



**ENTECH**  
ENGINEERING, INC.

505 ELKTON DRIVE  
COLORADO SPRINGS, CO 80907  
PHONE (719) 531-5599  
FAX (719) 531-5238

**SUBSURFACE SOIL INVESTIGATION  
CATHEDRAL COMMONS  
SPANISH BIT DRIVE AND STRUTHERS ROAD  
MONUMENT, COLORADO**

Prepared for:

**Cathedral Rock Investments, LLC  
3145 Electra Drive  
Colorado Springs, CO 80906**

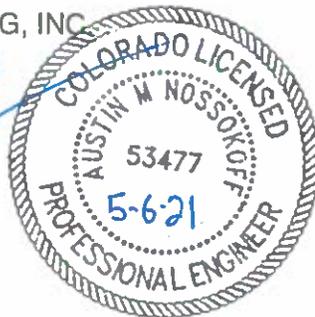
**Attn: Marvin Boyd**

May 3, 2021

Respectfully Submitted,

ENTECH ENGINEERING, INC

  
Austin M. Nossokoff



Reviewed by,



Mark H. Hauschild, P.E.  
Senior Engineer

DPS/kah

Encl.

Entech Job No. 210536  
AAProjects/2021/210536 ssi

Table of Contents

1.0 INTRODUCTION ..... 1

2.0 PROJECT AND SITE DESCRIPTION .....2

3.0 SUBSURFACE EXPLORATIONS AND LABORATORY TESTING .....2

4.0 SUBSURFACE CONDITIONS.....3

    4.1 Soil and Bedrock .....3

    4.2 Groundwater .....5

5.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS.....6

    5.1 Footing Subgrade Improvement/Foundation Systems .....7

    5.2 Shallow Foundations.....8

    5.3 Foundation Wall and Retaining Wall Design Values.....9

    5.4 On-Grade Floor Slabs .....9

    5.5 Seismic Site Classification ..... 10

    5.6 Surface and Subsurface Drainage..... 10

    5.7 Concrete Degradation Due to Sulfate Attack ..... 11

    5.8 Foundation Excavation Observation..... 11

    5.9 Overlot Grading..... 12

    5.10 Utility Trench Backfill ..... 13

    5.11 General Backfill ..... 13

    5.12 Excavation Stability ..... 13

    5.13 Winter Construction..... 14

    5.14 Construction Observations ..... 14

6.0 CLOSURE ..... 15

**Tables**

Table 1: Summary of Laboratory Test Results

**Figures**

- Figure 1: Vicinity Map
- Figure 2: Test Boring Location Map
- Figure 3: Perimeter Drain Detail

**List of Appendices**

- Appendix A: Test Boring Logs
- Appendix B: Laboratory Test Results

**SUBSURFACE SOIL INVESTIGATION  
CATHEDRAL COMMONS  
SPANISH BIT DRIVE AND STRUTHERS ROAD  
MONUMENT, COLORADO**

**1.0 INTRODUCTION**

Cathedral Rock Investments, LLC is planning the construction of a mixed-use center with commercial and multi-family development, and associated site improvements, on a property located on Spanish Bit Drive, east of Struthers Road, in the southeastern portion of Monument, Colorado. The approximate location of the project site is shown on the Vicinity Map, Figure 1. The planned layout of the site is shown on Figure 2, Test Boring Location Map.

This report describes the Subsurface Soil Investigation conducted for the planned mixed-use development and provides recommendations for foundation design and construction. The subsurface soil investigation included drilling twenty-three (23) test borings on the site, collecting samples of soil and conducting a geotechnical evaluation of the investigation findings. All drilling and subsurface investigation activities were performed by Entech Engineering, Inc. (Entech). The contents of this report, including the geotechnical evaluation and recommendations, are subject to the limitations and assumptions presented in Section 6.0.

## **2.0 PROJECT AND SITE DESCRIPTION**

It is Entech's understanding that the project will consist of construction of a restaurant/community center building and a retail building on the northern parcel (north of Spanish Bit Drive), and five apartment buildings with a daycare center on the southern parcel (south of Spanish Bit Drive), with associated site improvements. At the time of drilling, the site for the proposed development was vacant. A minor drainage swale area bisects the southern parcel from east to west. A detention pond exists in the western portion of the northern parcel. The property and drainages have gentle slopes to the west. Vegetation consists of field grasses, weeds, and yucca. The site is bounded by commercial development to the north, vacant land and residential to the south and east, and Struthers Road, followed by Interstate 25 to the west.

## **3.0 SUBSURFACE EXPLORATIONS AND LABORATORY TESTING**

Subsurface conditions in the planned development were explored by drilling twenty-three (23) test borings at the approximate locations shown in Figure 2. The test borings were drilled to depths of 5 to 20 feet below the existing ground surface (bgs). The drilling was performed using a truck-mounted, continuous flight auger-drilling rig supplied and operated by Entech. Boring logs descriptive of the subsurface conditions encountered during drilling are presented in Appendix A. At the conclusion of drilling and subsequent to drilling, observations of groundwater levels were made in each of the open boreholes.

Soil and bedrock samples were obtained from the borings utilizing the Standard Penetration Test (ASTM D-1586) using 2-inch O.D. split-barrel and California samplers. Results of the Standard Penetration Test (SPT) are included on the boring logs in terms of N-values expressed in blows per foot (bpf). Soil and bedrock samples recovered from the borings were visually classified and recorded on the boring logs. The soil and bedrock classifications were later verified utilizing laboratory testing and grouped by soil type. The soil and bedrock type numbers are included on the boring logs. It should be understood that the soil and bedrock descriptions shown on the boring logs will vary between boring location and sample depth. It should also be noted that the lines of stratigraphic separation shown on the boring logs represent approximate boundaries between soil and bedrock types and the actual stratigraphic

transitions may be more gradual and vary with location. The Test Boring Logs are presented in Appendix A.

Water content testing (ASTM D-2216) was performed on the samples recovered from the borings, and the results are shown on the boring logs. Grain-Size Analysis (ASTM D-422) and Atterberg Limits Testing (ASTM D-4318) were performed on selected samples to assist in classifying the materials encountered in the borings. Volume change testing was performed on selected samples using the FHA Swell Test and the Swell/Consolidation Test (ASTM D-4546) in order to evaluate expansion/consolidation potential of the soil. Soluble sulfate testing was performed on select soil samples to evaluate the potential for below grade degradation of concrete due to sulfate attack. The laboratory testing results are summarized on Table 1 and are presented in Appendix B.

#### **4.0 SUBSURFACE CONDITIONS**

Two soil types and two bedrock types were encountered in the test borings drilled for the subsurface investigation: Type 1: slightly silty to very silty sand (SM-SW, SM), Type 2: sandy clay and sandy to clayey silt (CL, CH, ML), Type 3: silty to very silty sandstone and silty, clayey sandstone (SM, SM-SC), and Type 4: sandy claystone, sandy claystone-siltstone, and sandy siltstone (CL, CL-ML, ML). Each soil and bedrock type were classified in accordance with the Unified Soil Classification System (USCS) using the laboratory testing results and the observations made during drilling.

##### **4.1 Soil and Bedrock**

Soil Type 1 classified as slightly silty to very silty sand (SM-SW, SM). The sand was encountered in all the test borings at the existing ground surface and extending to depths ranging from 6 to 14 feet bgs and to the termination of Test Boring Nos. 3, 6, 13, 21 and 22 (5 feet). Standard Penetration Testing conducted on the sand resulted in N-values ranging from 3 to 41 bpf, indicating loose to dense states. Water content and grain size testing of sand samples resulted in water contents of approximately 1 to 11 percent, with approximately 7 to 23 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits Testing indicated

the silty sands are non-plastic. Sulfate testing performed on samples of the sand resulted in 0.00 percent and less than 0.01 percent sulfate by weight, indicating the sand exhibits a negligible potential for concrete degradation due to below grade sulfate attack.

Soil Type 2 classified as sandy clay and sandy to clayey silt (CL, CH, ML). The clay/silt was encountered in six test borings, underlying Soil Type 1, at depths ranging from 9 to 14 feet and extending to depths of 11 to 19 feet bgs. Standard Penetration Testing conducted in the clay/silt resulted in N-values of 15 to 33 bpf, indicating stiff to very stiff consistencies. Water content and grain size testing resulted in water contents of 12 to 22 percent, with approximately 66 to 94 percent of the soil size particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in liquid limit of 50 to no value and plastic indexes of 25 to non-plastic. A FHA Swell Test conducted on a sample of sandy clay resulted in a swell pressure of 1110 psf, indicating moderate expansion potential. Swell/Consolidation Testing conducted on a clay/silt samples resulted in consolidations of 0.3 to 3.5 percent, indicating low to high consolidation potentials. Highly expansive clays have been encountered in the area. Sulfate testing on the clay/silt resulted in less than 0.01 percent sulfate by weight indicating a negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 3 classified as silty to very silty sandstone and clayey, silty sandstone (SM, SM-SC). The sandstone was encountered in thirteen of the test borings at depths ranging from 6 to 18 feet bgs, and extending to 14 feet and the termination of the borings (20 feet). Standard Penetration Testing conducted on the sandstone resulted in N-values greater than 50 bpf, indicating very dense states. Water content and grain size testing resulted in a water contents of 2 to 18 percent, with approximately 14 to 49 percent of the soil size particles passing the No. 200 Sieve. Atterberg Limits Testing indicated the silty sandstone is non-plastic. Sulfate testing on the sandstone resulted in 0.00 percent sulfate by weight indicating the sandstone exhibits a negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 4 classified as sandy claystone, sandy claystone-siltstone, and sandy siltstone (CL, CL-ML, ML). The claystone/siltstone was encountered in seven of the test borings at depths ranging from 7 to 19 feet bgs, and extending to depths ranging from 18 feet to the termination

of the test borings (10 to 20 feet). Standard Penetration Testing conducted in the claystone/siltstone resulted in N-values greater than 50 bpf, indicating hard consistencies. Water content and grain size testing resulted in water contents of 11 to 18 percent, with approximately 71 to 91 percent of the soil size particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in liquid limits of 27 and 39, with corresponding plastic indexes of 6 and 13. Swell/Consolidation Test conducted on a sandy siltstone resulted in a volume change of 2.2 to 3.9 percent, indicating moderate to high expansion potential. The claystone in the area is known to be highly expansive.

Additional descriptions and engineering properties of the soil encountered during drilling are included on the boring logs. Laboratory Testing Results are summarized on Table 1 and presented in Appendix B. It should be understood that the soil descriptions reported on the boring logs may vary between boring locations and sampling depths. Similarly, the lines of stratigraphic separation shown on the boring logs represent approximate boundaries between soil types and the actual transitions between types may be more gradual or variable.

#### **4.2 Groundwater**

Depth to groundwater was measured in each of the borings at the conclusion and subsequent to drilling. Groundwater was encountered in Test Boring Nos. 4, 16, and 17 at depths of 10, 15.5, and 14 feet bgs, respectively. Water levels are indicated on the Test Boring Logs in Appendix A. Groundwater is not expected to affect construction of shallow foundations on a majority of the site depending upon final site grading. Groundwater may affect areas of grading cuts and within deeper excavations made for the installation of utilities. Unstable soil conditions should be anticipated if excavations approach water levels. Stabilization with shotrock or geofabric may be required. It should be noted that groundwater levels, other than those observed at the time of the subsurface investigation, could change due to seasonal variations, changes in land runoff characteristics and future development of nearby areas.

## 5.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

*The following discussion is based on the subsurface conditions encountered in the borings drilled for the planned buildings. If subsurface conditions different from those described herein are encountered during construction or if the project elements change from those described, Entech Engineering, Inc. should be notified so that the evaluation and recommendations presented can be reviewed and revised if necessary.*

The site will be developed by constructing a mixed-use development, consisting of commercial and multi-family residential buildings. The proposed buildings are expected to have slab-on-grade type construction with no basement or below grade levels. Given the subsurface conditions encountered at the time of drilling and the site development as described, the buildings can be supported with standard shallow spread footing foundations bearing on the medium dense sands or recompacted granular site soils. Notably, grading plans were not available at the time of this investigation.

Subsurface soils encountered at anticipated foundation depths in the test borings generally consist of loose to medium dense silty to very silty sands. The loose soils were primarily encountered on the southern parcel in the apartment area. Very dense sandstone was encountered at depths ranging from 7 to 18 feet. Clays, silts, claystone and siltstone were also encountered at depths that will likely not affect the construction of shallow foundation systems; however, these soils may be encountered in deep utility excavations. Excavation of sandstone is anticipated for a portion of the foundation utilities, and track-mounted equipment is likely required. Rubber-tired equipment should be capable of excavating the overburden soils.

Any fill required for overexcavation or overlot grading should be approved by Entech Engineering and be compacted according to the "Structural Fill" paragraph. Loose sands encountered in the building areas should be recompacted. Overexcavation of sandstone, if encountered, may be required to provide uniform building pads. A minimum layer of 2 feet of suitable soils below and beyond the building foundation is recommended where sandy soils and sandstone exist at footing grade. Any expansive or collapsible soils (clay, silt, claystone or siltstone) in building areas should be removed and replaced with non-expansive structural fill.

On-site granular soils may be used as structural fill, as approved by Entech. All overexcavations should be observed by Entech prior to placing fill. Final depth of an overexcavation, if needed, is pending completion of the excavation for a given building. Prior to placing the structural fill, the surface should be scarified, moisture-conditioned and compacted.

Groundwater was encountered in three of the test borings at depths ranging from 10 to 15.5 feet bgs. Groundwater will likely not affect the construction of shallow foundation systems on this site. Deep utility excavations may encounter water. Unstable soil conditions should be anticipated if excavations approach water levels. Stabilization with shotrock or geofabric may be required. Personnel of Entech should be contacted if groundwater is encountered in excavations on this site to determine corrective actions.

### **5.1 Footing Subgrade Improvement/Foundation Systems**

Based on the existing soil conditions, the structures can be supported utilizing shallow foundations resting on the sandstone, medium dense sands, or well compacted granular soils. Shallow foundations can consist of conventional spread footing type foundations. If conventional shallow spread footing foundations are designed to bear on the site sands, then the footing subgrade should be scarified to a minimum depth of 12 inches, moisture conditioned and compacted. The interior slab areas may require soil mitigation. The very loose soils on the southern parcel (Test Boring Nos. 7, 8, 12, 14, 16, 17, 20, and 23) will require moisture conditioning and recompaction. The depth of recompaction (3 to 4 feet is anticipated in some areas) should be determined during site grading. Subgrade preparation/conditioning can be completed during site grading.

All topsoil must be removed and the existing subgrade scarified and moisture-conditioned prior to placing fill. Where loose sands are encountered at foundation grade, removal, moisture conditioning, and recompaction will be required. An overexcavation depth of 2 to 4 feet should be anticipated. Clay, silt, claystone or siltstone, if encountered, should be overexcavated 3 to 4 feet. All foundation members should maintain a minimum of 4 feet separation from the underlying claystone/siltstone. The overexcavation should extend outward a minimum distance of 4 feet from the building's perimeter. The overexcavation subgrade should be scarified to a

minimum depth of 12 inches, and be moisture-conditioned and compacted prior to the fill placement. The fill should be placed in 6-inch lifts. Density tests should be performed to verify compaction with the first density test performed at the scarified overexcavation subgrade and when each 12 to 18 inches of fill has been placed. All structural fill should be placed to the requirements of the "Structural Fill" paragraph. The need for and extent of overexcavation should be determined during overlot grading or at the time of the excavation observations.

## **5.2 Shallow Foundations**

Provided the above recommendations are followed, the proposed structure can be supported with shallow spread footing foundation. A maximum allowable bearing pressure of 2400 psf is recommended for foundation members bearing on medium dense native sands or recompacted sands. For final design, continuous spread footings are recommended to have a minimum width of 16 inches, and individual column footings for main support beams should have minimum plan dimensions of 24 inches on each side in order to avoid punching failure into the supporting subgrade granular soils. Exterior footings should extend a minimum of 30 inches below the adjacent exterior site grade for frost protection. Following the above subgrade preparation recommendations, and adhering to the recommended maximum allowable bearing pressure, it is expected to result in foundation design which should limit total and differential vertical movements to 1 and ½ inches, respectively.

Foundation walls should be designed to resist lateral pressures generated by the soils on this site. An equivalent hydrostatic fluid pressure (in the active state) of 40 pcf is recommended for the on-site granular soils. The backfill soils should consist of a non-expansive soil. Expansive soils are not recommended for backfill against foundation walls. It should be noted that this value applies to level backfill conditions. If sloping backfill conditions exist, pressures will increase substantially depending on the conditions adjacent to the walls. Surcharge loading should also be considered in wall designs. Equivalent fluid pressures for sloping conditions should be determined on an individual basis.

Entech should observe overexcavated subgrades as well as the overall foundation excavation subgrade and evaluate if the exposed soil conditions are consistent with those described in this

report. Entech should also provide recommendations for additional overexcavation depth, if required, and foundation drainage based on the excavation conditions observed at that time.

### **5.3 Foundation Wall and Retaining Wall Design Values**

The following values are recommended for use in designing below grade foundation walls with unbalanced lateral loading and retaining walls that may be associated with the project.

#### **Recommended Design Values – Lateral Loading**

Equivalent fluid density for lateral earth pressure (active), pcf	40
Equivalent fluid density for lateral earth pressure (passive), pcf	300
Equivalent fluid density for lateral earth pressure (at rest), pcf	55
Soil density (compacted sand), pcf	125
Angle of Internal Friction (loose sand), degrees	28
Angle of Internal Friction (compacted sand), degrees	32
Coefficient of sliding between concrete and silty sand	0.3

\*Note: The above lateral loading design values are for level backslope angles and no surcharge loads. If wall backfill is submerged, water pressures must be taken into account as additional wall loading. If backfill slope angles are greater than zero degrees, if the backfill is surcharged, the design values must be adjusted to account for additional lateral loading.

### **5.4 On-Grade Floor Slabs**

On-grade floor slabs for the planned structures should be supported on well-compacted, on-site granular soils or structural fill. Loose sandy soils should be recompacted below slabs. If expansive soils are encountered at or within 3 to 4 feet of floor slab grade it should be removed a minimum of 3 to 4 feet and replaced with non-expansive structural fill. The depth of overexcavation, if needed, should be determined at the time of the excavation observation on each lot. On-site granular soils, as approved by Entech, may be used as structural fill. Loose sand, if encountered, should be recompacted or removed and replaced with structural fill. Structural fill should be compacted to a minimum of 95 percent of its Maximum Modified Proctor

Dry Density Test (ASTM D-1557). The fill should be moisture conditioned to  $\pm 2$  percent of the optimum moisture content as determined to aid in compaction. All soil beneath the slab should be free of organics, debris and stone sized larger than 3 inches in diameter.

Grade supported floor slabs should be separated from other building structural components and utility penetrations to allow for possible future vertical movement. Interior partition walls should be constructed in such a manner so as not to transfer slab movement into the overlying floor(s) and/or roof members, should slab movement occur. Control joints in grade-supported slabs are recommended at 10 to 15-foot perpendicular spacings to control cracking.

### **5.5 Seismic Site Classification**

Based on the subsurface conditions encountered at the site and in accordance with Section 1613 of the 2015 International Building Code (IBC), the site meets the conditions of a Site Class D for the buildings on shallow foundations.

### **5.6 Surface and Subsurface Drainage**

Positive surface drainage is recommended around the building's perimeter to minimize infiltration of surface water into the supporting foundation soils. A 10 percent slope adjacent to foundations is recommended where possible. A minimum ground surface slope of 5 percent in the first 10 feet adjacent to exterior foundation walls is recommended for landscaped areas. For paved areas and other impervious surfaces, a minimum slope of 2 percent is adequate. All roof drains and gutter downspouts should be extended to discharge well beyond the building's foundation backfill zone or be connected to a storm sewer system.

To help minimize infiltration of water into the foundation zone, vegetative plantings placed close to foundation walls should be limited to those species having low watering requirements and irrigated grass should not be located within 5 feet of the foundation. Trees should be located a minimum of 10 feet from foundations. Similarly, sprinklers are not recommended to discharge water within 5 feet of foundations. Irrigation near foundations should be limited to the minimum amount sufficient to maintain vegetation. Application of more irrigation water than necessary can increase the potential for slab and foundation movement. Items such as sidewalks should not be situated as to allow water to be trapped near the foundation.

Perimeter drains are not necessary for slab-on-grade construction provided the slab is positioned above finished exterior site grade. In the event a below grade space is included with buildings, a foundation perimeter drain around that space is recommended. A typical perimeter drain detail is shown in Figure 3. The perimeter drain should be provided with a free gravity outlet or be connected to a sump/pump system.

### **5.7 Concrete Degradation Due to Sulfate Attack**

Sulfate solubility testing was conducted on soil samples to evaluate the potential for sulfate attack on concrete placed below surface grade. The test results indicated 0.00 percent and less than 0.01 percent soluble sulfate (by weight) (Table 1). The test results indicate the sulfate component of the in-place soil presents a negligible exposure threat to concrete placed below the site grade.

Type II cement is recommended for concrete at this site. To further avoid concrete degradation during construction it is recommended that concrete not be placed on frozen or wet ground. Care should be taken to prevent the accumulation or ponding of water in the foundation excavation prior to the placement of concrete. If standing water is present in the foundation excavation, it should be removed by ditching to sumps and pumping the water away from the foundation area prior to concrete placement. If concrete is placed during periods of cold temperatures, the concrete must be kept from freezing. This may require covering the concrete with insulated blankets and adding heat to prohibit freezing.

### **5.8 Foundation Excavation Observation**

Subgrade preparation for building foundation should be observed by Entech prior to construction of the footings and floor slabs in order to verify that (1) no anomalies are present, (2) materials of the proper bearing pressure have been encountered or placed, and (3) no loose or soft spots, expansive or organic soil, soil or debris are present in the foundation area prior to concrete placement or backfilling. Entech should make final recommendations for over-excavation, if required, and foundation drainage at the time of excavation observation, if necessary. Final design parameters for each building should also be determined.

### **5.9 Overlot Grading**

Areas to receive fill should have all topsoil, organic material or debris removed. Fill must be properly benched into sloping areas. The surface should be scarified and moisture conditioned to within -2 to +2 percent of its optimum moisture content and be compacted to 95 percent of its maximum Modified Proctor Dry Density (ASTM D-1557) for cohesionless soils and within 0 to +3 percent of its optimum moisture content and be compacted to 95 percent of its maximum Standard Proctor Dry Density (ASTM D-698) for cohesive soils beneath footings and floor slabs prior to placing new fill. New fill beneath footings should be non-expansive or reconditioned fill and be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95 percent of its maximum Modified Proctor Dry Density (ASTM D-1557) for granular soils. These materials should be placed at a moisture content conducive to compaction, usually -2 to +2 percent of Proctor optimum moisture content. In areas with fill greater than 15 feet, the fill should be compacted to 98 percent of its maximum Modified Proctor Density ASTM D-1557. The placement and compaction of fill should be observed and tested by Entech Engineering, Inc. Imported soils should be approved by Entech Engineering, Inc. prior to being hauled to the site.

Compacted, non-expansive granular soil, free of organics, with no debris or cobbles greater than 3- inches in diameter, is recommended for filling foundation components and for filling beneath floor slabs. All fill placed within the foundation area or beneath floor slabs should be placed and compacted as previously discussed. Fill material should be placed in horizontal lifts such that each finished lift has a compacted thickness of six inches or less. Mechanical methods can be used for placement and compaction of fill; however, heavy equipment should be kept at distance from foundation walls and below slab infrastructure to avoid over stressing. No water flooding techniques of any type should be used for compaction or placement of foundation or floor slab fill material. Entech should approve any imported fill to be used within the foundation area prior to delivery to the site.

### **5.10 Utility Trench Backfill**

Fill placed in utility trenches should be compacted according to local specifications. Fill should be placed in horizontal lifts having a compacted thickness of six inches or less and at a water content conducive to adequate compaction. Mechanical methods should be used for fill placement; however, heavy equipment should be kept at a distance from foundation walls. No water flooding techniques of any type should be used for compaction or placement of utility trench fill.

Trench backfill placement should be performed in accordance with the Town of Monument specifications. All excavation and excavation shoring/bracing should be performed in accordance with OSHA guidelines.

### **5.11 General Backfill**

Any areas to receive fill outside the foundation limits should have all topsoil, organic material, and debris removed. Fill must be properly benched into existing slopes in order to be adequately compacted. The fill receiving surface should be scarified to a depth of 12-inches and moisture conditioned to -2 to +2 percent of the optimum water content, and compacted to a minimum of 95 percent of the ASTM D-1557 Modified Maximum Dry Density for the site sands before the addition of new fill. Fill should be placed in thin lifts not to exceed 6 inches in thickness after compaction while maintaining at least 95 percent of the ASTM D-1557 Modified Maximum Dry Density for granular soil. Fill material should be free of vegetation and other unsuitable material and shall not contain rocks or fragments greater than 3-inches. Topsoil and strippings should be segregated from all other fill sources on the site. Fill placement and compaction beneath and around foundations, in utility trenches, beneath roadways or other structural features of the project should be observed and tested by Entech during construction.

### **5.12 Excavation Stability**

Excavation sidewalls must be properly sloped, benched and/or otherwise supported in order to maintain stable conditions. All excavation openings and work completed therein shall conform to OSHA Standards as put forward in CFR 29, Part 1926.650-652, (Subpart P).

### **5.13 Winter Construction**

In the event construction of the planned facility occurs during winter, foundations and subgrades should be protected from freezing conditions. Concrete should not be placed on frozen soil and once concrete has been placed, it should not be allowed to freeze. Similarly, once exposed, the foundation subgrade should not be allowed to freeze. During site grading and subgrade preparation, care should be taken to eliminate burial of snow, ice or frozen material within the planned construction area.

### **5.14 Construction Observations**

It is recommended that Entech observe and document the following activities during construction of the building foundations.

- Excavated subgrades and subgrade preparation.
- Placement of foundation perimeter drains (if installed).
- Placement/compaction of fill material for the foundation components and floor slabs.
- Placement/compaction of utility bedding and trench backfill.

## **6.0 CLOSURE**

The subsurface investigation, geotechnical evaluation and recommendations presented in this report are intended for use by Cathedral Rock Investments, LLC with application to the planning of the construction of the Cathedral Commons Mixed Use Center, located on Spanish Bit Drive at Struthers Road, in the southeastern portion of Monument, Colorado. In conducting the subsurface investigation, laboratory testing, engineering evaluation and reporting, Entech Engineering, Inc. endeavored to work in accordance with generally accepted professional geotechnical and geologic practices and principles consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in same locality and under similar conditions. No other warranty, expressed or implied is made. During final design and/or construction, if conditions are encountered which appear different from those described in this report, Entech Engineering, Inc. requests that it be notified so that the evaluation and recommendations presented herein can be reviewed and modified as appropriate.

If there are any questions regarding the information provided herein or if Entech Engineering, Inc. can be of further assistance, please do not hesitate to contact us.

## TABLE

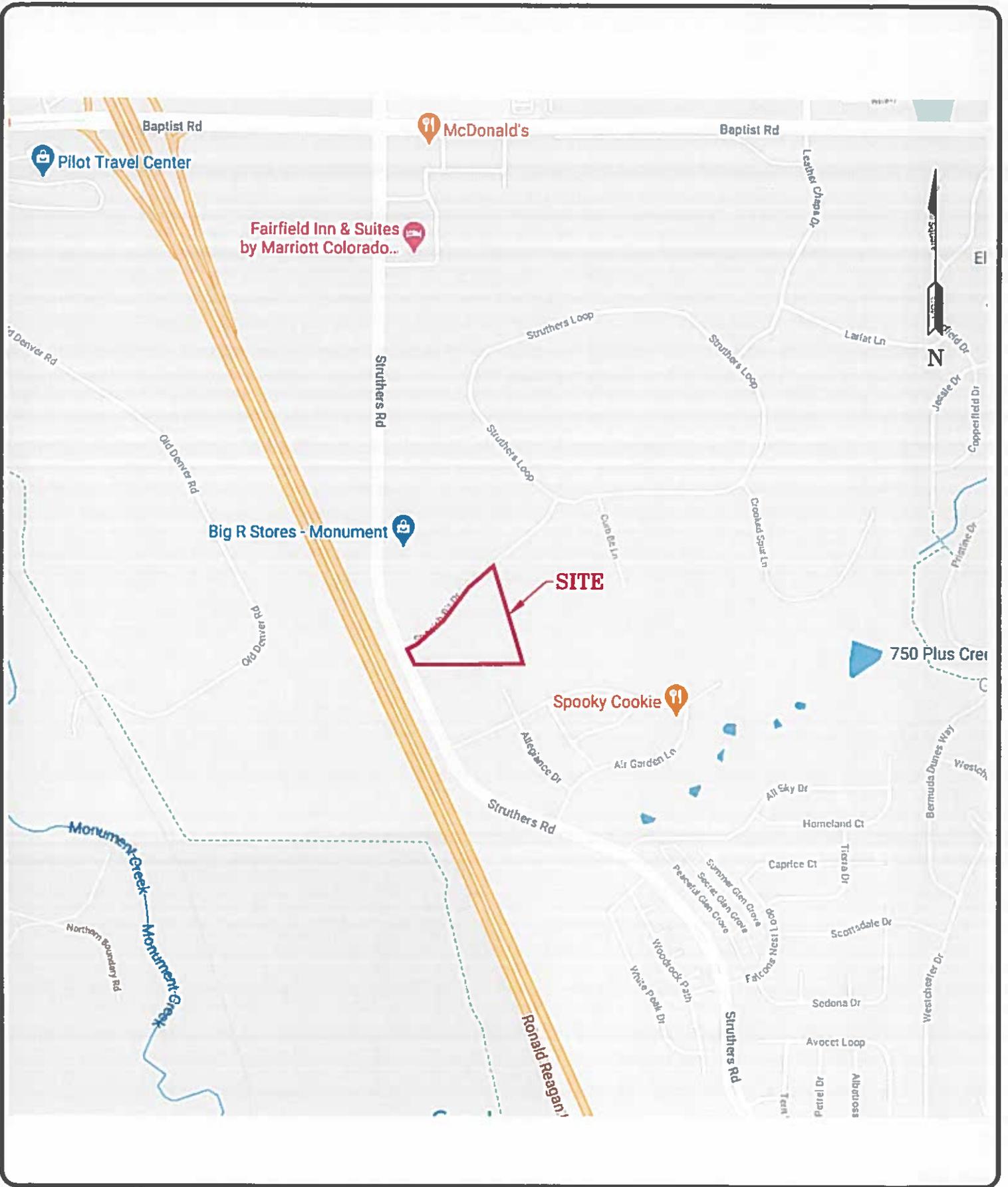
**TABLE 1**

**SUMMARY OF LABORATORY TEST RESULTS**

CLIENT CATHEDRAL ROCK INVEST.  
 PROJECT STRUTHERS AND SPANISH BIT  
 JOB NO. 210536

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1, CBR	3	0-3			15.5	NV	NP				SM	SAND, SILTY
1	1	2-3			10.0	NV	NP	0.00			SM-SW	SAND, SLIGHTLY SILTY
1	3	1-2			9.4	NV	NP	<0.01			SM-SW	SAND, SLIGHTLY SILTY
1	4	10			9.9						SM-SW	SAND, SLIGHTLY SILTY
1	6	1-2			17.0	NV	NP				SM	SAND, SILTY
1	8	2-3			16.8						SM	SAND, SILTY
1	10	5			6.5						SM-SW	SAND, SLIGHTLY SILTY
1	13	1-2			11.2	NV	NP				SM-SW	SAND, SLIGHTLY SILTY
1	14	2-3			13.6						SM	SAND, SILTY
1	16	2-3			13.2						SM	SAND, SILTY
1	18	1-2			12.1	NV	NP				SM	SAND, SILTY
1	19	5			20.8						SM	SAND, SILTY
1	21	1-2			16.8	NV	NP				SM	SAND, SILTY
1	22	1-2			23.2	NV	NP				SM	SAND, SILTY
2	5	15	14.4	111.9	66.4	NV	NP	<0.01		-0.4	ML	SILT, SANDY
2	7	10	13.5	98.9	71.0					-3.5	CL	CLAY, SANDY
2	11	10	12.1	100.7	80.6			1110		-0.3	CL	CLAY, SANDY
2	14	15			94.3	50	25				CH	CLAY, SANDY
3	2	15			48.6	NV	NP	0.00			SM	SANDSTONE, VERY SILTY
3	9	10			26.2						SM	SANDSTONE, SILTY
3	12	15			14.4						SM	SANDSTONE, SILTY
3	15	10			19.6						SM	SANDSTONE, SILTY
3	20	10			14.5						SM	SANDSTONE, SILTY
4	23	15	13.9	119.5	71.1					2.2	ML	SILTSTONE, SANDY
4	8	20			91.3	27	6				CL-ML	CLAYSTONE-SILTSTONE, SANDY
4	17	15	14.4	120.6	71.7	39	13			3.9	ML	SILTSTONE, SANDY

## FIGURES




**ENTECH**  
ENGINEERING, INC.  
505 ELKTON DRIVE  
COLORADO SPRINGS, CO. 80907 (719) 531-3399

**VICINITY MAP**  
**STRUTHERS RD & SPANISH BIT**  
**EL PASO COUNTY, CO**  
**FOR: MARVIN BOYD c/o YOW ARCH.**

DRAWN: <b>JAC</b>	DATE: <b>04/19/20</b>	CHECKED: <b>KAH</b>	DATE:
----------------------	--------------------------	------------------------	-------

**JOB NO.:**  
**201536**

**FIG NO.:**  
**1**

REVISION BY	

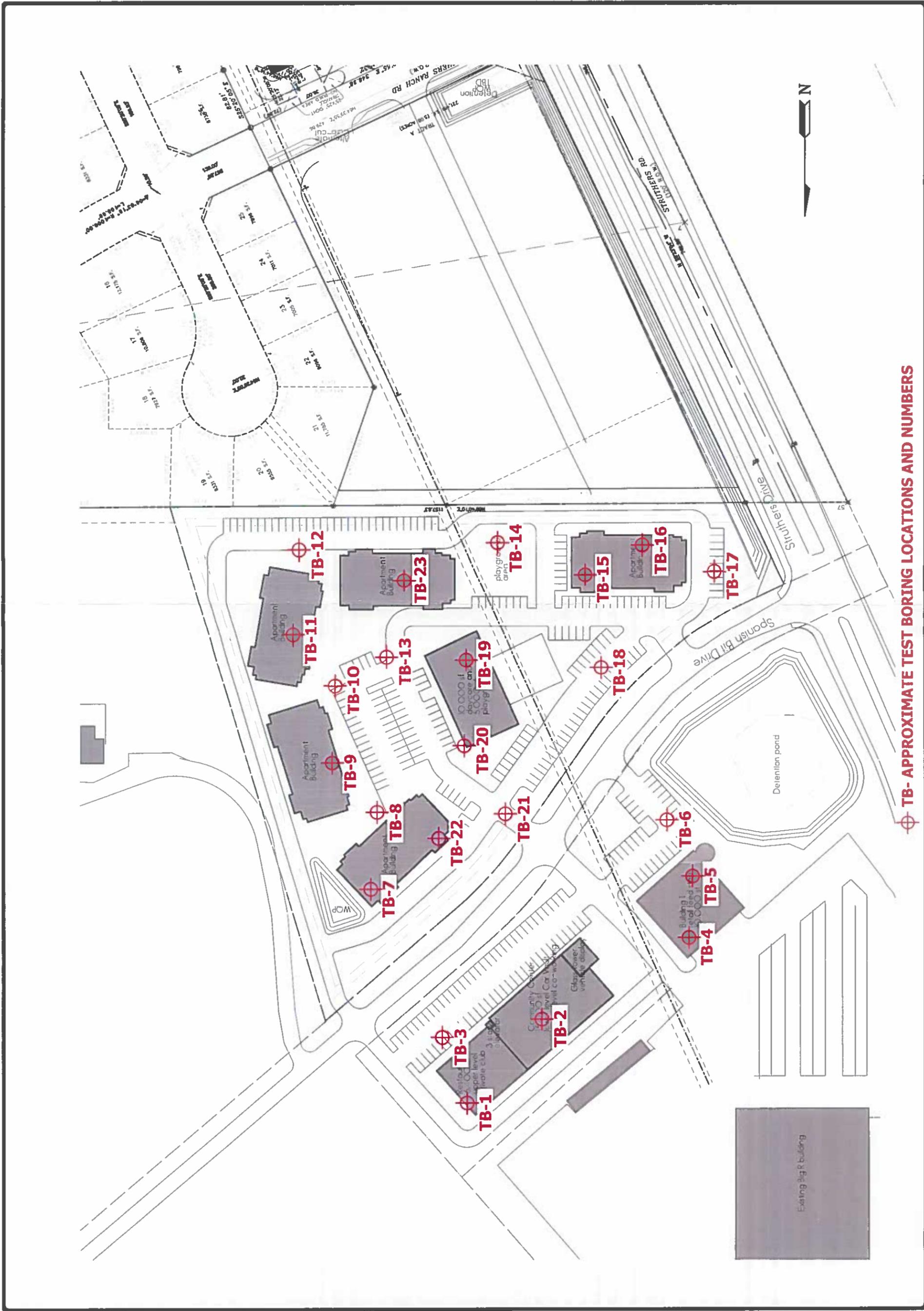
**ENTTECH**  
ENGINEERING, INC.

505 ELKTON DRIVE  
COLORADO SPRINGS, CO 80907  
(719) 531-5599

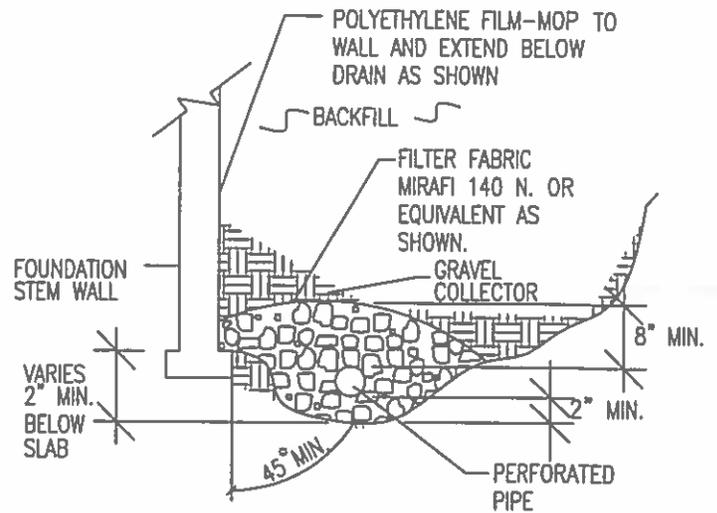
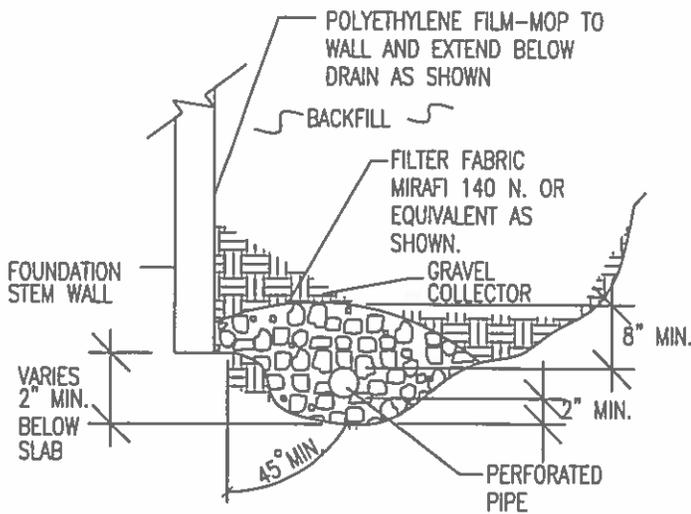


**TEST BORING LOCATION MAP**  
FOR: CATHEDRAL ROCK INVESTMENT, LLC  
EL PASO COUNTY, CO  
STRUTHERS RD & SPANISH BIT

DATE	04/19/21
BY	AS SHOWN
CHECKED	JOB NO.
DATE	510550
	7406 W.
	2



TB- APPROXIMATE TEST BORING LOCATIONS AND NUMBERS



NOTES:

-GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS-85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

-PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4-INCH DIAMETER IS MOST OFTEN USED.

-ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON-PERFORATED PIPE.

-FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

-MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

-DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.



**ENTECH**  
ENGINEERING, INC.  
505 ELKTON DRIVE  
COLORADO SPRINGS, CO. 80907 (719) 531-9599

*PERIMETER DRAIN DETAIL*

DRAWN:

DATE:

DESIGNED:

CHECKED:  
*lw*

JOB NO.:

210536

FIG NO.:

3

## **APPENDIX A: Test Boring Logs**

TEST BORING NO. 1  
 DATE DRILLED 3/10/2021  
 Job # 210536

TEST BORING NO. 2  
 DATE DRILLED 3/10/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 19', 3/15/21						
SAND, SLIGHTLY SILTY TO SILTY, FINE TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST	5			7	3.6	1
	5			13	7.0	1
	10			8	8.0	1
SILT, SANDY, CLAYEY, GRAY BROWN, STIFF, MOIST	15			15	16.7	2
SILTSTONE, SANDY, GRAY BROWN, HARD, MOIST	20			50 8"	17.5	4

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 19', 3/15/21						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST	5			19	1.9	1
	5			13	3.6	1
	10			14	7.2	1
SANDSTONE, VERY SILTY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST	15			50 10"	13.1	3
	20			50 7"	11.0	3



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**TEST BORING LOG**

DRAWN:	DATE:	CHECKED: <i>AY</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO:  
 210536

FIG NO:  
 A-1

TEST BORING NO. 3  
 DATE DRILLED 3/10/2021  
 Job # 210536

TEST BORING NO. 4  
 DATE DRILLED 3/10/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 3/15/21							WATER @ 10', 3/15/21						
SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST	5			14	1.7	1	SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	5			10	8.8	1
	5			14	6.9	1		5			11	7.5	1
	10							10			12	6.4	1
	15						SILT, SANDY, CLAYEY, GRAY BROWN, STIFF, MOIST	15			23	16.0	2
	20						SILTSTONE, SANDY, TAN, HARD, MOIST	20			50 9"	12.1	4



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**TEST BORING LOG**

DRAWN:

DATE:

CHECKED: *AM*

DATE:

5-3-21

JOB NO:  
 210536

FIG NO:  
 A- 2

TEST BORING NO. 5  
 DATE DRILLED 3/10/2021  
 Job # 210536

TEST BORING NO. 6  
 DATE DRILLED 3/10/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

DRY TO 20', 3/10/21  
 CAVED TO 18.5', 3/15/21  
 SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, MEDIUM DENSE  
 TO LOOSE, DRY TO MOIST

SILT, SANDY, GRAY BROWN,  
 VERY STIFF, MOIST

SANDSTONE, SILTY, FINE  
 GRAINED, GRAY BROWN, VERY  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			12	1.9	1
5			15	6.3	1
10			6	11.4	1
15			33	14.9	2
20			50 6"	9.6	3

REMARKS

DRY TO 5', 3/15/21  
 SAND, SILTY, FINE TO MEDIUM  
 GRAINED, TAN, MEDIUM DENSE,  
 DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			11	2.2	1
5			18	1.4	1
10					
15					
20					



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE	CHECKED: <i>MR</i>	DATE: 5-3-21
--------	------	--------------------	--------------

JOB NO.:  
 210536

FIG NO.:  
 A-3

TEST BORING NO. 7  
 DATE DRILLED 3/10/2021  
 Job # 210536

TEST BORING NO. 8  
 DATE DRILLED 3/10/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

REMARKS

DRY TO 18', 3/15/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, LOOSE, DRY TO  
 MOIST

FINE GRAINED LENSES

CLAY, SANDY, GRAY BROWN,  
 VERY STIFF, MOIST

SANDSTONE, VERY SILTY, FINE  
 GRAINED, GRAY BROWN, VERY  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-3	[Symbol]	3	3	1.9	1
3-5	[Symbol]	8	8	6.9	1
5-10	[Symbol]	30	30	12.6	2
10-15	[Symbol]	50 5"	50 5"	13.4	3
15-20	[Symbol]	50 4"	50 4"	13.3	3

DRY TO 18', 3/15/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, DARK BROWN TO  
 BROWN, LOOSE, DRY

SAND, SILTY, FINE GRAINED,  
 GRAY BROWN, DENSE, MOIST

CLAYSTONE-SILTSTONE, SANDY,  
 GRAY BROWN, HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]	5	5	1.7	1
5-10	[Symbol]	6	6	0.9	1
10-15	[Symbol]	35	35	7.6	1
15-20	[Symbol]	50 7"	50 7"	11.9	4
20-25	[Symbol]	50 10"	50 10"	12.4	4



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN: DATE: CHECKED: *AW* DATE: 5-3-21

JOB NO:  
 210536

FIG NO:  
 A- 4

TEST BORING NO. 9  
 DATE DRILLED 3/10/2021  
 Job # 210536

TEST BORING NO. 10  
 DATE DRILLED 3/11/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

DRY TO 20', 3/10/21  
 CAVED TO 17', 3/15/21, DRY  
 SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, LOOSE TO MEDIUM  
 DENSE, DRY

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			8	1.1	1
5			20	1.9	1
10			50 6"	3.4	3
15			50 6"	4.8	3
20			50 5"	7.7	3

REMARKS

DRY TO 18.5', 3/15/21  
 SAND, SLIGHTLY SILTY, FINE TO  
 COARSE GRAINED, TAN, MEDIUM  
 DENSE, DRY TO MOIST

SAND, VERY SILTY, FINE  
 GRAINED, GRAY BROWN, DENSE,  
 MOIST  
 CLAYSTONE, SANDY, GRAY  
 BROWN, HARD, MOIST

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			14	1.0	1
5			21	2.6	1
10			38	9.2	1
15			50 10"	12.9	4
20			50 5"	2.3	3



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>AV</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
 210536

FIG NO.:  
 A- 5

TEST BORING NO. 11  
 DATE DRILLED 3/11/2021  
 Job # 210536

TEST BORING NO. 12  
 DATE DRILLED 3/11/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

REMARKS

DRY TO 19', 3/15/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, MEDIUM DENSE,  
 DRY

CLAY, SANDY, GRAY BROWN,  
 STIFF, MOIST

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			14	1.4	1
5			15	1.8	1
10			29	12.2	2
15			50 5"	3.7	3
20			50 5"	4.5	3

DRY TO 18', 3/15/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, BROWN, LOOSE TO  
 DENSE, DRY TO MOIST

SAND, SILTY, FINE GRAINED,  
 GRAY BROWN, DENSE, MOIST

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			6	1.3	1
5			7	1.5	1
10			41	8.4	1
15			50 8"	9.2	3
20			50 3"	3.9	3



**ENTECH**  
 ENGINEERING, INC.

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN

DATE

CHECKED: *AV*

DATE: 5-3-21

JOB NO.  
 210536

FIG NO.  
 A- 6

TEST BORING NO. 13  
 DATE DRILLED 3/11/2021  
 Job # 210536

TEST BORING NO. 14  
 DATE DRILLED 3/11/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

DRY TO 5', 3/15/21

SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			10	1.2	1
5			17	1.2	1
10					
15					
20					

REMARKS

DRY TO 18', 3/15/21

SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, DRY TO MOIST

CLAY, SANDY, GRAY BROWN, VERY STIFF, MOIST  
 SANDSTONE, SILTY, CLAYEY, FINE GRAINED, TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			3	1.8	1
5			3	2.1	1
10			23	5.9	1
15			31	21.8	2
20			50	8.9	3
			4"		



**ENTECH**  
 ENGINEERING, INC.

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: *[Signature]*

DATE: 5-3-21

JOB NO.: 210536

FIG NO.: A-7

TEST BORING NO. 15  
 DATE DRILLED 3/11/2021  
 Job # 210536

TEST BORING NO. 16  
 DATE DRILLED 3/11/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

DRY TO 18.5', 3/15/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, MEDIUM DENSE,  
 DRY

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			13	1.4	1
5			18	1.9	1
10			50 11"	6.5	3
15			50 5"	4.1	3
20			50 3"	10.3	3

REMARKS

WATER @ 15.5', 3/15/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, LOOSE TO  
 MEDIUM DENSE, DRY TO MOIST

FINE GRAINED LENSES

SANDSTONE, VERY SILTY, FINE  
 GRAINED, TAN, VERY DENSE,  
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			5	1.4	1
5			32	8.4	1
10			50 5"	13.6	3
15			50 6"	15.4	3
20			50 8"	11.1	3



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: *AV*

DATE: 5-3-21

JOB NO:  
 210536

FIG NO:  
 A- 8

TEST BORING NO. 17  
 DATE DRILLED 3/12/2021  
 Job # 210536

TEST BORING NO. 18  
 DATE DRILLED 3/12/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

REMARKS

WATER @ 14', 3/15/21  
 SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, LOOSE TO  
 MEDIUM DENSE, DRY

CLAYSTONE, SANDY, GRAY  
 BROWN, HARD, MOIST

VERY SILTY LENSE

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			6	0.7	1
5			13	1.7	1
10			50 8"	12.6	4
15			50 9"	16.4	4
20			50 9"	12.1	4

DRY TO 9.5', 3/15/21  
 SAND, SILTY, FINE TO COARSE  
 GRAINED, BROWN TO TAN,  
 MEDIUM DENSE, DRY

CLAYSTONE, SANDY, SILTY,  
 GRAY BROWN, HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			10	1.7	1
5			12	2.4	1
10			50 10"	12.6	4
15					
20					



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: *M*

DATE:

5-3-21

JOB NO:  
 210536

FIG NO:  
 A- 9

TEST BORING NO. 19  
 DATE DRILLED 3/12/2021  
 Job # 210536

TEST BORING NO. 20  
 DATE DRILLED 3/12/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

REMARKS

DRY TO 18', 3/15/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, BROWN TO TAN,  
 MEDIUM DENSE TO LOOSE,  
 DRY TO MOIST

SANDSTONE, SILTY, FINE  
 GRAINED, GRAY BROWN TO  
 TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			15	2.3	1
5			6	2.6	1
10			22	3.4	1
15			50 7"	11.3	3
20			50 5"	17.6	3

DRY TO 18.5', 3/15/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, BROWN TO TAN,  
 LOOSE, DRY

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			6	1.4	1
5			4	2.9	1
10			50 7"	6.6	3
15			50 5"	5.0	3
20			50 5"	5.3	3



**ENTECH**  
 ENGINEERING, INC.

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: *AN*

DATE:

5-3-21

JOB NO.:  
 210536

FIG NO.:  
 A- 10

TEST BORING NO. 21  
 DATE DRILLED 3/12/2021  
 Job # 210536

TEST BORING NO. 22  
 DATE DRILLED 3/12/2021  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

DRY TO 5', 3/15/21  
 SAND, SILTY, FINE TO COARSE  
 GRAINED, BROWN, LOOSE,  
 DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			6	2.1	1
5			5	2.1	1
10					
15					
20					

REMARKS

DRY TO 5', 3/15/21  
 SAND, SILTY, FINE TO COARSE  
 GRAINED, BROWN, MEDIUM  
 DENSE TO LOOSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			13	6.9	1
5			9	3.8	1
10					
15					
20					



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED: *M*

DATE: 5-3-21

JOB NO:  
 210536

FIG NO:  
 A- 11

TEST BORING NO. 23  
 DATE DRILLED 4/22/2021  
 Job # 210536

TEST BORING NO.  
 DATE DRILLED  
 CLIENT CATHEDRAL ROCK INVEST.  
 LOCATION STRUTHERS AND SPANISH BIT

REMARKS

REMARKS

DRY TO 18', 4/26/21

SAND, SILTY, FINE TO COARSE  
 GRAINED, BROWN, LOOSE TO  
 MEDIUM DENSE, MOIST

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, MOIST

SILTSTONE, SANDY, GRAY  
 BROWN, HARD, MOIST

\* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			6	5.3	1	5					
5			17	8.6	1	5					
10			50 7"	3.6	3	10					
15			50 7"	10.9	4	15					
20			*	14.5	4	20					



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

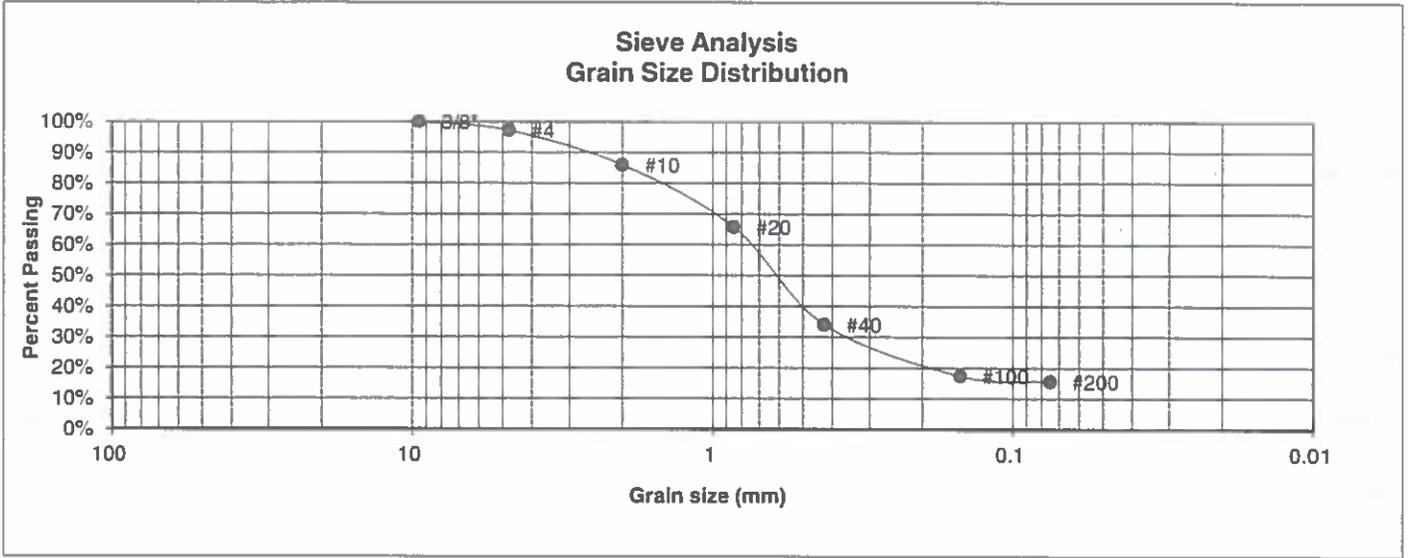
4-22-21

JOB NO.:  
 210536

FIG NO.:  
 A- 12

## **APPENDIX B: Laboratory Testing Results**

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1, CBR	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	3	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	0-3	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.2%
10	85.9%
20	65.7%
40	34.0%
100	17.4%
200	15.5%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

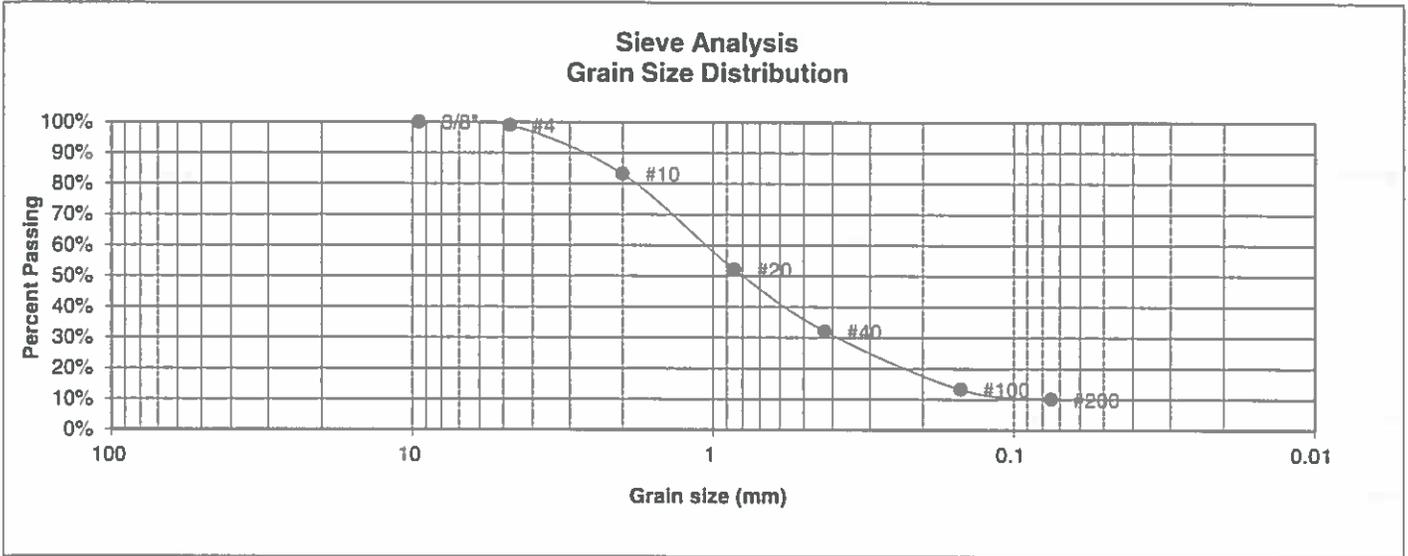
<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>M</i>	<u>DATE:</u> 5-3-21
---------------	--------------	--------------------------	---------------------

JOB NO:  
210536

FIG NO:

B-1

<b>UNIFIED CLASSIFICATION</b>	SM-SW	<b>CLIENT</b>	CATHEDRAL ROCK INVEST.
<b>SOIL TYPE #</b>	1	<b>PROJECT</b>	STRUTHERS AND SPANISH BIT
<b>TEST BORING #</b>	1	<b>JOB NO.</b>	210536
<b>DEPTH (FT)</b>	2-3	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.0%
10	83.2%
20	52.1%
40	32.0%
100	13.2%
200	10.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH**  
**ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

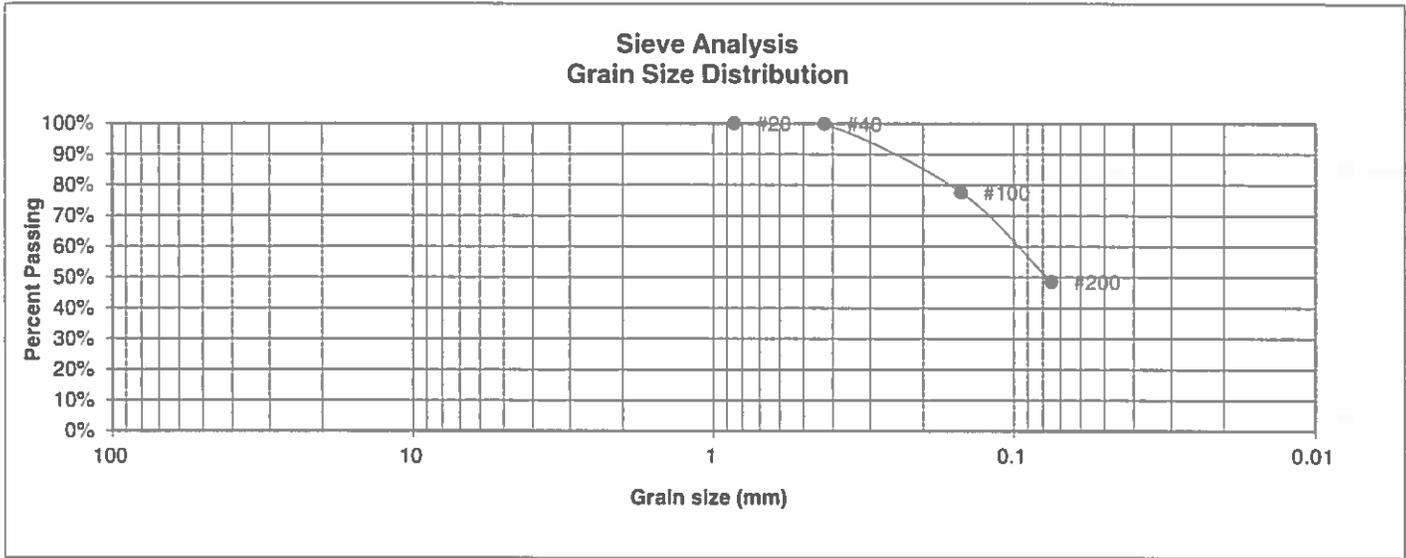
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>M</i>	DATE: 5-3-21
--------	-------	-------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-2

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	3	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	2	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	15	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.8%
100	77.6%
200	48.6%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

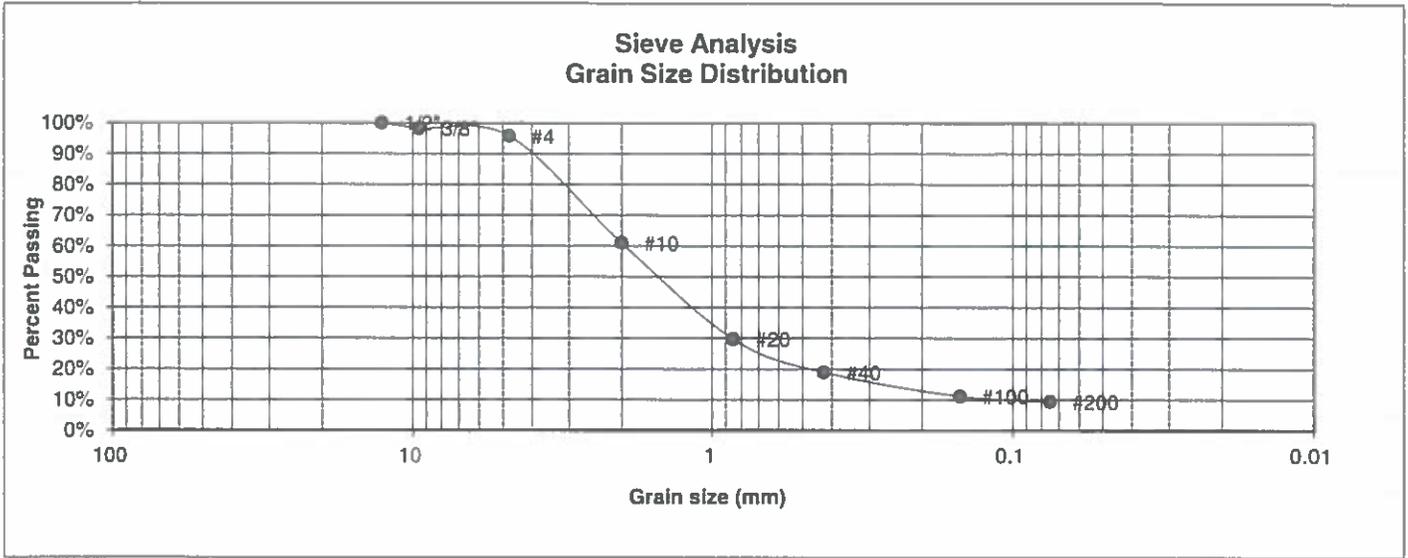
**LABORATORY TEST  
RESULTS**

DRAWN	DATE	CHECKED	DATE
		<i>AN</i>	5-3-21

JOB NO.:  
210536

FIG NO.:  
B-3

<b>UNIFIED CLASSIFICATION</b>	SM-SW	<b>CLIENT</b>	CATHEDRAL ROCK INVEST.
<b>SOIL TYPE #</b>	1	<b>PROJECT</b>	STRUTHERS AND SPANISH BIT
<b>TEST BORING #</b>	3	<b>JOB NO.</b>	210536
<b>DEPTH (FT)</b>	1-2	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.3%
4	95.7%
10	61.0%
20	29.7%
40	18.9%
100	11.1%
200	9.4%

**Atterberg Limits**

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

- Swell**
- Moisture at start
  - Moisture at finish
  - Moisture increase
  - Initial dry density (pcf)
  - Swell (psf)



**ENTECH  
ENGINEERING, INC.**  
505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

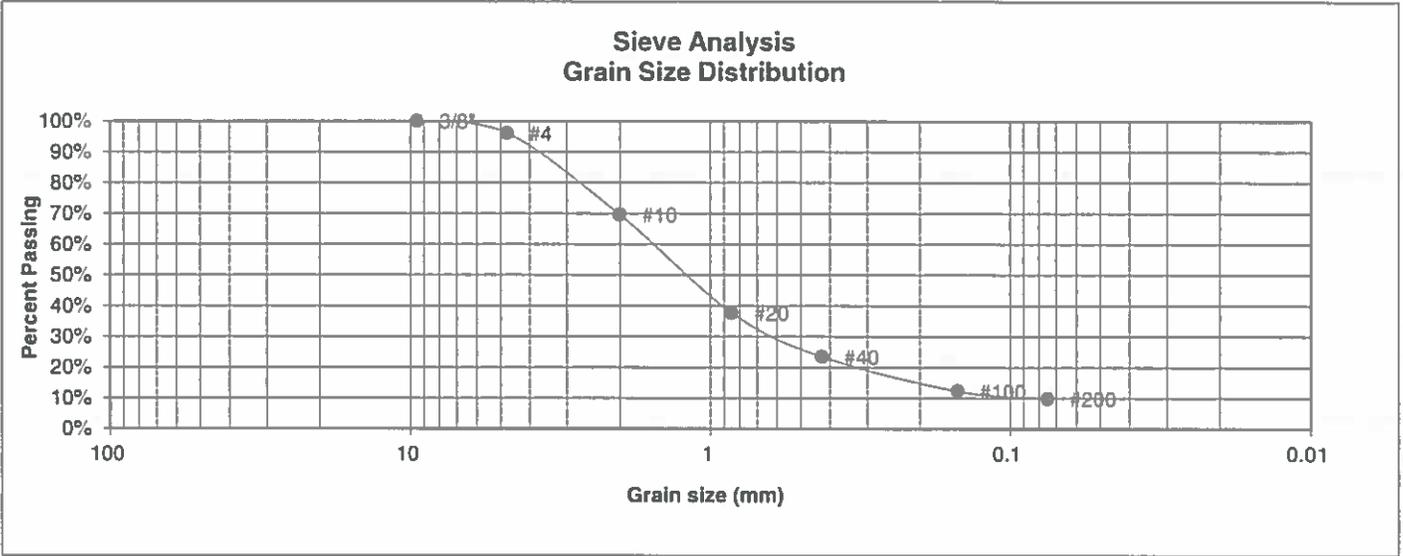
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>M</i>	DATE: 5-3-21
--------	-------	-------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-4

<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	4	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.1%
10	69.6%
20	37.7%
40	23.4%
100	12.3%
200	9.9%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH  
ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

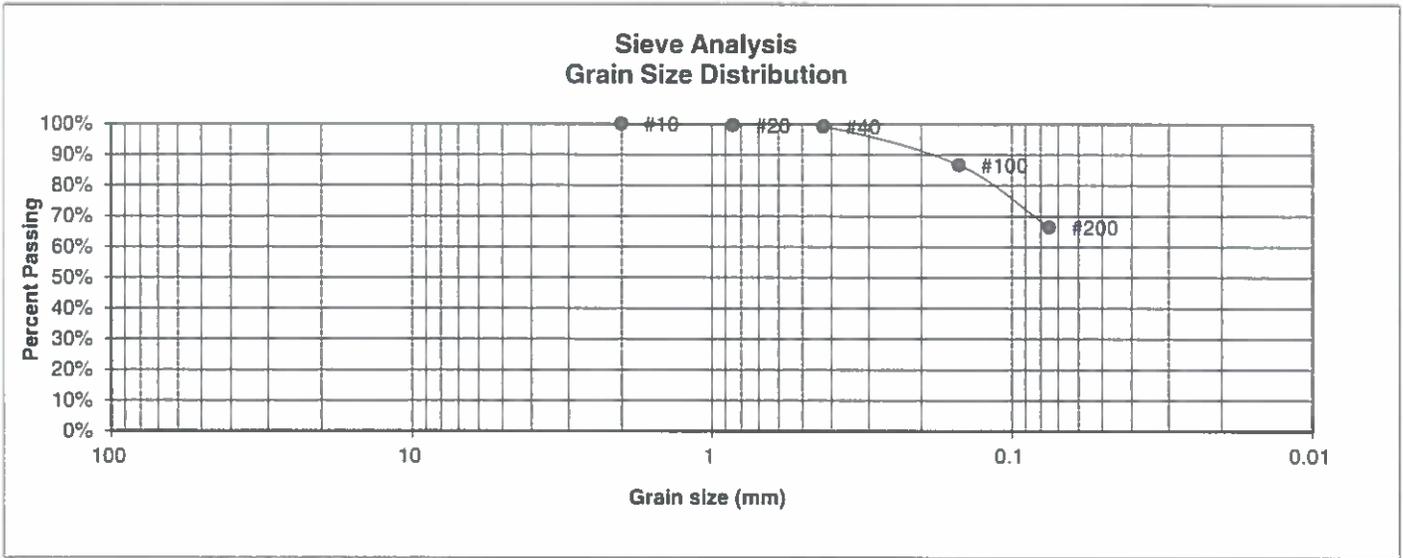
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>AY</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-5

<u>UNIFIED CLASSIFICATION</u>	ML	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	5	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	15	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.6%
40	99.2%
100	86.7%
200	66.4%

<u>Atterberg Limits</u>	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH**  
ENGINEERING, INC.  
505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

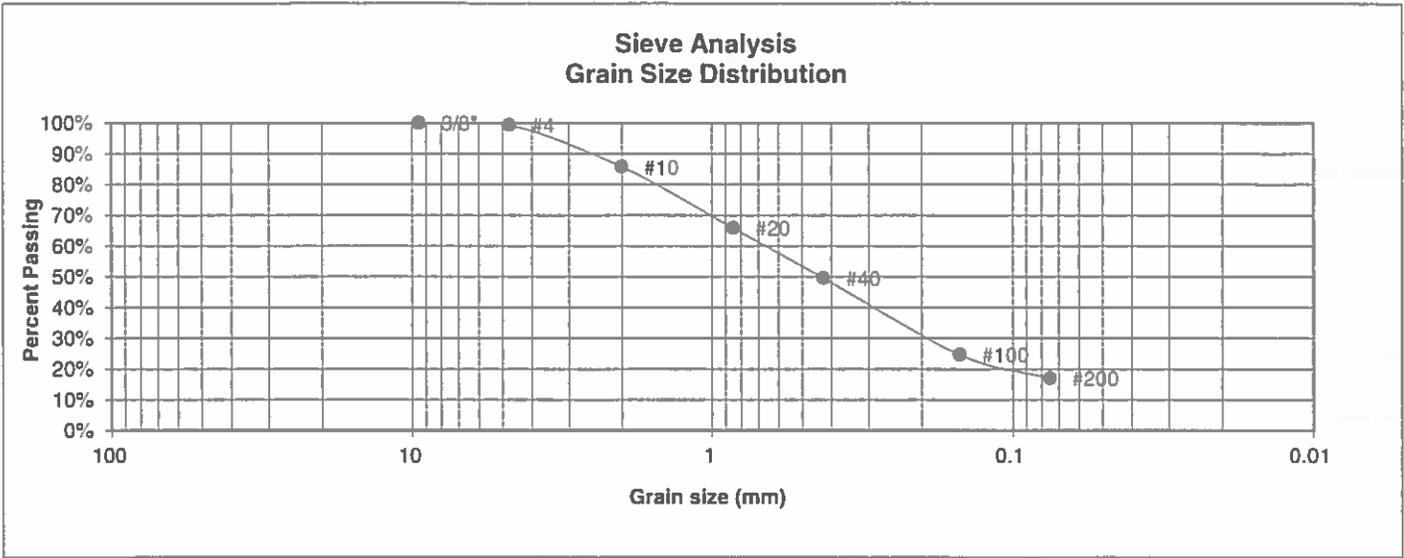
DRAWN:	DATE:	CHECKED: <i>Ar</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
210536

FIG NO.:

B-6

<b>UNIFIED CLASSIFICATION</b>	SM	<b>CLIENT</b>	CATHEDRAL ROCK INVEST.
<b>SOIL TYPE #</b>	1	<b>PROJECT</b>	STRUTHERS AND SPANISH BIT
<b>TEST BORING #</b>	6	<b>JOB NO.</b>	210536
<b>DEPTH (FT)</b>	1-2	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.3%
10	85.8%
20	65.9%
40	49.5%
100	24.7%
200	17.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

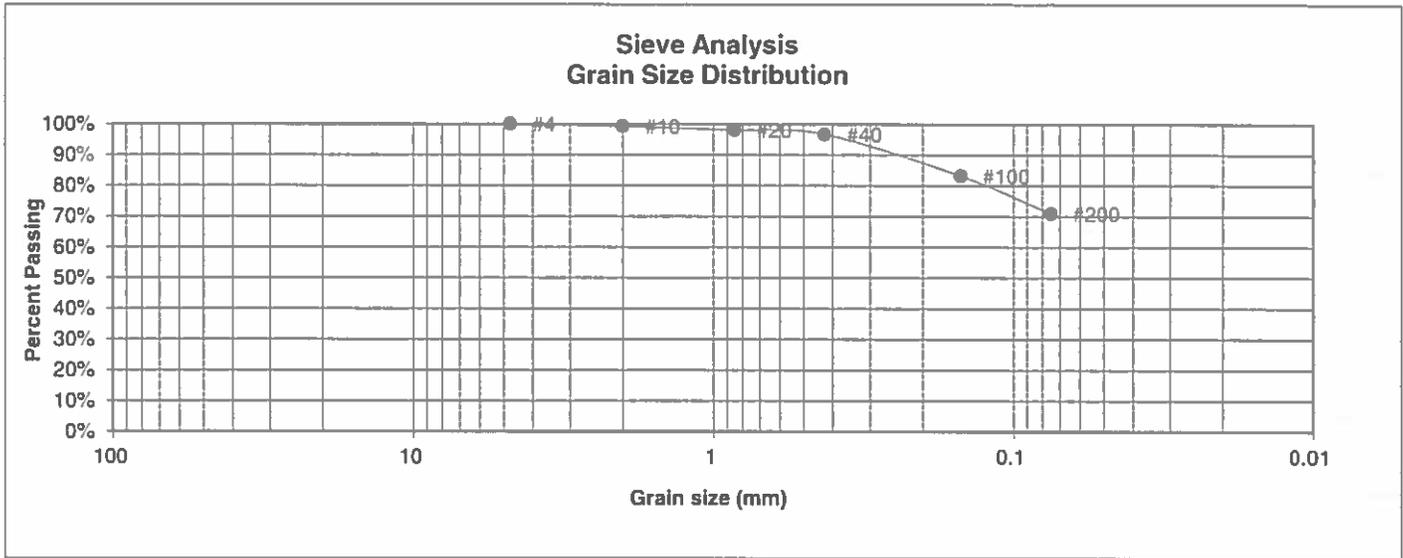
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>AV</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-7

<u>UNIFIED CLASSIFICATION</u>	CL	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	7	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.2%
20	98.0%
40	96.7%
100	83.2%
200	71.0%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

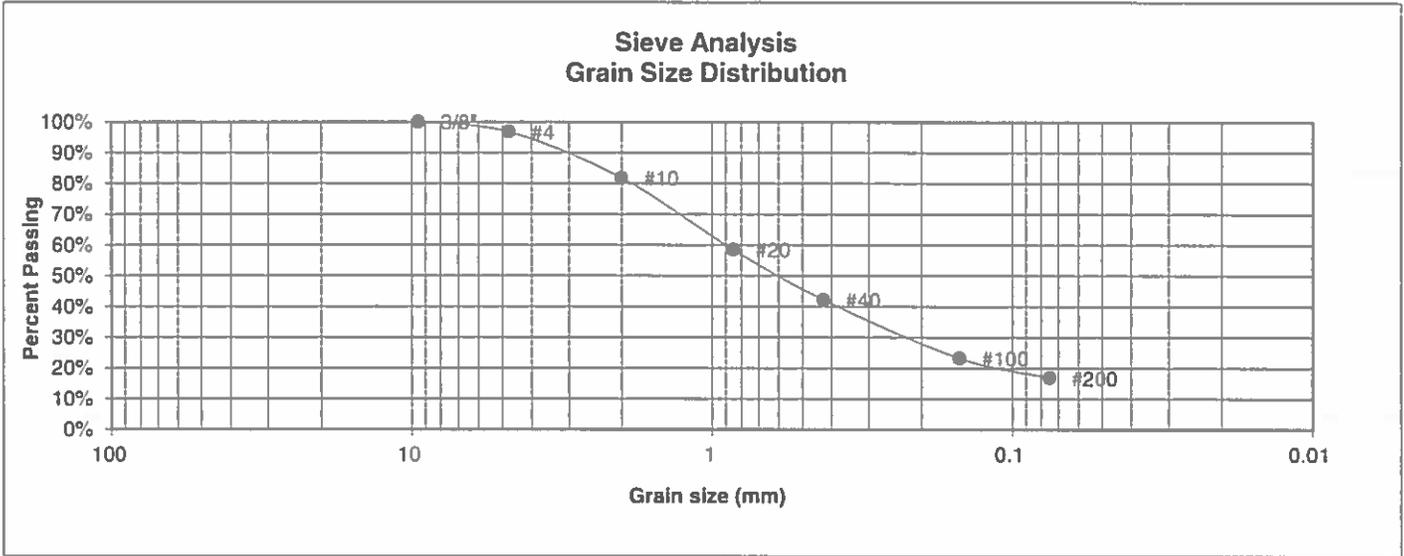
**LABORATORY TEST  
RESULTS**

<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>ML</i>	<u>DATE:</u> 5-3-21
---------------	--------------	---------------------------	---------------------

JOB NO:  
210536

FIG NO:  
B-8

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	8	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	2-3	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.7%
10	81.8%
20	58.5%
40	42.2%
100	23.2%
200	16.8%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
 RESULTS**

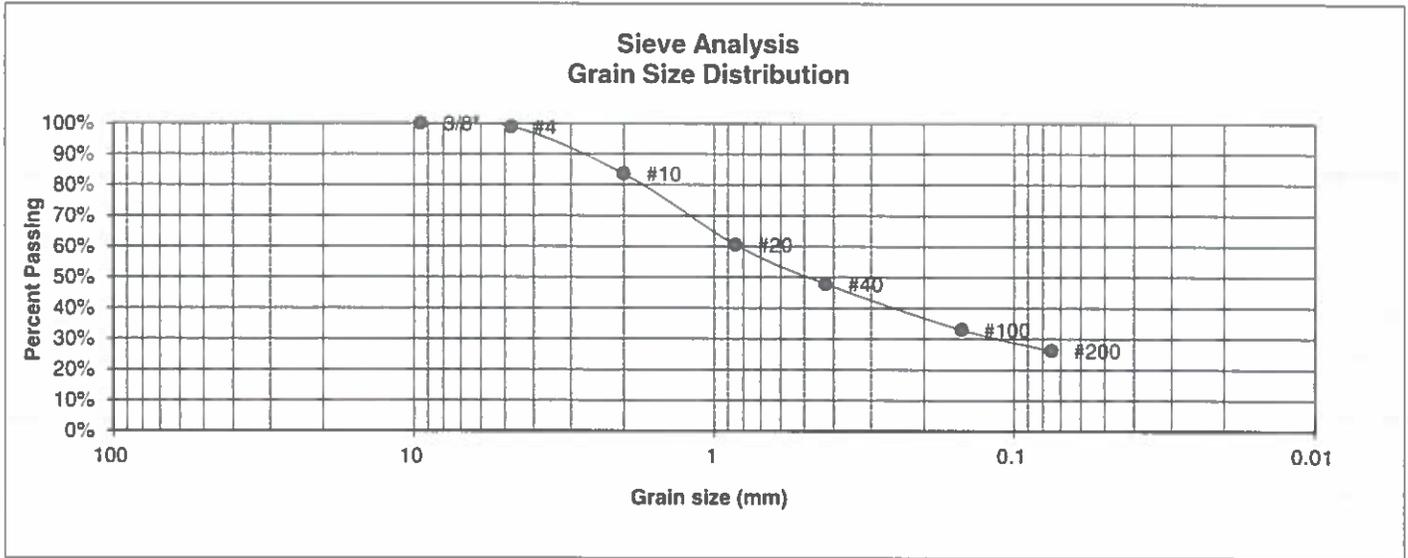
<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>M</i>	<u>DATE:</u> 5-3-21
---------------	--------------	--------------------------	---------------------

JOB NO.:  
210536

FIG NO.:  
B-9

**UNIFIED CLASSIFICATION** SM  
**SOIL TYPE #** 3  
**TEST BORING #** 9  
**DEPTH (FT)** 10

**CLIENT** CATHEDRAL ROCK INVEST.  
**PROJECT** STRUTHERS AND SPANISH BIT  
**JOB NO.** 210536  
**TEST BY** BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.9%
10	83.6%
20	60.5%
40	47.8%
100	33.0%
200	26.2%

**Atterberg Limits**  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

**Swell**  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

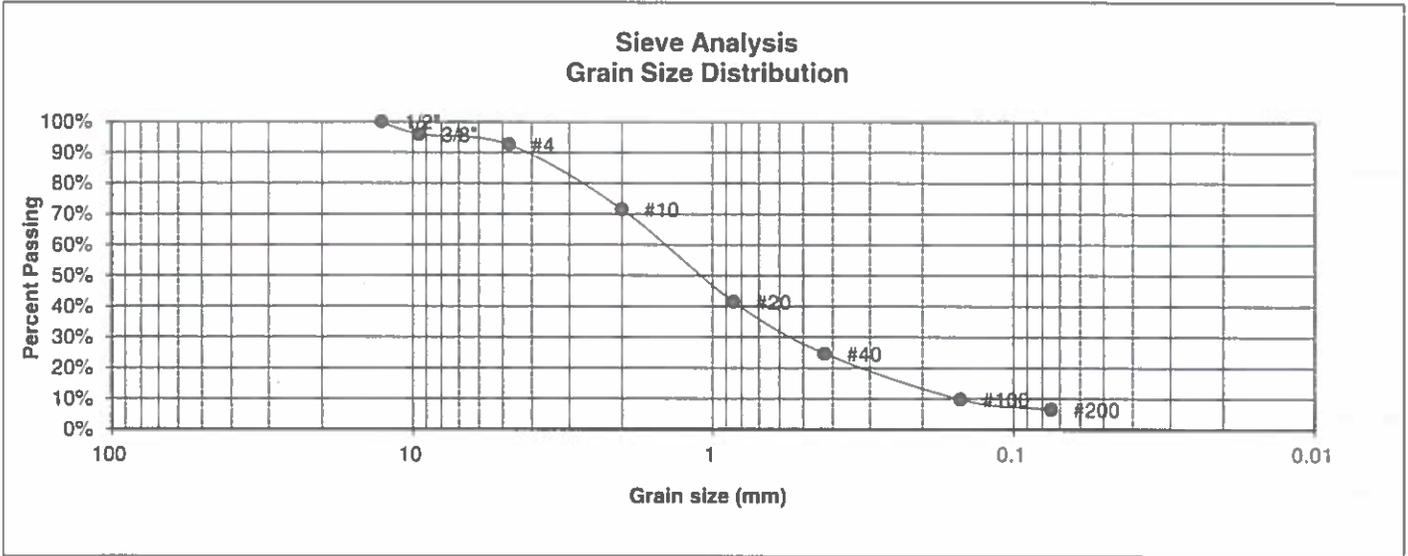
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>AV</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-10

<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	10	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	95.9%
4	92.5%
10	71.5%
20	41.4%
40	24.6%
100	9.7%
200	6.5%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

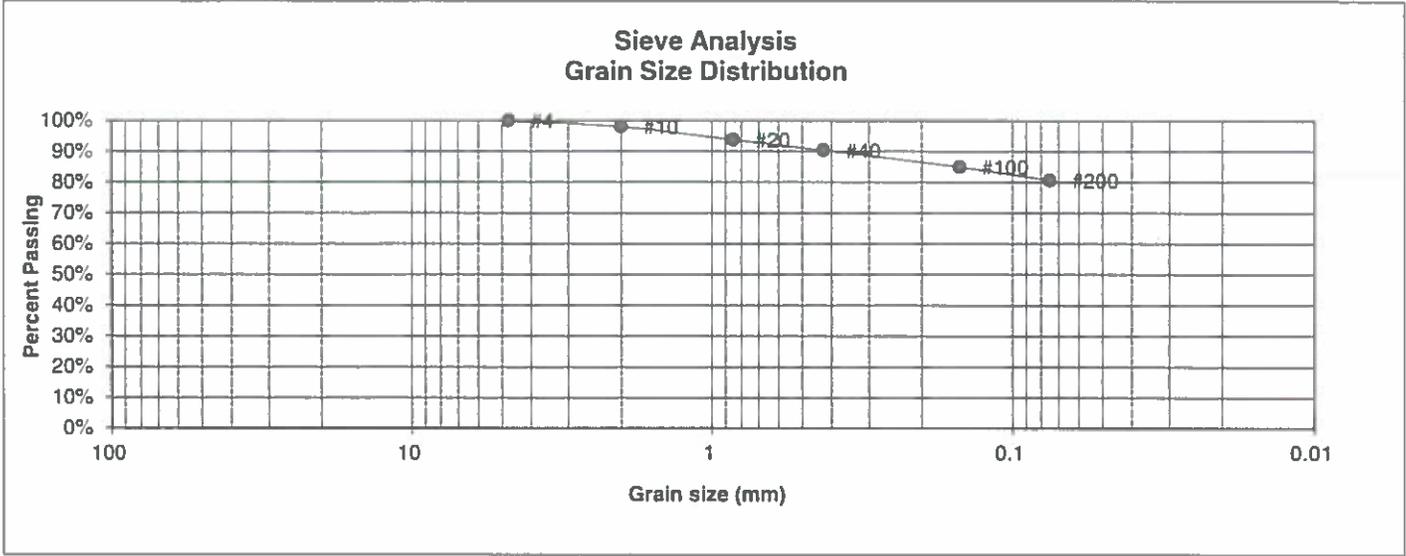
**LABORATORY TEST  
 RESULTS**

<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>AV</i>	<u>DATE:</u> 5-3-21
---------------	--------------	---------------------------	---------------------

JOB NO:  
210536

FIG NO:  
B-11

<u>UNIFIED CLASSIFICATION</u>	CL	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	11	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.0%
20	93.8%
40	90.3%
100	84.9%
200	80.6%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

<u>Swell</u>	
Moisture at start	12.0%
Moisture at finish	20.3%
Moisture increase	8.3%
Initial dry density (pcf)	106
Swell (psf)	1110



**ENTECH  
ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

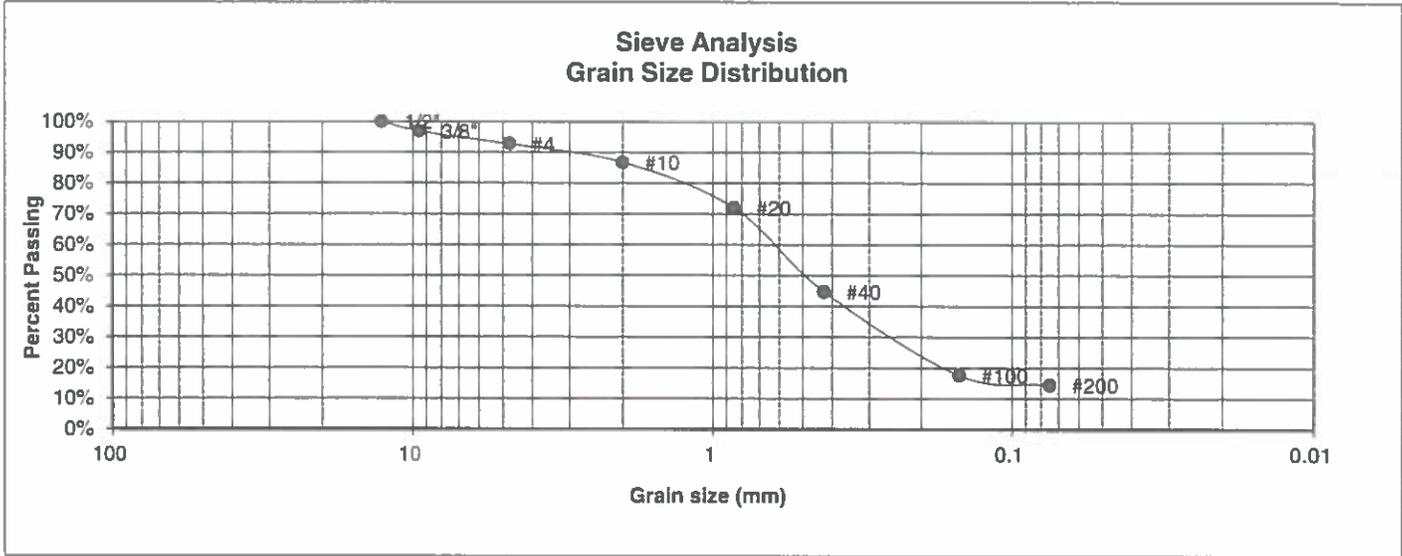
**LABORATORY TEST RESULTS**

DRAWN:	DATE:	CHECKED: <i>AV</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.: 210536  
 FIG NO.: B-12

**UNIFIED CLASSIFICATION** SM  
**SOIL TYPE #** 3  
**TEST BORING #** 12  
**DEPTH (FT)** 15

**CLIENT** CATHEDRAL ROCK INVEST.  
**PROJECT** STRUTHERS AND SPANISH BIT  
**JOB NO.** 210536  
**TEST BY** BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.9%
4	92.7%
10	86.8%
20	72.0%
40	44.7%
100	17.6%
200	14.4%

**Atterberg Limits**  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

**Swell**  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

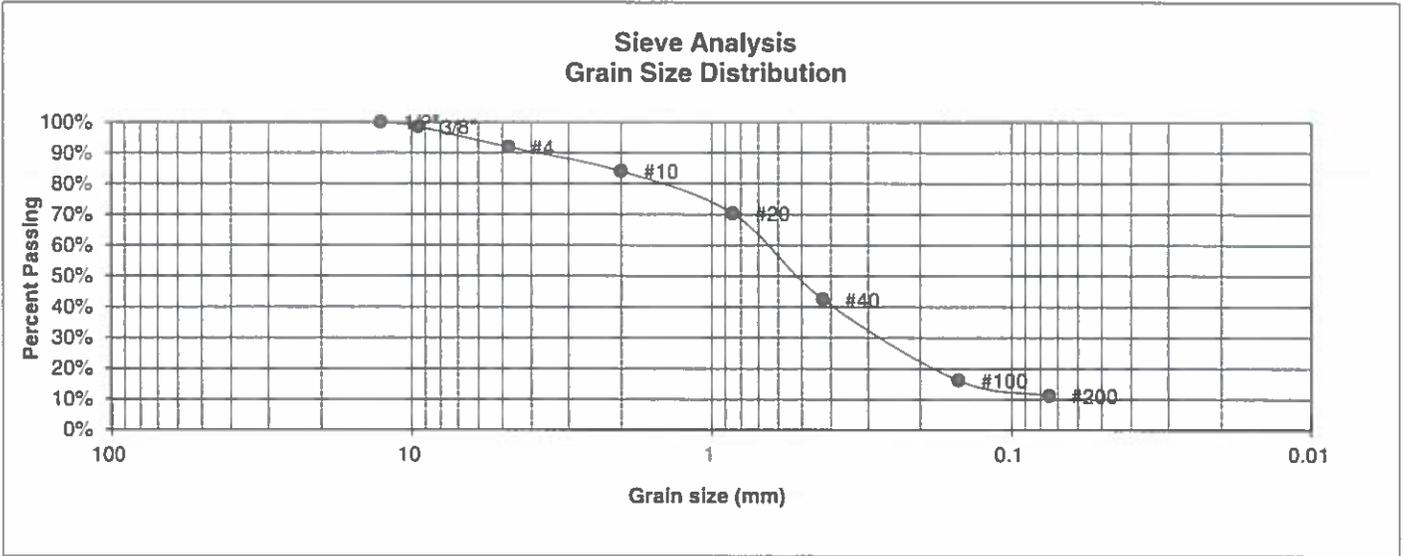
**LABORATORY TEST  
 RESULTS**

DRAWN:	DATE:	CHECKED: <i>mv</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO:  
 210536

FIG NO.:  
 B-13

<u>UNIFIED CLASSIFICATION</u>	SM-SW	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	13	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.4%
4	91.8%
10	84.0%
20	70.3%
40	42.4%
100	16.2%
200	11.2%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH**  
ENGINEERING, INC.  
505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

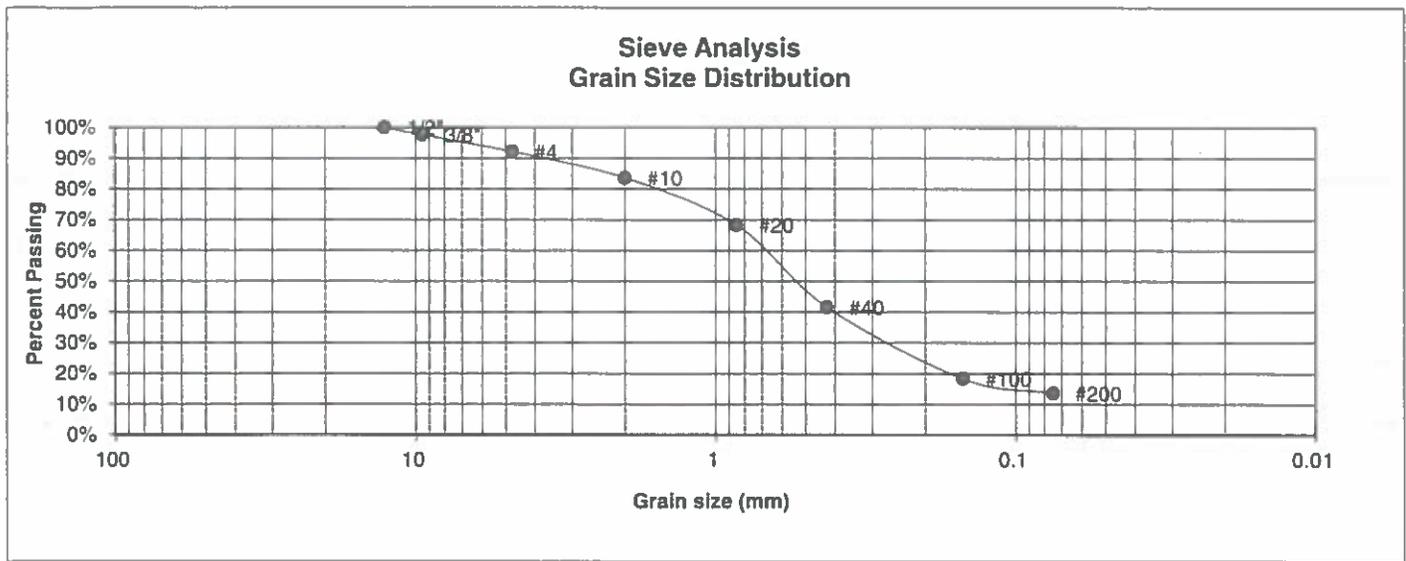
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>BL</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-14

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	14	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	2-3	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.6%
4	92.2%
10	83.6%
20	68.3%
40	41.5%
100	18.3%
200	13.6%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

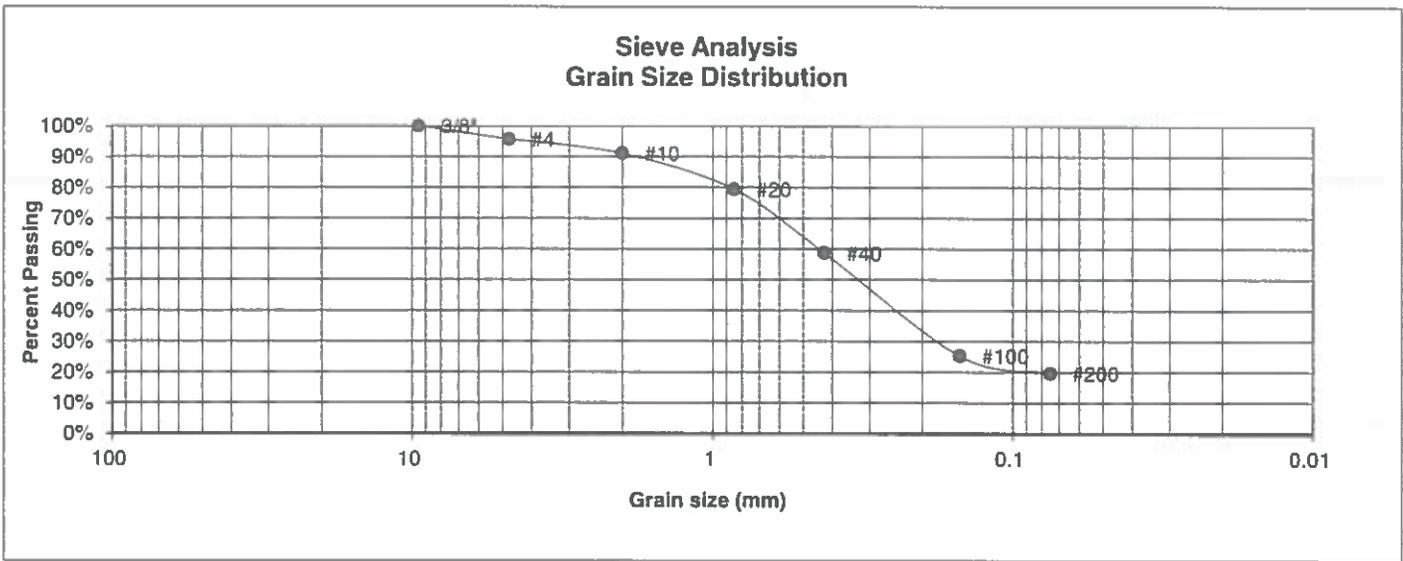
<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>AY</i>	<u>DATE:</u> 5-3-21
---------------	--------------	---------------------------	---------------------

JOB NO.:  
210536

FIG NO.:  
B-15

**UNIFIED CLASSIFICATION** SM  
**SOIL TYPE #** 3  
**TEST BORING #** 15  
**DEPTH (FT)** 10

**CLIENT** CATHEDRAL ROCK INVEST.  
**PROJECT** STRUTHERS AND SPANISH BIT  
**JOB NO.** 210536  
**TEST BY** BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.7%
10	91.1%
20	79.4%
40	58.7%
100	25.3%
200	19.6%

**Atterberg Limits**  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

**Swell**  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

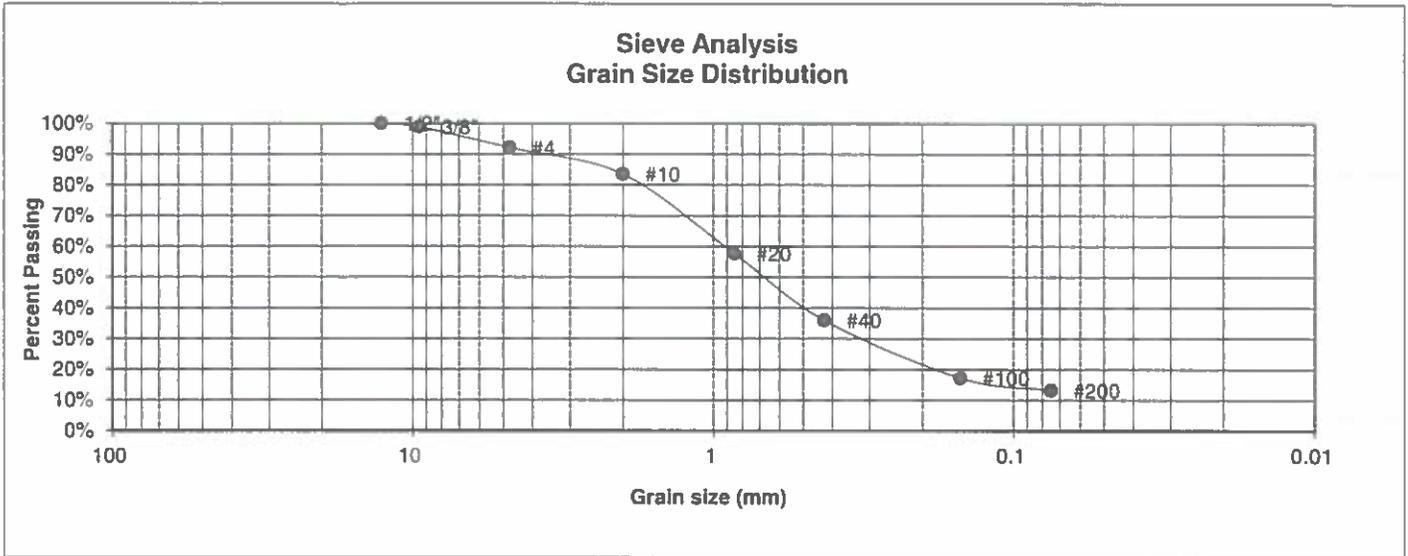
### LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: <i>BL</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.: 210536

FIG NO.: B-6

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	16	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	2-3	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.9%
4	92.1%
10	83.5%
20	57.7%
40	36.0%
100	17.2%
200	13.2%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
 RESULTS**

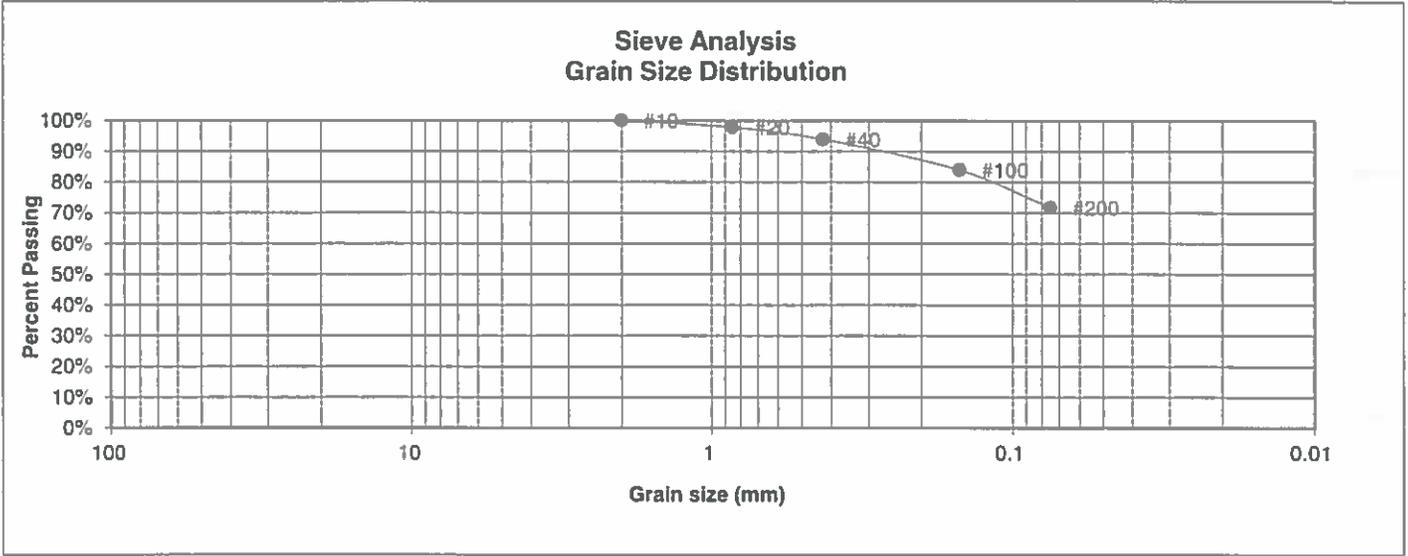
<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>AV</i>	<u>DATE:</u> 5-2-21
---------------	--------------	---------------------------	---------------------

JOB NO.:  
210536

FIG NO.:

B-17

<u>UNIFIED CLASSIFICATION</u>	ML	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	4	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	17	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	15	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	97.9%
40	93.9%
100	84.0%
200	71.7%

<u>Atterberg Limits</u>	
Plastic Limit	26
Liquid Limit	39
Plastic Index	13

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

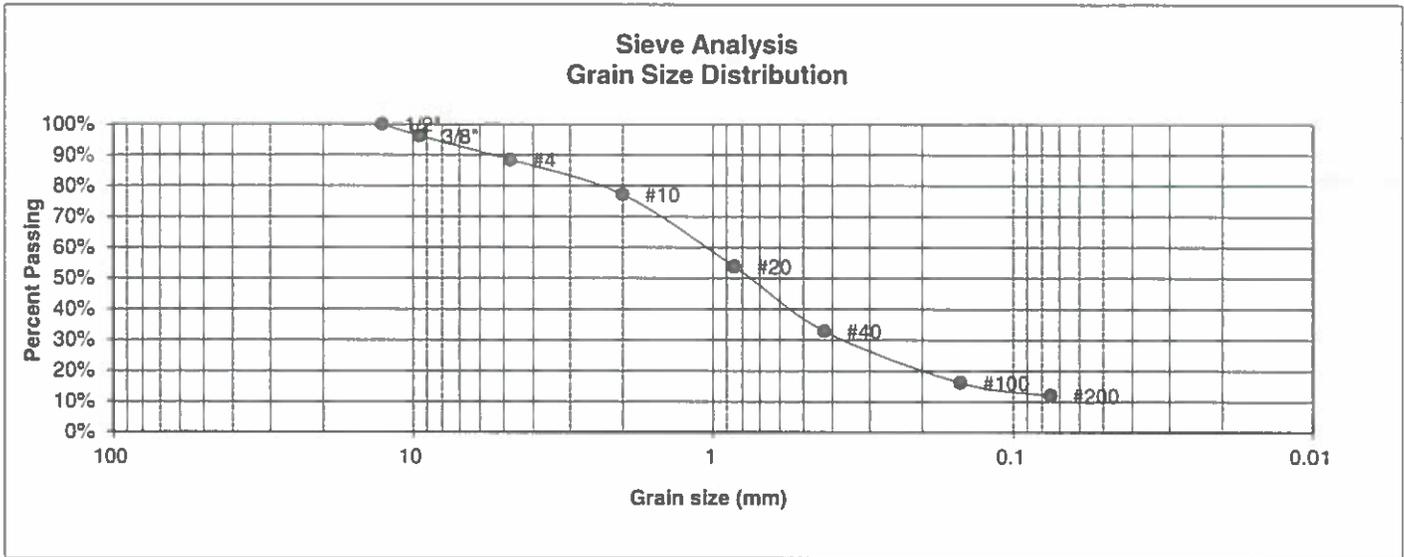
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>AN</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO:  
210536

FIG NO:  
B-18

<b>UNIFIED CLASSIFICATION</b>	SM	<b>CLIENT</b>	CATHEDRAL ROCK INVEST.
<b>SOIL TYPE #</b>	1	<b>PROJECT</b>	STRUTHERS AND SPANISH BIT
<b>TEST BORING #</b>	18	<b>JOB NO.</b>	210536
<b>DEPTH (FT)</b>	1-2	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.1%
4	88.4%
10	77.2%
20	53.8%
40	32.9%
100	16.2%
200	12.1%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

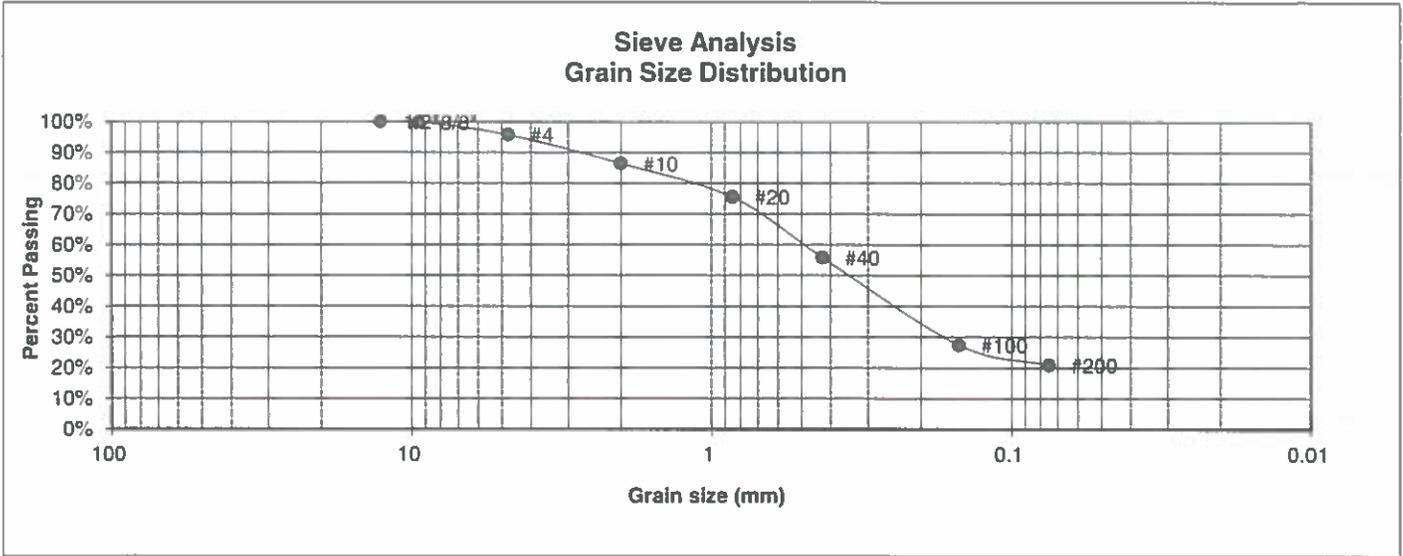
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>W</i>	DATE: 5-3-21
--------	-------	-------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-19

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	19	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	5	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	99.8%
4	95.7%
10	86.4%
20	75.5%
40	55.8%
100	27.4%
200	20.8%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

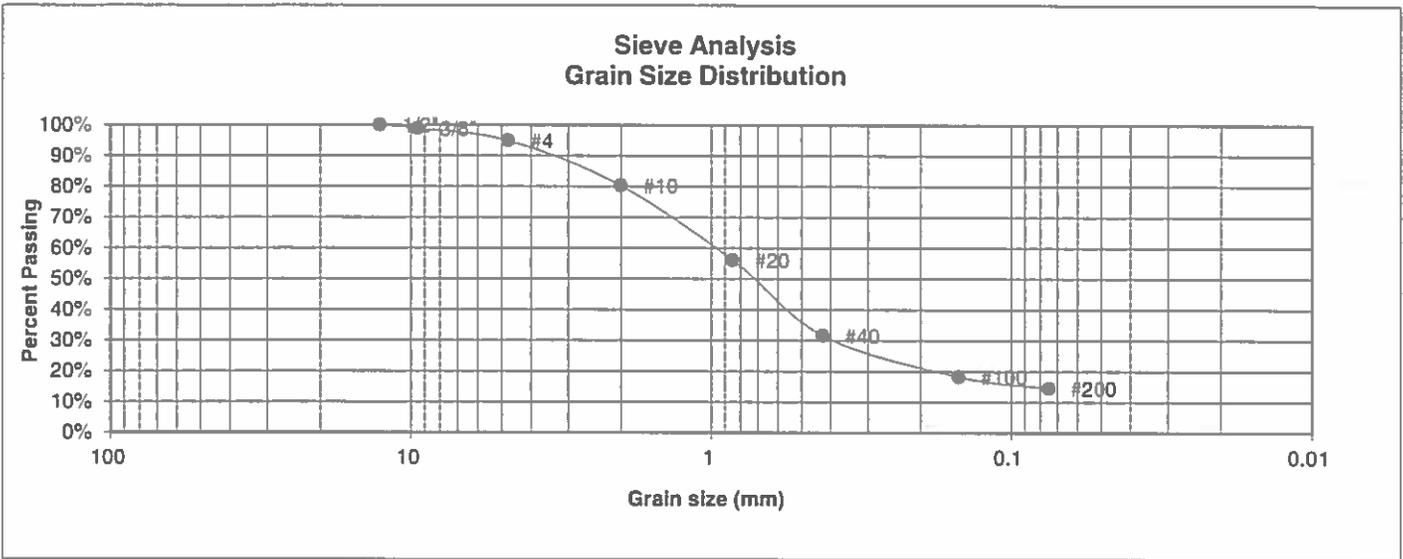
**LABORATORY TEST  
RESULTS**

<u>DRAWN</u>	<u>DATE</u>	<u>CHECKED</u>	<u>DATE</u>
		<i>ML</i>	5-3-21

JOB NO:  
210536

FIG NO.:  
B-20

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	3	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	20	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	10	<u>TEST BY</u>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.9%
4	94.9%
10	80.3%
20	56.1%
40	31.6%
100	18.3%
200	14.5%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

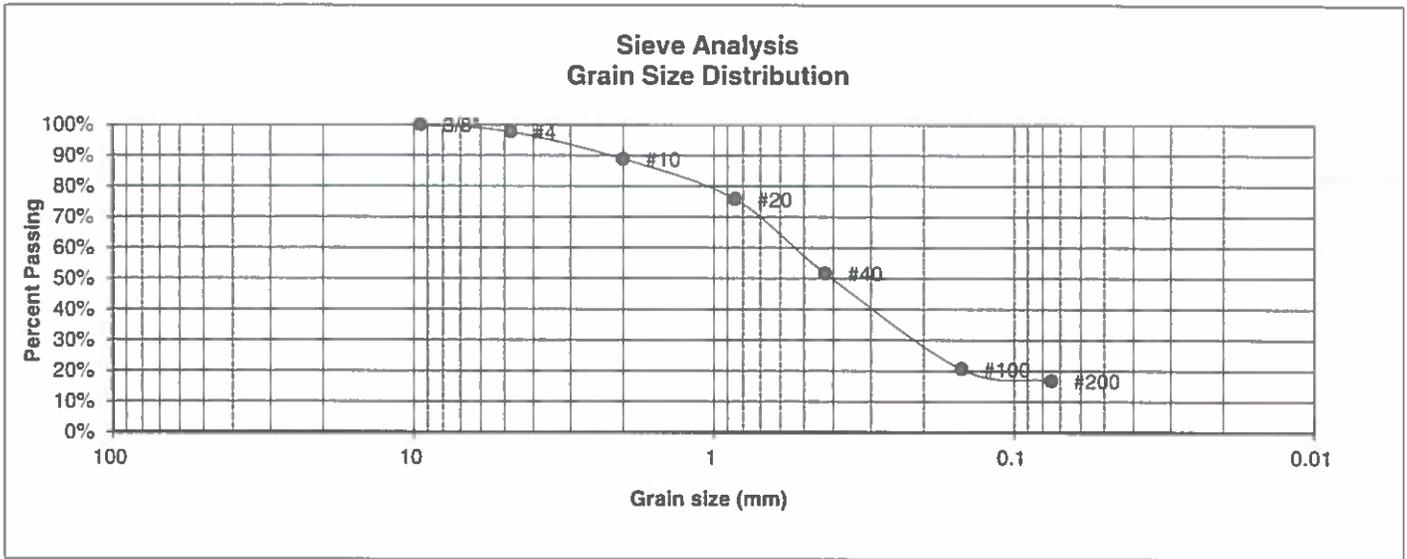
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>AV</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-21

<b>UNIFIED CLASSIFICATION</b>	SM	<b>CLIENT</b>	CATHEDRAL ROCK INVEST.
<b>SOIL TYPE #</b>	1	<b>PROJECT</b>	STRUTHERS AND SPANISH BIT
<b>TEST BORING #</b>	21	<b>JOB NO.</b>	210536
<b>DEPTH (FT)</b>	1-2	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.7%
10	88.8%
20	75.8%
40	51.6%
100	20.6%
200	16.8%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

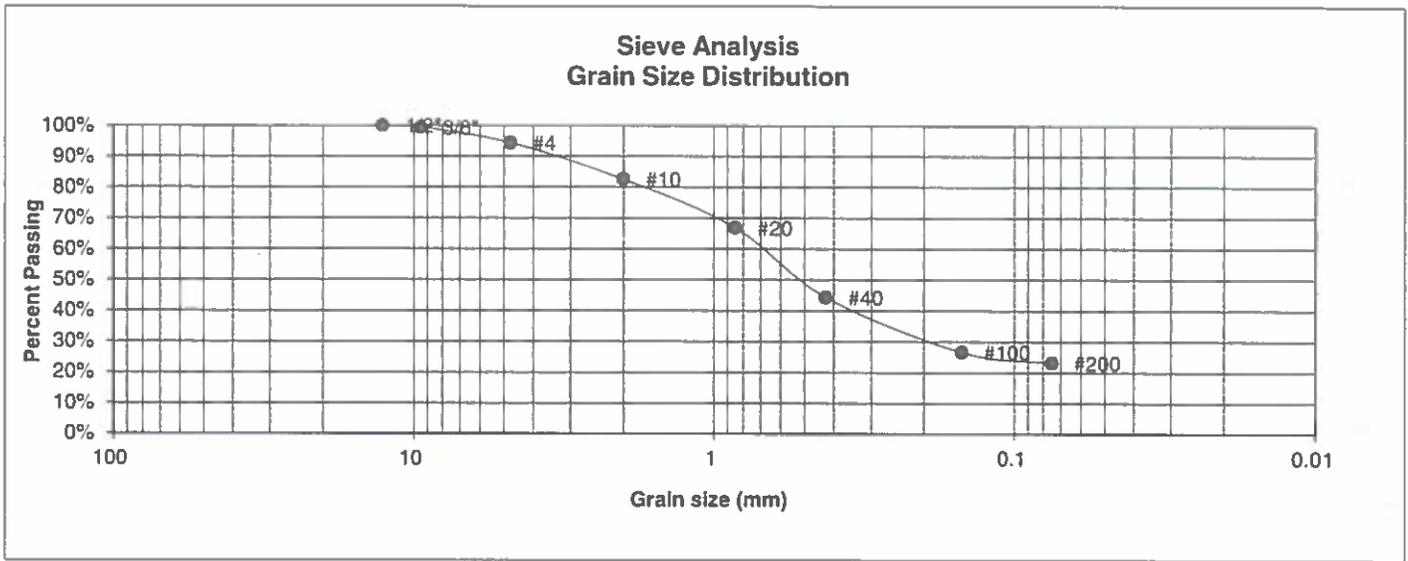
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>AV</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-22

<u>UNIFIED CLASSIFICATION</u>	SM	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	1	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	22	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	1-2	<u>TEST BY</u>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	99.4%
4	94.3%
10	82.5%
20	66.9%
40	44.3%
100	26.6%
200	23.2%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

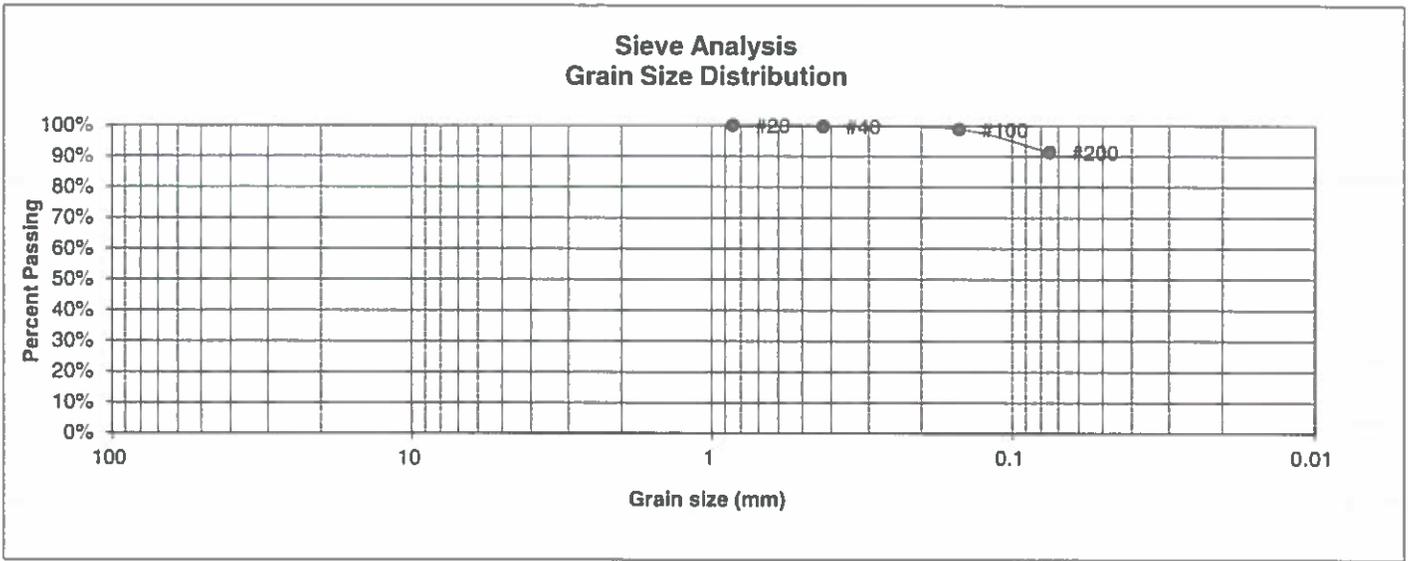
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>AW</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO:  
210536

FIG NO:  
B-23

<u>UNIFIED CLASSIFICATION</u>	CL-ML	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	4	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	8	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	20	<u>TEST BY</u>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.7%
100	98.8%
200	91.3%

<u>Atterberg Limits</u>	
Plastic Limit	21
Liquid Limit	27
Plastic Index	6

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

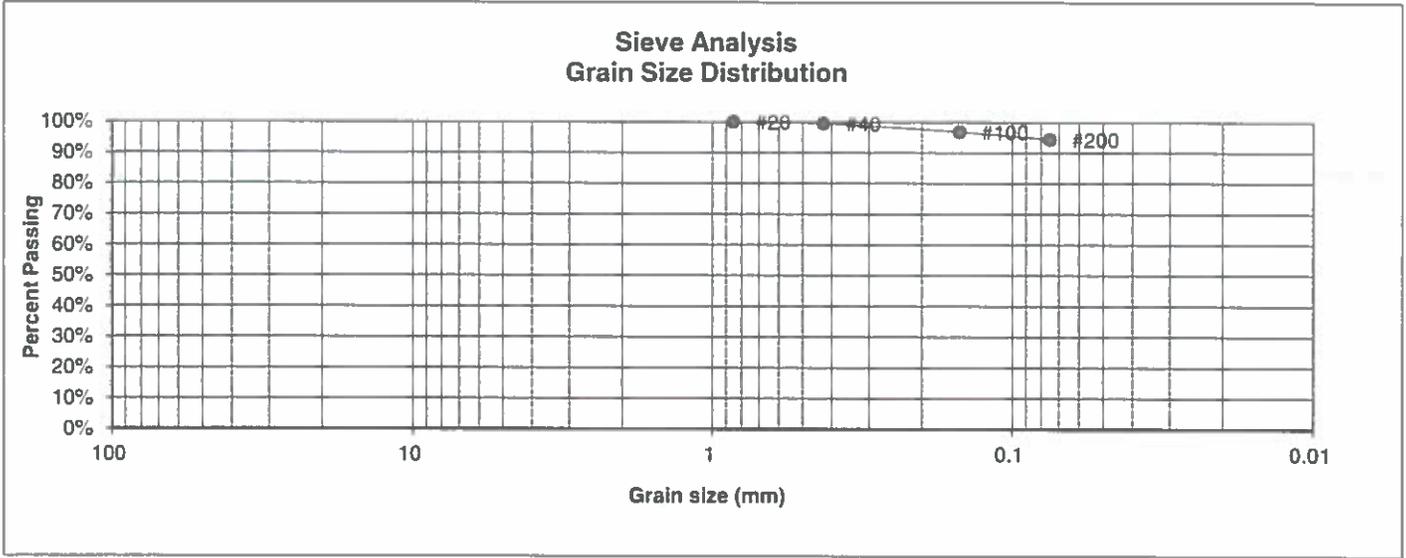
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: <i>AN</i>	DATE: 5-3-21
--------	-------	--------------------	--------------

JOB NO.:  
210536

FIG NO.:  
B-24

<u>UNIFIED CLASSIFICATION</u>	CH	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	2	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	14	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	15	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.5%
100	96.8%
200	94.3%

<u>Atterberg Limits</u>	
Plastic Limit	25
Liquid Limit	50
Plastic Index	25

<u>Swell</u>	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**  
505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

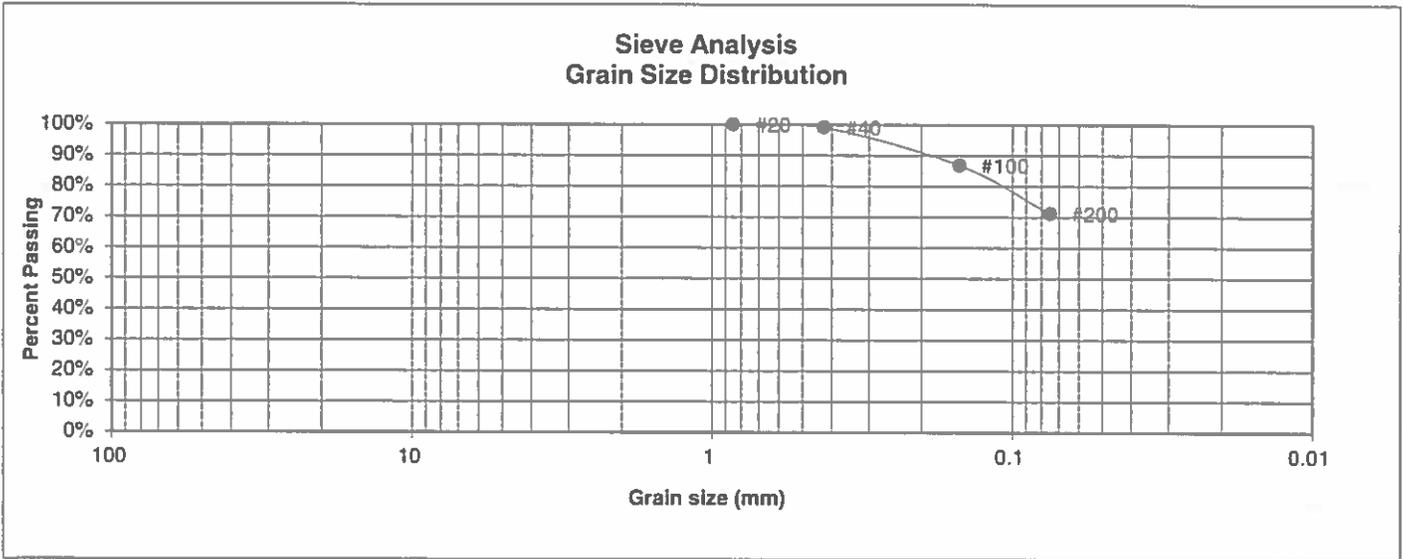
**LABORATORY TEST  
RESULTS**

<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>AN</i>	<u>DATE:</u> 5-3-21
---------------	--------------	---------------------------	---------------------

JOB NO.:  
210536

FIG NO.:  
B-25

<u>UNIFIED CLASSIFICATION</u>	ML	<u>CLIENT</u>	CATHEDRAL ROCK INVEST.
<u>SOIL TYPE #</u>	4	<u>PROJECT</u>	STRUTHERS AND SPANISH BIT
<u>TEST BORING #</u>	23	<u>JOB NO.</u>	210536
<u>DEPTH (FT)</u>	15	<u>TEST BY</u>	BL



<u>U.S. Sieve #</u>	<u>Percent Finer</u>
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.1%
100	86.9%
200	71.1%

Atterberg Limits  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

Swell  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
 RESULTS**

<u>DRAWN:</u>	<u>DATE:</u>	<u>CHECKED:</u> <i>AN</i>	<u>DATE:</u> 5-3-21
---------------	--------------	---------------------------	---------------------

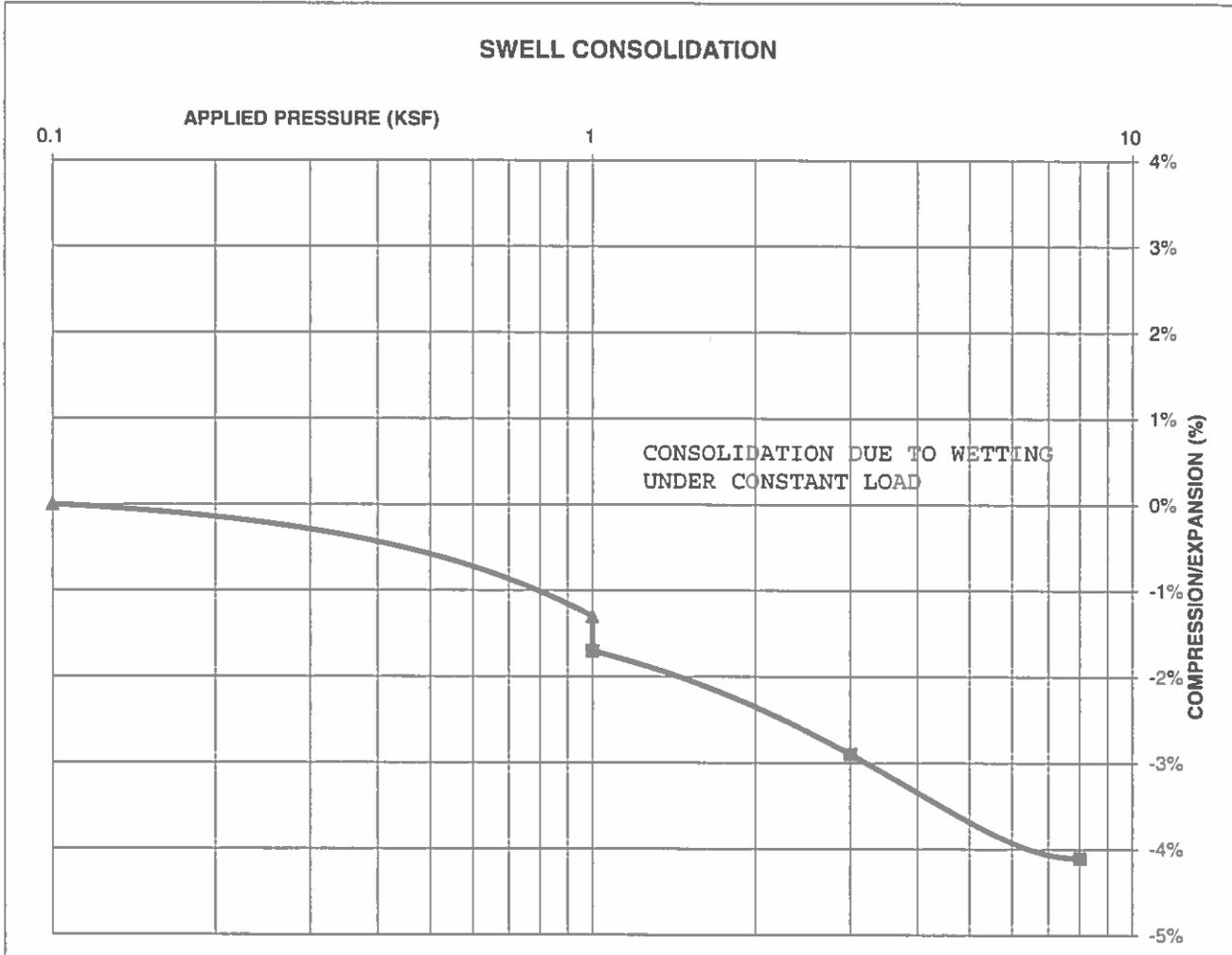
JOB NO.:  
 210536

FIG NO.:  
 B-26

**CONSOLIDATION TEST RESULTS**

TEST BORING #	5	DEPTH(ft)	15
DESCRIPTION	ML	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			14.4%
SWELL/CONSOLIDATION (%)			-0.4%

JOB NO. 210536  
 CLIENT CATHEDRAL ROCK INVEST.  
 PROJECT STRUTHERS AND SPANISH BIT



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION  
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *AW*

DATE: 5-3-21

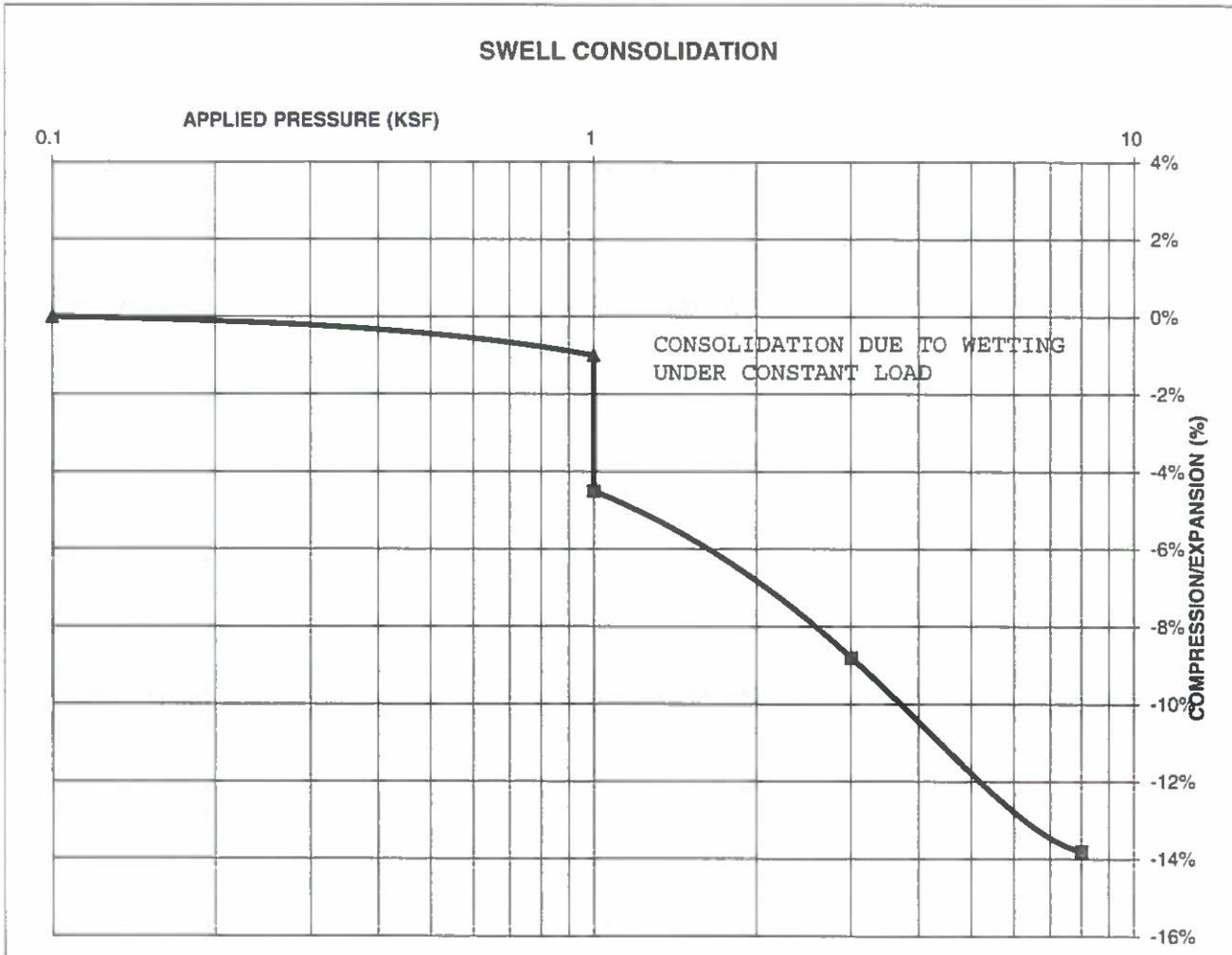
JOB NO.  
 210536

FIG NO.  
 B-27

**CONSOLIDATION TEST RESULTS**

TEST BORING #	7	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)	99		
NATURAL MOISTURE CONTENT	13.5%		
SWELL/CONSOLIDATION (%)	-3.5%		

JOB NO. 210536  
 CLIENT CATHEDRAL ROCK INVEST.  
 PROJECT STRUTHERS AND SPANISH BIT



**ENTECH**  
**ENGINEERING, INC.**  
 505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION TEST RESULTS**

DRAWN: DATE: CHECKED: *MY* DATE: *5-3-21*

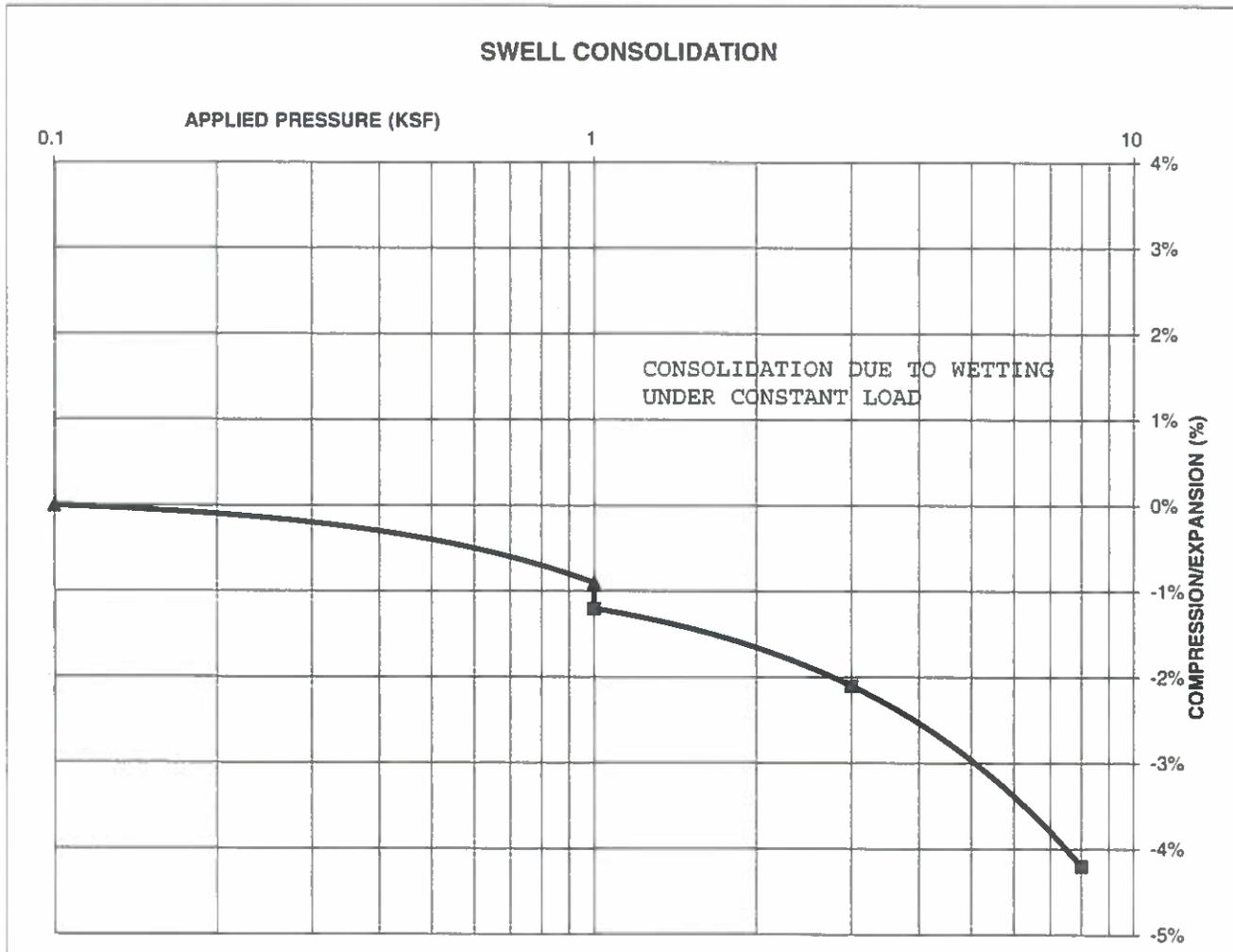
JOB NO.: 210536

FIG NO.: B-28

**CONSOLIDATION TEST RESULTS**

TEST BORING #	11	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			101
NATURAL MOISTURE CONTENT			12.1%
SWELL/CONSOLIDATION (%)			-0.3%

JOB NO. 210536  
 CLIENT CATHEDRAL ROCK INVEST.  
 PROJECT STRUTHERS AND SPANISH BIT



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION  
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *MY*

DATE 5-3-21

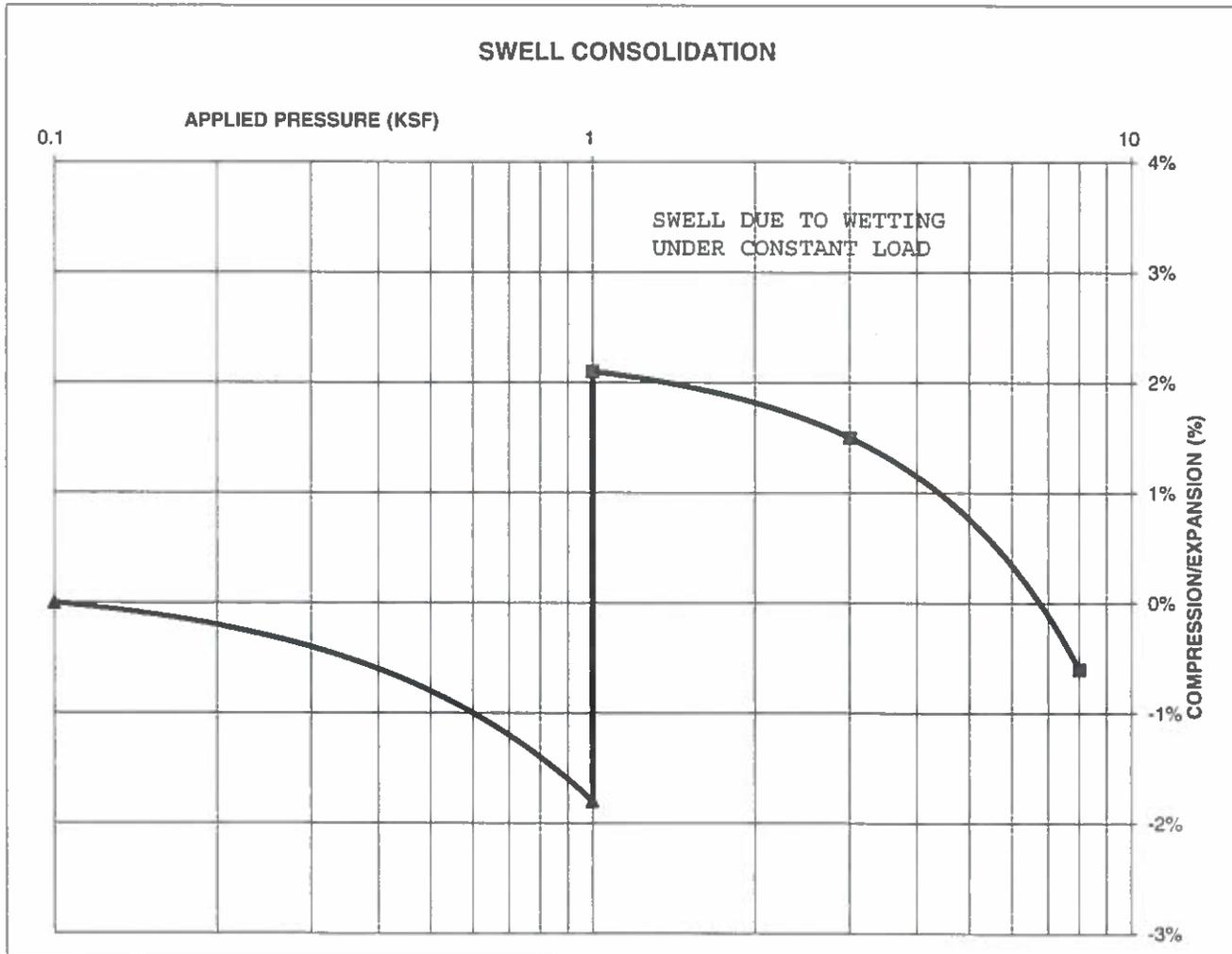
JOB NO:  
 210536

FIG NO:  
 B-2a

**CONSOLIDATION TEST RESULTS**

TEST BORING #	17	DEPTH(ft)	15
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			121
NATURAL MOISTURE CONTENT			14.4%
SWELL/CONSOLIDATION (%)			3.9%

JOB NO. 210536  
 CLIENT CATHEDRAL ROCK INVEST.  
 PROJECT STRUTHERS AND SPANISH BIT



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION  
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *AY*

DATE: 5-3-21

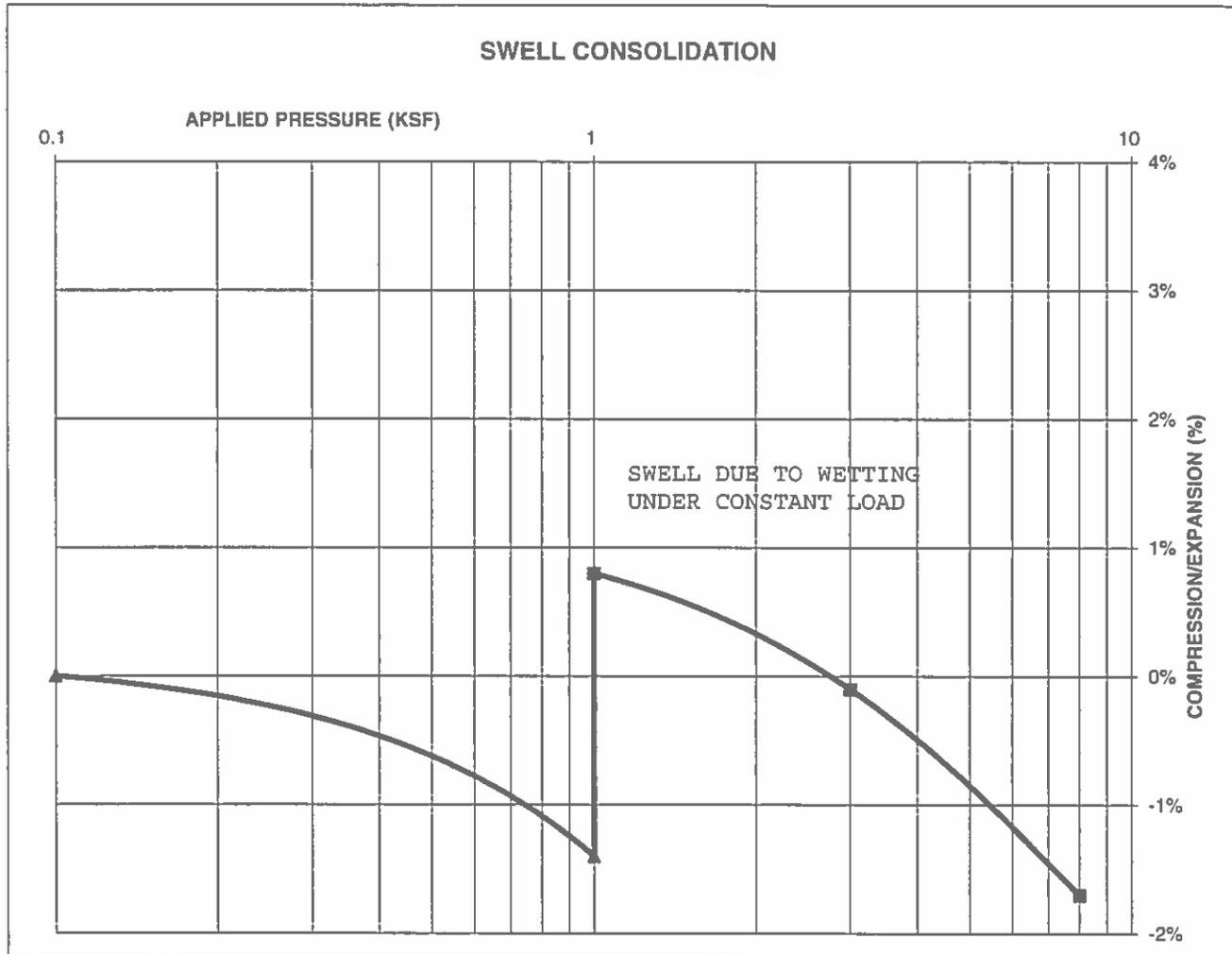
JOB NO.:  
 210536

FIG NO.:  
 B-30

**CONSOLIDATION TEST RESULTS**

TEST BORING #	23	DEPTH(ft)	15
DESCRIPTION	ML	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			120
NATURAL MOISTURE CONTENT			13.9%
SWELL/CONSOLIDATION (%)			2.2%

JOB NO. 210536  
 CLIENT CATHEDRAL ROCK INVEST.  
 PROJECT STRUTHERS AND SPANISH BIT



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION  
 TEST RESULTS**

DRAWN:

DATE:

CHECKED: *AV*

DATE: 5-3-21

JOB NO.:  
 210536

FIG NO.:  
 B-31

