REPORT

18-1562.1

February 10, 2022

Explorations and Geotechnical Engineering Services

Project 8-Bay Maintenance Garage
Maine Turnpike Authority Litchfield Maintenance Yard
Litchfield, Maine

Prepared For:
HNTB Corporation
Attention: Timothy Cote, P.E.
82 Running Hill Road, Suite 201
South Portland, ME 04106

Prepared By:
S. W. Cole Engineering, Inc.
26 Coles Crossing Drive
Sidney, ME 04330
T: 207.626.0600

TABLE OF CONTENTS

18-1562.1

February 10, 2022

HNTB Corporation
Attention: Timothy Cote, P.E.
82 Running Hill Road, Suite 201
South Portland, ME 04106

Subject: Explorations and Geotechnical Engineering Services
Proposed 8-Bay Maintenance Garage
Maine Turnpike Authority Litchfield Maintenance Yard
Litchfield, Maine

Dear Tim:

In accordance with our Proposal, dated December 15, 2021, we have performed subsurface explorations for the subject project. This report summarizes our findings and geotechnical recommendations to date, and its contents are subject to the limitations set forth in Appendix A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our services was to obtain subsurface information at the site in order to develop geotechnical recommendations relative to foundations and earthwork associated with the proposed construction. Our scope of services included test pit and test boring explorations, soils laboratory testing, a geotechnical analysis of the subsurface findings and preparation of this report.

1.2 Site and Proposed Construction

The project site is located at the existing Maine Turnpike Authority (MTA) Litchfield Maintenance Yard at I-95 Mile Marker 92.7. The preferred building site is located on the northwestern boundary of the maintenance yard. The site is currently paved and occupied by existing concrete pads supporting an 8,000-gallon fuel tank and pumps and three propane tanks and post or pier foundations supporting equipment storage racks. The existing tanks and equipment will be relocated in favor of the proposed

construction. We understand a septic leach field exists on the northerly side of the proposed building. It is unknown if this leach field is active.

We understand development plans call for construction of a new maintenance garage with associated paved and landscape areas. We understand the new garage will be an 8-bay, heated, pre-engineered metal building occupying a 55-foot by 160-foot plan area. Proposed finish floor elevation (FFE) is not available at this time however, we anticipate the FFE will be within 2 feet of existing grades.

Proposed and existing site features are shown on the "Exploration Location Plan" attached in Appendix B.

2.0 EXPLORATION AND TESTING

2.1 Explorations

Four test pits (TP-201 through TP-204) were made at the site on January 13, 2022, by MTA and five test borings (B-201 through B-205) were made at the site on February 2, 2022, by S. W. Cole Explorations, LLC for the preferred building location. The exploration locations were selected and established in the field by S. W. Cole Engineering, Inc. (S.W.COLE) using measurements from existing site features. The approximate exploration locations are shown on the "Exploration Location Plan" attached in Appendix B. Logs of the explorations and a key to the notes and symbols used on the logs are attached in Appendix C. The elevations shown on the logs were estimated based on topographic information shown on the "Exploration Location Plan".

2.2 Field Testing

The test pits were excavated using a Bobcat E85 excavator by the MTA and continuously observed and logged by S.W.COLE. The test borings were drilled using hollow-stem augers. The soils in the test borings were sampled at 2-to-5-foot intervals using a split-spoon sampler and Standard Penetration Testing (SPT) methods. SPT blow counts are shown on the logs.

2.3 Laboratory Testing

Soil samples obtained from the explorations were returned to our laboratory for further classification and testing. Moisture content test results are shown on the logs in Appendix C. The results of two gradation tests are attached in Appendix D.

3.0 SUBSURFACE CONDITIONS

3.1 Soil and Bedrock

Test pits TP-201 through TP-204 and test borings B-201 through B-205 were made for the proposed maintenance building and encountered a soils profile generally consisting of a surficial layer of pavement or topsoil overlying medium dense, gravelly silty sand (granular fill) to a depth of about 1.5 to 4 feet overlying medium dense to very dense silty sand with varying amounts of gravel and occasional cobbles (glacial till). The explorations were terminated in the glacial till at depths of about 6.5 to 22 feet.

In TP-203, a layer of dark brown, sand and silt with numerous organics (roots) was encountered. In B-202 and B-205, a layer of dark brown, sand and silt with trace organics (rootlets) was encountered. These organic layers appeared to be about 4 to 6 inches thick.

Not all the strata were encountered at each exploration; refer to the attached logs for more detailed subsurface information.

3.2 Groundwater

The soils encountered at the test borings were generally moist to wet from the ground surface. Groundwater seepage was observed in TP-201 at a depth of about 6 feet during excavation. Groundwater was not observed in the remaining explorations at the time of digging or drilling. Groundwater likely becomes perched on the relatively impervious glacial till encountered at the explorations. Long term groundwater information is not available. It should be anticipated that groundwater levels will fluctuate, particularly in response to periods of snowmelt and precipitation, as well as changes in site use.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General Findings

Based on the subsurface findings, the proposed construction appears feasible from a geotechnical standpoint. The principle geotechnical considerations include:

- Existing structures and foundations present within the proposed building area will be removed and relocated. Additionally, soils with organics observed generally in the northwest corner of the proposed building are problematic for support of structures. We anticipate foundations will extend through these soils. We

recommend complete removal of the existing foundations, structures, and utilities as well as the existing fills and soils with organics below the building footprint. The over-excavation should be backfilled with compacted Structural Fill or Granular Borrow up to slab base gravel.

- Following removal of the existing foundations, fills and soils with organics, spread footing foundations and a slab-on-grade floors bearing on properly prepared subgrades appear suitable for the proposed building. Footings should bear on at least 3 inches of compacted Crushed Stone overlying undisturbed native soils. On-grade floor slabs in heated areas should bear on at least 12-inches of properly compacted Structural Fill overlying properly prepared subgrades.

- An exterior perimeter foundation drain is recommended for the proposed building.

- Subgrades across the site will consist of moisture sensitive glacial till. Earthwork and grading activities should occur during drier, non-freezing weather of Spring, Summer and Fall.

4.2 Site and Subgrade Preparation

We recommend site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. Surficial organics, roots and topsoil should be completely removed from areas of proposed fill and construction. As much vegetation and pavement as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance.

As discussed, the site has been previously developed. Structures and foundations are present at the site. Structures, foundations, existing fills, and soils with organics should be completely removed from beneath the proposed foundations and slab areas. The extent of removal should extend 1 foot laterally outward from outside edge of perimeter footings for every 1-foot of excavation depth (1H:1V bearing splay). The over-excavated area should be backfilled with compacted Structural Fill or Granular Borrow.

We recommend footings be underlain by at least 3 inches of Crushed Stone overlying undisturbed native glacial till soils

4.3 Excavation and Dewatering

Excavation work will generally encounter existing foundations and structures, possible existing utilities, granular fills, soils with organics and silty sand with varying amounts of gravel and occasional cobbles (glacial till). Care must be exercised during construction to limit disturbance of the bearing soils. Earthwork and grading activities should occur during drier, non-freezing weather of Spring, Summer and Fall.

Sumping and pumping dewatering techniques should be adequate to control groundwater in excavations. Controlling the water levels to at least one foot below planned excavation depths will help stabilize subgrades during construction. Excavations must be properly shored or sloped in accordance with OSHA Regulations to prevent sloughing and caving of the sidewalls during construction. Care must be taken to preclude undermining adjacent structures, utilities and roadways. The design and planning of excavations, excavation support systems, and dewatering is the responsibility of the contractor.

4.4 Foundations

We recommend the proposed building be supported on spread footings founded on at least 3 inches of compacted Crushed Stone bearing on undisturbed glacial till. For foundations bearing on properly prepared subgrades, we recommend the following geotechnical parameters for design consideration:

Geotechnical Parameters for Spread Footings and Foundation Walls	
Design Frost Depth (100-year AFI)	5 feet
Net Allowable Soil Bearing Pressure	3.5 ksf
Base Friction Factor	0.35
Total Unit Weight of Backfill	125 pcf
At-Rest Lateral Earth Pressure Coefficient	0.5
Internal Friction Angle of Backfill	30°
Seismic Soil Site Class	D (IBC 2015)
Estimated Total Settlement	1-inch
Differential Settlement	½-inch

4.5 Foundation Drainage

We recommend an underdrain system be installed on the outside edge of perimeter footings. The underdrain pipe should consist of 4-inch diameter, perforated SDR-35 foundation drainpipe bedded in Crushed Stone and wrapped in non-woven geotextile fabric. The underdrain pipe must have a positive gravity outlet protected from freezing, clogging and backflow. Surface grades should be sloped away from the building for

positive surface water drainage. General underdrain details are illustrated on the "Foundation Detail Sketch" attached in Appendix B.

4.6 Slab-On-Grade

On-grade floor slabs in heated areas may be designed using a subgrade reaction modulus of 100 pci (pounds per cubic inch) provided the slab is underlain by at least 12 inches of compacted Structural Fill placed over properly prepared subgrades. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

We recommend a sub-slab vapor retarder particularly in areas of the building where the concrete slab will be covered with an impermeable surface treatment or floor covering that may be sensitive to moisture vapors. The vapor retarder must have a permeance that is less than the floor cover or surface treatment that is applied to the slab. The vapor retarder must have sufficient durability to withstand direct contact with the sub-slab base material and construction activity. The vapor retarder material should be placed according to the manufacturer's recommended method, including the taping and lapping of all joints and wall connections. The architect and/or flooring consultant should select the vapor retarder products compatible with flooring and adhesive materials.

The floor slab should be appropriately cured using moisture retention methods after casting. Typical floor slab curing methods should be used for at least 7 days. The architect or flooring consultant should assign curing methods consistent with current applicable American Concrete Institute (ACI) procedures with consideration of curing method compatibility to proposed surface treatments, flooring and adhesive materials.

4.7 Entrance Slabs and Sidewalks

Entrance slabs and sidewalks adjacent to the building must be designed to reduce the effects of differential frost action between adjacent pavement, doorways, and entrances. We recommend that non-frost susceptible Structural Fill be provided to a depth of at least 5 feet below the top of entrance slabs. This thickness of Structural Fill should extend the full width of the entrance slab and outward at least 5 feet, thereafter, transitioning up to the bottom of the adjacent sidewalk or pavement gravels at a 3H:1V or flatter slope. General details of this frost transition zone are shown on the "Foundation Detail Sketch" attached in Appendix B.

4.8 Fill, Backfill and Compaction

We recommend the following fill and backfill materials: recycled products must also be tested in accordance with applicable environmental regulations and approved by a qualified environmental consultant.

Granular Borrow: Fill to raise grades in building and paved areas, as well as to repair soft areas, should be sand or silty sand meeting the requirements of 2020 MaineDOT Standard Specification 703.19 Granular Borrow.

Structural Fill: Backfill for foundations, slab base material and material below exterior entrances slabs should be clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below:

Structural Fill	
Sieve Size	**Percent Finer by Weight**
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
No. 40	0 to 30
No. 200	0 to 6

Crushed Stone: Crushed Stone, used beneath foundations and for underdrain aggregate should be washed ¾-inch crushed stone meeting the requirements of 2020 MaineDOT Standard Specification 703.13 Crushed Stone ¾-Inch.

Reuse of Site Soils: Based on the completed laboratory testing, the existing granular fill soils appear suitable for reuse Granular Borrow provided they are at a compactable moisture content at the time of reuse.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in building and paved areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557. Crushed Stone should be compacted with 3 to 5 passes of a vibratory plate compactor having a static weight of at least 500 pounds.

4.9 Weather Considerations

Construction activity should be limited during wet and freezing weather and the site soils may require drying or thawing before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

4.10 Design Review and Construction Testing

S.W.COLE should be retained to review the construction documents prior to bidding to determine that our earthwork and foundation recommendations have been properly interpreted and implemented.

A construction material testing, and quality assurance program should be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to observe earthwork activities, the preparation of foundation bearing surfaces, as well as to provide testing and IBC Special Inspection services for soils, concrete, steel, spray-applied fireproofing, and asphalt construction materials.

5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

Sincerely,

S. W. Cole Engineering, Inc.

Digitally signed by Michael St. Pierre, P.E.
Date: 2022.02.10 15:40:20 -05'00'

STATE OF MAINE
MICHAEL ST. PIERRE
No. 12519
LICENSED PROFESSIONAL ENGINEER

Michael A. St. Pierre, P.E.
Senior Geotechnical Engineer

MAS:pfk

APPENDIX A

Limitations

This report has been prepared for the exclusive use of HNTB Corporation for specific application to the proposed 8-Bay Maintenance Garage at the Maine Turnpike Authority Litchfield Maintenance Yard in Litchfield, Maine. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

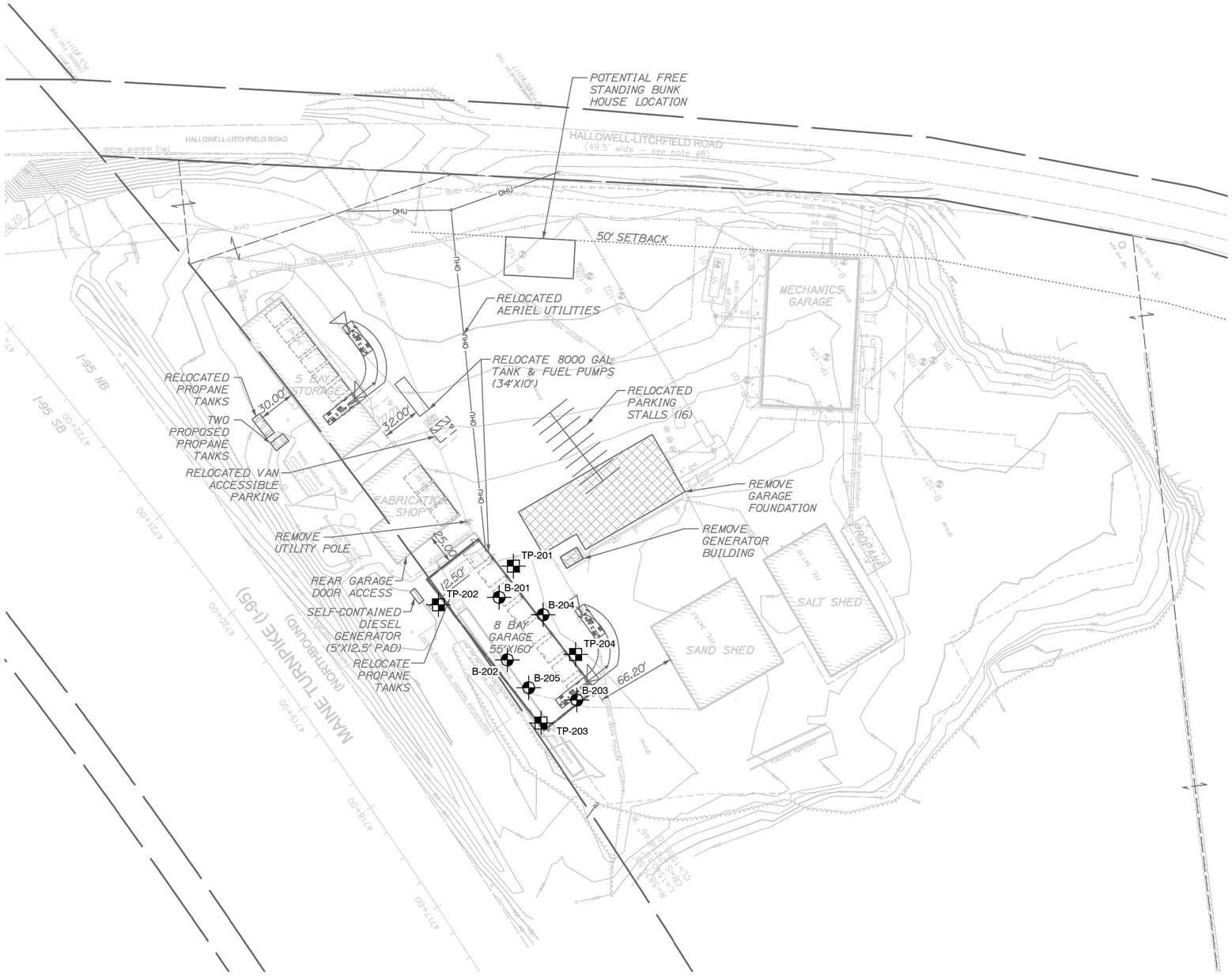
Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of services has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.

APPENDIX B

Figures



LEGEND:

- APPROXIMATE TEST PIT LOCATION
- APPROXIMATE BORING LOCATION

NOTES:

1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1"=50' SCALE PLAN OF THE SITE ENTITLED "LITCHFIELD MAINTENANCE YARD, SITE PLAN - ALT 1," PREPARED BY HNTB, DATED 12/23/2021 AND PROVIDED IN PORTABLE DOCUMENT FORMAT (PDF).
2. THE EXPLORATIONS WERE LOCATED IN THE FIELD BY TAPED MEASUREMENTS FROM EXISTING SITE FEATURES.
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S. W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
4. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.

0 50 100 Feet

NO.	DATE	DESCRIPTION	BY
1	02/09/2022	ADD BORINGS B-201 THROUGH B-205, FINAL REPORT SUBMITTAL	CEM
0	01/26/2022	DRAFT REPORT SUBMITTAL	CEM

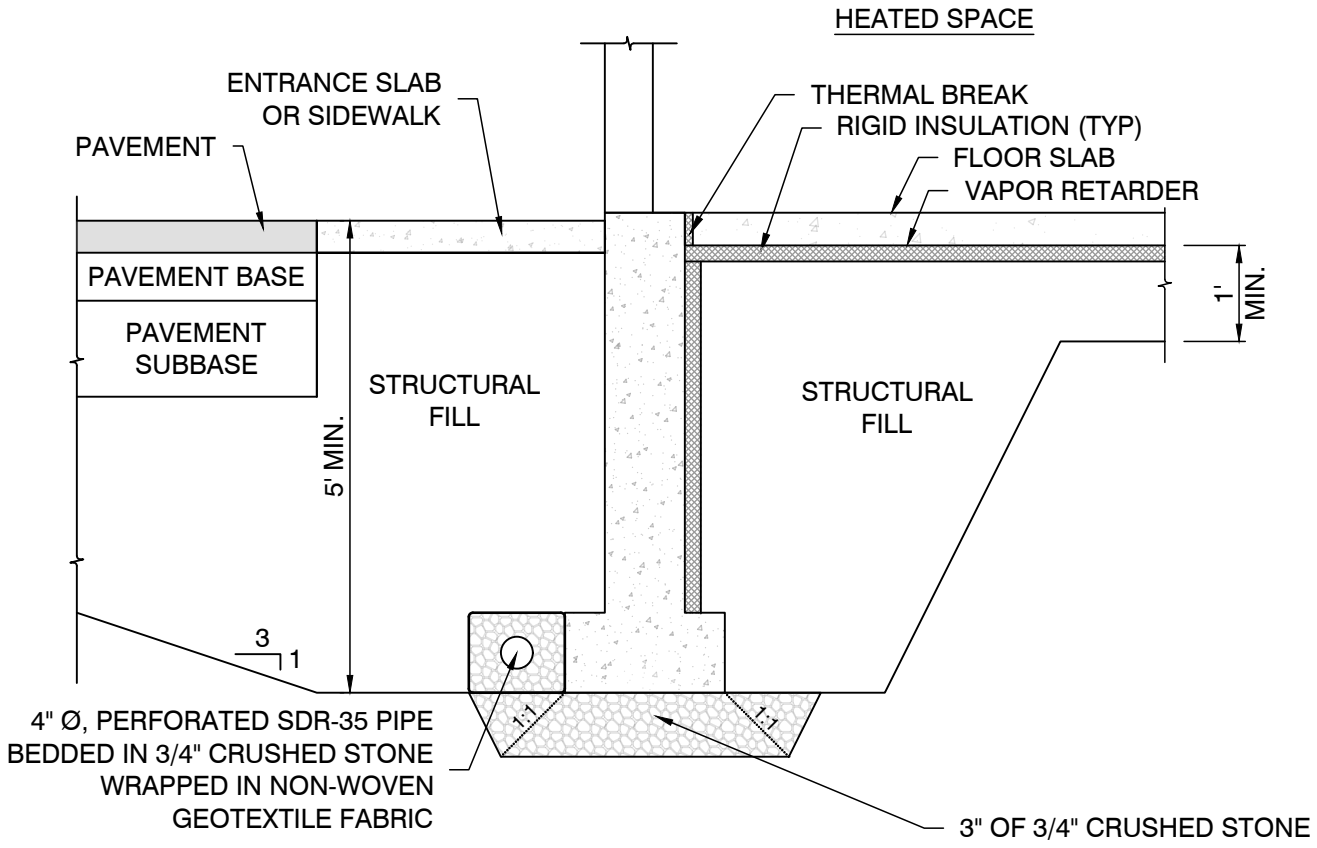
S.W.COLE ENGINEERING, INC.

HNTB, CORPORATION

EXPLORATION LOCATION PLAN

PROPOSED 8-BAY VEHICLE MAINTENANCE GARAGE
MAINE TURNPIKE AUTHORITY LITCHFIELD MAINTENANCE YARD
I-95 MILE MARKER 92.7
LITCHFIELD, MAINE

Job No.: 18-1562.1 Scale: 1" = 50'
Date : 01/21/2022 Sheet: 1



NOTE:

1. UNDERDRAIN INSTALLATION AND MATERIAL GRADATION RECOMMENDATIONS ARE CONTAINED WITHIN THIS REPORT.

2. DETAIL IS PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY, NOT FOR CONSTRUCTION.

S.W.COLE ENGINEERING, INC.

HNTB, CORPORATION

FOUNDATION DETAIL SKETCH

PROPOSED 8-BAY VEHICLE MAINTENANCE GARAGE
MAINE TURNPIKE AUTHORITY LITCHFIELD MAINTENANCE YARD
I-95 MILE MARKER 92.7
LITCHFIELD, MAINE

Job No.:	18-1562.1	Scale:	Not to Scale
Date :	01/21/2022	Sheet:	2

APPENDIX C

Exploration Logs and Key

BORING LOG

CLIENT: HNTB Corporation
PROJECT: Proposed 8-Bay Maintenance Garage
LOCATION: MTA Litchfield Maintenance Yard, Litchfield, Maine

BORING NO.: B-201
SHEET: 1 of 1
PROJECT NO. 18-1562.1
DATE START: 2/2/2022
DATE FINISH: 2/2/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** 349' Estimated | **TOTAL DEPTH (FT):** 17.0 | **LOGGED BY:** M. St. Pierre
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** K. Hanscom | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: 0.91 | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES: Frost to ±2 ft

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
										0.4 — 4.5" of Pavement		
			1D		2-4	24/20	11-5-4-6			Medium dense, brown, frozen to moist, Gravelly Silty SAND, (FILL)		
										3.0 — Medium dense, brown, moist, Silty SAND, some gravel (GLACIAL TILL)		
345	5		2D		5-7	24/24	10-10-11-12					
340	10		3D		10-12	24/24	12-20-29-24			Dense to very dense, brown, moist to wet, Gravelly Silty SAND (GLACIAL TILL)		
335	15		4D		15-17	24/24	24-27-30-31			Very dense, gray, wet, Gravelly Silty SAND (GLACIAL TILL)		
										Bottom of Exploration at 17.0 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: HNTB Corporation
PROJECT: Proposed 8-Bay Maintenance Garage
LOCATION: MTA Litchfield Maintenance Yard, Litchfield, Maine

BORING NO.: B-202
SHEET: 1 of 1
PROJECT NO. 18-1562.1
DATE START: 2/2/2022
DATE FINISH: 2/2/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** 349' Estimated | **TOTAL DEPTH (FT):** 17.0 | **LOGGED BY:** M. St. Pierre
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** K. Hanscom | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: 0.91 | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES: Frost to ±1.5 ft

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
										0.4 — 4.5" of Pavement		
			1D		2-4	24/24	8-2-2-3			Medium dense, brown, frozen to moist, Gravelly Silty SAND, (FILL)		
										2.8		
345										3.2 — Loose, dark brown, moist to wet, SILT and SAND, trace organics (rootlets)		
	5		2D		4-6	24/24	6-3-4-4			Medium dense, gray-brown, moist, Silty SAND, some gravel (GLACIAL TILL)		
340												
	10		3D		10-12	24/24	11-17-19-20			Dense, brown, moist to wet, Gravelly Silty SAND (GLACIAL TILL)		
335												
	15		4D		15-17	24/24	13-18-22-25					

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: HNTB Corporation
PROJECT: Proposed 8-Bay Maintenance Garage
LOCATION: MTA Litchfield Maintenance Yard, Litchfield, Maine

BORING NO.: B-203
SHEET: 1 of 1
PROJECT NO. 18-1562.1
DATE START: 2/2/2022
DATE FINISH: 2/2/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** 349' Estimated | **TOTAL DEPTH (FT):** 22.0 | **LOGGED BY:** M. St. Pierre
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** K. Hanscom | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: 0.91 | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES: Frost to ±1.1 ft

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
										0.4 4.5" of Pavement		
			1D		1-2.8	21/21	42-58-38-20/3"			Medium dense, brown, frozen to moist, Gravelly Silty SAND, (FILL)		
			2D		3-5	24/24	2-3-4-5			3.2 Medium dense, brown, moist, Silty SAND, some gravel (GLACIAL TILL)		
345	5		3D		5-7	24/24	4-6-7-7					
340	10		4D		10-10.7	8/8	13-50/2"			Dense to very dense, brown, moist to wet, Gravelly Silty SAND, occasional cobbles (GLACIAL TILL)		Sampler refusal on cobble
										Frequent cobbles from ±11 to 14.5 feet		
335	15		5D		15-17	24/24	17-21-26-31			Dense to very dense, gray, wet, Gravelly Silty SAND (GLACIAL TILL)		
330	20		6D		20-22	24/24	11-19-23-26					

Bottom of Exploration at 22.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: HNTB Corporation
PROJECT: Proposed 8-Bay Maintenance Garage
LOCATION: MTA Litchfield Maintenance Yard, Litchfield, Maine

BORING NO.: B-204
SHEET: 1 of 1
PROJECT NO. 18-1562.1
DATE START: 2/2/2022
DATE FINISH: 2/2/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** 349' Estimated | **TOTAL DEPTH (FT):** 22.0 | **LOGGED BY:** M. St. Pierre
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** K. Hanscom | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:** N/A
HAMMER EFFICIENCY FACTOR: 0.91 | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES: Frost to ±1.6 ft

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
										0.5 — 5.5" of Pavement		
			1D		1-1.8	9/8	46-50/3"			Medium dense, brown, frozen to moist, Gravelly Silty SAND, (FILL)		
			2D		3-5	24/24	3-3-4-4					
345										3.8 — Medium dense, brown, moist, Silty SAND, some gravel (GLACIAL TILL)		
	5		3D		5-7	24/22	6-8-6-11					
340												
	10		4D		10-12	24/24	11-18-37-31			Very dense, brown, moist to wet, Gravelly Silty SAND (GLACIAL TILL)		
335												
	15		5D		15-17	24/24	12-18-22-27			Dense, gray, wet, Gravelly Silty SAND (GLACIAL TILL)		
330												
	20		6D		20-22	24/24	8-14-14-16					

Bottom of Exploration at 22.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: HNTB Corporation
PROJECT: Proposed 8-Bay Maintenance Garage
LOCATION: MTA Litchfield Maintenance Yard, Litchfield, Maine

BORING NO.: B-205
SHEET: 1 of 1
PROJECT NO. 18-1562.1
DATE START: 2/2/2022
DATE FINISH: 2/2/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT): 349' Estimated
TOTAL DEPTH (FT): 6.0
LOGGED BY: M. St. Pierre
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: K. Hanscom
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL: N/A
HAMMER EFFICIENCY FACTOR: 0.91
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free water observed
GENERAL NOTES: Frost to ±2 ft

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
										0.4 — 4.25" of Pavement		
			1D		2-4	24/6	7-4-3-6			Medium dense, brown, frozen to moist, Gravelly Silty SAND, (FILL)		
										2.5		
345										3.0 — Loose to medium dense, dark brown, moist to wet, SILT and SAND, trace organics (rootlets)		
			2D		4-6	24/24	4-5-5-6			Medium dense, brown, moist, Silty SAND, some gravel (GLACIAL TILL)		
	5											

Bottom of Exploration at 6.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

TEST PIT LOGS

CLIENT: HNTB Corporation
PROJECT: Proposed 8-Bay Maintenance Garage
LOCATION: MTA Litchfield Maintenance Yard, Litchfield, Maine

PROJECT NO.: 18-1562.1
LOGGED BY: M. St. Pierre
CONTRACTOR: Maine Turnpike Authority
EQUIPMENT: Bobcat E85

TEST PIT TP-201

DATE: 1/13/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 349' Estimated **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL DEPTHS (FT): Light seepage at ±6 ft **REMARKS:** Frost to ±1.8 ft

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		0.4 4.5" of Pavement					
		Brown, frozen to moist, Gravelly Silty SAND, (FILL)					
		2.9 Brown, moist to wet, Silty SAND, some gravel (GLACIAL TILL)					
5			▽ 6	S-1		6.5-7	ID 13731A w =13.5 %
		Bottom of Exploration at 7.0 feet					

TEST PIT TP-202

DATE: 1/13/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 350' Estimated **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL DEPTHS (FT): No water seepage observed **REMARKS:** Frost to ±1.2 ft

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		0.2 Topsoil					
		Brown, frozen to moist, Gravelly Silty SAND, occasional cobbles (FILL)					
		1.4 Brown, moist to wet, Silty SAND, some gravel, occasional cobbles (GLACIAL TILL)					
5							
		Bottom of Exploration at 7.0 feet					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT 18-1562.1.GPJ SWCE TEMPLATE.GDT 2/10/22

TEST PIT LOGS

CLIENT: HNTB Corporation
PROJECT: Proposed 8-Bay Maintenance Garage
LOCATION: MTA Litchfield Maintenance Yard, Litchfield, Maine

PROJECT NO.: 18-1562.1
LOGGED BY: M. St. Pierre
CONTRACTOR: Maine Turnpike Authority
EQUIPMENT: Bobcat E85

TEST PIT TP-203

DATE: 1/13/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 349' Estimated **COMPLETION DEPTH (FT):** 7.5
WATER LEVEL DEPTHS (FT): No water seepage observed **REMARKS:** Frost to ±0.8 ft

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Brown, frozen to moist, Gravelly Silty SAND, occasional cobbles (FILL)		S-1		2-2.5	ID 13732A w =10.7 %
		2.6 / 3.0 Dark brown, moist, Sandy SILT, with organics (probable relic ground surface)					
5		Brown, moist to wet, Silty SAND, some gravel, occasional cobbles (GLACIAL TILL)					

Bottom of Exploration at 7.5 feet

TEST PIT TP-204

DATE: 1/13/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** 349' Estimated **COMPLETION DEPTH (FT):** 6.5
WATER LEVEL DEPTHS (FT): No water seepage observed **REMARKS:** Frost to ±1.7 ft

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		5" of Pavement					
		0.4 Brown, frozen to moist, Gravelly Silty SAND, (FILL)					
		3.6 / 3.8 Dark brown, moist, Silty SAND, trace organics (rootlets, probable relic grubbed ground surface)					
5		Brown, moist to wet, Silty SAND, some gravel (GLACIAL TILL)					

Bottom of Exploration at 6.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

KEY TO NOTES & SYMBOLS
Test Boring and Test Pit Explorations

Stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q_u	-	unconfined compressive strength, kips/sq. ft. - laboratory test
S_v	-	field vane shear strength, kips/sq. ft.
L_v	-	lab vane shear strength, kips/sq. ft.
q_p	-	unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W_L	-	liquid limit - Atterberg test
W_P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight

Description of Proportions:

Trace:	0 to 5%
Some:	5 to 12%
"Y"	12 to 35%
And	35+%
With	Undifferentiated

Description of Stratified Soils

Parting:	0 to 1/16" thickness
Seam:	1/16" to 1/2" thickness
Layer:	½" to 12" thickness
Varved:	Alternating seams or layers
Occasional:	one or less per foot of thickness
Frequent:	more than one per foot of thickness

REFUSAL: **Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: **Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

APPENDIX D

Laboratory Test Results

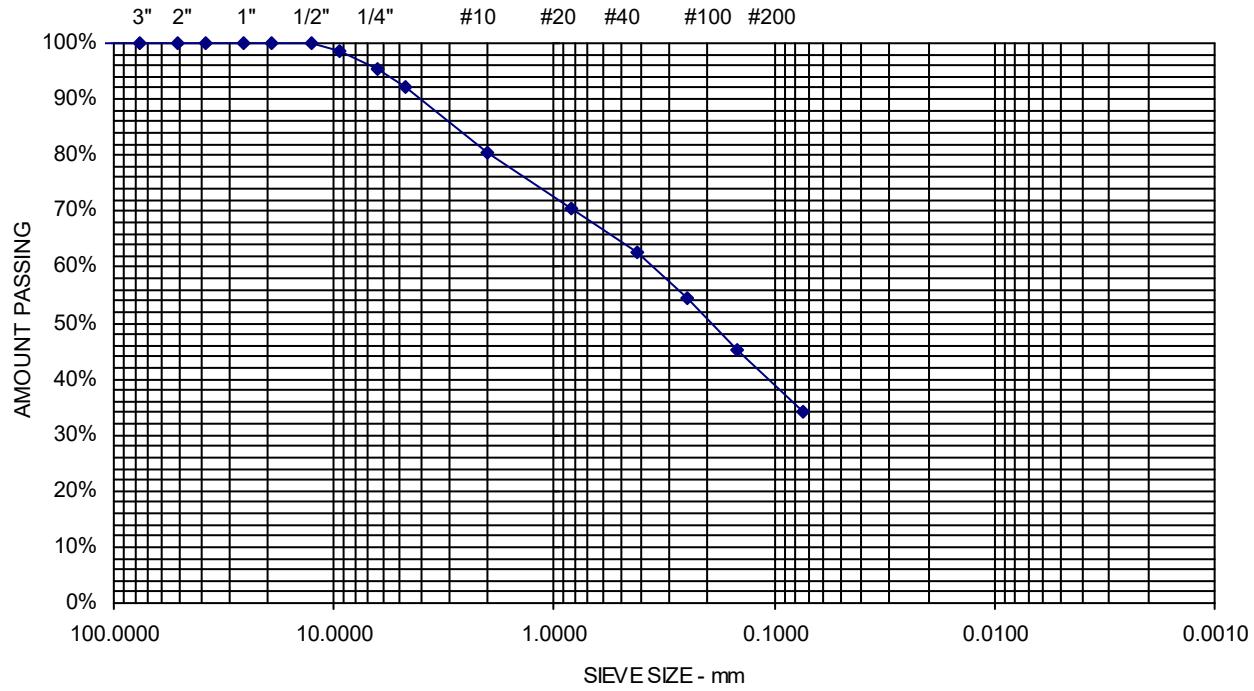
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	LITCHFIELD ME - PROPOSED MTA MAINTENANCE GARAGE - EXPLORATIONS AND GEOTECHNICAL ENGINEERING SERVICES	Project Number	18-1562.1
Client	HNTB CORPORATION	Lab ID	13731A
Exploration	**TP-201**	Date Received	1/14/2022
Material Source	**S-1, 6.5 FT**	Date Completed	1/19/2022
		Tested By	ERNEST FORGIONE JR

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**100**	
9.5 mm	**3/8"**	**99**	
6.3 mm	**1/4"**	**95**	
4.75 mm	**No. 4**	**92**	7.7% Gravel
2.00 mm	**No. 10**	**81**	
850 um	**No. 20**	**70**	
425 um	**No. 40**	**63**	58.2% Sand
250 um	**No. 60**	**54**	
150 um	**No. 100**	**45**	
75 um	**No. 200**	**34.1**	34.1% Fines



Comments: As Delivered MC: 13.5%

Sheet

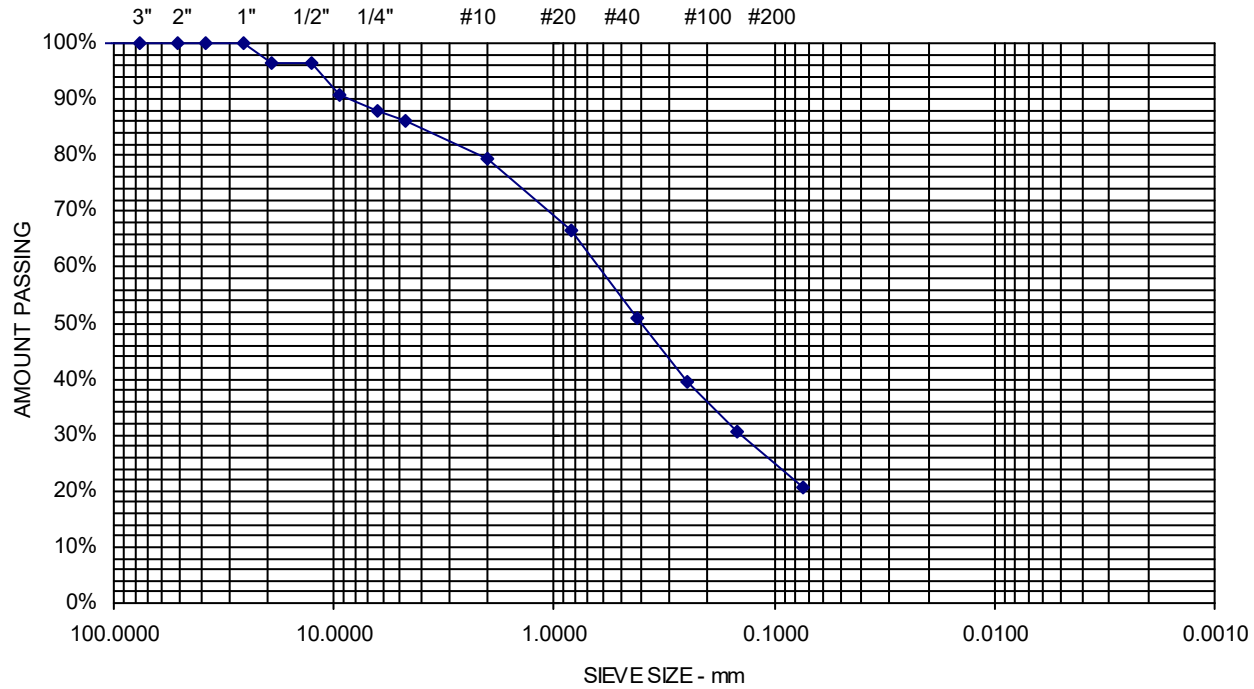
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	LITCHFIELD ME - PROPOSED MTA MAINTENANCE GARAGE - EXPLORATIONS AND GEOTECHNICAL ENGINEERING SERVICES	Project Number	18-1562.1
Client	HNTB CORPORATION	Lab ID	13732A
Exploration	**TP-203**	Date Received	1/14/2022
Material Source	**S-1, 2.0 FT**	Date Completed	1/19/2022
		Tested By	ERNEST FORGIONE JR

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**96**	
12.5 mm	**1/2"**	**96**	
9.5 mm	**3/8"**	**91**	
6.3 mm	**1/4"**	**88**	
4.75 mm	**No. 4**	**86**	13.8% Gravel
2.00 mm	**No. 10**	**79**	
850 um	**No. 20**	**67**	
425 um	**No. 40**	**51**	65.6% Sand
250 um	**No. 60**	**39**	
150 um	**No. 100**	**31**	
75 um	**No. 200**	**20.7**	20.7% Fines



Comments: As Delivered MC: 10.7%

Sheet