February 24, 2020

ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
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Homes by Turner
12265 Oracle Blvd, Ste 105
Colorado Springs, CO 80921

Attn: Michael Turner

Re: Embankment Recommendations
Abert Ranch Subdivision
El Paso County, Colorado

Ref: Entech Engineering, Inc., Dated February 2, 2017. *Soils, Geology, Geologic Hazard, and Wastewater Study, Abert Ranch,* El Paso County, Colorado. Entech Job No. 162443.

Dear Mr. Turner:

Entech Engineering, Inc. previously performed a Soils, Geology, Geologic Hazard, and Wastewater Study at the above referenced site. Information from that report was used for preparing this letter. The proposed detention pond/dam embankment will be located on Lot 10 of Abert Ranch Subdivision. The location is indicated on the Vicinity Map, Figure 1. The project is to consist of construction of a detention pond in the location of an existing stock pond embankment. Three test borings were drilled in the area of the existing embankment for this investigation. The location of the test borings is shown on Site Plan/Test Boring Location Map, Figure 2. This letter provides recommendations for the embankment improvements based on the site conditions encountered in this investigation and the above referenced report.

SITE CONDITIONS:

The site is currently vacant. Adjacent properties consist of undeveloped land and future rural residential development. Topography of the site is gradually sloping to the east and northeast. The proposed embankment site encompasses an existing drainage area. Vegetation consists of field grasses and weeds. An existing embankment/pond is located at the new pond site. The existing embankment is approximately 10 feet in height. The upstream side and downstream slopes are approximately 3:1 and 2.5:1 respectively. No areas of significant erosion on the embankments were noted, however, snow was present during our field investigation. Observations from the previous soils/geology study did not reveal major erosion.

PROJECT DESCRIPTION:

The project is to consist the construction of a detention pond/earthen embankment located on Lot 10 of Abert Ranch. The proposed detention pond will be constructed in the location of an existing stock pond.

FIELD INVESTIGATION AND LABORATORY TESTING:

The subsurface conditions in the embankment area were investigated by drilling three (3) exploratory test borings around the existing embankment. The test borings were drilled to depths ranging from 5 to 20 feet. Test boring locations were limited due to recent snowfall. The

approximate locations of the test borings are indicated on the Site Plan/Test Boring Location Map, Figure 2.

The two of the test borings were advanced with a power-driven continuous flight auger drilling rig to depths of 20 feet below the existing ground surface, and one test boring was hand augered to a depth of 5 feet in the existing embankment. Samples were obtained during drilling using the Standard Penetration Test, ASTM D-1586, utilizing a 2.0-inch O.D. split-barrel sampler and California sampler. Results of the Standard Penetration Tests are shown on the Test Boring Logs. The Test Boring Logs are included in Appendix A, Laboratory Test esults are summarized in Table 1 and Laboratory Test Results are included in Appendix B.

SOIL AND GROUNDWATER CONDITIONS:

Three soil types were encountered in the test borings. Soil Type 1A: sandy clay fill (CL), Soil Type 1: silty sand (SM), and Soil Type 2: silty sandstone (SM). The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1A classified as sandy clay fill (CL). The sandy clay fill was encountered in Test Boring No. 3 at the existing ground surface and extending to termination of the boring 5 feet below the existing ground surface (bgs). Standard Penetration Testing conducted on the clay fill resulted in an N-value of 6 to 8 blows per foot (bpf) which indicates firm consistencies. Moisture content and grain size testing resulted in a moisture content of 8 to 9 percent with 68 percent of the soil size particles passing the No. 200 sieve.

Soil Type 1 classified as silty sand (SM). The sand was encountered in Test Boring Nos. 1 and 2 at the existing ground surface and extending to depths of 9 and 12 feet bgs. Standard Penetration Testing conducted on the sand resulted in N-values ranging between 6 and 25 bpf, which indicated loose to medium dense states. Moisture content and grain size testing resulted in moisture contents of 4 to 10 percent with 17 to 23 percent of the soil size particles passing the No. 200 sieve.

Soil Type 2 classified as silty sandstone (SM). The sandstone was encountered in Test Boring Nos. 1 and 2 underlying Soil Type 1 at depths of 9 and 12 feet and extending to the termination of the test borings, 20 feet bgs. Standard Penetration Testing conducted on the sandstone resulted in N-values of greater than 50 bpf which indicates very dense states. Moisture content and grain size testing resulted in moisture contents of 8 to 13 percent with 29 percent of the soil size particles passing the No. 200 sieve.

Groundwater was not encountered in the test borings. It should be noted that the area of the proposed dam/embankment within the existing drainage and is mapped as an area of seasonal shallow groundwater (Figure 1). Groundwater conditions may vary due to the depths of the proposed cuts, variations in rainfall, drainage and other factors not readily apparent at this time. Unstable soil conditions should be expected where excavations approach the groundwater level. Stabilization utilizing shot rock or geogrids may be necessary. Development of the property, adjacent properties and associated changes in runoff may affect the groundwater surface elevations in the drainage basin.

DEVELOPMENT CONSIDERATIONS AND RECOMMENDATIONS:

In general, the site soils encountered in the test borings are suitable for the proposed dam embankment. Groundwater should be expected to be encountered in any cuts made in the drainage area mapped as seasonal shallow groundwater. Dewatering of the area may be required during site grading and embankment construction. Saturated unstable soil conditions may be encountered during construction of the basin and embankment. Excavation of saturated soils will be difficult with rubber-tired equipment. Stabilization using shot rock or geogrids may be necessary in areas where groundwater is encountered.

Any areas to receive new fill should have all topsoil, organic material or debris removed. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Fill slopes should be 3:1 or flatter on the upstream faces or 2.5:1 or flatter on the downstream face. The subgrade should be scarified and moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557, prior to placing new fill. Areas receiving fill may require stabilization with rock or fabric if water is encountered.

The proposed improvements include installing a new outfall pipe, spillway channel, and regrading the downstream slope. The outlet pipe will require reworking the center of the embankment. The pipe subgrade should be scarified moisture conditioned and compacted. The fill on each side of the pipe must be benched into the existing embankment. Any soft/loose areas must be removed and recompacted.

New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. These materials should be placed at a moisture content conducive to compaction, usually 0 to ±2% of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech during construction/grading. Entech should approve any import materials prior to placing or hauling them to the site.

CONCRETE:

Type II cement may be used for all concrete on 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 excavations prior to the placement of concrete. If standing water is present in the foundation excavations, 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.

CLOSURE

The subsurface investigation, geotechnical evaluation and recommendations presented in this report are intended for use by Homes by Turner with application to the planned Detention Pond on Lot 10 of Abert Ranch Subdivision. 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. Final embankment /pond plans should be reviewed to determine where additional investigation is recommended. 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.

Respectfully Submitted,

ENTECH ENGINEERING, INC.

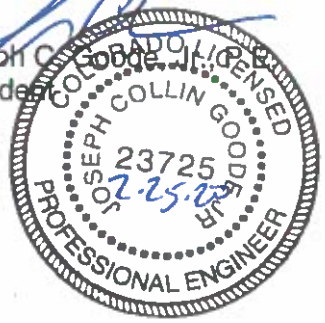
Logan L. Langford, P.G.
Geologist

LLL/nc

Entech Job No. 200199
AAProjects/2020/200199 Embankment Recommendations

Reviewed by:

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



TABLE

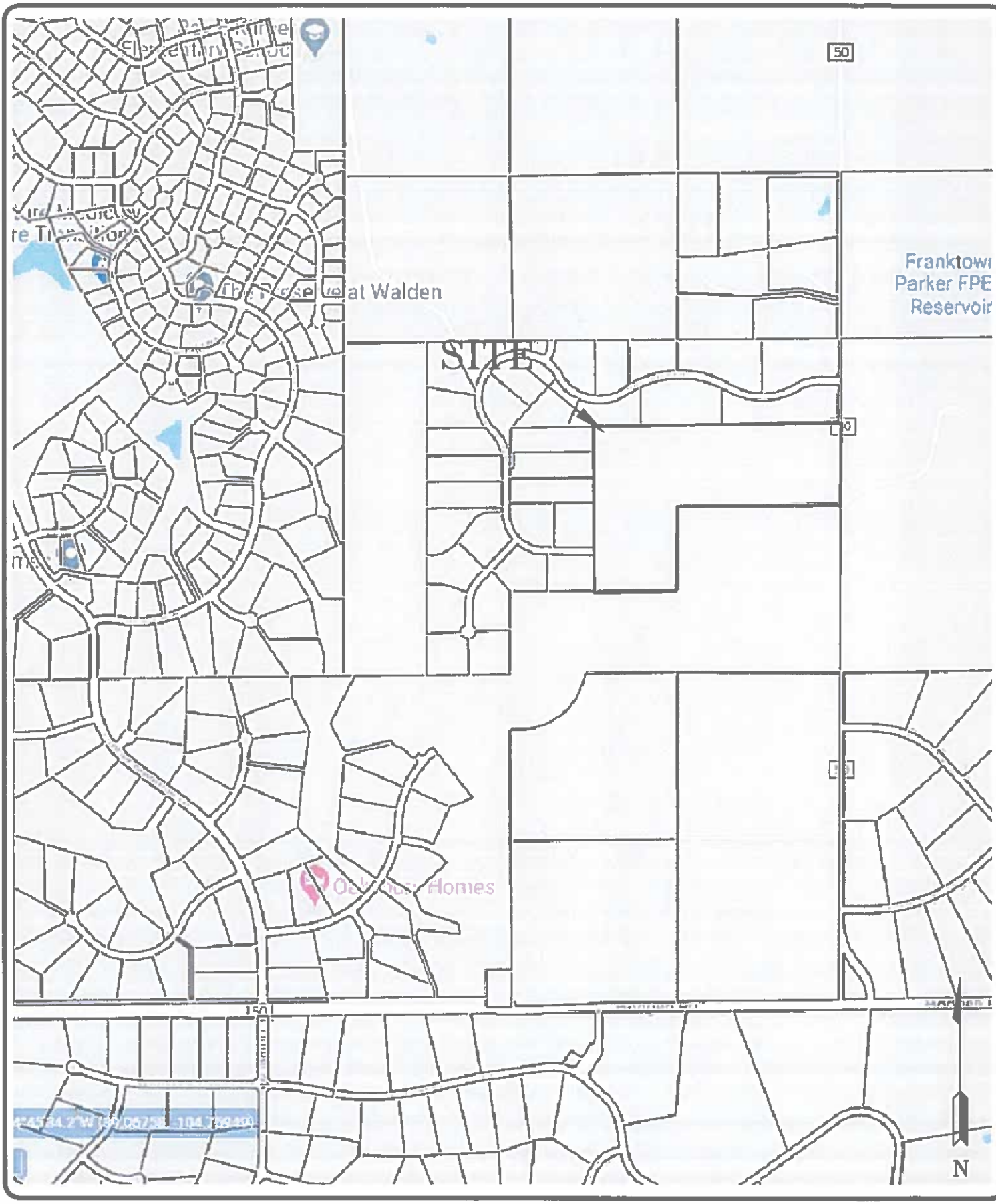
TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT HOMES BY TURNER
PROJECT SETTLERS VW. AND HODGEN RD.
JOB NO. 200199

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
1A	3	2-3			67.5						CL	FILL, CLAY, SANDY
1	1	2-3			23.2						SM	SAND, SILTY
1	2	5			16.8						SM	SAND, SILTY
2	1	10			29.0				330		SM	SANDSTONE, SILTY

FIGURES



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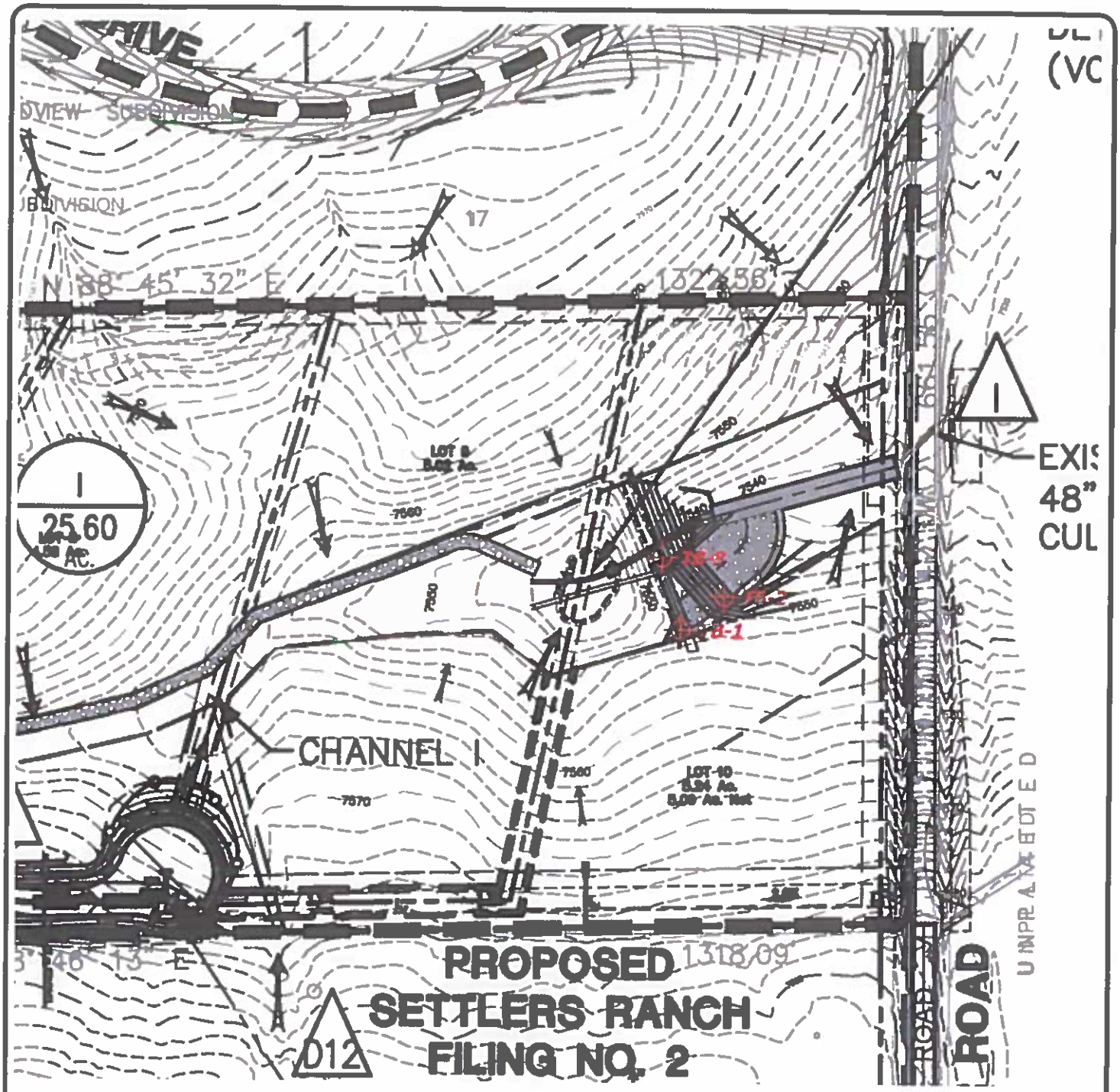
VICINITY MAP
ABERT RANCH SUBDIVISION
EL PASO COUNTY, COLORADO
FOR: HOMES BY TURNER

DRAWN:	DATE:	CHECKED:	DATE:
LLL	2/19/20		

JOB NO.: 200199

FIG NO.: 1



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

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SITE PLAN/TEST BORING LOCATION MAP
ABERT RANCH SUBDIVISION
EL PASO COUNTY, COLORADO
FOR: HOMES BY TURNER

DRAWN:	DATE:	CHECKED:	DATE:
LLL	2/19/20		

JOB NO.: 200199

FIG NO.: 2

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 2/10/2020
Job # 200199

REMARKS

DRY TO 20', 2/10/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			25	6.1	1	6" TOPSOIL, SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST
5			13	8.6	1	
10			50/11"	11.0	2	SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST
15			50/7"	7.9	2	
20			50/7"	9.9	2	

TEST BORING NO. 2
DATE DRILLED 2/10/2020
CLIENT HOMES BY TURNER
LOCATION SETTLERS VW. AND HODGEN RD.

REMARKS

DRY TO 20', 2/10/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			6	5.4	1	6" TOPSOIL, SAND, SILTY WITH ORGANICS, FINE TO COARSE GRAINED, BROWN TO TAN, LOOSE TO MEDIUM DENSE, MOIST
5			12	3.9	1	
10			28	10.2	1	
15			50/10"	9.3	2	SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST
20			50/11"	12.8	2	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE: 2/13/20

JOB NO.: 200199
FIG NO.: A- 1

TEST BORING NO. 3
DATE DRILLED 2/10/2020
Job # 200199

REMARKS

DRILLED WITH A 3" HAND AUGER

DRY TO 5', 2/18/20

FILL, CLAY, SANDY, BROWN, FIRM, MOIST

* - DRIVES TAKEN WITH A 35lb HAMMER, BLOW COUNTS CONVERTED TO STANDARD 140lb HAMMER

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			6*	7.9	1A
			8*	9.2	1A
10					
15					
20					

TEST BORING NO.
DATE DRILLED
CLIENT HOMES BY TURNER
LOCATION SETTLERS VW. AND HODGEN RD.

REMARKS

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

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TEST BORING LOG

DRAWN	DATE	CHECKED: LLL	DATE: 2/24/20

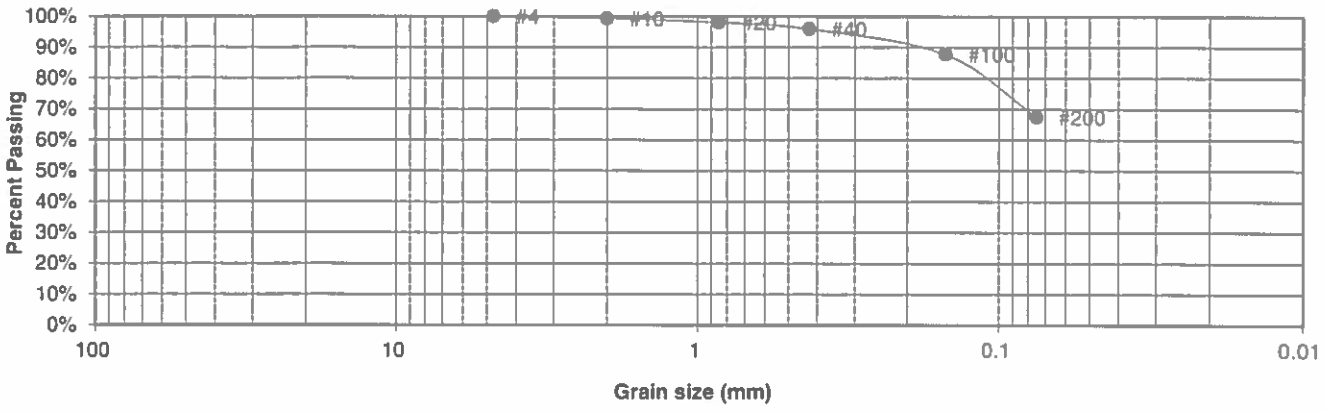
JOB NO. 200199

FIG NO. A- 2

APPENDIX B: Laboratory Testing Results

UNIFIED CLASSIFICATION	CL	CLIENT	HOMES BY TURNER
SOIL TYPE #	1A	PROJECT	SETTLERS VW. AND HODGEN RD.
TEST BORING #	3	JOB NO.	200199
DEPTH (FT)	2-3	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.3%
20	98.1%
40	95.9%
100	87.8%
200	67.5%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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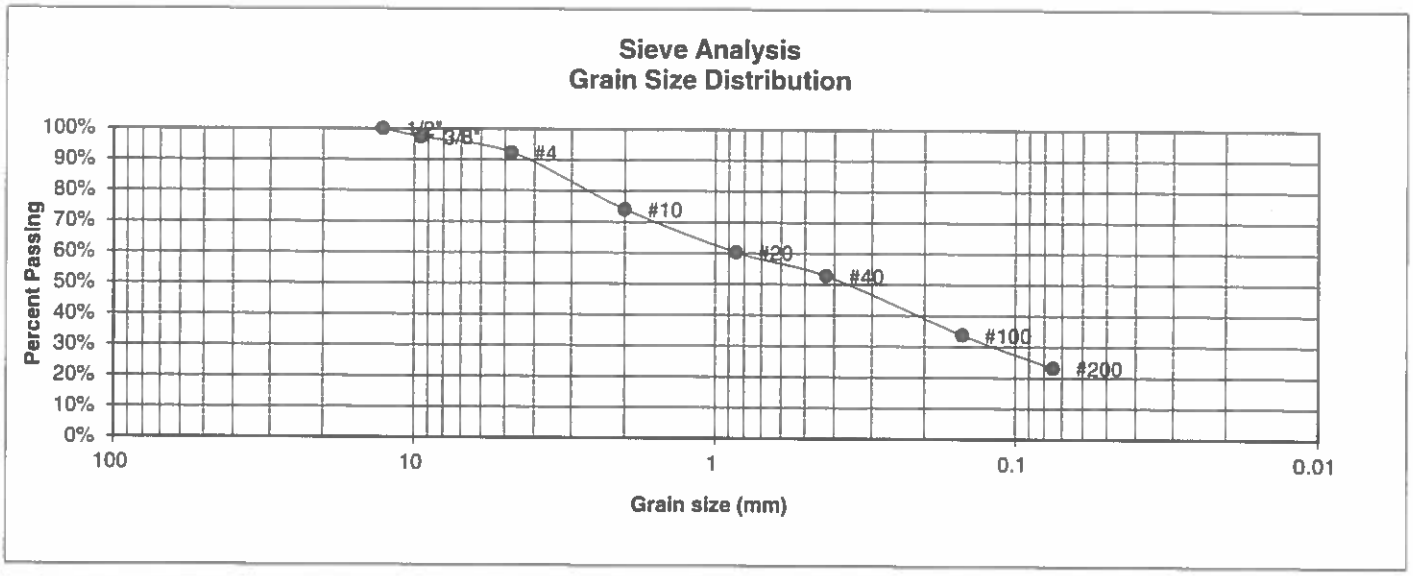
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	2/24/20

JOB NO.: 200199

FIG NO.: B-1

UNIFIED CLASSIFICATION	SM	CLIENT	HOMES BY TURNER
SOIL TYPE #	1	PROJECT	SETTLERS VW. AND HODGEN RD.
TEST BORING #	1	JOB NO.	200199
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.3%
4	92.4%
10	74.1%
20	60.3%
40	52.8%
100	33.8%
200	23.2%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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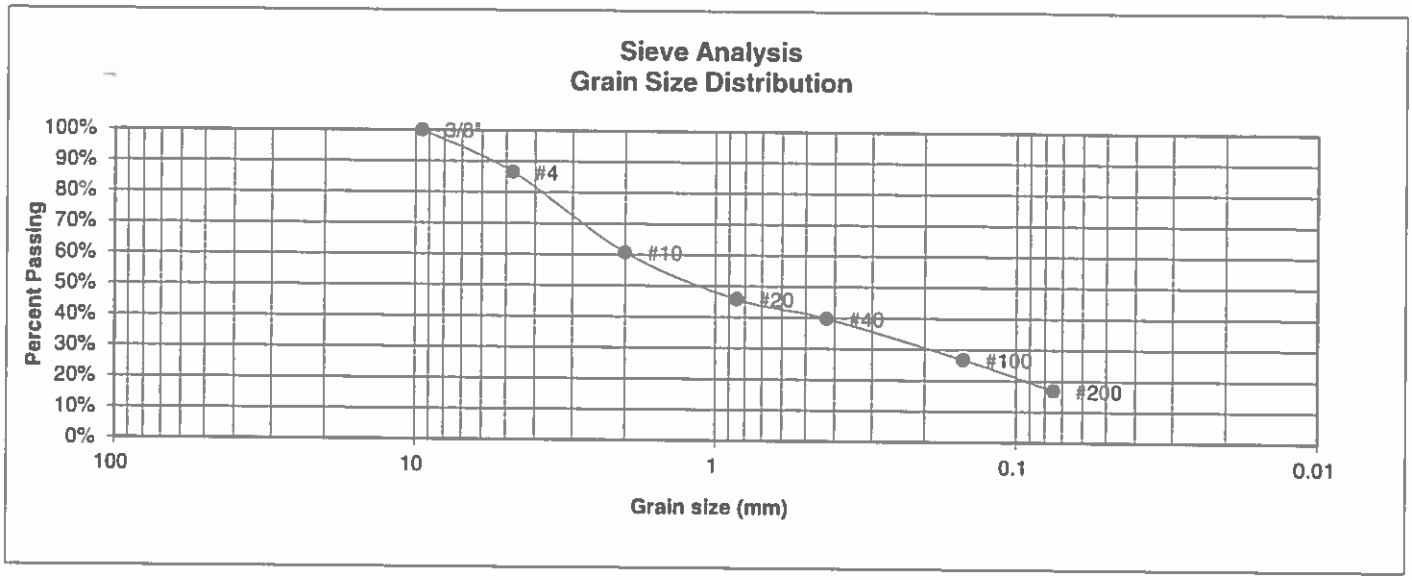
LABORATORY TEST RESULTS

DRAWN:	DATE	CHECKED:	DATE: 2/13/20

JOB NO.: 200199

FIG NO.: B-2

UNIFIED CLASSIFICATION	SM	CLIENT	HOMES BY TURNER
SOIL TYPE #	1	PROJECT	SETTLERS VW. AND HODGEN RD.
TEST BORING #	2	JOB NO.	200199
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	86.5%
10	60.7%
20	45.8%
40	39.8%
100	26.8%
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)

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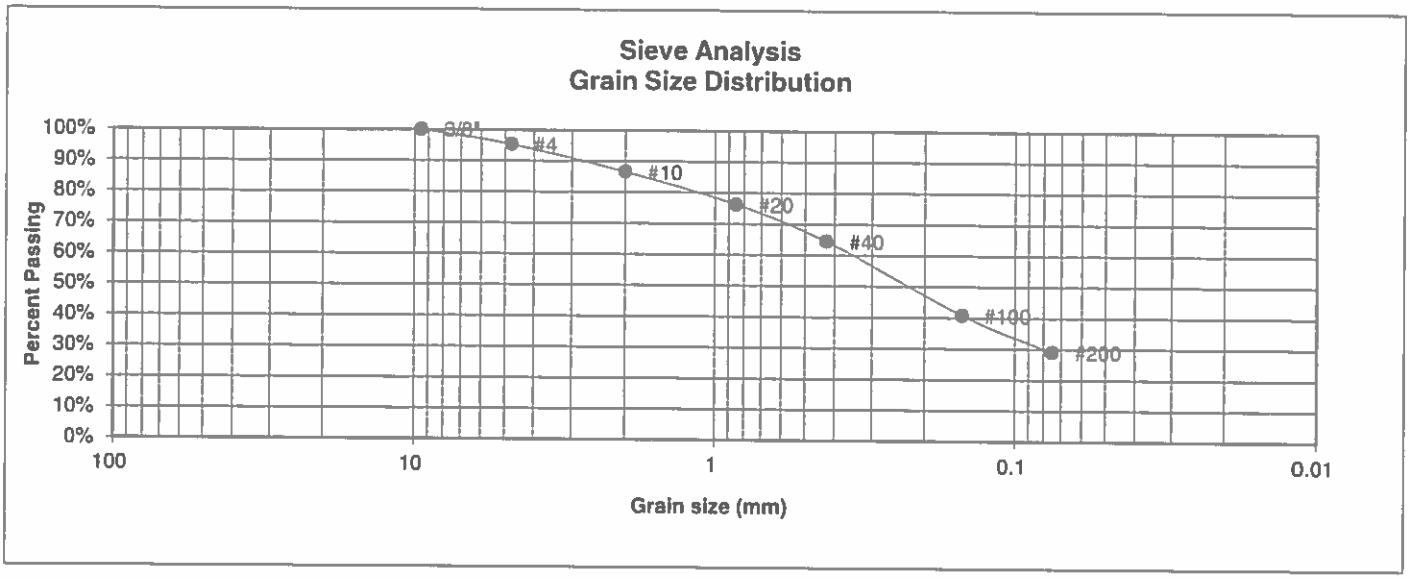
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			2/13/20

JOB NO.: 200199

FIG NO.: B-3

UNIFIED CLASSIFICATION	SM	CLIENT	HOMES BY TURNER
SOIL TYPE #	2	PROJECT	SETTLERS VW. AND HODGEN RD.
TEST BORING #	1	JOB NO.	200199
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.3%
10	86.6%
20	76.3%
40	64.5%
100	40.8%
200	29.0%

Atterberg Limits

Plastic Limit	
Liquid Limit	
Plastic Index	

Swell

Moisture at start	12.9%
Moisture at finish	20.2%
Moisture increase	7.2%
Initial dry density (pcf)	100
Swell (psf)	330

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			2/13/20

JOB NO.: 200199

FIG NO.: B-4