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GEOTECHNICAL DESIGN REPORT
PASSENGER RAIL STATION IMPROVEMENTS
WELLS TRANSPORTATION CENTER
WELLS, MAINE

Prepared for:
Vanasse Hangen Brustlin, Inc.
South Portland, Maine

July 2023
09.0026004.01

Prepared by:

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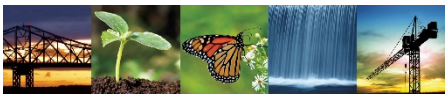

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Via Email

July 14, 2023
File No. 09.0026004.01

Mr. Tim Bryant, P.E.
Vanasse Hangen Brustlin, Inc.
500 Southborough Drive
Suite 105B
South Portland, Maine 04106

Re: Geotechnical Design Report
Passenger Rail Station Improvements
Wells Transportation Center
Wells, Maine

Dear Tim:

We are pleased to provide this Geotechnical Design Report (GDR) to Vanasse Hangen Brustlin, Inc. (VHB) for the improvements to the passenger rail station at Wells Transportation Center in Wells, Maine. Our services were provided in accordance with the Subconsultant Agreement between VHB and GZA GeoEnvironmental, Inc. (GZA), signed on June 9, 2022, which incorporates GZA's proposal No. 09.P000142.22 dated January 26, 2022, and the attached *Limitations* included in **Appendix A**. GZA is providing geotechnical engineering services as a Subconsultant to VHB, who is under contract with Northern New England Passenger Rail Authority (NNEPRA) for design of the proposed station improvements.

It has been a pleasure serving VHB on this phase of the project, and we look forward to our continued work with you through project completion. If you have any questions regarding the report, or if we can provide further assistance, please do not hesitate to contact the undersigned.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Nicholas V. Williams, P.E.
Project Manager

STATE OF MAINE
CHRISTOPHER L. SNOW
No. 7275
LICENSED PROFESSIONAL ENGINEER
07-14-2023

Andrew R. Blaisdell, P.E.
Consultant Reviewer

Christopher L. Snow, P.E.
Principal

NVW/CLS/ARB:erc
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APPENDIX C	Laboratory Test Results

1.0 INTRODUCTION

This report presents the results of GZA GeoEnvironmental, Inc.'s (GZA's) geotechnical evaluation for the proposed improvements to the Wells Transportation Center in Wells, Maine. Our services were provided in accordance with our executed contract dated June 9, 2022, and the attached *Limitations* included in **Appendix A**.

GZA is providing geotechnical engineering services as a Subconsultant to Vanasse Hangen Brustlin, Inc. (VHB), who is under contract with the Northern New England Passenger Rail Authority (NNEPRA) for design of the proposed station improvements.

1.1 BACKGROUND

The project includes improvements to the existing station, including a new platform south of the No. 2 track and a new pedestrian overpass to access the new platform. The site is located between Route 109, Interstate 95 (I-95) and the railroad in Wells, Maine as shown on **Figure 1 - Locus Plan**. A new 200-foot platform will be located on the south side of the railroad opposite the existing platform. It will consist of a 120-foot-long, reinforced concrete, high-level platform structure, and an 80-foot-long, paved, low-level platform. The pedestrian overpass will have an up-and-over configuration with stairs and elevators at both platforms connecting to an elevated walkway overpass over the No. 1 and No. 2 tracks. The layout of the proposed improvements is shown on **Figure 2** - **Boring Location Plan**.

1.2 OBJECTIVES AND SCOPE OF SERVICES

The objectives of our work were to evaluate subsurface conditions and to provide final geotechnical engineering recommendations for the proposed improvements to the existing station. To meet these objectives, GZA completed the following Scope of Services:

- Conducted a site visit to observe surficial conditions and reviewed available plans, and mapped surficial and bedrock geology of the site;
- Coordinated and observed preliminary and final subsurface exploration programs consisting of seven test borings, to evaluate subsurface conditions;
- Conducted laboratory testing programs to evaluate classification and engineering properties of the site soils;
- Completed geotechnical evaluations for soil properties; ASD factors of safety associated with geotechnical design elements, capacity of pile foundations; pile drivability; and bearing capacity of soil.
- Developed geotechnical engineering recommendations including foundation design recommendations for driven pile and shallow foundations, and design recommendations for the preferred foundation type;
- Evaluated potential settlement beneath earth-bearing structures; and
- Prepared this report summarizing our findings and final design recommendations.

2.0 SUBSURFACE EXPLORATIONS

GZA completed a preliminary subsurface exploration program consisting of five test borings (GZ-1 through -5) between December 5 and 10, 2018. Two additional borings (GZ-101 and -102) were drilled as part of the final design phase between August 2 and August 3, 2022. Borings were completed on both sides of the railroad and at the approximate locations of the pedestrian walkway structures.

The borings were drilled using an ATV-mounted drill rig and were backfilled with cuttings and gravel. VHB surveyed the as-drilled boring locations and elevations as indicated on **Figure 2**. Elevations referenced in this report are in feet and refer to the North American Vertical Datum of 1988 (NAVD88).

New England Boring Contractors of Hermon, Maine provided drilling services and coordinated utility clearance, and private utility clearance was provided by Maine Turnpike Authority. The borings were drilled to depths of approximately 36 to 77 feet below ground surface. GZA personnel monitored the drilling work and prepared logs of each boring, and Pan-Am Railways provided flagging personnel throughout the program. The boring logs are included in **Appendix B**.

The borings were drilled using 3- and 4-inch casings and drive-and-wash drilling techniques as noted on the boring logs. Standard Penetration Testing (SPT) and split-spoon sampling were performed continuously through the fill material (with the exception of GZ-2), then at 5-foot intervals thereafter, using a 24-inch-long, 1-3/8-inch inside-diameter sampler. Pocket Penetrometer tests were conducted to assess the undrained shear strength of Clay. Two thin-walled tube samples were taken in boring GZ-3 to provide samples for use in laboratory compressibility testing and laboratory vane shear testing.

A driven rod probe was advanced to practical refusal below the depth of sampling in boring GZ-1 to estimate the overburden thicknesses. A roller cone was advanced approximately 6 to 7 feet into probable bedrock in borings GZ-2 and GZ-3, and 5 feet of rock coring was performed in borings GZ-101 and GZ-102.

3.0 LABORATORY TESTING

GZA retained Thielsch Engineering's Geotechnical Laboratory in Cranston, Rhode Island to complete a soil testing program to assess the gradation and engineering characteristics of the soil; and R.W. Gillespie & Associates' laboratory in Biddeford, Maine to perform the consolidation and strength testing of the cohesive soil encountered. The program included: eleven gradation analysis / Maine Department of Transportation (MaineDOT) Frost Classification / Unified Soil Classification System (USCS) assessments, ten moisture content tests, four Atterberg Limit tests, four laboratory vane shear tests, and two, one-dimensional consolidation tests on soil samples taken from the explorations. Results of the testing are included in **Appendix C**.

4.0 SUBSURFACE CONDITIONS

4.1 SURFICIAL AND BEDROCK GEOLOGY

The available surficial geology maps[1] indicate that the site is mapped primarily as a Marine nearshore Deposit. This unit consists of till that has been reworked by the sea during regressive phase of marine submergence and has had finer constituents (Silt and Sand) removed and redeposited as thin veneers over till, and may include Marine Clay and Sand, as well as isolated boulders. Bedrock is commonly present at shallow depths. Secondary units are mapped as Wetland and/or Artificial Fill deposits.

Based on available bedrock geologic mapping[2], the site is underlain by Devonian Granite of the Webhannet Pluton, described as medium to coarse-grained, massive to very slightly foliated gray granite.

4.2 SUBSURFACE PROFILE

Five subsurface units were encountered above bedrock at the site: Topsoil, Fill, Marine Sand, Marine Clay, and Sand/Glacial Till. The encountered thicknesses, generalized descriptions, and selected engineering properties of the units encountered are described in descending order from ground surface in the following table. Detailed descriptions of the materials encountered at specific locations are provided in the boring logs in **Appendix B**.

[1] Smith, Geoffrey W., 1999, Surficial geology, Wells Quadrangle, Maine: Maine Geological Survey, Open-File Report 99-104.

[2] Osberg, Philip H., Hussey II, Arthur M., Boone, Gary, M., 1985. Bedrock Geologic Map of Maine, Maine Geological Survey, Department of Conservation, map, scale 1:500,000.

Soil Unit	Approximate Encountered Thickness (ft)	Generalized Description
Topsoil	0.2 to 0.5	Very loose to medium dense, dark brown, fine to coarse SAND, with varying amounts of Silt and Gravel, traces of roots and leaves (USCS: SM). *Encountered in borings GZ-1, -2, -101 and -102*
Fill	0.8 to 7.2	Loose to medium dense, brown, fine to coarse SAND, little to some Gravel, trace to some Silt (USCS: SM, SP-SM). MaineDOT Frost Classification = 0 – III *Encountered in all borings.*
Marine Sand	0.8 to 12.5	Medium dense to very dense, gray to brown, fine to medium SAND, trace to some Silt (USCS: SP-SM, SM). MaineDOT Frost Classification = 0-II *Encountered as layers interbedded with the marine clay in all borings.*
Marine Clay	4.7 to 42	From medium stiff to very stiff, gray, Silty CLAY, little to trace fine Sand noted as lenses, seams and partings throughout deposit (USCS: CL); to Soft, gray, Silty CLAY, occasional trace fine Sand (USCS: CL). *Encountered in all borings.*
Sand or Glacial Till	2.4 to 24.5	Very dense, brown to gray, fine to coarse SAND, some to little Gravel, some to trace Silt (USCS: SM, SW-SM) *Encountered in borings GZ-1, -2, -3, -5, -101, and -102*
Top of Probable Bedrock Elevation	Encountered Probable Top of Rock ranging from Approx. El. 60 to El. 102 *Encountered in borings GZ-1, -2, -3, -101, and -102*	

The top of bedrock elevation was initially evaluated based on split spoon, roller bit, or drive probe refusals, and was confirmed with rock coring in GZ-101 and -102. Bedrock was described as hard, fresh, coarse-grained, black and white, GRANITE. The primary joints were typically very close to moderately spaced, low angle, planar, smooth, fresh to discolored, and partially open to very wide. The secondary joints were typically closely spaced, moderately dipping to high angle, planar, smooth, discolored, and moderately wide. The Rock Quality Designation (RQD) ranged from 12 to 48.

Groundwater was encountered at depths between 1.4 and 8.7 feet below ground surface at the time of the explorations, corresponding to approximately El. 129 to El. 124. Groundwater levels in the borings were taken during or immediately after drilling and may have been affected by drilling procedures, which included introduction of water for drilling purposes. Measured groundwater levels are presented on the boring logs.

Fluctuations in groundwater level occur due to variations in season, precipitation, and construction activities in the area. Consequently, water levels during construction are likely to vary from those encountered at the time the observations were made.

5.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS

5.1 GENERAL

GZA conducted geotechnical engineering evaluations in accordance with Allowable Stress Design (ASD), the 2015 International Building Code (IBC) and the AREMA Manual for Railway Engineering, latest edition. To the extent that portions of these documents are applicable, we also referenced AASHTO LRFD Bridge Design Specifications 2019 Edition and the Maine Department of Transportation Bridge Design Manual. The sections that follow describe the evaluations made and the geotechnical basis for evaluation of each element.

5.2 INTERPRETATION OF MARINE CLAY PROPERTIES

The marine clay profile encountered at the site includes a heavily overconsolidated upper clay crust overlying moderately overconsolidated primarily stiff silty clay. Nearly all of the clay has experienced greater loading in the past than in its current condition. As a result of the overconsolidation, the material is less compressible, and tends to compress more rapidly than normally consolidated clay.

5.3 EVALUATION OF FOUNDATION TYPES

Foundation support types for the proposed transportation center improvements are outlined below. The site conditions include variable thicknesses of fill, marine clay and sand deposits overlying glacial till and bedrock. As previously described, the marine clay deposits typically consist of a stiff, moderately compressible layer.

VHB has indicated that the stairway/elevator shafts, bridge piers, and mini-high platform piers have very little tolerance for post-construction settlement due to the length and height of the pedestrian bridge spanning the railroad tracks and operational constraints of mechanical utilities in the elevators. To eliminate the risk of post-construction settlement of these elements, deep foundations were chosen for support.

The plans for the project indicate the new platform expansion will consist of the following:

- Stairway and elevators supported by H-piles on both sides of the proposed pedestrian bridge;
- A Pedestrian bridge spanning the railroad tracks supported by H-piles;
- A mini-high platform supported by piers on the south side of the tracks, each pier supported by pairs of H-piles;
- An ADA ramp located on the south side of the proposed High Platform supported by H-piles or shallow foundations; and
- A lower platform constructed as an earth filled structure with timber facing and bituminous concrete surface.

5.4 PILE DESIGN CONSIDERATIONS AND RECOMMENDATOINS

5.4.1 Pile Type and Loading

It is our understanding that VHB plans to utilize ASTM A572 Grade 50 steel HP10x42 piles to support the proposed stairway, elevator, and bridge structures. VHB provided an axial design load of 120 kips per pile. The piles will be driven to refusal on or near the top of rock to achieve the required axial geotechnical resistance. Since the piles will gain support largely in end bearing, there is no reduction for group interaction in axial compression.

Axial Capacity

The H-piles will gain axial geotechnical compressive resistance through a combination of skin friction and end bearing on or near the bedrock surface. In GZA's experience for piles gaining a significant portion of their geotechnical resistance on bedrock, the drivability resistance will control the geotechnical static resistance of the pile. We recommend that the pile-driving criteria be established based on dynamic pile testing with signal-matching analysis. Based on the loads provided, piles should be driven to 300 kips to provide a factor of safety of 2.5 on axial design load.

Axial tension capacity may be assumed to be 13 kips per pile based on a factor of safety of 3 and an embedment of at least 25 feet.

5.4.2 Preliminary Drivability Analysis

GZA completed a wave equation analysis to assess drivability of the proposed piles. A Delmag D16-32 open-end diesel hammer with maximum rated energy of 40,200 foot-pounds was evaluated driving a 25- to 70-foot-long ASTM A572 Grade 50 steel HP10x42 pile. The analyses were completed using GRLWEAP software.

Pile Location and Type	Embedded Pile Length	Driving System	Required Geotechnical Capacity (kips)	Max Driving Stress (ksi)	Final Penetration Resistance (blows per inch)
North Stairway/Elevator	25 feet	Delmag D16-32*	300	37	8
West Side of High Platform	70 feet	Delmag D16-32 **	300	33	8

*Hammer was operated on the lowest fuel setting (1095 psi).
** Hammer was operated on the highest fuel setting (1500 psi).

The results show that the driving stresses do not exceed the limiting driving stress of 45 ksi for ASTM A572 steel (0.9fy), and that the pile can be driven with a blow count between approximately 6 and 15 blows per inch. In our opinion a diesel hammer system similar to the typical hammer system used in the preliminary analysis would be suitable to install the piles to an ultimate capacity of 300 kips providing a factor of safety of 2.5 on a 120-kip design capacity. To limit driving damage, the steel H-piles should be fitted with APF Hard-Bite Points Model HP-77600-B or similar.

5.4.3 Lateral Pile Analysis

GZA developed a design soil profile for lateral pile evaluation at the shallowest anticipated location (North Elevator/Stairway). The profile reflects the soil conditions encountered in the test borings.

L-PILE® INPUT PARAMETERS NORTH STAIRWAY/ELEVATOR AREA, PILE LENGTH = 26 FT (BORING GZ-101)						
Stratum	**Soil Model**	**Top of Layer Elevation (ft- NAVD 88)**	**Layer Thickness (ft)**	**k (pci) / E50 / UC (psi)**	**ϕ' (deg) / Su (psf)**	**γ_e (pcf)**
Fill	Reese Sand	134.0[1]	6.5	85	32	125
Marine Sand	Reese Sand	127.5	6	55	32	56
Marine Clay	Stiff Clay	121.5	10	E_{50}=0.01	1000	46
Glacial Till	Reese Sand	111.5	9.5	85	35	66
Bedrock	Weak rock	102.0	--	Krm = 0.0005	--	96

1. The top of the pile is at El. 128, assume Marine Sand is up to El. 128 at the top of the pile.

The pile was modeled as both a pinned top connection (0 moment) assuming pile embedment into concrete less than 2 times the pile width, and as a fixed top connection (0 rotation) assuming the pile was embedded at least 2 times the pile width.

GZA conducted lateral pile analyses to estimate the amount shear to deflect the top of the pile ¼" and ½" with the pile bending about the weak or strong axes considering an ASTM A572 Grade 50, HP 10x42 pile. Lateral pile analysis used the Ensoft, Inc. LPILE version 2016.9.06 software. The axial load was 120 kips, representing the design axial load, and a maximum shear of up to 10 kips was provided by VHB. Our results are summarized in the table below.

L-PILE® RESULTS							
Orientation	**Condition**	1/4" Deflection			1/2" Deflection		
		Shear applied (kips)	Top Rotation (rad)	Max Total Stress (psi)	Shear applied (kips)	Top Rotation (rad)	Max Total Stress (psi)
Weak	Pinned	2.75	0.004	17,948	4.5	0.008	24,891
[1]Weak	Fixed	7.75	0	32,754	10	0	40,501
Strong	Pinned	4.75	0.004	15,657	7.5	0.007	19,697
[1]Strong	Fixed	10	0	21,864	-	-	-

1. Weak Axis – fixed condition resulted in pile overstressing based on 0.55*fy (AREMA).
2. Strong Axis – fixed condition resulted in a total of 0.2" deflection.

5.5 SHALLOW FOUNDATIONS

GZA evaluated the option of supporting the proposed ADA ramp structure on spread footing foundations, bearing on medium dense granular fill.

Based on the plans, the proposed spread footing width is 9 feet, and VHB provided a design footing pressure of 1,500 psf and design life of 50 to 75 years. We anticipate that stress increases from the new fill and spread footings would cause recompression of the marine clay. We estimate that the total post-construction settlement will be approximately ½ to ¾ inches, relative to the pile supported platform which is anticipated to have negligible settlement. It is anticipated that this magnitude of differential settlement can be accommodated using a typical bridging plate. We recommend the ramp footing contact pressure be limited to 1.9 ksf and that the footings be approximately 9 feet wide.

The lower platform will consist of an earth-filled retaining structure with a paved surface. Considering the maximum proposed fill height up to approximately 3 feet, and that the loading will be moderate, we estimate the post-construction settlement of the lower platform to be on the order of ½ inch. The structural engineer should review the estimated settlement magnitude to access its acceptability for the continued performance of the proposed structure.

Buried Retaining Walls

It is recommended that the walls be backfilled with free draining material compacted to at least 95% of the maximum dry density (ASTM D1557) (92 % maximum within 5 feet of the wall). For wall design, a moist unit weight of 135 pcf and an internal angle of friction of 32 degrees are recommended for granular backfill. A drainage system should be provided to prevent the buildup of hydrostatic pressures behind the walls. Drainage may consist of 4-inch diameter weep holes through the wall, spaced 10 feet on center. The walls should also be designed for any surcharge loads that may occur, including construction traffic.

For walls that are unrestrained at the top, an active soil pressure coefficient (K_a) of 0.3 is recommended. For foundation and retaining walls that are restrained at the top, an at-rest soil pressure coefficient (K_o) of 0.5 is recommended. Foundation walls not designed for lateral earth pressures should be backfilled evenly on both sides with a maximum difference of 2 feet between the height of the material on each side.

Lateral loads and base shear forces applied to foundation walls may be resisted by bottom friction on the footings. We recommend using the ultimate friction factors tabulated below to estimate sliding resistance.

Bearing Material	Ultimate Sliding Coefficient
Compacted Fill or Marine Sand	0.4
Silty Clay	0.3

The minimum factors of safety for sliding and overturning under static loads should be 1.5 and 2, respectively. Passive soil resistance should be ignored when analyzing for overturning and sliding.

5.6 FROST AND SUBGRADE CONSIDERATIONS

Based on the MaineDOT BDG, the Design Freezing Index for the site is approximately 1300. Therefore, in accordance with Figure 5-1 of the BDG, considering primarily saturated granular subgrade material, the estimated depth of frost penetration is about 55 inches. Consistent with MaineDOT BDG, we recommend that the new foundations be embedded at least 55 inches below the nearest ground surface exposed to freezing.

5.7 SEISMIC DESIGN

Seismic design parameters were developed in accordance with the 2015 IBC. Based on SPT N-Values and field vane test results, a Site Class D (stiff soil profile) is recommended for design. The peak ground acceleration coefficient, and short- and long-period spectral acceleration coefficients were interpolated from the AASHTO design guide maps (3.10.2.1-1 through -21 as appropriate). Based on the site coordinates, the recommended AASHTO Response Spectra (Site Class D) for a 7 percent probability of exceedance in 75 years are summarized for the site are as follows:

SITE CLASS D SEISMIC DESIGN PARAMETERS	
Parameter	**Design Value**
Mapped short-period spectral response acceleration, Ss	0.250 g
Mapped long-period spectral response acceleration, S_1	0.078 g
Short-period site coefficient, Fa	1.6
Long-period site coefficient, Fv	2.4

Based on depth to groundwater and density of the subsurface soils, the Site is not likely to be susceptible to liquefaction.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 FOUNDATION SUBGRADE PREPARATION

Excavation to footing subgrade should be performed using a smooth-edged bucket in order to limit disturbance of soil subgrades.

6.2 PILE INSTALLATION CONTROL

We recommend that the pile installation be controlled using wave equation analysis of the contractor's proposed driving system and field logging of the pile installation, and that final penetration resistance be based on dynamic pile testing with signal matching analysis. We recommend that two dynamic pile tests with signal matching be performed at the site at the end of initial drive and again at the beginning of restrike 24 hours later.

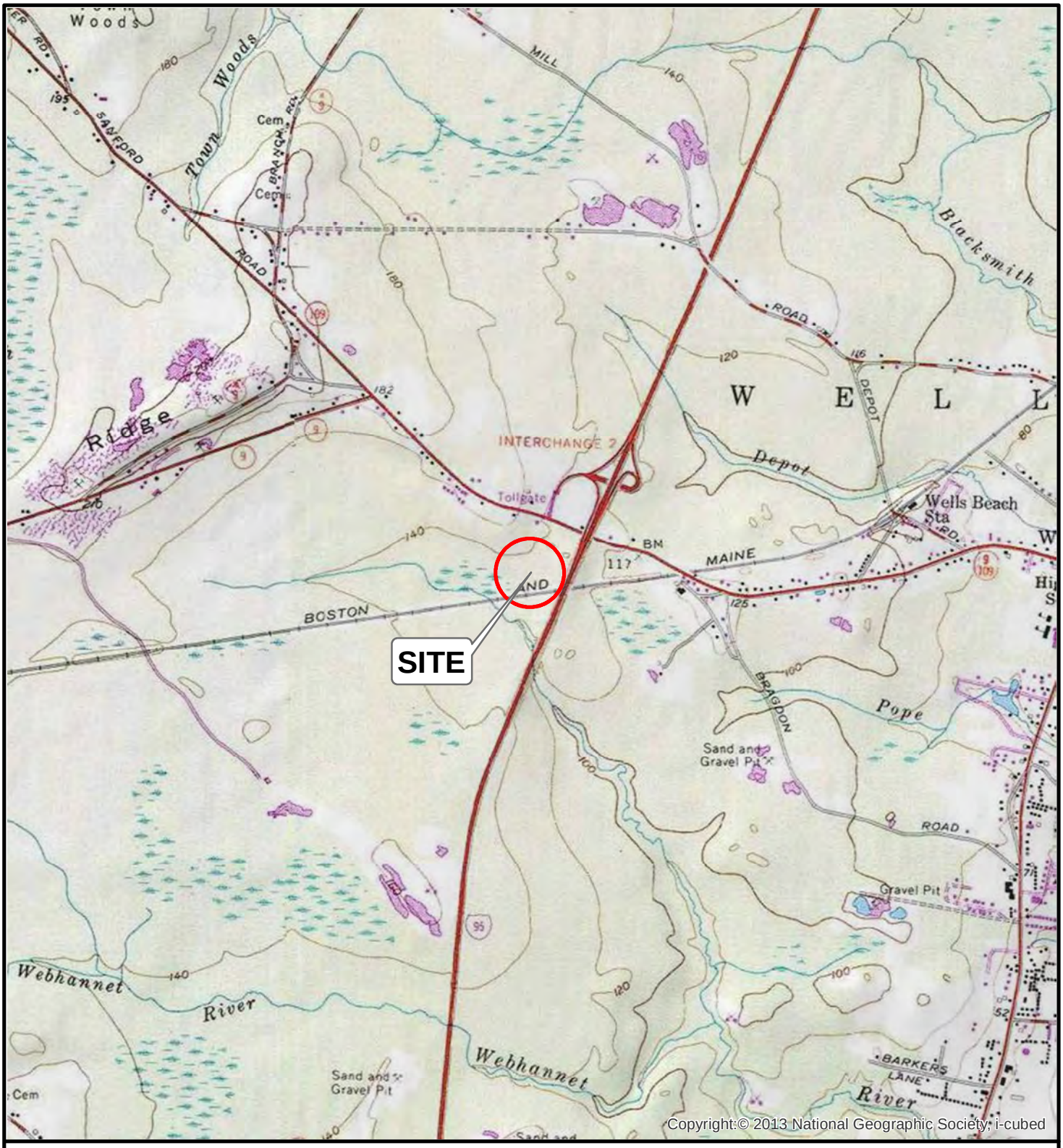
6.3 EXCAVATION AND DEWATERING

Excavation for the proposed piers and elevators are anticipated to extend approximately 5 to 6 feet below existing grades. Due to the proximity to the railroad, the excavation planning will need to consider the track support / embankment requirements of the railroad operator. It may be necessary to provide temporary lateral support to meet those requirements. Cantilever or internally braced steel sheet pile systems may be suitable for temporary support at this site.

Groundwater may be present at or near the ground surface for excavations near track level. Dewatering may be necessary to remove water that may accumulate in excavations due to surface runoff and infiltration. We anticipate that dewatering, if necessary, can be achieved by pumping from sumps placed within the excavations.

The contractor should be responsible for controlling groundwater, surface runoff, infiltration and water from all other sources by methods which preserve the undisturbed condition of the subgrade and permit foundation construction in-the-dry. Discharge of pumped groundwater and river water should comply with all local, State, and federal regulations.

FIGURES



USGS QUADRANGLE LOCATION

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SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS. THIS MAP ALSO CONTAINS THE ESRI ARCGIS ONLINE USA COUNTIES WHICH PROVIDES DETAILED BOUNDARIES THAT ARE CONSISTENT WITH THE TRACT, BLOCK GROUP, AND STATE DATA SETS AND ARE EFFECTIVE AT REGIONAL AND STATE LEVELS.

Data Supplied by : esri USGS science for a changing world

0 1,000 2,000 4,000 6,000

SCALE IN FEET

GZA

PROJ. MGR.: NVW
DESIGNED BY: NVW
REVIEWED BY: CLS
OPERATOR: DL

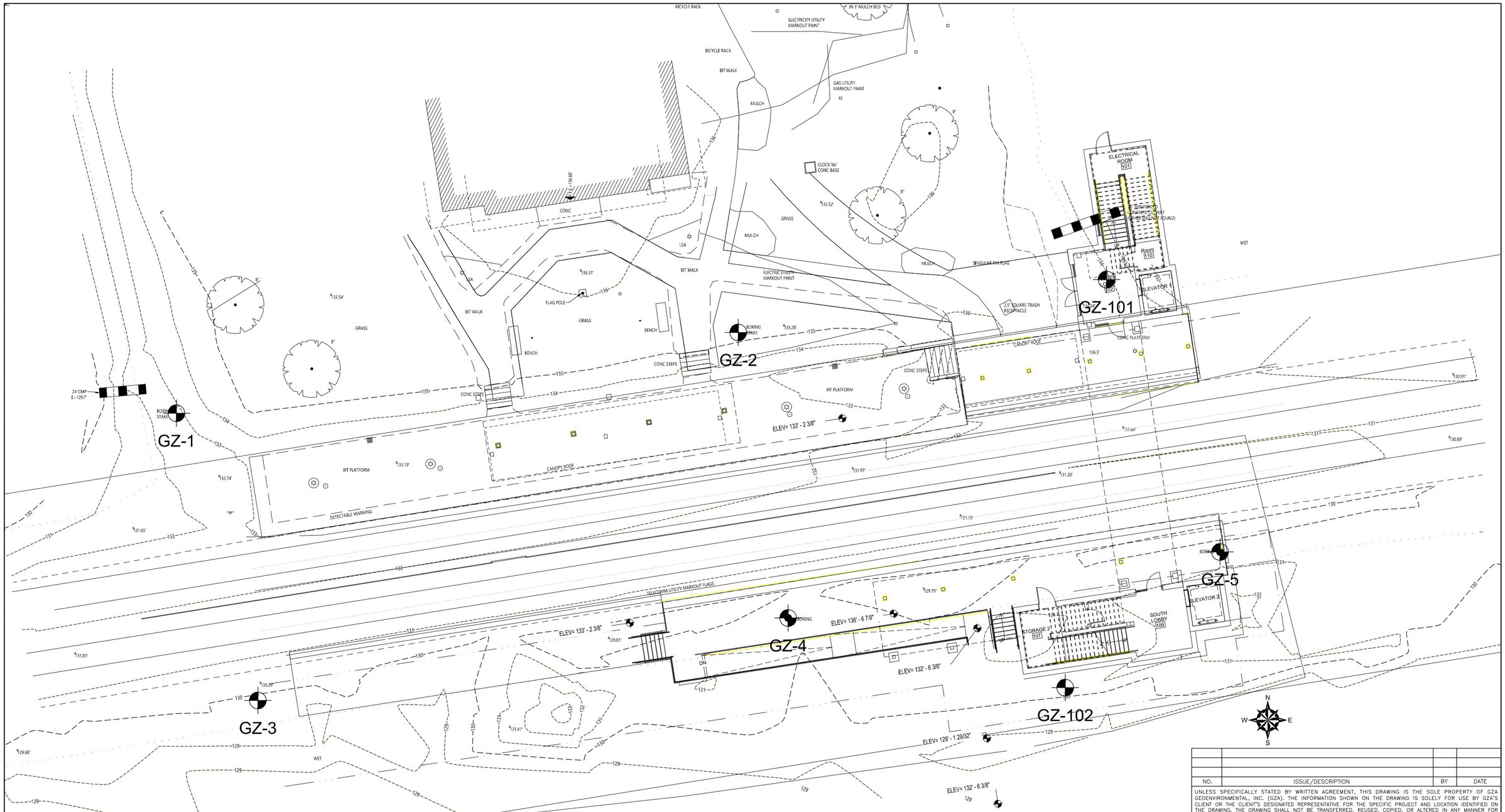
DATE: 10-11-2019

LOCUS PLAN

PASSENGER RAIL STATION IMPROVEMENTS
WELLS, MAINE

JOB NO.
09.0026004.01

FIGURE NO.
1



NOTES:

1) GROUND PROFILE AND BENT LOCATIONS DEVELOPED FROM THE FOLLOWING ELECTRONIC DRAWING FILES PROVIDED BY VHB: 55095.05 EX to client.dwg ON JUNE 27, 2019, 1159_SItePlan w Elev.DWG ON SEPTEMBER 27, 2019, AND plans-1221_NNEPRA_Wells Station_ARCH_R22-Sheet - A-100 - FIRST FLOOR PLAN.DWG on November 11, 2022. .

2) THE AS-DRILLED LOCATIONS AND ELEVATIONS OF THE GZ-01 SERIES TEST BORINGS WERE SURVEYED BY VHB AND PROVIDED BY VHB IN AND ELECTRONIC FILE (Proposed Boring Location Plan NNEPRA Wells Station with Location Info.pdf) ON MAY 13, 2019. THE AS-DRILLED LOCATIONS OF THE GZ-100 SERIES TEST BORINGS WERE BASED ON TAPE TIE MEASUREMENT FROM EXISTING STRUCTURES AND ELEVATIONS WERE SURVEYED BY VHB.

3) ALL TEST BORINGS WERE DRILLED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, MAINE BETWEEN DECEMBER 5 AND DECEMBER 12, 2018, AND AUGUST 2 AND AUGUST 4, 2022, AND OBSERVED BY GZA PERSONNEL.

4) UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LEGEND:

GZ-102 — LOCATION AND DESIGNATION OF CASED WASH BORING.

0 5 10 20
SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

PASSENGER RAIL STATION IMPROVEMENTS
WELLS TRANSPORTATION CENTER
WELLS, MAINE

BORING LOCATION PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
VHB
500 SOUTHBOROUGH DRIVE, SUITE 105B
SOUTH PORTLAND, MAINE

PROJ MGR: NVW	REVIEWED BY: CLS	CHECKED BY: ARB	FIGURE 2
DESIGNED BY: NVW	DRAWN BY: NVW	SCALE: AS NOTED	
DATE: JUNE, 2023	PROJECT NO. 09.0026004.01	REVISION NO. 0	

APPENDIX A – LIMITATIONS

GEOTECHNICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions .

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Cost Estimates

11. Unless otherwise stated, our cost estimates are only for comparative and general planning purposes. These estimates may involve approximate quantity evaluations. Note that these quantity estimates are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we have no control over either when the work will take place or the labor and material costs required to plan and execute the anticipated work, our cost estimates were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

Additional Services

12. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B – TEST BORING LOGS

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-1
SHEET: 1 of 3
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177913.8, E2834118.0
Ground Surface Elev. (ft.): 132.8
Final Boring Depth (ft.): 65.5
Date Start - Finish: 12/10/2018 - 12/10/2018

H. Datum:
V. Datum:

Hammer Type: Donut/Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/10/18	1140	8.7	10 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0.0-2.0	24	13	WOH 7 12	19	S-1: Loose, brown, fine to coarse SAND, little Gravel, trace Silt, dry. -FILL- (SP-SM)	1		0.5	TOPSOIL	132.3
5		S-2	4.0-6.0	24	6	7 8 7 10	15	S-2: Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt, wet. (SP-SM)				FILL	
		S-3	6.0-8.0	24	16	12 6 8 12	14	S-3: Top 14": Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt, wet. (SP-SM) Bottom 2": Gray, fine to medium SAND, little Silt, wet.			7.2		125.6
		S-4	8.0-10.0	24	13	11 17 24 29	41	S-4: Very dense, brown, fine to medium SAND, little Silt. (SM)					
10		S-5	10.0-12.0	24	20	26 25 22 24	47	S-5: Very dense, brown, fine to medium SAND, trace Silt. (SP-SM)				MARINE SAND	
		S-6	12.0-14.0	24	13	8 11 7 5	18	S-6: Top 9": Very dense, brown, fine to medium SAND, trace Silt. (SP-SM) Bottom 4": Gray, Silty CLAY, little fine Sand, wet.	2		12.8		120.0
15		S-7	14.0-16.0	24	16	6 5 7 8	12	S-7: Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL)				MARINE CLAY	
20		S-8	19.0-21.0	24	24	4 3 4 6	7	S-8: Medium stiff, gray, Silty CLAY. (CL) PP=1.25 tsf			22.5		110.3
25		S-9	24.0-26.0	24	17	9 11 15 15	26	S-9: Medium dense, gray, fine to medium SAND, little Silt, wet. (sm)	3 4			MARINE CLAY WITH SAND LAYERS	
30													

REMARKS

1 - Samples S-1 through S-5 sampled using a split spon driven with a 140 lb Rope & Cathead hammer. Automatic hammer frozen.
2 - Samples S-6 through 5-9 sampled using a split spoon driven with an automatic hammer.
3 - After Sample S-9, advanced roller cone to 35.0'. Intermittent increase in resistance during advancement indicated possible sand layers from 26.0'-35.0'.
4 - Advance drive probe from 35.0'-65.5' to refusal. Advancement noted in the casing blows / core rate column.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-1

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-1
SHEET: 2 of 3
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177913.8, E2834118.0
Ground Surface Elev. (ft.): 132.8
Final Boring Depth (ft.): 65.5
Date Start - Finish: 12/10/2018 - 12/10/2018

H. Datum:
V. Datum:

Hammer Type: Donut/Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/10/18	1140	8.7	10 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
35	3											MARINE CLAY WITH SAND LAYERS	
	6												
	7												
	8												
40	12												
	20										41		91.8
	29												
	29												
	61												
45	47												
	32												
	30												
	25												
	20												
50	18											PROBABLE SAND OR GLACIAL TILL	
	17												
	15												
	13												
	37												
55	17												
	20												
	35												
	111												
	54												
60	17												

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-1

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:33 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-1
SHEET: 3 of 3
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177913.8, E2834118.0
Ground Surface Elev. (ft.): 132.8
Final Boring Depth (ft.): 65.5
Date Start - Finish: 12/10/2018 - 12/10/2018

H. Datum:
V. Datum:

Hammer Type: Donut/Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: --

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/10/18	1140	8.7	10 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
65	19 41 38 77 130											PROBABLE SAND OR GLACIAL TILL	
			65.5-65.5					Driven rod probe refusal at 65.5' in probable bedrock. End of exploration at 65.5 feet.			65.5	PROBABLE BEDROCK	67.3
70													
75													
80													
85													
90													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-1

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:33 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-2
SHEET: 1 of 2
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177930.8, E2834236.1
Ground Surface Elev. (ft.): 135.3
Final Boring Depth (ft.): 49
Date Start - Finish: 12/10/2018 - 12/10/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4", 3.5/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	18	12 20 11 11	31	S-1: Dense, brown, fine to coarse SAND, some Gravel, little Silt, dry. (SP-SM)			0.5	TOPSOIL	134.8
5		S-2	4.0-6.0	24	16	5 6 6 4	12	S-2: Loose, brown, fine to medium SAND, trace Silt, wet. (SP-SM)				FILL	
											7.5		127.8
10		S-3	9.0-11.0	24	14	15 16 18 20	34	S-3: Dense, gray, fine to medium SAND, trace Silt, wet. (SP-SM)				MARINE SAND	
		S-4	11.0-13.0	24	20	15 13 19 19	32	S-4: Top 18": Dense, gray, fine to medium SAND, trace Silt, wet. (SP-SM) Bottom 2": Gray, fine to medium SAND, some Silt, wet. Apparent oxidation throughout 2". (SM)			13		122.3
15		S-5	13.0-15.0	24	13	7 5 6 6	11	S-5: Stiff, gray, Silty CLAY, little fine Sand, wet. (CL) PP=1.75 tsf					
		S-6	15.0-17.0	24	24	7 6 6 7	12	S-6: Stiff, gray, CLAY and SILT, trace fine Sand, wet. (CL) PP=2.0 tsf					
20		S-7	19.0-21.0	24	24	2 3 4 5	7	S-7: Medium stiff, CLAY and SILT, trace fine Sand, wet. (CL) PP=1.5 tsf	1			MARINE CLAY	
25													
30													

REMARKS

1 - After Sample S-7, advance roller cone from 21.0'-42.7'. Intermittent resistance during roller cone advancement from 33.3'-42.7', indicating possible sand layers or glacial till.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-2

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-2
SHEET: 2 of 2
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177930.8, E2834236.1
Ground Surface Elev. (ft.): 135.3
Final Boring Depth (ft.): 49
Date Start - Finish: 12/10/2018 - 12/10/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4", 3.5/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
												MARINE CLAY	
											33.3		102.0
35													
												POSSIBLE SAND OR GLACIAL TILL	
40													
									2		42.7		92.6
45	3:55												
	3:21											PROBABLE BEDROCK	
	4:53												
	3:19										49		86.3
50			49.0-49.0					Probable bedrock. End of exploration at 49 feet.					
55													
60													

REMARKS

2 - Increase in resistance during roller cone advancement indicates probable bedrock at 42.7'; advanced roller cone under 1,000 lbs pressure from 42.7'-49.0'. Drilling times are noted in the casing blows / coring rate column. Rock chips observed in wash return.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-2

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-3
SHEET: 1 of 3
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): See plan
Ground Surface Elev. (ft.): 130.0
Final Boring Depth (ft.): 77
Date Start - Finish: 12/6/2018 - 12/7/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4", 3.5/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	10	1 WOH 2 8	2	S-1: Loose, gray/brown, fine to coarse SAND, little Silt, dry. (SP-SM)					
		S-2	2.0-4.0	24	20	10 13 13 14	26	S-2: Medium dense, brown, fine to coarse SAND, trace Silt, wet. (SP-SM)				FILL	
5		S-3	4.0-6.0	24	14	11 12 13 15	25	S-3: Medium dense, brown, fine to medium SAND, trace Silt, wet. (SP-SM)					
		S-4	6.0-8.0	24	20	13 13 15 13	28	S-4: Top 14": Medium dense, brown, fine to medium SAND, trace Silt, wet. (SP-SM) Bottom 6": Gray, fine to medium SAND, trace Silt, wet.			7.2		122.8
		S-5	8.0-10.0	24	24	2 4 5 7	9	S-5: Medium stiff, gray, Silty CLAY, wet. (CL)			8	MARINE SAND	122.0
10		S-6	10.0-12.0	24	16	12 13 15 19	28	S-6: Very stiff, gray, Silty CLAY, trace fine Sand, wet. PP=3.5 tsf				MARINE CLAY	
15		U-1	15.0-17.5	30	27			U-1: Shelby Tube 15'-17.5' Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL)	1		17.5		112.5
											19	SAND SEAM	111.0
20		S-7	19.0-21.0	24	24	8 4 4 5	8	S-7: Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL)					
25		U-2	24.0-26.0	24	24			U-2: Shelby Tube 24'-26'. Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL)				MARINE CLAY	
30													

REMARKS

1 - Increase in resistance during roller cone advancement from 17.5'-19.0' indicates possible sand seam.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-3

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:35 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-3
SHEET: 2 of 3
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): See plan
Ground Surface Elev. (ft.): 130.0
Final Boring Depth (ft.): 77
Date Start - Finish: 12/6/2018 - 12/7/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4", 3.5/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
35		S-8	34.0-36.0	24	24	WOH WOH WOH 3	0	S-8: Medium stiff, gray, Silty CLAY, trace fine Sand, wet. (CL) PP=0.75 tsf					
40												MARINE CLAY	
45		S-9	44.0-46.0	24	6	WOH WOH WOH WOH	0	S-9: Soft, gray, Silty CLAY, wet. (CL)					
50											50		80.0
55		S-10	54.0-56.0	24	10	11 5 8 9	13	S-10: Loose, gray, fine SAND, little Silt, wet. (SM)				MARINE SAND	
60		S-11	59.0-	24	17	12 17		S-11: Dense, gray, fine SAND, some Silt, wet. (SM)					

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-3

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:35 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-3
SHEET: 3 of 3
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): See plan
Ground Surface Elev. (ft.): 130.0
Final Boring Depth (ft.): 77
Date Start - Finish: 12/6/2018 - 12/7/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4", 3.5/3"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
			61.0			26 31	43					MARINE SAND	
											62.5		67.5
												MARINE CLAY	
65		S-12	64.0-66.0	24	24	WOH WOH 4 6	4	S-12: Soft, gray, Silty CLAY, trace fine Sand, wet. (CL)			65		65.0
												GLACIAL TILL	
70		S-13	69.0-69.9	11	9	24 65		S-13: Very dense, gray, fine to coarse SAND and Gravel. (SP)	2		69.9		60.1
			69.9-69.9					Probable bedrock.					
	4:32												
	4:50											PROBABLE BEDROCK	
75	5:27												
	5:15												
	7:09										77		53.0
								End of exploration at 77 feet.					
80													
85													
90													

REMARKS

2 - Advanced roller cone to 71.3'. Set up to core; no core recovered. Advanced roller cone under 1,000 lbs of pressure from 71.3' to 77.0'. Drilling times are noted in the casing blows / coring rate column. Rock chips observed in wash return.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-3

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:36 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-4
SHEET: 1 of 2
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177870.8, E2834246.5
Ground Surface Elev. (ft.): 130.3
Final Boring Depth (ft.): 36
Date Start - Finish: 12/5/2018 - 12/5/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/5/18	1530	1.7	10 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	9	2 2 4 4	6	S-1: Loose, brown, fine to coarse SAND, some Gravel, little Silt, little organics, wet. (SM)					
		S-2	2.0-4.0	24	15	3 4 5 6	9	S-2: Loose, brown, fine to medium SAND, some Silt, wet. (SM)				FILL	
5		S-3	4.0-6.0	24	14	3 9 13 13	22	S-3: Medium dense, brown, fine to medium SAND, trace Silt, black mottling, wet. (SP-SM)					
		S-4	6.0-8.0	24	20	11 18 20 16	38	S-4: Top 10": Medium dense, brown, fine to medium SAND, trace Silt, black mottling, wet. (SP-SM) Bottom 10": Gray, fine to medium SAND, trace Silt. (SP-SM)			6.8		123.5
		S-5	8.0-10.0	24	19	5 4 6 10	10	S-5: Top 3": Gray, fine to coarse SAND, little Gravel, wet.			8.3	MARINE SAND	122.0
10		S-6	10.0-12.0	24	15	14 13 18 21	31	Bottom 16": Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL) S-6: Very stiff, gray, Silty CLAY, wet. (CL)				MARINE CLAY	
											13		117.3
15		S-7	14.0-16.0	24	14	3 9 15 14	24	S-7: Medium dense, fine SAND, some Silt, wet. (SM)				MARINE SAND	
											16		114.3
20		S-8	19.0-21.0	24	24	1 3 3 4	6	S-8: Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL)				MARINE CLAY	
25		S-9	24.0-26.0	24	24	WOH 4 8 10	12	S-9: Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL)					
30		S-10	29.0-	24	24	2 3		S-10: Medium stiff, gray, Silty CLAY, little fine Sand. (CL)					

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-4

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:37 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-4
SHEET: 2 of 2
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177870.8, E2834246.5
Ground Surface Elev. (ft.): 130.3
Final Boring Depth (ft.): 36
Date Start - Finish: 12/5/2018 - 12/5/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.):

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/5/18	1530	1.7	10 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
			31.0			4 8	7					MARINE CLAY	
35		S-11	34.0-36.0	24	20	8 4 4 8	8	S-11: Stiff, gray, Silty CLAY. (CL)			36		94.3
			36.0-36.0					No refusal. End of exploration at 36 feet.					
40													
45													
50													
55													
60													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-4

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:37 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-5
SHEET: 1 of 2
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177884.7, E2834337.3
Ground Surface Elev. (ft.): 130.4
Final Boring Depth (ft.): 36
Date Start - Finish: 12/5/2018 - 12/5/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/5/18	1300	1.4	30 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	0.0-2.0	24	7	2 2 2 3	4	S-1: Loose, dark brown, fine to coarse SAND, little organic matter, little Gravel, wet. (SP)				FILL	
		S-2	2.5-4.0	18	17	6 8 9	17	S-2: Top 6": Loose, dark brown, fine to coarse SAND, little organic matter, little Gravel, wet. (SP)			3		127.4
5		S-3	4.0-6.0	24	14	8 15 19 16	34	Bottom 11": Loose, gray, fine to medium SAND, trace Silt, wet. (SP-SM)	1			MARINE SAND	
		S-4	6.0-8.0	24	22	15 16 15 8	31	S-3: Dense, brown, fine to medium SAND, trace Silt, wet. (SP-SM) S-4: Top 20": Dense, brown, fine to medium SAND, trace Silt, wet. (SP-SM)			7.8		122.6
		S-5	8.0-10.0	24	1	2 6 8 13	14	Bottom 2": Gray, Silty CLAY, trace fine Sand, wet. S-5: Stiff, gray, Silty CLAY, little Gravel. (CL)					
10		S-6	10.0-12.0	24	12	13 14 15 18	29	S-6: Very stiff, Silty CLAY, some fine Sand, wet. (CL)					
15		S-7	14.0-16.0	24	24	5 4 5 5	9	S-7: Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL) PP=2.5 tsf					
20		S-8	19.0-21.0	24	10	1 2 4 3	6	S-8: Stiff, gray, Silty CLAY, trace fine Sand, wet. (CL) PP=1.75 tsf				MARINE CLAY	
25		S-9	24.0-26.0	24	12	4 11 7 5	18	S-9: Very stiff, gray, Silty CLAY, trace fine Sand. (CL) PP>0.5 tsf					
30		S-10	29.0-	24	24	2 3		S-10: Stiff, gray, Silty CLAY, trace fine Sand. (CL)					

REMARKS

1 - After Sample S-2, advance 4" casing.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-5

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:38 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Vanasse Hangen Brustlin, Inc.
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-5
SHEET: 2 of 2
PROJECT NO: 09.0026004.00
REVIEWED BY: N. Williams

Logged By: B. Woodman
Drilling Co.: New England Boring Contractors
Foreman: W. Hoeckele

Type of Rig: ATV
Rig Model: Mobile B53
Drilling Method: Drive & Wash

Boring Location (N,E): N177884.7, E2834337.3
Ground Surface Elev. (ft.): 130.4
Final Boring Depth (ft.): 36
Date Start - Finish: 12/5/2018 - 12/5/2018

H. Datum:
V. Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size:

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/5/18	1300	1.4	30 min

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
			31.0			4 6	7	PP=2 tsf				MARINE CLAY	
											32.5		97.9
35		S-11	34.0-36.0	24	14	14 18 24 31	42	S-11: Dense, gray, fine to medium SAND, trace Gravel, trace Silt. (SP-SM)				MARINE SAND	
											36		94.4
			36.0-36.0					No refusal. End of exploration at 36 feet.					
40													
45													
50													
55													
60													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-5

GZA TEMPLATE TEST BORING; 9/30/2019; 12:28:38 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

VHB
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-101
SHEET: 1 of 2
PROJECT NO: 09.0026004.01
REVIEWED BY: N. Williams

Logged By: E. Tombaugh
Drilling Co.: New England Boring Contractors
Foreman: S. Shaw

Type of Rig: ATV Track
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 134.0
Final Boring Depth (ft.): 39
Date Start - Finish: 8/3/2022 - 8/4/2022

H. Datum:
V. Datum: NAVD88

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4.0"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/4/22	0746	8.5'	0.1 hr

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
	PUSH	S-1	0.0-2.0	24	12	2 4 4 6	8	S-1: Top 2": Dark brown, Roots and Silt, dry. Bottom 10": Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt, dry.	1 2		0.2	TOPSOIL	133.8
		S-2	2.0-4.0	24	0	8 7 10 14	17	S-2: No recovery. Gravel piece in tip of spoon.	3 4			FILL	
5		S-3	4.0-6.0	24	8	11 11 8 7	19	S-3: Medium dense, brown, fine to coarse SAND, trace Gravel, wet.					
		S-4	6.0-8.0	24	16	8 13 15 16	28	S-4: Top 6": Brown, fine to coarse SAND, trace Gravel, wet. Bottom 10": Medium dense, tan, fine to medium SAND, wet.			6.5		127.5
	V	S-5	8.0-10.0	24	11	12 18 19 14	37	S-5: Dense, brown, fine to medium SAND, trace Gravel, trace Silt, wet.				MARINE SAND	
10	71										12.5		121.5
	87												
	85												
	112												
	172												
15	64	S-6	15.0-17.0	24	19	5 7 8 10	15	S-6: Very stiff, gray, Silty CLAY, wet.	5	4.5 4.5 4.2			
	100											MARINE CLAY	
	72												
	75												
20	92	S-7	20.0-22.0	24	6	3 3 4 4	7	S-7: Very stiff, gray, Silty CLAY, trace fine Sand, wet. Increase in resistance during roller cone advancement at 22.5'.					
	70												
	71										22.5		111.5
	76												
	114												
25	98	S-8	25.0-27.0	24	9	18 13 12 17	25	S-8: Dense, brown, fine to coarse SAND, little Gravel, trace Silt, wet.				GLACIAL TILL	
	82												
	87												
	98												
30	120												

REMARKS

1 - After continuous sampling in upper 10.0', advanced a solid stem auger to 10.0', then pushed casing to 10.0'.
2 - NEBC Automatic Hammer # NEBC-28; energy efficiency ratio = 0.92.
3 - Water level measured immediately after removal of casing.
4 - As-drilled boring locations were based on tape tie measurements from existing structures. Elevations were surveyed by VHB.
5 - Field test data column shows results of field pocket penetrometer test in tsf.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-101

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

VHB
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-101
SHEET: 2 of 2
PROJECT NO: 09.0026004.01
REVIEWED BY: N. Williams

Logged By: E. Tombaugh
Drilling Co.: New England Boring Contractors
Foreman: S. Shaw

Type of Rig: ATV Track
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 134
Final Boring Depth (ft.): 39
Date Start - Finish: 8/3/2022 - 8/4/2022

H. Datum:
V. Datum: NAVD88

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4.0"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/4/22	0746	8.5'	0.1 hr

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
	104 178 104	S-9	30.0- 31.2	14	11	146 63 178/2"	R	S-9: Very dense, gray, fine to medium SAND, some Silt, 3" of rock fragments within the sample. Increase in resistance during roller cone advancement at 32.0'. Rock fragments observed in wash return. Advanced roller cone to 34.0' and setup to core.				GLACIAL TILL	
35	3:25 4:36 7:50 9:54 8:33	R1	34.0- 39.0	60	55	RQD = 48%		R1: Hard, fresh, coarse grained, black and white, GRANITE. Primary joints are very close to moderately spaced, low angle, planar, smooth, fresh to discolored, partially open to moderately wide. One moderately dipping joint, planar, smooth, discolored, moderately wide. Recovery = 92%			32		102.0
												BEDROCK	
40								End of exploration at 39 feet.			39		95.0
45													
50													
55													
60													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-101

GZA TEMPLATE TEST BORING; 9/14/2022; 12:43:37 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

VHB
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-102
SHEET: 1 of 2
PROJECT NO: 09.0026004.01
REVIEWED BY: N. Williams

Logged By: E. Tombaugh
Drilling Co.: New England Boring Contractors
Foreman: S. Shaw

Type of Rig: ATV Track
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 130.5
Final Boring Depth (ft.): 49
Date Start - Finish: 8/2/2022 - 8/3/2022

H. Datum:
V. Datum: NAVD88

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4.0"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/3/22	0730	6.3'	0.1 hr

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
	PUSH	S-1	0.0-2.0	24	10	2 5 5 3	10	S-1: Top 2": Topsoil. Bottom 8": Medium dense, brown, fine to coarse SAND and Silt, trace Gravel, dry.	1 2		0.2	TOPSOIL	130.3
											2	FILL	128.5
		S-2	2.0-4.0	24	12	3 4 9 12	13	S-2: Medium dense, tan, fine to medium SAND, moist.	3 4				
5		S-3	4.0-6.0	24	12	12 13 19 19	32	S-3: Dense, brown, fine to medium SAND, trace Silt, wet.				MARINE SAND	
		S-4	6.0-8.0	24	16	15 16 18 25	34	S-4: Dense, brown, fine to medium SAND, trace Silt, wet.					
		S-5	8.0-10.0	24	15	6 3 5 7	8	S-5: Top 2": Fine to medium SAND, trace Silt. Bottom 13": Stiff, gray, Silty CLAY, wet.		1.5	8.2		122.3
10	86 102 124 98 112											MARINE CLAY	
15	84	S-6	15.0-17.0	24	14	24 9 7 10	16	S-6: Top 4": Fine to medium SAND and Silt, little Gravel. Bottom 13": Very stiff, gray, Silty CLAY, wet.	5	2.8 1.8	15 15.3	SAND SEAM	115.5 115.2
	76 79 96												
20	114 53 82 87 95	S-7	20.0-22.0	24	7	2 2 4 2	6	S-7: Medium stiff, gray, Silty CLAY, trace fine Sand, wet.		0.5		MARINE CLAY	
25	80 94 102 123 133	S-8	25.0-27.0	24	19	1 6 9 4	15	S-8: Stiff, gray, Silty CLAY, wet. One piece of fractured gravel.		1.3 2.0			
30													

REMARKS

1 - After continuous sampling in upper 10.0', advanced a solid stem auger to 10.0', then pushed casing to 10.0'.
2 - NEBC Automatic Hammer # NEBC-28; energy efficiency ratio = 0.92.
3 - Water level measured immediately after removal of casing.
4 - As-drilled boring locations were based on tape tie measurements from existing structures. Elevations were surveyed by VHB.
5 - Field test data column shows results of field pocket penetrometer test in tsf.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-102

GZA TEMPLATE TEST BORING; 9/14/2022; 12:43:40 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

VHB
Wells RR Station
Wells, Maine

EXPLORATION NO.: GZ-102
SHEET: 2 of 2
PROJECT NO: 09.0026004.01
REVIEWED BY: N. Williams

Logged By: E. Tombaugh
Drilling Co.: New England Boring Contractors
Foreman: S. Shaw

Type of Rig: ATV Track
Rig Model: B-53
Drilling Method: Drive & Wash

Boring Location (N,E): See Plan
Ground Surface Elev. (ft.): 130.5
Final Boring Depth (ft.): 49
Date Start - Finish: 8/2/2022 - 8/3/2022

H. Datum:
V. Datum: NAVD88

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5/4.0"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NX

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/3/22	0730	6.3'	0.1 hr

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
	101	S-9	30.0-	24	13	7 12		S-9: Top 6": Gray, Silty CLAY, wet.			30.5		100.0
	118		32.0			16 10	28	Bottom 7": Dense, gray, fine SAND and Silt, wet.					
	124												
	186												
	183											MARINE SAND	
35	115	S-10	35.0-	24	3	6 3		S-10: Medium dense, gray, fine SAND, some Silt, wet.					
	112		37.0			4 2	7						
	98												
	114										38.5		92.0
	92												
40	97	S-11	40.0-	24	11	7 10		S-11: Medium dense, tan, fine to coarse SAND, some					
	100		42.0			13 12	23	Silt, piece of gravel at top of spoon.				GLACIAL TILL	
	167												
	188/6"							Casing resistance at 43.5. Advanced roller cone to 44.0' and set up to core.			43.5		87.0
	2:35	R1	44.0-	60	22	RQD =		R1: Hard, fresh, coarse grained, black and white					
45	8:48		49.0			12%		GRANITE. Primary joints are closely spaced, low angle,					
	3:22							planar, smooth, discolored, moderately wide to very wide.				BEDROCK	
	2:46							Secondary joints are closely spaced, high angle, planar,					
	8:06							smooth, discolored.					
								Recovery = 37%			49		81.5
50								End of exploration at 49 feet.					
55													
60													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-102

APPENDIX C – LABORATORY TEST RESULTS

THIELSCH ENGINEERING
195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
thielsch.com
Let's Build a Solid Foundation

Client Information:
GZA GeoEnvironmental
Portland, ME
PM: NVW
Assigned By: NVW
Collected By: BLJ

Project Information:
Wells Transportation Center Improvements
Wells, ME
GZA Project Number: 09.0026004.00
Summary Page: 1 of 1
Report Date: 1.4.19

LABORATORY TESTING DATA SHEET

Boring ID	Sample No.	Depth (ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As-Recieved Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G_s	Dry unit wt. pcf	Test Water Content %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) (Corr.)	Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Perme-ability (cm/sec)	
				D2216	D4318		D6913			D2874	D854			D1557			D1883			
GZ-2	S-1	0-2	S-1	18.6			20.7	68.4	10.9											Brown f-c SAND, some fine Gravel, little Silt
GZ-2	S-2	2-4	S-2	20.8			0.0	93.1	6.9											Light Brown f-m SAND, trace Silt
GZ-3	S-6	10-12	S-3	17.6																
GZ-3	S-7	19-21	S-4	28.9																
GZ-3	S-8	34-36	S-5	4.8																
GZ-3	S-9	44-46	S-6	21.1																
GZ-4	S-1	0-2	S-7	24.1			30.9	56.5	12.6											Brown f-c SAND, some fine Gravel, little Silt
GZ-4	S-2	2-4	S-8	27.1			0.0	77.8	22.2											Brown f-m SAND, some Silt
GZ-5	S-3(Lower 11")	4-6	S-9	19.7			0.0	92.4	7.6											Dark Brown f-m SAND, trace Silt
GZ-5	S-4	6-8	S-10	18.3			0.0	95.5	4.5											Brown f-m SAND, trace Silt

Reviewed by: _____ 01.05.2019

THIELSCH ENGINEERING

State of Maine - Department of Transportation
Laboratory Testing Summary Sheet

Wells Transportation Center Improvements

MDOT Project Number:

GZA Project Number: 09.0026004.00

Town(s): Wells, ME

Boring & Sample Identification Number	Station (Feet)	Sample No.	Depth (Feet)	Lab Number	Organic %	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
GZ-2		S-1	0-2	S-1		18.6			SP-SM	A-1-b	II
GZ-2		S-2	2-4	S-2		20.8			SP-SM	A-3	0
GZ-3		S-6	10-12	S-3		17.6					
GZ-3		S-7	19-21	S-4		28.9					
GZ-3		S-8	34-36	S-5		4.8					
GZ-3		S-9	44-46	S-6		21.1					
GZ-4		S-1	0-2	S-7		24.1			SM	A-1-b	II
GZ-4		S-2	2-4	S-8		27.1			SM	A-2-4(0)	III
GZ-5		S-3 (Lower 11')	4-6	S-9		19.7			SP-SM	A-3	II
GZ-5		S-4	6-8	S-10		18.3			SP	A-3	0

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

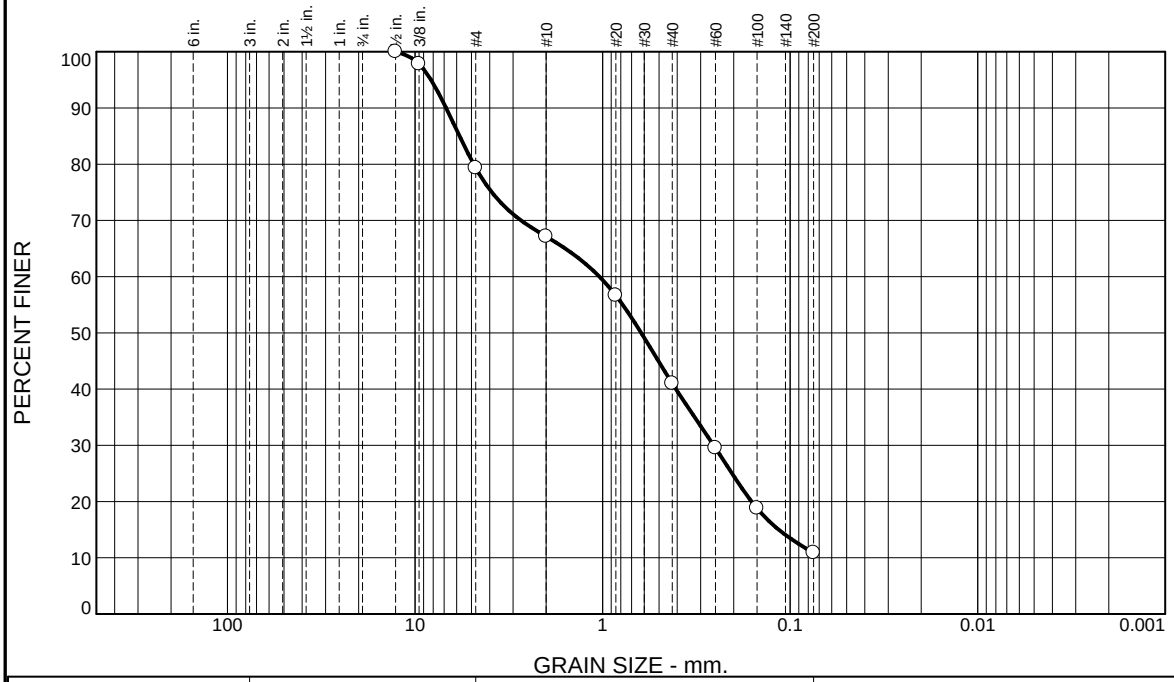
GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	20.7	12.2	26.1	30.1	10.9	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5"	100.0		
0.375"	97.8		
#4	79.3		
#10	67.1		
#20	56.6		
#40	41.0		
#60	29.5		
#100	18.8		
#200	10.9		

* (no specification provided)

Material Description

Brown f-c SAND, some fine Gravel, little Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 6.8258 D_{85}= 5.7902 D_{60}= 1.0396
D_{50}= 0.6224 D_{30}= 0.2556 D_{15}= 0.1151
D_{10}= C_u= C_c=

Remarks

Date Received: 12.28.18 **Date Tested:** 1.4.18

Tested By: MN

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Borings **Depth:** 0-2' **Date Sampled:**
Sample Number: GZ-2 / S-1

Thielsch Engineering Inc.

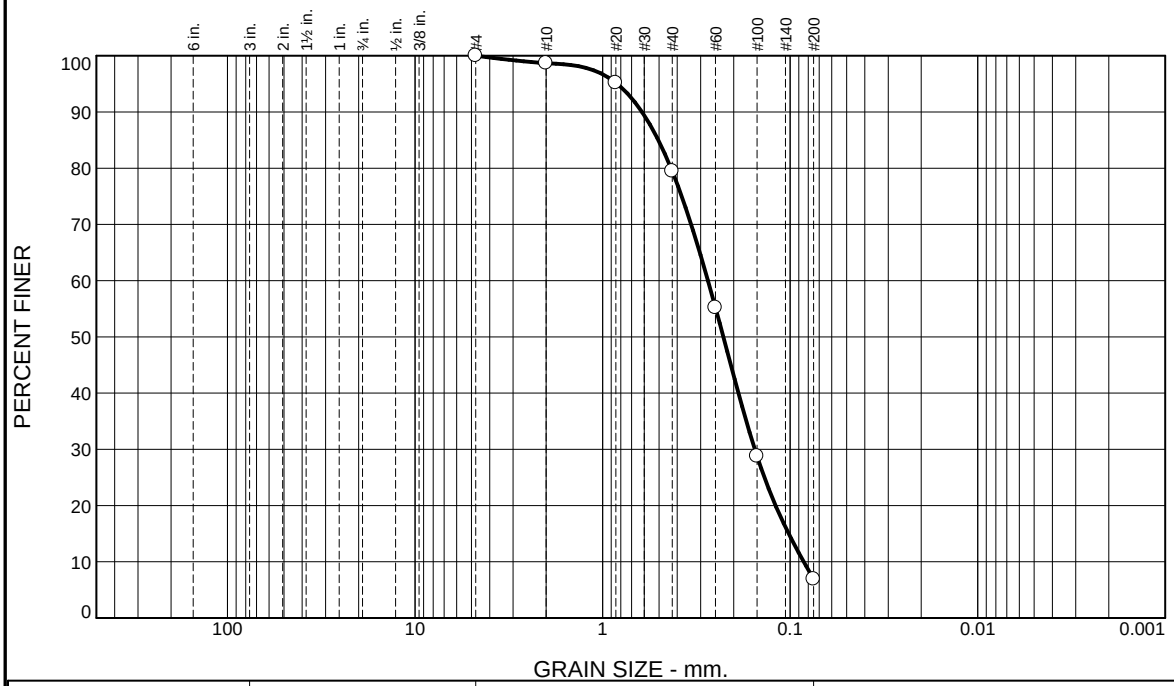
Cranston, RI

Client: GZA GeoEnvironmental

Project: Wells Transportation Center Improvements
Wells, ME

Project No: 09.0026004.00 **Figure** S-1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.3	19.2	72.6	6.9	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	98.7		
#20	95.2		
#40	79.5		
#60	55.2		
#100	28.8		
#200	6.9		

* (no specification provided)

Material Description

Light Brown f-m SAND, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.6160 D_{85}= 0.5043 D_{60}= 0.2741
D_{50}= 0.2270 D_{30}= 0.1542 D_{15}= 0.1018
D_{10}= 0.0847 C_u= 3.24 C_c= 1.02

Remarks

Date Received: 12.28.18 **Date Tested:** 1.4.18

Tested By: MN

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Borings **Depth:** 2-4' **Date Sampled:**
Sample Number: GZ-2 / S-2

Thielsch Engineering Inc.

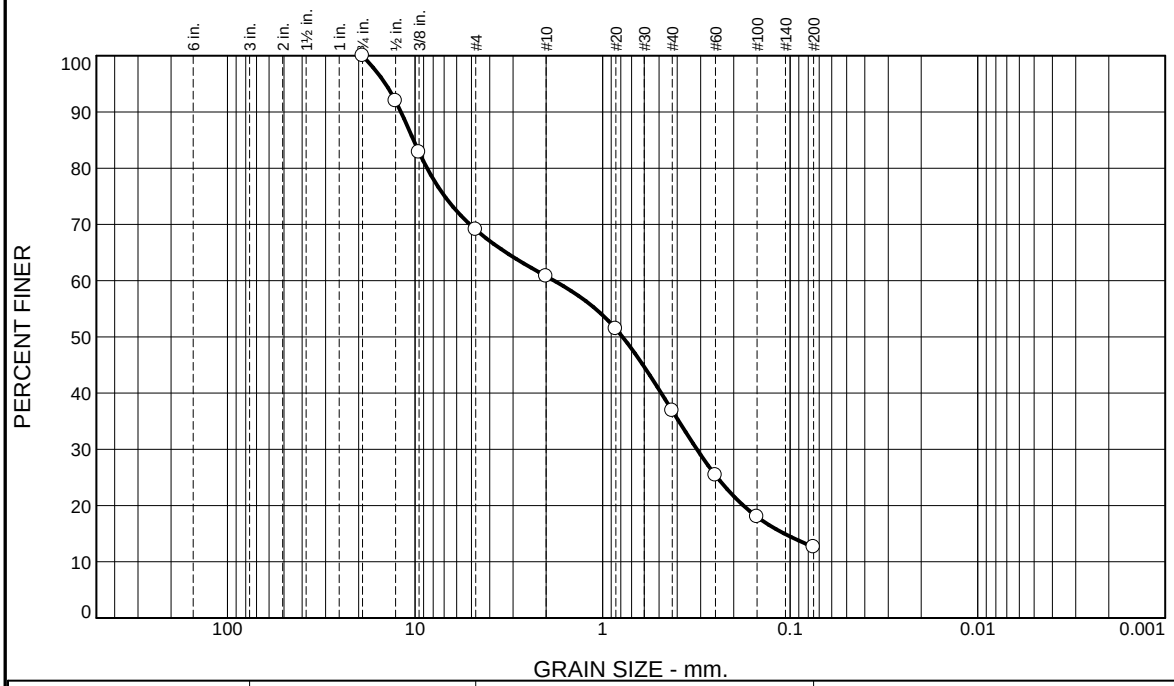
Cranston, RI

Client: GZA GeoEnvironmental

Project: Wells Transportation Center Improvements
Wells, ME

Project No: 09.0026004.00 **Figure** S-2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	30.9	8.3	23.9	24.3	12.6	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
0.5"	92.0		
0.375"	82.8		
#4	69.1		
#10	60.8		
#20	51.4		
#40	36.9		
#60	25.4		
#100	18.0		
#200	12.6		

* (no specification provided)

Material Description

Brown f-c SAND, some fine Gravel, little Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 11.8840 D_{85}= 10.1946 D_{60}= 1.8141
D_{50}= 0.7829 D_{30}= 0.3140 D_{15}= 0.1073
D_{10}= C_u= C_c=

Remarks

Date Received: 12.28.18 **Date Tested:** 1.4.18

Tested By: MN

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Borings **Depth:** 0-2' **Date Sampled:**
Sample Number: GZ-4 / S-1

Thielsch Engineering Inc.

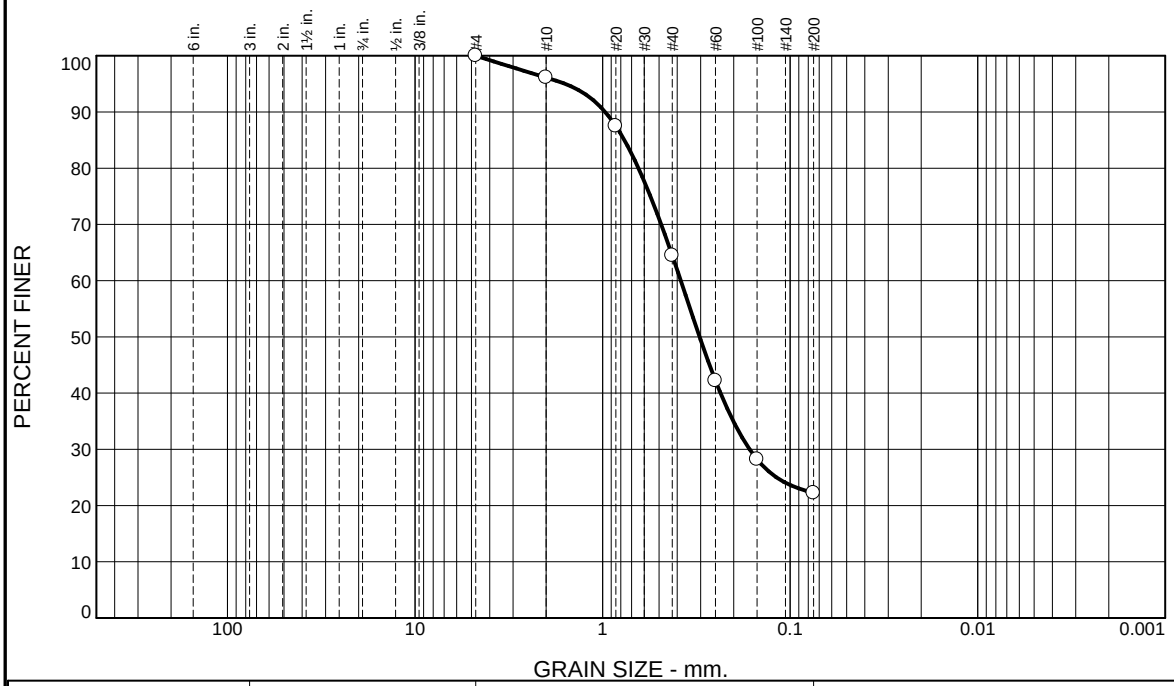
Cranston, RI

Client: GZA GeoEnvironmental

Project: Wells Transportation Center Improvements
Wells, ME

Project No: 09.0026004.00 **Figure** S-7

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.9	31.6	42.3	22.2	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	96.1		
#20	87.5		
#40	64.5		
#60	42.2		
#100	28.2		
#200	22.2		

* (no specification provided)

Material Description

Brown f-m SAND, some Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.9690 D_{85}= 0.7655 D_{60}= 0.3829
D_{50}= 0.3039 D_{30}= 0.1644 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 12.28.18 **Date Tested:** 1.4.19

Tested By: MN

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Borings **Depth:** 2-4' **Date Sampled:**
Sample Number: GZ-4 / S-2

Thielsch Engineering Inc.

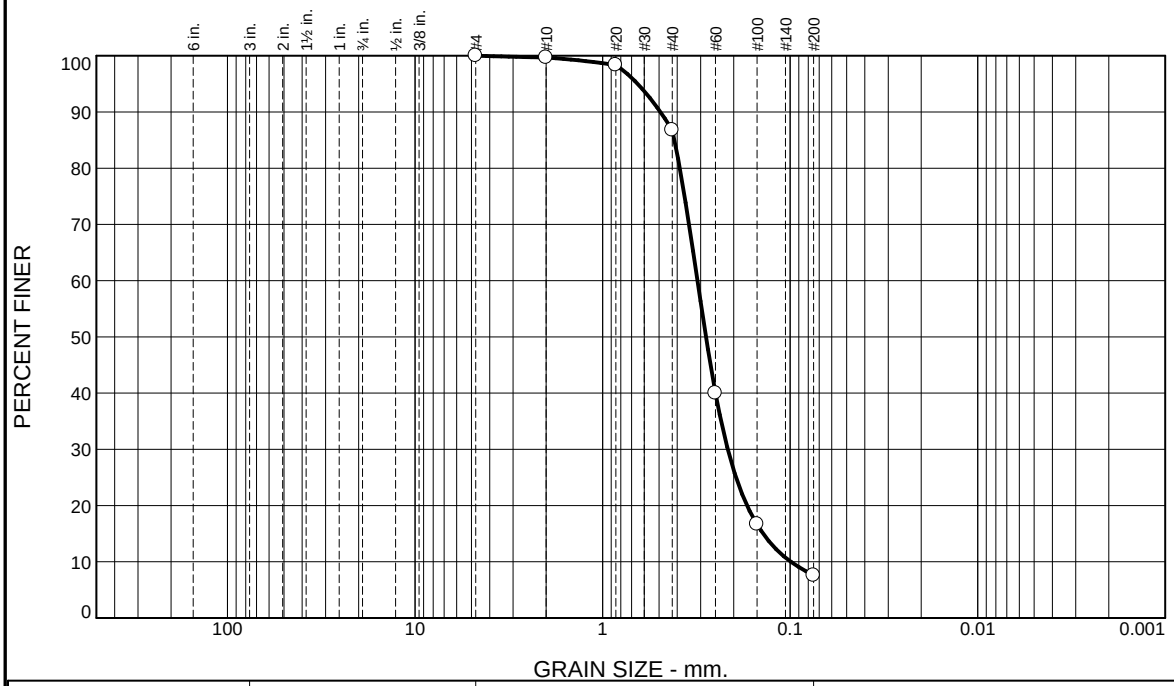
Cranston, RI

Client: GZA GeoEnvironmental

Project: Wells Transportation Center Improvements
Wells, ME

Project No: 09.0026004.00 **Figure** S-8

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	12.9	79.2	7.6	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.7		
#20	98.4		
#40	86.8		
#60	40.0		
#100	16.7		
#200	7.6		

* (no specification provided)

Material Description

Dark Brown f-m SAND, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.4916 D_{85}= 0.4138 D_{60}= 0.3119
D_{50}= 0.2809 D_{30}= 0.2150 D_{15}= 0.1391
D_{10}= 0.0991 C_u= 3.15 C_c= 1.50

Remarks

Date Received: 12.28.18 **Date Tested:** 1.4.19

Tested By: IA

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Borings **Depth:** 4-6' **Date Sampled:**
Sample Number: GZ-5/S-3(Lower-11")

Thielsch Engineering Inc.

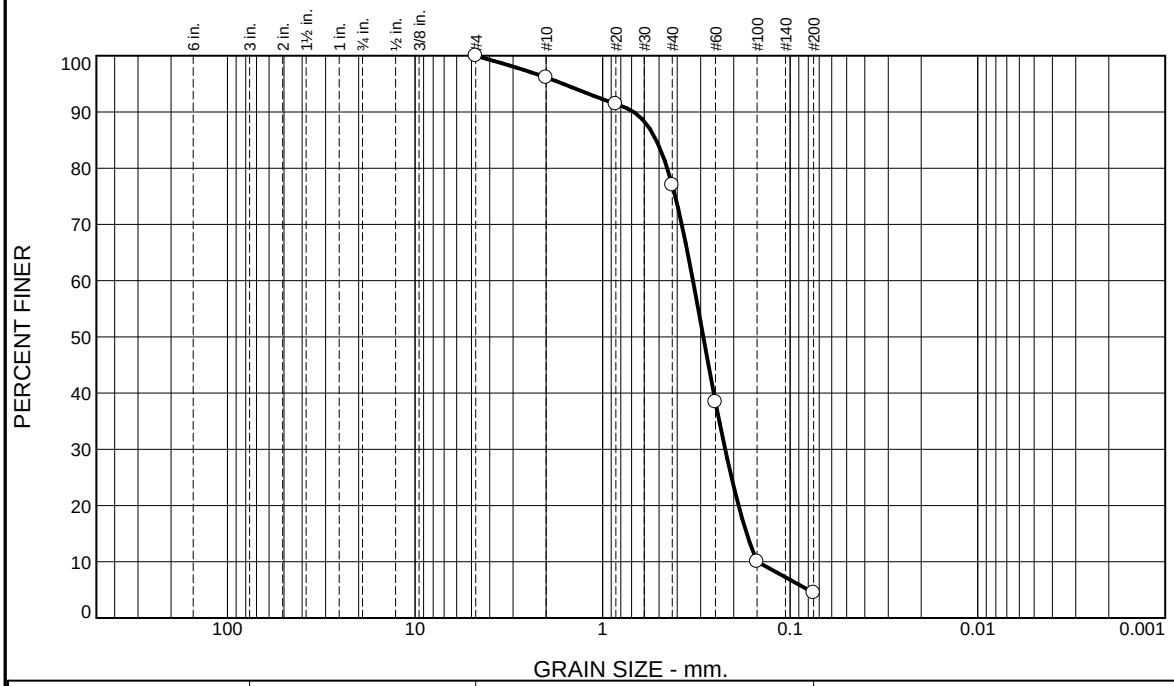
Cranston, RI

Client: GZA GeoEnvironmental

Project: Wells Transportation Center Improvements
Wells, ME

Project No: 09.0026004.00 **Figure** S-9

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.9	19.1	72.5	4.5	

Test Results (D6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	96.1		
#20	91.4		
#40	77.0		
#60	38.4		
#100	10.0		
#200	4.5		

* (no specification provided)

Material Description

Brown f-m SAND, trace Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP **AASHTO (M 145)=** A-3

Coefficients

D_{90}= 0.6826 D_{85}= 0.5175 D_{60}= 0.3295
D_{50}= 0.2902 D_{30}= 0.2220 D_{15}= 0.1703
D_{10}= 0.1491 C_u= 2.21 C_c= 1.00

Remarks

Date Received: 12.28.18 **Date Tested:** 1.4.18

Tested By: MN

Checked By: Rebecca Roth

Title: Laboratory Coordinator

Source of Sample: Borings **Depth:** 6-8' **Date Sampled:**
Sample Number: GZ-5 / S-4

Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental

Project: Wells Transportation Center Improvements
Wells, ME

Project No: 09.0026004.00 **Figure** S-10

R. W. Gillespie & Associates, Inc.
20 Pomerleau St., Suite 100, Biddeford, ME 04005 207-286-8008
177 Shattuck Way, Suite 1 West, Newington NH 03801 603-427-0244
44 Wood Avenue, Suite I, Mansfield, MA 508-623-0101

LETTER OF TRANSMITTAL

Date:	Project No.:
January 25, 2019	0876-015

Attention: Nicholas Williams P.E. (nicholas.williams@gza.com)

Re: Laboratory Testing
Wells Transportation Center Imp. #: 09.0026004.00
Wells, ME

GZA Geoenvironmental

477 Congress Street

Portland, ME 04101

We are sending you attached Laboratory Test Results.

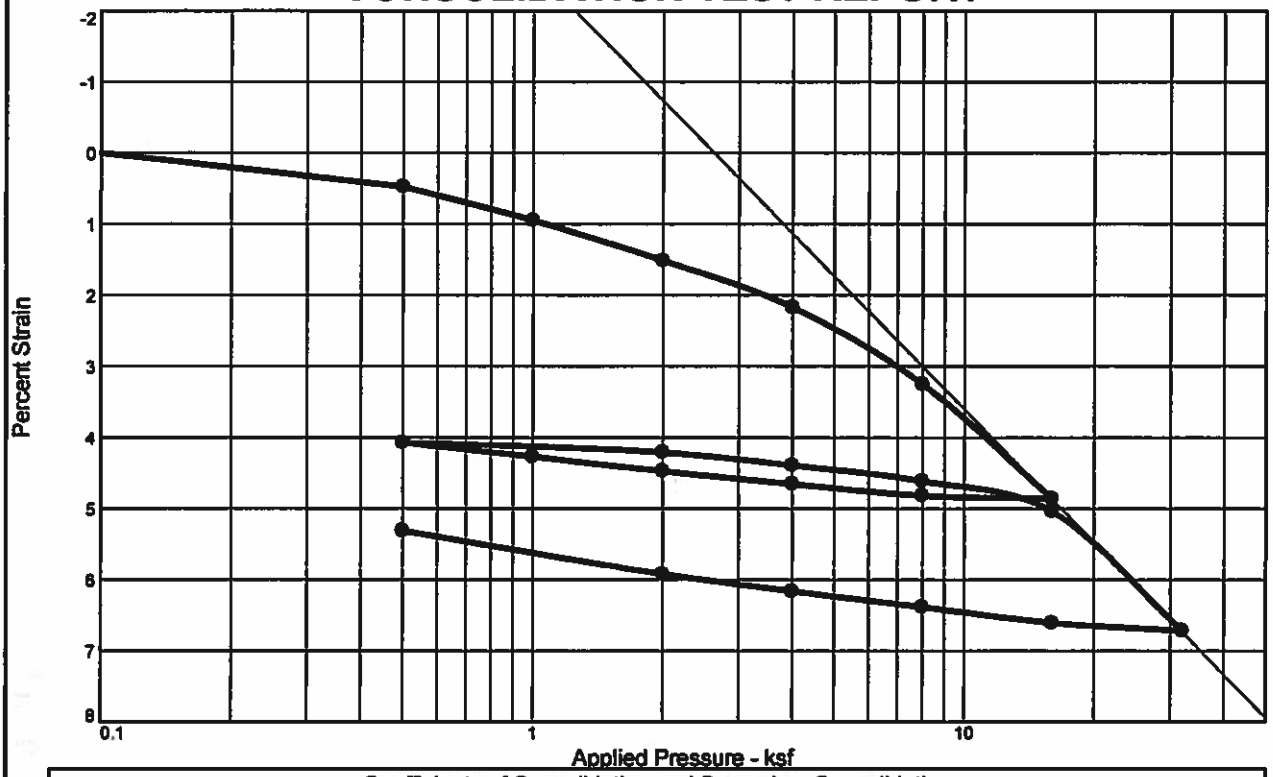
Laboratory No. (s)	Test (s) Performed
15366a	Consolidation Test Report, Dial Reading vs. Time, Vane Shear, & Liquid and Plastic Limits
15366b	Consolidation Test Report, Dial Reading vs. Time, Vane Shear, & Liquid and Plastic Limits

Remarks:

Copy to:

If enclosures are not noted, kindly notify us at once.

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α
1	0.50	4.767		8	4.00	15.960		15	16.00	10.255	
2	1.00	4.718		9	2.00	5.405		16	32.00	5.090	
3	2.00	3.094	0.001	10	1.00	4.089		17	16.00	11.670	
4	4.00	3.387	0.001	11	0.50	2.144		18	8.00	15.283	
5	8.00	3.305	0.002	12	2.00	5.208	0.000	19	4.00	4.740	
6	16.00	5.421		13	4.00	6.080	0.000	20	2.00	3.203	
7	8.00	12.130		14	8.00	6.500	0.000	21	0.50	0.703	

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
101.1 %	20.8 %	108.8	28	10	2.70		6.5	0.10	0.03	0.555

MATERIAL DESCRIPTION	USCS	AASHTO
Lean Clay		

Project No. 0876-015 **Client:** GZA GeoEnvironmental, Inc.

Project: Wells Transportation Center Improvements #:09.0026004.00
Wells, ME

Location: B-1 **Depth:** 15'-17.5' **Sample Number:** U-1

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

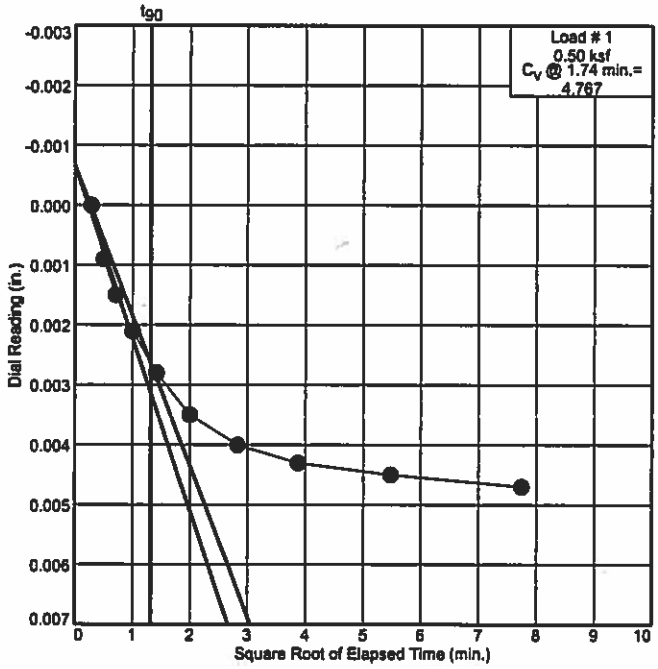
Lab No. 15366a

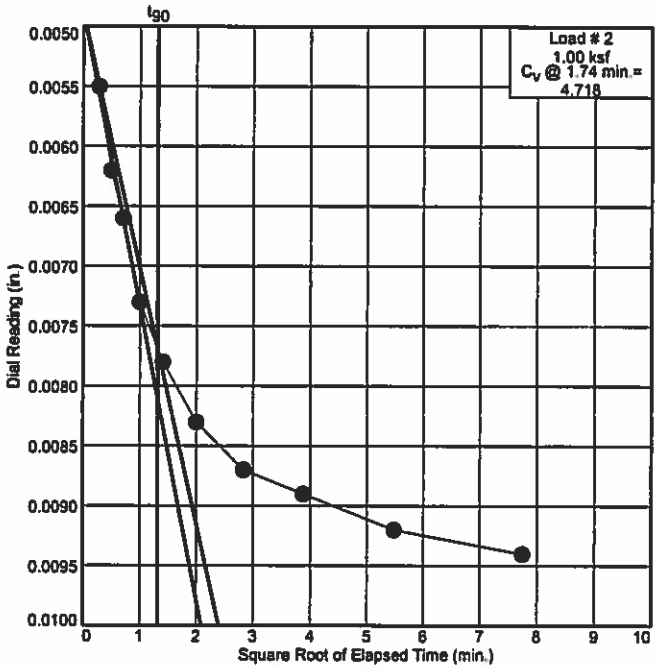
Tested By: JRF/AGS **Checked By:** MTG MTG

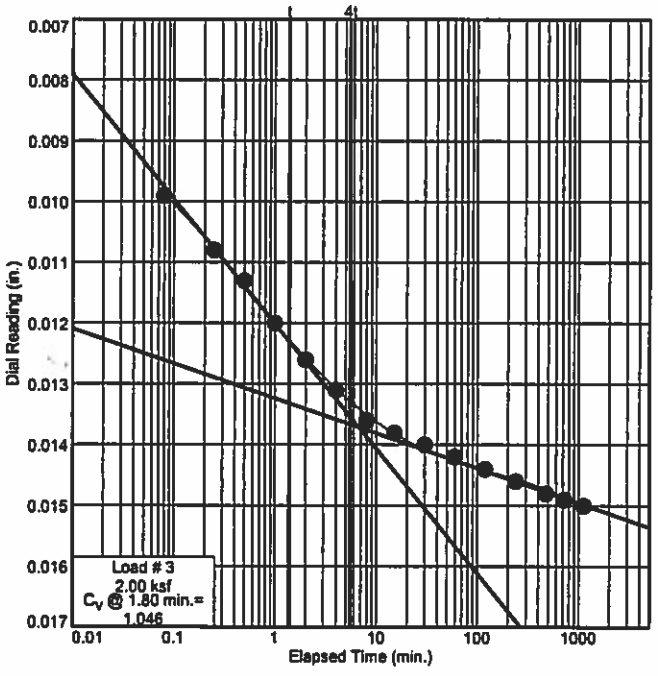
Dial Reading vs. Time

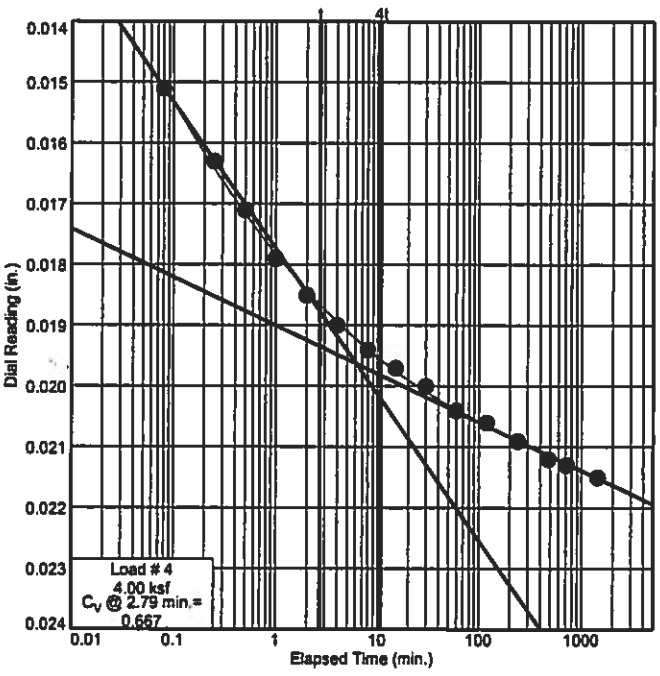
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 15'-17.5' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

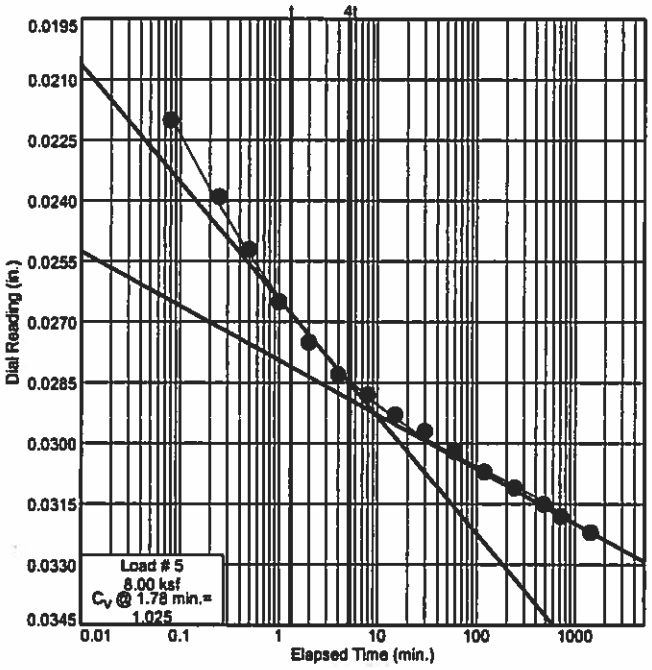
Biddeford, Maine

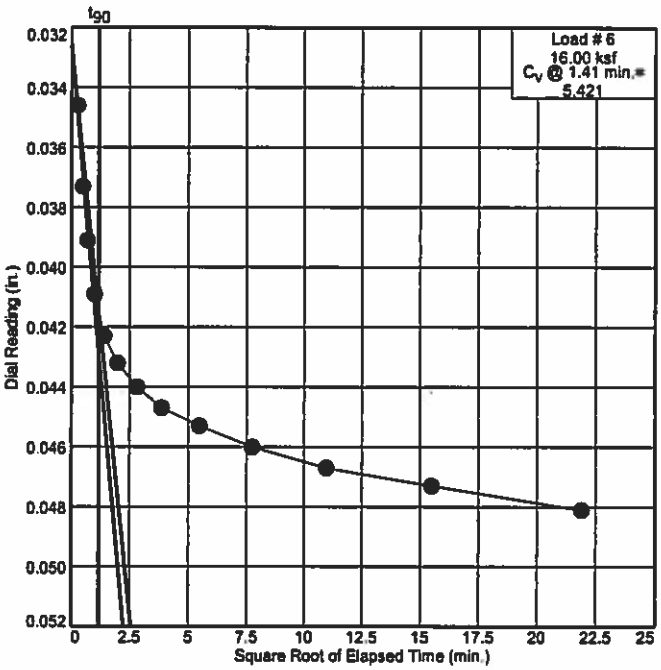
Lab No. 15366a

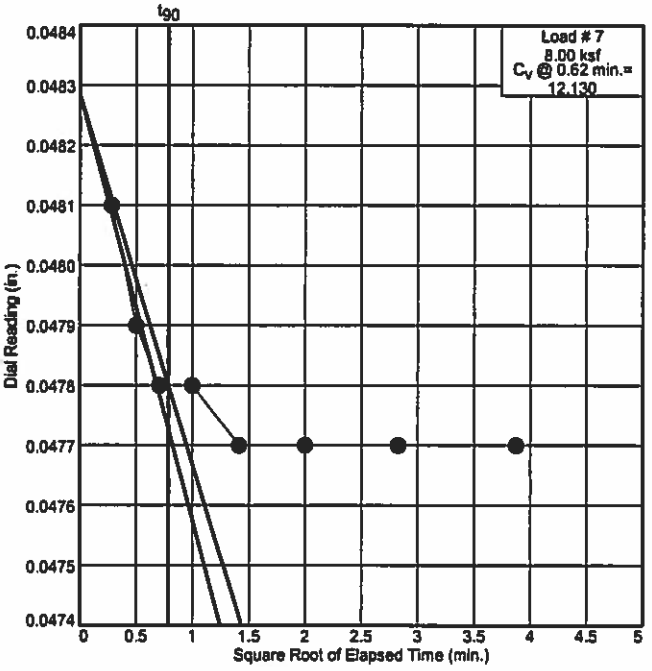
Dial Reading vs. Time

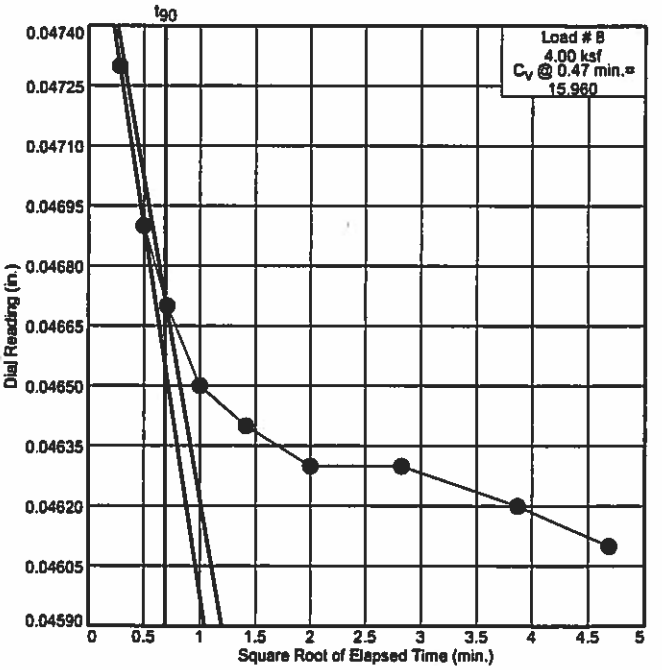
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 15'-17.5' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

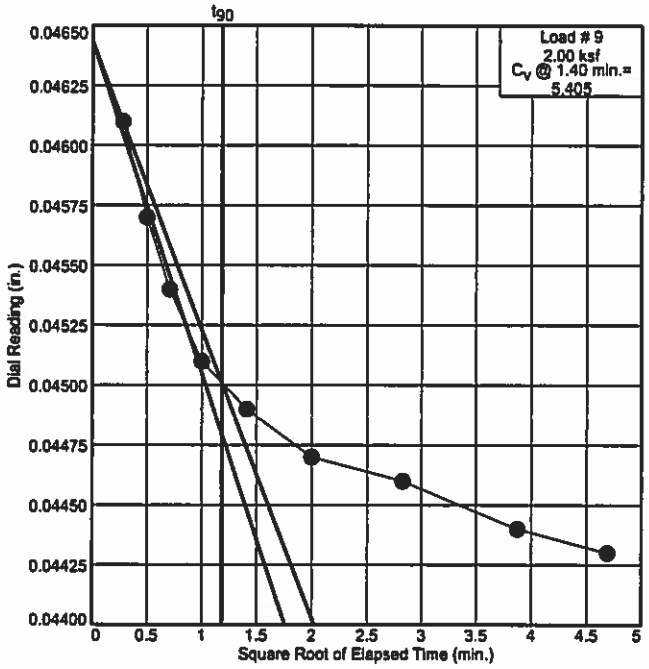
Biddeford, Maine

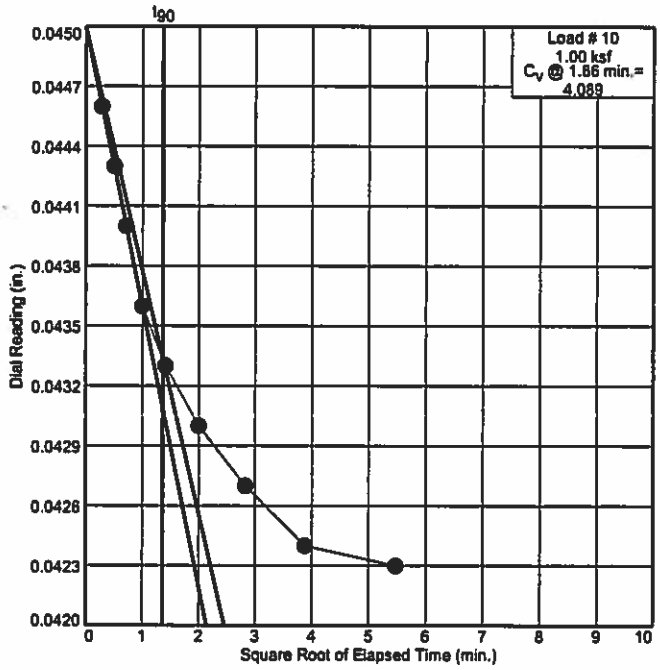
Lab No. 15366a

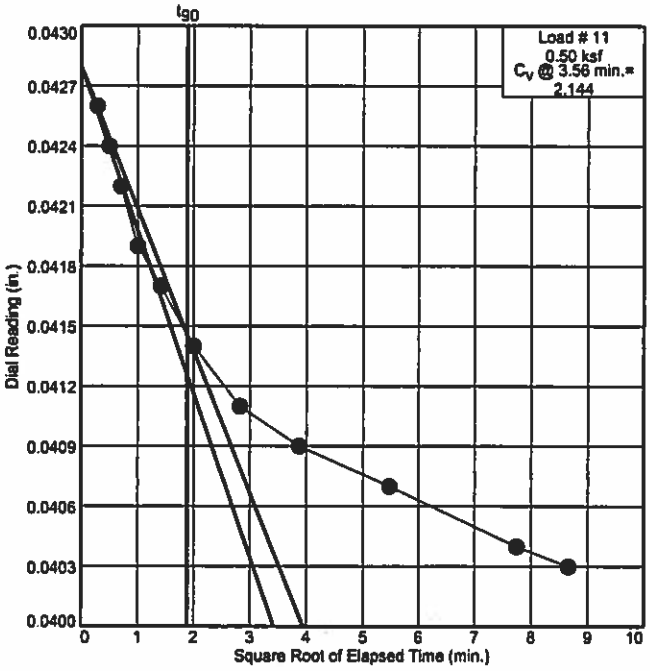
Dial Reading vs. Time

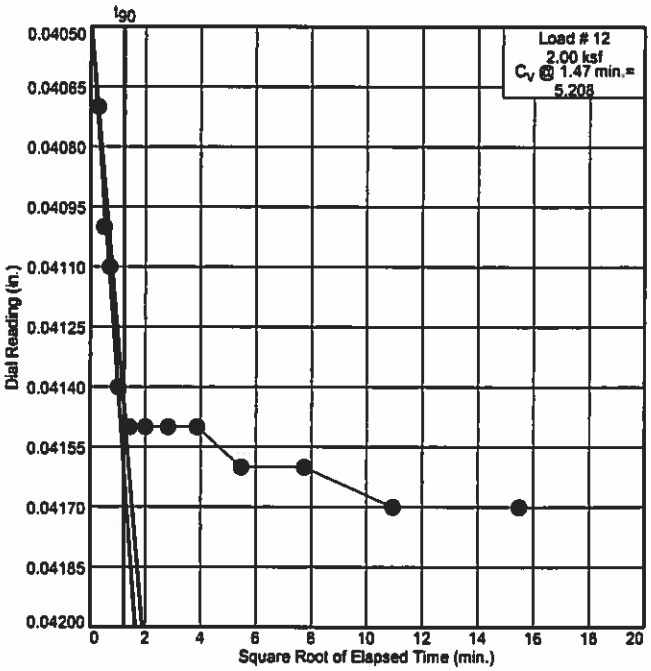
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 15'-17.5' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

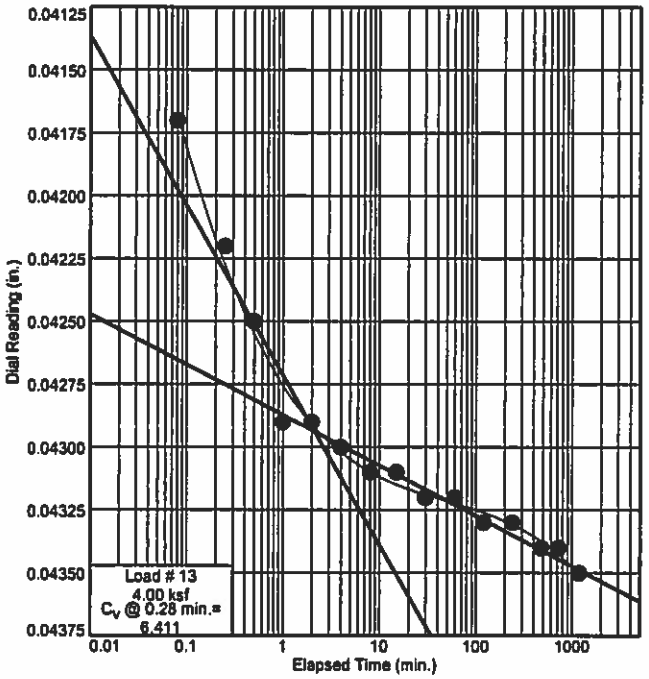
Biddeford, Maine

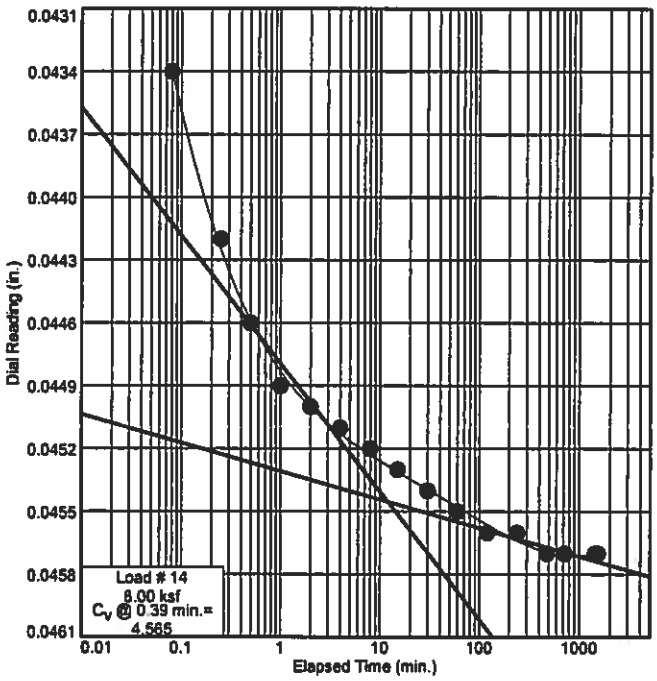
Lab No. 15360a

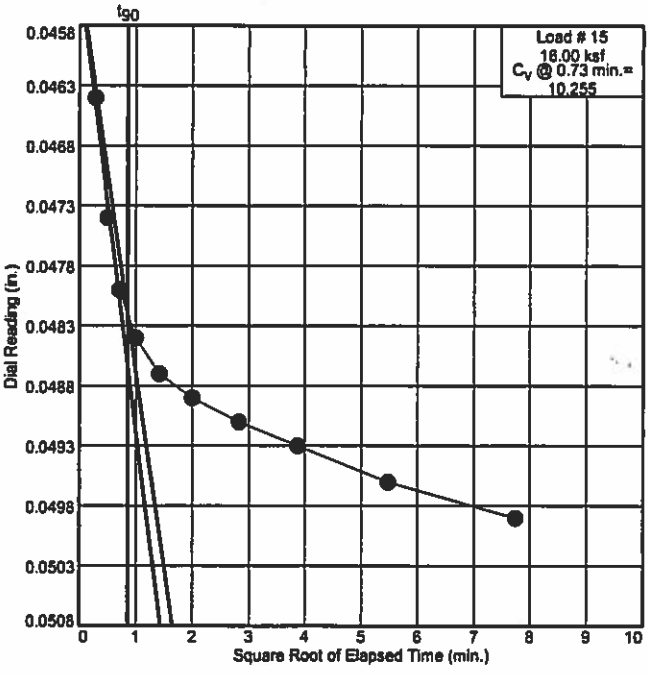
Dial Reading vs. Time

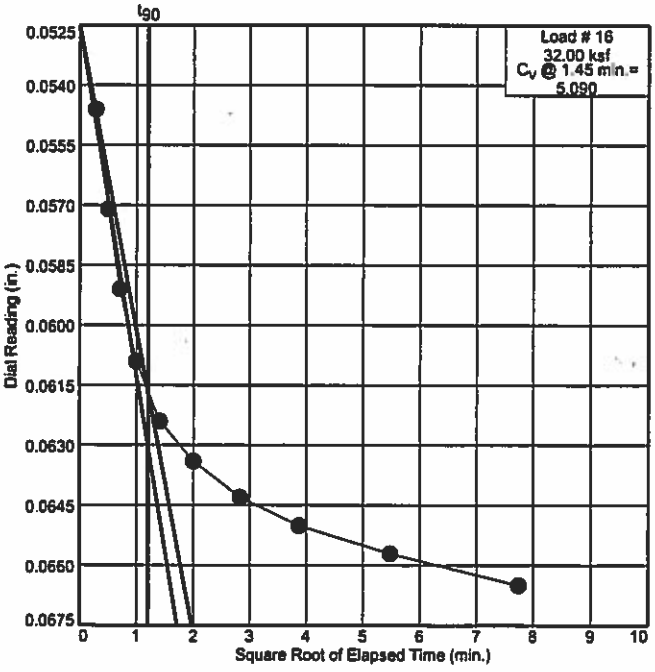
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 15'-17.5' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

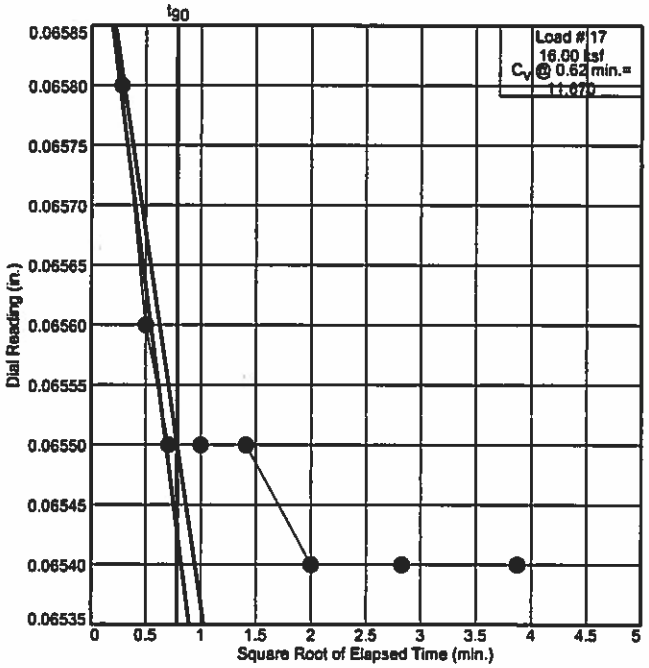
Biddeford, Maine

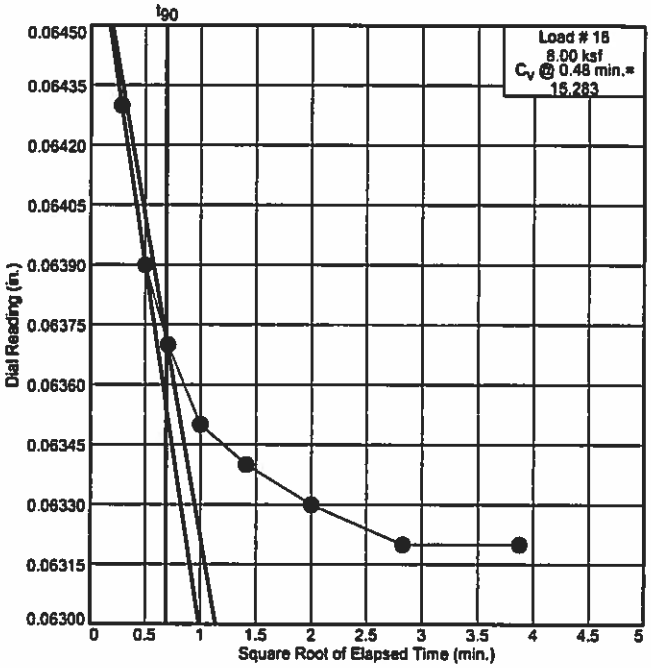
Lab No. 15376a

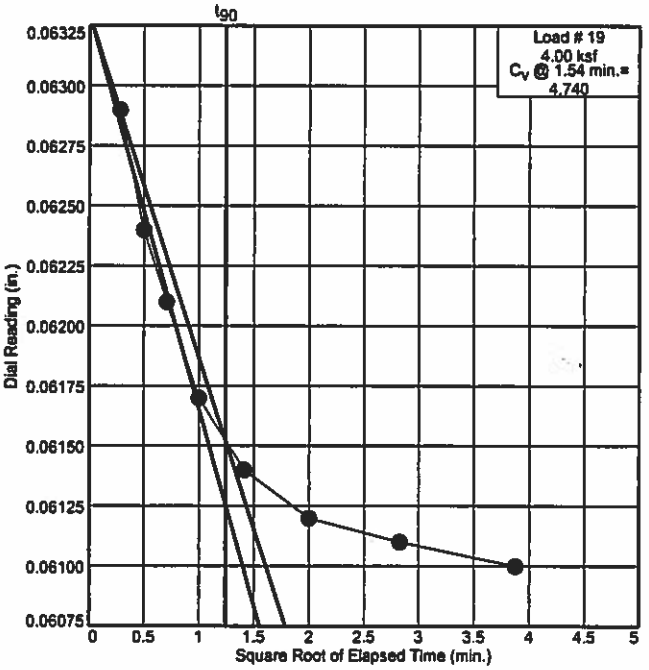
Dial Reading vs. Time

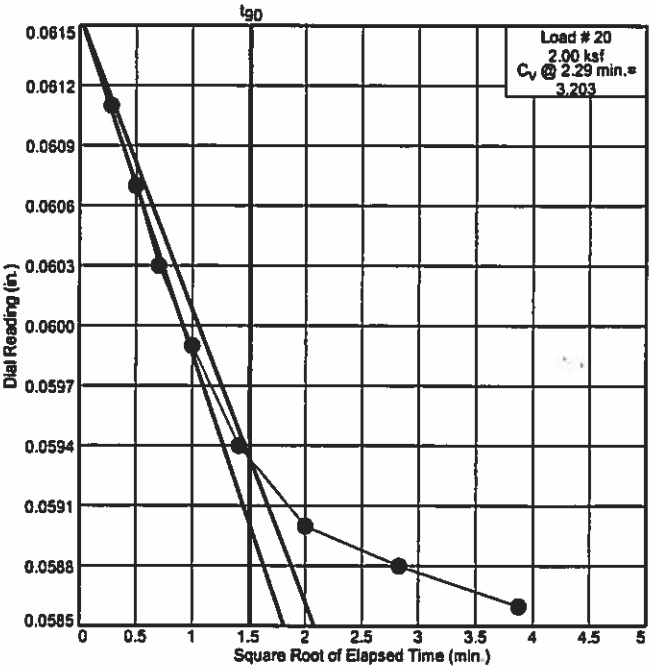
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 15'-17.5' Sample Number: U-1









R.W. Gillespie & Associates, Inc.

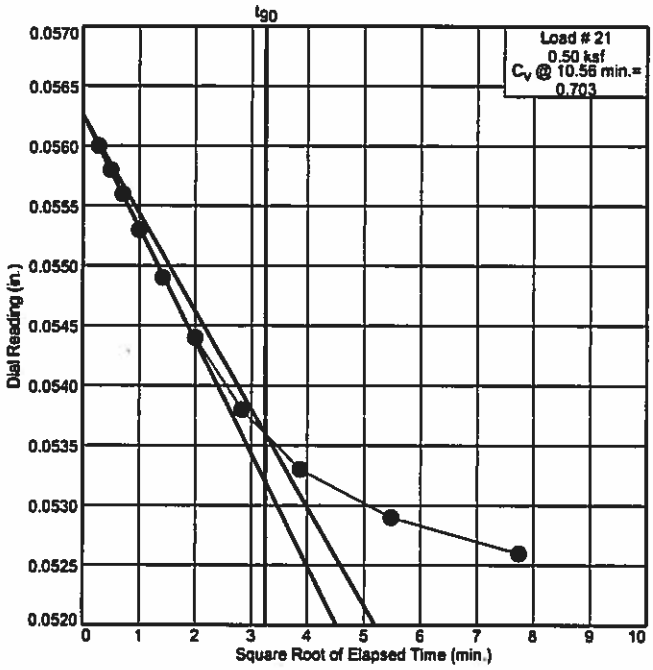
Biddeford, Maine

Lab No. 15366a

Dial Reading vs. Time

Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 15'-17.5' Sample Number: U-1



R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15366a

MTG

Laboratory Vane Shear Test Results

ASTM D4648 Standard Test Method for Laboratory Miniature Vane Shear Test for Saturated Fine-Grained Clayey Soil

Project: Wells Transportation Center Improvement
Client: GZA GeoEnvironmental, Inc.
Project No.: 0876-015
Location: Wells, ME
Date: 12/21/2018
Test Depth: 15.23 to 15.79

Boring/Sample No.		B-1			Lab No.	15366a	
Test No.	Test Depth (ft)	Vane Size	Max. Torque (Undisturbed) (kg-cm)	Max. Torque (Remolded) (kg-cm)	Undrained Shear Strength (psf)	Undrained Shear Strength (psf)	Moisture Content
	15.23						26%
	15.38						22%
	15.46						21%
	15.79						22%

Vane Size	
	(mm)
S	16 x 32
M	20 x 40
L	24.5 x 50.8

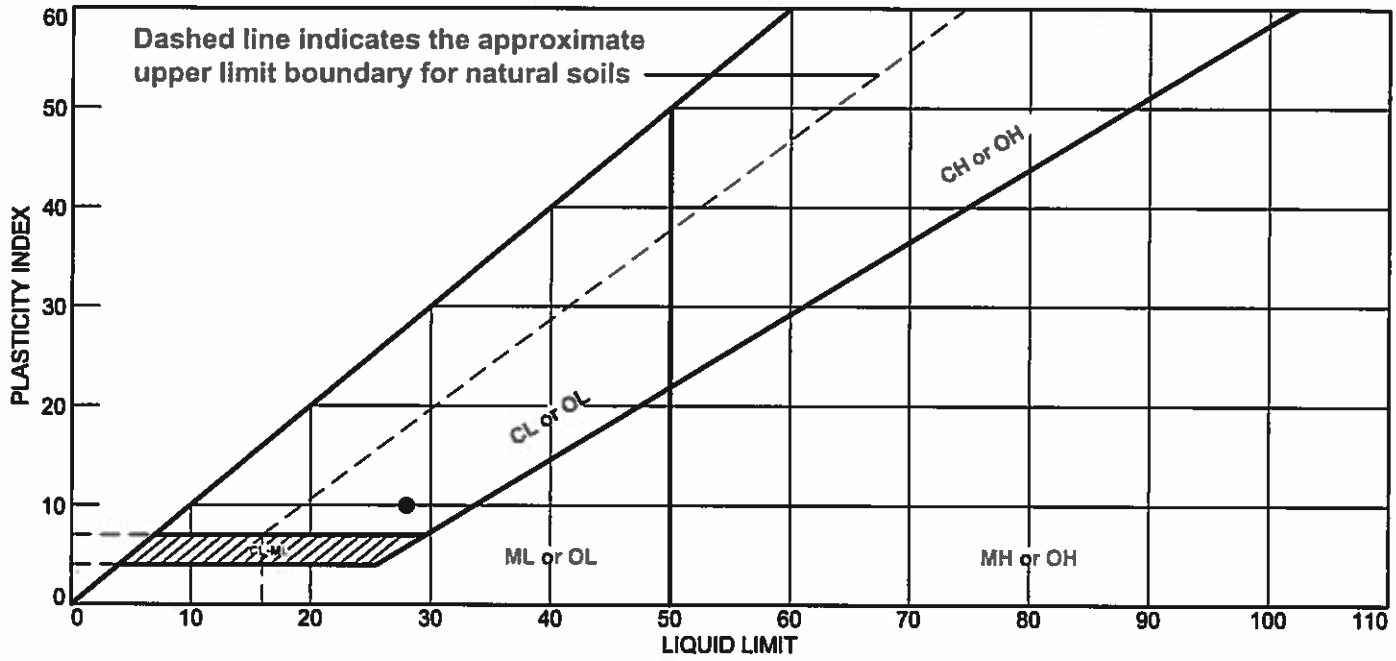
Tested By: JRF

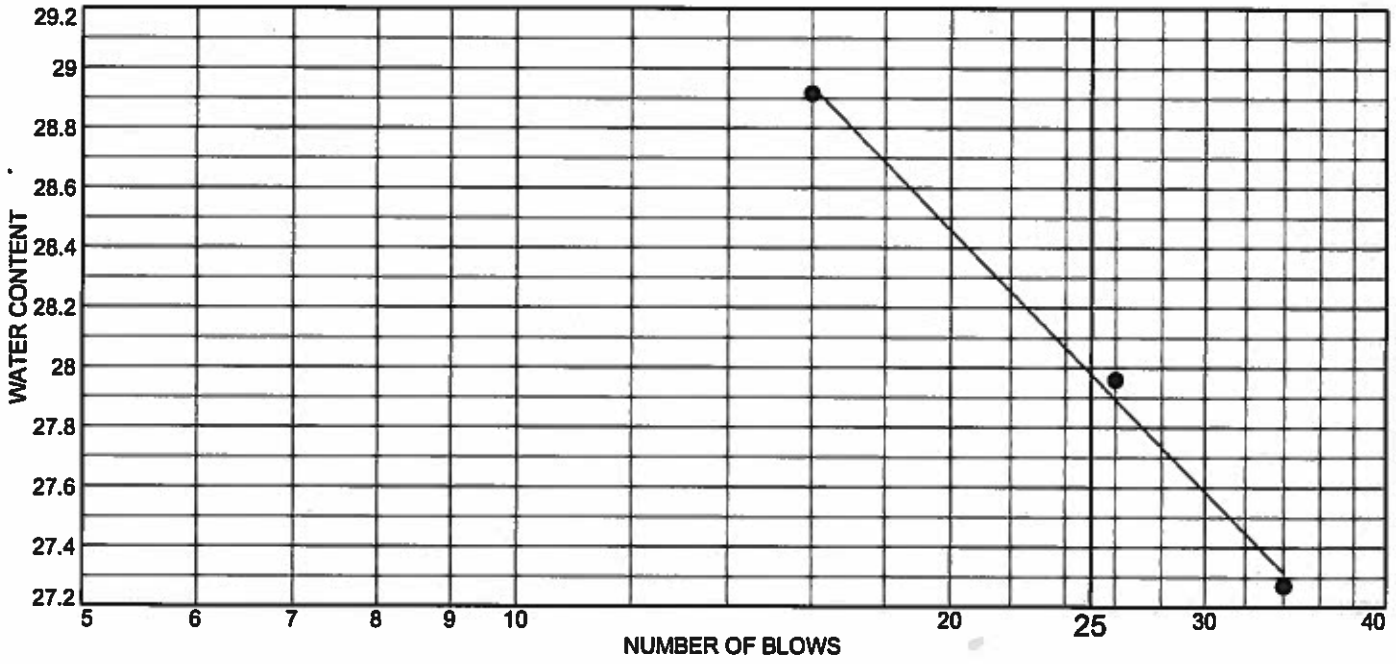
Checked By: MB

R.W. Gillespie & Associates

86 Industrial Park Rd., Suite 4, Saco ME 04072, 207-286-8008 / 200 International Dr., Suite 170, Portsmouth NH 03801, 603-427-0244

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean Clay	28	18	10			

Project No. 0876-015 **Client:** GZA GeoEnvironmental, Inc.

Project: Wells Transportation Center Improvements #:09.0026004.00

Wells, ME

Location: B-1

Sample Number: U-1 **Depth:** 15'-17.5'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

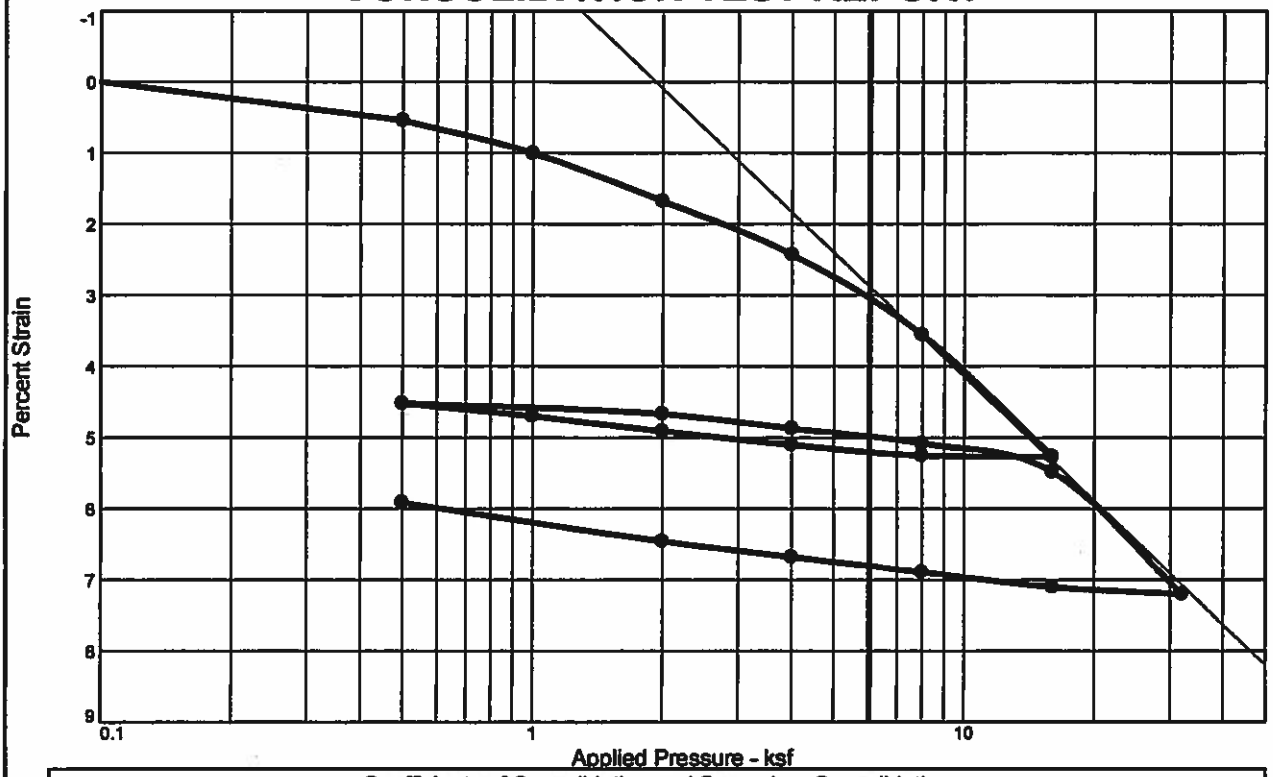
Remarks:

● Natural Moisture: 21.3%

Lab No. 15366a

Tested By: AGS **Checked By:** MTG

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α	No.	Load (ksf)	C_v (ft.2/day)	C_α
1	0.50	1.634		8	4.00	9.628		15	16.00	5.520	
2	1.00	1.340		9	2.00	4.055		16	32.00	4.362	
3	2.00	1.563	0.001	10	1.00	4.067		17	16.00	11.676	
4	4.00	1.707	0.002	11	0.50	1.049		18	8.00	10.469	
5	8.00	2.854	0.003	12	2.00	4.856	0.000	19	4.00	5.000	
6	16.00	2.708		13	4.00	8.839	0.000	20	2.00	2.400	
7	8.00	12.156		14	8.00	10.472	0.000	21	0.50	0.474	

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
100.2 %	20.8 %	108.6	25	8	2.70		6.6	0.09	0.03	0.559

MATERIAL DESCRIPTION	USCS	AASHTO
Clay		

Project No. 0876-015 **Client:** GZA GeoEnvironmental, Inc.

Project: Wells Transportation Center Improvements #:09.0026004.00
Wells, ME

Location: B-1 **Depth:** 26'-28.5' **Sample Number:** U-2

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

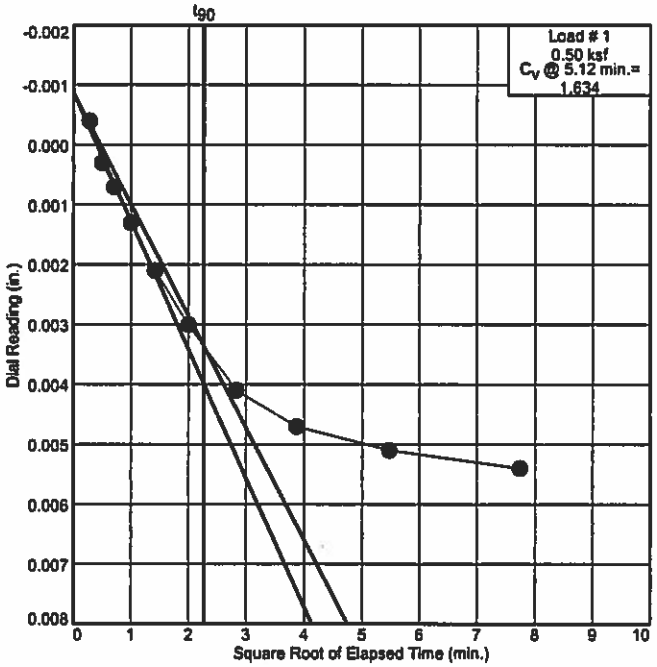
Lab No. 15366b

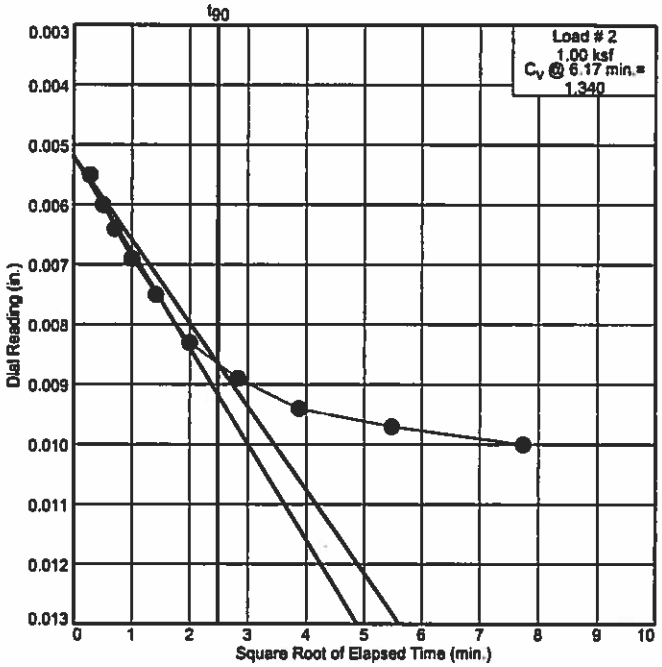
Tested By: JRF/AGS **Checked By:** MTG

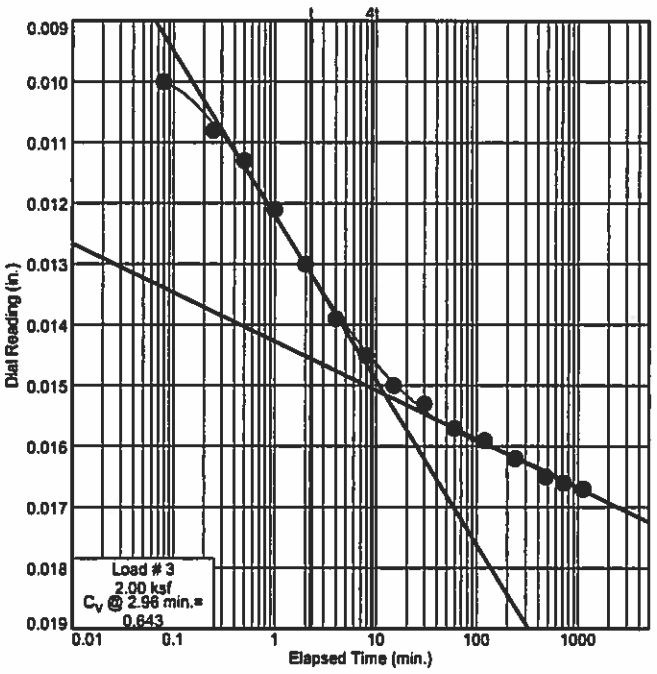
Dial Reading vs. Time

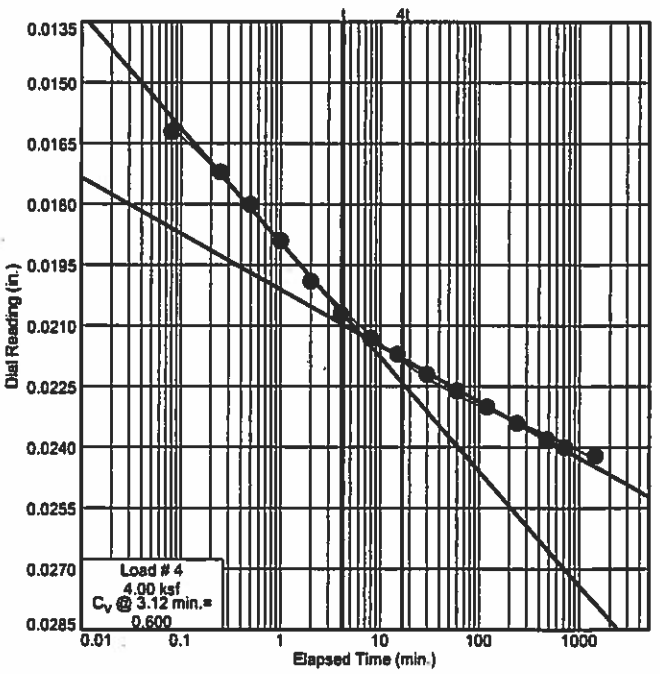
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 26'-28.5' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

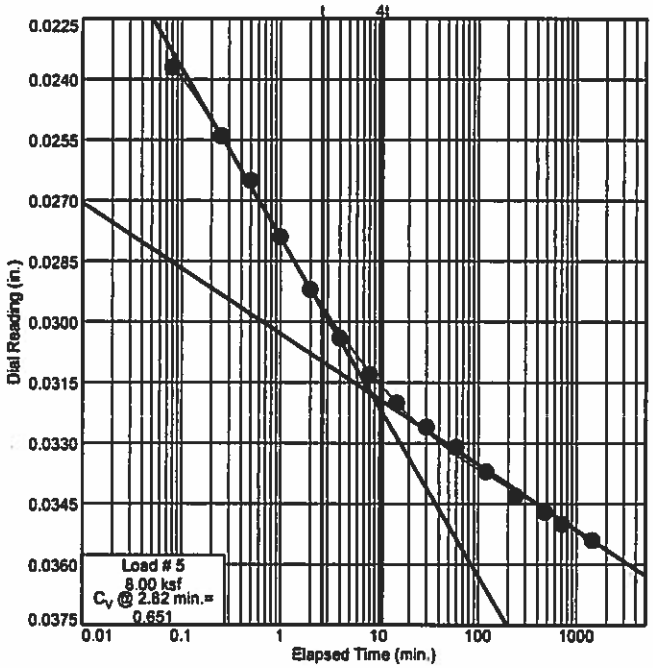
Biddeford, Maine

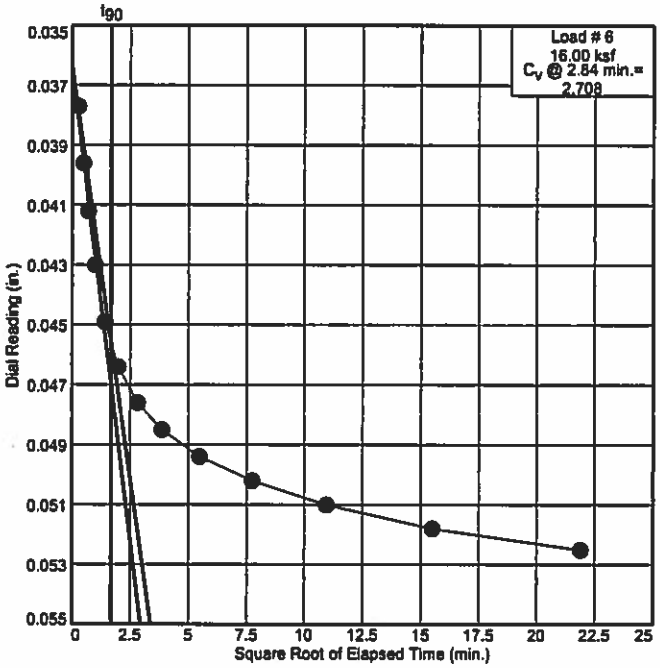
Lab No. 15366b

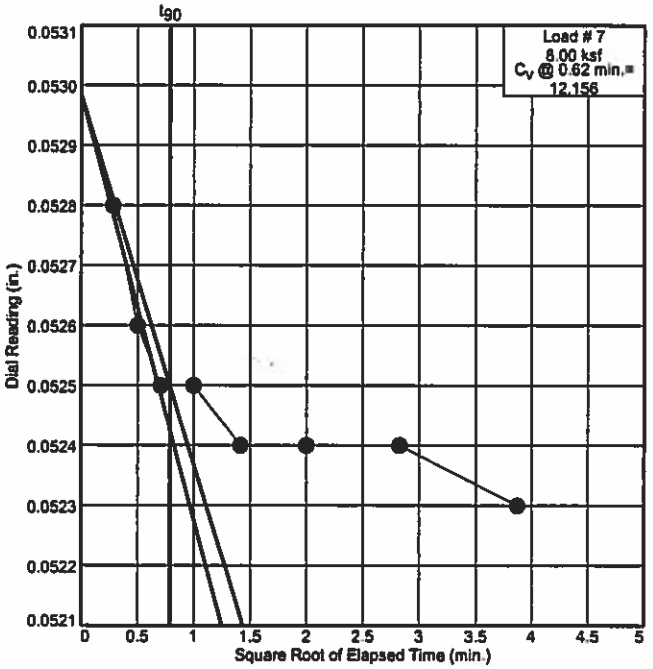
Dial Reading vs. Time

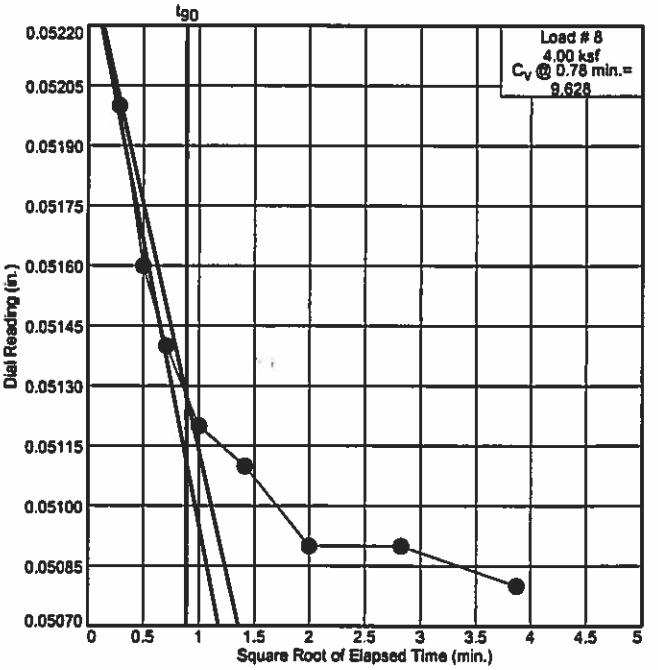
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 26'-28.5' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

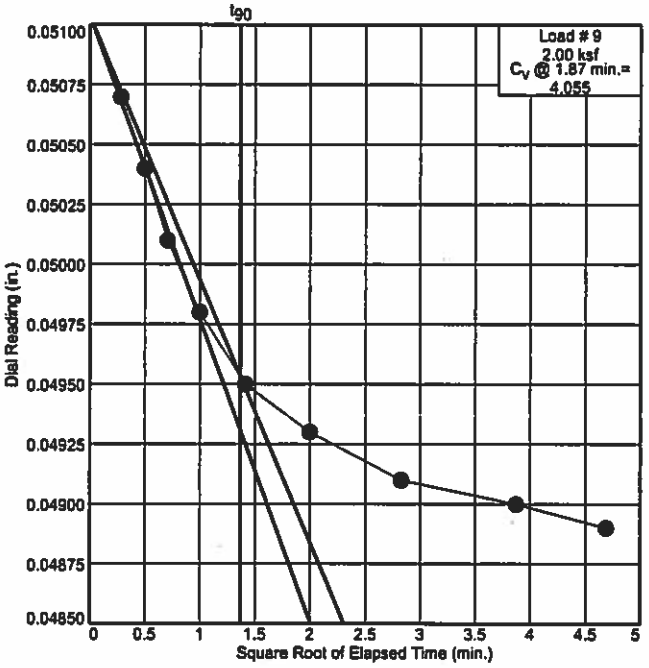
Biddeford, Maine

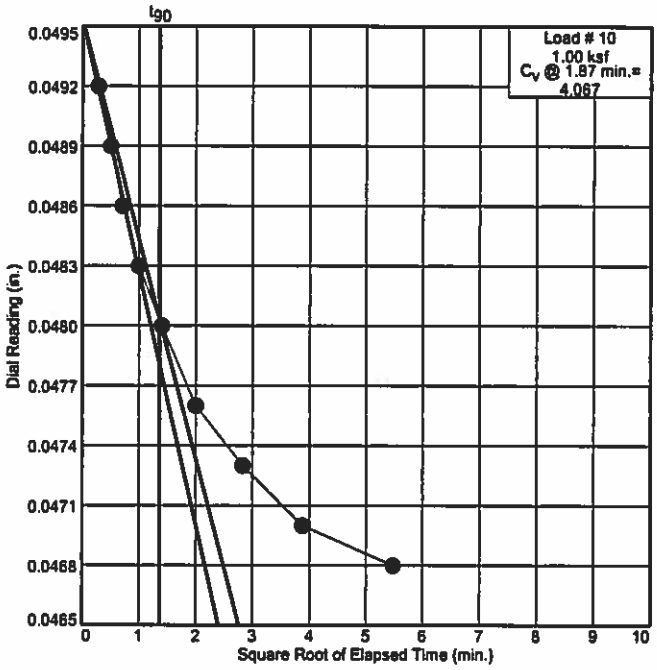
Lab No. 15366b

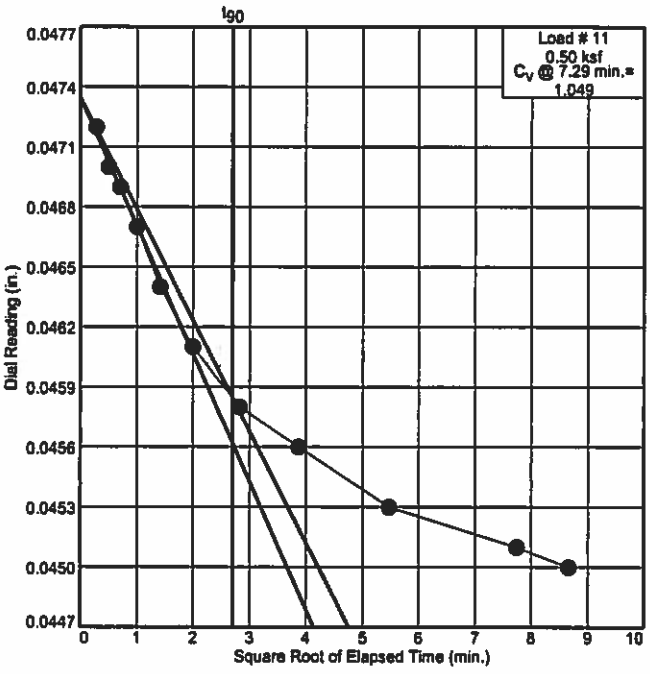
Dial Reading vs. Time

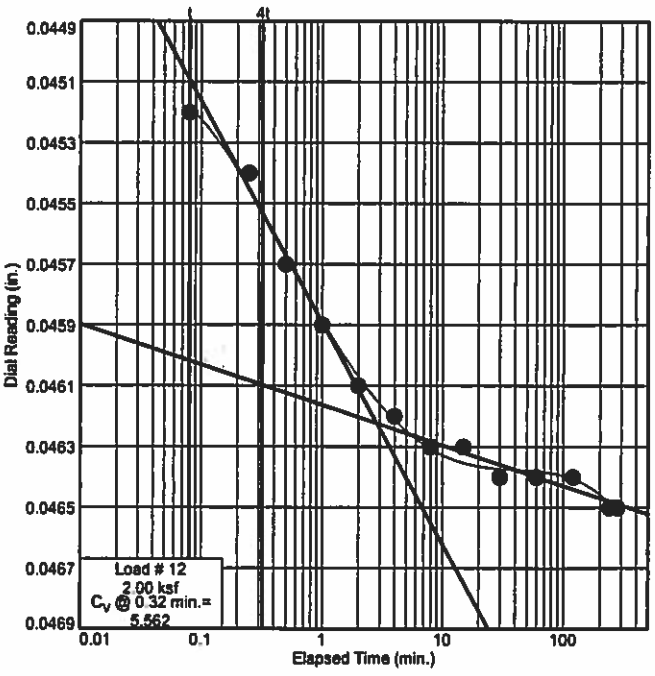
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 26'-28.5' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

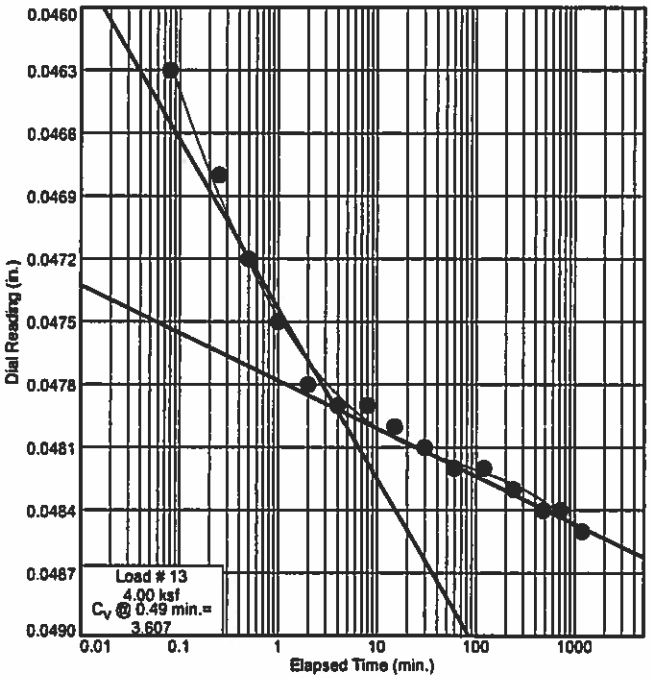
Lab No. 15369b

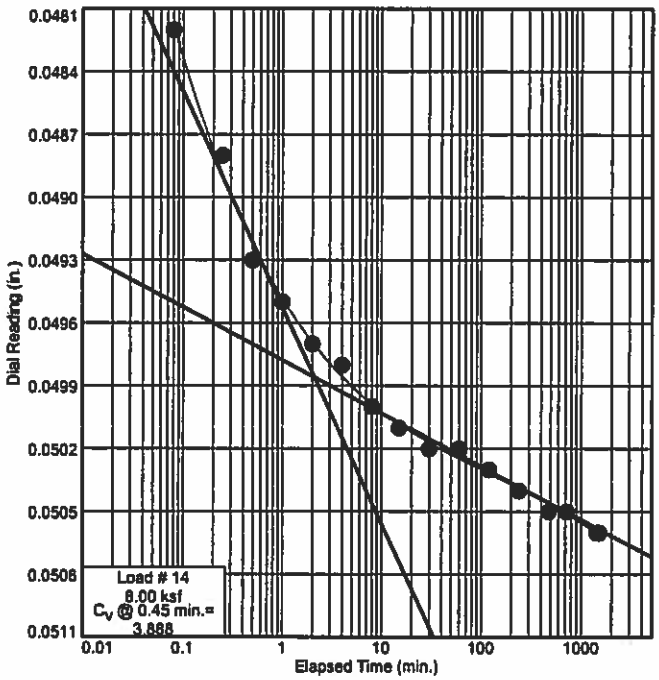
MTG

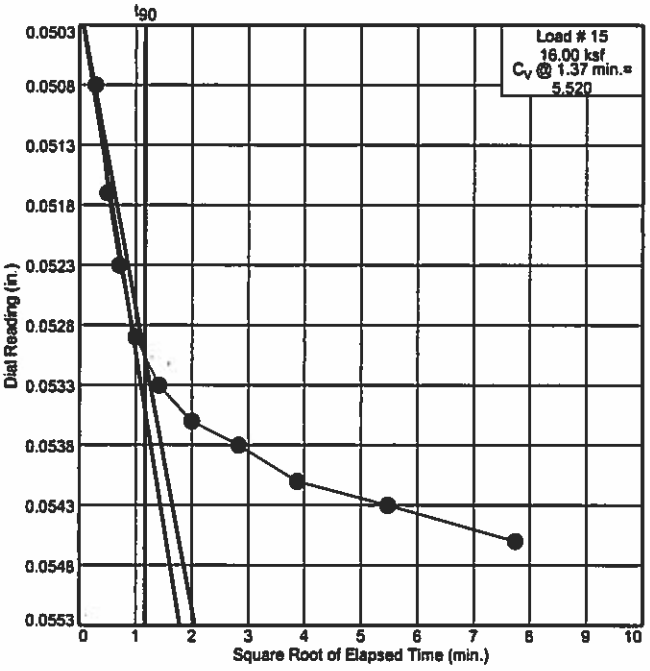
Dial Reading vs. Time

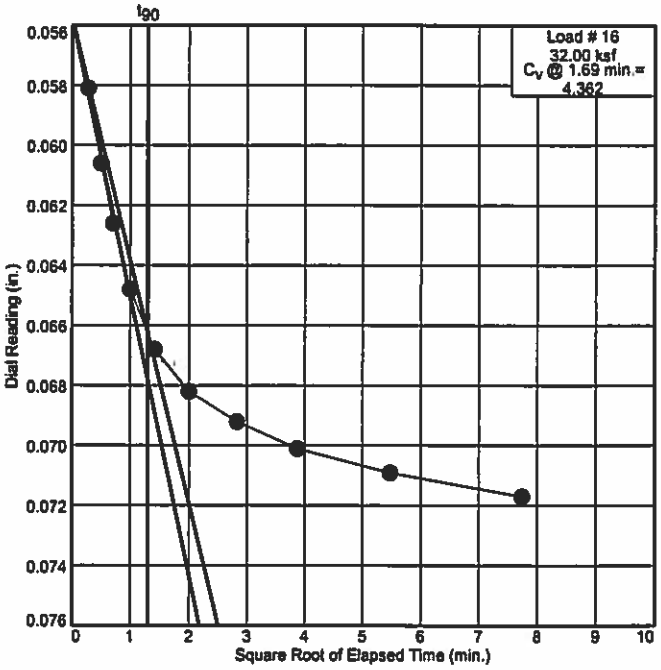
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 26'-28.5' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

Biddeford, Maine

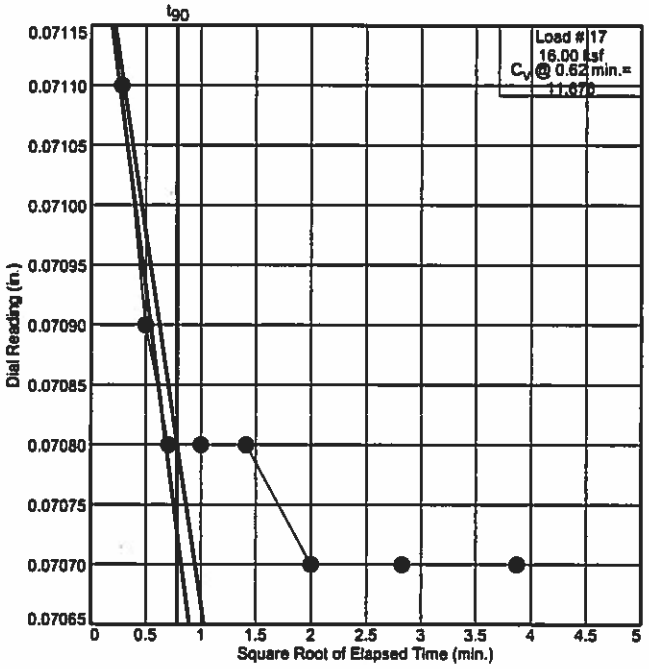
Lab No. 15370b

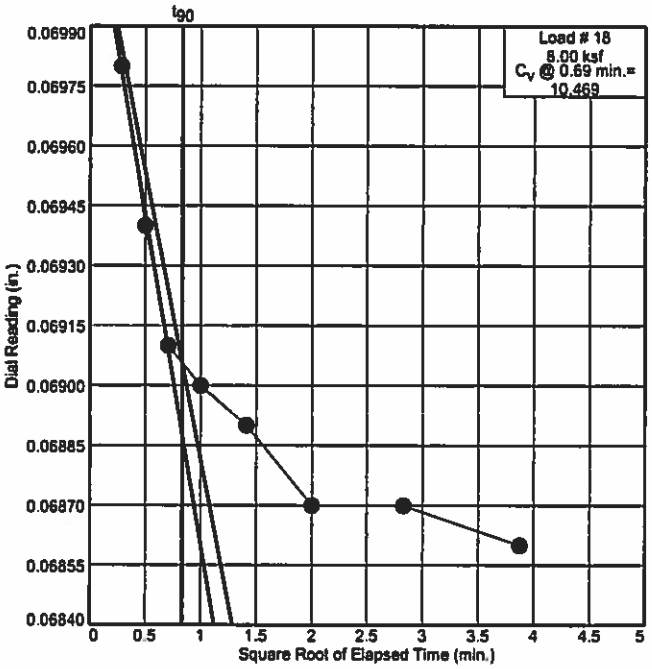
MTF

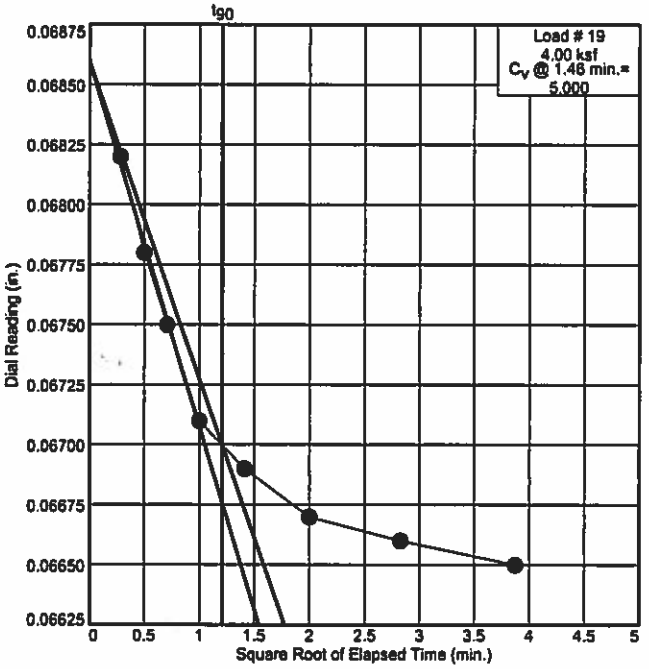
Dial Reading vs. Time

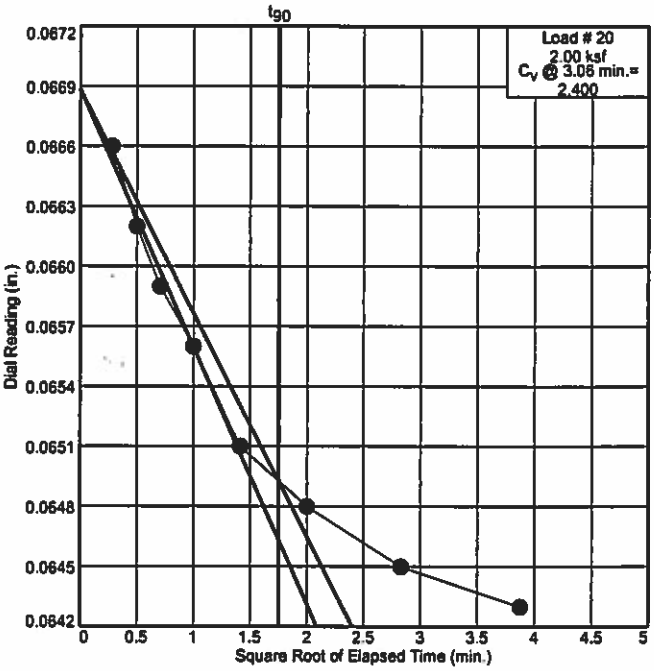
Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 26'-28.5' Sample Number: U-2









R.W. Gillespie & Associates, Inc.

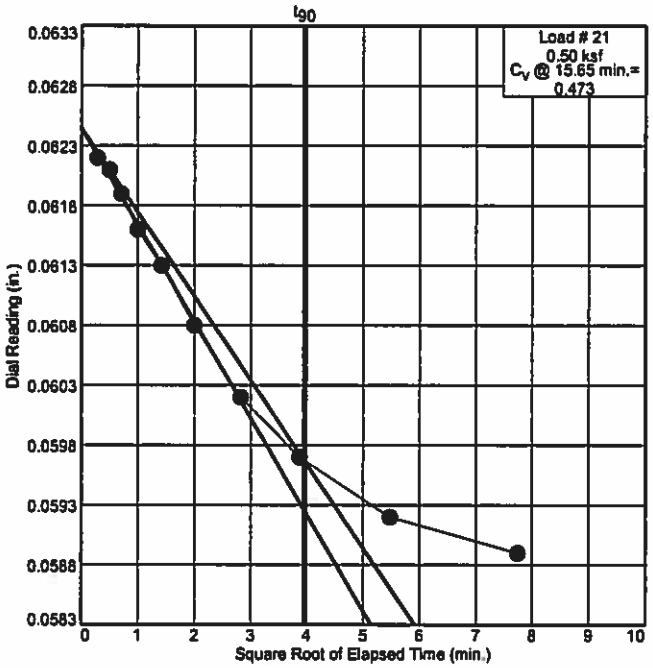
Biddeford, Maine

Lab No. 15366b

Dial Reading vs. Time

Project No.: 0876-015
Project: Wells Transportation Center Improvements #:09.0026004.00

Location: B-1 Depth: 26'-28.5' Sample Number: U-2



R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Lab No. 15362b

MJG

Laboratory Vane Shear Test Results

ASTM D4648 Standard Test Method for Laboratory Miniature Vane Shear Test for Saturated Fine-Grained Clayey Soil

Project: Wells Transportation Center Improvement
Client: GZA GeoEnvironmental, Inc.
Project No.: 0876-015

Location: Wells, ME
Date: 12/21/2018
Test Depth: 26.19 to 26.77

Boring/Sample No.		B-1			Lab No.	15366b	
Test No.	Test Depth (ft)	Vane Size	Max. Torque (Undisturbed) (kg-cm)	Max. Torque (Remolded) (kg-cm)	Undrained Shear Strength (psf)	Undrained Shear Strength (psf)	Moisture Content
1	26.19	M	74	19	1545	397	21%
2	26.31	M	100	22	2089	459	22%
3	26.44	M	121	18	2527	376	21%
4	26.77	S	69	17	2882	710	20%

Vane Size	
	(mm)
S	16 x 32
M	20 x 40
L	24.5 x 50.8

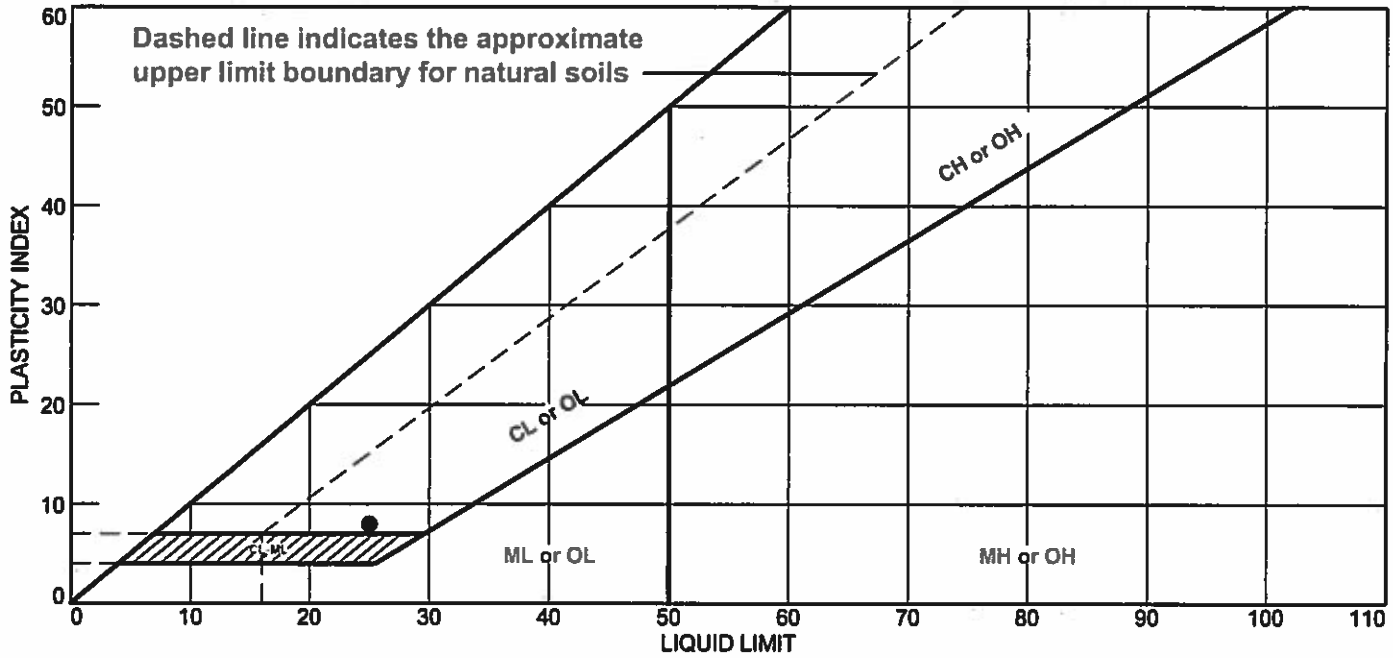
Tested By: JRF

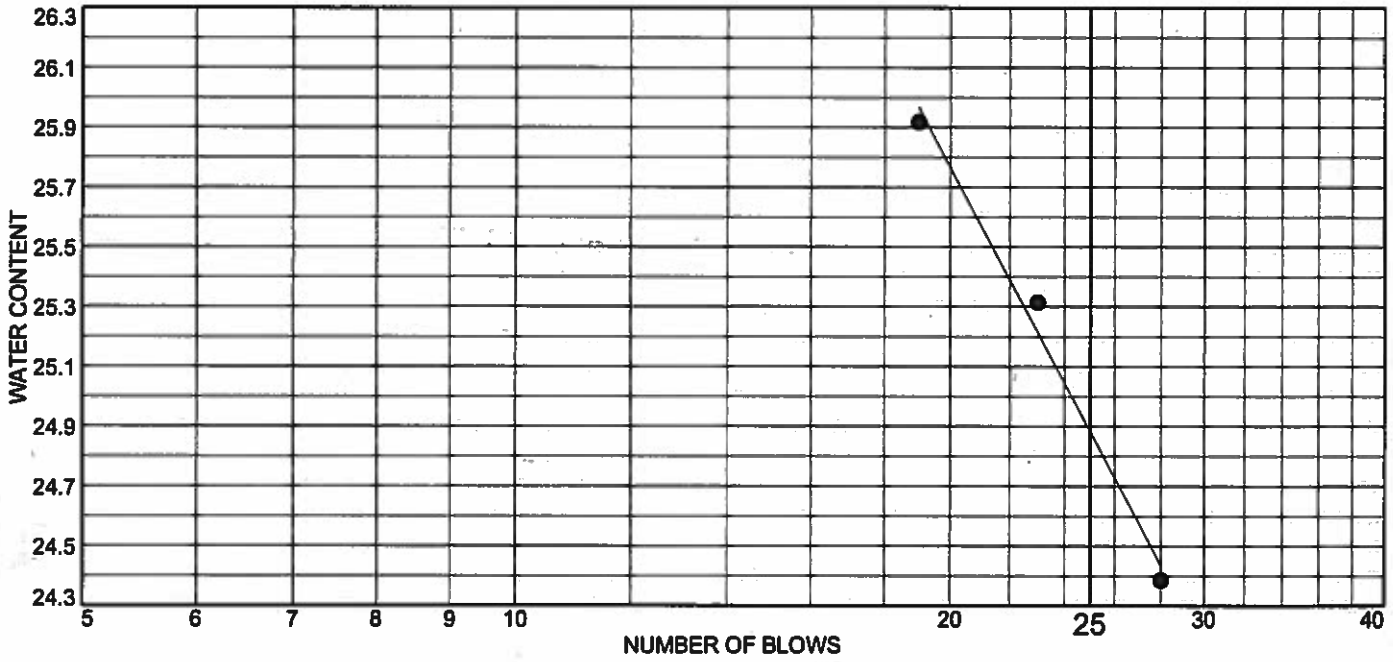
Checked By: MTB

R.W. Gillespie & Associates

86 Industrial Park Rd., Suite 4, Saco ME 04072, 207-286-8008 / 200 International Dr., Suite 170, Portsmouth NH 03801, 603-427-0244

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clay	25	17	8			

Project No. 0876-015 **Client:** GZA GeoEnvironmental, Inc.

Project: Wells Transportation Center Improvements #:09.0026004.00

Wells, ME

Location: B-1

Sample Number: U-2 **Depth:** 26'-28.5'

R.W. Gillespie & Associates, Inc.

Biddeford, Maine

Remarks:

● Natural Moisture 21.5%

Lab No. 15366b

Tested By: AGS **Checked By:** MTG

THIELSCH ENGINEERING
195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
thielsch.com
Let's Build a Solid Foundation

Client Information:
GZA GeoEnvironmental
South Portland, ME
PM: Nicholas Williams
Assigned By: Nicholas Williams
Collected By: Emma Tombaugh

Project Information:
Wells Transportation Center Final Design
Wells, Me
Client Project Number: 09.0026004.01
Summary Page: 1 of 1
Report Date: 09.07.22

LABORATORY TESTING DATA SHEET, Report No.: 7422-H-200

Boring	Sample No.	Depth (ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Received Moisture Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	pH	Dry unit wt. (pcf)	Test Moisture Content %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) (Corr.)	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318		D6913			D2974	D4792			D1557						
GZ-101	S1	0-2	22-S-3299	3.4			15.9	76.5	7.6											Brown f-c SAND, little fine Gravel, trace Silt
GZ-101	S5	8-10	22-S-3300	18.2			0.5	93.9	5.6											Brown f-m SAND, trace Silt, trace fine Gravel
GZ-101	S8	25-27	22-S-3301	11.3			12.5	78.4	9.1											Brown f-c SAND, little f-c Gravel, trace Silt
GZ-102	S3	4-6	22-S-3302	21.3			0.0	93.1	6.9											Brown fine SAND, trace Silt
GZ-102	S6	15-17 Bott 10"	22-S-3303	20.4	33	18														Grey CLAY & SILT
GZ-102	S8	25-27	22-S-3304	19.7	33	17														Grey CLAY & SILT
GZ-102	S9	30-32	22-S-3305	15.0			0.0	27.9	72.1											Grey CLAY & SILT, some fine Sand

Date Received: *08.29.22*

Reviewed By:

Date Reviewed: *09.07.22*

THIELSCH ENGINEERING

State of Maine - Department of Transportation
Laboratory Testing Summary Sheet

Wells Transportation Center Final Design

MDOT Project Number:

GZA Project Number: 09.0026004.01

Town(s): Wells, ME

Boring & Sample Identification Number	Station (Feet)	Sample No.	Depth (Feet)	Lab Number	Organic %	W.C.	L.L.	P.I.	Classification		
									Unified	AASHTO	Frost
GZ-101		S1	0-2	S-3299		3.4			SW-SM	A-1-b	0
GZ-101		S5	8-10	S-3300		18.2			SP-SM	A-3	0
GZ-101		S8	25-27	S-3301		11.3			SW-SM	A-1-b	II
GZ-102		S3	4-6	S-3302		21.3			SP-SM	A-3	0
GZ-102		S6	15-17	S-3303		20.4	33	18	CL	A-6	IV
GZ-102		S8	25-27	S-3304		19.7	33	17	CL	A-6	IV
GZ-102		S9	30-32	S-3305		15.0			CL	A-6	

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MDOT and Corps of Engineers Classification Systems.

GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

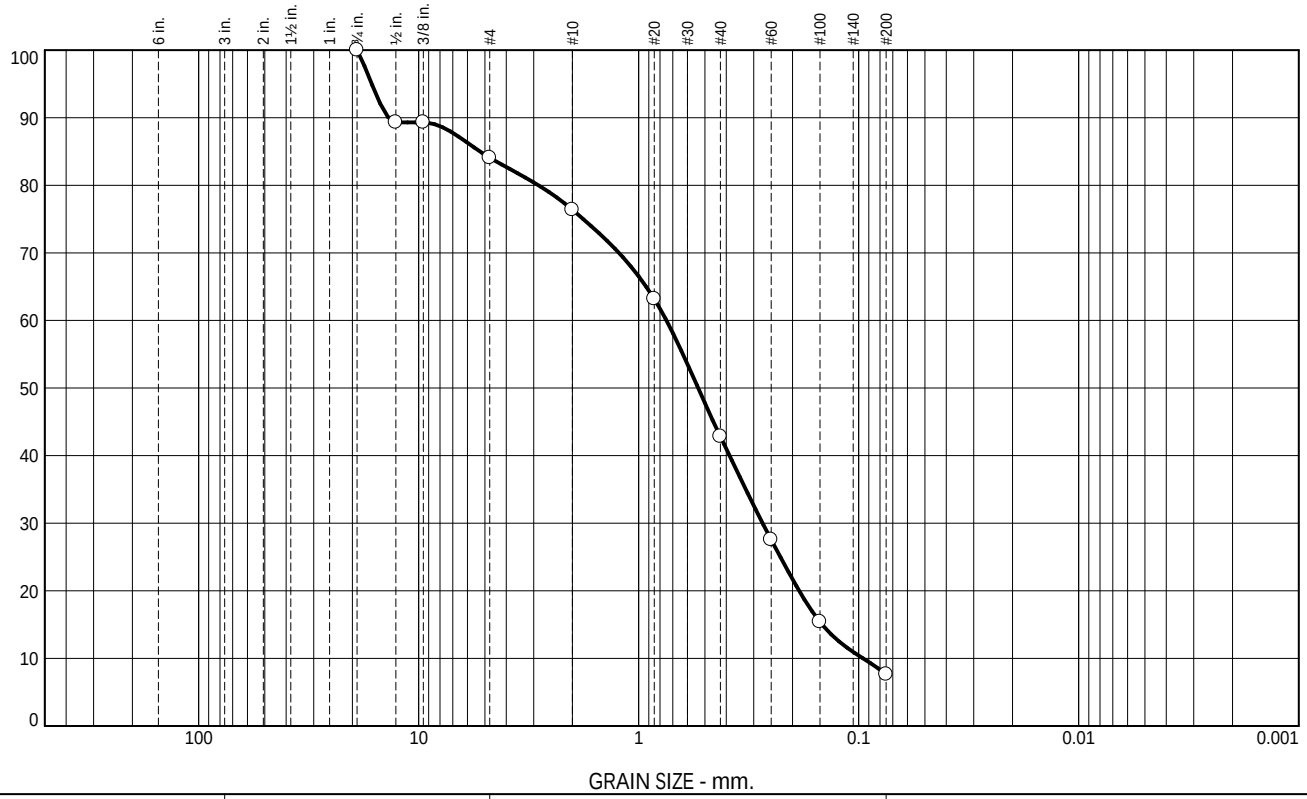
WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	15.9	7.7	33.6	35.2	7.6	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
3/4"	100.0			
1/2"	89.3			
3/8"	89.3			
#4	84.1			
#10	76.4			
#20	63.2			
#40	42.8			
#60	27.6			
#100	15.4			
#200	7.6			

* (no specification provided)

Material Description

Brown f-c SAND, little fine Gravel, trace Silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 13.7174 D_{85}= 5.2664 D_{60}= 0.7476
D_{50}= 0.5367 D_{30}= 0.2735 D_{15}= 0.1466
D_{10}= 0.0956 C_u= 7.82 C_c= 1.05

Classification

USCS= SW-SM AASHTO= A-1-b

Test Remarks

Source of Sample: Borings Depth: 0-2'
Sample Number: GZ-101 / S1 Sample Date: 08.31.22

Thielsch Engineering Inc.

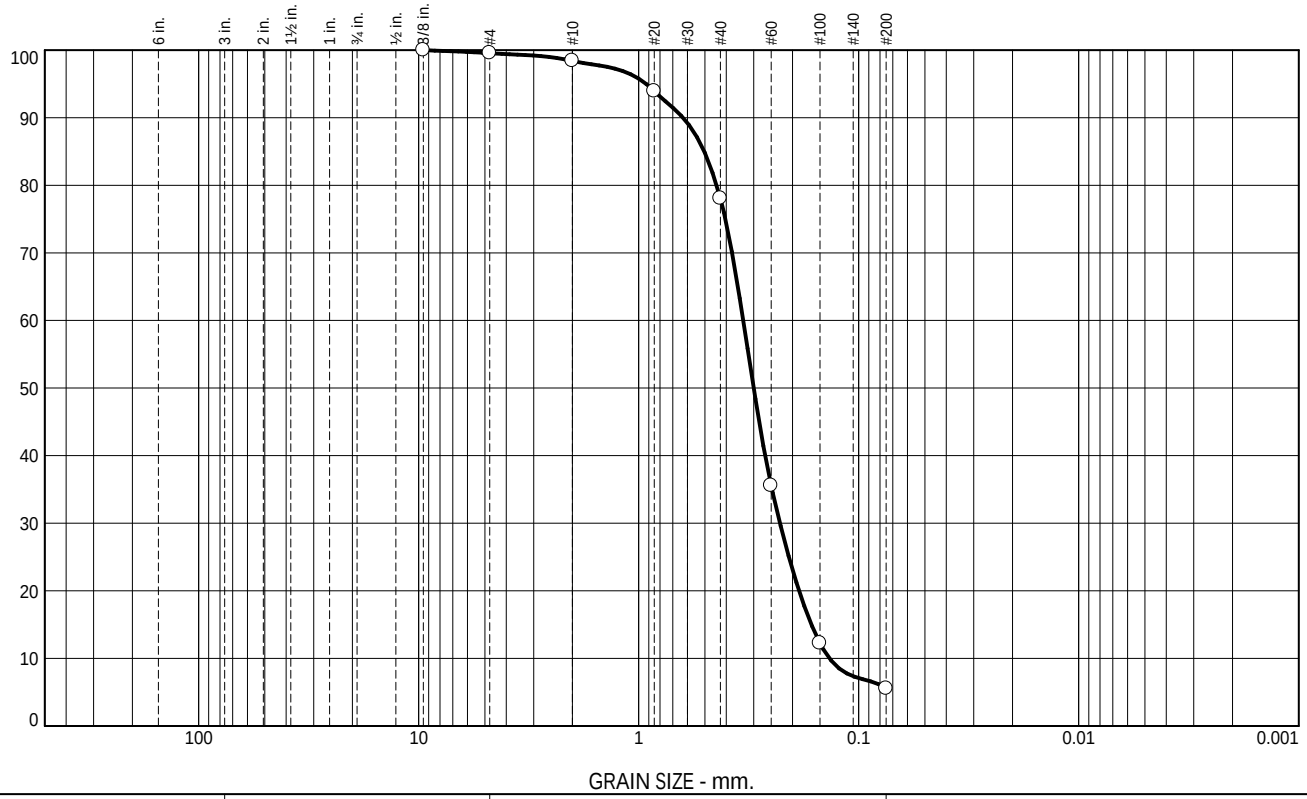
Cranston, RI

Client: GZA GeoEnvironmental
Project: Wells Transportation Center Final Design
Wells, ME
Project No: 09.0026004.01 Figure 22-S-3299

Tested By: JB Checked By: Rebecca Roth

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	1.1	20.3	72.5	5.6	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
3/8"	100.0			
#4	99.5			
#10	98.4			
#20	93.9			
#40	78.1			
#60	35.6			
#100	12.3			
#200	5.6			

* (no specification provided)

Material Description

Brown f-m SAND, trace Silt, trace fine Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.6287 D_{85}= 0.5037 D_{60}= 0.3348
D_{50}= 0.3000 D_{30}= 0.2278 D_{15}= 0.1640
D_{10}= 0.1358 C_u= 2.47 C_c= 1.14

Classification

USCS= SP-SM AASHTO= A-3

Test Remarks

Source of Sample: Borings Depth: 8-10'
Sample Number: GZ-101 / S5 Sample Date: 08.31.22

Thielsch Engineering Inc.

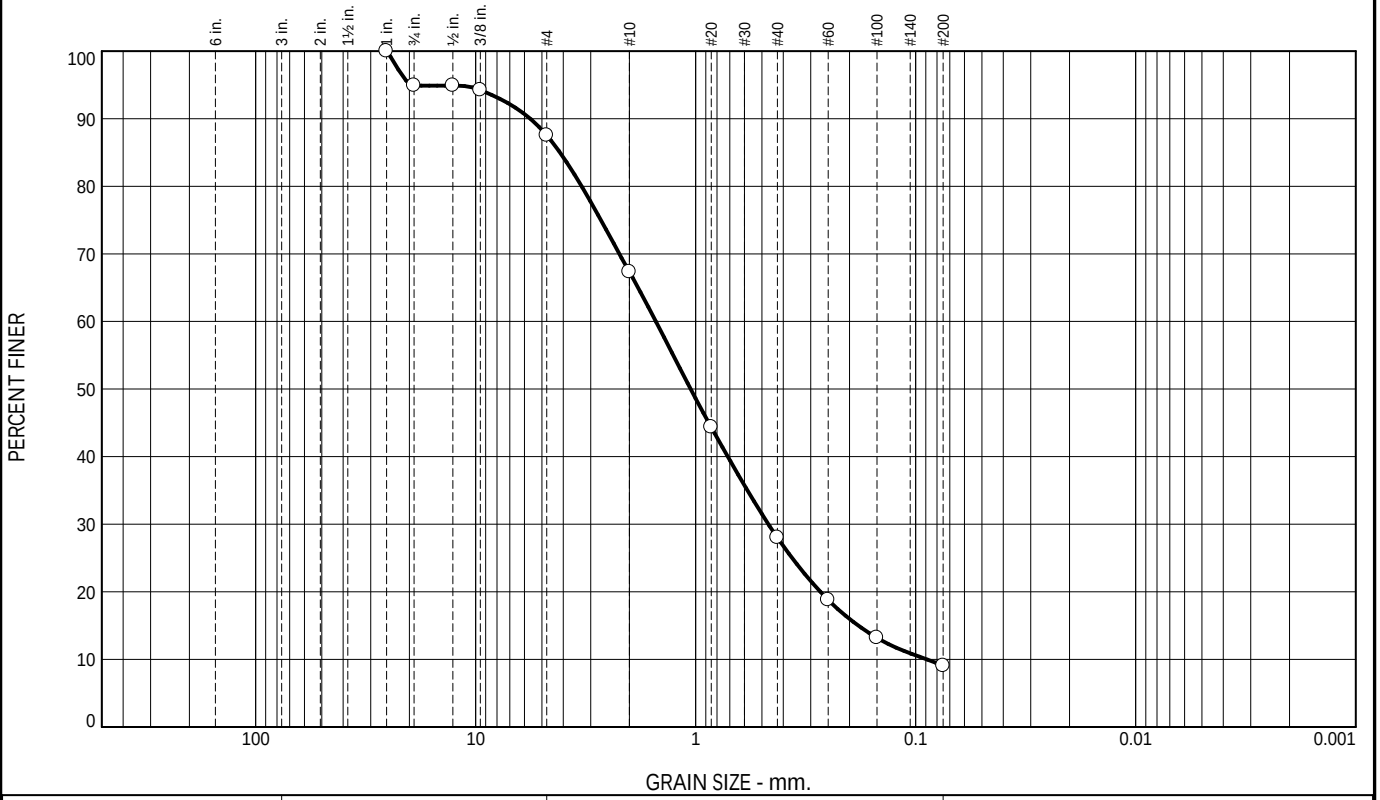
Cranston, RI

Client: GZA GeoEnvironmental
Project: Wells Transportation Center Final Design
Wells, ME
Project No: 09.0026004.01 Figure 22-S-3300

Tested By: JB Checked By: Rebecca Roth

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.1	7.4	20.2	39.3	18.9	9.1	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1"	100.0			
3/4"	94.9			
1/2"	94.9			
3/8"	94.2			
#4	87.5			
#10	67.3			
#20	44.4			
#40	28.0			
#60	18.8			
#100	13.2			
#200	9.1			

* (no specification provided)

Material Description

Brown f-c SAND, little f-c Gravel, trace Silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 5.6507 D_{85}= 4.1358 D_{60}= 1.5157
D_{50}= 1.0539 D_{30}= 0.4671 D_{15}= 0.1823
D_{10}= 0.0891 C_u= 17.02 C_c= 1.62

Classification

USCS= SW-SM AASHTO= A-1-b

Test Remarks

Source of Sample: Borings Depth: 25-27'
Sample Number: GZ-101 / S8 Sample Date: 08.31.22

Thielsch Engineering Inc.

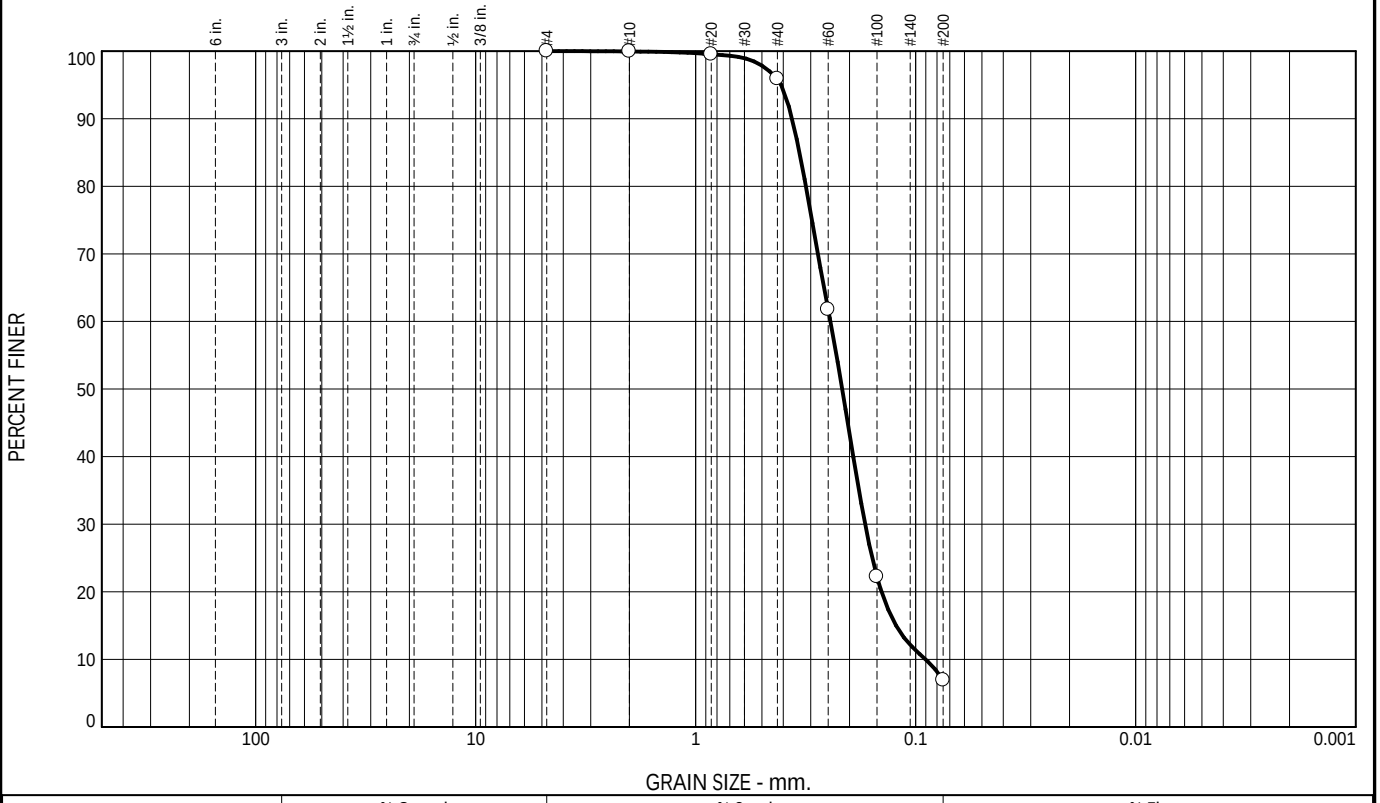
Cranston, RI

Client: GZA GeoEnvironmental
Project: Wells Transportation Center Final Design
Wells, ME
Project No: 09.0026004.01 Figure 22-S-3301

Tested By: JB Checked By: Rebecca Roth

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	4.0	89.0	6.9	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#4	100.0			
#10	99.9			
#20	99.5			
#40	95.9			
#60	61.8			
#100	22.2			
#200	6.9			

* (no specification provided)

Material Description

Brown fine SAND, trace Silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.3646 D_{85}= 0.3374 D_{60}= 0.2440
D_{50}= 0.2157 D_{30}= 0.1698 D_{15}= 0.1228
D_{10}= 0.0902 C_u= 2.70 C_c= 1.31

Classification

USCS= SP-SM AASHTO= A-3

Test Remarks

Source of Sample: Borings Depth: 4-6'
Sample Number: GZ-102 / S3 Sample Date: 08.31.22

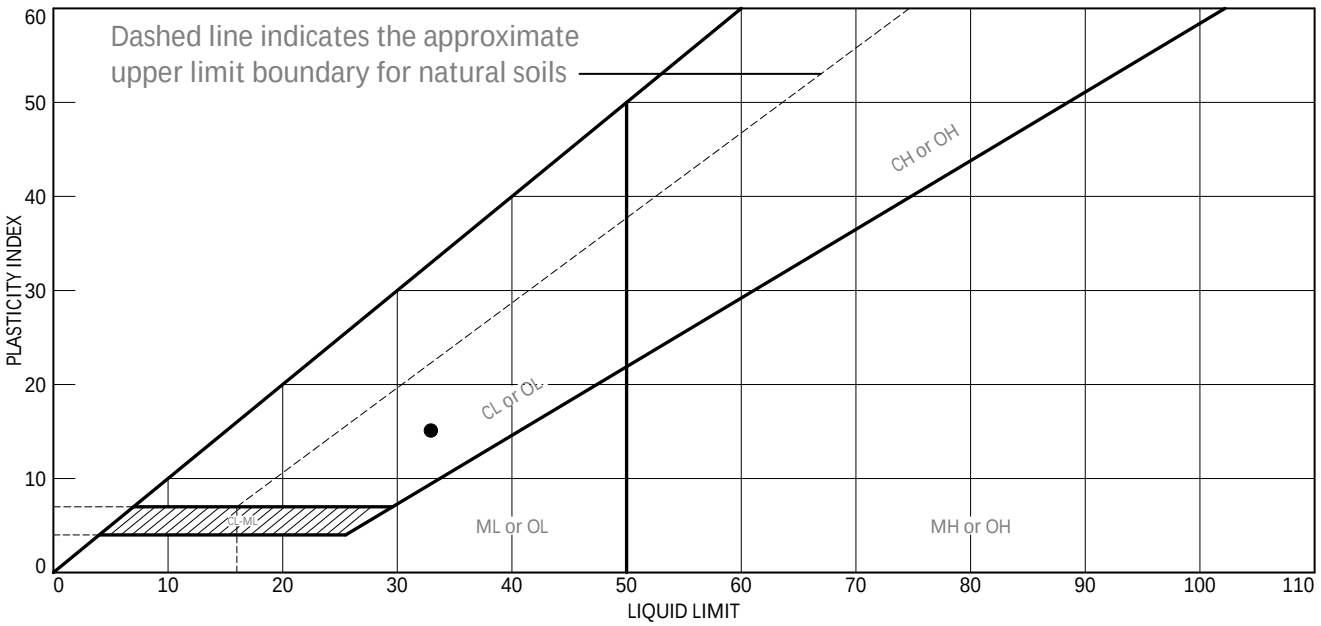
Thielsch Engineering Inc.

Cranston, RI

Client: GZA GeoEnvironmental
Project: Wells Transportation Center Final Design
Wells, ME
Project No: 09.0026004.01 Figure 22-S-3302

Tested By: JB Checked By: Rebecca Roth

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grey CLAY & SILT	33	18	15			

Project No. 09.0026004.01 Client: GZA GeoEnvironmental

Project: Wells Transportation Center Final Design

Wells, ME

Source of Sample: Borings Depth: 15-17'

Sample Number: GZ-102 / S6

Remarks:

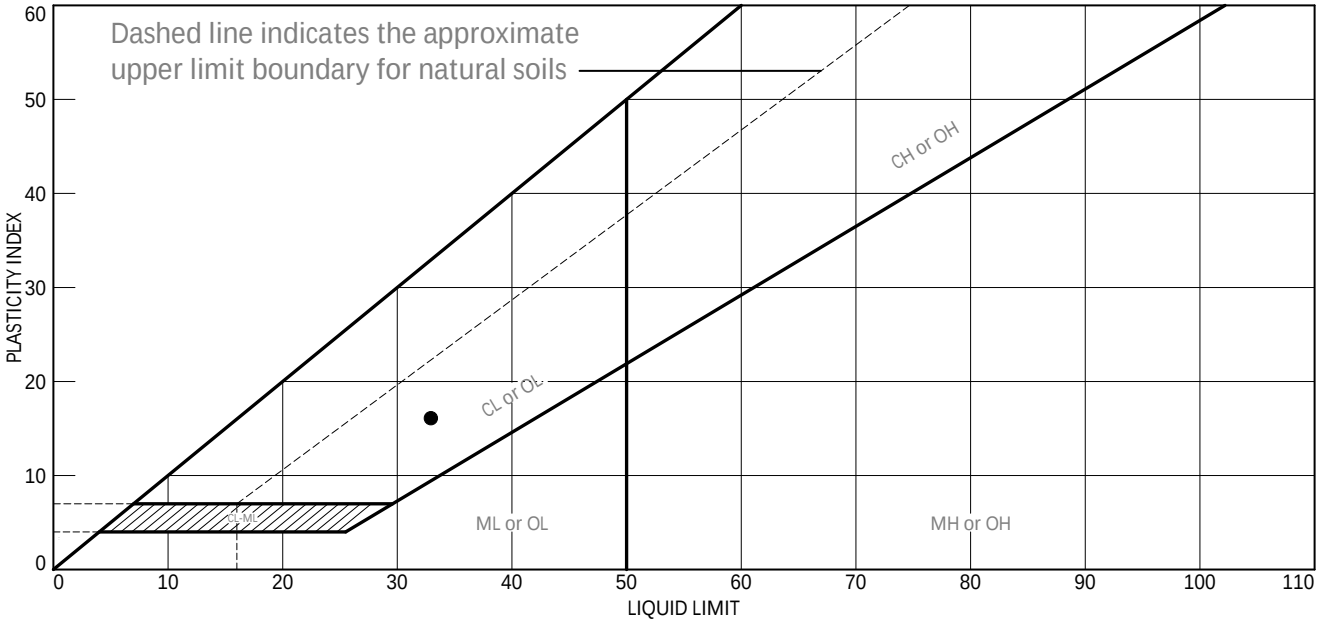
Thielsch Engineering Inc.

Cranston, RI

Figure 22-L-3303

Tested By: JB Checked By: Rebecca Roth

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grey CLAY & SILT	33	17	16			

Project No. 09.0026004.01 Client: GZA GeoEnvironmental

Project: Wells Transportation Center Final Design

Wells, ME

Source of Sample: Borings Depth: 25-27'

Sample Number: GZ-102 / S8

Remarks:

Thielsch Engineering Inc.

Cranston, RI

Figure 22-L-3304

Tested By: JB Checked By: Rebecca Roth

Particle Size Distribution Report

ASTM D6913

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	27.8	72.1	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#4	100.0			
#10	100.0			
#20	99.9			
#40	99.9			
#60	99.9			
#100	99.2			
#200	72.1			

* (no specification provided)

Material Description

Grey CLAY & SILT, some fine Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1092 D_{85}= 0.0985 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6

Test Remarks

Sample visually classified as plastic. Sample rolled to 1/8".

Source of Sample: Borings Depth: 30-32'
Sample Number: GZ-102 / S9 Sample Date: 08.31.22

Thielsch Engineering Inc.
Cranston, RI

Client: GZA GeoEnvironmental
Project: Wells Transportation Center Final Design
Wells, ME
Project No: 09.0026004.01 Figure 22-S-3305

Tested By: JB Checked By: Rebecca Roth