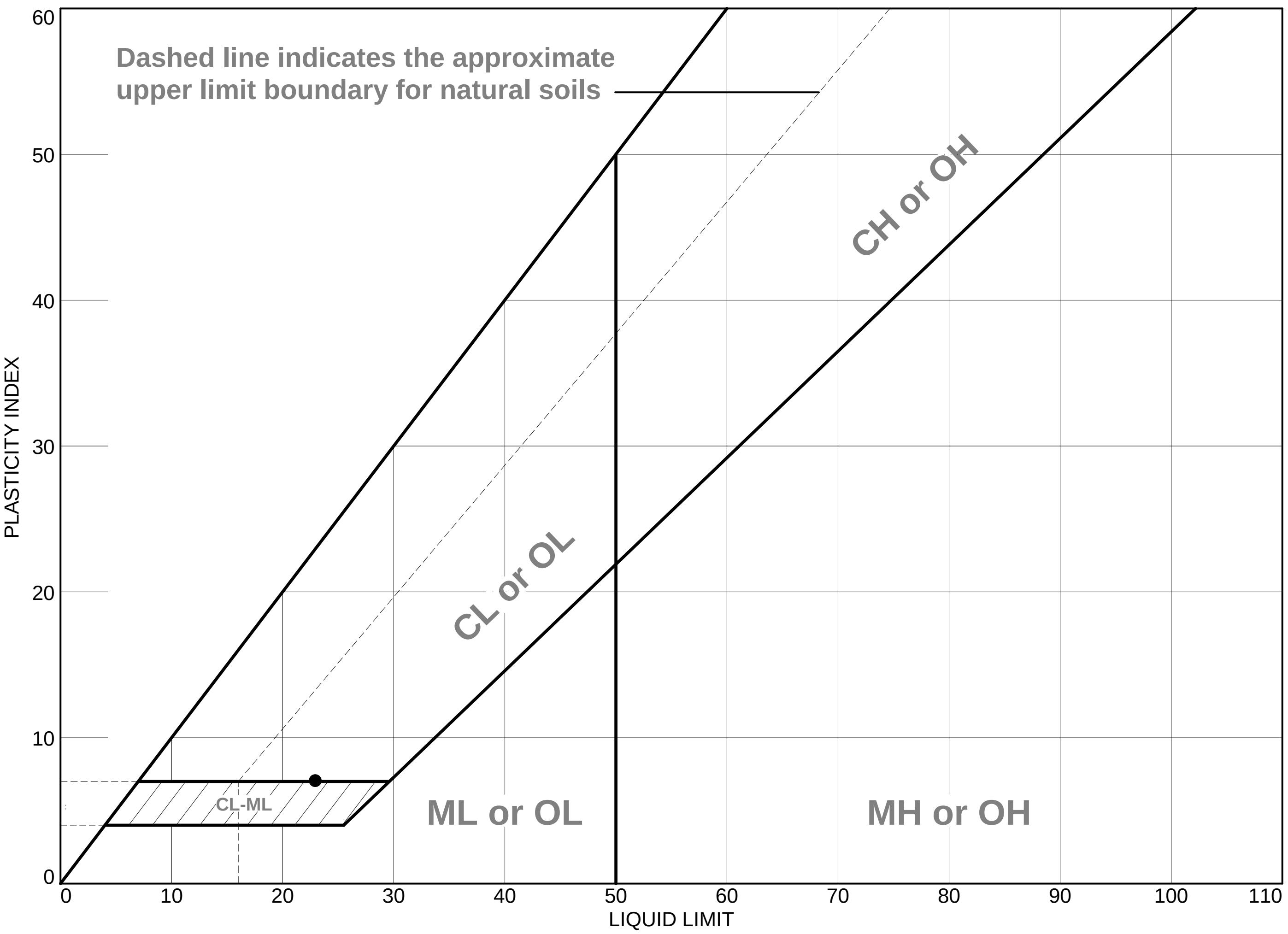
Tested By: SJ

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

ATTERBERG LIMITS



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown silty, clayey SAND with gravel	23	16	7	39.7	24.5	SC-SM

Project No. 7122.74614.01 **Client:** Genessee

Project: Society Turn Parcel

Telluride, CO

● **Source of Sample:** BH#6 **Depth:** 10-11.5' **Sample Number:** DS15

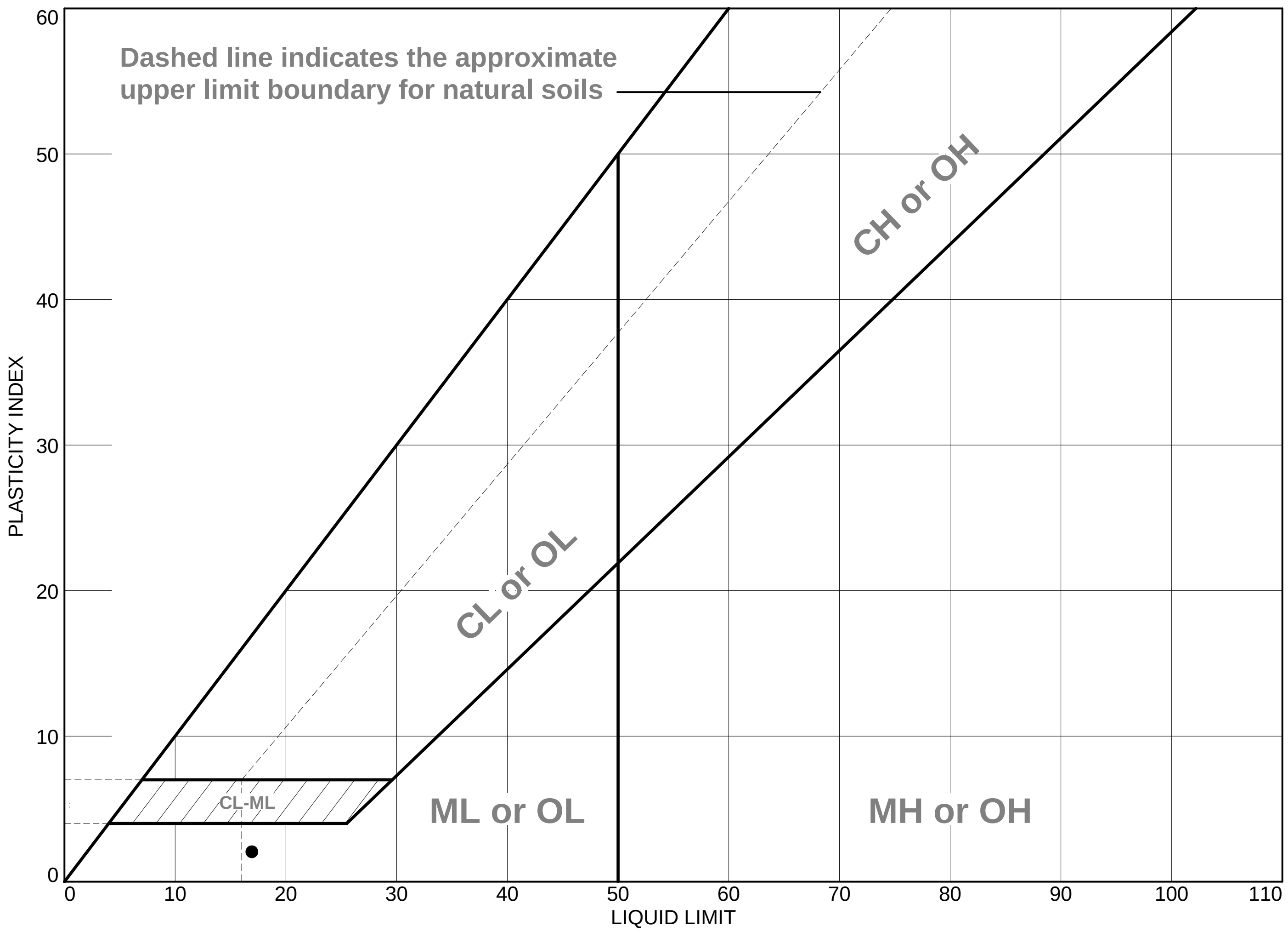
Remarks:

DOWL

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Tested By: BK **Checked By:** SJ

ATTERBERG LIMITS



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	reddish brown silty SAND with gravel	17	15	2	45.0	29.6	SM

Project No. 7122.74614.01 **Client:** Genessee

Project: Society Turn Parcel

Telluride, CO

● **Source of Sample:** BH#10 **Depth:** 5-6.5' **Sample Number:** DS25

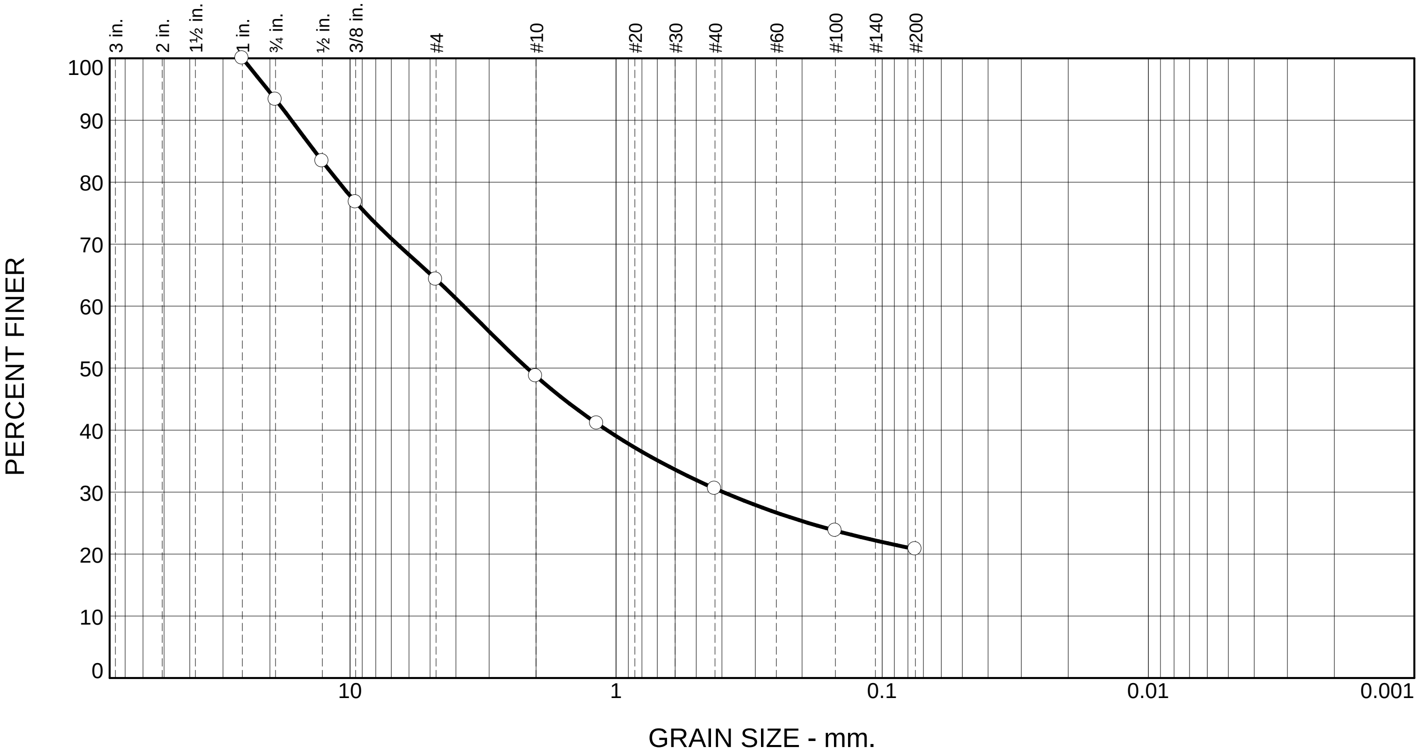
Remarks:

DOWL

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Tested By: BK **Checked By:** SJ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.7	29.0	15.6	18.1	9.8	20.8	

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	93.3		
1/2"	83.4		
3/8"	76.8		
#4	64.3		
#10	48.7		
#16	41.1		
#40	30.6		
#100	23.8		
#200	20.8		

* (no specification provided)

Material Description

brown silty SAND with gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NP **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 16.6085 D_{85}= 13.5704 D_{60}= 3.7396
D_{50}= 2.1589 D_{30}= 0.3960 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture Content = 8.8%

Date Received: 7/17/19 **Date Tested:** 8/5/19

Tested By: SJ

Checked By: LB

Title: Professional Geologist

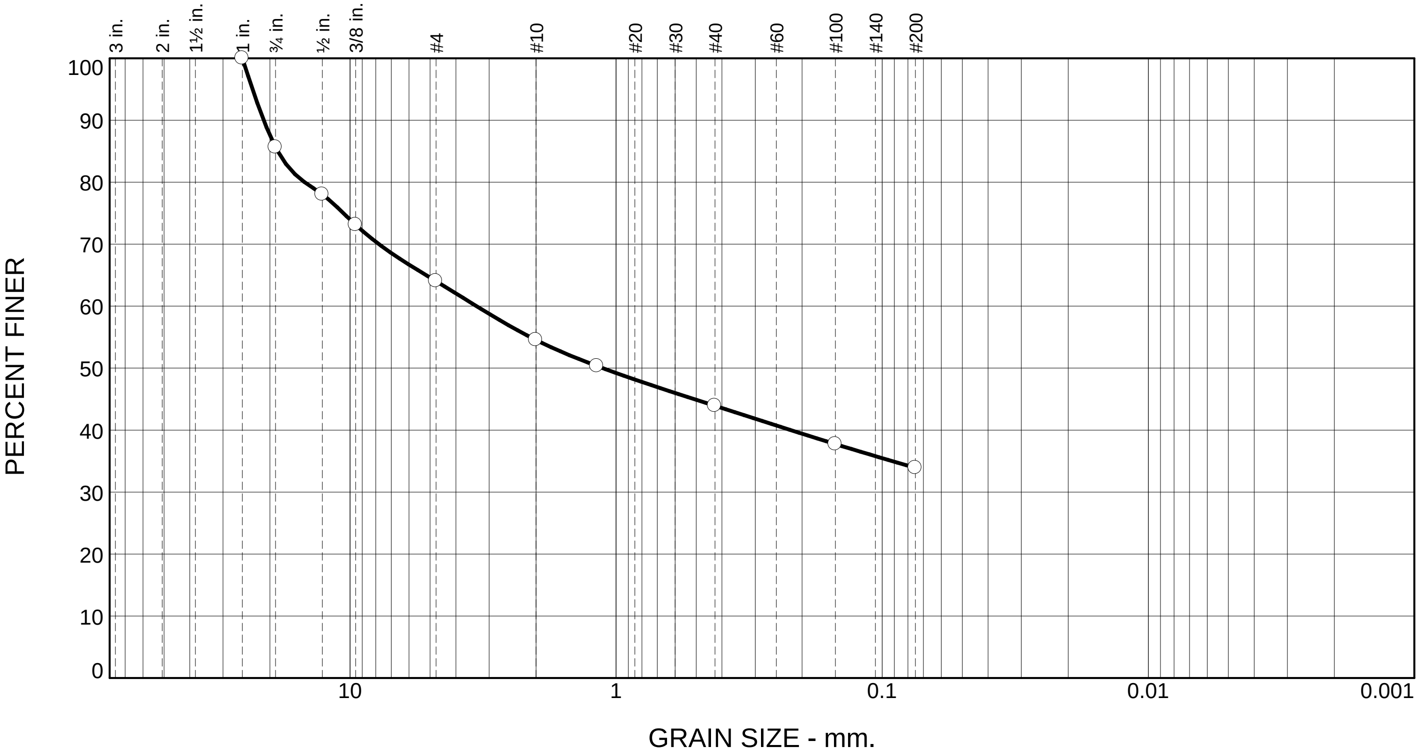
Source of Sample: BH#1 **Depth:** 5-6.5' **Date Sampled:** 7/16/19
Sample Number: DS1

DOWL

Client: Genessee
Project: Society Turn Parcel
Telluride, CO
Project No: 7122.74614.01 .

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.4	21.6	9.5	10.6	10.0	33.9	

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	85.6		
1/2"	78.0		
3/8"	73.1		
#4	64.0		
#10	54.5		
#16	50.3		
#40	43.9		
#100	37.7		
#200	33.9		

* (no specification provided)

Material Description

reddish-brown silty clayey GRAVEL with sand

Atterberg Limits (ASTM D 4318)

PL= 17 **LL=** 23 **PI=** 6

Classification

USCS (D 2487)= GC-GM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 21.1138	D_{85}= 18.7100	D_{60}= 3.3466
D_{50}= 1.1227	D_{30}=	D_{15}=
D_{10}=	C_u=	C_c=

Remarks

Natural Moisture Content = 12.7%

Date Received: 7/17/19 **Date Tested:** 8/5/19

Tested By: SJ

Checked By: LB

Title: Professional Geologist

Source of Sample: BH#2 **Depth:** 10-11.5'

Sample Number: DS6

Date Sampled: 7/16/19

DOWL

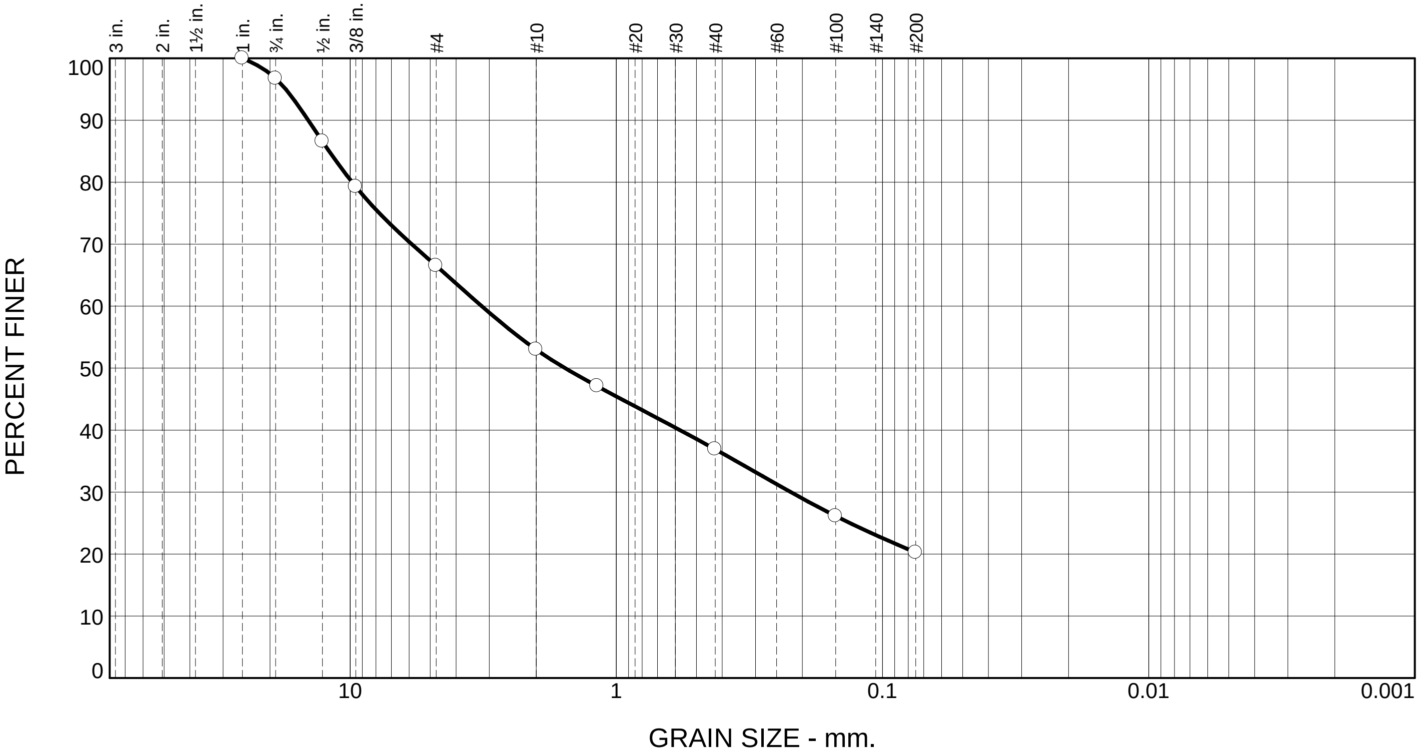
Client: Genessee

Project: Society Turn Parcel
Telluride, CO

Project No: 7122.74614.01 .

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.3	30.2	13.5	16.1	16.7	20.2	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	96.7		
1/2"	86.6		
3/8"	79.3		
#4	66.5		
#10	53.0		
#16	47.1		
#40	36.9		
#100	26.1		
#200	20.2		

* (no specification provided)

Material Description

brown silty SAND with gravel

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NP **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 14.3607 **D_{85}=** 11.9870 **D_{60}=** 3.2018
D_{50}= 1.5574 **D_{30}=** 0.2211 **D_{15}=**
D_{10}= **C_u=** **C_c=**

Remarks

Natural Moisture Content = 8.3%

Date Received: 7/17/19 **Date Tested:** 8/5/19

Tested By: SJ

Checked By: LB

Title: Professional Geologist

Source of Sample: BH#5 **Depth:** 15-16.5'
Sample Number: DS12

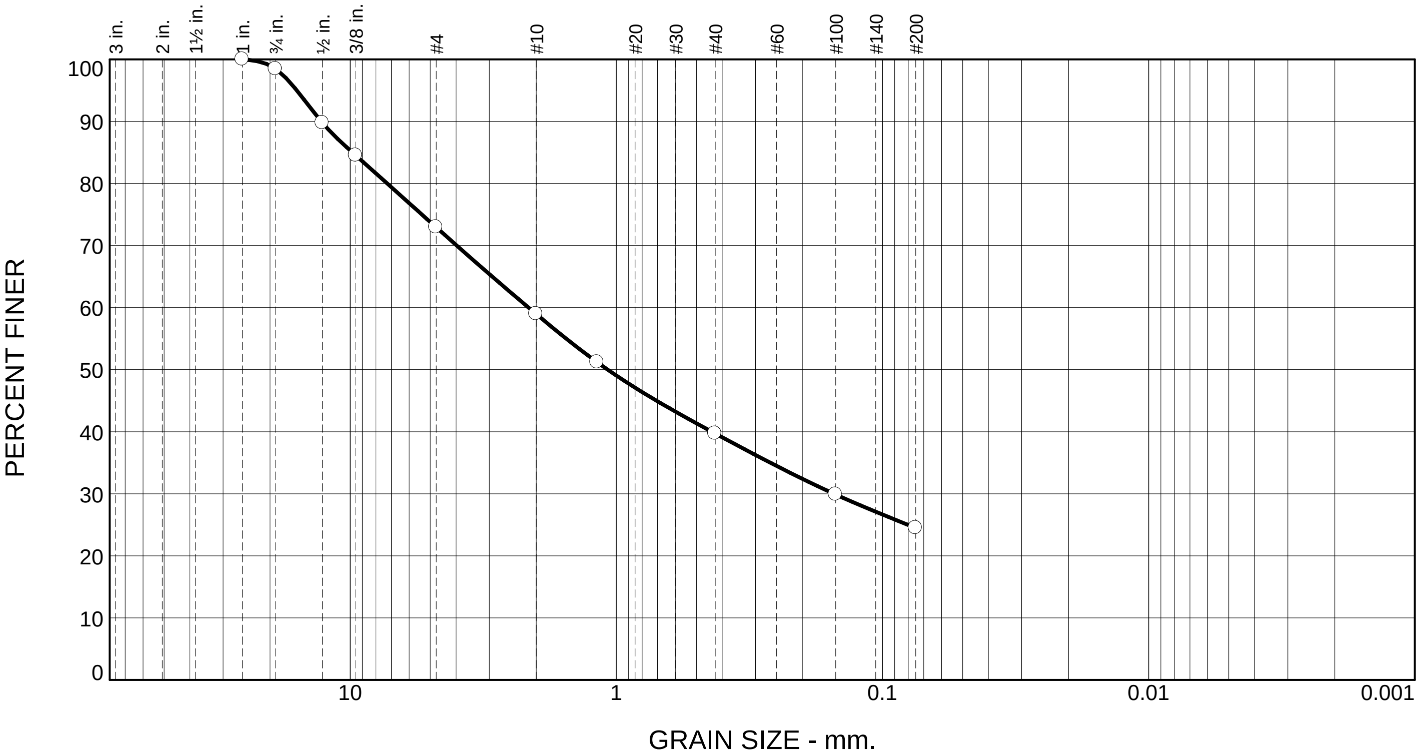
Date Sampled: 7/16/19

DOWL

Client: Genessee
Project: Society Turn Parcel
Telluride, CO
Project No: 7122.74614.01

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.6	25.5	13.9	19.3	15.2	24.5	

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	98.4		
1/2"	89.8		
3/8"	84.5		
#4	72.9		
#10	59.0		
#16	51.2		
#40	39.7		
#100	29.9		
#200	24.5		

* (no specification provided)

Material Description

brown silty, clayey SAND with gravel

Atterberg Limits (ASTM D 4318)

PL= 16 **LL=** 23 **PI=** 7

Classification

USCS (D 2487)= SC-SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 12.8337 D_{85}= 9.8034 D_{60}= 2.1382

D_{50}= 1.0777 D_{30}= 0.1521 D_{15}=

D_{10}= C_u= C_c=

Remarks

Natural Moisture Content = 13.1%

Date Received: 7/17/19 **Date Tested:** 8/5/19

Tested By: SJ

Checked By: LB

Title: Professional Geologist

Source of Sample: BH#6 **Depth:** 10-11.5' **Date Sampled:** 7/16/19

Sample Number: DS15

DOWL

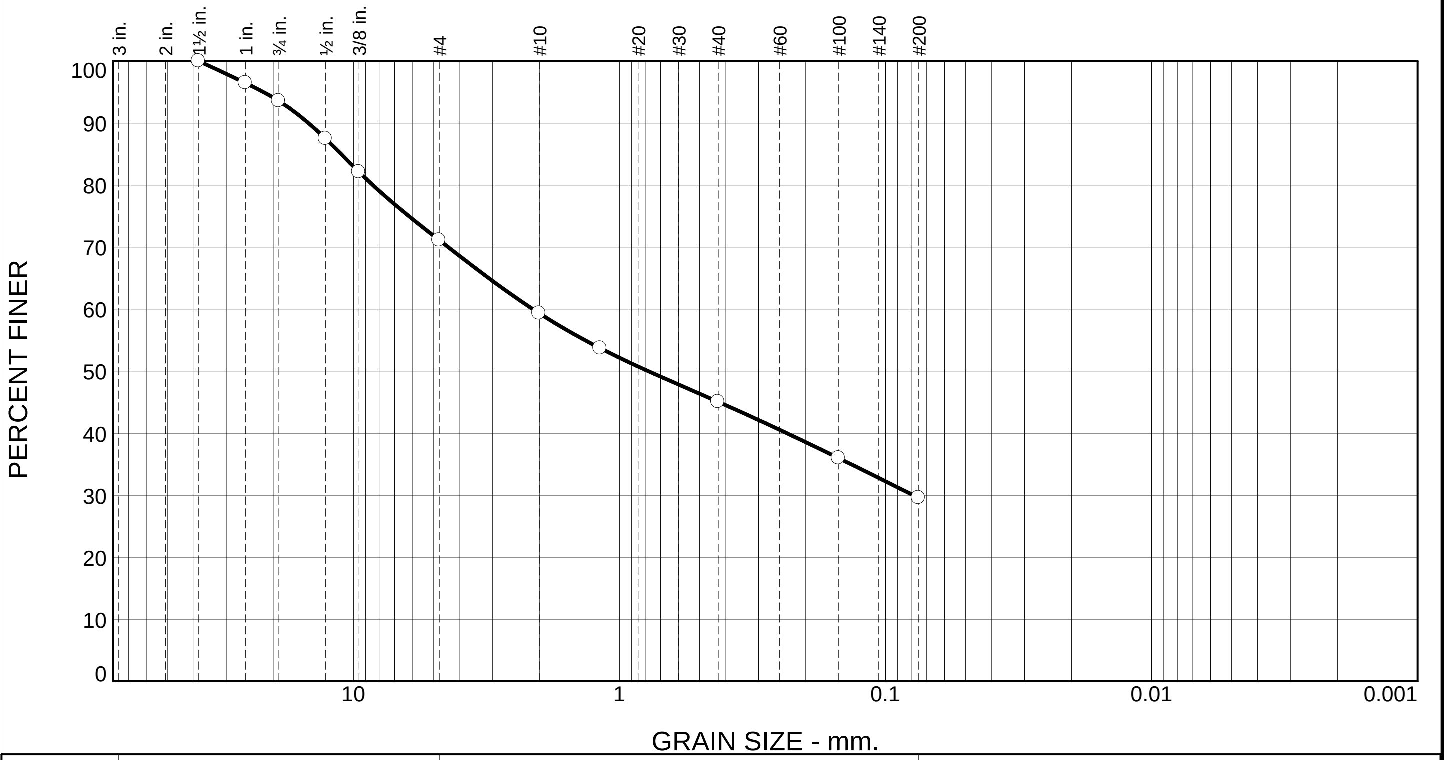
Client: Genessee

Project: Society Turn Parcel
Telluride, CO

Project No: 7122.74614.01

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.4	22.5	11.8	14.3	15.4	29.6	

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	96.4		
3/4"	93.6		
1/2"	87.5		
3/8"	82.1		
#4	71.1		
#10	59.3		
#16	53.7		
#40	45.0		
#100	36.0		
#200	29.6		

* (no specification provided)

Material Description

reddish brown silty SAND with gravel

Atterberg Limits (ASTM D 4318)

PL= 15 **LL=** 17 **PI=** 2

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 14.7382 **D_{85}=** 11.1060 **D_{60}=** 2.1157
D_{50}= 0.7786 **D_{30}=** 0.0787 **D_{15}=**
D_{10}= **C_u=** **C_c=**

Remarks

Natural Moisture Content = 8.7%

Date Received: 7/17/19 **Date Tested:** 8/5/19

Tested By: SJ

Checked By: LB

Title: Professional Geologist

Source of Sample: BH#10 **Depth:** 5-6.5' **Date Sampled:** 7/16/19
Sample Number: DS25

DOWL

Client: Genessee
Project: Society Turn Parcel
Telluride, CO
Project No: 7122.74614.01 .

Results are for the exclusive use of the client and are not indicative of apparantly identical samples.

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Laboratory Data Sheet: In-Situ Moisture Content

ASTM D-2216

Project Name Society Turn Parcel
Project Location Telluride, CO
Client Genessee

Date 7/24/2019
Project # 7122.74614.01
Test By SJ
Test for LB

Sample #	**Sample Location**		**Soil Description**	
DS1	BH#1 @5-6.5'		brown silty SAND with gravel	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	36.2	149.1	140.0	8.8%

Sample #	**Sample Location**		**Soil Description**	
DS2	BH#1 @10-11.5'		brown clayey SAND with gravel (ASTM D2488)	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	35.9	175.9	168.4	5.7%

Sample #	**Sample Location**		**Soil Description**	
DS3	BH#1 @15-16.5'		brown clayey SAND with gravel (ASTM D2488)	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	36.1	221.8	210.0	6.8%

Sample #	**Sample Location**		**Soil Description**	
DS4	BH#1 @20-21.5'		brown clayey SAND with gravel (ASTM D2488)	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	36.8	171.5	164.0	5.9%

Sample #	**Sample Location**		**Soil Description**	
DS5	BH#2 @5-6.5'		brown sandy CLAY with gravel (ASTM D2488)	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	206.8	997.5	924.2	10.2%

Laboratory Data Sheet: In-Situ Moisture Content

ASTM D-2216

Project Name Society Turn Parcel
Project Location Telluride, CO
Client Genessee

Date 7/24/2019
Project # 7122.74614.01
Test By SJ
Test for LB

Sample #	**Sample Location**		**Soil Description**	
DS6	BH#2 @10-11.5'		reddish brown silty, clayey GRAVEL with sand	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	36.1	131.7	120.9	12.7%

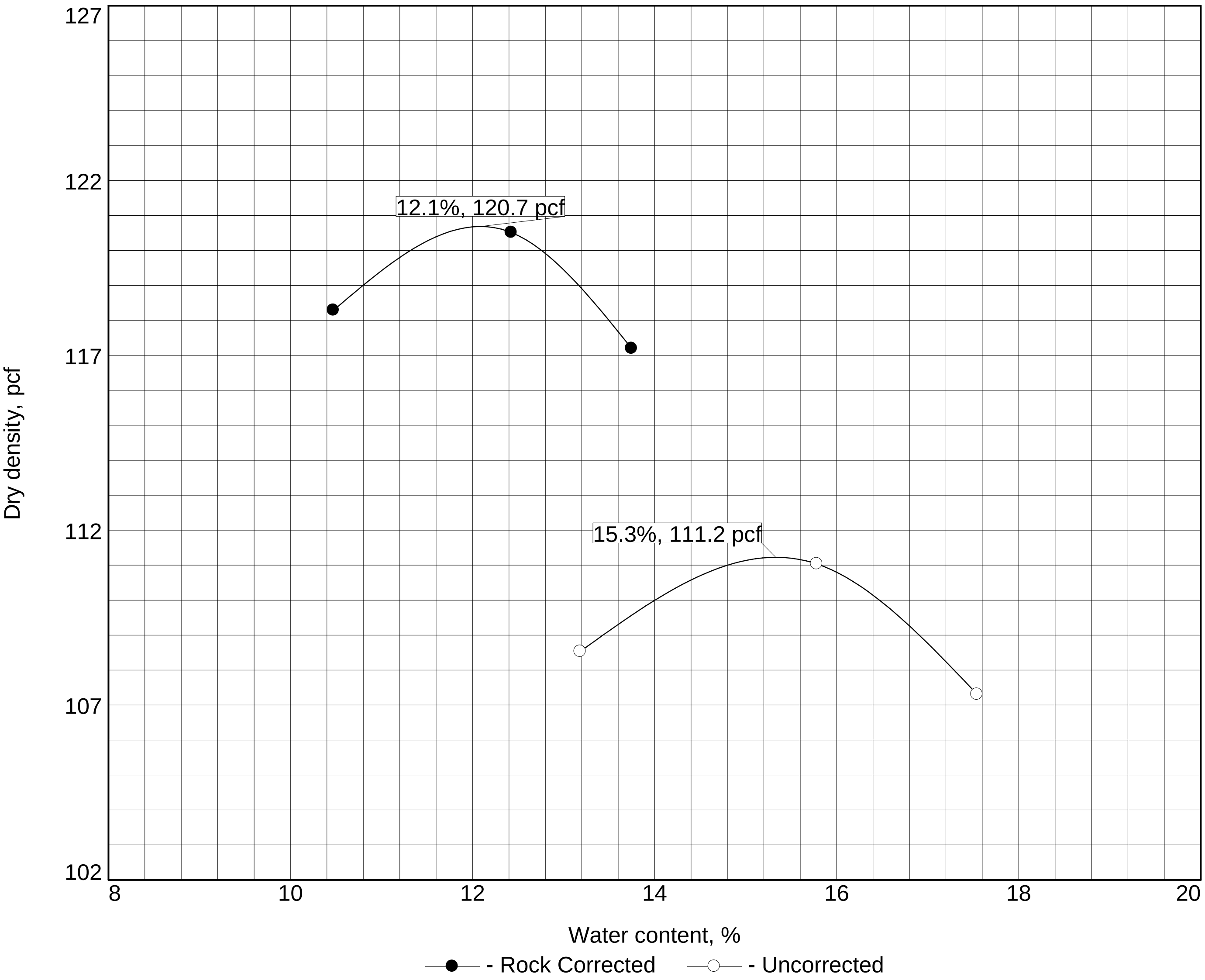
Sample #	**Sample Location**		**Soil Description**	
DS12	BH#5 @15-16.5'		brown silty SAND with gravel	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	37.0	132.6	125.3	8.3%

Sample #	**Sample Location**		**Soil Description**	
DS15	BH#6 @10-11.5'		brown silty, clayey SAND with gravel	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	36.8	148.5	135.6	13.1%

Sample #	**Sample Location**		**Soil Description**	
DS25	BH#10 @5-6.5'		reddish brown silty SAND with gravel	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	36.2	158.3	148.5	8.7%

Sample #	**Sample Location**		**Soil Description**	
DS26	BH#10 @10-11.5'		reddish brown silty, clayey SAND with gravel (ASTM D2488)	
	Tare (g)	**Tare + wet (g)**	**Tare + dry (g)**	**% Moisture**
	36.0	163.2	156.5	5.6%

MOISTURE-DENSITY RELATIONSHIP



Test specification: ASTM D 698-12 Method A Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
2-5'							24.9	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 120.7 pcf	111.2 pcf	brown silty clayey SAND with gravel (ASTM D2488)
Optimum moisture = 12.1 %	15.3 %	

Project No. 7122.74614.01 **Client:** Genessee
Project: Society Turn Parcel
Telluride, CO **Date:** 7/23/19
○ **Location:** BH#2 **Sample Number:** BS1

Remarks:

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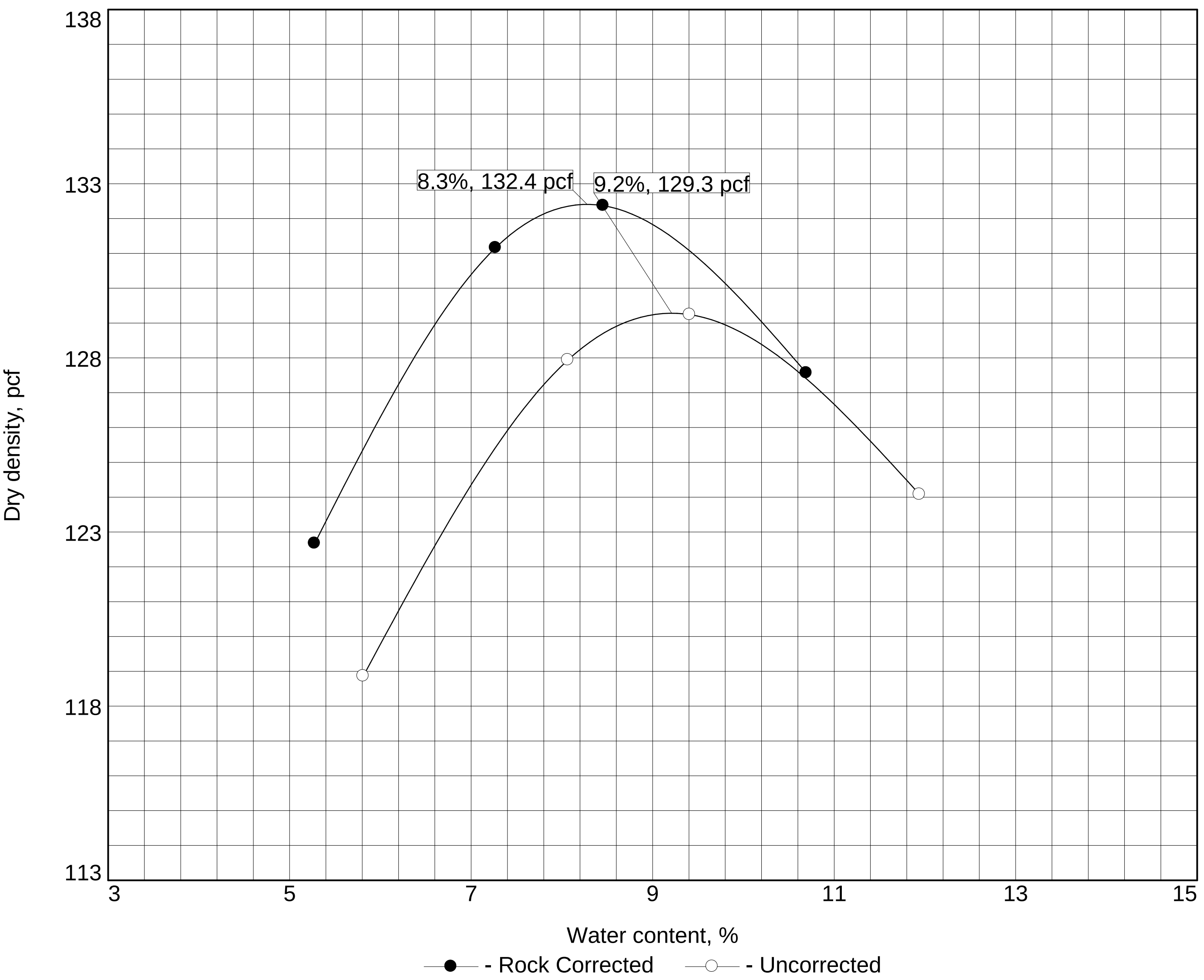
Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

Tested By: BR **Checked By:** SJ

MOISTURE-DENSITY RELATIONSHIP



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
2-5'							11.6	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 132.4 pcf	129.3 pcf	reddish brown silty clayey SAND with gravel (ASTM D2488)
Optimum moisture = 8.3 %	9.2 %	

Project No. 7122.74614.01 **Client:** Genessee
Project: Society Turn Parcel
Telluride, CO **Date:** 7/30/19
○ **Location:** BH#8 **Sample Number:** BS2

DOWL

Remarks:

.

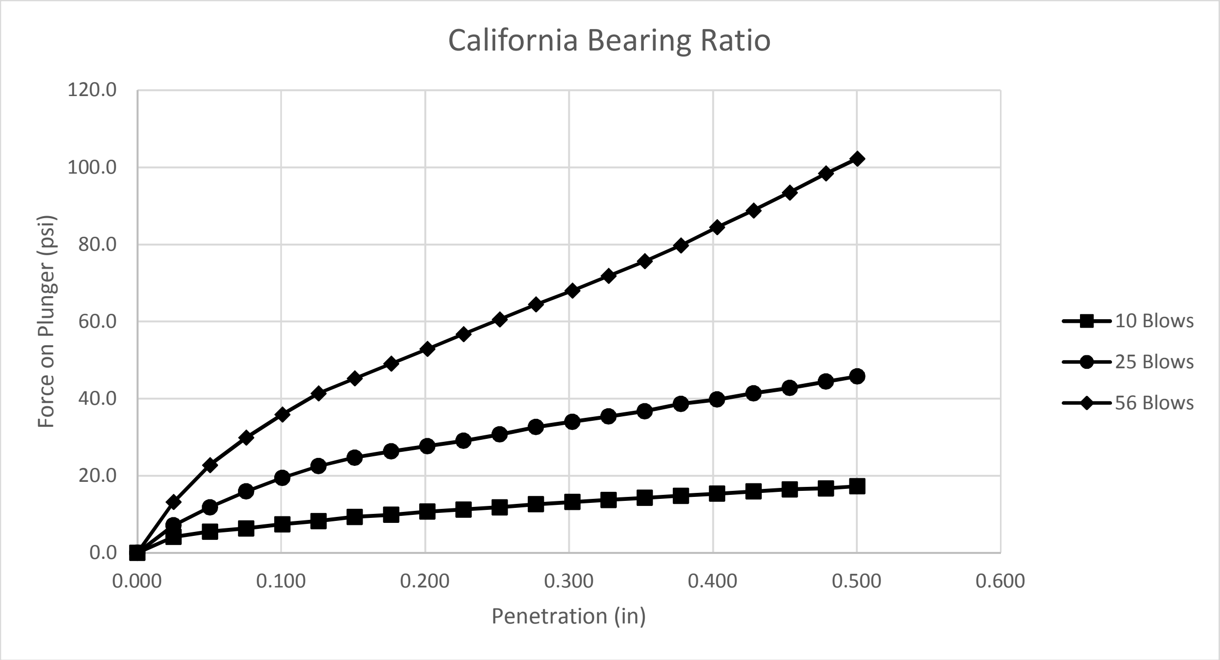
Tested By: BR **Checked By:** SJ

Results are for the exclusive use of the client and apply only to the samples tested and are not indicative of apparantly identical samples.

California Bearing Ratio

ASTM D1883

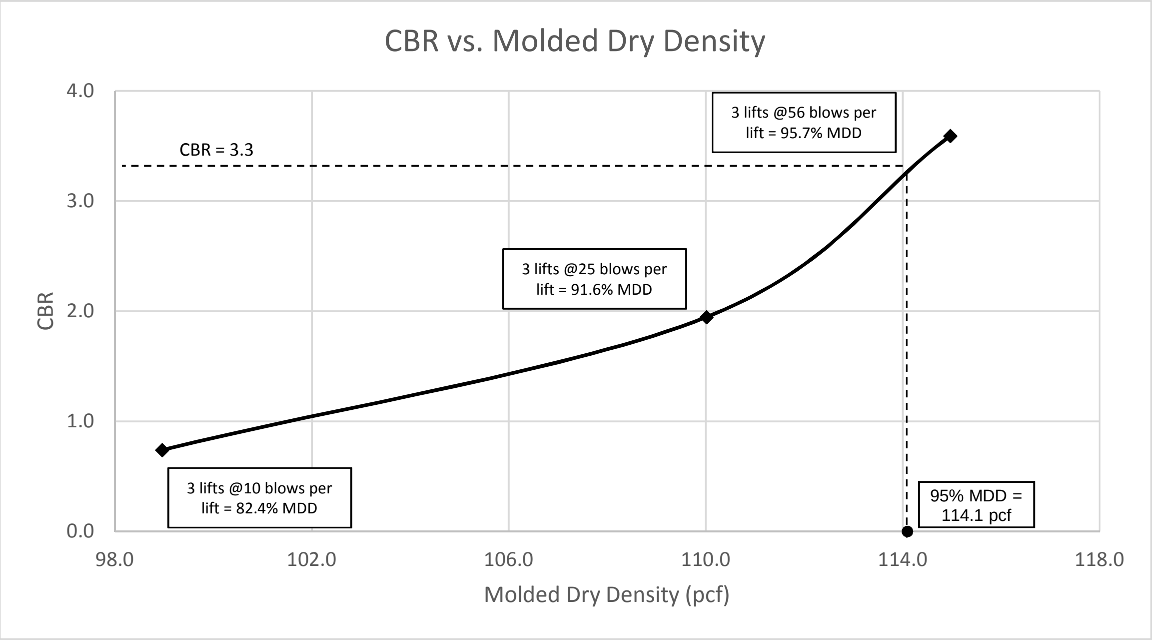
Project Name	Society Turn Parcel	Date Sampled	7/16/2019
Project Location	Telluride, CO	Sampled By	LB
Project #	7122.74614.01	Date Received	7/16/2019
Client	Genessee	Date Molded	7/26/2019
Source/Depth	2-5' Sample # BS1	Date Tested	7/30/2019
Soil Description	brown silty clayey SAND with gravel (ASTM D2488)	Tested By	SJ



	10 Blows	25 Blows	56 Blows
CBR at 0.1"	0.7	1.9	3.6
CBR at 0.2"	0.7	1.8	3.5
Moisture before soak	12.3%	11.4%	12.4%
Density before soak	99.0	110.0	115.0
swell	1.4%	1.9%	1.9%
Top 1" moisture after soak	28.7%	25.0%	22.8%
Core moisture after soak	20.4%	17.6%	14.8%
Surcharge Weight (lbs)	10.0	10.0	10.0

California Bearing Ratio
ASTM D1883

Project Name	Society Turn Parcel	Date Sampled	7/16/2019
Project Location	Telluride, CO	Sampled By	LB
Project #	7122.74614.01	Date Received	7/16/2019
Client	Genessee	Date Molded	7/26/2019
Source/Depth	2-5' Sample # BS1	Date Tested	7/30/2019
Soil Description	brown silty clayey SAND with gravel (ASTM D2488)	Tested By	SJ



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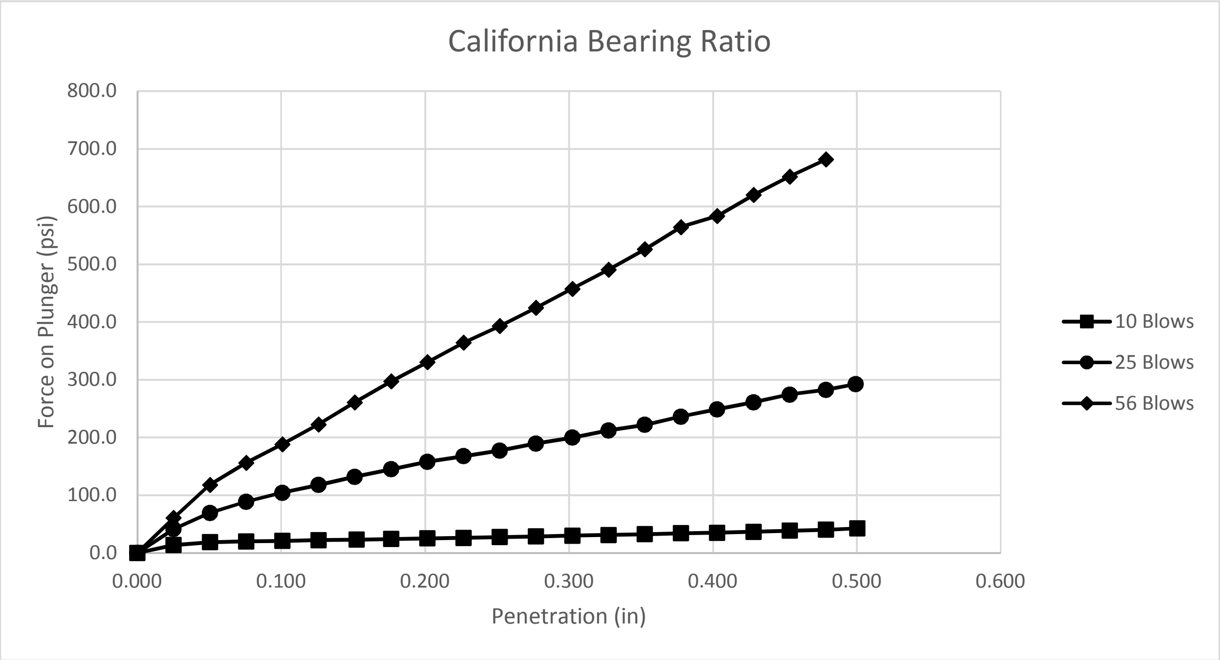
California Bearing Ratio
ASTM D1883

Project Name Society Turn Parcel
Project Location Telluride, CO
Project # 7122.74614.01
Client Genessee
Source/Depth 2-5' Sample # BS2
Soil Description reddish brown silty clayey SAND with gravel

Date Sampled 7/16/2019
Sampled By LB
Date Received 7/16/2019
Date Molded 8/1/2019
Date Tested 8/5/2019
Tested By SJ

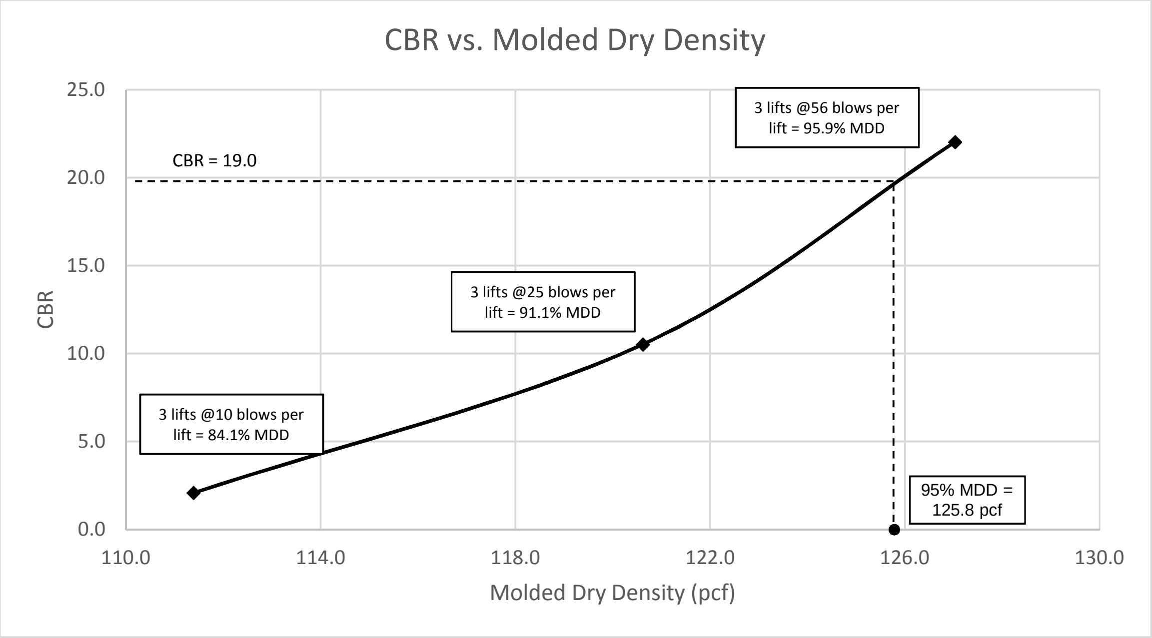


	10 Blows	25 Blows	56 Blows
CBR at 0.1"	2.1	10.4	18.8
CBR at 0.2"	1.7	10.5	22.0
Moisture before soak	8.1%	8.7%	8.7%
Density before soak	111.4	120.6	127.0
swell	0.2%	0.4%	0.2%
Top 1" moisture after soak	14.8%	13.3%	12.3%
Core moisture after soak	12.4%	10.8%	8.5%
Surcharge Weight (lbs)	10.0	10.0	10.0

California Bearing Ratio

ASTM D1883

Project Name	Society Turn Parcel		Date Sampled	7/16/2019
Project Location	Telluride, CO		Sampled By	LB
Project #	7122.74614.01		Date Received	7/16/2019
Client	Genessee		Date Molded	8/1/2019
Source/Depth	2-5'	Sample # BS2	Date Tested	8/5/2019
Soil Description	reddish brown silty clayey SAND with gravel		Tested By	SJ



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Corrosivity Series

Project Name Society Turn Parcel
Project Location Telluride, CO
Project # 7122.74614.01
Client Genessee
Source/Depth BH#2 @5-6.5' Sample # DS5
Soil Description brown sandy CLAY with gravel (ASTM D2488)

Date Sampled 7/16/2019
Sampled By LB
Date Received 7/17/2019
Tests For LB
Date Tested 8/1/2019
Tested By SJ

Water-soluble sulfates, dry soil basis	**0.00**	**%**	CDOT CP-L 2103 - Method B
Chlorides	**0.053**	**%**	CDOT CP-L 2104- Method B
pH	**7.6**		ASTM G51
Electroconductivity	**479**	**µS/cm**	

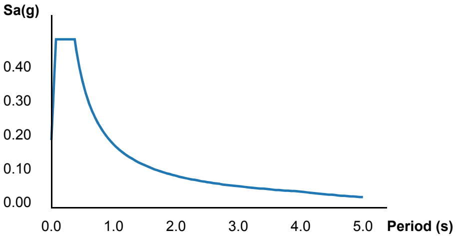
APPENDIX D – ENGINEERING ANALYSIS

ATC Hazards by Location

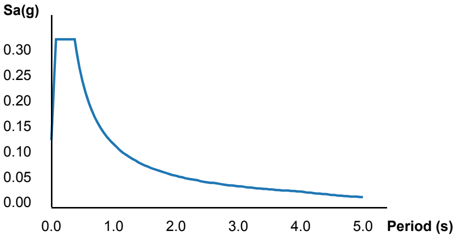
Search Information

Coordinates:	37.9497, -107.8755
Elevation:	ft
Timestamp:	2019-11-01T22:05:08.348Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	III
Site Class:	D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.321	MCE$_R$ ground motion (period=0.2s)
S_1	0.077	MCE$_R$ ground motion (period=1.0s)
S_{MS}	0.495	Site-modified spectral acceleration value
S_{M1}	0.185	Site-modified spectral acceleration value
S_{DS}	0.33	Numeric seismic design value at 0.2s SA
S_{D1}	0.124	Numeric seismic design value at 1.0s SA

▾Additional Information

Name	Value	Description
SDC	B	Seismic design category
F_a	1.543	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.936	Coefficient of risk (0.2s)
CR_1	0.932	Coefficient of risk (1.0s)
PGA	0.186	MCE$_G$ peak ground acceleration
F_{PGA}	1.428	Site amplification factor at PGA
PGA_M	0.265	Site modified peak ground acceleration
T_L	4	Long-period transition period (s)
SsRT	0.321	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.343	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.077	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.083	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

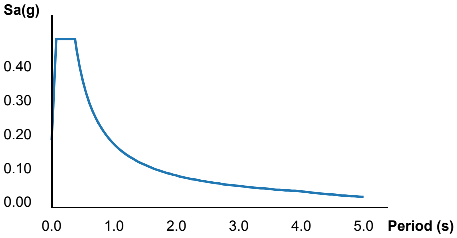
Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

Hazards by Location

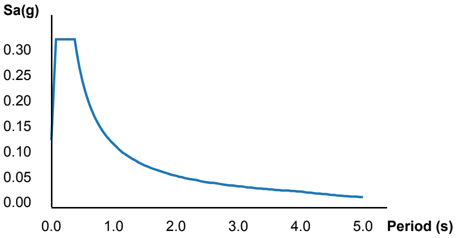
Search Information

Coordinates:	37.9497, -107.8755
Elevation:	ft
Timestamp:	2019-11-01T22:06:58.871Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	IV
Site Class:	D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.321	MCE_R ground motion (period=0.2s)
S_1	0.077	MCE_R ground motion (period=1.0s)
S_{MS}	0.495	Site-modified spectral acceleration value
S_{M1}	0.185	Site-modified spectral acceleration value
S_{DS}	0.33	Numeric seismic design value at 0.2s SA
S_{D1}	0.124	Numeric seismic design value at 1.0s SA

▾Additional Information

Name	Value	Description
SDC	C	Seismic design category
F_a	1.543	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.936	Coefficient of risk (0.2s)
CR_1	0.932	Coefficient of risk (1.0s)
PGA	0.186	MCE_G peak ground acceleration
F_{PGA}	1.428	Site amplification factor at PGA
PGA_M	0.265	Site modified peak ground acceleration
T_L	4	Long-period transition period (s)
SsRT	0.321	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.343	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.077	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.083	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

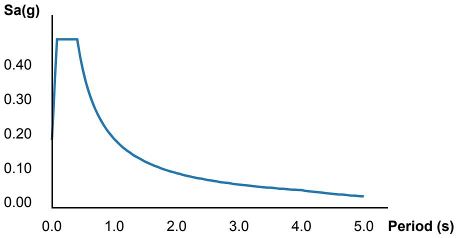
Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

ATC Hazards by Location

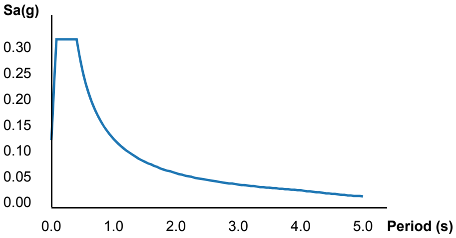
Search Information

Coordinates:	37.9497, -107.8755
Elevation:	ft
Timestamp:	2019-11-01T22:11:10.224Z
Hazard Type:	Seismic
Reference Document:	IBC-2015
Risk Category:	III
Site Class:	D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.315	MCE_R ground motion (period=0.2s)
S_1	0.083	MCE_R ground motion (period=1.0s)
S_{MS}	0.488	Site-modified spectral acceleration value
S_{M1}	0.198	Site-modified spectral acceleration value
S_{DS}	0.325	Numeric seismic design value at 0.2s SA
S_{D1}	0.132	Numeric seismic design value at 1.0s SA

▾Additional Information

Name	Value	Description
SDC	B	Seismic design category
F_a	1.548	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.889	Coefficient of risk (0.2s)
CR_1	0.912	Coefficient of risk (1.0s)
PGA	0.174	MCE_G peak ground acceleration
F_{PGA}	1.451	Site amplification factor at PGA
PGA_M	0.253	Site modified peak ground acceleration
T_L	4	Long-period transition period (s)
SsRT	0.315	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.355	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.083	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.091	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.6	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

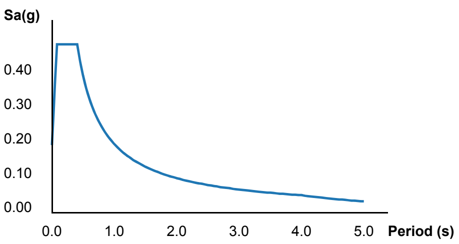
Disclaimer

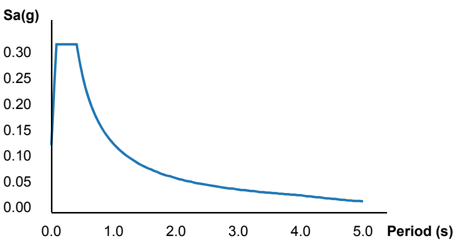
Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

ATC Hazards by Location

Search Information

Coordinates:	37.9497, -107.8755
Elevation:	ft
Timestamp:	2019-11-01T22:07:51.915Z
Hazard Type:	Seismic
Reference Document:	IBC-2015
Risk Category:	IV
Site Class:	D





Basic Parameters

Name	Value	Description
S_S	0.315	MCE$_R$ ground motion (period=0.2s)
S_1	0.083	MCE$_R$ ground motion (period=1.0s)
S_{MS}	0.488	Site-modified spectral acceleration value
S_{M1}	0.198	Site-modified spectral acceleration value
S_{DS}	0.325	Numeric seismic design value at 0.2s SA
S_{D1}	0.132	Numeric seismic design value at 1.0s SA

▾Additional Information

Name	Value	Description
SDC	C	Seismic design category
F_a	1.548	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.889	Coefficient of risk (0.2s)
CR_1	0.912	Coefficient of risk (1.0s)
PGA	0.174	MCE$_G$ peak ground acceleration
F_{PGA}	1.451	Site amplification factor at PGA
PGA_M	0.253	Site modified peak ground acceleration
T_L	4	Long-period transition period (s)
SsRT	0.315	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.355	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.083	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.091	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.6	Factored deterministic acceleration value (PGA)

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