

GEOTECHNICAL AND
WATER RESOURCES ENGINEERING

PHASE II GEOTECHNICAL REPORT

SOUTH BOULDER CREEK REGIONAL DETENTION PROJECT

BOULDER COUNTY, COLORADO

Submitted to

City of Boulder

1777 Broadway Boulder, Colorado 80301

Submitted by

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July 2022 Project 16134



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SECTION 1 - INTRODUCTION

1.1 Objective and Purpose

The South Boulder Creek Regional Detention Project (Project) will consist of constructing a stormwater detention facility along South Boulder Creek (SBC) and south of U.S. Highway 36 (US36). The City of Boulder (City) retained RJH Consultants, Inc. (RJH) to provide engineering services for the Project. As part of our services, RJH performed a preliminary (Phase II) geotechnical investigation at the Project site (Site). The objectives of this investigation were to collect data to support evaluation of subsurface conditions along approximate alignments of proposed facilities and support the 30-percent design. The purposes of this Geotechnical Data Report (Report) are to a) present data collected from our Phase II geotechnical investigation, and b) present groundwater data that has been collected for the Project since completion of the *South Boulder Creek Regional Detention - Water Level Data Collection Update* (RJH, 2020b).

RJH previously performed an initial (Phase I) geotechnical investigation at and around the Project Site. Data collected from the Phase I geotechnical investigation is presented in the *Phase I Geotechnical Report - South Boulder Creek Regional Detention Project* (Phase I GDR) (RJH, 2019).

1.2 Site Description

The Site is located in southeast Boulder County, Colorado, adjacent to City limits. The Site is generally located south of US36, west of SBC, and east of several residential communities. The Site Vicinity Map is shown on Figure 1.1.

Property owners near the Site include the University of Colorado (CU), Open Space and Mountain Parks (OSMP), and the Colorado Department of Transportation (CDOT). An overview of the Site is shown on Figure 1.2. Additional information about key existing components at and near the Site is presented in the Phase I GDR (RJH, 2019).

Project facilities that are currently under consideration correspond to Option 1 as defined in the *Concept Design Report* (RJH, 2020a). The Project facilities are currently anticipated to be designed for the 100-year flood event and would generally consist of the following features, which are shown on Figure 1.2:

• An earthen embankment dam along the northwest portion of CU South Campus.



- A spillway along the south side of US36.
- A detention excavation on the CU South Campus.
- An outlet works tunnel that extends beneath US36 between the detention excavation and Viele Channel.
- Earthfill placed on CU South Campus west of the detention excavation.

1.3 Scope of Work

RJH performed the following services for the Phase II geotechnical investigation:

- Prepared a Site-specific Health and Safety Plan (HASP) prior to performing fieldwork.
- Performed a geophysical seismic refraction investigation along the spillway alignment to evaluate the bedrock profile.
- Coordinated utility clearances with Colorado 811 prior to subsurface work.
- Prepared a subsurface investigation plan in accordance with the Colorado Office of the State Engineer (SEO) requirements and subcontracted with a drilling company.
- Drilled eighteen borings and prepared field logs to document drilling activities and describe recovered materials.
- Excavated five test pits, prepared field logs to document excavation activities, and described recovered materials.
- Performed in-situ water pressure tests (Packer tests) to evaluate the hydraulic conductivity of the bedrock.
- Performed in-situ hydraulic conductivity (slug) tests to evaluate hydraulic conductivity of surficial soils and bedrock.
- Completed thirteen borings as open standpipe monitoring wells and permitted the monitoring wells with the Colorado Division of Water Resources (DWR). The monitoring wells were instrumented with datalogging piezometers.
- Backfilled borings not completed as monitoring wells with grout.
- Performed periodic site visits to download water level measurements from Phase I and Phase II datalogging piezometers and manually collect readings from monitoring wells.



- Performed quality assurance review of collected samples and field logs by a senior engineer/geologist.
- Performed laboratory tests on selected samples of soil and bedrock.
- Prepared final boring logs based on field logs, quality assurance review, and laboratory test results.
- Prepared this report.

1.4 Authorization

This work was performed in general accordance with the terms and conditions of the Professional Services Agreement between the City and RJH dated May 15, 2019.

Fieldwork was performed in general accordance with the following:

- Access agreements established with the City, CU, CDOT, OSMP, and 5330 Manhattan Partners, LLC.
- A General Floodplain Development Permit (FDP) was granted by Boulder County on November 1, 2016, to allow the installation of groundwater monitoring wells within the floodplain.
- Subsurface Investigation Plan approved by the SEO.
- Notice of Intent to Construct Monitoring Hole(s) permits were approved by the DWR prior to monitoring well construction.
- Well completion reports and permit applications were submitted to and processed by the DWR following the construction of each monitoring well.

Copies of access agreements and floodplain permits are provided in Appendix A. SEO well permit documents are provided in Appendix B.

1.5 Project Personnel

The following personnel from RJH are responsible for the work contained in this Report:

Project Manager: Robert Huzjak, P.E.

Project Engineer: Eric Hahn, P.E.

Lead Geotechnical Engineer: Adam Prochaska, Ph.D., P.E., P.G.⁽¹⁾

Geological Engineers: Jacquelyn Hagbery, E.I., P.G.⁽¹⁾



Regan Wess, E.I.

Geotechnical Engineers: Samantha Guillies, P.E.

Joseph Lawinger, E.I.

Civil Engineers: Matt Kull, E.I.

Luke Anderson, E.I. Audrie Hillis, E.I. Matthew Howard, E.I. Jake Weems, E.I.

Technical Review: Robert Huzjak, P.E.

Note: (1) Licensed in states other than Colorado

RJH coordinated our Site activities with the following personnel:

Brandon Coleman, P.E. (City)

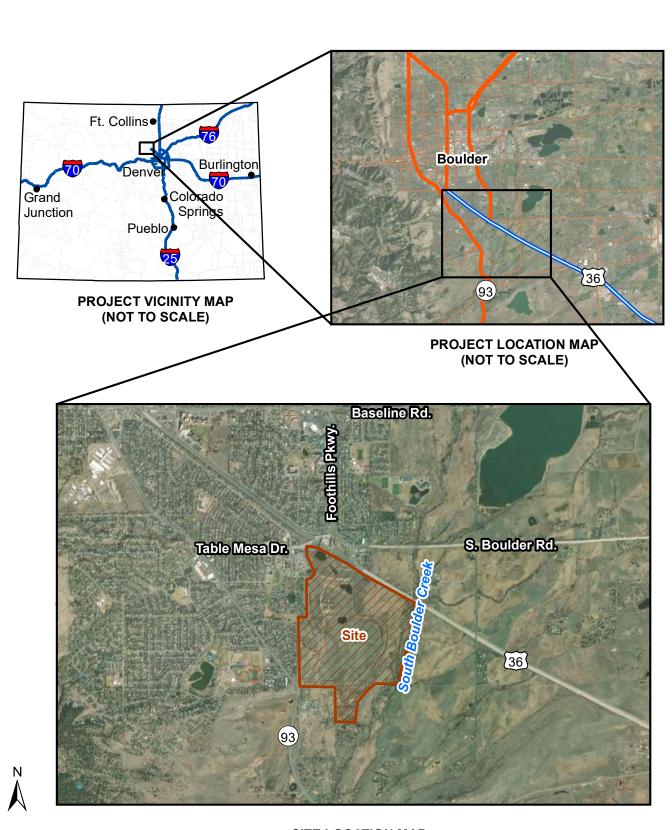
Don D'Amico (OSMP)

Jonathon Akins (CU)

Tanisha Alford (CDOT)

Susan Chrisman (5330 Manhattan Partners, LLC)







REPRODUCE IN COLOR





SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

SITE VICINITY MAP

PROJECT NO. 16134

July 2022

Figure 1.1

SECTION 2 - SITE INVESTIGATION

2.1 General

The Phase II geotechnical investigation included the following general activities:

- Geophysical investigation.
- Drilling, sampling, and logging 18 geotechnical borings.
- Excavating, sampling, and logging five test pits.
- Performing hydraulic conductivity (slug) tests in surficial soils and bedrock and water pressure (Packer) tests in bedrock.
- Installing monitoring wells with data loggers in 13 of the 18 borings to provide long-term monitoring of groundwater levels.

A plan of boring and test pit locations completed for the Phase II geotechnical investigation is presented on Figure 2.1. A legend for Figure 2.1 is presented on Figure 2.2.

The geophysical investigation was performed on November 7 and 8, 2019. The geotechnical borings were drilled between January 20, 2020, and August 30, 2021. The test pits were excavated between December 13 and 15, 2021. RJH was also onsite periodically between August 2018 and March 2022 to obtain monitoring well readings, install data loggers in monitoring wells, and oversee surveying of the boring and monitoring well locations.

Potable water obtained offsite was used during drilling and hydraulic conductivity testing.

2.2 Surveying

Borings and monitoring wells were surveyed by Flatirons Surveying, Inc. (Flatirons) on June 23, 2020, and October 5, 2021. Test pit locations were measured by RJH using a handheld recreational-grade Global Positioning System (GPS).

The horizontal coordinate system for the survey is the Colorado State Plane, North Zone, North American Datum of 1983 (NAD83), and the vertical datum is the North American Vertical Datum of 1988 (NAVD88).



2.3 Geophysical Investigation

The geophysical investigation was performed by Collier Consulting, Inc. (Collier) on November 7 and 8, 2019. The objectives of the investigation were to estimate the top of bedrock along the spillway alignment and evaluate if any buried paleochannels existed. The geophysical investigation was performed generally along the CDOT Right-of-Way (ROW) and extended approximately 3,000 feet, as shown on Figure 2.1. Collier used Multi-Channel Analysis of Surface Waves (MASW) to process the collected geophysical data.

The geophysical investigation report prepared by Collier is presented in Appendix C. The survey results present shear wave velocity data and interpretations of bedrock based on the velocity data. In some areas, it was difficult for Collier to estimate the top of bedrock because of the variability of the shale. The locations of the two borings along the spillway, B-214(P) and B-215(P), were selected in areas where the depth of the bedrock was difficult to interpret from the MASW data.

2.4 Borings

Eighteen borings were drilled for the Phase II geotechnical investigation. The horizontal coordinates and ground surface elevations at the boring locations are provided in Table 2.1. The boring locations are presented on Figure 2.1. Photographs of the boring locations are provided in Appendix G.1.

TABLE 2.1 SUMMARY OF BORINGS

| Boring or Well ID | Northing ⁽¹⁾ (ft) | Easting ⁽¹⁾ (ft) | Elevation ⁽²⁾ (ft) | Depth ⁽³⁾ to Bedrock (ft) | Total Depth ⁽³⁾ of Boring or Well (ft) | Boring or Well Completion |
|----------------------|------------------------------|--------------------------------|----------------------------------|--|--|------------------------------|
| B-201(P) | 1236619.7 | 3074124.6 | 5358.8 | 17.5 | 38.0 | 2-inch Monitoring Well |
| B-202(P) | 1236886.2 | 3074595.9 | 5351.8 | 15.1 | 35.0 | 2-inch Monitoring Well |
| B-203(P) | 1236927.9 | 3074814.6 | 5353.8 | 15.0 | 34.0 | 2-inch Monitoring Well |
| B-204(P) | 1236836.2 | 3075333.5 | 5353.8 | 20.8 | 40.0 | 2-inch Monitoring Well |
| B-205(P) | 1236743.3 | 3075809.0 | 5354.3 | 17.5 | 38.0 | 2-inch Monitoring Well |
| B-206 | 1236837.1 | 3076117.6 | 5354.7 ⁽⁴⁾ | 14.5 | 35.1 | Cement-Bentonite Grout |
| B-207(P) | 1236997.6 | 3076388.1 | 5350.1 | 12.5 | 34.0 | 2-inch Monitoring Well |



| Boring or Well ID | Northing ⁽¹⁾ (ft) | Easting ⁽¹⁾ (ft) | Elevation ⁽²⁾ (ft) | Depth ⁽³⁾ to Bedrock (ft) | Total Depth ⁽³⁾ of Boring or Well (ft) | Boring or Well Completion |
|----------------------|---------------------------------|--------------------------------|----------------------------------|--|--|------------------------------|
| B-208(P) | 1236457.4 | 3075844.6 | 5359.9 | 20.1 | 40.0 | 2-inch Monitoring Well |
| B-209(P) | 1235872.7 | 3075850.3 | 5354.7 | 7.0 | 30.0 | 2-inch Monitoring Well |
| B-210 | 1235542.8 | 3075765.8 | 5354.0 ⁽⁴⁾ | 3.7 | 25.0 | Cement-Bentonite Grout |
| B-211(P) | 1235986.9 | 3075493.9 | 5354.8 | 11.0 | 30.0 | 2-inch Monitoring Well |
| B-212(P) | 1236198.6 | 3075102.9 | 5359.4 | 10.2 | 30.0 | 2-inch Monitoring Well |
| B-213 | 1236455.3 | 3074765.5 | 5355.5 ⁽⁴⁾ | 16.0 | 37.0 | Cement-Bentonite Grout |
| B-214(P) | 1236273.3 | 3077129.3 | 5358.3 | 8.0 | 60.0 | 2-inch Monitoring Well |
| B-215(P) | 1235903.4 | 3077841.7 | 5362.8 | 12.8 | 65.3 | 2-inch Monitoring Well |
| B-216 | 1236317.1 | 3074169.2 | 5375.6(4) | 32.7 | 38.0 | Cement-Bentonite Grout |
| B-217(P) | 1235549.7 | 3074158.5 | 5384.7 | 29.0 | 33.3 | 2-inch Monitoring Well |
| B-218 | 1235163.2 | 3074158.3 | 5381.8 ⁽⁴⁾ | 15.5 | 25.5 | Cement-Bentonite Grout |

Notes:

- Boring and monitoring well locations were surveyed by Flatirons. Horizontal coordinate system is Colorado State Plane, North Zone, NAD83 and is considered accurate to within 0.1 feet.
- Elevation is reported for the top of the monitoring well flush mount casing, unless noted otherwise, and
 is within approximately 0.2 feet of ground surface elevation. Vertical datum is NAVD88 and considered
 accurate to within 0.1 feet.
- 3. Vertical depth below ground surface.
- 4. Ground surface elevation.

RJH retained Elite Drilling Services (Elite) of Denver, Colorado, to provide drilling equipment and services. Elite used an all-terrain rubber-tire-mounted CME 550x drill rig with an automatic hammer to complete the borings.

Borings were advanced from the ground surface and into bedrock using 8.0-inch outside-diameter (O.D.) (4.25-inch inside-diameter (I.D.)) hollow stem augers (HSA). During auger advancement, sampling was performed at frequencies that ranged from continuously to 2.5-foot intervals. The following sampler types were used during drilling:

- 1.375-inch I.D. (2.0-inch O.D.) standard split-spoon sampler (American Society for Testing and Materials International (ASTM) D1586). These sample locations are denoted with the prefix "S-" on the boring logs.
- 2.0-inch I.D. (2.5-inch O.D.) thick-walled, ring-lined (California) sampler (ASTM D3550). These sample locations are denoted with the prefix "CA-" on the boring logs.



- 2.5-inch I.D. (3.0-inch O.D.) ring-lined split barrel (Dames & Moore, or Modified California) sampler (ASTM D3550). These sample locations are denoted with the prefix "D-" on the boring logs.
- CME continuous sampler. These sample locations are denoted with "C-" on the boring logs.
- Bulk samples of cuttings were collected during auger advancement. These sample locations are denoted with "Bu-" on the boring logs.

The ability to sample coarse particles was limited by the sampler sizes and sampling techniques, and the collected samples may underestimate the percentages of gravels, cobbles, or boulders within the subsurface.

A standard penetration test (SPT) was performed in general accordance with ASTM D1586 at the location of each split-spoon sample. At each SPT location, RJH obtained a "standard penetration resistance" or SPT N-value. The SPT N-value equals the number of blows that are required for a 140-pound hammer dropped 30 inches to drive a standard split-spoon sampler from 6 to 18 inches. At some locations, the SPT sampler encountered refusal (50 blows for less than 6 inches of penetration) prior to advancing 18 inches; therefore, SPT N-values could not be obtained at these sample locations. The number of blows that were required from a 140-pound hammer dropped 30-inches to drive a California sampler and Dames & Moore sampler were also recorded; these blow counts do not correlate directly to N-values but provide a general indication of the consistency of the sampled material. The SPT N-values and blow counts presented in this Report were not adjusted to account for overburden pressures, hammer energy, etc.

Bedrock in 15 of the 18 borings was sampled continuously using NQ₃-size (1.75-inch core diameter, 2.98-inch hole diameter) wireline rock coring techniques in general accordance with ASTM D2113. Bedrock core runs ranged in length from 0.5 to 5.0 feet and were typically 1.0 to 5.0 feet long.

Borings were completed as monitoring wells as described in Section 2.9 except for five borings (B-206, B-210, B-213, B-216, and B-218) that were backfilled with tremie-placed cement-bentonite grout upon completion.

2.5 Test Pits

On December 13 to 15, 2021, five test pits were performed within potential borrow areas. RJH subcontracted Coal Creek Excavation (Coal Creek) of Erie, Colorado, to provide excavation equipment and services. Coal Creek excavated the test pits using a rubber-



tracked Komatsu PC138 excavator. RJH collected bulk samples from the test pits. The horizontal coordinates and ground surface elevations at the test pit locations are provided in Table 2.2. The test pit locations are presented on Figure 2.1.

TABLE 2.2 SUMMARY OF TEST PITS

| Test Pit ID | Northing ⁽¹⁾ (ft) | Easting ⁽¹⁾ (ft) | Elevation ⁽²⁾ (ft) | Depth ⁽³⁾ to Bedrock (ft) | Total Depth ⁽³⁾ of Test Pit (ft) |
|-------------|------------------------------|--------------------------------|----------------------------------|--|--|
| TP-201 | 1236718.4 | 3075654.8 | 5354.8 | NE ⁽⁴⁾ | 9.0 |
| TP-202 | 1236781.6 | 3074898.0 | 5354.0 | NE | 8.0 |
| TP-203 | 1236519.7 | 3075013.6 | 5355.0 | 7.0 | 9.5 |
| TP-204 | 1235541.1 | 3074223.5 | 5369.0 | NE | 12.0 |
| TP-205 | 1235070.9 | 3074152.1 | 5371.7 | 5.5 | 7.0 |

Notes:

- 1. Test pit locations were measured using a handheld GPS with an anticipated horizontal accuracy of 10 feet. Horizontal coordinate system is Colorado State Plane, North Zone, NAD83.
- Elevations were estimated using the measured horizontal coordinates and Project topography from Flatirons 2018 topographic survey. Elevation is reported at the ground surface and has an anticipated vertical accuracy of 1 foot. Vertical datum is NAVD88.
- 3. Vertical depth below ground surface.
- 4. NE = Not encountered
- 5. Groundwater was encountered in TP-205 at a depth of 5.5 feet. Groundwater was not encountered in the other four test pits.

Test pits were backfilled with the excavated materials.

2.6 Logging and Sample Packaging Procedures

RJH observed drilling and excavation procedures, recorded relevant drilling and excavation information, photographed and visually classified soil and rock samples, and prepared a field log of each boring. In the field, soil samples were classified in general accordance with ASTM D2488 (visual-manual method), except that constituent percentages were estimated for the entire recovered sample, not just the fraction finer than 3 inches. Rock cores were classified in general accordance with the U.S. Bureau of Reclamation (Reclamation) *Engineering Geology Field Manual* (Reclamation, 2001).

Collected soil and rock samples were packaged and transported in general conformance with ASTM D4220. Recovered split-spoon, California samples, and Dames & Moore samples were placed in sealed plastic bags to help preserve the natural moisture content of the material. Intact samples recovered from California and Dames & Moore samplers were kept



in brass liners that were capped and sealed with vinyl tape. Bulk samples collected from auger cuttings were placed in either sealed plastic bags or canvas sample bags.

RJH prepared final boring and test pit logs based on field and laboratory classifications, quality assurance office review of samples, and indirect observations (i.e., drill chatter, drill resistance, etc.) as appropriate. Between recovered samples, the lithology presented on the boring logs is interpreted. Explanations of the soil and bedrock descriptors used on the boring logs and test pit logs are presented in Appendix D. Boring logs are presented in Appendix F. Photographs of representative recovered soil samples are presented in Appendix G.2. Photographs of recovered rock core are presented in Appendix G.3. Photographs of the test pits are presented in Appendix G.4.

2.7 Hydraulic Conductivity (Slug) Testing in Soil and Bedrock

RJH performed 17 in-situ slug tests to evaluate the hydraulic conductivity characteristics of soil and bedrock. In-situ hydraulic conductivity testing consisted of rising head and falling head tests over test intervals ranging from 0 to 12.0 feet in length. Falling head tests were performed with potable water obtained offsite by Elite. Testing was generally performed as follows:

- **Rising Head Test:** Rising head tests were performed in completed monitoring wells. A submersible pump was used to remove water from the well casing. The water level in the well was then measured over time as it recovered to near its original level. RJH interprets rising head tests to predominantly measure horizontal hydraulic conductivity (K_h).
- Falling Head Test: Falling head tests were performed in augers as borings were advanced. Hollow stem augers remained at the bottom of the hole during the test. The augers were filled with water, and then the water level within the augers was measured over time as it declined. RJH interprets that falling head tests predominantly measure vertical hydraulic conductivity (K_v).

RJH generally collected data manually in the field using a stopwatch and electronic water level indicator while performing rising head tests and falling head tests. Two rising head tests performed within bedrock in B-204(P) and B-208(P) used the datalogger installed in the monitoring well to collect data every 12 hours for multiple days while the water level in the well recovered. Additional information about the dataloggers is presented in Section 2.9.

Hydraulic conductivity of each test interval was estimated from the field data using techniques published by Reclamation (2001) and Lambe and Whitman (1969) as



appropriate for each test configuration. In-situ hydraulic conductivity test results are summarized in Table 2.3, and additional information is presented in Appendix H.

TABLE 2.3
HYDRAULIC CONDUCTIVITY (SLUG) TEST RESULTS

| | | Depth Interval ⁽¹⁾ | | Hydraulic Conductivity | Direction of Hydraulic Conductivity | uscs |
|-------------------------|------|----------------------------------|--------------|---------------------------|---|------------------------|
| Boring ID | Test | (ft) | Test Type | (cm/s) | Measured | Classification |
| | | T | Fill | T | T | |
| B-202(P) | K-1 | 4.0 to 15.0 | Rising Head | 8.6x10 ⁻⁵ | K _h | SC |
| B-203(P) | K-1 | 14.0 to 15.0 | Rising Head | 3.4x10 ⁻⁶ | Kh | Unknown ⁽²⁾ |
| B-209(P) | K-1 | 6.0 to 7.0 | Rising Head | 2.0x10 ⁻⁴ | K _h | GP-GC |
| B-211(P) | K-1 | 6.0 to 13.0 | Rising Head | 3.5x10 ⁻⁴ | K _h | CL |
| B-212(P) | K-1 | 6.3 to 10.0 | Rising Head | 4.5x10 ⁻⁵ | K _h | SM to SC |
| B-217(P) | K-1 | 17.0 to 29.0 | Rising Head | 2.0x10 ⁻⁴ | K _h | SP-SC to CL |
| | | | Alluvi | um | | |
| B-201(P) | K-1 | 12.5 to 12.5 | Falling Head | 5.0x10 ⁻³ | K _v | GP-GC |
| B-201(P) | K-2 | 7.9 to 17.5 | Rising Head | 2.6x10 ⁻⁴ | K _h | GP-GC to SP- SC |
| B-204(P) | K-1 | 7.5 to 9.5 | Falling Head | 4.6x10 ⁻⁵ | Κ _ν | SP to CL |
| B-207(P) | K-1 | 4.1 to 12.7 | Rising Head | 2.4x10 ⁻⁴ | K _h | SP-SM |
| B-214(P) | K-1 | 3.1 to 8.0 | Rising Head | 2.9x10 ⁻⁴ | K _h | SP-SM to SM |
| B-215(P) | K-1 | 6.5 to 12.8 | Rising Head | 2.9x10 ⁻⁴ | K_h | SC to SP-SM |
| | | | Pierre S | hale | | |
| B-204(P) | K-2 | 23.5 to 30.0 | Rising Head | 1.4x10 ⁻⁶ | K _h | Shale |
| B-204(P) ⁽³⁾ | K-3 | 23.5 to 30.0 | Rising Head | 9.6x10 ⁻⁸ | K _h | Shale |
| B-205(P) | K-1 | 18.5 to 25.3 | Rising Head | 4.9x10 ⁻⁵ | K _h | Shale |
| B-208(P) | K-1 | 23.5 to 30.0 | Rising Head | 1.9x10 ⁻⁶ | K _h | Shale |
| B-208(P) ⁽³⁾ | K-2 | 23.5 to 30.0 | Rising Head | 5.8x10 ⁻⁷ | K _h | Shale |

Notes:

- 1. Vertical depth below the ground surface.
- 2. Unified Soil Classification System (USCS) classification is unknown at this depth interval. A sandstone cobble was recovered from the depth interval.
- 3. Rising head calculations were performed using data downloaded from the data loggers.



2.8 Water Pressure Testing in Bedrock

Water pressure testing (Packer testing) was performed to evaluate the in-situ hydraulic conductivity of the bedrock. Borings were flushed with clear water prior to the start of each test. Potable water used for flushing the borings and performing the tests was obtained offsite by Elite. Test intervals ranged from about 1.5 to 15.0 feet long and were typically about 4.0 to 8.0 feet long.

Test pressures were applied in a stepped sequence. Generally, the stepped sequence included pressures at about 50, 70, 90, 70, and 50 percent of the maximum allowable pressure. The maximum allowable pressure was considered to be the estimated effective vertical stress at the top of the test interval.

All five pressure steps were not conducted for test intervals when there was zero or negligible volume change (no take) during the first three pressure steps. In these cases, the final two pressure steps were not performed.

At each pressure step, the flow of water within the test zone was measured at 1-minute intervals. The applied pressure was generally maintained on the test zone until a relatively constant flow volume was obtained for five consecutive minutes, and then the pressure was adjusted to the next step.

Lugeon values and hydraulic conductivities computed for each pressure step, based on the applied pressures, measured water loss during the 1-minute intervals, and estimated head loss of water from flow through the test apparatus. Hydraulic conductivities at each pressure step were estimated based on equations published by Hvorslev (1951). Lugeon values at each pressure step were based on equations published by Houslby (1990). The reported hydraulic conductivity and Lugeon value for each step of the Packer test was developed by calculating the geometric mean of hydraulic conductivities developed for each 1-minute interval for each pressure step.

For each Packer test, RJH evaluated the Lugeon value at each applied pressure relative to other Lugeon values obtained from the other pressures. Based on relative trends in results, RJH categorized the flow condition as one of the following (Weaver and Bruce, 2007):

• Laminar Flow: Lugeon values were relatively constant at each pressure step, which usually indicates smooth flow in fine fractures. For tests that showed laminar flow, we reported the arithmetic mean of the Lugeon values from each pressure step.



- **Turbulent Flow:** Lugeon values decreased with increasing pressure and increased with decreasing pressure, which usually indicates fast flow in wide fractures. For tests that showed turbulent flow, we reported the lowest Lugeon value from all pressure steps.
- **Dilation:** Lugeon values step up significantly at the highest pressure stage and step back at lower pressure stages, which usually indicates local dilation of fractures due to compression of adjacent softer material or closure of adjacent parallel fractures. For tests that showed dilation, we reported the arithmetic mean of the Lugeon values from the lowest pressure steps ("a" steps).
- Washout: Lugeon values increase for each pressure step, which usually indicates flushing out of fracture infilling. For tests that showed washout, we reported the Lugeon value from the final pressure step.
- **Void Filling:** Lugeon values decrease for each pressure step, which usually indicates that voids are being filled. For tests that showed void filling, we reported the lowest Lugeon value from all pressure steps.
- **No Flow:** There was zero or negligible water loss at each pressure step. For tests that showed no flow, we reported a nominal value of 0.1 Lugeon $(1.0x10^{-7}$ centimeters per second (cm/s)).

Idealized test result sequences associated with each of these six flow conditions are presented on Figure 2.3.

Water pressure test results are in Appendix I and are summarized in Table 2.4.

TABLE 2.4
WATER PRESSURE TEST RESULTS

| Boring ID | Test | Depth Interval ⁽¹⁾ (ft) | Lugeon Value ⁽²⁾ | Hydraulic Conductivity (cm/s) ⁽²⁾ | Flow Condition ⁽²⁾ |
|--------------|------|--|--------------------------------|--|----------------------------------|
| | | Р | erre Shale | | |
| B-201(P) | P-1 | 21.5 to 25.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-201(P) | P-2 | 25.0 to 30.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-201(P) | P-3 | 30.0 to 38.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-202(P) | P-1 | 18.5 to 22.5 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-202(P) | P-2 | 22.5 to 29.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-202(P) | P-3 | 29.0 to 35.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |



| Boring ID | Test | Depth Interval ⁽¹⁾ (ft) | Lugeon Value ⁽²⁾ | Hydraulic Conductivity (cm/s) ⁽²⁾ | Flow Condition ⁽²⁾ |
|--------------|------|--|--------------------------------|--|----------------------------------|
| B-203(P) | P-1 | 15.5 to 18.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-203(P) | P-2 | 18.0 to 25.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-203(P) | P-3 | 25.0 to 34.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-204(P) | P-1 | 24.0 to 27.5 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-204(P) | P-2 | 27.5 to 35.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-204(P) | P-3 | 35.0 to 40.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-205(P) | P-1 | 21.0 to 24.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-205(P) | P-2 | 24.0 to 29.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-205(P) | P-3 | 29.0 to 38.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-206 | P-1 | 18.5 to 20.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-206 | P-2 | 20.0 to 25.0 | 0.1 | 1.7x10 ⁻⁷ | No Flow |
| B-206 | P-3 | 25.0 to 35.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-207(P) | P-1 | 17.0 to 22.0 | 0.1 | 1.0x10 ⁻⁷ | Infilling |
| B-207(P) | P-2 | 22.0 to 27.0 | 0.1 | 1.8x10 ⁻⁷ | No Flow |
| B-207(P) | P-3 | 27.0 to 34.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-208(P) | P-1 | 23.5 to 27.5 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-208(P) | P-2 | 27.5 to 34.0 | 0.2 | 2.8x10 ⁻⁷ | Laminar |
| B-208(P) | P-3 | 34.0 to 40.0 | 0.1 | 1.7x10 ⁻⁷ | No Flow |
| B-209(P) | P-1 | 11.0 to 15.0 | 0.1 | 1.8x10 ⁻⁷ | No Flow |
| B-209(P) | P-2 | 15.0 to 20.0 | 0.2 | 2.5x10 ⁻⁷ | Laminar |
| B-209(P) | P-3 | 20.0 to 30.0 | 0.1 | 1.7x10 ⁻⁷ | No Flow |
| B-210 | P-1 | 7.0 to 15.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-210 | P-2 | 15.0 to 20.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-210 | P-3 | 20.0 to 25.0 | 0.1 | 1.8x10 ⁻⁷ | No Flow |
| B-211(P) | P-1 | 17.0 to 20.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-211(P) | P-2 | 20.0 to 25.0 | 0.1 | 1.6x10 ⁻⁷ | No Flow |
| B-211(P) | P-3 | 25.0 to 30.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-212(P) | P-1 | 14.0 to 17.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-212(P) | P-2 | 17.0 to 22.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-212(P) | P-3 | 22.0 to 30.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-213 | P-1 | 20.5 to 22.5 | 0.1 | 1.0x10 ⁻⁷ | No Flow |



| Boring ID | Test | Depth Interval ⁽¹⁾ (ft) | Lugeon Value ⁽²⁾ | Hydraulic Conductivity (cm/s) ⁽²⁾ | Flow Condition ⁽²⁾ |
|--------------|------|--|--------------------------------|--|----------------------------------|
| B-213 | P-2 | 22.5 to 28.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-213 | P-3 | 28.0 to 37.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-214(P) | P-1 | 12.0 to 17.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-214(P) | P-2 | 17.0 to 23.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-214(P) | P-3 | 23.0 to 30.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-214(P) | P-4 | 30.0 to 45.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-214(P) | P-5 | 45.0 to 60.0 | 0.1 | 1.5x10 ⁻⁷ | No Flow |
| B-215(P) | P-1 | 17.3 to 22.3 | 0.1 | 1.8x10 ⁻⁷ | No Flow |
| B-215(P) | P-2 | 22.3 to 30.3 | 0.1 | 1.0x10 ⁻⁷ | Infilling |
| B-215(P) | P-3 | 30.3 to 38.3 | 0.1 | 1.0x10 ⁻⁷ | No Flow |
| B-215(P) | P-4 | 38.3 to 50.3 | 0.1 | 2.1x10 ⁻⁷ | No Flow |
| B-215(P) | P-5 | 50.3 to 65.0 | 0.1 | 1.0x10 ⁻⁷ | No Flow |

Notes:

- 1. Vertical depth below the ground surface.
- 2. Packer tests that exhibited no flow are assigned a nominal hydraulic conductivity of 0.1 lugeon (1.0x10⁻⁷ cm/s).

2.9 Monitoring Well Installation

Monitoring wells were installed in each boring except B-206, B-210, B-213, B-216, and B-218. The locations of the monitoring wells are shown on Figure 2.4.

The sensing zones for monitoring wells B-204(P), B-205(P), and B-208(P) are located entirely within bedrock, and we interpret that these wells measure groundwater conditions in the shallow bedrock. The remaining wells have sensing zones either entirely within the soil or within a combination of soil and bedrock, and we interpret that these wells monitor the groundwater levels within the soil.

Monitoring wells were constructed using solid and slotted polyvinyl chloride (PVC) pipe and 10/20 silica sand. Well casings consisted of a 2-inch Schedule 40 PVC pipe. Information about construction of each monitoring well is shown on Figures 2.5 to 2.17. Well permit information is provided in Appendix B.

All monitoring wells were developed to remove drilling water from the well and sand pack. Wells were developed using a surge block and submersible pump until either no additional water could be removed or the water was generally clear.



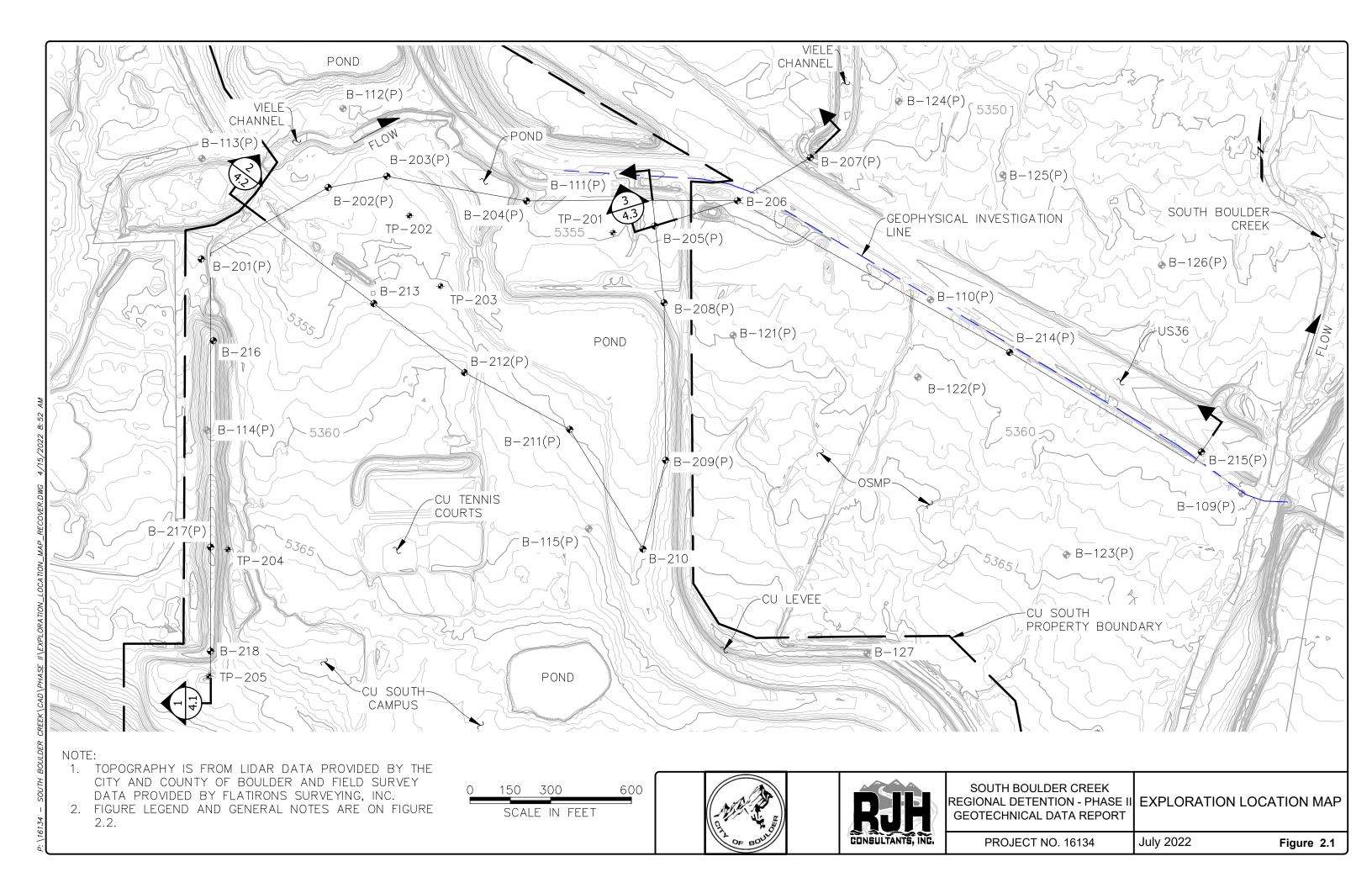
Each monitoring well was instrumented by RJH with a Rugged TROLL 200 or a Rugged TROLL 100 datalogging piezometer that was programmed to collect water level readings automatically every 12 hours. The instruments are non-vented piezometers manufactured by In-Situ, Inc.

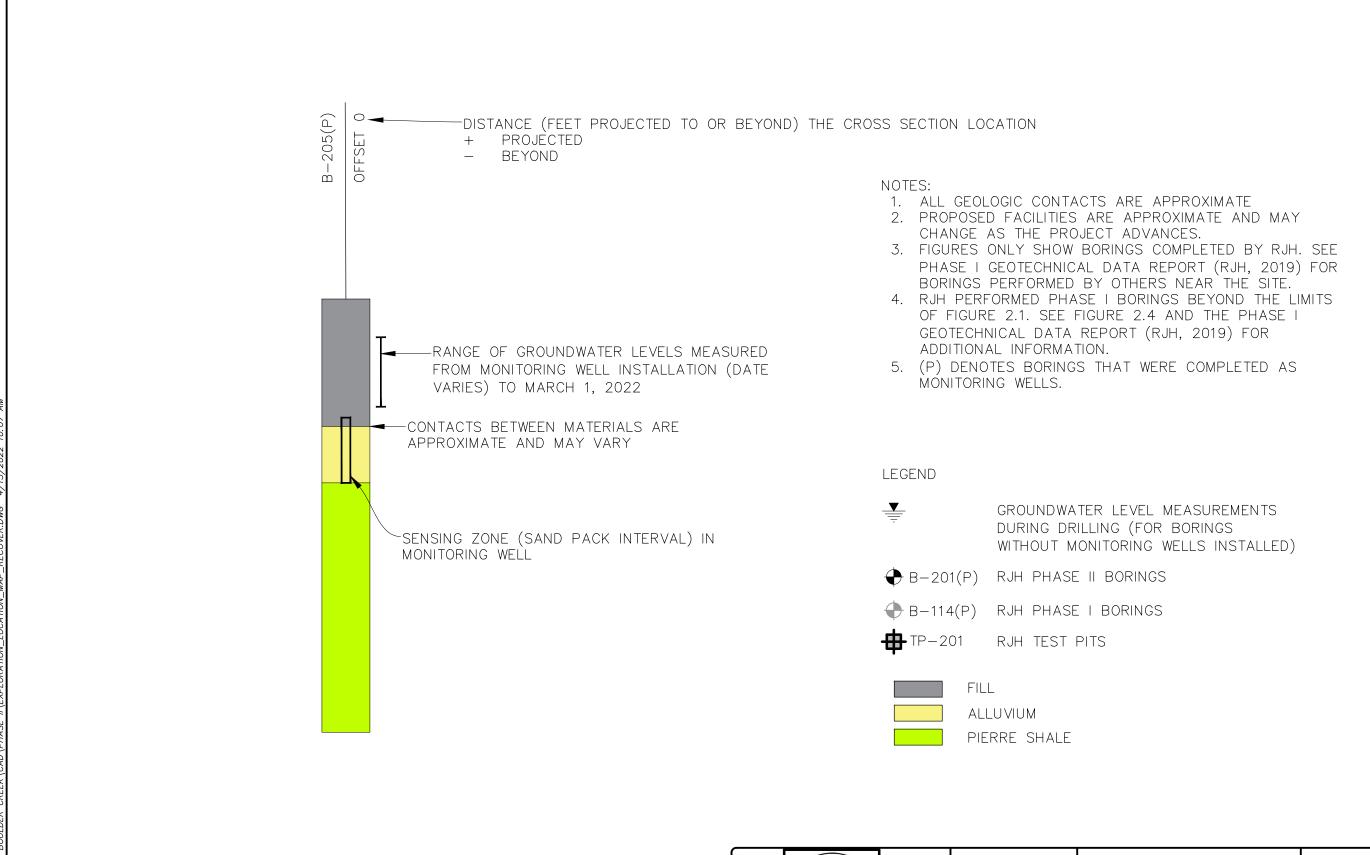
2.10 Monitoring Well Readings

Groundwater levels were manually measured in monitoring wells after the well installation, after well development, and approximately monthly after the installation. The data collected from the monitoring wells through March 1, 2022, is presented on Figures 2.18 to 2.23. These figures also include data collected from wells installed during the Phase I geotechnical investigation (RJH, 2019). The locations of the wells are presented on Figure 2.4. Data on Figures 2.18 to 2.23 are generally grouped according to the well locations onsite as follows:

- Figure 2.18 shows wells that are within far-field alluvium upstream of the Site (i.e., Group 1).
- Figure 2.19 shows wells that are predominantly located within areas of fill on CU South Campus (i.e., Group 2).
- Figure 2.20 shows wells that are located within alluvium near the Site upstream (south) of US36 (i.e., Group 3).
- Figure 2.21 shows wells that are located within alluvium near the Site downstream (north) of US36 (i.e., Group 4).
- Figure 2.22 shows wells that are within far-field alluvium downstream of the Site (i.e., Group 5).
- Figure 2.23 shows wells that are screened in Pierre Shale (i.e., Group 6).











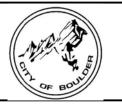
SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

LEGEND

PROJECT NO. 16134

July 2022

| LAMINAR FLOW | PRESSURE STEP 1 2 3 4 5 | PRESSURE | |
|----------------|--------------------------|----------|-------------------------|
| TURBULENT FLOW | PRESSURE STEP 1 2 3 4 5 | PRESSURE | |
| DILATION | PRESSURE STEP 1 2 3 4 5 | PRESSURE | |
| WASHOUT | PRESSURE STEP 1 2 3 4 5 | PRESSURE | |
| VOID FILLING | PRESSURE STEP 1 2 3 4 5 | PRESSURE | LUGEON VALUE |
| NO FLOW | PRESSURE STEP 1 2 3 4 5 | PRESSURE | LUGEON VALUE 1 1 1 1 1 |



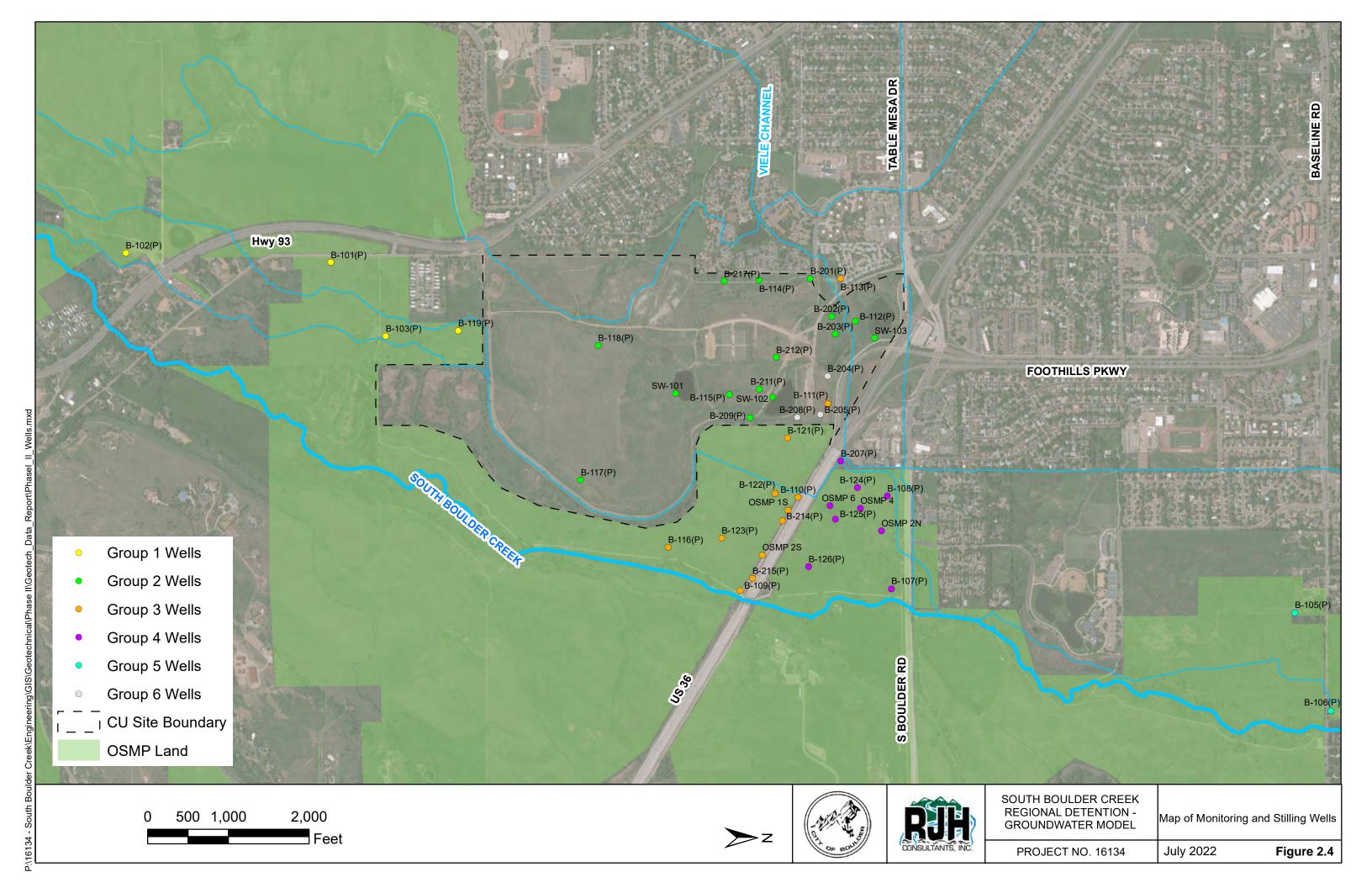
P:\16134 - SOUTH BOULDER CREEK\CAD\PHASE II\TEST RESULT SEQUENCES.DWG 7/21/2020 1:03 PM

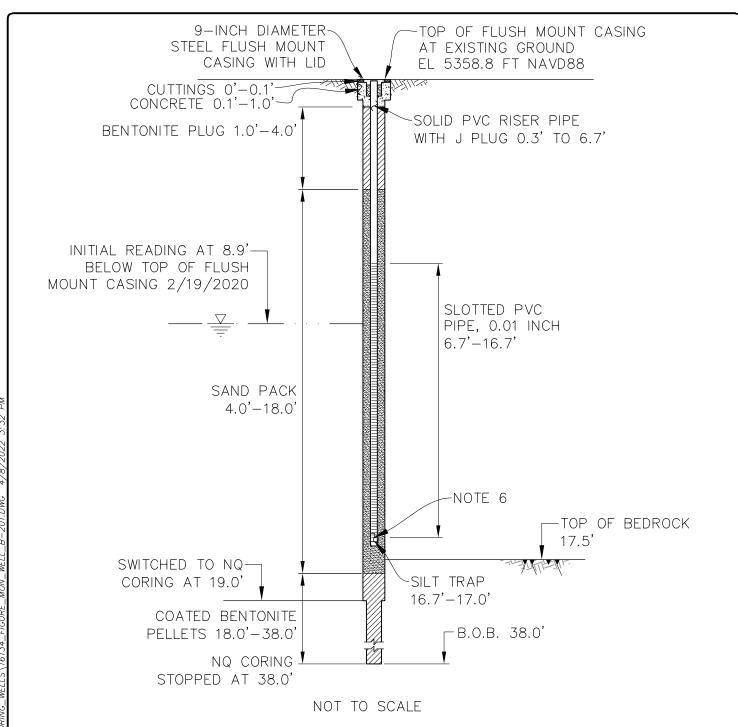


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT TEST RESULT SEQUENCES INDICATING DIFFERENT FLOW CONDITIONS

PROJECT NO. 16134

July 2022





NOTES:

- 1. MONITORING WELL INSTALLED 2/19/2020 WITH 8.0-INCH 0.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1236619.7, E 3074124.6 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 316960.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 571007) SUSPENDED FROM THE J PLUG TO 16.7 FT BELOW THE TOP OF FLUSH MOUNT CASING.



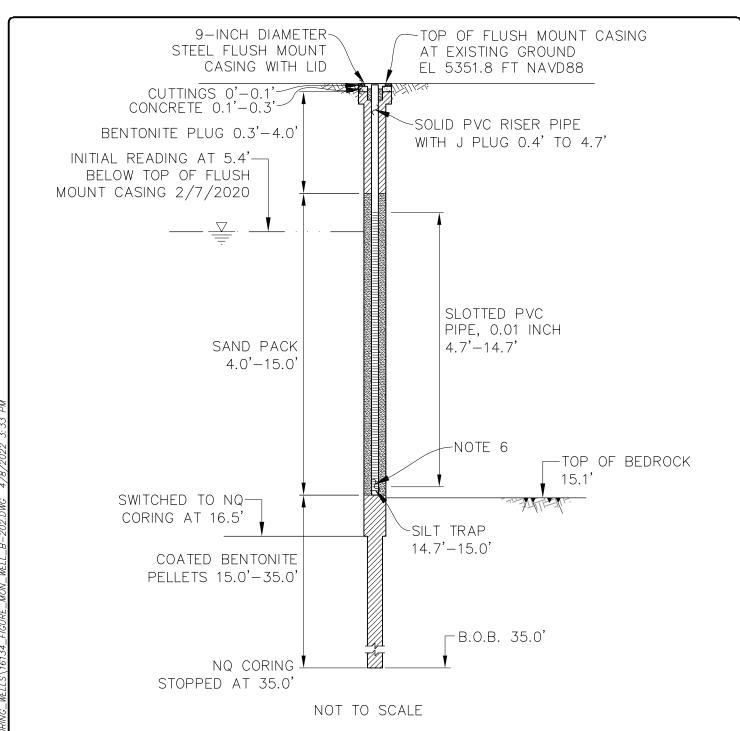


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-201(P)

PROJECT NO. 16134

July 2022



NOTES:

- 1. MONITORING WELL INSTALLED 2/6/2020 WITH 8.0-INCH 0.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1236886.2, E 3074595.9 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 316961.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 635721) SUSPENDED FROM THE J PLUG TO 14.6 FT BELOW THE TOP OF FLUSH MOUNT CASING.



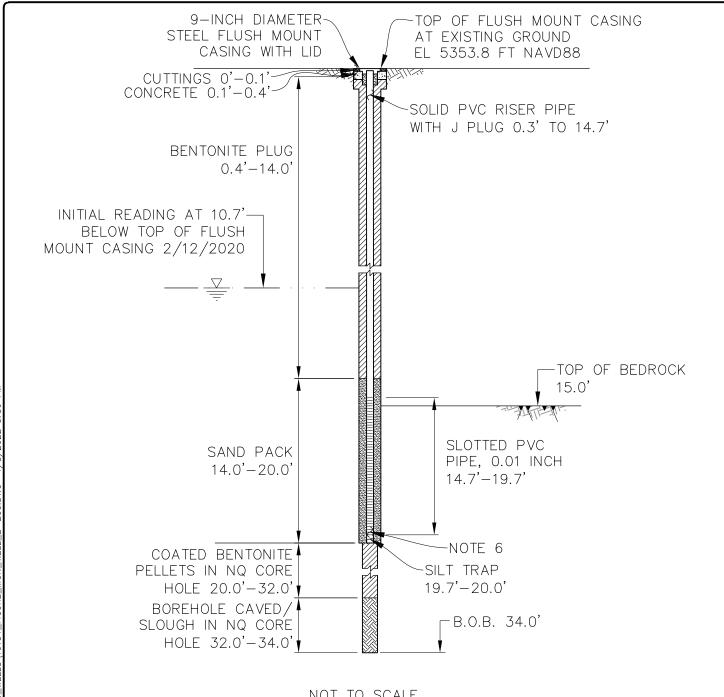


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-202(P)

PROJECT NO. 16134

July 2022



NOTES:

- MONITORING WELL INSTALLED 2/11/2020 WITH 8.0-INCH O.D. HOLLOW STEM AUGERS.
- LOCATION: N 1236927.9, E 3074814.6 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- WELL PERMIT NO. 316962.
- TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738932) SUSPENDED FROM THE J PLUG TO 19.6 FT BELOW THE TOP OF FLUSH MOUNT CASING.



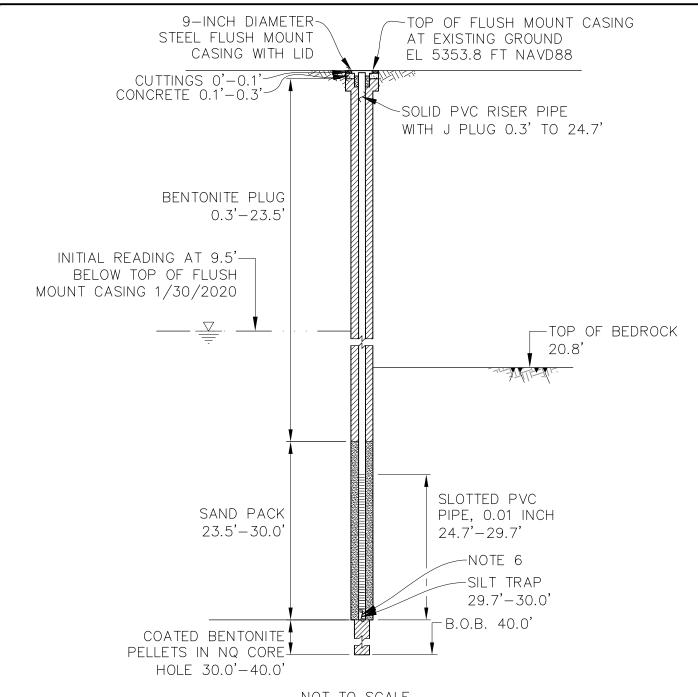


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL **INSTALLATION B-203(P)**

PROJECT NO. 16134

July 2022



NOTES:

- MONITORING WELL INSTALLED 1/30/2020 WITH 8.0-INCH O.D. HOLLOW STEM AUGERS.
- LOCATION: N 1236836.2, E 3075333.5 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- WELL PERMIT NO. 316963.
- TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738937) SUSPENDED FROM THE J PLUG TO 29.8 FT BELOW THE TOP OF FLUSH MOUNT CASING.



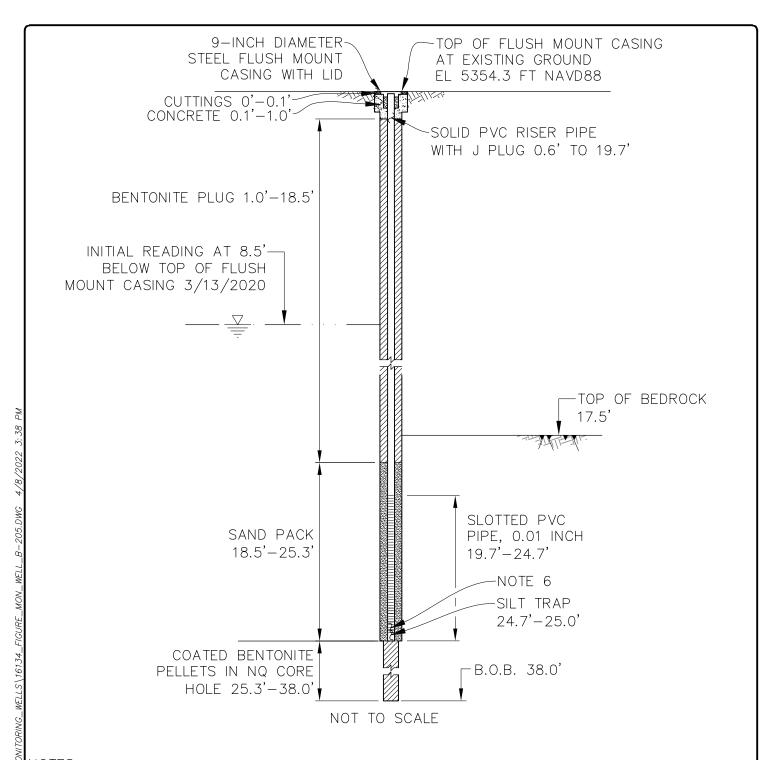


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL **INSTALLATION B-204(P)**

PROJECT NO. 16134

July 2022



NOTES:

- 1. MONITORING WELL INSTALLED 3/13/2020 WITH 8.0-INCH O.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1236743.3, E 3075809.0 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 317090.
- F. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738938) SUSPENDED FROM THE J PLUG TO 24.6 FT BELOW THE TOP OF FLUSH MOUNT CASING.



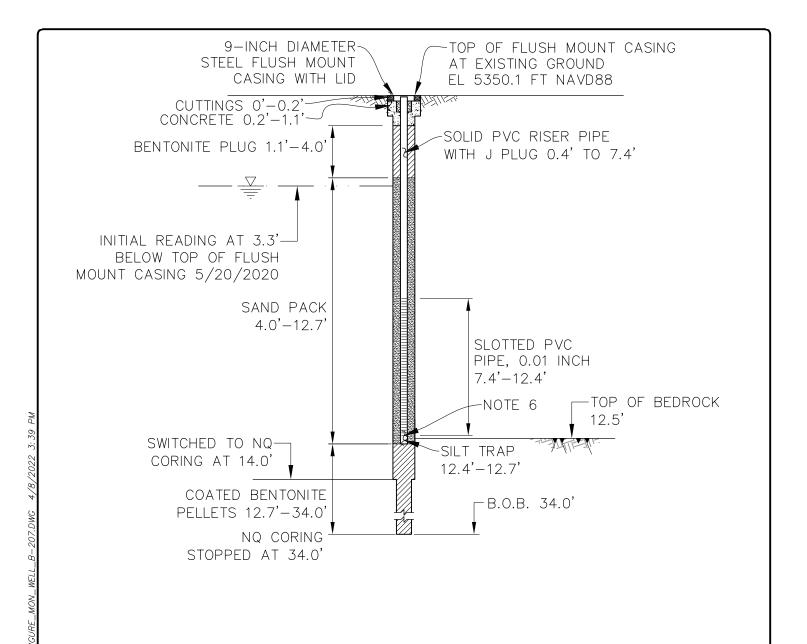


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-205(P)

PROJECT NO. 16134

July 2022



NOTES:

- 1. MONITORING WELL INSTALLED 5/20/2020 WITH 8.0-INCH O.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1236997.6, E 3076388.1 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 317764.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738940) SUSPENDED FROM THE J PLUG TO 12.3 FT BELOW THE TOP OF FLUSH MOUNT CASING.



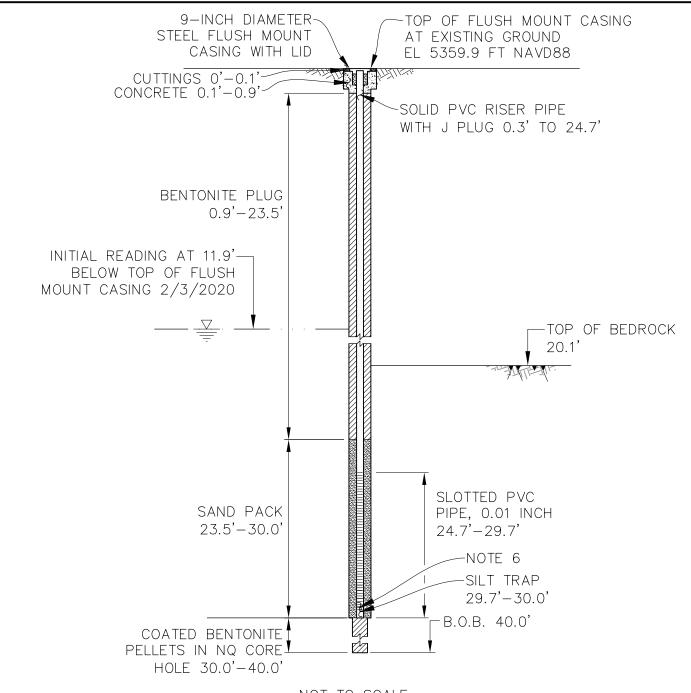


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-207(P)

PROJECT NO. 16134

July 2022



NOTES:

- 1. MONITORING WELL INSTALLED 1/31/2020 WITH 8.0-INCH O.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1236457.4, E 3075844.6 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 316964.
- F. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738941) SUSPENDED FROM THE J PLUG TO 29.6 FT BELOW THE TOP OF FLUSH MOUNT CASING.





SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-208(P)

PROJECT NO. 16134

July 2022

NOTES:

II\MONITORING_WELLS\16134_FIGURE_MON_WELL_B-209.DWG

- 1. MONITORING WELL INSTALLED 1/23/2020 WITH 8.0-INCH 0.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1235872.7, E 3075850.3 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 316965.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738944) SUSPENDED FROM THE J PLUG TO 8.1 FT BELOW THE TOP OF FLUSH MOUNT CASING.



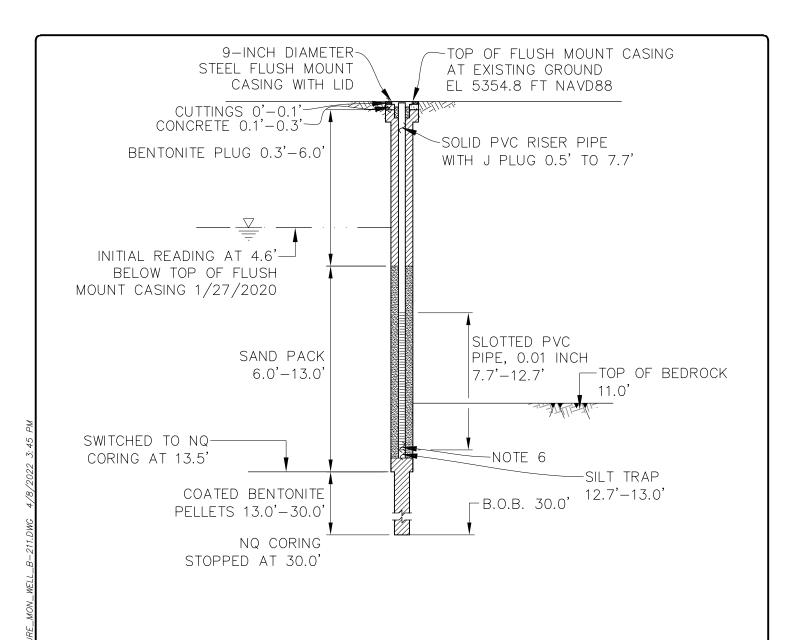


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-209(P)

PROJECT NO. 16134

July 2022



NOTES:

- 1. MONITORING WELL INSTALLED 1/27/2020 WITH 8.0-INCH 0.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1235986.9, E 3075493.9 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 316966.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738947) SUSPENDED FROM THE J PLUG TO 12.7 FT BELOW THE TOP OF FLUSH MOUNT CASING.



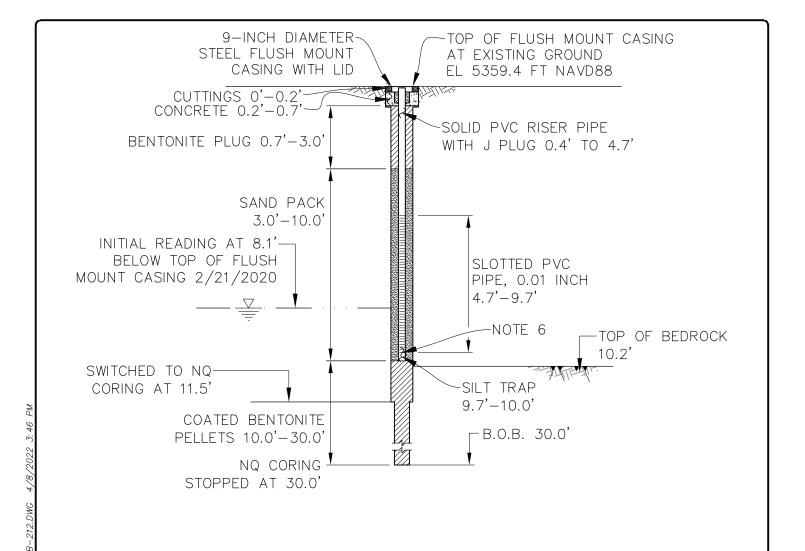


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-211(P)

PROJECT NO. 16134

July 2022



NOTES:

- 1. MONITORING WELL INSTALLED 2/21/2020 WITH 8.0-INCH O.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1236198.6, E 3075102.9 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 316967.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738955) SUSPENDED FROM THE J PLUG TO 9.7 FT BELOW THE TOP OF FLUSH MOUNT CASING.





SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-212(P)

PROJECT NO. 16134

July 2022

NOTES:

- I. MONITORING WELL INSTALLED 6/3/2020 WITH 8.0-INCH O.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1236273.3, E 3077129.3 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 317765.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 738958) SUSPENDED FROM THE J PLUG TO 8.4 FT BELOW THE TOP OF FLUSH MOUNT CASING.



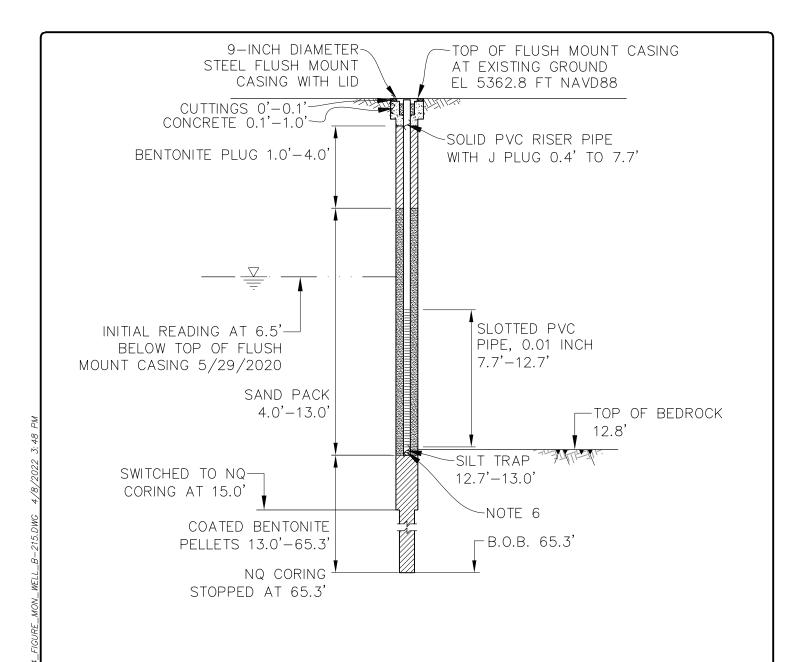


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-214(P)

PROJECT NO. 16134

July 2022



NOTES:

- 1. MONITORING WELL INSTALLED 5/28/2020 WITH 8.0-INCH 0.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1235903.4, E 3077841.7 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 317907.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 725974) SUSPENDED FROM THE J PLUG TO 12.9 FT BELOW THE TOP OF FLUSH MOUNT CASING.



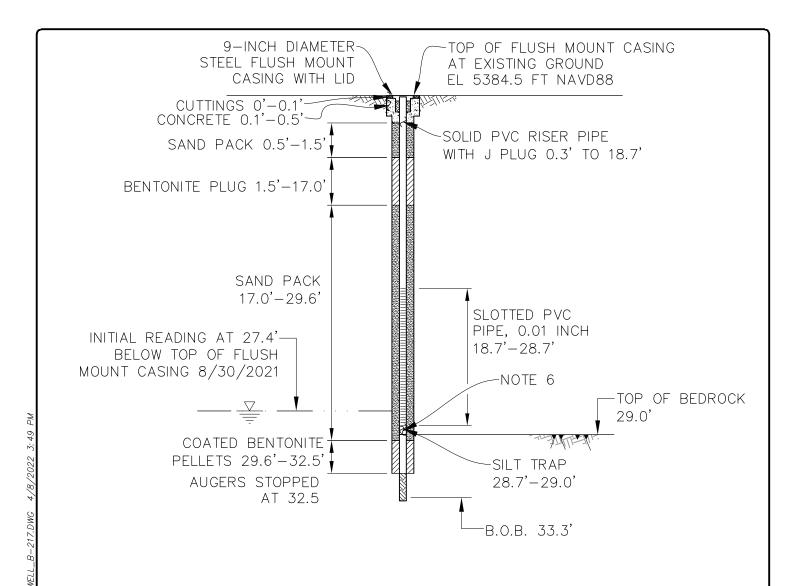


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-215(P)

PROJECT NO. 16134

July 2022



NOTES:

- 1. MONITORING WELL INSTALLED 8/27/2021 WITH 8.0-INCH O.D. HOLLOW STEM AUGERS.
- 2. LOCATION: N 1235549.7, E 3074158.5 FT COLORADO STATE PLANE NAD83. NORTH ZONE.
- 3. WELL PERMIT NO. 323669.
- 4. TWO 7/32-INCH TAMPER PROOF ALLEN BOLTS SECURE SURFACE MOUNT CASING.
- 5. PVC RISER PIPE 2.0 INCHES I.D. 2-3/8 INCHES O.D. AND SAND PACK SIZE WAS 10/20.
- 6. WELL IS EQUIPPED WITH A RUGGED TROLL 200 DATA LOGGER (S/N 587247) SUSPENDED FROM THE J PLUG TO 28.9 FT BELOW THE TOP OF FLUSH MOUNT CASING.



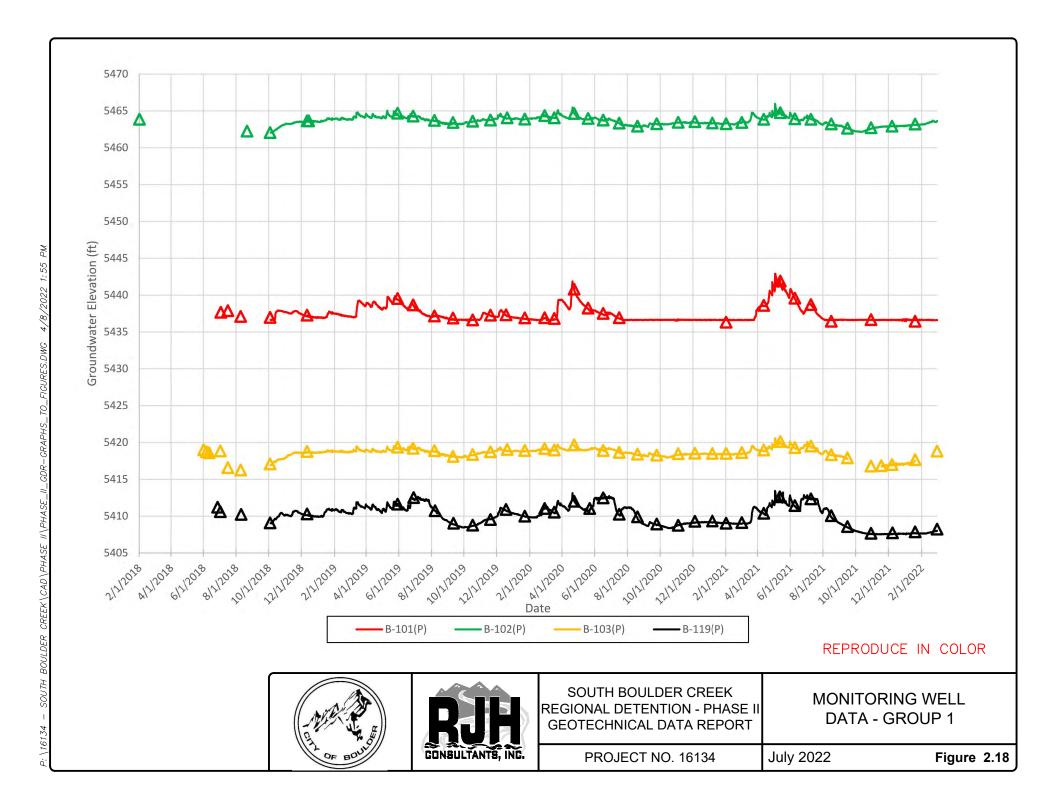


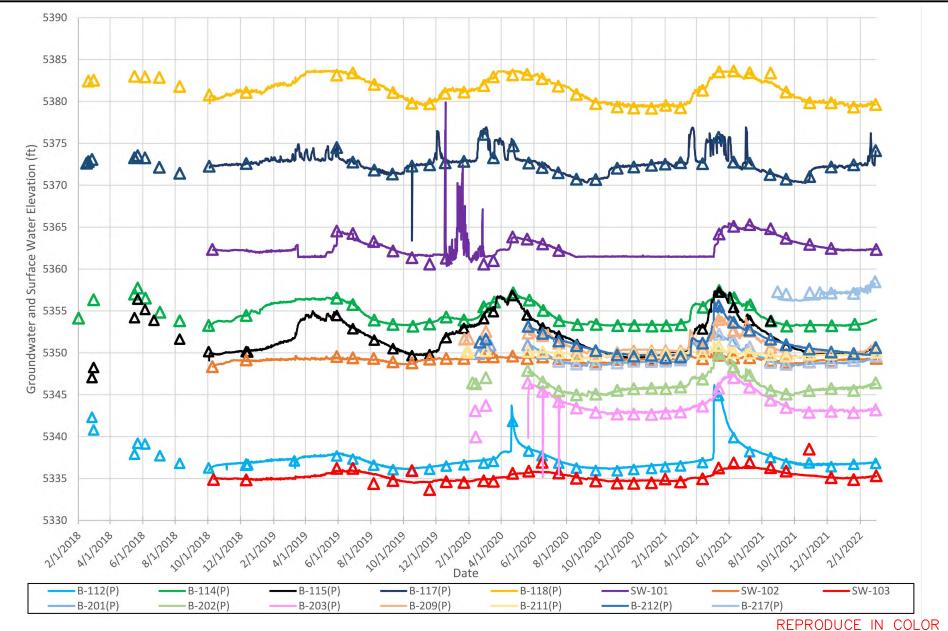
SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL INSTALLATION B-217(P)

PROJECT NO. 16134

July 2022





B-203(P) IN MAY, JUNE, AND JULY 2020 ARE FROM PURGING THE WELL AND PERFORMING RISING HEAD TESTS.





SOUTH BOULDER CREEK **REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT**

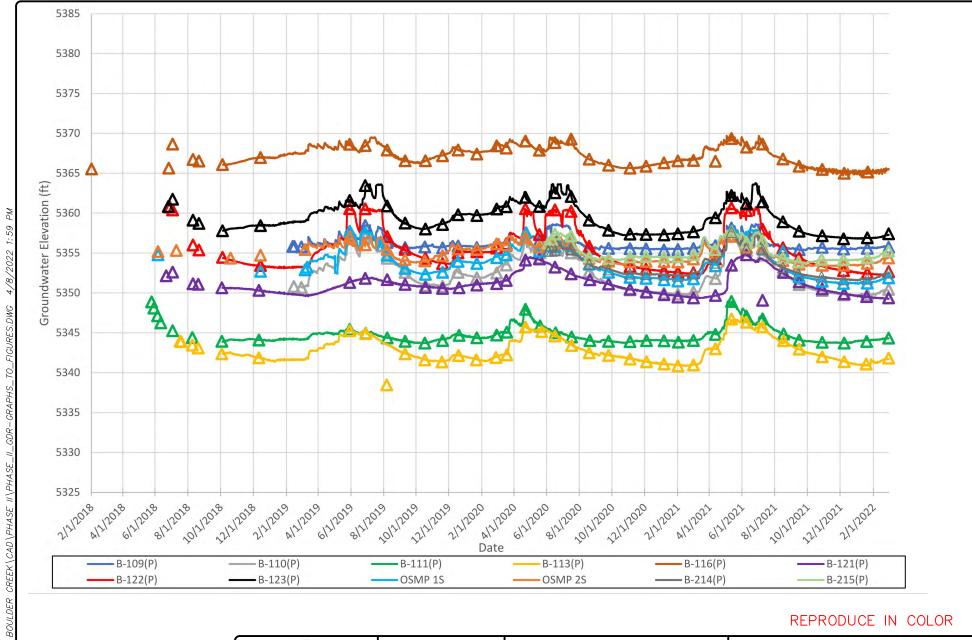
MONITORING WELL DATA - GROUP 2

PROJECT NO. 16134

July 2022

Figure 2.19

NOTE: BRIEF DECLINES IN





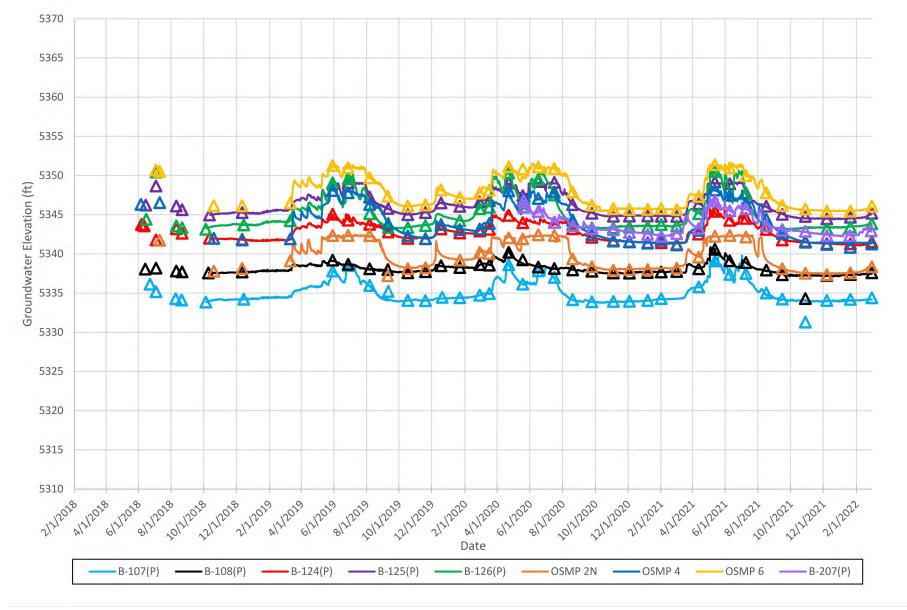


SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL DATA - GROUP 3

PROJECT NO. 16134

July 2022







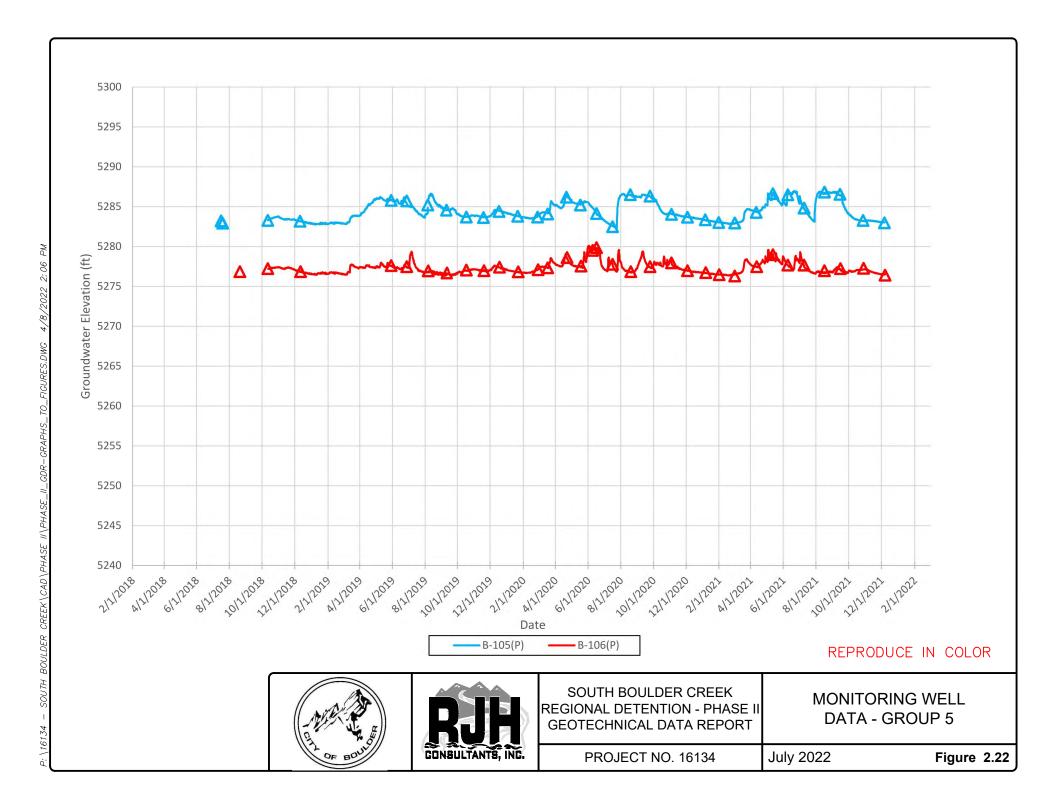


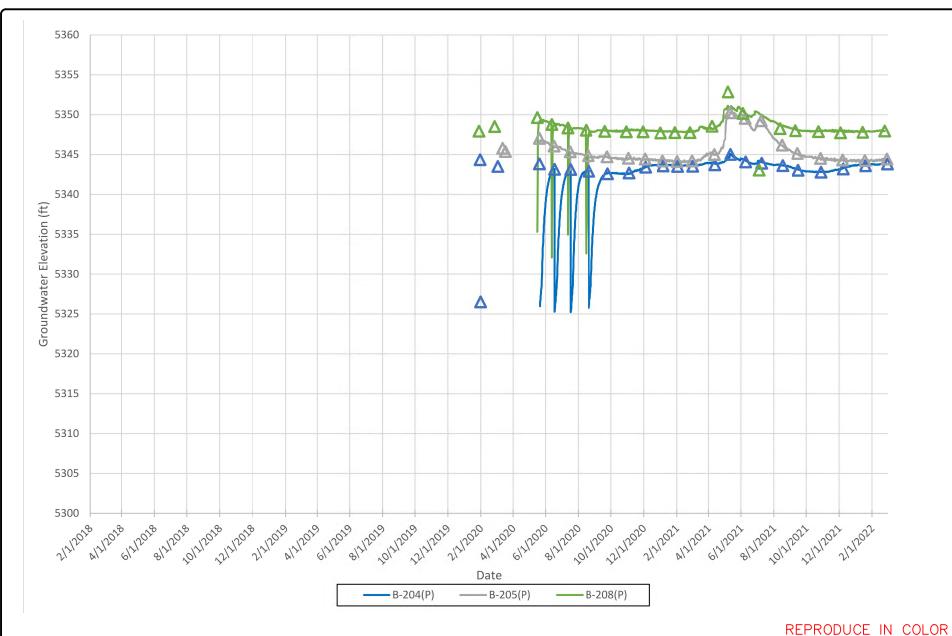
SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

MONITORING WELL DATA - GROUP 4

PROJECT NO. 16134

July 2022





WELLS IN MAY, JUNE, JULY, AND AUGUST 2020 ARE FROM PURGING THE WELLS AND PERFORMING RISING HEAD TESTS.





SOUTH BOULDER CREEK **REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT**

MONITORING WELL DATA - GROUP 6

PROJECT NO. 16134

July 2022

Figure 2.23

NOTE: BRIEF DECLINES IN

SECTION 3 - LABORATORY TESTING

Laboratory tests were performed on selected samples of soil and bedrock. RJH engaged Advanced Terra Testing of Lakewood, Colorado, to perform the following geotechnical laboratory tests:

- Forty-eight moisture content tests (ASTM D2216) and thirty density tests (ASTM D7263). Additional moisture-density test results for initial specimen conditions were also obtained with the results from consolidation, unconfined compressive strength, and triaxial tests.
- Thirty-four Atterberg limit multipoint tests (ASTM D4318).
- Thirty-one particle size analysis tests (ASTM D6913).
- Four grain size analyses with a hydrometer (ASTM D7928 and D6913).
- Seven percent minus #200 tests (ASTM D1140).
- Three one-dimensional consolidation tests (ASTM D2435).
- Thirteen unconfined compressive strength (UCS) tests (D7012, Method C).
- Nine consolidated, undrained triaxial shear tests with pore pressure measurements (ASTM D4767).
- Three swell/collapse tests (ASTM D4546).
- Three flexible wall permeability tests (ASTM D5084).
- Six crumb dispersion tests (Reclamation Method).
- Three direct shear tests (ASTM D3080).
- One standard proctor test (ASTM D698).
- Two suites of corrosion tests, including pH test (ASTM D4972), resistivity test (ASTM G187), chlorides test (ASTM D1411), sulfates test (ASTM C1580), and sulfides test (ASTM D4658).

RJH also engaged SGS of Wheat Ridge, Colorado, to perform the following environmental laboratory tests:

• Two n-Hexane Extractable Material (HEM) Oil and Grease tests (SW-846 Test Method 9071B).



• One SGT-HEM Non-polar Material test (SW-846 Test Method 9071B with silica gel treatment).

Geotechnical laboratory test results are summarized in Table 3.1. Corrosion test results are summarized in Table 3.2, and environmental test results are summarized in Table 3.3. Laboratory test results from the borings and test pits are provided in Appendix J.1. The shear data reduction results are provided in Appendix J.2. The interpreted triaxial test results are presented in Table 4.1 to 4.3.



TABLE 3.1 LABORATORY TEST RESULTS

| Boring | Depth (ft) | Moisture Content (%) | Dry Unit Weight (pcf) | Liquid Limit, LL | Plasticity Index, Pl | Percent Cobbles (12" to 3") | Percent Gravel (3" to #4) | Percent Sand (#4 to #200) | Percent Fines (<#200) | Optimum Moisture Content (%) | Maximum Dry Unit Weight (pcf) | Coefficient of Compression (Cc) | Coefficient of Re-Compression (Cr) | Preconsolidation Stress (psf) | Unconfined Compressive Strength (psi) | Crumb Test Grade | Swell (%) | Swell Pressure (psf) | Hydraulic Conductivity (cm/s) |
|-------------------------------|-----------------------|----------------------------|--------------------------------|------------------------|-------------------------|--------------------------------------|------------------------------------|------------------------------------|-----------------------------|---------------------------------------|--|---------------------------------------|------------------------------------|-------------------------------------|--|------------------------|--------------|----------------------------|-------------------------------------|
| | CU South General Fill | | | | | | | | | | | | | | | | | | |
| B-202(P) | 3.2-3.5 | 17.4 | 106.2 | 34 | 12 | | 16 | 57 | 27(1) | | | | | | | | | | |
| B-202(P) | 5.4-5.7 | 7.8 | 103.6 | 27 | 7 | | 21 | 59 | 20 | | | | | | | | | | |
| B-203(P) | 3.2-3.8 | 6.2 | 105.9 | 31 | 11 | | 35 ⁽²⁾ | 49(2) | 16 ⁽²⁾ | | | 0.069(11) | 0.009(11) | (10)(11) | | | | | |
| B-203(P) | 7.9-8.2 | 11.2 | 108.9 | 30 | 6 | | 9 | 62 | 30 | | | | | | | | | | |
| B-203(P) | 8.2-8.5 | 11.4 | 112.3 | 30 | 6 | | 24(2) | 59 ⁽²⁾ | 17(2)(3) | | | | | | | | | | 2.6x10-5 ⁽¹¹⁾ |
| B-208(P) | 5.0-6.5 | 9.5 | | 38 | 19 | | 32(2) | 15 ⁽²⁾ | 53 ⁽²⁾ | | | | | | | | | | |
| B-209(P) | 0.0-2.5 | 4.0 | | 30 | 15 | | 60 | 30 | 10 | | | | | | | | | | |
| B-209(P) | 5.0-6.5 | | | | | | 55 ⁽²⁾ | 32(2) | 13 ⁽²⁾ | | | | | | | | | | |
| B-210 | 0.0-3.7 | | | 32 | 16 | | 24(2) | 38(2) | 38(2) | | | | | | | | | | |
| B-210 | 2.5-3.7 | | | | | | 49(2) | 28(2) | 23(2) | | | | | | | | | | |
| B-211(P) | 0.0-1.5 | | | | | | 35(2) | 32(2) | 33(2) | | | | | | | | | | |
| B-211(P) | 2.5-4.0 | 15.5 | | 44 | 25 | | | 3 | 97 | | | | | | | | | | |
| B-212(P) | 0.0-3.4 | 7.1 | | NP ⁽⁴⁾ | NP | | 37(2) | 48(2) | 15 ⁽²⁾ | | | | | | | | | | |
| B-212(P) | 0.0-10.2 | | | 23 | 8 | | 39 | 43 | 18 | | | | | | | | | | |
| B-213 | 5.5-6.5 | 75.8 | | 80 | 54 | | | 9 | 90 | | | | | | | | | | |
| B-213 | 10.0-11.1 | 10.1 | | 28 | 9 | | 47(2) | 38(2) | 15 ⁽²⁾ | | | | | | | | | | |
| | _ | | | | | | | | | US36 | Embankmen | t Fill | | | | | | | |
| B-215(P) | 4.4-5.0 | 12.6 | 108.5 | 41 | 26 | | 20 | 35 | 45 ⁽⁵⁾ | | | | | | | 1 | | | |
| D-213(F) | 4.4-3.0 | 13.9 | 119.4 | 41 | 20 | | 20 | 33 | 43(*) | | | | | | | ı | | | |
| B-215(P) | 5.7-6.0 | 15.6 | 114.9 | 45 | 29 | | 22 | 16 | 62 | | | | | | | | | | 1.2x10-7 ⁽¹¹⁾ |
| | | | | | | | | | | CU | South Berm | Fill | | | | | | | |
| B-217(P) | 20.0-21.5 | 13.7 | | 70 | 51 | | 8 | 16 | 76 | | | | | | | 1 | | | |
| B-218 | 5.5-10.0 | 7.3 | | 42 | 22 | | 2 | 8 | 90 | | | | | | | 1 | | | |
| TP-204 | 7.5-12.0 | 5.5 | | 38 | 21 | | 18 | 45 | 37 | | | | | | | 1 | | | |
| B-216, B-217(P), TP-204 | 0.0-15.0 | 8.4 | | 43 | 20 | | 1 | 8 | 91 ⁽⁶⁾ | 17.2 | 108.7 | 0.247 ⁽¹²⁾ | 0.031(12) | 4,940(12) | | 1 | | | 2.0x10-6 ⁽¹²⁾ |



| | | Moisture | Dry Unit | Liquid | | Percent Cobbles | Percent Gravel | Percent Sand | Percent | Optimum Moisture | Maximum Dry Unit | Coefficient of | Coefficient of | Preconsolidation | Unconfined Compressive | Crumb | | Swell | Hydraulic |
|----------|---------------|----------------|--------------|--------------|-------------------------|--------------------|-------------------|--------------------------|------------------|---------------------|---------------------|----------------------|------------------------|------------------------|------------------------|---------------|---------------------|----------------|---------------------|
| Boring | Depth (ft) | Content (%) | Weight (pcf) | Limit, LL | Plasticity Index, Pl | (12" to 3") | (3" to #4) | (#4 to #200) | Fines (<#200) | Content (%) | Weight (pcf) | Compression (Cc) | Re-Compression (Cr) | Stress (psf) | Strength (psi) | Test Grade | Swell (%) | Pressure (psf) | Conductivity (cm/s) |
| Domig | (10) | (70) | (601) | | maox, i i | <i>J</i> | <i></i>) | 2007 | (4,1200) | (70) | Alluvium | (00) | (6.) | (60.) | (60.) | Oraco | (70) | (60.) | (011110) |
| B-201(P) | 5.0-7.9 | 3.3 | | 27 | 10 | | 61 | 30 | 9 | | | | | | | | | | |
| B-201(P) | 12.5-14.0 | | | | | | 46 | 44 | 10 | | | | | | | | | | |
| B-204(P) | 5.7-6.0 | 5.7 | | NP | NP | | 1 | 96 | 3 | | | | | | | | | | |
| B-204(P) | 12.5-19.0 | 10.3 | | 21 | 3 | | 40(2) | 50(2) | 10(2) | | | | | | | | | | |
| B-205(P) | 15.0-16.5 | 15.2 | | 29 | 13 | | 43 | 42 | 15 | | | | | | | | | | |
| B-206 | 8.0-10.4 | 4.5 | | 21 | 2 | | 44 | 45 | 11 | | | | | | | | | | |
| B-206 | 12.5-14.0 | 13.0 | | 22 | 2 | | 41 | 20 | 39 | | | | | | | | | | |
| B-207(P) | 10.0-11.5 | | | | | | 30 | 57 | 13 | | | | | | | | | | |
| B-208(P) | 15.0-16.5 | | | | | | 28 | 60 | 13 | | | | | | | | | | |
| B-208(P) | 17.5-18.9 | 12.7 | | 21 | 4 | | | | | | | | | | | | | | |
| B-214(P) | 5.0-6.4 | | | | | | 37(2) | 53 ⁽²⁾ | 10(2) | | | | | | | | | | |
| B-215(P) | 7.5-9.0 | | | | | | 30 | 62 | 9 | | | | | | | | | | |
| B-217(P) | 27.5-29.0 | | | 26 | 9 | | 41 | 33 | 26 | | | | | | | | | | |
| TP-201 | 5.0-9.0 | | | | | | 57 | 38 | 5 | | | | | | | | | | |
| | | | | | | | | | | ļ | Pierre Shale | | | | | | | | |
| B-201(P) | 22.4-23.0 | 12.9 | 118.9 | 46 | 28 | | | | | | | | | | 160 | | | | |
| B-201(P) | 24.4-24.9 | 11.5 | 128.6 | | | | | | | | | | | | | | | | |
| B-202(P) | 16.9-17.5 | 13.7 | 114.4 | | | | | | | | | | | | 141 | | | | |
| B-202(P) | 19.4-20.0 | 38.3 | 100.5 | | | | | | | | | | | | | | | | |
| B-202(P) | 21.6-22.2 | 13.6 | 120.2 | | | | | | 100 | | | | | | | | 1.64 ⁽⁷⁾ | 9,445 | |
| B-203(P) | 15.8-16.3 | 12.4 | 121.4 | 38 | 19 | | | 4 | 96 | | | | | | | | | | |
| B-203(P) | 16.9-17.4 | 12.9 | 113.5 | | | | | | | | | | | | 110 | | | | |
| B-203(P) | 19.5-20.0 | 10.4 | 122.7 | | | | | | | | | 0.13 ⁽¹¹⁾ | 0.036(11) | 18,940 ⁽¹¹⁾ | | | | | |
| B-204(P) | 25.4-25.9 | 10.6 | 121.8 | | | | | | | | | | | | 218 | | | | |
| B-204(P) | 26.4-27.0 | 9.9 | 131.3 | 38 | 21 | | | 4 | 96 | | | | | | | | 0.60(8) | 16,369 | |
| B-207(P) | 16.3-16.9 | 8.3 | 130.2 | 35 | 16 | | | 2 | 98 | | | | | | 246 | | | | |
| B-208(P) | 25.1-25.6 | 13.7 | 110.4 | | | | | | | | | | | | 71 | | | | |
| B-209(P) | 11.3-11.8 | 8.8 | 117.9 | 37 | 21 | | | 15 | 85 | | | | | | 166 | | | | |
| B-210 | 7.1-7.6 | 10.2 | 121.3 | | | | | | | | | | | | 103 | | | | |
| B-211(P) | 12.0-13.5 | 16.3 | | | | | | | | | | | | | | 1 | | | |
| B-212(P) | 11.6-12.1 | 9.5 | 130.4 | | | | | | | | | | | | | | 0.65(9) | 4,006 | |
| B-212(P) | 13.5-14.1 | 9.3 | 127.7 | 35 | 19 | | | 8 | 92 | | | | | | | | | | |
| B-213 | 19.3-19.8 | 13.6 | 119.0 | | | | | | | | | | | | 165 | | | | |



| Boring | Depth (ft) | Moisture Content (%) | Dry Unit Weight (pcf) | Liquid Limit, LL | Plasticity Index, Pl | | Percent Sand (#4 to #200) | Percent Fines (<#200) | Optimum Moisture Content (%) | Maximum Dry Unit Weight (pcf) | Coefficient of Compression (Cc) | Coefficient of Re-Compression (Cr) | Preconsolidation Stress (psf) | Unconfined Compressive Strength (psi) | Crumb Test Grade | Swell (%) | Swell Pressure (psf) | Hydraulic Conductivity (cm/s) |
|----------|---------------|----------------------------|--------------------------------|------------------------|-------------------------|--|------------------------------------|-----------------------------|---------------------------------------|--|---------------------------------------|--|-------------------------------------|--|------------------------|--------------|----------------------------|-------------------------------------|
| B-213 | 21.2-21.7 | 11.5 | 123.8 | | | | | | | | | | | | | | | 1 |
| B-214(P) | 11.2-11.7 | 12.6 | 125.4 | | | | | | | | | | | 124 | | | | |
| B-214(P) | 15.8-16.4 | 8.7 | 134.7 | | | | | | | | | | | 359 | | | | |
| B-215(P) | 19.4-19.9 | 11.9 | 123.8 | 36 | 19 | | 1 | 99 | | | | | | 256 | | | | 1 |
| B-215(P) | 22.3-22.9 | 9.1 | 128.7 | | | | | | | | | | | 380 | | | | |

Notes:

- Notes:

 Fines consist of 18 percent silt and 9 percent clay.
 Size of sample did not meet the requirements of ASTM D6913.
 Fines consist of 12 percent silt and 5 percent clay.
 NP = non-plastic.
 Fines consist of 28 percent silt and 17 percent clay.
 Fines consist of 65 percent silt and 26 percent clay.
 Inundation load: 2008 psf.
 Inundation load: 4000 psf.
 Inundation load: 993 psf.

 Preconsolidation stress could not be identified from lab results.
 This test was performed on an intact sample.
 This test was performed on a remolded sample.

- 12. This test was performed on a remolded sample.



TABLE 3.2 CORROSION TEST RESULTS

| Boring | Depth (ft) | Sulfate Concentration (ppm) | Chloride Concentration (ppm) | рН | Minimum Resistivity (Ω-cm) |
|----------|---------------|-----------------------------------|------------------------------------|-----|----------------------------------|
| B-205(P) | 7.5-7.7 | 45 | 36 | 7.6 | 8200 |
| B-214(P) | 16.4-17.0 | 379 | 15.5 | 8.1 | 856 |

TABLE 3.3 ENVIRONMENTAL TEST RESULTS

| Boring | Depth (ft) | HEM Oil and Grease (mg/kg) | SGT-HEM Non-polar Material (mg/kg) |
|----------|-------------------------------------|-------------------------------------|---|
| B-202(P) | 7.5-9.0, 10.0-11.0, 12.5-13.5 | 46,900 | 12,200 ⁽¹⁾ |
| B-213 | 2.5-4.0(1) | 41,800 | |

Note:

1. Test was performed on black gravel-sized particles selectively removed from recovered samples.



SECTION 4 - SITE AND SUBSURFACE CONDITIONS

4.1 General Site Conditions

The Site vicinity was generally covered by grass and other light vegetation; however, some areas with mature trees and woody brush were also present at various locations.

Various existing facilities and evidence of historical disturbance associated with previous mining activities are present throughout the CU South Campus. Pedestrian trails on the CU South Campus and OSMP property also experience significant use from the public throughout the year. Additional information about general existing Site conditions is presented in the Phase I GDR (RJH, 2019).

4.2 Geology

4.2.1 Site Geology

Geology at the Site generally consists of alluvium overlying Pierre Shale bedrock. Based on the published mapping, the bedrock in the Site vicinity is dipping downward to the southeast at about 20 degrees. Alluvium is predominantly coarse-grained (sand, gravel, cobbles, and boulders) and was deposited by South Boulder Creek. The alluvium has previously been mined from throughout the CU South Campus area, and the mined area has been reclaimed with fill.

A Project-specific geologic map and additional information about Site geology is presented in the Phase I GDR (RJH, 2019).

4.2.2 Seismicity

According to U. S. Geological Survey (USGS) Quaternary Faults and Folds Database (USGS, 2021a), there are no active faults near the site. The closest potentially active fault is the Golden Fault, 8 miles to the south.

Peak ground accelerations (PGA) with a 5,000-year recurrence interval were obtained from the USGS Unified Hazard Tool (USGS, 2021b) and were adjusted in accordance with American Society of Civil Engineers (ASCE) Standard 7-16 *Minimum Design Loads and Associated Criteria for Buildings and other Structures* (ASCE, 2016) to account for the foundation conditions expected to exist onsite. We interpret site conditions to be site class C



(very dense soil and soft rock), and the PGA is 0.25g. Ground accelerations at the Site are predominately influenced by events with magnitudes 4.5 to 6.

4.3 Subsurface Conditions

4.3.1 General Subsurface Profile

The general subsurface profile at the exploration locations included fill and alluvium overlying Pierre Shale bedrock. Various features of fill exist at the Site as described in Section 4.3.2. Subsurface cross sections are presented on Figures 4.1 to 4.3, and the encountered subsurface conditions are described in the following sections.

Large particles (cobbles and boulders) were encountered in both alluvium and fill. These particles were observed in test pits, were exposed on the ground surface, and indirect indicators of cobbles and boulders (sampler refusal, auger refusal, and other difficult drilling conditions) were common throughout the Phase I and Phase II investigations. The representativeness of soil samples collected from borings was limited by the drilling and sampling techniques, the sampler sizes, and the volumes of the collected samples. Test pits allowed for improved observation and sampling of large particles; however, the samples collected from test pits might still not be representative of the overall material gradation because of practical limitations to sample volume. The composition of collected samples may vary from the actual, in-situ material, and in our opinion, the collected samples and gradation test results likely underestimate the abundance of gravel, cobbles, and boulders.

Material descriptions presented in sections 4.3.2 to 4.3.4 are based on data collected during Phase II. Additional information collected during the Phase I investigation is presented in the Phase I GDR (RJH, 2019).

4.3.2 Fill

4.3.2.1 US36 Embankment Fill

US36 embankment fill exists beneath the highway and adjacent trails within the CDOT ROW. B-215(P) was drilled at the approximate location where the spillway is proposed to connect to the US36 embankment fill. At this location, the fill extended from the ground surface to 6.0 feet below the ground surface and was underlain by alluvium.



The fill consisted of sandy lean clay with gravel, clayey sand with gravel, and gravelly lean clay with sand. Fill ranged from 35 to 75 percent medium to high plasticity fines, 10 to 40 percent fine to coarse grained sand, and 15 to 25 percent fine to coarse grained gravel with a maximum recovered particle size of 1 inch. The fill ranged from medium stiff to very stiff. N values obtained from two SPT tests were 11 and 18, and pocket penetrometer results ranged from 1.0 to 4.0 tons per square foot (tsf). The fill generally ranged from dry to moist and was wet where the bottom of the fill was near the groundwater table.

Three tested samples had moisture contents of 12.6, 13.9, and 15.6 percent, and dry unit weights of 108.5, 119.4, and 114.9 pounds per cubic foot (pcf), respectively. Two samples had liquid limits of 41 and 45 with plastic indices of 26 and 29, respectively. The gradation results for two samples were 20 and 22 percent gravel, 35 and 16 percent sand, and 45 and 62 percent fines, respectively. The tested sample with 45 percent fines contained 17 percent clay and 28 percent silt. A crumb dispersion test was performed on a sample, and the sample was classified as non-dispersive. One flexible wall permeability test was performed on an intact specimen of fill, and the vertical hydraulic conductivity was 1.2×10^{-7} cm/s.

4.3.2.2 CU South General Fill

The CU South General Fill is located throughout a previously mined portion of the CU South Campus that has been reclaimed as a generally broad, flat area. B-201(P), B-202(P), B-203(P), B-208(P), B-209(P), B-210, B-211(P), B-212(P), B-213, TP-202, and TP-203 encountered fill throughout this area. The fill ranged from 2.0 to 16.0 feet thick and was underlain by alluvium or bedrock. In B-201(P) and B-208(P), the fill was underlain by alluvium. In the remaining borings and in TP-203, the fill was underlain by bedrock. In TP-202, the excavation terminated in fill at a depth of 8.0 feet.

The fill consisted mostly of clayey sand with gravel; however, the fill ranged widely from fine grained to coarse grained soil types. Coarse grained materials included clayey sand with gravel, silty sand with gravel, clayey sand, clayey sand with gravel, poorly graded sand with clay and gravel, silty sand with gravel, well graded sand with silt, gravel, and cobbles, well graded sand with silt, gravel, and cobbles, clayey sand with gravel and cobbles, poorly graded gravel with clay and sand, clayey gravel with sand, and well graded gravel with sand, cobbles, and boulders. Fine grained materials included fat clay, lean clay, gravelly lean clay with sand, sandy lean clay with gravel, sandy lean clay with cobbles, sandy lean clay with gravel, and gravelly lean clay with sand.



Fill typically contained 15 to 40 percent gravel, 30 to 60 percent sand, and 15 to 65 percent non-plastic to medium plasticity fines; however, the composition of fill was variable and ranged from 0 to 25 percent boulders, 0 to 35 percent cobbles, 0 to 70 percent fine to coarse grained gravel, 5 to 80 percent fine to coarse grained sand, and 5 to 95 non-plastic to high plasticity fines. Nine sampler locations encountered refusal (50 blows for less than 6 inches) after 0.2 to 1.2 feet of advancement. At 19 other sample locations, N values ranged from 1 to 72 and averaged 29. The fill ranged from dry to wet, and the fine grained fill ranged from very soft to very stiff. The maximum particle size recovered was 18 inches. Five rising head tests that predominantly measure K_h had results that ranged from 2.0x10⁻⁴ to 3.4x10⁻⁶ cm/s.

Moisture contents ranged from 4.0 to 75.8 percent, with an average of 16.0 for 11 samples tested. Unit weights ranged from 103.6 to 112.3, with an average of 107.4, for five samples tested. The liquid limits ranged from 23 to 80 and averaged 36, and the plasticity indices ranged from 6 to 54 and averaged 16 for the 12 samples tested. Sixteen gradation tests were performed on fill from this area, and the results ranged from 9 to 60 percent gravel, 3 to 62 percent sand, and 10 to 97 percent fines. A one-dimension compression test was performed on one sample of intact fill collected from within the proposed embankment foundation and yielded a compression index (Cc) of 0.069 and a recompression index (Cr) of 0.009. One flexible wall permeability test was performed on an intact specimen of fill, and the vertical hydraulic conductivity was 2.6x10⁻⁵ cm/s.

Three consolidated undrained triaxial tests were performed on intact samples of fill at consolidation pressures of 1,000, 2,000, and 3,000 pounds per square foot (psf). RJH interpreted the laboratory test results to develop peak strengths for the fill. The strength parameters developed from our interpretation of the triaxial data are summarized in Table 4.1, and the strength envelopes are presented in Appendix J2.

TABLE 4.1
CU SOUTH GENERAL FILL STRENGTH PARAMETERS

| | Effective | Stress | Total Stress | | |
|------------------------|--------------|-------------|--------------------------|-------------------------|--|
| Failure Criteria | φ' (deg.) | c' (psf) | φ _⊤ (deg.) | c _T (psf) | |
| 3 percent Axial Strain | 36 | 0 | 17 | 31 | |

Black, gravel-sized particles that consisted of strongly cemented black sand-sized particles were recovered in B-202(P) from 7.5 to 13.5 feet deep and in B-213 from 2.5 to



4.0 feet deep. Two tested samples contained 41,800 and 46,900 milligrams per kilogram (mg/kg) of HEM (oil and grease). One tested sample contained 12,200 mg/kg of Silica Gel Treated HEM, which removes polar compounds and yields a result that is more targeted to petroleum-related organics.

4.2.2.3 CU South Berm Fill

CU South Berm Fill comprises an earthen berm oriented north/south near the west side of the CU South Campus. In B-216, B-217(P), and B-218, the fill ranged from 14.5 to 26.0 feet in thickness and was underlain by alluvium. In TP-205, the fill was 5.5 feet thick and was underlain by bedrock. In TP-204, the excavation terminated in fill at a depth of 12.0 feet.

The fill consisted mostly of lean clay with sand; however, the fill ranged widely from fine grained to coarse grained soil types. Fine grained materials included fat clay with sand and cobbles, lean clay, lean clay with sand, lean clay with sand and cobbles, sandy lean clay, and sandy lean clay with cobbles. Coarse grained materials included clayey sand with cobbles and gravel, clayey sand with gravel and cobbles and boulders, and clayey gravel with sand.

Fill typically contained 75 to 95 percent low to medium plasticity fines; however, the composition of the CU South Berm Fill ranged from 0 to 10 percent boulders, 0 to 25 percent cobbles, 0 to 25 percent fine to coarse grained gravel, 5 to 55 percent fine to coarse grained sand, and 30 to 95 non-plastic to high plasticity fines. One sampler location encountered refusal after 1.4 feet of advancement. At nine other sample locations, N values ranged from 6 to 31 and averaged 18. The fill ranged from dry to wet and medium stiff to hard. The maximum particle size recovered was 17 inches.

Moisture contents ranged from 5.5 to 13.7 percent, with an average of 8.7, for four samples tested. The liquid limits ranged from 38 to 70 and averaged 48, and the plasticity indices ranged from 20 to 51 and averaged 29 for the four samples tested. Four gradation tests were performed on fill from the CU South Berm, and the results ranged from, 1 to 18 percent gravel, 8 to 45 percent sand, and 37 to 91 percent fines. The tested sample with 91 percent fines contained 65 percent silt and 26 percent clay. The optimum moisture content was 17.2 percent, with a maximum dry unit weight of 108.7 pcf for one Standard Procter Test. The results of four crumb test were all non-dispersive.

Consolidation, hydraulic conductivity, and triaxial tests were performed on a sample of lean clay with sand that was remolded to about 95 percent of the standard Proctor maximum dry



unit weight at 0 to 2 percent above the optimum moisture content. The tested material had a preconsolidation stress of 4,940 psf, a compression index (Cc) of 0.247, a recompression index (Cr) of 0.031, and vertical hydraulic conductivity of 2.0x10⁻⁶ cm/s. Three consolidated undrained triaxial tests were performed on the remolded CU South Berm Fill at consolidation pressures of 500, 1,500, and 2,500 psf. RJH interpreted the laboratory test results to develop peak strengths for the fill. The strength parameters developed from our interpretation of the triaxial data are summarized in Table 4.2, and the strength envelopes are presented in Appendix J.2.

TABLE 4.2
REMOLDED CU SOUTH BERM FILL STRENGTH PARAMETERS

| | Effective | Stress | Total Stress | | | |
|-----------------------------------|--------------|-------------|--------------|-------------------------|--|--|
| Failure Criteria | φ' (deg.) | c' (psf) | φ⊤ (deg.) | c _⊤ (psf) | | |
| 1 percent Axial Strain | 30 | 0 | 10 | 500 | | |
| Maximum Principal Stress Ratio | 37 | 0 | 9 | 470 | | |

4.3.3 Alluvium (Qal)

Alluvium was encountered in eleven borings and one test pit. In B-215(P), alluvium was interpreted to exist beneath the US36 embankment fill and above bedrock and was 6.8 feet thick. On the west side of CU South and in one boring near the levee, the alluvium in borings B-201(P), B-208(P), B-216, B-217(P), and B-218 was interpreted to exist beneath the fill and above bedrock and ranged from 1.0 to 16.7 feet thick. In the northeast portion of CU South Campus and on OSMP property, the alluvium in B-204(P), B-205(P), B-206, B-207(P), and B-214(P) was encountered at the ground surface and extended to bedrock and ranged in thickness from 8.0 to 20.8 feet. In TP-201, on the east side of CU South, the excavation terminated in fill at a depth of 9.0 feet.

Alluvium primarily consisted of coarse-grained materials (boulders, cobbles, gravels, and sands) with lesser amounts of non-plastic to medium plastic fines. In several of the borings and test pits, cobbles and/or boulders were encountered at or near the ground surface or while drilling. Samples of alluvium from the borings and test pits are primarily classified as poorly graded sand with silt and gravel. Other soils in lesser amounts are classified as poorly graded sand with clay and gravel, poorly graded gravel with clay and sand, clayey gravel with sand, poorly graded gravel with silt and sand, silty gravel with sand, poorly graded gravel with clay and cobbles, well graded gravel with silt and sand and cobbles, well



graded gravel with sand and cobbles and boulders, clayey sand with gravel, silty sand, poorly graded sand, poorly graded sand with clay, gravelly lean clay with sand, poorly graded sand with silt, and sandy lean clay.

In TP-201, alluvium consisted of 25 to 40 percent cobbles and 0 to 25 percent boulders within a matrix of soil. The matrix material observed in TP-201 and sampled from borings was typically 45 to 65 percent gravel, 30 to 45 percent sand, and 0 to 15 percent fines, and ranged from 5 to 70 percent fine to coarse grained gravel, 15 to 100 percent fine to coarse grained sand, and 0 to 45 percent non-plastic to medium plasticity fines.

Nineteen sampler locations encountered refusal (50 blows for less than 6 inches) after advancing the sampler 0.2 to 1.5 feet. At 25 other sample locations, N values ranged from 5 to 73 and averaged 36. The alluvium generally ranged from medium dense to very dense. Alluvium was dry to moist above the water table and moist to wet below the water table. Four rising head tests that predominately measure K_h had results that ranged from 2.4×10^{-4} to 2.9×10^{-4} cm/s. Two falling head tests that predominately measure K_v had results that ranged from 5.0×10^{-3} to 4.6×10^{-5} cm/s. The shear wave velocity of the alluvium generally ranged from about 800 to 1,500 feet per second (fps) along the spillway alignment.

Moisture contents ranged from 3.3 to 15.2 percent, with an average of 9.2, for seven samples tested. The liquid limits ranged from 21 to 29 and averaged 24, and the plasticity indices ranged from 2 to 13 and averaged 6 for six samples tested and one additional sample was non-plastic. Thirteen gradation tests were performed on the alluvium, and the results ranged from 0 to 5 percent cobbles, 1 to 61 percent gravel, 20 to 96 percent sand, and 3 to 39 percent fines.

4.3.4 Pierre Shale (Kp)

Bedrock of the Pierre Shale formation was encountered in each boring and in two test pits (TP-203 and TP-205). Pierre Shale was encountered 3.7 to 32.7 feet below the ground surface and extended for the remaining depths investigated. In TP-201, TP-202, and TP-204, the excavations extended 8.0 to 12.0 feet deep and did not encounter bedrock.

The Pierre Shale consisted of mostly fines of low to high plasticity, varied in color from brown to gray, and was generally dry to moist. Moisture observed in samples might have been influenced by water used during drilling. The hardness ranged from H4 to H7 and generally was H6 to H7. Bedrock ranged from fresh to decomposed and unfractured to intensely fractured and was mostly slightly weathered and unfractured. The interpreted top of weathered bedrock had a shear wave velocity of approximately 1,100 to 1,500 fps,



and the shear wave velocity ranged up to about 4,000 fps within the depths evaluated by the geophysical survey. Apparent trends between rock properties and depth were not identified at the exploration locations.

Thirteen sample locations encountered refusal (50 blows for less than 6 inches) after advancing the sampler from 0.5 to 1.4 feet. At nine other sample locations, N-values ranged from 14 to 62 and averaged 44. Bedrock core recovery ranged from 0 to 167 percent and averaged 102 percent, and was mostly 95 to 105 percent. Over-recovery (recovery greater than 100 percent) occurred in multiple core runs, most likely due to stress relief after extraction. Rock quality designations (RQD) ranged from 0 to 167 and averaged 100; however, the RQD may not be applicable because of the softness of the shale. RQD greater than 100 occurred when recovery was greater than 100 percent.

Moisture contents ranged from 8.3 to 38.3 percent for 23 samples tested. Excluding one anomalously high result, the moisture contents ranged from 8.3 to 16.3, with an average of 11.4 percent. Unit weights ranged from 100.5 to 134.7 pcf, with an average of 122.1 pcf for 22 samples tested. The liquid limits ranged from 35 to 46 and averaged 38, and the plasticity indices ranged from 16 to 28 and averaged 20 for the seven samples tested. The unconfined compressive strength of thirteen samples ranged from 71 to 380 psi and averaged 192 psi. The unconfined compressive strength of tested samples is generally lower towards the west (on CU South) than along the spillway alignment. A one-dimension compression test was performed on one sample with a preconsolidation stress of 18,940 psf and yielded a compression index (Cc) of 0.13 and a recompression index (Cr) of 0.036. The results of one crumb test were non-dispersive. Three swell/collapse tests were performed and resulted in swell of 1.64, 0.60, and 0.65 percent and swell pressures of 9,445, 16,369, and 4,006 psf, respectively.

Three consolidated undrained triaxial tests were performed on samples of intact rock core at consolidation pressures of 500, 1500, and 4,000 psf. RJH interpreted the laboratory test results to develop peak and fully softened strengths for the intact bedrock. Peak strengths represent the strength of the bedrock at low displacements, and fully softened strength represents a lower strength that exists after relatively large displacements. We selected peak and fully softened strengths to occur at 1 and 9 percent axial strain, respectively. We developed both drained and undrained strength envelopes corresponding to peak and fully softened conditions. The strength parameters developed from our interpretation of the triaxial data are summarized in Table 4.3, and the strength envelopes are presented in Appendix J2.



TABLE 4.3
PIERRE SHALE STRENGTH PARAMETERS

| | Effectiv | e Stress | Total Stress | | |
|--|--------------|-------------|--------------|-------------------------|--|
| Failure Criteria | φ' (deg.) | c' (psf) | φ⊤ (deg.) | c _T (psf) | |
| Peak Strength (1 percent Axial Strain) | 65 | 0 | 0 | 4,000 | |
| Fully Softened Strength (9 percent Axial Strain) | 40 | 0 | 0 | 4,000 | |

Direct shear tests were performed on two samples of intact rock core of Pierre Shale along existing bedding planes. Test specimens often continued to gain strength with increasing displacement, and therefore we were not able to differentiate between peak and fully softened strengths. The friction angle for softened conditions is estimated to be 32 degrees. Additional information is presented in Appendix J.2.

Five rising head tests that predominately measure K_h had hydraulic conductivity results that ranged from 4.9×10^{-5} to 9.6×10^{-8} cm/s. Forty-nine Packer tests were performed in the Pierre Shale. Test results ranged from 0.1 to 0.2 Lugeons $(1.0 \times 10^{-7}$ to 2.8×10^{-7} cm/s) and had a geometric mean of 0.1 Lugeon $(1.2 \times 10^{-7}$ cm/s). Test results exhibited laminar flow, infilling, and no flow.

4.3.5 Groundwater

During drilling and test pit excavation, groundwater was encountered in 14 borings and one test pit at depths of about 3.5 to 28.0 feet below the ground surface. In the remaining four borings and four test pits, free water was not measured at the time of drilling or excavation. Two of the four borings in which water was not measured during drilling were completed as monitoring wells and groundwater recharged into the completed wells after drilling.

Groundwater was observed in alluvial or fill material and bedrock, but the phreatic surface exists within fill and alluvium. Groundwater generally varies spatially, as presented on Figures 4.1 to 4.3, and varies seasonally, as shown on Figures 2.18 to 2.23.

Groundwater levels recorded in wells installed during Phase I and Phase II are presented on Figures 2.18 to 2.23. On each of these figures, the individual triangles represent water levels measured manually by RJH, and the solid lines represent groundwater levels measured every 12 hours by the datalogging piezometers.



Between April 2020 and February 2022, the groundwater levels on Figures 2.18 to 2.23 are generally higher and more variable in the spring and summer and are generally lower and more stable in the fall and winter. Trends observed between June 2019 and April 2020 are presented in the Water Level Data Collection Update (RJH, 2020b), and trends observed prior to June 2019 are presented in the Phase I GDR (RJH, 2019).

Collected data was not included on the graphs if the data was not considered to be representative of site water levels. Conditions that caused measurements not to be representative included a) time period when the data logger was removed from B-103(P), b) period when the data logger cable was hung at the incorrect elevation at B-103, and c) period when SW-101 did not respond similarly to nearby groundwater monitoring wells because the pond was frozen.

4.4 Subsurface Profile along Embankment Alignment

The subsurface profile generally along the proposed embankment alignment is shown on Figure 4.1 and consists of varying thicknesses of fill and alluvium overlying Pierre Shale bedrock. CU South Berm Fill is present near the left side of the embankment and is mostly fine-grained soil that is expected to contain some cobbles and boulders. Alluvium is present at the ground surface near the right side of the embankment and is anticipated to be a coarse-grained material that also contains cobbles and boulders. CU South General Fill exists throughout the central portion of the embankment alignment and is anticipated to range from fine-grained to coarse-grained material, with cobbles and boulders.

During Phase I, two borings, B-111(P) and B-114(P), were drilled near the embankment alignment. Additional information about B-111(P) and B-114(P) is presented in the Phase I GDR.

4.5 Subsurface Profile along the Spillway Alignment

The subsurface profile along the spillway alignment is shown on Figure 4.1 and generally consists of alluvium overlying bedrock. The alluvium is predominantly poorly graded sand with silt and gravel and is expected to contain cobbles and boulders. Bedrock generally becomes lower in elevation, and alluvium becomes thicker towards the left side of the spillway. The top of bedrock ranges from 12.8 feet below the ground surface at the right end of the spillway to 14.5 feet below the ground surface at the left end of the spillway. Bedrock encountered during the Phase II investigation was predominantly unfractured to slightly fractured and low-permeable. However, the bedrock encountered in B-110(P) during the Phase I investigation was moderately to intensely fractured from



0.0 to 17.0 feet into bedrock and more permeable (hydraulic conductivity ranged from 0.2 to 29 lugeons). Additional information about B-110(P) is presented in the Phase I GDR.

US36 Embankment Fill is present above alluvium at the right end of the spillway alignment. This fill is generally stiff fine-grained soil.

4.6 Subsurface Profile along the Detention Excavation Perimeter

The subsurface profile along the detention excavation perimeter is shown on Figure 4.2 and generally consists of CU South General Fill and alluvium overlying bedrock. Bedrock ranges from 3.7 to 20.1 feet below the ground surface and was low-permeable. The bedrock was unfractured to moderately fractured and fresh to slightly weathered.

Alluvium is present in the northeast portion of the detention excavation and was generally sand and gravel with varying amounts of cobbles and boulders with a maximum particle size of 20 inches. CU South General Fill exists along most of the detention excavation perimeter, was highly variable and ranged from fine grained to coarse grained soil with a maximum particle size of 18 inches. The fill ranged from 3.7 to 16.0 feet thick Measured groundwater levels vary from about 2.0 to 6.4 feet below the ground surface.

4.7 Subsurface Profile along the Outlet Works Alignment

The subsurface profile near the outlet works alignment is shown on Figure 4.3. Materials near the proposed outlet works profile consists of alluvium overlying bedrock. The outlet works is expected to be located predominantly through alluvium; however, the invert of the tunnel might also encounter shallow bedrock. Alluvium generally consists of coarse grained material that includes sand, gravel, cobbles, and boulders. Groundwater is anticipated to be near to slightly above the outlet works alignment.

4.8 Subsurface Conditions within On Site Borrow Areas

We anticipate that onsite borrow material could be obtained from the CU South berm, CU general fill within the detention excavation, and the CU levee.

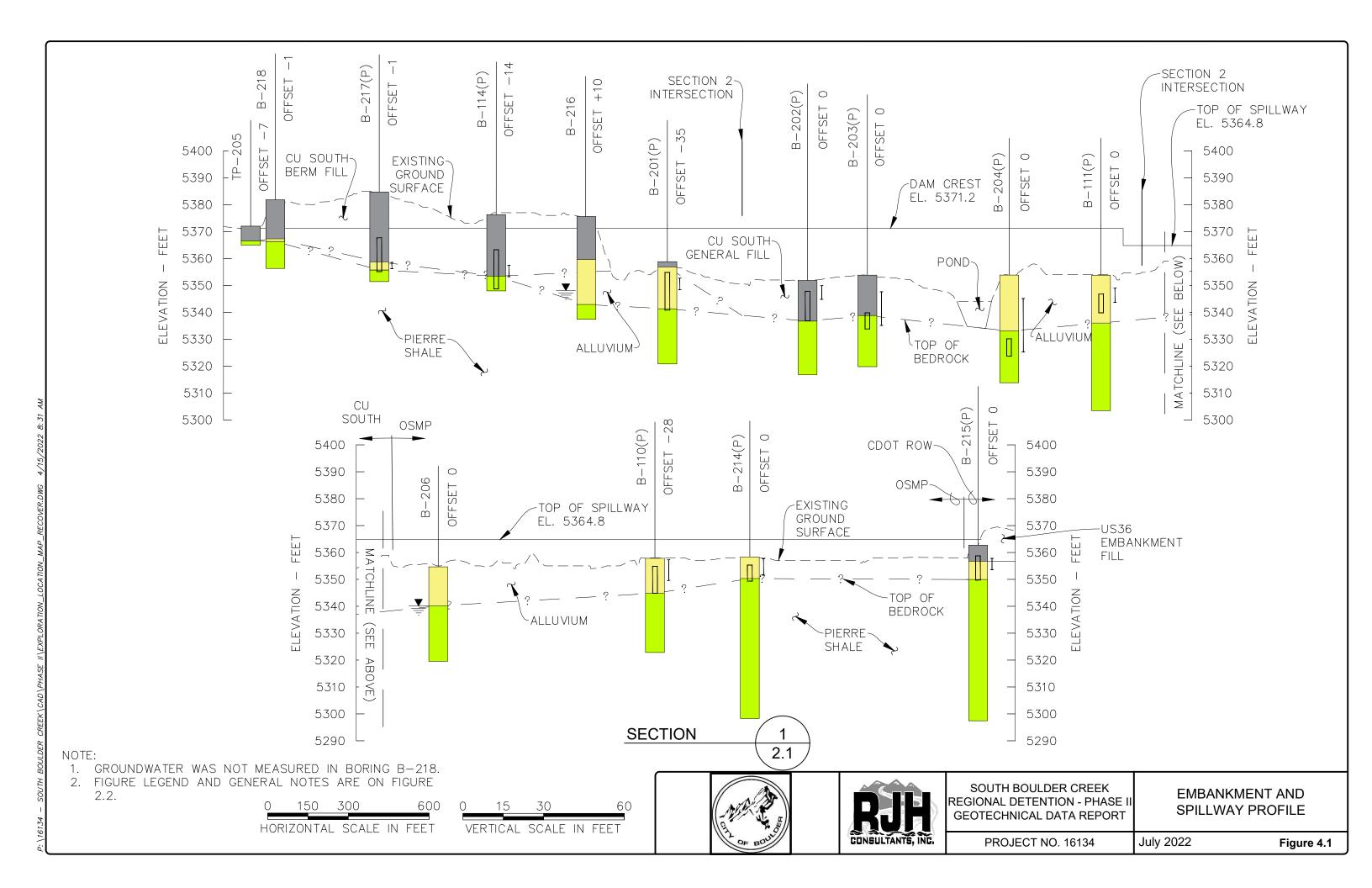
The CU South berm generally consists predominantly of clayey low permeable material and is expected to contain some cobbles and boulders, and is predominantly situated above the groundwater table.

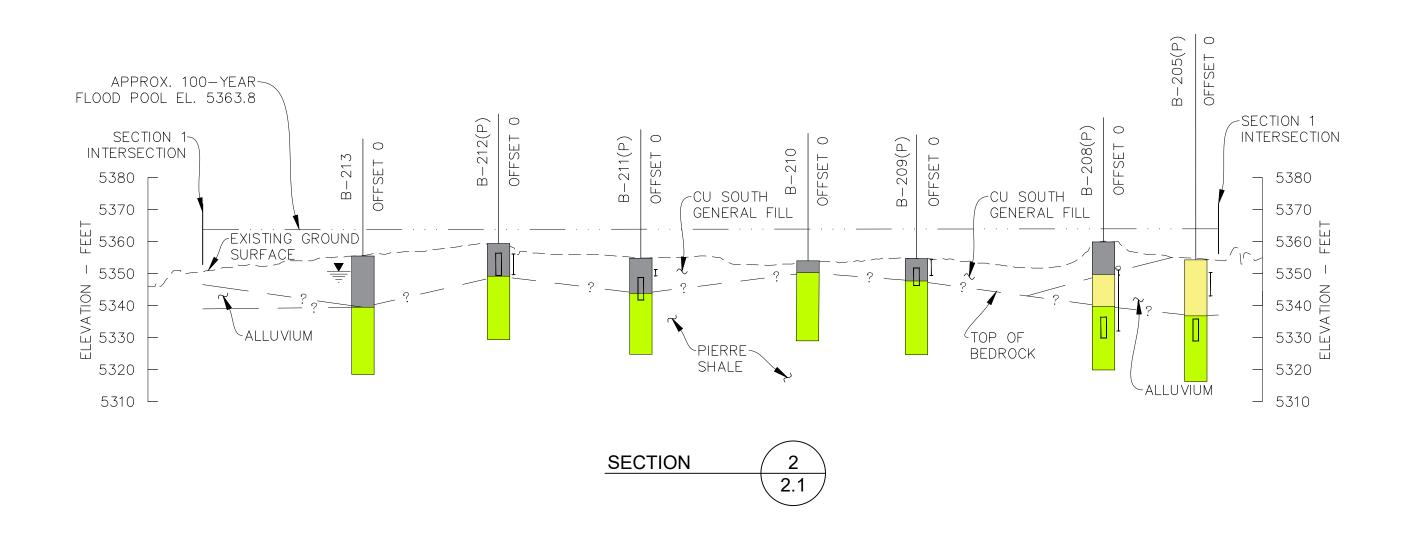


The CU general fill composition is variable and includes both fine and coarse grained soil. Up to about 35 percent cobbles and less than 10 percent boulders were also encountered in test pits performed in CU general fill within the proposed detention excavation area.

The CU levee was not investigated during the Phase II investigation; however, based on two borings performed during Phase I (RJH, 2019), the levee fill appears to consist of clayey sand, clayey sand with gravel, and lean clay. Groundwater is not anticipated to be encountered within the levee fill.







NOTE:

- 1. GROUNDWATER WAS NOT ENCOUNTERED IN BORING B-210.
- 2. FIGURE LEGEND AND GENERAL NOTES ARE ON FIGURE 2.2.

| 0 | 150 | 300 | | 600 |
|------|--------|---------|-----|------------|
| HORI | ZONTAL | SCALE | IN | FEET |
| 0 | 15 | 30 | | <u>6</u> 0 |
| VEF | RTICAL | SCALE I | N F | EET |





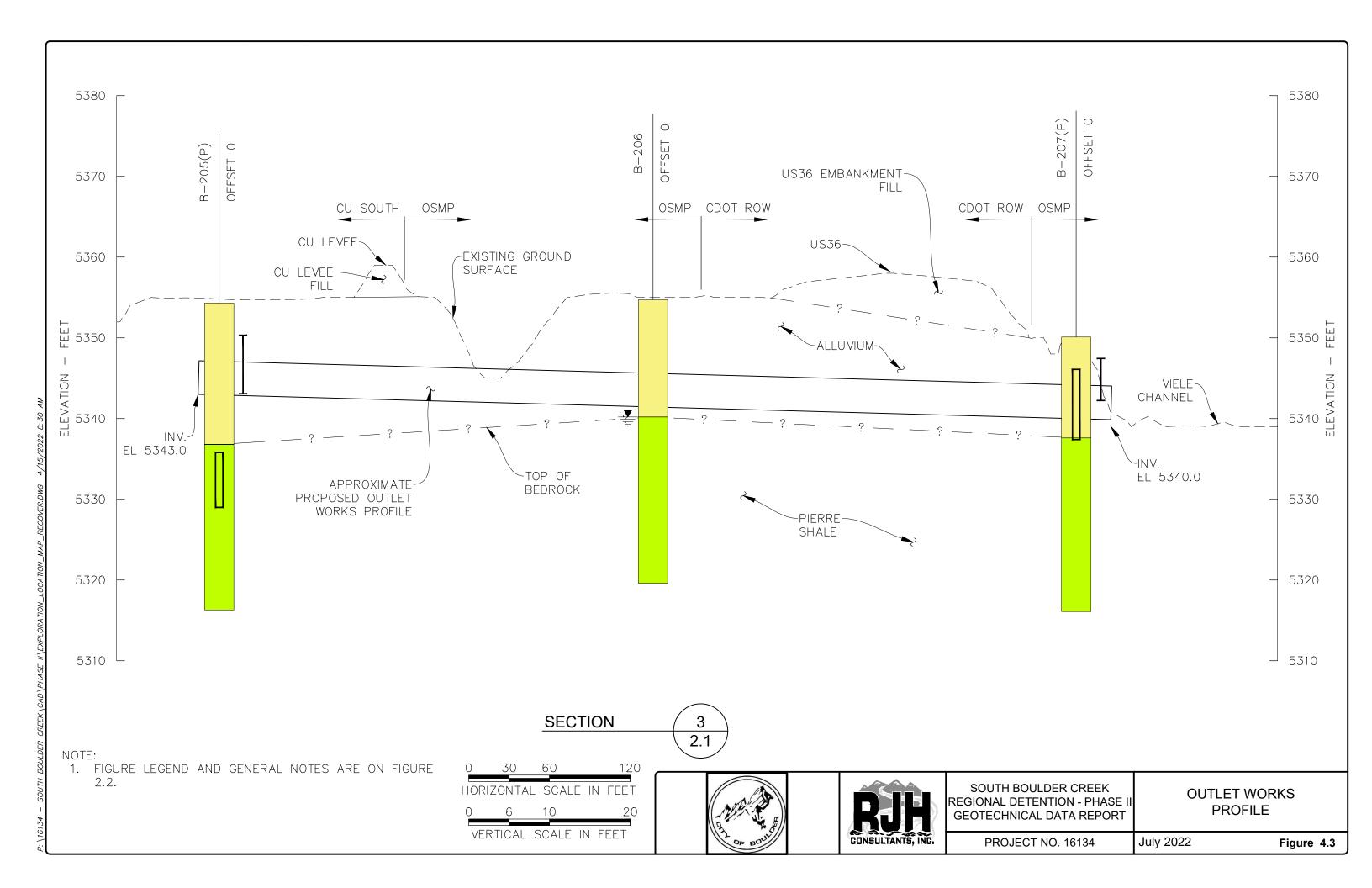
SOUTH BOULDER CREEK REGIONAL DETENTION - PHASE II GEOTECHNICAL DATA REPORT

DETENTION EXCAVATION PROFILE

PROJECT NO. 16134

July 2022

Figure 4.2



SECTION 5 - LIMITATIONS

This Report has been prepared for the exclusive use of RJH, the City, and other Project partners to support the preliminary design of Project facilities. In our opinion, additional data will be required to support the development of the final design. RJH is not responsible for technical interpretations of this data by others. RJH has endeavored to conduct our professional services for this Project in a manner consistent with a level of care and skill ordinarily exercised by members of the engineering profession currently practicing in Colorado under similar conditions as this Project. RJH makes no other warranty, expressed or implied.

The methods used in this study indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Samples cannot be relied on to accurately reflect variations in subsurface conditions that may exist between sampling locations.

The nature and extent of variations between borings may not become evident until construction. Timely and comprehensive observation and evaluation of actual subsurface conditions, supported by appropriate field and laboratory testing, will be critical during construction as variations from anticipated subsurface conditions may be encountered.



SECTION 6 - REFERENCES

- American Society of Civil Engineers (ASCE) (2016). ASCE/SEI 7-16 Minimum Design Loads and Associate Criteria for Building and other Structures.
- Houlsby, A.C. (1990). Construction and Design of Cement Grouting, A Guide to Grouting in Rock Formations. John Wiley & Sons, New York.
- Hsorslev, M.J. (1951). *Time Lag and Soil Permeabilities in Groundwater Observations*. U.S. Army Corps of Engineers Waterways Experiment Station Bulletin 36.
- Lambe, T.W. and Whitman, R.V. (1969). *Soil Mechanics*. John Wiley & Sons, New York.
- RJH Consultants, Inc. (RJH)) (2019). *Phase I Geotechnical Report South Boulder Creek Regional Detention Project*, August.
- RJH Consultants, Inc. (RJH) (2020a). Concept Design Report South Boulder Creek Regional Detention Project.
- RJH Consultants, Inc. (RJH) (2020b). South Boulder Creek Regional Detention Water Level Collection Update, April.
- U.S. Bureau of Reclamation (Reclamation) (2001). Engineering Geology Field Manual, Second Edition.
- U.S. Geological Survey (USGS) (2021a). Quaternary Fault and Fold Database of the United States. Accessed March 2022, from the USGS website:

 https://www.usgs.gov/natural-hazards/earthquake-hazards/faults?qt-science_support_page_related_con=4#qt-science_support_page_related_con.
- U.S. Geological Survey (USGS) (2021b). Earthquake Hazards Program, Unified Hazards Tool. Accessed March 2022 from the USGS website: https://earthquake.usgs.gov/hazards/interactive/.
- Weaver, K.D. and Bruce, D.A. (2007). Dam Foundation Grouting. ASCE Press.



Appendix A

PERMITS AND ACCESS AGREEMENTS

- A.1 CU
- A.2 OSMP
- A.3 CDOT
- A.4 BOULDER COUNTY GENERAL FDP

CU

SECOND AMENDMENT TO AMENDED AND RESTATED PERMISSION TO ENTER PROPERTY AGREEMENT DATED Dec. 11, 2017

This Second Amendment to Amended and Restated Permission to Enter Property Agreement (the "Second Amendment") is made and effective as of the 31st day of December, 2019, by and between The Regents of the University of Colorado, a body corporate, acting on behalf of the University of Colorado Boulder ("CU" or "University") and City of Boulder, Colorado, a Colorado home rule city ("City").

- A. The City and CU entered into the original Permission to Enter Property Agreement to permit the City access on CU South property for the purposes of conducting a field survey ("Phase I"), dated December 11, 2017 ("Superseded Agreement"), which Superseded Agreement was subsequently superseded by that certain Amended and Restated Permission to Enter Property Agreement ("Amended and Restated Agreement") on about Feb. 9, 2018, and the Amended and Restated Agreement was subsequently amended by that certain Amendment to Amended and Restated Permission to Enter Property Agreement dated March 26, 2018 ("First Amendment");
- B. The Amended and Restated Agreement, as subsequently amended by the First Amendment, is herein referred to as the "Agreement";
- C. CU now wishes to grant the City access for its geotechnical investigations ("*Phase II*"), add a new Exhibit A-2 and B-3, respectively describing the details of the work and the location of such Phase II work, and to grant such Phase II access through Dec. 31, 2020, including the option of a Phase II extension period for maintenance and monitoring of wells; and
- D. The parties do not intend that this Phase II access will amend or revise the current access permissions granted for Phase I work as described in Exhibit A-1 and B-2 attached to the Agreement, except that the Phase I Extension Period option is extended through Dec. 31, 2023.

NOW THEREFORE, in consideration of the promises and obligations set forth below, the parties agree to amend the Agreement as follows:

- 1. The third, fourth and fifth paragraphs of Recital section B. are hereby deleted in their entirety and the following Recital sections C, D, E, and F are hereby added to the Recitals immediately following Recital B.:
 - "C. WHEREAS, CITY has requested permission from CU to enter certain property owned by CU in Boulder County, Colorado, for the purposes of (i) conducting a field survey of portions of the Survey Property (as defined hereinbelow), (ii) performing certain field activities to conduct and complete Phase I geotechnical investigations on the Phase I Property (as defined hereinbelow) related to the Project, (iii) conducting environmental studies on the Phase I Property in preparation for submitting Project environmental permits, (iv) operating an Unmanned Aircraft System ("UAS") to take aerial photographs of the Property (as defined hereinbelow) and (v) conducting site visits to confirm existing conditions and project design assumptions. The scope of the CITY's Phase I work is more particularly described on Exhibit A-1, attached hereto and all such

Second Amendment to Amended and Restated Permission to Enter Property (Phase II)

work is referred to herein as the "Permitted Uses"; and

- D. WHEREAS, CITY has further requested permission for access to the CU property for the purposes of Phase II geotechnical investigations, including (i) evaluating foundation conditions along the Variant 1 alignments for the floodwall, outlet works tunnel, soil-bentonite cutoff wall and embankment, and (ii) evaluating available onsite borrow materials. The scope of the CITY's Phase II work is more particularly described on **Exhibit A-2**, attached hereto and all such work is referred to herein as the "Phase II Permitted Uses," and which exhibit is not intended to replace **Exhibit A-1**:
- E. WHEREAS, the real property on which the Permitted Uses may be performed is partially located within the confines of the south campus of The University of Colorado Boulder ("CU South"). The specific portions of CU South upon which the CITY may enter and perform the Permitted Uses are depicted on Exhibit B, Exhibit B-1, and Exhibit B-2 attached hereto and such areas depicted thereon are herein respectively referred to as the "Survey Property" and the "Phase I Property". The Survey Property and the Phase I Property may be together or individually referred to herein as the "Property"; and
- F. WHEREAS, CU is willing to give City permission to enter the Property for the Permitted Uses on the terms and conditions set forth herein."

2. Paragraph 1, is replaced by the following section:

- 1. a. Phase I. CU hereby grants its permission for CITY, and its agents, employees; and/or CITY's contractors ("CITY Contractors"), at CITY's sole risk and expense, to enter upon the Property beginning on the Effective Date and ending on the earlier of (a) December 31, 2019 or (2) the date of completion of preliminary design for the Project (the "Use Period"), during the hours of 7:30am to 5:00pm, Monday through Friday and solely for the Permitted Uses. Provided that the City gives CU written notice to extend no later than 30 days prior to the expiration of the Use Period, the Use Period may be extended to December 31, 2023 (the "Extension Period"). Notwithstanding any provision of this Agreement to the contrary, the Permitted Uses during the Extension Period shall be limited to downloading data and conducting maintenance of the groundwater monitoring wells (in accordance with Section II.A of Exhibit A-1 attached hereto) until the City and CU reach a separate agreement to abandon the wells under the terms outlined in this Agreement.
- b. <u>Phase II.</u> CU hereby grants its permission for CITY, and its agents, employees; and/or CITY's contractors ("CITY Contractors"), at CITY's sole risk and expense, to enter upon the portion of the Property identified as "Phase II Investigation Limits" on the attached Exhibit B-3. beginning on the Effective Date and ending on the earlier of (a) December 31, 2020 or (2) the date of completion of Phase II (the "Phase II Use Period"), during the hours of 7:30am to 5:00pm, Monday through Friday and solely for the Phase II Permitted Uses described on the attached Exhibit A-2. Provided that the City gives CU written notice to extend no later than 30 days prior to the expiration of the Phase II Use Period, that period may be extended for an additional period of three (3) years commencing on January 1, 2021 and expiring on December 31, 2023 (the "Phase II Extension Period").

- c. <u>Termination</u>. City and CU each acknowledge that this Agreement is a revocable license and may be terminated by either party by delivery of written notice of termination to the other party; such termination shall be effective on the date that is 30 days following delivery of such written notice of termination. Unless extended or sooner terminated as provided herein, the term of this Agreement shall be coterminous with the Use Period or Phase II Use Period, as applicable.
- 3. Paragraph 15 is hereby amended to change the notice addressee for the city:

"If to CITY:

Brandon Coleman City of Boulder 1739 Broadway Boulder, CO

Email: colemanb@bouldercolorado.gov

4. Signature Page (Page 6), "Exhibits Attached", is amended to add new Exhibit A-2, and add the new Exhibit B-3 to the list of Exhibits:

"Exhibits Attached:

A-1 – Phase I Permitted Uses

A-2 - Phase II Permitted Uses

B – Field Survey Property Depiction

B-1 Phase I property Depiction

B-2 Wetlands and Habitat Evaluation Study Limits

B-3 Phase II Investigation Limits

C - UAS Procedures

5. Except as amended herein, the Agreement shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have set their hands to this Second Amendment on the day and year above first written.

> THE REGENTS OF THE UNIVERSITY OF COLORADO, a body corporate, acting on behalf of the University of Colorado Boulder

Title: Vice Chancellor for infrastructure and Safety

CITY OF BOULDER

ATTEST:

APPROVED AS TO FORM:

City Attorney's Office

Exhibit A-2 Phase II Permitted Uses (Scopes of Work)

South Boulder Creek Regional Detention - Preliminary Design

Phase II Geotechnical Investigation Plan on CU Property

Introduction

The City of Boulder (City) has prepared this draft plan to perform Phase II geotechnical investigations on University of Colorado (CU) property for the South Boulder Creek Regional Detention Project. The intent of the plan is to provide a description of the field work tasks and proposed field procedures, equipment, schedule, and access. A final Phase II geotechnical investigation plan will be developed following incorporation of comments from CU.

The general objectives of the Phase II investigation are:

- Evaluate foundation conditions along the Variant 1 alignments for the floodwall, outlet works tunnel, soil-bentonite cutoff wall, and embankment.
- Evaluate available onsite borrow materials.

The geotechnical investigations are evolutionary in nature and additional geotechnical investigations will likely be required as the design progresses based on the selected project configuration and results of the Phase II geotechnical investigations.

Background

The City completed 24 borings as part the Phase I geotechnical investigations from January 2018 to February 2019. Seven of the 24 borings were completed on CU property. The City also installed three stilling wells in the ponds on CU property. The purposes of the Phase I geotechnical investigations were to advance the generalized understanding of geologic conditions at and around the site and to obtain data to develop a preliminary baseline groundwater model.

Field Work Tasks

Field activities on CU property will be performed by the City and will include test pits, borings and installation of monitoring wells. The extent of the work area on CU property is provided on **Exhibit B-3**. Approximately four to six test pits will be excavated on CU property. The purposes of the test pits are to evaluate nearby available borrow materials for construction of the earthen embankment and to observe and sample subsurface materials at a larger scale than possible with borings. A description of the purpose of each boring on CU property is provided in Table 1.

TABLE 1 BORING SUMMARY

| Boring ID | Purpose |
|----------------|--|
| B-201 to B-204 | Investigate subsurface profile below Variant 1 embankment alignment. |

| B-205 and B- 206 | Investigate subsurface profile below outlet works tunnel alignment. |
|---------------------|---|
| B-208 to B-213 | Investigate subsurface profile below the soilbentonite cutoff wall alignment. |

The City will complete some borings as open standpipe PVC monitoring wells. The City has not yet decided which borings will be completed as monitoring wells. Borings not completed as monitoring wells will be backfilled with grout. A datalogging piezometer will be installed in each monitoring well to automatically record groundwater data.

The City will perform site visits to download data from the datalogging piezometers installed as part of the Phase I and Phase II geotechnical investigations once per month for approximately 18 months.

CU will be the owner of the monitoring wells since they will be located on their property. The City will act as an authorized agent on behalf of CU to perform permitting of the well through the Colorado Office of the State Engineer (SEO). Maintenance and abandonment of the wells will be in accordance with the most current version of the State's Rules and Regulations for Water Well Construction, Pump Installation, Cistern Installation, and Monitoring and Observation Well Construction.

Equipment and Procedures

Test pits will be excavated using a rubber-tired backhoe (see Photograph 1), unless large cobbles are encountered then a track excavator (see Photograph 2) may be necessary. Test pits will be excavated to a maximum depth of 15 feet, until excavation refusal, or until trench walls are not stable. Pit depth may be limited to less than 15 feet if shallow groundwater and permeable soil materials adversely affect trench stability. Excavated materials will be piled along each test pit during excavation. Test pits will be backfilled with excavated soil and the disturbed area will be graded to match the surrounding ground surface. Additional soil may be brought onsite as needed to backfill and regrade the test pit locations.

The City will subcontract a materials testing firm to perform one compaction test per test pit to confirm that the test pit backfill compaction is to 95% in accordance with CU specifications. The City will provide a compaction test report for each test pit to CU.



Photograph 1 - Backhoe



Photograph 2 - Track Excavator

Borings will be advanced to about 35 feet below top of bedrock. Borings will be performed using the following equipment and procedures:

- Borings will be performed using a using a traditional truck-mounted drill rig (see Photograph 3) or ATV tire drill rig (see Photograph 4).
- Soil spoils generated from borings will be thin-spread by hand on the adjacent ground surface.
- A full-size pickup truck (for engineer) and a heavy-duty dually pickup (for driller) will accompany the drill rig. A small ATV with a trailer may be used instead of a pickup truck depending upon ground conditions.
- Borings will require water for rock coring. Water will also be required for mixing grout and concrete. Clean water for drilling will be obtained from the driller's shop and brought to site in a plastic water tank hauled on a pickup truck.
- Water produced during the bedrock coring and the installation of monitoring wells will be
 discharged to the ground surface. We anticipate the water will be clean except for some soil
 turbidity caused by drilling activities.



Photograph 3 - Truck Mounted Drill Rig



Photograph 4 – ATV Tire Drill Rig

We anticipate equipment operations will cause minimal dust. Work will be performed between 7:30 am to 5:00 pm on weekdays to reduce noise disruptions.

Monitoring wells will be completed using a flush-mounted casing (see Photograph 5). A small concrete ring will be placed round the top of the well casing.



Photograph 5 - Flush-Mounted Well Casing

The backhoe and drill rig will be left at the location being drilled overnight and during weekends if the drilling location is outside of the 100-year floodplain. If the drilling location is within the 100-year floodplain, the backhoe and drill rig will not be left at the drilling location during weekend but can be left overnight during the week. Portable fuel cans will be hauled to the boring locations to refill equipment as needed.

The City will develop a Health and Safety Plan (HASP) prior to mobilizing to the site. The City will coordinate utility clearances with Colorado 811 prior to subsurface work. Any private utilities that are not located by Colorado 811 will need to be located and marked by CU. Required approvals and permits will be obtained from the City and CU prior to subsurface work.

Schedule

We anticipate that field work could take up to 7 weeks to complete depending on subsurface conditions and weather. We anticipate that field work will begin in November.

Access

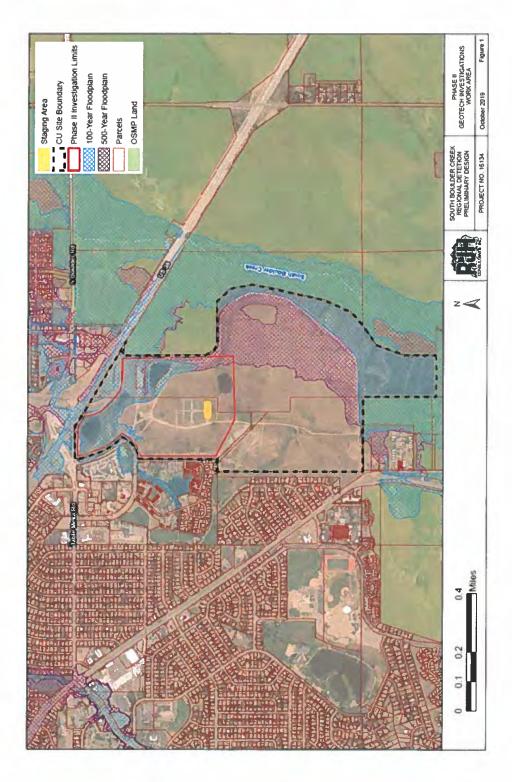
Site access will be the shortest distance that can reasonably be achieved from existing roadways while minimizing ground disturbance. The backhoe will be un-trailed from a semi-truck in the existing gravel parking lot. The semi-truck and trailer will only be on site when the equipment is actively being mobilized and demobilized.

Staging Area

The City desires to use CU property as a staging area while performing geotechnical investigations on CU property and on adjacent Boulder Open Space and Mountain Parks (OSMP) and Colorado Department of Transportation (CDOT) property. The following activities would occur:

- Equipment would be un-trailed in the existing CU gravel parking lot south of the tennis courts
 and would be driven to work areas on OSMP and CDOT properties. The City is coordinating
 separately with OSMP and CDOT for access to their properties. The semi-truck and trailer will
 only be on site when the equipment is actively being mobilized and demobilized.
- The City plans to leave a Conex and a portable toilet in the staging area for use during the Phase II investigations.

Exhibit B-3
Phase II Investigation Limits



Second Amendment to Amended and Restated Permission to Enter Property (Phase II)

Appendix A.1

OSMP

TEMPORARY LICENSE AGREEMENT: SOUTH BOULDER CREEK FLOOD CONTROL MONITORING WELLS ON THE VAN VLEET NORTH AND VAN VLEET SOUTH OPEN SPACE PROPERTIES

This TEMPORARY LICENSE AGREEMENT (the "License") is made as of the day of February 2020, by and between the City of Boulder, a Colorado home rule city ("City"), and RJH Consultants, Inc. a Colorado corporation, whose principal office street address is 9800 Mt Pyramid Ct, Suite 330, Englewood, CO 80112 (the "Company") (collectively "the Parties").

RECITALS

WHEREAS, the Company is working with the City on a long-term flood control project for South Boulder Creek (the "South Boulder Creek Flood Control Project"); and

WHEREAS, the Parties entered into a temporary license agreement on May17th, 2018 for the drilling of groundwater monitoring wells on OSMP properties;

WHEREAS the Company is proposing to drill two additional groundwater monitoring wells to allow for monitoring of groundwater levels and installation of surface water piezometers (the "Project") to support the engineering required for the South Boulder Creek Flood Control Project on City-owned land which is managed by the City of Boulder Department of Open Space and Mountain Parks ("OSMP") (as generally depicted on Exhibit A, the "Properties" or "Property"); and

WHEREAS, the Project involves access by and use of crews, a drill rig, materials and equipment to the water monitoring well locations as agreed to herein and as generally depicted on Exhibit A, and ongoing monitoring access to the wells; and

WHEREAS, the Parties have conducted a pre-construction meeting to agree upon access, schedules, safety precautions, and construction protocols to limit impacts to the Property during the Company's access and use; and

WHEREAS, this agreement sets forth the understandings between the Parties concerning the Company's temporary access to City property for drilling of the soil bores.

NOW, THEREFORE, in consideration of the promises and obligations set forth below, the Parties agree to the following:

TERMS AND CONDITIONS

1. The Recitals set forth above are incorporated herein and made a part of this License.

- 2. In accordance with, and subject to, this License, City hereby grants to Company and its contractors, consultants, agents and employees, temporary access, including ingress and egress, and use to complete the Project on the Property over the access route shown on the diagrams attached as Exhibit A.
- 3. Vehicular access is restricted to one all-terrain vehicle tire drill rig (the "ATV Tire Drill Rig"), one small all-terrain vehicle ("ATV") in place of a pickup truck to provide access for a driller and engineer, and limited backhoe use to remove drilled soils. Vehicles will not be permitted on the Property between 5:00 pm and 7:30 am, except as specifically provided herein. No trailers are permitted. All vehicular traffic will be minimized to the extent possible and will only be over the path specified in the pre-construction site visit, or on the paths specified in Exhibit A (the "Vehicle Path"), with no additional grading or modifications to the route. Driving, parking, or turning around on any area outside the Vehicle Path is strictly prohibited. Overnight storage of Vehicles will be allowed on the Property, but only within the Vehicle Path, on an already disturbed area, with mats placed below the ATV Tire Drill Rig when parked to reduce disturbance to vegetation, and for no longer than 3 consecutive nights at each drilling location.
- 4. Company and its contractors, consultants, agents and employees shall take all necessary precautions during the Project and coordinate with City's Open Space and Mountain Parks Department ("OSMP") to minimize disruption, except as necessary to complete the Project, to City and the public's access and use of the Property or rights of way. Company and its contractors, consultants, agents and employees shall be responsible for any notice, signage and personnel necessary to notify and protect the public during the Project.
- 5. Company and its contractors, consultants, agents and employees shall not store, use, manufacture, generate, transport, discharge or dispose of any hazardous or toxic substance, material or waste on the Property. Notwithstanding the foregoing, fuels, fluids, lubricants and petroleum distillates necessary to run machinery required for the Project are permitted.
- 6. Company shall require its contractors, consultants, agents and employees to exercise due care and best management practices, including but not limited to the procedures and terms in the Construction and Restoration Plan attached hereto as Exhibit B, and all applicable federal, state and local laws to minimize the disturbance of the Property or rights of way, and shall pay for or repair any damages resulting from the failure to exercise due care as requested by OSMP.
- 7. Company shall obtain any and all necessary City, State, County, and Federal permits required for construction and environmental compliance. This includes but is not limited to a City Wetland permit, and consultation with US Fish and Wildlife Service.
- 8. Upon completion of the Project, Company shall restore all of the impacted Property and rights of way impacted by this License to a level comparable to its original condition and approved by OSMP's Natural Resources staff. Company agrees to take pre- and post-Project photographs of the Property and provide those photographs to OSMP. Company and OSMP will do a post-Project site visit to evaluate any restoration or repair needs.

Appendix A.2 2 of 12

- 9. Before entering the Property, Company shall notify OSMP of the expected time of its entry and of the expected duration of the Project. Whenever notice to City is required to be given hereunder, it shall be provided to Matt Ashley, OSMP Associate Property Agent, at (303) 828-6402 or AshleyM@bouldercolorado.gov.
- 10. The City does not waive or intends to waive the limitations on liability which are provided to the City, its officers, and employees under the Colorado Governmental Immunity Act, Section. 24-10-101 et. seq., C.R.S.
- 11. Company agrees to cause its contractors, consultants or agents performing any of the work related to the Project to indemnify and hold City harmless from and against all losses, claims, demands, liabilities, injuries, damages and expenses, including, without limitation, attorneys' fees and court costs City may suffer or incur which may arise from negligent or wrongful performance of the contractors, consultants or agents while completing the Project.
- 12. Company agrees to cause its contractors, consultants or agents performing any of the work related to the Project and which are not governmental entities who are insured to the limits of the Colorado Governmental Immunity Act to procure and maintain in force during the term of this License, at its own cost, the following minimum coverages:
 - a. Workers' Compensation and Employers' Liability

i. State of Colorado: Statutory

b. General Liability

i. General Aggregate Limit: \$1,000,000

ii. Per Occurrence: \$1,000,000

Coverage provided should be at least as broad as found in Insurance Services Office (ISO) form CG0001.

- c. Automobile Liability Limits
 - i. Bodily Injury & Property Damage Combined Single Limit: \$1,000,000

Coverage provided should be at least as broad as found in ISO form CA0001 (BAP) including coverage for owned, non-owned and hired autos.

- d. Insurance shall:
 - i. Provide primary coverage;
 - Include City and its officials and employees as additional insureds as their interest may appear (except for Worker's Compensation and Professional Liability). Additional insured endorsement should be at least as broad as ISO form CG2010 for General Liability coverage and similar forms for auto liability;

- iii. Include a waiver of subrogation for General Liability coverage;
- iv. Issue from a company licensed to do business in Colorado having an AM Best rating of at least A-VI; and
- v. Be procured and maintained in full force and effect for the duration of the Project.
- e. Certificates of Insurance evidencing the coverages described herein shall be forwarded to Matt Ashley, Associate Property Agent at AshleyM@bouldercolorado.gov. Certificate Holder shall be: City of Boulder, 1777 Broadway, Boulder, CO 80306.
- f. Within seven (7) days after receiving insurer's notice of cancellation or reduction in coverage, Company, and its contractors, consultants, and agents, or its insurance broker(s), shall notify City. In either such case, Company, and its contractors, consultants, and agents, shall promptly obtain and submit proof of substitute insurance complying with City's insurance requirements.
- 13. The Property is under an operating cattle lease with tenants of the City ("Agricultural Tenants"). The Company shall not interfere with cattle operations on the Property. The Company shall compensate the Agricultural Tenants for any loss of agricultural use or reduced livestock carrying capacity resulting from the Company's access or activities for the Project. The amount and method of compensation will be calculated based on the pro-rated per-day price of the agricultural lease multiplied by the number of days that the Agricultural Tenants are unable to use the Property due to Project access and activities.
- 14. If City visits the Property and discovers noncompliance with the agreed upon terms of this License, City can request a halt to operations. If operations are halted, they may not resume until City determines, in its reasonable discretion, that Company and their contractors, consultants or agents are compliant with this License.
- 15. The License shall expire on December 31, 2020, or at the Project's completion as mutually determined by the Parties, whichever occurs earlier. Thereafter (including after the expiration date) Company and its contractors, consultants and agents may continue to access the Property after forty-eight (48) hour prior notice to OSMP to perform any ongoing monitoring and maintenance related to the Project and agreed to with OSMP and in accordance with the Construction and Restoration Plan. All notice to City shall be in accordance with Paragraph 10 hereunder.

(Signature Page Below)

Appendix A.2

4 of 12

IN WITNESS WHEREOF, the Parties have set their hands to this License on the day and year above first written.

RJH Consultants, Inc. a Colorado corporation

By:

Name: RUBENT J HUZDAL

Title: PRESIDENT

CITY OF BOULDER, a Colorado home rule City Open Space and Mountain Parks Department

By:

Dan Burke, Director

EXHIBIT A Construction Plans and Property Map



DRAFT MEMORANDUM

Project 16134

TO:

Brandon Coleman, P.E. - City of Boulder

FROM:

Robert Huzjak, P.E. - RJH Consultants, Inc.

DATE:

January 8, 2020

RE:

South Boulder Creek Regional Detention - Preliminary Design Phase II Geotechnical Investigation Plan on OSMP Property - Draft

Introduction

RJH Consultants, Inc. (RJH) has prepared this draft plan to perform Phase II geotechnical investigations on Open Space and Mountain Parks (OSMP) property for the South Boulder Creek Regional Detention Project. The intent of the plan is to provide a description of the field work tasks and proposed field procedures, equipment, schedule, and access. A final Phase II geotechnical investigation plan will be developed following approval from OSMP. The general objectives of the Phase II investigation are:

- Evaluate foundation conditions along the alignments for the floodwall, outlet works tunnel, perimeter of reservoir, and embankment.
- Evaluate available onsite borrow materials.
- Obtain stratigraphy data to support refinement of the groundwater model.

The geotechnical investigations are evolutionary in nature and additional geotechnical investigations will be required as the design progresses based on the selected project configuration and results of the Phase II geotechnical investigations.

Background

RJH completed 24 borings as part of the Phase I geotechnical investigations from January 2018 to February 2019. Fourteen of the 24 borings were completed on OSMP property. The purpose of the Phase I geotechnical investigations was to advance the generalized understanding of geologic conditions at and around the site and to obtain data to develop a preliminary baseline groundwater model.

Field Work Tasks

Phase II field activities on OSMP property include two borings. The planned locations of the borings are shown on Figure 1. Boring locations and access routes are outside of mapped wetlands. The purpose of the borings is to investigate the subsurface profile along the outlet works tunnel alignment.

The borings might be completed as open standpipe polyvinyl chloride (PVC) monitoring wells that have a sensing zone in the alluvium above bedrock or within bedrock. RJH will identify if there is benefit in completing borings as monitoring wells based on the conditions encountered during drilling. Borings not completed as monitoring wells will be backfilled

16134_20-01-08_SBC_Phase_II_Plan_on_OSMP_Property_Memo

Appendix A.2

with cement-bentonite grout. Where monitoring wells are constructed a datalogging piezometer will be installed in each monitoring well to automatically record groundwater data.

RJH may perform site visits to download data from the datalogging piezometers installed as part of the Phase I and Phase II geotechnical investigations once per month for approximately 18 months and possibly until the start of construction.

The City of Boulder (City) will be the owner of the monitoring wells (if installed) since the wells will be located on OSMP property. RJH will act as an authorized agent on behalf of the City to perform permitting of the wells through the Colorado Office of the State Engineer (SEO). Maintenance and abandonment of the wells will need to be in accordance with the most current version of the State's Rules and Regulations for Water Well Construction, Pump Installation, Cistern Installation, and Monitoring and Observation Well Construction and will be the responsibility of the well owner.

Equipment and Procedures

Borings will be advanced to about 40 feet into bedrock using a combination of hollow stem augers, ODEX, and rock coring techniques. Borings will be performed using the following equipment and procedures:

- Borings will be advanced using an all-terrain vehicle (ATV) tire drill rig (see Photograph 1).
- A layer of plastic will be placed beneath the drill rig to reduce the potential for any
 fluid that may leak from the drill rig from contacting the ground surface. The
 perimeter of the plastic will be raised using planks of wood to reduce the potential for
 any fluid from flowing off of the plastic onto the ground.
- Soil spoils generated from borings will be collected, hauled, and disposed at an offsite location.
- A small ATV vehicle will be used in place of a pickup truck to provide access for the driller and engineer. The ATV vehicle might pull a small trailer to haul equipment and supplies, which will reduce the overall number of trips needed to boring locations.



Photograph 1: ATV Tire Drill Rig.

Water for drilling will be obtained off site. Water will need to be drained from pumps, hoses, etc. each evening to prevent freezing. Water drained from the pumps and hoses will be discharged onto the ground surface. Water that has been used for drilling will also be discharged onto the ground surface. This water will be discharged through sedimentation vessels and filters to remove a majority of the sediment.

RJH anticipates equipment operations will cause minimal dust. Work will be performed between 7:30 am to 5:00 pm on weekdays.

Monitoring wells will be completed using a flush-mounted casing (see Photograph 2). A small concrete ring will be placed round the top of the well casing.



Photograph 2: Flush-Mounted Well Casing.

The ATV drill rig will be left at the location being drilled overnight during the work week and will be moved to the designated staging area during weekends. All other equipment will be moved to the staging area each night. Portable fuel cans will be hauled to the boring locations to refuel equipment as needed.

RJH will develop a Health and Safety Plan (HASP) prior to mobilizing to the site. RJH will coordinate utility clearances with Colorado 811 prior to subsurface work. Any private utilities that are not located by Colorado 811 will need to be located and marked by OSMP. Approvals/permits will be obtained from the City and OSMP prior to subsurface work.

Schedule

RJH anticipates that field work could take up to 2 weeks to complete depending on subsurface conditions and weather. RJH anticipates that field work will begin in February. RJH will attempt to schedule the work when the ground is hard or frozen to reduce impacts.

Access

RJH will notify OSMP two days before beginning field work on OSMP property. The general plan for accessing each boring location includes:

- B-206: The drill rig and authorized support vehicles will be un-trailered at the
 existing University of Colorado (CU) South gravel parking lot. The equipment will
 drive to the boring on OSMP property via CU South property.
- B-207: The drill rig and authorized support vehicles will be un-trailered on Manhattan Circle. RJH will cut an OSMP fence to access OSMP property. The equipment will drive through the 5330 Manhattan Circle parking lot, through the cut fence and onto the OSMP property. The semi-truck and trailers will only be on Manhattan Circle on days when equipment is actively being mobilized and demobilized. The opening in the fence will remain open throughout the duration of the work at this boring. RJH will repair the fence after the drilling and borehole completion is complete for this boring.

Specific access routes were reviewed by RJH and OSMP in the field prior to preparation of this memorandum and the access routes identified during this field meeting will be used to access the boring locations. The following number of trips are expected for each boring:

- One roundtrip by the drill rig.
- Four to six roundtrips by the ATV.

Attachments: Figure 1 - Phase II of Borings on OSMP

RJH/mme



Appendix A.2

Appendix A.2

CDOT

COLORADO DEPARTMENT OF TRANSPORTATION Type: Borings SPECIAL USE PERMIT DEPARTMENT USE ONLY APPLICANT PERMITTEE Date issued: 05/06/2020 Name: City of Boulder Name: RJH Consultants, Inc. Address: Address: Permit # 1200612 9800 Mt Pyramid Ct 1739 Broadway S.H.# 036 M.P. 39.700 Side Boulder, Colorado 80302 Englewood, Colorado 80209 S.H.# M.P. Side S.H.# M.P. Side S.H.# M.P. Side Email: colemanb@bouldercolorado.gov Email: sguillies@rjh-consultants.com Region: 1 REP: S.H. Section: B REP: **Brandon Coleman** Samantha Guillies

NOTICE TO PERMITTEE: You must notify owner or operator of underground utility facilities at least two (2) business days prior to making or beginning excavations in the vicinity of such facilities, as required under Section 9-1.5-103, Colorado Revised Statutes. CALL UTILITY NOTIFICATION CENTER OF COLORADO (UNCC), 1-800-922-1987, FOR MARKING OF MEMBER UTILITIES.. CONTACT NON-MEMBER UTILITIES DIRECTLY

ACTIVITY DESCRIPTION (Furnished by Permittee)

NATURE OF ACTIVITY RJH plans to complete two geotechnical borings within the CDOT right-of-way between MP 39.7 and 39.9 along US 36. The borings will be approximately 60 ft deep. The work will begin within two months of receipt of acceptance by CDOT and would last a duration of no

LOCATION: S.H. Number: 036

Telephone: 303-441-4232

County: Boulder County

Telephone: 3032254611

City/Town: Boulder

Patrol: 13 Superior

Mile point(s): 39.700

Intersecting Feature(s):

Other Location Information: U.S 36 at Milie Marker 39

intersecting reature(s).

ADDITIONAL REMARKS:

SPECIAL PROVISIONS (completed by the Department) The Special Provisions are terms and conditions of this permit.

Any work shall only be in accordance with the special provisions and other applicable details as set forth in this permit and its attachments.

The CDOT Inspector is: Anthony Cdebaca Telephone: (303) 579-4665

Inspector Email:

Work is to be completed on or before: 09/03/2020 or within days, (as applicable)

Work time restrictions: Shoulder Work Only.

(ALSO SEE ATTACHED STANDARD PROVISIONS, AND ADDITIONAL SPECIAL PROVISIONS), (TRAFFIC CONTROL MUST CONFORM TO THE MUTCD)

Other:

Permittee is prohibited from commencing any activity within highway ROW prior to issuance of a fully endorsed and validated permit.

Permit, insurance certificate(s), and traffic control plan must be available on site during work. High visibility vests are required at all times during working hours.

- Your request to perform the work as described above is granted subject to the terms and conditions of this permit, including the Standard and Special Provisions as shown on the permit and all attachments hereto.
- To the extent authorized by law, the Permittee shall indemnify, save, and hold harmless the State, its employees and agents, against any and all claims, damages, liability, and court awards including costs, expenses, and attorney fees incurred as a result of any act or omission by the Permittee, or its employees, agents, subcontractors or assignees pursuant to the terms of this permit.
- 3. Failure by the Permittee to comply with any of the included terms or conditions may subject this permit to suspension or cancellation, at the discretion of the Department of Transportation.
- 4. THIS PERMIT IS NOT VALID UNTIL FULLY ENDORSED BY ALL PARTIES, WITH DATE OF ISSUE AFFIXED BY AN AUTHORIZED REPRESENTATIVE OF THE DEPARTMENT. A FULLY EXECUTED COPY OF THIS PERMIT MUST BE ON FILE AT THE TRANSPORTATION REGION OFFICE.
- In accepting this permit the undersigned, representing the Permittee, verifies that he or she has the authority to sign for and bind the Permittee, and that he or she has read, understands and accepts all the included conditions.

CDOT Signature: Tanisha Alford 5/6/2020 | 8:07 AM MDT

COLORADO DEPARTMENT OF TRANSPORTATION
Chief Engineer, Regional Transportation Director or Designee

COLORADO DEPARTMENT OF TRANSPORTATION
Chief Engineer, Regional Transportation Director or Designee

Permittee Signature

Brandon Coleman Project Manager

| CDOT WEEKLY OCCUPANCY REPORT FOR THE WEEK OF: | | | Prepared By: Tanisha Alford | | |
|--|-----------------|---|-----------------------------|--|--|
| Highway No: 036 Region: 1 | | | Permit # 1200612 | | |
| Location Description: U.S 36 at Mille Marker 39 | | Brief Description of Permit: RJH plans to complete two geotechnic the CDOT right-of-way between MP 39.7 and 39.9 along US 36. The b | | olete two geotechnical borings within along US 36. The borings will be | |
| Start Date: 06-01-2020 | | End Date: 06-12-2020 | | | |
| CDOT Permit Inspector: | Anthony Cdebaca | | Phone: (303) 579-4665 | Mobile: | |
| Contractor (Prime): | | | Phone: | Mobile: | |
| TCS Contractor: | | | Phone: | Mobile: | |

| DAY | DATE | TIMES | MM# to MM# | Direction | LANE(S) CLOSED | DESCRIPTION OF WORK |
|-----|------|-------|---------------|------------|-------------------|------------------------|
| SUN | | | | N S E W | | |
| MON | | | | N S E W | | |
| TUE | | | | N S E W | | |
| WED | | | | N S E W | | |
| THU | | | | N S E W | | |
| FRI | | | | N S E W | | |
| SAT | | | | N S E W | | |

If There Is A Lane Closure, How Long Will The Same Lane Closure Be In Effect?

This form must be complete in its entirety, if there are no lanes closed please put appropriate location in the Lane(s) Closed column. Example: Shoulder Work, Median Work.

This form must be filled out and submitted to the appropriate permit coordinator via email by the close of business (COB) Wednesday, the week prior to the scheduled work.

August, 2016

The following Standard Provisions are terms and conditions of this permit:

Effective March 1, 2006

Utility work authorized under this permit shall comply with the requirements of the State Highway Utility Accommodation Code, and applicable federal, state, local, and industry codes and regulations.

Construction of any portion of the highway facility, including the pavement structure, subsurface support, drainage, landscaping elements and all appurtenant features, shall comply with the provisions of the CDOT Standard Specifications for Road and Bridge Construction, and with the Colorado Standard Plans (M & S Standards).

1. COMMENCEMENT AND COMPLETION

Work on highway Right of Way (ROW) shall not commence prior to issuance of a fully endorsed and validated permit.

Permittee shall notify the CDOT inspector:

- At least 2 working days prior to commencing work, or resuming operations which have been suspended for five or more consecutive working days
- b. When suspending operations for 5 or more working days
- c. Upon completion of work.

Work shall not proceed beyond a completion date specified in the Special Provisions without written approval of the Department.

2. PLANS, PLAN REVISIONS, ALTERED WORK

Plans or work sketch (EXHIBIT A) are subject to CDOT approval. A copy of the approved plans or sketch must be available on site during work. Plan revisions or altered work differing in scope or nature from that authorized under this permit, are subject to CDOT prior approval. Permittee shall promptly notify the CDOT inspector of changed or unforeseen conditions, which may occur on the job.

3. INSURANCE

Insurance Requirements for Utility and Special-Use Permits (Revised 7-05 per State Requirements)

- A. The Permittee shall obtain, and maintain at all times during the performance of work authorized by this Permit, insurance in the following kinds and amounts. The Permittee shall require any Contractor working for them within the State Highway Right of Way to obtain like coverage. The Permittee shall also require any Contractor or Consultant performing work described in subparagraph 4) below, to obtain Professional Liability Insurance.
 - Workers' Compensation Insurance as required by state statute, and Employer's Liability Insurance covering all employees acting within the course and scope of their employment and work on the activities authorized by this Permit.
 - 2) Commercial General Liability Insurance written on ISO occurrence form CG 00 01 10/93 or equivalent, covering premises operations, fire damage, independent Consultants, products and completed operations, blanket contractual liability, personal injury, and advertising liability with minimum limits as follows:
 - a. \$1,000,000 each occurrence;
 - b. \$2,000,000 general aggregate;
 - c. \$2,000,000 products and completed operations aggregate;
 - d. \$50,000 any one fire.

- e. For any permanent Permittee-owned installations located within the State Highway Right of Way, highway repairs, or site restoration, Completed Operations coverage shall be provided for a minimum period of one year following final acceptance of work.
 - If any aggregate limit is reduced below 1,000,000 because of claims made or paid, the Permittee, or as applicable their Contractor, shall immediately obtain additional insurance to restore the full aggregate limit and furnish to CDOT a certificate or other document satisfactory to CDOT showing compliance with this provision.
- Automobile Liability Insurance covering any auto (including owned, hired and non-owned autos) with a minimum limit as follows: \$1,000,000 each accident combined single limit.
- 4) For any: a) engineering design; b) construction inspection; or, c) traffic control plans approved by a Traffic Control Supervisor; done in association with the operations or installations authorized by this permit, Professional Liability Insurance with minimum limits of liability of not less than \$1,000,000 Each Claim and \$1,000,000 Annual Aggregate. If the policy is written on a Claims Made form, the Permittee, or, as applicable their Consultant or Contractor, shall renew and maintain Professional Liability Insurance for a minimum of two years following final acceptance of the work, or provide a project specific Policy with a two year extended reporting provision.
- 5) Pollution Legal Liability Insurance with minimum limits of liability of \$1,000,000 Each Claim and \$1,000,000 Annual Aggregate. CDOT shall be named as an additional insured to the Pollution Legal Liability policy. If the Policy is a component of the Professional Liability Policy, the Additional Insured requirement is waived, and the Policy shall be written on a Claims Made form, with an extended reporting period of at least two year following final acceptance of the work.
- 6) Umbrella or Excess Liability Insurance with minimum limits of \$1,000,000. This policy shall become primary (drop down) in the event the primary Liability Policy limits are impaired or exhausted. The Policy shall be written on an Occurrence form and shall be following form of the primary. The following form Excess Liability shall include CDOT as an additional insured.
- B. CDOT shall be named as additional insured on the Commercial General Liability and Automobile Liability Insurance policies. Completed operations additional insured coverage shall be on endorsements CG 2010 11/85, CG 2037, or equivalent. Coverage required by the Permit will be primary over any insurance or selfinsurance program carried by the State of Colorado.
- C. The Insurance shall include provisions preventing cancellation or non-renewal without at least 30 days prior notice to CDOT by certified mail.
- D. The Permittee, or, as applicable their Contractor or Consultant, will require all insurance policies in any way related to the Permit and secured and maintained by the Permittee, Contractor or Consultant, to include clauses stating that each carrier will waive all rights of recovery, under subrogation or otherwise, against CDOT, its agencies, institutions, organizations, officers, agents, employees and volunteers.
- E. All policies evidencing the insurance coverages required hereunder shall be issued by insurance companies satisfactory to CDOT.
- F. The Permittee, or as applicable their Contractor or Consultant, shall provide certificates showing insurance coverage required by this Permit to CDOT prior to commencing work. No later than 15 days prior to the expiration date of any such coverage, the Permittee, Contractor or Consultant, shall deliver CDOT certificates

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of insurance evidencing renewals thereof. At any time during the term of this contract, CDOT may request in writing, and the Permittee, Contractor or Consultant, shall thereupon within 10 days supply to CDOT, evidence satisfactory to CDOT of compliance with the provisions of this section.

- G. Notwithstanding subsection A of this section, if the Permittee is a "public entity" within the meaning of the Colorado Governmental Immunity Act CRS 24-10-101, et seq., as amended ("Act'), the Permittee shall at all times during the term of this permit maintain only such liability insurance, by commercial policy or self-insurance, as is necessary to meet its liabilities under the Act. Upon request by CDOT, the Permittee shall show proof of such insurance satisfactory to CDOT. Public entity Permittees are not required to name CDOT as an Additional Insured.
- H. If the Permittee engages a Contractor and/or Consultant to act independently from the Permittee on the permitted work, that Contractor and/or Consultant shall be required to provide an endorsement naming CDOT as an Additional Insured on their Commercial General Liability, Auto Liability, Pollution Legal Liability and Umbrella or Excess Liability policies.

4. WORK WHERE DEPARTMENT LACKS AUTHORITY

Utility work within municipal boundaries (pursuant to 43-2-135 CRS), on certain public lands, or on private property, may require separate approval of the appropriate jurisdictional agency or property owner.

5. INSTALLATIONS ON FREEWAYS

CDOT may permit utility accommodations on freeways, including but not limited to the Interstate System, only in accordance with Utility Accommodation Code provisions. Special case exceptions as defined therein may be permitted only in accordance with FHWA-approved Departmental policy.

6. JOINT USE ALTERNATIVES

As directed or approved by CDOT, if necessary for the safe and efficient use of the ROW, Permittee shall utilize joint use facilities such as the placement of two or more separate lines in a common trench, or attachment to the same overhead support. The Permittee will be responsible for proper coordination with other affected utilities.

7. ATTACHMENT TO HIGHWAY STRUCTURES

Permittee is responsible for designing structure attachments, subject to the approval of the CDOT Staff Bridge Design Engineer.

8. DRAINAGEWAYS AND WATERCOURSES

The flow of water shall not ever be impaired or interrupted. Where possible, crossings of ditches, canals or water-carrying structures shall be bored or jacked beneath. Irrigation ditch or canal crossings require approval of the ditch company or owner, Permittee shall repair damage to any drainage facility to the satisfaction of the owner.

9. TRAFFIC CONTROL PLAN

- a. Prior to commencing work, the Permittee shall develop and submit to the Department for acceptance, a Traffic Control Plan (TCP) for any accommodation work that will affect traffic movement or safety. The Permittee shall implement the TCP and utilize traffic control devices as necessary to ensure the safe and expeditious movement of traffic around and through the work site.
- b. The Permittee shall develop the TCP, and Methods of Handling Traffic (MHT's) included therein, in conformance with the Manual on Uniform Traffic Control Devices (MUTCD), the Colorado Supplement thereto adopted by the Commission pursuant to sections 42-4-104 and 42-4-105 CRS, the Department's standard specifications for temporary traffic control and the Department's

- standard plans for signing Standard Plans S 630-1 and S 630-2. The TCP shall include provisions for the passage of emergency vehicles through the work zone, and shall conform to the requirements of the Americans with Disabilities Act. The TCP and MHT's shall contain sufficient detail to demonstrate conformity with all applicable requirements.
- c. The Permittee shall have a competent person at the work site at all times in responsible charge of temporary traffic control. In situations where the TCP goes beyond any Typical Application shown in the MUTCD, or particularly dangerous roadway or traffic conditions exist, the Department may require the Permittee to have a Traffic Control Supervisor (TCS) develop or approve the TCP or to have a TCS on-site during work. The TCS shall be certified as a worksite traffic supervisor by either the American Traffic Safety Services Association (ATSSA) or the Colorado Contractors Association (CCA), and shall have a current CDOT flaggers' certification card. The TCS shall be responsible for the planning, preparation, coordination, implementation, and inspection of the TCP.
- The Permittee shall not start the permitted work before the Department accepts the TCP.
- The Department may review and order changes to the TCP and MHT's during performance of the work, as required.
- The Permittee shall comply with the TCP at all times during performance of the work,
- The Permittee shall keep a copy of the TCP at the work site at all times during performance of the work for inspection,
- h. The TCP shall ensure that closure of intersecting streets, road approaches and other access points is minimized. On heavily traveled highways, the Department will not permit operations that interfere with traffic during periods of peak traffic flow.
- When Permittee operations coincide with highway construction or maintenance operations, the Permittee shall develop and implement the TCP in cooperation and coordination with the highway agency and/or its contractors and as otherwise directed by the Department in the permit.
- All flaggers shall have a current CDOT flagger certification card and shall be capable of communicating with the traveling public and others at the work site.

10. NCHRP 350 CRASHWORTHINESS REQUIREMENTS FOR WORK ZONE TRAFFIC CONTROL DEVICES

Work zone devices designated by FHWA as: Category I, including but not limited to single-piece drums, tubes, cones and delineators; Category II, including but not limited to barricades, vertical panels with light, drums or cones with light, portable sign supports, intrusion detectors and type III barricades; or as Category III, including but not limited to concrete barriers, fixed sign supports, crash cushions, and other work zone devices not meeting the definitions of Category I or II; shall meet NCHRP 350 crash test requirements. The Permittee, or their contractor shall obtain and make available upon request, the manufacturer's written NCHRP 350 certification, or as applicable, the FHWA Acceptance Letter, for each type of device. FHWA Acceptance Letters for Category II or Category III Work Zone Devices may be accessed through the FHWA website at http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm

11. WORKER SAFETY AND HEALTH

a. All workers within the State Highway right of way shall comply with their employer's safety and health policies/procedures and all applicable U.S. Occupational Safety and Health Administration (OSHA) regulations - including, but not limited to the applicable sections of 29 CFR Part 1910 - Occupational Safety and Health Standards and 29 CFR Part 1926 - Safety and Health Regulations for Construction.

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- b. Personal protective equipment (PPE) (e.g. head protection, footwear, high visibility apparel, safety glasses, hearing protection, respirators, gloves, etc.) shall be worn as appropriate for the work being performed, and as specified in regulation. At a minimum, all workers in the SH ROW, except when in their vehicles, shall wear the following personal protective equipment:
 - Head protection that complies with the ANSI Z89.1standard;
 - At all construction sites or whenever there is danger of injury to feet, workers shall comply with OSHA's PPE requirements for foot protection per 29 CFR 1910.136, 1926.95, and 1926.96. If required, such footwear shall meet the requirements of ANSI Z41;
 - 3) High visibility apparel, which shall, at a minimum comply with the Class 2 specifications of the ANSI/ISEA 107standard. Class 3 apparel shall be considered for use at night or in particularly hazardous situations.
 - The most recent version of the ANSI standards listed above shall apply.

12. ADA REQUIREMENTS

The Permittee shall comply with the applicable provisions of the Americans With Disabilities Act, with respect to both permanent facilities installations and temporary work zones.

13. CLEAR ROADSIDE CONSIDERATIONS

- a. CDOT is committed to provide a roadside area that is as free as practical from nontraverseable hazards and fixed objects ("clear zone"). New above ground installations may be permitted within the clear zone only upon a showing that no feasible alternate locations exist. Permittee must utilize appropriate countermeasures to minimize hazards.
- b. Permittee shall remove materials and equipment from the highway ROW at the close of daily operations. The traffic control plan must include protective measures where materials and equipment may be stored on ROW. Protection of open trenches and other excavations within highway ROW shall be addressed in the Permittee's traffic control plan. All excavations shall be closed at the end of daily operations, and no open excavation will be allowed in the clear zone after dark. The Permittee agrees to promptly undertake mitigating or corrective actions acceptable to the Department upon notification by CDOT that the installation permitted herein has resulted in a hazardous situation for highway users.

14. GENERAL CONSTRUCTION REQUIREMENTS

- a. Work shall not be performed at night or on Saturdays, Sundays, or holidays without prior authorization or unless otherwise specified in this permit. CDOT may restrict work on ROW during adverse weather conditions or during periods of high traffic volume.
- b. Those areas within ROW, which must be disturbed by permit operations, shall be kept to a practical minimum. Permittee shall not spray, cut, or trim trees or other landscaping elements within highway ROW, unless such work is otherwise specified in this permit, or clearly indicated on the approved plans. Cleated or tracked equipment shall not work on or move over paved surfaces without mats, or pads on tracks.
- c. Material removed from any portion of the roadway prism must be replaced in like kind with equal or better compaction. Segregation of material is not permitted. The permitted facility shall be of durable materials in conformity with accepted practice or industry standards, designed for long service life, and relatively free from routine servicing or maintenance.

- d. Construction or compaction by means of jetting, puddling, or water flooding is prohibited within all highway ROW.
- Thrust blocks are required on all vertical and horizontal bends in pressure pipes.
- Meters shall not be placed on highway ROW except within corporate limits where municipal regulations allow such use.

15. ALIGNMENT, COVER, CLEARANCE

- Location and alignment of Permittee's facilities shall only be as specified in this permit or as otherwise indicated in the approved plans or work sketch (EXHIBIT A).
- Parallel installations will not be permitted within roadways (including curbing and/or shoulders) or median areas, except within corporate boundaries, subject to municipal regulations.
- c. Parallel installations should be located as near as practicable to the ROW line. Crossings shall be as nearly perpendicular to the highway as feasible.
- d. Where no feasible alternate locations exist, the Department may permit parallel installations along roadside areas within 15 feet from edge of shoulder or back of curb. In these cases, the facility must be so located and safeguarded as to avoid potential conflict with necessary highway appurtenances (signs, guard rail, delineators, etc.). Specific safeguards such as increasing depth of cover to 60 inches, capping, or encasement, shall be specified in this permit's Special Provisions.
- e. Parallel installations shall follow a uniform alignment, wherever practical. Due consideration must be given to conserving space available for future utility accommodations. The standard allowable deviation from the approved horizontal alignment is ± 18 inches.
- f. Minimum cover shall conform to the Special Provisions, Normal specified cover will be 48 inches or greater; reduced cover may be approved where site conditions warrant, subject to other safeguards as may be specified or approved in the permit. Minimum overhead clearance shall conform to the Special Provisions, consistent with Utility Accommodation Code criteria.

16. PAVEMENT CUTS AND REPAIRS

Paved surfaces shall not be cut unless otherwise specified in this pennit. No more than one half the width of the roadbed may be opened at a time, when otherwise permitted. Pavement shall be sawed or wheel-cut to a neat line. Pavement shall be replaced to a design equal to or greater than that of the surrounding undisturbed pavement structure. Pavement repair shall conform to the Special Provisions or the approved plans.

17. BORING, JACKING, ENCASEMENT

Unless otherwise specified, buried crossings shall be bored or jacked beneath the roadway, at least from toe of slope to toe of opposite slope. Portals for untrenched crossings more than 5 feet in depth shall be bulk headed in conformance with OSHA construction and safety standards. Portal limits of untrenched crossings shall be established safely beyond the highway surface and clear zone and in no case shall the lateral distance from the surfaced area of the highway to the boring or jacking pit be less than the vertical difference in elevation between such surface and the bottom of the pit. Water jetting or tunneling is not permitted. Water assisted boring may be permitted as determined by the CDOT Inspector. Boring hole shall be oversized to the minimum amount required to allow pull-through of the conduit being installed. Resultant voids shall be grouted or otherwise backfilled, subject to CDOT approval. Ends of bored sections shall not be covered before being inspected. Encasement shall be consistent with Utility Accommodation Code provisions. CDOT may require protective casing for shallow installations or certain conduit materials. Encased crossings shall extend at least from toe of slope to toe of slope, or the full width between access-control lines on freeways, including the Interstate System.



18. INSPECTION AND ACCEPTANCE

- a. CDOT will determine the extent of inspection services necessary for a given installation. Permittee shall attend final inspection as may be required. If the initial performance of permitted work was unacceptable, as determined by the Department, the Permittee shall perform any reconstruction or improvement of that work as ordered by the Department, in a timely manner and prior to any further construction. If permitted operations are not being carried out in compliance with the terms and conditions of this permit, the Department may order the Permittee to perform whatever corrective measures are necessary to attain compliance with the permit. If there is an immediate danger to the public's health, safety or welfare, the Department may order the Permittee to cease all operations and if necessary, to remove all equipment and facilities from the SHROW.
- b. Final acceptance does not relieve Permittee of maintenance obligations toward those elements of the highway facility constructed under this permit. Final acceptance begins the two-year warranty period (see requirement under "Operation and Maintenance" below).

19. ENVIRONMENTAL CLEARANCES/PERMITS

- a. It is the responsibility of the Permittee to determine which environmental clearances and/or regulations apply to their activities and to obtain any clearances that are required directly from the appropriate regulatory agency prior to commencing work. Please refer to or request a copy of the "CDOT Environmental Clearance Information Summary" (ECIS) for details. The ECIS may be obtained from CDOT Permitting Offices or may be accessed via the CDOT webpage at http://www.dot.state.co.us/UtilityProgram/Forms.cfm. Failure to comply with regulatory requirements may result in suspension or revocation of your CDOT permit, or enforcement actions by other agencies.
- b. The Special Provisions of this permit shall list any specific environmental clearances or permits that the Department has been notified by the Permittee or by the administering regulatory agency apply to the operations authorized by this permit. The Special Provisions shall require the Permittee obtain the listed environmental clearances/permits prior to beginning work.
- The Permittee shall comply with all requirements described in the CDOT Environmental Clearances Information Summary, including those pertaining to:
 - 1) Ecological Resources
 - 2) Cultural Resources
 - 3) Discharges of Stormwater or Process Water
 - 4) Hazardous Materials
 - 5) Discharges of Dredged or Fill Material
 - 6) Erosion and Sediment Control
 - 7) Disposal of Drilling Fluids
 - 8) Concrete Washout
 - 9) Spill Reporting
 - 10) Transportation of Hazardous Materials
- d. Disturbance of any wildlife shall be avoided to the maximum extent practicable. If threatened or endangered species or archeological or historical artifacts are encountered during the progress of a project, work in the subject area shall be halted and the CDOT regional permitting office shall be contacted immediately for direction as to how to proceed.
- All discharges of stormwater or process water are subject to the applicable provisions of the Colorado Water Quality Control Act and the Colorado Discharge Permit Regulations.
- f. There shall be no disposal of hazardous materials in the state highway right of way. Solid waste shall be removed from the state highway right of way and disposed of at a permitted facility or

- designated collection point (such as the Permittee's own dumpster). Drilling fluids must be disposed of as described in the ECIS.
- g. If pre-existing solid waste or hazardous materials contamination (including oil or gasoline contaminated soil, asbestos, chemicals, mine tailings, etc.) are encountered during the performance of work, the Permittee shall halt work in the affected area and immediately contact the CDOT regional permitting office for direction as to how to proceed.
- h. Spills shall be reported immediately using the CDOT Illicit Discharge Hotline (303) 512-4446. Spills on the highway, into waterways, or that may otherwise present an immediate danger to the public, shall be reported by calling 911 or the Colorado State Patrol at (303) 239-4501, and the Colorado Department of Public Health and Environment at 1-(877) 518-5608.

20. RESTORATION OF RIGHT OF WAY

Prior to final acceptance, all disturbed portions of highway right of way shall be cleaned up and restored to their original condition, subject to CDOT approval. Seeding, sodding, and planting shall be as specified, or otherwise approved by CDOT. Construction, maintenance and watering requirements shall conform to the CDOT Standard Specifications. Where landscape restoration must be delayed due to seasonal requirements, such work may be authorized by separate permit. Permittee shall use only certified weed-free seed and mulch. Permittee shall clean equipment before transporting it into or out of the state to prevent the migration of noxious weeds.

21. OPERATION AND MAINTENANCE

- a. Permittee agrees to own and maintain the installation permitted herein. The facility shall be kept in an adequate state of repair and maintained in such a manner as to cause the least interference with the normal operation and maintenance of the highway.
- b. If any element of the transportation facility, constructed or replaced as a condition of this permit, fails within 24 months due to improper construction or materials, Permittee shall make all repairs immediately as notified in writing by CDOT.
- c. Routine, periodic maintenance and emergency repairs may be performed under the general terms and conditions of this permit. CDOT shall be given proper advance notice whenever maintenance work will affect the movement or safety of traffic. In an emergency, the CDOT Region office and the State Patrol shall immediately be notified of possible traffic hazards. Emergency procedures shall be coordinated beforehand, where possible.
- d. Maintenance activities requiring new excavation or other disturbance within highway ROW may require separate permit. Where highway construction or maintenance operations so require, Permittee will shut off lines, remove all combustible materials from the highway right of way, or provide other temporary safeguards.

22. MARKERS, LOCATION AIDS, LOCATION ASSISTANCE

- a. The utility shall take all practical measures to ensure that buried utility facilities are surface-detectable by standard geophysical methods. Where the utility facilities, by the nature of their material properties, burial depth or other factors, may by themselves not be surface-detectable, the utility shall, where feasible, incorporate detection wire or other detection aids in the installation of those facilities. In instances where detection aids are not feasible or would be ineffective and surface-detectability cannot be ensured, surface markers shall be installed as directed by the Department and as-constructed plans and showing the accurate horizontal and vertical location of the buried facilities shall be provided to the Department.
- All plowed or trenched installations must include color-coded (using the American Public Works Association color coding system) warning tape placed not less than 12 inches vertically above

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the top of the line. The warning tape shall be surface-detectable if needed to facilitate detection of the line.

- c. The utility shall place readily identifiable markers at the right of way line where it is crossed by pipelines carrying transmittants which are flammable, corrosive, expansive, energized, or unstable, particularly if carried at high pressure or potential, except where a vent will serve as a marker.
- d. The utility shall place markers for longitudinal underground facilities vertically above the facilities or at a known horizontal offset, unless otherwise approved in writing by the Department. Each marker shall provide a fore- and backsight to succeeding and preceding markers. Markers shall be installed at suitable intervals along tangent sections, at angle points or points of curvature and at reasonable intervals along curves.
- The utility shall maintain any markers required by this Code for the life of the installation.
- f. The Department may require the utility to submit "as-constructed" plans. The Department may enter into an agreement with the utility whereby the Department can rely on those plans for the exact location of the utility for any future excavations, and need not give notice to the utility under Article 1.5 of Title 9, C.R.S.
- g. The utility will comply with the applicable requirements of Article 1.5 of Title 9 C.R.S., including any requirement to participate in the State's Notification Association pursuant to 9-1.5-105 C.R.S.. All owners of underground utilities within the SHROW, with the exception of the Department itself, must become members of the UNCC Notification Association.
- h. In addition to complying with the provisions of Article 1.5 of Title 9 C.R.S (One-Call Statute) in response to the Department's notification of planned excavations, utility owners shall surface-mark their buried utility facilities that are located within the SHROW in order to facilitate Departmental engineering and design activities, upon reasonable request from the Department, and at no cost to the Department. The Permittee shall respond to such request within a reasonable timeframe acceptable to the Department, but no longer than 14 calendar days from the date of request, and the accuracy of the surface marking shall be within 18 inches of either side of the actual location of the buried facility.

23. ADJUSTMENTS DUE TO HIGHWAY CONSTRUCTION

If for any transportation purpose it becomes necessary to remove, adjust, or relocate this facility, Permittee will do so promptly, at no cost to the CDOT except as provided by law, upon written notice from CDOT and in accordance with the utility relocation permit issued to cover the necessary work. The utility shall perform the relocation at or within a time convenient to and in proper coordination with the project or transportation-related activity, to minimize public inconvenience and cost, as directed by the Department in the permit authorizing the relocation. The utility company shall pay for damages caused by the company's delay in the performance of utility relocation work or interference with the performance of transportation project work done by others. Such damages include, but are not limited to, payments made by the Department to any third party based on a claim that performance of the transportation project work was delayed or interfered with as a direct result of the utility company's failure to timely perform the utility relocation work. Damages resulting from delays in the performance of the utility relocation work or interference with the transportation project work that are caused by events beyond the utility company's ability to reasonably foresee or control (a force majeure) shall not be charged to the utility company.

24. ABANDONMENT, RETIREMENT, CHANGE IN OWNERSHIP

- a. The Permittee shall notify the Department in writing of the planned retirement or abandonment of its facility or any portion thereof. The Department will notify the Permittee in writing if it determines that the facilities may be retired or abandoned in place, along with any special conditions that may apply.
- Retired facilities shall remain the Permittee's sole responsibility, subject to all provisions of the Utility Accommodation Code and all

- of the terms and conditions of the permit issued for that facility, including maintenance and relocation requirements.
- c. The Permittee shall promptly remove all abandoned facilities from the SH ROW and promptly restore the SH ROW to pre-existing or other conditions prescribed by the Department unless the Department in writing expressly allows the facility to remain in place. Written notice from the Department, allowing an abandoned facility to remain in place, may include special conditions.
- d. If utility facilities are retired or abandoned in place, the utility shall comply with that decision if directed by the Department:
 - 1) cap, plug or fill lines,
 - 2) furnish suitable location records for any such buried facilities,
 - maintain its own records of such facilities and respond to locate notices/requests from the UNCC and/or excavators, In providing such locates, the utility will indicate to the requesting entity whether or not the subject facilities are retired or abandoned.
 - perform any other actions as deemed necessary by the Department to protect the transportation facility and/or the traveling public.
- e. If the ownership of utility facilities is transferred, both the original Permittee and the new owner shall notify the Department in writing prior to the change in ownership, and such notice shall state the planned date of change in ownership. The notice from the new owner shall include a written statement accepting all terms and conditions of the existing permit, effective upon the planned date of the change in ownership.
- f. Utility facilities containing asbestos may not be abandoned in-place. Ordinarily, such facilities must be removed from the SHROW when take out of service. On a case-by-case basis, the Department may allow such facilities to be retired in-place, with the owner retaining full legal ownership and responsibility for the facilities.

25. SUSPENSION AND CANCELLATION

- a. The CDOT inspector may suspend operation due to:
 - 1) Non compliance with the provisions of this permit
 - 2) Adverse weather or traffic conditions
 - Concurrent transportation construction or maintenance operations in conflict with the permitted work.
 - Any condition deemed unsafe for workers or for the general public.
- b. Work may resume when grounds for suspension no longer exist.

This permit is subject to cancellation due to:

- 1) Persistent noncompliance with permit provisions
- 2) Abandonment or transfer of ownership
- 3) Superseded by new permit covering the same installation
- 4) Conflict with necessary planned transportation construction.
- Permittee must promptly terminate occupancy upon notice of cancellation of permit, unless a new permit is applied for and granted.
- d. Where Permittee does not fulfill an obligation to repair or maintain any portion of the highway facility, or control and safely maintain the flow of traffic thereon, CDOT reserves the right, in lieu of canceling this permit, to accomplish the required work by any other appropriate means, and Permittee shall be liable for the actual costs thereof.



COLORADO DEPARTMENT OF TRANSPORTATION

Environmental Clearances Information Summary

PURPOSE - This summary is intended to inform entities external to CDOT that may be entering the state highway right-of-way to perform work related to their own facilities (such as Utility, Special Use or Access Permittees), about some of the more commonly encountered environmental permits/clearances that may apply to their activities. This listing is not all-inclusive - additional environmental or cultural resource permits/clearances may be required in certain instances. Appropriate local, state and federal agencies should be contacted for additional information if there is any uncertainty about what permits/clearances are required for a specific activity. IMPORTANT - Please Review The Following Information Carefully - Failure to Comply With Regulatory Requirements May Result In Suspension or Revocation of Your CDOT Permit, Or Enforcement Actions By Other Agencies.

CLEARANCE CONTACTS - As indicated in the permit/clearance descriptions listed below, the following individuals or agencies may be contacted for additional information:

- Colorado Department of Public Health and Environment (CDPHE): General Information (303) 692-2035
 Water Quality Control Division (WQCD): (303) 692-3500
 Environmental Permitting Website https://www.colorado.gov/pacific/cdphe/all-permits
- CDOT Water Quality Program Manager: (303) 757-9343 https://www.codot.gov/programs/environmental/water-quality
- CDOT Asbestos Project Manager: Phil Kangas, (303) 512-5519
- Colorado Office of Archaeology and Historic Preservation: (303) 866-5216
- U.S. Army Corps of Engineers, District Regulatory Offices:

Omaha District (NE CO), Denver Office (303) 979-4120

http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Colorado.aspx

Sacramento Dist. (Western CO), Grand Junction Office (970) 243-1199

http://www.spk.usace.army.mil/Missions/Regulatory.aspx

Albuquerque District (SE CO), Pueblo Office (719)-543-9459

http://www.spa.usace.army.mil/Missions/RegulatoryProgramandPermits.aspx

• CDOT Utilities, Special Use and Access Permitting: (303) 757-9654 https://www.codot.gov/business/permits

Wildlife Resources - Disturbance of wildlife shall be avoided to the maximum extent practicable. Entry into areas of known or suspected threatened or endangered species habitat will require special authorization from the CDOT permitting office. If any threatened or endangered species are encountered during the progress of the permitted work, work in the subject area shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Information about threatened or endangered species may be obtained from the CDOT website, http://www.codot.gov/programs/environmental/wildlife/guidelines, or the Colorado Parks and Wildlife (CPW) website, http://www.cpw.state.co.us/learn/Pages/SOC-ThreatenedEndangeredList.aspx. Additional guidance may be provided by the appropriate Region Planning and Environmental Manager (RPEM).

Cultural Resources - The applicant must request a file search of the permit area through the Colorado Office of Archaeology and Historic Preservation (OAHP), Denver, to ascertain if historic or archaeological resources have previously been identified (http://www.historycolorado.org/oahp/file-search). Inventory of the permit area by a qualified cultural resources specialist may be necessary, per the recommendation of CDOT. If archaeological sites/artifacts or historic resources are known to exist prior to the initiation of the permitted work or are encountered as the project progresses, all work in the subject area shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Additional guidance may be provided by the Regional Permitting Office and RPEM. Contact Information: Contact the OAHP for file searches at (303) 866-5216.

Paleontological Resources - The applicant must request a fossil locality file search through the University of Colorado Museum, Boulder (https://cumuseum.colorado.edu/research/paleontology/vertebrates/policies), and the Denver Museum of Nature and Science (https://www.dmns.org/science/collections/earth-science-collections/) to ascertain if paleontological resources have been previously identified in or near the permit area. Inventory of the permit area by a qualified paleontologist may be necessary, per the recommendation of CDOT. If fossils are encountered during the permitted work, all work in the subject area shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately. Authorization must be provided by CDOT prior to the continuation of work. Additional guidance may be provided by the Regional Permitting Office in the Permit Special Provisions. Contact Information: See the museum websites listed above for Paleontological Collections Manager contact information. Contact the CDOT Paleontologist for further information at nicole.peavey@state.co.us or (303) 757-9632. The CDOT Paleontologist will not conduct a comprehensive file search independently of the museums.

Hazardous Materials, Solid Waste - The Solid Wastes Disposal Sites and Facilities Act C.R.S. 30-20-100, et al, and Regulations Pertaining to Solid Waste Disposal Sites and Facilities (6 CCR 1007-2), prohibit solid waste disposal without an approved Certificate of Designation (a landfill permit). The Colorado Hazardous Waste Act C.R.S. 25-15-301 et al, and the Colorado Hazardous Waste Regulations (6 CCR 1007-3) prohibit the transfer, storage or disposal (TSD) of hazardous waste except at permitted TSD sites. There are no permitted landfills or TSD sites within the State Highway Right of Way. Therefore, all solid or hazardous wastes that might be generated by the activities of entities entering the State Highway Right of Way must be removed from the ROW and disposed of at a permitted facility or designated collection point (e.g., for solid waste, a utility or construction company's own dumpster). If pre-existing solid waste or hazardous materials contamination (including oil or petroleum contaminated soil, asbestos, chemicals, mine tailings, etc.) is encountered during the performance of work, the permittee shall halt work in the affected area and immediately contact the CDOT Regional Permitting Office for direction as to how to proceed. *Contact Information:* Theresa Santangelo-Dreiling, CDOT Hazardous Materials Management Supervisor: (303) 512-5524.

Asbestos Containing Materials, Asbestos Contaminated Soil - All work on asbestos containing materials (ACM) must comply with the applicable requirements of the CDPHE Air Pollution Control Division's (APCD) Regulation 8. Disposal of ACM, and work done in asbestos-contaminated soil, must comply with the CDPHE Hazardous Materials and Waste Management Division's (HMWMD) Sold

Appendix A.3
Environmental Clearances
Information Summary

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Waste Regulations. The application for any CDOT permit must specifically identify any ACM involved in the work for which authorization is being requested. Additional guidance or requirements may be specified in the permit special provisions. *Contact Info:* CDPHE APCD and HMWMD Regulations can be accessed via the CDPHE Environmental Permitting Website listed above. Additional information <u>concerning clearance on CDOT projects</u> is available from the CDOT Asbestos Project Manager (303) 512-5519, or Theresa Santangelo-Dreiling, Hazardous Materials Management Supervisor: (303) 512-5524.

Transportation of Hazardous Materials - No person may offer or accept a hazardous material for transportation in commerce unless that person is registered in conformance with the United States Department of Transportation regulations at 49 CFR, Part 171. The hazardous material must be properly classed, described, packaged, marked, labeled, and in condition for shipment as required or authorized by applicable requirements, or an exemption, approval or registration has been issued. Vehicles requiring a placard, must obtain authorization and a State HAZMAT Permit from the Colorado Public Utilities Commission. *Contact Information:* For authorization and more info call the Federal Motor Safety Carrier Administration, US DOT for inter- and intra-state HAZMAT Registration (303) 969-6748. Colorado Public Utilities Commission: (303) 894-2868.

Discharge of Dredged or Fill Material – 404 Permits Administered By the U.S. Army Corps of Engineers, and Section 401 Water Quality Certifications Issued by the CDPHE WQCD - Corps of Engineers 404 permits are required for the discharge of dredged or fill materials into waters of the United States, including wetlands. There are various types of 404 permits, including nationwide permits, which are issued for activities with relatively minor impacts. For example, there is a nationwide permit for utility line activities (nwp #12). Depending upon the specific circumstances, it is possible that either a "general" or "individual" 404 permit would be required. If an individual 404 permit is required, section 401 water quality certification from the CDPHE WQCD is also required. Contact the appropriate Corps District Regulatory Office for information about what type of 404 permit may be required (contact information above). Contact the CDPHE Water Quality Control Division at (303) 692-3500.

Working on or in any stream or its bank - In order to protect and preserve the state's fish and wildlife resources from actions that may obstruct, diminish, destroy, change, modify, or vary a natural existing stream or its banks or tributaries, it may be necessary to obtain a Senate Bill 40 certification from the Colorado Department of Natural Resources. A stream is defined as 1) represented by a solid blue line on USGS 7.5' quadrangle maps; and/or 2) intermittent streams providing live water beneficial to fish and wildlife; and/or 3) segments of streams supporting 25% or more cover within 100 yards upstream or downstream of the project; and/or 4) segments of streams having wetlands present within 200 yards upstream or downstream of the project measured by valley length. The CPW application, as per guidelines agreed upon by CDOT and CPW, can be accessed at https://www.codot.gov/programs/environmental/wildlife/guidelines.

Stormwater Construction Permit (SCP) and Stormwater Discharge From Industrial Facilities - Discharges of stormwater runoff from construction sites disturbing one acre or more - or certain types of industrial facilities, such as concrete batch plants - require a CDPS Stormwater Permit. Contact Information: Contact the CDPHE Water Quality Control Division at (303) 692-3500. Website: https://www.colorado.gov/pacific/cdphe/wq-construction-general-permits and https://colorado.gov/pacific/cdphe/wq-commerce-and-industry-permits.

Construction Dewatering (Discharge or Infiltration) and Remediation Activities - Discharges of water encountered during excavation or work in wet areas may require a Construction Dewatering or Remediation Activities Discharge Permit. Contact Information: For Construction Dewatering and Remediation Activities Discharge Permits, contact the CDPHE WQCD at (303) 692-3500. For Applications and Instructions (CDPHE website): https://www.colorado.gov/pacific/cdphe/wq-construction-general-permits.

Municipal Separate Storm Sewer System (MS4) Discharge Permit - Discharges from the storm sewer systems of larger municipalities, and from the CDOT highway drainage system that lies within those municipalities, are subject to MS4 Permits issued by the CDPHE WQCD. For facilities that lie within the boundaries of a municipality that is subject to an MS4 permit, the owner of such facility should contact the municipality regarding stormwater related clearances that may have been established under that municipality's MS4 permit. All discharges to the CDOT highway drainage system or within the Right of Way (ROW) must comply with the applicable provisions of the Colorado Water Quality Control Act, the Water Quality Control Commission (WQCC) Regulations (https://www.colorado.gov/pacific/cdphe/wqcc-regulations-and-policies-and-water-quality-statutes) and the CDOT MS4 Permit # COS-000005 (https://www.codot.gov/programs/environmental/water-quality/documents). Discharges are subject to inspection by CDOT and CDPHE. Contact the CDPHE Water Quality Control Division at (303) 692-3500 for a listing of municipalities required to obtain MS4 Permits, or go to https://www.colorado.gov/pacific/cdphe/wq-municipal-ms4-permits. For CDOT-related MS4 regulations, go to: https://www.codot.gov/programs/environmental/water-quality/stormwater-programs.html.

<u>General Prohibition – Discharges</u> - All discharges are subject to the provisions of the Colorado Water Quality Control Act and the Colorado Discharge Permit Regulations. Prohibited discharges include, but are not limited to, substances such as wash water, paint, automotive fluids, solvents, oils or soaps and sediment. *Contact Information*: Contact the CDPHE Water Quality Control Division at (303) 692-3500.

General Authorization - Allowable Non-Stormwater Discharges - Unless otherwise identified by CDOT or the WQCD as significant sources of pollutants to the waters of the State, the following discharges to stormwater systems are allowed without a Colorado Discharge Permit System permit: landscape irrigation, diverted stream flows, uncontaminated ground water infiltration to separate storm sewers, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, uncontaminated springs, footing drains, water line flushing, flows from riparian habitats and wetlands, and flow from firefighting activities. Allowable non-stormwater discharges can be found under Illicit Discharge PDD at: https://www.codot.gov/programs/environmental/water-quality/stormwater-programs.html. Contact Information: The CDPHE Water Quality Control Division (telephone #'s listed above).

Erosion and Sediment Control Practices - For activities requiring a Stormwater Construction Permit, erosion control requirements will be specified in that permit. In situations where a stormwater permit is not required, all reasonable measures should be taken to minimize erosion and sedimentation according to CDOT Standard Specifications 107.25, 208, 213 and 216 (https://www.codot.gov/business/designsupport/2011-construction-specifications/2011-Specs/2011-specs-book). All disturbances require a stabilization plan, native seeding or landscape design plan according to applicable CDOT Standard Specifications 212-217 and 623. The CDOT Erosion Control and Stormwater Quality Guide (available from the Bid Plans Office at (303) 757-9313) should be used to design erosion controls and restore disturbed vegetation.

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Disposal of Drilling Fluids - Drilling fluids used in operations such as Horizontal Directional Drilling may be classified as "discharges" or "solid wastes," and in general, should be pumped or vacuumed from the construction area, removed from the State Highway Right of Way, and disposed of at permitted facilities that specifically accept such wastes. Disposal of drilling fluids into storm drains, storm sewers, roadside ditches or any other type of man-made or natural waterway is prohibited by Water Quality Control and/or Solid Waste regulations. Small quantities of drilling fluid solids (less than 1 cubic yard of solids) may be left on-site after either being separated from fluids or after infiltration of the water, provided: 1) the drilling fluid consists of only water and bentonite clay, or, if required for proper drilling properties, small quantities of polymer additives that are approved for use in drinking water well drilling; 2) the solids are fully contained in a pit, and are not likely to pose a nuisance to future work in the area, 3) the solids are covered and the area restored as required by CDOT permit requirements (Utility, Special Use, or Access Permits, etc.). Contact Information: Contact CDPHE (telephone #'s listed above).

Noxious Weeds and Invasive Species Management Plan – Noxious Weeds and Invasive Species guidance can be found by contacting the Colorado Department of Agriculture (https://www.colorado.gov/pacific/agconservation/noxiousweeds) and the Colorado Division of Parks and Wildlife (https://cpw.state.co.us/aboutus/Pages/RS-NoxiousWeeds.aspx). In either case, management plans involving the control of noxious weeds associated with the permitted activity and cleaning of equipment will be required.

Concrete Washout - Waste generated from concrete activities shall NOT be allowed to flow into the drainage ways, inlets, receiving waters, or in the CDOT ROW. Concrete waste shall be placed in a temporary concrete washout facility and must be located a minimum of 50 feet from state waters, drainageways, and inlets. Concrete washout shall only be performed as specified by the CDOT Environmental Program and shall be in accordance to CDOT specifications and guidelines. Contact Information: Contact CDPHE or find additional information on the CDOT website: https://www.codot.gov/business/designsupport/2011-construction-specifications/2011-Specs and refer to the specifications and their revisions for sections 101, 107 and 208.

Spill Reporting - Spills shall be contained and cleaned up as soon as possible. Spills shall NOT be washed down into the storm drain or buried. All spills shall be reported to the CDOT Illicit Discharge Hotline at (303) 512-4446 (4H20), as well as the Regional Permitting Office and Regional Maintenance Supervisor. Spills on highways, into waterways, any spill in the highway right-of-way exceeding 25 gallons, or that may otherwise present an immediate danger to the public shall be reported by calling 911, and shall also be reported to the CDPHE at 1-877-518-5608. More information can be found at https://www.colorado.gov/pacific/cdphe/emergency-reporting-line.

pendix A.3

Best management practices for industrial facility permittees

practices to prevent or reduce pollution entering CDOT's storm drain system. BMPs also include treatment, operating procedures, and practices to control site runoff, spillage or leaks, waste disposal, or drainage from material storage. BMPs include structural and acility and when operating the facility. Best management practices are schedules of activities, prohibitions of practices, maintenance procedures, and other management industrial facilities can use best management practices during construction of the nonstructural controls.

Resources for BMPs during construction of a facility

- http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm EPA Storm Water Phase II Menu of BMP's
- International Stormwater BMP Database www.bmpdatabase.org
- www.ieca.org/resources/TS6ErosionSedimentControl.asp International Erosion Control Association

Resources for BMPs during operation of a facility

- www.cabmphandbooks.com/Industrial.asp Industrial and Commercial Handbook
- www.ci.santa-cruz.ca.us/pw/Stormwater2004/Att16.pdf Industrial Facilities Best Management Practices
- Best Management Practices for Industrial Storm Water Pollution Control www.emd.saccounty.net/Documents/Info/Sacramento%20 Industrial%20BMP%20Manual%20Nov.pdf



For more information on CDOT Access Permits: For more information on CDOT Utility Permits: www.dot.state.co.us/UtilityProgram

For more information on CDOT's Water Quality Program:

Contact: Water Quality Program Manager 4201 East Arkansas Avenue Shumate Building Denver, CO 80222

CDOT's stormwater program website: www.cdoth2o.com 303-757-9343

CDOT Illicit Discharge Hotline: 303-512-4H20 (4426) CDOT MS4 Helpline: 303-918-7535



JUSTRIAL FACILITIES PROGRAM Water Quality Program



Stormwater runoil enters the storm drain system, which is different from the wastewater system. Stormwater nunoff drains to waterways untreated.

What is stormwater runoff?

precipitation from rain or snowmelt prevent stormwater from naturally flows over the ground. Impervious surfaces like roads and sidewalks Stormwater runoff occurs when soaking into the ground.



Why is stormwater runoff a problem?

system or directly into a stream, river, lake, wetland, or reservoir. Anything chemicals, dirt, and other pollutants system is discharged untreated into and flow into CDOT's storm drain swimming, and providing drinking the waterways we use for fishing. that enters CDOT's storm drain Stormwater can pick up debris,

CDOT has a permit from the Colorado Department discharge stormwater from its storm drain system. The allowable discharges like landscape irrigation overflow) and grease, antifreeze; and other automotive fluids are Pollutants, such as dirt; fertilizers; pesticides; and oil can be discharged from CDOT's storm drain system. strictly prohibited from being disposed of in CDOT's permit states that only stormwater (and a few other of Public Health and the Environment (CDPHE) to storm drain system.

programs to prevent pollutants from entering the storm As part of the permit, CDOT has several different drain system. The programs are:

- Construction sites program
- New development and redevelopment program
- Illicit discharges program
- Industrial facilities program
- Public education and involvement program
- Pollution prevention and good housekeeping program
- Wet weather monitoring program





drain system that is not composed entirely another permit from CDPHE). Allowable CDOT has a program to identify and eliminate any discharge to their storm of stommwater (unless authorized by discharges into CDOT's storm drain system include the following:

- Landscape irrigation
- Diverted stream flows
- Rising ground waters
- infiltration to separate storm sewers Uncontaminated ground water
- Uncontaminated pumped ground water
 - Discharges from potable water sources
- Foundation drains
- Air conditioning condensation
- Irrigation water
- Springs
- Water from crawl space pumps Footing drains

Lawn watering

- Individual residential swimming pool Individual residential car washing and hot tub discharges
- Individual residential street washing
- Water-line flushing
- Flows from riparian habitats and wetlands
- Flows from emergency fine fighting activities
- Water incidental to street sweeping Mincluding associated side walks and Amedians) and that is not associated with construction

CDOT's Utility and Access Permitting Program

Accesspermits) are responsible for providing services in the and Access Permitting Programs (www.dot.state.co.us/ The Utilities (www.dot.state.co.us/utilitiesprogram) following areas:

- any necessary relocation of these facilities to facilitate and utility companies to identify the utilities that are utilities engineers work with other CDOT employees within highway project boundaries and coordinate Utility/Highway Project Coordination—Region highway construction activities.
- Special Use Permits are issued to entitles external to performance of other types of work, within the state CDOT to manage the installation of utilities, or the Utility and Special Use Permitting—Utility and highway right-of-way.
- by any entity when a vehicle access needs to be Access Permits—Access Permits are required constructed, modified, or relocated within the highway right-of-way.

CDOT does not permit or back indirect connections (e.g., overland flow) to its storm drain system.

ndustrial Facilities Program Elements

The goal of the Industrial Facilities Program is to do the following:

- Educate those directly discharging into CDOT's storm drain system
- 2. Track direct dischargers
- 3. Detect and remove any illicit discharges
- number of informational brochures distributed, and 4. Submit an annual report to CDPHE containing the a summary by region of the number of Utility and Special Use Permits and Access Permits issued.



Bal

a CDOT Utility and Special Use Permit or Access Permit to obtain all required clearances. This fact sheet is given require some type of environmental permit or clearance for that work. CDOT has put together an Environmental Clearances Information Summary for those applying for entity doing work in the state highway right-of-way will co.us/UtilityProgram/Announcements/Announcements. cfm#enviro and www.dot.state.co.us/AccessPermits/ There are instances when a utility company or other to each permittee and is available at www.dof.state. index.htm.

is given to each permittee. This fact sheet is available development of an additional brochure that promotes quality." This fact sheet was developed in 2007 and at www.dot.state.co.us/environmental/envWaterQual/ that industries can implement to protect stormwater stormwater discharges from industrial facilities" and includes "references to guidance manuals for BMPs the "proper management of potential pollutants in in addition, CDOT's MS4 permit requires the Whatcanlolo.asp.

Tracking

CDOT tracks all Utility and Special Use and Access permittees.

Illicht Discharges

CDOT employees see or suspect that an industrial facility disposed of materials from CDOT's storm drain system. to detect and remove illicit discharges and improperly storm drain system, they should call 303-512-4H20 Another requirement of the MS4 permit is a program CDOT's right-of-way, or a reported illicit discharge. If permitting process, a report of unpermitted work in is discharging an unallowable pollutant into CDOT's inspections may be conducted in response to the (CDOT's illicit discharge hotline).

Annual Reporting

number of permits issued each year for its annual report Regions 1, 2, and 6 submit to CDOT headquarters the



cooperatively owned line, facility, or facility as any privately, publicly, or system producing, transmitting, or CDOT defines a utility or utility distributing the following

- Communications
- Cable television
- Power
- Electricity

- Light

- Heat gas
- 5
- Crude products
- Water
- Waste
- Stormwater not connected with highway drainage
- Other similar commodity



BOULDER COUNTY GENERAL FDP



Transportation Department

Tel: 303.441.3900 • Fax: 303.441.4594 • transportation@bouldercounty.org
Mailing Address: P.O. Box 471 • Boulder, Colorado 80306-0471 • www.bouldercounty.org

GENERAL FLOODPLAIN DEVELOPMENT PERMIT 2016-1

Per the authority granted in the Boulder County floodplain regulations, Section 4-404.1 of the Land Use Code, and having considered each of the review criteria listed in Section 4-404.1(B), the County Engineer hereby determines that the activities described below are appropriately regulated under a General Floodplain Development Permit ("FDP") so long as they are conducted in conformance with the conditions stated in section 3 below.

| Date Posted: | October 17, 2016 |
|--|------------------------------------|
| This General FDP is deemed in effect as of | of close of business on this date: |
| | NOVEMBER 1,2016 |
| Signature of County Engineer: | MARIA |
| Printed name: | Michael A. Thomas, P.E |

Notice and Comment Period

This General FDP shall be posted on the County Transportation Department website as of the "Date Posted" specified above. Notice to the public will also be provided in the manner described in Article 3-205 of the Land Use Code for comprehensive rezonings. The County Engineer will accept written public comment on this General FDP for 14 days after the date posted.

*** Next section to be completed by County Engineer at the end of the 14-day period.***

Final Determination on this General FDP

Check the applicable box (only one):

- ☐ The County Engineer received no written comments during the 14-day notice period. This General FDP is deemed in effect as of close of business 14 days after the "Date Posted" shown above.
- ☐ The County Engineer received one or more written comments during the 14-day notice period. No changes to the terms and conditions of this General FDP were made in response to these comments. This General FDP is deemed in effect as of close of business 14 days after the "Date Posted" shown above.
- ★ The County Engineer received one or more written public comments during the 14-day notice period.
 - O Having determined their consistency with the review criteria in Section 4-401.1(B), the following changes were made in response to public comments:
 - -1(a), 2(a): added cross-culverts

- 1(f), 2(d): changed fish 'ladders' to fish 'passage'
- -1(f): removed 'necessary to maintain water rights' and updated language to reflect trigger for Individual FDP
- -1(g): clarified that conversion of open ditches to buried pipeline only requires notice if the project will take place in the regulatory Floodway
- -1(h): clarified language such that notification is required for maintenance activities in or along a stream channel greater than 300 feet from infrastructure. Maintenance of infrastructure itself is covered under 2(d)
- -1(i): added 3-foot diameter threshold trigger for new measuring devices
- -2(d): clarified that maintenance of water delivery/ditch system infrastructure, including ditches, does not require notice under the General FDP. Clarified that maintenance activities in or along a stream channel less than 300 feet from infrastructure does not require notice
- -2(e): clarified that new measuring devices less than 3 feet in diameter do not require notice
- -2(f): updated language to clarify intent (specific to easements/ROWs)
- -2(h): updated language to clarify intent (sediment removal outside of stream channel)
- -3(f): removed unnecessary language (Maintenance definition takes precedence)
- -3(j): added clarifying examples
- -3(k): changed 'must' be relocated to 'should' be relocated

* * *

- 1. <u>Activities Requiring Notice</u>. The following activities require written notification be submitted to the County Engineer 21 days prior to commencement, which notification must comply with the requirements of Section 4-404.1(D)(2):
 - a) Road and trail widening, surface type changes, replacement of cross-culverts greater than 48 inches in diameter, and overlays of greater than six inches measured vertically. An Individual FDP is required if fill is necessary for widening.
 - b) New parking lots greater than 0.1-acre.
 - c) New underground utilities that do not permanently alter topography and are:
 - i. Greater than 250 feet in length and installed perpendicular to flood flows; or
 - ii. Installed under a perennial stream channel.
 - d) Temporary in-stream diversions or dewatering (limited to temporary construction diversions and temporary diversions to maintain water rights; under the General FDP, the dewatered reach must not exceed 300 feet, and may require additional permitting through the Colorado Department of Public Health and Environment).
 - e) In-kind replacement of public and private storm drainage system or infrastructure components including but not limited to hydraulic structures such as culverts and check dams. An Individual FDP is required for all replacement bridges. An Individual FDP may also be required if physical conditions of the channel have changed to the extent that in-kind replacement is not possible and/or if Boulder County requires replacement with a different design, size, and/or new component.
 - f) In-kind replacement of public and private water delivery and ditch system infrastructure and components, including but not limited to headgates, diversions, ditches, flumes, sand gates, fish passage, wells, and pumps; provided, however, that an Individual FDP may be required if physical conditions of the channel have changed to the extent that in-kind replacement is not possible, or if a design change is desired for other reasons.
 - g) Conversion of open ditches to buried pipeline, when the section of ditch to be buried is located in the regulatory Floodway.
 - h) Maintenance activities associated with water delivery or ditch system function, where such work occurs in or along a perennial stream channel more than 300 feet upstream or downstream of the nearest water delivery/ditch system structure or component.
 - i) Installation of new water measuring devices and their housings that are greater than 3 feet in diameter (if the County Engineer determines that a device/housing creates a significant obstruction to flood flows, an Individual FDP may be required; in addition, devices to be installed in the channel require an Individual FDP).
 - j) Private storm drainage infrastructure Maintenance.
 - k) New fences that comply with County fence requirements (available at the Land Use Department upon request) as well as maintenance and/or repair of existing

legal fences. Fences that are to be oriented perpendicular to flood flows may require an Individual FDP.

- 2. <u>Activities Not Requiring Notice</u>. The following activities do not require notification be submitted to the County Engineer prior to commencement:
 - a) Road, trail, parking area, and driveway patching, sealing, milling, dirt/gravel leveling, replacement of cross-culverts less than 48 inches in diameter, and repair of drainage-related damage to match adjacent grade within 6 inches, measured vertically.
 - b) New driveways, trails, sidewalks, roads and streets constructed completely at-orbelow existing grade.
 - c) Maintenance of public drainage system infrastructure and components, including but not limited to roadside ditches, bridges, culverts, and check dams, where such work occurs within 300 feet upstream or downstream of the nearest drainage system structure or component.
 - d) Maintenance of water delivery or ditch system infrastructure and components, including but not limited to diversions, ditches, erosion and sediment control devices, headgates, sand gates, measuring devices and their housing structures, flumes, siphons, wells, pumps, and fish passage, as well as perennial stream channel maintenance associated with water delivery or ditch system function. Work within or along a perennial stream channel is limited to within 300 feet upstream or downstream of the nearest water delivery/ditch system structure or component.
 - e) In-kind replacement of water measuring devices and their housings, as well as installation of new water measuring devices and their housings less than 3 feet in diameter (devices to be installed in the channel require a General FDP).
 - f) Maintenance of utility and water delivery system/ditch easements and ROWs, including, for example, access road maintenance, repairs or resurfacing.
 - g) Replacement guardrails that are no more than 6-inches taller than the previous existing or designed guardrails, and that do not decrease the available conveyance of floodwaters; (new guardrails or replacement guardrails that do not meet the above criteria require an Individual FDP).
 - h) Removal of flood-deposited sediment from the overbanks and floodplain areas (outside of a perennial stream channel), of an amount 6 inches or less in height (greater than 6 inches requires Individual FDP). Sediment removal associated with storm drainage system and water delivery infrastructure is covered elsewhere in this General FDP (2016-1) as Maintenance.
 - i) Removal of debris limited to large, woody, unanchored or dead vegetation and rubbish as defined in Article 14.
 - j) New overhead utilities, including supporting structures, as well as maintenance of overhead utilities.
 - k) New underground utilities that do not permanently alter topography more than 6 inches vertically, and are:
 - i. Less than 250 feet in length; and
 - ii. Installed parallel to flood flows.

- l) Maintenance of underground utilities (work must not permanently alter topography).
- m) Installation, repair, or replacement of sign or mailbox posts, telephone poles, or similar elements not greater than 3 feet in diameter, unless more than 5 such elements are located together in a manner that could create an obstruction.
- n) Repair or replacement of existing piers or posts supporting a conforming deck.
- o) Activities associated with construction stormwater BMPs, including but not limited to temporary erosion control measures, etc.
- p) General farming, pasture, horticultural activities, and forestry that do not involve earthwork that permanently alters the topography or any clearing/grubbing of an area greater than 0.1 acres. For projects involving fences associated with farming, pasture, horticultural activities, please see item 1(j) of this General FDP (2016-1).
- q) Temporary buildings or structures associated with general farming, water delivery systems, pasture, horticulture, and forestry activities that do not exceed 120 square feet (200 square feet for loafing sheds) and are outside of the Floodway.
- r) Repairs necessary to correct existing violations of Boulder County health and safety codes or to ensure safe and healthy living conditions, such as:
 - i. Electrical repairs;
 - ii. Furnace repairs or replacements;
 - iii. Water heaters, boilers, and evaporative cooler repairs or replacements;
 - iv. Air conditioner repairs or replacements;
 - v. Repairs or replacements to roof coverings; and
 - vi. Insulation or simple weatherization or energy efficiency upgrades.
- s) Gardening and landscaping activities, including but not limited to planting new vegetation, revegetation, mulching, and raised beds. Raised beds in the Floodway that are greater than 6 inches tall require an Individual FDP. (Hardscaping such as retaining walls, terraces, etc. are not covered by the General FDP and require an Individual FDP.)
- t) Lawns and lawn maintenance activities.
- 3. Conditions Applicable to Activities Authorized Under this General FDP.
 - a) It is the Permittee's responsibility to comply with the requirements of Section 404 of the Clean Water Act and Sections 7 and 9 of the Endangered Species Act of 1973, or with any other applicable federal, state, or local laws, criteria, or regulations. Which may include: the Boulder County Land Use Code, the Boulder County Storm Drainage Criteria Manual, and the Boulder County Multimodal Transportation Standards.
 - b) All required local, state, and federal permits must be obtained prior to beginning work.
 - c) Permanent placement or storage of materials, outside of that allowed under the General FDP may not occur in the regulatory Floodway without the issuance of an Individual FDP.

- d) Construction equipment, material, and waste should be located outside the regulatory floodplain when not in use.
- e) Maintenance of public drainage system infrastructure and components must match the most recent County-approved design, flow condition, and vertical grade.
- f) Maintenance of water delivery / ditch system infrastructure and components must not alter the historical elevation profile.
- g) Maintenance must not lower the normal channel invert elevation.
- h) All work covered by this General FDP, when applicable, must use flood-resistant materials (in-accordance with FEMA Technical Bulletin 2, Flood Damage-Resistant Materials Requirements) up to the Flood Protection Elevation (FPE) asdefined in Boulder County Land Use Code Section 4-405(A).
- i) Utilities installed in accordance with the General FDP (such as underground utilities) that are below the FPE must be designed such that flood waters cannot enter the utility components.
- j) All work covered by this General FDP, when applicable (i.e., utility support structures, bridge abutments, other hardened structures), must be designed (and, if necessary, anchored) to withstand the forces associated with a 100-year flood event.
- k) Temporary buildings allowed under this General FDP should be deconstructed or relocated outside of the floodplain in the event of a flood warning.
- In the event of any change or modification to a use or activity permitted hereunder that is likely to be in conflict with the criteria established in Section 404.1(B) of the Boulder County Land Use Code, the County Engineer must be notified of the change and the modification approved prior to continuing work. Modifications may require an Individual FDP as determined by the County Engineer.
- 4. <u>Duration</u>. This General FDP remains in effect until further notice.

5. Definitions.

- a) For the purposes of this General FDP 2016-1, Maintenance means any routine or regularly-scheduled activity undertaken to repair or prevent the deterioration, impairment, or failure of any utility, structure, or infrastructure component. Maintenance includes activities to restore or preserve function and/or usability of a storm drainage, water delivery, or ditch system. Such activities may include, without limitation, the removal or movement of sediment, debris, and vegetation, installation of erosion and sediment control devices, stabilization of stream channel and/or water delivery channel (ditch) banks, and the replacement of structural components, so long as the work substantially conforms to the most recent County-approved design, flow condition, and vertical grade, as applicable. Maintenance does not include expansion or enlargement of a building or structure, Substantial Modifications, Substantial Improvements, total replacement of existing facilities, or total reconstruction of a facility.
- b) For definitions of other terms used herein, e.g., "Floodway," see Section 4-414.

Well Permits

- B.1 NOTICE OF INTENTS (NOI)
- B.2 PERMIT APPLICATIONS
- B.3 WELL PERMITS
- B.4 COMPLETION REPORTS

NOTICE OF INTENTS (NOI)

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black or blue ink or file online, dwrpermitsonline@state.co.us
State of Colorado, Office of the State Engineer 1313 Sherman St, Room 821,
Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

JAN 06 2020

RECEIVED

WATER RESOURCES STATE ENGINEER COLO

| Well Owner Maine(s): | | |
|--|--|--|
| Address: 1777 Broadway, Boulder, CO 80302 | Township 1 N I S, Range 70 DE IW, 6th PM | |
| Phone: (303) 441-4232 | County: Boulder | |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Lot: Block: Filing: | |
| Landowner's Name: University of Colorado Please check one and complete as indicated including contact info: Water Well Driller Licensed in Colorado - Lic. No. | Site/Property Address <u>Univ. of Colorado Boulder</u> "CU Boulder South" Property, Table Mesa Dr GPS Location in UTM format if known: Set GPS unit to true north, datum NAD83, and use meters for | |
| Professional Engineer Registered in Colorado - Reg. No. 44966 | the distance units, \square Zone 12 or \square Zone 13. | |
| ☐ Professional Geologist per C.R.S. 23-41-208(b) | Easting Northing | |
| ☐ Other — anyone directly employed by or under the supervision of a licensed driller, registered professional engineer or professional geologist Contact / Company Adam Prochaska / RJH Consultants, Inc. | # of Monitoring Holes to be constructed in Section: 11 Estimated Depth 65 Ft., Aquifer Alluvial or Pierre Shale | |
| Address 9800 Mt. Pyramid Ct, Suite 330 City, State & Zip Englewood, CO 80112 Phone (303) 225-4611 | Purpose of Monitoring Hole(s) Monitor groundwater levels in alluvium or shallow bedrock | |
| Email aprochaska@rjh-consultants.com Print Name: Adam Prochaska | Anticipated Date of Construction: 01/13/2019 | |
| Signature or enter full name here: Adam Prochaska | Date Notice Submitted: 01/06/2019 (Must be at least 3 days prior to construction) | |
| · · · · · · · · · · · · · · · · · · · | | |

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE FOR OFFICE USE ONLY

060352

- MH

--- No------ City of Boulder, Colorado Atto: Brandon Coleman

PROCESSED BY

DATE ACKNOWLEDGED

Location: Section

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

- 1) Notice was provided to the State Engineer at least 72 hours prior to construction of monitoring & observation hole(s).
- 2) Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer. Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer. Water diverted during testing must not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.
- 3) All work must comply with the Water Well Construction Rules, 2 CCR 402-2. Standard permit application and work report forms are found on the DWR website at http://www.water.state.co.us. Well Construction and Yield Estimate Reports (GWS-31) must be completed for each hole drilled. The licensed contractor or authorized individual must submit the completed forms to this office within 60 days of monitoring hole completion. Aquifer testing information must be submitted on Well Yield Test Report (GWS-39).
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- 5) A MONITORING HOLE CANNOT BE CONVERTED TO A PRODUCTION WATER WELL, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.
- 6) IF HOLES WILL NOT BE CONSTRUCTED UNDER THIS NOTICE WITHIN 90 DAYS, PLEASE WRITE "NO HOLES CONSTRUCTED" ON A COPY OF THE ACKNOWLEDGED NOTICE WITH THE FILE NUMBER AND EMAIL TO THE DIVISION OF WATER RESOURCES AT DWRpermitsonline@state.co.us.

THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

Incomplete forms or Notice provided less than 72 hours prior to well construction will not be acknowledged

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JAN **06** 2020

RECEIVED

WATER RESOURCES STATE ENGINEER COLO

| Well Owner Name(s): City of Boulder, Colorado Attn: Brandon Coleman | Location: Section9 |
|--|---|
| Address: 1777 Broadway, Boulder, CO 80302 | Township 1 N IS, Range 70 DE IW, 6th PM |
| Phone: (303) 441-4232 | County: Boulder |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Block: Filing: |
| Landowner's Name: University of Colorado | Site/Property Address Univ. of Colorado Boulder |
| Please check one and complete as indicated including contact info: Water Well Driller Licensed in Colorado - Lic. No | "CU Boulder South" Property, Table Mesa Dr GPS Location in UTM format if known: |
| Professional Engineer Registered in Colorado - Reg. No. 44966 | Set GPS unit to true north, datum NAD83, and use meters for the distance units, \(\bigcap Zone 12 \) or \(\bigcap Zone 13. \) |
| ☐ Professional Geologist per C.R.S. 23-41-208(b) | Easting Northing |
| ☐ Other — anyone directly employed by or under the supervision of a licensed driller, registered professional engineer or professional geologist | # of Monitoring Holes to be constructed in Section: 11 Estimated Depth 65 Ft., Aquifer Alluvial or Pierre Shale |
| Contact / Company Adam Prochaska / RJH Consultants, Inc. Address 9800 Mt. Pyramid Ct, Suite 330 | Purpose of Monitoring Hole(s) |
| City, State & Zip Englewood, CO 80112 | Monitor groundwater levels in alluvium |
| Phone (303) 225-4611 | or shallow bedrock |
| Email aprochaska@rjh-consultants.com | Anticipated Date of Construction: 01/13/2019 |
| Print Name: Adam Prochaska | |
| Signature or enter full name here: Adam Plocheska NSTRUC | Mistre Submitted: U1/U6/2019 Mistre Test 3 days prior to construction) |

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE FOR OFFICE USE ONLY

060352

PROCESSED BY

DATE ACKNOWLEDGED

Location: Section

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State of Colorado, Office of the State Engineer 1313 Sherman St, Room 821,
Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

JAN 06 2020

WATER RESOURCES STATE ENGINEER

| Well Owner Name(s): City of Boulder, Colorado Attn: Brandon Coleman | Location: Section COLONALER | | | |
|--|---|--|--|--|
| Address: 1777 Broadway, Boulder, CO 80302 | Township 1 N S, Range 70 TE W, 6th PM | | | |
| Phone: (303) 441-4232 | County: Boulder | | | |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Filing: | | | |
| Landowner's Name: City of Boulder Open Space and Mountain Parks (OSMP) | Site/Property Address OSMP property near US36 and | | | |
| Please check one and complete as indicated including contact info: | south of S Boulder Rd GPS Location in UTM format if known: | | | |
| ☐ Water Well Driller Licensed in Colorado - Lic. No | | | | |
| Professional Engineer Registered in Colorado - Reg. No. 44966 | Set GPS unit to true north, datum NAD83, and use meters for the distance units, \(\bigcap\)Zone 12 or \(\bigcap\)Zone 13. | | | |
| ☐ Professional Geologist per C.R.S. 23-41-208(b) | Easting Northing | | | |
| Other — anyone directly employed by or under the supervision of a licensed driller, registered professional engineer or professional geologist | # of Monitoring Holes to be constructed in Section: 2 | | | |
| Contact / Company Adam Prochaska / RJH Consultants, Inc. | Estimated Depth 65 Ft., Aquifer Alluvial or Pierre Sh | | | |
| Address 9800 Mt. Pyramid Ct, Suite 330 | | | | |
| City, State & Zip Englewood, CO 80112 | Purpose of Monitoring Hole(s) Monitor groundwater levels in alluvium | | | |
| Phone (303) 225-4611 | or shallow bedrock | | | |
| Email aprochaska@rjh-consultants.com | Anticipated Date of Construction: 01/13/2019 | | | |
| Print Name: Adam Prochaska | | | | |
| Signature or enter full name here: Adam Prochaska | Date Notice Submitted: 01/06/2019 (Must be at least 3 days prior to construction) | | | |
| | (must be at least 3 days prior to construction) | | | |
| ACKNOWLEDGEMENT FROM STATE FOR OFFICE USE ON | NLY - | | | |
| 603 53 мн | PROCESSED BY Structur fichulete | | | |
| DIV. WD-Ce BAS MD- | | | | |
| CONDITIONS OF MONITORING HOLE | | | | |
| A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT | SHALL BE AVAILABLE AT THE DRILLING SITE. | | | |
| 1) Notice was provided to the State Engineer at least 72 hours prior to const | truction of monitoring & observation hole(s). | | | |
| 2) Construction of the hole(s) must be completed within 90 days of the date | notice was given to the State Engineer. Testing and/or | | | |

- 2) Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer. Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer. Water diverted during testing must not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.
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State of Colorado, Office of the State Engineer 1313 Sherman St, Room 821,
Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

JAN 06 2020

WATER RESOURCES STATE ENGINEER COLO

| Well Owner Name(s): City of Boulder, Colorado Attn: Brandon Coleman | Location: Section COLO COLO |
|---|---|
| Address: 1777 Broadway, Boulder, CO 80302 | Township 1 N S, Range 70 DE EW, 6th PM |
| Phone: (303) 441-4232 | County: Boulder |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Filing: |
| Landowner's Name: City of Boulder Open Space and Mountain Parks (OSMP) | Site/Property Address OSMP property near US36 and |
| Please check one and complete as indicated including contact info: | south of S Boulder Rd |
| ☐ Water Well Driller Licensed in Colorado - Lic. No | GPS Location in UTM format if known: |
| Professional Engineer Registered in Colorado - Reg. No. 44966 | Set GPS unit to true north, datum NAD83, and use meters for the distance units, \(\bigcup Zone 12 \) or \(\bigcup Zone 13. \) |
| ☐ Professional Geologist per C.R.S. 23-41-208(b) | Easting Northing |
| Other — anyone directly employed by or under the supervision of a licensed | # of Monitoring Holes to be constructed in Section: 2 |
| driller, registered professional engineer or professional geologist Contact / Company Adam Prochaska / RJH Consultants, Inc. | Estimated Depth 65 Ft., Aquifer Alluvial or Pierre Sh |
| Address 9800 Mt. Pyramid Ct, Suite 330 | Purpose of Monitoring Hole(s) |
| City, State & Zip Englewood, CO 80112 | Monitor groundwater levels in alluvium |
| Phone (303) 225-4611 | or shall ow-bedrock |
| Email aprochaska@rjh-consultants.com | Anticipated Date of Construction:01/13/2019 |
| Print Name: Adam Prochaska | |
| Signature or enter full name here: Alam Rocha: ka | (Aust le at leas 3 day prior to construction) |
| ACKNOWLEDGEMENT FROM STATE ENG | INEER'S OFFICE |
| FOR OFFICE USE ONLY | |
| | ESSED BY South Achilete |

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

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State of Colorado, Office of the State Engineer 1313 Sherman St, Room 821,
Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

RCVD DWR 05/11/2020

| Well Owner Name(s): City of Boulder, Colorado Attn: Brandon Coleman | Location: Section9 | | |
|--|---|--|--|
| Address: 1777 Broadway, Boulder, CO 80302 | Township $1 \square N \square S$, Range $70 \square E \square W$, $6th$ PM | | |
| Phone: (303) 441-4232 | County: Boulder | | |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Lot: Block: Filing: | | |
| Landowner's Name: Colorado Department of Transportation (CDOT) | Site/Property Address <u>CDOT right-of-way, south of</u> | | |
| Please check one and complete as indicated including contact info: | US 36 GPS Location in UTM format if known: | | |
| □ Water Well Driller Licensed in Colorado - Lic. No | Set GPS unit to true north, datum NAD83, and use meters for | | |
| ✓ Professional Engineer Registered in Colorado - Reg. No. $\frac{44966}{}$ Professional Geologist per C.R.S. 23-41-208(b) | the distance units, \(\bigcap \) Zone 12 or \(\bigcap \) Zone 13. Easting \(\bigcap \) Northing \(\bigcap \) | | |
| Other — anyone directly employed by or under the supervision of a licensed driller, registered professional engineer or professional geologist Contact / Company Adam Prochaska / RJH Consultants, Inc. | # of Monitoring Holes to be constructed in GYVMJcb: 2 Estimated Depth 65 Ft., Aquifer Alluvial or Pierre Shale | | |
| Address 9800 Mt. Pyramid Ct, Suite 330 City, State & Zip Englewood, CO 80112 | Purpose of Monitoring Hole(s) Monitor groundwater levels in alluvium or shallow bedrock | | |
| Phone (303) 225-4611 Email aprochaska@rjh-consultants.com | Anticipated Date of Construction: 05/18/2020 | | |
| Print Name: Adam Prochaska Signature or enter full name here: Adam Prochaska | Date Notice Submitted:05/11/2020 (Must be at least 3 days prior to construction) | | |
| | | | |

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE
FOR OFFICE USE ONLY

| 60778 | - MH | Processed By | The Line Some | |
|-------|------|---------------------|---------------|---|
| | MD | DATE ACKNOWLEDGED _ | 05/11/2020 | _ |

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Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

RCVD DWR 05/11/2020

| Well Owner Name(s): _City of Boulder, Colorado Attn: Brandon Coleman | Location: Section9 | | |
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| Address: 1777 Broadway, Boulder, CO 80302 | Township 1 N IS, Range 70 DE IW, 6th PM | | |
| Phone: (303) 441-4232 | County: Boulder | | |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Lot: Filing: | | |
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| Please check one and complete as indicated including contact info: Water Well Driller Licensed in Colorado - Lic. No. | US 36 GPS Location in UTM format if known: Set GPS unit to true north, datum NAD83, and use meters for | | |
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| Address 9800 Mt. Pyramid Ct. Suite 330 City, State & Zip En lew oo CO 80/12 OES CO Phone (303) 225-4611 | Murpose of Monitoring Hole(s) Monitor g oung Mater I (ve.) s in alluvium or shallow bedrock | | |
| Email aprochaska@rjh-consultants.com | Anticipated Date of Construction:05/18/2020 | | |
| Print Name: Adam Prochaska Signature or enter full name here: Adam Prochaska | Date Notice Submitted: 05/11/2020 (Must be at least 3 days prior to construction) | | |

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

| 607 | 78 | - MH | Processed By | The Const |
|---------|---------|------|---------------------|------------|
| DIV WD6 | Bas ——— | MD | DATE ACKNOWLEDGED _ | 05/11/2020 |

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- 4) Unless a well permit is obtained or variance approved, the hole(s) must be plugged and sealed within eighteen (18) months after construction. An Abandonment Report (GWS-09) must be submitted within 60 days of plugging & sealing. The above MH acknowledgement number, owner's structure name, and owner's name and address must be provided on all well permit application(s), well construction and abandonment reports.
- 5) A MONITORING HOLE CANNOT BE CONVERTED TO A PRODUCTION WATER WELL, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.
- 6) IF HOLES WILL NOT BE CONSTRUCTED UNDER THIS NOTICE WITHIN 90 DAYS, PLEASE WRITE "NO HOLES CONSTRUCTED" ON A COPY OF THE ACKNOWLEDGED NOTICE WITH THE FILE NUMBER AND EMAIL TO THE DIVISION OF WATER RESOURCES AT DWRpermitsonline@state.co.us.

THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)
Please type or print legibly in black or blue ink or file online, dwrpermitsonline@state.co.us
RCVD DWR State of Colorado, Office of the State Engineer 1313 Sherman St, Room 821, Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

05/11/2020

01 1.

| Well Owner Name(s): City of Boulder, Colorado Attn: Brandon Coleman | Location: Section9 |
|--|--|
| Address: 1777 Broadway, Boulder, CO 80302 | Township 1 N S, Range 70 DE W, 6th PM |
| Phone: (303) 441-4232 | County: Boulder |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Filing: |
| Landowner's Name: City of Boulder Open Space and Mountain Parks (OSMP) | Site/Property Address OSMP property near US36 and |
| Please check one and complete as indicated including contact info: Water Well Driller Licensed in Colorado - Lic. No. | south of S Boulder Rd GPS Location in UTM format if known: Set GPS unit to true north, datum NAD83, and use meters for |
| Professional Engineer Registered in Colorado - Reg. No. 44966 | the distance units, \(\bigcap\)Zone 12 or \(\bigcap\)Zone 13. |
| ☐ Professional Geologist per C.R.S. 23-41-208(b) | Easting Northing |
| Other — anyone directly employed by or under the supervision of a licensed driller, registered professional engineer or professional geologist Contact / Company Adam Prochaska / RJH Consultants, Inc. | # of Monitoring Holes to be constructed in GYVMJcb: 1 Estimated Depth 65 Ft., Aquifer Alluvial or Pierre Shale |
| Address 9800 Mt. Pyramid Ct, Suite 330 City, State & Zip Englewood, CO 80112 Phone (303) 225-4611 | Purpose of Monitoring Hole(s) Monitor groundwater levels in alluvium or shallow bedrock |
| Email aprochaska@rjh-consultants.com Print Name: Adam Prochaska | Anticipated Date of Construction:05/18/2020 |
| Signature or enter full name here: Adam Prochaska | Date Notice Submitted:05/11/2020 (Must be at least 3 days prior to construction) |
| ACKNOW! EDGEMENT EDOM STATE E | NCINEED'S OFFICE |

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

| | 607 | 779 | MH | Processed By | Intick from the |
|------|-----|---------|----|---------------------|-----------------|
| DIV1 | WD6 | Bas ——— | MD | DATE ACKNOWLEDGED _ | 05/11/2020 |

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

- 1) Notice was provided to the State Engineer at least 72 hours prior to construction of monitoring & observation hole(s).
- 2) Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer. Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer. Water diverted during testing must not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.
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NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black or blue ink or file online, dwrpermitsonline@state.co.us
State of Colorado, Office of the State Engineer 1313 Sherman St, Room 821,
Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

RCVD DWR 05/22/2020

| Well Owner Name(s): City of Boulder, Colorado Attn: Brandon Coleman | Location: Section9 |
|---|---|
| Address: 1777 Broadway, Boulder, CO 80302 | Township 1 N IS, Range 70 DE IW, 6th PM |
| Phone: (303) 441-4232 | County: Boulder |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Lot: Block: Filing: |
| _andowner's Name: City of Boulder Open Space and Mountain Parks (OSMP) | Site/Property Address OSMP land south of US36 |
| Please check one and complete as indicated including contact info: | and east of "CU Boulder South" GPS Location in UTM format if known: |
| ☐ Water Well Driller Licensed in Colorado - Lic. No ☐ Professional Engineer Registered in Colorado - Reg. No44966 | Set GPS unit to true north, datum NAD83, and use meters for the distance units, ☐Zone 12 or ☐Zone 13. |
| Professional Geologist per C.R.S. 23-41-208(b) | Easting Northing |
| Other — anyone directly employed by or under the supervision of a licensed driller, registered professional engineer or professional geologist Contact / Company Adam Prochaska / RJH Consultants, Inc. | # of Monitoring Holes to be constructed in GYVMcb:1 Estimated Depth 65 Ft., AquiferAlluvial or Pierre Shale |
| Address 9800 Mt. Pyramid Ct, Suite 330 City, State & Zip Englewood, CO 80112 | Purpose of Monitoring Hole(s) Monitor groundwater levels in alluvium |
| Phone (303) 225-4611 | or shallow bedrock |
| aprochaska@rjh-consultants.com | Anticipated Date of Construction:05/29/2020 |
| Print Name: Adam Prochaska | |
| Signature or enter full name here: Adam Prochaska | Date Notice Submitted:05/22/2020 (Must be at least 3 days prior to construction) |

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE
FOR OFFICE USE ONLY

| 60805 | - MH | PROCESSED BY |
|-----------------|------|-------------------|
| DIV. 1 WD 6 BAS | | DATE ACKNOWLEDGED |

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

- 1) Notice was provided to the State Engineer at least 72 hours prior to construction of monitoring & observation hole(s).
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NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black or blue ink or file online, dwrpermitsonline@state.co.us State of Colorado, Office of the State Engineer 1313 Sherman St, Room 821, Denver, CO 80203 Phone 303-866-3581 www.water.state.co.us

RCVD DWR 08/16/2021

9

| Well Owner Name(s): City of Boulder, Colorado Attn: Brandon Coleman | Location: Section9 |
|--|--|
| Address: 1777 Broadway, Boulder, CO 80302 | Township 1 □N □S, Range 70 □E □W, 6th PM |
| Phone: (303) 441-4232 | County: Boulder |
| Email: ColemanB@bouldercolorado.gov | Subdivision: Lot: Block: Filing: |
| Landowner's Name: University of Colorado | Site/Property Address <u>Univ. of Colorado Boulder</u> |
| Please check one and complete as indicated including contact info: | "CU Boulder South" Property, Table Mesa Dr |
| ☐ Water Well Driller Licensed in Colorado - Lic. No | GPS Location in UTM format if known: |
| ✓ Professional Engineer Registered in Colorado - Reg. No. 44966 | Set GPS unit to true north, datum NAD83, and use meters for the distance units, ☐Zone 12 or ☐Zone 13. |
| ☐ Professional Geologist per C.R.S. 23-41-208(b) | Easting Northing |
| Other — anyone directly employed by or under the supervision of a licensed driller, registered professional engineer or professional geologist | # of Monitoring Holes to be constructed in Section:1 Estimated Depth _40 Ft., Aquifer _Alluvial |
| Contact / Company Adam Prochaska / RJH Consultants, Inc. | Estimated Depth —— Ft., Aquirer According |
| Address 9800 Mt. Pyramid Ct, Suite 330 | Durnace of Manitaring Hala(s) |
| City, State & Zip Englewood, CO 80112 | Purpose of Monitoring Hole(s) Monitor groundwater levels in alluvium |
| Phone (303) 225-4611 | |
| Email aprochaska@rjh-consultants.com | Anticipated Date of Construction: 08/23/2021 |
| Print Name: Adam Prochaska | |
| | Date Notice Submitted: 08/04/2021 |
| Signature or enter full name here: Adam Prochaska | (Must be at least 3 days prior to construction) |
| ACKNOWLEDGEMENT FROM STATE OF THE PROPERTY OF | |
| FOR OFFICE Use (| PROCESSED BY |
| 62389 - MH DIV. 1 WD 6 BAS MD | PROCESSED BY DATE ACKNOWLEDGED 08/17/2021 |
| FOR OFFICE USE OF MANITORING HOLD CONDITIONS OF MONITORING CONDITIONS OF MONITORING CONDITIONS OF MONITORING CONDITIONS OF MONITORING CONDITIONS OF MONITORI | PROCESSED BY DATE ACKNOWLEDGED DESCRIPTION OF THE PROCESSED BY DATE ACKNOWLEDGEMENT |
| FOR OFFICE USE OF ACKNOWLEDGEMEN | PROCESSED BY DATE ACKNOWLEDGED LE ACKNOWLEDGEMENT T SHALL BE AVAILABLE AT THE DRILLING SITE. |
| 62389 - MH DIV. 1 WD 6 BAS MD— CONDITIONS OF MONITORING HOLE A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMEN 1) Notice was provided to the State Engineer at least 72 hours prior to continuous con | PROCESSED BY DATE ACKNOWLEDGED LE ACKNOWLEDGEMENT T SHALL BE AVAILABLE AT THE DRILLING SITE. Instruction of monitoring & observation hole(s). |
| FOR OFFICE USE OF ACKNOWLEDGEMEN | PROCESSED BY DATE ACKNOWLEDGED O8/17/2021 LE ACKNOWLEDGEMENT T SHALL BE AVAILABLE AT THE DRILLING SITE. Instruction of monitoring & observation hole(s). Ite notice was given to the State Engineer. Testing and/or I is obtained from the State Engineer. Water diverted during is responsible for obtaining permit(s) and complying with all rules |
| FOR OFFICE USE OF THE WRITTEN NOTICE OR ACKNOWLEDGEMEN 1) Notice was provided to the State Engineer at least 72 hours prior to concept the hole of the hole of the hole of the state of the state of the hole of | PROCESSED BY DATE ACKNOWLEDGED 108/17/2021 LE ACKNOWLEDGEMENT T SHALL BE AVAILABLE AT THE DRILLING SITE. Instruction of monitoring & observation hole(s). It e notice was given to the State Engineer. Testing and/or l is obtained from the State Engineer. Water diverted during is responsible for obtaining permit(s) and complying with all rules ing. 102-2. Standard permit application and work report forms are truction and Yield Estimate Reports (GWS-31) must be dividual must submit the completed forms to this office within 60 |
| FOR OFFICE USE OF THE WRITTEN NOTICE OR ACKNOWLEDGEMEN 1 Notice was provided to the State Engineer at least 72 hours prior to concept the hole of the | PROCESSED BY DATE ACKNOWLEDGED DEFINITION DATE ACKNOWLEDGEMENT T SHALL BE AVAILABLE AT THE DRILLING SITE. Instruction of monitoring & observation hole(s). It e notice was given to the State Engineer. Testing and/or I is obtained from the State Engineer. Water diverted during is responsible for obtaining permit(s) and complying with all rules ing. D2-2. Standard permit application and work report forms are truction and Yield Estimate Reports (GWS-31) must be dividual must submit the completed forms to this office within 60 submitted on Well Yield Test Report (GWS-39). P plugged and sealed within eighteen (18) months after hin 60 days of plugging & sealing. The above MH |
| FOR OFFICE USE OF A CONDITIONS OF MONITORING HOLD A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMEN 1) Notice was provided to the State Engineer at least 72 hours prior to contact the state of 200 hours unless prior written approvate testing must not be used for beneficial purposes. The owner of the hole(s) and regulations pertaining to the discharge of fluids produced during testing Must not exceed a total of 200 hours unless prior written approvate testing must not be used for beneficial purposes. The owner of the hole(s) and regulations pertaining to the discharge of fluids produced during testing. 3) All work must comply with the Water Well Construction Rules, 2 CCR 40 found on the DWR website at http://www.water.state.co.us . Well Construction of monitoring hole completion. Aquifer testing information must be construction. An Abandonment Report (GWS-09) must be submitted with acknowledgement number, owner's structure name, and owner's name and construction. | PROCESSED BY DATE ACKNOWLEDGED LE ACKNOWLEDGEMENT T SHALL BE AVAILABLE AT THE DRILLING SITE. Instruction of monitoring & observation hole(s). It e notice was given to the State Engineer. Testing and/or I is obtained from the State Engineer. Water diverted during is responsible for obtaining permit(s) and complying with all rules ing. D2-2. Standard permit application and work report forms are truction and Yield Estimate Reports (GWS-31) must be dividual must submit the completed forms to this office within 60 submitted on Well Yield Test Report (GWS-39). Pulugged and sealed within eighteen (18) months after hin 60 days of plugging & sealing. The above MH address must be provided on all well permit application(s), well R WELL, except for purposes of remediation (recovery) or as a |
| FOR OFFICE USE OF THE WALL AND A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMEN 1) Notice was provided to the State Engineer at least 72 hours prior to contesting must not be used for beneficial purposes. The owner of the hole(s) and regulations pertaining to the discharge of fluids produced during testing. 3) All work must comply with the Water Well Construction Rules, 2 CCR 40 found on the DWR website at http://www.water.state.co.us . Well Conscompleted for each hole drilled. The licensed contractor or authorized indicates of monitoring hole completion. Aquifer testing information must be construction. An Abandonment Report (GWS-09) must be submitted with acknowledgement number, owner's structure name, and owner's name and construction and abandonment reports. | PROCESSED BY DATE ACKNOWLEDGED 108/17/2021 LE ACKNOWLEDGEMENT T SHALL BE AVAILABLE AT THE DRILLING SITE. Instruction of monitoring & observation hole(s). It e notice was given to the State Engineer. Testing and/or I is obtained from the State Engineer. Water diverted during is responsible for obtaining permit(s) and complying with all rules ing. 102-2. Standard permit application and work report forms are truction and Yield Estimate Reports (GWS-31) must be dividual must submit the completed forms to this office within 60 submitted on Well Yield Test Report (GWS-39). 10 plugged and sealed within eighteen (18) months after hin 60 days of plugging & sealing. The above MH address must be provided on all well permit application(s), well 11 R WELL, except for purposes of remediation (recovery) or as a per Well Construction Rules and policies of the State Engineer. 12 AYS, PLEASE WRITE "NO HOLES CONSTRUCTED" ON A COPY OF |

Appendix B.1 9 of 9

PERMIT APPLICATIONS

| COLORADO DIVISION OF WA DEPARTMENT OF NATURAL 1313 SHERMAN ST., Ste 821, | RESOURCE | S O 80203 | | Office Use Only | | F | orm GW | /S-46 (01/2020) | | |
|--|-------------------------|----------------|--|--|---------------------|----------------|------------|-----------------|--|--|
| Phone: (303) 866-3581 MONITORING/OE | CEDV | | mitsonline@state.co.us | | | | | | | |
| | | | | | | | | | | |
| Water Well Permi Review instructions on revers The form must be typed, com | se side prior | r to comp | leting form. | | | | | | | |
| 1. Well Owner Information | | | | | | | | | | |
| Name of well owner | | | | 6. Use Of Well | | | | | | |
| City of Boulder, Colorado, | Attn: Bran | ndon Co | leman | Use of this well is limited to monitoring water levels and/or water quality sampling | | | | | | |
| 1777 Broadway | | | | | | | | | | |
| City | Louis | 7: | | 7. Well Data (pr | oposea) | Aquifer | | | | |
| | State | Zip code | | 38.0 | feet | | | | | |
| Boulder | СО | 80302 | | | | Alluvial | | | | |
| Telephone # | , | - | it is required) | 8. Consultant li | nformation (| f applicable | e) | | | |
| 303-441-4232 | | | ouldercolorado.g | Name of contact person | | | | | | |
| 2. Type Of Application (| check app | licable t | ooxes) | Adam Prochaska | 1 | | | | | |
| Use existing well Construct new well Other: | Replacement Permit no.: | nt for exist | ting monitoring well: | Company name RJH Consultants | , Inc. | | | | | |
| | | | | Mailing address 9800 Mt. Pyramio | 4 C+ Sta 33 | 0 | | | | |
| 3. Refer To (if applicable) Monitoring hole acknowledgment | Well nar | me or# | | City | J Ul., Sie. 30 | State | Zip C | | | |
| MH- 060352 | B-20 | | | Englewood | | CO | 801 | | | |
| 4. Location Of Proposed | | | l Coo Impérios (amp) | Telephone # | | 100 | 100. | 12 | | |
| County | weii (iiii | portant | ! See instructions; | 303-225-4611 | | | | | | |
| Boulder | NE | 1/4 of | the NW 1/4 | 9. Proposed We | ell Driller Lic | ense #(opt | ional): | | | |
| Section Township N or S | S Range | E or W | Principal Meridian | 10. Name of We | | | | t | | |
| 9 1 - | 70 | □ x | 6th | The making of false degree, which is pur 24-4-104 (13)(a). If | statements here | in constitutes | perjury in | n the second | | |
| Distance of well from section lines (section | | y not property | | thereof and state that | it they are true to | my knowled | ge. | the contents | | |
| 1190 Ft. from X N | 1630 | | Ft. from E 🗷 W | Sign or enter full name here Date (mm/dd/yyyy) | | | | | | |
| For replacement wells only – distance and fee | | d well to new | well direction | If signing print name. Print title if other than land owner. | | | | | | |
| Well location address (Include City, State, 2 | | | The second secon | Adam Prochaska, Project Engineer | | | | | | |
| Univ. of CO Boulder "CU E | | - | oulder,CO 80309 | Office Use Only | | | | | | |
| Optional: GPS well location informa You must check GPS unit for required | | | | | | | | | | |
| Format must be UTM | 3 Settings as in | Diluws. | | USGS map name | | DWR map no. | Su | urface elev. | | |
| Zone 12 or Zone 13 | | 4700 | | | Receipt area | only | | | | |
| Units must be Meters | Easti | ng <u>4798</u> | 95 | | Trecorpt area. | only | | | | |
| Datum must be NAD83 | North | ing 4425 | 855 | | | | | | | |
| Unit must be set to true north | Rom | | . T Wanne | | | | | | | |
| Was GPS unit checked for above? | | ember to s | et Datum to NAD83 | | | | | | | |
| 5. Property Owner Inform | nation | | | | | | | | | |
| Name of property owner | | | | | | | | | | |
| University of Colorado Bou | ılder, Attn | Jonath | an Akins | | | | | | | |
| Mailing address | | | | | (| | | | | |
| 1540 30th St., Ste. 101 | | | | | | | | | | |
| City | State | 1 | Zip Code | | | | | | | |
| Boulder | co | | 80309 | | | | | | | |
| Telephone # | | | | | DIV | ND DA | | 15 | | |
| 303-492-8306 | | | | | DIV | WD BA | M | .D | | |

| COLORADO DIVISION OF WA | | | | Office Use Only | | | Form (| GWS-46 (01/2020) | | |
|--|----------------------|-------------------|---------------------------------------|---|----------------|--|----------|------------------|--|--|
| 1313 SHERMAN ST., Ste 821, Phone: (303) 866-3581 | | 0 80203 | nitsonline@state.co.us | | | | | | | |
| MONITORING/OF | BSER\ | ATION | V | | | | | | | |
| Water Well Perm | | | | | | | | | | |
| Review instructions on rever The form must be typed, com | se side pri | or to compl | eting form. | | | | | | | |
| 1. Well Owner Informati | | ne or in bia | ack or blue ink. | | | | | | | |
| Name of well owner | 011 | | | 6. Use Of Well | | | | | | |
| City of Boulder, Colorado | , Attn: Bra | andon Co | leman | Use of this well is limited to monitoring water levels and/or water quality sampling | | | | | | |
| Mailing address | | | | | | 9 | | | | |
| 1777 Broadway | 1 | 1 | | 7. Well Data (pro | posed) | Aquifer | | - | | |
| City | State | Zip code | | 35.0 | feet | Fill | | | | |
| Boulder | co | 80302 | | | F (1 / | | L1-\ | | | |
| Telephone # | | (If filing online | | 8. Consultant In | formation (| ii applica | ible) | | | |
| 303-441-4232 | | ouldercolorado.g | Name of contact person Adam Prochaska | | | | | | | |
| 2. Type Of Application | | | | | | | | | | |
| ■ Use existing well □ Construct new well □ Other: | ing monitoring well: | RJH Consultants, | Inc. | | | | | | | |
| | \ | | | Mailing address 9800 Mt. Pyramid | Ct Ste 33 | 10 | | | | |
| 3. Refer To (if applicable Monitoring hole acknowledgment | , | ame or # | | City | 01., 010. 00 | State | Z | Zip Code | | |
| MH- 060352 | B-20 | 02(P) | | 12 To 12 A A A A | | | OO 80112 | | | |
| 4. Location Of Proposed | | | See Instructions) | Telephone # 303-225-4611 | | | - | | | |
| Boulder | NE | 1/4 of | the NW 1/4 | 9. Proposed We | Il Driller Lic | ense #(c | optiona | 1): | | |
| Section Township N or | S Range | E or W | Principal Meridian | 10. Name of Wel | l Owner or | Authoriz | zed Ag | ent | | |
| 9 1 Distance of well from section lines (section | 70 | Silv pet prepert | 6th | The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge. Sign or enter full name here Date (mm/dd/yyyy) 3 - 11 - 2 0 If signing print name. Print title if other than land owner. | | | | | | |
| 920 Ft. from X N | s 2070 | | Ft. from E X W | | | | | | | |
| For replacement wells only – distance and fee | | old well to new | well direction | | | | | | | |
| Well location address (Include City, State, | Zip) Che | ck if well addres | ss is same as Item 1. | Adam Prochaska, Project Engineer | | | | | | |
| Univ. of CO Boulder "CU | Boulder S | South", Bo | oulder,CO 80309 | Office Use Only | | | | - | | |
| Optional: GPS well location inform You must check GPS unit for require | | | | USGS map name | | DWR map n | 10. | Surface elev. | | |
| Format must be UTM | | | | | | | | | | |
| Zone 12 or Zone 13 Units must be Meters | Eas | sting 48003 | 33 | | Receipt area | only | | | | |
| Datum must be NAD83 | No | thing 4425 | 937 | | | | | | | |
| Unit must be set to true north | | | | | | | | | | |
| Was GPS unit checked for above? | | nember to se | et Datum to NAD83 | | | | | | | |
| 5. Property Owner Infor | mation | | | | | | | | | |
| University of Colorado Bo | ulder, Att | an Akins | | | | | | | | |
| Mailing address | | | | | | | | | | |
| 1540 30th St., Ste. 101 | | | | | | and the same of th | | | | |
| City | Sta | te | Zip Code | | | | | | | |
| Boulder | C |) | 80309 | | | | | | | |
| Telephone # | | | | DIV | WD | RΔ | _ MD | | | |
| 303-492-8306 | | | | | DIV | .,,, | ۵۸ | | | |
| Appendix B.2 | | | | | | | | 2 of 13 | | |

| COLORADO DIVISION OF WAT DEPARTMENT OF NATURAL R 1313 SHERMAN ST., Ste 821, D Phone: (303) 866-3581 | ESOURCE | S O 80203 | Office Use Only | | | Form G | WS-46 (01/2020) | |
|--|--------------------------|--|---|--|----------------------------|------------------|-------------------|--|
| MONITORING/OB | SFRV | dwrpermitsonline@state.co.us ATION | | | | | | |
| Water Well Permit | | 7 7 7 7 7 | | | | | | |
| Review instructions on reverse | side prio | r to completing form. | | | | | | |
| The form must be typed, comp | | e or in black or blue ink. | | | | | | |
| 1. Well Owner Informatio | n | | 6. Use Of Well | | | | | |
| City of Boulder, Colorado, | Attn: Bra | ndon Coleman | Use of this well | | | ing wa | ater levels | |
| Mailing address 1777 Broadway | | | and/or water quality sampling | | | | | |
| · · | 5 | | 7. Well Data (pr | oposed) | Aquifer | | | |
| City | State | Zip code | 34.0 | feet | Pierre SI | halo | | |
| Boulder | CO | 80302 | 8. Consultant Ir | eformation (| | | | |
| Telephone # 303-441-4232 | | If filing online it is required) | Name of contact person | normation (| паррпсац | ле) | | |
| 2. Type Of Application (c | | nanb@bouldercolorado.g | Adam Prochaska | 1 | | | | |
| | | | Company name | | | | | |
| Construct new well | Replaceme Permit no.: | nt for existing monitoring well: | RJH Consultants | , Inc. | | | | |
| Other: | OTTILL TIO | | Mailing address | | 121 | | | |
| 3. Refer To (if applicable) Monitoring hole acknowledgment | T 547.0 | | 9800 Mt. Pyramio | d Ct., Ste. 33 | | | | |
| MH- 060352 | B-20 | | 1 2 2 3 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 | | | Zip Code O 80112 | | |
| 4. Location Of Proposed | | . , | Telephone # | | | 100 | ,,,, | |
| County | | | 303-225-4611 | | | | | |
| Boulder | NE | 1/4 of the NW 1/4 | 9. Proposed We | The same of the sa | | | | |
| Section Township N or S | Range | E or W Principal Meridian | 10. Name of We The making of false | | | | | |
| 9 1 x | nes are typical | ly not property lines) | degree, which is pun 24-4-104 (13)(a). If thereof and state tha | ishable as a cla have read the sta | ss 1 misden atements he | neanor po | ursuant to C.R.S. | |
| 880 Ft. from X N | s 2300 | Ft. from E 🗷 W | Sign or enter full name here | // | o my knowie | uge. | Date (mm/dd/yyyy) | |
| For replacement wells only - distance and di | | d well to new well | ad Proshh 3-11-20 | | | | | |
| feet | | direction | If signing print name. Print | | owner. | | | |
| Well location address (Include City, State, Zi | | A CONTRACTOR OF THE PROPERTY O | Adam Prochaska | a, Project Eng | gineer | | | |
| Univ. of CO Boulder "CU Bo Optional: GPS well location informati | | | Office Use Only | | | | | |
| You must check GPS unit for required | | | USGS map name | | DWR map no | | Surface elev. | |
| Format must be UTM | | | | | | | | |
| Zone 12 or Zone 13 Units must be Meters | East | ng 480102 | | Receipt area | only | | | |
| Datum must be NAD83 | North | ning 4425946 | | | | | | |
| Unit must be set to true north | | | | | | | | |
| Was GPS unit checked for above? YE | | ember to set Datum to NAD83 | | | | | | |
| 5. Property Owner Inform | ation | | | | | | | |
| Name of property owner | | | | | | | | |
| University of Colorado Boul | der, Attn | : Jonathan Akins | | | | | | |
| Mailing address | | | | | | | | |
| 1540 30th St., Ste. 101 | | | | | | | | |
| City | State | | | | | | | |
| Boulder | co | 80309 | | | | | | |
| Telephone # | | | | DIV | WD E | 3.4 | MD | |
| 303-492-8306 | | | | DIV | .,,, | <i></i> | | |
| Appendix B.2 | | | | | | | 3 of 13 | |

| COLORADO DIVISION OF WAT DEPARTMENT OF NATURAL R | ESOURCE | S | Office Use Only | | | Form G | SWS-46 (01/2020) | | |
|---|--------------------------|------------------------------------|--|--------------|------------|---------|-------------------|--|--|
| 1313 SHERMAN ST., Ste 821, E Phone: (303) 866-3581 | - This section with | dwrpermitsonline@state.co.us | | | | | | | |
| | | | | | | | | | |
| Water Well Permit Review instructions on reverse The form must be typed, comp | side prio | to completing form. | | | | | | | |
| 1. Well Owner Informatio | | | | | | | | | |
| Name of well owner | | | 6. Use Of Well | | | | | | |
| City of Boulder, Colorado, A | Attn: Brai | ndon Coleman | Use of this well is and/or water qual | | | ring wa | ater levels | | |
| 1777 Broadway | | | 7 Well Date (pres | d\ | | | | | |
| City | State | Zip code | 7. Well Data (prop | osea) | Aquifer | - | | | |
| Boulder | | | 40.0 | feet | Pierre S | hale | | | |
| Telephone # | CO | 80302 | | rmatian / | | | | | |
| | | If filing online it is required) | 8. Consultant Info | ormation (| арриса | bie) | | | |
| 303-441-4232 | and the same of the same | nanb@bouldercolorado.g | Name of contact person Adam Prochaska | | | | | | |
| 2. Type Of Application (c | | | | | | | | | |
| Construct new well | Replaceme Permit no.: | nt for existing monitoring well: | RJH Consultants, In | nc. | | | | | |
| A. T. C. | | | Mailing address 9800 Mt. Pyramid 0 | 't Sto 33 | 0 | | | | |
| 3. Refer To (if applicable) Monitoring hole acknowledgment | Well nar | me or # | City | 71., Ole. 33 | State | 717 | Code | | |
| MH- 060352 | B-204 | | Englewood | CO | | 0112 | | | |
| 4. Location Of Proposed | Well (Im | portant! See Instructions) | Telephone # 303-225-4611 | | | | | | |
| Boulder | NW | 1/4 of the NE 1/4 | 9. Proposed Well | Driller Lic | ense #(c | ptional |): | | |
| Section Township N or S | Range | E or W Principal Meridian | 10. Name of Well | | | | | | |
| 9 1 Example 2 1 Distance of well from section lines (section lines) | nes are typical | of the ly not property lines) | The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge. | | | | | | |
| 980 Ft. from X N | ^S 2480 | Ft. from 🕱 E 🗌 W | Sign or enter full name here | 11 | | | Date (mm/dd/yyyy) | | |
| For replacement wells only – distance and different | irection from ol | d well to new well direction | If signing print name. Print title if other than land owner. | | | | | | |
| Well location address (Include City, State, Zi | p) Check | if well address is same as Item 1. | Adam Prochaska | Project End | ineer | | | | |
| Univ. of CO Boulder "CU Bo | oulder So | outh", Boulder,CO 80309 | Adam Prochaska, Project Engineer Office Use Only | | | | | | |
| Optional: GPS well location informati You must check GPS unit for required | | | USGS map name | | DWR map no | o. T | Surface elev. | | |
| Format must be UTM | | | | | | | | | |
| Zone 12 or Zone 13 | Easti | ng 480264 | F | Receipt area | only | | | | |
| Units must be Meters | | | | | | | | | |
| Datum must be NAD83 Unit must be set to true north | North | ing 4425919 | | | | | | | |
| Was GPS unit checked for above? | | ember to set Datum to NAD83 | | | | | | | |
| 5. Property Owner Inform | | | | | | | | | |
| Name of property owner | | | | | | | | | |
| University of Colorado Boul | der, Attn | : Jonathan Akins | | | | | | | |
| Mailing address | | | | | | | | | |
| 1540 30th St., Ste. 101 | | | | | | | | | |
| City | State | Zip Code | | | | | | | |
| Boulder | co | 80309 | | | | | | | |
| Telephone # | | | | 501 | | | .27 | | |
| 303-492-8306 | | | U | DIV | WD | ва | MD | | |
| Appendix B.2 | | | | | | | 4 of 13 | | |

| COLORADO DIVISION OF WAT DEPARTMENT OF NATURAL F 1313 SHERMAN ST., Ste 821, D | RESOURC | ES | | Office Use Only | | | Form (| GWS-46 (01/2020) | | |
|---|----------------|---------------------------|------------------------|---|--------------------------------------|--------------------------------|---------------------|---------------------------------------|--|--|
| Phone: (303) 866-3581 MONITORING/OB | | dwrper | mitsonline@state.co.us | | | | | | | |
| | | | 27.0 | | | | | | | |
| Water Well Permi Review instructions on reverse | side prio | or to comp | leting form. | | | | | | | |
| The form must be typed, comp | | ne or in b | ack or blue ink. | | | | | | | |
| Name of well owner | n | | | 6. Use Of Well | | | | | | |
| City of Boulder, Colorado, | Attn: Bra | andon Co | leman | Use of this wel | | | ring w | rater levels | | |
| Mailing address 1777 Broadway | | | | | | 9 | | | | |
| City | Chata | The sade | | 7. Well Data (pr | oposea) | Aquifer | | | | |
| Boulder | State | Zip code | | 38.0 | feet | Pierre S | halo | | | |
| | CO | 80302 | | 8. Consultant I | nformation / | 1 1 2 1 3 2 1 2 | C. Carlo | | | |
| Telephone # 303-441-4232 | 11000 | it is required) | Name of contact person | mormation (| ii applicat | ne) | | | | |
| 2. Type Of Application (c | | ouldercolorado.g | Adam Prochaska | a | | | | | | |
| | | | ting monitoring well: | Company name | | | | | | |
| Construct new well | Permit no.: | | ting monitoring well. | RJH Consultants | s, Inc. | | | | | |
| Other: | Cittile 110 | | | Mailing address | | | | | | |
| 3. Refer To (if applicable) Monitoring hole acknowledgment | 1 | | | 9800 Mt. Pyrami | d Ct., Ste. 33 | | | · · · · · · · · · · · · · · · · · · · | | |
| MH- 060352 | | ame or # | | city Englewood | CO | State Zip Code CO 80112 | | | | |
| 4. Location Of Proposed | B-20 | | See Instructions | Telephone # | | 100 | | | | |
| County | 144611 (111 | iportani | : See instructions) | 303-225-4611 | | | | | | |
| Boulder | NW | 1/4 of | the NE 1/4 | 9. Proposed W | | | | | | |
| Section Township N or S | Range | | Principal Meridian | 10. Name of We | | | | | | |
| 9 1 🗆 🗷 | 70 | × | 6th | The making of false degree, which is put | statements here nishable as a cla | ein constitute iss 1 misder | es perjui neanor | ry in the second pursuant to C.R.S. | | |
| Distance of well from section lines (section li | nes are typica | ally not proper | y lines) | 24-4-104 (13)(a). I thereof and state that | nave read the st | atements he | erein, kn | | | |
| 1070 Ft. from X N | s 2020 | | Ft. from X E W | Sign or enter full name her | | / | ruge. | Date (mm/dd/yyyy) | | |
| For replacement wells only - distance and d | | | well | ad | Kunha | | | 4-10-20 | | |
| feet | | | direction | If signing print name. Print | title if other than land | d owner. | | | | |
| Well location address (Include City, State, Z | ., | and the second his second | ZP 15 (5000 7E 6500 11 | Adam Prochaska | a, Project En | gineer | | | | |
| Univ. of CO Boulder "CU B Optional: GPS well location informat | | | bulder,CO 80309 | Office Use Only | | | | | | |
| You must check GPS unit for required | | | | USGS map name | | DWR map no |). | Surface elev. | | |
| Format must be UTM | | | | | | | | | | |
| Zone 12 or Zone 13 Units must be Meters | Eas | ting <u>4804</u> | 06 | | Receipt area | only | | | | |
| Datum must be NAD83 | Nort | thing 4425 | 896 | | | | | | | |
| Unit must be set to true north | | | | | | | | | | |
| Was GPS unit checked for above? YE | S Ren | nember to s | et Datum to NAD83 | | | | | | | |
| 5. Property Owner Inform | ation | | | | | | | | | |
| Name of property owner University of Colorado Bou | lder. Attr | n: Jonath | an Akins | | | | | | | |
| Mailing address | , , , , , , | | | | | | | | | |
| 1540 30th St., Ste. 101 | | | | | | | | | | |
| City | Stat | te | Zip Code | | | | | | | |
| Boulder | CC |) | 80309 | | | | | | | |
| Telephone # | | | | 5 | 14/5 | | | | | |
| 303-492-8306 | | | | | אוט | WD | 5A | _ MD | | |
| Appendix B.2 | | | | | | | | 5 of 13 | | |

| _ | | | | | | | | | | | |
|---|-------------------|--------------|------------------|-----------------------|-------------------------------|--|-----------------|------------|--------|----------|-----------------|
| COLORADO D DEPARTMENT | | | | | | Office Use Only | | | Form | GWS | S-46 (01/2020) |
| 1313 SHERMA | AN ST., Ste | | | 80203 | | | | • | | | |
| Phone: (303) 8 | | /ODG | CEDY | _ | <u>nitsonline@state.co.us</u> | | | | | | |
| MONITO | | | | | | | | | | | |
| Water W | | | | | | | | | | | |
| Review instruction The form mus | | | | | ack or blue ink. | | | | | | |
| 1. Well Owr | ner Inforr | matio | า | | | | | | | | |
| Name of well owner | • | | | | | 6. Use Of Well | | | | | |
| City of Bould | ler, Color | ado, A | ttn: Brar | idon Co | leman | Use of this well and/or water qu | | | ring w | ate | r levels |
| Mailing address | | | | | | | | | | | |
| 1777 Broadway | | | | | | 7. Well Data (pro | posea) | Aquifer | | | |
| City State Zip code | | | | | | 34.0 | feet | Alluvial | | | |
| Boulder CO 80302 | | | | | | | . | | | | |
| Telephone # | | | | = | it is required) | 8. Consultant In | tormation (| ır applica | bie) | | |
| 303-441-423 | | | | | ouldercolorado.g | Name of contact person | | | | | |
| 2. Type Of A | Applicati | on (ch | neck app | licable l | ooxes) | Adam Prochaska | | | | | |
| ■ Use existing □ Construct no | - | | eplaceme | nt for exis | ting monitoring well: | Company name RJH Consultants, | Inc. | | | | |
| Other: 3. Refer To | (if applica | | | | | Mailing address 9800 Mt. Pyramid | Ct., Ste. 33 | 0 | | | |
| Monitoring hole ackr | | , | We ll nar | ne or # | | City | | State | | Zip Co | |
| мн- 060779 | | | B-20 | 7(P) | | Englewood CO 80112 | | | | 12 | |
| 4. Location | Of Prop | osed \ | Well (Im | portant | ! See Instructions) | Telephone # 303-225-4611 | | | | | |
| County | | | NIVAZ | | NE 4/4 | | | •• / | | | |
| Boulder | T = | | NW | 1/4 of | | 9. Proposed We | | | | | |
| Section | Township | N or S | Range | E or W | Principal Meridian | 10. Name of Wel | | | | | |
| 9 | 1 | | 70 | | 6th | degree, which is puni | shable as a cla | ss 1 misde | meanor | purs | suant to C.R.S. |
| Distance of well from | n section lines (| (section lin | nes are typical | y not propert | y lines) | 24-4-104 (13)(a). I hat thereof and state that | | | | ow 1 | the contents |
| 830 | Ft. from | K N 🗌 | s 1440 | | Ft. from 🗷 E 🗌 W | Sign or enter full name here Date (mm/dd/yyyy) | | | | | |
| For replacement we | lls only – distar | nce and dir | | d we ll to new | well | Adam Prochaska 06/15/2020 | | | | | 06/15/2020 |
| | | feet | | | direction | If signing print name. Print title if other than land owner. | | | | | |
| Well location addres | ss (Include City, | , State, Zip | o) | if well addre | ess is same as Item 1. | Adam Prochaska, Project Engineer | | | | | |
| Univ. of CO I | Boulder " | CU Bo | oulder So | outh", Bo | oulder,CO 80309 | Office Use Only | | | | | |
| Optional: GPS v | | | | | | USGS map name | | LDWD | | | - |
| You must check (| | required | seuings as i | ollows: | | USGS map name | | DWR map r | 10. | Sui | rface elev. |
| Zone 12 or 🗷 Zo | one 13 | | | 400E | 00 | | Receipt area | only | | <u> </u> | |
| Units must be Meter | rs | | East | ng <u>4805</u> | <u>os</u> | | • | • | | | |
| Datum must be NA | D83 | | North | ing <u>4425</u> | 965 | | | | | | |
| Unit must be set to t | true north | | Pom | ombor to s | et Datum to NAD83 | | | | | | |
| Was GPS unit check | ked for above? | ☐ YES | | ember to s | et batum to NADOS | | | | | | |
| 5. Property Owner Information | | | | | | | | | | | |
| Name of property owner | | | | | | | | | | | |
| City of Boulder OSMP, Attn: Don D'Amico | | | | | | | | | | | |
| Mailing address | | | | | | | | | | | |
| 66 S. Cherryvale Rd | | | | | | | | | | | |
| City State Zip Code | | | | | | | | | | | |
| Boulder | | | CO | | 80303 | | | | | | |
| Telephone # | | | | | I | | | | | | |
| 720-564-205 | 55 | | | | | | DIV | WD | ВА | _ M | D |
| 1,50-204-203 | ,,, | | | | | | | | | | |

| DEPARTMENT 1313 SHERMA | DIVISION OF WATTOF NATURAL F | RESOURCE | S D 80203 | Office Use Only | | | Form 0 | GWS-46 (01/2020) | | |
|---|---|------------------|---|---|---|---|--------------------|-------------------|--|--|
| Phone: (303) 8 | RING/OB | SEDV | dwrpermitsonline@state.co. | <u>IS</u> | | | | | | |
| | /ell Permi | | | | | | | | | |
| Review instru | ctions on revers | e side prio | to completing form. | | | | | | | |
| The form mus | t be typed, comp | leted onlin | e or in black or blue ink. | | | | | | | |
| Name of well owner | ner Informatio | on | | 6 Upo Of Wall | | | | | | |
| City of Bould | ler, Colorado, | Attn: Bra | ndon Coleman | Use of this we | 6. Use Of Well Use of this well is limited to monitoring water levels and/or water quality sampling | | | | | |
| 1777 Broady | vav | | | | | iiig | | | | |
| City | vay | State | 17 | 7. Well Data (p | roposed) | Aquifer | | | | |
| Boulder | | | Zip code | 40.0 | feet | Pierre S | Shalo | | | |
| Telephone # | | CO | 80302 If filing online it is required) | 8. Consultant | Information (| 100000000000000000000000000000000000000 | | | | |
| 303-441-423 | 2 | | nanb@bouldercolorado.c | | mormation (| паррпса | ble) | | | |
| | | | licable boxes) | Adam Prochask | а | | | | | |
| Use existing Construct ne | well | | nt for existing monitoring well: | Company name RJH Consultant | s, Inc. | | | | | |
| Other: | | emit no | | Mailing address | | | | | | |
| 3. Refer To Monitoring hole ackn | (if applicable) | | | 9800 Mt. Pyram | id Ct., Ste. 33 | 0 | - | | | |
| MH- 060352 | nowledgment | B-208 | | City Sta | | | Zip Code 80112 | | | |
| | Of Proposed | | portant! See Instructions | | | 100 | 100 | 3112 | | |
| County | | Contract of | | 303-225-4611 | | | | | | |
| Boulder | | SW | 1/4 of the NE 1/ | 3. Proposed W | | | | | | |
| Section | Township N or S | Range | E or W Principal Meridian | 10. Name of W | | | _ | | | |
| 9 Distance of well from | 1 section lines (section li | nes are typical | of th | The making of false degree, which is pu 24-4-104 (13)(a). I thereof and state the | nishable as a cla have read the sta | ss 1 misder atements he | meanor perein, kno | ursuant to C.R.S. | | |
| 1370 | Ft. from X N | s 1980 | Ft. from X E W | Sign or enter full name he | re // | o my known | euge. | Date (mm/dd/yyyy) | | |
| For replacement well | s only – distance and d feet | irection from ol | d well to new well direction | If signing print name. Print title if other than land owner. | | | | | | |
| | | | if well address is same as Item 1. | Adam Prochask | Adam Prochaska, Project Engineer | | | | | |
| | | | uth", Boulder,CO 80309 | Office Use Onl | | | | | | |
| | ell location informati SPS unit for required | | | USGS map name | | DWR map no | n T | Surface elev. | | |
| Format must be UTM | | | 72.44.90 | | | DWITTINAPTI | 0. | Surface ejev. | | |
| Zone 12 or Zor | ne 13 | Easti | ng 480418 | | Receipt area | only | | | | |
| Units must be Meters Datum must be NAD | | | ing 4425802 | - | | | | | | |
| Unit must be set to tru | | North | ng 4423002 | - | | | | | | |
| Was GPS unit checke | ed for above? YE | Remo | ember to set Datum to NAD83 | | | | | | | |
| 5. Property | Owner Inform | ation | | | | | | | | |
| Name of property own | | | | - | | | | | | |
| University of | Colorado Boul | der, Attn: | Jonathan Akins | | | | | | | |
| Mailing address | | | N-111-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1 | 7 | | | | | | |
| 1540 30th St. | , Ste. 101 | | | | | | | | | |
| City | | State | Zip Code | 7 | | | | | | |
| Boulder | | co | 80309 | | | | | | | |
| Telephone # | | | | | | | | | | |
| 303-492-8306 | 5 | | | | DIV | WD1 | ВА | MD | | |
| Appendix B.2 | | | | | | | | 7 of 13 | | |

| COLORADO DIVISION OF WA | TED DESO | IDCES | 05. 11. 0.1 | | | | | | |
|--|-----------------------------|--|--|--------------------------------------|--------------------------|-------------------|---------------------------------------|--|--|
| DEPARTMENT OF NATURAL I | RESOURCE | S | Office Use Only | | | Form C | GWS-46 (01/2020) | | |
| 1313 SHERMAN ST., Ste 821, I Phone: (303) 866-3581 | DENVER C | dwrpermitsonline@state.co.us | | | | | | | |
| MONITORING/OB | 7-3-3 | | | | | | | | |
| Water Well Permi | t Appl | ication | | | | | | | |
| Review instructions on revers The form must be typed, comp | e side prio oleted onlir | r to completing form. ie or in black or blue ink. | | | | | | | |
| 1. Well Owner Information | | | | | | | | | |
| Name of well owner | | | 6. Use Of Well | | | | | | |
| City of Boulder, Colorado, | Attn: Bra | ndon Coleman | Use of this well | | | ring w | ater levels | | |
| Mailing address | | | and/or water qu | ality sampli | ng | | | | |
| 1777 Broadway | | | 7. Well Data (pro | oposed) | Aquifer | | | | |
| City | State | Zip code | 30.0 | feet | Fill | | | | |
| Boulder | CO | 80302 | | formation (| 100 | hla) | | | |
| Telephone # 303-441-4232 | | If filing online it is required) nanb@bouldercolorado.gm | 8. Consultant In | iormation (| парриса | ble) | | | |
| 2. Type Of Application (c | | | Adam Prochaska | | | | | | |
| | | nt for existing monitoring well: | Company name | | | | | | |
| ☐ Construct new well | Permit no.: | The for existing monitoring well. | RJH Consultants, | Inc. | | | | | |
| Other: | | | Mailing address | 1 Ot - 00 | 0 | | | | |
| 3. Refer To (if applicable) Monitoring hole acknowledgment | Well na | me or # | 9800 Mt. Pyramic | ot., Ste. 33 | State | 17 | ip Code | | |
| MH- 060352 | B-20 | | Englewood | | CO | | | | |
| 4. Location Of Proposed | | . , | Telephone # | | | | | | |
| County | sw | | 303-225-4611 | U.B. W I. | | | | | |
| Boulder Section Township Nor S | | 1/4 of the NE 1/4 E or W Principal Meridian | 9. Proposed We 10. Name of We | | | | | | |
| 9 1 | | | The making of false s | statements here | in constitut | tes perjur | ry in the second | | |
| 9 1 | 170 | 6th | degree, which is puni 24-4-104 (13)(a). I h | ishable as a cla ave read the sta | ss 1 misde atements h | meanor perein, kn | pursuant to C.R.S. ow the contents | | |
| Distance of well from section lines (section | | ly not property lines) Ft. from 🕱 E 🗌 W | thereof and state that Sign or enter full name here | they are true to | | | Date (mm/dd/yyyy) | | |
| 1960 For replacement wells only – distance and d | 1950 | d well to new well | If signing print name. Print title if other than land owner. | | | | | | |
| fee | t | direction | | | | | | | |
| Well location address (Include City, State, 2 | | | Adam Prochaska, Project Engineer | | | | | | |
| Univ. of CO Boulder "CU B | | | Office Use Only | | | | | | |
| Optional: GPS well location information with the control of the co | | | USGS map name | | DWR map n | 10. | Surface elev. | | |
| Format must be UTM | | | | | | | | | |
| Zone 12 or Zone 13 Units must be Meters | East | ing 480425 | | Receipt area | only | | | | |
| Datum must be NAD83 | Norti | ning 4425623 | | | | | | | |
| Unit must be set to true north | | | | | | | | | |
| Was GPS unit checked for above? Y | | ember to set Datum to NAD83 | (1) | | | | | | |
| 5. Property Owner Inform | nation | | | | | | | | |
| Name of property owner University of Colorado Bou | lder, Attn | : Jonathan Akins | | | | | | | |
| Mailing address | | | | | | | | | |
| 1540 30th St., Ste. 101 | | | | | | | | | |
| City | State | | | | | | | | |
| Boulder | co | 80309 | | | | | | | |
| Telephone # | | | | DIV | WD | ВА | _ MD | | |
| 303-492-8306 | | | | | | | | | |
| Appendix B.2 | | | · · · · · · · · · · · · · · · · · · · | | | | 8 of 13 | | |

| COLORADO DIVISION OF WAT DEPARTMENT OF NATURAL R 1313 SHERMAN ST., Ste 821, D | RESOURCE | S | | Office Use Only | | F | orm GW | /S-46 (01/2020) | | |
|---|---------------------------|---------------|------------------------|--|--------------------|---------------|---------|-------------------|--|--|
| Phone: (303) 866-3581 | | dwrperr | mitsonline@state.co.us | | | | | | | |
| MONITORING/OB | | | | | | | | | | |
| Water Well Permit Review instructions on reverse | (Appii | catio | n letina forma | | | | | | | |
| The form must be typed, comp | leted onlin | e or in bl | ack or blue ink. | | | | | | | |
| 1. Well Owner Informatio | n | | | | | | | | | |
| Name of well owner | | | | 6. Use Of Well | | | | | | |
| City of Boulder, Colorado, A | Attn: Bran | idon Co | leman | Use of this well is limited to monitoring water levels and/or water quality sampling | | | | | | |
| 1777 Broadway | | | | 7 Well Date /pr | d\ | | | | | |
| City | State | 1 7: | | 7. Well Data (pr | oposeu) | Aquifer | | | | |
| | | Zip code | | 30.0 | feet | Fill | | | | |
| Boulder | 00 00002 | | | | | | | a knjess | | |
| Telephone # | | - | | 8. Consultant li | ntormation (| if applicable |) | *** | | |
| 303-441-4232 | | | ouldercolorado.g | Name of contact person | | | | | | |
| 2. Type Of Application (c | heck app | licable b | ooxes) | Adam Prochaska | l | | | | | |
| Construct new well | Replacemer Permit no.: | nt for exist | ting monitoring well: | Company name RJH Consultants | , Inc. | | | | | |
| | | | | Mailing address 9800 Mt. Pyramio | d C+ C+0 22 | 0 | | | | |
| 3. Refer To (if applicable) Monitoring hole acknowledgment | Well nam | ne or# | | City | J Cl., Ste. 33 | State | 1 7:- 0 | la del | | |
| MH- 060352 | B-211 | | | Englewood | | CO | 2ip C | | | |
| 4. Location Of Proposed | | . , | I Con Instruction | Telephone # | | 100 | 1001 | 12 | | |
| County | aven (mil | oortant | See instructions) | 303-225-4611 | | | | | | |
| Boulder | SW | 1/4 of | the NE 1/4 | 9. Proposed We | ell Driller Lic | ense #(opti | onal): | | | |
| Section Township N or S | Range | E or W | Principal Meridian | 10. Name of We | | | | t | | |
| 9 1 Distance of well from section lines (section li | 70 | not propert | 6th | The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge. | | | | | | |
| 1820 Ft. from X N | | | Ft. from X E W | Sign or enter full name here | t they are true to | o my knowledg | e. | Date (mm/dd/yyyy) | | |
| For replacement wells only – distance and di | | well to new | well | - Och Punch 3-11-20 | | | | | | |
| feet | | | direction | | | | | | | |
| Well location address (Include City, State, Zi | n) Check | if well addre | | If signing print name. Print title if other than land owner. | | | | | | |
| Univ. of CO Boulder "CU Bo | | | | Adam Prochaska, Project Engineer | | | | | | |
| Optional: GPS well location informati | on in UTM for | rmat | | Office Use Only | | | | | | |
| You must check GPS unit for required | settings as fo | llows: | | USGS map name | | DWR map no. | Su | urface elev. | | |
| Format must be UTM | | | | | | | | | | |
| Zone 12 or Zone 13 Units must be Meters | Eastir | 4803 | 07 | | Receipt area | only | | | | |
| Datum must be NAD83 | Northi | ing 4425 | 663 | | | | | | | |
| Unit must be set to true north | 1.0 | g <u> </u> | | | | | | | | |
| Was GPS unit checked for above? YE | Reme | mber to s | et Datum to NAD83 | | | | | | | |
| 5. Property Owner Inform | | | | | | | | | | |
| Name of property owner | ation | | | | | | | | | |
| University of Colorado Boul | der, Attn: | Jonath | an Akins | | | | | | | |
| Mailing address | | | | | | | | | | |
| 1540 30th St., Ste. 101 | | | | | | | | | | |
| City | State | | Zip Code | | | | | | | |
| Boulder | co | | 80309 | | | | | | | |
| Telephone # | | | | | | | | | | |
| 303-492-8306 | | | | | DIV | WD BA | M | D | | |
| | | | | | | | | | | |

| COLORADO E DEPARTMEN | DIVISION OF WA | TER RESO | URCES | Office Use Only | | | Form G | WS-46 (01/2020) | | |
|---|----------------------------|----------------|--|---|--------------------------|------------|-----------|-----------------|--|--|
| 1313 SHERMA Phone: (303) 8 | AN ST., Ste 821, | DENVER C | 0 80203 dwrpermitsonline@state.co.us | | | | | | | |
| MONITO | PRING/OE | SERV | ATION | 1 | | | | | | |
| Water W | Vell Permi | t Appl | ication | | | | | | | |
| Review instru | ctions on revers | e side prior | to completing form. e or in black or blue ink. | | | | | | | |
| White the same of | ner Information | n | | | | | | | | |
| Name of well owner | | | | 6. Use Of Well | | | | | | |
| City of Bould | ler, Colorado, | Attn: Bran | ndon Coleman | Use of this well is limited to monitoring water levels and/or water quality sampling | | | | | | |
| 1777 Broady | way | | | 7. Well Data (p | | | | | | |
| City | | State | Zip code | Total depth | | Aquifer | | | | |
| Boulder | | co | 80302 | 30.0 | feet | Fill | | | | |
| Telephone # | | E-Mail (| f filing online it is required) | 8. Consultant I | nformation (| if applica | ble) | | | |
| 303-441-423 | 2 | colen | nanb@bouldercolorado.g | Name of contact person | | | | | | |
| 2. Type Of / | Application (| heck app | licable boxes) | Adam Prochask | a | | | | | |
| Use existing | well | | nt for existing monitoring well: | Company name RJH Consultants | - Inc | | | | | |
| Other: | ew well | Permit no.: | | Mailing address | 5, 1110. | | | | | |
| 3. Refer To | (if applicable) | | | 9800 Mt. Pyrami | d Ct., Ste. 33 | 0 | | | | |
| Monitoring hole ackr | nowledgment | Well nan | ne or# | City | , | State | Zip | Code | | |
| мн- 060352 | | B-212 | | Englewood C | | | 80112 | | | |
| 4. Location | Of Proposed | Well (Im | portant! See Instructions) | Telephone # 303-225-4611 | | | | | | |
| Boulder | | SE | 1/4 of the NW 1/4 | 9. Proposed W | ell Driller Lic | ense #(c | optional) | | | |
| Section | Township N or S | Range | E or W Principal Meridian | 10. Name of We | | | | | | |
| 9 Distance of wall from | 1 section lines (section l | 170 | □ × 6th | The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge. Sign or enter full name here Date (mm/dd/yyyy) | | | | | | |
| 1620 | Ft. from X N | | Ft. from E × W | | | | | | | |
| For replacement well | ls only - distance and o | | well to new well | ach K | willer | | | 3-11-20 | | |
| | feet | | direction | If signing print name. Print | title if other than land | owner. | | | | |
| | | | if well address is same as Item 1. uth", Boulder,CO 80309 | Adam Prochaska, Project Engineer | | | | | | |
| | /ell location informat | | | Office Use Only | | | | | | |
| You must check G | GPS unit for required | settings as fo | ollows: | USGS map name | | DWR map no |). I s | Surface elev. | | |
| Format must be UTM | | | | | | | | conduct city. | | |
| Zone 12 or Zor | ne 13 | Eastir | g 480190 | | Receipt area | only | | | | |
| Units must be Meters | | | | | 1 | | | | | |
| Unit must be set to tro | | North | ng 4425724 | | | | | | | |
| | ed for above? | Reme | mber to set Datum to NAD83 | | | | | | | |
| | Owner Inform | | | | | | | | | |
| Name of property own | | ation | | | | | | 0 1 | | |
| | | der, Attn: | Jonathan Akins | | | | | | | |
| Mailing address | | | | | | | | | | |
| 1540 30th St. | , Ste. 101 | | | | | | | | | |
| City | | State | Zip Code | | | | | | | |
| Boulder | | co | 80309 | | | | | | | |
| Telephone # | | | - | | | | | | | |
| 303-492-8306 | 3 | | | | DIV \ | WD E | 3A N | MD | | |
| Appendix B.2 | 2 | | | | | | | 10 of 13 | | |

| | | | | | | I | | | | | | |
|---|--|---------|----------------|---------------|-----------------------|--|--------------------------|-----------|-----------------------|-------------------|-------------|--|
| COLORADO DIVISION OF WATER RESOURCES DEPARTMENT OF NATURAL RESOURCES | | | | | | Office Use Only | | | Form GWS-46 (01/2020) | | | |
| 1313 SHERMAN ST., Ste 821, DENVER CO 80203 Phone: (303) 866-3581 dwrpermitsonline@state.co.us | | | | | | | | | | | | |
| MONITO | | OBS | FRV | | | | | | | | | |
| Water W | | | | | | | | | | | | |
| Review instru | | | | | | | | | | | | |
| | | | | or in bla | ack or blue ink. | | | | | | | |
| 1. Well Own | | nation | | | | C Han Of Wall | | | | | | |
| City of Bould | | ado, At | tn: Bran | don Co | leman | 6. Use Of Well Use of this well is limited to monitoring water levels | | | | | | |
| Mailing address | | | | | | and/or water quality sampling | | | | | | |
| 1777 Broad | way | | | | | 7. Well Data (pro | posed) | | | | | |
| City | | 5 | tate Zip code | | | Total depth Aquifer | | | | | | |
| Boulder | | c | O | 80302 | | 60.0 | ^{feet} Alluvial | | | | | |
| Telephone # | | | E-Mail (If | filing online | it is required) | 8. Consultant In | formation (i | f applica | ıble) | | | |
| 303-441-423 | 32 | | colem | anb@b | ouldercolorado.g | Name of contact person | | | | | | |
| 2. Type Of | Application | on (ch | eck appl | icable b | ooxes) | Adam Prochaska | | | | | | |
| ■ Use existino | • | _ | placemen | t for exist | ting monitoring well: | Company name RJH Consultants, Inc. | | | | | | |
| ☐ Other: | | | 1111111 110 | | | Mailing address | | | | | | |
| 3. Refer To | | able) | | | | 9800 Mt. Pyramid | Ct., Ste. 33 | _ | | | | |
| Monitoring hole ack | ū | | Well nam | | | City Englewood | St | | | Zip Code 80112 | | |
| мн- 060805 | | | B-214 | ` ' | | Englewood CO 80112 Telephone # | | | | 12 | | |
| 4. Location | Of Propo | sed V | Vell (Imp | ortant | ! See Instructions) | 303-225-4611 | | | | | | |
| Boulder | | | SE | 1/4 of | the NE 1/4 | 9. Proposed Well Driller License #(optional): | | | | | | |
| Section | Township | N or S | Range | E or W | Principal Meridian | 40.11 (34.11.0 4.11.1 1.4 1.1 | | | | | | |
| 9 | 1 | | 70 | _ x | 6th | The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents | | | | | | |
| Distance of well from | Distance of well from section lines (section lines are typically not property lines) | | | | | | they are true to | | | anow. | | |
| 1560 Ft. from ▼ N □ S 690 Ft. from ▼ E □ W | | | | | | Sign or enter full name here Date (mm/dd/yyyy) OC (1.5 (2000) | | | | | | |
| For replacement wells only – distance and direction from old well to new well | | | | | | Adam Prochaska 06/15/2020 | | | | | | |
| feet direction | | | | | | If signing print name. Print title if other than land owner. | | | | | | |
| Well location address (Include City, State, Zip) | | | | | | Adam Prochaska, Project Engineer | | | | | | |
| Optional: GPS well location information in UTM format | | | | | | Office Use Only | | | | | | |
| You must check GPS unit for required settings as follows: | | | | | | USGS map name DWR map no. | | | | Su | rface elev. | |
| Format must be UTM | | | | | | | | | | | | |
| Zone 12 or Zone 13 | | Eastir | ng <u>4808</u> | 09 | | Receipt area | only | | | | | |
| Datum must be NA | Units must be Meters | | | ing 4425 | 5744 | | | | | | | |
| | Unit must be set to true north | | | J | | | | | | | | |
| Remember to set Datum to NAD83 Was GPS unit checked for above? YES | | | | | | | | | | | | |
| 5. Property | Owner In | nforma | ition | | | | | | | | | |
| Name of property or | | | | | | | | | | | | |
| City of Boulder OSMP, Attn: Don D'Amico | | | | | | | | | | | | |
| Mailing address | | | | | | | | | | | | |
| 66 S. Cherry | vale Rd | | | | | | | | | | | |
| City | - | | State | | Zip Code | 1 | | | | | | |
| Boulder | | | CO | | 80303 | | | | | | | |
| Telephone # | | | | | l | 1 | | | | | | |
| 720-564-2055 | | | | | | | DIV | WD | ВА | M | D | |
| 15 5560 | | | | | | 1 | | | | | | |

| 001 00400 0 | N (1010N 05) | WATER | DECOL | D050 | | Loss II o I | | | _ | | | | |
|--|--|----------------|------------------|----------------|--|--|--|------------|---------|-----------------------|-------------------|--|--|
| COLORADO DIVISION OF WATER RESOURCES DEPARTMENT OF NATURAL RESOURCES | | | | | | Office Use Only | | | | Form GWS-46 (01/2020) | | | |
| 1313 SHERMAN ST., Ste 821, DENVER CO 80203 Phone: (303) 866-3581 dwrpermitsonline@state.co.us | | | | | | | | | | | | | |
| | | BSF | -RVA | | | | | | | | | | |
| MONITORING/OBSERVATION Water Well Permit Application | | | | | | | | | | | | | |
| Review instru | ctions on rev | erse sid | le prior | to compl | eting form. | | | | | | | | |
| | | • | d online | or in bla | ack or blue ink. | | | | | | | | |
| 1. Well Owr | | ation | | | | 6. Use Of Well | | | | | | | |
| | City of Boulder, Colorado, Attn: Brandon Coleman | | | | | | Use of this well is limited to monitoring water levels and/or water quality sampling | | | | | | |
| Mailing address | | | | | | | | <u>.</u> | | | | | |
| 1777 Broady | way | | | | | 7. Well Data (pr | oposed) | Aguifer | | | | | |
| City | | Stat | ate Zip code | | | 65.3 | feet | · · | | | | | |
| Boulder | | CC |) | 80302 | | | - f t' / | Alluviai | | | | | |
| Telephone # | | | | = | it is required) | 8. Consultant Ir | itormation (| іт аррііса | abie) | | | | |
| 303-441-423 | | | | | ouldercolorado.g | Name of contact person Adam Prochaska | 1 | | | | | | |
| 2. Type Of A | Application | n (ched | ck appl | icable b | ooxes) | | 1 | | | | | | |
| Use existing Construct n | • | | acemen | t for exist | ing monitoring well: | RJH Consultants, Inc. | | | | | | | |
| Other: | /'f l' l- | . 1 - 1 | | | | Mailing address 9800 Mt. Pyramid Ct., Ste. 330 | | | | | | | |
| 3. Refer To Monitoring hole ack | · · · | oie) T | We ll nam | e or # | | City | State Zip Code | | | | | | |
| MH- 060778 | · · | | B-215 | | | Englewood | | СО | | 80112 | | | |
| | 4. Location Of Proposed Well (Important! See Instructions) | | | | | | Telephone # - 303-225-4611 | | | | | | |
| Boulder | | | SE | 1/4 of | the NE 1/4 | 9. Proposed Well Driller License #(optional): | | | | | | | |
| Section | Township N | N or S | Range | E or W | Principal Meridian | 10. Name of Well Owner or Authorized Agent | | | | | | | |
| 9 | | | 70 | 6th | The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104 (13)(a). I have read the statements herein, know the contents | | | | | | | | |
| Distance of well from | m section lines (se | | are typically | not propert | y lines) Ft. from 💌 E 🗌 W | thereof and state that Sign or enter full name here | | o my know | /ledge. | | Date (mm/dd/yyyy) | | |
| 1940 — 0 | | | | | | Adam Prochaska 06/15/2020 | | | | | | | |
| For replacement wells only – distance and direction from old well to new well feet direction | | | | | | If signing print name. Print title if other than land owner. | | | | | | | |
| Well location address (Include City, State, Zip) Check if well address is same as Item 1. | | | | | | Adam Prochaska, Project Engineer | | | | | | | |
| CDOT right-of-way, south of US36, Boulder, CO 80303 | | | | | | Office Use Only | | | | | | | |
| | Optional: GPS well location information in UTM format | | | | | | • | | | | | | |
| You must check GPS unit for required settings as follows: | | | | | | USGS map name | | DWR map | no. | Su | rface elev. | | |
| Zone 12 or Zone | Format must be UTM | | | | | | Receipt area | only | | | | | |
| | Units must be Meters | | | g <u>4810</u> | 24 | | 1 Roocipt area | Omy | | | | | |
| Datum must be NA | Datum must be NAD83 | | | ng <u>4425</u> | 6633 | | | | | | | | |
| Unit must be set to t | Unit must be set to true north | | | mbor to c | ot Dotum to NAD92 | | | | | | | | |
| Was GPS unit checked for above? YES Remember to set Datum to NAD83 | | | | | | | | | | | | | |
| 5. Property | Owner Inf | ormati | ion | | | | | | | | | | |
| Name of property ov | | | | | | | | | | | | | |
| Colorado De | epartment o | f Trans | sportati | on, Attr | n: Tanisha Alford | | | | | | | | |
| Mailing address | | | | | | | | | | | | | |
| 2829 W. Hov | ward PL 25 | 5i Denv | ver, CC | 80204 | ļ | | | | | | | | |
| 2023 **. 110* | wara i i, 20. | | | | | 1 | | | | | | | |
| City | ward 1 1, 20 | | State | | Zip Code | | | | | | | | |
| | waru i i, 23 | | State CO | | Zip Code 80204 | | | | | | | | |
| City | ward 1 1, 23 | | | | | | DIV | WD | DΛ | B 4 | ID. | | |

| COLORADO DIVISION OF WAT DEPARTMENT OF NATURAL F | Office Use Only | For | Form GWS-46 (01/2020) | | | | | | | |
|--|--------------------------|----------------|------------------------|--|---------------------------------|-----------------------------------|----------------|-------------------|--|--|
| 1313 SHERMAN ST., Ste 821, I Phone: (303) 866-3581 | | | | | | | | | | |
| MONITORING/OB | SERV | | mitsonline@state.co.us | | | | | | | |
| Water Well Permi | t App | icatio | on | | | | | | | |
| Review instructions on reverse The form must be typed, comp | side pric | r to com | pleting form. | | | | | | | |
| Well Owner Information | | ne or in L | nack of blue link. | | | | | | | |
| Name of well owner | | | | 6. Use Of Well | | | | | | |
| City of Boulder, Colorado, | Attn: Bra | ndon C | oleman | Use of this well is and/or water quali | | | wate | er levels | | |
| 1777 Broadway | | | | 7. Well Data (propo | | | | | | |
| City | State | Zip cod | e | Total depth Aquifer | | | | | | |
| Boulder | CO | 8030 | 2 | 32.5 | | Fill | | | | |
| Telephone # | 1 | | e it is required) | 8. Consultant Info | rmation (i | f applicable) | | | | |
| 303-441-4232 | | | bouldercolorado.g | Name of contact person Adam Prochaska | | | | | | |
| 2. Type Of Application (o | | | | 100 | | | | | | |
| ☐ Construct new well | Replaceme Permit no.: | | sting monitoring well: | RJH Consultants, Inc. | | | | | | |
| Other: | | | | Mailing address 9800 Mt. Pyramid C | t Sto 331 | n | | | | |
| 3. Refer To (if applicable) Monitoring hole acknowledgment | I Well n | ame or # | | City | State | Zip C | orle | | | |
| MH- 62389 | B-21 | | | Englewood | CO | | | | | |
| 4. Location Of Proposed | | . , | t! See Instructions) | Telephone # | | | | | | |
| County | SE | | | 303-225-4611 | | | | | | |
| Boulder Section Township I Nor S | | | of the NW 1/4 | 9. Proposed Well Driller License #(optional): | | | | | | |
| | | E or W | | 10. Name of Well Owner or Authorized Agent The making of false statements herein constitutes perjury in the second | | | | | | |
| 9 1 Distance of well from section lines (section lines) | 70 | | 6th | degree, which is punishat 24-4-104 (13)(a). I have | able as a class read the sta | ss 1 misdemear atements herein | or pur know | suant to C.R.S. | | |
| 2260 Ft. from X N | | | Ft. from EXW | thereof and state that the Sign or enter full name here | ey are true to | / Knowledge | - | Date (mm/dd/yyyy) | | |
| For replacement wells only - distance and of | | old well to ne | w well | alle Voohler 9-3-21 | | | | | | |
| feet | | | direction | If signing print name. Print title it | | | _ | | | |
| Well location address (Include City, State, Z | | | | Adam Prochaska, P | roject Eng | jineer | | | | |
| Univ. of CO Boulder "CU B | | | Soulder,CO 80309 | Office Use Only | | | | | | |
| Optional: GPS well location informat You must check GPS unit for required | USGS map name | | DWR map no. | I St | ırface elev. | | | | | |
| Format must be UTM | | | | | | | | | | |
| Zone 12 or Zone 13 | Eas | ting 479 | 900 | R | eceipt area | only | | | | |
| Units must be Meters | New | thing 442 | 5531 | | | | | | | |
| Datum must be NAD83 Unit must be set to true north | INOF | thing 442 | 3331 | | | | | | | |
| Was GPS unit checked for above? | | nember to | set Datum to NAD83 | | | | | | | |
| 5. Property Owner Inform | | | | | | | | | | |
| Name of property owner | idiloli | | | | | | | | | |
| University of Colorado Bou | lder, Attı | n: Jonat | han Akins | | | | | | | |
| Mailing address | | | | | | | | | | |
| 1540 30th St., Ste. 101 | | | | | | | | - | | |
| City | Sta | | Zip Code | | | | | | | |
| Boulder | CC |) | 80309 | | | | | | | |
| Telephone # | | | | | DIV | WD BA_ | | ID. | | |
| 303-492-8306 | | | | | JIV | BA_ | IV | | | |

Well Permits



WELL PERMIT NUMBER 317907-RECEIPT NUMBER 10004080

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: CDOT RIGHT-OF-WAY, SOUTH OF US36

BOULDER, CO 80309

SW 1/4 NW 1/4 Section 10 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone:13, NAD83)

Easting: 481024.0 Northing: 4425633.0

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- 1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- 2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- 3) Approved pursuant to CRS 37-92-602(3)(b)(I) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
- 4) Approved for the use of an existing well known as B-215(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- 6) Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- 10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

NOTICE: This permit has been approved subject to the following changes: The 60778-MH was not referenced on this permit since it was issued for Sec. 9, Twp. 1 S, Rng. 70 W, 6th P.M., and the monitoring well was constructed in Sec. 10, Twp. 1 S, Rng. 70 W, 6th P.M. You are hereby notified that you have the right to appeal the issuance of this permit, by filing a written request with this office within sixty (60) days of the date of issuance, pursuant to the State Administrative Procedures Act. (See Section 24-4-104 through 106, C.R.S.)

WELL PERMIT NUMBER 317907-

RECEIPT NUMBER 10004080

Date Issued: 7/9/2020

Expiration Date: N/A

Issued By ANITIA ARCHULETA



WELL PERMIT NUMBER 316960-RECEIPT NUMBER 10000256

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

NE 1/4 NW 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 479895.3 Northing: 4425854.8

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-201(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Issued By ANIT

ANITIA ARCHULETA

Date issued: 3/26/2020

Expiration Date: N/A



WELL PERMIT NUMBER 316961-RECEIPT NUMBER 10000257

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water District: 6

Designated Basin:

N/A

Management District:

Water Division: 1

BOULDER.

County:

Parcel Name:

N/A

N/A

Physical Address:

UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

NE 1/4 NW 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

480032.9 Easting:

Northing: 4425936.5

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not 1) ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a 2) variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- 3) Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to monitoring water levels and/or water quality sampling.
- 4) Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-202(P).
- This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The 5) well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the 6) Division of Water Resources upon request.
- Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well 7) Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and 8) shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit. 10)

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Date Issued:

3/26/2020

Issued By

ANITIA ARCHULETA

Expiration Date: N/A



WELL PERMIT NUMBER 316962-RECEIPT NUMBER 10000258

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

NE 1/4 NW 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 480102.1 Northing: 4425946.3

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-203(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Settle State Life

Issued By

ANITIA ARCHULETA

Date issued: 3/26/2020



WELL PERMIT NUMBER 316963-RECEIPT NUMBER 10000259

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

NW 1/4 NE 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 480264.3 Northing: 4425919.3

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-204(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well
 Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60
 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Issued By ANI

ANITIA ARCHULETA

Date Issued: 3/26/2020



WELL PERMIT NUMBER 316964-RECEIPT NUMBER 10000260

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

SW 1/4 NE 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 480417.7 Northing: 4425802.3

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-208(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well
 Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60
 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- 9) This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Antication life

Date Issued:

3/26/2020

Issued By

ANITIA ARCHULETA



WELL PERMIT NUMBER 316965-RECEIPT NUMBER 10000261

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

SW 1/4 NE 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 480424.9 Northing: 4425622.5

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-209(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well
 Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60
 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Antication like

Issued By

ANITIA ARCHULETA

Date issued: 3/26/2020



WELL PERMIT NUMBER 316966-RECEIPT NUMBER 10000262

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

APPROVED WELL LOCATION

CITY OF BOULDER (COLEMAN, BRANDON)

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address:

UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

SW 1/4 NE 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 480307.1 Northing: 4425662.8

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-211(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

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Date Issued:

3/27/2020

Issued By

ANITIA ARCHULETA



WELL PERMIT NUMBER 316967-RECEIPT NUMBER 10000263

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

SE 1/4 NW 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 480190.3 Northing: 4425724.1

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-212(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well
 Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60
 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- 10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Issued By ANIT

ANITIA ARCHULETA

Date Issued: 3/27/2020



WELL PERMIT NUMBER 317090-RECEIPT NUMBER 10002917

ORIGINAL PERMIT APPLICANT(S)

APPROVED WELL LOCATION

CITY OF BOULDER (COLEMAN, BRANDON)

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

AUTHORIZED AGENT Physical Address:

NW 1/4 NE 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

N/A

Easting: 480406.0 Northing: 4425896.0

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS INC (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60352-MH, and known as B-205(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- 10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

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Date Issued: 4/16/2020

Expiration Date: N/A

Issued By

ANITIA ARCHULETA



WELL PERMIT NUMBER 317764-RECEIPT NUMBER 10004078

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: UNIV OF CO BOULDER "CU BOULDER

SOUTH" BOULDER, CO 80309

NW 1/4 NE 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 480583.0 Northing: 4425965.0

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60779-MH, and known as B-207(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Antical total life

Issued By

ANITIA ARCHULETA

Date Issued: 6/23/2020



WELL PERMIT NUMBER 317765-RECEIPT NUMBER 10004079

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: OSMP LAND, SOUTH OF US36 BOULDER,

CO 80309

SE 1/4 NE 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 480809.0 Northing: 4425744.0

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 60805-MH, and known as B-214(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- 10) This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Antication like

Issued By

ANITIA ARCHULETA

Date Issued: 6/23/2020



WELL PERMIT NUMBER 323669-RECEIPT NUMBER 10015176

ORIGINAL PERMIT APPLICANT(S)

AUTHORIZED AGENT

CITY OF BOULDER (COLEMAN, BRANDON)

APPROVED WELL LOCATION

Water Division: 1 Water District: 6

Designated Basin: N/A
Management District: N/A

County: BOULDER

Parcel Name: N/A

Physical Address: UNIV OF CO BOULDER BOULDER, CO

80309

SE 1/4 NW 1/4 Section 9 Township 1.0 S Range 70.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 479900.4 Northing: 4425530.7

PERMIT TO USE AN EXISTING WELL

RJH CONSULTANTS INC (PROCHASKA, ADAM)

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT CONDITIONS OF APPROVAL

- This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of this permit does not
 ensure that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking
 relief in a civil court action.
- The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.
- Approved pursuant to CRS 37-92-602(3)(b)(l) for uses as described in CRS 37-92-602(1)(f). Use of this well is limited to
 monitoring water levels and/or water quality sampling.
- Approved for the use of an existing well acknowledged for construction under monitoring hole notice 62389-MH, and known as B-217(P).
- 5) This well must be equipped with a locking cap or seal to prevent well contamination or possible hazards as an open well. The well must be kept capped and locked at all times except during sampling or measuring.
- Records of water level measurements and water quality analyses shall be maintained by the well owner and submitted to the Division of Water Resources upon request.
- 7) Upon conclusion of the monitoring program the well owner shall plug this well in accordance with Rule 16 of the Water Well Construction Rules. A Well Abandonment Report must be completed and submitted to the Division of Water Resources within 60 days of plugging.
- 8) The owner shall mark the well in a conspicuous location with the well permit number and name of aquifer as appropriate, and shall take necessary means and precautions to preserve these markings.
- This well must have been constructed by or under the supervision of a licensed well driller or other authorized individual according to the Water Well Construction Rules.
- This well must be located not more than 200 feet from the location specified on this permit.

NOTE: Issuance of this permit does not guarantee that this well can be converted to a production well under a future permit. Additionally, pursuant to Rule 14.2 of the Water Well Construction Rules (2 CCR 402-2), monitoring holes constructed pursuant to a monitoring hole notice shall not be converted to a production well. (Upon obtaining a permit from the State Engineer, a monitoring hole may be converted to a monitoring well, recovery well for remediation of the aquifer, or a dewatering system for dewatering the aquifer.)

Issued By ANIT

ANITIA ARCHULETA

Date Issued: 9/15/2021.

Completion Reports

Form No. GWS-31

WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

State of Colorado, Office of the State Engineer

| GW5-31 | 1313 | Sherman St., Ro | oom 821, Den | ver, CO 8020 | 3 303.866.35 | 81 | | | | |
|-------------------|---|--|-----------------|----------------|------------------|--|-----------|-------------|-------------------|-----------------|
| 02/2017 | ww | w.water.state.d | co.us and dw | rpermitsonlin | e@state.co.u | S | | | | |
| 1. Well Permit | Number: 060352 | -MH | Receipt | Number: 006 | 0352 | | | | | |
| | ell Designation: B- | and the second s | | - | .0332 | | | | | |
| | Name: City of Box | | Attn: Brando | n Coleman | | | | | | |
| | on Street Address | | | | outh", Boulde | r, CO 80309 | | | | |
| | Well Location (r | | | | | | | 4.8 | | |
| | Location: NE 1 | /4, <u>NW</u> 1/4, | Sec., 9 | Twp1 | N or S | , Range 7 | 70 | E or | r W 🔳, 6t | hP.M. |
| County: _B | Boulder | | | | | | | | | |
| Subdivision: _ | | | | | , Lot | -, Block - | | —, Fili | ng (Unit) | |
| 7. Ground Sur | face Elevation: 53 | 57 fee | t Date Com | pleted: 02/ | 19/2020 | Drilling Met | hod: 8 | .0" HSA a | and NO3 rock | core |
| | Aquifer Name : _/ | | | otal Depth: | | | | mpleted | | feet |
| | tification: Was N | | | | | | • | | | |
| 10. Aquifer Ty | | (One Confining L | | | Multiple Conf | | | | Fox Hills | |
| (Check on | | (Not overlain by | | | Overlain by 1 | The state of the s | | | alluvial/coll | uvial) |
| 11. Geologic | | ` | | | 12. Hole Di | | | | n (ft) | To (ft) |
| Depth | Туре | Grain Size | Color | Water Loc. | | 8.0 | | | 0.0 | 19.0 |
| 0.0 - 17.5 | Alluvium | Sand/Gravel | Brown | 8.9 | - | .98 | - | | 9.0 | 38.0 |
| 17.5 - 38.0 | Shale | Clay | Gray | | | | | | | |
| | | | | | 13. Plain Ca | sing | | | | |
| | | | | | OD (in) | Kind | Wall S | ize (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch | 40 | 0.3 | 6.7 |
| | | | | | 2 | PVC | Sch | 40 | 16.7 | 17.0 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | Perforate | ed Casing So | creen S | lot Size (| in): 0.01 | |
| | | | | | OD (in) | Kind | Wall S | ize (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch | 40 | 6.7 | 16.7 |
| | | | | | l | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | 14. Filter Pa | | 1 | | er Placemer | nt: |
| | | | | | Material | Sand | - 1 | Type | | |
| | | | | | Size | 10/20 | . | | | |
| | | | | | Interval | 4.0 - 18.0 | | Depth | | |
| | | | | - | 16. Grouting | | 2.0 | The U | | |
| Damarda | | | | 1 | Material | Amount | | nsity | Interval | Method |
| Remarks: | | | | | Portland Cemen | | | pounds | 0.1 - 1.0 | Downhole |
| | | | | | Bentonite | 2 bag | | hips | 1.0 - 4.0 | Downhole |
| 47 Disinforti | T | | | | Bentonite | 2 buckets | Coate | ed Pellets | 18.0 - 38.0 | Downhole |
| 17. Disinfecti | Estimate Data: | | Chock b | ov if Test Dat | Amt. Used | A STATE OF THE PARTY OF THE PAR | | CWC 20 | Wall Viold 7 | To the Document |
| | Estimate Method: | | Crieck b | ox ii Test Dat | a is submitte | a on Form N | umber | GW5-39, | well rield i | est Report |
| Static Leve | | | | Testimated V | ield (gpm) | | | | | |
| | | /19/2020 @ 08:1 | 10 | | ,0, | | | | | |
| | measured: | 1972020 @ 06.1 | 10 | Estimate Le | ngth (hrs) | | | | | |
| Remarks: | | | | | | | | | | |
| 19. I have read t | the statements made | herein and know th | he contents the | reof, and they | are true to my l | knowledge. Ti | his docur | nent is sig | ned (or name o | entered if |
| | certified in accordan iolation of section 37 | | | | | | | | | |
| | er considers the entry | | | | | | n or the | Contractin | ig ticense. If if | ung onune |
| | | | | | | | | | Tree se | |
| Company Name | | | Email: | orih consulta | | Phone w/ar | | | License Nu | mber: |
| RJH Consultan | | 20.0 | | erjh-consulta | | | 225-46 | | 44966 | |
| Mailing Addres | 10 | Mt Pyrar | | | O Er | nglewoo | d | 00 | 80112 | |
| or enter | name if filing onlin | ie/ | 10.00 | ne and Title | oct Enginess | | | | Date: | |
| alla | Visale 1 | la | Adam Pro | ociiaska, Pioj | ect Engineer | | | | 3-11- | 20 |

Form No.

WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

State of Colorado, Office of the State Engineer

| GWS-31 | 1313 | Sherman St., Ro | om 821, Den | ver. CO 8020 | 3 303.866.35 | 81 | | | | |
|---------------------|---|-----------------------|------------------|------------------|-----------------------------|--------------|-----------|-------------|-------------------|-------------|
| 02/2017 | 1 | ww.water.state.c | | | | | | | | |
| 1. Well Permit | t Number: 060352 | -MH | Receipt | Number: 006 | 0352 | | | | | |
| | ell Designation: B- | | Мосопре | | 0332 | | | | | |
| | Name: City of Bo | | Attn: Brando | n Coleman | | | | | | |
| | on Street Address | | | | outh". Boulde | r. CO 8030 | 9 | | | |
| 5. As Built GPS | Well Location (r | required): Zor | ne 12 🔳 Zo | ne 13 Easting | g: 480032.9 | Northing: | 442593 | 36.5 | | |
| 6. Legal Well I | Location: NE 1 | /4, <u>NW</u> 1/4, | Sec., 9 | _Twp1 | N or S | , Range | 70 | | r W = , 6t | h P.M. |
| County: _B | | | | | | | | | | |
| Subdivision: _ | | | | | _, Lot | , Block - | | —, Fili | ing (Unit) | |
| 7. Ground Sur | face Elevation: 53 | 351 feet | t Date Com | | | | | | | |
| | Aquifer Name : | | | | 35.0 fe | | | | | feet |
| 9. Advance No | otification: Was N | lotification Requi | | | | | | | | |
| 10. Aquifer Ty | /pe: Type I | (One Confining La | ayer) | | Multiple Confi | | | | | |
| (Check on | e) Type II | (Not overlain by | Type III) | | Overlain by T | | | | alluvial/collu | uvial) |
| 11. Geologic I | Log: | | | | 12. Hole Dia | | | | n (ft) | To (ft) |
| Depth | Туре | Grain Size | Color | Water Loc. | 8 | .0 | | 0 | 0.0 | 16.5 |
| 0.0 - 15.1 | Fill | Sand | Brown | 5.4 | 2. | 98 | | 16 | 6.5 | 35.0 |
| 15.1 - 35.0 | Shale | Clay | Gray | | | | | | | |
| | | | | | 13. Plain Cas | | | | | 4.146 |
| | | | | | OD (in) | Kind | | size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | | h 40 | 0.4 | 4.7 |
| | | - | | | 2 | PVC | Sc | h 40 | 14.7 | 15.0 |
| | | | | | | | | | | |
| | | + | | | Perforate | d Casing S | creen 9 | lot Size (| (in): 0.01 | |
| | | | | + | OD (in) | Kind | | Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | | 1 40 | 4.7 | 14.7 |
| | | | | | | | - | , 10 | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | 14. Filter Pa | ck: | | 15. Pack | er Placemen | nt: |
| | | | | | Material | Sand | | Туре | | |
| | | | | | Size | 10/20 | | | | |
| | | | | | Interval | 4.0 - 15.0 | | Depth | | |
| | | | | | 16. Grouting | Record | | | | |
| D | | | | | Material | Amount | | ensity | Interval | Method |
| Remarks: | | | | | Portland Cement | | | pounds | 0.1 - 0.3 | Downhole |
| | | | | | Bentonite | 2 bags | | Chips | 0.3 - 4.0 | Downhole |
| 17. Disinfection | on: Type | | | | Bentonite Amt Used | 2 buckets | Coat | ed Pellets | 15.0 - 35.0 | Downhole |
| | Estimate Data: | | Check ho | ny if Test Dat | Amt. Used a is submitted | on Form N | lumbor | CWE 20 | Wall Viold T | ant Damant |
| | Estimate Method: | | | on il lest bat | ם וז זעטווווננפט | OH FOITH IS | uniber | GW3-39, | well field I | est Report |
| Static Leve | | | | Estimated Y | ield (gpm) | | | - | | |
| | | ./7/2020 @ 08:40 | | | ngth (hrs) | | | | | |
| Remarks: | | | | Listinate Lei | igen (1113) | | | | | |
| | he statements made | herein and know the | e contents the | reof and they a | re true to my kr | nowledge T | his docu | mont is sig | nod for nome - | |
| filing online) and | certified in accordan | ice with Rule 17.4 of | f the Water We | ell Construction | Rules, 2 CCR 40 | 22. The fili | ng of a d | document t | hat contains fa | alse |
| statements is a vi- | olation of section 37 | 91 108(1)(e), C.R.S. | ., and is punish | nable by fines u | p to \$1,000 and | or revocatio | n of the | contractin | g license. If fil | ling online |
| the State Enginee | r considers the entry | of the licensed cont | tractor's name | to be compliar | nce with Rule 17 | .4. | | | | |
| Company Name | | E | mail: | | F | hone w/ar | ea cod | e: | License Nur | mber: |
| RJH Consultant | | 7 | aprochaska@ | rjh-consultar | nts.com | (303) | 225-4 | 611 | 44966 | |
| Mailing Address | 1000 " | 1+ Pyramii | d C+ | #330 | Enel | ewood | C | 0 8 | 20112 | |
| Sign (or enter n | name if filing onlin | (e) | | e and Title | , | | | | Date: | |
| all | Pumbh | ~ | Adam Pro | ochaska, Proje | ect Engineer | | | | 3-11- | -20 |

For Office Use Only WELL CONSTRUCTION AND YIELD ESTIMATE REPORT Form No. State of Colorado, Office of the State Engineer **GWS-31** 1313 Sherman St., Room 821, Denver, CO 80203 303.866.3581 02/2017 www.water.state.co.us and dwrpermitsonline@state.co.us 1. Well Permit Number: 060352-MH Receipt Number: 0060352 2. Owner's Well Designation: B-203(P) 3. Well Owner Name: City of Boulder, Colorado Attn: Brandon Coleman 4. Well Location Street Address: Univ. of Colorado Boulder "CU Boulder South", Boulder, CO 80309 5. As Built GPS Well Location (required): Zone 12 Tone 13 Easting: 480102.1 Northing: 4425946.3 6. Legal Well Location: NE 1/4, NW 1/4, Sec., 9 Twp.1 NorS , Range 70 E or W , 6th P.M. County: Boulder Subdivision: _ _____, Lot _____, Block _____ _____, Filing (Unit) ___ 7. Ground Surface Elevation: 5352 feet Date Completed: 02/11/2020 Drilling Method: 8.0" HSA and NQ3 rock core 8. Completed Aquifer Name: Pierre Shale Total Depth: 34.0 feet Depth Completed: 20.0 9. Advance Notification: Was Notification Required Prior to Construction? Yes No, Date Notification Given: _ Type I (One Confining Layer) Type I (Multiple Confining Layers) Laramie-Fox Hills (Check one) Type II (Not overlain by Type III) Type II (Overlain by Type III) Type III (alluvial/colluvial) 11. Geologic Log: 12. Hole Diameter (in.) From (ft) To (ft) Depth Type Grain Size Color Water Loc. 8.0 0.0 20.0 0.0 - 15.0 Fill Sand Brown 10.7 2.98 20.0 34.0 15.0 - 34.0 Shale Clay Gray 13. Plain Casing OD (in) Kind Wall Size (in) To (ft) From (ft) 2 **PVC** Sch 40 14.7 0.5 2 PVC Sch 40 19.7 20.0 Perforated Casing Screen Slot Size (in): 0.01 OD (in) Kind Wall Size (in) To (ft) From (ft) PVC 2 Sch 40 19.7 14.7 14. Filter Pack: 15. Packer Placement: Material Sand Type Size 10/20 Interval 14.0 - 20.0 Depth 16. Grouting Record Material Amount Density Interval Method Remarks: Portland Cement 1 bag 47 pounds 0.1 - 0.4 Downhole Bentonite 7 bags Chips 0.4 - 14.0 Downhole 1 bucket Coated Pellets 20.0 - 32.0 Downhole Bentonite 17. Disinfection: Type Amt. Used 18. Well Yield Estimate Data: Check box if Test Data is submitted on Form Number GWS-39, Well Yield Test Report Well Yield Estimate Method: Static Level: 10.7 Estimated Yield (gpm) __ 2/12/2020 @ 08:18 Date/Time measured: ___ Estimate Length (hrs) Remarks: Well backfill from 32.0 - 34.0 ft is sluff and collapsed material. 19. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if

filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402 2. The filing of a document that contains false statements is a violation of section 37 91 108(1)(e), C.R.S., and is punishable by fines up to \$1,000 and/or revocation of the contracting license. If filing online the State Engineer considers the entry of the licensed contractor's name to be compliance with Rule 17.4.

| Company Name: RJH Consultants, Inc. | | | Email: aprochaska | @rjh-cons | ultants.com | Phone w/area code: (303) 225-4611 | | License Number: 44966 | |
|--|------|----|----------------------|-----------|-------------|--------------------------------------|----|--------------------------|--|
| Mailing Address: | 9800 | My | Pyramid | C+ | #330 | Englewood | CO | 80112 | |

Sign (or enter name if filing online) Print Name and Title

Adam Prochaska, Project Engineer

3-11-20

Form No. GWS-31

WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

State of Colorado, Office of the State Engineer

| 0113-31 | 1313 | Sherman St., Ro | om 821, Den | ver, CO 8020 | 3 303.866.35 | 581 | | | |
|--------------------|--|---|-----------------|-----------------------|------------------|--|---------------------|--|-------------|
| 02/2017 | | w.water.state.c | | Carried Marie Control | | | | | |
| 1. Well Permit | Number: 060352 | -MH | Receipt | Number: 006 | 0352 | | | | |
| | Il Designation: B- | | | | 1033 <u>L</u> | | _ | | |
| | Name: City of Box | | Attn: Brando | n Coleman | | | | | |
| | on Street Address | | | | outh". Boulde | r. CO 80309 | | | |
| | Well Location (re | | | | | | 4425919.3 | | |
| | ocation: NW 1 | | | | | | 70 E or | - W , 6t | h_P.M. |
| County: B | oulder | | | | | | | | |
| Subdivision: _ | | ,075-975-05-05-05-05-05-05-05-05-05-05-05-05-05 | | | _, Lot | -, Block - | , Fili | ng (Unit) | |
| 7. Ground Sur | face Elevation: 53 | 52 fee | t Date Com | pleted: 01/ | 30/2020 | Drilling Met | thod: 8.0" HSA a | and NO3 rock | k core |
| | Aquifer Name : F | | | • | 40.0 fe | _ | pth Completed | The state of the s | feet |
| | tification: Was N | | | | | | | | - 1000 |
| 10. Aquifer Ty | | One Confining L | | | Manager 1 | |) Laramie- | | |
| (Check one | | (Not overlain by | | | (Overlain by 1 | | | alluvial/coll | uvial) |
| 11. Geologic l | Log: | | | | 12. Hole Di | | | n (ft) | To (ft) |
| Depth | Type | Grain Size | Color | Water Loc. | 4 | 8.0 | | .0 | 30.0 |
| 0.0 - 20.8 | Alluvium | Sand/Gravel | Brown | 9.5 | 2 | .98 | 30 | 0.0 | 40.0 |
| 20.8 - 40.0 | Shale | Clay | Gray | | | | | | |
| | | | | | 13. Plain Ca | sing | | | |
| | | | | | OD (in) | Kind | Wall Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch 40 | 0.3 | 24.7 |
| | | | | | 2 | PVC | Sch 40 | 29.7 | 30.0 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | - | | creen Slot Size (| in): 0.01 | |
| | | | | | OD (in) | Kind | Wall Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch 40 | 24.7 | 29.7 |
| | | | | | | | | | |
| | | | | | | | | | |
| | e/icolitecture | | | | | | | | |
| | | | | | 14. Filter Pa | | 15. Pack | er Placemer | nt: |
| | | | | | Material | Sand | Туре | | |
| | | | | | Size | 10/20 | | | |
| | | | | | Interval | 23.5 - 30.0 | Depth | | |
| | | | | | 16. Grouting | 7 | | | |
| | | | | | Material | Amount | Density | Interval | Method |
| Remarks: | | | | | Portland Cemen | t 1 bag | 47 pounds | 0.1 - 0.3 | Downhole |
| | | | | | Bentonite | 6 bags | Chips | 0.3 - 23.5 | Downhole |
| 47 District | - | | | | Bentonite | 1 bucket | Coated Pellets | 30.0 - 40.0 | Downhole |
| 17. Disinfection | | | Charlet | (6 T+ D-1 | Amt. Used | and the second s | | | |
| | Estimate Data: | | Спеск во | ox if Test Dat | a is submitte | d on Form N | lumber GWS-39, | Well Yield T | est Report |
| | Estimate Method: | | - | Te | | | | | |
| Static Leve | | /20/2020 - 00-2 | | | ield (gpm) | | | | |
| | measured:1/ | /30/2020 @ 08:2 | .0 | Estimate Le | ngth (hrs) | | | | |
| Remarks: | | | | | | | | | |
| 19. I have read t | he statements made | herein and know th | ne contents the | reof, and they | are true to my l | knowledge, T | his document is sig | ned (or name o | entered if |
| filing online) and | certified in accordance | ce with Rule 17.4 c | of the Water We | ell Construction | Rules, 2 CCR 4 | 02 2. The fili | ng of a document t | hat contains fa | alse |
| | olation of section 37 r considers the entry | | | | | | n of the contractin | g license. If fi | ling online |
| | | | | to be computa | | | | - | |
| Company Name | | 1 | Email: | | | Phone w/ar | | License Nu | mber: |
| RJH Consultan | | | aprochaska@ | | | | 225-4611 | 44966 | |
| Mailing Address | 7000 | M+ Pyro | unid Ct | # # 330 | D Eng | lewood | CO 8 | 30112 | |
| Sign (or enter r | name if filing onlin | ie) / | | e and Title | | | | Date: | |
| ach | Ywork | la | Adam Pro | ocnaska, Proj | ect Engineer | | | 3-11- | 20 |
| The second second | | • | | | | | | 1 | |

Form No. GWS-31 WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

State of Colorado, Office of the State Engineer

| 02/2017 | | w.water.state.c | | | | | | | |
|-------------------|--|--------------------|-----------------|----------------|------------------|--|---|-------------------|-------------|
| 1. Well Permit | Number: 060352- | | | Number: 006 | | | - | | |
| | ell Designation: B-2 | | | | 00332 | | | | |
| | Name: City of Bou | | Attn: Brando | n Coleman | | | | | |
| | on Street Address | | | | outh". Boulde | r. CO 80309 | | | |
| | Well Location (re | | | | | | | | |
| | ocation: NW 1/ | | | | | | | W , 6t | h P.M. |
| County: B | | | | | | | | | |
| Subdivision: _ | | | | | , Lot | , Block — | , Fili | ng (Unit) | |
| 7. Ground Sur | face Elevation: 53 | 53 fee | t Date Com | pleted: 03/ | | | | | |
| | Aquifer Name : F | | | | | | pth Completed | | feet |
| | tification: Was No | | | | | | | | . 1000 |
| 10. Aquifer Ty | | One Confining L | | | | | Laramie- | | |
| (Check one | | (Not overlain by | | | (Overlain by T | | | alluvial/coll | uvial) |
| 11. Geologic l | | · | | - / | 12. Hole Dia | | | n (ft) | To (ft) |
| Depth | Type | Grain Size | Color | Water Loc. | - | 3.0 | | .0 | 25.3 |
| 0.0 - 17.5 | Alluvium | Sand | Brown | 8.5 | 2 | .98 | 25 | 5.3 | 38.0 |
| 17.5 - 38.0 | Shale | Clay | Gray | | | | | | |
| | | | | | 13. Plain Ca | sing | | | |
| | | | | | OD (in) | | Wall Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch 40 | 0.6 | 19.7 |
| | | | | | 2 | PVC | Sch 40 | 24.7 | 25.0 |
| | | | | | | | | | |
| | | | | | - | 10 1 0 | C! . C! | | |
| | | | | | - | | reen Slot Size (| | To (ft) |
| | | | | | OD (in) | Kind PVC | Wall Size (in) | From (ft) | 24.7 |
| | | | | | 2 | PVC | Sch 40 | 19.7 | 24.7 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | 14. Filter Pa | rck: | 15. Pack | er Placemer | nt. |
| | | | | | Material | Sand | Туре | er i taccinici | |
| | 10000 | | | | Size | 10/20 | .,,,,, | | |
| | | | | | Interval | 18.5 - 25.3 | Depth | | |
| | | | | | 16. Grouting | *************************************** | | | |
| | | | | | Material | Amount | Density | Interval | Method |
| Remarks: | | | | | Portland Cement | t 1 bag | 47 pounds | 0.1 - 1.0 | Downhole |
| | | | | | Bentonite | 5 bags | Chips | 1.0 - 18.5 | Downhole |
| | | | - | | Bentonite | 3 buckets | Coated Pellets | 25.3 - 38.0 | Downhole |
| 17. Disinfection | | | | | Amt. Used | And the second s | | | |
| | Estimate Data: | | Check bo | ox if Test Dat | a is submitted | d on Form N | umber GWS-39, | Well Yield T | est Report |
| | Estimate Method: | | | 1 | | _ | | | |
| Static Leve | | | | Estimated Y | ield (gpm) | | | | |
| Date/Time | measured: 3/ | 13/2020 @ 11:4 | 10 | Estimate Le | ngth (hrs) | | | | |
| Remarks: | | | | | | | 1 2 11 11 11 11 11 11 11 11 11 11 11 11 | | |
| 19. I have read t | he statements made i | nerein and know th | ne contents the | reof, and they | are true to my k | nowledge. Th | is document is sig | ned (or name | entered if |
| | certified in accordance | | | | | | | | |
| | olation of section 37 or considers the entry | | | | | | of the contractin | ig license. If fi | ling online |
| | | | | to be complia | | | | | |
| Company Name | | 1 | Email: | wile consult | | Phone w/are | | License Nu | mber: |
| RJH Consultan | | _ | aprochaska@ | | | | 225-4611 | 44966 | |
| | s: 9800 M+ | Pyramio | | | te 330 | Engle | wood Co | | 2 |
| or enter r | name if filing onlin | e) | | e and Title | oct Engineer | | | Date: | |
| alla 1 | V. orlo da | | Auaili Pro | iciiaska, Pioj | ect Engineer | | | 4-10 | -20 |

WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

| Form No. GWS-31 | 4242 | | orado, Office | | • | E 0.4 | | | |
|--------------------|--|--|----------------|-----------------------|------------------|----------------|------------------------|-------------------|-------------|
| 02/2017 | | Sherman St., Rown St., Row | | | | | | | |
| . Well Permit | : Number: 60779-A | ЛН | Receipt | Number: 006 | 0779 | | | | |
| | ell Designation: B-2 | | <u> </u> | | | | | | |
| | Name: City of Bou | , , | Attn: Brando | n Coleman | | | | | |
| | on Street Address | | | | Rd, Boulder, | CO 80309 | | | |
| . As Built GPS | Well Location (re | equired): 🔲 Zo | one 12 🔳 Zo | ne 13 Easting | g: 480582.9 | Northing: 4 | | | |
| | ocation: <u>NW</u> 1 | /4, <u>NE</u> 1/4, | Sec., 9 | Twp. 1 | N or S | Range 7 | 0 E or | · W 💽, <u>6</u> t | h P.M. |
| County: B | loulder | | | | | | | | |
| ubdivision: _ | | | | | , Lot | _, Block | , Filiı | ng (Unit) | |
| . Ground Sur | face Elevation: 53 | 49 fee | et Date Com | npleted: <u>05/</u> 2 | 20/2020 | Drilling Metl | hod: <u>8.0" HSA</u> a | and NQ3 roc | k core |
| | Aquifer Name: 💆 | | | otal Depth: | | | oth Completed: | _ | _ feet |
| . Advance No | tification: Was N | otification Requ | uired Prior to | Construction | ? 🔲 Yes 🔳 | No, Date N | lotification Give | en: | _ |
| 0. Aquifer Ty | . = | One Confining | • | | • | fining Layers) | Laramie-I | Fox Hills | |
| (Check one | | (Not overlain b | y Type III) | ☐Type II(| Overlain by | , , | ■Type III (a | | uvial) |
| 1. Geologic l | | | | _ | | iameter (in.) | | | To (ft) |
| Depth | Туре | Grain Size | Color | Water Loc. | | 8.0 | | .0 | 14.0 |
| 0.0 - 12.5 | Alluvium | Sand/Gravel | Brown | 3.3 | 2 | 2.98 | 14 | .0 | 34.0 |
| 12.5 - 34.0 | Shale | Clay | Gray | | | | | | |
| | | | | | 13. Plain Ca | • | | | T- (ft) |
| | | | | | OD (in) | | Wall Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch 40 | 0.4 | 7.4 |
| | | | | | 2 | PVC | Sch 40 | 12.4 | 12.7 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | _ | reen Slot Size (| | T- (f+) |
| | | | | | OD (in) | | Wall Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch 40 | 7.4 | 12.4 |
| | | | | | | | | | |
| | | <u> </u> | | | | | | | |
| | | | | | | | 1 | | |
| | | | | | 14. Filter P | | | er Placemei | nt: |
| | | ļ | | ļ | Material | Sand | Туре | | - |
| | | ļ | | ļ | Size | 10/20 | | | |
| | | ļ | | ļ | Interval | 4.0 - 12.7 | Depth | | • |
| | | | | | 16. Groutin | - | D. " | Ind. | 44 -1 -1 |
| | | <u> </u> | | | Material | Amount | Density | Interval | Method |
| emarks: | | | | | Portland Cemer | | 47 pounds | 0.2 - 1.1 | Downhole |
| | | | | | Bentonite | 1 bag | Chips | 1.1 - 4.0 | Downhole |
| 7 District 11 | T | | | | <u>Bentonite</u> | 2 buckets | Coated Pellets | 12.7 - 34.0 | Downhole |
| 7. Disinfection | | | Псыл | av if Table Dir | Amt. Use | | imbar CMC 30 | Mall Mart 13 | Fact Decree |
| | Estimate Data: | | ∐Check bo | ox if Test Dat | a is submitte | ea on Form Nu | umber GWS-39, | well Yield 1 | est Report |
| | Estimate Method: | | | Institute 124 | المام المام | _ | | | |
| Static Leve | | (20/2020 - 40 | <u></u> | | ield (gpm) | | | | |
| Date/Time | measured:5/ | /20/2020 @ 10: ₄ | 43 <u> </u> | Estimate Le | ngth (hrs) | | | | |
| emarks: | | | | | | | | | |
| | he statements made certified in accordan | | | | | | | | |
| - | iolation of section 37 | | | | | | - | | |
| | er considers the entry | | | | | | | | |
| ompany Name | <u>:</u> | | Email: | | | Phone w/are | ea code: | License Nu | ımber: |
| RJH Consultan | | | | rjh-consulta | nts.com | | 225-4611 | 44966 | 3. • |
| | s: 9800 Mt Pyramid | Ct Suite #330 i | ' | | | <u>'</u> | | 1 | |
| | name if filing onlin | | | ne and Title | | | | Date: | |
| • , | • | -, | | ochaska, Proj | ect Engineer | • | | | |
| dam Prochaci | /3 | | | , | | | | 06/15/201 | 113 |

Adam Prochaska

06/15/2020

WELL CONSTRUCTION Form No. State of Colorado **GWS-31** 1313 Sherman St., Room 02/2017 www.water.state.co.us 1. Well Permit Number: 060352-MH 2. Owner's Well Designation: B-208(P) 3. Well Owner Name: City of Boulder, Colorado Attn. 4. Well Location Street Address: Univ. of Colorado E 5. As Built GPS Well Location (required): Zone 1: 6. Legal Well Location: SW 1/4, NE 1/4, Sec. County: Boulder Subdivision: 7. Ground Surface Elevation: 5360 8. Completed Aquifer Name: Pierre Shale 9. Advance Notification: Was Notification Required 10. Aquifer Type: Type I (One Confining Layer (Check one) Type II (Not overlain by Typ 11. Geologic Log: Depth Туре Grain Size 0.0 - 20.1Alluvium Sand/Gravel 20.1 - 40.0 Shale Clay

| N AND Y | IELD ESTIMA | TE REPORT | | For | Office Use C | nly |
|---------------|--|----------------|------------|--------------------|----------------|---------|
| , Office | of the State B | Engineer | | | | |
| | | 3 303.866.358 | 81 | 1 | | |
| | | e@state.co.us | | | | |
| Receipt | Number: 006 | 0352 | | | | |
| | | | | | | |
| : Brando | n Coleman | | | | | |
| Boulder " | CU Boulder S | outh", Boulder | , CO 8030 | 09 | | |
| 2 = Zo | ne 13 Easting | g: 480417.7 | Northing | : 4425802.3 | | |
| | | N or S | | | W , 6tl | P.M. |
| | | | | | | |
| | | , Lot | , Block | , Fili | ng (Unit) | |
| ate Com | pleted: 01/ | 31/2020 | Drilling M | ethod: 8.0" HSA a | and NQ3 rock | core |
| Т | otal Depth: | 40.0 fee | et D | epth Completed | 30.0 | feet |
| Prior to | Construction | ? Yes • N | lo, Date | Notification Give | en: | |
|) | | | | rs) Laramie- | Fox Hills | |
| e III) | Type II (| Overlain by Ty | ype III) | Type III (| alluvial/collu | ıvial) |
| | | 12. Hole Dia | meter (ir | n.) From | n (ft) | To (ft) |
| Color | Water Loc. | 8. | .0 | 0 | .0 | 30.0 |
| rown | 11.9 | 2. | 98 | 30 | 0.0 | 40.0 |
| Gray | | | | | | |
| | | 13. Plain Cas | ing | | | |
| | | OD (in) | Kind | Wall Size (in) | From (ft) | To (ft) |
| | | 2 | PVC | Sch 40 | 0.3 | 24.7 |
| | | 2 | PVC | Sch 40 | 29.7 | 30.0 |
| | - | | | - | | |
| | | Perforated | Casing | Screen Slot Size (| in): 0.04 | |
| | | OD (in) | | Wall Size (in) | | To (ft) |
| | | 2 | PVC | Sch 40 | 24.7 | 29.7 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Size 10/20 Interval 23.5 - 30.0 Depth 16. Grouting Record Material Amount Density Interval Method Portland Cement 47 pounds 0.1 - 0.9 Downhole 1 bag Chips Bentonite 9 bags 0.9 - 23.5 Downhole 1 bucket Coated Pellets 30.0 - 40.0 Downhole Bentonite

Type

15. Packer Placement:

Amt. Used 18. Well Yield Estimate Data: Check box if Test Data is submitted on Form Number GWS-39, Well Yield Test Report Well Yield Estimate Method: Static Level: 11.9 Estimated Yield (gpm) 2/3/2020 @ 08:15 Date/Time measured: Estimate Length (hrs) ___

19. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402 2. The filing of a document that contains false statements is a violation of section 37 91 108(1)(e), C.R.S., and is punishable by fines up to \$1,000 and/or revocation of the contracting license. If filing online the State Engineer considers the entry of the licensed contractor's name to be compliance with Rule 17.4.

Adam Prochaska, Project Engineer

| Company Name: | Email: | Phone w/area code: |
|-----------------------|--------------------------------|--------------------|
| RJH Consultants, Inc. | aprochaska@rjh-consultants.com | (303) 225-4611 |

Print Name and Title

Suite 330 Englewood

14. Filter Pack:

Sand

Material

00 3-11-20

44966

License Number:

Sign (or enter name if filing online)

Remarks:

17. Disinfection: Type

For Office Use Only WELL CONSTRUCTION AND YIELD ESTIMATE REPORT Form No. State of Colorado, Office of the State Engineer **GWS-31** 1313 Sherman St., Room 821, Denver, CO 80203 303.866.3581 02/2017 www.water.state.co.us and dwrpermitsonline@state.co.us 1. Well Permit Number: 060352-MH Receipt Number: 0060352 2. Owner's Well Designation: B-209(P) 3. Well Owner Name: City of Boulder, Colorado Attn: Brandon Coleman 4. Well Location Street Address: Univ. of Colorado Boulder "CU Boulder South", Boulder, CO 80309 5. As Built GPS Well Location (required): Zone 12 Tone 13 Easting: 480424.9 Northing: 4425622.5 6. Legal Well Location: SW 1/4, NE 1/4, Sec., 9 Twp.1 NorS , Range 70 E or W , 6th P.M. County: Boulder Subdivision: _ _____, Lot ______, Block _____ ____, Filing (Unit) ___ 7. Ground Surface Elevation: 5353 feet Date Completed: 01/23/2020 Drilling Method: 8.0" HSA and NQ3 rock core 8. Completed Aguifer Name: Fill Total Depth: 30.0 feet Depth Completed: 8.5 9. Advance Notification: Was Notification Required Prior to Construction? Yes No, Date Notification Given: 10. Aquifer Type: Type I (One Confining Layer) Type I (Multiple Confining Layers) Laramie-Fox Hills Type II (Not overlain by Type III) (Check one) Type II (Overlain by Type III) Type III (alluvial/colluvial) 11. Geologic Log: 12. Hole Diameter (in.) From (ft) To (ft) Depth Type Grain Size Color Water Loc. 8.0 0.0 8.5 0.0 - 7.0Fill Sand/Gravel Brown 3.0 2.98 8.5 30.0 7.0 - 30.0Shale Clay Gray 13. Plain Casing Wall Size (in) OD (in) Kind To (ft) From (ft) PVC Sch 40 3.2 2 0.4 PVC Sch 40 8.2 8.5 Perforated Casing Screen Slot Size (in): 0.01 OD (in) To (ft) Kind Wall Size (in) From (ft) PVC 2 Sch 40 3.2 8.2 14. Filter Pack: 15. Packer Placement: Material Sand Type Size 10/20 Interval 3.0 - 8.5 Depth 16. Grouting Record Material Amount Density Interval Method Remarks: Portland Cement 1 bag 47 pounds 0.1 - 0.8 Downhole Bentonite 1 bag Chips 0.8 - 3.0 Downhole 2 buckets Coated Pellets Bentonite 8.5 - 30.0 Downhole 17. Disinfection: Type Amt. Used 18. Well Yield Estimate Data: Check box if Test Data is submitted on Form Number GWS-39, Well Yield Test Report Well Yield Estimate Method: Static Level: 3.0 Estimated Yield (gpm) 1/23/2020 @ 12:26 Date/Time measured: Estimate Length (hrs) Remarks: 19. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if

filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402 2. The filing of a document that contains false statements is a violation of section 37 91 108(1)(e), C.R.S., and is punishable by fines up to \$1,000 and/or revocation of the contracting license. If filing online the State Engineer considers the entry of the licensed contractor's name to be compliance with Rule 17.4.

| Company Name: RJH Consultants, Inc. | Email: aprochaska@rjh-consultants.com | Phone w/area code: (303) 225-4611 | License Number: 44966 |
|--|--|--------------------------------------|--------------------------|
| Mailing Address: 9800 M+ | Pyramid C+ #330 E | nelewood CO | 80112 |
| Sign (or enter name if filing online) Oth Proof | Print Name and Title Adam Prochaska, Project Engine | / | Date: 3-11-20 |

Form No. GWS-31

WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

State of Colorado, Office of the State Engineer

| 02/2017 | | Sherman St., Rowww.water.state.o | | | | | | | |
|----------------------|---|--|-------------------|-------------------|--------------------|------------------|--|--------------------------|-----------------|
| | | | | | | <u>US</u> | | | |
| | t Number: 060352 | | Receipt | Number: 006 | 60352 | | | | |
| | ell Designation: B- | | Maria Daniela | | | | | | |
| 4 Well Location | r Name: City of Box | ulder, Colorado | Attn: Brando | n Coleman | | | | | |
| 5 Ac Ruilt GP | on Street Address | Univ. of Colora | ado Boulder | CU Boulder S | outh", Bould | ler, CO 80309 | | | |
| 6 Legal Well I | S Well Location (re | /4 NF 1/4 | one 12 = 20 | Tun 1 | g: 480307.1 | Northing: | 4425662.8 | - 111 | |
| County: B | Location: <u>SW</u> 1. Boulder | /4, <u>NE</u> 1/4, | Sec., <u>3</u> | _ I wpi | ∐ N or S [| , Range | /0 L E 0 | or W = , 6t | thP.M. |
| Subdivision: | | - | | | 124 | Disale | C:I. | | |
| | | 153 | | | | | , Fili | | |
| Completed | face Elevation: 53 Aquifer Name: F | .53 ree | | | | | | | |
| | | | ired Drier to | Construction | 30.0 T | leet De | pth Completed | 1: 13.0 | _ feet |
| 10. Aquifer Ty | otification: Was No | (One Confining L | laver) | Construction | tes [| No, Date | Notification Giv | | |
| (Check one | - | (Not overlain by | | | (Overlain by | fining Layers | The second secon | | -2-10 |
| 11. Geologic I | | (Not orenam 2) | y Type III, | - Турс п | | Diameter (in. | | (alluvial/coll m (ft) | |
| Depth | Туре | Grain Size | Color | Water Loc. | | 8.0 | | 0.0 | To (ft) 13.5 |
| 0.0 - 11.0 | Fill | Sand | Brown | 4.6 | - | 2.98 | | 3.5 | 30.0 |
| 11.0 - 30.0 | Shale | Clay | Gray | | | 2.70 | | 3.3 | 30.0 |
| | | | | | 13. Plain Ca | asing | | | Anna Paris |
| | | | | | OD (in) | | Wall Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch 40 | 0.5 | 7.7 |
| | | | | | 2 | PVC | Sch 40 | 12.7 | 13.0 |
| | | - | | | | | | | |
| | | | | | 7-6 | 10-1-0 | 61 . 61 | | |
| | | | | | | | reen Slot Size (| | To (ft) |
| | | | | | OD (in) 2 | Kind PVC | Wall Size (in) | From (ft) | To (ft) |
| | | | | | | FVC | Sch 40 | 7.7 | 12.7 |
| | | | | | - | | | | |
| | | | | | | | | | |
| | | | | | 14. Filter P | ack: | 15. Pack | er Placemer | nt: |
| | | | | | Material | Sand | Туре | | |
| | | | | | Size | 10/20 | | | |
| | | | | | Interval | 6.0 - 13.0 | Depth | | |
| | | - | | | 16. Groutin | | | | |
| Remarks: | | | | | Material | Amount | Density | Interval | Method |
| Kemarks. | | | | | Portland Cemer | | 47 pounds | 0.1 - 0.3 | Downhole |
| | | | | / | Bentonite | 2 bags | Chips | 0.3 - 6.0 | Downhole |
| 17. Disinfection | on: Type | | | | Bentonite Amt Hear | 2 buckets | Coated Pellets | 13.0 - 30.0 | Downhole |
| | Estimate Data: | | Check bo | ov if Test Dat | Amt. Used | | umber GWS-39, | Wall Viold T | Danaut |
| | Estimate Method: | | | A II TOSE DUE | a is sublimite | d on rount | אני-ניייט ושעוווג, | well field i | est keport |
| Static Level | | | | Estimated Y | ield (gpm) _ | | | | |
| Date/Time | | 27/2020 @ 08:5! | 5 | | ngth (hrs) | | | | |
| Remarks: | | | | moentinger | igen (ms) | | | | |
| | he statements made h | nerein and know th | ne contents ther | reof and they : | ere true to my | knowledge Th | is document is sig | - ad /ar name e | |
| riting online) and o | certified in accordanc | ce with Rule 17.4 or | of the Water We | ell Construction | Rules, 2 CCR 4 | 402 2. The filin | g of a document the | hat contains fa | oleo |
| statements is a vic | olation of section 37 9 | 91 108(1)(e), C.R.S. | s., and is punish | nable by fines up | p to \$1,000 and | d/or revocation | of the contracting | g license. If fil | ling online |
| the state Engineer | r considers the entry of | of the licensed con | itractor's name | to be complian | nce with Rule 1 | 7.4. | | | |
| Company Name | | 4 | Email: | | | Phone w/are | a code: | License Nur | mber: |
| RJH Consultant | AND THE COLUMN TWO IS NOT THE COLUMN TWO IS | ī | aprochaska@i | | | (303) | 225-4611 | 44966 | |
| Mailing Address | | | ramid | | 330 | Englewo | 00 00 | 8011 | 2 |
| Sign (or enter n | ame if filing online | e) / | | e and Title | | , | | Date: | |
| ach | Kuncht | Ĺ | Adam Pro | chaska, Proje | ect Engineer | | | 3-11- | -20 |

For Office Use Only WELL CONSTRUCTION AND YIELD ESTIMATE REPORT Form No. State of Colorado, Office of the State Engineer GWS-31 1313 Sherman St., Room 821, Denver, CO 80203 303.866.3581 02/2017 www.water.state.co.us and dwrpermitsonline@state.co.us 1. Well Permit Number: 060352-MH Receipt Number: 0060352 2. Owner's Well Designation: B-212(P) 3. Well Owner Name: City of Boulder, Colorado Attn: Brandon Coleman 4. Well Location Street Address: Univ. of Colorado Boulder "CU Boulder South", Boulder, CO 80309 5. As Built GPS Well Location (required): Zone 12 Tone 13 Easting: 480190.3 Northing: 4425724.1 6. Legal Well Location: SE 1/4, NW 1/4, Sec., 9 Twp.1 N or S , Range 70 E or W , 6th P.M. County: Boulder Subdivision: _____, Lot ______, Block _______, Filing (Unit) ____ 7. Ground Surface Elevation: 5358 feet Date Completed: 02/21/2020 Drilling Method: 8.0" HSA and NQ3 rock core 8. Completed Aquifer Name: Fill Total Depth: 30.0 feet Depth Completed: 10.0 9. Advance Notification: Was Notification Required Prior to Construction? Yes No, Date Notification Given: Type I (One Confining Layer) 10. Aquifer Type: Type I (Multiple Confining Layers) Laramie-Fox Hills (Check one) Type II (Not overlain by Type III) Type II (Overlain by Type III) Type III (alluvial/colluvial) 11. Geologic Log: 12. Hole Diameter (in.) From (ft) To (ft) Depth Туре Grain Size Color Water Loc. 8.0 0.0 11.5 0.0 - 10.2 Fill Sand Brown 8.1 11.5 2.98 30.0 10.2 - 30.0 Shale Clay Gray 13. Plain Casing OD (in) Wall Size (in) Kind From (ft) To (ft) **PVC** 2 Sch 40 4.7 0.4 PVC Sch 40 10.0 Perforated Casing Screen Slot Size (in): 0.01 OD (in) Kind Wall Size (in) To (ft) From (ft) 2 PVC Sch 40 9.7 14. Filter Pack: 15. Packer Placement: Material Sand Type Size 10/20 Interval 3.0 - 10.0 Depth 16. Grouting Record Density Material Amount Interval Method Remarks: Portland Cement 1 bag 47 pounds 0.2 - 0.7Downhole Bentonite 1 bag Chips 0.7 - 3.0 Downhole Bentonite 2 buckets Coated Pellets 10.0 - 30.0 Downhole 17. Disinfection: Type Amt. Used 18. Well Yield Estimate Data: Check box if Test Data is submitted on Form Number GWS-39, Well Yield Test Report Well Yield Estimate Method: Static Level: 8.1 Estimated Yield (gpm) __ 2/21/2020 @ 13:40 Date/Time measured: Estimate Length (hrs) ___ 19. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed (or name entered if filing online) and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402 2. The filing of a document that contains false statements is a violation of section 37 91 108(1)(e), C.R.S., and is punishable by fines up to \$1,000 and/or revocation of the contracting license. If filing online the State Engineer considers the entry of the licensed contractor's name to be compliance with Rule 17.4. Company Name: Phone w/area code: License Number: RJH Consultants, Inc. aprochaska@rjh-consultants.com (303) 225-4611 44966 Mailing Address: 9800

Pyramid

Print Name and Title

Adam Prochaska, Project Engineer

Sign (or enter name if filing online)

CO 80112

Englewood

Form No.

WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

| GWS-31 | 1313 | Sherman St., Ro | | | • | 501 | | | |
|------------------------------------|--|---------------------|-----------------|--|-----------------------|--------------------|------------------------|------------------|----------------|
| 02/2017 | | w.water.state.c | | • | | | | | |
| 1. Well Permit | Number: 60805-A | | | Number: 006 | | _ | | | |
| | ell Designation: B-2 | | receipe i | \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | 0003 | | | | |
| | Name: City of Bou | | Attn: Brando | n Coleman | | | | | |
| | on Street Address | | | | 30303 | | | | |
| | Well Location (re | | | | | Northing: | | | |
| | Location: <u>SE</u> 1/ | ′4, <u>NE</u> 1/4, | Sec., <u>9</u> | _ Twp. <u>1</u> | N or S | ■, Range _ | 70 <u> </u> | . W 💽, <u>6t</u> | <u>h</u> P.M. |
| County: <u>E</u> Subdivision: _ | | | | | , Lot | _, Block _ | , Fili | ng (Unit) | |
| 7. Ground Sur | face Elevation: 53 | 57 fee | t Date Com | pleted: <u>06/</u> 0 | 03/2020 | Drilling Met | hod: <u>8.0" HSA</u> a | and NQ3 rock | k core |
| | Aquifer Name: 🗡 | | | otal Depth: | | | pth Completed | | feet |
| | otification: Was No | | | | | | | | |
| 10. Aquifer Ty | | (One Confining L | | = ' ' | Multiple Conf | | · — | | |
| (Check on | | (Not overlain by | / Type III) | ∐lype II (| Overlain by | | | alluvial/collu | |
| 11. Geologic Depth | Type | Grain Size | Color | Water Loc. | 12. Hole Di | ameter (in. 8.0 | • | n (ft) v.0 | To (ft) 9.0 |
| 0.0 - 8.0 | Alluvium | Sand/Gravel | Brown | 3.0 | | 98 | | .0 | 60.0 |
| 8.0 - 60.0 | Shale | Clay | Gray | 3.0 | | | · | | |
| | | , i | , | | 13. Plain Ca | sing | | | |
| | | | | | OD (in) | Kind | Wall Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch 40 | 0.3 | 3.7 |
| | | | | | 2 | PVC | Sch 40 | 8.7 | 9.0 |
| | | | | | | | | | |
| | | | | | Porforate | d Casing S | creen Slot Size (| (in): 0.04 | |
| | | | | | OD (in) | Kind | Wall Size (in) | From (ft) | To (ft) |
| | | | | | 2 | PVC | Sch 40 | 3.7 | 8.7 |
| | | | | | l ——— | | | | |
| | | | | | | | | | |
| | | | | | - | | | | |
| | | | | | 14. Filter P | | | er Placemer | nt: |
| | | | | | Material | Sand | Type | | |
| | | | | | Size | 10/20 | . | | |
| | | <u> </u> | | | Interval 16. Groutin | 3.0 - 9.0 | Depth | | |
| | | | | | Material | Amount | Density | Interval | Method |
| Remarks: | | 1 | | | Portland Cemer | | 47 pounds | 0.1 - 1.0 | Downhole |
| | | | | | Bentonite | 1 bag | Chips | 1.0 - 3.0 | Downhole |
| | | | | | Bentonite | 5 buckets | Coated Pellets | 9.0 - 60.0 | Downhole |
| 17. Disinfecti | on: Type | | | | Amt. Used | | | | |
| | Estimate Data: | | Check bo | ox if Test Dat | a is submitte | d on Form N | umber GWS-39, | Well Yield T | est Report |
| | Estimate Method: | | | I= | | = | | | |
| Static Leve | , | /2/2020 @ 44-24 | | | ield (gpm) | | | | |
| | measured: 6 | /3/2020 @ 14:30 | <u> </u> | Estimate Le | ngth (hrs) | | | | |
| Remarks: | | | | | | | | | |
| | the statements made line certified in accordance | | | | | | | | |
| - ' | iolation of section 37 | | | | · · | | - | | |
| the State Enginee | er considers the entry | of the licensed cor | ntractor's name | to be complia | nce with Rule 1 | 7.4. | | | |
| Company Name | e: | | Email: | | | Phone w/ar | ea code: | License Nu | mber: |
| RJH Consultan | its, Inc. | | aprochaska@ | rjh-consultai | nts.com | (303) | 225-4611 | 44966 | |
| Mailing Addres | s: 9800 Mt Pyramid | Ct Suite #330 E | inglewood, Co | O 80112 | | | | | |
| Sign (or enter i | name if filing onlin | e) | | e and Title | | | | Date: | |
| Adam Prochas | ka | | Adam Pro | ochaska, Proj | ect Engineer | | | 06/15/202 | 20 |
| | | | I | | | | | Ī | |

Form No.

WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

| 02/2017 | 1212 | Sherman St., Ro | , | or the State b | 9 | Ω1 | | | |
|---|--|---|--|--|--|--|--|--|---|
| UZ/ ZU 1 / | | vw.water.state.c | | | | | | | |
| | <u></u> t Number: 60778-/ | | | | | <u> </u> | | | |
| | ell Designation: B- | | кесеірі | Number: 006 | 50778 | | | | |
| | r Name: City of Bo | | Attn: Brando | n Coloman | | | | | |
| | ion Street Address | • | | | der CO 80303 | <u> </u> | | | |
| | S Well Location (r | | | | | | 4425633.2 | | |
| | Location: SE 1 | | | | | | | or W 🔳, 6t | h P.M. |
| County: _ | | , | , | - ' | | | | — ′ — | |
| Subdivision: _ | | | | | , Lot | _, Block _ | | Filing (Unit) | |
| 7. Ground Sur | face Elevation: 53 | 362 fee | t Date Com | nleted: 05/ | | | | SA and NQ3 roc | |
| | Aquifer Name : | | | • | 65.3 fe | - | pth Comple | | feet |
| | otification: Was N | | | | | | Notification | | |
| 10. Aquifer T | | (One Confining L | | | Multiple Conf | |) 🔲 Laran | nie-Fox Hills | |
| (Check or | ne) 🔲 Type II | (Not overlain by | Type III) | Type II (| (Overlain by 1 | Гуре III) | ⊡ Туре | III (alluvial/coll | uvial) |
| 11. Geologic | Log: | | | | 12. Hole Di | ameter (in. |) F | rom (ft) | To (ft) |
| Depth | Type | Grain Size | Color | Water Loc. |] | 3.0 | | 0.0 | 15.0 |
| 0.0 - 7.5 | Fill | Clay/Sand | Brown | 6.5 | 2 | .98 | | 15.0 | 65.3 |
| 7.5 - 12.8 | Alluvium | Sand/Gravel | Brown | | | | | | - |
| 12.8 - 65.3 | Shale | Clay | Gray | <u> </u> | 13. Plain Ca | _ | | | To (ft) |
| | | <u> </u> | | | OD (in) | Kind | Wall Size (i | , , , | To (ft) |
| | | | | <u> </u> | 2 | PVC | Sch 40 | 0.4 | 7.7 |
| | | + | | | 2 | PVC | Sch 40 | 12.7 | 13.0 |
| | | + | | | ┨ ─── | | | | |
| | | + | | | Perforate | d Casing S | creen Slot Si | ze (in): 0.01 | |
| | | + | | + | OD (in) | Kind | Wall Size (i | | To (ft) |
| | | 1 | | + | 2 | PVC | Sch 40 | 7.7 | 12.7 |
| | | | | | l — — | | | | |
| | | | | 1 | 1 | | | | |
| | | | | | 1 | | | | |
| | | | | | 14. Filter Pa | ack: | 15. P | acker Placeme | nt: |
| | | | | | Material | Sand | Туре | | _ |
| | | | | | Size | 10/20 | _ | | |
| | | | | | | | | L | |
| | | | | | Interval | 4.0 - 13.0 | Dept | <u> </u> | |
| | | | | | 16. Groutin | | • | | - |
| | | | | | 16. Groutin Material | g Record Amount | Density | Interval | Method |
| Remarks: | | | | | 16. Grouting Material Portland Cemen | g Record Amount t 1 bag | Density 47 pounds | Interval s 0.1 - 1.0 | Downhole |
| Remarks: | | | | | 16. Grouting Material Portland Cemen Bentonite | g Record Amount t 1 bag 1 bag | Density 47 pounds Chips | Interval 0.1 - 1.0 1.0 - 4.0 | Downhole Downhole |
| | ioni Typo | | | | 16. Grouting Material Portland Cemen Bentonite Bentonite | g Record Amount t 1 bag 1 bag 4 buckets | Density 47 pounds | Interval 5 0.1 - 1.0 1.0 - 4.0 | Downhole |
| 17. Disinfect | | | Check by | y if Test Dat | 16. Grouting Material Portland Cemen Bentonite Bentonite Amt. Used | Record Amount t 1 bag 1 bag 4 buckets | Density 47 pounds Chips Coated Pelle | Interval 5 | Downhole Downhole |
| 17. Disinfect 18. Well Yield | Estimate Data: | | Check bo | ox if Test Dat | 16. Grouting Material Portland Cemen Bentonite Bentonite Amt. Used | Record Amount t 1 bag 1 bag 4 buckets | Density 47 pounds Chips Coated Pelle | Interval 0.1 - 1.0 1.0 - 4.0 | Downhole Downhole |
| 17. Disinfect 18. Well Yield Well Yield | Estimate Data: Estimate Method: | | Check bo | | 16. Grouting Material Portland Cement Bentonite Bentonite Amt. Used | g Record Amount t 1 bag 1 bag 4 buckets d on Form N | Density 47 pounds Chips Coated Pelle | Interval 5 | Downhole Downhole |
| 17. Disinfect 18. Well Yield Well Yield Static Leve | Estimate Data: Estimate Method: el: 6.5 | | | Estimated Y | 16. Grouting Material Portland Cemens Bentonite Bentonite Amt. Used ta is submitte | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N | Density 47 pounds Chips Coated Pelle | Interval 5 | Downhole Downhole |
| 17. Disinfect 18. Well Yield Well Yield Static Lev Date/Time | Estimate Data: Estimate Method: el: 6.5 | /29/2020 @ 08:1 | | Estimated Y | 16. Grouting Material Portland Cement Bentonite Bentonite Amt. Used | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N | Density 47 pounds Chips Coated Pelle | Interval 5 | Downhole Downhole |
| 17. Disinfect 18. Well Yield Well Yield Static Leve Date/Time | Estimate Data: Estimate Method: el: 6.5 e measured: 5 | /29/2020 @ 08:1 | 5 | Estimated Y Estimate Le | Material Portland Cemen Bentonite Bentonite Amt. Used ta is submitte Yield (gpm) | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N | Density 47 pounds Chips Coated Pelle Iumber GWS | Interval 5 0.1 - 1.0 1.0 - 4.0 ets 13.0 - 65.3 -39, Well Yield | Downhole Downhole Downhole Fest Report |
| 17. Disinfect 18. Well Yield Well Yield Static Leve Date/Time Remarks: 19. I have read | Estimate Data: Estimate Method: el: 6.5 | /29/2020 @ 08:1 | 5 ne contents the | Estimated Y Estimate Le | 16. Grouting Material Portland Cement Bentonite Bentonite Amt. Used ta is submitte Aight (gpm) Ength (hrs) are true to my limite | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N | Density 47 pounds Chips Coated Pelle Iumber GWS | Interval 5 0.1 - 1.0 1.0 - 4.0 ets 13.0 - 65.3 -39, Well Yield s signed (or name | Downhole Downhole Downhole Fest Report |
| 17. Disinfect 18. Well Yield Well Yield Static Leve Date/Time Remarks: 19. I have read filing online) and statements is a vertical | Estimate Data: Estimate Method: el: 6.5 e measured:5 the statements made d certified in accordanylolation of section 37 | /29/2020 @ 08:1 herein and know thoce with Rule 17.4 c '91 108(1)(e), C.R.S | 5 ne contents the of the Water West, and is punish | Estimated Y Estimate Le | Amt. Used ta is submitted (gpm) are true to my In Rules, 2 CCR 4up to \$1,000 and | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N | Density 47 pounds Chips Coated Pelle Iumber GWS his document ing of a document | Interval of the second of the | Downhole Downhole Downhole Fest Report entered if alse |
| 17. Disinfect 18. Well Yield Well Yield Static Leve Date/Time Remarks: 19. I have read filing online) and statements is a vertical | Estimate Data: Estimate Method: el: 6.5 e measured:5 the statements made d certified in accordan | /29/2020 @ 08:1 herein and know thoce with Rule 17.4 c '91 108(1)(e), C.R.S | 5 ne contents the of the Water West, and is punish | Estimated Y Estimate Le | Amt. Used ta is submitted (gpm) are true to my In Rules, 2 CCR 4up to \$1,000 and | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N | Density 47 pounds Chips Coated Pelle Iumber GWS his document ing of a document | Interval of the second of the | Downhole Downhole Downhole Fest Report entered if alse |
| 17. Disinfect 18. Well Yield Well Yield Static Leve Date/Time Remarks: 19. I have read filing online) and statements is a vertical | Estimate Data: Estimate Method: el: 6.5 e measured: 5 the statements made discertified in accordanciolation of section 37 er considers the entry | herein and know the hoce with Rule 17.4 con the licensed cor | 5 ne contents the of the Water West, and is punish | Estimated Y Estimate Le | 16. Grouting Material Portland Cement Bentonite Bentonite Amt. Used ta is submitte Yield (gpm) ength (hrs) are true to my len Rules, 2 CCR 4 up to \$1,000 and unce with Rule 1 | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N | Density 47 pounds Chips Coated Pelle lumber GWS his document ing of a document of the contra | Interval of the second of the | Downhole Downhole Test Report entered if alse illing online |
| 17. Disinfect 18. Well Yield Well Yield Static Leve Date/Time Remarks: 19. I have read filing online) and statements is a vector of the state Engine | Estimate Data: Estimate Method: el: 6.5 e measured: 5. the statements made discrified in accordanciolation of section 37 er considers the entry e: | herein and know the with Rule 17.4 ct 191 108(1)(e), C.R.S. of the licensed cor | 5 me contents the of the Water West, and is punish ntractor's name Email: | Estimated Y Estimate Le | 16. Grouting Material Portland Cement Bentonite Bentonite Amt. Used ta is submitte Arrich (gpm) Pength (hrs) are true to my length (hrs) Rules, 2 CCR 4 up to \$1,000 and unce with Rule 1 | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N knowledge. T 02 2. The filit for revocatio 7.4. Phone w/ar | Density 47 pounds Chips Coated Pelle lumber GWS his document ing of a document of the contra | Interval 5 0.1 - 1.0 1.0 - 4.0 ets 13.0 - 65.3 39, Well Yield s signed (or name ent that contains facting license. If f | Downhole Downhole Test Report entered if alse illing online |
| 17. Disinfect 18. Well Yield Well Yield Static Leve Date/Time Remarks: 19. I have read filing online) and statements is a vector of the State Engine Company Nam RJH Consultar | Estimate Data: Estimate Method: el: 6.5 e measured: 5. the statements made discrified in accordanciolation of section 37 er considers the entry e: | /29/2020 @ 08:1 herein and know the ce with Rule 17.4 cm (19) 108(1)(e), C.R.S. of the licensed core | 5 The contents the of the Water Website in the water website in the water website in the water was a manager of the water water was a manager of the water water was a manager of the water was a manager of the water water water was a manager water wate | Estimated Y Estimate Let Preof, and they a ell Construction hable by fines u e to be complian Orjh-consultan | 16. Grouting Material Portland Cement Bentonite Bentonite Amt. Used ta is submitte Arrich (gpm) Pength (hrs) are true to my length (hrs) Rules, 2 CCR 4 up to \$1,000 and unce with Rule 1 | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N knowledge. T 02 2. The filit for revocatio 7.4. Phone w/ar | Density 47 pounds Chips Coated Pelle lumber GWS his document in g of a document of the contractions of the | Interval 5 0.1 - 1.0 1.0 - 4.0 ets 13.0 - 65.3 -39, Well Yield s signed (or name ent that contains facting license. If f | Downhole Downhole Test Report entered if alse illing online |
| 17. Disinfect 18. Well Yield Static Leve Date/Time Remarks: 19. I have read filing online) and statements is a very the State Engine Company Nam RJH Consultar Mailing Address | Estimate Data: Estimate Method: el: 6.5 e measured:5 the statements made of certified in accordanyiolation of section 37 er considers the entry e: ets, Inc. | herein and know the ce with Rule 17.4 cc 91 108(1)(e), C.R.S of the licensed cord Ct Suite #330 E | se contents the of the Water We in and is punish intractor's name improchaska@inglewood, Content in the content | Estimated Y Estimate Let Preof, and they a ell Construction hable by fines u e to be complian Orjh-consultan | 16. Grouting Material Portland Cement Bentonite Bentonite Amt. Used ta is submitte Arrich (gpm) Pength (hrs) are true to my length (hrs) Rules, 2 CCR 4 up to \$1,000 and unce with Rule 1 | g Record Amount t 1 bag 1 bag 4 buckets d d on Form N knowledge. T 02 2. The filit for revocatio 7.4. Phone w/ar | Density 47 pounds Chips Coated Pelle lumber GWS his document in g of a document of the contractions of the | Interval 5 0.1 - 1.0 1.0 - 4.0 ets 13.0 - 65.3 -39, Well Yield s signed (or name ent that contains facting license. If f | Downhole Downhole Test Report entered if alse illing online |

| Form No. GWS-31 02/2017 | WELL CONSTRUCTION AND YIELD ESTIMATE REPORT State of Colorado, Office of the State Engineer 1313 Sherman St., Room 821, Denver, CO 80203 303.866.3581 www.water.state.co.us and dwrpermitsonline@state.co.us | | | | | | For | For Office Use Only | | |
|--|--|--|--|---|--|----------------------------------|-------------------------------|---------------------------|--------------------|--|
| 1. Well Permit Number: 62389-MH Receipt Number: 062389 | | | | | | | | | | |
| 2. Owner's Well | Control and the control of the contr | 1751 | Кесегр | ridiliber 00 | 2307 | | | | | |
| 3. Well Owner N | | | Δttn: Brand | on Coleman | | | | | | |
| 4. Well Location | | | | | South". Boulde | r. CO 80309 | | | | |
| 5. As Built GPS | | | | | | | | | | |
| 6. Legal Well Lo | | | | | | | | r W 🔳 61 | th P.M. | |
| County: <u>Bo</u> Subdivision: | ulder | | | | | | , Fil | | | |
| 7. Ground Surfa 8. Completed A | | 100 | | | /27/2021 | Drilling Met | | A | feet | |
| 9. Advance Noti | | | | | | | | | 1000 | |
| 10. Aquifer Typ (Check one) | e: Type I | (One Confining (Not overlain l | Layer) | Т Туре I | (Multiple Conf (Overlain by 1 | ining Layers |) 🔲 Laramie- | | luvial) | |
| 11. Geologic Lo | | , | , ,, , | | 12. Hole Di | | | n (ft) | To (ft) | |
| Depth | Type | Grain Size | Color | Water Loc | | .75 | | 0.0 | 32.5 | |
| 0.0 - 29.0 | Fill | Clay | Brown | 27.4 | 1 | | | - | | |
| 29.0 - 32.5 | Shale | Clay | Gray | | 15 | | | | | |
| 27.2 | 7.1747 | | | | 13. Plain Casing | | | | | |
| | | | | | OD (in) 2 | Kind PVC | Wall Size (in) Sch 40 | From (ft) 0.3 | To (ft) 18.7 | |
| | | | | | 2 | PVC | Sch 40 | 28.7 | 29 | |
| | | | | | | | | | | |
| 1 | | | | | | | reen Slot Size | | To /ft) | |
| | | | | | OD (in) | Kind | Wall Size (in) | From (ft) | | |
| | | | | | 2 | PVC | Sch 40 | 18.7 | 28.7 | |
| | | | | | | | | | | |
| | | | | | 14. Filter Pa | | | er Placeme | nt: | |
| | | | V- | | Material | Sand | Туре | - | - | |
| <u> </u> | | | | | Size | 10/20 | 200.00 | | | |
| | | | - | 4 | Interval | 17.0 - 29.6 | Depth | A | | |
| | | | - | | 16. Grouting | | Densites | Internal | n.ac.a | |
| Demonstrat | | | | | Material | Amount | Density | Interval | Method Downhole | |
| Remarks: | | | | | Concrete | 1 bag | 47 pounds | 0.1 - 0.5 | Downhole | |
| | | | | | Bentonite | 5 bags 1 bucket | Crumbles/Chips Coated Pellets | 1.5 - 17.0 29.6 - 32.5 | Downhole | |
| 17. Disinfection | n: Typo | | | | Amt. Used | | Coated Fettets | 27.0 - 32.3 | DOMINIOLE | |
| 18. Well Yield E | | | Check I | box if Test Da | | | umber GWS-39 | , Well Yield | Test Report | |
| Well Yield Es | stimate Method: | | | | | | | | | |
| | | | | | Yield (gpm) | | | | | |
| Date/Time measured:8/30/2021 @ 12:45 | | | | Estimate Lo | stimate Length (hrs) | | | | | |
| Remarks: 10/20 | | m 0 5 to 1 5 fe | et hetween c | | | | | | | |
| 19. I have read the filing online) and constatements is a viole the State Engineer | e statements made ertified in accordar lation of section 37 | herein and know nce with Rule 17.4 91 108(1)(e), C.F | the contents th of the Water V I.S., and is puni | ereof, and they Well Constructions is the second se | are true to my l on Rules, 2 CCR 4 up to \$1,000 and | 02 2. The filid Or revocation | ng of a document | that contains f | false | |
| Company Name: | | or the ficulacid C | Email: | to be compti | | Phone w/ar | ea code: | License Nu | umber: | |
| RJH Consultants, Inc. | | | | | | 225-4611 | | | | |
| Mailing Address: | | | | | | | | 1=== | | |
| 2 1 1 1 2 2 1 1 | | | | ame and Title Prochaska, Project Engineer | | | | Date: 9-13 | 3-21 | |
| Appendix B.4 | 10000 | | | _ | | | | | 13 of 14 | |

INSTRUCTIONS FOR WELL CONSTRUCTION AND YIELD ESTIMATE REPORT

This report must be computer generated online, typed or printed in <u>BLACK OR BLUE INK</u> and may be reproduced by photocopy or computer generation. Photocopy reproductions must retain margins and print quality. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface. If filing online please see online form submittal instructions at http://water.state.co.us/groundwater/wellpermit/onlineformsubmittal/Pages/DWRSite1.aspx You may also save, print and email the completed form to: dwrpermitsonline@state.co.us

The form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. A copy of the form must be provided to the well owner.

Item Instructions: (numbers correspond with those on the front of this form)

- 1. Complete the well permit and receipt number.
- 2. Provide the identification (owner's well designation) for the well.
- 3. Fill in well owner name.
- 4. Provide the street address where the well is located.
- 5. Provide the GPS location where the well was drilled (required field).

Colorado contains two (2) UTM zones. Zone 13 covers most of Colorado. The boundary between Zone 12 and Zone 13 is the 108th Meridian (longitude). West of the 108th Meridian is UTM Zone 12 and east of the 108th Meridian is UTM Zone 13. The 108th Meridian is approximately 57 miles east of the Colorado-Utah state line. On most GPS units, the UTM zone is given as part of the Easting measurement, e.g. 12T0123456. Check the appropriate box for the zone.

- 6. Complete the legal description location of the well and county. For wells located in subdivisions, the name, lot, block, and filing, must be provided.
- 7. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Provide the date the well was completed and describe the drilling method used to construct the well.
- 8. Indicate the aguifer in which the well was completed, the total depth drilled, and the actual completed depth of the well.
- 9. Indicate whether or not the well inspection team was required to be notified prior to construction. If required, provide the date notification was given. See http://water.state.co.us/groundwater/BOE/Pages/VariancesWaivers.aspx for more information on Notifications.
- 10. Check the box indicating the type aquifer in which the well is completed (See Rule 5.2.2 Well Construction Rules).
- 11. Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials. Examples of descriptive terms include:

Type - sandstone, sand, etc.

Grain size - Boulders, gravel, sand, silt, clay, etc.

Color - Denote for all materials, most critical in sedimentary rock

Water Location - Depth where water is encountered (if it can be determined)

- 12. Provide the diameters of the drilled borehole.
- 13. The outside diameter, type, wall thickness, and interval of plain and perforated casing lengths must be indicated. For perforated casing, the screen size must be indicated.
- 14. Indicate the material and size of filter pack (e.g. sand, gravel, etc.) and the interval where placed.
- 15. Indicate the type and setting depth for any packers installed.
- 16. The material, amount, and interval of the grout slurry must be reported. Density may be indicated as pounds per gallon, gallons of water per sack, total gallons of water used, or number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive placement. The percentage of additives mixed with the grout should be reported under remarks.
- 17. Record the type and the amount of disinfection used, how placed, and the length of time left in the hole.
- 18. Report Well Yield Estimate data as required by Rule 17.1.1. Spaces are provided to report all estimates made during the assessment. The report should show that the estimate complied with the provisions of the rules. If available, report clock time when measurements were taken. If an estimate was not performed, explain when it will be done. A full Well Yield Test may be performed instead of an estimate; if so, check the appropriate box and submit the data on form GWS-39.
- 19. Fill in Company Name, Email, and Address and License Number (or PE/PG) of the Individual who is responsible for the well construction. The licensed contractor or authorized individual responsible for the construction of the well must sign or if filing online, enter his/her name on the report. If filing online the State Engineer considers the entering of the licensed contractors name on the form to be a certification of accuracy and truthfulness in compliance with Rule 17.4 of the Water Well Construction Rules and Regulations, 2 CCR 402-2.
 - Rule 17.4 Certification Work reports must be signed and certified as to accuracy and truthfulness of the information on the report by the well construction or pump installation contractors or authorized individuals responsible for the work performed by them or under their direction or supervision, or by the private driller or private pump installer if the work was performed by them. Such reports are deemed to be completed, signed and certified under oath.

Submit completed report to: State of Colorado, Office of the State Engineer, 1313 Sherman St, Room 821, Denver, CO 80203. You may also save, print, scan and email the completed form to dwrpermitsonline@state.co.us

IF YOU HAVE ANY QUESTIONS regarding any item on this form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1845), or refer to our web site at www.water.state.co.us for www.water.state.co.us and access to state rules and statutes.

Appendix C

GEOPHYSICS REPORT



7711 W 6th Ave., Suite G/H Lakewood, CO 80214 (720) 487-9200 A Service-Disabled Veteran-Owned Small Business (SDVOSB)

January 16, 2020

RJH Consultants, Inc. 9800 Mt. Pyramid Court, Suite 330 Englewood, CO 80112

Attn: Samantha Guillies Office: (303) 225-4611

Email: sguillies@rjh-consultants.com

RE: MASW Geophysical Investigation

South Boulder Creek, Boulder, CO Collier Geophysics Project 19-225

Collier Geophysics, LLC (Collier) conducted a geophysical investigation on behalf of RJH Consultants, Inc. (RJH) southeast of Boulder, CO (Figure 1). The seismic line paralleled US 36 and the US 36 Bike Path, northwest of where they cross the South Boulder Creek. The objectives of the investigation were to map top of rock and to map buried paleochannels (if present). The objectives were met using Multi-channel Analysis of Surface Waves (MASW).

The survey was performed November 7th and 8th, led by Collier geophysicist Miriam Moller. The following report presents results from the geophysical investigation and summarizes the site conditions, field methods, data acquisition, and interpretation procedures. For further information regarding the details of the MASW technique, see Appendix A.

Appendix C

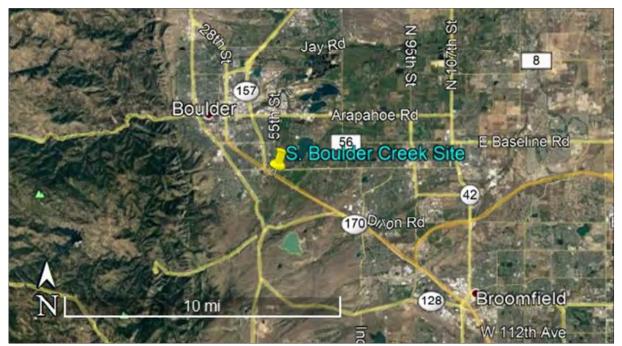


Figure 1. Project location map with approximate project area shown in yellow. Google Earth Imagery, 2019.

Site Conditions

The seismic line paralleled the US 36 bike path, along its southern side, with a total line length of approximately 3,000 feet. Conditions along most of the line consisted of short grass and gravely soils. On the southeast end of the line, around South Boulder Creek, conditions consisted of moderately thick, very tall grasses and shrubs with rocky to silty soils. Figure 2 presents photographs taken during data collection, showing typical conditions encountered at the site. The creek had 6 inches to 2 feet of running water, depending on the depth and width of the creek bed. The weather during data collection was cold to cool and partly sunny.



Figure 2. Typical site conditions encountered during data collection.

Data Acquisition

Data were collected along one continuous line at the site, as shown in the line location map in Figure 3. Seismic data were acquired using Geometrics Geode 24-channel digital seismographs, a state-of-the-art, 24-bit seismograph, connected to a field laptop via an Ethernet cable. Data were collected using two 24 channel seismographs coupled together to collect 48 channels of active data, in a roll-along manner (explained below). The geophones were placed down the line at a 10 foot interval, for an array length of 470 feet. Data were acquired using an active seismic source, consisting of a 90-pound (lb) accelerated weight drop mounted on an ATV, impacting a metal strike plate. Shot points were located every 30 feet along the line, beginning with a 30 foot off-end shot. Once the shot point reached the center of the 48 channel spread, the first 24 channels of the spread were picked up and moved forward of the array off the end of the line, in a roll-along manner. In this way, continuous data coverage was possible along any length of line. Data were collected over a total of approximately 3,020 linear feet.

Geophysical Letter Report 3 Collier Geophysics



Figure 3. Line location map (red line). Google Map Imagery(2019).

Acquisition parameters of the seismic system used for this survey comprised of stacked 2-second records at a 0.125 millisecond (ms) sample rate. Analog data from the geophones are collected in the seismograph where the data are digitized, transmitted to the laptop computer, and then recorded on the hard drive. The geophone positions, and thereby, line location and orientation, were measured with a Trimble Geo7x, a handheld GPS unit with sub-foot precision.

Geophysical Letter Report 4 Collier Geophysics

Data Processing

MASW analysis consists of generating a frequency-velocity transform from the surface waves, picking the transformed data to derive a dispersion curve, and inverting this dispersion curve to a layered shear-wave velocity (Vs) model. These steps are repeated for each shot location downline, using 24 geophones at a time. This generates a 1D Vs model centered at each 24 geophone group (between the 12th and 13th geophone positions), every 30 feet down the seismic line. The 1D Vs models are inverted together, to generate a 2D Vs profile of the line. Because the 1D models are centered on a 24 geophone group, there is a difference between the surface line

coverage from data collection and the length of the final processed 2D profile. The result is that the final 2D profile is shorter than the surface coverage. The inset photo on the right shows the difference, with the red line representing the surface coverage of the seismic lines as deployed in the field, and the overlying yellow line representing the subsurface coverage of the final 2D profiles.



Figure 4 illustrates the dispersion curve picking approach used for MASW soundings, with an example from of this investigation. The program SurfSeis, version 6.3, by the Kansas Geological Survey, was used for the MASW processing.

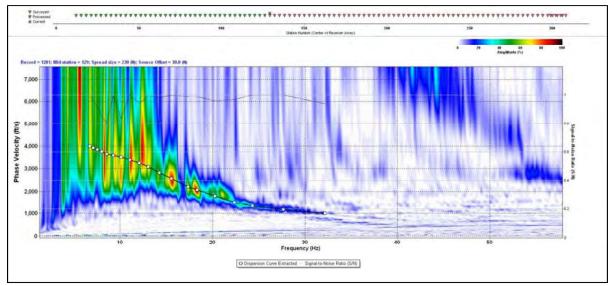


Figure 4. Example of dispersion curve picking (white boxes) from this project.

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Results and Discussion

Attached to end of this report are Figures 5 and 6, presenting line locations, results, and interpretations, in 11" x 17" landscape format. Figure 5 presents the full depth of the MASW Vs results. Figure 6 presents the results truncated at approximately 100 feet below ground surface with two times vertical exaggeration. Both figures are annotated with simplified borehole information, provided to Collier by RJH, and include annotated line location maps. Each profile has the same color scale line to line, with high velocity values represented by "warm" colors (orange and red) and low velocity values represented by "cool" colors (dark and light blue).

As stated in the borehole data, top of rock is slightly to highly weathered. This variable weathering of the rock makes choosing a single velocity to represent the top of rock interpretation impractical. Additionally, shale, as was encountered in the borings, has a wide range of possible shear wave velocity values, from 700 feet per second (ft/s), to above 8,000 ft/s. Based on bedrock depth from the borings and velocity gradients from Figures 5 and 6, a velocity range from approximately 1,100 to 1,500 feet per second (ft/s) was interpreted as the top of weathered rock. This is annotated on the profiles as a dashed black line. The interpreted top of rock line differs marginally from the bedrock depth indicated in the boreholes. At boring B-111 the overburden immediately above bedrock is very dense with high blow counts, which could attribute to the higher velocity values seen in the near surface at this location. At B-110, the logs indicate low RQD values (<20%) down to about 20 feet, and bedrock is described as moderately weathered, and moderately to highly fractured. Both of which could attribute to the lower velocity values here, and therefore deeper interpreted top of rock. While Boring B-109 indicates higher RQD, it also states moderate to intense weathering increasing to slight weathering, and moderate fracturing of the bedrock. Again, these attributes can lower the velocity of the bedrock. Given these correlations, it is apparent that bedrock has varying degrees of weathering and fracturing across the site. It could be inferred that low velocity value variations at depth indicate areas of higher fracturing and weathering, or possibly paleochannels, as discussed below.

The second objective of the geophysical investigation was to map paleochannels if there were any present. The top of rock profile is relatively flat across the across the site. There is a section however, from 1,700 to 1,925 feet downline, where the top of rock line could be approximately 20 feet deeper, as indicated with the red dashed line. With the aforementioned variability of the shale, it is difficult to determine which is more likely. There are additional, deeper, low velocity anomalies across the site as well, which may be due to paleochannels and/or flood deposits. Without boring data at those exact locations, it is difficult to determine the exact cause. Most notable of these low velocity variations are 675 to 1,050 feet downline, 2,350 to 2,650 feet, 2,650

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to 2,750 feet, and 2,975 feet to the end of the line, east of the current creek location. Except for the anomaly at 2,700 feet, these anomalies are 20 to 30 feet deep. The anomaly at 2,700 feet downline is approximately 50 feet below ground surface.

Closure

The geophysical methods and field procedures defined in this report were applicable to the project objectives and have been successfully applied by Collier geophysicists to investigations of similar size and nature. However, sometimes field or subsurface conditions are different from those anticipated and the resultant data may not achieve the investigation objectives. Collier warrants that our services were performed within the limits prescribed for this project, with the usual thoroughness and competence of the geophysical profession. Collier conducted this project using the current standards of the geophysical industry and utilized in house quality control standards to produce a precise geophysical survey.

The quality of the data acquired during this investigation was good. The quality of the data yields a high degree of confidence in the results obtained and presented in this report. If you have any questions regarding the field procedures, data analyses, or the interpretive results presented herein, please do not hesitate to contact us. We appreciate working with you and look forward to providing RJH Consultants, Inc. with geophysical services in the future.

Respectfully Submitted,

Collier Geophysics, LLC

Miriam Moller

Geophysicist

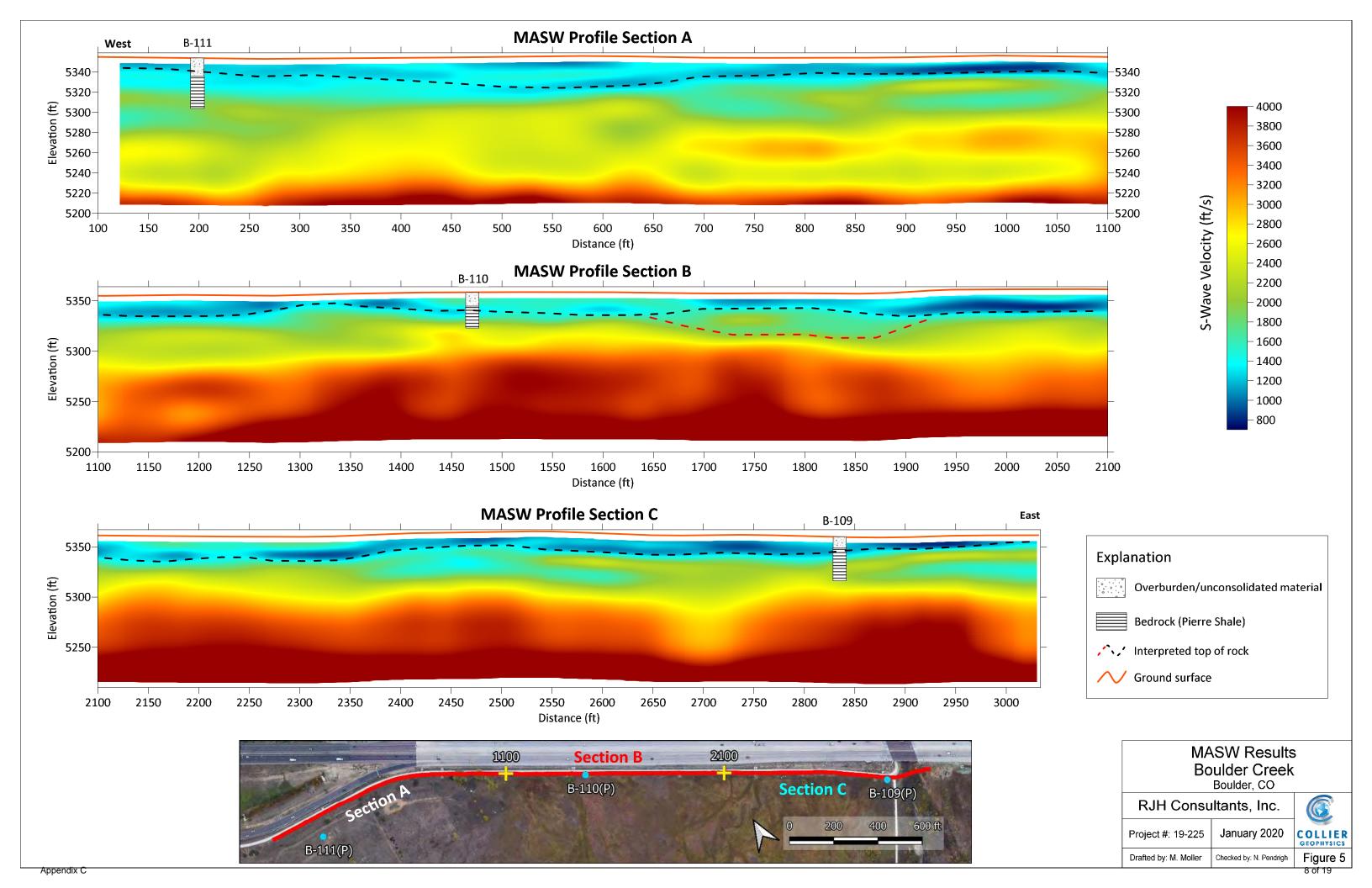
Jacob Sheehan Senior Geophysicist

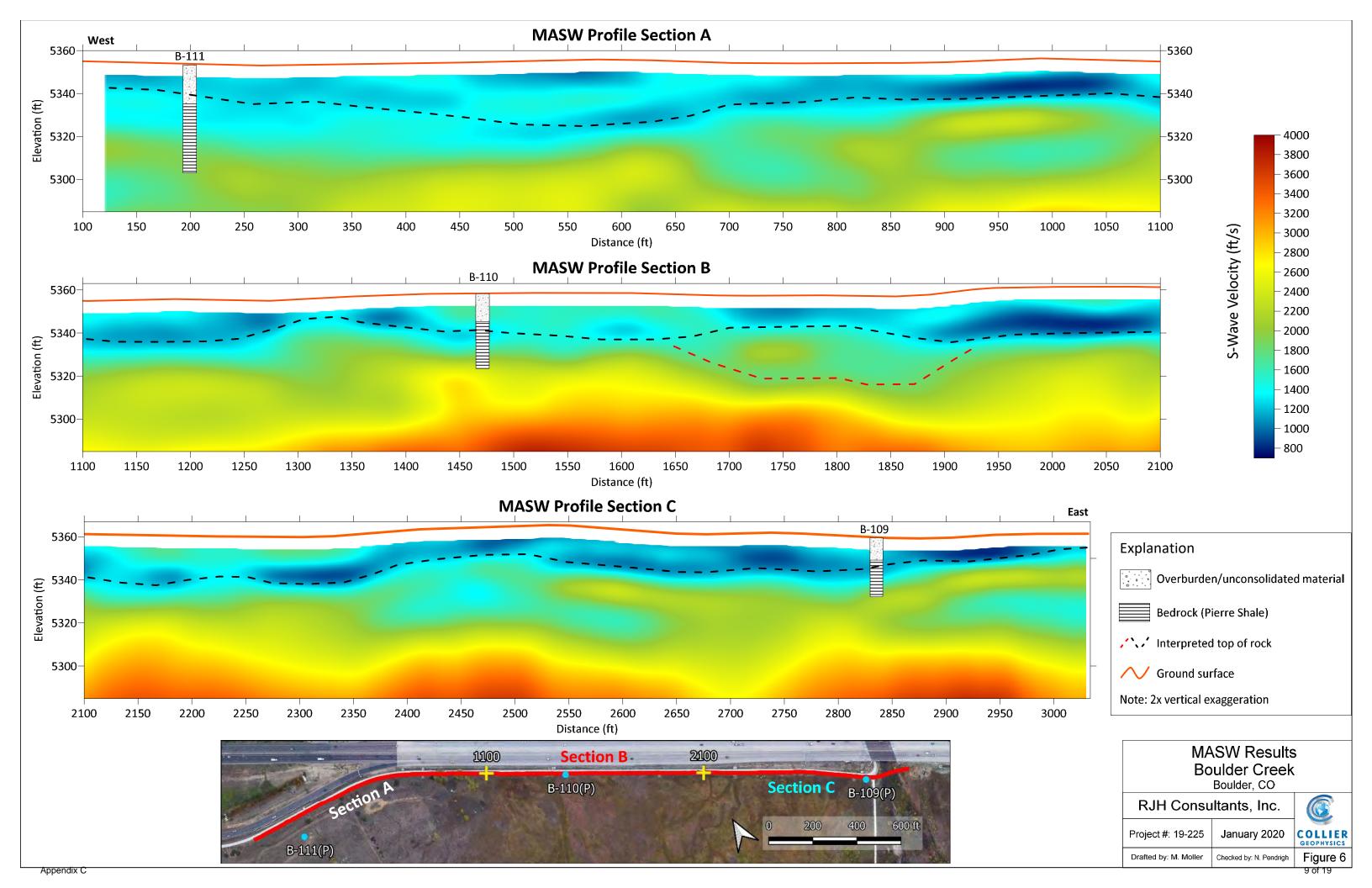
Jacob Sheekan

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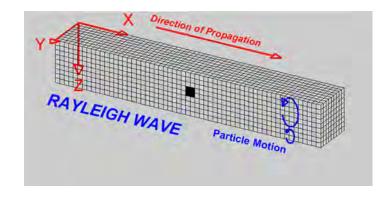


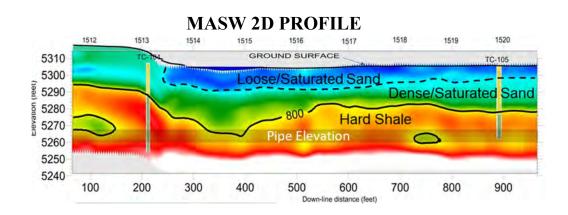
Appendix A MASW Method

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SEISMIC: ACTIVE MULTICHANNEL ANALYSIS OF SURFACE WAVES





A-1

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AN INTRODUCTION TO THE MULTICHANNEL ANALYSIS OF SURFACE WAVES (MASW) METHOD

GENERAL:

The multichannel analysis of surface waves method (MASW) is a nondestructive seismic method to evaluate the shear-wave velocity distribution and structure for overburden soil deposits and the bedrock. It analyses dispersion properties of certain types of seismic surface waves (fundamental-mode Rayleigh waves) propagating horizontally along the surface of measurement directly from impact points to receivers (hammer shot points to geophones. respectively). The method provides the shear wave (Vs) information in either 1D (depth) or 2D (depth and surface distance) formats.

The main benefit of the MASW method is to take a full advantage of the complicated nature of seismic waves that always contain body and surface wave energy. Surface wave energy comprises greater than 70% of the energy generated by an impact to the surface. Utilizing pattern-recognition techniques similar to those used in seismic exploration surveys, the MASW method properly accounts for the body waves, the ambient noise, and the surface wave energy contained in a shot record. In urban settings this method is the most applicable seismic method to map the subsurface.

OBJECTIVE:

The objective of the MASW geophysical survey method is to present in 1D or 2D format the lateral and vertical changes in shear wave velocities caused by geologic structure. The structure can be the result of stiffness changes in the overburden soils, relief on the bedrock surface, or a combination of both.

FIELD METHOD:

The fieldwork is accomplished in noisy urban environments using a specialized array of surface geophones (low frequency phones) and measuring the travel-time and frequency of energy created by hammer blows to the ground surface. The field setup generally involves laying out a line of geophones spaced appropriately for the depth of investigation and the target.

Figure 1 illustrates the basic setup for MASW field surveys. A multiple number of receivers (usually 24 or more) are deployed with an even spacing along a linear survey line with geophones connected to a multichannel seismograph. Each channel is dedicated to recording vibrations from one receiver. Typically records of 1 second are stored in the seismograph from impacts to the surface repeated several times for signal stacking, using a 1 millisecond sample interval. One multichannel record, commonly referred to as a shot gather, consists of a multiple number of time series (called traces) from all the receivers in ordered manner (i.e., 1 through 24). Because MASW processing schemes utilize a wavefield transform applied to the field data, the method has the capability to automatically account for adverse effects of near-field, far-field, spatial aliasing, and ambient energy. Therefore, acquisition parameters for MASW have a wide range of tolerance, unlike conventional refraction and reflection seismic surveys. The two most important parameters to be considered for MASW surveys are the source offset and the receiver spacing. These parameters are dependent on the site conditions and the average stiffness of the near-surface geologic materials.

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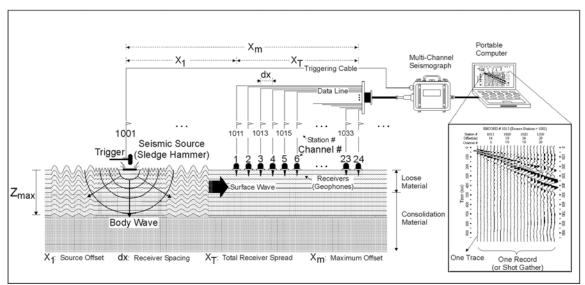


Figure 1. Schematic illustration of the typical MASW field instrumentation, setup and data recording.

Data acquisition proceeds with the linear array of geophones incrementally moving forward at an interval equal to the receiver spacing, and repeating the hammer impacts and recordings. Figure 2 presents a planview schematic diagram of the progression of field recordings. Shot and receiver geometry (i.e., spacing) remain the same of course, however the array is moved linearly along the same line as the initial setup, usually designed to be near or centered on a drill hole location.

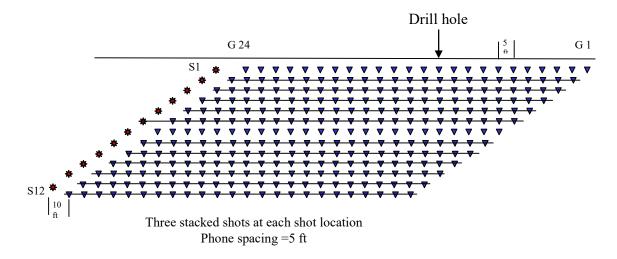


Figure 2. Typical MASW field survey setup – each setup is termed an array. G (triangles) represent geophone positions and S (stars) represent shot points.

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DATA PROCESSING:

Data processing consists of three basic steps.

- 1) Preliminary detection of surface waves;
- 2) Constructing the dispersion image panel and extracting the signal dispersion curve; and,
- 3) Back-calculating (inverting) the shear-wave variation with depth (1D)

Figure 3 illustrates these first three steps. Generally, a series of 1D profiles are generated for each array position and the process is iteratively repeated for each shot gather.

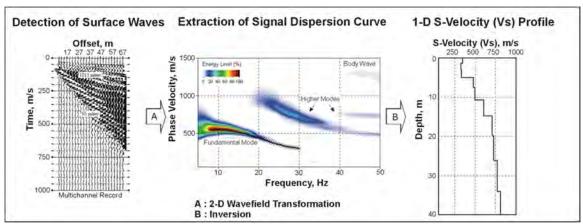


Figure 3. Illustration of the process used to derive 1D shear wave velocity profile from MASW data (from Kansas Geologic Survey).

Figure 4 defines the process flow for analysis and interpretation of MASW data. The sequence was developed and the inversion process automated using software from Kansas Geologic Survey (KGS). Data processing is complex series of iterative sequences analyzing each shot record for dispersion of the surface waves recorded, combining the acquisition parameters and extracting the optimum offset traces. The dispersion curves generated are then run through an inversion algorithm that produces a 1D velocity profile. Figure 5 shows the step-by-step process in a more schematic format than the actual flow-chart presented in Figures 4 or the first part of the data processing sequence shown in Figure 3.

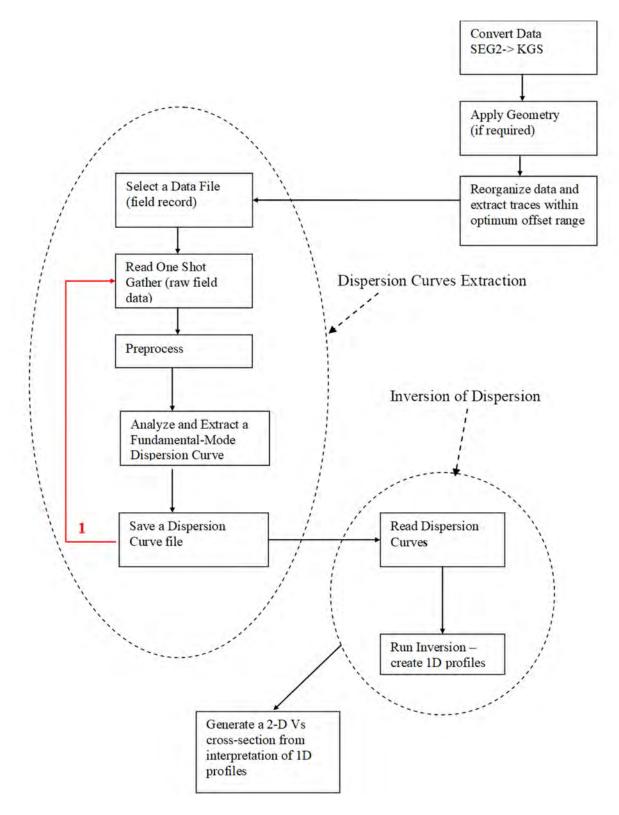


Figure 4. Processing flow used to derive MASW shear wave velocity (2D) cross-sections (from Kansas Geologic Survey).

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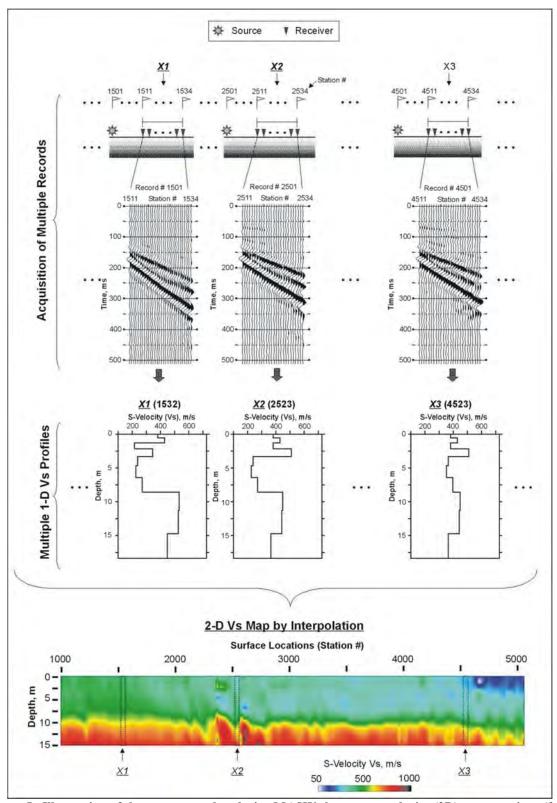


Figure 5. Illustration of the process used to derive MASW shear wave velocity (2D) cross-sections (from Kansas Geologic Survey).

RESULTS:

Because surface waves propagate approximately 90-92% of the shear wave velocity for near-surface geologic materials, and the material property that governs the speed of both of these seismic waves is the material stiffness, profiles generated with MASW surveys are shown as shear-wave profiles. MASW results are typically shown as 2D cross-section beneath the geophone array. Typically, it represents the distribution of shear-wave velocities in overburden soils, showing any lateral variation due to stiffness (e.g., cementation or induration). Shear wave velocity is NOT affected by fluids in the pore spaces, as compressional (P-) waves are and as such the MASW method cannot detect the presence of the water table. Because bedrock, even if weathered is typically much stiffer than overlying soils, the method is well-suited to map the interface between soil and bedrock. Where the bedrock is weathered, the interface may be identified as having a gradual increase in velocity (stiffness) with depth; that is a gradient between soft soils, stiff weathered bedrock, and competent (hard) bedrock.

Figure 6 shows a typical MASW cross-section where a thin layer of soft soil overlies weathered (claystone) bedrock. The bedrock grades with depth into competent claystone, siltstone and sandstone; typical shallow geology along the Rocky Mountain front range. Boring logs should be used to confirm the velocity structure with the geologic materials and posted on the 2D velocity sections as much as possible (i.e., without projection from great distances). Figure 7 shows a long (~1,000 feet) cross-section of Swave velocities obtained from a 'deep' geotechnical project in Hawaii for the Honolulu High-Capacity Transit Corridor Project (HHCTCP), where Vs data were needed to depths of greater than 150 feet below ground surface for foundation design.

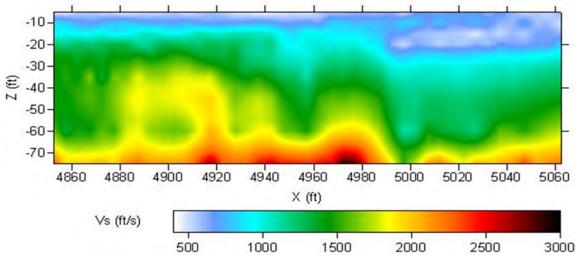


Figure 6. Example MASW shear wave velocity (2D) cross-section. Z is depth in feet, and X is distance along the ground surface in feet. Interpretation: Blue (low-velocities) represents soft overburden soils, green (moderate velocities) represents weathered bedrock, and orange/red (high-velocities) indicates competent bedrock.

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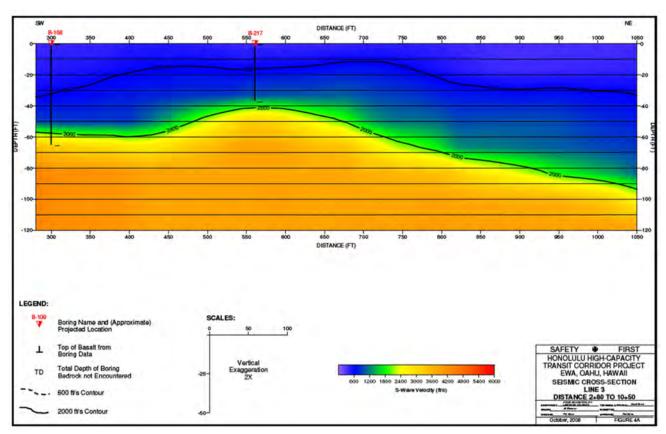


Figure 7. Example passive 2D MASW shear wave velocity (2D) cross-section. Z is depth in feet, and X is distance along the ground surface in feet. Interpretation: Blue (low-velocities) represents soft overburden soils, green (moderate velocities) represents weathered bedrock, and orange/red (high-velocities) represents competent bedrock. This project is for deep geotechnical needs on the Island of Oahu, Hawaii.

A-8

REFERENCES:

Park, C.B., R.D. Miller and J. Zia, 1999. Multichannel analysis of surface Waves. Geophysics, Vol. 64, No. 3, pp. 800-808. (Kansas Geologic Survey)

Louie, J.N. 2001 "Faster, Better: Shear-Wave Velocity to 100 Meters Depth from Refraction Microtremor Arrays", Bulletin of the Seismological Society of America, Vol. 91, no. 2.

Example of Specifics used for an Environmental Project at a Dry Cleaner Facility (Project No. 1/05-119-01.4301 – Aurora Colorado).

Field Instrumentation: (pictured to the right)

RAS-24 Seistronix 24-channel seismograph

HP field laptop computer with RAS-24 system software

GeoStuff 24-channel landstreamer – 4.5 Hz geophones, 5-foot geophone spacing,

115 total length

Source – 16 lbs sledge hammer,

Records:

1 second record length

1 millisecond sample interval

3 blows per station on aluminum plate

Station interval – 5 feet

Source interval – 10 feet (to first geophone)

Processing software – MASW SurfSeis (KGS)

proprietary software

Four lines occupied: Lines A, B, C and D.

Line A - 32 shot records, 275 feet

Line B - 42 shot records, 325 feet

Line C - 42 shot records, 325 feet

Line D - 65 shot records, 440 feet



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Appendix D

BOREHOLE LOG DESCRIPTORS

Bu Bulk sample

CA 2.0-inch I.D. ring-lined split barrel California sample

DM 2.5-inch I.D. ring-lined split barrel Dames and Moore (modified California)

sample

RQD Rock Quality Designation

S 1.375-inch I.D. standard split-spoon sample (unlined)

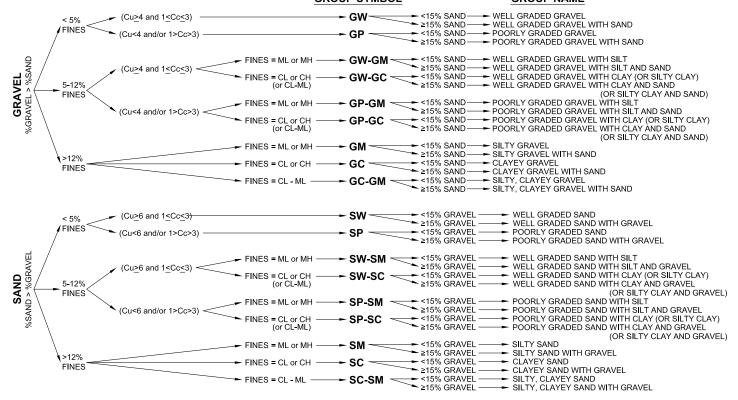
U Shelby Tube sample

Appendix D 2 of 17

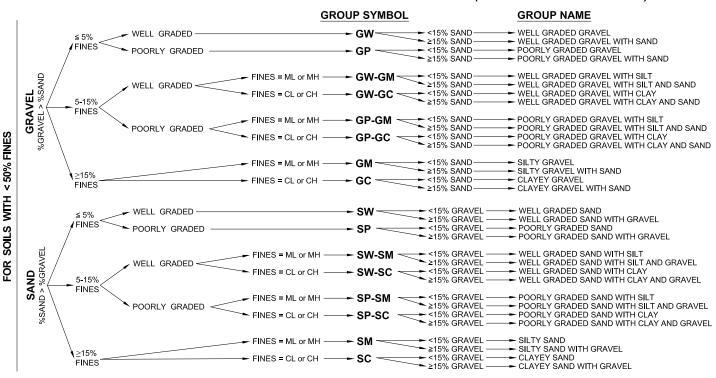
SOIL CLASSIFICATION FLOWCHARTS AND DESCRIPTION CRITERIA

COARSE GRAINED SOILS (< 50% FINES)

A) FLOWCHART APPLIED TO LABORATORY TESTED SOIL SAMPLES. ADAPTED FROM ASTM D 2487 CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES (USCS). GROUP SYMBOL GROUP NAME

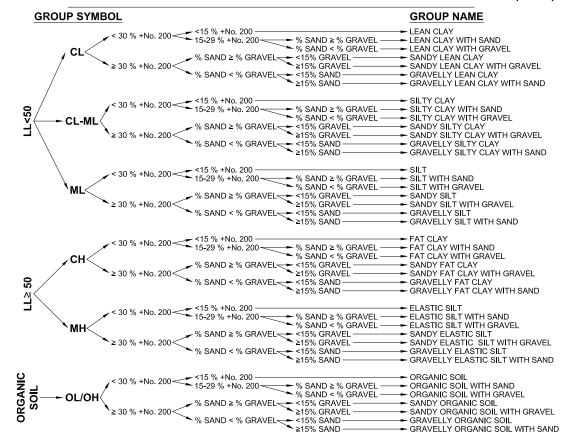


B) FLOWCHART APPLIED TO FIELD CLASSIFIED SOIL SAMPLES. ADAPTED FROM ASTM D 2488 DESCRIPTION AND IDENTIFICATION OF SOILS (VISUAL-MANUAL PROCEDURE).

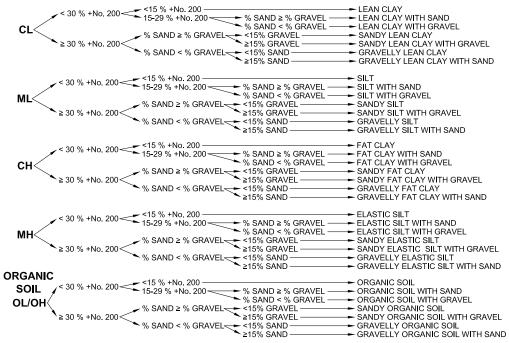


FINE GRAINED SOILS (≥ 50% FINES)

A) FLOWCHART APPLIED TO LABORATORY TESTED SOIL SAMPLES.
ADAPTED FROM ASTM D 2487 CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES (USCS).



B) FLOWCHART APPLIED TO FIELD CLASSIFIED SOIL SAMPLES. ADAPTED FROM ASTM D 2488 DESCRIPTION AND IDENTIFICATION OF SOILS (VISUAL-MANUAL PROCEDURE). GROUP SYMBOL GROUP NAME



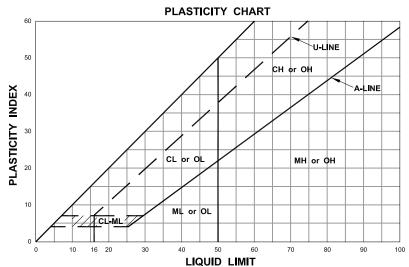
NOTE:

UPDATED 03-2014

THE PLASTICITY CHART ON THE FOLLOWING PAGE WAS USED TO IDENTIFY THE GROUP SYMBOL FOR FLOWCHART A.

A COMBINATION OF THE VISUAL MANUAL CRITERIA ON THE FOLLOWING PAGE WERE USED TO IDENTIFY THE GROUP SYMBOL FOR FLOWCHART B.

SOIL PLASTICITY CHARACTERISTICS



A) IDENTIFICATION OF FINES GROUP SYMBOL FROM LABORATORY TESTS.
REPRODUCED FROM ASTM D 2487 CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES (USCS).

B) IDENTIFICATION OF FINES GROUP SYMBOL FROM VISUAL-MANUAL CRITERIA. REPRODUCED FROM ASTM D 2488 DESCRIPTION AND IDENTIFICATION OF SOILS (VISUAL-MANUAL PROCEDURE).

| DRY STRENGTH | | |
|-----------------------------------|--|--|
| DESCRIPTION | CRITERIA | |
| NONE | CRUMBLES TO POWDER WHILE HANDLING. | |
| LOW | CRUMBLES TO POWDER WITH SOME FINGER PRESSURE. | |
| MEDIUM | BREAKS INTO PIECES OR CRUMBLES WITH CONSIDERABLE FINGER PRESSURE. | |
| HIGH | CANNOT BE BROKEN WITH FINGER PRESSURE. BREAKS INTO PIECES BETWEEN THUMB AND HARD SURFACE. | |
| VERY HIGH | CANNOT BE BROKEN BETWEEN THUMB AND HARD SURFACE. | |
| DILATANCY (RESISTANCE TO SHAKING) | | |
| DESCRIPTION | CRITERIA | |
| NONE | NO VISIBLE CHANGE IN SPECIMEN. | |
| SLOW | WATER APPEARS SLOWLY ON THE SURFACE OF THE SPECIMEN DURING SHAKING AND DOES NOT DISAPPEAR OR DISAPPEARS SLOWLY UPON SQUEEZING. | |
| RAPID | WATER APPEARS QUICKLY ON THE SURFACE OF THE SPECIMEN DURING SHAKING AND DISAPPEARS QUICKLY UPON SQUEEZING. | |

| TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT) | | | |
|--|--|--|--|
| DESCRIPTION | PTION CRITERIA | | |
| LOW | ONLY SLIGHT PRESSURE IS REQUIRED TO ROLL THE THREAD. THREAD AND LUMP ARE WEAK AND SOFT. | | |
| MEDIUM | MEDIUM PRESSURE IS REQUIRED TO ROLL THE THREAD. THREAD AND LUMP HAVE MEDIUM STIFFNESS. | | |
| HIGH | CONSIDERABLE EFFORT IS REQUIRED TO ROLL THE THREAD. THREAD AND LUMP HAVE HIGH STIFFNESS. | | |
| | PLASTICITY | | |
| DESCRIPTION | CRITERIA FOR A 1/8-INCH (3 mm) THREAD. | | |
| NON-PLASTIC | THREAD CANNOT BE ROLLED. | | |
| LOW | THREAD CAN BARELY BE ROLLED AND THE LUMP CANNOT BE FORMED WHEN DRIER THAN THE PLASTIC LIMIT. | | |
| MEDIUM | THREAD IS EASY TO ROLL AND NOT MUCH TIME IS REQUIRED TO REACH THE PLASTIC LIMIT. THE THREAD CANNOT BE RE-ROLLED SEVERAL TIMES AFTER REACHING THE PLASTIC LIMIT. THE LUMP CRUMBLES WHEN DRIER THAN THE PLASTIC LIMIT. | | |
| HIGH | IT TAKES CONSIDERABLE TIME ROLLING AND KNEADING TO REACH THE PLASTIC LIMIT. THE THREAD CAN BE RE-ROLLED SEVERAL TIMES AFTER REACHING THE PLASTIC LIMIT. THE LUMP CAN BE FORMED WITHOUT CRUMBLING WHEN DRIER THAN THE PLASTIC LIMIT. | | |

| SYMBOL | DRY STRENGTH | DILATANCY | TOUGHNESS AND PLASTICITY | PLASTICITY |
|--------|------------------|--------------|-----------------------------|--------------------|
| ML | NONE - LOW | SLOW - RAPID | LOW | LOW TO NON-PLASTIC |
| CL | MEDIUM - HIGH | NONE - SLOW | MEDIUM | LOW TO MEDIUM |
| MH | LOW - MEDIUM | NONE - SLOW | LOW TO MEDIUM | LOW TO MEDIUM |
| CH | HIGH - VERY HIGH | NONE | HIGH | HIGH |

SOIL GRAIN SIZE AND ANGULARITY

PARTICLE ANGULARITY









UPDATED 03-2014

TABLE 1.1 CRITERIA FOR DESCRIBING SOIL STRUCTURE⁽¹⁾

| Description | Criteria | |
|--------------|--|--|
| Stratified | Alternating layers of varying material or color with layers greater than or equal to 1/4 inch thick (6 mm) | |
| Laminated | Alternating layers of varying material or color with layers less than 1/4 inch thick (6 mm) | |
| Fissured | Breaks along definite plates of fracture with little resistance to fracturing | |
| Slickensided | Fracture planes appear polished or glossy, sometimes striated | |
| Blocky | Cohesive soil that can be broken down into small angular lumps which resist further breakdown | |
| Lensed | Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay | |
| Homogeneous | Same color and appearance throughout | |

Note:

TABLE 1.2
RELATIVE DENSITY OF SANDS ACCORDING TO RESULTS OF STANDARD PENETRATION TEST⁽¹⁾

| Number of Blows N | Relative Density | |
|-------------------|------------------|--|
| 0-4 | Very Loose | |
| 5-10 | Loose | |
| 11-30 | Medium | |
| 31-50 | Dense | |
| Over 50 | Very Dense | |

Note:

TABLE 1.3 GUIDE FOR STIFFNESS OF FINE-GRAINED SOILS⁽¹⁾

| Description | Criteria | Estimated Unconfined Compressive Strength (TSF) |
|-------------|---|---|
| Very Soft | Extrudes between fingers when squeezed | <0.25 |
| Soft | Molded by light finger pressure | 0.25-0.50 |
| Medium | Molded by strong finger pressure | 0.50-1.00 |
| Stiff | Readily indented by thumb or penetrated with great effort | 1.00-2.00 |
| Very Stiff | Readily indented by thumbnail | 2.00-4.00 |
| Hard | Indented with difficulty by thumbnail | >4.00 |

Note:

Modified from ASTM D 2488 Description and Identification of Soils (Visual-Manual Procedure) and differ from the U.S. Bureau of Reclamation Engineering Geology Field Manual (2001).

^{1.} Modified from Terzaghi, Peck, and Mesri (1996).

^{1.} Reproduced from NAVFAC (1986).

TABLE 1.4 CRITERIA FOR DESCRIBING SOIL MOISTURE CONDITION⁽¹⁾

| Description | Criteria | |
|-------------|---|--|
| Dry | Absence of moisture, dusty, dry to the touch | |
| Moist | Damp but no visible water | |
| Wet | Visible free water, usually soil is below the water table | |

Note:

1. Reproduced from ASTM 2488 Description and Identification of Soils (Visual-Manual Procedure).

TABLE 1.5 CRITERIA FOR DESCRIBING SOIL CEMENTATION⁽¹⁾⁽²⁾

| Description | Criteria | |
|-------------|--|--|
| Weak | Crumbles or breaks with handling or little finger pressure | |
| Moderate | Crumbles or breaks with considerable finger pressure | |
| Strong | Will not crumble or break with finger pressure | |

Notes:

- 1. Reproduced from ASTM 2488 Description and Identification of Soils (Visual-Manual Procedure).
- 2. The absence of cementation was not recorded on boring logs.

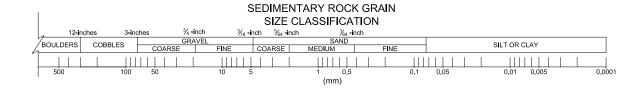
TABLE 1.6 CRITERIA FOR DESCRIBING SOIL REACTION WITH HCL⁽¹⁾

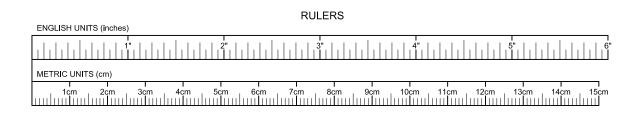
| Description | Criteria | |
|---------------------|--|--|
| None ⁽²⁾ | No visible reaction | |
| Weak | Some reaction, with bubbles forming slowly | |
| Strong | Violent reaction, with bubbles forming immediately | |

Notes:

- 1. Reproduced from ASTM 2488 Description and Identification of Soils (Visual-Manual Procedure).
- 2. The absence of a reaction was not recorded on boring logs.

SEDIMENTARY ROCK CLASSIFICATION AND CRITERIA FOR DESCRIPTIONS





| | PARTICLE A | NGULARITY | |
|---------|------------|------------|---------|
| | | | |
| ROUNDED | SUBROUNDED | SUBANGULAR | ANGULAR |

| PLASTICITY | | | |
|-------------|---|--|--|
| DESCRIPTION | CRITERIA | | |
| NON-PLASTIC | A $\frac{1}{8}$ in. (3mm) THREAD CANNOT BE ROLLED AT ANY WATER CONTENT. | | |
| LOW | THE THREAD CAN BARELY BE ROLLED AND THE LUMP CANNOT BE FORMED WHEN DRIER THAN THE PLASTIC LIMIT. | | |
| MEDIUM | THE THREAD IS EASY TO ROLL AND NOT MUCH TIME IS REQUIRED TO REACH THE PLASTIC LIMIT. THE THREAD CANNOT BE RE-ROLLED AFTER REACHING THE PLASTIC LIMIT. THE LUMP CRUMBLES WHEN DRIER THAN THE PLASTIC LIMIT. | | |
| HIGH | IT TAKES CONSIDERABLE TIME ROLLING AND KNEADING TO REACH THE PLASTIC LIMIT. THE THREAD CAN BE RE-ROLLED SEVERAL TIMES AFTER REACHING THE PLASTIC LIMIT. THE LUMP CAN BE FORMED WITHOUT CRUMBLING WHEN DRIER THAN THE PLASTIC LIMIT. | | |

NOTES:

- SOURCE: ASTM D2488.
 ONLY APPLIES TO FINE-GRAINED ROCKS SUCH AS CLAYSTONE.

TABLE 2.1 GENERAL SEDIMENTARY ROCK TYPES

| Rock Type | General Description | | |
|--------------|--|--|--|
| Conglomerate | Mostly gravel, cobbles, or boulders; grains are rounded to subrounded. | | |
| Breccia | Mostly gravel, cobbles, or boulders; grains are angular to subangular. | | |
| Sandstone | Mostly sand sized particles. | | |
| Siltstone | Mostly silt sized particles that are generally non to low plastic. | | |
| Claystone | Mostly clay sized particles that are generally low to high plastic fines. | | |
| Mudstone | Mostly clay sized particles that are generally low to high plastic fines. | | |
| ividusione | Generally less competent and more friable than claystone. | | |
| Shale | Mostly clay sized particles that are generally low to high plastic fines; more | | |
| | competent than claystone; fissile along bedding planes. | | |

TABLE 2.2 BEDDING, FOLIATION, OR FLOW TEXTURE DESCRIPTIONS⁽¹⁾⁽²⁾

| Descriptor | Thickness/Spacing | | | | | |
|--|---|--|--|--|--|--|
| Massive | Greater than 10 ft. (3 m) | | | | | |
| Very Thickly (Bedded, Foliated, or Banded) | 3 to 10 ft. (1 to 3 m) | | | | | |
| Thickly | 1 to 3 ft. (300 mm to 1 m) | | | | | |
| Moderately | 0.3 to 1 ft. (100 to 300 mm) | | | | | |
| Thinly | 0.1 to 0.3 ft. (30 to 100 mm) | | | | | |
| Very Thinly | 0.03 [3/8-in.] to 0.1 ft. (10 to 30 mm) | | | | | |
| Laminated (Intensely Foliated or Banded) | Less than 0.03 ft. [3/8-in] (10 mm) | | | | | |

Notes:

- 1. The dip of the bedding noted on the logs is measured from horizontal for vertical boreholes and normal to the axis on angled boreholes.
- 2. Reproduced from U.S. Bureau of Reclamation, Engineering Geology Field Manual (2001).

14-2-26_Soil_and_Rock_Descriptors.doc.docx

TABLE 2.3 WEATHERING DESCRIPTORS

| | | Diagnostic Features | atures | | |
|-----------------------|---|---|--|--|---|
| | Chemical Weathering – Discoloration and/or Oxidation | or Oxidation | Mechanical Weathering | | |
| Weathering Descriptor | Body of Rock | Fracture Surfaces ⁽²⁾ | (Grain boundary conditions-use with granitics and coarse grained sediments) | Texture | Solutioning |
| Fresh | No discoloration, not oxidized | No discoloration or oxidation | No separation, intact (tight) | No change | No Solutioning |
| | SIIS | Slightly weathered to fresh ⁽¹⁾ | | | |
| Slightly weathered | Discoloration or oxidation is limited to surface or short distance from, fractures: some feldspar crystals are dull | Minor to complete discoloration or oxidation of most surfaces | No visible separation, intact (tight) | Preserved | Minor leaching of some soluble minerals may be noted |
| | Mode | Moderately to slightly weathered (1) |) | | |
| Moderately weathered | Discoloration or oxidation extends from fractures, usually throughout: Fe-Mg minerals are "rusty", feldspar crystals are "cloudy" | All fracture surfaces are discolored or oxidized | Partial separation of boundaries visible | Generally Preserved | Soluble minerals may be mostly leached |
| | Intense | Intensely to moderately weathered | (1) | | |
| Intensely weathered | Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundaries conditions | All fracture surfaces are discolored or oxidized, surfaces friable | Partial separation, rock is friable; in semi-arid conditions granitics are disaggregated | Texture altered by chemical disintegration (hydration) | Leaching of soluble minerals may be complete |
| | Λ | Very intensely weathered ⁽¹⁾ | | | |
| Decombosed | Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay | | Complete separation of grain boundaries (disaggregated) | Resembles a soil, partial, or complete remnant i structure may be preserved; leaching of soluble minerals usually complete | Resembles a soil, partial, or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete |
| | | | | | |

Notes.

This chart and its horizontal categories are most readily applied to rocks with feldspars and mafic minerals. Weathering in various sedimentary rocks, particularly limestones and poorly indurated sediments, will not always fit the categories established. This chart and weathering categories may have to be modified for particular site conditions or alteration such as hydrothermal effects; however, the basic framework and similar descriptors are to be used.

- Combination descriptors are permissible where equal distribution of both weathering characteristics are present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, dual descriptors should not be used where significant, identifiable zones can be delineated. When given as a range, only two adjacent terms may be combined (i.e., decomposed to slightly weathered or moderately weathered to fresh are not acceptable).
 - Does not include directional weathering along shears or faults and their associated features. For example, a shear zone that carried weathering to great depths into a fresh rock mass would not require the rock mass to be classified as weathered. ď
 - 3. Reproduced from U.S. Bureau of Reclamation, Engineering Geology Field Manual (2001).

TABLE 2.4 FRACTURE DENSITY DESCRIPTORS⁽¹⁾

| Descriptor | Criteria | | | | | | | |
|---|--|--|--|--|--|--|--|--|
| • | (Excludes Mechanical Breaks) | | | | | | | |
| Unfractured No observed fractures. | | | | | | | | |
| Very Slightly Fractured Core recovered mostly in lengths greater than 3 feet (1 m). | | | | | | | | |
| Slightly to Very Slightly Fractured (2) | | | | | | | | |
| Slightly Fractured Core recovered mostly in lengths from 1 to 3 feet (300 to 1,000 mm few scattered lengths less than 1 foot (300 mm) or greater than 3 few (1,000 mm). | | | | | | | | |
| Moderately to Slightly Fractured (2) | | | | | | | | |
| Moderately Fractured | Core recovered mostly in lengths from 0.33 to 1.0 foot (100 to 300 mm) lengths with most lengths about 0.67 foot (200 mm). | | | | | | | |
| | Intensely to Moderately Fractured ⁽²⁾ | | | | | | | |
| Intensely Fractured | Lengths average from 0.1 to 0.33 foot (30 to 100 mm) with scattered fragmented intervals. Core recovered mostly in lengths less than 0.33 foot (100 mm). | | | | | | | |
| Very Intensely to Intensely Fractured (2) | | | | | | | | |
| Very Intensely Fractured Core recovered mostly as chips and fragments with a few some core lengths. | | | | | | | | |

Notes:

- 1. Reproduced from U.S. Bureau of Reclamation, Engineering Geology Field Manual (2001).
- 2. Combinations of fracture densities are permissible (e.g., very intensely to intensely fractured or moderately to slightly fractured) where equal distribution of both fracture density characteristics are present over a significant core interval or exposure, or where characteristics are "in between" the descriptor definitions.

TABLE 2.5 ROCK HARDNESS / STRENGTH DESCRIPTORS⁽¹⁾

| Alphanumeric Descriptor | Descriptor | Criteria | | | | | | | |
|----------------------------|-----------------|---|--|--|--|--|--|--|--|
| H1 | Extremely Hard | Core, fragment, or exposure cannot be scratched with knife or sharp pick; can only be chipped with repeated heavy hammer blow. | | | | | | | |
| H2 | Very Hard | Cannot be scratched with knife or sharp pick. Core or fragment breaks with repeated heavy hammer blow. | | | | | | | |
| H3 | Hard | Can be scratched with knife or sharp pick with difficulty (heavy pressure). Heavy hammer blow required to break specimen. | | | | | | | |
| H4 | Moderately Hard | Can be scratched with knife or sharp pick with light or moderate pressure. Core or fragment breaks with moderate hammer blow. | | | | | | | |
| H5 | Moderately Soft | Can be grooved 1/16 inch (2 mm) deep by knife or sharp pick with moderate or heavy pressure. Core or fragment breaks with light hammer blow or heavy manual pressure. | | | | | | | |
| H6 | Soft | Can be grooved or gouged easily by knife or sharp pick with light pressure. Can be scratched with fingernail. Breaks with light to moderate manual pressure. | | | | | | | |
| H7 | Very Soft | Can be readily indented, grooved, or gouged with fingernail, or carved with a knife. Breaks with light manual pressure. | | | | | | | |

Note:

1. Reproduced from U.S. Bureau of Reclamation, Engineering Geology Field Manual (2001).

TABLE 2.6 FRACTURE OPENNESS DESCRIPTORS⁽¹⁾

| Alphanumeric Descriptor | Descriptor | Openness |
|-------------------------|-----------------|---|
| 00 | Tight | No visible separation |
| 01 | Slightly Open | Less than 0.003 ft [1/32 in] (< 1 mm) |
| O2 | Moderately Open | 0.003 to 0.01 ft [1/32 to 1/8 in] (1 to 3 mm) |
| O3 | Open | 0.01 to 0.03 ft [1/8 to 3/8 in] (3 to 10 mm) |
| 04 | Moderately Wide | 0.03 to 0.1 ft [3/8 to 1.2 in] (10 to 30 mm) |
| O5 | Wide | Greater than 0.1 ft [1.2 in] (> 30 mm) |

Note:

1. Reproduced from U.S. Bureau of Reclamation, Engineering Geology Field Manual (2001).

TABLE 2.7 FRACTURE ROUGHNESS DESCRIPTORS⁽¹⁾

| Alphanumeric Descriptor | Roughness Descriptor | Criteria | | | | | | | | | |
|-------------------------|---------------------------|--|--|--|--|--|--|--|--|--|--|
| R1 | Stepped | Near-normal steps and ridges occur on the fracture surface. | | | | | | | | | |
| R2 | Rough | Large angular asperities can be seen. | | | | | | | | | |
| R3 | Moderately Rough | Asperities are clearly visible and fracture surface feels abrasive. | | | | | | | | | |
| R4 | Slightly Rough | Small asperities on the fracture surface are visible and can be felt. | | | | | | | | | |
| R5 | Smooth | No asperities, smooth to the touch. | | | | | | | | | |
| R6 | Polished/ Slickensided | Extremely smooth and shiny. A polished fault surface, often with a lineation parallel to the displacement direction. | | | | | | | | | |

Note:

1. Reproduced from U.S. Bureau of Reclamation, Engineering Geology Field Manual (2001).

TABLE 2.8 FRACTURE FILLING THICKNESS DESCRIPTORS⁽¹⁾

| Alphanumeric Descriptor | Fracture Filling Descriptor | Thickness |
|----------------------------|-----------------------------|---|
| T0 | Clean | No film or coating |
| T1 | Very Thin | Less than 0.003 ft [1/32 in] (< 1 mm) |
| T2 | Moderately Thin | 0.003 to 0.01 ft [1/32 to 1/8 in] (1 to 3 mm) |
| T3 | Thin | 0.01 to 0.03 ft [1/8 to 3/8 in] (3 to 10 mm) |
| T4 | Moderately Thick | 0.03 [3/8 in] to 0.1 ft (10 to 30 mm) |
| T5 | Thick | Greater than 0.1 ft (> 30 mm) |

Note:

1. Reproduced from U.S. Bureau of Reclamation, Engineering Geology Field Manual (2001).

TABLE 2.9 REACTION WITH HCL⁽¹⁾

| Descriptor | Criteria |
|---------------------|--|
| None ⁽²⁾ | No visible reaction |
| Weak | Some reaction, with bubbles forming slowly |
| Strong | Violent reaction, with bubbles forming immediately |

Notes:

- Reproduced from ASTM 2488 Description and Identification of Soils (Visual-Manual Procedure).
 The absence of a reaction was not recorded on boring logs.

- ASTM D 2487 (2011). Standard Classification of Soils for Engineering Purposes (USCS). June.
- ASTM D 2488 (2009). Standard Practice for Description and Identification of Soils (Visual-Manual Method). July.
- Bates, Robert C. and Jackson, Julia A. (1984). *Dictionary of Geologic Terms*, 3rd Edition.
- Hunt, Roy E. (Hunt) (2005). Geotechnical Investigation Handbook.
- Naval Facilities Engineering Command (NAVFAC) (1986). Soil Mechanics Design Manual 7.01 (DM-7;01). September.
- Terzaghi, Karl, Peck, Ralph B., and Mesri, Gholamreza. (Terzaghi, Peck, and Mesri). (1996). *Soil Mechanics in Engineering Practice*.
- U.S. Bureau of Reclamation (USBR) (2001). Engineering Geology Field Manual.

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Borehole Logs

Borehole ID: OG OF SOIL BORING Start Date: 02-17-2020 End Date: 02-18-2020 B-201(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 17.5 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236619.7, E 3074124.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5358.8 ft Total Depth: 38.0 ft Groundwater EI: 5353.3 ft On Date: 02-17-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation S-1: Clayey Sand with Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 25-35% fines, low to medium plasticity; 15-25% gravel, fine to coarse grained, subangular to subrounded; maximum particle size = 1.25 inches; medium dense; moist; brown; occasional roots; weak reaction with HCI; (SC); 2/5/20 1.5 1.5 S - 1 Minor grinding, brown cuttings. 5356.8 2 S-2, D-3, CA-4, S-5, S-6: Poorly Graded Gravel with Clay and Sand Mostly gravel, fine to coarse grained, subangular to subrounded; 25-35% sand, fine to coarse grained, subangular to subrounded; 5-15% fines, low plasticity; maximum particle size = 1.25 inches; dense; dry; light brown; (GP-GC); [Alluvium] 3 26/22/20 1.5 0.9 4.5 to 7.0 ft: maximum particle size = 2.5 inches; very dense; slightly moist; brown; 5 Groundwater encountered at 5.5 feet during drilling on 2/17/20. D - 317/25/45 1.5 0.8 Grinding. 7.0 to 9.0 ft: Mostly gravel; 35-45% sand; Fines are low to medium plasticity; maximum particle size = 2.5 inches; very dense; slightly moist; CA - 4 0.4 0.2 50 for 5 inches 8 9.0 to 11.7 ft: 35-45% sand; maximum particle size = 1.25 inches; very dense; moist;

Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have influenced blow counts and sample recovery. Boring completed as monitoring well.

Notes



Appendix E 1 of 87

Borehole ID: OG OF SOIL BORI Start Date: 02-17-2020 End Date: 02-18-2020 B-201(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 17.5 ft Checked By: ABP Sheet 2 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236619.7, E 3074124.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5358.8 ft Total Depth: 38.0 ft Groundwater EI: 5353.3 ft On Date: 02-17-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation 0.7 S - 5 40/50 for 2 inches 0.5 Minor grinding. Increasing amount of gravel in cuttings. 11.7 to 14.5 ft: 35-45% sand; maximum particle size = 1.5 inches; very dense; wet; 12 Falling head test performed with bottom of the augers at 12.5 feet before performing S-6. 13 16/33/40 1.5 1.1 14 5344.3 S-7: Poorly Graded Sand with Clay and Gravel Mostly sand; 15-25% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, low to medium plasticity; maximum particle size = 1.5 inches; very dense; wet; brown; (SP-SC); 15 [Alluvium] S - 7 20/35/50 for 1 inch 1.1 1.1 16 17 Slow drilling, grinding. 5341.3 Top of bedrock at 17.5 feet. S-8: Shale Mostly fines, medium plasticity; 5-15% sand; fresh to slightly weathered; dry to moist; gray; weak to strong reaction with 18 S - 8 20/50 for 6 inches 1.0 1.0 [PIERRE SHALE]
17.5 to 17.6 ft: moderately to intensely weathered; 5339.8 Augered to 19.0 feet and 19 End of boring log at 19.00 ft switched to NQ3 coring equipment after performing S-8. Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have influenced blow counts and sample recovery. Boring completed as monitoring well.

Appendix E 2 of 87

Start Date: 02-17-2020 End Date: 02-18-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-201(P) Bedrock Depth: 17.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236619.7, E 3074124.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5358.8 ft Total Depth: 38.0 ft Groundwater EI: 5353.3 ft On Date: 02-17-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo Shortest (ft) RQD, ft (%) Joint Description € Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 12 13 14 15 16 17 18 5339.8 19 19.0 to 38.0 ft: Shale Laminated; mostly fines, medium to high plasticity; less than 5% sand; fresh to slightly weathered; unfractured; dry to moist; gray; weak reaction with HCl; [PIERRE SHALE] Core loss

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

0.3 <0.1 Н7

5 5

19.0 to 20.0

NQ-1

0.7 (70) 0.0

1.0



Continued on next shee

Appendix E 3 of 87

Mechanical break Mechanical break Mechanical break

Mechanical break

LOG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Notes

Boring Location: N 1236619.7, E 3074124.6 ft

Start Date: 02-17-2020 Driller: Elite - Greg

Driller: Elite - Greg Logged
Bedrock Depth: 17.5 ft Checked
Plunge: 90.0 Bear

End Date: 02-18-2020 Logged By: SMG Checked By: ABP Bearing: Not applicable Borehole ID: B-201(P) Sheet 4 of 5

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Equipment: NQ3 Wireline Rock Coring

| | Ground | d El: 5358.8 ft | Tota | l Dep | th: 38 | | | | | Equip | omen | t: NQ | 3 Wireline Rock | Coring |
|-------------|------------|---|-----------------|------------------|------------------|-------------|-------------------|---------------|--------------|---------------|----------|-----------------|------------------------------------|--|
| Elevation O | Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | (£) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (Min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | To the control of the |
| | 21 | NQ-2 Smooth drilling. | 20.0 to 23.0 | | | 3.0 (100) | | 1 | 3.0 | 3.0 | Н7 | | 7.5 | |
| | 23 | NQ-3 | 23.0 to 25.0 | 2.0 | 1.9 (95) | 1.9 (95) | 5 | 2 | 1.8 | 0.1 | Н7 | P-1 | Core loss Mechanical break | |
| | 26 | Drillers stopped core run at 27.5 feet because of plugged bit. NQ-4 Full circulation. | 25.0 to 27.5 | 2.5 | 3.0 (120) | 3.0 (120) | 6 | 2 | 2.9 | 0.1 | Н7 | P-2 | Mechanical break Mechanical break | 25.0 to 30.0 ft: Fines are medium plasticity; |
| | 28 | NQ-5 | 27.5 to 30.0 | 2.5 | 2.4 (96) | 2.4 (96) | 6 | 2 | 2.3 | 0.1 | H7 | | Mechanical break | Continued on next sheet |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Start Date: 02-17-2020 End Date: 02-18-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-201(P) Bedrock Depth: 17.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 5 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236619.7, E 3074124.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5358.8 ft Total Depth: 38.0 ft Groundwater EI: 5353.3 ft On Date: 02-17-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 30.0 to 34.0 ft: Fines are medium plasticity; very slightly fractured; 20 degrees, Slightly to moderately open, slightly rough, clean 31 4.0 4.0 (100) (100) NQ-6 4.0 14 3 2.6 0.3 32 34.0 33 Mechanical break P-3 34 34.0 to 38.0 ft: Fines are medium plasticity; 34.0 to 1.0 1.0 NQ-7 1.0 3 3 0.5 0.3 Н7 Mechanical break (100) (100) Mechanical break 35 Mechanical break Full circulation, smooth drilling 36 Mechanical break 3.3 3.3 (110) (110) 35.0 to H7 NQ-8 3.0 7 3 2.0 0.4 37 5320.8 38 Bottom of boring at End of rock core log at 38.00 ft 38.0 feet. 39 Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

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Borehole ID: OG OF SOIL BORING Start Date: 02-03-2020 End Date: 02-06-2020 B-202(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 15.1 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236886.2, E 3074595.9 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5351.8 ft Total Depth: 35.0 ft Groundwater EI: 5341.8 ft On Date: 02-03-2020 Recovery (ft) Penetration Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation S-1, CA-2, CA-3, S-4, CA-5, S-6, S-7: Clayey Sand with Gravel Grinding. Mostly sand, fine to coarse grained, subangular to subrounded; 20-30% fines, low plasticity; 15-25% gravel, fine to coarse grained, subangular to subrounded; maximum particle size = 1.5 inches; medium dense; slightly 3/10/7 1.5 1.0 S - 1 moist; brown; (SC); 2 2.0 to 4.3 ft: Fines are low to medium plasticity; 10-20% gravel; maximum particle size = 1.75 inches; 1.0 1.0 3 CA - 2 14/21 Continuous grinding, dark brown cuttings. 4.3 to 6.8 ft: 15-25% fines; organics; 5 CA - 3 16/9 1.0 0.6 6.8 to 9.5 ft: 15-25% fines; dry; brown-black; Black gravel-sized particles recovered in S-4, S-5, and S-6. Particles consist of strongly cemented black sand-sized 8 particles. 2/12/17 1.5 1.3 S - 4 Smooth drilling, darker brown cuttings 9.5 to 11.8 ft: 15-25% fines; maximum particle size = 1.25 inches; moist to wet; brown-black;

Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have influenced blow counts and sample recovery. Boring completed as monitoring well.

Notes



Continued on next sheet

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Borehole ID: OG OF SOIL BORING Start Date: 02-03-2020 End Date: 02-06-2020 B-202(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 15.1 ft Checked By: ABP Sheet 2 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236886.2, E 3074595.9 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5351.8 ft Total Depth: 35.0 ft Groundwater EI: 5341.8 ft On Date: 02-03-2020 Penetration (ft) Recovery (ft) Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation Groundwater encountered at 10.0 feet during drilling on 2/3/20. CA - 5 25/27 1.0 1.0 11.8 to 15.1 ft: 20-30% gravel; maximum particle size = 1.5 inches; very dense; moist to wet; light brown -12 Minor grinding. 32/50 for 6 inches 1.0 0.8 13 S - 6 14 15 5336.7 Top of bedrock at 15.1 feet. Mostly fines, low to medium plasticity; less than 10% sand, fine grained, subangular to subrounded; slightly weathered; moist; gray; H7; [PIERRE SHALE] S - 7 11/15/16 1.5 1.4 16 5335.3 Augered to 16.5 feet and End of boring log at 16.50 ft switched to NQ3 coring equipment after performing S-7. 17 18 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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influenced blow counts and sample recovery. Boring completed as monitoring well.

LOG OF ROCK CORE

Project name: South Boulder Creek Regional Detention
Project No: 16134

Boring Location: N 1236886.2, E 3074595.9 ft

Start Date: 02-03-2020 Driller: Elite - Greg Bedrock Depth: 15.1 ft Plunge: 90.0 End Date: 02-06-2020 Logged By: SMG Checked By: ABP Bearing: Not applicable Borehole ID: B-202(P) Sheet 3 of 5

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Equipment: NQ3 Wireline Rock Coring

| | | | | | 5.0 ft | | | | Equip | omen | t: NQ | 3 Wireline Rock | (Cor | ing | |
|------------|---|--|---|--|--------------------------|--------------------------------------|--|--|--|--|---|---|--|--|--|
| oundwate | r EI: 5341.8 ft | | | | | 2020 | | | | | | | | | |
| Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials |
| 11 — | | | | | | | | | | | | | | | |
| 17 — | Full circulation. NQ-1 | 16.5 to 20.0 | 3.5 | 4.5 (129) | 4.5 (129) | 15 | 3 | 1.9 | 0.5 | Н7 | | Mechanical break 0 degrees, Tight, slightly rough to smooth, clean | | | 16.5 to 35.0 ft. Shale Laminated; mostly fines, medium plasticity; less than 5% sand; fresh to slightly weathered; unfractured; dry to moist; gray; [PIERRE SHALE] |
| | 11 | Ground El: 5351.8 ft Coundwater El: 5341.8 ft | Ground EI: 5351.8 ft Dundwater EI: 5341.8 ft (a) Notes: Groundwater, Drilling, Conditions, Circulation etc 11 | Ground EI: 5351.8 ft On Date oundwater EI: 5341.8 ft On Date o | Coundwater El: 5341.8 ft | Ground EI: 5351.8 ft On Date: 02-03- | Ground EI: 5351.8 ft On Date: 02-03-2020 | Ground EI: 5351.8 ft On Date: 02-03-2020 | Ground EI: 5351.8 ft Dundwater EI: 5341.8 ft On Date: 02-03-2020 | Ground El: 5351.8 ft On Date: 02-03-2020 | Sequence Sequence | Cround El: 5351.8 ft | Company Comp | Equipment: NG3 Wireline Rock Corolladors | Equipment No3 Wreline Rock Coring Equipment No3 Wreline Rock C |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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OG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Notes

Boring Location: N 1236886.2, E 3074595.9 ft

Start Date: 02-03-2020 Driller: Elite - Greg Bedrock Depth: 15.1 ft

Logged By: SMG Checked By: ABP Plunge: 90.0

Bearing: Not applicable

End Date: 02-06-2020

Borehole ID: B-202(P) Sheet 4 of 5

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Equipment: NQ3 Wireline Rock Coring

| | Ground | d EI: 5351.8 ft | otal Depth: 35.0 ft On Date: 02-03-2020 | | | | | | Equipment: NQ3 Wireline Rock Coring | | | | | | | | | |
|-----------|------------|--|---|------------------|------------------|--------------|-------------------|---------------|-------------------------------------|---------------|----------|-----------------|---|--------------|-----------|---|--|--|
| Elevation | Depth (ft) | r EI: 5341.8 ft Notes: Groundwater, Drilling, Conditions, Circulation etc | £) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials | | |
| | 21 | NQ-2 Smooth drilling. | 20.0 to 22.5 | 2.5 | 2.7 (108) | 2.7 (108) | | 2 | 2.4 | 0.3 | Н7 | P-1 | Mechanical break | | | | | |
| | 23 — | NQ-3 | 22.5 to 25.0 | 2.5 | 2.4 (96) | 2.4 (96) | 8 | 5 | 0.9 | 0.2 | Н7 | | Mechanical break Mechanical break Mechanical break Mechanical break | | | | | |
| | 25 — | Full circulation. NQ-4 | 25.0 to 29.0 | 4.0 | 4.4 (110) | 4.4 (110) | 9 | 3 | 2.4 | 0.1 | Н7 | P-2 | Mechanical break | | | | | |
| | 29 — | NQ-5 | 29.0 to 30.0 | 1.0 | 0.8 (80) | 0.8 (80) | 6 | 1 | 0.8 | 0.8 | H7 | | Core loss | X | | Continued on next sheet | | |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Start Date: 02-03-2020 End Date: 02-06-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-202(P) Bedrock Depth: 15.1 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 5 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236886.2, E 3074595.9 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5351.8 ft Total Depth: 35.0 ft Groundwater EI: 5341.8 ft On Date: 02-03-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 30.0 to 32.4 ft: weak reaction with HCl; 4.2 4.2 (105) (105) NQ-6 4.0 15 3 2.5 8.0 32 34.0 32.4 to 32.5 ft: H5, strongly cemented; Mechanical break strong reaction with HCl; 32.5 to 35.0 ft: weak reaction with HCl; 33 34 Core loss 34.0 to 0.8 0.8 NQ-7 1.0 6 2 0.6 0.2 Н7 (80) (80) 35.0 Mechanical break 5316.8 End of rock core log at 35.00 ft 35 Bottom of boring at 35.0. 36 37 38 39 Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

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extraction. Boring completed as monitoring well.

Borehole ID: OG OF SOIL BORING Start Date: 02-07-2020 End Date: 02-11-2020 B-203(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 15.0 ft Checked By: ABP Sheet 1 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236927.9, E 3074814.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5353.8 ft Total Depth: 34.0 ft Groundwater EI: Not Encountered On Date: 02-07-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation S-1: Clayey Sand Mostly sand, fine to coarse grained, subangular to subrounded; 15-25% fines, low plasticity; less than 15% Minor grinding. gravel, fine to coarse grained, subangular to subrounded; 1.2 0.9 maximum particle size = 1.5 inches; very dense; moist; 3/7/50 for 2 inches brown; (SC); [Fill] 5351.9 D-2: Clayey Sand with Gravel 2 Brown cuttings with coarse Mostly sand, fine to coarse grained, subangular to subrounded; 30-40% gravel, fine to coarse grained, subangular to subrounded; 10-20% fines, low to medium plasticity; maximum particle size = 1.5 inches; dry to moist; Bu-5 from 2.5 to 13.0 feet. brown; occasional organics; (SC); 3 D - 2 13/13/42 1.5 0.8 Smooth drilling. 5349.3 CA-3, CA-4, D-6, CA-7: Silty Sand with Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 15-30% fines, nonplastic to low plasticity; 5-25% gravel, fine to coarse grained, subangular to subrounded; maximum particle size = 2 inches; dry to 5 moist; brown; (SM); CA - 3 11/7 1.0 0.3 6.8 to 9.3 ft: maximum particle size = 0.75 inches; 8 CA - 4 5/8 1.0 1.0 9.3 to 12.0 ft: Fines are low to medium plasticity; maximum particle size = 1.25 inches; moist; Continued on next sheet Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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Borehole ID: OG OF SOIL BORING Start Date: 02-07-2020 End Date: 02-11-2020 B-203(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Sheet 2 of 5 Bedrock Depth: 15.0 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236927.9, E 3074814.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5353.8 ft Total Depth: 34.0 ft Groundwater EI: Not Encountered On Date: 02-07-2020 Penetration (ft) Recovery (ft) Depth (ft) Blows per 6 inch Type - No Remarks Description and Classification of Materials Graphic Lithology Elevation 3/2/7 1.5 D - 6 1.2 11 12 12.0 to 12.9 ft: 25-35% fines; maximum particle size = 1.5 inches; moist; 5340.9 CA-7: Lean Clay 11/25 1.0 1.0 - 13 CA - 7 Laminated; mostly fines, medium plasticity; 5-15% sand; fresh to slightly weathered; dry to moist; gray; (CL); [Fill] Augered to 13.5 feet and 5340.3 End of boring log at 13.50 ft switched to NQ3 coring equipment after performing 14 15 16 17 18 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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Start Date: 02-07-2020 End Date: 02-11-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-203(P) Bedrock Depth: 15.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236927.9, E 3074814.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5353.8 ft Total Depth: 34.0 ft Groundwater EI: Not Encountered On Date: 02-07-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials 11 12 13 5340.3 13.5 to 15.0 ft: Sandstone Cobble Mostly sand, fine grained; less than 15% fines; fresh to slightly weathered; unfractured; dry; red; 14 13.5 to 0.0 Core loss NQ-1 1.5 0.2 H4 8 0.2 1 15.0 (13) 15 Top of bedrock at 5338.8 15.0 to 34.0 ft; Shale 15.0 feet. Laminated; mostly fines, medium plasticity; less than 5% can intered, mostly lines, mediatri plasticity, less than 2/s sand; fresh to slightly weathered; slightly to moderately fractured; dry to moist; gray; [PIERRE SHALE] Mechanical break Mechanical break Mechanical break Full circulation. 16 Mechanical break 3.3 3.3 (110) (110) 15.0 to NQ-2 3.0 13 8 0.9 0.2 H7 17 5 degrees, Tight to slightly open, slightly rough, clean 0 degrees, Tight to slightly open, slightly rough and smooth, clean Mechanical break 18 Smooth drilling 18.0 to 24.0 ft: unfractured; Mechanical break 1.9 1.9 18.0 to NQ-3 2.0 19 10 4 0.5 0.4 H7 Mechanical break 20.0 (95)(95)Mechanical break Notes Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

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extraction. Boring completed as monitoring well.

Start Date: 02-07-2020 End Date: 02-11-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-203(P) Bedrock Depth: 15.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236927.9, E 3074814.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5353.8 ft Total Depth: 34.0 ft Groundwater EI: Not Encountered On Date: 02-07-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbol RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials Mechanical break Mechanical break Mechanical break Mechanical break 0.2 H6 to 4.4 4.4 (110) (110) NQ-4 4.0 15 7 2.9 22 24.0 P-2 23 Mechanical break Mechanical break Full circulation. 24 Mechanical break Mechanical break H6 to H7 24.0 to 1.0 0.7 NQ-5 1.0 5 4 0.3 0.2 (100) (70) 0 degrees, Tight, slightly rough, clear 25 25.0 to 30.0 ft: unfractured; dry; Core loss Mechanical break Smooth drilling. 26 Mechanical break 25.0 to 29.0 3.3 (82) 3.3 (82) 4.0 NQ-6 25 0.1 H6 27 7 1.2 Mechanical break P-3 28 Full circulation. Mechanical break 29 Core loss 29.0 to 30.0 0.9 (90) 0.9 (90) H5 to H6 NQ-7 1.0 0.9 6 1 0.9

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Notes



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Start Date: 02-07-2020 End Date: 02-11-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-203(P) Bedrock Depth: 15.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 5 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236927.9, E 3074814.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5353.8 ft Total Depth: 34.0 ft Groundwater EI: Not Encountered On Date: 02-07-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo Shortest (ft) RQD, ft (%) € Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials Mechanical break Mechanical break Mechanical break 31 Mechanical break 5 degrees, Tight, slightly rough to smooth, clean 5 degrees, Tight, slightly rough to smooth, clean 4.6 (115) (115) 0.1 H6 to NQ-8 4.0 13 >10 2.8 32 34.0 Mechanical break 33 Mechanical break Mechanical break 5319.8 Bottom of boring at 34 End of rock core log at 34.00 ft 34.0 feet. 35 36 37 38 39 Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

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extraction. Boring completed as monitoring well.

Borehole ID: OG OF SOIL BORING Start Date: 01-28-2020 End Date: 01-29-2020 B-204(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 20.8 ft Checked By: ABP Sheet 1 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236836.2, E 3075333.5 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5353.8 ft Total Depth: 40.0 ft Groundwater EI: 5337.4 ft On Date: 01-28-2020 Recovery (ft) Penetration Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation S-1, CA-2, CA-3, CA-4: Poorly Graded Sand Mostly sand, fine to coarse grained, subangular to subrounded; less than 5% fines, nonplastic; less than 5% gravel, coarse grained, subangular to subrounded; maximum particle size = 1 inch; dry to moist; light brown; (SP); [Alluvium] 4/5/9 1.5 1.5 S - 1 Smooth drilling. Sandy cuttings. 2 2.0 to 4.3 ft: maximum particle size = 0.25 inches; 1.0 1.0 3 CA - 2 5/7 4.3 to 9.3 ft: maximum particle size = 0.25 inches; 5 CA - 3 2/3 1.0 1.0 7 Performed K-1 after augering to 7.5 feet and performing CA-4. 8 CA - 4 3/3 1.0 1.0 Minor grinding 5344.6 S-5: Sandy Lean Clay Mostly fines, low plasticity; 30-40% sand, fine to coarse grained, subangular to subrounded; maximum particle size = 0.5 inches; wet; dark brown; (CL); [Alluvium] Continued on next sheet Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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Borehole ID: OG OF SOIL BORING Start Date: 01-28-2020 End Date: 01-29-2020 B-204(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Sheet 2 of 5 Bedrock Depth: 20.8 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236836.2, E 3075333.5 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5353.8 ft Total Depth: 40.0 ft Groundwater EI: 5337.4 ft On Date: 01-28-2020 Penetration (ft) Recovery (ft) Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation 18/6/4 1.5 0.1 S - 5 5341.8 Continuous grinding, minor rig 12 S-6, S-7, S-8, S-9: Poorly Graded Sand with Silt and Gravel Mostly sand, fine to medium grained, subangular to subrounded; 35-45% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, low plasticity; maximum particle size = 1.5 inches; wet; brown; (SP-SM); [Alluvium] 13 6/7/14 1.5 0.2 Elite realigned rig over the 14 augers because rig was rocking off of augers. 14.5 to 16.8 ft: 30-40% sand; 15 S - 7 40/50 for 6 inches 1.0 1.0 Continuous grinding, rig rocking. 16 Groundwater encountered at 16.4 feet during drilling on 1/28/20. 17 Darker brown cuttings. 18 20/30/50 for 6 1.5 1.5 S - 8 inches 19 19.6 to 20.8 ft: 30-40% sand; Fines are low plasticity; Continued on next sheet Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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Borehole ID: OG OF SOIL BORING Start Date: 01-28-2020 End Date: 01-29-2020 B-204(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Sheet 3 of 5 Bedrock Depth: 20.8 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236836.2, E 3075333.5 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5353.8 ft Total Depth: 40.0 ft Groundwater EI: 5337.4 ft On Date: 01-28-2020 Penetration (ft) Recovery (ft) Depth (ft) Blows per 6 inch Type - No Remarks Description and Classification of Materials Graphic Lithology Elevation 20/13/20 S - 9 1.5 1.5 5333.0 Top of bedrock at 20.8 feet. S-9: Shale Laminated; mostly fines, medium plasticity; less than 15% sand; fresh to slightly weathered; slightly moist; gray; H7; [PIERRE SHALE] 21 5331.8 Augered to 22.0 feet and 22 End of boring log at 22.00 ft switched to NQ3 rock coring after performing S-9. 23 24 25 26 27 28 29 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

OG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Notes

Boring Location: N 1236836.2, E 3075333.5 ft

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Start Date: 01-28-2020

Driller: Elite - Greg Logged By: SMG Bedrock Depth: 20.8 ft Checked By: ABP Plunge: 90.0 Bearing: Not applicable

End Date: 01-29-2020

B-204(P)

Borehole ID: Sheet 4 of 5

| Bori | Boring Location: N 1236836.2, E 3075333.5 ft Ground El: 5353.8 ft Total Depth: 40.0 ft | | | | | | | | Equipment: NQ3 Wireline Rock Coring | | | | | | | | |
|-----------|---|---|-----------------|------------------|------------------|--------------|----------------------|---------------|-------------------------------------|---------------|----------|-----------------|--|--------------|-----------|---|--|
| Gro | Groundwater EI: 5337.4 ft On Date: 01-28-2020 | | | | | | | | | | | | | | | | |
| Elevation | Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials | |
| 5331.8 | 21 — | Full circulation. NQ-1 Drillers note that mechanical breaks are from increasing the coring pressure to core through the rock. | 22.0 to 25.0 | | | 3.0 (100) | | >10 | 0.5 | 0.1 | Н7 | | Mechanical break | | | 22.0 to 40.0 ft: Shale Laminated; mostly fines, medium plasticity; less than 5% sand; fresh; unfractured; dry to slightly moist; gray; [PIERRE SHALE] | |
| | 26 | NQ-2 | 25.0 to 27.5 | 2.5 | 2.5 (100) | 2.5 (100) | 16 | 4 | 1.7 | 0.1 | Н7 | P-1 | Mechanical break | | | | |
| | 28 | Full circulation. NQ-3 | 27.5 to 30.0 | 2.5 | 2.5 (100) | 2.5 (100) | 10 | 5 | 0.9 | 0.1 | Н7 | | Mechanical break Mechanical break Mechanical break | | | Continued on post cheet | |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



Appendix E 19 of 87 OG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Notes

Boring Location: N 1236836.2, E 3075333.5 ft

Start Date: 01-28-2020 Driller: Elite - Greg

Logged By: SMG Bedrock Depth: 20.8 ft Checked By: ABP Plunge: 90.0

Bearing: Not applicable

End Date: 01-29-2020

Borehole ID: B-204(P) Sheet 5 of 5

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Equipment: NQ3 Wireline Rock Coring

| Ground El: 5353.8 ft Total Depth: 40.0 ft | | | | | | | | Equipment: NQ3 Wireline Rock Coring | | | | | | | | | |
|---|------------------------------------|---|-----------------|------------------|------------------|--------------|----------------------|-------------------------------------|--------------|---------------|----------|-----------------|--------------------------------------|--------------|-----------|---|--|
| Grou | ndwate | r EI: 5337.4 ft | С | n Da | ite: 01 | 1-28- | 2020 | | | | | | | | | | |
| Elevation | Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials | |
| | - - - - - | | | | | | | | | | | | | | | | |
| | 31 — | | | | | | | | | | | | Mechanical break | | | | |
| | 32 — | NQ-4 | 30.0 to 34.0 | 4.0 | 4.1 (102) | 4.1 (102) | 10 | 7 | 1.2 | 0.1 | Н7 | | Mechanical break Mechanical break | | | | |
| | 33 — | Full circulation. | | | | | | | | | | P-2 | Mechanical break | | | | |
| | 34 — | | | | | | | | | | | | Mechanical break | | | | |
| | - - - - - | NQ-5 | 34.0 to 35.0 | 1.0 | 1.2 (120) | 1.2 (120) | 9 | 2 | 1.1 | 0.1 | H7 | | | | | | |
| | 35 — - - - - - - | | | | | | | | | | | | | | | | |
| | 36 — - - - | | | | | | | | | | | | Mechanical break Mechanical break | | | | |
| | 37 — | NQ-6 | 35.0 to 39.0 | 4.0 | 4.4 (110) | 4.4 (110) | 12 | 7 | 2.6 | 0.1 | H7 | | Mechanical break Mechanical break | | | | |
| | 38 — | Full circulation. | | | | | | | | | | P-3 | Mechanical break Mechanical break | | | | |
| | - - - - - - | | | | | | | | | | | | Mechanical break | | | | |
| | 39 — | NQ-7 | 39.0 to 40.0 | 1.0 | 1.0 (100) | 1.0 (100) | 3 | 3 | 0.7 | 0.1 | H7 | | Mechanical break | | | | |
| 5313.8 | 40 — | Bottom of boring at 40.0 feet. | | | | | | | | | | | Mechanical break | | | End of rock core log at 40.00 ft | |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Borehole ID: OG OF SOIL BORING Start Date: 03-11-2020 End Date: 03-13-2020 B-205(P) Driller: Elite - Greg Logged By: SMG/JNH Project name: South Boulder Creek Regional Detention Bedrock Depth: 17.5 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236743.3, E 3075809.0 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5354.3 ft Total Depth: 38.0 ft Groundwater EI: 5343.8 ft On Date: 03-11-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Elevation Graphic Lithology Bu-1 from 0.0 to 7.5 feet. S-2: Poorly Graded Sand with Silt and Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 25-35% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, nonplastic to low Minor grinding, cobbles in plasticity; maximum particle size = 1.2 inches; medium dense; moist; brown; occasional roots; (SP-SM); 0.5 3/8/7 1.5 S-2 [Alluvium] 5352.3 2 S-3: Poorly Graded Gravel with Silt and Sand Mostly gravel, fine to coarse grained, subangular to subrounded; 25-35% sand, fine to coarse grained, subangular to subrounded; 5-15% fines, nonplastic; maximum particle size = 1.4 inches; medium dense; dry; light brown; (GP-GM); [Alluvium] 3 6/8/21 1.5 1.1 Continous grinding. 5349.8 S-4, S-5, S-6: Poorly Graded Sand with Silt and Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 30-40% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, nonplastic to low plasticity; maximum particle size = 1.2 inches; very dense; 5 dry; (SP-SM); [Alluvium] 28/50 for 5 inches 0.9 0.9 6.7 to 8.9 ft: maximum particle size = 1 inch; dry to 7 Grinding, minor rig rocking. S - 5 50 for 2 inches 0.2 0.2 Groundwater level measurement at 7.7 feet on 3/13/20 at 08:10 during monitoring well installation. Finer sand material in cuttings. 8 8.9 to 11.8 ft: Gravel is angular; maximum particle size = 1.4 inches; dry to moist; Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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Borehole ID: OG OF SOIL BORING Start Date: 03-11-2020 End Date: 03-13-2020 B-205(P) Driller: Elite - Greg Logged By: SMG/JNH Project name: South Boulder Creek Regional Detention Bedrock Depth: 17.5 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236743.3, E 3075809.0 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5354.3 ft Total Depth: 38.0 ft Groundwater EI: 5343.8 ft On Date: 03-11-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation S - 6 20/50 for 6 inches Groundwater encountered at 10.5 feet during drilling on 3/11/20. Grinding, minor rig rocking. S-7: Poorly Graded Gravel with Silt and Sand Similar to S-3 Except: maximum particle size = 1 inch; very 12 dense; wet; (GP-GM); [Alluvium] S - 7 50 for 6 inches 0.5 0.5 13 5340.3 14 S-8: Poorly Graded Gravel with Clay and Sand Mostly gravel, fine to coarse grained, subangular to subrounded; 35-45% sand, fine to coarse grained, subangular to subrounded; 10-20% fines, medium plasticity; Minor grinding, slow augering. maximum particle size = 1.3 inches; very dense; wet; brown; (GP-GC); [Alluvium] 15 Groundwater level measurement at 15.2 feet before starting rock coring on 3/12/20 at 08:30. S - 8 14/25/29 1.5 1.2 16 17 5336.8 Top of bedrock at 17.5 feet. S-9: Shale Laminated; mostly fines, medium plasticity; less than 15% sand, fine grained; slightly weathered; moist; gray; H7; [PIERRE SHALE] 18 S-9 14/50 for 6 inches 1.0 1.0 Drillers noted that it felt like the augers encountered bedrock at 17.5 feet. 5335.3 Augered to 19.0 feet and then 19 End of boring log at 19.00 ft switched to NQ3 rock coring after performing S-9. Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have influenced blow counts and sample recovery. Boring completed as monitoring well.

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LOG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Boring Location: N 1236743.3, E 3075809.0 ft

Start Date: 03-11-2020 Driller: Elite - Greg

Driller: Elite - Gree Bedrock Depth: 17.5 ft Plunge: 90.0 End Date: 03-13-2020 Logged By: SMG/JNH Checked By: ABP

Bearing: Not applicable

Borehole ID: B-205(P) Sheet 3 of 5

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Equipment: NQ3 Wireline Rock Coring

| Ground El: 5354.3 ft Total Depth: 38.0 ft Groundwater El: 5343.8 ft On Date: 03-11-2020 | | | | | | | | | | | | | | | | |
|--|---|---|-----------------|------------------|------------------|--------------|----------------------|---------------|--------------|---------------|----------|-----------------|--------------------------------------|--------------|-----------|---|
| Gro | undwate | r EI: 5343.8 ft | С | 1 | | 3-11-2 | 2020 | | 1 | | | | | | | |
| Elevation | Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials |
| | - - - - - | | | | | | | | | | | | | | | |
| | 11 — | | | | | | | | | | | | | | | |
| | - - - - 12 — | | | | | | | | | | | | | | | |
| | - - - - - | | | | | | | | | | | | | | | |
| | 13 — | | | | | | | | | | | | | | | |
| | 14 — | | | | | | | | | | | | | | | |
| | - - - - | | | | | | | | | | | | | | | |
| | 15 — - - - - - - - | | | | | | | | | | | | | | | |
| | 16 — - - - - | | | | | | | | | | | | | | | |
| | 17 — | | | | | | | | | | | | | | | |
| | - - - - - | | | | | | | | | | | | | | | |
| | 18 — - - - - - | | | | | | | | | | | | | | | |
| 335.3 | 19 — - - 19 — - | | | | | | | | | | | | Mechanical break Mechanical break | | | 19.0 to 36.3 ft: Shale Laminated; mostly fines, medium plasticity; less than 5% sand, fine grained; fresh to slightly weathered; |
| | | NQ-1 | 19.0 to 20.0 | 1.0 | 1.2 (120) | 1.2 (120) | 4 | 6 | 0.5 | <0.1 | H7 | | Mechanical break | _ | | unfractured; dry to moist; gray; [PIERRE SHALE] |
| | 20 — | | | | | | | | | | | | | | | Continued on next sheet |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Start Date: 03-11-2020 End Date: 03-13-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG/JNH B-205(P) Bedrock Depth: 17.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236743.3, E 3075809.0 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.3 ft Total Depth: 38.0 ft Groundwater EI: 5343.8 ft On Date: 03-11-2020 In Situ Testing Coring Time (min) of Pieces Joint Symbo ft (%) € Shortest Notes: Groundwater Drilling, Conditions, RQD, Description and Classification of Materials Circulation etc 20.0 to 24.0 ft: moderately fractured; Lost approximately Core loss 70 gallons of water while coring NQ-2. Mechanical break Mechanical break 20 degrees, Tight, moderately rough, clean 20 degrees, Tight, moderately rough, clean 20 degrees, Tight, moderately rough, clean 2.8 (70) <0.1 H5 to NQ-2 4.0 8 >10 0.9 22 (38) 24.0 泌 moderately rough, clean
Moderately open, moderately rough, very thin infilling, Magnesium stain 50 degrees, Tight, moderately rough, clean
30 degrees, Tight, moderately rough, moderately thin white to light gray infilling P-1 23 Hole collapsed to 22.4 feet after NQ-2 Drillers removed extra material during next core run. Sluff from 22.4 to 24.0 was Mechanical break 24 not logged. Mechanical break 24.0 to 1.0 1.0 NQ-3 1.0 4 1.0 1.0 Н5 (100) (100) 25.0 25 25.0 to 29.0 ft: slightly fractured; 20 degrees, Moderately open, moderately rough, 26 Full circulation. clean to very thin infilling P-2 4.0 (100) 3.9 (98) 25.0 to NQ-4 4.0 11 27 2 2.9 1.0 H5 29.0 28 29 29.0 to 30.0 ft: minor iron staining; weak reaction with HCI; Full circulation H5 to H6 1.0 1.0 (100) (100) 1.0 NQ-5 1.0 4 1.0 1 30.0 Notes Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

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extraction. Boring completed as monitoring well.

Start Date: 03-11-2020 End Date: 03-13-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG/JNH B-205(P) Bedrock Depth: 17.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 5 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236743.3, E 3075809.0 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.3 ft Total Depth: 38.0 ft Groundwater EI: 5343.8 ft On Date: 03-11-2020 In Situ Testing Coring Time (min) of Pieces ft (%) Joint Symbo € Shortest Notes: Groundwater Drilling, Conditions, Circulation etc RQD, Description and Classification of Materials Mechanical break Full circulation. Mechanical break 32 30.0 to 35.0 5.0 5.0 (100) (100) NQ-6 5.0 7 5 1.9 0.4 H6 33 Mechanical break P-3 34 Mechanical break 35 35.0 to 36.3 ft: slightly fractured; occasional weak reaction with HCl; Mechanical break Full circulation. Mechanical break 36 36.3 to 36.5 ft: Sandstone Laminated; mostly sand, fine to medium grained, 20 degrees, Moderately open, moderately rough, very thin calcite infilling Mechanical break 35.0 to 3 1 H4 to NQ-7 3.0 6 6 1.3 <0.1 (103) subangular to subrounded; slightly fractured; dry to moist; gray and white mottled; H4; weak to strong reaction with [PIERRE SHALE] 36.5 to 38.0 ft: Shale 37 Similar to 19.0 to 20.0 ft Except: slightly fractured; occasional weak reaction with HCl; [PIERRE SHALE] 5316.3 38 Bottom of boring at End of rock core log at 38.00 ft 38.0 feet. 39 Notes Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

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Borehole ID: OG OF SOIL BORING Start Date: 03-16-2020 End Date: 03-18-2020 **B-206** Driller: Elite - Greg Logged By: EJS Project name: South Boulder Creek Regional Detention Bedrock Depth: 14.5 ft Checked By: ABP Sheet 1 of 5 Project No: 16134 -1 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236837.1, E 3076117.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5354.7 ft Total Depth: 35.1 ft Groundwater EI: 5340.2 ft On Date: 03-16-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Bu-1 from 0.0 to 7.5 feet. S-2: Poorly Graded Sand with Clay and Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 35-45% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, low plasticity; Minor grinding. maximum particle size = 1.25 inches; dense; dry to moist; dark brown; occasional roots; (SP-SC); 7/10/32 1.5 S-2 1.4 [Alluvium] 5352.7 2 S-3, S-4, S-5, S-6: Poorly Graded Sand with Silt and Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 35-45% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, nonplastic to low plasticity; maximum particle size = 1.25 inches; very dense; (SP-SM); [Alluvium] 3 Minor grinding, redish brown S - 3 9/24/50 for 4 inches 1.3 1.2 cuttings 4.4 to 6.7 ft: 25-35% gravel; less than 10% fines; very dense; brown to gray; 5 Minor grinding. S - 4 25/50 for 3 inches 8.0 0.7 6.7 to 8.0 ft: 25-35% gravel; maximum particle size = 7 8 S - 5 24/50 for 6 inches 1.0 0.9 8.0 to 9.3 ft: Fines are low plasticity; dry to moist; red Groundwater level measurement at 8.1 feet on 3/19/2020 after rock coring to 35.1 feet. 9.3 to 11.5 ft: 20-30% gravel; Fines are low plasticity; dry to moist; dark brown; Continued on next sheet Notes Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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influenced blow counts and sample recovery. Boring backfilled with cement-bentonite grout.

Borehole ID: OG OF SOIL BORING Start Date: 03-16-2020 End Date: 03-18-2020 **B-206** Driller: Elite - Greg Logged By: EJS Project name: South Boulder Creek Regional Detention Bedrock Depth: 14.5 ft Checked By: ABP Sheet 2 of 5 Project No: 16134 -1 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236837.1, E 3076117.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5354.7 ft Total Depth: 35.1 ft Groundwater EI: 5340.2 ft On Date: 03-16-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation 0.4 0.4 S - 6 50 for 5 inches Groundwater level measurement at 10.1 feet on 3/17/2020 at 09:00. Harder grinding, rig rocking. Slower drilling 11 Groundwater level measurement at 11.0 feet on 3/16/2020 at 12:30. 5343.2 S-7: Silty Gravel with Sand Mostly gravel, fine to coarse grained, subangular to subrounded; 35-45% fines, low plasticity; 15-25% sand, fine to coarse grained, subangular to subrounded; maximum 12 particle size = 1.25 inches; medium dense; wet; dark brown; (GM); [Alluvium] 13 14/19/10 1.5 0.9 14 5340.2 Top of bedrock at 14.5 feet. Laminated; mostly fines, medium to high plasticity; less than 10% sand; intensely weathered to decomposed; dry to 15 [PIERRE SHALE] 15.5 to 16.5 ft: slightly to moderately weathered; gray; occasional iron staining; S - 8 7/14/37 1.5 1.5 16 5338.2 Augered to 16.5 feet and End of boring log at 16.50 ft switched to NQ3 rock coring after performing S-8. 17 18 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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influenced blow counts and sample recovery. Boring backfilled with cement-bentonite grout.

Start Date: 03-16-2020 End Date: 03-18-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: EJS **B-206** Bedrock Depth: 14.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236837.1, E 3076117.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.7 ft Total Depth: 35.1 ft Groundwater EI: 5340.2 ft On Date: 03-16-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) Joint Description € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials 12 13 14 15 16 5338.2 16.5 to 35.1 ft: Shale Mechanical break 10 degrees, Tight, slightly rough, clean Mechanical break Laminated; mostly fines, medium plasticity; less than 10% sand, fine grained; fresh to slightly weathered; slightly fractured; moist; gray; occasional strong reaction with HCl; Smooth coring. 17 Mechanical break [PIERRE SHALE] Mechanical break, some iron staining Mechanical break 10 degrees, Tight, moderately rough, clean 10 degrees, Tight, moderately rough, clean Gray return fluid. 18 3.5 4.1 3.8 (109) 8 10 NQ-1 2.5 <0.1 20.0 19 P-1 Mechanical break

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Mechanical breaks are generally near softer rock core. Boring backfilled with cement-bentonite grout.

Notes



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Start Date: 03-16-2020 End Date: 03-18-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: EJS **B-206** Bedrock Depth: 14.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236837.1, E 3076117.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.7 ft Total Depth: 35.1 ft Groundwater EI: 5340.2 ft On Date: 03-16-2020 In Situ Testing Coring Time (min) of Pieces ft (%) Joint Symbo € Shortest Notes: Groundwater Drilling, Conditions, Circulation etc RQD, Description and Classification of Materials 20.0 to 24.0 ft: fresh; slightly to moderately fractured; occasional weak reaction with Mechanical break Full circulation. Mechanical break Mechanical break along bedding plane 4.0 4.0 (100) (100) 0.3 H6 to NQ-2 4.0 12 7 1.2 Mechanical break along bedding plane 22 24.0 Mechanical break along bedding plane 23 Mechanical break 24 24.0 to 25.0 ft: fresh; no reaction with HCl; Tight, smooth, clean 24.0 to 1.0 0.9 H6 to NQ-3 1.0 4 2 0.9 0.1 (100) (90) 25 25.0 to 29.0 ft: 5-15% sand; fresh; slightly to moderately fractured; 26 Full circulation. 10 degrees, Tight, rough, clean 4.2 4.2 (105) (105) H6 to 25.0 to NQ-4 4.0 6 0.3 27 4 1.8 29.0 0 degrees, Tight, moderately rough, clean 10 degrees, Tight, rough, clean 28 29 29.0 to 30.0 ft: 5-15% sand; fresh; 1.1 1.1 (110) (110) NQ-5 1.0 2 2 0.6 0.5 Mechanical break 30.0

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Mechanical breaks are generally near softer rock core. Boring backfilled with cement-bentonite grout.

Notes



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Start Date: 03-16-2020 End Date: 03-18-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: EJS **B-206** Bedrock Depth: 14.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 5 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236837.1, E 3076117.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.7 ft Total Depth: 35.1 ft Groundwater EI: 5340.2 ft On Date: 03-16-2020 In Situ Testing Coring Time (min) of Pieces Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 30.0 to 35.1 ft: Fines are medium to high plasticity; fresh; moderately fractured; Mechanical break Full circulation. Mechanical break Mechanical break 4.5 3.1 (112) (78) 0.1 H6 to NQ-6 4.0 5 8 1.1 32 34.0 Mechanical break Mechanical break 33 Mechanical break Mechanical break 34 1.2 (109) 0.9 (82) NQ-7. 1.1 2 2 0.9 0.2 Mechanical break 35 5319.6 Bottom of boring at 35.1. End of rock core log at 35.10 ft 36 37 38 39 Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

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extraction. Mechanical breaks are generally near softer rock core. Boring backfilled with cement-bentonite grout.

Borehole ID: OG OF SOIL BORING Start Date: 05-18-2020 End Date: 05-20-2020 B-207(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 12.5 ft Checked By: ABP Sheet 1 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236997.6, E 3076388.1 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5350.1 ft Total Depth: 34.0 ft Groundwater EI: 5344.0 ft On Date: 05-18-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Bu-1 from 0.0 to 6.0 feet. S-2, S-3, S-4, S-5, S-6: Poorly Graded Sand with Silt and Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 15-25% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, nonplastic; maximum particle size = 1.25 inches; dense; dry to moist; 2/12/20 1.5 1.2 S-2 brown; (SP-SM); [Alluvium]
0.0 to 2.0 ft: occasional roots; Smooth drilling Sandy light brown cuttings with 2 2.0 to 4.5 ft: 20-30% gravel; maximum particle size = 1.5 inches; very dense; dry to moist; occasional roots; weak reaction with HCl; 3 Minor grinding S - 3 14/24/32 1.5 1.1 Groundwater level 4.5 to 7.0 ft: 20-30% gravel; maximum particle size = measurement at 4.5 feet on 1.5 inches; very dense; dry to moist; occasional iron staining, occasional weathered shale fragments; 5/19/20 at 08:15. Continuous grinding. 5 Groundwater encountered at 6.0 feet during drilling on 5/19/20. S - 4 14/24/45 1.5 1.3 7 7.0 to 12.5 ft: Fines are nonplastic to low plasticity; 25-35% gravel; maximum particle size = 1.5 inches; very dense; wet, Grinding, rig rocking. S - 5 50 for 6 inches 0.5 0.5 8 Minor grinding. Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 05-18-2020 End Date: 05-20-2020 B-207(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 12.5 ft Checked By: ABP Sheet 2 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236997.6, E 3076388.1 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5350.1 ft Total Depth: 34.0 ft Groundwater EI: 5344.0 ft On Date: 05-18-2020 Penetration (ft) Recovery (ft) Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation Less gravel in cuttings. 14/34/50 for 6 S - 6 1.5 1.1 inches 12 5337.6 Top of bedrock at 12.5 S-7: Shale Laminated; mostly fines, medium plasticity; 5-15% sand, fine grained; slightly to moderately weathered; dry to moist; gray; 13 [PIERRE SHALE] 5/20/40 1.5 1.5 5336.1 14 Augered to 14.0 feet and End of boring log at 14.00 ft switched to NQ3 rock coring after performing S-7. 15 16 17 18 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

Appendix E 32 of 87

samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Start Date: 05-18-2020 End Date: 05-20-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-207(P) Bedrock Depth: 12.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236997.6, E 3076388.1 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5350.1 ft Total Depth: 34.0 ft Groundwater EI: 5344.0 ft On Date: 05-18-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo Shortest (ft) RQD, ft (%) € Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 12 13 14 5336.1 14.0 to 34.0 ft: Shale Mechanical break

Laminated; mostly fines, medium plasticity; less than 5% sand; fresh to slightly weathered; unfractured; dry to moist; gray; strong reaction with HCl; [PIERRE SHALE] 14.0 to 1.2 1.2 NQ-1 1.0 3 2 0.9 0.3 Н7 (120) (120) 15 Mechanical break Mechanical break 15.0 to 20.0 ft: no reaction with HCl; Mechanical break Full circulation 16 Mechanical break Mechanical break Smooth drilling. 17 5.1 5.1 (102) (102) NQ-2 5.0 13 6 2.9 0.1 18 P-1 19 Mechanical break Notes

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Start Date: 05-18-2020 End Date: 05-20-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-207(P) Bedrock Depth: 12.5 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236997.6, E 3076388.1 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5350.1 ft Total Depth: 34.0 ft Groundwater EI: 5344.0 ft On Date: 05-18-2020 In Situ Testing Coring Time (min) of Pieces Joint Symbo ft (%) € Shortest Notes: Groundwater Drilling, Conditions, RQD, Circulation etc Description and Classification of Materials 20.0 to 22.0 ft: slightly fractured; weak to strong reaction with HCl; Full circulation. 0 degrees, Tight to slightly open, moderately to slightly rough, very thin infilling 2.0 20.0 to 2.0 NQ-3 2.0 5 4 0.9 0.1 H7 (100) (100) 22 22.0 to 25.0 ft: slightly fractured; no reaction Mechanical break 0 degrees, Tight to slightly open, slightly rough to smooth, clean to very thin infilling 23 3.2 3.2 (107) (107) NQ-4 3.0 8 5 1.5 <0.1 H7 Mechanical break 24 P-2 Mechanical break 25 25.0 to 27.0 ft: no reaction with HCl; Mechanical break 1.8 (90) 2.0 5 26 (90) Mechanical break Smooth drilling. Core loss 27 Mechanical break 28 27.0 to 3.2 3.2 7 NQ-6 3.0 5 0.9 0.1 H7 (107) (107) Mechanical break 29

Notes Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Mechanical break

Mechanical break

OG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Notes

extraction. Boring completed as monitoring well.

Boring Location: N 1236997.6, E 3076388.1 ft

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

End Date: 05-20-2020

Bearing: Not applicable

Logged By: SMG

Checked By: ABP

Equipment: NQ3 Wireline Rock Coring

Start Date: 05-18-2020

Bedrock Depth: 12.5 ft

Plunge: 90.0

Driller: Elite - Greg

Borehole ID: B-207(P)

Sheet 5 of 5

| | Ground El: 5350.1 ft Total Depth: 34.0 ft | | | | | | | Equipment: NQ3 Wireline Rock Coring | | | | | | | | | |
|-----------|---|---|---------------------|------------------|------------------|-------------|----------------------|-------------------------------------|--------------|---------------|----------|-----------------|----------------------|--------------|-----------|---|--|
| Gro | Groundwater EI: 5344.0 ft | | On Date: 05-18-2020 | | | | | | | | | | | | | | |
| Elevation | Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials | |
| 5316.1 | 31 32 33 33 34 35 36 37 38 39 39 39 39 39 39 39 | NQ-7 Bottom of boring at 34.0 feet. | 30.0 to 34.0 | 4.0 | 4.2 (105) | 4.2 (105) | 12 | 1 | 4.2 | 4.2 | Н7 | P-3 | | | | End of rook core log at 34.00 ft | |

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Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

Borehole ID: OG OF SOIL BORING Start Date: 01-30-2020 End Date: 01-31-2020 B-208(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 20.1 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236457.4, E 3075844.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5359.9 ft Total Depth: 40.0 ft Groundwater EI: 5342.4 ft On Date: 01-30-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation S-2, S-3: Clayey Sand with Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 30-40% gravel, fine to coarse grained, Bu-1 from 0.0 to 5.0 feet. subangular to subrounded; 20-30% fines, low plasticity; maximum particle size = 1.5 inches; medium dense; dry to moist; brown; included slightly to moderately weathered Pierre Shale fragments, occasional roots; (SC); 7/11/13 0.8 1.5 S-2 Minor grinding. 2 2.0 to 4.5 ft: 25-35% gravel: included moderately to intensely weathered Pierre Shale fragments, no roots; 3 Smooth drilling, brown cuttings. S - 3 7/19/11 1.5 1.3 5355.4 S-4, S-5: Gravelly Lean Clay with Sand Mostly fines, medium plasticity; 25-35% gravel, fine to coarse grained, subangular to subrounded; 15-25% sand, fine to coarse grained, subangular to subrounded; maximum particle size = 1 inch; very stiff; dry to slightly 5 moist; brown to gray; PP = 3 tsf; included processed Pierre [Fill] S - 4 6/11/20 1.5 1.5 Minor grinding. 7.0 to 9.5 ft: 15-25% gravel; maximum particle size = 1 inch; gray; occasional iron staining; 8 7/11/10 S - 5 1.5 1.4 9 5350.4 S-6: Poorly Graded Gravel with Clay and Sand Mostly gravel, fine to coarse grained, subangular to subrounded; 25-35% sand, fine to coarse grained,

Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have influenced blow counts and sample recovery. Boring completed as monitoring well.

Notes



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OG OF SOIL BORING Borehole ID: Start Date: 01-30-2020 End Date: 01-31-2020 B-208(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 20.1 ft Checked By: ABP Sheet 2 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236457.4, E 3075844.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5359.9 ft Total Depth: 40.0 ft Groundwater EI: 5342.4 ft On Date: 01-30-2020 Penetration (ft) Recovery (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation subangular to subrounded; 5-10% fines, low to medium plasticity; dense; brown to gray; (GP-GC); [Alluvium] S - 6 6/15/30 1.5 1.4 11 5347.9 12 Grinding, minor rig rocking. S-7, S-8, S-9: Poorly Graded Sand with Clay and Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 20-30% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, nonplastic to low plasticity; maximum particle size = 1.25 inches; very dense; dry to moist; brown to gray; (SP-SC); S - 7 0.5 50 for 6 inches 0.5 [Alluvium] 13 14 14.0 to 17.0 ft: maximum particle size = 1.5 inches; Minor grinding, gravel in 15 cuttings. S - 8 20/25/35 1.5 1.4 16 17 17.0 to 20.1 ft: maximum particle size = 1.75 inches; Groundwater encountered at 17.5 feet during drilling on 1/30/20. 18 25/40/50 for 5 1.4 0.9 S-9 inches 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 01-30-2020 End Date: 01-31-2020 B-208(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 20.1 ft Checked By: ABP Sheet 3 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236457.4, E 3075844.6 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5359.9 ft Total Depth: 40.0 ft Groundwater EI: 5342.4 ft On Date: 01-30-2020 Penetration (ft) Recovery (ft) Depth (ft) Blows per 6 inch Type - No Remarks Description and Classification of Materials Elevation Graphic Lithology 5339.8 Top of bedrock at 20.1 feet. S-10: Shale Laminated; mostly fines, medium plasticity; less than 15% sand; slightly weathered; slightly moist; gray; S - 10 25/50 for 6 inches 1.0 1.0 [PIERRE SHALE] 21 5338.4 Augered to 21.5 feet and End of boring log at 21.50 ft switched to NQ3 rock coring after performing S-10. 22 23 24 25 26 27 28 29 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Start Date: 01-30-2020 End Date: 01-31-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-208(P) Bedrock Depth: 20.1 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236457.4, E 3075844.6 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5359.9 ft Total Depth: 40.0 ft Groundwater EI: 5342.4 ft On Date: 01-30-2020 In Situ Testing Coring Time (min) Joint Symbo ft (%) of Piec € Shortest Notes: Groundwater Drilling, Conditions, RQD, Description and Classification of Materials Circulation etc 21 5338.4 Drillers noted that the 21.5 to 40.0 ft: Shale Laminated; mostly fines, medium plasticity; less than 5% coring pressure would increase sand; fresh; unfractured to very slightly fractured; dry to around the softer moist; gray; [PIERRE SHALE] rock. 22 Full circulation. 23 21.5 to 25.0 1.2 (34) 1.2 (34) NQ-1 3.5 11 >10 0.2 <0.1 NQ-1 was performed 24 using a pack bit. Drillers had trouble removing NQ-1 from Mechanical breaks casing resulting in multiple mechanical 24.4 to 24.6 ft: H5, strongly cemented zone; strong reaction with HCI; breaks in the sample.

Drillers switched to a
surface set bit after Mechanical breaks 25 NQ-1. Mechanical break Mechanical break 26 Full circulation. 2.9 2.9 (116) (116) 25.0 to 2.5 7 8 0.1 Н7 NQ-2 1.1 27.5 Mechanical break 27 Mechanical break Mechanical break Mechanical break Mechanical break Drillers noted they lowered the coring pressure from 220 to 180 for runs NQ-3, NQ-4, NQ-5. 28 Mechanical break Mechanical break 2.9 2.9 (116) (116) NQ-3 2.5 5 8 1.0 0.1 Н7 30.0 5 degrees, Tight, slightly rough to smooth, clean 29 Mechanical break Mechanical break Mechanical break Mechanical break

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Mechanical breaks are generally near softer rock core. Drillers noted that the coring pressure would increase around



the softer rock. Boring completed as monitoring well.

Notes

Start Date: 01-30-2020 End Date: 01-31-2020 Driller: Elite - Greg Logged By: SMG Bedrock Depth: 20.1 ft Checked By: ABP

Borehole ID: B-208(P)

| Р | Project name: South Boulder Creek Regional Detention | | | | | | | | | | | h: 20. | 1 ft | C | Checked By: ABP Bearing: Not applicable Sheet 5 of 5 | | | | | |
|-----------|--|---|-----------------|------------------|-------------------|--------------|--|---------------|-------------------------------------|---------------|----------|-----------------|---|--------------|--|---------------------|-------------------------------|--|--|--|
| | | i No: 16134 | | | | | Plunge: 90.0 Bearing: Not applicable Sheet 5 of 5 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig | | | | | | | | | | | | | |
| Bori | | tion: N 1236457.4 | | | | " | | | Equipment: NQ3 Wireline Rock Coring | | | | | | | | | | | |
| Gro | | d EI: 5359.9 ft er EI: 5342.4 ft | | | oth: 40 ate: 0 | | วกวก | | , | | | | | | | | | | | |
| Gio | unuwate | 1 21. 5542.4 11 | | 1 | | 1-30-2 | 2020 | | | | | | | | | | | | | |
| Elevation | Depth (ff) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | | d Classification of Materials | | | |
| | - | | | | | | | | | | | | 0 degrees Tight | | | 30.0 to 40.0 ft: fi | resh to slightly weathered; | | | |
| | = | | | | | | | | | | | | 0 degrees, Tight, slightly rough to smooth, clean | | | | | | | |
| | = | - | | | | | | | | | | | Mechanical break | | | | | | | |
| | 31 — | | | | | | | | | | | | | | | | | | | |
| | _ | - | | | | | | | | | | | | | | | | | | |
| | = | | | | | | | | | | | | | | | | | | | |
| | - | - | | | | | | | | | | | | | | | | | | |
| | 32 — | NQ-4 | 30.0 to 34.0 | 4.0 | 4.2 | 4.2 (105) | 12 | 5 | 3.3 | 0.1 | H7 | P-2 | | | | | | | | |
| | - - | - | 34.0 | 4.0 | (105) | (105) | 12 | | 0.0 | 0.1 | ''' | | | | | | | | | |
| | - | | | | | | | | | | | | | | | | | | | |
| | = | | | | | | | | | | | | | | | | | | | |
| | - | - | | | | | | | | | | | | | | | | | | |
| | 33 — | | | | | | | | | | | | | | | | | | | |
| | = | - | | | | | | | | | | | | | | | | | | |
| | = | | | | | | | | | | | | | | | | | | | |
| | = | - | | | | | | | | | | | Mechanical break | | | | | | | |
| | 34 — | | | | | | | | | | | | | | | | | | | |
| | = | | 34.0 to | | 1.1 | 1.1 | | | ١ | ١ | H5 to | | | | | | | | | |
| | = | NQ-5 | 35.0 | 1.0 | (110) | 1.1 (110) | 3 | 1 | 1.1 | 1.1 | H6 | | | | | | | | | |
| | = | - | | | | | | | | | | | | | | | | | | |
| | 35 — | | | | | | | | | | | | | | | | | | | |
| | = | - | | | | | | | | | | | | | | | | | | |
| | = | | | | | | | | | | | | | | | | | | | |
| | = | - | | | | | | | | | | | | | | | | | | |
| | 36 — | | | | | | | | | | | | | | | | | | | |
| | - | - | | | | | | | | | | | | | | | | | | |
| | - | | | | | | | | | | | | Machanical broot | | | | | | | |
| | = | - | 35.0 to | | 4.0 | 4.0 | | | | | | | Mechanical break Mechanical break | | | | | | | |
| | 37 — | NQ-6 | 39.0 | 4.0 | (100) | (100) | 18 | 3 | 2.2 | 0.1 | H7 | P-3 | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | - | - | | | | | | | | | | | | | | | | | | |
| | = | | | | | | | | | | | | | | | | | | | |
| | 38 — | Full circulation. | | | | | | | | | | | | | | | | | | |
| | - | | | | | | | | | | | | | | | | | | | |
| | - | - | | | | | | | | | | | | | | | | | | |
| | - | | | | | | | | | | | | | | | | | | | |
| | 39 — | - | | | | | | | | | | 1 | | | | | | | | |
| | = | 1 | | | | | | | | | | | | | | | | | | |
| | - | NQ-7 | 39.0 to 40.0 | 1.0 | 1.0 (100) | 1.0 (100) | 5 | 1 | 1.0 | 1.0 | H7 | | | | | | | | | |
| | - | Bottom of boring at 40.0 feet. | | | | | | | | | | | | | | | | | | |
| 5319.9 | 40 — | -0.0 leet. | | | | | | | | | | | | | | End of r | ock core log at 40.00 ft | | | |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Mechanical breaks are generally near softer rock core. Drillers noted that the coring pressure would increase around the softer rock. Boring completed as monitoring well.

RUH

Notes

Borehole ID: OG OF SOIL BORING Start Date: 01-22-2020 End Date: 01-23-2020 B-209(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 7.0 ft Checked By: ABP Sheet 1 of 4 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235872.7, E 3075850.3 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5354.7 ft Total Depth: 30.0 ft Groundwater EI: 5348.7 ft On Date: 01-22-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Bu-1 from 0.0 to 2.5 feet. S-2, S-3, S-4: Poorly Graded Gravel with Clay and Sand Mostly gravel, fine to coarse grained, angular to subangular; 25-35% sand, fine to coarse grained, subangular to subrounded; 5-15% fines, medium plasticity; maximum Grinding, rig rocking. particle size = 1.5 inches; dry to moist; brown; occasional roots; (GP-GC); 7/32/40 1.5 1.5 S-2 Brown cuttings with gravel. 2 2.0 to 5.0 ft: red; Bu-2 from 2.5 to 5.0 feet. S - 3 0.3 0.3 50 for 3 inches 3 Cutting are more red. 5 Grindina 5.0 to 7.0 ft: Gravel is subangular to subrounded; Fines are low to medium plasticity; maximum particle size = 1.25 inches; wet; light brown; no roots; S - 4 12/41/11 1.5 0.7 Groundwater encountered at 6.0 6 feet during drilling on 1/22/20. Brown cuttings. 5347.7 7 Top of bedrock at 7.0 feet. Laminated; mostly fines, medium plasticity; 5-15% sand; fresh to slightly weathered; dry to slightly moist; gray; H7; [PIERRE SHALE] 8 S - 5 30/50 for 6 inches 1.0 1.0 Augered to 8.5 feet and switched to NQ3 rock coring 5346.2 End of boring log at 8.50 ft after performing S-5. 9 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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OG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Notes

Boring Location: N 1235872.7, E 3075850.3 ft

End Date: 01-23-2020 Driller: Elite - Greg Logged By: SMG Bedrock Depth: 7.0 ft

Start Date: 01-22-2020

Checked By: ABP Plunge: 90.0 Bearing: Not applicable

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Borehole ID: B-209(P)

Sheet 2 of 4

| Bor | Boring Location: N 1235872.7, E 3075850.3 ft Ground El: 5354.7 ft Total Depth: 30.0 ft | | | | | | | | | | Equipment: NQ3 Wireline Rock Coring | | | | | | | | | |
|---|---|---|----------------|------------------|------------------|-------------|----------------------|---------------|--------------|---------------|-------------------------------------|-----------------|---|--------------|-----------|---|--|--|--|--|
| Groundwater El: 5348.7 ft On Date: 01-22-2020 | | | | | | | | | ı | | | | | | | | | | | |
| Elevation | Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials | | | | |
| | 1 ———————————————————————————————————— | | | | | | | | | | | | | | | | | | | |
| 5346.2 | 9 — | Smooth drilling. NQ-1 | 8.5 to 10.0 | 1.5 | 1.2 (80) | 1.2 (80) | 5 | 5 | 0.4 | 0.2 | Н7 | | Core loss Mechanical break Mechanical break | <u>×</u> | | 8.5 to 30.0 ft: Shale Laminated; mostly fines, medium plasticity; 10-15% sand; fresh to slightly weathered; unfractured; dry to moist; gray; [PIERRE SHALE] | | | | |
| | 10 — | | | | | | | | | | | | Mechanical break Mechanical break | | | Continued on next sheet | | | | |
| <u> </u> | | | | | | l | | | | | | | | | | Continued off flext sneet | | | | |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Start Date: 01-22-2020 End Date: 01-23-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-209(P) Bedrock Depth: 7.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 4 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235872.7, E 3075850.3 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.7 ft Total Depth: 30.0 ft Groundwater EI: 5348.7 ft On Date: 01-22-2020 In Situ Testing Coring Time (min) No. of Pieces Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 10.0 to 15.0 ft: weak reaction with HCl; Mechanical break Mechanical break 12 10.0 to 15.0 5.0 5.0 (100) (100) NQ-2 5.0 9 10 2.0 0.1 H7 13 P-1 Mechanical break Mechanical break Smooth drilling. Mechanical break 14 Mechanical break Mechanical break Mechanical break Mechanical break 15 Mechanical break

Mechanical break

Mechanical break

17 — NQ-3 15.0 to 20.0 5.0 (100) (100) 10 6 2.2 0.2 H7 P-2

16

19

Notes

Smooth drilling.

Mechanical break

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Start Date: 01-22-2020 End Date: 01-23-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-209(P) Bedrock Depth: 7.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 4 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235872.7, E 3075850.3 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.7 ft Total Depth: 30.0 ft Groundwater EI: 5348.7 ft On Date: 01-22-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials Drillers note that the Mechanical break shale is swelling in the core sleeves. Mechanical break Mechanical break 21 Smooth drilling. Mechanical break Mechanical break 22 Mechanical break 20.0 to 25.0 5.0 5.0 (100) (100) NQ-4 5.0 12 >10 1.0 0.1 H7 Mechanical break Mechanical break 23 Mechanical break Mechanical break 24 Mechanical break Mechanical break Mechanical break Mechanical break P-3 25 Mechanical break Mechanical break Mechanical break 26

Mechanical break

Mechanical break

Mechanical break

Mechanical break

Mechanical break

Mechanical break Mechanical break Mechanical break

Notes Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

5.0 5.0 (100) (100)

18 >10 1.3 0.1

5.0

27

28

29

5324.7

NQ-5

Bottom of boring at

RIH

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OG OF SOIL BORI Borehole ID: Start Date: 01-20-2020 End Date: 01-21-2020 **B-210** Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Sheet 1 of 4 Bedrock Depth: 3.7 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235542.8, E 3075765.8 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5354.0 ft Total Depth: 25.0 ft Groundwater EI: Not Encountered On Date: 01-20-2020 Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Bu-1 from 0.0 to 3.7 feet. S-2: Clayey Sand Mostly sand, fine to coarse grained, subangular to subrounded; 15-20% fines, medium plasticity; less than 10% S - 2 2/50 for 4 inches 0.9 0.8 gravel, fine to coarse grained, angular to subangular; maximum particle size = 0.5 inches; very dense; moist; brown; roots throughout; (SC); [Fill] Grinding, minor rig rocking. 5352.3 S-3: Clayey Gravel with Sand Mostly gravel, fine to coarse grained, subangular to 2 Smooth drilling subrounded; 20-30% sand, fine to coarse grained, subangular to subrounded; 15-25% fines, low to medium plasticity; maximum particle size = 1.5 inches; very dense; moist; light brown; (GC); Minor grinding. 3 S - 3 7/17/20 1.5 1.5 5350.3 Top of bedrock at 3.7 feet. S-3: Sandy Shale Laminated; mostly fines, low to medium plasticity; 20-30% 5350.0 sand, fine grained; moderately to intensely weathered; dry; brown to gray; H7, oxidized; [PIERRE SHALE] S - 4 0.5 0.5 50 for 6 inches 5349.5 Augered to 4.5 feet and Laminated; mostly fines, low to medium plasticity; less than switched to NQ3 rock coring 15% sand, fine grained; fresh to slightly weathered; dry; after performing S-4. brown to gray [PIERRE SHALE] 5 End of boring log at 4.50 ft 8 Notes Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Start Date: 01-20-2020 End Date: 01-21-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG **B-210** Bedrock Depth: 3.7 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 2 of 4 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235542.8, E 3075765.8 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.0 ft Total Depth: 25.0 ft Groundwater EI: Not Encountered On Date: 01-20-2020 In Situ Testing Coring Time (min) No. of Pieces Joint Symbo Shortest (ft) RQD, ft (%) Joint Description € Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 5349.5 4.5 to 25.0 ft: Shale 0.6 0.6 (120) Laminated; mostly fines, low to medium plasticity; less than 5% sand; fresh to slightly weathered; unfractured; NQ-1 6 0.6 0.5 0.6 moist to wet; gray; [PIERRE SHALE] Smooth drilling. 5.0 5.0 5.0 (100) NQ-2 18 1 5.0 5.0

Notes Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring backfilled with cement-bentonite grout.



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Start Date: 01-20-2020 End Date: 01-21-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG **B-210** Bedrock Depth: 3.7 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 4 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235542.8, E 3075765.8 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.0 ft Total Depth: 25.0 ft Groundwater EI: Not Encountered On Date: 01-20-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) Joint Description € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials 10.0 to 15.0 ft: very slightly to slightly fractured; Smooth drilling. 12 10.0 to 15.0 5.0 5.0 (100) (100) NQ-3 5.0 12 3 2.9 0.5 H7 P-1 Mechanical break 13 10 degrees, Slightly to moderately open, slightly rough to smooth, very thin to moderately thin infilling 14 15 Smooth drilling. Mechanical break 16 17 Mechanical break Mechanical break 5.0 5.0 (100) (100) NQ-4 5.0 11 8 1.2 0.2 H7 Mechanical break 18 Mechanical break 19 Several mechanical breaks were caused during extraction of Mechanical break rock core from the core barrel. Mechanical break Mechanical break Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes

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hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

extraction. Boring backfilled with cement-bentonite grout.

Start Date: 01-20-2020 End Date: 01-21-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG **B-210** Bedrock Depth: 3.7 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 4 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235542.8, E 3075765.8 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.0 ft Total Depth: 25.0 ft Groundwater EI: Not Encountered On Date: 01-20-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 20.0 to 23.0 ft: very slightly fractured; Smooth drilling Mechanical break 22 Mechanical break 20.0 to 25.0 5.0 5.0 (100) (100) NQ-5 5.0 16 4 1.6 0.2 H7 P-3 23 Mechanical break 23.0 to 25.0 ft: very slightly fractured; H5; Drillers note smooth drilling except for soft areas of rock core where mechanical breaks have 24 occurred. 3 degrees, Slightly to moderately open, slightly rough to smooth, clean to very thin infilling End of rock core log at 25.00 ft 5329.0 25 Bottom of boring at 25.0 feet. 26 27 28 29 Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

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extraction. Boring backfilled with cement-bentonite grout.

Borehole ID: OG OF SOIL BORING Start Date: 01-24-2020 End Date: 01-27-2020 Driller: Elite - Greg Logged By: SMG B-211(P) Project name: South Boulder Creek Regional Detention Bedrock Depth: 11.0 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235986.9, E 3075493.9 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5354.8 ft Total Depth: 30.0 ft Groundwater EI: 5349.8 ft On Date: 01-24-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Bu-1 from 0.0 to 2.5 feet. S-2: Clayey Gravel with Sand Mostly gravel, fine to coarse grained, subangular to subrounded; 25-35% sand, fine to coarse grained, subangular to subrounded; 25-35% fines, low to medium plasticity; maximum particle size = 1 inch; moist; brown; occasional roots; (GC); 3/5/8 1.5 1.0 S-2 [Fill] Smooth drilling. 5352.8 2 S-3, S-4, S-5, S-6, S-7: Lean Clay Mostly fines, medium to high plasticity; less than 5% sand, fine to coarse grained; less than 5% gravel, fine grained; maximum particle size = 0.75 inches; very stiff; dry to moist; gray; processed Pierre Shale; (CL); 3 8/8/8 1.5 1.5 Groundwater encountered at 5.0 feet during drilling on 1/24/2020. Boring was advanced from 4.0 to 10.0 feet using NQ3 rock coring after performing S-3. Core recovery was poor and consisted mostly of gravel particles. 5 S-4 was performed after coring to 10.0 feet. Boring collapsed at 6.0 feet after performing S-4. S-5 and S-6 were performed to remove collapsed material from the boring and each sampler advanced 2.0 feet under the weight of the hammer. 6.0 to 9.0 ft: wet; Augers were advanced from 4.0 to 10.0 feet after S-6. S-7 was performed in the same depth interval as S-4 after augering to 10.0 feet 8 Switched back to augering after Grinding 9.0 to 11.0 ft: less than 10% gravel, fine grained; maximum particle size = 0.5 inches; medium stiff; Continued on next shee Notes Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

influenced blow counts and sample recovery. Boring completed as monitoring well.

Borehole ID: OG OF SOIL BORING Start Date: 01-24-2020 End Date: 01-27-2020 B-211(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 11.0 ft Checked By: ABP Sheet 2 of 4 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235986.9, E 3075493.9 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5354.8 ft Total Depth: 30.0 ft Groundwater EI: 5349.8 ft On Date: 01-24-2020 Penetration (ft) Recovery (ft) Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation S-7 was performed in the same interval as S-4. Recovery was 1.5 feet and blow counts were 9/16/40 S - 4 1.5 1.5 3/7/11. 5343.8 11 Drillers note more difficult augering at 11.0 feet. Laminated; mostly fines, low to medium plasticity; less than 10% sand, fine grained; slightly weathered; slightly moist; gray; H7; [PIERRE SHALE] 12 S - 8 35/50 for 5 inches 0.9 0.9 13 Augered to 13.5 feet and 5341.3 End of boring log at 13.50 ft switched to NQ3 rock coring after performing S-8. 14 15 16 17 18 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

influenced blow counts and sample recovery. Boring completed as monitoring well.

Start Date: 01-24-2020 End Date: 01-27-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-211(P) Bedrock Depth: 11.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 4 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235986.9, E 3075493.9 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.8 ft Total Depth: 30.0 ft Groundwater EI: 5349.8 ft On Date: 01-24-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) Joint Description € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials 12 NQ-1 was performed from 4.0 to 5.0 feet and NQ-2 was 13 formed from 5.0 to 10.0 feet. 5341.3 13.5 to 30.0 ft: Shale 13.5 to 30.0 it: Snale Laminated, mostly fines, medium plasticity; less than 5% sand, fine to coarse grained, subangular to subrounded; fresh to slightly weathered; unfractured; dry to moist; gray; [PIERRE SHALE] 14 2.5 2.5 (167) (167) 13.5 to NQ-3 0.2 H7 1.5 7 3 1.1 15.0 Mechanical break Mechanical break 15 Full circulation Mechanical break 16 17 5.0 5.8 5.8 (116) (116) NQ-4 22 8 2.7 0.1 18 P-1 19 19.0 to 20.0 ft: H6;

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Notes



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Mechanical break

Start Date: 01-24-2020 End Date: 01-27-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-211(P) Bedrock Depth: 11.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 4 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235986.9, E 3075493.9 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5354.8 ft Total Depth: 30.0 ft Groundwater EI: 5349.8 ft On Date: 01-24-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc ģ Description and Classification of Materials 20.0 to 30.0 ft: very slightly fractured; Mechanical break 30 degrees, Slightly to moderately open, moderately to slightly rough, very thin calcite infilling 21 22 20.0 to 25.0 5.4 5.4 (108) (108) NQ-5 5.0 19 6 2.9 0.1 H7 P-2 23 Mechanical break 24 Mechanical break Mechanical break 25 Full circulation, 15 degrees, Tight to slightly open, smooth, clean 0 degrees, Tight to slightly open, moderately to slightly rough, very thin calcite infilling smooth drilling 26 27 5.2 (104) 4.8 (96) NQ-6 5.0 17 5 3.2 0.2 H7 28 29 Mechanical break Bottom of boring at 5324.8 Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes

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hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

extraction. Boring completed as monitoring well.

Borehole ID: OG OF SOIL BORING Start Date: 02-19-2020 End Date: 02-21-2020 B-212(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 10.2 ft Checked By: ABP Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236198.6, E 3075102.9 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5359.4 ft Total Depth: 30.0 ft Groundwater EI: Not Measured On Date: 02-19-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Elevation Graphic Lithology Boulders up to 2.5 feet in S-2, S-3: Silty Sand with Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 30-40% gravel, fine to coarse grained, diameter on the ground surface near boring. subangular to subrounded; 10-20% fines, nonplastic; Bu-1 from 0.0 to 10.2 feet. maximum particle size = 1.5 inches; medium dense; moist; brown; occasional roots; (SM); 6/14/14 1.5 1.3 S-2 2 2.5 to 4.2 ft: very dense; slightly moist; S - 3 35/50 for 5 inches 0.9 0.9 3 Grinding, gravel in cuttings. 5355.2 S-4: Clayey Sand with Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 15-25% fines, low plasticity; 35-45% gravel, fine to coarse grained, subangular to subrounded; maximum particle size = 1 inch; very dense; moist to wet; brown; occasional roots; (SC); Continuous grinding. Split spoon 5 shoe broke during hammering 0.3 0.1 S - 4 50 for 4 inches 6 5353.0 S-5: Silty Sand with Gravel Similar to S-2 Except: very dense; dry to moist; red to brown; no roots; weak reaction with HCI; (SM); 7 S - 5 30/50 for 5 inches 8.0 0.5 8 Rig rocking, more intense grinding. Coarser gravel in cuttings 5350.2 S-6: Clayey Sand with Gravel Similar to S-4 Except: Gravel is angular to subrounded; maximum particle size = 1.75 inches; very dense; slightly moist; no roots; (SC); Continued on next sheet Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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influenced blow counts and sample recovery. Boring completed as monitoring well.

Borehole ID: OG OF SOIL BORING Start Date: 02-19-2020 End Date: 02-21-2020 B-212(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 10.2 ft Checked By: ABP Sheet 2 of 4 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236198.6, E 3075102.9 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5359.4 ft Total Depth: 30.0 ft Groundwater EI: Not Measured On Date: 02-19-2020 Penetration (ft) Recovery (ft) Depth (ft) Blows per 6 inch Type - No Remarks Description and Classification of Materials Elevation Graphic /// 5349.2 Top of bedrock at 10.2 feet. 10.2 to 11.5 ft: Shale Mostly fines, medium plasticity; 5-15% sand, fine grained; fresh to slightly weathered; dry to moist; gray; H7; weak reaction with HCI; 6/22/40 1.5 1.2 S - 6 [PIERRE SHALE] 11 5347.9 Augered to 11.5 feet and End of boring log at 11.50 ft switched to NQ3 rock coring after performing S-6. 12 13 14 15 16 17 18 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

influenced blow counts and sample recovery. Boring completed as monitoring well.

Start Date: 02-19-2020 End Date: 02-21-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-212(P) Bedrock Depth: 10.2 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 4 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236198.6, E 3075102.9 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5359.4 ft Total Depth: 30.0 ft Groundwater EI: Not Measured On Date: 02-19-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials 5347.9 11.5 to 30.0 ft: Shale Laminated; mostly fines, medium plasticity; 5-10% sand; Mechanical break fresh to slightly weathered; unfractured; dry; gray; weak reaction with HCl; [PIERRE SHALE] Mechanical break 12 Mechanical break 13 4.2 4.2 (120) (120) 11.5 to 15.0 NQ-1 3.5 8 7 2.5 0.1 Н7 Smooth drilling, full 14 circulation. Mechanical break Mechanical break Mechanical break 15 Mechanical break 2.1 2.1 (105) (105) 2.0 3 16 0.3 Mechanical break 17 17.0 to 20.0 ft: very slightly fractured; Mechanical break Drillers note that the bit is plugging due to softness of rock. Mechanical break 18 17.0 to 3.2 3.2 P-2 NQ-3 3.0 8 7 1.1 0.4 H7 (107) (107) 19 20 degrees, Moderately open, noderately to slightly rough, clean Mechanical break

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Notes



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LOG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Notes

Boring Location: N 1236198.6, E 3075102.9 ft

Ground EI: 5359.4 ft Total Depth: 30.0 ft

Start Date: 02-19-2020 Driller: Elite - Greg

Bedrock Depth: 10.2 ft
Plunge: 90.0

End Date: 02-21-2020 Logged By: SMG Checked By: ABP

ecked By: ABP Bearing: Not applicable

Borehole ID:
B-212(P)
Sheet 4 of 4

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Equipment: NQ3 Wireline Rock Coring

| Ground EI: 5359.4 ft Groundwater EI: Not Measured Total Depth: 30.0 ft On Date: 02-19-2020 | | | | | | | Lqui | JIIIGII | i. IVQ | 3 Wireline Rock | COI | | | | | |
|---|------------------|---|-----------------|------------------|------------------|--------------|----------------------|---------------|--------------|-----------------|----------|-----------------|---|--------------|-----------|---|
| Groundwater EI: Not Measured | | | С | n Da | | 2-19-2 | 2020 | | | | | | | | | |
| Elevation | Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials |
| | 21 — | NQ-4 | 20.0 to 22.0 | 2.0 | 2.1 (105) | 2.1 (105) | | 1 | 2.1 | 2.1 | Н7 | | | | | |
| | 22 — | | | | | | | | | | | | Mechanical break Mechanical break | | | |
| | 23 — | NQ-5 | 22.0 to 25.0 | 3.0 | 3.1 (103) | 3.1 (103) | 13 | 7 | 1.5 | <0.1 | H7 | | Mechanical break | | | |
| | 24 — | | | | | | | | | | | | | | | |
| | 25 — | | | | | | | | | | | | Mechanical break Mechanical break | | | |
| | 26 — | | | | | | | | | | | P-3 | Mechanical break | | | |
| | 27 — | NQ-6 | 25.0 to 29.0 | 4.0 | 4.0 (100) | 4.0 (100) | 15 | 5 | 2.7 | <0.1 | H7 | | | | | |
| | 28 — | | | | | | | | | | | | Machanical brook | | | |
| | 29 — | | | | | | | | | | | | Mechanical break Mechanical break Mechanical break Mechanical break | | | |
| | - - - - | NQ-7 Bottom of boring at 30.0 feet. | 29.0 to 30.0 | 1.0 | 1.1 (110) | 1.1 (110) | 4 | 3 | 0.7 | 0.1 | H7 | | Mechanical break | | | |
| 329.4 | 30 — | | | | | | | | | | | | | | | End of rock core log at 30.00 ft |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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OG OF SOIL BORIN Borehole ID: Start Date: 02-12-2020 End Date: 02-14-2020 Driller: Elite - Greg Logged By: SMG **B-213** Project name: South Boulder Creek Regional Detention Bedrock Depth: 16.0 ft Checked By: ABP Sheet 1 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236455.3, E 3074765.5 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5355.5 ft Total Depth: 37.0 ft Groundwater EI: 5350.8 ft On Date: 02-12-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Minor grinding S-1: Clayey Sand with Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 20-30% gravel, subangular to subrounded; 15-25% fines, low plasticity; maximum particle size = 1.25 inches; dense; slightly moist; brown; (SC); 9/20/23 1.5 1.5 S - 1 5353.5 Smooth drilling 2 S-2: Poorly Graded Sand with Clay and Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 15-25% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, low to medium Bu-3 from 2.5 to 5.5 feet. plasticity; maximum particle size = 1 inch; dense; slightly moist; black; (SP-SC); 3 Much of sample S-2 consists of black sand-sized particles. 21/23/18 1.5 1.5 5351.0 S-4, S-5: Fat Clay Mostly fines, medium to high plasticity; 5-15% sand, fine to Groundwater encountered at 4.7 feet during drilling on 2/12/20. to gray; PP = 1.5 tsf; processed Pierre Shale; (CH); [Fill] coarse grained, subangular to subrounded; wet; dark brown 5 5.5 to 7.0 ft: less than 5% sand; very soft; gray; S - 4 1/1/0 1.5 1.5 Grinding, minor rig rocking. 7.0 to 9.0 ft: PP = 1 tsf; S - 5 50 for 5 inches 0.5 0.5 8 Smooth drilling 5346.5 9 S-6: Clayey Gravel with Sand Mostly gravel, subangular to subrounded; 35-45% sand, medium to coarse grained, subangular to subrounded; 15-25% fines, low to medium plasticity; maximum particle size = 1.5 inches; medium dense; brown; (GC); [Fill] Continued on next sheet Notes Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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Borehole ID: OG OF SOIL BORING Start Date: 02-12-2020 End Date: 02-14-2020 **B-213** Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 16.0 ft Checked By: ABP Sheet 2 of 5 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236455.3, E 3074765.5 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5355.5 ft Total Depth: 37.0 ft Groundwater EI: 5350.8 ft On Date: 02-12-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation S - 6 12/15/3 1.5 1.2 5344.4 S-6, S-7, S-8: Lean Clay Mostly fines, low plasticity; 5-15% sand, fine to coarse grained, subangular to subrounded; less than 5% gravel, subrounded to rounded; maximum particle size = 1 inch; medium stiff; moist to wet; gray; PP = 0.75 tsf; (CL); 11.5 to 13.5 ft: PP = 1.25 tsf; 12 S - 7 3/4/4 1.5 1.5 13 13.5 to 15.0 ft: soft; moist; PP = 0.25 tsf; 14 S - 8 15/11/13 1.5 1.3 5340.5 15 S-8: Sandy Lean Clay with Gravel Mostly fines, low to medium plasticity; 20-30% sand, medium to coarse grained, subangular to subrounded; 15-25% gravel, fine to coarse grained, subangular to Drillers noted soil seemed stiffer subrounded; maximum particle size = 0.75 inches; soft; while augering. brown to gray; PP = 0.5 tsf; (CL); [Fill] 5339.5 Top of bedrock at 16.0. 16 S-9: Shale Laminated; mostly fines, medium plasticity; 5-15% sand; slightly weathered; dry to moist; gray; [PIERRE SHALE] 17 S - 9 13/16/27 1.5 1.5 18 5337.0 Augered to 18.5 and switched to End of boring log at 18.50 ft NQ3 rock coring after performing S-9. 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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Start Date: 02-12-2020 End Date: 02-14-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG **B-213** Bedrock Depth: 16.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 3 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236455.3, E 3074765.5 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5355.5 ft Total Depth: 37.0 ft Groundwater EI: 5350.8 ft On Date: 02-12-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) Joint Description € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 12 13 14 15 16 17 18 5337.0 18.5 to 37.0 ft: Shale Laminated; mostly fines, medium plasticity; less than 5% sand; fresh to slightly weathered; unfractured; slightly moist; gray; [PIERRE SHALE] Mechanical break 19 18.5 to 20.0 1.3 (87) 1.3 (87) Mechanical break NQ-1 1.5 6 4 0.5 0.1 H7

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Mechanical breaks are generally near softer rock core. Boring backfilled with cement-bentonite grout.

Notes



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Mechanical break

Start Date: 02-12-2020 End Date: 02-14-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG **B-213** Bedrock Depth: 16.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 4 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236455.3, E 3074765.5 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5355.5 ft Total Depth: 37.0 ft Groundwater EI: 5350.8 ft On Date: 02-12-2020 In Situ Testing Coring Time (min) of Pieces (%) H Joint Symbo € Notes: Groundwater Drilling, Conditions, Circulation etc Shortest RQD, Description and Classification of Materials Full circulation. 20.0 to 22.5 ft: slightly weathered; smooth drilling. 21 Mechanical break 2.9 2.9 (116) (116) NQ-2 2.5 7 3 1.1 0.2 H6 22.5 P-1 22 Mechanical break Mechanical break 23 25 degrees, Slightly open, slightly rough, very thin clay infilling 22.5 to 2.5 2.5 NQ-3 2.5 14 5 1.2 0.2 H7 (100) (100) 24 Mechanical break Drillers note core bit was plugging up near the end of NQ-3. Mechanical break 25 Mechanical break Mechanical break Mechanical break Mechanical break 26 3.4 3.4 (113) (113) 25.0 to NQ-4 3.0 10 6 1.8 0.2 H7 27 Full circulation Mechanical break Mechanical break 28 Mechanical break 2.1 2.1 (105) (105) NQ-5 9 H7 29 2.0 3 3.7 0.1

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Mechanical breaks are generally near softer rock core. Boring backfilled with cement-bentonite grout.

Full circulation

Notes



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Start Date: 02-12-2020 End Date: 02-14-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG **B-213** Bedrock Depth: 16.0 ft Checked By: ABP Project name: South Boulder Creek Regional Detention Sheet 5 of 5 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236455.3, E 3074765.5 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5355.5 ft Total Depth: 37.0 ft Groundwater EI: 5350.8 ft On Date: 02-12-2020 In Situ Testing Coring Time (min) of Pieces Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials Mechanical break Mechanical break Mechanical break 2.5 2.5 (109) (109) NQ-6 2.3 12 Mechanical break 32 Mechanical break Mechanical break 33 P-3 NQ-7 32.3 to 3.0 3.0 (111) (111) Mechanical break 2.7 13 10 0.5 0.1 H7 Mechanical break Mechanical break 34 Mechanical break Mechanical break Mechanical break 35 Full circulation. Mechanical break Mechanical break Mechanical break 2.0 2.0 (100) (100) 0.1 H6 to 2.0 10 36 0.6 Mechanical break Mechanical break Bottom of boring at 5318.5 37 End of rock core log at 37.00 ft 38 39

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Mechanical breaks are generally near softer rock core. Boring backfilled with cement-bentonite grout.

Notes



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Borehole ID: OG OF SOIL BORING Start Date: 06-01-2020 End Date: 06-03-2020 Driller: Elite - Greg Logged By: SMG B-214(P) Project name: South Boulder Creek Regional Detention Bedrock Depth: 8.0 ft Checked By: JNH Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236273.3, E 3077129.3 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5358.3 ft Total Depth: 60.0 ft Groundwater EI: 5354.8 ft On Date: 06-01-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Elevation Graphic Lithology Cobbles on ground surface up S-2: Poorly Graded Sand with Silt and Gravel Mostly sand, fine to coarse grained, subangular to subrounded; 20-30% gravel, fine to coarse grained, to 8.5 inches. Bu-1 from 0.0 to 8.0 feet. subangular to subrounded; 5-15% fines, nonplastic to low Grinding, rig rocking. plasticity; maximum particle size = 2 inches; medium dense; dry to moist; brown; occasional organics and roots; (SP-6/12/17 1.5 1.0 S-2 [Alluvium] Continous grinding, sandy 2 2.0 to 4.5 ft: 15-25% gravel; maximum particle size = brown cuttings. 1.5 inches; moist; no roots or organics; 3 Groundwater level measurement at 3.0 feet on S - 3 7/4/12 1.5 1.1 6/2/20 at 09:15. Groundwater encountered at 3.5 feet during drilling on 6/1/20. 4.5 to 7.0 ft: 30-40% gravel; maximum particle size = 1.25 inches; very dense; moist to wet; no roots or 5 12/42/50 for 5 S - 4 1.4 1.0 inches Continous grinding, slow augering. 5351.3 7 S-5: Silty Sand Mostly sand, fine to coarse grained, subangular to subrounded; 15-25% fines, nonplastic to low plasticity; less than 10% gravel, fine to coarse grained, subangular to subrounded; maximum particle size = 0.5 inches; medium dense; wet; brown; (SM); [Alluvium] 5350.3 8 Top of bedrock at 8.0 feet. Mostly fines, medium plasticity; less than 10% sand, fine 6/5/9 1.5 1.5 S - 5 grained; moderately to intensely weathered; dry to moist; gray to brown; occasional iron staining; [PIERRE SHALE] 5349.3 Augered to 9.0 feet and 9 End of boring log at 9.00 ft switched to NQ3 rock coring after performing S-5. Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have influenced blow counts and sample recovery. Boring completed as monitoring well.

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Start Date: 06-01-2020 End Date: 06-03-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-214(P) Bedrock Depth: 8.0 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Sheet 2 of 7 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236273.3, E 3077129.3 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5358.3 ft Total Depth: 60.0 ft Groundwater EI: 5354.8 ft On Date: 06-01-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo Shortest (ft) RQD, ft (%) Joint Description € Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials No recovery in NQ-1 because gravel piece stuck in shoe of core 5349.3 9.0 to 60.0 ft: Shale 9.0 to 60.0 ft. Shale Laminated; mostly fines, medium plasticity; 5-15% sand; fresh to slightly weathered; slightly fractured; dry to moist; gray; occasional weak to strong reaction with HCl along bedding planes and fractures; [PIERRE SHALE] 9.0 to 10.0 0.0 NQ-1 1.0 2 0 NA NA NA Core loss (0) Continued on next sheet

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Notes



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Start Date: 06-01-2020 End Date: 06-03-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-214(P) Bedrock Depth: 8.0 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Sheet 3 of 7 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236273.3, E 3077129.3 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5358.3 ft Total Depth: 60.0 ft Groundwater EI: 5354.8 ft On Date: 06-01-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials Core loss Mechanical break Mechanical break 5 degrees, Tight to slightly open, slightly rough, clean to very thin infilling 0 degrees, Slightly to moderately open, moderately rough, clean to very thin calcite infilling NQ-2 4.0 9 0.4 Н7 1.1 12 (95) (95) 14.0 13 Mechanical break Full circulation. Mechanical break 14 14.0 to 20.0 ft: unfractured; Mechanical break Mechanical break Mechanical break P-1 Mechanical break 15 3.0 3.0 (100) (100) 14.0 to 17.0 NQ-3 3.0 6 8 1.2 <0.1 H7 Mechanical break 16 Smooth drilling. 17 Mechanical break Mechanical break 18 Mechanical break 17.0 to 3.2 3.2 (107) (107) 3.0 7 NQ-4 6 1.8 0.1 H7 Mechanical break Full circulation. 19 Mechanical break

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Notes



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Start Date: 06-01-2020 End Date: 06-03-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-214(P) Bedrock Depth: 8.0 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Sheet 4 of 7 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236273.3, E 3077129.3 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5358.3 ft Total Depth: 60.0 ft Groundwater EI: 5354.8 ft On Date: 06-01-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials Mechanical break Smooth drilling. Mechanical break 3.2 (107) 3.2 (107) 20.0 to NQ-5 3.0 5 6 H7 P-2 0.8 0.2 23.0 Mechanical break 22 10 degrees, Tight to slightly open, slightly rough to smooth, clean to very thin infilling Mechanical break Full circulation. 23 23.0 to 30.0 ft: unfractured; Mechanical break 23.0 to 25.0 2.1 2.1 (105) (105) NQ-6 2.0 4 0.8 0.4 24 Mechanical break Mechanical break 25 Full circulation. Mechanical break 26 Mechanical break 3.1 3.1 (103) (103) 25.0 to P-3 3.0 6 6 0.7 0.1 H7 Mechanical break NQ-7 27 Mechanical break 28 Mechanical break Mechanical break 2.2 2.2 (105) (105) 28.0 to NQ-8 2.1 0.1 H7 29 5 6 0.5 Mechanical break Mechanical break Mechanical break

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Notes



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LOG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Notes

Driller: Elite - Greg
Regional Detention

Bedrock Depth: 8.0 ft
Plunge: 90.0

End Date: 06-03-2020 Logged By: SMG Checked By: JNH Bearing: Not applicable Borehole ID: B-214(P) Sheet 5 of 7

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Start Date: 06-01-2020

Boring Location: N 1236273.3, E 3077129.3 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5358.3 ft Total Depth: 60.0 ft Groundwater EI: 5354.8 ft On Date: 06-01-2020 In Situ Testing Coring Time (min) of Pieces Joint Symbo ft (%) € Shortest Notes: Groundwater Drilling, Conditions, RQD, ģ Circulation etc Description and Classification of Materials Mechanical break Mechanical break Mechanical break Full circulation. 45 degrees, Slightly open, smooth, very thin infilling, Occasional iron staining Mechanical break 45 degrees, Tight to slightly open, smooth, clean to very thin 32 infilling 30.1 to 35.0 4.9 4.9 (100) (100) <0.1 H6 to NQ-9 4.9 10 >10 0.5 Mechanical break 33 Mechanical break Mechanical break Smooth drilling. Mechanical break Mechanical break Drillers dropped core 34 sample causing mechanical breaks Mechanical break Mechanical break 35 P-4 35.0 to 44.0 ft: unfractured; Shells present at 39.0 feet: Mechanical break 36 Mechanical break 4.2 4.2 (105) (105) 35.0 to 4.0 7 0.1 H7 37 NQ-10 5 1.9 39.0 38 Full circulation. 39 Mechanical break, Less than 1/8 inch layer of shells and calcite 39.0 to 40.0 1.0 1.0 (100) (100) NQ-11 0.1 1.0 2 3 0.5 Н7 Mechanical break

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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OG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134 Boring Location: N 1236273.3, E 3077129.3 ft Start Date: 06-01-2020 Driller: Elite - Greg

Bedrock Depth: 8.0 ft Plunge: 90.0

End Date: 06-03-2020 Logged By: SMG Checked By: JNH

Bearing: Not applicable

Borehole ID: B-214(P)

Sheet 6 of 7

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

Equipment: NO3 Wireline Rock Coring

| Ground El: 5358.3 ft Total Depth: 60.0 ft Groundwater El: 5354.8 ft On Date: 06-01-2020 | | | | | | | | | Equipment: NQ3 Wireline Rock Coring | | | | | | | |
|--|--|---|-----------------|------------------|------------------|--------------|----------------------|---------------|-------------------------------------|---------------|-------------|-----------------|--|--------------|-----------|---|
| Gro | undwate | r EI: 5354.8 ft | С | | | 3-01-: | 2020 | | ı | l | I | | | | | |
| Elevation | Depth (ft) | Notes: Groundwater, Drilling, Conditions, Circulation etc | Interval (ft) | Penetration (ft) | Recovery ft, (%) | RQD, ft (%) | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | Hardness | In Situ Testing | Joint Description | Joint Symbol | Lithology | Description and Classification of Materials |
| | 41 — | Full circulation. NQ-12 Smooth drilling. | 40.0 to 44.0 | 4.0 | 4.0 (100) | 4.0 (100) | 7 | 6 | 2.0 | 0.1 | H6 to H7 | | Mechanical break Mechanical break Mechanical break Mechanical break | | | |
| | 44 — - - - - - - - - | NQ-13 | 44.0 to 45.0 | 1.0 | 1.1 (110) | 1.1 (110) | 3 | 3 | 0.7 | 0.2 | H6 to H7 | | Mechanical break Mechanical break | | | 44.0 to 46.0 ft: unfractured; weak reaction with HCl; |
| | 45 — | NQ-14 | 45.0 to 46.0 | 1.0 | 1.0 (100) | 1.0 (100) | 2 | 3 | 0.3 | 0.2 | H7 | | Mechanical break Mechanical break Mechanical break | | | |
| | 46 | NQ-15 Full circulation. | 46.0 to 50.0 | 4.0 | 4.2 (105) | 4.2 (105) | 8 | 5 | 3.0 | 0.1 | H6 to | | Mechanical break Mechanical break Mechanical break Mechanical break | | | 46.0 to 50.0 ft: unfractured; occasional shells; Continued on next sheet |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Start Date: 06-01-2020 End Date: 06-03-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-214(P) Bedrock Depth: 8.0 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Plunge: 90.0 Bearing: Not applicable Sheet 7 of 7 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1236273.3, E 3077129.3 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5358.3 ft Total Depth: 60.0 ft On Date: 06-01-2020 Groundwater EI: 5354.8 ft In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 50.0 to 60.0 ft: unfractured; Mechanical break Full circulation. 4.2 4.2 (105) (105) 0.4 H6 to NQ-16 4.0 8 2.0 52 54.0 Mechanical break 53 Mechanical break 54 1.0 54.0 to 1.0 NQ-17 1.0 2 1.0 1.0 (100) (100) 55 P-5 Smooth drilling. 56 4.0 4.0 (100) (100) 55.0 to NQ-18 4.0 9 0.1 Н6 57 3 3.8 59.0 Mechanical break Mechanical break 59 59.0 to 60.0 1.0 1.0 (100) (100) 1.0 2 1.0 1.0 Н6 NQ-19

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Bottom of boring at

5298.3 Notes



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Borehole ID: OG OF SOIL BORING Start Date: 05-26-2020 End Date: 05-28-2020 Driller: Elite - Greg Logged By: SMG B-215(P) Project name: South Boulder Creek Regional Detention Bedrock Depth: 12.8 ft Checked By: JNH Sheet 1 of 8 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235903.4, E 3077841.7 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5362.8 ft Total Depth: 65.3 ft Groundwater EI: 5356.8 ft On Date: 05-26-2020 € Penetration Type - No Blows per 6 inch Recovery Remarks Description and Classification of Materials Depth (ft) Elevation Graphic Lithology S-2, CA-3, S-4: Sandy Lean Clay with Gravel Mostly fines, medium plasticity; 25-35% sand, fine to coarse grained, subangular to subrounded; 15-25% gravel, fine Bu-1 from 0.0 to 6.0 feet. grained, subangular to subrounded; maximum particle size = 0.75 inches; very stiff; dry to moist; brown; PP = 2.5 tsf; occasional strong reaction with HCI, occsaional roots; (CL); 0.8 1.5 S-2 3/5/6 Brown cuttings. 1.5 to 2.5 ft: maximum particle size = 0.5 inches; medium stiff; PP = 1 tsf; (CL); CA - 3 5/10 0.8 Minor grinding, 2 2.5 to 4.0 ft: 20-30% sand; Gravel is fine to coarse grained; maximum particle size = 1 inch; very stiff; PP = 4 tsf; strong reaction with HCl; 3 6/8/10 1.5 1.0 5358.8 4 Smooth drilling. CA-5: Clayey Sand with Gravel Mostly fines, high plasticity; 30-40% sand, fine to coarse grained, subangular to subrounded; 15-25% gravel, fine grained; maximum particle size = 0.75 inches; stiff; moist; white to tan; PP = 1.25 tsf; weak to strong reaction with HCl; CA - 5 6/6 1.0 1.0 (SC): [Fill] 5357.8 5 CA-6: Gravelly Lean Clay with Sand Mostly fines, high plasticity; 10-20% sand, fine to coarse grained, subangular to subrounded; 15-25% gravel, fine grained; maximum particle size = 0.75 inches; medium stiff; CA - 6 8/8 1.0 1.0 moist to wet; brown; weak to strong reaction with HCI; (CL); Bu-11 from 6.0 to 7.5 feet. 5356.8 Groundwater encountered at 6.0 6 S-7: Clayey Sand with Gravel feet during drilling on 5/26/20. Mostly sand, fine to coarse grained, subangular to Groundwater level subrounded; 15-25% fines, medium plasticity; 15-25% measurement at 6.1 feet on gravel, fine to coarse grained, subangular to subrounded; maximum particle size = 1.5 inches; medium dense; wet; 5/24/20 at 08:45. brown; (SC); S - 7 3/9/16 1.5 1.3 [Alluvium] 7 5355.3 CA-8 was performed from 7.5 to S-9: Poorly Graded Sand with Silt and Gravel 8.5 feet before performing S-9. Mostly sand, fine to coarse grained, subangular to CA-5 had no recovery and blow subrounded; 25-35% gravel, fine to coarse grained, counts were 4/8. subangular to subrounded; 5-15% fines, nonplastic to low 8 plasticity; maximum particle size = 1.5 inches; dense; wet; brown; (SP-SM); 2/23/24 S - 9 1.5 1.5 [Alluvium] Continous grinding.

Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have influenced blow counts and sample recovery. Boring completed as monitoring well.

Notes



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Borehole ID: OG OF SOIL BORING Start Date: 05-26-2020 End Date: 05-28-2020 B-215(P) Driller: Elite - Greg Logged By: SMG Project name: South Boulder Creek Regional Detention Bedrock Depth: 12.8 ft Checked By: JNH Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235903.4, E 3077841.7 ft Equipment: 4-1/4" I.D., 8" O.D. Hollow Stem Auger (HSA) Ground EI: 5362.8 ft Total Depth: 65.3 ft Groundwater EI: 5356.8 ft On Date: 05-26-2020 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Rig rocking, drillers note large S - 10 0.3 0.0 50 for 3 inches cobble while augering. 5352.0 S-12: Poorly Graded Sand with Silt Mostly sand, fine to coarse grained, subangular to subrounded; 5-15% fines, nonplastic to low plasticity; 5-15% 11 gravel, fine grained, subangular to subrounded; maximum particle size = 0.75 inches; medium dense; wet; brown; (SP-SM); [Alluvium] 12 5350.0 Top of bedrock at 12.8 feet. S-12, S-13: Shale Laminated; mostly fines, medium plasticity; less than 10% sand; moderately to intensely weathered; moist; gray to 13 S - 12 2/4/11 1.5 1.2 brown; occasional iron staining; [PIERRE SHALE] 14 14.0 to 15.3 ft: moderately weathered; occasional weak to strong reaction with HCI; 17/23/50 for 3 S - 13 1.3 1.3 inches Augered to 15.3 feet and 15 switched to NQ3 rock coring after performing S-13. 5347.5 End of boring log at 15.30 ft 16 17 18 19 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

influenced blow counts and sample recovery. Boring completed as monitoring well.

Start Date: 05-26-2020 End Date: 05-28-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-215(P) Bedrock Depth: 12.8 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Sheet 3 of 8 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235903.4, E 3077841.7 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5362.8 ft Total Depth: 65.3 ft Groundwater EI: 5356.8 ft On Date: 05-26-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) Joint Description € Shortest (Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials 12 13 14 15 5347.5 15.3 to 65.3 ft: Shale Mechanical break Laminated; mostly fines, medium plasticity; less than 10% sand; slightly to moderately weathered; slightly to moderately fractured; dry to moist; gray; strong reaction with LPC: with HCI; [PIERRE SHALE] Smooth drilling, full 16 20 degrees, Tight, slightly rough, moderately thin calcite infilling circulation 3.5 3.5 (100) (100) 17 15.3 to 3.5 12 6 0.1 H7 1.5 NQ-1 18 P-1 19 Mechanical break Mechanical break Mechanical break Mechanical break 19.3 to 22.3 ft: slightly weathered; 10 degrees, Tight to Full circulation. Continued on next sheet Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock Notes hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

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extraction. Boring completed as monitoring well.

Start Date: 05-26-2020 End Date: 05-28-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-215(P) Bedrock Depth: 12.8 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Plunge: 90.0 Bearing: Not applicable Sheet 4 of 8 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235903.4, E 3077841.7 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5362.8 ft Total Depth: 65.3 ft Groundwater EI: 5356.8 ft On Date: 05-26-2020 In Situ Testing of Pieces Coring Time (min) Joint Symbo RQD, ft (%) Joint Description € Shortest (Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials slightly open, noderately to slightly rough, very thin infilling 5 degrees, Tight to slightly open, moderately to slightly rough, very thin infilling NQ-2 3.6 3.6 (103) (103) 3.5 13 22 22.3 to 30.3 ft: slightly weathered; unfractured, 23 3.0 3.0 (100) (100) NQ-3 3.0 7 1 3.0 3.0 H7 24 25 26 Mechanical break Mechanical break 27 4.0 4.0 (100) (100) NQ-4 4.0 11 3 2.7 0.2 Н7 28 29 1.0 3 2 0.5 0.4 H7 (90) 30.3 (90)NQ-5 Mechanical break

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Notes



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OG OF ROCK CORE

Project name: South Boulder Creek Regional Detention

Project No: 16134

Boring Location: N 1235903.4, E 3077841.7 ft

Start Date: 05-26-2020 Driller: Elite - Greg

End Date: 05-28-2020 Logged By: SMG Checked By: JNH Bedrock Depth: 12.8 ft Plunge: 90.0 Bearing: Not applicable

Borehole ID: B-215(P)

Sheet 5 of 8

Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig

| (ft) | r EI: 5356.8 ft Notes: Groundwater, | | Penetration (ft) | Recovery ft, (%) | | Coring Time (min) | No. of Pieces | Longest (ft) | Shortest (ft) | ess | In Situ Testing | iption | Joint Symbol | бб | |
|------------|--|-----------------|------------------|------------------|--------------|----------------------|---------------|--------------|---------------|-------------|-----------------|--|--------------|-----------|--|
| Depth (ft) | Drilling, Conditions, Circulation etc | Interval (ft) | Penet | Recov | RQD, ft (%) | Coring (min) | o O | Longe | Shorte | Hardness | In Situ | Joint Description | Joint 8 | Lithology | Description and Classification of Materials |
| - | | | | | | | | | | | | | | | 30.3 to 34.3 ft: slightly weathered; |
| = | | | | | | | | | | | | Manhanianthanah | | | unfractured; occasional strong reaction with HCl; |
| = | | | | | | | | | | | | Mechanical break | | | |
| 31 — | | | | | | | | | | | | | | | |
| = | | | | | | | | | | | | | | | |
| _ | | | | | | | | | | | | | | | |
| 32 — | | | | | | | | | | | | | | | |
| _ | NQ-6 | 30.3 to 34.3 | 4.0 | 4.0 (100) | 4.0 (100) | 10 | 2 | 3.6 | 0.4 | H6 to H7 | | | | | |
| _ | | | | | | | | | | | | | | | |
| - | | | | | | | | | | | | | | | |
| 33 — | | | | | | | | | | | | | | | |
| _ | | | | | | | | | | | | | | | |
| = | | | | | | | | | | | | | | | |
| 34 — | | | | | | | | | | | | | | | |
| _ | | | | | | | | | | | P-3 | | | | 34.3 to 35.3 ft: slightly weathered; very |
| = | | 04.01 | | | | | | | | | | I | | | slightly fractured; |
| 35 — | NQ-7 | 34.3 to 35.3 | 1.0 | (110) | 1.1 (110) | 2 | 2 | 0.6 | 0.5 | H6 to H7 | | 10 degrees, Tight to slightly open, | | | |
| - | | | | | | | | | | | | slightly open, moderately to slightly rough, clean to very thin infilling | | | |
| _ | | | | | | | | | | | | Mechanical break | | | 35.3 to 40.3 ft: slightly weathered; unfractured; occasional strong reaction with HCl; |
| - | | | | | | | | | | | | Wedianical break | | | noi, |
| 36 | Full circulation. | | | | | | | | | | | | | | |
| = | | | | | | | | | | | | Mechanical break | | | |
| _ | | 35.3 to | | 3.0 | 3.0 | | | | | H6 to | | | | | |
| 37 — | NQ-8 | 35.3 to 38.3 | 3.0 | (100) | 3.0 (100) | 8 | 3 | 2.2 | 0.3 | H7 | | | | | |
| _ | | | | | | | | | | | | | | | |
| _ | | | | | | | | | | | | | | | |
| _ | | | | | | | | | | | | | | | |
| 38 — | | | | | | | | | | | | | | | |
| _ | | | | | | | | | | | | Mechanical break | | | |
| _ | | | | | | | | | | | | | | | |
| 39 — | | 20.0. | | 0.4 | 0.4 | | | | | ш. | | | | | |
| = | NQ-9 | 38.3 to 40.3 | 2.0 | 2.1 (105) | (105) | 4 | 4 | 1.5 | 0.1 | H6 to H7 | | | | | |
| _ | | | | | | | | | | | | | | | |
| = | | | | | | | | | | | | Mechanical break | | | |

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.



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Start Date: 05-26-2020 End Date: 05-28-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-215(P) Bedrock Depth: 12.8 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Plunge: 90.0 Bearing: Not applicable Sheet 6 of 8 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235903.4, E 3077841.7 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5362.8 ft Total Depth: 65.3 ft Groundwater EI: 5356.8 ft On Date: 05-26-2020 In Situ Testing Coring Time (min) of Piece Joint Symbo RQD, ft (%) € Shortest Notes: Groundwater Drilling, Conditions, Circulation etc Description and Classification of Materials Mechanical break 40.3 to 44.3 ft: slightly weathered; Smooth drilling. unfractured; weak to strong reaction with 42 4.0 (100) 4.0 (100) 40.3 to 4.0 10 4.0 NQ-10 1 4.0 43 44 44.3 to 49.3 ft: fresh to slightly weathered; unfractured; weak to strong reaction with 0.8 (80) 8.0 NQ-11 1.0 2 8.0 8.0 H6 45.3 (80) P-4 45 Full circulation 46 47 4.1 4.1 (102) (102) NQ-12 4.0 11 1 4.1 4.1 Н6 48

Notes Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

1.0 1.0 (100) (100)

2 3 0.7 0.1

1.0

50.3

NQ-13

49



49.3 to 50.3 ft: fresh to slightly weathered; unfractured; occasional strong reaction with

Continued on next shee

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Mechanical break

Start Date: 05-26-2020 End Date: 05-28-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-215(P) Bedrock Depth: 12.8 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Plunge: 90.0 Bearing: Not applicable Sheet 7 of 8 Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235903.4, E 3077841.7 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5362.8 ft Total Depth: 65.3 ft Groundwater EI: 5356.8 ft On Date: 05-26-2020 In Situ Testing Coring Time (min) of Piece Joint Symbo ft (%) € Shortest Notes: Groundwater Drilling, Conditions, RQD, Circulation etc Description and Classification of Materials Mechanical break 50.3 to 52.3 ft: fresh to slightly weathered; very slightly fractured; occasional strong reaction with HCl; 10 degrees, Tight to slightly open, slightly rough, clean to very thin infilling Smooth drilling. 2.0 2.0 (100) (100) 2.0 NQ-14 3 3 1.3 0.3 Н6 52.3 52 Mechanical break 52.3 to 59.3 ft: fresh to slightly weathered; unfractured; occasional strong reaction with HCI, shells present at 55.3 feet; 53 Mechanical break 52.3 to 55.3 3.0 (100) (100) NQ-15 3.0 6 2 2.2 8.0 H6 54 55 P-5 56 57 Mechanical break 4.2 4.2 (105) (105) 0.5 H6 to NQ-16 4.0 8 4 1.8 Full circulation. 59 59.3 to 60.3 ft: fresh to slightly weathered; unfractured; occasional weak reaction with HCI; 1.0 2 1 0.9 0.9 H6 (90) 60.3 (90)NQ-17 Continued on next shee Notes Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock

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hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core

extraction. Boring completed as monitoring well.

Start Date: 05-26-2020 End Date: 05-28-2020 OG OF ROCK CORE Borehole ID: Driller: Elite - Greg Logged By: SMG B-215(P) Bedrock Depth: 12.8 ft Checked By: JNH Project name: South Boulder Creek Regional Detention Sheet 8 of 8 Plunge: 90.0 Bearing: Not applicable Project No: 16134 Drilling Rig: CME-550X Rubber Tire ATV Mounted Rig Boring Location: N 1235903.4, E 3077841.7 ft Equipment: NQ3 Wireline Rock Coring Ground EI: 5362.8 ft Total Depth: 65.3 ft Groundwater EI: 5356.8 ft On Date: 05-26-2020 In Situ Testing Coring Time (min) No. of Pieces Joint Symbo Shortest (ft) RQD, ft (%) € Notes: Groundwater, Drilling, Conditions, Circulation etc Description and Classification of Materials 60.3 to 65.3 ft: fresh to slightly weathered; unfractured; occasional strong reaction with 62 5.0 5.0 (100) (100) 5.0 12 Н6 NQ-18 5.0 5.0 1 65.3 63 64 65 Bottom of boring at 65.3 feet. 5297.5 End of rock core log at 65.30 ft 66 67 69

Contacts are approximate and lithology between recovered samples is interpreted. RQD may not be applicable because of rock hardness. Fracture angles measured perpendicular to core axis. Overrecovery is likely due to rock swelling after rock core extraction. Boring completed as monitoring well.

Notes



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Borehole ID: OG OF SOIL BORING Start Date: 08-30-2021 End Date: 08-30-2021 **B-216** Driller: Elite - Dan Logged By: LEA Project name: South Boulder Creek Regional Detention Bedrock Depth: 32.7 ft Checked By: ABP Sheet 1 of 4 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1236317.1, E 3074169.2 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5375.6 ft Total Depth: 38.0 ft Groundwater EI: 5348.1 ft On Date: 08-30-2021 Penetration (ft) Recovery (ft) Depth (ft) Blows per 6 inch Type - No Remarks Description and Classification of Materials Graphic Lithology Elevation S-1, CA-2, S-3, C-4: Lean Clay with Sand Mostly fines, medium plasticity; 15-25% sand, fine to medium grained, subangular to subrounded; stiff; dry; Smooth, fast drilling. brown; weak to strong reaction with HCl; occasional roots; 2 Brown, dry cuttings. 3 3/3/4 1.5 1.5 4.5 to 6.8 ft: weak reaction with HCI;; Smooth drilling. 5 CA - 2 6/12 1.0 1.0 Bu-5 from 5.0 to 15.0 feet. 6.8 to 9.5 ft: weak reaction with HCl; no roots; 7 Smooth drilling. 8 S - 3 9/9/10 1.5 1.5 9.5 to 16.3 ft: includes some processed Pierre Shale; Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 08-30-2021 End Date: 08-30-2021 **B-216** Driller: Elite - Dan Logged By: LEA Project name: South Boulder Creek Regional Detention Bedrock Depth: 32.7 ft Checked By: ABP Sheet 2 of 4 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1236317.1, E 3074169.2 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5375.6 ft Total Depth: 38.0 ft Groundwater EI: 5348.1 ft On Date: 08-30-2021 Penetration (ft) Recovery (ft) Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation Smooth drilling. 12 C - 4 N/A 5.0 4.0 13 14 Brown, dry cuttings. 15 16 5359.4 S-6: Poorly Graded Gravel with Clay and Sand Mostly gravel, fine to coarse grained, subangular to rounded; 25-35% sand, fine to coarse grained, subangular to subrounded; 5-15% fines, medium plasticity; maximum particle size = 1 inch; medium dense; dry; brown; (GP-GC); [Alluvium] 17 Minor grinding. 18 13/15/20 1.5 1.0 S - 6 19 5356.1 C-7: Poorly Graded Gravel with Clay, Sand, and Cobbles Mostly gravel, fine to coarse grained, angular to rounded; 20-30% cobbles, angular to subrounded; 10-20% sand, fine Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 08-30-2021 End Date: 08-30-2021 **B-216** Driller: Elite - Dan Logged By: LEA Project name: South Boulder Creek Regional Detention Bedrock Depth: 32.7 ft Checked By: ABP Sheet 3 of 4 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1236317.1, E 3074169.2 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5375.6 ft Total Depth: 38.0 ft Groundwater EI: 5348.1 ft On Date: 08-30-2021 Penetration (ft) Recovery (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Grinding. More gravel in cuttings. to coarse grained, subangular to subrounded; 5-10% fines, low plasticity; maximum particle size = 3.25 inches; dry; brown; (GP-GC); [Alluvium] 21 C - 7 N/A 2.0 2.4 Smooth drilling 5353.6 Grinding. C-7 encountered 22 C-8, S-9, S-10: Poorly Graded Sand with Clay and Gravel efusal at 22.0 feet. Mostly sand, fine to coarse grained, angular to subrounded; 30-40% gravel, fine to coarse grained, subangular to subrounded; 5-15% fines, low plasticity; maximum particle size = 3 inches; dry; brown; (SP-SC); [Alluvium] 23 3.0 2.1 C - 8N/A 24 24.0 to 26.5 ft: moist; Less gravel in cuttings. 25 Grinding. 26 26.5 to 29.5 ft: 25-35% gravel; maximum particle size = 1 inch; very dense; wet; 27 Groundwater encountered at 27.5 feet during drilling on 28 20/26/32 1.5 1.1 S - 9 29 29.5 to 32.0 ft: 25-35% gravel; maximum particle size = 1.25 inches; medium dense; wet; Continued on next sheet Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 08-30-2021 End Date: 08-30-2021 **B-216** Driller: Elite - Dan Logged By: LEA Project name: South Boulder Creek Regional Detention Bedrock Depth: 32.7 ft Checked By: ABP Sheet 4 of 4 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1236317.1, E 3074169.2 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5375.6 ft Total Depth: 38.0 ft Groundwater EI: 5348.1 ft On Date: 08-30-2021 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Graphic Lithology Elevation Sampler shoe plugged with gravel. 10/10/5 1.5 0.5 S - 10 31 5343.6 32 S-11: Poorly Graded Sand with Clay Mostly sand, fine to coarse grained, angular to subrounded; 5-15% gravel, fine grained, subangular to subrounded; 5-15% fines, low plasticity; maximum particle size = 0.75 inches; medium dense; wet; brown; (SP-SC); 5342.9 Top of bedrock at 32.7 feet. [Alluvium] S-11, S-12, S-13: Shale Mostly fines, medium plasticity; less than 5% sand; slightly 33 to moderately weathered; moist; gray; H7; weak reaction S - 11 8/10/40 1.5 1.5 [PIERRE SHALE] 34 Smooth drilling. 34.5 to 36.5 ft: slightly weathered; Gray, moist cuttings. 35 S - 12 50 for 6 inches 0.5 0.9 36 36.5 to 38.0 ft: moist to wet; 37 Smooth drilling. S - 13 50 for 6 inches 0.5 0.9 5337.6 38 Bottom of boring at 38.0 feet. End of boring log at 38.00 ft 39 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

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Borehole ID: OG OF SOIL BORING Start Date: 08-27-2021 End Date: 08-27-2021 B-217(P) Driller: Elite - Dan Logged By: RMW Project name: South Boulder Creek Regional Detention Bedrock Depth: 29.0 ft Checked By: ABP Sheet 1 of 4 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1235549.7, E 3074158.5 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5384.5 ft Total Depth: 33.3 ft Groundwater EI: 5356.5 ft On Date: 08-27-2021 Recovery (ft) Penetration Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation Bu-1 from 0.0 to 7.5 feet. S-2, S-3, CA-4: Lean Clay Mostly fines, low plasticity; 5-15% sand, fine to medium grained, subangular to subrounded; less than 5% gravel, fine grained, subangular; maximum particle size = 0.5 inches; medium stiff; dry; light brown; processed Pierre Smooth drilling. 1.5 Shale; roots throughout; (CL); S - 2 2/3/3 1.5 [Fill] Brown, dry cuttings. 2 2.0 to 4.5 ft: Sand is fine grained; no gravel; weak reaction with HCI; 3 S - 3 4/4/5 1.5 1.4 4.5 to 6.8 ft: maximum particle size = 0.25 inches; 5 CA - 4 9/14 1.0 0.7 6 5377.8 C-5: Sandy Lean Clay Mostly fines, low plasticity; 15-25% sand, fine to medium 7 grained, subangular to subrounded; 5-15% gravel, fine grained, subangular; maximum particle size = 1.5 inches; medium stiff to stiff; dry; light brown; (CL); [Fill] 8 Minor grinding. C - 5 N/A 2.5 1.9 5374.5 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 08-27-2021 End Date: 08-27-2021 B-217(P) Driller: Elite - Dan Logged By: RMW Project name: South Boulder Creek Regional Detention Bedrock Depth: 29.0 ft Checked By: ABP Sheet 2 of 4 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1235549.7, E 3074158.5 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5384.5 ft Total Depth: 33.3 ft Groundwater EI: 5356.5 ft On Date: 08-27-2021 Penetration (ft) Recovery (ft) Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation C-6, S-7: Lean Clay with Sand Mostly fines, low to medium plasticity; 15-25% sand, fine to medium grained, subangular to subrounded; less than 5% gravel, fine grained, subangular; maximum particle size = 0.25 inches; stiff; dry; brown; no roots; weathered shale pieces recovered in sample; (CL); [Fill] 12 C-6 N/A 5.0 4.5 13 14 15 16 16.3 to 20.0 ft: no gravel; maximum particle size = 0.5 17 18 Processed Pierre Shale present in cuttings. S - 7 8/10/12 1.5 1.4 19 5364.5 Grinding. Moist to dry cuttings. Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 08-27-2021 End Date: 08-27-2021 Driller: Elite - Dan Logged By: RMW B-217(P) Project name: South Boulder Creek Regional Detention Bedrock Depth: 29.0 ft Checked By: ABP Sheet 3 of 4 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1235549.7, E 3074158.5 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5384.5 ft Total Depth: 33.3 ft Groundwater EI: 5356.5 ft On Date: 08-27-2021 Recovery (ft) Penetration Type - No Blows per 6 inch Remarks Description and Classification of Materials Depth (ft) Elevation Graphic Lithology S-8, C-9: Fat Clay with Sand with Cobbles Mostly fines, high plasticity; 10-20% sand, fine to coarse grained, subangular to subrounded; 5-15% gravel, fine to medium grained, subangular to subrounded; 5-15% cobbles, subrounded; maximum particle size = 3.25 inches; stiff; moist; brown; (CL); 5/10/21 1.5 1.5 S - 8 [Fill] 21 The C-9 sample interval is from 20.0 to 23.9 and partially overlapped the S-8 sample interval. 22 Cobble at 22.3 ft diameter of sampler. Slower drilling with minor C - 9 N/A 3.2 grinding. 23 5360.6 C-10, CA-11: Clayey Sand with Cobbles and Gravel 24 Mostly sand, fine to medium grained, angular to subangular; 25-35% cobbles, subangular to subrounded; 15-25% fines, low to medium plasticity; 15-25% gravel, fine to medium grained, angular to subrounded; maximum particle size = 3.25 inches; moist; brown; weak reaction with HCl; (SC); C - 10 N/A 1.1 1.0 Grinding. 25 CA - 11 8/11 1.0 0.7 5358.5 26 S-13: Clayey Gravel with Sand Mostly gravel, fine to medium grained, subrounded; 30-40% sand, fine to coarse grained, subangular to subrounded; 20-30% fines, low plasticity; maximum particle size = 1.25 inches; medium dense; moist to wet; brown; (GC); [Alluvium] S - 12 2/2/3 1.5 0.0 27 No recovery in sample S-12 likely due to cobbles from 26.0 to 27.5 feet, as noted by driller. 28 Groundwater encountered at 28.0 feet during drilling on 11/11/8 S - 13 1.5 1.1 8/27/21 5355.5 Top of bedrock at 29.0 feet. 29 S-14, S-15: Shale Mostly fines, low to medium plasticity; less than 10% sand, fine grained; slightly weathered; dry to moist; dark gray; H7; weak reaction with HCl; [PIERRE SHALE] Notes Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 08-27-2021 End Date: 08-27-2021 B-217(P) Driller: Elite - Dan Logged By: RMW Project name: South Boulder Creek Regional Detention Bedrock Depth: 29.0 ft Checked By: ABP Sheet 4 of 4 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1235549.7, E 3074158.5 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5384.5 ft Total Depth: 33.3 ft Groundwater EI: 5356.5 ft On Date: 08-27-2021 Penetration (ft) Recovery (ft) Depth (ft) Blows per 6 inch Description and Classification of Materials Type - No Remarks Elevation 35/40/50 for 5 1.4 1.6 S - 14 inches 31 32 32.0 to 33.3 ft: no reaction with HCl; 35/50 for 3 inches 8.0 S - 15 1.2 33 5351.2 Bottom of boring at 33.3 feet. End of boring log at 33.30 ft 34 35 36 37 38 39 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered Notes

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

Borehole ID: OG OF SOIL BORING Start Date: 08-26-2021 End Date: 08-26-2021 **B-218** Driller: Elite - Dan Logged By: LEA Project name: South Boulder Creek Regional Detention Bedrock Depth: 15.5 ft Checked By: ABP Sheet 1 of 3 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1235163.2, E 3074158.3 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5381.8 ft Total Depth: 25.5 ft Groundwater EI: Not Measured On Date: 08-26-2021 Recovery (ft) Penetration Depth (ft) Type - No Blows per 6 inch Remarks Description and Classification of Materials Graphic Lithology Elevation S-2, S-3, C-4, S-5, C-6: Lean Clay Mostly fines, medium plasticity; 5-15% sand, fine to medium grained, subangular to subrounded; less than 5% gravel, Sample No. 1 was not collected. fine grained, subangular to subrounded; maximum particle size = 0.25 inches; stiff; dry; gray; processed Pierre Shale; weak reaction with HCl; (CL); Cobbles, harder drilling from 0 to 2.5 feet. 2 Smooth drilling. 3 S - 2 10/12/14 1.5 1.5 4.0 to 5.5 ft: maximum particle size = 0.5 inches; gray-brown; S - 3 12/11/12 1.5 1.4 5 5.5 to 10.0 ft: Gravel is fine to coarse grained; maximum particle size = 1.5 inches; 7 C - 4 N/A 4.5 2.0 8 Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered

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samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

influenced blow counts and sample recovery. Boring backfilled with 20 gallons of cement-bentonite grout.

Notes

| LUG | i OF | SOILE | SORING | j | | Start Date: 08-26-2021 | | End Date: 08-26-2021 | DOTERIOR ID. | | | | |
|------------------|---|---------------------|--------------------------|------------------|---------------|--|----------------------|--|---|--|--|--|--|
| | | | eek Regional Deter | | | Driller: Elite - Dan | | Logged By: LEA | B-218 | | | | |
| P | roject No: | 16134 | - | | | Bedrock Depth: 15.5 ft | | Checked By: ABP | Sheet 2 of 3 | | | | |
| Boring | Location: | N 1235163.2, E 3 | 074158.3 ft | | | Drilling Rig: CME-75 Truck Mounted Rig | | | | | | | |
| (| Fround EI: | 5381.8 ft To | tal Depth: 25.5 ft | | | Equipment: 4-1/4" I.D., | 7-3/4" O | .D. Hollow Stem Auger (HS | A) | | | | |
| | dwater EI: | | On Date: 08-26-2 | 021 | | | | | | | | | |
| | | | | _ | | | | | | | | | |
| Elevation | Depth (ft) | Type - No | Blows per 6 inch | Penetration (ft) | Recovery (ft) | Remarks | Graphic Lithology | Description and Clas | sification of Materials | | | | |
| | | S - 5 | 9/10/12 | 1.5 | 1.9 | The C-6 sample interval is from 10.0 to 13.0 and partially overlapped the S-5 sample interval. Smooth drilling. | | 10.0 to 11.5 ft: moist; gray- | brown; | | | | |
| 5368.8 | 12 | C - 6 | N/A | 3.0 | 2.8 | | | 11.5 to 13.0 ft: no gravel; n | noist; brown; | | | | |
| | | S-7 | 16/17/50 for 5 inches | 1.5 | 0.4 | | | S-7: Clayey Gravel with Sand Mostly gravel, fine to coarse g sand, fine to coarse grained, a fines, low to medium plasticity inch; very dense; moist; browr of a granitic particle; (GC); [Fill] | ingular to subangular; 10-20% ; maximum particle size = 1 | | | | |
| 5367.3 5366.3 | - - - - - - - - - - - - - - - - - - - | | | | | Top of bedrock at 15.5 feet. | | C-8: Poorly Graded Gravel wit Mostly gravel, fine to coarse g subrounded; 25-35% sand, fin subangular to subrounded; 5-plasticity; less than 10% cobbl subrounded; maximum partici moist; dark brown; (GP-GC); [Alluvium] C-8, S-9, S-10, S-11: Shale Mostly fines, medium plasticity grained; moderately weathere | rained, subangular to e to coarse grained, 15% fines, low to medium es, subangular to le size = 3.5 inches; dense; //; less than 10% sand, fine | | | | |
|] | 16 | C - 8 | N/A | 3.0 | 4.0 | Minor grinding. | | H7; [PIERRE SHALE] | | | | | |
| | - - - - - - - - - - - - - - - - - - - | | | | | | | (| | | | | |
| | - 18 - 18 | | | | | Increased drilling resistance. | | 19.3 to 21.8 ft: Laminated; dry; gray-black; | fresh to slightly weathered; | | | | |
| | L | | | | | | | | | | | | |
| | _ 20 | | | | | Smooth drilling. | | Continued of | n next sheet | | | | |
| Notes (| | | | | | | | | | | | | |
| 5 | samples, c | uttings, and surfac | e observations. De | ensity | des | criptions are based on blow c filled with 20 gallons of ceme | ounts. La | rge particles may have | RUTA CONSULTANTS INC | | | | |

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Borehole ID: OG OF SOIL BORING End Date: 08-26-2021 Start Date: 08-26-2021 **B-218** Driller: Elite - Dan Logged By: LEA Project name: South Boulder Creek Regional Detention Bedrock Depth: 15.5 ft Checked By: ABP Sheet 3 of 3 Project No: 16134 Drilling Rig: CME-75 Truck Mounted Rig Boring Location: N 1235163.2, E 3074158.3 ft Equipment: 4-1/4" I.D., 7-3/4" O.D. Hollow Stem Auger (HSA) Ground EI: 5381.8 ft Total Depth: 25.5 ft Groundwater EI: Not Measured On Date: 08-26-2021 Penetration (ft) Depth (ft) Blows per 6 inch Description and Classification of Materials Type - No Remarks Elevation S - 9 43/50 for 5 inches 1.0 1.0 21 21.8 to 25.5 ft: Laminated; fresh; dry; gray-black; 22 Smooth drilling. 8.0 S - 10 40/50 for 3 inches 1.2 23 24 25 S - 11 50 for 6 inches 0.5 1.0 5356.3 Bottom of boring at 25.5 feet. End of boring log at 25.50 ft 26 27 28 29 Notes Contacts are approximate and lithology between recovered samples is interpreted. Material descriptions are based on recovered

Appendix E 87 of 87

samples, cuttings, and surface observations. Density descriptions are based on blow counts. Large particles may have

influenced blow counts and sample recovery. Boring backfilled with 20 gallons of cement-bentonite grout.

Test Pit Logs

Start Date: 12-15-2021

Logged By: LEA

Borehole ID:

End Date: 12-15-2021 Checked By: JNH

Dimensions in ft

TP-201

Sheet 1 of 1

Project No: 16134

Boring Location: N 1236718.4, E 3075654.8 ft

Project name: South Boulder Creek Regional Detention

Total Depth: 9.0 ft Ground EI: 5354.8 ft Groundwater EI: Not Encountered On Date: 12-15-2021

Bedrock Depth: Not Encountered Bearing: North to South

Width:3.5

Length:16.0

Contractor: Coal Creek Excavation - Jonathan

Equipment: Komatsu PC138 Ex

| Equi | pmer | it: Koma | itsu PC138 Excav | vator | | |
|------------------|---|--------------|------------------------|---|----------------------|--|
| Elevation | Depth (ft) | Type - No | Depth Interval (ft) | Remarks | Graphic Lithology | Description and Classification of Materials |
| 5349.8 5345.8 | 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - | Bu - 1 | 0.5 - 5.0 5.0 - 9.0 | Ground Engineering collected material for laboratory testing from 0.5 to 2.0 feet. Bottom of test pit at 9.0 feet. | | Bu-1: Well Graded Gravel with Silt, Sand, and Cobbles Consists of 30-40% cobbles and 60-70% matrix material; Matrix material is; Mostly gravel, fine to coarse grained, subangular to subrounded; 30-40% sand, fine to coarse grained, subangular; 5-15% fines, nonplastic; dry; brown; occasional roots; cobbles are subrounded and mostly 4 to 6 inches; maximum particle size = 10 inches; (GW-GM); [Alluvium] Bu-2: Well Graded Gravel with Sand, Cobbles, and Boulders Consists of 25-35% cobbles, 15-25% boulders, and 40-60% matrix material; Matrix material is; Mostly gravel, fine to coarse grained, subangular to subrounded; 36-45% sand, fine to coarse grained, suba |
| | 12 — | | | | | |

Contacts are approximate. Test pit was backfilled with excavated material. Test pit was compacted in 1-foot lifts with the excavator bucket head below a depth of 4 feet and compacted in 8-inch lifts with hydraulic compactor above a depth of 4 feet. Notes



Appendix F 1 of 5

Start Date: 12-13-2021

End Date: 12-13-2021

Bearing: South to North

Logged By: LEA Checked By: JNH Borehole ID:

TP-202

Sheet 1 of 1

Project name: South Boulder Creek Regional Detention

Project No: 16134

Boring Location: N 1236781.6, E 3074898.0 ft

On Date: 12-13-2021

Ground EI: 5354.0 ft Total Depth: 8.0 ft Groundwater EI: Not Encountered

Bedrock Depth: Not Encountered

Dimensions in ft

Length:16.0

Width:3.0

Contractor: Coal Creek Excavation - Jonathan

Equipment: Komatsu PC138 Ex

| Equi | pmer | it: Koma | itsu PC138 Exca | vator | | |
|----------------------------|------------|--------------|-------------------------------------|---|--|--|
| Elevation | Depth (ft) | Type - No | Depth Interval (ft) | Remarks | Graphic Lithology | Description and Classification of Materials |
| 5348.5 5347.0 5346.0 | 2 | Bu - 1 | 0.5 - 5.5 5.5 - 7.0 7.0 - 8.0 | Ground Engineering collected material for laboratory testing from 0.5 to 2.0 feet. Bottom of test pit at 8.0 feet. | 10000000000000000000000000000000000000 | subrounded; 5-15% fines, low plasticity; dry to moist; brown; occasional roots; cobbles are subangular to subrounded; maximum particle size = 10 inches; (SW-SM); [Fill] |
| | 12 — | | | | | |

Contacts are approximate. Test pit was backfilled with excavated material. Test pit was compacted in 1-foot lifts with the excavator bucket head below a depth of 4 feet and compacted in 8-inch lifts with hydraulic compactor above a depth of 4 feet. Notes



Appendix F 2 of 5

Start Date: 12-15-2021

Logged By: LEA

Borehole ID:

End Date: 12-15-2021

Checked By: JNH

Dimensions in ft

TP-203Sheet 1 of 1

Project name: South Boulder Creek Regional Detention

Project No: 16134

Groundwater EI: Not Encountered

Boring Location: N 1236519.7, E 3075013.6 ft

Ground El: 5355.0 ft Total Depth: 9.5 ft

On Date: 12-15-2021

Bedrock Depth: 7.0 ft

Bearing: South to North

Length:16.0

Width:3.5

Contractor: Coal Creek Excavation - Jonathan

Equipment: Komatsu PC138 Excavator

| Equi | pmer | it: Koma | tsu PC138 Exca | vator | | |
|-----------|------------|--------------|------------------------|--|----------------------|---|
| Elevation | Depth (ft) | Type - No | Depth Interval (ft) | Remarks | Graphic Lithology | Description and Classification of Materials |
| | 3 | Bu - 1 | 0.5 - 7.0 | Ground Engineering collected material for laboratory testing from 0.5 to 2.0 feet. | | Bu-1: Well Graded Gravel with Sand, Cobbles, and Boulders Consists of 20-30% cobbles, less than 5% boulders, and 65-75% matrix material; Matrix material is; Mostly gravel, fine to coarse grained, subangular to subrounded; 30-40% sand, fine to coarse grained, subangular to subrounded; less than 10% fines, nonplastic; dry to moist; brown; cobbles are subangular to subrounded and mostly 3 to 4 inches; maximum particle size = 18 inches; (GW); [Fill] |
| 5348.0 | 8 - | | | Top of bedrock at 7.0 feet. | | 7.0 to 9.5 ft: Shale Mostly fines, medium plasticity; less than 5% sand, fine to medium grained; slightly weathered; dry to moist; black; H7; [PIERRE SHALE] |
| 5345.5 | 10 | Bu - 2 | 9.0 - 9.5 | Bottom of test pit at 9.5 feet. | | End of test pit at 9.50 ft |

Notes Contacts are approximate. Test pit was backfilled with excavated material. Test pit was compacted in 1-foot lifts with the excavator bucket head below a depth of 4 feet and compacted in 8-inch lifts with hydraulic compactor above a depth of 4 feet.



Appendix F 3 of 5

Start Date: 12-14-2021

Logged By: LEA

Borehole ID:

End Date: 12-14-2021

Checked By: JNH

TP-204 Sheet 1 of 1

Project No: 16134

Boring Location: N 1235541.1, E 3074223.5 ft

Project name: South Boulder Creek Regional Detention

Total Depth: 12.0 ft Ground EI: 5369.0 ft Groundwater EI: Not Encountered

On Date: 12-14-2021

Bedrock Depth: Not Encountered

Bearing: East to West

Dimensions in ft

Length:14.0

Width:3.5

Contractor: Coal Creek Excavation - Jonathan

| Equi | pmer | nt: Koma | tsu PC138 Exca | /ator | | |
|-----------|------------|--------------|------------------------|--|----------------------|--|
| Elevation | Depth (ft) | Type - No | Depth Interval (ft) | Remarks | Graphic Lithology | Description and Classification of Materials |
| 5361.5 | 1 | Bu - 1 | 0.5 - 7.5 | Ground Engineering collected material for laboratory testing from 0.5 to 2.0 feet. | | Bu-1: Lean Clay with Sand and Cobbles Consists of 10-20% cobbles and 80-90% matrix material; Matrix material is; Mostly fines, low plasticity; 5-15% sand, fine to medium grained, subangular; less than 5% gravel, fine to coarse grained, subangular; very stiff to hard; dry; brown; occasional weak reaction with HCl; occasional roots; cobbles are subangular to subrounded and mostly 3 inches; maximum particle size = 6 inches; (CL); [Fill] |
| | 9 | Bu - 2 | 7.5 - 12.0 | Excavator scraping on cobbles and boulders. | | Bu-2: Clayey Sand with Gravel, Cobbles, and Boulders Consists of 15-25% cobbles, less than 10% boulders, and 65-85% matrix material; Matrix material is; Mostly sand, fine to coarse grained, subangular to subrounded; 30-40% fines, low to medium plasticity; 15-25% gravel, fine to coarse grained, subangular; dry to moist; brown; cobbles and boulders are subangular to subrounded; cobbles are mostly 4 to 6 inches; maximum particle size = 17 inches; (SC); [Fill] |
| 5357.0 | 12 — | | | Bottom of test pit at 12.0 feet. | //// | End of test pit at 12.00 ft |

Contacts are approximate. Test pit was backfilled with excavated material. Test pit was compacted in 1-foot lifts with the excavator bucket head below a depth of 4 feet and compacted in 8-inch lifts with hydraulic compactor above a depth of 4 feet. Notes



Appendix F 4 of 5

Start Date: 12-14-2021

End Date: 12-14-2021

Logged By: LEA Checked By: JNH Borehole ID:

TP-205

Sheet 1 of 1

Project name: South Boulder Creek Regional Detention

Project No: 16134

Groundwater EI: 5366.2 ft

Boring Location: N 1235070.9, E 3074152.1 ft

Ground EI: 5371.7 ft Total Depth: 7.0 ft

Bedrock Depth: 5.5 ft On Date: 12-14-2021 Bearing: East to West

Dimensions in ft Length:15.5

Width:3.5

Contractor: Coal Creek Excavation - Jonathan

| Equip | pmer | it: Koma | tsu PC138 Exca | vator | | |
|-----------|------------|--------------|------------------------|--|----------------------|--|
| Elevation | Depth (ft) | Type - No | Depth Interval (ft) | Remarks | Graphic Lithology | Description and Classification of Materials |
| | 2 2 | Bu - 1 | 0.5 - 5.5 | Ground Engineering collected material for laboratory testing from 0.5 to 2.0 feet. | | Bu-1: Sandy Lean Clay with Cobbles Consists of 15-25% cobbles and 75-85% matrix material; Matrix material is; Mostly fines, low plasticity; 20-30% sand, fine to coarse grained, subangular to subrounded; less than 15% gravel, fine grained, subangular to subrounded; dry to moist; brown; cobbles are subangular to subrounded and mostly 4 to 6 inches; maximum particle size = 12 inches; (CL); [Fill] 4.0 to 5.5 ft: moist to wet; |
| 5366.2 | 6 | Bu - 2 | 5.5 - 7.0 | Groundwater encountered at 5.5 feet during excavation on 12/14/2021. | | Bu-2: Shale Mostly fines, low to medium plasticity; less than 10% sand, fine to medium grained, subangular to subrounded; very intensely weathered to decomposed; moist to wet; black-brown; iron staining throughout; H7; [PIERRE SHALE] |
| | 7 | | | Bottom of test pit at 7.0 feet. | | End of test pit at 7.00 ft |

Contacts are approximate. Test pit was backfilled with excavated material. Test pit was compacted in 1-foot lifts with the excavator bucket head below a depth of 4 feet and compacted in 8-inch lifts with hydraulic compactor above a depth of 4 feet. Notes



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Appendix G

Photographs

- G.1 Boring Location Photographs
- G.2 Boring Sample Photographs
- G.3 CORE BOX PHOTOGRAPHS
- G.4 TEST PIT PHOTOGRAPHS

APPENDIX G.1

BORING LOCATION PHOTOGRAPHS



Photograph 1: Area surrounding B-201(P) prior to drilling, looking northeast. Red arrow indicates approximate location of proposed boring.



Photograph 2: Equipment setup at B-201(P), looking south.

Appendix G.1 1 of 27



Photograph 3: Completed monitoring well at B-201(P), looking west.



Photograph 4: Area surrounding B-202(P) prior to drilling, looking southeast. Red arrow indicates approximate location of proposed boring.

Appendix G.1 2 of 27



Photograph 5: Equipment setup at B-202(P), looking east.



Photograph 6: Completed monitoring well at B-202(P), looking north.

Appendix G.1 3 of 27



Photograph 7: Area surrounding B-203(P) prior to drilling, looking north. Red arrow indicates approximate location of proposed boring.



Photograph 8: Equipment setup at B-203(P), looking east.

Appendix G.1 4 of 27



Photograph 9: Completed monitoring well at B-203(P), looking northeast.



Photograph 10: Area surrounding B-204(P) prior to drilling, looking north. Red arrow indicates approximate location of proposed boring.

Appendix G.1 5 of 27



Photograph 11: Equipment setup at B-204(P), looking northwest.



Photograph 12: Completed monitoring well at B-204(P), looking southwest. Red arrow indicated location of monitoring well.

Appendix G.1 6 of 27



Photograph 13: Area surrounding B-205(P) prior to drilling, looking southwest.



Photograph 14: Equipment setup at B-205(P), looking southeast.

Appendix G.1 7 of 27



Photograph 15: Completed monitoring well at B-205(P), looking southwest.



Photograph 16: Area surrounding B-206 prior to drilling, looking east. Red arrow indicates approximate location of proposed boring.

Appendix G.1 8 of 27



Photograph 17: Equipment setup at B-206, looking north.



Photograph 18: Backfilled boring at B-206, looking east.

Appendix G.1 9 of 27



Photograph 19: Area surrounding B-207(P) prior to drilling, looking south. Red arrow indicates approximate location of proposed boring.



Photograph 20: Equipment setup at B-207(P), looking south.

Appendix G.1 10 of 27



Photograph 21: Completed monitoring well at B-207(P), looking north.



Photograph 22: Area surrounding B-208(P) prior to drilling, looking northwest. Red arrow indicates approximate location of proposed boring.

Appendix G.1 11 of 27



Photograph 23: Equipment setup at B-208(P), looking southwest.



Photograph 24: Completed monitoring well at B-208(P), looking west. Red arrow indicates location of monitoring well.

Appendix G.1 12 of 27



Photograph 25: Area surrounding B-209(P) prior to drilling, looking north. Red arrow indicates approximate location of proposed boring.



Photograph 26: Equipment setup at B-209(P), looking northeast.

Appendix G.1 13 of 27



Photograph 27: Completed monitoring well at B-209(P), looking north.



Photograph 28: Area surrounding B-210 prior to drilling, looking northwest. Red arrow indicates approximate location of proposed boring.

Appendix G.1 14 of 27



Photograph 29: Equipment setup at B-210, looking northwest.



Photograph 30: Backfilled boring at B-210, looking east.

Appendix G.1 15 of 27



Photograph 31: Area surrounding B-211(P) prior to drilling, looking northeast. Red arrow indicates approximate location of proposed boring.



Photograph 32: Equipment setup at B-211(P), looking west.

Appendix G.1 16 of 27



Photograph 33: Completed monitoring well at B-211(P), looking northwest.



Photograph 34: Area surrounding B-212(P) prior to drilling, looking southwest.

Appendix G.1 17 of 27



Photograph 35: Equipment setup at B-212(P), looking northeast.



Photograph 36: Completed monitoring well at B-212(P), looking north.

Appendix G.1 18 of 27



Photograph 37: Area surrounding B-213 prior to drilling, looking north.



Photograph 38: Equipment setup at B-213, looking northwest.

Appendix G.1 19 of 27



Photograph 39: Backfilled boring at B-213, looking west. Red arrow indicates location of backfilled boring.



Photograph 40: Area surrounding B-214(P) prior to drilling, looking north. Red arrow indicates approximate location of proposed boring.

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Photograph 41: Equipment setup at B-214(P), looking west.



Photograph 42: Completed monitoring well at B-214(P), looking southwest.

Appendix G.1 21 of 27



Photograph 43: Area surrounding B-215(P) prior to drilling, looking east. Red arrow indicates approximate location of proposed boring.



Photograph 44: Equipment setup at B-215(P), looking southeast.

Appendix G.1 22 of 27



Photograph 45: Completed monitoring well at B-215(P), looking south.



Photograph 46: Area surrounding B-216 prior to drilling, looking southeast.

Appendix G.1 23 of 27



Photograph 47: Equipment set up at B-216, looking south.



Photograph 48: Backfilled boring at B-216, looking east.

Appendix G.1 24 of 27



Photograph 49: Area surrounding B-217(P) prior to drilling, looking north. Red arrow indicates approximate location of proposed boring.



Photograph 50: Equipment set up at B-217(P), looking south.

Appendix G.1 25 of 27



Photograph 51: Completed monitoring well at B-217(P), looking south.



Photograph 52: Area surrounding B-218 prior to drilling, looking northeast. Red arrow indicates approximate location of proposed boring.

Appendix G.1 26 of 27



Photograph 53: Equipment set up at B-218, looking south.



Photograph 54: Backfilled boring at B-218, looking south.

Appendix G.1 27 of 27

BORING SAMPLE PHOTOGRAPHS



Photograph 1: B-201(P); S-1 from 0.0 to 1.5 feet: Clayey Sand with Gravel [Fill]



Photograph 2: B-205(P); S-5 from 7.5 to 7.7 feet: Poorly Graded Sand with Silt and Gravel [Alluvium]

Appendix G.2 1 of 6



Photograph 3: B-205(P); S-6 from 10.0 to 11.0 feet: Poorly Graded Sand with Silt and Gravel [Alluvium]



Photograph 4: B-205(P); S-8 from 15.0 to 16.5 feet: Poorly Graded Gravel with Clay and Sand [Alluvium]

Appendix G.2 2 of 6



Photograph 5: B-207(P); S-4 from 5.0 to 6.5 feet: Poorly Graded Sand with Silt and Gravel [Alluvium]



Photograph 6: B-208(P); S-3 from 2.5 to 4.0 feet: Clayey Sand with Gravel [Fill]

Appendix G.2 3 of 6



Photograph 7: B-208(P); S-6 from 10.0 to 11.5 feet: Poorly Graded Gravel with Clay and Sand [Alluvium]



Photograph 8: B-209(P); S-2 from 0.0 to 1.5 feet: Poorly Graded Gravel with Clay and Sand [Fill]

Appendix G.2 4 of 6



Photograph 9: B-210; S-3 from 2.5 to 4.0 feet: Clayey Gravel with Sand [Fill]



Photograph 10: B-212(P); S-2 from 0.0 to 1.5 feet: Silty Sand with Gravel [Fill]

Appendix G.2 5 of 6



Photograph 11: B-213; S-2 from 2.5 to 4.0: Poorly Graded Sand with Clay and Gravel [Fill]



Photograph 12: B-214(P); S-3 from 2.5 to 4.0: Poorly Graded Sand with Silt and Gravel [Alluvium]

Appendix G.2 6 of 6

Core Box Photographs



Photograph 1: B-201(P); Core box 1 of 1 [Pierre Shale]



Photograph 2: B-202(P); Core box 1 of 1 [Pierre Shale]

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Photograph 3: B-203(P); Core box 1 of 1 [Pierre Shale]



Photograph 4: B-204(P); Core box 1 of 1 [Pierre Shale]

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Photograph 5: B-205(P); Core box 1 of 1 [Pierre Shale]



Photograph 6: B-206; Core box 1 of 1 [Pierre Shale]

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Photograph 7: B-207(P); Core box 1 of 1 [Pierre Shale]



Photograph 8: B-208(P); Core box 1 of 1 [Pierre Shale]

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Photograph 9: B-209(P); Core box 1 of 2 [Pierre Shale]



Photograph 10: B-209(P); Core box 2 of 2 [Pierre Shale]

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Photograph 11: B-210; Core box 1 of 2 [Pierre Shale]



Photograph 12: B-210; Core box 2 of 2 [Pierre Shale]

Appendix G.3 6 of 11



Photograph 13: B-211(P); Core box 1 of 1 [Pierre Shale]



Photograph 14: B-212(P); Core box 1 of 1 [Pierre Shale]

Appendix G.3 7 of 11



Photograph 15: B-213; Core box 1 of 1 [Pierre Shale]



Photograph 16: B-214(P); Core box 1 of 3 [Pierre Shale]

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Photograph 17: B-214(P); Core box 2 of 3 [Pierre Shale]



Photograph 18: B-214(P); Core box 3 of 3 [Pierre Shale]

Appendix G.3 9 of 11



Photograph 19: B-215(P); Core box 1 of 3 [Pierre Shale]



Photograph 20: B-215(P); Core box 2 of 3 [Pierre Shale]

Appendix G.3 10 of 11



Photograph 21: B-215(P); Core box 3 of 3 [Pierre Shale]

Appendix G.3

APPENDIX G.4

TEST PIT PHOTOGRAPHS



Photograph 1: Area surrounding TP-201 prior to excavation, looking southwest.



Photograph 2: Equipment set up at TP-201 and stockpile of fill, looking northeast.

Appendix G.4 1 of 11



Photograph 3: TP-201 alluvium from 0.0 to 9.0 feet.



Photograph 4: Backfilled TP-201, looking northeast.

Appendix G.4 2 of 11



Photograph 5: Area surrounding TP-202 prior to excavation, looking south.



Photograph 6: Equipment set up at TP-202, looking southwest.

Appendix G.4 3 of 11



Photograph 7: TP-202 fill from 0.0 to 8.0 feet.



Photograph 8: Stockpile of fill from TP-202.

Appendix G.4 4 of 11



Photograph 9: Backfilled TP-202, looking east.



Photograph 10: Area surrounding TP-203 prior to excavation, looking northeast.

Appendix G.4 5 of 11



Photograph 11: Equipment set up at TP-203, looking north.



Photograph 12: TP-203 fill from 0.0 to 7.0 and Pierre Shale from 7.0 to 9.5 feet.

Appendix G.4 6 of 11



Photograph 13: Backfilled TP-203, looking east.



Photograph 14: Area surrounding TP-204 prior to excavation, looking northwest. Red arrow indicates approximate location of test pit location.

Appendix G.4 7 of 11



Photograph 15: Equipment set up at TP-204, looking east.



Photograph 16: TP-204 fill from 0.0 to 12.0 feet.

Appendix G.4 8 of 11



Photograph 17: Stockpile of fill from TP-204.



Photograph 18: Backfilled TP-204, looking east.

Appendix G.4 9 of 11



Photograph 19: Area surrounding TP-205 prior to excavation, looking west.



Photograph 20: Equipment set up at TP-205, looking east.

Appendix G.4 10 of 11



Photograph 21: TP-205 fill from 0.0 to 5.5 feet, and Pierre Shale from 5.5 to 7.0 feet.



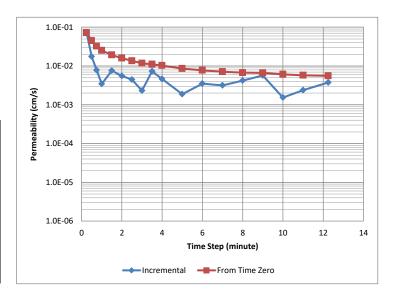
Photograph 22: Backfilled TP-205, looking north.

Appendix G.4 11 of 11

IN-SITU HYDRAULIC CONDUCTIVITY TEST RESULTS

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-201(P) |
| Test Number: | K-1 |

| Depth to top of Ground | | |
|----------------------------------|------|----|
| Water | 5.5 | ft |
| Casing Stickup | 3.2 | ft |
| Top Depth of Test Interval | 12.5 | ft |
| Bottom Depth of Test Interval | 12.5 | ft |
| Inside Diameter Pipe | 4.25 | in |
| D = Diameter, intake, sample | 4.25 | in |
| L = Length, intake, sample | 0.0 | ft |
| M = Transformation Ratio | 1.00 | |

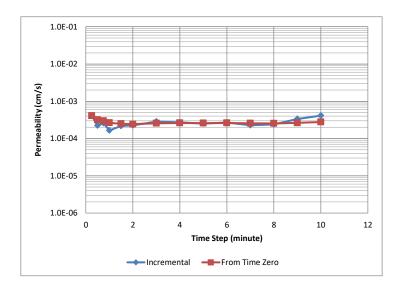


| Depth to Water Surface In Pipe From Top of Riser Pipe | Time, t | Time, t | Length of Water | Incremental | | From Time Zero | |
|--|----------------|---------|----------------------|--------------|--------------|----------------|--------------|
| | Time, t | Time, t | Column at time, H | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 0.00 | 0.0 | 0 | 8.7 | | | | |
| 2.58 | 0.3 | 15 | 6.1 | 2.4E-03 | 7.2E-02 | 2.4E-03 | 7.2E-02 |
| 3.08 | 0.5 | 30 | 5.6 | 5.7E-04 | 1.8E-02 | 1.5E-03 | 4.5E-02 |
| 3.29 | 0.8 | 45 | 5.4 | 2.6E-04 | 7.8E-03 | 1.1E-03 | 3.3E-02 |
| 3.38 | 1.0 | 60 | 5.3 | 1.1E-04 | 3.4E-03 | 8.3E-04 | 2.5E-02 |
| 3.76 | 1.5 | 90 | 4.9 | 2.5E-04 | 7.6E-03 | 6.4E-04 | 1.9E-02 |
| 4.02 | 2.0 | 120 | 4.7 | 1.8E-04 | 5.6E-03 | 5.2E-04 | 1.6E-02 |
| 4.22 | 2.5 | 150 | 4.5 | 1.5E-04 | 4.5E-03 | 4.5E-04 | 1.4E-02 |
| 4.32 | 3.0 | 180 | 4.4 | 7.6E-05 | 2.3E-03 | 3.9E-04 | 1.2E-02 |
| 4.62 | 3.5 | 210 | 4.1 | 2.4E-04 | 7.3E-03 | 3.6E-04 | 1.1E-02 |
| 4.80 | 4.0 | 240 | 3.9 | 1.5E-04 | 4.6E-03 | 3.4E-04 | 1.0E-02 |
| 4.94 | 5.0 | 300 | 3.8 | 6.2E-05 | 1.9E-03 | 2.8E-04 | 8.6E-03 |
| 5.19 | 6.0 | 360 | 3.5 | 1.2E-04 | 3.5E-03 | 2.6E-04 | 7.8E-03 |
| 5.40 | 7.0 | 420 | 3.3 | 1.0E-04 | 3.2E-03 | 2.3E-04 | 7.1E-03 |
| 5.66 | 8.0 | 480 | 3.0 | 1.4E-04 | 4.2E-03 | 2.2E-04 | 6.8E-03 |
| 5.98 | 9.0 | 540 | 2.7 | 1.9E-04 | 5.7E-03 | 2.2E-04 | 6.6E-03 |
| 6.06 | 10.0 | 600 | 2.6 | 5.0E-05 | 1.5E-03 | 2.0E-04 | 6.1E-03 |
| 6.18 | 11.0 | 660 | 2.5 | 7.8E-05 | 2.4E-03 | 1.9E-04 | 5.8E-03 |
| 6.40 | 12.3 | 735 | 2.3 | 1.2E-04 | 3.8E-03 | 1.8E-04 | 5.6E-03 |
| Estimated Permeability | | | | 1.5E-03 | to | 7.2E-02 | (cm/sec) |
| Geometric Mean of Increme | ntal Permeabil | itv | | | 5.0.E-03 | (cm/sec) | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case C.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-201(P) |
| Test Number: | K-2 |

| Depth to top of Ground Water | 7.9 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 7.9 | ft |
| Bottom Depth of Test Interval | 17.5 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 8.8 | ft |
| M = Transformation Ratio | 1.00 | |

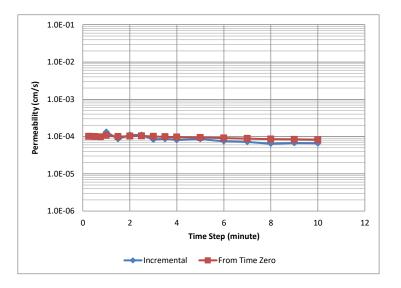


| Depth to Water Surface In | Time, t | Time, t | Length of Water | Incremental | | From Time Zero | |
|-----------------------------|--------------|----------|----------------------|--------------|--------------|----------------|--------------|
| Pipe From Top of Riser Pipe | rime, t | i mic, t | Column at time, H | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 13.46 | 0.0 | 0 | 5.6 | | | | |
| 12.66 | 0.3 | 15 | 4.8 | 1.3E-05 | 4.1E-04 | 1.3E-05 | 4.1E-04 |
| 12.27 | 0.5 | 30 | 4.4 | 7.4E-06 | 2.2E-04 | 1.0E-05 | 3.2E-04 |
| 11.86 | 0.8 | 45 | 4.0 | 8.5E-06 | 2.6E-04 | 9.7E-06 | 3.0E-04 |
| 11.62 | 1.0 | 60 | 3.7 | 5.4E-06 | 1.6E-04 | 8.7E-06 | 2.6E-04 |
| 11.05 | 1.5 | 90 | 3.2 | 7.2E-06 | 2.2E-04 | 8.2E-06 | 2.5E-04 |
| 10.55 | 2.0 | 120 | 2.7 | 7.4E-06 | 2.3E-04 | 8.0E-06 | 2.4E-04 |
| 9.61 | 3.0 | 180 | 1.7 | 9.4E-06 | 2.9E-04 | 8.5E-06 | 2.6E-04 |
| 9.03 | 4.0 | 240 | 1.1 | 8.9E-06 | 2.7E-04 | 8.6E-06 | 2.6E-04 |
| 8.67 | 5.0 | 300 | 0.8 | 8.3E-06 | 2.5E-04 | 8.5E-06 | 2.6E-04 |
| 8.41 | 6.0 | 360 | 0.5 | 8.9E-06 | 2.7E-04 | 8.6E-06 | 2.6E-04 |
| 8.26 | 7.0 | 420 | 0.4 | 7.5E-06 | 2.3E-04 | 8.4E-06 | 2.6E-04 |
| 8.15 | 8.0 | 480 | 0.3 | 7.9E-06 | 2.4E-04 | 8.4E-06 | 2.5E-04 |
| 8.05 | 9.0 | 540 | 0.2 | 1.1E-05 | 3.4E-04 | 8.6E-06 | 2.6E-04 |
| 7.98 | 10.0 | 600 | 0.1 | 1.4E-05 | 4.1E-04 | 9.1E-06 | 2.8E-04 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | 1 | 1 | 1.6E-04 | to | 4.1E-04 | (cm/sec) |
| Geometric Mean of Increme | ntal Permeal | oility | | | 2.6.E-04 | (cm/sec) | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-202(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 3.9 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 4.0 | ft |
| Bottom Depth of Test Interval | 15.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.0 | in |
| L = Length, intake, sample | 10.7 | ft |
| M = Transformation Ratio | 1.00 | |

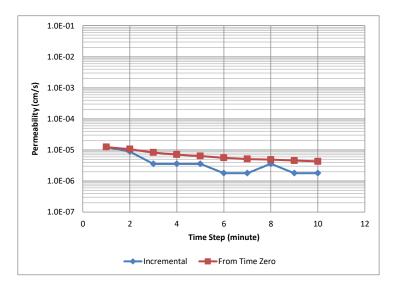


| Depth to Water Surface In | Time, t Time | Time, t | Length of Water | Incremental | | From Time Zero | |
|-----------------------------|--------------|----------|----------------------|--------------|--------------|----------------|--------------|
| Pipe From Top of Riser Pipe | rinic, t | i mic, t | Column at time, H | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 11.40 | 0.0 | 0 | 7.5 | | | | |
| 11.08 | 0.3 | 15 | 7.2 | 3.3E-06 | 1.0E-04 | 3.3E-06 | 1.0E-04 |
| 10.78 | 0.5 | 30 | 6.9 | 3.2E-06 | 9.8E-05 | 3.3E-06 | 9.9E-05 |
| 10.50 | 0.8 | 45 | 6.6 | 3.1E-06 | 9.5E-05 | 3.2E-06 | 9.8E-05 |
| 10.13 | 1.0 | 60 | 6.2 | 4.4E-06 | 1.3E-04 | 3.5E-06 | 1.1E-04 |
| 9.68 | 1.5 | 90 | 5.8 | 2.8E-06 | 8.6E-05 | 3.3E-06 | 1.0E-04 |
| 9.15 | 2.0 | 120 | 5.2 | 3.6E-06 | 1.1E-04 | 3.4E-06 | 1.0E-04 |
| 8.67 | 2.5 | 150 | 4.7 | 3.6E-06 | 1.1E-04 | 3.4E-06 | 1.0E-04 |
| 8.34 | 3.0 | 180 | 4.4 | 2.7E-06 | 8.3E-05 | 3.3E-06 | 1.0E-04 |
| 8.02 | 3.5 | 210 | 4.1 | 2.8E-06 | 8.6E-05 | 3.2E-06 | 9.8E-05 |
| 7.74 | 4.0 | 240 | 3.8 | 2.7E-06 | 8.1E-05 | 3.2E-06 | 9.6E-05 |
| 7.21 | 5.0 | 300 | 3.3 | 2.8E-06 | 8.6E-05 | 3.1E-06 | 9.4E-05 |
| 6.81 | 6.0 | 360 | 2.9 | 2.4E-06 | 7.4E-05 | 3.0E-06 | 9.1E-05 |
| 6.47 | 7.0 | 420 | 2.5 | 2.4E-06 | 7.2E-05 | 2.9E-06 | 8.8E-05 |
| 6.20 | 8.0 | 480 | 2.3 | 2.1E-06 | 6.4E-05 | 2.8E-06 | 8.5E-05 |
| 5.95 | 9.0 | 540 | 2.0 | 2.2E-06 | 6.7E-05 | 2.7E-06 | 8.3E-05 |
| 5.73 | 10.0 | 600 | 1.8 | 2.2E-06 | 6.6E-05 | 2.7E-06 | 8.1E-05 |
| | | | | | | | |
| Estimated Permeability | | | | 6.4E-05 | to | 1.3E-04 | (cm/sec) |
| Geometric Mean of Increme | ntal Permeal | oility | | | 8.6.E-05 | (cm/sec) | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-203(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 7.38 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 14.0 | ft |
| Bottom Depth of Test Interval | 15.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 1.0 | ft |
| M = Transformation Ratio | 1.00 | |
| | | |



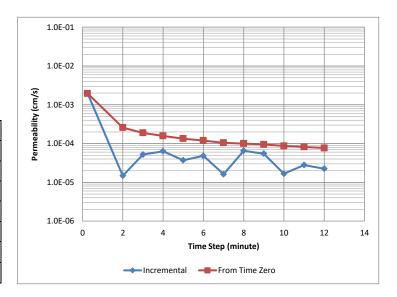
| Depth to Water Surface In Pipe From Top of Riser Pipe | Time, t | Time, t | Length of Water | | | From Time Zero | |
|--|---------|---------|----------------------|--------------|--------------|----------------|--------------|
| | rime, t | Time, t | Column at time, H | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 19.35 | 0.0 | 0 | 12.0 | | | | |
| 19.28 | 1.0 | 60 | 11.9 | 4.1E-07 | 1.2E-05 | 4.1E-07 | 1.2E-05 |
| 19.23 | 2.0 | 120 | 11.9 | 2.9E-07 | 8.9E-06 | 3.5E-07 | 1.1E-05 |
| 19.21 | 3.0 | 180 | 11.8 | 1.2E-07 | 3.6E-06 | 2.7E-07 | 8.3E-06 |
| 19.19 | 4.0 | 240 | 11.8 | 1.2E-07 | 3.6E-06 | 2.3E-07 | 7.1E-06 |
| 19.17 | 5.0 | 300 | 11.8 | 1.2E-07 | 3.6E-06 | 2.1E-07 | 6.4E-06 |
| 19.16 | 6.0 | 360 | 11.8 | 5.9E-08 | 1.8E-06 | 1.8E-07 | 5.6E-06 |
| 19.15 | 7.0 | 420 | 11.8 | 5.9E-08 | 1.8E-06 | 1.7E-07 | 5.1E-06 |
| 19.13 | 8.0 | 480 | 11.8 | 1.2E-07 | 3.6E-06 | 1.6E-07 | 4.9E-06 |
| 19.12 | 9.0 | 540 | 11.7 | 5.9E-08 | 1.8E-06 | 1.5E-07 | 4.5E-06 |
| 19.11 | 10.0 | 600 | 11.7 | 5.9E-08 | 1.8E-06 | 1.4E-07 | 4.3E-06 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | 1 | | 1.8E-06 | to | 1.2E-05 | (cm/sec) |
| Geometric Mean of Incremental Permeability | | | | 3.4.E-06 | (cm/sec) | | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

1/28/2020 4/9/2020 6/8/2020 Field Engineer/Geologist: Calculated By: SMG/APH SMG Checked By: JNH Approved By: ABP 7/23/2020

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-204(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | NE | ft |
|---|------|----|
| Casing Stickup | 3.5 | ft |
| Top Depth of Test Interval | 7.5 | ft |
| Bottom Depth of Test Interval ⁽²⁾ | 9.5 | ft |
| Inside Diameter Pipe | 4.25 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 2.0 | ft |
| M = Transformation Ratio | 1.00 | |

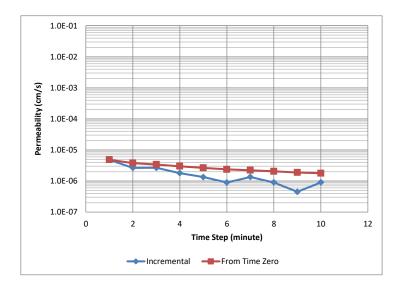


| Depth to Water Surface In | Time, t | Time, t | Length of Water | Water | | From Time Zero | |
|-----------------------------|----------------|----------------------|--------------------|--------------|--------------|----------------|----------|
| Pipe From Top of Riser Pipe | Time, t | Column at time, H | Permeability | Permeability | Permeability | Permeability | |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 0.00 | 0.0 | 0 | 11.0 | | | | |
| 1.00 | 0.3 | 15 | 10.0 | 6.4E-05 | 2.0E-03 | 6.4E-05 | 2.0E-03 |
| 1.05 | 2.0 | 120 | 10.0 | 4.8E-07 | 1.5E-05 | 8.5E-06 | 2.6E-04 |
| 1.15 | 3.0 | 180 | 9.9 | 1.7E-06 | 5.2E-05 | 6.2E-06 | 1.9E-04 |
| 1.27 | 4.0 | 240 | 9.7 | 2.1E-06 | 6.3E-05 | 5.2E-06 | 1.6E-04 |
| 1.34 | 5.0 | 300 | 9.7 | 1.2E-06 | 3.7E-05 | 4.4E-06 | 1.3E-04 |
| 1.43 | 6.0 | 360 | 9.6 | 1.6E-06 | 4.8E-05 | 3.9E-06 | 1.2E-04 |
| 1.46 | 7.0 | 420 | 9.5 | 5.3E-07 | 1.6E-05 | 3.4E-06 | 1.0E-04 |
| 1.58 | 8.0 | 480 | 9.4 | 2.1E-06 | 6.5E-05 | 3.3E-06 | 1.0E-04 |
| 1.68 | 9.0 | 540 | 9.3 | 1.8E-06 | 5.5E-05 | 3.1E-06 | 9.5E-05 |
| 1.71 | 10.0 | 600 | 9.3 | 5.4E-07 | 1.7E-05 | 2.8E-06 | 8.7E-05 |
| 1.76 | 11.0 | 660 | 9.2 | 9.1E-07 | 2.8E-05 | 2.7E-06 | 8.1E-05 |
| 1.80 | 12.0 | 720 | 9.2 | 7.3E-07 | 2.2E-05 | 2.5E-06 | 7.7E-05 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | | | 1.5E-05 | to | 2.0E-03 | (cm/sec) |
| Geometric Mean of Incremen | ntal Permeahil | itv | | 1.02.00 | 4.6.E-05 | (cm/sec) | (cm/sec) |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case C.
(2) Based on groundwater measured at completion of well installation.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-204(P) |
| Test Number: | K-2 |

| Depth to top of Ground Water | 9.99 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 23.5 | ft |
| Bottom Depth of Test Interval | 30.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 6.2 | ft |
| M = Transformation Ratio | 1.00 | |
| | | |



| Depth to Water Surface In Time, t | | W | Length of Water | | | From Time Zero | |
|--|---------|---------|--------------------|--------------|--------------|----------------|--------------|
| Pipe From Top of Riser Pipe | rime, t | Time, t | Column at time, H | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 28.91 | 0.0 | 0 | 18.9 | | | | |
| 28.80 | 1.0 | 60 | 18.8 | 1.6E-07 | 4.9E-06 | 1.6E-07 | 4.9E-06 |
| 28.74 | 2.0 | 120 | 18.8 | 8.7E-08 | 2.7E-06 | 1.2E-07 | 3.8E-06 |
| 28.68 | 3.0 | 180 | 18.7 | 8.8E-08 | 2.7E-06 | 1.1E-07 | 3.4E-06 |
| 28.64 | 4.0 | 240 | 18.7 | 5.9E-08 | 1.8E-06 | 9.8E-08 | 3.0E-06 |
| 28.61 | 5.0 | 300 | 18.6 | 4.4E-08 | 1.3E-06 | 8.7E-08 | 2.7E-06 |
| 28.59 | 6.0 | 360 | 18.6 | 2.9E-08 | 8.9E-07 | 7.8E-08 | 2.4E-06 |
| 28.56 | 7.0 | 420 | 18.6 | 4.4E-08 | 1.3E-06 | 7.3E-08 | 2.2E-06 |
| 28.54 | 8.0 | 480 | 18.6 | 2.9E-08 | 9.0E-07 | 6.7E-08 | 2.1E-06 |
| 28.53 | 9.0 | 540 | 18.5 | 1.5E-08 | 4.5E-07 | 6.2E-08 | 1.9E-06 |
| 28.51 | 10.0 | 600 | 18.5 | 2.9E-08 | 9.0E-07 | 5.8E-08 | 1.8E-06 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | | | 4.5E-07 | to | 4.9E-06 | (cm/sec) |
| Geometric Mean of Incremental Permeability | | | | | 1.4.E-06 | (cm/sec) | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

 Field Engineer/Geologist:
 Not Applicable

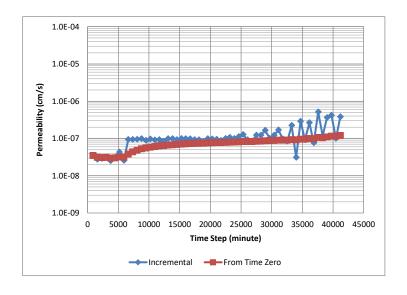
 Calculated By:
 SMG
 7/21/2020

 Checked By:
 APH
 7/22/2020

 Approved By:
 ABP
 7/23/2020

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-204(P) |
| Test Number: | K-3 |

| Depth to top of Ground Water | 10.67 | ft |
|----------------------------------|-------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 23.5 | ft |
| Bottom Depth of Test Interval | 30.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 6.2 | ft |
| M = Transformation Ratio | 1.00 | |



| Depth to Water Surface In | Time, t | Time, t | Length of Water | Incre | mental | From | Time Zero |
|-----------------------------|--------------------|--------------------|----------------------|--------------------|--------------------|--------------------|--------------------|
| Pipe From Top of Riser Pipe | Time, t | Time, t | Column at time, H | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 28.51 | 146.0 | 8760 | 17.8 | | | | |
| 27.99 | 866.0 | 51960 | 17.3 | 1.1E-09 | 3.5E-08 | 1.1E-09 | 3.5E-08 |
| 27.58 | 1586.0 | 95160 | 16.9 | 9.0E-10 | 2.8E-08 | 1.0E-09 | 3.1E-08 |
| 27.17 | 2306.0 | 138360 | 16.5 | 9.5E-10 | 2.9E-08 | 9.9E-10 | 3.0E-08 |
| 26.72 | 3026.0 | 181560 | 16.1 | 1.0E-09 | 3.1E-08 | 1.0E-09 | 3.1E-08 |
| 26.38 | 3746.0 | 224760 | 15.7 | 8.3E-10 | 2.5E-08 | 9.7E-10 | 3.0E-08 |
| 25.96 | 4466.0 | 267960 | 15.3 | 1.0E-09 | 3.1E-08 | 9.8E-10 | 3.0E-08 |
| 25.40 | 5186.0 | 311160 | 14.7 | 1.4E-09 | 4.3E-08 | 1.0E-09 | 3.2E-08 |
| 25.08 | 5906.0 | 354360 | 14.4 | 8.4E-10 | 2.6E-08 | 1.0E-09 | 3.1E-08 |
| 23.96 | 6626.0 | 397560 | 13.3 | 3.1E-09 | 9.3E-08 | 1.2E-09 | 3.8E-08 |
| 22.93 | 7346.0 | 440760 | 12.3 | 3.1E-09 | 9.3E-08 | 1.4E-09 | 4.3E-08 |
| 21.97 | 8066.0 | 483960 | 11.3 | 3.1E-09 | 9.5E-08 | 1.6E-09 | 4.8E-08 |
| 21.04 | 8786.0 | 527160 | 10.4 | 3.2E-09 | 9.9E-08 | 1.7E-09 | 5.2E-08 |
| 20.27 | 9506.0 | 570360 | 9.6 | 2.9E-09 | 8.9E-08 | 1.8E-09 | 5.5E-08 |
| 19.50 | 10226.0 | 613560 | 8.8 | 3.2E-09 | 9.7E-08 | 1.9E-09 | 5.8E-08 |
| 18.83 | 10946.0 | 656760 | 8.2 | 3.0E-09 | 9.1E-08 | 2.0E-09 | 6.0E-08 |
| 18.20 | 11666.0 | 699960 | 7.5 | 3.0E-09 | 9.3E-08 | 2.0E-09 | 6.2E-08 |
| 17.68 | 12386.0 | 743160 | 7.0 | 2.7E-09 | 8.4E-08 | 2.1E-09 | 6.4E-08 |
| 17.11 | 13106.0 | 786360 | 6.4 | 3.2E-09 | 9.8E-08 | 2.1E-09 | 6.6E-08 |
| 16.58 | 13826.0 | 829560 | 5.9 | 3.2E-09 | 9.9E-08 | 2.2E-09 | 6.7E-08 |
| 16.12 | 14546.0 | 872760 | 5.5 | 3.1E-09 | 9.3E-08 | 2.2E-09 | 6.9E-08 |
| 15.67 | 15266.0 | 915960 | 5.0 | 3.3E-09 | 1.0E-07 | 2.3E-09 | 7.0E-08 |
| 15.26 | 15986.0 | 959160 | 4.6 | 3.2E-09 | 9.9E-08 | 2.3E-09 | 7.1E-08 |
| 14.89 | 16706.0 | 1002360 | 4.2 | 3.2E-09 | 9.8E-08 | 2.4E-09 | 7.2E-08 |
| 14.56 | 17426.0 | 1045560 | 3.9 | 3.1E-09 | 9.3E-08 | 2.4E-09 | 7.3E-08 |
| 14.27 | 18146.0 | 1088760 | 3.6 | 3.0E-09 | 9.2E-08 | 2.4E-09 | 7.4E-08 |
| 14.02 | 18866.0 | 1131960 | 3.4 | 2.7E-09 | 8.2E-08 | 2.4E-09 | 7.4E-08 |
| 13.75 | 19586.0 | 1175160 | 3.1 2.8 | 3.2E-09 3.2E-09 | 9.9E-08 | 2.5E-09 2.5E-09 | 7.5E-08 7.6E-08 |
| 13.50 | 20306.0 | 1218360 | | | 9.6E-08 | | |
| 13.28 13.08 | 21026.0 21746.0 | 1261560 1304760 | 2.6 2.4 | 3.1E-09 2.9E-09 | 9.5E-08 8.9E-08 | 2.5E-09 2.5E-09 | 7.7E-08 7.7E-08 |
| 12.89 | 22466.0 | 1347960 | 2.4 | | | | |
| 12.69 | 23186.0 | 1391160 | 2.0 | 3.3E-09 | 1.0E-07 1.1E-07 | 2.6E-09 2.6E-09 | 7.8E-08 7.9E-08 |
| 12.52 | 23186.0 | 1434360 | 1.9 | 3.5E-09 3.3E-09 | 9.9E-08 | 2.6E-09 2.6E-09 | 7.9E-08 7.9E-08 |
| 12.35 | 24626.0 | 1434360 | 1.7 | 3.7E-09 | 9.9E-08 1.1E-07 | 2.6E-09 2.6E-09 | 7.9E-08 8.0E-08 |
| 12.18 | 25346.0 | 1520760 | 1.7 | 4.2E-09 | 1.1E-07 1.3E-07 | 2.6E-09 2.7E-09 | 8.2E-08 |
| 12.16 | 26066.0 | 1563960 | 1.3 | 3.0E-09 | 9.2E-08 | 2.7E-09 2.7E-09 | 8.2E-08 |
| 11.96 | 26786.0 | 1607160 | 1.4 | 2.8E-09 | 8.5E-08 | 2.7E-09 2.7E-09 | 8.2E-08 |
| 11.83 | 27506.0 | 1650360 | 1.2 | 4.0E-09 | 1.2E-07 | 2.7E-09 2.7E-09 | 8.3E-08 |
| 11.72 | 28226.0 | 1693560 | 1.0 | 4.0E-09 | 1.2E-07 | 2.8E-09 | 8.4E-08 |
| 11.72 | 28946.0 | 1736760 | 0.9 | 5.4E-09 | 1.7E-07 | 2.8E-09 | 8.6E-08 |
| 11.50 | 29666.0 | 1779960 | 0.8 | 3.3E-09 | 1.0E-07 | 2.8E-09 2.8E-09 | 8.6E-08 |
| 11.42 | 30386.0 | 1823160 | 0.7 | 4.0E-09 | 1.2E-07 | 2.9E-09 | 8.7E-08 |
| 11.32 | 31106.0 | 1866360 | 0.6 | 5.5E-09 | 1.7E-07 | 2.9E-09 | 8.9E-08 |
| 11.26 | 31826.0 | 1909560 | 0.6 | 3.2E-09 | 9.7E-08 | 2.9E-09 | 8.9E-08 |
| 11.22 | 32546.0 | 1952760 | 0.6 | 2.8E-09 | 8.4E-08 | 2.9E-09 | 8.9E-08 |
| 11.13 | 33266.0 | 1995960 | 0.5 | 7.4E-09 | 2.2E-07 | 3.0E-09 | 9.2E-08 |
| 11.11 | 33986.0 | 2039160 | 0.4 | 1.0E-09 | 3.1E-08 | 3.0E-09 | 9.1E-08 |
| 11.02 | 34706.0 | 2082360 | 0.3 | 9.5E-09 | 2.9E-07 | 3.1E-09 | 9.5E-08 |

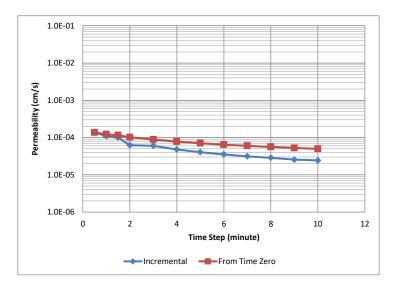
| 10.99 | 35426.0 | 2125560 | 0.3 | 3.0E-09 | 9.2E-08 | 3.1E-09 | 9.5E-08 |
|--|---------|---------|-----|---------|----------|----------|----------|
| 10.92 | 36146.0 | 2168760 | 0.3 | 8.7E-09 | 2.6E-07 | 3.2E-09 | 9.8E-08 |
| 10.91 | 36866.0 | 2211960 | 0.2 | 2.5E-09 | 7.6E-08 | 3.2E-09 | 9.8E-08 |
| 10.82 | 37586.0 | 2255160 | 0.2 | 1.7E-08 | 5.1E-07 | 3.5E-09 | 1.1E-07 |
| 10.82 | 38306.0 | 2298360 | 0.2 | 3.9E-09 | 1.2E-07 | 3.4E-09 | 1.0E-07 |
| 10.78 | 39026.0 | 2341560 | 0.1 | 1.2E-08 | 3.6E-07 | 3.6E-09 | 1.1E-07 |
| 10.75 | 39746.0 | 2384760 | 0.1 | 1.4E-08 | 4.2E-07 | 3.7E-09 | 1.1E-07 |
| 10.74 | 40466.0 | 2427960 | 0.1 | 3.3E-09 | 1.0E-07 | 3.7E-09 | 1.1E-07 |
| 10.72 | 41186.0 | 2471160 | 0.1 | 1.3E-08 | 3.8E-07 | 3.9E-09 | 1.2E-07 |
| Estimated Permeability | | | | 2.5E-08 | to | 5.1E-07 | (cm/sec) |
| Geometric Mean of Incremental Permeability | | | | | 9.6.E-08 | (cm/sec) | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.

Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-205(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 7.22 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 18.5 | ft |
| Bottom Depth of Test Interval | 25.3 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 6.2 | ft |
| M = Transformation Ratio | 1.00 | |

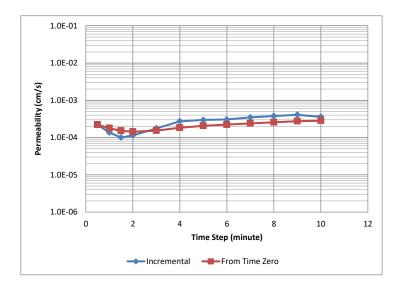


| Depth to Water Surface In | Time, t | Time, t | Length of Water Column at time, H | Incremental | | From Time Zero | |
|-----------------------------|---------|----------|--|--------------|--------------|----------------|--------------|
| Pipe From Top of Riser Pipe | | | | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 14.58 | 0.0 | 0 | 7.4 | | | | |
| 14.00 | 0.5 | 30 | 6.8 | 4.5E-06 | 1.4E-04 | 4.5E-06 | 1.4E-04 |
| 13.57 | 1.0 | 60 | 6.4 | 3.6E-06 | 1.1E-04 | 4.0E-06 | 1.2E-04 |
| 13.20 | 1.5 | 90 | 6.0 | 3.3E-06 | 1.0E-04 | 3.8E-06 | 1.2E-04 |
| 12.98 | 2.0 | 120 | 5.8 | 2.0E-06 | 6.2E-05 | 3.3E-06 | 1.0E-04 |
| 12.58 | 3.0 | 180 | 5.4 | 2.0E-06 | 6.0E-05 | 2.9E-06 | 8.8E-05 |
| 12.28 | 4.0 | 240 | 5.1 | 1.6E-06 | 4.8E-05 | 2.6E-06 | 7.8E-05 |
| 12.04 | 5.0 | 300 | 4.8 | 1.3E-06 | 4.0E-05 | 2.3E-06 | 7.0E-05 |
| 11.84 | 6.0 | 360 | 4.6 | 1.2E-06 | 3.5E-05 | 2.1E-06 | 6.5E-05 |
| 11.67 | 7.0 | 420 | 4.5 | 1.0E-06 | 3.1E-05 | 2.0E-06 | 6.0E-05 |
| 11.52 | 8.0 | 480 | 4.3 | 9.4E-07 | 2.9E-05 | 1.8E-06 | 5.6E-05 |
| 11.39 | 9.0 | 540 | 4.2 | 8.4E-07 | 2.6E-05 | 1.7E-06 | 5.3E-05 |
| 11.27 | 10.0 | 600 | 4.1 | 8.0E-07 | 2.4E-05 | 1.6E-06 | 5.0E-05 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | | | 2.4E-05 | to | 1.4E-04 | (cm/sec) |
| Geometric Mean of Increme | oility | 4.9.E-05 | (cm/sec) | • | | | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-207(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 4.05 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 4.1 | ft |
| Bottom Depth of Test Interval | 12.7 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 8.4 | ft |
| M = Transformation Ratio | 1.00 | |

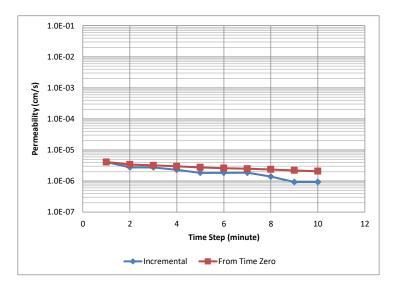


| Depth to Water Surface In | Time, t | Time, t | Length of Water Column at time, H | Incremental | | From Time Zero | |
|--|---------|---------|--|--------------|--------------|----------------|--------------|
| Pipe From Top of Riser Pipe | | | | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 10.46 | 0.0 | 0 | 6.4 | | | | |
| 9.50 | 0.5 | 30 | 5.5 | 7.2E-06 | 2.2E-04 | 7.2E-06 | 2.2E-04 |
| 8.98 | 1.0 | 60 | 4.9 | 4.5E-06 | 1.4E-04 | 5.9E-06 | 1.8E-04 |
| 8.63 | 1.5 | 90 | 4.6 | 3.3E-06 | 1.0E-04 | 5.0E-06 | 1.5E-04 |
| 8.26 | 2.0 | 120 | 4.2 | 3.8E-06 | 1.1E-04 | 4.7E-06 | 1.4E-04 |
| 7.30 | 3.0 | 180 | 3.3 | 5.8E-06 | 1.8E-04 | 5.1E-06 | 1.5E-04 |
| 6.23 | 4.0 | 240 | 2.2 | 8.9E-06 | 2.7E-04 | 6.0E-06 | 1.8E-04 |
| 5.46 | 5.0 | 300 | 1.4 | 9.7E-06 | 3.0E-04 | 6.8E-06 | 2.1E-04 |
| 4.95 | 6.0 | 360 | 0.9 | 1.0E-05 | 3.1E-04 | 7.3E-06 | 2.2E-04 |
| 4.59 | 7.0 | 420 | 0.5 | 1.1E-05 | 3.5E-04 | 7.9E-06 | 2.4E-04 |
| 4.36 | 8.0 | 480 | 0.3 | 1.2E-05 | 3.8E-04 | 8.5E-06 | 2.6E-04 |
| 4.22 | 9.0 | 540 | 0.2 | 1.3E-05 | 4.1E-04 | 9.0E-06 | 2.7E-04 |
| 4.15 | 10.0 | 600 | 0.1 | 1.2E-05 | 3.6E-04 | 9.3E-06 | 2.8E-04 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | | | 1.0E-04 | to | 4.1E-04 | (cm/sec) |
| Geometric Mean of Incremental Permeability | | | | | 2.4.E-04 | (cm/sec) | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-208(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 10.25 | ft |
|----------------------------------|-------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 23.5 | ft |
| Bottom Depth of Test Interval | 30.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 6.2 | ft |
| M = Transformation Ratio | 1.00 | |

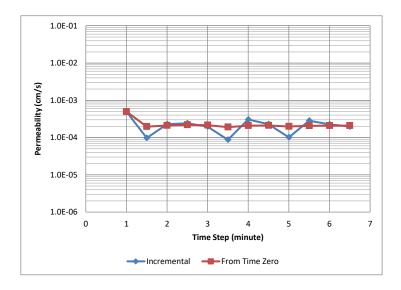


| Depth to Water Surface In | Time, t | Time, t | Length of Water Column at time, H | Incremental | | From Time Zero | |
|--|---------|---------|--|--------------|--------------|----------------|--------------|
| Pipe From Top of Riser Pipe | | | | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 28.64 | 0.0 | 0 | 18.4 | | | | |
| 28.55 | 1.0 | 60 | 18.3 | 1.3E-07 | 4.1E-06 | 1.3E-07 | 4.1E-06 |
| 28.49 | 2.0 | 120 | 18.2 | 9.0E-08 | 2.7E-06 | 1.1E-07 | 3.4E-06 |
| 28.43 | 3.0 | 180 | 18.2 | 9.0E-08 | 2.7E-06 | 1.0E-07 | 3.2E-06 |
| 28.38 | 4.0 | 240 | 18.1 | 7.5E-08 | 2.3E-06 | 9.7E-08 | 3.0E-06 |
| 28.34 | 5.0 | 300 | 18.1 | 6.0E-08 | 1.8E-06 | 9.0E-08 | 2.7E-06 |
| 28.30 | 6.0 | 360 | 18.1 | 6.0E-08 | 1.8E-06 | 8.5E-08 | 2.6E-06 |
| 28.26 | 7.0 | 420 | 18.0 | 6.1E-08 | 1.8E-06 | 8.1E-08 | 2.5E-06 |
| 28.23 | 8.0 | 480 | 18.0 | 4.6E-08 | 1.4E-06 | 7.7E-08 | 2.3E-06 |
| 28.21 | 9.0 | 540 | 18.0 | 3.0E-08 | 9.3E-07 | 7.2E-08 | 2.2E-06 |
| 28.19 | 10.0 | 600 | 17.9 | 3.0E-08 | 9.3E-07 | 6.8E-08 | 2.1E-06 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | | | 9.3E-07 | to | 4.1E-06 | (cm/sec) |
| Geometric Mean of Incremental Permeability | | | | | 1.9.E-06 | (cm/sec) | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-209(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 6.0 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 6.0 | ft |
| Bottom Depth of Test Interval | 7.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 1.0 | ft |
| M = Transformation Ratio | 1.00 | |
| | | |



| Depth to Water Surface In Pipe From Top of Riser Pipe | Time, t | Time, t | Length of Water Column at time, H | Incremental | | From Time Zero | |
|--|--------------|---------|--|--------------|--------------|----------------|--------------|
| | | | | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 7.82 | 0.8 | 50 | 1.8 | | | | |
| 7.75 | 1.0 | 60 | 1.8 | 1.6E-05 | 5.0E-04 | 1.6E-05 | 5.0E-04 |
| 7.71 | 1.5 | 90 | 1.7 | 3.2E-06 | 9.7E-05 | 6.5E-06 | 2.0E-04 |
| 7.62 | 2.0 | 120 | 1.6 | 7.5E-06 | 2.3E-04 | 6.9E-06 | 2.1E-04 |
| 7.53 | 2.5 | 150 | 1.5 | 7.9E-06 | 2.4E-04 | 7.2E-06 | 2.2E-04 |
| 7.46 | 3.0 | 180 | 1.5 | 6.5E-06 | 2.0E-04 | 7.0E-06 | 2.1E-04 |
| 7.43 | 3.5 | 210 | 1.4 | 2.9E-06 | 8.8E-05 | 6.3E-06 | 1.9E-04 |
| 7.33 | 4.0 | 240 | 1.3 | 1.0E-05 | 3.1E-04 | 6.8E-06 | 2.1E-04 |
| 7.26 | 4.5 | 270 | 1.3 | 7.5E-06 | 2.3E-04 | 6.9E-06 | 2.1E-04 |
| 7.23 | 5.0 | 300 | 1.2 | 3.3E-06 | 1.0E-04 | 6.5E-06 | 2.0E-04 |
| 7.15 | 5.5 | 330 | 1.2 | 9.3E-06 | 2.8E-04 | 6.8E-06 | 2.1E-04 |
| 7.09 | 6.0 | 360 | 1.1 | 7.4E-06 | 2.3E-04 | 6.9E-06 | 2.1E-04 |
| 7.04 | 6.5 | 390 | 1.0 | 6.5E-06 | 2.0E-04 | 6.8E-06 | 2.1E-04 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | | | 8.8E-05 | to | 5.0E-04 | (cm/sec) |
| Geometric Mean of Increme | ntal Permeab | oility | | | 2.0.E-04 | (cm/sec) | • |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

 Field Engineer/Geologist:
 Not Applicable

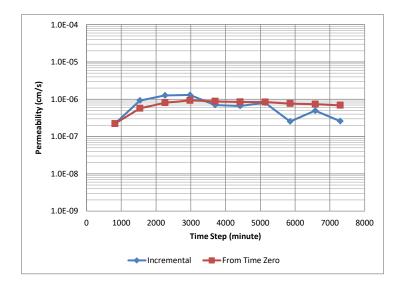
 Calculated By:
 SMG
 7/21/2020

 Checked By:
 APH
 7/22/2020

 Approved By:
 ABP
 7/23/2020

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-208(P) |
| Test Number: | K-2 |

| Depth to top of Ground Water | 11.07 | ft |
|----------------------------------|-------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 23.5 | ft |
| Bottom Depth of Test Interval | 30.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 6.2 | ft |
| M = Transformation Ratio | 1.00 | |

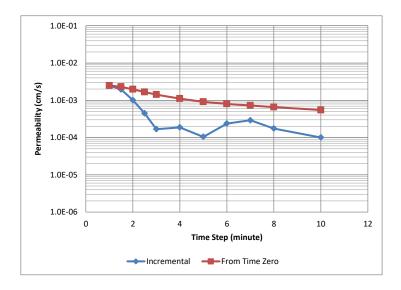


| Depth to Water Surface In Pipe From Top of Riser Pipe | Time, t Ti | Time, t | Length of Water Column at time, H Per | Incre | Incremental | | From Time Zero | |
|--|------------|---------|---------------------------------------|--------------|--------------|--------------|----------------|--|
| | | Time, t | | Permeability | Permeability | Permeability | Permeability | |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) | |
| 27.78 | 97.0 | 5820 | 16.7 | | | | | |
| 24.88 | 817.0 | 49020 | 13.8 | 7.2E-09 | 2.2E-07 | 7.2E-09 | 2.2E-07 | |
| 17.29 | 1537.0 | 92220 | 6.2 | 3.0E-08 | 9.2E-07 | 1.9E-08 | 5.7E-07 | |
| 13.14 | 2257.0 | 135420 | 2.1 | 4.2E-08 | 1.3E-06 | 2.6E-08 | 8.1E-07 | |
| 11.74 | 2977.0 | 178620 | 0.7 | 4.2E-08 | 1.3E-06 | 3.0E-08 | 9.3E-07 | |
| 11.44 | 3697.0 | 221820 | 0.4 | 2.3E-08 | 7.0E-07 | 2.9E-08 | 8.8E-07 | |
| 11.28 | 4417.0 | 265020 | 0.2 | 2.2E-08 | 6.6E-07 | 2.8E-08 | 8.5E-07 | |
| 11.17 | 5137.0 | 308220 | 0.1 | 2.6E-08 | 8.0E-07 | 2.8E-08 | 8.4E-07 | |
| 11.15 | 5857.0 | 351420 | 0.1 | 8.3E-09 | 2.5E-07 | 2.5E-08 | 7.7E-07 | |
| 11.12 | 6577.0 | 394620 | 0.1 | 1.6E-08 | 4.9E-07 | 2.4E-08 | 7.4E-07 | |
| 11.11 | 7297.0 | 437820 | 0.0 | 8.5E-09 | 2.6E-07 | 2.3E-08 | 6.9E-07 | |
| Stimated Permeability | | | | 2.2E-07 | to | 1.3E-06 | (cm/sec) | |
| Geometric Mean of Incremental Permeability | | | | | 5.8.E-07 | (cm/sec) | • | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165. Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-211(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 4.62 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 6.0 | ft |
| Bottom Depth of Test Interval | 11.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 2.98 | in |
| L = Length, intake, sample | 5.0 | ft |
| M = Transformation Ratio | 1.00 | |

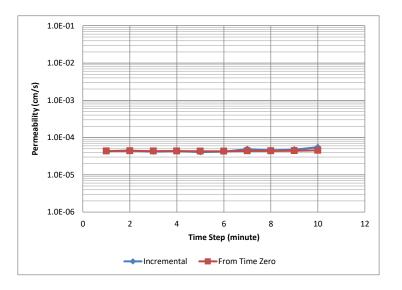


| Time, t | Time, t | Length of Water Column at time, H | Incremental | | From Time Zero | |
|---------|---|---|---|--|---|--|
| | i iine, t | | Permeability | Permeability | Permeability | Permeability |
| (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 0.0 | 0 | 4.0 | | | | |
| 1.0 | 60 | 0.6 | 8.1E-05 | 2.5E-03 | 8.1E-05 | 2.5E-03 |
| 1.5 | 90 | 0.3 | 6.4E-05 | 1.9E-03 | 7.6E-05 | 2.3E-03 |
| 2.0 | 120 | 0.2 | 3.3E-05 | 1.0E-03 | 6.5E-05 | 2.0E-03 |
| 2.5 | 150 | 0.2 | 1.5E-05 | 4.5E-04 | 5.5E-05 | 1.7E-03 |
| 3.0 | 180 | 0.1 | 5.5E-06 | 1.7E-04 | 4.7E-05 | 1.4E-03 |
| 4.0 | 240 | 0.1 | 6.1E-06 | 1.9E-04 | 3.7E-05 | 1.1E-03 |
| 5.0 | 300 | 0.1 | 3.4E-06 | 1.0E-04 | 3.0E-05 | 9.1E-04 |
| 6.0 | 360 | 0.1 | 7.8E-06 | 2.4E-04 | 2.6E-05 | 8.0E-04 |
| 7.0 | 420 | 0.1 | 9.5E-06 | 2.9E-04 | 2.4E-05 | 7.3E-04 |
| 8.0 | 480 | 0.1 | 5.7E-06 | 1.7E-04 | 2.2E-05 | 6.6E-04 |
| 10.0 | 600 | 0.1 | 3.3E-06 | 1.0E-04 | 1.8E-05 | 5.5E-04 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | 1.0E-04 | to | 2.5E-03 | (cm/sec) |
| | 0.0 1.0 1.5 2.0 2.5 3.0 4.0 5.0 6.0 7.0 8.0 10.0 | 0.0 0 1.0 60 1.5 90 2.0 120 2.5 150 3.0 180 4.0 240 5.0 300 6.0 360 7.0 420 8.0 480 | (min) (sec) (ft) 0.0 0 4.0 1.0 60 0.6 1.5 90 0.3 2.0 120 0.2 2.5 150 0.2 3.0 180 0.1 4.0 240 0.1 5.0 300 0.1 6.0 360 0.1 7.0 420 0.1 8.0 480 0.1 10.0 600 0.1 | (min) (sec) (ft) (ft/s) 0.0 0 4.0 1.0 60 0.6 8.1E-05 1.5 90 0.3 6.4E-05 2.0 120 0.2 3.3E-05 2.5 150 0.2 1.5E-05 3.0 180 0.1 5.5E-06 4.0 240 0.1 6.1E-06 5.0 300 0.1 3.4E-06 6.0 360 0.1 7.8E-06 7.0 420 0.1 9.5E-06 8.0 480 0.1 5.7E-06 10.0 600 0.1 3.3E-06 | (min) (sec) (ft) (ft/s) (cm/s) 0.0 0 4.0 1.0 60 0.6 8.1E-05 2.5E-03 1.5 90 0.3 6.4E-05 1.9E-03 2.0 120 0.2 3.3E-05 1.0E-03 2.5 150 0.2 1.5E-05 4.5E-04 3.0 180 0.1 5.5E-06 1.7E-04 4.0 240 0.1 6.1E-06 1.9E-04 5.0 300 0.1 3.4E-06 1.0E-04 6.0 360 0.1 7.8E-06 2.4E-04 7.0 420 0.1 9.5E-06 2.9E-04 8.0 480 0.1 5.7E-06 1.7E-04 10.0 600 0.1 3.3E-06 1.0E-04 | (min) (sec) (ft) (ft/s) (cm/s) (ft/s) 0.0 0 4.0 1.0 60 0.6 8.1E-05 2.5E-03 8.1E-05 1.5 90 0.3 6.4E-05 1.9E-03 7.6E-05 2.0 120 0.2 3.3E-05 1.0E-03 6.5E-05 2.5 150 0.2 1.5E-05 4.5E-04 5.5E-05 3.0 180 0.1 5.5E-06 1.7E-04 4.7E-05 4.0 240 0.1 6.1E-06 1.9E-04 3.7E-05 5.0 300 0.1 3.4E-06 1.0E-04 3.0E-05 6.0 360 0.1 7.8E-06 2.4E-04 2.6E-05 7.0 420 0.1 9.5E-06 2.9E-04 2.4E-05 8.0 480 0.1 5.7E-06 1.7E-04 2.2E-05 10.0 600 0.1 3.3E-05 1.0E-04 1.8E-05 |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-212(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 6.29 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 6.3 | ft |
| Bottom Depth of Test Interval | 10.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 3.4 | ft |
| M = Transformation Ratio | 1.00 | |

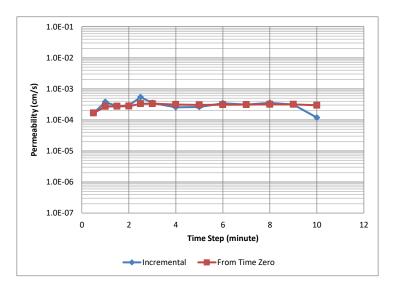


| Depth to Water Surface In | Time, t | Time, t | Length of Water Column at time, H | Incremental | | From Time Zero | |
|--|---------|---------|--|--------------|--------------|----------------|--------------|
| Pipe From Top of Riser Pipe | | | | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 9.42 | 0.0 | 0 | 3.1 | | | | |
| 9.31 | 1.0 | 60 | 3.0 | 1.4E-06 | 4.3E-05 | 1.4E-06 | 4.3E-05 |
| 9.20 | 2.0 | 120 | 2.9 | 1.5E-06 | 4.5E-05 | 1.4E-06 | 4.4E-05 |
| 9.10 | 3.0 | 180 | 2.8 | 1.4E-06 | 4.2E-05 | 1.4E-06 | 4.3E-05 |
| 9.00 | 4.0 | 240 | 2.7 | 1.4E-06 | 4.4E-05 | 1.4E-06 | 4.4E-05 |
| 8.91 | 5.0 | 300 | 2.6 | 1.3E-06 | 4.1E-05 | 1.4E-06 | 4.3E-05 |
| 8.82 | 6.0 | 360 | 2.5 | 1.4E-06 | 4.2E-05 | 1.4E-06 | 4.3E-05 |
| 8.72 | 7.0 | 420 | 2.4 | 1.6E-06 | 4.9E-05 | 1.4E-06 | 4.4E-05 |
| 8.63 | 8.0 | 480 | 2.3 | 1.5E-06 | 4.6E-05 | 1.4E-06 | 4.4E-05 |
| 8.54 | 9.0 | 540 | 2.3 | 1.6E-06 | 4.7E-05 | 1.5E-06 | 4.4E-05 |
| 8.44 | 10.0 | 600 | 2.2 | 1.8E-06 | 5.5E-05 | 1.5E-06 | 4.5E-05 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | • | • | 4.1E-05 | to | 5.5E-05 | (cm/sec) |
| Geometric Mean of Incremental Permeability | | | | | 4.5.E-05 | (cm/sec) | - |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-214(P) |
| Test Number: | K-1 |

| Depth to top of Ground | | |
|----------------------------------|------|----|
| Water | 3.06 | ft |
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 3.1 | ft |
| Bottom Depth of Test Interval | 8.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 4.9 | ft |
| M = Transformation Ratio | 1.00 | |

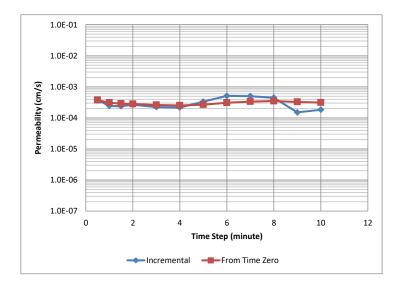


| Depth to Water Surface In | Time, t | Time, t | Length of Water Column at time, H | Incremental | | From Time Zero | |
|--|---------|---------|--|--------------|--------------|----------------|--------------|
| Pipe From Top of Riser Pipe | | | | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 8.03 | 0.0 | 0 | 5.0 | | | | |
| 7.62 | 0.5 | 30 | 4.6 | 5.4E-06 | 1.7E-04 | 5.4E-06 | 1.7E-04 |
| 6.81 | 1.0 | 60 | 3.8 | 1.2E-05 | 3.8E-04 | 8.9E-06 | 2.7E-04 |
| 6.31 | 1.5 | 90 | 3.3 | 9.1E-06 | 2.8E-04 | 9.0E-06 | 2.7E-04 |
| 5.85 | 2.0 | 120 | 2.8 | 9.7E-06 | 2.9E-04 | 9.1E-06 | 2.8E-04 |
| 5.17 | 2.5 | 150 | 2.1 | 1.8E-05 | 5.4E-04 | 1.1E-05 | 3.3E-04 |
| 4.82 | 3.0 | 180 | 1.8 | 1.1E-05 | 3.5E-04 | 1.1E-05 | 3.3E-04 |
| 4.41 | 4.0 | 240 | 1.4 | 8.4E-06 | 2.6E-04 | 1.0E-05 | 3.1E-04 |
| 4.09 | 5.0 | 300 | 1.0 | 8.6E-06 | 2.6E-04 | 1.0E-05 | 3.0E-04 |
| 3.78 | 6.0 | 360 | 0.7 | 1.1E-05 | 3.5E-04 | 1.0E-05 | 3.1E-04 |
| 3.58 | 7.0 | 420 | 0.5 | 1.0E-05 | 3.1E-04 | 1.0E-05 | 3.1E-04 |
| 3.42 | 8.0 | 480 | 0.4 | 1.2E-05 | 3.5E-04 | 1.0E-05 | 3.2E-04 |
| 3.32 | 9.0 | 540 | 0.3 | 1.0E-05 | 3.1E-04 | 1.0E-05 | 3.2E-04 |
| 3.29 | 10.0 | 600 | 0.2 | 3.9E-06 | 1.2E-04 | 9.7E-06 | 3.0E-04 |
| | | | | | | | |
| | | | | | | | |
| Estimated Permeability | | | | 1.2E-04 | to | 5.4E-04 | (cm/sec) |
| Geometric Mean of Incremental Permeability | | | | | 2.9.E-04 | (cm/sec) | (CIII/SEC) |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-215(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 6.5 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 6.5 | ft |
| Bottom Depth of Test Interval | 12.8 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 8.00 | in |
| L = Length, intake, sample | 6.3 | ft |
| M = Transformation Ratio | 1.00 | |



| Depth to Water Surface In | Time, t | Time, t | Length of Water | Incre | mental | From Time Zero | | |
|-----------------------------|--------------|---------|----------------------|--------------|--------------|----------------|--------------|--|
| Pipe From Top of Riser Pipe | rime, t | Time, t | Column at time, H | Permeability | Permeability | Permeability | Permeability | |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) | |
| 11.89 | 0.0 | 0 | 5.4 | | | | | |
| 10.79 | 0.5 | 30 | 4.3 | 1.2E-05 | 3.8E-04 | 1.2E-05 | 3.8E-04 | |
| 10.20 | 1.0 | 60 | 3.7 | 8.0E-06 | 2.4E-04 | 1.0E-05 | 3.1E-04 | |
| 9.70 | 1.5 | 90 | 3.2 | 7.8E-06 | 2.4E-04 | 9.4E-06 | 2.9E-04 | |
| 9.22 | 2.0 | 120 | 2.7 | 8.8E-06 | 2.7E-04 | 9.2E-06 | 2.8E-04 | |
| 8.57 | 3.0 | 180 | 2.1 | 7.4E-06 | 2.2E-04 | 8.6E-06 | 2.6E-04 | |
| 8.09 | 4.0 | 240 | 1.6 | 7.1E-06 | 2.2E-04 | 8.2E-06 | 2.5E-04 | |
| 7.56 | 5.0 | 300 | 1.1 | 1.1E-05 | 3.3E-04 | 8.8E-06 | 2.7E-04 | |
| 7.07 | 6.0 | 360 | 0.6 | 1.7E-05 | 5.1E-04 | 1.0E-05 | 3.1E-04 | |
| 6.81 | 7.0 | 420 | 0.3 | 1.6E-05 | 5.0E-04 | 1.1E-05 | 3.4E-04 | |
| 6.68 | 8.0 | 480 | 0.2 | 1.5E-05 | 4.5E-04 | 1.1E-05 | 3.5E-04 | |
| 6.65 | 9.0 | 540 | 0.2 | 4.9E-06 | 1.5E-04 | 1.1E-05 | 3.3E-04 | |
| 6.62 | 10.0 | 600 | 0.1 | 6.0E-06 | 1.8E-04 | 1.0E-05 | 3.1E-04 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Estimated Permeability | | | | 1.5E-04 | to | 5.1E-04 | (cm/sec) | |
| Geometric Mean of Increme | ntal Permeab | oility | | | 2.9.E-04 | (cm/sec) | <u> </u> | |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.
Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

 Field Engineer/Geologist:
 SMG/LEA
 8/30/2021

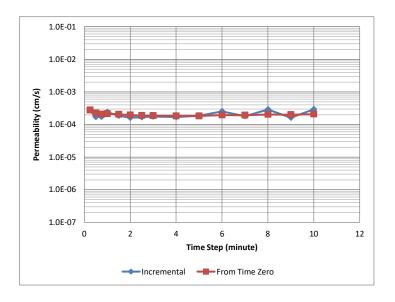
 Calculated By:
 LEA
 9/8/2021

 Checked By:
 SMG
 9/27/2021

 Approved By:
 ABP
 4/8/2022

| Project Number: | 16134 |
|-----------------|----------|
| Boring: | B-217(P) |
| Test Number: | K-1 |

| Depth to top of Ground Water | 27.4 | ft |
|----------------------------------|------|----|
| Casing Stickup | 0.0 | ft |
| Top Depth of Test Interval | 17.0 | ft |
| Bottom Depth of Test Interval | 29.0 | ft |
| Inside Diameter Pipe | 2.00 | in |
| D = Diameter, intake, sample | 7.75 | in |
| L = Length, intake, sample | 1.3 | ft |
| M = Transformation Ratio | 1.00 | |



| Depth to Water Surface In Time t Time t | | Length of Water | Incre | mental | From Time Zero | | |
|--|---------|--------------------|----------------------|--------------|----------------|---------------------|--------------|
| Pipe From Top of Riser Pipe | rime, t | Time, t | Column at time, H | Permeability | Permeability | Permeability | Permeability |
| (ft) | (min) | (sec) | (ft) | (ft/s) | (cm/s) | (ft/s) | (cm/s) |
| 28.85 | 0.0 | 0 | 1.5 | | | | |
| 28.80 | 0.3 | 15 | 1.4 | 9.1E-06 | 2.8E-04 | 9.1E-06 | 2.8E-04 |
| 28.77 | 0.5 | 30 | 1.4 | 5.6E-06 | 1.7E-04 | 7.3E-06 | 2.2E-04 |
| 28.74 | 0.8 | 45 | 1.3 | 5.7E-06 | 1.7E-04 | 6.8E-06 | 2.1E-04 |
| 28.70 | 1.0 | 60 | 1.3 | 7.8E-06 | 2.4E-04 | 7.0E-06 | 2.1E-04 |
| 28.64 | 1.5 | 90 | 1.2 | 6.1E-06 | 1.9E-04 | 6.7E-06 | 2.1E-04 |
| 28.59 | 2.0 | 120 | 1.2 | 5.3E-06 | 1.6E-04 | 6.4E-06 | 1.9E-04 |
| 28.54 | 2.5 | 150 | 1.1 | 5.5E-06 | 1.7E-04 | 6.2E-06 | 1.9E-04 |
| 28.49 | 3.0 | 180 | 1.1 | 5.8E-06 | 1.8E-04 | 6.1E-06 | 1.9E-04 |
| 28.40 | 4.0 | 240 | 1.0 | 5.6E-06 | 1.7E-04 | 6.0E-06 | 1.8E-04 |
| 28.31 | 5.0 | 300 | 0.9 | 6.1E-06 | 1.9E-04 | 6.0E-06 | 1.8E-04 |
| 28.20 | 6.0 | 360 | 0.8 | 8.3E-06 | 2.5E-04 | 6.4E-06 | 1.9E-04 |
| 28.13 | 7.0 | 420 | 0.7 | 5.9E-06 | 1.8E-04 | 6.3E-06 | 1.9E-04 |
| 28.03 | 8.0 | 480 | 0.6 | 9.5E-06 | 2.9E-04 | 6.7E-06 | 2.0E-04 |
| 27.98 | 9.0 | 540 | 0.6 | 5.3E-06 | 1.6E-04 | 6.6E-06 | 2.0E-04 |
| 27.90 | 10.0 | 600 | 0.5 | 9.6E-06 | 2.9E-04 | 6.9E-06 | 2.1E-04 |
| | | | | | | | |
| Estimated Permeability Geometric Mean of Increme | | | | 1.6E-04 | to 2.0.E-04 | 2.9E-04 (cm/sec) | (cm/sec) |

⁽¹⁾ Calculations above the water table are from USBR, Engineering Geology Field Manual, Volume 2, pp 162-165.

Calculations below the water table are from Hvorslev printed in Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G.

Appendix I

PACKER TEST RESULTS

| Project Name | South Boulde | r Creek | | | 201(P) |
|----------------------------|---------------|------------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test | P-1 |
| | | | | | |
| Field Engineer/Geologist: | SMG | Date: | 2/17/2020 | | |
| Calculated By: | SMG | Date: | 3/3/2020 | | |
| Checked By: | JEL | Date: | 3/20/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | - | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | ed from groun | d surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | • | 2.98 | Number of Packers | Single |
| Depth to top of Ground Wa | ater (ft) | | 5.5 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 21.5 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | • | 25.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 3.5 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | • | 3.2 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | • | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|--|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 5.0 | 0.0 | 64062.4 | | | | | | | |
| 5.0 | 1.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | Geometric Mean of Hydraulic Conductivity | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | | |
| | | | | | | | | | |
| 6.0 | 0.0 | 64062.4 | | | | | | | |
| 6.0 | 1.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 8.0 | 0.0 | 64062.4 | | | | | | | |
| 8.0 | 1.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 64062.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

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^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulder | r Creek | | Boring E | 3-201(P) |
|----------------------------|-----------------|------------|-----------|------------------------|-----------|
| Project No. | 16134 | | | Test | P-2 |
| | | | | | |
| Field Engineer/Geologist: | JEL | Date: | 2/18/2020 | | |
| Calculated By: | SMG | Date: | 3/3/2020 | | |
| Checked By: | JEL | Date: | 3/30/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | • | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | l surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 8.4 | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 25.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 30.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.3 | Pipe Roughness (e), ft | 0.00033 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|--|-----------------|----------|---------------------|-------------|--|----------|---------|---------------------|----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons |
| 6.0 | 0.0 | 640703.6 | | | | | | | |
| 6.0 | 1.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| Geometric Mean of Hydraulic Conductivity | | | | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | |
| 8.0 | 0.0 | 640703.6 | | | | | | | |
| 8.0 | 1.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 10.0 | 0.0 | 640703.6 | | | | | | | |
| 10.0 | 1.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 2.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 3.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 4.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 5.0 | 640703.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | Geometric Mean of Hydraulic Conductivity | | | | |

Approximate Water Temperature

40

Height of Pressure Gauge Stickup (ft)

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

South Boulder Creek Project Name B-201(P) Boring Project No. 16134 P-3 Test Field Engineer/Geologist: JEL Date: 2/18/2020 Calculated By: SMG Date: 3/3/2020 Checked By: Date: 3/30/2020 JEL Approved By: ABP Date: 7/22/2020 **Test Data Packer Configuration** (All depths/heights measured from ground surface) Sampler Type NQ_3 2.98 Boring Diameter (in) Number of Packers Single Depth to top of Ground Water (ft) 8.4 Type Pneumatic Plunge Angle from Horizontal (Deg) 90.0 Packer Pressure (psi) 180 Packer Length (in) Depth to Top of Test Zone (ft) 30.0 24.0 2.38 Depth to Bottom of Test Zone (ft) 38.0 Water Pipe I.D. (in) Test Interval Length (ft) 8.0 Pipe Materials Steel Height of Water Pipe Stickup (ft) 1.3 Pipe Roughness (e), ft 0.00033 Height of Pressure Gauge Stickup (ft) 1.5 Approximate Water Temperature 40

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Hydraulic Conductivity (K) | | |
|--|-----------------|-----------|---------------------|-------------|-------------|----------|---------|----------------------------|-----------|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | |
| | | | | | | | | | | |
| 7.0 | 0.0 | 640704.5 | | | | | | | | |
| 7.0 | 1.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 2.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 3.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 4.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 5.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| Geometric Mean of Hydraulic Conductivity | | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | | | |
| | | | | | | | | | | |
| 10.0 | 0.0 | 640704.5 | | | | | | | | |
| 10.0 | 1.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 10.0 | 2.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 10.0 | 3.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 10.0 | 4.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 10.0 | 5.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| 12.0 | 0.0 | 640704.5 | | | | | | | | |
| | *** | 0.10,0.10 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 12.0 | 1.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 12.0 | 2.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | | * | |
| 12.0 | 3.0 | 640704.5 | 0.0 | 0.0 | 0.0 | | | * | | |
| 12.0 | 4.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 12.0 | 5.0 | 640704.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Creek 16134 | | | E | 02(P) P-1 |
|--|------------------------------|-------------------------|-----------------------|-------------------------------|--------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: | 2/14/2020 3/4/2020 | | |
| Test Data (All depths/heights measur | ed from ground | surface) | | Packer Configuration | |
| Sampler Type | C | , | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground Wa | ater (ft) | | 6.4 | Туре | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 18.5 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 22.5 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 4.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.7 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 4.0 | 0.0 | 64116.3 | | | | | | | |
| 4.0 | 1.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | | tric Mean of | 0.0 | 0.10 | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | Geome | tric Mean or | | onductivity | 2.0E-07 | 0.1 | 1.UE-U/ | 0.1 |
| 6.0 | 0.0 | 64116.3 | | | | | | | |
| 6.0 | 1.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| 7 0 | 0.0 | 641162 | | | | | | | |
| 7.0 | 0.0 | 64116.3 | | | | | | | <u> </u> |
| 7.0 | 1.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64116.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

South Boulder Creek Project Name B-202(P) Boring Project No. 16134 P-2 Test Field Engineer/Geologist: APH Date: 2/6/2020 Calculated By: APH 2/14/2020 Date: Checked By: SMG Date: 3/4/2020 Approved By: ABP Date: 7/22/2020 **Test Data Packer Configuration** (All depths/heights measured from ground surface) Sampler Type NQ_3 2.98 Boring Diameter (in) Number of Packers Single Depth to top of Ground Water (ft) 6.4 Type Pneumatic Plunge Angle from Horizontal (Deg) 90.0 Packer Pressure (psi) 180 Packer Length (in) Depth to Top of Test Zone (ft) 22.5 24.0 2.38 Depth to Bottom of Test Zone (ft) 29.0 Water Pipe I.D. (in) 6.5 Test Interval Length (ft) Pipe Materials Steel Height of Water Pipe Stickup (ft) 2.8 Pipe Roughness (e), ft 0.00033 Height of Pressure Gauge Stickup (ft) 1.5 Approximate Water Temperature 40

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | - | Hydraulic Conductivity (K) | | |
|--|-----------------|---------|---------------------|-------------|-------------|----------|---------|----------------------------|-----------|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | |
| 5.0 | 0.0 | (4117.0 | | | | | | | | |
| 5.0 | 0.0 | 64117.0 | 0.0 | | 0.0 | * | | | | |
| 5.0 | 1.0 | 64117.0 | 0.0 | 0.0 | 0.0 | | * | * | * | |
| 5.0 | 2.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 3.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 4.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 5.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| Geometric Mean of Hydraulic Conductivity | | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | | | |
| | | | | | | | | | | |
| 7.0 | 0.0 | 64117.0 | | | | | | | | |
| 7.0 | 1.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 2.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 3.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 4.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 5.0 | 64117.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 9.0 | 0.0 | 64117.2 | | | | | | | | |
| 9.0 | 1.0 | 64117.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 2.0 | 64117.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 3.0 | 64117.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 4.0 | 64117.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 5.0 | 64117.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

South Boulder Creek Project Name B-202(P) Boring Project No. 16134 P-3 Test Field Engineer/Geologist: APH Date: 2/6/2020 Calculated By: APH 2/14/2020 Date: Checked By: SMG Date: 3/4/2020 Approved By: ABP Date: 7/22/2020 **Test Data Packer Configuration** (All depths/heights measured from ground surface) Sampler Type NQ_3 2.98 Boring Diameter (in) Number of Packers Single Depth to top of Ground Water (ft) 6.4 Type Pneumatic Plunge Angle from Horizontal (Deg) 90.0 Packer Pressure (psi) 180 Packer Length (in) Depth to Top of Test Zone (ft) 29.0 24.0 2.38 Depth to Bottom of Test Zone (ft) 35.0 Water Pipe I.D. (in) Test Interval Length (ft) 6.0 Pipe Materials Steel Height of Water Pipe Stickup (ft) 1.3 Pipe Roughness (e), ft 0.00033 Height of Pressure Gauge Stickup (ft) 1.5 Approximate Water Temperature 40

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 7.0 | 0.0 | 64118.3 | | | | | | | |
| 7.0 | 1.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| , , , , | | | tric Mean of | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | Ĭ | , | | | | |
| 9.0 | 0.0 | 64118.3 | | | | | | | |
| 9.0 | 1.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 64118.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 12.0 | 0.0 | 64118.5 | | | | | | | |
| 12.0 | 1.0 | 64118.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 2.0 | 64118.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 3.0 | 64118.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 4.0 | 64118.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 5.0 | 64118.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

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^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder (| Creek | | £ | P-1 |
|--|-----------------------|----------------|------------------------------------|-------------------------------|-----------|
| Field Engineer/Geologist: Calculated By: Checked By: | APH APH SMG | Date: Date: | 2/10/2020 2/14/2020 3/4/2020 | | |
| Approved By: Test Data (All depths/heights measure) | ABP red from ground s | Date: | 7/22/2020 | Packer Configuration | |
| Sampler Type | | ŕ | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 15.5 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 18.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 2.5 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.7 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| | Elapsed | | Change in | | | | Hydraulic | Conductivity | 7 |
|-------------------------------|---------|---------|----------------|-------------|-------------|----------|-----------|--------------|-----------|
| Applied Water Pressure | Time | Volume | Volume | Flow | Rate | | | (K) | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 4.5 | 0.0 | 64122.6 | | | | | | | |
| 4.5 | 1.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.5 | 2.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.5 | 3.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.5 | 4.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.5 | 5.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 5.0 | 0.0 | 64122.6 | | | | | | | |
| 5.0 | 1.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 64122.6 | | | | | | | |
| 6.0 | 1.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64122.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

B-203(P) South Boulder Creek Project Name Boring Project No. 16134 P-2 Test Field Engineer/Geologist: APH Date: 2/10/2020 Calculated By: APH Date: 2/14/2020 Checked By: SMG Date: 3/4/2020 Approved By: ABP Date: 7/22/2020 **Test Data Packer Configuration** (All depths/heights measured from ground surface) Sampler Type NQ_3 2.98 Boring Diameter (in) Number of Packers Single Depth to top of Ground Water (ft) NE Type Pneumatic Plunge Angle from Horizontal (Deg) 90.0 Packer Pressure (psi) 180 Packer Length (in) Depth to Top of Test Zone (ft) 18.0 24.0 2.38 Depth to Bottom of Test Zone (ft) 25.0 Water Pipe I.D. (in) Test Interval Length (ft) 7.0 Pipe Materials Steel Height of Water Pipe Stickup (ft) 1.8 Pipe Roughness (e), ft 0.00033 Height of Pressure Gauge Stickup (ft) 1.5 Approximate Water Temperature 40

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 4.0 | 0.0 | 64124.2 | | | | | | | |
| 4.0 | 1.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 64124.2 | | | | | | | |
| 6.0 | 1.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 7.0 | 0.0 | 64124.2 | | | | | | | |
| 7.0 | 1.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64124.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

16134 Project No. P-3 Test Field Engineer/Geologist: APH/SMG Date: 2/11/2020 Calculated By: APH Date: 2/14/2020 Checked By: 3/4/2020 SMG Date: Approved By: ABP Date: 7/22/2020 **Test Data Packer Configuration**

(All depths/heights measured from ground surface) Sampler Type NQ_3 2.98 Boring Diameter (in) Depth to top of Ground Water (ft) NE Plunge Angle from Horizontal (Deg) 90.0 Depth to Top of Test Zone (ft) 25.0 Depth to Bottom of Test Zone (ft) 34.0

South Boulder Creek

Project Name

Test Interval Length (ft) 9.0 Height of Water Pipe Stickup (ft) 1.7 Height of Pressure Gauge Stickup (ft) 1.2

| Number of Packers | Single |
|-------------------------------|-----------|
| Туре | Pneumatic |
| Packer Pressure (psi) | 180 |
| Packer Length (in) | 24.0 |
| Water Pipe I.D. (in) | 2.38 |
| Pipe Materials | Steel |
| Pipe Roughness (e), ft | 0.00033 |
| Approximate Water Temperature | 40 |

Boring

B-203(P)

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 6.0 | 0.0 | 64126.2 | | | | | | | |
| 6.0 | 1.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 0.0 | 5.0 | | tric Mean of | | 0.0 | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | Grome | | | onaccivity | 2.02 07 | 0.1 | 1,02 0, | *** |
| 8.0 | 0.0 | 64126.2 | | | | | | | |
| 8.0 | 1.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 10.0 | 0.0 | 64126.2 | | | | | | | |
| 10.0 | 1.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 2.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 3.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 4.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 5.0 | 64126.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to 1x10 cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder C 16134 | reek | | | 04(P) P-1 |
|--|--------------------------|-------------------------|---|-------------------------------|--------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: | 1/28/2020 1/28/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground s | urface) | | Packer Configuration | |
| Sampler Type | Č | , | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 24.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 27.5 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 3.5 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.3 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.7 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 5.0 | 0.0 | 64108.1 | | | | | | | |
| 5.0 | 1.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 7.0 | 0.0 | 64108.1 | | | | | | | |
| 7.0 | 1.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 9.0 | 0.0 | 64108.1 | | | | | | | |
| 9.0 | 1.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 64108.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder C 16134 | reek | | £ | P-2 |
|--|--------------------------|-------------------------|---|-------------------------------|-----------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | SMG APH SMG ABP | Date: Date: Date: | 1/29/2020 1/31/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground si | ırface) | | Packer Configuration | |
| Sampler Type | | ĺ | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 16.4 | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 27.5 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | Cone (ft) | | 35.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 7.5 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.4 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | 8 | | | - | Conductivity (K) | I |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 7.0 | 0.0 | 64119.8 | | | | | | | |
| 7.0 | 1.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 9.0 | 0.0 | 64119.8 | | | | | | | |
| 9.0 | 1.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 12.0 | 0.0 | 64119.8 | | | | | | | |
| 12.0 | 1.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 2.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 3.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 4.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 5.0 | 64119.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulde 16134 | er Creek | | £ | 04(P) 2-3 |
|--|-----------------------|-------------------------|---|-------------------------------|--------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | SMG APH SMG ABP | Date: Date: Date: | 1/29/2020 1/31/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | ed from groun | d surface) | 110 | Packer Configuration | |
| Sampler Type Boring Diameter (in) | | | NQ ₃ 2.98 | Number of Packers | Single |
| Depth to top of Ground Wa | ater (ft) | | 16.4 | Туре | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 35.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 40.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.2 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 8.0 | 0.0 | 64111.3 | | | | | | | |
| 8.0 | 1.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 11.0 | 0.0 | 64111.3 | | | | | | | |
| 11.0 | 1.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 11.0 | 2.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 11.0 | 3.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 11.0 | 4.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 11.0 | 5.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 14.0 | 0.0 | 64111.3 | | | | | | | |
| 14.0 | 1.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 14.0 | 2.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 14.0 | 3.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 14.0 | 4.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 14.0 | 5.0 | 64111.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulde | r Creek | | Boring | B-205(P) |
|----------------------------|-----------------|------------|-----------|-----------------------|-----------|
| Project No. | 16134 | | | Test | P-1 |
| | | | | | |
| Field Engineer/Geologist: | APH | Date: | 3/12/2020 | | |
| Calculated By: | SMG | Date: | 3/31/2020 | | |
| Checked By: | JEL | Date: | 4/1/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | d surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 10.5 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 21.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 24.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 3.0 | Pipe Materials | Steel |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Flow Rate | | Hydraulic Conductivity (K) | | | |
|--|-----------------|---------|---------------------|-------------|-------------|----------|-------------------------------|----------|----------|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons | |
| 4.0 | 0.0 | (4072.4 | | | | | | | | |
| 4.0 | 0.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 4.0 | 1.0 | 64073.4 | 0.0 | 0.0 | 0.0 | | | | | |
| 4.0 | 2.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 4.0 | 3.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 4.0 | 4.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 4.0 | 5.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | 1 | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 6.0 | 0.0 | 64073.4 | | | | | | | | |
| 6.0 | 1.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 2.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 3.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 4.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 5.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 7.0 | 0.0 | 64073.4 | | | | | | | | |
| 7.0 | 1.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 2.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 3.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 4.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 5.0 | 64073.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| Geometric Mean of Hydraulic Conductivity | | | | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

Pipe Roughness (e), ft

Approximate Water Temperature

0.00033

40

Height of Water Pipe Stickup (ft)

Height of Pressure Gauge Stickup (ft)

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Creek 16134 | | | <u></u> | 05(P) P-2 |
|--|------------------------------|-------------------------|-----------------|-------------------------------|--------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH SMG JEL ABP | Date: Date: Date: | 4/1/2020 | | |
| Test Data (All denths/heights measured from ground surface) | | | | Packer Configuration | |
| ` 1 0 | 8 | , | NQ ₃ | | |
| 1 71 | | | 2.98 | Number of Packers | Single |
| • | ater (ft) | | 10.5 | Туре | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 24.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 29.0 | Water Pipe I.D. (in) | 2.38 |
| (All depths/heights measured from ground surface Sampler Type Boring Diameter (in) Depth to top of Ground Water (ft) Plunge Angle from Horizontal (Deg) Depth to Top of Test Zone (ft) Depth to Bottom of Test Zone (ft) Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | NA | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time Volume | | Change in Volume | Flow | Rate | Hydraulic Conductivity (K) | | | | |
|--|------------------------|---------|------------------|-------------|-------------|-------------------------------|---------|----------|-----------|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | |
| | | | | | | | | | | |
| 5.0 | 0.0 | 64075.5 | | | | | | | | |
| 5.0 | 1.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 2.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 3.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 4.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 5.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 7.0 | 0.0 | 64075.5 | | | | | | | | |
| 7.0 | 1.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 2.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 3.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 4.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 5.0 | 64075.5 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | • | Geome | etric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 9.0 | 0.0 | 64075.7 | | | | | | | | |
| 9.0 | 1.0 | 64075.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 2.0 | 64075.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 3.0 | 64075.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 4.0 | 64075.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 5.0 | 64075.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| Geometric Mean of Hydraulic Conductivity | | | | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulde | r Creek | | Boring B-2 | 05(P) |
|----------------------------|---------------|------------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test F | P-3 |
| | | | | | |
| Field Engineer/Geologist: | APH | Date: | 3/12/2020 | | |
| Calculated By: | SMG | Date: | 3/31/2020 | | |
| Checked By: | JEL | Date: | 4/1/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | • | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | ed from groun | d surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground Wa | ater (ft) | | 10.5 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 29.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 38.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 9.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | NA | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | NA | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow Rate | | Hydraulic Conductivity (K) | | | |
|--|-----------------|---------|---------------------|-------------|-------------|----------------------------|---------|----------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 7.0 | 0.0 | 64076.7 | | | | | | | |
| 7.0 | 1.0 | 64076.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64076.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64076.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64076.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64076.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| , , , , | | | tric Mean of | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 9.0 | 0.0 | 64076.8 | | | | | | | |
| 9.0 | 1.0 | 64076.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 64076.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 64076.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 64076.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 64076.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 12.0 | 0.0 | 64076.9 | | | | | | | |
| 12.0 | 1.0 | 64076.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 2.0 | 64076.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 3.0 | 64076.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 4.0 | 64076.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 5.0 | 64076.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| Geometric Mean of Hydraulic Conductivity | | | | | | | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

South Boulder Creek Project Name B-206(P) Boring Project No. 16134 P-1 Test Field Engineer/Geologist: JNH Date: 3/17/2020 Calculated By: SMG 3/31/2020 Date: Checked By: JEL Date: 4/1/2020 Approved By: ABP Date: 7/22/2020 **Test Data Packer Configuration** (All depths/heights measured from ground surface) Sampler Type NQ_3 2.98 Boring Diameter (in) Number of Packers Single Depth to top of Ground Water (ft) 10.1 Type Pneumatic Plunge Angle from Horizontal (Deg) 90.0 Packer Pressure (psi) 180 Packer Length (in) Depth to Top of Test Zone (ft) 18.5 24.0 2.38 Depth to Bottom of Test Zone (ft) 20.0 Water Pipe I.D. (in) Test Interval Length (ft) 1.5 Pipe Materials Steel Height of Water Pipe Stickup (ft) 1.5 Pipe Roughness (e), ft 0.00033 Height of Pressure Gauge Stickup (ft) 2.0 Approximate Water Temperature 40

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 4.0 | 0.0 | 64088.7 | | | | | | | |
| 4.0 | 1.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 64088.7 | | | | | | | |
| 6.0 | 1.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 7.0 | 0.0 | 64088.7 | | | | | | | |
| 7.0 | 1.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64088.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

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^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulder | Creek | | Boring B-2 | 206(P) |
|----------------------------|-----------------|----------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test | P-2 |
| | | | | | |
| Field Engineer/Geologist: | EJS | Date: | 3/17/2020 | | |
| Calculated By: | SMG | Date: | 3/31/2020 | | |
| Checked By: | JEL | Date: | 4/1/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | • | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 10.1 | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 20.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 25.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 3.0 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 3.0 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | e Flow Rate | | | | Hydraulic Conductivity (K) | | | |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|-------------------------------|-----------|--|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | | |
| 4.0 | 0.0 | 64089.7 | | | | | | | | | |
| 4.0 | 1.0 | 64089.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 4.0 | 2.0 | 64089.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 4.0 | 3.0 | 64089.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 4.0 | 4.0 | 64089.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 4.0 | 5.0 | 64089.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 4.0 | 3.0 | | etric Mean of | 0.0 | 0.0 | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | | |
| | | Geome | THE MEAN OF | | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | | |
| 5.5 | 0.0 | 64089.7 | | | | | | | | | |
| 5.5 | 1.0 | 64089.8 | 0.1 | 0.1 | 0.0 | 6.1E-05 | 32 | 3.1E-05 | 3 | | |
| 5.5 | 2.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 5.5 | 3.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 5.5 | 4.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 5.5 | 5.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| | | Geome | etric Mean of | Hydraulic C | onductivity | 6.2E-07 | 0.3 | 3.1E-07 | 0.2 | | |
| 7.0 | 0.0 | 64089.8 | | | | | | | | | |
| 7.0 | 1.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 7.0 | 2.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 7.0 | 3.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 7.0 | 4.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 7.0 | 5.0 | 64089.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | | |
| 7.0 | 3.0 | | etric Mean of | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | | |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder 16134 | Creek | | E | 06(P) 2-3 |
|--|------------------------|-------------------------|-----------------------|-------------------------------|--------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | JNH SMG JEL ABP | Date: Date: Date: | 3/31/2020 4/1/2020 | | |
| Test Data (All depths/heights measur | ed from ground | surface) | | Packer Configuration | |
| Sampler Type | C | , | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground Wa | ater (ft) | | 10.1 | Туре | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 25.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 35.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 10.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.5 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|-----------------|----------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 6.0 | 0.0 | 64090.9 | | | | | | | |
| 6.0 | 1.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 8.0 | 0.0 | 64090.9 | | | | | | | |
| 8.0 | 1.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | etric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| 10.0 | 0.0 | 64090.9 | | | | | | | |
| 10.0 | | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 1.0 2.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | 64090.9 | | | | * | * | * | * |
| 10.0 | 3.0 | 0.07.0.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 4.0 | 64090.9 | 0.0 | 0.0 | 0.0 | | | * | |
| 10.0 | 5.0 | 64090.9 | 0.0 | 0.0 | 0.0 | * | * | • | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

B-207(P)

24.0

2.38

Steel

0.00033

60

South Boulder Creek Boring Project No. 16134 Test P-1 5/19/2020 Field Engineer/Geologist: MSK Date: 6/23/2020 Calculated By: APH Date: 6/25/2020 Checked By: Date: SMG Approved By: ABP 7/22/2020 Date: **Packer Configuration** (All depths/heights measured from ground surface) Sampler Type NQ_3 Boring Diameter (in) 3.0 Number of Packers Single Depth to top of Ground Water (ft) 6.0 Pneumatic Type Plunge Angle from Horizontal (Deg) 90.0 Packer Pressure (psi) 180

Packer Length (in)

Water Pipe I.D. (in)

Pipe Roughness (e), ft

Approximate Water Temperature

Pipe Materials

17.0

22.0

5.0

3.2

3.2

| | Elapsed | | Change in | | | Hydraulic Conductivity | | | | |
|------------------------|---------|--------------------|---------------|-------------|-------------|------------------------|---------|----------|----------|--|
| Applied Water Pressure | Time | Volume | Volume | | Rate | | | (K) | | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons | |
| 4.0 | 0.0 | (2411.5 | | | | | | | <u> </u> | |
| 4.0 | 1.0 | 63411.5 63411.6 | 0.1 | 0.1 | 0.0 | 8.5E-05 | 45 | 4.3E-05 | 4 | |
| 4.0 | 2.0 | 63411.7 | 0.1 | 0.1 | 0.0 | 8.5E-05 | 45 | 4.3E-05 | 4 | |
| 4.0 | 3.0 | 63411.8 | 0.1 | 0.1 | 0.0 | 8.5E-05 | 45 | 4.3E-05 | 4 | |
| 4.0 | 4.0 | 63411.9 | 0.1 | 0.1 | 0.0 | 8.5E-05 | 45 | 4.3E-05 | 4 | |
| 4.0 | 5.0 | 63412.0 | 0.1 | 0.1 | 0.0 | 8.5E-05 | 45 | 4.3E-05 | 4 | |
| 4.0 | 6.0 | 63412.1 | 0.1 | 0.1 | 0.0 | 8.5E-05 | 45 | 4.3E-05 | 4 | |
| | | Geom | etric Mean of | Hydraulic C | onductivity | 8.5E-05 | 45 | 4.3E-05 | 4 | |
| | | | | | | | | | | |
| 5.0 | 0.0 | 63412.1 | | | | | | | | |
| 5.0 | 1.0 | 63412.2 | 0.1 | 0.1 | 0.0 | 7.6E-05 | 40 | 3.9E-05 | 4 | |
| 5.0 | 2.0 | 63412.3 | 0.1 | 0.1 | 0.0 | 7.6E-05 | 40 | 3.9E-05 | 4 | |
| 5.0 | 3.0 | 63412.4 | 0.1 | 0.1 | 0.0 | 7.6E-05 | 40 | 3.9E-05 | 4 | |
| 5.0 | 4.0 | 63412.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 5.0 | 63412.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geom | etric Mean of | Hydraulic C | onductivity | 7.0E-06 | 4 | 3.6E-06 | 1 | |
| 6.0 | 0.0 | 63412.4 | | | | | | | | |
| 6.0 | 1.0 | 63412.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 2.0 | 63412.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 3.0 | 63412.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 4.0 | 63412.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 5.0 | 63412.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geom | etric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

Project Name

Depth to Top of Test Zone (ft)

Test Interval Length (ft)

Depth to Bottom of Test Zone (ft)

Height of Water Pipe Stickup (ft)

Height of Pressure Gauge Stickup (ft)

^{2.-*} Indicates conductivity less than 1x10⁻⁷ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to 1x10⁻⁷ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^{-7}$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Cree 16134 | K | | 207(P) P-2 |
|--|--------------------------|---|-------------------------------|---------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH SMG | Date: 5/19/2020 Date: 6/23/2020 Date: 6/25/2020 Date: 7/22/2020 | - - - - | |
| Test Data (All depths/heights measur | red from ground surfa | ce) | Packer Configuration | |
| Sampler Type | | NQ_3 | | |
| Boring Diameter (in) | | 3.0 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | 6.0 | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | 22.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | Zone (ft) | 27.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Sticl | kup (ft) | 3.2 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | 3.2 | Approximate Water Temperature | 60 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 5.0 | 0.0 | 63414.1 | | | | | | | |
| 5.0 | 1.0 | 63414.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 63414.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 63414.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 63414.2 | 0.1 | 0.1 | 0.0 | 7.6E-05 | 40 | 3.9E-05 | 4 |
| 5.0 | 5.0 | 63414.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 6.5E-07 | 0.3 | 3.3E-07 | 0.2 |
| | | | | | | | | | |
| 6.0 | 0.0 | 63414.2 | | | | | | | |
| 6.0 | 1.0 | 63414.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 63414.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 63414.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 63414.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63414.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | etric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| 0.0 | 0.0 | 62414.2 | | | | | | | |
| 8.0 | 0.0 | 63414.3 | 0.0 | 0.0 | 0.0 | 44 | * | | |
| 8.0 | 1.0 | 63414.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 63414.3 | 0.0 | 0.0 | 0.0 | | | | · |
| 8.0 | 3.0 | 63414.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 63414.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 63414.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulde 16134 | er Creek | | <u></u> | 07(P) 2-3 |
|--|-----------------------|-------------------------|------------------------|-------------------------------|--------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | MSK APH SMG ABP | Date: Date: Date: | 6/23/2020 6/25/2020 | | |
| Test Data (All depths/heights measur | ed from groun | d surface) | | Packer Configuration | |
| Sampler Type | C | , | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground Wa | ater (ft) | | 6.0 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 27.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Zo | one (ft) | | 34.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 7.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 3.2 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge S | Stickup (ft) | | 3.2 | Approximate Water Temperature | 60 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 6.0 | 0.0 | 63414.5 | | | | | | | |
| 6.0 | 1.0 | 63414.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 63414.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 63414.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 63414.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63414.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 8.0 | 0.0 | 63414.6 | | | | | | | |
| 8.0 | 1.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 10.0 | 0.0 | 63414.6 | | | | | | | |
| 10.0 | 1.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 2.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 3.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 4.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 5.0 | 63414.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder O | Creek | | | 208(P) P-1 |
|--|-------------------|-------------------------|---|-------------------------------|---------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: | 1/30/2020 1/31/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground s | urface) | | Packer Configuration | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 17.5 | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 23.5 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 27.5 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 4.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.6 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.4 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 5.0 | 0.0 | 64111.2 | | | | | | | |
| 5.0 | 1.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 7.0 | 0.0 | 64111.2 | | | | | | | |
| 7.0 | 1.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 9.0 | 0.0 | 64111.2 | | | | | | | |
| 9.0 | 1.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 64111.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder O | Creek | | £ | 08(P) P-2 |
|--|-------------------|-------------------------|---|-------------------------------|--------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: | 1/31/2020 1/31/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground s | urface) | | Packer Configuration | |
| Sampler Type | | , | NQ ₃ | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 17.5 | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 27.5 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | Cone (ft) | | 34.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 6.5 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.8 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.4 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 6.0 | 0.0 | 64112.3 | | | | | | | |
| 6.0 | 1.0 | 64112.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64112.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64112.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64112.4 | 0.1 | 0.1 | 0.0 | 4.0E-05 | 21 | 2.0E-05 | 2 |
| 6.0 | 5.0 | 64112.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 5.7E-07 | 0.3 | 2.9E-07 | 0.2 |
| | | | | | | | | | |
| 8.0 | 0.0 | 64112.4 | | | | | | | |
| 8.0 | 1.0 | 64112.5 | 0.1 | 0.1 | 0.0 | 3.5E-05 | 18 | 1.8E-05 | 2 |
| 8.0 | 2.0 | 64112.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 64112.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 64112.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 64112.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 5.5E-07 | 0.3 | 2.8E-07 | 0.2 |
| | | | | | | | | | |
| 10.0 | 0.0 | 64112.5 | | | | | | | |
| 10.0 | 1.0 | 64112.6 | 0.1 | 0.1 | 0.0 | 3.1E-05 | 16 | 1.6E-05 | 1 |
| 10.0 | 2.0 | 64112.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 3.0 | 64112.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 4.0 | 64112.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 5.0 | 64112.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| · | | Geome | tric Mean of l | Hydraulic C | onductivity | 5.4E-07 | 0.3 | 2.7E-07 | 0.2 |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder 16134 | Creek | | E | 208(P) P-3 |
|--|------------------------|-------------------------|---|-------------------------------|---------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: | 1/31/2020 1/31/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measure | red from ground | surface) | | Packer Configuration | |
| Sampler Type | _ | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 17.5 | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 34.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 40.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 6.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.4 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.4 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | I71 | Rate | | - | Conductivity | 7 | |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|--------------|-----------|--|
| * * | | | | | | (K) | | | | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | |
| 0.0 | 0.0 | 64114.0 | | | | | | | | |
| 8.0 | 0.0 | 64114.0 | | | | | | | | |
| 8.0 | 1.0 | 64114.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 8.0 | 2.0 | 64114.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 8.0 | 3.0 | 64114.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 8.0 | 4.0 | 64114.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 8.0 | 5.0 | 64114.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 11.0 | 0.0 | 64114.0 | | | | | | | | |
| 11.0 | 1.0 | 64114.2 | 0.2 | 0.2 | 0.0 | 6.2E-05 | 33 | 3.2E-05 | 3 | |
| 11.0 | 2.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 11.0 | 3.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 11.0 | 4.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 11.0 | 5.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 6.2E-07 | 0.3 | 3.2E-07 | 0.2 | |
| | | | | | | | | | | |
| 14.0 | 0.0 | 64114.2 | | | | | | | | |
| 14.0 | 1.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 14.0 | 2.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 14.0 | 3.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 14.0 | 4.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 14.0 | 5.0 | 64114.2 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder C 16134 | reek | | £ | P-1 |
|--|--------------------------|----------------------------------|---|-------------------------------|-----------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | SMG APH SMG ABP | Date: Date: Date: Date: | 1/22/2020 1/22/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measure | red from ground su | ırface) | | Packer Configuration | |
| Sampler Type | | 1 | NQ ₃ | | |
| Boring Diameter (in) | | - | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | • | 6.0 | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | • | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 11.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | Cone (ft) | | 15.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 4.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 4.4 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | Hydraulic Conductivity (K) | | | |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------------------------|---------|----------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 4.0 | 0.0 | 63457.7 | | | | | | | |
| 4.0 | 1.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 5.0 | 0.0 | 63457.7 | | | | | | | |
| 5.0 | 1.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 63457.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 63457.7 | | | | | | | |
| 6.0 | 1.0 | 63457.8 | 0.1 | 0.1 | 0.0 | 8.6E-05 | 45 | 4.4E-05 | 5 |
| 6.0 | 2.0 | 63457.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 63457.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 63457.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63457.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | etric Mean of | Hydraulic C | onductivity | 6.7E-07 | 0.3 | 3.4E-07 | 0.2 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Cre | eek | | | 209(P) P-2 |
|--|---------------------|----------------|------------------------------------|-------------------------------|---------------|
| Field Engineer/Geologist: Calculated By: Checked By: | SMG APH SMG | Date: Date: | 1/22/2020 1/22/2020 3/4/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground sur | face) | | Packer Configuration | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 3.0 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 6.0 | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 15.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | Cone (ft) | | 20.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.0 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | Hydraulic Conductivity (K) | | | | |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------------------------|---------|----------|----------|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons | |
| 4.0 | 0.0 | 63459.3 | | | | | | | | |
| 4.0 | 1.0 | 63459.3 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 4.0 | 2.0 | 63459.3 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 4.0 | 3.0 | 63459.3 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 4.0 | 4.0 | 63459.3 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 4.0 | 5.0 | 63459.3 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| 5.0 | 0.0 | 63459.6 | | | | | | | | |
| 5.0 | 1.0 | 63459.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 2.0 | 63459.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 3.0 | 63459.7 | 0.1 | 0.1 | 0.0 | 8.3E-05 | 43 | 4.2E-05 | 4 | |
| 5.0 | 4.0 | 63459.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 5.0 | 63459.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | etric Mean of | Hydraulic C | onductivity | 6.6E-07 | 0.3 | 3.3E-07 | 0.2 | |
| 6.0 | 0.0 | 63459.7 | | | | | | | | |
| 6.0 | 1.0 | 63459.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 2.0 | 63459.7 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 3.0 | 63459.8 | 0.0 | 0.0 | 0.0 | 7.4E-05 | 39 | 3.7E-05 | 4 | |
| 6.0 | 4.0 | 63459.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 5.0 | 63459.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 0.0 | 2.0 | | etric Mean of | | | 6.4E-07 | 0.3 | 3.3E-07 | 0.2 | |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder O | Creek | | | 209(P) P-3 |
|--|-------------------|----------------------------------|---|-------------------------------|---------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: Date: | 1/22/2020 1/22/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground s | urface) | | Packer Configuration | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 6.0 | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 20.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 30.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 10.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 3.1 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | - | Conductivity (K) | 7 |
|------------------------|-----------------|---------|------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 5.0 | 0.0 | 63451.2 | | | | | | | |
| 5.0 | 1.0 | 63451.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 63451.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 63451.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 63451.3 | 0.1 | 0.1 | 0.0 | 4.9E-05 | 26 | 2.5E-05 | 2 |
| 5.0 | 5.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 5.9E-07 | 0.3 | 3.0E-07 | 0.2 |
| | | | | | | | | | |
| 6.0 | 0.0 | 63451.3 | | | | | | | |
| 6.0 | 1.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 8.0 | 0.0 | 63451.3 | | | | | | | |
| 8.0 | 1.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 63451.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder O | Creek | | | P-1 |
|--|-------------------|-------------------------|---|-------------------------------|-----------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: | 1/21/2020 1/21/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measure | red from ground s | surface) | | Packer Configuration | |
| Sampler Type | | | NQ ₃ | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 7.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 15.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 8.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 3.3 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 1.0 | 0.0 | 62442.6 | | | | | | | |
| 4.0 | 0.0 | 63443.6 | | | | | | | <u> </u> |
| 4.0 | 1.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| 5.0 | 0.0 | 63443.6 | | | | | | | |
| 5.0 | 1.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 63443.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| 6.0 | 0.0 | (2442.7 | | | | | | | <u> </u> |
| | 0.0 | 63443.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 1.0 | 63443.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 63443.7 | 0.0 | 0.0 | 0.0 | · · | | · · | |
| 6.0 | 3.0 | 63443.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 63443.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63443.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | etric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder C | reek | | <u> </u> | P-2 |
|--|-----------------|----------------------------------|---|-------------------------------|-----------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: Date: | 1/21/2020 1/21/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | | | 7,22,2020 | Packer Configuration | |
| Sampler Type | | | NQ ₃ | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 15.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 20.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.2 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| | Elapsed | | Change in | | | | Hydraulic | Conductivity | 7 |
|-------------------------------|--|---------|----------------|-------------|-------------|----------|-----------|--------------|-----------|
| Applied Water Pressure | Time | Volume | Volume | Flow | Rate | | - | (K) | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 4.0 | 0.0 | 63445.0 | | | | | | | |
| 4.0 | 1.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | Geometric Mean of Hydraulic Conductivity | | | | | | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 5.0 | 0.0 | 63445.0 | | | | | | | |
| 5.0 | 1.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 63445.0 | | | | | | | |
| 6.0 | 1.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63445.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Co | reek | | | P-3 |
|--|------------------|----------------------------------|---|-------------------------------|-----------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: Date: | 1/21/2020 1/21/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measure | | | 772272020 | Packer Configuration | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 20.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 25.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.2 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| | Elapsed | | Change in | | | | Hydraulic | Conductivity | 7 |
|-------------------------------|---------|---------|----------------|-------------|-------------|----------|-----------|--------------|-----------|
| Applied Water Pressure | Time | Volume | Volume | Flow | Rate | | - | (K) | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 4.0 | 0.0 | 63446.0 | | | | | | | |
| 4.0 | 1.0 | 63446.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 63446.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 63446.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 63446.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 63446.2 | 0.2 | 0.2 | 0.0 | 9.5E-05 | 50 | 4.8E-05 | 5 |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 6.8E-07 | 0.4 | 3.4E-07 | 0.2 |
| | | | | | | | | | |
| 6.0 | 0.0 | 63446.2 | | | | | | | |
| 6.0 | 1.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 8.0 | 0.0 | 63446.3 | | | | | | | |
| 8.0 | 1.0 | 63446.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 63446.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 63446.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 63446.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 63446.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Co | reek | | | 211(P) P-1 |
|--|--------------------|----------------------------------|---|-------------------------------|---------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: Date: | 1/27/2020 1/27/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground su | ırface) | | Packer Configuration | |
| Sampler Type Boring Diameter (in) | | | NQ ₃ 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 17.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 20.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 3.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.1 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| | Elapsed | | Change in | | | | Hydraulic | Conductivity | , |
|-------------------------------|--|---------|----------------|-------------|-------------|----------|-----------|--------------|-----------|
| Applied Water Pressure | Time | Volume | Volume | Flow | Rate | | - | (K) | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 4.0 | 0.0 | 64104.0 | | | | | | | |
| 4.0 | 1.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | Geometric Mean of Hydraulic Conductivity | | | | | | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 5.0 | 0.0 | 64104.0 | | | | | | | |
| 5.0 | 1.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 64104.0 | | | | | | | |
| 6.0 | 1.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64104.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Cre | ek | | | P-2 |
|--|-------------------------|----------------|------------------------------------|-------------------------------|-----------|
| Field Engineer/Geologist: Calculated By: Checked By: | APH APH SMG | Date: Date: | 1/27/2020 1/27/2020 3/4/2020 | | |
| Approved By: Test Data (All depths/heights measurement) | ABP red from ground sur | Date: | 7/22/2020 | Packer Configuration | |
| Sampler Type | Č | ĺ | NQ ₃ | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 20.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 25.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.1 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| | Elapsed | | Change in | | | | Hydraulic | Conductivity | 7 |
|--|---------|---------|----------------|-------------|-------------|----------|-----------|--------------|-----------|
| Applied Water Pressure | Time | Volume | Volume | Flow | Rate | | - | (K) | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 5.0 | 0.0 | 64104.9 | | | | | | | |
| 5.0 | 1.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| Geometric Mean of Hydraulic Conductivity | | | | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 64104.9 | | | | | | | |
| 6.0 | 1.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64104.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 8.0 | 0.0 | 64104.9 | | | | | | | |
| 8.0 | 1.0 | 64105.0 | 0.1 | 0.1 | 0.0 | 3.7E-05 | 19 | 1.9E-05 | 2 |
| 8.0 | 2.0 | 64105.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 64105.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 64105.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 64105.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 5.6E-07 | 0.3 | 2.9E-07 | 0.2 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder O | Creek | | | 211(P) P-3 |
|--|-------------------|----------------------------------|---|-------------------------------|---------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: Date: | 1/27/2020 1/27/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground s | urface) | | Packer Configuration | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 25.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 30.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.1 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 6.0 | 0.0 | 64105.9 | | | | | | | |
| 6.0 | 1.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 8.0 | 0.0 | 64105.9 | | | | | | | |
| 8.0 | 1.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 10.0 | 0.0 | 64105.9 | | | | | | | |
| 10.0 | 1.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 2.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 3.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 4.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 10.0 | 5.0 | 64105.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Co | reek | | | 212(P) P-1 |
|--|--------------------|----------------|------------------------------------|-------------------------------|---------------|
| Field Engineer/Geologist: Calculated By: Checked By: | JEL SMG JEL | Date: Date: | 2/20/2020 3/3/2020 3/30/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground su | ırface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 14.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 17.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 3.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.2 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|----------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 4.0 | 0.0 | 640705.8 | | | | | | | |
| 4.0 | 1.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 5.0 | 0.0 | 640705.8 | | | | | | | |
| 5.0 | 1.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 640705.8 | | | | | | | |
| 6.0 | 1.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 640705.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulder | Creek | | Boring | B-212(P) |
|----------------------------|-----------------|----------|-----------|------------------------|-----------|
| Project No. | 16134 | | | Test | P-2 |
| | | | | | |
| Field Engineer/Geologist: | JEL | Date: | 2/20/2020 | | |
| Calculated By: | SMG | Date: | 3/3/2020 | | |
| Checked By: | JEL | Date: | 3/30/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 17.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 22.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.6 | Pipe Roughness (e), ft | 0.00033 |

1.5

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|-----------------|----------|---------------------|-------------|-------------|----------|---------|---------------------|----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons |
| 5.0 | 0.0 | 640706.3 | | | | | | | |
| | | | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 1.0 | 640706.3 | 0.0 | 0.0 | 0.0 | | | | |
| 5.0 | 2.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| 7.0 | 0.0 | 6407063 | | | | | | | |
| 7.0 | 0.0 | 640706.3 | | | | | | | . |
| 7.0 | 1.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 9.0 | 0.0 | 640706.3 | | | | | | | |
| 9.0 | 1.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 640706.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

Approximate Water Temperature

40

Height of Pressure Gauge Stickup (ft)

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulder | Creek | | Boring B-2 | 12(P) |
|----------------------------|-----------------|----------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test | 2-3 |
| | | | | | |
| Field Engineer/Geologist: | JEL | Date: | 2/21/2020 | | |
| Calculated By: | SMG | Date: | 3/3/2020 | | |
| Checked By: | JEL | Date: | 3/30/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | NE | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 22.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 30.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 8.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 1.3 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 5.0 | 0.0 | 64077.6 | | | | | | | |
| 5.0 | 1.0 | 64077.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64077.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64077.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64077.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64077.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | | tric Mean of | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 7.0 | 0.0 | 64077.7 | | | | | | | |
| 7.0 | 1.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 9.0 | 0.0 | 64077.7 | | | | | | | |
| 9.0 | 1.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 64077.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Cr 16134 | eek | | 8 | -213 P-1 |
|--|---------------------------|-------------------------|---|-------------------------------|-------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH APH SMG ABP | Date: Date: Date: | 2/13/2020 2/14/2020 3/4/2020 7/22/2020 | | |
| Test Data (All depths/heights measure | red from ground su | rface) | | Packer Configuration | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 5.5 | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 20.5 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 22.5 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 2.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.8 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | - | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| (1) | | (8) | (8) | (8) | , | , | () / | (6112 566) | (Eugerns) |
| 5.0 | 0.0 | 64136.7 | | | | | | | |
| 5.0 | 1.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | etric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 64136.7 | | | | | | | |
| 6.0 | 1.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 8.0 | 0.0 | 64136.7 | | | | | | | |
| 8.0 | 1.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 64136.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| · | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulder | r Creek | | Boring E | 3-213 |
|----------------------------|-----------------|------------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test | P-2 |
| | | | | | |
| Field Engineer/Geologist: | APH | Date: | 2/14/2020 | | |
| Calculated By: | APH | Date: | 2/14/2020 | | |
| Checked By: | SMG | Date: | 3/4/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | l surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 5.5 | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 22.5 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | Cone (ft) | | 28.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.5 | Pipe Materials | Steel |
| Height of Water Pipe Sticl | cup (ft) | | 1.7 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | • | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 5.0 | 0.0 | 64142.4 | | | | | | | |
| 5.0 | 1.0 | 64142.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 64142.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 64142.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 64142.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 64142.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 7.0 | 0.0 | 64142.2 | | | | | | | |
| 7.0 | 1.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 9.0 | 0.0 | 64142.2 | | | | | | | |
| 9.0 | 1.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 64142.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulde | r Creek | | Boring I | 3-213 |
|----------------------------|-----------------|------------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test | P-3 |
| | | | | | |
| Field Engineer/Geologist: | APH | Date: | 2/14/2020 | | |
| Calculated By: | APH | Date: | 2/14/2020 | | |
| Checked By: | SMG | Date: | 3/4/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | - | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | d surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | • | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 5.5 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 28.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 37.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | • | 9.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | • | 1.9 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | • | 1.5 | Approximate Water Temperature | 40 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | - | Conductivity (K) | 7 | |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|--|
| * * | | | | | | | | | | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | |
| | | | | | | | | | | |
| 6.0 | 0.0 | 64146.6 | | | | | | | | |
| 6.0 | 1.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 2.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 3.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 4.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 6.0 | 5.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 8.0 | 0.0 | 64146.6 | | | | | | | | |
| 8.0 | 1.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 8.0 | 2.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 8.0 | 3.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 8.0 | 4.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 8.0 | 5.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 10.0 | 0.0 | 64146.6 | | | | | | | | |
| 10.0 | 1.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 10.0 | 2.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 10.0 | 3.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 10.0 | 4.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 10.0 | 5.0 | 64146.6 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulder | Creek | | Boring B | -214 |
|----------------------------|-----------------|----------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test | P-1 |
| Field Engineer/Geologist: | MSK | Date: | 6/2/2020 | | |
| Calculated By: | APH | Date: | 6/23/2020 | | |
| Checked By: | SMG | Date: | 6/25/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 3.0 | Туре | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 12.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 17.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.0 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 2.0 | Approximate Water Temperature | 60 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | - | Conductivity (K) | 7 |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons |
| 2.0 | 0.0 | 63446.2 | | | | | | | |
| 2.0 | 1.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 2.0 | 2.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 2.0 | 3.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 2.0 | 4.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 2.0 | 5.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 2.0 | 0.0 | | tric Mean of | 1 | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 3.0 | 0.0 | 63446.2 | | | | | | | |
| 3.0 | 1.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 3.0 | 2.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 3.0 | 3.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 3.0 | 4.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 3.0 | 5.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 4.0 | 0.0 | 63446.2 | | | | | | | |
| 4.0 | 1.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 63446.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hvdraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder | Creek | | | -214 P-2 |
|--|-----------------|-------------------------|---|-------------------------------|-------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | MSK APH SMG ABP | Date: Date: Date: | 6/2/2020 6/23/2020 6/25/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground | l surface) | | Packer Configuration | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 3.0 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 17.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 23.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 6.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.0 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 2.0 | Approximate Water Temperature | 60 |

| | Elapsed | | Change in | | | | Hydraulic | Conductivity | 7 |
|-------------------------------|---------|---------|----------------|-------------|-------------|----------|-----------|--------------|-----------|
| Applied Water Pressure | Time | Volume | Volume | Flow | Rate | | - | (K) | |
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 4.0 | 0.0 | 63446.9 | | | | | | | |
| 4.0 | 1.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 5.0 | 0.0 | 63446.9 | | | | | | | |
| 5.0 | 1.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 63446.9 | | | | | | | |
| 6.0 | 1.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 2.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 4.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63446.9 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q*\ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulde | r Creek | | Boring I | 3-214 |
|----------------------------|-----------------|------------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test | P-3 |
| | | | | | |
| Field Engineer/Geologist: | MSK | Date: | 6/2/2020 | | |
| Calculated By: | APH | Date: | 6/23/2020 | | |
| Checked By: | SMG | Date: | 6/25/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | - | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | d surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | • | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 3.0 | Туре | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 23.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 30.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 7.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | • | 3.0 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | • | 3.0 | Approximate Water Temperature | 60 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | Hydraulic Conductivity (K) | | | | |
|------------------------|-----------------|---------|---------------------|-------------|-------------|-------------------------------|---------|----------|-----------|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | |
| 5.0 | 0.0 | 63447.9 | | | | | | | | |
| 5.0 | 1.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 2.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 3.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 4.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 5.0 | 5.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | I | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| 7.0 | 0.0 | 63447.9 | | | | | | | | |
| 7.0 | 1.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 2.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 3.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 4.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 5.0 | 63447.9 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | ı | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| 9.0 | 0.0 | 63448.0 | | | | | | | | |
| 9.0 | 1.0 | 63448.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 2.0 | 63448.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 3.0 | 63448.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 4.0 | 63448.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 5.0 | 63448.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder Cree 16134 | ek | | Boring Test | B-214 P-4 |
|--|-----------------------------|---------------------|---|-------------------------------|--------------|
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | APH SMG | Date: 6/2 Date: 6/2 | 3/2020 23/2020 25/2020 22/2020 | | |
| Test Data (All depths/heights measur | red from ground surf | ace) | | Packer Configuration | |
| Sampler Type | C | <i></i> | NQ ₃ | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 3.0 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 30.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 45.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 15.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.0 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 2.0 | Approximate Water Temperature | 60 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | ity | |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | |
| | | | | | | | | | | |
| 7.0 | 0.0 | 63450.4 | | | | | | | | |
| 7.0 | 1.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 2.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 3.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 4.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 7.0 | 5.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| | | | | | | | | | | |
| 9.0 | 0.0 | 63450.4 | | | | | | | | |
| 9.0 | 1.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 2.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 3.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 4.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 9.0 | 5.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | etric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| 12.0 | 0.0 | 63450.4 | | | | | | | 1 | |
| 12.0 | 1.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 12.0 | 2.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | - | | | | | * | * | * | * | |
| 12.0 | 3.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 12.0 | 4.0 | 63450.4 | 0.0 | 0.0 | 0.0 | * | | * | * | |
| 12.0 | 5.0 | 63450.4 | 0.0 | 0.0 | 0.0 | • | * | | | |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulde | er Creek | | Boring B- | -214 |
|----------------------------|----------------|------------|-----------|-------------------------------|-----------|
| Project No. | 16134 | | | Test | P-5 |
| | | | | | |
| Field Engineer/Geologist: | MSK | Date: | 6/3/2020 | | |
| Calculated By: | APH | Date: | 6/23/2020 | | |
| Checked By: | SMG | Date: | 6/25/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | • | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from groun | d surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground Wa | ater (ft) | | 3.0 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 45.0 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 60.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 15.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.0 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 2.0 | Approximate Water Temperature | 60 |

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | Hydraulic Conductivity (K) | | | |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|----------------------------|----------|-----------|--|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) | |
| 11.0 | 0.0 | 63451.8 | | | | | | | | |
| | | | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 11.0 | 1.0 | 63451.8 | 0.0 | 0.0 | 0.0 | * | * | | * | |
| 11.0 | 2.0 | 63451.8 | 0.0 | 0.0 | 0.0 | | | * | | |
| 11.0 | 3.0 | 63451.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 11.0 | 4.0 | 63451.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 11.0 | 5.0 | 63451.8 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |
| 15.0 | 0.0 | 63451.9 | | | | | | | 1 | |
| 15.0 | 1.0 | 63452.0 | 0.1 | 0.1 | 0.0 | 1.7E-05 | 9 | 8.7E-06 | 1 | |
| 15.0 | 2.0 | 63452.0 | 0.0 | 0.1 | 0.0 | * | * | * | * | |
| 15.0 | 3.0 | 63452.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 15.0 | 4.0 | 63452.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 15.0 | 5.0 | 63452.0 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | | tric Mean of | | | 4.8E-07 | 0.3 | 2.4E-07 | 0.1 | |
| | | | | | | | | | | |
| 19.0 | 0.0 | 63452.1 | | | | | | | | |
| 19.0 | 1.0 | 63452.1 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 19.0 | 2.0 | 63452.1 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 19.0 | 3.0 | 63452.1 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 19.0 | 4.0 | 63452.1 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| 19.0 | 5.0 | 63452.1 | 0.0 | 0.0 | 0.0 | * | * | * | * | |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 | |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulder | r Creek | | Boring E | 3-215 |
|----------------------------|-----------------|------------|-----------|------------------------|-----------|
| Project No. | 16134 | | | Test | P-1 |
| | | | | | |
| Field Engineer/Geologist: | MSK | Date: | 5/26/2020 | | |
| Calculated By: | APH | Date: | 6/23/2020 | | |
| Checked By: | SMG | Date: | 6/25/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | • | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground | l surface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 6.0 | Туре | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 17.3 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 22.3 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 5.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 3.0 | Pipe Roughness (e), ft | 0.00033 |
| | | | , | | |

3.0

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | Į. |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 3.0 | 0.0 | 63416.3 | | | | | | | |
| 3.0 | 1.0 | 63416.4 | 0.1 | 0.1 | 0.0 | 9.9E-05 | 52 | 5.0E-05 | 5 |
| 3.0 | 2.0 | 63416.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 3.0 | 3.0 | 63416.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 3.0 | 4.0 | 63416.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 3.0 | 5.0 | 63416.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 6.8E-07 | 0.4 | 3.5E-07 | 0.2 |
| | | | | | | | | | |
| 4.0 | 0.0 | 63416.5 | | | | | | | |
| 4.0 | 1.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 2.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 3.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 4.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 4.0 | 5.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 5.0 | 0.0 | 63416.5 | | | | | | | |
| 5.0 | 1.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 2.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 3.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 4.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 5.0 | 5.0 | 63416.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

Approximate Water Temperature

60

Height of Pressure Gauge Stickup (ft)

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulde | r Creek | | · | P-2 |
|--|-----------------|-------------------------|--|-----------------------|-----------|
| Project No. | 16134 | | | Test | P-2 |
| Field Engineer/Geologist: Calculated By: Checked By: Approved By: | MSK APH SMG ABP | Date: Date: Date: | 5/27/2020 6/23/2020 6/25/2020 7/22/2020 | | |
| Test Data (All depths/heights measur | red from ground | d surface) | | Packer Configuration | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 6.0 | Туре | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 22.3 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 30.3 | Water Pipe I.D. (in) | 2.38 |

Pipe Materials

Pipe Roughness (e), ft

Approximate Water Temperature

Steel

0.00033

60

8.0

3.0

3.0

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | I |
|------------------------|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| 5.0 | 0.0 | 63417.4 | | | | | | | |
| 5.0 | 1.0 | 63417.5 | 0.1 | 0.1 | 0.0 | 5.4E-05 | 28 | 2.7E-05 | 2 |
| 5.0 | 2.0 | 63417.6 | 0.1 | 0.1 | 0.0 | 5.4E-05 | 28 | 2.7E-05 | 2 |
| 5.0 | 3.0 | 63417.7 | 0.1 | 0.1 | 0.0 | 5.4E-05 | 28 | 2.7E-05 | 2 |
| 5.0 | 4.0 | 63417.8 | 0.1 | 0.1 | 0.0 | 5.4E-05 | 28 | 2.7E-05 | 2 |
| 5.0 | 5.0 | 63417.8 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 1.8E-05 | 9 | 8.9E-06 | 1 |
| | | | | | | | | | |
| 6.0 | 0.0 | 63417.9 | | | | | | | |
| 6.0 | 1.0 | 63418.0 | 0.1 | 0.1 | 0.0 | 4.8E-05 | 25 | 2.5E-05 | 2 |
| 6.0 | 2.0 | 63418.0 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 3.0 | 63418.1 | 0.1 | 0.1 | 0.0 | 4.8E-05 | 25 | 2.5E-05 | 2 |
| 6.0 | 4.0 | 63418.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 6.0 | 5.0 | 63418.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 1.8E-06 | 0.9 | 9.0E-07 | 0.3 |
| | | | | | | | | | |
| 8.0 | 0.0 | 63418.2 | | | | | | | |
| 8.0 | 1.0 | 63418.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 2.0 | 63418.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 3.0 | 63418.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 4.0 | 63418.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 8.0 | 5.0 | 63418.2 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

Test Interval Length (ft)

Height of Water Pipe Stickup (ft)

Height of Pressure Gauge Stickup (ft)

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name Project No. | South Boulder O | South Boulder Creek 16134 | | 8 | P-3 |
|-----------------------------|-------------------|------------------------------|-----------|-------------------------------|-----------|
| Field Engineer/Geologist: | MSK | Date: | 5/27/2020 | | |
| 8 | | | | | |
| Calculated By: | APH | Date: | 6/23/2020 | | |
| Checked By: | SMG | Date: | 6/25/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | • | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measur | red from ground s | urface) | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 6.0 | Type | Pneumatic |
| Plunge Angle from Horizo | ntal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | (ft) | | 30.3 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | one (ft) | | 38.3 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 8.0 | Pipe Materials | Steel |
| Height of Water Pipe Stick | cup (ft) | | 2.0 | Pipe Roughness (e), ft | 0.00033 |
| Height of Pressure Gauge | Stickup (ft) | | 2.0 | Approximate Water Temperature | 60 |

| Applied Water Pressure | Elapsed Time Volume | | Change in Volume | Flow Rate | | Hydraulic Conductivity (K) | | | |
|------------------------|------------------------|---------|---------------------|-------------|-------------|----------------------------|---------|----------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 7.0 | 0.0 | 63419.3 | | | | | | | |
| 7.0 | 1.0 | 63419.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 2.0 | 63419.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 3.0 | 63419.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 4.0 | 63419.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 7.0 | 5.0 | 63419.3 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | etric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 9.0 | 0.0 | 63419.4 | | | | | | | |
| 9.0 | 1.0 | 63419.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 63419.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 3.0 | 63419.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 63419.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 63419.4 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | • | Geome | etric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| 12.0 | 0.0 | (2410.5 | | | | | | | |
| | 0.0 | 63419.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 1.0 | 63419.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 2.0 | 63419.5 | 0.0 | 0.0 | 0.0 | | | | · · |
| 12.0 | 3.0 | 63419.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 4.0 | 63419.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 5.0 | 63419.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | etric Mean of l | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulde | r Creek | | Boring 1 | B-215 | |
|-----------------------------------|-----------------|------------|-----------|-------------------------------|-----------|--|
| Project No. | 16134 | | | Test | P-4 | |
| | | | | | | |
| Field Engineer/Geologist: | MSK | Date: | 5/27/2020 | | | |
| Calculated By: | APH | Date: | 6/23/2020 | | | |
| Checked By: | SMG | Date: | 6/26/2020 | | | |
| Approved By: | ABP | Date: | 7/22/2020 | | | |
| | | - | | | | |
| Test Data | | | | Packer Configuration | | |
| (All depths/heights measur | red from ground | d surface) | | | | |
| Sampler Type | | | NQ_3 | | | |
| Boring Diameter (in) | | • | 2.98 | Number of Packers | Single | |
| Depth to top of Ground W | ater (ft) | | 6.0 | Type | Pneumatic | |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 | |
| Depth to Top of Test Zone | e (ft) | | 38.3 | Packer Length (in) | 24.0 | |
| Depth to Bottom of Test Z | one (ft) | | 50.3 | Water Pipe I.D. (in) | 2.38 | |
| Test Interval Length (ft) | | • | 12.0 | Pipe Materials | Steel | |
| Height of Water Pipe Stickup (ft) | | | 3.0 | Pipe Roughness (e), ft | 0.00033 | |
| Height of Pressure Gauge | Stickup (ft) | • | 3.0 | Approximate Water Temperature | 60 | |

| Applied Water Pressure | Elapsed Time Volume | | Change in Volume | Flow Rate | | Hydraulic Conductivity (K) | | | |
|------------------------|------------------------|----------|---------------------|-------------|-------------|-------------------------------|---------|----------|----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons |
| 9.0 | 0.0 | 63421.5 | | | | | | | |
| 9.0 | 1.0 | 63421.5 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 2.0 | 63421.6 | 0.1 | 0.1 | 0.0 | 2.7E-05 | 14 | 1.4E-05 | 1 |
| 9.0 | 3.0 | 63421.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 4.0 | 63421.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 9.0 | 5.0 | 63421.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 5.3E-07 | 0.3 | 2.7E-07 | 0.2 |
| 12.0 | 0.0 | 63421.6 | | | | | | | |
| 12.0 | 1.0 | 63421.6 | 0.1 | 0.1 | 0.0 | 2.2E-05 | 12 | 1.1E-05 | 1 |
| 12.0 | 2.0 | 63421.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 3.0 | 63421.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 4.0 | 63421.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 5.0 | 63421.6 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 5.1E-07 | 0.3 | 2.6E-07 | 0.2 |
| 15.0 | 0.0 | 62.421.7 | | | | | | | |
| 15.0 | 0.0 | 63421.7 | 0.0 | 0.0 | 0.0 | * | * | | * |
| 15.0 | 1.0 | 63421.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 15.0 | 2.0 | 63421.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 15.0 | 3.0 | 63421.7 | 0.0 | 0.0 | 0.0 | | | | |
| 15.0 | 4.0 | 63421.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 15.0 | 5.0 | 63421.7 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

^{1.-} Hydraulic Conductivity, K = q*ln(2*L/D)/(2*Pi*L*Hc), as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

| Project Name | South Boulder | Creek | | Boring | B-215 |
|--|---------------|-------|-----------|------------------------|-----------|
| Project No. | 16134 | | | Test | P-5 |
| | | | | | |
| Field Engineer/Geologist: | MSK | Date: | 5/28/2020 | | |
| Calculated By: | APH | Date: | 6/23/2020 | | |
| Checked By: | SMG | Date: | 6/26/2020 | | |
| Approved By: | ABP | Date: | 7/22/2020 | | |
| | | • | | | |
| Test Data | | | | Packer Configuration | |
| (All depths/heights measured from ground surface) | | | | | |
| Sampler Type | | | NQ_3 | | |
| Boring Diameter (in) | | | 2.98 | Number of Packers | Single |
| Depth to top of Ground W | ater (ft) | | 6.0 | Type | Pneumatic |
| Plunge Angle from Horizo | ontal (Deg) | | 90.0 | Packer Pressure (psi) | 180 |
| Depth to Top of Test Zone | e (ft) | | 50.3 | Packer Length (in) | 24.0 |
| Depth to Bottom of Test Z | Cone (ft) | | 65.0 | Water Pipe I.D. (in) | 2.38 |
| Test Interval Length (ft) | | | 14.7 | Pipe Materials | Steel |
| Calculated By: APH Checked By: SMG Approved By: ABP Test Data (All depths/heights measured from ground surf Sampler Type Boring Diameter (in) Depth to top of Ground Water (ft) Plunge Angle from Horizontal (Deg) Depth to Top of Test Zone (ft) Depth to Bottom of Test Zone (ft) | | | 3.0 | Pipe Roughness (e), ft | 0.00033 |

3.0

| Applied Water Pressure | Elapsed Time | Volume | Change in Volume | Flow | Rate | | | Conductivity (K) | 7 |
|--|-----------------|---------|---------------------|-------------|-------------|----------|---------|---------------------|-----------|
| (psi) | (min) | (gal) | (gal) | (gal/min) | (cf/min) | (ft/min) | (ft/yr) | (cm/sec) | (Lugeons) |
| | | | | | | | | | |
| 12.0 | 0.0 | 63420.1 | | | | | | | |
| 12.0 | 1.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 2.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 3.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 4.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 12.0 | 5.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | 1 | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| | | | | | | | | | |
| 16.0 | 0.0 | 63420.1 | | | | | | | |
| 16.0 | 1.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 16.0 | 2.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 16.0 | 3.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 16.0 | 4.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 16.0 | 5.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | Geome | tric Mean of | Hydraulic C | onductivity | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |
| 21.0 | 0.0 | 63420.1 | | | | | | | |
| 21.0 | 1.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 21.0 | 2.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 21.0 | 3.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| | | | | | | * | * | * | * |
| 21.0 | 4.0 | 63420.1 | 0.0 | 0.0 | 0.0 | * | * | * | * |
| 21.0 | 5.0 | 63420.1 | 0.0 | 0.0 | 0.0 | | | | |
| Geometric Mean of Hydraulic Conductivity | | | | | | 2.0E-07 | 0.1 | 1.0E-07 | 0.1 |

Approximate Water Temperature

60

Height of Pressure Gauge Stickup (ft)

^{1.-} Hydraulic Conductivity, $K = q \ln(2*L/D)/(2*Pi*L*Hc)$, as per Lambe & Whitman, Soil Mechanics, 1969, pp 285, case G, for isotropic conditions (m=1), and for L/D not less than 4.

^{2.-*} Indicates conductivity less than $1x10^7$ cm/sec or equivalent.

^{3.-} The geometric mean was calculated for hydraulic conductivity. If the hydraulic conductivity was less than or equivalent to $1x10^7$ cm/sec, then the hydraulic conductivity was assumed to be equal to $1x10^7$ cm/sec for purposes of calculating the geometric mean.

Laboratory Testing

- J.1 Boring and Test Pit Laboratory Test Results
- J.2 Shear Data REDUCTION

BORING AND TEST PIT LABORATORY TEST RESULTS

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| CLIENT RJH Consultants | | | JOB NO. | 2679-148 |
|---|---------------------------------|--|---|---------------------|
| PROJECT South Boulder Creel PROJECT NO. 16134 | k - Phase II | | LOCATION | |
| BORING NO. | B-204 | B-208 | B-212 | B-211 |
| DEPTH | 5.7-6.0' | 17.5-18.9' | 0-3.4' | 2.5-4.0' |
| SAMPLE NO. | CA-3 | S-9 | S-2 & S-3 | S-3 |
| DATE SAMPLED | 1/28/20 | 1/28/20 | 2/19/20 | 1/24/20 |
| DATE TESTED | 03/11/20 | 03/11/20 | 03/11/20 | 03/11/20 |
| TECHNICIAN | ASE | ASE | ASE | ASE |
| DESCRIPTION | Poorly graded sand with silt | Poorly graded sand with clay and gravel | Poorly graded sand with clay and gravel | Lean clay with sand |
| Mass of Wet Cail and Day (a) | 200.04 | 004.0- | | |
| Mass of Wet Soil and Pan (g): | 338.21 | 291.05 | 659.14 | 448.64 |
| Mass of Dry Soil and Pan (g): | 329.30 | 277.76 | 626.91 | 411.50 |
| Mass of Pan (g): | 172.33 | 172.72 | 171.24 | 171.61 |
| Moisture (%): | 5.7 | 12.7 | 7.1 | 15.5 |
| BORING NO. | B-208 | B-204 | B-213 | B-213 |
| DEPTH | 5.0-6.5' | 12.5-19' | 5.5-6.5' | 10.0-11.1' |
| SAMPLE NO. | S-4 | S-6 to S-8 | S-4 | S-6 |
| DATE SAMPLED | 1/30/20 | 1/28/20 | 2/12/20 | |
| DATE TESTED | 03/11/20 | 03/11/20 | 03/11/20 | 03/11/20 |
| TECHNICIAN | ASE | ASE | ASE | ASE |
| DESCRIPTION | | | Lean clay | Clayey sand |
| | Lean clay with sand | Poorly graded gravel with clay and sand | , | |
| Mass of Wet Soil and Pan (g): | 463.54 | 1082.11 | 325.52 | 410.85 |
| Mass of Dry Soil and Pan (g): | 438.19 | 997.12 | 259.20 | |
| Mass of Pan (g): | 172.50 | | | 388.91 |
| Moisture (%): | | 173.32 | 171.74 | 172.43 |
| ivioisture (76). | 9.5 | 10.3 | 75.8 | 10.1 |
| BORING NO. | B-201 | | | |
| DEPTH | 5.0-7.9' | | | |
| SAMPLE NO. | D-3 & CS-4 | | | |
| DATE SAMPLED | 2/17/20 | | | |
| DATE TESTED | 03/11/20 | | | |
| TECHNICIAN | ASE | | | |
| DESCRIPTION | Poorly graded sand | | | |
| | with clay and gravel | | | |
| Mass of Wet Soil and Pan (g): | 714.86 | | | |
| Mass of Dry Soil and Pan (g): | 696.08 | | | |
| Mass of Pan (g): | 123.50 | | | |
| Moisture (%): | 3.3 | | | |
| violate (70). | 3.3 | | | |
| NOTES | | | | |
| | | | | |
| | | | | |
| Data entry by: TAF Checked by: who | Date: | 3/12/2020 | | |
| | ASTM D2216_0. | | | |



| CLIENT RJH Consultants | | | JOB NO. | 2679-152 | |
|---|--|--|---|----------|---|
| PROJECT South Boulder Cree PROJECT NO. 16134 | k - Phase II Geot | echnical Investig | LOCATION | | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | B-206 12.5-14' S-7 06/22/20 CT | B-205 15-16.6' S-8 06/22/20 CT | B-206 8-10.4' S-5,S-6 06/22/20 CT | | - |
| Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g): Mass of Pan (g): Moisture (%): | 37.65 34.09 6.75 13.0 | 37.92 33.80 6.65 15.2 | 52.41 50.46 6.69 4.5 | | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | | | | |
| Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g): Mass of Pan (g): Moisture (%): | | | | | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | | | | |
| Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g): Mass of Pan (g): Moisture (%): | | | | | |
| NOTES | | | | | |
| Data entry by: TAF Checked by: <u>IAMS</u> File name: 2679152_Moisture | Date Date e ASTM D2216_0 | Le 34/20 | | | |

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| CLIENT RJH Consultants | | JOB NO. | 2679-148 |
|---|---|------------------------------|----------|
| PROJECT South Boulder Cree PROJECT NO. 16134 | ek - Phase II | LOCATION | - |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | B-209 0-2.5 S-2 03/18/20 CT | | |
| Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g): Mass of Pan (g): Moisture (%): | 1190.63 1159.43 371.75 4.0 | | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | | |
| Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g): Mass of Pan (g): Moisture (%): | | | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | | |
| Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g): Mass of Pan (g): Moisture (%): | | | |
| NOTES | | | |
| Data entry by: TAF Checked by: File name: 2679148 Moisture | Date: Date: <i>3/2</i> . ASTM D2216_1.xls | 3/19/2020 3 <i>/202</i> 0 | |



| CLIENT | RJH Consultants | | | JOB NO. | 2679-168 |
|---|-------------------------------|--|--|---|---|
| PROJECT PROJECT NO. | South Boulder Creek 16134 | Phase II | | LOCATION | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | B-218 5.5-10' C-4 8/26/21 02/04/22 MG | TP-204 7.5-12' Bu-2 12/14/21 02/04/22 BDF | TP-204, B-216, B-217(P) 0-15' Composite 01/18/22 BDF/AR | B-217(P) 20-21.5' S-8 8/27/21 02/02/22 BDF |
| Mass of Wet Soil Mass of Dry Soil a Mass of Pan (g): Moisture (%): | | 1193.06 1126.90 225.39 7.3 | 3898.60 3708.00 236.80 5.5 | 7027.60 6553.10 897.80 8.4 | 745.87 682.61 222.50 13.7 |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | | | | |
| Mass of Wet Soil Mass of Dry Soil a Mass of Pan (g): Moisture (%): | | | | | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | | | | |
| Mass of Wet Soil Mass of Dry Soil a Mass of Pan (g): Moisture (%): | | | | | |
| NOTES | | | | | |
| Data entry by: Checked by: File name: | JL DPM 2679168 Moisture | ASTM D2216 0.: | xlsm | | 02/07/22 02/08/22 |

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Moisture and Density ASTM D 2216 and ASTM D 7263

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Moisture and Density ASTM D 2216 and ASTM D 7263

| CLIENT RJH Consultants | | | JOB NO. | 2679-148 |
|--|---|---------------------------|----------|----------|
| PROJECT South Boulder Creek PROJECT NO. 16134 | c - Phase II | | LOCATION | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | B-212 13.5-14.1 NQ-1 02/20/20 04/03/20 DPM Core | | | |
| Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g): Mass of Pan (g): Moisture (%): | 127.78 119.90 35.19 9.3 | | | |
| Diameter (in): Height (in): Mass of Wet Soil and Ring (g): Mass of Ring (g): Wet Density (lbs/ft³): Dry Density (lbs/ft³): Wet Density (kg/m³): Dry Density (kg/m³): | 1.79 1.01 141.27 48.63 139.6 127.7 2236 2046 | | | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | | | |
| Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g): Mass of Pan (g): Moisture (%): | | | | |
| Diameter (in): Height (in): Mass of Wet Soil and Ring (g): Mass of Ring (g): Wet Density (lbs/ft³): Dry Density (lbs/ft³): Wet Density (kg/m³): Dry Density (kg/m³): NOTES | | | | |
| Data entry by: TAF Checked by: | Date: Date: <u>►</u> and Density ASTM | 4/4/2020 1 D7236_0.xls | | |



Moisture and Density ASTM D 2216 and ASTM D 7263

Additional notes provided after discussion with ATT

| CLIENT RJH Consultants | | | JOB NO. | 2679-152 |
|--|-------------------------|-----------------|---------------------|--------------------------|
| PROJECT South Boulder Cree PROJECT NO. 16134 | ek - Phase II Geote | chnical Investi | gLOCATION | |
| PROJECT NO. 16134 | | | | |
| DODING NO | B-215 | B-215 | | |
| BORING NO. | D-210 | 4.7-5.0' | | |
| DEPTH | 4.4- 4.9 4.7 | | | |
| SAMPLE NO. | CA-5 | CA-5 | | |
| DATE SAMPLED | 05/26/20 | 05/26/20 | | |
| DATE TESTED | 06/22/20 | 06/22/20 | | |
| TECHNICIAN | BDF | BDF | | |
| DESCRIPTION | *** | | | |
| Mass of Wet Soil and Pan (g): | 95.99 | 93.70 | | |
| Mass of Dry Soil and Pan (g): | 86.01 | 83.11 | | |
| 177 | 6.69 | 6.75 | | |
| Mass of Pan (g): | 12.6 | 13.9 | | |
| Moisture (%): | 12.0 | 13.9 | | |
| Diameter (in): | 1.94 | 1.94 | | |
| Height (in): | 3.50 | 3.75 | | |
| Mass of Wet Soil and Ring (g): | 626.38 | 597.27 | | |
| Mass of Ring (g): | 295.37 | 202.63 | | |
| Wet Density (lbs/ft³): | 122.1 | 135.9 | | |
| Dry Density (lbs/ft³): | 108.5 | 119.4 | | |
| Wet Density (kg/m³): | 1956 | 2177 | | |
| Dry Density (kg/m³): | 1738 | 1912 | | |
| DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | | | | |
| Mass of Wet Soil and Pan (g): | | | | |
| Mass of Dry Soil and Pan (g): | | | | nple from 4.4 to 4.7 |
| Mass of Pan (g): | 1 | | | sand and half clay and |
| Moisture (%): | | | the sam all clay | ple from 4.7 to 5.0 was |
| Diameter (in): | | | | |
| Height (in): | | | | in size analysis for the |
| Mass of Wet Soil and Ring (g): | | | sample | range 4.4 to 5.0 |
| Mass of Ring (g): | | | included | l both samples |
| Wet Density (lbs/ft³): | | | | • |
| Dry Density (lbs/ft³): | | | | |
| Wet Density (kg/m³): | | | | |
| Dry Density (kg/m³): | | | | |
| NOTES | ***The sample | was half Cla | ay and half S | and. |
| Data entry by: DPM | Date: | 6/24/202 | 0 | |
| Checked by: KMS | Date: | | - | |
| File name: 2679152_Moistur | e and Density AST | M D7236 0.xls | sm | |

Rock Moisture and Density ASTM D 2216 and ASTM D 7263

Appendix J.1 9 of 262



Rock Moisture and Density ASTM D 2216 and ASTM D 7263

| CLIENT RJH Consultants | | | JOB NO. | 2679-148 | |
|--|---|---|---|---------------------------------|---|
| PROJECT South Boulder Cre PROJECT NO. 16134 | ek - Phase II | | LOCATION | | |
| 11134 | | | | | |
| BORING NO. | B-201 | B-202 | D 000 | D 004 | |
| DEPTH | 22.4-23.0 | 16.9-17.5 | B-203 | B-204 | |
| SAMPLE NO. | NQ-2 | NQ-2 | 16.9-17.4 | 25.4-25.9 | |
| DATE SAMPLED | 1402-2 | 14Q-2 | NQ-2 | NQ-2 | |
| DATE TESTED | 03/25/20 | 03/25/20 | 00/05/00 | 20/27/22 | |
| TECHNICIAN | HN | | 03/25/20 | 03/25/20 | |
| ROCK TYPE | Shale | HN | HN | HN | |
| NOOK TITE | Shale | Shale | Shale | Shale | _ |
| Mass of Wet Rock and Pan (g): | 52.3 | 304.7 | 94.9 | 216.2 | |
| Mass of Dry Rock and Pan (g): | 47.1 | 268.8 | 94.9 84.8 | | |
| Mass of Pan (g): | 6.7 | 6.6 | 6.7 | 196.2 | |
| Moisture (%): | 12.87 | 13.69 | | 6.8 | |
| (). | 12.07 | 13.03 | 12.93 | 10.56 | |
| Diameter (in): | 1.799 | 1.797 | 1.799 | 1 70 4 | |
| Height (in): | 3.692 | 3.840 | | 1.724 | |
| Vass of Wet Rock (g): | 330.6 | 332.5 | 4.437 | 3.695 | |
| 3. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. | 330.0 | 332.5 | 379.5 | 304.9 | |
| Wet Density (lbs/ft³): | 134.2 | 130.1 | 420.2 | 4047 | |
| Ory Density (lbs/ft³): | 118.9 | 114.4 | 128.2 | 134.7 | |
| Wet Density (g/cm³): | 2.15 | | 113.5 | 121.8 | |
| Ory Density (g/cm³): | 1.90 | 2.08 | 2.05 | 2.16 | |
| , (3, 2111) | 1.30 | 1.83 | 1.82 | 1.95 | |
| BORING NO. | B-208 | B-209 | D 040 | D 040 | |
| DEPTH | 25.1-25.6 | | B-210 | B-213 | |
| SAMPLE NO. | NQ-2 | 11.3-11.8 | 7.1-7.6 | 19.3-19.8 | |
| DATE SAMPLED | NQ-2 | NQ-2 | NQ-2 | NQ-1 | |
| DATE TESTED | 03/25/20 | 02/05/00 | 00/07/00 | | |
| ECHNICIAN | HN | 03/25/20 | 03/25/20 | 03/25/20 | |
| DESCRIPTION | 1 | HN | HN | HN | |
| ZEGORII FICIN | Shale | Shale | Shale | Shale | _ |
| lass of Wet Rock and Pan (g): | 185.2 | 170 0 | 044.4 | 000 7 | |
| lass of Dry Rock and Pan (g): | 163.7 | 178.8 | 244.4 | 228.7 | |
| lass of Pan (g): | 6.5 | 164.9 | 222.4 | 202.2 | |
| Noisture (%): | | 6.8 | 6.6 | 6.7 | |
| 10.000. | 13.68 | 8.79 | 10.19 | 13.55 | |
| Diameter (in): | 1.787 | 1.700 | 4 770 | 4 | |
| ` ' | | 1.769 | 1.772 | 1.775 | |
| leight (in): | 2 004 | | 2 600 | 4.067 | |
| | 3.884 | 4.214 | 3.620 | | |
| | 3.884 320.9 | 348.6 | 313.3 | 356.9 | |
| lass of Wet Rock (g): | 320.9 | 348.6 | 313.3 | 356.9 | |
| lass of Wet Rock (g): Vet Density (lbs/ft³): | 320.9 125.5 | 348.6 128.2 | 313.3 133.7 | 356.9 135.1 | |
| lass of Wet Rock (g): Vet Density (lbs/ft³): ry Density (lbs/ft³): | 320.9 125.5 110.4 | 348.6 128.2 117.9 | 313.3 133.7 121.3 | 356.9 135.1 119.0 | |
| lass of Wet Rock (g): Vet Density (lbs/ft³): ry Density (lbs/ft³): Vet Density (g/cm³): | 320.9 125.5 110.4 2.01 | 348.6 128.2 117.9 2.05 | 313.3 133.7 121.3 2.14 | 356.9 135.1 119.0 2.16 | |
| leight (in): flass of Wet Rock (g): Vet Density (lbs/ft³): Vet Density (lbs/ft³): Vet Density (g/cm³): Ty Density (g/cm³): | 320.9 125.5 110.4 | 348.6 128.2 117.9 | 313.3 133.7 121.3 | 356.9 135.1 119.0 | |
| flass of Wet Rock (g): Vet Density (lbs/ft³): Pry Density (lbs/ft³): Vet Density (g/cm³): | 320.9 125.5 110.4 2.01 | 348.6 128.2 117.9 2.05 | 313.3 133.7 121.3 2.14 | 356.9 135.1 119.0 2.16 | |
| Mass of Wet Rock (g): Vet Density (lbs/ft³): Pry Density (lbs/ft³): Vet Density (g/cm³): Pry Density (g/cm³): OTES | 320.9 125.5 110.4 2.01 1.77 | 348.6 128.2 117.9 2.05 1.89 | 313.3 133.7 121.3 2.14 | 356.9 135.1 119.0 2.16 | |
| Vet Density (lbs/ft³): Ory Density (lbs/ft³): Vet Density (lbs/ft³): Vet Density (g/cm³): Ory Density (g/cm³): | 320.9 125.5 110.4 2.01 1.77 Date: | 348.6 128.2 117.9 2.05 | 313.3 133.7 121.3 2.14 1.94 | 356.9 135.1 119.0 2.16 | |

Appendix J.1



Rock Moisture and Density ASTM D 2216 and ASTM D 7263

| CLIENT RJH Consultants | | | JOB NO. | 2679-152 | |
|--|---------------------|------------------|-----------|-----------|--|
| PROJECT South Boulder Creek - PROJECT NO. 16134 | Phase II Geotechnic | al Investigation | LOCATION | | |
| DODING NO | D 207 | B-214 | B-214 | B-215 | |
| BORING NO. | B-207 | | 15.8-16.4 | 19.4-19.9 | |
| DEPTH | 16.3-16.9 | 11.2-11.7 | | | |
| SAMPLE NO. | NQ-2 | NQ-2 | NQ-3 | NQ-2 | |
| DATE SAMPLED | | 00/00/00 | 00/00/00 | 00/00/00 | |
| DATE TESTED | 06/23/20 | 06/23/20 | 06/23/20 | 06/23/20 | |
| TECHNICIAN | BFUTCH | BFUTCH | BFUTCH | BFUTCH | |
| ROCK TYPE | Shale | Shale | Shale | Shale | |
| Mass of Wet Rock and Pan (g): | 100.9 | 107.9 | 227.8 | 115.7 | |
| Mass of Dry Rock and Pan (g): | 93.7 | 96.6 | 210.4 | 104.1 | |
| Mass of Pan (g): | 6.6 | 6.8 | 9.5 | 6.9 | |
| Moisture (%): | 8.27 | 12.58 | 8.66 | 11.93 | |
| Diameter (in): | 1.741 | 1.774 | 1.753 | 1.779 | |
| Height (in): | 4.557 | 4.118 | 4.327 | 4.275 | |
| Mass of Wet Rock (g): | 401.5 | 377.3 | 401.1 | 386.4 | |
| | | 444.0 | 440.0 | 400 5 | |
| Wet Density (lbs/ft³): | 141.0 | 141.2 | 146.3 | 138.5 | |
| Dry Density (lbs/ft³): | 130.2 | 125.4 | 134.7 | 123.8 | |
| Wet Density (g/cm³): | 2.26 | 2.26 | 2.34 | 2.22 | |
| Dry Density (g/cm³): | 2.09 | 2.01 | 2.16 | 1.98 | |
| BORING NO. | B-215 | | | | |
| DEPTH | 22.3-22.9 | | | | |
| SAMPLE NO. | NQ-3 | | | | |
| DATE SAMPLED | | | | | |
| DATE TESTED | 06/23/20 | | | | |
| TECHNICIAN | BFUTCH | | | | |
| DESCRIPTION | Shale | | | | |
| Mass of Wet Rock and Pan (g): | 95.6 | | | | |
| | 88.2 | | | | |
| Mass of Dry Rock and Pan (g): Mass of Pan (g): | 7.0 | | | | |
| Mass of Fail (g). Moisture (%): | 9.11 | | | | |
| | 4 770 | | | | |
| Diameter (in): | 1.778 | | | | |
| Height (in): | 4.601 | | | | |
| Mass of Wet Rock (g): | 421.2 | | | | |
| Wet Density (lbs/ft³): | 140.5 | | | | |
| Dry Density (lbs/ft³): | 128.7 | | | | |
| Wet Density (g/cm³): | 2.25 | | | | |
| Dry Density (g/cm³): | 2.06 | | | | |
| NOTES | | | | | |
| Data entry by: BFUTCH | Date: | 6/25/202 | 20 | | |
| Checked by: HW | Date: | / | | | |
| | D ASTM D7263_0 | | | | |

Appendix J.1 11 of 262

Moisture and Density (Paraffin Coated Specimens) ASTM D 2216 and ASTM D 7263 Method A

Appendix J.1 12 of 262



Moisture and Density (Paraffin Coated Specimens) ASTM D 2216 and ASTM D 7263 Method A

| CLIENT RJH Consultants | | J | OB NO. | 2679-148 |
|---|--|--|---------|----------|
| PROJECT South Boulder Creek - F PROJECT NO. 16134 | Phase II | L | OCATION | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN DESCRIPTION | B-213 21.2-21.7' NQ-2 02/13/20 04/06/20 DPM Core | | | |
| Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g): Moisture (%): | 149.77 138.08 35.99 11.5 | | | |
| Mass of Wet Soil (g): Mass of Wet Soil and Wax (g): Mass of Wet Soil and Wax in Water (g): Temperature of Water (°C): Wet Density (lbs/ft³): Dry Density (lbs/ft³): Wet Density (kg/m³): Dry Density (kg/m³): | 98.09 101.99 53.37 23.5 138.0 123.8 2211 | | | |
| | | | | |
| | | | | |
| | | | | |
| NOTES | | 4/0/0000 | | |
| Data entry by: DPM Checked by: File name: | Date: Date: <u>'</u> ty ASTM D7236_0.xl | / 4/8/2020 1 <i> (0 2.1)</i> s | | |

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ADVANCED TERRA TESTING

CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

16134

PROJECT NO. LOCATION

DATE TESTED

TECHNICIAN

TAF

3/18/2020

DATE SAMPLED **DESCRIPTION**

BORING NO.

SAMPLE NO.

DEPTH

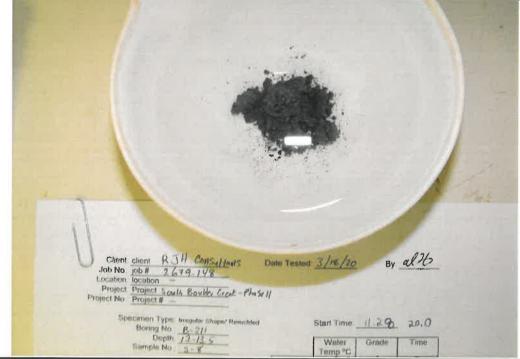
B-211

S-8

12-13.5'

Irregular Shape

| Test Data | | | | | | |
|--------------------------------|--------|--------------|------------------|-------|--|--|
| Moisture | | | Dispersion | | | |
| Mass of Wet Soil and Dish (g): | 103.07 | Elapsed Time | Water | Grade | | |
| Mass of Dry Soil and Dish (g): | 89.56 | (min) | Temperature (°c) | Grade | | |
| Mass of Dish (g): | 6.77 | 2 | 20 | 1 | | |
| Moisture (%): | 16.3 | 15 | 20.2 | 1 | | |
| Grade Description | | 60 | 20.2 | 1 | | |
| Grade 1: Non-Dispersive | | 1440 | 20.2 | 1 | | |
| Grade 2: Intermediate | | | | | | |
| Grade 3: Dispersive | | | | | | |
| Grade 4: Dispersive | | | | | | |



NOTES

Overall grade should be taken at the 60 minute reading.Irregular initial shapes were obtained.

Data entry by: Checked by:

ALH

Date:

3/19/2020

File name:

TAF

2679148 Crumb USBR5400_0.xls

3119/20 Date:



ADVANCED TERRA TESTING

RJH Consultants CLIENT

BORING NO.

B-215

JOB NO.

2679-152

DEPTH

4.4-5' CA-5

PROJECT PROJECT NO.

South Boulder Creek - Phase II Geotec SAMPLE NO. DATE SAMPLED

LOCATION

16134

DESCRIPTION

1440

DATE TESTED

6/24/2020

Mass of Wet Soil and Dish (g):

Mass of Dry Soil and Dish (g):

Moisture

Mass of Dish (g):

Moisture (%):

TECHNICIAN

BDF

Test Data Dispersion Water Elapsed Time 19.65 Grade Temperature (°c) 17.13 (min) 23.9 1 1.76 2 15 23.5 1 16.4 1 60 23

22.4

1

Grade Description Grade 1: Non-Dispersive Grade 2: Intermediate

Grade 3: Dispersive

Grade 4: Dispersive



NOTES

Overall grade should be taken at the 60 minute reading.

Data entry by:

KMS

Date:

6/29/2020

Checked by:

cn

Date: <u>6/30/2020</u>

File name:

2679152 Crumb USBR5400_0.xls

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CLIENT RJH Consultants
JOB NO. 2679-168

South Boulder Creek Phase II

PROJECT NO. 16134 LOCATION --

PROJECT

DATE TESTED 2/15/2022 TECHNICIAN BDF BORING NO. B-217(P) DEPTH 20-21.5'

SAMPLE NO. S-8 DATE SAMPLED --

DESCRIPTION --

| Test Data | | | | | | |
|--------------------------------|-------|--------------|------------------|-------|--|--|
| Moisture | | | Dispersion | | | |
| Mass of Wet Soil and Dish (g): | 28.20 | Elapsed Time | Water | Grade | | |
| Mass of Dry Soil and Dish (g): | 24.93 | (min) | Temperature (°c) | Grade | | |
| Mass of Dish (g): | 3.12 | 2 | 20.5 | 1 | | |
| Moisture (%): | 15.0 | 15 | 20.4 | 1 | | |
| Grade Description | | 60 | 20.5 | 1 | | |
| Grade 1: Non-Dispersive | | 1440 | 20.4 | 1 | | |
| Grade 2: Intermediate | | | | | | |
| Grade 3: Dispersive | | | | | | |
| Grade 4: Dispersive | | | | | | |



NOTES

Overall grade should be taken at the 60 minute reading.

Data entry by: BDF Date: 02/16/22 Checked by: CAL Date: 02/17/22

File name: 2679168__Crumb USBR5400_1.xlsm

Appendix J.1 17 of 262



B-218

CLIENT **RJH Consultants** BORING NO. JOB NO. 2679-168 **DEPTH** 5.5-10'

PROJECT South Boulder Creek Phase II SAMPLE NO. S-4 PROJECT NO. 16134 DATE SAMPLED --LOCATION **DESCRIPTION**

DATE TESTED 2/15/2022 TECHNICIAN BDF

| | Te | st Data | | | |
|--------------------------------|-------|--------------|------------------|-------|--|
| Moisture | | Dispersion | | | |
| Mass of Wet Soil and Dish (g): | 21.86 | Elapsed Time | Water | Grade | |
| Mass of Dry Soil and Dish (g): | 21.16 | (min) | Temperature (°C) | Grade | |
| Mass of Dish (g): | 3.10 | 2 | 20.4 | 1 | |
| Moisture (%): | 3.9 | 15 | 20.3 | 2 | |
| Grade Description | | 60 | 20.4 | 1 | |
| Grade 1: Non-Dispersive | | 1440 | 20.2 | 1 | |
| Grade 2: Intermediate | | | | | |
| Grade 3: Dispersive | | | | | |
| Grade 4: Dispersive | | | | | |



NOTES

Overall grade should be taken at the 60 minute reading.

Data entry by: BDF Date: 02/16/22 Checked by: CAL Date: 02/17/22

File name: 2679168 Crumb USBR5400 2.xlsm

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TP-204

7.5-12'

CLIENT RJH Consultants BORING NO.

JOB NO. 2679-168 DEPTH

PROJECT South Boulder Creek Phase II SAMPLE NO.

PROJECT South Boulder Creek Phase II SAMPLE NO. Bu-2
PROJECT NO. 16134 DATE SAMPLED -LOCATION -- DESCRIPTION --

DATE TESTED 2/15/2022 TECHNICIAN BDF

| Test Data | | | | | |
|--------------------------------|-------|--------------|------------------|-------|--|
| Moisture | | | Dispersion | | |
| Mass of Wet Soil and Dish (g): | 50.54 | Elapsed Time | Water | Grade | |
| Mass of Dry Soil and Dish (g): | 46.77 | (min) | Temperature (°c) | Graue | |
| Mass of Dish (g): | 3.10 | 2 | 20.8 | 1 | |
| Moisture (%): | 8.6 | 15 | 20.6 | 1 | |
| Grade Description | | 60 | 20.5 | 1 | |
| Grade 1: Non-Dispersive | | 1440 | 20.3 | 1 | |
| Grade 2: Intermediate | | | | | |
| Grade 3: Dispersive | | | | | |
| Grade 4: Dispersive | | | | | |



NOTES

Overall grade should be taken at the 60 minute reading.

Data entry by: BDF Date: 02/16/22 Checked by: CAL Date: 02/17/22

File name: 2679168__Crumb USBR5400_0.xlsm

Appendix J.1 19 of 262



CLIENT RJH Consultants BORING NO. TP-204,B-216, B-217(P)

JOB NO.2679-168DEPTH0-15'PROJECTSouth Boulder Creek Phase IISAMPLE NO.Composite

PROJECT NO. 16134 DATE SAMPLED --LOCATION -- DESCRIPTION --

DATE TESTED 2/15/2022 TECHNICIAN BDF

| Test Data | | | | |
|--|----------------|-----------------------|---------------------------|-------|
| Moisture | | Dispersion | | |
| Mass of Wet Soil and Dish (g): Mass of Dry Soil and Dish (g): | 71.22 60.93 | Elapsed Time (min) | Water Temperature (°c) | Grade |
| Mass of Dish (g): | 3.10 | 2 | 20.3 | 1 |
| Moisture (%): | 17.8 | 15 | 20.4 | 1 |
| Grade Description | | 60 | 20.3 | 1 |
| Grade 1: Non-Dispersive Grade 2: Intermediate Grade 3: Dispersive Grade 4: Dispersive | | 1440 | 20.3 | 1 |



NOTES

Overall grade should be taken at the 60 minute reading.

Data entry by: BDF Date: 02/16/22 Checked by: CAL Date: 02/17/22

File name: 2679168 Crumb USBR5400_3.xlsm

Appendix J.1 20 of 262

Appendix J.1 21 of 262



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED TECHNICIAN

03/13/20 ASE

BORING NO.

B-201

DEPTH

5-7.9

SAMPLE NO.

D-3 & CA-4

DATE SAMPLED 02/17/20

SAMPLED BY

DESCRIPTION --

Plastic Limits

| ı | Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): |
|---|--|
| ı | Mass of Dry Pan and Soil (g): |

8.87 7.74 8.87 7.76

Mass of Pan (g):

1.08

1.09

Moisture (%)

16.9

16.7

Liquid Limits

| I | Number of Blows |
|---|--|
| I | Mass of Wet Pan and Soil (g): |
| I | Number of Blows Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g): |
| I | Mass of Ban (a): |

15 10.14 8.12 1.15

25 11.09 8.92

29 11.72 9.51

|Mass of Pan (g):

Moisture (%)

29.1

1.10 27.8

26.4

1.15

Plastic Index

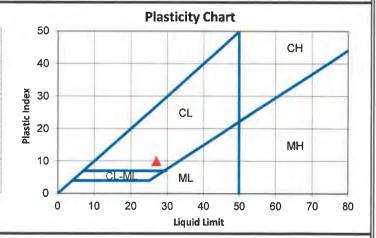
| Plastic Limit: | 17 |
|----------------|----|
| Liquid Limit: | 27 |
| Plastic Index: | 10 |

Atterberg Classification: Method:

CL

Α

Flow Curve 30 28 26 24 22 20 **Number of Blows**



NOTES

Data entry by: Checked by:

TAF

2679148__Atterberg ASTM D4318_2.xism

Date:

3/16/2020

Date: 3/18/20



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION DATE TESTED

TECHNICIAN

03/26/20 **TAF**

BORING NO.

B-201

DEPTH

22.4-23

SAMPLE NO.

DATE SAMPLED --

SAMPLED BY

DESCRIPTION --

| ı | Plastic Limits |
|---|----------------|
| ı | |

Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g):

4.67 4.13 1.12 3.94 3.53 1.17

Mass of Pan (g):

Moisture (%)

17.9

17.7

Liquid Limits

Number of Blows Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g):

9.42 6.68 1.17

49.6

17

27 7.72 5.67

8.79 6.43

29

7.87 5.84

1.08

1.09

1.14

31

Moisture (%)

44.7

44.4

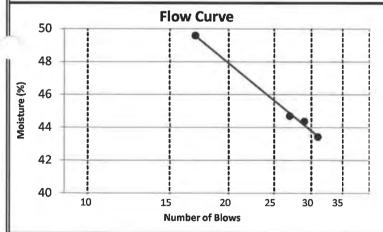
43.4

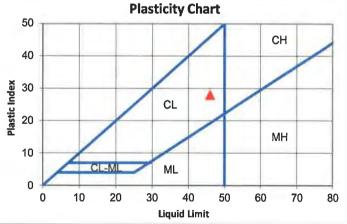
Plastic Index

Plastic Limit: 18 Liquid Limit: 46 Plastic Index: 28 Atterberg Classification: Method:

CL

Α





NOTES

Data entry by: Checked by:

File name:

CAL

2679148

Atterberg ASTM D4318_20.xlsm

Date:

3/29/2020



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION DATE TESTED

03/24/20

TAF

TECHNICIAN

BORING NO.

B-202

DEPTH

3.2-3.5'

SAMPLE NO.

CA-2

DATE SAMPLED 02/03/20

SAMPLED BY

DESCRIPTION --

Plastic Limits

| l | Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g): |
|---|--|
| l | Mass of Dry Pan and Soil (g): |
| ١ | Mass of Pan (a): |

5.46 4.70 1.32 6.45 5.48 1.10 6.61 5.65 1.31

Moisture (%)

22.3

22.2

22.1

Liquid Limits

22

| l | Number of Blows |
|---|---|
| I | Number of Blows Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): |
| ۱ | Mass of Dry Pan and Soil (g): |

7.32 5.71

1.14

21

6.46 5.08 1.08

Moisture (%) Corrected Moisture (%)

Mass of Pan (g):

35.3 34.6 34.6 34.0

Plastic Index

| Plastic Limit: | 22 |
|----------------|-----|
| Liquid Limit: | 34 |
| Disatia Inday | 4.0 |

Atterberg Classification:

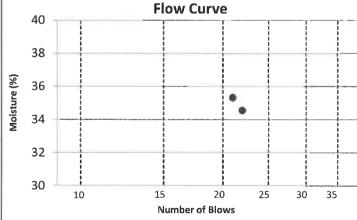
CL

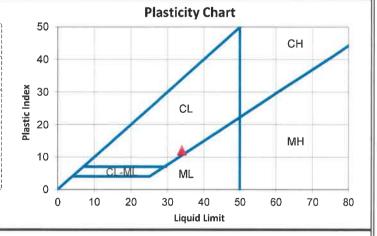
Plastic Index:

12

Method:

В





NOTES

Data entry by: Checked by:

KMS

2679148 Atterberg ASTM D4318 16.xlsm Date:

3/25/2020 3/31/20 Date: _



CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION --

DATE TESTED 03/30/20

TECHNICIAN BDF

BORING NO.

B-203

DEPTH

3.2-3.8'

SAMPLE NO. D-2

DATE SAMPLED 02/07/20

SAMPLED BY

DESCRIPTION --

| PI | astic | Limits | |
|----|-------|--------|--|

| Mass of Wet Pan and Soil (g): | 10.99 | 10.79 |
|-------------------------------|-------|-------|
| Mass of Dry Pan and Soil (g): | 9.36 | 9.20 |
| Mass of Pan (g): | 1.13 | 1.15 |
| 1 | | |

Moisture (%) 19.8

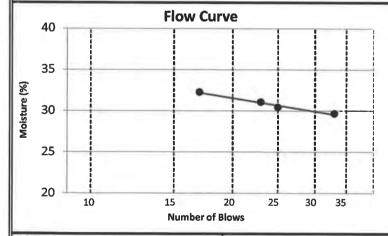
Liquid Limits

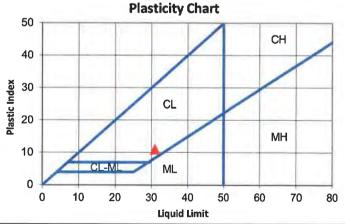
19.7

| II . | | | | |
|-------------------------------|-------|-------|-------|------|
| Number of Blows | 17 | 23 | 25 | 33 |
| Mass of Wet Pan and Soil (g): | 10.96 | 10.19 | 10.64 | 9.57 |
| Mass of Dry Pan and Soil (g): | 8.56 | 8.04 | 8.42 | 7.64 |
| Mass of Pan (g): | 1.14 | 1.12 | 1.14 | 1.13 |
| Moisture (%) | 32.3 | 31.1 | 30.4 | 29.7 |

Plastic Index

| Plastic Limit: | 20 | Atterberg Classification: | CL |
|----------------|----|---------------------------|----|
| Liquid Limit: | 31 | Method: | Α |
| Plastic Index: | 11 | | |





NOTES

Data entry by: ALH

Checked by: MLM

1.16141

2679148__Atterberg ASTM D4318_22.xlsm

Date:

3/31/2020

Date: <u>4/4/20</u>



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED 03/19/20

TECHNICIAN

ALH

BORING NO.

B-203

DEPTH

7.9-8.2'

SAMPLE NO.

CA-4

DATE SAMPLED 02/07/20

SAMPLED BY

DESCRIPTION -

| | PI | astic | Limits | |
|--|----|-------|--------|--|
|--|----|-------|--------|--|

| II. | | |
|-------------------------------|------|------|
| Mass of Wet Pan and Soil (g): | 8.80 | 8.59 |
| Mass of Dry Pan and Soil (g): | 7.28 | 7.14 |
| Mass of Pan (g): | 1.15 | 1.08 |

Moisture (%)

24.7

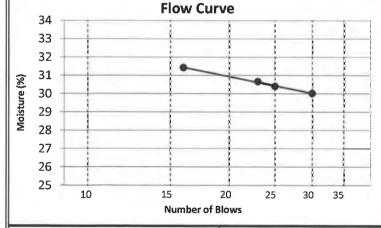
24.0

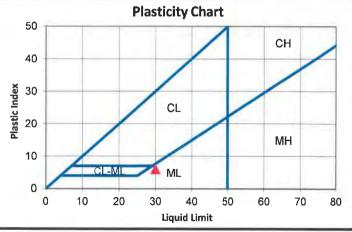
Liquid Limits

| II I | | | | |
|-------------------------------|------|------|-------|-------|
| Number of Blows | 16 | 23 | 25 | 30 |
| Mass of Wet Pan and Soil (g): | 9.97 | 9.10 | 10.53 | 10.90 |
| Mass of Dry Pan and Soil (g): | 7.86 | 7.24 | 8.34 | 8.64 |
| Mass of Pan (g): | 1.15 | 1.16 | 1.11 | 1.14 |
| Moisture (%) | 31.4 | 30.7 | 30.4 | 30.0 |

Plastic Index

| Plastic Limit: | 24 | Atterberg Classification: | ML |
|----------------|----|---------------------------|----|
| Liquid Limit: | 30 | Method: | Α |
| Plastic Index: | 6 | | |





NOTES

Data entry by: TA

Checked by:

TAF

2679148__Atterberg ASTM D4318_9.xlsm

Date:

3/20/2020

Date: 3/23/ 2020



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION

DATE TESTED 03/16/20 TECHNICIAN ALH

BORING NO. B-203 DEPTH 15.8-16.3' SAMPLE NO. NQ-2

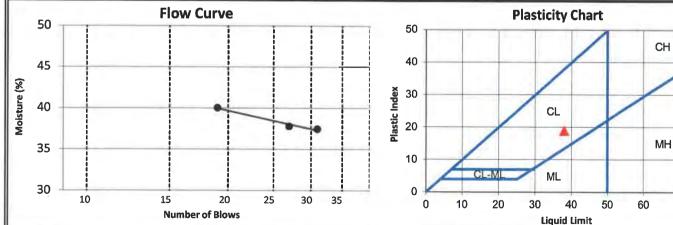
DATE SAMPLED 02/10/20

| SAMPLED BY | |
|-------------|--|
| DESCRIPTION | |

| Mass of Wet Pan and Soil (g): | 8.34 | 8.34 | |
|-------------------------------|------|------|--|
| Mass of Dry Pan and Soil (g): | 7.16 | 7.19 | |
| Mass of Pan (g): | 1.15 | 1.14 | |
| Moisture (%) | 19.5 | 19.1 | |
| | | | |

| | | Liquid Limits | | |
|-------------------------------|-------|---------------|-------|--|
| Number of Blows | 19 | 27 | 31 | |
| Mass of Wet Pan and Soil (g): | 13.66 | 12.01 | 13.37 | |
| Mass of Dry Pan and Soil (g): | 10.09 | 9.03 | 10.03 | |
| Mass of Pan (g): | 1.17 | 1.15 | 1.13 | |
| Moisture (%) | 40.0 | 37.8 | 37.5 | |

| | | Plastic Index | | |
|------------|------------------|---------------------------|----|--|
| Plastic L | .imit: 19 | Atterberg Classification: | CL | |
| Liquid L | .imit: 38 | Method: | Α | |
| Plastic In | dex: 19 | | | |



NOTES

Data entry by: TAF

Checked by: File name: 2679148__Atterberg ASTM D4318 3.xlsm

3/17/2020 Date: Date: 3/18/20

70

80



CLIENT **RJH Consultants** BORING NO. B-204 JOB NO. 2679-148 DEPTH 5.7-6.01 PROJECT South Boulder Creek - Phase II SAMPLE NO. CA-3 PROJECT NO. 16134 DATE SAMPLED ---LOCATION SAMPLED BY DATE TESTED 03/12/20 DESCRIPTION Poorly graded sand with silt TECHNICIAN ALH **Plastic Limits** Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g): Moisture (%) Non-Plastic **Liquid Limits** Number of Blows Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g): Moisture (%) Corrected Moisture (%) Non-Plastic Plastic Index Plastic Limit: Atterberg Classification: NP Liquid Limit: Method: Α Plastic Index: Flow Curve **Plasticity Chart** 40 50 CH 38 40 Moisture (%) 36 Plastic Index 30 CL 34 20 МН 32 10 ML 30 0 20 10 20 30 40 50 60 70 80 Number of Blows Liquid Limit NOTES Data entry by: TAE Date: 3/12/2020 Checked by: Date: 3/18/20 File name: 2679148 Atterberg ASTM D4318_0.xlsm



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

LOCATION

DATE TESTED TECHNICIAN ALH

16134

03/20/20

BORING NO.

B-204

DEPTH

12.5-19'

SAMPLE NO. S-6 to S-8

DATE SAMPLED 01/28/20

SAMPLED BY

DESCRIPTION --

| P | last | tic | Lin | nits | |
|---|------|-----|-----|------|--|
| | | | | | |

| Mass of Wet Pan and Soil (g): | 8.99 | 8.74 |
|-------------------------------|------|------|
| Mass of Dry Pan and Soil (g): | 7.78 | 7.57 |
| Mass of Pan (g): | 1.13 | 1.07 |
| | 1 | |

Moisture (%)

18.2

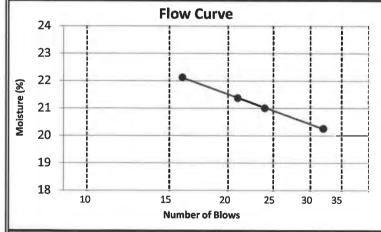
18.0

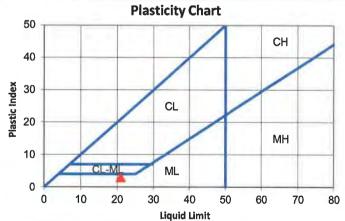
Liquid Limits

| Number of Blows | 16 | 21 | 24 | 32 |
|-------------------------------|-------|-------|-------|-------|
| Mass of Wet Pan and Soil (g): | 12.52 | 12.83 | 10.08 | 11.31 |
| Mass of Dry Pan and Soil (g): | 10.46 | 10.76 | 8.53 | 9.60 |
| Mass of Pan (g): | 1.15 | 1.10 | 1.15 | 1.14 |
| Moisture (%) | 22.1 | 21.4 | 21.0 | 20.3 |

Plastic Index

| | | 1 Idollo IIIdox | |
|----------------|----|---------------------------|----|
| Plastic Limit: | 18 | Atterberg Classification: | ML |
| Liquid Limit: | 21 | Method: | Α |
| Plastic Index: | 3 | | |





NOTES

Data entry by:

Checked by:

File name:

TAF

CHL

2679148_ _Atterberg ASTM D4318_12.xlsm Date:

3/23/2020

Date: 3/23/2020



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/24/20

TECHNICIAN **TAF** BORING NO.

B-204

DEPTH 26.4-27.0'

SAMPLE NO. NQ-2

DATE SAMPLED 01/28/20

SAMPLED BY

DESCRIPTION --

| P | lastic | Limits |
|---|--------|--------|
| | | |

| Mass of Wet Pan and Soil (g): | 7.24 | 6.08 |
|-------------------------------|------|------|
| Mass of Dry Pan and Soil (g): | 6.37 | 5.35 |
| Mass of Pan (g): | 1.31 | 0.97 |

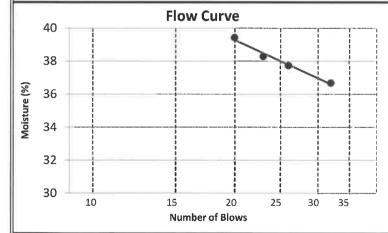
Moisture (%) 17.1 16.8

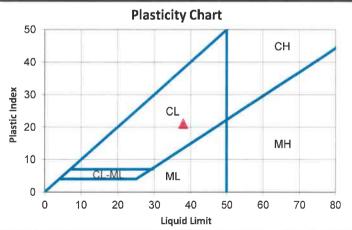
Liquid Limits

| Mass of Pan (g): | 1.15 | 1.15 | 1.09 | 1.10 |
|-------------------------------|------|------|------|------|
| Mass of Dry Pan and Soil (g): | 7.12 | 6.23 | 6.67 | 5.30 |
| Mass of Wet Pan and Soil (g): | 9.47 | 8.18 | 8.78 | 6.84 |
| Number of Blows | 20 | 23 | 26 | 32 |

Plastic Index

| Plastic Limit: | 17 | Atterberg Classification: | CL |
|----------------|----|---------------------------|----|
| Liquid Limit: | 38 | Method: | Α |
| Plastic Index: | 21 | | |





NOTES

Data entry by: Checked by:

KMS

2679148__Atterberg ASTM D4318_17.xlsm

Date:

3/25/2020

3/31/20 Date:



CLIENT **RJH Consultants**

CAL

2679152__Atterberg ASTM D4318_3.xlsm

Data entry by:

Checked by:

File name:

JOB NO. 2679-152

PROJECT South Boulder Creek - Phase II Geotechnical Investigation

16134 PROJECT NO. LOCATION

06/24/20

BORING NO. B-205 DEPTH 15-16.5'

SAMPLE NO. S-8

DATE SAMPLED --SAMPLED BY

DESCRIPTION --

| DATE TESTED 06/24/20 FECHNICIAN BDF | | | | | |
|--|--------------|----------------|---------------------|-----------|------|
| | | Plastic Limits | | | |
| Mass of Wet Pan and Soil (| g): 9.18 | 8.93 | | | |
| lass of Dry Pan and Soil (g | | 7.84 | | | |
| Mass of Pan (g): | 1.08 | 1.15 | | | |
| Moisture (%) | 16.5 | 16.3 | | | |
| | | Liquid Limits | | | |
| Number of Blows | 16 | 24 | 31 | | |
| Mass of Wet Pan and Soil (| g): 13.33 | 10.25 | 10.77 | | |
| Mass of Dry Pan and Soil (g | | 8.19 | 8.68 | | |
| Mass of Pan (g): | 1.15 | 1.14 | 1.17 | | |
| Moisture (%) | 30.2 | 29.1 | 27.9 | | |
| | | Plastic Index | | | |
| | ic Limit: 16 | Atterbe | erg Classification: | CL | |
| | id Limit: 29 | | Method: | Α | |
| Plasti | c Index: 13 | | | | |
| 40 FI | ow Curve | . 50 | Plastic | ity Chart | |
| 40 | | 30 | | CH | , |
| | | 40 | | | / |
| 35 | | | | | |
| Moisture (%) | | ğ 30 | | | + |
| i 30 | • | <u> </u> | | CL | |
| No. | | Plastic index | | | 1 |
| | | | / A | MI | 1 |
| 25 | | 10 + | CL-ML N | AL | |
| 25 | | 4 1 | | | |
| | | | CL-IVIL IN | /IL | |
| 25 20 10 15 | 20 25 30 | 35 0 | | 40 50 60 | 70 8 |

Appendix J.1 31 of 262

Date:

Date:

6/25/2020



CLIENT **RJH Consultants**

JOB NO. 2679-152

South Boulder Creek - Phase II Geotechnical Investigation PROJECT

PROJECT NO. 16134

LOCATION 06/23/20 DATE TESTED TECHNICIAN ALH

DEPTH 8-10.4' SAMPLE NO. S-5, S-6 DATE SAMPLED --SAMPLED BY DESCRIPTION

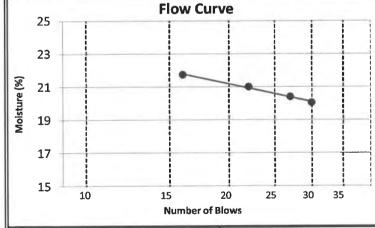
B-206

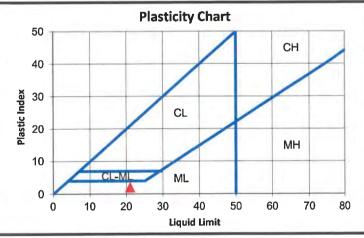
BORING NO.

| Plastic Limits | | | | | |
|-------------------------------|-------|---------------|-------|-------|--|
| Mass of Wet Pan and Soil (g): | 8.75 | 8.70 | | | |
| Mass of Dry Pan and Soil (g): | 7.54 | 7.50 | | | |
| Mass of Pan (g): | 1.08 | 1.13 | | | |
| Moisture (%) | 18.8 | 18.7 | | | |
| | | Liquid Limits | | | |
| Number of Blows | 16 | 22 | 27 | 30 | |
| Mass of Wet Pan and Soil (g): | 10.59 | 10.02 | 12.25 | 10.95 | |
| Mass of Dry Pan and Soil (g): | 8.90 | 8.48 | 10.36 | 9.32 | |

| Number of Blows | 16 | 22 | 27 | 30 | |
|-------------------------------|-------|---------------|-------|-------|--|
| Mass of Wet Pan and Soil (g): | 10.59 | 10.02 | 12.25 | 10.95 | |
| Mass of Dry Pan and Soil (g): | 8.90 | 8.48 | 10.36 | 9.32 | |
| Mass of Pan (g): | 1.14 | 1.14 | 1.07 | 1.18 | |
| Moisture (%) | 21.7 | 21.0 | 20.4 | 20.0 | |
| | | Plastic Index | | | |

| | | Flastic illuex | |
|----------------|----|---------------------------|----|
| Plastic Limit: | 19 | Atterberg Classification: | ML |
| Liquid Limit: | 21 | Method: | Α |
| Plastic Index | 2 | | |





NOTES

6/24/2020 **KMS** Date: Data entry by: Date: 6/25/2020 Checked by: cm

File name: 2679152 Atterberg ASTM D4318_0.xlsm



CLIENT

RJH Consultants

JOB NO.

2679-152

PROJECT

South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO. LOCATION

16134

06/23/20 DATE TESTED

TECHNICIAN

ALH

BORING NO.

B-206

DEPTH

12.5-14'

SAMPLE NO.

S-7 DATE SAMPLED --

SAMPLED BY

DESCRIPTION --

| II . | | |
|-------------------------------|------|------|
| Mass of Wet Pan and Soil (g): | 8.68 | 8.63 |
| Mass of Dry Pan and Soil (g): | 7.40 | 7.37 |
| Mass of Pan (g): | 1.12 | 1.14 |

Moisture (%)

20.5

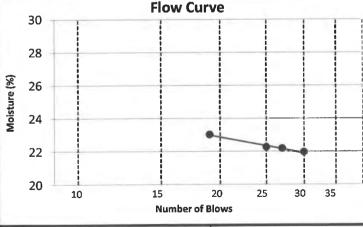
20.3

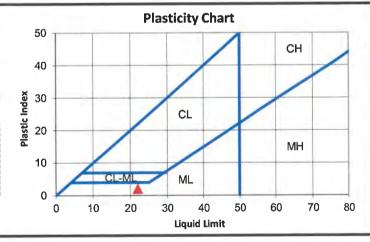
Liquid Limits

| Number of Blows | 19 | 25 | 27 | 30 |
|-------------------------------|-------|-------|-------|-------|
| Mass of Wet Pan and Soil (g): | 10.67 | 11.04 | 11.47 | 10.92 |
| Mass of Dry Pan and Soil (g): | 8.88 | 9.23 | 9.60 | 9.16 |
| Mass of Pan (g): | 1.09 | 1.13 | 1.15 | 1.16 |
| Moisture (%) | 23.0 | 22.3 | 22.2 | 22.0 |

Plastic Index

| Plastic Limit: | 20 | Atterberg Classification: | ML |
|----------------|----|---------------------------|----|
| Liquid Limit: | 22 | Method: | Α |
| Plastic Index: | 2 | | |





6/25/2020

NOTES

Data entry by:

Checked by:

CAL

2679152__Atterberg ASTM D4318_1.xlsm

Date:

Date:



CLIENT **RJH Consultants**

JOB NO. 2679-152

PROJECT South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO. 16134

LOCATION DATE TESTED 06/25/20

TECHNICIAN **ALH** BORING NO.

B-207

DEPTH

16.3-16.9'

SAMPLE NO. NQ-2

DATE SAMPLED --

SAMPLED BY

DESCRIPTION

| Plastic Limits | |
|----------------|---|
| | _ |

8.54 Mass of Wet Pan and Soil (g): 8.57 7.35 Mass of Dry Pan and Soil (g): 7.37 1.13 Mass of Pan (g): 1.14

19.2 19.1 Moisture (%)

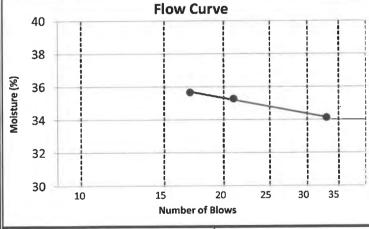
Liquid Limits

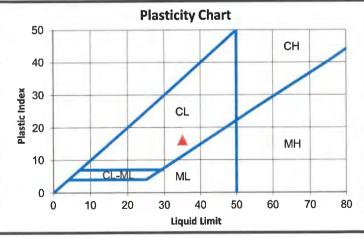
21 33 17 Number of Blows 9.25 Mass of Wet Pan and Soil (g): 9.42 9.05 6.99 7.20 Mass of Dry Pan and Soil (g): 7.23 1.18 1.07 1.14 Mass of Pan (g):

35.3 34.1 35.7 Moisture (%)

Plastic Index

CL Atterberg Classification: Plastic Limit: 19 Method: Α Liquid Limit: 35 Plastic Index: 16





NOTES

BDF Data entry by:

KMS Checked by:

2679152

Atterberg ASTM D4318 5.xlsm

Date:

6/26/2020

Date:

6/29/20



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

LOCATION

ALH

DATE TESTED 03/18/20

TECHNICIAN

16134

SAMPLE NO. DATE SAMPLED 01/30/20 SAMPLED BY

B-208

S-4

5.0-6.5'

BORING NO.

DEPTH

DESCRIPTION --

| Р | lastic | Lir | nits | |
|---|--------|-----|------|---|
| | | | | _ |

| Mass of Wet Pan and Soil (g): | 8.28 | 8.30 |
|-------------------------------|------|------|
| Mass of Dry Pan and Soil (g): | 7.16 | 7.16 |
| Mass of Pan (g): | 1.13 | 1.08 |

Moisture (%)

18.6

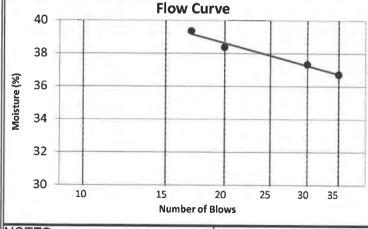
18.6

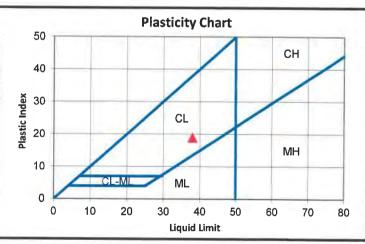
Liquid Limits

| II . | | | | |
|-------------------------------|-------|-------|-------|------|
| Number of Blows | 17 | 20 | 30 | 35 |
| Mass of Wet Pan and Soil (g): | 11.95 | 12.13 | 13.66 | 8.33 |
| Mass of Dry Pan and Soil (g): | 8.87 | 9.08 | 10.26 | 6.40 |
| Mass of Pan (g): | 1.05 | 1.14 | 1.15 | 1.13 |
| Moisture (%) | 39.4 | 38.4 | 37.3 | 36.7 |

Plastic Index

| sification: | 19 | Plastic Limit: |
|-------------|----|----------------|
| Method: | 38 | Liquid Limit: |
| | 19 | Plastic Index: |





NOTES

Data entry by: TAF

Checked by:

File name:

CHL

Atterberg ASTM D4318_6.xlsm 2679148

Date:

3/19/2020

Date: 3/23/2020



CLIENT **RJH Consultants** BORING NO. B-208 JOB NO. 2679-148 DEPTH 17.5-18.9 PROJECT South Boulder Creek - Phase II SAMPLE NO. S-9 PROJECT NO. 16134 DATE SAMPLED --LOCATION SAMPLED BY DATE TESTED 03/20/20 DESCRIPTION --TECHNICIAN **BDF Plastic Limits** Mass of Wet Pan and Soil (g): 12 08 11.27 Mass of Dry Pan and Soil (g): 10.47 9.79 Mass of Pan (g): 1.17 1.12 Moisture (%) 17.2 17.1 **Liquid Limits** Number of Blows 16 25 28 Mass of Wet Pan and Soil (g): 17.15 15.20 12.18 Mass of Dry Pan and Soil (g): 14.17 12.78 10.30 Mass of Pan (g): 1.13 1.14 1.14 Moisture (%) 22.8 20.8 20.5 Plastic Index Plastic Limit: 17 Atterberg Classification: CL-ML Liquid Limit: 21 Method: Α Plastic Index: 4 Flow Curve **Plasticity Chart** 30 50 СН 28 40 Moisture (%) 26 Plastic Index 30 CL 24 20 МН 22 10 ML 20 0

Data entry by: Checked by:

File name:

NOTES

30

Sand groving tool used.

2679148 _Atterberg ASTM D4318_11.xlsm

20

Number of Blows

Date:

10

20

40

Liquid Limit

50

60

70

80

Date:



ADVANCED TERRA TESTING

CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION DATE TESTED

TECHNICIAN

03/23/20

BDF

BORING NO.

B-209

DEPTH

0.0-2.5'

SAMPLE NO. S-2 & BU-1

DATE SAMPLED --

SAMPLED BY

DESCRIPTION ---

| P | lastic | Limits | |
|---|--------|--------|---|
| | | | _ |

| | 1 | |
|-------------------------------|------|------|
| Mass of Wet Pan and Soil (g): | 9.51 | 9.57 |
| Mass of Dry Pan and Soil (g): | 8.40 | 8.50 |
| Mass of Pan (g): | 1.14 | 1.11 |

Moisture (%)

15.2

30.8

30.0

14.5

Liquid Limits

| Number of Blows | 20 | 22 |
|-------------------------------|------|------|
| Mass of Wet Pan and Soil (g): | 7.33 | 6.08 |
| Mass of Dry Pan and Soil (g): | 5.88 | 4.90 |
| Mass of Pan (g): | 1.14 | 1.10 |
| | | |

Moisture (%) Corrected Moisture (%)

30.6 Plastic Index

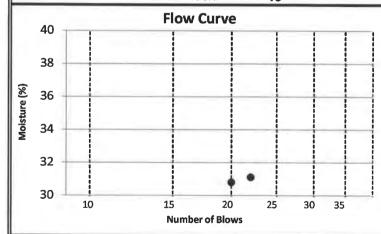
31.1

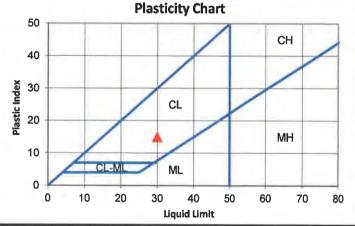
| Plastic Limit: | 15 |
|----------------|----|
| Liquid Limit: | 30 |
| Plastic Index: | 15 |

Atterberg Classification:

Method:

CL В





NOTES

1 point Atterberg.

Atterberg ASTM D4318_15.xlsm

Data entry by: Checked by:

TAF

KMS

2679148_

Date:

3/24/2020

Date:



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED TECHNICIAN

03/29/20 ALH

BORING NO.

B-209

DEPTH

11.3-11.8

SAMPLE NO. NQ-2

DATE SAMPLED 01/22/20

SAMPLED BY

DESCRIPTION shale

Plastic Limits

| II . | |
|--|---------------|
| Mass of Wet Pan | and Soil (g): |
| Mass of Wet Pan a Mass of Dry Pan a | and Soil (g): |
| Mass of Pan (a): | |

8.38 7.37 1.14

8.43 7.41 1.09

∥Mass of Pan (g):

Moisture (%)

16.3

16.1

| Liquid | Limits |
|--------|--------|
|--------|--------|

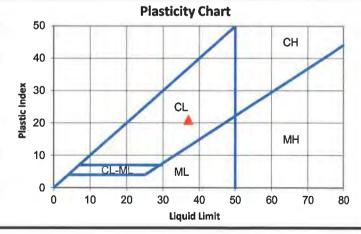
| Number of Blows | 18 | 23 | 27 | 32 | 35 |
|-------------------------------|------|-------|-------|-------|-------|
| Mass of Wet Pan and Soil (g): | 9.57 | 12.75 | 10.36 | 10.21 | 11.10 |
| Mass of Dry Pan and Soil (g): | 7.28 | 9.61 | 7.89 | 7.79 | 8.47 |
| Mass of Pan (g): | 1.17 | 1.13 | 1.15 | 1.13 | 1.17 |
| Moisture (%) | 37.5 | 37.1 | 36.6 | 36.2 | 36.0 |

Plastic Index

| Plastic Limit: | 16 | Atte |
|----------------|----|------|
| Liquid Limit: | 37 | |
| Plastic Index: | 21 | |

erberg Classification: CL Method: Α

Flow Curve 40 38 36 34 32 30 10 30 **Number of Blows**



NOTES

Data entry by:

CAL al H

Date:

3/29/2020

Checked by:

2679148_ _Atterberg ASTM D4318_21.xlsm Date: 3/31/20



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

ALH

DATE TESTED 03/12/20

TECHNICIAN

B-210 0-3.7 BU-1

SAMPLE NO.

DATE SAMPLED 01/20/20

SAMPLED BY

BORING NO.

DEPTH

DESCRIPTION Clayey sand w/ gravel

| | | Plastic Limits |
|-------------------------------|------|----------------|
| Mass of Wet Pan and Soil (g): | 7.65 | 7.59 |

Mass of Dry Pan and Soil (g): Mass of Pan (g):

6.75 1.07

6.71 1.11

Moisture (%)

15.8

15.6

Liquid Limits

| Number of Blows | 18 | 24 | 27 | 33 |
|-------------------------------|-------|-------|-------|-------|
| Mass of Wet Pan and Soil (g): | 15.41 | 13.77 | 11.54 | 17.02 |
| Mass of Dry Pan and Soil (g): | 11.86 | 10.67 | 9.03 | 13.23 |
| Mass of Pan (g): | 1.09 | 1.10 | 1.14 | 1.10 |
| Moisture (%) | 33.0 | 32.3 | 31.8 | 31.3 |

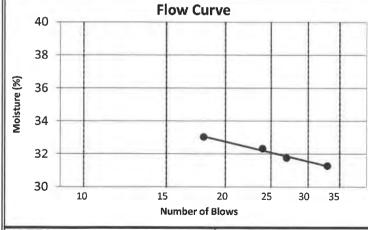
Plastic Index

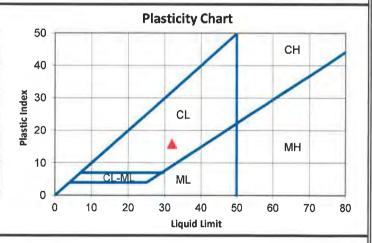
| Plastic Limit: | 16 |
|----------------|----|
| Liquid Limit: | 32 |
| Plastic Index: | 16 |

Atterberg Classification: CL

Method: Α







NOTES

Data entry by: Checked by:

TAF

2679148__Atterberg ASTM D4318_1.xlsm

Date:

3/16/2020

Date: 3/18/20



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

TECHNICIAN

DATE TESTED 03/16/20

ALH

BORING NO.

B-211

DEPTH

2.5-4.0'

SAMPLE NO. S-3

DATE SAMPLED 01/24/20

SAMPLED BY

DESCRIPTION --

| Plastic Limits | |
|----------------|--|
|----------------|--|

| Mass of Wet Pan and Soil (g): | 7.46 | 7.41 |
|-------------------------------|------|------|
| Mass of Dry Pan and Soil (g): | 6.44 | 6.41 |
| Mass of Pan (g): | 1.17 | 1.15 |
| | | |

Moisture (%)

19.4

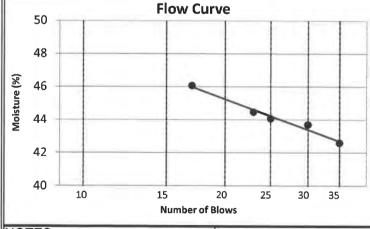
19.0

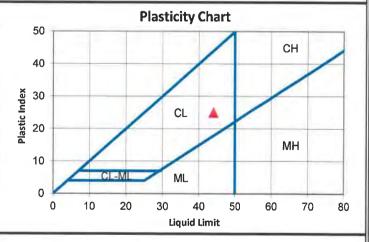
Liquid Limits

| Number of Blows | 17 | 23 | 25 | 30 | 35 |
|-------------------------------|-------|-------|-------|-------|-------|
| Mass of Wet Pan and Soil (g): | 14.02 | 12.68 | 12.69 | 11.89 | 12.98 |
| Mass of Dry Pan and Soil (g): | 9.95 | 9.13 | 9.15 | 8.61 | 9.44 |
| Mass of Pan (g): | 1.13 | 1.14 | 1.13 | 1.11 | 1.13 |
| Moisture (%) | 46.1 | 44.5 | 44.1 | 43.7 | 42.6 |

Plastic Index

| Plastic Limit: | 19 | Atterberg Classification: | CL |
|----------------|----|---------------------------|----|
| Liquid Limit: | 44 | Method: | Α |
| Plastic Index: | 25 | | |





NOTES

Data entry by:

Checked by:

TAE 26

2679148__Atterberg ASTM D4318_4.xism

Date: 3/17/2020 Date: 3/18/20



CLIENT **RJH Consultants** BORING NO. B-212 JOB NO. 2679-148 DEPTH 0-3.41 PROJECT South Boulder Creek - Phase II SAMPLE NO. S-2 & S-3 PROJECT NO. 16134 DATE SAMPLED 02/19/20 LOCATION SAMPLED BY DATE TESTED 03/20/20 DESCRIPTION --TECHNICIAN **ALH Plastic Limits** Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g): Moisture (%) Non-Plastic **Liquid Limits** Number of Blows Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g): Moisture (%) Corrected Moisture (%) Non-Plastic Plastic Index Plastic Limit: Atterberg Classification: NP Liquid Limit: Method: Α Plastic Index: Flow Curve **Plasticity Chart** 40 50 CH 38 40 Moisture (%) 36 Plastic Index 30 CL 34 20 МН 32 10 ML 30 10 20 30 40 50 60 70 80 **Number of Blows** Liquid Limit NOTES Data entry by: TAF Date: 3/20/2020 Checked by: CHL Date: <u>3/23/2020</u> File name: 2679148 _Atterberg ASTM D4318_8.xlsm



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

03/17/20

DATE TESTED TECHNICIAN

ALH

BORING NO.

B-212

DEPTH

0-10.2'

SAMPLE NO.

BU-1

DATE SAMPLED 02/19/20

SAMPLED BY

DESCRIPTION --

Plastic Limits

| | Mass of Wet Pan and Soil (g): | |
|---|-------------------------------|--|
| ı | Mass of Dry Pan and Soil (g): | |

8.76 7.75 1.11 8.81 7.82 1.15

Mass of Pan (g):

Moisture (%)

15.2

14.9

Liquid Limits

| ı | Number of Blows |
|---|---|
| ı | Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): |
| ı | Mass of Dry Pan and Soil (g): |
| 1 | Mass of Day (a) |

16.04 13.13

19

21 14.14 11.62

28 13.01 10.78

33 14.46 12.03

∥Mass of Pan (g):

1.10

1.12

1.12

1.18

Moisture (%)

24.2

23.0

22.4

CL

Plastic Index

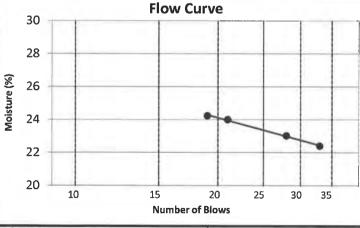
24.0

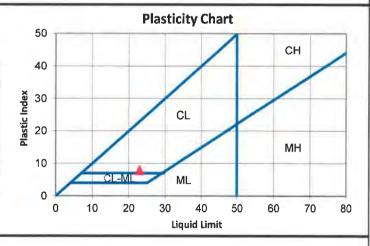
| Plastic Limit: | 15 |
|----------------|----|
| Liquid Limit: | 23 |
| Plastic Index: | 8 |

Atterberg Classification:

Method:

Α





NOTES

Data entry by: Checked by:

2679148

Atterberg ASTM D4318 5.xlsm

Date:

3/18/2020

3/18/20 Date:



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED 04/08/20 **BDF**

TECHNICIAN

BORING NO.

B-212

DEPTH

13.5-14.1'

SAMPLE NO.

NQ-1

DATE SAMPLED 02/20/20

SAMPLED BY

DESCRIPTION --

Plastic Limits

| -1 | | |
|----|-------------------------------|--|
| ı | Mass of Wet Pan and Soil (g): | |
| ı | Mass of Dry Pan and Soil (g): | |
| I | Mass of Pan (g): | |

8.03 7.09 1.14 7.91 7.00 1.15

Moisture (%)

15.8

15.6

Liquid Limits

| ı | Number of Blows |
|---|--|
| I | Mass of Wet Pan and Soil (g): |
| I | Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Pan (g): |
| ı | Mass of Pan (a) |

15 13.40 10.20 1.14

22 11.27 8.64 1.13

10.31 7.94 1.13

34

Moisture (%)

35.3

34.9

34.8

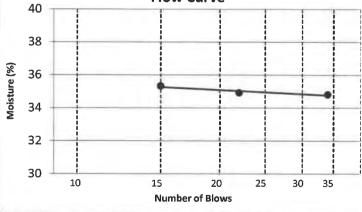
Plastic Index

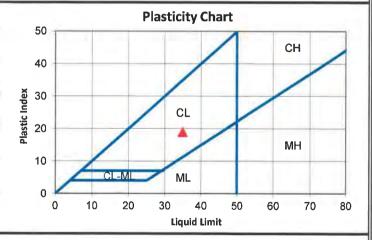
| Plastic | Limit: | 16 |
|---------|--------|----|
| Liquid | Limit: | 35 |

Plastic Index: 19 Atterberg Classification: CL

Method: Α







NOTES

Data entry by: Checked by:

CAL

KMS

2679148__Atterberg ASTM D4318_23.xlsm

Date:

4/9/2020

4/10/20 Date:



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED

TECHNICIAN

03/19/20

ALH

BORING NO.

B-213

DEPTH

5.5-6.5 S-4

SAMPLE NO.

DATE SAMPLED 02/12/20

SAMPLED BY

DESCRIPTION --

Plastic Limits

| Mass of Wet Pan and Soil (g): | 7.5 |
|-------------------------------|-----|
| Mass of Dry Pan and Soil (g): | 6. |
| Mass of Pan (g): | 0.9 |

50 15 0.97 7.78 6.45 1.17

Moisture (%)

25.9

25.1

Liquid Limits

| | Number of Blows |
|---|--|
| | Number of Blows Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): Mass of Ban (g): |
| | Mass of Dry Pan and Soil (g): |
| ١ | Moss of Don (a): |

9.21 5.58

19

22 8.12 5.00

31 8.99 5.50

|Mass of Pan (g):

Moisture (%)

1.14

1.13

1.08

80.9 81.6

79.1

Plastic Index

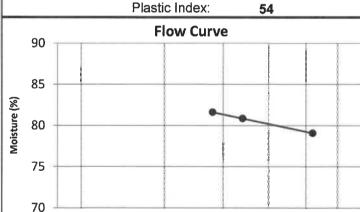
| Plastic | Limit: | 26 |
|---------|--------|----|
| Liquid | Limit: | 80 |

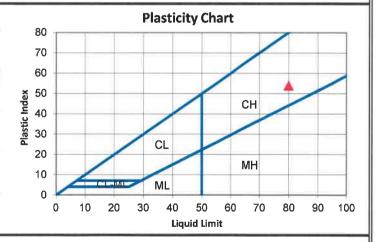
54

Atterberg Classification:

Method:

CH Α





NOTES

Data entry by: Checked by:

TAF

CAL

2679148_ _Atterberg ASTM D4318_10.xlsm

Number of Blows

Date:

3/20/2020

Date: 3/23/2020



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED 03/20/20 TECHNICIAN ALH/TAF BORING NO.

B-213

DEPTH

10-11.11'

SAMPLE NO. S-6

DATE SAMPLED 02/12/20

SAMPLED BY

DESCRIPTION --

| P | lastic | Limits | |
|---|--------|--------|--|
| | | | |

| Mass of Wet Pan and Soil (g): | 6.48 | 7.56 | 6.40 | 6.62 |
|-------------------------------|------|------|------|------|
| Mass of Dry Pan and Soil (g): | 5.65 | 6.54 | 5.59 | 5.81 |
| Mass of Pan (g): | 1.33 | 1.13 | 1.15 | 1.32 |

Moisture (%)

19.0

18.8

18.3

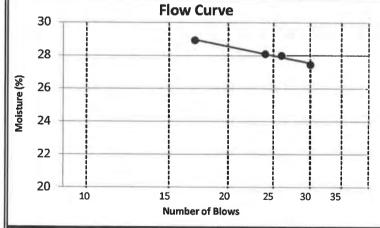
18.1

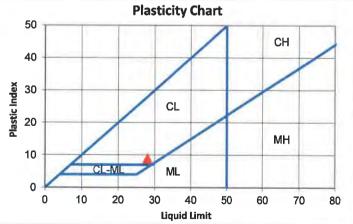
Liquid Limits

| Number of Blows | 17 | 24 | 26 | 20 |
|-------------------------------|-------|----------------|-------|------|
| II . | ''' | - - | | 30 |
| Mass of Wet Pan and Soil (g): | 11.56 | 10.55 | 10.04 | 9.26 |
| Mass of Dry Pan and Soil (g): | 9.22 | 8.48 | 8.09 | 7.52 |
| Mass of Pan (g): | 1.14 | 1.12 | 1.14 | 1.17 |
| Moisture (%) | 28.9 | 28.1 | 28.0 | 27.5 |

Plastic Index

| Plastic Limit: | 19 | Atterberg Classification: | CL |
|----------------|----|---------------------------|----|
| Liquid Limit: | 28 | Method: | Α |
| Plastic Indev | 0 | | |





NOTES

Data entry by: TAF

<u>CAL.</u> 2679148_

Atterberg ASTM D4318_13.xlsm

Date:

3/23/2020

Date: <u>3/23/2020</u>

Checked by:



ADVANCED TERRA TESTING

CLIENT RJH Consultants

JOB NO. 2679-152

PROJECT South Boulder Creek - Phase II Geotechnical Investigation

2679152__Atterberg ASTM D4318_2.xlsm

PROJECT NO. 16134

LOCATION --

DATE TESTED 06/24/20

BORING NO. B-215 DEPTH 4.4-5' SAMPLE NO. CA-5

DATE SAMPLED 05/26/20

SAMPLED BY -- DESCRIPTION --

| | | Plastic Limits | | | |
|-------------------------------|----------|---|---------------------|---------------|---------|
| Mass of Wet Pan and Soil (g): | 7.59 | 7.61 | | | |
| Mass of Dry Pan and Soil (g): | 6.75 | 6.76 | | | |
| Mass of Pan (g): | 1.16 | 1.12 | | | |
| Moisture (%) | 15.0 | 15.0 | | | |
| | | Liquid Limits | | | |
| Number of Blows | 18 | 22 | 24 | 32 | |
| Mass of Wet Pan and Soil (g): | 9.65 | 10.50 | 10.86 | 10.67 | |
| Mass of Dry Pan and Soil (g): | 7.14 | 7.78 | 8.04 | 7.96 | |
| Mass of Pan (g): | 1.15 | 1.13 | 1.15 | 1.15 | |
| Moisture (%) | 42.0 | 40.9 | 40.9 | 39.7 | |
| | | Plastic Index | | | |
| Plastic Limit: | 15 | Atterb | erg Classification: | CL | |
| Liquid Limit: | 41 | | Method: | Α | |
| Plastic Index: | 26 | | | | |
| Flow Curv | ve . | 50 | Plas | sticity Chart | |
| 30 | | 30 | | | СН |
| | | 40 | | | / |
| 45 | | | | | |
| 8 | | ⊕ 30 - | | | |
| ਬੂ 40 | | 트 | | CL A | |
| Moisture (%) | | 9 30 - 20 - 20 - 20 - 20 - 20 - 20 - 20 - | | | |
| 35 | | | | | MH |
| | | 10 | CL-ML | ML | |
| 30 | | 0 | | IVIL | |
| 10 15 | 20 25 30 | 35 | 10 20 3 | 30 40 50 | 60 70 8 |
| Number of B | lows | | | Liquid Limit | |
| NOTES | | | | | |
| | | | | | |
| | | | | | |
| Data entry by: CAL | | Date: | 6/25/2020 | | |



CLIENT

RJH Consultants

JOB NO.

2679-152

PROJECT

South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO.

16134

BDF

LOCATION

DATE TESTED 07/01/20

TECHNICIAN

BORING NO.

B-215

DEPTH

5.7-6'

SAMPLE NO. CA-6

DATE SAMPLED 05/26/20

SAMPLED BY

DESCRIPTION

| P | astic | : Lim | its |
|---|-------|-------|-----|
| | | | |

| 7.70 | 7.51 |
|------|------|
| 6.80 | 6.67 |
| 1.13 | 1.14 |
| | 6.80 |

Moisture (%)

15.9

15.2

Liquid Limits

| Number of Blows | 17 | 22 | 28 | 30 |
|-------------------------------|------|------|------|-------|
| Mass of Wet Pan and Soil (g): | 9.85 | 9.69 | 7.57 | 10.45 |
| Mass of Dry Pan and Soil (g): | 7.03 | 7.01 | 5.61 | 7.59 |
| Mass of Pan (g): | 1.07 | 1.16 | 1.19 | 1.14 |
| Moisture (%) | 47.4 | 45.9 | 44.5 | 44.3 |

Moisture (%)

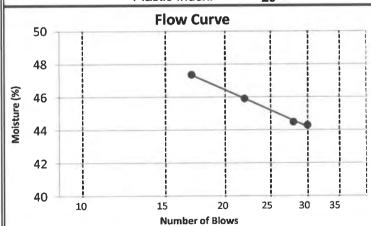
Plastic Index

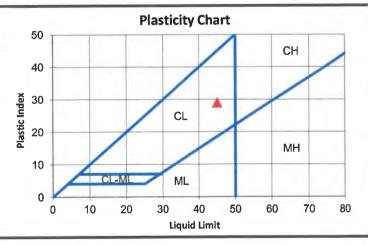
Plastic Limit: 16 45

Liquid Limit: Plastic Index: 29 Atterberg Classification:

Method:

CL Α





NOTES

Data entry by:

Checked by:

File name:

CAL

al 26

Atterberg ASTM D4318_6.xlsm 2679152

Date:

7/2/2020

Date: 7/2/20



CLIENT

RJH Consultants

JOB NO.

2679-152

PROJECT

South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO.

16134

LOCATION DATE TESTED

06/25/20

TECHNICIAN

CAL

BORING NO.

B-215

NQ-2

DEPTH

19.4-19.9'

SAMPLE NO.

DATE SAMPLED --

SAMPLED BY

DESCRIPTION --

| Plastic Limits |
|----------------|
| |

| Mass of Wet Pan and Soil (g): Mass of Dry Pan and Soil (g): | 6.60 |
|---|------|
| Mass of Dry Pan and Soil (g): | 5.79 |
| Macc of Pan (a): | 1 15 |

|Mass of Pan (g):

Moisture (%)

17.5

1.17 17.1

6.95 6.10

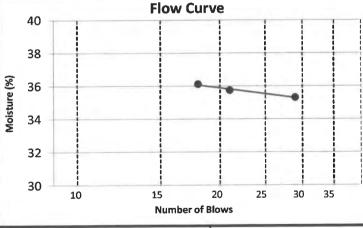
Liquid Limits

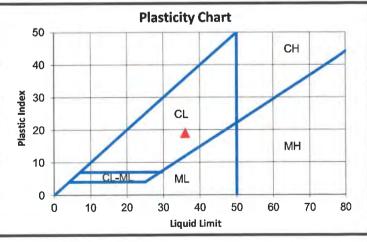
| Number of Blows | 18 | 21 | 29 |
|-------------------------------|------|-------|------|
| Mass of Wet Pan and Soil (g): | 8.96 | 10.01 | 9.09 |
| Mass of Dry Pan and Soil (g): | 6.89 | 7.67 | 7.01 |
| Mass of Pan (g): | 1.14 | 1.10 | 1.12 |
| Moisture (%) | 36.1 | 35.7 | 35.3 |

Moisture (%)

Plastic Index

| Plastic Limit: | 17 | Atterberg Classification: | CL |
|----------------|----|---------------------------|----|
| Liquid Limit: | 36 | Method: | Α |
| Plastic Index: | 19 | | |





NOTES

BDF Data entry by: Checked by:

KMS

2679152 Atterberg ASTM D4318_4.xlsm Date: Date: 6 6/26/2020



CLIENT **RJH Consultants** BORING NO. B-217(P) JOB NO. 2679-168 DEPTH 20-21.5' PROJECT South Boulder Creek Phase II SAMPLE NO. S-8 PROJECT NO. 16134 DATE SAMPLED 08/27/21 LOCATION SAMPLED BY DATE TESTED 02/08/22 DESCRIPTION TECHNICIAN MM **Plastic Limits** Mass of Wet Pan and Soil (g): 25.79 27.82 Mass of Dry Pan and Soil (g): 26.37 24.66 Mass of Pan (g): 18.61 18.62 Moisture (%) 18.7 18.6 **Liquid Limits** Number of Blows 23 35 15 Mass of Wet Pan and Soil (g): 27.59 26.64 28.15 Mass of Dry Pan and Soil (g): 23.79 23.24 24.32 Mass of Pan (g): 18.74 18.50 18.44 Moisture (%) 75.3 71.7 65.2 Plastic Index Plastic Limit: 19 Atterberg Classification: СН Liquid Limit: 70 Method: Α Plastic Index: 51 **Plasticity Chart Flow Curve** 80 55 45 75 35 Moisture (%) Plastic Index 70 25

Data entry by: MM Date: 02/09/22 Checked by: JJA Date: 02/09/22

15

5

MH

ML

Liquid Limit

File name: 2679168 Atterberg ASTM D4318 0.xlsm

20

Number of Blows

25

30

65

60

NOTES



CLIENT RJH Consultants BORING NO. B-217(P)

JOB NO. 2679-168 DEPTH 27.5-29'

PROJECT South Boulder Creek Phase II SAMPLE NO. S-13

PROJECT NO. 16134 DATE SAMPLED 08/27/21

LOCATION -- SAMPLED BY -DATE TESTED 02/09/22 DESCRIPTION --

TECHNICIAN JL

| | | Plastic Limits | | |
|-------------------------------|-------|----------------|-------|--|
| Mass of Wet Pan and Soil (g): | 28.10 | 26.58 | | |
| Mass of Dry Pan and Soil (g): | 26.75 | 25.30 | | |
| Mass of Pan (g): | 18.75 | 17.65 | | |
| Moisture (%) | 16.9 | 16.8 | | |
| | 1 | Liquid Limits | | |
| Number of Blows | 19 | 27 | 35 | |
| Mass of Wet Pan and Soil (g): | 28.96 | 28.06 | 28.67 | |
| Mass of Dry Pan and Soil (g): | 26.75 | 25.94 | 26.66 | |
| Mass of Pan (g): | 18.51 | 17.73 | 18.68 | |

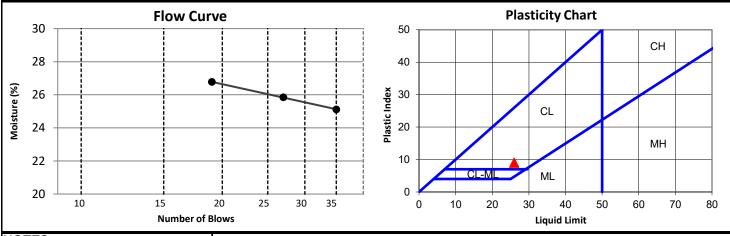
25.8

25.1

Plastic Index

Plastic Limit: 17 Atterberg Classification: CL
Liquid Limit: 26 Method: A
Plastic Index: 9

26.8



NOTES

Moisture (%)

Data entry by: AR Date: 02/10/22 Checked by: JJA Date: 02/10/22

File name: 2679168__Atterberg ASTM D4318_2.xlsm

Appendix J.1 50 of 262



CLIENT RJH Consultants BORING NO. B-218

JOB NO. 2679-168 DEPTH 5.5-10'

PROJECT South Boulder Creek Phase II SAMPLE NO. C-4

PROJECT South Boulder Creek Phase II SAMPLE NO. C-4
PROJECT NO. 16134 DATE SAMPLED 08/26/21

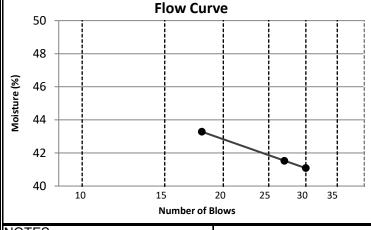
LOCATION -- SAMPLED BY DATE TESTED 02/08/22 DESCRIPTION --

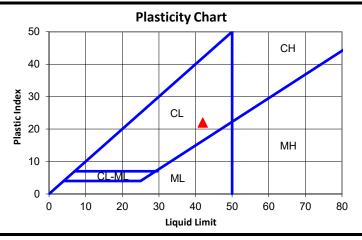
TECHNICIAN AR

| Plastic Limits | | | | | |
|-------------------------------|-------|-------|--|--|--|
| Marca (IVA) | 05.04 | 05.55 | | | |
| Mass of Wet Pan and Soil (g): | 25.64 | 25.55 | | | |
| Mass of Dry Pan and Soil (g): | 24.45 | 24.41 | | | |
| Mass of Pan (g): | 18.47 | 18.68 | | | |
| | | | | | |
| Moisture (%) | 20.0 | 19.8 | | | |

| Liquid Limits | | | | |
|-------------------------------|-------|-------|-------|--|
| Number of Blows | 18 | 27 | 30 | |
| Mass of Wet Pan and Soil (g): | 27.77 | 27.78 | 30.12 | |
| Mass of Dry Pan and Soil (g): | 24.92 | 25.04 | 26.81 | |
| Mass of Pan (g): | 18.34 | 18.45 | 18.74 | |
| Moisture (%) | 43.3 | 41.5 | 41.1 | |

| | Plastic index | | |
|----------------|---------------|---------------------------|----|
| Plastic Limit: | 20 | Atterberg Classification: | CL |
| Liquid Limit: | 42 | Method: | Α |
| Plastic Index: | 22 | | |





NOTES

Data entry by: AR Date: 02/09/22 Checked by: JJA Date: 02/09/22

File name: 2679168__Atterberg ASTM D4318_1.xlsm

Appendix J.1 51 of 262



CLIENT RJH Consultants BORING NO. TP-204

JOB NO. 2679-168 DEPTH 7.5-12'

PROJECT South Boulder Creek Phase II SAMPLE NO. Bu-2

PROJECT NO. 16134 DATE SAMPLED 12/14/21

LOCATION -- SAMPLED BY -- DATE TESTED 02/14/22 DESCRIPTION --

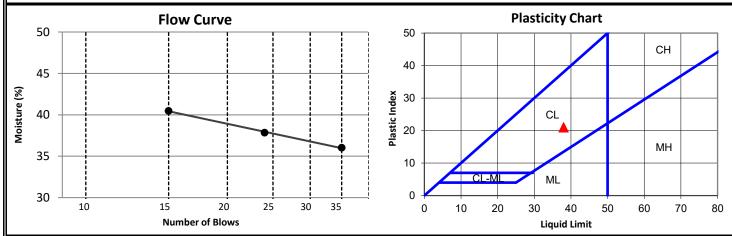
TECHNICIAN MM

| | | Plastic Limits | | |
|-------------------------------|-------|----------------|----|--|
| Mass of Wet Pan and Soil (g): | 26.62 | 26.35 | | |
| Mass of Dry Pan and Soil (g): | 25.45 | 25.23 | | |
| Mass of Pan (g): | 18.67 | 18.59 | | |
| Moisture (%) | 17.2 | 17.0 | | |
| | | Liquid Limits | | |
| Number of Blows | 15 | 24 | 35 | |

| 18.63 | 18.46 | 18.75 | |
|-------|----------------|----------------------------|--|
| | | 40 == | |
| 25.72 | 26.10 | 25.84 | |
| 28.59 | 28.99 | 28.40 | |
| 15 | 24 | 35 | |
| | 28.59 25.72 | 28.59 28.99 25.72 26.10 | 28.59 28.99 28.40 25.72 26.10 25.84 |

Plastic Index

Plastic Limit: 17 Atterberg Classification: CL
Liquid Limit: 38 Method: A
Plastic Index: 21



NOTES

Data entry by: JJA Date: 02/15/22 Checked by: MM Date: 02/15/22

File name: 2679168_Atterberg ASTM D4318_3.xlsm

Appendix J.1 52 of 262



CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217(P)

JOB NO. 2679-168 DEPTH 0-15'
PROJECT South Boulder Creek Phase II SAMPLE NO. Composite

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY -DATE TESTED 02/24/22 DESCRIPTION --

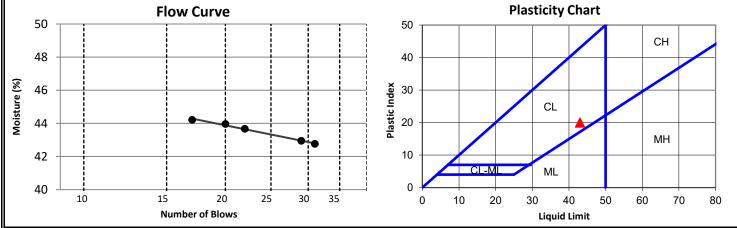
TECHNICIAN JL

| Plastic Limits | | | | | |
|-------------------------------|---------------|-------|--|--|--|
| Mass of Wet Pan and Soil (g): | 25.09 | 25.26 | | | |
| Mass of Dry Pan and Soil (g): | 23.85 | 24.04 | | | |
| Mass of Pan (g): | 18.47 | 18.73 | | | |
| Moisture (%) | 23.0 | 22.9 | | | |
| | Liquid Limits | | | | |

| | | Liquid Limits | | | |
|-------------------------------|-------|---------------|-------|-------|-------|
| Number of Blows | 17 | 20 | 22 | 29 | 31 |
| Mass of Wet Pan and Soil (g): | 26.50 | 26.41 | 26.85 | 26.44 | 26.65 |
| Mass of Dry Pan and Soil (g): | 24.00 | 23.97 | 24.26 | 24.09 | 24.16 |
| Mass of Pan (g): | 18.35 | 18.43 | 18.34 | 18.60 | 18.34 |
| Moisture (%) | 44.2 | 44.0 | 43.7 | 43.0 | 42.8 |

Plactic Index

| | | i lastic illacx | |
|----------------|----|---------------------------|----|
| Plastic Limit: | 23 | Atterberg Classification: | CL |
| Liquid Limit: | 43 | Method: | Α |
| Plastic Index: | 20 | | |



NOTES

Data entry by: JJA Date: 02/25/22 Checked by: MM Date: 02/25/22

File name: 2679168__Atterberg ASTM D4318_4.xlsm

Appendix J.1 53 of 262

Atterberg Limits, Method B ASTM D 4318

Appendix J.1 54 of 262



Atterberg Limits, Method B **ASTM D 4318**

CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/26/20

TECHNICIAN CAL BORING NO.

B-202

DEPTH

5.4-5.7'

SAMPLE NO.

CA-3 DATE SAMPLED 02/03/20

SAMPLED BY

DESCRIPTION --

| Р | lastic | Limits | Π |
|---|--------|--------|---|
| | | | |

| Mass of Wet Pan and Soil (g): | 6.72 | 7.80 |
|-------------------------------|------|------|
| Mass of Dry Pan and Soil (g): | 5.79 | 6.68 |
| Mass of Pan (g): | 1.18 | 1.10 |
| II . | | |

Moisture (%) 20.3 20.1

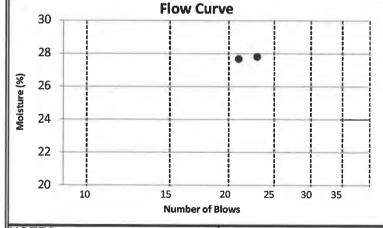
Liquid Limits

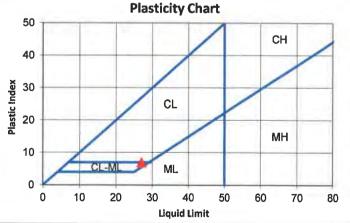
| II . | | |
|-------------------------------|-------|-------|
| Number of Blows | 21 | 23 |
| Mass of Wet Pan and Soil (g): | 10.94 | 12.78 |
| Mass of Dry Pan and Soil (g): | 8.82 | 10.24 |
| Mass of Pan (g): | 1.16 | 1.11 |
| II . | | |

Moisture (%) 27.7 27.8 Corrected Moisture (%) 27.1 27.5

Plastic Index

| Plastic Limit: | 20 | Atterberg Classification: | CL |
|----------------|----|---------------------------|----|
| Liquid Limit: | 27 | Method: | В |
| Plastic Index: | 7 | | |





NOTES

Data entry by: TAF

Checked by: File name:

CAL

2679148 Atterberg ASTM D4318_19.xlsm Date:

3/28/2020

Date: 3/28/2020



Atterberg Limits, Method B ASTM D 4318

ADVANCED TERRA TESTING

CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION --

DATE TESTED 03/26/20

TECHNICIAN ALH

BORING NO.

B-203

DEPTH

8.2-8.5'

SAMPLE NO. CA-4

DATE SAMPLED 02/07/20

SAMPLED BY

DESCRIPTION --

| Р | lastic | Limits | |
|---|--------|--------|--|

| Mass of Wet Pan and Soil (g): | 7.86 | 7.72 |
|-------------------------------|------|------|
| Mass of Dry Pan and Soil (g): | 6.54 | 6.44 |
| Mass of Pan (g): | 1.14 | 1.17 |
| | | |

Moisture (%) 24.6 24.3

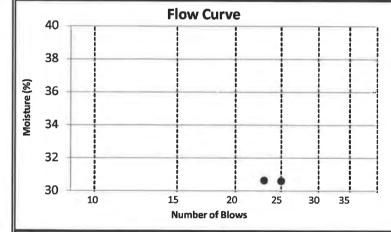
Liquid Limits

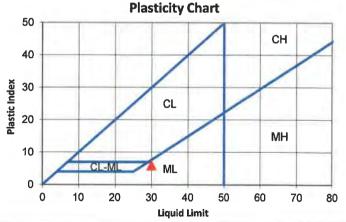
| Number of Blows | 23 | 25 |
|-------------------------------|------|-------|
| Mass of Wet Pan and Soil (g): | 9.63 | 11.81 |
| Mass of Dry Pan and Soil (g): | 7.64 | 9.31 |
| Mass of Pan (g): | 1.14 | 1.14 |
| | | |
| | | |

Moisture (%) 30.6 30.6 Corrected Moisture (%) 30.3 30.6

Plastic Index

| | | · Idollo Illdox | |
|----------------|----|---------------------------|----|
| Plastic Limit: | 24 | Atterberg Classification: | ML |
| Liquid Limit: | 30 | Method: | В |
| Plastic Index: | 6 | | |





NOTES

Data entry by: TAF

Checked by: eAc

Date:

3/28/2020

Date: _

3/28/2020

Appendix J.1 57 of 262



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

DATE TESTED 04/13/20 TECHNICIAN WAR

BORING NO.

B-202

NQ-2

DEPTH

21.6-22.2

SAMPLE NO.

DATE SAMPLED ---

DESCRIPTION --

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 263.49

Mass Dry Pan and Soil (g): 263.49

Mass of Pan (g): 183.27

Moisture (%): 0.0

Sample Data

Total Wet Mass of Sample (g): 80.2

Total Dry Mass of Sample (g): 80.2

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| #4 | 4.75 | 0.0 | | 0.3 | | 100.0 |
| #200 | 0.075 | 183.6 | 183.3 | | 1.00 | 99.6 |

USCS Classification ASTM D 2487

Atterberg Classification: --

Group Symbol: --

USCS Classification: --

NOTES

Data entry by: Checked by:

CAL

Date:

4/14/2020

KMS

2679148 Percent Minus #200 ASTM D1140_5.xls

Date:



CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 1 LOCATION -

16134

DATE TESTED 03/26/20 TECHNICIAN TAF BORING NO.

B-203

DEPTH 15.8-16.3'

SAMPLE NO. NQ-2

DATE SAMPLED 02/10/20

DESCRIPTION --

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 534.86

Mass Dry Pan and Soil (g): 490.38

Mass of Pan (g): 173.69 Moisture (%): **14.0** Sample Data

Total Wet Mass of Sample (g): 361.2

Total Dry Mass of Sample (g): 316.7

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| #4 | 4.75 | 0.0 | 0.0 | | | 100.0 |
| #200 | 0.075 | 185.4 | 173.7 | 11.8 | 1.00 | 96.3 |

USCS Classification ASTM D 2487

Atterberg Classification: CL

Group Symbol: CL

USCS Classification: Lean Clay

NOTES

Data entry by: TAF/CAL Checked by:

Date:

4/5/2020

File name:



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/25/20 TECHNICIAN CT

BORING NO.

B-204

DEPTH

26.4-27

SAMPLE NO. NQ-2

DATE SAMPLED 01/28/20

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 24.87 Mass Dry Pan and Soil (g): 23.51

Mass of Pan (g): 1.74

Moisture (%): 6.3

Sample Data

Total Wet Mass of Sample (g): 127.1 Total Dry Mass of Sample (g): 119.6

Split Fraction: #10

Mass of Sub-Sample Fraction (g): 127.05

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| #4 | 4.75 | 0.0 | | | | |
| #200 | 0.075 | 169.2 | 164.0 | 5.2 | 1.00 | 95.7 |

USCS Classification ASTM D 2487

Atterberg Classification: CL

Group Symbol: CL

USCS Classification: Lean Clay

NOTES

Data entry by: Checked by:

File name:

Date: 3/29/2020 Date: 3/31/20

2679148__Percent Minus #200 ASTM D1140_2.xls



CLIENT RJH Consultants

JOB NO. 2679-152

PROJECT South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO. 16134 LOCATION --

DATE TESTED 07/06/20 TECHNICIAN WAR BORING NO.

B-207

DEPTH 16.3-16.9'

SAMPLE NO. NQ 2 DATE SAMPLED --

DESCRIPTION --

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 204.49
Mass Dry Pan and Soil (g): 202.78
Mass of Pan (g): 127.84

Mass of Pan (g): 137.84 Moisture (%): 2.6 **Sample Data**

Total Wet Mass of Sample (g): 66.7

Total Dry Mass of Sample (g): 64.9

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| #4 | 4.75 | 0.0 | | | | 100.0 |
| #200 | 0.075 | 138.9 | 137.8 | 1.0 | 1.00 | 98.4 |

USCS Classification ASTM D 2487

Atterberg Classification: CL Group Symbol: CL

USCS Classification: Lean Clay

NOTES

Data entry by: CAL Date: 7/8/2020
Checked by: KM5 Date: 7/8/2020

File name: 2679152_Percent Minus #200 ASTM D1140_1.xls



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED 03/28/20 TECHNICIAN **TAF**

BORING NO.

B-209

DEPTH

11.3-11.8'

SAMPLE NO.

NQ-2 DATE SAMPLED 01/22/20

DESCRIPTION Shale

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 209.80

Mass Dry Pan and Soil (g): 205.18

Mass of Pan (g): 118.91

Moisture (%): 5.4

Sample Data

Total Wet Mass of Sample (g): 292.3

Total Dry Mass of Sample (g): 277.5

Split Fraction: #10

Mass of Sub-Sample Fraction (g): 90.90

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| #4 | 4.75 | 0.0 | | _ | | |
| #200 | 0.075 | 131.6 | 118.9 | 12.7 | 1.00 | 85.3 |

USCS Classification ASTM D 2487

Atterberg Classification: CL

Group Symbol: CL

USCS Classification: Lean Clay

NOTES

Data entry by:

ALH

Date:

3/31/2020

Checked by: File name:

mum

Date: 4/4/20

2679148__Percent Minus #200 ASTM D1140_3.xls



ADVANCED TERRA TESTING

CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 04/09/20 TECHNICIAN ALH

BORING NO.

B-212

DEPTH 13.5-14.1'

SAMPLE NO. NQ-1

DATE SAMPLED 02/20/20

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 425.97 Mass Dry Pan and Soil (g): 420.88

Mass of Pan (g): 171.76

Moisture (%): 2.0

Sample Data

Total Wet Mass of Sample (g): 494.2 Total Dry Mass of Sample (g): 484.3

Split Fraction: #4

Mass of Sub-Sample Fraction (g): 154.21

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| #4 | 4.75 | 0.0 | | | | |
| #200 | 0.075 | 184.2 | 171.8 | 12.4 | 1.00 | 91.8 |

USCS Classification ASTM D 2487

Atterberg Classification: CL

Group Symbol: CL

USCS Classification: Lean Clay

NOTES

Data entry by:

KMS

Date:

4/10/2020

Checked by:

·MM2

Date: 4/10

File name:

2679148 Percent Minus #200 ASTM D1140 4.xls



RJH Consultants CLIENT

2679-152

BORING NO.

B-215

JOB NO. PROJECT

DEPTH 19.4-19.9

South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. NQ-2

PROJECT NO.

16134

DATE SAMPLED --

LOCATION

DESCRIPTION --

DATE TESTED TECHNICIAN

06/27/20 TAF

Hygroscopic Moisture

Sample Data

Mass Wet Pan and Soil (g): 340.18 Mass Dry Pan and Soil (g): 332.93 Total Wet Mass of Sample (g): 200.6 Total Dry Mass of Sample (g): 193.4

Mass of Pan (g): 139.56

Moisture (%): 3.7

Mass of Correction Percent Passing Mass of Pan and Mass of Pan (g) Individual Sieve Size (mm) Sieve Number by Weight (%) Factor Soil (a) Retained Soil (g) 100.0 #4 0.0

#200

4.75 0.075

142.0

139.6

2.5

1.00

98.7

USCS Classification ASTM D 2487

Atterberg Classification: CL

Group Symbol: CL

USCS Classification: Lean Clay

NOTES

Data entry by: Checked by:

Date:

Date:

6/30/2020

File name:

Percent Minus #200 ASTM D1140_0.xls

Grain Size Analysis ASTM D 6913 and CDOT CP21

Appendix J.1 65 of 262



CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION --

DATE TESTED 03/12/20 TECHNICIAN ALH BORING NO. B-201

DEPTH 5-7.9'

SAMPLE NO. D-3 & CA-4

DATE SAMPLED 02/17/20

DESCRIPTION --

Hygroscopic Moisture

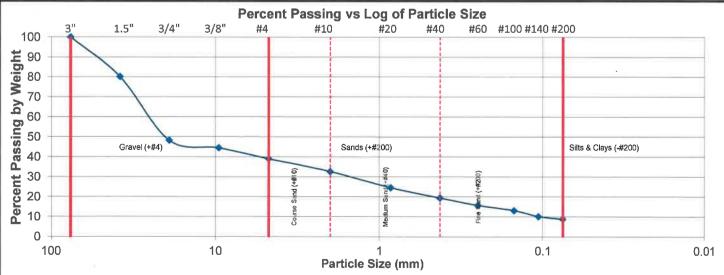
Mass Wet Pan and Soil (g): 714.86 Mass Dry Pan and Soil (g): 696.08

> Mass of Pan (g): 123.50 Moisture (%): **3.3**

Sample Data

Total Wet Mass of Sample (g): 591.4 Total Dry Mass of Sample (g): 572.6

| | | | | | | 7 |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | 0.0 | | | |
| 1.5" | 38.1 | 113.5 | 0.0 | 113.5 | 1.00 | 80.2 |
| 3/4" | 19.05 | 183.1 | 0.0 | 183.1 | 1.00 | 48.2 |
| 3/8" | 9.53 | 21.6 | 0.0 | 21.6 | 1.00 | 44.4 |
| #4 | 4.75 | 31.0 | 0.0 | 31.0 | 1.00 | 39.0 |
| #10 | 2.00 | 36.9 | 0.0 | 36.9 | 1.00 | 32.6 |
| #20 | 0.850 | 46.0 | 0.0 | 46.0 | 1.00 | 24.5 |
| #40 | 0.425 | 29.5 | 0.0 | 29.5 | 1.00 | 19.4 |
| #60 | 0.250 | 20.9 | 0.0 | 20.9 | 1.00 | 15.7 |
| #100 | 0.150 | 15.3 | 0.0 | 15.3 | 1.00 | 13.1 |
| #140 | 0.106 | 16.9 | 0.0 | 16.9 | 1.00 | 10.1 |
| #200 | 0.075 | 8.0 | 0.0 | 8.0 | 1.00 | 8.7 |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - C_c: 0.99

Group Symbol: GP-GC

Coefficient of Uniformity - Cu: 251.98

USCS Classification: Poorly Graded Gravel With Clay And Sand (Or Silty Clay And Sand)

Data entry by: Checked by: al 46

Date: 3/16/2020 Date: 3/18/20

2679148__Grain Size Analysis ASTM D6913_0.xlsm



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED 03/16/20 TECHNICIAN ASF

BORING NO.

B-201

DEPTH

12.5-14

SAMPLE NO.

S-6

DATE SAMPLED 02/17/20

DESCRIPTION --

Hygroscopic Moisture

#100

#140

Mass Wet Pan and Soil (g): 871.71

Mass Dry Pan and Soil (g): 870.01

0.150

0.106

34.4

17.0

Mass of Pan (g): 171.32 Moisture (%): 0.2

Sample Data

34.4

17.0

1.00

1.00

14.3

11.9

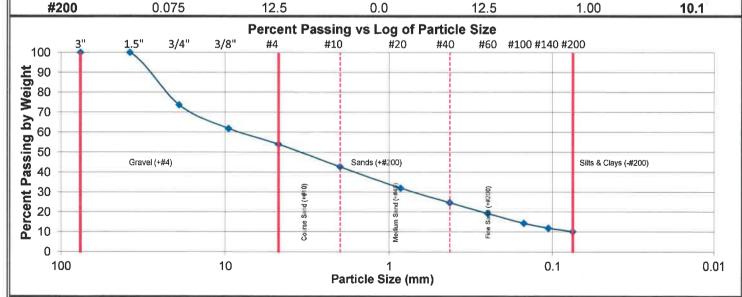
Total Wet Mass of Sample (g): 700.4

Total Dry Mass of Sample (g): 698.7

Mass of Mass of Pan and Correction Percent Passing Sieve Size (mm) Mass of Pan (q) Individua! Sieve Number Soil (g) Factor by Weight (%) Retained Soil (g) 3" 76.2 0.0 0.0 100.0 1.5" 38.1 0.0 0.0 100.0 3/4" 19.05 184.1 0.0 184.1 1.00 73.6 3/8" 9.53 82.9 0.0 82.9 1.00 61.8 #4 4.75 55.0 0.0 55.0 1.00 53.9 #10 2.00 79.0 0.0 79.0 1.00 42.6 #20 0.850 74.3 0.0 74.3 1.00 32.0 #40 0.425 51.2 0.0 51.2 24.7 1.00 #60 0.250 37.8 0.0 37.8 1.00 19.2

0.0

0.0



USCS Classification ASTM D 2487

Atterberg Classification: --

Coefficient of Curvature - C_c: 0.88

Coefficient of Uniformity - Cu: 115.37 Group Symbol: --

USCS Classification: --

Data entry by: Checked by:

TAE

3/17/2020 Date: Date: 3/18/20

2679148 Grain Size Analysis ASTM D6913 10.xlsm File name:



ADVANCED TERRA TESTING

CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED 03/26/20 TECHNICIAN TAF BORING NO.

B-202

DEPTH

5.4-5.7'

SAMPLE NO.

CA-3

DATE SAMPLED 02/03/20

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 228.07

Mass Dry Pan and Soil (g): 227.37

Mass of Pan (g): 123.50

Moisture (%): 0.7

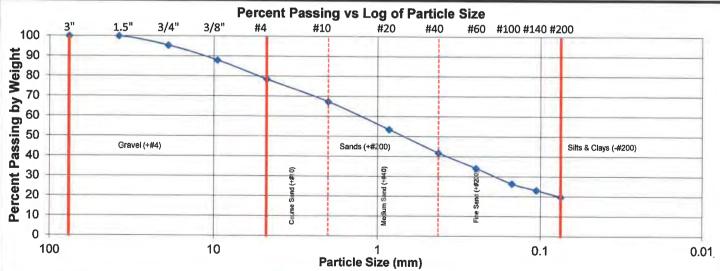
Sample Data

Total Wet Mass of Sample (g): 270.1 Total Dry Mass of Sample (g): 268.7

Split Fraction: #4

Mass of Sub-Sample Fraction (g): 104.56

| Mass of out-sample Fraction (g). 104.50 | | | | | | |
|---|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 12.4 | 0.0 | 12.4 | 1.00 | 95.4 |
| 3/8" | 9.53 | 19.7 | 0.0 | 19.7 | 1.00 | 88.0 |
| #4 | 4.75 | 25.4 | 0.0 | 25.4 | 1.00 | 78.6 |
| #10 | 2.00 | 14.8 | 0.0 | 14.8 | 0.79 | 67.4 |
| #20 | 0.850 | 18.4 | 0.0 | 18.4 | 0.79 | 53.5 |
| #40 | 0.425 | 15.4 | 0.0 | 15.4 | 0.79 | 41.9 |
| #60 | 0.250 | 10.1 | 0.0 | 10.1 | 0.79 | 34.3 |
| #100 | 0.150 | 10.3 | 0.0 | 10.3 | 0.79 | 26.5 |
| #140 | 0.106 | 4.3 | 0.0 | 4.3 | 0.79 | 23.2 |
| #200 | 0.075 | 4.5 | 0.0 | 4.5 | 0.79 | 19.9 |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - C_c: --

Group Symbol: SC

Coefficient of Uniformity - Cu: --

USCS Classification: Clayey Sand With Gravel

Data entry by: TAF

Date:

3/28/2020

Checked by:

CAL

Date: 3/28/2020

File name:

2679148__Grain Size Analysis ASTM D6913_17.xlsm



ADVANCED TERRA TESTING

CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II.

PROJECT NO.

16134

LOCATION

DATE TESTED 03/31/20 TECHNICIAN MLM

BORING NO.

B-203

DEPTH

3.2-3.8'

SAMPLE NO. D-2 DATE SAMPLED 02/07/20

DESCRIPTION

NOTE

Sample size not to spec.

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 383.04

Mass Dry Pan and Soil (g): 377.46 Mass of Pan (g): 118.30

Moisture (%): 2.2

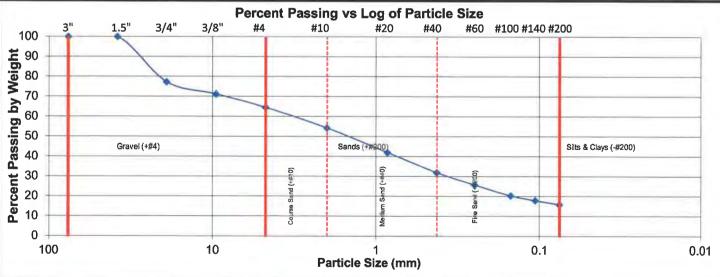
Sample Data

Total Wet Mass of Sample (g): 815.0 Total Dry Mass of Sample (g): 803.8

Split Fraction: #4

Mass of Sub-Sample Fraction (g): 264.74

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 182.2 | 0.0 | 182.2 | 1.00 | 77.3 |
| 3/8" | 9.53 | 49.0 | 0.0 | 49.0 | 1.00 | 71.2 |
| #4 | 4.75 | 53.6 | 0.0 | 53.6 | 1.00 | 64.6 |
| #10 | 2.00 | 41.1 | 0.0 | 41.1 | 0.65 | 54.3 |
| #20 | 0.850 | 49.4 | 0.0 | 49.4 | 0.65 | 42.0 |
| #40 | 0.425 | 40.4 | 0.0 | 40.4 | 0.65 | 31.9 |
| #60 | 0.250 | 24.7 | 0.0 | 24.7 | 0.65 | 25.8 |
| #100 | 0.150 | 21.7 | 0.0 | 21.7 | 0.65 | 20.4 |
| #140 | 0.106 | 9.9 | 0.0 | 9.9 | 0.65 | 17.9 |
| #200 | 0.075 | 8.2 | 0.0 | 8.2 | 0.65 | 15.9 |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - Cc: --

Group Symbol: SC Coefficient of Uniformity - Cu: --USCS Classification: Clayey Sand With Gravel

Data entry by:

TAF

Date:

4/2/2020

Checked by:

MLM

Date: 4/4/20

File name:

2679148 Grain Size Analysis ASTM D6913 18.xlsm



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/20/20 TECHNICIAN ALH

BORING NO.

B-203

DEPTH

7.9-8.2'

SAMPLE NO. CA-4

DATE SAMPLED 02/07/20

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 294.73 Mass Dry Pan and Soil (g): 294.05

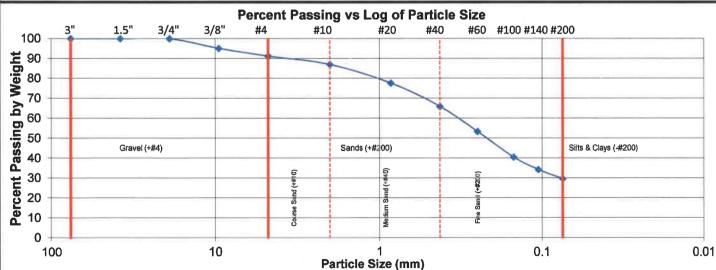
Mass of Pan (q): 172.73

Sample Data

Total Wet Mass of Sample (g): 274.2 Total Dry Mass of Sample (g): 272.8

Split Fraction: #4

| Moisture (%): 0.6 | | | Mass of Sub-Sample Fraction (g): 122.00 | | | |
|--------------------------|-----------------|-----------------------------|---|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | 0.0 | - | - | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 0.0 | 0.0 | | | 100.0 |
| 3/8" | 9.53 | 13.3 | 0.0 | 13.3 | 1.00 | 95.1 |
| #4 | 4.75 | 10.6 | 0.0 | 10.6 | 1.00 | 91.2 |
| #10 | 2.00 | 5.6 | 0.0 | 5.6 | 0.91 | 87.0 |
| #20 | 0.850 | 12.4 | 0.0 | 12.4 | 0.91 | 77.7 |
| #40 | 0.425 | 15.6 | 0.0 | 15.6 | 0.91 | 65.9 |
| #60 | 0.250 | 16.7 | 0.0 | 16.7 | 0.91 | 53.4 |
| #100 | 0.150 | 17.1 | 0.0 | 17.1 | 0.91 | 40.5 |
| #140 | 0.106 | 8.3 | 0.0 | 8.3 | 0.91 | 34.2 |
| #200 | 0.075 | 6.2 | 0.0 | 6.2 | 0.91 | 29.6 |



USCS Classification ASTM D 2487

Atterberg Classification: ML Coefficient of Curvature - Cc: --

Coefficient of Uniformity - Cu: --Group Symbol: SM

USCS Classification: Silty Sand

TAF Data entry by:

CAL

3/23/2020 Date: Date: 3/23/2020

Checked by: 2679148 Grain Size Analysis ASTM D6913_15.xlsm File name:



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/12/20

TECHNICIAN TAF BORING NO. B-204

DEPTH 5.7-6.0'

SAMPLE NO. CA-3

DATE SAMPLED 01/28/20

DESCRIPTION --

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 338.21

Mass Dry Pan and Soil (g): 329.30 Mass of Pan (g): 172.33

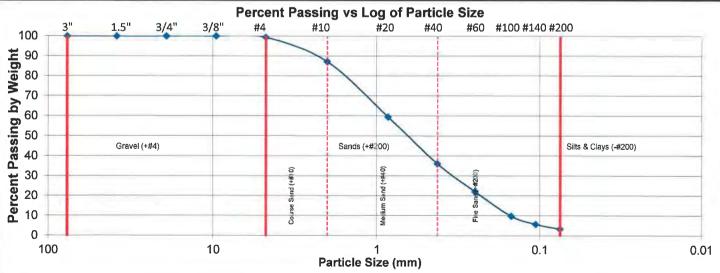
Moisture (%): 5.7

Sample Data

Total Wet Mass of Sample (g): 165.9

Total Dry Mass of Sample (g): 157.0

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | |
| 1.5" | 38.1 | 0.0 | 0.0 | | | |
| 3/4" | 19.05 | 0.0 | 0.0 | | | |
| 3/8" | 9.53 | 0.0 | 0.0 | | | 100.0 |
| #4 | 4.75 | 1.1 | 0.0 | 1.1 | 1.00 | 99.3 |
| #10 | 2.00 | 19.1 | 0.0 | 19.1 | 1.00 | 87.2 |
| #20 | 0.850 | 43.4 | 0.0 | 43.4 | 1.00 | 59.5 |
| #40 | 0.425 | 36.8 | 0.0 | 36.8 | 1.00 | 36.1 |
| #60 | 0.250 | 21.9 | 0.0 | 21.9 | 1.00 | 22.1 |
| #100 | 0.150 | 19.4 | 0.0 | 19.4 | 1.00 | 9.7 |
| #140 | 0.106 | 6.4 | 0.0 | 6.4 | 1.00 | 5.6 |
| #200 | 0.075 | 3.9 | 0.0 | 3.9 | 1.00 | 3.2 |



USCS Classification ASTM D 2487

Atterberg Classification: NP Coefficient of Curvature - Cc: 0.92

> Coefficient of Uniformity - Cu: 5.73 Group Symbol: SP

USCS Classification: Poorly Graded Sand

Data entry by:

TAF/CAL Checked by:

Date: 4/5/2020 120 Date:

File name: 2679148__Grain Size Analysis ASTM D6913_3.xlsm



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

03/12/20

LOCATION DATE TESTED

TECHNICIAN **TAF** BORING NO.

B-204

DEPTH

12.5-19'

SAMPLE NO.

S-6 To S-8

DATE SAMPLED 01/28/20

DESCRIPTION --

NOTE

Sample size not to spec.

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 1082.11 Mass Dry Pan and Soil (g): 997.12

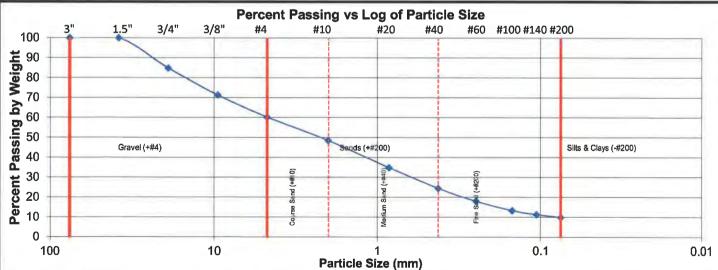
Mass of Pan (g): 173.32

Moisture (%): 10.3

Sample Data

Total Wet Mass of Sample (g): 908.8 Total Dry Mass of Sample (g): 823.8

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 124.9 | 0.0 | 124.9 | 1.00 | 84.8 |
| 3/8" | 9.53 | 110.7 | 0.0 | 110.7 | 1.00 | 71.4 |
| #4 | 4.75 | 91.7 | 0.0 | 91.7 | 1.00 | 60.3 |
| #10 | 2.00 | 96.7 | 0.0 | 96.7 | 1.00 | 48.5 |
| #20 | 0.850 | 112.0 | 0.0 | 112.0 | 1.00 | 34.9 |
| #40 | 0.425 | 86.0 | 0.0 | 86.0 | 1.00 | 24.5 |
| #60 | 0.250 | 53.1 | 0.0 | 53.1 | 1.00 | 18.0 |
| #100 | 0.150 | 38.6 | 0.0 | 38.6 | 1.00 | 13.4 |
| #140 | 0.106 | 16.6 | 0.0 | 16.6 | 1.00 | 11.3 |
| #200 | 0.075 | 11.6 | 0.0 | 11.6 | 1.00 | 9.9 |



USCS Classification ASTM D 2487

Atterberg Classification: ML

Coefficient of Curvature - C_c: 1.18

Group Symbol: SP-SM

Coefficient of Uniformity - Cu: 61.30

USCS Classification: Poorly Graded Sand With Silt And Gravel

TAF Data entry by:

CAL

Date:

3/16/2020

Checked by:

Date: 3/23/2000

File name:

2679148 Grain Size Analysis ASTM D6913 1.xlsm



CLIENT RJH Consultants BC JOB NO. 2679-152 DE

BORING NO. B-205 DEPTH 15-16.5'

S-8

PROJECT South Boulder Creek - Phase II Geotechnical Investic SAMPLE NO. PROJECT NO. 16134 DATE SAMPL

DATE SAMPLED --DESCRIPTION --

LOCATION --DATE TESTED 06/24/20 TECHNICIAN CT

Hygroscopic Moisture of Fines

Sample Data

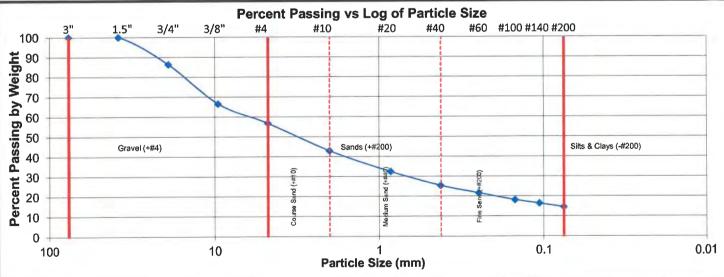
Mass Wet Pan and Soil (g): 359.49 Mass Dry Pan and Soil (g): 357.77 Total Wet Mass of Sample (g): 671.0 Total Dry Mass of Sample (g): 667.5

Mass of Pan (g): 170.54

Split Fraction: #4

Moisture (%): 0.9 Mass of Sub-Sample Fraction (g): 188.97

| | Wiolotal C (70). | 0.10 | | p.e : reiotion (9) | | |
|--------------|------------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | | | | | |
| 1.5" | 38.1 | | | | | |
| 3/4" | 19.05 | 91.1 | | 91.1 | 1.00 | 86.4 |
| 3/8" | 9.53 | 132.0 | | 132.0 | 1.00 | 66.6 |
| #4 | 4.75 | 65.3 | | 65.3 | 1.00 | 56.8 |
| #10 | 2.00 | 45.8 | | 45.8 | 0.57 | 42.9 |
| #20 | 0.850 | 34.5 | •= | 34.5 | 0.57 | 32.4 |
| #40 | 0.425 | 23.1 | | 23.1 | 0.57 | 25.4 |
| #60 | 0.250 | 12.4 | | 12.4 | 0.57 | 21.7 |
| #100 | 0.150 | 11.6 | | 11.6 | 0.57 | 18.1 |
| #140 | 0.106 | 5.7 | | 5.7 | 0.57 | 16.4 |
| #200 | 0.075 | 6.0 | | 6.0 | 0.57 | 14.6 |



USCS Classification: Clayey Gravel With Sand

Data entry by: ALH Date: 6/25/2020
Checked by: Date:

File name: 2679152 Grain Size Analysis ASTM D6913_5.xlsm



ADVANCED TERRA TESTING

CLIENT RJH Consultants

JOB NO. 2679-152

PROJECT South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO. 16134

LOCATION --DATE TESTED 06/23/20 TECHNICIAN CAL BORING NO. B-206

DEPTH 8-10.4' SAMPLE NO. S-5, S-6

DATE SAMPLED --

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 274.82 Mass Dry Pan and Soil (g): 270.53

> Mass of Pan (g): 123.50 Moisture (%): 2.9

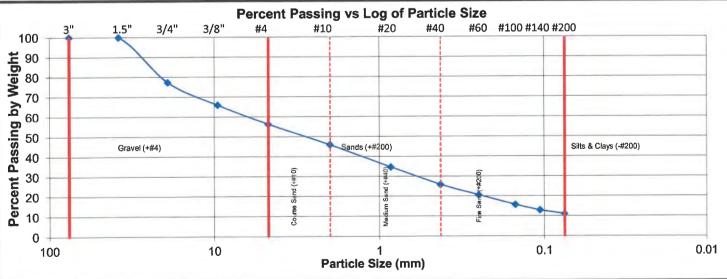
Sample Data

Total Wet Mass of Sample (g): 533.2 Total Dry Mass of Sample (g): 524.6

Split Fraction: #4

Mass of Sub-Sample Fraction (g): 151.32

| | Moisture (70). | 2.5 | Mass of Oab Oa | inpic i raction (g). | 101.02 | 154 |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | | | | |
| 1.5" | 38.1 | 0.0 | | | | 100.0 |
| 3/4" | 19.05 | 118.4 | | 118.4 | 1.00 | 77.4 |
| 3/8" | 9.53 | 60.0 | | 60.0 | 1.00 | 66.0 |
| #4 | 4.75 | 50.7 | | 50.7 | 1.00 | 56.3 |
| #10 | 2.00 | 27.0 | | 27.0 | 0.56 | 46.0 |
| #20 | 0.850 | 29.5 | | 29.5 | 0.56 | 34.7 |
| #40 | 0.425 | 23.0 | | 23.0 | 0.56 | 25.9 |
| #60 | 0.250 | 13.8 | | 13.8 | 0.56 | 20.6 |
| #100 | 0.150 | 12.7 | - | 12.7 | 0.56 | 15.7 |
| #140 | 0.106 | 7.21 | | 7.21 | 0.56 | 13.0 |
| #200 | 0.075 | 4.91 | | 4.91 | 0.56 | 11.1 |



USCS Classification ASTM D 2487

Atterberg Classification: ML Coefficient of Curvature - C_c: 1.04

Group Symbol: SP-SM Coefficient of Uniformity - C_u: 115.25

USCS Classification: Poorly Graded Sand With Silt And Gravel

 Data entry by:
 KMS
 Date:
 6/24/2020

 Checked by:
 CHC
 Date:
 6/25/2020

File name: 2679152_Grain Size Analysis ASTM D6913_0.xlsm



CLIENT RJH Consultants BORING NO. B-206

JOB NO. 2679-152 DEPTH 12.5-14'

PROJECT South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. S-7

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- DESCRIPTION --

DATE TESTED 06/24/20 TECHNICIAN CT

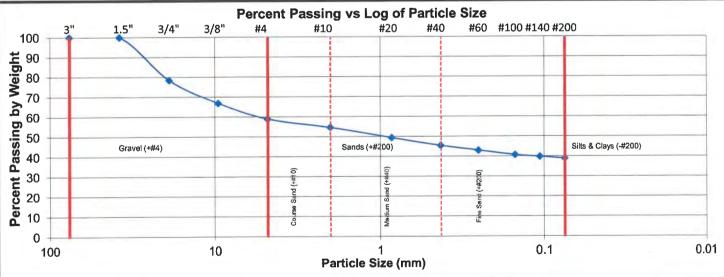
Hygroscopic Moisture of Fines Sample Data

Mass Wet Pan and Soil (g): 284.97 Total Wet Mass of Sample (g): 295.1 Mass Dry Pan and Soil (g): 282.50 Total Dry Mass of Sample (g): 292.6

Mass of Pan (g): 112.81 Split Fraction: #4

Moisture (%): 1.5 Mass of Sub-Sample Fraction (g): 405.39

| | Moistare (70). | 110 | 111000 01 000 00 | inplo i radion (g): | | _ |
|--------------|-----------------|-----------------------------|------------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | | | 49-04- | nga que | |
| 1.5" | 38.1 | | | | | |
| 3/4" | 19.05 | 63.0 | | 63.0 | 1.00 | 78.5 |
| 3/8" | 9.53 | 33.8 | | 33.8 | 1.00 | 66.9 |
| #4 | 4.75 | 23.4 | | 23.4 | 1.00 | 58.9 |
| #10 | 2.00 | 28.9 | | 28.9 | 0.59 | 54.6 |
| #20 | 0.850 | 35.8 | | 35.8 | 0.59 | 49.4 |
| #40 | 0.425 | 26.8 | | 26.8 | 0.59 | 45.4 |
| #60 | 0.250 | 16.5 | | 16.5 | 0.59 | 43.0 |
| #100 | 0.150 | 15.4 | | 15.4 | 0.59 | 40.7 |
| #140 | 0.106 | 6.0 | | 6.0 | 0.59 | 39.8 |
| #200 | 0.075 | 6.4 | | 6.4 | 0.59 | 38.9 |



Atterberg Classification: ML Coefficient of Curvature - C_c: -Group Symbol: GM Coefficient of Uniformity - C_u: -USCS Classification: Silty Gravel With Sand

Data entry by: ALH Date: 6/25/2020
Checked by: Date:

File name: 2679152_Grain Size Analysis ASTM D6913_3.xlsm



ADVANCED TERRA TESTING

CLIENT **RJH Consultants**

JOB NO. 2679-152

PROJECT South Boulder Creek - Phase II Geotechnical Investigation

16134 PROJECT NO.

LOCATION

DATE TESTED 06/23/20 TECHNICIAN CAL

BORING NO. B-207

DEPTH 10-11.5'

SAMPLE NO. S-6 DATE SAMPLED --

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 359.54 Mass Dry Pan and Soil (g): 353.33

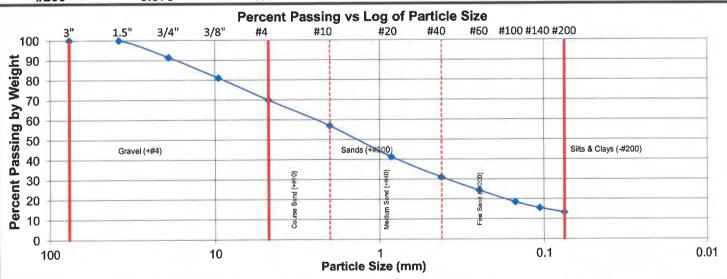
Mass of Pan (g): 137.84

Sample Data

Total Wet Mass of Sample (g): 648.5 Total Dry Mass of Sample (g): 635.7

Split Fraction: #4

| | Moisture (%): | 2.9 | Mass of Sub-Sa | mple Fraction (g): | 221.70 | |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | | | | |
| 1.5" | 38.1 | 0.0 | | | | 100.0 |
| 3/4" | 19.05 | 54.1 | | 54.1 | 1.00 | 91.5 |
| 3/8" | 9.53 | 65.7 | | 65.7 | 1.00 | 81.2 |
| #4 | 4.75 | 70.9 | | 70.9 | 1.00 | 70.0 |
| #10 | 2.00 | 40.0 | | 40.0 | 0.70 | 57.0 |
| #20 | 0.850 | 48.2 | | 48.2 | 0.70 | 41.4 |
| #40 | 0.425 | 31.6 | | 31.6 | 0.70 | 31.1 |
| #60 | 0.250 | 20.7 | | 20.7 | 0.70 | 24.4 |
| #100 | 0.150 | 17.8 | | 17.8 | 0.70 | 18.6 |
| #140 | 0.106 | 9.2 | | 9.2 | 0.70 | 15.6 |
| #200 | 0.075 | 7.1 | | 7.1 | 0.70 | 13.3 |



USCS Classification ASTM D 2487

Coefficient of Curvature - Cc: --Atterberg Classification: --

Coefficient of Uniformity - Cu: --Group Symbol: --

USCS Classification: --

6/24/2020 **KMS** Date: Data entry by: 6/25/2020 Date: _____ Checked by: CAL

Grain Size Analysis ASTM D6913 2.xlsm 2679152 File name:



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED

TECHNICIAN

03/13/20

ASE

BORING NO.

B-208

DEPTH

5.0-6.5

SAMPLE NO.

S-4

DATE SAMPLED 01/30/20

DESCRIPTION

NOTE

Sample size not to spec.

Hygroscopic Moisture

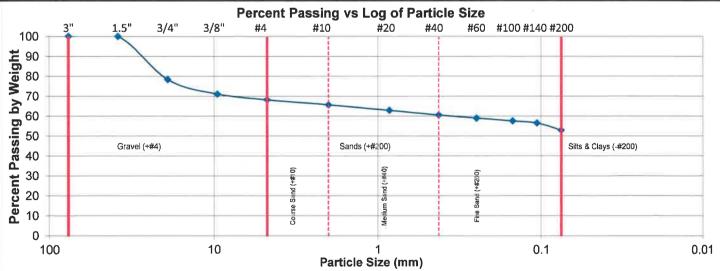
Mass Wet Pan and Soil (g): 463.54 Mass Dry Pan and Soil (g): 438.19

> Mass of Pan (g): 172.50 Moisture (%): 9.5

Sample Data

Total Wet Mass of Sample (g): 291.0 Total Dry Mass of Sample (g): 265.7

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 57.7 | 0.0 | 57.7 | 1.00 | 78.3 |
| 3/8" | 9.53 | 19.4 | 0.0 | 19.4 | 1.00 | 71.0 |
| #4 | 4.75 | 7.6 | 0.0 | 7.6 | 1.00 | 68.1 |
| #10 | 2.00 | 6.9 | 0.0 | 6.9 | 1.00 | 65.6 |
| #20 | 0.850 | 7.4 | 0.0 | 7.4 | 1.00 | 62.8 |
| #40 | 0.425 | 6.1 | 0.0 | 6.1 | 1.00 | 60.5 |
| #60 | 0.250 | 4.1 | 0.0 | 4.1 | 1.00 | 58.9 |
| #100 | 0.150 | 3.9 | 0.0 | 3.9 | 1.00 | 57.4 |
| #140 | 0.106 | 2.8 | 0.0 | 2.8 | 1.00 | 56.4 |
| #200 | 0.075 | 9.4 | 0.0 | 9.4 | 1.00 | 52.8 |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - Cc: --

Group Symbol: CL

Coefficient of Uniformity - Cu: --

USCS Classification: Gravelly Lean Clay With Sand

Grain Size Analysis ASTM D6913_5.xlsm

Data entry by: TAF

3/16/2020 Date:

Checked by: File name:

CAL 2679148

3/23/2020 Date:

Appendix J.1

77 of 262



CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II
PROJECT NO. 16134

PROJECT NO. 16 LOCATION --

DATE TESTED 03/16/20

TECHNICIAN ASE

BORING NO.

B-208

DEPTH

15-16.5'

SAMPLE NO. S-8

DATE SAMPLED 01/30/20

DESCRIPTION ---

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 423.48 Mass Dry Pan and Soil (g): 416.95

Mass of Pan (g): 119.43

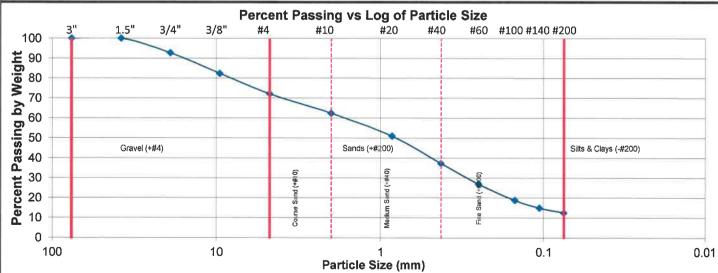
Sample Data

Total Wet Mass of Sample (g): 802.7 Total Dry Mass of Sample (g): 790.1

Split Fraction: #4

Mass of Sub-Sample Fraction (g): 304.04

| | Moisture (%): | 2.2 | iviass of Sub-Sa | mple Fraction (g): | 304.04 | |
|--------------|-----------------|-----------------------------|------------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 57.8 | 0.0 | 57.8 | 1.00 | 92.7 |
| 3/8" | 9.53 | 81.5 | 0.0 | 81.5 | 1.00 | 82.4 |
| #4 | 4.75 | 80.8 | 0.0 | 80.8 | 1.00 | 72.1 |
| #10 | 2.00 | 40.5 | 0.0 | 40.5 | 0.72 | 62.3 |
| #20 | 0.850 | 47.1 | 0.0 | 47.1 | 0.72 | 50.9 |
| #40 | 0.425 | 56.3 | 0.0 | 56.3 | 0.72 | 37.3 |
| #60 | 0.250 | 42.8 | 0.0 | 42.8 | 0.72 | 26.9 |
| #100 | 0.150 | 33.5 | 0.0 | 33.5 | 0.72 | 18.8 |
| #140 | 0.106 | 15.8 | 0.0 | 15.8 | 0.72 | 15.0 |
| #200 | 0.075 | 10.0 | 0.0 | 10.0 | 0.72 | 12.5 |



USCS Classification ASTM D 2487

Atterberg Classification: -- Coefficient of Curvature - C_c: --

Group Symbol: -- Coefficient of Uniformity - C_u: --

USCS Classification: --

Data entry by: TAF Date: 3/17/2020
Checked by: 4/4 Date: 3/18/20

File name: 2679148__Grain Size Analysis ASTM D6913_8.xlsm



CLIENT

RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

DATE TESTED 03/20/20 TECHNICIAN ALH

BORING NO.

B-209

DEPTH

0.0 - 2.5BU-1

SAMPLE NO.

DATE SAMPLED --

DESCRIPTION --

Hygroscopic Moisture of Fines Sample Data

Mass Wet Pan and Soil (g): 967.40 Mass Dry Pan and Soil (g): 964.41

Mass of Pan (g): 260.70 Moisture (%): 0.4

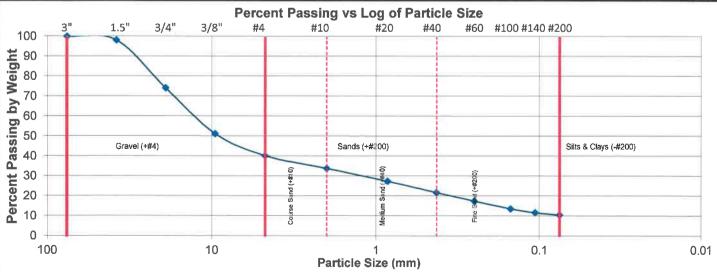
Total Wet Mass of Sample (g): 7703.9

Total Dry Mass of Sample (g): 7687.2

Split Fraction: 3/8"

Mass of Sub-Sample Fraction (g): 706.70

| | molecule (70). | · · · | 111000 01 000 00 | mpie i radiidii (g). | 7 0 0 1 7 0 | |
|--------------|-----------------|-----------------------------|------------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 149.8 | 0.0 | 149.8 | 1.00 | 98.1 |
| 3/4" | 19.05 | 1843.0 | 0.0 | 1843.0 | 1.00 | 74.1 |
| 3/8" | 9.53 | 1766.7 | 0.0 | 1766.7 | 1.00 | 51.1 |
| #4 | 4.75 | 151.9 | 0.0 | 151.9 | 0.51 | 40.1 |
| #10 | 2.00 | 87.5 | 0.0 | 87.5 | 0.51 | 33.7 |
| #20 | 0.850 | 88.2 | 0.0 | 88.2 | 0.51 | 27.3 |
| #40 | 0.425 | 78.2 | 0.0 | 78.2 | 0.51 | 21.6 |
| #60 | 0.250 | 58.1 | 0.0 | 58.1 | 0.51 | 17.4 |
| #100 | 0.150 | 54.0 | 0.0 | 54.0 | 0.51 | 13.5 |
| #140 | 0.106 | 27.2 | 0.0 | 27.2 | 0.51 | 11.5 |
| #200 | 0.075 | 15.9 | 0.0 | 15.9 | 0.51 | 10.4 |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - Cc: 2.05

Group Symbol: GP-GC

Coefficient of Uniformity - Cu: 201.67

USCS Classification: Poorly Graded Gravel With Clay And Sand (Or Silty Clay And Sand)

Data entry by:

ŢĄF KMS Date:

3/23/2020

Checked by:

2679148__Grain Size Analysis ASTM D6913_16.xlsm

24/20 Date:

File name:



CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION --

DATE TESTED 03/16/20

TECHNICIAN ASE

BORING NO. B-209 DEPTH 5.0-6.5'

SAMPLE NO. S-4

DATE SAMPLED 01/22/20

DESCRIPTION --

NOTE

Sample size not to spec.

Hygroscopic Moisture

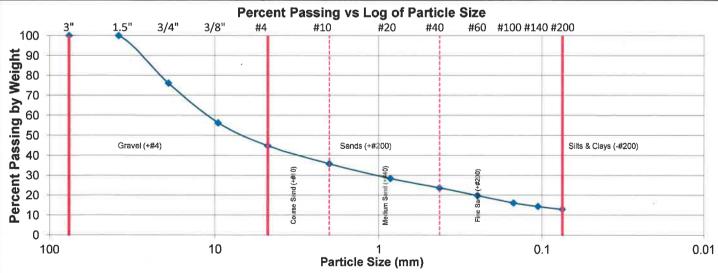
Mass Wet Pan and Soil (g): 477.74 Mass Dry Pan and Soil (g): 476.30

> Mass of Pan (g): 119.43 Moisture (%): **0.4**

Sample Data

Total Wet Mass of Sample (g): 358.3 Total Dry Mass of Sample (g): 356.9

| - | | 2 | - | - | | |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 85.4 | 0.0 | 85.4 | 1.00 | 76.1 |
| 3/8" | 9.53 | 70.7 | 0.0 | 70.7 | 1.00 | 56.3 |
| #4 | 4.75 | 41.0 | 0.0 | 41.0 | 1.00 | 44.8 |
| #10 | 2.00 | 32.3 | 0.0 | 32.3 | 1.00 | 35.7 |
| #20 | 0.850 | 26.3 | 0.0 | 26.3 | 1.00 | 28.4 |
| #40 | 0.425 | 16.8 | 0.0 | 16.8 | 1.00 | 23.7 |
| #60 | 0.250 | 13.7 | 0.0 | 13.7 | 1.00 | 19.8 |
| #100 | 0.150 | 13.3 | 0.0 | 13.3 | 1.00 | 16.1 |
| #140 | 0.106 | 6.4 | 0.0 | 6.4 | 1.00 | 14.3 |
| #200 | 0.075 | 5.1 | 0.0 | 5.1 | 1.00 | 12.9 |
| | | | | | | |



USCS Classification ASTM D 2487

Atterberg Classification: -- Coefficient of Curvature - C_c: --

Group Symbol: -- Coefficient of Uniformity - C_u: --

USCS Classification: --

Data entry by: TAF Date: 3/17/2020
Checked by: 41/2 Date: 3/18/20

File name: 2679148__Grain Size Analysis ASTM D6913_14.xlsm



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED 03/16/20

TECHNICIAN ASF BORING NO. B-210

DEPTH 0 - 3.7'

SAMPLE NO. BU-1

DATE SAMPLED 01/20/20

DESCRIPTION

NOTE

Sample size not to spec.

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 483.14 Mass Dry Pan and Soil (g): 479.72

> Mass of Pan (g): 124.09 Moisture (%): 1.0

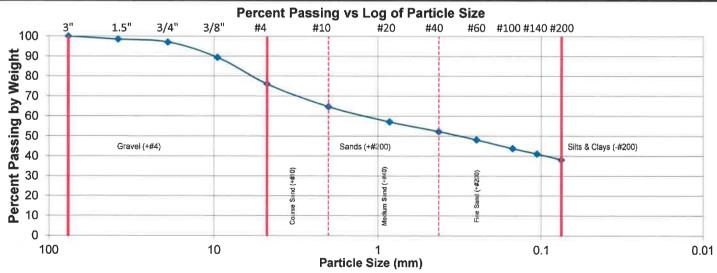
Sample Data

Total Wet Mass of Sample (g): 7658.9 Total Dry Mass of Sample (g): 7593.6

Split Fraction: 3/8"

Mass of Sub-Sample Fraction (g): 359.05

| | 1110101010 (70): | | | imple i raction (g). | | |
|--------------|------------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | 0.0 | - | | 100.0 |
| 1.5" | 38.1 | 112.3 | 0.0 | 112.3 | 1.00 | 98.5 |
| 3/4" | 19.05 | 112.2 | 0.0 | 112.2 | 1.00 | 97.0 |
| 3/8" | 9.53 | 580.4 | 0.0 | 580.4 | 1.00 | 89.4 |
| #4 | 4.75 | 52.9 | 0.0 | 52.9 | 0.89 | 76.1 |
| #10 | 2.00 | 45.5 | 0.0 | 45.5 | 0.89 | 64.7 |
| #20 | 0.850 | 30.0 | 0.0 | 30.0 | 0.89 | 57.1 |
| #40 | 0.425 | 19.4 | 0.0 | 19.4 | 0.89 | 52.2 |
| #60 | 0.250 | 16.4 | 0.0 | 16.4 | 0.89 | 48.1 |
| #100 | 0.150 | 17.2 | 0.0 | 17.2 | 0.89 | 43.8 |
| #140 | 0.106 | 10.8 | 0.0 | 10.8 | 0.89 | 41.1 |
| #200 | 0.075 | 11.6 | 0.0 | 11.6 | 0.89 | 38.2 |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - Cc: --

Coefficient of Uniformity - Cu: --Group Symbol: SC

USCS Classification: Clayey Sand With Gravel

Data entry by: Checked by:

Date: 3/17/2020 Date:

2679148__Grain Size Analysis ASTM D6913_12.xlsm

File name:



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION DATE TESTED 03/16/20

TECHNICIAN ASE BORING NO.

B-210 **DEPTH** 2.5-3.7'

SAMPLE NO. S-3

DATE SAMPLED 01/20/20

DESCRIPTION

NOTE

Sample size not to spec.

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 673.98 Mass Dry Pan and Soil (g): 669.56

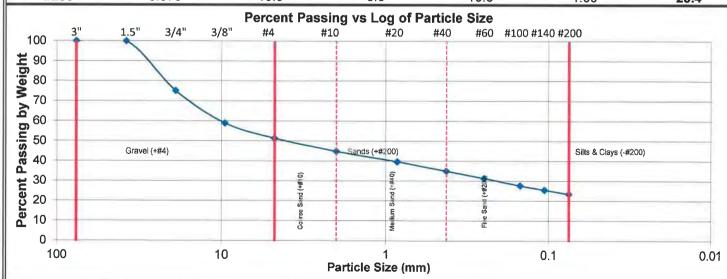
Mass of Pan (g): 172.34

Sample Data

Total Wet Mass of Sample (g): 501.6 Total Dry Mass of Sample (g): 497.2

Moisture (%): 0.9

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 123.6 | 0.0 | 123.6 | 1.00 | 75.1 |
| 3/8" | 9.53 | 81.0 | 0.0 | 81.0 | 1.00 | 58.9 |
| #4 | 4.75 | 37.5 | 0.0 | 37.5 | 1.00 | 51.3 |
| #10 | 2.00 | 32.5 | 0.0 | 32.5 | 1.00 | 44.8 |
| #20 | 0.850 | 25.8 | 0.0 | 25.8 | 1.00 | 39.6 |
| #40 | 0.425 | 23.4 | 0.0 | 23.4 | 1.00 | 34.9 |
| #60 | 0.250 | 18.0 | 0.0 | 18.0 | 1.00 | 31.3 |
| #100 | 0.150 | 18.3 | 0.0 | 18.3 | 1.00 | 27.6 |
| #140 | 0.106 | 10.5 | 0.0 | 10.5 | 1.00 | 25.5 |
| #200 | 0.075 | 10.5 | 0.0 | 10.5 | 1.00 | 23.4 |



USCS Classification ASTM D 2487

Atterberg Classification: --Coefficient of Curvature - Cc: --

Coefficient of Uniformity - Cu: --Group Symbol: --

USCS Classification: --

Data entry by: TAF 3/17/2020 Date: Date: 3/18/20 Checked by:

File name: 2679148__Grain Size Analysis ASTM D6913_11.xlsm



CLIENT

RJH Consultants

JOB NO. 2679-148

South Boulder Creek - Phase II PROJECT

PROJECT NO.

16134

LOCATION

DATE TESTED 03/16/20

TECHNICIAN ASE BORING NO. B-211

DEPTH 0 - 1.5'

SAMPLE NO. S-2

DATE SAMPLED 1/24/20

DESCRIPTION Clayey gravel with sand

NOTE

Sample size not to spec.

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 553.01 Mass Dry Pan and Soil (g): 547.71

Mass of Pan (g): 118.66

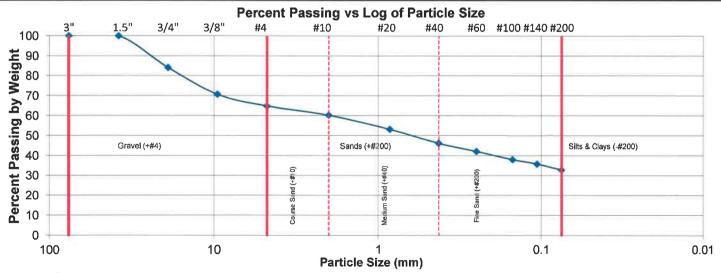
Moisture (%): 1.2

Sample Data

Total Wet Mass of Sample (g): 434.4

Total Dry Mass of Sample (g): 429.1

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 68.5 | 0.0 | 68.5 | 1.00 | 84.0 |
| 3/8" | 9.53 | 57.4 | 0.0 | 57.4 | 1.00 | 70.7 |
| #4 | 4.75 | 25.0 | 0.0 | 25.0 | 1.00 | 64.8 |
| #10 | 2.00 | 20.0 | 0.0 | 20.0 | 1.00 | 60.2 |
| #20 | 0.850 | 30.4 | 0.0 | 30.4 | 1.00 | 53.1 |
| #40 | 0.425 | 29.9 | 0.0 | 29.9 | 1.00 | 46.1 |
| #60 | 0.250 | 17.4 | 0.0 | 17.4 | 1.00 | 42.1 |
| #100 | 0.150 | 17.7 | 0.0 | 17.7 | 1.00 | 37.9 |
| #140 | 0.106 | 9.6 | 0.0 | 9.6 | 1.00 | 35.7 |
| #200 | 0.075 | 12.7 | 0.0 | 12.7 | 1.00 | 32.7 |



USCS Classification ASTM D 2487

Atterberg Classification: --Coefficient of Curvature - Cc: --

Coefficient of Uniformity - Cu: --Group Symbol: --

USCS Classification: --

Data entry by: TAF Checked by:

3/17/2020 Date: Date: _3/18/20

File name: 2679148__Grain Size Analysis ASTM D6913_13.xlsm



CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION --

DATE TESTED 03/12/20

TECHNICIAN TAF

BORING NO. B-212

DEPTH 0-3.4'

SAMPLE NO. S-2 & S-3

DATE SAMPLED 02/19/20

DESCRIPTION --

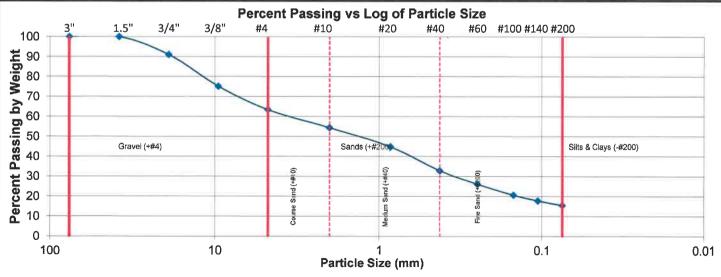
NOTE Sample size not to spec.

Hygroscopic Moisture Sample Data

Mass Wet Pan and Soil (g): 659.14 Total Wet Mass of Sample (g): 487.9 Mass Dry Pan and Soil (g): 626.91 Total Dry Mass of Sample (g): 455.7

Mass of Pan (g): 171.24 Moisture (%): **7.1**

| Sieve Number Sieve Size (mm) Soil (g) Mass of Pan (g) Individual Retained Soil (g) Factor k | Percent Passing by Weight (%) |
|---|----------------------------------|
| | |
| 3" 76.2 0.0 0.0 | 100.0 |
| 1.5" 38.1 0.0 0.0 | 100.0 |
| 3/4" 19.05 41.2 0.0 41.2 1.00 | 91.0 |
| 3/8" 9.53 72.4 0.0 72.4 1.00 | 75.1 |
| #4 4.75 53.4 0.0 53.4 1.00 | 63.4 |
| #10 2.00 41.4 0.0 41.4 1.00 | 54.3 |
| #20 0.850 43.4 0.0 43.4 1.00 | 44.8 |
| #40 0.425 54.2 0.0 54.2 1.00 | 32.9 |
| #60 0.250 30.5 0.0 30.5 1.00 | 26.2 |
| #100 0.150 25.3 0.0 25.3 1.00 | 20.6 |
| #140 0.106 13.1 0.0 13.1 1.00 | 17.7 |
| #200 0.075 10.7 0.0 10.7 1.00 | 15.4 |



USCS Classification ASTM D 2487

Atterberg Classification: NP Coefficient of Curvature - C_c: --

Group Symbol: SM Coefficient of Uniformity - C_u: --

USCS Classification: Silty Sand With Gravel

 Data entry by:
 TAF
 Date:
 3/16/2020

 Checked by:
 Car
 Date:
 3/23/2020

File name: 2679148_Grain Size Analysis ASTM D6913 4.xlsm



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/16/20 TECHNICIAN **ASE**

BORING NO.

B-212

DEPTH

0-10.2

SAMPLE NO.

BU-1

DATE SAMPLED 02/19/20

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 698.03 Mass Dry Pan and Soil (g): 690.80

> Mass of Pan (g): 123.24 Moisture (%): 13

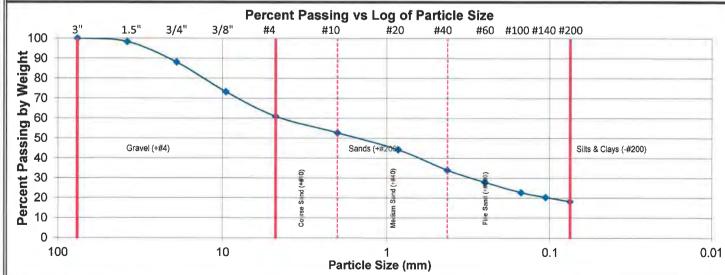
Sample Data

Total Wet Mass of Sample (g): 25021.3 Total Dry Mass of Sample (g): 24790.1

Split Fraction: 3/8"

Mass of Sub-Sample Fraction (a): 574.81

| Wass of Sub-Sample Fraction (g). 374.61 | | | | | | | | |
|---|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|--|--|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) | | |
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 | | |
| 1.5" | 38.1 | 420.1 | 0.0 | 420.1 | 1.00 | 98.3 | | |
| 3/4" | 19.05 | 2550.0 | 0.0 | 2550.0 | 1.00 | 88.0 | | |
| 3/8" | 9.53 | 3671.2 | 0.0 | 3671.2 | 1.00 | 73.2 | | |
| #4 | 4.75 | 95.4 | 0.0 | 95.4 | 0.73 | 60.9 | | |
| #10 | 2.00 | 64.0 | 0.0 | 64.0 | 0.73 | 52.7 | | |
| #20 | 0.850 | 65.4 | 0.0 | 65.4 | 0.73 | 44.2 | | |
| #40 | 0.425 | 79.3 | 0.0 | 79.3 | 0.73 | 34.0 | | |
| #60 | 0.250 | 47.3 | 0.0 | 47.3 | 0.73 | 27.9 | | |
| #100 | 0.150 | 39.5 | 0.0 | 39.5 | 0.73 | 22.8 | | |
| #140 | 0.106 | 18.8 | 0.0 | 18.8 | 0.73 | 20.4 | | |
| #200 | 0.075 | 16.4 | 0.0 | 16.4 | 0.73 | 18.3 | | |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - Cc: --

Group Symbol: SC

Coefficient of Uniformity - Cu: --

USCS Classification: Clayey Sand With Gravel

Data entry by: Checked by:

Date: Date: 3/18/20

3/17/2020

File name:

2679148_ Grain Size Analysis ASTM D6913 9.xlsm



CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION ---

DATE TESTED 03/12/20 TECHNICIAN TAF BORING NO.

B-213

DEPTH

5.5-6.5

SAMPLE NO. S-4

DATE SAMPLED 02/12/20

DESCRIPTION --

Hygroscopic Moisture

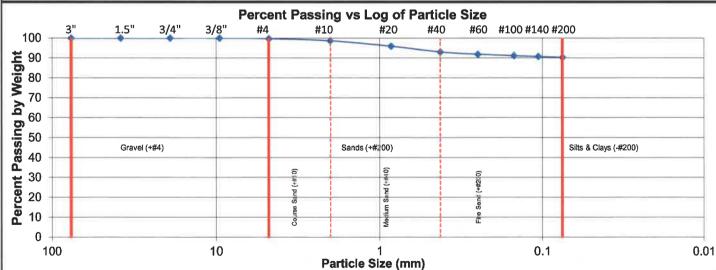
Mass Wet Pan and Soil (g): 325.52 Mass Dry Pan and Soil (g): 259.20

Mass of Pan (g): 171.74 Moisture (%): **75.8**

Sample Data

Total Wet Mass of Sample (g): 153.8 Total Dry Mass of Sample (g): 87.5

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 0.0 | 0.0 | | | 100.0 |
| 3/8" | 9.53 | 0.0 | 0.0 | | | 100.0 |
| #4 | 4.75 | 0.2 | 0.0 | 0.2 | 1.00 | 99.7 |
| #10 | 2.00 | 0.9 | 0.0 | 0.9 | 1.00 | 98.7 |
| #20 | 0.850 | 2.4 | 0.0 | 2.4 | 1.00 | 96.0 |
| #40 | 0.425 | 2.6 | 0.0 | 2.6 | 1.00 | 93.1 |
| #60 | 0.250 | 1.0 | 0.0 | 1.0 | 1.00 | 91.9 |
| #100 | 0.150 | 0.7 | 0.0 | 0.7 | 1.00 | 91.2 |
| #140 | 0.106 | 0.4 | 0.0 | 0.4 | 1.00 | 90.8 |
| #200 | 0.075 | 0.4 | 0.0 | 0.4 | 1.00 | 90.3 |



USCS Classification ASTM D 2487

Atterberg Classification: CH Coefficient of Curvature - C_c: --

Group Symbol: CH Coefficient of Uniformity - C_u: --

USCS Classification: Fat Clay

 Data entry by:
 TAF
 Date:
 3/16/2020

 Checked by:
 ch
 Date:
 3/23/2020

File name: 2679148_Grain Size Analysis ASTM D6913_2.xlsm



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/16/20

TECHNICIAN **ASE** BORING NO.

B-213

DEPTH 10-11.1'

SAMPLE NO. S-6

DATE SAMPLED 02/12/20

DESCRIPTION --

NOTE: Not enough sample provided, per ASTM

D6913)

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 410.85 Mass Dry Pan and Soil (g): 388.91

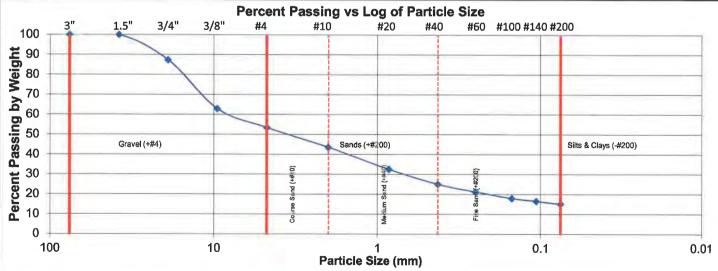
> Mass of Pan (g): 172.43 Moisture (%): 10.1

Sample Data

Total Wet Mass of Sample (g): 238.4

Total Dry Mass of Sample (g): 216.5

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 27.3 | 0.0 | 27.3 | 1.00 | 87.4 |
| 3/8" | 9.53 | 53.0 | 0.0 | 53.0 | 1.00 | 62.9 |
| #4 | 4.75 | 20.5 | 0.0 | 20.5 | 1.00 | 53.5 |
| #10 | 2.00 | 21.4 | 0.0 | 21.4 | 1.00 | 43.6 |
| #20 | 0.850 | 23.9 | 0.0 | 23.9 | 1.00 | 32.6 |
| #40 | 0.425 | 16.2 | 0.0 | 16.2 | 1.00 | 25.1 |
| #60 | 0.250 | 8.2 | 0.0 | 8.2 | 1.00 | 21.3 |
| #100 | 0.150 | 7.1 | 0.0 | 7.1 | 1.00 | 18.0 |
| #140 | 0.106 | 3.1 | 0.0 | 3.1 | 1.00 | 16.6 |
| #200 | 0.075 | 3.0 | 0.0 | 3.0 | 1.00 | 15.2 |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - Cc: --

Group Symbol: GC

Coefficient of Uniformity - Cu: --

USCS Classification: Clayey Gravel With Sand

Data entry by: TAF

Date:

3/17/2020

Checked by:

Cor

Date: 3/23/2020

File name:

2679148__Grain Size Analysis ASTM D6913_7.xlsm



CLIENT RJH Consultants BORING NO. B-214
JOB NO. 2679-152 DEPTH 5-6.4'
PROJECT South Boulder Creek - Phase II Geotechnical Investic SAMPLE NO. S-4
PROJECT NO. 16134 DATE SAMPLED --

DATE SAMPLED -- DESCRIPTION --

DATE TESTED 06/24/20 NOTES: Sample size not to specification

TECHNICIAN CT

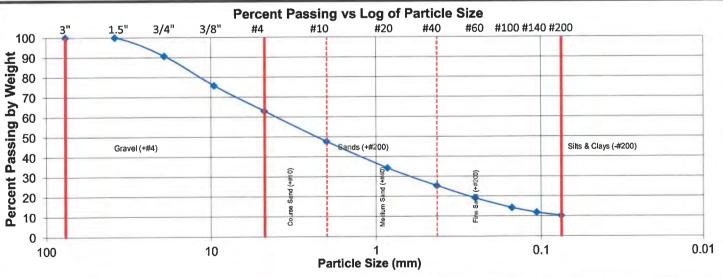
LOCATION

Hygroscopic Moisture Sample Data

Mass Wet Pan and Soil (g): 893.05 Total Wet Mass of Sample (g): 633.9 Mass Dry Pan and Soil (g): 890.70 Total Dry Mass of Sample (g): 631.6

Mass of Pan (g): 259.15 Moisture (%): **0.4**

| | Moistare (70). | | | | | |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | | | | | |
| 1.5" | 38.1 | | | | | |
| 3/4" | 19.05 | 58.8 | | 58.8 | 1.00 | 90.7 |
| 3/8" | 9.53 | 94.1 | | 94.1 | 1.00 | 75.8 |
| #4 | 4.75 | 80.8 | | 80.8 | 1.00 | 63.0 |
| #10 | 2.00 | 96.7 | | 96.7 | 1.00 | 47.7 |
| #20 | 0.850 | 84.4 | | 84.4 | 1.00 | 34.3 |
| #40 | 0.425 | 56.8 | | 56.8 | 1.00 | 25.3 |
| #60 | 0.250 | 39.2 | | 39.2 | 1.00 | 19.1 |
| #100 | 0.150 | 31.1 | | 31.1 | 1.00 | 14.2 |
| #140 | 0.106 | 14.9 | | 14.9 | 1.00 | 11.9 |
| #200 | 0.075 | 10.5 | | 10.5 | 1.00 | 10.2 |



USCS Classification ASTM D 2487

Atterberg Classification: -- Coefficient of Curvature - C_c: 1.39
Group Symbol: -- Coefficient of Uniformity - C_u: 58.97

USCS Classification: --

Data entry by: ALH Date: 6/25/2020
Checked by: Date:

File name: 2679152_Grain Size Analysis ASTM D6913_4.xlsm



CLIENT

RJH Consultants

JOB NO.

2679-152

PROJECT

South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO.

16134

LOCATION

06/27/20 DATE TESTED TECHNICIAN TAF

BORING NO.

B-215

DEPTH

5.7-6.0'

SAMPLE NO.

CA-6 DATE SAMPLED 05/26/20

DESCRIPTION --

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 399.26 Mass Dry Pan and Soil (g): 365.79

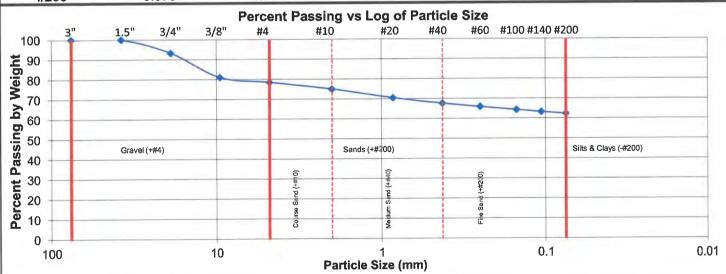
Mass of Pan (q): 171.34 Moisture (%): 17.2

Sample Data

Total Wet Mass of Sample (g): 227.9

Total Dry Mass of Sample (g): 194.5

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| 3" | 76.2 | | | | | us da |
| 1.5" | 38.1 | 0.0 | | | | 100.0 |
| 3/4" | 19.05 | 13.0 | | 13.0 | 1.00 | 93.3 |
| 3/8" | 9.53 | 23.9 | | 23.9 | 1.00 | 81.0 |
| #4 | 4.75 | 4.96 | | 4.96 | 1.00 | 78.5 |
| #10 | 2.00 | 6.70 | | 6.70 | 1.00 | 75.0 |
| #20 | 0.850 | 8.91 | | 8.91 | 1.00 | 70.5 |
| #40 | 0.425 | 5.48 | | 5.48 | 1.00 | 67.6 |
| #60 | 0.250 | 3.30 | | 3.30 | 1.00 | 65.9 |
| #100 | 0.150 | 3.16 | | 3.16 | 1.00 | 64.3 |
| #140 | 0.106 | 1.98 | | 1.98 | 1.00 | 63.3 |
| #200 | 0.075 | 1.79 | | 1.79 | 1.00 | 62.4 |



USCS Classification ASTM D 2487

Atterberg Classification: CL

Coefficient of Curvature - Cc: --

Group Symbol: CL

Coefficient of Uniformity - C₁₁: --

7/2/2020

USCS Classification: Gravelly Lean Clay With Sand

Data entry by: CAL Date: Date:

Checked by: File name:

Grain Size Analysis ASTM D6913_6.xlsm 2679152



ADVANCED TERRA TESTING

CLIENT

RJH Consultants

JOB NO.

2679-152

PROJECT PROJECT NO. South Boulder Creek - Phase II Geotechnical Investigation

16134

LOCATION

DATE TESTED 06/23/20 TECHNICIAN CAL

BORING NO.

B-215

DEPTH

7.5-9'

SAMPLE NO.

S-9 DATE SAMPLED --

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 337.09

Mass Dry Pan and Soil (g): 330.47 Mass of Pan (g): 118.30

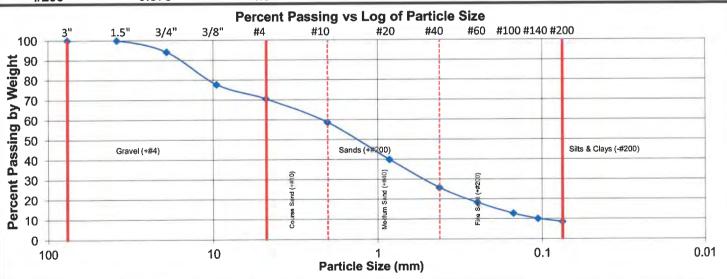
Sample Data

Total Wet Mass of Sample (g): 619.1 Total Dry Mass of Sample (g): 605.8

Split Fraction: #4

Mass of Sub-Sample Fraction (a): 218.79

| Moisture (%): 3.1 Mass of Sub-Sample Fraction (g): 216.79 | | | | | | | | | |
|---|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|--|--|--|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) | | | |
| 3" | 76.2 | 0.0 | | | - | •• | | | |
| 1.5" | 38.1 | 0.0 | | | | 100.0 | | | |
| 3/4" | 19.05 | 35.0 | | 35.0 | 1.00 | 94.2 | | | |
| 3/8" | 9.53 | 99.4 | | 99.4 | 1.00 | 77.8 | | | |
| #4 | 4.75 | 44.2 | | 44.2 | 1.00 | 70.5 | | | |
| #10 | 2.00 | 35.4 | | 35.4 | 0.71 | 58.7 | | | |
| #20 | 0.850 | 56.4 | - | 56.4 | 0.71 | 40.0 | | | |
| #40 | 0.425 | 42.7 | | 42.7 | 0.71 | 25.8 | | | |
| #60 | 0.250 | 22.5 | | 22.5 | 0.71 | 18.3 | | | |
| #100 | 0.150 | 16.6 | | 16.6 | 0.71 | 12.8 | | | |
| #140 | 0.106 | 8.1 | | 8.1 | 0.71 | 10.1 | | | |
| #200 | 0.075 | 4.5 | | 4.5 | 0.71 | 8.6 | | | |



USCS Classification ASTM D 2487

Atterberg Classification: --

Coefficient of Curvature - C_c: 1.27

6/24/2020

6/25/2020

Coefficient of Uniformity - Cu: 22.11 Group Symbol: --

USCS Classification: --

Data entry by: Checked by:

KMS

Date: Date: ____

CAL Grain Size Analysis ASTM D6913 1.xlsm 2679152 File name:



DESCRIPTION

Sample Data

CLIENT RJH Consultants BORING NO. B-217(P)
JOB NO. 2679-168 DEPTH 20-21.5'
PROJECT South Boulder Creek Phase II SAMPLE NO. S-8
PROJECT NO. 16134 DATE SAMPLED 08/27/21

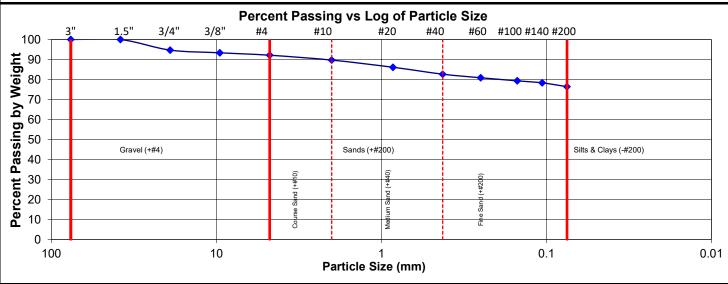
LOCATION --DATE TESTED 02/03/22 TECHNICIAN JL

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 745.87 Total Wet Mass of Sample (g): 523.4 Mass Dry Pan and Soil (g): 682.61 Total Dry Mass of Sample (g): 460.1

Mass of Pan (g): 222.50 Moisture (%): **13.7**

| | Moistare (70). | 10.7 | | | | |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | | | | 100.0 |
| 1.5" | 38.1 | 0.0 | | | | 100.0 |
| 3/4" | 19.05 | 24.3 | | 24.3 | 1.00 | 94.7 |
| 3/8" | 9.53 | 6.2 | | 6.2 | 1.00 | 93.4 |
| #4 | 4.75 | 5.6 | | 5.6 | 1.00 | 92.2 |
| #10 | 2.00 | 11.2 | | 11.2 | 1.00 | 89.7 |
| #20 | 0.850 | 16.6 | | 16.6 | 1.00 | 86.1 |
| #40 | 0.425 | 15.9 | | 15.9 | 1.00 | 82.7 |
| #60 | 0.250 | 8.3 | | 8.3 | 1.00 | 80.9 |
| #100 | 0.150 | 7.0 | | 7.0 | 1.00 | 79.3 |
| #140 | 0.106 | 4.7 | | 4.7 | 1.00 | 78.3 |
| #200 | 0.075 | 8.8 | | 8.8 | 1.00 | 76.4 |



USCS Classification ASTM D 2487

Atterberg Classification: CH Coefficient of Curvature - C_c: -Group Symbol: CH Coefficient of Uniformity - C_u: --

USCS Classification: Fat Clay With Sand

Data entry by: JL Date: 02/09/22 Checked by: JJA Date: 02/10/22

File name: 2679168__Grain Size Analysis ASTM D6913_2.xlsm

Appendix J.1 91 of 262



CLIENT **RJH Consultants**

JOB NO. 2679-168 PROJECT South Boulder Creek Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 02/03/22 **TECHNICIAN** JL

BORING NO. B-217(P)

DEPTH 27.5-29' SAMPLE NO. S-13

DATE SAMPLED 08/27/21

DESCRIPTION --

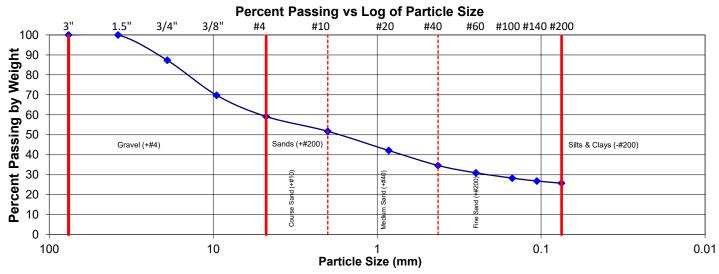
Hygroscopic Moisture of Fines Sample Data

Total Wet Mass of Sample (g): 287.1 Mass Wet Pan and Soil (g): 510.93 Mass Dry Pan and Soil (g): 489.99 Total Dry Mass of Sample (g): 268.6

Mass of Pan (g): 223.84 Split Fraction: 3/4"

Moisture (%): 7.9 Mass of Sub-Sample Fraction (g): 287.09

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| 3" | 76.2 | | | | | |
| 1.5" | 38.1 | | | | | |
| 3/4" | 19.05 | 34.1 | | 34.1 | 1.00 | 87.3 |
| 3/8" | 9.53 | 53.3 | | 53.3 | 0.87 | 69.8 |
| #4 | 4.75 | 32.5 | | 32.5 | 0.87 | 59.1 |
| #10 | 2.00 | 22.5 | | 22.5 | 0.87 | 51.8 |
| #20 | 0.850 | 29.4 | | 29.4 | 0.87 | 42.1 |
| #40 | 0.425 | 22.9 | | 22.9 | 0.87 | 34.6 |
| #60 | 0.250 | 11.2 | | 11.2 | 0.87 | 31.0 |
| #100 | 0.150 | 8.1 | | 8.1 | 0.87 | 28.3 |
| #140 | 0.106 | 4.5 | | 4.5 | 0.87 | 26.8 |
| #200 | 0.075 | 3.3 | | 3.3 | 0.87 | 25.8 |



USCS Classification ASTM D 2487

Atterberg Classification: CL Coefficient of Curvature - Cc: --Coefficient of Uniformity - Cu: --

Group Symbol: GC

USCS Classification: Clayey Gravel With Sand

Date: 02/10/22 Data entry by: MM Checked by: JL Date: 02/11/22

File name: 2679168__Grain Size Analysis ASTM D6913_3.xlsm

Appendix J.1 92 of 262



CLIENT **RJH Consultants** BORING NO. B-218 JOB NO. 2679-168 **DEPTH** 5.5-10' **PROJECT** South Boulder Creek Phase II SAMPLE NO. C-4 PROJECT NO. 16134 DATE SAMPLED 08/26/21

LOCATION DESCRIPTION --

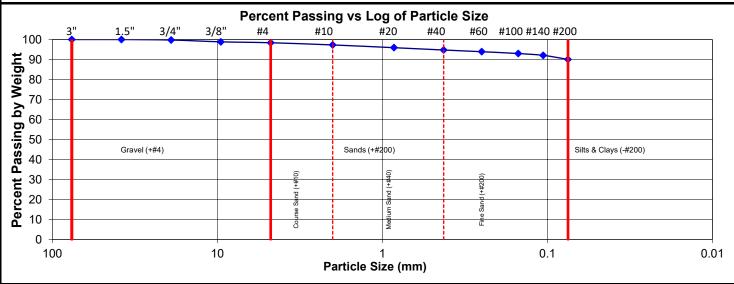
DATE TESTED 02/07/22 TECHNICIAN AR

Hygroscopic Moisture of Fines

Sample Data Mass Wet Pan and Soil (g): 1102.79 Total Wet Mass of Sample (g): 3532.3 Mass Dry Pan and Soil (g): 1082.30 Total Dry Mass of Sample (g): 3451.1 Mass of Pan (g): 221.45 Split Fraction: 3/8"

Moisture (%): 2.4 Mass of Sub-Sample Fraction (g): 881.34

| | \ / | | | 1 (0) | | |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | | | | 100.0 |
| 1.5" | 38.1 | 0.0 | | | | 100.0 |
| 3/4" | 19.05 | 8.0 | | 8.0 | 1.00 | 99.8 |
| 3/8" | 9.53 | 31.1 | | 31.1 | 1.00 | 98.9 |
| #4 | 4.75 | 4.1 | | 4.1 | 0.99 | 98.4 |
| #10 | 2.00 | 9.5 | | 9.5 | 0.99 | 97.3 |
| #20 | 0.850 | 11.9 | | 11.9 | 0.99 | 95.9 |
| #40 | 0.425 | 10.2 | | 10.2 | 0.99 | 94.8 |
| #60 | 0.250 | 7.4 | | 7.4 | 0.99 | 93.9 |
| #100 | 0.150 | 8.0 | | 8.0 | 0.99 | 93.0 |
| #140 | 0.106 | 7.9 | | 7.9 | 0.99 | 92.1 |
| #200 | 0.075 | 17.5 | | 17.5 | 0.99 | 90.1 |



USCS Classification ASTM D 2487

Atterberg Classification: CL Coefficient of Curvature - C_c: --Coefficient of Uniformity - Cu: --Group Symbol: CL

USCS Classification: Lean Clay

Data entry by: Date: 02/08/22 AR Checked by: JJA Date: 02/10/22

Grain Size Analysis ASTM D6913_1.xlsm File name: 2679168

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CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION --

DATE TESTED 03/13/20 TECHNICIAN ASE BORING NO.

B-211

DEPTH

2.5-4.0'

SAMPLE NO. S-3

DATE SAMPLED 01/24/20

DESCRIPTION --

Hygroscopic Moisture

Mass Wet Pan and Soil (g): 448.64

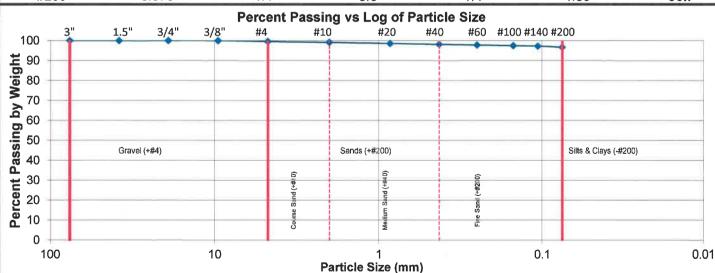
Mass Dry Pan and Soil (g): 411.50

Mass of Pan (g): 171.61 Moisture (%): **15.5** Sample Data

Total Wet Mass of Sample (g): 277.0

Total Dry Mass of Sample (g): 239.9

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 0.0 | 0.0 | | | 100.0 |
| 3/8" | 9.53 | 0.0 | 0.0 | | | 100.0 |
| #4 | 4.75 | 1.1 | 0.0 | 1.1 | 1.00 | 99.6 |
| #10 | 2.00 | 1.1 | 0.0 | 1.1 | 1.00 | 99.1 |
| #20 | 0.850 | 1.3 | 0.0 | 1.3 | 1.00 | 98.6 |
| #40 | 0.425 | 1.1 | 0.0 | 1.1 | 1.00 | 98.1 |
| #60 | 0.250 | 0.7 | 0.0 | 0.7 | 1.00 | 97.8 |
| #100 | 0.150 | 0.8 | 0.0 | 0.8 | 1.00 | 97.5 |
| #140 | 0.106 | 0.5 | 0.0 | 0.5 | 1.00 | 97.3 |
| #200 | 0.075 | 1.4 | 0.0 | 1.4 | 1.00 | 96.7 |



USCS Classification ASTM D 2487

Atterberg Classification: CL Group Symbol: CL Coefficient of Curvature - C_c: --Coefficient of Uniformity - C_u: --

USCS Classification: Lean Clay

Data entry by: TAF
Checked by:

al Ho

Date: 3/16/2020 Date: 3/18/20

File name: 2679148__Grain Size Analysis ASTM D6913_6.xlsm



CLIENT **RJH Consultants** JOB NO. 2679-168

South Boulder Creek Phase II PROJECT

PROJECT NO. 16134

LOCATION

DATE TESTED 01/20/22 **TECHNICIAN** JL

BORING NO. TP-201

DEPTH 5-9'

SAMPLE NO. Bu-2 DATE SAMPLED 12/15/21

DESCRIPTION --

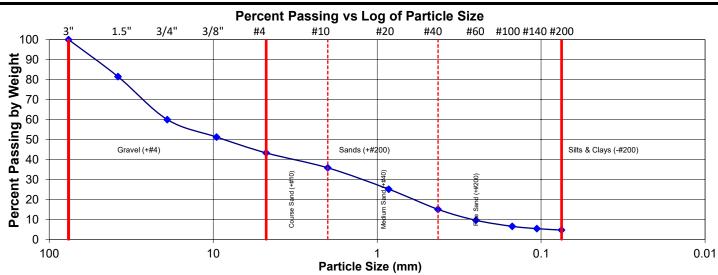
Hygroscopic Moisture of Fines Sample Data

Total Wet Mass of Sample (g): 38532.9 Mass Wet Pan and Soil (g): 1880.00 Mass Dry Pan and Soil (g): 1874.23 Total Dry Mass of Sample (g): 38433.5 Mass of Pan (g): 537.09

Split Fraction: 3/4"

Moisture (%): 0.4 Mass of Sub-Sample Fraction (g): 1342.91

| | (3) | | | | | | |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|--|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) | |
| 3" | 76.2 | 0.0 | | | | 100.0 | |
| 1.5" | 38.1 | 7112.7 | | 7112.7 | 1.00 | 81.5 | |
| 3/4" | 19.05 | 8275.3 | | 8275.3 | 1.00 | 60.0 | |
| 3/8" | 9.53 | 195.2 | | 195.2 | 0.60 | 51.2 | |
| #4 | 4.75 | 177.2 | | 177.2 | 0.60 | 43.3 | |
| #10 | 2.00 | 166.5 | | 166.5 | 0.60 | 35.8 | |
| #20 | 0.850 | 238.3 | | 238.3 | 0.60 | 25.1 | |
| #40 | 0.425 | 225.4 | | 225.4 | 0.60 | 15.0 | |
| #60 | 0.250 | 121.6 | | 121.6 | 0.60 | 9.5 | |
| #100 | 0.150 | 68.0 | | 68.0 | 0.60 | 6.5 | |
| #140 | 0.106 | 25.9 | | 25.9 | 0.60 | 5.3 | |
| #200 | 0.075 | 15.4 | | 15.4 | 0.60 | 4.6 | |



USCS Classification ASTM D 2487

Atterberg Classification: --Coefficient of Curvature - C_c: 0.38

> Coefficient of Uniformity - Cu: 72.13 Group Symbol: --

USCS Classification: --

Date: 01/21/22 Data entry by: AR Checked by: **KMS** Date: 01/21/22

File name: 2679168__Grain Size Analysis ASTM D6913_0.xlsm

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CLIENT **RJH Consultants**

JOB NO. 2679-168 South Boulder Creek Phase II PROJECT

PROJECT NO. 16134

LOCATION DATE TESTED 02/14/22 **TECHNICIAN** MM

BORING NO. TP-204

DEPTH 7.5-12' SAMPLE NO. Bu-2

DATE SAMPLED 12/14/21

3/4"

DESCRIPTION --

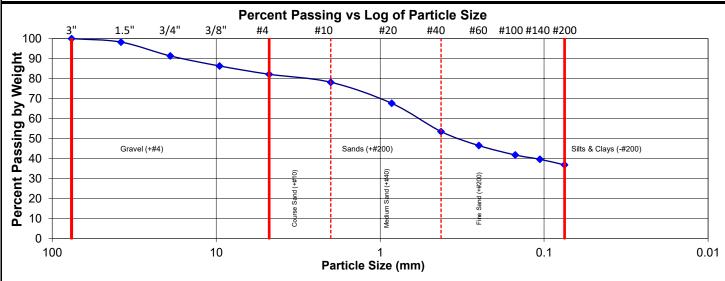
Hygroscopic Moisture of Fines Sample Data

Total Wet Mass of Sample (g): 27893.0 Mass Wet Pan and Soil (g): 511.76 Mass Dry Pan and Soil (g): 505.77 Total Dry Mass of Sample (g): 27415.7

> Mass of Pan (g): 223.78 Split Fraction: #4

Moisture (%): 2.1 Mass of Sub-Sample Fraction (g): 287.97 3080.40

| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| 3" | 76.2 | 0.0 | | | | 100.0 |
| 1.5" | 38.1 | 477.9 | | 477.9 | 1.00 | 98.3 |
| 3/4" | 19.05 | 1898.3 | | 1898.3 | 1.00 | 91.3 |
| 3/8" | 9.53 | 166.8 | | 166.8 | 0.91 | 86.3 |
| #4 | 4.75 | 137.2 | | 137.2 | 0.91 | 82.1 |
| #10 | 2.00 | 13.7 | | 13.7 | 0.82 | 78.1 |
| #20 | 0.850 | 36.2 | | 36.2 | 0.82 | 67.6 |
| #40 | 0.425 | 48.5 | | 48.5 | 0.82 | 53.5 |
| #60 | 0.250 | 24.1 | | 24.1 | 0.82 | 46.5 |
| #100 | 0.150 | 16.2 | | 16.2 | 0.82 | 41.7 |
| #140 | 0.106 | 7.5 | | 7.5 | 0.82 | 39.6 |
| #200 | 0.075 | 9.6 | | 9.6 | 0.82 | 36.8 |



USCS Classification ASTM D 2487

Atterberg Classification: CL Coefficient of Curvature - C_c: --

2679168__Grain Size Analysis ASTM D6913_4.xlsm

Coefficient of Uniformity - Cu: --Group Symbol: SC

USCS Classification: Clayey Sand With Gravel

Date: 02/15/22 Data entry by: MM Checked by: **KMS** Date: 02/15/22 File name:

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ADVANCED TERRA TESTING

CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED 03/25/20

TECHNICIAN

BDF

BORING NO.

B-202

DEPTH

3.2-3 5'

CA-2 SAMPLE NO.

DATE SAMPLED 02/03/20

DESCRIPTION Clayey sand w/gravel

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 25.48 Mass Dry Pan and Soil (g): 25.38

Mass of Pan (g): 6.77

Moisture (%): 0.6

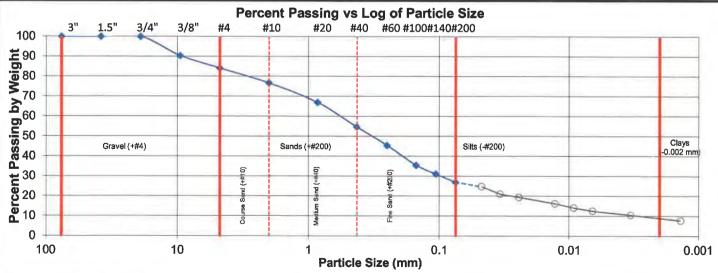
Sample Data

Total Wet Mass of Sample (g): 296.7 Total Dry Mass of Sample (g): 295.5

Split Fraction: #10

Mass of Sub-Sample Fraction (g): 72.35

| | Moisture (70). | 0.0 | wass or sub-sample Fraction (g). 72.55 | | | | |
|------------------------------|----------------|-----------------------------|--|--|----------------------|-------------------------------|--|
| Sieve Number Sieve Size (mm) | | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) | |
| 3" | 76.2 | _ | | | | | |
| 1.5" | 38.1 | | | | | | |
| 3/4" | 19.05 | 0.0 | | | | 100.0 | |
| 3/8" | 9.53 | 28.4 | | 28.4 | 1.00 | 90.4 | |
| #4 | 4.75 | 18.4 | | 18.4 | 1.00 | 84.2 | |
| #10 | 2.00 | 21.9 | | 21.92 | 1.000 | 76.7 | |
| #20 | 0.850 | 9.2 | | 9.15 | 0.767 | 67.0 | |
| #40 | 0.425 | 11.5 | | 11.50 | 0.767 | 54.7 | |
| #60 | 0.250 | 8.7 | | 8.69 | 0.767 | 45.4 | |
| #100 | 0.150 | 9.3 | | 9.31 | 0.767 | 35.5 | |
| #140 | 0.106 | 4.1 | | 4.08 | 0.767 | 31.2 | |
| #200 | 0.075 | 4.0 | | 3.95 | 0.767 | 26.9 | |



USCS Classification ASTM D 2487

Grain Size with Hydrometer ASTM D6913 D7928 2.xlsm

Atterberg Classification: CL

Coefficient of Curvature - Cc: --Coefficient of Uniformity - Cu: --

Group Symbol: SC

USCS Classification: Clayey Sand With Gravel

Data entry by: Checked by:

CAL also 2679148 Date:

3/29/2020 Date: 3/31/20

Page 1 of 2

File name:



CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/25/20 TECHNICIAN **BDF**

BORING NO.

B-202

DEPTH 3.2-3.5

SAMPLE NO. CA-2

DATE SAMPLED 02/03/20 DESCRIPTION Clayey sand w/gravel

Hydrometer and Flask Parameters

Hydrometer ID: 0805

Average Mass Offset (g/L): 9.87 Hydrometer Bulb Volume (cm³): 56.50

Meniscus Correction (g/L): 1.00

H_b (cm): 24.5

H_{ch} (cm): 6.8

H_s (cm): 8.2

Flask ID: 1184

Flask Volume (cm3): 1000.4 Flask Surface Area (cm²): 27.14 Assumed Specific Gravity 2.65

Hydrometer Type: 152H

Percent Finer by Mass at 2 µm: 8.6

| | | | Hydrometer Data | | | |
|---------------------------|-----------------------------|-------------------------|------------------|----------------------|--|------------------------------|
| Elapsed Time (minutes) | Hydrometer Reading (g/L) | Offset Reading (g/L) | Temperature (°c) | Effective Depth (cm) | Maximum Particle Diameter in Suspension (mm) | Percent Finer by Mass (%) |
| 1 | 29.00 | 5.82 | 21.8 | 12.05 | 0.047 | 24.7 |
| 2 | 25.50 | 5.82 | 21.8 | 12.63 | 0.034 | 21.0 |
| 4 | 24.00 | 5.82 | 21.8 | 12.87 | 0.024 | 19.4 |
| 15 | 21.00 | 5.82 | 21.8 | 13.37 | 0.013 | 16.2 |
| 30 | 19.00 | 5.78 | 21.9 | 13.70 | 0.009 | 14.1 |
| 60 | 17.50 | 5.78 | 21.9 | 13.94 | 0.007 | 12.5 |
| 240 | 15.50 | 5.64 | 22.3 | 14.27 | 0.003 | 10.5 |
| 1440 | 12.75 | 5.53 | 22.6 | 14.73 | 0.001 | 7.7 |
| | | | | | | |

| NOTES: | | |
|--------|--|--|
| | | |
| | | |
| | | |
| | | |
| | | |

File name: 2679148 Grain Size with Hydrometer ASTM D6913 D7928 2.xlsm

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CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/25/20

TECHNICIAN **BDF** BORING NO.

B-203

DEPTH

8.2-8.5

SAMPLE NO. CA-4

DATE SAMPLED 02/07/20

DESCRIPTION Clayey sand with gravel

NOTE

Sample size not to spec.

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 32.44 Mass Dry Pan and Soil (g): 32.31

Mass of Pan (g): 6.59

Moisture (%): 0.5

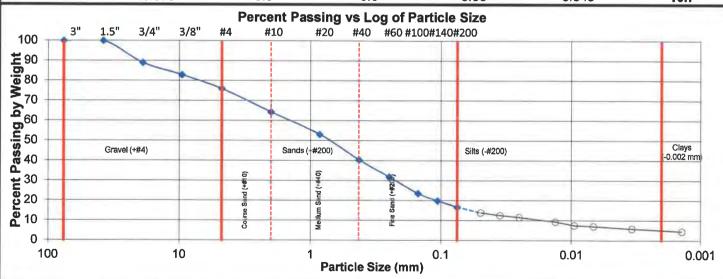
Sample Data

Total Wet Mass of Sample (g): 297.0 Total Dry Mass of Sample (g): 296.0

Split Fraction: #10

Mass of Sub-Sample Fraction (g): 70.65

| Sieve Number Sieve Size (mr | | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
|-----------------------------|-------|-----------------------------|-----------------|--|----------------------|-------------------------------|
| 3" | 76.2 | 0.0 | 0.0 | | | 100.0 |
| 1.5" | 38.1 | 0.0 | 0.0 | | | 100.0 |
| 3/4" | 19.05 | 32.5 | 0.0 | 32.5 | 1.00 | 89.0 |
| 3/8" | 9.53 | 18.0 | 0.0 | 18.0 | 1.00 | 82.9 |
| #4 | 4.75 | 20.5 | 0.0 | 20.5 | 1.00 | 76.0 |
| #10 | 2.00 | 34.5 | 0.0 | 34.51 | 1.000 | 64.3 |
| #20 | 0.850 | 12.2 | 0.0 | 12.22 | 0.643 | 53.2 |
| #40 | 0.425 | 13.9 | 0.0 | 13.91 | 0.643 | 40.4 |
| #60 | 0.250 | 9.4 | 0.0 | 9.36 | 0.643 | 31.9 |
| #100 | 0.150 | 9.0 | 0.0 | 9.03 | 0.643 | 23.6 |
| #140 | 0.106 | 4.0 | 0.0 | 3.99 | 0.643 | 19.9 |
| #200 | 0.075 | 3.5 | 0.0 | 3.53 | 0.643 | 16.7 |



USCS Classification ASTM D 2487

Grain Size with Hydrometer ASTM D6913 D7928 0.xlsm

Atterberg Classification: ML

Coefficient of Curvature - Cc: --

Group Symbol: SM

Coefficient of Uniformity - Cu: --

USCS Classification: Silty Sand With Gravel

Data entry by: TAF Date:

3/28/2020

Checked by: File name:

cn 2679148 Date: 3/28/2020 Page 1 of 2

Appendix J.1

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CLIENT RJH Consultants
JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION --

DATE TESTED 03/25/20
TECHNICIAN BDF

BORING NO. B-203 DEPTH 8.2-8.5'

SAMPLE NO. CA-4 DATE SAMPLED 02/07/20

DESCRIPTION Clayey sand with gravel NOTE Sample size not to spec.

Hydrometer and Flask Parameters

Hydrometer ID: 0805 Average Mass Offset (g/L): 9.87 Hydrometer Bulb Volume (cm³): 56.50 Meniscus Correction (g/L): 1.00

> H_b (cm): 24.5 H_{cb} (cm): 6.8

H_s (cm): 8.2

Flask ID: 1179

Flask Volume (cm³): 999.7 Flask Surface Area (cm²): 28.12 Assumed Specific Gravity 2.65

Hydrometer Type: 152H

Percent Finer by Mass at 2 µm: 4.9

| Hydrometer Data | | | | | | | | | |
|---------------------------|-----------------------------|-------------------------|------------------|----------------------|--|------------------------------|--|--|--|
| Elapsed Time (minutes) | Hydrometer Reading (g/L) | Offset Reading (g/L) | Temperature (°c) | Effective Depth (cm) | Maximum Particle Diameter in Suspension (mm) | Percent Finer by Mass (%) | | | |
| 1 | 21.00 | 5.78 | 21.9 | 13.40 | 0.050 | 13.9 | | | |
| 2 | 19.50 | 5.78 | 21.9 | 13.65 | 0.036 | 12.6 | | | |
| 4 | 18.50 | 5.78 | 21.9 | 13.81 | 0.025 | 11.6 | | | |
| 15 | 16.00 | 5.78 | 21.9 | 14.23 | 0.013 | 9.3 | | | |
| 30 | 14.00 | 5.78 | 21.9 | 14.56 | 0.009 | 7.5 | | | |
| 60 | 13.50 | 5.75 | 22.0 | 14.64 | 0.007 | 7.1 | | | |
| 240 | 12.00 | 5.60 | 22.4 | 14.88 | 0.003 | 5.9 | | | |
| 1440 | 10.50 | 5.53 | 22.6 | 15.13 | 0.001 | 4.5 | | | |

| NOTES: | |
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File name: 2679148_Grain Size with Hydrometer ASTM D6913 D7928_0.xlsm

Page 2 of 2



ADVANCED TERRA TESTING

CLIENT RJH Consultants

JOB NO. 2679-152

PROJECT South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO. 16134

LOCATION -

DATE TESTED 06/24/20 TECHNICIAN BDF BORING NO. B-215

DEPTH 4.4-5.0'

SAMPLE NO. CA-5

DATE SAMPLED 05/26/20

DESCRIPTION --

Hygroscopic Moisture of Fines

Mass Wet Pan and Soil (g): 48.91 Mass Dry Pan and Soil (g): 47.70

Mass of Pan (g): 25.57

Moisture (%): **5.5**

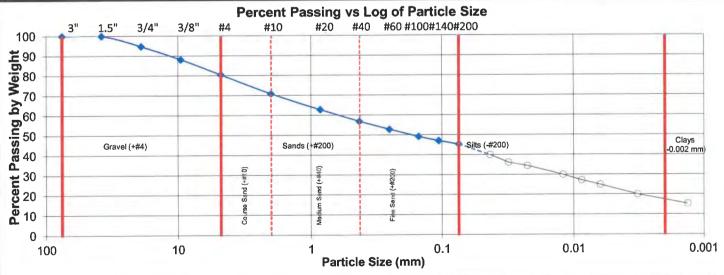
Sample Data

Total Wet Mass of Sample (g): 548.6 Total Dry Mass of Sample (g): 528.1

Split Fraction: #10

Mass of Sub-Sample Fraction (g): 67.19

| | Moistare (70). | 010 | mass of east earning traction (8). | | | | |
|--------------|-----------------|-----------------------------|------------------------------------|--|----------------------|-------------------------------|--|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) | |
| 3" | 76.2 | | | | | | |
| 1.5" | 38.1 | 0.0 | | | | 100.0 | |
| 3/4" | 19.05 | 27.8 | | 27.8 | 1.00 | 94.7 | |
| 3/8" | 9.53 | 34.7 | | 34.7 | 1.00 | 88.2 | |
| #4 | 4.75 | 40.6 | | 40.6 | 1.00 | 80.5 | |
| #10 | 2.00 | 50.5 | | 50.49 | 1.000 | 70.9 | |
| #20 | 0.850 | 7.23 | | 7.23 | 0.709 | 62.9 | |
| #40 | 0.425 | 5.36 | | 5.36 | 0.709 | 56.9 | |
| #60 | 0.250 | 3.61 | | 3.61 | 0.709 | 52.9 | |
| #100 | 0.150 | 3.26 | | 3.26 | 0.709 | 49.3 | |
| #140 | 0.106 | 1.89 | | 1.89 | 0.709 | 47.1 | |
| #200 | 0.075 | 1.63 | | 1.63 | 0.709 | 45.3 | |



USCS Classification ASTM D 2487

Atterberg Classification: CL Coefficient of Curvature - C_c: --

Group Symbol: SC Coefficient of Uniformity - C_u: --

USCS Classification: Clayey Sand With Gravel

Data entry by: CAL Date: 6/30/2020
Checked by: Date: 7/2/20

File name: 2679152 Grain Size with Hydrometer ASTM D6913 D7928_0.xlsm

Page 1 of 2



CLIENT

RJH Consultants

JOB NO.

2679-152

PROJECT

South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO.

16134

LOCATION

--

DATE TESTED 06/24/20 TECHNICIAN BDF BORING NO.

B-215

DEPTH

4.4-5.0'

SAMPLE NO.

CA-5

DATE SAMPLED 05/26/20

DESCRIPTION --

Hydrometer and Flask Parameters

Hydrometer ID: 0805

Average Mass Offset (g/L): 9.87 Hydrometer Bulb Volume (cm³): 56.50

Meniscus Correction (g/L): 1.00

H_b (cm): 24.5

H_{cb} (cm): 6.8

H_s (cm): 8.2

Flask ID: 1190

Flask Volume (cm3): 998.9

Flask Surface Area (cm²): 28.96

Assumed Specific Gravity 2.65

Hydrometer Type: 152H

Percent Finer by Mass at 2 µm: 16.9

| | | | Hydrometer Data | | | |
|---------------------------|-----------------------------|-------------------------|------------------|----------------------|--|------------------------------|
| Elapsed Time (minutes) | Hydrometer Reading (g/L) | Offset Reading (g/L) | Temperature (°c) | Effective Depth (cm) | Maximum Particle Diameter in Suspension (mm) | Percent Finer by Mass (%) |
| 1 | 40.50 | 4.59 | 25.0 | 10.22 | 0.044 | 39.9 |
| 2 | 37.00 | 4.59 | 25.0 | 10.80 | 0.032 | 36.0 |
| 4 | 35.50 | 4.59 | 25.0 | 11.05 | 0.023 | 34.4 |
| 15 | 31.50 | 4.63 | 24.9 | 11.70 | 0.012 | 29.9 |
| 30 | 29.00 | 4.63 | 24.9 | 12.12 | 0.009 | 27.1 |
| 60 | 27.00 | 4.63 | 24.9 | 12.44 | 0.006 | 24.9 |
| 240 | 22.50 | 4.55 | 25.1 | 13.19 | 0.003 | 20.0 |
| 1440 | 18.50 | 4.83 | 24.4 | 13.84 | 0.001 | 15.2 |

| NOTES: | | |
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File name:

2679152 Grain Size with Hydrometer ASTM D6913 D7928_0.xlsm

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CLIENT RJH Consultants BORING NO. TP -204, B-216, B-217(P)

JOB NO. 2679-168 DEPTH 0-15'
PROJECT South Boulder Creek Phase II SAMPLE NO. Composite

PROJECT NO. 16134 DATE SAMPLED --LOCATION -- DESCRIPTION --

DATE TESTED 02/24/22 TECHNICIAN MM

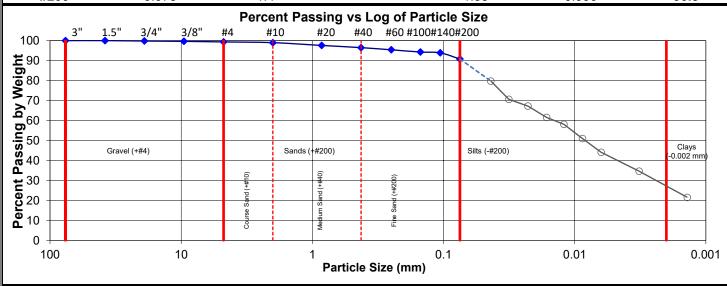
Hygroscopic Moisture of Fines Sample Data

Mass Wet Pan and Soil (g): 101.38 Total Wet Mass of Sample (g): 25969.0 Mass Dry Pan and Soil (g): 98.85 Total Dry Mass of Sample (g): 25281.4

Mass of Pan (g): 6.79 Split Fraction: #10 3/8"

Moisture (%): **2.7** Mass of Sub-Sample Fraction (g): 44.46 1678.50

| | \ / | | | 1 (0) | | |
|--------------|-----------------|-----------------------------|-----------------|--|----------------------|----------------------------------|
| Sieve Number | Sieve Size (mm) | Mass of Pan and Soil (g) | Mass of Pan (g) | Mass of Individual Retained Soil (g) | Correction Factor | Percent Passing by Weight (%) |
| 3" | 76.2 | 0.0 | | | | 100.0 |
| 1.5" | 38.1 | 0.0 | | | | 100.0 |
| 3/4" | 19.05 | 53.4 | | 53.4 | 1.00 | 99.8 |
| 3/8" | 9.53 | 40.4 | | 40.4 | 1.00 | 99.6 |
| #4 | 4.75 | 4.7 | | 4.7 | 1.00 | 99.3 |
| #10 | 2.00 | 5.9 | | 5.93 | 0.996 | 99.0 |
| #20 | 0.850 | 0.6 | | 0.61 | 0.990 | 97.6 |
| #40 | 0.425 | 0.5 | | 0.48 | 0.990 | 96.5 |
| #60 | 0.250 | 0.5 | | 0.48 | 0.990 | 95.4 |
| #100 | 0.150 | 0.5 | | 0.48 | 0.990 | 94.3 |
| #140 | 0.106 | 0.2 | | 0.18 | 0.990 | 93.9 |
| #200 | 0.075 | 1.4 | | 1.35 | 0.990 | 90.8 |



USCS Classification ASTM D 2487

Atterberg Classification: CL Coefficient of Curvature - C_c : -Group Symbol: CL Coefficient of Uniformity - C_u : --

USCS Classification: Lean Clay

Data entry by: MM Date: 02/28/22 Checked by: KMS Date: 02/28/22

File name: 2679168__Grain Size with Hydrometer ASTM D6913 D7928_0.xlsm Page 1 of 2

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CLIENT RJH Consultants BORING NO. TP -204, B-216, B-217(P)

JOB NO. 2679-168 DEPTH 0-15'
PROJECT South Boulder Creek Phase II SAMPLE NO. Composite

PROJECT NO. 16134 DATE SAMPLED --LOCATION -- DESCRIPTION --

DATE TESTED 02/24/22 TECHNICIAN MM

Hydrometer and Flask Parameters

Hydrometer ID: 0805

Average Mass Offset (g/L): 9.87

Hydrometer Bulb Volume (cm³): 56.50

Meniscus Correction (g/L): 1.00

Hydrometer Section (g/L): 1.00

 H_b (cm): 24.5 Hydrometer Type: 152H H_{cb} (cm): 6.8

 H_s (cm): 8.2 Percent Finer by Mass at 2 μ m: **25.9**

| Hydrometer Data | | | | | | | | | |
|---------------------------|-----------------------------|-------------------------|------------------|----------------------|--|------------------------------|--|--|--|
| Elapsed Time (minutes) | Hydrometer Reading (g/L) | Offset Reading (g/L) | Temperature (°C) | Effective Depth (cm) | Maximum Particle Diameter in Suspension (mm) | Percent Finer by Mass (%) | | | |
| 1 | 40.50 | 5.53 | 22.6 | 10.21 | 0.044 | 79.7 | | | |
| 2 | 36.50 | 5.53 | 22.6 | 10.87 | 0.032 | 70.6 | | | |
| 4 | 35.00 | 5.53 | 22.6 | 11.12 | 0.023 | 67.2 | | | |
| 8 | 32.50 | 5.53 | 22.6 | 11.53 | 0.016 | 61.5 | | | |
| 15 | 31.00 | 5.53 | 22.6 | 11.77 | 0.012 | 58.1 | | | |
| 30 | 28.00 | 5.64 | 22.3 | 12.27 | 0.009 | 51.0 | | | |
| 60 | 25.00 | 5.67 | 22.2 | 12.76 | 0.006 | 44.1 | | | |
| 240 | 20.75 | 5.56 | 22.5 | 13.46 | 0.003 | 34.6 | | | |
| 1396 | 15.00 | 5.56 | 22.5 | 14.41 | 0.001 | 21.5 | | | |

1396 15.00 5.56 22.5 14.41 0.001 **21.5**NOTES:

File name: 2679168_Grain Size with Hydrometer ASTM D6913 D7928_0.xlsm Page 2 of 2

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Standard Proctor ASTM D698 and AASHTO T99

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Laboratory Compaction Characteristics

ASTM D698

CLIENT **RJH Consultants**

JOB NO. 2679-168

PROJECT South Boulder Creek Phase II

PROJECT NO. 16134 LOCATION DATE TESTED 01/27/22 TECHNICIAN MM

BORING NO. TP-204, B-216, B-217(P)

DEPTH 0-15' SAMPLE NO. Composite

DATE SAMPLED **DESCRIPTION**

Laboratory Compaction Characteristics

Hygroscopic Moisture

Mass of Wet Pan and Soil (g): 286.64 Mass of Dry Pan and Soil (g): 278.40 Mass of Pan (g): 6.68 Moisture (%): 3.0

Rock Correction ASTM D 4718

Method: В Course Fraction (%): 1.4 Rock Correction Applied: NO Mass of Dry Aggregate (g): Mass of SSD Aggregate (g): Mass of Aggregate in Water (g): Rock Specific Gravity: N/A Zero Air Voids Specific Gravity: 2.65

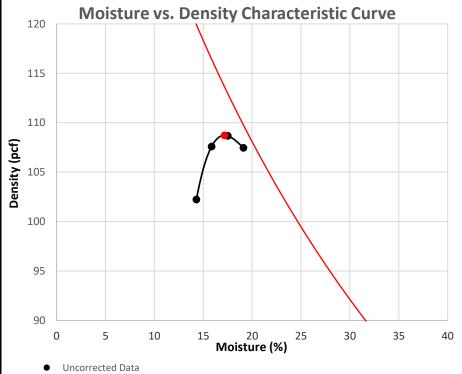
Optimum Dry Density and Moisture

Uncorrected

108.7 Dry Density (pcf): Dry Density (kg/m³): 1742 Moisture (%): 17.2

Corrected

N/A Dry Density (pcf): Dry Density (kg/m³): N/A Moisture (%): N/A



Maximum Dry Density and Optimum Moisture

Zero Air Voids Curve

| | | 20107111 | voids curve | | |
|--------------------------------|--------|----------|-------------|--------|--|
| Sample Number: | 1 | 2 | 3 | 4 | |
| Mass of Wet Pan and Soil (g): | 429.02 | 478.98 | 403.02 | 417.12 | |
| Mass of Dry Soil and Pan (g): | 361.26 | 408.64 | 348.80 | 365.78 | |
| Mass of Pan (g); | 6.67 | 6.71 | 6.74 | 6.73 | |
| Moisture (%): | 19.1 | 17.5 | 15.9 | 14.3 | |
| Mass of Wet Soil and Mold (g): | 6509.8 | 6505.1 | 6459.2 | 6341.3 | |
| Mass of Mold (g): | 4574.5 | 4574.5 | 4574.5 | 4574.5 | |
| Wet Density (pcf): | 128.0 | 127.7 | 124.7 | 116.9 | |
| Dry Density (pcf): | 107.5 | 108.7 | 107.6 | 102.2 | |
| Wet Density (kg/m³): | 2050 | 2045 | 1997 | 1872 | |
| Dry Density (kg/m³): | 1721 | 1741 | 1724 | 1638 | |

Data entry by: MM Date: 01/28/22

Checked by: **DPM** Date: 01/28/22 File name: 2679168 compaction ASTM D698 D1557_0.xlsm

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Direct Shear ASTM D 3080

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Direct Shear

ASTM D 3080

CLIENT JOB NO. PROJECT PROJECT NO. LOCATION

DATE TESTED

TECHNICIAN

RJH Consultants

2679-148

South Boulder Creek - Phase II

16134

04/01/20

DPM/ALH

BORING NO.

DEPTH

SAMPLE NO. DATE SAMPLED DESCRIPTION

B-203

23.5-24.0' NQ-4

02/10/20 Rock Core

Direct Shear Results Point: A В $\overline{\mathsf{c}}$ Normal Load (psf): 4007 2518 1014 Normal Load (kPa): 191.9 120.6 48.6 Peak Strength (psf): 3715 1700 949 Ultimate Strength (psf): 2341 1634 883 Peak Strength (kPa): 177.9 81.4 45.4 Ultimate Strength (kPa): 112.1 78.2 42.3

Peak Strength

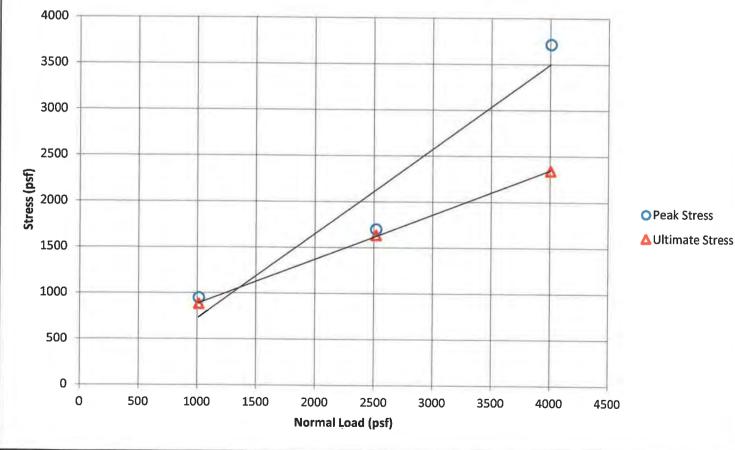
Friction Angle: 42.7

Cohesion (psf): Cohesion (kPa): **Ultimate Strength**

Friction Angle: Cohesion (psf): 26.0 395

Cohesion (kPa): 19.0

Normal Load vs. Stress



Data entry by:

Checked by: File name:

TAF DPM

2679148 Direct Shear ASTM D3080 0.xlsm

Date:

4/4/2020 Date: 4/8/20

Page 1 of 2



Direct Shear

ASTM D 3080

CLIENT JOB NO. RJH Consultants 2679-148

BORING NO.
DEPTH

B-203

PROJECT NO.

South Boulder Creek - Phase II 16134

SAMPLE NO.
DATE SAMPLED

23.5-24.0' NQ-4

LOCATION DATE TESTED

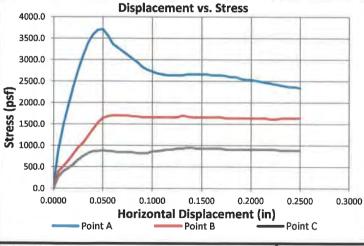
04/01/20

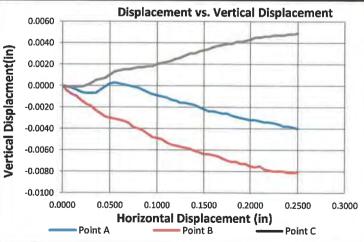
TECHNICIAN

DPM/ALH

DATE SAMPLED 02/10/20
DESCRIPTION Rock Core

| | Test Pa | rameters | | |
|--|-----------------|--------------------|------------------|-----------------------|
| Displacement Rate (in/min): | 0.0007 | | t Rate (cm/min): | 0.001778 |
| Raw Data Files: F | RJDS324A.DAT, F | RJDS324B.DAT, RJDS | S324C.DAT, | |
| | | | | |
| Before Test Mass of Wet Soil and Ring (g): | 125.25 | 122.19 | 89.20 | |
| After Test Mass of Wet Soil and Pan (g): | 102.28 | 99.43 | 100.33 | |
| Mass of Dry Soil and Pan (g): | 90.52 | 87.80 | 88.35 | |
| Mass of Ring (g): | 32.85 | 32.84 | 0.00 | |
| Mass of Pan (g): | 6.64 | 6.78 | 6.66 | |
| Diameter (in): | 1.81 | 1.78 | 1.78 | |
| Initial Height (in): | 1.00 | 1.00 | 1.00 | |
| Height Change (in): | 0.0249 | 0.02125 | 0.00125 | |
| | | | | |
| Area (in²): | 2.56 | 2.49 | 2.47 | |
| Initial Wet Density (pcf): | 137.4 | 136.6 | 137.3 | |
| Initial Dry Density (pcf): | 124.7 | 123.9 | 125.8 | |
| Initial Wet Density (kg/m³): | 2201 | 2189 | 2200 | |
| Initial Dry Density (kg/m³): | 1998 | 1985 | 2015 | |
| Initial Moisture (%): | 10.1 | 10.3 | 9.2 | |
| Final Wet Density (pcf): | 145.9 | 140.8 | 139.5 | |
| Final Dry Density (pcf): | 127.9 | 123.1 | 121.6 | |
| Final Wet Density (kg/m³): | 2336 | 2255 | 2234 | |
| Final Dry Density (kg/m³): | 2049 | 1972 | 1948 | |
| Final Moisture (%): | 14.0 | 14.4 | 14.7 | |
| Displacement vs. Stress | | | Displacement w | Vertical Displacement |





NOTES:

Data indicated negative intercept no value reported. Sample was broken. Could not align to bedding plane.

Page 2 of 2

File name:

2679148 Direct Shear ASTM D3080 0.xlsm

CLIENT RJH Consultants JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION --

DATE TESTED 04/01/20 TECHNICIAN DPM/ALH

 BORING NO.
 B-203

 DEPTH
 23.5-24.0'

 SAMPLE NO.
 NQ-4

 DATE SAMPLED
 2/10/20

 DESCRIPTION
 Rock Core

| / | Point A | | | Point B | | | Point C | |
|----------------------|--------------|------------------|----------------------|--------------|------------------|----------------------|--------------|---------------------|
| Disalgooment | | Vertical | Diselesses | | Vertical | Dississes | | Vertical |
| Displacement (in) | Stress (psf) | Displacment (in) | Displacement (in) | Stress (psf) | Displacment (in) | Displacement (in) | Stress (psf) | Displacment (in) |
| 0.0000 | 21.0 | 0.0000 | 0.0000 | 0.0 | 0.0000 | 0.0000 | 0.0 | -0.0001 |
| 0.0050 | 923.0 | -0.0001 | 0.0050 | 397.0 | -0.0005 | 0.0050 | 265.0 | -0.0001 |
| 0.0100 | 1482.0 | -0.0002 | 0.0100 | 508.0 | -0.0008 | 0.0100 | 397.0 | -0.0001 |
| 0.0150 | 1933.0 | -0.0004 | 0.0150 | 640.0 | -0.0010 | 0.0150 | 464.0 | -0.0001 |
| 0.0200 | 2384.0 | -0.0006 | 0.0200 | 795.0 | -0.0014 | 0.0200 | 552.0 | -0.0001 |
| 0.0250 | 2770.0 | -0.0007 | 0.0250 | 949.0 | -0.0017 | 0.0250 | 662.0 | 0.0000 |
| 0.0300 | 3114.0 | -0.0007 | 0.0300 | 1060.0 | -0.0019 | 0.0300 | 751.0 | 0.0002 |
| 0.0350 | 3393.0 | -0.0007 | 0.0350 | 1214.0 | -0.0023 | 0.0350 | 817.0 | 0.0005 |
| 0.0400 | 3586.0 | -0.0004 | 0.0400 | 1369.0 | -0.0026 | 0.0400 | 861.0 | 0.0006 |
| 0.0450 | 3693.0 | -0.0001 | 0.0450 | 1524.0 | -0.0029 | 0.0450 | 861.0 | 0.0007 |
| 0.0500 | 3715.0 | 0.0002 | 0.0500 | 1634.0 | -0.0030 | 0.0500 | 883.0 | 0.0010 |
| 0.0550 | 3565.0 | 0.0002 | 0.0550 | 1678.0 | -0.0031 | 0.0550 | 861.0 | 0.0013 |
| 0.0600 | 3371.0 | 0.0003 | 0.0600 | 1700.0 | -0.0031 | 0.0600 | 861.0 | 0.0013 |
| 0.0650 | 3285.0 | 0.0002 | 0.0650 | 1700.0 | -0.0032 | 0.0650 | 839.0 | 0.0015 |
| 0.0700 | 3200.0 | 0.0001 | 0.0000 | 1700.0 | -0.0035 | 0.0700 | 839.0 | 0.0015 |
| 0.0750 | 3114.0 | -0.0001 | 0.0750 | 1700.0 | -0.0039 | 0.0750 | 839.0 | 0.0015 |
| 0.0800 | 3028.0 | -0.0001 | 0.0750 | 1678.0 | -0.0039 | 0.0750 | 839.0 | 0.0017 |
| 0.0850 | 2942.0 | | | | | | | |
| 0.0900 | | -0.0004 | 0.0850 | 1678.0 | -0.0042 | 0.0850 | 817.0 | 0.0017 |
| | 2834.0 | -0.0006 | 0.0900 0.0950 | 1656.0 | -0.0045 | 0.0900 | 817.0 | 0.0018 |
| 0.0950 | 2770.0 | -0.0008 | | 1656.0 | -0.0048 | 0.0950 | 817.0 | 0.0018 |
| 0.1000 | 2727.0 | -0.0009 | 0.1000 | 1656.0 | -0.0049 | 0.1000 | 861.0 | 0.0020 |
| 0.1050 | 2684.0 | -0.0010 | 0.1050 | 1656.0 | -0.0050 | 0.1050 | 861.0 | 0.0021 |
| 0.1100 | 2663.0 | -0.0011 | 0.1100 | 1656.0 | -0.0053 | 0.1100 | 883.0 | 0.0022 |
| 0.1150 | 2641.0 | -0.0013 | 0.1150 | 1656.0 | -0.0055 | 0.1150 | 905.0 | 0.0023 |
| 0.1200 | 2641.0 | -0.0014 | 0.1200 | 1656.0 | -0.0056 | 0.1200 | 905.0 | 0.0025 |
| 0.1250 | 2641.0 | -0.0016 | 0.1250 | 1656.0 | -0.0057 | 0.1250 | 927.0 | 0.0026 |
| 0.1300 | 2641.0 | -0.0016 | 0.1300 | 1700.0 | -0.0058 | 0.1300 | 927.0 | 0.0028 |
| 0.1350 | 2663.0 | -0.0017 | 0.1350 | 1678.0 | -0.0059 | 0.1350 | 949.0 | 0.0030 |
| 0.1400 | 2663.0 | -0.0018 | 0.1400 | 1656.0 | -0.0061 | 0.1400 | 949.0 | 0.0030 |
| 0.1450 | 2663.0 | -0.0020 | 0.1450 | 1656.0 | -0.0062 | 0.1450 | 927.0 | 0.0032 |
| 0.1500 | 2663.0 | -0.0022 | 0.1500 | 1656.0 | -0.0064 | 0.1500 | 927.0 | 0.0033 |
| 0.1550 | 2663.0 | -0.0024 | 0.1550 | 1656.0 | -0.0064 | 0.1550 | 927.0 | 0.0034 |
| 0.1600 | 2641.0 | -0.0024 | 0.1600 | 1656.0 | -0.0065 | 0.1600 | 927.0 | 0.0036 |
| 0.1650 | 2641.0 | -0.0025 | 0.1650 | 1656.0 | -0.0066 | 0.1650 | 927.0 | 0.0037 |
| 0.1700 | 2641.0 | -0.0026 | 0.1700 | 1656.0 | -0.0068 | 0.1700 | 927.0 | 0.0038 |
| 0.1750 | 2620.0 | -0.0026 | 0.1750 | 1634.0 | -0.0070 | 0.1750 | 905.0 | 0.0039 |
| 0.1800 | 2598.0 | -0.0028 | 0.1800 | 1634.0 | -0.0071 | 0.1800 | 905.0 | 0.0039 |
| 0.1850 | 2598.0 | -0.0029 | 0.1850 | 1634.0 | -0.0071 | 0.1850 | 905.0 | 0.0041 |
| 0.1900 | 2555.0 | -0.0030 | 0.1900 | 1634.0 | -0.0073 | 0.1900 | 905.0 | 0.0041 |
| 0.1950 | 2534.0 | -0.0031 | 0.1950 | 1634.0 | -0.0073 | 0.1950 | 905.0 | 0.0042 |
| 0.2000 | 2534.0 | -0.0032 | 0.2000 | 1634.0 | -0.0075 | 0.2000 | 905.0 | 0.0043 |
| 0.2050 | 2512.0 | -0.0032 | 0.2050 | 1634.0 | -0.0076 | 0.2050 | 905.0 | 0.0045 |
| 0.2100 | 2491.0 | -0.0033 | 0.2100 | 1634.0 | -0.0075 | 0.2100 | 905.0 | 0.0045 |
| | | | *. | | | | | |

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CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT PROJECT NO. South Boulder Creek - Phase II

0.2400

0.2450

0.2500

1634.0

1634.0

1634.0

LOCATION

0.2400

0.2450

0.2500

2362.0

2362.0

2341.0

16134

DATE TESTED

04/01/20

DPM/ALH

-0.0038

-0.0039

-0.0040

BORING NO.

SAMPLE NO.

B-203 23.5-24.0'

DEPTH

DATE SAMPLED

NQ-4 2/10/20

DESCRIPTION

883.0

883.0

883.0

Rock Core

| TECHNICI | AN | DPM/ALH | | | | | | |
|--------------|--------------|-------------|--------------|--------------|-------------|--------------|--------------|-------------|
| 6 | Point A | | | Point B | | | Point C | |
| | | Vertical | | | Vertical | | | Vertical |
| Displacement | | Displacment | Displacement | | Displacment | Displacement | | Displacment |
| (in) | Stress (psf) | (in) | (in) | Stress (psf) | (in) | (in) | Stress (psf) | (in) |
| 0.2150 | 2469.0 | -0.0034 | 0.2150 | 1634.0 | -0.0078 | 0.2150 | 905.0 | 0.0046 |
| 0.2200 | 2448.0 | -0.0034 | 0.2200 | 1612.0 | -0.0079 | 0.2200 | 905.0 | 0.0046 |
| 0.2250 | 2426.0 | -0.0035 | 0.2250 | 1612.0 | -0.0080 | 0.2250 | 905.0 | 0.0047 |
| 0.2300 | 2405.0 | -0.0036 | 0.2300 | 1634.0 | -0.0080 | 0.2300 | 883.0 | 0.0047 |
| 0.2350 | 2384.0 | -0.0038 | 0.2350 | 1634.0 | -0.0080 | 0.2350 | 883.0 | 0.0047 |

0.2400

0.2450

0.2500

-0.0081

-0.0081

-0.0081

0.0048

0.0048

0.0049



Direct Shear

ASTM D 3080

CLIENT JOB NO. **RJH Consultants**

BORING NO. DEPTH

147.0

B-212

PROJECT

2679-148 South Boulder Creek - Phase II

SAMPLE NO.

13.5-14.1' NQ-1

PROJECT NO. LOCATION

16134

DATE SAMPLED

02/20/20

DATE TESTED

04/03/20

Ultimate Strength (kPa):

DESCRIPTION

Core

TECHNICIAN DPM

| | Direct She | ar Results | |
|--------------------------|------------|------------|------|
| Point: | Α | В | С |
| Normal Load (psf): | 4000 | 2500 | 1000 |
| Normal Load (kPa): | 191.5 | 119.7 | 47.9 |
| Peak Strength (psf): | 4623 | 3071 | 1599 |
| Ultimate Strength (psf): | 4623 | 3071 | 1470 |
| Peak Strength (kPa): | 221.3 | 147.0 | 76.5 |

221.3

Ultimate Strength

Friction Angle: Cohesion (psf):

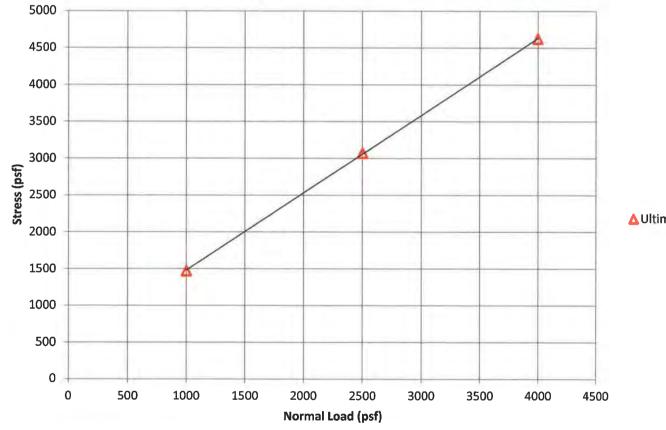
70.4

46.4 427

Cohesion (kPa):

20.5

Normal Load vs. Stress



△Ultimate Stress

Data entry by: Checked by:

DPM wm

2679148

Direct Shear ASTM D3080 2.xlsm

Date: Date: 4/10/20

Page 1 of 2

File name:



Direct Shear

ASTM D 3080

CLIENT **RJH Consultants** JOB NO.

2679-148

BORING NO.

B-212

PROJECT

South Boulder Creek - Phase II

DEPTH SAMPLE NO. 13.5-14.1' NQ-1

PROJECT NO. LOCATION

16134

DATE SAMPLED

02/20/20

DESCRIPTION

Core

DATE TESTED TECHNICIAN

04/03/20 **DPM**

Test Parameters

Displacement Rate (in/min): 0.02 Displacement Rate (cm/min): 0.0508

Raw Data Files: RJH_DS_B-212_13-14_NQ-1_A.txt, RJH_DS_B-212_13-14_NQ-1_B.txt, RJH_DS_B-212_13

14 NQ-1 C.txt,

Before Test Mass of Wet Soil and Ring (g):

After Test Mass of Wet Soil and Pan (g): Mass of Dry Soil and Pan (g):

Mass of Ring (g):

Mass of Pan (g):

Diameter (in):

1.79

1.79

1.79

Initial Height (in): Height Change (in):

Area (in²):

2.57

2.57

2.57

Initial Wet Density (pcf):

Initial Dry Density (pcf):

Initial Wet Density (kg/m³):

Initial Dry Density (kg/m³):

Initial Moisture (%):

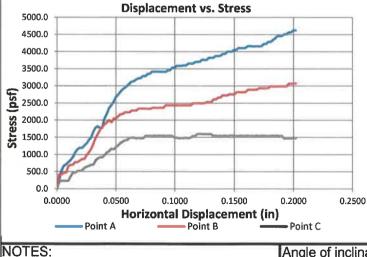
Final Wet Density (pcf):

Final Dry Density (pcf):

Final Wet Density (kg/m³):

Final Dry Density (kg/m³):

Final Moisture (%):



Displacement vs. Vertical Displacement 0.0250 0.0200 /ertical Displacment(in) 0.0150 0.0100 0.0050 0.0000 -0.0050 -0.0100 -0.0150 0.0000 0.0500 0.1000 0.1500 0.2000 0.2500 Horizontal Displacement (in) Point A Point B Point C

Angle of inclination = 11 degrees.

Page 2 of 2

File name:

2679148 Direct Shear ASTM D3080 2.xlsm

Appendix J.1

CLIENT RJH Consultants JOB NO. 2679-148

South Boulder Creek - Phase II

PROJECT NO. 16134

PROJECT

LOCATION -DATE TESTED 04/03/20
TECHNICIAN DPM

 BORING NO.
 B-212

 DEPTH
 13.5-14.1'

 SAMPLE NO.
 NQ-1

 DATE SAMPLED
 2/20/20

 DESCRIPTION
 Core

| - | Point A | | | Point B | | | Point C | | |
|----------------------|--------------|------------------|-------------------|--------------|------------------|----------------------|--------------|------------------|--|
| | | Vertical | | | Vertical | | | Vertical | |
| Displacement (in) | Stress (psf) | Displacment (in) | Displacement (in) | Stress (psf) | Displacment (in) | Displacement (in) | Stress (psf) | Displacment (in) | |
| 0.0000 | 0.0 | 0.0000 | 0.0000 | 0.0 | 0.0000 | 0.0000 | 0.0 | 0.0000 | |
| 0.0019 | 231.5 | -0.0001 | 0.0019 | 407.5 | -0.0010 | 0.0019 | 178.2 | 0.0003 | |
| 0.0038 | 522.4 | -0.0005 | 0.0038 | 409.2 | -0.0011 | 0.0038 | 232.6 | 0.0010 | |
| 0.0057 | 660.9 | -0.0006 | 0.0058 | 459.6 | -0.0014 | 0.0058 | 228.1 | 0.0008 | |
| 0.0077 | 712.4 | -0.0010 | 0.0077 | 465.2 | -0.0010 | 0.0077 | 228.1 | 0.0008 | |
| 0.0096 | 773.0 | -0.0012 | 0.0096 | 652.5 | -0.0010 | 0.0096 | 232.1 | 0.0008 | |
| 0.0115 | 825.7 | -0.0014 | 0.0115 | 692.3 | -0.0012 | 0.0115 | 352.6 | 0.0009 | |
| 0.0134 | 920.9 | -0.0016 | 0.0135 | 697.3 | -0.0012 | 0.0134 | 460.2 | 0.0009 | |
| 0.0153 | 1053.2 | -0.0018 | 0.0154 | 773.5 | -0.0013 | 0.0154 | 464.7 | 0.0008 | |
| 0.0172 | 1151.3 | -0.0021 | 0.0173 | 769.6 | -0.0013 | 0.0173 | 514.6 | 0.0006 | |
| 0.0172 | 1196.2 | -0.0021 | 0.0173 | 817.3 | -0.0013 | 0.0173 | 520.7 | 0.0006 | |
| 0.0211 | 1190.6 | -0.0024 | 0.0132 | 864.3 | -0.0012 | 0.0192 | 527.5 | 0.0005 | |
| 0.0230 | 1256.1 | -0.0024 | 0.0212 | 863.8 | -0.0012 | 0.0212 | 602.6 | 0.0005 | |
| 0.0230 | 1317.2 | -0.0023 | | | | | | | |
| | | | 0.0250 | 982.0 | -0.0012 | 0.0250 | 647.4 | 0.0006 | |
| 0.0268 | 1418.1 | -0.0024 | 0.0270 | 1059.4 | -0.0011 | 0.0269 | 662.5 | 0.0005 | |
| 0.0287 | 1478.7 | -0.0023 | 0.0289 | 1152.4 | -0.0011 | 0.0289 | 697.3 | 0.0006 | |
| 0.0306 | 1650.2 | -0.0025 | 0.0309 | 1313.3 | -0.0012 | 0.0308 | 694.5 | 0.0006 | |
| 0.0325 | 1770.2 | -0.0024 | 0.0328 | 1480.9 | -0.0012 | 0.0327 | 822.9 | 0.0006 | |
| 0.0344 | 1825.1 | -0.0028 | 0.0347 | 1598.6 | -0.0023 | 0.0346 | 880.6 | 0.0007 | |
| 0.0364 | 1770.2 | -0.0026 | 0.0366 | 1714.1 | -0.0025 | 0.0366 | 914.2 | 0.0005 | |
| 0.0383 | 1770.2 | -0.0026 | 0.0386 | 1817.8 | -0.0027 | 0.0385 | 916.5 | 0.0006 | |
| 0.0402 | 2047.1 | -0.0024 | 0.0405 | 1871.0 | -0.0027 | 0.0404 | 977.6 | 0.0005 | |
| 0.0421 | 2169.8 | -0.0023 | 0.0424 | 1929.3 | -0.0034 | 0.0423 | 1054.4 | 0.0006 | |
| 0.0440 | 2334.6 | -0.0026 | 0.0443 | 1998.3 | -0.0036 | 0.0442 | 1092.5 | 0.0006 | |
| 0.0460 | 2431.6 | -0.0028 | 0.0463 | 1932.7 | -0.0032 | 0.0461 | 1162.5 | 0.0006 | |
| 0.0479 | 2530.2 | -0.0030 | 0.0482 | 2050.4 | -0.0033 | 0.0480 | 1146.3 | 0.0006 | |
| 0.0498 | 2665.9 | -0.0030 | 0.0501 | 2047.1 | -0.0033 | 0.0500 | 1204.0 | 0.0005 | |
| 0.0517 | 2724.7 | -0.0031 | 0.0520 | 2105.3 | -0.0030 | 0.0519 | 1256.7 | 0.0006 | |
| 0.0537 | 2821.1 | -0.0033 | 0.0539 | 2172.1 | -0.0030 | 0.0538 | 1323.4 | 0.0004 | |
| 0.0556 | 2896.3 | -0.0036 | 0.0559 | 2174.9 | -0.0030 | 0.0557 | 1370.5 | 0.0008 | |
| 0.0575 | 2941.7 | -0.0042 | 0.0578 | 2227.0 | -0.0031 | 0.0577 | 1413.7 | 0.0008 | |
| 0.0594 | 2990.4 | -0.0040 | 0.0597 | 2227.0 | -0.0030 | 0.0596 | 1412.5 | 0.0011 | |
| 0.0614 | 3067.2 | -0.0045 | 0.0616 | 2227.0 | -0.0032 | 0.0615 | 1482.6 | 0.0019 | |
| 0.0633 | 3125.5 | -0.0046 | 0.0635 | 2279.7 | -0.0036 | 0.0634 | 1486.5 | 0.0026 | |
| 0.0652 | 3129.4 | -0.0044 | 0.0654 | 2278.0 | -0.0037 | 0.0653 | 1487.1 | 0.0030 | |
| 0.0671 | 3186.0 | -0.0044 | 0.0674 | 2279.7 | -0.0042 | 0.0672 | 1471.4 | 0.0034 | |
| 0.0690 | 3219.7 | -0.0049 | 0.0693 | 2336.8 | -0.0042 | 0.0692 | 1478.1 | 0.0044 | |
| 0.0709 | 3225.8 | -0.0052 | 0.0712 | 2337.4 | -0.0045 | 0.0711 | 1474.8 | 0.0044 | |
| 0.0729 | 3291.4 | -0.0052 | 0.0731 | 2338.0 | -0.0046 | 0.0731 | 1474.8 | 0.0049 | |
| 0.0748 | 3281.3 | -0.0052 | 0.0750 | 2335.2 | -0.0044 | 0.0750 | 1541.5 | 0.0056 | |
| 0.0768 | 3352.0 | -0.0053 | 0.0769 | 2332.9 | -0.0044 | 0.0769 | 1544.3 | 0.0058 | |
| 0.0787 | 3355.3 | -0.0054 | 0.0788 | 2332.9 | -0.0043 | 0.0788 | 1545.9 | 0.0053 | |
| 0.0806 | 3418.1 | -0.0056 | 0.0807 | 2359.3 | -0.0044 | 0.0808 | 1538.7 | 0.0057 | |

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CLIENT JOB NO. PROJECT **RJH Consultants**

2679-148

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

DATE TESTED 04/03/20 TECHNICIAN DPM

BORING NO. DEPTH

B-212 13.5-14.1'

SAMPLE NO. NQ-1 DATE SAMPLED 2/20/20 DESCRIPTION Core

| | Point A | | | Point B | | | Point C | |
|----------------------|--------------|------------------|-------------------|--------------|---------------------|----------------------|--------------|------------------|
| Di-d | | Vertical | D. 1 | | Vertical | | | Vertical |
| Displacement (in) | Stress (psf) | Displacment (in) | Displacement (in) | Stress (psf) | Displacment (in) | Displacement (in) | Stress (psf) | Displacment (in) |
| 0.0825 | 3415.9 | -0.0059 | 0.0827 | 2361.5 | -0.0043 | 0.0827 | 1548.2 | 0.0063 |
| 0.0844 | 3415.3 | -0.0058 | 0.0846 | 2356.5 | -0.0042 | 0.0846 | 1541.5 | 0.0066 |
| 0.0863 | 3416.4 | -0.0061 | 0.0865 | 2358.1 | -0.0043 | 0.0865 | 1547.1 | 0.0066 |
| 0.0882 | 3410.3 | -0.0062 | 0.0884 | 2362.1 | -0.0047 | 0.0884 | 1544.3 | 0.0080 |
| 0.0901 | 3411.4 | -0.0066 | 0.0903 | 2358.1 | -0.0047 | 0.0903 | 1546.5 | 0.0083 |
| 0.0921 | 3411.9 | -0.0065 | 0.0922 | 2433.8 | -0.0046 | 0.0922 | 1541.5 | 0.0085 |
| 0.0940 | 3449.5 | -0.0069 | 0.0941 | 2429.9 | -0.0046 | 0.0941 | 1543.1 | 0.0088 |
| 0.0959 | 3456.2 | -0.0068 | 0.0961 | 2432.1 | -0.0047 | 0.0960 | 1553.8 | 0.0090 |
| 0.0978 | 3533.0 | -0.0067 | 0.0980 | 2433.3 | -0.0047 | 0.0979 | 1541.5 | 0.0092 |
| 0.0998 | 3536.4 | -0.0069 | 0.0999 | 2431.0 | -0.0047 | 0.0999 | 1487.1 | 0.0092 |
| 0.1017 | 3589.6 | -0.0071 | 0.1019 | 2434.4 | -0.0047 | 0.1018 | 1489.3 | 0.0091 |
| 0.1036 | 3582.9 | -0.0071 | 0.1038 | 2431.0 | -0.0047 | 0.1037 | 1470.8 | 0.0093 |
| 0.1055 | 3585.7 | -0.0072 | 0.1057 | 2434.9 | -0.0047 | 0.1056 | 1478.7 | 0.0095 |
| 0.1074 | 3601.4 | -0.0073 | 0.1076 | 2432.1 | -0.0048 | 0.1075 | 1479.2 | 0.0096 |
| 0.1094 | 3596.9 | -0.0073 | 0.1095 | 2437.2 | -0.0048 | 0.1094 | 1491.0 | 0.0099 |
| 0.1114 | 3654.1 | -0.0075 | 0.1114 | 2434.9 | -0.0047 | 0.1113 | 1472.5 | 0.0104 |
| 0.1134 | 3654.1 | -0.0075 | 0.1133 | 2429.9 | -0.0048 | 0.1132 | 1494.9 | 0.0106 |
| 0.1153 | 3654.1 | -0.0076 | 0.1152 | 2493.8 | -0.0047 | 0.1152 | 1541.5 | 0.0111 |
| 0.1172 | 3698.4 | -0.0075 | 0.1172 | 2492.1 | -0.0047 | 0.1171 | 1540.9 | 0.0114 |
| 0.1191 | 3704.5 | -0.0074 | 0.1191 | 2498.8 | -0.0047 | 0.1190 | 1598.6 | 0.0118 |
| 0.1210 | 3704.0 | -0.0076 | 0.1210 | 2493.8 | -0.0047 | 0.1209 | 1598.1 | 0.0113 |
| 0.1230 | 3769.6 | -0.0077 | 0.1229 | 2494.9 | -0.0045 | 0.1229 | 1595.8 | 0.0123 |
| 0.1249 | 3761.2 | -0.0079 | 0.1248 | 2496.6 | -0.0042 | 0.1248 | 1598.6 | 0.0125 |
| 0.1268 | 3756.7 | -0.0081 | 0.1268 | 2530.2 | -0.0043 | 0.1267 | 1598.6 | 0.0124 |
| 0.1287 | 3825.6 | -0.0084 | 0.1287 | 2528.5 | -0.0040 | 0.1286 | 1598.6 | 0.0125 |
| 0.1306 | 3822.8 | -0.0084 | 0.1307 | 2530.8 | -0.0033 | 0.1305 | 1598.6 | 0.0130 |
| 0.1325 | 3825.6 | -0.0084 | 0.1326 | 2609.8 | -0.0030 | 0.1324 | 1543.7 | 0.0132 |
| 0.1345 | 3877.7 | -0.0085 | 0.1345 | 2604.2 | -0.0030 | 0.1343 | 1553.2 | 0.0130 |
| 0.1364 | 3873.3 | -0.0085 | 0.1365 | 2663.1 | -0.0029 | 0.1363 | 1541.5 | 0.0132 |
| 0.1383 | 3875.5 | -0.0085 | 0.1384 | 2663.1 | -0.0031 | 0.1382 | 1547.1 | 0.0130 |
| 0.1402 | 3931.0 | -0.0085 | 0.1403 | 2724.2 | -0.0031 | 0.1401 | 1538.7 | 0.0135 |
| 0.1421 | 3933.2 | -0.0085 | 0.1422 | 2723.6 | -0.0032 | 0.1421 | 1553.8 | 0.0136 |
| 0.1440 | 3998.3 | -0.0085 | 0.1442 | 2727.5 | -0.0035 | 0.1440 | 1535.9 | 0.0139 |
| 0.1459 | 4000.5 | -0.0084 | 0.1461 | 2757.2 | -0.0036 | 0.1459 | 1552.1 | 0.0142 |
| 0.1479 | 3996.6 | -0.0086 | 0.1480 | 2753.3 | -0.0033 | 0.1478 | 1553.2 | 0.0141 |
| 0.1498 | 4053.7 | -0.0085 | 0.1499 | 2752.8 | -0.0026 | 0.1498 | 1551.0 | 0.0139 |
| 0.1518 | 4053.7 | -0.0085 | 0.1518 | 2818.9 | -0.0025 | 0.1517 | 1536.4 | 0.0146 |
| 0.1537 | 4107.6 | -0.0084 | 0.1537 | 2818.3 | -0.0024 | 0.1536 | 1538.1 | 0.0153 |
| 0.1556 | 4105.3 | -0.0085 | 0.1556 | 2817.2 | -0.0024 | 0.1555 | 1550.4 | 0.0154 |
| 0.1575 | 4104.2 | -0.0084 | 0.1576 | 2818.3 | -0.0022 | 0.1574 | 1542.6 | 0.0154 |
| 0.1594 | 4107.6 | -0.0085 | 0.1595 | 2820.6 | -0.0021 | 0.1594 | 1541.5 | 0.0152 |
| 0.1614 | 4162.5 | -0.0084 | 0.1615 | 2888.4 | -0.0017 | 0.1613 | 1546.5 | 0.0155 |
| 0.1633 | 4163.6 | -0.0085 | 0.1634 | 2891.8 | -0.0013 | 0.1632 | 1539.2 | 0.0156 |

Appendix J.1

CLIENT JOB NO. **RJH Consultants**

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. **LOCATION**

16134

DATE TESTED 04/03/20 **TECHNICIAN**

DPM

BORING NO. B-212 **DEPTH** 13.5-14.1' SAMPLE NO. NQ-1 2/20/20 DATE SAMPLED **DESCRIPTION** Core

| | Point A | | | Point B | | | Point C | | |
|--------------|--------------|-------------------------|--------------|--------------|-------------------------|--------------|--------------|-------------------------|----|
| Displacement | | Vertical Displacment | Displacement | | Vertical Displacment | Displacement | | Vertical Displacment | |
| (in) | Stress (psf) | (in) | (in) | Stress (psf) | (in) | (in) | Stress (psf) | (in) | |
| 0.1652 | 4156.3 | -0.0084 | 0.1653 | 2888.4 | -0.0012 | 0.1652 | 1542.6 | 0.0157 | |
| 0.1672 | 4156.3 | -0.0079 | 0.1672 | 2888.4 | -0.0012 | 0.1671 | 1541.5 | 0.0165 | |
| 0.1691 | 4160.2 | -0.0077 | 0.1692 | 2895.7 | -0.0012 | 0.1691 | 1553.8 | 0.0167 | |
| 0.1710 | 4154.6 | -0.0074 | 0.1711 | 2937.7 | -0.0010 | 0.1710 | 1538.1 | 0.0177 | |
| 0.1729 | 4159.7 | -0.0075 | 0.1730 | 2931.0 | -0.0008 | 0.1729 | 1544.3 | 0.0177 | |
| 0.1748 | 4225.3 | -0.0075 | 0.1750 | 2933.3 | -0.0004 | 0.1748 | 1547.1 | 0.0176 | |
| 0.1767 | 4220.8 | -0.0074 | 0.1769 | 2932.7 | -0.0006 | 0.1767 | 1537.5 | 0.0182 | |
| 0.1787 | 4285.2 | -0.0073 | 0.1788 | 2935.5 | -0.0005 | 0.1787 | 1540.9 | 0.0177 | |
| 0.1806 | 4283.0 | -0.0069 | 0.1807 | 2988.2 | -0.0005 | 0.1806 | 1539.2 | 0.0178 | |
| 0.1825 | 4339.1 | -0.0071 | 0.1826 | 2984.8 | -0.0001 | 0.1826 | 1553.8 | 0.0178 | |
| 0.1844 | 4390.6 | -0.0069 | 0.1845 | 2982.0 | -0.0002 | 0.1845 | 1537.5 | 0.0179 | |
| 0.1864 | 4454.0 | -0.0068 | 0.1865 | 2983.1 | -0.0002 | 0.1864 | 1548.7 | 0.0182 | |
| 0.1883 | 4455.6 | -0.0067 | 0.1884 | 2985.4 | 0.0002 | 0.1883 | 1538.1 | 0.0184 | |
| 0.1903 | 4456.2 | -0.0067 | 0.1903 | 2985.4 | 0.0005 | 0.1902 | 1543.7 | 0.0184 | |
| 0.1922 | 4510.6 | -0.0064 | 0.1922 | 2987.1 | 0.0004 | 0.1921 | 1470.3 | 0.0189 | |
| 0.1941 | 4510.6 | -0.0062 | 0.1942 | 2982.6 | 0.0005 | 0.1941 | 1473.1 | 0.0191 | |
| 0.1960 | 4565.0 | -0.0062 | 0.1961 | 3067.2 | 0.0009 | 0.1960 | 1469.7 | 0.0198 | |
| 0.1979 | 4565.5 | -0.0061 | 0.1981 | 3063.9 | 0.0010 | 0.1979 | 1466.9 | 0.0196 | |
| 0.1998 | 4621.0 | -0.0060 | 0.2000 | 3066.7 | 0.0010 | 0.1998 | 1492.1 | 0.0196 | |
| 0.2018 | 4622.7 | -0.0058 | 0.2019 | 3071.1 | 0.0011 | 0.2018 | 1469.7 | 0.0199 | |
| | | | | | | | | | |
| | | | | | | | | | |
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Direct Shear

ASTM D 3080

CLIENT JOB NO. PROJECT PROJECT NO. LOCATION

DATE TESTED

TECHNICIAN

RJH Consultants

2679-148

South Boulder Creek - Phase II

16134

DPM

04/06/20

BORING NO.

DEPTH

DESCRIPTION

B-213 21.2-21.7'

SAMPLE NO. DATE SAMPLED

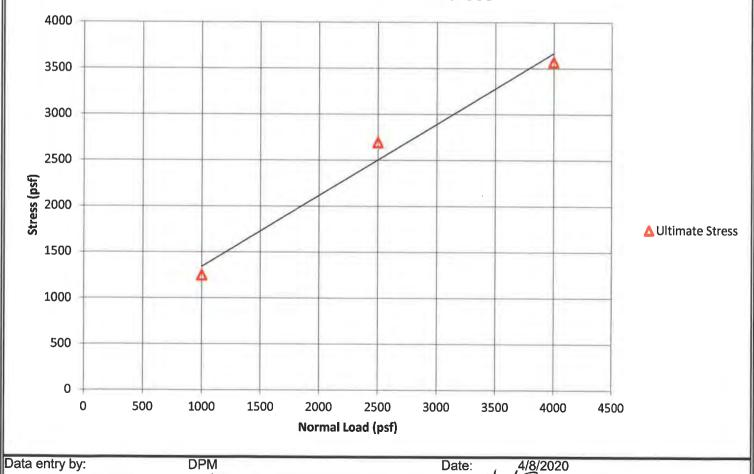
NQ-2 02/13/20

Core

| | Direct She | ar Results | | |
|--------------------------|------------|------------|-------------------|--|
| Point: | Α | В | С | |
| Normal Load (psf): | 4000 | 2500 | 1000 | |
| Normal Load (kPa): | 191.5 | 119.7 | 47.9 | |
| Peak Strength (psf): | 3572 | 2809 | 2706 | |
| Ultimate Strength (psf): | 3569 | 2693 | 1246 | |
| Peak Strength (kPa): | 171.0 | 134.5 | 129.6 | |
| Ultimate Strength (kPa): | 170.9 | 128.9 | 59.7 | |
| | | | Ultimate Strength | |

Friction Angle: 37.7 Cohesion (psf): 567 Cohesion (kPa): 27.2

Normal Load vs. Stress



Data entry by: Checked by:

DPM ware

2679148

Direct Shear ASTM D3080 1.xlsm

Date: Date: 4/10/20

Page 1 of 2

File name:



Direct Shear

ASTM D 3080

CLIENT **RJH Consultants** BORING NO. B-213 JOB NO. 2679-148 DEPTH 21.2-21.7' PROJECT South Boulder Creek - Phase II SAMPLE NO. NQ-2 PROJECT NO. 16134 DATE SAMPLED 02/13/20 LOCATION **DESCRIPTION** Core

DATE TESTED 04/06/20
TECHNICIAN DPM

| | | | Test Pa | arameters | | |
|----------------|--|---------------------------------|-------------------------|--|--------------------------|----------------------------|
| | Displacement F | | 0.02 | | t Rate (cm/min): | 0.0508 |
| | Ra | | IH_DS_B-213_2 C.txt, | 1_NQ-2_A.txt, RJH_D | OS_B-213_21_NQ-2_B | 3.txt, RJH_DS_B-213_21_NQ- |
| Before Test Ma | ss of Wet Soil a | and Ring (g): | | | | |
| | ass of Wet Soil | 1,47 | | | | |
| N | lass of Dry Soil | | | | | |
| | | s of Ring (g): | | | | |
| | | s of Pan (g): liameter (in): | 1.80 | 1.80 | 1.80 | |
| | | I Height (in): | 1.00 | 1.60 | 1.60 | |
| | | Change (in): | | | | |
| | | onango (m.). | | | | |
| | | Area (in²): | 2.59 | 2.59 | 2.59 | |
| | | Density (pcf): | | | | |
| | | Density (pcf): | | | | |
| | Initial Wet Der | | | | | |
| | Initial Dry Der | /loisture (%): | | | | |
| | | Density (pcf): | | | | |
| | | Density (pcf): | | | | |
| | Final Wet Der | nsity (kg/m³): | | | | |
| | Final Dry Der | | | | | |
| | | loisture (%): | | | | |
| 4000.0 | Displacement v | s. Stress | | 0.0150 | Displacement | vs. Vertical Displacement |
| 3500.0 | | | | 0.0255 | | |
| | | | | <u> </u> | | |
| 3000.0 | A promote | | | 0.0050 | | |
| 2500.0 | The same of the sa | | | E | | |
| 2000.0 | M | | | 0.0000 | | |
| 1500.0 | 1 | 7 | | -0.0050 | 1 | |
| 2000.0 | | | | -0.0000 Occopion occo | 0 | |
| 500.0 | | | | -0.0100 | | ~ |
| 0.0 | - | | | -0.0150 | | |
| | 500 0.1000 | 0.1500 0.20 | 000 0.2500 | 0.0000 | 0.0500 0.1000 | 0.1500 0.2000 0. |
| Point A | Horizontal Disp | lacement (in) | oint C | Poi | Horizontal Disport A Poi | |
| . 011107 | 1011 | | | | | Tollit C |

Page 2 of 2

File name:

2679148__Direct Shear ASTM D3080_1.xlsm

CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II
PROJECT NO. 16134

PROJECT NO. LOCATION

DATE TESTED 04/06/20 TECHNICIAN DPM

 BORING NO.
 B-213

 DEPTH
 21.2-21.7'

 SAMPLE NO.
 NQ-2

 DATE SAMPLED
 2/13/20

 DESCRIPTION
 Core

| | Point A | | | Point B | | | Point C | | |
|-------------------|--------------|---------------------------------|-------------------|--------------|---------------------------------|-------------------|--------------|---------------------------------|-----|
| Displacement (in) | Stress (psf) | Vertical Displacment (in) | Displacement (in) | Stress (psf) | Vertical Displacment (in) | Displacement (in) | Stress (psf) | Vertical Displacment (in) | |
| 0.0000 | 0.0 | 0.0000 | 0.0000 | 0.0 | 0.0000 | 0.0000 | 0.0 | 0.0000 | |
| 0.0019 | 270.3 | 0.0005 | 0.0019 | 171.3 | -0.0010 | 0.0019 | 588.5 | -0.0003 | |
| 0.0039 | 402.1 | 0.0002 | 0.0038 | 298.1 | -0.0012 | 0.0038 | 591.8 | -0.0003 | |
| 0.0058 | 455.5 | 0.0001 | 0.0057 | 357.6 | -0.0012 | 0.0058 | 649.6 | -0.0002 | |
| 0.0077 | 513.4 | 0.0002 | 0.0077 | 354.9 | -0.0014 | 0.0077 | 649.6 | -0.0003 | |
| 0.0096 | 583.5 | -0.0001 | 0.0096 | 401.0 | -0.0012 | 0.0096 | 652.4 | -0.0002 | |
| 0.0115 | 641.9 | -0.0002 | 0.0115 | 461.1 | -0.0013 | 0.0115 | 654.1 | -0.0002 | |
| 0.0134 | 679.7 | -0.0004 | 0.0134 | 510.0 | -0.0013 | 0.0135 | 912.7 | -0.0002 | |
| 0.0153 | 772.6 | -0.0004 | 0.0154 | 520.6 | -0.0015 | 0.0154 | 1049.5 | -0.0002 | |
| 0.0173 | 802.6 | -0.0003 | 0.0173 | 583.5 | -0.0014 | 0.0173 | 1086.3 | -0.0001 | |
| 0.0192 | 856.0 | -0.0004 | 0.0192 | 585.1 | -0.0014 | 0.0192 | 1246.4 | 0.0005 | |
| 0.0211 | 857.7 | -0.0004 | 0.0211 | 645.2 | -0.0014 | 0.0212 | 1703.6 | 0.0005 | |
| 0.0230 | 917.7 | -0.0003 | 0.0231 | 653.5 | -0.0015 | 0.0231 | 1921.1 | 0.0013 | |
| 0.0249 | 909.4 | -0.0005 | 0.0250 | 653.0 | -0.0014 | 0.0250 | 1982.9 | 0.0017 | |
| 0.0269 | 973.9 | -0.0004 | 0.0269 | 649.6 | -0.0014 | 0.0269 | 2034.0 | 0.0022 | |
| 0.0288 | 968.9 | -0.0004 | 0.0288 | 658.5 | -0.0015 | 0.0289 | 2092.4 | 0.0027 | |
| 0.0307 | 1062.3 | -0.0004 | 0.0308 | 686.9 | -0.0015 | 0.0308 | 2153.0 | 0.0032 | |
| 0.0326 | 1096.8 | -0.0004 | 0.0327 | 769.8 | -0.0017 | 0.0327 | 2209.8 | 0.0041 | |
| 0.0345 | 1139.7 | -0.0005 | 0.0347 | 815.4 | -0.0016 | 0.0347 | 2257.1 | 0.0044 | |
| 0.0364 | 1194.2 | -0.0005 | 0.0366 | 819.8 | -0.0018 | 0.0366 | 2334.4 | 0.0052 | |
| 0.0384 | 1183.6 | -0.0004 | 0.0385 | 814.3 | -0.0020 | 0.0385 | 2476.8 | 0.0066 | |
| 0.0403 | 1246.4 | -0.0003 | 0.0404 | 858.8 | -0.0020 | 0.0404 | 2589.1 | 0.0075 | |
| 0.0422 | 1246.4 | -0.0005 | 0.0424 | 855.4 | -0.0020 | 0.0424 | 2591.3 | 0.0079 | |
| 0.0441 | 1303.2 | -0.0006 | 0.0443 | 911.6 | -0.0019 | 0.0444 | 2482.3 | 0.0080 | |
| 0.0461 | 1358.2 | -0.0007 | 0.0462 | 1047.9 | -0.0019 | 0.0463 | 2320.5 | 0.0081 | |
| 0.0480 | 1405.0 | -0.0007 | 0.0481 | 1045.1 | -0.0019 | 0.0482 | 2416.1 | 0.0091 | |
| 0.0499 | 1471.1 | -0.0006 | 0.0500 | 1091.3 | -0.0019 | 0.0501 | 2478.4 | 0.0098 | |
| 0.0518 | 1534.0 | -0.0008 | 0.0519 | 1144.7 | -0.0018 | 0.0520 | 2506.8 | 0.0100 | |
| 0.0537 | 1586.3 | -0.0008 | 0.0539 | 1181.4 | -0.0018 | 0.0539 | 2589.1 | 0.0109 | |
| 0.0556 | 1699.7 | -0.0008 | 0.0558 | 1246.4 | -0.0020 | 0.0559 | 2706.5 | 0.0112 | |
| 0.0576 | 1813.2 | -0.0012 | 0.0577 | 1305.4 | -0.0020 | 0.0578 | 2410.6 | 0.0112 | |
| 0.0595 | 1927.2 | -0.0020 | 0.0596 | 1402.7 | -0.0020 | 0.0597 | 2345.5 | 0.0113 | |
| 0.0614 | 2036.8 | -0.0024 | 0.0616 | 1586.3 | -0.0021 | 0.0616 | 2317.7 | 0.0111 | |
| 0.0634 | 2085.7 | -0.0023 | 0.0635 | 1700.9 | -0.0024 | 0.0636 | 2339.9 | 0.0107 | |
| 0.0654 | 1910.0 | -0.0028 | 0.0654 | 1811.5 | -0.0030 | 0.0655 | 2322.7 | 0.0114 | |
| 0.0673 | 1982.9 | -0.0031 | 0.0673 | 1863.3 | -0.0029 | 0.0674 | 2317.1 | 0.0119 | |
| 0.0692 | 2096.9 | -0.0033 | 0.0692 | 1982.9 | -0.0034 | 0.0694 | 2262.6 | 0.0119 | |
| 0.0711 | 2208.7 | -0.0042 | 0.0711 | 2034.6 | -0.0037 | 0.0713 | 2265.4 | 0.0119 | |
| 0.0730 | 2264.8 | -0.0040 | 0.0731 | 2086.3 | -0.0039 | 0.0732 | 2209.8 | 0.0119 | |
| 0.0750 | 2312.7 | -0.0039 | 0.0750 | 2153.0 | -0.0038 | 0.0751 | 2153.0 | 0.0117 | |
| 0.0769 | 2343.8 | -0.0041 | 0.0769 | 2153.0 | -0.0039 | 0.0771 | 2153.0 | 0.0125 | |
| 0.0788 | 2415.0 | -0.0042 | 0.0788 | 2209.8 | -0.0045 | 0.0790 | 2086.9 | 0.0124 | |
| 0.0808 | 2420.6 | -0.0043 | 0.0807 | 2208.1 | -0.0051 | 0.0809 | 2029.0 | 0.0127 | |
| | | | | | 3.3001 | 3.3000 | | V.V.E. | II. |

Appendix J.1 120 of 262

CLIENT RJH Consultants JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION --DATE TESTED 04/06/20 TECHNICIAN DPM BORING NO. B-213
DEPTH 21.2-21.7'
SAMPLE NO. NQ-2
DATE SAMPLED 2/13/20
DESCRIPTION Core

| | Point A | | | Point B | | | Point C | | |
|--------------|------------------|-------------|--------------|--------------|-------------|--------------|--------------|-------------|----|
| | Tomera | Vertical | | TOIRE | Vertical | | 1 01110 | Vertical | |
| Displacement | | Displacment | Displacement | 0 : | Displacment | Displacement | 00 | Displacment | |
| (in) | Stress (psf) | (in) | (in) | Stress (psf) | (in) | (in) | Stress (psf) | (in) | |
| 0.0827 | 2470.6 | -0.0047 | 0.0827 | 2261.5 | -0.0050 | 0.0828 | 1982.9 | 0.0127 | |
| 0.0846 | 2512.9 | -0.0058 | 0.0846 | 2257.1 | -0.0053 | 0.0847 | 1980.1 | 0.0128 | |
| 0.0865 | 2511.8 | -0.0062 | 0.0865 | 2316.6 | -0.0050 | 0.0867 | 1920.6 | 0.0128 | |
| 0.0884 | 2578.0 | -0.0058 | 0.0884 | 2316.6 | -0.0052 | 0.0886 | 1860.5 | 0.0128 | |
| 0.0904 | 2592.4 | -0.0059 | 0.0904 | 2337.7 | -0.0057 | 0.0905 | 1811.5 | 0.0129 | |
| 0.0923 | 2657.0 | -0.0056 | 0.0923 | 2337.7 | -0.0057 | 0.0924 | 1756.5 | 0.0129 | |
| 0.0942 | 2697.6 | -0.0056 | 0.0942 | 2347.7 | -0.0056 | 0.0943 | 1755.4 | 0.0129 | |
| 0.0961 | 2707.6 | -0.0056 | 0.0961 | 2422.2 | -0.0055 | 0.0963 | 1699.7 | 0.0129 | |
| 0.0981 | 2743.7 | -0.0058 | 0.0981 | 2405.6 | -0.0059 | 0.0982 | 1700.3 | 0.0129 | |
| 0.1000 | 2745.4 | -0.0061 | 0.1000 | 2465.6 | -0.0059 | 0.1002 | 1702.5 | 0.0128 | |
| 0.1019 | 2796.6 | -0.0064 | 0.1019 | 2477.3 | -0.0059 | 0.1021 | 1642.5 | 0.0128 | |
| 0.1038 | 2788.8 | -0.0066 | 0.1038 | 2467.9 | -0.0060 | 0.1041 | 1635.8 | 0.0129 | |
| 0.1058 | 2873.9 | -0.0068 | 0.1057 | 2464.0 | -0.0061 | 0.1060 | 1647.5 | 0.0127 | |
| 0.1077 | 2872.2 | -0.0071 | 0.1076 | 2473.4 | -0.0064 | 0.1079 | 1586.3 | 0.0123 | |
| 0.1096 | 2879.4 | -0.0074 | 0.1095 | 2505.1 | -0.0064 | 0.1098 | 1583.5 | 0.0118 | |
| 0.1116 | 2921.2 | -0.0074 | 0.1114 | 2508.5 | -0.0066 | 0.1118 | 1586.3 | 0.0122 | |
| 0.1135 | 2913.9 | -0.0075 | 0.1134 | 2501.2 | -0.0067 | 0.1137 | 1640.8 | 0.0121 | |
| 0.1155 | 2970.1 | -0.0077 | 0.1153 | 2505.1 | -0.0068 | 0.1156 | 1634.7 | 0.0121 | |
| 0.1174 | 2955.1 | -0.0079 | 0.1172 | 2501.8 | -0.0069 | 0.1176 | 1635.2 | 0.0122 | |
| 0.1193 | 3039.6 | -0.0081 | 0.1191 | 2499.0 | -0.0068 | 0.1195 | 1637.5 | 0.0122 | |
| 0.1212 | 3037.4 | -0.0080 | 0.1210 | 2595.2 | -0.0068 | 0.1215 | 1637.5 | 0.0122 | |
| 0.1232 | 3106.4 | -0.0081 | 0.1210 | 2593.6 | -0.0070 | 0.1234 | 1586.3 | 0.0122 | |
| 0.1252 | 3156.4 | -0.0079 | 0.1249 | 2593.6 | -0.0069 | 0.1253 | 1586.3 | 0.0123 | |
| 0.1231 | 3168.7 | -0.0073 | 0.1243 | 2591.9 | -0.0068 | 0.1272 | 1632.4 | 0.0122 | |
| 0.1270 | 3188.7 | -0.0085 | 0.1287 | 2632.5 | -0.0069 | 0.1272 | 1643.6 | 0.0121 | |
| 0.1209 | | -0.0085 | 0.1287 | 2648.6 | -0.0009 | 0.1292 | 1632.4 | 0.0121 | |
| 0.1308 | 3192.6 3253.2 | -0.0085 | 0.1300 | 2630.3 | -0.0070 | 0.1331 | 1638.0 | 0.0121 | |
| | | | | | | | | 0.0121 | |
| 0.1347 | 3252.7 | -0.0084 | 0.1345 | 2648.1 | -0.0071 | 0.1349 | 1642.5 | | |
| 0.1366 | 3255.4 | -0.0087 | 0.1364 | 2710.9 | -0.0071 | 0.1368 | 1586.3 | 0.0122 | |
| 0.1385 | 3335.5 | -0.0093 | 0.1383 | 2709.2 | -0.0070 | 0.1387 | 1586.3 | 0.0122 | |
| 0.1404 | 3326.1 | -0.0090 | 0.1402 | 2689.2 | -0.0070 | 0.1406 | 1586.3 | 0.0122 | |
| 0.1424 | 3393.4 | -0.0093 | 0.1422 | 2744.8 | -0.0070 | 0.1425 | 1586.3 | 0.0123 | |
| 0.1443 | 3392.8 | -0.0094 | 0.1441 | 2741.5 | -0.0070 | 0.1444 | 1586.3 | 0.0121 | |
| 0.1462 | 3381.1 | -0.0095 | 0.1460 | 2738.7 | -0.0069 | 0.1463 | 1586.3 | 0.0127 | |
| 0.1481 | 3328.3 | -0.0094 | 0.1479 | 2741.5 | -0.0070 | 0.1483 | 1586.3 | 0.0128 | |
| 0.1501 | 3252.1 | -0.0095 | 0.1499 | 2742.1 | -0.0070 | 0.1502 | 1586.3 | 0.0128 | |
| 0.1520 | 3326.1 | -0.0094 | 0.1518 | 2807.1 | -0.0069 | 0.1521 | 1529.5 | 0.0129 | |
| 0.1539 | 3327.2 | -0.0094 | 0.1538 | 2808.8 | -0.0069 | 0.1541 | 1471.7 | 0.0129 | |
| 0.1558 | 3323.3 | -0.0100 | 0.1557 | 2726.5 | -0.0070 | 0.1560 | 1466.1 | 0.0128 | |
| 0.1578 | 3323.3 | -0.0102 | 0.1576 | 2732.1 | -0.0070 | 0.1579 | 1469.5 | 0.0129 | |
| 0.1597 | 3332.2 | -0.0101 | 0.1595 | 2716.5 | -0.0070 | 0.1598 | 1463.9 | 0.0128 | |
| 0.1617 | 3387.8 | -0.0103 | 0.1615 | 2643.6 | -0.0069 | 0.1618 | 1470.0 | 0.0128 | |
| 0.1636 | 3382.2 | -0.0104 | 0.1634 | 2584.7 | -0.0069 | 0.1637 | 1465.0 | 0.0128 | I. |

Appendix J.1 121 of 262

CLIENT JOB NO. **RJH Consultants**

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

DATE TESTED 04/06/20 TECHNICIAN DPM

BORING NO. B-213
DEPTH 21.2-21.7'
SAMPLE NO. NQ-2
DATE SAMPLED 2/13/20

DATE SAMPLED 2/13/2 DESCRIPTION Core

| | Point A | | | Point B | | | Point C | | |
|----------------------|--------------|---------------------|----------------------|--------------|---------------------|-------------------|--------------|------------------|--|
| Disabase | | Vertical | District in | | Vertical | Black | | Vertical | |
| Displacement (in) | Stress (psf) | Displacment (in) | Displacement (in) | Stress (psf) | Displacment (in) | Displacement (in) | Stress (psf) | Displacment (in) | |
| 0.1655 | 3322.2 | -0.0107 | 0.1653 | 2501.8 | -0.0070 | 0.1656 | 1464.5 | 0.0128 | |
| 0.1674 | 3326.1 | -0.0110 | 0.1672 | 2495.7 | -0.0070 | 0.1675 | 1463.4 | 0.0128 | |
| 0.1693 | 3390.6 | -0.0109 | 0.1691 | 2465.1 | -0.0069 | 0.1695 | 1468.9 | 0.0128 | |
| 0.1713 | 3388.9 | -0.0109 | 0.1710 | 2460.1 | -0.0069 | 0.1714 | 1467.8 | 0.0129 | |
| 0.1732 | 3421.7 | -0.0111 | 0.1730 | 2421.1 | -0.0069 | 0.1733 | 1467.8 | 0.0129 | |
| 0.1751 | 3426.7 | -0.0111 | 0.1749 | 2426.1 | -0.0069 | 0.1752 | 1461.1 | 0.0128 | |
| 0.1770 | 3425.6 | -0.0111 | 0.1768 | 2420.6 | -0.0070 | 0.1771 | 1532.3 | 0.0128 | |
| 0.1790 | 3499.6 | -0.0111 | 0.1788 | 2402.2 | -0.0070 | 0.1791 | 1529.5 | 0.0129 | |
| 0.1809 | 3499.0 | -0.0111 | 0.1807 | 2395.0 | -0.0070 | 0.1810 | 1527.3 | 0.0130 | |
| 0.1828 | 3503.5 | -0.0112 | 0.1826 | 2455.1 | -0.0070 | 0.1829 | 1531.2 | 0.0131 | |
| 0.1848 | 3555.8 | -0.0109 | 0.1845 | 2462.9 | -0.0070 | 0.1848 | 1465.0 | 0.0130 | |
| 0.1867 | 3552.4 | -0.0109 | 0.1864 | 2462.3 | -0.0070 | 0.1867 | 1531.2 | 0.0130 | |
| 0.1886 | 3555.2 | -0.0109 | 0.1883 | 2502.9 | -0.0069 | 0.1886 | 1529.5 | 0.0131 | |
| 0.1906 | 3557.5 | -0.0108 | 0.1902 | 2512.9 | -0.0070 | 0.1906 | 1530.7 | 0.0132 | |
| 0.1925 | 3571.9 | -0.0110 | 0.1922 | 2601.9 | -0.0069 | 0.1925 | 1534.0 | 0.0131 | |
| 0.1944 | 3569.1 | -0.0109 | 0.1941 | 2588.6 | -0.0070 | 0.1944 | 1466.7 | 0.0133 | |
| 0.1964 | 3569.1 | -0.0108 | 0.1960 | 2642.5 | -0.0070 | 0.1964 | 1359.9 | 0.0125 | |
| 0.1983 | 3569.7 | -0.0107 | 0.1979 | 2655.9 | -0.0070 | 0.1983 | 1246.4 | 0.0127 | |
| 0.2002 | 3571.4 | -0.0106 | 0.1998 | 2689.2 | -0.0069 | 0.2003 | 1244.2 | 0.0127 | |
| 0.2022 | 3569.1 | -0.0107 | 0.2018 | 2693.1 | -0.0069 | 0.2022 | 1246.4 | 0.0127 | |
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One Dimensional Swell / Collapse ASTM D4546 (Method C)

Appendix J.1 123 of 262



ASTM D4546 (Method C)

CLIENT JOB NO. **RJH Consultants** 2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/23/20

TECHNICIAN DPM

BORING NO.

B-202 21.6-22.2'

DEPTH

SAMPLE NO. DATE SAMPLED NQ-2

SAMPLED BY

2/6/2020

DESCRIPTION

Core

Sample Conditions

Before Test Mass of Wet Soil and Ring (g): 90.35 After Test Mass of Wet Soil and Ring (g): 91.84

Mass of Dry Soil, Ring, and Pan (g): 235.50

Diameter (in): 1.80

Initial Height (in): 1.00

Mass of Ring (g): 0.00

Mass of Pan (g): 155.98

Inundation Load (psf): 2008

Inundation Load (kPa): 96

Oedometer ID: ATT-08

Initial Wet Density (pcf): 136.5

Initial Dry Density (pcf): 120.2

Initial Wet Density (kg/m3): 2187

Initial Dry Density (kg/m³): 1925

Initial Moisture (%): 13.6

Final Wet Density (pcf): 142.0

Final Dry Density (pcf): 123.0

Final Wet Density (kg/m³): 2275

Final Dry Density (kg/m³): 1970

Final Moisture (%): 15.5

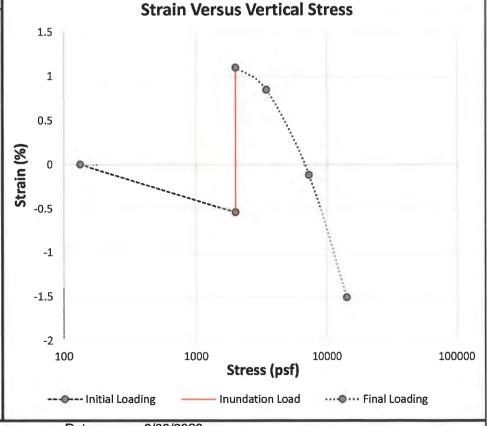
Swell / Collapse Data

Swell (%): 1.64

Swell Pressure (psf): 9445

Swell Pressure (kPa): 452

| Load (pst) | Deformation (in) | Strain (%) |
|------------|------------------|------------|
| 134 | 0.0000 | 0.00 |
| 2008 | -0.0054 | -0.54 |
| Inudated | 0.0109 | 1.10 |
| 3448 | 0.0084 | 0.84 |
| 7300 | -0.0012 | -0.12 |
| 14348 | -0.0150 | -1.51 |



Data entry by: Checked by:

File name:

DPM

CH

2679148 Swell Colapse ASTM D4546_0.xls

Date: 3/30/2020

Date: 4/5/20



ASTM D4546 (Method C)

CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION

DATE TESTED 03/23/20

TECHNICIAN DPM

BORING NO.

DEPTH

B-202 21.6-22.2'

SAMPLE NO.

DATE SAMPLED

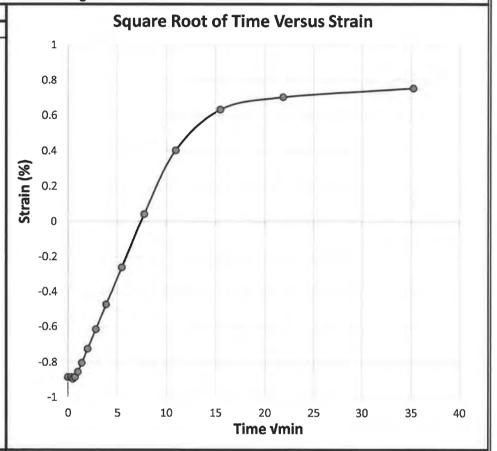
NQ-2 2/6/2020

SAMPLED BY

DESCRIPTION Core

Time Reading At Inundation Load

| Inun | dation Load (psf): | 2008 |
|------------|--------------------|------------|
| Time (min) | Deformation (in) | Strain (%) |
| 0 | -0.0088 | -0.88 |
| 0.1 | -0.0088 | -0.88 |
| 0.25 | -0.0089 | -0.89 |
| 0.5 | -0.0088 | -0.88 |
| 1 | -0.0085 | -0.85 |
| 2 | -0.0080 | -0.80 |
| 4 | -0.0072 | -0.72 |
| 8 | -0.0061 | -0.61 |
| 15 | -0.0047 | -0.47 |
| 30 | -0.0026 | -0.26 |
| 60 | 0.0004 | 0.04 |
| 120 | 0.0040 | 0.40 |
| 240 | 0.0063 | 0.63 |
| 480 | 0.0070 | 0.70 |
| 1241 | 0.0075 | 0.75 |
| | | |
| | | |



NOTES:

File name:

2679148__Swell Colapse ASTM D4546_0.xls



ASTM D4546 (Method C)

CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION

DATE TESTED 03/23/20

TECHNICIAN DPM

BORING NO.

B-204 26.4-27.0

DEPTH

SAMPLE NO.

NQ-2

DATE SAMPLED

1/28/2020

SAMPLED BY

DESCRIPTION

Core

Sample Conditions

Before Test Mass of Wet Soil and Ring (g): 92.56 After Test Mass of Wet Soil and Ring (g): 93.35

Mass of Dry Soil, Ring, and Pan (g): 240.03

Diameter (in): 1.76

Initial Height (in): 1.01

Mass of Ring (g): 0.00

Mass of Pan (g): 155.81 Inundation Load (psf): 4000

Inundation Load (kPa): 192

Ctrain (0/)

Oedometer ID: ATT-16

Initial Dry Density (kg/m³): 2103

Initial Moisture (%): 9.9

Initial Wet Density (pcf): 144.3

Initial Dry Density (pcf): 131.3

Initial Wet Density (kg/m3): 2311

Final Wet Density (pcf): 148.5

Final Dry Density (pcf): 134.0

Final Wet Density (kg/m3): 2378

Final Dry Density (kg/m³): 2146

Final Moisture (%): 10.8

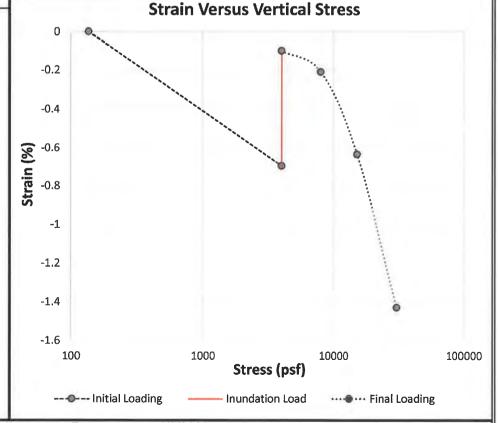
Swell / Collapse Data

Swell (%): 0.60

Swell Pressure (psf): 16369

Swell Pressure (kPa): 784

| | Load (pst) | Deformation (in) | Strain (%) |
|---|------------|------------------|------------|
| Ī | 136 | 0.0000 | 0.00 |
| | 4000 | -0.0070 | -0.69 |
| | Inudated | -0.0010 | -0.10 |
| | 7924 | -0.0021 | -0.21 |
| | 15229 | -0.0064 | -0.63 |
| | 30434 | -0.0144 | -1.43 |
| | | | |



Data entry by: Checked by:

File name:

2679148

Swell Colapse ASTM D4546_2.xls

4/3/2020 Date: Date:



ASTM D4546 (Method C)

CLIENT RJH Consultants
JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION --DATE TESTED 03/23/20 TECHNICIAN DPM BORING NO.
DEPTH
SAMPLE NO.

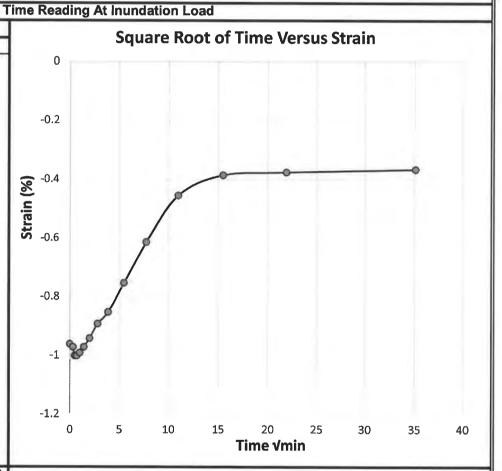
B-204 26.4-27.0 NQ-2

DATE SAMPLED SAMPLED BY

1/28/2020

DESCRIPTION Core

| Inundation Load (psf): 4000 | | |
|-----------------------------|------------------|------------|
| Time (min) | Deformation (in) | Strain (%) |
| 0 | -0.0097 | -0.96 |
| 0.1 | -0.0098 | -0.97 |
| 0.25 | -0.0101 | -1.00 |
| 0.5 | -0.0101 | -1.00 |
| 1 | -0.0100 | -0.99 |
| 2 | -0.0098 | -0.97 |
| 4 | -0.0095 | -0.94 |
| 8 | -0.0090 | -0.89 |
| 15 | -0.0086 | -0.85 |
| 30 | -0.0076 | -0.75 |
| 60 | -0.0062 | -0.62 |
| 120 | -0.0046 | -0.46 |
| 240 | -0.0039 | -0.39 |
| 480 | -0.0038 | -0.38 |
| 1232 | -0.0037 | -0.37 |



NOTES:

File name:

2679148_Swell Colapse ASTM D4546_2.xls



ASTM D4546 (Method C)

CLIENT JOB NO. **RJH Consultants**

PROJECT

2679-148

South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION

DATE TESTED 03/23/20

TECHNICIAN DPM

BORING NO.

B-212

DEPTH

SAMPLE NO.

11.6-12.1 NQ-1

DATE SAMPLED

2/20/2020

SAMPLED BY

DESCRIPTION

Core

Sample Conditions

Before Test Mass of Wet Soil and Ring (g): 91.84

After Test Mass of Wet Soil and Ring (g): 93.05

Mass of Dry Soil, Ring, and Pan (g): 240.16

Diameter (in): 1.77

Initial Height (in): 0.99

Mass of Ring (g): 0.00

Mass of Pan (g): 156.28

Inundation Load (psf): 993

Inundation Load (kPa): 48

Oedometer ID: ATT-09

Initial Wet Density (pcf): 142.7

Initial Dry Density (pcf): 130.4

Initial Wet Density (kg/m³): 2286

Initial Dry Density (kg/m³): 2088

Initial Moisture (%): 9.5

Final Wet Density (pcf): 147.0

Final Dry Density (pcf): 132.5

Final Wet Density (kg/m3): 2354

Final Dry Density (kg/m³): 2122

Final Moisture (%): 10.9

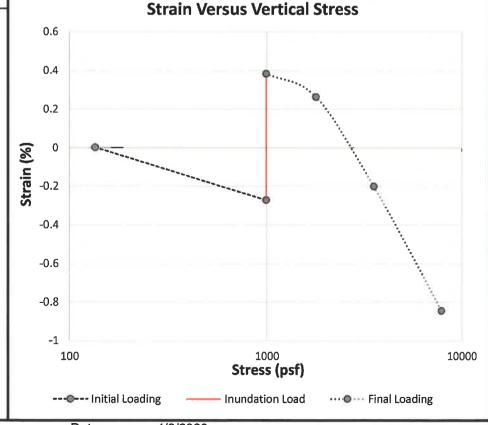
Swell / Collapse Data

Swell (%): 0.65

Swell Pressure (psf): 4006

Swell Pressure (kPa): 192

| | Load (pst) | Deformation (in) | Strain (%) |
|---|------------|------------------|------------|
| Ī | 135 | 0.0000 | 0.00 |
| | 993 | -0.0027 | -0.27 |
| | Inudated | 0.0038 | 0.38 |
| | 1781 | 0.0026 | 0.26 |
| | 3534 | -0.0020 | -0.20 |
| | 7850 | -0.0084 | -0.85 |



Data entry by: Checked by:

File name:

2679148 Swell Colapse ASTM D4546 1.xls

Date: 4/3/2020 Date:



ASTM D4546 (Method C)

CLIENT JOB NO. **RJH Consultants**

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/23/20

TECHNICIAN DPM

BORING NO. **DEPTH**

B-212

11.6-12.1

SAMPLE NO.

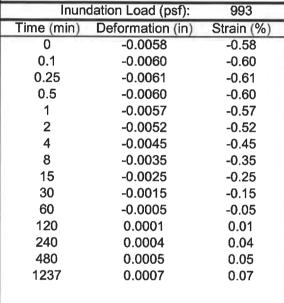
NQ-1

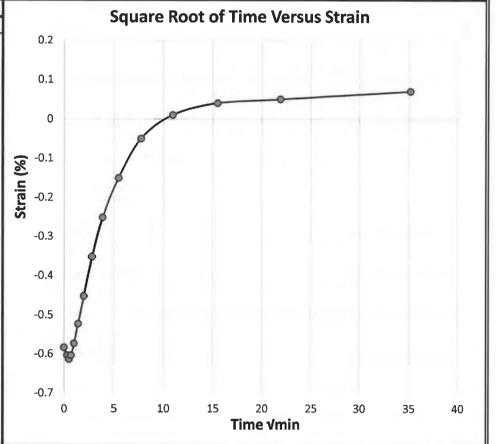
DATE SAMPLED SAMPLED BY

2/20/2020

DESCRIPTION Core

| Time Reading At Inundation Loa |
|--------------------------------|
|--------------------------------|





NOTES:

File name:

2679148__Swell Colapse ASTM D4546_1.xls

One-Dimensional Consolidation ASTM D 2435

Appendix J.1 130 of 262



One-Dimensional Consolidation

ASTM D 2435

CLIENT **RJH Consultants** JOB NO.

2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/06/20 TECHNICIAN DPM

BORING NO.

B-203

DEPTH

3.2-3.81

SAMPLE NO.

D-2

DATE SAMPLED

02/07/20

SAMPLED BY

DESCRIPTION

Rings

14.5

Sample Conditions

| Before Test Mass of Wet Soil and Ring (g): | 172.81 | Initial Wet Density (pcf): | 112.5 |
|--|--------|------------------------------|-------|
| After Test Mass of Wet Soil and Ring (g): | 183.31 | Initial Dry Density (pcf): | 105.9 |
| Mass of Dry Soil, Ring, and Pan (g): | 168.09 | Initial Wet Density (kg/m³): | 1802 |
| Diameter (in): | 2.41 | Initial Dry Density (kg/m³): | 1697 |
| Initial Height (in): | 1.00 | Initial Moisture (%): | 6.2 |
| Mass of Ring (g): | 38.12 | Final Wet Density (pcf): | 131.7 |
| Mass of Pan (g): | 3.11 | Final Dry Density (pcf): | 115.0 |
| Assumed Specific Gravity: | 2.65 | Final Wet Density (kg/m³): | 2109 |
| Initial Saturation (%): | 29.2 | Final Dry Density (kg/m³): | 1843 |
| | | | |

Consolidation Data

Coefficient of Compression: 0.069 Coefficient of Re-Compression: 0.009

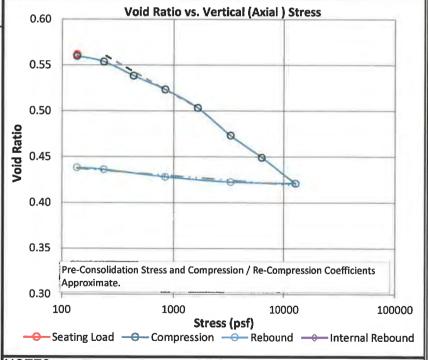
Final Saturation (%):

87.6

| Pre-Consolidation Stress (psf): | |
|---------------------------------|--|
| Pre-Consolidation Stress (kPa): | |

Final Moisture (%):

| Void Ratio | Deformation (in) | Strain (%) |
|------------|---|---|
| 0.562 | 0.0000 | 0.00 |
| 0.560 | 0.0011 | 0.11 |
| 0.554 | 0.0050 | 0.50 |
| 0.538 | 0.0148 | 1.48 |
| 0.523 | 0.0244 | 2.44 |
| 0.503 | 0.0373 | 3.73 |
| 0.473 | 0.0566 | 5.66 |
| 0.449 | 0.0719 | 7.19 |
| 0.421 | 0.0900 | 9.00 |
| | | |
| 0.421 | 0.0900 | 9.00 |
| 0.423 | 0.0890 | 8.90 |
| 0.428 | 0.0854 | 8.54 |
| 0.436 | 0.0803 | 8.03 |
| 0.438 | 0.0790 | 7.90 |
| | | |
| | 0.562 0.560 0.554 0.538 0.523 0.503 0.473 0.449 0.421 0.421 0.423 0.428 0.436 | 0.562 0.0000 0.560 0.0011 0.554 0.0050 0.538 0.0148 0.523 0.0244 0.503 0.0373 0.473 0.0566 0.449 0.0719 0.421 0.0900 0.423 0.0890 0.428 0.0854 0.436 0.0803 |



NOTES:

The sample contained Gravel, up to +1". Filling was Required to achieve a testable specimen.

Data entry by:

DPM

Date:

3/30/2020 120

Page 1 of 3

Checked by: File name:

WIL

Date:



One-Dimensional Consolidation ASTM D 2435

CLIENT RJH Consultants JOB NO. 2679-148

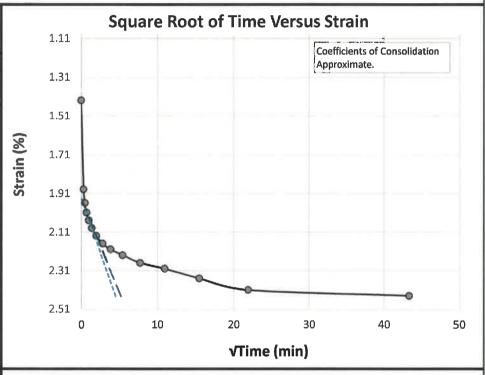
PROJECT South Boulder Creek - Phase II

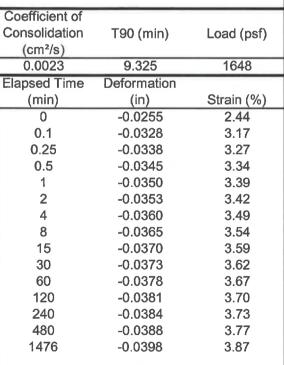
PROJECT NO. 16134 LOCATION --

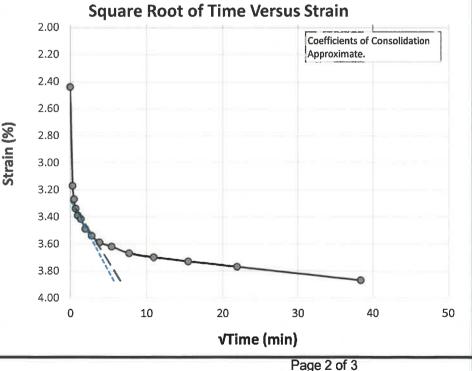
DATE TESTED 03/06/20
TECHNICIAN DPM

BORING NO. B-203
DEPTH 3.2-3.8'
SAMPLE NO. D-2
DATE SAMPLED 02/07/20
SAMPLED BY --DESCRIPTION Rings

| LOUINICIAIN | | DITIVI |
|---------------------------------|-------------|------------|
| Coefficient of Consolidation | T90 (min) | Load (psf) |
| (cm²/s) | 4 4 4 4 | 000 |
| 0.0053 | 4.141 | 839 |
| Elapsed Time | Deformation | |
| (min) | (in) | Strain (%) |
| 0 | -0.0154 | 1.43 |
| 0.1 | -0.0200 | 1.89 |
| 0.25 | -0.0207 | 1.96 |
| 0.5 | -0.0212 | 2.01 |
| 1 | -0.0216 | 2.05 |
| 2 | -0.0220 | 2.09 |
| 4 | -0.0224 | 2.13 |
| 8 | -0.0228 | 2.17 |
| 15 | -0.0231 | 2.20 |
| 30 | -0.0234 | 2.23 |
| 60 | -0.0238 | 2.27 |
| 120 | -0.0241 | 2.30 |
| 240 | -0.0246 | 2.35 |
| 480 | -0.0252 | 2.41 |
| 1875 | -0.0255 | 2.44 |
| | | |







File name: 2679148__Consol ASTM D2435_0.xlsm

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One-Dimensional Consolidation ASTM D 2435

CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II
PROJECT NO. 16134

LOCATION

DATE TESTED

TECHNICIAN

16134 --03/06/20

DPM

 BORING NO.
 B-203

 DEPTH
 3.2-3.8'

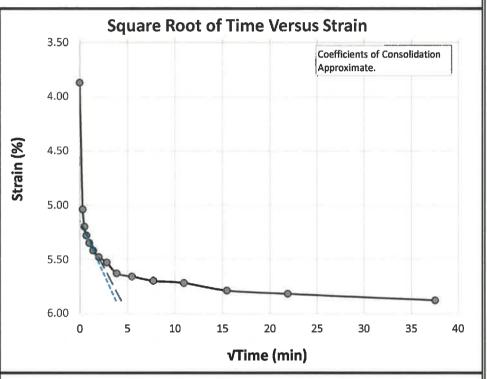
 SAMPLE NO.
 D-2

 DATE SAMPLED
 02/07/20

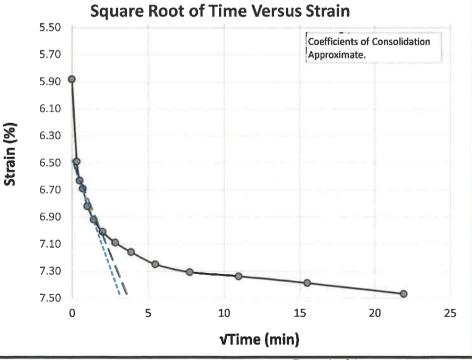
 SAMPLED BY
 -

 DESCRIPTION
 Rings

| Coefficient of Consolidation (cm²/s) | T90 (min) | Load (psf) |
|--|-------------|------------|
| 0.0057 | 3.600 | 3264 |
| Elapsed Time | Deformation | |
| (min) | (in) - | Strain (%) |
| 0 | -0.0398 | 3.87 |
| 0.1 | -0.0515 | 5.04 |
| 0.25 | -0.0531 | 5.20 |
| 0.5 | -0.0539 | 5.28 |
| 1 | -0.0546 | 5.35 |
| 2 | -0.0553 | 5.42 |
| 4 | -0.0559 | 5.48 |
| 8 | -0.0564 | 5.53 |
| 15 | -0.0574 | 5.63 |
| 30 | -0.0577 | 5.66 |
| 60 | -0.0581 | 5.70 |
| 120 | -0.0583 | 5.72 |
| 240 | -0.0590 | 5.79 |
| 480 | -0.0593 | 5.82 |
| 1413 | -0.0599 | 5.88 |
| | | |



| Coefficient of Consolidation (cm²/s) | T90 (min) | Load (psf) |
|--|-------------|------------|
| 0.0060 | 3.284 | 6250 |
| Elapsed Time | Deformation | |
| (min) | (in) | Strain (%) |
| 0 | -0.0599 | 5.88 |
| 0.1 | -0.0660 | 6.49 |
| 0.25 | -0.0674 | 6.63 |
| 0.5 | -0.0680 | 6.69 |
| 1 | -0.0693 | 6.82 |
| 2 | -0.0703 | 6.92 |
| 4 | -0.0712 | 7.01 |
| 8 | -0.0720 | 7.09 |
| 15 | -0.0727 | 7.16 |
| 30 | -0.0736 | 7.25 |
| 60 | -0.0742 | 7.31 |
| 120 | -0.0745 | 7.34 |
| 240 | -0.0750 | 7.39 |
| 480 | -0.0758 | 7.47 |



File name: 2679148_Consol ASTM D2435_0.xlsm

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DPM

TECHNICIAN

One-Dimensional Consolidation

ASTM D 2435

CLIENT **RJH Consultants** BORING NO. B-203 JOB NO. 2679-148 DEPTH 19.5-20 PROJECT South Boulder Creek - Phase II SAMPLE NO. NQ-3 PROJECT NO. 16134 DATE SAMPLED 02/10/20 LOCATION SAMPLED BY DATE TESTED 03/18/20 DESCRIPTION Core

| 5 | ample Conditions | |
|-------|---|--|
| 36.14 | Initial Wet Density (pcf): | 135.6 |
| 37.50 | Initial Dry Density (pcf): | 122.7 |
| 31.11 | Initial Wet Density (kg/m³): | 2172 |
| 1.76 | Initial Dry Density (kg/m³): | 1966 |
| 1.00 | Initial Moisture (%): | 10.4 |
| 0.00 | Final Wet Density (pcf): | 146.6 |
| 3.12 | Final Dry Density (pcf): | 130.7 |
| 2.65 | Final Wet Density (kg/m³): | 2348 |
| 79.7 | Final Dry Density (kg/m³): | 2093 |
| 0.00 | Final Moisture (%): | 12.2 |
| | 36.14 37.50 31.11 1.76 1.00 0.00 3.12 2.65 79.7 | Initial Dry Density (pcf): Initial Dry Density (kg/m³): Initial Dry Density (kg/m³): Initial Dry Density (kg/m³): Initial Dry Density (kg/m³): Initial Moisture (%): Initial Moisture (%): Initial Dry Density (pcf): Final Wet Density (pcf): Final Dry Density (kg/m³): Final Dry Density (kg/m³): |

Consolidation Data Coefficient of Compression: 0.130 Pre-Consolidation Stress (psf): Coefficient of Re-Compression: 0.036 Pre-Consolidation Stress (kPa): Void Ratio vs. Vertical (Axial) Stress

| Load (psf) | Void Ratio | Deformation (in) | Strain (%) |
|------------|------------|------------------|------------|
| 136 | 0.348 | 0.0000 | 0.00 |
| Inundation | 0.350 | -0.0018 | -0.18 |
| 248 | 0.352 | -0.0032 | -0.32 |
| 471 | 0.352 | -0.0031 | -0.31 |
| 916 | 0.352 | -0.0034 | -0.34 |
| 1804 | 0.352 | -0.0029 | -0.29 |
| 3581 | 0.349 | -0.0008 | -0.08 |
| 8000 | 0.340 | 0.0060 | 0.60 |
| 16000 | 0.323 | 0.0183 | 1.84 |
| 32000 | 0.300 | 0.0354 | 3.56 |
| 64000 | 0.262 | 0.0632 | 6.35 |
| 128000 | 0.223 | 0.0922 | 9.27 |
| Rebound | | | |
| 128000 | 0.223 | 0.0922 | 9.27 |
| 64000 | 0.229 | 0.0879 | 8.83 |
| 32000 | 0.238 | 0.0808 | 8.12 |
| 16000 | 0.251 | 0.0715 | 7.19 |
| 8000 | 0.266 | 0.0604 | 6.07 |
| Internal | | | |
| 32000 | 0.300 | 0.0354 | 3.56 |
| 19400 | 0.302 | 0.0336 | 3.38 |
| 9700 | 0.310 | 0.0276 | 2.77 |
| 19400 | 0.305 | 0.0319 | 3.21 |
| 38800 | 0.287 | 0.0449 | 4.51 |
| | | | |

0.37 0.35 0.33 0.31 **/oid Ratio** 0.29 0.27 0.25 0.23 0.21 Pre-Consolidation Stress and Compression / Re-Compression Coefficients Approximate. 0.19 100 1000 10000 100000 1000000 Stress (psf) Seating Load Compression Rebound Internal Rebound

18940

907

NOTES: The sample was loaded to prevent active swelling in accordance with ASTM D2435. The sample up to and including the 3581psf load.

Data entry by: DPM 4/3/2020 Date: Checked by: Date: 네/6 um File name: 2679148 Consol ASTM D2435 1.xlsm

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One-Dimensional Consolidation ASTM D 2435

| CLIENT | RJH Consultants |
|---------|--------------------------------|
| JOB NO. | 2679-148 |
| PROJECT | South Boulder Creek - Phase II |

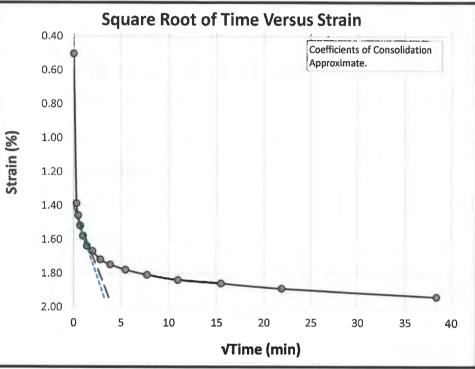
PROJECT NO. 16134

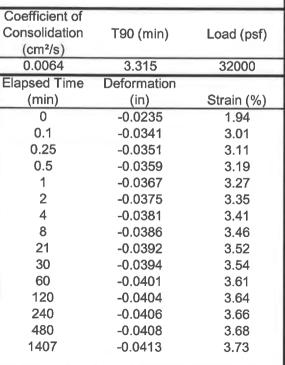
LOCATION -

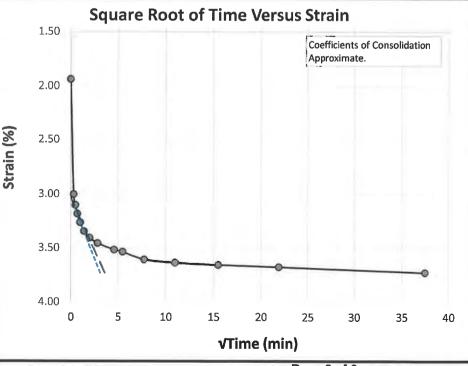
DATE TESTED 03/18/20 TECHNICIAN DPM BORING NO. B-203
DEPTH 19.5-20
SAMPLE NO. NQ-3
DATE SAMPLED 02/10/20
SAMPLED BY --

DESCRIPTION Core

| TEOTH TOTAL | | |
|--|-------------|------------|
| Coefficient of Consolidation (cm²/s) | T90 (min) | Load (psf) |
| 0.0075 | 2.928 | 16000 |
| Elapsed Time | Deformation | |
| (min) | (in) | Strain (%) |
| 0 | -0.0092 | 0.50 |
| 0.1 | -0.0180 | 1.39 |
| 0.25 | -0.0187 | 1.46 |
| 0.5 | -0.0193 | 1.52 |
| 1 | -0.0199 | 1.58 |
| 2 | -0.0205 | 1.64 |
| 4 | -0.0208 | 1.67 |
| 8 | -0.0213 | 1.72 |
| 15 | -0.0216 | 1.75 |
| 30 | -0.0219 | 1.78 |
| 60 | -0.0222 | 1.81 |
| 120 | -0.0225 | 1.84 |
| 240 | -0.0227 | 1.86 |
| 480 | -0.0230 | 1.89 |
| 1479 | -0.0235 | 1.94 |







File name: 2679148 Consol ASTM D2435_1.xlsm

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One-Dimensional Consolidation ASTM D 2435

| CLIENT |
|-------------|
| JOB NO. |
| PROJECT |
| PROJECT NO |
| LOCATION |
| DATE TESTER |

TECHNICIAN

RJH Consultants 2679-148

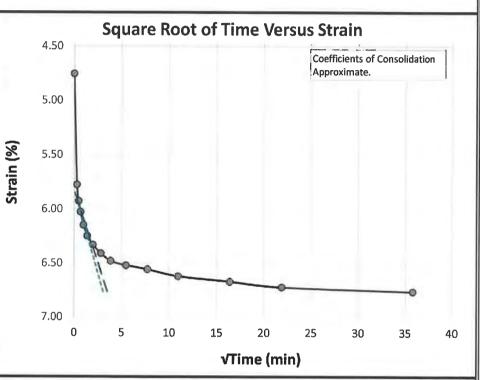
South Boulder Creek - Phase II

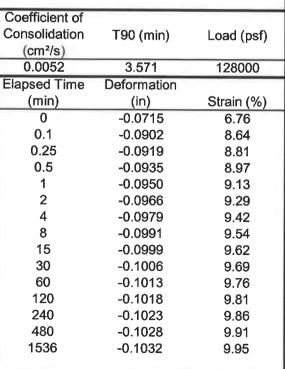
16134

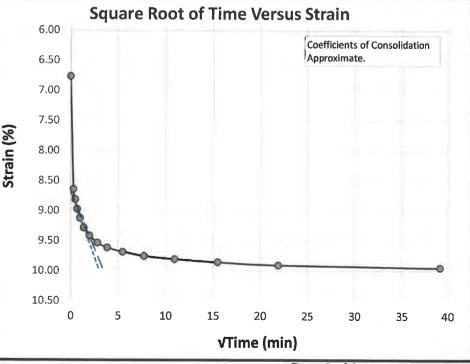
03/18/20 DPM BORING NO. B-203
DEPTH 19.5-20
SAMPLE NO. NQ-3
DATE SAMPLED 02/10/20
SAMPLED BY --

DESCRIPTION Core

| Coefficient of Consolidation (cm²/s) | T90 (min) | Load (psf) |
|--|-------------|------------|
| 0.0062 | 3.199 | 64000 |
| Elapsed Time | Deformation | |
| (min) | (in) | Strain (%) |
| 0 | -0.0515 | 4.75 |
| 0.1 | -0.0617 | 5.78 |
| 0.25 | -0.0632 | 5.93 |
| 0.5 | -0.0642 | 6.03 |
| 1 | -0.0654 | 6.15 |
| 2 | -0.0664 | 6.25 |
| 4 | -0.0672 | 6.33 |
| 8 | -0.0680 | 6.41 |
| 15 | -0.0687 | 6.48 |
| 30 | -0.0691 | 6.52 |
| 60 | -0.0695 | 6.56 |
| 120 | -0.0701 | 6.62 |
| 269 | -0.0706 | 6.67 |
| 480 | -0.0711 | 6.72 |
| 1283 | -0.0715 | 6.76 |
| | | |







File name: 2679148 Consol ASTM D2435 1.xlsm

Page 3 of 3



One-Dimensional Consolidation

ASTM D 2435

CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217(P)

JOB NO.2679-168DEPTH0-15'PROJECTSouth Boulder Creek Phase IISAMPLE NO.Composite

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY -DATE TESTED 02/15/22 DESCRIPTION --

100.0

TECHNICIAN JL

| Sample Conditions | | | |
|--|--------|------------------------------|-------|
| Before Test Mass of Wet Soil and Ring (g): | 182.90 | Initial Wet Density (pcf): | 122.0 |
| After Test Mass of Wet Soil and Ring (g): | 183.25 | Initial Dry Density (pcf): | 103.3 |
| Mass of Dry Soil, Ring, and Pan (g): | 209.80 | Initial Wet Density (kg/m³): | 1955 |
| Diameter (in): | 2.41 | Initial Dry Density (kg/m³): | 1654 |
| Initial Height (in): | 1.00 | Initial Moisture (%): | 18.2 |
| Mass of Ring (g): | 36.79 | Final Wet Density (pcf): | 134.9 |
| Mass of Pan (g): | 49.36 | Final Dry Density (pcf): | 113.9 |
| Assumed Specific Gravity: | 2.65 | Final Wet Density (kg/m³): | 2160 |
| Initial Saturation (%): | 80.1 | Final Dry Density (kg/m³): | 1824 |

| | Cons | solidation Data |
|--------------------------------|-------|-----------------|
| Coefficient of Compression: | 0.247 | Pre-Co |
| Coefficient of Re-Compression: | 0.031 | Pre-Cor |

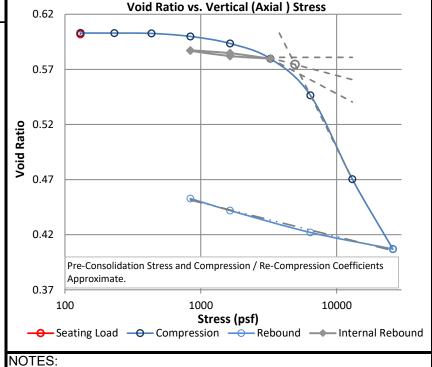
Final Saturation (%):

Pre-Consolidation Stress (psf): 4940 Pre-Consolidation Stress (kPa): 236

Final Moisture (%):

18.4

| - 00 | | o o o mproodiom. | 0.001 |
|------------|------------|------------------|------------|
| Load (psf) | Void Ratio | Deformation (in) | Strain (%) |
| 130 | 0.602 | 0.0000 | 0.00 |
| Inundation | 0.603 | -0.0006 | -0.06 |
| 231 | 0.603 | -0.0006 | -0.06 |
| 433 | 0.603 | -0.0004 | -0.04 |
| 837 | 0.600 | 0.0013 | 0.13 |
| 1643 | 0.593 | 0.0053 | 0.53 |
| 3254 | 0.580 | 0.0139 | 1.39 |
| 6406 | 0.547 | 0.0346 | 3.46 |
| 13035 | 0.470 | 0.0821 | 8.21 |
| 25915 | 0.407 | 0.1217 | 12.17 |
| Rebound | | | |
| 25915 | 0.407 | 0.1217 | 12.17 |
| 6406 | 0.422 | 0.1123 | 11.23 |
| 1643 | 0.442 | 0.0999 | 9.99 |
| 837 | 0.453 | 0.0931 | 9.31 |
| Internal | | | |
| 3254 | 0.580 | 0.0139 | 1.39 |
| 1643 | 0.582 | 0.0124 | 1.24 |
| 837 | 0.587 | 0.0093 | 0.93 |
| 1643 | 0.585 | 0.0108 | 1.08 |
| 3254 | 0.580 | 0.0139 | 1.39 |
| | | | |



 Data entry by:
 JL
 Date: 02/23/22

 Checked by:
 WAR
 Date: 02/23/22

 File name:
 2679168__Consol ASTM D2435_0.xlsm
 Page 1 of 3



DATE TESTED

480

1340

One-Dimensional Consolidation ASTM D 2435

CLIENT **RJH Consultants** JOB NO. 2679-168 South Boulder Creek Phase II PROJECT PROJECT NO. 16134 LOCATION

02/15/22

0.50

0.53

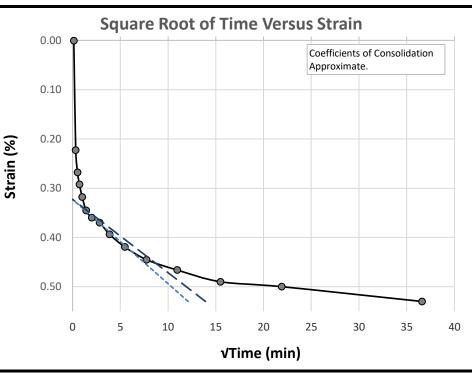
BORING NO. TP-204, B-216, B-217(P) **DEPTH** 0-15' SAMPLE NO. Composite

DATE SAMPLED SAMPLED BY **DESCRIPTION**

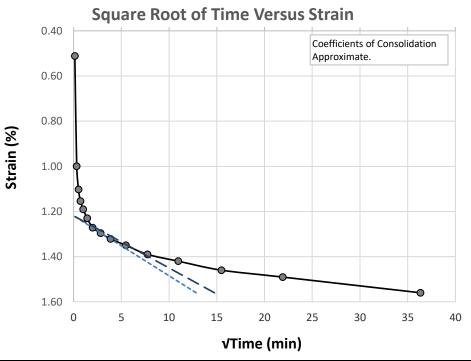
| | JL |
|-------------|--|
| T90 (min) | Load (psf) |
| 74.010 | 1643 |
| Deformation | |
| (in) | Strain (%) |
| -0.0026 | 0.00 |
| -0.0048 | 0.22 |
| -0.0053 | 0.27 |
| -0.0055 | 0.29 |
| -0.0058 | 0.32 |
| -0.0061 | 0.35 |
| -0.0062 | 0.36 |
| -0.0063 | 0.37 |
| -0.0065 | 0.39 |
| -0.0068 | 0.42 |
| -0.0071 | 0.45 |
| -0.0073 | 0.47 |
| -0.0075 | 0.49 |
| | T90 (min) 74.010 Deformation (in) -0.0026 -0.0048 -0.0053 -0.0055 -0.0061 -0.0062 -0.0063 -0.0065 -0.0068 -0.0071 -0.0073 |

-0.0076

-0.0079



| Coefficient of Consolidation (cm²/s) | T90 (min) | Load (psf) |
|--|-------------|------------|
| 0.0006 | 39.364 | 3254 |
| Elapsed Time | Deformation | |
| (min) | (in) | Strain (%) |
| 0 | -0.0077 | 0.51 |
| 0.1 | -0.0126 | 1.00 |
| 0.27 | -0.0136 | 1.10 |
| 0.5 | -0.0141 | 1.15 |
| 1 | -0.0145 | 1.19 |
| 2 | -0.0149 | 1.23 |
| 4 | -0.0153 | 1.27 |
| 8 | -0.0156 | 1.30 |
| 15 | -0.0158 | 1.32 |
| 30 | -0.0161 | 1.35 |
| 60 | -0.0165 | 1.39 |
| 120 | -0.0168 | 1.42 |
| 240 | -0.0172 | 1.46 |
| 480 | -0.0175 | 1.49 |
| 1321 | -0.0182 | 1.56 |
| | | _ |



Data Files 2679168 Consol ASTM D2435 0.xlsm File name:



One-Dimensional Consolidation ASTM D 2435

CLIENT RJH Consultants

JOB NO. 2679-168

PROJECT South Boulder Creek Phase II

PROJECT NO. 16134

LOCATION -DATE TESTED 02/15/22
TECHNICIAN JL

th Boulder Creek Phase II SAMPLE NO.

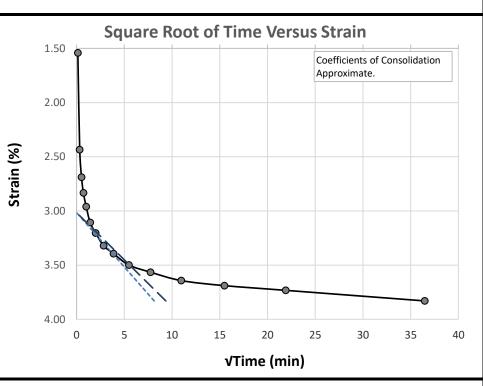
34 DATE SAMPLED
SAMPLED BY
DESCRIPTION

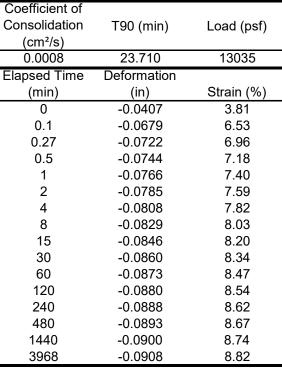
BORING NO. TP-204, B-216, B-217(P)

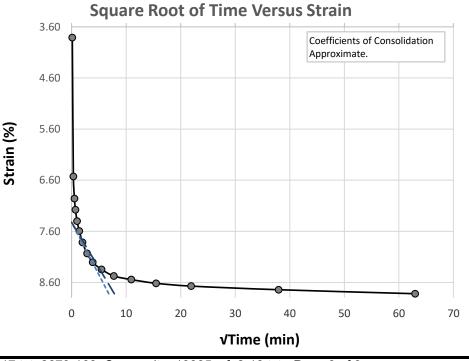
DEPTH 0-15' SAMPLE NO. Composite

DESCRIPTION --

| Coefficient of | | |
|----------------|-------------|------------|
| Consolidation | T90 (min) | Load (psf) |
| (cm²/s) | | |
| 0.0007 | 31.202 | 6406 |
| Elapsed Time | Deformation | |
| (min) | (in) | Strain (%) |
| 0 | -0.0180 | 1.54 |
| 0.1 | -0.0269 | 2.43 |
| 0.27 | -0.0295 | 2.69 |
| 0.5 | -0.0309 | 2.83 |
| 1 | -0.0322 | 2.96 |
| 2 | -0.0337 | 3.11 |
| 4 | -0.0346 | 3.20 |
| 8 | -0.0358 | 3.32 |
| 15 | -0.0365 | 3.39 |
| 30 | -0.0376 | 3.50 |
| 60 | -0.0383 | 3.57 |
| 120 | -0.0390 | 3.64 |
| 240 | -0.0395 | 3.69 |
| 480 | -0.0399 | 3.73 |
| 1330 | -0.0409 | 3.83 |
| | | |







Constant Rate of Flow Flexible Wall Hydraulic Conductivity ASTM D 5084 Method D

Appendix J.1 140 of 262



Constant Rate of Flow Flexible Wall Hydraulic Conductivity

ASTM D 5084 Method D

| CLIENT RJH Consultants | | | | | BORI | NG NO. | | | B-203 | |
|------------------------|----------------------|-------------------|------------|------------------------------|--------------|----------------|-----------------|---------------|----------------------|--------------|
| JOB NO. | | | | | DEPTH | | | | 8.2-8.5' | |
| PROJECT | | | | hase II | SAMPLE NO. | | | | CA-4 | |
| PROJECT NO. 16134 | | | naoo n | DATE SAMPLED | | | | 2/7/2020 | | |
| LOCATION – | | | | SAMPLED BY | | | | 2/1/2020 | | |
| II . | DATE TESTED 03/11/20 | | | | | RIPTION | | | elevery send w/e | |
| TECHNICIA | | CAL | | | DESC | KIFTION | | | clayey sand w/gravel | |
| LOI INIOIA | | OAL | | | | | | | | |
| | | | | Sa | mple Cond | litions | | | | |
| Before | Test Mass of | Wet Soil (g): | 296.6 | | | Initial Wet | Density (pcf): | 125.2 | | |
| After | Test Mass of | Wet Soil (g): | 307.4 | Initial Dry Density (pcf): 1 | | | | | | |
| Ma | ss of Dry Soil | and Pan (g): | 439.6 | | | Initial Wet D | ensity (kg/m³): | 2005 | | |
| | Mas | ss of Pan (g): | 173.5 | | | Initial Dry D | ensity (kg/m³): | 1800 | | |
| | | Diameter (in): | 1.93 | | | Initial | Moisture (%): | 11.4 | | |
| | Initial Sampl | e Height (in): | 3.08 | | | | Density (pcf): | 135.6 | | |
| | Assumed Spe | ecific Gravity: | 2.650 | | | | Density (pcf): | 117.4 | | |
| | · | · | | | | | ensity (kg/m³): | | | |
| | Back Pr | ressure (psi): | 58.0 | | | | ensity (kg/m³): | | | |
| | | ressure (psi): | 68.4 | | | • | Moisture (%): | 15.5 | | |
| | | | | | | | . , | | | |
| | | | | | | | calculated usir | ng volume cha | nge method | |
| | | | | | 1. 1024 | from ASTM D | 4767. | | | |
| | | | | P | ermeability | Data | | | | |
| | Percentage | | Pump | | | Effective | Effective | - | | Corrected |
| Pump | of Pump | Rate of | Pressure | Head Loss | Gradient - i | Stress (psi) - | | | Temperature | |
| Setting | Setting | Flow (cc/s) | (psi) | (cm) | Gradion: 1 | σ_{3} | σ_{3} | (°C) | Correction | Conductivity |
| | , and the second | | (1-7 | | | 03 | 03 | | | (cm/s) - k |
| | | 5.56E-04 | 0.118 | 8.31 | 1.07 | 10.34 | 71.3 | 21.7 | 0.960 | 2.73E-05 |
| | | 5.56E-04 | 0.119 | 8.38 | 1.08 | 10.34 | 71.3 | 21.7 | 0.960 | 2.70E-05 |
| | | 5.56 E -04 | 0.120 | 8.45 | 1.09 | 10.34 | 71.3 | 21.7 | 0.960 | 2.68E-05 |
| | | 5.56E-04 | 0.121 | 8.52 | 1.10 | 10.34 | 71.3 | 21.8 | 0.958 | 2.65E-05 |
| | | 5.56E-04 | 0.123 | 8.66 | 1.12 | 10.34 | 71.3 | 21.7 | 0.960 | 2.62E-05 |
| | | 5.56E-04 | 0.124 | 8.73 | 1.13 | 10.34 | 71.3 | 21.6 | 0.962 | 2.60E-05 |
| | | 5.56E-04 | 0.126 | 8.87 | 1.14 | 10.34 | 71.3 | 21.5 | 0.965 | 2.57E-05 |
| | | 5.56E-04 | 0.127 | 8.94 | 1.15 | 10.34 | 71.3 | 21.6 | 0.962 | 2.54E-05 |
| | | 5.56E-04 | 0.127 | 8.94 | 1.15 | 10.34 | 71.3 | 21.5 | 0.965 | 2.55E-05 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | Test Resu | ilts | | | | |
| | | Ave | rage Corre | cted Hvdrau | ılic Conduc | tivity (cm/s): | 2.56E-05 | | | |
| | | | | , | | | | | | |
| NOTES: | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Data entry | bv: | CAL | | Date: | 3/19/2020 | | | | | |
| Checked by: SPH | | | | Date: 3-23-20 | | | | Page 1 of 2 | | |
| File name: | | | | | | | | | | |
| | | | | • | | | | | | |



Constant Rate of Flow Flexible Wall Hydraulic Conductivity

ASTM D 5084 Method D

CLIENT **RJH Consultants**

2679-148 JOB NO.

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED **TECHNICIAN** CAL

03/11/20

BORING NO.

DEPTH SAMPLE NO. DATE SAMPLED

SAMPLED BY

DESCRIPTION

B-203

8.2-8.5'

CA-4 2/7/2020

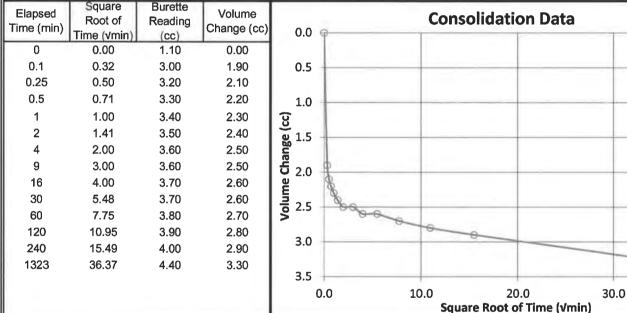
clayey sand w/gravel

Consolidation

| Initial Saturation (%): | 64.0 | Initial Volume of Sample (cc): | 147.9 |
|---------------------------------|-------|---|-------|
| Final Saturation (%): | 100.0 | Final Volume of Sample (cc): | 141.5 |
| Cell Pressure (psi): | 68.4 | Volume Change After Consolidation (cc): | 22.6 |
| Back Pressure (psi): | 58.0 | Initial Dial Reading (in): | 0.200 |
| Effective Stress (psi): | 10.4 | Final Dial Reading (in): | 0.230 |
| Effective Stress (kPa): | 71.7 | Height Change (in): | 0.03 |
| Cell Expansion Correction (cc): | 16.20 | Initial Area (cm²): | 18.89 |
| Cell ID: | 8P | Final Area (cm²): | 18.25 |

Cell ID: 8P

Consolidation Data



Saturation

| Cell Pressure (psi) | | Pore Pressure (psi) | | Burette Reading (cc) | | Back Pressure | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
|---------------------|-------|---------------------|-------|----------------------|-------|------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | go (00) | oc. cos (psi) | | |
| 40.0 | 50.0 | 38.8 | 47.3 | 16.30 | 17.30 | 38.0 | 1.00 | 2.0 | 8.5 | 0.85 |
| 50.0 | 60.0 | 48.4 | 57.7 | 19.60 | 20.75 | 48.0 | 1.15 | 2.0 | 9.3 | 0.93 |
| 60.0 | 70.0 | 58.6 | 68.2 | 21.30 | 21.50 | 58.0 | 0.20 | 2.0 | 9.6 | 0.96 |

Page 2 of 2

File name: 2679148__Permeability Method D ASTM D5084_0.xlsm

40.0

Image Attachment



CLIENT

RJH Consultants

JOB NO.

2679-148

16134

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

LOCATION -

BORING NO.

B-203

DEPTH

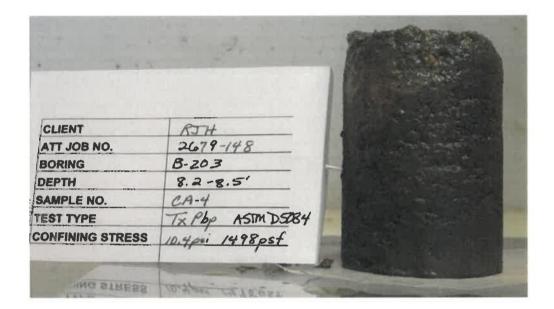
8.2-8.5' CA-4

SAMPLE NO.

DATE SAMPLED

DESCRIPTION

TxPbp after test



| NOTES | | = = | |
|-------|---|-----|--|
| | | | |
| | | | |
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| | 2 | | |
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File name:

2679148__lmage_20_03_19_11_48_50



Constant Rate of Flow Flexible Wall Hydraulic Conductivity

ASTM D 5084 Method D

Sample Conditions

B-215 BORING NO. **RJH Consultants** CLIENT 5.7-6.0' JOB NO. 2679-152 DEPTH CA-6 PROJECT South Boulder Creek - Phase II Geot SAMPLE NO. 5/26/2020 DATE SAMPLED PROJECT NO. 16134 SAMPLED BY LOCATION DESCRIPTION lean clay 06/23/20 DATE TESTED

TECHNICIAN CAL

File name:

2679152

Before Test Mass of Wet Soil (g):

After Test Mass of Wet Soil (g):

Mass of Dry Soil and Pan (g):

Mass of Pan (g): Diameter (in): 383.7

389.0 503.2

171.3

1.93

| UE | imple conditions | |
|----|------------------------------|-------|
| | Initial Wet Density (pcf): | 132.8 |
| | Initial Dry Density (pcf): | 114.9 |
| | Initial Wet Density (kg/m³): | 2128 |
| | Initial Dry Density (kg/m³): | 1840 |
| | Initial Moisture (%): | 15.6 |
| | Final Wet Density (pcf): | 132.9 |
| | Final Day Danaity (mafty | 112 / |

3.77 Initial Sample Height (in): Assumed Specific Gravity: 2.650 Final Dry Density (pcf): 113.4 Final Wet Density (kg/m³): 2129 Final Dry Density (kg/m³): 1817 Back Pressure (psi): 48.0 Final Moisture (%): 17.2 50.1

Cell Pressure (psi):

Final density calculated using volume change method from ASTM D4767. Pormoshility Data

| Permeability Data | | | | | | | | | |
|-------------------|---------------------|---------------------------|-------------------|--------------|---|---|---------------------|---------------------------|--|
| | Rate of Flow (cc/s) | Pump Pressure (psi) | Head Loss (cm) | Gradient - i | Effective Stress (psi) - σ_3 | Effective Stress (kPa) σ_3 | Temperature (°C) | Temperature Correction | Corrected Hydraulic Conductivity (cm/s) - k |
| | 5.56E-05 | 0.899 | 63.30 | 6.63 | 1.65 | 11.4 | 23.6 | 0.918 | 4.02E-07 |
| | 2.78E-05 | 0.545 | 38.37 | 4.02 | 1.83 | 12.6 | 23.6 | 0.918 | 3.32E-07 |
| | 1.39E-05 | 0.542 | 38.16 | 4.00 | 1.83 | 12.6 | 23.6 | 0.918 | 1.67 E-07 |
| | 1.39E-05 | 0.594 | 41.82 | 4.38 | 1.80 | 12.4 | 23.6 | 0.918 | 1.52E-07 |
| | 1.39E-05 | 0.623 | 43.86 | 4.59 | 1.79 | 12.3 | 23.6 | 0.918 | 1.45E-07 |
| | 1.39E-05 | 0.650 | 45.77 | 4.79 | 1.78 | 12.2 | 23.7 | 0.916 | 1.39E-07 |
| | 6.94E-06 | 0.481 | 33.87 | 3.55 | 1.86 | 12.8 | 23.7 | 0.916 | 9.38E-08 |
| | 6.94E-06 | 0.474 | 33.37 | 3.49 | 1.86 | 12.8 | 23.5 | 0.920 | 9.56E-08 |

Test Results Average Corrected Hydraulic Conductivity (cm/s): NOTES: Date: 6/27/2020 CAL Data entry by: Date: 6 30 20 Page 1 of 2 Checked by:

Appendix J.1 144 of 262

Permeability Method D ASTM D5084_0.xlsm



Constant Rate of Flow Flexible Wall Hydraulic Conductivity

ASTM D 5084 Method D

BORING NO.

DESCRIPTION

DEPTH

RJH Consultants CLIENT

2679-152

B-215 5.7-6.0'

JOB NO. PROJECT

South Boulder Creek - Phase II Geote

SAMPLE NO.

PROJECT NO.

DATE SAMPLED

CA-6 5/26/2020

LOCATION DATE TESTED 16134

SAMPLED BY

lean clay

TECHNICIAN

06/23/20 CAL

Consolidation

| Initial Saturation (%): | 94.1 | Initial Volume of Sample (cc): | 180.3 | |
|---------------------------------|-------|---|-------|--|
| Final Saturation (%): | 99.4 | Final Volume of Sample (cc): | 182.7 | |
| Cell Pressure (psi): | 50.1 | Volume Change After Consolidation (cc): | 10.9 | |
| Back Pressure (psi): | 48.0 | Initial Dial Reading (in): | 0.200 | |
| Effective Stress (psi): | 2.1 | Final Dial Reading (in): | 0.205 | |
| Effective Stress (kPa): | 14.5 | Height Change (in): | 0.005 | |
| Cell Expansion Correction (cc): | 13.26 | Initial Area (cm²): | 18.85 | |
| | | | 40.40 | |

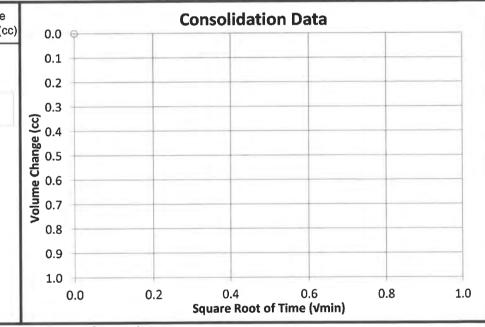
8P Cell ID:

Final Area (cm²):

19.13

| Elapsed | Root of Time (vmin) | Reading | Volume |
|------------|---------------------|---------|----------|
| Time (min) | | (cc) | Change (|
| | | | |

NO CONSOLIDATION DATA



Saturation

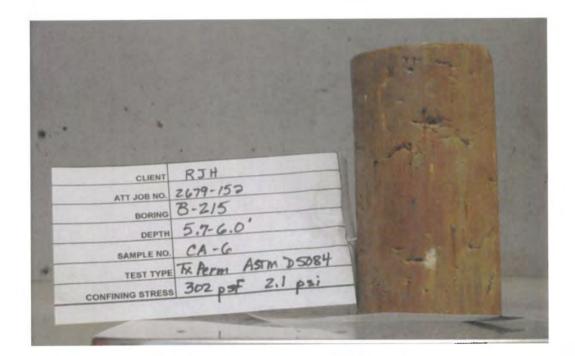
| Cell Pressure (psi) | | Pore Pressure (psi) | | Pressure (psi) Burette Reading (co | | Back Pressure | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
|---------------------|-------|---------------------|-------|------------------------------------|-------|------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | | | | |
| 40.0 | 50.0 | 38.4 | 47.8 | 11.10 | 12.10 | 38.0 | 1.00 | 2.0 | 9.4 | 0.94 |
| 50.0 | 60.0 | 48.5 | 58.1 | 12.20 | 12.30 | 48.0 | 0.10 | 2.0 | 9.6 | 0.96 |

Page 2 of 2

File name: 2679152__Permeability Method D ASTM D5084_0.xlsm



BORING NO. B-215 CLIENT **RJH** Consultants DEPTH 5.7-6.0' JOB NO. 2679-152 South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. CA-6 PROJECT DATE SAMPLED 5/26/20 PROJECT NO. 16134 DESCRIPTION LOCATION lean clay



| NOTES | | | | |
|-------|--|--|--|--|
| | | | | |
| | | | | |
| | | | | |

File name: 2679152__lmage_20_06_28_08_30_04

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Constant Rate of Flow Flexible Wall Hydraulic Conductivity

ASTM D 5084 Method D

CLIENT RJH Consultants BORING NO. TP-204,B-216,B-217(P)

JOB NO. 2679-168 DEPTH 0-15'

PROJECT South Boulder Creek Phase II SAMPLE NO. Bu-1,C-4,C-6 Composite

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION Remolded -3/8"

TECHNICIAN CAL

| | ditions | |
|--|---------|--|
| | | |
| | | |
| | | |
| | | |

| Before Test Mass of Wet Soil (g): | 440.2 | Initial Wet Density (pcf): | 122.8 |
|-----------------------------------|-------|------------------------------|-------|
| After Test Mass of Wet Soil (g): | 464.1 | Initial Dry Density (pcf): | 104.7 |
| Mass of Dry Soil and Pan (g): | 639.5 | Initial Wet Density (kg/m³): | 1967 |
| Mass of Pan (g): | 264.1 | Initial Dry Density (kg/m³): | 1677 |
| Diameter (in): | 2.41 | Initial Moisture (%): | 17.3 |
| Initial Sample Height (in): | 3.00 | Final Wet Density (pcf): | 138.8 |
| Assumed Specific Gravity: | 2.650 | Final Dry Density (pcf): | 112.2 |
| | | Final Wet Density (kg/m³): | 2223 |
| Back Pressure (psi): | 58.0 | Final Dry Density (kg/m³): | 1798 |
| Cell Pressure (psi): | 64.9 | Final Moisture (%): | 23.6 |

Final density calculated using volume change method from ASTM D4767.

Permeability Data

| Pump Setting | Percentage of Pump Setting | Rate of Flow (cc/s) | Pump Pressure (psi) | Head Loss (cm) | Gradient - i | Effective Stress (psi) - σ_3 | Effective Stress (kPa) σ_3 | Temperature (°C) | Temperature Correction | Corrected Hydraulic Conductivity (cm/s) - k |
|-----------------|----------------------------------|------------------------|---------------------------|-------------------|--------------|--|--------------------------------------|---------------------|---------------------------|--|
| | | 1.67E-04 | 0.167 | 11.76 | 1.57 | 6.82 | 47.0 | 22.3 | 0.947 | 3.6E-06 |
| | | 1.67E-04 | 0.200 | 14.08 | 1.88 | 6.80 | 46.9 | 22.4 | 0.944 | 3.0E-06 |
| | | 1.67E-04 | 0.208 | 14.65 | 1.95 | 6.80 | 46.9 | 22.5 | 0.942 | 2.9E-06 |
| | | 1.67E-04 | 0.254 | 17.88 | 2.39 | 6.77 | 46.7 | 22.5 | 0.942 | 2.4E-06 |
| | | 1.67E-04 | 0.266 | 18.73 | 2.50 | 6.77 | 46.7 | 22.7 | 0.938 | 2.2E-06 |
| | | 1.67E-04 | 0.276 | 19.43 | 2.59 | 6.76 | 46.6 | 22.8 | 0.936 | 2.2E-06 |
| | | 1.67E-04 | 0.291 | 20.49 | 2.73 | 6.75 | 46.6 | 22.8 | 0.936 | 2.0E-06 |
| | | 1.67E-04 | 0.301 | 21.19 | 2.83 | 6.75 | 46.5 | 22.9 | 0.933 | 2.0E-06 |
| | | 1.67E-04 | 0.300 | 21.12 | 2.82 | 6.75 | 46.5 | 22.9 | 0.933 | 2.0E-06 |
| | | 1.67E-04 | 0.293 | 20.63 | 2.75 | 6.75 | 46.6 | 23.0 | 0.931 | 2.0E-06 |

Test Results

Average Corrected Hydraulic Conductivity (cm/s): 2.0E-06

NOTES:

 Data entry by:
 JJA
 Date: 02/10/22

 Checked by:
 CAL
 Date: 02/11/22

 File name:
 2679168__Permeability Method D ASTM D5084_0.xlsm
 Page 1 of 2

Appendix J.1 147 of 262



Constant Rate of Flow Flexible Wall Hydraulic Conductivity

ASTM D 5084 Method D

CLIENT RJH Consultants BORING NO. TP-204,B-216,B-217(P)

JOB NO. 2679-168 DEPTH 0-15'

PROJECT South Boulder Creek Phase II SAMPLE NO. Bu-1,C-4,C-6 Composite

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION Remolded -3/8"

TECHNICIAN CAL

Consolidation Initial Saturation (%): Initial Volume of Sample (cc): Final Saturation (%): 100.0 Final Volume of Sample (cc): 208.8 Cell Pressure (psi): 64.9 Volume Change After Consolidation (cc): 30.6 Back Pressure (psi): 58.0 Initial Dial Reading (in): 0.200 Effective Stress (psi): 6.9 Final Dial Reading (in): 0.249 Effective Stress (kPa): 47.6 Height Change (in): 0.049 Cell Expansion Correction (cc): 15.64 Initial Area (cm2): 29.36 Final Area (cm²): Cell ID: 8P 27.85

| Elapsed Time (min) | Square Root of Time (√min) | Burette Reading (cc) | Volume Change (cc) | 0.0 ↔ | | Consolida | tion Data | | |
|-----------------------|----------------------------------|----------------------------|-----------------------|------------------|----------|-----------|------------------------|-------------|------|
| 0 | 0.00 | 0.50 | 0.00 | 1 | | | | | |
| 0.1 | 0.32 | 2.00 | 1.50 | 0.5 | | | | | |
| 0.25 | 0.50 | 2.40 | 1.90 | | | | | | |
| 0.5 | 0.71 | 2.60 | 2.10 | 1.0 | | | | | |
| 1 | 1.00 | 2.90 | 2.40 | 3 1.5 → | | | | | |
| 2 | 1.41 | 3.20 | 2.70 | 9 1.5 | 1 | | | | |
| 4 | 2.00 | 3.40 | 2.90 | Change 2.0 | <u> </u> | | | | |
| 9 | 3.00 | 3.50 | 3.00 | ا نے ا | 9 | | | | |
| 16 | 4.00 | 3.50 | 3.00 | و 2.5 🗕 | 4 | | | | |
| 30 | 5.48 | 3.60 | 3.10 | 9 2.5 + 3.0 + | Ø | | | | |
| 60 | 7.75 | 3.70 | 3.20 | 3 .0 + | | -0- | | | |
| 120 | 10.95 | 3.80 | 3.30 | | | 0 | - | | |
| 240 | 15.49 | 3.90 | 3.40 | 3.5 + | | | | | - |
| 360 | 18.97 | 4.00 | 3.50 | 4.0 | | | | | |
| | | | | 0.0 | 5. | | 10.0 ot of Time (vm | 15.0 in) | 20.0 |

| | Saturation | | | | | | | | | | | | | |
|---------------------|------------|---------------------|-------|----------------------|-------|----------------------|-----------|----------------------|-----|------------------|-----------------------|---------------------------|----------|---|
| Cell Pressure (psi) | | Pore Pressure (psi) | | Burette Reading (cc) | | Burette Reading (cc) | | Burette Reading (cc) | | Back Pressure | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
| Initial | Final | Initial | Final | Initial | Final | (psi) | 5ag5 (55) | 3ti c33 (p3i) | | | | | | |
| 40.0 | 50.0 | 39.2 | 48.0 | 23.70 | 24.80 | 38.0 | 1.10 | 2.0 | 8.8 | 0.88 | | | | |
| 50.0 | 60.0 | 49.2 | 58.5 | 28.40 | 29.90 | 48.0 | 1.50 | 2.0 | 9.3 | 0.93 | | | | |
| 60.0 | 70.0 | 59.2 | 68.7 | 30.90 | 31.00 | 58.0 | 0.10 | 2.0 | 9.5 | 0.95 | | | | |

Page 2 of 2

File name: 2679168__Permeability Method D ASTM D5084_0.xlsm

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Unconfined Compressive Strength ASTM D7012 Method C

Appendix J.1 149 of 262



Unconfined Compressive Strength ASTM D7012 Method C

| CLIENT | D.III. Consul | | M D7012 Metho | | | |
|--|------------------------|---|---|---|---|---|
| CLIENT | RJH Consul | tants | | JOB NO. | 2679-148 | |
| PROJECT PROJECT NO. | South Bould 16134 | ler Creek - Phase I | I | LOCATION | | |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED | | B-201 22.4-23.0 NQ-2 | B-202 16.9-17.5 NQ-2 | B-203 16.9-17.4 NQ-2 | B-204 25.4-25.9 NQ-2 | B-208 25.1-25.6 NQ-2 |
| DATE TESTED TECHNICIAN ROCK TYPE | | 03/25/20 HN Shale | 03/25/20 HN Shale | 03/25/20 HN Shale | 03/25/20 HN Shale | 03/25/20 HN Shale |
| Diameter (in): Height (in): Mass of Wet Rock Wet Density (lbs/ft³ Wet Density (g/cm³ |): | 1.799 3.692 330.60 134.2 2.15 | 1.797 3.840 332.50 130.1 2.08 | 1.799 4.437 379.50 128.2 2.05 | 1.724 3.695 304.90 134.7 2.16 | 1.787 3.884 320.90 125.5 2.01 |
| Peak Load (lbs): Compressive Streng Compressive Streng Failure Type: | gth (psi) gth (MPa) | 408 160 1.11 Shear / Fracture | 357 141 0.97 Fracture / Bedding | 280 110 0.76 Shear / Fracture | 510 218 1.51 Fracture / Bedding | 178 71 0.49 Fracture / Bedding |
| BORING NO. DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN ROCK TYPE | | B-209 11.3-11.8 NQ-2 03/25/20 HN Shale | B-210 7.1-7.6 NQ-2 03/25/20 HN Shale | B-213 19.3-19.8 NQ-1 03/25/20 HN Shale | | |
| Diameter (in): Height (in): Mass of Wet Rock (Wet Density (lbs/ft³) Wet Density (g/cm³) | : | 1.769 4.214 348.60 128.2 2.05 | 1.772 3.620 313.30 133.7 2.14 | 1.775 4.067 356.90 135.1 2.16 | | |
| Peak Load (lbs): Compressive Streng Compressive Streng Failure Type: | th (MPa) | 408 166 1.14 Fracture / Bedding | 255 103 0.71 Fracture / Bedding | 408 165 1.14 Shear / Fracture | | |
| | FUTCH | Date: Date: | 3/26/2020 31 2 71 70 70 | | | |
| File name: 26 | 79148R | ock UCS-TCS AST | M D7012 Method A | and C_0.xlsm | | |



CLIENT JOB NO. RJH Consultants 2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-201

DEPTH

22.4-23.0

SAMPLE NO.

NQ-2 UCS

TEST TYPE ROCK TYPE

Shale



NOTES

File name:

2679148__lmage_20_03_26_09_23_30



CLIENT

RJH Consultants

JOB NO. 2679-148 PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-202

DEPTH

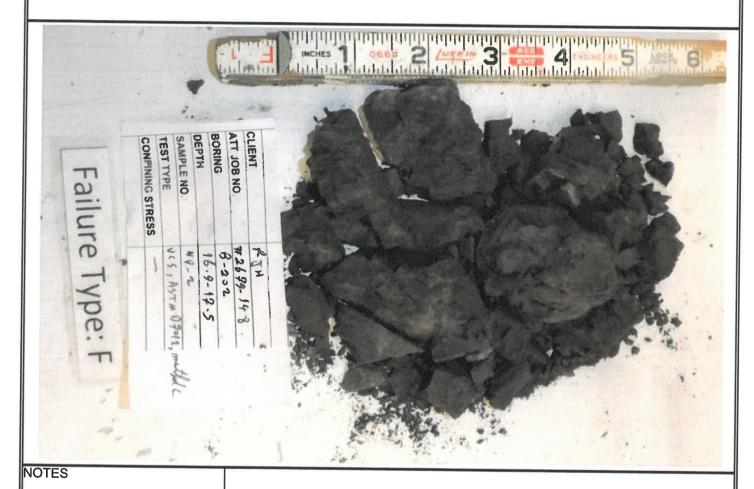
16.9-17.5

SAMPLE NO. TEST TYPE

NQ-2 UCS

ROCK TYPE

Shale



File name:

2679148__lmage_20_03_26_09_24_32



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-203

DEPTH

16.9-17.4

SAMPLE NO.

NQ-2

TEST TYPE

UCS

ROCK TYPE Shale



NOTES

File name:

2679148__lmage_20_03_26_09_56_49



ADVANCED TERRA TESTING

CLIENT JOB NO.

RJH Consultants

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-204

DEPTH

25.4-25.9

SAMPLE NO.

NQ-2

TEST TYPE

UCS

ROCK TYPE Shale



NOTES

File name:

2679148__lmage_20_03_26_09_26_35



CLIENT JOB NO. **RJH Consultants**

PROJECT

2679-148 South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-208

DEPTH

25.1-25.6

SAMPLE NO.

NQ-2

TEST TYPE

UCS

ROCK TYPE Shale



NOTES

File name:

2679148__lmage_20_03_26_09_27_33



CLIENT JOB NO. **RJH Consultants**

B NO. 2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-209

DEPTH

1

11.3-11.8

SAMPLE NO.

NQ-2 UCS

TEST TYPE ROCK TYPE

Shale



NOTES

File name:

2679148__lmage_20_03_26_09_28_22



ADVANCED TERRA TESTING

CLIENT JOB NO.

RJH Consultants

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

BORING NO.

B-210

DEPTH

7.1-7.6

SAMPLE NO.

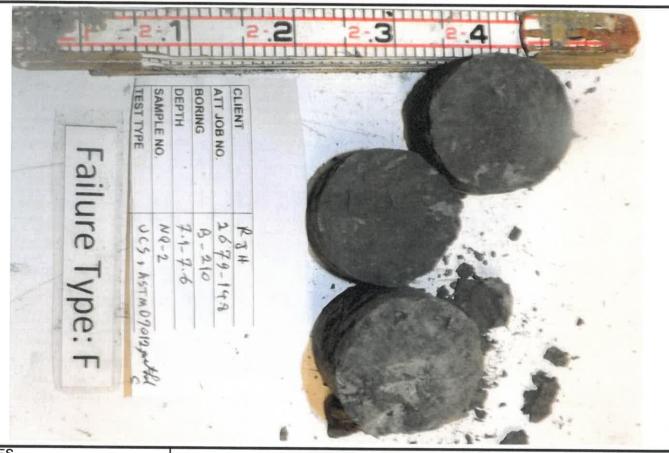
NQ-2

TEST TYPE

UCS

ROCK TYPE

Shale



NOTES

File name:

2679148__lmage_20_03_26_09_29_09



ADVANCED TERRA TESTING

CLIENT JOB NO. **RJH Consultants**

DOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-213

DEPTH

19.3-19.8

SAMPLE NO.

NQ-1

TEST TYPE

UCS

ROCK TYPE Shale



NOTES

File name:

2679148__lmage_20_03_26_09_30_35



Unconfined Compressive Strength ASTM D7012 Method C

| | ASIN | 1 D7012 Met | thoa C | | |
|---|-------------------------|-------------------|-------------------|------------|------------|
| CLIENT RJH Consultants | | | JOB NO. | 2679-152 | |
| PROJECT South Boulder Creek - Photographic PROJECT NO. 16134 | ase II Geotechnical Inv | estigation/ | LOCATION | alterna | |
| BORING NO. | B-207 | B-214 | B-214 | B-215 | B-215 |
| DEPTH | 16.3-16.9 | 11.2-11.7 | 15.8-16.4 | 19.4-19.9 | 22.3-22.9 |
| SAMPLE NO. | NQ-2 | NQ-2 | NQ-3 | NQ-2 | NQ-3 |
| DATE SAMPLED | 1402-2 | 1402-2 | 1402-0 | 1402.2 | 1402-0 |
| | 06/23/20 | 06/23/20 | 06/23/20 | 06/23/20 | 06/23/20 |
| DATE TESTED | l . | | | BFUTCH | BFUTCH |
| TECHNICIAN | BFUTCH | BFUTCH | BFUTCH | | |
| ROCK TYPE | Shale | Shale | Shale | Shale | Shale |
| Diameter (in): | 1.741 | 1.774 | 1.753 | 1.779 | 1.778 |
| Height (in): | 4.557 | 4.118 | 4.327 | 4.275 | 4.601 |
| Mass of Wet Rock (g): | 401.5 | 377.3 | 401.1 | 386.4 | 421.2 |
| Wet Density (lbs/ft³): | 141.0 | 141.2 | 146.3 | 138.5 | 140.5 |
| Wet Density (g/cm³): | 2.26 | 2.26 | 2.34 | 2.22 | 2.25 |
| (3.0) | | | | | |
| Peak Load (lbs): | 586 | 306 | 867 | 637 | 943 |
| | 246 | 124 | 359 | 256 | 380 |
| Compressive Strength (psi) | 1.7 | | 2.5 | 1.8 | 2.6 |
| Compressive Strength (MPa) | I./ Fracture / | 0.9 Fracture / | Z.5 Fracture / | Fracture / | Fracture / |
| Failure Type: | Bedding | Bedding | Bedding | Bedding | Bedding |
| DEPTH SAMPLE NO. DATE SAMPLED DATE TESTED TECHNICIAN ROCK TYPE Diameter (in): Height (in): Mass of Wet Rock (g): Wet Density (lbs/ft³): Wet Density (g/cm³): Peak Load (lbs): Compressive Strength (psi) | | | | | |
| Compressive Strength (MPa) Failure Type: | | | | | |
| | | | | | |
| NOTES | | | | | |
| | | | | | |
| Data entry by: BFUTCH Checked by: | Date: Date: | 6/23/202 | | | |
| | S-TCS ASTM D | 7012 Method A | and C_0.xlsm | | |

Appendix J.1 159 of 262



RJH Consultants CLIENT

BORING NO.

B-207

JOB NO.

2679-152

DEPTH

16.3-16.9

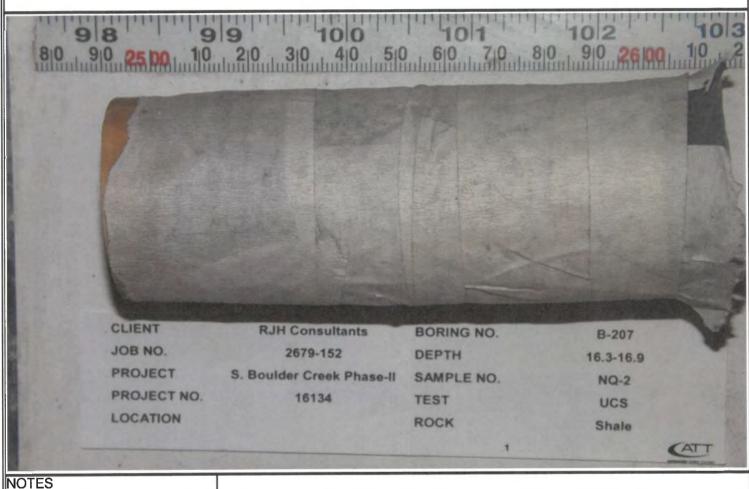
PROJECT PROJECT NO. South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO.

NQ-2 UCS

16134 LOCATION

TEST TYPE ROCK TYPE

Shale



File name: 2679152 Image 20 06 23 18 38 20

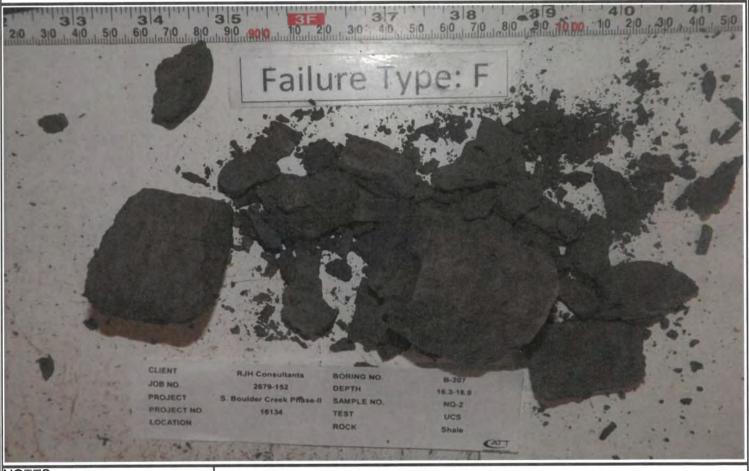


CLIENT RJH Consultants BORING NO. B-207

JOB NO. 2679-152 DEPTH 16.3-16.9

PROJECT South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. NQ-2

PROJECT NO. 16134 TEST TYPE UCS
LOCATION -- ROCK TYPE Shale



NOTES

File name: 2679152__lmage_20_06_23_18_38_43

Appendix J.1 161 of 262

B-214

NQ-2

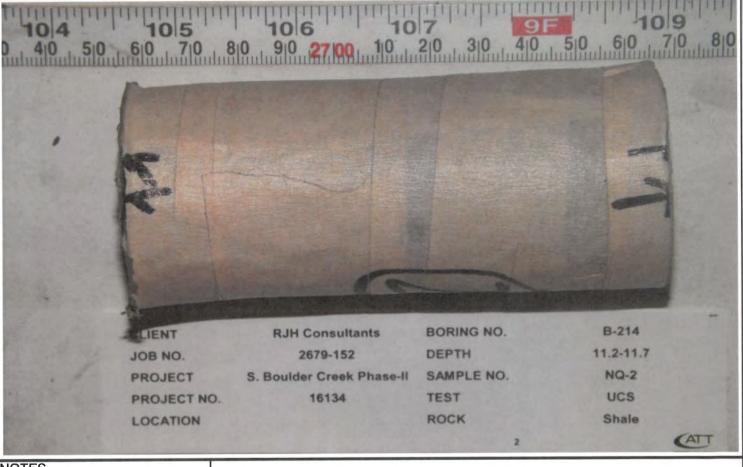
11.2-11.7



CLIENT RJH Consultants BORING NO. JOB NO. 2679-152 DEPTH

PROJECT South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO.

PROJECT NO. 16134 TEST TYPE UCS LOCATION -- ROCK TYPE Shale



NOTES

File name: 2679152 Image_20_06_23_18_39_36

ROCK TYPE

Shale



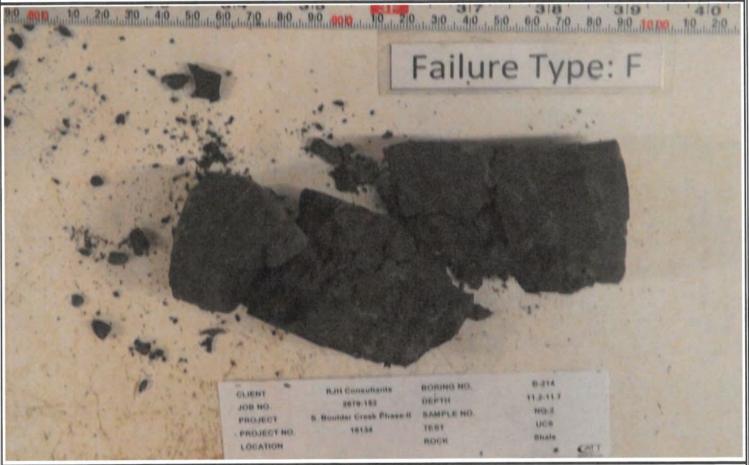
LOCATION

CLIENT RJH Consultants BORING NO. B-214

JOB NO. 2679-152 DEPTH 11.2-11.7

PROJECT South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. NQ-2

PROJECT NO. 16134 TEST TYPE UCS



NOTES

File name: 2679152__Image_20_06_23_18_40_02

Appendix J.1 163 of 262

B-214

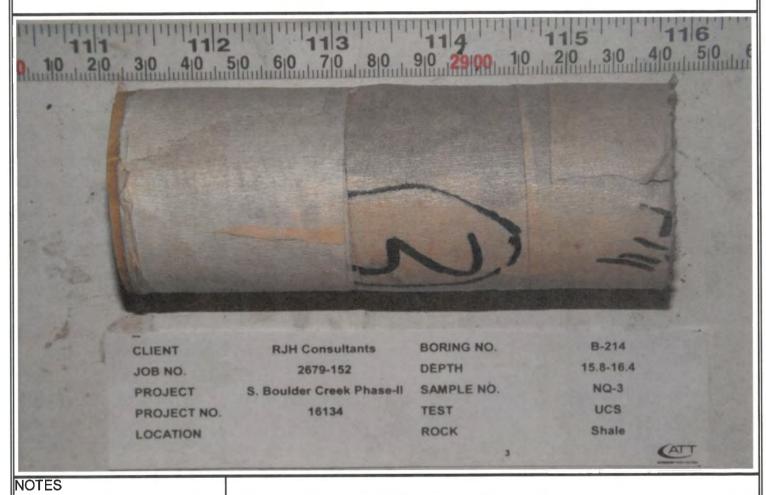
15.8-16.4



RJH Consultants BORING NO. CLIENT **DEPTH** 2679-152 JOB NO.

South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. PROJECT

NQ-3 UCS PROJECT NO. 16134 **TEST TYPE ROCK TYPE** Shale LOCATION



File name: 2679152__Image_20_06_23_18_40_46



CLIENT RJH Consultants

2679-152

BORING NO.

B-214

JOB NO.

South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO.

DEPTH

15.8-16.4

PROJECT NO. LOCATION

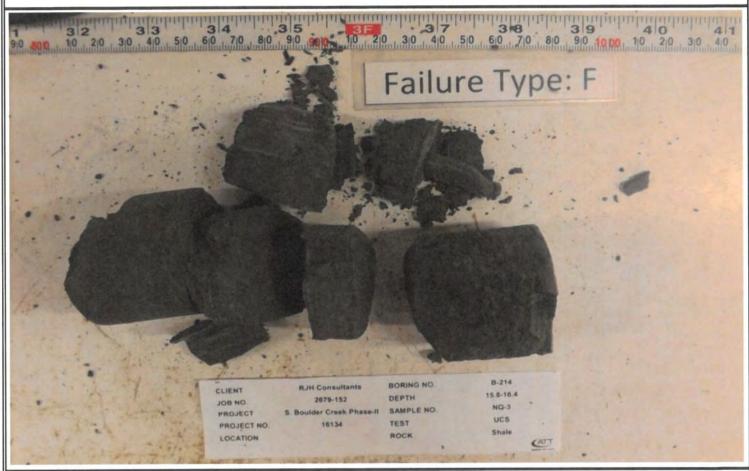
16134

TEST TYPE

NQ-3 UCS

ROCK TYPE

Shale



NOTES

File name:

2679152 Image_20_06_23_18_41_15



RJH Consultants CLIENT

BORING NO.

B-215

JOB NO.

2679-152

DEPTH South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. 19.4-19.9

PROJECT PROJECT NO.

16134

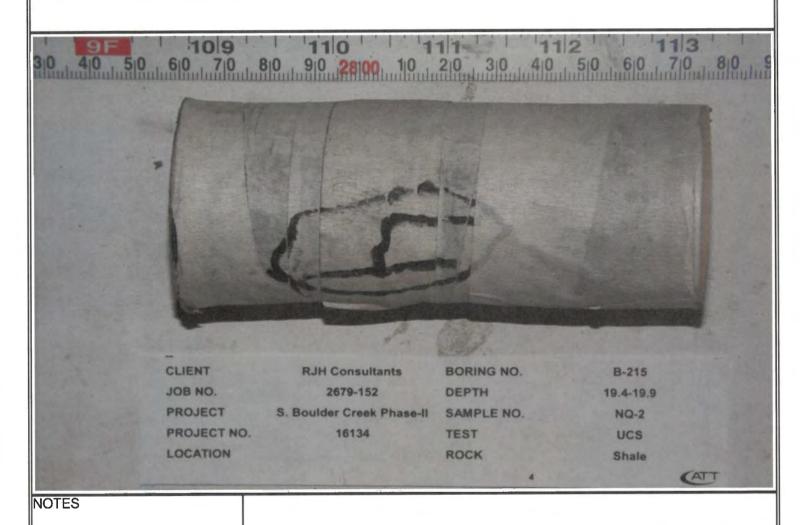
TEST TYPE

NQ-2

LOCATION

ROCK TYPE

UCS Shale



File name:

2679152 Image 20 06 23 18 41 54



CLIENT

BORING NO. B-215 **RJH Consultants**

19.4-19.9 **DEPTH** JOB NO. 2679-152 South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. NQ-2 PROJECT

PROJECT NO. 16134 **TEST TYPE** UCS

ROCK TYPE Shale LOCATION

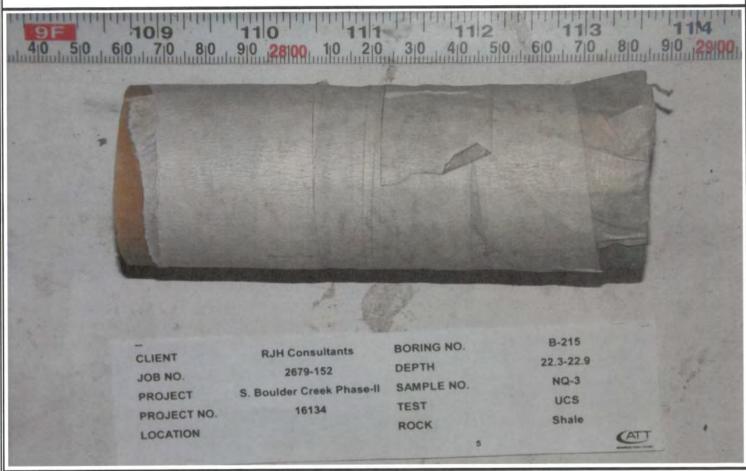


NOTES

File name: 2679152__lmage_20_06_23_18_42_18



BORING NO. B-215 CLIENT **RJH Consultants** 22.3-22.9 **DEPTH** 2679-152 JOB NO. South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. NQ-3 PROJECT UCS PROJECT NO. 16134 **TEST TYPE ROCK TYPE** Shale LOCATION



NOTES

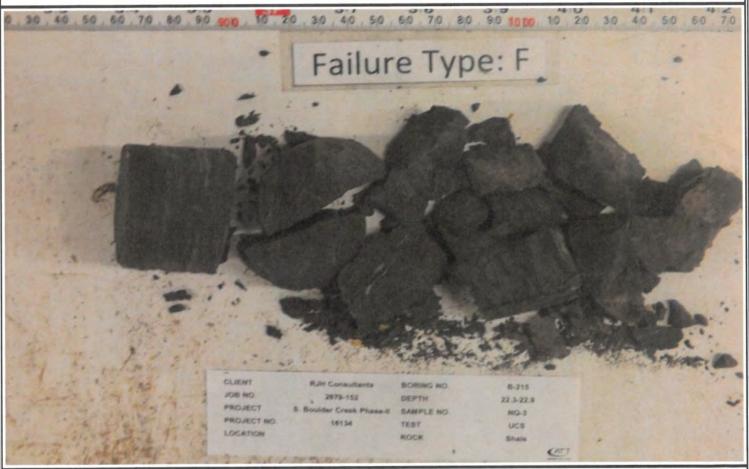
File name: 2679152__Image_20_06_23_18_42_52

Appendix J.1 168 of 262



LOCATION

BORING NO. B-215 CLIENT **RJH Consultants** 22.3-22.9 **DEPTH** JOB NO. 2679-152 South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO. NQ-3 PROJECT **TEST TYPE** UCS PROJECT NO. 16134 **ROCK TYPE** Shale



NOTES

2679152 Image_20_06_23_18_43_19 File name:

Appendix J.1 170 of 262



ASTM D 4767

CLIENT **RJH Consultants** JOB NO.

2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION

DATE TESTED 03/11/20

TECHNICIAN CAL BORING NO.

B-202&203

DEPTH

3.2-8.2'

SAMPLE NO.

CA-2.3&4

DATE SAMPLED

2-3&7-2020

SAMPLED BY

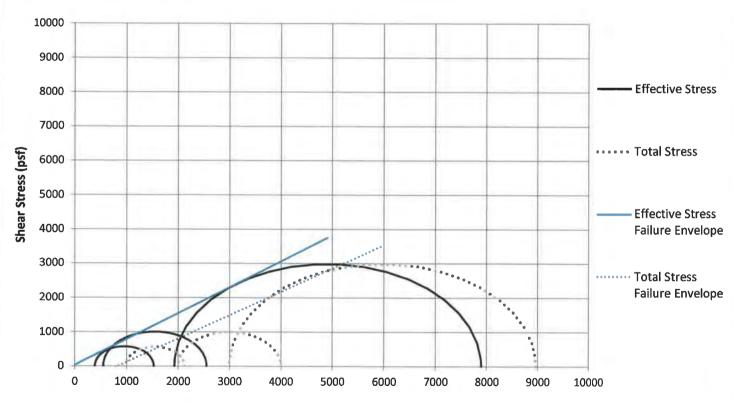
DESCRIPTION

clayey sand

| Effective Stress | Total Stress |
|-----------------------------------|---|
| Internal Friction Angle - φ: 37.2 | Internal Friction Angle - φ: 34.4 |
| Cohesion (psf): 28 | Cohesion (psf): |
| Cohesion (kPa): 1.3 | Cohesion (kPa): |
| Modified Friction Angle - ψ: 31.1 | Modified Friction Angle - ψ: 29.5 |
| Modified Cohesion - a (psf): 22 | Modified Cohesion - a (psf): |
| Modified Cohesion - a (kPa): 1.1 | Modified Cohesion - a (kPa): |
| Raw Data Files 2670148 CUOO B-20 | 3 CA 4 DTA try 2670148 CHDD B 202 CA 2 DT B try |

2679148_CUPP_B-202_CA-2_PT-C.trx,

Mohr Stress Circles



Total or Effective Stress (psf)

NOTES:

Pts. A and B were shorter than the 2/1 L/D specification. Sample B was not homogenous, part of it was clean sand and gravel.

Data entry by:

CAL

SPH

Date:

3/23/2020

Checked by: File name:

2679148 TxCuPP ASTM D4767 0.xlsm

Date: 3-27-20

Page 1 of 8



ASTM D 4767

CLIENT JOB NO. PROJECT PROJECT NO.

LOCATION

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

DATE TESTED 03/11/20 **TECHNICIAN** CAL

BORING NO. DEPTH SAMPLE NO. B-202&203 3.2-8.2 CA-2,3&4 2-3&7-2020

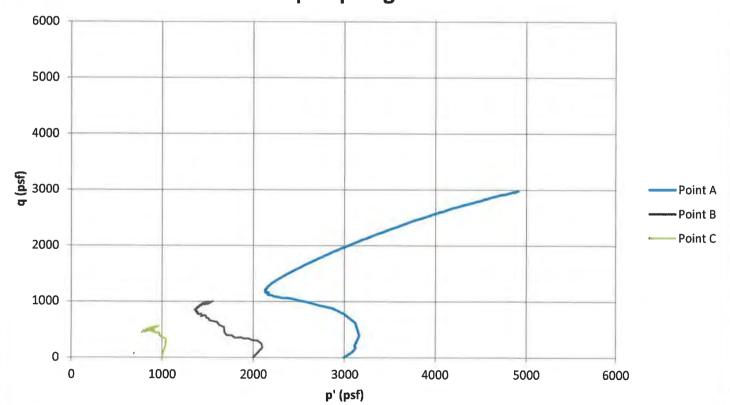
DATE SAMPLED SAMPLED BY

DESCRIPTION clayey sand

Shear Summary at Peak Deviator Stress

| | Point A | Point B | Point C |
|---|---------|---------|---------|
| Peak Deviator Stress (psf): | 5967 | 2004 | 1136 |
| Peak Deviator Stress (kPa): | 285.7 | 95.9 | 54.4 |
| Major Principal Stress (psf) - σ_{1f} : | 8963 | 4005 | 2130 |
| Major Principal Stress (kPa) - σ_{1f} : | 429.1 | 191.8 | 102.0 |
| Minor Principal Stress (psf) - σ_{3f} : | 2995 | 2002 | 994 |
| Minor Principal Stress (kPa) - σ_{3f} : | 143.4 | 95.8 | 47.6 |
| Effective Major Principal Stress (psf) - σ'_{1f} : | 7895 | 2556 | 1529 |
| Effective Major Principal Stress (kPa) - σ'1f: | 378.0 | 122.4 | 73.2 |
| Effective Minor Principal Stress (psf) - σ'3f: | 1928 | 552 | 393 |
| Effective Minor Principal Stress (kPa) - σ' _{3f} : | 92.3 | 26.4 | 18.8 |

p' - q Diagram



File name:

2679148__TxCuPP ASTM D4767 0.xlsm

Page 2 of 8



ASTM D 4767

CLIENT JOB NO. PROJECT PROJECT NO.

DATE TESTED

RJH Consultants

2679-148

South Boulder Creek - Phase II

16134

LOCATION

03/11/20

TECHNICIAN

CAL

BORING NO. **DEPTH**

SAMPLE NO. **DATE SAMPLED**

SAMPLED BY

DESCRIPTION

B-202&203

3.2-8.2 CA-2,3&4

2-3&7-2020

clayey sand

Point A

| Before Test Mass of Wet Soil (g): | 317.60 | |
|-----------------------------------|--------|--|
| After Test Mass of Wet Soil (g): | 322.17 | |
| Mass of Dry Soil and Pan (g): | 284.79 | |
| Mass of Pan (g): | 14.20 | |
| Diameter (in): | 1.935 | |
| Initial Sample Height (in): | 3.301 | |
| After Consolidation Height (in): | 3.224 | |
| Assumed Specific Gravity: | 2.65 | |
| | | |
| Back Pressure (psi): | 48.0 | |
| | | |

Cell Pressure (psi): 68.8 Initial Effective Stress (psi): 20.8

143.4

Strain Rate (in/min): 0.01

Initial Effective Stress (kPa):

Initial Wet Density (pcf): 124.6 Initial Dry Density (pcf): 106.2 Initial Wet Density (kg/m³): 1997 Initial Dry Density (kg/m³): 1701

Initial Moisture (%): 17.4

Final Wet Density (pcf): 136.0 114.3 Final Dry Density (pcf): Final Wet Density (kg/m³): 2179 Final Dry Density (kg/m³): 1830

Final Moisture (%): 19.1

Membrane Correction Factor (lb/in²): 40.78 1.1

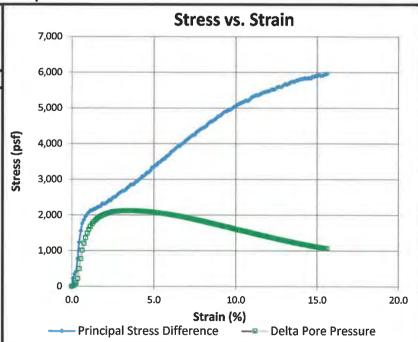
Filter Paper Load Capacity (lb/in):

Triaxial Compression Data

Peak Deviator Stress (psf): 5967 Peak Deviator Stress (kPa): 285.7

Parameters at Peak Deviator Stress

Major Principal Stress (psf) - σ_{1f} : 8963 Major Principal Stress (kPa) - σ_{1f} : 429.1 Minor Principal Stress (psf) - σ_{3f} : 2995 Minor Principal Stress (kPa) - σ_{3f} : 143.4 Induced Pore Pressure (psf): 1067.16 Induced Pore Pressure (kPa): 51.10 Effective Major Principal Stress (psf) - σ'_{1f}: 7895.48 Effective Major Principal Stress (kPa) - σ'1f: 378.04 Effective Minor Principal Stress (psf) - σ'_{3f} : 1928.04 Effective Minor Principal Stress (kPa) - σ'3f: 92.32 4912 p' (psf): q (psf): 2984 p' (kPa) : 235.2 q (kPa): 142.9 15.62 Strain (%):



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File name:

2679148__TxCuPP ASTM D4767_0.xlsm

Appendix J.1

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ASTM D 4767

CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT PROJECT NO. South Boulder Creek - Phase II

LOCATION

16134

DATE TESTED **TECHNICIAN** CAL

03/11/20

BORING NO.

DEPTH SAMPLE NO.

DATE SAMPLED SAMPLED BY

DESCRIPTION

B-202&203

3.2-8.2'

CA-2,3&4 2-3&7-2020

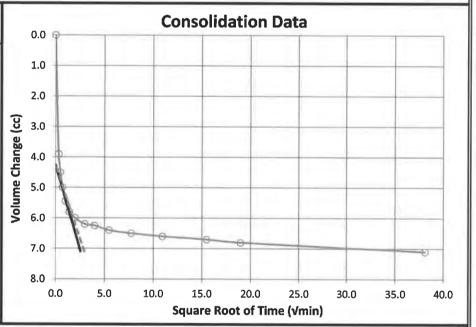
clayey sand

Consolidation - Point A

| ample (cc): 159. | 1 |
|-------------------|--|
| ample (cc): 147.8 | 8 |
| dation (cc): 21.1 | |
| eading (in): 0.20 | 0 |
| eading (in): 0.27 | 7 |
| hange (in): 0.07 | 7 |
| Area (cm²): 18.9 | 7 |
| Area (cm²): 18.0 | 5 |
| | ample (cc): 147.4 dation (cc): 21.1 eading (in): 0.20 eading (in): 0.27 Change (in): 0.07 Area (cm²): 18.9 |

0.88 T50 (min):

Square Burette Elapsed Volume Root of Reading Time (min) Change (cc) Time (vmin) (cc) 0 0.00 16.40 0.00 0.1 0.32 20.30 3.90 0.25 0.50 20.90 4.50 0.5 0.71 21.40 5.00 1 1.00 21.85 5.45 2 1.41 22.20 5.80 4 2.00 22.40 6.00 9 3.00 22.60 6.20 16 4.00 22.65 6.25 30 5.48 22.80 6.40 60 7.75 22.90 6.50 120 10.95 23.00 6.60 240 15.49 23.10 6.70 360 18.97 23.20 6.80 1450 38.08 23.50 7.10



Saturation

| Cell Pres | sure (psi) | Pore Pres | ssure (psi) | Burette R | eading (cc) | Back Pressure | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
|-----------|------------|-----------|-------------|-----------|-------------|------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | Change (CC) | ouless (psi) | | |
| 40.0 | 50.0 | 38.7 | 47.5 | 13.50 | 14.40 | 38.0 | 0.90 | 2.0 | 8.8 | 0.88 |
| 50.0 | 60.0 | 48.8 | 58.3 | 16.30 | 16.40 | 48.0 | 0.10 | 2.0 | 9.5 | 0.95 |

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File name: 2679148__TxCuPP ASTM D4767_0.xlsm



ASTM D 4767

CLIENT JOB NO. **RJH Consultants**

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134

LOCATION

DATE TESTED

TECHNICIAN

03/11/20 CAL

BORING NO.

DEPTH

SAMPLE NO. DATE SAMPLED

SAMPLED BY

DESCRIPTION

B-202&203

3.2-8.2'

CA-2,3&4

2-3&7-2020

clayey sand

Point B

Before Test Mass of Wet Soil (q): 288.43 After Test Mass of Wet Soil (g): 305.46 Mass of Dry Soil and Pan (g): 440.44

Mass of Pan (g): 172.76 Diameter (in): 1.910

Initial Sample Height (in): 3.435 After Consolidation Height (in): 3.360

Assumed Specific Gravity: 2.65

> Back Pressure (psi): 68.0 Cell Pressure (psi): 81.9

Initial Effective Stress (psi): 13.9 Initial Effective Stress (kPa): 95.8

> Strain Rate (in/min): 0.0047

Initial Wet Density (pcf): 111.6 Initial Dry Density (pcf): 103.6

Initial Wet Density (kg/m³): 1788 Initial Dry Density (kg/m³): 1660

Initial Moisture (%): 7.8

Final Wet Density (pcf): 132.2

Final Dry Density (pcf): 115.8 Final Wet Density (kg/m3): 2118

Final Dry Density (kg/m³): 1856 Final Moisture (%): 14.1

Membrane Correction Factor (lb/in²): 40.78

Filter Paper Load Capacity (lb/in):

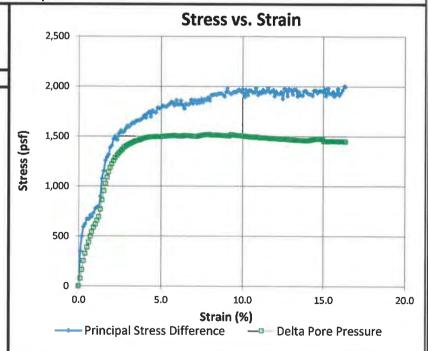
Triaxial Compression Data

Peak Deviator Stress (psf): 2004 Peak Deviator Stress (kPa): 95.9

Parameters at Peak Deviator Stress

Strain (%):

Major Principal Stress (psf) - σ_{1f}: 4005 Major Principal Stress (kPa) - σ_{1f} : 191.8 Minor Principal Stress (psf) - σ_{3f} : 2002 Minor Principal Stress (kPa) - σ_{3f}: 95.8 Induced Pore Pressure (psf): 1449.56 Induced Pore Pressure (kPa): 69.41 Effective Major Principal Stress (psf) - σ'1f: 2555.77 Effective Major Principal Stress (kPa) - σ'16: 122.37 Effective Minor Principal Stress (psf) - σ'3f: 552.04 Effective Minor Principal Stress (kPa) - σ'3f: 26.43 p' (psf): 1554 1002 q (psf): p' (kPa): 74.4 q (kPa): 48.0



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File name:

2679148__TxCuPP ASTM D4767 0.xlsm

16.27



ASTM D 4767

CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION

DATE TESTED 03/11/20

Square

Root of

Time (vmin)

0.00

0.32

0.50

0.71

1.00

1.41

2.00

3.00

4.00

5.48

7.75

10.95

15.49

17.32

38.85

Elapsed

Time (min)

0

0.1

0.25

0.5

1

2

4

9

16

30

60

120

240

300

1509

TECHNICIAN CAL BORING NO. **DEPTH**

SAMPLE NO. **DATE SAMPLED**

SAMPLED BY

DESCRIPTION

B-202&203 3.2-8.2'

CA-2,3&4

2-3&7-2020

clayey sand

Consolidation - Point B

| | Initial Saturation (%): | 34.4 | Initial Volume of Sample (cc): | 161.3 | |
|---|---------------------------------|------|---|-------|--|
| | Final Saturation (%): | 87.4 | Final Volume of Sample (cc): | 144.3 | |
| | Cell Pressure (psi): | 81.9 | Volume Change After Consolidation (cc): | 26.7 | |
| | Back Pressure (psi): | 68.0 | Initial Dial Reading (in): | 0.400 | |
| | Effective Stress (psi): | 13.9 | Final Dial Reading (in): | 0.475 | |
| | Effective Stress (kPa): | 95.8 | Height Change (in): | 0.075 | |
| (| Cell Expansion Correction (cc): | 9.67 | Initial Area (cm²): | 18.49 | |
| | Cell ID: | 15S | Final Area (cm²): | 16.90 | |
| | | | | | |

T50 (min): 2.99

0.00

4.30

4.90

5.20

5.40

5.55

5.70

5.90

6.05

6.30

6.50

6.60

6.65

6.70

7.10

Burette Volume Reading Change (cc)

(cc)

0.10

4.40

5.00

5.30

5.50

5.65

5.80

6.00

6.15

6.40

6.60

6.70

6.75

6.80

7.20

| 0.0 | 9 | | Co | nsoli | datio | n Data | | 1 | |
|-------------------|------|------|----|-------|-------------------|--------|---|----------|-----|
| 1.0 | | | | | | | | | |
| 2.0 | | | | | | | | | |
| 3.0 | | | | | | | | | |
| 3.0 4.0 5.0 | 0 | | | | | - | | | |
| 5.0 | | | | | - | | | | |
| 6.0 | 1 | 2. | | | | | - | | |
| 7.0 | | 11 | 0 | 0-0- | | | - | | |
| 8.0 0 | .0 5 | .0 1 | | | 20.0 Root of 1 | | | 5.0 40.0 | 45. |

Saturation

| Cell Pressure (psi) | | Pore Pressure (psi) | | Burette Reading (cc) | | Back Pressure | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
|---------------------|-------|---------------------|-------|----------------------|-------|--------------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) Change (cc) Stress | Stress (psi) | | | |
| 40.0 | 50.0 | 38.5 | 46.3 | 18.80 | 19.90 | 38.0 | 1.10 | 2.0 | 7.8 | 0.78 |
| 50.0 | 60.0 | 48.0 | 56.8 | 21.00 | 21.80 | 48.0 | 0.80 | 2.0 | 8.8 | 0.88 |
| 60.0 | 70.0 | 58.8 | 68.2 | 22.20 | 23.00 | 58.0 | 0.80 | 2.0 | 9.4 | 0.94 |
| 70.0 | 80.0 | 68.7 | 78.3 | 23.20 | 23.30 | 68.0 | 0.10 | 2.0 | 9.6 | 0.96 |

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File name: 2679148__TxCuPP ASTM D4767_0.xlsm



ASTM D 4767

CLIENT **RJH Consultants** JOB NO.

2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/11/20

TECHNICIAN CAL BORING NO. B-202&203 DEPTH 3.2-8.21

SAMPLE NO. CA-2,3&4 DATE SAMPLED 2-3&7-2020

SAMPLED BY

DESCRIPTION clayey sand

Point C

| Ī | Before Test Mass of Wet Soil (g): | 329.28 | Initial Wet Density (pcf): | 121.2 |
|---|-----------------------------------|--------|------------------------------|-------|
| | After Test Mass of Wet Soil (g): | 350.65 | Initial Dry Density (pcf): | 108.9 |
| | Mass of Dry Soil and Pan (g): | 466.65 | Initial Wet Density (kg/m³): | 1941 |
| | Mass of Pan (g): | 170.57 | Initial Dry Density (kg/m³): | 1745 |
| | Diameter (in): | 1.881 | Initial Moisture (%): | 11.2 |
| | Initial Sample Height (in): | 3.726 | Final Wet Density (pcf): | 142.2 |
| | After Consolidation Height (in): | 3.672 | Final Dry Density (pcf): | 120.1 |
| | Assumed Specific Gravity: | 2.65 | Final Wet Density (kg/m³): | 2278 |
| | | | Final Dry Density (kg/m³): | 1923 |
| | Back Pressure (psi): | 58.0 | Final Moisture (%): | 18.4 |

Cell Pressure (psi): 64.9 Initial Effective Stress (psi): 6.9

Initial Effective Stress (kPa): 95.8

> Strain Rate (in/min): 0.01

Final Moisture (%): 18.4

Membrane Correction Factor (lb/in²): 72.64

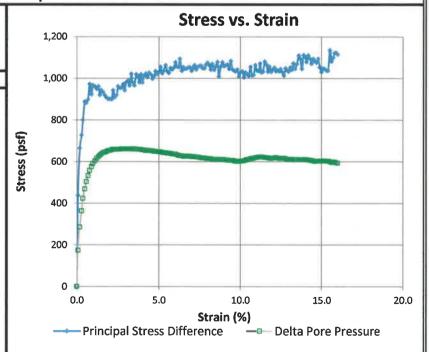
Filter Paper Load Capacity (lb/in): 1.1

Triaxial Compression Data

Peak Deviator Stress (psf): 1136 Peak Deviator Stress (kPa): 54.4

Parameters at Peak Deviator Stress

Major Principal Stress (psf) - σ_{1f}: 2130 Major Principal Stress (kPa) - σ_{1f} : 102.0 Minor Principal Stress (psf) - σ_{3f} : 994 Minor Principal Stress (kPa) - σ_{3f}: 47.6 Induced Pore Pressure (psf): 601.05 Induced Pore Pressure (kPa): 28.78 Effective Major Principal Stress (psf) - σ'1f: 1528.76 Effective Major Principal Stress (kPa) - σ'1f: 73.20 Effective Minor Principal Stress (psf) - σ'3f: 392.55 Effective Minor Principal Stress (kPa) - σ'3f: 18.80 p' (psf): 961 568 q (psf): p' (kPa) : 46.0 q (kPa): 27.2 Strain (%): 15.51



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File name: 2679148__TxCuPP ASTM D4767_0.xlsm

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ASTM D 4767

CLIENT **RJH Consultants** JOB NO.

2679-148

South Boulder Creek - Phase II

DEPTH SAMPLE NO.

BORING NO.

B-202&203 3.2-8.2'

PROJECT NO.

16134

DATE SAMPLED

CA-2,3&4 2-3&7-2020

LOCATION

PROJECT

SAMPLED BY

DATE TESTED TECHNICIAN

03/11/20 CAL

DESCRIPTION

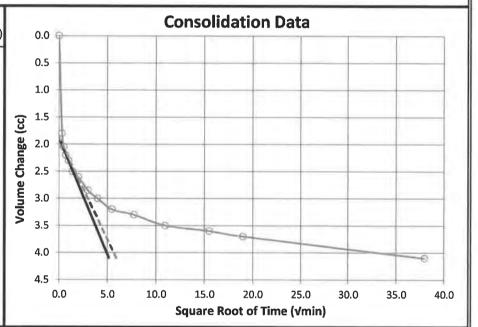
clayey sand

Consolidation - Point C

| | | | CONSONALION - I CINCO | |
|---|--------------------------------|-------|---|-------|
| | Initial Saturation (%): | 57.3 | Initial Volume of Sample (cc): | 169.7 |
| | Final Saturation (%): | 100.0 | Final Volume of Sample (cc): | 153.9 |
| | Cell Pressure (psi): | 64.9 | Volume Change After Consolidation (cc): | 23.4 |
| | Back Pressure (psi): | 58.0 | Initial Dial Reading (in): | 0.400 |
| | Effective Stress (psi): | 6.9 | Final Dial Reading (in): | 0.454 |
| | Effective Stress (kPa): | 47.6 | Height Change (in): | 0.054 |
| C | ell Expansion Correction (cc): | 7.66 | Initial Area (cm²): | 17.93 |
| | Cell ID: | 13S | Final Area (cm²): | 16.50 |

T50 (min): 1.04

| Elapsed Time (min) | Square Root of Time (vmin) | Burette Reading (cc) | Volume Change (cc) |
|-----------------------|----------------------------------|----------------------------|-----------------------|
| 0 | 0.00 | 0.20 | 0.00 |
| 0.1 | 0.32 | 2.00 | 1.80 |
| 0.25 | 0.50 | 2.25 | 2.05 |
| 0.5 | 0.71 | 2.40 | 2.20 |
| 1 | 1.00 | 2.50 | 2.30 |
| 2 | 1.41 | 2.70 | 2.50 |
| 4 | 2.00 | 2.80 | 2.60 |
| 9 | 3.00 | 3.05 | 2.85 |
| 16 | 4.00 | 3.20 | 3.00 |
| 30 | 5.48 | 3.40 | 3.20 |
| 60 | 7.75 | 3.50 | 3.30 |
| 120 | 10.95 | 3.70 | 3.50 |
| 240 | 15.49 | 3.80 | 3.60 |
| 360 | 18.97 | 3.90 | 3.70 |
| 1440 | 37.95 | 4.30 | 4.10 |
| I | | | |



| | ra | |
|--|----|--|
| | | |

| Cell Pres | Cell Pressure (psi) | | Pore Pressure (psi) | | eading (cc) | Back Pressure | Volume Change (cc) | Effective Stress (psi) | ∆u (psi) | В |
|-----------|---------------------|---------|---------------------|---------|-------------|------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | Onango (cc) | arige (cc) Stress (psi) | | |
| 40.0 | 50.0 | 39.1 | 47.6 | 20.20 | 21.20 | 38.0 | 1.00 | 2.0 | 8.5 | 0.85 |
| 50.0 | 60.0 | 49.0 | 58.3 | 22.10 | 22.80 | 48.0 | 0.70 | 2.0 | 9.3 | 0.93 |
| 60.0 | 70.0 | 59.2 | 68.8 | 22.80 | 22.90 | 58.0 | 0.10 | 2.0 | 9.6 | 0.96 |

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File name: 2679148__TxCuPP ASTM D4767_0.xlsm

CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED

TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

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03/11/20 CAL BORING NO. DEPTH SAMPLE NO. DATE SAMPLED SAMPLED BY

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

3Y --

DESCRIPTION clayey sand

| | | | | Poi | nt A | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|---|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.000 | 0.00 | 2.80 | 0.0 | 0 | 0 | 0.0 | 2995.2 | 2995.2 | 0.0 |
| 0.003 | 0.09 | 2.80 | 4.7 | 15 | 225 | 10.4 | 2984.8 | 3097.2 | 112.4 |
| 0.006 | 0.19 | 2.80 | 7.4 | 32 | 349 | 42.6 | 2952.6 | 3127.2 | 174.6 |
| 0.009 | 0.27 | 2.81 | 8.9 | 46 | 410 | 87.9 | 2907.3 | 3112.3 | 205.0 |
| 0.011 | 0.36 | 2.81 | 16.3 | 61 | 777 | 219.3 | 2775.9 | 3164.1 | 388.3 |
| 0.014 | 0.45 | 2.81 | 25.7 | 76 | 1241 | 494.7 | 2500.5 | 3120.8 | 620.3 |
| 0.018 | 0.55 | 2.81 | 32.2 | 94 | 1554 | 773.9 | 2221.3 | 2998.2 | 776.9 |
| 0.020 | 0.63 | 2.82 | 36.6 | 108 | 1762 | 1012.0 | 1983.2 | 2864.3 | 881.1 |
| 0.024 | 0.74 | 2.82 | 39.0 | 126 | 1864 | 1203.8 | 1791.4 | 2723.5 | 932.1 |
| 0.027 | 0.83 | 2.82 | 41.3 | 142 | 1963 | 1361.7 | 1633.5 | 2615.2 | 981.7 |
| 0.030 | 0.94 | 2.82 | 43.0 | 161 | 2029 | 1489.0 | 1506.2 | 2521.0 | 1014.7 |
| 0.034 | 1.04 | 2.83 | 44.4 | 178 | 2082 | 1592.3 | 1402.9 | 2443.8 | 1040.9 |
| 0.036 | 1.12 | 2.83 | 45.5 | 192 | 2123 | 1677.9 | 1317.3 | 2378.9 | 1061.6 |
| 0.040 | 1.24 | 2.83 | 46.1 | 212 | 2131 | 1749.8 | 1245.4 | 2311.0 | 1065.6 |
| 0.043 | 1.33 | 2.84 | 47.0 | 227 | 2161 | 1807.0 | 1188.2 | 2268.8 | 1080.6 |
| 0.047 | 1.44 | 2.84 | 47.8 | 247 | 2180 | 1857.5 | 1137.7 | 2227.7 | 1090.1 |
| 0.050 | 1.54 | 2.84 | 48.9 | 263 | 2215 | 1897.4 | 1097.8 | 2205.1 | 1107.3 |
| 0.053 | 1.63 | 2.84 | 49.6 | 279 | 2230 | 1933.3 | 1061.9 | 2176.8 | 1115.0 |
| 0.056 | 1.74 | 2.85 | 50.4 | 297 | 2250 | 1962.4 | 1032.8 | 2157.6 | 1124.8 |
| 0.060 | 1.85 | 2.85 | 52.2 | 316 | 2323 | 1988.3 | 1006.9 | 2168.3 | 1161.3 |
| 0.063 | 1.96 | 2.85 | 52.6 | 335 | 2317 | 2011.5 | 983.7 | 2141.9 | 1158.3 |
| 0.067 | 2.07 | 2.86 | 53.1 | 342 | 2333 | 2031.7 | 963.5 | 2130.3 | 1166.7 |
| 0.070 | 2.17 | 2.86 | 53.9 | 342 | 2372 | 2047.5 | 947.7 | 2133.8 | 1186.1 |
| 0.073 | 2.26 | 2.86 | 54.9 | 342 | 2417 | 2060.8 | 934.4 | 2143.0 | 1208.6 |
| 0.076 | 2.36 | 2.87 | 54.9 | 343 | 2414 | 2073.8 | 921.4 | 2128.2 | 1206.8 |
| 0.079 | 2.45 | 2.87 | 56.0 | 343 | 2469 | 2084.1 | 911.1 | 2145.6 | 1234.5 |
| 0.083 | 2.56 | 2.87 | 56.7 | 343 | 2502 | 2092.9 | 902.3 | 2153.4 | 1251.1 |
| 0.086 | 2.66 | 2.87 | 57.2 | 343 | 2520 | 2099.7 | 895.5 | 2155.6 | 1260.1 |
| 0.089 | 2.76 | 2.88 | 58.1 | 344 | 2563 | 2104.9 | 890.3 | 2171.9 | 1281.6 |
| 0.092 | 2.86 | 2.88 | 59.1 | 344 | 2610 | 2111.2 | 884.0 | 2188.9 | 1304.9 |
| 0.096 | 2.97 | 2.88 | 59.8 | 344 | 2642 | 2115.8 | 879.4 | 2200.2 | 1320.8 |
| 0.099 | 3.08 | 2.89 | 60.3 | 345 | 2665 | 2118.1 | 877.1 | 2209.7 | 1332.7 |
| 0.102 | 3.17 | 2.89 | 60.7 | 345 | 2681 | 2121.0 | 874.2 | 2214.5 | 1340.3 |
| 0.105 | 3.27 | 2.89 | 61.2 | 345 | 2701 | 2120.0 | 875.2 | 2225.9 | 1350.7 |
| 0.109 | 3.37 | 2.90 | 62.5 | 346 | 2763 | 2122.3 | 872.9 | 2254.3 | 1381.4 |
| 0.112 | 3.47 | 2.90 | 63.3 | 346 | 2797 | 2122.8 | 872.4 | 2270.8 | 1398.4 |
| 0.116 | 3.58 | 2.90 | 64.5 | 346 | 2856 | 2121.8 | 873.4 | 2301.5 | 1428.1 |
| 0.119 | 3.69 | 2.91 | 64.6 | 346 | 2855 | 2121.0 | 874.1 | 2301.7 | 1427.6 |
| 0.122 | 3.78 | 2.91 | 65.0 | 347 | 2870 | 2121.1 | 874.9 | 2310.1 | 1435.2 |
| 0.126 | 3.90 | 2.91 | 66.3 | 347 | 2933 | 2120.3 | 876.3 | 2342.8 | |
| 0.128 | 3.98 | 2.91 | 66.6 | 347 | 2933 2943 | 2116.9 | 877.3 | | 1466.6 |
| 0.120 | 4.08 | 2.92 | | | | | | 2348.9 | 1471.5 |
| 0.132 | 4.00 | 2.92 | 67.7 | 348 | 2994 | 2116.4 | 878.8 | 2375.6 | 1496.8 |

ADVANCED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT JOB NO. PROJECT PROJECT NO. LOCATION DATE TESTED

TECHNICIAN

RJH Consultants 2679-148 Soulder Creek - Phase II

16134

03/11/20 CAL BORING NO.
DEPTH
SAMPLE NO.
DATE SAMPLED
SAMPLED BY

DESCRIPTION

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

--

clayey sand

| Point A | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------|--------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf | |
| 0.135 | 4.18 | 2.92 | 68.3 | 348 | 3022 | 2113.4 | 881.8 | 2392.5 | 1510.8 | |
| 0.138 | 4.28 | 2.92 | 69.6 | 348 | 3081 | 2109.8 | 885.4 | 2426.0 | 1540.5 | |
| 0.141 | 4.37 | 2.93 | 69.9 | 348 | 3092 | 2105.9 | 889.3 | 2435.3 | 1546.0 | |
| 0.144 | 4.48 | 2.93 | 70.9 | 349 | 3137 | 2102.8 | 892.4 | 2460.8 | 1568.4 | |
| 0.147 | 4.57 | 2.93 | 72.0 | 349 | 3185 | 2099.1 | 896.1 | 2488.8 | 1592.7 | |
| 0.151 | 4.68 | 2.94 | 72.3 | 349 | 3199 | 2093.4 | 901.8 | 2501.4 | 1599.5 | |
| 0.154 | 4.78 | 2.94 | 73.5 | 350 | 3254 | 2088.9 | 906.3 | 2533.1 | 1626.8 | |
| 0.158 | 4.89 | 2.94 | 75.2 | 350 | 3332 | 2084.0 | 911.2 | 2577.3 | 1666.0 | |
| 0.161 | 4.99 | 2.95 | 75.7 | 350 | 3348 | 2079.0 | 916.2 | 2590.5 | 1674.2 | |
| 0.164 | 5.07 | 2.95 | 76.4 | 350 | 3383 | 2073.7 | 921.5 | 2612.9 | 1691.5 | |
| 0.167 | 5.18 | 2.95 | 77.1 | 351 | 3409 | 2066.6 | 928.6 | 2633.0 | 1704.4 | |
| 0.169 | 5.26 | 2.95 | 78.3 | 351 | 3465 | 2062.1 | 933.1 | 2665.5 | 1732.4 | |
| 0.174 | 5.38 | 2.96 | 79.0 | 351 | 3495 | 2054.5 | 940.7 | 2688.4 | 1747.7 | |
| 0.176 | 5.47 | 2.96 | 80.0 | 352 | 3538 | 2051.1 | 944.1 | 2713.0 | 1768.9 | |
| 0.180 | 5.58 | 2.96 | 80.8 | 352 | 3576 | 2043.6 | 951.6 | 2739.6 | 1788.0 | |
| 0.183 | 5.66 | 2.97 | 81.0 | 352 | 3579 | 2039.1 | 956.1 | 2745.6 | 1789. | |
| 0.186 | 5.78 | 2.97 | 82.7 | 353 | 3657 | 2032.0 | 963.2 | 2791.5 | 1828.3 | |
| 0.189 | 5.87 | 2.97 | 83.0 | 353 | 3669 | 2025.0 | 970.2 | 2805.0 | 1834.7 | |
| 0.193 | 5.97 | 2.98 | 84.2 | 353 | 3721 | 2016.9 | 978.3 | 2838.8 | 1860. | |
| 0.196 | 6.07 | 2.98 | 85.4 | 353 | 3776 | 2009.7 | 985.5 | 2873.7 | 1888.2 | |
| 0.199 | 6.17 | 2.98 | 86.2 | 354 | 3807 | 2002.5 | 992.7 | 2896.0 | 1903.3 | |
| 0.202 | 6.28 | 2.99 | 87.3 | 354 | 3855 | 1993.7 | 1001.5 | 2929.0 | 1927. | |
| 0.205 | 6.37 | 2.99 | 88.2 | 354 | 3894 | 1986.5 | 1008.7 | 2956.0 | 1947.2 | |
| 0.209 | 6.47 | 2.99 | 89.1 | 355 | 3932 | 1979.5 | 1015.7 | 2981.7 | 1966.0 | |
| 0.212 | 6.57 | 3.00 | 89.2 | 355 | 3935 | 1970.0 | 1025.2 | 2992.6 | 1967.4 | |
| 0.215 | 6.68 | 3.00 | 90.5 | 355 | 3992 | 1960.3 | 1034.9 | 3030.8 | 1995.9 | |
| 0.218 | 6.77 | 3.00 | 91.0 | 355 | 4011 | 1950.2 | 1045.0 | 3050.2 | 2005.3 | |
| 0.221 | 6.87 | 3.00 | 92.2 | 356 | 4064 | 1940.4 | 1054.8 | 3086.8 | 2032.0 | |
| 0.225 | 6.97 | 3.01 | 93.2 | 356 | 4105 | 1931.7 | 1063.5 | 3116.1 | 2052.6 | |
| 0.228 | 7.08 | 3.01 | 93.9 | 356 | 4133 | 1921.2 | 1074.0 | 3140.5 | 2066.5 | |
| 0.231 | 7.17 | 3.01 | 95.0 | 357 | 4182 | 1912.1 | 1083.1 | 3173.9 | 2090.8 | |
| 0.235 | 7.29 | 3.02 | 95.9 | 357 | 4221 | 1903.3 | 1091.9 | 3202.2 | 2110.3 | |
| 0.238 | 7.37 | 3.02 | 96.5 | 357 | 4242 | 1890.9 | 1104.3 | 3225.3 | 2120.9 | |
| 0.241 | 7.48 | 3.02 | 96.9 | 358 | 4255 | 1879.3 | 1115.9 | 3243.3 | 2127.4 | |
| 0.245 | 7.59 | 3.03 | 98.5 | 358 | 4328 | 1870.1 | 1125.1 | 3289.0 | 2163.9 | |
| 0.248 | 7.68 | 3.03 | 99.2 | 358 | 4353 | 1861.9 | 1133.3 | 3310.0 | 2176.3 | |
| 0.251 | 7.79 | 3.03 | 100.1 | 358 | 4390 | 1849.7 | 1145.5 | 3340.4 | 2194.9 | |
| 0.254 | 7.79 | 3.04 | 100.1 | 359 | 4421 | 1841.0 | 1154.2 | 3364.8 | 2210. | |
| 0.257 | 7.98 | 3.04 | 100.5 | 359 | 4446 | 1830.1 | 1165.1 | 3388.1 | 2222.9 | |
| 0.260 | 8.08 | 3.04 | 101.9 | 359 | 4463 | 1819.7 | 1175.5 | 3407.0 | 2231.4 | |
| 0.264 | 8.18 | 3.05 | 101.8 | 360 | 4497 | 1808.2 | 1187.0 | 3435.3 | 2248.3 | |
| 0.267 | 8.27 | 3.05 | 102.8 | 360 | 4557 | 1796.6 | 1198.6 | 3477.1 | 2278.4 | |

ADVANCED TERRA TESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT JOB NO. PROJECT PROJECT NO. LOCATION DATE TESTED

TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

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03/11/20 CAL BORING NO. DEPTH SAMPLE NO. DATE SAMPLED SAMPLED BY

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

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DESCRIPTION clayey sand

| Point A | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|---|------------------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) | |
| 0.270 | 8.38 | 3.05 | 105.2 | 360 | 4601 | 1785.1 | 1210.1 | 3510.5 | 2300.3 | |
| 0.273 | 8.48 | 3.06 | 105.9 | 360 | 4629 | 1774.4 | 1220.8 | 3535.5 | 2314.7 | |
| 0.276 | 8.57 | 3.06 | 106.3 | 361 | 4642 | 1762.9 | 1232.3 | 3553.1 | 2320.9 | |
| 0.280 | 8.69 | 3.06 | 107.2 | 361 | 4676 | 1752.4 | 1242.8 | 3580.6 | 2337.8 | |
| 0.282 | 8.76 | 3.07 | 107.6 | 361 | 4693 | 1742.5 | 1252.7 | 3598.9 | 2346.3 | |
| 0.286 | 8.87 | 3.07 | 109.1 | 362 | 4757 | 1731.6 | 1263.6 | 3642.0 | 2378.4 | |
| 0.289 | 8.97 | 3.07 | 109.7 | 362 | 4775 | 1718.9 | 1276.3 | 3664.0 | 2387.7 | |
| 0.293 | 9.08 | 3.08 | 110.4 | 362 | 4803 | 1708.3 | 1286.9 | 3688.6 | 2401.7 | |
| 0.296 | 9.17 | 3.08 | 111.4 | 362 | 4844 | 1698.0 | 1297.2 | 3719.4 | 2422.2 | |
| 0.299 | 9.27 | 3.08 | 112.3 | 363 | 4880 | 1686.6 | 1308.6 | 3748.7 | 2440.1 | |
| 0.302 | 9.37 | 3.09 | 113.0 | 363 | 4906 | 1676.2 | 1319.0 | 3771.8 | 2452.8 | |
| 0.305 | 9.48 | 3.09 | 113.5 | 363 | 4924 | 1664.5 | 1330.7 | 3792.5 | 2461.9 | |
| 0.309 | 9.59 | 3.10 | 114.4 | 364 | 4958 | 1654.2 | 1341.0 | 3820.0 | 2478.9 | |
| 0.312 | 9.67 | 3.10 | 114.5 | 364 | 4958 | 1642.9 | 1352.3 | 3831.3 | 2479.0 | |
| 0.316 | 9.79 | 3.10 | 115.6 | 364 | 5001 | 1629.6 | 1365.6 | 3866.1 | 2500.5 | |
| 0.318 | 9.87 | 3.10 | 116.3 | 364 | 5031 | 1617.1 | 1378.1 | 3893.3 | 2515.3 | |
| 0.322 | 9.98 | 3.11 | 117.0 | 365 | 5056 | 1606.7 | 1388.5 | 3916.6 | 2528.1 | |
| 0.324 | 10.05 | 3.11 | 117.7 | 365 | 5082 | 1595.1 | 1400.1 | 3940.9 | 2540.8 | |
| 0.328 | 10.19 | 3.12 | 118.8 | 365 | 5124 | 1584.2 | 1411.0 | 3973.0 | 2562.0 | |
| 0.331 | 10.28 | 3.12 | 119.1 | 366 | 5135 | 1573.5 | 1421.7 | 3989.3 | 2567.6 | |
| 0.335 | 10.38 | 3.12 | 119.8 | 366 | 5161 | 1562.1 | 1433.1 | 4013.5 | 2580.4 | |
| 0.338 | 10.48 | 3.13 | 120.4 | 366 | 5179 | 1551.4 | 1443.8 | 4033.4 | 2589.5 | |
| 0.341 | 10.59 | 3.13 | 121.4 | 367 | 5219 | 1547.4 | 1447.8 | 4057.1 | 2609.3 | |
| 0.345 | 10.69 | 3.13 | 121.3 | 367 | 5206 | 1531.5 | 1463.7 | 4066.7 | 2603.0 | |
| 0.348 | 10.79 | 3.14 | 121.7 | 367 | 5220 | 1520.6 | 1474.6 | 4084.6 | 2610.0 | |
| 0.351 | 10.89 | 3.14 | 122.9 | 367 | 5268 | 1511.4 | 1483.8 | 4117.9 | 2634.1 | |
| 0.355 | 11.00 | 3.14 | 124.1 | 368 | 5316 | 1497.1 | 1498.1 | 4155.8 | 2657.8 | |
| 0.358 | 11.09 | 3.15 | 124.6 | 368 | 5331 | 1485.9 | 1509.3 | 4175.1 | 2665.7 | |
| 0.361 | 11.21 | 3.15 | 125.4 | 368 | 5363 | 1474.3 | 1520.9 | 4202.4 | 2681.5 | |
| 0.365 | 11.31 | 3.16 | 125.5 | 369 | 5358 | 1462.6 | 1532.6 | 4211.6 | 2679.0 | |
| 0.368 | 11.42 | 3.16 | 125.9 | 369 | 5368 | 1451.6 | 1543.6 | 4227.7 | 2684.1 | |
| 0.371 | 11.51 | 3.16 | 126.8 | 369 | 5402 | 1440.9 | 1554.3 | 4255.6 | 2701.2 | |
| 0.374 | 11.60 | 3.17 | 127.1 | 370 | 5415 | 1433.4 | 1561.8 | 4269.1 | 2707.3 | |
| 0.377 | 11.71 | 3.17 | 128.0 | 370 | 5446 | 1420.6 | 1574.6 | 4297.8 | 2723.2 | |
| 0.381 | 11.81 | 3.17 | 128.3 | 370 | 5451 | 1415.2 | 1580.0 | 4305.3 | 2725.2 | |
| 0.384 | 11.91 | 3.17 | 128.9 | 370 | 5475 | 1413.2 | 1592.0 | 4305.3 | 2725.3 | |
| 0.387 | 12.00 | 3.18 | 120.9 | 371 | 5475 5472 | 1389.4 | 1605.8 | 4329.5 | 2735.8 | |
| 0.390 | 12.00 | 3.18 | 129.0 | 371 | 547 <i>2</i> 5494 | 1309.4 | 1616.8 | | 2747.2 | |
| 0.393 | 12.11 | 3.19 | 130.5 | 371 | 5494 5526 | 13/6.4 | 1626.9 | 4364.0 4390.0 | | |
| 0.393 | 12.20 | 3.19 | 130.5 | | 5526 5522 | 1355.7 | | | 2763.1 | |
| 0.397 | 12.32 | | | 372 373 | | | 1639.5 | 4400.7 | 2761.2 | |
| | | 3.20 | 131.0 | 372 | 5531 5577 | 1348.8 | 1646.4 | 4412.0 | 2765.6 | |
| 0.404 | 12.52 | 3.20 | 132.2 | 372 | 5577 | 1337.5 | 1657.7 | 4446.2 | 2788.5 | |

ADWARCED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED
TECHNICIAN

RJH Consultants 2679-148 South Boulder Creek - Phase II

16134

03/11/20 CAL BORING NO. B-202&203
DEPTH 3.2-8.2'
SAMPLE NO. CA-2,3&4
DATE SAMPLED 2-3&7-2020
SAMPLED BY --

DESCRIPTION clayey sand

| Point A | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf) | |
| 0.407 | 12.61 | 3.20 | 132.8 | 373 | 5600 | 1324.7 | 1670.5 | 4470.6 | 2800.1 | |
| 0.410 | 12.71 | 3.21 | 132.8 | 373 | 5595 | 1314.2 | 1681.0 | 4478.4 | 2797.4 | |
| 0.413 | 12.82 | 3.21 | 133.1 | 373 | 5600 | 1305.9 | 1689.3 | 4489.2 | 2799.9 | |
| 0.417 | 12.93 | 3.21 | 134.2 | 373 | 5640 | 1294.6 | 1700.6 | 4520.5 | 2819.9 | |
| 0.420 | 13.02 | 3.22 | 135.1 | 374 | 5673 | 1286.9 | 1708.3 | 4544.6 | 2836.3 | |
| 0.424 | 13.14 | 3.22 | 135.0 | 374 | 5659 | 1277.1 | 1718.1 | 4547.7 | 2829.6 | |
| 0.426 | 13.22 | 3.22 | 135.6 | 374 | 5680 | 1266.6 | 1728.6 | 4568.8 | 2840.2 | |
| 0.430 | 13.32 | 3.23 | 136.3 | 375 | 5707 | 1256.1 | 1739.1 | 4592.4 | 2853.3 | |
| 0.433 | 13.42 | 3.23 | 137.2 | 375 | 5736 | 1247.9 | 1747.3 | 4615.0 | 2867.8 | |
| 0.436 | 13.52 | 3.24 | 137.5 | 375 | 5742 | 1236.4 | 1758.8 | 4630.0 | 2871.2 | |
| 0.439 | 13.61 | 3.24 | 137.5 | 375 | 5739 | 1227.3 | 1767.9 | 4637.2 | 2869.3 | |
| 0.442 | 13.71 | 3.24 | 138.5 | 376 | 5773 | 1216,5 | 1778.7 | 4665.0 | 2886.3 | |
| 0.446 | 13.82 | 3.25 | 138.8 | 376 | 5782 | 1207.4 | 1787.8 | 4678.6 | 2890.8 | |
| 0.449 | 13.93 | 3.25 | 139.6 | 376 | 5806 | 1198.0 | 1797.2 | 4700.1 | 2902.9 | |
| 0.452 | 14.01 | 3.25 | 139.9 | 377 | 5814 | 1188.3 | 1806.9 | 4714.0 | 2907.2 | |
| 0.455 | 14.12 | 3.26 | 140.2 | 377 | 5820 | 1178.9 | 1816.3 | 4726.0 | 2909.8 | |
| 0.459 | 14.22 | 3.26 | 140.8 | 377 | 5839 | 1171.0 | 1824.2 | 4743.8 | 2919.6 | |
| 0.461 | 14.31 | 3.27 | 140.7 | 377 | 5828 | 1162.3 | 1832.9 | 4746.9 | 2913.9 | |
| 0.465 | 14.43 | 3.27 | 141.2 | 378 | 5838 | 1154.3 | 1840.9 | 4760.0 | 2919.2 | |
| 0.468 | 14.52 | 3.27 | 141.3 | 378 | 5839 | 1144.2 | 1851.0 | 4770.6 | 2919.6 | |
| 0.471 | 14.62 | 3.28 | 141.5 | 378 | 5837 | 1138.2 | 1857.0 | 4775.6 | 2918.5 | |
| 0.474 | 14.70 | 3.28 | 142.7 | 379 | 5884 | 1129.1 | 1866.1 | 4808.0 | 2941.9 | |
| 0.477 | 14.81 | 3.28 | 142.8 | 379 | 5881 | 1119.5 | 1875.7 | 4816.0 | 2940.3 | |
| 0.481 | 14.91 | 3.29 | 143.4 | 379 | 5901 | 1113.0 | 1882.2 | 4832.7 | 2950.5 | |
| 0.484 | 15.00 | 3.29 | 143.7 | 379 | 5905 | 1104.9 | 1890.3 | 4842.8 | 2952.5 | |
| 0.487 | 15.12 | 3.30 | 144.6 | 380 | 5934 | 1097.2 | 1898.0 | 4865.2 | 2967.2 | |
| 0.491 | 15.23 | 3.30 | 144.2 | 380 | 5910 | 1087.7 | 1907.5 | 4862.6 | 2955.1 | |
| 0.494 | 15.31 | 3.30 | 144.2 | 380 | 5906 | 1083.2 | 1912.0 | 4864.9 | 2952.9 | |
| 0.497 | 15.43 | 3.31 | 145.1 | 381 | 5934 | 1076.5 | 1918.7 | 4885.5 | 2966.9 | |
| 0.500 | 15.51 | 3.31 | 145.7 | 381 | 5953 | 1072.7 | 1922.5 | 4899.2 | 2976.7 | |
| 0.504 | 15.62 | 3.32 | 146.2 | 381 | 5967 | 1067.2 | 1928.0 | 4911.8 | 2983.7 | |

ADVANCED TERRATESTING **CLIENT** JOB NO. **PROJECT** PROJECT NO. LOCATION **DATE TESTED**

TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

03/11/20 CAL

BORING NO. DEPTH SAMPLE NO. **DATE SAMPLED** SAMPLED BY

B-202&203 3.2-8.2 CA-2,3&4 2-3&7-2020

DESCRIPTION clayey sand

| Point B | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf) | |
| 0.000 | 0.00 | 2.62 | 0.0 | 0 | 0 | 0.0 | 2001.6 | 2001.6 | 0.0 | |
| 0.003 | 0.10 | 2.62 | 6.4 | 0 | 351 | 76.6 | 1925.0 | 2100.4 | 175.4 | |
| 0.006 | 0.19 | 2.62 | 9.1 | 1 | 500 | 162.9 | 1838.7 | 2088.5 | 249.8 | |
| 0.010 | 0.28 | 2.63 | 10.8 | 1 | 593 | 252.6 | 1749.0 | 2045.5 | 296.5 | |
| 0.013 | 0.38 | 2.63 | 11.3 | 1 | 620 | 326.5 | 1675.1 | 1985.1 | 309.9 | |
| 0.017 | 0.50 | 2.63 | 12.3 | 1 | 672 | 387.7 | 1613.9 | 1949.8 | 335.9 | |
| 0.020 | 0.61 | 2.64 | 12.3 | 2 | 671 | 439.6 | 1562.0 | 1897.6 | 335.6 | |
| 0.0237 | 0.70 | 2.64 | 13.0 | 2 | 708 | 495.2 | 1506.4 | 1860.2 | 353.8 | |
| 0.026 | 0.78 | 2.64 | 12.8 | 2 | 696 | 542.3 | 1459.3 | 1807.1 | 347.8 | |
| 0.030 | 0.89 | 2.64 | 13.5 | 3 | 732 | 586.2 | 1415.4 | 1781.6 | 366.2 | |
| 0.034 | 1.00 | 2.65 | 14.3 | 3 | 776 | 618.6 | 1383.0 | 1771.2 | 388.2 | |
| 0.037 | 1.10 | 2.65 | 14.6 | 3 | 791 | 656.9 | 1344.7 | 1740.1 | 395.4 | |
| 0.041 | 1.21 | 2.65 | 14.7 | 4 | 795 | 693.6 | 1308.0 | 1705.7 | 397.7 | |
| 0.044 | 1.32 | 2.65 | 16.7 | 4 | 900 | 768.2 | 1233.4 | 1683.4 | 450.0 | |
| 0.047 | 1.41 | 2.66 | 20.0 | 4 | 1079 | 863.8 | 1137.8 | 1677.5 | 539.6 | |
| 0.051 | 1.52 | 2.66 | 21.4 | 5 | 1154 | 954.1 | 1047.5 | 1624.7 | 577.2 | |
| 0.054 | 1.62 | 2.66 | 23.4 | 5 | 1260 | 1028.2 | 973.4 | 1603.3 | 629.9 | |
| 0.057 | 1.71 | 2.67 | 24.0 | 5 | 1293 | 1090.0 | 911.6 | 1558.1 | 646.5 | |
| 0.061 | 1.80 | 2.67 | 24.6 | 5 | 1320 | 1143.2 | 858.4 | 1518.5 | 660.1 | |
| 0.064 | 1.90 | 2.67 | 25.8 | 6 | 1388 | 1186.1 | 815.5 | 1509.2 | 693.8 | |
| 0.067 | 2.00 | 2.67 | 26.3 | 6 | 1408 | 1222.9 | 778.7 | 1482.7 | 704.0 | |
| 0.071 | 2.11 | 2.68 | 27.5 | 6 | 1473 | 1256.7 | 744.9 | 1481.6 | 736.7 | |
| 0.074 | 2.20 | 2.68 | 28.0 | 7 | 1500 | 1285.3 | 716.3 | 1466.4 | 750.1 | |
| 0.078 | 2.33 | 2.68 | 27.4 | 7 | 1464 | 1310.3 | 691.3 | 1423.4 | 732.1 | |
| 0.081 | 2.42 | 2.68 | 28.6 | 7 | 1526 | 1332.0 | 669.6 | 1432.7 | 763.1 | |
| 0.086 | 2.55 | 2.69 | 29.2 | 8 | 1559 | 1352.3 | 649.3 | 1428.7 | 779.4 | |
| 0.089 | 2.64 | 2.69 | 28.9 | 8 | 1540 | 1368.4 | 633.2 | 1403.4 | 770.2 | |
| 0.092 | 2.74 | 2.69 | 29.1 | 8 | 1545 | 1385.0 | 616.6 | 1389.2 | 772.6 | |
| 0.095 | 2.84 | 2.70 | 29.7 | 9 | 1576 | 1397.8 | 603.8 | 1392.0 | 788.2 | |
| 0.099 | 2.94 | 2.70 | 30.2 | 9 | 1604 | 1409.0 | 592.6 | 1394.8 | 802.2 | |
| 0.102 | 3.05 | 2.70 | 30.1 | 9 | 1594 | 1418.5 | 583.1 | 1380.3 | 797.2 | |
| 0.106 | 3.14 | 2.70 | 30.5 | 9 | 1613 | 1427.6 | 574.0 | 1380.7 | 806.7 | |
| 0.109 | 3.24 | 2.71 | 31.0 | 10 | 1637 | 1436.4 | 565.2 | 1383.8 | 818.5 | |
| 0.113 | 3.35 | 2.71 | 30.9 | 10 | 1630 | 1445.3 | 556.3 | 1371.5 | 815.2 | |
| 0.116 | 3.45 | 2.71 | 31.3 | 10 | 1653 | 1453.2 | 548.4 | 1375.0 | 826.6 | |
| 0.120 | 3.57 | 2.72 | 31.5 | 11 | 1660 | 1458.0 | 543.6 | 1373.5 | 829.9 | |
| 0.123 | 3.67 | 2.72 | 31.6 | 11 | 1660 | 1462.1 | 539.5 | 1369.4 | 830.0 | |
| 0.126 | 3.76 | 2.72 | 31.7 | 11 | 1667 | 1468.8 | 532.8 | 1366.5 | 833.7 | |
| 0.130 | 3.87 | 2.73 | 32.1 | 12 | 1684 | 1476.2 | 525.4 | 1367.4 | 842.0 | |
| 0.134 | 3.98 | 2.73 | 32.6 | 12 | 1710 | 1482.2 | 519.4 | 1374.4 | 855.0 | |
| 0.137 | 4.07 | 2.73 | 32.2 | 12 | 1686 | 1486.3 | 515.3 | 1358.2 | 842.8 | |
| 0.140 | 4.17 | 2.73 | 33.1 | 13 | 1731 | 1488.6 | 513.0 | 1378.5 | 865.5 | |

ADVANCED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED
TECHNICIAN

RJH Consultants 2679-148 South Boulder Creek - Phase II

16134

03/11/20 CAL BORING NO. DEPTH SAMPLE NO. DATE SAMPLED SAMPLED BY

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

2-3&7-2020 --

DESCRIPTION clayey sand

| Point B | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃* | p' (psf) | q (psf) | |
| 0.144 | 4.28 | 2.74 | 33.5 | 13 | 1749 | 1492.5 | 509.1 | 1383.4 | 874.3 | |
| 0.147 | 4.37 | 2.74 | 32.5 | 13 | 1696 | 1493.6 | 508.0 | 1356.0 | 848.0 | |
| 0.151 | 4.48 | 2.74 | 33.8 | 14 | 1759 | 1494.2 | 507.4 | 1387.1 | 879.7 | |
| 0.154 | 4.58 | 2.75 | 33.5 | 14 | 1742 | 1495.0 | 506.6 | 1377.6 | 870.9 | |
| 0.157 | 4.68 | 2.75 | 33.4 | 14 | 1738 | 1497.0 | 504.6 | 1373.7 | 869.1 | |
| 0.161 | 4.78 | 2.75 | 34.4 | 14 | 1787 | 1495.6 | 506.0 | 1399.3 | 893.3 | |
| 0.164 | 4.88 | 2.75 | 34.3 | 15 | 1779 | 1496.4 | 505.2 | 1394.5 | 889.3 | |
| 0.168 | 4.99 | 2.76 | 34.5 | 15 | 1789 | 1496.4 | 505.2 | 1399.8 | 894.5 | |
| 0.171 | 5.09 | 2.76 | 34.9 | 15 | 1806 | 1497.6 | 504.0 | 1406.9 | 903.0 | |
| 0.175 | 5.21 | 2.76 | 34.8 | 16 | 1799 | 1501.7 | 499.9 | 1399.4 | 899.5 | |
| 0.178 | 5.31 | 2.77 | 34.8 | 16 | 1796 | 1500.2 | 501.4 | 1399.4 | 898.1 | |
| 0.182 | 5.40 | 2.77 | 35.1 | 16 | 1811 | 1503.4 | 498.2 | 1403.5 | 905.3 | |
| 0.185 | 5.51 | 2.77 | 35.4 | 17 | 1822 | 1505.5 | 496.1 | 1407.2 | 911.2 | |
| 0.188 | 5.61 | 2.78 | 35.9 | 17 | 1845 | 1504.4 | 497.2 | 1419.7 | 922.5 | |
| 0.192 | 5.72 | 2.78 | 35.8 | 17 | 1837 | 1507.8 | 493.8 | 1412.5 | 918.7 | |
| 0.195 | 5.80 | 2.78 | 35.3 | 18 | 1811 | 1508.8 | 492.8 | 1398.5 | 905.7 | |
| 0.199 | 5.92 | 2.78 | 36.4 | 18 | 1863 | 1505.6 | 496.0 | 1427.5 | 931.6 | |
| 0.202 | 6.01 | 2.79 | 35.6 | 18 | 1819 | 1503.3 | 498.3 | 1407.6 | 909.3 | |
| 0.206 | 6.12 | 2.79 | 35.6 | 18 | 1818 | 1503.6 | 498.0 | 1407.2 | 909.2 | |
| 0.209 | 6.21 | 2.79 | 36.4 | 19 | 1859 | 1501.5 | 500.1 | 1429.4 | 929.3 | |
| 0.212 | 6.31 | 2.80 | 35.6 | 19 | 1814 | 1501.7 | 499.9 | 1407.0 | 907.1 | |
| 0.216 | 6.42 | 2.80 | 35.0 | 19 | 1779 | 1508.1 | 493.5 | 1383.3 | 889.7 | |
| 0.218 | 6.50 | 2.80 | 35.9 | 20 | 1825 | 1506.2 | 495.4 | 1407.7 | 912.3 | |
| 0.222 | 6.62 | 2.81 | 35.8 | 20 | 1818 | 1506.9 | 494.7 | 1403.5 | 908.8 | |
| 0.226 | 6.72 | 2.81 | 36.0 | 20 | 1823 | 1506.9 | 494.7 | 1406.2 | 911.6 | |
| 0.229 | 6.82 | 2.81 | 36.9 | 21 | 1869 | 1503.3 | 498.3 | 1432.8 | 934.4 | |
| 0.233 | 6.93 | 2.81 | 36.1 | 21 | 1828 | 1501.3 | 500.3 | 1414.2 | 914.0 | |
| 0.237 | 7.04 | 2.82 | 36.9 | 21 | 1864 | 1500.2 | 501.4 | 1433.6 | 932.2 | |
| 0.241 | 7.16 | 2.82 | 36.3 | 22 | 1830 | 1499.0 | 502.6 | 1417.7 | 915.1 | |
| 0.243 | 7.25 | 2.82 | 36.9 | 22 | 1862 | 1500.9 | 500.7 | 1431.6 | 930.9 | |
| 0.247 | 7.34 | 2.83 | 36.5 | 22 | 1835 | 1506.0 | 495.6 | 1413.2 | 917.6 | |
| 0.251 | 7.46 | 2.83 | 37.3 | 23 | 1876 | 1509.6 | 492.0 | 1430.1 | 938.0 | |
| 0.254 | 7.55 | 2.83 | 36.7 | 23 | 1840 | 1513.7 | 487.9 | 1407.9 | 920.0 | |
| 0.257 | 7.66 | 2.84 | 37.4 | 23 | 1873 | 1515.2 | 486.4 | 1422.8 | 936.4 | |
| 0.261 | 7.76 | 2.84 | 37.2 | 23 | 1862 | 1517.6 | 484.0 | 1415.0 | 931.0 | |
| 0.264 | 7.86 | 2.84 | 37.8 | 24 | 1888 | 1517.0 | 484.6 | 1428.7 | 944.1 | |
| 0.268 | 7.97 | 2.85 | 37.2 | 24 | 1859 | 1518.3 | 483.3 | 1412.6 | 929.3 | |
| 0.271 | 8.07 | 2.85 | 38.4 | 24 | 1914 | 1513.8 | 487.8 | 1444.9 | 957.0 | |
| 0.274 | 8.16 | 2.85 | 38.4 | 25 | 1913 | 1512.8 | 488.8 | 1445.2 | 956.3 | |
| 0.278 | 8.26 | 2.86 | 38.6 | 25 | 1921 | 1512.7 | 488.9 | 1449.5 | 960.7 | |
| 0.281 | 8.38 | 2.86 | 38.6 | 25 | 1916 | 1512.7 | 488.9 | 1447.1 | 958.1 | |
| 0.285 | 8.47 | 2.86 | 38.8 | 26 | 1928 | 1512.9 | 488.7 | 1452.6 | 963.9 | |

ADMANCED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT JOB NO. PROJECT PROJECT NO. LOCATION DATE TESTED TECHNICIAN RJH Consultants 2679-148 South Boulder Creek - Phase II

16134

03/11/20 CAL BORING NO. DEPTH SAMPLE NO. DATE SAMPLED SAMPLED BY

DESCRIPTION

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

clayey sand

| Point B | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|---|------------------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) | |
| 0.288 | 8.56 | 2.87 | 38.9 | 26 | 1927 | 1511.6 | 490.0 | 1453.5 | 963.5 | |
| 0.291 | 8.66 | 2.87 | 39.0 | 26 | 1931 | 1510.1 | 491.5 | 1456.8 | 965.3 | |
| 0.294 | 8.76 | 2.87 | 38.8 | 26 | 1919 | 1508.6 | 493.0 | 1452.6 | 959.6 | |
| 0.298 | 8.88 | 2.88 | 38.5 | 27 | 1899 | 1508.9 | 492.7 | 1442.4 | 949.6 | |
| 0.302 | 8.98 | 2.88 | 39.5 | 27 | 1947 | 1507.8 | 493.8 | 1467.2 | 973.3 | |
| 0.305 | 9.07 | 2.88 | 40.2 | 27 | 1983 | 1505.6 | 496.0 | 1487.7 | 991.7 | |
| 0.308 | 9.17 | 2.88 | 39.4 | 28 | 1937 | 1503.5 | 498.1 | 1466.7 | 968.6 | |
| 0.312 | 9.28 | 2.89 | 39.1 | 28 | 1924 | 1517.9 | 483.7 | 1445.5 | 961.8 | |
| 0.315 | 9.38 | 2.89 | 39.4 | 28 | 1934 | 1515.6 | 486.0 | 1453.0 | 967.0 | |
| 0.319 | 9.49 | 2.89 | 39.6 | 29 | 1942 | 1512.6 | 489.0 | 1460.3 | 971.2 | |
| 0.322 | 9.60 | 2.90 | 39.7 | 29 | 1942 | 1510.9 | 490.7 | 1462.0 | 971.2 | |
| 0.326 | 9.70 | 2.90 | 40.0 | 29 | 1955 | 1507.5 | 494.1 | 1471.8 | 977.7 | |
| 0.329 | 9.80 | 2.90 | 40.2 | 30 | 1965 | 1508.3 | 493.3 | 1475.7 | 982.4 | |
| 0.333 | 9.91 | 2.91 | 39.9 | 30 | 1947 | 1505.6 | 496.0 | 1469.3 | 973.3 | |
| 0.336 | 10.01 | 2.91 | 40.4 | 30 | 1969 | 1504.1 | 497.5 | 1482.1 | 984.6 | |
| 0.340 | 10.12 | 2.92 | 39.0 | 31 | 1894 | 1501.7 | 499.9 | 1447.0 | 947.1 | |
| 0.343 | 10.21 | 2.92 | 40.4 | 31 | 1965 | 1499.3 | 502.3 | 1485.0 | 982.6 | |
| 0.347 | 10.32 | 2.92 | 39.4 | 31 | 1910 | 1498.0 | 503.6 | 1458.6 | 955.0 | |
| 0.350 | 10.42 | 2.92 | 40.5 | 31 | 1960 | 1495.5 | 506.1 | 1486.2 | 980.1 | |
| 0.354 | 10.52 | 2.93 | 40.4 | 32 | 1956 | 1492.9 | 508.7 | 1486.5 | 977.8 | |
| 0.357 | 10.64 | 2.93 | 40.1 | 32 | 1939 | 1492.0 | 509.6 | 1479.3 | 969.6 | |
| 0.360 | 10.73 | 2.93 | 40.2 | 32 | 1940 | 1496.1 | 505.5 | 1475.7 | 970.2 | |
| 0.364 | 10.83 | 2.94 | 41.2 | 33 | 1987 | 1494.5 | 507.1 | 1500.7 | 993.6 | |
| 0.368 | 10.95 | 2.94 | 39.8 | 33 | 1914 | 1490.8 | 510.8 | 1468.0 | 957.1 | |
| 0.371 | 11.05 | 2.95 | 40.4 | 33 | 1940 | 1487.8 | 513.8 | 1483.6 | 969.8 | |
| 0.375 | 11.15 | 2.95 | 40.2 | 34 | 1930 | 1485.0 | 516.6 | 1481.7 | 965.1 | |
| 0.378 | 11.26 | 2.95 | 41.0 | 34 | 1964 | 1486.7 | 514.9 | 1496.9 | 982.0 | |
| 0.382 | 11.37 | 2.96 | 40.5 | 34 | 1939 | 1486.1 | 515.5 | 1484.9 | 969.4 | |
| 0.385 | 11.47 | 2.96 | 40.8 | 35 | 1953 | 1484.0 | 517.6 | 1494.0 | 976.4 | |
| 0.389 | 11.57 | 2.96 | 41.6 | 35 | 1986 | 1483.3 | 518.3 | 1511.3 | 993.0 | |
| 0.393 | 11.68 | 2.97 | 40.7 | 35 | 1940 | 1478.1 | 523.5 | 1493.5 | 970.0 | |
| 0.395 | 11.77 | 2.97 | 40.9 | 36 | 1948 | 1480.6 | 521.0 | 1495.0 | 974.0 | |
| 0.399 | 11.89 | 2.97 | 41.3 | 36 | 1963 | 1481.4 | 520.2 | 1501.5 | 981.3 | |
| 0.402 | 11.97 | 2.98 | 40.1 | 36 | 1902 | 1478.7 | 520.2 | 1473.8 | 950.9 | |
| 0.406 | 12.08 | 2.98 | 41.1 | 36 | 1948 | 1477.9 | 523.7 | 1497.9 | 974.2 | |
| 0.409 | 12.18 | 2.98 | 40.7 | 37 | 1926 | 1477.9 | 526.6 | 1489.4 | 962.8 | |
| 0.413 | 12.28 | 2.99 | 40.7 | 37 | 1924 | 1473.0 | 527.3 | 1489.1 | 961.8 | |
| 0.417 | 12.40 | 2.99 | 41.2 | 37 | 1946 | 1474.3 | 527.5 528.5 | 1501.4 | 972.9 | |
| 0.420 | 12.50 | 2.99 | 39.8 | 38 | 1876 | 1475.1 | 526.0 | 1464.1 | 972.9 | |
| 0.423 | 12.60 | 3.00 | 41.9 | 38 | 1976 | 1475.0 | 527.6 | | 987.8 | |
| 0.426 | 12.69 | 3.00 | 41.7 | 38 | 1965 | 1474.0 | | 1515.4 1512.2 | | |
| 0.420 | | | | | | | 529.8 529.1 | 1512.3 | 982.5 | |
| 0.430 | 12.79 | 3.00 | 40.5 | 39 | 1903 | 1472.5 | 529.1 | 1480.5 | 951.4 | |

ADVANCED TERRIATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED

TECHNICIAN

RJH Consultants 2679-148 South Boulder Creek - Phase II 16134

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03/11/20 CAL BORING NO. DEPTH SAMPLE NO. DATE SAMPLED SAMPLED BY

DESCRIPTION

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

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clayey sand

| Point B | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|---|----------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) | |
| 0.433 | 12.88 | 3.01 | 42.0 | 39 | 1974 | 1467.0 | 534.6 | 1521.8 | 987.2 | |
| 0.437 | 13.00 | 3.01 | 41.9 | 39 | 1964 | 1465.5 | 536.1 | 1518.1 | 982.1 | |
| 0.441 | 13.11 | 3.02 | 41.0 | 40 | 1921 | 1467.4 | 534.2 | 1494.6 | 960.3 | |
| 0.443 | 13.19 | 3.02 | 42.1 | 40 | 1968 | 1465.5 | 536.1 | 1519.9 | 983.8 | |
| 0.447 | 13.31 | 3.02 | 42.2 | 40 | 1971 | 1461.8 | 539.8 | 1525.2 | 985.4 | |
| 0.450 | 13.41 | 3.03 | 40.8 | 40 | 1901 | 1460.6 | 541.0 | 1491.5 | 950.5 | |
| 0.454 | 13.50 | 3.03 | 41.8 | 41 | 1945 | 1461.4 | 540.2 | 1512.6 | 972.4 | |
| 0.457 | 13.60 | 3.03 | 41.2 | 41 | 1915 | 1461.3 | 540.3 | 1497.7 | 957.4 | |
| 0.461 | 13.72 | 3.04 | 41.1 | 41 | 1910 | 1461.5 | 540.1 | 1495.0 | 954.9 | |
| 0.464 | 13.80 | 3.04 | 42.1 | 42 | 1952 | 1458.0 | 543.6 | 1519.8 | 976.2 | |
| 0.467 | 13.91 | 3.04 | 42.3 | 42 | 1959 | 1458.5 | 543.1 | 1522.6 | 979.5 | |
| 0.471 | 14.01 | 3.05 | 41.8 | 42 | 1934 | 1457.4 | 544.2 | 1511.4 | 967.2 | |
| 0.474 | 14.11 | 3.05 | 41.7 | 43 | 1925 | 1459.7 | 541.9 | 1504.3 | 962.4 | |
| 0.478 | 14.22 | 3.05 | 41.7 | 43 | 1922 | 1462.8 | 538.8 | 1499.8 | 961.0 | |
| 0.481 | 14.33 | 3.06 | 41.4 | 43 | 1908 | 1468.4 | 533.2 | 1487.3 | 954.1 | |
| 0.485 | 14.42 | 3.06 | 42.6 | 44 | 1961 | 1470.7 | 530.9 | 1511.5 | 980.5 | |
| 0.488 | 14.53 | 3.07 | 42.7 | 44 | 1961 | 1472.4 | 529.2 | 1509.5 | 980.3 | |
| 0.491 | 14.63 | 3.07 | 42.2 | 44 | 1935 | 1473.6 | 528.0 | 1495.6 | 967.5 | |
| 0.496 | 14.75 | 3.07 | 42.7 | 45 | 1958 | 1473.7 | 527.9 | 1507.0 | 979.1 | |
| 0.499 | 14.85 | 3.08 | 42.7 | 45 | 1953 | 1472.0 | 529.6 | 1506.0 | 976.4 | |
| 0.502 | 14.95 | 3.08 | 42.8 | 45 | 1954 | 1473.4 | 528.2 | 1505.0 | 976.8 | |
| 0.506 | 15.05 | 3.08 | 43.2 | 45 | 1971 | 1451.1 | 550.5 | 1535.8 | 985.3 | |
| 0.509 | 15.15 | 3.09 | 41.8 | 46 | 1905 | 1451.7 | 549.9 | 1502.4 | 952.5 | |
| 0.513 | 15.26 | 3.09 | 43.6 | 46 | 1983 | 1450.4 | 551.2 | 1542.5 | 991.3 | |
| 0.516 | 15.35 | 3.09 | 42.5 | 46 | 1932 | 1450.2 | 551.4 | 1517.1 | 965.8 | |
| 0.520 | 15.46 | 3.10 | 42.5 | 47 | 1927 | 1451.2 | 550.4 | 1513.7 | 963.3 | |
| 0.523 | 15.56 | 3.10 | 43.0 | 47 | 1947 | 1452.4 | 549.2 | 1522.5 | 973.3 | |
| 0.526 | 15.66 | 3.11 | 42.0 | 47 | 1902 | 1451.4 | 550.2 | 1501.1 | 950.9 | |
| 0.530 | 15.76 | 3.11 | 42.6 | 48 | 1924 | 1450.8 | 550.8 | 1513.0 | 962.2 | |
| 0.533 | 15.86 | 3.11 | 43.8 | 48 | 1977 | 1449.0 | 552.6 | 1541.2 | 988.6 | |
| 0.536 | 15.96 | 3.12 | 42.4 | 48 | 1912 | 1448.8 | 552.8 | 1508.9 | 956.1 | |
| 0.540 | 16.07 | 3.12 | 43.0 | 48 | 1935 | 1450.7 | 550.9 | 1518.4 | 967.5 | |
| 0.543 | 16.16 | 3.12 | 43.7 | 49 | 1964 | 1450.5 | 551.1 | 1533.1 | 982.0 | |
| 0.547 | 16.27 | 3.13 | 44.6 | 49 | 2004 | 1449.6 | 552.0 | 1553.9 | 1001.9 | |
| 0.549 | 16.34 | 3.13 | 44.5 | 49 | 1999 | 1446.2 | 555.4 | 1554.7 | 999.3 | |

ADMINISTRATESTING
CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

DATE TESTED 03/11/20 TECHNICIAN CAL

BORING NO.
DEPTH
SAMPLE NO.
DATE SAMPLED
SAMPLED BY

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

BY --

DESCRIPTION clayey sand

| | | | | Poi | nt C | | | | |
|-------------------|------------|--|------------|------------------------------|---|------------------------------|--------------------------------------|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf) |
| 0.000 | 0.00 | 2.56 | 0.0 | 0 | 0 | 0.0 | 993.6 | 993.6 | 0.0 |
| 0.003 | 0.07 | 2.56 | 8.0 | 13 | 438 | 174.4 | 819.2 | 1038.4 | 219.2 |
| 0.007 | 0.18 | 2.56 | 12.4 | 34 | 665 | 285.1 | 708.5 | 1040.9 | 332.4 |
| 0.011 | 0.29 | 2.57 | 13.9 | 54 | 728 | 363.9 | 629.7 | 993.6 | 363.9 |
| 0.014 | 0.37 | 2.57 | 15.5 | 69 | 801 | 423.8 | 569.8 | 970.3 | 400.4 |
| 0.018 | 0.48 | 2.57 | 17.5 | 89 | 889 | 468.9 | 524.7 | 969.0 | 444.3 |
| 0.021 | 0.58 | 2.57 | 17.7 | 108 | 882 | 503.9 | 489.7 | 930.8 | 441.1 |
| 0.025 | 0.68 | 2.58 | 18.4 | 127 | 899 | 532.1 | 461.5 | 910.9 | 449.4 |
| 0.029 | 0.78 | 2.58 | 20.0 | 146 | 972 | 557.5 | 436.1 | 922.3 | 486.2 |
| 0.033 | 0.89 | 2.58 | 19.5 | 167 | 923 | 576.3 | 417.3 | 878.8 | 461.5 |
| 0.036 | 0.98 | 2.58 | 20.7 | 183 | 968 | 591.9 | 401.7 | 885.9 | 484.2 |
| 0.041 | 1.11 | 2.59 | 21.0 | 207 | 962 | 603.8 | 389.8 | 870.9 | 481.1 |
| 0.044 | 1.21 | 2.59 | 21.1 | 226 | 950 | 615.8 | 377.8 | 852.5 | 474.8 |
| 0.048 | 1.32 | 2.59 | 21.8 | 246 | 962 | 623.4 | 370.2 | 851.4 | 481.2 |
| 0.051 | 1.40 | 2.59 | 21.3 | 261 | 921 | 630.4 | 363.2 | 823.6 | 460.5 |
| 0.055 | 1.49 | 2.60 | 22.1 | 279 | 944 | 636.9 | 356.7 | 828.9 | 472.2 |
| 0.059 | 1.60 | 2.60 | 22.3 | 299 | 934 | 643.5 | 350.1 | 817.1 | 467.0 |
| 0.062 | 1.70 | 2.60 | 22.3 | 318 | 919 | 645.3 | 348.3 | 807.7 | 459.4 |
| 0.066 | 1.80 | 2.61 | 22.5 | 337 | 908 | 648.4 | 345.2 | 799.3 | 454.1 |
| 0.070 | 1.90 | 2.61 | 22.8 | 355 | 901 | 652.8 | 340.8 | 791.3 | 450.5 |
| 0.074 | 2.01 | 2.61 | 23.1 | 374 | 902 | 653.5 | 340.1 | 791.0 | 450.9 |
| 0.078 | 2.12 | 2.61 | 23.1 | 375 | 900 | 656.5 | 337.1 | 787.1 | 450.0 |
| 0.081 | 2.21 | 2.62 | 24.0 | 376 | 943 | 659.9 | 333.7 | 805.3 | 471.6 |
| 0.085 | 2.31 | 2.62 | 23.4 | 377 | 910 | 659.3 | 334.3 | 789.3 | 455.1 |
| 0.089 | 2.41 | 2.62 | 23.6 | 378 | 920 | 659.8 | 333.8 | 793.6 | 459.8 |
| 0.092 | 2.51 | 2.62 | 24.4 | 380 | 962 | 659.8 | 333.8 | 814.8 | 481.1 |
| 0.096 | 2.62 | 2.63 | 24.3 | 381 | 954 | 660.1 | 333.5 | 810.5 | 477.0 |
| 0.099 | 2.71 | 2.63 | 24.4 | 382 | 956 | 661.6 | 332.0 | 809.8 | 477.8 |
| 0.104 | 2.82 | 2.63 | 24.8 | 383 | 973 | 661.1 | 332.5 | 819.0 | 486.5 |
| 0.107 | 2.91 | 2.63 | 24.3 | 384 | 943 | 661.2 | 332.4 | 803.9 | 471.5 |
| 0.110 | 3.00 | 2.64 | 25.0 | 385 | 982 | 661.5 | 332.1 | 823.0 | 490.9 |
| 0.114 | 3.12 | 2.64 | 25.2 | 386 | 989 | 661.2 | 332.4 | | |
| 0.114 | 3.12 | 2.64 | 24.8 | 387 | 966 | 662.0 | | 827.1 | 494.7 |
| 0.118 | 3.32 | 2.65 | 25.9 | 389 | | | 331.6 | 814.7 | 483.1 |
| | | | | | 1023 | 661.2 | 332.4 | 843.8 | 511.4 |
| 0.125 | 3.40 | 2.65 | 25.2 | 390 | 982 | 660.8 | 332.8 | 823.7 | 491.0 |
| 0.129 | 3.51 | 2.65 | 25.0 | 391 | 967 | 661.9 | 331.7 | 815.0 | 483.3 |
| 0.133 | 3.62 | 2.65 | 26.0 | 392 | 1020 | 660.4 | 333.2 | 843.2 | 510.0 |
| 0.136 | 3.71 | 2.66 | 25.9 | 393 | 1011 | 659.9 | 333.7 | 839.2 | 505.5 |
| 0.140 | 3.81 | 2.66 | 25.4 | 394 | 981 | 660.0 | 333.6 | 824.2 | 490.6 |
| 0.143 | 3.90 | 2.66 | 26.2 | 395 | 1021 | 659.4 | 334.2 | 844.5 | 510.3 |
| 0.147 | 4.00 | 2.66 | 25.5 | 396 | 981 | 657.0 | 336.6 | 826.9 | 490.3 |
| 0.151 | 4.11 | 2.67 | 26.2 | 398 | 1015 | 656.9 | 336.7 | 844.4 | 507.7 |

ADWANCED TEPRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT JOB NO. **PROJECT** PROJECT NO. LOCATION DATE TESTED

TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

03/11/20 CAL

BORING NO. DEPTH SAMPLE NO. DATE SAMPLED SAMPLED BY

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

DESCRIPTION clayey sand

| Point C | | | | | | | | | | |
|-------------------|--------------|--|------------|------------------------------|---|------------------------------|--------------------------------------|----------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf) | |
| 0.154 | 4.20 | 2.67 | 26.4 | 399 | 1023 | 654.0 | 339.6 | 851.4 | 511.7 | |
| 0.158 | 4.31 | 2.67 | 26.1 | 400 | 1006 | 655.5 | 338.1 | 841.0 | 502.9 | |
| 0.162 | 4.40 | 2.68 | 26.5 | 401 | 1028 | 653.7 | 339.9 | 853.7 | 513.9 | |
| 0.165 | 4.50 | 2.68 | 26.5 | 402 | 1021 | 653.0 | 340.6 | 850.9 | 510.3 | |
| 0.169 | 4.60 | 2.68 | 26.1 | 403 | 999 | 651.9 | 341.7 | 841.1 | 499.4 | |
| 0.173 | 4.71 | 2.68 | 26.4 | 404 | 1012 | 649.9 | 343.7 | 849.8 | 506.1 | |
| 0.176 | 4.79 | 2.69 | 26.9 | 405 | 1036 | 650.0 | 343.6 | 861.5 | 517.8 | |
| 0.180 | 4.91 | 2.69 | 26.7 | 407 | 1021 | 648.8 | 344.8 | 855.4 | 510.7 | |
| 0.184 | 5.00 | 2.69 | 26.9 | 408 | 1033 | 648.5 | 345.1 | 861.5 | 516.5 | |
| 0.187 | 5.10 | 2.70 | 27.4 | 409 | 1056 | 647.3 | 346.3 | 874.2 | 528.0 | |
| 0.191 | 5.21 | 2.70 | 26.9 | 410 | 1025 | 645.2 | 348.4 | 861.0 | 512.6 | |
| 0.194 | 5.30 | 2.70 | 27.2 | 411 | 1038 | 643.5 | 350.1 | 869.2 | 519.1 | |
| 0.199 | 5.41 | 2.70 | 27.7 | 412 | 1064 | 644.1 | 349.5 | 881.7 | 532.2 | |
| 0.202 | 5.50 | 2.71 | 27.2 | 413 | 1036 | 641.4 | 352.2 | 870.1 | 517.9 | |
| 0.206 | 5.60 | 2.71 | 27.1 | 415 | 1027 | 641.7 | 351.9 | 865.2 | 513.3 | |
| 0.209 | 5.70 | 2.71 | 27.6 | 416 | 1051 | 640.0 | 353.6 | 879.3 | 525.7 | |
| 0.213 | 5.80 | 2.72 | 27.5 | 417 | 1042 | 638.0 | 355.6 | 876.8 | 521.2 | |
| 0.217 | 5.91 | 2.72 | 27.7 | 418 | 1051 | 636.5 | 357.1 | 882.8 | 525.7 | |
| 0.221 | 6.02 | 2.72 | 28.3 | 419 | 1079 | 636.8 | 356.8 | 896.2 | 539.4 | |
| 0.224 | 6.11 | 2.72 | 28.0 | 420 | 1057 | 633.8 | 359.8 | 888.2 | 528.4 | |
| 0.228 | 6.21 | 2.73 | 28.0 | 421 | 1055 | 630.5 | 363.1 | 890.5 | 527.4 | |
| 0.231 | 6.29 | 2.73 | 28.8 | 422 | 1095 | 629.0 | 364.6 | 912.1 | 547.5 | |
| 0.235 | 6.40 | 2.73 | 27.7 | 424 | 1037 | 629.1 | 364.5 | 883.2 | 518.7 | |
| 0.239 | 6.50 | 2.74 | 28.1 | 425 | 1055 | 626.4 | 367.2 | 894.8 | 527.5 | |
| 0.243 | 6.60 | 2.74 | 28.0 | 426 | 1046 | 626.4 | 367.2 | 890.3 | 523.1 | |
| 0.246 | 6.71 | 2.74 | 28.1 | 427 | 1048 | 627.6 | 366.0 | 890.0 | 524.0 | |
| 0.249 | 6.79 | 2.74 | 28.2 | 428 | 1053 | 626.2 | 367.4 | 894.2 | 526.7 | |
| 0.253 | 6.89 | 2.75 | 28.3 | 429 | 1054 | 626.7 | 366.9 | 894.0 | 527.1 | |
| 0.257 | 7.00 | 2.75 | 28.0 | 430 | 1037 | 624.6 | 369.0 | 887.5 | 518.5 | |
| 0.260 | 7.08 | 2.75 | 28.4 | 431 | 1057 | 625.3 | 368.3 | 894.2 | 525.9 | |
| 0.264 | 7.18 | 2.76 | 28.6 | 432 | 1064 | 624.5 | 369.1 | 901.1 | | |
| 0.267 | 7.18 | 2.76 | 28.3 | 434 | 1043 | 623.7 | | | 532.1 | |
| 0.271 | 7.20 | 2.76 | 28.6 | | | | 369.9 | 891.7 | 521.7 | |
| 0.271 | 7.59 7.50 | | | 435 436 | 1056 | 623.3 | 370.3 | 898.5 | 528.2 | |
| 0.275 | | 2.77 | 28.7 | 436 | 1061 | 620.3 | 373.3 | 903.5 | 530.3 | |
| 0.279 | 7.59 | 2.77 | 28.8 | 437 | 1062 | 619.4 | 374.2 | 905.3 | 531.0 | |
| | 7.69 | 2.77 | 28.6 | 438 | 1049 | 618.0 | 375.6 | 900.3 | 524.7 | |
| 0.286 | 7.80 | 2.77 | 28.7 | 439 | 1049 | 618.0 | 375.6 | 900.2 | 524.7 | |
| 0.290 | 7.89 | 2.78 | 29.1 | 440 | 1067 | 616.9 | 376.7 | 910.4 | 533.7 | |
| 0.293 | 7.99 | 2.78 | 29.3 | 442 | 1077 | 615.1 | 378.5 | 916.8 | 538.3 | |
| 0.297 | 8.09 | 2.78 | 29.1 | 443 | 1063 | 615.2 | 378.4 | 910.0 | 531.6 | |
| 0.301 | 8.19 | 2.79 | 28.8 | 444 | 1042 | 614.3 | 379.3 | 900.4 | 521.1 | |
| 0.304 | 8.27 | 2.79 | 29.4 | 445 | 1071 | 612.2 | 381.4 | 916.7 | 535.3 | |

ADMINICED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT JOB NO. **PROJECT** PROJECT NO. LOCATION

DATE TESTED

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

03/11/20 CAL

TECHNICIAN

BORING NO. DEPTH SAMPLE NO. DATE SAMPLED SAMPLED BY

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

DESCRIPTION clayey sand

| Point C | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---|------------------------------|---|----------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) | |
| 0.308 | 8.40 | 2.79 | 28.9 | 446 | 1042 | 611.8 | 381.8 | 902.8 | 521.0 | |
| 0.312 | 8.49 | 2.80 | 29.2 | 447 | 1059 | 610.9 | 382.7 | 912.3 | 529.6 | |
| 0.316 | 8.60 | 2.80 | 29.7 | 448 | 1080 | 612.3 | 381.3 | 921.2 | 539.9 | |
| 0.319 | 8.68 | 2.80 | 28.4 | 449 | 1010 | 612.3 | 381.3 | 886.1 | 504.8 | |
| 0.323 | 8.80 | 2.81 | 29.4 | 451 | 1058 | 611.2 | 382.4 | 911.5 | 529.1 | |
| 0.327 | 8.91 | 2.81 | 29.9 | 452 | 1079 | 611.3 | 382.3 | 921.8 | 539.5 | |
| 0.330 | 9.00 | 2.81 | 29.5 | 453 | 1058 | 611.3 | 382.3 | 911.4 | 529.2 | |
| 0.334 | 9.10 | 2.81 | 29.7 | 454 | 1064 | 608.4 | 385.2 | 917.0 | 531.8 | |
| 0.338 | 9.21 | 2.82 | 29.8 | 455 | 1068 | 608.3 | 385.3 | 919.2 | 533.8 | |
| 0.342 | 9.31 | 2.82 | 29.4 | 457 | 1046 | 607.1 | 386.5 | 909.6 | 523.0 | |
| 0.346 | 9.41 | 2.82 | 30.3 | 458 | 1085 | 606.7 | 386.9 | 929.2 | 542.4 | |
| 0.349 | 9.51 | 2.83 | 29.5 | 459 | 1044 | 607.2 | 386.4 | 908.6 | 522.2 | |
| 0.353 | 9.61 | 2.83 | 29.4 | 460 | 1038 | 604.6 | 389.0 | 908.1 | 519.1 | |
| 0.356 | 9.71 | 2.83 | 29.4 | 461 | 1034 | 603.2 | 390.4 | 907.6 | 517.1 | |
| 0.360 | 9.81 | 2.84 | 29.7 | 462 | 1043 | 601.4 | 392.2 | 913.9 | 521.7 | |
| 0.364 | 9.91 | 2.84 | 29.1 | 463 | 1010 | 602.2 | 391.4 | 896.4 | 504.9 | |
| 0.368 | 10.01 | 2.84 | 29.5 | 465 | 1030 | 603.5 | 390.1 | 905.1 | 515.0 | |
| 0.372 | 10.12 | 2.85 | 29.7 | 466 | 1035 | 604.1 | 389.5 | 906.9 | 517.3 | |
| 0.375 | 10.22 | 2.85 | 29.1 | 467 | 1005 | 605.1 | 388.5 | 890.9 | 502.5 | |
| 0.379 | 10.32 | 2.85 | 29.7 | 468 | 1030 | 607.6 | 386.0 | 900.8 | 514.9 | |
| 0.382 | 10.41 | 2.86 | 29.6 | 469 | 1022 | 610.7 | 382.9 | 894.0 | 511.1 | |
| 0.386 | 10.50 | 2.86 | 29.4 | 470 | 1013 | 611.7 | 381.9 | 888.3 | 506.4 | |
| 0.390 | 10.62 | 2.86 | 30.4 | 471 | 1056 | 615.6 | 378.0 | 906.2 | 528.1 | |
| 0.393 | 10.71 | 2.86 | 29.6 | 472 | 1015 | 615.7 | 377.9 | 885.2 | 507.3 | |
| 0.397 | 10.81 | 2.87 | 29.7 | 474 | 1018 | 617.3 | 376.3 | 885.2 | 508.9 | |
| 0.401 | 10.92 | 2.87 | 30.7 | 475 | 1065 | 620.1 | 373.5 | 906.0 | 532.5 | |
| 0.404 | 11.01 | 2.87 | 30.2 | 476 | 1039 | 620.9 | 372.7 | 892.1 | 519.4 | |
| 0.408 | 11.12 | 2.88 | 30.2 | 477 | 1036 | 623.0 | 370.6 | 888.4 | 517.8 | |
| 0.412 | 11.21 | 2.88 | 31.0 | 478 | 1073 | 623.2 | 370.4 | 906.8 | 536.4 | |
| 0.415 | 11.31 | 2.88 | 30.2 | 479 | 1029 | 623.5 | 370.1 | 884.6 | 514.5 | |
| 0.419 | 11.40 | 2.89 | 30.3 | 480 | 1033 | 622.4 | 371.2 | 887.8 | 516.6 | |
| 0.422 | 11.50 | 2.89 | 31.4 | 481 | 1081 | 621.1 | 372.5 | 913.2 | 540.7 | |
| 0.426 | 11.61 | 2.89 | 31.2 | 483 | 1068 | 619.7 | 373.9 | 907.9 | 534.0 | |
| 0.430 | 11.70 | 2.90 | 30.5 | 484 | 1033 | 620.0 | 373.6 | 890.0 | 516.4 | |
| 0.433 | 11.80 | 2.90 | 31.1 | 485 | 1058 | 617.8 | 375.8 | 904.8 | 529.0 | |
| 0.433 | 11.91 | 2.90 | 30.6 | 486 | 1036 | 616.7 | 375.8 376.9 | | | |
| 0.437 | 12.00 | 2.90 | 30.9 | 487 | 1032 | | | 892.8 | 515.9 | |
| 0.441 | 12.00 | | | | | 618.4 | 375.2 375.3 | 897.4 | 522.2 | |
| 0.449 | | 2.91 | 31.2 | 488 | 1054 | 618.3 | 375.3 | 902.1 | 526.8 | |
| | 12.22 | 2.91 | 30.9 | 489 | 1035 | 620.4 | 373.2 | 890.7 | 517.5 | |
| 0.451 | 12.29 | 2.92 | 31.0 | 490 | 1040 | 618.3 | 375.3 | 895.4 | 520.1 | |
| 0.455 | 12.40 | 2.92 | 30.9 | 492 | 1035 | 617.8 | 375.8 | 893.1 | 517.3 | |
| 0.459 | 12.50 | 2.92 | 31.2 | 493 | 1046 | 616.1 | 377.5 | 900.7 | 523.2 | |

ADMANCED TEFRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT JOB NO. PROJECT PROJECT NO. LOCATION DATE TESTED

TECHNICIAN

RJH Consultants 2679-148 South Boulder Creek - Phase II

16134

03/11/20 CAL BORING NO.
DEPTH
SAMPLE NO.
DATE SAMPLED
SAMPLED BY

DESCRIPTION

B-202&203 3.2-8.2' CA-2,3&4 2-3&7-2020

clayey sand

| Point C | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---|------------------------------|--------------------------------------|----------|---------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf) | |
| 0.463 | 12.60 | 2.93 | 31.0 | 494 | 1031 | 616.3 | 377.3 | 892.6 | 515.4 | |
| 0.467 | 12.71 | 2.93 | 30.7 | 495 | 1014 | 617.4 | 376.2 | 883.3 | 507.1 | |
| 0.470 | 12.80 | 2.93 | 31.5 | 496 | 1050 | 615.2 | 378.4 | 903.2 | 524.8 | |
| 0.474 | 12.90 | 2.94 | 31.3 | 497 | 1039 | 611.8 | 381.8 | 901.2 | 519.4 | |
| 0.477 | 12.99 | 2.94 | 31.3 | 498 | 1034 | 611.7 | 381.9 | 898.6 | 516.8 | |
| 0.481 | 13.10 | 2.94 | 31.7 | 499 | 1053 | 611.9 | 381.7 | 908.3 | 526.6 | |
| 0.484 | 13.18 | 2.95 | 31.6 | 500 | 1042 | 612.4 | 381.2 | 902.2 | 521.0 | |
| 0.488 | 13.28 | 2.95 | 32.3 | 502 | 1073 | 610.3 | 383.3 | 919.9 | 536.6 | |
| 0.492 | 13.39 | 2.95 | 31.8 | 503 | 1047 | 611.1 | 382.5 | 905.8 | 523.3 | |
| 0.495 | 13.49 | 2.96 | 32.3 | 504 | 1069 | 611.3 | 382.3 | 917.0 | 534.7 | |
| 0.500 | 13.61 | 2.96 | 33.2 | 505 | 1110 | 609.7 | 383.9 | 938.8 | 554.9 | |
| 0.503 | 13.70 | 2.96 | 33.0 | 506 | 1095 | 610.5 | 383.1 | 930.6 | 547.5 | |
| 0.507 | 13.79 | 2.97 | 32.0 | 507 | 1046 | 610.9 | 382.7 | 905.8 | 523.0 | |
| 0.510 | 13.90 | 2.97 | 33.5 | 509 | 1113 | 610.9 | 382.7 | 939.1 | 556.4 | |
| 0.514 | 14.00 | 2.97 | 33.3 | 510 | 1105 | 611.2 | 382.4 | 934.6 | 552.3 | |
| 0.517 | 14.09 | 2.98 | 32.9 | 511 | 1079 | 610.0 | 383.6 | 923.3 | 539.7 | |
| 0.521 | 14.19 | 2.98 | 33.6 | 512 | 1111 | 608.9 | 384.7 | 940.4 | 555.7 | |
| 0.525 | 14.30 | 2.99 | 33.3 | 513 | 1095 | 608.0 | 385.6 | 933.4 | 547.7 | |
| 0.528 | 14.39 | 2.99 | 32.9 | 514 | 1071 | 606.8 | 386.8 | 922.3 | 535.5 | |
| 0.532 | 14.50 | 2.99 | 33.5 | 515 | 1095 | 604.2 | 389.4 | 936.8 | 547.4 | |
| 0.536 | 14.60 | 3.00 | 33.3 | 516 | 1083 | 602.2 | 391.4 | 932.8 | 541.4 | |
| 0.540 | 14.69 | 3.00 | 33.2 | 518 | 1077 | 602.0 | 391.6 | 929.9 | 538.3 | |
| 0.543 | 14.79 | 3.00 | 33.7 | 519 | 1096 | 603.1 | 390.5 | 938.4 | 547.9 | |
| 0.547 | 14.90 | 3.01 | 32.9 | 520 | 1054 | 603.9 | 389.7 | 916.8 | 527.1 | |
| 0.551 | 15.00 | 3.01 | 32.4 | 521 | 1031 | 603.9 | 389.7 | 905.1 | 515.4 | |
| 0.555 | 15.10 | 3.01 | 32.9 | 522 | 1049 | 604.6 | 389.0 | 913.2 | 524.3 | |
| 0.558 | 15.20 | 3.02 | 32.9 | 523 | 1046 | 603.7 | 389.9 | 912.8 | 522.8 | |
| 0.562 | 15.31 | 3.02 | 32.8 | 525 | 1038 | 603.2 | 390.4 | 909.4 | 519.0 | |
| 0.566 | 15.41 | 3.02 | 32.8 | 526 | 1038 | 603.9 | 389.7 | 908.8 | 519.1 | |
| 0.570 | 15.51 | 3.03 | 35.0 | 527 | 1136 | 601.0 | 392.6 | 960.7 | 568.1 | |
| 0.573 | 15.61 | 3.03 | 33.9 | 528 | 1082 | 597.2 | 396.4 | 937.4 | 541.0 | |
| 0.577 | 15.70 | 3.03 | 34.3 | 529 | 1100 | 599.8 | 393.8 | 944.0 | 550.2 | |
| 0.580 | 15.80 | 3.04 | 34.9 | 530 | 1123 | 598.9 | 394.7 | 956.1 | 561.4 | |
| 0.584 | 15.91 | 3.04 | 35.0 | 531 | 1124 | 595.2 | 398.4 | 960.3 | 562.0 | |
| 0.587 | 15.99 | 3.05 | 34.8 | 532 | 1115 | 593.7 | 399.9 | 957.7 | 557.7 | |



CLIENT

RJH Consultants

JOB NO.

2679-148

16134

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

LOCATION -

BORING NO.

B-203

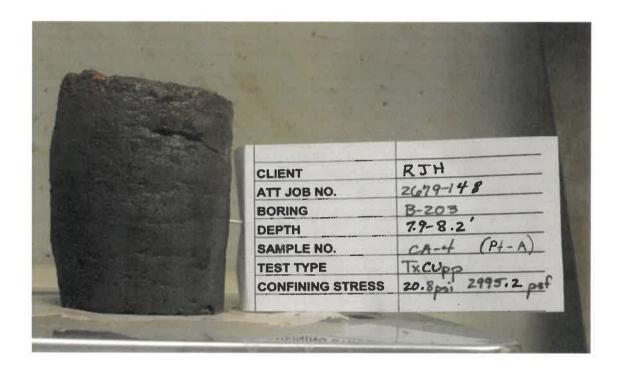
DEPTH

7.9-8.2'

SAMPLE NO.

CA-4

DATE SAMPLED DESCRIPTION



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NOTES

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CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

16134 LOCATION

BORING NO.

B-202 (PT. B)

DEPTH

5.4-5.7

SAMPLE NO.

CA-3

DATE SAMPLED

DESCRIPTION

clayey sand with gravel



| NOTES | | | |
|-------|--|--|--|
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2679148__lmage_20_03_23_12_40_27



CLIENT

RJH Consultants

JOB NO.

2679-148

16134

PROJECT

South Boulder Creek - Phase II

PROJECT NO.

LOCATION

BORING NO.

B-202

DEPTH

3.2'-3.5' CA-2

SAMPLE NO.

DATE SAMPLED

DESCRIPTION

TxCupp-Pt. C



File name:

2679148__lmage_20_03_19_11_47_20



ASTM D 4767

CLIENT **RJH Consultants**

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/12/20

TECHNICIAN CAL/SPH BORING NO.

B-203, 202 & 201

DEPTH 15.8-24.9' SAMPLE NO. NQ-2, 1 & 3

DATE SAMPLED

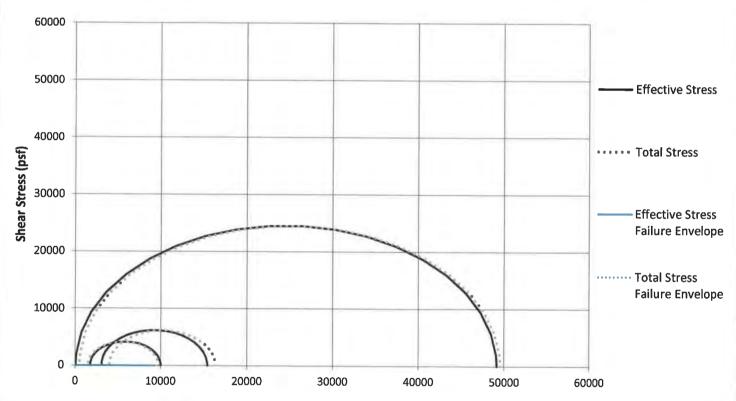
SAMPLED BY

DESCRIPTION shale cores

| Effective Stress | Total Stress |
|-----------------------------------|---|
| Internal Friction Angle - φ: | Internal Friction Angle - φ: |
| Cohesion (psf): | Cohesion (psf): |
| Cohesion (kPa): | Cohesion (kPa): |
| Modified Friction Angle - ψ: 48.3 | Modified Friction Angle - ψ: 47.6 |
| Modified Cohesion - a (psf): | Modified Cohesion - a (psf): |
| Modified Cohesion - a (kPa): | Modified Cohesion - a (kPa): |
| Raw Data Files 2679-148 CUPP B-20 | 3 NQ-2 Pt-A.trx 2679-148 CUPP B-202 NQ-1 Pt-B.trx 2679- |

148_CUPP_B-201_NQ-3_PTC.trx,

Mohr Stress Circles



Total or Effective Stress (psf)

NOTES:

PT. A had a prexisting shear plane in it. PT. C-the membrane puntured during the test after failure the after test moisture content was calculated from volume changes during saturation and consolidation.

Data entry by:

File name:

Checked by:

CAL

SPH 2679148 TxCuPP ASTM D4767 1.xlsm

Date:

3/26/2020 Date: 3-30-20

Page 1 of 8



ASTM D 4767

CLIENT JOB NO. PROJECT PROJECT NO.

LOCATION

RJH Consultants 2679-148

South Boulder Creek - Phase II

BORING NO. B-203, 202 & 201 **DEPTH** 15.8-24.9' SAMPLE NO. NQ-2, 1 & 3

16134

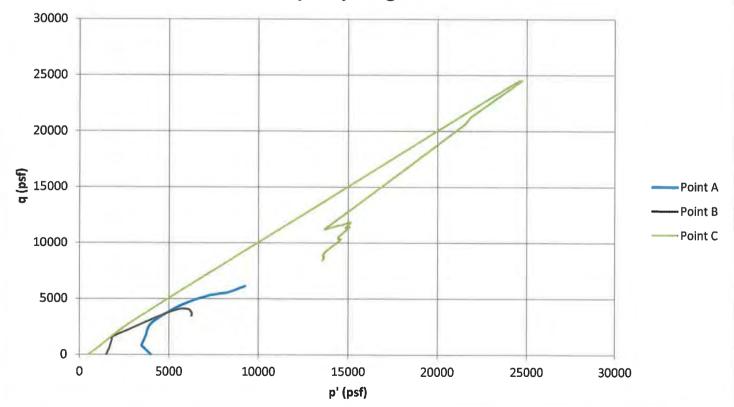
DATE SAMPLED SAMPLED BY

DATE TESTED 03/12/20 TECHNICIAN CAL/SPH **DESCRIPTION** shale cores

Shear Summary at Peak Deviator Stress Point A Point B

| | Point A | Point B | Point C |
|---|---------|---------|---------|
| Peak Deviator Stress (psf): | 12309 | 8215 | 49083 |
| Peak Deviator Stress (kPa) : | 589.4 | 393.3 | 2350.1 |
| Major Principal Stress (psf) - σ_{1f} : | 16312 | 9712 | 49587 |
| Major Principal Stress (kPa) - σ_{1f} : | 781.0 | 465.0 | 2374.2 |
| Minor Principal Stress (psf) - σ_{3f} : | 4003 | 1498 | 504 |
| Minor Principal Stress (kPa) - σ_{3f} : | 191.7 | 71.7 | 24.1 |
| Effective Major Principal Stress (psf) - σ' _{1f} : | 15417 | 10003 | 49166 |
| Effective Major Principal Stress (kPa) - σ'1f: | 738.2 | 478.9 | 2354.1 |
| Effective Minor Principal Stress (psf) - σ' _{3f} : | 3108 | 1788 | 84 |
| Effective Minor Principal Stress (kPa) - σ'3f: | 148.8 | 85.6 | 4.0 |

p' - q Diagram



File name:

2679148__TxCuPP ASTM D4767_1.xlsm

Page 2 of 8



ASTM D 4767

CLIENT JOB NO. PROJECT **RJH Consultants** 2679-148

South Boulder Creek - Phase II

PROJECT NO. 16134 LOCATION

DATE TESTED TECHNICIAN CAL/SPH

03/12/20

BORING NO. DEPTH

SAMPLE NO. DATE SAMPLED

SAMPLED BY DESCRIPTION B-203, 202 & 201 15.8-24.9'

NQ-2, 1 & 3 2/10/2020

shale cores

Point A (B-203, NQ-2, 15.8-16.3')

| Before Test Mass of Wet Soil (g): | 356.04 | |
|-----------------------------------|--------|--|
| After Test Mass of Wet Soil (g): | 361.11 | |
| Mass of Dry Soil and Pan (g): | 490.38 | |
| Mass of Pan (g): | 173.69 | |
| Diameter (in): | 1.788 | |
| Initial Sample Height (in): | 3.959 | |
| After Consolidation Height (in): | 4.032 | |
| Assumed Specific Gravity: | 2.65 | |
| | | |
| Back Pressure (psi): | 68.0 | |

Cell Pressure (psi): 95.8 Initial Effective Stress (psi): 27.8 Initial Effective Stress (kPa): 191.7

> Strain Rate (in/min): 0.0063

Initial Wet Density (pcf): 136.4 Initial Dry Density (pcf): 121.4 Initial Wet Density (kg/m³): 2186 Initial Dry Density (kg/m³): 1944 Initial Moisture (%): 12.4 Final Wet Density (pcf): 150.1

Final Dry Density (pcf): 131.7 Final Wet Density (kg/m³): 2405 Final Dry Density (kg/m³): 2109

Final Moisture (%): 14.0

Membrane Correction Factor (lb/in2): 77.80 Filter Paper Load Capacity (lb/in): 1.1

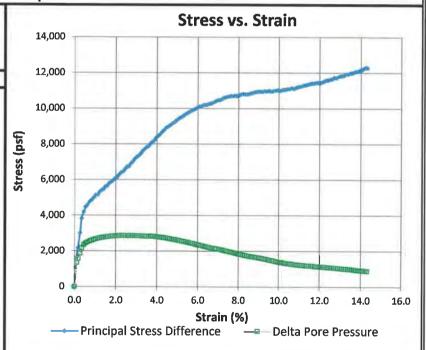
Triaxial Compression Data

Peak Deviator Stress (psf): 12309 Peak Deviator Stress (kPa): 589.4

Parameters at Peak Deviator Stress

Strain (%):

Major Principal Stress (psf) - σ_{1f}: 16312 Major Principal Stress (kPa) - σ_{1f}: 781.0 Minor Principal Stress (psf) - σ_{3f} : 4003 Minor Principal Stress (kPa) - 93: 191.7 Induced Pore Pressure (psf): 895.37 Induced Pore Pressure (kPa): 42.87 Effective Major Principal Stress (psf) - σ'_{1f}: 15417.05 Effective Major Principal Stress (kPa) - σ'1f: 738.17 Effective Minor Principal Stress (psf) - σ'3f: 3107.83 Effective Minor Principal Stress (kPa) - σ'3f: 148.80 p' (psf): 9262 6155 q (psf): p' (kPa): 443.5 q (kPa): 294.7



2679148__TxCuPP ASTM D4767_1.xlsm

14.24

Page 3 of 8

File name:



CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/12/20

TECHNICIAN CAL/SPH

BORING NO.

DEPTH

SAMPLE NO. DATE SAMPLED

SAMPLED BY

DESCRIPTION

B-203, 202 & 201

15.8-24.9'

NQ-2, 1 & 3

2/10/2020

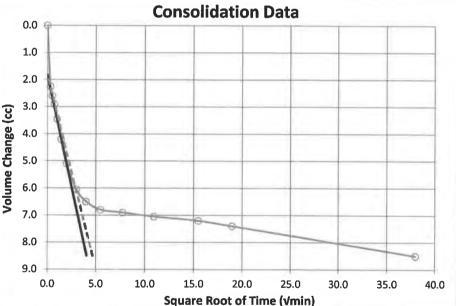
shale cores

| Consolidation-Point A | (B-203, NQ-2, 15.8-16.3') |
|-----------------------|---------------------------|
|-----------------------|---------------------------|

| | | | (= ===; :=== ; :=== ; | | |
|---|---------------------------------|-------|---|---------|--|
| | Initial Saturation (%): | 90.7 | Initial Volume of Sample (cc): | 162.9 | |
| | Final Saturation (%): | 100.0 | Final Volume of Sample (cc): | 150.2 | |
| | Cell Pressure (psi): | 95.8 | Volume Change After Consolidation (cc): | 25.4 | |
| | Back Pressure (psi): | 68.0 | Initial Dial Reading (in): | 0.200 | |
| | Effective Stress (psi): | 27.8 | Final Dial Reading (in): | 0.127 | |
| | Effective Stress (kPa): | 191.7 | Height Change (in): | -0.0732 | |
| (| Cell Expansion Correction (cc): | 12.68 | Initial Area (cm²): | 16.20 | |
| | Cell ID: | 148 | Final Area (cm²): | 14.66 | |

T50 (min): 2.52

| | Elapsed Time (min) | Root of Time (vmin) | Reading (cc) | Volume Change (cc) | | 0.0 | 9 |
|---|-----------------------|------------------------|-----------------|-----------------------|-------------|-----|-----|
| I | 0 | 0.00 | 0.40 | 0.00 | 1 | 4.0 | 1 |
| I | 0.1 | 0.32 | 2.65 | 2.25 | | 1.0 | |
| ı | 0.25 | 0.50 | 3.00 | 2.60 | | 2.0 | |
| l | 0.5 | 0.71 | 3.30 | 2.90 | | | 8 |
| ı | 1 | 1.00 | 3.85 | 3.45 | ত্ | 3.0 | 1 |
| | 2 | 1.41 | 4.60 | 4.20 | Change (cc) | 4.0 | 1 |
| | 4 | 2.00 | 5.50 | 5.10 | <u>ا</u> | 4.0 | 1 |
| | 9 | 3.00 | 6.45 | 6.05 | දී | 5.0 | 1 |
| | 16 | 4.00 | 6.90 | 6.50 | | | 1 |
| | 30 | 5.48 | 7.20 | 6.80 | Volume | 6.0 | - |
| ı | 60 | 7.75 | 7.30 | 6.90 | | 7.0 | |
| | 120 | 10.95 | 7.45 | 7.05 | | 7.0 | |
| | 240 | 15.49 | 7.60 | 7.20 | | 8.0 | - |
| | 360 | 18.97 | 7.80 | 7.40 | | | |
| I | 1440 | 37.95 | 8.90 | 8.50 | | 9.0 | 1 |
| I | | | | | | C | 0.0 |



Saturation Back Cell Pressure (psi) Pore Pressure (psi) Burette Reading (cc) Volume Effective Pressure В ∆u (psi) Change (cc) Stress (psi) (psi) Initial Final Initial Final Initial Final 40.0 50.0 39.4 48.3 3.60 38.0 2.0 8.9 0.89 50.0 60.0 48.7 57.8 48.0 2.0 9.1 0.91 60.0 70.0 59.1 68.5 58.0 2.0 9.4 0.94 70.0 80.0 68.8 78.4 20.50 68.0 2.0 9.6 0.96

Page 4 of 8

File name: 2679148__TxCuPP ASTM D4767_1.xlsm



ASTM D 4767

CLIENT **RJH Consultants** JOB NO.

2679-148

PROJECT South Boulder Creek - Phase II

16134

LOCATION

PROJECT NO.

DATE TESTED 03/12/20

TECHNICIAN CAL/SPH BORING NO.

DEPTH

SAMPLE NO.

DATE SAMPLED

SAMPLED BY

DESCRIPTION

B-203, 202 & 201

15.8-24.9'

NQ-2, 1 & 3

2/6/2020

shale cores

Point B (B-202, NQ-1, 19,4-20,0')

| Before Test Mass of Wet Soil (g): | 360.86 | Initial Wet Density (pcf): | 139.0 |
|-----------------------------------|--------|--------------------------------------|-------|
| After Test Mass of Wet Soil (g): | 374.24 | Initial Dry Density (pcf): | 100.5 |
| Mass of Dry Soil and Pan (g): | 433.33 | Initial Wet Density (kg/m³): | 2227 |
| Mass of Pan (g): | 172.45 | Initial Dry Density (kg/m³): | 1610 |
| Diameter (in): | 1.795 | Initial Moisture (%): | -38.3 |
| Initial Sample Height (in): | 3.908 | Final Wet Density (pcf): | 144.2 |
| After Consolidation Height (in): | 3.909 | Final Dry Density (pcf): | 100.5 |
| Assumed Specific Gravity: | 2.65 | Final Wet Density (kg/m³): | 2310 |
| | | Final Dry Density (kg/m³): | 1610 |
| Back Pressure (psi): | 78.0 | Final Moisture (%): | 43.5 |
| Cell Pressure (psi): | 88.4 | | |
| Initial Effective Stress (psi): | 10.4 | Membrane Correction Factor (lb/in²): | 40.78 |
| Initial Effective Stress (kPa): | 71.7 | Filter Paper Load Capacity (lb/in): | 1.1 |

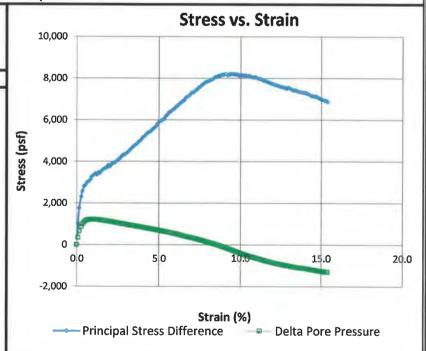
Strain Rate (in/min): 0.0039

Triaxial Compression Data

Peak Deviator Stress (psf): 8215 Peak Deviator Stress (kPa): 393.3

Parameters at Peak Deviator Stress

Major Principal Stress (psf) - σ_{1f}: 9712 Major Principal Stress (kPa) - σ_{1f} : 465.0 Minor Principal Stress (psf) - σ_{3f} : 1498 Minor Principal Stress (kPa) - σ_{3f}: 71.7 Induced Pore Pressure (psf): -290.17 Induced Pore Pressure (kPa): -13.89Effective Major Principal Stress (psf) - σ'_{1f}: 10002.55 Effective Major Principal Stress (kPa) - σ'1f: 478.92 Effective Minor Principal Stress (psf) - σ'_{3f} : 1787.77 Effective Minor Principal Stress (kPa) - σ'3f: 85.60 p' (psf): 5895 4107 q (psf): p' (kPa) : 282.3 q (kPa): 196.7 Strain (%): 9.59



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File name:

2679148__TxCuPP ASTM D4767_1.xlsm



ASTM D 4767

CLIENT RJH Consultants

JOB NO. 2679-148
PROJECT South Boulder Creek - Phase II

PROJECT PROJECT NO.

16134

LOCATION

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DATE TESTED 03/12/20 TECHNICIAN CAL/SPH BORING NO.

DEPTH

SAMPLE NO.
DATE SAMPLED

SAMPLED BY

DESCRIPTION

B-203, 202 & 201

15.8-24.9'

NQ-2, 1 & 3

2/6/2020

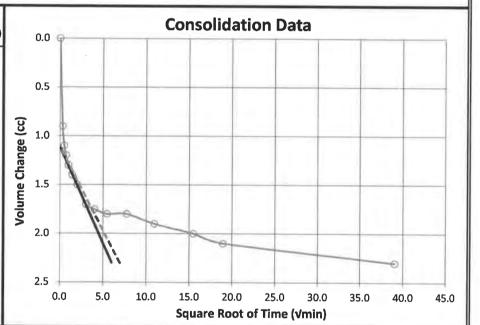
shale cores

Consolidation-Point B (B-202, NQ-1, 19.4-20.0')

| | , , , , , , , , , , , , , , , , , , , | |
|-------|---|--|
| 157.2 | Initial Volume of Sample (cc): | 162.1 |
| 100.0 | Final Volume of Sample (cc): | 162.0 |
| 88.4 | Volume Change After Consolidation (cc): | 11.4 |
| 78.0 | Initial Dial Reading (in): | 0.200 |
| 10.4 | Final Dial Reading (in): | 0.199 |
| 71.7 | Height Change (in): | -0.001 |
| 11.38 | Initial Area (cm²): | 16.33 |
| 178 | Final Area (cm²): | 16.32 |
| | 157.2 100.0 88.4 78.0 10.4 71.7 11.38 | 100.0 Final Volume of Sample (cc): 88.4 Volume Change After Consolidation (cc): 78.0 Initial Dial Reading (in): 10.4 Final Dial Reading (in): 71.7 Height Change (in): 11.38 Initial Area (cm²): |

T50 (min): 4.03

| Elapsed Time (min) | Square Root of Time (√min) | Burette Reading (cc) | Volume Change (cc) |
|-----------------------|----------------------------------|----------------------------|-----------------------|
| 0 | 0.00 | 12.10 | 0.00 |
| 0.1 | 0.32 | 13.00 | 0.90 |
| 0.25 | 0.50 | 13.20 | 1.10 |
| 0.5 | 0.71 | 13.30 | 1.20 |
| 1 | 1.00 | 13.40 | 1.30 |
| 2 | 1.41 | 13.50 | 1.40 |
| 4 | 2.00 | 13.60 | 1.50 |
| 9 | 3.00 | 13.80 | 1.70 |
| 16 | 4.00 | 13.85 | 1.75 |
| 30 | 5.48 | 13.90 | 1.80 |
| 60 | 7.75 | 13.90 | 1.80 |
| 120 | 10.95 | 14.00 | 1.90 |
| 240 | 15.49 | 14.10 | 2.00 |
| 360 | 18.97 | 14.20 | 2.10 |
| 1524 | 39.04 | 14.40 | 2.30 |



Saturation

| Cell Pressure (psi) | | Pore Pressure (psi) | | Burette Reading (cc) | | Back Pressure | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
|---------------------|-------|---------------------|-------|----------------------|-------|------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | Orlange (CC) | otress (psi) | | |
| 40.0 | 50.0 | 39.0 | 47.6 | 7.30 | 8.20 | 38.0 | 0.90 | 2.0 | 8.6 | 0.86 |
| 50.0 | 60.0 | 49.1 | 58.1 | 8.50 | 9.20 | 48.0 | 0.70 | 2.0 | 9.0 | 0.90 |
| 60.0 | 70.0 | 59.0 | 68.2 | 9.60 | 10.30 | 58.0 | 0.70 | 2.0 | 9.2 | 0.92 |
| 70.0 | 80.0 | 69.0 | 78.4 | 11.00 | 11.80 | 68.0 | 0.80 | 2.0 | 9.4 | 0.94 |
| 80.0 | 90.0 | 78.9 | 88.4 | 12.10 | 12.10 | 78.0 | 0.00 | 2.0 | 9.5 | 0.95 |

File name: 2679148__TxCuPP ASTM D4767_1.xlsm

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ASTM D 4767

CLIENT **RJH Consultants** JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION

DATE TESTED 03/12/20

TECHNICIAN CAL/SPH BORING NO.

DEPTH SAMPLE NO.

DATE SAMPLED SAMPLED BY

DESCRIPTION

B-203, 202 & 201

15.8-24.9' NQ-2, 1 & 3

2/17/2020

shale cores

Point C (B-201, NQ-3, 24,4-24,9')

| Before Test Mass of Wet Soil (g): | 368.36 | Initial Wet Density (pcf): | 143.5 |
|-----------------------------------|--------|--------------------------------------|-------|
| After Test Mass of Wet Soil (g): | 375.26 | Initial Dry Density (pcf): | 128.6 |
| Mass of Dry Soil and Pan (g): | 502.61 | Initial Wet Density (kg/m³): | 2298 |
| Mass of Pan (g): | 172.39 | Initial Dry Density (kg/m³): | 2060 |
| Diameter (in): | 1.767 | Initial Moisture (%): | 11.5 |
| Initial Sample Height (in): | 3.989 | Final Wet Density (pcf): | 155.9 |
| After Consolidation Height (in): | 3.989 | Final Dry Density (pcf): | 137.2 |
| Assumed Specific Gravity: | 2.65 | Final Wet Density (kg/m³): | 2497 |
| | | Final Dry Density (kg/m³): | 2198 |
| Back Pressure (psi): | 68.0 | Final Moisture (%): | 13.6 |
| Cell Pressure (psi): | 71.5 | | |
| Initial Effective Stress (psi): | 3.5 | Membrane Correction Factor (lb/in²): | 40.78 |
| Initial Effective Stress (kPa): | 71.7 | Filter Paper Load Capacity (lb/in): | 1.1 |
| | | | |

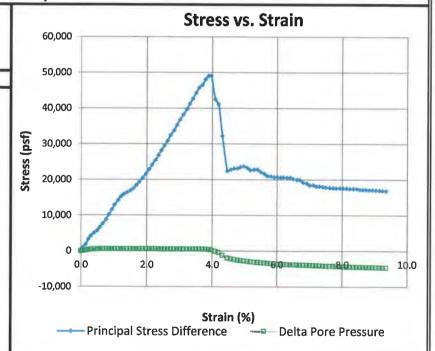
Strain Rate (in/min): 0.0063

Triaxial Compression Data

Peak Deviator Stress (psf): 49083 Peak Deviator Stress (kPa): 2350.1

Parameters at Peak Deviator Stress

Major Principal Stress (psf) - σ_{1f} : 49587 Major Principal Stress (kPa) - σ_{1f}: 2374.2 Minor Principal Stress (psf) - σ_{3f} : 504 Minor Principal Stress (kPa) - σ_{3f}: 24.1 Induced Pore Pressure (psf): 420.34 Induced Pore Pressure (kPa): 20.13 Effective Major Principal Stress (psf) - σ'_{1f}: 49166.31 Effective Major Principal Stress (kPa) - σ'1f: 2354.10 Effective Minor Principal Stress (psf) - σ'3f: 83.66 Effective Minor Principal Stress (kPa) - σ'3f: 4.01 p'(psf): 24625 q (psf): 24541 p' (kPa): 1179.1 q (kPa): 1175.0 Strain (%): 3.88



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File name:

2679148__TxCuPP ASTM D4767_1.xlsm



CLIENT **RJH Consultants** BORING NO.

B-203, 202 & 201

JOB NO.

2679-148

DEPTH

15.8-24.9'

PROJECT

South Boulder Creek - Phase II

SAMPLE NO.

PROJECT NO.

16134

DATE SAMPLED

NQ-2, 1 & 3

LOCATION

2/17/2020

DATE TESTED

SAMPLED BY

TECHNICIAN

03/12/20 CAL/SPH DESCRIPTION

shale cores

Consolidation Point C (B-201, NQ-3, 24.4-24.9')

| Initial Saturation (%): | 106.9 | Initial Volume of Sample (cc): | 160.3 |
|---------------------------------|-------|---|-------|
| Final Saturation (%): | 100.0 | Final Volume of Sample (cc): | 150.3 |
| Cell Pressure (psi): | 71.5 | Volume Change After Consolidation (cc): | 18.8 |
| Back Pressure (psi): | 68.0 | Initial Dial Reading (in): | 0.200 |
| Effective Stress (psi): | 3.5 | Final Dial Reading (in): | 0.200 |
| Effective Stress (kPa): | 24.1 | Height Change (in): | 0 |
| Cell Expansion Correction (cc): | 8.76 | Initial Area (cm²): | 15.82 |
| Cell ID: | 15S | Final Area (cm²): | 14.83 |
| | | | |

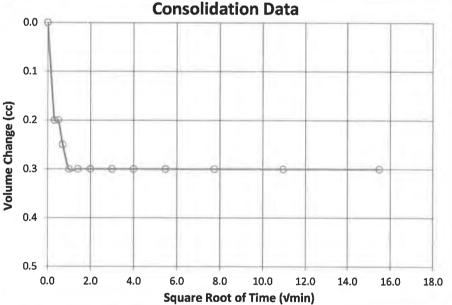
T50

| T50 (min): | | |
|------------|--------|------------|
| Burette | Volume | 0 111. |
| Reading | volume | Consolidat |

| Elapsed Time (min) | Root of Time (vmin) | Reading (cc) | Volume Change (cc) |
|-----------------------|------------------------|-----------------|-----------------------|
| 0 | 0.00 | 6.70 | 0.00 |
| 0.1 | 0.32 | 6.90 | 0.20 |
| 0.25 | 0.50 | 6.90 | 0.20 |
| 0.5 | 0.71 | 6.95 | 0.25 |
| 1 | 1.00 | 7.00 | 0.30 |
| 2 | 1.41 | 7.00 | 0.30 |
| 4 | 2.00 | 7.00 | 0.30 |
| 9 | 3.00 | 7.00 | 0.30 |
| 16 | 4.00 | 7.00 | 0.30 |
| 30 | 5.48 | 7.00 | 0.30 |
| 60 | 7.75 | 7.00 | 0.30 |
| 120 | 10.95 | 7.00 | 0.30 |
| 240 | 15.49 | 7.00 | 0.30 |

Square

consolidation stress not sufficient to yield good curve for determining T50. Use strain rate from Pt. A



Saturation

| Cell Pres | sure (psi) | Pore Pres | sure (psi) | Burette Re | eading (cc) | Back Pressure | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
|-----------|------------|-----------|------------|------------|-------------|------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | Change (60) | Stress (psi) | | |
| 40.0 | 50.0 | 39.2 | 48.3 | 14.30 | 15.30 | 38.0 | 1.00 | 2.0 | 9.1 | 0.91 |
| 50.0 | 60.0 | 49.1 | 58.5 | 17.80 | 18.70 | 48.0 | 0.90 | 2.0 | 9.4 | 0.94 |
| 60.0 | 70.0 | 59.0 | 68.4 | 19.20 | 20.00 | 58.0 | 0.80 | 2.0 | 9.4 | 0.94 |
| 70.0 | 80.0 | 69.0 | 78.5 | 20.30 | 20.40 | 68.0 | 0.10 | 2.0 | 9.5 | 0.95 |

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File name: 2679148__TxCuPP ASTM D4767_1.xlsm

ADVANCED TERRA TESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT JOB NO. PROJECT PROJECT NO. LOCATION DATE TESTED

TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

__

03/12/20 CAL/SPH BORING NO. DEPTH

DEPTH SAMPLE NO.

DATE SAMPLED SAMPLED BY DESCRIPTION B-203, 202 & 201 15.8-24.9'

15.8-24.9° NQ-2, 1 & 3

__

| | Point A | | | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|---|----------|--------|--|--|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf | | | | |
| 0.000 | 0.00 | 2.27 | 0.0 | 0 | 0 | 0.0 | 4003.2 | 4003.2 | 0.0 | | | | |
| 0.004 | 0.10 | 2.28 | 25.7 | 21 | 1604 | 1352.9 | 2650.3 | 3452.5 | 802.2 | | | | |
| 0.007 | 0.17 | 2.28 | 35.0 | 35 | 2177 | 1567.4 | 2435.8 | 3524.3 | 1088.5 | | | | |
| 0.011 | 0.28 | 2.28 | 48.5 | 57 | 3011 | 1866.5 | 2136.7 | 3642.0 | 1505.3 | | | | |
| 0.014 | 0.35 | 2.28 | 61.8 | 71 | 3832 | 2176.2 | 1827.0 | 3742.9 | 1915.9 | | | | |
| 0.018 | 0.45 | 2.28 | 68.2 | 92 | 4209 | 2346.9 | 1656.3 | 3760.8 | 2104.5 | | | | |
| 0.022 | 0.54 | 2.29 | 72.8 | 110 | 4480 | 2439.0 | 1564.2 | 3804.1 | 2240.0 | | | | |
| 0.025 | 0.63 | 2.29 | 75.0 | 130 | 4590 | 2500.4 | 1502.8 | 3797.6 | 2294.8 | | | | |
| 0.030 | 0.74 | 2.29 | 78.4 | 152 | 4780 | 2553.4 | 1449.8 | 3839.5 | 2389.8 | | | | |
| 0.033 | 0.83 | 2.29 | 80.0 | 170 | 4859 | 2596.5 | 1406.7 | 3836.0 | 2429.3 | | | | |
| 0.037 | 0.93 | 2.29 | 82.6 | 191 | 4994 | 2635.6 | 1367.6 | 3864.6 | 2496.9 | | | | |
| 0.041 | 1.03 | 2.30 | 85.2 | 211 | 5135 | 2669.6 | 1333.6 | 3901.1 | 2567.5 | | | | |
| 0.046 | 1.13 | 2.30 | 86.0 | 232 | 5154 | 2698.4 | 1304.8 | 3881.7 | 2577.0 | | | | |
| 0.049 | 1.21 | 2.30 | 88.8 | 249 | 5309 | 2726.6 | 1276.6 | 3931.4 | 2654.7 | | | | |
| 0.053 | 1.32 | 2.30 | 91.1 | 272 | 5425 | 2748.2 | 1255.0 | 3967.5 | 2712.5 | | | | |
| 0.057 | 1.41 | 2.31 | 92.1 | 289 | 5463 | 2768.2 | 1235.0 | 3966.3 | 2731.3 | | | | |
| 0.060 | 1.50 | 2.31 | 94.8 | 307 | 5612 | 2785.4 | 1217.8 | 4023.8 | 2806.1 | | | | |
| 0.064 | 1.59 | 2.31 | 96.1 | 327 | 5667 | 2797.4 | 1205.8 | 4039.1 | 2833.3 | | | | |
| 0.068 | 1.68 | 2.31 | 98.8 | 345 | 5808 | 2813.3 | 1189.9 | 4093.7 | 2903.8 | | | | |
| 0.072 | 1.79 | 2.31 | 100.2 | 367 | 5871 | 2824.9 | 1178.3 | 4113.8 | 2935.5 | | | | |
| 0.076 | 1.88 | 2.32 | 102.0 | 385 | 5958 | 2834.2 | 1169.0 | 4148.1 | 2979.2 | | | | |
| 0.080 | 1.97 | 2.32 | 104.4 | 405 | 6077 | 2844.6 | 1158.6 | 4197.0 | 3038.4 | | | | |
| 0.083 | 2.07 | 2.32 | 105.7 | 412 | 6145 | 2850.8 | 1152.4 | 4224.6 | 3072.3 | | | | |
| 0.087 | 2.16 | 2.32 | 107.9 | 414 | 6275 | 2855.7 | 1147.5 | 4285.0 | 3137.4 | | | | |
| 0.091 | 2.26 | 2.33 | 110.2 | 416 | 6409 | 2861.3 | 1141.9 | 4346.5 | 3204.7 | | | | |
| 0.095 | 2.37 | 2.33 | 111.2 | 418 | 6464 | 2861.5 | 1141.7 | 4373.9 | 3232.2 | | | | |
| 0.099 | 2.46 | 2.33 | 113.5 | 419 | 6595 | 2862.0 | 1141.2 | 4438.7 | 3297.5 | | | | |
| 0.103 | 2.55 | 2.33 | 115.9 | 421 | 6737 | 2862.5 | 1140.7 | 4509.4 | 3368.7 | | | | |
| 0.106 | 2.64 | 2.33 | 116.3 | 423 | 6753 | 2859.8 | 1143.4 | 4519.9 | 3376.5 | | | | |
| 0.111 | 2.74 | 2.34 | 119.2 | 425 | 6919 | 2860.3 | 1142.9 | 4602.2 | 3459.3 | | | | |
| 0.114 | 2.84 | 2.34 | 121.0 | 426 | 7025 | 2858.8 | 1144.4 | 4657.1 | 3512.7 | | | | |
| 0.118 | 2.92 | 2.34 | 123.5 | 428 | 7169 | 2858.7 | 1144.5 | 4729.0 | 3584.6 | | | | |
| 0.122 | 3.02 | 2.34 | 125.3 | 430 | 7271 | 2854.1 | 1149.1 | 4784.6 | 3635.5 | | | | |
| 0.126 | 3.11 | 2.35 | 126.8 | 432 | 7354 | 2849.6 | 1153.6 | 4830.7 | 3677.1 | | | | |
| 0.129 | 3.21 | 2.35 | 128.8 | 434 | 7468 | 2847.7 | 1155.5 | 4889.4 | 3733.9 | | | | |
| 0.133 | 3.30 | 2.35 | 131.1 | 435 | 7599 | 2842.5 | 1160.7 | 4960.3 | 3799.6 | | | | |
| 0.137 | 3.40 | 2.35 | 133.2 | 437 | 7714 | 2836.9 | 1166.3 | 5023.3 | 3857.0 | | | | |
| 0.141 | 3.49 | 2.35 | 135.0 | 439 | 7816 | 2832.5 | 1170.7 | 5078.6 | 3907.9 | | | | |
| 0.145 | 3.59 | 2.36 | 136.3 | 441 | 7885 | 2826.5 | 1176.7 | 5119.3 | 3942.5 | | | | |
| 0.149 | 3.69 | 2.36 | 138.9 | 443 | 8034 | 2835.9 | 1167.3 | 5184.4 | 4017.1 | | | | |
| 0.152 | 3.78 | 2.36 | 140.5 | 444 | 8123 | 2828.1 | 1175.1 | 5236.4 | 4061.3 | | | | |
| 0.156 | 3.88 | 2.36 | 142.3 | 446 | 8222 | 2816.1 | 1187.1 | 5298.4 | 4111.2 | | | | |

ADVANCED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT JOB NO. PROJECT PROJECT NO. LOCATION

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

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DATE TESTED 03/12/20 TECHNICIAN CAL/SPH BORING NO.

DEPTH SAMPLE NO.

DATE SAMPLED SAMPLED BY

DESCRIPTION

B-203, 202 & 201

15.8-24.9' NQ-2, 1 & 3

--

| | Point A | | | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|---|------------------|--------|--|--|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf | | | | |
| 0.160 | 3.97 | 2.37 | 144.9 | 448 | 8370 | 2802.7 | 1200.5 | 5385.2 | 4184.8 | | | | |
| 0.164 | 4.06 | 2.37 | 146.5 | 450 | 8455 | 2793.3 | 1209.9 | 5437.4 | 4227.5 | | | | |
| 0.167 | 4.15 | 2.37 | 148.4 | 452 | 8559 | 2779.4 | 1223.8 | 5503.1 | 4279.3 | | | | |
| 0.172 | 4.25 | 2.37 | 150.6 | 454 | 8680 | 2765.0 | 1238.2 | 5578.5 | 4340.2 | | | | |
| 0.175 | 4.33 | 2.38 | 152.2 | 455 | 8769 | 2751.4 | 1251.8 | 5636.3 | 4384.5 | | | | |
| 0.179 | 4.44 | 2.38 | 154.6 | 457 | 8903 | 2735.0 | 1268.2 | 5719.7 | 4451.5 | | | | |
| 0.183 | 4.53 | 2.38 | 156.1 | 459 | 8980 | 2715.2 | 1288.0 | 5778.2 | 4490.2 | | | | |
| 0.186 | 4.62 | 2.38 | 157.3 | 461 | 9044 | 2695.9 | 1307.3 | 5829.3 | 4522.0 | | | | |
| 0.191 | 4.73 | 2.39 | 159.1 | 463 | 9141 | 2671.1 | 1332.1 | 5902.8 | 4570.7 | | | | |
| 0.195 | 4.83 | 2.39 | 160.6 | 465 | 9216 | 2649.5 | 1353.7 | 5961.8 | 4608.1 | | | | |
| 0.198 | 4.91 | 2.39 | 162.0 | 466 | 9295 | 2630.9 | 1372.3 | 6020.0 | 4647.7 | | | | |
| 0.202 | 5.01 | 2.39 | 163.8 | 468 | 9388 | 2607.7 | 1395.5 | 6089.6 | 4694.1 | | | | |
| 0.206 | 5.11 | 2.40 | 165.5 | 470 | 9479 | 2586.6 | 1416.6 | 6156.1 | 4739.5 | | | | |
| 0.210 | 5.20 | 2.40 | 166.2 | 472 | 9514 | 2563.7 | 1439.5 | 6196.6 | 4757.1 | | | | |
| 0.214 | 5.31 | 2.40 | 167.9 | 474 | 9599 | 2538.8 | 1464.4 | 6264.1 | 4799.7 | | | | |
| 0.218 | 5.41 | 2.40 | 169.5 | 475 | 9683 | 2519.3 | 1483.9 | 6325.3 | 4841.5 | | | | |
| 0.221 | 5.49 | 2.40 | 170.6 | 477 | 9739 | 2495.2 | 1508.0 | 6377.5 | 4869.5 | | | | |
| 0.225 | 5.58 | 2.41 | 171.8 | 479 | 9799 | 2471.9 | 1531.3 | 6430.8 | 4899.5 | | | | |
| 0.229 | 5.67 | 2.41 | 173.2 | 481 | 9869 | 2447.2 | 1556.0 | 6490.6 | 4934.6 | | | | |
| 0.233 | 5.77 | 2.41 | 174.3 | 482 | 9922 | 2422.3 | 1580.9 | 6542.1 | 4961.2 | | | | |
| 0.237 | 5.87 | 2.41 | 175.5 | 484 | 9979 | 2396.0 | 1607.2 | 6597.0 | 4989.7 | | | | |
| 0.240 | 5.96 | 2.42 | 176.5 | 486 | 10032 | 2367.9 | 1635.3 | 6651.2 | 5015.9 | | | | |
| 0.244 | 6.05 | 2.42 | 178.0 | 488 | 10107 | 2344.7 | 1658.5 | 6712.2 | 5053.7 | | | | |
| 0.248 | 6.15 | 2.42 | 178.5 | 490 | 10126 | 2319.6 | 1683.6 | 6746.7 | 5063.1 | | | | |
| 0.252 | 6.25 | 2.42 | 179.7 | 491 | 10180 | 2294.8 | 1708.4 | 6798.7 | 5090.2 | | | | |
| 0.255 | 6.33 | 2.43 | 180.2 | 493 | 10200 | 2266.4 | 1736.8 | 6836.7 | 5099.8 | | | | |
| 0.259 | 6.42 | 2.43 | 180.4 | 495 | 10201 | 2239.4 | 1763.8 | 6864.2 | 5100.3 | | | | |
| 0.263 | 6.53 | 2.43 | 181.7 | 497 | 10263 | 2213.1 | 1790.1 | 6921.6 | 5131.5 | | | | |
| 0.267 | 6.61 | 2.43 | 182.1 | 498 | 10277 | 2187.2 | 1816.0 | 6954.5 | 5138.6 | | | | |
| 0.271 | 6.71 | 2.44 | 182.8 | 500 | 10304 | 2166.7 | 1836.5 | 6988.2 | 5151.8 | | | | |
| 0.275 | 6.82 | 2.44 | 184.2 | 502 | 10370 | 2150.3 | 1852.9 | 7037.8 | 5184.9 | | | | |
| 0.279 | 6.91 | 2.44 | 185.3 | 504 | 10424 | 2135.0 | 1868.2 | 7080.2 | 5212.0 | | | | |
| 0.283 | 7.02 | 2.44 | 186.5 | 506 | 10481 | 2112.2 | 1891.0 | 7131.7 | 5240.7 | | | | |
| 0.286 | 7.10 | 2.45 | 186.7 | 508 | 10483 | 2091.6 | 1911.6 | 7153.3 | 5241.7 | | | | |
| 0.290 | 7.18 | 2.45 | 187.7 | 509 | 10531 | 2066.0 | 1937.2 | 7202.5 | 5265.3 | | | | |
| 0.293 | 7.28 | 2.45 | 189.3 | 511 | 10608 | 2040.8 | 1962.4 | 7266.3 | 5304.0 | | | | |
| 0.297 | 7.37 | 2.45 | 189.8 | 513 | 10626 | 2017.6 | 1985.6 | 7298.6 | 5313.0 | | | | |
| 0.301 | 7.47 | 2.46 | 190.8 | 515 | 10668 | 1993.5 | 2009.7 | 7343.8 | 5334.1 | | | | |
| 0.305 | 7.57 | 2.46 | 191.2 | 517 | 10680 | 1967.0 | 2036.2 | 7376.3 | 5340.1 | | | | |
| 0.309 | 7.65 | 2.46 | 191.8 | 518 | 10702 | 1939.7 | 2063.5 | 7414.3 | 5350.8 | | | | |
| 0.313 | 7.76 | 2.46 | 192.1 | 520 | 10702 | 1914.0 | 2089.2 | 7443.3 | 5354.0 | | | | |
| 0.317 | 7.85 | 2.47 | 192.5 | 522 | 10718 | 1887.6 | 2115.6 | 7443.3 7474.7 | 5354.0 | | | | |

Consolidated Undrained Triaxial Compression ASTM D4767 ADMANCED TERRATESTING

CLIENT JOB NO. **PROJECT** PROJECT NO. LOCATION

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

DATE TESTED 03/12/20 **TECHNICIAN** CAL/SPH BORING NO. DEPTH

SAMPLE NO. DATE SAMPLED

SAMPLED BY **DESCRIPTION** B-203, 202 & 201

15.8-24.9' NQ-2, 1 & 3

| | | | | Poi | nt A | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|---|------------------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.320 | 7.94 | 2.47 | 192.5 | 524 | 10704 | 1860.9 | 2142.3 | 7494.5 | 5352.2 |
| 0.324 | 8.03 | 2.47 | 193.5 | 525 | 10750 | 1838.8 | 2164.4 | 7539.2 | 5374.9 |
| 0.328 | 8.12 | 2.47 | 194.3 | 527 | 10782 | 1817.5 | 2185.7 | 7576.8 | 5391.1 |
| 0.332 | 8.22 | 2.48 | 195.2 | 529 | 10823 | 1792.6 | 2210.6 | 7622.0 | 5411.3 |
| 0.335 | 8.31 | 2.48 | 195.1 | 531 | 10800 | 1765.3 | 2237.9 | 7638.1 | 5400.2 |
| 0.339 | 8.42 | 2.48 | 195.2 | 533 | 10792 | 1744.8 | 2258.4 | 7654.3 | 5395.9 |
| 0.343 | 8.51 | 2.48 | 195.7 | 535 | 10810 | 1720.8 | 2282.4 | 7687.6 | 5405.2 |
| 0.347 | 8.61 | 2.49 | 196.8 | 536 | 10861 | 1700.7 | 2302.5 | 7733.0 | 5430.6 |
| 0.350 | 8.69 | 2.49 | 197.2 | 538 | 10872 | 1679.6 | 2323.6 | 7759.6 | 5436.0 |
| 0.355 | 8.80 | 2.49 | 198.5 | 540 | 10931 | 1665.4 | 2337.8 | 7803.3 | 5465.5 |
| 0.358 | 8.88 | 2.49 | 198.8 | 542 | 10937 | 1643.3 | 2359.9 | 7828.6 | 5468.7 |
| 0.362 | 8.98 | 2.50 | 199.2 | 544 | 10942 | 1629.4 | 2373.8 | 7844.7 | 5471.0 |
| 0.366 | 9.08 | 2.50 | 199.6 | 545 | 10955 | 1613.1 | 2390.1 | 7867.8 | 5477.7 |
| 0.370 | 9.18 | 2.50 | 199.7 | 547 | 10942 | 1591.9 | 2411.3 | 7882.4 | 5471.1 |
| 0.374 | 9.27 | 2.51 | 200.6 | 549 | 10979 | 1570.1 | 2433.1 | 7922.8 | 5489.7 |
| 0.378 | 9.37 | 2.51 | 200.6 | 551 | 10967 | 1545.6 | 2457.6 | 7941.1 | 5483.4 |
| 0.382 | 9.48 | 2.51 | 201.2 | 553 | 10987 | 1524.1 | 2479.1 | 7972.6 | 5493.5 |
| 0.386 | 9.56 | 2.51 | 201.2 | 555 | 10976 | 1497.3 | 2505.9 | 7994.1 | 5488.2 |
| 0.390 | 9.67 | 2.52 | 201.2 | 557 | 10961 | 1473.9 | 2529.3 | 8009.6 | 5480.3 |
| 0.393 | 9.75 | 2.52 | 202.2 | 558 | 11005 | 1451.4 | 2551.8 | 8054.4 | 5502.5 |
| 0.397 | 9.86 | 2.52 | 202.7 | 560 | 11015 | 1427.9 | 2575.3 | 8082.7 | 5507.3 |
| 0.402 | 9.96 | 2.52 | 203.2 | 562 | 11033 | 1405.4 | 2597.8 | 8114.1 | 5516.3 |
| 0.405 | 10.05 | 2.53 | 202.9 | 564 | 11001 | 1385.3 | 2617.9 | 8118.4 | 5500.5 |
| 0.409 | 10.14 | 2.53 | 203.7 | 566 | 11034 | 1368.1 | 2635.1 | 8151.9 | 5516.8 |
| 0.413 | 10.24 | 2.53 | 204.5 | 568 | 11065 | 1349.0 | 2654.2 | 8186.6 | 5532.4 |
| 0.416 | 10.32 | 2.53 | 204.7 | 569 | 11062 | 1329.4 | 2673.8 | 8204.9 | 5531.1 |
| 0.421 | 10.43 | 2.54 | 205.6 | 571 | 11100 | 1310.4 | 2692.8 | 8242.7 | 5549.9 |
| 0.425 | 10.54 | 2.54 | 206.1 | 573 | 11108 | 1295.8 | 2707.4 | 8261.2 | 5553.8 |
| 0.428 | 10.62 | 2.54 | 207.1 | 575 | 11152 | 1276.8 | 2726.4 | 8302.5 | 5576.1 |
| 0.433 | 10.73 | 2.55 | 206.8 | 577 | 11119 | 1261.0 | 2742.2 | 8301.5 | 5559.3 |
| 0.437 | 10.83 | 2.55 | 207.8 | 579 | 11162 | 1251.2 | 2752.0 | 8333.0 | 5581.0 |
| 0.440 | 10.92 | 2.55 | 208.8 | 581 | 11201 | 1240.8 | 2762.4 | 8363.1 | 5600.7 |
| 0.444 | 11.01 | 2.55 | 209.6 | 582 | 11233 | 1229.6 | 2773.6 | 8390.2 | 5616.7 |
| 0.448 | 11.11 | 2.56 | 210.1 | 584 | 11247 | 1214.5 | 2788.7 | | |
| 0.452 | 11.21 | 2.56 | 211.4 | 586 | 11305 | 1214.5 | 2797.7 | 8412.1 | 5623.5 |
| 0.456 | 11.30 | 2.56 | 211.6 | 588 | 11307 | 1194.3 | 2808.9 | 8450.2 | 5652.4 |
| 0.460 | 11.40 | 2.57 | 212.7 | 590 | 11351 | 1185.6 | | 8462.2 | 5653.3 |
| 0.464 | 11.50 | 2.57 | 213.3 | 592 | 11372 | | 2817.6 | 8492.9 | 5675.3 |
| 0.468 | 11.60 | 2.57 | 213.3 | 592 593 | | 1178.9 | 2824.3 | 8510.2 8530.0 | 5685.9 |
| 0.471 | 11.69 | 2.57 | 214.4 | 595 | 11414 | 1171.2 | 2832.0 | 8539.0 8547.6 | 5707.0 |
| 0.475 | 11.77 | 2.57 | 214.0 | 595 597 | 11411 | 1161.1 | 2842.1 | 8547.6 | 5705.5 |
| 0.479 | 11.77 | | | | 11440 | 1150.5 | 2852.7 | 8572.4 | 5719.8 |
| U.713 | 11.07 | 2.58 | 215.9 | 599 | 11458 | 1140.8 | 2862.4 | 8591.3 | 5728.8 |

ADVANCED TERRATES TING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

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DATE TESTED 03/12/20 TECHNICIAN CAL/SPH BORING NO.

DEPTH SAMPLE NO.

DATE SAMPLED SAMPLED BY DESCRIPTION B-203, 202 & 201

15.8-24.9' NQ-2, 1 & 3

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| | | | | Poi | nt A | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf) |
| 0.483 | 11.97 | 2.58 | 216.0 | 601 | 11448 | 1132.6 | 2870.6 | 8594.8 | 5724.2 |
| 0.486 | 12.05 | 2.58 | 216.3 | 602 | 11448 | 1124.6 | 2878.6 | 8602.8 | 5724.2 |
| 0.489 | 12.14 | 2.59 | 217.3 | 604 | 11495 | 1117.0 | 2886.2 | 8633.9 | 5747.7 |
| 0.493 | 12.23 | 2.59 | 218.6 | 605 | 11549 | 1110.5 | 2892.7 | 8667.0 | 5774.3 |
| 0.497 | 12.33 | 2.59 | 219.6 | 607 | 11589 | 1101.9 | 2901.3 | 8696.1 | 5794.7 |
| 0.501 | 12.42 | 2.60 | 220.1 | 609 | 11604 | 1091.2 | 2912.0 | 8714.0 | 5802.0 |
| 0.505 | 12.52 | 2.60 | 221.1 | 611 | 11644 | 1080.8 | 2922.4 | 8744.3 | 5821.9 |
| 0.509 | 12.61 | 2.60 | 221.5 | 613 | 11653 | 1072.5 | 2930.7 | 8757.4 | 5826.7 |
| 0.512 | 12.70 | 2.60 | 223.4 | 614 | 11742 | 1063.0 | 2940.2 | 8811.2 | 5871.1 |
| 0.516 | 12.79 | 2.61 | 223.2 | 616 | 11715 | 1052.9 | 2950.3 | 8808.0 | 5857.7 |
| 0.520 | 12.89 | 2.61 | 224.7 | 618 | 11781 | 1045.7 | 2957.5 | 8848.2 | 5890.7 |
| 0.524 | 13.00 | 2.61 | 225.9 | 620 | 11834 | 1037.0 | 2966.2 | 8883.1 | 5916.9 |
| 0.528 | 13.10 | 2.62 | 226.1 | 622 | 11827 | 1025.0 | 2978.2 | 8891.8 | 5913.6 |
| 0.532 | 13.19 | 2.62 | 227.2 | 624 | 11872 | 1018.4 | 2984.8 | 8920.9 | 5936.1 |
| 0.535 | 13.28 | 2.62 | 228.6 | 625 | 11935 | 1008.3 | 2994.9 | 8962.2 | 5967.3 |
| 0.539 | 13.38 | 2.62 | 228.8 | 627 | 11928 | 997.9 | 3005.3 | 8969.4 | 5964.1 |
| 0.543 | 13.48 | 2.63 | 230.1 | 629 | 11982 | 987.2 | 3016.0 | 9007.2 | 5991.2 |
| 0.547 | 13.56 | 2.63 | 230.6 | 631 | 11997 | 976.3 | 3026.9 | 9025.3 | 5998.5 |
| 0.551 | 13.66 | 2.63 | 231.6 | 633 | 12035 | 960.1 | 3043.1 | 9060.4 | 6017.3 |
| 0.555 | 13.76 | 2.64 | 232.6 | 635 | 12074 | 948.2 | 3055.0 | 9092.2 | 6037.2 |
| 0.558 | 13.85 | 2.64 | 233.1 | 636 | 12090 | 934.9 | 3068.3 | 9113.5 | 6045.2 |
| 0.562 | 13.94 | 2.64 | 234.3 | 638 | 12138 | 924.9 | 3078.3 | 9147.2 | 6068.9 |
| 0.566 | 14.04 | 2.64 | 235.1 | 640 | 12165 | 915.0 | 3088.2 | 9170.5 | 6082.3 |
| 0.570 | 14.14 | 2.65 | 237.1 | 642 | 12257 | 906.2 | 3097.0 | 9225.4 | 6128.5 |
| 0.574 | 14.24 | 2.65 | 238.4 | 644 | 12309 | 895.4 | 3107.8 | 9262.4 | 6154.6 |
| 0.577 | 14.32 | 2.65 | 238.2 | 645 | 12286 | 886.8 | 3116.4 | 9259.4 | 6143.0 |

ADMINISTRATESTING
CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED
TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

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03/12/20 CAL/SPH BORING NO.
DEPTH

SAMPLE NO. DATE SAMPLED

SAMPLED BY DESCRIPTION

B-203, 202 & 201 15.8-24.9' NQ-2, 1 & 3 2/(10,6 &17)/2020

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| | | | | Poi | nt B | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------|--------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (pst |
| 0.000 | 0.00 | 2.53 | 0.0 | 0 | 0 | 0.0 | 1497.6 | 1497.6 | 0.0 |
| 0.003 | 80.0 | 2.53 | 18.3 | 15 | 1027 | 351.2 | 1146.4 | 1659.8 | 513.5 |
| 0.006 | 0.16 | 2.53 | 31.7 | 30 | 1770 | 658.5 | 839.1 | 1724.3 | 885.2 |
| 0.011 | 0.27 | 2.54 | 41.5 | 49 | 2308 | 865.4 | 632.2 | 1786.2 | 1154.0 |
| 0.014 | 0.36 | 2.54 | 46.6 | 64 | 2581 | 992.2 | 505.4 | 1795.9 | 1290.5 |
| 0.018 | 0.46 | 2.54 | 51.2 | 82 | 2817 | 1079.6 | 418.0 | 1826.3 | 1408.3 |
| 0.021 | 0.55 | 2.54 | 53.0 | 98 | 2902 | 1151.7 | 345.9 | 1797.0 | 1451.0 |
| 0.025 | 0.65 | 2.55 | 55.1 | 117 | 3001 | 1186.0 | 311.6 | 1811.9 | 1500.4 |
| 0.029 | 0.74 | 2.55 | 56.5 | 133 | 3059 | 1202.9 | 294.7 | 1824.0 | 1529.3 |
| 0.033 | 0.84 | 2.55 | 58.2 | 151 | 3132 | 1209.6 | 288.0 | 1854.1 | 1566.2 |
| 0.036 | 0.92 | 2.55 | 60.9 | 166 | 3270 | 1214.9 | 282.7 | 1917.9 | 1635.1 |
| 0.041 | 1.04 | 2.56 | 62.7 | 186 | 3346 | 1214.2 | 283.4 | 1956.3 | 1673.0 |
| 0.045 | 1.14 | 2.56 | 64.4 | 204 | 3417 | 1210.2 | 287.4 | 1995.9 | 1708.5 |
| 0.048 | 1.24 | 2.56 | 63.7 | 222 | 3359 | 1206.0 | 291.6 | 1971.4 | 1679.7 |
| 0.052 | 1.32 | 2.56 | 66.0 | 237 | 3468 | 1199.0 | 298.6 | 2032.4 | 1733.8 |
| 0.056 | 1.43 | 2.57 | 66.2 | 258 | 3459 | 1190.1 | 307.5 | 2036.9 | 1729.3 |
| 0.060 | 1.53 | 2.57 | 68.4 | 275 | 3558 | 1180.2 | 317.4 | 2096.4 | 1779.0 |
| 0.064 | 1.63 | 2.57 | 69.9 | 292 | 3621 | 1169.3 | 328.3 | 2139.0 | 1810.7 |
| 0.068 | 1.73 | 2.57 | 71.2 | 310 | 3672 | 1157.4 | 340.2 | 2176.4 | 1836.1 |
| 0.072 | 1.84 | 2.58 | 72.3 | 330 | 3711 | 1143.4 | 354.2 | 2209.7 | 1855.5 |
| 0.075 | 1.93 | 2.58 | 74.6 | 347 | 3820 | 1131.7 | 365.9 | 2275.9 | 1910.0 |
| 0.080 | 2.04 | 2.58 | 73.9 | 359 | 3762 | 1118.9 | 378.7 | 2259.7 | 1881.0 |
| 0.083 | 2.12 | 2.58 | 75.9 | 360 | 3869 | 1104.2 | 393.4 | 2327.8 | 1934.4 |
| 0.087 | 2.22 | 2.59 | 76.8 | 360 | 3914 | 1089.1 | 408.5 | 2365.6 | 1957.2 |
| 0.091 | 2.33 | 2.59 | 77.5 | 360 | 3950 | 1075.6 | 422.0 | 2397.0 | 1975.0 |
| 0.095 | 2.43 | 2.59 | 78.9 | 361 | 4019 | 1061.5 | 436.1 | 2445.6 | 2009.5 |
| 0.099 | 2.53 | 2.60 | 80.1 | 361 | 4081 | 1046.5 | 451.1 | 2491.8 | 2040.7 |
| 0.103 | 2.63 | 2.60 | 81.5 | 361 | 4155 | 1032.1 | 465.5 | 2542.8 | 2077.3 |
| 0.106 | 2.72 | 2.60 | 83.0 | 361 | 4236 | 1019.2 | 478.4 | 2596.4 | 2117.9 |
| 0.111 | 2.83 | 2.60 | 84.8 | 362 | 4330 | 1003.9 | 493.7 | 2658.7 | 2165.0 |
| 0.115 | 2.93 | 2.61 | 85.1 | 362 | 4338 | 989.9 | 507.7 | 2676.5 | 2168.9 |
| 0.118 | 3.02 | 2.61 | 86.1 | 362 | 4389 | 976.0 | 521.6 | 2716.2 | 2194.5 |
| 0.122 | 3.13 | 2.61 | 87.5 | 363 | 4461 | 962.5 | 535.1 | 2765.4 | 2230.4 |
| 0.126 | 3.21 | 2.61 | 88.9 | 363 | 4537 | 948.0 | 549.6 | 2818.1 | 2268.5 |
| 0.130 | 3.32 | 2.62 | 90.6 | 363 | 4622 | 934.6 | 563.0 | 2874.2 | 2311.2 |
| 0.134 | 3.43 | 2.62 | 92.4 | 364 | 4715 | 921.3 | 576.3 | 2933.8 | 2357.4 |
| 0.137 | 3.52 | 2.62 | 93.4 | 364 | 4764 | 907.0 | 590.6 | 2972.8 | 2382.1 |
| 0.142 | 3.64 | 2.63 | 95.0 | 364 | 4847 | 894.8 | 602.8 | 3026.1 | 2423.3 |
| 0.146 | 3.73 | 2.63 | 96.5 | 365 | 4924 | 881.2 | 616.4 | 3078.3 | 2461.9 |
| 0.149 | 3.82 | 2.63 | 97.5 | 365 | 4972 | 866.3 | 631.3 | 3117.2 | 2485.9 |
| 0.153 | 3.92 | 2.63 | 98.9 | 365 | 5043 | 852.2 | 645.4 | 3167.1 | 2521.7 |
| 0.157 | 4.02 | 2.64 | 101.1 | 365 | 5160 | 837.8 | 659.8 | 3239.5 | 2579.8 |

ADMINISTRATEST NG
CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION

DATE TESTED

TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

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03/12/20 CAL/SPH BORING NO.
DEPTH

SAMPLE NO. DATE SAMPLED

SAMPLED BY DESCRIPTION

B-203, 202 & 201 15.8-24.9' NQ-2, 1 & 3 2/(10,6 &17)/2020

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| Point B | | | | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|------------------|---------|--|--|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf) | | | | |
| 0.161 | 4.12 | 2.64 | 102.2 | 366 | 5212 | 825.4 | 672.2 | 3278.4 | 2606.2 | | | | |
| 0.165 | 4.21 | 2.64 | 103.8 | 366 | 5292 | 811.2 | 686.4 | 3332.4 | 2646.0 | | | | |
| 0.169 | 4.31 | 2.64 | 105.4 | 366 | 5377 | 797.4 | 700.2 | 3388.7 | 2688.5 | | | | |
| 0.173 | 4.42 | 2.65 | 106.0 | 367 | 5402 | 783.5 | 714.1 | 3415.1 | 2700.9 | | | | |
| 0.177 | 4.53 | 2.65 | 107.5 | 367 | 5477 | 769.0 | 728.6 | 3467.0 | 2738.4 | | | | |
| 0.181 | 4.63 | 2.65 | 109.4 | 367 | 5573 | 754.2 | 743.4 | 3530.1 | 2786.7 | | | | |
| 0.184 | 4.70 | 2.65 | 110.3 | 367 | 5614 | 738.8 | 758.8 | 3565.8 | 2807.0 | | | | |
| 0.188 | 4.82 | 2.66 | 111.7 | 368 | 5684 | 723.9 | 773.7 | 3615.7 | 2841.9 | | | | |
| 0.192 | 4.92 | 2.66 | 114.4 | 368 | 5821 | 709.2 | 788.4 | 3699.1 | 2910.7 | | | | |
| 0.196 | 5.02 | 2.66 | 116.2 | 368 | 5912 | 693.1 | 804.5 | 3760.5 | 2956.0 | | | | |
| 0.200 | 5.13 | 2.67 | 117.3 | 369 | 5967 | 679.3 | 818.3 | 3801.7 | 2983.4 | | | | |
| 0.204 | 5.21 | 2.67 | 118.2 | 369 | 6011 | 663.2 | 834.4 | 3839.7 | 3005.3 | | | | |
| 0.208 | 5.32 | 2.67 | 119.0 | 369 | 6045 | 648.5 | 849.1 | 3871.7 | 3022.6 | | | | |
| 0.212 | 5.41 | 2.67 | 121.6 | 370 | 6177 | 633.6 | 864.0 | 3952.5 | 3088.6 | | | | |
| 0.215 | 5.51 | 2.68 | 123.2 | 370 | 6256 | 618.3 | 879.3 | 4007.5 | 3128.2 | | | | |
| 0.219 | 5.61 | 2.68 | 125.1 | 370 | 6352 | 599.4 | 898.2 | 4074.2 | 3176.0 | | | | |
| 0.223 | 5.71 | 2.68 | 126.3 | 371 | 6405 | 585.4 | 912.2 | 4115.0 | 3202.7 | | | | |
| 0.227 | 5.82 | 2.69 | 127.7 | 371 | 6477 | 566.2 | 931.4 | 4170.1 | 3238.7 | | | | |
| 0.232 | 5.94 | 2.69 | 129.0 | 371 | 6536 | 547.0 | 950.6 | 4218.4 | 3267.8 | | | | |
| 0.236 | 6.03 | 2.69 | 131.1 | 372 | 6639 | 528.7 | 968.9 | 4288.3 | 3319.3 | | | | |
| 0.239 | 6.12 | 2.69 | 131.7 | 372 | 6666 | 509.3 | 988.3 | 4321.2 | 3332.9 | | | | |
| 0.243 | 6.22 | 2.70 | 133.7 | 372 | 6763 | 489.8 | 1007.8 | 4389.3 | 3381.6 | | | | |
| 0.247 | 6.32 | 2.70 | 134.9 | 372 | 6824 | 470.2 | 1027.4 | 4439.2 | 3411.8 | | | | |
| 0.251 | 6.43 | 2.70 | 136.6 | 373 | 6905 | 446.9 | 1050.7 | 4503.3 | 3452.6 | | | | |
| 0.255 | 6.52 | 2.71 | 137.5 | 373 | 6941 | 428.5 | 1069.1 | 4539.5 | 3470.4 | | | | |
| 0.259 | 6.63 | 2.71 | 140.0 | 373 | 7066 | 407.3 | 1090.3 | 4623.3 | 3533.0 | | | | |
| 0.263 | 6.73 | 2.71 | 141.3 | 374 | 7131 | 387.2 | 1110.4 | 4676.0 | 3565.6 | | | | |
| 0.266 | 6.82 | 2.71 | 142.1 | 374 | 7163 | 369.7 | 1127.9 | 4709.4 | 3581.5 | | | | |
| 0.270 | 6.92 | 2.72 | 143.7 | 374 | 7240 | 355.1 | 1142.5 | 4762.4 | 3619.9 | | | | |
| 0.274 | 7.00 | 2.72 | 145.4 | 375 | 7324 | 338.6 | 1159.0 | 4821.0 | 3662.1 | | | | |
| 0.278 | 7.11 | 2.72 | 145.6 | 375 | 7327 | 325.2 | 1172.4 | 4835.7 | 3663.3 | | | | |
| 0.282 | 7.21 | 2.73 | 147.5 | 375 | 7417 | 305.7 | 1191.9 | 4900.3 | 3708.3 | | | | |
| 0.285 | 7.30 | 2.73 | 148.5 | 375 | 7462 | 286.7 | 1210.9 | 4941.7 | 3730.8 | | | | |
| 0.290 | 7.41 | 2.73 | 150.3 | 376 | 7548 | 266.2 | 1231.4 | 5005.5 | 3774.2 | | | | |
| 0.294 | 7.51 | 2.74 | 151.3 | 376 | 7588 | 243.1 | 1254.5 | 5048.6 | 3774.2 | | | | |
| 0.298 | 7.62 | 2.74 | 153.3 | 376 | 7685 | 222.1 | 1275.5 | 5118.2 | 3842.7 | | | | |
| 0.302 | 7.71 | 2.74 | 154.4 | 377 | 7733 | 199.2 | 1298.4 | 5164.7 | 3866.4 | | | | |
| 0.305 | 7.81 | 2.74 | 155.8 | 377 | 7799 | 174.2 | 1323.4 | 5222.7 | 3899.3 | | | | |
| 0.309 | 7.91 | 2.75 | 156.6 | 377 | 7834 | 150.5 | 1347.1 | 5222.7 5264.2 | 3917.1 | | | | |
| 0.313 | 8.01 | 2.75 | 157.6 | 377 | 7874 | 127.2 | 1370.4 | 5307.5 | 3917.1 | | | | |
| 0.317 | 8.11 | 2.75 | 158.3 | 378 | 7904 | 104.2 | 1370.4 | | 3952.2 | | | | |
| 0.321 | 8.22 | 2.76 | 100.0 | 570 | 1004 | 104.2 | 1383.4 | 5345.6 | 393Z.Z | | | | |

ADVANCED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED

TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

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03/12/20 CAL/SPH BORING NO. DEPTH SAMPLE NO.

DATE SAMPLED SAMPLED BY

DESCRIPTION

B-203, 202 & 201 15.8-24.9' NQ-2, 1 & 3 2/(10,6 &17)/2020

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| Point B | | | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--------------------------------------|----------|--------|--|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ₃' | p' (psf) | q (psf | | | |
| 0.326 | 8.34 | 2.76 | 160.6 | 379 | 8000 | 55.7 | 1441.9 | 5441.8 | 3999.8 | | | |
| 0.329 | 8.42 | 2.76 | 161.9 | 379 | 8062 | 35.1 | 1462.5 | 5493.6 | 4031.1 | | | |
| 0.333 | 8.52 | 2.77 | 162.3 | 379 | 8070 | 12.3 | 1485.3 | 5520.4 | 4035.1 | | | |
| 0.337 | 8.63 | 2.77 | 163.2 | 380 | 8110 | -11.9 | 1509.5 | 5564.7 | 4055.2 | | | |
| 0.340 | 8.71 | 2.77 | 163.5 | 380 | 8116 | -37.2 | 1534.8 | 5592.7 | 4057.9 | | | |
| 0.344 | 8.81 | 2.77 | 164.5 | 380 | 8157 | -63.1 | 1560.7 | 5639.2 | 4078.4 | | | |
| 0.348 | 8.91 | 2.78 | 165.0 | 380 | 8178 | -87.0 | 1584.6 | 5673.7 | 4089.0 | | | |
| 0.352 | 9.01 | 2.78 | 165.5 | 381 | 8194 | -114.3 | 1611.9 | 5708.8 | 4096.9 | | | |
| 0.356 | 9.11 | 2.78 | 165.9 | 381 | 8204 | -142.5 | 1640.1 | 5742.1 | 4102.0 | | | |
| 0.360 | 9.20 | 2.79 | 165.3 | 381 | 8160 | -173.2 | 1670.8 | 5750.7 | 4079.9 | | | |
| 0.364 | 9.31 | 2.79 | 165.9 | 382 | 8181 | -201.6 | 1699.2 | 5789.7 | 4090.5 | | | |
| 0.367 | 9.40 | 2.79 | 166.6 | 382 | 8210 | -230.2 | 1727.8 | 5832.7 | 4104.9 | | | |
| 0.371 | 9.50 | 2.80 | 166.7 | 382 | 8205 | -259.2 | 1756.8 | 5859.6 | 4102.7 | | | |
| 0.375 | 9.59 | 2.80 | 167.1 | 382 | 8215 | -290.2 | 1787.8 | 5895.2 | 4107.4 | | | |
| 0.379 | 9.70 | 2.80 | 166.7 | 383 | 8185 | -318.2 | 1815.8 | 5908.5 | 4092.7 | | | |
| 0.383 | 9.80 | 2.80 | 166.9 | 383 | 8186 | -347.6 | 1845.2 | 5938.1 | 4092.9 | | | |
| 0.387 | 9.89 | 2.81 | 165.9 | 383 | 8128 | -376.2 | 1873.8 | 5937.9 | 4064.1 | | | |
| 0.390 | 9.99 | 2.81 | 166.6 | 384 | 8154 | -403.7 | 1901.3 | 5978.1 | 4076.8 | | | |
| 0.394 | 10.09 | 2.81 | 166.8 | 384 | 8152 | -429.2 | 1926.8 | 6003.0 | 4076.1 | | | |
| 0.398 | 10.18 | 2.82 | 166.8 | 384 | 8143 | -457.1 | 1954.7 | 6026.1 | 4071.4 | | | |
| 0.402 | 10.28 | 2.82 | 167.0 | 385 | 8142 | -482.1 | 1979.7 | 6050.7 | 4071.0 | | | |
| 0.406 | 10.38 | 2.82 | 166.8 | 385 | 8125 | -506.2 | 2003.8 | 6066.5 | 4062.7 | | | |
| 0.410 | 10.49 | 2.83 | 167.0 | 385 | 8123 | -532.3 | 2029.9 | 6091.6 | 4061.7 | | | |
| 0.414 | 10.58 | 2.83 | 166.6 | 386 | 8097 | -554.8 | 2052.4 | 6100.7 | 4048.3 | | | |
| 0.418 | 10.68 | 2.83 | 166.5 | 386 | 8079 | -577.3 | 2074.9 | 6114.5 | 4039.6 | | | |
| 0.421 | 10.78 | 2.84 | 165.9 | 386 | 8041 | -599.2 | 2096.8 | 6117.2 | 4020.4 | | | |
| 0.426 | 10.89 | 2.84 | 166.5 | 386 | 8058 | -622.8 | 2120.4 | 6149.3 | 4028.9 | | | |
| 0.430 | 10.99 | 2.84 | 166.2 | 387 | 8032 | -644.9 | 2142.5 | 6158.5 | 4016.0 | | | |
| 0.434 | 11.10 | 2.85 | 165.4 | 387 | 7984 | -666.8 | 2164.4 | 6156.5 | 3992.1 | | | |
| 0.438 | 11.20 | 2.85 | 165.6 | 387 | 7982 | -689.7 | 2187.3 | 6178,1 | 3990.8 | | | |
| 0.441 | 11.29 | 2.85 | 165.0 | 388 | 7945 | -713.2 | 2210.8 | 6183.3 | 3972.5 | | | |
| 0.446 | 11.40 | 2.86 | 164.3 | 388 | 7897 | -734.8 | 2232.4 | 6180.7 | 3948.3 | | | |
| 0.449 | 11.50 | 2.86 | 164.2 | 388 | 7883 | -757.9 | 2255.5 | 6196.8 | 3941.3 | | | |
| 0.453 | 11.60 | 2.86 | 163.6 | 389 | 7847 | -779.5 | 2277.1 | 6200.4 | 3923.3 | | | |
| 0.458 | 11.71 | 2.87 | 163.2 | 389 | 7811 | -801.4 | 2299.0 | 6204.5 | 3905.6 | | | |
| 0.461 | 11.80 | 2.87 | 162.9 | 389 | 7789 | -819.7 | 2317.3 | 6211.8 | 3894.5 | | | |
| 0.465 | 11.90 | 2.87 | 162.3 | 390 | 7749 | -839.4 | 2337.0 | 6211.3 | 3874.3 | | | |
| 0.469 | 12.00 | 2.87 | 162.0 | 390 | 7728 | -859.4 | 2357.0 | 6220.8 | 3863.8 | | | |
| 0.473 | 12.11 | 2.88 | 161.8 | 390 | 7707 | -876.0 | 2373.6 | 6227.2 | 3853.6 | | | |
| 0.477 | 12.21 | 2.88 | 161.2 | 391 | 7665 | -896.4 | 2373.0 | 6226.4 | 3832.4 | | | |
| 0.481 | 12.32 | 2.89 | 161.1 | 391 | 7650 | -912.6 | 2410.2 | 6235.3 | | | | |
| 0.485 | 12.40 | 2.89 | 160.7 | 391 | 7622 | -912.6 -927.9 | 24 IV.Z | 6236.6 | 3825.1 | | | |

ADMINISTRATES THE CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED
TECHNICIAN

RJH Consultants 2679-148 South Boulder Creek - Phase II

16134

03/12/20 CAL/SPH BORING NO.
DEPTH
SAMPLE NO.
DATE SAMPLED
SAMPLED BY
DESCRIPTION

B-203, 202 & 201 15.8-24.9' NQ-2, 1 & 3 2/(10,6 &17)/2020

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| | | | | Poi | nt B | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|---|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.489 | 12.50 | 2.89 | 160.4 | 391 | 7597 | -943.7 | 2441.3 | 6239.6 | 3798.4 |
| 0.493 | 12.61 | 2.89 | 160.3 | 392 | 7583 | -957.9 | 2455.5 | 6246.8 | 3791.4 |
| 0.497 | 12.71 | 2.90 | 160.0 | 392 | 7560 | -972.7 | 2470.3 | 6250.1 | 3779.8 |
| 0.500 | 12.80 | 2.90 | 159.5 | 392 | 7525 | -987.0 | 2484.6 | 6247.4 | 3762.7 |
| 0.505 | 12.92 | 2.90 | 159.8 | 393 | 7530 | -1000.7 | 2498.3 | 6263.2 | 3764.8 |
| 0.508 | 13.00 | 2.91 | 160.2 | 393 | 7543 | -1018.1 | 2515.7 | 6287.0 | 3771.3 |
| 0.512 | 13.11 | 2.91 | 159.6 | 393 | 7499 | -1030.0 | 2527.6 | 6277.0 | 3749.4 |
| 0.516 | 13.20 | 2.91 | 158.8 | 394 | 7450 | -1045.8 | 2543.4 | 6268.5 | 3725.1 |
| 0.520 | 13.30 | 2.92 | 158.4 | 394 | 7424 | -1060.4 | 2558.0 | 6270.2 | 3712.2 |
| 0.524 | 13.40 | 2.92 | 158.8 | 394 | 7435 | -1073.2 | 2570.8 | 6288.1 | 3717.3 |
| 0.528 | 13.50 | 2.92 | 158.2 | 395 | 7394 | -1086.3 | 2583.9 | 6280.9 | 3696.9 |
| 0.531 | 13.60 | 2.93 | 157.6 | 395 | 7359 | -1099.1 | 2596.7 | 6276.0 | 3679.3 |
| 0.536 | 13.70 | 2.93 | 157.6 | 395 | 7346 | -1109.5 | 2607.1 | 6279.9 | 3672.8 |
| 0.540 | 13.81 | 2.93 | 157.3 | 395 | 7325 | -1118.2 | 2615.8 | 6278.2 | 3662.4 |
| 0.544 | 13.91 | 2.94 | 157.4 | 396 | 7320 | -1125.1 | 2622.7 | 6282.6 | 3659.9 |
| 0.548 | 14.01 | 2.94 | 157.4 | 396 | 7307 | -1134.2 | 2631.8 | 6285.5 | 3653.7 |
| 0.551 | 14.09 | 2.94 | 157.0 | 396 | 7282 | -1148.0 | 2645.6 | 6286.8 | 3641.2 |
| 0.555 | 14.21 | 2.95 | 156.4 | 397 | 7242 | -1162.0 | 2659.6 | 6280.7 | 3621.1 |
| 0.559 | 14.30 | 2.95 | 155.8 | 397 | 7203 | -1176.3 | 2673.9 | 6275.5 | 3601.6 |
| 0.563 | 14.39 | 2.96 | 155.1 | 397 | 7160 | -1190.9 | 2688.5 | 6268.3 | 3579.9 |
| 0.567 | 14.50 | 2.96 | 154.8 | 398 | 7137 | -1203.8 | 2701.4 | 6270.0 | 3568.6 |
| 0.571 | 14.60 | 2.96 | 155.1 | 398 | 7140 | -1219.0 | 2716.6 | 6286.6 | 3569.9 |
| 0.574 | 14.69 | 2.97 | 155.0 | 398 | 7127 | -1231.2 | 2728.8 | 6292.2 | 3563.4 |
| 0.578 | 14.80 | 2.97 | 154.1 | 398 | 7074 | -1243.7 | 2741.3 | 6278.3 | 3537.0 |
| 0.582 | 14.89 | 2.97 | 153.6 | 399 | 7044 | -1257.1 | 2754.7 | 6276.5 | 3521.8 |
| 0.586 | 14.99 | 2.98 | 153.0 | 399 | 7004 | -1269.7 | 2767.3 | 6269.2 | 3501.9 |
| 0.590 | 15.10 | 2.98 | 152.8 | 399 | 6987 | -1279.5 | 2777.1 | 6270.8 | 3493.6 |
| 0.594 | 15.20 | 2.98 | 152.0 | 400 | 6937 | -1290.3 | 2787.9 | 6256.3 | 3468.4 |
| 0.598 | 15.31 | 2.99 | 151.8 | 400 | 6917 | -1300.7 | 2798.3 | 6256.7 | 3458.4 |
| 0.601 | 15.36 | 2.99 | 151.2 | 400 | 6884 | -1310.9 | 2808.5 | 6250.5 | 3442.0 |

ATT ADMANCED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED
TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

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03/12/20 CAL/SPH BORING NO. DEPTH SAMPLE NO.

DATE SAMPLED SAMPLED BY

DESCRIPTION

B-203, 202 & 201 15.8-24.9' NO-2 1 & 3

NQ-2, 1 & 3 2/(10,6 &17)/2020

| Point C | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---|------------------------------|---|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.000 | 0.00 | 2.30 | 0.0 | 0 | 0 | 0.0 | 504.0 | 504.0 | 0.0 |
| 0.002 | 0.05 | 2.30 | 15.2 | 10 | 941 | 47.2 | 456.8 | 927.1 | 470.3 |
| 0.006 | 0.15 | 2.30 | 30.3 | 28 | 1869 | 150.2 | 353.8 | 1288.5 | 934.7 |
| 0.009 | 0.22 | 2.30 | 52.5 | 41 | 3240 | 318.9 | 185.1 | 1805.1 | 1620.0 |
| 0.012 | 0.31 | 2.31 | 68.7 | 58 | 4231 | 418.7 | 85.3 | 2200.6 | 2115.3 |
| 0.016 | 0.40 | 2.31 | 82.6 | 75 | 5080 | 486.5 | 17.5 | 2557.4 | 2540.0 |
| 0.020 | 0.50 | 2.31 | 92.9 | 93 | 5695 | 521.8 | -17.8 | 2829.8 | 2847.6 |
| 0.023 | 0.58 | 2.31 | 107.6 | 109 | 6595 | 539.3 | -35.3 | 3262.0 | 3297.3 |
| 0.026 | 0.66 | 2.31 | 125.1 | 125 | 7657 | 548.7 | -44.7 | 3783.7 | 3828.4 |
| 0.031 | 0.77 | 2.32 | 144.8 | 145 | 8854 | 555.6 | -51.6 | 4375.3 | 4426.9 |
| 0.034 | 0.85 | 2.32 | 166.3 | 159 | 10168 | 556.7 | -52.7 | 5031.4 | 5084.0 |
| 0.037 | 0.94 | 2.32 | 189.0 | 177 | 11553 | 557.9 | -53.9 | 5722.7 | 5776.6 |
| 0.041 | 1.02 | 2.32 | 211.6 | 193 | 12926 | 557.2 | -53.2 | 6409.9 | 6463.1 |
| 0.045 | 1.13 | 2.32 | 232.5 | 212 | 14186 | 556.8 | -52.8 | 7040.0 | 7092.8 |
| 0.049 | 1.22 | 2.33 | 250.1 | 229 | 15244 | 552.7 | -48.7 | 7573.5 | 7622.2 |
| 0.052 | 1.30 | 2.33 | 260.6 | 244 | 15869 | 549.1 | -45.1 | 7889.3 | 7934.4 |
| 0.056 | 1.40 | 2.33 | 269.6 | 263 | 16390 | 545.8 | -41.8 | 8153.2 | 8195.0 |
| 0.060 | 1.50 | 2.33 | 277.9 | 282 | 16867 | 547.0 | -43.0 | 8390.3 | 8433.3 |
| 0.064 | 1.59 | 2.34 | 288.9 | 300 | 17510 | 545.6 | -41.6 | 8713.4 | 8755.1 |
| 0.067 | 1.68 | 2.34 | 303.9 | 316 | 18399 | 547.5 | -43.5 | 9156.0 | 9199.6 |
| 0.071 | 1.78 | 2.34 | 320.3 | 334 | 19372 | 546.4 | -42.4 | 9643.6 | 9686.0 |
| 0.075 | 1.87 | 2.34 | 339.1 | 353 | 20493 | 546.8 | -42.8 | 10203.5 | 10246.3 |
| 0.079 | 1.98 | 2.35 | 359.6 | 373 | 21706 | 544.4 | -40.4 | 10812.5 | 10853.0 |
| 0.083 | 2.08 | 2.35 | 379.8 | 377 | 22918 | 543.9 | -39.9 | 11419.0 | 11458.9 |
| 0.086 | 2.16 | 2.35 | 400.7 | 377 | 24182 | 543.7 | -39.7 | 12051.4 | 12091.1 |
| 0.090 | 2.27 | 2.35 | 422.8 | 378 | 25505 | 542.8 | -38.8 | 12713.7 | 12752.5 |
| 0.094 | 2.36 | 2.35 | 445.8 | 378 | 26892 | 539.6 | -35.6 | 13410.6 | 13446.2 |
| 0.098 | 2.45 | 2.36 | 467.9 | 378 | 28217 | 538.9 | -34.9 | 14073.8 | 14108.7 |
| 0.101 | 2.54 | 2.36 | 490.4 | 379 | 29560 | 537.6 | -33.6 | 14746.7 | 14780.2 |
| 0.105 | 2.64 | 2.36 | 513.6 | 379 | 30949 | 536.1 | -32.1 | 15442.1 | 15474.3 |
| 0.108 | 2.72 | 2.36 | 538.0 | 379 | 32408 | 532.9 | -28.9 | 16175.4 | 16204.2 |
| 0.113 | 2.83 | 2.37 | 562.7 | 379 | 33875 | 534.0 | -30.0 | 16907.4 | 16937.4 |
| 0.116 | 2.92 | 2.37 | 587.5 | 380 | 35352 | 532.3 | -28.3 | 17647.5 | 17675.8 |
| 0.120 | 3.01 | 2.37 | 612.1 | 380 | 36810 | 530.4 | -26.4 | 18378.7 | 18405.2 |
| 0.124 | 3.11 | 2.37 | 636.7 | 380 | 38263 | 529.0 | -25.0 | 19106.3 | 19131.3 |
| 0.128 | 3.22 | 2.38 | 661.6 | 381 | 39732 | 525.8 | -21.8 | 19844.1 | 19865.8 |
| 0.132 | 3.31 | 2.38 | 687.3 | 381 | 41250 | 523.3 | -19.3 | 20605.6 | 20624.9 |
| 0.136 | 3.40 | 2.38 | 712.5 | 381 | 42734 | 517.4 | -13.4 | 21353.4 | 21366.8 |
| 0.140 | 3.50 | 2.38 | 738.9 | 382 | 44289 | 513.5 | -9.5 | 22134.8 | 22144.4 |
| 0.143 | 3.59 | 2.38 | 764.2 | 382 | 45771 | 502.9 | 1.1 | 22886.4 | 22885.3 |
| 0.147 | 3.69 | 2.39 | 778.6 | 382 | 46588 | 467.8 | 36.2 | 23330.3 | 23294.0 |
| 0.151 | 3.79 | 2.39 | 804.2 | 383 | 48089 | 454.0 | 50.0 | 24094.5 | 24044.5 |

ADMAICED TERRATESTING

Consolidated Undrained Triaxial Compression ASTM D4767

CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED
TECHNICIAN

RJH Consultants 2679-148 South Boulder Creek - Phase II 16134

03/12/20 CAL/SPH BORING NO. DEPTH SAMPLE NO. DATE SAMPLED SAMPLED BY DESCRIPTION B-203, 202 & 201 15.8-24.9' NQ-2, 1 & 3 2/(10,6 &17)/2020

| Point C | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---|------------------------------|---|--------------------|------------------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.155 | 3.88 | 2.39 | 821.5 | 383 | 49083 | 420.3 | 83.7 | 24625.0 | 24541.3 |
| 0.158 | 3.97 | 2.39 | 822.2 | 383 | 49082 | 293.0 | 211.0 | 24752.1 | 24541.2 |
| 0.163 | 4.09 | 2.40 | 713.4 | 384 | 42480 | -111.9 | 615.9 | 21855.7 | 21239.8 |
| 0.167 | 4.19 | 2.40 | 691.9 | 384 | 41145 | -427.6 | 931.6 | 21503.9 | 20572.3 |
| 0.172 | 4.31 | 2.40 | 543.8 | 384 | 32212 | -1177.4 | 1681.4 | 17787.3 | 16105.9 |
| 0.178 | 4.47 | 2.41 | 380.5 | 385 | 22389 | -1968.7 | 2472.7 | 13667.0 | 11194.3 |
| 0.183 | 4.58 | 2.41 | 387.6 | 385 | 22783 | -2221.1 | 2725.1 | 14116.6 | 11391.5 |
| 0.187 | 4.68 | 2.41 | 393.5 | 385 | 23111 | -2396.4 | 2900.4 | 14456.1 | 11555.7 |
| 0.191 | 4.78 | 2.41 | 394.8 | 386 | 23165 | -2545.5 | 3049.5 | 14631.9 | 11582.4 |
| 0.194 | 4.87 | 2.42 | 401.4 | 386 | 23534 | -2673.2 | 3177.2 | 14944.1 | 11766.9 |
| 0.198 | 4.97 | 2.42 | 405.0 | 386 | 23726 | -2793.4 | 3297.4 | 15160.2 | 11862.9 |
| 0.203 | 5.08 | 2.42 | 398.5 | 387 | 23311 | -2899.1 | 3403.1 | 15058.4 | 11655.3 |
| 0.206 | 5.17 | 2.42 | 388.5 | 387 | 22691 | -3008.5 | 3512.5 | 14857.9 | 11345.4 |
| 0.211 | 5.29 | 2.43 | 391.7 | 387 | 22854 | -3097.3 | 3601.3 | 15028.3 | 11427.0 |
| 0.215 | 5.39 | 2.43 | 391.1 | 388 | 22788 | -3190.7 | 3694.7 | 15089.0 | 11394.2 |
| 0.219 | 5.49 | 2.43 | 380.3 | 388 | 22127 | -3262.7 | 3766.7 | 14830.0 | 11063.3 |
| 0.223 | 5.60 | 2.44 | 374.4 | 388 | 21749 | -3338.7 | 3842.7 | 14717.3 | 10874.6 |
| 0.227 | 5.70 | 2.44 | 362.4 | 389 | 21019 | -3421.7 | 3925.7 | 14435.4 | 10509.7 |
| 0.231 | 5.80 | 2.44 | 361.7 | 389 | 20953 | -3495.3 | 3999.3 | 14476.0 | 10476.7 |
| 0.236 | 5.91 | 2.44 | 358.0 | 389 | 20714 | -3566.9 | 4070.9 | 14427.7 | 10356.8 |
| 0.240 | 6.01 | 2.45 | 358.8 | 390 | 20738 | -3629.7 | 4133.7 | 14502.8 | 10369.1 |
| 0.244 | 6.11 | 2.45 | 358.1 | 390 | 20675 | -3679.1 | 4183.1 | 14520.4 | 10337.3 |
| 0.247 | 6.20 | 2.45 | 358.6 | 390 | 20683 | -3727.8 | 4231.8 | 14573.1 | 10341.3 |
| 0.252 | 6.32 | 2.45 | 358.0 | 391 | 20618 | -3769.2 | 4273.2 | 14582.4 | 10309.2 |
| 0.256 | 6.42 | 2.46 | 357.2 | 391 | 20551 | -3806.7 | 4310.7 | 14586.0 | 10275.3 |
| 0.259 | 6.50 | 2.46 | 352.3 | 391 | 20243 | -3838.5 | 4342.5 | 14463.9 | 10121.4 |
| 0.264 | 6.61 | 2.46 | 348.3 | 392 | 19984 | -3865.1 | 4369.1 | 14361.3 | 9992.2 |
| 0.267 | 6.70 | 2.46 | 348.4 | 392 | 19972 | -3888.1 | 4392.1 | 14377.9 | 9985.8 |
| 0.271 | 6.80 | 2.47 | 336.2 | 392 | 19236 | -3923.1 | 4427.1 | 14045.2 | 9618.1 |
| 0.276 | 6.92 | 2.47 | 332.7 | 393 | 19007 | -3951.2 | 4455.2 | 13958.5 | 9503.3 |
| 0.279 | 7.01 | 2.47 | 323.9 | 393 | 18477 | -3987.5 | 4491.5 | 13729.8 | 9238.3 |
| 0.284 | 7.11 | 2.47 | 324.6 | 393 | 18493 | -4024.8 | 4528.8 | 13775.4 | 9246.7 |
| 0.288 | 7.21 | 2.48 | 319.3 | 394 | 18169 | -4065.4 | 4569.4 | 13654.1 | 9084.6 |
| 0.291 | 7.31 | 2.48 | 319.2 | 394 | 18143 | -4098.0 | 4602.0 | 13673.7 | 9071.6 |
| 0.296 | 7.41 | 2.48 | 317.4 | 394 | 18016 | -4132.5 | 4636.5 | 13644.7 | 9008.2 |
| 0.299 | 7.51 | 2.49 | 315.4 | 395 | 17878 | -4168.0 | 4672.0 | 13611.1 | 8939.2 |
| 0.304 | 7.62 | 2.49 | 313.3 | 395 | 17736 | -4206.4 | 4710.4 | 13578.3 | 8867.9 |
| 0.308 | 7.72 | 2.49 | 313.1 | 395 | 17705 | -4242.2 | 4746.2 | 13578.3 | 8852.6 |
| 0.312 | 7.81 | 2.49 | 312.1 | 396 | 17626 | -4278.0 | 4740.2 | 13595.2 | 8813.2 |
| 0.316 | 7.93 | 2.50 | 313.1 | 396 | 17663 | -4310.1 | 4814.1 | 13645.8 | 8831.7 |
| 0.320 | 8.02 | 2.50 | 312.7 | 396 | 17620 | -4310.1 -4340.4 | | | |
| 0.324 | 8.12 | 2.50 | 311.9 | 397 | 17554 | -4340.4 -4369.1 | 4844.4 4873.1 | 13654.3 13649.9 | 8810.0 8776.8 |



CLIENT
JOB NO.
PROJECT
PROJECT NO.
LOCATION
DATE TESTED

TECHNICIAN

RJH Consultants 2679-148

South Boulder Creek - Phase II

16134

03/12/20 CAL/SPH BORING NO.

DEPTH SAMPLE NO.

DATE SAMPLED

SAMPLED BY

DESCRIPTION shale cores

B-203, 202 & 201

15.8-24.9'

NQ-2, 1 & 3 2/(10,6 &17)/2020

--

| Point C | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---|------------------------------|---|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.328 | 8.22 | 2.50 | 311.0 | 397 | 17483 | -4398.4 | 4902.4 | 13644.1 | 8741.7 |
| 0.332 | 8.33 | 2.51 | 311.1 | 397 | 17469 | -4426.8 | 4930.8 | 13665.4 | 8734.6 |
| 0.337 | 8.44 | 2.51 | 310.6 | 398 | 17418 | -4450.1 | 4954.1 | 13663.1 | 8709.0 |
| 0.340 | 8.53 | 2.51 | 308.0 | 398 | 17252 | -4476.5 | 4980.5 | 13606.6 | 8626.1 |
| 0.344 | 8.63 | 2.52 | 307.9 | 398 | 17223 | -4494.9 | 4998.9 | 13610.1 | 8611.3 |
| 0.348 | 8.72 | 2.52 | 307.6 | 398 | 17191 | -4514.6 | 5018.6 | 13614.2 | 8595.6 |
| 0.352 | 8.83 | 2.52 | 307.1 | 399 | 17141 | -4532.8 | 5036.8 | 13607.3 | 8570.5 |
| 0.356 | 8.92 | 2.52 | 307.5 | 399 | 17146 | -4550.8 | 5054.8 | 13627.9 | 8573.1 |
| 0.360 | 9.03 | 2.53 | 307.0 | 399 | 17096 | -4570.8 | 5074.8 | 13622.7 | 8547.9 |
| 0.365 | 9.14 | 2.53 | 306.2 | 400 | 17027 | -4591.6 | 5095.6 | 13608.9 | 8513.3 |
| 0.369 | 9.24 | 2.53 | 305.1 | 400 | 16943 | -4609.1 | 5113.1 | 13584.9 | 8471.7 |
| 0.373 | 9.35 | 2.54 | 304.0 | 400 | 16863 | -4627.0 | 5131.0 | 13562.6 | 8431.6 |



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-203

DEPTH

15.8-16.3'

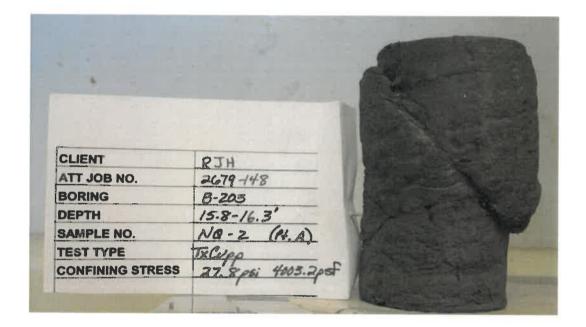
SAMPLE NO.

NQ-2 (Pt. A)

DATE SAMPLED 2/10/20

shale core

DESCRIPTION



| File | name: |
|------|-------|

NOTES

2679148__lmage_20_03_24_14_13_55



ADVANCED TERRA TESTING

CLIENT RJH Consultants

JOB NO. 2679-148

PROJECT South Boulder Creek - Phase II

PROJECT NO. 16134

LOCATION --

BORING NO.

B-202

DEPTH

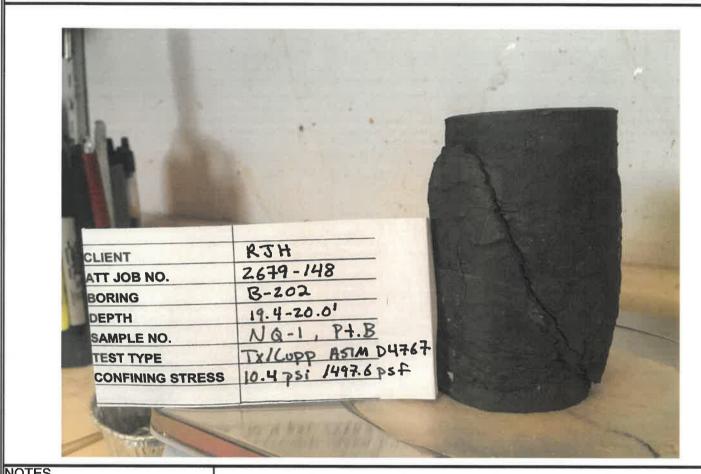
19.4-20.0'

SAMPLE NO. NQ-1 Pt B

DATE SAMPLED

DESCRIPTION

TxCupp 10.4 psi / 1497.6 psf



| NOTES | | | |
|-------|--|--|--|
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| | | | |
| | | | |

File name: 2679148__lmage_20_03_25_16_10_19



CLIENT

RJH Consultants

JOB NO.

2679-148

PROJECT

South Boulder Creek - Phase II

PROJECT NO. LOCATION

16134

BORING NO.

B-201

DEPTH

24.4-24.9'

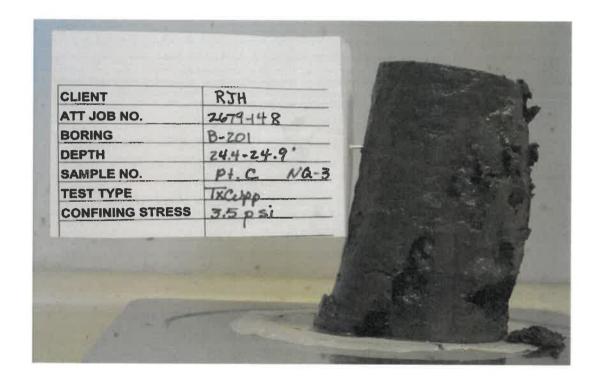
SAMPLE NO.

NQ-3 (Pt. C)

DATE SAMPLED 2/17/20

DESCRIPTION

shale core



| 11 | | | |
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| | | _ | |
| 11 | | | |
| | | | |
| | | | |

NOTES

File name:

2679148__lmage_20_03_24_14_15_30



CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

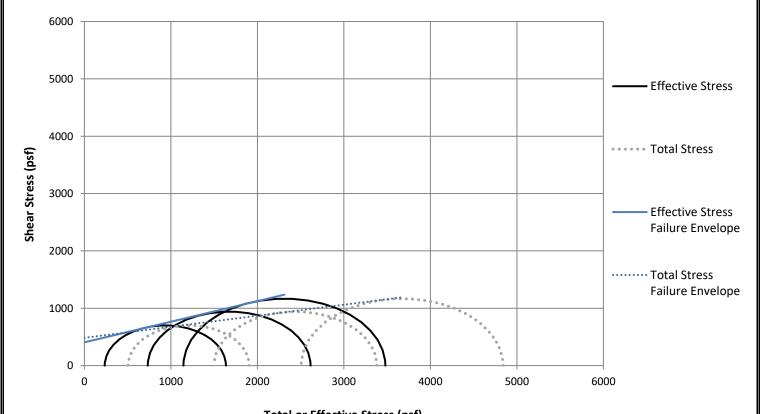
TECHNICIAN CAL

NOTES:

| Effective Stress | Total Stress |
|-----------------------------------|-----------------------------------|
| Internal Friction Angle - φ: 19.8 | Internal Friction Angle - φ: 10.9 |
| Cohesion (psf): 406 | Cohesion (psf): 485 |
| Cohesion (kPa): 19.4 | Cohesion (kPa): 23.2 |
| Modified Friction Angle - ψ: 18.7 | Modified Friction Angle - ψ: 10.7 |
| Modified Cohesion - a (psf): 382 | Modified Cohesion - a (psf): 476 |
| Modified Cohesion - a (kPa): 18.3 | Modified Cohesion - a (kPa): 22.8 |

Raw Data Files 2679-168_cupp_16134_pt a.trx, 2679-168_cupp_16134_pt B.trx, 2679-168_cupp_16134_pt C.trx,





Total or Effective Stress (psf)

 Data entry by:
 CAL
 Date: 02/15/22

 Checked by:
 JJA
 Date: 02/17/22

 File name:
 2679168_TxCuPP ASTM D4767_0.xlsm
 Page 1 of 8

Appendix J.1 216 of 262



RJH Consultants

2679-168

South Boulder Creek Phase II

SAMPLE NO.

BORING NO.

TP-204, B-216, B-217 (P) 0-15' composite

DEPTH Bu-1, C-4, C-6

DATE SAMPLED SAMPLED BY

DESCRIPTION remolded -3/8"

LOCATION DATE TESTED **TECHNICIAN**

CLIENT

JOB NO.

PROJECT

PROJECT NO.

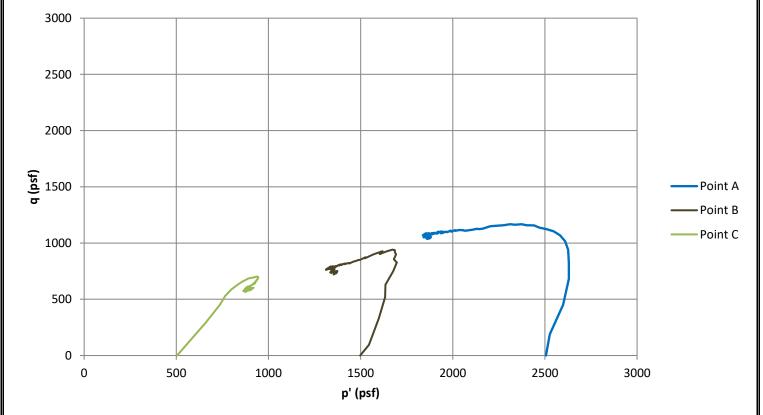
02/01/22 CAL

16134

| Shear Summary at Peak Deviator Stress | 3 |
|---------------------------------------|---|
|---------------------------------------|---|

| Shear Summary at Peak Deviator Stress | | | | | | | | |
|---|---------|---------|---------|--|--|--|--|--|
| | Point A | Point B | Point C | | | | | |
| Peak Deviator Stress (psf): | 2335 | 1883 | 1403 | | | | | |
| Peak Deviator Stress (kPa): | 111.8 | 90.2 | 67.2 | | | | | |
| Major Principal Stress (psf) - σ_{1f} : | 4841 | 3381 | 1907 | | | | | |
| Major Principal Stress (kPa) - σ_{1f} : | 231.8 | 161.9 | 91.3 | | | | | |
| Minor Principal Stress (psf) - σ_{3f} : | 2506 | 1498 | 504 | | | | | |
| Minor Principal Stress (kPa) - σ_{3f} : | 120.0 | 71.7 | 24.1 | | | | | |
| Effective Major Principal Stress (psf) - σ' _{1f} : | 3479 | 2615 | 1636 | | | | | |
| Effective Major Principal Stress (kPa) - σ' _{1f} : | 166.6 | 125.2 | 78.4 | | | | | |
| Effective Minor Principal Stress (psf) - σ' _{3f} : | 1144 | 732 | 234 | | | | | |
| Effective Minor Principal Stress (kPa) - $\sigma^{\mbox{\tiny 1}}_{3f}$: | 54.8 | 35.1 | 11.2 | | | | | |
| | | | | | | | | |

p' - q Diagram



2679168__TxCuPP ASTM D4767_0.xlsm File name:

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Appendix J.1 217 of 262



ASTM D 4767

CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

TECHNICIAN CAL

Point A

| Before Test Mass of Wet Soil (g): | 732.44 | Initial Wet Density (pcf): | 122.3 |
|-----------------------------------|--------|------------------------------|-------|
| After Test Mass of Wet Soil (g): | 765.58 | Initial Dry Density (pcf): | 104.2 |
| Mass of Dry Soil and Pan (g): | 885.10 | Initial Wet Density (kg/m³): | 1958 |
| Mass of Pan (g): | 260.68 | Initial Dry Density (kg/m³): | 1669 |
| Diameter (in): | 2.407 | Initial Moisture (%): | 17.3 |
| Initial Sample Height (in): | 5.016 | Final Wet Density (pcf): | 131.3 |
| After Consolidation Height (in): | 4.998 | Final Dry Density (pcf): | 107.1 |
| Assumed Specific Gravity: | 2.65 | Final Wet Density (kg/m³): | 2104 |
| | | Final Dry Density (kg/m³): | 1716 |
| Back Pressure (psi): | 78.0 | Final Moisture (%): | 22.6 |
| O-II D (:\) | 05.4 | | |

Cell Pressure (psi): 95.4

Initial Effective Stress (psi): 17.4 Membrane Correction Factor (lb/in²): 40.78

Initial Effective Stress (kPa): 120.0 Filter Paper Load Capacity (lb/in): 1.1

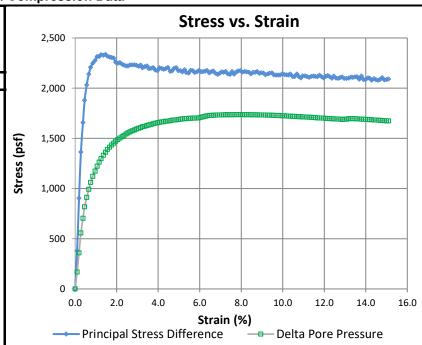
Strain Rate (in/min): 0.0049

Triaxial Compression Data

Peak Deviator Stress (psf): 2335
Peak Deviator Stress (kPa): 111.8

Parameters at Peak Deviator Stress

Major Principal Stress (psf) - σ_{1f} : 4841 Major Principal Stress (kPa) - σ_{1f} : 231.8 Minor Principal Stress (psf) - σ_{3f} : 2506 Minor Principal Stress (kPa) - σ_{3f} : 120.0 Induced Pore Pressure (psf): 1361.28 Induced Pore Pressure (kPa): 65.18 Effective Major Principal Stress (psf) - σ'_{1f}: 3479.42 Effective Major Principal Stress (kPa) - σ'_{1f} : 166.60 Effective Minor Principal Stress (psf) - σ'_{3f}: 1144.32 Effective Minor Principal Stress (kPa) - σ'_{3f}: 54.79 p' (psf): 2312 1168 q (psf): p' (kPa): 110.7 55.9 q (kPa): Strain (%): 1.47



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File name: 2679168__TxCuPP ASTM D4767_0.xlsm

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ASTM D 4767

CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED --LOCATION -- SAMPLED BY ---

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

TECHNICIAN CAL

Consolidation - Point A

| Initial Saturation (%): | 78.1 | Initial Volume of Sample (cc): | 374.0 |
|---------------------------------|-------|---|-------|
| Final Saturation (%): | 100.0 | Final Volume of Sample (cc): | 363.9 |
| Cell Pressure (psi): | 95.4 | Volume Change After Consolidation (cc): | 22.2 |
| Back Pressure (psi): | 78.0 | Initial Dial Reading (in): | 0.200 |
| Effective Stress (psi): | 17.4 | Final Dial Reading (in): | 0.218 |
| Effective Stress (kPa): | 120.0 | Height Change (in): | 0.018 |
| Cell Expansion Correction (cc): | 12.11 | Initial Area (cm²): | 29.36 |
| Cell ID: | 17S | Final Area (cm²): | 28.67 |
| | | | |

T50 (min): 4.05

| Elapsed Time (min) | Square Root of Time (√min) | Burette Reading (cc) | Volume Change (cc) | Consolidation Data |
|-----------------------|----------------------------------|----------------------------|-----------------------|-------------------------------------|
| 0 | 0.00 | 0.90 | 0.00 |] |
| 0.1 | 0.32 | 6.00 | 5.10 | 2.0 |
| 0.25 | 0.50 | 7.60 | 6.70 | |
| 0.5 | 0.71 | 9.00 | 8.10 | 4.0 |
| 1 | 1.00 | 10.20 | 9.30 | |
| 2 | 1.41 | 11.10 | 10.20 | Nolume Change (C) 8.0 8.0 10.0 10.0 |
| 4 | 2.00 | 11.60 | 10.70 | |
| 9 | 3.00 | 12.10 | 11.20 | ਤੱ _{8.0} |
| 16 | 4.00 | 12.30 | 11.40 | 9 |
| 30 | 5.48 | 12.60 | 11.70 | 5 10.0 |
| 60 | 7.75 | 12.90 | 12.00 | > 10.0 |
| 120 | 10.95 | 13.10 | 12.20 | 120 |
| 247 | 15.72 | 13.30 | 12.40 | 12.0 |
| 360 | 18.97 | 13.50 | 12.60 | |
| 1440 | 37.95 | 13.90 | 13.00 | 14.0 |
| | | | | Square Root of Time (Vmin) |

Saturation

| Cell Pressure (psi) | | Pore Pressure (psi) | | Burette Reading (cc) | | Back Pressure | Volume Change (cc) | Effective Stress (psi) | ∆u (psi) | В |
|---------------------|-------|---------------------|-------|----------------------|-------|------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | Gridings (66) | 3ti e33 (p3i) | | |
| 40.0 | 50.0 | 38.3 | 46.3 | 8.70 | 9.80 | 38.0 | 1.10 | 2.0 | 8.0 | 0.80 |
| 50.0 | 60.0 | 48.5 | 56.9 | 9.50 | 10.40 | 48.0 | 0.90 | 2.0 | 8.4 | 0.84 |
| 60.0 | 70.0 | 58.3 | 67.0 | 10.40 | 11.30 | 58.0 | 0.90 | 2.0 | 8.7 | 0.87 |
| 70.0 | 80.0 | 68.0 | 77.4 | 11.60 | 12.40 | 68.0 | 0.80 | 2.0 | 9.4 | 0.94 |
| 80.0 | 90.0 | 77.9 | 87.4 | 12.40 | 12.50 | 78.0 | 0.10 | 2.0 | 9.5 | 0.95 |

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File name: 2679168__TxCuPP ASTM D4767_0.xlsm

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Consolidated Undrained Triaxial Compression ASTM D4767 (Point A After Picture)

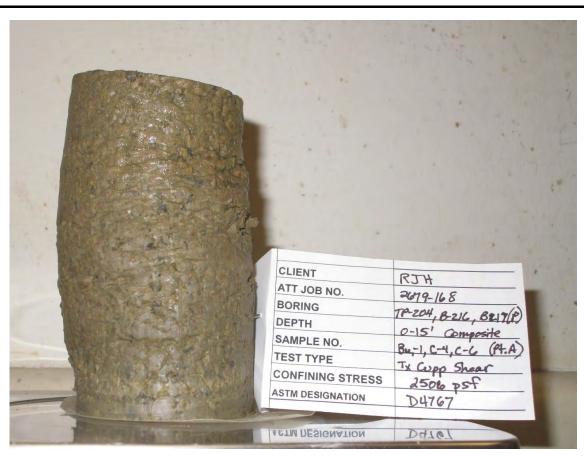
TP-204, B-216, B-217 (P)

CLIENT RJH Consultants BORING NO. JOB NO. 2679-168 DEPTH

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"
TECHNICIAN CAL



| NOTES | |
|-------|--|
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Picture File: 2679-168_CUPP_16134_PT A.JPG
File name: 2679168__TxCuPP ASTM D4767_0.xlsm

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ASTM D 4767

CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

TECHNICIAN CAL

Point B

| Before Test Mass of Wet Soil (g): | 732.55 | Initial Wet Density (pcf): | 122.1 |
|-----------------------------------|--------|------------------------------|-------|
| After Test Mass of Wet Soil (g): | 768.87 | Initial Dry Density (pcf): | 103.9 |
| Mass of Dry Soil and Pan (g): | 887.51 | Initial Wet Density (kg/m³): | 1955 |
| Mass of Pan (g): | 264.16 | Initial Dry Density (kg/m³): | 1664 |
| Diameter (in): | 2.410 | Initial Moisture (%): | 17.5 |
| Initial Sample Height (in): | 5.012 | Final Wet Density (pcf): | 131.1 |
| After Consolidation Height (in): | 4.995 | Final Dry Density (pcf): | 106.3 |
| Assumed Specific Gravity: | 2.65 | Final Wet Density (kg/m³): | 2101 |
| | | Final Dry Density (kg/m³): | 1703 |
| Back Pressure (psi): | 78.0 | Final Moisture (%): | 23.3 |
| Cell Pressure (psi): | 88.4 | | |

Initial Effective Stress (psi): 10.4 Membrane Correction Factor (lb/in²): 40.78
Initial Effective Stress (kPa): 71.7 Filter Paper Load Capacity (lb/in): 1.1

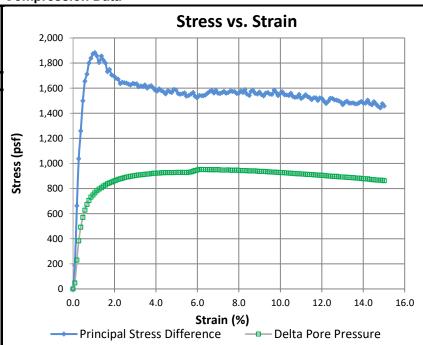
Strain Rate (in/min): 0.0058

Triaxial Compression Data

Peak Deviator Stress (psf): 1883 Peak Deviator Stress (kPa): 90.2

Parameters at Peak Deviator Stress

Major Principal Stress (psf) - σ_{1f} : 3381 Major Principal Stress (kPa) - σ_{1f} : 161.9 Minor Principal Stress (psf) - σ_{3f} : 1498 Minor Principal Stress (kPa) - σ_{3f} : 71.7 Induced Pore Pressure (psf): 765.54 Induced Pore Pressure (kPa): 36.65 Effective Major Principal Stress (psf) - σ'_{1f}: 2615.05 Effective Major Principal Stress (kPa) - σ'_{1f} : 125.21 Effective Minor Principal Stress (psf) - σ'_{3f}: 732.06 Effective Minor Principal Stress (kPa) - σ'_{3f}: 35.05 p' (psf): 1674 941 q (psf): p' (kPa): 80.1 45.1 q (kPa): Strain (%): 1.06



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File name: 2679168__TxCuPP ASTM D4767_0.xlsm

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ASTM D 4767

CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

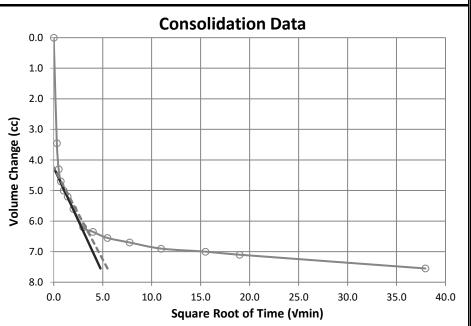
TECHNICIAN CAL

Consolidation - Point B

| Initial Saturation (%): | 78.3 | Initial Volume of Sample (cc): | 374.7 |
|---------------------------------|-------|---|-------|
| Final Saturation (%): | 100.0 | Final Volume of Sample (cc): | 366.0 |
| Cell Pressure (psi): | 88.4 | Volume Change After Consolidation (cc): | 18.5 |
| Back Pressure (psi): | 78.0 | Initial Dial Reading (in): | 0.200 |
| Effective Stress (psi): | 10.4 | Final Dial Reading (in): | 0.217 |
| Effective Stress (kPa): | 71.7 | Height Change (in): | 0.017 |
| Cell Expansion Correction (cc): | 9.85 | Initial Area (cm²): | 29.43 |
| Cell ID: | 13S | Final Area (cm²): | 28 85 |

T50 (min): 3.42

| Elapsed Time (min) | Square Root of Time (√min) | Burette Reading (cc) | Volume Change (cc) |
|-----------------------|----------------------------------|----------------------------|-----------------------|
| 0 | 0.00 | 13.30 | 0.00 |
| 0.1 | 0.32 | 16.75 | 3.45 |
| 0.25 | 0.50 | 17.60 | 4.30 |
| 0.5 | 0.71 | 18.00 | 4.70 |
| 1 | 1.00 | 18.30 | 5.00 |
| 2 | 1.41 | 18.50 | 5.20 |
| 4 | 2.00 | 18.90 | 5.60 |
| 9 | 3.00 | 19.50 | 6.20 |
| 16 | 4.00 | 19.65 | 6.35 |
| 30 | 5.48 | 19.85 | 6.55 |
| 60 | 7.75 | 20.00 | 6.70 |
| 120 | 10.95 | 20.20 | 6.90 |
| 240 | 15.49 | 20.30 | 7.00 |
| 360 | 18.97 | 20.40 | 7.10 |
| 1440 | 37.95 | 20.85 | 7.55 |



Saturation

| Cell Pressure (psi) | | Pore Pressure (psi) | | Burette Re | Burette Reading (cc) Back Pressure | | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
|---------------------|-------|---------------------|-------|------------|---------------------------------------|-------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | Change (66) | 3ti e33 (p3i) | | |
| 40.0 | 50.0 | 38.7 | 46.9 | 9.00 | 10.10 | 38.0 | 1.10 | 2.0 | 8.2 | 0.82 |
| 50.0 | 60.0 | 48.6 | 57.4 | 10.60 | 11.50 | 48.0 | 0.90 | 2.0 | 8.8 | 0.88 |
| 60.0 | 70.0 | 58.8 | 67.6 | 11.40 | 12.20 | 58.0 | 0.80 | 2.0 | 8.8 | 0.88 |
| 70.0 | 80.0 | 68.4 | 77.8 | 12.40 | 13.00 | 68.0 | 0.60 | 2.0 | 9.4 | 0.94 |
| 80.0 | 90.0 | 78.4 | 88.0 | 13.30 | 13.30 | 78.0 | 0.00 | 2.0 | 9.6 | 0.96 |

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File name: 2679168__TxCuPP ASTM D4767_0.xlsm

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Consolidated Undrained Triaxial Compression ASTM D4767 (Point B After Picture)

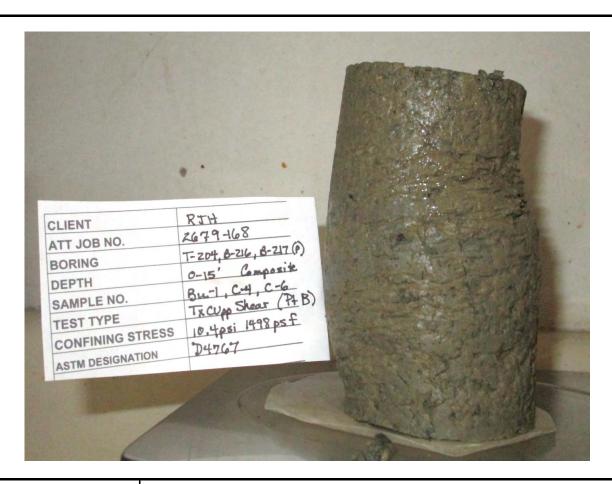
CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

TECHNICIAN CAL



| NOTES | | |
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Picture File: 2679-168_CUPP_16134_PT B.JPG
File name: 2679168__TxCuPP ASTM D4767_0.xlsm

Appendix J.1 223 of 262



ASTM D 4767

CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

TECHNICIAN CAL

Point C

| Before Test Mass of Wet Soil (g): | 732.01 | Initial Wet Density (pcf): | 121.3 |
|-----------------------------------|--------|--------------------------------------|-------|
| After Test Mass of Wet Soil (g): | 774.82 | Initial Dry Density (pcf): | 103.0 |
| Mass of Dry Soil and Pan (g): | 878.06 | Initial Wet Density (kg/m³): | 1944 |
| Mass of Pan (g): | 256.46 | Initial Dry Density (kg/m³): | 1650 |
| Diameter (in): | 2.411 | Initial Moisture (%): | 17.8 |
| Initial Sample Height (in): | 5.034 | Final Wet Density (pcf): | 129.7 |
| After Consolidation Height (in): | 5.024 | Final Dry Density (pcf): | 104.0 |
| Assumed Specific Gravity: | 2.65 | Final Wet Density (kg/m³): | 2077 |
| | | Final Dry Density (kg/m³): | 1666 |
| Back Pressure (psi): | 78.0 | Final Moisture (%): | 24.6 |
| Cell Pressure (psi): | 81.5 | | |
| Initial Effective Stress (psi): | 3.5 | Membrane Correction Factor (lb/in²): | 40.78 |
| Initial Effective Stress (kPa): | 24.1 | Filter Paper Load Capacity (lb/in): | 1.1 |

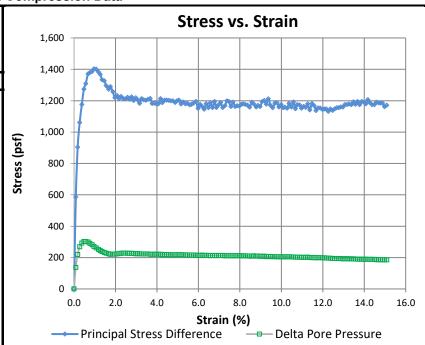
Strain Rate (in/min): 0.01

Triaxial Compression Data

Peak Deviator Stress (psf): 1403 Peak Deviator Stress (kPa): 67.2

Parameters at Peak Deviator Stress

Major Principal Stress (psf) - σ_{1f} : 1907 Major Principal Stress (kPa) - σ_{1f} : 91.3 Minor Principal Stress (psf) - σ_{3f} : 504 Minor Principal Stress (kPa) - σ_{3f} : 24.1 Induced Pore Pressure (psf): 270.35 Induced Pore Pressure (kPa): 12.94 Effective Major Principal Stress (psf) - σ'_{1f}: 1636.45 Effective Major Principal Stress (kPa) - σ'_{1f} : 78.35 Effective Minor Principal Stress (psf) - σ'_{3f}: 233.65 Effective Minor Principal Stress (kPa) - σ'3f: 11.19 p' (psf): 935 701 q (psf): p' (kPa): 44.8 33.6 q (kPa): Strain (%): 0.97



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File name: 2679168__TxCuPP ASTM D4767_0.xlsm

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ASTM D 4767

CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED --LOCATION -- SAMPLED BY ---

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

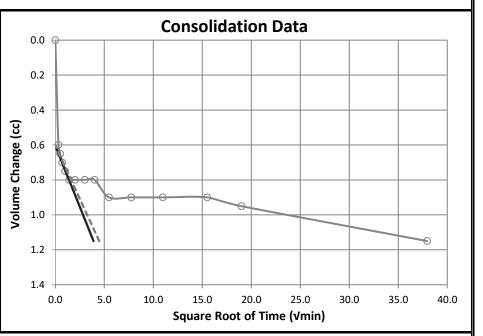
TECHNICIAN CAL

Consolidation - Point C

Initial Saturation (%): 77.7 Initial Volume of Sample (cc): 376.6 Final Saturation (%): Final Volume of Sample (cc): 373.0 100.0 Cell Pressure (psi): 81.5 Volume Change After Consolidation (cc): 16.45 Back Pressure (psi): 78.0 Initial Dial Reading (in): 0.200 Effective Stress (psi): Final Dial Reading (in): 0.210 3.5 Effective Stress (kPa): 24.1 Height Change (in): 0.01 Cell Expansion Correction (cc): 12.86 Initial Area (cm²): 29.45 Cell ID: 21S Final Area (cm²): 29.23

T50 (min): 0.80

| | | (/ | |
|-----------------------|----------------------------------|----------------------------|-----------------------|
| Elapsed Time (min) | Square Root of Time (√min) | Burette Reading (cc) | Volume Change (cc) |
| 0 | 0.00 | 17.60 | 0.00 |
| 0.1 | 0.32 | 18.20 | 0.60 |
| 0.25 | 0.50 | 18.25 | 0.65 |
| 0.5 | 0.71 | 18.30 | 0.70 |
| 1 | 1.00 | 18.35 | 0.75 |
| 2 | 1.41 | 18.40 | 0.80 |
| 4 | 2.00 | 18.40 | 0.80 |
| 9 | 3.00 | 18.40 | 0.80 |
| 16 | 4.00 | 18.40 | 0.80 |
| 30 | 5.48 | 18.50 | 0.90 |
| 60 | 7.75 | 18.50 | 0.90 |
| 120 | 10.95 | 18.50 | 0.90 |
| 240 | 15.49 | 18.50 | 0.90 |
| 360 | 18.97 | 18.55 | 0.95 |
| 1440 | 37.95 | 18.75 | 1.15 |
| | | | |



Saturation

| Cell Pres | sure (psi) | Pore Pres | ssure (psi) | Burette Re | eading (cc) | Back Pressure | Volume Change (cc) | Effective Stress (psi) | Δu (psi) | В |
|-----------|------------|-----------|-------------|------------|-------------|------------------|-----------------------|---------------------------|----------|------|
| Initial | Final | Initial | Final | Initial | Final | (psi) | Change (66) | 3ti c33 (p3i) | | |
| 40.0 | 50.0 | 38.2 | 46.5 | 13.30 | 14.50 | 38.0 | 1.20 | 2.0 | 8.3 | 0.83 |
| 50.0 | 60.0 | 48.2 | 57.2 | 14.30 | 15.10 | 48.0 | 0.80 | 2.0 | 9.0 | 0.90 |
| 60.0 | 70.0 | 58.3 | 67.5 | 15.80 | 16.40 | 58.0 | 0.60 | 2.0 | 9.2 | 0.92 |
| 70.0 | 80.0 | 68.0 | 77.4 | 16.80 | 17.40 | 68.0 | 0.60 | 2.0 | 9.4 | 0.94 |
| 80.0 | 90.0 | 78.0 | 87.6 | 17.60 | 17.60 | 78.0 | 0.00 | 2.0 | 9.6 | 0.96 |

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File name: 2679168__TxCuPP ASTM D4767_0.xlsm

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Consolidated Undrained Triaxial Compression ASTM D4767 (Point C After Picture)

CLIENT RJH Consultants BORING NO. TP-204, B-216, B-217 (P)

JOB NO.2679-168DEPTH0-15' compositePROJECTSouth Boulder Creek Phase IISAMPLE NO.Bu-1, C-4, C-6

PROJECT NO. 16134 DATE SAMPLED -LOCATION -- SAMPLED BY --

DATE TESTED 02/01/22 DESCRIPTION remolded -3/8"

TECHNICIAN CAL



| NOTES | | |
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Picture File: 2679-168_CUPP_16134_PT C.JPG
File name: 2679168__TxCuPP ASTM D4767_0.xlsm

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CLIENT JOB NO. PROJECT PROJECT NO. LOCATION

0.183

0.188

0.193

0.198

0.203

3.66

3.77

3.86

3.97

4.06

4.61

4.62

4.62

4.63

4.63

79.2

79.5

78.8

78.7

275

275

275

276

RJH Consultants 2679-168

South Boulder Creek Phase II

16134

DATE TESTED 02/01/22 TECHNICIAN CAL BORING NO. DEPTH

O. TP-204, B-216, B-217 (P) 0-15' composite

SAMPLE NO. Bu-1, C-4, C-6

DATE SAMPLED --SAMPLED BY --

DESCRIPTION remolded -3/8"

| | | | | Poi | nt A | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.000 | 0.00 | 4.44 | 0.0 | 0 | 0 | 0.0 | 2505.6 | 2505.6 | 0.0 |
| 0.005 | 0.09 | 4.45 | 12.1 | 13 | 378 | 168.1 | 2337.5 | 2526.6 | 189.1 |
| 0.009 | 0.19 | 4.45 | 28.7 | 26 | 904 | 359.2 | 2146.4 | 2598.4 | 452.0 |
| 0.014 | 0.28 | 4.46 | 43.4 | 38 | 1364 | 557.5 | 1948.1 | 2629.9 | 681.8 |
| 0.019 | 0.38 | 4.46 | 52.9 | 51 | 1656 | 704.3 | 1801.3 | 2629.5 | 828.1 |
| 0.023 | 0.46 | 4.46 | 60.1 | 62 | 1878 | 818.3 | 1687.3 | 2626.3 | 939.0 |
| 0.028 | 0.56 | 4.47 | 65.4 | 76 | 2032 | 912.1 | 1593.5 | 2609.4 | 1015.9 |
| 0.033 | 0.66 | 4.47 | 69.2 | 89 | 2138 | 992.1 | 1513.5 | 2582.6 | 1069.1 |
| 0.037 | 0.75 | 4.48 | 71.8 | 101 | 2208 | 1061.7 | 1443.9 | 2547.7 | 1103.9 |
| 0.042 | 0.85 | 4.48 | 73.5 | 115 | 2247 | 1121.5 | 1384.1 | 2507.7 | 1123.6 |
| 0.048 | 0.97 | 4.49 | 75.0 | 131 | 2276 | 1174.4 | 1331.2 | 2469.2 | 1137.9 |
| 0.053 | 1.06 | 4.49 | 76.7 | 144 | 2315 | 1221.8 | 1283.8 | 2441.3 | 1157.5 |
| 0.058 | 1.16 | 4.50 | 77.2 | 158 | 2316 | 1262.8 | 1242.8 | 2400.6 | 1157.8 |
| 0.063 | 1.25 | 4.50 | 78.2 | 170 | 2333 | 1298.2 | 1207.4 | 2374.1 | 1166.7 |
| 0.068 | 1.36 | 4.50 | 78.5 | 184 | 2327 | 1331.5 | 1174.1 | 2337.4 | 1163.3 |
| 0.074 | 1.47 | 4.51 | 79.4 | 199 | 2335 | 1361.3 | 1144.3 | 2311.9 | 1167.5 |
| 0.078 | 1.56 | 4.51 | 79.3 | 212 | 2318 | 1389.4 | 1116.2 | 2275.0 | 1158.9 |
| 0.083 | 1.66 | 4.52 | 79.6 | 225 | 2311 | 1411.6 | 1094.0 | 2249.2 | 1155.3 |
| 0.088 | 1.76 | 4.52 | 79.9 | 238 | 2305 | 1433.6 | 1072.0 | 2224.7 | 1152.6 |
| 0.093 | 1.86 | 4.53 | 80.2 | 251 | 2300 | 1452.8 | 1052.8 | 2202.7 | 1149.9 |
| 0.098 | 1.96 | 4.53 | 79.4 | 265 | 2257 | 1470.1 | 1035.5 | 2164.0 | 1128.6 |
| 0.103 | 2.06 | 4.54 | 79.4 | 271 | 2248 | 1487.0 | 1018.6 | 2142.8 | 1124.2 |
| 0.108 | 2.16 | 4.54 | 79.6 | 271 | 2254 | 1501.8 | 1003.8 | 2130.7 | 1126.9 |
| 0.113 | 2.26 | 4.55 | 79.2 | 272 | 2238 | 1516.3 | 989.3 | 2108.5 | 1119.2 |
| 0.118 | 2.35 | 4.55 | 79.0 | 272 | 2229 | 1529.8 | 975.8 | 2090.5 | 1114.7 |
| 0.123 | 2.46 | 4.56 | 78.9 | 272 | 2220 | 1543.4 | 962.2 | 2072.4 | 1110.2 |
| 0.127 | 2.55 | 4.56 | 78.9 | 272 | 2221 | 1555.0 | 950.6 | 2061.1 | 1110.4 |
| 0.132 | 2.65 | 4.56 | 79.4 | 273 | 2231 | 1564.3 | 941.3 | 2056.8 | 1115.5 |
| 0.138 | 2.75 | 4.57 | 79.4 | 273 | 2230 | 1574.5 | 931.1 | 2046.2 | 1115.1 |
| 0.143 | 2.86 | 4.57 | 79.6 | 273 | 2233 | 1583.5 | 922.1 | 2038.7 | 1116.6 |
| 0.147 | 2.95 | 4.58 | 79.5 | 273 | 2228 | 1592.7 | 912.9 | 2027.0 | 1114.1 |
| 0.153 | 3.06 | 4.58 | 79.3 | 273 | 2217 | 1600.4 | 905.2 | 2013.6 | 1108.5 |
| 0.158 | 3.16 | 4.59 | 79.8 | 274 | 2229 | 1607.2 | 898.4 | 2013.0 | 1114.6 |
| 0.162 | 3.25 | 4.59 | 79.0 | 274 | 2203 | 1614.9 | 890.7 | 1992.0 | 1101.3 |
| 0.168 | 3.36 | 4.60 | 79.5 | 274 | 2214 | 1620.1 | 885.5 | 1992.6 | 1107.1 |
| 0.173 | 3.46 | 4.60 | 79.8 | 274 | 2221 | 1626.7 | 878.9 | 1989.6 | 1110.7 |
| 0.178 | 3.56 | 4.61 | 79.0 | 275 | 2195 | 1633.8 | 871.8 | 1969.0 | 1097.3 |
| 0.400 | 0.00 | 4.04 | | | 0.400 | 4000 = | | 4000 | 40000 |

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 $^{79.7}$ 2679168 276 TxCuPP ASTM D476 $^{1659.2}$

2198

2204

2181

2173

1638.5

1645.0

1650.4

1655.2

867.1

860.6

855.2

850.4

846.4

1966.0

1962.8

1945.5

1937.1

1947.6

1098.8

1102.2

1090.3

1086.7

1101.2



CLIENT JOB NO. PROJECT PROJECT NO. LOCATION RJH Consultants 2679-168

South Boulder Creek Phase II

16134

DATE TESTED 02/01/22 TECHNICIAN CAL BORING NO. DEPTH

DEPTH 0-15' composite SAMPLE NO. Bu-1, C-4, C-6

TP-204, B-216, B-217 (P)

DATE SAMPLED - SAMPLED BY -

DESCRIPTION remolded -3/8"

Point A

| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--|----------|---------|
| 0.208 | 4.17 | 4.64 | 79.6 | 276 | 2196 | 1663.0 | 842.6 | 1940.8 | 1098.2 |
| 0.213 | 4.27 | 4.64 | 79.4 | 276 | 2187 | 1665.9 | 839.7 | 1933.0 | 1093.3 |
| 0.218 | 4.37 | 4.65 | 79.7 | 276 | 2194 | 1669.7 | 835.9 | 1933.0 | 1097.1 |
| 0.223 | 4.47 | 4.65 | 80.2 | 277 | 2206 | 1672.5 | 833.1 | 1936.3 | 1103.2 |
| 0.229 | 4.58 | 4.66 | 79.1 | 277 | 2168 | 1676.0 | 829.6 | 1913.3 | 1083.8 |
| 0.233 | 4.67 | 4.66 | 79.3 | 277 | 2172 | 1680.1 | 825.5 | 1911.5 | 1086.1 |
| 0.238 | 4.76 | 4.67 | 80.1 | 277 | 2196 | 1681.7 | 823.9 | 1922.0 | 1098.1 |
| 0.243 | 4.87 | 4.67 | 80.5 | 278 | 2204 | 1684.1 | 821.5 | 1923.3 | 1101.8 |
| 0.249 | 4.98 | 4.68 | 79.6 | 278 | 2174 | 1687.0 | 818.6 | 1905.4 | 1086.9 |
| 0.254 | 5.07 | 4.68 | 79.7 | 278 | 2174 | 1690.0 | 815.6 | 1902.8 | 1087.1 |
| 0.258 | 5.17 | 4.69 | 79.4 | 278 | 2162 | 1693.4 | 812.2 | 1893.0 | 1080.8 |
| 0.263 | 5.27 | 4.69 | 80.2 | 279 | 2183 | 1695.8 | 809.8 | 1901.5 | 1091.7 |
| 0.268 | 5.36 | 4.70 | 79.4 | 279 | 2155 | 1696.0 | 809.6 | 1887.2 | 1077.5 |
| 0.273 | 5.47 | 4.70 | 79.3 | 279 | 2150 | 1698.1 | 807.5 | 1882.7 | 1075.2 |
| 0.278 | 5.56 | 4.71 | 80.3 | 279 | 2178 | 1699.3 | 806.3 | 1895.2 | 1088.8 |
| 0.283 | 5.67 | 4.71 | 80.2 | 280 | 2173 | 1702.2 | 803.4 | 1890.1 | 1086.7 |
| 0.288 | 5.76 | 4.72 | 79.7 | 280 | 2155 | 1701.4 | 804.2 | 1881.8 | 1077.6 |
| 0.293 | 5.87 | 4.72 | 80.1 | 280 | 2163 | 1703.0 | 802.6 | 1884.0 | 1081.4 |
| 0.298 | 5.96 | 4.73 | 80.6 | 280 | 2176 | 1704.5 | 801.1 | 1888.9 | 1087.8 |
| 0.303 | 6.06 | 4.73 | 80.3 | 280 | 2164 | 1709.4 | 796.2 | 1878.0 | 1081.8 |
| 0.308 | 6.16 | 4.74 | 80.4 | 281 | 2164 | 1713.9 | 791.7 | 1873.8 | 1082.1 |
| 0.313 | 6.26 | 4.74 | 80.6 | 281 | 2169 | 1718.4 | 787.2 | 1871.7 | 1084.5 |
| 0.318 | 6.36 | 4.75 | 80.9 | 281 | 2175 | 1723.9 | 781.7 | 1869.2 | 1087.5 |
| 0.323 | 6.46 | 4.75 | 80.3 | 281 | 2153 | 1726.9 | 778.7 | 1854.9 | 1076.3 |
| 0.328 | 6.57 | 4.76 | 80.8 | 282 | 2164 | 1727.9 | 777.7 | 1859.9 | 1082.2 |
| 0.333 | 6.65 | 4.76 | 81.1 | 282 | 2170 | 1731.3 | 774.3 | 1859.4 | 1085.1 |
| 0.338 | 6.76 | 4.77 | 80.5 | 282 | 2149 | 1731.6 | 774.0 | 1848.6 | 1074.6 |
| 0.343 | 6.86 | 4.77 | 80.1 | 282 | 2137 | 1732.3 | 773.3 | 1841.7 | 1068.4 |
| 0.348 | 6.96 | 4.78 | 80.6 | 283 | 2147 | 1732.3 | 773.3 | 1847.0 | 1073.7 |
| 0.353 | 7.06 | 4.78 | 81.2 | 283 | 2163 | 1732.8 | 772.8 | 1854.2 | 1081.4 |
| 0.358 | 7.16 | 4.79 | 81.1 | 283 | 2157 | 1734.2 | 771.4 | 1849.8 | 1078.4 |
| 0.363 | 7.25 | 4.79 | 81.5 | 283 | 2166 | 1735.3 | 770.3 | 1853.5 | 1083.1 |
| 0.368 | 7.36 | 4.80 | 80.8 | 283 | 2141 | 1734.3 | 771.3 | 1841.9 | 1070.7 |
| 0.373 | 7.46 | 4.80 | 80.7 | 284 | 2136 | 1736.0 | 769.6 | 1837.7 | 1068.1 |
| 0.378 | 7.56 | 4.81 | 81.7 | 284 | 2165 | 1735.0 | 770.6 | 1852.9 | 1082.3 |
| 0.383 | 7.66 | 4.81 | 81.0 | 284 | 2139 | 1735.2 | 770.4 | 1839.9 | 1069.5 |
| 0.388 | 7.76 | 4.82 | 81.8 | 284 | 2160 | 1735.4 | 770.2 | 1850.3 | 1080.1 |
| 0.393 | 7.85 | 4.82 | 82.2 | 285 | 2171 | 1735.9 | 769.7 | 1855.1 | 1085.4 |
| 0.398 | 7.96 | 4.83 | 82.4 | 285 | 2174 | 1735.3 | 770.3 | 1857.3 | 1086.9 |
| 0.403 | 8.06 | 4.83 | 82.0 | 285 | 2159 | 1735.4 | 770.2 | 1849.6 | 1079.4 |
| 0.408 | 8.17 | 4.84 | 82.4 | 285 | 2166 | 1734.8 | 770.8 | 1853.8 | 1083.0 |
| 0.413 | 8.27 | 4.84 | | '9168 <u>'</u> 86 '9168 | | | 770.5 | 1851.2 | 1080.7 |

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CLIENT JOB NO. PROJECT PROJECT NO. LOCATION RJH Consultants 2679-168 South Boulder Creek Ph

South Boulder Creek Phase II

16134 --

DATE TESTED 02/01/22 TECHNICIAN CAL

BORING NO. DEPTH

TP-204, B-216, B-217 (P) 0-15' composite

SAMPLE NO. Bu-1, C-4, C-6

DATE SAMPLED --SAMPLED BY --

DESCRIPTION remolded -3/8"

| | Point A | | | | | | | | | | | |
|-------------------|------------|--|---------------------|------------------------------|---------------------------------------|------------------------------|--|----------|---------|--|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) | | | |
| 0.418 | 8.37 | 4.85 | 82.3 | 286 | 2159 | 1735.4 | 770.2 | 1849.8 | 1079.6 | | | |
| 0.423 | 8.47 | 4.85 | 81.8 | 286 | 2141 | 1734.8 | 770.8 | 1841.5 | 1070.7 | | | |
| 0.428 | 8.57 | 4.86 | 82.4 | 286 | 2156 | 1734.0 | 771.6 | 1849.8 | 1078.2 | | | |
| 0.433 | 8.67 | 4.87 | 82.6 | 286 | 2157 | 1734.1 | 771.5 | 1850.2 | 1078.7 | | | |
| 0.438 | 8.77 | 4.87 | 83.0 | 287 | 2166 | 1733.4 | 772.2 | 1855.1 | 1082.9 | | | |
| 0.444 | 8.87 | 4.88 | 82.4 | 287 | 2147 | 1732.2 | 773.4 | 1847.1 | 1073.7 | | | |
| 0.449 | 8.98 | 4.88 | 82.7 | 287 | 2154 | 1731.7 | 773.9 | 1850.7 | 1076.9 | | | |
| 0.454 | 9.08 | 4.89 | 82.7 | 287 | 2149 | 1733.1 | 772.5 | 1847.1 | 1074.6 | | | |
| 0.458 | 9.17 | 4.89 | 82.3 | 288 | 2134 | 1730.5 | 775.1 | 1842.1 | 1067.0 | | | |
| 0.464 | 9.28 | 4.90 | 82.6 | 288 | 2140 | 1730.5 | 775.1 | 1845.0 | 1069.9 | | | |
| 0.468 | 9.37 | 4.90 | 83.0 | 288 | 2149 | 1730.1 | 775.5 | 1850.2 | 1074.7 | | | |
| 0.474 | 9.48 | 4.91 | 83.2 | 288 | 2152 | 1729.5 | 776.1 | 1852.0 | 1075.8 | | | |
| 0.478 | 9.57 | 4.91 | 82.6 | 289 | 2131 | 1728.5 | 777.1 | 1842.7 | 1065.6 | | | |
| 0.484 | 9.68 | 4.92 | 82.6 | 289 | 2130 | 1727.4 | 778.2 | 1843.1 | 1064.9 | | | |
| 0.489 | 9.78 | 4.93 | 82.8 | 289 | 2131 | 1727.4 | 778.2 | 1843.6 | 1065.4 | | | |
| 0.493 | 9.87 | 4.93 | 82.8 | 289 | 2130 | 1725.2 | 780.4 | 1845.2 | 1064.8 | | | |
| 0.499 | 9.98 | 4.94 | 83.3 | 289 | 2142 | 1723.7 | 781.9 | 1852.9 | 1071.0 | | | |
| 0.504 | 10.08 | 4.94 | 83.2 | 290 | 2135 | 1723.6 | 782.0 | 1849.6 | 1067.6 | | | |
| 0.509 | 10.19 | 4.95 | 83.2 | 290 | 2132 | 1722.8 | 782.8 | 1848.8 | 1066.0 | | | |
| 0.514 | 10.28 | 4.95 | 83.3 | 290 | 2131 | 1721.0 | 784.6 | 1850.0 | 1065.4 | | | |
| 0.518 | 10.27 | 4.96 | 83.7 | 290 | 2140 | 1719.9 | 785.7 | 1855.5 | 1069.8 | | | |
| 0.524 | 10.48 | 4.96 | 82.9 | 291 | 2115 | 1719.6 | 786.0 | 1843.7 | 1057.7 | | | |
| 0.524 | 10.40 | 4.97 | 83.0 | 291 | 2116 | 1718.4 | 787.2 | 1845.1 | 1057.7 | | | |
| 0.526 | 10.68 | 4.97 | 84.0 | 291 | 2110 | 1716.4 | 789.1 | 1859.5 | 1070.3 | | | |
| 0.534 | 10.08 | 4.98 | 83.2 | 291 | 2141 | 1710.3 | 789.1 | 1846.8 | 1076.3 | | | |
| 0.539 | 10.78 | 4.96 4.99 | 82.9 | 291 | 2114 | 1715.7 | 769.9 790.6 | 1841.8 | 1050.9 | | | |
| 0.544 | 10.86 | | 83.7 | 292 | 2102 | 1713.0 | 790.6 792.5 | 1853.7 | 1051.1 | | | |
| | 11.07 | 4.99 | 83.7 | 292 292 | 2122 | 1713.1 | 792.5 792.8 | | 1061.2 | | | |
| 0.553 0.558 | | 5.00 | 83.7 | 292 292 | 2121 | | 792.6 794.8 | 1853.5 | 1050.7 | | | |
| | 11.17 | 5.00 | | | | 1710.8 | | 1852.7 | | | | |
| 0.563 | 11.27 | 5.01 | 83.5 | 292 | 2107 | 1711.3 | 794.3 | 1847.9 | 1053.6 | | | |
| 0.569 | 11.38 | 5.01 | 83.9 | 293 | 2117 | 1709.1 | 796.5 | 1855.1 | 1058.7 | | | |
| 0.574 | 11.48 | 5.02 | 84.1 | 293 | 2120 | 1707.7 | 797.9 | 1857.7 | 1059.8 | | | |
| 0.578 | 11.57 | 5.02 | 84.1 | 293 | 2117 | 1705.3 | 800.3 | 1858.9 | 1058.6 | | | |
| 0.584 | 11.67 | 5.03 | 84.1 | 293 | 2113 | 1704.4 | 801.2 | 1857.8 | 1056.7 | | | |
| 0.588 | 11.77 | 5.04 | 84.7 | 294 | 2128 | 1702.6 | 803.0 | 1867.2 | 1064.2 | | | |
| 0.594 | 11.88 | 5.04 | 84.3 | 294 | 2113 | 1701.5 | 804.1 | 1860.4 | 1056.4 | | | |
| 0.599 | 11.98 | 5.05 | 84.0 | 294 | 2101 | 1700.5 | 805.1 | 1855.6 | 1050.5 | | | |
| 0.603 | 12.07 | 5.05 | 84.6 | 294 | 2117 | 1699.1 | 806.5 | 1865.1 | 1058.6 | | | |
| 0.608 | 12.17 | 5.06 | 85.0 | 295 | 2125 | 1697.8 | 807.8 | 1870.3 | 1062.5 | | | |
| 0.613 | 12.27 | 5.06 | 84.7 | 295 | 2113 | 1695.4 | 810.2 | 1866.6 | 1056.4 | | | |
| 0.618 | 12.37 | 5.07 | 84.3 | 295 | 2099 | 1695.2 | 810.4 | 1859.9 | 1049.5 | | | |
| 0.623 | 12.46 | 5.08 | 85.1 ₂₆₇ | 9168_ ²⁹ TxCu | PP 42319M D | 476 ^{7694.3} | 811.3 | 1871.0 | 1059.7 | | | |

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CLIENT JOB NO. **PROJECT** PROJECT NO. **RJH Consultants** 2679-168

South Boulder Creek Phase II

16134 **LOCATION**

02/01/22 DATE TESTED CAL **TECHNICIAN**

BORING NO. DEPTH

SAMPLE NO.

TP-204, B-216, B-217 (P)

0-15' composite Bu-1, C-4, C-6

DATE SAMPLED SAMPLED BY

DESCRIPTION remolded -3/8"

| | | | | Poi | nt A | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.628 | 12.57 | 5.08 | 84.5 | 295 | 2100 | 1692.7 | 812.9 | 1862.7 | 1049.8 |
| 0.633 | 12.67 | 5.09 | 84.5 | 296 | 2096 | 1691.6 | 814.0 | 1861.9 | 1047.9 |
| 0.638 | 12.77 | 5.09 | 85.0 | 296 | 2106 | 1690.1 | 815.5 | 1868.3 | 1052.8 |
| 0.643 | 12.87 | 5.10 | 85.2 | 296 | 2110 | 1687.6 | 818.0 | 1873.2 | 1055.2 |
| 0.648 | 12.96 | 5.11 | 84.9 | 296 | 2097 | 1691.4 | 814.2 | 1862.8 | 1048.6 |
| 0.653 | 13.07 | 5.11 | 85.0 | 297 | 2097 | 1691.1 | 814.5 | 1862.8 | 1048.3 |
| 0.659 | 13.18 | 5.12 | 85.2 | 297 | 2101 | 1695.1 | 810.5 | 1860.8 | 1050.3 |
| 0.664 | 13.29 | 5.12 | 85.6 | 297 | 2109 | 1695.7 | 809.9 | 1864.5 | 1054.6 |
| 0.669 | 13.38 | 5.13 | 85.7 | 297 | 2107 | 1696.2 | 809.4 | 1863.0 | 1053.7 |
| 0.674 | 13.48 | 5.14 | 85.9 | 298 | 2111 | 1695.9 | 809.7 | 1865.4 | 1055.7 |
| 0.679 | 13.58 | 5.14 | 86.1 | 298 | 2114 | 1694.1 | 811.5 | 1868.4 | 1056.9 |
| 0.684 | 13.68 | 5.15 | 85.3 | 298 | 2088 | 1692.3 | 813.3 | 1857.5 | 1044.2 |
| 0.689 | 13.79 | 5.15 | 86.6 | 298 | 2120 | 1690.3 | 815.3 | 1875.4 | 1060.1 |
| 0.694 | 13.89 | 5.16 | 85.5 | 299 | 2087 | 1690.3 | 815.3 | 1858.8 | 1043.6 |
| 0.699 | 13.99 | 5.17 | 85.5 | 299 | 2084 | 1689.3 | 816.3 | 1858.4 | 1042.2 |
| 0.705 | 14.10 | 5.17 | 86.2 | 299 | 2101 | 1687.8 | 817.8 | 1868.5 | 1050.7 |
| 0.709 | 14.19 | 5.18 | 86.2 | 299 | 2098 | 1685.8 | 819.8 | 1868.6 | 1048.8 |
| 0.714 | 14.29 | 5.18 | 85.6 | 299 | 2078 | 1685.4 | 820.2 | 1859.1 | 1038.8 |
| 0.720 | 14.40 | 5.19 | 86.3 | 300 | 2095 | 1682.7 | 822.9 | 1870.3 | 1047.4 |
| 0.724 | 14.49 | 5.20 | 86.0 | 300 | 2084 | 1681.6 | 824.0 | 1865.8 | 1041.8 |
| 0.730 | 14.60 | 5.20 | 85.9 | 300 | 2078 | 1680.7 | 824.9 | 1863.9 | 1039.0 |
| 0.734 | 14.69 | 5.21 | 86.3 | 300 | 2087 | 1678.7 | 826.9 | 1870.2 | 1043.3 |
| 0.739 | 14.79 | 5.21 | 87.1 | 301 | 2106 | 1677.2 | 828.4 | 1881.2 | 1052.8 |
| 0.744 | 14.89 | 5.22 | 86.4 | 301 | 2081 | 1676.1 | 829.5 | 1870.2 | 1040.7 |
| 0.750 | 15.00 | 5.23 | 86.6 | 301 | 2085 | 1673.9 | 831.7 | 1874.1 | 1042.5 |
| 0.755 | 15.10 | 5.23 | 86.9 | 301 | 2091 | 1674.3 | 831.3 | 1876.7 | 1045.5 |

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CLIENT JOB NO. PROJECT PROJECT NO. LOCATION RJH Consultants 2679-168

South Boulder Creek Phase II

16134

DATE TESTED 02/01/22 TECHNICIAN CAL

BORING NO. DEPTH

TP-204, B-216, B-217 (P) 0-15' composite

SAMPLE NO. Bu-1, C-4, C-6

DATE SAMPLED --SAMPLED BY --

DESCRIPTION remolded -3/8"

| Point B | | | | | | | | | | | |
|-------------------|------------|--|------------|---------------------------------|---------------------------------------|------------------------------|--|----------|--------|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf | | |
| 0.000 | 0.00 | 4.47 | 0.0 | 0 | 0 | 0.0 | 1497.6 | 1497.6 | 0.0 | | |
| 0.004 | 0.09 | 4.48 | 6.3 | 12 | 190 | 47.2 | 1450.4 | 1545.3 | 94.8 | | |
| 0.009 | 0.19 | 4.48 | 21.4 | 25 | 662 | 229.8 | 1267.8 | 1598.7 | 330.9 | | |
| 0.014 | 0.27 | 4.48 | 33.5 | 37 | 1037 | 383.8 | 1113.8 | 1632.5 | 518.6 | | |
| 0.019 | 0.37 | 4.49 | 40.8 | 50 | 1259 | 492.0 | 1005.6 | 1634.9 | 629.3 | | |
| 0.024 | 0.47 | 4.49 | 48.8 | 64 | 1499 | 570.2 | 927.4 | 1677.0 | 749.6 | | |
| 0.028 | 0.57 | 4.50 | 54.1 | 77 | 1654 | 628.1 | 869.5 | 1696.4 | 827.0 | | |
| 0.033 | 0.67 | 4.50 | 56.3 | 90 | 1710 | 672.6 | 825.0 | 1680.2 | 855.1 | | |
| 0.038 | 0.77 | 4.51 | 59.6 | 104 | 1800 | 705.5 | 792.1 | 1691.8 | 899.8 | | |
| 0.043 | 0.87 | 4.51 | 61.3 | 117 | 1839 | 731.3 | 766.3 | 1685.7 | 919.4 | | |
| 0.048 | 0.96 | 4.51 | 62.8 | 130 | 1873 | 748.5 | 749.1 | 1685.9 | 936.7 | | |
| 0.053 | 1.06 | 4.52 | 63.6 | 143 | 1883 | 765.5 | 732.1 | 1673.6 | 941.5 | | |
| 0.058 | 1.15 | 4.52 | 63.2 | 156 | 1857 | 782.3 | 715.3 | 1643.8 | 928.4 | | |
| 0.063 | 1.25 | 4.53 | 62.0 | 169 | 1803 | 795.6 | 702.0 | 1603.6 | 901.6 | | |
| 0.068 | 1.37 | 4.53 | 64.3 | 185 | 1856 | 806.7 | 690.9 | 1619.1 | 928.2 | | |
| 0.073 | 1.46 | 4.54 | 63.7 | 197 | 1824 | 819.6 | 678.0 | 1589.9 | 911.8 | | |
| 0.078 | 1.56 | 4.54 | 63.4 | 211 | 1799 | 828.1 | 669.5 | 1569.1 | 899.6 | | |
| 0.083 | 1.66 | 4.55 | 61.7 | 224 | 1731 | 838.7 | 658.9 | 1524.3 | 865.4 | | |
| 0.088 | 1.76 | 4.55 | 62.8 | 238 | 1748 | 845.3 | 652.3 | 1526.4 | 874.1 | | |
| 0.093 | 1.86 | 4.56 | 61.9 | 252 | 1704 | 852.3 | 645.3 | 1497.2 | 851.9 | | |
| 0.098 | 1.97 | 4.56 | 62.1 | 266 | 1696 | 859.7 | 637.9 | 1485.8 | 847.9 | | |
| 0.103 | 2.07 | 4.57 | 61.8 | 270 | 1679 | 865.4 | 632.2 | 1471.6 | 839.4 | | |
| 0.109 | 2.17 | 4.57 | 61.6 | 271 | 1670 | 872.7 | 624.9 | 1460.0 | 835.2 | | |
| 0.114 | 2.28 | 4.58 | 60.6 | 271 | 1636 | 877.4 | 620.2 | 1438.2 | 817.9 | | |
| 0.118 | 2.37 | 4.58 | 61.0 | 271 | 1647 | 881.1 | 616.5 | 1439.9 | 823.4 | | |
| 0.123 | 2.47 | 4.58 | 60.9 | 271 | 1642 | 886.4 | 611.2 | 1432.2 | 821.0 | | |
| 0.128 | 2.57 | 4.59 | 60.9 | 271 | 1640 | 890.5 | 607.1 | 1427.1 | 819.9 | | |
| 0.134 | 2.68 | 4.59 | 60.7 | 272 | 1631 | 893.2 | 604.4 | 1420.1 | 815.7 | | |
| 0.139 | 2.78 | 4.60 | 60.6 | 272 | 1625 | 896.8 | 600.8 | 1413.4 | 812.6 | | |
| 0.144 | 2.88 | 4.60 | 61.1 | 272 | 1638 | 900.5 | 597.1 | 1415.9 | 818.8 | | |
| 0.148 | 2.97 | 4.61 | 61.0 | 272 | 1633 | 903.0 | 594.6 | 1411.2 | 816.6 | | |
| 0.153 | 3.07 | 4.61 | 61.1 | 273 | 1634 | 905.1 | 592.5 | 1409.4 | 816.9 | | |
| 0.158 | 3.17 | 4.62 | 60.4 | 273 | 1610 | 907.8 | 589.8 | 1394.9 | 805.1 | | |
| 0.164 | 3.27 | 4.62 | 60.7 | 273 | 1618 | 909.0 | 588.6 | 1397.4 | 808.8 | | |
| 0.169 | 3.38 | 4.63 | 60.6 | 273 | 1612 | 910.8 | 586.8 | 1392.7 | 805.9 | | |
| 0.173 | 3.47 | 4.63 | 61.1 | 274 | 1625 | 914.0 | 583.6 | 1396.1 | 812.6 | | |
| 0.179 | 3.58 | 4.64 | 60.3 | 274 | 1600 | 915.0 | 582.6 | 1382.6 | 800.0 | | |
| 0.183 | 3.66 | 4.64 | 60.8 | 274 | 1611 | 916.3 | 581.3 | 1386.7 | 805.4 | | |
| 0.188 | 3.77 | 4.65 | 61.1 | 274 | 1619 | 918.1 | 579.5 | 1389.0 | 809.5 | | |
| 0.194 | 3.88 | 4.65 | 60.5 | 275 | 1600 | 921.2 | 576.4 | 1376.2 | 799.8 | | |
| 0.198 | 3.97 | 4.66 | 60.1 | 275 | 1583 | 921.2 | 576.4 | 1367.9 | 791.5 | | |
| 0.203 | 4.06 | 4.66 | | 9168 <u>²⁷⁵</u> TxCu | | | 574.8 | 1363.0 | 788.2 | | |

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CLIENT JOB NO. **PROJECT** PROJECT NO. LOCATION

RJH Consultants 2679-168

South Boulder Creek Phase II

16134

02/01/22 DATE TESTED CAL **TECHNICIAN**

BORING NO. **DEPTH**

TP-204, B-216, B-217 (P) 0-15' composite SAMPLE NO. Bu-1, C-4, C-6

DATE SAMPLED SAMPLED BY

DESCRIPTION remolded -3/8"

| Point B | | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--|----------|--------|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf | | |
| 0.208 | 4.16 | 4.67 | 60.6 | 275 | 1595 | 923.3 | 574.3 | 1371.6 | 797.3 | | |
| 0.213 | 4.26 | 4.67 | 60.2 | 275 | 1580 | 925.1 | 572.5 | 1362.7 | 790.2 | | |
| 0.218 | 4.36 | 4.68 | 60.0 | 276 | 1572 | 925.1 | 572.5 | 1358.3 | 785.8 | | |
| 0.223 | 4.47 | 4.68 | 59.5 | 276 | 1554 | 926.7 | 570.9 | 1347.8 | 776.9 | | |
| 0.229 | 4.58 | 4.69 | 60.4 | 276 | 1580 | 926.7 | 570.9 | 1360.7 | 789.8 | | |
| 0.233 | 4.67 | 4.69 | 60.2 | 276 | 1571 | 926.5 | 571.1 | 1356.5 | 785.4 | | |
| 0.238 | 4.76 | 4.70 | 60.0 | 277 | 1564 | 927.0 | 570.6 | 1352.6 | 782.1 | | |
| 0.243 | 4.86 | 4.70 | 60.9 | 277 | 1588 | 927.2 | 570.4 | 1364.5 | 794.2 | | |
| 0.248 | 4.96 | 4.71 | 60.9 | 277 | 1586 | 928.2 | 569.4 | 1362.3 | 792.8 | | |
| 0.253 | 5.07 | 4.71 | 60.0 | 277 | 1557 | 928.3 | 569.3 | 1347.5 | 778.3 | | |
| 0.258 | 5.17 | 4.72 | 59.9 | 277 | 1551 | 928.5 | 569.1 | 1344.6 | 775.5 | | |
| 0.264 | 5.28 | 4.72 | 60.1 | 278 | 1556 | 928.5 | 569.1 | 1347.0 | 777.9 | | |
| 0.269 | 5.38 | 4.73 | 60.4 | 278 | 1562 | 928.5 | 569.1 | 1350.1 | 781.0 | | |
| 0.274 | 5.48 | 4.73 | 59.6 | 278 | 1535 | 927.3 | 570.3 | 1337.8 | 767.5 | | |
| 0.279 | 5.58 | 4.74 | 59.9 | 278 | 1542 | 929.6 | 568.0 | 1338.9 | 770.9 | | |
| 0.285 | 5.70 | 4.74 | 60.3 | 279 | 1554 | 932.7 | 564.9 | 1341.7 | 776.9 | | |
| 0.290 | 5.80 | 4.75 | 60.8 | 279 | 1565 | 937.2 | 560.4 | 1342.9 | 782.4 | | |
| 0.294 | 5.89 | 4.75 | 59.9 | 279 | 1535 | 942.5 | 555.1 | 1322.7 | 767.6 | | |
| 0.299 | 5.98 | 4.76 | 59.5 | 279 | 1523 | 947.5 | 550.1 | 1311.5 | 761.4 | | |
| 0.304 | 6.09 | 4.76 | 60.2 | 280 | 1542 | 952.4 | 545.2 | 1316.2 | 771.0 | | |
| 0.310 | 6.20 | 4.77 | 60.2 | 280 | 1540 | 950.7 | 546.9 | 1316.7 | 769.8 | | |
| 0.314 | 6.29 | 4.77 | 60.3 | 280 | 1539 | 950.8 | 546.8 | 1316.2 | 769.5 | | |
| 0.319 | 6.39 | 4.78 | 60.6 | 280 | 1546 | 951.1 | 546.5 | 1319.6 | 773.0 | | |
| 0.325 | 6.50 | 4.78 | 61.2 | 281 | 1561 | 950.2 | 547.4 | 1327.9 | 780.5 | | |
| 0.329 | 6.59 | 4.79 | 61.6 | 281 | 1573 | 950.7 | 546.9 | 1333.1 | 786.3 | | |
| 0.334 | 6.69 | 4.79 | 62.0 | 281 | 1581 | 949.6 | 548.0 | 1338.5 | 790.4 | | |
| 0.339 | 6.80 | 4.80 | 61.3 | 281 | 1560 | 949.7 | 547.9 | 1328.0 | 780.1 | | |
| 0.344 | 6.89 | 4.80 | 62.2 | 281 | 1584 | 950.3 | 547.3 | 1339.1 | 791.8 | | |
| 0.349 | 7.00 | 4.81 | 61.5 | 282 | 1560 | 950.5 | 547.1 | 1326.9 | 779.8 | | |
| 0.354 | 7.09 | 4.81 | 61.5 | 282 | 1557 | 948.7 | 548.9 | 1327.4 | 778.5 | | |
| 0.359 | 7.19 | 4.82 | 61.8 | 282 | 1565 | 947.5 | 550.1 | 1332.6 | 782.5 | | |
| 0.364 | 7.29 | 4.82 | 62.2 | 282 | 1574 | 947.5 | 550.1 | 1337.2 | 787.1 | | |
| 0.369 | 7.38 | 4.83 | 61.7 | 283 | 1559 | 947.3 | 550.3 | 1329.6 | 779.3 | | |
| 0.374 | 7.49 | 4.83 | 62.0 | 283 | 1564 | 947.7 | 549.9 | 1331.9 | 782.0 | | |
| 0.380 | 7.60 | 4.84 | 62.5 | 283 | 1577 | 945.6 | 552.0 | 1340.7 | 788.7 | | |
| 0.384 | 7.69 | 4.84 | 62.4 | 283 | 1572 | 945.6 | 552.0 | 1338.0 | 786.0 | | |
| 0.389 | 7.80 | 4.85 | 62.5 | 284 | 1573 | 945.3 | 552.3 | 1338.6 | 786.3 | | |
| 0.394 | 7.89 | 4.85 | 62.1 | 284 | 1558 | 946.4 | 551.2 | 1330.2 | 779.0 | | |
| 0.399 | 7.98 | 4.86 | 62.2 | 284 | 1558 | 944.2 | 553.4 | 1332.3 | 778.9 | | |
| 0.404 | 8.10 | 4.87 | 62.9 | 284 | 1578 | 942.8 | 554.8 | 1343.6 | 788.8 | | |
| 0.409 | 8.19 | 4.87 | 62.6 | 284 | 1565 | 942.3 | 555.3 | 1337.7 | 782.4 | | |
| 0.414 | 8.30 | 4.88 | 63.4007 | 9168_ ²⁸ 5 | DD 41588 4 D | 942.4 | 555.2 | 1349.1 | 793.9 | | |

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CLIENT JOB NO. **PROJECT** PROJECT NO. LOCATION

RJH Consultants 2679-168

South Boulder Creek Phase II

16134

02/01/22 DATE TESTED CAL **TECHNICIAN**

BORING NO. **DEPTH**

TP-204, B-216, B-217 (P) 0-15' composite SAMPLE NO. Bu-1, C-4, C-6

DATE SAMPLED SAMPLED BY

DESCRIPTION remolded -3/8"

| Point B | | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--|----------|--------|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf | | |
| 0.419 | 8.39 | 4.88 | 62.3 | 285 | 1552 | 942.0 | 555.6 | 1331.6 | 776.0 | | |
| 0.425 | 8.50 | 4.89 | 62.0 | 285 | 1542 | 940.9 | 556.7 | 1327.6 | 770.9 | | |
| 0.429 | 8.59 | 4.89 | 63.2 | 285 | 1574 | 940.4 | 557.2 | 1344.4 | 787.2 | | |
| 0.434 | 8.69 | 4.90 | 63.5 | 286 | 1582 | 939.8 | 557.8 | 1349.0 | 791.2 | | |
| 0.439 | 8.79 | 4.90 | 62.8 | 286 | 1558 | 940.1 | 557.5 | 1336.4 | 778.9 | | |
| 0.444 | 8.89 | 4.91 | 62.7 | 286 | 1553 | 937.3 | 560.3 | 1336.7 | 776.4 | | |
| 0.449 | 8.99 | 4.91 | 63.3 | 286 | 1569 | 936.7 | 560.9 | 1345.4 | 784.5 | | |
| 0.454 | 9.09 | 4.92 | 62.7 | 287 | 1549 | 935.8 | 561.8 | 1336.1 | 774.3 | | |
| 0.459 | 9.19 | 4.92 | 62.4 | 287 | 1538 | 936.3 | 561.3 | 1330.3 | 769.0 | | |
| 0.464 | 9.29 | 4.93 | 63.2 | 287 | 1560 | 935.6 | 562.0 | 1341.8 | 779.8 | | |
| 0.469 | 9.40 | 4.94 | 63.5 | 287 | 1565 | 933.2 | 564.4 | 1346.9 | 782.4 | | |
| 0.474 | 9.49 | 4.94 | 63.1 | 287 | 1553 | 932.8 | 564.8 | 1341.2 | 776.4 | | |
| 0.479 | 9.60 | 4.95 | 63.1 | 288 | 1550 | 930.9 | 566.7 | 1341.9 | 775.2 | | |
| 0.485 | 9.71 | 4.95 | 64.4 | 288 | 1585 | 931.5 | 566.1 | 1358.7 | 792.6 | | |
| 0.490 | 9.80 | 4.96 | 63.8 | 288 | 1564 | 929.1 | 568.5 | 1350.7 | 782.2 | | |
| 0.494 | 9.89 | 4.96 | 63.0 | 288 | 1540 | 928.5 | 569.1 | 1339.2 | 770.1 | | |
| 0.500 | 10.00 | 4.97 | 63.7 | 289 | 1558 | 927.3 | 570.3 | 1349.4 | 779.1 | | |
| 0.504 | 10.09 | 4.97 | 64.2 | 289 | 1571 | 926.5 | 571.1 | 1356.5 | 785.4 | | |
| 0.510 | 10.20 | 4.98 | 63.5 | 289 | 1548 | 925.6 | 572.0 | 1345.8 | 773.8 | | |
| 0.515 | 10.30 | 4.99 | 63.5 | 289 | 1545 | 924.3 | 573.3 | 1346.1 | 772.7 | | |
| 0.520 | 10.41 | 4.99 | 63.5 | 290 | 1541 | 922.8 | 574.8 | 1345.5 | 770.7 | | |
| 0.525 | 10.51 | 5.00 | 64.1 | 290 | 1559 | 921.7 | 575.9 | 1355.3 | 779.4 | | |
| 0.530 | 10.62 | 5.00 | 63.3 | 290 | 1532 | 920.6 | 577.0 | 1343.0 | 766.0 | | |
| 0.535 | 10.71 | 5.01 | 63.2 | 290 | 1527 | 919.1 | 578.5 | 1341.9 | 763.4 | | |
| 0.540 | 10.81 | 5.01 | 63.3 | 291 | 1528 | 916.9 | 580.7 | 1344.9 | 764.2 | | |
| 0.545 | 10.91 | 5.02 | 64.2 | 291 | 1550 | 917.3 | 580.3 | 1355.4 | 775.1 | | |
| 0.550 | 11.01 | 5.02 | 63.1 | 291 | 1518 | 916.0 | 581.6 | 1340.4 | 758.8 | | |
| 0.555 | 11.11 | 5.03 | 63.6 | 291 | 1529 | 914.8 | 582.8 | 1347.1 | 764.3 | | |
| 0.560 | 11.22 | 5.04 | 64.3 | 291 | 1548 | 912.9 | 584.7 | 1358.5 | 773.8 | | |
| 0.565 | 11.32 | 5.04 | 63.9 | 292 | 1532 | 912.7 | 584.9 | 1350.9 | 766.0 | | |
| 0.570 | 11.41 | 5.05 | 63.7 | 292 | 1525 | 911.8 | 585.8 | 1348.5 | 762.7 | | |
| 0.575 | 11.51 | 5.05 | 63.2 | 292 | 1509 | 910.5 | 587.1 | 1341.4 | 754.3 | | |
| 0.580 | 11.62 | 5.06 | 63.8 | 292 | 1523 | 909.7 | 587.9 | 1349.3 | 761.5 | | |
| 0.585 | 11.71 | 5.06 | 63.9 | 293 | 1523 | 907.4 | 590.2 | 1351.9 | 761.7 | | |
| 0.590 | 11.81 | 5.07 | 63.2 | 293 | 1501 | 907.2 | 590.4 | 1340.9 | 750.5 | | |
| 0.595 | 11.91 | 5.08 | 64.0 | 293 | 1522 | 905.7 | 591.9 | 1353.0 | 761.1 | | |
| 0.600 | 12.01 | 5.08 | 63.9 | 293 | 1518 | 905.2 | 592.4 | 1351.3 | 758.9 | | |
| 0.605 | 12.11 | 5.09 | 63.2 | 294 | 1496 | 903.4 | 594.2 | 1342.1 | 747.9 | | |
| 0.610 | 12.21 | 5.09 | 62.7 | 294 | 1478 | 901.4 | 596.2 | 1335.1 | 738.9 | | |
| 0.615 | 12.31 | 5.10 | 63.3 | 294 | 1495 | 900.4 | 597.2 | 1344.5 | 747.4 | | |
| 0.620 | 12.41 | 5.11 | 64.3 | 294 | 1519 | 898.3 | 599.3 | 1358.6 | 759.3 | | |
| 0.625 | 12.51 | 5.11 | | 9168_ ²⁹ 1xCu | | | 600.0 | 1359.1 | 759.1 | | |

Appendix J.1 233 of 262



CLIENT JOB NO. PROJECT PROJECT NO. LOCATION RJH Consultants 2679-168

South Boulder Creek Phase II

16134

DATE TESTED 02/01/22 TECHNICIAN CAL

BORING NO. TP-204, B-216, B-217 (P)

DEPTH 0-15' composite SAMPLE NO. Bu-1, C-4, C-6

DATE SAMPLED ---SAMPLED BY --

DESCRIPTION remolded -3/8"

| | | | | Poi | nt B | | | | |
|-------------------|------------|--|------------|------------------------------|---------------------------------------|------------------------------|--|----------|---------|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Deviator Stress (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
| 0.630 | 12.61 | 5.12 | 64.0 | 295 | 1506 | 895.3 | 602.3 | 1355.5 | 753.2 |
| 0.635 | 12.71 | 5.12 | 64.0 | 295 | 1504 | 896.7 | 600.9 | 1353.1 | 752.1 |
| 0.640 | 12.81 | 5.13 | 63.9 | 295 | 1499 | 893.0 | 604.6 | 1354.0 | 749.5 |
| 0.646 | 12.92 | 5.14 | 63.6 | 295 | 1488 | 892.2 | 605.4 | 1349.3 | 743.9 |
| 0.650 | 13.02 | 5.14 | 62.9 | 296 | 1468 | 891.8 | 605.8 | 1339.7 | 733.9 |
| 0.655 | 13.12 | 5.15 | 63.7 | 296 | 1487 | 890.4 | 607.2 | 1350.8 | 743.6 |
| 0.660 | 13.21 | 5.15 | 64.1 | 296 | 1497 | 889.6 | 608.0 | 1356.3 | 748.3 |
| 0.665 | 13.32 | 5.16 | 63.7 | 296 | 1481 | 887.9 | 609.7 | 1350.0 | 740.3 |
| 0.670 | 13.41 | 5.16 | 63.7 | 297 | 1480 | 886.5 | 611.1 | 1351.3 | 740.1 |
| 0.675 | 13.52 | 5.17 | 63.9 | 297 | 1483 | 886.6 | 611.0 | 1352.4 | 741.5 |
| 0.680 | 13.61 | 5.18 | 63.7 | 297 | 1475 | 883.9 | 613.7 | 1351.0 | 737.4 |
| 0.685 | 13.72 | 5.18 | 63.8 | 297 | 1475 | 882.4 | 615.2 | 1352.8 | 737.6 |
| 0.690 | 13.81 | 5.19 | 64.2 | 297 | 1485 | 882.2 | 615.4 | 1357.7 | 742.3 |
| 0.695 | 13.91 | 5.19 | 64.6 | 298 | 1493 | 880.1 | 617.5 | 1364.2 | 746.7 |
| 0.700 | 14.01 | 5.20 | 64.2 | 298 | 1480 | 877.4 | 620.2 | 1360.2 | 739.9 |
| 0.705 | 14.11 | 5.21 | 64.3 | 298 | 1480 | 876.8 | 620.8 | 1361.0 | 740.1 |
| 0.710 | 14.22 | 5.21 | 65.2 | 298 | 1504 | 876.5 | 621.1 | 1373.1 | 752.1 |
| 0.715 | 14.31 | 5.22 | 64.4 | 299 | 1478 | 873.5 | 624.1 | 1363.1 | 739.0 |
| 0.720 | 14.42 | 5.22 | 64.1 | 299 | 1467 | 869.8 | 627.8 | 1361.3 | 733.6 |
| 0.725 | 14.52 | 5.23 | 65.1 | 299 | 1492 | 870.2 | 627.4 | 1373.4 | 746.0 |
| 0.730 | 14.61 | 5.24 | 64.5 | 299 | 1474 | 867.5 | 630.1 | 1366.9 | 736.8 |
| 0.735 | 14.71 | 5.24 | 63.9 | 300 | 1456 | 866.9 | 630.7 | 1358.6 | 728.0 |
| 0.740 | 14.82 | 5.25 | 63.5 | 300 | 1443 | 866.1 | 631.5 | 1352.8 | 721.3 |
| 0.745 | 14.92 | 5.26 | 64.8 | 300 | 1476 | 864.9 | 632.7 | 1370.7 | 738.0 |
| 0.750 | 15.01 | 5.26 | 64.2 | 300 | 1458 | 862.7 | 634.9 | 1363.7 | 728.8 |

Appendix J.1 234 of 262



CLIENT JOB NO. PROJECT PROJECT NO. LOCATION

RJH Consultants 2679-168

South Boulder Creek Phase II

16134 --

DATE TESTED 02/01/22 TECHNICIAN CAL

BORING NO. DEPTH

SAMPLE NO.

TP-204, B-216, B-217 (P)

0-15' composite Bu-1, C-4, C-6

DATE SAMPLED --SAMPLED BY --

DESCRIPTION remolded -3/8"

| Point | C |
|-------|----|
| | |
| ad | Co |

| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) |
|-------------------|------------|--|---------------------|---------------------------------|---|-------------------------------|--|----------|---------|
| 0.000 | 0.00 | 4.53 | 0.0 | 0 | 0 | 0.0 | 504.0 | 504.0 | 0.0 |
| 0.004 | 0.08 | 4.53 | 18.8 | 11 | 586 | 137.3 | 366.7 | 659.6 | 292.9 |
| 0.009 | 0.18 | 4.54 | 29.2 | 24 | 903 | 219.7 | 284.3 | 736.0 | 451.7 |
| 0.014 | 0.27 | 4.54 | 34.6 | 36 | 1061 | 269.1 | 234.9 | 765.4 | 530.4 |
| 0.019 | 0.38 | 4.55 | 38.7 | 50 | 1175 | 292.8 | 211.2 | 798.8 | 587.6 |
| 0.024 | 0.47 | 4.55 | 42.3 | 63 | 1273 | 302.3 | 201.7 | 838.4 | 636.7 |
| 0.028 | 0.56 | 4.56 | 43.8 | 75 | 1309 | 302.6 | 201.4 | 855.8 | 654.4 |
| 0.034 | 0.68 | 4.56 | 46.3 | 91 | 1371 | 298.7 | 205.3 | 890.8 | 685.5 |
| 0.039 | 0.77 | 4.57 | 47.0 | 103 | 1380 | 290.2 | 213.8 | 903.5 | 689.8 |
| 0.044 | 0.87 | 4.57 | 47.7 | 117 | 1386 | 281.4 | 222.6 | 915.8 | 693.2 |
| 0.049 | 0.97 | 4.58 | 48.7 | 130 | 1403 | 270.4 | 233.6 | 935.0 | 701.4 |
| 0.054 | 1.07 | 4.58 | 49.1 | 143 | 1400 | 261.3 | 242.7 | 943.0 | 700.2 |
| 0.059 | 1.18 | 4.58 | 49.1 | 158 | 1383 | 251.2 | 252.8 | 944.3 | 691.5 |
| 0.064 | 1.27 | 4.59 | 49.0 | 170 | 1367 | 244.4 | 259.6 | 943.2 | 683.6 |
| 0.068 | 1.36 | 4.59 | 48.3 | 182 | 1333 | 237.3 | 266.7 | 933.2 | 666.5 |
| 0.073 | 1.46 | 4.60 | 48.6 | 195 | 1327 | 232.3 | 271.7 | 935.3 | 663.6 |
| 0.078 | 1.55 | 4.60 | 48.1 | 208 | 1296 | 228.4 | 275.6 | 923.4 | 647.8 |
| 0.084 | 1.67 | 4.61 | 47.9 | 224 | 1274 | 223.8 | 280.2 | 917.0 | 636.8 |
| 0.088 | 1.76 | 4.61 | 48.8 | 236 | 1290 | 220.7 | 283.3 | 928.1 | 644.8 |
| 0.094 | 1.87 | 4.62 | 48.3 | 251 | 1257 | 221.6 | 282.4 | 910.7 | 628.3 |
| 0.099 | 1.97 | 4.62 | 47.6 | 264 | 1219 | 221.9 | 282.1 | 891.6 | 609.5 |
| 0.104 | 2.07 | 4.63 | 48.2 | 269 | 1233 | 223.6 | 280.4 | 896.9 | 616.5 |
| 0.109 | 2.17 | 4.63 | 47.7 | 269 | 1213 | 224.4 | 279.6 | 886.3 | 606.7 |
| 0.114 | 2.27 | 4.64 | 48.2 | 269 | 1227 | 226.7 | 277.3 | 891.0 | 613.7 |
| 0.119 | 2.38 | 4.64 | 47.7 | 269 | 1212 | 227.6 | 276.4 | 882.2 | 605.8 |
| 0.124 | 2.47 | 4.65 | 47.8 | 269 | 1211 | 228.3 | 275.7 | 881.2 | 605.4 |
| 0.130 | 2.58 | 4.65 | 48.2 | 270 | 1222 | 227.5 | 276.5 | 887.4 | 610.9 |
| 0.134 | 2.67 | 4.66 | 47.8 | 270 | 1209 | 227.2 | 276.8 | 881.1 | 604.3 |
| 0.139 | 2.78 | 4.66 | 48.4 | 270 | 1224 | 227.3 | 276.7 | 888.9 | 612.2 |
| 0.144 | 2.87 | 4.66 | 47.7 | 270 | 1201 | 225.9 | 278.1 | 878.7 | 600.6 |
| 0.149 | 2.97 | 4.67 | 48.3 | 271 | 1218 | 224.3 | 279.7 | 8.888 | 609.1 |
| 0.154 | 3.07 | 4.67 | 47.9 | 271 | 1204 | 224.6 | 279.4 | 881.6 | 602.2 |
| 0.159 | 3.17 | 4.68 | 47.3 | 271 | 1183 | 224.3 | 279.7 | 871.3 | 591.6 |
| 0.164 | 3.26 | 4.68 | 48.3 | 271 | 1213 | 222.9 | 281.1 | 887.5 | 606.5 |
| 0.169 | 3.36 | 4.69 | 48.1 | 272 | 1206 | 222.8 | 281.2 | 884.2 | 603.0 |
| 0.174 | 3.47 | 4.69 | 48.0 | 272 | 1202 | 222.8 | 281.2 | 882.3 | 601.1 |
| 0.180 | 3.57 | 4.70 | 48.3 | 272 | 1209 | 222.5 | 281.5 | 885.9 | 604.3 |
| 0.185 | 3.68 | 4.70 | 48.5 | 272 | 1214 | 220.6 | 283.4 | 890.1 | 606.8 |
| 0.189 | 3.77 | 4.71 | 47.5 | 272 | 1181 | 220.5 | 283.5 | 874.3 | 590.7 |
| 0.195 | 3.88 | 4.71 | 47.7 | 273 | 1184 | 221.1 | 282.9 | 875.0 | 592.1 |
| 0.199 | 3.96 | 4.72 | 47.6 | 273 | 1181 | 221.8 | 282.2 | 872.7 | 590.5 |
| 0.204 | 4.07 | 4.72 | ^{47.6} 267 | ′9168 <u>²⁷</u> TxCu | PP A ¹ 3 ⁸⁹ M D4 | 4767 <u>-</u> 0 ^{.5} | 283.5 | 873.3 | 589.8 |

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CLIENT JOB NO. PROJECT PROJECT NO. LOCATION

RJH Consultants 2679-168

South Boulder Creek Phase II

16134

DATE TESTED 02/01/22 TECHNICIAN CAL

BORING NO. DEPTH

DEPTH 0-15' composite SAMPLE NO. Bu-1, C-4, C-6

TP-204, B-216, B-217 (P)

DATE SAMPLED --SAMPLED BY --

DESCRIPTION remolded -3/8"

| Point | C |
|-------|---|
|-------|---|

| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf, |
|-------------------|------------|--|------------|------------------------------|---|------------------------------|--|----------|---------|
| 0.210 | 4.18 | 4.73 | 48.8 | 273 | 1213 | 220.2 | 283.8 | 890.5 | 606.7 |
| 0.214 | 4.27 | 4.73 | 48.0 | 274 | 1187 | 217.7 | 286.3 | 879.9 | 593.6 |
| 0.219 | 4.37 | 4.74 | 48.6 | 274 | 1203 | 219.5 | 284.5 | 886.1 | 601.6 |
| 0.224 | 4.47 | 4.74 | 48.7 | 274 | 1204 | 217.3 | 286.7 | 888.5 | 601.8 |
| 0.229 | 4.57 | 4.75 | 48.7 | 274 | 1202 | 218.4 | 285.6 | 886.6 | 600.9 |
| 0.234 | 4.67 | 4.75 | 48.6 | 274 | 1198 | 217.5 | 286.5 | 885.7 | 599.2 |
| 0.240 | 4.78 | 4.76 | 48.7 | 275 | 1199 | 217.7 | 286.3 | 885.6 | 599.3 |
| 0.245 | 4.88 | 4.76 | 48.4 | 275 | 1188 | 217.3 | 286.7 | 880.7 | 594.0 |
| 0.250 | 4.97 | 4.77 | 48.8 | 275 | 1199 | 218.1 | 285.9 | 885.6 | 599.6 |
| 0.254 | 5.06 | 4.77 | 49.0 | 275 | 1203 | 218.0 | 286.0 | 887.5 | 601.5 |
| 0.259 | 5.16 | 4.78 | 48.3 | 276 | 1179 | 218.2 | 285.8 | 875.2 | 589.4 |
| 0.264 | 5.26 | 4.78 | 48.7 | 276 | 1191 | 216.4 | 287.6 | 883.3 | 595.7 |
| 0.270 | 5.37 | 4.79 | 48.4 | 276 | 1180 | 217.6 | 286.4 | 876.4 | 590.0 |
| 0.275 | 5.46 | 4.79 | 48.6 | 276 | 1183 | 216.6 | 287.4 | 878.9 | 591.5 |
| 0.280 | 5.58 | 4.80 | 48.3 | 277 | 1174 | 216.4 | 287.6 | 874.4 | 586.8 |
| 0.285 | 5.67 | 4.80 | 48.5 | 277 | 1177 | 216.3 | 287.7 | 876.2 | 588.5 |
| 0.290 | 5.77 | 4.81 | 48.8 | 277 | 1184 | 215.0 | 289.0 | 881.0 | 592.0 |
| 0.295 | 5.88 | 4.81 | 49.2 | 277 | 1195 | 215.2 | 288.8 | 886.2 | 597.4 |
| 0.301 | 5.99 | 4.82 | 47.8 | 278 | 1150 | 214.6 | 289.4 | 864.4 | 575.1 |
| 0.306 | 6.08 | 4.82 | 48.7 | 278 | 1177 | 213.0 | 291.0 | 879.4 | 588.4 |
| 0.310 | 6.18 | 4.83 | 48.3 | 278 | 1163 | 214.7 | 289.3 | 870.8 | 581.5 |
| 0.315 | 6.28 | 4.83 | 47.8 | 278 | 1146 | 213.1 | 290.9 | 863.8 | 572.9 |
| 0.320 | 6.38 | 4.84 | 49.1 | 278 | 1181 | 214.0 | 290.0 | 880.5 | 590.5 |
| 0.326 | 6.49 | 4.85 | 48.2 | 279 | 1155 | 213.2 | 290.8 | 868.3 | 577.4 |
| 0.330 | 6.58 | 4.85 | 49.4 | 279 | 1187 | 212.5 | 291.5 | 885.0 | 593.6 |
| 0.336 | 6.68 | 4.86 | 48.4 | 279 | 1156 | 213.5 | 290.5 | 868.6 | 578.1 |
| 0.341 | 6.78 | 4.86 | 49.7 | 279 | 1194 | 212.8 | 291.2 | 888.4 | 597.2 |
| 0.345 | 6.87 | 4.87 | 48.5 | 280 | 1156 | 212.4 | 291.6 | 869.4 | 577.8 |
| 0.351 | 6.98 | 4.87 | 49.2 | 280 | 1173 | 213.2 | 290.8 | 877.5 | 586.7 |
| 0.355 | 7.08 | 4.88 | 49.7 | 280 | 1188 | 212.6 | 291.4 | 885.6 | 594.2 |
| 0.360 | 7.17 | 4.88 | 48.7 | 280 | 1156 | 212.9 | 291.1 | 869.3 | 578.2 |
| 0.366 | 7.28 | 4.89 | 49.1 | 280 | 1168 | 211.2 | 292.8 | 876.6 | 583.8 |
| 0.371 | 7.38 | 4.89 | 50.3 | 281 | 1199 | 212.1 | 291.9 | 891.6 | 599.7 |
| 0.376 | 7.48 | 4.90 | 50.2 | 281 | 1194 | 211.9 | 292.1 | 889.2 | 597.1 |
| 0.380 | 7.57 | 4.90 | 49.1 | 281 | 1162 | 211.0 | 293.0 | 874.2 | 581.2 |
| 0.385 | 7.67 | 4.91 | 50.1 | 281 | 1190 | 211.6 | 292.4 | 887.4 | 595.0 |
| 0.391 | 7.77 | 4.91 | 49.3 | 282 | 1163 | 210.8 | 293.2 | 874.5 | 581.4 |
| 0.396 | 7.87 | 4.92 | 49.5 | 282 | 1167 | 211.5 | 292.5 | 876.2 | 583.7 |
| 0.401 | 7.98 | 4.92 | 49.5 | 282 | 1166 | 212.2 | 291.8 | 874.8 | 583.0 |
| 0.405 | 8.07 | 4.93 | 49.9 | 282 | 1177 | 211.3 | 292.7 | 881.2 | 588.5 |
| 0.410 | 8.17 | 4.93 | 50.1 | 283 | 1180 | 210.8 | 293.2 | 883.2 | 590.0 |
| 0.415 | 8.26 | 4.94 | 50.0 | 28 3 | PP A ¹ 576M D4 | 176-21Q.9 | 293.1 | 881.0 | 588.0 |

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CLIENT JOB NO. PROJECT PROJECT NO. LOCATION

RJH Consultants 2679-168

South Boulder Creek Phase II

16134 --

DATE TESTED 02/01/22 TECHNICIAN CAL

BORING NO.
DEPTH
SAMPLE NO.
DATE SAMPLED

TP-204, B-216, B-217 (P)

0-15' composite Bu-1, C-4, C-6

DATE SAMPLED --SAMPLED BY --

DESCRIPTION remolded -3/8"

| Point C | | | | | | | | | | |
|-------------------|----------------|--|---------------------|------------------------------|--|------------------------------------|--|----------------|----------------|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) | |
| 0.421 | 8.38 | 4.95 | 49.9 | 283 | 1171 | 210.2 | 293.8 | 879.2 | 585.4 | |
| 0.426 | 8.47 | 4.95 | 49.6 | 283 | 1159 | 208.9 | 295.1 | 874.4 | 579.3 | |
| 0.431 | 8.58 | 4.96 | 50.7 | 283 | 1190 | 209.2 | 294.8 | 889.8 | 594.9 | |
| 0.435 | 8.67 | 4.96 | 50.4 | 284 | 1180 | 210.4 | 293.6 | 883.4 | 589.8 | |
| 0.441 | 8.79 | 4.97 | 49.8 | 284 | 1159 | 209.3 | 294.7 | 874.2 | 579.5 | |
| 0.446 | 8.87 | 4.97 | 50.2 | 284 | 1170 | 209.6 | 294.4 | 879.4 | 585.0 | |
| 0.451 | 8.97 | 4.98 | 50.0 | 284 | 1162 | 207.8 | 296.2 | 877.3 | 581.1 | |
| 0.456 | 9.08 | 4.98 | 51.2 | 285 | 1194 | 208.2 | 295.8 | 892.9 | 597.1 | |
| 0.461 | 9.18 | 4.99 | 51.5 | 285 | 1201 | 208.7 | 295.3 | 895.8 | 600.5 | |
| 0.466 | 9.28 | 4.99 | 50.7 | 285 | 1177 | 206.0 | 298.0 | 886.5 | 588.5 | |
| 0.471 | 9.38 | 5.00 | 52.0 | 285 | 1212 | 206.6 | 297.4 | 903.5 | 606.1 | |
| 0.476 | 9.48 | 5.01 | 50.6 | 286 | 1170 | 205.5 | 298.5 | 883.4 | 584.9 | |
| 0.482 | 9.58 | 5.01 | 50.1 | 286 | 1155 | 206.1 | 297.9 | 875.4 | 577.5 | |
| 0.487 | 9.69 | 5.02 | 51.2 | 286 | 1184 | 205.6 | 298.4 | 890.4 | 592.0 | |
| 0.492 | 9.78 | 5.02 | 51.4 | 286 | 1187 | 204.8 | 299.2 | 892.7 | 593.5 | |
| 0.496 | 9.88 | 5.03 | 50.5 | 286 | 1159 | 204.8 | 299.2 | 878.7 | 579.5 | |
| 0.502 | 9.99 | 5.03 | 51.1 | 287 | 1175 | 204.0 | 300.0 | 887.4 | 587.4 | |
| 0.506 | 10.08 | 5.04 | 50.4 | 287 | 1154 | 204.6 | 299.4 | 876.6 | 577.2 | |
| 0.511 | 10.17 | 5.04 | 50.6 | 287 | 1159 | 204.9 | 299.1 | 878.4 | 579.4 | |
| 0.517 | 10.29 | 5.05 | 50.5 | 287 | 1152 | 204.2 | 299.8 | 875.8 | 575.9 | |
| 0.521 | 10.23 | 5.06 | 51.6 | 288 | 1183 | 204.3 | 299.7 | 891.4 | 591.7 | |
| 0.527 | 10.48 | 5.06 | 50.8 | 288 | 1159 | 204.6 | 299.4 | 878.8 | 579.4 | |
| 0.532 | 10.48 | 5.07 | 52.1 | 288 | 1191 | 203.3 | 300.7 | 896.4 | 595.7 | |
| 0.537 | 10.68 | 5.07 | 50.6 | 288 | 1148 | 202.5 | 300.7 | 875.6 | 574.1 | |
| 0.537 | 10.00 | 5.08 | 51.6 | 289 | 1175 | 202.5 | 301.5 | 889.2 | 587.7 | |
| 0.547 | 10.77 | 5.08 | 51.6 | 289 | 1173 | 202.3 | 301.3 | 888.2 | 586.1 | |
| | | | | | | | | | | |
| 0.551 0.557 | 10.98 11.08 | 5.09 5.10 | 50.9 51.4 | 289 289 | 1152 1164 | 201.1 201.2 | 302.9 302.8 | 878.9 884.7 | 576.0 582.0 | |
| 0.561 | 11.06 | 5.10 | 51.4 | 289 | 1158 | 201.2 | 302.6 | 881.9 | 578.8 | |
| | | | | 290 | | 200.9 | | | | |
| 0.567 | 11.28 | 5.11 | 52.1 | 290 | 1180 1140 | | 302.1 | 891.9 | 589.8 | |
| 0.571 | 11.37 | 5.11 | 50.8 | | | 200.5 | 303.5 | 873.7 | 570.2 | |
| 0.577 | 11.48 | 5.12 | 52.3 | 290 | 1182 | 199.4 | 304.6 | 895.5 | 590.9 | |
| 0.582 | 11.59 | 5.12 | 51.9 | 290 | 1168 | 199.9 | 304.1 | 888.3 | 584.2 | |
| 0.587 | 11.68 | 5.13 | 50.8 | 291 | 1137 | 198.1 | 305.9 | 874.3 | 568.4 | |
| 0.591 | 11.77 | 5.14 | 51.5 | 291 | 1154 | 199.1 | 304.9 | 881.9 | 577.0 | |
| 0.597 | 11.88 | 5.14 | 51.6 | 291 | 1153 | 198.7 | 305.3 | 881.8 | 576.4 | |
| 0.602 | 11.98 | 5.15 | 51.3 | 291 | 1145 | 197.7 | 306.3 | 878.6 | 572.3 | |
| 0.607 | 12.08 | 5.15 | 51.5 | 292 | 1147 | 198.0 | 306.0 | 879.4 | 573.4 | |
| 0.612 | 12.17 | 5.16 | 51.6 | 292 | 1147 | 197.1 | 306.9 | 880.6 | 573.7 | |
| 0.616 | 12.26 | 5.16 | 51.1 | 292 | 1132 | 195.9 | 308.1 | 873.9 | 565.8 | |
| 0.621 | 12.37 | 5.17 | 51.7 | 292 | 1148 | 196.0 | 308.0 | 882.0 | 573.9 | |
| 0.627 | 12.47 | 5.18 | ^{51.4} 267 | ′9168_ ²⁹ TxCu | PP A ¹ 5 ¹⁸ M D ₄ | 4767 ¹⁹ ð ^{.6} | 310.4 | 879.5 | 569.0 | |

Appendix J.1 237 of 262



CLIENT JOB NO. **PROJECT** PROJECT NO. **LOCATION**

RJH Consultants 2679-168

South Boulder Creek Phase II

16134

02/01/22 DATE TESTED CAL **TECHNICIAN**

SAMPLE NO.

DATE SAMPLED SAMPLED BY

BORING NO.

DEPTH

DESCRIPTION remolded -3/8"

TP-204, B-216, B-217 (P)

0-15' composite

Bu-1, C-4, C-6

| | Point C | | | | | | | | | | | |
|-------------------|------------|--|------------|------------------------------|---|------------------------------|--|----------|---------|--|--|--|
| Displacement (in) | Strain (%) | Average Cross Sectional Area (in²) | Load (lbs) | Combined Correction (psf) | Corrected Principal Stress Difference (psf) | Delta Pore Pressure (psf) | Effective Minor Pricipal Stress (psf) - σ ₃ ' | p' (psf) | q (psf) | | | |
| 0.632 | 12.57 | 5.18 | 51.8 | 293 | 1148 | 194.0 | 310.0 | 883.9 | 573.9 | | | |
| 0.637 | 12.67 | 5.19 | 52.2 | 293 | 1155 | 194.2 | 309.8 | 887.3 | 577.5 | | | |
| 0.642 | 12.77 | 5.19 | 52.2 | 293 | 1155 | 193.6 | 310.4 | 887.9 | 577.6 | | | |
| 0.646 | 12.86 | 5.20 | 52.5 | 293 | 1161 | 193.7 | 310.3 | 890.6 | 580.3 | | | |
| 0.652 | 12.97 | 5.21 | 52.5 | 294 | 1159 | 191.6 | 312.4 | 891.8 | 579.4 | | | |
| 0.657 | 13.07 | 5.21 | 53.2 | 294 | 1175 | 192.7 | 311.3 | 898.9 | 587.6 | | | |
| 0.662 | 13.17 | 5.22 | 53.2 | 294 | 1175 | 193.0 | 311.0 | 898.7 | 587.7 | | | |
| 0.667 | 13.27 | 5.22 | 53.5 | 294 | 1179 | 191.7 | 312.3 | 901.8 | 589.5 | | | |
| 0.672 | 13.38 | 5.23 | 53.3 | 294 | 1174 | 191.8 | 312.2 | 899.2 | 587.0 | | | |
| 0.677 | 13.48 | 5.24 | 54.1 | 295 | 1192 | 191.6 | 312.4 | 908.6 | 596.2 | | | |
| 0.682 | 13.57 | 5.24 | 53.6 | 295 | 1177 | 190.8 | 313.2 | 901.5 | 588.3 | | | |
| 0.687 | 13.68 | 5.25 | 54.3 | 295 | 1195 | 189.9 | 314.1 | 911.7 | 597.5 | | | |
| 0.692 | 13.78 | 5.25 | 53.6 | 295 | 1174 | 189.5 | 314.5 | 901.6 | 587.1 | | | |
| 0.697 | 13.88 | 5.26 | 54.4 | 296 | 1194 | 189.6 | 314.4 | 911.6 | 597.2 | | | |
| 0.702 | 13.98 | 5.27 | 54.4 | 296 | 1190 | 188.0 | 316.0 | 911.1 | 595.2 | | | |
| 0.707 | 14.08 | 5.27 | 54.0 | 296 | 1179 | 189.2 | 314.8 | 904.5 | 589.7 | | | |
| 0.712 | 14.17 | 5.28 | 55.1 | 296 | 1207 | 188.7 | 315.3 | 918.8 | 603.5 | | | |
| 0.718 | 14.28 | 5.29 | 54.4 | 297 | 1186 | 188.2 | 315.8 | 908.9 | 593.1 | | | |
| 0.723 | 14.38 | 5.29 | 54.1 | 297 | 1174 | 188.7 | 315.3 | 902.5 | 587.2 | | | |
| 0.728 | 14.49 | 5.30 | 54.1 | 297 | 1174 | 188.4 | 315.6 | 902.8 | 587.2 | | | |
| 0.733 | 14.58 | 5.30 | 54.8 | 297 | 1190 | 186.3 | 317.7 | 912.9 | 595.2 | | | |
| 0.738 | 14.69 | 5.31 | 54.7 | 297 | 1186 | 185.7 | 318.3 | 911.3 | 593.0 | | | |
| 0.743 | 14.78 | 5.32 | 54.7 | 298 | 1184 | 185.2 | 318.8 | 910.5 | 591.8 | | | |
| 0.748 | 14.88 | 5.32 | 54.8 | 298 | 1185 | 186.4 | 317.6 | 910.0 | 592.4 | | | |
| 0.753 | 14.98 | 5.33 | 54.0 | 298 | 1161 | 185.0 | 319.0 | 899.6 | 580.6 | | | |
| 0.758 | 15.09 | 5.34 | 54.4 | 298 | 1171 | 185.1 | 318.9 | 904.3 | 585.5 | | | |

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Chemical Analyses

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Chemical Analysis

RJH Consultants CLIENT

2679-152

BORING NO.

B-205

JOB NO. PROJECT

South Boulder Creek - Phase II Geotechnical Investig SAMPLE NO.

7.5-7.7

S-5, S-6, S-7

PROJECT NO. 16134 DATE SAMPLED --

DEPTH

LOCATION

DESCRIPTION --

07/01/20 DATE TESTED SPH TECHNICIAN

Sulfate Concentration ASTM C1580

Measured Sulfate Concentration (ppm):

45

Dilution:

1.00:1

Sulfate Concentration (ppm):

45

Chloride Concentration ASTM D1411

Chloride Concentration (ppm):

36.0

Soil Ph ASTM D4972

pH:

7.6

Temperature (°C):

23.9

Soil Resistivity ASTM G187

Minimum Measured Resistivity (Ω):

4100

Box Correction Factor (cm):

2.00

Minimum Resistivity (Ω·cm):

8200

Sulfide Concentration ASTM D4658

Measured Sulfide Concentration (ppm):

Dilution:

Sulfide Concentration (ppm):

Oxidation-Reduction Potential ASTM D1498

ORP (mV):

Temperature (°C):

Carbonate Content ASTM D4373

Pressure (psi):

Percent Calcite Equivalent:

Sulfide concentration not possible. Sample was disturbed before testing began.

NOTES

Data entry by:

SPH

Date:

7/3/2020

Checked by:

Date: -

File name:

2679152 Chemical Analysis ASTM C1580 D4972 D1411 D1498 G187 D4373 1.xlsm



Chemical Analysis

CLIENT

RJH Consultants

JOB NO.

2679-152

PROJECT

South Boulder Creek - Phase II Geotechnical Investigation

PROJECT NO.

16134

LOCATION

07/01/20

DATE TESTED TECHNICIAN

SPH

BORING NO.

B-214

DEPTH

16.4-17' NQ-3

SAMPLE NO.

DATE SAMPLED --

DESCRIPTION --

Sulfate Concentration ASTM C1580

Measured Sulfate Concentration (ppm):

38

Dilution:

10.00:1

Sulfate Concentration (ppm):

379

Chloride Concentration ASTM D1411

Chloride Concentration (ppm):

15.5

Soil Ph ASTM D4972

pH:

8.1 23.4

Temperature (°C):

Soil Resistivity ASTM G187

Minimum Measured Resistivity (Ω):

428

Box Correction Factor (cm):

2.00

Minimum Resistivity (Ω·cm):

856

Sulfide Concentration ASTM D4658

Measured Sulfide Concentration (ppm):

0.01

Dilution:

1.00:1

Sulfide Concentration (ppm):

0.01

Oxidation-Reduction Potential ASTM D1498

ORP (mV):

Temperature (°C):

Carbonate Content ASTM D4373

Pressure (psi):

Percent Calcite Equivalent:

NOTES

Data entry by:

SPH

7/1/2020

Checked by:

File name:

Date: 7/1

2679152__Chemical Analysis ASTM C1580 D4972 D1411 D1498 G187 D4373_0.xlsm

Environmental Tests

Appendix J.1 242 of 262



Wheat Ridge, CO

03/20/20

e-Hardcopy 2.0
Automated Report

The results set forth herein are provided by SGS North America Inc.

Technical Report for

RJH Consutants

South Boulder Creek

16134

SGS Job Number: DA24708

Sampling Dates: 02/03/20 - 02/12/20



RJH Consutants 9800 Mount Pyramid Court #330 Englewood, CO 80112 aprochaska@rjhconsultants.com

ATTN: Adam Prochaska

Total number of pages in report: 10

TNI TNI TNI TNI TNI

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Scott Heideman Laboratory Director

Seed walk

Client Service contact: Carissa Cumine 303-425-6021

Certifications: CO (CO00049), NE (NE-OS-06-04), ND (R-027), UT (NELAP CO00049) LA (LA150028), TX (T104704511), WY (8TMS-L)

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| 3.1: DA24708-1: -202 | |
| 3.2: DA24708-2: -213 S-2 | |
| Section 4: Misc. Forms | |
| 4.1: Chain of Custody | |
| | _ |



Sample Summary

RJH Consutants

Job No:

DA24708

South Boulder Creek Project No: 16134

| Sample | ole Collected | | Matrix | | | Client | | |
|-----------|---------------|----------|----------|------|------|-----------|--|--|
| Number | Date | Time By | Received | Code | Type | Sample ID | | |
| DA24708-1 | 02/03/20 | 00:00 SG | 03/09/20 | SO | Soil | -202 | | |
| DA24708-2 | 02/12/20 | 00:00 SG | 03/09/20 | SO | Soil | -213 S-2 | | |

Soil samples reported on a dry weight basis unless otherwise indicated on result page.



Summary of Hits Job Number: DA24708

Job Number: DA24708
Account: RJH Consutants
Project: South Boulder Creek
Collected: 02/03/20 thru 02/12/20

| Lab Sample ID Client Sample ID Analyte | Result/ Qual | RL | MDL | Units | Method |
|--|-----------------|-----|-----|-------|-------------|
| DA24708-1 -202 | | | | | |
| HEM Oil and Grease ^a | 46900 | 250 | | mg/kg | SW846 9071B |
| DA24708-2 -213 S-2 | | | | | |
| HEM Oil and Grease b | 41800 | 260 | | mg/kg | SW846 9071B |

- (a) Sample received outside the holding time.
- (b) Analysis performed past the recommended method holding time as per client instructions.



Wheat Ridge, CO

Section 3

| Sample Results | |
|--------------------|--|
| Report of Analysis | |

Report of Analysis

Page 1 of 1

Client Sample ID: -202

 Lab Sample ID:
 DA24708-1
 Date Sampled:
 02/03/20

 Matrix:
 SO - Soil
 Date Received:
 03/09/20

 Percent Solids:
 99.4

Project: South Boulder Creek

General Chemistry

| Analyte | Result | RL | Units | DF | Analyzed | By | Method |
|---------------------------------|--------|-----|-------|----|----------|----|----------------|
| %solids Solids, Percent | 99.4 | | % | 1 | 03/19/20 | ST | SM2540G-2011 M |
| HEM Oil and Grease ^a | 46900 | 250 | mg/kg | 1 | 03/13/20 | ST | SW846 9071B |

(a) Sample received outside the holding time.

Report of Analysis

Page 1 of 1

Client Sample ID: -213 S-2 Lab Sample ID: DA24708-2 Matrix: SO - Soil

Date Sampled: 02/12/20Date Received: 03/09/20Percent Solids: 94.6

Project: South Boulder Creek

General Chemistry

| Analyte | Result | RL | Units | DF | Analyzed | By | Method |
|---------------------------------|--------|-----|-------|----|----------|----|----------------|
| %solids Solids, Percent | 94.6 | | % | 1 | 03/19/20 | ST | SM2540G-2011 M |
| HEM Oil and Grease ^a | 41800 | 260 | mg/kg | 1 | 03/13/20 | ST | SW846 9071B |

⁽a) Analysis performed past the recommended method holding time as per client instructions.



Misc. Forms

Wheat Ridge, CO

Custody Documents and Other Forms

Includes the following where applicable:

· Chain of Custody

| SGS | | | | | SCON- TO COSTODI | | | | | | | | | Page _1_ of _1_ | | | | | | | | | | | | | | |
|--|---|---------------------------------|--------------|---|------------------|------------|-------------------------------|---|----------|-------------|--------|---------|--------------------|------------------------|--------------------|--------|--------|---------|-------------------|----------------|-------------------------------------|---|--------------|---|--|--|-------------------------|--|
| | | | | | 036 Youn | gfield | ATE CODA . EAST CODE CO COURS | | | | | | | Bottle Order Control # | | | | | FED-EX Tracking # | | | | | | | | | |
| | TEL: 303-425-6021 FAX: 303-425-6854 www.sgs.com/ehsusa | | | | | | | | | SGS Quote # | | | | | SGS Job #DA ZY 708 | | | | | | | | | | | | | |
| Slient / Reporting Information | | | | Pr | oject Inf | orma | tion | | | | | | | | | | | Req | ueste | d Ana | ivsis | see 1 | TEST (| CODE | sheet) | 6-7 | | Matrix Codes |
| seny: RJH CONSUlt. | ants | Project Name | 50 | wth | Bou | de | ~ | C | - | 20 | L | | | | | | | | | | | T | Ī | T | 1 | TT | | DW - Drinking Water |
| 9800 Mt Pyramid C+ #330 Street CU Sou | | | | Billing Information (if different from Report to) | | | | | | | | | | | | | | | | | | 1 1 | | GW - Ground Wate WW - Water SW - Surface Wate | | | | |
| liate: Englewood. C | City, State: Boulder, CO | | | | | Company: | | | | | | | | | | | | | | | | | | İ | | Ì | SO - Soll SL- Sludge | |
| 1363-241-0571 | Project#: 16134 | | | | Street Address: | | | | | | | | | | | | | | | | | | | 1 | | SED-Sediment OI - OII LIQ - Other Liquid | | |
| | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | - 1 | AIR - Air | |
| aprochaska eribec | consultants. | Form | | | | City, | State | ZIP. | | | | | | | | | 5- | | | | | 1 | | | | | - 1 | SOL - Other Solid WP - Wipe |
| | | Project Manager; Collection: | | | | Attention: | | | | | | | | | 1991 | | | | | | | | | ļ | FB - Field Blank EB-Equipment Blank | | | |
| | Number of preserved Battles | | | | | | | | | | | | 1 | 1 | | 1 | ľ | | | - 1 | RB - Rinse Blank TB - Trip Blank | | | | | | | |
| | | | Sampled | | | ш | | T. | 3 | igi. | _ 4 | 1 8 | 8 | T | Т | Т | 포 | Ì | | | ŀ | | |]. | | | - 1 | 1B-1np Blank |
| Field ID / Point of Collection | Date | Time | by. | Matrix | # of bottles | NONE | HCI NaOH | HNO3 | H2SO4 | Mid. | MEOH | Na2S2O3 | Nazsoa | | | | 0 | | | | | | 1 | | | | | LAB USE ONLY |
| -2.02 | 2-3-20 | | 56 | 50 | 1 | 1 | | | | T | | T | | ŀ | T | | 1 | | | | | | 1 | <u> </u> | - | \vdash | | CI |
| -213 S-2 | 2-12-20 | | 5 G | 50 | 1 | 1 | | | | | T | | | | \top | | F | | | | - | | + | 1 | _ | - | | 02 |
| | | | | | | | \top | | | | | 1 | 77 | 1 | | \top | | | | L | - | - | + | + | + | - | | 02 |
| | | | | | | | \top | | | | 1 | † | 11 | Ť | + | Ħ | | | | | <u> </u> | - | - | - | | - | | |
| | | | | <u> </u> | | | + | † | | + | + | + | 7 | + | + | ╁ | | | | | - | - | | | | - | | |
| | | | | | | \vdash | + | H | | + | + | + | +- | + | + | ++ | | | | | | - | - | 4 | | - | _ | |
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| - | | | | | | H | + | \vdash | \vdash | - | + | + | + | - | + | ++ | | | | | | | | 1 | <u> </u> | - | | |
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| | | | | | | - | - | H | | _ | 1 | 4 | 44 | 1 | | Ш | | | | | | | | Ŀ | | | | |
| | | | | | | H | + | Н | _ | 1 | 1 | 1 | $\perp \downarrow$ | \perp | | | | | | | | | | | | | | |
| *************************************** | | | | | | | 1 | Ц | Ц | 1 | | | | \perp | | | | _] | | | | | 1 | T | | | | Andreign Control of the Control of t |
| rnaround Time (Business days) | | | <u></u> | l | | LL | | Ш | | | | | | | | | | | | | | | 1 | | | | \neg | |
| Standard 10 Business Days | Special Repor | rting Instructio | ns | | Com | | Carlina i | Dat | a De | live | rab | le Ir | nfor | nat | ion | | | | | | | Com | nents | Speci | al Instru | ictions | | |
| 5 Business Days RUSH | Report in P | | 112 | | | | | | | | | | | | š | | | į | | | | | | | | | | |
| — | = - | | | | | | | imarcial "B" (Level 2, Results + QC Summary) IMBN (Results/QC/Narrative) | | | | | | | | | | | | | | | | | ···· | | | |
| 2 Business Days RUSH [1 Business Day EMERGENC | Report MDI | Ls: | | | СОМ | MBN- | + [Res | ults | /QC/I | Varra | itive. | (+ cr | romi | itog | rama; |)) | | İ | | | | | | - | | | - | |
| nergancy & Rush T/A data available vis | LabLink, RUS | SH TAT approve | ol nosidad: | | RED FULT | | | | | | | | | | | | | | | | | | | | | | | |
| | | le Custody n | | ocumer | | | 1 4 | | | | 1_ |] EI | DD Fo | irma | it | - | | | | - | | | | | | | | |
| uished by Sampler: | Date/Time: | | | Rocciped | BV/ | 3 | 19. | 7 | ampi | es c | uishe | ge p | 0556 | essi | on, i | nclud | ing co | urler c | eliven | /: Date/Tin | 201 | | Receiv | 73.2 | | | | |
| ulahed by Sampler: | Date/Time: | | | Received | | | -14 | 43 |) 2 | | uishe | d Die | | | | | | | | | | | 2 | . • | | | | |
| iy Seal # Intact N | lot intact | Absent | | 3 0 | | | - | 1 | 4 | | | | | 2 | <u></u> | | 7 | (20) | | Date/Tin | ie; | | Receiv 4 | ed By: | | - | | |
| | | | | r. reserved | where appl | cable | سلها | | c | ooler | Tem | p. 'C: | - | | | Them | i. ID: | - | | On Ice | Ø | *************************************** | ļ., | · | | | | |
| Standard COC-excel Rev. Dista. 4/47 | vie a | | | | (0) | | | | | | | | | | | | | | - | | | | TUILD:/ | /WWW. | sgs.com | /en/tern | <u> 15-an</u> | d-conditions |

DA24708: Chain of Custody Page 1 of 2

SGS Accutest Sample Receipt Summary

| Job Number: DA | 8 | Client: | RJH | | | Project: SOUTH BO | Project: SOUTH BOULDER CREEK | | | | | |
|-------------------------------|-------------|---------------|---------------|-----------|-----------------|-------------------|--|--------------|----------|--------------|--|--|
| Date / Time Received: 3/9 | 00 PM | Delivery N | lethod: | | Airbill #'s: CO | Airbill #'s: CO | | | | | | |
| Cooler Temps (Initial/Adjus | ted): | <u>#1: (2</u> | .3/2.3); | | | | | | | | | |
| Cooler Security | Y or | N_ | | | Y or | N_ | Sample Integrity - Documentation | <u>Y</u> | or N | | | |
| 1. Oddiody Oddio i roddin. – | / | | 3. COC Pr | | ✓ | | Sample labels present on bottles: | ✓ | | | | |
| 2. Custody Seals Intact: | / | | 4. Smpl Date: | s/Time OK | \checkmark | | Container labeling complete: | \checkmark | | | | |
| Cooler Temperature | _ | Y or | N | | | | 3. Sample container label / COC agree: | ✓ | | | | |
| 1. Temp criteria achieved: | | ✓ | | | | | Sample Integrity - Condition | <u>Y</u> | or N | | | |
| Cooler temp verification: | | IR Gu | ın; | | | | 1. Sample recvd within HT: | ✓ | | | | |
| 3. Cooler media: | | Ice (E | Bag) | | | | 2. All containers accounted for: | V | | | | |
| 4. No. Coolers: | | 1 | | | | | 3. Condition of sample: | _ | Intact | | | |
| Quality Control Preservation | <u>on</u> . | Y or | N N/A | | | | Sample Integrity - Instructions | <u> </u> | or N | N/A | | |
| Trip Blank present / cooler: | | | | | | | Analysis requested is clear: | ~ | | | | |
| 2. Trip Blank listed on COC: | | | | | | | Bottles received for unspecified tests | | ✓ | | | |
| 3. Samples preserved properly | <i>'</i> : | ✓ | | | | | Sufficient volume recvd for analysis: | V | | | | |
| 4. VOCs headspace free: | | | | | | | Compositing instructions clear: | | | ✓ | | |
| · | | _ | | | | | 5. Filtering instructions clear: | | | \checkmark | | |

DA24708: Chain of Custody

Page 2 of 2

Comments



Wheat Ridge, CO

06/09/20

e-Hardcopy 2.0
Automated Report

The results set forth herein are provided by SGS North America Inc.

Technical Report for

RJH Consutants

South Boulder Creek

16134

SGS Job Number: DA26138

Sampling Date: 02/03/20

Report to:

RJH Consutants 9800 Mount Pyramid Court #330 Englewood, CO 80112 aprochaska@rjh-consultants.com

ATTN: Adam Prochaska

Total number of pages in report: 10



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Scott Heideman Laboratory Director

Seed walk

Client Service contact: Carissa Cumine 303-425-6021

Certifications: CO (CO00049), NE (NE-OS-06-04), ND (R-027), UT (NELAP CO00049) LA (LA150028), TX (T104704511), WY (8TMS-L)

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| Section 4: Misc. Forms | 7 |
| 4.1: Chain of Custody | 8 |

DA26138



Sample Summary

RJH Consutants

Job No:

DA26138

South Boulder Creek Project No: 16134

| Sample | Collected | | | Matr | | Client |
|-----------|-----------|----------|----------|------|------|-----------|
| Number | Date | Time By | Received | Code | Type | Sample ID |
| DA26138-1 | 02/03/20 | 00:00 SG | 05/18/20 | SO | Soil | B-202 |

Soil samples reported on a dry weight basis unless otherwise indicated on result page.



Summary of Hits Job Number: DA26138

Account: DA26138

Account: RJH Consutants

Project: South Boulder Creek

Collected: 02/03/20

| Lab Sample ID Analyte | Client Sample ID | Result/ Qual | RL | MDL | Units | Method |
|--------------------------|------------------|-----------------|-----|-----|-------|-------------|
| DA26138-1 | B-202 | | | | | |
| HEM Petroleum | Hydrocarbons a | 12200 | 250 | | mg/kg | SW846 9071B |

(a) Sample received outside the holding time.



Wheat Ridge, CO

| Sample Results | | |
|--------------------|--|--|
| | | |
| | | |
| Report of Analysis | | |
| | | |
| | | |
| | | |

Report of Analysis

Page 1 of 1

Client Sample ID: B-202 Lab Sample ID: DA26

Lab Sample ID: DA26138-1 **Matrix:** SO - Soil

Date Sampled: 02/03/20Date Received: 05/18/20Percent Solids: 95.0

Project: South Boulder Creek

General Chemistry

| Analyte | Result | RL | Units | DF | Analyzed | By | Method |
|--|---------|-----|-------|----|----------|----|----------------|
| %solids Solids, Percent | 95 | | % | 1 | 05/29/20 | ST | SM2540G-2011 M |
| 1664 using silica gel HEM Petroleum Hydrocarbo | a 12200 | 250 | mg/kg | 1 | 06/08/20 | ST | SW846 9071B |

(a) Sample received outside the holding time.



Wheat Ridge, CO

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

• Chain of Custody

Client / Reporting Information

| | N OF CUSTODY | | | | | | | Page | 1 of | 1 | | | | | | | |
|--------------|--|------------|-------------|--------|---------|-------|-------|-------------------|------|------|---|--|--|--|--|--|--|
| 4036 Young | field Street, Wheat Ridge, CO 80033 | Bottle Ord | ler Control | # | - | | FED-E | FED-EX Tracking # | | | | | | | | | |
| TEL: 30: | 3-425-6021 FAX: 303-425-6854 www.sgs.com/ehsusa | SGS Quo | te# | | | | sgs. | Q#.dol | AZ | 2613 | 8 | | | | | | |
| Project Info | rmation | . 1 | Reques | ed Ana | lysis (| see T | STC | DE she | et) | | Matrix Codes | | | | | | |
| | South Boulder Creek | | | | | | | ĺ | ĺ | | DW - Drinking Wa GW - Ground Wat | | | | | | |
| th Campus | Billing Information (if different from Report to) | | | | | | | | | | WW - Water SW - Surface Wat SO - Soil | | | | | | |
| der, CO | Company: | | | | · | | | | | | SL- Sludge SED-Sediment | | | | | | |
| | | | | | 1 | ١. | l i | 1 | - 1 |) | OI - Oil | | | | | | |

| Company: RJH Consultan | ts, Inc. | Project Name: | | | | South Boulder Creek | | | | | | | | | | | | ĺ | i | | DW - Drinking Water GW - Ground Water | | | | | | | | | |
|---|-----------------|----------------|--|--------------------|--------------|---|----------------|-----------|----------|--------------|-----------------|---------------|-------------------|-------|----------|--------|----------|--------|---------|----------|--|--|--|----------|---|---------------|----------|---------------------------------------|--|--------------------------------|
| Street: 9800 Mt Pyramid | Ot #330 | Street: | cu | South Ca | mpus | Pull left at 16 dig left by | | | | | | | | | | | | | | | | | | | WW - Water SW - Surface Water | | | | | |
| City, State: Englewood, (| 00 | City, State: | E | Boulder, (| 00 | Billing Information (if different from Report to Company: | | | | | | 10) | 7 | | | | | | | | | | | | SO - Soil SL- Sludge SED-Sediment | | | | | |
| Project Contact: Adam Pro | chaska | Project #: | | 16134 | | Stree | et Ado | iress: | : | | | | | | | | | | | | | | | | | | | OI - Oil LIQ - Other Liquid AIR - Air | | |
| Phone: 303-501-455 Email: aprochaska@rih-consu | | Client Purchas | se Order#: | | | City, | ty, State ZIP: | | | | ity, State ZIP: | | | | | | | | | | | | | | | | | | | SOL - Other Solid WP - Wipe |
| Sampler(s) Name(s): Samantha | | Project Manag | oor: | | | Attention; | | | | | | | \dashv | | | | | | | | | ŀ | | | FB - Field Blank EB-Equipment Blank | | | | | |
| - Carrier III | | Collection | | | | | | umba | r of pri | eser | | | | | | | 964 | | | | | | | | | | | RB - Rinse Blank TB - Trip Blank | | |
| Field ID / Point of Collection | Date | Time | Sampled by | Matrix | # of bottles | NONE | NaOH | HN03 | H2SQ4 | Di Water | ENCORE | Na2S2O3 | Na2SO3 | | | | PHC 1664 | | | | | | | | | | | LAB USE ONLY | | |
| B-202 | 2/3/2020 | | SG | so | 1 | 1 | | | | 1 | | T | \sqcap | T | | | 1 | | | | | | | | 1 | | | 01 | | |
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| Turnaround Time (Business days) | | | <u></u> | | - | Ш | | Dat | 2 De | 11111 | | lo in | forr | 1 | Ш | | | | | <u> </u> | | | <u> </u> | | <u></u> | 1 | Ļ | L | | |
| Standard 10 Business Days S | pecial Reportin | g instructions | | | Соп | merc | | | | | _ | | | iau | UII | | | | - | | | COM | nents. | Speci | iai instr | ructions | š: | | | |
| _ | Report in PPE | | | | | merc | | | | | | | | ımarı | y) | | | | | | | | | | | | | | | |
| | Report in PPN | 4 | | | | MBN | | | | | | | | | | | | | | | | | | | | | | | | |
| | Report MDLs | | | | | | + [Re: | sults, | /QC/I | Narra | tive | (+ ch | rom | togr | ams)] | | | | | | | | | | | | | | | |
| 1 Business Day EMERGENC | | | | | RED | | | | | | | _ | | | | | | | | | | | | | | | | | | |
| Emergency & Rush T/A data available via | | | | | FUL: | | | | | | _ | _ | DD Fo | | | | | | L | | | | | | | | | - | | |
| Relinquished by Sampler: | Date/Time: | e Custody mi | ust be do | Cument Received | By Delow | S- | 8- Z | sar | nple: | telino | ang | e po d By: | sses : | sion | , incl | udin | g cou | rier d | elivery | Date/Ti | me: | | Receiv | red By: | | | | *- " | | |
| Relinquished by Sampler: | Date/Time: | | | 1 / Received | | - | 12 | ستديو | | | uishe | d Bv: | : | | | | | | | Date/T | mo- | | 2 Pacely | red By: | | | | | | |
| 3 Custody Seal # Intact A N | ot intact | Absent | | 3 | | | | | 4 | ļ. | | | - | 1 | 3 | | | 63 | | | | | 4 | rea sy. | | | | | | |
| Name of the Party | or mater [| Ausent [] | Ì | rreserve | d where app | licable | سلكار | | С | oole | r Tem | p. °C; | <u></u> | - 1 | _ 1 | Therm | . ID: _1 | | | On Ice | / | | http: | lhananar | eae co | mlonth | rme e | ind-conditions | | |
| **** | | | | | | | | | _ | | | | | | | | | | | | | | HILLO. | TAXAAAA. | aus,co | DUCINE | 211112-5 | na-conditions | | |

2020-05-14-CoC Rev. Date: 4/10/18

DA26138: Chain of Custody Page 1 of 3

303-225-4611 - phone 303-225-4615 - fax 866-900-1930 - toll free



May 15, 2020 Project 16134

Wheat Ridge, CO 80033 SGS North America Inc. 4036 Youngfield Street Carissa Cumine

South Boulder Creek - Phase II Geotechnical Investigation Laboratory Testing Request Re:

Dear Ms. Cumine:

Custody paperwork. This sample is from the same project as samples that were previously tested under SGS Job Number DA24708. As we discussed on the phone, please test the Included with this letter is a soil sample for laboratory testing along with the Chain of sample for petroleum hydrocarbons (PHC1664 with silica gel treatment).

results will be available in 10 Business Days. Please use the same credit card authorization form that we previously provided for Job Number DA24708. We understand that the cost for the test is \$68.24 plus \$9.50 environmental fees, and the

Please contact me if you have any questions or require additional information.

Sincerely,

RJH CONSULTANTS, INC.

F612

Adam B. Prochaska, Ph.D., P.E., P.G.

Project Engineer

ABP/tjp

Attachments: Chain of Custody

DA26138: Chain of Custody

Page 2 of 3

9800 Mt. Pyramid Court, Suite 330 Englewood, CO 80112

www.rih-consultants.com

SGS Accutest Sample Receipt Summary

| Job Number: DA26138 Client: RJH | Project: SOUTH BOULDER CREEK |
|---|---|
| Date / Time Received: 5/18/2020 12:00:00 PM Delivery Method: | Airbill #'s: CO |
| Cooler Temps (Initial/Adjusted): #1: (5.3/5.3); | |
| | Sample Integrity - Documentation 1. Sample labels present on bottles: 2. Container labeling complete: 3. Sample container label / COC agree: Sample Integrity - Condition 1. Sample recvd within HT: 2. All containers accounted for: 3. Condition of sample: |
| Quality Control Preservation Y or N N/A 1. Trip Blank present / cooler: | Sample Integrity - Instructions Y or N N/A 1. Analysis requested is clear: ✓ ✓ 2. Bottles received for unspecified tests ✓ ✓ 3. Sufficient volume recvd for analysis: ✓ ✓ 4. Compositing instructions clear: ✓ ✓ 5. Filtering instructions clear: ✓ ✓ |

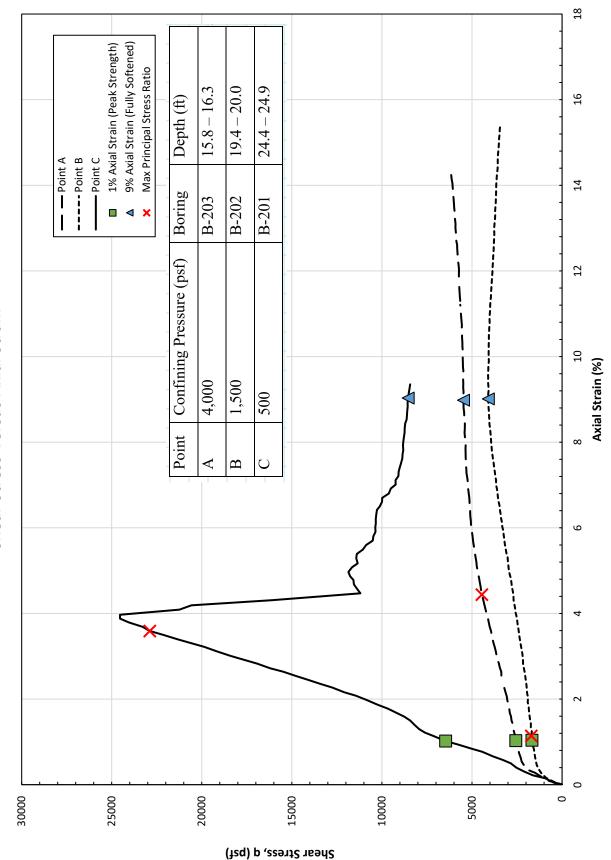
DA26138: Chain of Custody Page 3 of 3

Comments

APPENDIX J.2

Shear Data Reduction

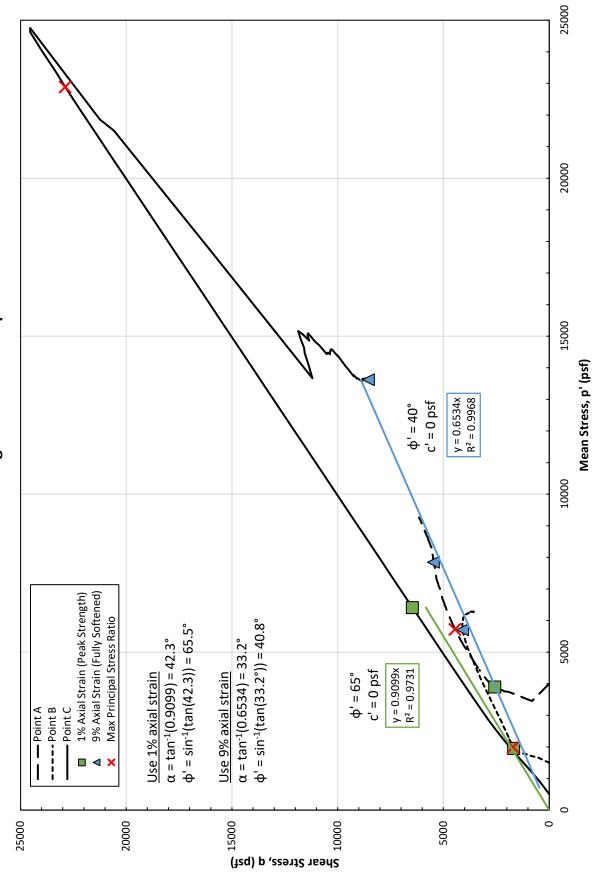
South Boulder Creek Consolidated Undrained Triaxial Shear Strength Results: Pierre Shale **Shear Stress Versus Axial Strain**



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Appendix J.2 1 of 10

South Boulder Creek Consolidated Undrained Triaxial Shear Strength Results: Pierre Shale **Drained Strength Failure Envelope**



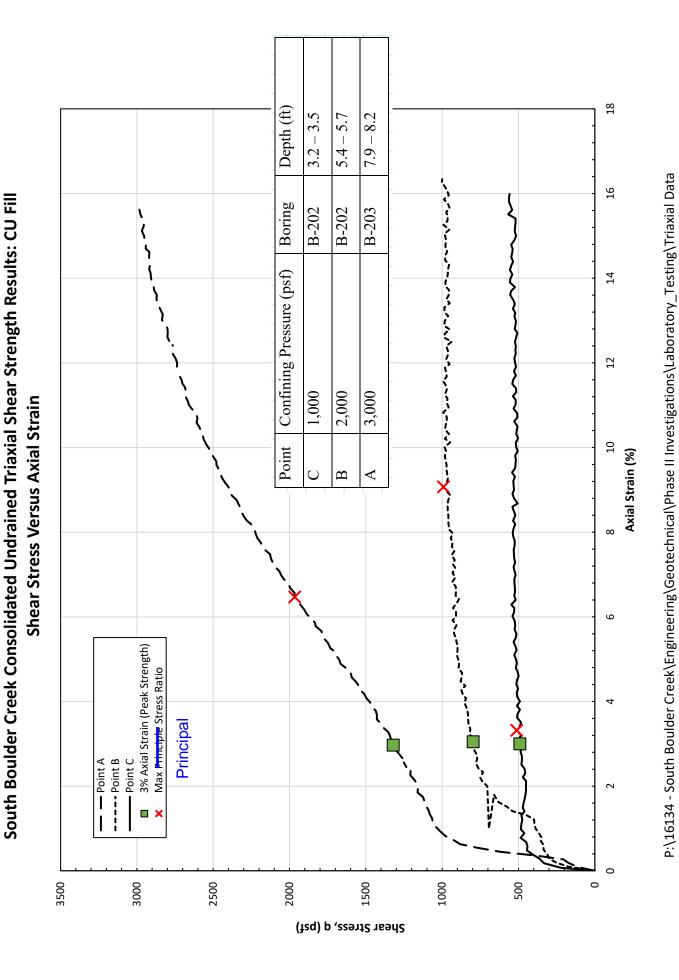
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Appendix J.2 2 of 10

4500 South Boulder Creek Consolidated Undrained Triaxial Shear Strength Results: Pierre Shale ♦ UCS Data (Borings w/out CU test) 4000 ▲ 9% Axial Strain (Fully Softened) ♦ UCS data (Borings w/ CU tests) ■ 1% Axial Strain (Peak Strength) $\triangleleft X$ X Max Principal Stress Ratio $c = y = 4000 \text{ psf}, \phi = 0$ 3500 3000 **Undrained Strength Failure Envelope** Consolidation Stress (psf) 1500 1000 500 30000 2000 25000 20000 15000 10000 0 Shear Strength (psf)

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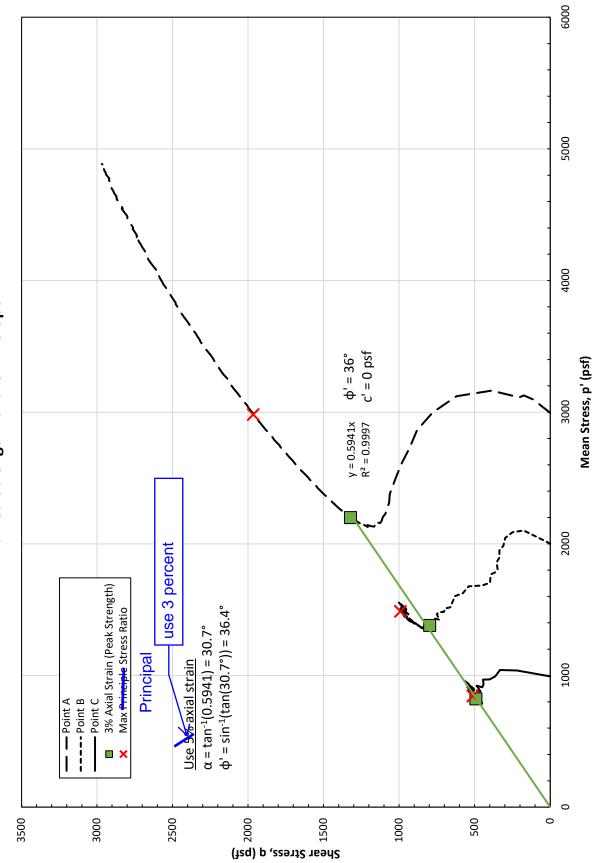
Appendix J.2 3 of 10



Reduction\16134_Triaxial_Data_Reduction_1

Appendix J.2 4 of 10

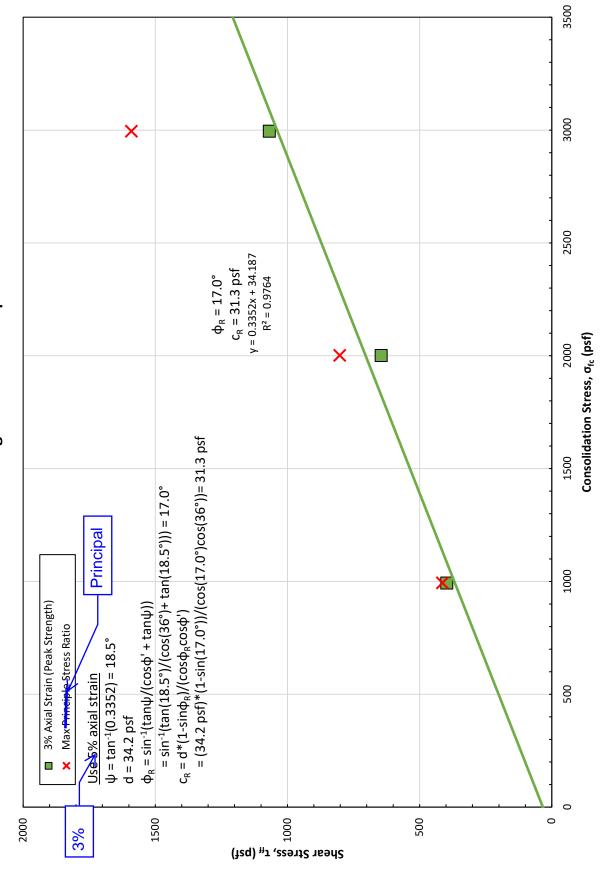
South Boulder Creek Consolidated Undrained Triaxial Shear Strength Results: CU Fill **Drained Strength Failure Envelope**



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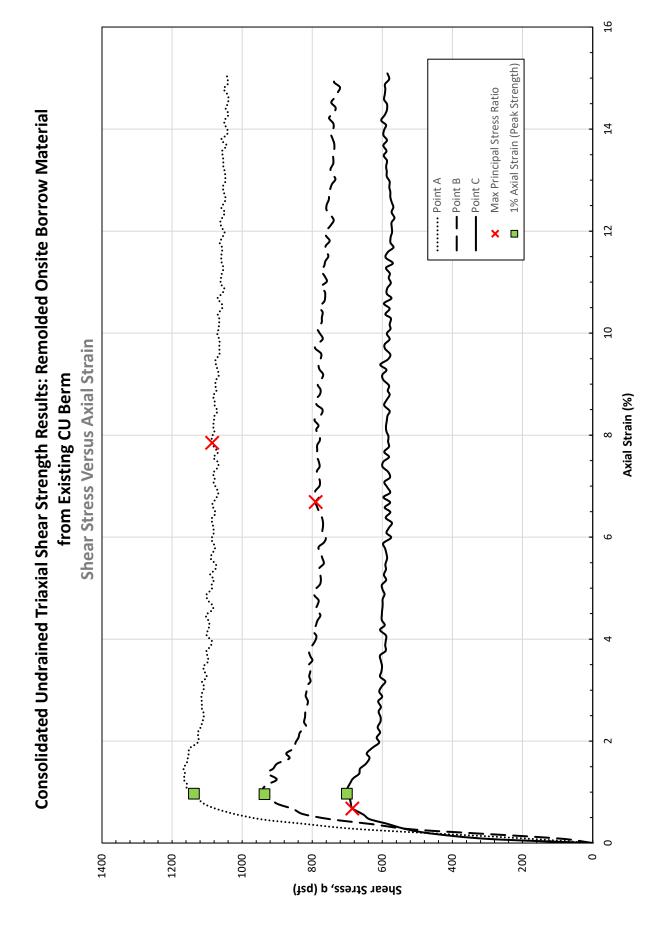
Appendix J.2 5 of 10

South Boulder Creek Consolidated Undrained Triaxial Shear Strength Results: CU Fill **Undrained Strength Failure Envelope**



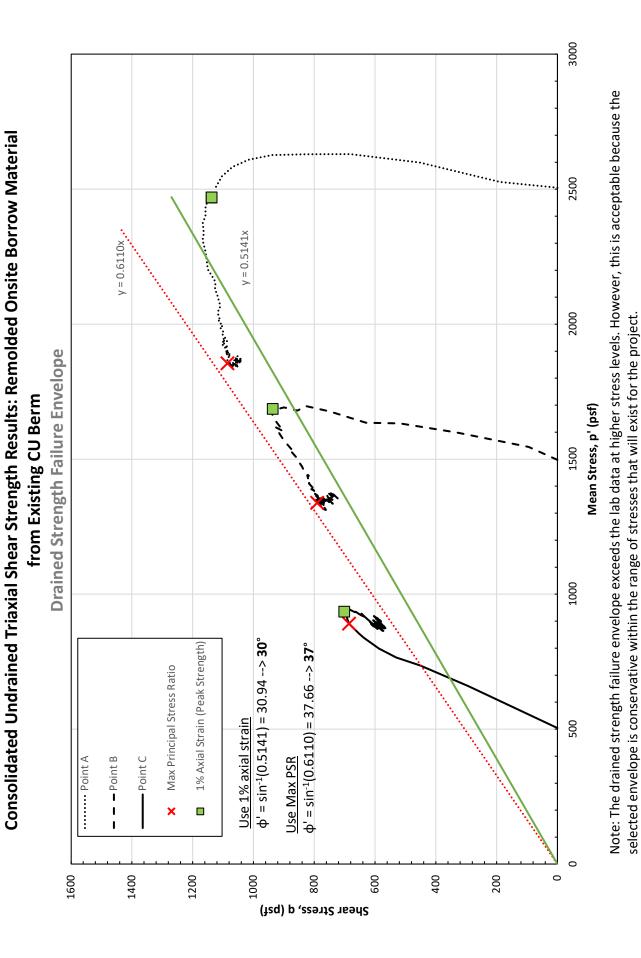
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Appendix J.2 6 of 10



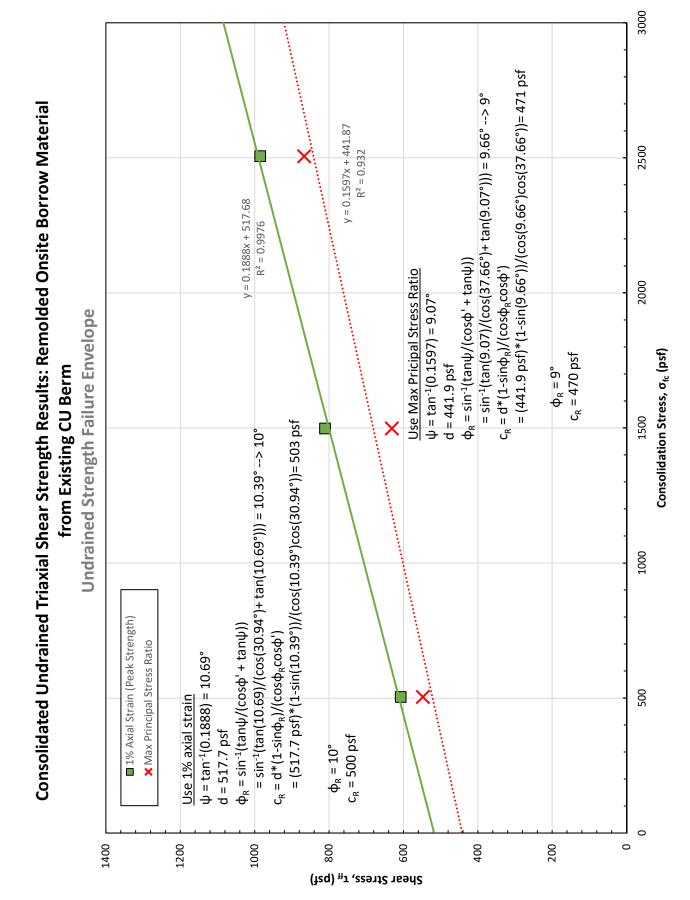
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Appendix J.2



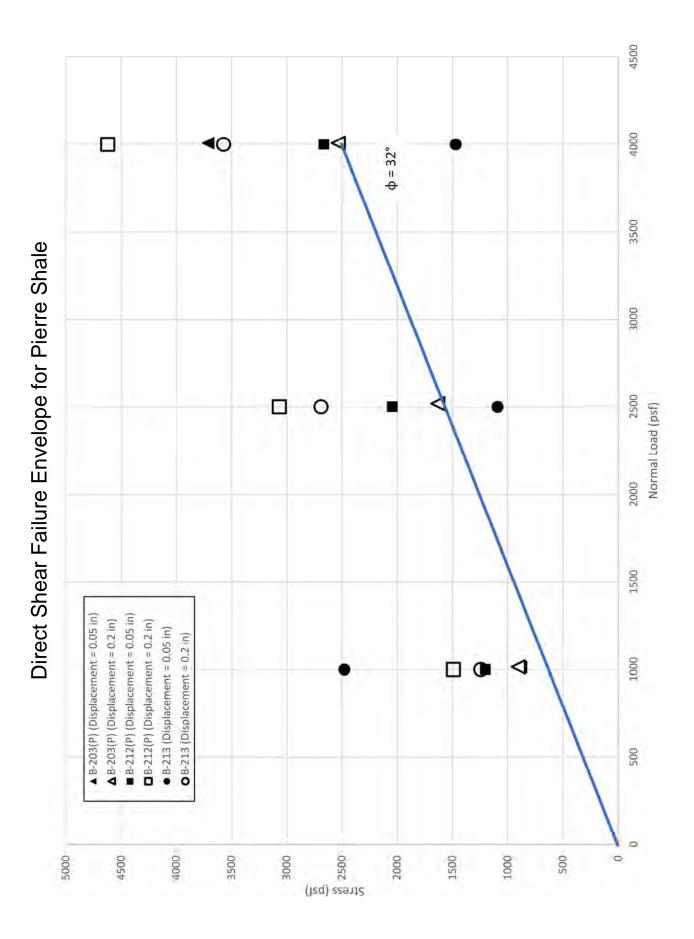
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Appendix J.2 8 of 10



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Appendix J.2 9 of 10



Appendix J.2 10 of 10