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May 20, 2021

Snowbasin Resort
c/o George Benford (Talisman Civil Consultants, LLC)
1588 South Main Street, Suite 200
Salt Lake City, Utah 84115

Subject: Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah
IGES Job No. 02284-002

Dear Mr. Benford:

This report presents the results of a geotechnical investigation performed for a proposed parking area at Snowbasin Resort in Huntsville, Utah. The purpose of the investigations was to evaluate the subsurface conditions at the site and provide design and construction recommendations as they relate to the proposed construction. This report has been prepared to summarize the field investigation program, laboratory testing program and engineering analysis performed in general accordance with our proposal dated April 29, 2021.

EXISTING CONDITIONS

The site is located to the south of the existing Maples parking area at Snowbasin Resort in Huntsville Utah (see Figure A-1). The site is currently undeveloped and slopes down towards the existing lots to the north and towards an unpaved service road to the west. The surface is sparsely vegetated with partially buried cobbles and boulders up to 2 feet in diameter frequently observed. Based on conversations with Snowbasin personnel, the area was previously rough graded for use during the 2002 Winter Olympics as the finish area for downhill ski racing. Public utilities were not delineated within the area. Private utilities in the area may include storm drainage, site lighting and power from the substation to the west.

PROPOSED CONSTRUCTION

To assist in preparation of our report, a drawing prepared by Ecosign Mountain Resort Planners, Ltd. titled *Maples Base Area and Beginner Area Grading – Immediate Action* dated April 2021, was provided. Based on the drawings, the project includes construction of a 1.75-acre asphalt parking lot at the Snowbasin Resort base Area in Huntsville, Utah. The parking lot will have 238 stalls with grading cuts of up to 8 feet and fills up to 6 feet currently proposed. Snowbasin intends to use the cut material as backfill beneath the parking area.

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FIELD INVESTIGATION

TEST PIT EXCAVATIONS

On May 5, 2021, IGES observed the performance of four test pit excavations (designated TP-01 through TP-04) for the proposed site improvements. The test pits were excavated by Snowbasin Resort utilizing a Bobcat ZTS mini excavator to depths ranging from 4 to 7 feet. A summary of the explorations is presented in Table 1. The approximate location of each exploration is shown on Figure A-2 in Appendix A.

The IGES representative observed the explorations, logged the explorations, and prepared the graphical boring logs (shown in Figures A-4 through A-7 in Appendix A). A key to the soil symbols and terminology is shown in as Attachment A-8. Disturbed bulk samples were collected in sealed bags and buckets. Representative samples were packaged and transported to our laboratory in Salt Lake City for subsequent review and testing. Upon completion, tests pit excavations were backfilled with the removed material with minimal compactive effort.

Table 1: Summary of Subsurface Explorations

Field Exploration	Existing Grade[1] (feet)	Total Depth of Exploration (feet)	Encountered Groundwater Depth (feet)
TP-01	6339	5	Not Encountered
TP-02	5361	7	Not Encountered
TP-03	6345	4	Not Encountered
TP-04	6354	6	Not Encountered

Notes:

1) Elevations estimated to nearest foot based on drawing prepared by Ecosign Mountain Report Planners Ltd.

Source: Compiled by IGES in 2021

LABORATORY PROGRAM

Geotechnical laboratory tests were conducted on relatively undisturbed and bulk soil samples obtained during the field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of on-site earth materials. Laboratory tests conducted during this investigation included the following:

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- **Index Testing**
  - In situ Moisture Content (ASTM D7263)
  - Atterberg Limits (ASTM D4318)
  - Particle-Size Analysis (ASTM D6913)
- **Compaction Testing**
  - Laboratory Compaction Characteristics of Soil (Modified Effort, ASTM D1557)
- **Subgrade Support**
  - California Bearing Ratio (CBR, ASTM D1883)
- **Corrosion Potential**
  - Sulfate (ASTM C1580)
  - Chloride (ASTM D4327)
  - pH (American Association of State Highway and Transportation Officials [AASHTO] T289)
  - Electrical Resistivity (AASHTO T288)

Selected results have been presented on the attached boring logs in Appendix A. The full results of the laboratory testing are provided in Appendix B.

SUBSURFACE CONDITIONS

SOIL

The subsurface conditions TP-01, TP-03 and TP-04 were generally observed to consist of 6 inches of topsoil transitioning to possible fill consisting of loose to dense, moist granular soil described as poorly graded to clayey gravel with sand or clayey sand with gravel to depth ranging from 4 to 6 feet beneath the existing grade. Oversized material (particles over 6 inches in nominal diameter) was estimated to make up 20 to 50 percent of the possible fill with boulders up to 3 feet in diameter observed. The fill may have been placed during construction and mass grading related to the 2002 Winter Olympic infrastructure which previously occupied the area but has since been removed. Debris was not observed within the fill and it was likely sourced locally from congruent construction activity.

In TP-02, the subsurface conditions were highly variable. Beneath the 6 inches of topsoil, a thin layer of loose, moist poorly graded sand was observed. Beneath the poorly grade sand, fill consisting of medium dense, moist clayey sand or medium dense clayey gravel (varied between test pit walls) was observed to a depth of approximately 4 feet. The composition of the fill was highly variable within the test pit. Boulders up to 36 inches in diameter were observed. An apparent cast in placed reinforced concrete footing was observed in the south wall of TP-02 from 3.5 to 5.5 feet. Beneath the fill, medium dense, clayey sand was observed to a depth of 7 feet where the limited reach of the excavation equipment could not advance the test pit deeper. The clayey sand layer displayed chaotic bedding and intermixed topsoil and charred or decomposed organics. The fines portion of the clayey sand was tested to be high plasticity and the moisture was within the plastic range. This layer may represent a mass movement deposit which would

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be consistent with geologic mapping in the vicinity.

GROUNDWATER

Groundwater was not encountered in the explorations performed during this investigation. Based on SGS topographic mapping (USGS 2020), Wheeler Spring and Chicken Spring Creek are located in the vicinity of the project area. Snowbasin personnel informed IGES that the springs had been diverted and that the springs were not known to cross the area. The investigations were completed in May, which is typically the time of the year when groundwater is at or near the annual high. Groundwater conditions likely vary seasonally and annually with changes in natural and manmade precipitation, runoff, development and other atmospheric conditions.

ENVIRONMENTAL CONDITIONS

A detailing field or lab environmental characterization program was beyond the scope of this analysis. Possible indications of impacted soil including odors or soil staining were not observed in the explorations performed as part of this investigation. The absence of indications of environmental conditions does not serve as an evaluation or quantification of environmental conditions at the site.

GEOLOGIC CONDITIONS

SURFICIAL GEOLOGY

Geologic mapping by King, Yonkee and Coogan (2008) and Coogan and King (2016) shows the area in the vicinity of the site as a confluence of alluvium, colluvium, alluvial fan deposits, landslidedeposits, glacial deposits, and Wasatch Formation bedrock (see Figures A-3a and A-3b). The proposed parking area is primarily mapped as alluvium and colluvium (map unit Qac), though younger undivided alluvium (map unit Qay) is mapped along the western portion of the site and the toe ofyounger landslide and slump deposits (map unit Qmsy) are mapped across the south-central part of the site. Young alluvial fan deposits (map unit Qafy) are mapped just outside the southwestern margin of the site. Similarly, undivided mass-movement and glacial deposits (map unit Qmg) are mapped just outside of the southeastern margin of the site, and glacial outwash overlying Wasatch Formation bedrock is mapped just outside the eastern margin of the site. Select abbreviated unit descriptions from the referenced mapping are provided below.

The alluvium and colluvium (map unit Qac) is described as a Holocene and Pleistocene aged unit that "Includes stream and fan alluvium, colluvium, and, locally, mass-movement deposits; 0 to 20 feet (0-6 m) thick."

The undivided alluvium (map unit Qay) is described as a Holocene and Pleistocene aged: "Sand, silt, clay, and gravel in stream and alluvial-fan deposits; composition depends on source area; deposits lack fan shape and are distinguished from terraces based on upper surface sloping toward adjacent drainage like an alluvial fan; relative ages indicated by letter suffixes…; generally 0 to 20 feet (0-6 m) thick."

The younger landslide and slump deposits (map unit Qmsy) are described as Holocene and Pleistocene aged: "Poorly sorted clay- to boulder-sized material; locally includes flow deposits; generally characterized

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by hummocky topography, main and internal scarps, and chaotic bedding in displaced blocks; composition depends on local sources; morphology becomes more subdued with time and amount of water in deposits…; thickness highly variable, boreholes in Rogers (1986) show thicknesses of about 20 to 30 feet (6-9 m) on small slides/flows…Estimated time of emplacement indicated by relative age number and letter suffixes with: 1 - likely emplaced in the last 80 to 150 years, mostly historical; y - post- Lake Bonneville in age and mostly pre-historic; and o – likely emplaced before Lake Bonneville transgression. Suffixes y (as well as 1) and o indicate probable Holocene and Pleistocene ages, respectively…"

GEOLOGIC HAZARDS

Geologic hazard presence was reviewed based on available mapping and data compiled in the Utah Geological Survey's *Utah Geologic Hazards Portal* (UGS 2021b). The mapped hazards in the vicinity of the site are landslide and earthquake ground shaking. Snow avalanche hazard of any kind was not evaluated as part of this investigation.

Faulting

Based on the Utah Quaternary Fault and Fold Database, the closest mapped Quaternary aged fault to the project area is a trace of the Ogden Valley Southwestern Margin faults located approximately ¼ miles to the northeast (UGS, 2021a). The closest active fault to the project area is the Weber Segment of the Wasatch Fault Zone, located approximately 3.25 miles west of the site.

Landslides

Based on mapping provided by King, Yonkee and Coogan (2008), Coogan and King (2016), and the *Utah Geologic Hazards Portal* (UGS 2021b), landslide deposits are present along the south-central margin of the property, extending and to the south and upslope of the proposed parking lot. Additionally, the predominant geologic unit in the parking area (Qac) is described as containing local mass movements that are unidentifiable at map scale. Possible landslide deposits were observed in TP-2 below a depth of 4 feet below existing grade as part of this investigation, consisting of a clayey sand with fat clay fines and exhibiting pockets of topsoil and charred organic materials. Given this data, the southern portion of the project area is considered moderate to high risk for mass movements.

Ground Shaking

The proposed parking area is subject to earthquake-related ground shaking from a large earthquake generated along the active Wasatch Fault. Given the distance from the Wasatch Fault, the hazard associated with ground shaking is considered high and very strong/severe shaking is expected during a seismic event (UGS, 2021b).

DISCUSSION AND RECOMMENDATIONS

The recommendations presented in this report are based on our understanding of the preliminary project plans, the subsurface conditions observed during field exploration, the results of in-situ and laboratory

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soil testing and our engineering analyses. At the time of the exploration, details regarding the proposed above-grade construction including the arrangement, size and type of any structures was not available. It is possible that variations in the soil and groundwater conditions exist between and beyond the points explored. The nature and extent of the variations may not be evident until construction occurs, and additional explorations/excavations are completed. If subsurface conditions other than those described herein are encountered in conjunction with construction, and/or if design and layout changes are initiated, our firm should be informed so that the recommendations herein can be reviewed and revised as changes or conditions may require.

EARTHWORK RECOMMENDATIONS

Excavation Review

Due to the mapped and observed presence of mass movement deposits, it is recommended that a licensed Geologist perform a field review of conditions exposed during grading and excavation activities to identify and document possible mass movement deposits.

Site Preparation

Following rough grading of pavement and fill areas, the exposed subgrade should be reviewed by a trained technician working under a geotechnical engineer familiar with the recommendations of this report. The exposed subgrade should be proof rolled by a minimum 10-ton static soil compactor (tri-axle dump truck loaded with site soil; large water trucks or graders may also be acceptable at the discretion of the reviewer) in the presence of a trained soils technician. Yielding or otherwise unsuitable material such as; loose granular soil, soft fine-grained soil, soils containing pinholes, frozen soils, expansive soil, construction debris or waste, soils containing organics or debris laden fill should be removed in their entirety and replaced with structural fill in accordance with the recommendations of this report. Scarification, moisture conditioning and recompaction of the material may also be possible if deemed acceptable to the project geotechnical engineer. Site grading should be designed to provide positive drainage away from the proposed construction area. Positive site drainage should be maintained throughout the construction activities. Subgrade preparation and inspection requirements from governing authorities should take precedence where more stringent.

Sensitive Subgrade

During exploration activities, the subsurface conditions generally appeared to be dense/stiff based on the observed excavation effort. However, based on laboratory index testing, subgrade conditions are expected to deteriorate rapidly with prolonged exposure to moisture and/or construction disturbances. Time between final grading and construction should be minimized to reduce the risk for detrimental impacts to the subgrade. If the stability of the subgrade is compromised, it is considered unsuitable and should be removed and replaced with structural fill as described herein.

Subgrade Stabilization

If soft or loose soils are encountered, they should be removed in their entirety and replaced with compacted structural fill meeting the requirements of this report. If the depth of soft soil is impractical to remove, subgrade stabilization should be performed prior to construction of the pavement section. Subgrade stabilization could include removal of up to 12 inches of unsuitable soil and working 3 to 4-inch diameter cobbles into the subgrade to create a working surface over the exposed subgrade. Following subgrade stabilization, a separation geotextile should be placed over the stabilized subgrade to prevent intrusion of fine-grained subgrade soils into the imported fill. If required, we recommend that a separation geotextile meeting the following criteria in Table 2 be used.

Table 2: AASHTO M 288 criteria for Separation Geotextiles

Property	Criteria
Survivability	Class 2
Minimum Permittivity	0.02 sec^{-1}
Maximum AOS	0.60 mm

Geotextiles have been utilized in road construction to extend the service life and load carrying capacity of pavement sections while generally reducing rutting and overall maintenance costs. The use of a geotextile can benefit the longevity of the section by acting to prevent subgrade intrusion into the soil portion of the pavement section or penetration of base and subbase materials into soft or loose subgrade soils. Additionally, if areas of soft soils are encountered, the use of a geotextile may help bridge the soft soils to aid in compaction of imported road section materials.

Fill Materials

Fill placed for the support of pavement sections should consist of structural fill. Structural fill may consist of approved onsite soils or an approved imported granular soil. Fill materials should be accepted by the Geotechnical Engineer for the specific use of the fill. Structural fill should conform with the following requirements:

- Hard, durable particles of stone or gravel; or crushed to the specific sized and gradations; free from organic matter, clay chunks, asphalt, construction debris and other deleterious material.
- Material having plasticity index not greater than 10 when tested in accordance with ASTM D4318.
- Durability: Percentage of wear not greater than 40 percent when tested in accordance with ASTM C131.
- Conform to sizes and grade within the limits presented in Table 3 when tested in accordance with ASTM D6913.

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Table 3: Structural Fill Gradation

Particle Size	Percent Passing (%)
4 inches	100
1.5 inch	70 – 100
¾ inch	45 – 85
No. 4	20 – 60
No. 40	10 – 30
No. 200	5 – 15

Fill for material utilized within the pavement section should conform to all applicable materials and construction standards and specifications.

Fill Placement

The engineered fill material shall be placed in maximum 8-inch loose lifts. Thinner lifts may be required to achieve required compaction depending on the equipment and methods chosen by the contractor. All fill should be placed and compacted on a horizontal plane unless otherwise approved by the Geotechnical Engineer. Each lift shall be spread evenly and be thoroughly mixed during the spreading to promote uniformity of material in each lift. Material should be mechanically compacted to the required maximum dry density and optimum moisture content as indicated in Table 4. Compaction by water injection should not be permitted.

Table 4: Summary of Compaction Requirements

Backfill Area[1]	Percent of Maximum Dry Density[1]	Moisture Content at Time of Compaction
Landscaped areas	90.0	Optimum[2] ± 2.0 percent
Untreated Base Course	95.0	
Pavement Areas	95.0	

Notes:

1) As determined by ASTM D1557

Source: Compiles by IGES in 2021

Fill placed on existing fill or slopes steeper than six horizontal to one vertical (6H:1V) should be keyed and benched into firm native soil, properly compacted fill, or rock. Benches should be a minimum of 2 feet high, maximum of 4 feet high and should be wide enough to accommodate standard earthwork equipment. Keying and benching can be conducted simultaneously with placement and compaction of engineered fill.

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The minimum width of structural fill required at the bottom of footing excavations should be equal to the width of the footing plus one lateral foot for each foot of fill thickness below the footing (for example, if the footing is 4 feet wide and the fill is 1 foot deep, then the total width of granular structural fill at the bottom of the excavation should be at least 5 feet). As a minimum, granular structural fill should extend at least 6 inches beyond the base of the footing in all directions.

Oversized Material

Oversized material up to 36 inches was observed within the granular soil layers at the site. If oversized material is encountered during construction, it may be included in embankment fill or fill slopes, at the discretion of the geotechnical engineer, provided that they are placed in a manner that will not result in voids, loose soils, honeycombing or uncompacted soils. These oversized particles should not be placed within five feet of the top of any embankment, or within five feet of the outer slope of the embankment. If oversized particles are used in embankment fill as discussed above, it is imperative that the contractor place and compact fill around oversized particles in accordance with the recommendations presented in the previous paragraphs. It is likely that the contractor will be need to compact soil in 4 to 6-inch lifts with small compaction equipment within a 2-foot radius of the oversized particle.

Reuse of Onsite Material as Fill

It is currently planned to utilize material from the cut portion of the parking lot for the fill portion of the parking lot. The shallow soil at the site was observed and tested to be predominantly granular in nature and is suitable for reuse as fill. Based on laboratory compaction and representative natural moisture content testing, the material appears to be slightly above optimum water content. If the site soil is to be reused, particles larger than 6 inches in nominal diameter should be screened from the material unless the contractor can demonstrate that the material can be properly compacted with larger particles included.

The light gray-blue clay material observed in TP-02 was observed and tested to have high plasticity, high fines content, is frost susceptible, has poor pavement support characteristics, will be very difficult to work with and, in our opinion, is unsuitable to be used as structural fill. If the contractor desires to re-use these soils for specific applications on the project, they should justify the suitability of the onsite material for use as fill, outlining appropriate means and methods for moisture-conditioning and compaction of soils and receiving approval from the geotechnical engineer prior to placement. Moisture conditioning and placement of fine-grained fill will be near impossible in wetter, colder months or if the material is allowed to dry or wet excessively.

Excavation Stability

The contractor is responsible for site safety, including all temporary slopes and trenches excavated at the site and design of any required temporary shoring. The presence of cobbles may complicate the installation of sheet piles. The contractor is responsible for providing the competent person required by Occupational Safety and Health Administration (OSHA) standards to evaluate soil conditions and regularly perform excavation inspections. Based on our observations, contractors may assume *Type C* for granular soils (sand and gravel) and *Type B* for fine-grained soils (silt and clay). Sloping or benching for excavations greater than 20 feet deep shall be designed by a Professional Engineer registered in the State of Utah.

PAVEMENT RECOMMENDATIONS

Pavement Design

A flexible pavement sections was analyzed for the proposed parking lot. Based on correspondence with the project team, the parking areas will see primarily passenger car traffic with occasional large snow clearing equipment (e.g. CAT 950 with snow pusher) while the remainder of snow maintenance is accomplished with relatively light trucks. In the summer months, heavy equipment such as snow cats or shipping containers are sometimes stored in the lots. For the traffic loading, it was assumed the lot will be full with passenger cars with a 25 percent spot turnover rate (spots used by multiple vehicles in a single day) for a 150 day ski season as well as summer weekend and holidays. Several large equipment passes were assumed for each day of the ski season which is likely conservative but may also account for occasional summer construction traffic. The presence of oversized material restricted the ability to perform insitu pavement support measurements a California Bearing Ratio of 15 was utilized in the analysis. The pavement section was analyzed using the pavement design software WinPAS 12 from the American Concrete Pavement Association which uses the AASHTO 1993 flexible pavement design methodology. The recommended pavement section is presented in Table 5.

Table 5: Summary of Pavement Sections

Pavement Usage	**Minimum Layer Thickness (inches)**	
	Hot Mix Asphalt	**Untreated Base Course**
Maples Parking Areas	5	8

Notes:

Source: Compiled by IGES in 2021

Pavement Frost Protection

Frost heave should be considered as a potential major contributor to pavement distress. Typically, soil with high clay content is considered frost susceptible. Differential frost heave is possible where soil transitions between fine- and coarse-grained soil. As the static water table was not observed within the likely pavement section, the primary means of moisture in the subgrade will likely be runoff and infiltration. As a general guideline, to reduce the risk of frost heave in the pavement section, materials within the top 70 percent of the design frost depth should consist of non-frost susceptible material such as granular borrow (UDOT 2019). Based on elevation, the anticipated frost depth for this site is 42 inches. To guard against frost heave, an additional 17 inches of non-frost susceptible material should be added to the minimum recommended pavement section presented in Table 10. Based on conditions observed in our explorations, it is likely that due to the proposed grading, that much of the parking lot will be constructed on non-frost susceptible compacted engineer fill, however, if the light gray, brown clayey sand (consistent with TP-02 sample from 4 to 6 feet) is encountered within the 30 inches of the finished asphalt grade, it represents a high risk for frost damage to the pavement section. We recommend that it be considered to undercut and remove this material to approximately 30 inches below grade where it is encountered to provide uniform subgrade support conditions. The decision to construct an increased pavement section to reduce the risk of pavement damage associated with frost heave, may be made based on the budgetary and pavement performance goals of the Owner. The increased engineered fill thickness would also likely improve the performance of the pavement section.

Materials

Imported granular subbase should be a minimum AASHTO A-2-4 classification and minimum CBR of 25. UTBC should be a well graded granular material, with a minimum AASHTO A-1 classification and minimum CBR of 50. Asphalt has been assumed to be a high stability plant mix and should be compacted to a minimum of 96 percent of the Marshall maximum density before excessive cooling takes place. All materials should conform to applicable local requirements where more stringent.

DEWATERING

Due to the lack of static groundwater, it is not expected that permanent dewatering will be required for shallow excavations anticipated at this site. Depending on the season, runoff, adjacent grading and other construction near the site, local dewatering may be required. Proper grading to shed water from the pavement and carry run-on/run-off away from the perimeter will limit infiltration into the pavement section.

EXISTING UTILITIES

The presence of utilities beneath improvements could result in crushing of pipes and/or undermining of the proposed improvements. Therefore, it is recommended that any identified utilities be removed and relocated outside the proposed improvement footprint prior to construction. Utilities may also be abandoned and grouted full. If removed, the resulting excavations should be backfilled with structural fill that is placed and compacted in accordance with the recommendations of this report. If the utilities cannot be relocated outside of the proposed building area, foundations should be designed to bear at or below the invert elevations of the utility and provide a suitable offset to protect the active utilities during construction.

PROPOSED UTILITIES

Utilities proposed beath the parking area should be placed according to the applicable jurisdictional standards. Construction of utilities after asphalt has been placed may lead to increased maintenance and accelerated pavement degradation. If backfill within the pavement section is not properly compacted, premature deaggregation of the pavement may be expected.

MOISTURE PROTECTION AND DRAINAGE

During construction, over-wetting the soils prior to, during or after construction may result in softening and pumping, causing equipment mobility problems and difficulty in achieving compaction. Every effort should be taken to ensure positive drainage away from construction areas. The recommended minimum slope is two percent in pavement areas. Moisture should not be allowed to infiltrate the soils in the vicinity of, or upslope from, the construction area. Moisture should not be allowed to accumulate in the construction area.

To aid in maintaining surficial slope stability and to maintain subgrade conditions, we recommend that a water interceptor swale be constructed at the top of all engineered slopes. This swale should be designed to intercept all uphill slope drainage and divert the drainage around the slopes. The drainage should be controlled as it travels around the slopes and should be tied into the appropriate site runoff management system.

SOIL CHEMISTRY

Samples were tested for soil resistivity, soluble chloride and pH to evaluate the corrosion potential for ferrous metal in contact with onsite soil, and tested for soluble sulfates to evaluate the potential for sulfate attack of cementitious concrete. A summary of typical indicators for a soil's corrosion potential to concrete and metals is presented in the tables below.

Table 6: Sulfate Based Corrosion Potential Indicator for Concrete

Soluble Sulfates		
Range (ppm)	**Corrosion Potential**	**Recommended Cement Type**
0 – 150	Low	I, II, V
150 – 1000	Moderate	II, V
1000 – 2000	Severe	V
> 2000	Very Severe	V

Table 7: Chloride Based Corrosion Potential Indicators for Metals

Soluble Chlorides	
Range (ppm)	**Corrosion Potential**
0 – 200	Low
200 – 700	Moderate
700 – 1,500	Severe
> 1,500	Very Severe

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Table 8: Resistivity Based Corrosion Potential Indicators for Metals

Electric Resistivity	
Range (Ω-cm)	**Corrosion Potential**
> 30,000	Low or Noncorrosive
30,000 – 10,000	Mild
10,000 – 2,000	Moderate
2,000 – 500	Severe
500 – 0	Very Severe

Additionally, a pH greater than 9 or less than 5 may indicate a problem soil. The completed results of the corrosion testing for soils along with the associated corrosion potentials are presented in Table 9 and in Appendix B.

Table 9: Corrosion Potential Indicator Testing Summary

Sample		Corrosion Potential Indicator		
Exploration	**Depth (ft)**	**Sulfate Potential**	**Chloride Potential**	**Electrical Resistivity**
TP-02	4 – 6	17.9	6.65	683
TP-04	1 – 3	12.5	11.9	5391

Notes:

Source: Compiled by IGES in 2021

Based on limited testing, site soils exhibit a low potential for sulfate attack to concrete and a low to moderate potential for chloride attack to steel. Resistivity testing results indicated that the soils at the site are moderately to severely corrosive to steel. pH testing results ranged between 7.98 and 8.13 which is within the range of typically expected values for soil.

Corrosion protection based on the above results should be considered for any buried elements of the proposed project including the use of specialized coatings and sacrificial steel thicknesses depending on the nature and criticality of the specific element. Designers of structures with steel reinforcement should consider the corrosive nature of site soils in design. Where it is not practicable to minimize the use of buried steel, we recommend that a qualified corrosion engineer be consulted for any metals that are to be embedded at the site.

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CONSTRUCTION OBSERVATIONS AND APPROVAL

Our geotechnical design recommendations are based on a limited site investigation and laboratory testing. Depending on subsurface conditions encountered during construction, field adjustments to subgrade preparation recommendations contained in this report may be required. We recommend that adequately trained personnel observe geotechnical construction aspects of the project for compliance with design concepts, specifications, and recommendations, and to assist in development of design changes should subsurface conditions differ from those anticipated. Specifically, subgrade preparation for all foundation and pavement areas should be observed by IGES to determine if additional over excavation is required prior to placement of structural fills and concrete.

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CLOSURE AND LIMITATIONS

The concept of risk is a significant consideration of geotechnical analyses. The analytical means and methods used in performing geotechnical analyses and development of resulting recommendations do not constitute an exact science. Analytical tools used by geotechnical engineers are based on limited data, empirical correlations, engineering judgment, and experience. As such, the solutions and resulting conclusions and recommendations presented in this report cannot be considered risk-free and constitute IGES's best professional opinions and recommendations based on the available data and other design information available at the time they were developed. IGES has developed the preceding analyses, recommendations and opinions, at a minimum, in accordance with generally accepted professional geotechnical engineering practices and care being exercised in the project area at the time our services were performed. No warrantees, guarantees or other representations are made.

The information contained in this report is based on limited field data and understanding of the project, it is possible for conditions to vary between and beyond the points explored. Such variations may not be observed until construction excavations are initiated. If any conditions are encountered at this site that are different from those described in this report, IGES must be immediately notified so that we may make any necessary revisions to recommendations and opinions contained in this report. In addition, if the scope of the proposed construction or grading changes from those described in this report, our firm must also be notified.

This report was prepared for our client's exclusive use on the project identified in the foregoing. Use of the data, recommendations, opinions or design information contained herein for any other project or development of the site not as specifically described in this report is at the user's sole risk and without the approval of IGES, Inc. It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc. are made aware of this report in its entirety.

We recommend that IGES be retained to review the final design plans, grading plans and specifications to determine if our engineering recommendations have been properly incorporated in the project development documents. We also recommend that IGES be retained to evaluate, construction performance and other geotechnical aspects of the projects as construction initiates, continues and progresses through its completion

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please do not hesitate to contact us at your convenience.

Respectfully submitted,

IGES, Inc.

11378954
BRIAN THOMAS LOWE

05/20/202
Brian Lowe, P.E.

Staff Engineer

Reviewed by,

Jared Hawes, P.E.

Senior Engineer, Project Manager

Attachments:

Appendix A

Figure A-1	Site Vicinity Map
Figure A-2	Site Exploration Map
Figure A-3a to A-3b	Geologic Maps
Figures A-4 to A-7	Test Pit Logs
Figures A-8	Key to Soil Symbols and Terminology
	DCP Test Results

Appendix B

	Lab Results

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REFERENCES

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U.S. Geological Survey (USGS). 1969. Topographic Map of the Snow Basin, UT 7.5-minute quadrangle.

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APPENDIX A

BASE IMAGE:
Utah AGRC Aerial Imagery 2018

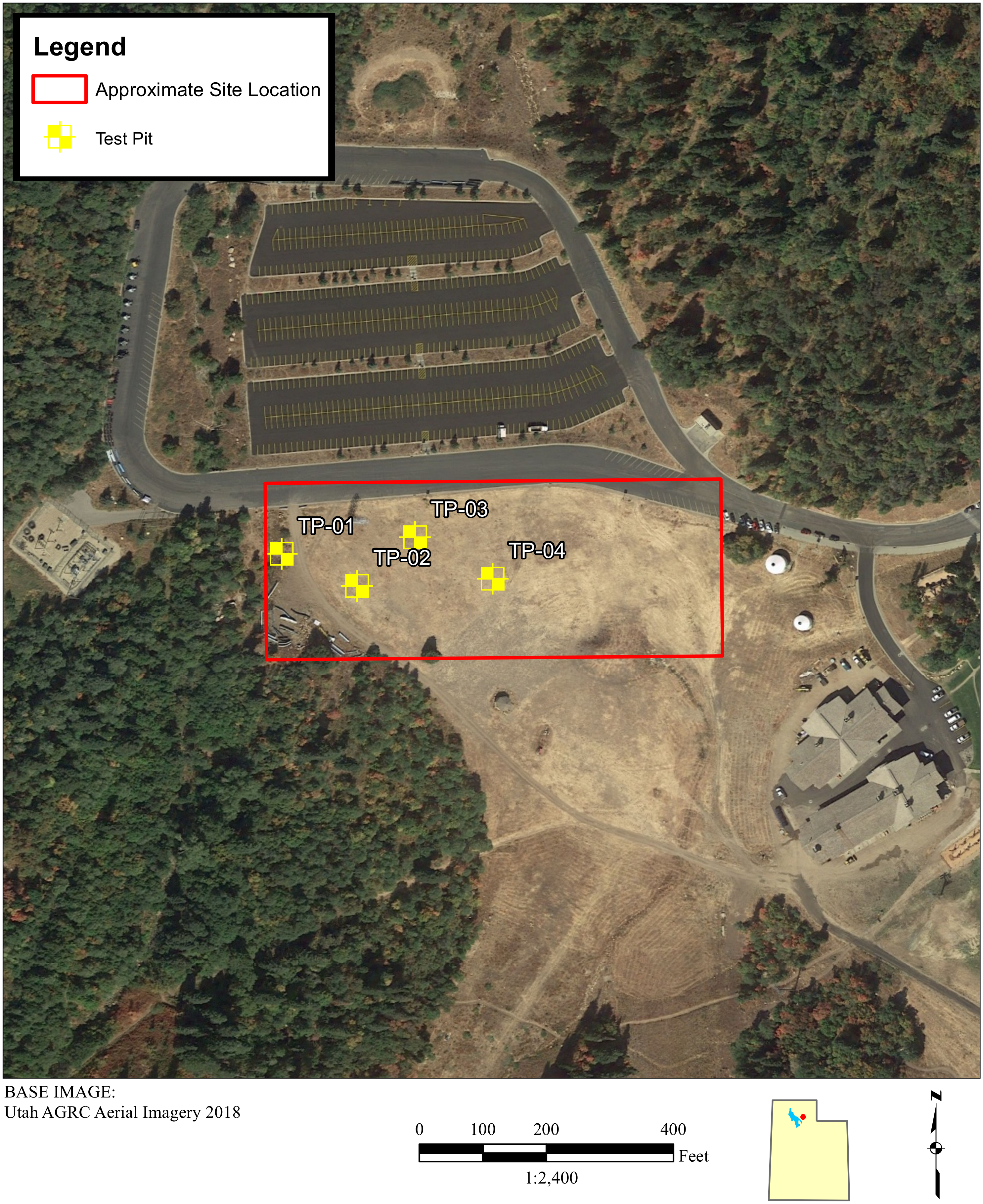
Project Number - 02284-002

Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah

SITE VICINITY MAP

FIGURE

A-1



BASE IMAGE:
Utah AGRC Aerial Imagery 2018

IGES

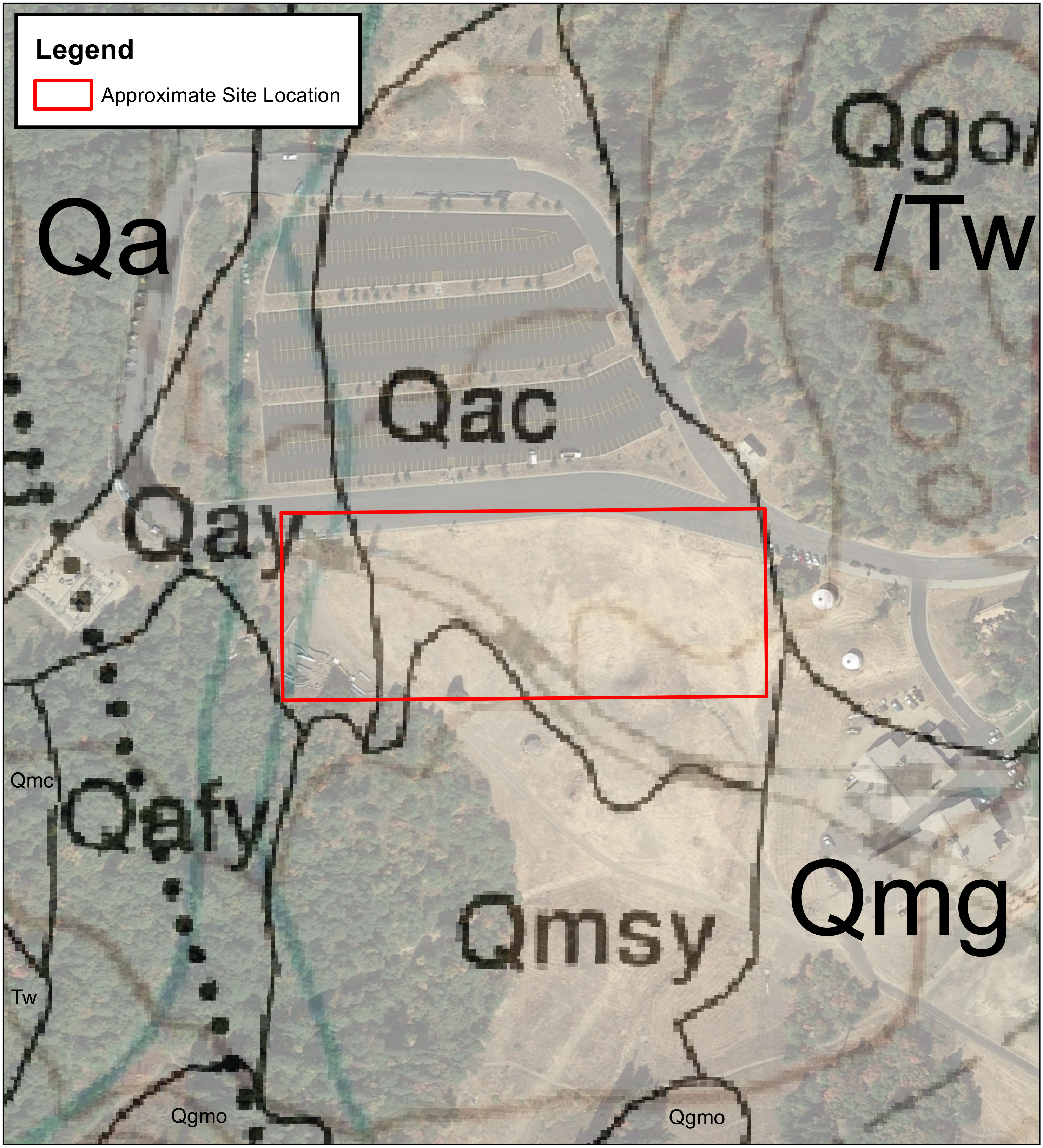
Project Number - 02284-002

Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah

SITE EXPLORATION MAP

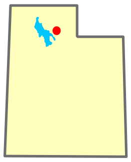
FIGURE

A-2



BASE IMAGE:
Utah AGRC Aerial Imagery 2018
OVERLAY:
King, Yonkee, and Coogan (2008)

0 100 200 400
Feet
1:2,400



N

Project Number - 02284-002

Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah

GEOLOGIC MAP

FIGURE

A-3a

MAP LEGEND

Qafl, Qafy

Younger alluvial-fan deposits (Holocene and uppermost Pleistocene) - Mostly sand, silt, and gravel that is poorly bedded and poorly sorted; includes debris flows, particularly in drainages and at drainage mouths (fan heads); generally less than 40 feet (12 m) thick. Near late Pleistocene Lake Bonneville, deposits with suffixes 1 and y are younger than Lake Bonneville (mostly Holocene), are active, and impinge on present-day drainages like the Weber River and Cottonwood Creek; Qafy fans may be partly older than Qafl fans, and may be as old as uppermost Pleistocene Provo shoreline.

Qa, Qay, Qap, Qab, Qao

Alluvium, undivided (Holocene and Pleistocene) - Sand, silt, clay, and gravel in stream and alluvial-fan deposits; composition depends on source area; deposits lack fan shape and are distinguished from terraces based on upper surface sloping toward adjacent drainage like an alluvial fan; relative ages indicated by letter suffixes; Qa with no suffix used where age uncertain or alluvium of different ages cannot be shown separately at map scale; generally 0 to 20 feet (0-6 m) thick, but Qap is up to about 50 feet (15 m) thick.

Near late Pleistocene Lake Bonneville, alluvium labeled y is mostly Holocene in age; alluvial deposits labeled Qap and Qab are graded to the Provo and Bonneville shorelines, respectively; here, letter o suffix means the alluvium is older than Lake Bonneville. Elsewhere relative-age letters y and o only apply to local drainages. In this and adjacent quadrangles, ages of alluvium, including terraces and fans, are partly based on heights above present drainages (table 1); here Qay is about 15 to 20 feet (5-6 m) above, Qap is about 25 to 45 feet (8-14 m) above, and Qab is 50 to 90 feet (15-27 m) above; Qao is 100 to 145 feet (30-45 m) above present drainages and is likely the same age as Qafo (300-600 ka).

A prominent surface ("bench") is present on Qap at about 4900 feet (1494 m) along the South Fork of the Ogden River and along the Weber River in Morgan Valley (Snow Basin, Peterson, Durst Mountain, and Morgan quadrangles), about 25 to 40 feet (8-14 m) above the Weber River, with the Provo shoreline at elevations of 4800 to 4840 feet (1463-1475 m) near the head of Weber Canyon and in uppermost Ogden Canyon, respectively.

Qgo, Qgmo, Qgao

Older glacial till and outwash (middle[?] Pleistocene) - Mapped down drainage from and locally laterally above Pinedale deposits as undivided (Qgo), till in distinct vegetated moraines (Qgmo), and outwash (Qgao); see differences under undivided and younger glacial units; mapped moraines have well-developed soil and subdued moraine morphology (BL and possibly m5 moraine crests); likely Bull Lake age (~110,000 to 150,000 yrs old; see for example Chadwick and others, 1997, and Phillips and others, 1997); 0 to 150? feet (0-45? m) thick.

Deposits in Maples area are much farther from cirques that any other deposits and might be related to Kansan continental glaciation (300-400 ka) (Pokes Point lake cycle, >200 ka - McCoy, 1987), or be some pre-Pokes Point glaciation (possibly Nebraskan continental glaciation, >500 ka; or Sacagawea Ridge age, ~600 ka - Chadwick and others, 1997) (see also Phillips and others, 1997). Qgo near Strawberry Bowl base lodge seems to "lie on" Qafoe, so could be pre Pokes Point or unit is Qafo rather than Qafoe.

Qms, Qms1, Qmsy, Qmso

Landslide and slump deposits (Holocene and Pleistocene) - Poorly sorted clay- to boulder-sized material; locally includes flow deposits; generally characterized by hummocky topography, main and internal scarps, and chaotic bedding in displaced blocks; composition depends on local sources; morphology becomes more subdued with time and amount of water in deposits; Qms may be in contact with Qms when two different slide/slumps abut; locally, unit involved in slide/slump is shown in parentheses where a nearly intact block is visible; Qms and Qmso queried (?) where bedrock block may be in place; thickness highly variable, boreholes in Rogers (1986) show thicknesses of about 20 to 30 feet (6-9 m) on small slides/flows.

Qms without suffix is mapped where age uncertain (though likely Holocene and/or upper Pleistocene), where portions of slide/slump complexes have different ages but cannot be shown separately at map scale, or where boundaries between slides/slumps of different ages are not distinct. Estimated time of emplacement indicated by relative-age number and letter suffixes with: 1 - likely emplaced in the last 80 to 150 years, mostly historical; y - post- Lake Bonneville in age and mostly pre-historic; and o - likely emplaced before Lake Bonneville transgression. Suffixes y (as well as 1) and o indicate probable Holocene and Pleistocene ages, respectively. Qmso typically mapped where rumpled morphology typical of mass movements has been diminished and/or younger surficial deposits cover or cut Qmso. These older deposits are as unstable as other landslides and slumps, and are easily reactivated with the addition of water, be it irrigation or septic tank drain fields.

Qmc Landslide and slump, and colluvial deposits, undivided (Holocene and Pleistocene) - Mapped where landslides and slumps are difficult to distinguish from colluvium (slopewash and soil creep) and where mapping separate, small, intermingled areas of slides and slumps, and colluvial deposits is not possible at map scale; locally includes talus and debris flows; typically mapped where landslides and slumps are thin ("shallow"); also mapped where the blocky or rumpled morphology that is characteristic of landslides and slumps has been diminished ("smoothed") by slopewash and soil creep; composition depends on local sources; 0 to 40 feet (0-12 m) thick. These deposits are as unstable as other landslides and slumps units (Qms_).

Qmg Mass-movement and glacial deposits, undivided (Holocene and Pleistocene) - Mapped where glacial deposits lack typical moraine morphology, and appear to have failed and moved down slope; also mapped in upper Strawberry Bowl where glacial deposits have lost their distinct morphology and the contacts between them and colluvium and talus in the cirques cannot be mapped; likely less than 30 feet (9 m) thick.

Qac Alluvium and colluvium (Holocene and Pleistocene) - Includes stream and fan alluvium, colluvium, and, locally, mass-movement deposits; 0 to 20 feet (0-6 m) thick.

Tw Wasatch Formation (Eocene and uppermost Paleocene) - Typically red-weathering conglomerate, as well as lesser sandstone, siltstone, and mudstone; clasts typically rounded and from Precambrian and Paleozoic rocks; lighter shades of red, yellow/tan, and light gray more common in upper Wasatch near contact with Norwood; basal conglomerate less likely to be red since dominated by locally derived material, with clasts of lower Paleozoic carbonates in the Maples area, and Precambrian crystalline rocks and Cambrian Tintic Quartzite west of Strawberry Creek; Wasatch knob on east margin of Snow Basin quadrangle is light-gray to brownish-gray, variably cemented conglomerate that contains angular pebble-sized Tintic clasts; thickness varies due to relief on basal and overlying erosional surfaces; thickness uncertain, in the Snow Basin quadrangle about 560 feet (170 m) exposed west of Strawberry Creek, additional estimated (partially exposed) 750 feet (230 m) east of creek may be fault repetition; on opposite (east) side of Morgan Valley in southeast Morgan quadrangle and southwest Devils Slide quadrangle, total thickness estimated by King as 5000 to 6000 feet (1500-1800 m), based on dip (20-

BASE IMAGE:
King, Yonkee, and Coogan (2008)

IGES

Project Number - 02284-002

Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah

GEOLOGIC MAP

FIGURE

A-3b

DATE	
STARTED:	5/5/21
COMPLETED:	5/5/21
BACKFILLED:	5/5/21

Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah

Project Number 02284-002

IGES Rep: BTL
Rig Type: Bobcat ZTS

TEST PIT NO:
TP-01
Sheet 1 of 1

LOCATION
LATITUDE 41.21677° LONGITUDE -111.86252° ELEVATION 6,339 ft
Elevation estimated based on ecosign drawings

ELEVATION	DEPTH FEET	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
	0				TOPSOIL - Silty Gravel - loose, moist, brown - gravel up to 3 inches, fine to coarse sand, grass roots					
				GP-GC	POSSIBLE FILL with sand - Poorly Graded GRAVEL with clay and sand - medium dense, moist, brown - gravel up to 3 inches, fine to coarse sand, lean clay fines					
	1									
				GP-GC	POSSIBLE FILL with sand- 50 percent of unit 12 to 24 inches boulders with Poorly Graded GRAVEL with clay and sand matrix - medium dense, moist, light brown, brown - fine sand, lean clay fines					
	2									
	3	▯					7.3	9.6	34	13
6335	4									
	5				- Groundwater not observed - Backfilled with excavated material					
	6									
	7									
	8									
6330	9									

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content ● — Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
▯ - GRAB SAMPLE
▮ - 3" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
▼- MEASURED
▽- ESTIMATED

NOTES:
- Latitude and longitude estimated

Figure
A-4

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DATE	
STARTED:	5/5/21
COMPLETED:	5/5/21
BACKFILLED:	5/5/21

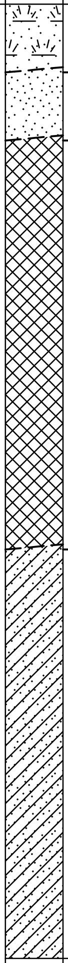
Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah

Project Number 02284-002

IGES Rep: BTL
Rig Type: Bobcat ZTS

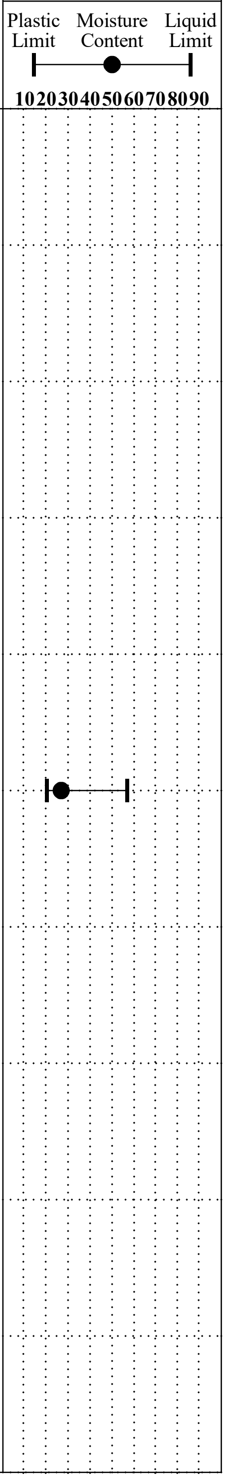
TEST PIT NO:
TP-02
Sheet 1 of 1

LOCATION
LATITUDE 41.21664° LONGITUDE -111.86209° ELEVATION 6,351 ft
Elevation estimated based on ecosign drawings



DEPTH ELEVATION	DEPTH FEET	SAMPLES	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
	0			TOPSOIL - Clayey GRAVEL - medium dense, moist, brown - grassroots					
			SP	FILL - Poorly Graded SAND - loose, moist, light brown-orange - medium sand					
6350	1		SC GC	FILL - Intermixed Clayey SAND - medium dense, moist, gray, brown mottled OR Clayey GRAVEL with sand - medium dense, moist, brown - 20 percent of unit boulders up to 36 inches, lean clay fines					
	2	▯							
	3			-Apparent reinforced concrete footing from ~3.5 to 5.5 feet on south wall of test pit. Appears to have been cut off below grade, rebar dowels bent and abandoned.					
	4	▯	SC	POSSIBLE FILL or LANDSLIDE - Clayey SAND - medium dense, moist, light gray, brown, light brown, pale red mottled - fat clay fines, charred organics up to 1 inch, decomposed wood up to 6 inches, brown topsoil intermixed, preserved grass roots, trace gravel					
	5					26.7	46.9	57	37
6345	6								
	7			- Groundwater not observed - Backfilled with excavated material					
	8								
	9								

Moisture Content and Atterberg Limits



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SAMPLE TYPE
▯ - GRAB SAMPLE
▮ - 3" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
▼ - MEASURED
▽ - ESTIMATED

NOTES:
- Latitude and longitude estimated

Figure
A-5

DATE		
STARTED:	5/5/21	
COMPLETED:	5/5/21	
BACKFILLED:	5/5/21	

Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah

Project Number 02284-002

IGES Rep: BTL
Rig Type: Bobcat ZTS

TEST PIT NO:
TP-03
Sheet 1 of 1

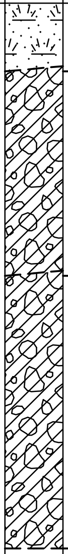
LOCATION
LATITUDE 41.21687° LONGITUDE -111.86176° ELEVATION 6,345 ft
Elevation estimated based on ecosign drawings

MATERIAL DESCRIPTION

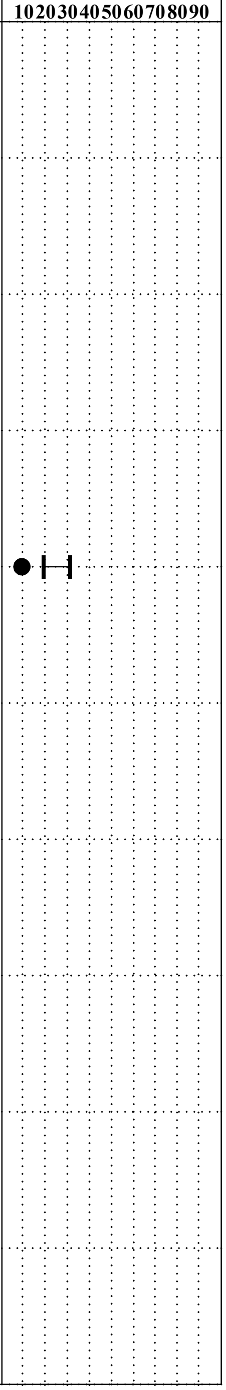
DEPTH (FEET)	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0		TOPSOIL - Silty GRAVEL - dense, moist, dark brown - gravel up to 6 inches, grass roots					
0.5	GC	POSSIBLE FILL - Clayey GRAVEL with sand - dense, moist, dark brown - infrequent organics, lean clay fines					
2	GC	POSSIBLE FILL - Clayey GRAVEL with sand - very dense, moist, brown - 30 percent of unit boulders up to 18 inches, lean clay fines					
3					29.6		
4				9.1		31	12

- Groundwater not observed
- Backfilled with excavated material

ELEVATION: 6340 (at 5 ft), 6335 (at 10 ft)
SAMPLES: grab sample from 3.5 to 4 ft



Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit



SAMPLE TYPE
▯ - GRAB SAMPLE
▮ - 3" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
▼- MEASURED
▽- ESTIMATED

NOTES:
- Latitude and longitude estimated

Figure
A-6

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DATE	
STARTED:	5/5/21
COMPLETED:	5/5/21
BACKFILLED:	5/5/21

Geotechnical Investigation
Maples Parking Lot
Snowbasin Resort
Huntsville, Utah

Project Number 02284-002

IGES Rep: BTL
Rig Type: Bobcat ZTS

TEST PIT NO:
TP-04
Sheet 1 of 1

LOCATION
LATITUDE 41.21676° LONGITUDE -111.86131° ELEVATION 6,354 ft
Elevation estimated based on ecosign drawings

DEPTH FEET	ELEVATION	SAMPLES	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0				TOPSOIL - Silty GRAVEL - dense, moist, brown - gravel up to 2 inches, grass roots					
0.5			SC	POSSIBLE FILL - Clayey SAND with gravel - dense, moist, brown - gravel up to 2 inches, grass roots, lean clay fines					
1		GRAB SAMPLE (1–3 ft)	SC	POSSIBLE FILL - Clayey SAND with gravel - dense, moist, light brown, gray - 20 percent of unit boulders up to 24 inches, lean clay fines					
2						9.5	33.1	28	11
3									
4	6350								
5									
6				- Groundwater not observed - Backfilled with excavated material					
7									
8									
9	6345								

Moisture Content and Atterberg Limits
Plastic Limit ⊢ Moisture Content ● Liquid Limit ⊣
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 3" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:
- Latitude and longitude estimated

Figure
A-7

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UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

LOG KEY SYMBOLS

⊕	BORING SAMPLE LOCATION	◧	TEST-PIT SAMPLE LOCATION
▼	WATER LEVEL (level after completion)	▽	WATER LEVEL (level where first encountered)

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKELY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
SLIGHTLY MOIST	CONTAINING A MINIMAL AMOUNT OF MOISTURE, NOT DRY OR DAMP
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16-1/2"
LAYER	1/2-12"

DESCRIPTION	THICKNESS
OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATE 12" WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNTRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

APPENDIX B

Water Content and Unit Weight of Soil

(In General Accordance with ASTM D7263 Method B and D2216)

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Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: JWB/JAB

Sample Info.	Boring No.	TP-1	TP-02	TP-03	TP-04				
	Sample								
	Depth	3.0'	4-6'	4.0'	1-3'				
	Split	Yes	Yes	Yes	Yes				
	Split sieve	3/8"	3/8"	3/8"	3/8"				
	Total sample (g)	1824.32	2397.92	3317.67	3429.35				
	Moist coarse fraction (g)	824.65	112.32	958.75	653.26				
	Moist split fraction (g)	999.67	2285.60	2358.92	2776.09				
	Sample height, H (in)								
	Sample diameter, D (in)								
	Mass rings + wet soil (g)								
	Mass rings/tare (g)								
	Moist unit wt., γ_m (pcf)								
Coarse Fraction	Wet soil + tare (g)	1000.28	261.15	1209.98	813.40				
	Dry soil + tare (g)	981.02	259.09	1195.31	805.66				
	Tare (g)	126.99	140.30	168.11	121.86				
	Water content (%)	2.3	1.7	1.4	1.1				
Split Fraction	Wet soil + tare (g)	417.17	355.54	422.19	439.94				
	Dry soil + tare (g)	385.84	304.83	389.25	407.50				
	Tare (g)	120.86	124.97	127.93	128.51				
	Water content (%)	11.8	28.2	12.6	11.6				
	Water Content, w (%)	**7.3**	**26.7**	**9.1**	**9.5**				
	Dry Unit Wt., γ_d (pcf)								

Entered by:___________

Reviewed:___________

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2021

Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-01
Sample:
Depth: 3.0'
Description: Dark brown lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved
Approximate maximum grain size: 1"
Estimated percent retained on No.40: See Particle Size Distribution
As-received water content (%): 7.3

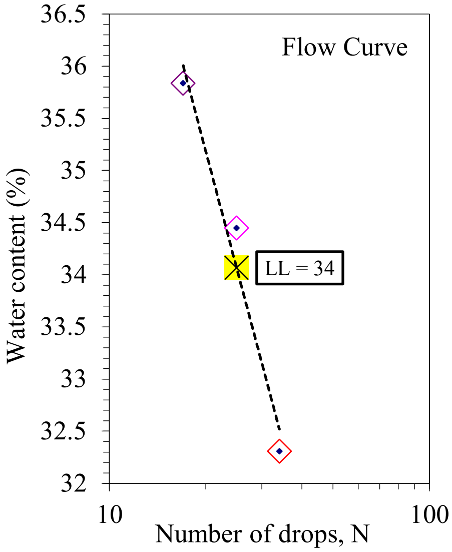
Plastic Limit

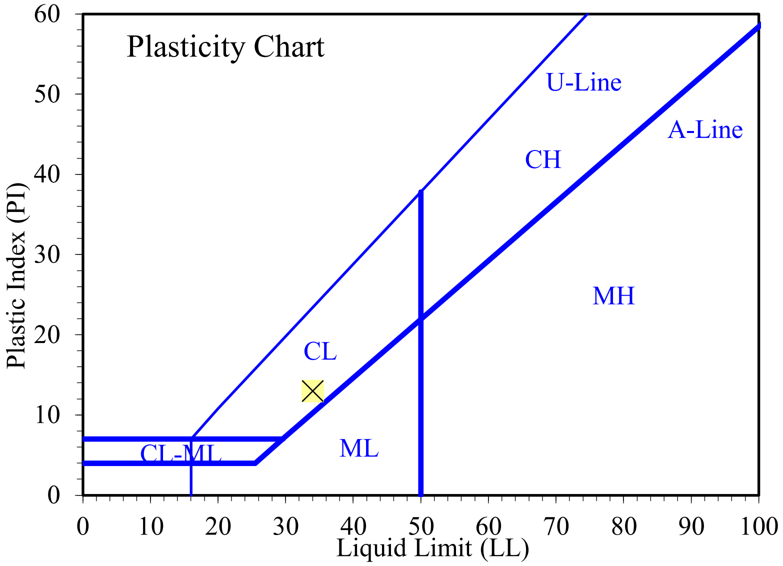
Determination No	1	2				
Wet Soil + Tare (g)	13.33	14.70				
Dry Soil + Tare (g)	12.26	13.49				
Water Loss (g)	1.07	1.21				
Tare (g)	7.10	7.53				
Dry Soil (g)	5.16	5.96				
Water Content, w (%)	20.74	20.30				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	34	25	17			
Wet Soil + Tare (g)	13.00	12.72	13.68			
Dry Soil + Tare (g)	11.53	11.28	12.01			
Water Loss (g)	1.47	1.44	1.67			
Tare (g)	6.98	7.10	7.35			
Dry Soil (g)	4.55	4.18	4.66			
Water Content, w (%)	32.31	34.45	35.84			
One-Point LL (%)		34				

Liquid Limit, LL (%)	**34**
Plastic Limit, PL (%)	**21**
Plasticity Index, PI (%)	**13**





Entered by:____________
Reviewed:____________

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: BRR

Boring No.: TP-02
Sample:
Depth: 4-6'
Description: Brown fat clay

Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved
Approximate maximum grain size: 1"
Estimated percent retained on No.40: See Particle Size Distribution
As-received water content (%): 26.7

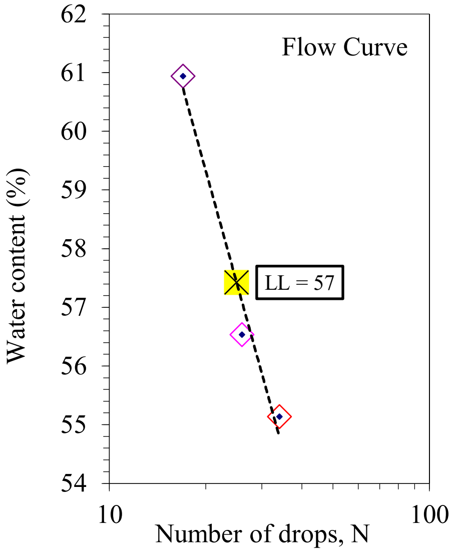
Plastic Limit

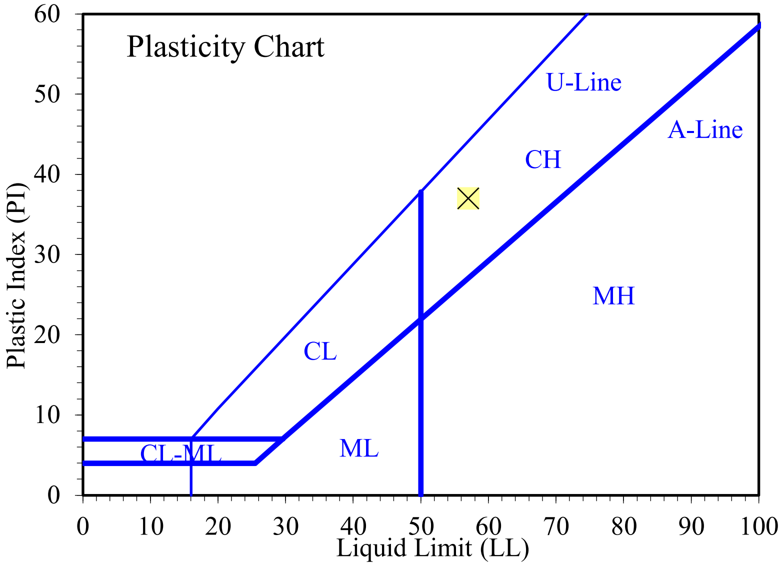
Determination No	1	2				
Wet Soil + Tare (g)	13.31	14.31				
Dry Soil + Tare (g)	12.29	13.14				
Water Loss (g)	1.02	1.17				
Tare (g)	7.11	7.35				
Dry Soil (g)	5.18	5.79				
Water Content, w (%)	19.69	20.21				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	34	26	17			
Wet Soil + Tare (g)	13.69	13.65	14.24			
Dry Soil + Tare (g)	11.49	11.53	11.65			
Water Loss (g)	2.20	2.12	2.59			
Tare (g)	7.50	7.78	7.40			
Dry Soil (g)	3.99	3.75	4.25			
Water Content, w (%)	55.14	56.53	60.94			
One-Point LL (%)		57				

Liquid Limit, LL (%)	**57**
Plastic Limit, PL (%)	**20**
Plasticity Index, PI (%)	**37**





Entered by:____________
Reviewed:____________

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-03
Sample:
Depth: 4.0'
Description: Dark brown lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved
Approximate maximum grain size: 1-1/2"
Estimated percent retained on No.40: See Particle Size Distribution
As-received water content (%): 9.1

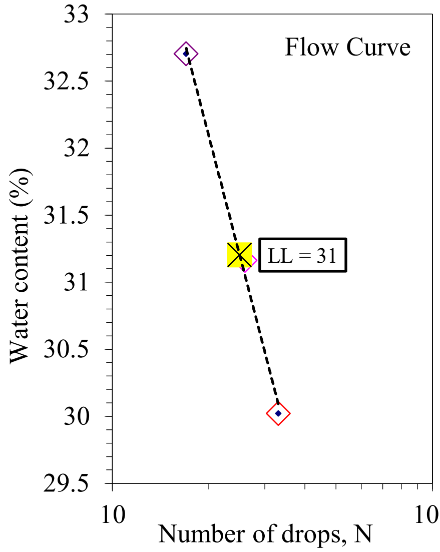
Plastic Limit

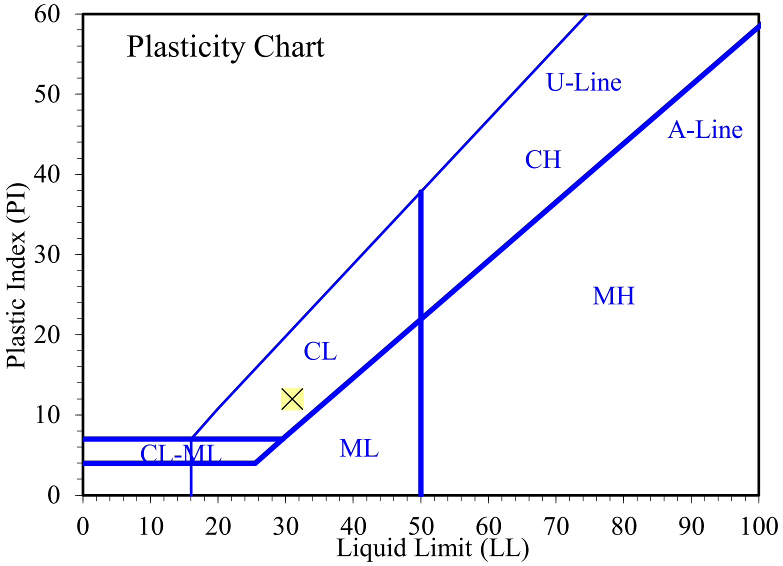
Determination No	1	2				
Wet Soil + Tare (g)	13.70	13.88				
Dry Soil + Tare (g)	12.63	12.77				
Water Loss (g)	1.07	1.11				
Tare (g)	7.10	7.07				
Dry Soil (g)	5.53	5.70				
Water Content, w (%)	19.35	19.47				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	33	26	17			
Wet Soil + Tare (g)	13.12	15.20	14.75			
Dry Soil + Tare (g)	11.73	13.43	13.02			
Water Loss (g)	1.39	1.77	1.73			
Tare (g)	7.10	7.75	7.73			
Dry Soil (g)	4.63	5.68	5.29			
Water Content, w (%)	30.02	31.16	32.70			
One-Point LL (%)		31				

Liquid Limit, LL (%)	**31**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**12**





Entered by:____________
Reviewed:____________

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-04
Sample:
Depth: 1-3'
Description: Dark brown lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved
Approximate maximum grain size: 1-1/2"
Estimated percent retained on No.40: See Particle Size Distribution
As-received water content (%): 9.5

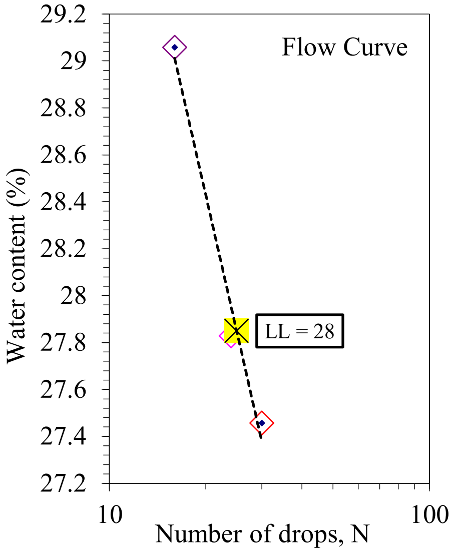
Plastic Limit

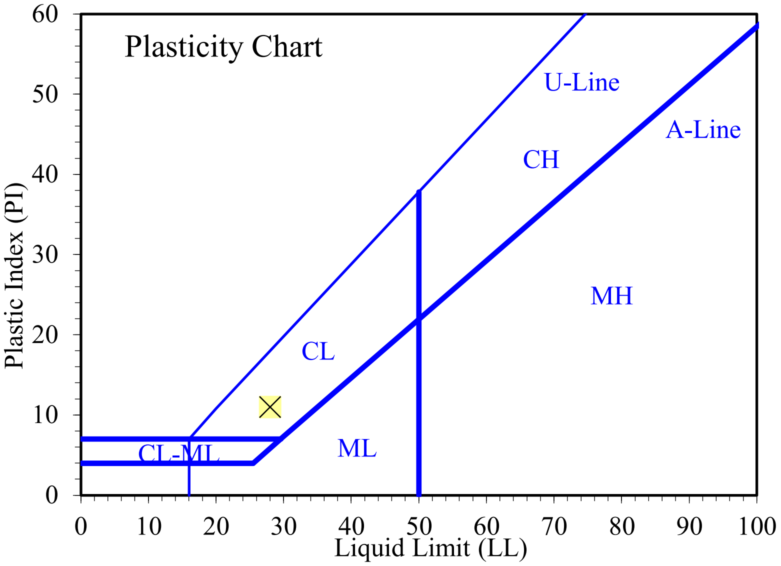
Determination No	1	2				
Wet Soil + Tare (g)	14.18	14.38				
Dry Soil + Tare (g)	13.17	13.34				
Water Loss (g)	1.01	1.04				
Tare (g)	7.38	7.30				
Dry Soil (g)	5.79	6.04				
Water Content, w (%)	17.44	17.22				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	24	16			
Wet Soil + Tare (g)	15.15	14.85	15.47			
Dry Soil + Tare (g)	13.53	13.30	13.68			
Water Loss (g)	1.62	1.55	1.79			
Tare (g)	7.63	7.73	7.52			
Dry Soil (g)	5.90	5.57	6.16			
Water Content, w (%)	27.46	27.83	29.06			
One-Point LL (%)	28	28				

Liquid Limit, LL (%)	**28**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**11**





Entered by:___________
Reviewed:___________

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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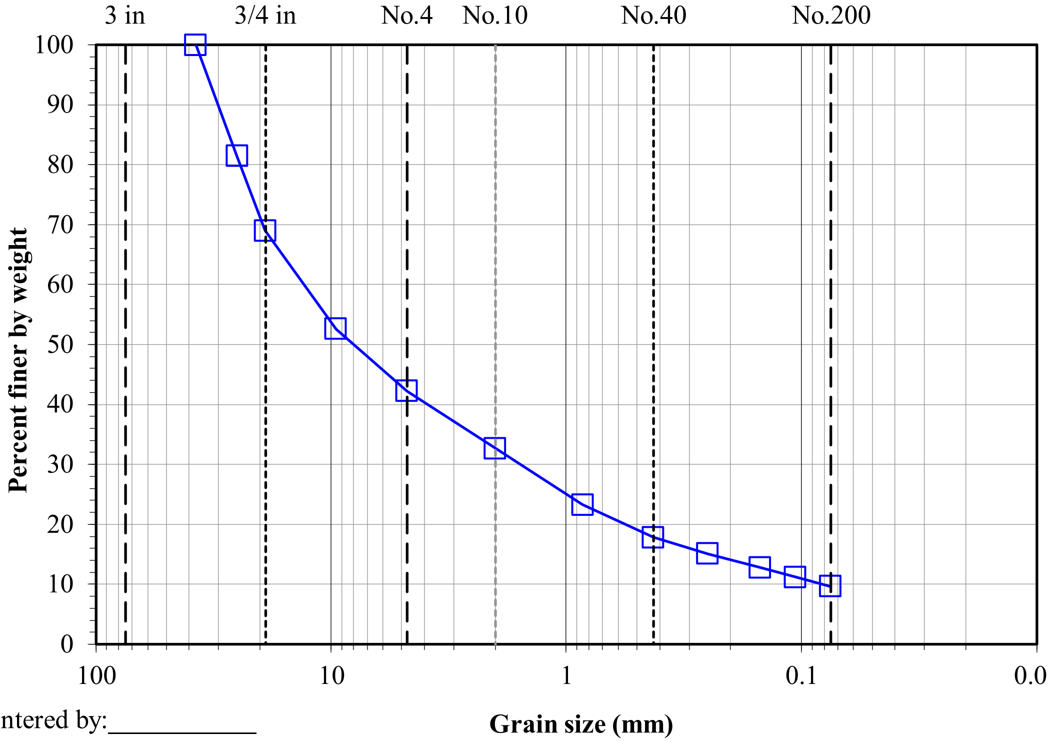
Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: JAB

Boring No.: TP-01
Sample:
Depth: 3.0'
Description: Dark brown gravel with clay and sand

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	1824.32	1700.43
+3/8" Coarse fraction (g):	824.65	806.46
-3/8" Split fraction (g):	296.31	264.98
Split fraction:	0.526	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	1000.28	417.17
Dry soil + tare (g):	981.02	385.84
Tare (g):	126.99	120.86
Water content (%):	2.3	11.8

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	315.60	25	81.4	
3/4"	527.10	19	69.0	
3/8"	806.46	9.5	52.6	←Split
No.4	52.13	4.75	42.2	
No.10	100.46	2	32.6	
No.20	147.83	0.85	23.2	
No.40	175.22	0.425	17.8	
No.60	188.84	0.25	15.1	
No.100	200.48	0.15	12.8	
No.140	208.70	0.106	11.2	
No.200	216.48	0.075	9.6	



Gravel (%): 57.8
Sand (%): 32.6
Fines (%): 9.6

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:___________
Reviewed:___________

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: JWB

Boring No.: TP-02
Sample:
Depth: 4-6'
Description: Brown clayey sand

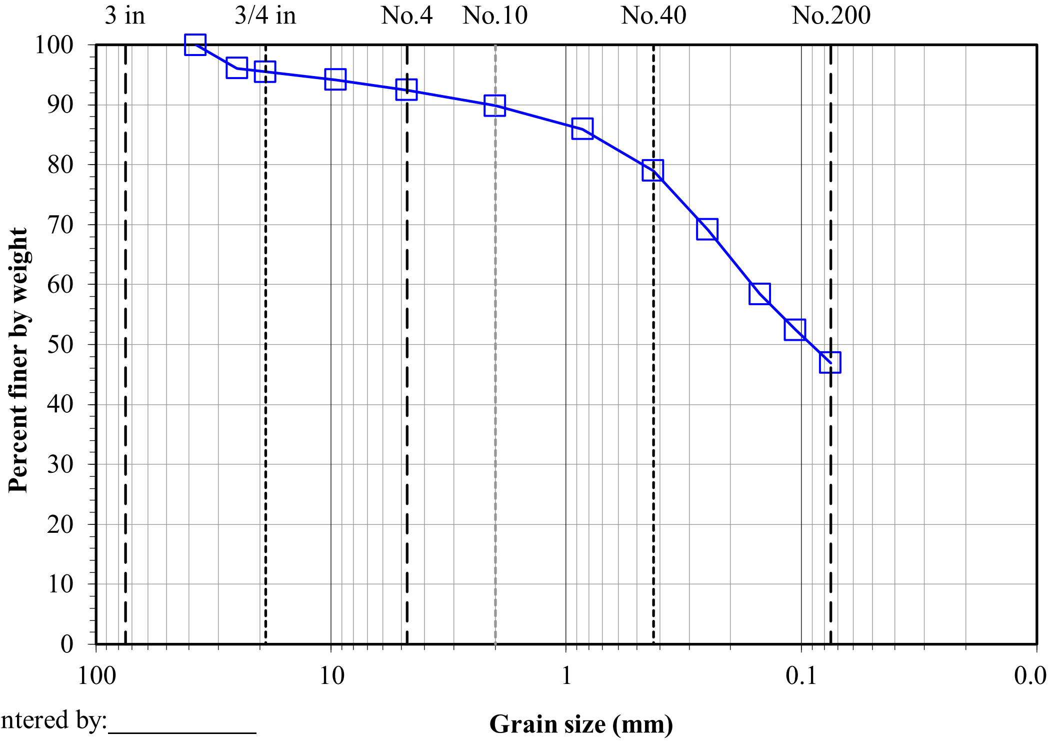
Split: Yes
Split sieve: 3/8"

	Moist	Dry
Total sample wt. (g):	2397.92	1893.33
+3/8" Coarse fraction (g):	112.32	110.41
-3/8" Split fraction (g):	230.57	179.86

Split fraction: 0.942

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	261.15	355.54
Dry soil + tare (g):	259.09	304.83
Tare (g):	140.30	124.97
Water content (%):	1.7	28.2

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	74.73	25	96.1	
3/4"	85.89	19	95.5	
3/8"	110.41	9.5	94.2	←Split
No.4	3.30	4.75	92.4	
No.10	8.30	2	89.8	
No.20	15.75	0.85	85.9	
No.40	29.00	0.425	79.0	
No.60	47.83	0.25	69.1	
No.100	68.26	0.15	58.4	
No.140	79.71	0.106	52.4	
No.200	90.21	0.075	46.9	



Gravel (%): 7.6
Sand (%): 45.5
Fines (%): 46.9

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:___________
Reviewed:___________

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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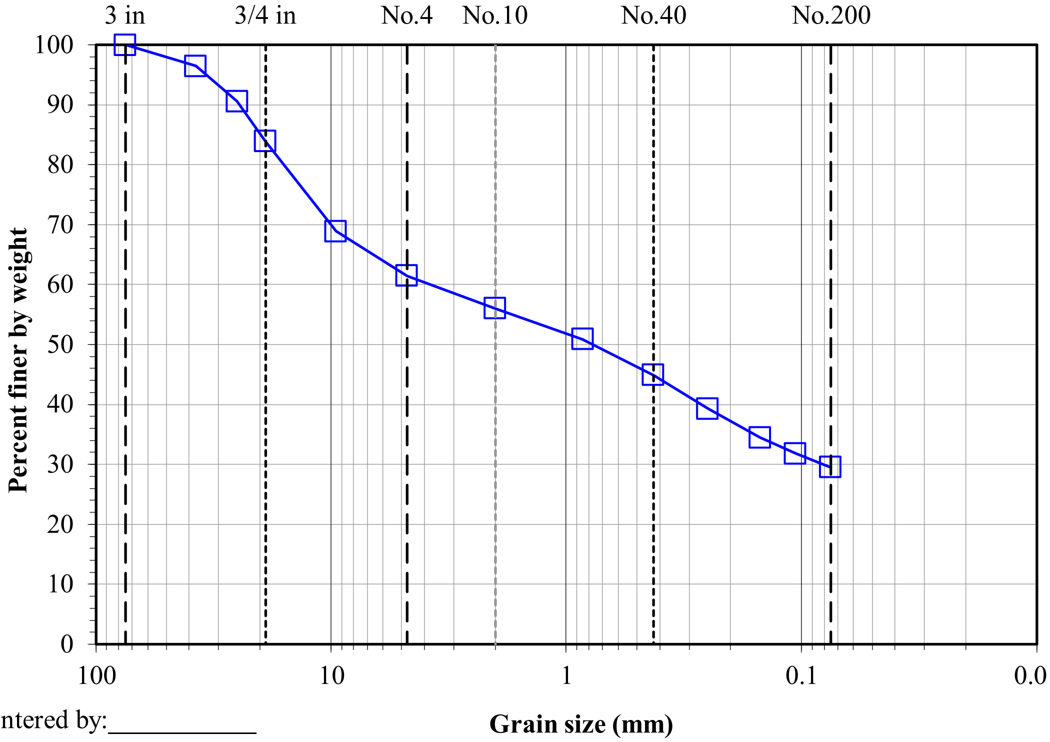
Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: JAB

Boring No.: TP-03
Sample:
Depth: 4.0'
Description: Dark brown clayey gravel with sand

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	3317.67	3040.11
+3/8" Coarse fraction (g):	958.75	945.25
-3/8" Split fraction (g):	294.26	261.32
Split fraction:	0.689	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	1209.98	422.19
Dry soil + tare (g):	1195.31	389.25
Tare (g):	168.11	127.93
Water content (%):	1.4	12.6

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	100.0	
1.5"	107.95	37.5	96.4	
1"	287.00	25	90.6	
3/4"	487.38	19	84.0	
3/8"	945.25	9.5	68.9	←Split
No.4	28.28	4.75	61.5	
No.10	48.85	2	56.0	
No.20	68.40	0.85	50.9	
No.40	91.15	0.425	44.9	
No.60	112.36	0.25	39.3	
No.100	130.49	0.15	34.5	
No.140	140.59	0.106	31.8	
No.200	149.43	0.075	29.5	



Gravel (%): 38.5
Sand (%): 31.9
Fines (%): 29.5

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:___________
Reviewed:___________

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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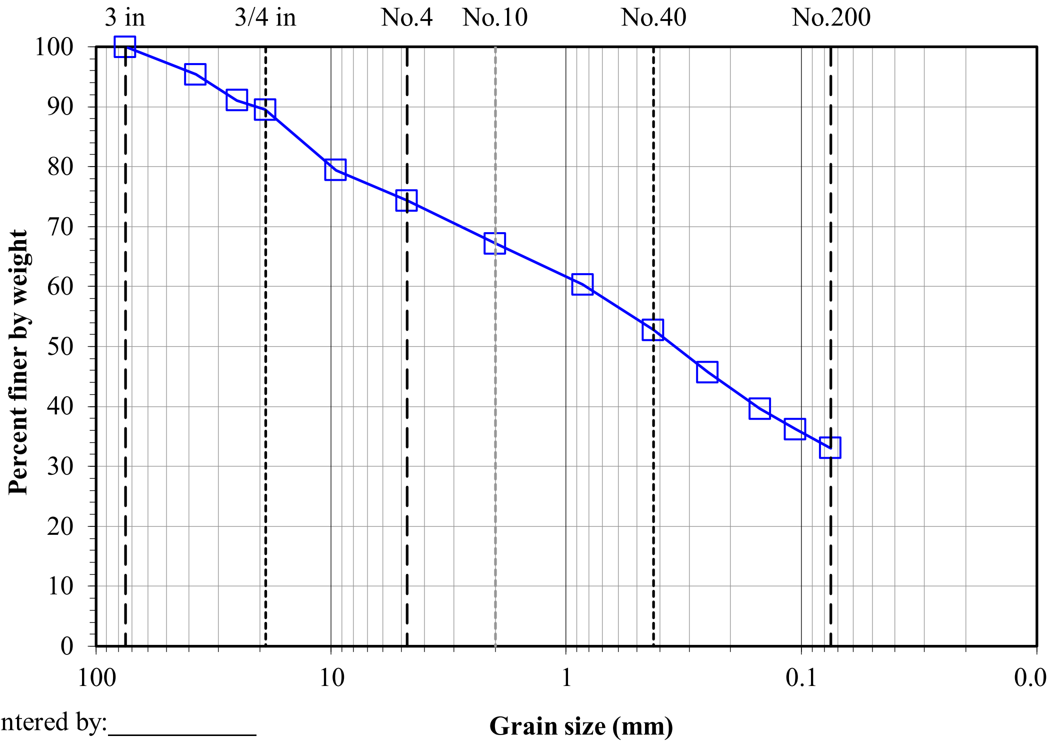
Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: JWB

Boring No.: TP-04
Sample:
Depth: 1-3'
Description: Dark brown clayey sand with gravel

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	3429.35	3132.87
+3/8" Coarse fraction (g):	653.26	645.95
-3/8" Split fraction (g):	311.43	278.99
Split fraction:	0.794	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	813.40	439.94
Dry soil + tare (g):	805.66	407.50
Tare (g):	121.86	128.51
Water content (%):	1.1	11.6

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	100.0	
1.5"	144.58	37.5	95.4	
1"	280.92	25	91.0	
3/4"	328.41	19	89.5	
3/8"	645.95	9.5	79.4	←Split
No.4	17.68	4.75	74.4	
No.10	42.96	2	67.2	
No.20	66.85	0.85	60.4	
No.40	93.55	0.425	52.8	
No.60	118.30	0.25	45.7	
No.100	139.86	0.15	39.6	
No.140	151.81	0.106	36.2	
No.200	162.73	0.075	33.1	



Gravel (%): 25.6
Sand (%): 41.3
Fines (%): 33.1

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:___________
Reviewed:___________

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/13/2021
By: KB/JAB

Method: ASTM D1557 B
Mold Id. INC 1
Mold volume (ft^3): 0.0333

Boring No.: TP-02
Sample:
Depth: 4-6'
Sample Description: Greyish brown clay with sand
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 14.9
Percent fraction passing, Pf (%) 85.1

Optimum water content (%): 16.6
Maximum dry unit weight (pcf): 111.2

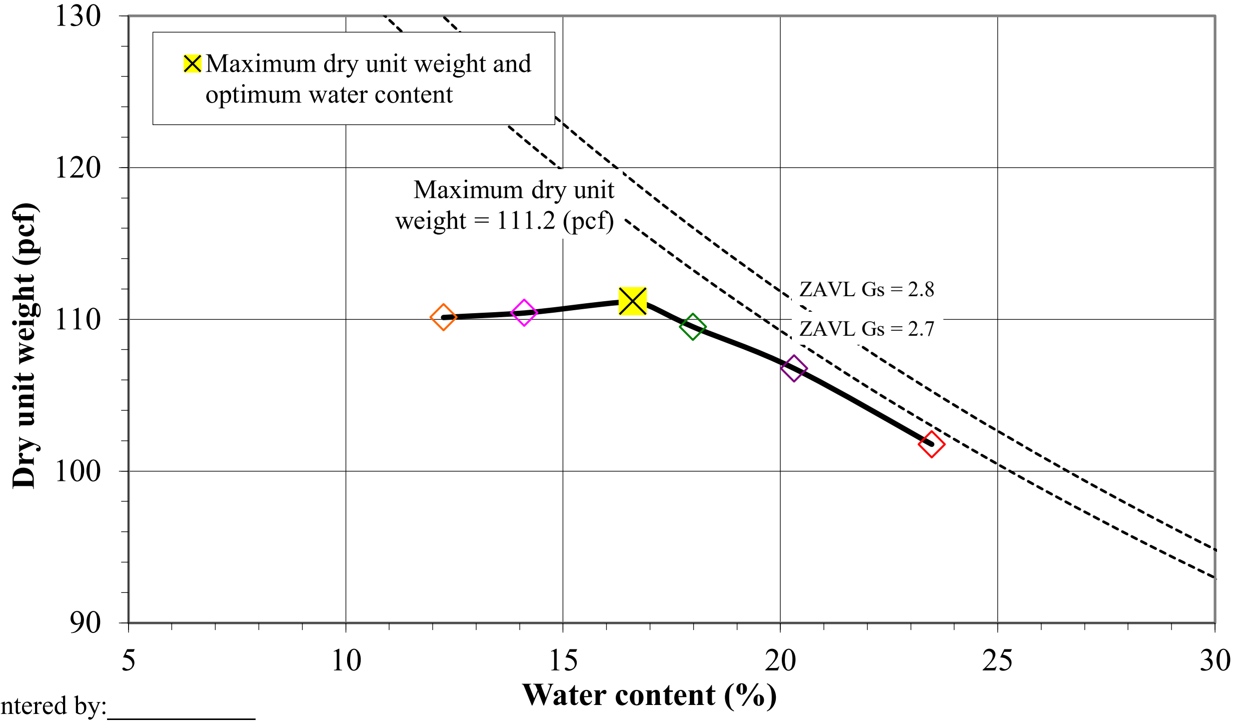
Point Number	-2%	As-Is	-4%	-6%	-8%			
Wt. Sample + Mold (g)	6168.0	6125.7	6179.4	6131.0	6095.0			
Wt. of Mold (g)	4227.4	4227.4	4227.4	4227.4	4227.4			
Wet Unit Wt., γ_m (pcf)	128.5	125.7	129.2	126.0	123.6			
Wet Soil + Tare (g)	1739.41	1655.52	1479.47	1025.18	1214.21			
Dry Soil + Tare (g)	1482.77	1383.23	1286.76	925.87	1105.21			
Tare (g)	219.36	223.48	215.34	221.90	215.40			
Water Content, w (%)	**20.3**	**23.5**	**18.0**	**14.1**	**12.2**			
Dry Unit Wt., γ_d (pcf)	**106.8**	**101.8**	**109.5**	**110.4**	**110.1**			

*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

(ASTM D4718)

Corrected water content (%): 15.2
Corrected dry unit weight (pcf): 116.9

Oversized fraction, +3/8-in. (%): 14.9
Water content, +3/8-in. (%): 7.2
Sieve for oversized fraction: 3/8-in.
Bulk specific gravity, Gs: 2.65 Assumed



Entered by:___________
Reviewed:___________

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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Project: Maples Parking
No: 02284-002
Location: Snowbasin Resort
Date: 5/14/2021
By: BSS/JAB

Boring No.: TP-04
Sample:
Depth: 1-3'
Sample Description: Dark brown clayey sand with gravel
Engineering Classification: Not requested
As-received water content (%): Not requested

Method: ASTM D1557 C
Mold Id. INC 6
Mold volume (ft^3): 0.0750

Preparation method: Moist
Rammer: Mechanical-sector face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 15.6
Percent fraction passing, Pf (%) 84.4

Optimum water content (%): 8.6
Maximum dry unit weight (pcf): 131.3

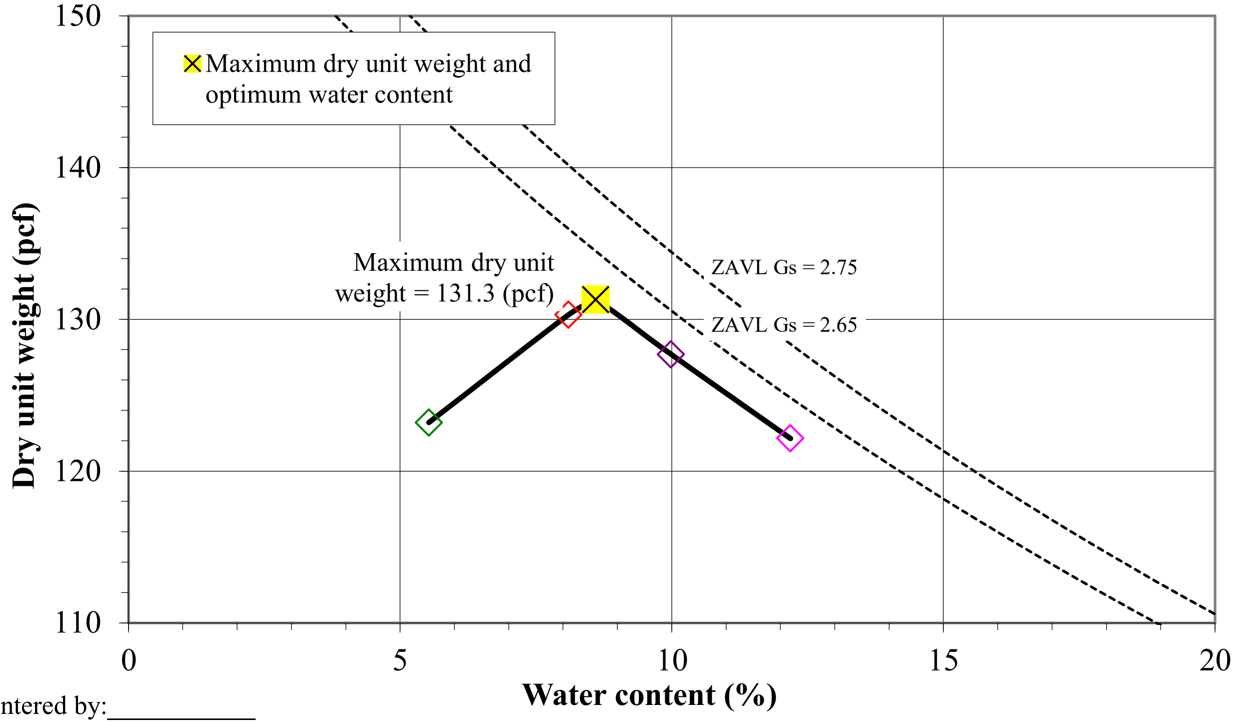
Point Number	As-Is	-2%	-4%	+2%				
Wt. Sample + Mold (g)	11223.5	11237.8	10868.6	11107.5				
Wt. of Mold (g)	6445.3	6445.3	6445.3	6445.3				
Wet Unit Wt., γ_m (pcf)	140.4	140.9	130.0	137.0				
Wet Soil + Tare (g)	2564.74	2615.29	2357.56	2547.06				
Dry Soil + Tare (g)	2368.90	2443.98	2250.36	2306.39				
Tare (g)	407.77	328.88	310.44	330.68				
Water Content, w (%)	**10.0**	**8.1**	**5.5**	**12.2**				
Dry Unit Wt., γ_d (pcf)	**127.7**	**130.3**	**123.2**	**122.2**				

*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

(ASTM D4718)

Corrected water content (%): 7.4
Corrected dry unit weight (pcf): 135.7

Oversized fraction, +3/4-in. (%): 15.6
Water content, +3/4-in. (%): 0.9
Sieve for oversized fraction: 3/4-in.
Bulk specific gravity, Gs: 2.65 Assumed



Entered by:___________

Reviewed:___________

California Bearing Ratio

(ASTM D 1883)

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Project:	**Maples Parking**	**Boring No.:**	TP-02
Number:	**02284-002**	**Sample:**	
Location:	Snowbasin Resort	**Depth:**	4-6'
Date:	5/19/2021	Original Method:	ASTM D1557 B
By:	JWB/KB	Engineering Classification:	Not requested
Maximum Dry Unit Weight (pcf):	111.2	Condition of Sample:	Soaked
Optimum Water Content (%):	16.6	Scalp and Replace:	No
Relative Compaction (%):	98.2		
0.1 in. CBR (%):	**2.0**		
0.2 in. CBR (%):	**2.0**		

As Compacted Data			Before	After
Mold Id.	CBR-8	Wet Soil + Tare (g)	567.56	1506.43
Wt. of Mold + Sample (g)	10916.5	Dry Soil + Tare (g)	503.26	1345.39
Wt. of Mold (g)	6584.4	Tare (g)	122.34	391.07
Dry Unit Weight (pcf)	109.2	Water Content (%)	16.9	16.9

After Soaking Data			Average	Top 1 in.
Wt. of Mold + Sample (g)	11174.0	Wet Soil + Tare (g)	1549.17	367.02
Dry Unit Weight (pcf)	101.6	Dry Soil + Tare (g)	1327.84	309.26
		Tare (g)	315.75	127.73
		Water Content (%)	21.9	31.8

Swell Data

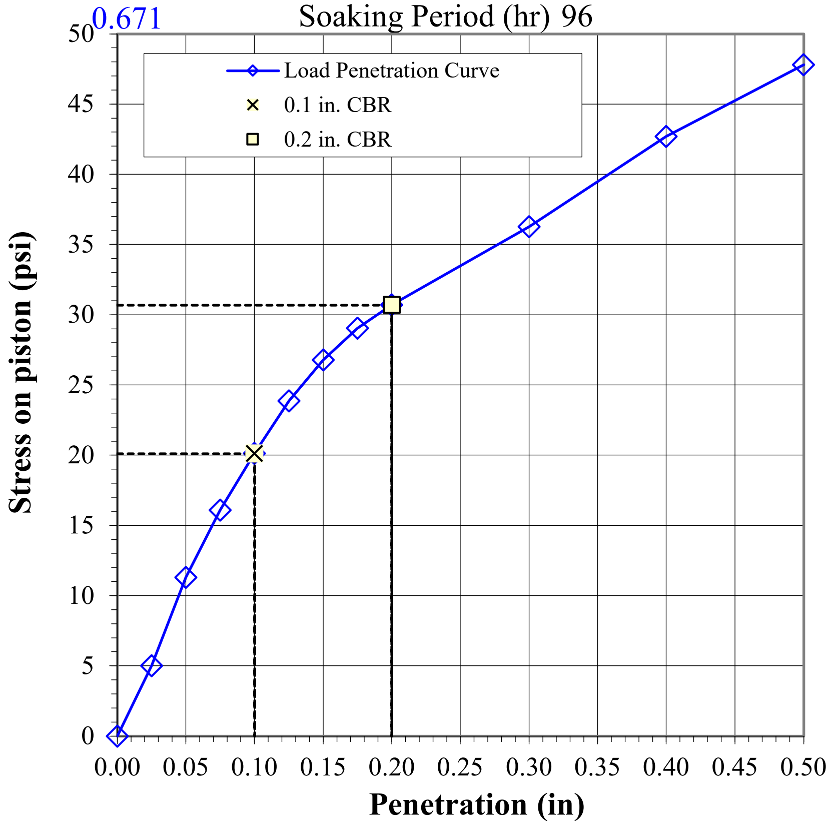
Date	Time	Dial		
5/14/2021	13:50	0.327	Surcharge (psf)	50
5/18/2021	14:05	0.671	Swell (%)	7.50
			Soaking Period (hr)	96

Penetration Data	Piston ID	CBR T1

Zero load (lb) = 0

Area of Piston (in^2) = 3.0

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	15	5	
0.050	34	11	
0.075	48	16	
0.100	60	20	1000
0.125	72	24	1125
0.150	80	27	1250
0.175	87	29	1375
0.200	92	31	1500
0.300	109	36	1900
0.400	128	43	2300
0.500	143	48	2600



Entered By:___________

Reviewed:___________

California Bearing Ratio

(ASTM D 1883)

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Project: Maples Parking
Number: 02284-002
Location: Snowbasin Resort
Date: 5/19/2021
By: JAB

Boring No.: TP-04
Sample:
Depth: 1-3'
Original Method: ASTM D1557 C
Engineering Classification: Not requested
Condition of Sample: Soaked
Scalp and Replace: No

Maximum Dry Unit Weight (pcf): 131.3
Optimum Water Content (%): 8.6
Relative Compaction (%): 99.0
0.1 in. Corrected CBR (%): 45.2
0.2 in. Corrected CBR (%): 44.9

As Compacted Data			Before	After
Mold Id.	CBR-7	Wet Soil + Tare (g)	2152.58	2124.58
Wt. of Mold + Sample (g)	11456.0	Dry Soil + Tare (g)	2016.76	1996.44
Wt. of Mold (g)	6667.1	Tare (g)	330.80	408.17
Dry Unit Weight (pcf)	129.9	Water Content (%)	8.1	8.1

After Soaking Data			Average	Top 1 in.
Wt. of Mold + Sample (g)	11549.6	Wet Soil + Tare (g)	2299.50	676.27
Dry Unit Weight (pcf)	129.3	Dry Soil + Tare (g)	2128.08	621.86
		Tare (g)	312.03	140.00
		Water Content (%)	9.4	11.3

Swell Data

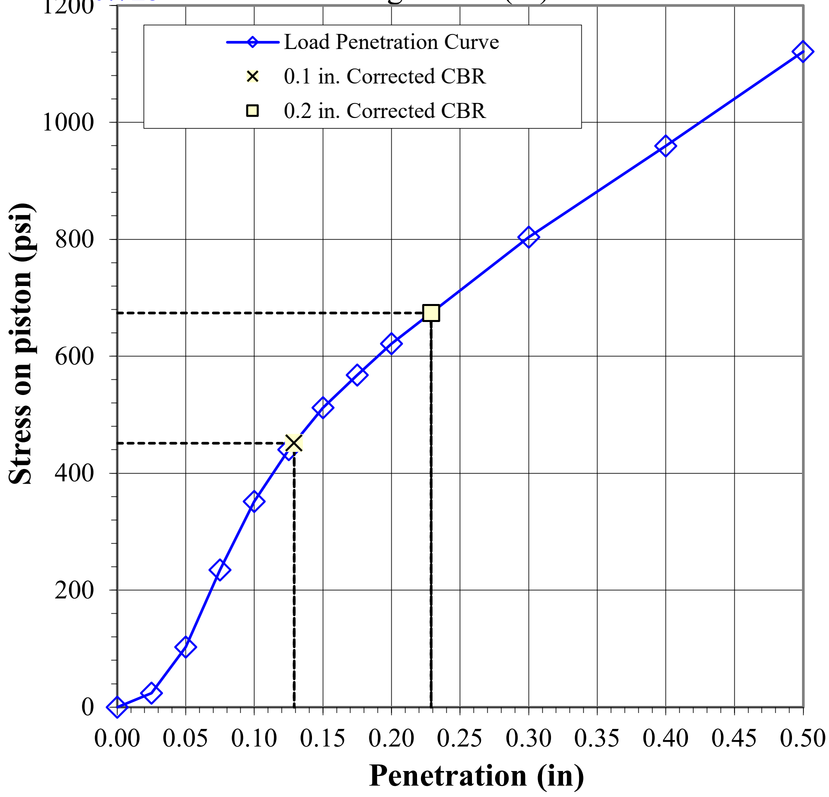
Date	Time	Dial
5/14/2021	16:50	0.702
5/18/2021	16:15	0.725

Surcharge (psf) 50
Swell (%) 0.50
Soaking Period (hr) 95

Penetration Data	Piston ID	CBR T1

Zero load (lb) = 0
Area of Piston (in^2) = 3.0

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	72	24	
0.050	308	103	
0.075	704	235	
0.100	1055	352	1000
0.125	1322	441	1125
0.150	1536	512	1250
0.175	1703	568	1375
0.200	1864	621	1500
0.300	2410	803	1900
0.400	2879	959	2300
0.500	3363	1121	2600



Entered By:___________

Reviewed:___________

Minimum Laboratory Soil Resistivity, pH of Soil for Use in Corrosion Testing, and Ions in Water by Chemically Suppressed Ion Chromatography *(AASHTO T 288, T 289, ASTM D4327, and C1580)*

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Project: **Maples Parking**
No: **02284-002**
Location: Snowbasin Resort
Date: 5/18/2021
By: KB

Sample info.	Boring No.	TP-02				TP-04			
	Sample								
	Depth	4-6'				1-3'			
Water content data	Wet soil + tare (g)	90.80				91.59			
	Dry soil + tare (g)	81.20				86.33			
	Tare (g)	36.17				36.51			
	Water content (%)	21.3				10.6			
Chem. data	pH*	7.98				8.13			
	Soluble chloride* (ppm)	6.65				11.9			
	Soluble sulfate** (ppm)	17.9				12.5			
Resistivity data	Pin method	2				2			
	Soil box	Miller Small				Miller Small			
		Approximate Soil condition (%)	Resistance Reading (Ω)	Soil Box Multiplier (cm)	Resistivity (Ω-cm)	Approximate Soil condition (%)	Resistance Reading (Ω)	Soil Box Multiplier (cm)	Resistivity (Ω-cm)
		As Is	3150	0.67	2111	As Is	38100	0.67	25527
		+3	1894	0.67	1269	+3	18710	0.67	12536
		+6	1377	0.67	923	+6	10050	0.67	6734
		+9	1048	0.67	702	+9	8136	0.67	5451
		+12	1020	0.67	683	+12	8046	0.67	5391
		+15	1079	0.67	723	+15	8390	0.67	5621
	Minimum resistivity (Ω-cm)	**683**				**5391**			

* Performed by AWAL using EPA 300.0

** Performed by AWAL using ASTM C1580

Entered by:___________
Reviewed:___________