This report does not meet the requirements of 8.4.9 of the LDC. please provide a report that meets county standards.

Please address item 8.4.9a of the LDC. no map of potentially hazardous area included.

this reads like a construction report and does not meet the requirement of a soils and geology report.

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
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SUBSURFACE SOIL INVESTIGATION
7765 ELECTRONIC DRIVE
EL PASO COUNTY, COLORADO

Prepared for:

D. Stefano – Building and Restoration, Inc.
520 West 21st Street, G-2 #710
Norfolk, Virgina 23517

Attn: David Stefano

March 16, 2020

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Daniel P. Stegman

COLORADO LICENSED MARK HOWARD HAUSCHILD 35140 PROFESSIONAL ENGINEER
3/16/2020

Reviewed by:

Mark H. Hauschild, P.E.
Senior Engineer

DPS/ao

Encl.

Entech Job No. 200127
AAprojects/2020/200127/200127 ssi

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SUBSURFACE SOIL INVESTIGATION
7765 ELECTRONIC DRIVE
EL PASO COUNTY, COLORADO

1.0 INTRODUCTION

D. Stefano – Building and Restoration, Inc. is planning the construction of a 4-story storage facility with a 20,000-square foot footprint and associated site improvements on a site located at 7765 Electronic Drive, in El Paso County, east of the city limits of Colorado Springs, Colorado. The approximate location of the project site is shown on the Vicinity Map, Figure 1. The proposed development plan is shown on Figure 2, the Test Boring Location Map.

This report describes the subsurface investigation conducted for the planned building and provides recommendations for foundation design and construction. The Subsurface Soil Investigation included drilling a total of seven test borings on the site: five test borings in the footprint of the planned building, and two in the parking/drive areas, 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 our understanding that the project will consist of the construction of 4-story storage facility with a 20,000 square foot building footprint and associated site improvements. A detention basin is proposed in the southeast corner of the site. The building will utilize slab-on-grade floors. At the time of drilling, the site was vacant and vegetation consisted of weeds and field grasses with a few coniferous trees. The property slopes very gently to the southeast. The site is located on the south side Electronic Drive, west of Marksheffel Road in El Paso County, and east of Colorado Springs, Colorado. Adjacent properties consist of existing industrial and commercial development.

3.0 SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

The subsurface conditions were investigated by drilling seven exploratory test borings: five within the proposed building footprint and two within the parking/drive areas at the locations shown in Figure 2. The borings were drilled to depths ranging from approximately 10 and 40 feet below the existing ground surface. The drilling was performed using a truck-mounted continuous flight auger-drilling rig supplied and operated by Entech Engineering, Inc. Boring Logs description of the subsurface conditions encountered during drilling is presented in Appendix A. At the conclusion of and subsequent to drilling, observations of groundwater levels were made in each of the open borings.

Soil 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 Test Boring Logs in terms of N-values expressed in blows per foot (bpf). Soil samples recovered from the borings were visually classified and recorded on the Test Boring Logs. The soil classifications were later verified utilizing laboratory testing and grouped by soil type. The soil type numbers are included on the Test Boring Logs. The Test Boring Logs are presented in Appendix A.

Moisture Content, ASTM D-2216, was obtained in the laboratory for all recovered samples. Grain-Size testing, ASTM D-422 and Atterberg limits testing were performed on various samples for the purpose of classification and to obtain pertinent engineering characteristics. Volume change testing was performed on selected samples using the Swell/Consolidation Test and FHA Swell

Test in order to evaluate potential expansion/compression characteristics of the soil. Sulfate testing was performed on select samples to determine the corrosive characteristics of the soils. The Laboratory Test Results are included in Appendix B and summarized in Table 1.

4.0 SUBSURFACE CONDITIONS

Four soil types were encountered in the borings drilled for the subsurface investigation: Type 1: silty and clayey to vey clayey sand (SM, SC), Type 2: sandy clay (CL), Type 3: silty to clayey sandstone (SM, SC) and Type 4: sandy claystone (CL) and clayey siltstone (MH). The soil types 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

Soil Type 1 is a silty and clayey to very clayey sand (SM, SC). The sand was encountered in all of the test borings at depths ranging from the existing surface to 10 feet and extending to depths ranging from 4 to 34 feet below the ground surface (bgs) in Test Boring Nos. 1 through 5 and to the termination of Test Boring Nos. 6 and 7 (10 feet). Standard Penetration Testing on the sand resulted in N-values ranging from 6 to 25 bpf, which indicates loose to medium dense states. Water content and grain size analysis conducted on samples resulted in water contents of 3 to 16 percent, with approximately 13 to 41 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits Testing resulted in liquid limits of 28 and 36 and plastic indexes of 9 and 16 respectively. FHA Swell Testing resulted in an expansion pressure of 330 psf, indicating low expansion potential. Swell/Consolidation Testing resulted in a volume change of 2.7 percent, indicating moderate expansion potential. Sulfate testing resulted in 0.00 percent soluble sulfate by weight indicating a negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 2 is a sandy clay (CL). The sandy clay was encountered in four of the test borings, at depths ranging from the existing ground surface to 34 feet and extending to depths ranging from 6 to 39 feet bgs. Standard Penetration Testing on the clay resulted in N-values of 12 to 36 bpf, which indicates firm to very stiff consistencies. Water content and grain size analysis conducted on samples resulted in water contents of 11 to 25 percent, with approximately 68 and 89 percent of the soil size particles passing the No. 200 sieve. Atterberg limits testing resulted in liquid limits

of 40 and 49 and plastic indexes of 20 and 23, respectively. Swell/Consolidation Testing on a sample of sandy clay resulted in a volume change of 1.4%, which indicates a low to moderate expansion potential. Sulfate testing resulted in less than 0.01 and 0.22 percent soluble sulfate by weight, indicating negligible to severe potential for below grade concrete degradation due to sulfate attack.

Soil Type 3 is a silty to clayey sandstone (SM, SC). The sandstone was encountered in two of the test borings at depths of 34 and 38 feet below the ground surface (bgs) and extending to the termination of the borings (35 and 40 feet bgs). Standard Penetration Testing on the sandstone resulted in N-values greater than 50 bpf, which indicates very dense states. Water content and grain size analysis conducted on samples resulted in water contents of 14 to 18 percent, with approximately 20 percent of the soil size particles passing the No. 200 sieve. Atterberg limits testing resulted in a liquid limit of 36 and plastic index of 8. Sulfate testing resulted in less than 0.01 percent soluble sulfate by weight, indicating a negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 4 classified as a sandy claystone (CL) and clayey siltstone (MH). The claystone/siltstone was encountered in three of the test borings at depths ranging from 31 to 39 feet and extending to the termination of the borings (35 to 40 feet). Standard Penetration Testing on the claystone/siltstone resulted in N-Values of 28 to greater than 50 bpf, indicating stiff to hard consistencies. Water content and grain size testing resulted in water contents of 18 to 25 percent with approximately 76 and 98 percent of the soil size particles passing the No. 200 sieve. Atterberg limits testing resulted in a liquid limit of 69 and a plastic index of 22. Swell/Consolidation Testing resulted in volume changes of 0.8 and 2.2 percent, indicating low to moderate expansion potential. Sulfate testing resulted in less than 0.01 percent solvable sulfate by weight, indicating a measurable potential of concrete degradation due to sulfate attack.

Additional descriptions and engineering properties of the soil encountered during drilling are included on the boring logs (Appendix A). 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

Groundwater was not encountered in the test borings during or subsequent to drilling which were drilled to depths of 10 to 40 feet. It is anticipated groundwater will not affect construction on the site. Development of this and adjacent properties, as well as seasonal precipitation changes, and changes in runoff may affect groundwater elevations.

5.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered in the borings drilled in the planned building footprint. 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 new 4-story storage facility and associated site improvements. The subsurface conditions primarily consisted of medium dense silty sand with occasional clay lenses. Bedrock was encountered at depths of 31 to 39 feet in the test borings. The bedrock consisted of sandstone and claystone. Given the subsurface conditions encountered at the time of drilling and the site development as described, it is anticipated that a shallow foundation resting on the native sands, recompacted loose sands, or structural fill will be utilized. The native non-expansive medium dense granular soils encountered in the test borings are suitable to support the shallow foundation. SPT N-values measured in the sands indicated loose to medium dense conditions. Uncontrolled fill or loose soils, if encountered, should be penetrated or removed and recompacted according to the "Structural Fill" paragraph. Clays and clayey sands exhibiting low to moderate expansion potential were encountered in the upper soil profile of Test Borings No. 1, 5 and 6. These areas will require overexcavation. Claystone and siltstone exhibiting low to moderate expansion were encountered at depth in the test borings. Clays and claystone exhibiting moderate to high expansion potential are common in the area. If expansive or low bearing soils are encountered within 3 to 4 feet of foundation components the soils should

be overexcavated and replaced with non-expansive structural fill, or penetrated. Design considerations are discussed in the following sections.

5.1 Subgrade Improvements and Bearing Capacity

The structure can be supported with a shallow foundation resting on the native non-expansive medium dense sands, recompacted loose sands, or structural fill in areas of mitigated uncontrolled fills, low bearing soils and/or expansive soils. To provide uniform bearing the footing subgrade should be recompacted to a depth of 3 feet. The existing sand soils are suitable for the recompacted soils. Observations should be made during excavation to evaluate the subgrade for loose soils, low bearing, expansive clay soils, or uncontrolled fill. Loose soils or uncontrolled fill material encountered beneath foundation components or floor slabs, will require removal and recompaction. Any new fill should be placed to the requirements of the "Structural Fill" paragraph. On-site granular sands may be used as structural fill as approved by Entech. Any import material should be approved by Entech prior to hauling to the site.

Clay soils were encountered at the surface and at 4 feet bgs in the Test Boring Nos. 1 and 6. Additionally, clayey sand exhibiting moderate expansion potential was encountered at anticipated foundation grades in Test Boring No. 5. The clay soils in the area are known to be expansive and would provide unequal soil bearing in comparison to the well compacted site sand soils. The expansive soils within 3 to 4 feet of slabs or foundations grades should be penetrated or removed and replaced with structural fill or suitable site soils. The structural fill/site materials should be a non-expansive soil approved by Entech. An overexcavation depth of 3 to 4 feet is anticipated. Final depths of overexcavation should be determined for the building during open hole excavation observation.

The overexcavation subgrade should be scarified, moisture-conditioned, and compacted to a minimum of 95 percent of its maximum Standard Proctor Dry Density (ASTM D-698) at a moisture content 0 to +3 percent of optimum moisture content. The structural fill should be placed in 6-inch maximum completed lifts compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density (ASTM D-1557). The structural fill should be moisture-conditioned to within ± 2 percent of its optimum moisture content to aid in compaction. Density tests should be performed to verify compaction with the first density test performed at overexcavated subgrade

and when each 12 to 18 inches of fill have been placed. Bearing capacities will be determined at the time of the excavation observation.

Provided the above recommendations are followed, an allowable bearing pressure of 2400 psf is recommended for structural fill or recompacted sands. For final design, continuous spread footings are recommended to have a minimum width of 16 inches, and individual column footings should have minimum plan dimensions of 24 inches on each side. Exterior footings should extend a minimum of 30 inches below the adjacent exterior surface grade for frost protection. Following the above foundation subgrade preparation recommendations, and adhering to the recommended maximum allowable bearing pressure, it is expected to result in foundation designs, which should limit total and differential vertical movements up to 1 and ½ inches, respectively.

Foundation excavations/recompaction are recommended to extend at least 4 feet horizontally beyond the foundation wall limits (inside and outside) in order to provide adequate space for installation of drain materials (if necessary) and placement of controlled fill. All foundation excavation side slopes should be inclined at angles of 1½ horizontal to 1 vertical or flatter, as necessary, to provide for excavation sidewall stability during construction or as required by OSHA regulations.

Entech should observe overexcavated subgrades as well as the overall foundation excavation subgrade and evaluate if the exposed conditions are consistent with those described in this report. Entech should also provide recommendations for overexcavation depth, if necessary, and the need for drain systems based on the excavation conditions observed at that time.

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 45 pcf is recommended for the granular site soils and is anticipated for imported granular structural fills. It should be noted that these values apply 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.

5.2 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.

5.3 On-Grade Floor Slabs

The floor slabs may be supported on structural fill, native sands or recompacted on-site sand. Slabs placed on loose soils, uncontrolled fill soils, or expansive clays should be expected to experience movement. Clay soils encountered at or within 3 to 4 feet of floor slab grade should be removed and replaced with a non-expansive on-site or imported structural fill. The depth of overexcavation should be determined at the time of the excavation observation. On-site or imported granular soils, as approved by Entech, may be used as 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 ±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 unless they are designed as part of the foundation system. 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 and should be placed according to ACI Guidelines.

5.4 Surface and Subsurface Drainage

Positive surface drainage must be maintained around the structure to minimize infiltration of surface water. A minimum gradient of 5 percent in the first 10 feet adjacent to foundation walls is recommended. A minimum gradient of 2 percent is recommended for paved areas. All grades should be directed away from the structure. All downspouts should be extended to discharge well beyond the backfill zone of the structure.

A subsurface perimeter drain is not required providing the slab is located above exterior grade, interior and exterior backfill is properly compacted, surface grading is maintained and irrigation is

minimized. A subsurface perimeter drain is recommended for useable space below finished grade. A typical drain detail is shown in Figure 3. The drain should be provided with a free gravity outlet or be connected to a sewer underdrain. If such an outlet or connection is not available within a reasonable distance from the structure, a sump and pump system would be required.

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. 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.

5.5 Concrete

Soluble sulfate testing was conducted on select samples of the site soils to evaluate the potential for sulfate attack on concrete placed below the surface grade. The test results indicated 0.00 and less than 0.01 percent soluble sulfate by weight for the majority of the site soils and bedrock. The test results indicate the sulfate component of the majority in-place site soils present a negligible exposure threat to concrete placed below grade that comes into contact with the site soils. Soluble sulfate testing on a sample of sandy clay resulted in 0.22 percent soluble sulfate by weight, indicating a severe potential for below grade concrete degradation due to sulfate attack.

Type II cement is recommended for the granular soils and bedrock, which pose a negligible exposure threat, which includes imported structural fill materials. Type V cement is recommended for manufacture of any concrete that will come into contact with the native clay soils, which exhibited a severe threat. This includes concrete for a drilled pier foundation system, should they be used. We understand Type V cement may not be readily available. Concrete made with cement which meets ASTM C 150 Type II requirements, 20 percent fly ash, and a maximum water to cement ratio of 0.45 and air entrainment of 5 to 7 percent can be used to provide similar resistance. The fly ash should meet ASTM C 618 Class F requirements. High strength concrete (4500 psi) is recommended.

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.

5.6 Foundation Excavation Observation

Subgrade preparation for building foundations should be observed by Entech Engineering prior to construction of the footings and floor slab in order to verify that (1) no anomalies are present, (2) materials of the proper bearing capacity have been encountered or placed, and (3) no soft, loose, uncontrolled fill material, expansive 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.

5.7 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 Standard Proctor Dry Density (ASTM D-698) beneath footings or floor slabs prior to placing new fill. New fill beneath footings should be non-expansive 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). These 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. Imported soils should be approved by Entech Engineering, Inc. prior to being hauled to the site and on-site granular soils prior to placement.

Compacted, non-expansive granular soil, free of organics, debris and 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 should be non-expansive and be compacted to a minimum of 95 percent of the soils maximum dry density as determined by the Modified Proctor Test (ASTM D-1557). Fill material placed beneath floor slabs should be compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557. Fill material should be placed in horizontal lifts such that each finished lift has a compacted thickness of six inches or less. Fill should be placed at water contents conducive to achieving adequate compaction, usually within ±2 percent of the optimum water content as determined by ASTM D-1557. 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 overstressing. No water flooding techniques of any type should be used for compaction or placement of foundation or floor slab fill material.

5.8 Utility Trench Backfill

Fill placed in utility trenches should be compacted to a minimum of 95 percent of its maximum dry density as determined by the Standard Proctor Test (ASTM D-698) for cohesive soils and 95 percent as determined by the Modified Proctor Test (ASTM D-1557) for cohesionless soils. 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, within ±2 percent of the optimum water content. 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 El Paso County specifications. All excavation and excavation shoring/bracing should be performed in accordance with OSHA guidelines.

5.9 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 percent of the optimum water content, and compacted to a minimum of 95 percent of the ASTM D-1557 maximum dry density 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 maximum dry density. 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.

5.10 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).

5.11 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.

5.12 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 drains (if installed).
- Placement/compaction of fill material for the foundation components or floor slab.
- 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 D. Stefano – Building and Restoration, Inc. with application to the planned 4-story storage building to be located at 7765 Electronic Drive, in El Paso County, east of the city of Colorado Springs, 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

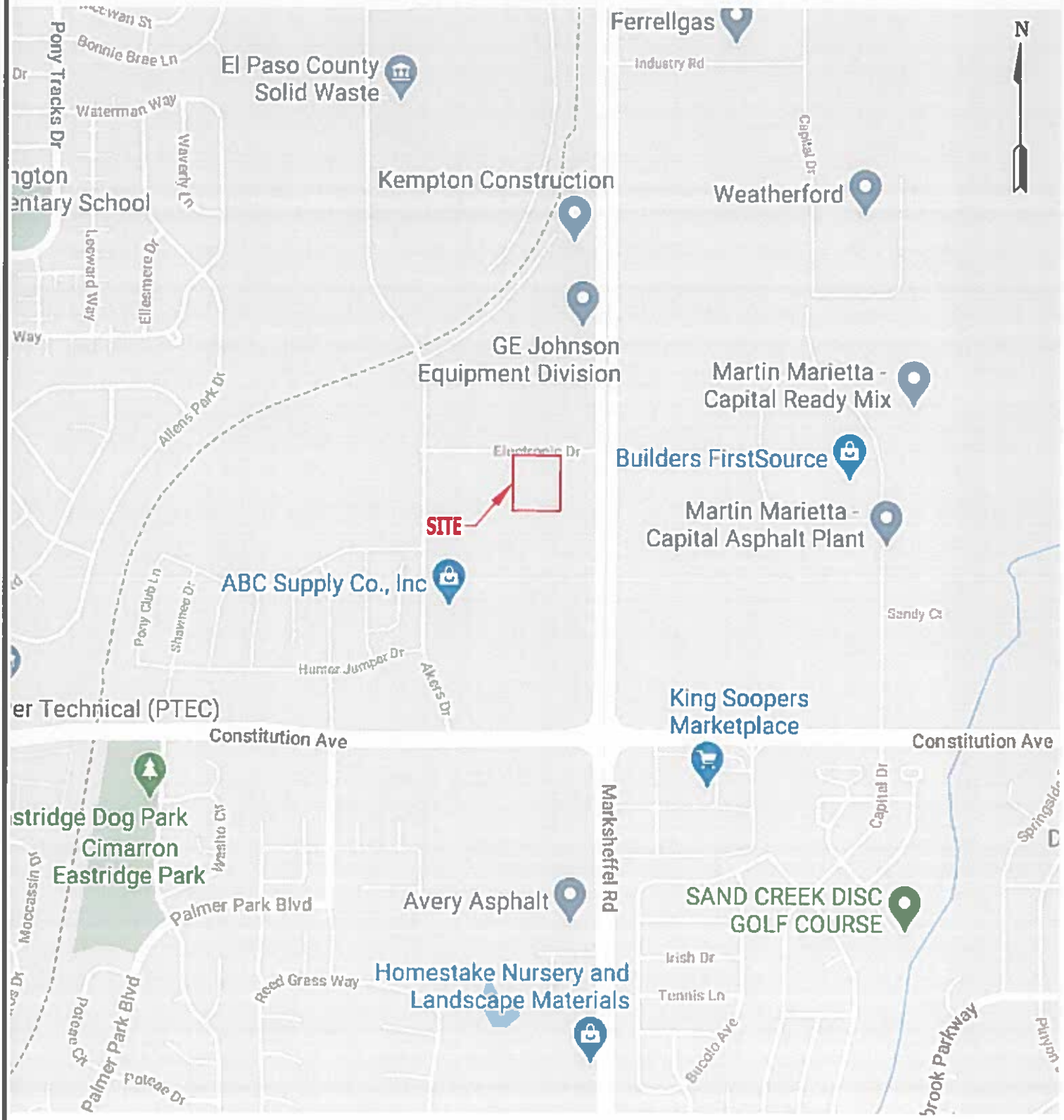
TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT D. STEFANO
PROJECT 7765 ELECTRONIC DRIVE
JOB NO. 200127

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	25			35.5	28	9	0.00			SC	SAND, CLAYEY
1	2	15			29.3						SC	SAND, CLAYEY
1	4	2-3			40.5						SC	SAND, VERY CLAYEY
1	4	20			25.1						SC	SAND, CLAYEY
1	5	15			12.7						SM	SAND, SILTY
1	7	1-2			38.8	36	16				SC	SAND, VERY CLAYEY
1	4	2-3			40.5				330		SC	SAND, VERY CLAYEY
1	5	5	16.8	99.1						2.7	SC	SAND, CLAYEY
2	1	5	21.1	91.7	88.9	49	23	0.22		1.4	CL	CLAY, SANDY
2	6	1-2			68.1	40	20	<0.01			CL	CLAY, SANDY
3	2	35			19.6	36	8	<0.01			SM	SANDSTONE, SILTY
4	5	35	32.7	88.3	75.8					2.2	CL	CLAYSTONE, SANDY
4	3	40	17.4	92.7	98.2	69	22	<0.01		0.8	MH	SILTSTONE

FIGURES

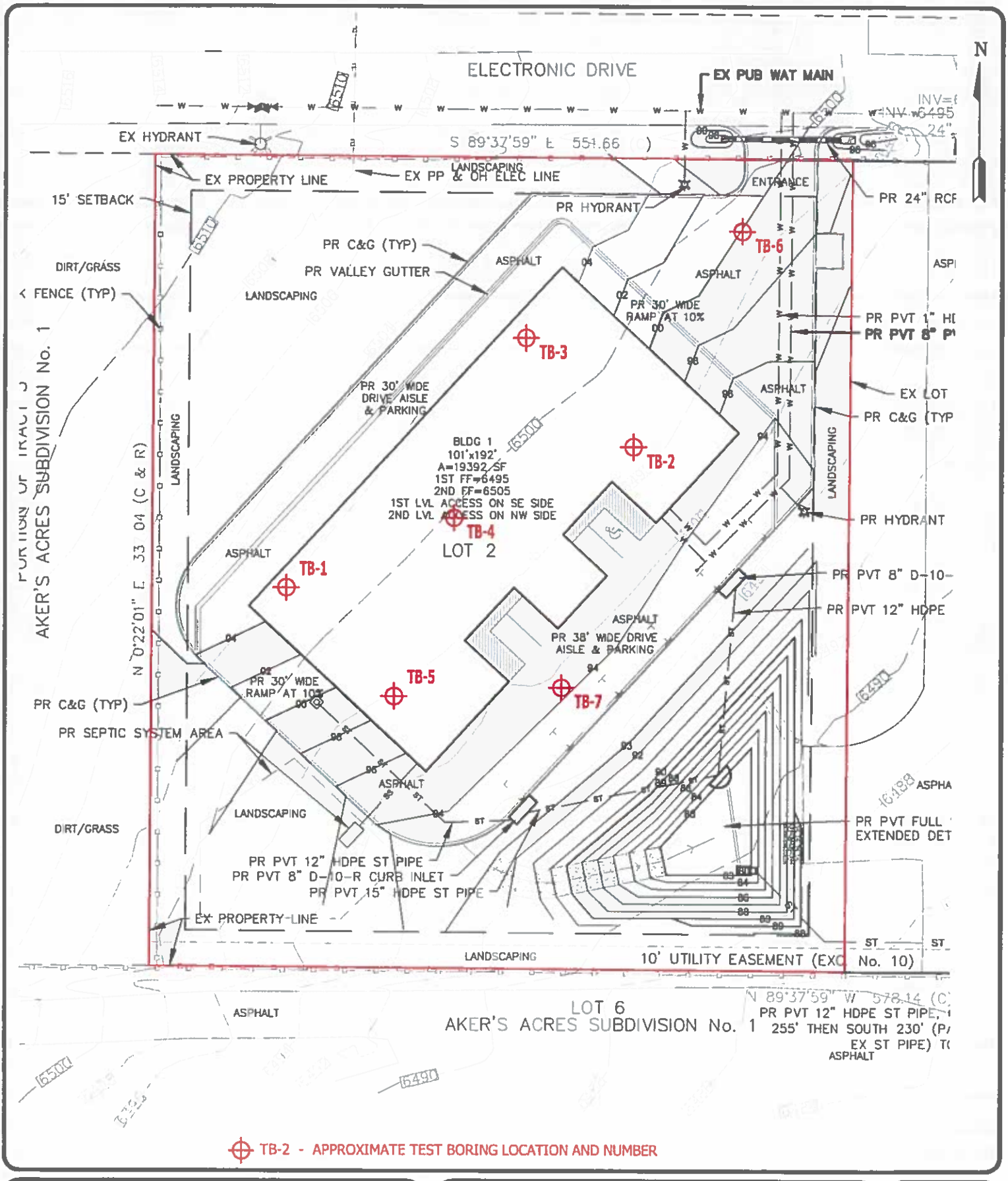


ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

VICINITY MAP
7765 ELECTRONIC DRIVE
EL PASO COUNTY, CO
FOR: D. STEFANO-BUILDING & RESTORATION, INC.

DRAWN BY:	DATE DRAWN:	DESIGNED BY:	CHECKED:
JAC	03/10/20	KAH	

JOB NO.: 200127
FIG. NO.: 1



TB-2 - APPROXIMATE TEST BORING LOCATION AND NUMBER

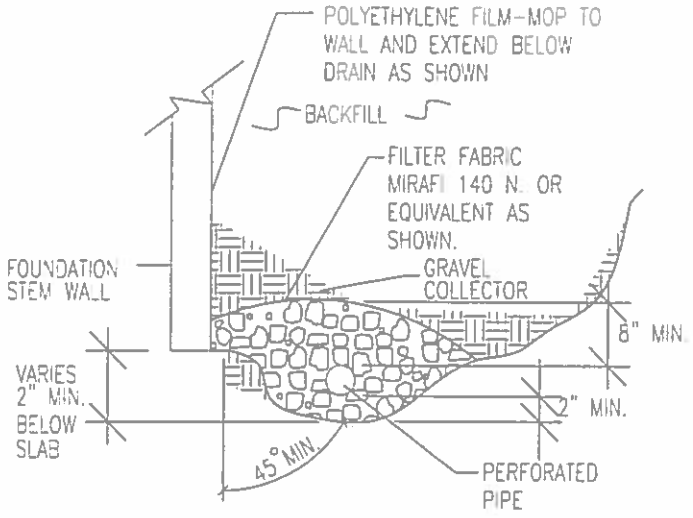
ENTECH ENGINEERING, INC.
325 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

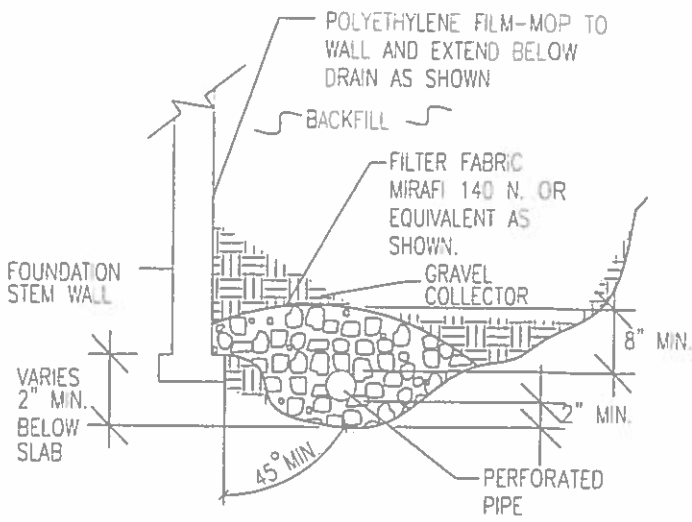
TEST BORING LOCATION MAP
7765 ELECTRONIC DRIVE
EL PASO COUNTY, CO
FOR: D. STEFANO-BUILDING & RESTORATION, INC.

DRAWN BY:	DATE DRAWN:	DESIGNED BY:	CHECKED:
JAC	03/10/20	KAH	

JOB NO.: 200127

FIG. NO.: 2





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) 531-5599

PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:
	3/10/20	DS	

JOB NO.: 200127

FIG NO.: 3

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 2/10/2020
Job # 200127

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 40', 2/11/20						
6" TOPSOIL, SAND, CLAYEY, FINE GRAINED, DARK BROWN, MEDIUM DENSE, MOIST				16	9.3	1
CLAY, SANDY, GRAY BROWN, STIFF, MOIST	5			15	17.1	2
	10			15	11.3	2
SAND, CLAYEY, FINE GRAINED, BROWN, MEDIUM DENSE, MOIST TO DRY						
	15			23	4.7	1
	20			20	11.1	1
	25			23	2.8	1
	30			20	5.4	1
CLAY, SANDY, DARK BROWN, FIRM, MOIST	35			12	17.2	2
SANDSTONE, CLAYEY, FINE GRAINED, TAN, VERY DENSE, MOIST	40			50/7"	17.8	3

TEST BORING NO. 2
DATE DRILLED 2/10/2020
CLIENT D. STEFANO
LOCATION 7765 ELECTRONIC DRIVE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 35', 2/11/20						
6" TOPSOIL, SAND, CLAYEY, FINE GRAINED, BROWN, MEDIUM DENSE TO LOOSE, MOIST				19	6.4	1
	5			9	4.7	1
	10			17	7.4	1
	15			15	10.7	1
	20			16	8.1	1
	25			17	6.5	1
VERY CLAYEY LENSES	30			16	15.8	1
SANDSTONE, SILTY, FINE GRAINED, TAN, VERY DENSE, MOIST	35			50/6"	13.9	3
	40					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			2/27/20

JOB NO.: 200127
FIG NO.: A- 1

TEST BORING NO. 3
DATE DRILLED 2/10/2020
Job # 200127

REMARKS

DRY TO 40', 2/11/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			7	5.7	1	6" TOPSOIL, SAND, CLAYEY, FINE GRAINED, BROWN, LOOSE TO MEDIUM DENSE, MOIST
5			13	6.2	1	
10			10	8.2	1	
15			14	6.7	1	
20			18	4.9	1	SILTY LENSES
25			13	6.4	1	
30			13	7.0	1	
35			15	17.3	2	CLAY, SANDY, BROWN, STIFF, MOIST
40			28	18.1	4	HIGHLY WEATHERED SILTSTONE, CLAYEY, GRAY BROWN, STIFF, MOIST

TEST BORING NO. 4
DATE DRILLED 2/10/2020
CLIENT D. STEFANO
LOCATION 7765 ELECTRONIC DRIVE

REMARKS

DRY TO 35', 2/11/20

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			22	7.0	1	6" TOPSOIL, SAND, VERY CLAYEY TO CLAYEY, FINE GRAINED, BROWN TO TAN, LOOSE TO MEDIUM DENSE, MOIST
5			9	6.6	1	
10			18	7.3	1	
15			19	7.1	1	
20			20	6.4	1	
25			13	10.3	1	
30			36	25.4	2	CLAY, SANDY, VERY STIFF, DARK BROWN, MOIST
35			50/10"	22.3	4	CLAYSTONE, SANDY, DARK GRAY, HARD, MOIST
40						

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE: 2/27/20

JOB NO. 200127
FIG NO. A- 2

TEST BORING NO. 5
DATE DRILLED 2/10/2020
Job # 200127

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 35', 2/11/20						
6" TOPSOIL, SAND, CLAYEY WITH ORGANICS, FINE GRAINED, DARK BROWN TO TAN, LOOSE TO MEDIUM DENSE, MOIST				6	8.2	1
	5			20	12.1	1
	10			16	6.3	1
SILTY LENSES	15			11	5.6	1
	20			11	9.9	1
	25			8	9.4	1
	30			14	6.2	1
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST	35			50	24.5	4

TEST BORING NO. 6
DATE DRILLED 2/10/2020
CLIENT D. STEFANO
LOCATION 7765 ELECTRONIC DRIVE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 2/11/20						
6" TOPSOIL, CLAY, SANDY WITH ORGANICS, DARK BROWN, FIRM TO STIFF, MOIST				12	11.0	2
	5			18	12.8	2
SAND, CLAYEY, FINE GRAINED, TAN, MEDIUM DENSE, MOIST	10			18	7.6	1
	15					
	20					

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TEST BORING LOG

DRAWN:	DATE	CHECKED:	DATE: 2/27/20

JOB NO. 200127
FIG NO. A-3

TEST BORING NO. 7
DATE DRILLED 2/10/2020
Job # 200127

TEST BORING NO.
DATE DRILLED
CLIENT D. STEFANO
LOCATION 7765 ELECTRONIC DRIVE

REMARKS

DRY TO 10', 2/11/20

REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Description
			14	6.6	1	SAND, VERY CLAYEY TO CLAYEY, FINE GRAINED, BROWN, MEDIUM DENSE, MOIST
5			25	7.4	1	
10			15	8.3	1	
15						
20						

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

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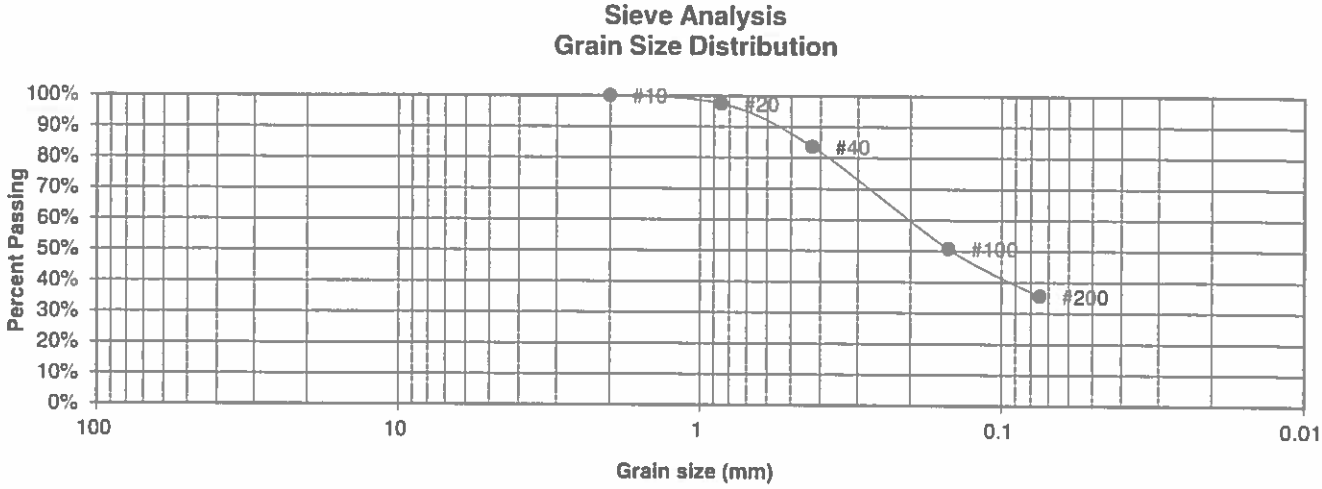
TEST BORING LOG

DRAWN:	DATE	CHECKED	DATE:
			2/27/20

JOB NO. 200127
FIG NO. A- 4

APPENDIX B: Laboratory Testing Results

UNIFIED CLASSIFICATION	SC	CLIENT	D. STEFANO
SOIL TYPE #	1	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	1	JOB NO.	200127
DEPTH (FT)	25	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	97.5%
40	83.6%
100	50.8%
200	35.5%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	28
Plastic Index	9

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

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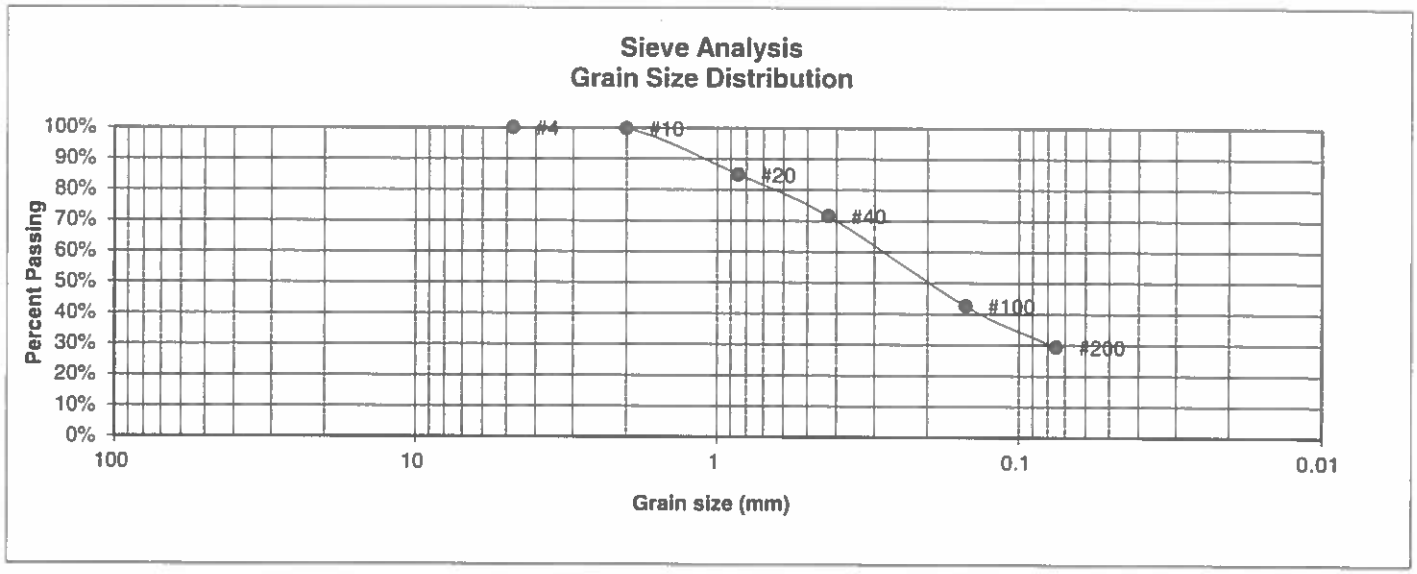
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			2/27/20

JOB NO: 200127

FIG NO: B-1

UNIFIED CLASSIFICATION	SC	CLIENT	D. STEFANO
SOIL TYPE #	1	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	2	JOB NO.	200127
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	84.9%
40	71.6%
100	42.6%
200	29.3%

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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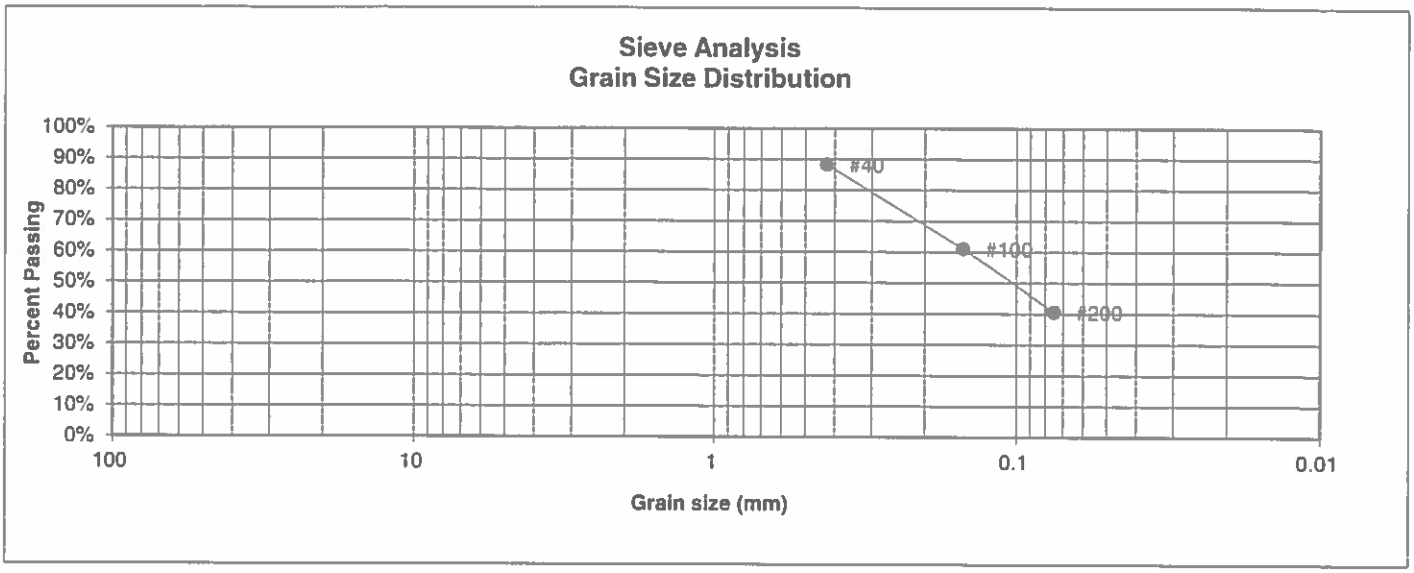
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			2/27/20

JOB NO: 200127

FIG NO: B-2

UNIFIED CLASSIFICATION	SC	CLIENT	D. STEFANO
SOIL TYPE #	1	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	4	JOB NO.	200127
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	88.2%
100	61.0%
200	40.5%

Atterberg Limits

Plastic Limit	
Liquid Limit	
Plastic Index	

Swell

Moisture at start	15.0%
Moisture at finish	19.9%
Moisture increase	4.9%
Initial dry density (pcf)	101
Swell (psf)	330

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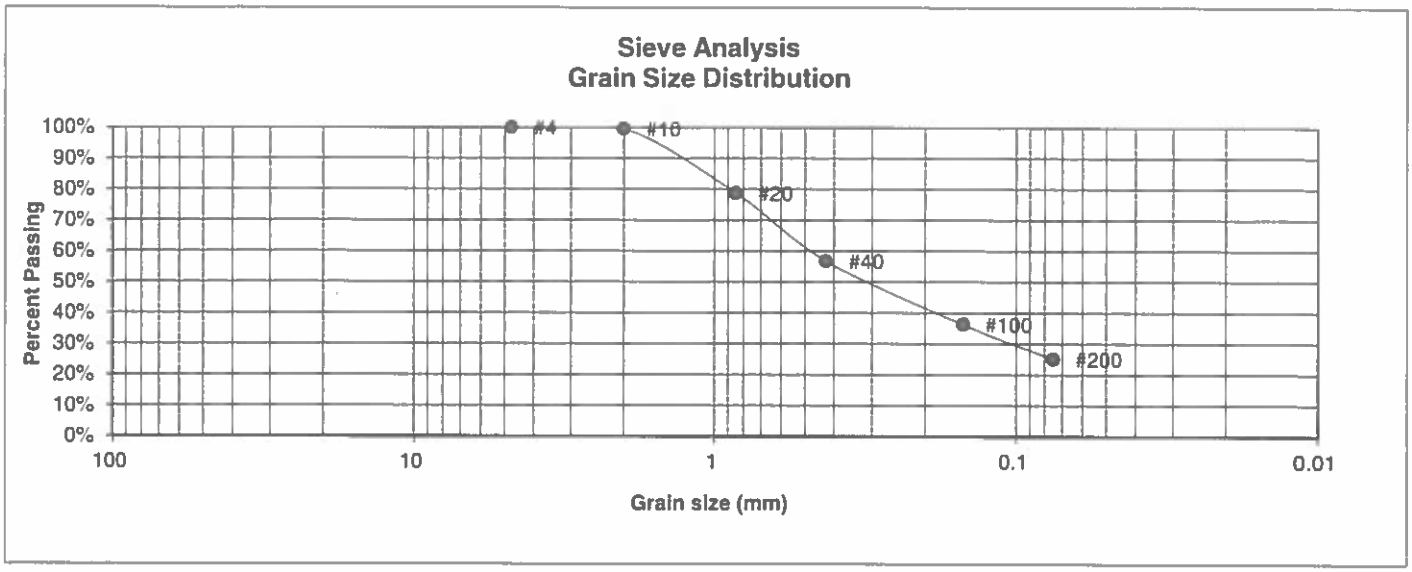
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
			3/16/20

JOB NO.: 200127

FIG NO.: TD-3

UNIFIED CLASSIFICATION	SC	CLIENT	D. STEFANO
SOIL TYPE #	1	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	4	JOB NO.	200127
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	99.6%
20	78.8%
40	56.7%
100	36.3%
200	25.1%

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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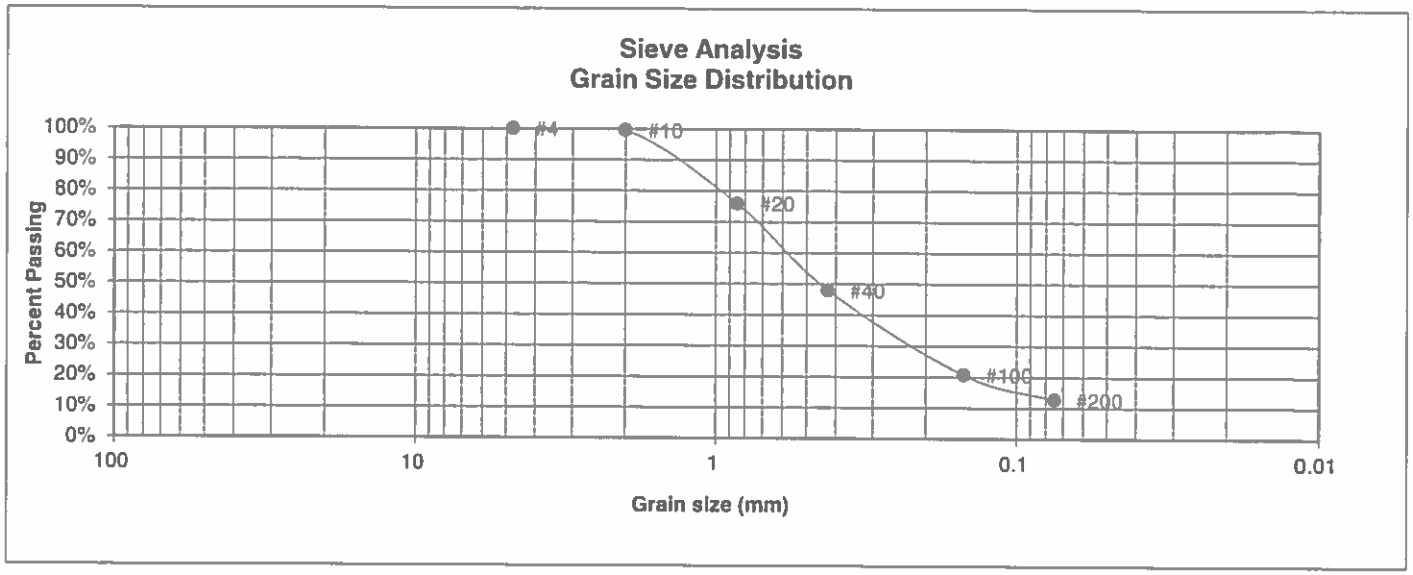
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE: 2/27/20

JOB NO.: 200127

FIG NO.: B-4

UNIFIED CLASSIFICATION	SM	CLIENT	D. STEFANO
SOIL TYPE #	1	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	5	JOB NO.	200127
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	75.9%
40	47.9%
100	20.7%
200	12.7%

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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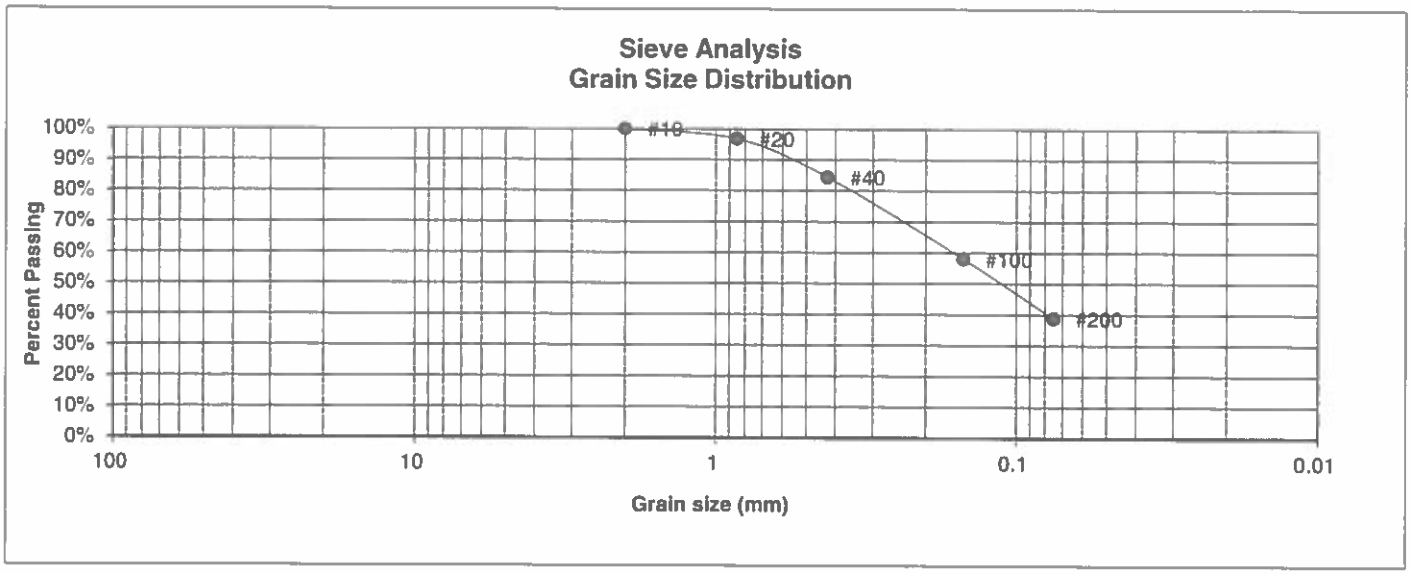
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE: 2/27/20

JOB NO. 200127

FIG NO. B-5

UNIFIED CLASSIFICATION	SC	CLIENT	D. STEFANO
SOIL TYPE #	1	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	7	JOB NO.	200127
DEPTH (FT)	1-2	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	96.8%
40	84.4%
100	58.0%
200	38.8%

Atterberg Limits	
Plastic Limit	20
Liquid Limit	36
Plastic Index	16

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

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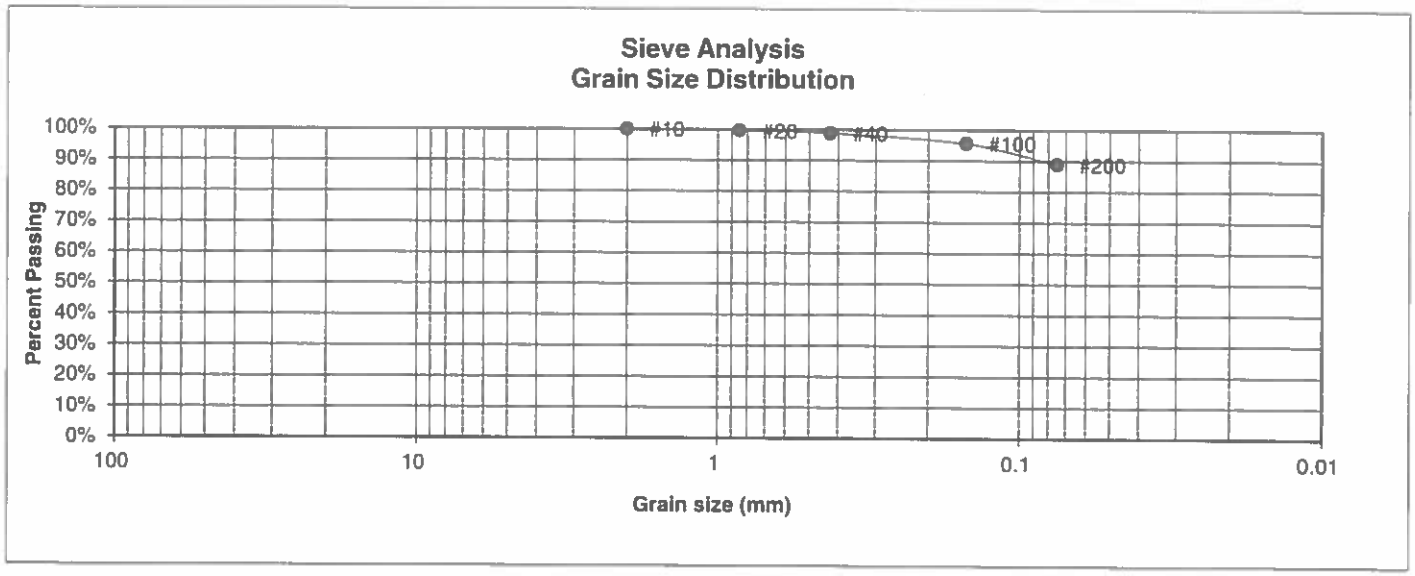
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE: 2/27/20

JOB NO: 200127

FIG NO: B-6

UNIFIED CLASSIFICATION	CL	CLIENT	D. STEFANO
SOIL TYPE #	2	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	1	JOB NO.	200127
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.6%
40	98.8%
100	95.6%
200	88.9%

Atterberg Limits

Plastic Limit	26
Liquid Limit	49
Plastic Index	23

Swell

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

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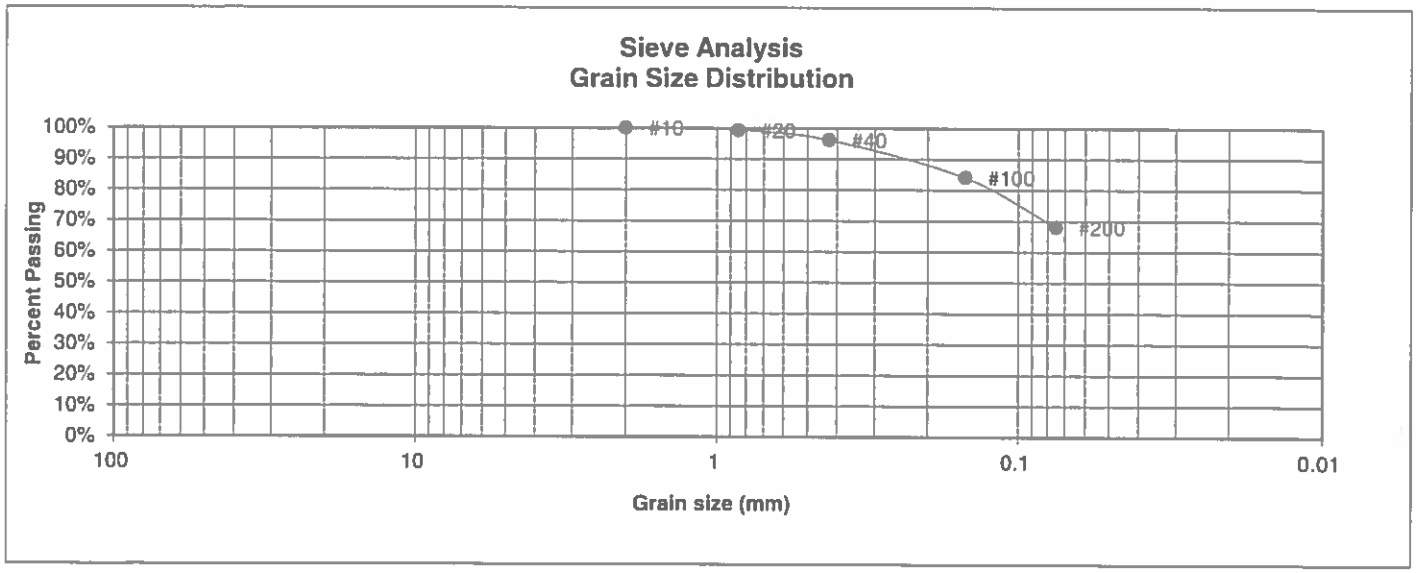
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			2/27/20

JOB NO.: 200127

FIG NO.: B-7

UNIFIED CLASSIFICATION	CL	CLIENT	D. STEFANO
SOIL TYPE #	2	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	6	JOB NO.	200127
DEPTH (FT)	1-2	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.3%
40	96.2%
100	84.1%
200	68.1%

Atterberg Limits	
Plastic Limit	20
Liquid Limit	40
Plastic Index	20

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

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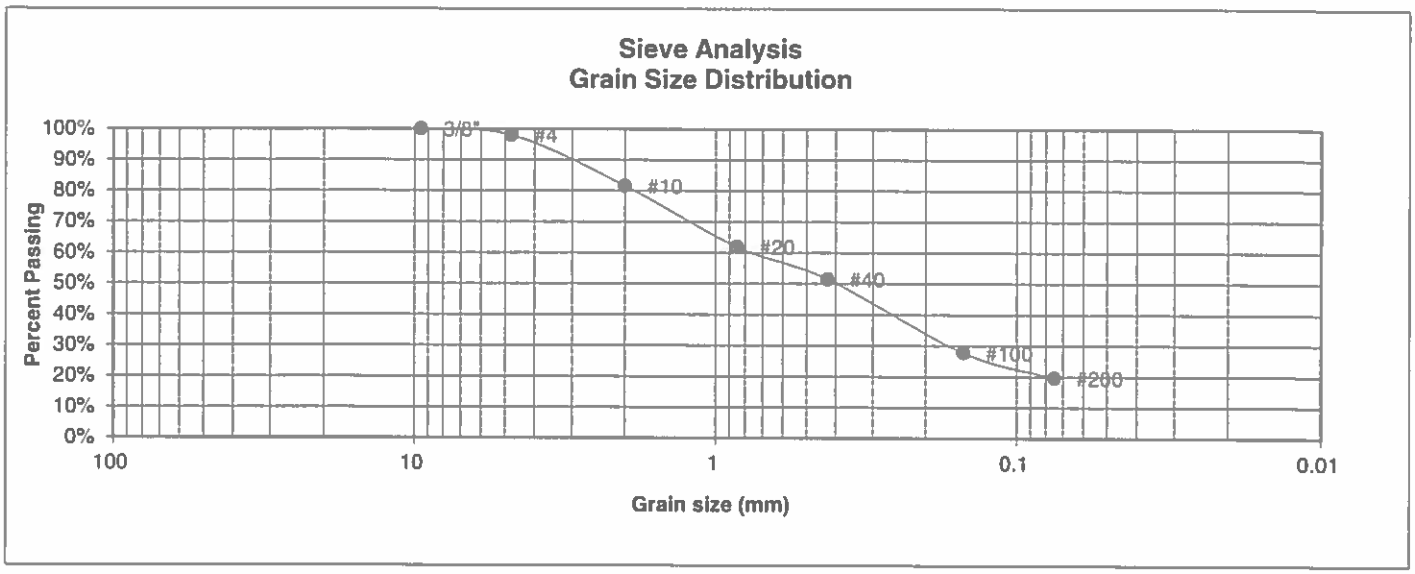
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			4/27/20

JOB NO.: 200127

FIG NO.: B-8

UNIFIED CLASSIFICATION	SM	CLIENT	D. STEFANO
SOIL TYPE #	3	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	2	JOB NO.	200127
DEPTH (FT)	35	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.0%
10	81.6%
20	61.9%
40	51.5%
100	27.7%
200	19.6%

Atterberg Limits	
Plastic Limit	28
Liquid Limit	36
Plastic Index	8

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

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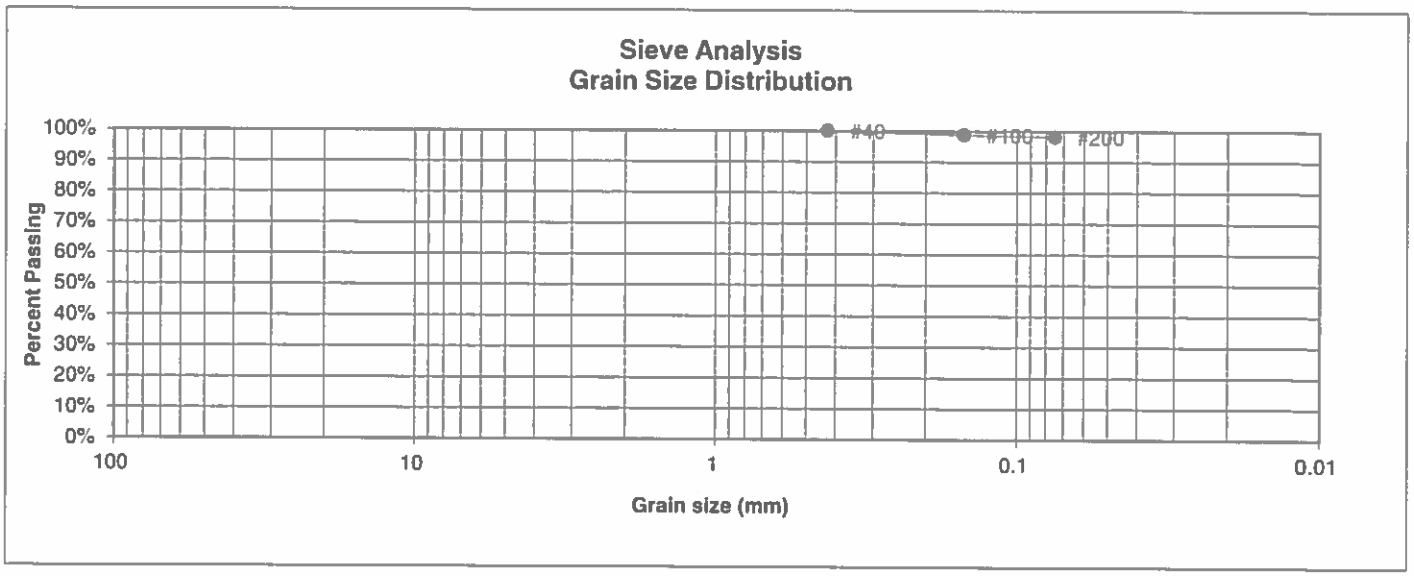
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			2/27/20

JOB NO. 200127

FIG NO. B-9

UNIFIED CLASSIFICATION	MH	CLIENT	D. STEFANO
SOIL TYPE #	4	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	3	JOB NO.	200127
DEPTH (FT)	40	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	100.0%
100	98.8%
200	98.2%

Atterberg Limits	
Plastic Limit	47
Liquid Limit	69
Plastic Index	22

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

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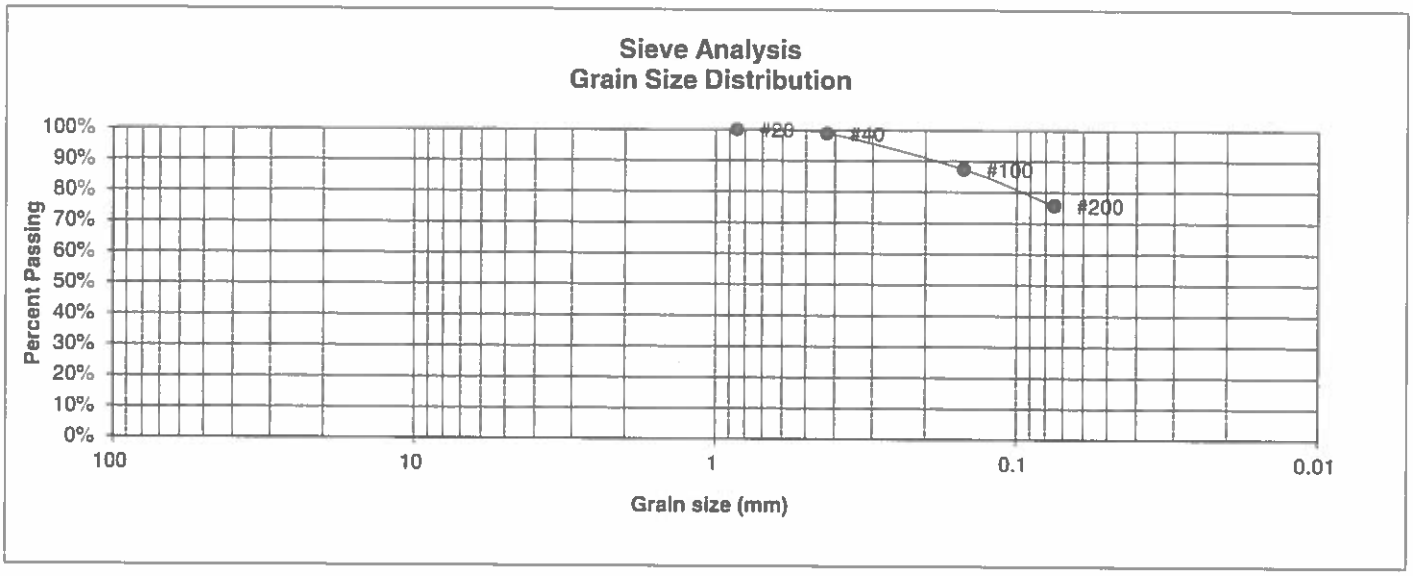
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		L	2/27/20

JOB NO. 200127

FIG NO. B - 10

UNIFIED CLASSIFICATION	CL	CLIENT	D. STEFANO
SOIL TYPE #	4	PROJECT	7765 ELECTRONIC DRIVE
TEST BORING #	5	JOB NO.	200127
DEPTH (FT)	35	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	98.8%
100	87.4%
200	75.8%

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
			2/27/20

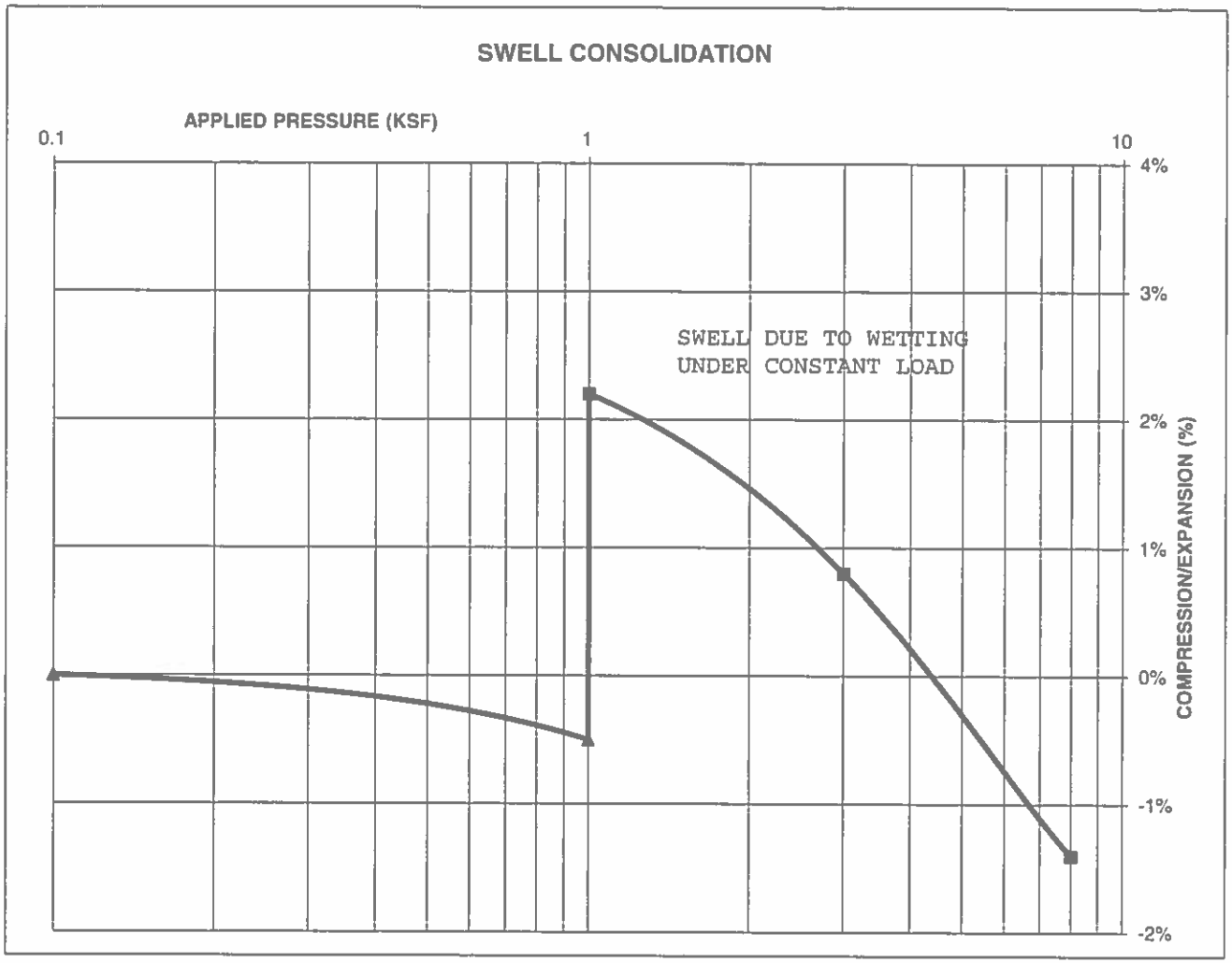
JOB NO. 200127

FIG NO. B-11

CONSOLIDATION TEST RESULTS

TEST BORING #	5	DEPTH(ft)	5
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			99
NATURAL MOISTURE CONTENT			16.8%
SWELL/CONSOLIDATION (%)			2.7%

JOB NO. 200127
CLIENT D. STEFANO
PROJECT 7765 ELECTRONIC DRIVE



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SWELL CONSOLIDATION
TEST RESULTS

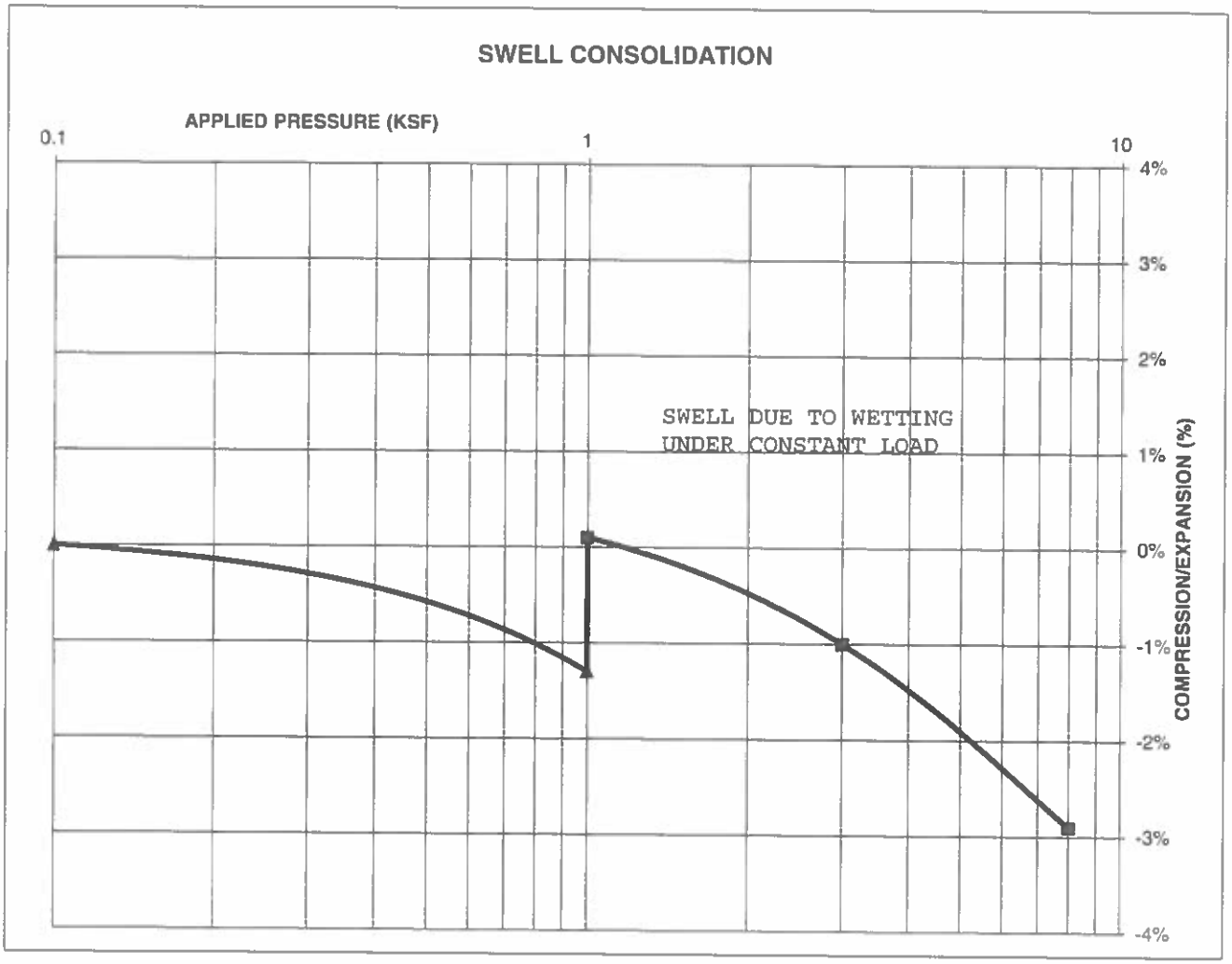
DRAWN	DATE	CHECKED:	DATE:
			3/16/20

JOB NO. 200127
FIG NO. B-12

CONSOLIDATION TEST RESULTS

TEST BORING #	1	DEPTH(ft)	5
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			92
NATURAL MOISTURE CONTENT			21.1%
SWELL/CONSOLIDATION (%)			1.4%

JOB NO. 200127
CLIENT D. STEFANO
PROJECT 7765 ELECTRONIC DRIVE



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SWELL CONSOLIDATION
TEST RESULTS

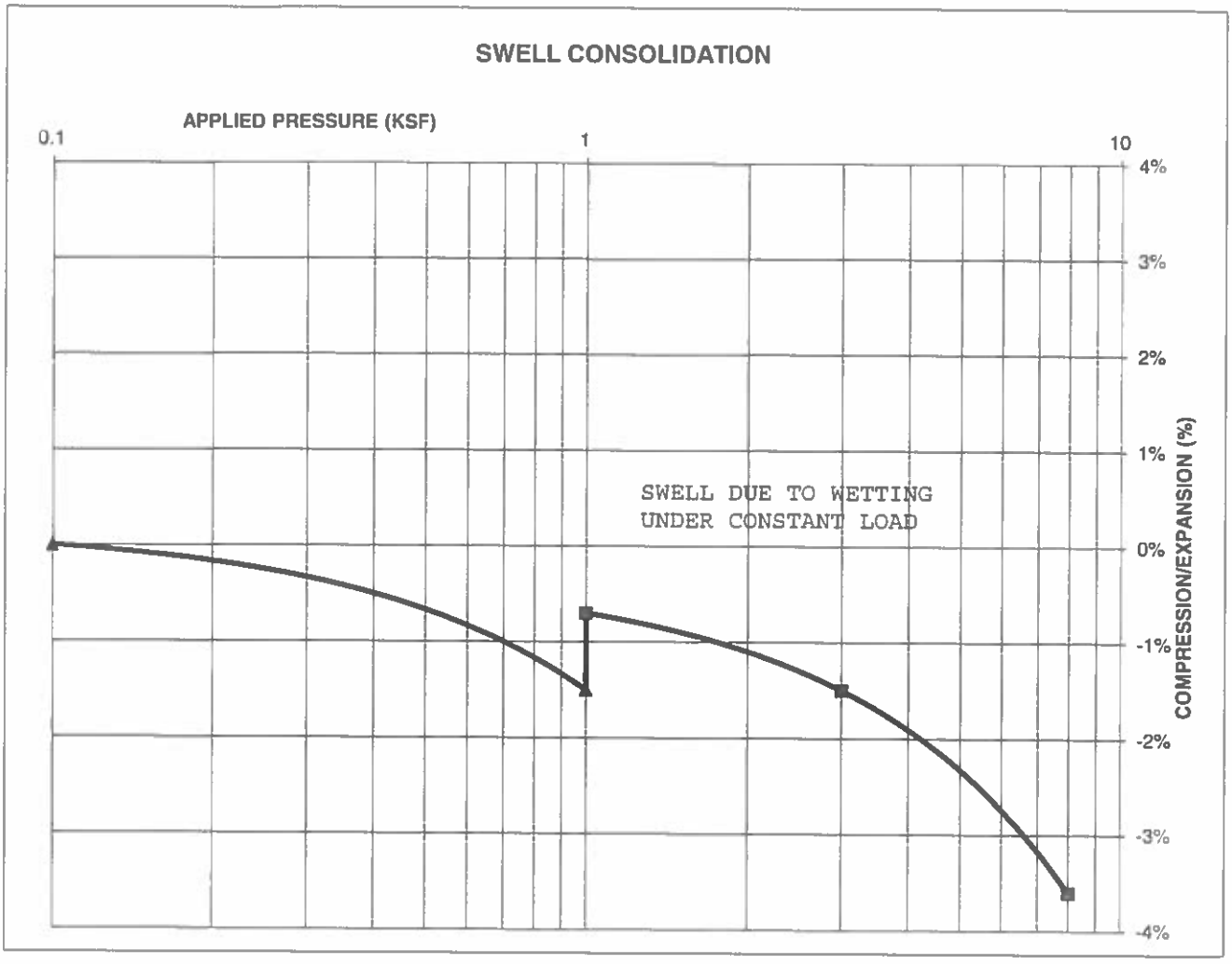
DRAWN:	DATE:	CHECKED:	DATE:
			2/27/20

JOB NO.: 200127
FIG NO.: B-13

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	40
DESCRIPTION	MH	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			93
NATURAL MOISTURE CONTENT			17.4%
SWELL/CONSOLIDATION (%)			0.8%

JOB NO. 200127
CLIENT D. STEFANO
PROJECT 7765 ELECTRONIC DRIVE



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SWELL CONSOLIDATION
TEST RESULTS

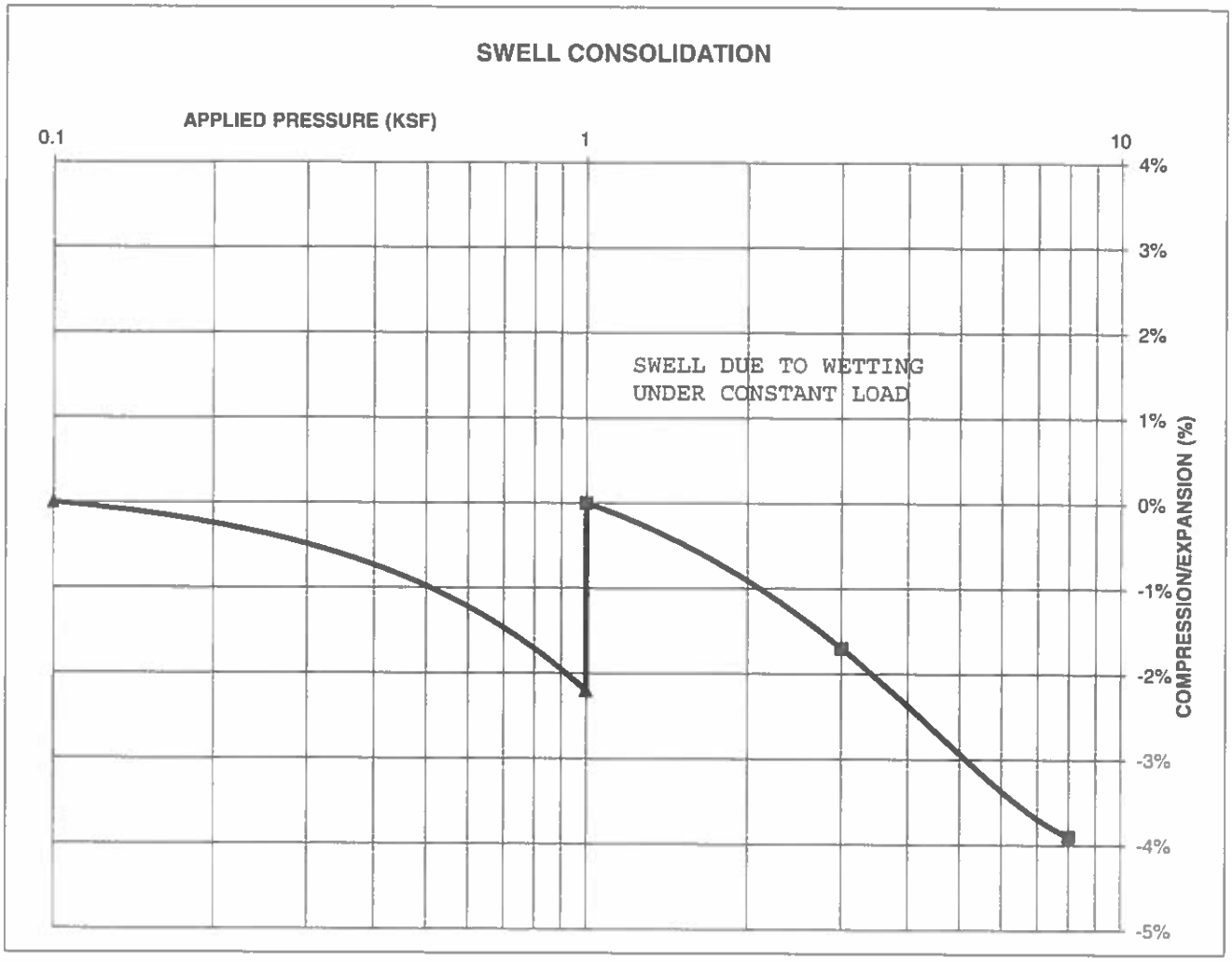
DRAWN:	DATE:	CHECKED:	DATE:
			2/27/20

JOB NO.: 200127
FIG NO.: B-14

CONSOLIDATION TEST RESULTS

TEST BORING #	5	DEPTH(ft)	35
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			88
NATURAL MOISTURE CONTENT			32.7%
SWELL/CONSOLIDATION (%)			2.2%

JOB NO. 200127
CLIENT D. STEFANO
PROJECT 7765 ELECTRONIC DRIVE



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		h	7/27/20

JOB NO.: 200127
FIG NO.: B-15

CLIENT	D. STEFANO	JOB NO.	200127
PROJECT	7765 ELECTRONIC DRIVE	DATE	2/18/2020
LOCATION	7765 ELECTRONIC DRIVE	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	5	2	CL	0.22
TB-1	25	1	SC	0.00
TB-2	35	3	SM	<0.01
TB-3	40	4	MH	<0.01
TB-6	1-2	2	CL	<0.01

QC BLANK PASS

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

LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			2/27/20

JOB NO.: 200127

FIG NO.: 13-16