ENTECH
ENGINEERING, INC.

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

SUBSURFACE SOIL INVESTIGATION
NORTH BEAVER CREEK BRIDGE
FOREST LAKES FILING 5, 6, & 7
MONUMENT, COLORADO

Prepared for

FLRD
6385 Corporate Drive, Suite 200
Colorado Springs, Colorado 80919

Attn: Jim Boulton

March 4, 2020

Respectfully Submitted,

ENTECH ENGINEERING, INC.

COLORADO LICENSED
AUSTIN M NOSSOKOFF
53477
3-4-20
PROFESSIONAL ENGINEER

Austin M. Nossokoff, P.E.

Reviewed by:

Joseph C. Goode, Jr., P.E.
President

AMN/amn

Encl.

Entech Job No. 200150
F:\AA projects\2020\200150-FLRD-North Beaver Creek Bridge-230-SSI\200150 ssi.docx

Table of Contents

SUBSURFACE SOIL INVESTIGATION
NORTH BEAVER CREEK BRIDGE
FOREST LAKES FILING 5, 6, & 7
MONUMENT, COLORADO

1.0 INTRODUCTION

FLRD is planning the construction of a vehicular bridge where the proposed Mesa Top Drive intersects North Beaver Creek. The project site is located west of existing Mesa Top Drive in southwestern Monument, Colorado. A Vicinity Map is presented in Figure 1. The Test Boring Location Map, Figure 2, indicates the approximate bridge location and test boring locations.

This report describes the subsurface conditions encountered in test borings drilled in the footprints of the proposed vehicular bridge abutments and provides recommendations for design and construction. The subsurface investigation for the vehicular bridge included drilling four (4) borings placed along the east and west sides of the proposed bridge, collecting samples of soil from the borings, performing laboratory tests on selected samples and conducting a geotechnical evaluation of the investigation findings. Drilling and subsurface investigation activities for the test borings 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.

2.0 PROJECT AND SITE DESCRIPTION

It is Entech's understanding that the project will consist of the construction of a vehicular bridge across existing North Beaver Creek. Two bridge spans, each 30 feet wide, are proposed. Adjacent properties consist of future residential parcels and existing residential parcels. North Beaver Creek flows to the southeast. At the time of drilling, water was not flowing in the channel.

3.0 SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

The subsurface conditions on this site were investigated by drilling four (4) exploratory test borings. The test borings were placed in the footprints of the proposed location of the vehicular bridge abutments. The approximate locations of the test borings are indicated on the Test Boring Location Map, Figure 2. The test borings were advanced with a power-driven continuous-flight auger-drilling rig to depths of 30 to 35 feet. Samples were obtained during drilling using the Standard Penetration Test, ASTM D-1586, utilizing a split-barrel sampler and a California sampler. Results of the Standard Penetration Tests are shown on the Test Boring Logs. The Test Boring Logs are presented in Appendix A.

Soil samples were obtained with respect to depth in 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 Testing (SPT) are included on the boring logs in terms of N-values expressed in blows per foot (bpf). Soil samples recovered from the borings were visually classified in the field and described on the boring logs. The field classifications were later verified using laboratory testing and grouped by soil type. The soil types (identified by number) are included on the boring logs.

Water content testing (ASTM D-2216) was performed on 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 Swell/Consolidation test in order to evaluate potential expansion/compression characteristics of the soil. Soluble sulfate testing was performed on samples of soil 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 2.

4.0 SUBSURFACE CONDITIONS

Two (2) soil types were encountered in the borings drilled for the proposed drainage improvements: Soil Type 1: slightly silty to very silty sand (SM, SM-SW), and Soil Type 2: very silty and clayey sandstone (SM, SC). The soil was classified using the results of the laboratory testing and the Unified Soil Classification System (USCS). Observations for groundwater presence were made in each of the boreholes following completion of drilling.

4.1 Soil and Bedrock

Soil Type 1 is a slightly silty to very silty sand (SM, SM-SW). The sand was encountered in all of the test borings at the existing surface grade and extended to depths ranging from 13 to 21 feet bgs. Standard Penetration Testing resulted in SPT N-values of 9 to greater than 50 bpf, indicating loose to very dense states. Water content and grain size testing resulted in approximately 1 to 18 percent water content and approximately 5 to 41 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits testing resulted in a liquid limit of no value and a plasticity index of non-plastic. Sulfate testing on a sample of sand resulted in 0.01 percent soluble sulfate by weight, indicating the sand exhibits negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 2 is a very silty and clayey sandstone (SM, SC). The sandstone was encountered in all of the test borings at depths ranging from 13 to 21 feet bgs and extended to the termination of the test borings (30 to 35 feet). Standard Penetration Testing resulted in SPT N-values of 41 to greater than 50 bpf, indicating dense to very dense states. Water content and grain size testing resulted in approximately 11 to 20 percent water content and approximately 33 to 47 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits testing resulted in a liquid limit of 25 and plastic index of 8. Sulfate testing on a sample of sandstone resulted in less than 0.01 percent soluble sulfate by weight, indicating the sandstone exhibits negligible potential for below grade concrete degradation due to sulfate attack

Additional soil descriptions can be seen on the enclosed drill logs. (Appendix A). A summary of the laboratory test results is presented in Table 1. Laboratory results are presented in Appendix B. It should be noted that the soil classification shown on the logs is based on the engineer's visual classification of the samples at the depths indicated. The soil types may vary between samples and locations tested. Also, stratification lines shown on the logs represent the approximate boundary between soil types and the actual transition may be gradual and vary with location.

4.2 Groundwater

Groundwater was encountered in all of the Test Borings at 10 to 19 feet during and subsequent to drilling. Creek flow will vary due to rainfall, drainage and other factors not readily apparent at this time. Groundwater will likely be encountered during the drilling of the piers. Casing of the pier holes may be recommended during caisson drilling.

5.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered in the borings drilled for the pedestrian bridge to be constructed at the location previously described. 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 below can be reviewed and revised if necessary.

Subsurface conditions at the bridge abutment consist of silty to slightly silty sand overlying very silty and clayey sandstone bedrock. Bedrock was encountered at 13 to 16 feet at the proposed West abutment. Bedrock was encountered at 16 to 21 feet at the proposed East abutment. Water was encountered at 10 to 19 feet in the test borings. Water was not flowing in creek at the time of the investigation. SPT N-values measured in the soils indicated loose to very dense states. The bridge abutments should be supported on drilled piers bearing into formational bedrock.

Any newly placed fill should be placed according to the "Structural Fill" paragraph. Prior to placing the structural fill, the surface should be scarified, moisture-conditioned and compacted. The structural fill should be moisture-conditioned to within ± 2% of its optimum moisture content to aid in compaction.

5.1 Deep Foundation Systems

A drilled pier foundation system is recommended for the vehicular bridge on this site.

- Drilled piers should be a minimum of 25 feet in total length and extend into the bedrock a minimum of 6 feet or 4 pier diameters, whichever is greater. Given the soil conditions measured in the borings drilled for the proposed structure and our observation, overall pier lengths of 25 feet are anticipated.

- Drilled piers should be designed to support compressive loads using a maximum allowable end-bearing pressure of 35,000 psf and a skin friction of 3,500 psf. The frictional component of pier capacity should be determined using only the portion of the pier extending into bedrock. Use of the upper 3 feet of bedrock for frictional resistance is not recommended in order to account for possible weathering of the bedrock surface.

- Drilled piers should be designed to transmit a minimum dead-load end bearing pressure of 5,000 psf to the bedrock in order to help control possible uplift forces. If the minimum dead load end bearing pressure cannot be achieved, the pier(s) should be advanced further into the site sandstone bedrock in order to develop additional uplift resistance. The additional uplift resistance developed as a result of the bedrock/pier interaction can be estimated using a skin friction resistance of 3500 psf for the portion of the pier which extends into the bedrock beyond the minimum recommended penetration length. Pier portions in bedrock, which are cased during pier drilling, should not be included in uplift resistance calculations.

- The piers should be roughened to aid in skin friction development.

- Piers may be designed to resist lateral loads assuring a modulus of horizontal subgrade reaction of 25 pci in the native, medium dense overburden soils (20 pci should be used for overburden material below the water table). A modulus of horizontal subgrade reaction of 225 pci in the native, dense sandstone is recommended (125 pci should be used for bedrock material below the water table). Resistance to lateral loads should be neglected in the upper native soils.

- Pier reinforcing should be designed based on the pier diameter and the expected maximum anticipated compressive loads. Piers should also be reinforced to resist uplift forces due to potential expansion of the bedrock as well as any tensile forces transmitted by the supported structure.

- Closely spaced piers should be avoided unless the associated pier capacities are appropriately reduced. To avoid reduction of pier capacity, piers should be separated by a minimum of 3 pier diameters for compression loading. A pier spacing of 4 pier diameters is recommended for tension loading. Reduction factors for lateral loading based on spacing are recommended as follows: 8D:1; 6D:0.7; 4D:0.4; and 3D:0.25.

- Grade beams used in conjunction with the piers should be designed to span the unsupported length between supporting piers. A 6-inch deep continuous void should be created beneath the grade beam(s) in order to concentrate the supported structure loads onto the piers. A suitable collapsible void forming material should be placed within the space beneath the grade beams.

- To resist the effects of frost, grade beams and pier supported footings should be positioned a minimum of 30 inches below the adjacent finished exterior site grade.

- Pier holes and pier hole bottoms should be cleaned prior to placing concrete. Temporary casing of the pier holes will likely be necessary to control groundwater. Concrete should be placed in the pier holes shortly after they have been drilled, cleaned and observed. Concrete should not be placed in pier holes having more than 6 inches of water depth, unless placed by tremmie methods.

Entech Engineering, Inc. should observe the pier hole drilling and identify that the end bearing strata is consistent with the subsurface conditions described in this report. Fulltime observation during pier drilling is typically required by the local Regional Building Authority.

5.2 Bearing Capacity/Lateral Pressures

The following values are recommended for use in designing below grade foundation walls subjected to unbalanced lateral loads and/or retaining walls that may be associate with this project.

Recommended Design Values – Lateral Loading*

Equivalent fluid density for lateral earth pressure (active case), pcf (sand)	45
Equivalent fluid density for lateral earth pressure (active case), pcf (saturated)	110
Equivalent fluid density for lateral earth pressure (passive case), pcf (sand)	250
Soil density (loose sand and gravel), psf	115
Soil density (compacted sand and gravel), psf	125
Angle of Internal Friction (loose sand), degrees	28
Angle of Internal Friction (compacted sand), degrees	34
Coefficient of sliding between concrete and sites sand	0.3

*Note: The passive pressure should be evaluated for site-specific conditions. The above lateral loading design values are for non-expansive, granular backfill conditions with level backslope angles and no surcharge loads. If the backfill slope angles are greater than zero degrees, if the backfill is surcharged, or if the backfill is not free draining, the design values must be adjusted to account for additional lateral loading.

Granular backfill material should be compacted to a minimum of 95% of its maximum Modified Proctor Dry Density (ASTM D-1557). Granular backfill should be placed at a moisture content of ±2% of its optimum moisture content. Density tests should be taken on the backfill to verify compaction, at 1-foot intervals.

5.3 Site Seismic 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.

5.4 Concrete

Sulfate solubility testing was conducted on several samples recovered from the test borings to evaluate the potential for sulfate attack on concrete placed below surface grade. The test results indicated 0.01 to less than 0.01 percent soluble sulfate (by weight). The test results indicate the sulfate component of the in-place soils 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.

5.5 Structural Fill

Areas to receive fill should have all topsoil, organic material or debris removed. Fill must be properly benched. The surface should be scarified and moisture conditioned to within ±2 percent of its optimum moisture content and compacted to 95 percent of its maximum Modified Proctor Dry Density (ASTM D-1557) for granular soils and 95 percent of its maximum Standard Proctor Dry Density (ASTM D-698) prior to placing new fill. New fill should 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). Standard (ASTM D-698 cohesive) fill materials should be placed at a moisture content conducive to compaction, usually ±2 percent of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech Engineering, Inc. Any imported soils should be approved by Entech Engineering, Inc. prior to being hauled to the site.

5.6 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 subgrade should not be allowed to freeze. During site grading and subgrade preparation, care should be taken to avoid burial of snow, ice or frozen material within the planned construction area.

5.7 Construction Observations

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

- Excavated subgrades and subgrade preparation.
- Placement of drains (if installed).
- Placement/compaction of fill material.
- Drilled Pier Installation

6.0 CLOSURE

The subsurface investigation, geotechnical evaluation and recommendations presented in this report are intended for use by FLRD with application to the planned vehicular bridge where Mesa Top Drive intersects North Beaver Creek in southwestern 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 FLRD
PROJECT N. BEAVER CREEK BRIDGE
JOB NO. 200150

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	1	2-3			5.4	NV	NP				SM-SW	SAND, SLIGHTLY SILTY
1	2	5			40.8			0.01			SM	SAND, VERY SILTY
1	4	2-3			14.7						SM	SAND, SILTY
1	4	10			7.5						SM-SW	SAND, SLIGHTLY SILTY
2	2	20			47.1			<0.01			SM	SANDSTONE, VERY SILTY
2	3	30			32.5	25	8				SC	SANDSTONE, CLAYEY

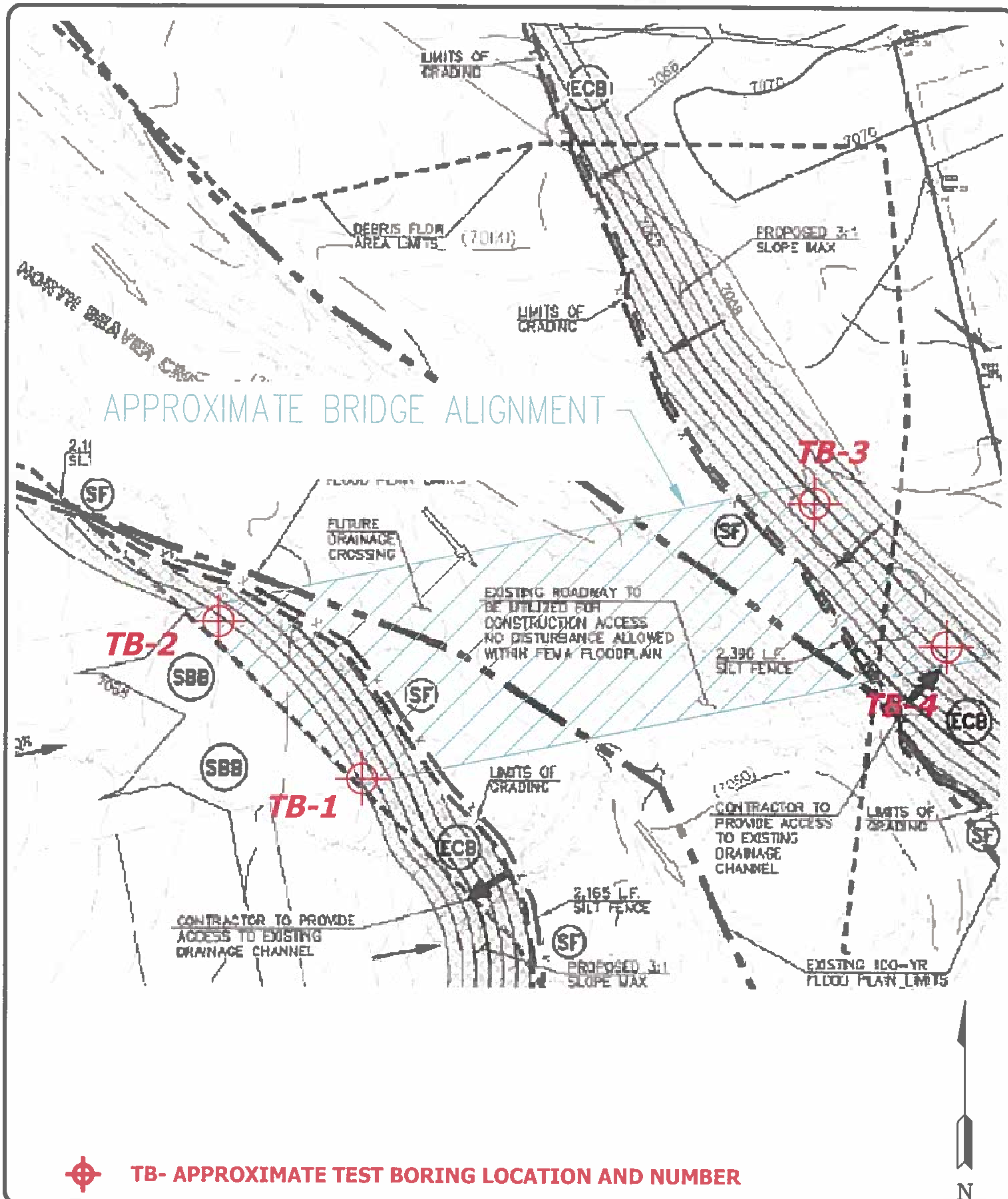
FIGURES

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

Vicinity Map North Beaver Creek Bridge Forest Lakes, Filings 5, 6 & 7 Monument, CO For: FLRD			
DRAWN: AMN	DATE: 2/12/20	CHECKED:	DATE:

JOB NO.: 200150

FIG NO.: 1



ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

Test Boring Location Map
North Beaver Creek Bridge
Forest Lakes, Filings 5, 6 & 7
Monument, CO
For: FLRD

DRAWN:	DATE:	CHECKED:	DATE:
AMN	2/12/20		

JOB NO.: 200150

FIG NO.: 2

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 1/22/2020
Job # 200150

REMARKS

WATER @ 10', 1/28/20

SAND, GRAVELLY, SLIGHTLY SILTY, FINE TO COARSE GRAINED, BROWN TO RED BROWN, VERY DENSE TO MEDIUM DENSE, DRY TO WET

SANDSTONE, SILTY, FINE TO COARSE GRAINED, RED BROWN, VERY DENSE, MOIST

Depth (ft)	Blows per foot	Watercontent %	Soil Type
	**	1.2	1
5	**	5.1	1
10	50* / 9"	4.9	1
15	20	10.9	1
20	50 / 4"	13.9	2
25	B	16.5	2
30	50 / 4"	10.3	2

* - HIGH BLOW COUNTS TO GRAVEL

* - BULK SAMPLE TAKEN

B - BOUNCE

TEST BORING NO. 2
DATE DRILLED 1/22/2020
CLIENT FLRD
LOCATION N. BEAVER CREEK BRIDGE

REMARKS

WATER @ 13', 1/27/20

SAND, VERY SILTY TO SILTY, FINE TO COARSE GRAINED, BROWN TO RED BROWN, MEDIUM DENSE, MOIST

SANDSTONE, VERY SILTY TO SILTY, FINE TO COARSE GRAINED, RED BROWN, VERY DENSE, MOIST

Depth (ft)	Blows per foot	Watercontent %	Soil Type
	12	2.9	1
5	20	8.4	1
10	18	3.4	1
15	50 / 8"	12.0	2
20	50 / 6"	14.4	2
25	50 / 5"	19.5	2
30	50 / 4"	15.7	2

TEST BORING NO. 3
DATE DRILLED 1/22/2020
Job # 200150

REMARKS

WATER @ 19.5', 1/28/20

Remarks	Depth (ft)	Blows per foot	Watercontent %	Soil Type
SAND, GRAVELLY, SILTY, FINE TO COARSE GRAINED, BROWN TO RED BROWN, LOOSE TO MEDIUM DENSE, DRY TO WET		9	5.3	1
	5	19	2.5	1
	10	27	1.5	1
COBBLES	15	*	8.2	1
	20	9	17.8	1
SANDSTONE, SILTY TO CLAYEY, FINE TO COARSE GRAINED, RED BROWN, VERY DENSE, MOIST	25	50/4"	11.6	2
	30	50/4"	11.0	2
	35	50/4"	14.4	2

* - BULK SAMPLE TAKEN

TEST BORING NO. 4
DATE DRILLED 1/22/2020
CLIENT FLRD
LOCATION N. BEAVER CREEK BRIDGE

REMARKS

WATER @ 19', 1/28/20

Remarks	Depth (ft)	Blows per foot	Watercontent %	Soil Type
SAND, GRAVELLY, SILTY TO SLIGHTLY SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST TO DRY		13	4.7	1
	5	20	3.0	1
COBBLES	10	*	1.8	1
	15	*	1.8	1
WEATHERED TO FORMATIONAL SANDSTONE, SILTY, FINE TO COARSE GRAINED, RED BROWN, DENSE TO VERY DENSE, MOIST	20	41	12.4	2
	25	50/4"	13.2	2
	30	50/4"	10.9	2
	35			

* - BULK SAMPLE TAKEN

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

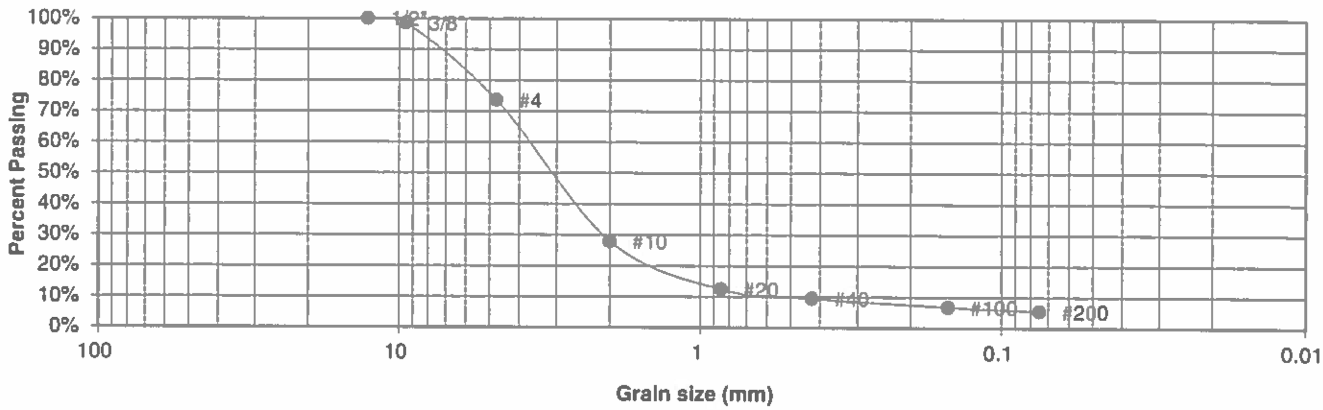
TEST BORING LOG

DRAWN: DATE: CHECKED: DATE: 2/5/20

JOB NO.: 200150
FIG NO.: A- 2

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SM-SW	CLIENT	FLRD
SOIL TYPE #	1	PROJECT	N. BEAVER CREEK BRIDGE
TEST BORING #	1	JOB NO.	200150
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.5%
4	73.6%
10	27.9%
20	12.4%
40	9.5%
100	6.9%
200	5.4%

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

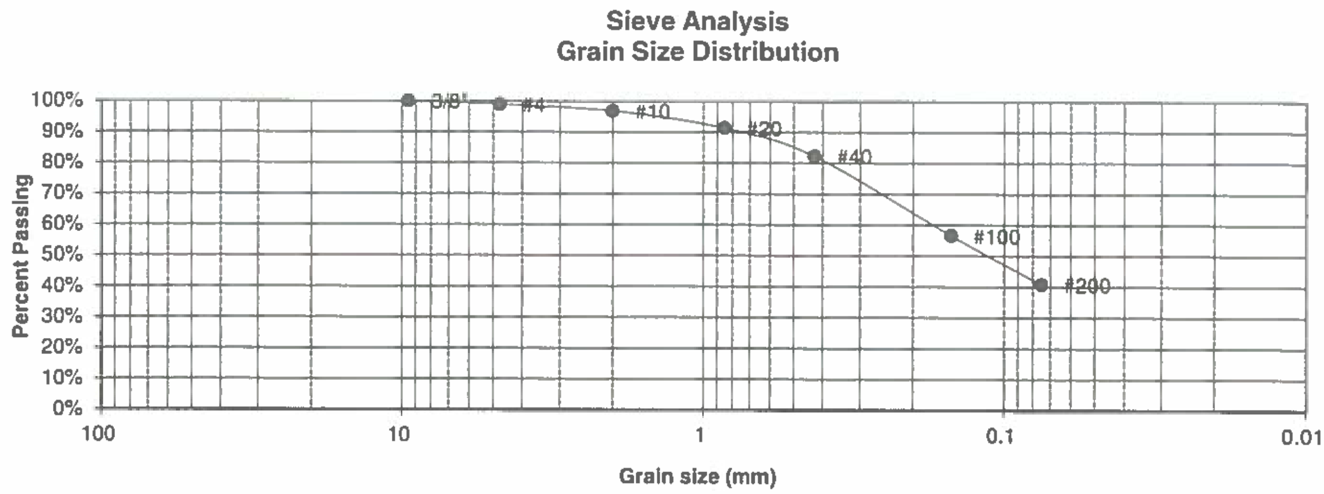
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: L	DATE: 2/5/20

JOB NO.: 200150

FIG NO.: B-1

UNIFIED CLASSIFICATION	SM	CLIENT	FLRD
SOIL TYPE #	1	PROJECT	N. BEAVER CREEK BRIDGE
TEST BORING #	2	JOB NO.	200150
DEPTH (FT)	5	TEST BY	BL

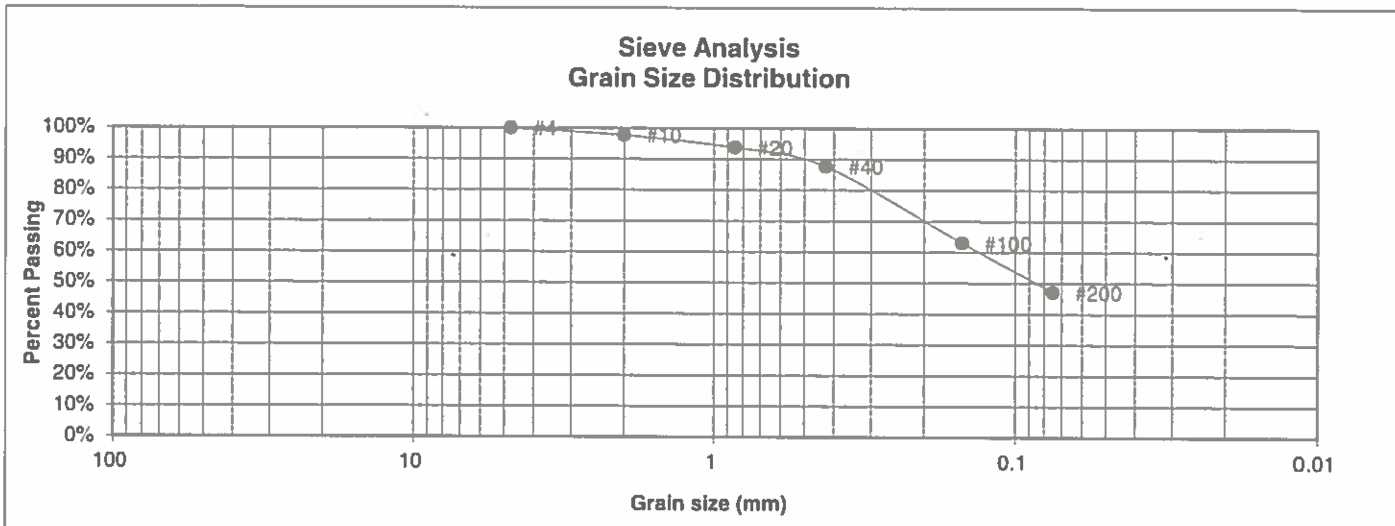


U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.9%
10	96.8%
20	91.3%
40	82.2%
100	56.6%
200	40.8%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

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

UNIFIED CLASSIFICATION	SM	CLIENT	FLRD
SOIL TYPE #	2	PROJECT	N. BEAVER CREEK BRIDGE
TEST BORING #	2	JOB NO.	200150
DEPTH (FT)	20	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.7%
20	93.8%
40	87.7%
100	63.0%
200	47.1%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

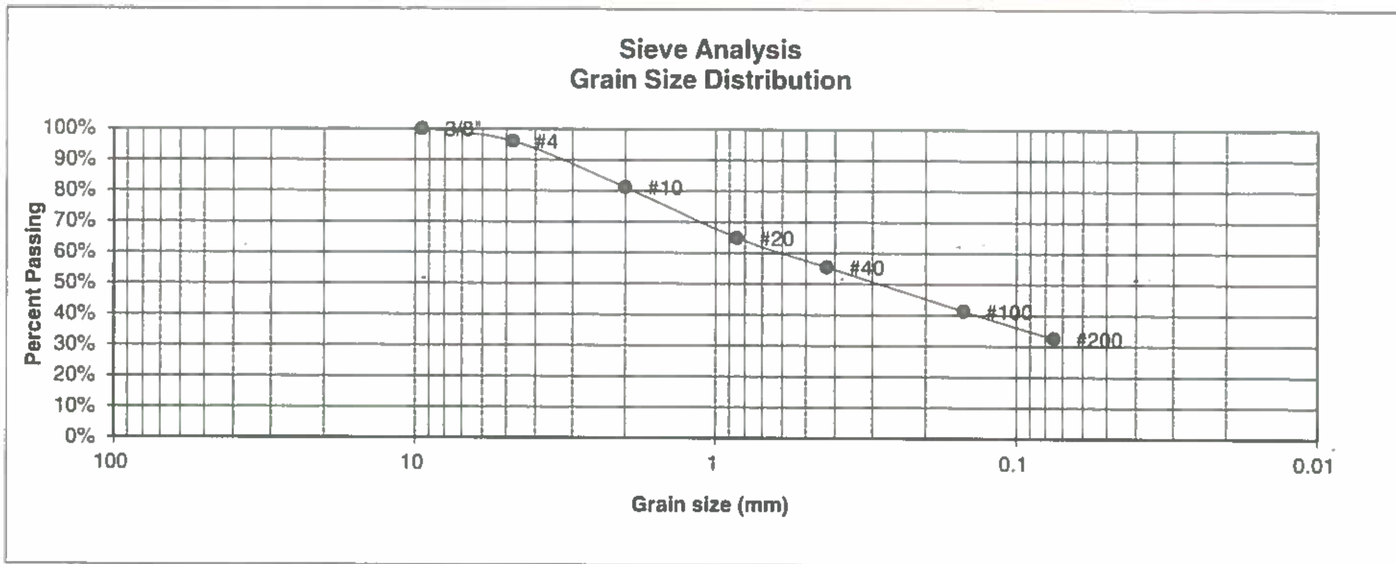
ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: L	DATE: 2/5/20

JOB NO.: 200150
FIG NO.: B-3

UNIFIED CLASSIFICATION	SC	CLIENT	FLRD
SOIL TYPE #	2	PROJECT	N. BEAVER CREEK BRIDGE
TEST BORING #	3	JOB NO.	200150
DEPTH (FT)	30	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.0%
10	81.2%
20	64.8%
40	55.5%
100	41.3%
200	32.5%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	25
Plastic Index	8

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

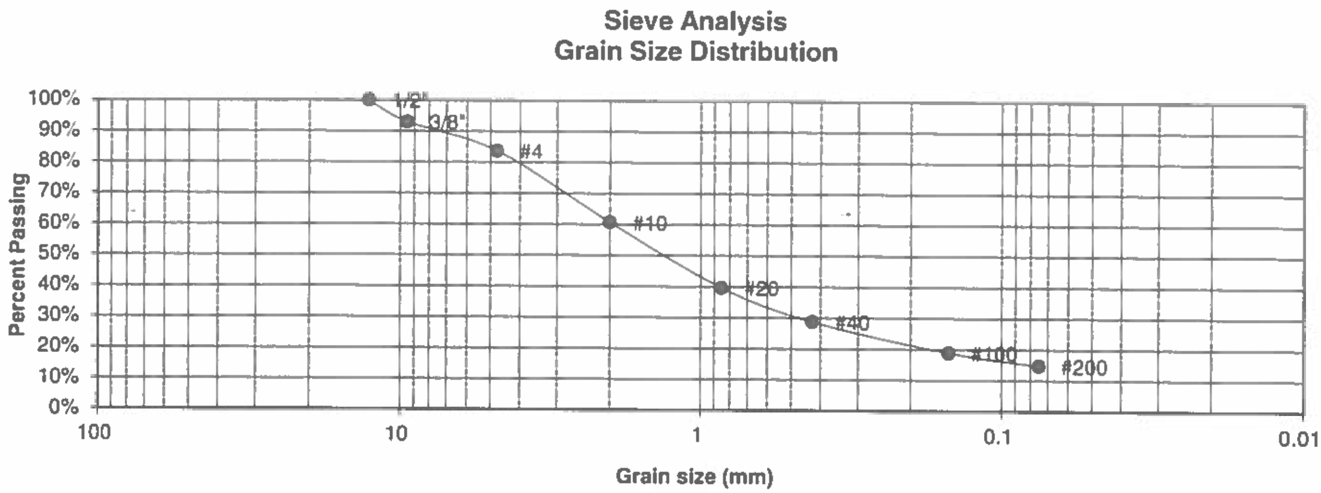
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		✓	2/5/20

JOB NO.: 200150

FIG NO.: B-4

UNIFIED CLASSIFICATION	SM	CLIENT	FLRD
SOIL TYPE #	1	PROJECT	N. BEAVER CREEK BRIDGE
TEST BORING #	4	JOB NO.	200150
DEPTH (FT)	2-3	TEST BY	BL

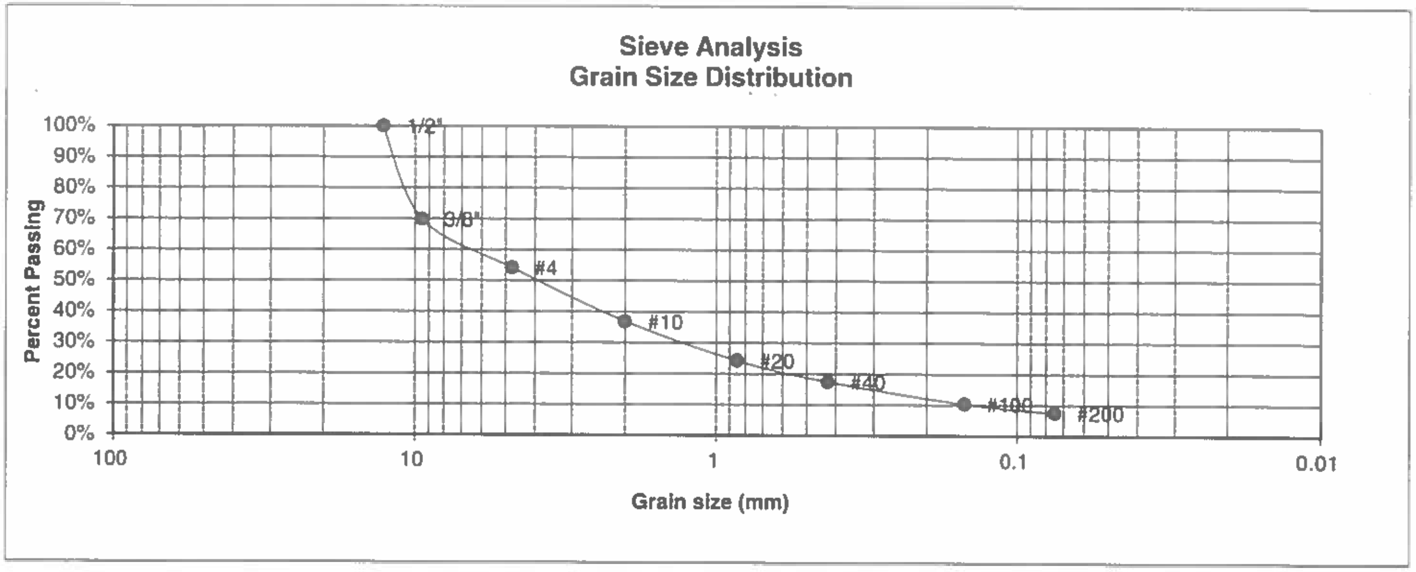


U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	93.0%
4	83.6%
10	60.6%
20	39.6%
40	28.7%
100	18.9%
200	14.7%

Atterberg
Limits
Plastic Limit
Liquid Limit
Plastic Index

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

UNIFIED CLASSIFICATION	SM-SW	CLIENT	FLRD
SOIL TYPE #	1	PROJECT	N. BEAVER CREEK BRIDGE
TEST BORING #	4	JOB NO.	200150
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	69.9%
4	54.1%
10	36.8%
20	24.2%
40	17.4%
100	10.3%
200	7.5%

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:	DATE:
		L	2/5/20

JOB NO.: 200150

FIG NO.: B-6

CLIENT	FLRD	JOB NO.	200150
PROJECT	N. BEAVER CREEK BRIDGE	DATE	2/3/2020
LOCATION	N. BEAVER CREEK BRIDGE	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-2	5	1	SM	0.01
TB-2	20	2	SM	<0.01

QC BLANK PASS

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

LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		[illegible]	2/5/20

JOB NO.: 200150

FIG NO.: B-7