UES™

Geotechnical Engineering Report

Colorado Springs McDonalds
NEC of Marksheffel Road and Fontaine Boulevard
Colorado Springs, Colorado

Prepared for:
McDonalds USA

Prepared By:
Universal Engineering Sciences (UES)
477 Parkland Drive, Sandy, Utah 84070

August 2, 2023
Revised August 18, 2023
Project No. 4430.2300012

Universal Engineering Sciences (UES)
477 Parkland Drive
Sandy Utah, 84070
P. 801.648.5206 | Team UES.com

August 2, 2023
Revised August 18, 2023

McDonalds USA
577 South 200 East
Salt Lake City, Utah 84075

Attention: Mr. Trevor Prophet

Reference: **Geotechnical Engineering Report**
Colorado Springs McDonalds
NEC Marksheffel Road and Fontaine Boulevard
Colorado Springs, CO
Project No: 4430.2300012

Universal Engineering Sciences (UES) is pleased to submit this Geotechnical Engineering Report for the referenced project. This report includes the results from the field exploration and laboratory testing program along with recommendations for use in preparation of the appropriate design and construction documents for this project.

UES appreciates the opportunity to provide this Geotechnical Engineering Report and looks forward to continuing participation during the design and construction phases of this project. UES also has great interest in providing construction services, including materials testing and inspection services during the construction of this project and will be glad to meet with you to further discuss how we can be of assistance as the project advances.

If there are questions pertaining to this report, or if UES may be of further service, please contact us at your convenience.

Respectfully,
Universal Engineering Sciences (UES)

Trae D. Boman, G.I.T.
Staff Geologist

Martin D. Jensen, P.E.
Principal Engineer

Table of Contents

1.0 INTRODUCTION

This report presents the results of our geotechnical exploration for the project site located at the northeast corner of Marksheffel Road and Fontaine Road in Colorado Springs, Colorado. The general location of the site is shown on Figure No. 1, Vicinity Map.

The purpose of our services was to provide subsurface information and preliminary geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Earthwork recommendations
- Foundation selection and design parameters
- Floor slab design and construction
- pavement design and construction

This report is for the purpose of providing geotechnical engineering and/or testing information and requirements. The scope of our services for this project did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic material in structures, soil, surface water, groundwater, or air, below or around this site.

1.1 PROJECT DEVELOPMENT

It is our understanding that a new McDonalds restaurant will be built on the site. We expect structures to be wood-frame or reinforced masonry construction up to one story in height. Maximum column and wall loads are assumed to be on the order of 30 kips and 3.5 kips per linear foot, respectively. We do not anticipate basement levels and expected the finished grade to be within four (4) feet of existing ground surface. There will be on-site paved areas.

1.2 SITE DESCRIPTION

It is our understanding that the proposed project site consists of an undeveloped parcel of land bounded on the east by an undeveloped parcel, on the north by an irrigation ditch, on the west by Marksheffel Road and on the south by Fontaine Road. The site is vacant, with light vegetation and remnant piping across the site.

1.3 SCOPE OF WORK

Mr. Trevor Prophet, representing McDonalds, gave authorization for UES services on July 6th, 2023, by sending PO number 2656389. The scope of our services for this project included a subsurface exploration program consisting of drilling four (4) borings to depths of 15 ft to 20 ft below existing site grades. The borings were logged during drilling and samples were obtained to aid in material classification and for possible laboratory testing. The approximate locations of the borings are shown on Figure No. 2, Boring Plan. The locations of the borings were determined in the field by approximating distances from existing features or improvements. The locations of the borings should be accurate only to the degree implied by the method used. Results of the borings are presented in the Appendix.

2.0 FINDINGS

2.1 GEOLOGICAL INFORMATION

The project site is in Colorado Springs, CO which is in the Great Plains physiographic region, just east of the Southern Rocky Mountains. It is in east-central Colorado 70 miles south of Denver and is approximately 5,712 feet in elevation. Colorado Springs, CO is bound by the Palmer Divide to the north, the Front Mountain Range and Pikes Peak to the west, with high plains to the east and high desert to the south. The Rocky Mountains were uplifted by the Laramide Orogeny during the late Cretaceous geologic period. The surficial geology of the Colorado Springs area consists of Upper cretaceous bedrock covered by Quaternary coarse to fine grained alluvial deposits. The project site is located approximately 10 miles from the Ute Pass fault zone.

The geology of the USGS Geologic Map of the Fountain quadrangle, El Paso County Colorado which includes the subject site, shows the surficial geology of the job site as Alluvium three (Mapped as Qa_3) dated to the lower to middle Holocene. Qa_3 is described as "Dark-brownish gray to tan-gray, stratified, poorly to occasionally well-sorted sand and clayey to silty sand. Unit can contain clean, medium-grained, well-sorted sand layers and sporadic gravel lenses with clasts sizes up to small cobbles. Gravel provenance is crystalline rocks reworked from conglomerates in the Dawson Formation up-valley along Jimmy Camp Creek or reworked from Pleistocene gravel-capped mesas; contains angular concretion fragments derived from the Pierre Shale.".[1]

According to the USDA Soil Survey for the site, the onsite surficial soils are mapped as Manzanst clay loam, 0 to 3 percent slopes (Fb) throughout the site. Clay loam soils typically have between 20 to 46 percent sands, and more than 27 to 40 percent clays. These typical descriptions are consistent with the encountered surficial subsurface soils from the exploration.

The natural soils are covered by approximately 1 foot of uncontrolled fill. The upper 4 to 5 feet of soils were encountered to be very soft, reddish-brown silt, generally in a moist condition. The boring logs and laboratory test results presented in the Appendix should be referred to for more detailed information.

2.2 SITE CLASS

The 2018 International Building Code (IBC) requires that a default Site Class D be assumed for seismic design when soil conditions for the top 100 feet are not known in sufficient detail for determination in accordance with Table 20.3-1 of ASCE Standard 7. UES is available to determine the shear wave profile of the top 100 feet underlying the site from ambient noise or refraction microtremor (ReMi) data using standard P-wave geophones. We recommend that the project's structural engineer be consulted to assess whether the increase in site class will provide sufficient benefit to offset the additional cost for this service. The site is located at approximately the following latitude and longitude:

Latitude	Longitude
38.7384	-104.6484

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[1] White, J.L., Lindsey, K.O., Morgan, M.L., and Mahan, S.A., 2017, Geologic Map of the Fountain Quadrangle, El Paso County, Colorado, Colorado Geological Survey, Open-File Report 17-05, 1:24,000.

A search of the USGS Earthquake Hazards Program's ASCE 7-16 data, as published by the Applied Technology Council (hazards.atcouncil.org), indicated the following spectral acceleration parameters for the location indicated above and a Site Class D:

Mapped Acceleration Parameters	
S_S	0.183 g
S_1	0.056 g
Design Acceleration Parameters	
S_{DS}	0.195 g
S_{D1}	0.089 g

2.3 COLLAPSIBLE AND EXPANSIVE SOILS

Collapsible soils are defined as any unsaturated soil that goes through a radical rearrangement of particles and great decrease in volume upon wetting, additional loading, or both. According to the Colorado Geologic Survey's collapsible soils hazard map, the project is in an area that has potential to have collapsible soils. There are historic cases of collapsible soils within 10 to 15 miles of the project area. The EG-14 Collapsible Soils in Colorado indicates that due to the soil composition of the project area, there is some risk for collapsible soils.

Expansive soils typically contain clay minerals that are capable of absorbing water. When they absorb water, they increase in volume. According to the Colorado Geologic Survey Map of Areas Susceptible to Differential Heave in Expansive, Steeply Dipping Bedrock, City of Colorado Springs, Colorado (CGS, 1999), the project site is located approximately 12.1 miles from mapped expansive soil areas.

2.4 GROUNDWATER

Perched groundwater was encountered in the top three feet of borehole 4 near the drainage ditch. No other groundwater was encountered on site. However, seasonal fluctuations in groundwater elevations may result in variations in the groundwater level below grade. It should be noted that the project vicinity has received an above average precipitation over the winter and may have influenced the moisture and groundwater levels.

2.5 LIQUEFACTION

Liquefaction is defined as the condition when saturated, loose, finer-grained sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Due to most soils being significantly fine grained, and the limited amount of groundwater within the depths explored, the potential for liquefaction at this site can be considered "Low."

2.6 CORROSIVITY

Based on test results and Table 19.3.1.1 of ACI 318-14 Section 19.3, the on-site soils classify as having a "S0" sulfate exposure. Please refer to Table 19.3.2.1 of ACI 318-14 for the requirements for concrete by exposure class. Consideration should be given to providing protection to buried metal pipes or use of nonmetallic pipe, where permitted by local building codes. Non-corrosive backfills, protective coatings and wrappings, sacrificial anodes, or a combination of these methods could be considered. Universal

Engineering Sciences personnel are not experts regarding corrosion and/or corrosion protection. We recommend a “Corrosion Engineer” be consulted for actual recommendations regarding the necessity and/or method of cathodic protection.

Additionally, we expected the project site to be subject to a seasonal frost depth between 2-3 feet below grade as determined by the Federal Highway Administration National Highway Institute Soils and Foundations, Reference Manual. Vol. I (FHWA-NHI-06-08 8). Therefore, we classify the site as having a Freezing and Thawing exposure of "F3" based on Table 19.3.1.1 of ACI 318-14 Section 19.3 and the expectation that heavily trafficked portions of the site will be subject to de-icing agents during winter months.

2.7 LANDSLIDES AND AVALANCHES

A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Due to the low topographic relief, the potential for landslides is considered low. Also, due to the low topographic relief and distance from the mountain front, the potential for avalanches is considered low.

2.8 RADON

The Colorado Department of Environmental Public Health shows El Paso County has an elevated risk for radon. A full radon investigation was beyond our proposed scope of work but with the proposed construction not having basements we believe the risk is reduced.

2.9 ABANDON MINES

The nearest abandoned mines, Old Shiek Mine and Bacon Mines, are both approximately 6 miles away. The Old Sheik Mine is to the southeast and the Bacon Mine is to the northwest of the project site.

3.0 RECOMMENDATIONS

3.1 GENERAL

Our recommendations are based on the soil conditions, being like those encountered within the explorations. If variations are noted during construction or if changes are made in site plan, structural loading, foundation type or floor level, we should be notified so we can supplement our recommendations, as applicable.

The upper 4 to 5 feet of the encountered soils were very soft and were not considered suitable for direct support of typical shallow foundations in their present condition. This soil would need to be removed and replaced with properly placed and compacted structural fill or be subjected to some ground stabilization or modification.

3.2 EARTHWORK

3.2.1 General

Earthwork should be performed in accordance with the guidelines presented in Chapter 18 of the 2018 IBC, except where specific recommendations are presented in this report. It is recommended that contractors perform their own reconnaissance of the site. If the contractors have any questions regarding site conditions, site preparation or recommendations in this report, they should contact a representative of Universal Engineering Sciences.

3.2.2 Site Clearing

Strip and remove existing vegetation, debris, uncontrolled fill, loose, soft, or disturbed natural soils, and other deleterious materials from proposed building areas, adjacent walks, and slabs, and in areas to be paved. Excavations should extend at least 5 feet beyond the areas to be improved in plan view. Uncontrolled fill is defined as any existing fill that was not properly placed, observed, and tested.

All exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. If unexpected fills or abandoned structures/improvements are encountered during site clearing, such features should be removed and the excavation thoroughly cleaned and backfilled. All excavations should be observed by the geotechnical engineer prior to backfill placement.

Demolition of existing structures/improvements should include removal of any foundation system and utilities. Any excavations because of demolition and removal should be properly filled.

All materials derived from the demolition of existing structures/improvements should be removed from the site, and not be allowed for use in any fills. In some cases, existing pavements, if properly broken up, can be used in required fills. The geotechnical engineer should determine the suitability for use based on conditions in the field.

3.2.3 Subgrade Preparation

As mentioned previously, the upper 4 to 5 feet of soils were encountered to be very soft. Therefore, within the building footprint and at least 5 feet beyond, these soils should be undercut to a depth of 3 feet below footings or 5 feet below existing grades and replaced with properly placed and compacted structural fill materials. For monument signs and trash enclosures the depth may be reduced to 2 feet below footings. Within pavement subgrade areas the upper soils should be overexcavated to a depth of 2 feet below subgrade elevation.

Alternatively, the soil could be improved utilizing soil stabilization or ground modifications techniques. The methods could include rammed aggregate piers, or variations of grouting or compaction grouting. Practical solutions can be discussed as the design phase progresses.

Following site clearing and over-excavation, the newly exposed subgrades in site improvement areas intended for structures and pavements must be approved by the Geotechnical Engineer prior to fill placement. These exposed subgrades should be proof rolled with a loaded tandem axle dump truck or similar piece of rubber-tired equipment (20 tons or greater) in the presence of the Geotechnical Engineer's representative. The purpose of the proof rolling is to detect the existence of marginal or loose near-surface materials or unsuitable soils that may require additional undercutting. Areas which deflect, rut or pump excessively during proof rolling, and which cannot de densified in-place, should be undercut to suitable soils and backfilled as directed by the geotechnical engineer. Proof rolling should not be performed on saturated or frozen soils, or during wet weather conditions.

3.2.3 Excavation

It is anticipated that excavations of the on-site natural, non-cemented deposits for the proposed project can be accomplished with conventional earthmoving equipment. Contractors, especially those excavating for foundations or utilities, should satisfy themselves as to the hardness of materials and equipment required.

Temporary unsurcharged construction excavations should be sloped or shored. Slopes should not be steeper than 1½ horizontal to 1 vertical. Slopes may need to be flattened depending on conditions exposed during construction. Exposed slopes should be kept moist (but not saturated) during construction. If there is not enough space for sloped excavations, shoring should be used. Traffic and surcharge loads should be kept back at least 10 feet from the top of the excavation. Slope stability analysis of embankments (natural or constructed) is not within the scope of this study.

Excavation, trenching and shoring should be conducted in accordance with the U.S. Department of Labor Occupational Safety and Health Administration's (OSHA) Excavation and Trenching Standard, Title 29 of the Code of Federal Regulation (CFR), Part 1926.650. Safety of construction personnel is the responsibility of the contractor.

Surface runoff should be drained away from excavations and not allowed to pond in the bottom of the excavation. Concrete for foundations should be placed as soon as practical after the excavation is made. That is, the exposed foundation soils should not be allowed to become excessively dry or wet before placement of concrete.

3.2.4 Fill Materials

On-site soils meeting the following criteria, as determined by visual observation by the 3rd party inspector, may be used in required fills:

- Most of the material (90+ percent) is 6 inches or less in maximum dimension.
- The minus 6-inch material is comprised of at least 70 percent by weight of material finer than ¾-inch in size.
- The material is free of debris and organic matter.

In general, material greater than 12 inches in diameter should not be used in fills within 3 feet below the bottom of the footing within building pad areas. Fill containing material greater than 6 inches in diameter should not be used in any utility trenches, behind retaining walls or against foundations or grade beams.

Imported material should be suitable for its intended use. All imported materials should be approved by the geotechnical firm providing testing during construction, prior to importing. In general, imported soils should be low-expansive (less than 2.0% if tested using a 60 psf load or an expansion index of less than 20), have a maximum solubility of less than 0.50%, a maximum sulfate content of less than 0.10% and a maximum sodium sulfate content less than 0.20%. A chloride content of less than 500 mg/kg is recommended if post-tensioned foundations are planned.

3.2.5 Fill Placement and Compaction

Fill materials should be placed on a horizontal plane unless otherwise accepted by the geotechnical engineer. Where the slope ratio of the original ground is steeper than 5H:1V, the slope should be benched to create near-level areas for the placement of fill. The maximum allowable height of the bench is 3 feet. Bench excavation should be continued to the top of the existing slope in structural fill areas or the daylight (cut/fill) contact.

All required fill should be placed in loose lifts generally not over 8 to 12 inches in thickness. Materials should be compacted to the following:

- Note: For compaction, fine-grained soils are soils with at least 30% passing the No. 200 Sieve.
- All Fill placed deeper than 5 feet below final grade should be compacted to a minimum of 95% at a moisture content of optimum or greater.
- Retaining wall backfill only needs to be compacted to a minimum of 90%.

Structural fill should be observed and tested as necessary to determine compliance with the compaction requirements presented in this report. In general, one compaction test should be performed for approximately every 1,000 cubic yards of fill, one for one foot of fill placed, or change in material.

Material	Percent Compaction (ASTM D1557)	Minimum Moisture Content
Fine-grained	90 Minimum	Optimum
Granular	95 Minimum	-2% of Optimum
Untreated Aggregate Base Course	95 Minimum	-2% of Optimum

3.2.6 Material Volume Changes

Clearing and grubbing operations will result in some loss of material. Excavation and re-compaction of the on-site soils will result in shrinkage losses. Based on our experience, a shrinkage factor of approximately 5 to 10 percent would be applicable for the upper natural soils when excavated and recompacted. As an example, a shrinkage factor of 10 percent would mean it would require 1.10 cubic yards of excavated material to equal 1.0 cubic yard of properly compacted fill. Scarification and compaction of surface soils will cause additional shrinkage.

3.3 FOUNDATIONS

If the grading recommendations presented in the Earthwork section of this report are complied with, the proposed structures and any block walls or retaining walls may be supported by conventional footings. Foundations should be established on approved native soils at least medium dense in consistency or properly compacted fill.

Foundations should be at least 18 inches wide, and the bottom of the foundations should be established at least 30 inches below the lowest adjacent final compacted subgrade. Foundations, established as recommended, may be designed to impose a net dead- plus live-load pressure of 2,000 pounds per square foot (psf). The bearing value may be increased by 1,000 psf for each additional 12 inches of embedment. However, the maximum net bearing value should not exceed 4,000 psf. A one-third increase may be used for wind or seismic loads when used with the alternative basic load combination of section 1605.3.2 of the 2018 IBC.

Settlement of the proposed structure, supported as recommended, should be within acceptable limits (less than 1 inch) based on the assumed loads. Differential settlement should be less than ½-inch. However, it is important that recommendations presented in the Drainage and Moisture Protection section of this report be adhered to. Settlement may be further reduced by following the recommendations provided on the Site Improvements section of this report.

3.4 ON-SITE PAVEMENT

The pavement area subgrade should be properly prepared as outlined in the Earthwork section of this report before placing any asphalt or base materials. Proper drainage of the paved areas should be provided to increase the pavement life. In addition, pavements must be maintained for durability and integrity during their life. Therefore, periodic seal coating, crack sealing, and/or patching may be required.

Near surface soils at the project site generally have an AASHTO classification of A-4. We estimate the soils have a CBR value of 10 or less. UES is available to perform a CBR test to determine the exact value which may allow for a less conservative pavement recommendation. Light-duty asphalt pavement sections are recommended for traffic areas subjected exclusively to automobile and pick-up truck traffic. Moderate-duty or thicker asphalt concrete sections are recommended for areas subject to light volume truck traffic. We recommend the following minimum pavement section thickness for on-site paved areas:

Traffic Area	Asphalt (inches)	Untreated Base Course (inches)
Light traffic and parking Areas (31.75 kN Wheel Loads)	3	6
Medium traffic (40.82 kN Wheel Loads)	4	6

Asphalt should conform to local specifications or to APWA requirements as applicable. Untreated base course (UTBC) should conform to city or state specifications or 1-inch minus aggregate base and have a minimum CBR value of 70% as applicable. Subgrade should be compacted to a minimum of 95 percent (ASTM D1557). Field and laboratory testing of asphalt and base materials should be performed to determine whether specified requirements have been met.

The performance of the pavement can be enhanced by minimizing excess moisture which can reach the subgrade soils. The following recommendations should be followed, where possible:

- Site grading at a minimum 2% grade away from the pavements.
- Compaction of any utility trenches for landscaped areas to the same criteria as the pavement subgrade.
- Consideration should be given to using "desert" landscaping and/or minimizing watering to help prevent surface runoff.
- Placing compacted backfill against the exterior side of curb and gutter.

Portland Cement Concrete (PCC) pavement is recommended in areas of truck traffic. A minimum of 6-inch thickness of PCC pavement is recommended in these areas.

3.5 DRAINAGE AND MOISTURE PROTECTION

Foundation soil should generally not be allowed to become saturated during or after construction, except when necessary to increase moisture contents prior to construction. Infiltration of water into foundation or utility excavations should be prevented during construction. Utility lines should be properly installed and the backfill properly compacted to avoid possible sources for subsurface saturation.

Positive drainage away from the structures should be provided during construction and maintained throughout the life of the structures. Any downspouts, roof drains or scuppers should discharge into splash blocks or extensions and away from the structures. Backfill against footings, exterior walls and in utility trenches should be properly compacted and free of all construction debris to reduce the possibility of moisture infiltration.

Performance of the foundation system recommended in this report is dependent on the ability to keep moisture from penetrating the soils below foundations and slabs. Therefore, we recommend the following:

- Positive drainage should be maintained away from the structures, adjoining concrete slabs and block walls. Positive drainage of 10% minimum shall be maintained for areas adjacent to structures or block walls that are not covered by concrete or asphalt. The 10% should be maintained for 10 feet. Where concrete or asphalt abut structures or block walls, the surface of these materials should be sloped a minimum of 2% away from structures or block walls. If physical obstructions or lot lines prohibit 10 feet of horizontal distance, the slope should be provided to an approved alternate method of drainage.
- No landscaping or sprinklers should be allowed within 5 feet of the buildings or block walls.
- Watering should be kept to a minimum.

If the above recommendations are not followed there would be an increased risk/potential for increasing moisture below foundations and slabs which could result in additional movement and distress to structures and slabs.

3.6 FLOOR SLABS

Moisture protection should be provided by a relatively impervious vapor retarder placed beneath interior slabs. The vapor retarder should be a Class A vapor retarder at least 10 mils in thickness, meeting the requirements of ASTM E1745, and should conform to and be placed in accordance with the requirements of the project structural engineer or architect. If the concrete is to be placed directly on aggregate base, the aggregate base should be moistened (but not saturated) prior to placement of concrete.

Recommendations presented by the American Concrete Institute (ACI 302) for slabs-on-grade should be complied with for all concrete placement and curing operations. Improper curing techniques and/or excessive slump (water-cement ratio) could cause excessive drying/shrinkage resulting in random cracking and/or slab curling. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor coverings.

4.0 OTHER SERVICES

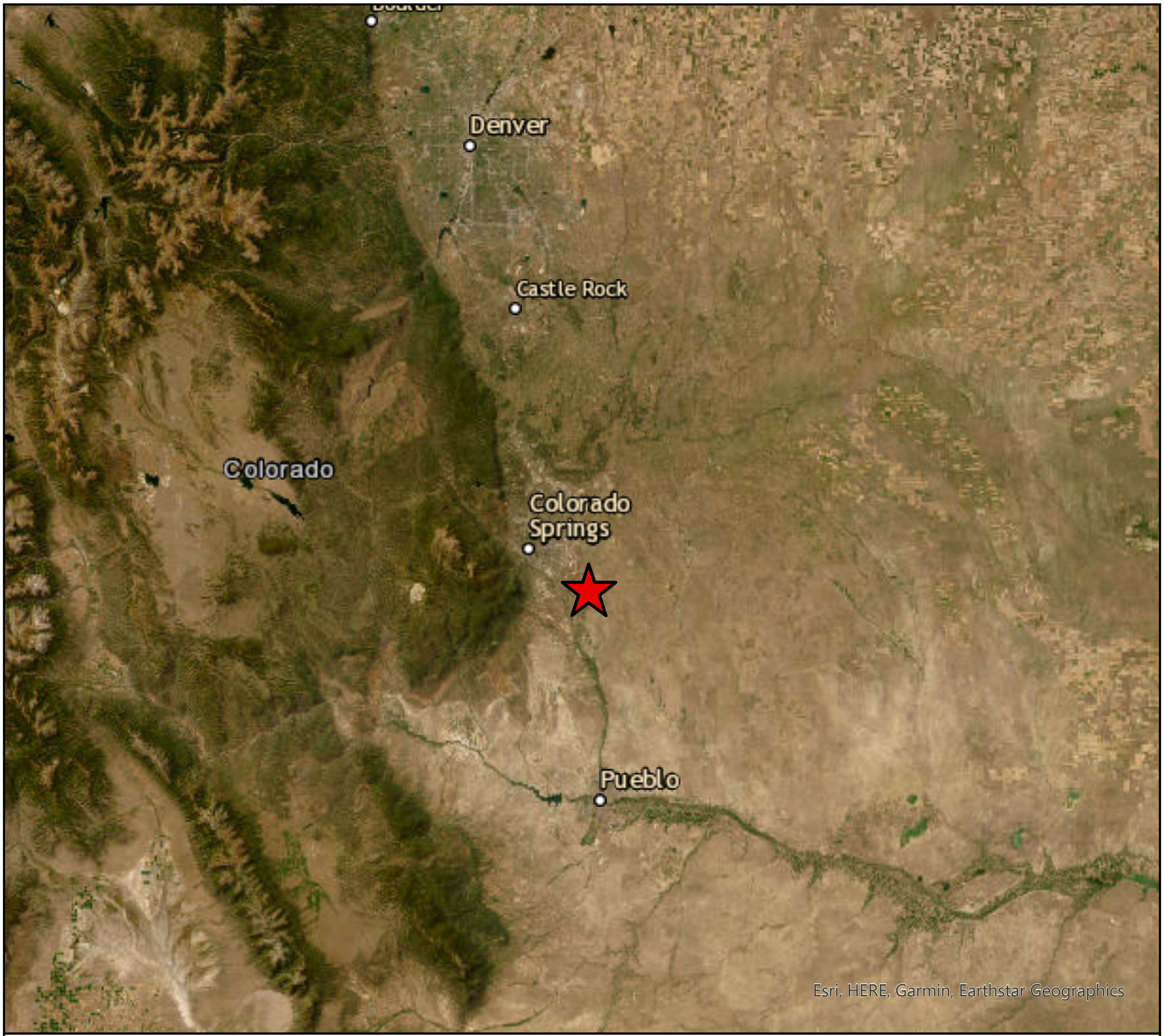
Universal Engineering Sciences should be retained to provide a general review of final design plans and specifications in order that grading, and foundation recommendations may be interpreted and implemented. If any changes to the proposed project are planned, the conclusions and recommendations contained in this report should be reviewed and the report modified or supplemented as necessary.

Universal Engineering Sciences should also be retained to provide services during excavation, grading, foundation, and construction phases of work. Observation of foundation excavations should be performed prior to placement of reinforcing and concrete to confirm that satisfactory bearing materials are present. Field and laboratory testing of concrete and soils should be performed to determine whether applicable requirements have been met. In addition, continuous special inspections and tests are required for soils as specified in the 2018 IBC, Table 1705.6.

The analyses and recommendations in this report are based in part upon data obtained from the field exploration. The nature and extent of variations beyond the locations of the explorations may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations of this report.

5.0 CLOSURE

Our professional services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No warranties, either expressed or implied, are intended or made. We prepared this report as an aid in the design of the proposed project. This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding site conditions and specific construction techniques to be used on this project.



The presented layers were obtained from various sources including
ESRI, USGS, USDA, CCBD GISMO, CCFCD,
GIS User Community among others.
The GIS information is presented for reference only.
No warranties, either expressed or implied, are intended or made.
If you have any questions regarding this information,
please contact UES.

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PROJECT:

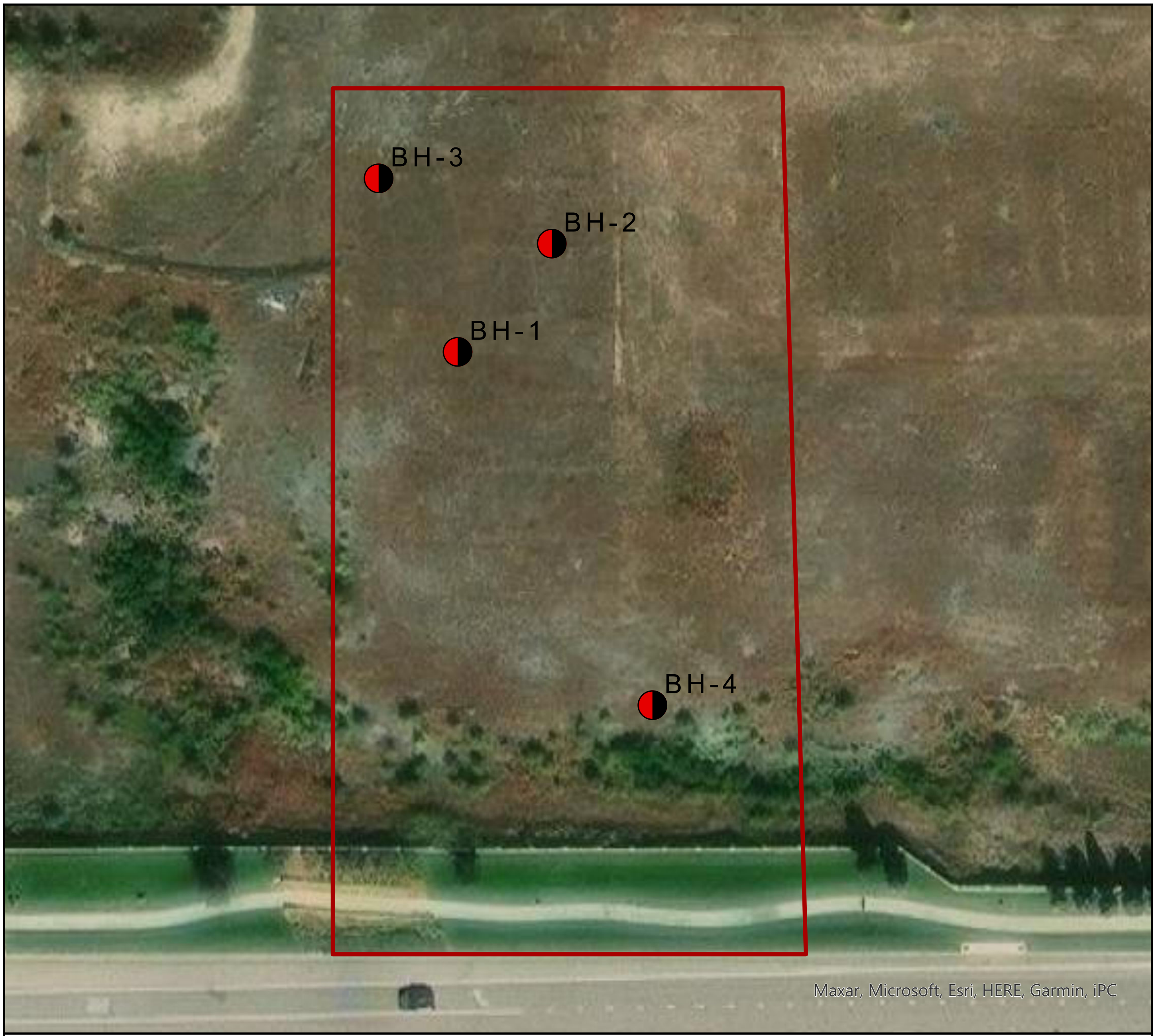
McDonalds Colorado Springs

CLIENT:
McDonalds Corporation

Project Location Map

PROJECT NO:
4430.2300012

FIGURE NO:
1



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Legend

◐ Borehole Location

▭ Project Boundary

0 20 40 80 120
US Feet

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please contact UES.

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PROJECT:

McDonalds Colorado Springs

CLIENT:

McDonalds Corporation

Borehole Location Map

PROJECT NO:
4430.2300012

FIGURE NO:
2

APPENDIX

SITE EXPLORATION

The subsurface conditions of the site were explored by drilling four (4) borings to target depths of 15 to 20 feet below existing site grade. The borings were drilled using a solid steam drill rig.

Soils were logged during drilling and samples were obtained to aid in material classification and for possible laboratory testing. The boring logs are presented on Plates 1 through 4. The number of blows required to drive a 2-inch diameter sampler (SPT) 12 inches using a 140-pound weight dropped 30 inches are shown on the logs. The soil is generally classified by the Unified Soil Classification System.

LABORATORY TESTING

Laboratory testing was performed on selected samples of on-site soil. Tests were performed in general accordance with applicable ASTM or local standards.

Sieve analyses and Atterberg Limits were performed to determine the grain-size distribution and soil classification of representative materials. The test results are presented on Plates 4 through 8 and summarized in the table below.

Sample	Description	Liquid Limit	Plasticity Index	%Fines
BH-1 @ 6 ft.	Silty Sand (SM)	-	-	16.7
BH-1 @ 10 ft	Sandy Silt (ML)	36	14	-
BH-2 @ 15 ft.	Sandy Silt (ML)	-	-	86.7
BH-3 @ 2.5 ft.	Silty Sand (SM)	31	NP	43.8
BH-4 @ 7.5 ft	Sandy Silt (ML)	36	NP	56.1

NP = Non-plastic

UNIVERSAL® ENGINEERING SCIENCES

477 Parkland Dr, Sandy, UT
84070, USA
Office: +1 (801) 448-0322

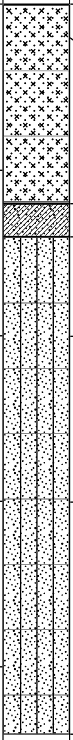
Colorado Springs McDonald's

Lat/Lon: 38.738282/-104.648215

SOIL BORING: BH-1

Date Started:	07/15/2023	Date Completed:	07/15/2023	Location Accuracy:	Estimated from Google Maps
Checked By:	TB	Driller:	Derek and Cesar	Drilling Firm:	Dakota Drilling
Hammer Type:	Auto	Hammer Weight:	145	Logged By:	Kayla Whipple
Method:	Auger	Reported Depth:	20'		

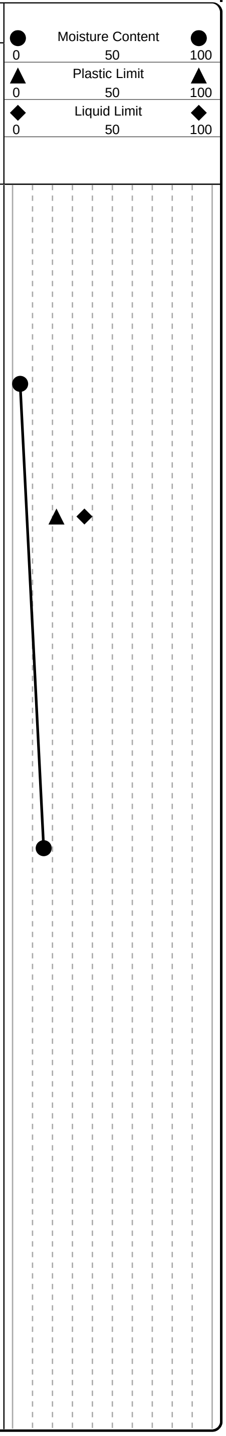
Rig Type	CME-75
Tooling	4" Solid Stem Auger
Surface Elevation	5708.8'



Visual Classification and Remarks

Depth (Feet)	Visual Classification and Remarks
1.0	**FILL**, dark reddish brown, dry, **Silty Sand**
6.0	Dark reddish brown, dry, **Silty Sand**, More sandy at 5 foot interval
7.0	Tan, dry, **Sandy Lean Clay**
10.0	Reddish brown, dry, **Sandy Silt**, Evaporate Veins, Compacted
15.0	Light tan, dry, fine, **Sandy Silt**, Thin layers of unconsolidated sand
	Brown, dry, **Silty Sand**
	Terminated

Samples			Lab			
Depth of Sample	Sample Number	Blow Counts	% Fines	Atterberg Limits (LL-PL-PI)	Moisture Content (%)	Dry Density
2.5'	BH-1 2.5	2 3 3 3				
5'	BH-1 5	3 4 5 4	16.7		3.8	
7.5'	BH-1 7 .5	8 9 6 7				
10'	BH-1 10	8 9 12 15		36-22-14		
	BH-1 15	6 8 9 9				
20'	BH-1 20	5 7			15.6	



▩	Silty Sand	⧓	Large Split Spoon
▨	Sandy Lean Clay	▲	California Sampler
▥	Sandy Silt		-

Depth	Comment	
-	-	▼
-	-	▼

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477 Parkland Dr, Sandy, UT
84070, USA
Office: +1 (801) 448-0322

Colorado Springs McDonald's

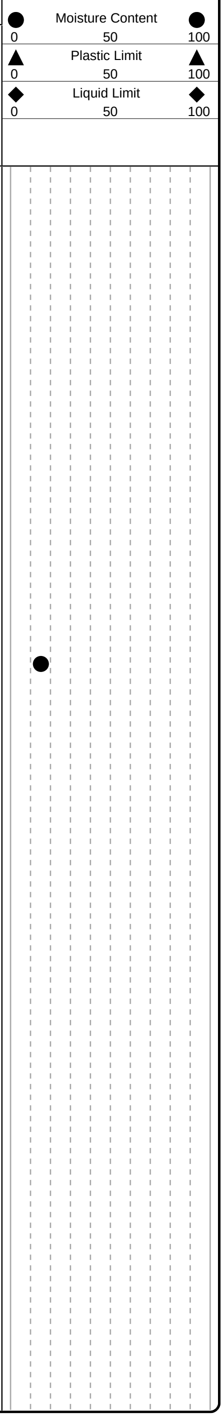
Lat/Lon: 38.738430/-104.648115

SOIL BORING: BH-2

Date Started: 07/15/2023
Date Completed: 07/15/2023
Location Accuracy: Surveyed
Checked By: TB
Driller: Derek and Cesar
Drilling Firm: Dakota Drilling
Hammer Type: Auto
Hammer Weight: 145
Logged By: Kayla Whipple
Method: Auger
Reported Depth: 15'

Rig Type: CME-75
Tooling: 4" Solid Stem Auger
Surface Elevation: 5708.9'

Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)	Lab: Moisture Content (%)	Lab: Dry Density
	▒	**FILL**, dark reddish brown, dry **Silt** with coarse, **Sand** 1.0							
	▒	Dark reddish brown, dry **Silt** with coarse, **Sand** 2.5	2.5'						
5	▨	Light red brown, dry, **Silty Clayey Sand**, Sandy layer at 6.5' interval 5.0	5'	BH-2 2.5	2 3 2 3				
	▒	Dry, **Sandy Silt** 7.5	7.5'	BH-2 5	4 5 3 4				
10	▒	Red brown, dry, **Sandy Silt** 10.0	10'	BH-2 7 .5	6 6				
	▒	Red brown, dry, **Sandy Silt**, Evaporate veins, compacted		BH-2 10	7 9 10 10				
15	▒		15'	BH-2 15	7 10 8 8	86.7		15.2	
		Terminated							
20									
25									
30									
35									



▒ Silt	⧓ Large Split Spoon
▨ Silty Clayey Sand	▲ California Sampler

Depth	Comment	
-	-	▼
-	-	▼

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Colorado Springs McDonald's

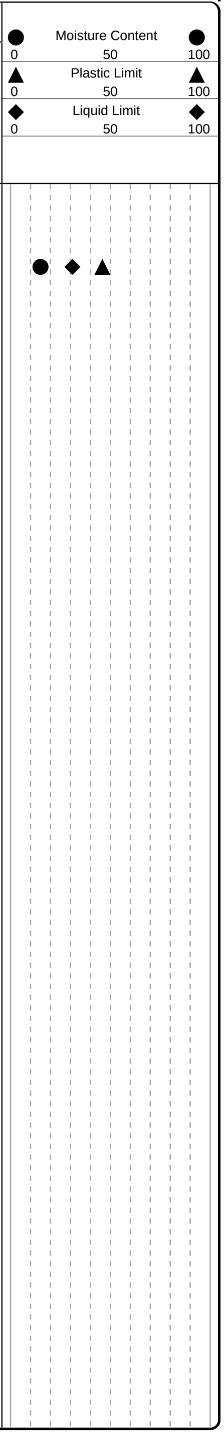
Lat/Lon: 38.738505/-104.648296

SOIL BORING: BH-3

Date Started:	07/15/2023	Date Completed:	07/15/2023	Location Accuracy:	Surveyed
Checked By:	TB	Driller:	Derek and Cesar	Drilling Firm:	Dakota Drilling
Hammer Type:	Auto	Hammer Weight:	145	Logged By:	Kayla Whipple
Method:	Auger	Reported Depth:	15'		

Rig Type CME-75
Tooling 4" Solid Stem Auger
Surface Elevation 5710.5'

Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)	Lab: Moisture Content (%)	Lab: Dry Density
	▨	**FILL**, dark reddish brown, dry, **Silty Sand** 1.0							
	▥	Dark reddish brown, dry, **Sandy Silt**, Compacted 2.5	2.5'						
	▥	Reddish brown, dry **Silt** with medium grained, **Sand** 5.0	5'	BH-3 2.5	2 2 1 2	43.8	NP	15	
5	▥	Dark reddish brown, dry **Silt** with medium grained, **Sand**, Compacted, Evaporate veins 7.5	7.5'	BH-3 5	2 3 5 7				
	▥	Reddish brown, dry **Silt** with medium grained, **Sand**, Evaporate veins 10.0	10'	BH-3 7.5	8 12 13 16				
10	▥	Reddish brown, dry **Silt** with coarse grained, **Sand**, Compacted, Evaporate veins		BH-3 10	8 16 19 21				
15	▥		15'	BH-3 15	5 7 5 5				
		Terminated							
20									
25									
30									
35									



▨	Silty Sand	⧓	Large Split Spoon
▥	Sandy Silt		-

Depth	Comment	
-	-	▼
-	-	▼

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Colorado Springs McDonald's

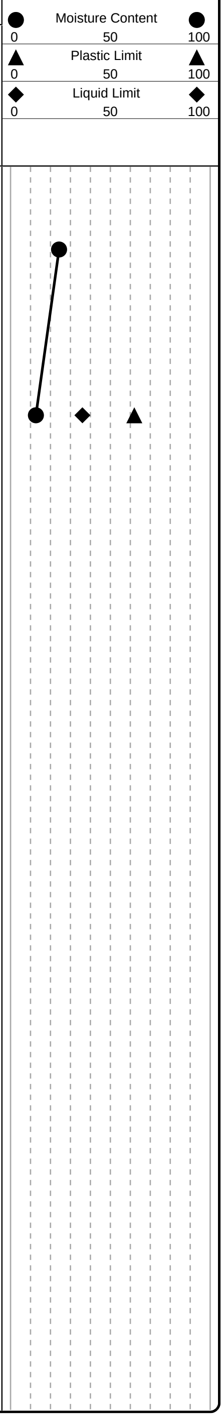
Lat/Lon: 38.738004/-104.648085

SOIL BORING: BH-4

Date Started:	07/15/2023	Date Completed:	07/15/2023	Location Accuracy:	Surveyed
Checked By:	TB	Driller:	Derek and Cesar	Drilling Firm:	Dakota Drilling
Hammer Type:	Auto	Hammer Weight:	145	Logged By:	Kayla Whipple
Method:	Auger	Reported Depth:	15'		

Rig Type CME-75
Tooling 4" Solid Stem Auger
Surface Elevation 5708.4'

Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Lab: % Fines	Lab: Atterberg Limits (LL-PL-PI)	Lab: Moisture Content (%)	Lab: Dry Density
	▨	**FILL**, dark red brown, wet, **Sandy Silt** 1.0							
	▨	Dark red brown, wet, **Sandy Silt** 2.5	2.5'						
5	▩	Tan, dry, fine, **Silty Clayey Sand** 5.0	5'	BH-4 2.5	3 2 3 4			24.3	
	▨	Light red brown, dry, **Sandy Silt** 7.5	7.5'	BH-4 5	4 6 6 7				
10	▨	Dark red brown, dry, **Sandy Silt**, Compacted 10.0	10'	BH-4 7.5	4 4 4 4	56.1	NP	12.7	
15	▨	Red brown, dry, **Sandy Silt**, Compacted, Evaporate veins	15'	BH-4 10 BH-4 15	6 8 7 6 4 5 7 8				
20 25 30 35		Terminated							



▨	Sandy Silt	⧓	Large Split Spoon
▩	Silty Clayey Sand	▲	California Sampler

Depth	Comment	
-	-	▼
-	-	▼

Water Content and Unit Weight of Soil

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

Project: **Universal Engineering Sciences**
No: **M04301-003 (4430.2300012)**
Location: Colorado Springs McDonald's
Date: 7/21/2023
By: BRR

Sample Info.	Boring No.	BH-2	BH-4						
	Sample	BH-2 7.5'	BH-4 15'						
	Depth	7.5'	15'						
	Split	No	No						
	Split sieve								
	Total sample (g)								
	Moist coarse fraction (g)								
	Moist split fraction (g)								
Unit Weight Data	Sample height, H (in)	2.994	3.562						
	Sample diameter, D (in)	1.901	1.927						
	Mass rings + wet soil (g)	772.39	695.06						
	Mass rings/tare (g)	561.09	367.41						
	Moist unit wt., γ_m (pcf)	94.7	120.2						
	Wet soil + tare (g)								
	Dry soil + tare (g)								
	Tare (g)								
	Water content (%)								
Water Content Data	Wet soil + tare (g)	276.26	219.45						
	Dry soil + tare (g)	270.01	208.15						
	Tare (g)	210.54	128.47						
	Water content (%)	10.5	14.2						
	Water Content, w (%)	**10.5**	**14.2**						
	Dry Unit Wt., γ_d (pcf)	**85.7**	**105.2**						

Entered by:___________
Reviewed:___________

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One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: **Universal Engineering Sciences**
No: **M04301-003 (4430.2300012)**
Location: Colorado Springs McDonald's
Date: 7/25/2023
By: JDF

Boring No.: **BH-2**
Sample: **BH-2 7.5'**
Depth: **7.5'**
Sample Description: Brown clay with sand
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

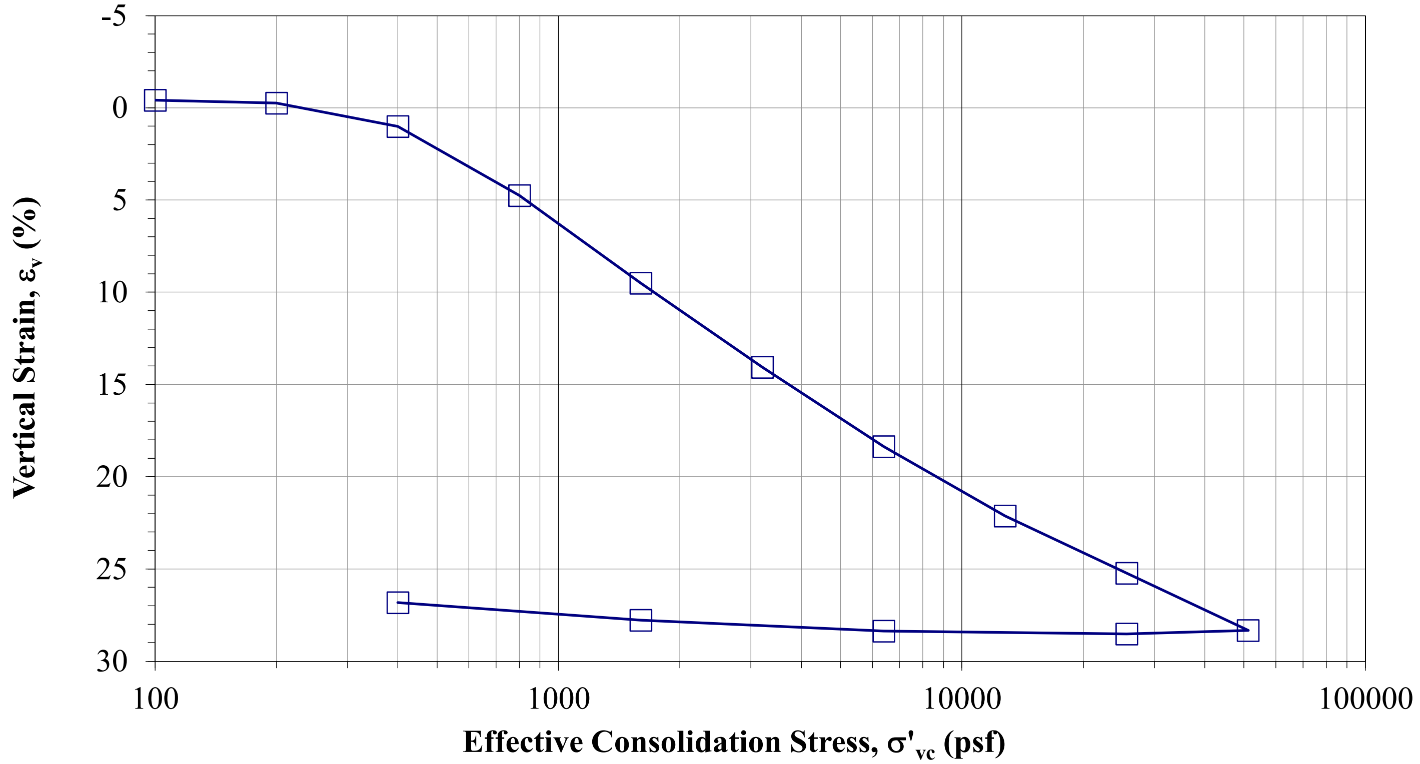
Test method:	A	
Inundation stress (psf), timing:	100	Beginning
Specific gravity, G_s	2.70	Assumed

Water type used for inundation Tap

	Initial (o)	Final (f)
Sample height, H (in.)	0.766	0.561
Sample diameter, D (in.)	1.923	1.923
Wt. rings + wet soil (g)	371.76	373.10
Wt. rings/tare (g)	292.11	292.11
Moist unit wt., γ_m (pcf)	136.4	189.50
Wet soil + tare (g)	276.26	183.75
Dry soil + tare (g)	270.01	177.52
Tare (g)	210.54	127.13
Water content, w (%)	10.5	12.4
Dry unit wt., γ_d (pcf)	123.4	168.6
Saturation	0.78	-596.90

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	0.7660	0.3657
100	-0.0032	-0.41	0.7692	0.3714
200	-0.0020	-0.26	0.7680	0.3692
400	0.0077	1.01	0.7583	0.3519
800	0.0364	4.75	0.7296	0.3008
1600	0.0729	9.51	0.6931	0.2358
3200	0.1078	14.07	0.6582	0.1736
6400	0.1407	18.37	0.6253	0.1148
12800	0.1695	22.13	0.5965	0.0635
25600	0.1933	25.23	0.5728	0.0212
51200	0.2171	28.34	0.5489	-0.0213
25600	0.2185	28.52	0.5475	-0.0238
6400	0.2173	28.36	0.5487	-0.0217
1600	0.2127	27.77	0.5533	-0.0136
400	0.2054	26.82	0.5606	-0.0006



Comments: Test specimen swelled upon inundation, and at the 100 psf load step.

Entered: ____________
Reviewed: ____________

One-Dimensional Consolidation Properties of Soils

(ASTM D2435)

Project: Universal Engineering Sciences
No: M04301-003 (4430.2300012)
Location: Colorado Springs McDonald's
Date: 7/25/2023
By: JDF

Boring No.: BH-4
Sample: BH-4 15'
Depth: 15'
Sample Description: Brown clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

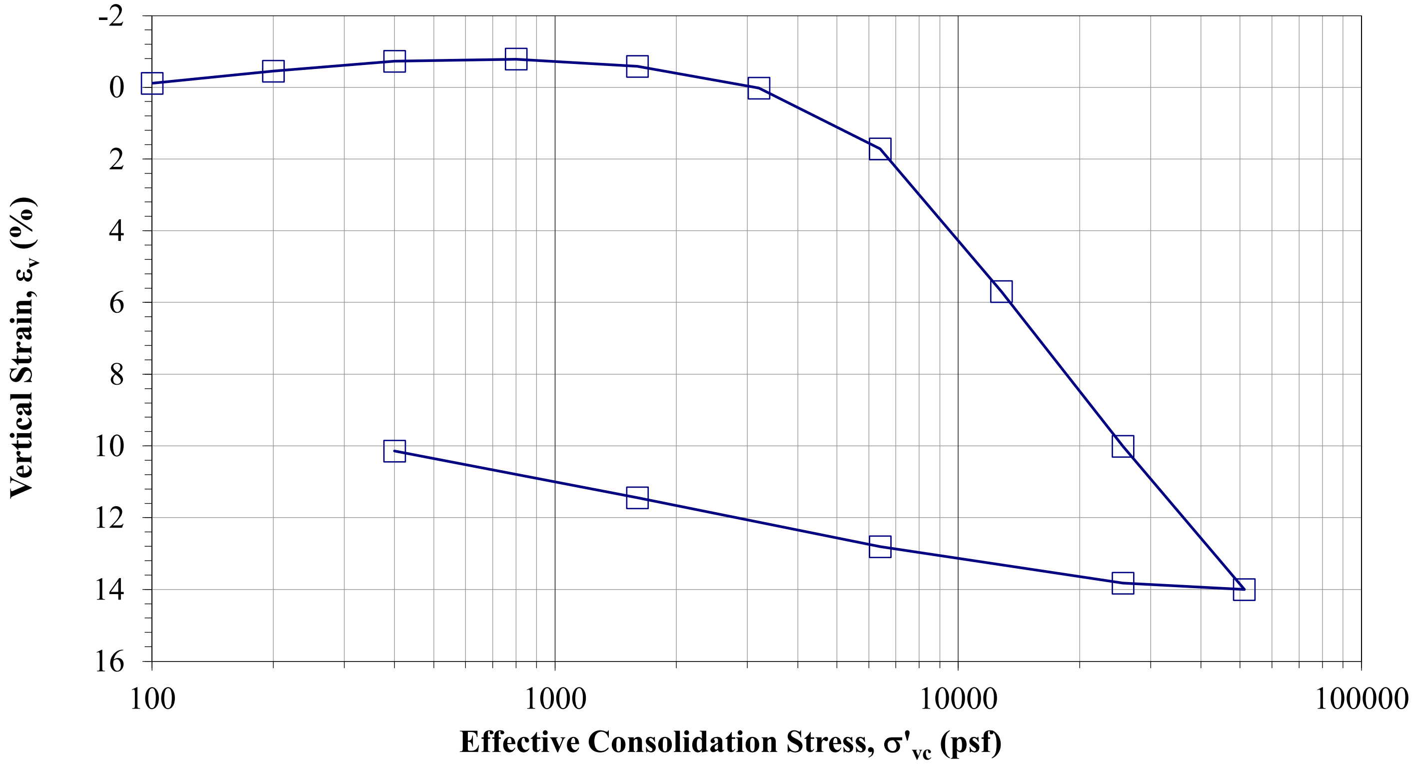
Test method: A
Inundation stress (psf), timing: 100 Beginning
Specific gravity, G_s 2.70 Assumed

Water type used for inundation Tap

	Initial (o)	Final (f)
Sample height, H (in.)	0.767	0.689
Sample diameter, D (in.)	1.921	1.921
Wt. rings + wet soil (g)	329.64	331.03
Wt. rings/tare (g)	260.67	260.67
Moist unit wt., γ_m (pcf)	118.2	134.19
Wet soil + tare (g)	219.45	192.14
Dry soil + tare (g)	208.15	182.17
Tare (g)	128.47	121.70
Water content, w (%)	14.2	16.5
Dry unit wt., γ_d (pcf)	103.5	115.2
Saturation	0.61	0.96

*Note: C_v, C_c, C_r, and σ_p' to be determined by Geotechnical Engineer.

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	0.7670	0.6283
100	-0.0009	-0.11	0.7679	0.6302
200	-0.0034	-0.45	0.7704	0.6356
400	-0.0056	-0.73	0.7726	0.6401
800	-0.0060	-0.79	0.7730	0.6411
1600	-0.0045	-0.59	0.7715	0.6379
3200	0.0001	0.02	0.7669	0.6280
6400	0.0132	1.71	0.7539	0.6004
12800	0.0437	5.69	0.7234	0.5357
25600	0.0767	10.01	0.6903	0.4654
51200	0.1074	14.00	0.6596	0.4003
25600	0.1060	13.82	0.6610	0.4033
6400	0.0983	12.81	0.6687	0.4197
1600	0.0878	11.44	0.6792	0.4420
400	0.0778	10.14	0.6892	0.4632



Comments: Test specimen swelled upon inundation and at the 100 psf, 200 psf, 400 psf and 800 psf load steps.

Entered: ________
Reviewed: ________

7/25/2023

Work Order: 23G1205
Project: Colorado Springs McDonalds

Universal Engineering Science
Attn: Trae Boman
477 Parkland Drive
Sandy, UT 84070

Client Service Contact: 801.262.7299

The analyses presented on this report were performed in accordance with the National Environmental Laboratory Accreditation Program (NELAP) unless noted in the comments, flags, or case narrative. If the report is to be used for regulatory compliance, it should be presented in its entirety, and not be altered.

Approved By:

Reed Hendricks, Director of Operations

Certificate of Analysis

Universal Engineering Science
Trae Boman
477 Parkland Drive
Sandy, UT 84070

PO#:
Receipt: **7/18/23 11:45 @ 25.2** °C
Date Reported: 7/25/2023
Project Name: **Colorado Springs McDonalds**

Sample ID: **BH-1 @ 2.5'**

Matrix: **Solid**

Lab ID: **23G1205-01**

Date Sampled: **7/15/23 11:30**

Sampled By: **Kayla Whipple**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
Chloride, Soluble (IC)	ND	mg/kg dry	11	EPA 300.0	7/18/23	7/18/23	
Resistivity	17.3	ohm m	1.0	SSSA 10-3.3	7/19/23	7/19/23	
Sulfate, Soluble (IC)	36	mg/kg dry	11	EPA 300.0	7/18/23	7/18/23	
Total Solids	92.0	%	0.1	CTF8000	7/20/23	7/21/23	

Certificate of Analysis

Universal Engineering Science
Trae Boman
477 Parkland Drive
Sandy, UT 84070

PO#:
Receipt: **7/18/23 11:45 @ 25.2** °C
Date Reported: 7/25/2023
Project Name: **Colorado Springs McDonalds**

Report Footnotes

Abbreviations

ND = Not detected at the corresponding Minimum Reporting Limit (MRL).
1 mg/L = one milligram per liter or 1 mg/kg = one milligram per kilogram = 1 part per million.
1 ug/L = one microgram per liter or 1 ug/kg = one microgram per kilogram = 1 part per billion.
1 ng/L = one nanogram per liter or 1 ng/kg = one nanogram per kilogram = 1 part per trillion.
On calculated parameters, there may be a slight difference between summing the rounded values shown on the report vs the unrounded values used in the calculation.